

UL Guideline Accessories

For frequency and servo inverters

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1 About this document

1.1 Purpose and application of the document

This document serves for the

- planning,
- selection,
- installation,
- approval according to UL requirements

of an application that uses Lenze components.

It is intended to provide the installer with information on Lenze components needed for assessment and approval according to UL requirements.

1.2 Scope of this document

This document contains information on Lenze accessories.

General information on the process of having an application approved by UL or by an Authority Having Jurisdiction (AHJ) is presented only to the extent necessary for understanding.

1.3 Disclaimer

The information in this document is the opinion and interpretation of Lenze. It is not legally binding nor has it been confirmed by a third party. Lenze is not liable for the correctness of this information. Users seeking legal advice are requested to contact the relevant providers.

1.4 Conventions

Many terms that appear in this document have their origin in UL's system and the terminology used there. Proper nouns are capitalized.

1.5 Terms and abbreviations

Term	Meaning
AHJ	Authority Having Jurisdiction
BCP	Branch Circuit Protection
CB	Circuit Breaker
CofA	Conditions of Applicability, part of the UL report for recognised components
MCB	Miniature Circuit Breaker
MCCB	Molded Case Circuit Breaker, Circuit Breaker
NEC	National Electric Code: Installation standard published by NFPA
NFPA	National Fire Protection Agency: Organization, which is, amongst other things, responsible for creating and monitoring safety regulations for electrical Installations in the USA.
NFPA70	Other expression for NEC
NFPA79	Installation specification, valid in the field of (large) machines, issued by the NFPA
SCCR	Short Circuit Current Rating
UL 508A	Standard for control cabinets

Table 1: Compilation of terms and abbreviations used in this document with brief explanation.

1.6 Document history

Important changes and additions in the text with corresponding note and date.

VERS	AMENDMENT / SUPPLEMENT
06/2023	First edition
08/2023	Chapter 2.1.3 and Chapter 5 added
09/2025	Cables EYB added, several CofA's added

2 UL information

2.1 UL and UR - difference in application

2.1.1 UL Listing

A listing usually means that the product is used as a stand-alone "device" in an installation. It is mounted in a location where the general installation rules (NFPA70 = NEC, National Electrical Code) apply.

Very little data is considered as a specification of a device and criteria for its applicability:

- Supply voltage (nominal voltage)
- Current consumption from the mains supply, current output to the load (rated current)
- Power consumption / power output
- Short circuit current coordination (SCCR rating)
- Enclosure type (UL type rating)

2.1.2 UR Recognized

An approval under the recognized label (UR) usually means that the product is intended to be integrated as a component in a system (device), which in turn can be approved by UL. It is important to note:

- The structure of the system (device) is usually analyzed and described during the approval process. It is noted which properties the components have. A component with UR approval is registered as such and may only be replaced by another component that has approval in the same category and also has the described properties.
- For components with UR approval, conditions apply that must be complied with: CofA (**C**onditions **o**f **A**pplicability). These are recorded in the report of the component. In order to enable the user to take them into account, they must be communicated by the manufacturer/provider, usually in the data sheet. The report is not publicly accessible.

2.1.3 Special approval type: Wiring Harnesses

For harnessed cables, there is a special way to prove that they have already been accepted by UL in advance. Cables are assembled for this purpose under the Wiring Harnesses Label.

These products are not assessed by UL in an acceptance test. Rather, the manufacturer/processor is assessed here. This makes it more like a Follow Up Service program, where UL monitors the manufacturer/processor through shop visits to ensure that the right materials are being processed in the right way for the product.

There is therefore no test report (UL report) for such products and also no index file. This offers greater flexibility in creating variants, which presents a great advantage for wires and cables. On the other hand, there is an index file for

the manufacturer/processor, in which it is shown that he has obtained the "Wiring Harnesses" label for his cable assembly and may present it.

For labeling, the product is marked with a UR mark and the text "Wiring Harness" placed next to it. This label proves that the component has already been approved by UL in the event of a subsequent acceptance (e.g. field inspection). As with a component with "recognized" acceptance, technical data must be considered and made available to the field inspector. See Chapter 3.4.

2.2 Scope of standards

2.2.1 National Electrical Code (NEC) NFPA70

This standard is used for an installation e.g. in a building. It is issued by the National Fire Protection Agency. Compliance with this standard is not controlled by UL, but by a government authority (AHJ = Authority Having Jurisdiction).

2.2.2 NFPA79

This standard gives requirements for installations in plants and (large) machines. It is published by the National Fire Protection Agency.

2.2.3 Standard for control cabinets: UL 508A

The control cabinet is considered a product (device) within a machine, plant, or installation. It can be tested and approved by UL. Requirements that apply are given in the UL 508A standard (Cat. NRMT). For various components that are mounted in a control cabinet, UL 508A again requires approval according to UL standards.

