Installation and Operational Instructions for ROBA®-DS couplings Type $95\frac{2}{3}$. _ _ _ (disk pack HT) Sizes 16 – 160 (B.9.7.2.EN)

Please read these Operational Instructions carefully and follow them accordingly!

Ignoring these Instructions may lead to malfunctions or to coupling failure, resulting in damage to other parts.

Contents:

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Safety and Guideline Signs

CAUTION

Danger of injury to personnel and damage to machines.

Please Observe!
Guidelines on important points.

Attention! Possible property damage can be the consequence.

Safety Regulations

These Installation and Operational Instructions (I + O) are part of the coupling delivery.
Please keep them handy and near to the coupling at all times.

It is forbidden to start initial operation of the product until you have ensured that all applicable EU directives and directives for the machine or system, into which the product has been installed, have been fulfilled.
At the time these Installation and Operational Instructions go to print, the ROBA®-DS couplings accord with the known technical specifications and are operationally safe at the time of delivery.
Without a conformity evaluation, this product is not suitable for use in areas where there is a high danger of explosion. This statement is based on the ATEX directive.

CAUTION

- ❒ If the ROBA®-DS couplings are modified.
- ❒ The relevant standards for safety and / or installation conditions are ignored.

User-implemented Protective Measures

- ❒ Cover all moving parts to protect against seizure, dust or foreign body impact.
- ❒ Replace self-locking hexagon nuts when they become ineffective after frequent loosening and tightening.

To prevent injury or damage, only specialist personnel are allowed to work on the components. They must be familiar with the dimensioning, transport, installation, initial operation, maintenance and disposal according to the relevant standards and regulations.
Please read the Installation and Operational Instructions carefully prior to installation and initial operation of the device.

These Safety Regulations are user hints only and may not be complete!

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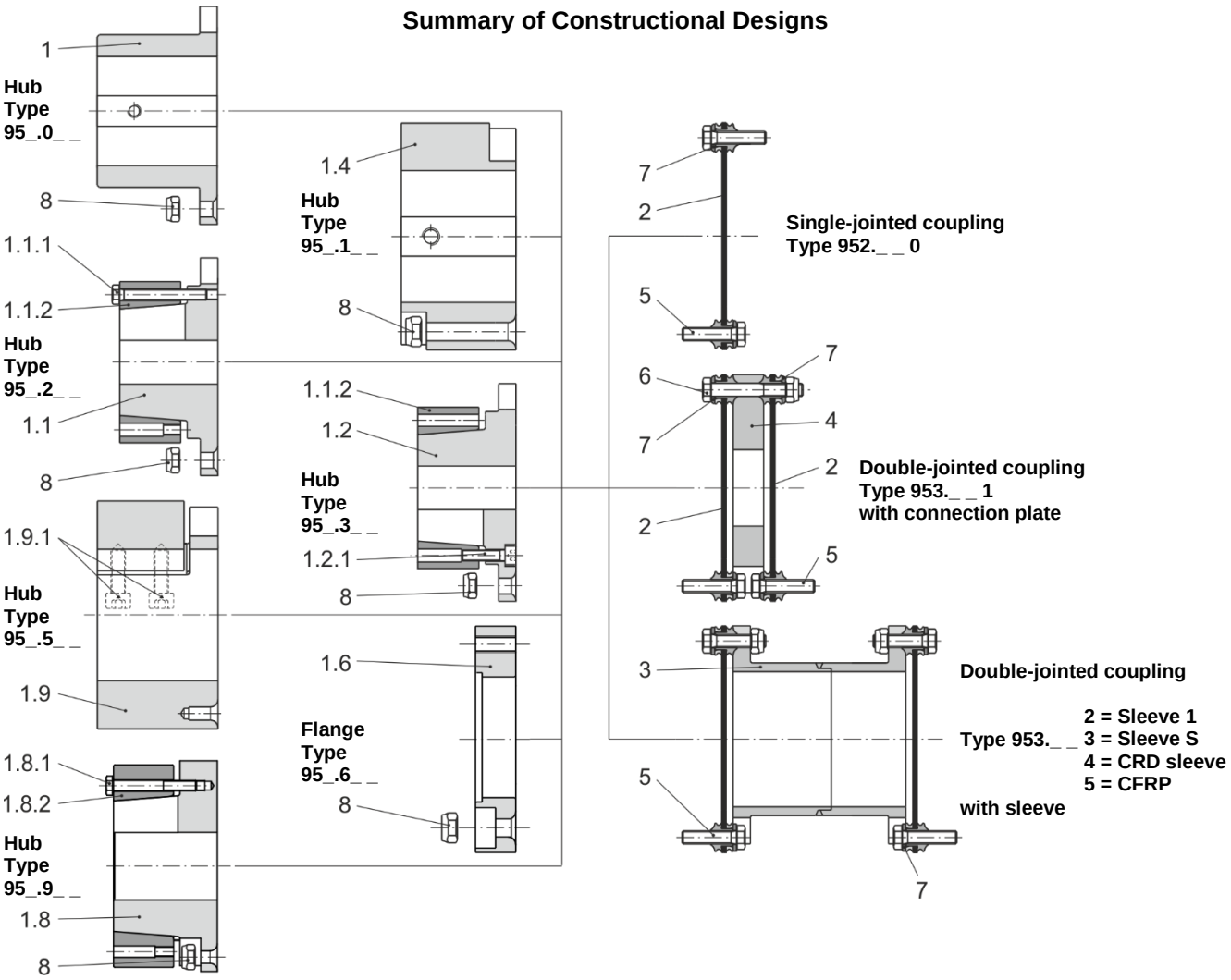

