



WITTENSTEIN

**Assembly
instructions**

Metal bellows coupling

EC2, BC2, BC3, BC5, BCH; BCT, BCT HIGH-TORQUE



Revision history

Revision	Date	Comment	Chapter
01	20.08.2013	New version	All
02	13.07.2017	Malfunctions; Standard	7, 8.6, 8.7

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1 About this manual

The original instructions were prepared in German; all other language versions are translations of these instructions.

If this manual is supplied with an amendment (e.g. for special applications), then the information in the amendment is valid. Contradictory specifications in this manual thereby become obsolete. This manual should be stored where it can be easily accessed near the metal bellows coupling.

1.1 Information symbols

The following information symbols are used:

- Indicates an action to be performed
- Ü Indicates the results of an action
- i Provides additional information on handling

2 Safety

This manual, especially the safety instructions and the rules and regulations valid for the operating site, must be observed by all persons working with the metal bellows coupling.

2.1 EC Machinery Directive

The metal bellows coupling is considered a “machine component” and is therefore not subject to the EC Machinery Directive 2006/42/EC.

Operation is prohibited within the area of validity of the EC directive until it has been determined that the machine in which this metal bellows coupling is installed corresponds to the regulations within this directive.

2.2 Intended use

The metal bellows coupling is designed for use in applications in machine and plant engineering. The flexible shaft couplings enable backlash-free and torsion-resistant transmission of torque. The metal ball bellows compensates for the misalignment of the shaft with minimal restoring forces. Please refer to our catalog for the maximum values for the various positions during operation.

The metal bellows coupling may not be operated in areas with explosion hazards.

2.3 Reasonably predictable misuse

Any usage that exceeds the maximum permitted speeds, torques, misalignment values, or ambient conditions is considered misuse and is therefore prohibited.


- i The maximum permissible values can be found in our general catalog (www.wittenstein-alpha.de).

2.4 Guarantee and liability

Any of the following will void guarantee and liability claims for personal injury or material damage:

- Ignoring the information on transport and storage
- Improper use (misuse)
- Improper assembly/disassembly or improper operation (e.g. test run without secure attachment)
- Operation of a heavily soiled metal bellows coupling
- Modifications or reconstructions that have been executed without written approval of **WITTENSTEIN alpha GmbH**.

2.5 General safety instructions

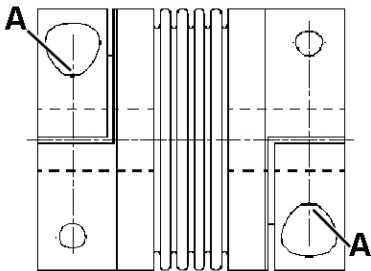
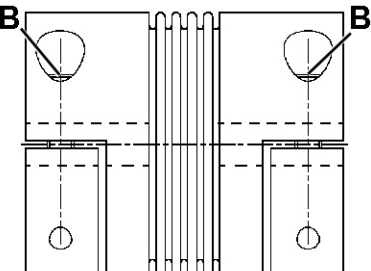
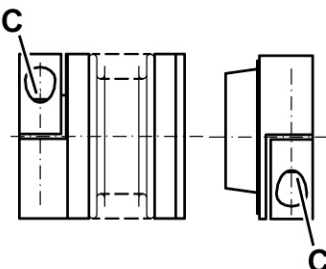
	⚠ WARNING
<p>Rotating couplings can pull in parts of the body and cause serious injuries and even death.</p> <ul style="list-style-type: none"> • Keep a sufficient distance from rotating machine parts when the machine is running. • Secure the machine against restarting and unintentional movements during assembly and maintenance work (e.g. uncontrolled lowering of lifting axes). 	