Supplementary document

"SUPPLEMENT SA SPECIFIC COMPONENT REQUIREMENTS FOR INDUSTRIAL CONTROL PANELS"

This supplementary document lists all the components concerned and the approval category or standard required for them (see table 1 in that document). In each case, reference is made to the chapter of standard 508A in which the corresponding requirement is listed. The entries in the table are arranged by chapter no. of these references. A particular component may be assigned to several different entries in table 1. Then approval is permissible according to one of the various possible categories.

This supplementary document is revised and updated at relatively short intervals. It is important to use the latest version.

2.2.4 Additional components

Additional components with a UL approval can be used within the control cabinet. This can be an approval in the form of a listing (UL) or a recognition (UR) (see chapter 2.1.1 and 2.1.2).

- Lenze frequency inverters and servo inverters generally have a listing, approved according to the standard for power drive systems, UL 61800-5-1 (category NMMS). For older products, the UL 508C standard was used before 2016.
- Accessory components such as filters, chokes, and brake resistors usually have a UR approval. The applicable standards are listed in the overview in chapter 3.

3 Overview of Lenze accessories

Drive systems are approved according to the standard UL 61800-5-1. This standard specifies that all accessory components in the drive system, from the mains connection to the motor shaft, are also subject to these requirements. This means that Lenze accessory products can always be evaluated under UL 61800-5-1 (Cat. NMMS) as well.. However, in this case they can be used exclusively as accessories for drive systems.

The portfolio of Lenze accessories includes the following products:

- Main chokes
- Filters (RFI filter, mains filter, motor filter)
- Brake resistors
- System cables
- Power supply units
- Fuses

3.1 Mains chokes

Mains chokes are filters installed on the mains side of a drive system with a low cut-off frequency to reduce harmonics in the mains current up to the 40th harmonic.

Designation Lenze	Manufacturer	File Number	Catergory	Standard	Model (ref. in UL file)
ELN1-xxxxHxxx	BLOCK	E103521	XPTQ2	UL 506	EI*
			XPTQ8	CSA-C22.2 No. 66.1-06	
EZAELN3xxxBxxx	BLOCK	E103521	XPTQ2	UL 506	3UI*
			XPTQ8	CSA-C22.2 No. 66.1-06	

* Additional characters may follow.

x: Placeholder for letter or number

Table 2 Lenze chokes (harmonic filters) with their UL acceptance and information for traceability (tracing of acceptance).

3.2 Filters

3.2.1 RFI filter

RFI filters are filters for EMC interference suppression installed on the mains side of the drive system.

→ UL recognized approval (UR)

Lenze RFI filters are "appliance filters", i.e. intended for the suppression of interference in a single application. They are therefore usually installed in the branch circuit, downstream of the branch circuit protection.

The standard for such filters is UL 60939-3 (Cat. FOKR), but the older standard UL 508 (Cat. NMTR) can also be used.

Older filters were often approved according to the UL 1283 standard (Cat. FOKY). Today, this standard should only be used for "facility filters", i.e. filters for interference suppression of entire facilities.

Designation Lenze	Manufacturer	File Number	Category	Standard	Model (ref. in UL file)
E94AZRSxxx4 E94AZRPxxx4	BLOCK	E219022	NMTR2	UL 508	E94AZRSxxx4
			NMTR8	CSA-C22.2 No. 14	E94AZRPxxx4
E94AZRSxxx4	FUSS EMC	E221999	NMMS2	UL 61800-5-1	3F480-xxx.290EM
			NMTR8	CSA-C22.2 No. 274	
E84AZESRxxxxxx	TDK	E70122	FOKY2	UL 1283	B84142xxxxxR840
			FOKY8	CSA-C22.2 No. 8	
IOFAExxxB100x000xS IOFAExxxF100x000xS	BLOCK	E219022	NMTR2	UL 508	IOFAExxxB100x000xS
			NMTR8	CSA-C22.2 No. 14	IOFAExxxF100x000xS

x: Placeholder for letter or number

Table 3: Lenze RFI filters with their UL approval and information for traceability.

3.2.2 Mains filter

Mains filters are a combination of mains choke and RFI filter for both purposes mentioned above.

Designation Lenze	Manufacturer	File Number	Category	Standard	Model (ref. in UL file)
E94AZMSxxx4 E94AZMPxxx4 E94AZMRxxx4*	BLOCK	E219022	NMTR2	UL 508	E94AZMSxxx4
			NMTR8	CSA-C22.2 No. 14	E94AZMPxxx4 E94AZMRxxx4*
IOFAExxxF100x000xS	BLOCK	E219022	NMTR2	UL 508	IOFAExxxF100x000xS
			NMTR8	CSA-C22.2 No. 14	
IOFAE322F100D0000S IOFAE330F100D0000S IOFAE337F100D0000S IOFAE345F100D0001S	BLOCK	E219022	NMTR2	UL 508	84-06021 84-07021
			NMTR8	CSA-C22.2 No. 14	84-07025 84-07026

* Additional characters may follow.

x: Placeholder for letter or number

Table 4: Lenze mains filters with their UL approval and information for traceability.

