



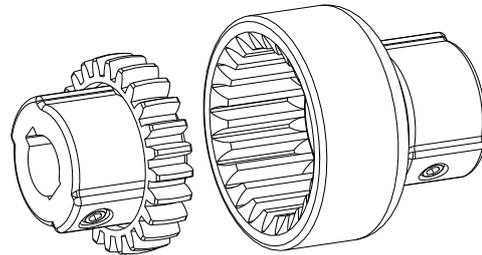
BoWex®

Non-failsafe
curved-tooth gear couplings
types

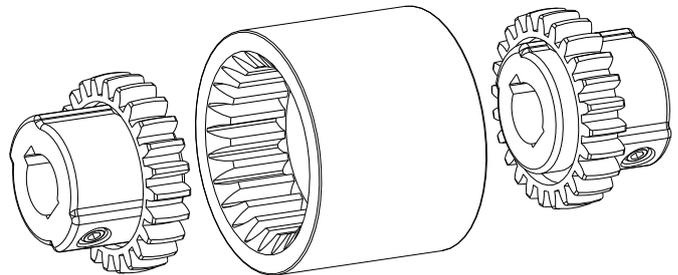
junior plug-in coupling,
junior M coupling,
M und M...C

|
and their combinations

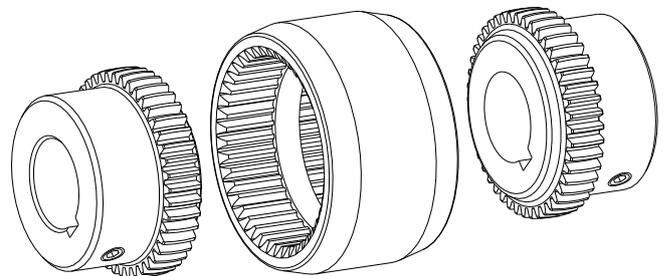
according to directive 2014/34/EU
and UK directive SI 2016 No. 1107



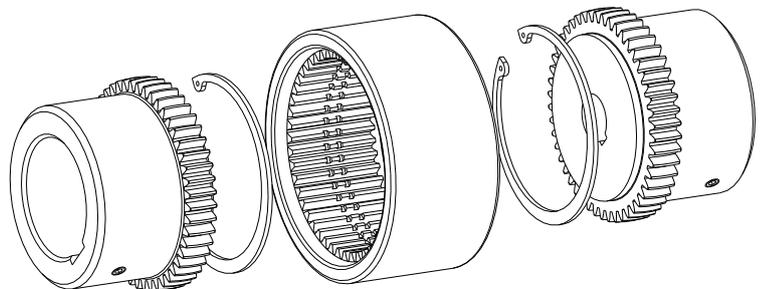
Type junior plug-in coupling (two-part)



Type junior M coupling (three-part)



Type M and M...C



Type I



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.

Table of contents

1	Technical data	3
2	Advice	5
2.1	General advice	5
2.2	Safety and advice symbols	5
2.3	General hazard warnings	5
2.4	Proper use	6
2.5	Coupling selection	6
2.6	Reference to EC Machinery Directive 2006/42/EC	6
3	Storage, transport and packaging	7
3.1	Storage	7
3.2	Transport and packaging	7
4	Assembly	7
4.1	Components of the coupling	7
4.2	Advice for finish bore	9
4.3	Assembly of the coupling (general)	10
4.4	Assembly of type junior plug-in coupling	11
4.5	Assembly of type junior M, M and I	12
4.6	Displacements - alignment of the couplings	13
5	Start-up	14
6	Breakdowns, causes and elimination	15
7	Disposal	17
8	Maintenance and service	18
9	Spares inventory, customer service addresses	18
10	Enclosure A	
	Advice and instructions regarding the use in  potentially explosive atmospheres	19
10.1	Proper use in  potentially explosive atmospheres	19
10.2	Inspection intervals for couplings in  potentially explosive atmospheres	20
10.3	Inspection of torsional backlash	21
10.4	Standard values of wear	22
10.5	 marking of couplings for potentially explosive atmospheres	23
10.6	EU Declaration of conformity	25
10.7	UK Declaration of conformity	26

1 Technical data

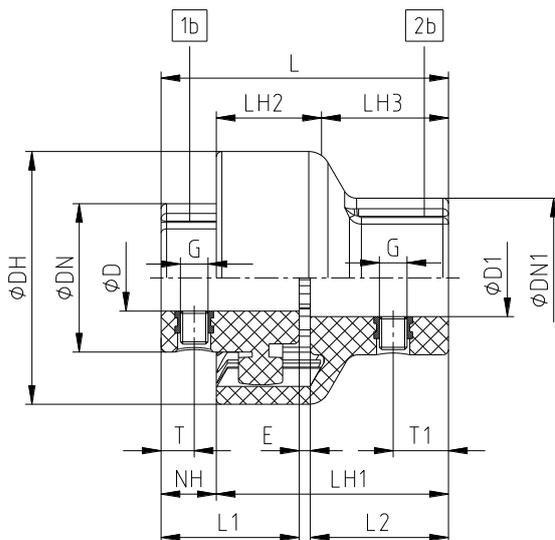


Illustration 1: BoWex® junior plug-in coupling (two-part)

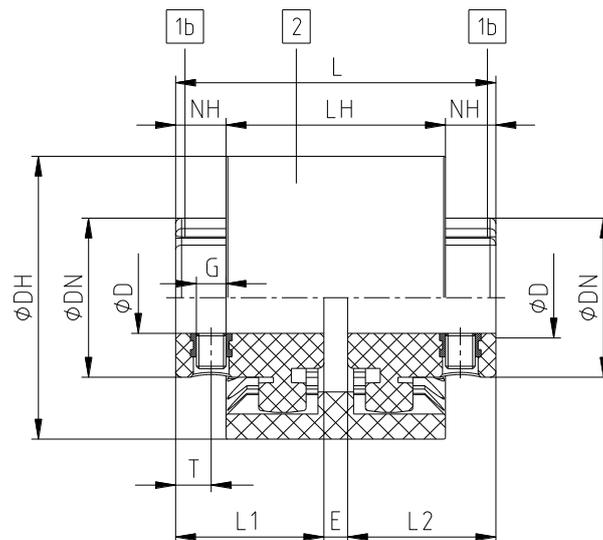


Illustration 2: BoWex® junior M coupling (three-part)