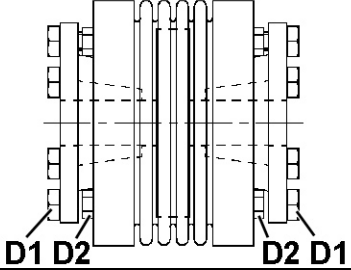
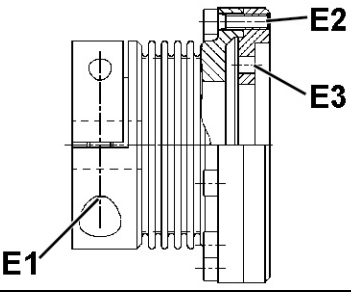
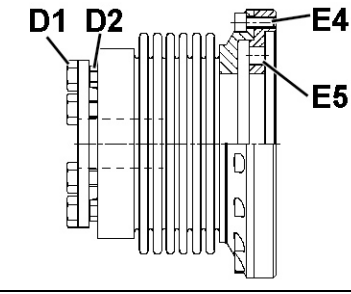
3 Description of the metal bellows coupling

The transmission of torque takes place free of backlash and with torsional rigidity via the attached metal bellows (thin walls, stainless steel), attached by various hubs. The input and output side of the coupling differ in their geometry (flange or shaft) as well as the mounting shape (design of the clamping hub). The metal bellows as intermediate element compensates for axial, angular, as well as lateral shaft misalignments.

For the use of the metal bellows coupling, both external conditions (e.g. dust, high humidity, temperature, etc.) as well as the technical design (torque to be transmitted, maximum speeds, shaft diameter, etc.) should be inspected for compliance with the maximum permissible values listed in our general catalog (www.wittenstein-alpha.de).

3.1 Overview of the models and components

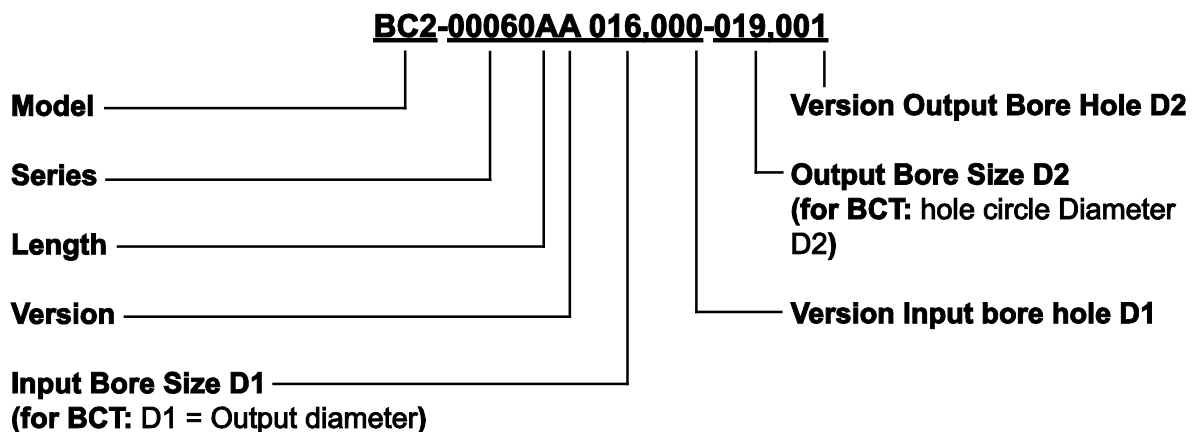
Model	Components
EC2, BC2 	- Metal bellows coupling with standard clamping hub
	A 2–4x clamping bolts ISO 4762
BCH 	- Metal bellows coupling with split clamping hub
	B 4x clamping bolts ISO 4762
BC5 	- Plug-in metal bellows coupling with standard clamping hub
	C 2–4x clamping bolts ISO 4762
The number of bolts depends on the product size / series	

Model	Components
BC3 	- Metal bellows coupling with conical clamping hub
	D1 12–16x clamping bolts ISO 4017
	D2 6–12x forcing screws ISO 4017
BCT 	- Metal bellows coupling with standard clamping hub
	- Intermediate flange
	E1 1–2x clamping bolts ISO 4762
	E2 10–16x fastening screws ISO 4762
BCT HIGH-TORQUE 	- Metal bellows coupling with conical clamping hub
	- Intermediate flange
	D1 6x clamping bolts ISO 4017
	D2 3x forcing screws ISO 4017
	E4 16–20x fastening screws ISO 4762
E5 12x fastening screws ISO 4017	

The number of bolts depends on the product size / series

Table 3.1: Overview of the models and components

3.2 Ordering code



- i For further information, please refer to the general catalog (www.wittenstein-alpha.de)
- i In case of questions, please contact our Customer Service department (technical customer service) and provide the article code located on the coupling.

