



SEW
EURODRIVE

Assembly and Operating Instructions



VARIMOT[®] Variable-Speed Gear Unit and Accessories





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1 General Information

1.1 How to use this documentation

The documentation is an integral part of the product and contains important information on operation and service. The documentation is written for all employees who assemble, install, startup, and service this product.

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

1.2 Structure of the safety notes

1.2.1 Meaning of signal words

The following table shows the grading and meaning of the signal words for safety notes, warnings regarding potential risks of damage to property, and other notes.

Signal word	Meaning	Consequences if disregarded
▲ DANGER	Imminent danger	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 drive system or its environment
INFORMATION	Useful information or tip: Simplifies the handling of the drive system.	

1.2.2 Structure of the section-related safety notes

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

This is the formal structure of a section-related safety note:



▲ SIGNAL WORD

Type and source of danger.

Possible consequence(s) if disregarded.

- Measure(s) to prevent the danger.

1.2.3 Structure of the embedded safety notes

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

This is the formal structure of an embedded safety note:

- **▲ SIGNAL WORD** Nature and source of hazard.
Possible consequence(s) if disregarded.
– Measure(s) to prevent the danger.



1.3 Rights to claim under warranty

A requirement of fault-free operation and fulfillment of any rights to claim under limited warranty is that you adhere to the information in the documentation. Read the documentation before you start working with the unit!

1.4 Exclusion of liability

You must comply with the information contained in this documentation to ensure safe operation of the Variable-speed gear units and to achieve the specified product characteristics and performance requirements. SEW-EURODRIVE assumes no liability for injury to persons or damage to equipment or property resulting from non-observance of the documentation. In such cases, any liability for defects is excluded.

1.5 Copyright

© 2012 - SEW-EURODRIVE. All rights reserved.

Copyright law prohibits the unauthorized duplication, modification, distribution, and use of this document, in whole or in part.

1.6 Product names and trademarks

The brands and product names contained within this publication are trademarks or registered trademarks of the titleholders.



2 Safety Notes

The following basic safety notes must be read carefully to prevent injury to persons and damage to property. The operator must ensure that the basic safety notes are read and adhered to. Make sure that persons responsible for the system and its operation, as well as persons who work independently on the unit, have read through the operating instructions carefully and understood them. If you are unclear about any of the information in this documentation or if you require further information, please contact SEW-EURO-DRIVE.

2.1 Preliminary information

The following safety notes are primarily concerned with the use of the following components: Variable-speed gear units. If using gearmotors, please also refer to the safety notes in the corresponding operating instructions for:

- Motors
- Gear units R..7, F..7, K..7, S..7, SPIROPLAN® W

Also observe the supplementary safety notes in the individual sections of this documentation.

2.2 General information



WARNING

During operation, the motors and gearmotors can have live, bare (in the event of open connectors/terminal boxes) and movable or rotating parts as well as hot surfaces, depending on their enclosure.

Severe or fatal injuries.

- All work related to transportation, storage, installation, assembly, connection, startup, maintenance and repair may only be carried out by qualified personnel, in strict observance of:
 - The relevant detailed operating instructions
 - The warning and safety signs on the motor/gearmotor
 - All other project planning documents, operating instructions and wiring diagrams related to the drive
 - The specific regulations and requirements for the system
 - The national/regional regulations governing safety and the prevention of accidents
- Never install damaged products
- Immediately report any damage to the shipping company

Removing the required protection cover or the housing without authorization, improper use as well as incorrect installation or operation may result in severe injuries to persons or damage to property.

This documentation provides additional information.



2.3 Target group

Any mechanical work may only be performed by adequately qualified personnel. Qualified staff in the context of this documentation are persons familiar with the design, mechanical installation, troubleshooting and servicing of the product who possess the following qualifications:

- Training in mechanical engineering, e.g. as a mechanic or mechatronics technician (final examinations must have been passed).
- They are familiar with these operating instructions.

Any electronic work may only be performed by adequately qualified electricians. Qualified electricians in the context of this documentation are persons familiar with electrical installation, startup, troubleshooting and servicing of the product who possess the following qualifications:

- Training in electrical engineering, e.g. as an electrician, electronics or mechatronics technician (final examinations must have been passed).
- They are familiar with these operating instructions.

All work in further areas of transportation, storage, operation and waste disposal must only be carried out by persons who are trained appropriately.

All qualified personnel must wear appropriate protective clothing.

2.4 Designated use

The Variable-speed gear units are intended for industrial systems.

The gear units may only be used according to the specifications in the technical documentation from SEW-EURODRIVE as well as the specifications on the nameplate. They fulfill the applicable standards and regulations.

When installed in machines, startup of the gear units (i.e. start of designated operation) is prohibited until it is determined that the machine meets the requirements stipulated in Directive 2006/42/EC (Machinery Directive).

Use in potentially explosive atmospheres is prohibited unless specifically designated otherwise.

2.5 Other applicable documentation

2.5.1 Variable-speed gear units

The following publications and documents have to be observed as well:

- "DR.71 – 225, 315 AC Motors" operating instructions for gearmotors
- "DR/DV/DT/DTE/DVE AC Motors, CT/CV Asynchronous Servomotors" operating instructions for gearmotors
- "SPIROPLAN® W Gear Units, R..7, F..7, K..7, S..7 Series" operating instructions
- Operating instructions of any attached options
- "Variable Speed Gearmotors" catalog



2.6 *Transport/storage*

Inspect the shipment for any damage that may have occurred in transit as soon as you receive the delivery. Inform the shipping company immediately. It may be necessary to preclude startup.

Tighten the eyebolts securely. They are designed to only carry the weight of the motor/gearmotor; do not attach any additional loads.

The built-in lifting eyebolts comply with DIN 580. Always observe the loads and regulations listed in this standard. If the gearmotor is equipped with two eyebolts, then both should be used for transportation. In this case, the tension force vector of the slings must not exceed a 45° angle according to DIN 580.

Use suitable, sufficiently rated handling equipment if required. Reattach these in the case of further transportation.

Store the motor/gearmotor in a dry, dust-free environment if it is not to be installed straight away. You must not store the motor/gearmotor outdoors or on the fan guard. The motor/gearmotor can be stored for up to 9 months without requiring any special measures before startup.

2.7 *Installation*

Observe the notes in the "Mechanical Installation" section.

2.8 *Startup/operation*

Check that the direction of rotation is correct in **decoupled** status. Listen out for unusual grinding noises as the shaft rotates.

Secure the key for test mode without output elements. Do not deactivate monitoring and protection equipment even in test mode.

Switch off the gearmotor if in doubt whenever changes occur in relation to normal operation (e.g. increased temperature, noise, vibration). Determine the cause and contact SEW-EURODRIVE, if required.

2.9 *Inspection/maintenance*

Observe the notes in chapter "Inspection/Maintenance"!

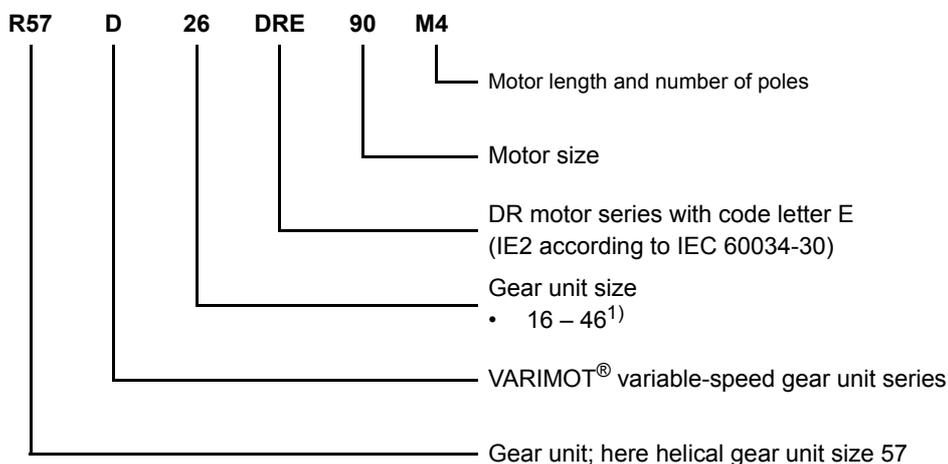


3 VARIMOT® Structure

3.1 Nameplate/type designation

3.1.1 Type designation

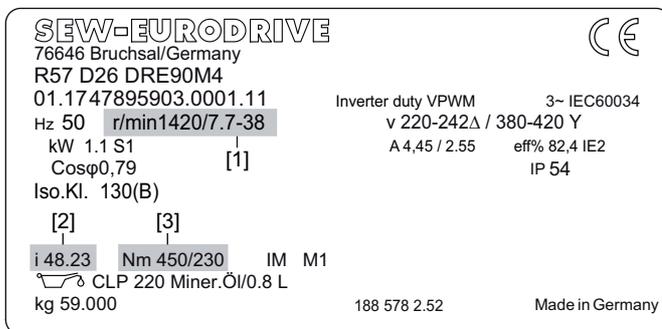
The following diagram shows a type designation example:



