

Edition

01/2024

ORIGINAL MOUNTING AND OPERATING INSTRUCTIONS

SIMOGEAR

Geared motor with holding brake for safety-related applications

SIMOGEAR 2332 - Safety-related brake

Geared motors SIMOGEAR Safety-related brake


Operating Instructions


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Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

 DANGER
indicates that death or severe personal injury will result if proper precautions are not taken.

 WARNING
indicates that death or severe personal injury may result if proper precautions are not taken.

 CAUTION
indicates that minor personal injury can result if proper precautions are not taken.

NOTICE
indicates that property damage can result if proper precautions are not taken.


If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Innomotics products

Note the following:

 WARNING
Innomotics products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Innomotics. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Trademarks

All names identified by ® are registered trademarks of Innomotics GmbH. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Introduction

Note

The following pages contain the Siemens logo and the Siemens legal information.

Please note that since July 1st, 2023 the Siemens Businesses **Large Drives Applications** and **Low Voltage Motors** are part of **Innomotics GmbH**, Germany.

All rights to and product information on the following pages have been transferred from Siemens to Innomotics.

The re-branding of the document will take place in due course.

1.1 About SIMOGEAR

Description

SIMOGEAR is the Siemens product family of geared motors in Digital Industry.

1.2 Sales legislation

Typical use cases are listed in this product documentation and in the online help to illustrate possible application areas for our products. These are purely exemplary and do not constitute a statement relating to the suitability of the respective product for use in specific individual cases. Unless explicitly agreed as part of a contract, Siemens assumes no liability relating to such suitability. Suitability for a particular application in specific individual cases must be assessed by the user on a case-for-case basis, taking into account all technical, legal and other requirements. Always observe the descriptions of the technical features and the relevant constraints of the respective product provided in the product documentation.

1.3 About this manual

1.3.1 Content

Description

These operating instructions provide you with information about the geared motors and their associated components. You will learn about safely and professionally handling the geared motors – from the initial delivery up to final disposal:

- Transporting and storing
- Setup and mounting
- Connecting
- Commissioning
- Testing
- Operating
- Searching for and eliminating faults
- Disassembly
- Disposal

Keeping the documentation in a safe place

This documentation should be kept in a location where it can be accessed. Make the documentation available to the personnel that have been deployed.

Description

This documentation includes recommendations relating to third-party products. Siemens is aware of the fundamental suitability of these third-party products. You can use equivalent products from other manufacturers.

Siemens does not accept any warranty when using third-party products.

1.3.2 Target group

Description

These operating instructions address all personnel who work on a geared motor or use a geared motor.

1.3.3 Preventing hazards

The safety instructions provided in these operating instructions are intended to avoid personal injury and material damage. They also guarantee the function and a long service life of the geared motors.

- Read these operating instructions before handling the geared motors.
- Always follow the safety instructions and notices in these operating instructions.

The warning note concept is explained at the beginning of this documentation.

1.3.4 What's new in BA_2332_1121?

Main changes in this edition

Changes

- Address changed from Siemens AG to Innomotics GmbH
- Front covers U1 and U4 adapted

1.3.5 Standard scope

Description

This documentation describes the functionality of the standard scope. This scope may differ from the scope of the functionality of the system that is actually supplied. The functions of the system delivered can only be found in the order documents.

Additional functions may be able to be executed in the system, which are not explained in this documentation. However, these functions cannot be claimed in the case of a new delivery or service.

This documentation does not contain all detailed information on all product types. Furthermore, this documentation cannot take into consideration every conceivable type of installation, operation and service/maintenance.

The machine manufacturer must document any additions or modifications made to the product.

1.3.6 Websites of third-party companies

Description

This document may contain hyperlinks to third-party websites. Siemens is not responsible for and shall not be liable for these websites and their content. Siemens does not check the information that appears on these websites and is not responsible for the content and information provided there. The user bears the full risk when visiting these websites.

1.4 SIMOGEAR documentation

Description

Comprehensive documentation on SIMOTICS, SIMOGEAR and on the SINAMICS converter family are provided in Internet (<https://support.industry.siemens.com/cs/de/en/ps/13204/man>).

You can display documents or download them in the PDF and HTML5 format.

The documentation is divided into the following categories:

Table 1-1 SIMOTICS / SIMOGEAR / SINAMICS documentation

Information	Documentation class ¹⁾	Content	Target group
General information	Configuration Manual	Rules, guidelines and tools for configuring products, systems, and plants. Further: Information about the operating and ambient conditions for hardware and software, the use of functions, as well as about circuit diagrams and terminal diagrams and the installation of software assuming that this is necessary for commissioning.	Planners, application engineers
Device information	Installation Instructions	All relevant information on setting up, installing and cabling as well as the required dimension drawings and circuit diagrams	Installation personnel, commissioning engineers, service and maintenance personnel

Information	Documentation class ¹⁾	Content	Target group
Basic information	Operating instructions	Comprehensive collection of all information necessary for the safe operation of products, plant/system parts and complete plants (IEC 82079)	Machine operators, plant operators
	Compact instructions	Essential contents of the operating instructions in abbreviated and compressed form	Machine operators, plant operators
	Product Information	Information that only becomes known shortly before or even after start of delivery and is therefore not included in the associated user documentation	Planners, configuration engineers, technologists, installation personnel, constructors; commissioning engineers, machine operators, programmers, service and maintenance personnel
	Online help	Instructions for configuring, programming and commissioning	Application engineers, programmers, commissioning engineers

¹⁾ Not all documentation classes are available for every SIMOTICS / SIMOGEAR / SINAMICS product.

1.5 Documentation on the Internet

The manuals for the motors, gearboxes and geared motors are available here: SIOS web site (<https://support.industry.siemens.com/cs/ww/en/ps/13424/man>)



1.6 Service and support

1.6.1 Siemens Industry Online Support on the Web

Description

The following is available via Siemens Industry Online Support (<https://support.industry.siemens.com/cs/ww/en/>), among others:

- Product support
- Global forum for information and best practice sharing between users and specialists
- Local contact persons via the contact person database (→ Contact)
- Information about field services, repairs, spare parts, and much more (→ Services)
- Search for product info

1.7 Important product information

- Important topics at a glance
- FAQs (frequently asked questions)
- Application examples
- Manuals
- Downloads
- Compatibility tool
- Newsletters with information about your products
- Catalogs/brochures

1.6.2 Spare parts services

Description

The online spare part service "Spares on Web" offers certain spare parts for the product:

- Website: SOW address (<https://www.sow.siemens.com/?lang=en>).

1.7 Important product information

1.7.1 Intended use

SIMOGEAR geared motors with safety-related brake has a signal yellow marking (Safety Integrated) on the fan cover.

The brake is stamped as LS on the rating plate.

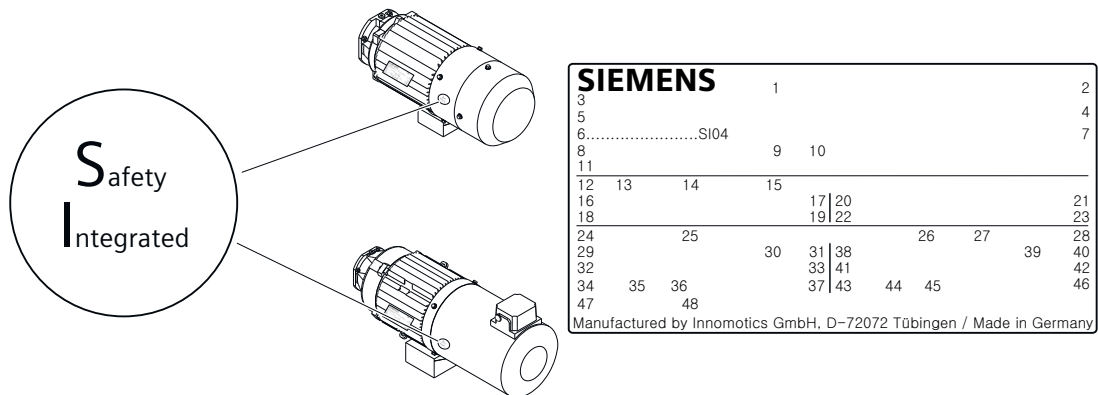



Figure 1-1 Marking for functional safety

The safety-related brake is suitable for use in the following environment	The safety-related brake is not suitable for use in the following environment
Plants and systems whose safety is evaluated and designed to be in compliance with EN 61800-5-2 and/or EN ISO 13849-1 and EN ISO 13849-2	Use in hazardous areas
Typical industrial environment e.g. indoor installation for conveyor technology	Harsh industrial environments e.g. offshore or the chemical industry
	Areas with direct exposure to seawater or splash seawater

The safety-related brakes are intended for use in plants machines and systems. Operate the safety-related brakes under the specified application conditions, and not outside the specified power limits. The technical data are part of the correct and intended use. Other uses or uses that go beyond this are not permitted. Carefully observe the information relating to configuring brakes.