4 Transport and storage

4.1 Packaging

The metal bellows coupling is delivered packed in foil and cardboard boxes.


- After the incoming goods inspection, store the metal bellows coupling in the original packaging until assembly.
- Dispose of the packaging materials at the recycling sites intended for this purpose. Observe the locally valid regulations for disposals.

4.2 Transport

No special direction or position is prescribed to transport the metal bellows coupling.

- Note the weight of the metal bellows coupling. If necessary, use hoisting equipment for transport.
- i For information on the weight, please refer to the general catalog (www.wittenstein-alpha.de)

4.2.1 Transport using hoisting equipment

	<h3>⚠ WARNING</h3>
<p>Suspended loads can fall and can cause serious injuries and even death.</p> <ul style="list-style-type: none"> • Do not stand under suspended loads. • Secure the metal bellows coupling before transport with suitable fasteners (e.g. belts). 	

5 Assembly

5.1 Preparations

	<p>Lubricants can reduce the transmission of force in the area of the clamping hubs (slippage).</p> <ul style="list-style-type: none"> • Do not use any oils/greases with molybdenum disulfide or other high-pressure additives or gliding pastes.
--	--



Fig. 5.1

- Clean/De-grease and dry the following components with a clean and lint-free cloth and grease-dissolving, non-aggressive detergent:
 - all shafts,
 - bores and
 - hubs.
- Also check the components for burrs, damage, or impurities.



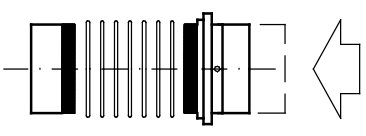
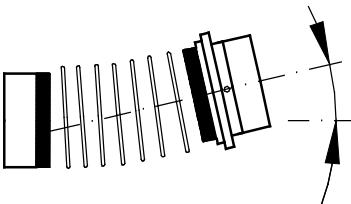
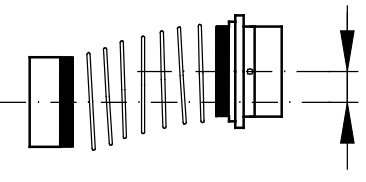
Fig. 5.2

- The metal bellows coupling has an H7 fit. The fit tolerance of the shaft/hub connection must lie between 0.01 and 0.05 mm.
- Check the connection dimensions.
 - Check that the coupling hub runs smoothly on the shaft.

During assembly and disassembly, the metal bellows must not be displaced by more than 1.5 times the permissible misalignment values specified in the catalog.

- Avoid applying any type of force.

5.1.1 Definition of types of misalignment

Axial misalignment (Ka)	Angular misalignment (Kw)	Lateral misalignment (Kr)
		
<p>The axial misalignment is the term for the misalignment in the length of an axis or shaft, i.e., in the axial direction. [specification in mm]</p>	<p>The angular misalignment is the term for the angular misalignment of two shafts in relation to each other. [specification in °]</p>	<p>The lateral misalignment is the term for the misalignment parallel to the shaft axis. [specification in mm]</p>

The lateral misalignment is detrimental to the service life of the metal bellows. An exact alignment of the metal bellows coupling significantly increases the service life of the metal bellows. The loads for the neighboring bearings are reduced and the smooth running of the entire drive train is influenced positively. For drives with very high speeds, we recommend aligning the metal bellows coupling using a dial gauge.

Design with intermediate housing

For installing the metal bellows coupling in a housing (Fig. 5.3):

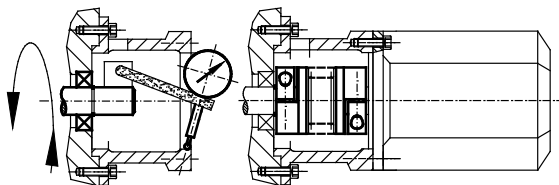


Fig. 5.3

- Arrange the centering of the fit and the plane parallelism of the machine/housing and housing/drive as precisely as possible, in order to minimize misalignments.

