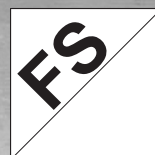
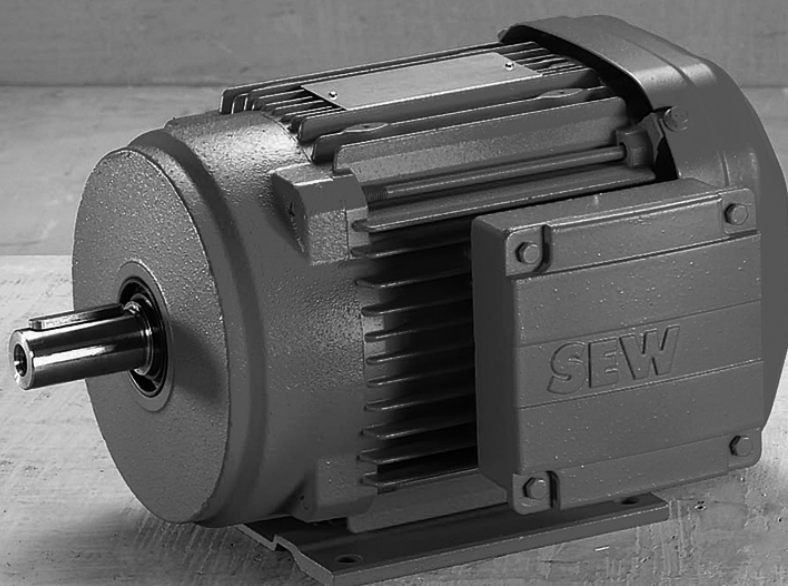




SEW
EURODRIVE

Addendum to the Operating Instructions



Safety Brakes

DR..., DRN..., DRU..., DR2..., EDR..., EDRN.. AC Motors

Functional Safety



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1 General information

1.1 About this documentation

The documentation at hand is the original.

This documentation is an integral part of the product. The documentation is intended for all employees who perform work on the product.

Make sure this documentation is accessible and legible. Ensure that persons responsible for the systems and their 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 if you require further information, contact SEW-EURODRIVE.

1.2 Other applicable documentation

This addendum to the operating instructions contains special information on safety brakes of the DR.., DRN.., DRU.., DR2.., EDR.., and EDRN.. motor series.

For all further components, refer to the corresponding documentation. It is particularly important to observe the following documentation:

- "AC Motors" operating instructions
- "Explosion-Protected AC Motors" (ATEX or IECEx) operating instructions
- "Project Planning for BE.. Brakes" manual
- "Built-In Encoders, Add-On Encoders and Safety Encoders – DR.., DRN.., DRU.., DR2.., EDR.., EDRN.. AC Motors" product manual

1.3 Structure of the safety notes

1.3.1 Meaning of signal words

The following table shows the graduation and meaning of the signal words in the safety notes.

Signal word	Meaning	Consequences if not observed
⚠ DANGER	Imminent danger	Death or severe injuries
⚠ WARNING	Possibly dangerous situation	Death or severe injuries
⚠ CAUTION	Possibly 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.

1.3.3 Meaning of the hazard symbols

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

Hazard symbol	Meaning
	General hazard

1.3.4 Structure of embedded safety notes

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

This is the formal structure of an embedded safety note:

⚠ SIGNAL WORD! Type and source of danger. Possible consequence(s) if disregarded. Measure(s) to prevent danger.

1.4 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.

1.5 Product names and trademarks

The product names mentioned in this documentation are trademarks or registered trademarks of the respective titleholders.

1.6 Copyright notice

© 2024 SEW-EURODRIVE. All rights reserved. Copyright law prohibits the unauthorized reproduction, modification, distribution and use of this document – in whole or in part.

1.7 Content of the documentation

This documentation contains additional safety-related information and conditions for operation in safety-related applications.

2 Safety notes

2.1 Preliminary information

The following general safety notes serve the purpose of preventing injury to persons and damage to property. They primarily apply to the use of products described in this documentation. If you use additional components, also observe the relevant warning and safety notes.

2.2 Designated use

- DR.., DRN.., DRU.., DR2.., EDR.., and EDRN.. motors with functionally safe motor options are intended for industrial systems.
- When installed in machines, starting the designated operation is prohibited until it is determined that the machine complies with the local laws and directives. Machinery Directive 2006/42/EC in particular must be followed in the respective validity.
- In order to determine the achieved safety integrity level (SIL) or performance level (PL) of a system's safety functions, the system manufacturer must perform an overall evaluation. This document contains the product-related specifications necessary for the evaluation.
- Operating DR.., DRN.., DRU.., DR2.., EDR.., and EDRN.. motors with functionally safe motor options on third-party inverters is permitted.
- Before starting the designated use and during the entire operation, make sure that the system complies with the specifications of this documentation, and in particular the technical data.

2.2.1 Safety brakes

- The safety brakes described in this documentation are intended for use with DR.., DRN.., DRU.., DR2.., EDR.., and EDRN.. motors. It is not permitted to mount them on other motors.
- When using an AC motor in combination with a BE.. safety brake, the safety brake may be used only as a holding brake. The designated use is to activate the brake at an idle state (brake application speed $< 20 \text{ min}^{-1}$). Emergency stops from higher motor speeds are permitted.

SEW-EURODRIVE recommends stopping the drive with stop category 1 in accordance with EN 60204-1.

- The BE.. safety brake may only be used at an ambient temperature of -20°C to $+40^\circ\text{C}$.
- The BE.. safety brake is rated for an installation altitude of up to 1000 m above sea level.
- The number of emergency stop braking operations must be limited to avoid overloading the safety brake and gear unit. The maximum number of emergency stop braking operations is configured during project planning.
- There must be a pause between 2 emergency stop braking operations to prevent overheating of the friction system. The required length of the pause is configured during project planning for the safety brake.
- When dimensioning the BE.. safety brake, observe the valid project planning specifications and the resulting application limits of SEW-EURODRIVE. If the application requirements or technical properties of the BE.. safety brake change, project planning and a check of the application limits must be performed again.
- It is not permitted to retrofit the BE.. safety brake or to replace an existing BE.. brake with a BE.. safety brake.
- The BE.. safety brake must not be exposed to the following substances/conditions:
 - Oils
 - Acids
 - Gases
 - Vapors
 - Radiation
- Motors with a BE.. safety brake are not suitable for operation in areas with increased vibration stress of level 1 (vibration level 1).