1.7.2 Predictable incorrect use

 WARNING
Injuries due to incorrect use
Death or severe injury can occur if you use the gearbox or the geared motor other than in the way intended by Siemens. You destroy or damage the gearbox or the geared motor.

Incorrect use includes, for example

- Not complying with the operating instructions
- Not observing the data on the rating plate
- Using the gearbox or geared motor in hazardous zones
- Using the gearbox or geared motor outside the permissible ambient conditions
- Using the gearbox or geared motor as generator
- Using the motor holding brake as an operating brake to reduce the motor speed
- Using the gearbox or geared motor as a result of its size, its weight, its shape or its material for applications other than those precisely described in this manual

Fundamental safety instructions

2.1 General safety instructions



	<p>! WARNING</p> <p>Electric shock and danger to life due to other energy sources</p> <p>Touching live components can result in death or severe injury.</p> <ul style="list-style-type: none"> • Only work on electrical devices when you are qualified for this job. • Always observe the country-specific safety rules. <p>Generally, the following steps apply when establishing safety:</p> <ol style="list-style-type: none"> 1. Prepare for disconnection. Notify all those who will be affected by the procedure. 2. Isolate the drive system from the power supply and take measures to prevent it being switched back on again. 3. Wait until the discharge time specified on the warning labels has elapsed. 4. Check that there is no voltage between any of the power connections, and between any of the power connections and the protective conductor connection. 5. Check whether the existing auxiliary supply circuits are de-energized. 6. Ensure that the motors cannot move. 7. Identify all other dangerous energy sources, e.g. compressed air, hydraulic systems, or water. Switch the energy sources to a safe state. 8. Check that the correct drive system is completely locked. <p>After you have completed the work, restore the operational readiness in the inverse sequence.</p>
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	<p>! WARNING</p> <p>Electric shock due to connection to an unsuitable power supply</p> <p>When equipment is connected to an unsuitable power supply, exposed components may carry a hazardous voltage. Contact with hazardous voltage can result in severe injury or death.</p> <ul style="list-style-type: none"> • Only use power supplies that provide SELV (Safety Extra Low Voltage) or PELV- (Protective Extra Low Voltage) output voltages for all connections and terminals of the electronics modules.
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⚠ WARNING

Electric shock due to damaged motors or devices

Improper handling of motors or devices can damage them.

Hazardous voltages can be present at the enclosure or at exposed components on damaged motors or devices.

- Ensure compliance with the limit values specified in the technical data during transport, storage and operation.
- Do not use any damaged motors or devices.



⚠ WARNING

Electric shock due to unconnected cable shield

Hazardous touch voltages can occur through capacitive cross-coupling due to unconnected cable shields.

- As a minimum, connect cable shields and the conductors of power cables that are not used (e.g. brake cores) at one end at the grounded housing potential.



⚠ WARNING

Electric shock if there is no ground connection

For missing or incorrectly implemented protective conductor connection for devices with protection class I, high voltages can be present at open, exposed parts, which when touched, can result in death or severe injury.

- Ground the device in compliance with the applicable regulations.



⚠ WARNING

Arcing when a plug connection is opened during operation

Opening a plug connection when a system is in operation can result in arcing that may cause serious injury or death.

- Only open plug connections when the equipment is in a voltage-free state, unless it has been explicitly stated that they can be opened in operation.

NOTICE

Property damage due to loose power connections

Insufficient tightening torques or vibration can result in loose power connections. This can result in damage due to fire, device defects or malfunctions.

- Tighten all power connections to the prescribed torque.
- Check all power connections at regular intervals, particularly after equipment has been transported.

NOTICE**Damage to equipment due to unsuitable tightening tools.**

Unsuitable tightening tools or fastening methods can damage the screws of the equipment.

- Only use screw inserts that exactly match the screw head.
- Tighten the screws with the torque specified in the technical documentation.
- Use a torque wrench or a mechanical precision nut runner with a dynamic torque sensor and speed limitation system.
- Adjust the tools used regularly.

 **WARNING****Unexpected machine movement caused by radio devices or mobile phones**

Using radio devices, cellphones, or mobile WLAN devices in the immediate vicinity of the components can result in equipment malfunction. Malfunctions may impair the functional safety of machines and can therefore put people in danger or lead to property damage.

- Therefore, if you move closer than 20 cm to the components, be sure to switch off radio devices, cellphones or WLAN devices.
- Use the "SIEMENS Industry Online Support App" or a QR code scanner only on equipment that has already been switched off.

 **WARNING****Unrecognized dangers due to missing or illegible warning labels**

Dangers might not be recognized if warning labels are missing or illegible. Unrecognized dangers may cause accidents resulting in serious injury or death.

- Check that the warning labels are complete based on the documentation.
- Attach any missing warning labels to the components, where necessary in the national language.
- Replace illegible warning labels.

 **WARNING**

Unexpected movement of machines caused by inactive safety functions

Inactive or non-adapted safety functions can trigger unexpected machine movements that may result in serious injury or death.

- Observe the information in the appropriate product documentation before commissioning.
- Carry out a safety inspection for functions relevant to safety on the entire system, including all safety-related components.
- Ensure that the safety functions used in your drives and automation tasks are adjusted and activated through appropriate parameterizing.
- Perform a function test.
- Only put your plant into live operation once you have guaranteed that the functions relevant to safety are running correctly.

Note

Important Safety instructions for Safety Integrated

If you want to use Safety Integrated functions, you must observe the Safety instructions in the Safety Integrated documentation.

 **WARNING**

Active implant malfunctions due to electromagnetic fields

Electromagnetic fields (EMF) are generated by the operation of electrical power equipment, such as transformers, converters, or motors. People with pacemakers or implants are at particular risk in the immediate vicinity of this equipment.

- If this affects you, maintain the minimum distance to such equipment that is specified in the "Important product information" chapter.



 **WARNING**

Active implant malfunctions due to permanent-magnet fields

Even when switched off, electric motors with permanent magnets represent a potential risk for persons with heart pacemakers or implants if they are close to converters/motors.

- If this affects you, maintain the minimum distance to such equipment that is specified in the "Important product information" chapter.
- When transporting or storing permanent-magnet motors always use the original packing materials with the warning labels attached.
- Clearly mark the storage locations with the appropriate warning labels.
- IATA regulations must be observed when transported by air.

 **WARNING****Injury caused by moving or ejected parts**


Contact with moving motor parts or drive output elements and the ejection of loose motor parts (e.g. feather keys) out of the motor enclosure can result in severe injury or death.

- Remove any loose parts or secure them so that they cannot be flung out.
- Do not touch any moving parts.
- Safeguard all moving parts using the appropriate safety guards.

 **WARNING****Fire due to incorrect operation of the motor**

When incorrectly operated and in the case of a fault, the motor can overheat resulting in fire and smoke. This can result in severe injury or death. Further, excessively high temperatures destroy motor components and result in increased failures as well as shorter service lives of motors.

- Operate the motor according to the relevant specifications.
- Only operate the motors in conjunction with effective temperature monitoring.
- Immediately switch off the motor if excessively high temperatures occur.

 **CAUTION****Burns and thermal damage caused by hot surfaces**

Temperatures above 100 °C may occur on the surfaces of motors, converters, and other drive components.

Touching hot surfaces may result in burns. Hot surfaces may damage or destroy temperature sensitive parts.

- Ensure that temperature-sensitive parts do not come into contact with hot surfaces.
- Mount drive components so that they are not accessible during operation.

Measures when maintenance is required:

- Allow drive components to cool off before starting any work.
- Use appropriate personnel protection equipment, e.g. gloves.

2.2 Equipment damage due to electric fields or electrostatic discharge

Electrostatic sensitive devices (ESD) are individual components, integrated circuits, modules or devices that may be damaged by either electric fields or electrostatic discharge.



NOTICE

Equipment damage due to electric fields or electrostatic discharge

Electric fields or electrostatic discharge can cause malfunctions through damaged individual components, integrated circuits, modules or devices.

