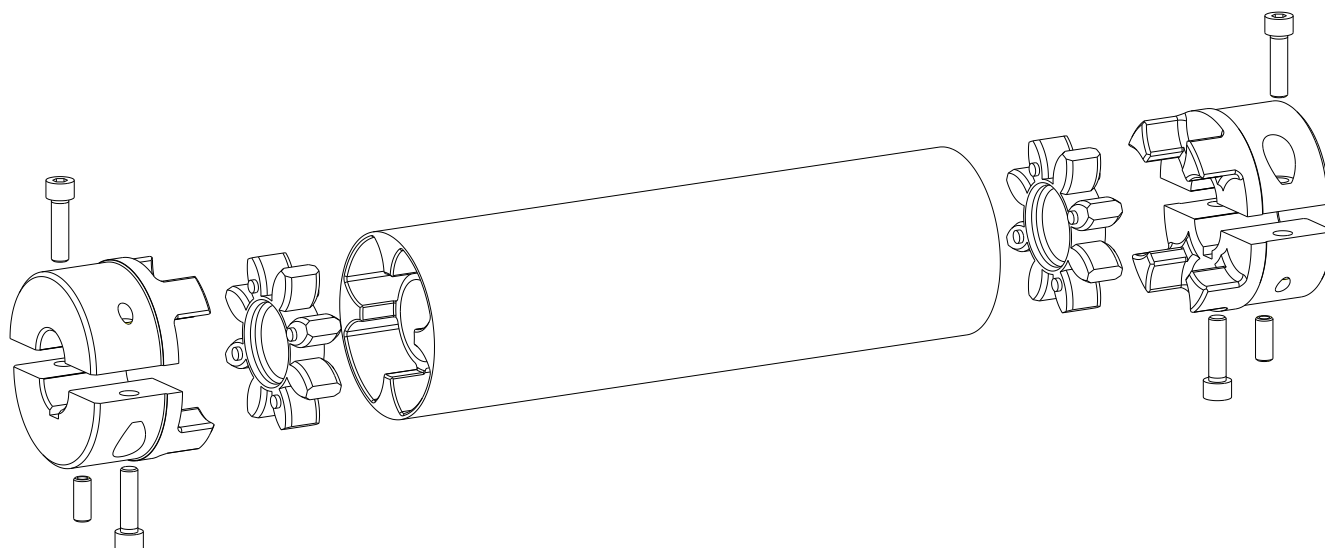
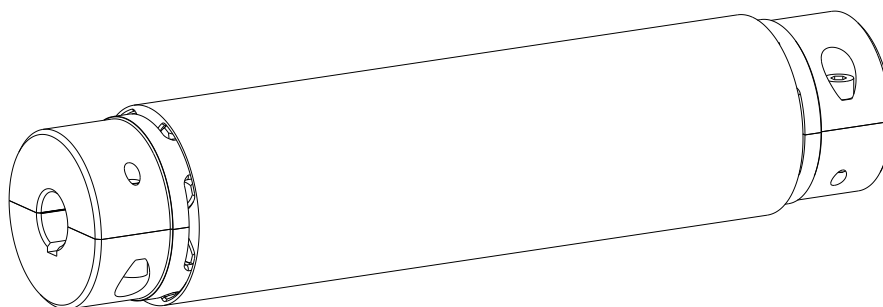


# ROTEX®

Torsionally flexible jaw couplings type ZRS  
and their combinations



|  |  |          |          |
|--|--|----------|----------|
|  | <b>ROTEX®</b>                          | KTR-N    | 40230 EN |
|  | <b>Operating/Assembly instructions</b> | Sheet:   | 2 of 14  |
|  | <b>Type ZRS</b>                        | Edition: | 3        |

**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 a pulling washer in the cam ground of the hub at the bottom.

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|   |           |                   |              |                        |
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**1 Technical data**