2.3 Inspection/maintenance

The users can perform work themselves on a drive with functionally safe motor options (can be identified by the FS logo on the motor nameplate).

Any work on the safety encoder and/or the safety brake is carried out at your own risk. The user is responsible and liable for the proper performance of the work described in the corresponding documentation.

The user has to ensure the traceability of the work performed with regard to the functional safety. In the event of proven compliance with the work described in the documentation, the characteristics regarding functional safety described by the manufacturer are maintained.

Use only genuine spare parts in accordance with the valid spare parts list.

3 Functional safety (FS)

3.1 Functionally safe motor options

Motors from SEW-EURODRIVE are also available with the following functionally safe motor options:

- Safety brake
- Safety encoder
- Integrated STO (decentralized inverter)

Functionally safe motor options are designed for implementing safety functions.

SEW-EURODRIVE assumes responsibility for the delivered motor in terms of compliance of the functionally safe motor options (including their safety-relevant mechanical connections) with the functional safety regulations. Safety-relevant mechanical connections are designed as a manipulation indicator and marked as follows:

- Safety brake: locking compound
- Safety encoder: retaining ring or adhesive label

If these markings are damaged, there is a deviation from the delivery state.

3.2 Safety brake

Safety brakes from SEW-EURODRIVE are characterized by their exceptional reliability as well as electronic and mechanical load capacity.

Safety brakes allow you to increase the safety in your machines by implementing safety functions for deceleration and stopping. The safety brake represents the safety-relevant actuator in the intelligent interaction of sensor, control, and actuator.

The safety brakes cannot trigger a safe state at the machine autonomously. The brakes must be augmented in the overall system with suitable brake control and monitored by means of a brake test, if necessary. The overall system triggers a suitable error response, e.g. the safe state, on request.

3.3 Safety encoders

Safety encoders from SEW-EURODRIVE are characterized by their exceptional reliability as well as electronic and mechanical load capacity.

Safety encoders allow you to improve the safety of your machines by implementing safety functions in relation to their speed, direction of rotation, idle state, relative position, or absolute position. The safety encoder provides the safety-relevant signals in the intelligent interaction of sensor, control, and actuator.

The safety function requires a reliable mechanical connection between encoder and motor. At SEW-EURODRIVE, this connection is dimensioned in such a way that fault exclusion is achieved.

The safety encoders cannot trigger a safe state at the machine autonomously. Therefore, they have to be monitored in the overall system. In case the encoder or the evaluation electronics detects a fault, a fault response, such as safe state, is initiated in the overall system.

3.4 General information

When implementing safety functions in machines, it is necessary to evaluate in particular whether the components to be used are suitable in terms of functional safety. When using functionally safe motor options from SEW-EURODRIVE, the following safety-related requirements, e.g. in accordance with EN ISO 13849 – parts 1 and 2, are already taken into account:

- Application of basic safety principles
- Application of proven safety principles
- Use of proven components
- Specifications on failure probability (B_{10D} , $MTTF_D$, or PFH_D)
- Common cause failure (CCF)
- Determination of the system structure (HFT) and/or the category (Cat.)
- Determination of the safety integrity level (SIL) and/or the performance level (PL)
- Determination of the service life
- Production monitoring with 100% final inspection
- Retraceability by the unique motor assignment
- Notice of influences and ambient conditions
- Compliance with normative requirements regarding documentation

As an advantage for the machine designer, SEW-EURODRIVE has already fulfilled these safety-relevant requirements for functionally safe motor options. In the overall analysis of safety technology, the machine designer can rely on the manufacturer's confirmation, e.g. based on the product documentation or the German Technical Inspection Association (TÜV) certificate. The internal effort required for evaluation and documentation is reduced considerably.

If other components (standard components) are used for implementing safety functions, the machine designer has to evaluate the safety-related requirements.

3.5 FS marking

SEW-EURODRIVE labels a functionally safe motor option at the drive with an FS logo and a 2-digit number on the motor nameplate. The number is a code that indicates which components in the drive are safety-related. This makes it possible to uniquely identify an available functionally safe motor option via the motor nameplate.

Make sure you observe any present FS logo on the nameplate and its meaning according to the following table:

FS logo	Available functionally safe motor option		
	Decentralized in-verters	Safety brake	Safety encoders
	X		
		X	
			X
	X		X
		X	X

X The motor option is functionally safe.

If the FS logo, e.g. with the code "FS 11" is present on the motor nameplate, the motor includes a combination of safety encoder and safety brake. Drives can also be equipped with 2 encoders, e.g. built-in encoder and add-on encoder. In such cases, the FS logo for the safety encoder always relates to the add-on encoder. If an FS logo is available, adhere to the information specified in the corresponding documentation.

If the FS logo with the code "FS 0X" is present on the motor nameplate, a special design related to functional safety is installed at the motor.

Observe the information concerning the special design in the documentation.

3.6 Retraceability

Functionally safe motor options can be retraced by SEW-EURODRIVE with the motor serial number and thus have a unique assignment to the motor.

If the SEW-EURODRIVE service replaces a safety encoder or a safety brake, the retraceability is ensured.

If you replace a functionally safe motor option on your own, you revoke this assignment. To continue the assignment, document the replacement yourself.

3.7 Underlying standards

The safety assessment of the safety brakes is based on the following standards:

	EN 62061 EN 61508	EN 61800-5-2	EN ISO 13849
BE..	–	–	X

Performance level e (PL e) can be achieved if a functionally safe motor option is suitably integrated into a safety system. The requirements (e.g. on the system architecture, required diagnostics and failure probabilities) are to be implemented according to the normative specifications and to the document in hand. If the safety system with safety brakes is to be evaluated in accordance with the safety integrity level (SIL), the necessary verification must be provided by the customer.

3.8 TÜV certification

The following certificate is available for the described safety brakes:

- Certificate of TÜV NORD Systems GmbH & Co. KG

A copy of the TÜV certificate can be obtained from SEW-EURODRIVE.

3.9 Safety sub-functions of the safety brake

The implementation of a safety function with brakes requires that the brake be applied on request. The safety function is activated when the brake is applied. The brake coil has to be de-energized and the energy stored in the brake coil reduced.

By adding a safety brake to a safe overall system, the following safety sub-functions can be implemented:

- SBA (Safe Brake Actuation)
- SBH (Safe Brake Hold)

INFORMATION



The SBA and SBH safety sub-functions are defined by SEW-EURODRIVE based on the standard EN 61800-5-2.