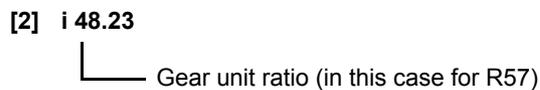
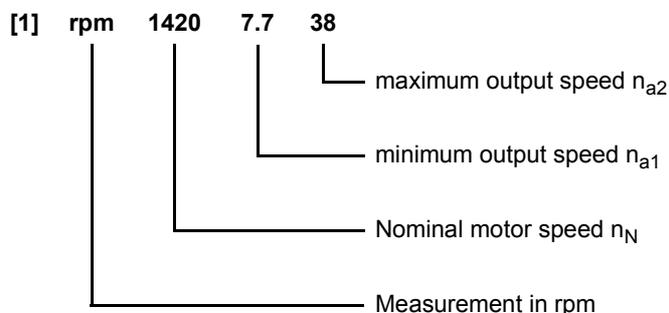
1) The gear unit sizes D36 and D46 cannot be combined with DR...

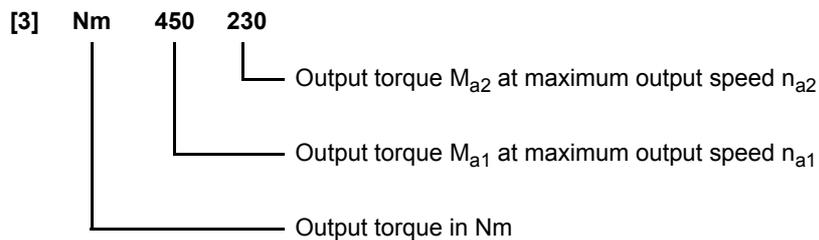
3.1.2 Nameplate

The following figure shows an example nameplate for a D.. variable-speed gear unit:



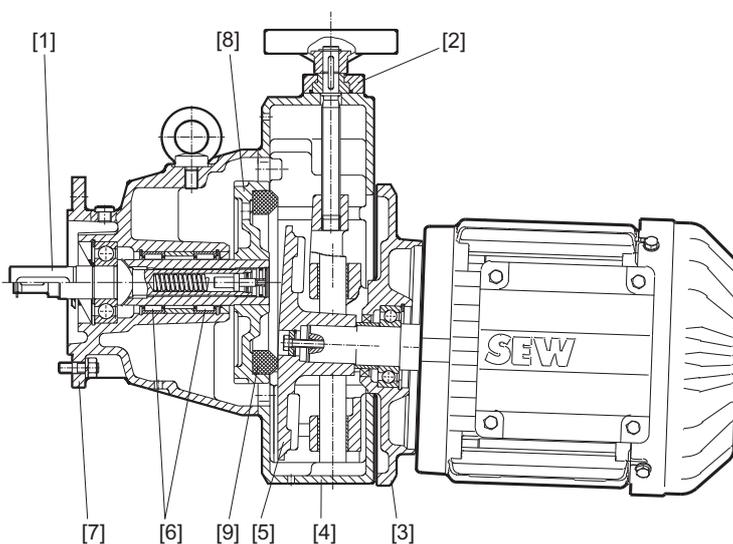
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3.2 Unit structure – VARIMOT® variable-speed gear unit

The following figure shows the unit design of the VARIMOT® variable-speed gear unit:



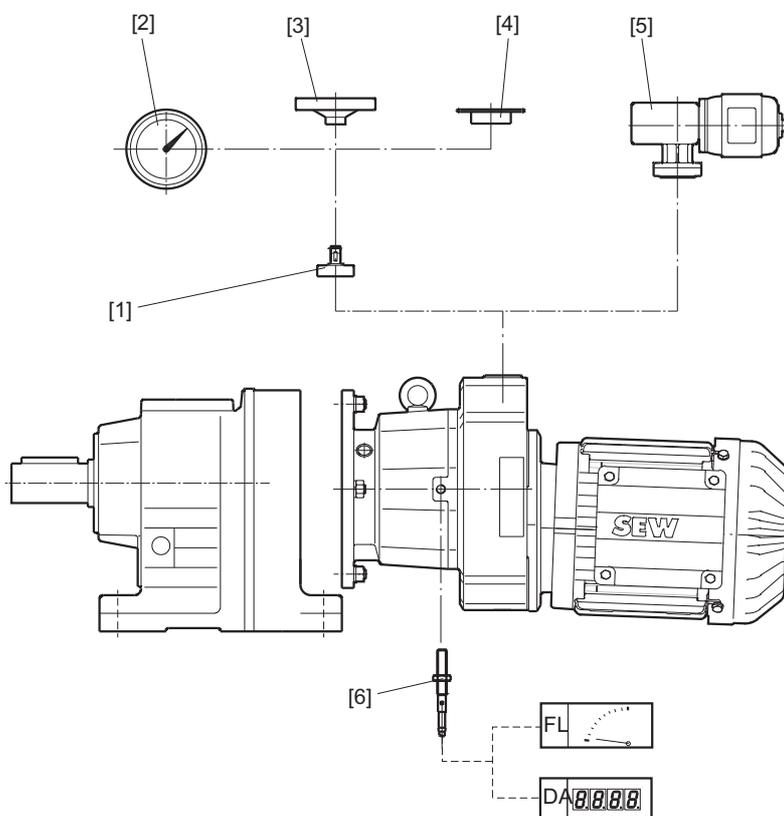
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- | | | | |
|-----|-----------------------|-----|-----------------------|
| [1] | Complete output shaft | [6] | Needle roller bearing |
| [2] | Plate | [7] | Housing |
| [3] | Adjusting plate | [8] | Complete hollow shaft |
| [4] | Housing cover | [9] | Friction ring |
| [5] | Drive disk | | |



3.3 Overview of VARIMOT® mounting options

The following figure shows the combination options for the VARIMOT® variable-speed gear unit:



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- [1] Adjustment device with free shaft end NV
- [2] Adjustment device with handwheel and HS position display
- [3] Adjustment device with handwheel H (standard design)
- [4] Adjustment device with chain sprocket K
- [5] Electromechanical remote control EF and EFPA (with remote setting indicator)
- [6] IG voltage pulse encoder with analog/digital remote speed indicator FL/DA



4 Installation



CAUTION

Damages of the friction ring due to excessive use of the adjustment function in standstill.

Possible damage to property

- Adjustment at standstill is possible, however this should not be done too frequently in operation.

4.1 Required tools/resources

- Set of wrenches
- Mounting device
- Mounting materials for output components

4.1.1 Installation tolerances

Shaft end	Flanges
Diameter tolerance according to DIN 748 <ul style="list-style-type: none"> • ISO k6 for solid shafts with $d, d_1 \leq 50$ mm • ISO k7 for solid shafts with $d, d_1 > 50$ mm • Center bore in accordance with DIN 332, shape DR.. 	Centering shoulder tolerance to DIN 42948 <ul style="list-style-type: none"> • ISO j6 at $b_1 \leq 230$ mm • ISO h6 with $b_1 > 230$ mm

4.2 Installation requirements



⚠ CAUTION

Risk of injury due to protruding gear unit parts.

Minor injuries.

- Keep a sufficient safety distance to the gear unit/gearmotor.



NOTICE

Damage to the gear unit/gearmotor due to improper installation.

Possible damage to property

- Do closely observe the notes in this chapter.

Check that the following conditions have been met:

- The entries on the nameplate of the gearmotor match the voltage supply system.
- The drive has not been damaged during transportation or storage.
- Ensure that the following requirements have been met:



Installation

Installation requirements

For standard gear units:

- Ambient temperature according to the technical documentation, and nameplate.
- No harmful oils, acids, gases, vapors, radiation etc. in the vicinity

For special designs:

- The drive is designed in accordance with the ambient conditions. Observe the information on the nameplate.
- You must clean the output shafts and flange surfaces thoroughly to ensure they are free of anti-corrosion agents, contamination or similar. Use a commercially available solvent. Do not expose the sealing lips of the oil seals to the solvent – damage to the material.
- When the drive is installed in abrasive ambient conditions, protect the output end oil seals against wear.
- Vertical mounting positions of the motor must be equipped with a cover (canopy C) in order to prevent foreign particles or liquid from entering.



4.3 Installing the gear unit



⚠ CAUTION

Improper assembly may result in damages to the gear unit/gearmotor.

