SEW EURODRIVE

Assembly Instructions

Didactics - Gear Unit Technology

K47 AD2 Helical-Bevel Gear Units

Edition 05/2017

23089326/EN

Table of contents

23089326/EN – 05/2017

1 General information

1.1 About this documentation

The current version of the documentation is the original.

This documentation is an integral part of the product. The documentation is written for all employees who assemble, install, start up, and service this product.

Make sure this documentation is accessible and legible. Ensure that persons responsible for the machinery and its operation as well as persons who work on the product independently have read through the documentation carefully and understood it. If you are unclear about any of the information in this documentation or require further information, contact SEW-EURODRIVE.

1.2 Important notes

Inspect the shipment for damage as soon as you receive the delivery. Inform the shipping company immediately about any damage. If the product is damaged, it must not be assembled, installed or started up.

Removing covers without authorization, improper use, or incorrect installation and operation may result in severe injuries to persons or damage to machinery.

1.3 Structure of the safety notes

1.3.1 Meaning of signal words

The following table shows the grading and meaning of the signal words for safety notes.

Signal word	Meaning	Consequences if disregarded
⚠ **DANGER**	Imminent hazard	Severe or fatal injuries
⚠ **WARNING**	Possible dangerous situation	Severe or fatal injuries
⚠ **CAUTION**	Possible dangerous situation	Minor injuries
NOTICE	Possible damage to property	Damage to the product or its environment
INFORMATION	Useful information or tip: Simplifies handling of the product.	

1.3.2 Structure of section-related safety notes

Section-related safety notes do not apply to a specific action but to several actions pertaining to one subject. The hazard symbols used either indicate a general hazard or a specific hazard.

This is the formal structure of a safety note for a specific section:

SIGNAL WORD

Type and source of hazard.

Possible consequence(s) if disregarded.

- Measure(s) to prevent the hazard.

23089326/EN – 05/2017

Meaning of the hazard symbols

The hazard symbols in the safety notes have the following meaning:

Hazard symbol	Meaning
	General hazard
	Warning of dangerous electrical voltage
	Warning of hot surfaces
	Warning of risk of crushing
	Warning of suspended load
	Warning of automatic restart

1.3.3 Structure of embedded safety notes

Embedded safety notes are directly integrated into the instructions just before the description of the dangerous action.

This is the formal structure of an embedded safety note:

⚠ **SIGNAL WORD** Type and source of hazard. Possible consequence(s) if disregarded. Measure(s) to prevent the hazard.

1.4 Designated use

The model is intended for training purposes only. The model serves to explain how gear units are assembled and disassembled and how they operate. Never fill the model with oil and/or operate it on a motor.

1.5 Rights to claim under limited warranty

Read the information in this documentation. This is essential for fault-free operation and fulfillment of any rights to claim under limited warranty. Read the documentation before you start working with the product.

23089326/EN – 05/2017

1.6 Exclusion of liability

Read the information in this documentation, otherwise safe operation is impossible. You must comply with the information contained in this documentation to achieve the specified product characteristics and performance features. SEW-EURODRIVE assumes no liability for injury to persons or damage to equipment or property resulting from non-observance of these operating instructions. In such cases, SEW-EURODRIVE assumes no liability for defects.

1.7 Applicable documentation

Observe the following applicable documents:

- "SPIROPLAN® W Gear Units, R..7, F..7, K..7, K..9, S..7 Series" assembly and operating instructions

Always use the latest edition of documentations and software.

The SEW-EURODRIVE website (www.sew-eurodrive.com) provides a wide selection of documents for download in various languages. If required, you can also order printed and bound copies of the documentation from SEW-EURODRIVE.

You can order the additional material "Didactics – Gear Unit Technology Documentation Package" from your contact person; see chapter "Contact persons" (→ 🗎 27).

