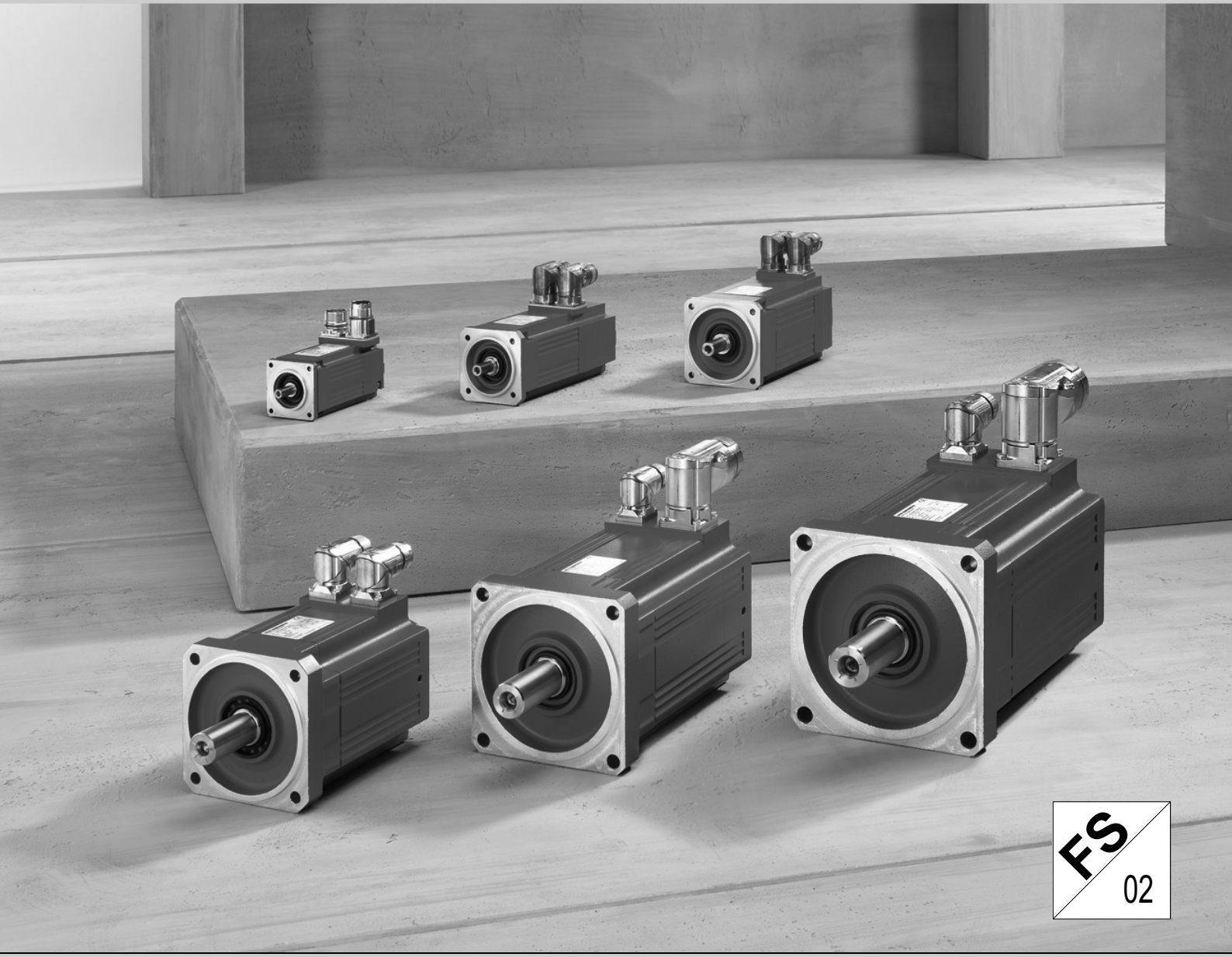
SEW EURODRIVE

Addendum to the Operating Instructions



Safety-Rated Brakes

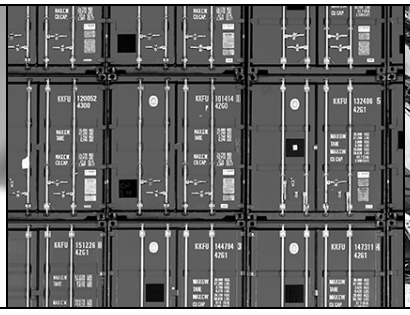
Functional Safety for Synchronous Servomotors

CMPZ71 – CMPZ100

Edition 07/2013

20060556 / EN






Contents

1 General information

1.1 About this documentation

The present addendum to the "Safety-Rated Brakes – Functional Safety for Synchronous Servomotors CMPZ71 – 100" operating instructions provides specific information regarding the safety-rated brakes of CMP motors.

The "CMP Synchronous Servomotors" operating instructions contain information about synchronous motors without functional safety.

The documentation for a motor with safety-rated brake comprises

- The "Synchronous Servomotors" operating instructions,
- The addendum to the operating instructions "Safety-Rated Brakes – Functional Safety for Synchronous Servomotors CMPZ71 – 100".