- Only pack, store, transport and send electronic components, modules or devices in their original packaging or in other suitable materials, e.g. conductive foam rubber or aluminum foil.
- Only touch components, modules and devices when you are grounded by one of the following methods:
 - Wearing an ESD wrist strap
 - Wearing ESD shoes or ESD grounding straps in ESD areas with conductive flooring
- Only place electronic components, modules or devices on conductive surfaces (table with ESD surface, conductive ESD foam, ESD packaging, ESD transport container).

2.3 Cybersecurity information

Siemens provides products and solutions with industrial cybersecurity functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial cybersecurity concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial cybersecurity measures that may be implemented, please visit <https://www.siemens.com/cybersecurity-industry>.

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Cybersecurity RSS Feed under <https://new.siemens.com/cert>.

Further information is provided on the Internet:

Industrial Security Configuration Manual (<https://support.industry.siemens.com/cs/ww/en/view/108862708>)

**WARNING****Unsafe operating states resulting from software manipulation**

Software manipulations, e.g. viruses, Trojans, or worms, can cause unsafe operating states in your system that may lead to death, serious injury, and property damage.

- Keep the software up to date.
- Incorporate the automation and drive components into a state-of-the-art, integrated industrial cybersecurity concept for the installation or machine.
- Make sure that you include all installed products in the integrated industrial cybersecurity concept.
- Protect files stored on exchangeable storage media from malicious software by with suitable protection measures, e.g. virus scanners.
- Carefully check all cybersecurity-related settings once commissioning has been completed.

2.4 Residual risks of power drive systems

When assessing the machine or system-related risk in accordance with the respective local regulations (e.g. EC Machinery Directive), the machine manufacturer or system integrator must take into account the following residual risks emanating from the control and drive components of a drive system:

1. Unintentional movements of driven machine or system components during commissioning, operation, maintenance, and repairs caused by, for example,
 - Hardware faults and/or software errors in the sensors, control system, actuators, and connections
 - Response times of the control system and of the drive
 - Operation and/or environmental conditions outside the specification
 - Condensation/conductive contamination
 - Parameterization, programming, cabling, and installation errors
 - Use of wireless devices/mobile phones in the immediate vicinity of electronic components
 - External influences/damage
 - X-ray, ionizing radiation and cosmic radiation
2. Unusually high temperatures inside and outside the components, including open flames, as well as emissions of light, noise, particles, gases, etc. due to fault conditions, e.g.:
 - Component failure
 - Software errors
 - Operation and/or environmental conditions outside the specification
 - External influences/damage
 - Short circuits or ground faults in the intermediate DC circuit of the converter
3. Hazardous shock voltages caused by, for example:
 - Component failure
 - Influence during electrostatic charging
 - Induction of voltages in moving motors
 - Operation and/or environmental conditions outside the specification
 - Condensation/conductive contamination
 - External influences/damage
4. Electrical, magnetic and electromagnetic fields generated in operation that can pose a risk to people with a pacemaker, implants or metal replacement joints, etc., if they are too close
5. Release of environmental pollutants or emissions as a result of improper operation of the system and/or failure to dispose of components safely and correctly

6. Influence of network-connected and wireless communications systems, e.g. ripple-control transmitters or data communication via the network or mobile radio, WLAN or Bluetooth.
7. Motors for use in potentially explosive areas:
When moving components such as bearings become worn, this can cause enclosure components to exhibit unexpectedly high temperatures during operation, creating a hazard in areas with a potentially explosive atmosphere.

For more information about the residual risks of the drive system components, see the relevant sections in the technical user documentation.

Specific safety instructions

3.1 General overview

Note

Siemens does not accept any liability for damage and operational disturbances that result from the non-observance of these operating instructions.

Note**EU RoHS Directive and UK Directive**

SIMOGEAR geared motors comply with the stipulations laid down in Directive 2011/65/EU and the UK directive "The Restriction of the Use of certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012".

These operating instructions are included with the gearbox when delivered or you can find them in SIOS (<https://support.industry.siemens.com/cs/ww/en/ps/13424/man>). Read the operating instructions before handling the gearbox. Carefully follow the instructions. This is how you ensure safe and disturbance-free operation.

These operating instructions are applicable for safety-related L brakes (Intorq BFK458), which are mounted onto SIMOGEAR geared motors. The L brakes mounted onto SIMOGEAR geared motors are in compliance with the relevant standards listed in the Declaration of Conformity for safety-related applications.

The BA 2332 Operating Instructions supplement the following operating instructions and can be found in SIOS (<https://support.industry.siemens.com/cs/ww/en/ps/13424/man>):

- BA 2030 SIMOGEAR gearboxes
- BA 2330 motors for mounting onto SIMOGEAR gearboxes
- BA 2331 Geared motor with DRIVE-CLiQ safety encoder for safety-related applications
- BA 2730 Geared motor with rotary encoder for safety-relevant applications

For the safety-related brake control, refer to the SINAMICS S120 documentation:

- SINAMICS S120 Commissioning Manual
- SINAMICS S120 Getting Started
- SINAMICS S120 Drive Functions Function Manual
- SINAMICS S120 Safety Integrated Function Manual
- SINAMICS S120 / S150 List Manual
- SINAMICS Guidelines for Handling the Safe Brake Test (SBT)
- EMC Installation Guideline Configuration Manual (6FC5297-0AD30-0AP3)

3.1 General overview

Additional operating instructions for the safety-related brake are available through Kendrion INTORQ:

- Operating instructions from brake manufacturer Kendrion INTORQ on electromagnetically released spring-loaded brakes INTORQ BFK 458, BA 14.0168, Kendrion (<http://www.kendrion.com>)

Option	Order code
L brake implemented as safety-related holding brake	C09

To select the brake size and the braking torque, option C09 should be combined with the order codes of the brake in the standard version. Only torque versions that are suitable for safety-related applications can be selected

Table 3-1 Article number code

Brake version	Order code
LS4/3	B03 + C09
LS4	B00 + C09
LS4/5	B57 + C09
LS8/6,3	B08 + C09
LS8	B04 + C09
LS8/10	B09 + C09
LS16/10	B11 + C09
LS16/13	B12 + C09
LS16	B10 + C09
LS16/20	B13 + C09
LS32/18	B16 + C09
LS32/23	B17 + C09
LS32	B15 + C09
LS32/40	B18 + C09
LS60/38	B20 + C09
LS60/50	B21 + C09
LS60	B19 + C09
LS80/50	B26 + C09
LS80/63	B27 + C09
LS80	B22 + C09
LS80/100	B23 + C09
LS150/100	B29 + C09
LS150/125	B30 + C09
LS150	B28 + C09
LS260/180	B36 + C09
LS260/200	B37 + C09
LS260/240	B38 + C09
LS260	B33 + C09
LS260/315	B58 + C09

Brake version	Order code
LS400/265	B40 + C09
LS400/300	B42 + C09
LS400/360	B42 + C09
LS400	B39 + C09
LS400/600	B59 + C09

The geared motors described here correspond to state-of-the-art technology at the time these operating instructions were printed.

Siemens reserves the right to change individual components and accessory parts in the interest of ongoing development. The changes are designed to improve performance and safety. The significant features are retained. The operating instructions are updated regularly.

The new versions of the operating instructions, the declaration of incorporation and the Declarations of Conformity are available in SIOS (<https://support.industry.siemens.com/cs/ww/en/ps/13424/man>).

3.2 Configuring notes

To guarantee safe operation, the safety-related brake must be configured on an application-specific basis.

When doing this, braking torque tolerances, thermal load capacity of the brake, the speed limits of rotors and active environmental influences must be carefully taken into consideration.

The safety-related brakes may only be used as a holding brake with emergency stop function. The brake may only be switched (opened or closed) when it is at a standstill. Emergency stops are an exception to this rule. A maximum of 2000 emergency stop operations are permissible over the complete service life of the brake. The brake holding torque must be used when selecting and dimensioning brakes (M4 torque).

The safety characteristic values of the safety-related brake are applicable under the precondition that the system is designed so that 80% of the rated brake torque is adequate for the safety function. This must be carefully ensured when selecting and dimensioning the brake.

When used in safety-related application, rotors must always be replaced after 10 years.

For technical reasons, the specified rated torques can generally only be reliably achieved after a brief run-in procedure. The run-in procedure has been completed after applying a braking energy of $5xW_{1max}$ distributed over 10 braking operations. The formulas and values required for the calculation are provided in the configuration notes for the brake provided in Catalog D50.1.

