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Notes on this manual

1  Notes on this manual

1.1  Subject matter and validity

This operation manual from RENK AG (Rheine plant) describes the transportation, assembly, operation, servicing, disassembly and disposal of couplings in the DSL series. The couplings described in this operation manual are also called the "product" in the following.

Only use this operation manual for the specified products. The operation manual is an important aid for the successful and safe operation of the product. The operation manual contains important notes on how to operate the product safely, properly and efficiently. You can prevent risks, repair costs and downtimes by paying attention to the operation manual. Complying with the operation manual increases the reliability and service life of product and machine.

The operation manual must always be available for working on the product.

In addition to this operation manual, the applicable national and international regulations on accident prevention, on environmental protection as well as the recognised rules concerning working safety and workmanlike conduct all need to be observed at the operating site. The safety regulations used by the European Union and Germany are incorporated in this operation manual.

1.2  Copyright and property rights

The documentation as a whole and this document are protected by copyright. All rights reserved.

The reproduction of these documents, in part or as a whole, as well as making use of them or making them available to others, i.e. for the purpose of competition or disclosure to third parties, shall require the previous consent of RENK AG.

1.3  Target group

This operation manual is aimed at qualified specialist personnel who plan, execute, manage or monitor the work described in this document. Specialist personnel are persons who owing to their technical training, know-how and experience, as well as their knowledge of the relevant standards and regulations, are capable of assessing the work assigned to them and identifying possible hazards. The operating company must instruct the specialist personnel regarding the safe and proper use of the product. All persons working with the product need to have read and understood this operation manual, and make use of it.
1.4 Warnings for risks posed to people

The following warnings indicate hazards and risks that could lead to personal injury. The warnings contain information about the type and severity of the hazards.

Always observe the warnings and follow the relevant measures put in place to prevent hazards.

**DANGER**
Type and source of danger to life (consequence: extremely serious injuries or death)!
Imminent danger if not observed.
- Measure put in place to prevent hazard.

**WARNING**
Type and source of risk of injury (consequence: extremely serious injuries with irreversible damage)!
Possible danger if not observed.
- Measure put in place to prevent hazard.

**CAUTION**
Type and source of risk of injury (consequence: minor injuries)!
Possible danger if not observed.
- Measure put in place to prevent hazard.

1.5 Warnings for possible damage to property

The following warnings indicate hazards and risks to property, which could lead to material damage as a result of the way the product is handled.

Always observe the warnings and follow the relevant measures put in place to prevent hazards.

**NOTICE**
Type and source of the risk of damage!
Possible damage to property if not observed.
- Measure put in place to prevent hazard.
1.6 Labelling in the text

The following symbol points to specific information.

\[ \text{indicates information which facilitates the working task, ensures an efficient workflow and provides other useful information.} \]

Individual points in a list are distinguished by a dash:

- Item in the list.

Individual steps in a sequence of tasks are highlighted with a bullet point. The steps of action must be executed in the correct sequence (from top to bottom):

- Step of action.

Figures include item numbers which indicate components. These numbers are printed in bold type in the associated text, for example (1). They always relate to the preceding figure.

Numbers relating to a different figure than the preceding one also include the number of the figure, for example (4 in Fig. 3).

1.7 Figures

The figures in this manual are used for understanding and visualising the work described.

Always observe for all work the corresponding drawings in the applicable documents. The figures used in this manual are not a replacement for dimension sheets, for example.

1.8 Applicable documents

Other documents contained in the complete set of documentation from RENK AG (Rheine plant) also apply in conjunction with this operation manual:

- Dimension sheet (if supplied).

This operation manual and all applicable documents are part of the product.

- Always keep the complete set of documentation ready and available for all work carried out.

- Pass the complete set of documentation on to the successor should the operating company be changed.

- In the event of contradictory figures and data, please always observe the figures and data in the dimension sheet.

- Before commencing work, please contact RENK AG (Rheine plant) in the event of missing or unclear information in the complete set of documentation.
2 Basic safety instructions

Basic safety instructions apply generally to several activities. For all types of work, always observe the basic safety instructions, observe the safety instructions at the beginning of the chapters and the safety instructions prior to certain potentially hazardous activities.

Safety conscious behaviour and observance of the safety instructions can help to prevent hazards arising that could have fatal consequences for the operator or third parties, and also helps to avoid risks of damaging the product or other material assets, and will also help in avoiding downtimes.

2.1 Using the operation manual

The operation manual is an essential part of the product and provides information on its correct, safe and efficient use.

The operation manual needs to be available for all types of work using the product. If the operation manual gets lost or becomes unusable, then you can order a new one at RENK AG (Rheine plant).

The manufacturer shall not be liable for any damages occurring due to the disregard of this operation manual.

2.2 Required provisions to be met by the operating company

The operating company may only employ instructed and qualified specialist personnel, who have read and understood the operation manual, to work with the product.

The operating company is responsible for proper transportation, assembly, operation, maintenance and repair, and disposal.

The operating company may not make any changes to, nor perform any extension or retrofitting work on, the product without the approval of RENK AG (Rheine plant). This also applies to assembly procedures, safety device settings and to welding work performed on parts of the product.

2.3 Requirements to be met by personnel

Only instructed and qualified specialist personnel are permitted to work with the product and need to have read and understood this operation manual, and make use of it.

The specialist personnel need to have been instructed by the operating company in the following themes:
- Safe handling of the product whilst being conscious of the hazards involved.
- Regulations in regard of accident prevention and environmental protection.
- Required personal protective equipment (protective gloves, protective goggles, helmet, safety footwear and standard protective clothing).
- Responsibility and workplace communication.
- Safe transportation of the product.
- Product storage.
- Operating and servicing the product.
- Response in the event of problems.
- Disassembling the product.
2.4 Safety instructions with regard to specific operating phases

2.4.1 Operating phase: Transportation

– Never stand underneath a suspended load.
– Prior to transportation, familiarise yourself with the weight, centre of gravity, construction and attachment points for the packing and product using the technical data as a guide.
– If available, always use for transportation the attachment points or lifting threads marked on the packing or stipulated in the technical data.
– Only use lifting tackle and load carrying attachments with an adequate lifting capacity.
– Always secure the product against rolling away or turning over, e.g. if you need to move the product or components of the product into a different position by tilting it.
– Use anti-slip mats as an underlay during lifting or turning operations applied to components, to prevent damage from occurring due to the unit slipping.
– Immediately remove any lubricants from the wetted surfaces that may have escaped out of the product during transportation.
– Check the product for damage after transportation.

2.4.2 Operating phase: Assembly

– Switch the machinery train off and secure the control devices against unwanted activation.
– Observe the assembly procedures described.
– Do not make any changes to the product, nor perform any extension or retrofitting work on it.
– Do not change the factory settings of safety devices.
– Always secure the product against rolling away or turning over, e.g. if you need to move the product or components of the product into a different position by tilting it.
– Use a guard to safeguard persons against being caught in the product, wound in or against the product from being touched inadvertently.

