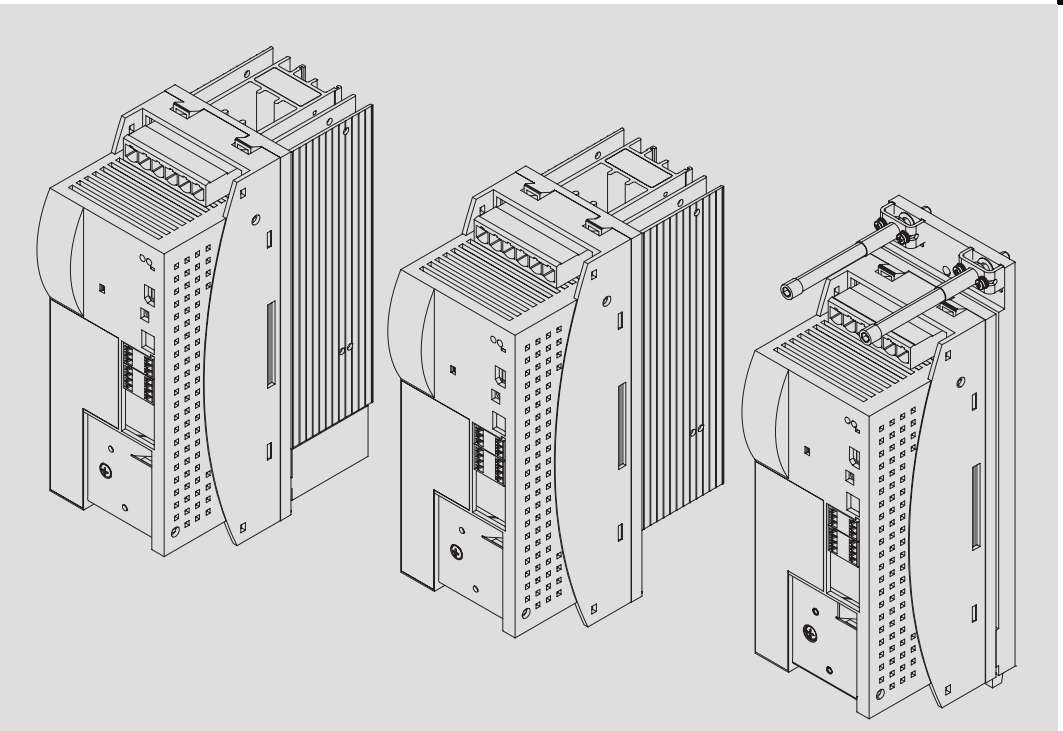
EDBCSXE040
13290557

Operating Instructions

ECS



ECSEExxx / ECSDExxx / ECSCExxx

Power supply module

Lenze

Please read these instructions before you start working!
Follow the enclosed safety instructions.

These instructions are valid for the ECSxE power supply modules as of version:

	①										
	ECS	x	E	xxx	x	4	x	xxx	XX	xx	xx

Type

Design

E = standard panel-mounted unit, IP20
D = push-through technique (thermally separated)
C = cold-plate technique

Rated current

012 = 12 A
020 = 20 A
040 = 38.5 A

Fieldbus interface

C = system bus CAN

Voltage class

4 = 400 V/480 V

Technical version

B = standard
I = for IT systems

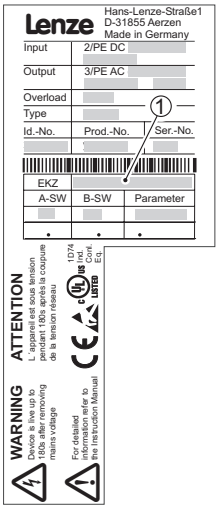
Variant

Hardware version

VA or higher

Operating software version (B-SW)

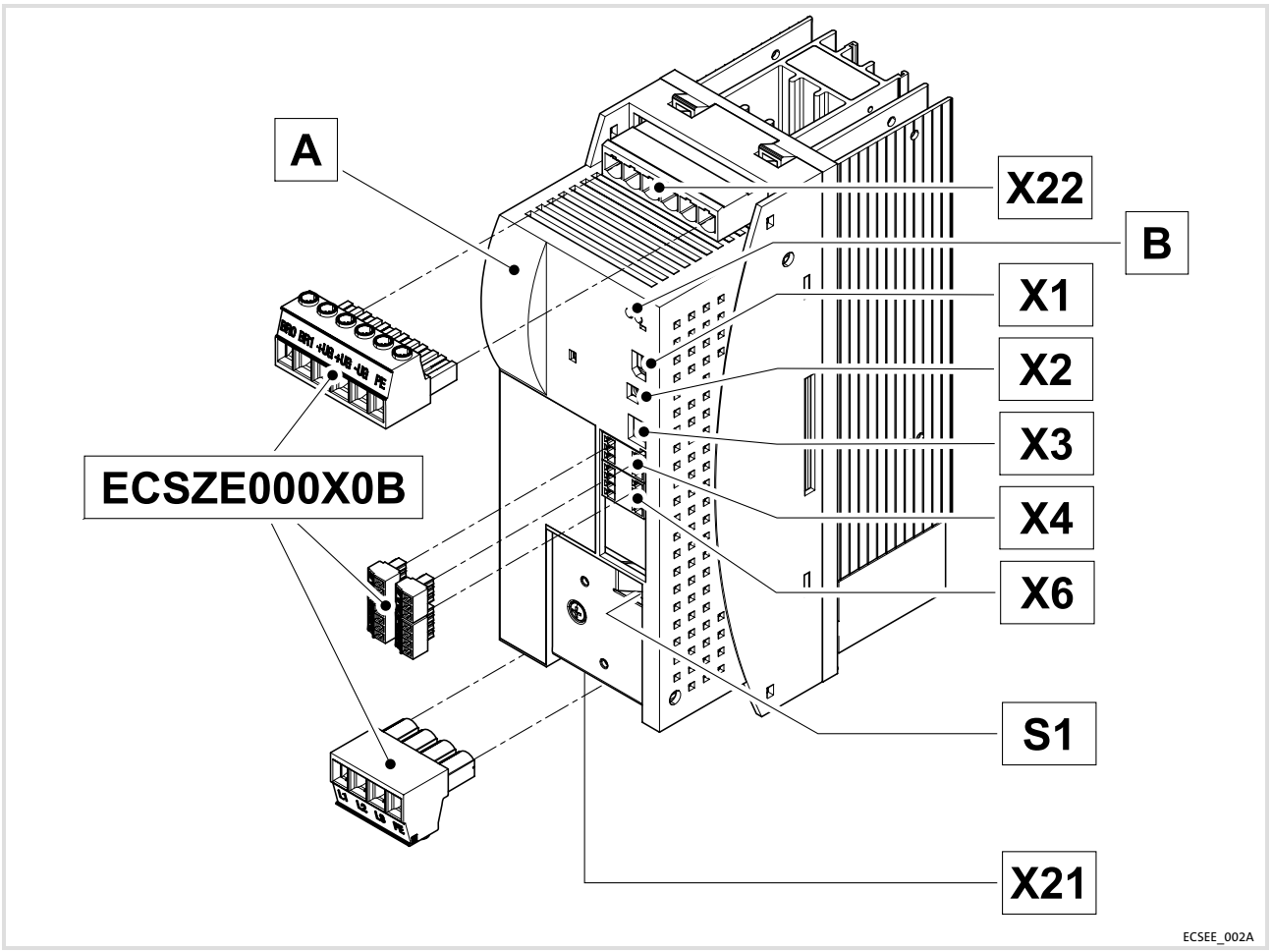
1.2 or higher



Tip!

Documentation and software updates for further Lenze products can be found on the Internet in the ”Services & Downloads” area under

http://www.Lenze.com


A
X22
B
X1
X2
X3
X4
X6
ECSZE000X0B
S1
X21
ECSEE_002A

Scope of supply

Position	Description	Quantity
A	Power supply module ECS☐E...	1
	Accessory kit with fixings according to the design (☐): ● ”E” - panel-mounted device ● ”D” - push-through technique ● ”C” - cold-plate technique	1
	Mounting Instructions	1
	Drilling jig	1

Note!

The connector set **ECSZE000X0B**must be ordered separately.

Connections and interfaces

Position	Description	Detailed information
X22	Connections ● External brake resistor ● DC-bus voltage ● PE	📖 42
B	LEDs: Status and fault display	
X1	Automation interface (AIF) for ● Communication module ● Operating module (XT keypad)	 📖 50 📖 68
X2	PE connection AIF	
X3	Not assigned	
X4	CAN connection ● System bus (CAN) ● Interface for – master control and other modules – PC/HMI for parameterisation and diagnostics	📖 51
X6	Connections ● Low-voltage supply ● Digital inputs and outputs ● Thermostat contacts	📖 49
S1	DIP switch ● CAN node address (device address in the CAN network) ● CAN baud rate	📖 90
X21	Mains connection	📖 40

Status displays

LED		Description
Red	Green	
Off	On	Power supply module is enabled, no fault
Off	Blinking	Power supply module is inhibited (CINH), switch-on inhibit
Blinking, 1 Hz	Off	Fault / error (TRIP) / short-circuit braking error (KSB-TRIP) is active
Blinking, 3 Hz	Off	Message active
Blinking, 1 Hz	Blinking	Warning active with inhibited module
Blinking, 1 Hz	On	Warning active with enabled module

1 Preface and general information

1.1 About these Operating Instructions

These Operating Instructions help you with the connection and commissioning of the ECSxE series power supply modules.

They contain safety instructions which must be observed!

All persons working on and with ECSxE series power supply 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	ECSxE... power supply module
ECSxE...	Any power supply module of the ECS series
Capacitor module	ECSxK series capacitor module
ECSxK...	Any capacitor module of the ECS series
Axis module Controller ECSxS... ECSxP... ECSxM... ECSxA ...	Any axis module of the ECS series: ● ECSxS... - ”Speed and Torque” mode ● ECSxP... - ”Posi and Shaft” mode ● ECSxM... - ”Motion” mode ● ECSxA... - ”Application” mode
Drive system	Drive systems with: ● Axis modules ECSxS... / ECSxP... / ECSxM... / ECSxA... ● ECSxE... power supply modules ● ECSxK... capacitor modules ● Other Lenze drive components
24 V supply Low-voltage supply	Voltage supply of the control card, voltage range 20 ... 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 plug connector Xk (e. g. X6/B+ = terminal B+ on plug connector X6)

1.3 Scope of supply

The scope of supply of the ECSxE... power supply module includes:

- Standard device
- Accessory kit with fixings according to the design:
  – ”E” - panel-mounted device
  – ”D” - push-through technique
  – ”C” - cold-plate technique
- Mounting Instructions
- Drilling jig

Accessories

The appendix includes information on the following accessories: (📖 142).

- Connector sets for
  – Power supply modules: ECSZE000X0B
  – Capacitor modules: ECSZK000X0B
  – Axis modules: ECSZA000X0B
- Shield mounting ECSZS000X0B001 (EMC accessories)
- Communication modules for the automation interface (AIF)
- ECSxS/P/M/A... axis module
- ECSxK series capacitor module
- Brake resistors
- Mains fuses
- Mains chokes
- RFI filters
- Motors

1.4 Properties of the ECSxE power supply module

- Generation of the DC-bus voltage for an ECS drive system or single drive
- Controlled charging of the DC bus
- Check of the DC bus for earth fault and short circuit during mains connection
- Automatic detection of mains voltage
- Mains failure monitoring
- Single-phase mains current measurement for diagnosis
- Internal brake chopper IGBT
- Mains-voltage dependent adaptation of brake chopper switch-on voltage
- Internal brake resistor with monitoring (not for ECS**C**E series in cold plate design)
- Connection of external brake resistor with temperature switch possible
- Communication via integrated system bus interface (CAN) for parameterisation and transmission of process data

1.5 Legal regulations

Identification	Nameplate	CE designation	Manufacturer
	Lenze power supply modules are unambiguously designated by the contents of the nameplate.	Conforms to the EC Low-Voltage Directive	Lenze Automation GmbH Grünstraße 36 D-40667 Meerbusch

Application as directed	**ECSxE series power supply modules** ● must only be operated under the conditions prescribed in these Instructions. ● are components – for the supply of servo inverters with DC bus voltage. – for installation in a machine. – for assembly with other components to form a machine. ● are electrical equipment for the installation in control cabinets or similar closed operating areas. ● comply with the protective requirements of the EC Low-Voltage Directive. ● are not machines for the purpose of the EC Machinery Directive. ● are not to be used as domestic appliances, but for industrial purposes only. **Drive systems with ECSxE series power supply modules** ● comply with the EC Directive "Electromagnetic compatibility" if they are installed according to the guidelines of CE-typical drive systems. ● can be used – at non-public mains. – in industrial premises. ● 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 power supply modules and components which have already been supplied cannot be derived from the information, illustrations and descriptions given in these Instructions. ● 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 power supply module – Operating errors – Improper working on and with the power supply 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.

2 Safety instructions

2.1 General safety and application notes for Lenze power supply modules

(acc. to Low-Voltage Directive 2006/95/EC)

For your personal safety

Depending on their degree of protection, Lenze power supply modules and their accessory components can be live, moving and rotating during operation. Surfaces can be hot.

Non-authorised removal of the required cover, inappropriate use, incorrect installation or operation, creates the risk of severe injury to persons or damage to material assets.

For more information please see the documentation.

High amounts of energy are produced in the power supply module. Therefore it is required to wear personal protective equipment (body protection, headgear, eye protection, ear protection, hand guard) when working with the power supply module.

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

Power supply modules are components which are designed for installation in electrical systems or machinery. They are not to be used as domestic appliances, but only for industrial purposes according to EN 61000-3-2.

When installing the power supply modules in machines, commissioning (i.e. starting of operation as directed) is prohibited until it is proven that the machine complies with the regulations of the EC Directive 98/37/EC (Machinery Directive); EN 60204 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 power supply modules meet the requirements of the Low-Voltage Directive 73/23/EEC. The harmonised standard EN 61800-5-1 applies to the power supply modules.

The technical data as well as the supply conditions can be obtained from the nameplate and the documentation. They must be strictly observed.

Warning: The power supply modules are products which can be installed in drive systems of category C2 according to EN 61800-3. These products can cause radio interference in residential areas. In this case, special measures can be necessary.

Transport, storage

Please observe the notes on transport, storage, and appropriate handling.

Observe the climatic conditions according to the technical data.

Installation

The power supply modules must be installed and cooled according to the instructions given in the corresponding documentation.

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

Power supply modules contain electrostatically sensitive components which can easily be damaged by inappropriate handling. Do not damage or destroy any electrical components since this might endanger your health!

Electrical connection

When working on live power supply modules, applicable national regulations (e.g. VBG 4) must be observed.

The electrical installation must be carried out according to the appropriate regulations (e.g. cable cross-sections, fuses, PE connection). Additional information can be obtained from the documentation.

The documentation contains information about installation in compliance with EMC (shielding, earthing, filters, and cables). These notes must also be observed for CE-marked power supply modules. The manufacturer of the system or machine is responsible for compliance with the required limit values demanded by EMC legislation. The controllers must be installed in housings (e.g. control cabinets) to meet the limit values for radio interferences valid at the site of installation. The housings must enable an EMC-compliant installation. Observe in particular that e.g. the control cabinet doors should have a circumferential metal connection to the housing. Reduce housing openings and cutouts to a minimum.

Operation

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

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

All protection covers and doors must be shut during operation.

Note for UL approved systems with integrated power supply modules: UL warnings are notes which only apply to UL systems. The documentation contains special UL notes.

Maintenance and servicing

The power supply modules do not require any maintenance if the prescribed operating conditions are observed.

If the ambient air is polluted, the cooling surfaces of the power supply module may become dirty or the ventilation slots may be obstructed. Therefore, clean the cooling surfaces and ventilation slots periodically under these operating conditions. Do not use sharp or pointed tools for this purpose!

Disposal

Recycle metal and plastic materials. Ensure professional disposal of assembled PCBs.

The product-specific safety and application notes given in these instructions must be observed!

2.2 Residual hazards

Protection of persons

- Before working on the power supply module, check that no voltage is applied to the power terminals,
  - the power terminals +UG, -UG, BR0 and BR1 remain live for at least 3 minutes after mains disconnection.
  - because the power terminals +UG, -UG, BR0 and BR1 remain live when the motor is stopped.
- The operating temperature of the heatsink can exceed 70 °C:
  - Direct skin contact with the heatsink results in burns!
- The leakage current to PE is > 3.5 mA AC or > 10 mA DC. Therefore, two PE connections are installed for protective reasons.
  - Comply with the requirements of EN 61800-5-1 for high leakage currents!
- For operation of the power supply module with an earth-leakage circuit breaker:
  - The power supply modules are provided with an internal mains rectifier. In the event of a short-circuit to frame, a non-pulsating DC fault current can prevent the tripping of AC-sensitive or pulse-current-sensitive earth-leakage circuit breakers and thus block the protective function for all electrical equipment operated on these earth-leakage circuit breakers.
  - If a residual current device (RCD) is used as a protective means in the case of direct or indirect contact, only a residual current device (RCD) of type B may be used. Otherwise, another protective measure, such as separation from the environment through double or reinforced insulation or disconnection from the mains by means of a transformer must be used.

Device protection

- The power supply module may only be driven from balanced mains supplies. Mains supplies with earthed phase are not permitted.
- Observe the max. permissible mains voltage. Higher voltages will damage the power supply module.
- The power supply module contains electrostatic sensitive devices. The personnel must be free of electrostatic charge prior to assembly and service operations.
- 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!
- Operation is not permitted
  - without the use of a brake resistor.
  - if an internal brake resistor and an external brake resistor are used simultaneously.
  - if several power supply modules are connected in parallel.

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.

Markings provided for the supply units:

- Suitable for use on a circuit capable of delivering not more than 5000 rms symmetrical amperes, 480 V max, when protected by K5 or H Fuses (400/480 V devices).
- Alternate - Circuit breakers (either inverse-time, instantaneous trip types or combination motor controller type E) may be used in lieu of above fuses when it is shown that the let-through energy (i^2t) and peak let-through current (I_p) of the inverse-time current-limiting circuit breaker will be less than that of the non-semiconductor type K5 fuses with which the drive has been tested.
- Alternate - An inverse-time circuit breaker may be used, sized upon the input rating of the drive, multiplied by 300 %.

Markings provided for the inverter units:

- The inverter units shall be used with supply units which are provided with overvoltage devices or systems in accordance with UL840 2nd ed., Table 5.1.
- The devices are provided with integral overload and integral thermal protection for the motor.
- The devices are not provided with overspeed protection.

Terminal tightening torque of lb-in (Nm)

Terminal	lb-in	Nm
X 21, X 22, X 23, X 24	10.6 ... 13.3	1.2 ... 1.5
X4, X6, X14	1.95 ... 2.2	0.22 ... 0.25
X 25	4.4 ... 7.1	0.5 ... 0.8

Wiring diagram AWG

Terminal	AWG
X 21, X 22, X 23, X 24	12 ... 8
X4, X6, X14	28 ... 16
X 25	24 ... 12

2.4 Notes used

The following pictographs and signal words 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 troublefree 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 and operating conditions

Standards and operating conditions			
Conformity		CE	Low-Voltage Directive (2006/95/EC)
Approvals		UL 508C	Power Conversion Equipment Underwriter Laboratories (File No. E132659) for USA and Canada
Packaging (DIN 4180)		Shipping package	
Installation		Installation in control cabinet	
Mounting position		Vertically suspended	
Free space	above	≥ 65 mm	
	below	≥ 65 mm With ECSZS000X0B shield mounting kit: > 195 mm	
	to the sides	Can be mounted directly side by side without any clearance	

Environmental conditions			
Climate		3k3 in accordance with IEC/EN 60721-3-3 Condensation, splash water and ice formation not permissible.	
	Storage	IEC/EN 60721-3-1	1K3 (-25 ... + 55 °C)
	Transport	IEC/EN 60721-3-2	2K3 (-25 ... +70 °C)
	Operation	IEC/EN 60721-3-3	3K3 (0 ... + 55 °C) ● Atmospheric pressure: 86 ... 106 kPa ● Above +40 °C: reduce the rated output current by 2 %/°C.
Site altitude			0 ... 4000 m amsl ● Reduce rated output current by 5 %/1000 m above 1000 m amsl. ● Over 2000 m amsl: use is only permitted in environments with overvoltage category II
Pollution		VDE 0110 part 2 pollution degree 2	
Vibration resistance		Accelerational stability up to 0.7 g (Germanischer Lloyd, general conditions)	

General electrical data			
EMC	Compliance with the requirements acc. to EN 61800-3		
Noise emission	Compliance with the limit class A acc. to EN 55011 (achieved by using collective filters typical for the application)		
Noise immunity	Requirements acc. to EN 61800-3		
	Requirement	**Standard**	**Severity**
	ESD [1)]	EN 61000-4-2	3, i. e. ● 8 kV for air discharge ● 6 kV for contact discharge
	Conducted high frequency	EN 61000-4-6	10 V; 0.15 ... 80 MHz
	RF interference (housing)	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 (surge voltage 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 acc. to VDE 0110		
Discharge current to PE (acc. to EN 61800-5-1)	> 3.5 mA AC during operation		
Enclosure	IP20 (NEMA 250 type 1) for ● standard mounting (panel-mounted unit) ● mounting in cold-plate technique ● mounting with thermal separation (push-through technique), IP54 on heatsink side		
Protective measures against	● Short circuit in power terminals (short-circuit-proof at mains connection) ● Short circuit in auxiliary circuits – Digital outputs: short-circuit-proof – System bus and encoder systems: partially short-circuit-proof (corresponding monitoring functions can be deactivated, if required.) ● Earth fault (earth-fault protected at mains connection) ● Overvoltage		
Protective insulation of control circuits	**Protective separation from the mains** Double/reinforced insulation acc. to EN 61800-5-1		

1) The noise immunity with the severities given must be ensured by the control cabinet. The user must check the compliance of the severities given.

3.2 Rated data

Rated data	Type	ECSxE012	ECSxE020	ECSxE040
Mains voltage	V_{mains} [V]	3 x 200 -10 % ... 3 x 480 +10 %		
Rated mains voltage	$V_{mains\ rated}$ [V]	3 x 400 V		
Mains frequency	f_{mains} [Hz]	45 ... 66		
Rated mains current	$I_{mains\ rated}$ [A]	9.6	15.9	31.3
Max. mains current	$I_{mains\ max}$ [A]	5 x $I_{mains\ rated}$ for 50 ms / 0 x $I_{mains\ rated}$ for 1.2 s		
		2 x $I_{mains\ rated}$ for 1 s / 0 x $I_{mains\ rated}$ for 3 s		
		1.5 x $I_{mains\ rated}$ for 10 s / 0 x $I_{mains\ rated}$ for 12.75 s		
Rated direct current (effective value)	$I_{DC\ rated,RMS}$ [A]	12.0	20.0	38.5
Max. connectable DC bus capacitance	C [uF]	6600		
Low-voltage supply of control electronics	U [V]	20 ... 30		
	$I_{typ.}$ [A]	0.35		
	I_{max} [A]	0.5 A at 24 V [1]		
Power loss, total	P_V [W]	50	68	111
Inside the device		20	23	30
Heatsink		30	45	81
Velocity of cooling air (only for ECSDE...)	V_C [m/s]	3		
Mass	m [kg]	approx. 2.5		approx. 3.2
Internal brake resistor (not available for ECSCE...)	R_B [Ω]	39		20
Continuous power	P_d [kW]	0.12		0.15
Max. braking power	P_{Bmax} [kW]	13.8		27.0
Max. braking energy	W_B [kWs]	2.5		3.0
Max. on-time	t_e [s]	0.15		0.10
Required recovery time	t_a [s]	20		

[1] For the dimensioning of a 24 V supply it may be necessary to add the current demand of the digital output (0.7 A).

3.3 External brake resistors

3.3.1 Assignment of external brake resistors

Brake resistor	Ω	P_d [kW]	Power supply module								
			ECSEE...			ECSDE...			ECSCE...		
			012	020	040	012	020	040	012	020	040
ERBM082R100W	82	0.10							●		
ERBM039R120W	39	0.12								●	
ERBM020R150W	20	0.15									●
ERBD082R600W	82	0.60	●			●			●		
ERBD047R01K2	47	1.20		●			●			●	
ERBD022R03K0	22	3.00			●			●			●
ERBS082R780W	82	0.78	●			●			●		
ERBS039R01K6	39	1.64		●			●			●	
ERBS020R03K2	20	3.20			●			●			●

P_d Continuous power

3.3.2 Rated data

Brake resistors of type ERBM...

Brake resistors with specifically adapted pulse capability in IP50 design

Rated data	Type	Brake resistor		
		ERBM082R100W	**ERBM039R120W**	**ERBM020R150W**
Resistance	R_B [Ω]	82	39	20
Continuous power	P_d [W]	100	120	150
Thermal capacity	C_B [kWs]	3	6	13
Max. on-time	t_e [s]	5		
Required recovery time	t_a [s]	90		
Operating voltage	U_{max} [V_{DC}]	1000		
Max. braking power	P_{Bmax} [kW]	$P_{Bmax} = \frac{\text{Thermal capacity } C_B}{\text{On - time}}$		

Brake resistors of type ERBD...

Brake resistors with increased power loss in IP20 design (protection against accidental contact acc. to NEMA 250 type 1)

Rated data	Type	Brake resistor		
		ERBD082R600W	ERBD047R01K2	ERBD022R03K0
Resistance	R_B [Ω]	82	47	22
Continuous power	P_d [W]	600	1200	3000
Thermal capacity	C_B [kWs]	87	174	375
Max. on-time	t_e [s]	15		
Required recovery time	t_a [s]	135		
Operating voltage	U_{max} [V_{DC}]	800		
Max. braking power	P_{Bmax} [kW]	$P_{Bmax} = \frac{\text{Thermal capacity } C_B}{\text{On} - \text{time}}$		

Brake resistors of type ERBS...