Possible damage to property

- Do closely observe the notes in this chapter.
-
- Work on the gear unit only when the machine is not in use. Secure the drive unit against unintentional power-up.
 - The service life of the lubricant in the bearings is reduced if the unit is stored for ≥ 1 year.
 - Do not butt or hammer the shaft end.

The gear unit or gearmotor is only allowed to be installed in the specified mounting position. Observe the information on the nameplate.

The support structure must have the following characteristics:

- Level
- Vibration damping
- Torsionally rigid

Maximum permitted flatness defect for foot and flange mounting (guide values with reference to DIN ISO 1101):

- Gear unit size D(F)16 – D(F)36: max. 0.4 mm
- Gear unit size D(F)46: max. 0.5 mm

Do not tighten the housing legs and mounting flanges against one another and ensure that you comply with the permitted overhung and axial loads! Observe chapter "Project Planning" in the variable-speed gearmotor catalog for calculating the permitted overhung and axial loads.

VARIMOT® in HS design (handwheel with position display) must be installed so that the adjustment spindle is in horizontal position as the position display does not work otherwise.

Secure gearmotors using quality 8.8 screws.

Use plastic inserts (2 – 3 mm thick) if there is a risk of electrochemical corrosion between the gear unit and the driven machine. The material used must have an electrical leakage resistance $< 10^9 \Omega$. Electrochemical corrosion can occur between various metals, for example, cast iron and high-grade steel. Also fit the bolts with plastic washers. Ground the housing additionally – use the grounding bolts on the motor.



4.3.1 Tightening torques for retaining screws

Mount the gearmotors with the following tightening torques:

Screw/nut	Tightening torque screw / nut Strength class 8.8 [Nm]
M6	11
M8	25
M10	48
M12	86
M16	210
M20	410
M24	710
M30	1450
M36	2500

4.3.2 Installation in damp locations or in the open

Drives are supplied in corrosion-resistant versions with an according surface protection coating for use in damp areas or outdoors. Repair any damage to the paint work (e.g. on the breather valve or the eyebolts).

Units installed outdoors must be protected from the sun. Provide for suitable protective devices such as covers or roofs. Avoid any heat accumulation. The operator must ensure that foreign objects do not impair the function of the gear unit (e.g. falling objects or coverings).

Coat the threads of the cable glands and filler plugs with sealing compound and tighten it properly. Then apply another coat.

Seal the cable entry properly.

Thoroughly clean the sealing surfaces of the terminal box and the terminal box cover prior to reassembly. Replace any brittle seals!



4.3.3 Painting gear units



NOTICE

Oil seals may be damaged during painting or re-painting.

Potential damage to property.

- Thoroughly cover the sealing lip of the oil seals with strips prior to painting.
- Remove the strips after painting.

4.4 Assembling input and output elements



CAUTION

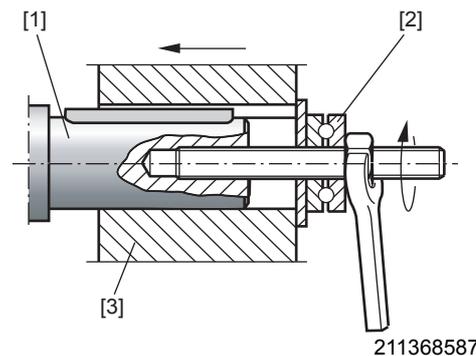
Bearing, hosing or shaft may be damaged due to improper assembly.

Possible damage to property

- Only assemble the input and output components with a mounting device. Use the center bore and the thread on the shaft end for positioning.
- Never force belt pulleys, couplings, pinions, etc. onto the shaft end by hitting them with a hammer.
- In the case of belt pulleys, make sure the belt is tensioned correctly in accordance with the manufacturer's instructions.
- Power transmission elements should be balanced after fitting and must not give rise to any impermissible radial or axial forces (see the "Gearmotors" or "Explosion-Proof Drives" catalog for permitted values).

4.4.1 Using a mounting device

The following figure shows a mounting device for installing couplings or hubs on gear unit or motor shaft ends. Should you be able to tighten the screw without any problems, you may not need the thrust bearing on the mounting device.



- [1] Gear unit shaft end
- [2] Thrust bearing
- [3] Coupling hub

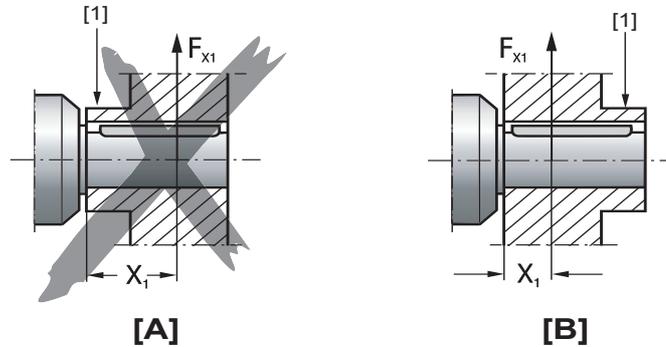


Installation

Mounting of couplings

4.4.2 Avoiding excessive overhung loads

Avoid high overhung loads by: Installing the gear or chain sprocket according to figure B if possible.



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[1] Hub
[A] unfavorable
[B] correct



INFORMATION

Mounting is easier if you first apply lubricant to the output element or heat it up briefly (to 80 - 100 °C).

4.5 Mounting of couplings



⚠ CAUTION

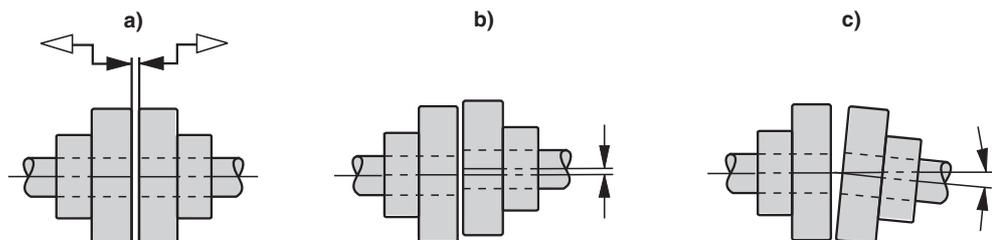
Input and output components such as belt pulleys, couplings etc. are in fast motion during operation.

Risk of jamming and crushing.

- Cover input and output components with a touch guard.

Adjust the following misalignments according to the coupling manufacturer's specifications when mounting couplings.

- Maximum and minimum clearance
- Axial offset
- Angular offset



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4.6 Accessory equipment

4.6.1 Electromechanical remote speed control EF/EFPA

Description

Electromechanical remote speed control consists of a servo motor which, in the EFPA type, is supplemented by an indicator unit. This indicator unit can be installed in a control cabinet. Speed changes resulting from load fluctuations are not shown on the display.

INFORMATION



The electromechanical remote speed control EF/EFPA is designed for max. 40 % cdf and a starting frequency 20 cycles per hour. They are not suited for automatic control.



⚠ WARNING

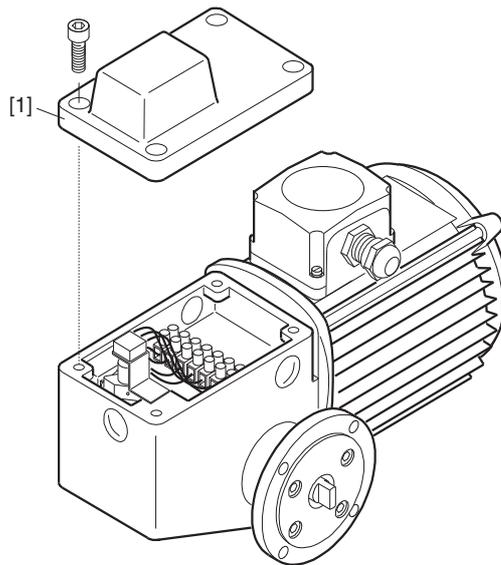
Electric shock due to improper adjustments or poor fusing of energized EF an EFPA.

Severe or fatal injuries.

- Only qualified staff may carry out adjustments.

Connecting EF/EFPA remote speed control

The following figure shows an EF/EFPA remote speed control:



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1. Remove the housing cover [1] from the switching unit of the remote speed control.
2. Establish the electrical connection:
 - According to the circuit diagram provided
 - According to the nameplate data
3. If required, limit the speed range of the EF/EFPA remote speed control, otherwise reassemble the housing cover, see chapter "Limiting the speed range of the EF/EFPA"

Connect the indicator unit of the EFPA remote speed control according to the enclosed wiring diagram, see chapter "Connecting and setting the indicator unit for EFPA".