The operating instructions and the addendum to the operating instructions are an integral part of the product and contain important information for operation and service.

The operating instructions and the addendum to the operating instructions must be legible and accessible at all times. Make sure that staff responsible for the plant and its operation, as well as persons who work independently on the unit, have read the operating instructions and the addendum to the operating instructions carefully and understood them.

Make sure you always use the latest documentation and software version.

Our documentation is available in various languages for download from the SEW website (www.sew-eurodrive.com).

You can also order the printed documentation from SEW-EURODRIVE.

If you are unclear about any of the information in this documentation, or if you require further information, contact SEW-EURODRIVE directly.

1.2 Underlying standards

The safety assessment of the brake is based on the following standard and safety class:

Underlying standards for safety-rated brakes	
Safety class / underlying standard	• Performance Level (PL) according to EN ISO 13849

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 for safety notes, warnings regarding potential risks of damage to property, and other notes.

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

1.3.2 Design of the section-related safety notes

Section-related safety notes do not apply to a specific action, but to several actions pertaining to one subject. The 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 danger.

Possible consequence(s) if disregarded.

- Measure(s) to prevent the danger.

1.3.3 Design of the embedded safety notes

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

This is the formal structure of an embedded safety note:

- ⚠ **SIGNAL WORD!** Type and source of hazard.

  Possible consequence(s) if disregarded.

  – Measure(s) to prevent the hazard.

1.4 Rights to claim under warranty

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

Performing any actions that go beyond those described in the addendum to the operating instructions, or failure to comply with the requirements, will shift the responsibility for traceability and the liability for the safety-rated components from SEW-EURODRIVE to the operator.

1.5 Exclusion of liability

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

1.6 Copyright

1.7 Product names and trademarks

All product names in this documentation are trademarks or registered trademarks of their respective titleholders.

2 Safety notes

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

2.1 Preliminary information

The following safety notes are primarily concerned with the use of the following components: CMPZ motors with safety-rated brake BY..(FS). If you are using a gear unit in addition, please also refer to the safety notes in the corresponding operating instructions.

Observe the supplementary safety notes in the individual chapters of this documentation.

2.2 General information

⚠ WARNING

Danger of fatal injury or risk of injury during the operation of motors or gearmotors caused by live, bare (in the event of open connectors/terminal boxes) and movable or rotating parts.

Risk of burns caused by hot surfaces

Severe or fatal injuries

- All work related to transport, storage, installation, assembly, connection, startup, maintenance and repair may only be carried out by qualified personnel.
- For transport, storage, installation, assembly, connection, startup, maintenance and repair it is important that you adhere to the information in the following documents:
  - Warning and safety signs on the motor/gearmotor
  - All the project planning documents, startup instructions and wiring diagrams related to the drive
  - System-specific regulations and requirements
  - National/regional safety and accident prevention regulations.
- Never install damaged products.
- Never operate or energize the unit without the necessary protection covers or housing.
- Use the unit only for its intended purpose.
- Make sure the unit is installed and operated properly.

INFORMATION

Report any transport damage to the shipping company immediately.

This documentation provides additional information.

2.3 Target group

The document is for everyone who plans, configures and starts up safety-rated brakes and safety-rated brake systems.

Any work with software may only be performed by adequately qualified personnel. Qualified personnel in this context are persons who have the following qualifications:

- Appropriate instruction.
- Knowledge of this documentation and other applicable documentation.
- SEW-EURODRIVE recommends additional product training for products that are operated using the respective software.

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

- Training in mechanical engineering, e.g. as a mechanic or mechatronics technician (final examinations must have been passed).
- Knowledge of this documentation and other applicable documentation.

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

- Training in electrical engineering, e.g. as an electrician or mechatronics technician (final examinations must have been passed).
- Knowledge of this documentation and other applicable documentation.
- Knowledge of the relevant safety regulations and laws.
- Knowledge of the other standards, guidelines, and laws mentioned in this documentation.

The above mentioned persons must have the authorization expressly issued by the company to install, operate, program, configure, label and ground units, systems and circuits in accordance with the standards of safety technology.

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

2.3.1 Functional safety (FS)

Any work on brakemotors or geared brakemotors with safety-rated brake – indicated by the FS logo on the nameplate – may only be performed by SEW service staff.

If you carry out work on brakemotors or geared brakemotors with safety-rated brake yourself, note that the responsibility for the traceability of the safety components and the liability regarding functional safety is then passed to the operator.

In addition to the qualifications listed above, persons that perform work on brakemotors or geared brakemotors with safety-rated brake must have the following knowledge:

- Functional safety
- The relevant safety regulations and laws, especially with the requirements of EN ISO 13849-1 and all other standards, directives and laws specified in this documentation.
- The content of the publication "Addendum to the Operating Instructions: "Safety-Rated Brakes – Functional Safety for Synchronous Servomotors CMPZ71 – 100" addendum to the operating instructions.
- The content of the detailed operating instructions.

In addition, for working on safety-rated encoders, observe the "Safety-Rated Encoders – Functional Safety for Synchronous Servomotors CMP" addendum to the operating instructions.

2.4 Designated use

The electromechanical single-disk brakes BY..(FS) are designed as safety-rated components to fulfill safety functions in industrial plants. They are certified according to EN ISO 13849.