Brake resistors with increased power loss in IP65 design (NEMA 250 type 4x)

Rated data	Type	Brake resistor		
		ERBS082R780W	ERBS039R01K6	ERBS020R03K2
Resistance	R_B [Ω]	82	39	20
Continuous power	P_d [W]	780	1640	3200
Thermal capacity	C_B [kWs]	117	246	480
Max. on-time	t_e [s]	15		
Required recovery time	t_a [s]	135		
Operating voltage	U_{max} [V_{DC}]	800		
Max. braking power	P_{Bmax} [kW]	$P_{Bmax} = \frac{\text{Thermal capacity } C_B}{\text{On} - \text{time}}$		

4 Mechanical installation

4.1 Important notes

- ECSxE... power supply modules are provided with IP20 enclosure (NEMA 250 type 1) and can therefore only be used for installation in control cabinets.
- 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.
- Possible mounting positions
  - Vertically at the mounting plate
  - DC bus connections (X22) at the top
  - Mains connection (X21) at the bottom
- Maintain the specified clearances (above and below) to other installations!
  - If the ECSZS000X0B shield mounting kit is used, an additional clearance is required.
  - Ensure unimpeded ventilation of cooling air and outlet of exhaust air.
  - Several modules of the ECS series can be installed in the control cabinet next to each other without any clearance.
- The mounting plate of the control cabinet
  - must be electrically conductive.
  - must not be varnished.
- In case of continuous vibrations or shocks use shock absorbers.

4.2 Mounting with fixing rails (standard installation)

4.2.1 Dimensions

Note!

Mounting with ECSZS000X0B shield mounting kit:

► Mounting clearance below the module > 195 mm

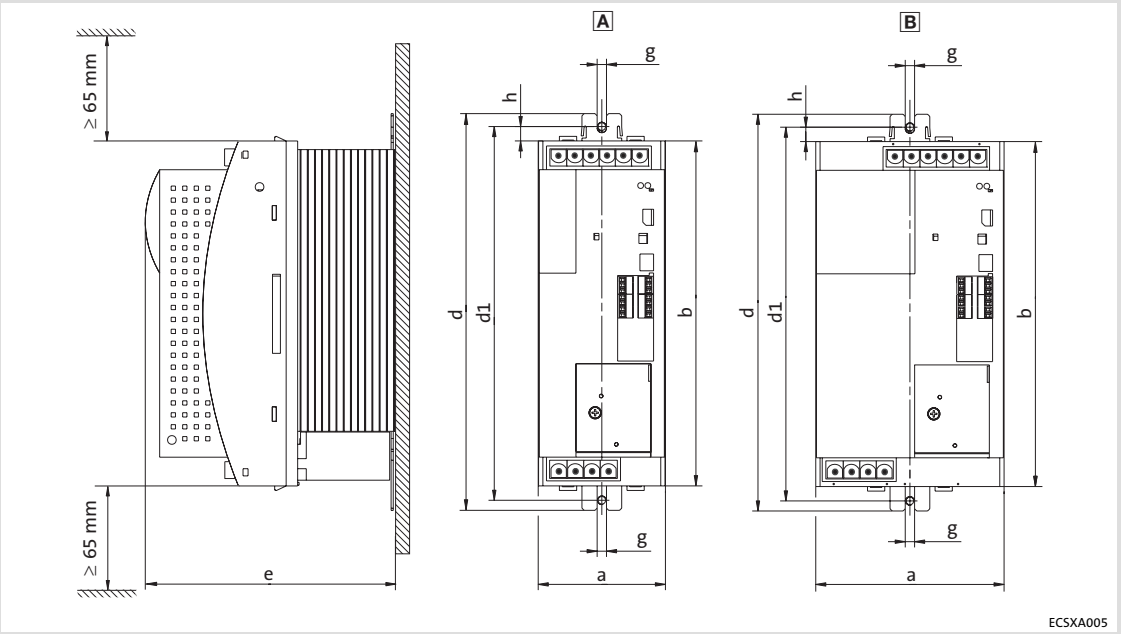


Fig. 4-1 Dimensions for "panel-mounted" design

Power supply module		Dimensions [mm]						
Type	Size	a	b	d	d1	e	h	g
ECSEE012	A	88.5	240	276	260	176 212 1)	10	6.5 (M6)
ECSEE020								
ECSEE040	B	131						

1) max. 212 mm, depending on the communication module attached

4.2.2 Mounting steps

Proceed as follows to mount the power supply module:

1. Prepare the fixing holes on the mounting surface.
   – Use the drilling jig for this purpose.
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. Attach the power supply module to the mounting surface.

4.3 Mounting with thermal separation (push-through technique)

Mounting in push-through technique requires the rear panel of the control cabinet to be a steel plate with a thickness of at least 3 mm.

The edges of the mounting cutout and the fixing holes for the clamps must be slightly curved inwards (towards the power supply module).

Cooling

The separated heatsink serves to reduce the heat generation in the control cabinet.

- Distribution of the power loss:
  - approx. 65 % via separated cooler
  - approx. 35 % inside the power supply module
- Protection class of the separated cooler: IP54
  - The sealing surface at the heatsink of the power supply module must rest completely against the mounting plate.
  - Use a liquid thread sealant to bond the screws of the clamps.
- Cooling of the drive system:
  - Air flow behind the rear panel of the control cabinet must be $\geq$ 3 m/s (e.g. by means of a collective fan).
- With sufficient cooling, the ratings of the power supply modules remain valid.

4.3.1 Dimensions

Note!

Mounting with ECSZS000X0B shield mounting kit:

► Mounting clearance below the module > 195 mm

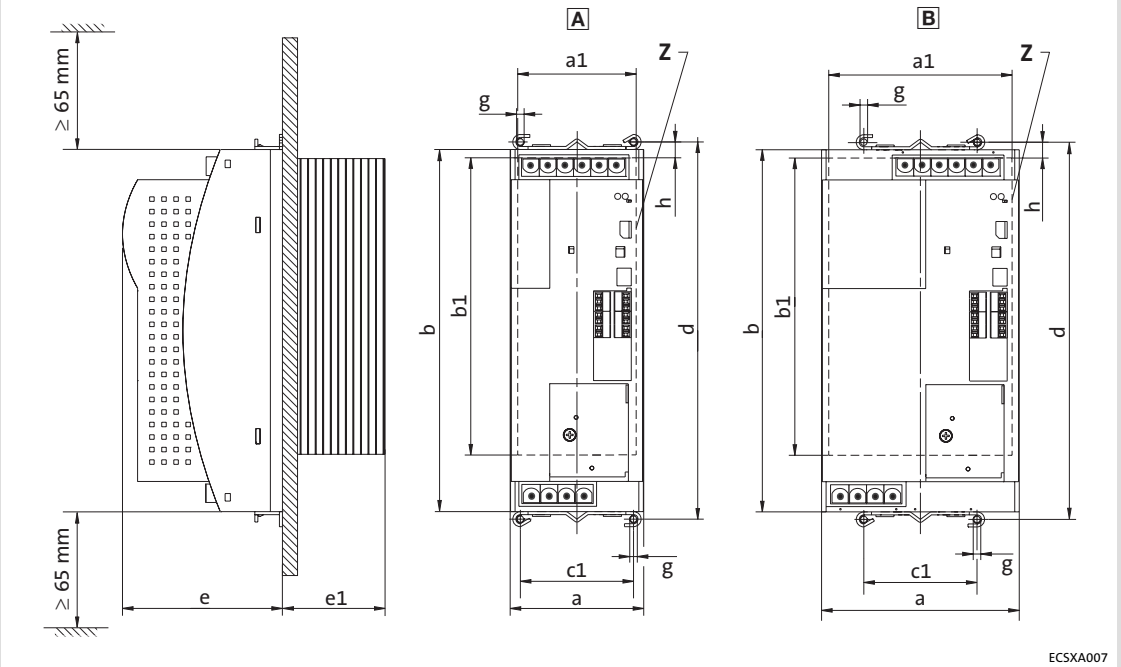


Fig. 4-2 Dimensions for "push-through design"

Z Mounting cutout (a1 x b1), 📖 28

Power supply module		Dimensions [mm]									
Type	Size	a	a1	b	b1	c1	d	e	e1	g	h
ECSDE012	A	88.5	78.5	240	197	75	250	109 145 [1]	67	M5	10.5
ECSDE020	A										
ECSDE040	B	131	121.5								

1) max. 145 mm, depending on the communication module attached

Dimensions of mounting cutout

Note!

Installation with shield mounting ECSZS000X0B:

► Clearance below the mounting cutout > 220 mm

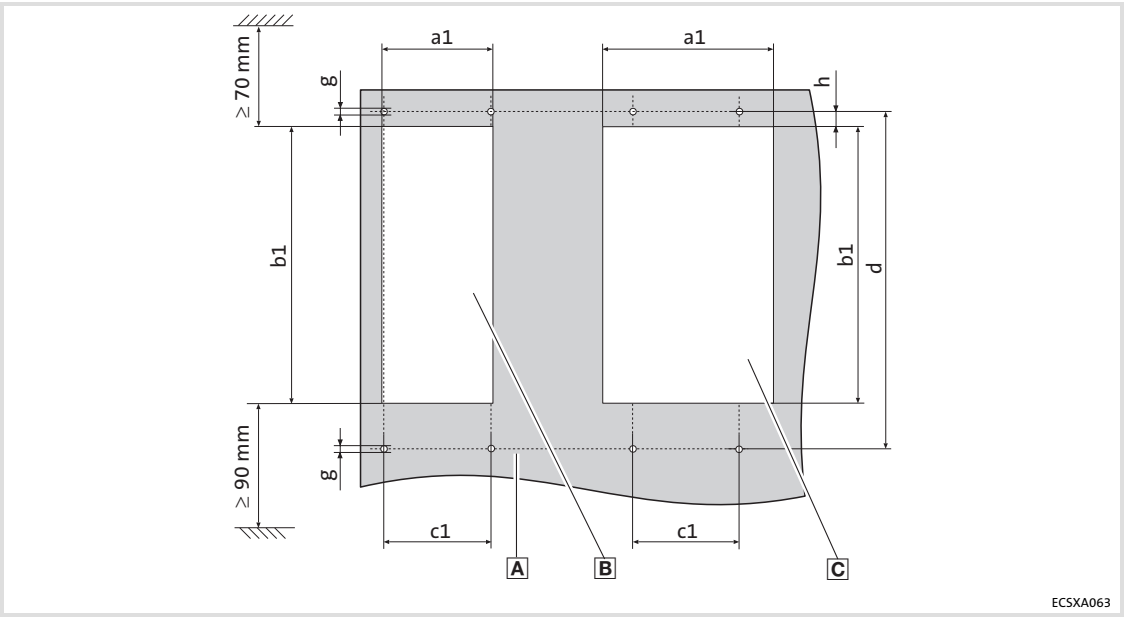


Fig. 4-3 Dimensions of mounting cutout

A Mounting surface
B Mounting cutout for size A
C Mounting cutout for size B

Power supply module		Dimensions [mm]					
Type	Size	a1	b1	c1	d	g	h
ECSDE012	A	78.5	197	75	250	M5	10.5
ECSDE020							
ECSDE040	B	121.5					

4.3.2 Mounting steps

Proceed as follows to mount the power supply module:

1. Prepare the fixing holes for the clamps on the mounting surface.
   – Use the drilling jig for this purpose.
2. Prepare the mounting cutout.
   – The edges of the mounting cutout and the fixing holes for the clamps must be slightly curved inwards (towards the power supply module).
3. Apply liquid thread sealant to the threads of the screws for the wire clamps.
4. Fix the clamps.
5. Push the power supply module into the mounting cutout.
6. Let the power supply module snap into the clamps at the top and at the bottom.

4.4 Mounting in cold-plate design

The ECSCE series power supply modules are intended for mounting in cold plate technique (e.g. on collective coolers).

Requirements for collective coolers

The following requirements must be met to ensure safe and reliable operation of the power supply modules:

- Good thermal contact with the cooler:
  - The contact surface between collective cooler and power supply module must be at least as large as the cooling plate of the power supply module.
  - Smooth contact surface, max. deviation 0.05 mm.
  - Use all prescribed screwed connections to connect the collective cooler to the power supply module.
- Comply with the thermal resistance R_{th} according to the table.
  - The values are valid for operation of the power supply modules under rated conditions.

Power supply module	Power to be dissipated	Heatsink – environment
Type	Ploss [W]	R_{th} [k/W]
ECSCE012	30.0	0.45
ECSCE020	45.0	0.34
ECSCE040	81.0	0.17

- Ambient conditions:
  - The rated data regarding the ambient temperature remain valid for the power supply modules (📖 19 ff.).
  - Temperature of the cooling plate (”cold plate”): max. +85 °C

4.4.1 Dimensions

Note!

Mounting with ECSZS000X0B shield mounting kit:

► Mounting clearance below the module > 195 mm

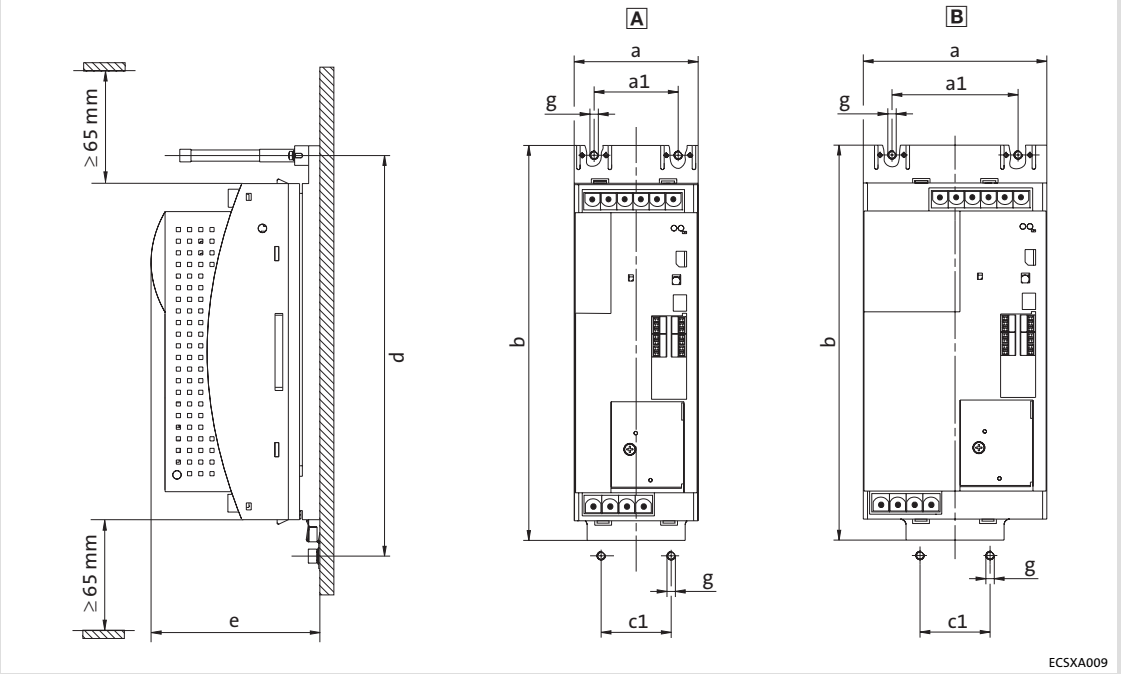


Fig. 4-4 Dimensions for "cold-plate design"

Power supply module		Dimensions [mm]						
Type	Size	a	a1	b	c1	d	e	g
ECSCE012	A	88.5	60	282	50	286	121 157 1)	M6
ECSCE020								
ECSCE040	B	131	90					

1) max. 157 mm, depending on the communication module attached

4.4.2 Mounting steps

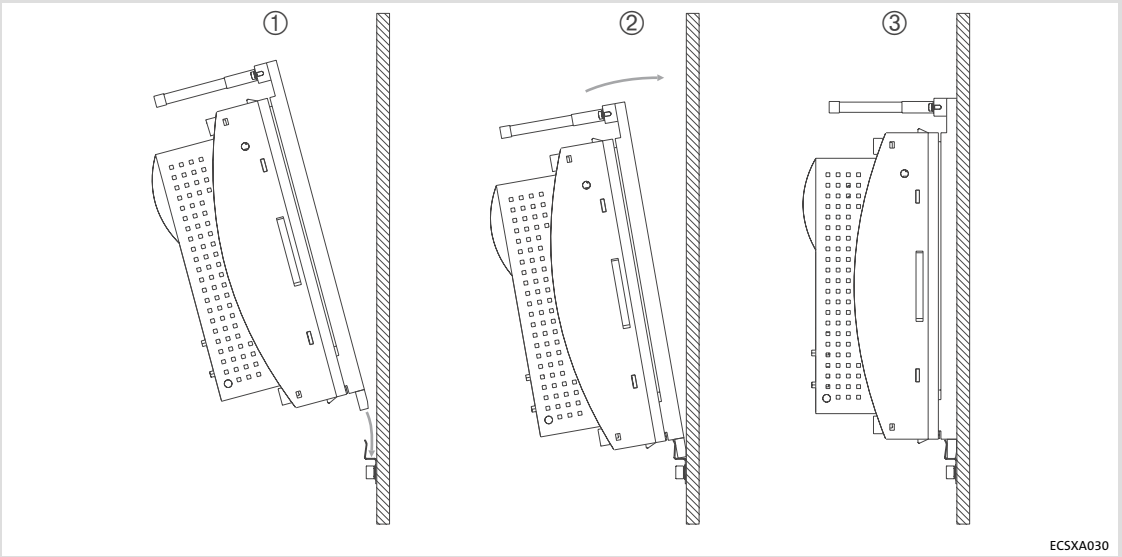


Fig. 4-5 Mounting for "cold-plate design"

Proceed as follows to mount the power supply module:

1. Prepare the fixing holes on the mounting surface.
   – Use the drilling jig for this purpose.
2. Clean and degrease the contact areas of the collective cooler and the power supply module's cooling plate (e.g. with methylated spirit).
3. Screw the support onto the collective cooler.
4. Push the power supply module from above ① into the support ② and tighten both studs with 3.5 ... 4.5 Nm ③.

Note!

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

Tip!

The heat transfer resistance is reduced if - following step 2. -

► a thin layer of heat conducting paste is applied to the contact surface or

► heat conducting foil is used.

5 Electrical installation

5.1 Installation according to EMC (installation of a CE-typical drive system)

General information

- The electromagnetic compatibility of a machine depends on the type of installation and care taken. Especially consider the following:
  - Assembly
  - Filters
  - Shielding
  - Earthing
- For diverging installations, the evaluation of the conformity to the EMC Directive requires a check of the machine or system regarding the EMC limit values. This for instance applies to:
  - Use of unshielded cables
  - Use of collective interference filters instead of the assigned RFI filters
  - Operation 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 requirements concerning noise immunity EN 61000-6-2 are operated close to the axis modules, these devices may be electromagnetically affected by the axis modules.

Assembly

- Connect the power supply modules, capacitor modules (optional), axis modules, RFI filters, and mains chokes to the earthed mounting plate with a surface as large as possible.
  - Mounting plates with conductive surfaces (zinc-coated or stainless steel) allow permanent contact.
  - Painted plates are not suitable for an EMC-compliant installation.
- If you use the ECSxK... capacitor module:
  - Install the capacitor module between the power supply module and the axis module(s).
  - If the total cable length in the DC-bus connection is > 5 m, install the capacitor module as close as possible to the axis module with the greatest power.
- Use of several mounting plates:
  - Connect as much surface of the mounting plates as possible (e.g. with copper bands).
- Ensure the separation of motor cable and signal or mains cables.
- Avoid a common terminal/power strip for the mains input and motor output.
- Lay the cables as close as possible to the reference potential. Freely suspended cables act like aerials.

Filters

Only 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 cables and their lengths.

Shielding

- Connect the motor cable shield to the axis module
  - with the ECSZS000X0B shield mounting kit.
  - to the mounting plate below the axis module with a large surface.
  - Recommendation: For the shield connection, use ground 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 and connect the shields 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 large-surface connection of the shield and the motor housing.
- Shield the control cables:
  - Connect both shield ends of the digital control cables.
  - Connect one shield end of the analog control cables.
  - Always connect the shields to the shield connection at the axis module 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 implemented by using standard, closed, metallic, and earthed control cabinets or boxes.

Earthing

- Earth all metallically conductive components (e. g. 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 cable surface and the contact surface which should be as large as possible.

5.2 Drive system on the mains

This information applies to the ECS drive system, consisting of:

- ECSxE... power supply module
- ECSxK series capacitor module (optional)
- ECSxS/P/M/A series axis module
- Motor
- Accessories
- Wiring

5.2.1 Electrical isolation

The integrated electrical isolation between the power section and the control section is a protective separation (reinforced insulation) acc. to EN 61800-5-1.

To maintain this protective separation, it must be ensured that the external 24 V supply and all components connected to this supply also have a protective separation (SELV/PELV) acc. to EN 61800-5-1.

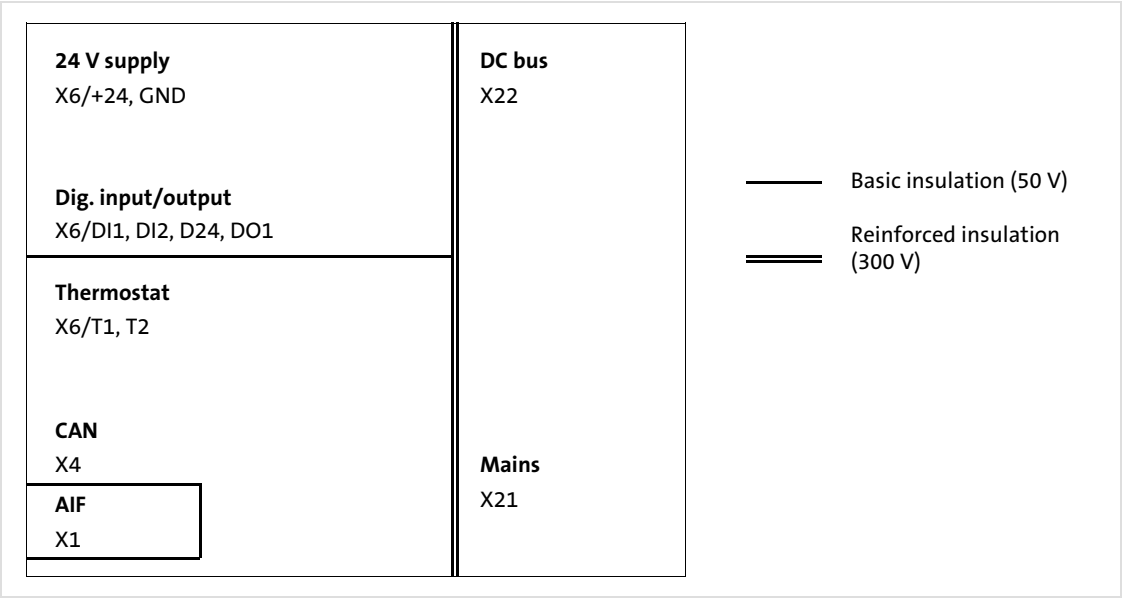


Fig. 5-1 Electrical isolation

5.2.2 Supply forms / electrical supply conditions

Stop!

The power supply module may only be operated on balanced mains supplies. Operation on mains supplies with earthed phase is not permitted.

The ECSxE series power supply modules are provided with an automatic detection of the mains voltage and adapt the brake chopper switch-on voltage.

Please observe the restrictions for the respective supply forms:

Mains	Operation of the power supply modules	Notes
With earthed neutral (TT/TN systems)	No restrictions	Observe the rated data of the power supply modules.
With isolated neutral (IT systems)	The ECSxExxxx**4**I IT variant can be used if the power supply module is protected in the event of an earth fault in the mains supply: ● by suitable equipment detecting the earth fault. ● by disconnecting the power supply module immediately from the mains.	In the event of an earth fault at the output of the power supply module, safe operation cannot be guaranteed.

Note!

► Mains voltage dips can be reduced by decreasing the max. charging current limit (C0022).

► Deactivate the charging current limitation (charge relay) of the connected ECS axis modules with C0175 = 3.

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

The European Standard EN 61000-3-2 determines limit values for limiting harmonic currents in the supply system. Non-linear loads (e.g. frequency inverters) produce harmonic currents which may ”pollute” the supply system and thus have an impact on other consumers.The standard wants to ensure the quality of the public supply system and reduce the mains load.

Note!

The standard only applies to public supply systems. Supply systems which have their own transformer substation as common in industry are not public. The standard does not apply to them.

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

5.3 Power terminals

Danger!

Dangerous voltage

The leakage current to earth (PE) is > 3.5 mA AC or > 10 mA DC.

Possible consequences:

► Death or severe injuries when the device is touched in the event of a fault.

Protective measures:

► Implement the actions required in the EN 61800-5-1. Especially:
– Fixed installation
– PE connection must conform to standards (PE conductor diameter ≥ 10 mm^2 or PE conductor must be connected twice)

Stop!

No device protection if the mains voltage is too high

The mains input is not internally fused.

Possible consequences:

► Destruction of the device if the mains voltage is too high.

Protective measures:

► Observe the maximally permissible mains voltage.

► Fuse the device correctly on the supply side against mains fluctuations and voltage peaks.

► All power connections are plug connections and are coded. The connector set for the ECSZ**E**000X0B power supply modules must be ordered separately.

► Installation of cables acc. to EN 60204-1.

► The cables used must comply with the approvals required for the respective application (e.g. VDE, UL, etc.).

Assignment of the plug connectors

Terminal	Function	Electrical data
X21	**Mains connection**	
X21/L1	Mains phase L1	Dependent on application and type 0 ... 480 V up to 31.3 A (📖 21)
X21/L2	Mains phase L2	
X21/L3	Mains phase L3	
X21/PE	Connection of PE conductor	
X22	**DC-bus voltage connection**	
X22/BR0	Internal brake resistor, connection 1	Dependent on application and type 0 ... 770 V up to 38.5 A (📖 21)
X22/BR1	External brake resistor, connection 1	
X22/+UG	Internal/external brake resistor, connection 2	
X22/+UG	DC-bus voltage supply, plus	
X22/-UG	DC-bus voltage supply, minus	
X22/PE	Connection of PE conductor	

Cable cross-sections and screw-tightening torques

Cable type	Wire end ferrule	Possible cable cross-sections	Tightening torque	Stripping length
Terminal strips X21 and X22				
Rigid	–	0.2 ... 10 mm² (AWG 24 ... 8)	1.2 ... 1.5 Nm (10.6 ... 13.3 lb-in)	5 mm for screw connection 10 mm for spring connection
Flexible	Without wire end ferrule	0.2 ... 10 mm² (AWG 24 ... 8)		
	With insulated wire end ferrule	0.25 ... 6 mm² (AWG 22 ... 10)		
	With insulated TWIN wire end ferrule	0.25 ... 4 mm² (AWG 22 ... 12)		

Shielded cables

The following factors decisively determine the effect of the shielded cables:

- 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 overlap rate of the braid
  - At least 70 ... 80 % with 90° overlap angle

The ECSZS000X0B shield mounting kit includes a wire clamp and shield sheet.

