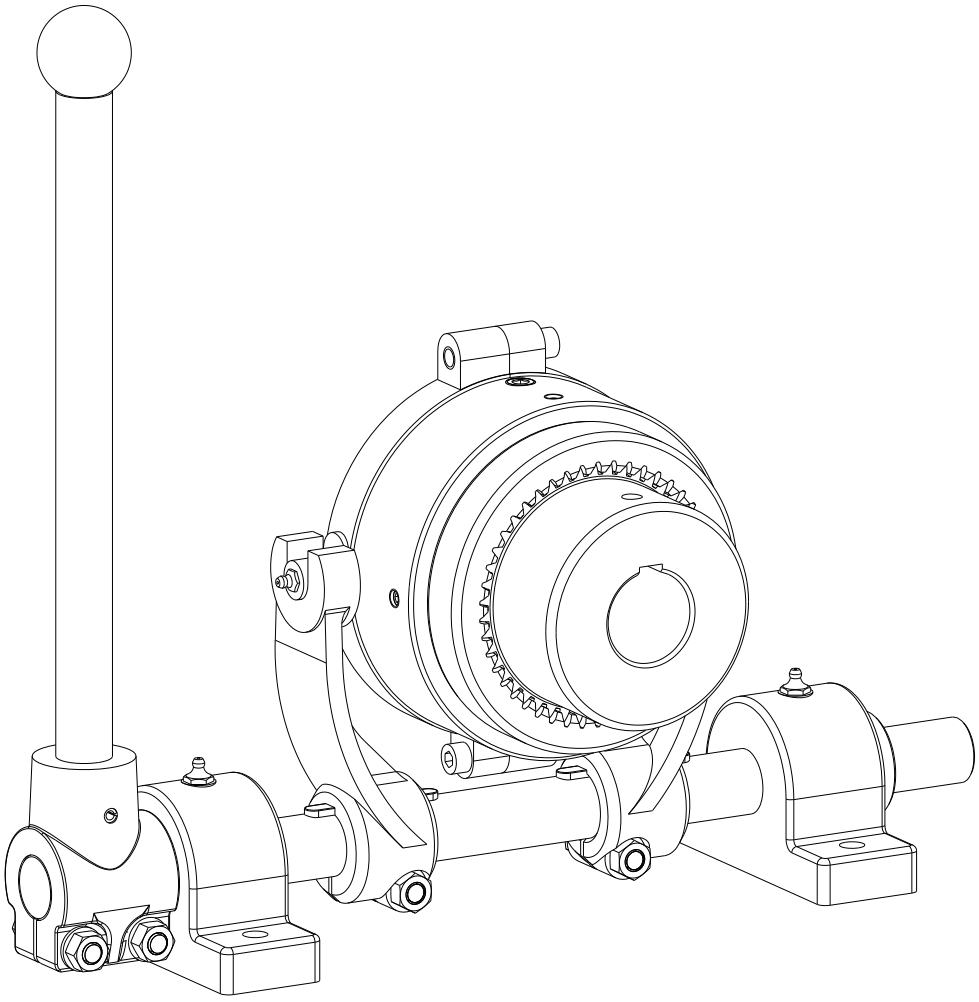
BoWex®

Non-failsafe curved-tooth gear couplings types
SD, SD-D, SD1, SD2 and their combinations



The **BoWex**® curved-tooth gear coupling® is a flexible shaft connection. It is able to compensate for shaft misalignment, for example caused by manufacturing inaccuracies, thermal expansion, etc.

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1 Technical data

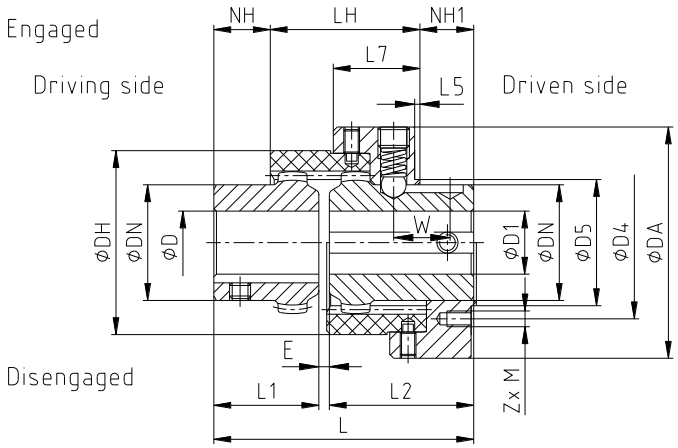


Illustration 1: BoWex® SD

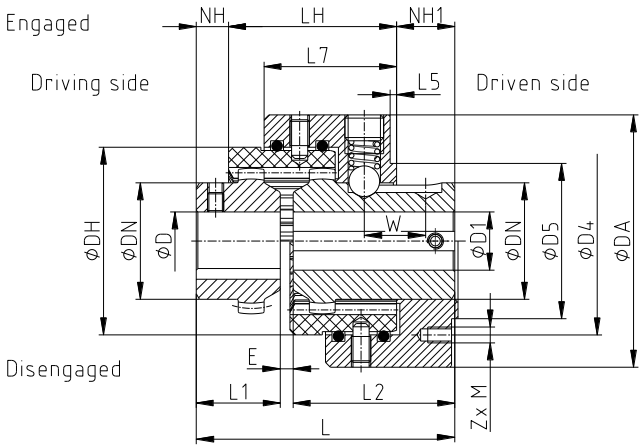


Illustration 2: BoWex® SD-D

Table 1: Dimensions and technical data - type SD and SD-D

Size	Pilot bore		Max. finish bore		Dimensions in mm						
	Unbored	Pilot bored	D	D1	DA	DH	DN	L	L1	L2	L7
24 SD	x	-	24	24	78	58	36	80	26	50	31
28 SD	x	-	28	28	88	70	44	99	40	55	33
32 SD	x	-	32	32	100	84	50	99	40	55	33
45 SD	x	-	45	45	125	100	65	106	42	60	37
			48					114	50		
65 SD	x	27 70 lg.	65	65	156	140	95	129	55	70	37
80 SD	-	25	80	80	195	175	124	186	90	90	47
100 SD	-	35	100	100	135	210	152	228	110	110	55
125 SD	-	45	125	125	298	270	192	290	140	140	70

Size	Dimensions in mm					Weight with max. bore		Mass moment of inertia J with max. bore		Shifting force in N
	E	LH	NH	NH1	W	Shifting hub with sleeve in kg	Driving hub in kg	Shifting hub with sleeve in kgcm2	Driving hub in kgcm2	
24 SD	4	52	10	18	19	1.08	0.14	8.23	0.36	140
28 SD	4	57	21.5	20.5	21.5	1.50	0.33	15.62	1.22	180
32 SD	4	58	20.5	20.5	21.5	1.85	0.43	22.87	2.17	180
45 SD	4	63	21.5	21.5	22.5	2.56	0.68	46.07	5.66	250
			29.5				0.79			
65 SD	4	79	26	24	25	5.07	2.30	158.99	43.96	350
80 SD	6	96	56	34	35	10.60	5.20	523.7	150.8	350
100 SD	8	113	72	43	43	18.87	9.37	1350	401.3	400
125 SD	10	149	89	52	52	40.40	9.44	4919	1362.3	450

