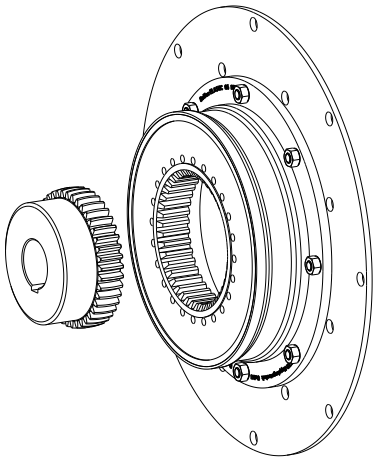
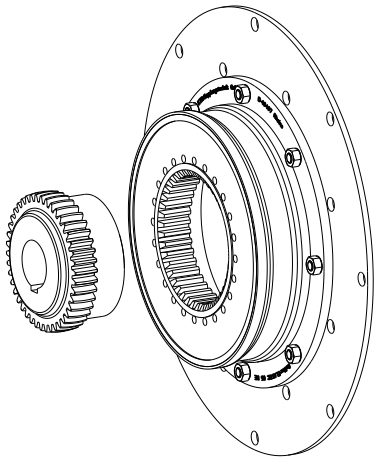
BoWex-ELASTIC®

highly flexible flange coupling types
HE1, HE2, HE3, HE4 and their combinations

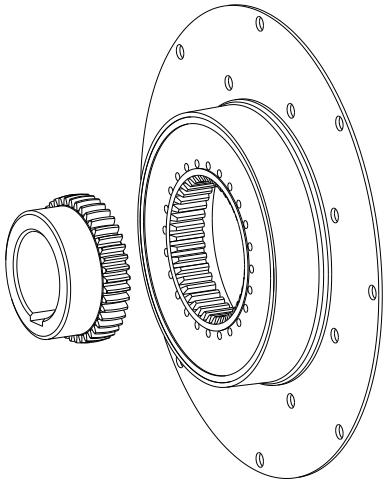
according to directive 2014/34/EU and UK directive SI 2016 No. 1107



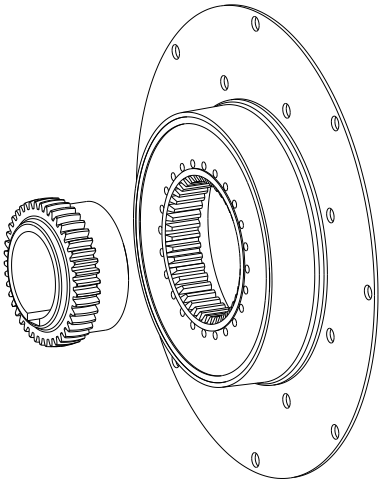
Type HE1



Type HE2



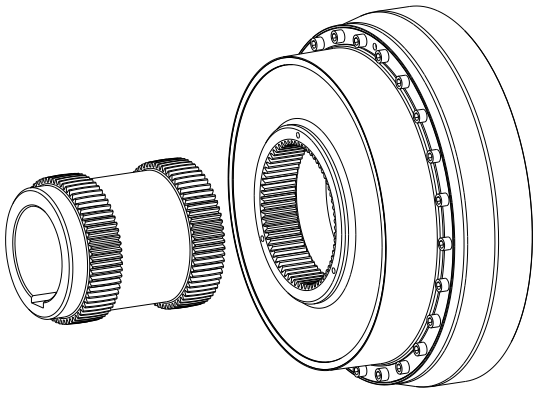
Type HE3



Type HE4

BoWex-ELASTIC®

highly flexible flange coupling type
HE-D and its combinations



Type HE-D

BoWex-ELASTIC® is a highly flexible flange coupling. It dampens torsional vibrations, reduces shocks and isolates structure-borne noise. The **BoWex-ELASTIC®** coupling compensates for relatively large shaft displacements generated by, as an example, manufacturing inaccuracies, thermal expansion, etc.

Table of contents

1 Technical data

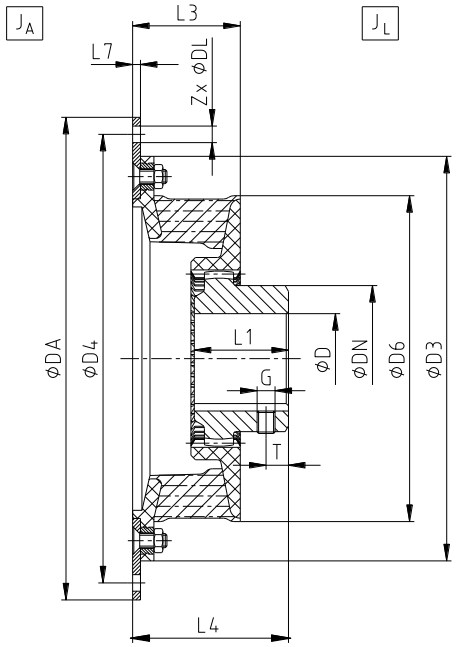


Illustration 1: BoWex-ELASTIC® type HE1

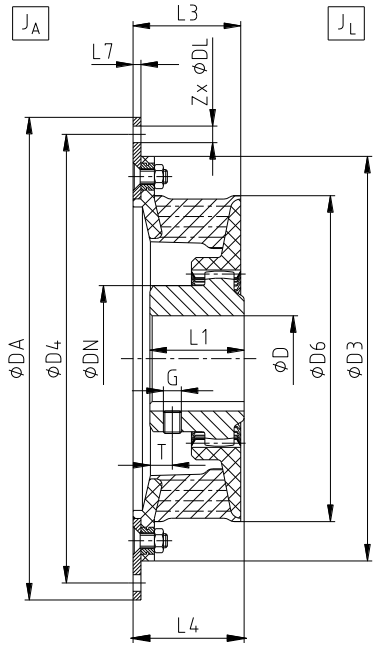


Illustration 2: BoWex-ELASTIC® type HE2

Table 1: Dimensions - type HE1 and HE2

Size	Bore D [mm]		Flange connection acc. to SAE - J620						Dimensions [1] [mm]							
	Pilot bored	Max.	6½“	7½“	8“	10“	11½“	14“	L1	L3	L4 HE1	L4 HE2	L7	D3	D6	DN
42 HE	-	42	●	●					42	49	70	50	4	180	146	65
					●											
48 HE	-	48	●	●					50	49	78	50	4	198	164	68
					●											
						●										
65 HE	-	65				●			55	60	85	62	5	244	205	96
							●									
80 HE	31	80				●			90	76	126	74	-	-	266	124
							●				132	80	6	316		
G 80 HE	31	80					●		90	86	136	84	-	-	302	124
								●			142	90	6	356		