Table 1: Dimensions - BoWex® junior plug-in coupling (two-part)

Size	Finish bores [mm]		Dimensions ¹⁾ [mm]									
	D	D1	DH	DN	DN1	L	L1, L2	E	LH1	LH2	LH3	NH
14	Ø6, Ø7, Ø8, Ø9	Ø8	40	22	22	48	23	2	40	18.5	21.5	8
	Ø10, Ø11	Ø10, Ø11		25	25							
	Ø12, Ø14	Ø12, Ø14		26	26							
19	Ø12, Ø14	Ø14, Ø15	47	27	29	52	25	2	42	19.0	23.0	10
	Ø16			30								
	Ø19	Ø19		32	35							
24	Ø10, Ø11, Ø12	Ø14, Ø16	53	26	32	54	26	2	45	21.5	23.5	9
	Ø14, Ø15, Ø16			32								
	Ø18, Ø19, Ø20	Ø19, Ø20		36	36							
	Ø24	Ø24		38	40							

1) For dimensions G, T and T1 see table 6

Table 2: Dimensions - BoWex® junior M coupling (three-part)

Size	Finish bores D [mm]	Dimensions ²⁾ [mm]						
		DH	DN	L	L1, L2	E	LH	NH
14	Ø6, Ø7, Ø8, Ø9	40	22	50	23	4	37	6.5
	Ø10, Ø11		25					
	Ø12, Ø14		26					
19	Ø12, Ø14	47	27	54	25	4	37	8.5
	Ø16		30					
	Ø19		32					
24	Ø10, Ø11, Ø12	53	26	56	26	4	41	7.5
	Ø14, Ø15, Ø16		32					
	Ø18, Ø19, Ø20		36					
	Ø24		38					

2) For dimensions G and T see table 6

Table 3: Torque and speed - BoWex® junior plug-in coupling and BoWex® junior M coupling

Size	Torque [Nm]			Max. speed [rpm]
	T _{KN}	T _{K max}	T _{KW}	
14	5	10	2.5	6000
19	8	16	4.0	
24	12	24	6.0	



1 Technical data

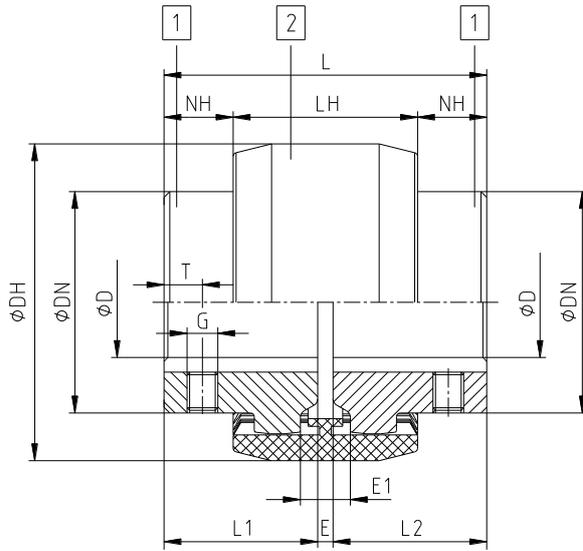


Illustration 3: BoWex® type M

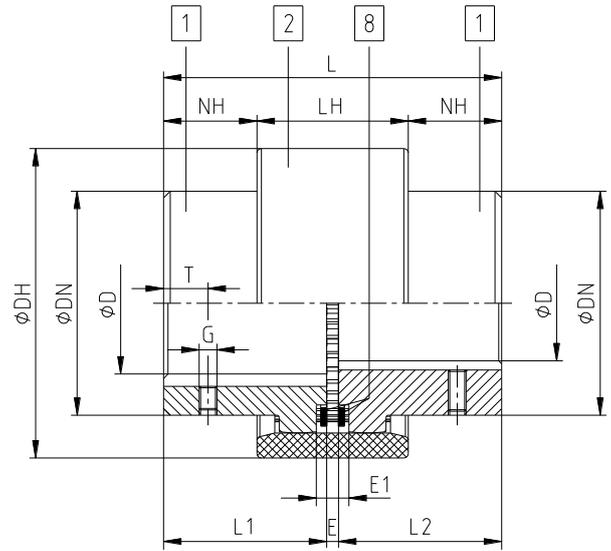


Illustration 4: BoWex® type I

Table 4: Dimensions - BoWex® type M and type I

Size	Ex	Pilot bore		Max. finish bore D [mm]	Dimensions ¹⁾ [mm]								
		Unbored	Pilot bored		DH	DN	L	L1, L2	E	E1	LH	NH	DZ ²⁾
M-14	M-14C	x	-	15	40	25	50	23	4	10	37	6.5	33
M-19	M-19C	x	-	20	47	32	54	25	4	10	37	8.5	39
M-24	M-24C	x	-	24	53	36	56	26	4	14	41	7.5	45
M-28	M-28C	x	-	28	65	44	84	40	4	13	46	19	54
M-32	M-32C	x	-	32	75	50	84	40	4	13	48	18	63
M-38	M-38C	x	-	38	83	58	84	40	4	13	48	18	69
M-42		x	-	42	92	65	88	42	4	13	50	19	78
M-48	M-48C	x	-	48	95	68	104	50	4	13	50	27	78
M-65	M-65C	x	27 70 lg.	65	132	96	114	55	4	16	68	23	110
I-80		-	31	80	175	124	186	90	6	20	93	46.5	145
I-100		-	35	100	210	152	228	110	8	22	102	63	176
I-125		-	45	125	270	192	290	140	10	30	134	78	225

1) For dimensions G and T see table 7

2) Tip circle of hub

Table 5: Torque and speed - BoWex® type M and type I

Size	Torque [Nm]			Max. speed [rpm]
	T _{KN}	T _{KN max}	T _{KW}	
14	10	30	5	14000
19	16	48	8	11800
24	20	60	10	10600
28	45	135	23	8500
32	60	180	30	7500
38	80	240	40	6700
42	100	300	50	6000
48	140	420	70	5600
65	380	1140	190	4000
80	700	2100	350	3150
100	1200	3600	600	3000
125	2500	7500	1250	2120



BoWex® couplings with attachments that can generate heat, sparks and static charging (e. g. combinations with brake drums, brake disks, overload systems such as torque limiters, fan impellers etc.) are not permitted for the use in potentially explosive atmospheres. A separate analysis must be performed.