Fig.1

Parts List

Only use *mayr*® original parts

Item	Name
1	Hub Type 95_.0_ _
1.1	Hub Type 95_.2_ _
1.1.1	Hexagon head screws for hubs Type 95_.2_ _
1.1.2	Shrink disk
1.2	Hub Type 95_.3_ _
1.2.1	Cap screws for hubs Type 95_.3_ _
1.4	Hub Type 95_.1_ _
1.6	Flange Type 95_.6 _ _
1.8	Hub Type 95_.9_ _
1.8.1	Hexagon head screws for hubs Type 95_.9_ _
1.8.2	Shrink disk
1.9	Hub Type 95_.5_ _
1.9.1	Cap screw for hubs Type 95_.5_ _

Item	Name
2	Disk pack
3	Sleeve
4	Connection plate
5	Hexagon head screw
6	Hexagon head screw
7	Washer
8	Hexagon nut

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Table 1: Technical Data

ROBA®-DS Size	16	25	40	64	100	160
d_{Pmax} Hub Type 95_.0 (1) [mm]	32	40	50	55	70	80
$d_{G\,max}$ Hub Type 95_.1 (1.4) [mm]	45	55	65	75	95	110
d_{Smax} Hub Type 95_.2/3 (1.1/2) [mm]	26	36	45	45	55	65
d_{Rmax} Hub Type 95_.5 (1.9) [mm]	45	52	60	70	90	100
d_{SGmax} Hub Type 95_.9 (1.8) [mm]	45	52	60	70	90	100
Coupling nominal torque T_{KN} valid for changing load direction as well as for max. permitted shaft misalignment [Nm]	300	420	650	1100	1600	2600
Coupling peak torque T_{KS} valid for unchanging load direction, max. load cycles ≤ 10^5 [Nm]	450	630	975	1650	2400	3900
Max. speed $n_{max.}$ [rpm]	13600	11800	10100	8500	7300	6200
Distance dimension "S" [mm]	4.6 ±0.2	5.0 ±0.2	6.1 ±0.2	8.0 ±0.25	8.6 ±0.25	9.2 ±0.25
Axial displacement ΔK_a 1) [mm] Values refer to couplings with 2 disk packs. Only permitted as a static or virtually static value.	±0.8	±0.9	±1.1	±1.3	±1.5	±1.7
Radial misalignment ΔK_r for Type 953._ _ 1 [mm]	0.2	0.2	0.25	0.3	0.3	0.35
Radial misalignment ΔK_r for Type 953._ _ 2 [mm]	0.7	0.8	1	1.25	1.45	1.5
Radial misalignment ΔK_r for Type 953._ _ 3 1) [mm]	$(H_S - S) \times 0.0122$					
Radial misalignment for single-jointed coupling	If there is only one disk pack, the shafts must be aligned exactly.					
Angular misalignment ΔK_w per disk pack 1) [°]	0.7	0.7	0.7	0.7	0.7	0.7
Hexagon head screws Item 1.1.1 (Hub Type 95_.2_ _) Tightening torque [Nm]	M5x30 6	M5x35 6	M5x40 8.5	M6x45 10	M8x50 25	M8x55 25
Cap screws Item 1.2.1 (Hub Type 95_.3_ _) Tightening torque [Nm]	M5x18 6	M5x18 6	M5x20 8.5	M6x20 10	M8x22 25	M8x25 25
Hexagon head screws Item 1.8.1 (Hub Type 95_.9_ _) Tightening torque [Nm]	M5x30 6	M5x35 6.5	M5x40 8.5	M6x45 14	M8x50 25	M8x55 32
Cap screws Item 1.9.1 (Hub Type 95_.5_ _) Tightening torque [Nm]	M6x25 17.4	M8x25 42	M10x35 83	M12x40 122	M12x45 143	M14x50 220
Hexagon head screws Item 5 Hexagon nut Item 8 Tightening torque [Nm]	M5x20 8.5	M5x20 8.5	M6x25 14	M8x30 35	M8x30 35	M10x40 69
Hexagon head screws Item 5 Hexagon nut Item 8 (Hub Type 95_.1_ _) Tightening torque [Nm]	M5x45 8.5	M5x50 8.5	M6x60 14	M8x70 35	M8x80 35	M10x90 69
Hexagon head screws Item 5 Hexagon nut Item 8 (Hub Type 95_.5_ _) Tightening torque [Nm]	M5x18 8.5	M5x18 8.5	M6x22 14	M8x30 35	M8x30 35	M10x35 69
Hexagon head screws Item 6 Hexagon nut Item 8 Tightening torque	M5x32 8.5	M5x32 8.5	M6x40 14	M8x50 35	M8x50 35	M10x60 69
Adjusting screws for hub Type 95_.0_ _ with hub bore Tightening torque [Nm]	M5 ≤22 2 / M6 >22 4.1	M5 ≤22 2 / M6 >22 4.1	M6 4.1	M8 8.5	M10 14	M12 35
Adjusting screws for hub Type 95_.1_ _ Tightening torque [Nm]	M8 8.5	M8 8.5	M10 14	M10 14	M12 35	M12 35