1) For dimensions G and T see table 7

Table 2: Technical data - type HE1 and HE2

Size	Flange connection acc. to SAE - J620						Weight with maximum bore of coupling [kg]	Mass moment of inertia with maximum bore of coupling [kgm²]		Perm. damping power P_{KW} [W]		
	6½“	7½“	8“	10“	11½“	14“		J_A	J_L	60 °C	80 °C	90 °C
42 HE	●						1.4	0.0032	0.0016	26.0	15.6	10.4
		●					1.8	0.0074	0.0016			
			●				2.8	0.0172	0.0016			
48 HE	●						1.5	0.0036	0.0021	36.0	21.6	14.4
		●					2.3	0.0119	0.0021			
			●				2.6	0.0170	0.0021			
				●			3.4	0.0342	0.0021			
65 HE				●			4.9	0.0424	0.0069	60.0	36.0	24.0
					●		5.7	0.0647	0.0069			
80 HE				●			8.1	0.0239	0.0307	120.0	72.0	48.0
					●		10.2	0.0765	0.0307			
G 80 HE					●		9.7	0.0426	0.0471	180.0	108.0	72.0
						●	14.7	0.2851	0.0471			

1 Technical data

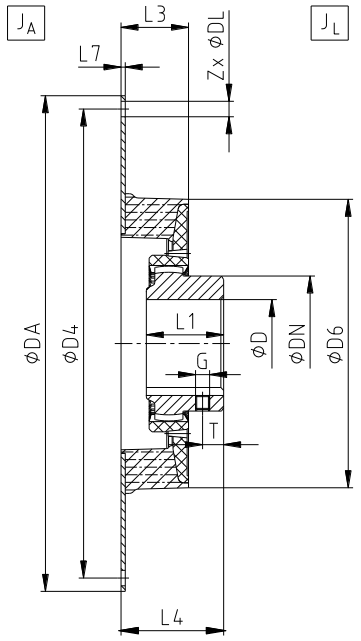


Illustration 3: BoWex-ELASTIC® type HE3

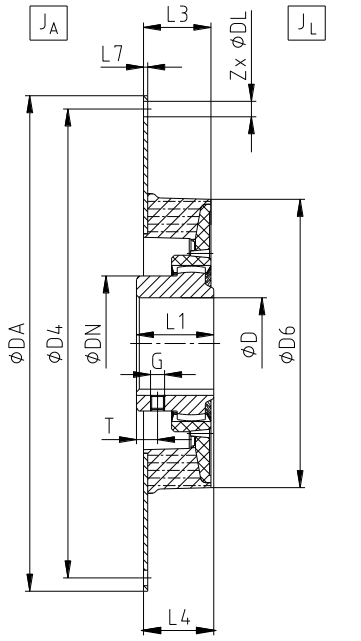


Illustration 4: BoWex-ELASTIC® type HE4

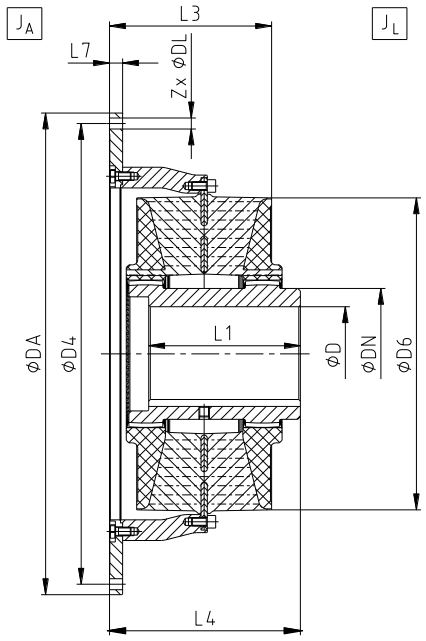


Illustration 5: BoWex-ELASTIC® type HE-D

Table 3: Dimensions - type HE3, HE4 and HE-D

Size	Bore D [mm]		Flange connection acc. to SAE - J620	Dimensions [1] [mm]						
				L1 [2]	L3 [2]	L4 [2]		L7 [2]	D6	DN
	Pilot bored	Max.		HE3 HE4	HE3 HE4	HE3	HE4	HE3 HE4		
42 HE	-	42	6½“	42	35	55	40	2	145	65
			7½“							
48 HE	-	48	7½“	50	39	68	42	2	163	68
			8“							
			10“							
G 65 HE	21	65	10“	55	48	73	50	3	205	96
			11½“							
80 HE	31	80	10“	90	60	112	60	4	265	124
G 80 HE	31	80	11½“	90	70	122	70	4	300	124
GG 80 HE	32	90	11½“	90	75	125	-	4	302	124
100 HE	38	100	14“	110	84	150	82	4	350	152
G 100 HE	38	100	14“	65	80	102	85	4	350	152
125 HE	45	125	14“	140	98	186	103	6	416	192
			16“			192	109			
G 125 HE	45	125	16“	140	95	179	91	6	440	192
			18“							
150 HE	44	160	18“	150	146	205	160	6	470	225
			21“							
150 HE-D	44	160	18“	275	286	291	-	-	470	225
			21“							
G 150 HE	44	160	18“	150	146	205	160	6	504	225
			21“							
G 150 HE-D	44	160	18“	275	286	291	-	-	504	225
			21“							
200 HE	46	180	21“	175	155	240	160	6	568	250
			24“							
200 HE-D	46	180	21“	298	325	310	-	-	568	250
			24“							
G 200 HE	46	180	21“	175	155	240	160	6	600	250
			24“							
G 200 HE-D	46	180	21“	298	325	310	-	-	600	250
			24“							
240 HE	80	240	Ø800	200	180	270	205	8	772	326
275 HE	80	275	Ø885	240	195	312	215	10	810	372

1) For dimensions G and T see table 7
2) Dimensions of type HE-D according to dimensional drawing
* Flange connection differing from SAE standard, dimensions in mm.