When installed in machines, startup (i.e. start of designated operation of the BY..(FS) brake) is prohibited until it is determined that the machine complies with the local laws and directives. In the EU/EC area of applicability, the Machinery Directive 2006/42/EC must be observed.

Brakemotors and geared brakemotors with safety-rated brake must only be operated on SEW-EURODRIVE frequency inverters.

It is not permitted to retrofit the BY..(FS) brake or to replace an existing BY brake with a BY..(FS) brake.

Use in potentially explosive gas or dust atmospheres is not permitted.

The manual lever must not be mounted during normal operation in order to avoid an accidental release. It is not permitted to convert the brake to lockable manual release.

The brake must not be exposed to oils, acids, gases, vapors, or radiation.

In order to determine the PL of the safety function of a plant, the plant manufacturer must perform an overall evaluation. The specifications in this document are to serve as a basis for further evaluation according to DIN EN ISO 13849.

Air-cooled versions are designed for ambient temperatures of -20 °C to +40 °C and installation altitudes ≤ 1000 m above sea level. Any differing specifications on the nameplate must be observed. The ambient conditions must comply with all the specifications on the nameplate.

The safety-rated BY..(FS) brake may only be used as a holding brake with emergency braking operations. The designated use is to activate the brake at standstill (< 50 rpm).

SEW-EURODRIVE recommends to stop the drive with stop category 1 according to EN 60204-1 before applying the brake.

2.5 Other applicable documentation

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

- "Synchronous Servomotors" operating instructions
- "Safe Brake System – Synchronous Servomotors" manual
- "Safety-Rated Encoders – Functional Safety for Synchronous Servomotors CMP" addendum to the operating instructions, if applicable

2.6 Transport

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

2.7 Extended storage/standstill

When the system is at standstill for a longer period of time, or the drive with safety-rated brake is stored for an extended period, the braking torque can be reduced. You must make sure that the brake is functioning properly before startup.

2.8 Installation

Make sure that the supports are even, the foot and flange mounting is correct and if there is direct coupling, align with precision. Resonances between the rotational frequency and the double network frequency caused by the structure are to be avoided. Release the brake (if installed), turn rotor manually, check for unusual grinding noise. Check the direction of rotation in decoupled state.

Only install or remove belt pulleys and couplings using suitable devices (heat up) and cover with a touch guard. Avoid improper belt tension.

2.9 Electrical connection

All work may only be carried out by qualified personnel. During work, the machine must be at standstill, de-energized, and safeguarded against accidental restart. This also applies to auxiliary circuits (e.g. anti-condensation heating or forced cooling fan).

Check whether the unit is de-energized!

Exceeding the tolerances in EN 60034-1 (VDE 0530, part 1) – voltage + 5%, frequency + 2%, curve shape, symmetry – increases the heating and influences electromagnetic compatibility. Also comply with EN 50110 (where necessary, observe other applicable national regulations, such as DIN VDE 0105 for Germany).

Observe the wiring information and any differing data on the nameplate as well as the wiring diagram in the terminal box.

INFORMATION

Observe the electrical connection according EN 60204-1 par. 14 and 15.

2.10 Startup/operation

Whenever changes to normal operation occur, such as increased temperatures, noise, vibrations, etc., try to determine the cause. Consult the manufacturer if required. Never deactivate protection devices, even in test mode. Switch off the motor in case of doubt.

Regularly clean air ducts in dusty or dirty environments.

2.10.1 Surface temperature during operation

Synchronous servomotors get very hot during operation.

Touching the servomotor when it has not cooled down could result in burns. The servomotor can have a surface temperature of more than 100 °C during operation.

Never touch the servomotor during operation or in the cool down phase after it has been switched off.

3 Functional safety

3.1 Safety-rated brake

The brakes of size BY 2 – BY 8 are available as safety-rated brakes for implementation in functional safety technology.

In this design, the brakes are referred to as BY..(FS) brakes. Proper functioning and the application of the braking torque to the motor shaft are ensured with the BY..(FS) brake. Safety-critical elements are sealed with a locking compound to protect them against manipulation.

The BY..(FS) brake may only be used as a holding brake with emergency braking properties. The designated use is to activate the brake at standstill (< 50 rpm). Emergency braking operations are permitted for the BY..(FS) brake. The permitted conditions for emergency switch-offs are listed in the technical data and must be complied with.

To evaluate the BY..(FS) brake in the overall system, the technical data chapter contains B_{10d} values. These are considerably higher for the BY..(FS) brake than for the standard BY.. brake.

3.2 Motor assignment

The safety-rated BY(FS) brake is available for the following synchronous servomotors. It is not permitted to adapt them to other motors.

Motor type	BY..(FS) brake type
CMPZ71	BY2
CMPZ80	BY4
CMPZ100	BY8

3.3 TÜV certification

The following certificate is available for the safety-rated BY..(FS) brakes:

- Certificate of the TÜV NORD Systems GmbH & Co. KG

The TÜV certificate is available for download on the SEW website (www.sew-eurodrive.de).

