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HKBR Gear Couplings

Proven gear couplings for
demanding applications

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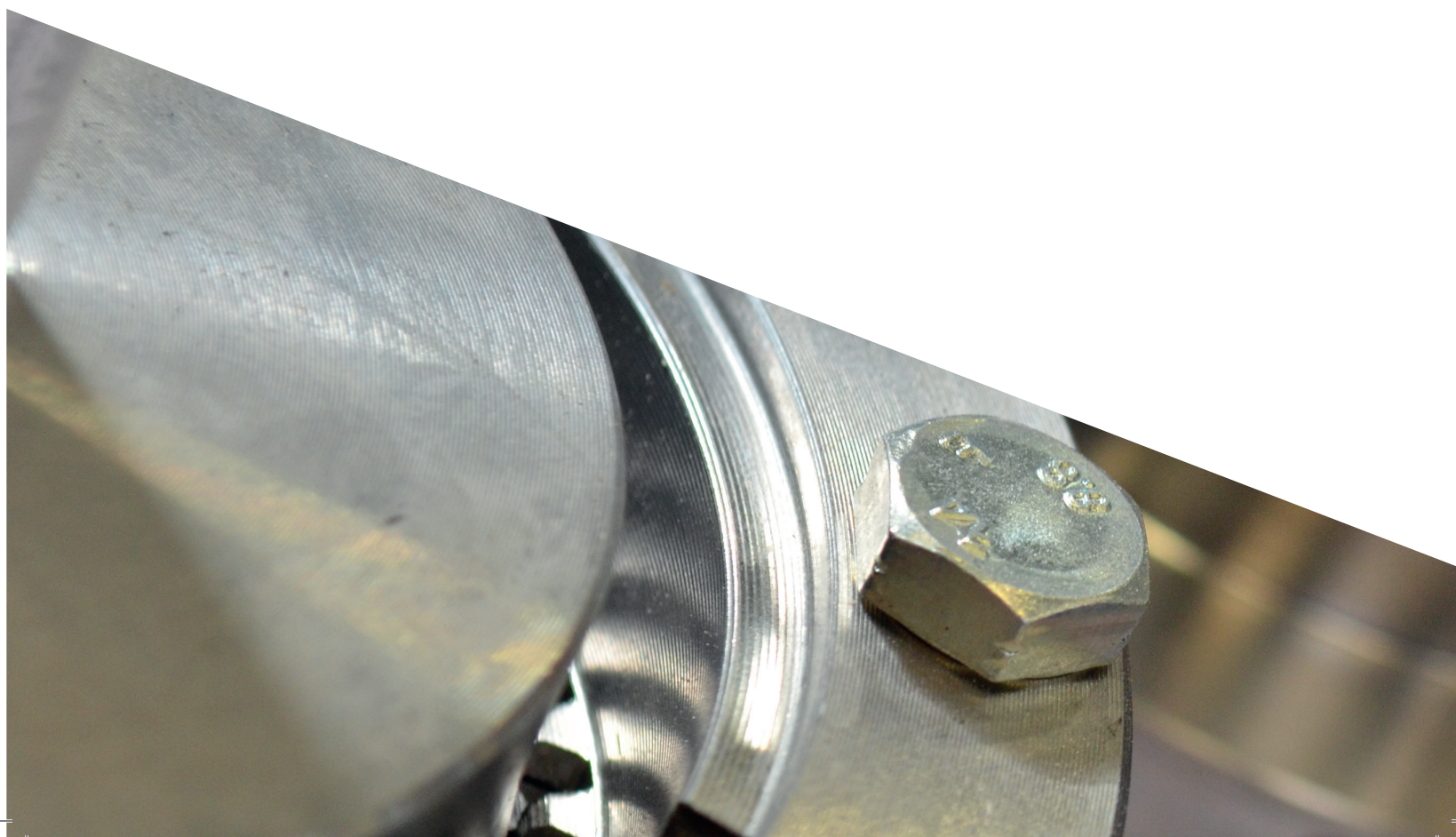
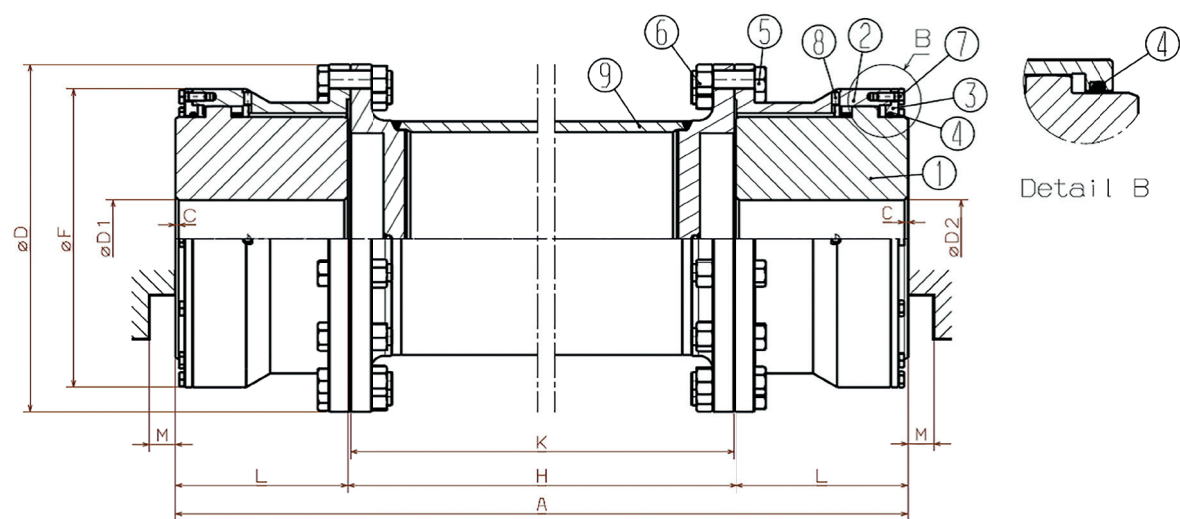