The implementation of the SBA and SBH safety sub-functions additionally require the safety sub-functions SBC and STO in the overall system, in accordance with EN 61800-5-2. For safety-related requests of the brake, SBC and STO ensure that the brake applies and that the drive does not generate a torque against the applied brake.

The SBC and STO safety sub-functions are not part of the brake and have to be additionally implemented in the overall safety system. The performance level (PL) of the SBC and STO safety sub-functions must at least meet the required performance level (PLr) of the application.

SEW-EURODRIVE recommends to stop the drive using stop category 1 according to EN 60204-1 prior to activating the SBC and STO safety sub-functions.

3.10 Brake test

In applications with brakes, the braking torque represents an important criterion for the functional and performance capability of the brake. If the braking torque is reduced or lost, the functionality of the application, the safety of the machine, and/or personal safety can be limited. To check the functional and performance capability of a brake, you can integrate a brake test into the overall system.

Especially for safety-related applications in which the brake performs a safety function, a brake test for the brake may be required by one or more standards, e.g. by EN ISO 13849-1. The brake test is not an independent safety sub-function but supplements a higher-level safety system for brake testing which is required by the standards. The overall system must meet the diagnostic coverage (DC) required by the standards.

A brake test provides you with information about the functional and performance capability of the brake. Potential faults or functional limitations can be detected at an early stage, allowing the necessary maintenance and repair work to be initiated. In a brake system with multiple brakes, each brake must be tested separately. This ensures that the safety function is maintained even if one brake fails.

The functional and performance capability of a brake can be adversely affected by a multitude of potential faults. To summarize, the potential faults can appear in one of the following fault patterns:

Fault pattern	Effect of fault
Brake remains applied	Safe state
Brake remains open	Dangerous state
Insufficient braking torque	Dangerous state
Brake does not release fully	Dangerous state



⚠ CAUTION

Undesired movements of the machine during a brake test due to damaged brake or brake control

Injury to persons and damage to property

- During the implementation and performance of a brake test, ensure that the safety of persons and the machine is guaranteed.



INFORMATION

SEW-EURODRIVE offers various types of brake tests. These brake tests can be used to implement safety functions with brakes in horizontal and vertical applications up to performance level e.

3.11 Motor combinations

3.11.1 Safety brake

Motor combinations with BE.. brake

Different brake sizes and braking torque steps are available for the various motor series.

DRN../DRU../DR2.. motors with BE.. safety brake are also available in combination with MOVILINK® DDI. Note that in this combination, only brake controls in the control cabinet are permitted for the safety brake (see chapter "Combination of safety brake and brake control" (→ 34)).

The following tables show the possible combinations of motor and brakes as well as the available braking torque graduations:

(E)DR..	–	–	71	80	–	90 100	112 132	160	180	200 225	250 280	315
(E)DRN../DRU../ DR2..	56	63	71	80	90	100	112 132S	132M 132L	160 180	200 225	250 280	315
BE02	✓											
BE03		✓	✓									
BE05			✓	✓	✓							
BE1			✓	✓	✓	✓						
BE2				✓	✓	✓						
BE5					✓	✓	✓					
BE11							✓	✓				
BE20								✓	✓			
BE30									✓	✓		
BE32									✓	✓		
BE60										✓	✓	
BE62										✓	✓	
BE120											✓	✓
BE122											✓	✓



Combination available



Combination available, optionally available as safety brake

Braking torque graduations

Depending on the demands placed on the brake, different braking torque graduations are available depending on the brake size.

The following table shows the maximum braking torque (M_{Bmax}) as well as the available braking torque graduations (M_B) in Nm.

Available braking torque graduations (M_B)	Brake (M_{Bmax})								
	BE03 (3.4)	BE05 (5)	BE1 (10)	BE2 (20)	BE5 (55)	BE11 (110)	BE20 (200)	BE30 (300)	BE32 (600)
0.9	✓								
1.3	✓								
1.7	✓								
1.8		✓							
2.1	✓								
2.5		✓							
2.7	✓								
3.4	✓								
3.5		✓							
5		✓	✓	✓					
7			✓	✓					
10			✓	✓					
14				✓	✓				
20				✓	✓	✓			
28					✓	✓			
40					✓	✓	✓		
55					✓	✓	✓		
75								✓	
80						✓	✓		
100								✓	✓
110						✓	✓		
150							✓	✓	✓
200								✓	✓
300							✓	✓	✓
400									✓
500									✓
600									✓

✓	Available
✓	Available, not available for BE.. safety brake.

INFORMATION



Note that for the BE.. safety brake, some of the reduced braking torque steps are not available in combination with the manual brake release option. Contact SEW-EURODRIVE, if necessary.

3.12 Acceptance

The system manufacturer has to perform an overall evaluation for determining the safety of a machine.

The effectiveness of each risk minimization must be checked. It must also be checked if the required safety integrity is reached for each implemented safety function.

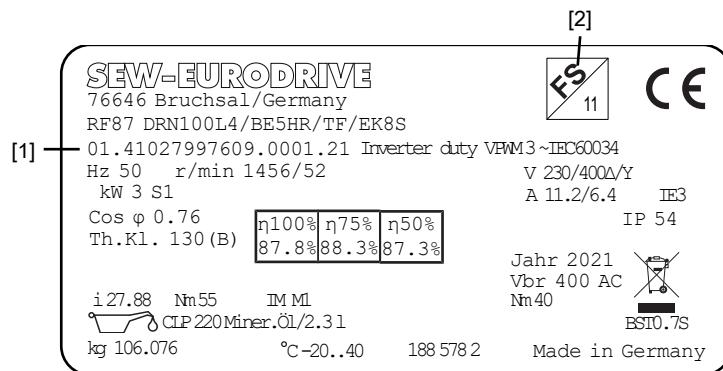
To validate the safety integrity level you can use the "SISTEMA" calculation tool from the Institut für Arbeitsschutz (Institute for Occupational Safety and Health of the German Social Accident Insurance).

4 Motor structure

4.1 Nameplates

4.1.1 Motor

The following figure shows an example motor nameplate with FS logo:



36067931403

- [1] Motor serial number
[2] FS logo for functional safety

4.1.2 Safety brake

The following figure shows an example self-adhesive label of a safety brake with FS mark:



9007203740398475

- [1] Identification number of the brake:
- 0001.: Plant
 - 123456789012.: Serial number of the brake
 - 160112: Date of production (DDMMYY)
- [2] Assembly order number
[3] Brake and brake size
[4] Data matrix
[5] FS mark

The design as a safety brake is marked on the motor nameplate, see chapter "FS mark".