However, actual torques can deviate from the specified braking torques as a result of fluctuating properties of the organic friction lining and changing environmental conditions. These must be taken into account by applying the appropriate safety margins when selecting and dimensioning the brake. Especially in humid conditions and fluctuating temperatures, an increased break loose torque can occur after long non-operational periods.

The friction lining must be reactivated at regular intervals if the brake is solely used as holding brake without any dynamic load being applied. You can achieve this by applying

3.2 Configuring notes

friction work, e.g. by braking from moderate motion or slow movement. This should be repeated several times.

The safety application involved does not take into account any friction lining wear or the load on the brake as the result of an emergency stop. These points must be separately checked carefully when configuring the brake.

Further, all of the restrictions relating to the standard and low-wear friction linings (permissible frequency of operation, permissible work as a result of frictional force, temperature range, etc.) specified in the catalog and these operating instructions strictly apply.

The geared motor complies with the requirements of the Machinery Directive 2006/42/EC.

The geared motor is certified for use at installation altitudes up to 1 000 m above sea level.

The safety-related brake is certified for ambient temperatures from -20 °C up to +40 °C, for simultaneous motor utilization according to temperature Class 155 (F) as a maximum.

The safety-related brakes are suitable for IP55 degree of protection – and in the encapsulated design, for IP65; however, not for IP56.

The motor is certified for vibration and shock according to EN 60721-3-3 : 1995 up to and including Class 3M3.

The drive should be installed so that vibration and shock are avoided as far as possible.

The anti-condensation heating may only be used at standstill.

The geared motors are designed and built according to state-of-the-art technology and are shipped in an operationally safe condition. Changes made by users negatively impact operational reliability and are forbidden.

The geared motor is designed for installation in a machine. The company operating the machine is responsible for complying with functional safety. The person marketing or operating the machine is responsible for the necessary safety functions and their attributes.

Ensuring functional safety

4.1 Fundamental safety instructions for Safety Integrated

DANGER

Risk minimization through Safety Integrated

Safety Integrated can be used to minimize the level of risk associated with machines and plants.

Machines or plants, however, can only be operated safely in conjunction with Safety Integrated if the machine manufacturer

- is familiar with and observes all aspects of this technical user documentation, including the documented constraints, safety instructions and residual risks,
- carefully installs and configures the machine or plant and verifies this through an acceptance test carefully performed and documented by qualified personnel,
- implements and validates all the measures required by the machine or plant risk analysis based on the programmed and configured Safety Integrated Functions or by other means.

The deployment of Safety Integrated does not replace the machine or plant risk assessment by the machine manufacturer as stipulated by the EU Machinery Directive.


In addition to deploying Safety Integrated Functions, further risk reduction measures must be implemented.

WARNING

Unexpected movement of machines caused by inactive safety functions


Inactive or unadjusted safety functions can trigger unexpected machine movements that may result in serious injury or death.


- Observe the information in the appropriate product documentation before commissioning.
- Carry out a safety inspection for safety-relevant functions on the entire system, including all safety-related components.
- Ensure that the safety functions used in your automation and drive tasks are adjusted and activated through appropriate assignment of parameters.
- Run a function test.
- Only put your plant into live operation once you have ensured that the safety-relevant functions are running correctly.


 WARNING
Danger to life as a result of undesirable motor motion
Danger to life as a result of undesirable motor motion when the system runs up and the drives are activated after modifying or replacing hardware and/or software.
After hardware and/or software components have been modified or replaced, it is only permissible for the system to run up and the drive to be activated with the protective devices closed. Personnel must not be present within the danger zone.
<ul style="list-style-type: none">• It may be necessary to carry out a partial or complete acceptance test or a simplified functional test depending on the modification or replacement.• Before personnel are allowed to re-enter the hazardous area, all of the drives should be tested to ensure that they exhibit stable control behavior by briefly moving them in both the plus and minus directions (+/-).• When switching on, observe the following: The Safety Integrated Functions are only available and can only be selected after the system has completely powered up.


4.2 General information

The functional safety complies with the relevant standards listed in the Declaration of Conformity for safety-related applications.

 WARNING
Non-compliance with warning information
The functional safety can be disabled if you do not observe the warning information and notes. Comply with the valid regulations and operating instructions.


 WARNING
Non-observance of intended use
The functional safety can be disabled if you do not observe the information regarding correct usage. Comply with the information regarding correct usage.

 WARNING
Functional safety without conformity assessment
The geared motor is designed for installation in a machine. The operating company is responsible for defining the safety level and its actual implementation in the machine. Evaluate the conformity of the machine before commissioning.

 **WARNING****Safety-related brake mounted on a motor not intended for the purpose**

It is not permitted to retrofit a safety-related brake.

The safety-related brake is mounted on a SIMOGEAR geared motor with the appropriate version. The geared motor with safety-related brake must be ordered in this specific version **and must not be retrofitted by the user**, as otherwise functional safety is not obtained.

 **WARNING****Functional safety without evaluating thermal motor protection**

SIMOGEAR geared motors with safety-related brakes are equipped with thermal motor protection, which must be evaluated.

The commissioning engineer must connect the temperature sensor to the converter system.

Operation without evaluating the motor temperature sensor is not permissible.

 **WARNING****Resonance effects in operation**

Resonance effects can occur on the geared motor as a result of the frequency converter or comparable power controlling devices.

Resonance effects must be excluded.

Optimize, for example, the control parameters by appropriately filtering the current setpoint.

Siemens AG takes responsibility for compliance with functional safety specifications relating to the supplied geared motor with safety-related brake and SINAMICS S120. The safety-related connecting elements are sealed before delivery.

Take into account the applicable national and regional legislation, standards and regulations.

To ensure that the geared motor is not damaged:

- Do not step on the geared motor.
- Do not place any objects on the geared motor.
- Do not place the geared motor down on the fan cover.

Working on the rotary encoder and the brake

All safety-related mechanical connections for the rotary encoder or the brake are marked with a seal (enamel dot).

Only Siemens service personnel or personnel trained and authorized by Siemens are permitted to carry out the work.

4.3 Safety characteristic values of the brake

Contact Technical Support for the following rotary encoder or brake topics:

- Maintenance and service
- Faults and how to resolve them
- Disposal

The responsibility and liability regarding functional safety and its associated traceability is completely transferred to the operating company:

- If the operating company damages the seal that was applied by Siemens AG.
- If the operating company carries out work in the area around the seal.
- If the operating company performs work on the rotary encoder or the brake and the respective mechanical connection.

4.3 Safety characteristic values of the brake

TÜV-Nord has certified that these brakes are suitable as holding brakes.

The basis of the certificate of suitability is the B_{10d} value determined from a series of tests. The B_{10d} value defines the number of switching cycles until 10 % of the components will have failed dangerously. Falling below a certain minimum braking torque is defined as a dangerous failure. This minimum torque may lie below the rated braking torque. Take into account the design torque provided by the plant/system manufacturer.

The safety function is classified based on the Performance Level (PL) according to DIN EN ISO 13849:2015 as well as the Safety Integrity Level (SIL) according to EN 61508.

TÜV-Nord has confirmed the following characteristic values of the brake according to DIN EN ISO 13849-1:2015:

	Brake LS sizes 4 to 400 (INTORQ BFK458 sizes 6 to 25)
HFT (hardware fault tolerance)	0
B_{10d}	6×10^6

With the assumed and the operating conditions defined for the following calculation of PL / SIL values:

Operating days per year	d_{op}	220 days
Operating hours per day	h_{op}	8 hours
Time for one actuation cycle	t_{cycle}	10 s
Probability of fault detection	DC < 60 %	(worst case)

The following characteristic values are obtained for the brake:

	Brake LS sizes 4 to 400 (INTORQ BFK458 sizes 6 to 25)
Mean time up to a dangerous failure $MTTF_d$	94.6 years
Performance Level (PL)	c

	Brake LS sizes 4 to 400 (INTORQ BFK458 sizes 6 to 25)
Probability of occurrence of a serious hardware fault PFHD (EN 61508-1)	1.205×10^{-6}
Safety Integrity Level (SIL)	1

The PLc / SIL1 determined in this calculation example is obtained by exclusively considering the brake.

Higher PL / SIL values can be achieved when considering a complete system/application, for example, through increased fault detection probability (DC). For instance, this can be realized with the safety-related brake control (SBC) of a SINAMICS converter in conjunction with the safe brake test (SBT). On this topic, refer to Siemens converter documentation or request the corresponding application examples from Siemens.