5.3.1 Mains connection

Important notes

- Keep the cables between the RFI filter and the power supply module as short as possible.
  – Make sure that no short-circuit can occur!
- Mains cables and $\pm U_G$ cables must not contact each other.
- When mains cables and $\pm U_G$ cables are laid in parallel:
  – Cable distance: > 150 mm
- Cable length > 30 cm:
  – Shield the cables between the RFI filter and the power supply module to comply with the general EMC Directive.
- With some 24 V switched-mode power supplies, the EMC limit values for the system will only be met if the power supplies are connected to **ECSZZ series** RFI filters. Please contact the manufacturer of the power supply unit on the compliance with EMC limit values for conducted interference.

You must observe ...

the notes in the documentation on the ECSZZ series RFI filter!

Wiring variants for the ECSxE power supply module

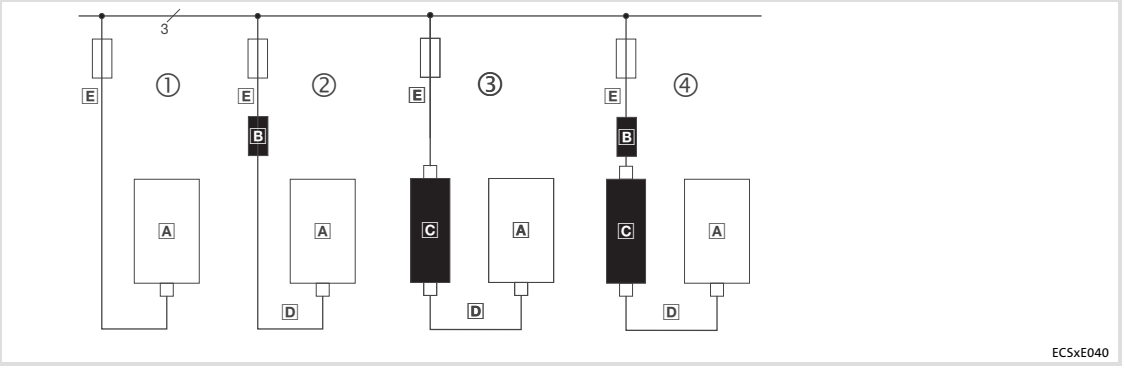


Fig. 5-2 Wiring variants for the ECSxE power supply module

① **Simple wiring**
②/④ **Wiring with mains chokes**
③ **Wiring with RFI filters**
A Power supply module ECSxE
B Mains choke
C RFI filter
D Wiring of components
E Mains cable

Fuses

Use the following circuit-breakers or UL-approved fuses to protect the mains cable:

Power supply module	Dimensioning to VDE		Dimensioning to UL	
	Circuit-breaker	Cable cross-section [mm²]	UL fuse	AWG
ECSxE012	C16 A	2.5	25A	12
ECSxE020	C16 A	2.5	25A	12
ECSxE040				
①: E	C 40 A	10 1)	35 A	8 1)
②/④: D, E	C 32 A	6	35 A	10
③: D	C 40 A	6 2)	35 A	10 2)
③: E	C 40 A	10	35 A	8

1) Cable without wire end ferrule or with pin-end connector
2) Cable length max. 30 cm

Warnings!

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

Replacing defective fuses

Danger!

Hazardous electrical voltage

Components can carry hazardous voltages up to 3 minutes after power-off.

Possible consequences:

- ► Death or severe injuries when touching the device.

Protective measures:

- ► Replace fuses in the deenergised state only.
  - – Set controller inhibit (CINH) for all axis modules in DC-bus operation and disconnect all power supply modules from the mains.

5.3.2 Connection to the DC bus (+U_G, -U_G)

Stop!

- ► The supply of Lenze controllers of the **82xx** and **93xx** series is not permitted.
- ► If synchronous motors with a high centrifugal mass are used, a considerable amount of energy can be fed back into the DC bus. Please take this into account when dimensioning the brake resistor.

- ► If the total cable length is > 20 m, install an axis module or a capacitor module directly at the power supply module.
- ► Design the ±U_G cables twisted and as short as possible. Ensure short-circuit-proof routing!
- ► Cable length (module ↔ module) > 30 cm: install shielded ±U_G cables.

Fuses

Fusing the DC-bus interconnection is not required if power supply modules of the ECS series are used which are fused on the mains side.

Cable cross-sections

Cable length (module/ module)	Wire end ferrule	Cable cross-section	Tightening torque	Stripping length
Up to 20 m	Without wire end ferrule	6 mm² (AWG 10)	1.2 ... 1.5 Nm (10.6 ... 13.3 lb-in)	5 mm for screw connection 10 mm for spring connection
	With insulated wire end ferrule			
> 20 m	Without wire end ferrule	10 mm² (AWG 8)		
	With insulated wire end ferrule **Use pin-end connectors for wiring!**			

5.3.3 Connection plan for mimimum wiring with internal brake resistor

Stop!

Always operate the ECS power supply modules with a brake resistor (internal/external).

The ECS power supply modules in the standard built-in unit and push-through design (ECSEE / ECSDE) are provided with a device-internal brake resistor.

In order to use the internal brake resistor (Rb), carry out the following wiring:

- Bridge between the terminals X22/+UG and X22/BR0 (CR)
  Current flow from +UG via the internal brake resistor (Rb) and the brake transistor to -UG.
- Bridge between the terminals X6/T1 and X6/T2 (CR)
  Deactivate the temperature monitoring of the non-existing external brake resistor.

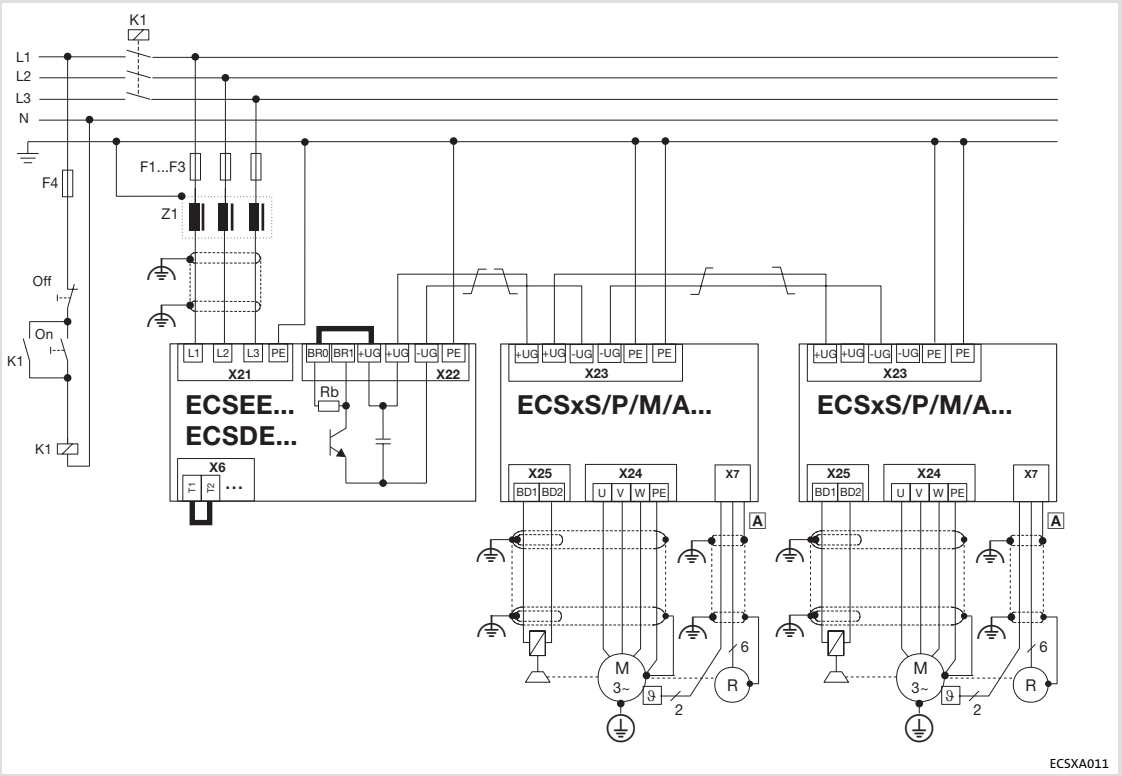


Fig. 5-3 Interconnected power system with internal brake resistor

⏚	HF-shield termination by large surface connection to functional earth (see mounting instructions for shield mounting ECSZS000X0B)
∫	Twisted cables
K1	Mains contactor
F1 ... F4	Fuse
Z1	Mains choke / mains filter, optional
Rb	Internal brake resistor
ϑ	KTY thermal sensor of the motor
A	System cable for feedback–

5.3.4 Connection plan for mimimum wiring with external brake resistor

Stop!

- ► Always operate the ECS power supply modules with a brake resistor.
- ► A parallel wiring of internal and external brake resistor is not permissible!
- ► Implement the thermal contact of the brake resistor into the system monitoring so that the mains supply of the power supply module will be switched off in case the brake resistor will be overheated.
- ► Read the documentation for the external brake resistor. Observe the safety instructions contained therein.

If the power supply module needs a high amount of braking power when it comes as standard built-in unit or in push-through technique design (**ECSEE / ECSDE**), an external and more powerful brake resistor can be connected instead of the internal brake resistor.

A power supply module in cold plate technique design (**ECSCE**) is not provided with an internal brake resistor so that this version always requires an external brake resistor (Rbext).

- ► Connect the brake resistor to X22/BR1 and X22/+UG.
- ► Connect the thermal contact (NC contact) of the external brake resistor to X6/T1 and X6/T2.

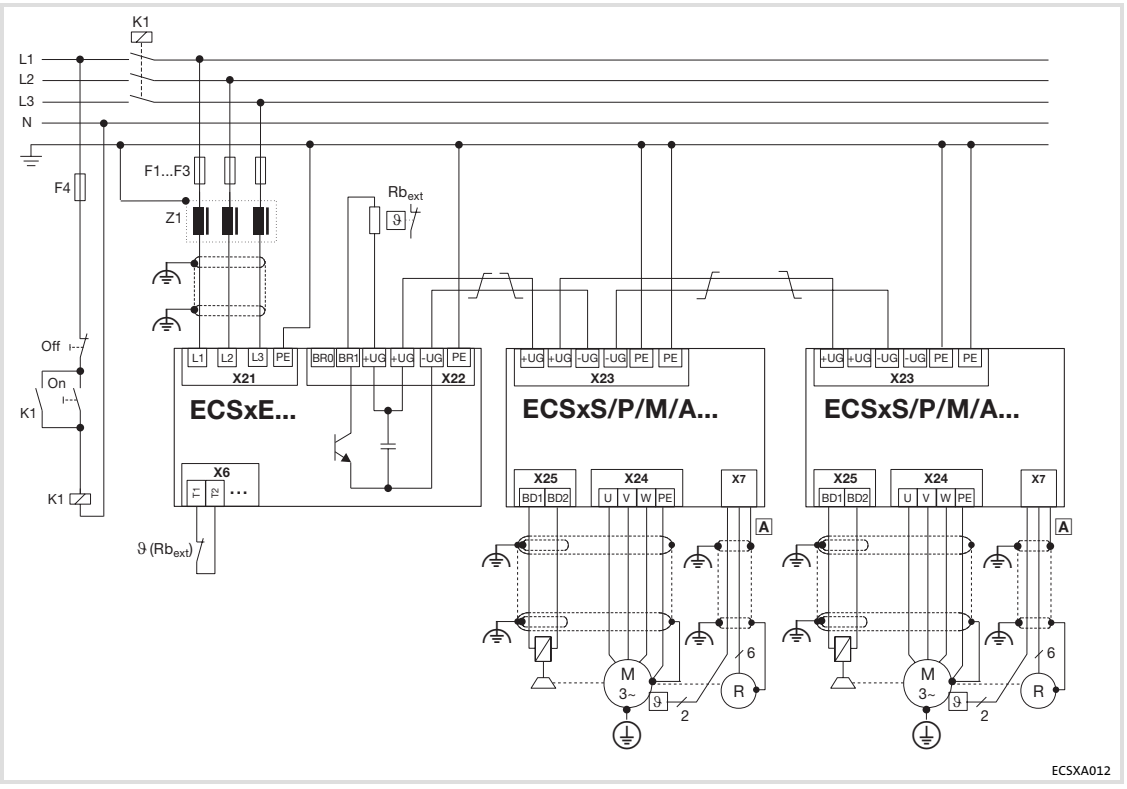


Fig. 5-4 Interconnected power system with external brake resistor

⏚	HF-shield termination by large surface connection to functional earth (see mounting instructions for shield mounting ECSZS000X0B)
∫	Twisted cables
K1	Mains contactor
F1 ... F4	Fuse
Z1	Mains choke / mains filter, optional
Rb_{ext}	External brake resistor
ϑ	KTY thermal sensor of the motor
A	System cable for feedback–

Wiring of external brake resistor ERBM...

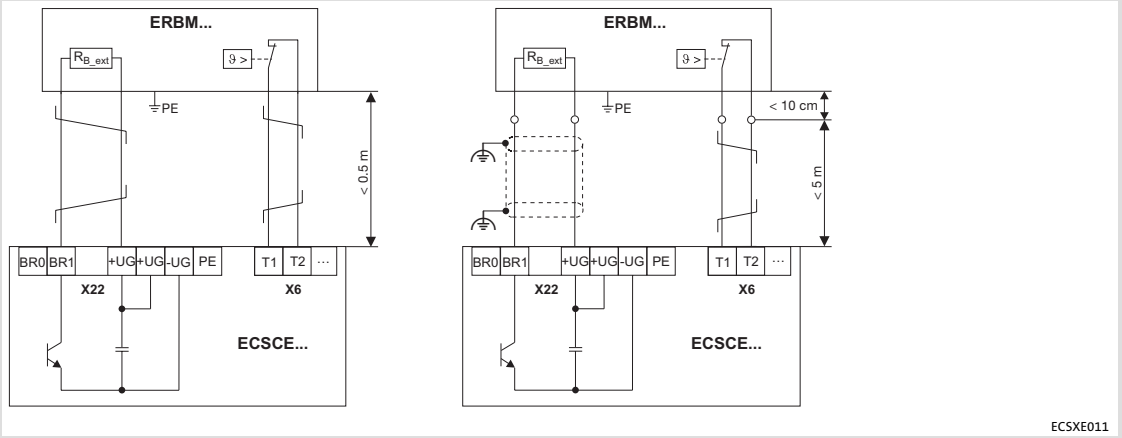


Fig. 5-5 Connection of external brake resistors, ERBM series

⏚	HF-shield termination by large surface PE connection
∫	Twisted cables

Wiring of external brake resistor of ERBS.../ERBD... series

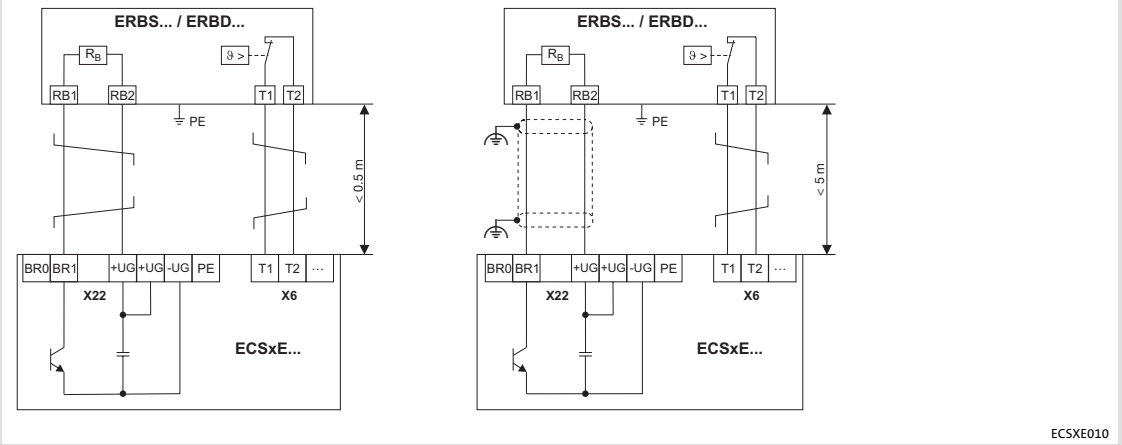


Fig. 5-6 Wiring of external brake resistor, ERBS.../ERBD... series

⏚	HF-shield termination by large surface PE connection
∫	Twisted cables

5.3.5 Connection of an ECSxK... capacitor module (optional)

Observe...
the notes in the detailed documentation of the capacitor module.

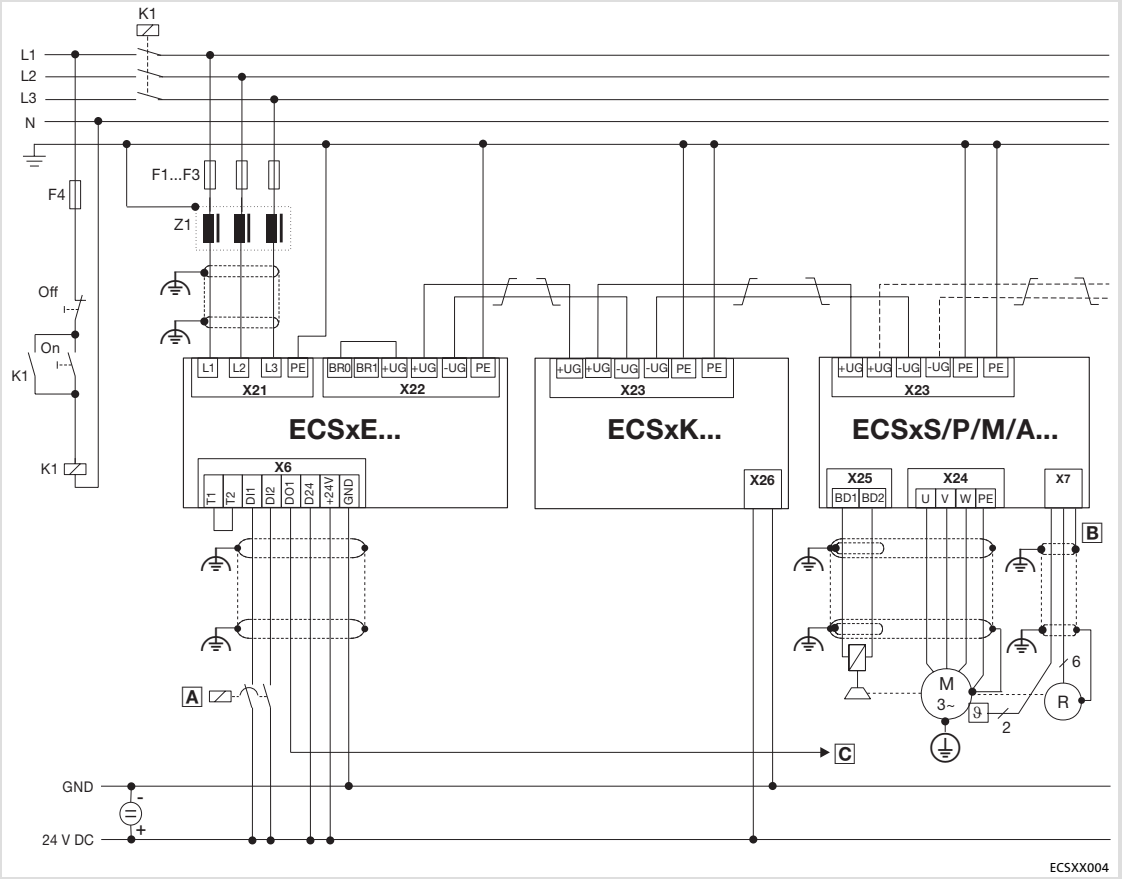


Fig. 5-7 Wiring of capacitor module ECSxK...

- HF-shield termination by large-surface connection to functional earth (see Mounting Instructions for ECSZS000X0B shield mounting kit)
- Twisted cables
- K1 Mains contactor
- F1 ... F4 Fuse
- Z1 Mains choke / mains filter, optional
- A Contactor relay
- B System cable – feedback
- C Terminal X6/SI1 of the connected axis modules (controller enable/inhibit)

5.4 Control terminals

- ► The supply of the control electronics requires an external 24 V DC voltage at terminals X6/+24 and X6/GND.
- ► Connect the thermal detector of an external brake resistor to the terminals X6/T1 and X6/T2. If no external brake resistor is required, jumper terminals X6/T1 and X6/T2.

Stop!

- ► The control cables must always be shielded to prevent interference injections.
- ► The voltage difference between X6/AG, X6/GND and PE of the axis module may maximally amount to 50 V.
- ► The voltage difference can be limited by:
  – overvoltage-limiting components or
  – direct connection of X6/AG and X6/GND to PE.
- ► The wiring has to ensure that for X6/DO1 = 0 (LOW level) the connected axis modules do not draw energy from the DC bus. Otherwise, the power supply module may be damaged.

Shield connection of control cables and signal cables

The plate on the front of the device serves as the mounting place (two threaded holes M4) for the shield connection of the signal cables. The screws used may extend into the inside of the device by up to 10 mm. For optimum contact of the shield connection, use the wire clamps from the ECSZS000X0B shield mounting kit.

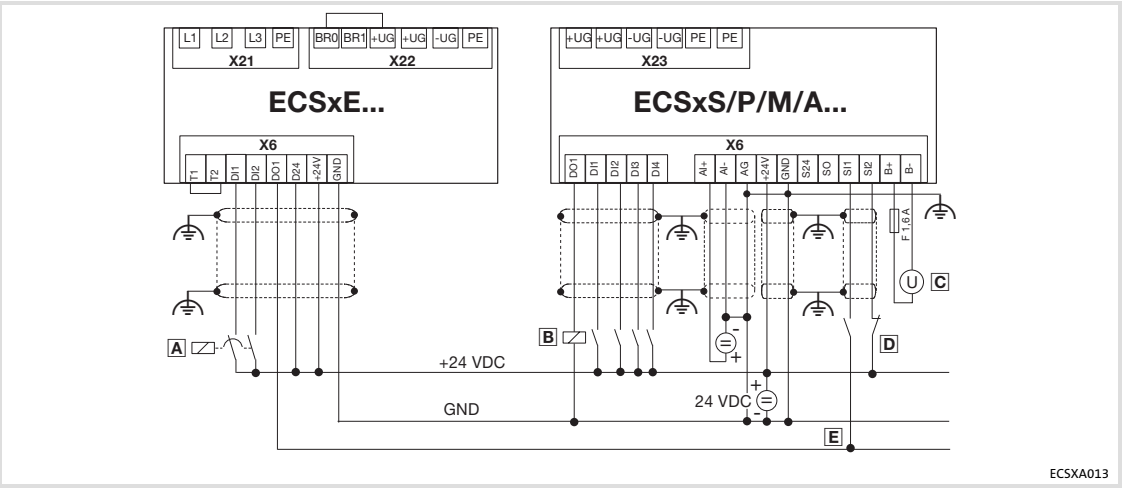


Fig. 5-8 Interconnection: Control signals with internal brake resistor

- ⏚ HF-shield termination by large surface connection to functional earth (see mounting instructions for shield mounting ECSZS000X0B)
- A / B Contactor relay
- C Voltage supply of motor holding brake 23 ... 30 V DC, max. 1.5 A
- D Safe torque off (formerly: "Safe standstill")
- E Controller enable/inhibit

Switch-on sequence for the auxiliary relay

Stop!

Overload of the charging connection in the power supply module

The controller enable for the axes may only take place when the charging process of the DC bus is completed and the power supply module is ready for operation.

Possible consequences:

► Destruction of the power supply module

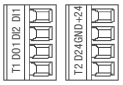
Protective measures:

► Use of switching the central controller enable for the axes via the inputs and outputs DI2 and DO1 of the power supply module (see the following descriptions).

The switch-on sequence of the auxiliary relay [A] (see Fig. 5-8) is as follows:

1. The digital input X6/DI1 (power supply enable) of the power supply module is switched to HIGH by the higher-level control or by the operator.
   – The DC bus is charged.
2. The ready for operation output of the axis module (DO1) now switches the X6/DI2 digital input (central controller enable) of the power supply module via the relay [A].
   – In the default Lenze setting of the ECS axis modules, DO1 is set to ”ready”. ”Ready” is only present if a specified DC-bus voltage has been reached.
3. The central controller enable for the axis module takes place via the X6/DO1 output of the power supply module. The central controller enable DO1 only switches if the charging process of the DC bus is completed AND the X6/DI2 input is set.

Assignment of the plug connectors

Terminal strip X6			
View	**Terminal**	**Function**	**Electrical data**
	X6/+24	Low-voltage supply of control electronics	20 ... 30 V DC, 0.5 A (max. 1 A) for 24 V starting current: max. 2 A for 50 ms
	X6/GND	Reference potential low-voltage supply	
	X6/T1	Thermostat contact 1	
	X6/T2	Thermostat contact 2	
	X6/D24	Low-voltage supply X6/DO1 (digital output 1)	18 ... 30 V DC
	X6/DO1	Digital output 1 (for central controller enable signal to connected axis modules)	24 V DC, 0.7 A (max. 1.4 A) short-circuit-proof
	X6/DI1	Digital input 1 (for power supply enable/charge of the DC bus)	LOW: -3 ... +5 V; -3 ... +1.5 mA HIGH: +15 ... +30 V; +2 ... +15 mA Input current at 24 V DC: 8 mA per input
	X6/DI2	Digital input 2 (for central controller enable signal to connected modules; available at output X6/DO1)	

Cable cross-sections and screw-tightening torques

Cable type	Wire end ferrule	Cable cross-section	Tightening torque	Stripping length
Flexible	Without wire end ferrule	0.08 ... 1.5 mm² (AWG 28 ... 16)	0.22 ... 0.25 Nm (1.95 ... 2.2 lb-in)	5 mm for screw connection
	With insulated wire end ferrule	0.25 ... 0.5 mm² (AWG 22 ... 20)		9 mm for spring connection

We recommend to use control cables with a cable cross-section of 0.25 mm².

5.4.1 Digital inputs and outputs

Stop!

If an inductive load is connected to X6/DO1, a spark suppressor with a limiting function to max. 50 V ± 0 % must be provided.