1 Technical data

Table 4: Technical data - type HE3, HE4 and HE-D

Size	Flange connection acc. to SAE - J620	Weight with maximum bore of coupling [kg]	Mass moment of inertia with maximum bore of coupling [kgm²]		Perm. damping power P_{KW} [W]		
			J_A	J_L	60 °C	80 °C	90 °C
42 HE	6½“	1.8	0.0071	0.0021	26.0	15.6	10.4
	7½“	1.8	0.0071	0.0021			
48 HE	7½“	1.9	0.0070	0.0022	36.0	21.6	14.4
	8“	2.1	0.0103	0.0022			
	10“	2.5	0.0201	0.0022			
G 65 HE	10“	4.1	0.0281	0.0075	68.0	40.8	27.2
	11½“	4.6	0.0423	0.0075			
80 HE	10“	9.1	0.0414	0.0305	120.0	72.0	48.0
G 80 HE	11½“	11.1	0.0713	0.0472	180.0	108.0	72.0
GG 80 HE	11½“	11.9	0.0768	0.0498	196.0	117.6	78.4
100 HE	14“	18.3	0.2028	0.1104	210.0	126.0	84.0
G 100 HE	14“	16.0	0.2172	0.1013	215.0	129.0	86.0
125 HE	14“	33.1	0.3142	0.2750	221.0	133.0	88.0
	16“	34.8	0.4231	0.2750			
G 125 HE	16“	36.6	0.4634	0.3264	240.0	144.0	96.0
	18“	39.5	0.6812	0.3264			
150 HE	18“	46.8	0.7277	0.5414	262.0	157.0	105.0
	21“	51.5	1.2120	0.5414			
150 HE-D	18“	112.8	3.0045	1.0738	524.0	314.0	210.0
	21“	155.2	6.4399	1.0738			
G 150 HE	18“	51.9	0.8164	0.6500	278.0	167.0	111.0
	21“	56.6	1.3007	0.6500			
G 150 HE-D	18“	122.9	3.1820	1.2910	556.0	334.0	222.0
	21“	165.4	6.6173	1.2910			
200 HE	21“	76.8	1.4880	1.2952	308.0	185.0	123.0
	24“	81.2	2.0390	1.2952			
200 HE-D	21“	228.2	11.7951	2.4672	616.0	370.0	246.0
	24“	216	10.6618	2.4672			
G 200 HE	21“	81.6	1.6272	1.5409	324.0	194.0	130.0
	24“	86.0	2.1782	1.5409			
G 200 HE-D	21“	238.4	12.0022	3.0387	648.0	388.0	260.0
	24“	229.8	10.9240	3.0387			
240 HE	Ø800 *	138.4	4.2414	4.0410	372.0	223.0	149.0
275 HE	Ø885 *	206.2	7.3696	7.6845	410.0	246.0	164.0

* Flange connection differing from SAE standard, dimensions in mm.

Table 5: Flange dimensions according to SAE J 620

Nominal size	Flange dimensions [mm]											
	6½“	7½“	8“	10“	11½“	14“	16“	18“	21“	24“	Ø800 *	Ø885 *
Dimension DA	215.90	241.30	263.52	314.32	352.42	466.72	517.50	571.50	673.10	733.42	800	885
Dimension D4	200.02	222.25	244.47	295.27	333.37	438.15	489.00	542.90	641.35	692.15	770	855
Number Z	6	8	6	8	8	8	8	6	12	12	32	36
Dimension DL	9	9	11	11	11	13	13	17	17	21	17	17

* Flange connection differing from SAE standard, dimensions in mm.

BoWex-ELASTIC® 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 <u>not</u> permitted for the use in potentially explosive atmospheres. A separate analysis must be performed.

2 Advice

2.1 General advice

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

The **BoWex-ELASTIC®** 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-ELASTIC®** described in here corresponds to the technical status 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-ELASTIC®").
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.

With applications in potentially explosive atmospheres in conjunction with gases only 50 % of the permissible damping power of the coupling is permissible with temperature class T6 to T4 (see chapter 1).

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.
With favourable storage conditions the properties of the elastomer part remain unchanged for up to 5 years.

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 supplied in the following subassemblies and single parts. Before assembly the coupling has to be inspected for completeness.

4.1 Components of the couplings

Components of type HE1 and HE2

Component	Quantity	Description
1	1	Elastomer part 1)
2	1	Hub
3	1	Connection flange 1)
4	see table 6	Countersunk screw DIN EN ISO 10642 1)
5	see table 6	Hexagon nut DIN EN ISO 4032 1)
6	1	Setscrew DIN EN ISO 4029

1) The elastomer part with the connection flange is supplied completely assembled by the manufacturer.

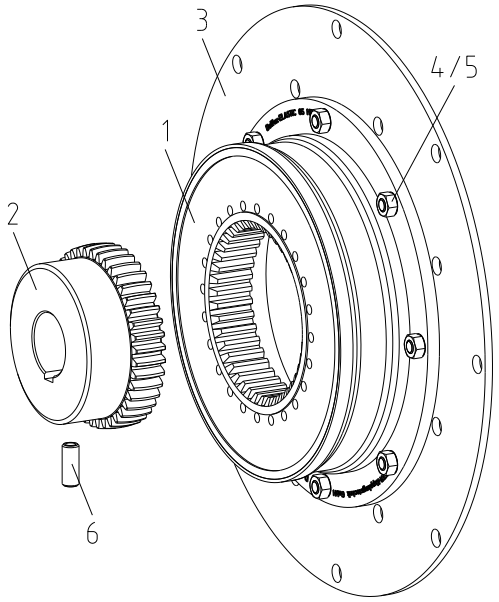


Illustration 6: BoWex-ELASTIC® type HE1

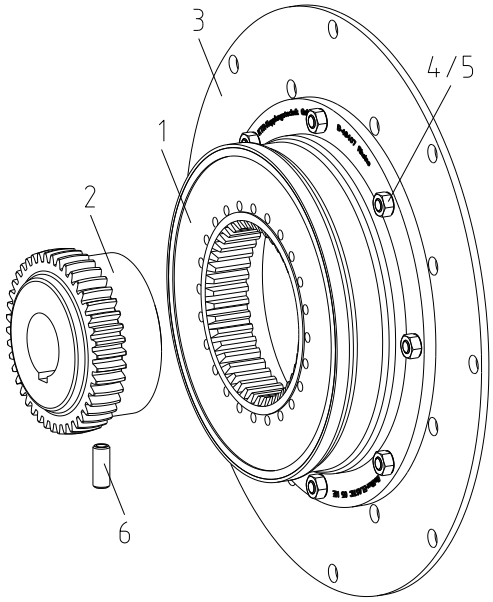


Illustration 7: BoWex-ELASTIC® type HE2

Table 6:

Size	42 HE	48 HE	65 HE	80 HE	G 80 HE
Screw size	M6	M6	M8	M10	M10
Number (screw and nut) z_1	6	8	8	8	8
Tightening torque T_A [Nm]	14	14	35	69	69

4 Assembly

4.1 Components of the couplings

Components of type HE3 and HE4

Component	Quantity	Description
1	1	Elastomer part
2	1	Hub
6	1	Setscrew DIN EN ISO 4029

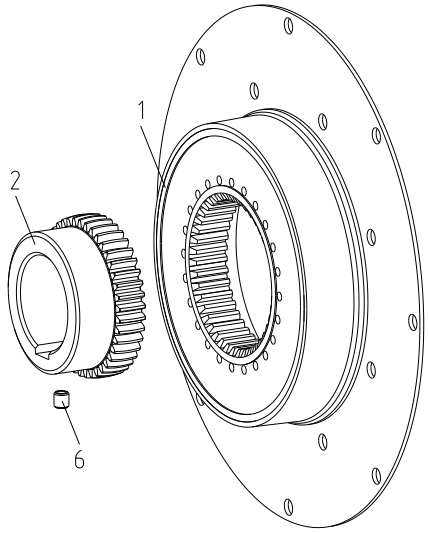


Illustration 8: BoWex-ELASTIC® type HE3

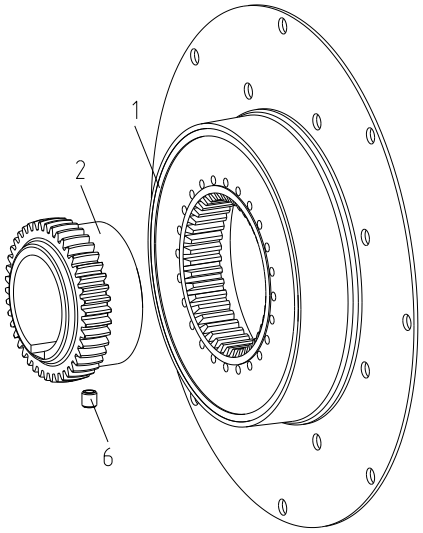


Illustration 9: BoWex-ELASTIC® type HE4

Components of type HE-D

Component	Quantity	Description
1	2	Elastomer part
2	1	Hub
3	1	Additional flange
6	1	Setscrew DIN EN ISO 4029
7	1	Distance washer
8	1	Cap screws DIN EN ISO 4762 (1 set)
9	1	Hexagon screws DIN EN ISO 4017 (1 set)

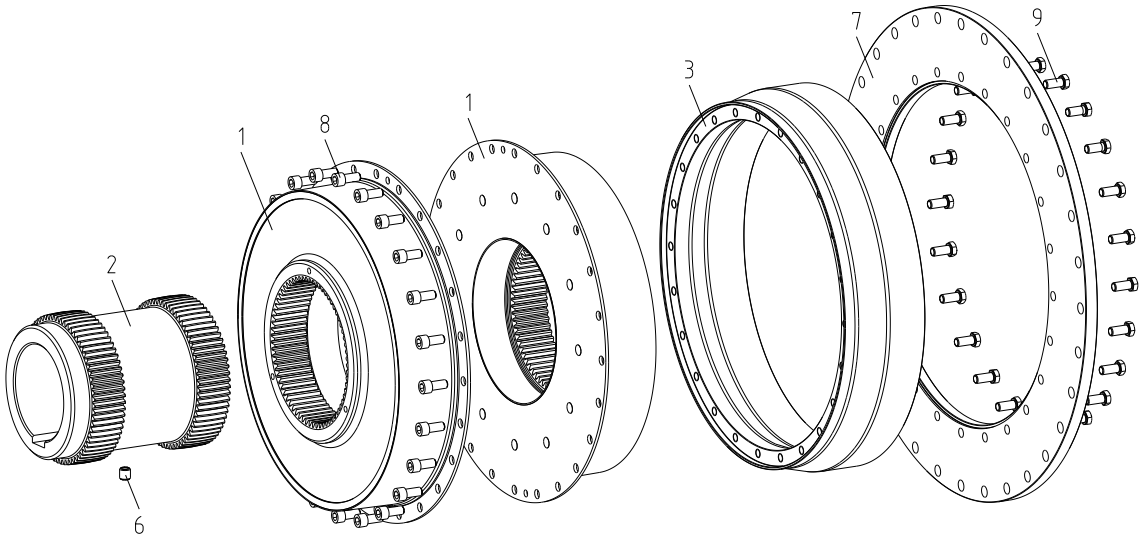


Illustration 10: BoWex-ELASTIC® type HE-D

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 11).
- Make absolutely sure to observe the figures for ØD.
- 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.

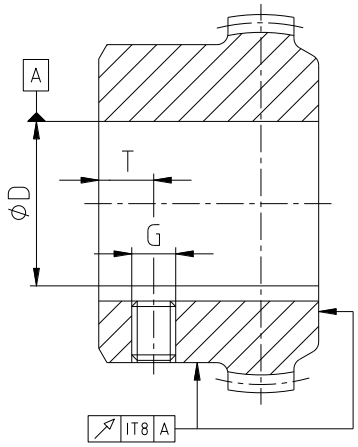


Illustration 11:
Concentricity and axial runout

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.

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 Ⓤ.

<u>Reference to unbored resp. pilot bored coupling components with explosion protection marking:</u>
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 7: Setscrew DIN EN ISO 4029

Size	42 HE	48 HE	65 HE G 65 HE GG 65 HE	80 HE G 80 HE GG 80 HE	100 HE	125 HE G 125 HE	150 HE G 150 HE	200 HE G 200 HE	240 HE	275 HE
Dimension G	M8	M8	M10	M10	M12	M16	M16	M16	M20	M24
Dimension T	10	10	15 / 20 [1)]	20	30	40	40	40	40	40
Tightening torque T_A [Nm]	10	10	17	17	40	80	80	80	140	240

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

4 Assembly

4.3 Assembly of the coupling (general)

In case if a dimensional drawing was prepared for the coupling, the dimensions specified have to be primarily observed.
The operator of the machine should be provided with the dimensional drawing.

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.

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. conglutinating with Loctite (average strength).