Uncovered installation

For uncovered installation of the metal bellows coupling between gearhead/motor with feet as well as installation of the connecting load shaft (Fig. 5.4):

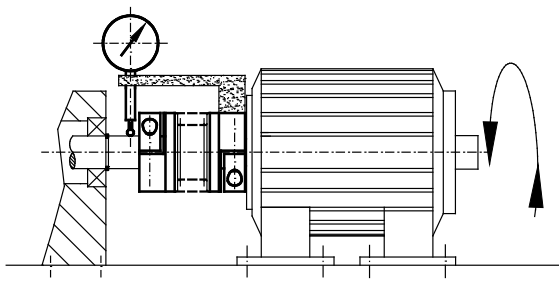


Fig. 5.4

- Carefully and thoroughly perform the alignment using a dial gauge, straight edge, or sensing gauge.

5.2 Assembly with standard/split clamping hub (EC2, BC2, BCH)

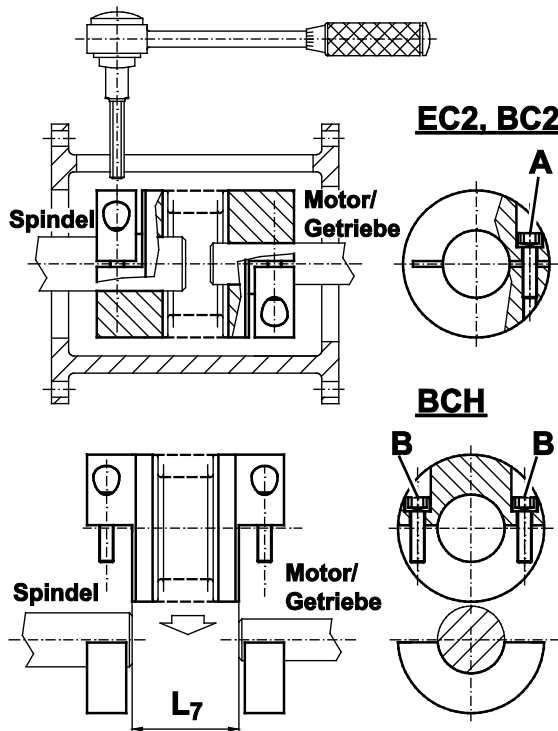


Fig. 5.5

To **disassemble** the metal bellows coupling, it is sufficient to release the clamping bolts (A/B).
 - For the model BCH with split clamping hubs, completely unscrew the clamping bolts (B).

5.3 Assembly with standard clamping hubs, plug-in version (BC5)

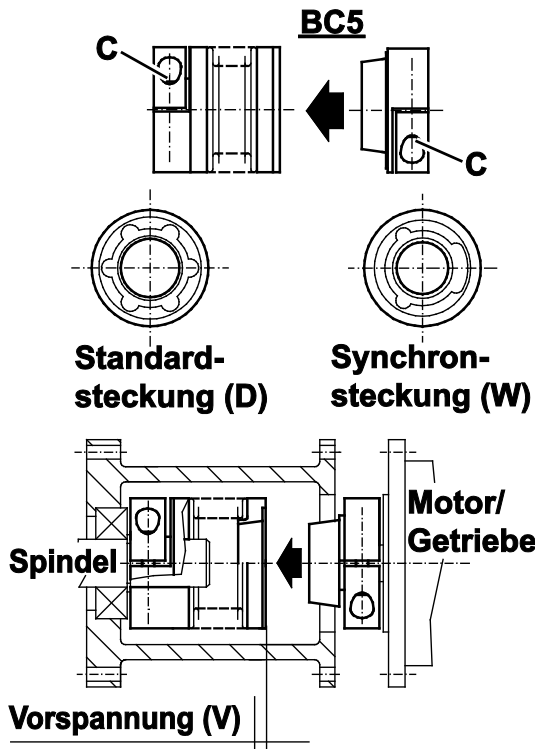


Fig. 5.6

Standard hubs as well as split clamping hubs must lie flush across the entire length of the fit.

- Push the entire metal bellows coupling onto the motor shaft / gearhead stub shaft.
 - **BCH:** In preparation, align the shaft precisely according to the catalog specifications.
- With the correct axial position, tighten the clamping bolts (A/B) using the torque wrench.
 - i For the specified torque for the bolts, see Chapters 7.1, 7.2 and 7.3 .
- Insert the spindle stub shaft / load stub shaft.
 - **BCH:** Maintain a clearance of L_7 between the faces of the stub shafts.
- With the correct axial position and with the metal bellows free of axial force, tighten the clamping bolts (A/B) on the output side.