1.8 Product names and trademarks

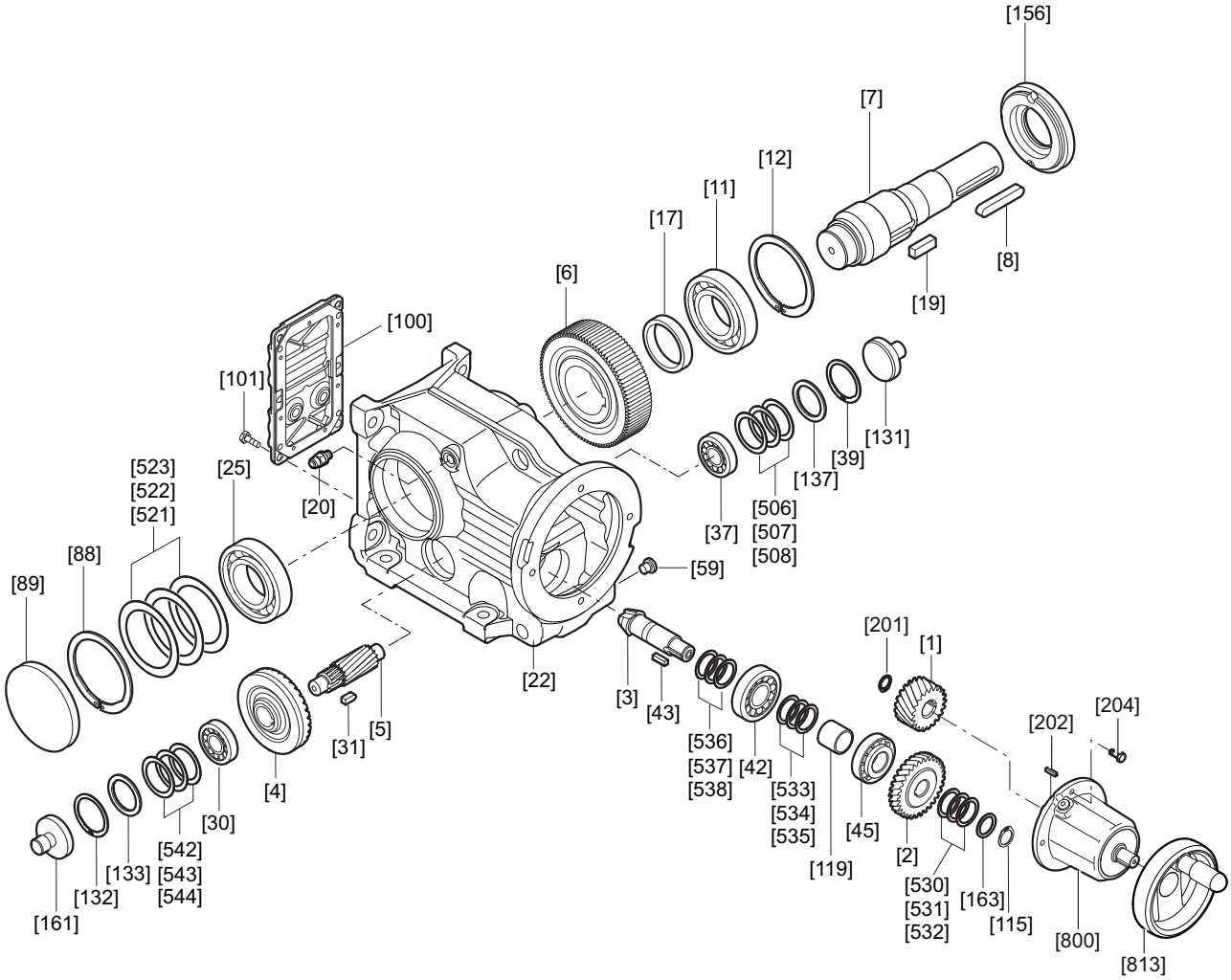
The brands and product names in this documentation are trademarks or registered trademarks of their respective titleholders.

1.9 Copyright notice

23089326/EN – 05/2017

2 Gear unit structure

2.1 Basic structure of helical-bevel gear units



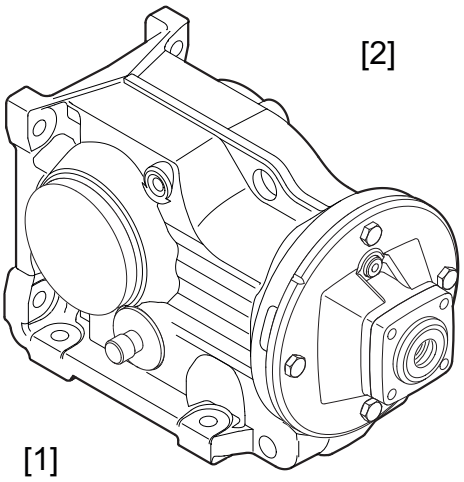
19150916107

[1]	Pinion	[30]	Tapered roller bearing	[132]	Retaining ring	[530]	Shim
[2]	Gear 2	[31]	Key	[133]	Supporting ring	[531]	Shim
[3]	Bevel pinion shaft	[37]	Tapered roller bearing	[137]	Supporting ring	[532]	Shim
[4]	Bevel gear	[39]	Retaining ring	[156]	Plastic ring	[533]	Shim
[5]	Pinion shaft 5	[42]	Tapered roller bearing	[161]	Closing cap	[534]	Shim
[6]	Gear 6	[43]	Key	[163]	Supporting ring	[535]	Shim
[7]	Output shaft	[45]	Tapered roller bearing	[201]	Retaining ring	[536]	Shim
[8]	Key	[59]	Screw plug	[202]	Barrel key	[537]	Shim
[11]	Deep groove ball bearing	[88]	Retaining ring	[204]	Hex head screw	[538]	Shim
[12]	Retaining ring	[89]	Closing cap	[506]	Shim	[542]	Shim
[17]	Spacer tube	[100]	Gear unit cover	[507]	Shim	[543]	Shim
[19]	Key	[101]	Hex head screw	[508]	Shim	[544]	Shim
[20]	Breather valve	[115]	Retaining ring	[521]	Shim	[800]	Input shaft assembly
[22]	Gear unit housing	[119]	Spacer tube	[522]	Shim	[813]	Handwheel
[25]	Deep groove ball bearing	[131]	Closing cap	[523]	Shim		

23089326/EN – 05/2017

2.1.1 A-side and B-side

The following figure shows the output A-side and B-side of the gear unit:

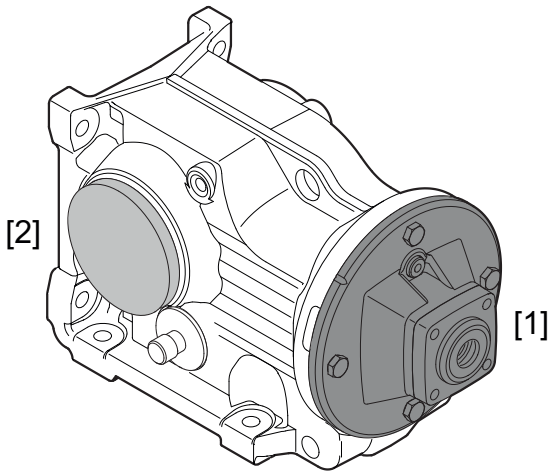


19151124363

[1] A-side
[2] B-side

2.1.2 Input and output end

The following figure shows the input and output end of the gear unit:



19151130379

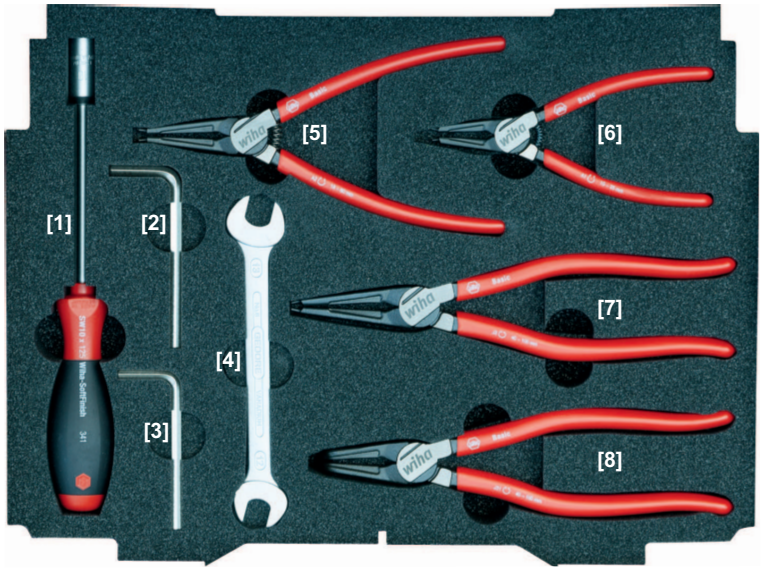
[1] Input end
[2] Output end

23089326/EN – 05/2017

2.2 Training kit

2.2.1 Content of the parts case

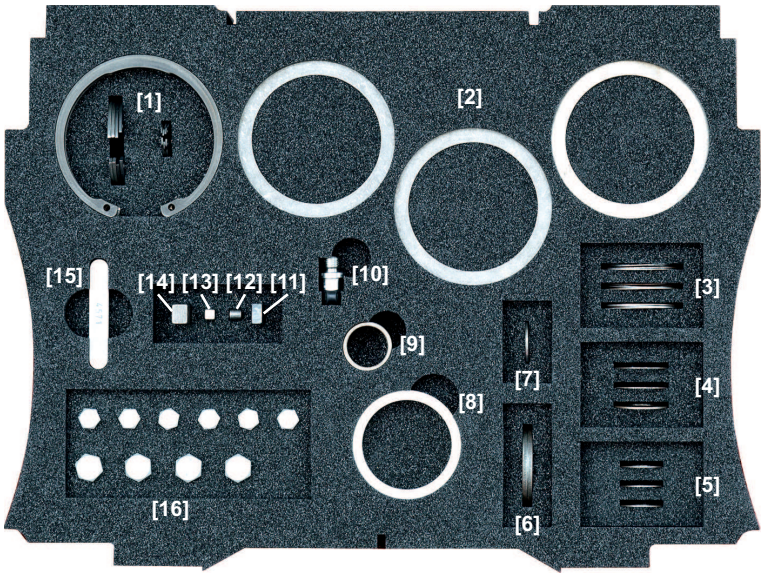
Tools



9007208008190347

[1]	Socket wrench size 10	[5]	Retaining ring pliers (inner)
[2]	Allen key size 6	[6]	Retaining ring pliers (inner)
[3]	Allen key size 5	[7]	Retaining ring pliers (outer)
[4]	Open-end wrench size 12/13	[8]	Angled retaining ring pliers (outer)

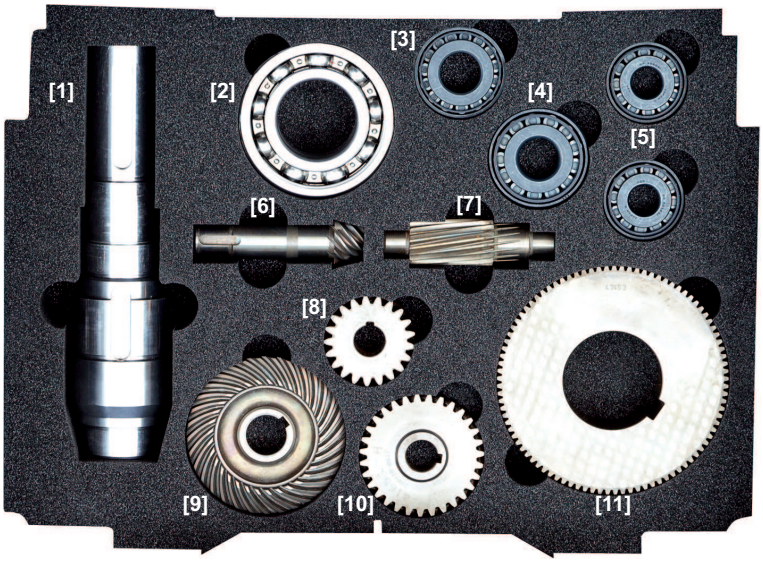
Small gear unit parts



18014407272025227

[1]	Retaining rings	[7]	Supporting ring S16 × 22 × 1.5	[13]	Key AB6 × 6 × 14
[2]	Shims 63 × 80 × (0.1/0.3/0.5) mm	[8]	Spacer tube 45 × 55 × 10 mm	[14]	Key B10 × 8 × 28
[3]	Shims 32 × 42 × (0.1/0.3/0.5) mm	[9]	Spacer tube 20.6 × 25 × 22 mm	[15]	Key A8 × 7 × 50 Niro
[4]	Shims 20 × 28 × (0.1/0.3/0.5) mm	[10]	Breather valve	[16]	Screws
[5]	Shims 16 × 22 × (0.1/0.3/0.5) mm	[11]	Magnet		
[6]	Supporting ring 32 × 42 × 2.5 mm	[12]	Key B5 × 5 × 16		