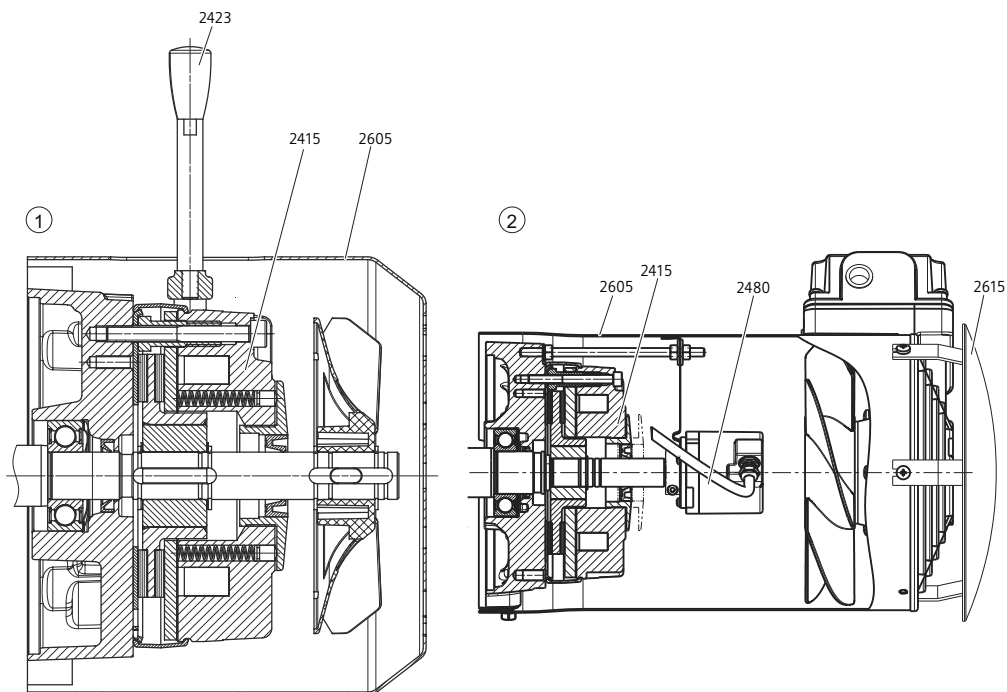
4.4 Unpacking

NOTICE
Transport damage impairs the correct functioning of the geared motor. Never commission damaged systems, drives or components.

Check the geared motor for completeness and for damage. Report any missing parts or damage immediately.


Remove and dispose of the packaging material and transport equipment in compliance with regulations.


Position of the brake under the cover



- ① Self-ventilated motor with brake
 - ② Motor with forced ventilation, brake and rotary encoder
- 2415 Brake
2423 Manual brake release lever
2480 Rotary encoder
2605 Fan cover of the motor/separately driven fan
2615 Canopy


4.5 General information regarding the installation of a safety-related brake


 DANGER
<p>Unintentional starting of the drive unit</p> <p>Any work on the stationary machine must be performed with the machine isolated from the supply and secured so that it cannot be switched back on again. This also applies to auxiliary circuits, e.g. anti-condensation heating.</p> <p>Check that the unit is in a no-voltage condition.</p> <p>Deviations in the voltage, frequency, waveform and/or symmetry of the line supply increase the temperature rise. This also negatively impacts the electromagnetic compatibility.</p> <p>Before starting work, make sure that a protective conductor is securely connected.</p>


 DANGER
<p>Dangerous voltages</p> <p>Can result in death, physical injury or material damage. Observe the following safety information before connecting-up the machine:</p> <ul style="list-style-type: none"> • Only qualified personnel is permitted to work on the machine. • Only perform work when the machine is stationary. • Isolate the machine from the power supply and take measures to prevent it being switched back on again. The same applies for auxiliary circuits. • Check that the machine really is in a no-voltage condition. • If you have loosened terminal blocks, rectifiers and/or similar parts when electrically connecting the motor, then secure these components back in the terminal box. See the diagram below.


NOTICE
<p>Malfunctions</p> <p>It must be ensured that there are no foreign bodies, dirt or moisture in the terminal box.</p> <p>The terminal box must be sealed so that dust and water cannot enter.</p> <p>Seal the terminal box with the original seal. Seal cable entries to the terminal box and other open cable entries with an O-ring or suitable flat gasket.</p> <p>Do not damage the terminal box or other functional parts inside the terminal box.</p>

4.6 Commissioning the safety-related brake

 WARNING
Inadequately qualified personnel If the safety-related brake is electrically installed by inadequately qualified personnel, then the functional safety will be disabled. Only qualified personnel are authorized to carry out the work. Such personnel must be trained in: <ul style="list-style-type: none">• Topics relating to functional safety• Legislation, safety regulations and standards for functional safety• The content of the detailed operating instructions provided

 WARNING
Commissioning components Never commission incompletely installed or incompletely connected components

 WARNING
Hazardous voltages, rotating parts, hot surfaces Before commissioning, attach all covers. This prevents coming into contact with active/live, rotating or hot parts. Attach the covers so that the motor cooling is not obstructed.

 WARNING
Commissioning the brake When commissioning the brake, run it in to achieve the specified characteristic torques. You can run-in the brake by applying a braking energy of $5 \times W_{1\max}$ (permissible working capacity per switching operation) distributed over 10 braking operations. For the calculation, take the necessary formulas and values from the configuring notes provided in Catalog D50.1.

Note

Required checks

The following list does not claim to be complete.

Additional checks and tests in accordance with the situation specific to the particular installation site are also required.

- Before commissioning the system, check that it is properly installed and connected.
- Commission the drive system according to the operating instructions of the converter or inverter being used.
- Before starting any work, carefully comply with the safety instructions and following checklists.

First complete the subsequent checklist before commissioning the brake.

Table 4-1 Checklist for commissioning the safety-related brake

Factory serial number, see the rating plate geared motor ④, in the Installation and Operating Instructions SIMOGEAR gearboxes 2030	
The designated product is designed for installation in a machine. Commissioning is prohibited until it has been established that the end product conforms with Directive 2006/42/EC.	
Measure	Yes
Is there a signal yellow Safety Integrated marking on the fan cover?	
Is the geared motor free of any damage?	
Are the BA 2332, BA 2030, BA 2330 operating instructions and all of the other instructions for the brake and drive available and have they been carefully read?	
Are all of the necessary components of the configured drive lineup available, correctly dimensioned, installed and connected?	
Is the current SINAMICS documentation available if the motor is to be operated with the SINAMICS S120 drive system or with other SINAMICS series? SINAMICS S120 Commissioning Manual, SINAMICS S120 Getting Started, SINAMICS S120 Drive Functions Function Manual, SINAMICS S120 Safety Integrated Function Manual	
Is the installation altitude less than 1000 m above sea level?	
Is the ambient temperature maintained between -20 °C and +40 °C	
Is operation under harsh industrial environments completely ruled out, for example the offshore or chemical industry, and areas with direct exposure to seawater or spraying seawater?	
Has the drive been installed so that no vibration and shock occurs that exceeds the limit of class 3M3 according to EN 60721-3-3 : 1995?	
Does the maximum drive speed (motor speed) remain below the maximum permissible brake speed?	
Has the temperature sensor been connected correctly, and has the temperature sensor been activated (p600=11), and has the correct sensor been selected (p601=6)?	
Have the controllers of the frequency converter or comparable power controlling device been set so that no resonance effects occur at the geared motor, rotary encoder or torque arm of the rotary encoder?	
Is the brake only used as a holding brake with emergency stop function?	
Was the brake run-in?	
Was the brake correctly connected by qualified personnel?	
Does the data stamped on the geared motor rating plate correspond to the particular application?	
Have the necessary safety functions of the converter been activated and correctly parameterized?	
Have the correct switching times been parameterized?	
Was a Safe Brake Test successfully performed?	
For brakes with manual release: Is the manual release function inactive and the manual brake release lever detached from the brake?	

4.7 Safety functions in conjunction with SINAMICS converters

Safe Brake Control (SBC)

- The Safe Brake Control function (SBC) is used to safely control holding brakes that function according to the closed-circuit principle (e.g. motor holding brake).
- The SBC function belongs to the Safety Integrated Basic Functions and is available for SINAMICS S120, S110 and G120 converters (depending on the Control Unit installed).
- The Motor Module / Power Module controls the opening and closing of the brake. Terminals are available at the device, depending on the particular SINAMICS type and version. A Safe Brake Relay or a Safe Brake Adapter are required for the safety-related brake control.

