



Assembly Instructions



Didactics - Gear Unit Technology
SF47 AD2 Helical-Worm Gear Unit



Table of contents

1	General information.....	4
1.1	About this documentation	4
1.2	Important notes	4
1.3	Structure of the safety notes	4
1.4	Designated use	5
1.5	Rights to claim under limited warranty	5
1.6	Exclusion of liability	6
1.7	Applicable documentation.....	6
1.8	Product names and trademarks.....	6
1.9	Copyright notice	6
2	Gear unit structure	7
2.1	Basic structure of helical-worm gear units	7
2.2	Training kit	9
3	Installation.....	11
3.1	Information about the assembly	11
3.2	Gear unit assembly	11
3.3	Dismantling the gear unit	20
4	Spare parts list.....	21
5	Contact persons	23

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.

Meaning of the hazard symbols

1

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.

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" (→  23).

1.8 Product names and trademarks

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

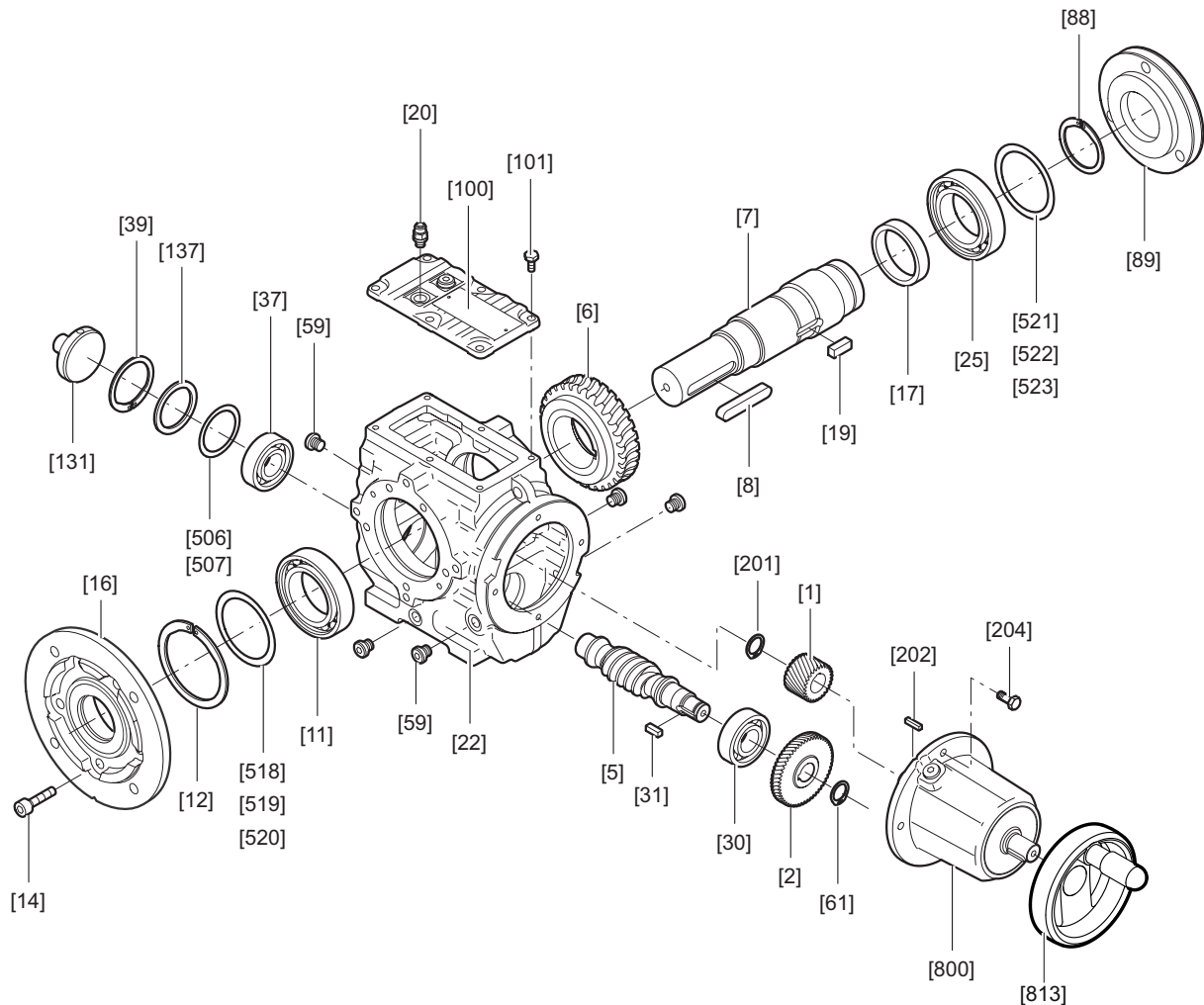
1.9 Copyright notice

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2 Gear unit structure

2.1 Basic structure of helical-worm gear units