Installation

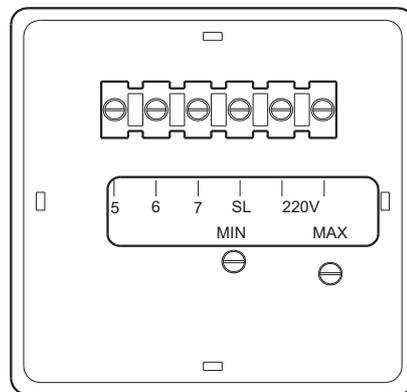
Accessory equipment

Connecting and setting the indicator unit for EFPA

The indicator unit of the electromechanical remote speed control can only be used in conjunction with the EFPA variable-speed gearmotor.

1. Connect the indicator unit to the adjustment motor according to the enclosed wiring diagram.
2. Set the variable-speed gearmotor to the required minimum speed.
3. Set the indicator unit via the "MIN" screw:
 - for D16 – D36 to 20 %
 - for D46 to 25 %
4. Set the variable-speed gearmotor to the required maximum speed.
 - Set the indicator unit to 100 % via the "MAX" screw.

The following figure shows the position of the screws on the indicator unit:



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Limiting the speed range for EF, EFPA

The trip stop cams are preset for the entire speed range of the variable-speed gearmotor. However, it may be limited as follows:

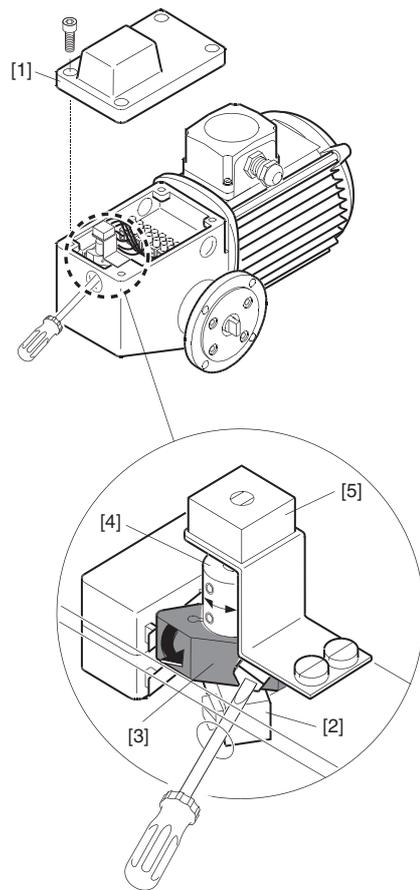


NOTICE

Damages due to mechanical stop.

Possible damage to property

- Only limit the setting range via limit switches. Prevent hitting the mechanical stop.

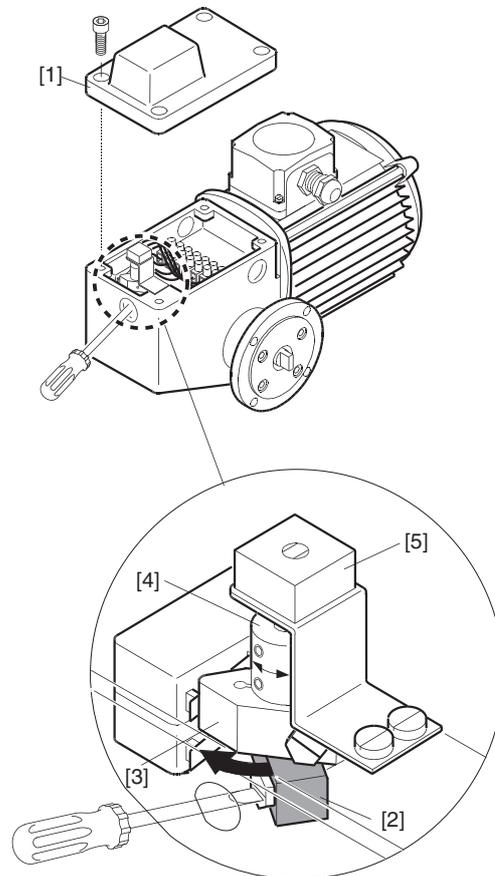


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1. Remove the housing cover [1] from the switching unit of the adjustment motor.
2. Set the variable-speed gear unit to the required upper end position (scale ≤ 100 = maximum speed).



3. **A) Upper trip stop cam [3]:**
- Loosen the upper trip stop cam with a screw driver.
 - Turn it to the left up to the trip point.



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4. **Additionally for variant with potentiometer [5]:**
- B) Loosen the lower screw of the coupling [4].
 - C) Turn the potentiometer [5] on the coupling:
 - All the way to the left
 - To the right by about 15° to about 120 – 180 Ω at terminals 6 and 7.
 - D) Tighten the lower screw of the coupling.
5. Fasten the upper trip stop cam [3].
6. Set the variable-speed gear unit to the required upper end position (scale ≤ 100 = maximum speed).
7. **Lower trip stop cam [2]:**
- Loosen the lower trip stop cam with a screw driver.
 - Turn it to the right up to the trip point.
 - Fasten the lower trip stop cam.
8. Assemble the housing cover [1] according to the enclosed wiring diagram.



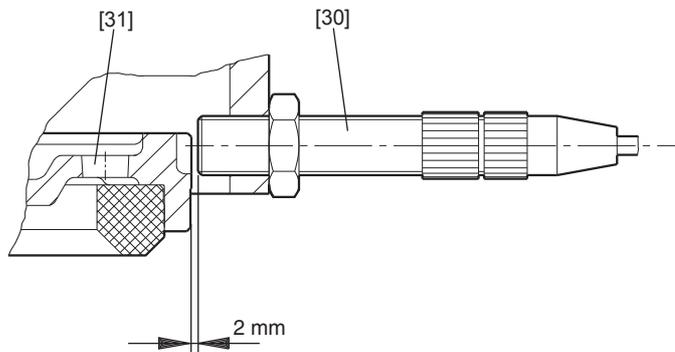
4.6.2 IG voltage pulse encoder, installing, connecting and setting the analog and digital FL and DA remote speed indicator

Different designs The following designs are available:

Accessories	Type
IG =	The scope of delivery for this type only includes the IG voltage pulse encoder [3] without indicator unit FL or DA.
FL =	This design includes the IG voltage pulse generator with analog FL remote speed indication.
DA =	This design includes the IG voltage pulse generator with digital DA remote speed indication.
IGV =	In this type, the housing of the variable speed gear unit has a tapped hole M16 x 1 [1] for accommodating a voltage pulse encoder.

IG voltage pulse generator installation

The following figure illustrates installation of the IG voltage pulse generator:



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1. Screw the voltage pulse generator [30] in the corresponding thread of the gear unit housing until it contacts the pressure disk [31].
2. Turn back the voltage pulse generator [30] by 2 revolutions (distance = 2 mm).
3. Secure the voltage pulse generator [30] with a lock nut.
4. If there is no display, adjust the input sensitivity:
 - Increase or reduce the distance between the voltage pulse encoder and the pressure disk.

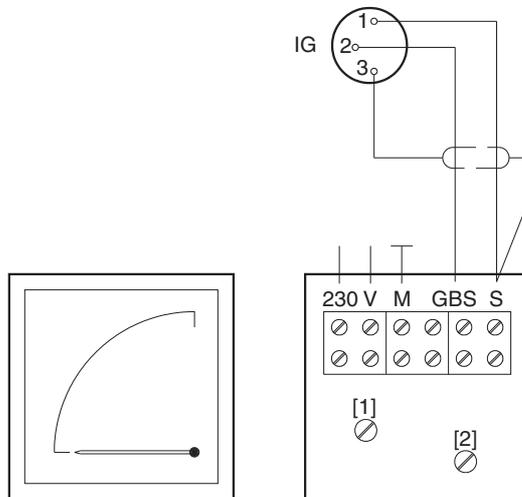


Installation

Accessory equipment

Connecting and adjusting the analog FL remote speed indicator

The contactless analog FL remote speed indicator is connected to the IG voltage pulse generator on the variable-speed gear unit.



- [1] Rough setting
[2] Fine tuning

4545491083

1. Wire the unit.
2. Accelerate the drive to the maximum speed.
3. Adjust the device to 100% display via the setting screws for rough setting [1] or fine tuning [2] on the back of the indicator unit.
4. Ensure a flawless ground connection at terminal M.