1) For Types 953._ _4 and 953._ _5, the permitted shaft misalignments must be reduced to one-third of the Table values.

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Table 2: Transmittable Torques on Shrink Disk Hubs, Large (1.8)
- Dependent on Bore / Suitable for H7/g6

Bore	Sizes					
	16	25	40	64	100	160
Ø25	339	-	-	-	-	-
Ø28	404	-	-	-	-	-
Ø30	448	-	-	-	-	-
Ø32	492	526	-	-	-	-
Ø35	558	602	-	-	-	-
Ø38	620	679	-	-	-	-
Ø40	659	730	873	-	-	-
Ø42	694	780	937	-	-	-
Ø45	738	851	1036	1268	-	-
Ø48	-	913	1132	1394	-	-
Ø50	-	948	1195	1480	-	-
Ø52	-	978	1255	1565	-	-
Ø55	-	-	1338	1691	2074	-
Ø60	-	-	1454	1890	2366	-
Ø65	-	-	-	2065	2658	3246
Ø70	-	-	-	2204	2943	3618
Ø75	-	-	-	-	3213	3991
Ø80	**Attention!** Please observe the permitted coupling torques of the coupling size used.		-	-	3458	4353
Ø85			-	-	3666	4695
Ø90	-	-	-	-	3828	5007
Ø100	-	-	-	-	-	5497

Table 3: Transmittable Torques on Shrink Disk Hubs (1.1/1.2)
- Dependent on Bore / Suitable for H7/g6

Bore	Sizes					
	16	25	40	64	100	160
Ø14	158	-	-	-	-	-
Ø16	186	-	-	-	-	-
Ø20	240	283	-	-	-	-
Ø22	269	320	-	-	-	-
Ø25	312	375	429	-	-	-
Ø28	-	428	495	-	-	-
Ø30	-	468	546	704	-	-
Ø32	-	509	600	769	-	-
Ø35	-	568	669	863	1057	-
Ø38	-	-	741	960	1176	-
Ø40	-	-	796	1031	1269	1783
Ø42	-	-	852	1104	1366	1919
Ø45	-	-	932	1206	1500	2107
Ø50	**Attention!** Please observe the permitted coupling torques of the coupling size used.		-	-	1692	2400
Ø55			-	-	1889	2680
Ø60	-	-	-	-	-	2967
Ø65	-	-	-	-	-	3263

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Table 4: Transmittable Torques on Clamping Hubs (1.9) - Dependent on Bore / Suitable for H7/h6

Bore	Sizes					
	16	25	40	64	100	160
Ø20	183	-	-	-	-	-
Ø22	202	354	-	-	-	-
Ø25	229	402	604	-	-	-
Ø28	257	450	677	821	-	-
Ø30	275	483	725	880	-	-
Ø32	293	515	773	938	1102	-
Ø35	321	563	846	1026	1205	-
Ø38	348	611	918	1114	1309	-
Ø40	367	643	967	1173	1378	1839
Ø42	385	676	1015	1232	1447	1931
Ø45	412	724	1087	1319	1550	2069
Ø48	-	772	1160	1407	1653	2207
Ø50	-	804	1208	1466	1722	2299
Ø52	-	836	1257	1525	1791	2391
Ø55	-	-	1329	1613	1894	2529
Ø60	-	-	1450	1759	2066	2759
Ø65	-	-	-	1906	2239	2989
Ø68	-	-	-	1994	2342	3127
Ø70	-	-	-	2053	2411	3219
Ø75	-	-	-	-	2583	3449
Ø80	-	-	-	-	2755	3679
Ø85	-	-	-	-	2927	3909
Ø90	-	-	-	-	3100	4139
Ø95	-	-	-	-	-	4369
Ø100	-	-	-	-	-	4599

Attention!
Please observe the permitted coupling torques of the coupling size used.

Function – Application

ROBA®-DS couplings are shaft connections for torsionally rigid, backlash-free torque transmission. At the same time they compensate for Angular misalignments and axial displacements on single-jointed couplings (Type 952._ _ _), and additionally for radial misalignments on double-jointed couplings (Type 953._ _ _).

State of Delivery

The ROBA®-DS couplings are delivered in individual parts and pre-assembled units.