3.2.3 Motor filter

Motor filters are installed between inverter and motor to suppress PWM switching frequencies in the output voltage.

→ UL recognized approval (UR)

Designation Lenze	Manufacturer	File Number	Category	Standard	Model (ref. in UL file)
EZS3-xxxA200	BLOCK	E219022	NMTR2	UL 508	SFB*
			NMTR8	CSA-C22.2 No. 14	

* Additional characters may follow.

x: Placeholder for letter or number

Table 5: Lenze motor filters with their UL approval and information for traceability.

3.3 Brake resistors

Brake resistors are power resistors for converting electrical braking power from the motor into heat. They are intended to prevent excessive accumulation of energy in an inverter.

Designation Lenze	Manufacturer	File Number	Category	Standard	Model (ref. in UL file)
ERBD*	Danotherm	E208678	NMTR2	UL 508	ZRF555000Axx+
			NMTR8	CSA-C22.2 No. 14	
ERBG*	Gino	E221095	NMTR2	UL 508	ERBG* Series BEG*
			NMTR8	CSA-C22.2 No. 14	
ERBM*	Turk + Hillinger	E232497	NMTR2	UL 508	ALW 40* ALW 60* ALW 80*
			NMTR8	CSA-C22.2 No. 14	
ERBM*	Danotherm	E208678	NMTR2	UL 508	CAV+ CBV+
			NMTR8	CSA-C22.2 No. 14	
ERBP*	Turk + Hillinger	E232497	NMTR2	UL 508	ALW 70*
			NMTR8	CSA-C22.2 No. 14	
ERBS*	Turk + Hillinger	E232497	NMTR2	UL 508	ALW 90*
			NMTR8	CSA-C22.2 No. 14	
ERBS*	Danotherm	E208678	NMTR2	UL 508	CCR-V+ CBT-V(@) CBR-V+
			NMTR8	CSA-C22.2 No. 14	
ERBU*	Turk + Hillinger	E232497	NMTR2	UL 508	ALW42X24
			NMTR8	CSA-C22.2 No. 14	
ERBU*	Turk + Hillinger	E331823	KSOT2	UL 499	HLP
			KSOT8	CSA-C22.2 No. 72	

*, +, (@): Additional characters may follow.

Table 6: Brake resistors in the Lenze portfolio with their UL approval and information for traceability (tracing of approval).

3.4 System cables

System cables are used to connect drives to the mains supply, inverters to motors, fans, encoders, sensors, and controllers. System cables do not have a UL approval, only their components. Therefore, there is no type testing and no UL report for cables.

System cables are assembled in workshops which are inspected and monitored by UL under the Wiring Harnesses program.

Category for Wiring Harnesses: ZPFW

Designation Lenze	Category	Component	Characteristic	Category
EYB*	ZPFW	Cable	600V/300V; $\leq 80^{\circ}\text{C}$	AVLV2, AVLV8
EYP*		Plug	600V;	ECBT2, ECBT8
EYL*		Cable lug	600V; $-40^{\circ}\text{C}..+120^{\circ}\text{C}$	ZMVV
EYR*				
EYF*	ZPFW	Cable	300 V; $\leq 80^{\circ}\text{C}$	AVLV2, AVLV8
		Plug	125V / 50V	ECBT2, ECBT8
EYD*	ZPFW	Cable	300 V; $\leq 80^{\circ}\text{C}$	AVLV2, AVLV8
		Plug	50V	ECBT2, ECBT8

* Additional characters may follow.

Table 7: Listing of components in Lenze system cables along with their properties and approval categories

Cables and cable harnesses built under the "Wiring Harnesses" program (Cat. ZPFW) are marked with a UL recognized (UR) mark. They are therefore considered components and are intended for installation in equipment (e.g. control cabinets), whereby the conditions (CofA) must be taken into account. They are not suitable for field installation, only for factory installation.

The permissible conditions of use result from the applicable conditions for the components which the cable is made of: wires, connectors, ferrules, cable lugs.

The components are listed in table 7 with information on UL approval: category and technical conditions of use. This information and compliance with the conditions will be verified by the UL inspector when the machine is approved and must be provided by the installer of the machine at that time.

The dimensioning of cables, in particular the cross-section, depends not only on the technical requirements (e.g. amperage) but also on the place of use. In each case, local regulation applicable for the place of use must be met:

- In the control cabinet: UL 508A, for power cables, chapter 28.3 (Table 28.1, UL 508A Ed. 3, 2022) gives requirements.
- In the machine, plant: NFPA79
- In the installation: NFPA70 (NEC)

3.5 Power supply units

Power supply units are mounted in the control cabinet and provide electrical power as DC voltage and DC current in the low voltage range (DVCA, <50 V DC).

Designation Lenze	Manufacturer	File Number	Category	Standard	Model (ref. in UL file)
EZVAXxxxxBxxxxxx	WEIDMÜLLER	E470829	NRAD	LISTED	PRO MAX*
		E255651	QQGQ2	UL 60950-1	
		E258476	NMTR	UL 508	

* Additional characters may follow.

x: Placeholder for letter or number

Table 8: Power supply units in the Lenze range with their UL approval and information for traceability (tracing of acceptance).