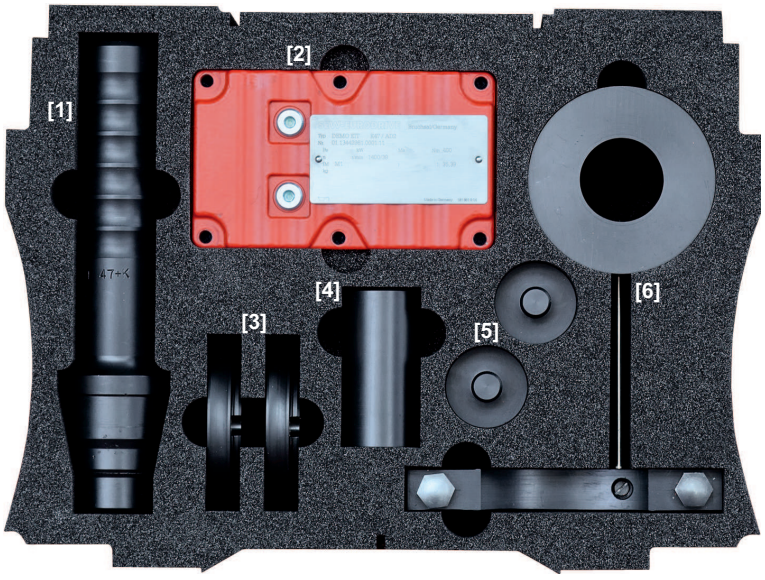
Gearing components, rolling bearings, shaft



9007208017288075

[1]	Output shaft	[7]	Pinion shaft 5
[2]	Deep groove ball bearing (6208)	[8]	Pinion (41610)
[3]	Tapered roller bearing (30204)	[9]	Bevel gear/crown gear
[4]	Tapered roller bearing (30304)	[10]	Gear 2 (41653)
[5]	Tapered roller bearing (30302)	[11]	Gear 6 (42463)
[6]	Bevel pinion shaft		

Mounting accessories

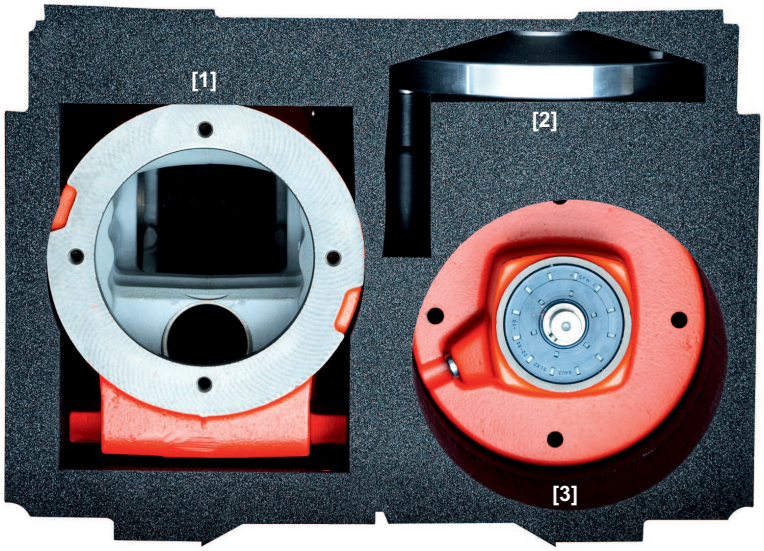


9007208017289995

[1]	Joining tool	[4]	Assembly sleeve
[2]	Inspection cover with gasket	[5]	Closing caps
[3]	Oil seals	[6]	Assembly device

23089326/EN – 05/2017

Housing, adapter, hand crank



9007208009024395

[1] Gear unit housing
[2] Hand crank
[3] Input shaft assembly AD2

23089326/EN – 05/2017

3 Assembly

3.1 Information about the assembly

⚠ WARNING

Gear units have moving gears and parts.

Severe injuries from crushing.

- Do not place your fingers in the gear unit housing while parts are rotating.
- Remove the crank handle before performing any work on the gear unit housing.

⚠ WARNING

Parts in the gear unit case and the case itself are heavy and may fall or topple over.

Severe injuries from crushing.

- Secure the parts by taking appropriate measures.
- Wear sturdy shoes.

⚠ CAUTION

Parts of the gear unit may have sharp edges, especially at keyways and gearings.

Risk of injury from incised wounds.

- Always wear gloves during assembly and disassembly.

⚠ CAUTION

Clamped retaining rings may loosen and spring out from the pliers.

Risk of injury due to flying parts.

- Wear safety goggles during installation and removal of retaining rings.
- Always insert the pliers into the small bore on the retaining ring first. (The bore of the retaining ring is conical)

NOTICE

Parts of the gear unit may be heavy and sharp-edged.

Damage to the assembly pad.

- Use the assembly pad during assembly and disassembly.

23089326/EN – 05/2017

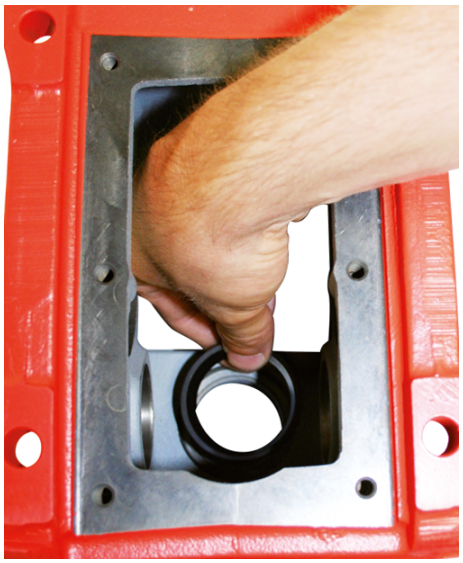
3.2 Gear unit assembly

INFORMATION

Numbers in square brackets designate the components from the exploded-view drawing.