2.4.3 Operating phase: Operation

– Only operate the product when it is completely assembled and when the guards are completely assembled and working correctly.
– Any malfunctions on the product have to be eliminated immediately.
– If any changes emerge in the operational behaviour (e.g. noises or vibrations) or if the product is faulty, then shut down the product immediately and eliminate the causes of the problem.


2.4.4 Operating phase: Servicing

- Switch the machinery train off and secure the control devices against unwanted activation.
- Before removing the guard, wait for the product and adjacent machine parts to come to a standstill as these may still be running for some time afterwards.
- Before starting work, allow the product and adjacent machine parts enough time to cool down in order to avoid burns.
- Adhere to the deadlines stipulated for the system and those specified in the operation manual for recurring maintenance work.
- Retighten all screwed connections undone for maintenance work and observe the details given in regard to the tightening torques.
- Install the guards removed for the servicing work and check that they are working correctly before the product is started up.

2.4.5 Operating phase: Disassembly

- Switch the machinery train off and secure the control devices against unwanted activation.
- Before removing the guard, wait for the product and adjacent machine parts to come to a standstill as these may still be running for some time afterwards.
- Before starting work, allow the product and adjacent machine parts enough time to cool down in order to avoid burns.
- Always secure the product and components used in the product against rolling away or turning over.

2.5 Safety instructions with regard to specific types of hazards

2.5.1 Hazards caused by lubricants and other substances

- Observe and comply with the applicable regulations and data sheets from the manufacturer when working with lubricants, cleaning agents and other chemical substances.
- Prevent slipping risks by immediately and completely removing any leaked lubricants from all wetted surfaces and, if necessary, use suitable binding agents.
- Lubricants could contaminate the soil and groundwater. Make sure that no lubricants get into the ground, soil, sewage system or the groundwater.
- Dispose of lubricants and any waste containing lubricants properly and observe the environment protection conditions.

2.5.2 Risks caused by heat

- The product and machine parts can become very hot during operation. Before starting work, allow the product and adjacent machine parts enough time to cool down in order to avoid burns.
- Wear suitable protective clothing for work on hot components.
2.5.3 Risks due to electrical energy

- Install optional electrical accessories in a technically correct manner.

2.5.4 Risks caused by noise

The continuous sound pressure level (A-weighted) of the product is below 83 dB(A). This is why the wearing of ear protectors is not mandatory due to the noise coming from the product.

We recommend permanently wearing ear protectors in the vicinity of loud machines.

2.5.5 Hazards caused by moving parts

- Rotating and moving parts need to be protected against access by people using guards in accordance with the legal requirements.

2.6 Safety devices and guards

- The safety guard must be designed to prevent ejection of the fragments if the discs break.
- Prior to starting up the product after maintenance or servicing work, make sure that all removed guards have been reattached.
- All safety devices and guards need to be in place when the system is running.
- Only remove the guards if the product is at standstill and is secured against being inadvertently started up.
- Guards may only be removable using tools.
3  Product description

3.1  Subject Matter and function

Depending on the version, the coupling consists of the spacer and the two flanges that are pulled onto the machine shaft. On the DSG series, the middle element consists of two flanges and the intermediate shaft.

The disc package is the core element of the coupling. The package is screwed to alternate sides of the flanges of the adjacent parts using fitted bolts and nuts.

The torsionally rigid, backlash-free and flexible coupling allows for displacements of the machine shafts. Axial, angular and radial displacements are all possible.

The restoring forces that occur remain small within the permissible offset range.

The coupling allows removal of the spacer without moving the adjacent power units.

The coupling parts are finished machined (exception: flange with pre-drilling) and prepared for assembly / installation.

3.2  Intended use

The coupling is used for transmitting the torque between connected machine parts and for compensating for displacements caused by misalignment.

Also constituting intended use is:

– Complying with the operation manual and the applicable documents.
– Always using the product within the guidelines from the technical data (see chapter 10).
– Carrying out all retrofitting work or additions with accessories only after this has been approved in writing by RENK AG (Rheine plant).

3.3  Improper use

Improper use can result in a risk of personal injury as well as damage to property and the risk of product failure, all of which the manufacturer shall not be liable for.

The following constitutes improper use and is prohibited:

– Using the product outside the specifications given in the dimension sheet (if supplied).
– Using the product outside the specifications given in the technical data.
– Welding on product components.
– Unauthorised rebuilds or modifications on the product.
– If welding work is carried out in the vicinity of the product, the product must not be located between the welded joint and the earthing for the welding equipment; i.e. the product must not be within the electric circuit.
3.4 Product components

Product components and items included in the scope of delivery:

– Coupling in individual parts.
– Operating manual.
– Other applicable documents.

3.5 Requirements to be met by the area of use

Include adequate space all around the product and its guard in your plans for assembly, servicing and disassembly at the location of installation.

The temperature in the area of use has to comply with the technical data.

The subsurface must be suitable for accommodating the weight loads during transport and assembly.

3.6 To be provided by the customer

To be provided by the customer for assembly are:

– Suitable means of transportation and lifting tackle.
– Usual set of tools (workshop trolleys).
– Rubber mallet.
– Torque wrench.
– Device for heating up the flange (e.g. oven or ring burner).
– Measuring instruments for measuring the alignment.
– Measuring instruments for measuring the temperature of the components.
– Device for pulling off the flange.
– Pressurised oil device, including lubricant.
– Guard.
4 Transportation and storage

4.1 Transportation

In addition to the basic safety instructions given in Chapter 2, always observe the following so that damage can be prevented during transportation:

– If possible, keep the product in its original packing until shortly before assembly, thus helping to prevent damage in transit and to avoid contamination.

– Use suitable attachment points or lifting threads in order to avoid damage in transit due to components becoming loose.

– In order to prevent damage to the surface of the product, always use round slings, lifting straps or similar, and include edge protection. Never use wire cables or chains.

– Do not use levers, e.g. made of metal, that could damage the components. For example, use wooden products or plastic rods as levers.

– Avoid impacts and knocks that could deform and damage the product.

– Check the product for damage after transportation.

– Avoid having any contamination on sealing elements or joining surfaces.

4.2 Checking the delivery

● Check the complete scope of delivery using the delivery note and packing list as a guide, and notify RENK AG (Rheine plant) in writing (e.g. per e-mail) of any deviations from the scope of delivery within 2 weeks upon receipt of delivery.

● Check the delivery for any damage (visual inspection) and note any damages on the delivery note from the freight forwarder. Also, immediately report any damages to last freight forwarder and to RENK AG (Rheine plant). Keep the packing in case the freight forwarder needs to check it or should it be needed for return shipment.

If parts are damaged to such an extent that a return shipment is needed, please contact RENK AG (Rheine plant) beforehand.

● Where applicable, pack the delivery for return shipment such that no further damage can occur during properly conducted transportation.
4.3 Storage

**NOTICE**
The coupling can be damaged by corrosion if the storage period is exceeded! Corrosion can render the coupling unserviceable.