2

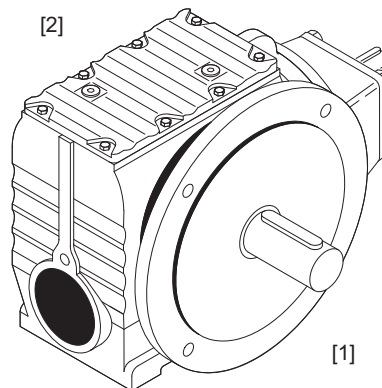


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[1] Pinion	[19] Key	[88] Retaining ring	[506] Shim
[2] Gear	[20] Breather valve	[89] Closing cap	[507] Shim
[5] Worm	[22] Gear unit housing	[100] Gear unit cover	[518] Shim
[6] Worm gear	[25] Rolling bearing	[101] Screw M6 × 16	[519] Shim
[7] Output shaft	[30] Rolling bearing	[102] Seal	[520] Shim
[8] Key	[31] Key	[131] Closing cap	[521] Shim
[11] Rolling bearing	[37] Rolling bearing	[137] Supporting ring	[522] Shim
[12] Retaining ring	[39] Retaining ring	[201] Retaining ring	[523] Shim
[14] M8 × 30 bolt	[59] Screw plug	[202] Key	[800] Input shaft assembly
[17] Spacer tube	[61] Retaining ring	[204] Screw M6 × 16	[813] Handwheel

2.1.1 A-side and B-side

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

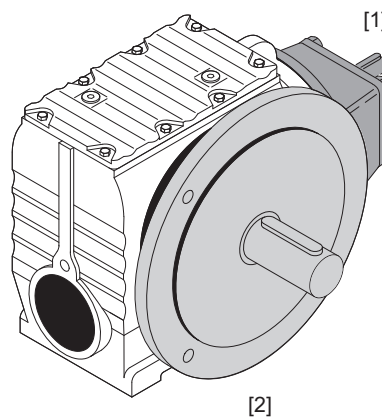


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- [1] A-side
- [2] B-side

2.1.2 Input and output end

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



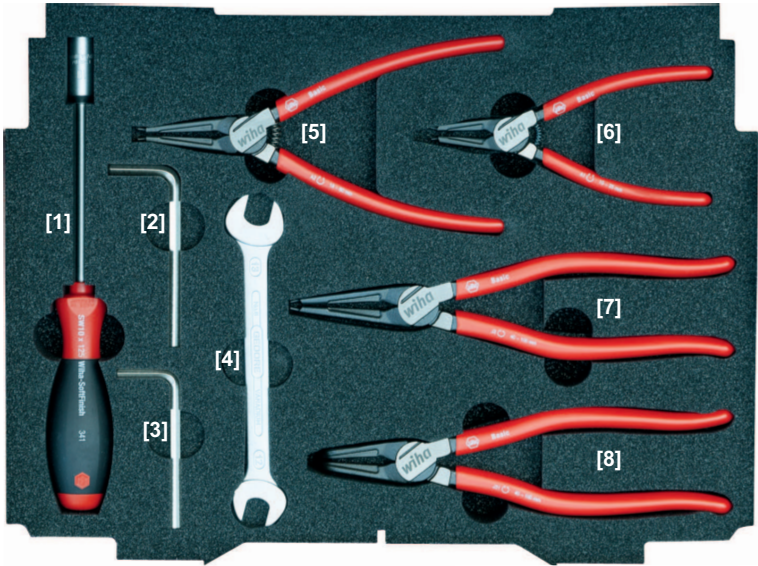
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- [1] Input end
- [2] Output end