Figure 1.



- M = Space required for installation
H = Distance between shaft ends
K = Spindle length
- K=H-6mm, HKBR-401-312
- K=H-10mm, HKBR-313-315
A = Total length
Detail B = Sizes HKBR-401 - 404

- 1 = Hub
2 = Sleeve
3 = End flange
4 = Seal
5 = Hexagon screw
6 = Self locking hexagon nut
7 = Hexagon screw
8 = Grease filler plug
9 = Spindle

Table 1.

D_1/D_2	Bore Chamfer V
> 20 < 45	2
> 45 < 110	4
> 110 < 200	6
> 200 < 480	8

Table 2.

Coupling Size	Nominal Torque	Dimensions in mm							Moment of inertia		Mass		Max. speed	Lubricant capacity
		D ₁ /D ₂	DIN 6885	ANSI B17.1	D	F	L	M	Standard parts 1)	Spindle	Standard parts 1)	Spindle		
		min	max	max inch					kgm ²	kgm ²	kg	kg		
HK	T ₁												1/min	dm ³
HKBR-401	2500	20	65	2 3/8	155	115	63	30	0.021	0.014 + 0.028/m	10	6+17.4/m	*)	2*0.05
HKBR-402	4200	30	80	3	175	135	80	30	0.044	0.024 + 0.064/m	16.3	8.6 + 23/m	*)	2*0.1
HKBR-403	6700	50	105	3 13/16	215	168	100	30	0.128	0.062 + 0.122/m	29.8	14.6 + 28.5/m	*)	2*0.2
HKBR-404	13500	60	135	4 15/16	250	204	125	30	0.316	0.15 + 0.221/m	53.8	25 + 34.6/m	*)	2*0.4
HKBR-405	25500	70	170	6 3/16	315	272	160	32	1.142	0.364 + 0.565/m	119.3	41.8 + 51.6/m	*)	2*0.4
HKBR-406	40000	80	190	6 7/8	340	295	200	32	1.953	0.504 + 0.965/m	173.8	50.4 + 71.5/m	*)	2*0.6
HKBR-407	56000	90	225	8	405	346	200	32	3.884	1.163 + 1.365/m	245.2	75.1 + 80.3/m	*)	2*0.85
HKBR-408	86000	110	245	9	445	384	250	37	7.309	1.921 + 2.887/m	378	99.1 + 121.5/m	*)	2*0.95
HKBR-409	107000	120	280	9 7/8	505	435	250	37	11.845	3.819 + 3.872/m	481.2	163.8 + 134/m	*)	2*1.2
HKBR-410	160000	140	305	11	550	476	300	37	19.693	5.746 + 5.879/m	668.8	206.2 + 154.1/m	*)	2*2.25
HKBR-311	225000	160	320	11 1/8	605	522	300	37	27.94	8.48	795	174	*)	2*4
HKBR-312	315000	200	360	12 6/8	685	594	360	42	54.34	15.8	1180	214	*)	2*5
HKBR-313	450000	230	400	14 1/16	760	685	400	42	89.38	20.7	1560	234	1200	2*9
HKBR-314	630000	260	440	15 3/16	850	774	450	45	166.74	32.4	2290	316	1100	2*14
HKBR-315	1000000	300	480	16 7/8	950	865	500	45	273	50.4	3000	366	1000	2*30