- Check the coupling for signs of corrosion every four weeks after the storage period has been exceeded.
- If there are signs of corrosion, use a long term preservative in accordance with the manufacturer's instructions to protect all coupling elements – after having consulted RENK AG (Rheine plant).

The default preservation used for the coupling is designed for indoor, dry transportation and storage lasting six months. If the coupling is stored for longer than six months after delivery ex works, then the preservation will have to be renewed. Preservation used in moist, salty or acidic conditions for transport and storage or long-term storage is possible upon request.

- All parts of the coupling:
  - should be stored indoors and in dry conditions.
  - should not be exposed to humid, salty or acidic atmospheres, nor atmospheres containing chemicals.
  - should be protected against mechanical damage.
- Observe the period of storage.
- Do not remove the preservation until shortly before assembly.

4.4 Disposing of the packing

The packing is adapted to the size, scope and transport route of the delivery.

- Dispose of the packing in accordance with the applicable national regulations.
5 Assembly

In addition to the basic safety instructions given in Chapter 2, always observe the following so that damage can be prevented during assembly:

– Always lift the coupling and parts of the coupling using suitable lifting tackle and also use edge protection, anti-slip mats or similar.
– Only use suitable tools (e.g. rubber mallet as a striking tool) and the appropriate devices and installation methods in order to prevent burr formation, deformation and coupling failure. Never use hard striking tools or pointed or sharp tools.
– Observe the instructions provided by the manufacturer of the machines to be coupled and by the manufacturer of the devices used for the installation.
– Only use solvent-free cleaning agents, e.g. wax solvents, benzine or alkaline industrial detergents so that surfaces and gaskets used in the coupling do not get damaged. Never use cleaning agents containing solvents or petrol for cleaning the coupling.
– Remove any stickers that may still be found on the parts.
– Coat the screws using a thin film of lubricating oil. In doing so, never use grease, paste or similar that reduces friction, as this will change the required friction coefficient ($\mu = 0.14$), and the screws could tear off.
– Observe the tightening torques for the screws.
– If a dimension sheet has been supplied, it is vital that you observe the data given in that dimension sheet.
5.1 Markings on the coupling

Fig. 1: Markings on the coupling e.g. DSL

<table>
<thead>
<tr>
<th>Side</th>
<th>Zero setting</th>
<th>Order number</th>
<th>Item in the order</th>
<th>Seq. no. of the order item</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0</td>
<td>880120</td>
<td>100</td>
<td>1</td>
</tr>
<tr>
<td>B</td>
<td>0</td>
<td>880120</td>
<td>100</td>
<td>1</td>
</tr>
</tbody>
</table>

Tab. 1: Example of marking using the order number 880120/100/1

Fig. 1 shows examples of the markings on the coupling.

The marking consists of the side designation ("A" or "B"), the zero setting ("0") and the order number.

The marking can be found on the largest outer diameter on the main parts of the coupling or both on the front surface (flange) and on the packing for the supplied small parts.

- Check whether all parts and data required for assembly are available.
- Take care to ensure that you only use the coupling specific to the application and the parts belonging to that coupling.
- Assemble the coupling in accordance with the factory markings and at the correct sides in accordance with system planning.
5.2 Preparing the coupling for assembly

The coupling must first be cleaned.
According to the order, the flanges used in the coupling are either delivered ready drilled (and balanced, where applicable), or just pre-drilled. Pre-drilled components will have to be drilled out and balanced, if necessary.
You can then pull the flanges onto the shaft ends, align the shafts and mount the flexible middle piece.

5.2.1 Partially disassembling and cleaning the coupling

If the flanges are going to be fitted onto the shaft journals and the final installation of the coupling is going to take place at a lengthy interval, then only clean the two flanges first.

- Clean all parts of the coupling prior to assembly using solvent-free cleaning agents and completely remove the preservative.

5.2.2 Drilling out the pre-drilled coupling

**DANGER**
Risk of fatal injury due to the coupling bursting!
If the bore hole is too large or the shrinkage strain in the coupling elements is too high, this can result in the coupling bursting and causing life threatening injuries.

- Drilling the hole should be done carefully and in accordance with the specifications.

The operator is responsible for the design and implementation of the shaft-hub connection.

If the coupling is delivered just pre-drilled upon request, then the flanges will still need to be drilled out to the required actual dimension.

Check the following prior to drilling out:
- The maximum permissible bore for the flange is limited by the ratio of the shaft diameter \(d\) to the rear of the flange \(H\) (compare Fig. 2). The ratio \(H/d\) may not be below the value of 1.3. This applies only to fitting key grooves in accordance with DIN 6885/1.
- If interference fits are used, then the resultant stress will have to be checked by calculation.
- Unless otherwise stated, the minimum yield strength for a standard flange is 350 N/mm\(^2\). The stresses in the interference fit and the stresses (expansion pressure) during installation or removal must not exceed this value.
- If an interference fit is used, then you will need to both calculate the required oversize and select the tolerances yourself.
- If fitting key connections are used, please observe the tolerances in the following table as reference values.
Table 2: Recommended tolerances for fitting key connections

<table>
<thead>
<tr>
<th>Bore</th>
<th>F7</th>
<th>H7</th>
<th>J7</th>
<th>K7</th>
<th>M7</th>
<th>P7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shaft</td>
<td>s6</td>
<td>p6</td>
<td>n6</td>
<td>m6</td>
<td>k6</td>
<td>h6</td>
</tr>
</tbody>
</table>

Fig. 2: Drilling out the pre-drilled coupling

Key
A Material removal
d Diameter of shaft
B Component mount
IT ISO Tolerance range
H Rear of flange

- Clamp the flanges Fig. 2 at the indicated surfaces (B) into the processing machine and carefully align them.
- When drilling out, Fig. 2 adhere to the permissible concentricity and axial run-out tolerances specified in.
5.3 Connecting the flanges to the shafts

The flanges can be connected to the shafts in different ways:
– fitting key connection or splines in accordance with DIN 5480.
– Thermally joining the interference fit.
– Hydraulically joining the interference fit.
Other connections are possible upon request.

● Check the dimensions of the bore hole and the shaft dimensions before commencing with work.
● Check whether the bore holes and shafts are well chamfered and burr-free. Remove any burrs or damage.
● Ensure that the flanges point away from the machines to be coupled or in the case of the DSH version towards the machines to be coupled.
Install the flanges one after the other as described below:

5.3.1 Key connection or splines in accordance with DIN 5480

Required tools:
– Suitable ring burner, oven or induction heater.
– Temperature gauge.
– Lifting tackle for holding the flange.

● Insert the key into the fitting key groove for the shaft.

**CAUTION**
Risk of damage due to loss of adhesive force if unsuitable lubricants (grease, paste or similar) are used!
The coupling could slip, not transmit the torque and get damaged.
● Coat the joining surfaces on the flange only using a thin film of mineral oil without additives.