2 Advice

2.1 General advice

Please read through these operating/assembly instructions carefully before you start up the coupling. Pay special attention to the safety instructions!



The **BoWex®** coupling is suitable and approved for the use in potentially explosive atmospheres. When using the coupling in potentially explosive atmospheres, observe the special advice and instructions regarding safety in enclosure A.

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 potentially explosive atmospheres

This symbol indicates notes which may contribute to preventing bodily injuries or serious bodily injuries that may result in death caused by explosion.



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 that 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 subject 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.

Please observe protection note ISO 16016.	Drawn:	2022-07-05 Pz/Wb	Replacing:	KTR-N dated 2019-07-01
	Verified:	2022-08-02 Pz	Replaced by:	



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 in individual parts. Before assembly the coupling has to be inspected for completeness.

4.1 Components of the coupling

Type made of nylon

Components of BoWex® junior plug-in coupling

Component	Quantity	Description
1	1	Hub
2	1	Plug-in sleeve
3	2	Setscrew DIN EN ISO 4029

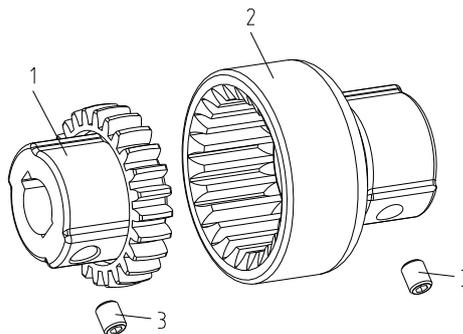


Illustration 5: BoWex® junior plug-in coupling



4 Assembly

4.1 Components of the coupling

Components of BoWex® junior M coupling

Component	Quantity	Description
1	2	Hub
2	1	Sleeve
3	2	Setscrew DIN EN ISO 4029

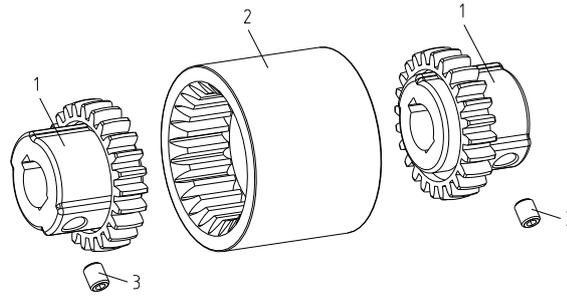


Illustration 6: BoWex® junior M coupling

Type made of steel/nylon

Components of BoWex® M coupling (size 14 - 65)

Component	Quantity	Description
1	2	Hub
2	1	Sleeve type M
3	2	Setscrew DIN EN ISO 4029

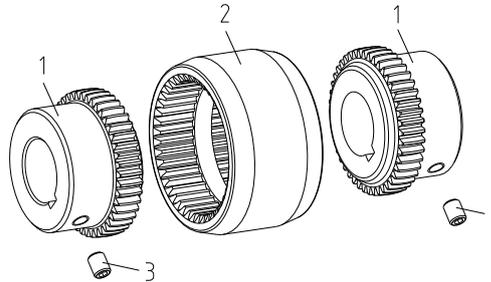


Illustration 7: BoWex® type M

Components of BoWex® I coupling (size 80 - 125)

Component	Quantity	Description
1	2	Hub
2	1	Sleeve type I ¹⁾
3	2	Setscrew DIN EN ISO 4029
4	2	Seeger circlip ¹⁾

1) The sleeve type I is supplied completely assembled by the manufacturer.

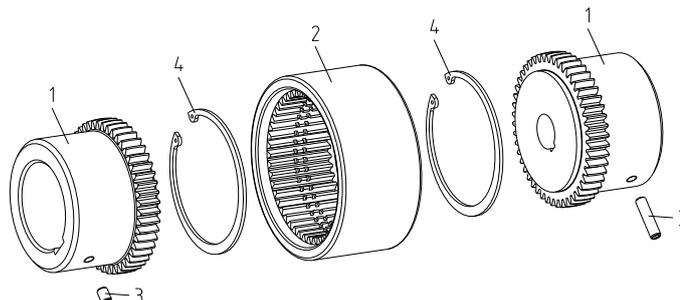


Illustration 8: BoWex® type I

Please observe protection note ISO 16016.	Drawn:	2022-07-05 Pz/Wb	Replacing:	KTR-N dated 2019-07-01
	Verified:	2022-08-02 Pz	Replaced by:	

**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 run-out (see illustration 9).
- Make absolutely sure to observe the figures for $\varnothing D$.
- 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.

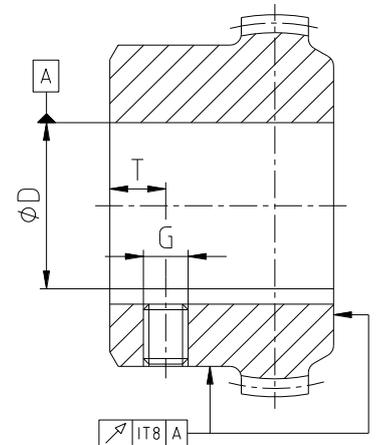


Illustration 9: Concentricity and axial runout



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.



KTR supplies unbored or pilot bored coupling components and spare parts only upon explicit request of the customer. These parts are additionally marked with the symbol Ex .

Reference to unbored resp. pilot bored coupling components with explosion protection marking:

Basically the company KTR Systems GmbH supplies couplings resp. coupling hubs with explosion protection marking as an unbored or pilot bored type only on explicit request of the customer. The prerequisite is a declaration of exemption submitted by the customer assuming any responsibility and liability for respective remachining performed on the product of KTR Systems GmbH.

Table 6: Setscrew DIN EN ISO 4029 - BoWex® junior plug-in coupling and BoWex® junior M coupling

Size	14	19	24
Dimension G	M5	M5	M5
Dimension T	6	6	6
Dimension T1	8	10	10
Tightening torque T_A [Nm]	1.4	1.4	1.4

Table 7: Setscrew DIN EN ISO 4029 - BoWex® type M and type I

Size	14	19	24	28	32	38	42	48	65	80	100	125
Dimension G	M5			M8			M10		M12	M16		
Dimension T	6			10			15 / 20 ¹⁾		20	30	40	
Tightening torque T_A [Nm]	2			10			17		40	80		

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

**4 Assembly****4.2 Advice for finish bore****Table 8: Recommended fit pairs acc. to DIN 748/1**

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

If a feather keyway is intended to be used in the hub, it should correspond to the tolerance ISO JS9 (KTR standard) with standard operating conditions or ISO P9 with sophisticated 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 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 easier mounting on the shaft.



