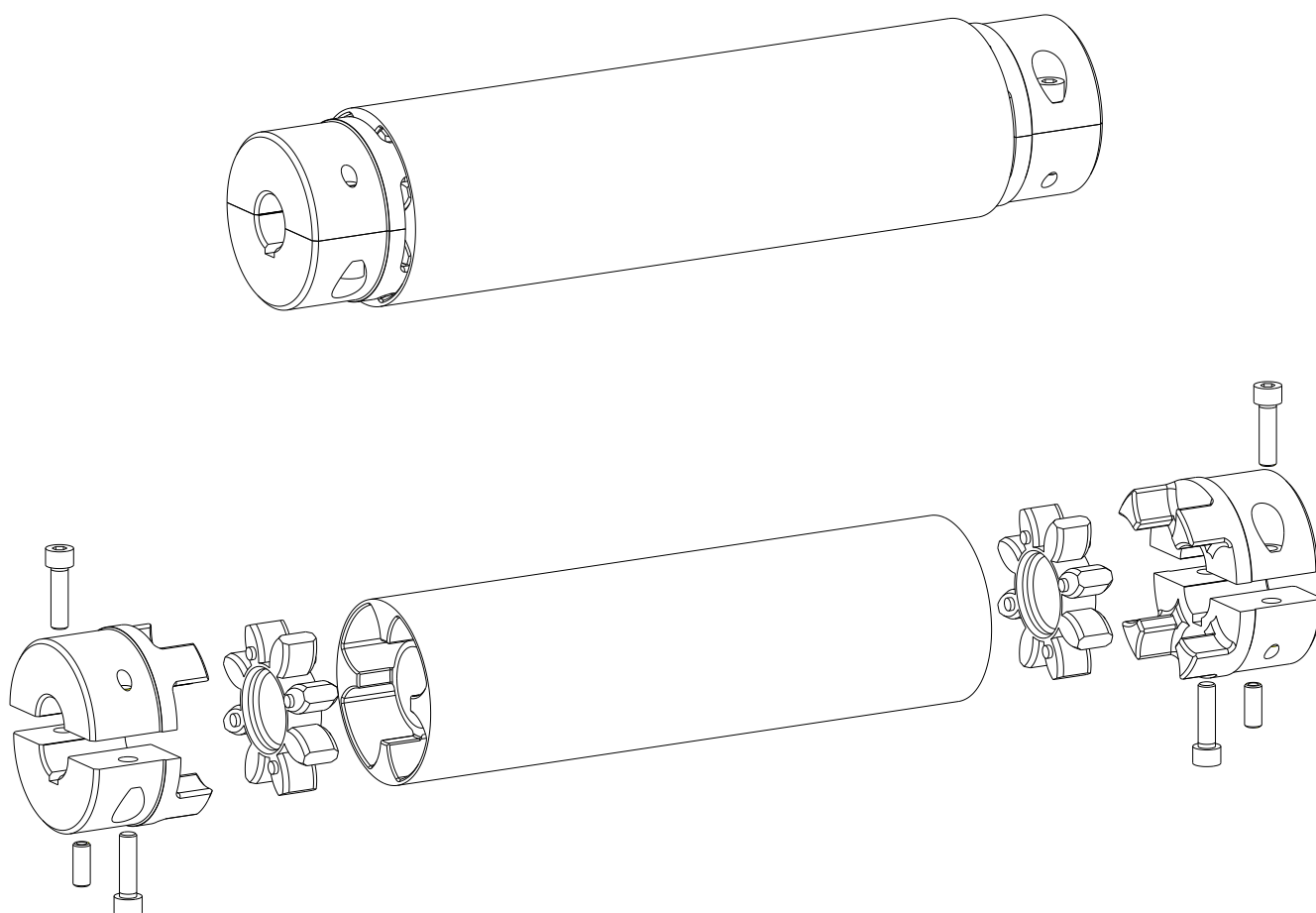




ROTEX®

Torsionally flexible jaw couplings type ZRS
and their combinations



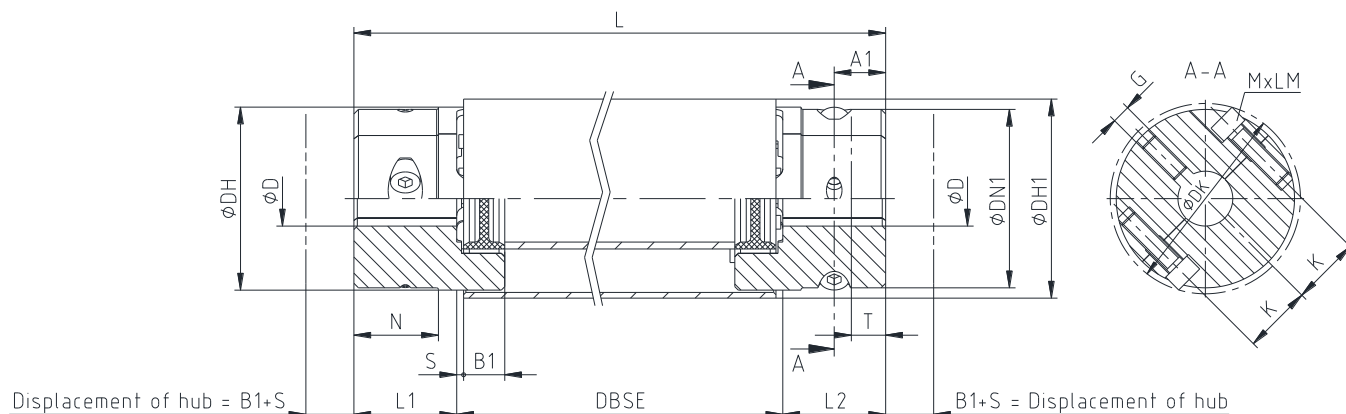
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ROTEX® is a torsionally flexible jaw coupling. It is able to compensate for shaft misalignment, for example caused by manufacturing inaccuracies, thermal expansion, etc.
The double-cardanic design of the coupling allows to compensate for higher radial displacements.
For vertical assembly of type ZRS it is necessary to use an extraction washer in the cam ground of the bottom hub.

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1 Technical data

Illustration 1: Type ZRS (with ROTEX® GS spider)
Table 1: Dimensions

Size	Dimensions ¹⁾ in mm														Cap screws DIN EN ISO 4762	
	Max. finish bore D ²⁾	L	L1, L2	B1	S	Min. DBSE ⁴⁾	DH	DH1	DN1	DK	N	K	A1	MxLM	T _A in Nm	
19	25	³⁾	25	12	2.0	33	40	54	-	46	-	14.5	8	M6x16	14	
24	35	L = DBSE + L1 + L2	30	14	2.0	37	55	60	-	57.5	-	20	15	M6x20	14	
28	40		35	15	2.5	40	65	72	-	73	-	25	17.5	M8x25	34	
38	48		45	18	3.0	49	80	87	78	83.5	37	30	22.5	M8x30	34	
42	55		50	20	3.0	53	95	103	94	97	40	30	25	M10x35	67	

1) For dimensions G and T see table 4; there is a setscrew on the keyway

2) Bores H7 with keyway to DIN 6885 sheet 1 [JS9] and setscrew

3) $L = DBSE + L1 + L2 - 15$

4) max. 3000 mm (different lengths on request)

Table 2: Technical data

Size	Spider ⁵⁾ (component 2) rated torque in Nm			Torsion spring stiffness C of intermediate pipe ⁶⁾ in Nm/rad
	92 ShA	98 ShA	64 ShD	
19	10	17	21	3800
24	35	60	75	11100
28	95	160	200	23600
38	190	325	405	43800
42	265	450	560	82600

5) Maximum torque of coupling $T_{K \max.}$ = rated torque of coupling $T_{KN} \times 2$

6) Torsion spring stiffness with 1 m length of the intermediate pipe

2 Advice

2.1 General advice

Read carefully through these operating/assembly instructions before you start up the coupling.

Pay special attention to the safety instructions!

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. 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".
- 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.
- Secure the coupling against accidental contact. 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
- are technically qualified and specifically trained (e. g. safety, environment, logistics)
- 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®** described in here corresponds to the state of the art at the time of printing of these operating/assembly instructions.