2.2 Training kit

2.2.1 Content of the parts case

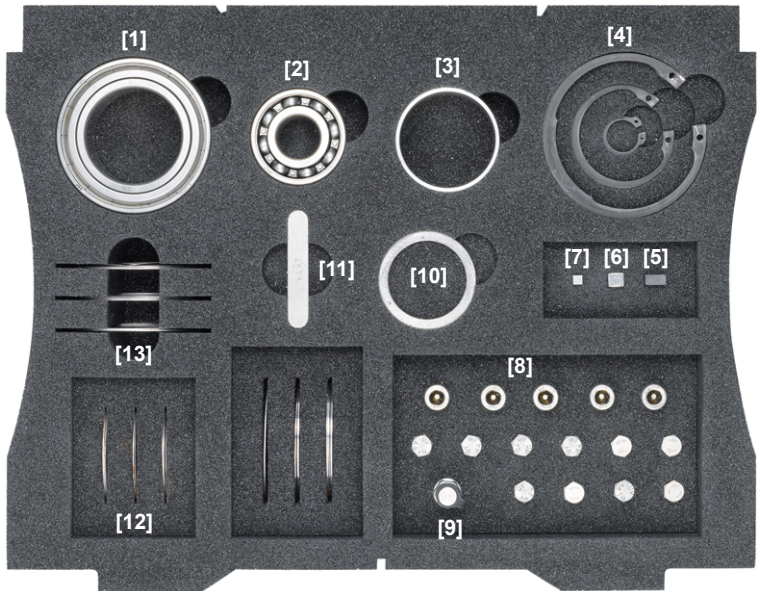
Tools



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- | | | | |
|-----|----------------------------|-----|--------------------------------------|
| [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