4.4 Assembly of type HE1, HE2, HE3 and HE4

- Mount the hub (component 2) on the shaft of driving and driven side (see illustration 12).
- Fasten the hub by tightening the setscrew (component 6) DIN EN ISO 4029 with a cup point or an end plate (tightening torques see table 7).

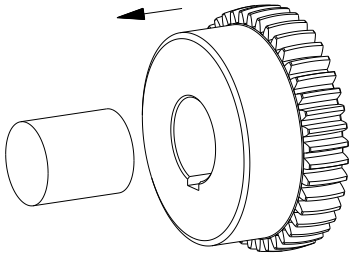


Illustration 12: Assembly of hub

- Insert the connection flange with elastomer part (component 1 and 3 of type HE1 and HE2) or the elastomer part (component 1 of type HE3 and HE4) in the centering of the flywheel (see illustration 13).
- Hand-tighten the components first.
- Tighten the screws at the appropriate tightening torque T_A by means of a suitable torque key.

We recommend to secure all screw connections against working loose additionally, e. g. applying Loctite screw adhesive (average strength), while the elastomer parts must <u>not</u> come into contact with any type of adhesive.

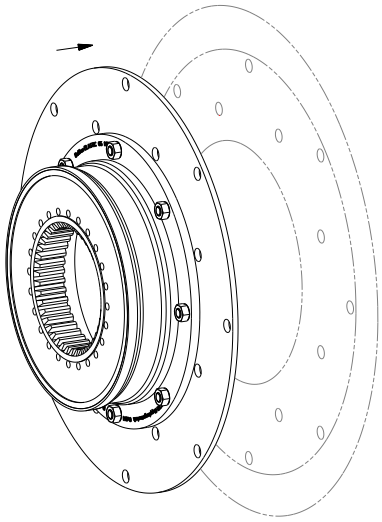


Illustration 13: Assembly of the elastomer part to the flywheel

4 Assembly

4.4 Assembly of type HE1, HE2, HE3 and HE4

Table 8: Screw tightening torques for screwing the external flange to the engine flywheel

Size of flywheel acc. to SAE - J620	-	6 ½“	7 ½“	8“	10“	11 ½“	14“	16“	18“	21“	24“
Screw size	M6	M8		M10			M12		M16		M20
Tightening torque [Nm]	10	25		49			120		295		580
Minimum screw strength	8.8						10.9				
Inch screw	-	5/16 - 18		3/8 - 16			1/2 - 13		5/8 - 11		
Tightening torque [Nm]	-	24		42			150		286		
Minimum screw strength	5						8				

- Shift the machine components in axial direction until the distance dimension L4 is achieved (see illustration 14 as well as table 1 and 3).
- If the position of the machine components is already fixed, the mounting dimension can be set by shifting the hub axially on the shaft.

With the assembly make sure that the spline of the hub is fully covered by the internal spline of the elastomer part (observe mounting dimension L4). Disregarding this advice may cause damage to the coupling.

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

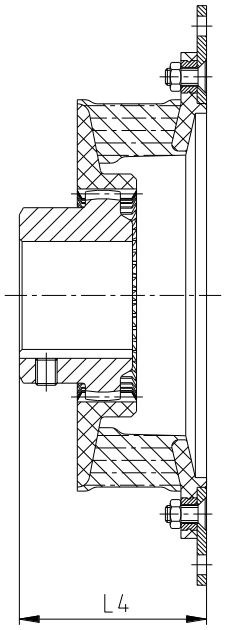


Illustration 14: Assembly of coupling

4.5 Assembly of type HE-D

- Mount the hub (component 2) on the shaft of driving and driven side (see illustration 15).
- Fasten the hub by tightening the setscrew (component 6) DIN EN ISO 4029 with a cup point or an end plate (tightening torques see table 7).

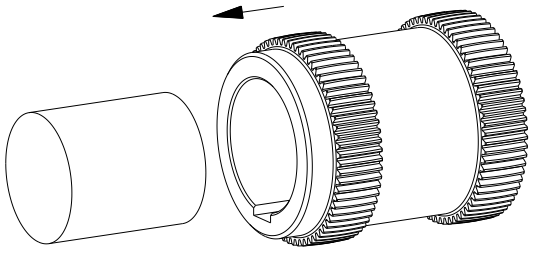


Illustration 15: Assembly of hub

4 Assembly

4.5 Assembly of type HE-D

☞ **We recommend to secure all screw connections against working loose additionally, e. g. applying Loctite screw adhesive (average strength), while the elastomer parts must <u>not</u> come into contact with any type of adhesive.**

- Insert the two elastomer parts (component 1) in the centering of the additional flange (component 3) placing the two connection surfaces of the elastomer parts on top of each other.
  Align the bores and tapped holes to each other (see illustration 16).
- Hand-tighten the components first.
- Tighten the screws (component 8) at the tightening torques T_A specified in the dimensional drawings by means of a suitable torque key.

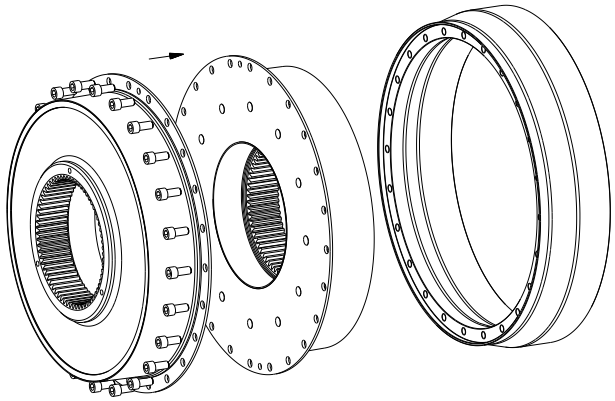


Illustration 16: Assembly of the elastomer parts with additional flange

- Insert the distance ring (component 7) on the additional flange and align the bores to the tapped holes (see illustration 17).
- Hand-tighten the components first.
- Tighten the screws (component 9) at the tightening torques T_A specified in the dimensional drawings by means of a suitable torque key.