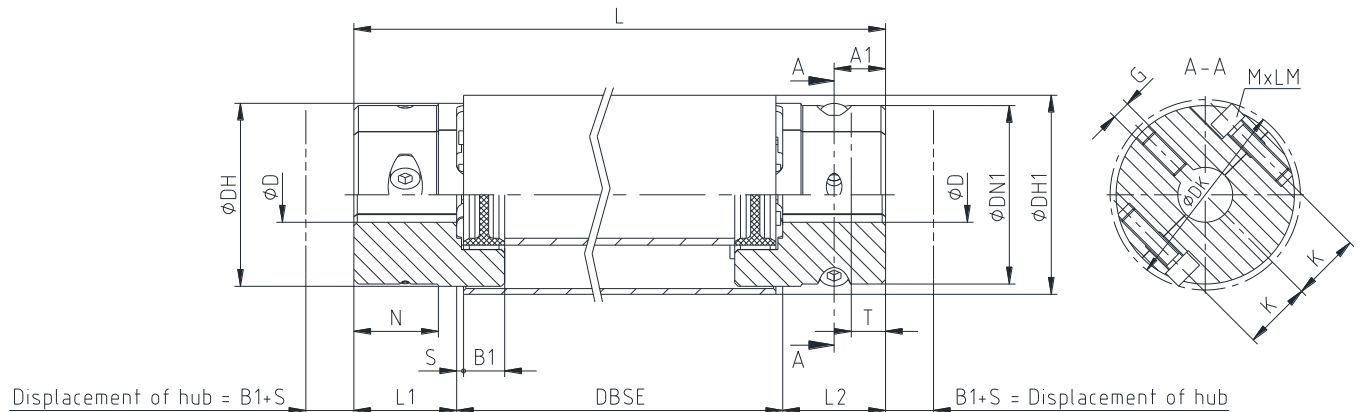


Illustration 1: Type ZRS (with ROTEX® GS spider)

**Table 1: Dimensions**

| Size | Dimensions <sup>1)</sup> in mm   |                          |        |    |     |                         |    |     |     |      |    |      |      | Cap screws<br>DIN EN ISO 4762 |                      |
|------|----------------------------------|--------------------------|--------|----|-----|-------------------------|----|-----|-----|------|----|------|------|-------------------------------|----------------------|
|      | Max. finish bore D <sup>2)</sup> | L                        | L1, L2 | B1 | S   | Min. DBSE <sup>4)</sup> | DH | DH1 | DN1 | DK   | N  | K    | A1   | MxLM                          | T <sub>A</sub> in Nm |
| 19   | 25                               | <sup>3)</sup>            | 25     | 12 | 2.0 | 33                      | 40 | 54  | -   | 46   | -  | 14.5 | 8    | M6x16                         | 14                   |
| 24   | 35                               | L =<br>DBSE +<br>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 3; 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 <sup>5)</sup> (component 2)<br>Rated torque in Nm |        |        | Torsional stiffness C of<br>intermediate pipe <sup>6)</sup><br>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<sub>Kmax</sub> = rated torque of coupling T<sub>KN</sub> x 2
- 6) Torsion spring stiffness with 1 m length of the intermediate pipe

## 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!

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.

|  |  |  |
|--|--|--|
|  | <b>ROTEX®</b><br><b>Operating/Assembly instructions</b><br><b>Type ZRS</b> | KTR-N 40230 EN<br>Sheet: 5 of 14<br>Edition: 3 |
|--|--|--|

## 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/EC

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 has to 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 |