Step	Figure	Procedure
1	 9007208506688651	• Installation of the bevel pinion shaft requires the following: – Bevel pinion shaft [3] – Tapered roller bearing (30304) [42] – Shims 20 × 28 mm [536], [537], [538] – Spacer tube 20.6 × 25 × 22 mm [119] – Key B5 × 5 × 16 [43]
2	 19123462795	• Using shims, equalize how deep the bevel pinion shaft engages into the later bevel gear. To do so, slide approx. 0.5 – 0.8 mm shims onto the bevel pinion shaft. Information: In gear units used industrially, correct equalization minimizes wear of the bevel gear set.
3	 19123471883	• Push the tapered roller bearing (30304) [42] (inner ring with rolling elements) onto the bevel pinion shaft [3].
4	 19124321163	• Push the other shims [533], [534], [535] (approx. 0.2 – 0.3 mm) behind the inner ring of the bearing on the shaft. • With these shims, you adjust the bearing pressure of the two tapered roller bearings.

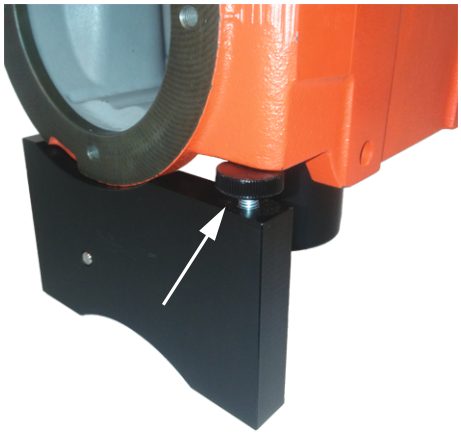
23089326/EN – 05/2017

Step	Figure	Procedure
5	 19124325259	• Push the spacer tube [119] onto the bevel pinion shaft. • Insert the key B5 × 5 × 16 [43] into the groove of the pinion shaft. • The illustration shows the completely assembled bevel pinion shaft.
6	 9007208506694411	• Place the gear unit housing [22] onto the work-bench with the input side down. • Insert the outer ring of the tapered roller bearing (30304) [42] into the bearing bore of the hous-ing.
7	 9007208773102475	• Rotate the gear unit housing so that you arrive at the bearing bore of the input side. • Mount the outer ring of the tapered roller bearing (30204) [45] from the input side into the bearing bore of the housing.

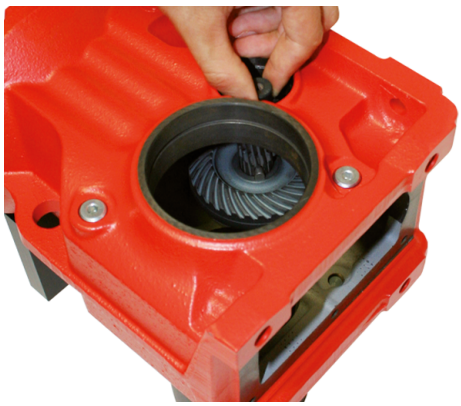
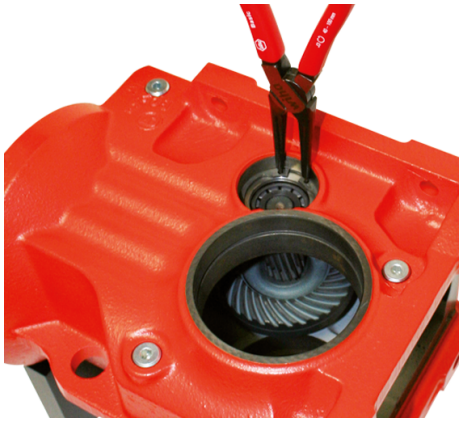
23089326/EN – 05/2017

Step	Figure	Procedure
8	 9007208507707531	• Push the pre-assembled bevel pinion shaft towards the input side through the bearing bores. • At the same time, push the inner bearing ring (30204) [45] and the gear 2 (41653) [2] onto the bevel pinion shaft [3] from the input side. • **Important:** The part number on the front side of the gear must be legible from the input side.
9	 9007208507709451	• Completely equalize the bevel pinion shaft with the shims 16 × 22 mm (approx. 0.5 mm) and the supporting ring S16 × 22 × 1.5 [163]. • To do so, push the shims [530], [531], [532] and the supporting ring [163] onto the bevel pinion shaft. • Install the retaining ring 16 × 1 [115] using the compatible retaining ring pliers. • Check the axial clearance of the shaft. The shaft must be installed tightly and without clearance. **Zero clearance:** Insert shims until the shaft can no longer be moved in axial direction. The shaft should not rotate too easily but with a slight resistance.
10	 9007208507711371	• Install the following parts in the small bearing bore on the B-side of the gear unit housing: – Retaining ring 42 × 1.75 [39] – Supporting ring 32 × 42 × 2.5 mm [137] – Shims 32 × 42 mm [506], [507], [508] (approx. 0.6 – 0.8 mm) • Install the complete tapered roller bearing (30302) [37] with outer ring in the bearing bore.