3.4 Brake control

When using the BY..(FS) brake in functional safety technology, the safety-related disconnection of the brake voltage must be realized externally via the SBC (Safe Brake Control) safety function.

The Performance Level (PL) of the external switching equipment must correspond with the Performance Level (PLr) of the application.

3.5 Traceability

All safety-rated brakes have a motor serial number for unique motor assignment (page 20).

3.6 Safety functions

By expanding the safety-rated brake into a brake system, the following safety functions can be implemented.

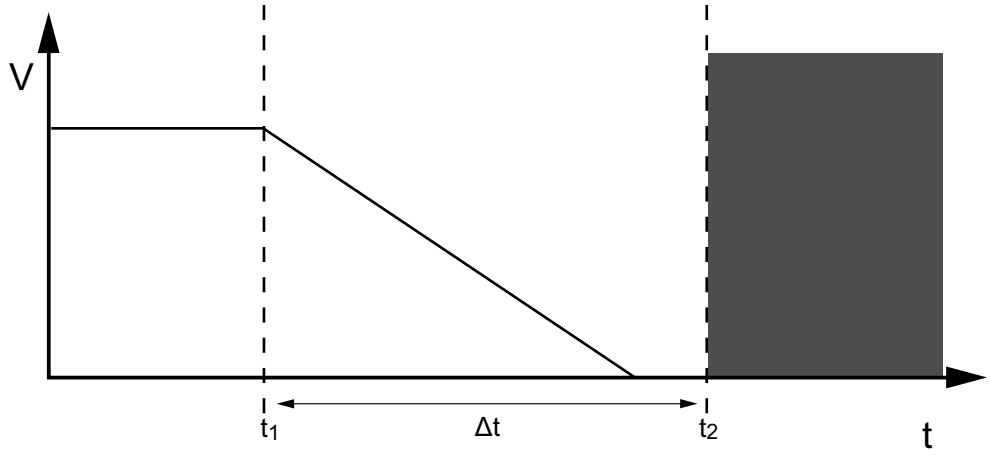
- SBA (safe brake actuation)
- SBH (safe brake hold)

INFORMATION

- SBA and SBH additionally require the safety function SBC for safety-related shut-down of the power supply of the brake, see section “Brake control”.
- A drive can, depending on the configuration and use in the application, generate more torque than the brake is able to stop. When activating the Safety Function SBA / SBH, the drive with the Safety Function STO - Safe Torque Off must also be switched off.
- SBA and SBH are defined by SEW-EURDORIVE in accordance with the standard DIN EN 61800-5-2.

3.6.1 SBC – Safe Brake Control

The SBC function provides a safe output signal for controlling an external brake. This means no power is supplied to release the brake electrically.



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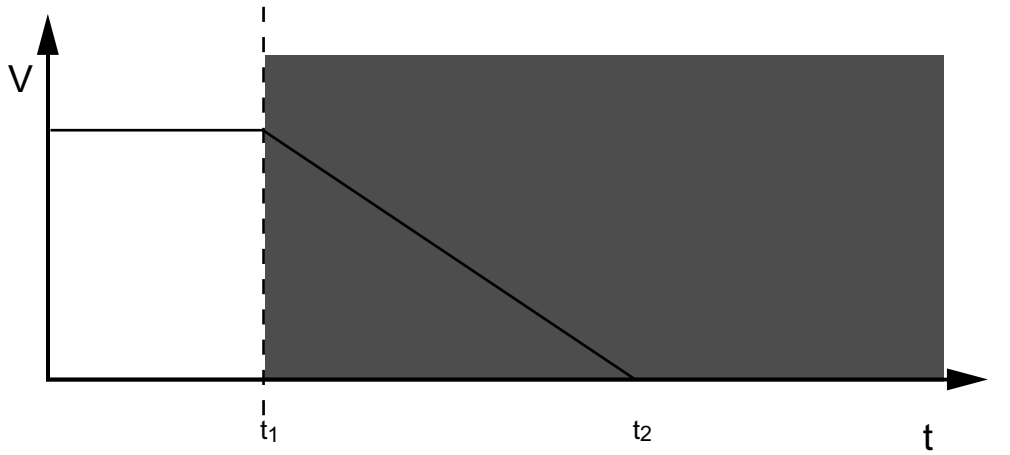
Safety function interrupts the power supply to the brake

v = Speed
t = Time
t_1 = Point of time when the drive is stopped
t_2 = Point of time when SBC is triggered
Δt = Safety-relevant period of time

3.6.2 SBA (Safe Brake Actuation)

When activated, the SBA function brakes uses the electromechanical brake in order to stop the motor shaft safely. This braking operation is considered an emergency stop braking.