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2 Advice

2.5 Coupling selection



For a permanent and failure-free operation of the coupling it must be selected according to the selection instructions (according to DIN 740 part 2) for the particular application (see catalogue drive technology "ROTEX®").

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

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 subjected 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 subjected 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.

2.6 Reference to EC Machinery Directive 2006/42/EG

The couplings supplied by KTR should be considered as components, not machines or partly completed machines according to EC Machinery Directive 2006/42/EC. Consequently KTR does not have to issue a declaration of incorporation. For details about safe assembly, start-up and safe operation refer to the present operating/assembly instructions considering the warnings.

3 Storage, transport and packaging

3.1 Storage

The coupling hubs are supplied in preserved condition and can be stored in 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.

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 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.

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4 Assembly

The coupling is generally supplied in individual parts. Before assembly the coupling must be inspected for completeness.

4.1 Components of the coupling

Components of ROTEX® type ZRS

Component	Quantity	Description
1	2	SPLIT hub
2	2	Spider
3	1	ZRS intermediate pipe
4	4	Cap screw DIN EN ISO 4762
5	2	Setscrews DIN EN ISO 4029

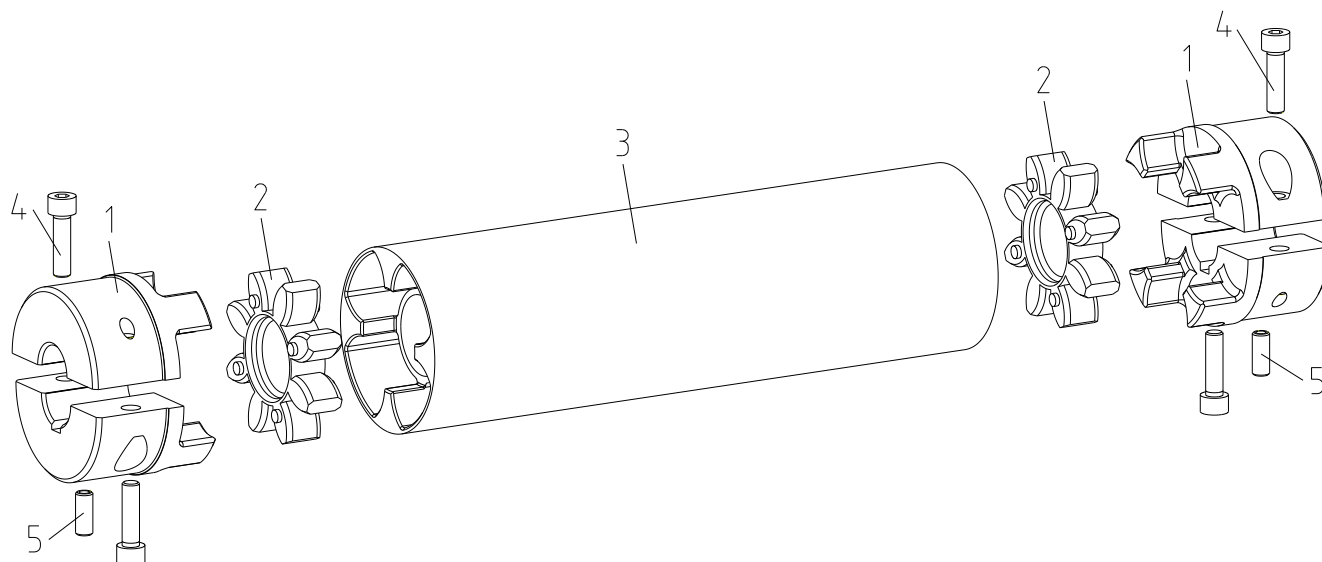


Illustration 2: ROTEX® type ZRS

Features of standard spiders

Spider hardness (Shore)	92 ShA-GS	98 ShA-GS	64 ShD-H-GS	64 ShD-GS
Size	19 - 42	19 - 42	19 - 38	42
Material	Polyurethane	Polyurethane	Hytrel®	Polyurethane
Marking (colour)				



4 Assembly

4.2 Advice for finish bore



The maximum permissible bore diameters D (see table 1 in chapter 1 - technical data) must not be exceeded. If these figures are disregarded, the coupling may tear. Rotating particles may cause danger to life.