All screw connections must be checked and pre-tensioned during the final installation to a torque value according to Table 1 and Table 2.

Except for the disk pack (2), all parts are phosphated and therefore have a basic corrosion protection.
All hub designs can be delivered either pilot bored or finish bored.
The preferred bore tolerance is H7; deviating bores are possible (please contact the manufacturer).
The key hubs (Items 1 and 1.4) additionally have a keyway acc. DIN 6885 sheet 1 or 3, as well as an adjusting screw for axial securement.

Temperature Resistance

Due to their all-steel design, ROBA®-DS couplings are temperature-resistant up to +250 °C. At temperatures of over +120 °C, the standard self-locking hexagon nuts must be replaced with self-locking all-steel nuts acc. EN ISO 7042.

Storage

To avoid corrosion, the coupling must be stored in dry rooms protected from the weather.
Preservative oil can be used for protecting (treating) the coupling.

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Installation Position

ROBA®-DS couplings are designed for horizontal installation. In case of vertical or inclined installation, on long sleeves (sleeves S/CRD/CFRP) the sleeve's own weight must be supported with a vertical support (Fig. 3). This vertical support including both centerings in the hub and in the sleeve is produced at the place of manufacture.

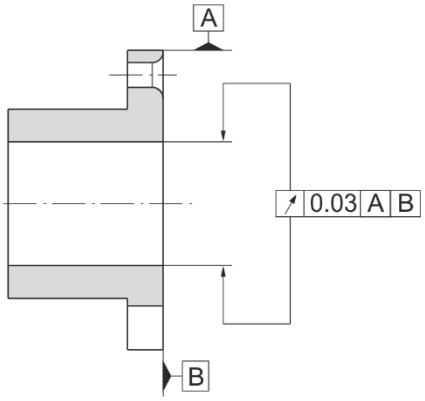

Fig. 2

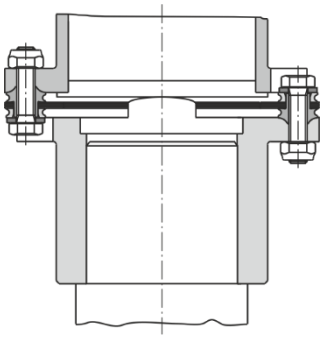

Fig. 3

Guidelines on Hub Bore and Shaft

General Guidelines:

- ❑ The maximum bore diameter according to Table 1 may not be exceeded.
- ❑ The hub bores are usually produced with tolerance H7. The required shaft tolerance depends on the hub type used as well as on the basic overall load configuration.

  - Shrink disk hubs / clamping hubs: h6/g6

  - Key hubs:
  r6/s6 (alternating rotational direction),
  k6/n6 (one-way rotational direction)
- ❑ The recommended bore tolerances are to be produced using the position and tolerance width as references; at the same time, please keep to the shaft run-out and axial run-out tolerances of 0.03 mm (see Fig. 2).
- ❑ After producing the finish bore, please clean it using suitable cleaning agents.
- ❑ The shaft surfaces should be finely turned or ground (Ra = 0.8 µm).
- ❑ The required yield point for the shafts used is at least 350 N/mm² (St60, St70, C45, C60).

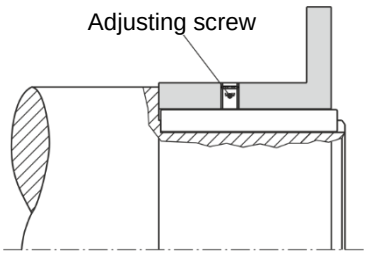

Fig. 4

Please observe the following when boring the hub with keyway
(Items 1 and 1.4) Types 95_.0_ _ and 95_.1_ _:

- ❑ The specified form (DIN 6885 sheet 1 or 3) and position* of the keyway.

  *** Position of the keyway on Type:**

  95_.0_ _ (Item. 1) aligned with a fixing hole.

  95_.1_ _ (Item 1.4) 25° offset to a fixing hole.
- ❑ For axial securement, please provide an additional adjusting screw (ISO 4029 - 45H) as an alternative to a press cover (see Figs. 4 and 5).
  The adjusting screw dimensions and tightening torques stated in Table 1 must be kept to.

Please observe the following when boring the shrink disk hubs (Items 1.1, 1.2 and 1.8) Types 95_.2_ _, 95_.3_ _ and 95_.9_ _:

- ❑ The shrink disk hubs are generally delivered greased and pre-assembled. For production of the finish bore, the shrink disk is de-installed and the hub is de-greased.
- ❑ Deburr the hubs, in particular in the area of the slots.
- ❑ Clean and re-grease the hubs in the shrink disk contact areas.
  Permitted grease: Klüber Alltemp QNB 50

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Hub Installation

The configuration of the different individual components can be seen in Fig. 1.