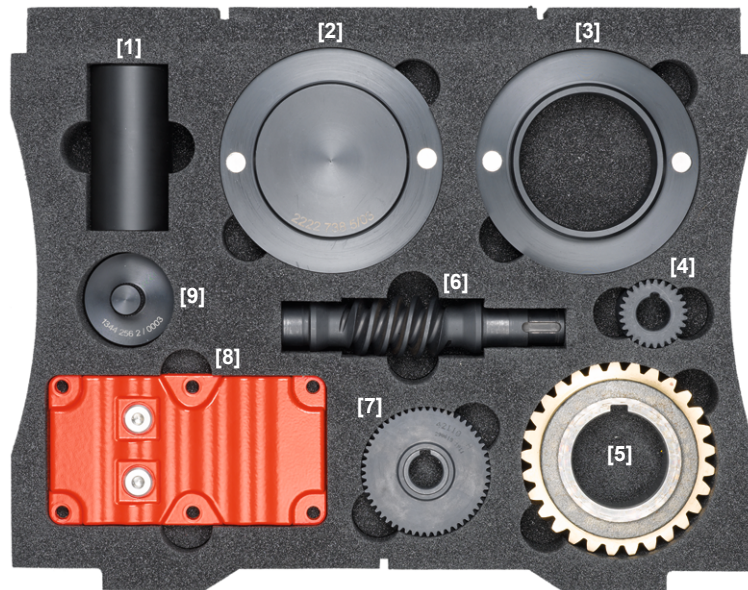


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- | | | | | | |
|-----|-----------------------------------|------|-----------------|------|-------------------------------|
| [1] | Deep groove ball bearing (6009) | [6] | Key B8 × 7 × 25 | [11] | Key A10 × 8 × 56 |
| [2] | Deep groove ball bearing (W 6204) | [7] | Key B5 × 5 × 14 | [12] | Shims 37 × 47 × (0.1/0.3/0.5) |
| [3] | Spacer tube | [8] | Screws | [13] | Shims 60 × 75 × (0.1/0.3/0.5) |
| [4] | Retaining rings | [9] | Breather valve | | |
| [5] | Magnet | [10] | Supporting ring | | |

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Gearing components, covers, closing caps



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- | | | | |
|-----|-----------------------------|-----|------------------------|
| [1] | Assembly sleeve | [6] | Worm |
| [2] | Closing cap (2222 738 5/03) | [7] | Gear 2 (42110) |
| [3] | Closing cap (2222 741 5/03) | [8] | Gear unit cover |
| [4] | Pinion (1935) | [9] | Closing cap (13442562) |
| [5] | Worm gear | | |

Housing, adapter, flange, shaft



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- | | | | |
|-----|--------------------------|-----|--------------|
| [1] | Input shaft assembly AD2 | [4] | Flange |
| [2] | Handwheel | [5] | Output shaft |
| [3] | Gear unit housing | | |

3 Installation

3.1 Information about the assembly

3



▲ 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.




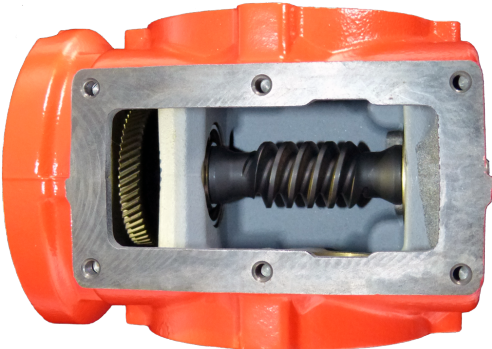

- Use the assembly pad during assembly and disassembly.



3.2 Gear unit assembly


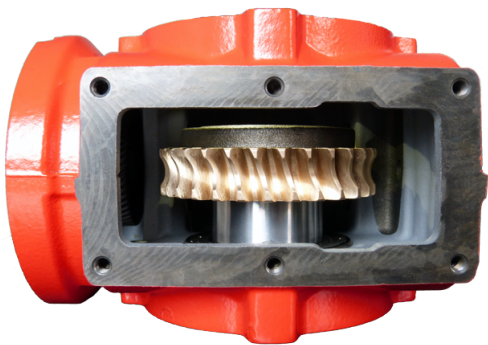







INFORMATION

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

Step	Figure	Procedure
1		Installation of the worm requires the following: <ul style="list-style-type: none"> • 2 deep groove ball bearings (W6204) [30], [37] • Worm shaft [5] • Key B5 × 5 × 14 [31]
		<ul style="list-style-type: none"> • Mount both deep groove ball bearings (W6204) onto the worm. • Insert the key B5 × 5 × 14.
2	 18144311307	<ul style="list-style-type: none"> • Beginning with the side where the key is inserted, completely insert the pre-assembled worm into the gear unit housing [22] via the bore opposite of the input end.
3	 18148807691	<ul style="list-style-type: none"> • Simultaneously to step 2, insert the gear 2 (42110) [2] from the input side. <ul style="list-style-type: none"> – Important: The part number on the front side of the gear must be legible from the input side. Gear 2 has a chamfer on the side of the bore, and a radius on the opposite side. Join gear 2 onto the worm with the radius. • Secure gear 2 using the retaining ring 16 × 1 mm [61].
4	 18148813067	<ul style="list-style-type: none"> • Insert shims 37 × 47 mm [506], [507] and a supporting ring 37 × 47 mm [137] at the deep groove ball bearing (W6204) [37] until it has zero clearance. <p>Zero clearance: Insert shims until the shaft can no longer be moved in axial direction.</p>