Power supply enable of the power supply module

- The X6/DI1 input serves to start the controlled charge of the DC bus by the charging thyristor.
- Only when the charging process is completed, which is displayed through the ready for operation message at the X6/DO1 output of the power supply module, the connected axis modules may be enabled. Otherwise, the charging thyristor would be overloaded.

X6/DI2 - central controller enable for the connected axis modules via DO1

- The X6/DI2 input can be used together with the X6/DO1 output as centrally controlled controller enable for all connected axes. The DO1 output only switched if the DC bus has been charged completely without any trouble. This automatically ensures that the axis modules cannot be enabled too early and consume energy from the DC bus too early.
- For this purpose, wire the X6/DO1 output with the X6/SI1 inputs of the axis modules for controller enable.

  If required, one further contact can be connected in series for each axis module to be able to inhibit and enable the individual axis modules during operation.
- In order that the output of the power supply module X6/DO1 is set to ”HIGH”, the following conditions must be met:
  - The power supply module is ready for operation.
  - The DC bus is charged.
  - X6/DI1 = HIGH (the controller enable input of the power supply module is triggered)
  - The X6/DO1 output of the power supply module requires the 24 V supply voltage via terminal X6/D24.

5.5 Automation interface (AIF)

The keypad XT or a communication module can be attached to or removed from the automation interface (X1). This is also possible during operation.

- The keypad XT serves to enter and visualise parameters and codes.
- The communication modules serve to network the power supply modules and axis modules of the ECS servo system with the host system (PLC or PC).

The following combinations are possible:

Operating/communication module	Type/order number	Can be used together with	
		ECSxE	ECSxS/P/M/A
Keypad XT	EMZ9371BC	✓	✓
Diagnosis terminal (keypad XT with hand-held)	E82ZBBXC	✓	✓
LECOM-A (RS232)	EMF2102IB-V004	✓	✓
LECOM-B (RS485)	EMF2102IB-V002	✓	✓
LECOM-A/B (RS232/485)	EMF2102IB-V001	✓	✓
LECOM-LI (optical fibre)	EMF2102IB-V003	✓	✓
LON	EMF2141IB	–	✓
INTERBUS	EMF2113IB	–	✓
PROFIBUS-DP	EMF2133IB	–	✓
CANopen/DeviceNet	EMF2178IB, EMF2179IB	–	✓

Further information ....

on wiring and application of communication modules can be found in the corresponding Mounting Instructions and Communication Manuals.

5.6 Connection of system bus (CAN)

The power supply module has a system bus interface (X4) for the communication. This interface serves to

- connect the axis modules of the ECS series.
- set parameters and display code contents.

System bus (CAN) wiring

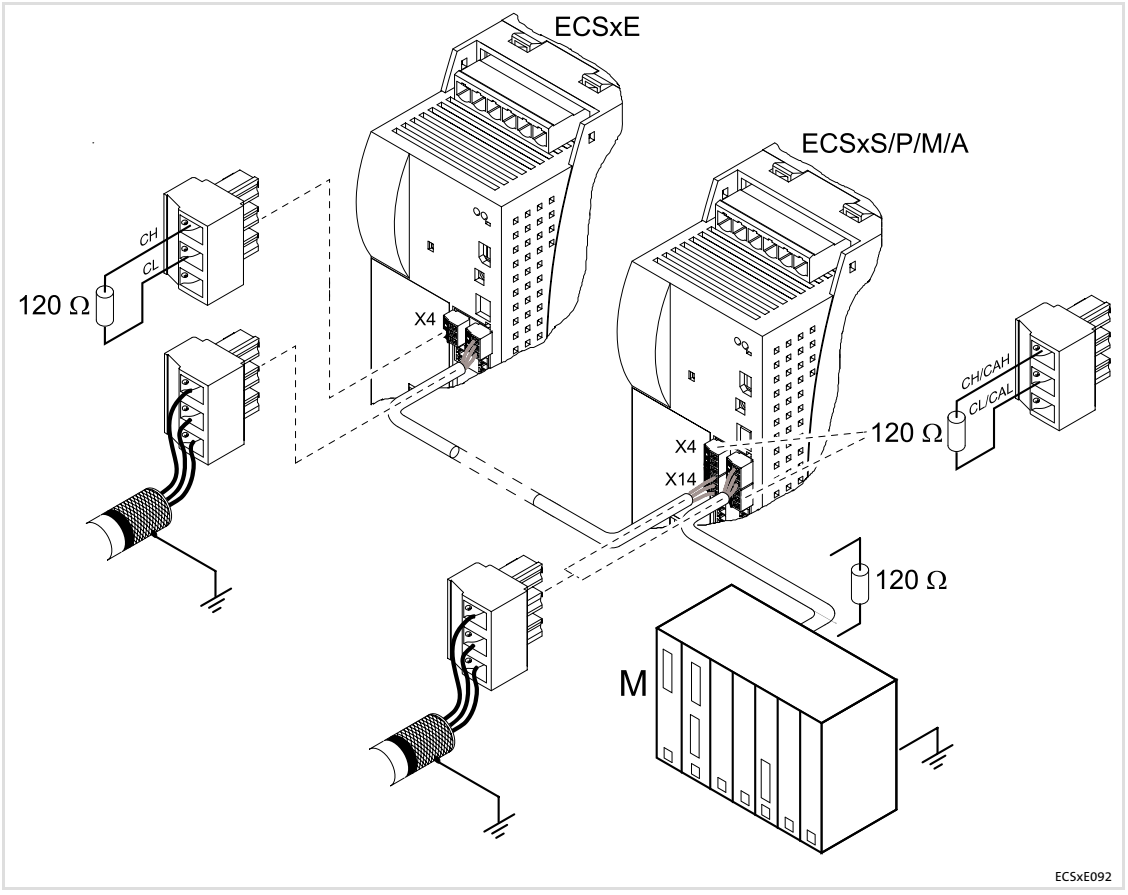


Fig. 5-9 Example of wiring the system bus (CAN)

ECSxE	Power supply module
ECSxS/P/M/A	Axis module
M	Master control, e.g. ETC

Note!

Connect one bus terminating resistor (120 Ω) each to the first and last node of the system bus (CAN).

Assignment of the plug connectors

X4 (CAN)	X14 (CAN-AUX)	Description
CH	CAH	CAN-HIGH
CL	CAL	CAN-LOW
CG	CAG	Reference potential

Specification of the transmission cable

For the use of the transmission cable, follow our recommendations:

Specification of the transmission cable		
Total length	≤ 300 m	≤ 1000 m
Cable type	LIYCY 2 x 2 x 0.5 mm2 (paired with shielding)	CYPIMF 2 x 2 x 0.5 mm^2 (paired with shielding)
Cable resistance	≤ 80 Ω/km	≤ 80 Ω/km
Capacitance per unit length	≤ 130 nF/km	≤ 60 nF/km

Bus cable length

Note!

The permissible cable lengths must be observed.

1. Check the compliance with the total cable length in Tab. 5-1.

The baud rate determines the total cable length.

CAN baud rate [kbit/s]	**Max. bus length** [m]
50	1500
125	630
250	290
500	120
1000	25

Tab. 5-1 Total cable length

2. Check the compliance with the segment cable length in Tab. 5-2.

The segment cable length is determined by the cable cross-section used and the number of nodes. Without a repeater, the segment cable length corresponds to the total cable length.

Number of nodes	**Cable cross-section**			
	0.25 mm^2	**0.5 mm^2**	**0.75 mm^2**	**1.0 mm^2**
2	240 m	430 m	650 m	940 m
5	230 m	420 m	640 m	920 m
10	230 m	410 m	620 m	900 m
20	210 m	390 m	580 m	850 m
32	200 m	360 m	550 m	800 m
63	170 m	310 m	470 m	690 m

Tab. 5-2 Segment cable length

3. Compare the two values detected.

If the value detected from Tab. 5-2 is smaller than the total cable length to be provided from Tab. 5-1 , repeaters must be used. Repeaters divide the total cable length into segments.

Observe...

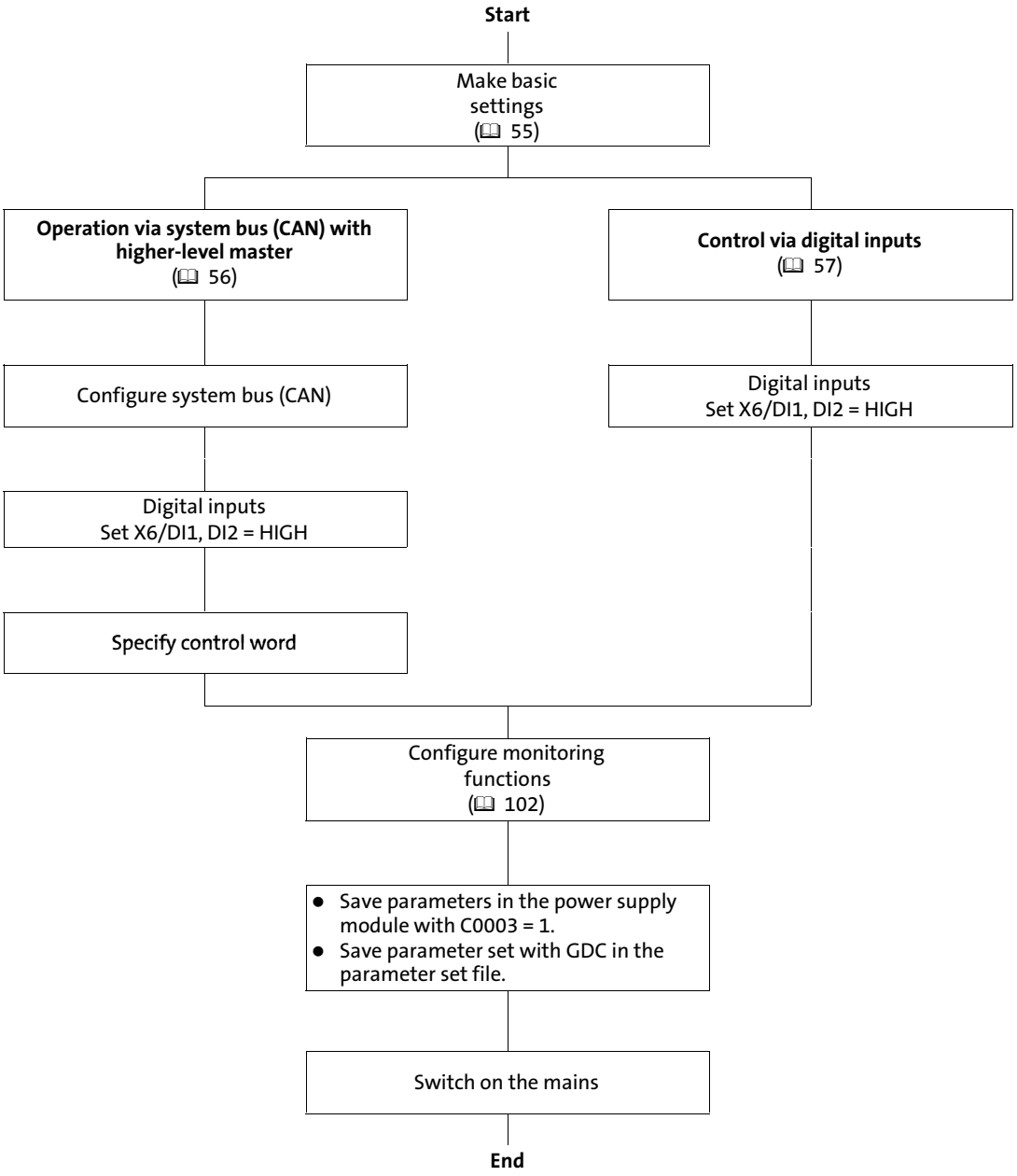
the information on the use of a repeater in the **CAN Communication Manual**.

6 Commissioning

Check before switching on the power supply module for the first time:

- The wiring for completeness, short-circuit, and earth fault
- The power connection:
  - Mains connection via terminals L1, L2, L3 (X21)
  - Connection of the RFI filter / mains choke
  - Connection of the brake resistor (internal/external) via terminals BR0, BR1 (X22)
  - Polarity of the DC bus voltage supply via terminals +UG, -UG (X22)
- The control connection (X6):
  - Connection of the 24 V supply, GND
  - Connection of temperature sensor contact of the external brake resistor or connection of jumper when using the internal brake resistor to terminals T1, T2.
  - Adjustment of wiring to the signal assignment of the control terminals.
- The communication via the system bus (CAN)

6.1 Commissioning steps (overview)



6.1.1 Basic settings with GDC

Note!
Follow the commissioning steps in the given order!

	Setting	Short description		Detailed information
	Requirements	● Mains is switched off. (Green LED is dark, red LED is blinking) ● Power supply module is inhibited. – Control bit 1 (STE_RESET) = 0 – Power supply enable input X6/DI1 = LOW		
1.	Switch on low-voltage supply.			
2.	Keypad XT or Connect PC/laptop (with installed GDC parameter setting program) with the power supply module.	Parameter setting with keypad XT ● Plug the keypad XT into the AIF interface (X1).		📖 68
		Parameter setting with GDC ● Connect PC/laptop to system bus interface (X4) with PC system bus adapter EMF2173IB/EMF2177IB. ● Start GDC and select the device to be set.		📖 66
3.	Set mains voltage.	Setting via C0173 ● Setting of the connected ECS axis modules: – C0173: Set DC bus thresholds according to the mains voltage used. – Set C0175 = 3 (charging current limitation is not active)		📖 58
4.	Set function of the brake resistor.	Setting via C0127 (Brake chopper and/or fast discharge function (short-circuit braking))		📖 59
5.	**Only for operation with external brake resistor:** Deactivate monitoring of the internal brake resistor.	C0579 = 3 (internal brake resistor deactivated)		📖 62
6.	Configure power supply enable input.	● DC bus is charged if X6/DI1 = HIGH ● Set the reaction of the power supply module for X6/DI1 = LOW via C0468.		📖 60
7.	Connect mains voltage.	The detection of the mains voltage takes about 1 seconds. If the mains voltage is within the operating range (📖 106) ● the green LED at the power supply module will be blinking. ● keypad XT displays ”ok”.		
8.	Select operating mode.	C0001 = 0	Operation via system bus (CAN) with higher-level master	📖 56
		C0001 = 1	Control via digital inputs	📖 57

The basic settings are now completed. Please continue with the settings for the operating mode selected.

► Operation via system bus (CAN) with higher-level master: 📖 56.

► Control via digital inputs: 📖 57

6.1.2 Operation via system bus (CAN) with higher-level master

Note!
Follow the commissioning steps in the given order!

	Setting	Short description	Detailed information
	Conditions	● Basic settings completed. ● C0001 = 0	📖 55
1.	Set baud rate.	● Setting via DIP switch (S1) or C0351 ● Lenze setting: 500 kbits/s ● Changes are accepted after – a "Reset Node" (e.g. C0358 = 1, 📖 98). – switching off and on again the low-voltage supply.	📖 90
2.	Set CAN node address at the power supply module and at each axis module.	**Each address can be used only once in the network!** ● Setting via DIP switch (S1) or C0350 ● Lenze setting power supply module: 32 ● Changes are accepted after – a "Reset Node" (e.g. C0358 = 1, 📖 98). – switching off and on again the low-voltage supply.	📖 90
3.	Set identifier for process data communication.	Setting via ● C0353 ● C0354	📖 93
	The master sets the system bus (CAN) to the "Operational" status.		
4.	If necessary, adapt further codes to your application.	● Master/slave operation: C0352 ● Mode for the process data transfer: – C0360 = 1: cyclic (sync-controlled), 📖 82) – C0360 = 0: event-controlled/cyclic without sync (📖 80) ● Boot up time/cycle time for process data transfer: C0356 ● "Node Guarding": C0352, C0382, C0383, C0384	📖 95 📖 96 📖 96 📖 97
5.	Set input X6/DI2 to HIGH.	If the power supply module is ready for operation, output X6/DO1 is set to HIGH.	
6.	Set input X6/DI1 to HIGH.	Charging is enabled.	
7.	Specify control word.	● Reset bit must be set to "0" in the first telegram. ● Transmit control word via CAN word 0. ● Initialise toggle bit or deactivate monitoring.	📖 99 📖 110
8.	Transmit sync telegram (optional).	Sync telegram will only be received by the power supply module if C0360 = 1 (📖 96).	
9.	Specify control word.	● Reset bit (LOW active) must be set to "1" to switch on the power supply module. ● Set controller enable bit to "1" if output X6/DO1 is to be set to HIGH when ready for operation.	📖 99
10.	Transmit sync telegram (optional).	See 8.	

After some seconds the earth-fault test is complete and the DC bus is charged. The power supply module is now ready for operation (status word 1, bit 0 = 1).

6.1.3 Control via digital inputs

Note!
Follow the commissioning steps in the given order!

	Setting	Short description	Detailed information
	Initial state: ● Basic settings completed. ● C0001 = 1		📖 55
1.	Set input X6/DI2 to HIGH.	Output X6/DO1 is set to HIGH when the module is ready for operation.	
2.	Set input X6/DI1 to HIGH.	Charging process is started.	

After some seconds the earth-fault test is complete and the DC bus is charged. The power supply module is now ready for operation (status word 1, bit 0 = 1).

6.2 Setting the mains voltage

The correct mains voltage must be set in the power supply module to ensure correct operation. The Lenze setting is the automatic adaptation of the switching thresholds for the brake chopper operation using the mains voltage measured (C0173 = 4). Optionally, also fixed values can be set.

► C0173 can be found in the GDC parameter menu (📖 67) under **Short setup**.

Stop!

Inhibit the power supply module before setting the mains voltage:

► Control bit 1 (STE_RESET) = 0

► Digital input X6/DI1 = LOW

Parameterisation of the connected axis modules:

► Set the DC bus voltage thresholds of the connected axis modules via axis module code C0173 according to the mains voltage used.

► Parameterise the charge relay function of the connected axis modules with C0175 = 3.

► Please observe the notes given in the detailed documentation on the axis modules!

C0173	Mains voltage selection	
Selection list (Lenze setting printed in bold)		**Information**
0	Operation on 230 V mains	📖 58
1	Operation on 400 V mains	
2	Operation on 460 V mains	
3	Operation on 480 V mains	
4	**Automatic determination**	

Switching thresholds for DC bus voltage and brake resistor

Depending on the mains voltage set in C0173, the following switching thresholds result for the DC bus voltage:

Value in C0173	Mains voltage [V]	DC-bus voltage [V]		
		Brake resistor		OU error (overvoltage threshold)
		On	Off	
0	230	380	370	880
1	400 ... 460	735	720	
2				
3	480	765	750	
4	180 ... 260	380	370	
	261 ... 528	765	750	

6.3 Setting chopper operation and short-circuit braking

The ”short-circuit braking” function serves to rapidly discharge the DC bus via the brake resistor. For this, the brake chopper IGBT is switched on permanently. The low-voltage supply of the power supply module must be ensured for this purpose.

Stop!

Pay attention to the kinetic energy of permanent-magnet synchronous motors during short-circuit braking!

Observe when short-circuit braking is deactivated:

- ► Rapid discharge of the DC bus via the brake resistor is not possible.
- ► For rapid discharge of the DC bus parameterise the charge relay function of the connected ECS axis modules with C0175 = 3.
- ► For the earth-fault test the DC bus is discharged via the brake resistor after switching on the low-voltage supply, independently of the settings.
- ► The discharging time depends on the entire DC bus circuit.

Observe when brake chopper IGBT is switched off:

During operation in generator mode

- ► overvoltage can occur in the DC bus.
- ► energy cannot be discharged from the DC bus.

- ► This function is carried out automatically with most error messages (📖 63) but it can also be requested via the master control system or manually.
- ► As the DC bus must be safely disconnected from the mains for short-circuit braking, the brake chopper IGBT is switched on with a delay of approx. 150 ms after the short-circuit braking request.
- ► The power supply enable input X6/DI1 can be configured in such a way that short-circuit braking is triggered with a LOW level (📖 60).
- ► The control bit 2 (STE_KSB) can be set by the control system when bus control is used (📖 99).
- ► In the case of manual operation (C0001 = 1), the STOP key of the keypad XT can also be configured to short-circuit braking via C0469.

The short-circuit braking function can be activated in the GDC parameter menu (📖 67) under **Short setup** via C0127.

C0127	**Function of integrated brake transistor**	
Activation of brake chopper IGBT/fast discharge function (short-circuit braking)		
Selection list (Lenze setting printed in bold)		**Information**
0	**Brake chopper and short-circuit braking**	📖 59
1	Only short-circuit braking	
2	Only brake chopper	
3	No function	

6.4 Configuring power supply enable input

A HIGH level at the power supply enable input X6/DI1 enables the charging of the DC bus.

Even if the control is carried out via the system bus (CAN), the input must be set to HIGH level to charge the DC bus.

The reaction of the power supply module to a low level or falling edge at X6/DI1 can be set under C0468.

► C0468 can be found in the GDC parameter menu (📖 67) under **Digital I/O**.

C0468	Function of power supply enable (X6/DI1)	
Note: The parameters can only be changed if the controller is inhibited.		
Selection list (Lenze setting printed in bold)		**Information**
0	Mains disconnection (slow discharge)	📖 60
1	**Mains disconnection and TRIP-RESET**	
2	Mains disconnection and fast discharge (short-circuit braking)	
3	Mains disconnection, fast discharge (short-circuit braking), and TRIP-RESET	

Note!

Mains voltage dips can be reduced by decreasing the max. charging current limit (C0022).

► C0022 can be found in the GDC parameter menu (📖 67) under **Short setup**.

C0022	Max. charging current after power supply enable		
Setting range (min. value | unit | max. value)			**Lenze setting**
2.0	A	25.0 ECSxE040: 32.0 (from firmware V4.0)	**16.0 A**

STOP key of the keypad XT

The STOP key only functions if controlled via digital inputs (C0001 = 1).

► The function of the STOP key can be set in the GDC parameter menu (📖 67) under **Keypad configuration** via C0469.

Stop!

Do not change the function of the STOP key if the STOP function has previously been activated by pressing the STOP key. The device cannot be restarted in this case.

C0469	Function of keypad key "STOP" for ECSxE	
Note: The parameters can only be changed if the controller is inhibited.		
Selection list (Lenze setting printed in bold)		**Information**
0	No function	🕮 60
1	**Mains disconnection (slow discharge)**	
2	Fast discharge (short-circuit braking)	

6.5 Operation with external brake resistor

When an external brake resistor is used, monitoring of the internal brake resistor (OC6) must be deactivated with C0579 = 3.

► C0579 can be found in the GDC parameter menu (📖 67) under **Short setup** and **Monitoring**.

Stop!

The device can be destroyed if the monitoring is deactivated while the internal brake resistor is used.

C0579	Response - monitoring of internal brake resistor (OC6)	
Monitoring response of the internal brake resistor (fault message OC6)		
Selection list (Lenze setting printed in bold)		**Information**
0	**TRIP**	📖 108
3	No response	

6.6 After mains switch-on

6.6.1 Detection of the mains parameters

The mains voltage detection will be enabled when the low-voltage supply is switched on.

The following data are continuously recorded:

- Mains voltage amplitude
- Mains phase sequence
- Mains frequency
- Balance of the mains

6.6.2 Monitoring functions

Various monitoring functions (📖 102) protect the drive system against impermissible operating conditions.

If a monitoring function responds,

- the set fault response is triggered to protect the drive and
- the fault message is entered at position 1 in the fault history buffer (C4168/x) (📖 120).

In the fault history buffer (C0168/x), fault messages are saved in codes as 4-digit numbers. The first digit describes the type of fault response. The last three digits correspond to the fault number.

No. of the fault message	Type of response
0xxx	TRIP
1xxx	Message
2xxx	Warning
3xxx	FAIL-QSP (only for ECSxS/P/M/A axis modules)

Example: C0168/1 = 2061

- x061:
  The current fault (subcode 1 of C0168) is a communication error (fault message ”CE0”/no. ”x061”) between the AIF module and the ECS axis module.
- 2xxx:
  The fault response is a warning.

6.6.3 Fault responses

Reaction	⇨ Consequence	Display Keypad XT		
		RDY	IMP	Fail
TRIP / Short-circuit braking TRIP		☐	■	■
TRIP active:	⇨ The charging of the DC bus is stopped. With short-circuit braking TRIP the DC bus is quickly discharged via the brake resistor. ⇨ The drive is coasting (no control). ⇨ The system bus (CAN) indicates to the master that the power supply module is not ready for operation.			
TRIP is reset:	⇨ The power supply module is ready for operation again. ⇨ The charging of the DC bus is continued.			
Message	**Danger!** The drive restarts automatically if the message is removed.	☐	■	■
Message active:	⇨ The charging of the DC bus is stopped. ⇨ The drive is coasting (no control). ⇨ The system bus (CAN) indicates to the master that the power supply module is not ready for operation.			
Message is reset:	⇨ The power supply module is ready for operation again. ⇨ The charging of the DC bus is continued.			
Warning	⇨ The failure is only displayed, the drive continues to run normally.	■	☐	■
Off	**STOP!** The drive can be destroyed due to deactivated monitoring functions.	–	–	–
	⇨ There is no response to the failure.			

☐ = off ■ = on

7 Parameter setting

7.1 General information

- Controllers and power supply modules can be adapted to your application by setting the parameters. A detailed description of the functions can be found in the chapter ”Commissioning” (📖 53).
- The parameters for the functions are stored in numbered codes:
  – The codes are marked in the text with a ”C”.
  – The code list in the appendix (📖 124) provides a quick overview of all codes. The codes are sorted in numerical ascending order, thus serving as a ”reference book”.

Parameter setting with keypad XT or PC/laptop

Detailed information on parameter setting with the keypad XT can be found in the following chapters.

Detailed information ...

on parameter setting with a PC/laptop can be found in the documentation on the parameter setting and operating program ”Global Drive Control” (GDC).

In addition to parameter setting, the keypad XT or the PC/laptop can be used to:

- Control the controller (e. g. inhibiting or enabling)
- Select the setpoints
- Display operating data
- Transfer of parameter sets to other controllers (only with PC/laptop).

Parameter setting with a bus system

Detailed information ...

on parameter setting with a bus system can be found in the documentation on the communication module to be used (📖 143).

7.2 Parameter setting with ”Global Drive Control” (GDC)

With the ”Global Drive Control” (GDC) parameterisation and operating program, Lenze provides a plain, concise and compatible tool for the configuration of your application-specific drive task with the PC or laptop:

- The GDC input assistant offers a comfortable motor selection.
- The menu structure supports the commissioning process by its clear structuring.