Please pay attention to the ignition risk in potentially explosive atmospheres!



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



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



If used in potentially explosive atmospheres the setscrews to fasten the hubs as well as all screw connections must be secured against working loose additionally, e. g. conglomerating with Loctite (average strength).



4 Assembly

4.4 Assembly of type junior plug-in coupling

- Mount the hub resp. plug-in sleeve on the shaft of driving and driven side (see illustration 10).
- The internal sides of the hub and plug-in sleeve must be flush with the front sides of the shafts.

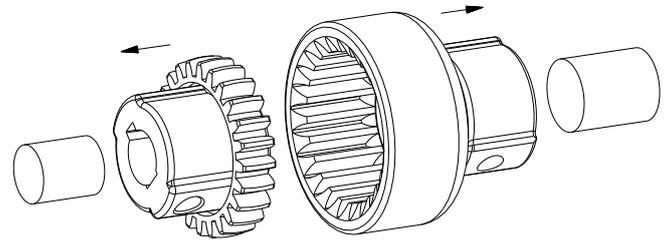


Illustration 10: Assembly of hub and plug-in sleeve

- Shift the power packs in axial direction until the distance dimension E or NH is achieved (see illustration 11).
- Fasten the hubs by tightening the setscrews DIN EN ISO 4029 with a cup point (tightening torque see table 6).

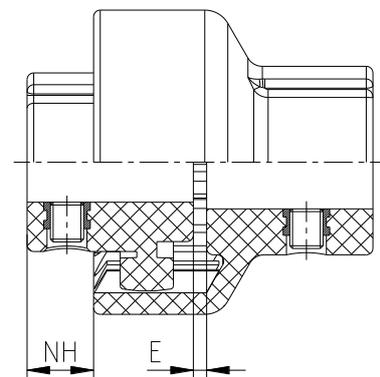


Illustration 11: Assembly of coupling



With the assembly make sure that the spline of the hub is fully covered by the internal spline of the plug-in sleeve (observe mounting dimensions L).
Disregarding this advice may cause damage to the coupling.



Having started up the coupling, the wear of the plug-in sleeve has to be inspected at regular maintenance intervals and it has to be replaced, if necessary.

**4 Assembly****4.5 Assembly of type junior M, M and I**

- Mount the hubs on the shaft of driving and driven side (see illustration 12).
- The internal sides of the hubs must be flush with the front sides of the shafts.

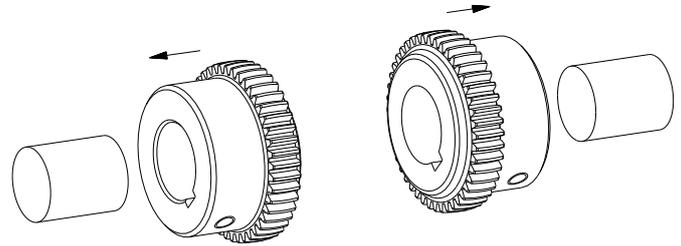


Illustration 12: Assembly of hubs

- Put the sleeve on the spline of the driving or driven side hubs (see illustration 13).

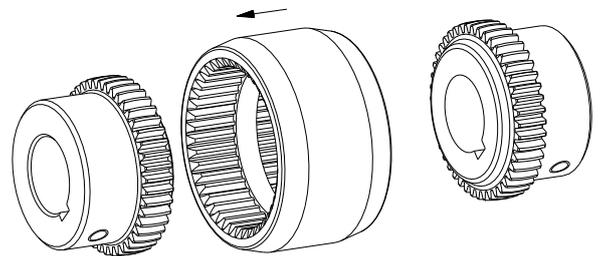


Illustration 13: Assembly of the sleeve

- Shift the power packs in axial direction until the distance dimension E is achieved (see illustration 14).
- Fasten the hubs by tightening the setscrews DIN EN ISO 4029 with a cup point (tightening torques see table 6 or 7).
- Align the sleeve via the hubs and check the dimensions E resp. NH (see illustration 14 and chapter 1).

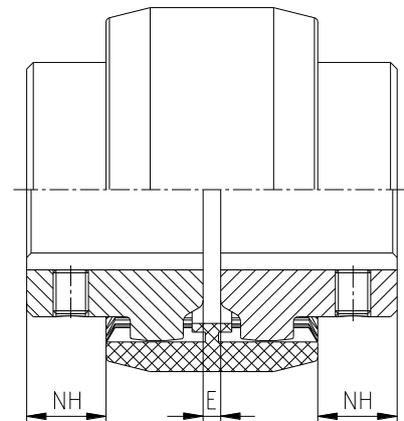


Illustration 14: Assembly of coupling



With the assembly make sure that the spline of the hub is fully covered by the internal spline of the sleeve (observe mounting dimensions L).
Disregarding this advice may cause damage to the coupling.



Having started up the coupling, the wear of the sleeve has to be inspected at regular maintenance intervals and it has to be replaced, if necessary.

4 Assembly

4.6 Displacements - alignment of the couplings

The displacement figures specified in table 9 and 10 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 and avoid hazards with the use in potentially explosive atmospheres, the shaft ends must be accurately aligned. Please absolutely observe the displacement figures specified (see tables 9 and 10). If the figures are exceeded, the coupling will be damaged. The more accurate the alignment of the coupling, the longer is its service life. If used in potentially explosive atmospheres for explosion group IIC, only half of the displacement figures (see tables 9 and 10) is permissible.

Please note:

- The displacement figures specified in table 9 and 10 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:

$$\Delta K_{r_{zul}} = \Delta K_r - \frac{\Delta K_r}{2\Delta K_w} \cdot \Delta W_w$$

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. Displacement figures between the speeds specified have to be interpolated accordingly. If necessary, ask about the displacement for the corresponding coupling type.
- Inspect with a dial gauge, ruler or feeler whether the permissible displacement figures of tables 9 and 10 can be observed.