1) = Values calculated with min. bore of the hub without the spindle

*) = See diagram 1

Unless otherwise agreed, hub bore tolerance J7 keyways to DIN 6885 and keyway width tolerance JS9.

Allowable angular misalignment of the shafts 0,6° /coupling half with unloaded coupling 1°/ coupling half.

Couplings with larger angular misalignment capacity are custom-made. Allowable axial float of a correctly mounted coupling relative to its nominal size (- inwards / + outwards)

HKBR-401 - 404 -6 / +8 mm

HKBR-405 - 312 -6 / +12 mm

HKBR-313 - 315 -10/ +15 mm

When necessary, the axial float can be divided differently.

Selection

Select the coupling size as basis of torque as follows:

T

=

9550 • P

———— (Nm)

n

T₁

>

f • T (Nm)

T₁

=

Nominal torque of coupling (Nm)

T

=

Operating torque of coupling (Nm)

P

=

Power requirement of driven machine (kW)

n

=

Coupling speed (1/min)

f

=

Service factor. Select the service factor for normal applications from Table 3 below

Table 3.

Load type	Service factor f		
	Hours of operation/ day		
	3	8	24
Uniform	1.0	1.4	1.6
Moderate shock load	1.4	1.6	2.0
Heavy shock load	1.6	2.0	2.5

Check

- a) that the shafts will fit into the bores of the coupling (D_{min}/ D_{max})
- b) that the allowable speed of the coupling will not be exceeded (sizes 401-312, see Diagram 1, sizes 313-315, see Table 2)
- c) that the allowable misalignments and axial floats will not be exceeded
- d) that there will be enough space (M) to align the coupling

Note! Check the drive system in demanding applications for torsional vibrations!

Example of selection

A coupling is needed between a reducer and an electric motor. The reducer drives a belt conveyor.

Power requirement of the conveyor = 56 kW

Motor speed = 1500 1/min

Conveyor load is uniform, operation time 16 hours/day

Shaft dimensions:

Motor: $\varnothing$ 70 mm tolerance m6, keyway to DIN 6885, shaft journal free length 140 mm

Reducer: $\varnothing$ 50 mm, tolerance m6, keyway to DIN 6885, shaft journal free length 110 mm

Distance between shaft ends 2000 mm.

The electric motor stands on a rigid base. The reducer in question is a shaft-mounted speed reducer.

The end of its vertically +/- 1 mm because of flexing and backlash in the torque arm.

Select the coupling size on the basis of torque as follows:

$$T = \frac{9550 \cdot P}{n} = \frac{9550 \cdot 56}{1500} = 356.53 \text{ Nm}$$

Calculate the service factor f according the Table 3 as follows:

$$f = 1.6 \text{ (belt conveyor, uniform load, 16 hours a day)}$$

$$f \cdot T = 1.6 \cdot 356.53 \text{ Nm} = 570 \text{ Nm}$$

The nominal torque of the coupling HKBR-401 is sufficient since:

$$T1 = 2500 \text{ Nm} > 570 \text{ Nm}$$

Check

a) **The bores of the coupling HKBR-401:**

$D_{\max} = 65\text{mm}$

$D_{\min} = 20\text{mm}$

The motor shaft $\varnothing 70\text{mm}$ will not fit into the coupling HKBR-401. Select the next size HKBR-402, where $D_{\max} = 80$ ja $D_{\min} = 30\text{mm}$