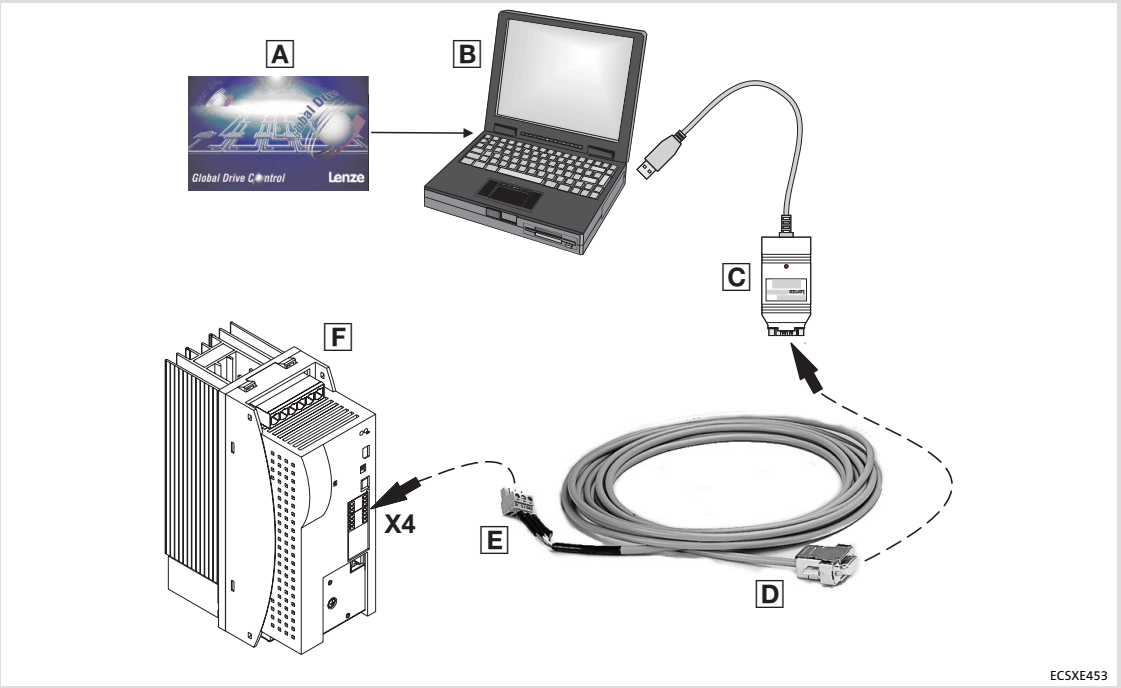


Fig.7-1 Using the GDC

- A Lenze parameter setting program ”Global Drive Control” (GDC)
- B PC or laptop
- C PC system bus adapter (EMF2173IB/EMF2177IB) with connection cable
- D Sub-D plug with 3-pole cable
- E 3-pole plug (CAG – CAL – CAH) from connector set ECSZE000X0B
- F Power supply module ECSxE

More detailed information ...

is given in the documentation on the parameter setting and operating program **Global Drive Control (GDC)**.

GDC parameter menu

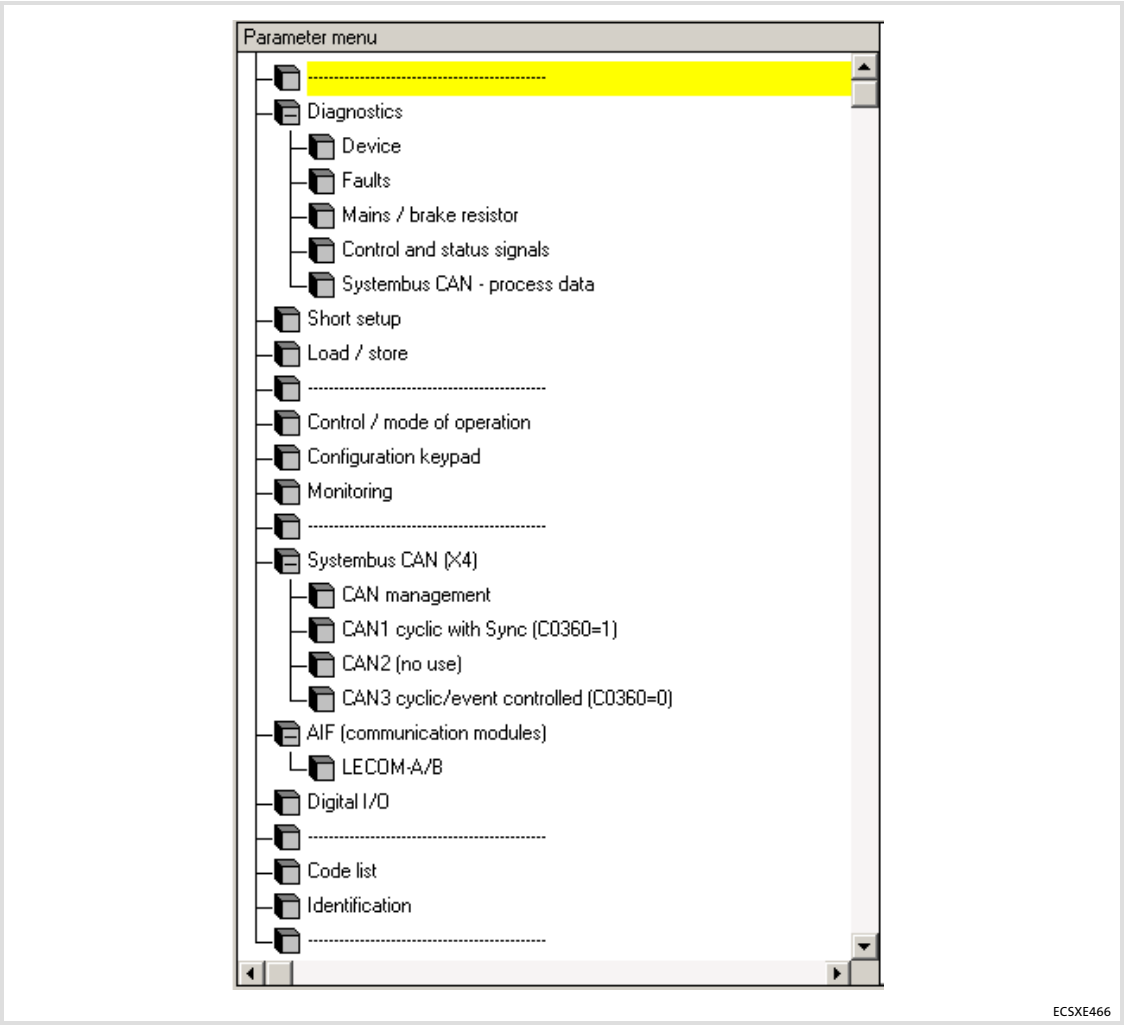


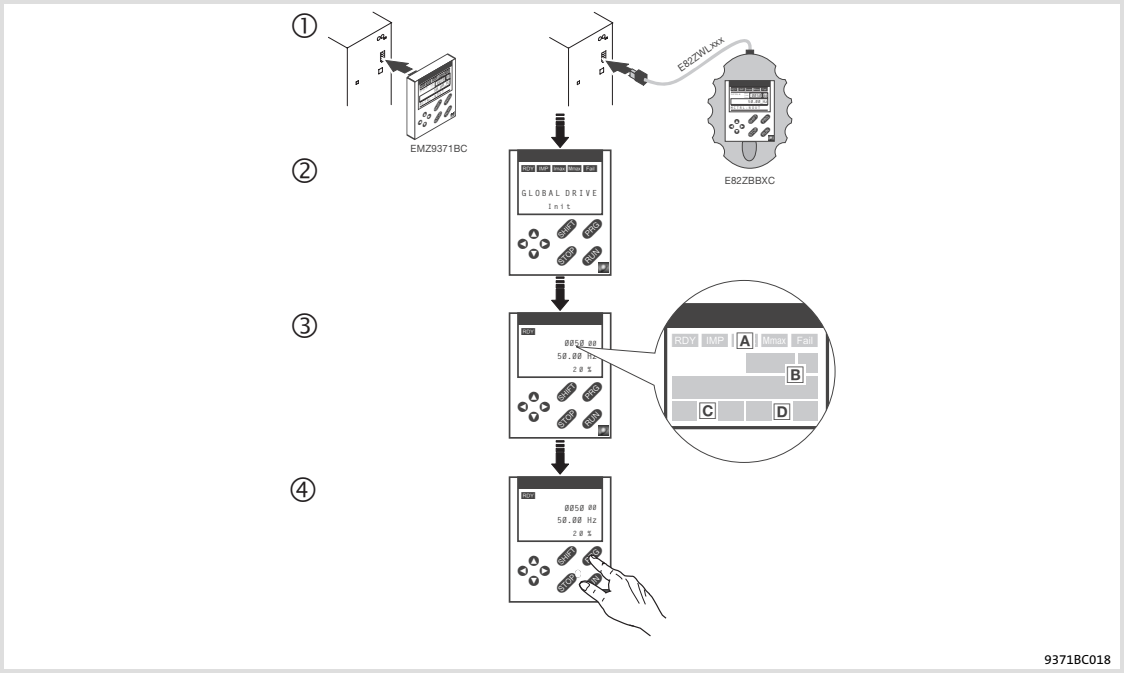
Fig.7-2 GDC parameter menu in case of ECSxE power supply module

By double-clicking the single menu items of the GDC parameter menu the corresponding codes for setting and display of parameters are indicated.

7.3 Parameter setting with the XT EMZ9371BC keypad

The keypad is available as accessories.
A complete description is given in the documentation on the keypad.

7.3.1 Connecting the keypad



① Connect the keypad to the AIF interface (X1) of the axis module/power supply module.
It is possible to connect/disconnect the keypad during operation.
② As soon as the keypad is supplied with voltage, it carries out a short self-test.
③ The operation level indicates when the keypad is ready for operation:
A Current status of the axis module/power supply module
B Code number, subcode number, and current value
C Active fault message or additional status message
D Current value in % of the status display defined under C0004
④ PRG must be pressed to leave the operation level.

7.3.2 Description of the display elements

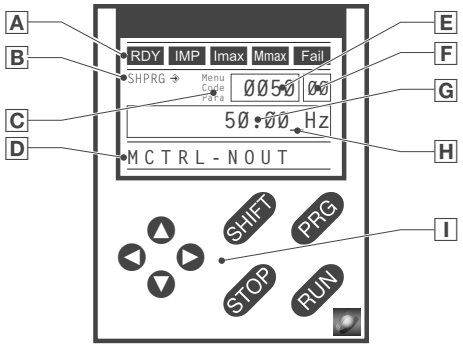


Fig.7-3 Keypad front view

A	**Status displays**		
	Display	**Meaning**	**Explanation**
	RDY	Ready for operation	
	IMP	Pulse inhibit active	Power outputs inhibited
	Imax	Adjusted current limitation is exceeded in motor mode or generator mode	
	Mmax	Speed controller 1 within its limitation	• Drive is torque-controlled • Only active for operation with Lenze devices of the 9300 series!
	Fail	Active fault	
B	**Parameter acceptance**		
	Display	**Meaning**	**Explanation**
	⇢	Parameter is accepted immediately	The device immediately operates with the new parameter value.
	SHPRG ⇢	The parameter must be confirmed with SHIFT PRG	The device operates with the new parameter value after being confirmed.
	SHPRG	When the controller is inhibited, the parameter must be confirmed with SHIFT PRG	The device operates with the new parameter value after the controller has been released again.
	None	Display parameters	Cannot be changed.
C	**Active level**		
	Display	**Meaning**	**Explanation**
	Menu	Active menu level	• Selection of main menu and submenus • No menu for ECSxE power supply module
	Code	Active code level	Selection of codes and subcodes
	Para	Active parameter level	Change of parameters in the codes or subcodes
	None	Active operating level	Display of operating parameters
D	**Short text**		
	Display	**Meaning**	**Explanation**
	Alphanumerical	Contents of the menus, meaning of the codes and parameters	
		Display of C0004 in % and the active fault in the operating level	

E	**Number**		
	Active level	**Meaning**	**Explanation**
	Menu level	Menu number	• Display is only active when operating Lenze devices of the 8200 vector or 8200 motec series. • No menu for ECSxE power supply module
	Code level	Four-digit code number	
F	**Number**		
	Active level	**Meaning**	**Explanation**
	Menu level	Submenu number	• Display is only active when operating Lenze devices of the 8200 vector or 8200 motec series. • No menu for ECSxE power supply module
	Code level	Two-digit subcode number	
G	**Parameter value**		
	Parameter value with unit		
H	**Cursor**		
	The figure over the cursor can be changed directly in the parameter level.		
I	**Function keys**		
	For description see the following table.		

7.3.3 Description of the function keys

Note!

Key combinations with SHIFT:

Press SHIFT and keep it pressed, then press second key in addition.

Key	Function			
	Menu level [1]	**Code level**	**Parameter level**	**Operating level**
PRG		Change to parameter level	Change to operating level	Change to code level
SHIFT PRG	Load predefined configurations in the menu "Short setup" [2]		Accept parameters when SHPRG ⇢ or SHPRG is displayed	
▲ ▼	Change between menu items	Change code number	Change figure over cursor	
SHIFT ▲ SHIFT ▼	Quick change between menu items	Quick change of code number	Quick change of figure over cursor	
▶ ◀	Change between main menu, submenus and code level		Cursor to the right Cursor to the left	
RUN	Cancel function of STOP key, the LED in the key goes out.			
STOP	Inhibit the controller, LED in the key lights up.			
	Reset fault (TRIP reset): 1. Remove cause of malfunction 2. Press STOP 3. Press RUN			

1) No menu for ECSxE power supply module
2) Only active when operating Lenze devices of the 8200 vector or 8200 motec series.

7.3.4 Changing and saving parameters

All parameters for the axis module/power supply module parameterisation or monitoring are stored in codes. The codes are numbered and marked with a ”C” in the documentation. Some codes store the parameters in numbered ”subcodes” to provide a clear structure for parameter setting (e.g. C0517 user menu).

Stop!

Your settings have an effect on the current parameters in the main memory. You must store your settings as a parameter set to prevent that they will get lost when switching the mains!

Step			Keys	Action
1.	Select menu		▲ ▼ ▶ ◀	Select the desired menu with arrow keys.
2.	Change to code level		▶	Display of first code in the menu
3.	Select code or subcode		▼ ▲	Display of the current parameter value
4.	Change to parameter level		PRG	
5.	If SHPRG is displayed, inhibit controller		STOP	The drive is coasting.
6.	Change parameter			
		A	▶ ◀	Move cursor under the digit to be changed
		B	▼ ▲	Change digit
			SHIFT ▼ SHIFT ▲	Change digit quickly
7.	Accept changed parameter			
	Display SHPRG or SHPRG →		SHIFT PRG	Confirm change to accept parameter Display ”OK”
	Display →		-	The parameter was accepted immediately.
8.	If necessary, enable controller		RUN	The drive should be running again.
9.	Change to code level			
		A	PRG	Display of operating level
		B	PRG	Display of the code with changed parameters
10.	Change further parameters			Restart the ”loop” at step 1. or step 3.
11.	Save changed parameters			
		A	▲ ▼ ▶ ◀	Select Code C0003 ”PAR SAVE” in the menu ”Load/Store”
		B	PRG	Change to parameter level Display ”0” and ”Ready”
	Select parameter set in which the parameters are to be saved permanently	C	▶	Save as parameter set 1: ⇨ set ”1” ”Save PS1”
		D	SHIFT PRG	When ”OK” is displayed, the settings are permanently saved.
12.	Change to code level			
		A	PRG	Display of operating level
		B	PRG	Display C0003 ”PAR SAVE”

8 Configuration

The drive system can be adapted to your application by configuring the power supply module. These interfaces can be used to configure the power supply module:

- X1 – AIF (automation interface)
  - For the connection of the keypad XT or communication modules (📖 143) which serves to access the codes.
- X4 – System bus interface (CAN)
  - PC interface/HMI for parameter setting and diagnostics (e.g. with the Lenze parameter setting and operating program "Global Drive Control")
    or
  - Interface to a decentralised I/O system

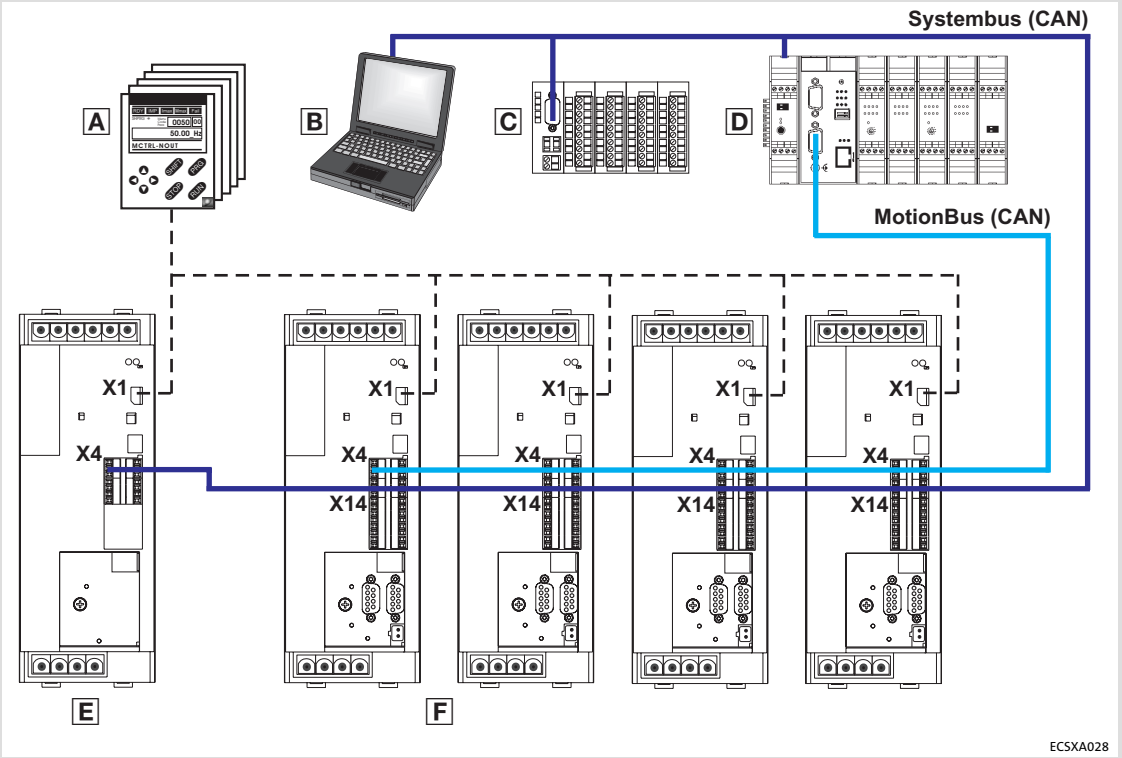


Fig. 8-1 Example: Wiring of the MotionBus (CAN) and system bus (CAN)

- A Keypad XT or another communication module
- B PC/laptop or HMI
- C Decentralised I/O system
- D Higher-level host system / MotionBus control
- E ECSxE... power supply module
- F ECSxS/P/M/A... axis module

8.1 General information about the system bus (CAN)

Note!

The information on this chapter will be part of the "CAN Communication Manual" at a later date.

All Lenze drive and automation systems are equipped with an integrated system bus interface for the networking of control components on field level.

Via the system bus interface, for instance process data and parameter values can be exchanged between the nodes. In addition, the interface enables the connection of further modules such as distributed terminals, operator and input devices or external controls and host systems.

The system bus interface transmits CAN objects following the CANopen communication profile (CiA DS301, version 4.01) developed by the umbrella organisation of **CiA** (**C**AN **i**n **A**utomation) in conformity with the **CAL** (**C**AN **A**pplication **L**ayer).

Tip!

For further information visit the homepage of the CAN user organisation CiA (CAN in Automation): www.can-cia.org.

8.1.1 Structure of the CAN data telegram

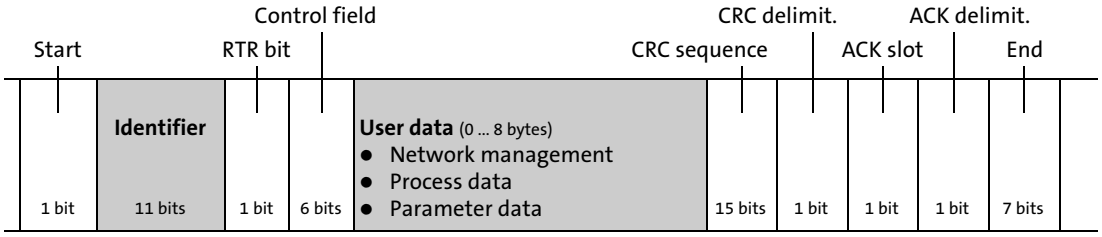


Fig. 8-2 Basic structure of the CAN telegram

Identifier

The identifier determines the priority of the message. Moreover, the following is coded:

- The CAN node address (device address in the CAN network) of the node which is to receive the CAN telegram.
  See also chapter "Addressing of the parameter and process data objects" (📖 88).
- The type of user data to be transferred

User data

The user data area of the CAN telegram either contains network management data, process data or parameter data:

User data	Description
Network management data (NMT data)	The information serves to establish communication via the CAN network
Process data (PDO, Process Data Objects)	● Process data are transmitted via the process data channel. ● The process data serve to control the controller. ● Process data can be accessed directly by the higher-level host system. The data are, for instance, stored directly in the I/O area of the PLC. It is necessary that the data can be exchanged between the host system and the controller within the shortest time possible. In this connection, small amounts of data can be transferred cyclically. ● Process data are transmitted between the higher-level host system and the controllers to ensure a permanent exchange of current input and output data. ● Process data are not stored in the controller. ● Process data are, for instance, setpoints and actual values.
Parameter data (SDO, Service Data Objects)	● Parameter data are transferred via the parameter data channel and acknowledged by the receiver, i.e. the receiver gets a feedback whether the transmission was successful. ● Parameter data of Lenze devices are called codes. ● The parameter data channel enables access to all Lenze codes and all CANopen indexes. ● Parameters are set, for instance, for the initial commissioning of a plant or when material of a production machine is exchanged. ● Usually the transfer of parameters is not time-critical. ● Parameter changes are stored in the controller. ● Parameter data are, for instance, operating parameters, diagnostic information and motor data.

Tip!

The other signals refer to the transfer features of the CAN telegram that are not described in these instructions.

For further information visit the homepage of the CAN user organisation CiA (CAN in Automation): www.can-cia.org.

8.1.2 Communication phases of the CAN network (NMT)

With regard to communication the controller knows the following states:

Status	Explanation
"Initialisation" (Initialisation)	After the controller is switched on, the initialisation process starts. During this phase the controller is not involved in the data exchange on the bus. Furthermore, a part of the initialisation or the entire initialisation process can be executed in each NMT status by transmitting different telegrams (see "state transitions"). All parameters will be written with their set values. After the initialisation is completed, the controller is in the "Pre-Operational" status.
"Pre-operational" (before ready for operation)	The controller can receive parameter data. The process data is ignored.
"Operational" (Ready for operation)	The controller can receive parameter data and process data.
"Stopped"	Only network management telegrams can be received.

State transitions

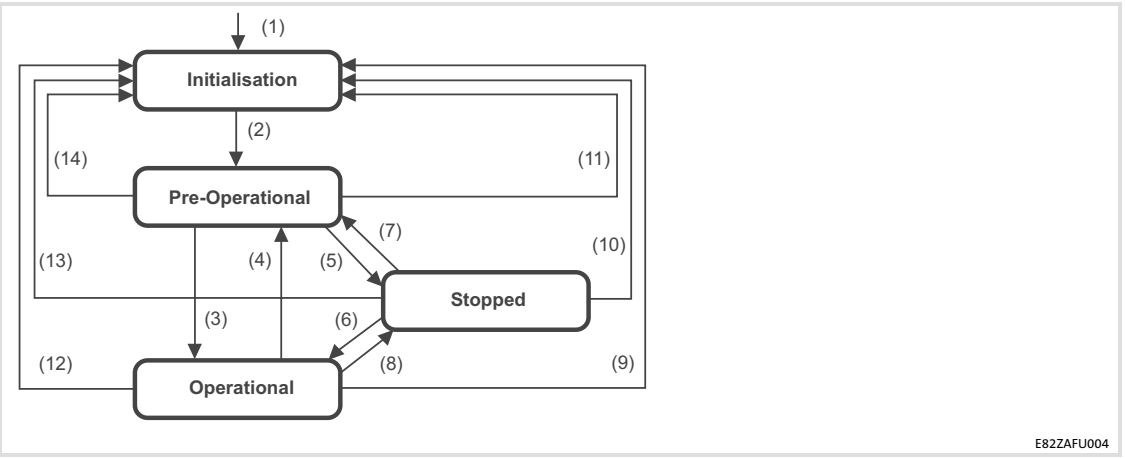


Fig. 8-3 State transitions in the CAN network (NMT)

State transition	Command (hex)	Network status after change	Effect on process or parameter data after state change
(1)	-	Initialisation	When the mains is switched on, the initialisation is started automatically. During the initialisation the controller is not involved in the data exchange. After the initialisation is completed, the node changes automatically to the "Pre-Operational" status.
(2)	-	Pre-operational	In this phase the master decides how the controllers take part in the communication.
From here, the states are changed over by the master for the entire network. A target address included in the command specifies the receiver/s.			
(3), (6)	01 xx	Operational	Network management telegrams, sync, emergency, process data (PDO) and parameter data (SDO) are active (corresponds to "Start Remote Node") Optional: In case of change, event-controlled and time-controlled process data (PDO) are sent once.
(4), (7)	80 xx	Pre-operational	Network management telegrams, sync, emergency, and parameter data (SDO) are active (corresponds to "Enter Pre-Operational State")
(5), (8)	02 xx	Stopped	Only network management telegrams can be received.
(9)	81 xx	Initialisation	Initialisation of all parameters in the communication module with the values stored (corresponds to "Reset Node")
(10)			
(11)			
(12)	82 xx		Initialisation of communication-relevant parameters (CiA DS 301) in the communication module with the values stored (corresponds to "Reset Communication")
(13)			
(14)			

xx = 00_{hex} With this assignment, all devices connected are addressed by the telegram. The state can be changed for all devices at the same time.

xx = node ID If a node address is specified, only the state of the addressed device will be changed.

Network management (NMT)

The telegram structure used for the network management contains the identifier and the command included in the user data which consists of the command byte and the node address.