3.6 Fuses

Designation Lenze	Manufacturer	File Number	Category	Standard	Model (ref. in UL file)
Fuses 660V AC					
EFSxxxxAxxx	SIBA	E180276	JFHR2	UL 248-13	50 12x 06.*
			JFHR8	CSA248-1	50 14x 06.* 20 21x 34.*
Semiconductor fuses 600V AC / 700V DC					
EFNNARxxxxWYx00000	EATON	E91958	JFHR2	UL 248-13	FWP-*A14F
		E91958 CSA Cl. 53787 1422-30	JFHR8	CSA248-1	FWP-*A22F
EFNNxRxxxxWYx00000	EATON	E125085	JFHR2	UL 248-13	170M14xx
		E125085 CSA Cl. 53787 1422-30	JFHR8	CSA248-1	

x Placeholder for letter or number

* Further characters digitize the value in amperes

Table 9: Class fuses (CC, CD, CF, J, T) and semiconductor fuses

4 Overload protection

For overload protection, the coordination of the rated current, the permissible overcurrent, and the short-circuit current is decisive.

4.1 Rated current

The permissible rated current of the fuse can be found in the data sheets of the products. If no rated current is recommended for the fuse, a maximum of four times the specified rated current of the device can be applied according to UL 508A, depending on the selected fuse type.

If several devices/drive systems are connected to a single fuse (group fusing), a higher value for their rated current must be selected. The extent to which the individual drives can operate simultaneously must be considered. This reduces the conditional short-circuit current for the connected devices (see explanation in chapter 4.2).

For group fusing, which is approved according to UL, the maximum permissible rated fuse current is specified in the data sheets of the products.

4.2 Short-circuit current

The prospective short-circuit current must not be greater than the max. permissible short-circuit current for the device (conditional short-circuit current). This prevents the device from posing a danger to the environment in the event of a short circuit on the output or inside the device (e.g. defective component) due to the excessive current and the associated energy that is released. Such a danger could be e.g. escaping fire or hot materials, but also changes to the product that result in live parts becoming accessible.

The conditional short-circuit current that applies to the product in conjunction with a specific fuse can be found in the tables in the data sheet. It must be ensured that the fuse can interrupt a current of this magnitude (max. interrupt current). The specified value of the interrupt current for the fuse must not be lower than the maximum occurring short-circuit current, thus not lower than the prospective short circuit current of the mains supply.

The applicability of a particular combination of product, fuse and prospective short-circuit current is determined by tests. For the tests of the accessory products, Lenze has selected those fuses for which the matching frequency inverters and servo inverters have been specified. This ensures that the entire system is consistent from this point of view.

Explanation

The energy released in the device in the event of a short circuit can cause destruction. The higher the rated value of the fuse is selected (let-through current) and the slower the fuse reacts, the more energy will be released. Therefore, if a fuse with a faster reaction or a lower rated value is selected, the conditional short-circuit current can be assumed to be higher. Such a system may be operated on a supply with the same rating for the prospective short-circuit current. If the fuse reacts slower or has a higher rated current, this is not permissible without further testing.

4.3 Fuses

Feeder Circuits

Feeder circuits are supply circuits that conduct energy to other supply circuits (branch circuits). Loads are normally not directly connected to feeder circuits. They are therefore located on the supply side of branch circuits.

Branch Circuits

Branch circuits are branched supply circuits which serve the direct connection of loads. Overload protection must be installed at the point of connection to the feeder circuit. This protection means will disconnect the load from the mains in the event of an overload. Branch Circuit Protection (BCP) is the common term for this kind of protection.

Branch Circuit Protection

- For short-circuit protection in branch circuits, fuses according to UL 248 (class fuses) or circuit breakers according to UL 489 must be used.
- Semiconductor fuses are fuses with a very fast reaction time. They reduce the energy released in the event of a short circuit by disconnecting with an extremely short delay.

For class fuses, only the rated class according to UL 248 is indicated, e.g. CC, CD, CF, J, T. All fuses of one particular class can be used alternatively, regardless of type and manufacturer. The same applies to CB according to UL 489.

It is also possible to use a type E motor protection circuit breaker (MPCB, also called manual motor controller in UL 508) as a protective element for a drive system. Here, however, the exact type and manufacturer are noted during tests. Only the indicated type supplied by the named manufacturer can then be used in the application, which leads to severe restrictions. The same applies to semiconductor fuses.

Lenze therefore specifies its products primarily for class fuses according to UL 248 and CB according to UL 489. Semiconductor fuses are only specified where the above fuses cannot be approved due to insufficient performance or other fuses are required by the applicable standard. This applies mainly to high SCCR and to fuses in DC bus groups. To date, Lenze has not specified its products for use with type E motor protection circuit breakers.