● Evenly heat the flange all around using a suitable device (e.g. ring burner, oven or inductively) up to a temperature of 80 °C. Observe the instructions from the device manufacturer in doing so.
● Fit the flange onto the shaft. Observe the direction of installation.
● Secure the flange against axial shift, e.g. using a support plate or locking screws.

5.3.2 Thermally joining the interference fit

Required tools:
– Suitable ring burner, oven or induction heater.
– Temperature gauge.
– Lifting tackle for holding the flange.

Required data:
– Jointing temperature
– Pull up dimension (for tapered bore hole).
Please refer to the dimension sheet for the required data or contact the system planner or RENK AG (Rheine plant).
If tapered connections are used:

- If it is not hot, push the flange so far onto the shaft that the fitting surfaces adjoin each other without pressure.
- Measure and note down the resulting position (zero position) in relation to a reference edge. Select the reference edge such that the pull up dimension can also be measured after fitting.

If tapered or cylindrical connections are used:

- Evenly heat up the flanges all around but not higher than necessary for the joint clearance.

⚠️ CAUTION

Risk of burns due to heated device or components!

Burns on parts of the body are possible.
- Wear suitable protective clothing.

The oven should be as close as possible to the installation point so that the expansion of the component, which cools down during transportation, is not reduced too much. Do the joining in a room free of draught if possible and join the components quickly after they have been warmed up.

- Evenly heat the flange all around using a suitable device (e.g. ring burner, oven or inductively) up to the required joining temperature. Observe the instructions from the device manufacturer in doing so.
- When heating up, continually check the temperatures at various positions of the bore hole.
- Check the expansion of the bore hole prior to fitting.

⚠️ DANGER

Risk of fatal injury due to the coupling elements bursting!

Tapered flanges that have been fitted on too far can burst immediately or during later operation, and ejected coupling elements can lead to life-threatening injuries.
- Comply with the stipulated pull up dimension if tapered connections are used. Do not push the flange on too far.

- Fit the flange onto the shaft in the required position.
- Secure the flange axially against slipping, e.g. using a support plate.
- Allow the flange and shaft to cool down as much as possible to the ambient temperature.
- Remove axial securing means. Suitable axial securing means, e.g. using a support plate, are constantly required in the event of a steep angle being used in the tapered connection (taper ratio less than 1:30). In this case, do not remove the axial securing means, or replace it at a later time with a suitable axial securing means.

Check the position of the flange and correct if necessary.
5.3.3 Hydraulically joining the interference fit

Fig. 3: Tapered interference fit

Key

1 Machine shaft
2 Oil groove for radial pressure
3 Hydraulic nut
4 Oil connection (example)
5 Flange

The interference fit is joined hydraulically in tapered connections only. Cylindrical interference fits and stepped cylindrical interference fits are joined thermally.

Unless otherwise stipulated on the dimension sheet, use mineral oil for hydraulic joining.

Required tools:
- Suitable pneumatic pump or motor pump (pressurised oil device) for generating the radial pressure. If mating parts with more than one oil connection are used, then you will need a pump for every single connection.
- Suitable (hand operated) pump for generating the axial pressure.
- Hydraulic nut (3) if possible with sufficient stroke.
- Lifting tackle for holding the flange.
- Oil for generating pressure.

Required data:
- Required and maximum expansion pressure.
- Axial installation force.
- Pull up dimension (for tapered bore hole).

Please refer to the dimension sheet for the required data or contact the system planner or RENK AG (Rheine plant).
Assembly

- Coat all joining surfaces with a thin film of oil.
- If it is not hot, push the flange so far onto the shaft that the fitting surfaces adjoin each other without pressure.
- Measure and note down the resulting position (zero position) in relation to a reference edge. Select the reference edge such that the pull up dimension can also be measured after fitting.
- If present, insert the O-ring or support ring according to the dimension sheet.

**DANGER**

Risk of fatal injury due to the coupling elements bursting!

Flanges that have expanded too far or are pushed on too far may rupture immediately or during later operation, and ejected coupling elements can cause fatal injuries.

- Do not exceed the maximum expansion pressure.
- Comply with the stipulated pull up dimension if tapered connections are used. Do not push the flange on too far.

- Install the flange using a hydraulic fitting tool in accordance with the instructions of the tool manufacturer. The fitting tool must secure the flange axially against slipping.

**Recommendations for hydraulic installation using a hydraulic nut:**

Proceed in a similar manner if you use a different fitting tool.

- Installation work should be carried out at room temperature if possible.
- The parts being joined together should have the same temperature.
- Use a pump for every single oil connection if mating parts with more than one oil connection are used.
- Retract the hydraulic nut completely.
- Screw on the hydraulic nut and connect up the pump. Do not submit any pressure just yet.
- Unscrew the screw plugs out of the oil connections and connect up the pump or pumps.
- Apply about 50% of the required pressure to the hydraulic nut.
- Apply the radial expansion pressure stipulated in the dimension sheet to the pump or pumps in several steps. Where applicable, please contact RENK AG (Rheine plant) in the event of any missing data.
  1st step: Apply 50% of the required pressure. Allow the pressure 10 minutes to take effect.
  2nd step: Increase the pressure by 200 bar. Allow the pressure 2 minutes to take effect.

Repeat the 2nd step for as long as it takes until the required expansion pressure is reached.

- If pressurised oil assemblies are used without a sealing ring, inject the pressurised oil only until it escapes around the entire circumference of the flange and the flange “floats”.
- If pressurised oil assemblies are used with a sealing ring, only inject the pressurised oil until it escapes to the full extent at the end of the shaft and the flange “floats”.

The oil outlet can be covered at the shaft end by the structural shape of the fitting tool used.

- Raise the axial pressure and use the hydraulic nut to fit the flange onto the shaft in the stipulated position. Continue to press the pressurised oil into the fitted joint.
● Continually check the maximum expansion pressure during the entire joining process and do not exceed that pressure.
● When the flange is in position, open the return valve on the pump in order to reduce the oil pressure in the fitted joint.
● Hold the oil pressure in the hydraulic nut for at least four hours.
● Remove the fitting tool when the oil pressure in the fitted joint is completely discharged.

● Measure the axial position for the flange and compare it with the specifications. If required, correct the axial position by pressing once more.
● Close the oil connections again.
● Install axial securing means. Suitable axial securing means, e.g. using a support plate, are constantly required in the event of a steep angle being used in the tapered connection (taper ratio less than 1:30).

**NOTICE**
Risk of damaging the coupling due to it being started up too early after the interference fit has been hydraulically joined!
Damage to and failure of the coupling is possible.
● Do not apply torque to the hydraulically joined interference fits until the pressurised oil film has been completely removed (after approx. eight hours).

5.4 Aligning the shafts

5.4.1 Shaft displacements

![Shaft displacements diagram](image)

**Key**

1. Axial offset
2. Radial offset
3. Angular offset
4. Radial and angular offset

Shaft displacements usually generate a combination of axial, angular and radial displacements.