1 Technical data

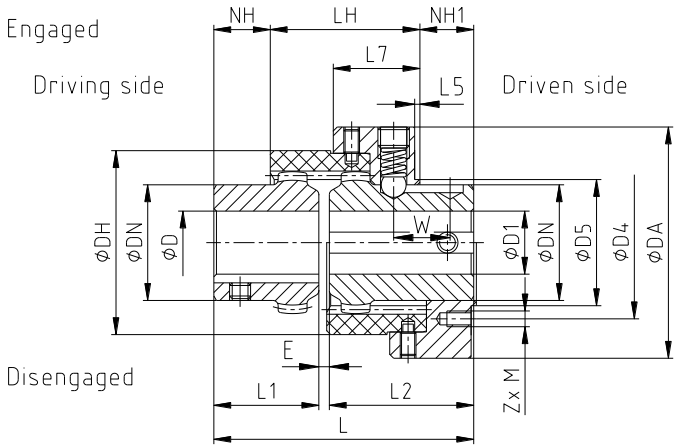


Illustration 1: BoWex® SD

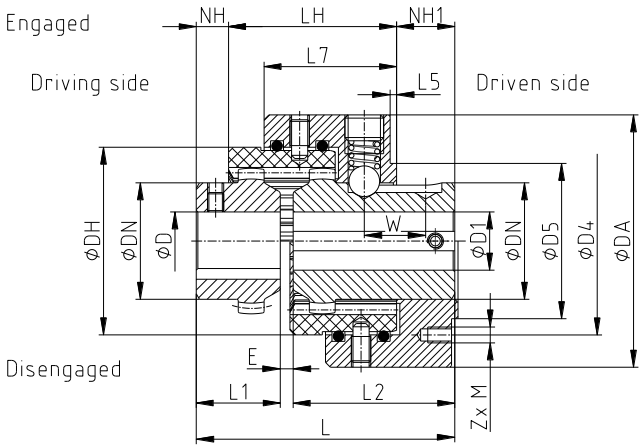


Illustration 2: BoWex® SD-D

Table 2: Dimensions - shifting ring (component 17) type SD

Connection dimensions of BoWex® SD shifting ring (component 17) for mounting of: slip ring SD1 - see table 6 shifting disk etc.									
Size	Dimensions in mm				Size	Dimensions in mm			
	D5 (h7)	D4	Z x M	L5		D5 (h7)	D4	Z x M	L5
24 SD	48	58	4 x M6	2	65 SD	100	114	4 x M8	2
28 SD	48	58	4 x M6	2	80 SD	130	145	4 x M8	3
32 SD	64	75	4 x M6	2	100 SD	180	196	6 x M10	4
45 SD	75	90	4 x M8	2	125 SD	220	236	6 x M10	4

Table 3: Power, torque and speed

Size	Power $\frac{P}{n}$ $\left[\frac{kW}{1/min}\right]$		Torque in Nm			Max. speed in rpm [1]
	Rated	Max.	T_{KN}	$T_{K\,max}$	T_{KW}	
24 SD	0.0021	0.0042	20	60	10	5000
28 SD	0.0047	0.0094	45	135	23	4400
32 SD	0.0063	0.013	60	180	30	3900
45 SD	0.015	0.029	140	420	70	3100
65 SD	0.040	0.080	380	1140	190	2500
80 SD	0.073	0.15	700	2100	350	2000
100 SD	0.13	0.25	1200	3600	600	1650
125 SD	0.26	0.52	2500	7500	1250	1300

1) Referring to diameter DA without using a slip ring.

1 Technical data

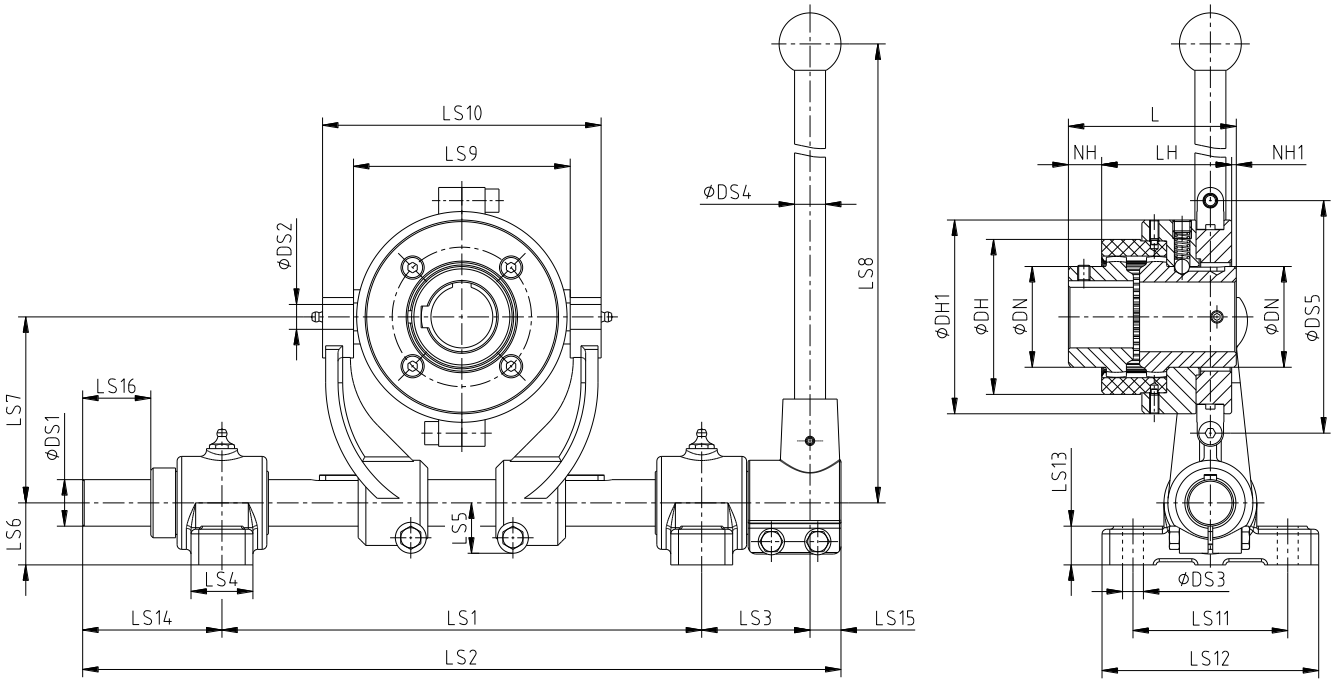


Illustration 3: BoWex® SD1 with shiftable linkage

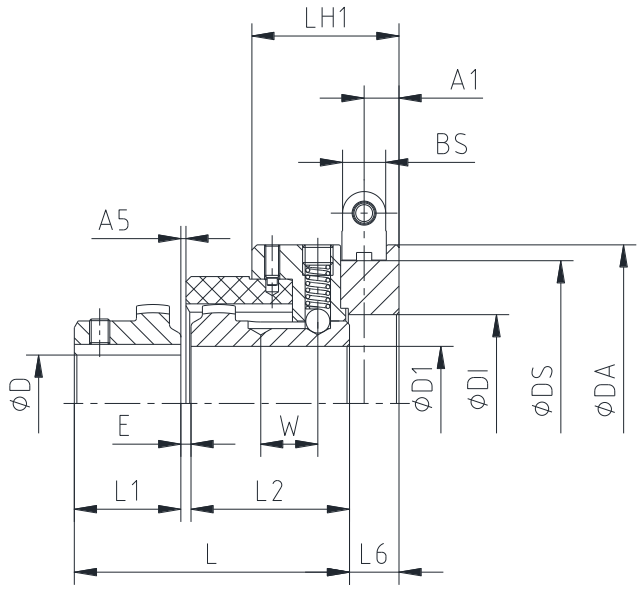


Illustration 4: BoWex® SD1

Table 4: Power, torque and speed

Size	Power $\frac{P}{n}$ $\left[\frac{kW}{1/min}\right]$		Torque in Nm			Max. speed in rpm
	Rated	Max.	T_{KN}	$T_{K\,max}$	T_{KW}	
24 SD1	0.0021	0.0042	20	60	10	3200
28 SD1	0.0047	0.0094	45	135	23	3200
32 SD1	0.0063	0.013	60	180	30	2500
45 SD1	0.015	0.029	140	420	70	2100
65 SD1	0.040	0.080	380	1140	190	1700
80 SD1	0.073	0.15	700	2100	350	1300
100 SD1	0.13	0.25	1200	3600	600	1200
125 SD1	0.26	0.52	2500	7500	1250	1000

