R+W Antriebselemente GmbH
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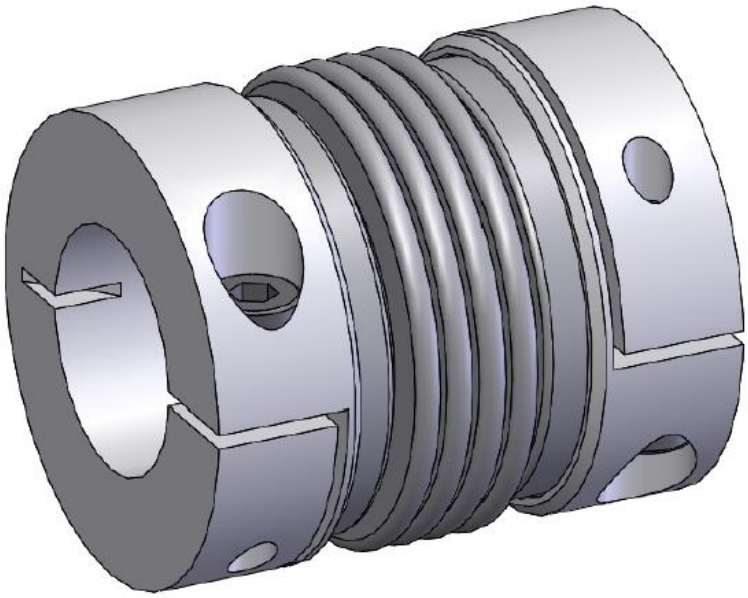
63939 Wörth am Main

R+W BKL Metal bellows coupling

Type BKL/xxx/xx/xx for use in hazardous areas

Original operating instructions in German
BKL 2-500 englisch



The operating instructions are an essential part of the BKL metal bellows coupling. It provides information for proper assembly, operation, and maintenance. Please read them carefully and observe all the notes. Failure to do so may lead to malfunctions or failure of the BKL metal bellows coupling. The installation of the coupling may only be carried out by trained personnel.

BKL metal bellows coupling may only be used according to the technical data specified here.

1. SAFETY AND GENERAL INFORMATION, USE

This manual enables the appropriate specialist personnel to handle the BKL metal bellows coupling throughout their life phases. Residual risks for persons and materials are present for certain activities. These activities are marked with warnings.

Symbol guide and warnings
The following sections represent all the symbols and abbreviations used.

Symbol guide

Learn in this section which icons are used in this guide.

Symbol	Importance
	Warning signs are triangular with a yellow base color, black border, and symbol
	Highlight sections of this operating and repair manual for explosion-proof pump designs by EX symbol and grey deposit
	Bid characters are round with a blue base color and a white icon
	Environmental requirements are highlighted with a crossed-out garbage can. Environmental requirements are indications of state requirements for the disposal of substances.

Warnings

Structure of the warnings

 Severity of danger by signal word
Kind and source of danger ***C***onsequences ***E***scape from danger

Signal words

Signal words in the head of the warning indicate the severity of the hazard if the escape measure is not followed.

Signal word and color	Severity
 **DANGER**	Designates a hazard with a high degree of risk resulting in death or serious injury.
 **WARNING**	Designates a risk with a medium degree of risk that could result in death or severe displacement.
 **CAUTION**	Designates a hazard that could result in minor or moderate injury.
ATTENTION	Warns of possible damage to property or the environment that may interfere with the operation.

Warning signs

These warning signs are used in the warning section.

Symbol	Importance
	General warning
	Warning of explosive atmosphere
	Warning of floating loads
	Warning of hand injuries due to rotating parts with risk of retraction
	Warning of hot surface
	Warning of electrical voltage

Bid signs

These bid signs indicate the personal protective equipment to be worn. Observe local regulations.

Symbol	Importance
	Use hand protection
	Use foot protection

WARNING
Defective personal protective equipment does not adequately protect against the respective hazards and could result in death or serious injury. In the event of defects, replace protective equipment.