Shaft displacements are produced through errors in the alignment and by additional displacements arising during operation. These include thermal expansion, shaft deflection or shifting in the foundations.

The coupling is designed for displacements specified in the technical data. The alignment values were substantially cut back in order to ensure reliable operation in the coupling. One third of the possible displacement in the coupling is achieved when the recommended alignment values are utilised. This means there are still enough reserves for additional displacements produced.
DANGER

Risk of fatal injury through incorrect alignment!

The disc packages can break during subsequent operation if the coupling is incorrectly aligned. Ejected coupling elements can lead to life threatening injuries.

- Observe the recommended coupling alignment values as described in Table 3 on Page 28.

If the manufacturers of the machines being coupled stipulate different alignment values, it is essential that these are then taken into account.

If displacements are known during operation, then take these into account during alignment such that the maximum permissible displacement taken from the technical data is not exceeded in any operating state.

Observe the following for aligning the shafts:

- If possible, also take into account the thermal expansions in the machines being coupled.
- The required data is specified in the dimension sheet.
- Use suitable resources when performing alignment work, e.g. measuring gauges or optical equipment (lasers) for bridging large distances. We recommend alignment using laser technology.
- Observe possible alignment values specified in the dimension sheet. These have priority.
5.4.2 Axial offset

Fig. 5: Axial offset

Key
I  DSL + DSG couplings
II DSH couplings

- E  Clearance of the flange surfaces
- $L_0$  Clearance between joint points
- C  dimension
- S  gap

The required clearance of the flange surfaces (E or C) can be found in the order confirmation, in the technical data or in the dimension sheet.

- Measure the E dimension or C dimension at a minimum of four positions distributed evenly around the circumference of the flange surfaces.
- Align the shafts of the machines to be connected to the DBFF dimension, to a tolerance of $\pm \Delta K_a$ in accordance with Chapter 5.4.5 at the DBFF dimension (see Page 28).

If specified, axial thermal expansion is to be taken into account in the E dimension via pre-tensioning.
5.4.3 Radial offset

Fig. 6: Radial offset

Key

I  DSL, DSG couplings  ΔKR  Radial offset
II DSH couplings

The permissible radial offset \( \Delta K_r \) depends on the offset of the fulcrum points \( l_0 \) in Chapter 0, i.e. the relative offsets of the multi disk packs to each other. The permissible radial offset can be found on Page 25.
5.4.4 Angular offset

Fig. 7: Gap using the flange as an example

Key
| I | DSL + DSG couplings   | A  | Flange diameter |
| II| DSH couplings         | ΔKw| Angular offset |
|   |                        | y  | Maximum gap     |
|   |                        | z  | Minimum gap     |
|   |                        | r  | Measured radius |

The angular offset $\Delta K_w$ is derived from the gap $y-z$ for the shafts and depends on the measured diameter $A$.

- Measure the gap for the flanges at a minimum of four positions distributed evenly around the circumference.

The difference between the largest and smallest value produces the value $y-z$. 
5.4.5 Determining the recommended alignment values

<table>
<thead>
<tr>
<th>Size</th>
<th>ΔKₐ mm</th>
<th>ΔKₗ mm</th>
<th>Size</th>
<th>ΔKₐ mm</th>
<th>ΔKₗ mm</th>
<th>Size</th>
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<th>ΔKₗ mm</th>
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<tr>
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<td>515</td>
<td>0.5</td>
<td>0.4</td>
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<td>0.4</td>
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<td></td>
<td>664</td>
<td></td>
<td>*)</td>
<td>665</td>
<td>0.6</td>
<td>0.4</td>
<td>44.0</td>
</tr>
</tbody>
</table>

ΔKₐ: Axial offset  
ΔKₗ: Angular offset  
y-z: permissible gap  
*) on request

Table 3: Data for determining the alignment values

The radial alignment value depends on the permissible angle and the distance of the joint points, i.e. the distance of the middle of the disc packages to each other l₀.

Angular displacement factor

\[ f_w = \tan \left( \frac{\Delta K_w}{l_0} \right) \]

Radial offset

\[ \Delta K_r = \frac{\Delta K_w}{f_w} \cdot l_0 \]

Angular offset

\[ y - z = l_0 \cdot f_w \cdot A \]
5.5 Installing the coupling

⚠️ CAUTION Risk of injury due to cuts during installation of the disc package!
Handling the clutch discs and/or the disc package can cause injury to fingers or the palms of hands!
- Wear protective gloves during installation work.

5.5.1 Installing DSL and DSG

⚠️ CAUTION Risk of injury due to cuts during installation of the disc package!
Handling the clutch discs and/or the disc package can cause injury to fingers or the palms of hands!
- Wear protective gloves during installation work.

⚠️ CAUTION Risk of damage to the disc packages through incorrect assembly!
The disc packages can be damaged or destroyed.
- Never expose the disc packages to open flames or temperatures above 220 °C.
Before the assembly of the spacer or intermediate shaft and the disc packages, check the joining of the fitted bolts with the disc package, flange and spacer or intermediate shaft. To do this, put the components together as a trial. If you identify a burr or see that the components are jamming, the components are to be correspondingly reworked. If you identify residue of the preservative on the components, then it should be removed.

Hold the spacer (3) or the intermediate shaft the correct way between the two flanges (9). Observe the markings "A" or "B" when doing this. Use appropriate lifting tackle for heavy couplings.

Turn the spacer so that the "A" or "B" markings on the flange and the spacer lie next to each other (see Fig. 1 on Page 16).

**NOTICE**

Risk of damaging the coupling due to screws being torn off!

The required friction coefficient (μ = 0.14) of the screws is changed owing to coating with grease, paste or similar.

Only coat the screws with a thin film of lubricating oil. In doing so, never use grease, paste or similar that reduces friction. Observe the tightening torques for the screws.

Observe all tightening torques specified in the dimension sheet. The values in the dimension sheet take precedence over the values in this operation manual.
5.5.2 Installing the DSH

**CAUTION** Risk of injury due to cuts during installation of the disc package!
Handling the clutch discs and/or the disc package can cause injury to fingers or the palms of hands!
- Wear protective gloves during installation work.

**CAUTION** Risk of damage to the disc packages through incorrect assembly!
The disc packages can be damaged or destroyed.
- Never expose the disc packages to open flames or temperatures above 220 °C.

**NOTICE** Risk of damaging the coupling due to screws being torn off!
The required friction coefficient (µ = 0.14) of the screws is changed owing to coating with grease, paste or similar.
- Only coat the screws with a thin film of lubricating oil. In doing so, never use grease, paste or similar that reduces friction. Observe the tightening torques for the screws.

*Observe all tightening torques specified in the dimension sheet. The values in the dimension sheet take precedence over the values in this operation manual.*

The disc packages of the coupling consist of clutch discs, bushes and washers. These components are supplied as individual parts. Install the disc packages on alternate sides as described in Fig. 9.
Before the assembly of the spacer or intermediate shaft and the disc packages, check the joining of the fitted bolts with the disc package, flange and spacer or intermediate shaft. To do this, put the components together as a trial. If you identify a burr or see that the components are jamming, the components are to be correspondingly reworked. If you identify residue of the preservative on the components, then it should be removed.