- Hub bores machined by the customer have to observe concentricity resp. axial runout (see illustration 3).
- Make absolutely sure to observe the figures for $\varnothing D$.
- Carefully align the hubs when the finish bores are drilled.
- Provide for a setscrew according to DIN EN ISO 4029 with a cup point or an end plate to fasten the hubs axially.

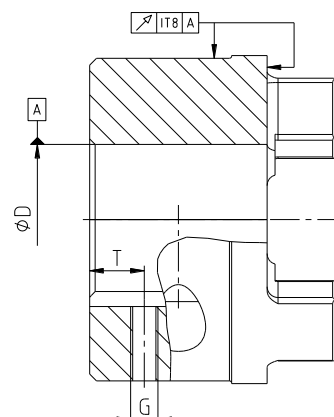


Illustration 3: Concentricity and axial runout

Table 3: Machining specifications of intermediate pipe

Size	Dimensions in mm			
	DH1	DI3	LI3	Total length of intermediate pipe L11
19	45	24 ± 0.2	12 ± 0.2	± 0.5
24	60	35 ± 0.3	14 ± 0.2	
28	72	39 ± 0.3	15 ± 0.2	
38	87	48 ± 0.3	18 ± 0.2	
42	103	57 ± 0.3	20 ± 0.2	

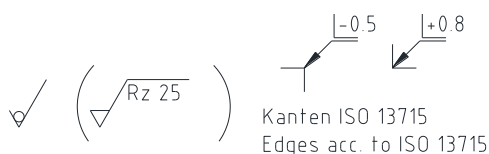


Illustration 4: Intermediate pipe



The customer bears the sole responsibility for all machining processes performed subsequently on unbored or pilot bored as well as finish machined coupling components and spare parts. KTR does not assume any warranty claims resulting from insufficient remachining.

Table 4: Setscrew DIN EN ISO 4029

Size	19	24	28	38	42
Dimension G in mm	M5	M5	M8	M8	M8
Dimension T in mm	10	10	15	15	20
Tightening torque T_A in Nm	2	2	10	10	10

Table 5: Recommended fit pairs acc. to DIN 748/1

Bore in mm		Shaft tolerance	Bore tolerance
above	up to		
	50	k6	H7 (KTR standard)
50		m6	

If a feather keyway is intended to be used in the hub, it should correspond to the tolerance ISO JS9 (KTR standard) with normal operating conditions or ISO P9 with sophisticated operating conditions (frequently alternating torsional direction, shock loads, etc.). The keyway should preferably be located between the cams. With axial fastening via setscrew the tapped hole should be positioned on the keyway except for AI-D which should be positioned opposite the keyway.

The transmittable torque of the shaft-hub-connection must be reviewed by the customer and is subject to his responsibility.

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4 Assembly

4.3 Assembly of the coupling (general)



We recommend to inspect bores, shaft, keyway and feather key for dimensional accuracy before assembly.



The cracked surfaces of the ROTEX® SH SPLIT hub halves must be inspected for cleanliness before assembly!

If necessary, clean the cracked surfaces of the EN-GJL hubs with a wire brush to ensure an optimal fit.



When disassembling the ROTEX® SH SPLIT EN-GJL hubs, small casting particles may come loose from the cracked surface, yet the function is not affected.



With the assembly make sure that the distance dimension DBSE or S (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.

4.4 Assembly of the coupling (axial assembly)

- Unscrew the cap screws (component 4) in the SPLIT hubs (component 1) by 2 - 3 pitches.
- Push the SPLIT hubs on the shaft of the driving and driven side until the hub surfaces on the face are flush with the shaft ends (see illustration 5).
- Hand-tighten the cap screws.
- Insert the spiders (component 2) in the cam section of the driving and driven side (see illustration 6).
- Insert the ZRS intermediate pipe (component 3) between the SPLIT hubs of the driving and driven side (see illustration 6).
- Shift the power packs in axial direction until the distance dimension DBSE is achieved (see illustration 1).
- If the power packs are already firmly assembled, shifting the SPLIT hubs axially on the shafts allows for setting the distance dimension DBSE.
- Tighten the cap screws of the SPLIT hubs reciprocally by means of a suitable torque key to the tightening torques T_A specified in table 1.
- Fasten the SPLIT hubs by tightening the setscrews DIN EN ISO 4029 with a cup point (tightening torque see table 1).

