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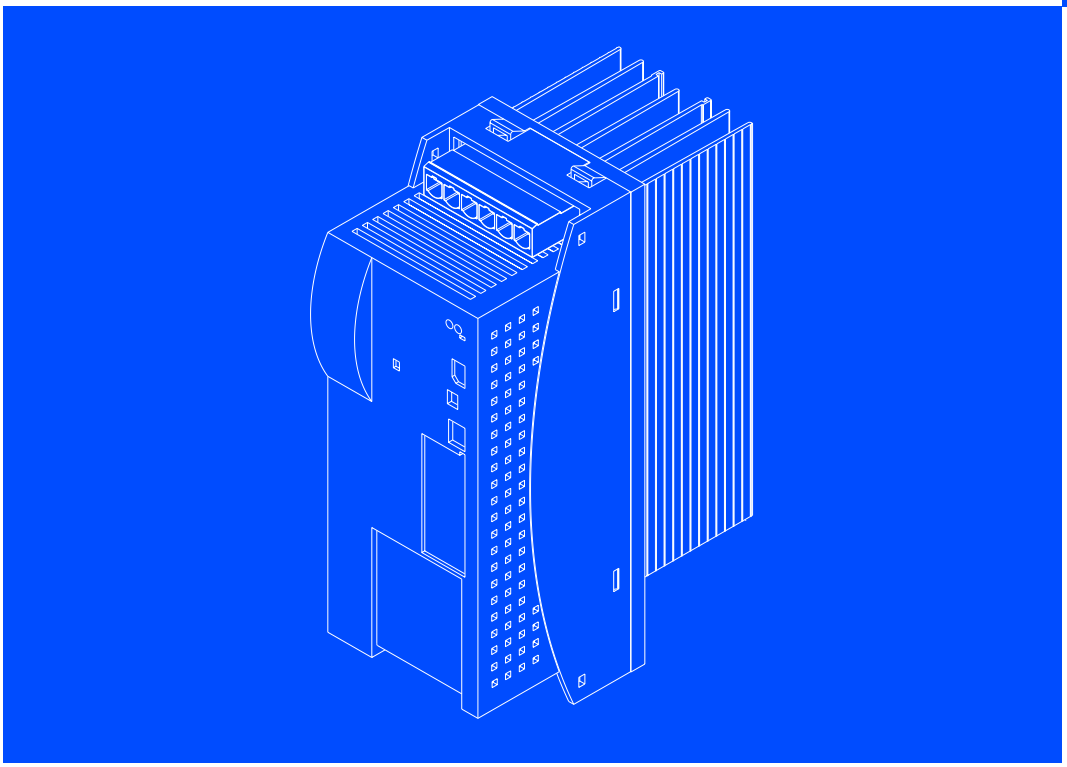
EDBCSXKXXX
13018327

Operating Instructions

ECS



Capacitor module of ECSxK series

Lenze

This documentation is valid for ECS capacitor modules as of version:

	①								
	ECS	x	K	xxx	x	4	B	xxx	1A

Type

Design

E = Enclosure IP20
D = Push-through technique (thermally separated)
C = Cold plate

Capacity

001 = 705 µF (±20 %)
002 = 1410 µF (±20 %)

Voltage class

4 = 400 V/480 V

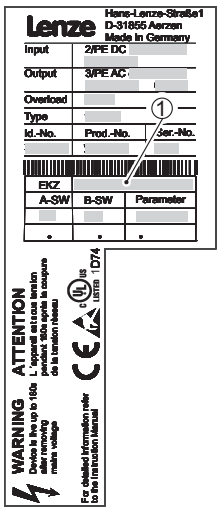
Technical version

B = Standard

Variant

Hardware version

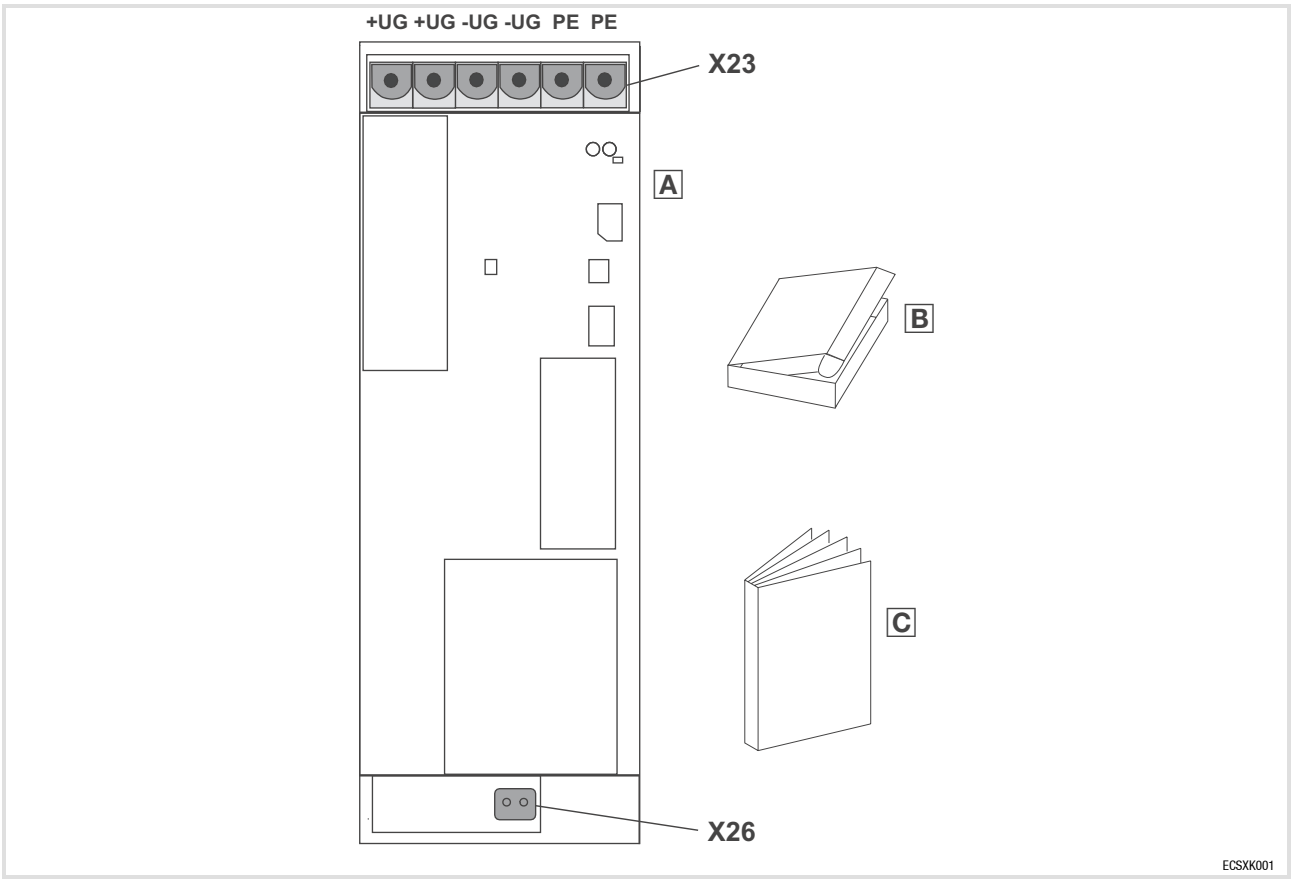
1A or higher



Tip!