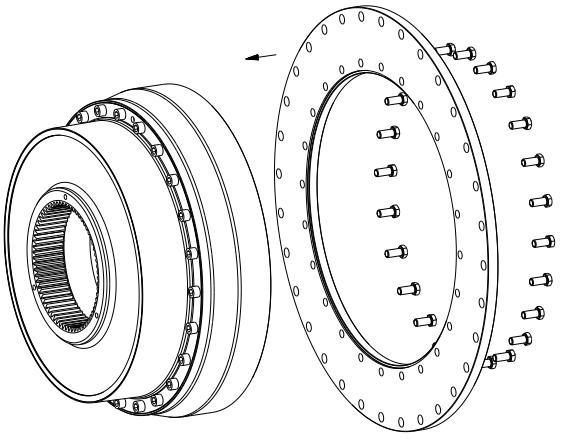


Illustration 17: Assembly of distance ring

- Insert the mounted unit in the centering of the flywheel (see illustration 18).
- Hand-tighten the components first.
- Tighten the screws at the appropriate tightening torque T_A by means of a suitable torque key.

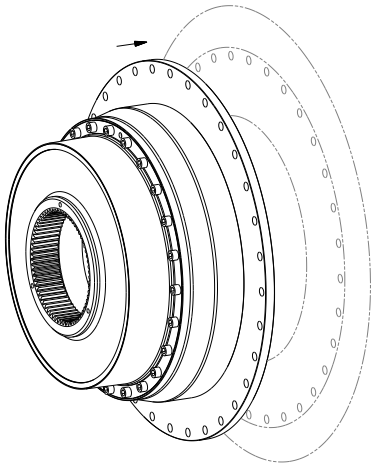


Illustration 18: Assembly of the elastomer part to the flywheel

4 Assembly

4.5 Assembly of type HE-D

- Shift the machine components in axial direction until the mounting dimension L4 is achieved (see illustration 19 as well as table 3).
- If the position of the machine components is already fixed, the mounting dimension can be set by shifting the hub axially on the shaft.

With the assembly make sure that the spline of the hub is fully covered by the internal spline of the elastomer part (observe mounting dimension L4). Disregarding this advice may cause damage to the coupling.

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

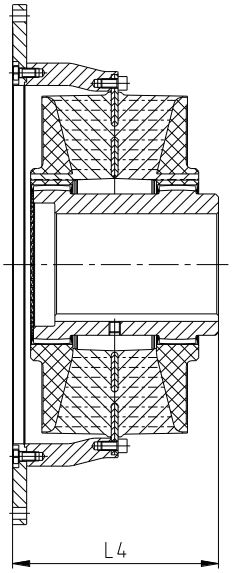


Illustration 19: Assembly of coupling

4.6 Displacements - alignment of the couplings

The **BoWex-ELASTIC®** flange couplings compensate for position deviations of the machine components to be connected up to the data specified in table 9.
With alignment, the radial and angular displacement should be kept as small as possible, because the service life is increased in this way provided that the operating conditions are maintained besides that.

The **BoWex-ELASTIC®** flange coupling has to be aligned from the coupling hub on the shaft side to one of the machined surfaces of the flywheel or machine.

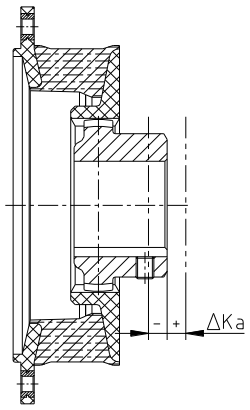
In order to ensure a long service life of the coupling and avoid dangers with the use in potentially explosive atmospheres, the shaft ends must be accurately aligned.
Please absolutely observe the displacement figures specified (see table 9).
If the figures are exceeded, the coupling will be damaged.
The more accurate the alignment of the coupling, the longer is its service life.

Please note:

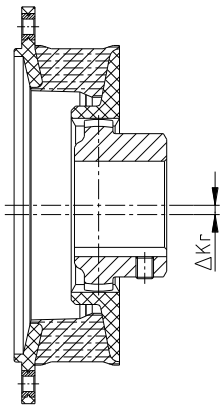
- The displacement figures specified in table 9 are maximum figures which must not arise in parallel. If radial and angular displacements arise simultaneously, the permissible displacement figures may only be used proportionally (see illustration 21).
- The displacement figures specified are general standard figures that apply up to an ambient temperature of 80 °C, ensuring a sufficient service life of the **BoWex-ELASTIC®** 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 gauge whether the permissible displacement figures specified in table 9 can be observed.

4 Assembly

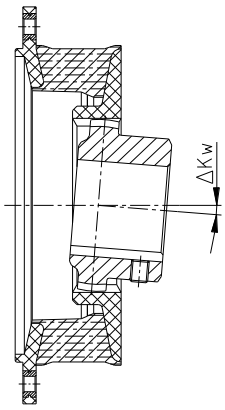
4.6 Displacements - alignment of the couplings



Axial displacement



Radial displacement



Angular displacement

Illustration 20: Displacements

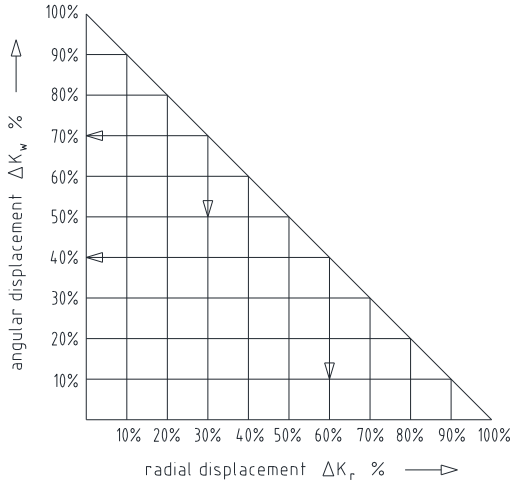
Examples of the displacement combinations specified in illustration 21:

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 21: Combinations of displacement