Target groups

The manual distinguishes three groups of professionals:

- Planners / Project planners
- Craftsmen / Operators
- Service / Repair

The groups have experience in:

- certificates, regulations; Accident prevention regulations and standards
- Techniques for the selection and construction of mechanical equipment
- Work license system

	For explosion-proof versions additionally: • Design, selection and construction of plants in potentially explosive atmospheres DIN EN 60079-14 • Principals of explosive protection • Ignition protection, device labeling • Tests according to DIN EN 60079-17

Depth of experience:

- Planners / Project planners:
  Detailed knowledge of the items listed in experience to plan, set, and monitor the activities.
- Craftsmen / Operators:
  Understanding the points listed in Experience to carry out the activities.
- Service / Repair
  Understanding the points listed in Experience to carry out the activities.
  Practical experience in carrying out repairs.

Safety-conscious working
All persons carrying out work relating to installation, commissioning, operation, and maintenance must read this manual in full and carefully and observe all the safety rules and warnings described.

- Planners / Project planners:
  - Planning the use
- Craftsmen / Operators:
  - Implementation of planned activities
  - Operation of the metal bellows coupling

Keep this manual in the appropriate place. Hand over this manual with the metal bellows coupling when changing the operator.

Intended use in compliance with Directive 2014/34/EU (ATEX)
BKL metal bellows couplings are suitable for use in potentially explosive atmospheres:

Category	Explosion subgroup	EPL	Temperature
II 2G	IIB	Gb	T4
II 2D	IIIC	Db	T135°C

The intended use of the BKL metal bellows coupling is:
Torque transmission between two shafts with offset. The coupling equals axial, lateral and angular offset up to the values specified in the technical data.

Use in zones 1, 2, 21, 22 of subgroups IIB and IIIC.
The evaluation and labelling are carried out in accordance with DIN EN ISO 80079-36 and 37.
Type of ignition protection “c” constructive safety with marking Ex h.
The operating parameters specified in this operating manual must be adhered to and the prescribed conditions for installation, assembly, initial commissioning, operation, maintenance, and disassembly must be considered.

According to Directive 2014/34/EU (ATEX), the BKL metal bellows coupling is treated as a device that transmits energy and has its own sources of ignition. Accordingly, they must be marked with CE and received an EU-declaration of conformity as advice.
The electrical conductivity of the metal bellows prevents the electrostatic charge of the coupling. Spark formation is prevented.

Explanation of the EC Machinery Directive 2006/42/EC
The BKL metal bellows coupling is an elastic shaft coupling due to its metal bellows. As an elastic coupling, it is a component for installation in different machines with different applications.
In accordance with the Machinery Directive 2006/42/EC and the guideline for the application of the Machinery Directive 2006/42/EC of the European Commission For Enterprise and Industry, 2nd edition June 2010, editor Ian Fraser, the BKL metal bellows coupling as a flexible coupling is a component and therefore not a machine or an incomplete machine. As a component within the meaning of the Machinery Directive, the BKL metal bellows coupling is not to be marked with a CE marking, receives neither CE declaration of conformity nor installation and no serial number, and is therefore not covered by the Machinery Directive.

Compliance with Directive 2006/42/EC must be declared for the whole, only after the installation in a machine by the manufacturer of that whole machine. Information on safe installation, safe commissioning and safe operation can be found in this manual. Commissioning is prohibited until the manufacturer meets the requirements of the machine guidelines by or after integration into the final product.

Coupling safety
Appropriate coupling protection shall be provided by the installer to prevent contact of personal body parts or retraction of parts with the rotating BKL metal bellows coupling. The cover housing must be sufficiently firm as itis intended to protect the coupling from falling objects. The aim is to ensure a possible heat dissipation.

WARNING

Rotating drive elements are hazard potentials and can cause serious injury when touching or indenting body parts or clothing. They shall be provided with an appropriate coverage which shall be at least in the IP2X class or comparable to national standards. It is the responsibility of the user to use appropriate coverage. The cover shall have a radial distance to the main/outer diameter of the coupling of at least 20 mm and ensure adequate ventilation.

The coupling protection must be carried out in accordance with the material requirements of DIN EN ISO 600790 and must be included in the potential compensation of the overall system.