1 Technical data

Table 5: Dimensions - type SD1

Size	Finish bore [1] D, D1		Dimensions in mm								
	min.	Max.	L	L1	L2	A1	A5	BS ± 0.1 (keyway)	DA	DH	DH1
24 SD1	10	24	80	26	50	11	3	12.5	78	58	78
28 SD1	10	28	99	40	55	11	3	12.5	78	70	88
32 SD1	12	32	99	40	55	13.5	2	17.5	100	84	100
45 SD1	20	45	106	42	60	14	2	18.0	125	100	125
		48 [7]	114	50							
65 SD1	25	65	129	55 [2]	70	16	-4 [2]	20.5	145	140	156
80 SD1	30	80	186	90	90	18.5	1	25.5	182	175	195
100 SD1	40	100	228	110	110	28	5	30.5	230	210	235
125 SD1	50	125	290	140	140	30.5	1	35.5	275	270	298

Size	Dimensions in mm										Shifting force set in N
	DI	DN	DS ± 1 (keyway)	E	LH	LH1	L6	NH	NH1	W	
24 SD1	45	36	70.5	4	67	46	16	10	3	19	140
28 SD1	45	44	70.5	4	72	48	16	21.5	5.5	21.5	180
32 SD1	60	50	89.5	4	78	53	21	20.5	0.5	21.5	180
45 SD1	70	65 [3]	112.5	4	84	58	22	21.5	0.5	22.5	250
								29.5			
65 SD1	96	96 / 95 [6]	130.5	4	103	61	25	26	0	25	350
80 SD1	125	124	164.5	6	124	75	29	56	6	35	350
100 SD1	174	152	210.5	8	152	94	39	72	4	43	400
125 SD1	214	192	250.5	10	193	114	44	89	8	52	450

Table 6: Dimensions of shift gear - type SD1

Size	Shiftable linkage size	Slip ring size	Dimensions in mm									
			DS1	DS2	DS3	DS5	LS1 [4] min.	LS1 [4] Max.	LS2	LS3 [4]	LS4	LS5
24 SD1	1	1.1	20	12	11	94	180	190	320	55	35	25
28 SD1	1	1.1	20	12	11	94	180	190	320	55	35	25
32 SD1	2	2.2	25	17	13.5	120	240	270	430	60	40	27
45 SD1	3	3.3	30	17	13.5	146	280	310	490	70	40	32.5
65 SD1	3	4.4	30	17	13.5	170	280	310	490	70	40	32.5
80 SD1	4	5.5	35	21	13.5	214	321	365	565	70	45	37.5
100 SD1	5	6.6	40	25	13.5	250	365	410	630	80	45	46
125 SD1	5	7.7	40	25	13.5	290	-	410	630	80	45	46

Size	Dimensions in mm											
	LS6	LS7	LS8	LS9	LS10	LS11	LS12	LS13	Dimensions with LS1 max.			
									DS4	LS14	LS15	LS16
24 SD1	30	70	400	90	114	75	110	18	16	20	55	16
28 SD1	30	70	400	90	114	75	110	18	16	20	55	16
32 SD1	40	97.5	450	111	151	100	140	25	20	20	80	34
45 SD1	40	120	600	140	180	100	140	25	20	20	90	44
65 SD1	40	120	600	170	210	100	140	25	20	20	90	44
80 SD1	50	147.5	750	200	244	120	160	25	30	30	100	54
100 SD1	50 [5]	190	1068	250	300	120	160	25	30	30	110	62
125 SD1	50 [5]	190	1068	300	350	120	160	25	30	30	110	62

1) Finish bore according to ISO fit H7, feather keyway according to DIN 6885 sheet 1 [JS9]; standard - setscrew on the keyway. With size 24 the setscrew is located opposite the keyway.
2) For radial disassembly the hub collar must be reduced by 5 mm.
3) With size 45 hub component 1 with LS1 = 50 mm, ØDN = 68 mm.
4) Dimension LS3 and LS1 max. = standard mounting dimensions
5) With a continuous base plate dimension LS6 with shiftable linkage size 5 has to be increased by 10 mm at the minimum and with shiftable linkage size 6 by 15 mm at the minimum. The brackets of the driving and driven side have to be adjusted accordingly.
6) ØDN = x / y x = driving hub / y = driven hub
7) Only valid with dimension D.