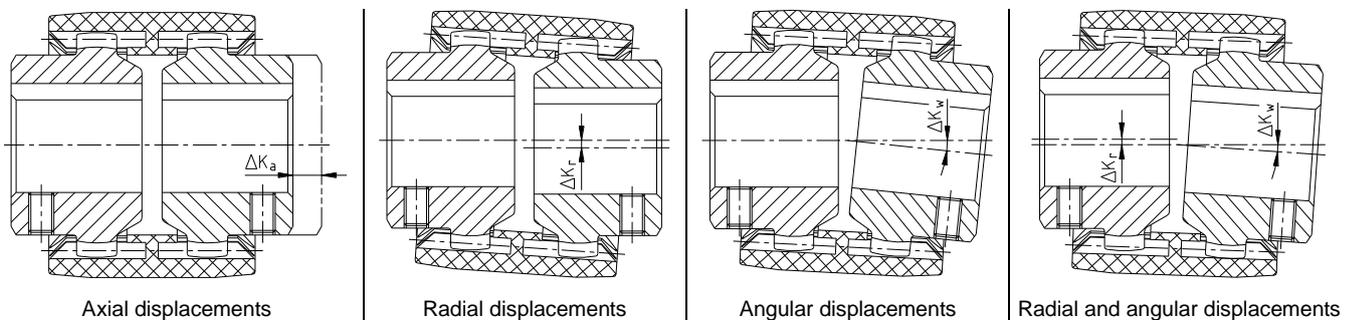


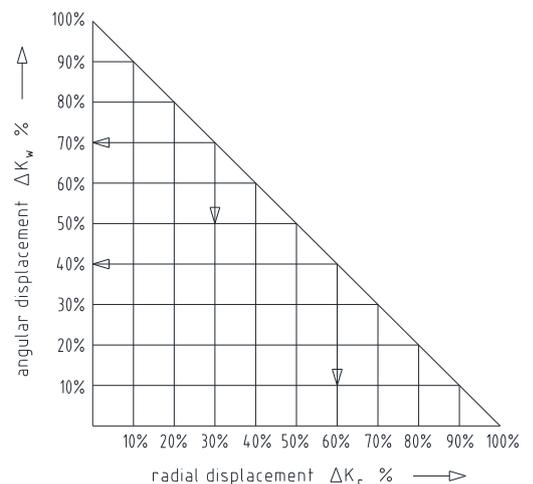
Illustration 15: Displacements

Examples of the displacement combinations specified in illustration 16:

Example 1:
 $\Delta K_r = 30 \%$
 $\Delta K_w = 70 \%$

Example 2:
 $\Delta K_r = 60 \%$
 $\Delta K_w = 40 \%$

Illustration 16:
Combinations of displacement



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

**4 Assembly****4.6 Displacements - alignment of the couplings****Table 9: Displacement figures - BoWex® junior plug-in coupling and BoWex® junior M coupling**

Size	Type junior plug-in coupling			Type junior M		
	14	19	24	14	19	24
Max. axial displacement ΔK_a [mm]	±1	±1	±1	±1	±1	±1
Max. radial displacement with n=1500 rpm ΔK_r [mm]	±0.1	±0.1	±0.1	±0.3	±0.3	±0.4
Max. radial displacement with n=3000 rpm ΔK_r [mm]	±0.1	±0.1	±0.1	±0.3	±0.3	±0.4
ΔK_w [degree] max. angular displacement with n=1500 rpm	±1.0	±1.0	±0.9	±1.0	±1.0	±0.9
ΔK_w [degree] max. angular displacement with n=3000 rpm	±0.7	±0.7	±0.6	±0.7	±0.7	±0.6

Table 10: Displacement figures - BoWex® type M and type I

Size	14	19	24	28	32	38	42	48	65	80	100	125
Max. axial displacement ΔK_a [mm]	±1	±1	±1	±1	±1	±1	±1	±1	±1	±1	±1	±1
Max. radial displacement with n=1500 rpm ΔK_r [mm]	±0.30	±0.30	±0.35	±0.35	±0.35	±0.40	±0.40	±0.40	±0.45	±0.45	±0.45	±0.45
Max. radial displacement with n=3000 rpm ΔK_r [mm]	±0.20	±0.20	±0.23	±0.23	±0.23	±0.25	±0.25	±0.25	±0.28	±0.28	±0.28	±0.28
ΔK_w [degree] max. angular displacement with n=1500 rpm	±1.0	±1.0	±0.9	±0.9	±0.9	±0.9	±0.9	±0.9	±0.7	±0.6	±0.6	±0.4
ΔK_w [degree] max. angular displacement with n=3000 rpm	±0.7	±0.7	±0.6	±0.6	±0.6	±0.6	±0.6	±0.6	±0.5	±0.4	±0.4	±0.3

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.



If used in potentially explosive atmospheres the setscrews to fasten the hubs as well as all screw connections must be secured against working loose additionally, e. g. conglomerating with Loctite (average strength).

Finally the coupling protection against accidental contact must be fitted. It is required in accordance with DIN EN ISO 12100 (Safety of Machinery) and directives 2014/34/EU and SI 2016 No. 1107 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 avoid contact safely. Depending on the outside diameter DH of the coupling, we recommend the following minimum distance:

$\varnothing DH$ to 50 mm = 6 mm, $\varnothing DH$ 50 mm to 120 mm = 10 mm, $\varnothing DH$ from 120 mm = 15 mm.

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.

The cover must be electrically conductive and included in the equipotential bonding. Bellhousings (magnesium share below 7.5 %) made of aluminium and damping rings (NBR) can be used as connecting element between pump and electric motor. The cover may only be taken off with standstill of the unit.

Please observe protection note ISO 16016.	Drawn:	2022-07-05 Pz/Wb	Replacing:	KTR-N dated 2019-07-01
	Verified:	2022-08-02 Pz	Replaced by:	

**5 Start-up**

If the couplings are used in locations subject to dust explosion and in mining the user must make sure that there is no accumulation of dust in a dangerous volume between the cover and the coupling. The coupling must not operate in an accumulation of dust.

For covers with unlocked openings on the top face no light metals must be used if the couplings are used as equipment of equipment group II (*if possible, from stainless steel*). If the couplings are used in mining (equipment group I M2), the cover must not be made of light metal. In addition, it must be resistant to higher mechanical loads than with use as equipment of equipment group II.

During operation of the coupling, 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.