Install the disc package (6) at the mounted flanges (2) with the hex fitted bolts (1), washers (5) and hex nuts (4) shown. Tighten the bolt connection diagonally. Observe the tightening torque specified in Chapter 10!
Fig. 10: Installing DSH coupling

Key
1  Spacer  6  Machine shaft 2
2  Washer  7  Machine shaft 1
3  Hex. nut  8  Hex. fitted bolt
4  Disc package  9  Flange
5  Flange  10  Disc package

- Position the spacer (1) between the machine shafts (6 and 7) with the mounted flanges (5 and 9) and the premounted disc packages (4 and 10).
- Push the spacer onto a flange and fix the spacer with the hex. fitted bolts (8), washers (2) and hex. nuts (3). Tighten the bolt connection diagonally. Observe the tightening torque specified in Chapter 10!
Fig. 11: Installing DSH coupling

Key
1  Spacer
2  Flange, disc package pre-installed
3  Hex. fitted bolt
4  Machine shaft 2
5  Washer
6  Hex. nut
7  Machine shaft 1
8  Flange, spacer pre-installed

- Guide the machine shaft (4) with flange (2) into the spacer (1). Adhere to the installation dimensions specified in the dimension sheet.
- Fix the spacer with hex. fitted bolts (3), washers (5) and hex. nuts (6). Tighten the bolt connection diagonally. Observe the tightening torque specified in Chapter 10!
6 Operation

<table>
<thead>
<tr>
<th>DANGER</th>
<th>Risk of fatal injury due to a coupling that is not ready for operation!</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ejected coupling elements can lead to life threatening injuries.</td>
</tr>
<tr>
<td></td>
<td>• Do not put the coupling into operation until it has been completely</td>
</tr>
<tr>
<td></td>
<td>assembled and all guards are ready for operation.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DANGER</th>
<th>Risk of fatal injury due to the coupling bursting!</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The ejection of coupling elements or the spurting of lubricants out of a</td>
</tr>
<tr>
<td></td>
<td>bursting coupling could lead to potentially fatal injuries.</td>
</tr>
<tr>
<td></td>
<td>• If any changes emerge in the operational behaviour (e.g. noises or</td>
</tr>
<tr>
<td></td>
<td>vibrations) or if the coupling is faulty, then shut down the coupling</td>
</tr>
<tr>
<td></td>
<td>immediately and remedy the causes.</td>
</tr>
</tbody>
</table>
7  Detecting faults and troubleshooting

Always notify RENK AG (Rheine plant) of any damage to the multi disk packs.

The coupling must run quietly and with low vibration in all operating phases. Any deviating behaviour is deemed as a malfunction and needs to be rectified immediately. When trying to find the fault, you always have to take both the coupling and the machines being coupled into consideration.

The following malfunctions are only a selection of possible problems.

<table>
<thead>
<tr>
<th>Fault</th>
<th>Possible cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clutch discs broken.</td>
<td>Vibrations in the drive train.</td>
<td>Determine the cause of the vibrations and reduce them. Replace the disc packages.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Displacement too great. Check the alignment. Replace the disc packages.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unacceptably high system torque. Reduce the system torque. Check the system. Replace the disc packages.</td>
</tr>
</tbody>
</table>

Table 4: Detecting faults and troubleshooting
## Detecting faults and troubleshooting

<table>
<thead>
<tr>
<th>Fault</th>
<th>Possible cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screw torn off.</td>
<td>Check the tightening torque.</td>
<td>Select the tightening torque according to the data given in the tables.</td>
</tr>
<tr>
<td></td>
<td>Thread coated with paste.</td>
<td>Do not coat the thread using paste. Replace fitted bolt.</td>
</tr>
<tr>
<td></td>
<td>Incorrect screw.</td>
<td>Check the strength of the screw. Replace screw with the original part.</td>
</tr>
<tr>
<td></td>
<td>Unacceptably high system torque.</td>
<td>Reduce the system torque. Check the system.</td>
</tr>
</tbody>
</table>

Table 5: Detecting faults and troubleshooting (continued)
8 Servicing

**DANGER** Risk of fatal injury due to unintended rotary motion of the machine parts!
Coupling elements or tools ejected from the machine, and being caught up by rotating machine parts can lead to fatal injuries.
- Switch off the engaged machinery train for all work and secure the control devices against unwanted activation.

**DANGER** Risk of fatal injury due to the coupling or machine parts still running for some time after the drive has been shut down!
Fatal injuries or loss of limbs are possible.
- Before removing the guard, wait for the coupling and adjacent machine parts to come to a standstill.

**CAUTION** Risk of burns due to heated coupling or components!
Components can cause burns.
- Before starting work, allow the coupling and adjacent machine parts enough time to cool down.
- Wear suitable protective clothing.

**DANGER** Risk of fatal injury due to a coupling that is not ready for operation!
Ejected coupling elements can lead to life threatening injuries.
- Do not put the coupling into operation until it has been completely assembled and all guards are ready for operation.

8.1 Checking the condition

**DANGER** Risk of fatal injury due to the coupling bursting!
A bursting coupling can eject coupling parts that can cause potentially fatal injuries.
- If any changes emerge in the operational behaviour (e.g. noises or vibrations) or if the coupling is faulty, then shut down the coupling immediately and remedy the causes.
- Check the coupling for external damage and missing parts, e.g. screws.

- Please pay careful attention to the operating behaviour when using the coupling:
  - Vibrations.
  - Noises.
  - Changes in the noise level.
8.2 Maintenance

The coupling does not require periodic maintenance. Immediately seek the cause of any changes to the running behaviour of the coupling.

8.3 Ordering spare parts

All spare parts must comply with the technical requirements defined by RENK AG (Rheine plant). This is always assured when the parts used are original spare parts from RENK AG (Rheine plant).

Only use original spare parts from RENK AG (Rheine plant) as replacements for supplied parts.

Specify the following when ordering spare parts:
- RENK order number (matching the label on the largest outer diameter on the coupling, see Fig. 1 on Page 16).
- Part designation.
- Parts number (according to the technical data).
- Size of the part (if known).
- Required quantity.

*The contact address can be found on the back cover of this manual.*
Disassembly

9 Disassembly

### DANGER
**Risk of fatal injury due to unintended rotary motion of the machine parts!**
Coupling elements or tools ejected from the machine, and being caught up by rotating machine parts can lead to fatal injuries.
- Switch off the engaged machinery train for all work and secure the control devices against unwanted activation.

### DANGER
**Risk of fatal injury due to the coupling or machine parts still running for some time after the drive has been shut down!**
Fatal injuries or loss of limbs are possible.
- Before removing the guard, wait for the coupling and adjacent machine parts to come to a standstill.