4 Assembly

4.6 Displacements - alignment of the couplings

Table 9: Displacement figures

Displacement figures	Elastomer hardness [Shore A]	Size				
		42 HE	48 HE	65 HE G 65 HE GG 65 HE	80 HE G 80 HE GG 80 HE	100 HE
Perm. axial displacement ΔK_a [mm]	T40/T50/T65	± 2	± 2	± 2	± 2	± 3
Perm. radial displacement ΔK_r [mm] with n = 1500 rpm	T40	1.1	1.2	1.6	1.8	2.2
	T50	1.0	1.1	1.5	1.7	2.0
	T65	0.5	0.5	0.7	0.8	1.0
Perm. radial displacement ΔK_r [mm] with n = 3000 rpm	T40	0.8	1.1	1.4	1.6	2.0
	T50	0.7	1.0	1.3	1.5	1.8
	T65	0.4	0.4	0.5	0.6	0.8
Max. radial displacement ΔK_r [mm] [1]	T40	3.6	3.8	5.1	5.7	6.5
	T50	3.3	3.5	4.7	5.3	6.0
	T65	1.5	1.7	2.2	2.4	3.0
Perm. angular displacement ΔK_w [degree] with n = 1500 rpm	T40	1.00	1.00	1.00	1.00	1.00
	T50	0.75	0.75	0.75	0.75	0.75
	T65	0.50	0.50	0.5	0.50	0.50
Perm. angular displacement ΔK_w [degree] with n = 3000 rpm	T40	0.50	0.50	0.50	0.50	0.50
	T50	0.40	0.40	0.40	0.40	0.40
	T65	0.25	0.25	0.25	0.25	0.25
Max. angular displacement ΔK_w [degree] [1]	T40/T50/T65	1.5	1.5	1.5	1.5	1.5

Displacement figures	Elastomer hardness [Shore A]	Size				
		125 HE G 125 HE	150 HE G 150 HE	200 HE G 200 HE	240 HE	275 HE
Perm. axial displacement ΔK_a [mm]	T40/T50/T70	± 3	± 4	± 4	± 4	± 4
Perm. radial displacement ΔK_r [mm] with n = 1500 rpm	T40	2.5	2.8	3.0	3.2	3.4
	T50	2.3	2.5	2.7	2.9	3.1
	T70	1.1	1.3	1.5	1.6	1.8
Perm. radial displacement ΔK_r [mm] with n = 3000 rpm	T40	2.2	2.5	2.8	-	-
	T50	2.0	2.2	2.5	-	-
	T70	0.8	1.0	1.2	-	-
Max. radial displacement ΔK_r [mm] [1]	T40	7.5	8.0	8.5	9.0	9.5
	T50	6.9	7.5	8.0	8.5	9.0
	T70	3.3	4.0	4.5	5.0	5.5
Perm. angular displacement ΔK_w [degree] with n = 1500 rpm	T40	1.00	1.00	1.00	1.0	1.0
	T50	0.75	0.75	0.75	0.75	0.75
	T70	0.50	0.50	0.50	0.5	0.5
Perm. angular displacement ΔK_w [degree] with n = 3000 rpm	T40	0.50	0.50	0.50	-	-
	T50	0.40	0.40	0.40	-	-
	T70	0.25	0.25	0.25	-	-
Max. angular displacement ΔK_w [degree] [1]	T40/T50/T70	1.5	1.5	1.5	1.5	1.5

1) for short-term start-up operation

5 Start-up

Before start-up of the coupling, inspect the tightening of the setscrews in the hubs, the alignment and the distance dimension L4 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. conglutinating 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. We recommend a minimum distance of 15 mm from the outside diameter DA of the coupling.

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.

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*).

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 conductibility and coating thickness must be considered. Coatings up to a maximum of 2.0 mm are permissible for gases and vapours of category IIA and IIB in potentially explosive atmospheres.
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 elastomer part and nylon components is not admitted to ensure an equipotential bonding.
In addition, make sure that the marking of the coupling remains clearly legible.

6 Breakdowns, causes and elimination

The below-mentioned failures can result in a use of the **BoWex-ELASTIC®** coupling other than intended. 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.

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 elastomer parts or those 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 elastomer part	Danger of ignition 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	Danger of ignition due to hot surfaces	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 elastomer part/spline	Fracture of elastomer part/spline caused by high dynamic energy/overload	none	1) Set the unit out of operation 2) Disassemble the coupling and remove remainders of the elastomer part 3) Inspect coupling components and replace coupling components that are damaged 4) Insert elastomer part, assemble coupling components 5) Find out the reason for overload
	Operating parameters do not meet with the performance of the coupling	none	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	none	1) Set the unit out of operation 2) Disassemble the coupling and remove remainders of the elastomer part 3) Inspect coupling components and replace coupling components that are damaged 4) Insert elastomer part, assemble coupling components 5) Instruct and train the service staff

6 Breakdowns, causes and elimination

Breakdowns	Causes	Hazard notes for potentially explosive atmospheres	Elimination
Excessive wear on the spline of the elastomer part, fracture of elastomer	Vibrations of drive	Danger of ignition due to hot surfaces	1) Set the unit out of operation 2) Disassemble the coupling and remove remainders of the elastomer part 3) Inspect coupling components and replace coupling components that are damaged 4) Insert elastomer part, assemble coupling components 5) Inspect alignment, adjust if necessary 6) Find out the reason for vibrations
	Ambient/contact temperatures which are too high for the elastomer part, max. permissible -30 °C/+80 °C	Danger of ignition due to hot surfaces	1) Set the unit out of operation 2) Disassemble the coupling and remove remainders of the elastomer part 3) Inspect coupling components and replace coupling components that are damaged 4) Insert elastomer part, assemble coupling components 5) Inspect alignment, adjust if necessary 6) Inspect and adjust ambient/contact temperature
	E. g. contact with aggressive liquids/oils, influence by ozone, too high ambient temperature etc. causing a physical change of the elastomer part	none	1) Set the unit out of operation 2) Disassemble the coupling and remove remainders of the elastomer part 3) Inspect coupling components and replace coupling components that are damaged 4) Insert elastomer part, assemble coupling components 5) Inspect alignment, adjust if necessary 6) Make sure that other physical modifications of the elastomer part are excluded

When operating with a worn elastomer part (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.

8 Maintenance and service

BoWex-ELASTIC® 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 elastomer parts 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.

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10 Enclosure A

Advice and instructions regarding the use in potentially explosive atmospheres

Types available:

HE1, HE2, HE3 and HE4 up to size G200 each

10.1 Proper use in potentially explosive atmospheres

Conditions of operation in potentially explosive atmospheres

The **BoWex-ELASTIC®** 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.

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 IIB (*gases, fogs, vapours*) *(explosion group IIA is included in IIB)* and explosion group IIIC (*dusts*) *(explosion groups IIIA and IIIB are included in IIIC)*

Temperature class:

Temperature class	Ambient or operating temperature T_a 1)	Max. surface temperature 2)
T4	-30 °C to +80 °C	+115 °C
T5	-30 °C to +60 °C	+95 °C
T6	-30 °C to +45 °C	+80 °C

Explanation:
The maximum surface temperatures each result from the maximum permissible ambient or operating temperature T_a plus the maximum temperature increase ΔT of 35 K to be considered. For the temperature class a safety margin subject to standard of 5 K is added.