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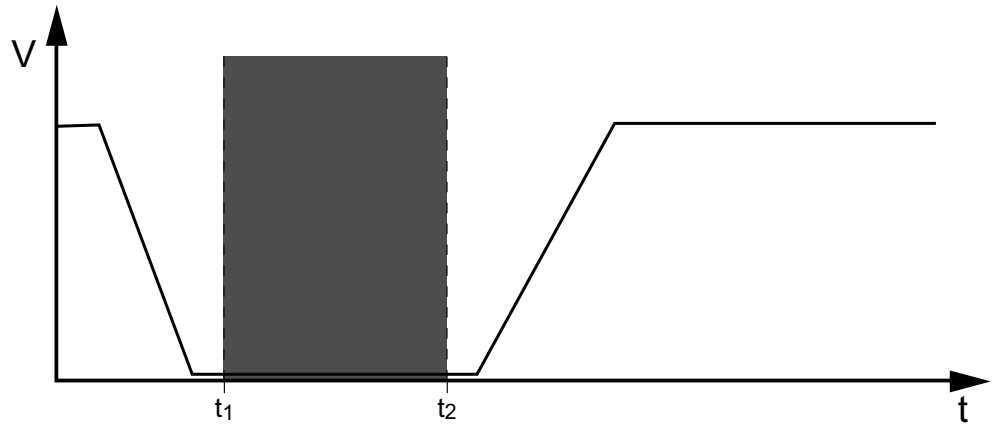
Safety function enabled

v = Speed
t = Time
t_1 = Point of time when SBA is triggered
t_2 = Point of time when SBA has stopped the motor shaft.

3.6.3 SBH (Safe Brake Hold)

Once activated, the SBH function uses the electromechanical brake to hold the current of the motor shaft safely. The motor shaft is already stopped when the function is activated.



Safety function enabled

v = Speed
t = Time
t_1 = Point of time when SBH is triggered
t_2 = Point of time when SBH is deactivated

3.7 Performance levels that can be achieved

The BY..(FS) brake meets category 1 according to EN ISO 13849.

The Performance Level that can be achieved is determined by the selection of a corresponding category, a safety-related brake control, and an additional diagnostic function. The resulting braking system must be assessed holistically by the user and meet the required Performance Level. Examples for achieving different Performance Levels are given in the "Safe Braking System – Synchronous Servomotors" manual from SEW-EURODRIVE.

To determine the achieved safety level, you can find the safety characteristics of the brake in chapter "Technical data" (page 27).

The safety characteristics are also available on the SEW website in the corresponding product documentation and in the library for the Sistema software of the Institute for Occupational Safety and Health of the German Social Accident Insurance (IFA, formerly BGIA).

3.8 Marking

3.8.1 FS symbol on the nameplate

Motors from SEW-EURODRIVE can be equipped with optional components for functional safety.

Inverters, encoders, brakes, or other accessories can be integrated in the motor as safety-relevant components either individually or in combination.

SEW-EURODRIVE indicates the integration of functional safety by the following FS mark and a two-digit number on the nameplate of the motor:

The number is a code that indicates which components in the motor are safety-related, see the following excerpt from the code table for all products:

FS code	Inverter	Motor monitoring (e.g. motor protection)	Encoder	Brake	Brake monitoring (e.g. function)	Manual brake release
01	**x**					
02				x		
03		x				
04			x			
05	x			x		
06	x	x				
07	x		x			
08				x		x
09				x	x	
10		x		x		
11			x	x		

If the FS symbol on the nameplate contains the code "FS 11", for example, the motor is equipped with a combination of safety-rated brake and safety-rated encoder.

If the motor bears the FS symbol on the nameplate, you must adhere to the information in the following documents:

- "Safety-Rated Encoders – Functional Safety for Synchronous Servomotors CMP" addendum to the operating instructions
- "Safety-Rated Brakes – Functional Safety for Synchronous Servomotors CMPZ71 – 100" addendum to the operating instructions
- "Safe Brake System – Synchronous Servomotors" manual

3.8.2 FS logo as a sticker on the brake

In addition to the FS symbol on the nameplate, there is a yellow FS logo without a specific number attached to the brake. The FS logo indicates the use of the brake as safety-rated component.

3.9 Brake diagnostics

A brake diagnosis is required according to EN ISO 13849 depending on the required Performance Level. The brake diagnosis is not a safety function. It provides additional information regarding the performance of the brake. This allows you to detect potential errors in time and provide for maintenance/repair.

The brake diagnostic function must detect the following possible errors of the BY brake with a DC value of ≥ 60 %:

- Brake is not applied
- Reduced braking torque

Brake diagnostics must be realized externally. A cyclic call-up via an external controller (e.g. UCS..B) must be ensured.

For detailed information about brake diagnostics, refer to the "Brake Diagnostics" manual[1)].

3.10 Validation

To determine the overall PL of a machine, the plant manufacturer must carry out an overall evaluation.

The user determines the PL for each implemented safety functions.

1) In preparation

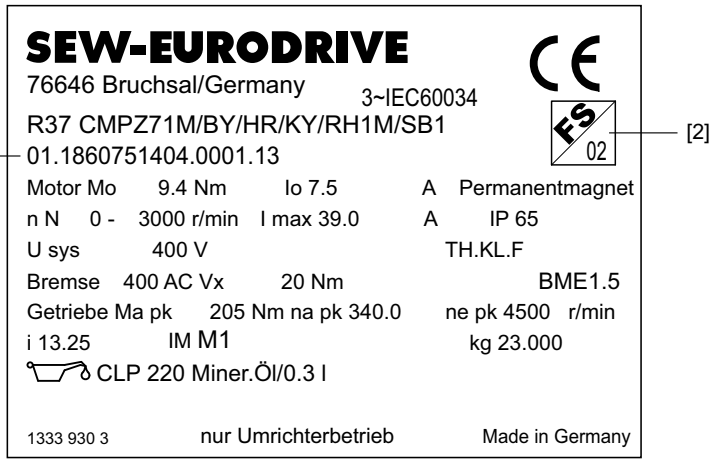
4 Unit structure

4.1 Nameplates

The FS logo is on the nameplate if the drive is designed for use in functional safety applications and is equipped with one or more safety-rated components. The combination of safety-rated components installed in a specific drive can be taken from the code table above.