1 Technical data

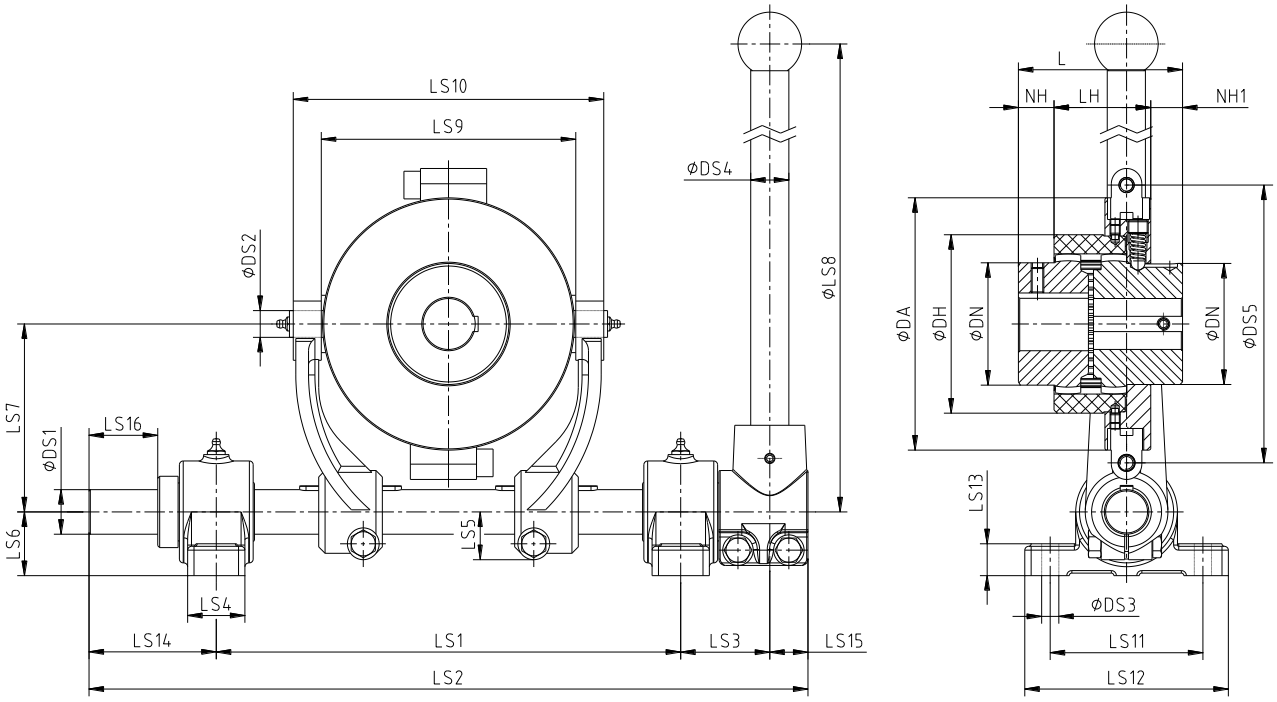


Illustration 5: BoWex® SD2 with shiftable linkage

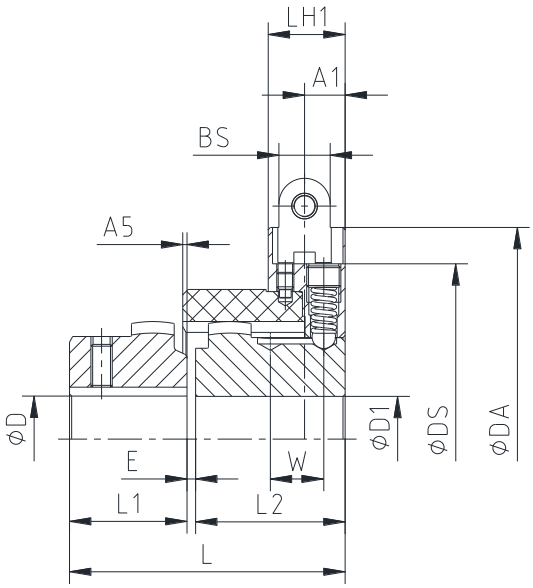


Illustration 6: BoWex® SD2

Table 7: Power, torque and speed

Size	Power $\frac{P}{n}$ $\left[\frac{kW}{1/min}\right]$		Torque in Nm			Max. speed in rpm
	Rated	Max.	T_{KN}	$T_{K\,max}$	T_{KW}	
24 SD2	0.0021	0.0042	20	60	10	3200
28 SD2	0.0047	0.0094	45	135	23	2500
32 SD2	0.0063	0.013	60	180	30	2100
45 SD2	0.015	0.029	140	420	70	1700
65 SD2	0.040	0.080	380	1140	190	1300
80 SD2	0.073	0.15	700	2100	350	1200
100 SD2	0.13	0.25	1200	3600	600	1000
125 SD2	0.26	0.52	2500	7500	1250	850

1 Technical data

Table 8: Dimensions - type SD2

Size	Finish bore [1] D, D1		Dimensions in mm							
	min.	Max.	L	L1	L2	A1	A5	BS ± 0.1 (keyway)	DA	DH
24 SD2	10	24	80	26	50	9.5	3	12.5	88	58
28 SD2	10	28	99	40	55	16	3	17.5	113	70
32 SD2	12	32	99	40	55	16	2	18	136	84
45 SD2	20	45	106	42	60	16	2	20.5	154	100
		48 [7]	114	50						
65 SD2	25	65	129	55 [2]	70	18	-4 [2]	25.5	198	140
80 SD2	30	80	186	90	90	23	1	30.5	250	175
100 SD2	40	100	228	110	110	28	5	35.5	295	210
125 SD2	50	125	290	140	140	30	1	38.5	355	270

Size	Dimensions in mm								Shifting force set in N
	DN	DS ± 0.1 (keyway)	E	LH	LH1	NH	NH1	W	
24 SD2	36	70.5	4	51	30	10	19	19	140
28 SD2	44	89.5	4	56	32	21.5	21.5	21.5	180
32 SD2	50	112.5	4	57	32	20.5	21.5	21.5	180
45 SD2	65 [3]	130.5	4	62	36	21.5	22.5	22.5	250
						29.5			
65 SD2	96 / 95 [6]	164.5	4	78	36	26	25	25	350
80 SD2	124	210.5	6	95	46	56	35	35	350
100 SD2	152	250.5	8	113	55	72	43	43	400
125 SD2	192	300.5	10	149	70	89	52	52	450

Table 9: Dimensions of shift gear - type SD2

Size	Shiftable linkage size	Slip ring size	Dimensions in mm									
			DS1	DS2	DS3	DS5	LS1 min.	LS1 Max.	LS2	LS3 [4]	LS4	LS5
24 SD2	1	1.1	20	12	11	94	180	190	320	55	35	25
28 SD2	2	2.2	25	17	13.5	120	240	270	430	60	40	27
32 SD2	3	3.3	30	17	13.5	146	280	310	490	70	40	32.5
45 SD2	3	4.4	30	17	13.5	170	280	310	490	70	40	32.5
65 SD2	4	5.5	35	21	13.5	214	321	365	565	70	45	37.5
80 SD2	5	6.6	40	25	13.5	250	365	410	630	80	45	46
100 SD2	5	7.7	40	25	13.5	290	-	410	630	80	45	46
125 SD2	6	8.8	40	35	13.5	360	-	540	760	80	45	56

Size	Dimensions in mm											
	LS6	LS7	LS8	LS9	LS10	LS11	LS12	LS13	Dimensions with LS1 max.			
									DS4	LS14	LS15	LS16
24 SD2	30	70	400	90	114	75	110	18	16	20	55	16
28 SD2	40	97.5	450	111	151	100	140	25	20	20	80	34
32 SD2	40	120	600	140	180	100	140	25	20	20	90	44
45 SD2	40	120	600	170	210	100	140	25	20	20	90	44
65 SD2	50	147.5	750	200	244	120	160	25	30	30	100	54
80 SD2	50 [5]	190	1068	250	300	120	160	25	30	30	110	62
100 SD2	50 [5]	190	1068	300	350	120	160	25	30	30	110	62
125 SD2	50 [5]	265	1068	360	420	120	160	25	30	30	110	62

1) Finish bore according to ISO fit H7, feather keyway according to DIN 6885 sheet 1 [JS9]; standard - setscrew on the keyway. With size 24 the setscrew is located opposite the keyway.
2) For radial disassembly the hub collar must be reduced by 5 mm.
3) With size 45 hub component 1 with L1 = 50 mm, ØDN = 68 mm.
4) Dimension LS3 and LS1 max. = standard mounting dimensions
5) With a continuous base plate dimension LS6 with shiftable linkage size 5 has to be increased by 10 mm at the minimum and with shiftable linkage size 6 by 15 mm at the minimum. The brackets of the driving and driven side have to be adjusted accordingly.
6) ØDN = x / y x = driving hub / y = driven hub
7) Only valid with dimension D1.

2 Advice

2.1 General advice

Please read carefully through these operating/assembly instructions before you start up the coupling.
Pay special attention to the safety instructions!
The operating/assembly instructions are part of your product. Please store them carefully and close to the coupling. The copyright for these operating/assembly instructions remains with KTR.

2.2 Safety and advice symbols

	**Warning of personal injury**	This symbol indicates notes which may contribute to preventing bodily injuries or serious bodily injuries that may result in death.
	**Warning of product damages**	This symbol indicates notes which may contribute to preventing material or machine damage.
	**General advice**	This symbol indicates notes which may contribute to preventing adverse results or conditions.
	**Warning of hot surfaces**	This symbol indicates notes which may contribute to preventing burns with hot surfaces resulting in light to serious bodily injuries.

2.3 General hazard warnings

With assembly, operation and maintenance of the coupling it has to be made sure that the entire drive train is secured against accidental switch-on. You may be seriously hurt by rotating parts. Make absolutely sure to read through and observe the following safety indications.

- All operations on and with the coupling have to be performed taking into account "safety first".
- Make sure to switch off the power pack before you perform your work on the coupling.
- Secure the power pack against accidental switch-on, e. g. by providing warning signs at the place of switch-on or removing the fuse for current supply.
- Do not reach into the operating area of the coupling as long as it is in operation.
- Secure the coupling against accidental contact. Provide for the necessary protection devices and covers.

2 Advice

2.4 Proper use

You may only assemble, operate and maintain the coupling if you

- have carefully read through the operating/assembly instructions and understood them
- are technically qualified and specifically trained (e. g. safety, environment, logistics)
- are authorized by your company

The coupling may only be used in accordance with the technical data (see chapter 1). Unauthorized modifications on the coupling design are not admissible. We will not assume liability for any damage that may arise. In the interest of further development we reserve the right for technical modifications.
The **BoWex®** described in here corresponds to the state of the art at the time of printing of these operating/assembly instructions.

2.5 Coupling selection

For a long-lasting and failure-free operation of the coupling it must be selected according to the selection instructions (according to DIN 740 part 2) for the particular application (see catalogue drive technology „BoWex®“).
If the operating conditions (performance, speed, modifications on engine and machine) change, the coupling selection must be reviewed.
Make sure the technical data regarding torque refer to the sleeve only. The transmittable torque of the shaft-hub-connection must be reviewed by the customer and is subject to his responsibility.