Current documentations and software updates for Lenze products can be found on the Internet in the ”Downloads” area under

http://www.Lenze.com



A	Capacitor module ECSxK
B	Accessory kit with fixing material
C	Safety instructions for modules of the ECS series
X23	Connections: - DC-bus supply - PE
X26	Control connection for bridging the charging current limitation

i Contents

1 Preface and general information

1.1 About these Operating Instructions

These Operating Instructions assist you in connecting and commissioning the ECSxKxxx capacitor modules. They include safety instructions which must be observed.

All persons working on and with the ECSxKxxx capacitor modules must have the Operating Instructions available and must observe the information and notes relevant for their work.

The Operating Instructions must always be in a complete and perfectly readable state.

1.2 Terminology used

Term	In the following text used for
Power supply module	Any type of power supply module
ECSxExxx	ECSxExxx power supply module
Capacitor module	Any type of capacitor module
ECSxKxxx	ECSxKxxx capacitor module
Axis module Controller	Any axis module
ECSxAxxx	ECSxAxxx axis module
Drive system	Drive systems with: ● ECSxAxxx axis modules ● ECSxExxx power supply modules ● ECSxKxxx capacitor modules ● Other Lenze drive components
24 V supply Low-voltage supply	24 V DC supply ● of the control card in a voltage range of 20 ... 30 V DC (±0 V) ● of "Safe standstill" in a voltage range of 18 ... 30 V DC (±0 V) ● of the motor holding brake in a voltage range of 18 ... 30 V DC (±0 V)
KSB	Short-circuit braking: Quick discharge of the DC bus via the brake resistor
AIF	**A**utomation**I**nter**F**ace
Cxxxx/y	Subcode y of code Cxxxx (e. g. C0470/3 = Subcode 3 of code C0470)
Xk/y	Terminal y on the terminal strip Xk (e. g. X6/B+ = terminal B+ on the terminal strip X6)

1.3 Legal regulations

Labelling	**Nameplate**	**CE-identification**	**Manufacturer**
	Lenze capacitor modules are clearly designated by the date on the nameplate.	Conforms to the EC Low-Voltage Directive	Lenze Drive Systems GmbH Postfach 101352 D-31763 Hameln
Application as directed	**ECSxKxxx capacitor modules** ● must only be operated under the conditions prescribed in these Instructions. ● are components – for backing up the DC-bus voltage for the drive system. – for installation into a machine – for assembly with other components to form a machine. ● are electric units for the installation into control cabinets or similar enclosed operating housing. ● comply with the requirements of the Low-Voltage Directive. ● are not machines for the purpose of the Machinery Directive. ● are not to be used as domestic appliances, but for industrial purposes only. **Drive systems with ECSxKxxx capacitor modules** ● comply with the EMC Directive "Electromagnetic compatibility" if they are installed according to the guidelines of CE-typical drive systems. ● can be used – for operation on public and non-public mains – in industrial areas. ● The user is responsible for the compliance of his application with the EC directives. **Any other use shall be deemed inappropriate!**		
Liability	● The information, data, and notes in these Instructions met the state of the art at the time of printing. Claims on modifications referring to capacitor modules and components which have already been supplied cannot be derived from the information, illustrations, and descriptions. ● The specifications, processes, and circuitry described in these Instructions are for guidance only and must be adapted to your own specific application. Lenze does not take responsibility for the suitability of the process and circuit proposals. ● Lenze does not accept any liability for damage and operating interference caused by: – Disregarding the Operating Instructions – Unauthorised modifications to the capacitor modules – Operating errors – Improper working on and with the capacitor module		
Warranty	● Terms of warranty: See terms of sales and delivery of Lenze Drive Systems GmbH. ● Warranty claims must be made to Lenze immediately after detecting the deficiency or fault. ● The warranty is void in all cases where liability claims cannot be made.		
Disposal	**Material**	**recycle**	**dispose**
	Metal	●	-
	Plastic	●	-
	Assembled PCBs	-	●

2 Safety instructions

2.1 General safety and application information for Lenze capacitor modules

(according to Low-Voltage Directive 73/23/EWG)

General

During operation, Lenze capacitor modules can include live parts, depending on their type of protection. Surfaces can be hot.

If the required cover is removed or the modules are used inappropriately or installed or operated incorrectly, severe damage to persons or material can occur.

For more information please see the documentation.

All operations concerning transport, installation, and commissioning as well as maintenance must be carried out by qualified, skilled personnel (IEC 364 and CENELEC HD 384 or DIN VDE 0100 and IEC report 664 or DIN VDE 0110 and national regulations for the prevention of accidents must be observed).

According to this basic safety information, qualified, skilled personnel are persons who are familiar with the assembly, installation, commissioning, and operation of the product and who have the qualifications necessary for their occupation.

Application as directed

Capacitor modules are components which are designed for the installation into electrical systems or machinery. They are not to be used as domestic appliances, but only for industrial purposes according to EN 61000-3-2. The documentation contains information about the compliance with the limit values to EN 61000-3-2.

When installing capacitor modules into machines, commissioning of the drive controllers (i.e. the starting of operation as directed) is prohibited until it is proven that the machine corresponds to the regulations of the EC Directive 98/37/EG (Machinery Directive); EN 60204 (VDE 0113) must be observed.

Commissioning (i.e. starting of operation as directed) is only allowed when there is compliance with the EMC Directive (89/336/EEC).

The capacitor modules meet the requirements of the Low-Voltage Directive 73/23/EWG. The harmonised standards of EN 50178 / DIN VDE 0160 apply to the capacitor modules.

The technical data and information on the connection conditions can be obtained from the nameplate and the documentation. The instructions must be strictly observed.

Warning: The capacitor modules are products with restricted availability according to EN 61800-3. These products can cause interferences in residential premises. If capacitor modules are used in residential premises, corresponding measures are required.

Transport, storage

The notes on transport, storage and appropriate handling must be observed.

Observe the climatic conditions required to EN 50178.

Installation

The capacitor modules must be installed and cooled according to the regulations given in the corresponding Instructions.

Ensure careful handling and avoid mechanical stress. Do not bend any components and do not change the insulation distances during transport and handling. Do not touch any electronic components and contacts.

Capacitor modules contain electrostatic sensitive devices which can easily be damaged by inappropriate handling. Do not damage or destroy any electrical components since this means hazards for your health!

Electrical connection

When working on live capacitor modules, the valid national regulations for the prevention of accidents (e. g. VBG 4) must be observed.

The electrical installation must be carried out in compliance with the corresponding regulations (e. g. cable cross-sections, fusing, PE connection). Additional information can be obtained from the documentation.

The documentation contains notes for EMC-compliant installation (shielding, earthing, filters and cable routing). These notes must also be observed when using CE-marked capacitor modules. The manufacturer of the system or machine is responsible for the compliance with the limit values required by the EMC legislation.

Operation

If necessary, systems including capacitor modules must be equipped with additional monitoring and protection devices according to the corresponding safety regulations (e. g. law on technical equipment, regulations for the prevention of accidents). The capacitor module can be adapted to your application. Please observe the corresponding information given in the documentation.

After the capacitor module has been disconnected from the supply voltage, live components and power connections must not be touched immediately because capacitors can be charged. Please observe the corresponding labels on the capacitor module.

All protection covers and doors must be shut during operation.

Note for UL-approved system with integrated capacitor modules:

UL warnings are notes which only apply to UL systems. The documentation contains special UL-related information.

Maintenance and servicing

The capacitor modules are free of maintenance if the prescribed conditions of operation are observed.