4.1.1 Gearmotor

The following figure shows an example nameplate of a gearmotor:



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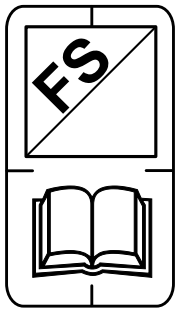
[1] Motor serial number
[2] FS logo for functional safety

4.1.2 Brake

The motor nameplate is sufficient for identifying the BY..(FS) brake. There is no need to disassemble the drive. The brake has no separate nameplate.

A yellow FS logo sticker is attached in addition for maintenance and service work on the brake. The sticker clearly indicates the safety-rated component and refers to the applicable documentation. The sticker is next to the brake inside the cover and cannot be seen from the outside.



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5 Mechanical installation of the motor

The use of safety-rated components does not affect mechanical installation.

6 Electrical installation

INFORMATION

- It is essential to comply with the safety notes in chapter 2 during installation!
- Switch contacts in utilization category AC-3 according to EN 60947-4-1 must be used for switching the motor and the brake.
- Use switch contacts in utilization category DC-3 according to EN 60947-4-1 for switching the brake with DC 24 V.
- Observe the operating instructions of the inverter and the corresponding wiring notes of the inverter manufacturer.

⚠ WARNING

Disabling functional safety devices.

Severe or fatal injuries.

- Only qualified personnel is allowed to carry out work on functional safety components.
- Any work on functional safety components must be carried out by strictly observing the specifications in the operating instructions at hand and the respective addendum to the operating instructions. Else, the right to claim under warranty will become invalid.

Note the information and explanations about correct wiring in the corresponding operating instructions and the correct brake connection.

6.1 Thermal motor protection

NOTICE

Electromagnetic interference of the drives.

Possible damage to property.

- Install the connecting lead of the KTY separately from other power cables maintaining a distance of at least 200 mm. The cables can only be routed together if either the KTY cable or the power cable is shielded.

7 Startup

7.1 Requirements

INFORMATION

- It is essential to comply with the safety notes in chapter 2 during installation.
- If you encounter problems, observe chapter "Malfunctions" in the corresponding operating instructions and the addendum to the operating instructions.

⚠ WARNING

Disabling functional safety devices.

Severe or fatal injuries.

- Only qualified personnel is allowed to carry out work on functional safety components.
- Any work on functional safety components must be carried out by strictly observing the specifications in the operating instructions at hand and the respective addendum to the operating instructions. Else, the right to claim under warranty will become invalid.
- Never operate a motor with safety-rated brake on a third-party inverter.

7.2 Ambient conditions

Install the drive only if the following conditions are met:

- There must be no oils, acids, gases, vapors etc. in the vicinity.
- Motors must not be subjected to hazardous radiation (such as ionizing radiation). Consult SEW-EURODRIVE, if necessary.
- The CMP. synchronous servomotors are equipped with gaskets that are suitable for the designated use.

  If the motor is operated in environments with high environmental impact, such as increased ozone values, the CMP. synchronous servomotors can be equipped with gaskets of a higher quality. If you have doubts regarding the stability of the gaskets in connection with the respective environmental impacts, consult SEW-EURODRIVE.

8 Inspection/maintenance

⚠ WARNING

Risk of crushing if the hoist falls or in the event of uncontrolled unit behavior.

Severe or fatal injuries.

- Secure or lower hoist drives (danger of falling)
- Safeguard and/or protect the driven machine against touching
- Isolate the motor, brake, and forced cooling fan, if installed, from the power supply before starting work, safeguarding them against unintentional re-start.
- Only use genuine spare parts in accordance with the valid spare parts list.

⚠ WARNING

Disabling functional safety devices.

Severe or fatal injuries.

- Any work on drives with functional safety must be carried out by SEW-EURODRIVE.

CAUTION

The surfaces of the drive can be very hot during operation.

Danger of burns

- Let the unit cool down before starting to work on it.

8.1 Functional safety (FS)

SEW-EURODRIVE assumes responsibility for the delivered brakemotor or geared brakemotor with safety-rated brake in terms of compliance with the functional safety regulations. This is why the safety-relevant connecting elements are sealed.

Work on the brakemotor or geared brakemotor for which sealed connections have to be opened may only be carried out by service engineers from SEW-EURODRIVE.

Each safety-rated brake has a unique motor assignment to provide for traceability. The motor serial number is required to ensure this assignment after replacing the BY..(FS) brake.