Technical data

The following table lists the data of the analog FL remote speed indicator:

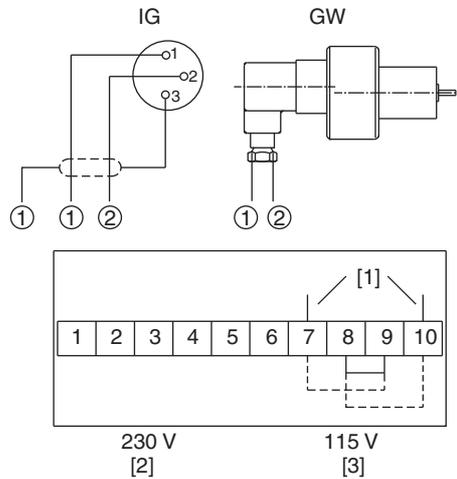
Description	
Voltage encoder	IG
Display unit	analog (scale 0 – 100 %)
Line connection	230 V, 50 – 60 Hz
Encoder connection	with two-core cable, shielded



Connecting and adjusting the digital DA remote speed indicator

The contactless, digital DA remote speed indicator is connected to the GW AC encoder or the IG voltage pulse encoder

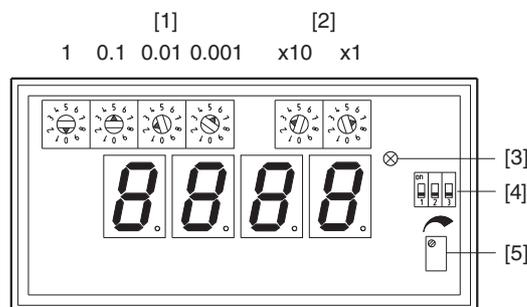
1. Assemble the unit as shown in the following figure:



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- [1] Auxiliary voltage
- [2] Jumper 8 – 9
- [3] Jumpers 7 – 9 and 8 – 10

2. Ensure a flawless ground connection at terminal 1.
3. Adjust the measuring time according to the following figure and chapter "Calculation examples DA":



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- [1] Time base in s
- [2] Pulse multiplier:
- [3] Pulse control
- [4] Decimal point setting
- [5] Input sensitivity

- Calculation using a formula
 - Data according to chapter "Adjusting the digital remote speed indicator" (page 26)
4. Adjust the input sensitivity, see figure above.
 - Turn the input sensitivity potentiometer to the right until the pulse control light just lights up.



Technical data

The following table lists the technical data of the digital DA remote speed indicator:

Description	
Voltage encoder	IG
Display unit	analog (scale 0 – 100 %)
Line connection	230 V, 50 – 60 Hz
Power consumption	about 4.2 VA
Encoder connection	with two-core cable, shielded

Adjusting the digital DA remote speed indicator.

The following table lists the adjustment data of the digital DA remote speed indicator:

Indicating accuracy	±1 of last digit
Measuring interval (time base: quartz)	Adjustment in increments of 0.001 s in the range of 0.010 s to 9.999 s after removing the front panel Recommended measuring interval: 0.5 – 2 s
Pulse multiplier	Adjustment in increments in the range from 1 - 99 after removing the front panel
Decimal point setting	Via DIP switch after removing the front panel
Calculation of measuring interval	Measuring interval = $\frac{60 \times A}{n \times k \times z \times f}$

A = four-digit display (at maximum speed), without decimal point indication

n = speed (see following table)

k = pulse multiplier ≥ 1

z = pulses / revolution (see following table)

f = calculation factor (at 50 Hz = 1, at 60 Hz = 1.2)

Reference data

The following table lists the reference data of the digital DA remote speed indicator:

Gear unit type and size	Pulses/revolution	VARIMOT® reference speed in rpm			
		2-pole	4-pole	6-pole	8-pole ¹⁾
D16	6	3305	1690	1065	833
D26		3520	1825	1200	885
D36 ¹⁾		3370	1675	1080	825
D46 ¹⁾		3240	1610	1073	850

1) Only in conjunction with DT/DV motors.



Calculation exam-
ples DA

	Example 1		Example 2	
Drive	R107 R77 D26DA DRE90L4		R107 R77 D26DA DRE90L4	
Data	Output speed	$n_a = 1.45 - 7.3$	Output speed	$n_a = 1.45 - 7.3$
	Pulses/revolution	$z = 6$	Pulses/revolution	$z = 6$
	max. speed of the variable-speed gear unit (see table above)	$n = 1825 \text{ rpm}$	max. speed of the variable-speed gear unit (see table above)	$n = 1825 \text{ rpm}$
Required indication	Output speed	1.450 – 7.300 rpm	Belt velocity	$A = 0.5 - 2.5 \text{ m / min}$
$\frac{60 \times A}{n \times k \times z \times f}$	$\frac{60 \times 7300}{1825 \times 1 \times 6 \times 1} = 40,00 \text{ s}$		$\frac{60 \times 2500}{1825 \times 1 \times 6 \times 1} = 13,69 \text{ s}$	
Recommended measuring interval	0.5 - 2 s (max. 9.999 s)			
Calculation with new pulse multiplier	$k = 50$ $\frac{60 \times 7300}{1825 \times 50 \times 6 \times 1} = 0,800 \text{ s}$		$k = 10$ Measuring interval = $\frac{60 \times 2500}{1825 \times 10 \times 6 \times 1} = 1,369 \text{ s}$	
Device setup	measuring interval	[0] [8] [0] [0]	measuring interval	[1] [3] [6] [9]
	Pulse multiplier	[5] [0]	Pulse multiplier	[1] [0]
	Decimal point setting	[1]	Decimal point setting	[1]



5 Startup



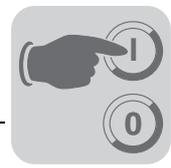
CAUTION

Damages of the friction ring due to excessive use of the adjustment function in standstill.

Possible damage to property

- Adjustment at standstill is possible, however this should not be done too frequently in operation.

- Secure the key for test mode without output elements.
- The most important technical data is provided on the nameplate. Additional data relevant for operation is available in drawings and the order confirmation.
- Ensure that all retaining screws are tight after the gear unit has been installed.
- Make sure that the orientation has not changed after tightening the mounting elements.
- Prior to startup, ensure that rotating shafts as well as couplings are equipped with suitable protective covers.
- It is essential that there is no open fire or risk of sparks when working on the gear unit.
- Protect the gear unit from falling objects.
- Remove transport fixtures prior to startup.
- Adhere to the safety notes in the individual chapters.
- Check the degree of protection.
- Check that there is sufficient clearance around the motor to provide for adequate cooling, and that the motor does not suck in warm air from other devices.



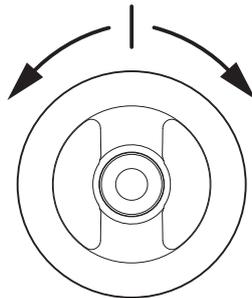
5.1 Speed adjustment via handwheel

Turning the handwheel changes the speed range as follows:

- CCW rotation increases the drive speed
- CW rotation decreases the drive speed

The following figure illustrates the directions:

Increasing speed Decreasing speed

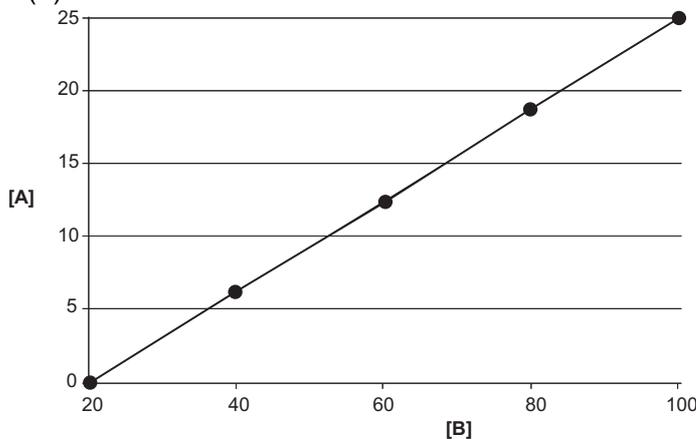


The minimum output speed n_{a1} and the maximum output speed n_{a2} are mechanically limited by a stop on the housing cover.

With the VARIMOT® variable-speed gear units, there is a linear relation between the handwheel rotations at the adjustment spindle and the output speed.

VARIMOT® type	Required handwheel rotations	Setting range in relation to the maximum output speed in n_{a2}
D/DF 16	25	20 – 100%
D/DF 26	32.5	20 – 100%
D/DF 36	29	20 – 100%
D/DF 46	30	25 – 100%

The following figure shows an example of an adjustment curve for VARIMOT® size D(F)16:



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- [A] Handwheel rotations
[B] Speed in % of the maximum output speed in n_{a2}



6 Inspection/Maintenance

6.1 Preliminary work regarding gear unit inspection/maintenance

Observe the following notes before you start with the inspection/maintenance work.



⚠ WARNING

Risk of crushing if the drive starts up unintentionally.

Severe or fatal injuries.

- Disconnect the gearmotor from the power supply before starting work and protect it against unintentional re-start.



⚠ WARNING

Risk of burns due to hot gear unit.

Severe injuries.

- Let the gear unit cool down before you begin with your work.



NOTICE

Damage to the gear unit due to improper handling.