In operating areas with polluted ambient air, the cooling surfaces of the capacitor module can get dirty or the cooling openings can block. Under these conditions a regular cleaning of the cooling surfaces and cooling openings is essential. Do not use sharp or pointed objects for this purpose!

Disposal

Recycle metals and plastics. Dispose of printed circuit board assemblies according to the state of the art.

The product-specific safety and application notes in these Instructions must also be observed!

2.2 Residual hazards

Protection of persons

- Before working on the capacitor module, check that no voltage is applied to the power terminals,
  - because the power terminals +UG and -UG at the supply module remain live for at least 3 minutes after mains switch-off.
  - because the power terminals +UG and -UG remain live when the motor is stopped.
- If an error occurs (short circuit to frame or earth fault) a DC residual current may occur in the PE conductor. If an earth-leakage circuit breaker (residual current device) is used to protect against direct or indirect contact, only the use of an earth-leakage circuit breaker of type B is permissible on the current supply side. If not, another protective measure is to be used, as for example, separation from the environment by double or reinforced insulation or separation from the mains by using a transformer.

Device protection

- All pluggable connection terminals must only be connected or disconnected when no voltage is applied.
- The power terminals +UG, -UG and PE are not protected against polarity reversal.
  - When wiring, observe the polarity of the power terminals.
- The power may only be converted if the power supply module in the power system is ready for operation and the charging current limitation is bridged. Otherwise the charging current limitation can be destroyed.
- If the charging current limitation is active, a cyclic switching of the mains voltage at the power supply module can overload and destroy the capacitor. Therefore, at least three minutes have to pass between two starting operations in case of cyclic mains switching over a longer period of time.

2.3 Safety instructions for the installation according to U_L or U_R

Warnings!

General markings:

► Use 60/75 °C or 75 °C copper wire only.

► Maximum ambient temperature 55 °C, with reduced output current.

Terminal tightening torque of lb-in (Nm)

► x23
– 10.6 ... 13.3 lb-in (1.2 ... 1.5 Nm)

► x26
– 4.4 ... 7.1 lb-in (0.5 ... 0.8 Nm)

Wiring diagram AWG

► x23
– AWG 12 ... AWG 8

► x26
– AWG 24 ... AWG 12

2.4 Definition of notes used

The following signal words and symbols are used in this documentation to indicate dangers and important information:

Safety instructions

Structure of safety instructions:

Danger!
(characterises the type and severity of danger)
Note
(describes the danger and gives information about how to prevent dangerous situations)

Pictograph and signal word	Meaning
Danger!	**Danger of personal injury through dangerous electrical voltage.** Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
Danger!	**Danger of personal injury through a general source of danger** Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
Stop!	**Danger of property damage.** Reference to a possible danger that may result in property damage if the corresponding measures are not taken.

Application notes

Pictograph and signal word	Meaning
Note!	Important note to ensure trouble-free operation
Tip!	Useful tip for simple handling
	Reference to another documentation

Special safety instructions and application notes for UL and UR

Pictograph and signal word	Meaning
Warnings!	**Safety or application note for the operation of a UL-approved device in UL-approved systems.** Possibly the drive system is not operated in compliance with UL if the corresponding measures are not taken.
Warnings!	**Safety or application note for the operation of a UR-approved device in UL-approved systems.** Possibly the drive system is not operated in compliance with UL if the corresponding measures are not taken.

3 Technical data

3.1 General data/operating conditions

Standards and operating conditions			
Conformity		CE	Low-Voltage Directive (73/23/EWG)
Approvals		UL 508C	Power Conversion Equipment Underwriter Laboratories (File No. E132659) for USA and Canada
Vibration resistance		Accelerational stability up to 0.7 g (Germanischer Lloyd, general conditions)	
Climatic conditions		Class 3K3 to EN 50178 (without condensation, relative humidity 30 ... 95 %)	
Degree of pollution		VDE 0110 part 2 pollution degree 2	
Packaging (DIN 4180)		Delivery packing	
Permissible temperature range	Transport	-25 ... +70 °C	
	Storage	-25 ... +55 °C	
	Operation	0 ... +55 °C	reduce the rated AC current by 2 %/°C above +40°C
Permissible installation height		0 ... 4000 m amsl	reduce rated AC current by 5%/1000 m above 1000 m amsl
Installation		Installation into control cabinet	
Mounting position		Vertically suspended	
Free space	Above/below	≥ 50 mm	
	To the sides	Side-by-side mounting without any clearance	

General electrical data			
EMC		Compliance with EN 61800-3	
Noise emission		Compliance with limit value class A to EN 55011 (achieved with application-specific collective filter)	
Noise immunity		Requirements to EN 61800-3	
		Requirements	**Standard** / **Severity**
		ESD [1]	EN 61000-4-2 / 3, i. e. ● 8 kV with air discharge ● 6 kV with contact discharge
		High frequency in cables	EN 61000-4-6 / 10 V; 0.15 ... 80 MHz
		RF interference (enclosure)	EN 61000-4-3 / 3, i. e. 10 V/m; 80 ... 1000 MHz
		Burst	EN 61000-4-4 / 3/4, i. e. 2 kV/5 kHz
		Surge (on mains cable)	EN 61000-4-5 / 3, i. e. 1.2/50 µs ● 1 kV phase-phase ● 2 kV phase PE
Insulation resistance		Overvoltage category III to VDE 0110	
Discharge current against PE (to EN 50178)		> 3.5 mA AC for operation with corresponding controllers	
Enclosure		● IP20 for standard mounting ● IP20 for mounting in cold-plate technique ● IP20 for mounting in push-through technique; IP54 on the heatsink side	
Protective insulation of control circuits		Safe disconnection from supply: Double/reinforced insulation to EN 50178; Rated insulation voltage 300 V x √2	

[1] Noise immunity in the above-mentioned severities must be guaranteed through the control cabinet! The user must check the compliance with the severities!

3.2 Rated data

Rated data		Type	ECSxK001xxx		ECSxK002xxx	
Data for operation with upstream supply module on mains voltage		U_{mains} [V]	400	480	400	480
DC-bus voltage		U_{DC} [V]	0 ... 770			
Rated AC current		I_r [A]	17,5		35	
Rated power		P_B [kW]	10		20	
Rated power with mains choke		P_{BN} [kW]	14		28	
Capacity		C [µF]	705 (±20 %)		1410 (±20 %)	
Time constant for charging the capacitors		τ [ms]	150			
Charging time after mains connection		$t_{C\_charging}$ [s]	1			
Weight	ECSEKxxx	m [kg]	2.1		3.2	
	ECSDKxxx	m [kg]	2.1		3.2	
	ECSCKxxx	m [kg]	2.4		3.4	
Dimensions	ECSEKxxx	(W x H x D) [mm]	88.5 x 247 x 176		132 x 247 x 176	
	ECSDKxxx	(W x H x D) [mm]	88.5 x 247 x 176		132 x 247 x 176	
	ECSCKxxx	(W x H x D) [mm]	88.5 x 282 x 123		132 x 282 x 123	

4 Mechanical installation

4.1 Important notes

- ECSxKxxx capacitor modules are provided with IP20 protection and can therefore only be used for installation into control cabinets.
  - For thermally separated mounting (ECS**D**Kxxx): IP54 on the heatsink side
- If the cooling air contains air pollutants (dust, fluff, grease, aggressive gases):
  - Take suitable preventive measures , e.g. separate air duct, installation of filters, regular cleaning.
- Ensure free space!
  - Ensure unimpeded ventilation of cooling air and outlet of exhaust air.
  - You can install several capacitor modules next to each other without any clearance in a control cabinet.
  - Allow a free space of 50 mm above and below other installations or limitations.
- The mounting plate of the control cabinet must be electrically conductive.
- In case of continuous vibrations or shocks use shock absorbers.