The following types of fuses (class fuses) are considered in the Lenze specification:

- CC (max. 30 A)
- CD (max. 60 A)
- CF (400 A)
- J and T (max. 1200 A)

For each fuse type, UL 508A defines a value for the melting integral (i^2t) and the let-through current in table SB4.2 (Supplement B). The above list arranges the types according to ascending values. One fuse type can be used as a substitute for another if the values for melting integral and let-through current are smaller. In this way, a better protection is provided: The fuse interrupts faster and less energy will be released in the device.

N.B.: For values omitted in table SB4.2, the next higher value in the same column must be used in each case. The table shows that the values also depend on the rated current of the fuse. For this reason, a specific rated current is assigned to each type in the specifications of Lenze products.

When selecting the protective element, it is important to make sure that the breaking capacity is selected sufficiently high in comparison to the prospective short-circuit current. The max. permissible cut-off current specified for the selected protective element must not be lower. The value should therefore correspond as far as possible to the conditional short-circuit current (see section 4.2) of the connected load. To evaluate the applicability, the smaller of these two values must be taken into account. (In case the other value is considerably larger, that element appears to be oversized.)

Fuse protection for DC supply

In DC circuits, which are generated with 400 V AC or with 460 ... 480 V AC (often used in USA), the class fuses are not suitable. Semiconductor fuses can be used instead in such circuits. Please note that the manufacturer and type designation of the protective element must be specified with the product. Only this model offered by this manufacturer may be used.

Semiconductor fuses only provide short-circuit protection for the connected load, but not for the wiring. The wires in the DC circuit should therefore be dimensioned such that the protection element in the upstream supplying AC circuit provides the necessary protection.

4.4 Devices connected downstream of the inverter

Rated current and overload behind the inverter

For components on the load side of an inverter, the inverter provides protection against overload.

- For sinusoidal filters, this is combined with the motor overload protection. Please make sure that the filter is specified for the same or a higher rated load than the motor.
- The inverter has an extra overload monitoring for the brake resistor. This is configured to the specification of the brake resistor by setting the corresponding parameters in the inverter to the values indicated for the particular resistor.

Short-circuit current behind the inverter

Devices connected to one of the outputs of the inverter are protected by switches or impedances inside the inverter. Here, in the event of a short circuit, the short-circuit current is limited to a significantly lower value. Therefore, the requirement for coordination of the short-circuit current does not exist here.

Such devices are:

- Sine filters for operation between inverter and motor
- Brake resistors

4.5 Specification of the short-circuit current for supply side filters

If a filter is installed in the control cabinet, the applicable standard (UL 508A) requires the coordination of the short-circuit current. This requirement in the standard was introduced in 2020 and comes into force on 1 September 2023. The application of this requirement is handled differently by various organizations. In July 2022, UL published an information on the implementation of new requirements that were introduced with the 3rd ed. of UL 508A. The organization announces that it will not apply the coordination of the short-circuit current for EMI filters even after September 1st 2023. However, other organizations are already applying the requirement.

Lenze statement: Due to the nature of its construction, the consideration of the short-circuit behavior of filters appears to be of limited use. It is not certain that the requirement will continue to exist in the future. Lenze has therefore not yet tested RFI filters for this behavior and does not specify the conditional short-circuit current for these products.

If the coordination of the short-circuit current has to be applied, Lenze filters can only be used for the standard value (i.e. 5 kA for low rated current and 10 kA for rated current 100 A and higher).

4.6 Specification of the short-circuit current for mains chokes

Mains chokes are mounted in the control cabinet. For these components, the applicable standard (UL 508A) does not require the coordination of the short-circuit current. Therefore, Lenze does not specify a conditional short-circuit current for mains chokes.

5 Conditions of Acceptability

UL recognized components are approved under the restriction that the Conditions of Acceptability (CofA) are met (see chap. 2.1.2). Some Lenze accessory components have a recognized approval and the user is requested to consider the CofA. In this chapter, some common information retrieved from different reports describing such components will be reflected. The texts are a compilation of several reports and do not always reflect the exact wording given in each report.

5.1 Filters

5.1.1 RFI filter E94AZRS...

Warnings! Conditions of Acceptability:

1. The products covered by this report are only intended for use with Power Conversion Equipment (inverters).
2. Consideration shall be given to the field wiring leads. No strain relief test was performed on the leads.
3. The devices in this report are only evaluated for factory wiring use.
4. Temperature tests were performed with hook mounted drive.