Possible damage to property.

- Observe the notes in this chapter.

- Strict adherence to the inspection and maintenance intervals is absolutely necessary to ensure safe working conditions.
- Before releasing shaft connections, make sure there are no active torsional moments present (tensions within the system).
- Prevent foreign bodies from entering the gear unit during maintenance and inspection work.
- Never clean the gear unit with a high-pressure cleaning system. Otherwise, water might enter the gear unit and the seals might be damaged.
- Perform safety and function tests following all maintenance and repair work.



6.2 Required tools/resources

- Set of wrenches
- Hammer
- Punch and/or piercer
- Retaining ring pliers
- Lubricant e.g. "Never Seez normal"
- Lever press

6.3 Inspection and maintenance intervals

6.3.1 VARIMOT® variable speed gear unit

The following table lists the obligatory intervals and the corresponding measures:

Unit / unit part	Time interval	What to do?
VARIMOT gear unit®	<ul style="list-style-type: none"> • Every 3000 operating hours • At least every six months 	Check the wear of the friction ring by testing the rotational clearance, see "Checking the rotational backlash" (page 31).

6.3.2 EF, EFPA accessory equipment

The following table lists the obligatory intervals and the corresponding measures:

Unit / unit part	Time interval	What to do?
EF/EFPA	<ul style="list-style-type: none"> • Every 20000 adjustments • At least every six months 	Check adjustment spindle <ul style="list-style-type: none"> – Replace if required – Otherwise, regrease, see chapter "Regreasing EF/EFPA adjustment spindle" (page 34).

6.4 Check torsional play

The torsional play of the output shaft is increased through wear of the friction ring. You can check the rotational clearance as follows:

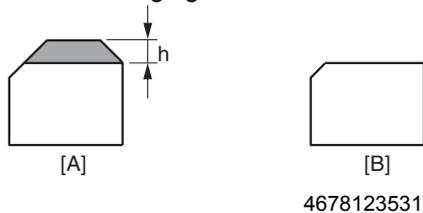
1. Remove the fan guard of the driving motor.
2. Set the drive to a speed ratio of 1:1 (about "80" on the scale of the position indicator)
3. Check the rotational clearance at the fan blade of the motor with the input shaft locked.
4. If the rotational clearance is $> 45^\circ$, you have to check the friction ring, see chapter "Checking the friction ring" (page 32).



6.5 Checking the friction ring

1. Loosen all retaining screws [2].
2. Separate the drive between the housing cover and the housing.
3. Check the friction ring:
 - if chamfers are visible: friction ring is OK
 - if friction ring is damaged or chamfer is ground off: Replace the friction ring

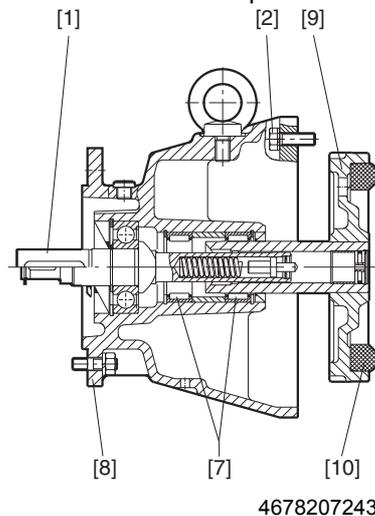
The following figure shows the difference between a new and a worn friction ring profile:



h Wear height
 [A] new profile
 [B] worn profile

6.6 Replacing the friction ring

1. Remove the complete hollow shaft (9) from the housing (8).

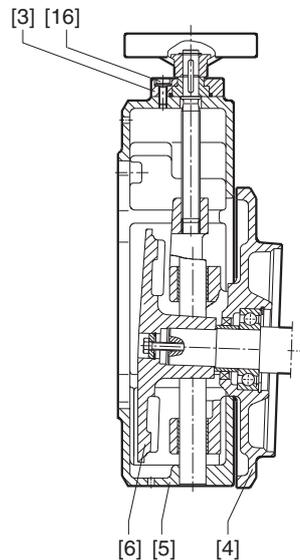


[1] Output shaft	[8] Housing
[2] Retaining screws	[9] Hollow shaft complete with friction ring
[7] Needle roller bearing	[10] Friction ring

2. Remove friction ring [10] from hollow shaft using a hammer and punch/piercer.
3. Place the new friction ring on a clean, flat base.
4. Place the complete hollow shaft on the friction ring.
 - Center the hollow shaft via the friction ring shoulder.
5. Press hollow shaft and friction ring together using slight pressure (if possible, use hand lever press) until stop is reached.
6. Regrease the needle roller bearing [7] with rolling bearing grease.



7. Clean the contact surfaces.
 - On the friction ring, use dry paper or cloth
 - On the drive pulley [6], use degreasing cleaning agent



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- | | |
|---------------------|----------------|
| [3] Plate | [6] Drive disk |
| [4] Adjusting plate | [16] Screw |
| [5] Housing cover | |

8. Push the complete hollow shaft with friction ring into the housing.
 - Turn the hollow shaft during insertion until cam lines are engaged (do not turn hollow shaft any further).
9. Carefully put the housing and the housing cover together and tighten the screws evenly.
10. Check the rotational clearance on the output shaft.
 - You must notice a light rotational clearance;
 - If there is no or too much rotational clearance, repeat the procedure.
11. Switch on the variable-speed gearmotor:
 - Slowly move through the speed range.
 - Drive runs smoothly and evenly;
 - if the drive does not run smoothly and evenly, check the correct installation of the drive.

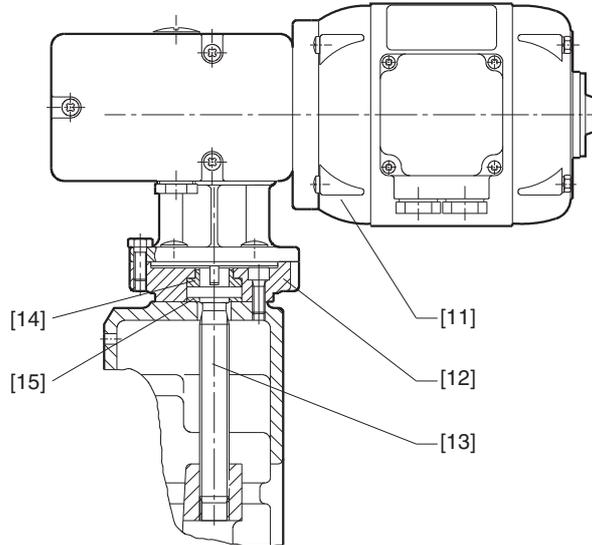


Inspection/Maintenance

Regreasing the EF/EFPA adjustment spindle

6.7 Regreasing the EF/EFPA adjustment spindle

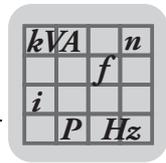
The following figure shows an adjustment motor with adjustment spindle:



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[11] Variable motor	[14] Socket
[12] Intermediate flange	[15] Washer
[13] Adjustment spindle	

1. Disassemble the adjustment motor [11] and the intermediate flange [12].
2. Unscrew the adjustment spindle [13] from the drive via CW rotation.
3. Lubricate adjustment spindle [13] with well-adhering lubricant, such as "Never Seez normal".
4. Assemble the parts in opposite order.



7 Technical Data

7.1 Extended storage



INFORMATION

For storage periods longer than 9 months, SEW-EURODRIVE recommends the "Extended storage" type. Gear units in this design are designated with a corresponding label.

For long-term storage, option ../B (in corrosion protection design) is used.

7.2 Lubricant

The adjustment spindle is filled with the grease listed below.

	Ambient temperature	Manufacturer	Type
Lubricant for EF/EFPA	-40 °C to +80 °C	Seiler MS-OIL	Never Seez normal



8 Malfunctions

8.1 VARIMOT® variable speed gear unit

Malfunction	Possible cause	Solution
Drive slipping	Friction ring is worn.	Replace friction ring, see chapter "Replacing the friction ring" (page 32).
	Friction ring or face of adjustment disk is contaminated.	Clean contaminated part: <ul style="list-style-type: none"> • Clean friction ring with dry cloth or paper • Clean drive pulley with solvent or similar product
	Load is too high.	Check picked off power and reduce to catalog values.
Drive gets too hot ¹⁾	Load is too high.	Check picked off power and reduce to catalog values.
	Ambient temperature too high or not taken into account during selection	Reduce the load according to the service factor f_T , see catalog.
Drive is too noisy ²⁾	Friction ring is damaged	1. Eliminate the cause 2. Replace friction ring, see chapter "Replacing the friction ring" (page 32)
Rated motor power is not transferred	Speed range too low	Increase speed range

1) Housing temperatures up to 70 °C are harmless.