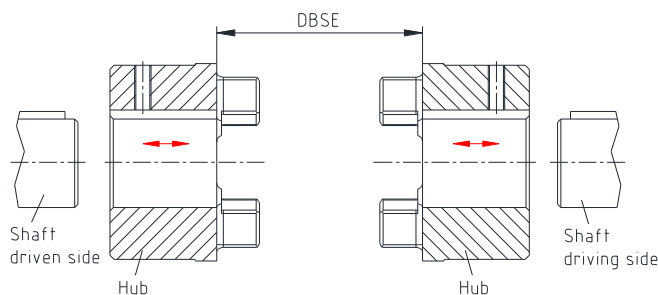


Illustration 5: Assembly of the SPLIT hubs

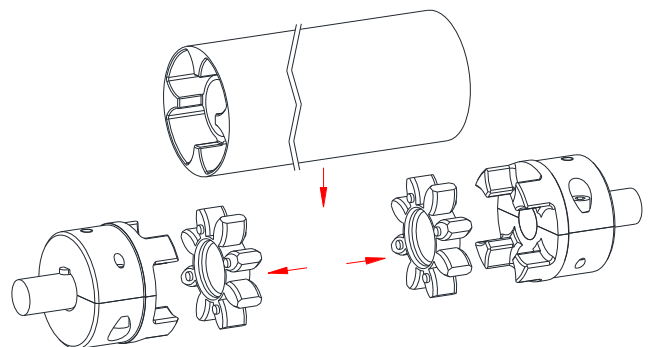


Illustration 6: Assembly of spiders and ZRS intermediate pipe



With vertical assembly of ROTEX® type ZRS, a special distance washer of KTR must be inserted between the coupling hub at the bottom and the spider at the bottom.

**4 Assembly****4.5 Assembly of the coupling (radial assembly)**

- Unscrew and remove the cap screws (component 4) from the SPLIT hubs (component 1) (see illustration 7). If the half shells cannot be separated, the separation process should be initiated via a suitable tool (mounting hammer).
- Position the upper half shell of the first SPLIT hub with the inserted cap screw on the shaft (see illustration 8).
- Align the lower half shell of the first SPLIT hub with the upper half shell under the shaft (see illustration 9). Screw in the cap screws over several pitches.
- Align the upper and lower half shell based on the outer shape so that the crack surfaces fit exactly.



Please note that the half shell pairs of the two SPLIT hubs must not be interchanged, since the crack surfaces of the respective hubs fit exactly with each other only.

- Hand-tighten the cap screws.
- Repeat the assembly of the first SPLIT hub described in here with the second SPLIT hub.
- Insert the spiders (component 2) in the cam section of the driving and driven side (see illustration 6).
- Insert the ZRS intermediate pipe (component 3) between the SPLIT hubs of the driving and driven side (see illustration 6).
- Shift the power packs in axial direction until the distance dimension DBSE is achieved (see illustration 1).
- If the power packs are already firmly assembled, shifting the SPLIT hubs axially on the shafts allows for setting the distance dimension DBSE.
- Tighten the cap screws of the SPLIT hubs reciprocally by means of a suitable torque key to the tightening torques T_A specified in table 1.
- Fasten the SPLIT hubs by tightening the setscrews DIN EN ISO 4029 with a cup point (tightening torque see table 1).