Hub Installation Types 95_.2_ _ / 95_.3_ _ / 95_.9 _ _ (Hubs with Shrink Disk)

- ❑ The force transmission of the shrink disk hubs (1.1/1.2/1.8) takes place using frictional locking. The contact surfaces between the shrink disk and the hub are greased manufacturer-side.
- ❑ The hub bores and the shaft ends must be completely grease-free during installation. Greasy or oily bores or shafts do not transmit the maximum coupling torque.
- ❑ The shafts must not have a keyway.
- ❑ The hub and the shrink disk (1.1.2/1.8.2) must be completely relaxed; if necessary, loosen the screws (1.1.1/1.2.1/1.8.1) by several thread turns.

a) Mount the hubs (1.1/1.2/1.8) onto the shafts using a suitable device and bring them into the correct position.

b) Tighten the tensioning screws (1.1.1/1.2.1/1.8.1) using a torque wrench evenly and **one after the other in 3 to max. 6 tightening sequences** to the torque stated in Table 1.

c) Check the tightening torque produced after 5 to 10 operating hours.

For de-installation:

a) Loosen all tensioning screws (1.1.1/1.2.1/1.8.1) in several sequences by several thread turns.

b) Screw out the tensioning screws located next to the tapped extracting holes and screw them into the tapped extracting holes up to their limits.

Please take the axial space requirements for the tensioning screws to be screwed into the tapped extracting holes into account (length of the hexagon head screws Item 1.1.1 / Item 1.8.1 in Table 1, page 3).

c) Tighten the tensioning screws (1.1.1/1.2.1/1.8.1) evenly and step-wise so that the shrink disk (1.1.2/1.8.2) is loosened from the hub.

Hub Installation Type 95_.5_ _ (Clamping Hubs)

- ❑ The hub bores and the shaft ends must be completely grease-free during installation. Greasy or oily bores or shafts do not transmit the maximum coupling torque.
- ❑ The shafts must not have a keyway.
- ❑ The clamping hub (1.9) must be completely relaxed; if necessary, loosen the screws (1.9.1) by several thread turns.

a) Mount the hubs (1.9) onto the shafts using a suitable device and bring them into the correct position.

b) Tighten the clamping screws (1.9.1) using a torque wrench to the torque stated in Table 1.

c) Check the tightening torque produced after 5 to 10 operating hours.

Hub Installation Types 95_.0_ _ / 95_.1_ _ (Hubs with Keyway)

- ❑ Mount the hubs (1/1.4) onto the shafts using a suitable device and secure them axially (Fig. 5). Axial securement takes place using a set screw (adjusting screw), which presses radially onto the key; or via a press cover and a screw, screwed into the shaft threaded centre hole.
- ❑ The key must lie over the entire length of the hub.

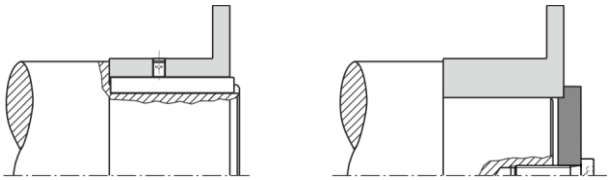

Fig. 5

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Coupling Installation (Figs. 1 and 6)

The disk packs (2) are screwed together **alternately** with the sleeve (3) and the hubs or the connection plate (4) using lightly oiled hexagon head screws (5 and 6), washers (7) and hexagon nuts (8).

Here, the tightening torque acc. Table 1 must be produced in several steps.
The hexagon nuts (8) or the hexagon head screws (5 and 6) must be tightened in several steps to their full tightening torque acc. Table 1. Please see Table 5 for the respective tightening torques for each step.

Table 5

Step	Tightening torque for hexagon nuts (8) or hexagon head screws (5 and 6)
1	30 % of the nominal tightening torque
2	60 % of the nominal tightening torque
3	100 % of the nominal tightening torque

The disk pack (2) must not under any circumstances be distorted when applying the pre-tension force.

The disk pack (2) is always to be inserted so that the collar bushing radius (part 2a, Fig. 6, detail “X”) lies in the hub grooves, the sleeve grooves or the connection plate grooves.

Due to the enlarged diameter of the shrink disks (1.8.2), please make sure that the installation sequence is suitable.
In this way, normal torque wrenches can be used for installation of the disk pack (2).

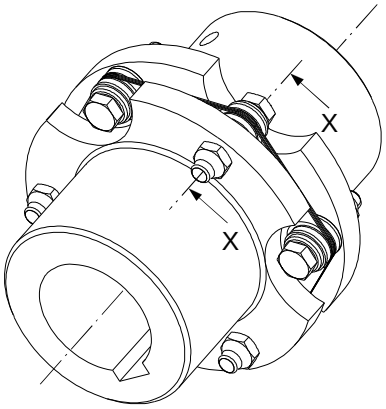

Fig. 6

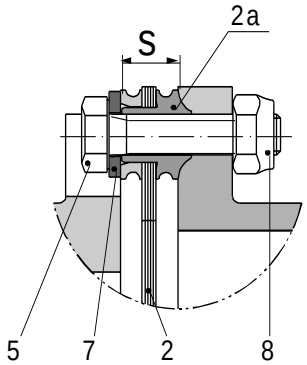

Fig. 6 Detail “X”

Coupling Alignment

Exact coupling alignment reduces the reaction forces and therefore increases the lifetime of the coupling and the shaft bearing.
In most of the applications, coupling alignment using a straight edge in two levels vertical to each other is sufficient.
However, we recommend alignment of the coupling (of the shaft ends) using a dial gauge or laser on drives operating at very high speeds.
In order to prevent axial distortion of the disk packs, the dimension “S” (Fig. 6, detail “X”, Table 1) must be maintained with aligned angular and radial shaft misalignments.