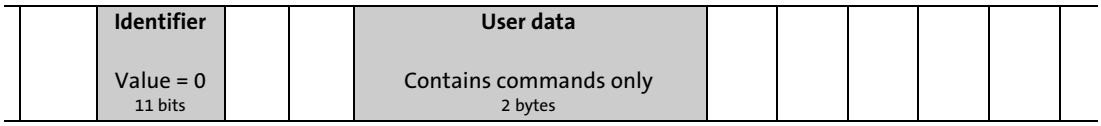


Fig. 8-4 Telegram for switching over the communication phases

The communication phases are changed over by a node, the network master, for the entire network. The change-over can also be done by a controller.

With a certain delay after mains connection, a telegram is sent once which changes the status of the entire drive system to ”Operational”. The delay time can be set via the following codes:

Interface		Code
X1	Automation interface (AIF)	C2356/4
X4	ECSxS/P/M: MotionBus (CAN) ECSxA/E: System bus (CAN)	C0356/4
X14	System bus (CAN) ● Interface is not available for ECSxE.	C2456/4

Note!

Communication via process data only is possible with a state change to “operational”!

Example:
For changing the state of all nodes on the bus from ”pre-operational” to “operational” via the CAN master, the following identifier and user data must be set in the telegram:

► Identifier: 00 (broadcast telegram)

► User data: 0100 (hex)

8.1.3 Process data transfer

Definitions

- Process data telegrams between host and drive are distinguished as follows:
  - Process data telegrams **to** the drive
  - Process data telegrams **from** the drive
- The CANopen process data objects are designated as seen from the node's view:
  - RPDOx: process data object received by a node
  - TPDOx: process data object sent by a node

8.1.3.1 Available process data objects

The following process data objects (PDOs) are available for the ECS modules via the interfaces X1, X4 and X14:

Interface	PDOs RPDO: to ECS module TPDO: from ECS module		in ECS module				
			ECSxE	ECSxS	ECSxP	ECSxM	ECSxA
X1 Automation interface (AIF)	RPDO	XCAN1_IN	–	✓	–	–	✓
		XCAN2_IN	–	✓	–	–	✓
		XCAN3_IN	–	✓	–	–	✓
	TPDO	XCAN1_OUT	–	✓	–	–	✓
		XCAN2_OUT	–	✓	–	–	✓
		XCAN3_OUT	–	✓	–	–	✓
X4 ECSxS/P/M: MotionBus (CAN) ECSxA/E: System bus (CAN)	RPDO	CAN1_IN	✓	✓	✓	✓	✓
		CAN2_IN	–	✓	✓	–	✓
		CAN3_IN	✓	✓	✓	–	✓
	TPDO	CAN1_OUT	✓	✓	✓	✓	✓
		CAN2_OUT	–	✓	✓	–	✓
		CAN3_OUT	✓	✓	✓	–	✓
X14 System bus (CAN) Interface is not available for ECSxE.	RPDO	CANaux1_IN	–	–	✓	–	✓
		CANaux2_IN	–	–	✓	–	✓
		CANaux3_IN	–	–	–	–	✓
	TPDO	CANaux1_OUT	–	–	✓	–	✓
		CANaux2_OUT	–	–	✓	–	✓
		CANaux3_OUT	–	–	–	–	✓

Note!

In case of the ECSxE power supply module, the PDOs CAN1_IN/OUT and CAN3_IN/OUT cannot be used simultaneously. The PDOs to be used are selected via C0360.

8.1.3.2 Structure of the process data

The process data telegrams have a maximum user data length of eight bytes each.

Process data input telegram (RPDO)

- The process data input telegram transmits control information to the controller.
- The eight bytes of user data can be freely assigned.

	Identifier 11 bits			User data (8 bytes)							
				00_{hex}	00_{hex}	00_{hex}	00_{hex}	00_{hex}	00_{hex}	00_{hex}	00_{hex}

Fig. 8-5 Structure of process data input telegram (RPDO)

Process data output telegram (TPDO)

- The process data output telegram reports status information from the controller. Status information can be as follows:
  - Current status of the controller
  - Status of the digital inputs
  - States about internal analog values
  - Fault/error messages

  This information enables the higher-level control to respond accordingly.
- The eight bytes of user data can be freely assigned.

	Identifier 11 bits			User data (8 bytes)							
				00_{hex}	00_{hex}	00_{hex}	00_{hex}	00_{hex}	00_{hex}	00_{hex}	00_{hex}

Fig. 8-6 Structure of process data output telegram (TPDO)

8.1.3.3 Transfer of the process data objects

Process data objects		Data transmission	
		ECSxE	ECSxS/P/M/A
RPDOs (to ECS module)	XCAN1_IN	–	cyclic (sync-controlled)
	CAN1_IN	cyclic (sync-controlled)	
	CANaux1_IN	–	
	XCAN2_IN	–	event-controlled/cyclic without sync
	CAN2_IN	–	
	CANaux2_IN	–	
	XCAN3_IN	–	event-controlled/cyclic without sync
	CAN3_IN	event-controlled/cyclic without sync	
	CANaux3_IN	–	
TPDOs (from ECS module)	XCAN1_OUT	–	cyclic (sync-controlled)
	CAN1_OUT	cyclic (sync-controlled)	
	CANaux1_OUT	–	
	XCAN2_OUT	–	event-controlled/cyclic without sync
	CAN2_OUT	–	
	CANaux2_OUT	–	
	XCAN3_OUT	–	event-controlled/cyclic without sync
	CAN3_OUT	event-controlled/cyclic without sync	
	CANaux3_OUT	–	

- Cyclic data transmission with sync telegram (📖 81)
  (via XCAN1, CAN1, CANaux1)
  The sync telegram enables the controller to accept the process data from the master (RPDOs) or send it to the master (TPDOs).
- Event-controlled data transmission (📖 82)
  (via XCAN2/3, CAN2/3, CANaux2/3)
  The data will be transmitted if a value changes in the corresponding output object.
- Cyclic data transmission without sync telegram
  (via XCAN2/3, CAN2/3, CANaux2/3)
  The data is transmitted in fixed times. The cycle time can be set via the following codes:

Interface		Code
X1	Automation interface (AIF)	C2356
X4	ECSxS/P/M: MotionBus (CAN) ECSxA/E: System bus (CAN)	C0356
X14	System bus (CAN) ● Interface is not available for ECSxE.	C2456

  – Setting of cycle time > 0: data transmission with fixed cycle time
  – Setting of cycle time = 0: event-controlled data transmission

8.1.3.4 Cyclic process data objects

Cyclic process data objects are determined for a higher-level host system.

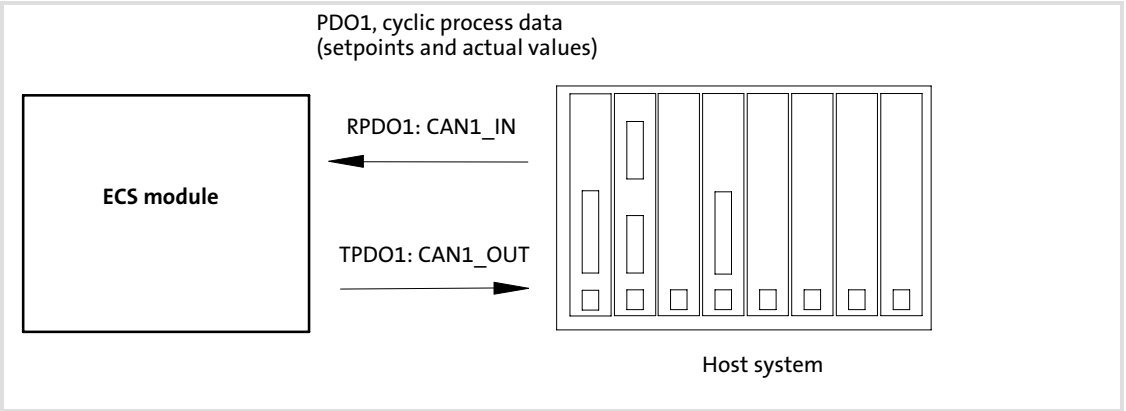


Fig. 8-7 Example: Process data transfer via CAN1_IN and CAN1_OUT

For a quick exchange of process data from or to the master, one process data object is available for input signals (RPDO1) and one process data object for output signals (TPDO1) with eight bytes of user data each.

Synchronisation of PDOs with sync-controlled transmission

In order that the cyclic process data can be read by the controller or the controller accepts the process data, a special telegram, the CAN sync telegram, is used in addition.

The CAN sync telegram is the trigger point for sending process data of the controller to the master and transferring process data from the master to the controller.

A sync-controlled process data processing requires a corresponding generation of the CAN sync telegram.

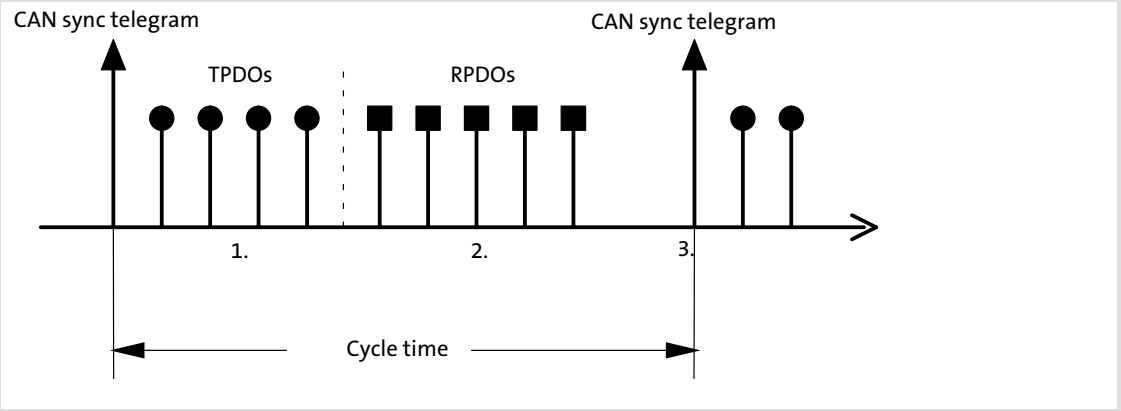


Fig. 8-8 Sync telegram

1. After the CAN sync telegram has been received, the synchronous process data from the controllers are sent to the master (TPDOs). They are read as process input data in the master.
2. When the transmission process is completed, the process output data (of the master) are received by the controllers (RPDOs).

   All other telegrams (e.g. parameters or event-controlled process data) are accepted acyclically by the controllers after transmission is completed. The acyclic data are not displayed in the above graphics. They must be considered when the cycle time is dimensioned.
3. The data in the controller is accepted with the next CAN sync telegram.

Tip!

The response to a CAN sync telegram is determined by the transmission type selected.

8.1.3.5 Event-controlled process data objects

The event-controlled process data objects are particularly suitable for the data exchange between controllers and for distributed terminal extensions. They can, however, also be used by a host system.

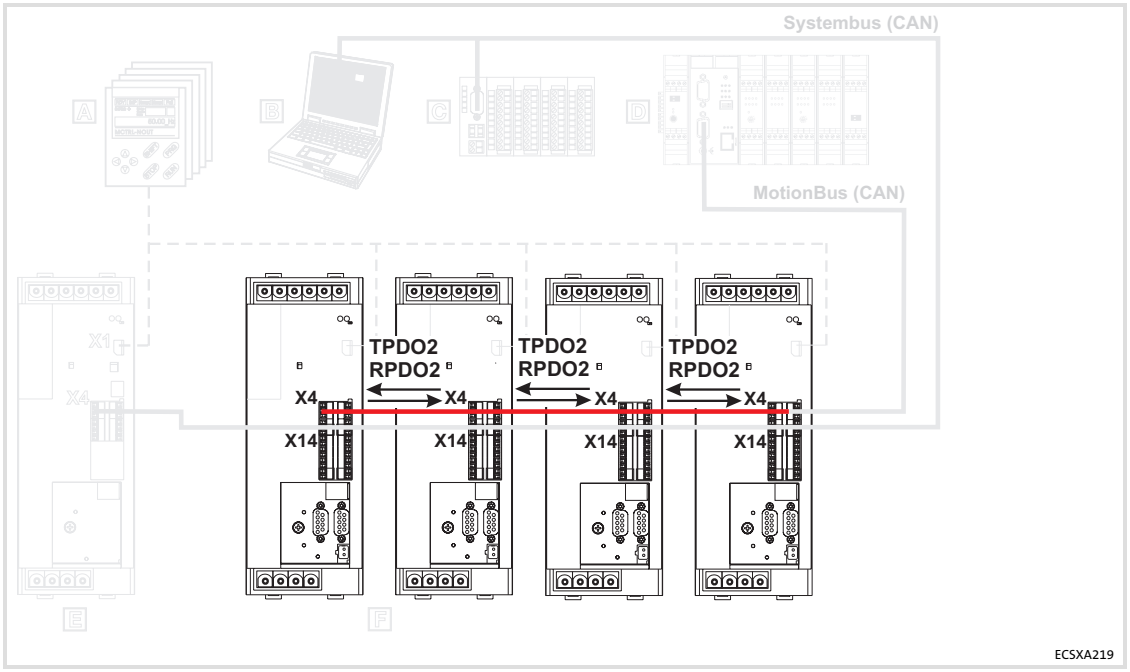


Fig. 8-9 Example: event-controlled process data objects PDO2

The process data objects serve to transmit simple binary signals (e.g. states of digital input terminals) or complete values in 16 and 32 bits (e.g. analog signals).

8.1.4 Parameter data transfer

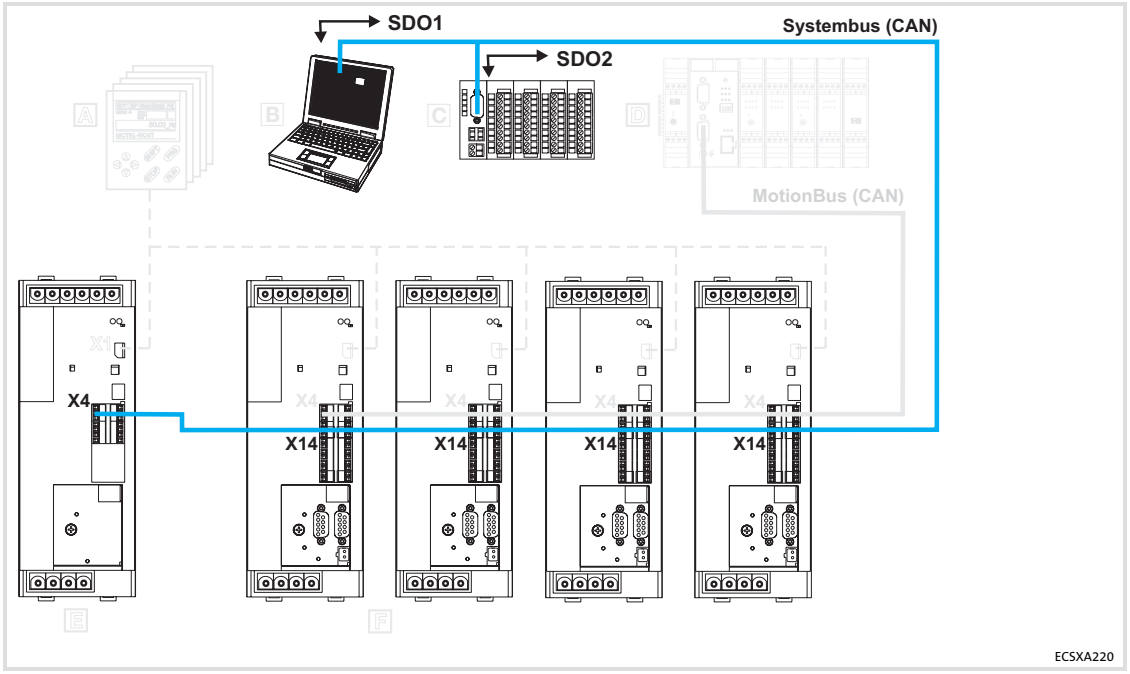


Fig. 8-10 Parameter data channels for parameterising ECS

Parameters

- are values which are stored under codes in the Lenze controllers.
- are set e.g. during initial commissioning or while changing materials in a machine.
- are transmitted with low priority.

Parameter data are transmitted as SDOs (Service Data Objects) via the system bus (CAN) and acknowledged by the receiver. The SDOs enable the writing and reading access to the object directory.

The CAN bus interfaces X4 and X14 have two separated parameter data channels each which enable the simultaneous connection of different devices for parameter setting and diagnostics.

The codes for parameter setting and diagnostics of the automation interface (AIF) X1 as well as the CAN bus interfaces X4 and X14 are divided into separate ranges:

Interface		Code range
X1	Automation interface (AIF)	C23xx
X4	ECSxS/P/M: MotionBus (CAN) ECSxA/E: System bus (CAN)	C03xx
X14	System bus (CAN) ● Interface is not available for ECSxE.	C24xx

8.1.4.1 User data

Structure of the parameter data telegram

User data (up to 8 bytes)							
1. byte	2. byte	3. byte	4. byte	5. byte	6. byte	7. byte	8. byte
Command	**Index** Low byte	**Index** High byte	**Subindex**	**Data 1**	**Data 2**	**Data 3**	**Data 4**
				Low word		High word	
				Low byte	High byte	Low byte	High byte
				Display			

Note!

The user data is shown in motorola format.

Examples for parameter data transfer can be found from 📖 87.

Command

The command contains the services for writing and reading the parameters and information on the length of the user data:

	Bit 7 MSB	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit 2**	**Bit 1**	**Bit 0** LSB
Command	Command specifier (cs)			toggle (t)	Length		e	E
Write request	0	0	1	0	00 = 4 bytes 01 = 3 bytes 10 = 2 bytes 11 = 1 byte		1	1
Write response	0	1	1	0			0	0
Read request	0	1	0	0			0	0
Read response	0	1	0	0			1	1
Error response	1	0	0	0	0	0	0	0

Tip!

Further commands are defined in the CANopen specification DS301, V4.02 (e.g. segmented transfer).

The command must contain the following information:

	4-byte data (5. ... 8. byte)		2-byte data (5. and 6. byte)		1-byte data (5. byte)		Block	
Command	**hex**	dec	**hex**	dec	**hex**	dec	**hex**	dec
Write request (Transmit parameter to the controller)	**23**	35	**2B**	43	**2F**	47	**21**	33
Write response (Acknowledgement, controller response to write request)	**60**	96	**60**	96	**60**	96	**60**	96
Read request (Request to read a controller parameter)	**40**	64	**40**	64	**40**	64	**40**	64
Read response (Response to read request with current value)	**43**	67	**4B**	75	**4F**	79	**41**	65
Error response (The controller reports a communication error)	**80**	128	**80**	128	**80**	128	**80**	128

”Error response” command: In case of a communication error an ”Error response” is generated by the addressed node. This telegram always contains the value ”6” in Data 4 and an error code in Data 3.

The error codes are standardised acc. to DS301, V4.02.

Addressing by index and subindex

The parameter or Lenze code is addressed with these bytes according to the following formula:

Index = 24575 - (Lenze code number)

Data 1 ... Data 4

Parameter value length depending on the data format			
Parameter value **(Length: 1 byte)**	00	00	00
Parameter value **(length: 2 bytes)**		00	00
Low byte	High byte		
Parameter value **(length: 4 bytes)**			
Low word		High word	
Low byte	High byte	Low byte	High byte

Note!

Lenze parameters are mainly represented as data type FIX32 (32 bit value with sign, decimally with four decimal positions). To obtain integer values, the desired parameter value must be multiplied by $10{,}000_{dec}$.

The parameters C0135 and C0150 must be transmitted bit-coded and without a factor.

Error messages

User data (up to 8 bytes)							
1st byte	2nd byte	3rd byte	4th byte	5th byte	6th byte	7th byte	8th byte
Command	Index Low byte	Index High byte	Subindex	**Display**			

- Byte 1:
  In the **command** byte the code $\mathbf{128_{dec}}$ or $\mathbf{80_{hex}}$ indicates that a fault has occurred.
- Byte 2, 3 and 4:
  In these bytes the **index** (byte 2 and 3) and **subindex** (byte 4) of the code in which an error occurred are entered.
- Byte 5 to 8:
  In the data bytes 5 to 8 the **error code** is entered. The structure of the error code is reversed to the read direction.

Example:
The representation of the error code 06 04 00 41_{hex} in the bytes 5 to 8

Read direction of the error code

41	**00**	**04**	**06**
5. byte	6. byte	7. byte	8. byte
Low word		High word	
Low byte	High byte	Low byte	High byte

Possible error codes:

Command	**7th byte**	**8th byte**	**Meaning**
80_{hex}	6	6	Wrong index
80_{hex}	5	6	Wrong subindex
80_{hex}	3	6	Access denied

8.1.4.2 Examples of the parameter data telegram

Reading parameters

The heatsink temperature C0061 (43 °C) is to be read from the controller with node address 5 via the parameter data channel 1.

► Identifier calculation

Identifier from SDO1 to controller	Calculation
1536 + node address	1536 + 5 = 1541

► Command ”Read Request” (request to read a parameter from the controller)

Command	Value
Read request	**40_{hex}**

► Index calculation:

Index	Calculation
24575 - code number	24575 - 61 = 24514 = $5FC2_{hex}$

► Subindex: 0

► Telegram to controller

	User data							
Identifier	Command	Index LOW byte	Index HIGH byte	Subindex	Data 1	Data 2	Data 3	Data 4
1541	$_{40hex}$	$C2_{hex}$	$5F_{hex}$	00	00	00	00	00

► Telegram from controller

	User data							
Identifier	Command	Index LOW byte	Index HIGH byte	Subindex	Data 1	Data 2	Data 3	Data 4
1413	43_{hex}	$C2_{hex}$	$5F_{hex}$	00	$B0_{hex}$	$8F_{hex}$	06_{hex}	00

– Command:
”Read Response” (response to the read request) = 43_{hex}
– Identifier:
SDO1 from controller (= 1408) + node address (= 5) = 1413
– Index of the read request:
$5FC2_{hex}$
– Subindex:
0
– Data 1 ... 4:
00 06 8F B0 = 430.000 → 430.000 : 10.000 = 43 °C

Writing parameters

The acceleration time C0012 (parameter set 1) of the controller with the node address 1 is to be changed to 20 seconds via the SDO1 (parameter data channel 1).

► Identifier calculation

Identifier from SDO1 to controller	Calculation
1536 + node address	1536 + 1 = 1537

► Command "Write Request" (transmit parameter to drive)

Command	Value
Write request	**23_{hex}**

► Index calculation:

Index	Calculation
24575 - code number	24575 - 12 = 24563 = $5FF3_{hex}$

► Subindex: 0

► Calculation of the acceleration time

Data 1 ... 4	Calculation
Value for acceleration time	20 s · 10.000 = 200.000_{dec} = 00 03 0D 40_{hex}

► Telegram to controller

	User data							
Identifier	**Command**	**Index** LOW byte	**Index** HIGH byte	**Subindex**	**Data 1**	**Data 2**	**Data 3**	**Data 4**
1537	23hex	$F3_{hex}$	$5F_{hex}$	00	40hex	$0D_{hex}$	03_{hex}	00

► Telegram from controller if executed faultlessly

	User data							
Identifier	**Command**	**Index** LOW byte	**Index** HIGH byte	**Subindex**	**Data 1**	**Data 2**	**Data 3**	**Data 4**
1409	60_{hex}	$F3_{hex}$	$5F_{hex}$	00	00	00	00	00

– Command:
"Write Response" (response of the controller (acknowledgement)) = 60_{hex}

– Identifier:
SDO1 from controller (= 1408) + node address (= 1) = 1409

8.1.5 Addressing of the parameter and process data objects

The CAN bus system is based on a message-oriented data exchange between a transmitter and many receivers. Thus, all nodes can transmit and receive messages at the same time.

The identifier in the CAN telegram – also called *COB-ID (Communication Object Identifier)* controls which node is to receive a transmitted message. With the exception of the network management (NMT) and the sync telegram (Sync) the identifier contains the node address of the drive besides the basic identifier:

Identifier (COB-ID) = basic identifier + adjustable node address (node ID)

The basic identifier for the ECSxE power supply module is preset ex works with the following values:

Object	Basic identifier	
	dec	hex
Network management (NMT)	0	0
Sync telegram	128	80
Process data channel to ECSxE in cyclic operation (sync-controlled) (RPDO: CAN1_IN)	512	200
Process data channel from ECSxE in cyclic operation (sync-controlled) (TPDO: CAN1_OUT)	384	180
Process data channel to ECSxE in event-controlled/cyclic operation without sync (RPDO: CAN3_IN)	768	300
Process data channel from ECSxE in event-controlled/cyclic operation without sync (TPDO: CAN3_OUT)	769	301
Parameter data channel 1 to ECSxE (SDO1)	1536	600
Parameter data channel 2 to ECSxE (SDO2)	1600	640
Parameter data channel 1 from ECSxE (SDO1)	1408	580
Parameter data channel 2 from ECSxE (SDO2)	1472	5C0
Node Guarding	1792	700

Note!

The ”8.2.1 Setting of CAN node address and baud rate” chapter contains information on

► Setting of the node address (📖 90).
► Individual addressing (📖 93).

8.2 Configuring system bus (CAN)

The codes for configuring the system bus (CAN) can be found in the GDC parameter menu (📖 67) under **system bus (CAN)**.

8.2.1 Setting CAN node address and baud rate

The CAN node address and baud rate can be set via the DIP switch (S1) or via C0350/C0351.

- ► If one of the (address) switches 2 ... 7 of the DIP switch is switched on (ON) and the low-voltage supply is connected, the setting of the DIP switch is evaluated and entered into C0350 (CAN node address) and C0351 (baud rate).
- ► If the (address) switches 2 ... 7 are switched off (OFF), the switch position is not evaluated. The node address and the baud rate are then taken from C0350 and C0351.
- ► The switch 1 of the DIP switch has no function.