DANGER

Components not included in the potential compensation can charge themselves electrostatically and cause an explosion when discharged. Before commissioning, the devices to be connected, the shafts of which are connected by the coupling, and the coupling protection must be included in the potential compensation in such a way that no dangerous charge can build up on the coupling.

Deposits:
The operator must ensure that no dust accumulates in dangerous quantities between the BKL metal bellows coupling and the coupling protection. The coupling must not run in a dust cast.

DANGER

Dust can cause undue heating due to friction on the rotating coupling and thus cause an explosion. The pump must not be operated in a dust atmosphere or dust build-up. Regularly clean depending on the application.

Direct spraying with liquid or partial immersion in liquid is not permitted.

DANGER

When spraying with liquid or in immersive operation with the possibility of partial covering, parts of the coupling can charge themselves electrostatically and cause an explosion when discharged. No spraying or partial immersing in liquid permitted.

Depending on the ambient temperatures, including the wave-end temperatures to be connected, the coupling can warm up to 135°C. A contact of the hot coupling by the operator must be prevented by the coupling protection to be installed by the installer.

WARNING

The torque transmission of the coupling leads to a hot surface, which can cause severe burns when touched. A coupling protection, installed by the installer, limits the possibility of contact.

Openings in the clutch protection should ensure a possible heat dissipation of the clutch to the outside.

DANGER

Missing cooling openings in the clutch protection can lead to unacceptably high ambient temperatures of the coupling and thus to explosion. Ensure adequate ventilation of the coupling.

The metal bellows coupling is suitable for indoor and outdoor installation.
The couplings are delivered unpainted. If the user uses lacquered couplings in potentially explosive areas, the requirements for the conductivity of the coating or the limitation of the layer thickness of the applied coating in potentially explosive areas must be observed.

DANGER

Painted surfaces can be electrostatically charged and become an effective source of ignition, triggering an explosion. The requirements for electrostatics must be observed by the operator. The metal bellows couplings must not be painted inadmissibly.

The metal bellows coupling may only be used if its materials are so resistant to mechanical and/or chemical influences or corrosion that the explosion protection is not lifted.

DANGER

Mechanical or corrosion-related damage can lead to explosion. It must be noted that the materials used fit the conditions at the site of use, so that the explosion protection is not lifted.

Foreseeable misuse:
The metal bellows coupling is **NOT** suitable for the following applications:

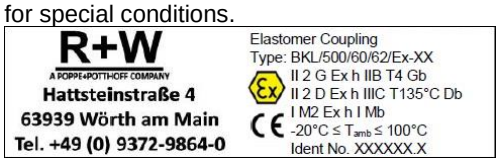
- Use in Gas Zone 0
- Use in Dust Zone 20

DANGER

In the event of incorrect operation or misuse, there are dangers that can lead to personal injury and/or material damage even by explosion. The metal bellows couplings must only be used for their intended use and in safety-related condition.

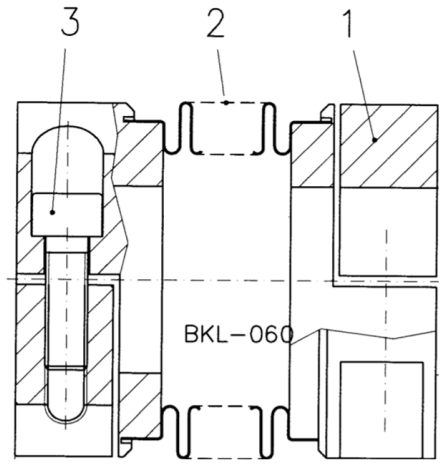
Marking
The BKL/xxx/xx/xx metal bellows couplings for use in potentially explosive areas are marked with an order-specific identification number and the last 2 digits of the production year. As far as Directive 2014/34/EU (ATEX) is concerned, it is a device that-receives a CE marking and an EU declaration of conformity.

Type key
Attached to a hub. If the complete type plate cannot be mounted on the coupling, it is replaced by a shortened version. The "x" stands for special conditions.