Before assembly, the installation dimension must be determined, so that after the halves of the coupling have been plugged into each other, the required preload (V) is achieved (Fig. 5.6).

- Plug the metal bellows coupling halves into each other free of play, and without axial force.
- Now measure the plugged in length of the metal bellows coupling and determine the installation dimension, taking into account the preload (V) in accordance with Chapter 7.4.
- Slide the halves of the plug-in metal bellows coupling onto each of the stub shafts.
- With the correct axial position, tighten the clamping bolts (C) of the coupling halves using the torque wrench.
 - i For the specified torque for the bolts, see Chapter 7.4.
- Plug the halves of the coupling into each other:
 - Standard plug connection (D): Several positions possible
 - Synchronous plug connection (W): Only one position possible
- Check whether it is possible to clearly feel the preload (V) of the metal bellows coupling as determined prior to the assembly.

5.4 Assembly with conical clamping hub (BC3)

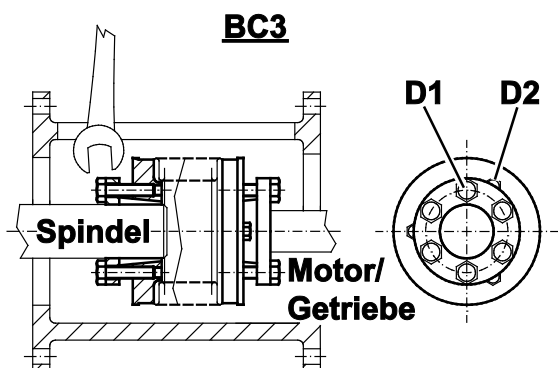


Fig. 5.7

The clamping bolts must be tightened by going around several times, alternating between the bolts, to avoid distortion.

- Push the entire metal bellows coupling onto the motor shaft / gearhead stub shaft.
 - With the correct axial position, start with the tightening of the clamping bolts (D1) as follows:
 - using the torque wrench
 - crosswise
 - going around in two cycles with 1/3 and 2/3 of the specified tightening torque
 - Next, tighten the clamping bolts (D1) as follows:
 - using the torque wrench
 - in order
 - with the total tightening torque
 - i For the specified torque for the bolts, see Chapter 7.5.
- Insert the spindle stub shaft / load stub shaft.
 - With the correct axial position and with the metal bellows free of axial force, tighten the clamping bolts (D1) on the output side, following the procedure described above.
 - Afterwards, avoid any further tightening of the clamping bolts (D1): This could damage the conical clamping hub.

To **disassemble** the metal bellows coupling, alternate between the clamping bolts (D1) to synchronously unscrew them. Afterwards, use the forcing screws (D2) to push off the cone, and then immediately screw these back into place.

5.5 Assembly with flange connection (BCT, BCT HIGH-TORQUE)

BCT and BCT HIGH-TORQUE coupling models are technically and geometrically tailored to our TP+, VDT+, TK+ and TPK+ flange gearheads:

Model	BCT					BCT HIGH-TORQUE					
Gearhead	TP+, VDT+, TK+, and TPK+					TP+ and TPK+					
Gearhead size	004	010	025	050	110	010	025/050	110	300	500	
Coupling series	00015	00060	00150	00300	01500	00150	00300	01500	04000	06000	10000