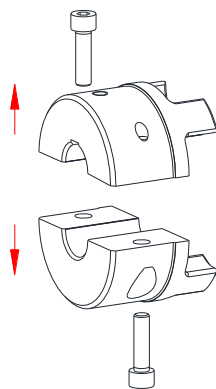


Illustration 7

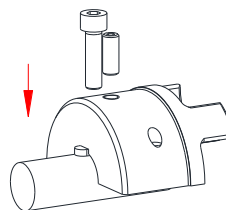


Illustration 8

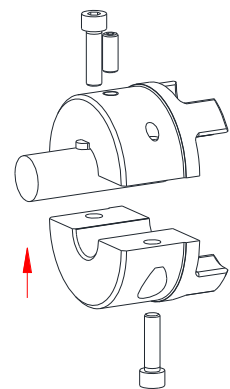


Illustration 9



With vertical assembly of ROTEX® type ZRS, a special distance washer of KTR must be inserted between the coupling hub at the bottom and the spider at the bottom.



4 Assembly

4.6 Displacements - alignment of the couplings

The displacement figures specified in table 6 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 must be accurately aligned. Absolutely observe the displacement figures specified (see table 6). 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 6 are maximum figures which must not arise in parallel. If radial and angular displacements arise simultaneously, the permissible displacement figures may only be used proportionally (see illustration 11).
- Inspect with a dial gauge, ruler or feeler gauge whether the permissible displacement figures specified in table 6 can be observed.

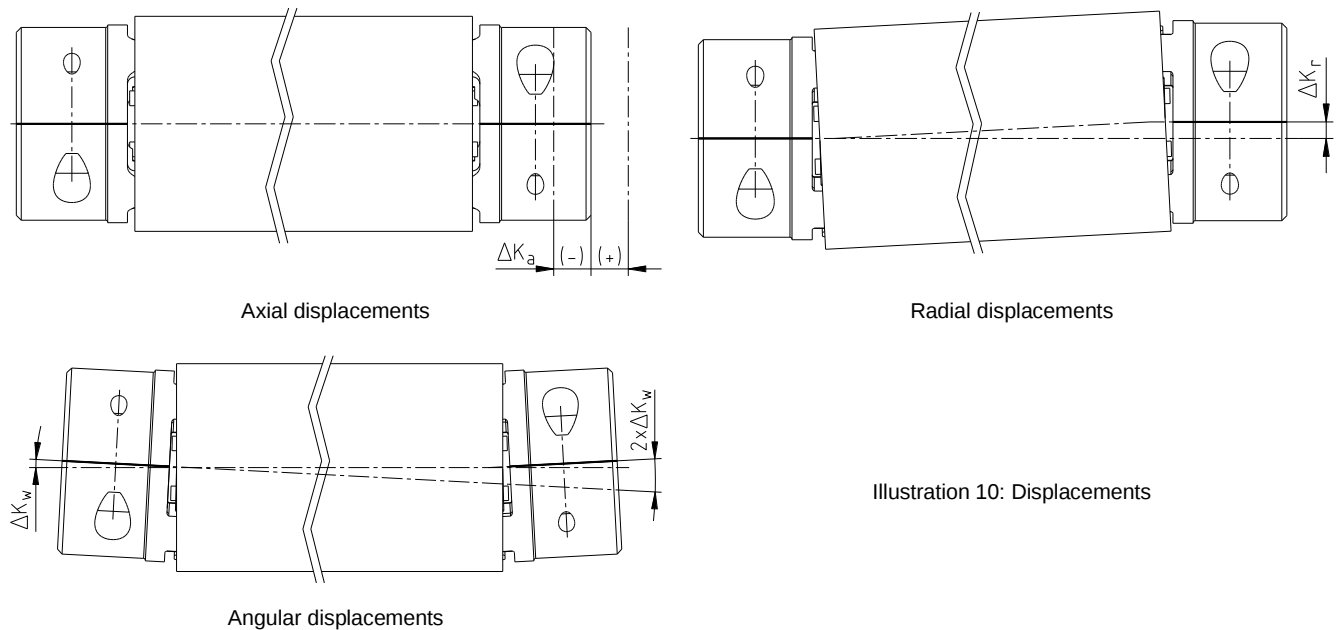
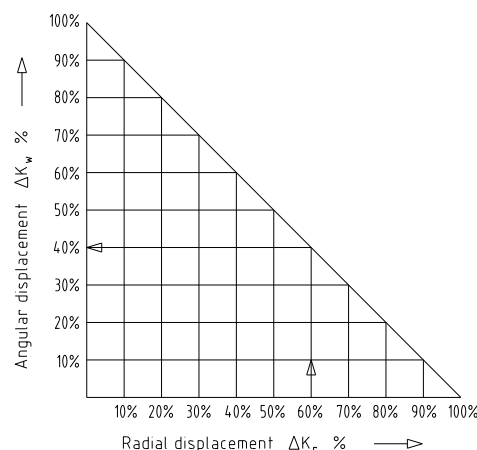