Possible mounting positions

Vertically on the mounting plate with DC-bus connections at the top

Mounting techniques

- With fixing rails (standard, 📖 18)
- Thermal separation (”push-through technique”, 📖 19)
- In ”cold plate” technique (📖 21)

4.2 Mounting with fixing rails (standard)

Type ECS**E**Kxxx

For standard mounting into the control cabinet the capacitor module types ECSEKxxx must be used. The accessories required for mounting are included in the scope of supply.

Dimensions

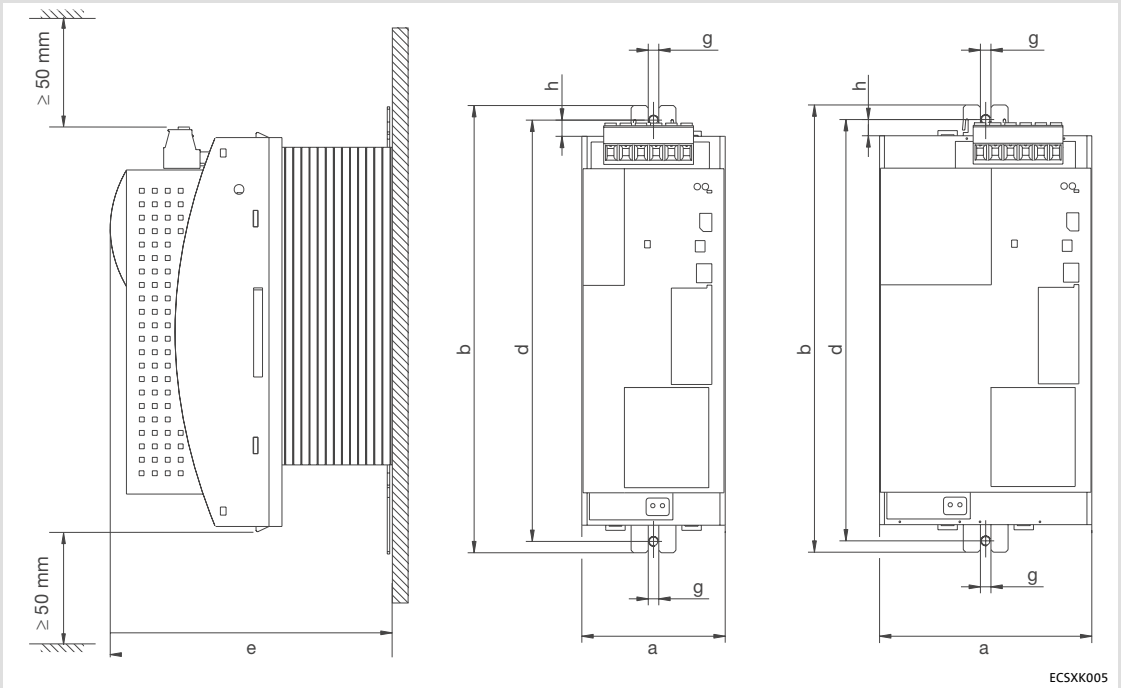


Fig.4-1 Dimensions for standard mounting with fixing rails, ECSEKxxx type

Capacitor modules		Dimensions [mm]					
Type	Size	O	B	D	E	g	h
ECSEK001	1	88.5	276	260	176	6.5 (M6)	10
ECSEK002	2	132					

Mounting

For mounting the capacitor module ECSEKxxx proceed as follows:

1. Prepare the fixing holes (see drawing)
2. Take the fixing rails from the accessory kit in the cardboard box.
3. Push the rails into the slots of the heatsink:
   – From above: push in the long side.
   – From below: push in the short side.
4. Fix the capacitor module onto the mounting plate.

4.3 Thermally separated mounting (”push-through technique”)

Type ECS**D**Kxxx

For thermally separated mounting the capacitor modules of ECSDKxxx type must be used. The accessories required for mounting are included in the scope of supply.

- Protection class of the separated cooler: IP54
- When using the push-through technique the pack panel of the control cabinet must be a steel plate with a thickness of 3 mm. The plate must be flat or slightly arched inwards (to the capacitor module). This applies to the transverse and lengthwise direction.

Dimensions

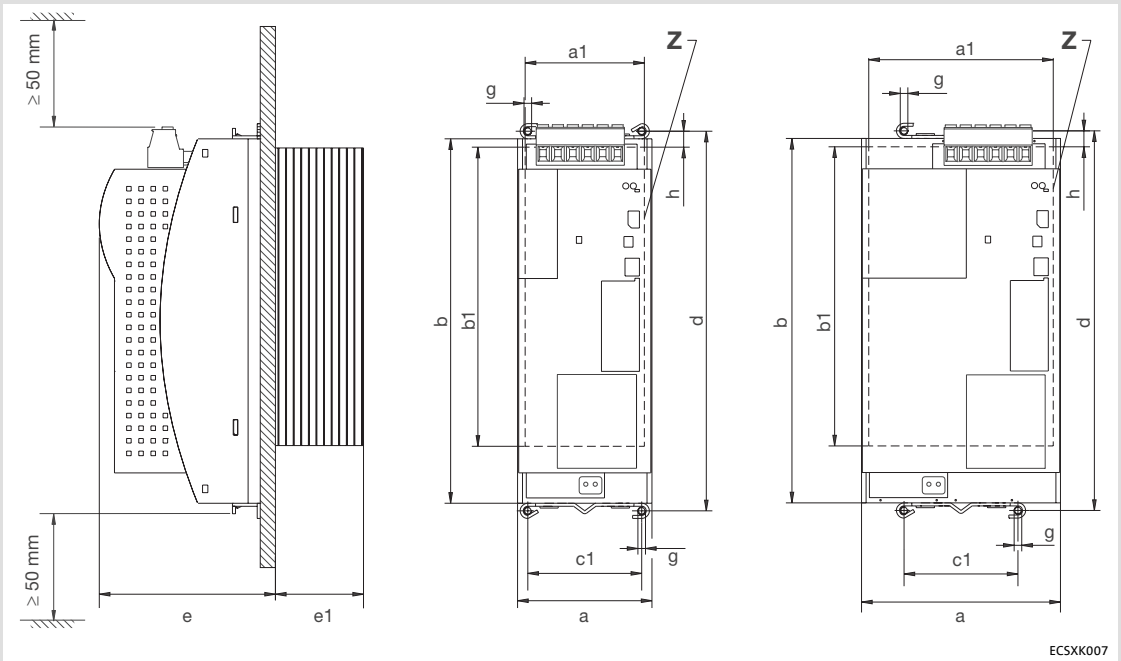


Fig.4-2 Dimensions for thermally separated mounting, ECSDKxxx type

Z Mounting cutout (a1 x b1)

Capacitor modules		Dimensions [mm]									
Type	Size	O	A1	B	b1	c1	D	E	e1	g	h
ECSDK001	1	88.5	78.5	240	197	75	250	116	58	M5	10.5
ECSDK002	2	132	121.5								