For drives subjected to torsional vibrations (drives with cyclic stress due to torsional vibrations) it is necessary to perform a torsional vibration calculation to ensure a reliable selection. Typical drives subjected to torsional vibrations are e. g. drives with diesel engines, piston pumps, piston compressors etc. If requested, KTR will perform the coupling selection and the torsional vibration calculation.

2.6 Reference to EC Machinery Directive 2006/42/EC

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

3 Storage, transport and packaging

3.1 Storage

The coupling hubs are supplied in preserved condition and can be stored in a dry and roofed place for 6 - 9 months.
The features of the coupling sleeves remain unchanged for up to 5 years with favourable storage conditions.

The storage rooms must not include any ozone-generating devices like e. g. fluorescent light sources, mercury-vapour lamps or electrical high-voltage appliances.
Humid storage rooms are not suitable.
Make sure that condensation is not generated. The best relative air humidity is less than 65 %.

3.2 Transport and packaging

In order to avoid any injuries and any kind of damage always make use of proper transport and lifting equipment.

The couplings are packed differently each depending on size, number and kind of transport. Unless otherwise contractually agreed, packaging will follow the in-house packaging specifications of KTR.

4 Assembly

The coupling is generally supplied with the shifting force set (see table 1, 5 and 8).
Before assembly the coupling has to be inspected for completeness.

4.1 Components of the coupling

Components of BoWex® type SD

Component	Quantity	Description
1	1	Hub
2	1	Shifting element "SD"
7	2	Setscrew DIN EN ISO 4029

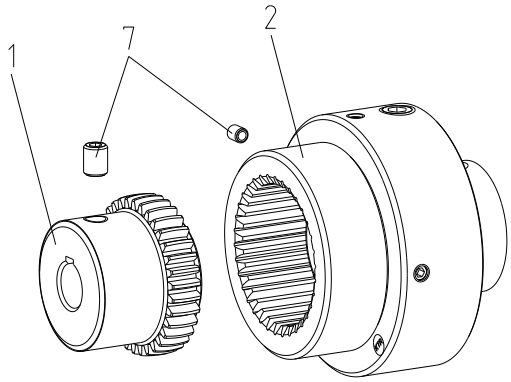


Illustration 7: BoWex® SD

Components of BoWex® type SD-D

Component	Quantity	Description
1	1	Hub
2	1	Shifting element "SD-D"
7	2	Setscrew DIN EN ISO 4029

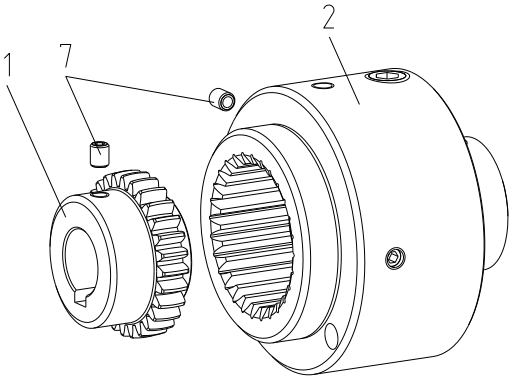


Illustration 8: BoWex® SD-D

4 Assembly

4.1 Components of the coupling

Components of BoWex® SD1 with shiftable linkage

Component	Quantity	Description
1	1	Hub
2	1	Shifting element "SD"
3	1	Shiftable linkage
4	1	Additional ring
5	1	Slip ring with lubricating nipple
6	4/6 1)	Cap screws DIN EN ISO 4726
7	2	Setscrew DIN EN ISO 4029

1) Quantity depends on coupling size

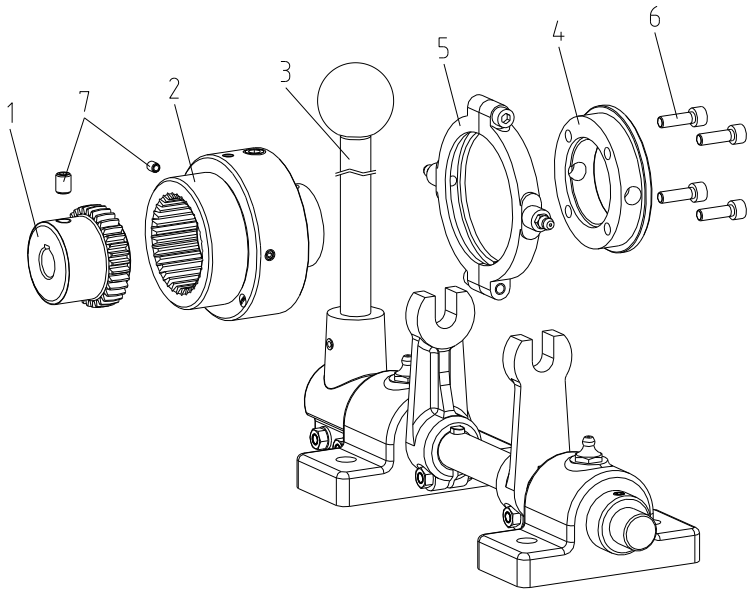


Illustration 9: BoWex® SD1 with shiftable linkage

Components of BoWex® SD2 with shiftable linkage

Component	Quantity	Description
1	1	Hub
2	1	Shifting element
3	1	Shiftable linkage
5	1	Slip ring with lubricating nipple
7	2	Setscrew DIN EN ISO 4029

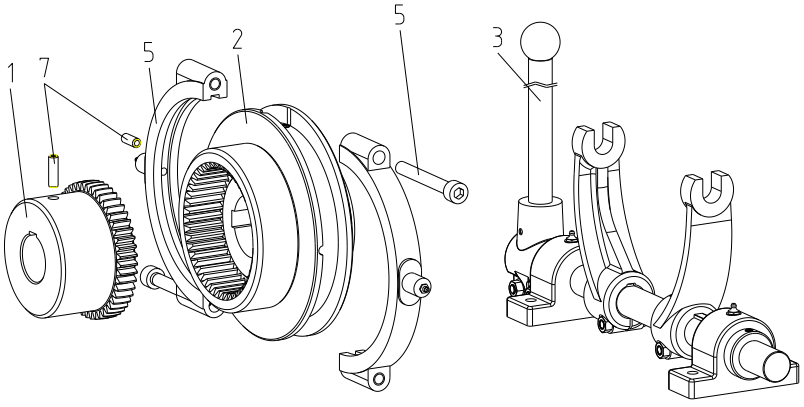


Illustration 10: BoWex® SD2 with shiftable linkage

4 Assembly

4.2 Advice for finish bore

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

- Hub bores (steel hubs) machined by the customer have to observe concentricity resp. axial runout (see illustration 11).
- Make absolutely sure to observe the figures for $ØD_{max.}$.
- Carefully align the hubs when the finish bores are drilled.
- Provide for a setscrew according to DIN EN ISO 4029 with a cup point or an end plate to fasten the hubs axially.

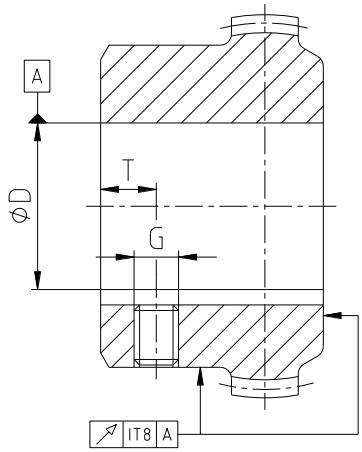


Illustration 11:
Concentricity and axial runout

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

Table 10: Setscrew DIN EN ISO 4029 (component 7)

Size	24	28	32	45	65	80	100	125
Dimension G in mm	M5	M8	M8	M8	M10	M10	M12	M16
Dimension T in mm	6	10	10	10	15 / 20 [1)]	20	30	40
Tightening torque T_A in Nm	2	10	10	10	17	17	40	80

1) Length of hub 55 mm T = 15 mm, length of hub 70 mm T = 20 mm

Table 11: Recommended fit pairs acc. to DIN 748-1

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

If a feather keyway is intended to be used in the hub, it should correspond to the tolerance ISO JS9 (KTR standard) with normal operating conditions or ISO P9 with difficult operating conditions (frequently alternating torsional direction, shock loads, etc.).