Illustration 10: Displacements



Example:

ROTEX® 24 ZRS,
Speed 1500 rpm,
Coupling length L = 651 mm
Max. radial displacement $\Delta K_r = 10$ mm
Max. angular displacement $\Delta K_w = 1^\circ$

with radial displacement of 4 mm = 40 % of the max.
radial displacement 10 mm,

results in a permissible angular displacement of 60 %
of the max. angular displacement $1^\circ = 0.6^\circ$

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



4 Assembly

4.6 Displacements - alignment of the couplings

Table 6: Displacement figures

Size	Max. axial displacement ΔK_a in mm	Max. radial displacement ΔK_r in mm	Max. angular displacement ΔK_w in degree with n=	
			1500 rpm	3000 rpm
19	1.2	1) Calculate the distance from the centre of one spider to the centre of the other spider LZK (see illustration 1 and 2) $E1 = L - L1 - L2 - E$ 2) Calculate the maximum radial displacement ΔK_r (see illustration 12) $\Delta K_r = \tan \Delta K_w \times E1$	1.0	0.75
24	1.4			
28	1.5			
38	1.8			
42	2.0			

4.7 Critical bending speed

Please observe the critical bending speed of the coupling.

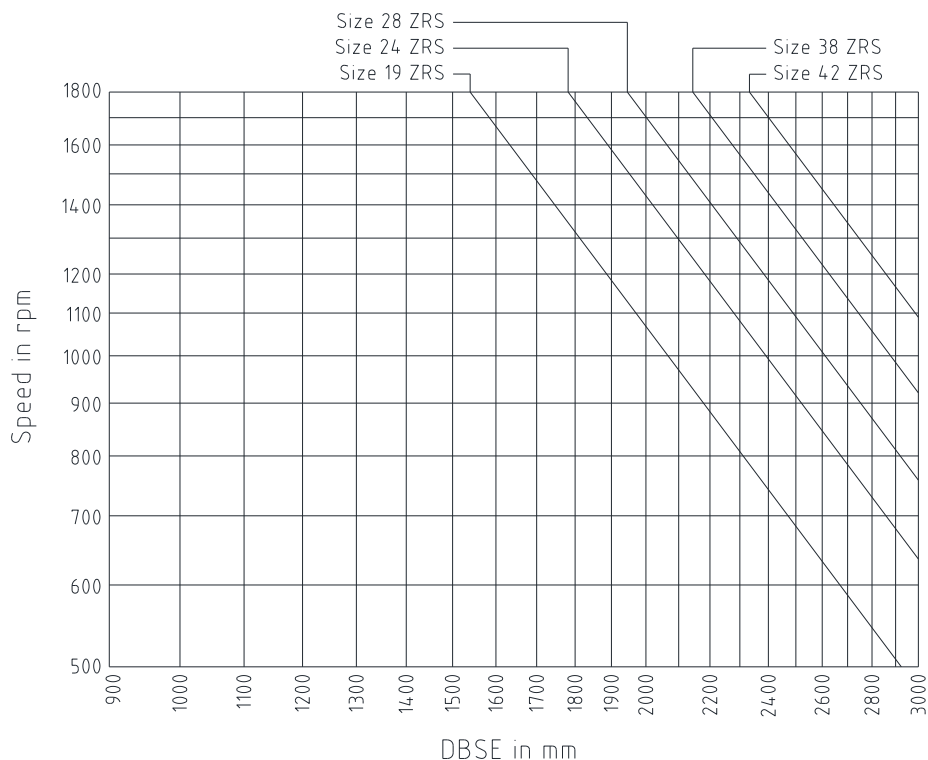


Illustration 12: Critical bending speed of type ZRS



4 Assembly

4.8 Verifying for concentricity deviations



Transportation and/or improper handling may affect straightness of the intermediate pipe. That is why testing before commissioning is compulsory to prevent consequential damages on the coupling and/or adjacent components.