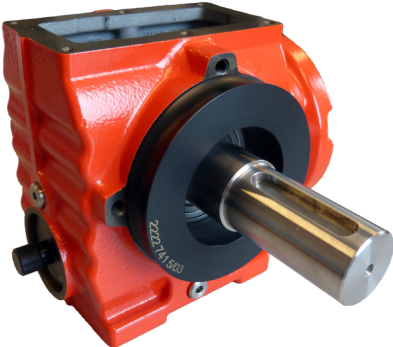

Step	Figure	Procedure
5	 <p>18148818315</p>	<ul style="list-style-type: none"> Insert the retaining ring 47×1.75 [39]. Check whether the deep groove ball bearing [37] and the shaft have been compensated correctly. <p>Once the retaining ring is installed, the supporting ring must no longer be able to be moved or turned.</p>
6	 <p>18196158219</p>	<ul style="list-style-type: none"> Insert the closing cap (13442562) [131] into the opening.
7	 <p>18149066507</p>	<ul style="list-style-type: none"> Insert the deep groove ball bearing (6009) [25] into the B-side. <ul style="list-style-type: none"> Information: As seen from the input side, the A-side is on the left. As seen from the input side, the B-side is on the right. Insert 2 shims $60 \times 75 \times 0.3$ mm [522]. <ul style="list-style-type: none"> Information: The sequence is described in chapter "Basic structure of helical-worm gear units" (\rightarrow 7). Insert the retaining ring 75×2.5 [88].


Step	Figure	Procedure
8	 <p>18149261195</p>	<ul style="list-style-type: none"> Place the gear unit housing [22] onto the B-side. Position the spacer tube (10640118/0003) [17] on the deep groove ball bearing (6009) [25] installed previously.
9	 <p>18149267979</p>	<ul style="list-style-type: none"> Position the worm gear on the spacer tube [6]. Align the worm gear and the spacer tube to the bearing, so that the output shaft [7] can be inserted through the individual components. <ul style="list-style-type: none"> Important: The worm gear collar points away from the spacer tube.
10		<ul style="list-style-type: none"> Insert the key B8 x 7 x 25 [19] into the smaller of the 2 keyways on the output shaft [7].
11	 <p>18150020363</p>	<ul style="list-style-type: none"> Push the pre-assembled output shaft into the gear unit housing through the worm gear and the spacer tube.

Step	Figure	Procedure
12	 <p>18178064523</p>	<ul style="list-style-type: none"> Insert the second deep groove ball bearing (6009) [11]. Equalize the deep groove ball bearing with shims 60 × 75 × 0.3 mm [518], [519], [529] to zero clearance. <p>Zero clearance: Insert shims until the shaft can no longer be moved in axial direction.</p>
13	 <p>18150114955</p>	<ul style="list-style-type: none"> Insert the retaining ring 75 × 2.5 [12] and centrally align the worm gear. <ul style="list-style-type: none"> Important: The worm gear must be aligned centrally to the worm. The worm gear is axially moved by inserting or removing shims [518], [519], [529]. Important: Make sure the bearings have zero clearance. In gear units used industrially, damage can occur to the bearings and to the gear due to faulty equalization.
14	 <p>18150946059</p>	<ul style="list-style-type: none"> Place the assembly sleeve (13442643.701003) onto the output shaft.