Dimensions of mounting cutout

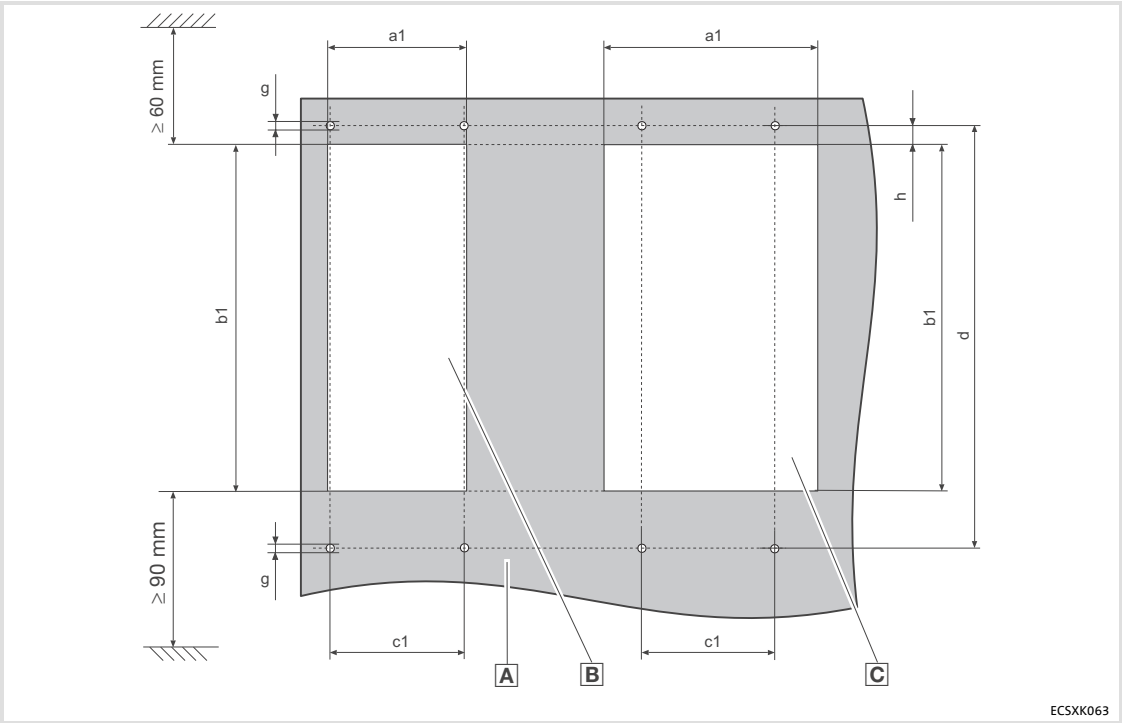


Fig.4-3 Dimensions of mounting cutout for thermally separated mounting, ECSDKxxx type

A Mounting plate
B Mounting cutout for ECSDK001
C Mounting cutout for ECSDK002

Capacitor modules		Dimensions [mm]					
Type	Size	A1	b1	c1	D	g	h
ECSDK001	1	78.5	197	75	250	M5	10.5
ECSDK002	2	121.5					

Mounting

Stop!

When boring through the rear panel of the control cabinet:

Seal the fixing screws with a liquid thread seal to ensure the protection class IP54 for the separated heatsink.

For mounting the capacitor module ECSDKxxx proceed as follows:

1. Prepare fixing holes for the clips (see drawing).
2. Prepare mounting cutout.
3. Fix the clips.
4. Push the capacitor module into the mounting cutout.
5. Let the capacitor module snap into place at the top and bottom.

4.4 Mounting in ”cold plate” technique

Type ECS**C**Kxxx

It is possible to mount the capacitor modules in cold-plate technique, for instance, onto collective coolers. For this mounting, the capacitor modules type ECSCAxxx must be used.

Dimensions

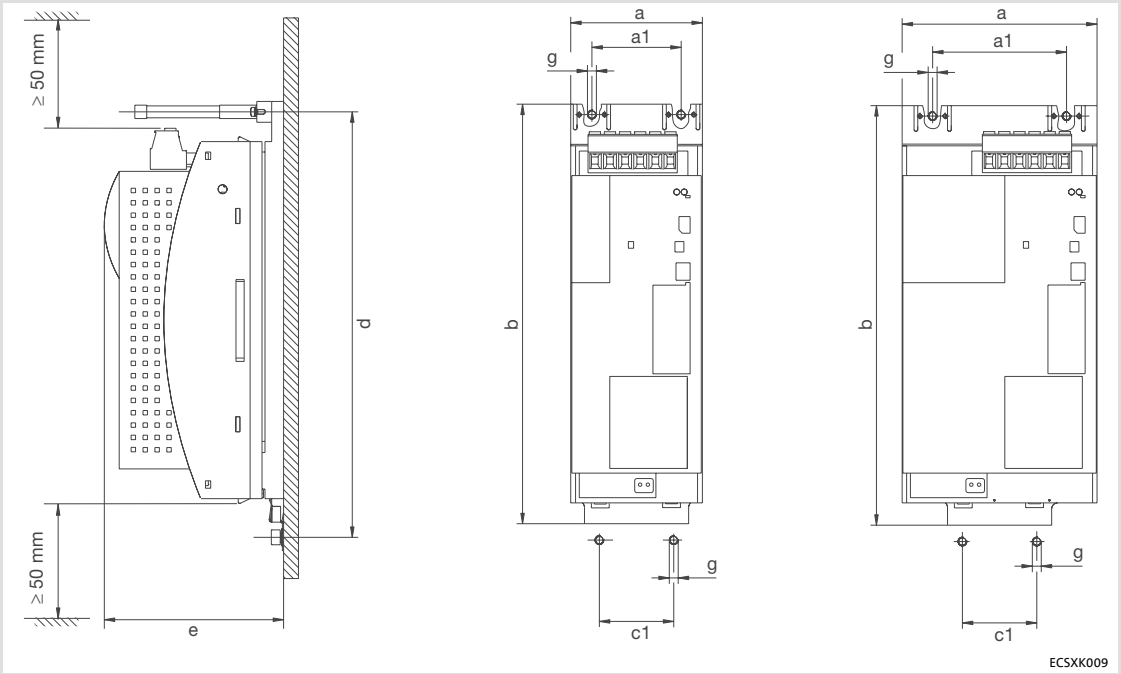


Fig.4-4 Dimensions for mounting in ”cold plate” technique, ECSCKxxx type

Capacitor modules		Dimensions [mm]						
Type	Size	O	A1	B	c1	D	E	g
ECSCK001	1	88.5	60	282	50	286	123	M6
ECSCK002	2	132	90					

Stop!

Penetration depth of the screws into the cooler: Approx. 15 mm!