To verify concentricity deviations with intermediate pipes, we recommend the following procedure:

- Mount the intermediate pipe completely without starting it up.
- The concentricity test can be made by rotating the shaft manually while simultaneously monitoring with a dial gauge.
- The dial gauge is positioned at several points along the intermediate pipe (ideally in the centre and close to the coupling hubs) (see illustration 13).
- The permissible concentricity must not exceed 0.2 mm.

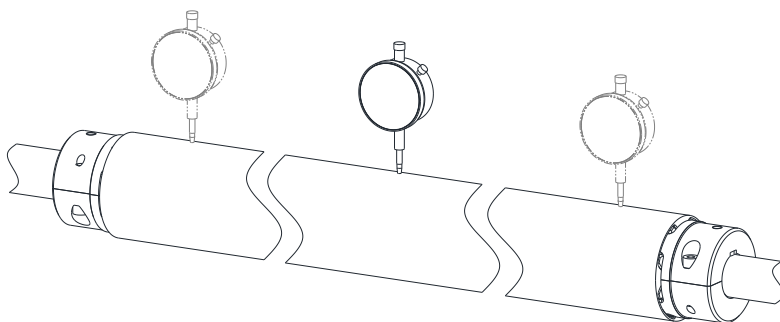


Illustration 13

5 Start-up

Before start-up of the coupling, inspect the tightening of the setscrews in the hubs, the alignment and the distance dimension DBSE and adjust, if necessary, and also inspect all screw connections for the tightening torques specified.

Finally the coupling protection against accidental contact must be fitted. It is required in accordance with DIN EN ISO 12100 (Safety of Machinery) and directive 2014/14/EU and must protect against

- access with a little finger
- falling down of solid foreign objects.

The cover may provide for openings intended for necessary heat dissipation. These openings have to comply with DIN EN ISO 13857.

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, pay attention to

- different operating noise
- vibrations occurring.



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®** coupling other than intended. In addition to the specifications given in these operating/assembly instructions 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 improper use:

- Important data for the coupling selection were not forwarded.
- The calculation of the shaft-hub-connection was disregarded.
- Coupling components with damage occurred during transport are assembled.
- If the heated hubs are assembled, the permissible temperature is exceeded.
- The clearance of the components to be assembled is not coordinated with one another.
- Tightening torques are 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.

Breakdowns	Causes	Elimination
Different operating noise and/or vibrations occurring	Misalignment	1) Set the unit out of operation 2) Eliminate the reason for the misalignment (e. g. loose foundation bolts, fracture 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 residues of the spider 3) Inspect coupling components and replace coupling components that have been 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
Fracture 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
	Fracture 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

6 Breakdowns, causes and elimination

Early wear of spider	Misalignment	1) Set the unit out of operation 2) Eliminate the reason for the misalignment (e. g. loose foundation bolts, fracture 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
	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 residues of the spider 3) Inspect coupling components and replace coupling components that have been 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
	Impermissibly high ambient/contact temperatures for the spider, max. permissible e. g. with T-PUR® -50 °C/+120 °C	1) Set the unit out of operation 2) Disassemble the coupling and remove residues of the spider 3) Inspect coupling components and replace coupling components that have been damaged 4) Insert spider, assemble coupling components 5) Inspect alignment, adjust if necessary 6) Inspect and adjust ambient/contact temperature (correct by using other spider materials, if necessary)
Early wear of spider (liquefaction of material inside the spider cam)	Vibrations of drive	1) Set the unit out of operation 2) Disassemble the coupling and remove residues of the spider 3) Inspect coupling components and replace coupling components that have been 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 resp. products on termination of their service life in accordance with the legal regulations and standards that apply.

- **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® is a low-maintenance coupling. We recommend to perform a visual inspection on the coupling **at least once a year**. 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, inspect the alignment of the coupling and re-align the coupling, if necessary.
- The coupling components must be inspected for damages.
- The screw connections must be visually inspected.



Having started up the coupling, the tightening torques of the screws must be inspected during the usual inspection intervals.

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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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