b) **The critical speed of the coupling HKBR-402, see diagram 1**

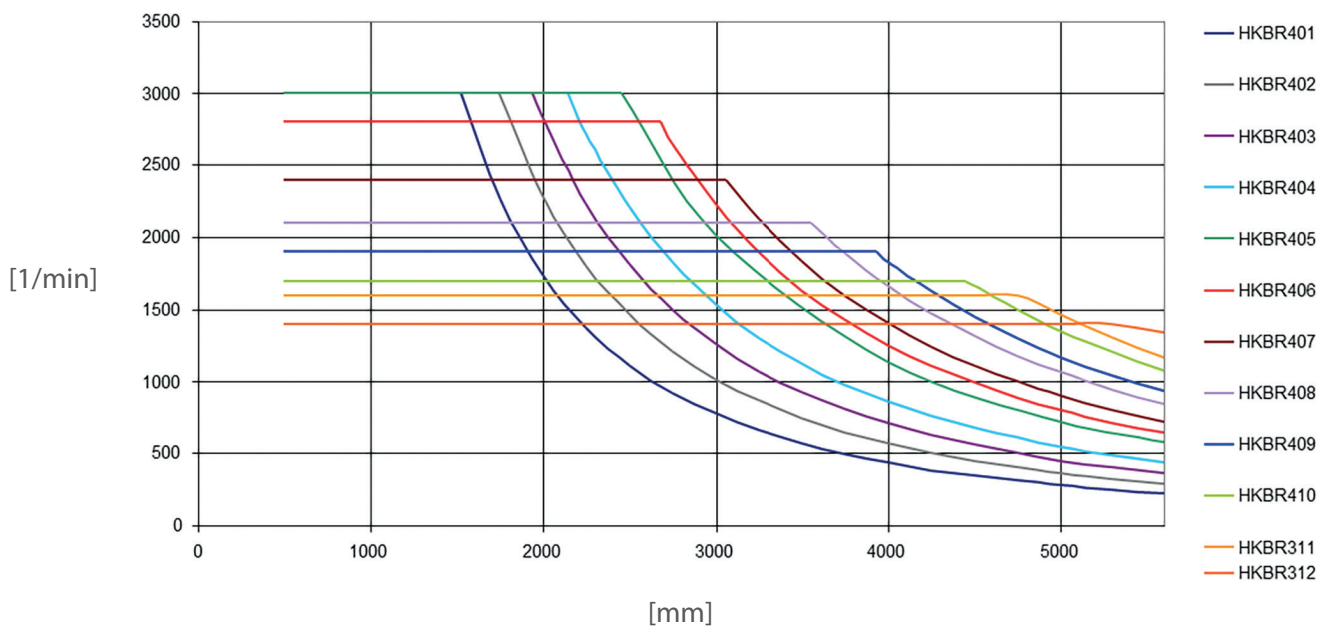
Total length $A = H + 2 \times L = 2000 + 2 \times 80 = 2160\text{mm}$

Critical speed approximately 2030 1/min

c) **That the allowable angular misalignment will not be exceeded**

$$\tan \alpha = 1/1160 \rightarrow \alpha = 0,05^\circ < \alpha_{\text{sall}} = 0,6^\circ$$

Diagram 1. Critical speed for standard couplings

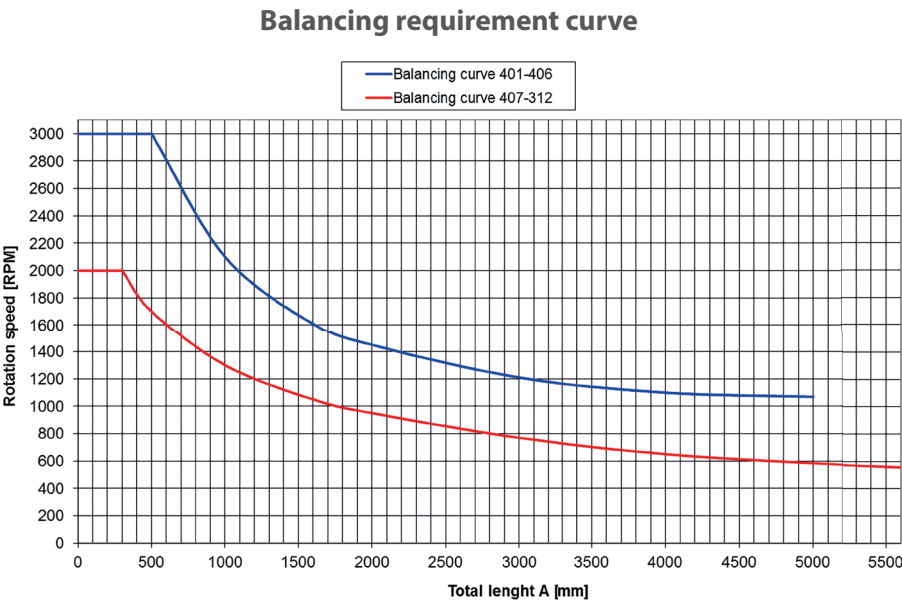


X-axis: Total length A (mm)

Y-axis: Speed /min)

Speed limits for couplings HKBR-313-315 see table 2

Diagram 2.