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

4.3 Advice on shifting force

Before delivery the shifting force is set and the screw plug is marked with marking lacquer.

4 Assembly

4.4 Assembly of the coupling (general)

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

Heating the hubs lightly (approx. 80 °C) allows for an easier mounting on the shaft.

Touching the heated hubs causes burns.
Please wear safety gloves.

With the assembly make sure that the distance dimension E (see table 1, 5 and 8) is observed to allow for axial clearance of the sleeve while in operation.
Disregarding this advice may cause damage to the coupling.

4.5 Assembly of the additional ring (component 4) and slip ring (component 5) - BoWex® SD1

Before assembly inspect the slip ring (component 5) for any damages and make sure the lubricating nipples exist.

- Push the slip ring (component 5) on the additional ring (component 4) (see illustration 12).

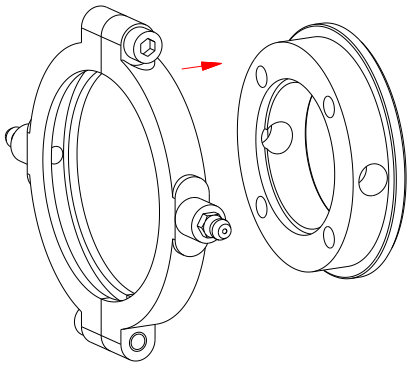


Illustration 12: Assembly of slip ring

- Set the additional ring with the slip ring onto the shifting element (component 2) (see illustration 13).
- Hand-tighten the components via the cap screws (component 8) first. Afterwards tighten the cap screws to the tightening torques T_A specified in table 12.
- Lubricate the slip ring through the lubricating nipples with a heat-resistant bearing grease while turning the slip ring manually repeatedly.

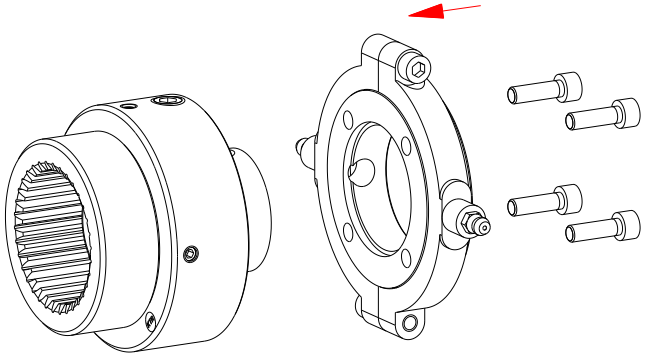


Illustration 13: Assembly of additional ring

Make sure the max. permissible speed of the slip ring is not exceeded (see table 13). After assembly it must be possible to rotate the slip ring manually.

4 Assembly

4.5 Assembly of the additional ring (component 4) and slip ring (component 5) - BoWex® SD1

Table 12: Cap screws DIN EN ISO 4762 (component 6)

Size	24 SD1	28 SD1	32 SD1	45 SD1	65 SD1	80 SD1	100 SD1	125 SD1
Slip ring size	1.1	1.1	2.2	3.3	4.4	5.5	6.6	7.7
Cap screw DIN EN ISO 4762	M6 x 20	M6 x 20	M6 x 25	M8 x 25	M8 x 30	M8 x 30	M10 x 50	M10 x 55
Tightening torque T_A in Nm	14	14	14	35	35	35	69	69

Table 13: Slip ring (component 5)

Slip ring size	1.1	2.2	3.3	4.4	5.5	6.6	7.7	8.8
Screw	M6	M8	M8	M10	M12	M16	M16	M16
Tightening torque T_A in Nm	10	25	25	49	86	210	210	210
Max. perm. speed in rpm	3200	2500	2100	1700	1300	1200	1000	850

4.6 Assembly of the hub (component 1) and shifting element (component 2)

- Mount the hub (component 1) on the shaft of the driving side and the shifting element (component 2) on the shaft of the driven side (see illustration 14).

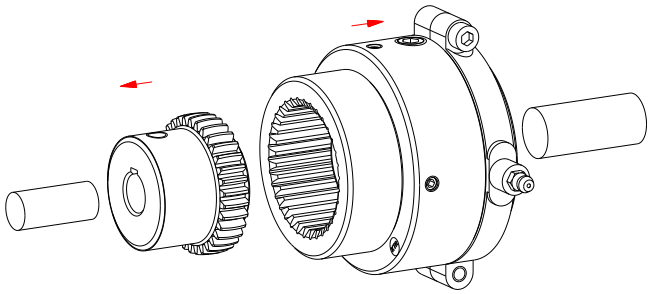


Illustration 14: Assembly of hub and shifting element

- Shift the power packs in axial direction until the distance dimension E is achieved (see illustration 15).
- If the power packs are already firmly assembled, shifting the hubs axially on the shafts allows for setting the distance dimension E.
- Fasten the hubs by tightening the setscrews DIN EN ISO 4029 with a cup point (component 7) (tightening torque see table 10).

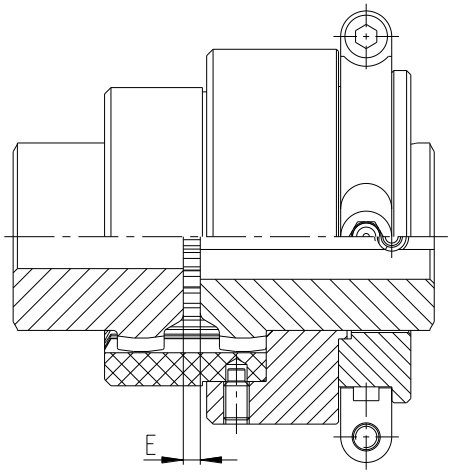


Illustration 15: Assembly of coupling

4 Assembly

4.7 Displacements - alignment of the couplings

The displacement figures specified in table 14 provide for sufficient safety to compensate for external influences like, for example, thermal expansion or foundation settling.

In order to ensure a long service life of the coupling, the shaft ends have to be accurately aligned.
Please absolutely observe the displacement figures specified (see table 14). If the figures are exceeded, the coupling will be damaged.

Please note:

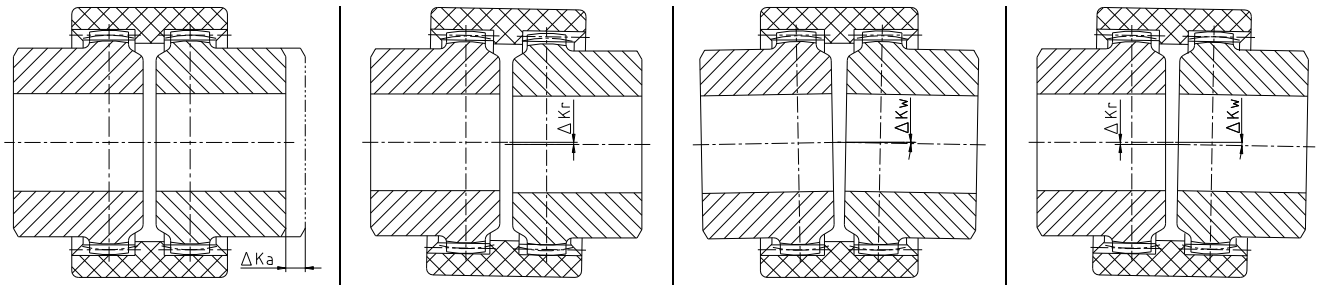
- The displacement figures specified in table 14 are maximum figures which must not arise in parallel. If radial and angular displacement arises at the same time, the permissible radial displacements of the coupling halves have to be reduced as follows:

$$\Delta K_{r\,zul.} = \Delta K_r - \frac{\Delta K_r}{2\Delta K_w} \bullet \Delta W_w$$

  ΔW_w = angular shaft displacement

  - The displacement figures specified are general standard figures that apply up to an ambient temperature of 80 °C, ensuring a sufficient service life of the **BoWex®** coupling.