Permitted Shaft Misalignments

ROBA®-DS single-jointed couplings (Type 952._ _ _) compensate for angular and axial shaft misalignments.
ROBA®-DS double-jointed couplings (Type 953._ _ _) compensate for angular, axial and radial shaft misalignments (Fig. 8) without losing their backlash-free function. However, the permitted shaft misalignments indicated in Table 1 must not simultaneously reach their maximum value. If more than one kind of misalignment takes place simultaneously, they influence each other. This means that the permitted misalignment values are dependent on one another, see Fig. 7. The sum total of the actual misalignments in percent of the maximum value must not exceed 100 % (see example and Fig. 7).

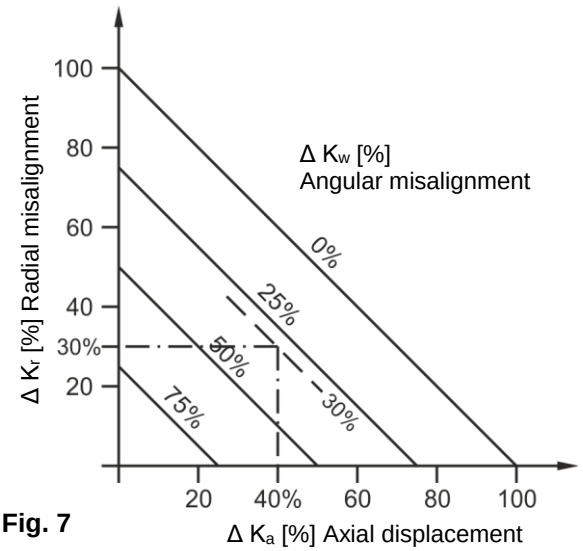

Fig. 7

Example:

ROBA®-DS, Size 40, Type 953.002
Axial displacement occurrence ΔK_a = 0.44 mm equals 40 % of the permitted maximum value ΔK_a = 1.1 mm.
Angular misalignment occurrence in the disk pack ΔK_w = 0.21° equals 30 % of the permitted maximum value ΔK_w = 0.7°.
=> permitted radial misalignment ΔK_r = 30 % of the maximum value
ΔK_r = 1.0 mm => ΔK_r = 0.3 mm

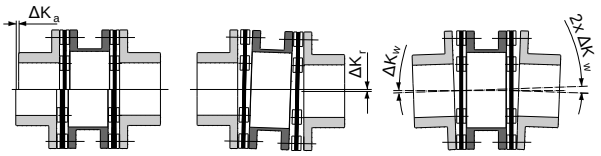

Fig. 8

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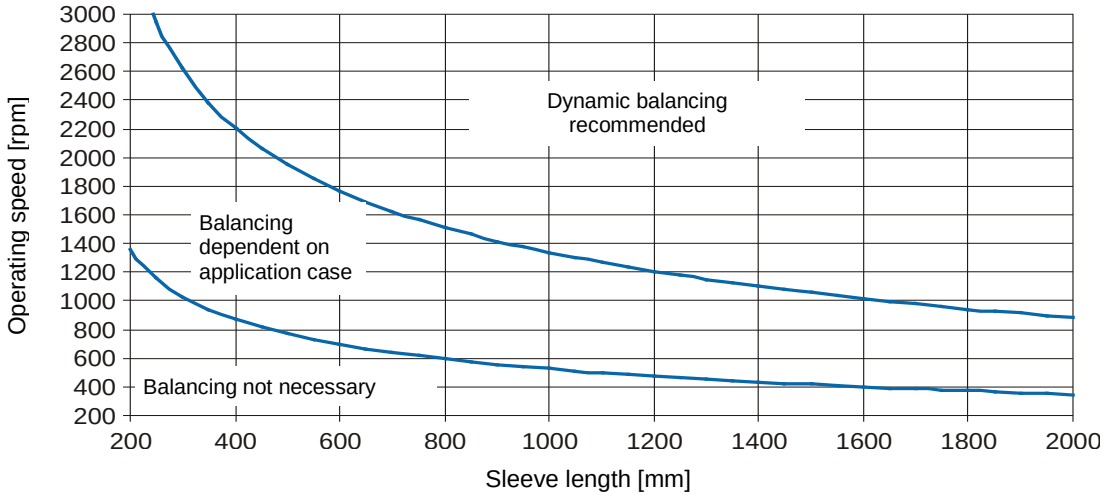
Balancing the Coupling