The brake is controlled through a safety-related two-channel data link via the brake connection on the Motor Module / Safe Brake Relay (SBR) / Safe Brake Adapter (SBA).

The Motor Module/Power Module adopts a controlling function for the "Safe Brake Control" function: The function ensures that if the Control Unit fails or malfunctions, the brake current is interrupted, therefore closing the brake.

Safe Brake Test (SBT)

The diagnostic function "Safe Brake Test " (SBT) checks whether a brake provides the required braking effect (holding torque).

The SBT function belongs to the Safety Integrated Extended Functions and is available for SINAMICS S120 converters (a Safety Extended License is required).

The Safe Brake Test (SBT) diagnostic function is possible if the drive has a mounted rotary encoder.


More detailed information is provided in the SINAMICS S120 Safety Integrated Function Manual (6SL3097-5AR00-0AP3) and in the manual for the specific converter.


Additional information is provided in the SINAMICS Guidelines for handling the Safe Brake Test (SBT), Article ID: 109782484.

4.8 Service and maintenance

4.8.1 General maintenance information

 WARNING
Unintentional starting of the drive unit
Secure the drive unit to prevent it from being started up unintentionally.
Attach a warning notice to the start switch.

 WARNING
Responsibility and liability regarding functional safety The responsibility and liability regarding the functional safety and its associated traceability is completely transferred to the operating company: <ul style="list-style-type: none">• If the operating company damages the seal that was attached by Siemens AG.• If the operating company carries out work in the area around the seal.• If the operating company performs work on the rotary encoder or the brake and the respective mechanical connection.

 WARNING
Loss of braking torque It is not permissible that the system is still operated if the maximum air gap s_{Lmax} is exceeded. The braking torque is significantly reduced if the maximum air gap is exceeded.

NOTICE
Improper maintenance Only authorized qualified personnel may perform the maintenance and servicing. Only original parts supplied by Siemens AG may be installed.

NOTICE
Working on the brake Only Siemens service personnel or personnel trained and authorized by Siemens may carry out the work on the brake.

4.8.2 Wear of spring-operated brakes

The friction lining and the mechanical components of the brake are subject to wear due to their inherent function. For safe and fault-free operation, the brake must be regularly checked and adjusted, and if necessary, replaced.


The following table describes the different causes of wear and their effects on the spring-operated brake components. The important influencing factors have to be quantified in order to calculate the service life of the rotor and the brake and determine the stipulated maintenance intervals. Here, the most important factors are the work as a result of the frictional force, the speed at the start of braking and the frequency of operation. If several of

the listed causes of wear to the friction lining occur at the same time in a single application, the influencing factors should be added together when calculating the wear.

Table 4-2 Causes of wear for spring-operated brakes

Component	Cause	Effect	Influencing factor
Friction lining	Emergency stops	Friction lining wear	Work as a result of the frictional force
	Wear caused by overlap when starting and stopping the geared motor		
	Active braking by the motor supported by the brake (quick stop)		
	Low speed and mounting position 'motor at top'		
	Wear when starting for motor a mounting position with vertical shaft, even when the brake is open		Number of start / stop cycles
Armature disk and flange	The brake lining is rubbing/ chafing	Run-in of armature disk and flange	Work as a result of the frictional force
Brake rotor gear teeth	Relative movement and shock between the rotor and hub	Wear of the teeth (primarily on the rotor side)	Number of start / stop cycles
Support of the armature disk	Load change and impacts in the backlash between the armature disk, sleeve screws and guide pins	Deflection of armature disk, sleeve screws and pins	Number of start / stop cycles, strength of braking torque
Springs	Axial load cycle and shear stresses in the springs due to radial backlash in the armature disk	Decrease in the spring force or fatigue failure	Number of switching operations of the brake

4.8.3 Maintenance intervals for the brake

 WARNING
Replacing rotors When used in safety-related applications subject to regular torque surges (e.g. caused by dynamic braking operations), the rotors must always be replaced at the latest after 2 million cycles or 10 years.

For safe and trouble-free operation, check and maintain the spring-operated brake at regular intervals.

For operational braking, the maintenance intervals depend on the load on the brake in the specific application. Take all causes of wear into account when calculating the maintenance intervals. Siemens AG recommends a regular inspection at fixed time intervals for brakes that are subject to low loads, e.g. holding brakes with an emergency stop.

Failure to maintain the brake can lead to operating faults, production outage or damage to the plant or system. Specify a maintenance concept for each application that is appropriate for the operating conditions and the brake load. The maintenance intervals and maintenance work for the L brake are listed in the table.

Table 4-3 Maintenance interval for the brake

Brake	Maintenance interval
Holding brake with emergency stop	Minimum, every 2 years.

4.8.4 Maintenance work

Note

Completely replace brakes with defective armature disks, springs or flanges.

When performing inspection and maintenance work always observe the following:

- Use a brake cleaning agent to remove any impurities as a result of oil and grease
- Possibly replace the brake after the cause has been clarified.
- Remove dirt and particles in the air gap between the solenoid and armature disk as they can impair the function.
- After replacing the rotor, the original braking torque is only reached after the friction surfaces have run-in. After a rotor has been changed, increased initial wear occurs for armature disks and flanges that have been run-in.

Testing the brake

Note

If the safety-related brake is operated according to the regulations listed in these instructions, then simplified testing/maintenance is permissible with the brake mounted.




After removing the brake, the extended testing/maintenance is no longer necessary.

Table 4-4 Testing the brake

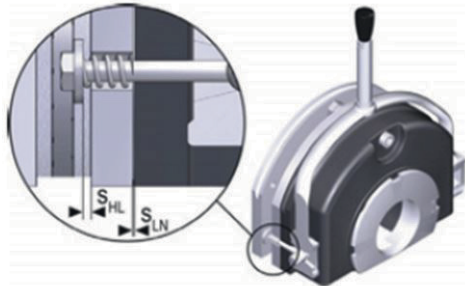
Simplified testing/maintenance with the brake mounted	Check the air gap (CAUTION: if the air gap must be readjusted, then an extended test is required after removing the brake)	See the work instruction Check the air gap and function (Page 40)
	Test the release function and control	

Extended testing/maintenance after removing the brake	Adjust the air gap	See the work instruction Adjust the air gap (Page 41)
	Check the rotor thickness	See the work instruction Checking the friction lining and replacing the rotor (Page 44)
	Check rotor teeth backlash, replace worn rotors	
	Any movement/deflection of the torque support at the guide parts and armature disk	
	Check the springs for any damage	
	Check the armature disk and flange and/or mating surfaces - thermal damage (dark blue tarnishing) - Flatness depending on the size Max. run-in depth = nominal air gap depending on the size	

4.8.5 Check the air gap and function

<p> WARNING</p> <p>Unintentional starting of the drive unit</p> <p>Switch off the power supply to the drive unit so that it is in a no-voltage condition.</p> <p>The brake must be in a torque-free condition.</p> <p>Secure the drive unit to prevent it from being started up unintentionally.</p> <p>Attach a warning notice to the start switch.</p>
<p> DANGER</p> <p>Danger due to rotating parts</p> <p>When checking the air gap it is not permissible that the motor runs.</p> <p>It is not permissible that the spinning rotor is touched.</p>
<p> DANGER</p> <p>Risk of injury caused by electric shock</p> <p>Do not touch live contacts</p>

Procedure



Checking the air gap

1. Remove the fan cover
For the combination with manual brake release:
Unscrew the manual brake release lever
For separately driven fans
Remove the fan cover with separately driven fan
2. Using a feeler gauge, measure the air gap s_L between the armature disk and solenoid in the vicinity of the fixing screws.
3. Compare the measured air gap with the value for the maximum permissible air gap s_{Lmax} . The values are listed in Chapter Adjust the air gap (Page 41).

You have now checked the air gap.

For versions with safety-related rotary encoder, limit values other than for the encoderless version apply.

Testing the function

1. Check the function of the brake with the drive running. The armature disk must be pulled-in, and the rotor must move freely without any residual torque.
2. Measure the DC voltage at the brake. Compare the measured DC voltage with the voltage stamped on the nameplate. Deviations of up to 10 % are permissible.

You have now checked the brake function.