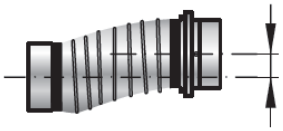


2. PLANNING AND TECHNICAL DATA

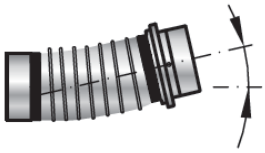
Planning
Structure exemplary



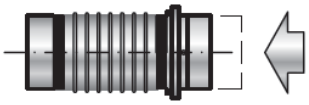
Pos	Lot	Naming	DIN/ISO	Standard short, drawing. Or material
1	2	Clamp hub new		36,0014 L
2	1	Metal bellows BK2		30 0001 15
3	2	Cylindric screw	4762	



lateral offset



angular offset



axial offset

How the R+W BKL metal bellows coupling works. They equal axial, lateral and angular offset of two shafts with the help of a metal bellows.

Explanation of the type key

1	2	3	4	5 - 7	8	9, 10	11	12, 13	14	15, 16	17	18, 19
B	K	L	/	XXX	/	XX	/	XX	/	Ex	-	XX
Metal **bellows coupling**		Model	Separator	Series	Separator	Bore diameter D1	Separator	Bore diameter D2	Separator	ATEX Version	Separator	Last two Figures for the year of production

Spaces are not filled; the type key can be shortened accordingly.

Technical data

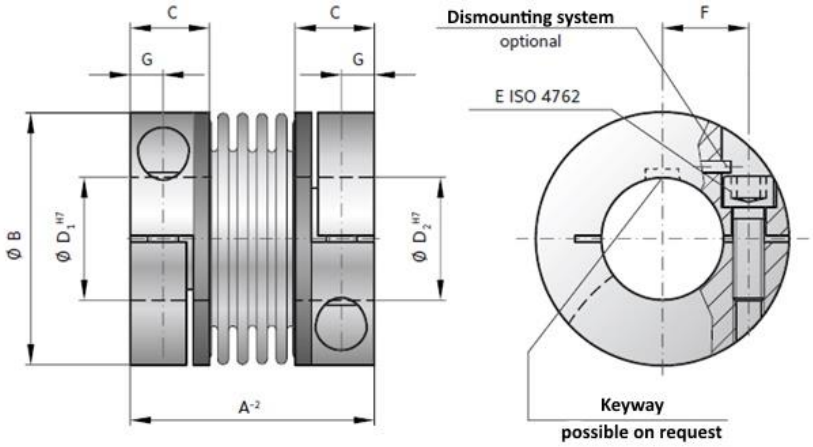


Table 1

BKL Serie		2	4,5	10	15	30
Nominal torque (Nm)	T_{KN}	1,4	3,15	7	10,5	21
Coupling length (mm)	A	30	40	44	58	68
Speed (1/min)	D_z	23000	17900	14300	11700	10200
Outer diameter (mm)	B	25	32	40	49	56
Fitting length (mm)	C	10,5	13	13	21,5	26
Bore diameter Ø - Ø H7 (mm)	D	4-12,7	6,16	6-24	8-28	10-32
Fixing bolts ISO 4762	And	M3	M4	M4	M5	M6
Tightening torque (Nm)		2,3	4	4,5	8	15
Dual spacing (mm)	F	8	11	14	17	20
Spacing (mm)	G	4	5	5	6,5	7,5
Moment of inertia (10^{-3}kgm²)	J_{ges}	0,002	0,007	0,016	0,065	0,12
Hub material		Aluminum	Aluminum	Aluminum	Aluminum	Aluminum
Mass approx. (kg)	G	0,02	0,05	0,06	0,16	0,25
Torsional stiffness(10^3Nm/rad)	C_T	1,5	7	9	23	31
Axial offset +/- (mm)	Max.	0,5	1	1	1	1
Lateral offset (mm)	Max.	0,2	0,2	0,2	0,2	0,2
Angular offset (degree)	Max.	1	1	1	1	1
Axial spring stiffness (N/mm)	C_a	8	35	30	30	50
Lateral spring stiffness (N/mm)	C_r	50	350	320	315	366

Table 1 (continued)