5 Mechanical installation

5.1 General information

INFORMATION



Note that greases and oils must not be allowed on the mechanical connections of the safety components during assembly or operation.

5.2 Manual brake release

If the /HR manual brake release was ordered, the safety brake with manual brake release is preinstalled and set at the factory.

INFORMATION



The manual brake release /HR must not be retrofitted, see corresponding operating instructions.

The brake option manual brake release /HF is not permitted and must not be retrofitted.

6 Electrical installation

6.1 Thermal motor monitoring

The following potential fault patterns of a brake can lead to an impermissible increase in the motor temperature:

- Brake remains applied
- Brake does not release fully

If a safety brake is used, one of the following options for thermal monitoring of the motor must be employed:

- Motor protection /TF or /PI
- Temperature detection /PK, /PT, or /KY

6.2 Brake control

The brake is released electrically. The brake applies after the voltage is switched off. The braking or stopping takes place mechanically.

These voltage disconnection types are distinguished:

- Functional control
Control of the brake outside functional safety.
- Safe control
Control of the brake for the use in functional safety.

6.3 Permitted brake controls

The supply of the safety brake must be achieved by a brake control. There are several designs for this purpose which are either designated for installation in the motor connection space or for installation in the control cabinet. The following supply types are **not permitted** for BE.. safety brake:

- Operation without brake control (DC direct voltage supply)
- Operation with third-party control
- Operation with integrated brake control with MOVILINK® DDI (e.g. BG1Z, BS1Z)
- Supply via motor terminal board (direct wiring)

The permissible brake controls can be found in chapter "Technical data" (→ 31). Connection may only be performed according to the valid wiring diagram enclosed.

7 Inspection/maintenance

7.1 Inspection and maintenance intervals

7.1.1 Safety brake

Inspect and maintain the safety brake in accordance with the configured inspection and maintenance intervals or every 0.5 to 2 years, depending on the operating conditions.

When using the diagnostic unit /DUE, the wear output of the evaluation unit will show that brake maintenance is required. You can use the air gap proportional analog signal to plan brake maintenance.

INFORMATION



Wear times are subject to many factors and can therefore be quite short. The system manufacturer must calculate the required inspection and maintenance intervals individually in accordance with the project planning documents.

INFORMATION



SEW-EURODRIVE recommends commissioning the Service of SEW-EURODRIVE for the performance of the maintenance work. This applies in particular to all steps that require the marked, safety-relevant connections to be opened.

If maintenance work is performed independently, the responsibility and liability for the proper performance of the work described in the corresponding documentation passes to the user. Please refer to the chapters "Functional safety (FS)" (→ 11) and "Other applicable documentation" (→ 5).

Type of work	Work permitted?	Comments
Replacement of safety brake	Yes	Replacement with safety brake of identical design, incl. options. Deviating product designs require a check of the configuration and the applicative suitability.
Replacement of an existing BE.. brake with a BE.. safety brake	No	If required, contact SEW-EURODRIVE.
Changing the braking torque	Yes	Requires replacement of the safety brake.
Checking the air gap and readjusting if necessary	Yes	Observe minimum permitted brake lining carrier thickness. See chapter "Working air gap" (→ 32).
Replacement of individual parts of the BE.. safety brake	Yes	Replacement of the following spare parts is permitted: • Sealing strip [66] • Clamping strap, if necessary [157] • Sealing ring [95] • Hex nut [61]
Replacement of the driver	Yes	–

Type of work	Work permitted?	Comments
Retrofit of manual brake release /HR	No	If required, contact SEW-EURODRIVE.
Replacement of manual brake release /HR ¹⁾	Yes	Observe the permitted position of the manual brake release.
Retrofit of diagnostic unit /DUE	Yes	Requires replacement of the safety brake.
Replacement of diagnostic unit /DUE ¹⁾	Yes	–
Retrofit of brake monitoring /DUB	Yes	Requires replacement of the safety brake.
Replacement of brake monitoring /DUB ¹⁾	Yes	–
Setting brake monitoring /DUB (switching point) ¹⁾	Yes	–

1) If the option is available.

7.2 Preliminary work for motor and brake maintenance

7.2.1 General information

Proceed as described in the respective documentation to remove and install the encoder/safety encoder and/or forced cooling fan.

Before you complete the maintenance work, restore all protection devices at the drive.

INFORMATION



Observe the following points for inspection and maintenance:

- When replacing the safety brake due to a defect of the brake coil, always replace the brake control as well.
- Observe the information in the respective operating instructions.

INFORMATION



For all numbers of spare parts needed during maintenance work (e.g. screws [900]), refer to the respective exploded view drawings in the relevant operating instructions.

7.2.2 Wear parts

NOTICE

Use of incorrect wear parts or a brake differing from the original.

Loss of the safety function.

- Replace the brake only with an identical brake including all options as delivered from SEW-EURODRIVE.

If the brake is replaced, replace the following wear parts:

- Screws [900] (only (E)DRN../DRU../DR2..71 with BE03, (E)DR..90 – 225, (E)DR../DRU../DR2..90 – 225)
- Gasket [392] (only (E)DR..71 – 80, (E)DRN../DRU../DR2..71 – 80)
- Sealing ring [95]
- O-ring [901] (only (E)DR..160 – 225, (E)DRN../DRU../DR2..132M – 225)
- Gasket [901] (only (E)DR..90 – 132, (E)DRN../DRU../DR2..63 - 71, (E)DRN../DRU../DR2..90 – 132S)
- Motor tie rods [13] (only (E)DR..71 – 80, (E)DRN../DRU../DR2..71 – 80)

In case of visible wear or damage to the driver, also replace the following parts:

- Driver [70]
- Key [71]
- Retaining ring [62]

Order these wear parts from SEW-EURODRIVE prior to the brake replacement.

INFORMATION



To order the correct design of the brake and the wear parts, the item number of the spare and/or wear parts and the serial number of the drive (see motor nameplate) are required.