- Inspect with a dial gauge, ruler or feeler gauge whether the permissible displacement figures specified in table 14 can be observed.



Axial displacements | Radial displacements | Angular displacements | Radial and angular displacements

Illustration 16: Displacements

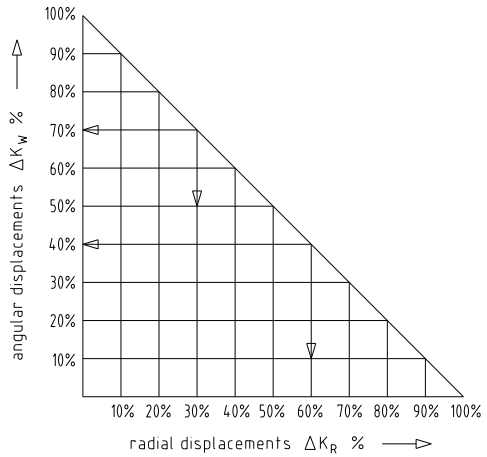
Examples of the displacement combinations specified in illustration 17:

Example 1:
ΔK_r = 30 %
ΔK_w = 70 %

Example 2:
ΔK_r = 60 %
ΔK_w = 40 %

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

Illustration 17: Combinations of displacement



4 Assembly

4.7 Displacements - alignment of the couplings

Table 14: Displacement figures

Size	24	28	32	45	65	80	100	125
Max. axial displacement ΔK_a in mm	±1	±1	±1	±1	±1	±1	±1	±1
Max. radial displacement with n=1500 rpm ΔK_r in mm	0.2	0.2	0.25	0.25	0.3	0.3	0.3	0.3
Max. angular displacement with n=1500 rpm ΔK_w in degree	1	1	1	1	1	1	1	1

4.8 Assembly of the slip ring (component 5) - BoWex® SD2

Before assembly inspect the slip ring (component 5) for any damages and make sure the lubricating nipples exist.

- Before separating the slip ring halves (component 5) mark the position of the slip ring halves screwed by the manufacturer.
- Insert the unscrewed slip ring halves in the shifting keyway of the shifting element (component 2) (see illustration 18). Pay attention to the marked position of the slip ring halves.
- Hand-tighten the components by means of the screws first. Afterwards tighten the screws at the tightening torque T_A specified in table 15.
- Lubricate the slip ring through the lubricating nipples with a heat-resistant bearing grease while turning the slip ring manually repeatedly.

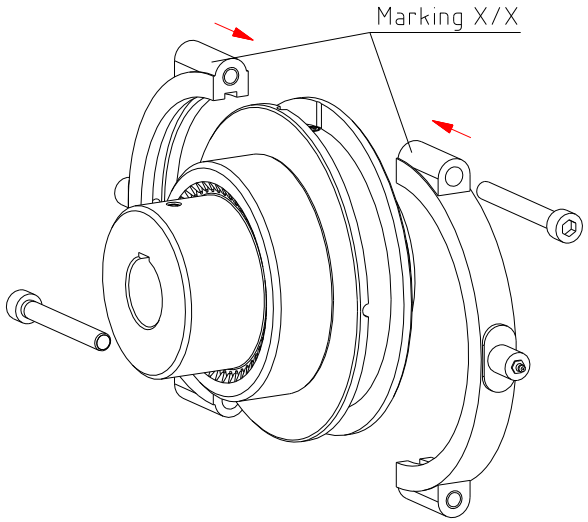


Illustration 18: Assembly of slip ring

Table 15:

Slip ring size	1.1	2.2	3.3	4.4	5.5	6.6	7.7	8.8
Screw	M6	M8	M8	M10	M12	M16	M16	M16
Tightening torque T_A in Nm	10	25	25	49	86	210	210	210
Max. perm. speed in rpm	3200	2500	2100	1700	1300	1200	1000	850

Make sure the max. permissible speed of the slip ring is not exceeded (see table 15). After assembly it must be possible to rotate the slip ring manually.

4 Assembly

4.9 Assembly of the shiftable linkage (component 3) - BoWex® SD1 and SD2

Before starting the assembly the coupling resp. shiftable linkage has to be inspected for completeness.

Component	Quantity	Quantity
3.1	2	Shifting fork
3.2	1	Shift lever with clamp
3.3	1	Shifting shaft
3.4	2	Eye type bearing DIN 504 with lubricating nipple
3.5	1	Clamping ring
3.6	2	Clamping screws for shifting forks
3.7	2	Clamping screws for shift lever
5	1	Slip ring with lubricating nipple

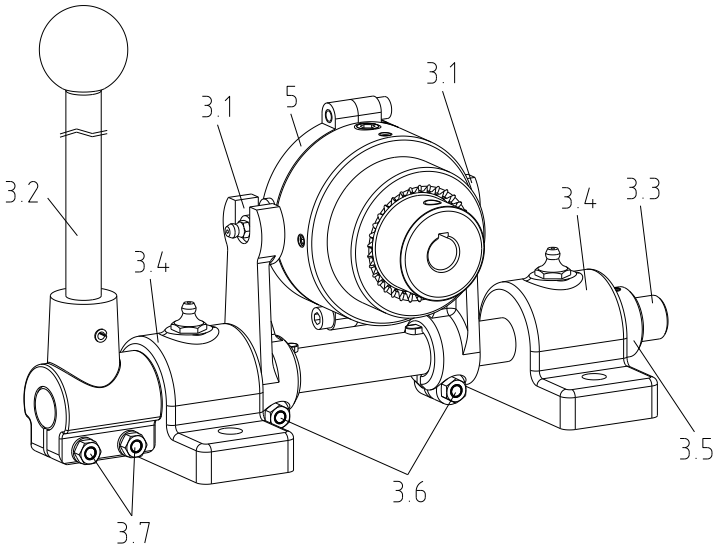


Illustration 19: BoWex® SD with shiftable linkage

- Insert the spigot of the slip ring (component 5) in the shifting forks (component 3.1) (see illustration 19).
- Align the shifting forks, shifting shaft (component 3.3) and eye type bearings (component 3.4) flush with the slip ring. Observe dimensions LS7 and LS9 (see illustration 20 resp. table 6 and 9). Make sure the shifting forks evenly fit with the shifting spigots.

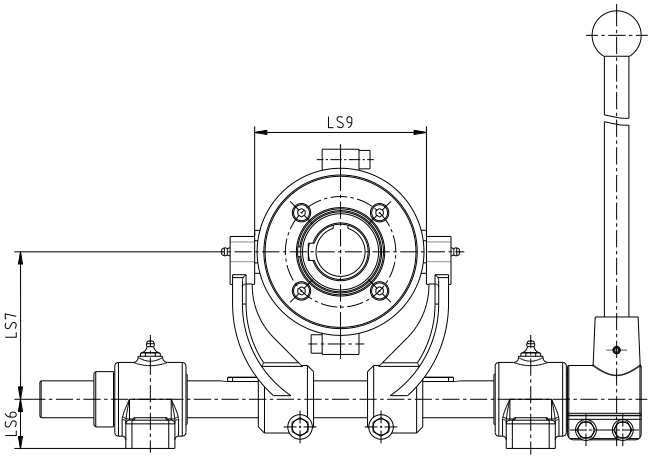


Illustration 20

Unscrew the clamping screws (component 3.6) for setting the shifting forks.

The shifting forks have to be arranged vertically to the base plate.

Make absolutely sure to observe the sequence of assembly, since otherwise the slip ring may get stuck resp. jammed during operation of the coupling.