2) Damage can occur after brief blocking or impulsive load of the drive, for example.

8.2 Accessory equipment

8.2.1 Electromechanical remote speed control EF, EFPA

Malfunction	Possible cause	Solution
Adjustment speed too slow	Sluggish guide, e.g. due to corrosion, if you do not use a B-design for applications in wet areas	Reduce sluggishness: <ul style="list-style-type: none"> • Remove screws between housing and housing cover • Open drive • Place drive vertically on fan guard • Loosen screws under the plastic cap next to the hand-wheel. • Pull the guide rods out of the drive from the bottom • Grease the guide screws with sticking lubricant, e.g. "Never Seez normal"¹⁾
Impossible to change speed	Device is not connected properly.	Connect device correctly according to wiring diagram.
Speed range is not reached.	Limit switches of the adjustment motor trip too early.	Set the limit switch control cams correctly, see chapter "Limiting the speed range for EF, EFPA" (page 21).
No display	<ul style="list-style-type: none"> • Indicator unit is not connected properly. • Voltage supply is missing or interrupted. 	Connect indicator unit correctly according to wiring diagram.



Malfunction	Possible cause	Solution
Incorrect display	Display not adjusted properly.	Set the display on the back of the unit, see chapter "Limiting the speed range for EF, EFPA" (page 21).

1) Remove, grease and reinstall each guide rod individually.

8.2.2 Contactless FL and DA remote speed indication, IG voltage pulse encoder

Malfunction	Possible cause	Solution
No display and/or no signal	Input sensitivity (distance voltage pulse encoder/screw head) too large or too little.	Correct input sensitivity: <ul style="list-style-type: none"> Reduce/increase distance between IG voltage pulse encoder and screw head, see chapter "Installing, connecting and setting the IG voltage pulse encoder, the analog and digital FL and DA remote speed indicator" (page 23).
	<ul style="list-style-type: none"> Device is not connected properly. Voltage supply is missing or interrupted. 	Connect device correctly according to wiring diagram.