3 Installation

Gear unit assembly

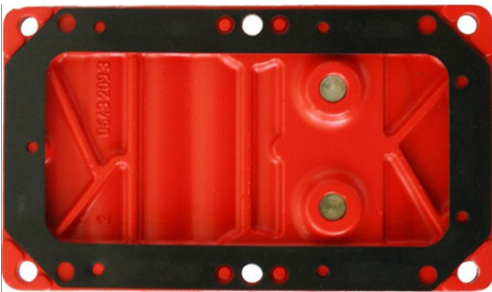

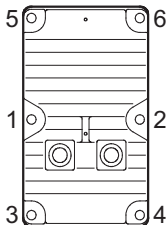
Step	Figure	Procedure
15	 <p>18150951307</p>	<ul style="list-style-type: none"> Mount the flange [16] to fit the bore pattern. Fasten the flange using the 5 M8 x 30 [14] hexagon socket head screws. <p>Optionally, you can tighten the bolts with a torque wrench. The M8 bolts consist of corrosion-resistant steel with a strength class of 70. This results in a tightening torque of 19 Nm.</p> <ul style="list-style-type: none"> Remove the assembly sleeve.
	 <p>18152496779</p>	<p>As an alternative, the gear unit can also be assembled without a flange:</p> <ul style="list-style-type: none"> Mount the closing cap (2222 741 5/03) on the side of the output shaft.
16	 <p>18150956299</p>	<ul style="list-style-type: none"> Insert the key A10 x 8 x 56 [8] into the output shaft end.




Step	Figure	Procedure
17	 <p>18151064203</p>	<ul style="list-style-type: none"> Insert the closing cap (2222 738 5/03) [89] into the opening on the B-side.

Alternative – Design with output shaft on B-side:


To assemble the gear unit with the output shaft on the B-side, perform the steps 7, 8, 9, 11, 12, 15, and 17 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.

18	 <p>18210752011</p>	<ul style="list-style-type: none"> Check that the rubber gasket is seated properly on the bottom of the gear unit cover.
19	 <p>18151069195</p>	<ul style="list-style-type: none"> Install the gear unit cover [100]. Screw the cover tight with M6 × 16 hex head screws [101], from inside to outside, in the following sequence: <div data-bbox="852 1442 1018 1666">  </div> <p>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.</p>

Step	Figure	Procedure
20	 <p>18151126027</p>	<ul style="list-style-type: none"> 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.
21	 <p>18196166027</p>	<ul style="list-style-type: none"> Remove the transport protection on the breather valve. <ul style="list-style-type: none"> 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.
22	 <p>18199100939</p>	<p>Installation of the drive cover requires the following:</p> <ul style="list-style-type: none"> Input shaft assembly AD2 [800] Pinion (1953) [1] Retaining ring 16 × 1 [201]

Step	Figure	Procedure
23	 18199104267	<ul style="list-style-type: none"> Mount the pinion (1953) onto the shaft of the input shaft assembly AD2. Important: Join the pinion onto the shaft with the radius.
24	 18199107595	<ul style="list-style-type: none"> Fit the retaining ring 16 × 1 using the retaining ring pliers.
25	 18197641483	<ul style="list-style-type: none"> 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. <ul style="list-style-type: none"> Information: When the pinion is tilted into the gear wheel, the pinion is not damaged. <p>In gear units used industrially, damage to the gear wheel or the pinion can occur that is audible in later operation.</p>
26	 18151136523	<ul style="list-style-type: none"> Fasten the drive cover with 4 M6 x 16 hex head screws [204]. Insert the bolts manually. Tighten the bolts in diametrically opposite sequence using a size 10 socket wrench. <p>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.</p>

Step	Figure	Procedure
27	 <p>18151986315</p>	<ul style="list-style-type: none"> • Place the handwheel on the input shaft. • Turn the crank and check whether the output shaft turns. • The assembly of the worm 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.