4.8.6 Adjust the air gap

WARNING

Unintentional starting of the drive unit

Switch off the power supply to the drive unit so that it is in a no-voltage condition.

The brake must be in a torque-free condition.

Secure the drive unit to prevent it from being started up unintentionally.

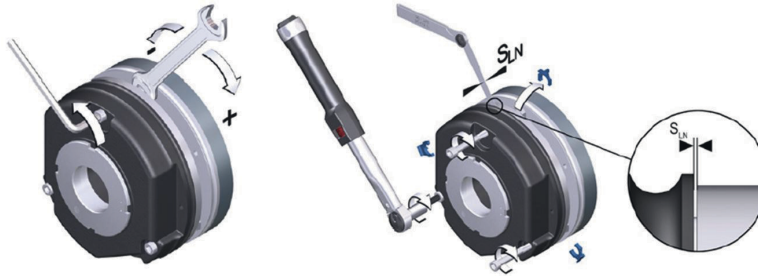
Attach a warning notice to the start switch.

⚠ WARNING

Decrease of braking effect due to contamination

Do not allow oil or grease to come into contact with friction surfaces.

Procedure



1. Remove the fan cover
For the combination with manual brake release:
Unscrew the manual brake release lever
For separately driven fans
Remove the fan cover with separately driven fan
2. Loosen the fastening screws of the brake.
3. Screw the sleeve screws further into the solenoid using an open-ended spanner.
4. Tighten the fastening screws of the brake.
5. Check the air gap s_{LN} in the vicinity of the screws using a feeler gauge. The values for the nominal air gap are listed in table air gap values.
6. If necessary, correct the air gap s_{LN} and then check it again.
7. When combined with manual brake release:
Check the setting dimension s_{HL} and correct s_{HL} if necessary.
8. Attach the fan cover.

You have now readjusted the air gap.


Table 4-5 Air gap values


Brake type	Nominal air gap s_{LN} (+0.1 / -0.05)	Maximum air gap $s_{Lmax.}$	Maximum air gap $s_{Lmax.}$ with FSD	Setting dimension of the manual brake release lever s_{HL}	Minimum rotor thickness
	mm	mm	mm	mm	mm
LS4/3	0.2	0.55	0.55	1.0	4.5
LS4		0.5	0.5		
LS4/5		0.4	0.4		
LS8/6,3		0.55	0.55		5.5
LS8		0.5	0.5		
LS8/10		0.45	0.45		
LS16/10, LS16/13, LS16		0.6	0.6		
LS16/20		0.5	0.5		7.5
LS32/18	0.3	0.9	0.7	1.5	8.0
LS32/23		0.85	0.7		
LS32		0.75	0.6		
LS32/40		0.65	0.5		
LS60/38		0.85	0.7		7.5
LS60/50, LS60		0.75	0.6		8.0
LS80/50, LS80/63, LS80		0.9	0.7		
LS80/100		0.7	0.6		
LS150/100, LS150/125, LS150	0.4	1.2	0.8	2.0	10.0
LS260/180, LS260/200, LS260/240, LS260					12.0
L260/315		1.05	0.7		
LS400/265, LS400/300, LS400/360, LS400	0.5	1.5	1.8	2.5	15.5
LS400/600		0.9	0.7		

Table 4-6 Tightening torque for the brake screw

Brake type	Thread size	Property class	Tightening torque
			Nm
LS4	3 x M4	8.8	3
LS8	3 x M5		6
LS16, LS32	3 x M6		10
LS60, LS80	3 x M8		25
LS150	6 x M8		25
LS260, LS400	6 x M10		50

4.8.7 Checking the friction lining and replacing the rotor

 WARNING
Unintentional starting of the drive unit Switch off the power supply to the drive unit so that it is in a no-voltage condition. The brake must be in a torque-free condition. Secure the drive unit to prevent it from being started up unintentionally. Attach a warning notice to the start switch.

 WARNING
Decrease of braking effect due to contamination Do not allow oil or grease to come into contact with friction surfaces.

Note

Reactivate the friction lining at regular intervals

The friction lining must be reactivated at regular intervals if the brake is solely used as holding brake without any dynamic load being applied. You can achieve reactivation of the friction lining by applying friction work, e.g. by braking from moderate motion or slow movement. This should be repeated several times.

Procedure

Checking the friction lining thickness (rotor)

1. Remove the fan cover
For the combination with manual brake release:
Unscrew the manual brake release lever
For separately driven fans:
Remove the fan cover with separately driven fan.
2. Release the connecting cable.
3. Remove the fan locking ring and pull out the fan.
4. Loosen the brake screws evenly and remove the screws completely. Remove the solenoid.
5. Pull the rotor off the hub.
6. Watch out for any possible damage, for example eruptions in the friction lining or worn gearing.
7. Measure the rotor thickness at 3 different positions around the rotor circumference using a caliper gauge.
8. Compare the measured rotor thickness with the minimum permissible rotor thickness. If the measured rotor thickness is too low, replace the complete rotor. The values are listed in the table in Chapter Adjust the air gap (Page 41).

Procedure when replacing the rotor

1. Remove the fan cover.
When combined with manual release:
Unscrew the manual brake release lever.
With separately driven fan:
Remove the fan cover together with the separately driven fan.
 2. Release the connecting cable.
 3. Remove the fan locking ring and pull out the fan.
 4. Loosen the brake screws evenly and remove the screws completely. Remove the solenoid.
 5. Pull the rotor completely off the hub.
 6. Check the hub teeth.
 7. Check the friction surface at the bearing shield. If there is severe scoring on the friction plate or flange, then replace the friction plate or flange.
 8. Measure the thickness of the new rotor and the head height of the sleeve screws using a caliper gauge.
 9. Calculate the gap between the solenoid and the armature disk as follows:
Gap = rotor thickness + s_{LN} - head height.
 10. Unscrew the sleeve screws evenly until the calculated gap between the solenoid and the armature disk is reached.
 11. Mount the new rotor and solenoid. Set the air gap of the brake, see section Adjust the air gap (Page 41).
 12. Connect the connection cable.
 13. Attach the fan cover.
- You have checked the friction lining and/or changed the rotor.

Technical data

5.1 General technical specifications

The most important technical data is stamped on the rating plate of the geared motor.

This data, the data provided in these mounting and operating instructions together with the contractual agreements for the geared motors, define the limits of intended use.

In the case of geared motors, a rating plate attached to the motor indicates the data for the entire drive.

In certain cases, separate rating plates are attached to the gearbox and the motor.

You can find more detailed information in the BA 2330.

5.2 Type designation of the geared motor

Example of a type designation of a motor equipped with a safety-related brake and a DQ rotary encoder: LE90SG4E-LS32/40N-ST SI04. The type designation is stamped on the rating plate in the area of ⑥. You can find the type designation code for the SIMOGEAR gearbox in the Mounting and Operating Instructions SIMOGEAR 2030 - E, D, Z, FD, FZ, B, K, C.

Table 5-1 Structure of the type designation

Example:	LE	90SG	4	E -	LS32/40N-	ST	SI04
Motor type	LE						
Motor frame size		90SG					
Number of poles			4				
Special features				E			
Brake					LS32/40N		
Single-turn encoder						ST	
Functionally safe rotary encoder							SI04

Table 5-2 Type designation code

Motor type	
LE, LES	Three-phase asynchronous motor, integrated
Special features	
E	High efficiency
P	Premium Efficiency
F	Forced ventilation
W	Canopy
X	Backstop
Brake	

5.3 Brake assignment and technical data

LS	Safety-related, spring-operated single-disk brake, DC excited
32	Size
../40	Set braking torque
N	Standard version
G	Encapsulated version
H, HA	Manual brake release, lockable manual brake release
M	Microswitch
Encoder	
IN	Incremental encoder
IA	Absolute encoder
ST	Single-turn encoder
MT	Multiturn encoder
Functional safety	
SI04	Functionally safe rotary encoder