8.2.1.1 Settings via DIP switch

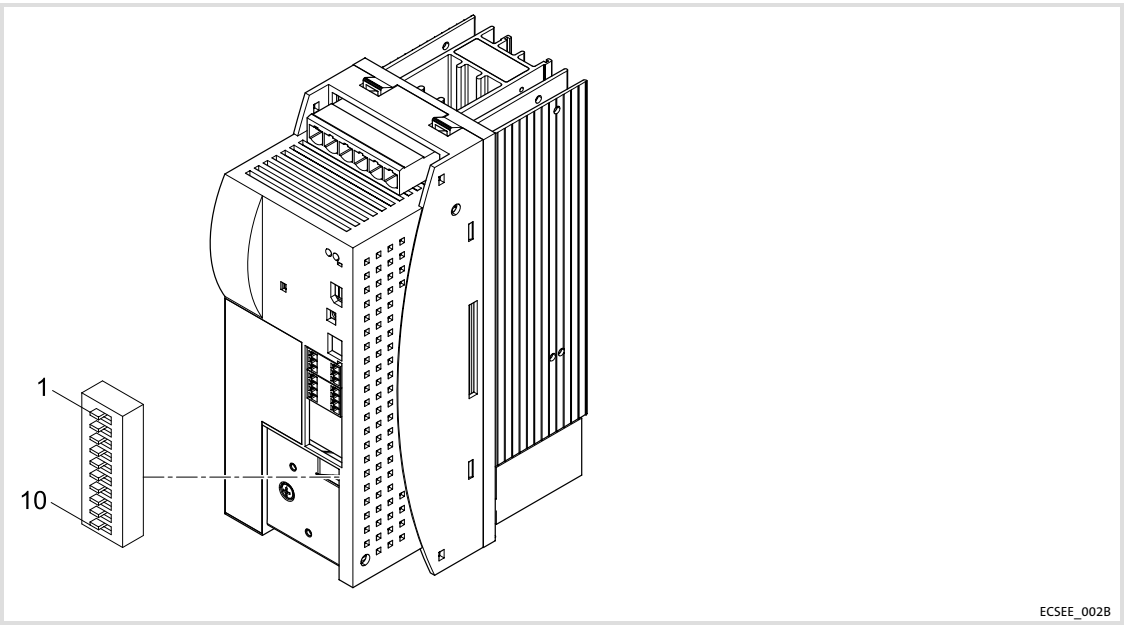
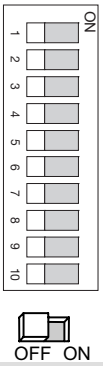


Fig. 8-11 DIP switch for node address and baud rate (all switches: OFF)

Node address setting

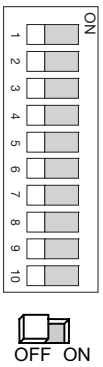
The node address is set with the switches 2 ... 7 of the DIP switch. The switches are assigned to certain valencies. The sum of the valencies make the node address to be set (see example).

Switch		Valency	Example	
			Switching status	Node address
	S1	**OFF:** Node address setting is only valid for CAN (C0350 is overwritten if one of switches S2 ... S7 is in ON position) **ON:** Node address setting is valid for CAN and CANaux (C0350 and C2450 are overwritten if one of switches S2 ... S7 is in ON position)		32 + 16 + 8 = 56
	S2	32	**ON**	
	S3	16	**ON**	
	S4	8	**ON**	
	S5	4	OFF	
	S6	2	OFF	
	S7	1	OFF	

Baud rate setting

Note!

The baud rate must be set identically for all CAN nodes.

Switch		Baud rate [kbit/s]				
		1000	500	250	125	50
	8	**ON**	OFF	OFF	OFF	OFF
	9	OFF	OFF	OFF	**ON**	**ON**
	10	OFF	OFF	**ON**	OFF	**ON**

8.2.1.2 Settings via codes

Note!

- ► If all DIP switches for the node address (S2 ... S7) are in ”OFF” position, the settings under code C0350 (node address) and C0351 (baud rate) apply.
- ► If only one DIP switch for the node address (S2 ... S7) is in ”ON” position, the settings of DIP switches S2 ... S10 apply.
- ► The baud rate must be set identically for all CAN nodes.

C0350	CAN node address		
Note: ● This code is not active if one of the switches 2 ... 7 of the DIP switch is set to ”ON”. (📖 90) ● After the setting, a reset node is required.			
Setting range (min. value | unit | max. value)			**Lenze setting**
1		63	**32**

C0351	CAN baud rate
Note: ● The baud rate must be set identically for all CAN nodes. ● This code is not active if one of the switches 2 ... 7 of the DIP switch is set to ”ON”. ● After the setting, a reset node is required.	

Selection list (Lenze setting printed in bold)		**Information**
0	**500 kbit/s**	📖 90
1	250 kbit/s	
2	125 kbit/s	
3	50 kbit/s	
4	1000 kbit/s	

Save changes with C0003 = 1.

The settings are only accepted after carrying out one of the following actions:

- ► Switching on again the low-voltage supply
- ► Reset node via the bus system (by the network management (NMT))
- ► Reset node with C0358 = 1 by means of keypad XT (📖 98)
  - – If the reset node is executed via GDC, the communication will be interrupted as a matter of principle. Thus, it is required to log in again manually or to research the devices connected to the bus.

8.2.2 Individual addressing

C0353 can be used to determine whether the identifier (COB-ID) is created from a basic identifier (📖 88) plus the node address in C0350 or individually with an ”ID offset” as follows:

Identifier (COB-ID) = 384 + ID offset (C0354)

The ”ID offset” can be defined via C0354.

Note!

The identifier for the process data input (CANx-IN) must be set the same as the identifier of the transmitting process data output (CANx-OUT) to receive the respective PDO telegram.

C0353	Mode CAN_IN/OUT ID creation (COB-IDs)	
Note: ● This code is not active if one of the switches 2 ... 7 of the DIP switch is set to ”ON”. ● After the setting, a reset node is required.		
Selection list (Lenze setting printed in bold)		**Information**
0	**COB-ID = basic identifier + C0350**	📖 88
1	COB-ID = 384 + C0354	📖 93
Subcodes		
C0353/1		ID creation CAN1_IN/OUT (cyclic operation (sync-controlled))
C0353/2		ID creation CAN2_IN/OUT (reserved)
C0353/3		ID creation CAN3_IN/OUT (event-controlled/cyclic operation without sync)

C0354	CAN_IN/OUT ID offset		
ID offset for calculating individual COB-IDs: COB-ID = 384 + ID offset **Note:** ● This code is not active if one of the switches 2 ... 7 of the DIP switch is set to ”ON”. ● After the setting, a reset node is required.			
Setting range (min. value | unit | max. value)			**Information**
0		513	📖 93
Subcodes	**Lenze setting**		
C0354/1	32		ID offset for COB-ID CAN1_IN
C0354/2	160		ID offset for COB-ID CAN1_OUT
C0354/3	288		ID offset for COB-ID CAN2_IN
C0354/4	289		ID offset for COB-ID CAN2_OUT
C0354/5	416		ID offset for COB-ID CAN3_IN
C0354/6	417		ID offset for COB-ID CAN3_OUT

Save changes with C0003 = 1.

The settings are only accepted after carrying out one of the following actions:

- Switching on again the low-voltage supply
- Reset node via the bus system (by the network management (NMT))
- Reset node with C0358 = 1 by means of keypad XT (📖 98)
  - If the reset node is executed via GDC, the communication will be interrupted as a matter of principle. Thus, it is required to log in again manually or to research the devices connected to the bus.

8.2.3 Display of the resulting identifiers

C0355 is the display code for the resulting identifiers:

- General addressing (📖 88):
  Identifier (COB-ID) = basic identifier + adjustable node address (Node ID)
- Individual addressing (📖 93):
  Identifier (COB-ID) = 384 + ID offset (C0354)

C0355	CAN_IN/OUT identifier (COB-IDs)		
Display range (min. value | unit | max. value)			**Information**
0		2047	📖 93
Subcodes			
C0355/1			COB-ID CAN1_IN
C0355/2			COB-ID CAN1_OUT
C0355/3			COB-ID CAN2_IN
C0355/4			COB-ID CAN2_OUT
C0355/5			COB-ID CAN3_IN
C0355/6			COB-ID CAN3_OUT

8.2.4 Defining boot-up master in the drive system

If the bus initialisation and the related state change from ”Pre-Operational” to ”Operational” is not carried out by a higher-level host system, another node can be determined as master to carry out this task.

The master functionality is only required for the initialisation phase of the drive system. C0356 serves to set a boot up time for the master for the initialisation phase (📖 96).

The NMT telegram *start_remote_node* (broadcast telegram) serves to set **all** nodes to the ”Operational” NMT status by the master. A data exchange via the process data objects is only possible in this status.

The configuration is carried out via C0352.

C0352	CAN master/slave boot-up configuration	
Note: After the setting, a reset node is required.		
Selection list (Lenze setting printed in bold)		**Information**
0	**Slave**	📖 95
1	Master (CAN network PDO enable)	
2	Slave node guarding	

Save changes with C0003 = 1.

The settings are only accepted after carrying out one of the following actions:

- Switching on again the low-voltage supply
- Reset node via the bus system (by the network management (NMT))
- Reset node with C0358 = 1 by means of keypad XT (📖 98)
  – If the reset node is executed via GDC, the communication will be interrupted as a matter of principle. Thus, it is required to log in again manually or to research the devices connected to the bus.

8.2.5 Setting the mode for process data transfer

The process data can be transmitted cyclically (sync-controlled, 📖 81) via CAN1_IN/OUT or event-controlled/cyclically without sync (📖 82) via CAN3_IN/OUT.

The configuration is carried out via C0360.

C0360	CAN PDOs/mode selection	
Selection of CAN PDOs/mode for process data transfer via system bus (CAN)		
Selection list (Lenze setting printed in bold)		**Information**
		📖 96
0	CAN3_IN/OUT	event-controlled/cyclic without sync
1	**CAN1_IN/OUT**	cyclic (sync-controlled)

8.2.6 Setting of boot-up time/cycle time

Boot-up time (C0356/1)

- Delay time (in ms) after the expiration of which the master sends the NMT telegram for initialising the CAN network after the master has been switched on (mains switching).
  - Only valid if C0352 = 1 (master).
  - Normally the Lenze setting (3000 ms) is sufficient.
- In a CAN network without a higher-level host, one node (master) must initialise the CAN network. The master activates the entire network once at a specific instant and thus starts the process data transfer.
  - Status changes from ”pre-operational” to operational”.

Cycle time for process output data CAN2_OUT (C0356/2)

Transmission cycle time (in ms) for CAN2_OUT

- No function (reserved)

Cycle time for process output data CAN3_OUT (C0356/3)

Transmission cycle time (in ms) for CAN3_OUT in cyclic operation (without Sync)

- Setting ”0” = event-controlled data transmission
  (The output data will only be sent if they have been changed.)

Activation delay for process output data (C0356/4)

Delay time (in ms) until the first transmission of process data via CAN2/3_OUT

- When the NMT status ”Pre-Operational” has changed to Operational”, the delay time is started. Only after the delay time has elapsed, the PDO CAN2/3_OUT is transmitted for the first time.

8.2.7 Node guarding

The ”Node Guarding” function is implemented as of operating system V3.0.

In case of cyclic node monitoring (Node Guarding) the CAN master regularly enquires the states of the slaves participating in the monitoring process.

- The master starts the node guarding by sending the node guarding telegram.
- If the slave does not receive a node guarding telegram within the monitoring time (Node Life Time), the ”Life Guarding Event” is enabled (fault message ”NodeGuard Trp/Msg/Wrn”).

Settings

In order that the power supply module takes over the function of the ”Node Guarding Slave”, make the following settings:

1. Set C0352 = 2.
   (The power supply module is configured as ”Node Guarding Slave”.)
2. Set the time interval of the status enquiry by the master (Node Guard Time) via C0382.
3. Set the factor for the monitoring time (Node Life Time Factor) via C0383.

   Node Life Time = Node Guard Time (C0382) · Node Life Time Factor (C0383)

4. Set the response to a ”Life Guarding Event” via C0384.

C0352	CAN master/slave boot-up configuration	
Note: After the setting, a reset node is required.		
Selection list (Lenze setting printed in bold)		**Information**
0	**Slave**	📖 95
1	Master (CAN network PDO enable)	
2	Slave node guarding	

C0382	CAN Node Guarding: ”Node Guard Time”	
Time interval of the status enquiry of the master (📖 97) ● Only relevant if C0352 = 2.		
Setting range (min. value | unit | max. value)		**Lenze setting**
0 ms 65535		**0**

C0383	CAN Node Guarding: ”Node Life Time Factor”	
Factor for monitoring time ”Node Life Time” (📖 97) ● Node Life Time = C0383 x C0382 ● Only relevant if C0352 = 2.		
Setting range (min. value | unit | max. value)		**Lenze setting**
0 255		**0**

C0384	Response - CAN node guarding

Response to a "Life Guarding Event" if no node guarding telegram has been received during "Node Life Time" (C0382 x C0383).

- When C0382 = 0 or C0383 = 0, the monitoring function is not active (no node guarding fault message is enabled).
- Only relevant if C0352 = 2.

Selection list (Lenze setting printed in bold)		Information
0	TRIP	📖 97
1	Message	
2	Warning	
3	**Off**	

8.2.8 Executing a reset node

The following changes will only be valid after a reset node:

- ► Changes of the CAN node addresses and baud rates (📖 90)
- ► Changes of the addresses of process data objects (COB-IDs)
  - – General addressing (📖 88)
  - – Individual addressing (📖 93)
- ► Change of the master/slave boot up configuration (📖 95)

A reset node can be made by:

- ► Switching on again the low-voltage supply
- ► Reset node via the bus system (by the network management (NMT))
- ► Reset node with C0358 = 1 by means of keypad XT
  - – If the reset node is executed via GDC, the communication will be interrupted as a matter of principle. Thus, it is required to log in again manually or to research the devices connected to the bus.

C0358	CAN reset node

Make a reset node for the CAN node.

Selection list (Lenze setting printed in bold)		Information
0	**No function**	📖 98
1	CAN reset	

8.2.9 Assignment of the control word

Control word to the power supply module (display in C0130)

Byte	Bit	Name	Meaning
LOW	0	STE_TOGGLE	Toggle bit: Bit state change as a ”sign of life” of the control
	1	STE_RESET	0: Reset fault message 1: Active fault message
	2	STE_KSB	0: No short-circuit braking (KSB) 1: Carry out short-circuit braking (KSB)
	3	STE_REGLERFREIGABE	0: X6/DO1 always LOW 1: X6/DO1 is HIGH if the power supply module is ready for operation and the input X6/DI2 is HIGH.
	4 ... 7	Free	
HIGH	8 ... 10	Reserved	
	11 ... 15	Free	

8.2.10 Assignment of status words

Status word 1 (display in C0131)

Byte	Bit	Name	Meaning
LOW	0	STA1_BTB	0: Power supply module not ready for operation 1: Status message: ready for operation
	1	STA1_WARNUNG	0: No warning active 1: At least one warning active
	2	STA1_MELDUNG	0: No message active 1: At least one message active
	3	STA1_TRIP	0: No TRIP active 1: At least one TRIP active
	4	STA1_KSB_FAIL	0: OK 1: No short-circuit braking possible because DC bus charged externally.
	5	STA1_KSB_AKTIV	0: Normal operation 1: Short-circuit braking active
	6	STA1_K1_EIN	0: -UG relay open 1: -UG relay closed (switched-on)
	7	STA1_K2_EIN	0: +UG relay open 1: +UG relay closed (switched-on)
HIGH	8 ... 10	Reserved	
	11	STA1_DI1	0: Terminal mains enable (x6/DI1) LOW 1: Terminal mains enable (x6/DI1) HIGH
	12	STA1_DI2	0: Terminal controller enable (X6/DI2) LOW 1: Terminal controller enable (X6/DI2) HIGH
	13	STA1_TOGGLE	Feedback of received toggle bit (as of operating system V2.3)
	14 15	Free	

Status word 2 (display under C0132)

The current fault number is transferred in status word 2 (📖 121).

8.2.11 Bus status

C0359 can be used to request the current bus status. If the system bus (CAN) is in the ”Operational” status, you can use C0866 and C0868 to check the contents of the data words transmitted and received via CAN1_IN/OUT.

Value in C0359	Operating status	Description
0	Operational	The bus system is fully operative.
1	Pre-operational	Only parameters (codes) can be transmitted via the bus system. A data exchange between nodes is not possible. A special signal on the system bus (CAN) serves to change to the ”Operational” status. The status can be changed from “pre-operational” to “operational” by one of the following actions: ● Master functionality of a higher-level host ● If a node is determined as master via C0352, the operating status is automatically changed for the entire drive system after the set boot-up time has elapsed (C0356/1), when power is switched on. ● Reset node (📖 98)
2	Warning	Faulty telegrams have been received. The node remains passive and does not send any data. Possible causes: ● Missing bus termination ● Insufficient shielding. ● Potential differences in the grounding of the control electronics ● Bus load is too high. ● Node is not connected to the system bus (CAN).
3	Bus off	Too many faulty telegrams: The node has disconnected from the system bus (CAN). It can be reconnected by: ● Mains reconnection ● Reset node (📖 98) ● Reset of the fault message CE4 (TRIP-RESET)

C0866	Process data input words CAN1_IN		
Display range (min. value | unit | max. value)			**Information**
0x0000	hex	0xFFFF	
Value is bit coded:			
Bit 0			
...			
Bit15			
Subcodes	**Lenze setting**		
C0866/1	0		CAN1_IN.W0 (word 1, control word ”Ctrl1”)
C0866/2	0		CAN1_IN.W1 (word 2)

C0868	Process data output words CAN1_OUT		
Display range (min. value | unit | max. value)			**Information**
0x0000	hex	0xFFFF	
Value is bit coded:			
Bit 0			
...			
Bit15			
Subcodes	**Lenze setting**		
C0868/1	0		CAN1_OUT.W0 (word 1, status word 1 ”Stat1”)
C0868/2	0		CAN1_OUT.W1 (word 2, status word 2 ”Stat2”)

8.3 Overview of monitoring functions

Responses (📖 104) of monitoring functions can be parameterised partly via codes – in the GDC parameter menu) under **Monitoring**.

Monitoring			Possible responses ● Lenze setting ✓ Setting possible					
Fault message		Description	Code	TRIP	Short-circuit braking TRIP	Message	Warning	Off
0011	OC1	Short circuit in the DC bus		✓	●	–	–	–
0012	OC2	Earth fault in the DC bus		✓	●	–	–	–
0013	OC3	Load of the DC bus during load process (as of operating system V2.3)		✓	●	–	–	–
0014	OC4	Short circuit/overload of brake resistor or IGBT		●	–	–	–	–
0015	OC5	Device utilisation I x t (fix 100%)		✓	●	–	–	–
0016	OC6	Overload of internal brake resistor	C0579	●	–	–		✓
0020	OU	Overvoltage in the DC bus (C0173)		✓	●	–	–	–
1031 2031	LP0	Mains voltage beyond the operating range		–	–	●	✓	–
0032 1032 2032	LP1	Mains phase failure (as of operating system V2.0) ● C0599 < 65535: LP1-TRIP ● C0599 = 65535: LP1 warning/LP1 message	C0599	✓	●	✓	✓	–
0050	OH	Device heatsink temperature > 90 °C		✓	●	–	–	–
0051	OH1	Internal device temperature > 90 °C		✓	●	–	–	–
0053	OH3	Overload of external brake resistor		●	–	–	–	–
0062	CE1	Communication error at the process data input object CAN1_IN in cyclic operation (sync-controlled) ● The monitoring time can be set via C0357/1.		✓	✓	–	–	●
0063	CE2	Communication error at the process data input object CAN2_IN in event-controlled/cyclic operation without sync ● The monitoring time can be set via C0357/1.		✓	✓	–	–	●
0064	CE3	Communication error at the process data input object CAN3_IN in event-controlled/cyclic operation without sync ● The monitoring time can be set via C0357/1.		✓	✓	–	–	●
0065	CE4	Bus-off status of the system bus (CAN) (too many faulty telegrams or toggle bit errors)	C0595	✓	●	–	–	✓
0070	U15	Undervoltage of external low-voltage supply		●	–	–	–	–
0071	CCr	System failure		✓	●	–	–	–
0072	PR1	Checksum error in parameter set 1		✓	●	–	–	–

Monitoring			Possible responses ● Lenze setting ✓ Setting possible					
Fault message		**Description**	Code	TRIP	Short-circuit braking TRIP	Message	Warning	Off
0079	PR5	Internal fault (EEPROM)		✓	●	–	–	–
0095	FAN1	Fan monitoring (only for built-in units ECS**E**E)		✓	●	–	–	–
0105	H05	Internal fault (memory)		✓	●	–	–	–
0106	H06	Internal fault (power stage)		✓	●	–	–	–
0260 1260 2260	NodeGuard Trp NodeGuard Msg NodeGuard Wrn	”Life Guarding Event”: The power supply module as CAN slave does not receive a node guarding telegram from the CAN master within the ”Node Life Time”.	C0384	●	–	✓	✓	✓

8.4 Configuring monitoring functions

8.4.1 Fault responses

Various monitoring functions (📖 102) protect the drive system against impermissible operating conditions.

If a monitoring function responds,

- the set fault response is triggered to protect the drive and
- the fault message is entered at position 1 in the fault history buffer (C4168/x) (📖 120).

In the fault history buffer (C0168/x), fault messages are saved in codes as 4-digit numbers. The first digit describes the type of fault response. The last three digits correspond to the fault number.

No. of the fault message	Type of response
0xxx	TRIP
1xxx	Message
2xxx	Warning
3xxx	FAIL-QSP (only for ECSxS/P/M/A axis modules)

Example: C0168/1 = 2061

- x061:
  The current fault (subcode 1 of C0168) is a communication error (fault message ”CE0”/no. ”x061”) between the AIF module and the ECS axis module.
- 2xxx:
  The fault response is a warning.

Reaction	⇨ Consequence	Display Keypad XT		
		RDY	IMP	Fail
TRIP / Short-circuit braking TRIP		☐	■	■
TRIP active:	⇨ The charging of the DC bus is stopped. With short-circuit braking TRIP the DC bus is quickly discharged via the brake resistor. ⇨ The drive is coasting (no control). ⇨ The system bus (CAN) indicates to the master that the power supply module is not ready for operation.			
TRIP is reset:	⇨ The power supply module is ready for operation again. ⇨ The charging of the DC bus is continued.			
Message	**Danger!** The drive restarts automatically if the message is removed.	☐	■	■
Message active:	⇨ The charging of the DC bus is stopped. ⇨ The drive is coasting (no control). ⇨ The system bus (CAN) indicates to the master that the power supply module is not ready for operation.			
Message is reset:	⇨ The power supply module is ready for operation again. ⇨ The charging of the DC bus is continued.			
Warning	⇨ The failure is only displayed, the drive continues to run normally.	■	☐	■
Off	**STOP!** The drive can be destroyed due to deactivated monitoring functions.	–	–	–
	⇨ There is no response to the failure.			

☐ = off ■ = on

8.4.2 Mains monitoring (LP0, LP1)

Mains voltage and mains frequency (LP0)

Mains voltage and mains frequency are permanently measured. The permissible ranges depend on the mains voltage set under C0173. The mains frequency must be within the range from 45 to 66 Hz. If the measured values are not within these limits, an LP0 message is activated and the DC bus cannot be charged or is disconnected from the mains.

If the power supply module is ready for operation, the limits are expanded to tolerate short mains fluctuations. In this case, an LP0 warning is displayed.

When C0173 = 4 (automatic detection of the mains voltage), the range is defined with the rising edge of the mains enable input.

Code C0173	Measured values U_{L1_L2} and U_{L2_L3} [V]				
	"Not ready for operation"		"Ready for operation"		
	OK	LP0 message	OK	LP0 warning	LP0 message
0	207 ... 253	< 207 > 253	207 ... 253	127 ... 206 254 ... 265	< 127 > 265
1	360 ... 440	< 360 > 440	360 ... 440	280 ... 359 441 ... 460	< 280 > 460
2	414 ... 506	< 414 > 506	414 ... 506	334 ... 413 507 ... 515	< 334 > 515
3	432 ... 528	< 432 > 528	432 ... 528	352 ... 431 529 ... 540	< 352 > 540
4	Lower range		Lower range		
	180 ... 260	< 180 > 260	180 ... 260	100 ... 179 261 ... 265	< 100 > 265
	Upper range		Upper range		
	261 ... 528	< 261 > 528	261 ... 528	181 ... 260 529 ... 540	< 181 > 540

Mains phase failure (LP1)

From the operating system V2.1 onwards, the power supply module monitors the mains for phase failure. A phase failure will be detected after half a mains period because the mains synchronisation is faulty. If the DC bus is charged and the power supply module is ready for operation, an LP1 warning is triggered. For all other states an LP1 message is triggered to prevent a charging process with faulty synchronisation. The LP1 warning/message will be deactivated when the mains synchronisation has been free of faults for 2 mains periods.

Under C0599 a time interval for triggering an LP1 TRIP can be set in addition. If an LP1 warning or an LP1 message is active for the time interval set under C0599, an LP1-TRIP is triggered. C0599 = 65535 ms deactivates the LP-TRIP. In this case, only an LP1 warning or an LP1 message is triggered.

C0599	Delay time - system disturbance (LP1)		
If an LP1 warning or LP1 message is active for the set time, an LP1-TRIP is enabled. (📖 106) ● Value < 65535 ms: LP1-TRIP ● Value = 65535 ms: LP1 warning/LP1 message			
Setting range (min. value | unit | max. value)			**Lenze setting**
0	ms	65535	**65535**

8.4.3 Voltage supply monitoring - control electronics (U15)

If the voltage at X6/DI1 or X6/DI3 falls below 17 V, TRIP ”U15” is triggered. The fault can only be reset if U > 19 V.

8.4.4 DC bus monitoring (OU, OC1, OC2, OC3)

Overvoltage in DC bus (OU)

If the DC bus voltage exceeds 880 V, the power supply module sets TRIP ”OU” to protect the devices.

Short circuit in the DC bus (OC1)

The power supply module monitors the DC bus for short circuit during charging. If a short circuit is detected, the TRIP ”OC1” is triggered. This TRIP can only be reset after 3 s.

Earth fault in the DC bus (OC2)

The power supply module checks the DC bus for an earth fault before charging. If current is already flowing or a voltage is detected on the DC bus, the power supply module sets TRIP OC2. This TRIP can only be reset after 3 s.

Load on DC bus when charging (OC3)

The power supply module monitors the voltage rise in the DC bus during charging. If the DC bus voltage does not rise for 500 ms, this indicates that power is drawn from the DC bus or that the charging current is set too low (C0022). In this case the TRIP ”OC3” is triggered. This TRIP can only be reset after 3 s (from software version 2.3 onwards).