Coating of coupling:

If coated (priming, paintings, etc.) couplings are used in potentially explosive atmospheres, the requirements on conductivity and coating thickness must be considered. With paintings up to 200 µm electrostatic load does not have to be expected. If thicker paintings resp. coatings up to a layer thickness of a maximum of 2.0 mm are applied, the couplings are not permissible for gases and vapours of category IIC in potentially explosive areas, but only for gases and vapours of category IIA and IIB.

This also applies for multiple coatings exceeding an overall thickness of 200 µm. Make sure with painting or coating that the coupling components are conductively connected with the device/devices to be connected so that the equipotential bonding is not impeded by the paint or coat applied. Basically painting of the sleeve is not admitted to ensure an equipotential bonding.

In addition, make sure that the marking of the coupling remains legible.

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.



If used other than intended the coupling can become a source of ignition. Directive 2014/34/EU and UK directive SI 2016 No. 1107 require special care by the manufacturer and the user.

**6 Breakdowns, causes and elimination****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.
- A wrong or no spider is inserted in the coupling.
- 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.

Breakdowns	Causes	Hazard notes for potentially explosive atmospheres	Elimination
Different operating noise and/or vibrations occurring	Micro friction by faulty alignment on the spline of the nylon sleeve	Ignition risk due to hot surfaces	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 chapter 10.2
	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 chapter 10.2
Fracture of the nylon sleeve/spline	Fracture of the nylon sleeve/spline due to high shock energy/overload	none	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	Ignition risk due to hot surfaces	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

**6 Breakdowns, causes and elimination**

Breakdowns	Causes	Hazard notes for potentially explosive atmospheres	Elimination
Excessive wear on the spline of sleeve	Ambient/contact temperatures which are too high for the sleeve, max. permissible -30 °C/+100 °C	Ignition risk due to hot surfaces	<ol style="list-style-type: none"> 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) Inspect and adjust ambient/contact temperature
	E. g. contact with aggressive liquids/oils, ozone influence, too high/low ambient temperatures etc. causing a physical modification of the nylon sleeve	none	<ol style="list-style-type: none"> 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 not the case



If you operate with a worn sleeve (see chapter 10.3 and 10.4) proper operation is not ensured.

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.

	BoWex® Operating/Assembly instructions	KTR-N 40110 EN Sheet: 18 of 26 Edition: 17
--	---	--

8 Maintenance and service

BoWex® is a low-maintenance coupling. We recommend to perform a visual inspection on the coupling **at least once a year**. Pay special attention to the condition of the sleeve of the coupling.

- Since the flexible machine bearings of the driving and driven side settle during the course of load, inspect the alignment of the coupling and re-align the coupling, if necessary.
- The coupling components have to be inspected for damages.
- The screw connections have to be inspected visually.



With the use in potentially explosive atmospheres observe chapter 10.2 "Inspection intervals for couplings in  potentially explosive atmospheres".

9 Spares inventory, customer service addresses

We recommend to store major spare parts on site to ensure the readiness for use of the machine in case if a coupling fails.

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

Please observe protection note ISO 16016.	Drawn: 2022-07-05 Pz/Wb	Replacing: KTR-N dated 2019-07-01
	Verified: 2022-08-02 Pz	Replaced by:

**10 Enclosure A**Advice and instructions regarding the use in  potentially explosive atmospheresEnclosure A only valid for BoWex® coupling.**10.1 Proper use in  potentially explosive atmospheres****Conditions of operation in  potentially explosive atmospheres**

The **BoWex®** couplings are suitable for the use according to directives 2014/34/EU and SI 2016 No. 1107.

- Protection against hazards arising from lightning must follow the lightning protection concept of the machine or plant. The relevant regulations and policy for lightning protection must be observed.
- The equipotential bonding of the couplings is made by metal contact between coupling hub and shaft. This equipotential bonding must not be affected.

1. Industry (with the exception of mining)

- Equipment group II of category 2 and 3 (*coupling is not approved/not suitable for equipment group 1*)
- Substance group G (*gases, fogs, vapours*), zone 1 and 2 (*coupling is not approved/not suitable for zone 0*)
- Substance group D (*dusts*), zone 21 and 22 (*coupling is not approved/not suitable for zone 20*)
- Explosion group IIC (*gases, fogs, vapours*) (*explosion groups IIA and IIB are included in IIC*) and explosion group IIIC (*dusts*) (*explosion groups IIIA and IIIB are included in IIIC*)

Temperature class:

Temperature class	Standard sleeve „light“ Conductive sleeve „black“	
	Ambient or operating temperature T_a ¹⁾	Max. surface temperature ²⁾
T4	-30 °C to +100 °C	+120 °C
T5	-30 °C to +75 °C	+95 °C
T6	-30 °C to +60 °C	+80 °C

Explanation:

The maximum surface temperatures result from each the maximum permissible ambient or operating temperature T_a plus the maximum temperature increase ΔT of 20 K (standard sleeve „light“ and conductive sleeve „black“) to be considered. A relevant standard safety margin of 5 K has to be added to the temperature class.

- 1) The ambient resp. operating temperature T_a is limited to + 100 °C (standard sleeve „light“ and conductive sleeve „black“) due to the permissible permanent operating temperature of the BoWex® sleeves used.
- 2) The maximum surface temperature of +120 °C applies for the use in locations which are potentially subject to dust explosion.

In potentially explosive atmospheres

- the ignition temperature of dusts generated must at least be 1.5 times the surface temperature to be considered
- the glow temperature must at least be the surface temperature to be considered plus a safety distance of 75 K.
- the gases and vapours generated must amount to the temperature class specified.

2. Mining

Equipment group I of category M2 (*coupling is not approved/not suitable for equipment group M1*).

Permissible ambient temperature - 30 °C to + 100 °C (standard sleeve „light“ and conductive sleeve „black“).