### CAUTION
**Risk of burns due to heated coupling or components!**
Components can cause burns.
- Before starting work, allow the coupling and adjacent machine parts enough time to cool down.
- Wear suitable protective clothing.

9.1 Disassembling the coupling

- Remove the guard, if necessary.
- Secure the spacer or the intermediate shaft by placing it on a support.
- Loosen the disc package bolted connections and turn them down from the fitted bolts. Always avoid also turning the fitted bolts during loosening.
- Pull the fitted bolts out of the holes and remove the disc packages.
- With type DSH move the machines away from each other.
- Remove the spacer or the intermediate shaft. Use appropriate lifting tackle for heavy couplings.

9.2 Removing the flanges

If it is necessary to pull the flange off one of the shafts, then proceed in accordance with the withdrawal method suited to the respective connection between shaft and hub, or flange.
9.2.1 Key connection or splines in accordance with DIN 5480

You will need a suitable mechanical detaching device for doing the pulling off. Work quickly so that the shaft does not heat up too much.

⚠️ CAUTION ⚠️

Risk of burns due to heated device or components!

Burns on parts of the body are possible.

- Wear suitable protective clothing.

- Evenly heat the flange all around using a suitable device (e.g. burner or inductively) up to a temperature of 80°C. Observe the instructions from the device manufacturer in doing so.

- Remove the heated flange from the shaft (and at the same time secure the hub or flange against dropping) using a detaching device in accordance with the instructions from the detaching device manufacturer.

9.2.2 Tapered interference fit

If press fits are used, remove the flange using a suitable hydraulic detaching device and a pressurised oil device.

![Tapered interference fit diagram](image)

**Fig. 12: Tapered interference fit**

**Key**

1. Machine shaft
2. Oil groove for radial pressure
3. Hydraulic nut
4. Oil connection (example)
5. Flange

**Required tools:**

- Suitable pneumatic pump or motor pump (pressurised oil device) for generating the radial pressure. If mating parts with more than one oil connection are used, then you will need a pump for every single connection.
- Suitable (hand operated) pump for generating the axial pressure.
- Hydraulic nut (3) if possible with sufficient stroke.
- Lifting tackle for holding the flange.
- Oil for generating pressure.
Required data:
– Required and maximum expansion pressure.
Please refer to the dimension sheet for the required data or contact the system planner or RENK AG (Rheine plant).

⚠️ DANGER
Risk of injury due to sudden release of the press fit!
When being removed, the flange can be released very suddenly from the shaft and lead to injuries!
- Secure the flange axially during removal.
- Under no circumstances should anyone be standing in front of the flange in the direction in which the flange is being released during removal.

⚠️ DANGER
Risk of fatal injury due to the coupling elements bursting!
Flanges that have been expanded too far or fitted on too far can burst immediately or when being removed, and ejected coupling elements can cause fatal injuries.
- Do not exceed the maximum expansion pressure.
- Remove the coupling elements carefully.
- Mount and operate the hydraulic detaching device and the associated pressurised oil device in accordance with the manufacturer's instructions.

Recommendations for hydraulic removal using a hydraulic nut:
Proceed in a similar manner when using a different assembly tool:
- Remove the shaft nut.
- Extend the hydraulic nut to its maximum and observe the permissible piston stroke in doing so.
- Screw on the hydraulic nut.
- Unscrew the screw plugs out of the oil connections and connect up the pump or pumps.
- Secure the flange against falling.
- Apply full pressure to the hydraulic nut.
- Apply the radial expansion pressure stipulated in the dimension sheet to the pump or pumps.
  1st step: 50 % of the required pressure, allow 10 minutes to take effect
  2nd step: Increase the pressure by 200 bar. Allow the pressure 2 minutes to take effect.
Repeat the 2nd step for as long as it takes until the required expansion pressure is reached.
- If pressurised oil assemblies are used without a sealing ring, inject the pressurised oil only until it escapes around the entire circumference of the flange and the flange "floats".
- If pressurised oil assemblies are used with a sealing ring, only inject the pressurised oil until it escapes to the full extent at the end of the shaft and the flange "floats".
The oil outlet can be covered at the shaft end by the structural shape of the fitting tool used.
- Slowly release the pressure in the hydraulic nut and allow the flange to slide from the shaft.
If the pull up dimension is greater than the hydraulic nut stroke:
● Push on the flange by another 1 to 2 mm.
● Release the expansion pressure.
● Release the pressure in the hydraulic nut.
● Wait approx. two to three hours so that the radial pressure can reduce fully.
● Turn the hydraulic nut back as far as is required.
● Apply full pressure to the hydraulic nut.
● Continue with removal.

If the flange does not release at the maximum expansion pressure:
● Use oil with a higher viscosity (ISO VG 220).
● Leave the assembly pressurised for one hour.
● Attempt removal once again.

If the flange still cannot be released:
● Increase the maximum pressure by 5%.
● Attempt removal once again.

After the flange has been released:
● Release the pressure from the two pumps.
● Unscrew the hydraulic nut.
● Remove the oil pipes.
● Pull the flange carefully down from the shaft so as not to damage the surfaces of the shaft.
● Set down the flange.
● Examine the parts for any damage. Smooth out any minor damage. In the event of any serious damage, please contact RENK AG (Rheine plant).
● Protect the flange bore and shaft against corrosion.
● Screw the screw plugs into the oil connections.
9.2.3 Cylindrical or stepped cylindrical interference fit

If cylindrical or stepped press fits are used, remove the flange using a hydraulic detaching device and pressurised oil device.

![Diagram of cylindrical interference fit](Fig. 13: Cylindrical interference fit (example))

**Key**
1. Machine shaft
2. Threaded rod
3. Stop plate
4. Retaining plate
5. Hydraulic cylinder
6. Threaded rod
7. Flange
8. Oil connection for radial pressure

**Required tools:**
- Suitable pneumatic pump or motor pump (pressurised oil device) for generating the radial pressure. If mating parts with more than one oil connection are used (8), then you will need a pump for every single connection.
- Suitable (hand operated) pump for generating the axial pressure.
- Hydraulic cylinder (5).
- Detaching device, e.g. consisting of a retaining plate (4) and threaded rods (2 and 6) suitably dimensioned for the axial force required.

**Only for stepped cylindrical interference fit:**
- Stop plate (3) with threaded rod screwed into the shaft.
- Lifting tackle for holding the flange and detaching device.
- Oil for generating pressure.

**Required data:**
- Required and maximum expansion pressure.
- Required axial removal force.

Please refer to the dimension sheet for the required data or contact the system planner or RENK AG (Rheine plant).
**DANGER**  
**Risk of injury due to sudden release of the press fit!**  
When being removed, the flange can be released very suddenly from the shaft and lead to injuries!  
- Secure the flange axially during removal.  
- Under no circumstances should anyone be standing in front of the flange in the direction in which the flange is being released during removal.

**DANGER**  
**Risk of fatal injury due to the coupling elements bursting!**  
Flanges that have been expanded too far or fitted on too far can burst immediately or when being removed, and ejected coupling elements can cause fatal injuries.  
- Do not exceed the maximum expansion pressure.  
- Remove the coupling elements carefully.