Table 5.1: Assignment of BCT metal bellows couplings to flange gearheads

BCT

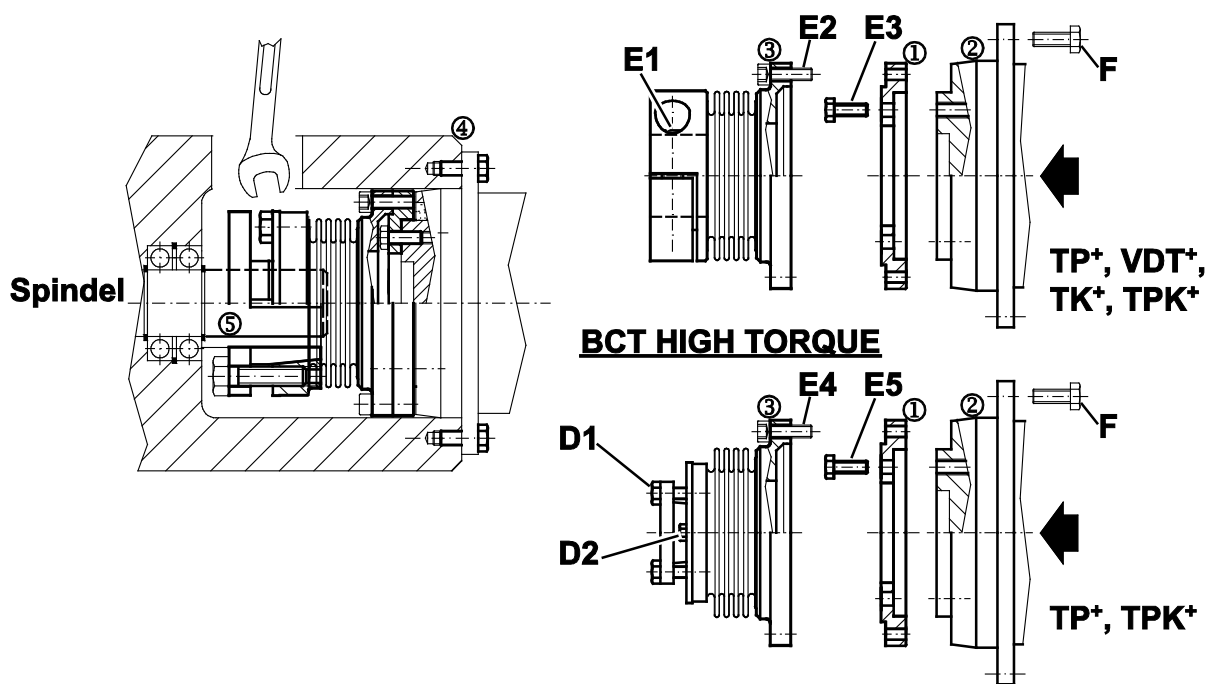


Fig. 5.8

- Slide the intermediate flange (1) onto the gearhead flange (2) and tighten the fastening screws (E3) crosswise.
- Connect the metal bellows coupling (3) with the intermediate flange (1) and tighten the supplied fastening screws (E2) crosswise.
- i For the specified torque for the bolts, see Chapters 7.6 and 7.7.
- Now slide the metal bellows coupling into the flange bell (4) and onto the load shaft / spindle (5).
- In the correct axial position, first tighten the flange screws (F) of the flange bell and gearhead.
- Next tighten the clamping bolts as follows:
 - **BCT:** Tighten the clamping bolts (E1) on the output side using a torque wrench.
 - **BCT HIGH-TORQUE:** Next, tighten the clamping bolts (D1) as follows:
 - using the torque wrench
 - crosswise
 - going around in two cycles with 1/3 and 2/3 of the specified tightening torque
 Next, tighten the clamping bolts (D1) as follows:
 - using the torque wrench
 - in order
 - with the total tightening torque
 Afterwards, avoid any further tightening of the clamping bolts (D1): This could damage the conical clamping hub.
- i For the specified torque for the bolts, see Chapters 7.6 and 7.7.

To disassemble:

- **BCT:** It is sufficient to release the clamping bolts (E1) and the flange screws (F). Afterwards, the entire gearhead-coupling unit can be drawn out axially.
- **BCT HIGH-TORQUE:** The clamping bolts (D1) should be released evenly. Afterwards, use the forcing screws (D2) to push off the cone. Afterwards, unscrew the flange screws (F). Afterwards, the entire gearhead-coupling unit can be drawn out axially. Next, screw the forcing screws (D2) back into place.


6 Maintenance and disposal

The metal bellows couplings from **WITTENSTEIN alpha GmbH** are maintenance-free if used as intended.

- Visually inspect the metal bellows couplings for any damage when performing regular maintenance on your machine.
- If the metal bellows coupling will no longer be placed in service, dispose of according to the locally valid regulations.

7 Malfunctions

	NOTICE
	<p>Changed operational behavior can be an indication of existing damage to the metal bellows coupling or cause damage to the metal bellows coupling.</p> <ul style="list-style-type: none"> • Do not put the metal bellows coupling back into operation until the cause of the malfunction has been rectified.