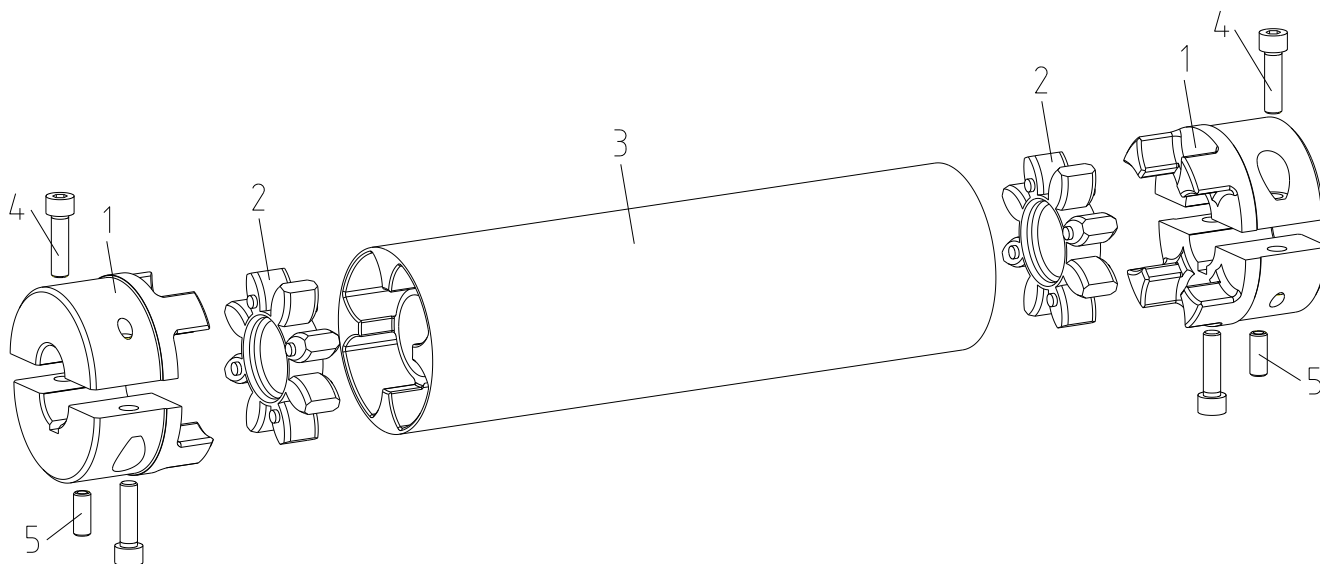





Illustration 2: ROTEX® type ZRS

#### 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 ØD.
- 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.

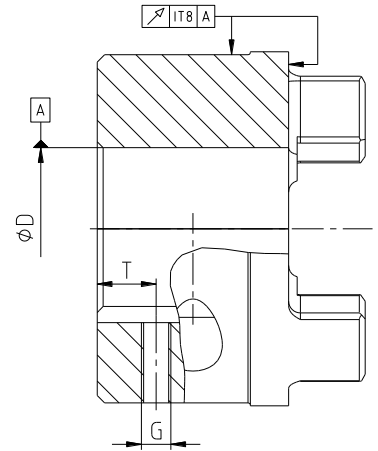


Illustration 3: Concentricity and axial runout



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 3: 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 <sub>A</sub> in Nm | 2  | 2  | 10 | 10 | 10 |

Table 4: Recommended fit pairs acc. to DIN 748-1

| Bore in mm |       | Shaft tolerance | Bore tolerance       |
|------------|-------|-----------------|----------------------|
| above      | up to |                 |                      |
|            | 50    | k6              | H7<br>(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 difficult 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, but 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 4).
- Hand-tighten the cap screws.
- Insert the spiders (component 2) in the cam section of the driving and driven side (see illustration 5).
- Insert the ZRS intermediate pipe (component 3) between the SPLIT hubs of the driving and driven side (see illustration 5).
- 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).