7.2.3 Order information for operating supplies and auxiliary material for maintenance

The following table lists the various operating supplies and auxiliary materials that are required for correct maintenance:

Usage	Manufacturer	Operating supply/auxiliary material	Part number	Quantity	Place of use	Motors
Sealing compound	Marston-Domstel	SEW-L-Spezial	09112286	80 g	[550]	All designs
Thread locking compound	Henkel	LOCTITE® 241	–	–	[13]	(E)DRN../DRU../DR2..63 – 80
					[900]	(E)DR..90 – 160 (E)DRN../DRU../DR2..90 – 132L
		LOCTITE® 243	–	–	[900]	(E)DR..180 – 225 (E)DRN../DRU../DR2..160 - 225
Anti-corrosion agent	SEW-EURODRIVE	NOCO-Paste	09107819	5.5 g	[70]	All designs

Observe the operating instructions for the particular motor regarding the lubrication of the oil seals on the motor and of the motor rolling bearings.

7.2.4 Drive with encoder/safety encoder

If an encoder/safety encoder is mounted onto the drive, then this must be disassembled before performing motor and brake maintenance.

⚠ WARNING



Loss of the safety functions due to a faulty mechanical connection between the motor and the safety encoder.

Severe or fatal injuries.

- To ensure the exclusion of any errors in the mechanical connection between the motor and the safety encoder, comply with the following points in accordance with EN 61800-5-2:
 - Perform a proper disassembly/assembly according to the corresponding documentation.
 - Replace worn or damaged components.
 - Adhere to the tightening torques specified in the corresponding documentation.

Note that the work steps for a safety encoder differ from an encoder without safety technology (standard encoder).

First, check the FS logo on the motor nameplate to ascertain whether a safety encoder is installed (see chapter "FS mark").

To perform the disassembly and assembly of the encoder/safety encoder, proceed as described in the "Built-In Encoders, Add-On Encoders and Safety Encoders – DR..., DRN..., DRU..., DR2..., EDR..., EDRN.. AC Motors" product manual.

7.3 Inspection of (E)DR..71 – 225, (E)DRN../DRU../DR2..63 – 225 brakemotors

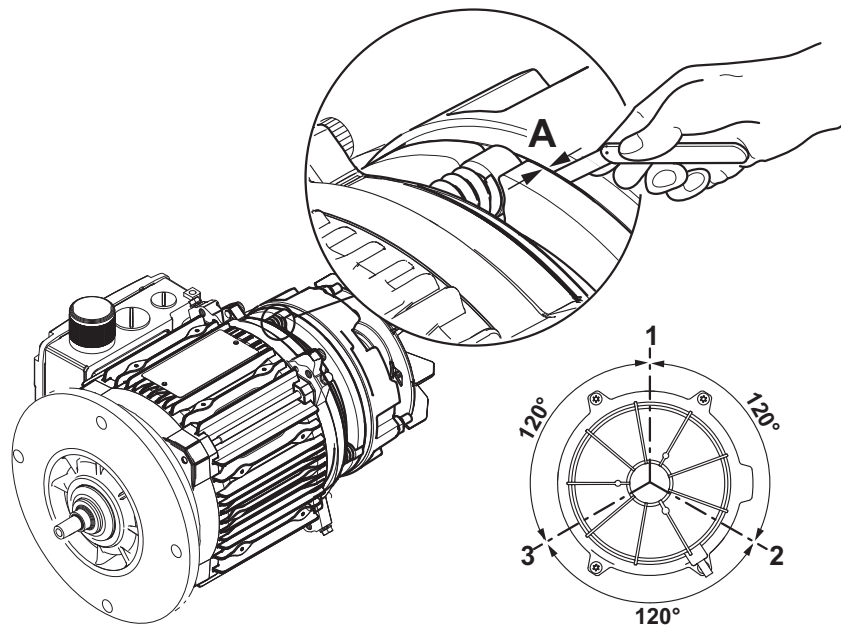
INFORMATION



If the drive is equipped with surface protection and corrosion protection, you must reestablish those measures after any work on the drive.

7.3.1 Setting the working air gap of brakes BE05 – BE32

- ✓ Before starting to perform any work on the motor, disconnect the motor and all mounted options from the power supply and secure the motor against unintentional power-up.
 - ✓ First identify if a safety encoder is present. Refer to chapter "Drive with encoder/safety encoder" (→ 26) for further information.
1. If present, remove the fan guard [35], the forced cooling fan [170], and the encoder [220].
 2. Shift the sealing strip [66]. To do so, release the clamping straps [157] if necessary.
 3. Remove the brake abrasion.
 4. Measure the working air gap A with a feeler gauge according to the figure at 3 points offset by 120°.



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5. Refer to chapter "Working air gap" (→ 32) for the correct values.
 - ⇒ If the correct value for the working air gap is exceeded or too low, correct it according to the documentation or contact the SEW-EURODRIVE Service to set the working air gap correctly.
6. Install the sealing strip [66] and, if necessary, the clamping straps [157].
7. Install the fan guard [35] or the forced cooling fan [170].
8. Install the disassembled parts.

7.3.2 Measuring the wear of BE03 brakes

The working air gap of BE03 brakes cannot be adjusted. Check the stroke of the pressure plate during maintenance.

Replacing individual parts of the brake is not permitted.

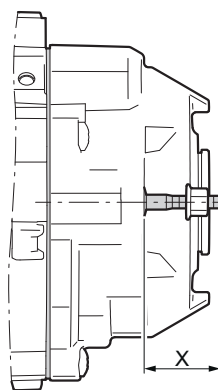
✓ The motor and all connected options are disconnected from the power supply.

✓ The motor is protected against unintended restart.

1. Measure the dimension "X" at the stroke of the studs when the brake is released or applied using a depth gauge or slide gauge.

⇒ The difference between both values is the working air gap.

⇒ The maximum permitted working air gap is 0.65 mm. Replace the brake in case this value is exceeded.



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7.4 Brake replacement

A precise description of the brake replacement can be found in the relevant operating instructions. In the case of safety brakes, observe the following tightening torques and use LOCTITE® to lock the threads:

Motors	Screw	Tightening torque in Nm ¹⁾	LOCTITE®
(E)DR..71 – 80 (E)DRN../DRU../ DR2..63 - 80	M5	5	241
(E)DR..90 – 100 (E)DRN../DRU../ DR2..90 - 100	M6	10.3	241
(E)DR..112 – 160 (E)DRN../DRU../ DR2..112 - 132	M8	25.5	241
(E)DR..180 (E)DRN../DRU../ DR2..160 - 180	M10	50	243
(E)DR..200 – 225 (E)DRN../DRU../ DR2..200 - 225	M12	87.3	243

1) Tolerance $\pm 10\%$

7.5 Diagnostic unit /DUE and /DUB for function and wear monitoring

The following setting values apply for the BE.. brake if it is designed as a safety brake.