10 Enclosure A

Advice and instructions regarding the use in  potentially explosive atmospheres

10.2 Inspection intervals for couplings in  potentially explosive atmospheres

Equipment category	Inspection intervals
M2 2G 2D No gases and vapours of explosion group IIC	The torsional backlash of the coupling (see chapter 10.3 and 10.4) according to directive 2014/34/EU only has to be inspected if a failure of the coupling and consequently a downtime of the drive causes explosion hazard. We recommend a preventive inspection of circumferential backlash and visual inspection of the sleeve. This should be performed after 3,000 operating hours for the first time, at the latest 6 months after start-up of the coupling. If you note insignificant or no wear on the sleeve upon this initial inspection, further inspections can each be performed after 6,000 operating hours or at the latest after 18 months, provided that the operating parameters remain the same. If you note significant wear during the initial inspection so that it would be recommendable to replace the sleeve, find out the cause according to the table „Breakdowns“, if possible. The maintenance intervals must be adjusted to the modified operating parameters without fail.
M2 2G 2D Gases and vapours of explosion group IIC	The torsional backlash of the coupling (see chapter 10.3 and 10.4) according to directive 2014/34/EU only has to be inspected if a failure of the coupling and consequently a downtime of the drive causes explosion hazard. We recommend a preventive inspection of circumferential backlash and visual inspection of the sleeve. This should be performed after 2,000 operating hours for the first time, at the latest 3 months after start-up of the coupling. If you note insignificant or no wear on the sleeve upon this initial inspection, further inspections can each be performed after 4,000 operating hours or at the latest after 12 months, provided that the operating parameters remain the same. If you note significant wear during the initial inspection so that it would be recommendable to replace the sleeve, find out the cause according to the table „Breakdowns“, if possible. The maintenance intervals must be adjusted to the modified operating parameters without fail.

BoWex® coupling

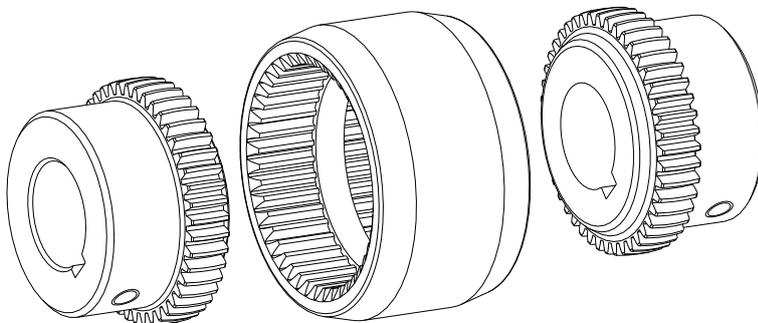


Illustration 17: BoWex® coupling

Here the backlash between the hub and the nylon spline must be inspected via torsional backlash, each separately from the driving and the driven side.

The friction/wear may only be X_{max} of the original spline thickness before the nylon sleeves must be replaced.

When reaching the torsional backlash ΔS_{max} , the nylon sleeve must be replaced immediately, irrespective of the inspection intervals.

**10 Enclosure A**Advice and instructions regarding the use in  potentially explosive atmospheres**10.3 Inspection of torsional backlash**

To inspect the torsional backlash the power pack switched off needs to be secured against accidental switch-on.

Driving side

- Rotate the hub opposite the direction of drive.



Here the sleeve must not be axially displaced from its position of wear.

- Mark sleeve and hub (see Illustration 18).
- Rotate the hub in the driving direction and measure the torsional backlash ΔS_{max} .
- When reaching the torsional backlash ΔS_{max} the nylon sleeve must be replaced.

Driven side

- Rotate the hub in the direction of the drive.



Here the sleeve must not be axially displaced from its position of wear.

- Mark sleeve and hub (see Illustration 18).
- Rotate the hub opposite the drive direction and measure the torsional backlash ΔS_{max} .
- When reaching the torsional backlash ΔS_{max} the nylon sleeve must be replaced.

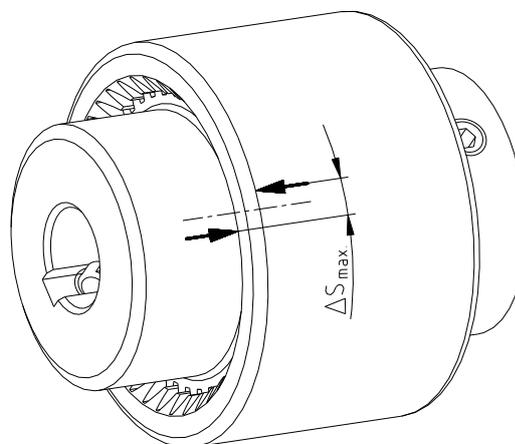


Illustration 18: Marking of sleeve and hub



10 Enclosure A

Advice and instructions regarding the use in  potentially explosive atmospheres

10.4 Standard values of wear

If the torsional backlash is $\geq \Delta S_{max.}$ [mm] / friction $\geq X_{max.}$ [mm], the nylon sleeves must be replaced.

Reaching the limits for replacing depends on the operating conditions and the existing operating parameters.



In order to ensure a long service life of the coupling and avoid hazards with the use in potentially explosive atmospheres, the shaft ends must be accurately aligned. Please absolutely observe the displacement figures specified (see tables 9 and 10). If the figures are exceeded, the coupling will be damaged.

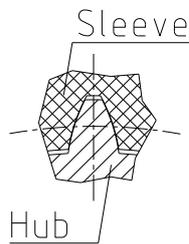


Illustration 19: Sleeve in new condition

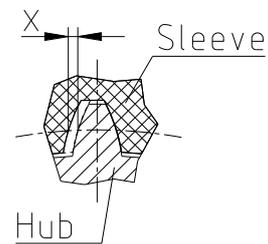


Illustration 20: Wear of sleeve

Table 8:

Size	Limits of wear each hub		Size	Limits of wear each hub	
	Wear $X_{max.}$ [mm]	Torsional backlash $\Delta S_{max.}$ [mm]		Wear $X_{max.}$ [mm]	Torsional backlash $\Delta S_{max.}$ [mm]
14	0.8	1.3	45	1.0	1.8
19	0.8	1.4	48	1.0	1.8
24	1.0	1.5	65	1.4	2.5
28	1.0	1.6	80	1.6	2.7
32	1.0	1.7	100	1.8	3.1
38	1.0	1.7	125	2.0	3.5
42	1.0	1.7			

10 Enclosure A

Advice and instructions regarding the use in  potentially explosive atmospheres

10.5  marking of couplings for potentially explosive atmospheres

The explosion protection marking of the BoWex® curved-tooth gear coupling is applied on the outer sheath or on the front side.

For the complete marking refer to the operating/assembly instructions and/or the delivery note/package.