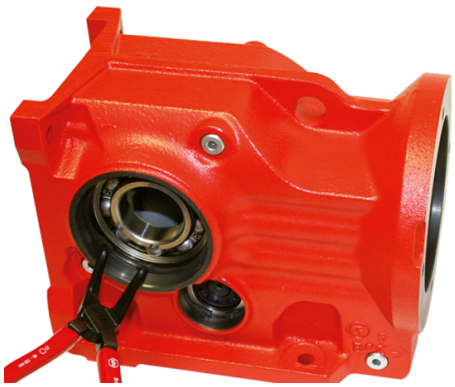
23089326/EN – 05/2017

Step	Figure	Procedure
11	 9252972299	• Put the gear unit housing onto the assembly device with the A-side pointing upwards. – **Information:** The installation aid serves for secure placement of the gear unit on the A- and B-side. Assemble the assembly device in such way that the housing lies horizontally and secured. If you reverse the installation aid, you can adjust the other side.
	 19124757515	• Adjust the height using the small knurled screw on the installation aid. This supports the gear unit securely and horizontally.
12	 9252974219	• Place the bevel gear [4] on the bearing [37] installed in step 10.
13	 9007208507717131	• Insert the key AB6 × 6 × 14 [31] into the groove of the pinion shaft 5 [5].

23089326/EN – 05/2017

Step	Figure	Procedure
14	 9007208507719051	• Insert the pinion shaft 5 [5] with installed key from above through the bevel gear into the bearing.
15	 9007208507720971	• Push the inner ring of the tapered roller bearing (30302) [30] through the gear unit bore onto the pinion shaft 5 [5]. • Insert the outer ring of the tapered roller bearing (30302) [30].
16	 9252981899	• Equalize the tapered roller bearing (30302) [30] with shims 32 × 42 mm [542], [543], [544] (approx. 0.6 – 0.8 mm) and a supporting ring 32 × 42 × 2.5 mm [133] to zero clearance. **Zero clearance:** Insert shims until the shaft can no longer be moved in axial direction. • **Information:** Check that the bevel gear is correctly equalized to the bevel pinion. In gear units used industrially, the tooth flanks must engage in the bevel gear cleanly and completely. This keeps the wear as low as possible and the force can be completely transferred.
17	 9007208507724811	• Install the retaining ring 42 × 1.75 [132] using the compatible retaining ring pliers.

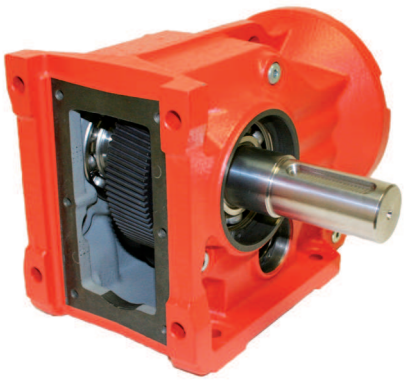
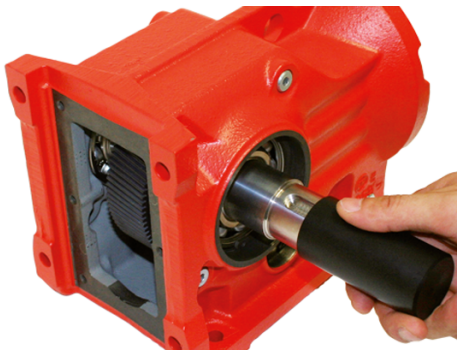
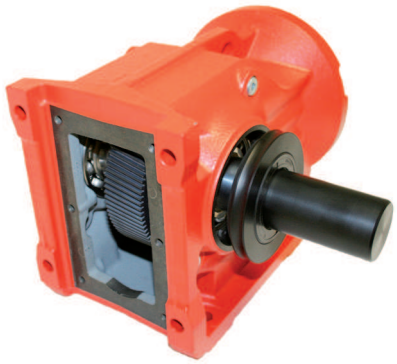
23089326/EN – 05/2017

Step	Figure	Procedure
18	 9007208507726731	• Take the housing off the assembly device. • Insert the deep groove ball bearing (6208) [25] into the housing bore of the output shaft on the A-side. • Install the retaining ring 80 × 2.5 [88] using the compatible retaining ring pliers.
19	 9252987659	• Reconfigure the assembly device. Lay the housing with the A-side pointing upwards. – **Information:** The installation aid serves for secure placement of the gear unit on the A- and B-side. Assemble the assembly device in such way that the housing lies horizontally and secured. If you reverse the installation aid, you can adjust the other side. • Place the spacer tube 45 × 55 × 10 mm [17] on the rolling bearing. – **Information:** Adjust the height using the small knurled screw on the installation aid. This supports the gear unit securely and horizontally.
20	 9252989579	• Place the gear 6 (42463) [6] on the spacer tube. • The radius of the bore of gear 6 (42463) [6] points up, in the direction of output side B. • Center the gear with the joining tool. • **Important:** If the output shaft is installed, the round shaft shoulder must be in contact with the radius of the gear wheel.

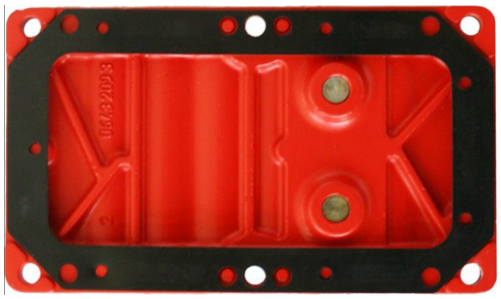
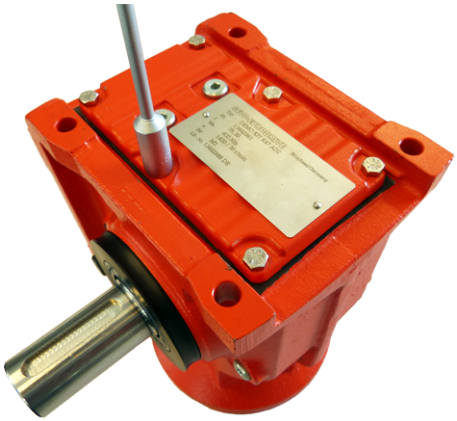
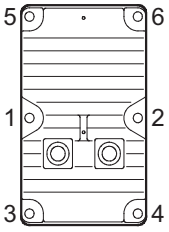
23089326/EN – 05/2017