In most applications, balancing the ROBA®-DS coupling is not necessary. In general, the following points are crucial when deciding whether the coupling needs balancing:

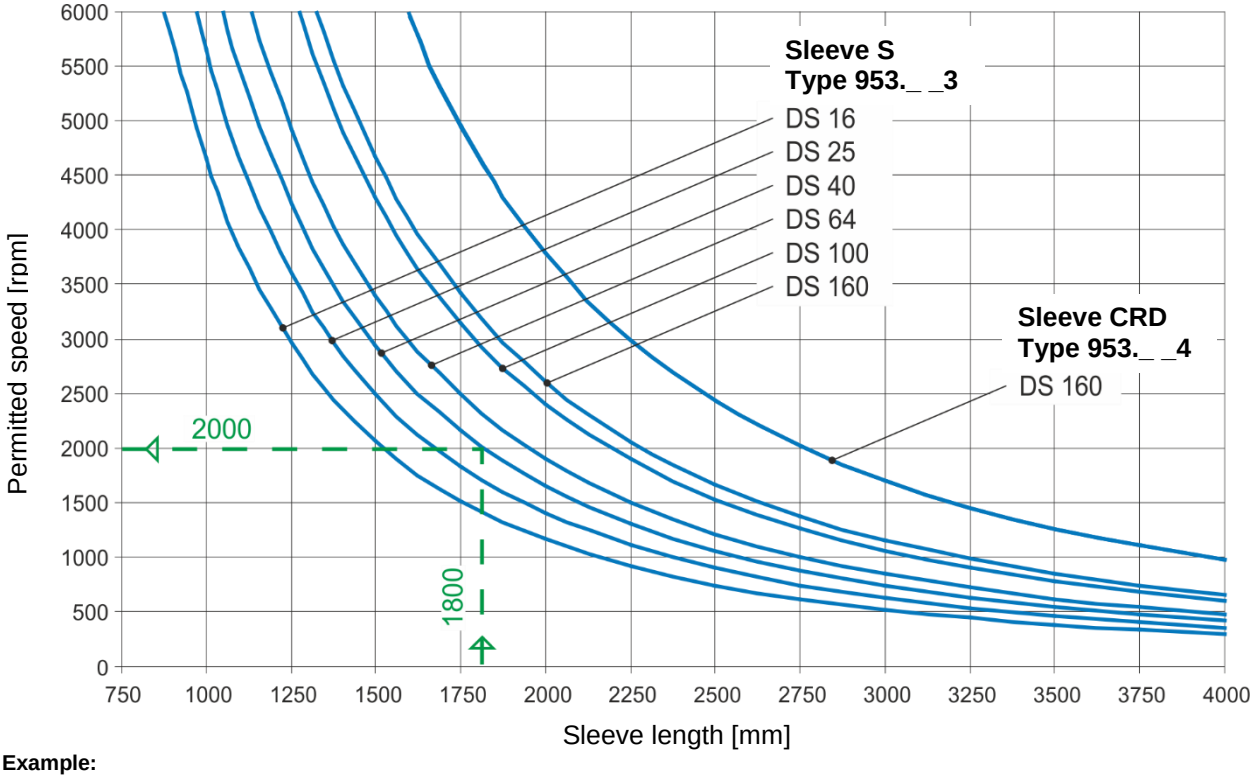
- ❑ Circumferential speed of the coupling
- ❑ Length of the sleeves S/CRD/CFRP (Diagram 1)
- ❑ Required balance quality

Diagram 1: Balancing Couplings with Sleeve S/CRD/CFRP (Special Length)



Smooth running of the machine is not only ensured by the coupling balance quality, but is also influenced by parameters such as rigidity and distance to the adjacent bearings as well as by the sensitivity and mass of the entire construction.
Diagram 1, therefore, only shows reference values as recommendations for balancing.
All parts of the ROBA®-DS couplings, except the sleeves S/CRD/CFRP, are machined on all sides, and therefore lie in the range G6.3 acc. DIN ISO 1940 at medium speeds (1500 rpm).
If higher demands are placed on the balance quality, it is possible to balance individual parts or even the entire installed coupling (on request). However, for this option, the hubs must have a finish bore.

Diagram 2: Permitted Speeds (Bend-critical) for Sleeves S Type 953._ _3 and Sleeves CRD Type 953._ _4 (only Size 160)



Example:
Size 40, sleeve length H_S = 1800 mm = > permitted speed 2000 rpm.