Method to calculate torsional stiffness

Total torsional stiffness
$$K_{\text{tot}} = \frac{1}{\left(\frac{1}{K_a} + \frac{\text{DBSE(mm)}}{K_b}\right)}$$

Calculation example HKBR-404 DBSE = 1m
$$K_{\text{tot}} = \frac{1}{\left(\frac{1}{325000} + \frac{1000}{2250 \times 10^6}\right)} = 283981 \text{ Nm/rad}$$

Calculation example HKBR-404 DBSE = 2m
$$K_{\text{tot}} = \frac{1}{\left(\frac{1}{325000} + \frac{2000}{2250 \times 10^6}\right)} = 252155 \text{ Nm/rad}$$

Table 4.

Torsional stiffness		
Type	Torsional stiffness for standard parts [Nm/rad] Ka	Torsional stiffness per 1mm spacer 106 [Nm/rad] Kb
HKBR-401	10900	288
HKBR-402	38000	654
HKBR-403	203000	1250
HKBR-404	325000	2250
HKBR-405	461000	5760
HKBR-406	614000	9840
HKBR-407	971000	13900
HKBR-408	1680000	29400
HKBR-409	2360000	39500
HKBR-410	3580000	59900

Torsional stiffness are given for minimum bore and 1mm DBSE

How to order

When ordering a gear coupling HKBR-402, specify it as follows:

Bores	$D_1 = 70 \text{ mm J7}$ $D_2 = 50 \text{ mm J7}$
Dimension	$H = 2000 \text{ mm}$
Keyways	to DIN 6885
Speed	$n = 1500 \text{ RPM}$
Nominal torque	$T_1 = 4200 \text{ Nm}$
Operating torque	$T = 356.5 \text{ Nm}$
Service factor	$f = 11.7$

Coupling guards

For safety reasons, a rotating coupling must always be equipped with an appropriate guard meeting safety regulations. David Brown Santasalo has developed standard guards for couplings which meet safety regulations. The guards will be offered upon request.

Installation

Clean any protective grease from the coupling. Check the seals and the sealing faces. Lift the outer sleeve with its seals (sizes 401–404) or the end flange with its seals (sizes 405–315) on the shaft. Heat the hub, for example, in oil or with a gas flame to about 90°C and press it on the shaft. **Use oil resistant glue to seal the ends of the keyway to prevent the lubricant from leaking out.** Lift the outer sleeve (sizes 405–315) on its place. Align the shafts according to section 6. **Apply sealing compound on the sealing faces of the flanges.** Lift the pipeshaft on its place. Install the flange joint fitting screws in place. Table 5 presents the tightening torque for the fitting screws. Install the end flanges with seals in place and install the end flange fixing screws (sizes 405–315). Grease the coupling halves according to section 7.

Table 5.

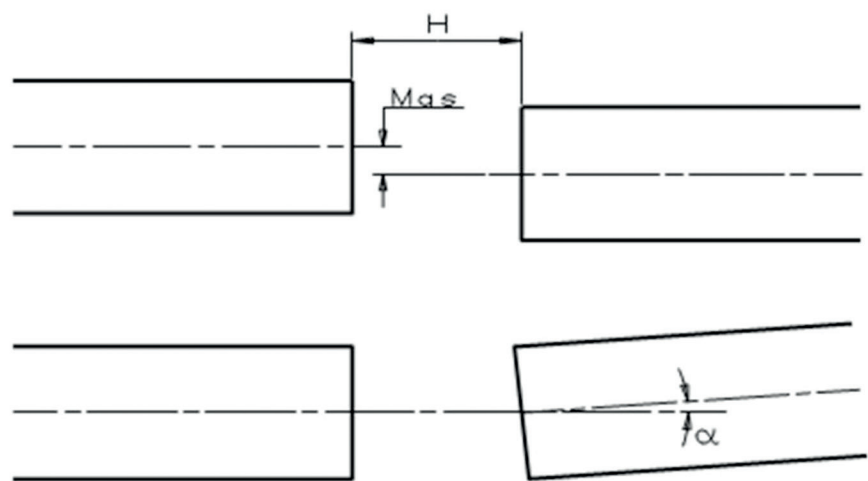
Tightening torque (Screws oiled)		(Strength class 8.8 Zne)
Size	Screw	Tightening torque (Nm)
HKBR-401...402	M10	51
HKBR-403...404	M12	89
HKBR-405...406	M16	218
HKBR-407...408	M20	426
HKBR-409...312	M24	735
HKBR-313...315	M30	1450