5.2 Brake resistors

5.2.1 Type ERBDxxxRxxKx (Manufacturer Danotherm)

Warnings! Conditions of Acceptability – when used in the end-product equipment, the following are among the considerations to be made:

1. The nominal loads of the resistors refer to conditions where the surrounding temperature does not exceed 40 °C. If the temperature exceeds 40 °C, contact LENZE for advice regarding de-rating of nominal power.
2. The surface temperature must not exceed 355 °C at any point of the metal housing, as the insulation material inside the resistor is rated 600 °C maximum. The resistor housing reaches up to 335 °C at nominal load.
3. These devices are enclosed type devices. Check that the surface, which the resistor is mounted on, can withstand the high temperature radiation and convection from the resistor surface. To protect personnel from contact with high temperature parts the resistors must be mounted minimum 6.5 feet (2 m) from the floor.
4. A clearance of minimum 200 mm below and at each side and 500 mm above the resistors must be observed.
5. The equipment must be properly connected to earth ground in the end-use equipment.
6. The thermal cut-out, if provided, protects the resistor from destruction when over loaded at normal conditions. The suitability of the thermal cut-out at motor drive fault must be determined in the end-use application.
7. The resistors are intended to be mounted with the longest side vertically or horizontally. Nominal load refers to the vertical position. Horizontal position requires a load reduction of 20 %. If mounted vertically the connection box must face downwards.
8. The resistors with protection class 4X / IP66 can be mounted in any allowed position whereas the 1X / IP21 types only meet the IP21 requirements when mounted vertically.
9. Nominal load refers to mounting of a single resistor. If two or more resistors are mounted next to each other de-rating according to the above mentioned maximum surface temperatures are necessary.
10. Use minimum 75 °C copper wire only.

5.2.2 Type ERBDxxxxxxxxRB

Warnings! Conditions of Acceptability:

1. These devices are only intended to be used as an integral part of power conversion equipment (UL508C applications).
2. They shall be mounted on an appropriate surface (in order to maintain enclosure rating type 1).

3. The terminals "Terminal block" (RB1/RB2) and "Terminal Block" (T1/T2) have been evaluated for field wiring.
4. No performance tests (e.g. temperature, dielectric strength and abnormal operation tests) have been performed. Since these devices are intended to be used as an integral part of power conversion equipment (UL508C applications) only, the performance tests for these devices shall be carried out in accordance with the requirements in the standard for Power Conversion Equipment UL508C. Tests shall be based on the duty cycle indicated and determined by the end-use application. Following UL508C tests shall be considered:
 - Temperature tests
 - Dielectric strength tests
 - Breakdown of component tests (e.g. failure of the control circuitry to maintain the proper duty cycle)
5. Settings and suitability of thermal protectors and thermal overload relays have not been evaluated. The need for additional tests shall be reconsidered in the end-use application.

5.2.3 Type ERBGxxxxxxx

Warnings! Conditions of Acceptability:

1. The product covered by this report is intended for use with Power Conversion Equipment and the like.
2. The devices were tested for horizontal mounting positions. If other mounting positions are necessary in the end use applications, a temperature test shall be performed to ensure the maximum allowed temperature rise.
3. These devices are intended for factory wiring only. The cable lug connector shall be mounted direct on the surface of the copper busbar to provide appropriate connection.
4. Temperature tests have been conducted for continuous duty as indicated in the rating table with closed bottom surface. The heat capability and the maximum temperature rise for higher current ratings at shorter duty cycles shall be determined in the end use.
5. The device were evaluated related to spacings according UL508. The appropriate spacings has to be determined in the end use application. The maximum Voltage rating each element could be max. 1000 V Ac. Therefore the spacing related to UL508 have to be 601–1000 V 14 mm through air and 25.4 mm over surface.
6. The temperature rating of the connection cable shall be at least 105 °C to ensure proper connection.
7. The required wire bending space and the spacings at the terminals after connection shall be determined in the end use application.

5.2.4 Type ERBM (Manufacturer Krah)

Applies to products no.:

00475006 00475007 00475050

Warnings! Conditions of Acceptability:

1. Spacings to enclosure must be in accordance with the end product standard.
2. The influence of heat emission within a combination of these single resistor shall be investigated regarding max. temperature rises acceptable for the end use standard.
3. The device was tested for vertical (wire leads down) and horizontal mounting positions

5.2.5 Type ERBMxxxRxxxW (Manufacturer ???)

Warnings! Conditions of Acceptability – when used in the end-product equipment, the following are among the considerations to be made:

1. The nominal loads of the resistors refer to conditions where the surrounding temperature does not exceed 40 °C. If the temperature exceeds 40 °C, contact LENZE for advice regarding de-rating of nominal power.
2. The surface temperature must not exceed 355 °C at any point of the metal housing, as the insulation material inside the resistor is rated 600 °C maximum. The resistor housing reaches up to 335 °C at nominal load.

3. These devices are enclosed type devices. Check that the surface, which the resistor is mounted on, can withstand the high temperature radiation and convection from the resistor surface. To protect personnel from contact with high temperature parts the resistors must be mounted minimum 6.5 feet (2 m) from the floor.
4. A clearance of minimum 200 mm below and at each side and 500 mm above the resistors must be observed.
5. The equipment must be properly connected to earth ground in the end-use equipment.
6. The thermal cut-out, if provided, protects the resistor from destruction when over loaded at normal conditions. The suitability of the thermal cut-out at motor drive fault must be determined in the end-use application.
7. The resistors are intended to be mounted with the longest side vertically or horizontally. Nominal load refers to the vertical position. Horizontal position requires a load reduction of 20 %. If mounted vertically the connection box must face downwards.
8. The resistors with protection class 4X / IP66 can be mounted in any allowed position whereas the 1X / IP21 types only meet the IP21 requirements when mounted vertically.
9. Nominal load refers to mounting of a single resistor. If two or more resistors are mounted next to each other de-rating according to the above mentioned maximum surface temperatures are necessary.
10. Use minimum 75 °C copper wire only.