	<p>Rectifying of malfunctions may only be done by specially trained technicians.</p>
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Fault	Possible cause	Solution
Running noise	Drive system overloaded	Repeat the motor mounting.
Bellows breakage	Lateral misalignment	Please consult our Customer Service Department.
	Angular misalignment	
	Torque overload	

Tabelle 7.1: Malfunctions

8 Attachment

8.1 Tightening torques for screws for BC2 coupling with standard clamping hubs

Standard design							
Bolts		Series	15	30	60	80	150
A	ISO 4762		M5	M6	M8	M10	M10
	T _A		8	15	40	50	70
	Property class		12.9	12.9	12.9	12.9	12.9
A		Series	200	300	500	800	1500
	ISO 4762		M12	M12	M16	2x M16	2x M20
	T _A		120	130	200	250	470
	Property class		12.9	12.9	12.9	12.9	12.9

Table 8.1: Tightening torques for screws for BC2 standard

Corrosion-resistant design (stainless steel hubs, welded)							
Bolts		Series	15	30	60	80	150
A	Stainless steel ISO 4762		M5	M6	M8	M10	M10
	T _A		7	11.8	28.7	50	58
	Property class		10.9	10.9	10.9	10.9	10.9
A		Series	200	300	500	800	1500
	Stainless steel ISO 4762		M12	M12	M16	2x M16	2x M20
	T _A		100	100	200	245	470
	Property class		10.9	10.9	10.9	10.9	10.9

Table 8.2: Tightening torques for screws for BC2 corrosion-resistant

8.2 Tightening torques for EC2 coupling with standard clamping hubs

Bolts		Series	2	4.5	10	15	30
A	ISO 4762		M3	M4	M4	M5	M6
	T _A		2.3	4	4.5	8	15
	Property class		12.9	12.9	12.9	12.9	12.9
A		Series	60	80	150	300	500
	ISO 4762		M8	M10	M10	M12	M16
	T _A		40	70	85	120	200
	Property class		12.9	12.9	12.9	12.9	12.9

Table 8.3: Tightening torques for screws for EC2

8.3 Tightening torques for screws for BCH coupling with split clamping hubs

Bolts		Series	15	30	60	80	150
B	ISO 4762		2x M5	2x M6	2x M8	2x M10	2x M10
	T _A		8	15	40	50	70
	Property class		12.9	12.9	12.9	12.9	12.9
B		Series	200	300	500	800	1500
	ISO 4762		2x M12	2x M12	2x M16	2x M16	2x M20
	T _A		120	130	200	250	470
	Property class		12.9	12.9	12.9	12.9	12.9

Table 8.4: Tightening torques for screws for BCH

8.4 Tightening torques for screws and preload for BC5 coupling in plug-in design with standard clamping hubs

Screws/Preload		Series	15	30	60	80	150
		C	ISO 4762		M5	M6	M8
T _A			8	15	40	50	70
Property class			12.9	12.9	12.9	12.9	12.9
V	Preload [mm]		0.5	0.7	1	1	1
		Series	300	500	800	1500	-
C	ISO 4762		M12	M16	2x M16	2x M20	-
	T _A		130	200	250	470	-
	Property class		12.9	12.9	12.9	12.9	-
V	Preload [mm]		1	1.2	1.7	1	-

Table 8.5: Tightening torque for screws and preload for BC5

8.5 Tightening torques for screws for BC3 coupling with conical clamping hubs

Standard design								
Bolts		Series	15	30	60	150	200	300
		D1	ISO 4017		6x M4	6x M5	6x M5	6x M6
T _A			4	6	8	12	14	18
Property class			10.9	10.9	10.9	10.9	10.9	10.9
D2	ISO 4017		3x M4	3x M4	3x M5	3x M5	3x M6	3x M6
	Property class		10.9	10.9	10.9	10.9	10.9	10.9
D1		Series	500	800	1500	4000	6000	10000
	ISO 4017		6x M8	6x M10	6x M12	6x M16	6x M16	8x M16
	T _A		25	40	70	120	150	160
	Property class		10.9	10.9	10.9	10.9	10.9	10.9
D2	ISO 4017		3x M6	3x M8	6x M8	6x M10	6x M10	8x M10
	Property class		10.9	10.9	10.9	10.9	10.9	10.9