BKL Serie		60	80	150	300	500
Nominal torque (Nm)	T_{KN}	42	56	105	210	350
Coupling length (mm)	A	79	92	92	109	114
Speed (1/min)	D_z	8700	7000	7000	5200	4600
Outer diameter (mm)	B	66	82	82	110	123
Fitting length (mm)	C	28	32,5	32,5	41	42,5
Bore diameter Ø - Ø H7 (mm)	D	14-35	16-42	19-42	24-60	35-62
Fixing bolts ISO 4762	And	M8	M10	M10	M10	M16
Tightening torque (Nm)		40	70	85	120	200
Dual spacing (mm)	F	23	27	27	39	41
Spacing (mm)	G	9,5	11	11	13	17
Moment of inertia (10^{-3}kgm²)	J_{ges}	0,3	0,75	1,8	7,5	11,7
Hub material		Aluminum	Aluminum	Steel	Steel	Steel
Mass approx. (kg)	G	0,4	0,7	1,7	3,8	4,9
Torsional stiffness(10^3Nm/rad)	C_T	72	80	141	157	290
Axial offset +/- (mm)	Max.	1,5	2	2	2	2,5
Lateral offset (mm)	Max.	0,2	0,2	0,2	0,2	0,2
Angular offset (degree)	Max.	1	1	1	1	1
Axial spring stiffness (N/mm)	C_a	67	44	77	112	72
Lateral spring stiffness (N/mm)	C_r	679	590	960	2940	1450

For the design, the torque to be transmitted between the devices is determined with all design guarantees. With this value, the coupling size is selected according to the nominal torque. The R+W coupling manual provides guidance on how to design.

DANGER

An overloaded coupling leads to the formation of sparks with explosion.

- The maximum torque to be transmitted from the coupling must be observed.
- Thermal expansion of the overall system shall not result in exceeding the maximum permissible offset.

Metal bellows couplings compensate for lateral, axial, and angular shaft offsets. In the table, you will find maximum allowable guide values for each type of displacement. They provide safety to compensate for operational influences such as thermal expansion and/or foundation subsidence.
The ambient temperature may be -20°C to +100°C.

DANGER

- A thermally overloaded coupling, also through the shaft ends to be connected, leads to the explosion. The maximum ambient temperature must be maintained.
- A deviation from the technical data, in particular the fit design of the shaft-nabe connection in diameter and length, leads to lose connections with friction on the circumference with heating up to the explosion. The data for interpretation must be complied with.
- An axial collision of the waves to be joined leads to heating up to the explosion. To ensure air between the waves, the nab sing-fit lengths must be observed.

3. ASSEMBLY AND DISASSEMBLY

Storage
BKL couplings are supplied pre-assembled. After the goods receipt check, the coupling must be stored in its original packaging and unpacked for assembly. Make available for installation in potentially explosive atmospheres.

Unpacking

DANGER

Unpacking from the foil packaging causes an electrostatic charge of the film and the coupling. An uncontrolled discharge of the charge generates sparks with possible explosion.
Remove the foil packaging of the coupling outside the potentially explosive area and discharge electrical charge outside the potentially explosive area to the ground.

ATTENTION

Dispose of packaging material according to local regulations.

Transport

CAUTION

When handling suspended loads, there may be bruises. Wear protective gloves and safety shoes according to local requirements.

Assembly and disassembly

WARNING

Rotating drive elements are hazard potentials and can cause serious injury when touching or indenting body parts or clothing.

- They shall be provided with an appropriate coverage which shall be at least in the IP2X class or comparable national standards. It is the responsibility of the user to use appropriate coverage. The cover shall have a radial distance from the main/outer diameter of the coupling of at least 20 mm and shall ensure adequate ventilation.
- Do not reach into the working area of the coupling when it is still spinning.
- Secure the machine against accidental switching on during assembly work.

Preparing assembly
The flanges to be connected must be dirt- and burr-free. Check connection dimensions and check tolerances. The holes of the coupling hubs have an "H7"or "f7" fit. The oiling of the centering facilitates the assembly and disassembly of the coupling hubs. Fit grate is thus reduced.