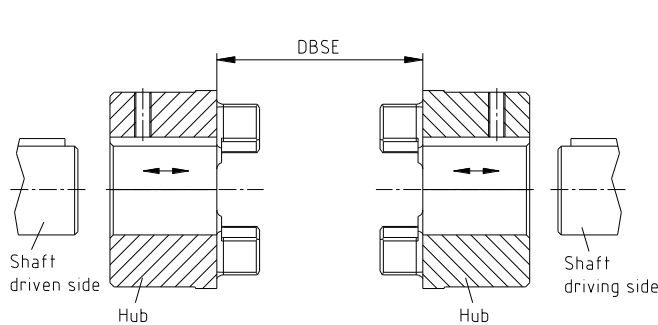


Illustration 4: Assembly of the SPLIT hubs

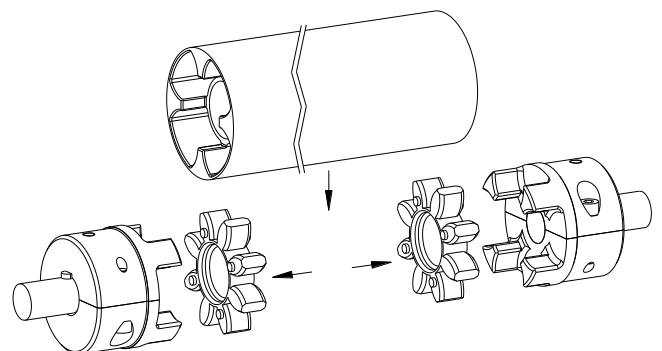


Illustration 5: Assembly of spiders and ZRS intermediate pipe



With vertical assembly of ROTEX® type ZRS a special distance washer of KTR has to 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 6). 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 7).
- Align the lower shell of the first SPLIT hub with the upper shell under the shaft (see illustration 8). Screw in the cap screws over several pitches.
- Align the upper and lower half shell based on the outer shape so that the fracture surfaces fit exactly.



**Please note that the half shell pairs of the two SPLIT hubs must not be interchanged, since the fracture 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 5).
- Insert the ZRS intermediate pipe (component 3) between the SPLIT hubs of the driving and driven side (see illustration 5).
- 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).

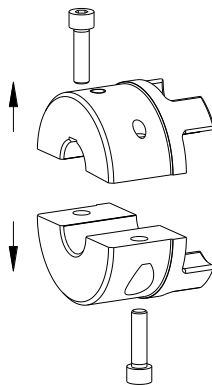


Illustration 6

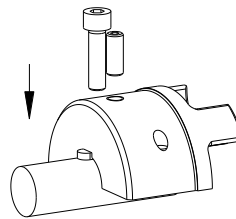


Illustration 7

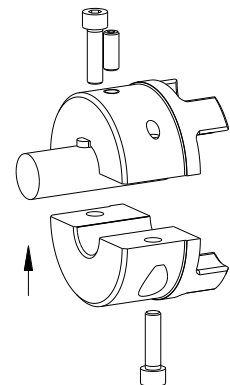


Illustration 8



**With vertical assembly of ROTEX® type ZRS a special distance washer of KTR has to 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 5 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 5). 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 5 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 10).
- Please inspect with a dial gauge, ruler or feeler gauge whether the permissible displacement figures specified in table 5 can be observed.