Table 8.6: Tightening torques for screws for BC3 standard

Corrosion-resistant design (stainless steel hubs, welded)								
Series		15	30	60	150	200	300	
Bolts								
D1	Stainless steel ISO 4017	6x M4	6x M5	6x M5	6x M6	6x M6	6x M8	
	T _A	2.6	5.1	5.1	8.8	8.8	21.4	
	Property class	8.8	8.8	8.8	8.8	8.8	8.8	
D2	Stainless steel ISO 4017	3x M4	3x M4	3x M5	3x M5	3x M6	3x M6	
	Property class	8.8	8.8	8.8	8.8	8.8	8.8	
		Series	500	800	1500	4000	6000	10000
D1	Stainless steel ISO 4017	6x M8	6x M10	6x M12	6x M16	6x M16	8x M16	
	T _A	21.4	44	74	183	183	183	
	Property class	8.8	8.8	8.8	8.8	8.8	8.8	
D2	Stainless steel ISO 4017	3x M6	3x M8	6x M8	6x M10	6x M10	8x M10	
	Property class	8.8	8.8	8.8	8.8	8.8	8.8	

Table 8.7: Tightening torques for screws for BC3 corrosion-resistant

8.6 Tightening torques for screws for BCT coupling with standard clamping hub

Standard design						
Series		15	60	150	300	1500
Bolts						
E1	ISO 4762	1x M5	1x M8	1x M10	1x M12	2x M20
	T _A	8	40	75	120	470
	Property class	12.9	12.9	12.9	12.9	12.9
E2	ISO 4762	10x M4 x 12	10x M5 x 16	10x M6 x 20	12x M6 x 20	16x M8 x 20
	T _A	4.6	8	14	14	35
	Property class	12.9	12.9	12.9	12.9	12.9
E3	ISO 4017	8x M5 x 16	8x M6 x 16	12x M6 x 16	12x M8 x 25	12x M10x30
	T _A	8	15	14	40	75
	Property class	10.9	10.9	10.9	10.9	10.9

Table 8.8: Tightening torques for screws for BCT standard

Corrosion-resistant design (stainless steel hubs, welded)						
Series		15	60	150	300	1500
Bolts						
E1	Stainless steel ISO 4762	1x M5	1x M8	1x M10	1x M12	2x M20
	T _A	7	28.7	50	100	470
	Property class	10.9	10.9	10.9	10.9	10.9
E2	Stainless steel ISO 4762	10x M4 x 12	10x M5 x 16	10x M6 x 20	12x M6 x 20	16x M8 x 20
	T _A	4	7	11.8	11.8	28.7
	Property class	10.9	10.9	10.9	10.9	10.9
E3	Stainless steel ISO 4017	8x M5 x 16	8x M6 x 16	12x M6 x 16	12x M8 x 25	12x M10x30
	T _A	5.1	8.8	8.8	21.4	44
	Property class	8.8	8.8	8.8	8.8	8.8

Table 8.9: Tightening torques for screws for BCT corrosion-resistant

8.7 Tightening torques for screws for BCT HIGH TORQUE coupling with conical clamping hub

Series Bolts		150	300		1500	4000	6000	10.000
		D1	ISO 4017	6xM6	6xM8	6xM8	6xM12	6xM16
T _A	12		18	18	70	120	150	160
Property class	10.9		10.9	10.9	10.9	10.9	10.9	10.9
D2	ISO 4017	3xM5	3xM6	3xM6	6xM8	6xM10	6xM10	8xM10
	Property class	10.9	10.9	10.9	10.9	10.9	10.9	10.9
E4	ISO 4762	10xM6x 20	12xM6x 20	12xM6x 20	16xM8x 20	20xM12x 35	20xM12x 35	24xM12x35
	T _A	14	14	14	35	120	120	120
	Property class	12.9	12.9	12.9	12.9	12.9	12.9	12.9
E5	ISO 4017	12xM6x 16	12xM8x 20	12xM10 x25	12xM12 x25	-	-	-
	ISO 4762	-	-	-	-	12xM20x 45	12xM24x 55	12xM24x55
	T _A	15,4	37,3	73,4	126	604	1042	1042
	Property class	10.9	10.9	10.9	10.9	12.9	12.9	12.9

Tabelle 8.10: Schraubenanziehmomente BCT HIGH TORQUE



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