5.3 Brake assignment and technical data

Table 5-3 Brake assignment

Brake type		Holding torque M4 Nm	Motor frame size									MLFB order code
Siemens designation	Kendron IN-TORQ designation		71	80	90	100	112	132	160	180	200	
LS4/3	BFK458-06E	2.4	x	x								B03 + C09
LS4		3.2	x	x								B00 + C09
LS4/5		4.0	x	x								B57 + C09
LS8/6.3	BFK458-08E	5.0	x	x	x							B08 + C09
LS8		6.4	x	x	x							B04 + C09
LS8/10		8.0	x	x	x							B09 + C09
LS16/10	BFK458-10E	8.0		x	x	x						B11 + C09
LS16/13		10.4		x	x	x						B12 + C09
LS16		12.8		x	x	x						B10 + C09
LS16/20		16.0			x	x						B13 + C09
LS32/18	BFK458-12E	14.4			x	x	x					B16 + C09
LS32/23		18.4			x	x	x					B17 + C09
LS32		25.6			x	x	x					B15 + C09
LS32/40		32.0				x	x					B18 + C09
LS60/38	BFK458-14E	30.4				x	x					B20 + C09
LS60/50		40.0				x	x					B21 + C09
LS60		48.0					x					B19 + C09

5.3 Brake assignment and technical data

Brake type		Holding torque M4 Nm	Motor frame size									MLFB order code
Siemens designation	Kendrion IN-TORQ designation		71	80	90	100	112	132	160	180	200	
LS80/50	BFK458-16E	40.0						x				B26 + C09
LS80/63		50.4						x				B27 + C09
LS80		64.0						x				B22 + C09
LS80/100		80.0						x				B23 + C09
LS150/100	BFK458-18E	80.0						x	x			B29 + C09
LS150/125		100.0						x	x			B30 + C09
LS150		120.0						x	x			B28 + C09
LS260/180	BFK458-20E	144.0							x	x	x	B36 + C09
LS260/200		160.0							x	x	x	B37 + C09
LS260/240		192.0							x	x	x	B38 + C09
LS260		208.0							x	x	x	B33 + C09
LS260/315		252.0								x	x	B58 + C09
LS400/265	BFK458-25E	212.0									x	B40 + C09
LS400/300		240.0									x	B41 + C09
LS400/360		288.0									x	B42 + C09
LS400		320.0									x	B39 + C09
LS400/600		480.0									x	B59 + C09

x standard assignment

The guide values for switching times required for rated operation of the holding brake and additional technical data can be found in Catalog D50.1 (Chapter 11). These switching times may change as a result of actual operating conditions and must then be adjusted accordingly.

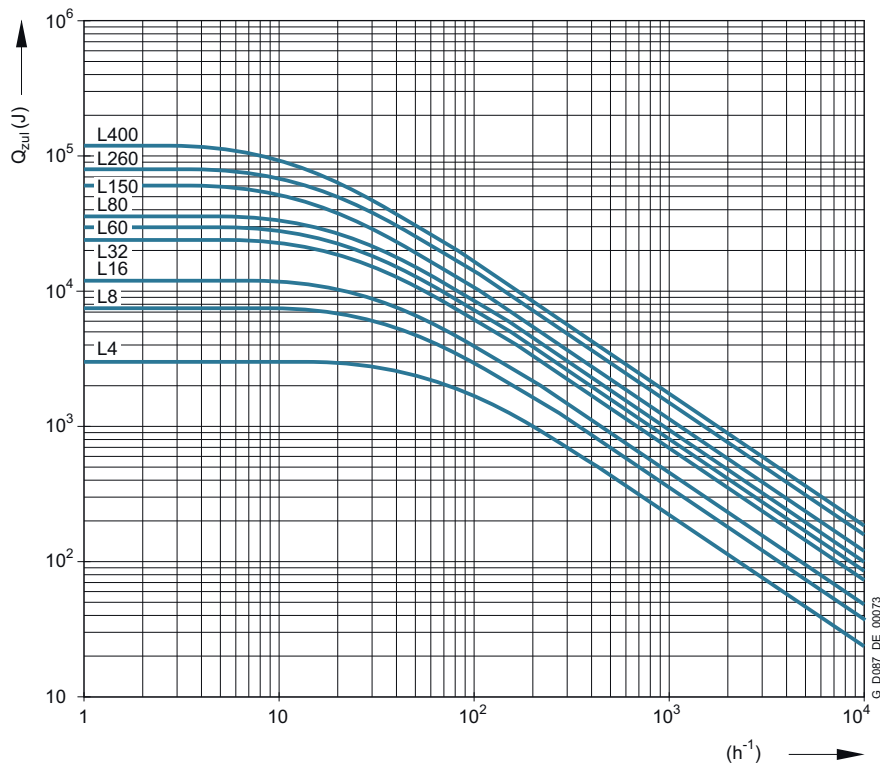
Table 5-4 Reliable working capacity of the brake for an emergency stop

Brake type	Working capacity per switching operation W_{1max}	Electrical power of the brake solenoid (at +20 ° C)
	kJ	W
LS4 (06E)	3	20
LS8 (08E)	7.5	25
LS16 (10E)	12	30
LS32 (12E)	24	40
LS60 (14E)	30	50
LS80 (16E)	36	55
LS150 (18E)	60	85
LS260 (20E)	80	100
LS400 (25E)	120	110

5.3 Brake assignment and technical data

Table 5-5 Braking torques as a function of speed and permissible speed limits for holding brakes with emergency stop function

Brake type	Max. permissible no-load speed with emergency stop function	Braking torque measured at the rated braking torque at 100 rpm				
		Friction lining, normal rpm	1500 rpm %	2500 rpm %	3000 rpm %	At max. speed %
LS4	6000		87	82	80	73
LS8	5000		85	79	78	72
LS16	4000		83	77	76	73
LS32	3600		81	76	74	72
LS60			80	75	73	71
LS80			79	73	72	69
LS150			77	71	70	67
LS260			75	69	68	66
LS400		3000		73	67	66



Q_{perm} Permissible operating energy (J)
 (h^{-1}) Frequency of operation

Figure 5-1 Permissible operating energy

The specified values refer to a brake in its delivery state. Additional technical data on the brake are provided in Catalog D51.1.

5.4 Optional brake accessories

Manual brake release (CO2) / Lockable manual release of the brake (CO3)

<p>⚠ WARNING</p> <p>A locked brake can cause injury and material damage</p> <p>No braking effect when the manual brake release lever is locked. The brake is then permanently released.</p> <p>Before commissioning the geared motor, ensure that the brake can be applied.</p> <p>Unscrew the manual brake release lever and keep it separate from the geared motor.</p>

The brake can be optionally equipped with a manual release. This allows the brake to be manually released in a no-current state. The manual release is also available with a locking mechanism. This allows a brake to be locked in the released (opened) state. This function is only permissible when setting up systems or when carrying out maintenance work. Before (re)commissioning, the manual brake release lever (that can be unscrewed) should be removed and the brake should be checked to ensure that it functions perfectly.

Keep the lockable manual brake release in the released state for maintenance work.

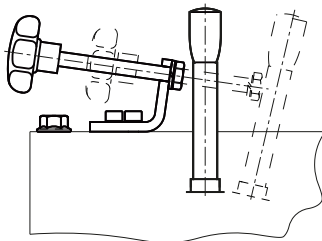


Figure 5-2 Lockable manual brake release

Microswitch (CO4)

<p>NOTICE</p> <p>Microswitch</p> <p>The microswitch is not a safety-related component and is not covered by the safety case.</p>

The brake can be equipped with a microswitch to monitor its release. The microswitch can be integrated in the circuit as an NC or NO contact.

The user must provide the electrical connection that is appropriate for the microswitch option.

Possible application of the brake release monitoring:

The motor does not start up until the brake has been fully released. This means that the microswitch can monitor all faults that occur, for example, when the motor does not start if the rectifier is defective, interrupted connecting cable, defective solenoid or excessively large air gap.

5.4 Optional brake accessories

Encapsulated brake (CO1) / encapsulated brake with condensation drain hole (C11)

LS safety-related brakes can be supplied as encapsulated brakes. In this case, a dust protection ring is installed around the circumference of the brake and a shaft sealing ring at the shaft outlet.

This prevents the release and penetration of dust, moisture and dirt. Other advantages include reduced noise when applying the brake as well as, in combination with a motor anti-condensation heater, a reduced risk of the rotor freezing on the friction surfaces.

In addition, a condensation drain hole can be incorporated in the dust protection ring for brakes. The encapsulated brake is also available in combination with a manual brake release lever and a manual brake release lever with locking mechanism.

Disposal



Recycling and disposal of SIMOGEAR geared motors

For environmentally friendly recycling and disposal of your old device, please contact a company certified for the disposal of old electrical and/or electronic devices and dispose of the device in accordance with the regulations in your country.

More information

SIMOGEAR on the Internet:
www.siemens.com/simogear

Industry Online Support (Service and Support):
www.siemens.com/online-support

IndustryMall:
www.siemens.com/industrymall