Step	Figure	Procedure
21	 9007208507732491	• Insert the key B10 × 8 × 28 [19] into the wider end of the output shaft [7].
22	 9007208507734411	• Remove the joining tool. • Insert the output shaft [7] through the bearing bore on top through the gear 6 (42463) [6] and the spacer tube [17] into the previously installed bearing.
23	 9252995339	• Insert the deep groove ball bearing (6208) [11] into the bearing bore on the B-side. • Equalize the deep groove ball bearing with shims 63 × 80 mm [521], [522], [523] to zero clearance. **Zero clearance:** Insert shims until the shaft can no longer be moved in axial direction. • Install the retaining ring 80 × 2.5 [12] using the compatible retaining ring pliers.

23089326/EN – 05/2017

Step	Figure	Procedure
24	 9252997259	• Take the gear unit off the assembly device. Place the gear unit in front of you.
Alternative – Design with output shaft on B-side: To assemble the gear unit with the output shaft on the B-side, perform the steps 10 – 24 inversely and in the same sequence. As a result, the direction of rotation of the output shaft is reversed while the input direction of rotation remains the same.		
25	 9007208507740171	• Place the assembly sleeve onto the output shaft. – **Information:** The assembly sleeve prevents the oil seal from being damaged on the keyway during installation. This prevents the gear unit from leaking.
26	 9253001099	• Push the oil seal [156] over the assembly sleeve onto the housing bore. • Remove the assembly sleeve. • Insert the key A8 × 7 × 50 [8] on the output shaft.

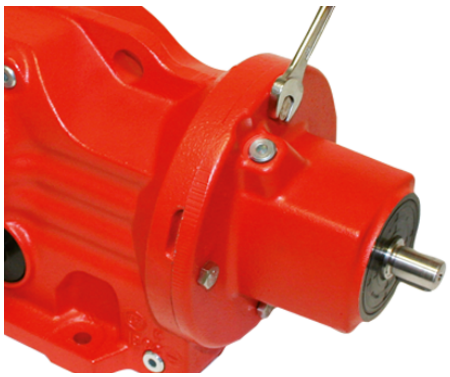
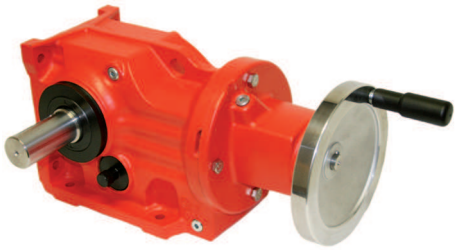
23089326/EN – 05/2017

Step	Figure	Procedure
27	 9253003019	• Install all closure caps [131], [161] on the gear unit housing. • Seal the gear unit housing on the B-side with the closing cap [89]. • **Information:** The plastic closing caps are only used with the demo units. In standard gear units, NBR closure caps are used, which are destroyed during disassembly.
28	 18210752011	• Check that the rubber gasket is seated properly on the bottom of the gear unit cover.
29	 19359247243	• Install the gear unit cover [100]. • Screw the cover tight with M6 x 16 hex head screws [101], from inside to outside, in the following sequence:  Optionally, you can tighten the bolts with a torque wrench. The M6 bolts consist of corrosion-resistant steel with a strength class of 70. This results in a tightening torque of 8 Nm.

Step	Figure	Procedure
30	 19360364811	• Remove one of the closure bolts [59] on the gear unit according to the required mounting position (here, M1). • Screw the breather valve [20] into this opening.
31	 19360368779	• Remove the transport protection on the breather valve. – **Information:** The transport protection on the breather valve prevents oil from escaping during the transport of gear units used industrially. The transport protection must be removed before operation. Heat is generated during operation, which causes the oil and air to expand. The pressure that can be created in the gear unit is released via the breather valve.
32	 9007218747846795	Installation of the drive cover requires the following: • Input shaft assembly AD2 [800] • Pinion (41610) [1] • Retaining ring 16 × 1 [201]

23089326/EN – 05/2017

Step	Figure	Procedure
33	 9007218747850379	• Mount the pinion (41610) onto the shaft of the drive-side cover AD2. • **Important**: Join the pinion onto the shaft with the radius.
34	 9007218747853963	• Fit the retaining ring 16 × 1 using the retaining ring pliers.
35	 9253008779	• Place the drive cover on. • Tilt the drive cover into the gear unit housing in such a way that the gears fit into one another and the flange is flush with the gear unit housing. – **Information:** When the pinion is tilted into the gear wheel, the pinion is not damaged. In gear units used industrially, damage to the gear wheel or the pinion can occur that is audible in later operation.

Step	Figure	Procedure
36	 9007208506684811	• Fasten the drive cover with 4 M8 × 20 hex head screws [204]. • Insert the bolts manually. • Tighten the bolts in diametrically opposite sequence using a size 12/13 open-end wrench. Optionally, you can tighten the bolts with a torque wrench. The M8 bolts consist of corrosion-resistant steel with a strength class of 70. This results in a tightening torque of 19 Nm.
37	 9251945739	• Place the handwheel on the input shaft. • Turn the crank and check whether the output shaft turns. • The assembly of the helical-bevel gear unit is completed.