4 Assembly

4.9 Assembly of the shiftable linkage (component 3) - BoWex® SD1 and SD2

- Tighten the clamping screws (component 3.6) of the shifting forks to the tightening torques T_A specified in table 16.
- Mount the eye type bearing to the base plate.

With a continuous base plate the dimension LS6 (see illustration 20 resp. table 6 and 9) with shiftable linkage size 5 has to be increased by 10 mm at the minimum and with shiftable linkage size 6 by 15 mm at the minimum. The brackets of the driving and driven side have to be adjusted accordingly.

- Fasten the shifting lever (component 3.2) on the shifting shaft (component 3.3).
- When the coupling is engaged, the shifting lever has to be vertically installed.

When the coupling hub is in operation the slip ring has to be disengaged. Support or fasten the shifting lever in vertical position.

STOP

Make absolutely sure to observe the sequence of assembly, since otherwise the slip ring may get stuck resp. jammed during operation of the coupling.

- Tighten the clamping screws (component 3.7) of the shifting lever to the tightening torques T_A specified in table 16.
- Secure the shifting shaft axially via the clamping ring (component 3.5) and the clamping screws of the shifting lever (component 3.7 and see illustration 19).
- Lubricate the eye type bearing with bearing grease after assembly.

Table 16:

Shiftable linkage size	1	2	3	4	5	6
Shifting fork Clamping screw (component 3.6)	M6	M8	M8	M12	M12	M12
Tightening torque T_A in Nm	10	25	25	86	86	86
Shift lever Clamping screw (component 3.7)	M6	M6	M8	M12	M12	M12
Tightening torque T_A in Nm	10	10	25	86	86	86

5 Start-up

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

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

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

The coupling protection is not part of KTR's scope of delivery and is the customer's responsibility. It must have sufficient distance to the rotating components to safely avoid contact. Depending on the outside diameter DH of the coupling, we recommend the following minimum distance:
ØDH to 50 mm = 6 mm, ØDH 50 mm to 120 mm = 10 mm, ØDH from 120 mm = 15 mm.

5 Start-up

Please check if a proper enclosure (ignition protection, coupling protection, contact protection) has been mounted and the operation of the coupling is not affected by the enclosure. The same applies for test runs and rotational direction inspections.

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

During operation of the coupling, please pay attention to

- different operating noise
- vibrations occurring.

If you note any irregularities with the coupling during operation, the drive unit must be switched off immediately. The cause of the breakdown must be specified by means of the table „Breakdowns“ and, if possible, be eliminated according to the proposals. The potential breakdowns specified can be hints only. To find out the cause all operating factors and machine components must be considered.

6 Breakdowns, causes and elimination

The below-mentioned failures can result in an improper use of the **BoWex®** coupling. In addition to the specifications given in these operating/assembly instructions make sure to avoid such failures.
The errors listed can only be clues to search for the failures. When searching for the failure the adjacent components must generally be considered.

General failures with improper use:

- Important data for the coupling selection are not forwarded.
- The calculation of the shaft-hub-connection is not considered.
- Coupling components with damage occurred during transport are assembled.
- If the heated hubs are assembled, the permissible temperature is exceeded.
- The clearance of the components to be assembled is not coordinated with one another.
- Tightening torques are fallen below/exceeded.
- Components are mixed up by mistake/assembled incorrectly.
- No original **KTR** components (purchased parts) are used.
- Old/already worn out sleeves or sleeves stored for too long are used.
- Maintenance intervals are not observed.

6 Breakdowns, causes and elimination

Breakdowns	Causes	Elimination
Different operating noise and/or vibrations occuring	Micro friction by faulty alignment on the spline of the nylon sleeve	1) Set the unit out of operation 2) Eliminate the reason for the misalignment (e. g. loose foundation bolts, fracture of the engine mount, heat expansion of unit components, modification of the installation dimension E of the coupling) 3) For inspection of wear see item inspection
	Screws for axial fastening of hubs working loose	1) Set the unit out of operation 2) Inspect alignment of coupling 3) Tighten the screws to fasten the hubs and secure against working loose 4) For inspection of wear see item inspection
Fracture of the nylon sleeve/spline	Fracture of the nylon sleeve/spline due to high shock energy/overload	1) Set the unit out of operation 2) Disassemble the coupling and remove remainders of the nylon sleeve 3) Inspect coupling components and replace coupling components that have been damaged 4) Insert nylon sleeve, assemble coupling components 5) Find out the reason for overload
	Operating parameters do not meet with the performance of the coupling	1) Set the unit out of operation 2) Review the operating parameters and select a bigger coupling (consider mounting space) 3) Assemble new coupling size 4) Inspect alignment
	Operating error of the unit	1) Set the unit out of operation 2) Disassemble the coupling and remove remainders of the nylon sleeve 3) Inspect coupling components and replace coupling components that have been damaged 4) Insert nylon sleeve, assemble coupling components 5) Instruct and train the service staff
Excessive wear on the spline of sleeve	Vibrations of drive	1) Set the unit out of operation 2) Disassemble the coupling and remove remainders of the nylon sleeve 3) Inspect coupling components and replace coupling components that have been damaged 4) Insert nylon sleeve, assemble coupling components 5) Inspect alignment, adjust if necessary 6) Find out the reason for vibrations
	e. g. contact with aggressive liquids/oils, ozone influence, too high/low ambient temperatures etc. causing a physical modification of the nylon sleeve	1) Set the unit out of operation 2) Disassemble the coupling and remove remainders of the nylon sleeve 3) Inspect coupling components and replace coupling components that have been damaged 4) Insert nylon sleeve, assemble coupling components 5) Inspect alignment, adjust if necessary 6) Make sure that further physical modifications of the sleeve are excluded

7 Disposal

In respect of environmental protection we would ask you to dispose of the packaging resp. products on termination of their service life in accordance with the legal regulations resp. standards that apply.

- **Metal**
  Any metal components have to be cleaned and disposed of by scrap metal.
- **Nylon materials**
  Nylon materials have to be collected and disposed of by a waste disposal company.

8 Maintenance and service

Shifting hub:

- Within the scope of the machine inspection periods the fit of the shifting hub has to be cleaned and lubricated (e. g. with Molykote MoS2, copper paste).
- With a high shifting frequency of the coupling we recommend one visual inspection and lubrication of the shifting hub monthly.
- In case of operation with dust and granular material as well as high air humidity one visual inspection and lubrication per month and an operational inspection every three months has to be performed (engagement/disengagement of the coupling at standstill).

Slip ring:

- Before every lubricating process the slip ring has to be inspected for damages (visual inspection).
- It must be possible to manually rotate the shifting hub element freely in the slip ring.
- The lubrication of the slip ring depends on the speed and operating periods of the machine (see table 17).
- The intervals for inspection and lubrication specified apply for drives with standard load.

☞ **For drives with high load, e. g. permanent operation during 3 shifts, hot operation, etc., consult with us.**

Table 17:

Max. perm. speed in rpm of the slip rings	3200 to 2100		1700 to 1000		850 to 700	
Daily operating period of machines in h	8	16	8	16	8	16
Visual inspection and lubrication intervals	1/2 month		1 month	1/2 month	1 1/2 months	1 month

⚠ **For operation sites, e. g. operation with dust and granular materials, high air humidity, high ambient temperatures, outdoor operations, etc., the intervals of visual inspections and lubrication have to be reduced.**

9 Spares inventory, customer service addresses

A basic requirement to ensure the readiness for use of the coupling is a stock of the most important spare parts on site.

Contact addresses of the KTR partners for spare parts and orders can be obtained from the KTR homepage at www.ktr.com.

☞ **KTR does not assume any liability or warranty for the use of spare parts and accessories which are not provided by KTR and for the damages which may incur as a result.**

KTR Systems GmbH
Carl-Zeiss-Str. 25
D-48432 Rheine
Phone: +49 5971 798-0
E-mail: mail@ktr.com