Note! Care should be taken not to damage the seals or the sealing faces.

Alignment of the shafts

Exact coupling alignment improves functionality and lengthens the operational life of the coupling. Align the couplings as accurately as possible, trying to predict the misalignments caused, for instance, by temperature differentials during running.

Figure 2.



Check the parallel offset and angular misalignment of the shafts as shown in figure 2. Table 6 gives the recommended mounting tolerances of the HKBR-type couplings.

The axial float can be checked by measuring the axial movement of the outer sleeve after installation.

Table 6.

Recommended mounting accuracy		
Rotation Speed	n ≤ 750 1/min	n > 750 1/min
Angular misalignment α [°]	0.080 (0.14/100)	0.060 (0.10/100)
Parallel offset misalignment Mas [mm/m]	0.8	0.6

Lubrication

For the lubrication of couplings used in normal operating conditions, we recommend gear coupling greases or semi-fluid greases suitable for lubricating gear couplings.

We recommend gear coupling greases with the minimum basic oil viscosity of ISO VG 630 cSt (40°C).

It is recommended that the grease contains EP, anti-wear, sticking and corrosion prevention and antioxidant additives.

The NLGI class of the grease should be 00 or 0.

The recommended lubricants are listed in Table 8A and Table 8B. The recommended lubricant volumes are presented in Table 7.

Grease the coupling with the bored lubrication holes in a horizontal position (at the 9 and 3 o'clock positions). Feed the grease volume, as presented in Table 7, into the coupling through the lubrication holes. Grease both halves separately.

Table 7.

Lubricant capacity	
Coupling Size	Lubricant Capacity dm³
HKBR-401	2x0.05
HKBR-402	2x0.10
HKBR-403	2x0.20
HKBR-404	2x0.35
HKBR-405	2x0.40
HKBR-406	2x0.60
HKBR-407	2x0.85
HKBR-408	2x0.95
HKBR-409	2x1.20
HKBR-410	2x2.25
HKBR-311	2x4.00
HKBR-312	2x5.00
HKBR-313	2x9.00
HKBR-314	2x14.00
HKBR-315	2x30.00

Table 8A.

Recommended lubricants				
Lubricant		NLGI-class	Operating temperature range (°C)	Soap Type
MOBIL	Mobilgrease XTC Centaur XHP 461	1 1	-30...+120 -20...+130	Lithium/polymer Calcium sulfonate
NESTE	Avora	0,5	-30...+140	Lithium/Calcium complex
KLÜBER	Klüberplex GE 11-680	0 / 00	0...+140	Aluminium complex
SHELL	Gadus S2 High Speed Coupling Grease	0 / 1	-28...+120	Lithium
TEBOIL	Gear Grease XHP	0,5	-30...+140	Lithium/Calcium complex
TOTAL	Multis Complex RT-1	1	-20...+177	Lithium complex
TEXACO	Coupling Grease KP 0/1 K-30	0 / 1	-10...+120	Lithium
CASTROL-TRIBOL	Tribol 3020/1000-1	1	-30...+120	Lithium

Table 8B.

Recommended lubricants/ High rotation speed and temperature *)				
Lubricant		NLGI-class	Operating temperature range (°C)	Soap Type
MOBIL	Mobilgrease XTC	1	-30...+120	Lithium/polymer
KLÜBER	Klüberplex GE 11-680	0 / 00	0...+140	Aluminium complex
SHELL	Gadus S2 High Speed Coupling Grease	0 / 1	-28...+120	Lithium
TEXACO	Coupling Grease KP 0/1 K-30	0 / 1	-10...+120	Lithium

*) = Rotating speed > 1500rpm and temperature > 80°C

Maintenance

Check the tightening torque of the screws in the mounting flange of the coupling after approximately 100 hours of operation.