**CAUTION**  
**Risk of damaging the shaft and flange due to tilting!**  
The flange can tilt and jam on the shaft if the pulling operation is interrupted.  
- Pull or flange off evenly and in one go.

- Mount and operate the detaching device and the associated pressurised oil device in accordance with the manufacturer’s instructions.

**For stepped cylindrical interference fit:**  
- Install the stop plate (3). The remaining space must be to be a little more than half the length of the flange.

---

**Fig. 14: Detaching intervals**

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Flange</td>
</tr>
<tr>
<td>2</td>
<td>Oil groove</td>
</tr>
<tr>
<td>3</td>
<td>Shaft</td>
</tr>
</tbody>
</table>

If the stroke of the hydraulic cylinder does not suffice for removing the flange (1) completely from the shaft (3) in one go, then select the position for readjustment such that the shaft end is centred \(a = b\) between two oil grooves (2).  
Wait enough time prior to readjustment (approx. 2 to 3 hours) until the radial pressure has dropped completely.
**Recommendations for hydraulic removal:**

- Secure the flange, detaching device and hydraulic cylinder against dropping.
- Unscrew the screw plugs out of the oil connections and connect up the pump or pumps.
- Apply the radial expansion pressure given in the dimension sheet to the pump.
  - **1st step:** 50 % of the required pressure, allow 10 minutes to take effect
  - **2nd step:** Increase the pressure by 200 bar. Allow the pressure 2 minutes to take effect.
  - Repeat the 2nd step for as long as it takes until the required expansion pressure is reached.
- If pressurised oil assemblies are used without a sealing ring, inject the pressurised oil only until it escapes around the entire circumference of the flange and the flange "floats".
- If pressurised oil assemblies are used with a sealing ring, only inject the pressurised oil until it escapes to the full extent at the end of the shaft and the flange "floats".

The oil outlet can be covered at the shaft end by the structural shape of the fitting tool used.

If a stepped cylindrical interference fit is used, the flange can automatically be released very suddenly after the required expansion pressure has been reached.

- Apply pressure to the hydraulic cylinder.
- Remove the flange, using readjustment if necessary.

**If the flange does not release at the maximum expansion pressure:**

- Use oil with a higher viscosity (ISO VG 220).
- Leave the assembly pressurised for one hour.
- Attempt removal once again.

**If the flange still cannot be released:**

- Increase the maximum pressure by 5%.
- Attempt removal once again.

After the flange has been released:

- Release the pressure from the two pumps.
- Set down the flange.
- Remove the oil pipes.
- Dismount the detaching device.
- Examine the parts for any damage. Smooth out any minor damage. In the event of any serious damage, please contact RENK AG (Rheine plant).
- Protect the flange bore and shaft against corrosion.
- Screw the screw plugs into the oil connections.
10 Technical data

The technical data for the couplings vary greatly according to the series and the order.

- Please refer to the order-specific documentation for the technical data applicable to your coupling.
- In the event of missing or unclear technical data, please contact RENK AG (Rheine plant) for more information.

10.1 Tightening torques

10.1.1 Tightening torques for bolt connection

<table>
<thead>
<tr>
<th>Thread</th>
<th>Tightening torque (Nm)</th>
<th>Thread</th>
<th>Tightening torque (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M5</td>
<td>10</td>
<td>M24</td>
<td>1140</td>
</tr>
<tr>
<td>M6</td>
<td>15</td>
<td>M27</td>
<td>1680</td>
</tr>
<tr>
<td>M8</td>
<td>40</td>
<td>M30</td>
<td>2300*</td>
</tr>
<tr>
<td>M12</td>
<td>140</td>
<td>M36</td>
<td>4020*</td>
</tr>
<tr>
<td>M14</td>
<td>220</td>
<td>M42</td>
<td>6450*</td>
</tr>
<tr>
<td>M18</td>
<td>470</td>
<td>M45</td>
<td>8050*</td>
</tr>
<tr>
<td>M20</td>
<td>665</td>
<td>M52</td>
<td>12450*</td>
</tr>
</tbody>
</table>

* Due to high torques, we recommend specific tools. Please consult RENK.

Table 6: Tightening torques for fitted bolts 10.9 (friction coefficient $\mu = 0.14$)
11 Index of technical terms

Threaded extraction hole
Thread attached in a component. If, during removal, one component needs to be released from one facing it, then you can turn a screw into the threaded extraction hole.

Stepped cylindrical interference fit
The stepped cylindrical interference fit, also known as step seat, is a sub-type of the cylindrical interference fit. The seat length of the interference fit is divided up into two "steps" of the same length. The difference in the diameters of the two steps is usually 2 mm. The graduation facilitates the disassembly of the component, the axial path for release is halved.

Pull up dimension
The pull up dimension is the axial path that the tapered hub needs to be pushed onto the shaft in order to be able to transmit the required torque. The pull up dimension is measured starting from the zero position.

Floating to the surface or bloating
Interference fits must be radially expanded for removal. The hub can be pulled off axially as soon as it has been fully released from the shaft and is floating on the oil film.

Expansion pressure
The oil is pressed into the interference fit so that the hub/flange can be expanded radially. When the required expansion pressure is reached, the hub is normally released from the shaft. The expansion pressure must not exceed the maximum permissible expansion pressure, otherwise the hub will be overstretched and may tear.

C and E dimension
Clearance between the two flange surfaces (see Fig. 5 on Page 25).

Flange
The flange is the coupling component that is pulled onto the shaft of the driving or working machine.

Flexible middle piece
The flexible middle piece consists of the spacer or torsion shaft and sleeves with disc package at mounted at both ends.

Joint clearance
The joint clearance is the gap (clearance) between the bore hole and shafts (after heating up). The joint clearance prevents the interference fit from sticking during the joining process. It is recommended that a joint clearance of $0.001 \cdot d$ be calculated in.
Gap
A gap indicates the obliquity of the front faces of the two flanges and thus the angular offset of the two shafts to each other (see Fig. 7 on Page 27). The value "y-z" is the difference between the largest gap "y" and the smallest gap "z".

Disc package
The disc package is the core element of the coupling. The disc package consists of steel discs of the same thickness. The flexible steel discs allow axial, angular and radial displacement of the coupling.

Zero position
The zero position is reached when the flange in a cold state has been pushed so far onto the shaft that the fitting surfaces lie on top of each other without pressure.

Zero setting
The zero setting (position of the number 0) is used for the correct assembly of the main coupling components. The two zeros must always be opposite each other on the components.

Balance trimming holes
Balancing weights are screwed into the balance trimming holes. During disassembly, the balance trimming holes are also used as extraction threads for separating adjacent components.

Oversize
Difference between the diameter of the bore hole and shaft diameter prior to joining in interference fits.

Surface for balancing run
The coupling elements are placed on these surfaces on the balancing machine.
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