Mounting

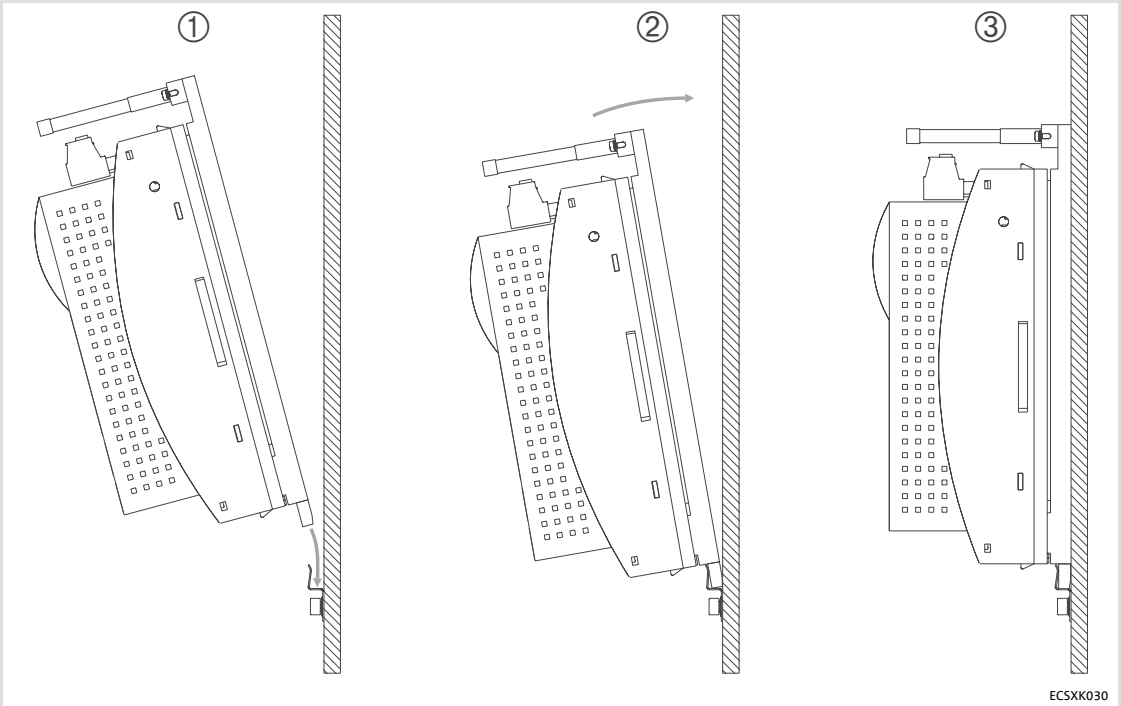


Fig.4-5 Mounting in ”cold plate” technique

For mounting the capacitor module ECSCKxxx proceed as follows:

1. Prepare the fixing holes (see drawing)
2. Clean and degrease the contact area of cooler and heatsink (e. g. with methylated spirit).
3. Screw the support onto the cooler.
4. Insert the capacitor module from above ① into the support ② and fasten both studs with 3.5 ... 4.5 Nm③.

5 Electrical installation

5.1 Important notes

Stop!

The capacitor module contains electrostatically sensitive components.

Prior to assembly and service operations, the personnel must be free of electrostatic charge.

5.1.1 Protection of persons

Danger!

- Before working on the capacitor module, check that no voltage is applied to the power terminals,
  - because the power terminals +UG and -UG remain live for at least three minutes after mains switch-off.
  - because the power terminals +UG and -UG remain live when the motor is stopped.
- If an error occurs (short circuit to frame or earth fault), a DC residual current may occur in the PE conductor. If an earth-leakage circuit breaker (residual current device) is used to protect against direct or indirect contact, only the use of an earth-leakage circuit breaker of type B is permissible on the current supply side. If not, another protective measure is to be used, as for example, separation from the environment by double or reinforced insulation or separation from the mains by using a transformer.

5.1.2 Device protection

Stop!

- ► All pluggable connection terminals must only be connected or disconnected when no voltage is applied.
- ► The power terminals +UG, -UG and PE are not protected against polarity reversal.
  - – When wiring, observe the polarity of the power terminals!
- ► The power may only be converted if the power supply module in the power system is ready for operation and the charging current limitation is bridged. Otherwise the charging current limitation can be destroyed.
- ► If the charging current limitation is active, a cyclic switching of the mains voltage at the power supply module can overload and destroy the capacitor. Therefore, at least three minutes have to pass between two starting operations in case of cyclic mains switching over a longer period of time!

5.1.3 Electrical isolation

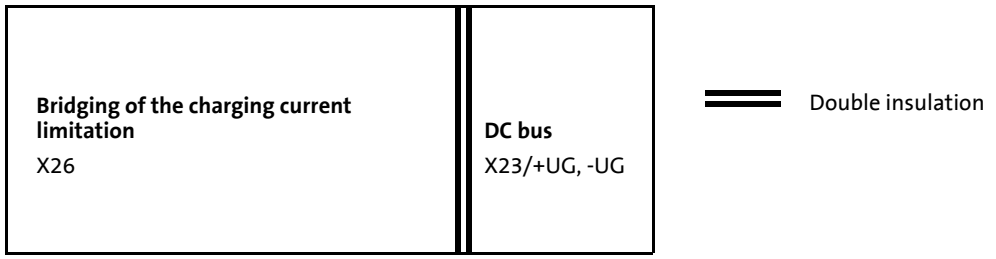


Fig.5-1 Electrical isolation

5.2 Drive system on the mains

These information apply to the drive system, consisting of:

- ECSxExxx power supply module
- ECSxKxxx capacitor module
- ECSxAxxx axis module
- Motor
- Accessories
- Wiring

5.2.1 Supply form/electrical supply conditions

Please observe the restrictions for the respective supply forms.

Mains	Operation of the capacitor modules	Notes
With earthed neutral (TT/TN systems)	No restrictions	The capacitor module will be destroyed if +UG conductor or -UG conductor are earthed.
With isolated neutral (IT systems)	The operation on symmetrical IT systems with PE is permitted.	
DC-supply via +UG/-UG	Permitted if the DC voltage is symmetrical with PE.	The capacitor module will be destroyed if +UG conductor or -UG conductor are earthed.

5.2.2 Operation on public supply systems (compliance with EN 61000-3-2)

The European standard EN 61000-3-2 specifies limit values for limiting harmonic currents in the supply system. Non-linear loads (e. g. frequency inverters) create harmonic currents, which impair the supply system and thus may disturb other loads. The objective of this standard is to ensure the quality of the public supply systems and reduce the mains load.

Note!

This standard only applies to public supply systems. Supply systems with an own transformer station which are standard in industrial firms are not public and are out of the scope of the standard.

If a device or machine consists of several components, the limit values of the standard are applied to the entire unit.

5.3 Installation of a DC-typical drive system

General notes

- The electromagnetic compatibility of a machine depends on the type of installation and care taken.Especially consider the following:
  - Structure
  - Filtering
  - Shielding
  - Earthing
- For diverging installations, the conformity to the CE EMC Directive requires a check of the machine or system regarding the EMC limit values. This is valid, for instance, when:
  - Using unshielded cables
  - Using collective suppression filters in place of the assigned RFI filters
  - Operating without RFI filters
- The compliance of the machine application with the EMC Directive is in the responsibility of the user.
  - If you observe the following measures, you can assume that the machine will operate without any EMC problems caused by the drive system and that compliance with the EMC Directive and the EMC law is achieved.
  - If devices which do not comply with the CE requirement concerning noise immunity EN 61000-6-2 are operated close to the axis modules, these devices may be disturbed electromagnetically by the axis modules.

Structure

- Install the capacitor module between the power supply module and the axis module(s)..
  - For cable lengths > 5 m we recommend to install the capacitor module as close as possible to the axis module with the highest power.
- Connect power supply modules, capacitor modules, axis modules, RFI filters, and mains choke to the earthed mounting plate with a large surface:
  - Mounting plates with conductive surfaces (zinc-coated or stainless steel) allow permanent contact.
  - Painted plates are not suitable for the installation in accordance with the EMC.
- If you use several mounting plates:
  - Connect the mounting plates electrically with a large surface (e.g. with copper bands).
- Ensure the separation of motor cable and signal or mains cable.
- Do not use the same terminal strip for mains input and motor output.
- Lay the cables as close as possible to the reference potential. Freely suspended cables act like aerials.