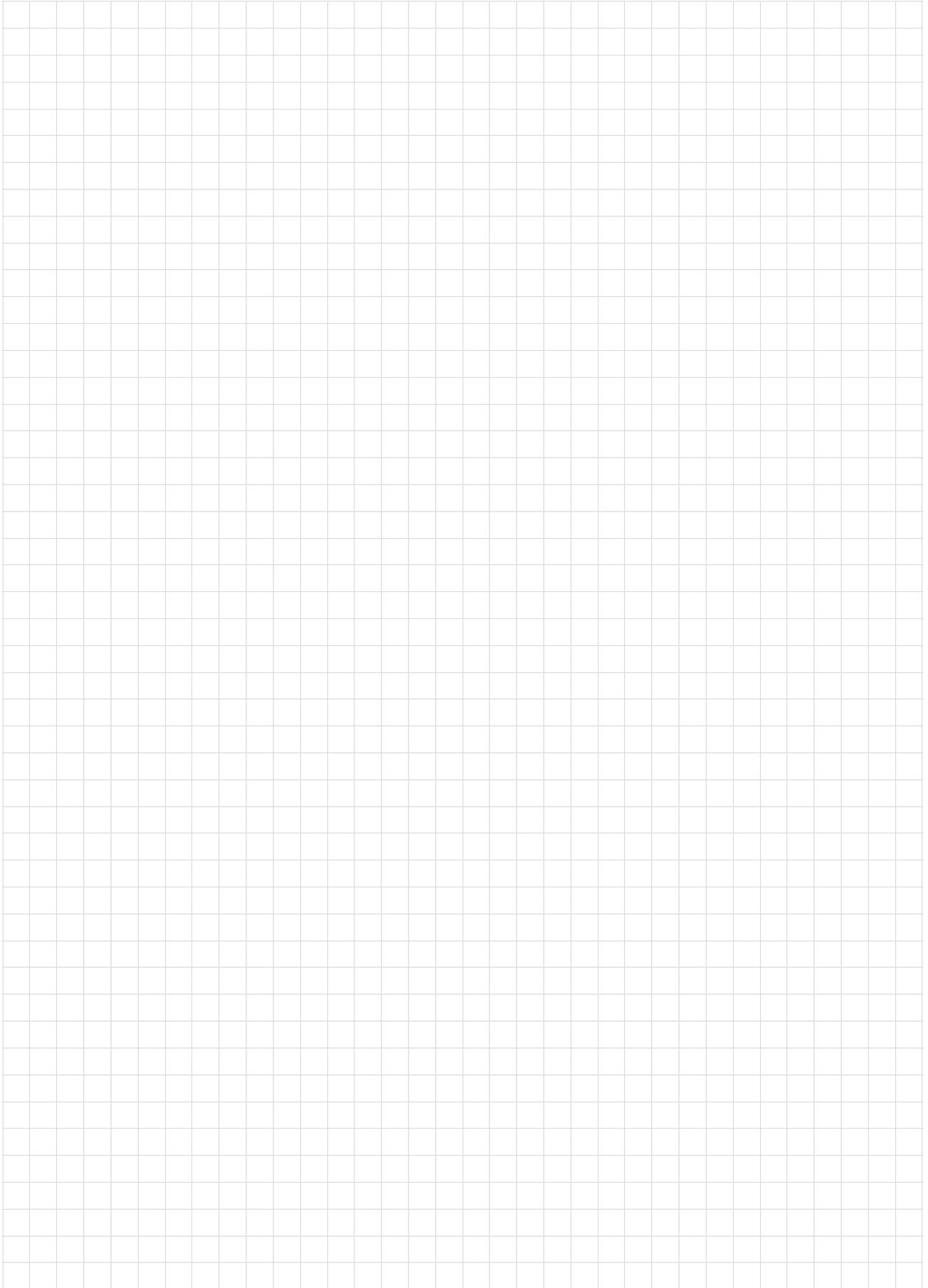


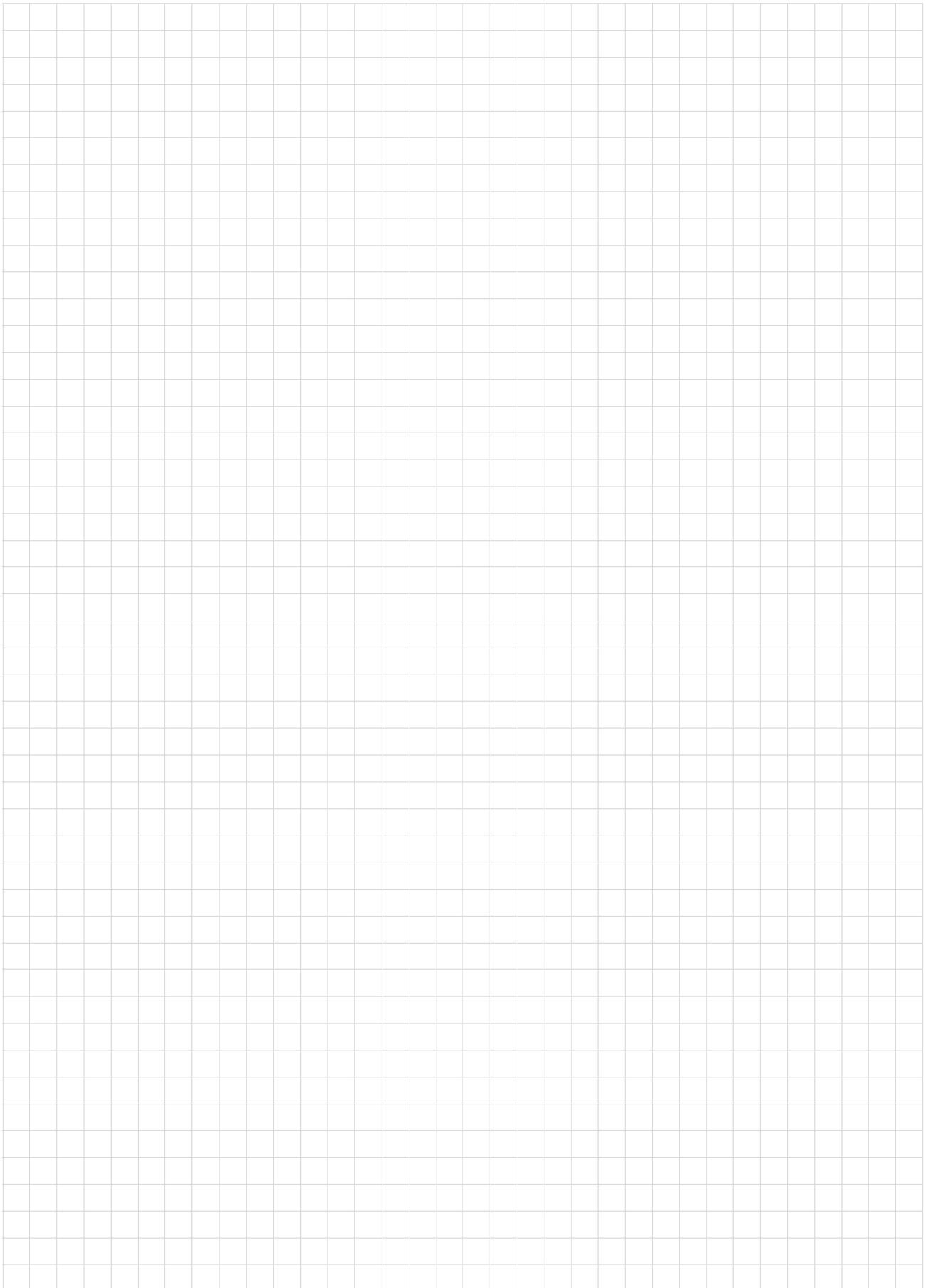
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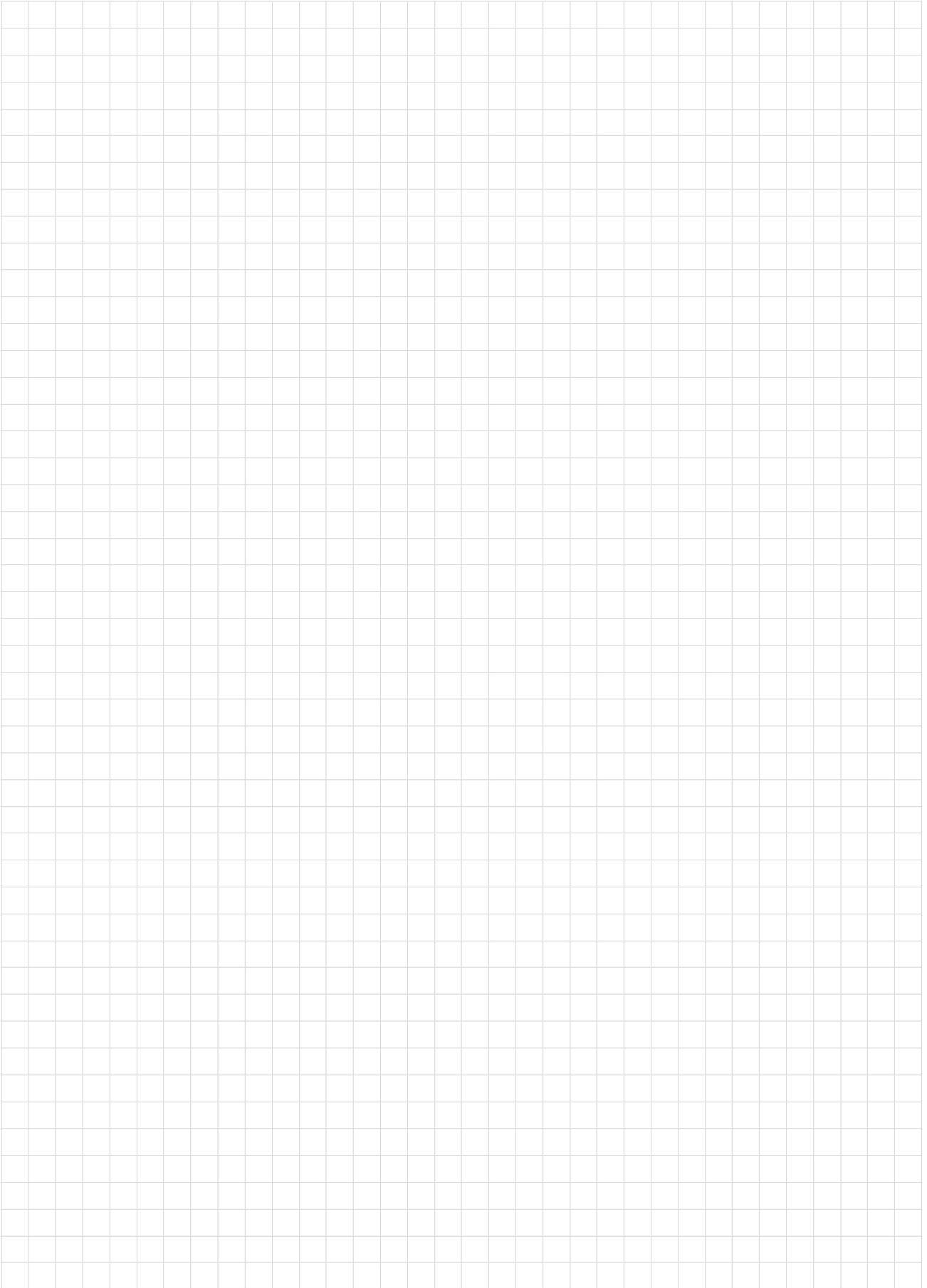
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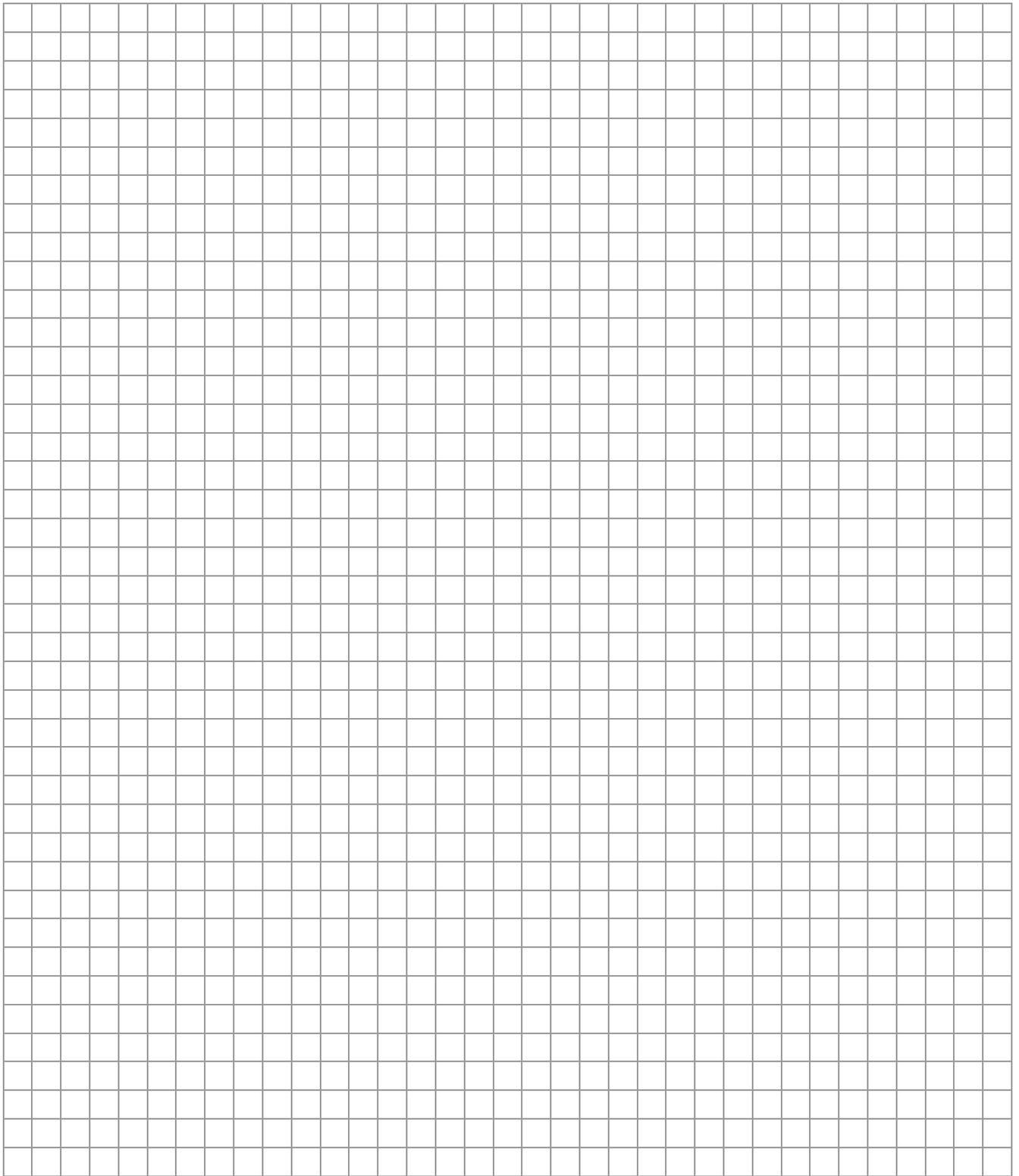


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