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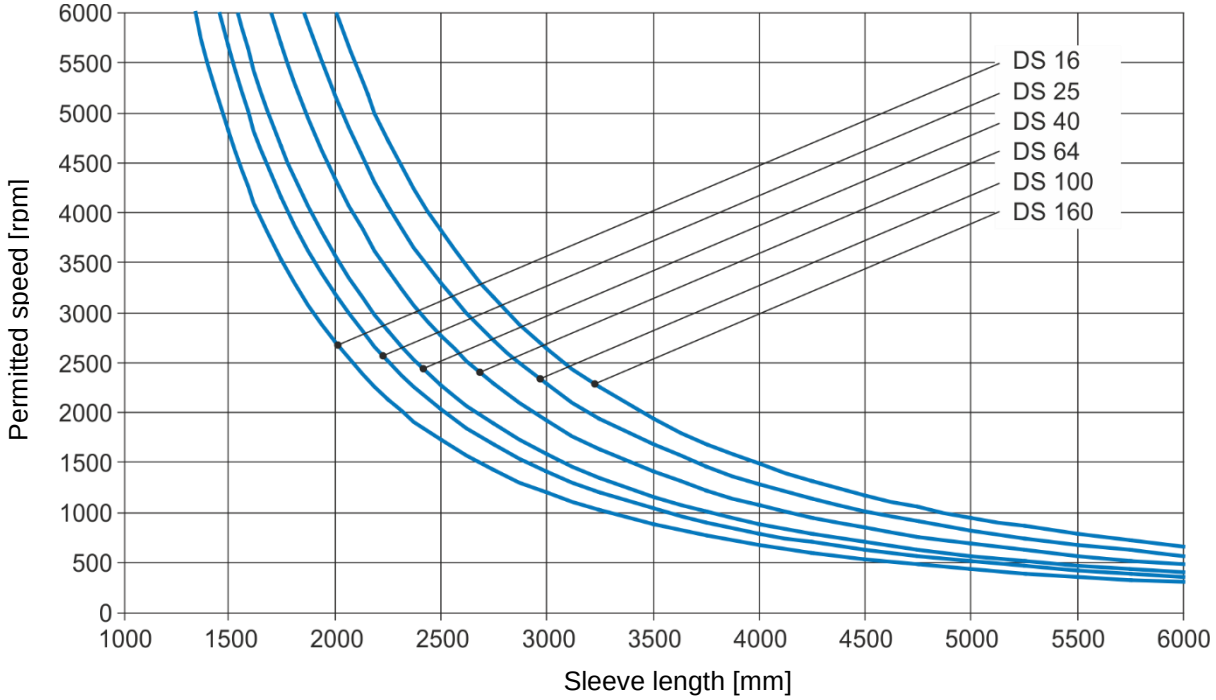
Diagram 3: Permitted Speeds (Bend-critical) for Sleeves CFRP Type 953._ _5



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Maintenance

ROBA®-DS couplings are mainly maintenance-free.

The following maintenance and inspection intervals are to be maintained:

1.) Visual inspection, inspection of the installation parameters (misalignment and tightening torques) and the coupling running behaviour **before initial operation.**

2.) Visual inspection, torsional backlash, inspection of the misalignment and the tightening torques, coupling running behaviour **after 1000 h, at the latest after 3 months.**

3.) If no irregularities or wear are found during the second maintenance and inspection interval, further inspection intervals can, with unchanged operating parameters, take place **after 4000 operating hours or after maximum 12 months.**

In extreme coupling ambient or operating conditions, the maintenance and inspection intervals should be shortened.

Disposal

All steel components:

Steel scrap (Code No. 160117)

Malfunctions / Breakdowns

Malfunction	Possible Causes	Solutions
Changes in running noise and / or vibration occurrence	Incorrect alignment, incorrect installation	1) Set the system out of operation 2) Find / resolve the cause of incorrect alignment 3) Check the coupling for wear
	Loose connecting screws, minor fretting corrosion under the screw head and on the disk pack	1) Set the system out of operation 2) Check the coupling parts and replace if damaged 3) Tighten the connecting screws to the specified torque 4) Check the alignment and correct if necessary
	Tensioning and clamping screws or locking set screw for axial hub securement are loose	1) Set the system out of operation 2) Check the coupling alignment 3) Tighten the tensioning and clamping screws for axial hub securement to the required torque or tighten the locking set screw and secure it against self-loosening using sealing lacquer 4) Check the coupling for wear
Disk pack breakage	Disk pack breakage due to high load impacts / overload	1) Set the system out of operation 2) Dismantle the coupling and remove the remainders of the disk packs 3) Check the coupling parts and replace if damaged 4) Find the cause of overload and remove it
	Operating parameters are not appropriate for the coupling performance	1) Set the system out of operation 2) Check the operating parameters and select a suitable coupling (observe installation space) 3) Install a new coupling 4) Check the alignment
	Incorrect operation of the system unit	1) Set the system out of operation 2) Dismantle the coupling and remove the remainders of the disk packs 3) Check the coupling parts and replace if damaged 4) Train and advise operating personnel
Disk packs / connecting screws cracks or breakage	Drive vibrations	1) Set the system out of operation 2) Dismantle the coupling and remove the remainders of the disk packs 3) Check the coupling parts and replace if damaged 4) Check the alignment and correct if necessary 5) Find the cause of vibration and remove it

mayr® will take no responsibility or guarantee for replacement parts and accessories which have not been delivered by *mayr*®, or for damage resulting from the use of these products.

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