3.3 Dismantling the gear unit

The gear unit is disassembled in the reverse order of the assembly.

The magnet included in the delivery allows for easier removal and disassembly of shims, supporting rings and other small parts.

23089326/EN – 05/2017

4 Spare parts list

Designation	Item no.	Quantity	Part no.
Hex head screw ISO 4017 M6×16-A2-70	[101]	6	118540
Hex head screw ISO 4017 M8×20-A2-70	[204]	4	118583
Output shaft K47 demo case 35×70	[7]	1	13443895
Drive cover complete AD2 demo case	[800]	1	13442503
Cover complete K47 demo case	[100]	1	13443046
Spacer tube K47 demo case 20.6×25×22	[119]	1	13442805
Spacer tube K47 demo case 45×55×10.5	[17]	1	13442813
Breather valve W4087 M10x1-CuZn-HEI	[20]	1	130303
Joining pin F47-W 32/1	–	1	7108893
Gear unit housing K47 demo case	[22]	1	13444751
Handwheel W4315 160×16-R-AL	[813]	1	13317970
Tapered roller bearing K47 demo case 30204	[45]	1	13444719
Tapered roller bearing K47 demo case 30302	[30]	2	13444697
Tapered roller bearing K47 demo case 30304	[42]	1	13444700
Bevel pinion shaft K47 demo case	[3]	1	13442783
Plastic ring K47 demo case 89×62×15	[156]	1	13444778
Magnet Oxyd300-25×10×5	–	1	19055714
Installation aid demo case K47	–	1	13443410
Assembly sleeve R57F demo case R57F	–	1	13442643
Key AD2 A4×4×18 demo case	[202]	1	13442619
Key DIN 6885-1 A10×8×56 Niro	[15]	1	13228218
Key K47 demo case AB6×6×14	[31]	1	13442724
Key K47 demo case B5×5×16	[43]	1	13442740
Key R57/R57F B10×8×28 demo case	[19]	1	13442570
Shim DIN 988 16×22×0.1-St	[530]	5	123439
Shim DIN 988 16×22×0.3-St	[531]	5	123447
Shim DIN 988 16×22×0.5-St	[532]	5	123692
Shim DIN 988 20×28×0.1-St	[536]	8	103683
Shim DIN 988 20×28×0.3-St	[537]	8	103926
Shim DIN 988 20×28×0.5-St	[538]	8	104159
Shim DIN 988 63×80×0.1-St	[521]	3	103799
Shim DIN 988 63×80×0.3-St	[522]	3	104035
Shim DIN 988 63×80×0.5-St	[523]	3	104191
Shim W4140 32×42×0.1-St	[542]	8	13238701
Shim W4140 32×42×0.3-St	[543]	8	13238728
Shim W4140 32×42×0.5-St	[544]	8	13238736

23089326/EN – 05/2017

Designation	Item no.	Quantity	Part no.
Gear 2 (41653) R57/RF57 demo case	[2]	1	13442376
Gear 6 (42463) K47 demo case	[6]	1	13442791
Deep groove ball bearing W6208	[25]	2	19051921
Pinion R57/RF57 demo case	[1]	1	13442341
Pinion shaft 5 K47 demo case	[5]	1	13442775
Retaining ring DIN 471 16×1-FS	[115], [201]	6	102687
Retaining ring DIN 472 42×1.75-FS	[132], [39]	2	103179
Retaining ring DIN 472 80×2.5-FS	[88], [12]	2	103241
Supporting ring DIN 988 S16×22×1.5-FS	[163]	1	124060
Supporting ring K47 demo case 32×42×2.5	[133], [137]	2	13442872
Bevel gear K47 demo case	[4]	1	13442848
Closing cap K47 demo case 42×30	[161], [131]	2	13444794
Closing cap K47 demo case 89×15	[89]	1	13444786
Screw plug W4085 M10×1-St-ADC3K	[59]	7	0011426X

23089326/EN – 05/2017

5 Contact persons

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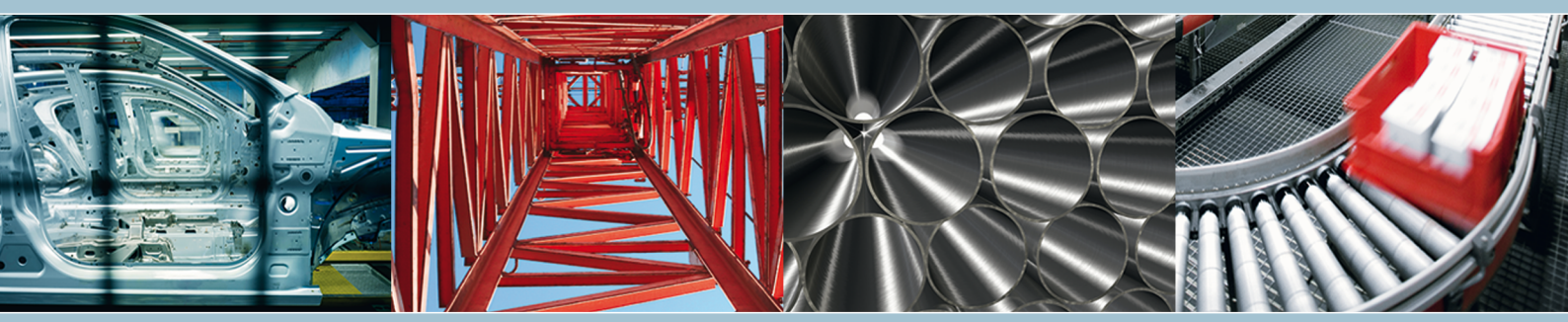
23089326/EN – 05/2017



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