DANGER

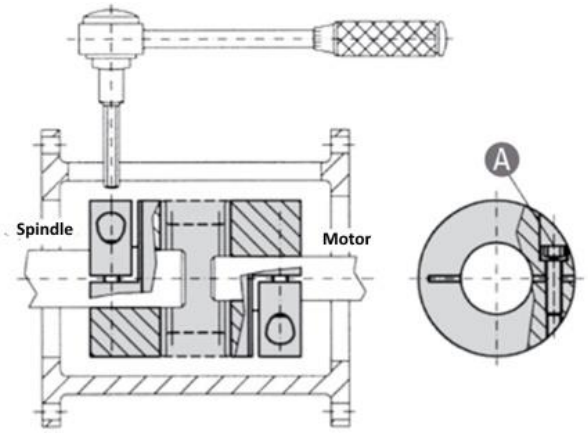
The use of oils and greases with molybdenum disulfide or other high-pressure additives as well as sliding grease pastes during assembly leads to a reduction in the transferable torque of the clamping and to a slip of the rod on the shaft and thus to hot surfaces with the risk of ignition of an explosion. Do not use such aids.

Heating the coupling hubs to approx. +80°C allows easy pulling on the flange centering.

WARNING

Hot surface leads to burns. Move the components with protective gloves. Allow coupling hubs to cool for further assembly.

Montage
Push the complete metal bellows clutch to the motor shaft stump. When the axial position is correct, tighten fastening screws (A) by means of torque wrenches on the tightening torque specified in Table 1. Insert the spindle shaft stump, in the correct axial position and axial force-free metal bellows fastening screws (A) as before and secure with screw protection medium-strength, e.g. Loctite 243.



Alignment
An exact alignment of the gene connected by the BKL couplings increases the service life of the metal bellows. The loads for the adjacent components are reduced and the smoothness of the entire drive train is positively affected.
The technical data provide the maximum permissible guide values for each type of relocation. They provide safety to compensate for operational intakes such as thermal expansions and/or fundament reductions.

DANGER

- Exceeding the permissible offset values leads to undue loads on the coupling up to an explosion. The permissible offset values must be adhered to when aligning. The permissible loads of the components to be connected by the coupling must be complied with.
- Loose components can cause the clutch to malfunction, form hot surfaces or sparks, and ignite an explosion.
  - When used in potentially explosive areas, the screws must be secured medium-tight with screw securing; pay attention to the operating temperature of the screw securing.
  - Never put the coupling into operation with loose robes or visible damage.

Mount the cover.
The coupling space must be shielded from the outdoor area by a flange or cover.
The cover must be electrically conductive. The sealing must be carried out according to ip2X.

Dismantling
Remove cover. Screw out flange fastening screws (2).

4. FIRST COMMISSIONING

First commissioning

1) Before the first commissioning, the tightening torques of the screw connections of the coupling as well as of the devices to be connected must be checked. The orientation and thus the offsets must be checked with suitable measuring equipment.
   A suitable cover for the respective location is properly installed by the installer /operator.
   visual inspection.
2) If possible, start machine gently and slowly. Check the running behavior at start-up, switch off at elevated vibrations or noises and check the overall structure in a secure standstill.

WARNING

Rotating drive elements are hazard potentials and can cause serious injury when touching or indenting body parts or clothing.

- Do not reach into the working area of the coupling when it is still spinning.
- Secure the machine against accidental switching on during assembly work.

5. MAINTENANCE AND REPAIR

1) After 1,000 h in operation or at the latest 3 months check of the tightening moments, the running behavior and visual inspection. Check the orientation and thus the offsets with suitable measuring equipment. Check the bellows for cracks by visual inspection. The orientation of the devices must be checked.
2) In accordance with the test result, specify further test intervals, but repeat at the latest every 4,000 operating hours or 12 months of testing.

DANGER

Damaged metal bellows cause sparks and explosions. The inspection as maintenance in accordance with DIN EN 80079-36 must be carried out as an elementary component of explosion protection.

6. SPARE PARTS AND CUSTOMER SERVICE

DANGER

- Spare parts from third-party suppliers can lead to malfunctions. An explosion can be the result. Use only original R+W spare parts.
- Do not perform any subsequent changes to the couplings
- Use only high-strength screws.

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