Filtering

- Use RFI filters and mains chokes which are assigned to the power supply modules:
  - RFI filters reduce impermissible high-frequency interferences to a permissible value.
  - Mains chokes reduce low-frequency interferences which depend on the motor cable and its length.

Shielding

- Connect the motor cable shield to the axis module
  - with the EMC accessories ECSZS000X0B.
  - to the mounting plate below the axis module with a large surface.
  - Recommendation: For the shield connection, use earthing clamps on bare metal mounting surfaces.
- If contactors, motor-protecting switches or terminals are located in the motor cable:
  - Connect the shields of the connected cables to the mounting plate, too, with a surface as large as possible.
- Connect the shield in the motor terminal box or on the motor housing to PE:
  - Metal glands at the motor terminal box ensure a connection of the shield and the motor housing.
- Shield the control cables:
  - Connect both shields of the digital control cables.
  - Connect one shields of the analog control cables.
  - Always connect the shields to the shield connection at the controller over the shortest possible distance.
- Using the axis modules in residential areas:
  - Additionally dampen the shield in order to limit the interfering radiation: ≥ 10 dB . This can be realised by using standard, closed, metallic, and earthed control cabinets or boxes.

Earthing

- Earth all metallically conductive components (power supply module, capacitor module, axis module, RFI filter, motor filter, mains choke) using suitable cables connected to a central point (PE bar).
- Maintain the minimum cross-sections prescribed in the safety regulations:
  - For the EMC, not the cable cross-section is important, but the surface and the contact with a cross-section as large as possible, i.e. large surface.

5.4 Power connections

5.4.1 Terminal assignment of the power connections

Terminal	Function	Electrical data
X23	**Connection of DC-bus voltage**	Dependent on application and type 0 ... 770 V
X23/+UG	Positive supply of DC-bus voltage	
X23/+UG		
X23/-UG	Negative supply of DC-bus voltage	
X23/-UG		
X23/PE	Earth connection	
X23/PE		

5.4.2 Fusing the DC-bus supply

When ECSxE power supply modules with a mains-side protection are used, the DC-bus cables do not need to be fused.

When using capacitor modules in the DC-bus connection with basic devices of the **82xx** and **93xx** series, use the following fuses:

Fuse		Support
Value [A]	Lenze type	Lenze type
50	EFSGR0500ANIN	EFH20007

Warnings!

- ► Use UL-approved cables, fuses and fuse holders only.
- ► UL fuse:
  - – Voltage 500 ... 600 V
  - – Tripping characteristic ”H”, ”K5” or ”CC”

5.4.3 Specification of the cables used

The cables used must comply with the required approvals at the place of installation (e. g. UL).

Installation of the cables to EN 60204-1 (1998)

Shielded cables

Observe the following to increase the effect of shielded cables:

- ► A good shield connection:
  - – Ensure a contact surface as large as possible
- ► Low shield resistance:
  - – Only use shields with tin-plated or nickel-plated copper braids (shields with steel braids cannot be used).
- ► High contact ratio of the shield braid:
  - – At least 70 ... 80 % with 90 ° overlap angle

Cable cross-sections

Terminal	Function	Screw tightening torques	Possible cable cross-sections
X23	**Connection of DC-bus voltage**	1.2 ... 1.5 Nm 10.6 ... 13.3 lb-in	• rigid – 0.2 ... 10 mm² – AWG 24 ... 8 • flexible – 0.2 ... 10 mm² – AWG 24 ... 10 • With wire end ferrule – 0.25 ... 6 mm² – AWG 22 ... 10 • With TWIN wire end ferrule – 0.25 ... 4 mm² – AWG 22 ... 12
X26	**Control connection for bridging the charging current limitation**	0.5 ... 0.8 Nm 4.4 ... 7.1 lb-in	• flexible – 0.2 ... 2.5 mm² – AWG 24 ... 12

5.5 Control connection

Terminal	Function	Electrical data
X26	Connection for bridging the charging current limitation	21.8 ... 30 V DC, max. 1.5 A

The polarity does not influence the function of the charging current limitation.

5.6 Wiring

5.6.1 Operation with ECSxE power supply module

Install the capacitor module ECSxKxxx between the power supply module and the axis module(s).

If the total cable length in the DC-bus connection is longer than 5 m, install the capacitor module as close as possible to the axis module with the highest power.

Stop!

- ► Permanently bridge the charging current limitation (X26) of the capacitor module (X26 = HIGH).
- ► Only release the controller (X6/SI1 = HIGH) if the power supply module ECSxE displays ”Ready for operation” (X6/DO1 = HIGH).

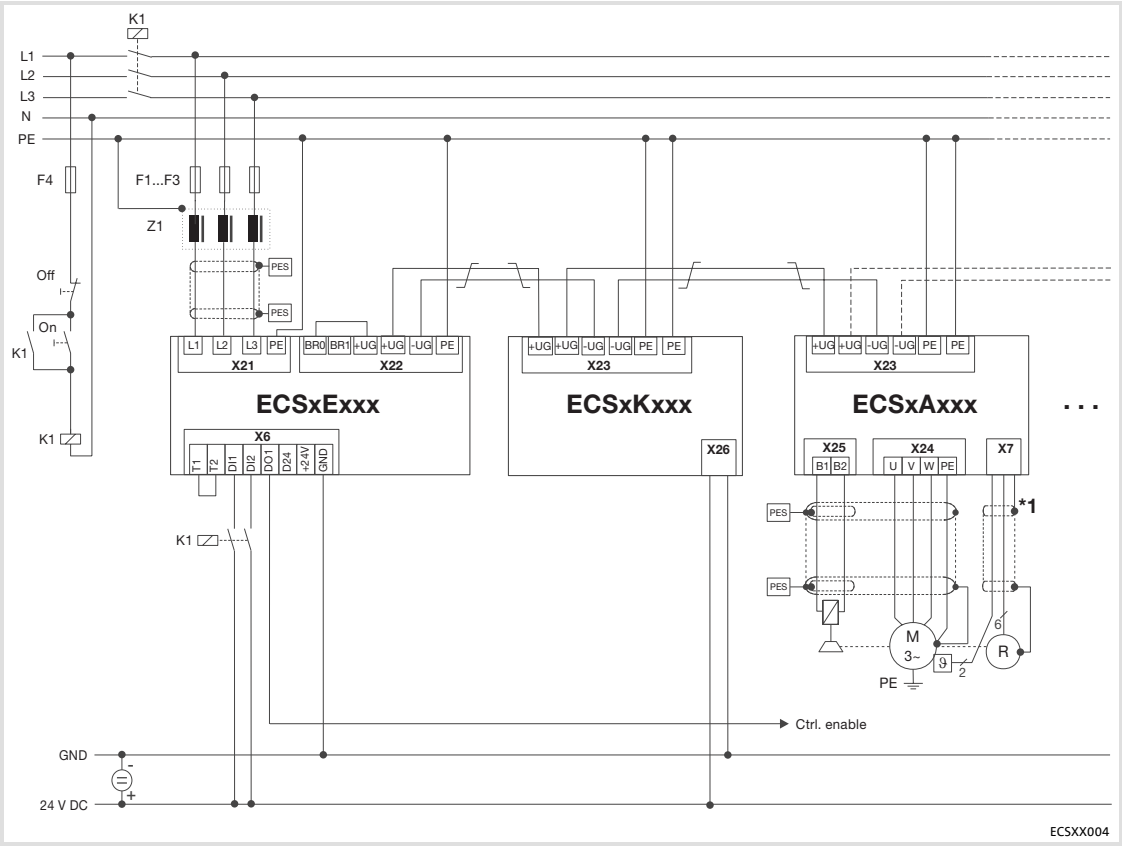


Fig.5-2 Wiring of the capacitor module ECSxK with power supply module ECSxE

PES	HF shield termination by large-surface PE connection
	Twisted cables
* 1	System cable - feedback
Ctrl. enable	Terminal X6/SI1 of the connected axis modules (controller enable)