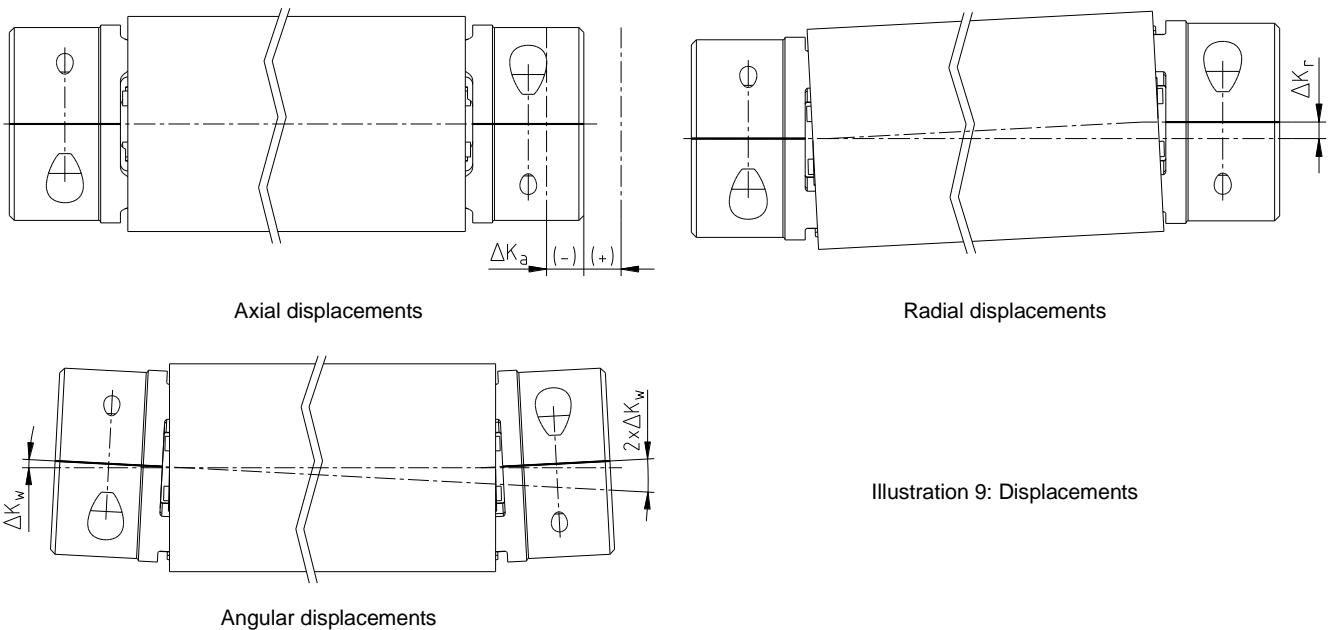


Illustration 9: Displacements

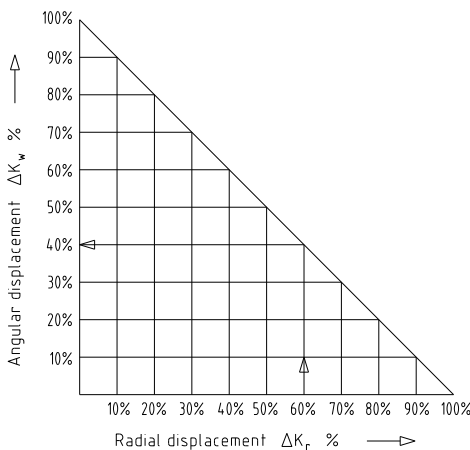


Illustration 10: Combinations of displacement

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  $1^\circ = 0.6^\circ$

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

|   |                          |                                   |
|---|--------------------------|-----------------------------------|
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4 Assembly

4.6 Displacements - alignment of the couplings

Table 5: Displacement figures

| Size | Max. axial displacement DKa in mm | Max. radial displacement $\Delta K_r$ in mm   | Max. angular displacement $\Delta K_w$ in degree with n= |          |
|------|-----------------------------------|---|--|----------|
|      |                                   |   | 1500 rpm   | 3000 rpm |
| 19   | 1.2                               | 1) Determine the distance from the center of one spider to the center of the other spider LZK (see illustration 1 and 2)<br>$LZK = L - L1 - L2 - E$<br>2) Calculate the maximum radial displacement $\Delta K_r$ (see illustration 11)<br>$\Delta K_r = \tan \Delta K_w \times LZK$ | 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.