5.2.6 Type ERBS

1. The components must be used within the intended range of their ratings (temperature, voltage, power etc.).
2. Components with screw terminals are suitable for factory wiring only.
3. The suitability of the mounting means shall be determined in the end-use application.
4. The need for a metal grid cover for protection must be determined in the end-use application.
5. Additional protection of persons against accidental contact with hot surfaces must be specified in the end-use application.
6. The component must be properly electrically grounded in the end-use application.
7. The suitability of the thermal cut-out (temperature switch if present) must be determined in the end-use application.
8. If the component is mounted in a different orientation than specified by the manufacturer, additional testing shall be conducted to prove that all conditions are met.
9. The suitability of use with duty cycles of less than one second shall be determined in the end-use application.
10. The suitability of use with a period of less than 120 seconds shall be determined in the end-use application.
11. The suitability of use with more than one component mounted side by side shall be determined in the end-use application.
(Note: Lenze specifies minimal spacing for the installation of brake resistors to enable sufficient cooling and protection of adjacent material in case of overheating. These must be considered additionally.)
12. Actual operational values for voltage and power shall be calculated for the end-use application to ensure that the devices are used within their ratings (see bullet point 1.).
13. Hazards due to voltage peaks exceeding the rated voltage have not been detected.
(Note: Lenze does not specify any overvoltage category for brake resistors. Therefore, these components are only suitable for connection to the brake resistor output of an inverter or servo drive as indicated in the connection diagrams. See brochure.)

5.2.7 Type ERBSxxxRxxxx (Manufacturer Danotherm)

Applies to products no.:

492588 492620 13016651 13016702 13016703 13016704
13016706 13053403 13053404 13053405 13200206

Warnings! Conditions of Acceptability – when used in the end-product equipment, the following are among the considerations to be made:

1. The nominal loads of the resistors refer to conditions where the surrounding temperature does not exceed 40 °C. If the temperature exceeds 40 °C, contact LENZE for advice regarding de-rating of nominal power.
2. The surface temperature must not exceed 355 °C at any point of the metal housing, as the insulation material inside the resistor is rated 600 °C maximum. The resistor housing reaches up to 335 °C at nominal load.
3. These devices are enclosed type devices. Check that the surface, which the resistor is mounted on, can withstand the high temperature radiation and convection from the resistor surface. To protect personnel from contact with high temperature parts the resistors must be mounted minimum 6.5 feet (2 m) from the floor.
4. A clearance of minimum 200 mm below and at each side and 500 mm above the resistors must be observed.
5. The equipment must be properly connected to earth ground in the end-use equipment.
6. The thermal cut-out, if provided, protects the resistor from destruction when over loaded at normal conditions. The suitability of the thermal cut-out at motor drive fault must be determined in the end-use application.
7. The resistors are intended to be mounted with the longest side vertically or horizontally. Nominal load refers to the vertical position. Horizontal position requires a load reduction of 20 %. If mounted vertically the connection box must face downwards.
8. The resistors with protection class 4X / IP66 can be mounted in any allowed position whereas the 1X / IP21 types only meet the IP21 requirements when mounted vertically.
9. Nominal load refers to mounting of a single resistor. If two or more resistors are mounted next to each other de-rating according to the above mentioned maximum surface temperatures are necessary.
10. Use minimum 75 °C copper wire only.

5.2.8 Type ERBM..., ERBS..., and ERBU...

(containing resistor elements ALW40, ALW60, ALW70, ALW80, ALW90 and HLP manufactured by Türrck+Hillinger)

Applies to products no.:

13554431, 13554432, 13556672, 13556673, 13556674, 13556675, 13557874, 13556676, 13556677, 13303959, 13565500, 13565501, 13565502, 13565503, 13565504, 13565505, 13565506, 13565507, 13548324, 13566402, 13566403, 13566404, 13566405, 13566406, 13566407, 13566408, 13566409, 13566410, 13566411, 13566412, 13566413, 13566414, 13599422, 13599423, 13599742, 13625930, 13625931, 13625982, 13431529, 13431530, 13515233, 13537643, 13641832, 13566393, 13566394, 13566395, 13566396, 13566397, 13566398, 13566399, 13566400, 13566401, 13620253, 13645061, 13476442, 13596343, 13596344, 13619027, 13619024, 13556640, 13556641, 13499267, 13499268, 13499269, 13492833

1. The products covered by this section are intended for use with power conversion equipment (drives) only.
2. The temperature switch must be connected to the drive, so that the drive switches off in case when the maximum temperature is exceeded.
3. Temperature tests and abnormal operation tests have only been conducted for single resistive elements and for continuous duty as indicated under RATINGS. For any grouping of the resistor elements an additional temperature test must be conducted, depending on the evaluation of the mechanical construction and the expected temperature rise.
4. For any duty cycle operation in the end-use application, it must be guaranteed that the maximum Wattage rating will not be exceeded. This may be evaluated by calculation. If there is any concern regarding to this, additional temperature tests have to be conducted under end-use conditions.
5. These devices should be used within their recognized ratings as specified in the data sheets.

