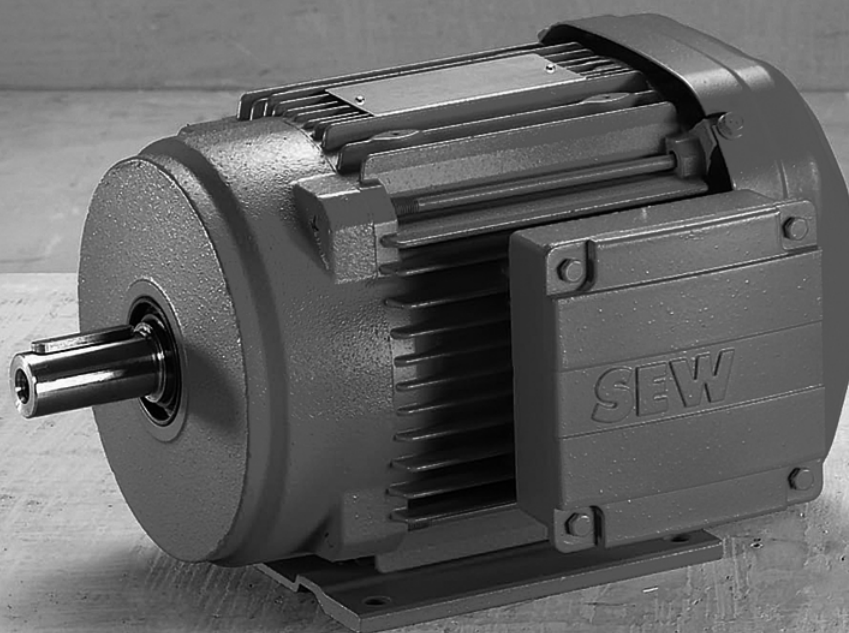




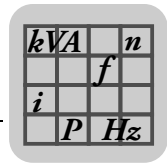
SEW
EURODRIVE

Data Sheet



Functional Safety Safety Characteristics for BE.. Brake





1 Data Sheet



INFORMATION

This data sheet applies in addition to the "DR.71-225, 315 AC Motors" operating instructions.

Please observe the data specified in this publication. This document does not replace the detailed operating instructions "DR.71-225, 315 AC Motors".

Observe the other applicable documentation¹⁾:

- "DR.71-225, 315 AC Motors" operating instructions
- "DR. Series AC Motors" catalog

1) We reserve the rights to make technical changes.

1.1 Safety notes



INFORMATION

Meaning of the value "MTTF_d":

MTTF_d is a statistical value. It is defined in the standard EN ISO 13849-1 as "expected value of the mean time to dangerous failure".

Statistical value means that it is a value that has been determined empirically. The value does not imply a "guaranteed operating life" or a "failure-free time".

For the BE.. brake, the value MTTF_d refers to its capability of performing the mechanical switching operation, that is to move the pressure plate. **Wear of the brake lining, which is caused by the conversion of kinetic energy during the braking process, does not affect this value.**

The values differ for every application because the value MTTF_d depends on the mean number of actuations per year.



INFORMATION

Observe the technical data for the brake in the "DR.71-225, 315 AC Motors" operating instructions, in particular the maximum permitted work done by the brake.

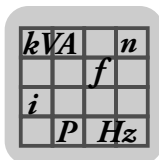


INFORMATION

Usage in safety-relevant applications:

The system/machine manufacturer is responsible for compliance of the system/ machine with applicable safety regulations.

If a BE.. brake is used to fulfil a safety function, then the brake is to be regarded as component (element) and not as safety-related subsystem. Usually, the BE.. brake alone is not sufficient to execute a safety function in compliance with the standard.



1.2 Characteristic safety values

Definition of the characteristic safety value B_{10d} :

The value B_{10d} specifies the number of cycles at which 10% of components have failed dangerously (definition according to standard EN ISO 13849-1). Failed dangerously means in this context that the brake is not applied when required. This means the brake does not deliver the necessary braking torque.

Size	B_{10d} Switching cycles
BE05	16.000.000
BE1	12.000.000
BE2	8.000.000
BE5	6.000.000
BE11	3.000.000
BE20	2.000.000
BE30	1.500.000
BE32	1.500.000
BE60	1.000.000
BE62	1.000.000
BE120	250.000
BE122	250.000

Definition of the categories:

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.

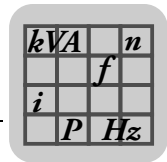
Brake type	Category
BE.. brake without safety technology	Category B (according to EN ISO 13849-1)
Safety characteristics BE.. brake (FS)	Category 1 (according to EN ISO 13849-1)

1.3 Sample calculations

Below some examples for how to use the value B_{10d} to calculate the mean time to dangerous failure ($MTTF_d$).

In the examples, the values $MTTF_d$ are calculated for size BE11 based on 2 different switching frequencies. The equations used are described in standard EN ISO 13849-1.

The following sample calculations are based on two selected applications. The calculation has to be adjusted for other applications. Also, other parameters might influence the calculation. If you have any questions on calculating the values, please contact SEW-EURODRIVE.



1.3.1 Example 1

Input data:

Input data for the BE11 brake:

- $B_{10d} = 3\,000\,000$
- Operating days per year: $d_{op} = 300\text{ d/a}$
- Daily operating period: $h_{op} = 24\text{ h/d}$
- Cycle time: $t_{cycle} = 87\text{ s}$
- Starting frequency: 41.4 per hour

Calculation:

$$MTTF_d = \frac{B_{10d}}{0.1 \times n_{op}}$$

$$n_{op} = \frac{d_{op} \times h_{op} \times 3600 \frac{s}{h}}{t_{cycle}}$$

Inserting the values:

$$n_{op} = \frac{300 \frac{d}{a} \times 24 \frac{h}{d} \times 3600 \frac{s}{h}}{87 s} = 297.931 \frac{1}{a}$$

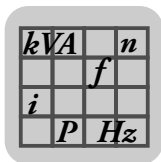
$$MTTF_d = \frac{3\,000\,000}{0.1 \times 297.931} a = 100.7 a$$

Result:

$MTTF_d = 100\text{ years}$

The result is assigned to "High" according to standard EN ISO 13849-1 as shown in the following table.

Designation	Range
Low	$3\text{ years} \leq MTTF_d < 10\text{ years}$
Medium	$10\text{ years} \leq MTTF_d < 30\text{ years}$
High	$30\text{ years} \leq MTTF_d \leq 100\text{ years}$



1.3.2 Example 2

Input data:

Input data for the BE11 brake:

- Same values as in example 1 but with reduced cycle time
- Cycle time: $t_{\text{cycle}} = 25 \text{ s}$
- Starting frequency: 144 per hour

Calculation:

Make the calculation as shown in example 1.

Result:

$\text{MTTF}_d = 29 \text{ years}$

The result is assigned to "Medium" according to standard EN ISO 13849-1.





SEW-EURODRIVE
Driving the world

SEW
EURODRIVE

SEW-EURODRIVE GmbH & Co KG
P.O. Box 3023
D-76642 Bruchsal/Germany
Phone +49 7251 75-0
Fax +49 7251 75-1970
sew@sew-eurodrive.com

→ www.sew-eurodrive.com