7.5.1 Option /DUB

The setting as well as the setting values of option /DUB are described in detail in the related operating instructions.

7.5.2 Option /DUE

The evaluation unit has a 5-pin DIP switch that is labeled with the numbers 1 to 5. Use it to set the measuring range and the maximum permitted wear limit (maximum working air gap).

To activate the DIP switch $\triangle 1$, push the switch upwards. To deactivate the DIP switch $\triangle 0$, push the switch downwards.

The table in chapter "DIP switch setting values for option /DUE" ($\rightarrow$ 30) shows the DIP switch settings of the evaluation unit for the maximum working air gap if a safety brake is present.

1. Check the set value. Correct the setting value according to the following tables, if necessary.
2. Check the setting values of the DIP switches and calibrate the infinite value again, if necessary. Refer to the corresponding operating instructions for detailed instructions.

INFORMATION



Set the DIP switches only in a de-energized state.

7.5.3 DIP switch setting values for option /DUE

The following tables show the setting values of the DIP switches for the option /DUE when the brake is designed as a safety brake.

S1	S2	S3	S4	S5	Wear limit	BE1 – 2	BE5
Sensor Ø 6 mm							
0	0	0	0	0	1.2 mm		
0	0	0	0	1	1.1 mm		
0	0	0	1	0	1.0 mm		
0	0	0	1	1	0.9 mm		
0	0	1	0	0	0.8 mm		
0	0	1	0	1	0.7 mm		✓
0	0	1	1	0	0.6 mm	✓	
0	0	1	1	1	0.5 mm		

S1	S2	S3	S4	S5	Wear limit	BE11 – 30	BE32
Sensor Ø 8 mm							
1	0	0	0	0	1.2 mm		
1	0	0	0	1	1.1 mm		
1	0	0	1	0	1.0 mm		
1	0	0	1	1	0.9 mm		
1	0	1	0	0	0.8 mm		✓
1	0	1	0	1	0.7 mm	✓	
1	0	1	1	0	0.6 mm		
1	0	1	1	1	0.5 mm		



Factory setting

Setting possible in addition

8 Technical data

8.1 Safety brakes

8.1.1 Braking work until maintenance

When using a brake as safety brake, the braking work until maintenance is reduced according to the following table.

Brake size	Braking work until maintenance ($W_{\text{insp}} \times 10^6 \text{ J}$)			
FS code	– Brake	FS04/FS07 Brake in combination with safety encoder	FS02 Safety brake	FS11 Safety brake in combination with safety encoder
BE02	15	–	–	–
BE03	200	200	200	200
BE05	120	120	120	120
BE1	120	120	120	120
BE2	180	180	180	180
BE5	390	390	270	270
BE11	640	640	285	285
BE20	1000	1000	445	445
BE30	1500	1500	670	670
BE32	1500	1500	670	670
BE60	2500	2500	–	–
BE62	2500	2500	–	–
BE120	390	390	–	–
BE122	300	300	–	–

8.1.2 Working air gap

The following values apply for brakes with the design safety brake:

Brake	Working air gap mm		Brake lining carrier mm
	Min. ¹⁾	Max.	Min.
BE03	0.25	0.65	— ²⁾
BE05	0.25	0.6	11
BE1	0.25	0.6	11
BE2	0.25	0.6	11
BE5	0.25	0.7	11
BE11	0.3	0.7	12.5
BE20	0.3	0.7	12.5
BE30	0.3	0.7	12.5
BE32	0.4	0.8	12.5

1) When checking the working air gap, note: After a test run, parallelism tolerances on the brake lining carrier may give rise to deviations of ± 0.15 mm.

2) The brake lining carrier of BE03 cannot be replaced. Once the maximum working air gap has been reached, the brake must be replaced.

8.1.3 Safety characteristics

INFORMATION



In addition to the documentation, you can also obtain the characteristic safety values of components from SEW-EURODRIVE in the SEW-EURODRIVE library for the SIS-TEMA software tool. The documentation and the library are available for download from www.sew-eurodrive.com.

	Characteristic safety values according to EN ISO 13849-1	
Classification	Category 1	
System structure	Single-channel (Cat. 1)	
Operating mode	High demand	
Safe state	The brake is applied	
Safety sub-functions	Safe brake actuation (SBA)	
	Safe brake hold (SBH)	
Service life	20 years or T_{10D} value (depending on which value occurs first)	
T_{10D} value	$0.1 \times MTTF_D$	
$MTTF_D$ value	Calculation via B_{10D} value	
B_{10D} value	BE03	24×10^6
	BE05	20×10^6
	BE1	16×10^6
	BE2	12×10^6
	BE5	10×10^6
	BE11	8×10^6
	BE20	5×10^6
	BE30	3×10^6
	BE32	3×10^6

8.1.4 Combination of safety brake and brake control

The following tables show the permitted and prohibited combinations of safety brake and brake control.

Installation in the control cabinet

Brake control	Voltage range V	Safety brake			
		BE03	BE05 BE1 BE2	BE5 BE11 BE20	BE30 BE32
BST 0.6S	AC 460	✓	✓	✓	✓
BST 0.7S	AC 400	✓	✓	✓	✓
BST 1.2S	AC 230	✓	✓	✓	✓
SBM S-230-120	AC 230	✓	✓	✓	–
SBM S-400-120	AC 400	✓	✓	✓	✓
SBM S-460-120	AC 460	✓	✓	✓	✓
SBM S-230-250	AC 230	✓	✓	✓	✓
SBM S-400-250	AC 400	✓	✓	✓	✓
SBM S-460-250	AC 460	✓	✓	✓	✓
BMS 1.4	AC 230 – 575	✓	✓	–	–
BMS 1.5	AC 150 – 500	✓	✓	–	–
BMS 3	AC 24 – 150	✓	✓	–	–
BME 1.4	AC 230 – 575	✓	✓	✓	✓
BME 1.5	AC 150 – 500	✓	✓	✓	✓
BME 3	AC 42 – 150	✓	✓	✓	✓
BMP 1.4	AC 230 – 575	✓	✓	✓	✓
BMP 1.5	AC 150 – 500	✓	✓	✓	✓
BMP 3	AC 42 – 150	✓	✓	✓	✓
BMK 1.4	AC 230 – 575	✓	✓	✓	✓
BMK 1.5	AC 150 – 500	✓	✓	✓	✓
BMKB 1.5	AC 150 – 500	✓	✓	✓	✓
BMK 3	AC 42 – 150	✓	✓	✓	✓
BMH 1.4	AC 230 – 575	✓	✓	✓	✓
BMH 1.5	AC 150 – 500	✓	✓	✓	✓
BMH 3	AC 42 – 150	✓	✓	✓	✓
BMV 5	DC 24	✓	✓	✓	–