6 Presentation of information

Like many other standards, UL standards mandatorily require the disclosure of information to the user if it is relevant to the safe use of the product. Depending on the product, this is done on the product itself (nameplate), in the paper documentation supplied with the product, or in a general publication by the supplier/manufacturer. The latter may be in the data sheet or on an Internet platform.

The source of this product-specific information is the UL Report. The required data is contained in the "Markings" section.

6.1 Nameplate

It contains information on traceability as well as the most important technical data and warnings.

6.1.1 Traceability

Traceability must allow a user or inspector to identify and verify that the product has UL approval. Information on this can be found in the "UL Online Certifications Directory" at ul.com. In order to be able to check this, the necessary information must be given on the nameplate which allows this entry to be found and assigned to the product.

Lenze accessory products are mostly designed and manufactured by third-party manufacturers. It is therefore the responsibility of the third-party manufacturer to obtain a UL approval for such a product. The file in which this approval is reported is assigned to this manufacturer.

There are two ways in which the existence of the approval can be traced, starting from the Lenze product:

- Multiple Listing
- Specification of the UL file with associated product identification

6.1.1.1 Multiple Listing

UL offers a special program for the situation where a product is not to be marketed under the manufacturer's name. The distributing organization (Lenze in this case), which affixes its name on the product (brand label distribution), can apply for a "UL multiple listing" of the product.

The product is then listed in a new file under the name of the sales organization. The same information is published as in the original file: Type designation as on the label, owner of the file, and category of approval. With this, the necessary information required for a field inspection is presented: to which standard the product has been approved.

In the background, UL keeps information about who is the manufacturer of the product and the corresponding type designation by that manufacturer. In this way UL can find and view the associated report and the test reports from the approval tests. These documents are not accessible to users.

6.1.1.2 Specification of the UL file with associated product identification

Alternatively, the UL file number under which the product is registered may be placed on the product. This would then be the UL file of the manufacturer. If different from the distributor's designation, the type designation used in the file by the manufacturer must also be specified in order to enable the identification within all products in this file. Usually, the manufacturer's type designation does not match the designation of the product by Lenze.

This information shall be displayed on the product grouped together with the UL Mark and other information from UL.

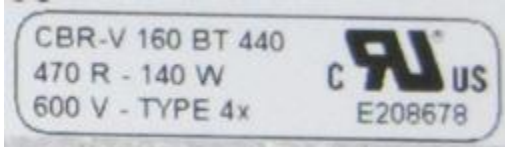


Illustration 1: Marking of the UL approval on a brake resistor.

In the example: Lenze type ERBS470RR150WQN600. This has an approval as a component (UR), registered in the UL file no. E208678 and is listed there with the designation CBR-V 160 BT 440.

Lenze has opted for this alternative route for most of its products.

6.1.2 Technical data

This is a selection of the most important characteristic values:

- Typical characteristic value (e.g. resistance value for a brake resistor)
- Maximum permissible supply voltage
- Maximum permissible current consumption and/or output current
- Maximum permissible power consumption and/or output power
- Enclosure rating

(Some information in this list may be omitted in certain cases).

Values determined by tests according to UL standards may be different from values resulting from tests according to other standards. Therefore, it may happen that several different values appear on the nameplate or in the data sheet.

There is usually not enough space on the nameplate to note in detail to which standard a certain value applies. Values according to UL standards are therefore often grouped together with other information concerning UL approval (UL mark, information on traceability). If necessary, a frame is drawn around them in order to make this grouping more obvious (see Illustration 1).

6.1.3 Warnings

Warnings must be placed on the nameplate and/or on a separate sticker attached to the device. UL approvals are often obtained for USA (UL) and for Canada (CSA). Since French is the second official language in Canada, in this case all warnings are given both in English and French.

6.2 Paper documents

Paper documents are enclosed with the product and contain information that is important for the installation.

6.3 Further documentation

Further documentation is available through Easy Product Finder and on the product page online on www.Lenze.com.

For a component with recognized approval (UR), further requirements from the CofA (Conditions of Applicability), which are formulated in the UL report for the product, must be taken into account by the user. These can be found in the technical data of the devices and components, combined with other information.

The compliance with the requirements from the CofA is checked during the UL inspection of control cabinets. The UL project engineer has access to the report and may get requirements from there. They can be of different types: E.g. maximum permissible temperature at a certain location, application of further protective devices or similar.