INFORMATION

If you carry out work on the safety-rated brakemotor or geared brakemotor yourself and/or if you open sealed screws, note that the responsibility for the traceability of the safety-rated components and the liability regarding functional safety is then passed to the executing person.

8.2 Inspection and maintenance intervals

The amount of wear depends on many factors and may be high. Depending on the load conditions, maintenance/inspection becomes necessary every 0.5 to 2 years.

INFORMATION

The system manufacturer must calculate the required inspection/maintenance intervals individually in accordance with the project planning documents.

Inspection and maintenance work includes:

- Cleaning
- Checking the connection cables for contact and damage
- Checking the working air gap

The maintenance and inspection work mentioned above are described in detail in the "Synchronous Servomotors" operating instructions.

Maintenance and inspection work going beyond this is strictly forbidden for the safety-rated BY..(FS) brake. This applies especially to:

- Changing the brake disks
- Changing the braking torque
- Changing the magnet body

Commission the SEW-EURODRIVE Service to carry out this kind of work.

9 Technical data

9.1 Categories

Definition:

The categories classify safety-related components regarding their resistance to errors and their response in the event of an error based on the reliability and/or the structural arrangement of the parts. A higher resistance to errors means a higher potential to reduce risk.

Brake type	Category (according to EN ISO 13849)
Safety-rated BY..(FS) brake	Category 1

9.2 Safety characteristics

9.2.1 Without external diagnostics

	Characteristic values according to EN ISO 13849
Classification/underlying standards	Max. PL c
System structure	Single channel
Operating mode selection	"High demand"
Probability of dangerous failure per hour (PFHd value)	Calculation by user via B_{10d} value
Service life (depending on the starting frequency)	Max. 20 years, after which the component must be replaced with a new one.
Safe state	Supply voltage to BY..(FS) brake disconnected. Brake is applied.
Safety function[1)]	• Safe brake hold (SBH), up to PLc • Safe braking (SBA), up to PL c (emergency braking)

1) Take into account the system architectures, see "Safe Brake System – Synchronous Servomotors" manual.

9.2.2 With external diagnostics

	Characteristic values according to EN ISO 13849
Classification/underlying standards	Max. PL d
System structure	Single channel
Operating mode selection	"High demand"
Probability of dangerous failure per hour (PFHd value)	Calculation by user via B_{10d} value
Service life (depending on the starting frequency)	Max. 20 years, after which the component must be replaced with a new one.
Safe state	Supply voltage to BY..(FS) brake disconnected. Brake is applied.
Safety function[1)]	• Safe brake hold (SBH), up to PLc • Safe braking (SBA), up to PL d (emergency braking)

1) Take into account the system architectures, see "Safe Brake System – Synchronous Servomotors" manual.

INFORMATION

The external brake diagnostics must have a DC value of ≥ 60 %.

9.3 Safety characteristics

9.3.1 B_{10d} characteristics for BY..(FS) brakes

The B_{10d} values for safety-rated BY..(FS) brakes are much higher than those for the standard BY.. brake.

Safety characteristics of BY..(FS) brakes	
Size	**B_{10d} = switching cycles**
BY2	15,000,000
BY4	12,000,000
BY8	9,000,000

9.4 Maximum permitted braking work in case of emergency off

With the safety-rated BY..(FS) brake, you must observe the max. permitted braking work per cycle for emergency braking operations. This must not be exceeded. The permitted limit value is listed in the following tables. Note the distinction between vertical and horizontal drives.

INFORMATION

Note the configuration information for the safety-rated brake in the "Safe Brake System – Synchronous Servomotors" manual.

9.4.1 Emergency braking work in horizontal drives

For horizontal movements, e.g. of travel drives, higher braking work values are permitted in case of emergency braking than for vertical movements – provided that the conditions below are met. The then applicable limit values of the permitted maximum braking work W_{max} listed below may not be exceeded during emergency braking operations.

In case of an emergency braking operation during which the braking work exceeds the limit values for vertical drives, the specific wear on the brake lining is significantly higher. The factor can be up to 100. This additional wear must be considered when determining the maintenance interval.

During the braking process, the effective dynamic braking torque can be reduced due to the heating of the brake lining. In extreme cases, the effective braking torque can be reduced to 60% of the rated value. Take this into account when you determine the braking distance.

A decisive factor for the permitted increased braking work of horizontal drives is the speed at which the braking process starts. The lower the speed, the greater the permitted braking work.

Application speed [rpm]	Brake type BY..(FS)	$M_{B\ max}$ [Nm]	W_{max} [kJ]
2000	BY2	7	40
		10	36
		14	30
		20	24
	BY4	14	48
		20	39
		28	34
		40	21
	BY8	28	96
		40	88
		55	64
		80	36

Application speed [rpm]	Brake type BY..(FS)	$M_{B\ max}$ [Nm]	W_{max} [kJ]
3000	BY2	7	40
		10	36
		14	28
		20	22
	BY4	14	40
		20	30
		28	20
		40	9
	BY8	28	72
		40	64
		55	36
		80	14
4500	BY2	7	32
		10	28
		14	20
		20	12
	BY4	14	30
		20	18
		28	10
		40	6
	BY8	28	44
		40	36
		55	22
		80	8

Legend:
$M_{B\ max}$ = Maximum braking torque
W_{max} = Permitted braking work per cycle

9.4.2 Emergency braking work in vertical drives

In hoist applications, the limit values of the permitted maximum braking work W_{max} listed below may not be exceeded during emergency braking operations.