4 Spare parts list

Designation	Item no.	Quantity	Part no.
Hex head screw ISO 4017 M6x12-A4-70	[101]	6	13234838
Hex head screw ISO 4017 M6x16-A4-70	[204]	4	13228579
Output flange demo case SF47	[16]	1	22227377
Output shaft demo case SF47	[7]	1	10640126
Drive cover complete demo case AD2/D120	[800]	1	22227407
Spacer tube demo c. SF47/D45.6xD49.5x28	[17]	1	10640118
Breather valve W4087 M10x1-Niro	[20]	1	00136239
Gear unit cover demo case SF47	[100]	1	22227350
Gear unit housing demo case SF47	[22]	1	10640134
Handwheel W4315 R-160x16-AI	[813]	1	13317970
Magnet Oxyd300-25x10x5	–	1	19055714
Installation aid demo case SF47	–	1	22227415
Assembly sleeve demo case K47/R57F/SF47	–	1	13442643
Key demo case AD2/A4x4x18	[202]	1	13442619
Key demo case SF47/B5x5x14	[31]	1	10640169
Key demo case SF47/B8x7x25	[19]	1	10640231
Key DIN 6885-1 A10x8x56 Niro	[8]	1	13228218
Shim DIN 988 37x47x0.1-St	[506]	3	0010373X
Shim DIN 988 37x47x0.3-St	[507]	3	00103977
Shim DIN 988 37x47x0.5-St	–	3	00123404
Shim DIN 988 60x75x0.1-St	[518], [521]	3	00103780
Shim DIN 988 60x75x0.3-St	[519], [522]	3	00104027
Shim DIN 988 60x75x0.5-St	[520], [523]	3	00113549
Gear 2 demo case SF47	[2]	1	22172319
Pinion demo case SF47/D16	[1]	1	22172327
Deep groove ball bearing W6009	[11], [25]	2	10640274
Deep groove ball bearing W6204	[30], [37]	2	19056419
Worm demo case SF47	[5]	1	22172300
Worm gear demo case SF47	[6]	1	22172335
Retaining ring DIN 471 16x1-FS	[61], [201]	6	00102687
Retaining ring DIN 472 47x1.75-FS	[39]	2	00103187
Retaining ring DIN 472x75x2.5-FS	[81], [88]	2	00103233
Supporting ring DIN 988 S37x47x2.5-FS	[137]	1	00103519
Closing cap demo case R57F/SF47	[131]	1	10686401
Closing cap demo case SF47	[89]	1	22227385
Screw plug W4085 B-M10x1-Niro-FKM	[59]	1	13263021

Designation	Item no.	Quantity	Part no.
Cyl. screw ISO 4762 M8x30-A2-70	[14]	5	13225235

5 Contact persons

For more information about the didactics modules please contact:

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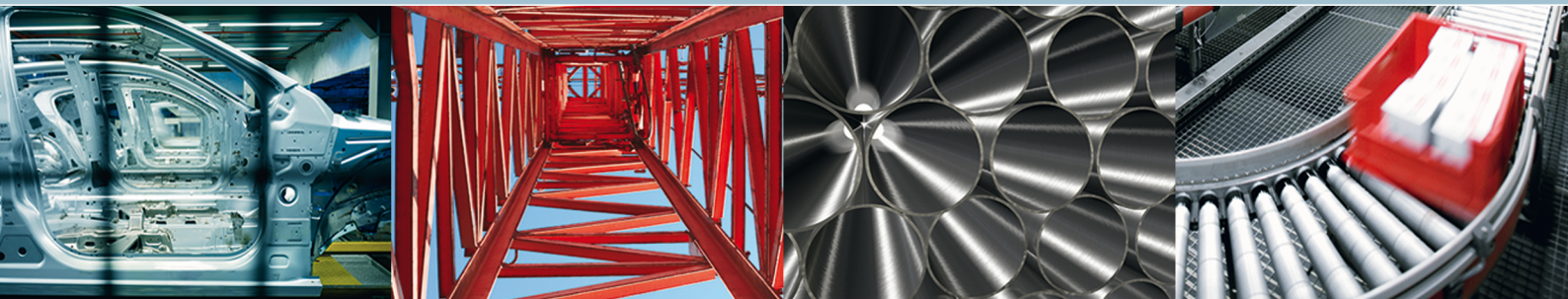
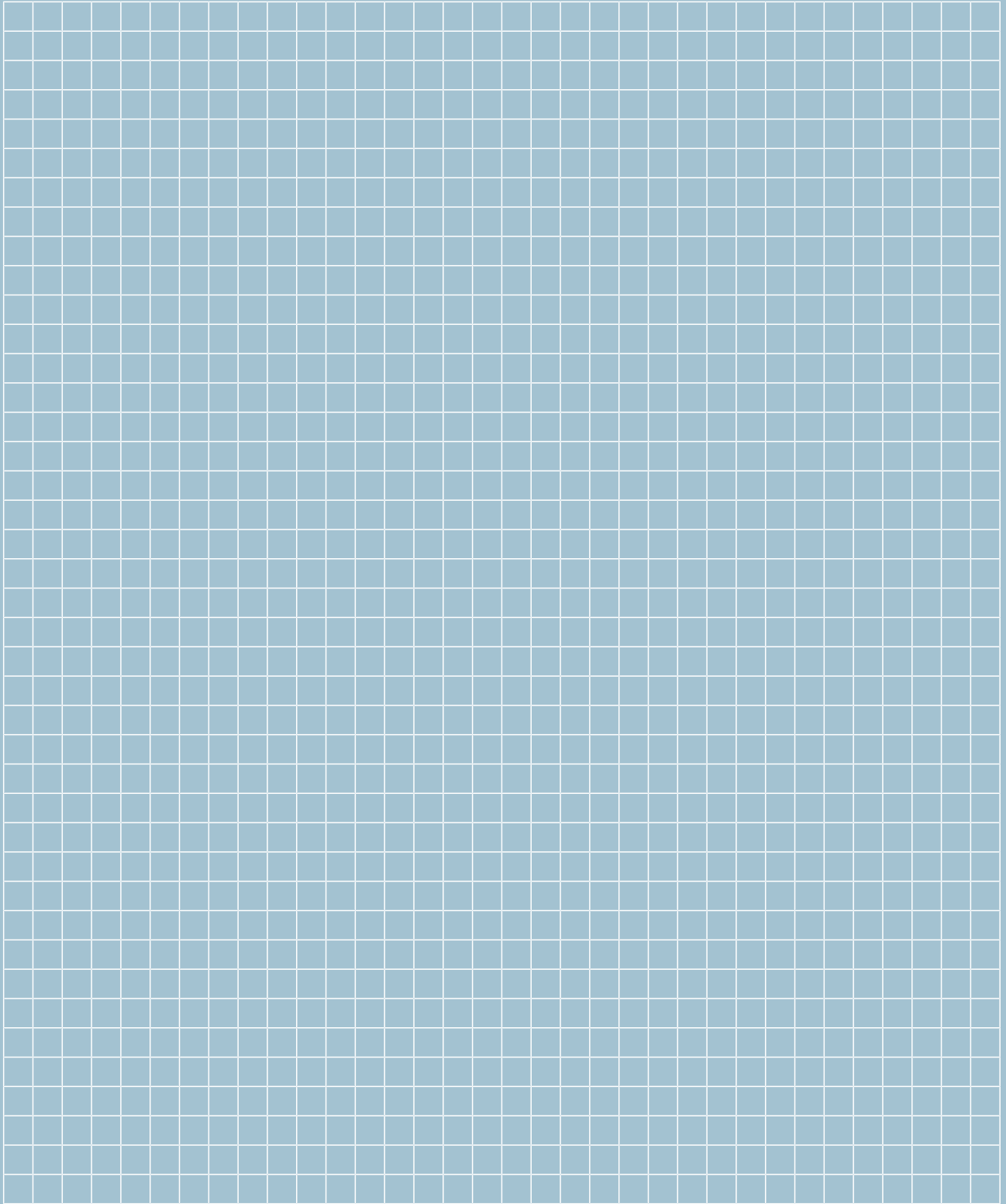
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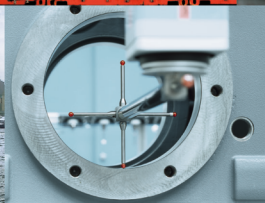
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Driving the world

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