✓

–

Permitted

Not permitted

Installation in the motor connection space

Brake control	Voltage range V	Safety brake			
		BE03	BE05 BE1 BE2	BE5 BE11 BE20	BE30 BE32
BG 1.2	AC 90 – 500	✓	–	–	–
BG 1.4	AC 230 – 575	–	✓	–	–
BG 1.5	AC 150 – 500	–	✓	–	–
BG 2.4	AC 24 – 90	✓	–	–	–
BG 3	AC 42 – 150	–	✓	–	–
BGE 1.4	AC 230 – 575	–	✓	✓	✓
BGE 1.5	AC 150 – 500	–	✓	✓	✓
BGE 3	AC 42 – 150	–	✓	✓	✓
BSG	DC 24	–	✓	✓	–
BS 24	DC 24	–	✓	–	–
BG1Z	AC 200 – 500	–	–	–	–

✓ Permitted
– Not permitted

9 Checklists

The checklists enable you to document the performed and safety-relevant work during the replacement of a safety brake.

9.1 Checklist for BE03 brake assembly

Drive and brake data	
Assembled by:	
Date:	
Drive designation:	
Motor serial number:	
Brake:	
Brake identification number:	
Working air gap, brake 2x:	

Motor size	Required wear parts	Quantity
All sizes	Brake premounted [550], key [71], driver [70], retaining ring [62], flat gasket [901]	1 each
(E)DRN../DRU../DR2..63	Screws [19]	3
(E)DR..71, (E)DRN../DRU../DR2..71	Screws [900]	3
(E)DRN../DRU../DR2..63	Oil seal [95]	1

Work performed	(E)DRN../ DRU..DR2..63	(E)DRN../DRU../ DR2..71
Key [71] installed in rotor	☐	☐
Driver [70] installed on rotor	☐	☐
Retaining ring [62] to secure the driver [70] installed	☐	☐
Flat gasket [901] placed on brake endshield	☐	☐
Brake cable of the brake [550] fed into terminal box	☐	☐
Brake [550] placed on motor	☐	☐
Screws [19] moistened with LOCTITE® 241 and secured (tightening torque 5 Nm)	☐	–
Screws [900] moistened with LOCTITE® 241 and secured (tightening torque 5 Nm)	–	☐
Oil seal [95] installed	☐	☐

9.2 Checklist for BE05 – 32 brake assembly

Drive and brake data			
Assembled by:			
Date:			
Drive designation:			
Motor serial number:			
Brake:			
Brake identification number:			
Working air gap, brake 3x:			

Motor size	Required wear parts	Quantity
All sizes	Brake premounted [550], key [71], driver [70], retaining ring [62]	1 each
(E)DR../(E)DRN../DRU../DR2..71 – 80	Gasket [392]	1
(E)DR../(E)DRN../DRU../DR2..90 – 225	O-ring/gasket [901]	1
(E)DR../(E)DRN../DRU../DR2..71 – 80	Screws [13]	4
(E)DR../(E)DRN../DRU../DR2..90 – 225	Screws [900]	4
(E)DR../(E)DRN../DRU../DR2..71 – 225	Sealing ring [95]	1

Work performed	(E)DR..71 – 80 (E)DRN../ DRU../ DR2..71 – 80	(E)DR..90 – 132 (E)DRN../DRU../ DR2..90 – 132S	(E)DR..160 – 225 (E)DRN../DRU../ DR2..132M – 225
Key [71] installed in rotor	☐	☐	☐
Driver [70] installed on rotor	☐	☐	☐
Retaining ring [62] to secure the driver [70] installed	☐	☐	☐
Gasket [392] placed on stator	☐	–	–
O-ring/gasket [901] placed on stator	–	☐	☐
Brake cable of the brake [550] fed into terminal box	☐	☐	☐
Brake [550] placed on motor	☐	☐	☐
Screws [13] moistened with LOCTITE® 241 and secured (tightening torque 5 Nm)	☐	–	–
Screws [900] moistened with LOCTITE® 241/243 and secured (tightening torque: M6 = 10.3 Nm, M8 = 25.5 Nm, M10 = 50 Nm, M12 = 87.3 Nm)	–	☐	☐
Sealing ring [95] installed	☐	☐	☐
Brake connector [698] connected	–	–	☐

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Work performed	(E)DR..71 – 80 (E)DRN../ DRU../ DR2..71 – 80	(E)DR..90 – 132 (E)DRN../DRU../ DR2..90 – 132S	(E)DR..160 – 225 (E)DRN../DRU../ DR2..132M – 225
Brake connected in terminal box	☐	☐	☐