The following marking applies for the products:

- Type M with standard sleeve (light), sizes M-14 and M-19
- Type S..-St with standard sleeve (light), sizes S14-St to S24-St inclusive
- Type M with conductive sleeve (black), sizes M-14C to M-80C inclusive
- Type SSR with Seeger circlips with conductive sleeve (black), sizes 24 SSR to 125 SSR inclusive
- Type S..-St with conductive sleeve (black), sizes S14-St to S55-St inclusive

 	I M2 Ex h I	Mb	X
	II 2G Ex h IIC T6 ... T4	Gb	X
	II 2D Ex h IIIC T80 °C ... T120 °C	Db	X
<Year>	-30 °C ≤ T _a ≤ +60 °C ... +100 °C		
KTR Systems GmbH, Carl-Zeiss-Str. 25, D-48432 Rheine			

- Type M with standard sleeve (light), sizes M-24 to M-65 inclusive
- Type SSR with Seeger circlips with standard sleeve (light), sizes 24 SSR to 45 SSR inclusive
- Type S..-St with standard sleeve (light), sizes S28-St to S55-St inclusive

 	I M2 Ex h I	Mb	X
	II 2G Ex h IIB T6 ... T4	Gb	X
	II 2D Ex h IIIC T80 °C ... T120 °C	Db	X
<Year>	-30 °C ≤ T _a ≤ +60 °C ... +100 °C		
KTR Systems GmbH, Carl-Zeiss-Str. 25, D-48432 Rheine			

Short marking:

(A short marking is only made if not possible differently for reason of space or functioning.)

BoWex®
<Year>

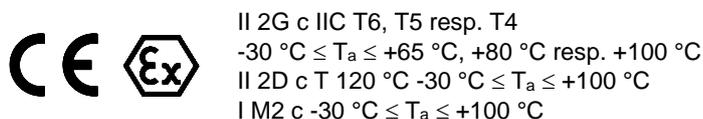


Deviating marking applied until 31st October 2019:

Short marking:



Complete marking:



Please observe protection note ISO 16016.	Drawn:	2022-07-05 Pz/Wb	Replacing:	KTR-N dated 2019-07-01
	Verified:	2022-08-02 Pz	Replaced by:	

10 Enclosure A

Advice and instructions regarding the use in  potentially explosive atmospheres

10.5  marking of couplings for potentially explosive atmospheres

Comments on marking

Equipment group I	Mining
Equipment group II	Non-mining
Equipment category 2G	Equipment ensuring a high level of safety, suitable for zone 1
Equipment category 2D	Equipment ensuring a high level of safety, suitable for zone 21
Equipment category M2	Equipment ensuring a high level of safety must be able to be switched off when an explosive atmosphere occurs
D	Dust
G	Gases and vapours
Ex h	Nonelectrical explosion protection
IIB	Gases and vapours of class IIB (including IIA)
IIC	Gases and vapours of class IIC (including IIA and IIB)
IIIC	Electrically conductive dusts of class IIIC (including IIIA and IIIB)
T6 ... T4	Temperature class to be considered, depending on the ambient temperature
T80 °C ... T120 °C	Maximum surface temperature to be considered, depending on the ambient temperature
-30 °C ≤ T _a ≤ +60 °C ... +100 °C or -30 °C ≤ T _a ≤ +100 °C	Permissible ambient temperature from -30 °C to +60 °C resp. -30 °C to +100 °C
Gb, Db, Mb	Equipment protection level, high level of safety, analogous to the equipment category
X	For a safe use of the couplings particular conditions apply

If the symbol  was punched in addition to marking , the coupling component was supplied by KTR as an unbored or pilot bored version (see chapter 4.2 of the present operating/assembly instructions).



10 Enclosure A

Advice and instructions regarding the use in  potentially explosive atmospheres

10.6 EU Declaration of conformity

EU Declaration of Conformity resp. Certificate of Conformity

corresponding to EU directive 2014/34/EU dated 26 February 2014
and to the legal provisions adopted for its implementation

The manufacturer - KTR Systems GmbH, Carl-Zeiss-Str. 25, D-48432 Rheine - states that the

BoWex® curved-tooth gear couplings®

in an explosion-proof design described in these assembly instructions are equipment resp. components corresponding to article 2, 1. of directive 2014/34/EU and comply with the general safety and health specifications according to enclosure II of directive 2014/34/EU.

This declaration of conformity is issued under the sole responsibility of the manufacturers KTR Systems GmbH.

The coupling described in here complies with the specifications of the following standards/rules:

- EN ISO 80079-36:2016-12
- EN ISO 80079-37:2016-12
- EN ISO/IEC 80079-38:2017-10
- IEC/TS 60079-32-1:2020-01-24

The BoWex® complies with the specifications of directive 2014/34/EU.

According to article 13 (1) b) ii) of directive 2014/34/EU the technical documentation is deposited with the notified body (type examination certificate IBExU13ATEXB007 X):

IBExU
Institut für Sicherheitstechnik GmbH
Identification number: 0637
Fuchsmühlenweg 7

09599 Freiberg

Rheine,
Place

2022-07-05
Date

i. V. 
Reinhard Wibbeling
Engineering/R&D

i. A. 
Andreas Hücker
Product Manager



10 Enclosure A

Advice and instructions regarding the use in  potentially explosive atmospheres

10.7 UK Declaration of conformity

UK Declaration of Conformity resp. Certificate of Conformity

corresponding to UK directive SI 2016 No. 1107 dated 26 February 2014
and to the legal provisions adopted for its implementation

The manufacturer - KTR Systems GmbH, Carl-Zeiss-Str. 25, D-48432 Rheine - states that the

BoWex® curved-tooth gear couplings®

in an explosion-proof design described in these assembly instructions are equipment resp. components corresponding to directive SI 2016 No. 1107 and comply with the general safety and health requirements according to directive SI 2016 No. 1107.

This declaration of conformity resp. certificate of conformity is issued under the sole responsibility of the manufacturer KTR Systems GmbH.

The coupling described in here complies with the specifications of the following standards/rules:

- EN ISO 80079-36:2016-12
- EN ISO 80079-37:2016-12
- EN ISO/IEC 80079-38:2017-10
- IEC/TS 60079-32-1:2020-01-24

The BoWex® complies with the specifications respectively the applicable specifications of directive SI 2016 No. 1107.

According to directive SI 2016 No. 1107 the technical documentation is deposited with the notified body:

Eurofins CML
Identification number: 2503

Rheine,
Place

2022-07-05
Date

i. V. 
Reinhard Wibbeling
Engineering/R&D

i. A. 
Andreas Hücker
Product Manager