Application speed [rpm]	Brake type BY..(FS)	$M_{B\ max}$ [Nm]	W_{max} [kJ]
2000	BY2	7	20
		10	18
		14	15
		20	12
	BY4	14	24
		20	19.5
		28	17
		40	10.5
	BY8	28	48
		40	44
		55	32
		80	18
3000	BY2	7	20
		10	18
		14	14
		20	11
	BY4	14	20
		20	15
		28	10
		40	4.5
	BY8	28	36
		40	32
		55	18
		80	7
4500	BY2	7	16
		10	14
		14	10
		20	6
	BY4	14	15
		20	9
		28	5
		40	3
	BY8	28	22
		40	18
		55	11
		80	4

Legend:
$M_{B\ max}$ = Maximum braking torque
W_{max} = Permitted braking work per cycle

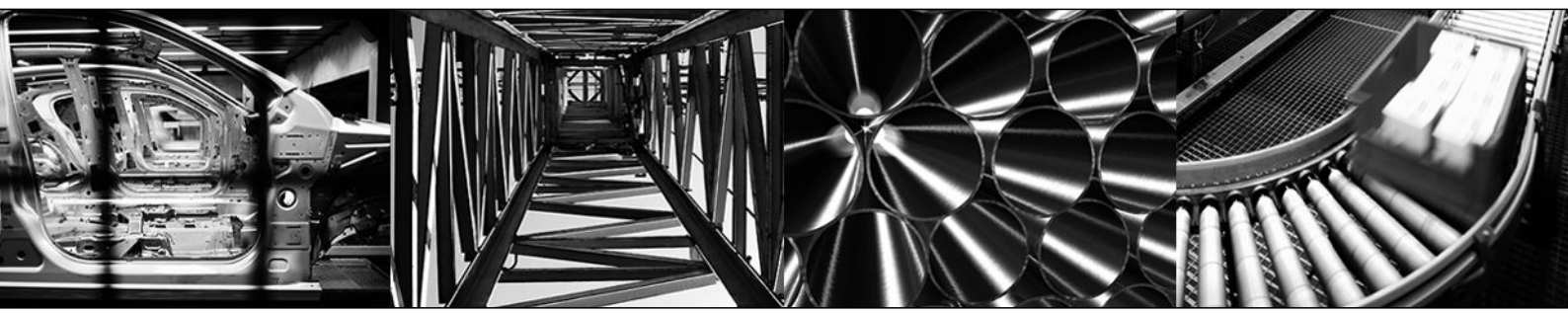
10 Malfunctions

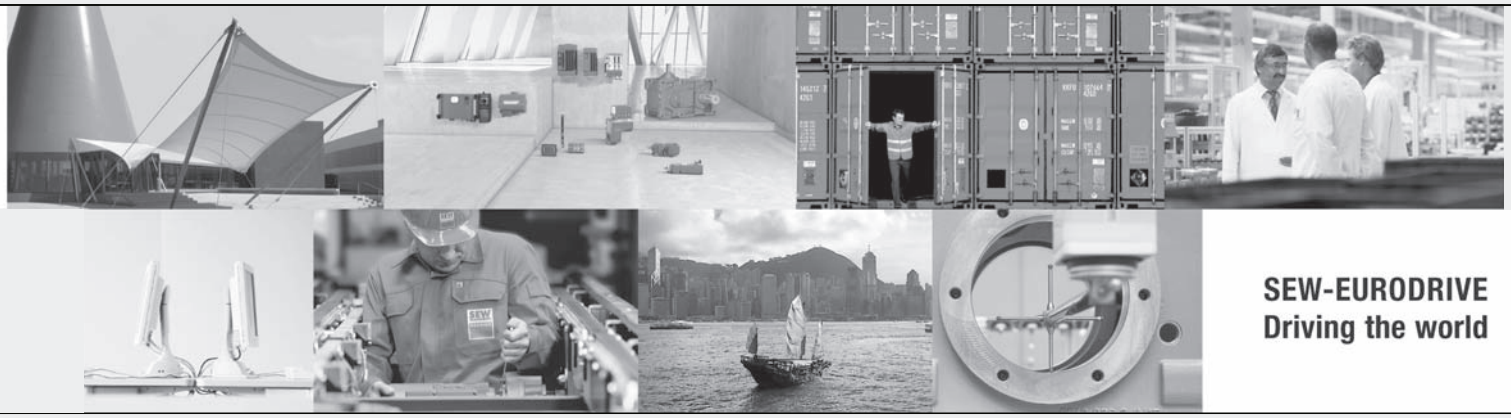
INFORMATION

In the event of a malfunctions of the safety-rated brake, consult the SEW-EURODRIVE service.

When you contact the SEW-EURODRIVE service, have the corresponding motor serial number or the FS marking of the brake at hand, see chapter Nameplates (page 20).

In the event of a malfunction of all other components, proceed as described in the corresponding operating instructions.





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