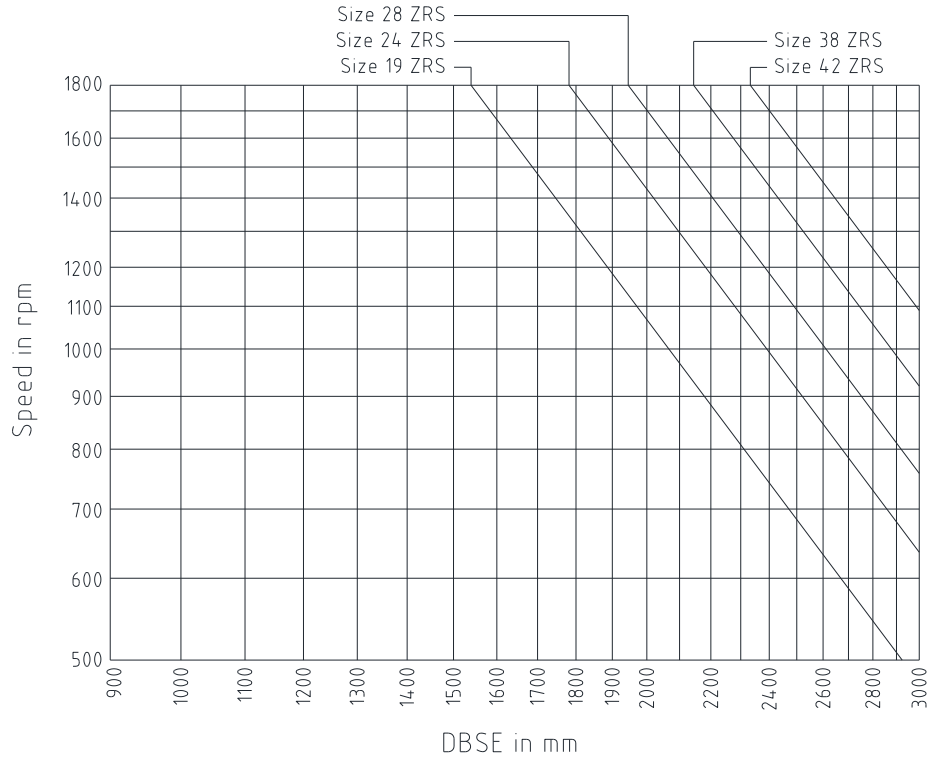


Illustration 11: Critical bending speed of type ZRS

|  |  |   |
|--|--|---|
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|  |  |   |

## 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, please 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.

|   |                          |                                   |
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**6 Breakdowns, causes and elimination**

| Breakdowns  | Causes  | Elimination  |
|---|---|--|
| Different operating noise and/or vibrations occurring                 | Misalignment  | 1) Set the unit out of operation<br>2) Eliminate the reason for the 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)<br>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<br>2) Disassemble the coupling and remove residues of the spider<br>3) Inspect coupling components and replace coupling components that have been damaged<br>4) Insert spider, assemble coupling components<br>5) Inspect alignment, adjust if necessary  |
|   | Screws for axial fastening of hubs working loose  | 1) Set the unit out of operation<br>2) Inspect alignment of coupling<br>3) Tighten the screws to fasten the hubs and secure against working loose<br>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<br>2) Replace complete coupling<br>3) Inspect alignment   |
|   | Breaking of the cams due to high impact energy/overload   | 1) Set the unit out of operation<br>2) Replace complete coupling<br>3) Inspect alignment<br>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<br>2) Review the operating parameters and select a bigger coupling (consider mounting space)<br>3) Assemble new coupling size<br>4) Inspect alignment   |
|   | Operating error of the unit   | 1) Set the unit out of operation<br>2) Replace complete coupling<br>3) Inspect alignment<br>4) Instruct and train the service staff  |
| Early wear of spider  | Misalignment  | 1) Set the unit out of operation<br>2) Eliminate the reason for the 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)<br>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<br>2) Disassemble the coupling and remove residues of the spider<br>3) Inspect coupling components and replace coupling components that have been damaged<br>4) Insert spider, assemble coupling components<br>5) Inspect alignment, adjust if necessary<br>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<br>2) Disassemble the coupling and remove residues of the spider<br>3) Inspect coupling components and replace coupling components that have been damaged<br>4) Insert spider, assemble coupling components<br>5) Inspect alignment, adjust if necessary<br>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<br>2) Disassemble the coupling and remove residues of the spider<br>3) Inspect coupling components and replace coupling components that have been damaged<br>4) Insert spider, assemble coupling components<br>5) Inspect alignment, adjust if necessary<br>6) Find out the reason for the vibrations (possibly corrective by spider with lower or higher Shore hardness) |

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## 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 resp. 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**. 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, inspect the alignment of the coupling and re-align the coupling, if necessary.
- The coupling components have to be inspected for damages.
- The screw connections have to be inspected visually.



**Having started up the coupling the tightening torques of the screws have to be inspected during the usual inspection intervals.**

## 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](http://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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|---|---|---|
| Please observe protection note ISO 16016. | Drawn: 2023-03-02 Ka/Bru<br>Verified: 2023-03-06 Ka | Replacing: KTR-N dated 2022-09-22<br>Replaced by: |
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