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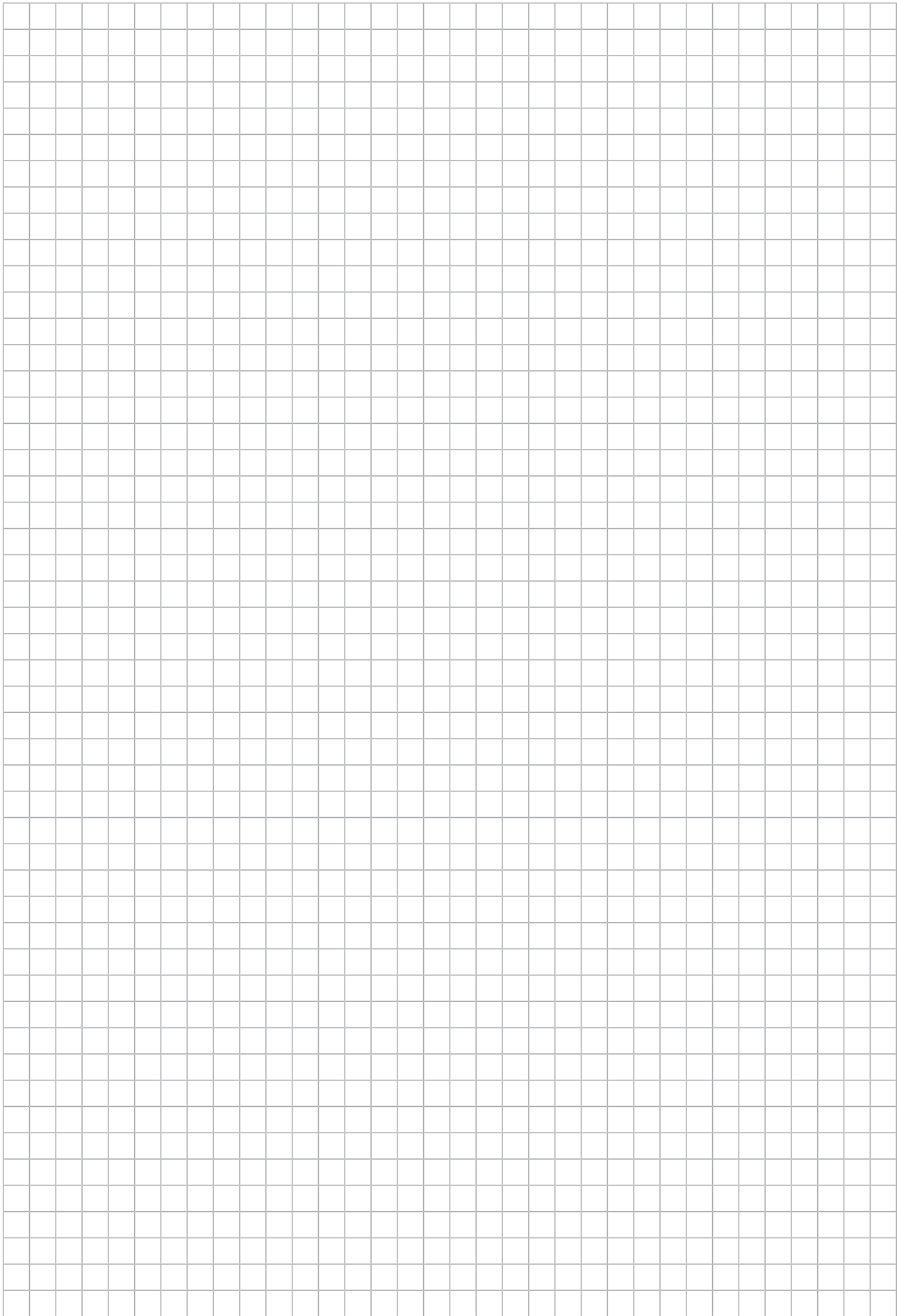
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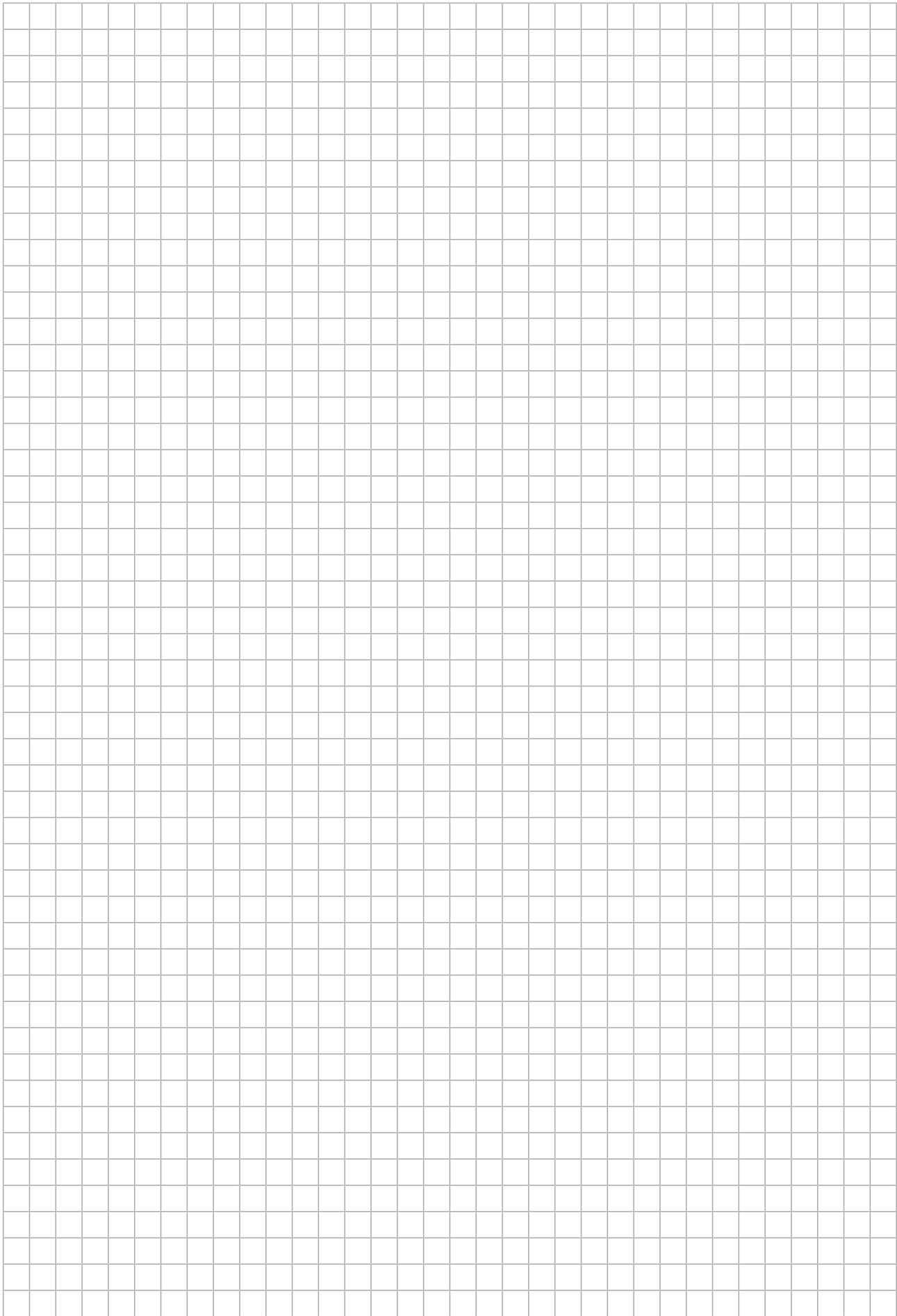
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