1) The ambient or operating temperature T_a is limited to +80 °C due to the permissible permanent operating temperature of the BoWex-ELASTIC® elastomer parts used.
2) The maximum surface temperature of +115 °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.

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
2G 2D Gases and vapours of explosion group IIA and IIB	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 torsional backlash and a visual inspection of the elastomer part. This should be performed after 1,000 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 elastomer part upon this initial inspection, further inspections can each be performed after 2,000 operating hours or at the latest after 18 months, provided that the operating parameters remain the same. If you note significant wear with the initial inspection so that it would be advisable to replace the elastomer part, 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-ELASTIC®

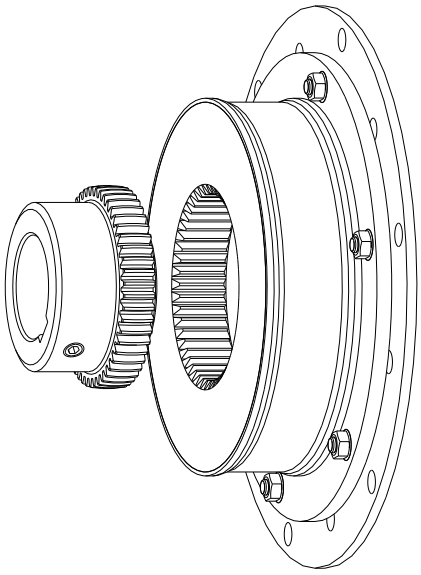

Illustration 22: BoWex-ELASTIC® type HE

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 elastomer part must be replaced.
When reaching the torsional backlash $\Delta S_{max.}$, the elastomer part must be replaced immediately, irrespective of the inspection intervals.

Visual inspection of the elastomer part (cracks, holes or anything similar).

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.

- Rotate the hub opposite the direction of drive.

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

- Mark elastomer part and hub (see Illustration 23).
- Rotate the hub in the driving direction and measure the torsional backlash $\Delta S_{max.}$
- When reaching the torsional backlash ΔS_{max} the elastomer part must be replaced.

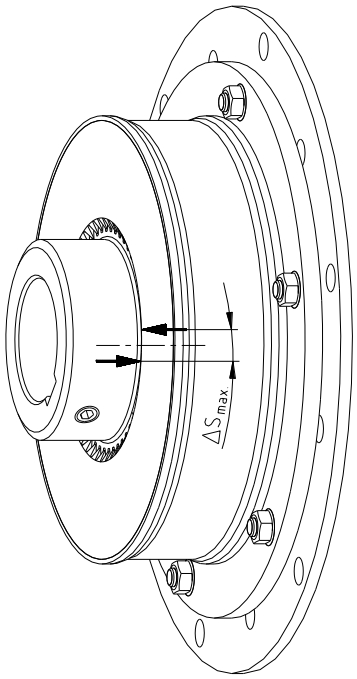

Illustration 23: Marking of the elastomer part and the hub

10 Enclosure A

Advice and instructions regarding the use in potentially explosive atmospheres

10.4 Standard values of wear

If the torsional backlash is ≥ $\Delta S_{max.}$ [mm] / friction ≥ $X_{max.}$ [mm], the elastomer part 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 dangers with the use in potentially explosive atmospheres, the shaft ends must be accurately aligned.
Please absolutely observe the displacement figures specified (see table 9). If the figures are exceeded, the coupling will be damaged.

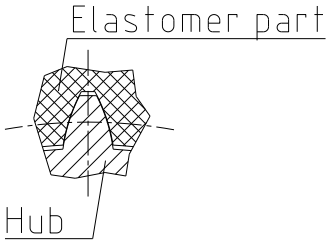

Illustration 24: Elastomer part in new condition

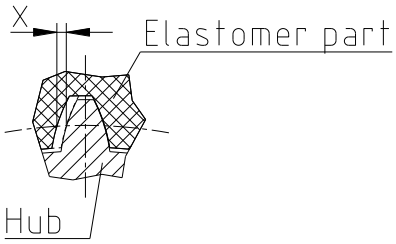

Illustration 25: Wear of elastomer part

Table 10:

Size	Limits of wear		Size	Limits of wear	
	Friction $X_{max.}$ [mm]	Torsional backlash $\Delta S_{max.}$ [mm]		Friction $X_{max.}$ [mm]	Torsional backlash $\Delta S_{max.}$ [mm]
42 HE	1.0	1.7	100 HE	1.8	3.1
48 HE	1.0	1.8	125 HE	2.0	3.5
65 HE	1.4	2.5	G 125 HE	2.0	3.5
G 65 HE	1.4	2.5	150 HE	2.5	4.0
GG 65 HE	1.4	2.5	G 150 HE	2.5	4.0
80 HE	1.6	2.7	200 HE	2.5	4.0
G 80 HE	1.6	2.7	G 200 HE	2.5	4.0
GG 80 HE	1.6	2.7			

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-ELASTIC® coupling is applied on the polyamide flange of the elastomer part.

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

Marking is as follows:

	II 2G	Ex h	IIB	T6	… T4	Gb	X
	II 2D	Ex h	IIIC	T80 °C	… T115 °C	Db	X
<Year>		-30 °C ≤ T_a ≤	+45 °C	…	+80 °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-ELASTIC®
<Year>

Deviating marking applied until 31st October 2019:

Short marking: II 2GD c IIB T X

Complete marking:
II 2G c IIB T6, T5 resp. T4
-30 °C ≤ T_a ≤ +50°C, +65 °C resp. +80 °C
II 2D c T 115 °C -30 °C ≤ T_a ≤ +80 °C

Comments on marking

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
D	Dust
G	Gases and vapours
Ex h	Nonelectrical explosion protection
IIB	Gases and vapours of class IIB (including IIA)
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 … T115 °C	Maximum surface temperature to be considered, depending on the ambient temperature
-30 °C ≤ T_a ≤ +45 °C … +80 °C or -30 °C ≤ T_a ≤ +80 °C	Permissible ambient temperature from -30 °C to +45 °C resp. -30 °C to +80 °C
Gb, Db	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-ELASTIC® highly flexible flange 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-ELASTIC® 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, 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-ELASTIC® highly flexible flange 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-ELASTIC® is in accordance 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