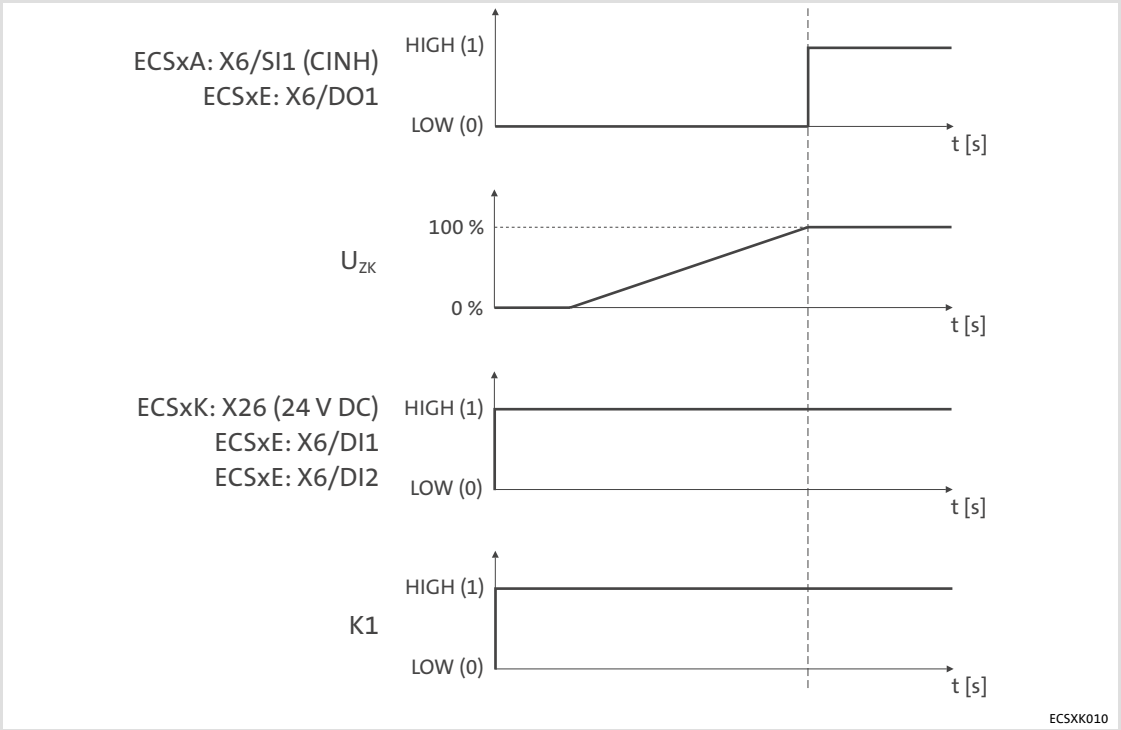


Fig.5-3 Level/time diagrams for operation with ECSxE power supply module

5.6.2 Operation with another supplier

Stop!

- ► After mains connection, wait at least one second before bridging the charging current limitation (X26 = HIGH).
- ► Only release the controller (X6/SI1 = HIGH) if the charging current limitation is bridged.

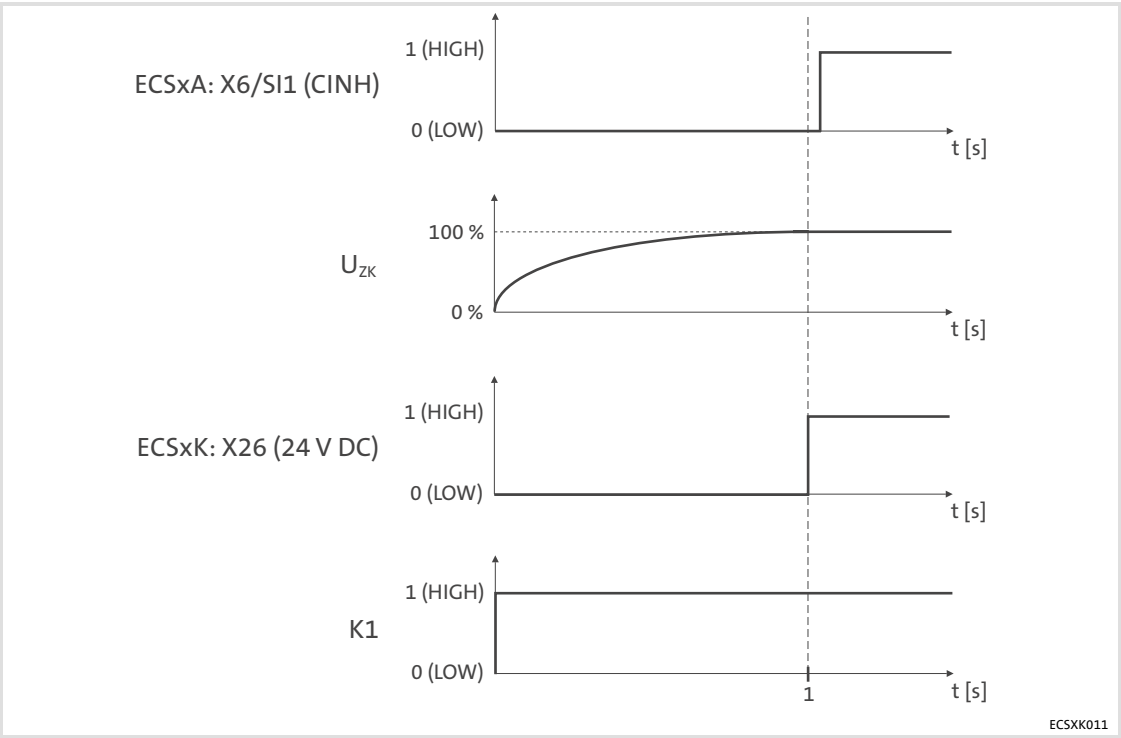


Fig.5-4 Level/time diagrams for operation with other supplier

6 Commissioning

Before you start

Prior to initial switch-on of the drive system, check the wiring of the capacitor module for completeness, short-circuit, and earth fault:

- Power connection (X23):
  - Polarity of the DC-bus voltage supply via terminals +UG and -UG
- Control connection (X26):
  - Wiring adjusted to the signal assignment of the control terminals.

Further information on commissioning the drive system can be obtained from the documentations for the power supply module and axis module.

7 Appendix

7.1 Overview of accessories

The accessories are not included in the scope of supply. The capacitor module and accessories are carefully coordinated.

7.1.1 Connectors

In order to provide a flexible purchasing, the connectors are available as a separate delivery unit.

► ECSZ**K**000X0B (connectors for capacitor modules)

7.1.2 DC bus fuses

The DC bus must only be fused when using the capacitor module with basic device of **82xx** and **93xx** series. Here, the following fuses must be used:

Fuse		Support
Value [A]	Lenze type	Lenze type
50	EFSGR0500ANIN	EFH20007

7.2 Index

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