Refilling with lubricant is recommended every 7,000 operating hours, or at least once a year.

- Turn the lubrication holes to a horizontal position (the 9 and 3 o'clock positions). Feed the new lubricant into the coupling through the boreholes so that some grease overflows from the opposite borehole. Grease both halves separately.

Disassembly and inspection of the coupling is recommended every 15,000 operating hours or every 3 years at a minimum.

- Clean the coupling components.
- Inspect the condition of the cogs and seals.
- Check the shaft alignment.
- Grease the coupling with new lubricant as specified in section 7.

When the coupling is used in high temperatures (80...100°C) or at low speeds (radial velocity <5m/s), or with reversible loads, it is recommended that the maintenance, disassembly and inspection interval is half of the recommended intervals defined in these instructions.

When using a new lubricant, the coupling must be flushed by pumping an appropriate solvent (for example, spirit) through it. You can use pressurised air to clean the coupling.

DO NOT MIX GREASES WITH DIFFERENT BASIC INGREDIENTS!



Removal of coupling

The hub has four tapped holes for a puller (table 9). The hub can also be heated to facilitate removal (max. temperature 120°C). Large coupling hubs (sizes 313-315) are removed with hydraulic pressure and are therefore provided with the necessary tapped holes and grooves.

Table 9.

HK & HKBR	Tapped hole for a puller
401	M8x10
402	M10x15
403	M10x15
404	M12x25
405	M16x30
406	M16x30
407	M20x40
408	M24x50
409	M24x50
410	M24x50
311	M30x60
312	M30x60
313	M30x50
314	M30x50
315	M30x50

Lifting of parts

The hubs of the couplings (sizes 311-315) are provided with a tapped hole for an eye bolt, see Figure 3 and Table 10.

Figure 3.

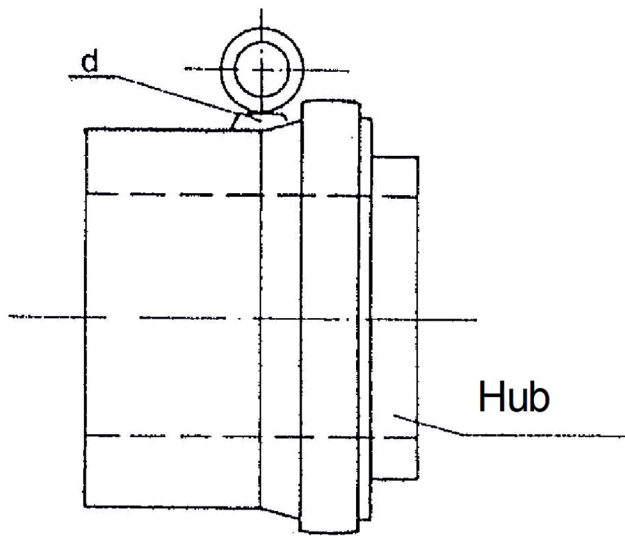


Table 10.

Tapped holes for lifting	
Coupling size	d
HKBR-311	M12
HKBR-312	M16
HKBR-313...314	M20
HKBR-315	M24

O-ring table

The sealing of the couplings (401-312) is implemented at o-rings that are seen in table 11.

The couplings (313-315) sealing is implemented with vulcanized o-ring band, diameter and length seen in table 12.

Table 11.

Coupling size	O-ring
HKBR-401	OR 89.2 x 5.7 FPM
HKBR-402	OR 109.1 x 5.7 FPM
HKBR-403	OR 139.3 x 5.7 FPM
HKBR-404	OR 174.2 x 5.7 FPM
HKBR-405	OR 219.3 x 5.7 FPM
HKBR-406	OR 239.3 x 5.7 FPM
HKBR-407	OR 279.3 x 5.7 FPM
HKBR-408	OR 319.3 x 5.7 FPM
HKBR-409	OR 359.3 x 5.7 FPM
HKBR-410	OR 389.3 x 5.7 FPM
HKBR-311	OR 379.3 x 5.7 FPM
HKBR-312	OR 439.3 x 5.7 FPM

Table 12.

Coupling size	O-ring band
HKBR-313	BAND Ø5.7 / L=1550mm
HKBR-314	BAND Ø5.7 / L=1900mm
HKBR-315	BAND Ø5.7 / L=2050mm



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