8.4.5 Temperature monitoring of device heatsink (OH) / inside the device (OH1)

The temperature inside the device and the heatsink temperature are monitored to protect the power supply module from impermissible heat. If the temperature exceeds the corresponding limit value, a TRIP is triggered. The higher-level control system can request the temperature values via the system bus (CAN).

- Heatsink temperature > 90 °C → TRIP ”OH”
- Temperature inside the device > 90 °C → TRIP ”OH1”

8.4.6 Fan monitoring (FAN1)

For built-in units of the ECSEE series, the integrated heatsink fan is monitored. If the fan is switched on and the feedback signal fails for more than 2 s, TRIP ”FAN1” is set.

8.4.7 Brake resistor monitoring (OC6, OH3)

Internal brake resistor (OC6)

Stop!

The power supply module can be destroyed if monitoring is deactivated while the internal brake resistor is used.

- The internal brake resistor is continuously monitored during operation (does not apply to ECS**C**E power supply module).
- The monitoring detects the duration of current flow in the brake resistor and calculates the power loss (display under C0066).
- If the power loss exceeds the limit value set permanently in the device – 120 W for ECSxE012/020 or 240 W for ECSxE040 – TRIP "OC6" is output.

  The TRIP "OC6" can be reset if the power loss falls below 114 W or 228 W again.
- The current flow is derived from the operating time and the voltage drop across the brake resistor. Thus, the fault message also occurs if the bridge between the terminals X22/BR1 and X22/+UG is missing or an external brake resistor is connected between X22/BR0 and X22/+UG.

C0579	**Response - monitoring of internal brake resistor (OC6)**	
Monitoring response of the internal brake resistor (fault message OC6)		
Selection list (Lenze setting printed in bold)		**Information**
0	**TRIP**	📖 108
3	No response	

External brake resistor (OH3)

Stop!

If an external brake resistor is used, the monitoring of the internal brake resistor must be deactivated (C0579 = 3).

The external brake resistor can be monitored via a temperature contact. It can be connected to X6/T1, X6/T2. If monitoring is not required, a jumper must be connected between X6/T1 and X6/T2. If the contact is opened, TRIP "OH3" is triggered.

8.4.8 Brake chopper IGBT monitoring (OC4)

The brake chopper IGBT is monitored independently of the brake resistor (internal or external). There are two types of monitoring causing a TRIP "OC4":

- The voltage U_{CE} is monitored by hardware. Monitoring is triggered by a low-resistance brake resistor. This error can be reset by a TRIP reset.
- It is also monitored whether the IGBT itself has a low resistance. For this purpose the voltage across the brake resistor is used. This error cannot be reset by a TRIP reset. Possible causes are:
  – Low-resistance IGBT,
  – wrong wiring of the brake resistor or
  – defective brake resistor / IGBT.

Note!
A TRIP "OC4" can occur even if no brake resistor is connected.

8.4.9 Device utilisation / I x t monitoring (OC5)

Use the mains fuses (📖 40) to ensure device protection.

A single-phase I x t monitoring measures the load of the power supply module. The monitoring enables operation with:

- a permanent device output current = I_r
- a device output current of up to 1.5 x I_N for ≤ 30 s

The power supply module calculates the device load in percent via the mains current. If this value exceeds 100 %, TRIP "OC5" is triggered. The TRIP can only be reset if the load has fallen below 95 %. The current value is indicated under C0064.

C0064	Device utilisation (I x t)		
Device utilisation (I x t) over the last 180 s ● C0064 > 100 % activates OC5-TRIP. ● TRIP-RESET only is possible if C0064 < 95 %.			
Display range (min. value | unit | max. value)			**Information**
0	%	65535	📖 109

8.4.10 Communication monitoring (CE1 ... CE4, node guarding)

Monitoring times (C0357)

Each process data input object is able to monitor if a telegram has been received within the set time. As soon as a telegram has been received, the corresponding monitoring time (C0357) is restarted.

If no telegram is received within the set time,

- ► TRIP "CE1" (CAN1_IN, cyclic (sync-controlled)),
- ► TRIP "CE2" (CAN2_IN, reserved) or
- ► TRIP "CE3" (CAN3_IN, event-controlled/cyclic without sync) enabled.

When C0357 = 0 ms (Lenze setting) this monitoring function is switched off.

C0357	CAN_IN monitoring times (CE1 ... CE3)		
Monitoring times for process data input objects ● If no telegram arrives within the time set, CE1 ... CE3-TRIP is enabled. ● Setting "0 ms" = monitoring is switched off			
Setting range (min. value | unit | max. value)			**Information**
0	ms	65000	🕮 110
Subcodes	**Lenze setting**		
C0356/1	0 ms		CAN1_IN monitoring time CE1 (cyclic operation (sync-controlled))
C0356/2	0 ms		CAN2_IN monit. time CE2 (reserved)
C0356/3	0 ms		CAN3_IN monitoring time CE3 (event-controlled/cyclic operation without sync)

Bus-off (C0595)

If the power supply module is disconnected from the system bus (CAN) due to faulty telegrams, the "BusOffState" signal is set and TRIP "CE4" is enabled.

The monitoring can be deactivated with C0595 = 3.

C0595	Response - bus-off/toggle bit monitoring (CE4)	
Bus-off/toggle bit monitoring response of the CAN bus (fault message CE4)		
Selection list (Lenze setting printed in bold)		**Information**
0	**TRIP**	🕮 110
3	No response	

Toggle bit monitoring

The functioning of the system bus connection is monitored via a cyclically toggling bit in the control word. The control system must change the bit status in every telegram sent. If the bit status does not change, an error counter in the power supply module is incremented. This counter is reset as soon as the toggle bit is transmitted error-free again. If the error counter reaches "10", TRIP "CE4" is triggered.

The monitoring can be deactivated with C0595 = 3.

Node Guarding

The ”Node Guarding” function is implemented as of operating system V3.0.

In case of cyclic node monitoring (Node Guarding) the CAN master regularly enquires the states of the slaves participating in the monitoring process.

- ► The master starts the node guarding by sending the node guarding telegram.
- ► If the slave does not receive a node guarding telegram within the monitoring time (Node Life Time), the ”Life Guarding Event” is enabled (fault message ”NodeGuard Trp/Msg/Wrn”).

Note!

Observe the information on the configuration of the ”Node Guarding” (📖 97).

C0384	Response - CAN node guarding	
Response to a ”Life Guarding Event” if no node guarding telegram has been received during ”Node Life Time” (C0382 x C0383). ● When C0382 = 0 or C0383 = 0, the monitoring function is not active (no node guarding fault message is enabled). ● Only relevant if C0352 = 2.		
Selection list (Lenze setting printed in bold)		**Information**
0	TRIP	📖 97
1	Message	
2	Warning	
3	**Off**	

9 Diagnostics

9.1 Diagnostics with Global Drive Control (GDC)

Different system values and fault messages can be read in the GDC parameter menu under **Diagnostics** via the following codes:

C0050	**Mains voltage (U_{eff}) between phases L1-L2**		
Display range (min. value | unit | max. value)			**Information**
-16383	V	16383	

C0051	**Mains voltage (U_{eff}) between phases L2-L3**		
Display range (min. value | unit | max. value)			**Information**
-16383	V	16383	

C0053	**DC-bus voltage (U_G)**		
Display range (min. value | unit | max. value)			**Information**
-32767	V	32767	

C0054	**Mains current (r.m.s. value)**		
Display range (min. value | unit | max. value)			**Information**
-1638.3	A	1638.3	

C0055	**Voltage across brake resistor**		
Display range (min. value | unit | max. value)			**Information**
-32767	V	32767	

C0057	**Mains frequency**		
Display range (min. value | unit | max. value)			**Information**
-3276.7	Hz	3276.7	

C0061	**Heatsink temperature**		
Display range (min. value | unit | max. value)			**Information**
-3276.7	°C	3276.7	

C0062	**Interior device temp.**		
Display range (min. value | unit | max. value)			**Information**
-3276.7	°C	3276.7	

C0064	**Device utilisation (I x t)**		
Device utilisation (I x t) over the last 180 s ● C0064 > 100 % activates OC5-TRIP. ● TRIP-RESET only is possible if C0064 < 95 %.			
Display range (min. value | unit | max. value)			**Information**
0	%	65535	🕮 109

C0065	External low-voltage supply (U_{24})		
Display range (min. value | unit | max. value)			**Information**
-1638.3	V	1638.3	

C0066	Load of internal brake resistor		
Display range (min. value | unit | max. value)			**Information**
0	W	65535	

C0093	Device identification (type)	
Display list		**Information**
0	No/unknown power section	
12	ECSxE012	
20	ECSxE020	
40	ECSxE040	

C0099	Firmware version		
Display range (min. value | unit | max. value)			**Information**
0.0		25.5	

C0161	Current TRIP fault
Display list	**Information**
TRIP, short-circ. braking TRIP	🕮 121

C0168	Fault history buffer
List of the fault messages occurred	
Display list	**Information**
TRIP, short-circ. braking-TRIP, message, warning	🕮 120 🕮 121
Subcodes	
C0168/1	Currently active fault message
C0168/2	Last fault message
C0168/3	Second to last fault message
C0168/4	Third last fault message
C0168/5	Fourth last fault message
C0168/6	Fifth last fault message
C0168/7	Sixth last fault message
C0168/8	Seventh last fault message

C0178	Elapsed-hour meter		
Time during which the power supply module was enabled.			
Display range (min. value | unit | max. value)			**Information**
-214748	h	214748	

C0179	Power-on time meter		
Time when the DC bus was charged.			
Display range (min. value | unit | max. value)			**Information**
-214748	h	214748	

C0200	Firmware identification (ID)
Read only	

C0201	Firmware creation date
Read only	

9.2 Diagnostics with the XT EMZ9371BC keypad

In the ”Diagnostic” menu the two submenus ”Actual info” and ”History” contain all codes for

- monitoring the drive
- fault/error diagnosis

In the operating level, more status messages are displayed. If several status messages are active, the message with the highest priority is displayed.

Priority	Display	Meaning	
1	GLOBAL DRIVE INIT	Initialisation or communication error between keypad and controller	
2	XXX - TRIP	Active TRIP (contents of C0168/1)	
3	XXX - MESSAGE	Active message (contents of C0168/1)	
4	Special device states:		
		Switch-on inhibit	
5	Source for controller inhibit (the value of C0004 is displayed simultaneously):		
	STP1	9300 servo:	Terminal X5/28
		ECSxS/P/M/A:	Terminal X6/SI1
	STP3	Operating module or LECOM A/B/LI	
	STP4	INTERBUS or PROFIBUS-DP	
	STP5	9300 servo, ECSxA/E:	System bus (CAN)
		ECSxS/P/M:	MotionBus (CAN)
	STP6	C0040	
6	Source for quick stop (QSP):		
	QSP-term-Ext	The MCTRL-QSP input of the MCTRL function block is on HIGH signal.	
	QSP-C0135	Operating module or LECOM A/B/LI	
	QSP-AIF	INTERBUS or PROFIBUS-DP	
	QSP-CAN	9300 servo, ECSxA:	System bus (CAN)
		ECSxS/P/M:	MotionBus (CAN)
7	XXX - WARNING	Active warning (contents of C0168/1)	
8	xxxx	Value below C0004	

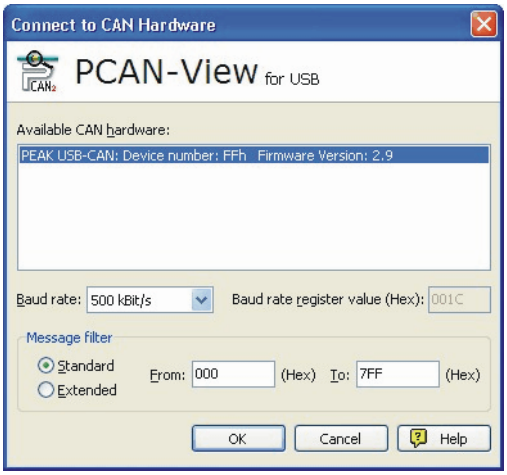
9.3 Diagnostics with PCAN-View

This chapter describes how to use the ”PCAN-View” program for diagnosing your CANopen network.

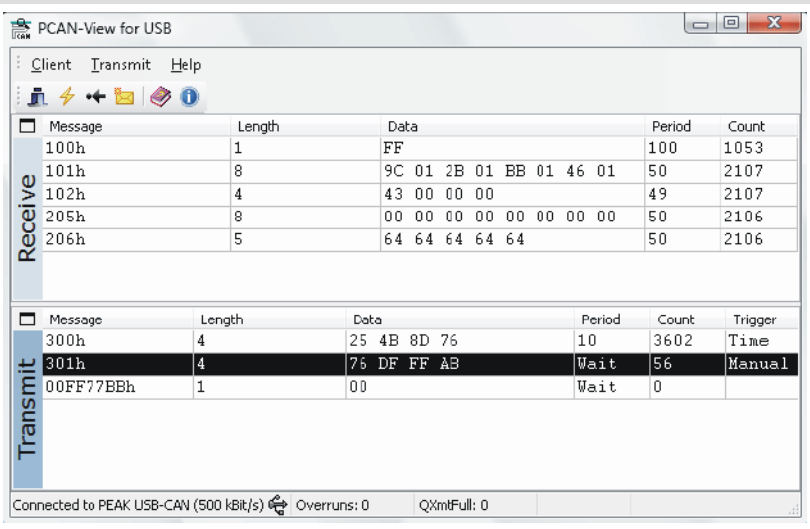
”PCAN-View” is the basic version of the ”PCAN-Explorer” program for Windows® of PEAK System Technik GmbH. The program permits a simultaneous transmission and reception of CAN messages which can be transmitted manually and periodically. Errors on the bus system and memory overflows of the triggered CAN hardware are displayed.

9.3.1 Monitoring of telegram traffic on the CANopen bus

1. Connect your Engineering PC directly to the CANopen bus via the EMF2177IB USB system bus adapter.
2. Start the PCAN-View program.
3. Connect PCAN-View with ”Connect to CAN Hardware” according to the USB system bus adapter and the baud rate.



The ”Receive” and ”Transmit” windows now continuously display the CAN telegrams:



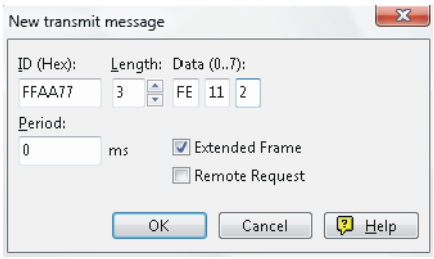
On the basis of the IDs displayed, you can assign the telegrams to the devices.

If no telegrams are displayed, this may be caused by various factors. Check the following:

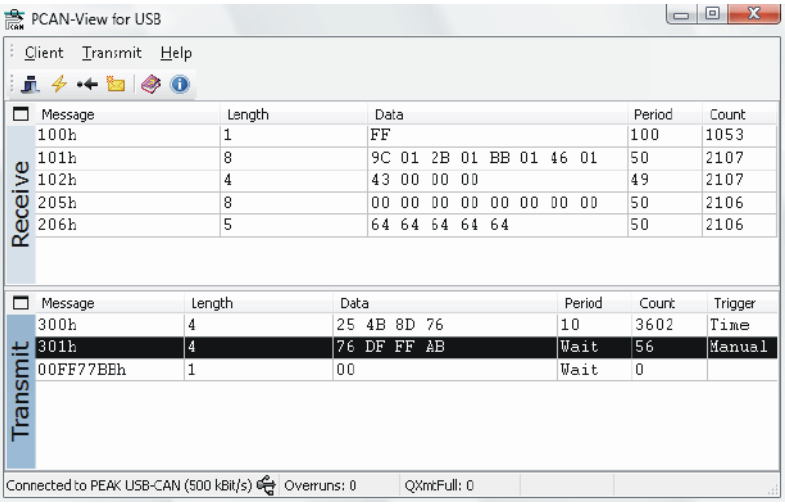
- ► Is your Engineering PC connected to the correct CANopen bus?
- ► Is the correct system bus adapter activated under ”System control, CAN Hardware”?
- ► What does the status line of the ”PCAN-View” contain?
- ► In case of ”Bus Heavy” mostly a node with a wrong baud rate disturbs the bus traffic.
- ► Do the devices are in the ”Operational” status?

9.3.2 Setting all nodes to the ”Operational” status

1. Create the following message under ”New transmit message”:



2. Select the CAN message in the ”Transmit” window and press the [space bar] once to transmit it.



10 Troubleshooting and fault elimination

Failures can be quickly detected and classified by means of display elements or status messages via the MotionBus (CAN).

The chapter ”10.2 Fault messages” (📖 121) contains notes on causes and deletion of faults.

10.1 Fault analysis

10.1.1 Fault analysis via the LED display

LED		Operating status	Check
Red	Green		
Off	On	Module enabled, no fault	
Off	Blinking	Module inhibited (CINH), switch-on inhibit	C0183
Blinking, 1 Hz	Off	Error (TRIP) / error short-circuit braking (short-circuit braking TRIP)	C0168/1
Blinking, 3 Hz	Off	Message	C0183, C0168/1
Blinking, 1 Hz	Blinking	Warning with inhibited module	C0183, C0168/1
Blinking, 1 Hz	On	Warning with enabled module	

10.1.2 Fault analysis with keypad XT EMZ9371BC

The status messages in the display give information on the device state.

Display	Device state	Check
RDY	Ready for operation, inhibit can be set	C0183, C0168/1
IMP	Power stage inhibited	C0183, C0168/1
Imax	Maximum current reached	
Fail	Fault caused by TRIP, short-circuit braking TRIP, message or warning	C0183, C0168/1

10.1.3 Fault analysis with the history buffer

The history buffer (C0168) enables you to trace faults. The corresponding fault messages are stored in eight memory locations in the sequence of their occurrence.

Structure of the history buffer

- The fields under ”fault history” show the memory locations 2 ... 7.
- The fields under ”current faults” indicate memory location 1. It gives information on the active fault.
- If the fault is no longer active or has been reset,
  - all information in the fault memory will be automatically shifted upwards by one subcode.
  - memory location 1 will be deleted (no active fault). The information on the formerly active fault is now in subcode 2.
  - the contents of subcode 8 will be eliminated from the history buffer and cannot be read any longer.
- The history buffer contains three information units for every fault occurred:
  - Fault number and response
  - Time of the last occurrence
  - Frequency of successive occurrence

Note!

- If several faults with different responses occur at the same time, only the fault the response of which has the highest priority is entered in the history buffer.
  - Power supply module ECSxE:
    TRIP/KSB-TRIP (highest) → message → warning (lowest)
  - Axis module ECSxS/P/M/A:
    TRIP (highest) → message → FAIL-QSP → warning (lowest)
- If several faults with the same response occur at the same time, (e.g. two messages) only the fault that occurred first is entered in the history buffer.
- If a fault occurs several times in quick succession, only the time of the last occurrence is entered in the history buffer.

Assignment of information to the codes

Code and retrievable information				contains information on ...
C0168	C0169	C0170	Subcode	
Number and **response** of the fault message	**Time** of the last occurrence of the fault message	**Frequency** of the occurrence of the fault message	1	active fault
			2	last fault
			3	second-to-last fault
			4	third-to-last fault
			5	fourth-to-last fault
			6	fifth-to-last fault
			7	six-to-last fault
			8	seventh-to-last fault

10.2 Fault messages

10.2.1 Causes and remedies

Tip!

When the fault messages are retrieved via the system bus (CAN) they are displayed as a number (see column “fault number –number” in the following table).

Fault message		Description	Cause	Remedy
No.	Display			
---	---	No fault	–	–
0011	OC1	Short circuit in the DC bus	In case of a short circuit	• Find cause of short-circuit • Check DC bus wiring
			Charging current limitation of the axis module is active.	Do not use charging current limitation
0012	OC2	Earth fault in the DC bus	One of the DC bus cables has ground contact	Check DC bus wiring
			Insufficient DC bus capacitance	Increase capacitance
0013	OC3	Load of the DC bus during loading (from software version 2.3 onwards)	• Power drawn from the DC bus during charging • Max. charging current too low (C0022)	• Check system control/wiring • Increase max. charging current (C0022)
0014	OC4	Short circuit/overload of brake resistor or IGBT	• Brake IGBT defective • Brake resistor has low resistance • No brake resistor connected	• Check brake resistor • Replace device
0015	OC5	I x t overload	• Frequent and too long acceleration with overcurrent • Continuous overload with $I_{mains} > 1.05 \times I_r$	Check dimensioning
0016	OC6	Overload of internal brake resistor	• Brake resistor thermally overloaded, caused e.g. by frequent or too long braking processes • OC6 monitoring activated while an external brake resistor is used	• Use external brake resistor • Deactivate OC6 monitoring when an external brake resistor is used (C0579 = 3)
0020	OU	Overvoltage in the DC bus	Excessive braking energy (DC-bus voltage higher than 880 V)	• Use braking unit or regenerative module • Check brake resistor dimensioning
1031 2031	LP0	Mains voltage beyond the operating range	Mains voltage beyond range defined under C0173	• Check mains voltage • Adapt C0173

Fault message		Description	Cause	Remedy
No.	Display			
0032 1032 2032	LP1	Mains phase failure (as of operating system V2.0)	• No mains phase • Mains not sinusoidal • Voltage dips (”unstable mains supply”)	• Check mains voltage In the case of voltage dips: • Reduce charging current (C0022) • For ECS axis modules, set charge relay function C0175 = 3.
0050	OH	Heatsink temperature > 90 °C	Ambient temperature T_{amb} > +40 5C or > +50 5C	• Allow power supply module to cool and ensure better ventilation • Check ambient temperature in the control cabinet
			Heatsink very dirty	Clean heatsink
			Wrong mounting position	Change mounting position
0051	OH1	Internal device temperature > 90 °C	Ambient temperature T_{amb} > +40 5C or > +50 5C	• Allow power supply module to cool and ensure better ventilation • Check ambient temperature in the control cabinet
			Wrong mounting position	Change mounting position
0053	OH3	Overload of external brake resistor	External brake resistor too hot because of excessive currents or frequent and too long braking processes	Check dimensioning
			• No PTC/temperature contact connected • No jumper	Correct wiring
0062	CE1	Communication error at the process data input object CAN1_IN in cyclic operation (sync-controlled)	• CAN1_IN object receives faulty data • Communication is interrupted	• Check cable at X4 • Check transmitter • Increase monitoring time under C0357/1, if necessary
0063	CE2	Communication error at the process data input object CAN2_IN in event-controlled/cyclic operation without sync	• CAN2_IN object receives faulty data • Communication is interrupted	• Check cable at X4 • Check transmitter • Increase monitoring time under C0357/2, if necessary
0064	CE3	Communication error at the process data input object CAN3_IN in event-controlled/cyclic operation without sync	• CAN3_IN object receives faulty data • Communication is interrupted	• Check cable at X4 • Check transmitter • Increase monitoring time under C0357/3, if necessary
0065	CE4	Bus-off status of the system bus (CAN)	Power supply module has received too many faulty telegrams	• Check wiring and bus termination • Check shield contact of the cables • Check PE connection • Check bus load, reduce baud rate if necessary (observe cable length)
		Toggle bit error	Transmitter does not change toggle bit	Check transmitter
0070	U15	Undervoltage of external low-voltage supply	Voltage < 17 V	Check low-voltage supply
0071	CCr	System failure	Strong interference on control cables	Control cables must be shielded
			Earth loops in the wiring	PE wiring
0072	PR1	Checksum error in parameter set 1		Contact Lenze
0079	PR5	Internal fault (EEPROM)		Contact Lenze

Fault message		Description	Cause	Remedy
No.	Display			
0095	FAN1	Fan monitoring (only for built-in units ECSEE)	Heatsink fan ● blocked ● dirty ● defective	Eliminate cause
0105	H05	Internal fault (memory)		Contact Lenze
0106	H06	Internal fault (power stage)	During initialisation of the power supply module a wrong power stage has been detected	Contact Lenze
0260 1260 2260	NodeGuard Trp NodeGuard Msg NodeGuard Wrn	”Life Guarding Event”	The power supply module as CAN slave does not receive a node guarding telegram from the CAN master within the ”Node Life Time”.	● Check wiring at X4. ● Check CAN configuration ● Make sure that ”Node Guarding” has been activated in the CAN master. ● Adapt ”Node Life Time” (C0382, C0383) to the setting in the CAN master.

10.2.2 Reset fault messages (TRIP-RESET)

Reaction	Measures to reset the fault message
TRIP	**Note!** If a TRIP source is still active, the pending TRIP cannot be reset. The TRIP can be reset by: ● Press keypad XT EMZ9371 BC ⇨ STOP. Then, press RUN to re-enable the power supply module. ● Set C0043 = 0. ● System bus (CAN) control word: C0130/Bit 1 = 0 (LOW active) ● Control word AIF After the reset: ⇨ The power supply module is ready for operation again. ⇨ The charging of the DC bus is continued.
Short-circuit braking TRIP	● Short-circuit braking function activated via C0127: – The short-circuit braking TRIP is set for a TRIP not related to the brake resistor or IGBT. ● Reset like TRIP After the reset: ⇨ The power supply module is ready for operation again. ⇨ The charging of the DC bus is continued.
Message	**Danger!** After eliminating the cause of malfunction, the fault message is reset automatically. ⇨ The power supply module is ready for operation again. ⇨ The charging of the DC bus is continued. ⇨ The drive restarts automatically.
Warning	After eliminating the cause of malfunction, the fault message is reset automatically.

11 Appendix

11.1 Code list

C0001	Operating mode	
Selection list (Lenze setting printed in bold)		**Information**
0	**System bus (CAN) control word**	
1	Control via dig. inputs	

C0002	Load Lenze setting	
Note: The Lenze setting can only be loaded if the controller is inhibited.		
Selection list (Lenze setting printed in bold)		**Information**
0	**Load Lenze setting**	
1	Loading executed	

C0003	Save parameter set	
Selection list (Lenze setting printed in bold)		**Information**
0	**Saving executed**	
1	Save parameter set	

C0004	Selection of keypad XT status display	
The keypad XT displays the selected code in the operating level if no other status displays of C0183 are active. • Example: 53 = C0053 (DC-bus voltage)		
Setting range (min. value | unit | max. value)		**Lenze setting**
0	989	**53**

C0009	LECOM device address	
Device address for operation via AIF interface Communication modules on AIF interface: • LECOM-A/B/LI 2102 • PROFIBUS-DP 213x		
Setting range (min. value | unit | max. value)		**Lenze setting**
1	99	**1**

C0022	Max. charging current after power supply enable		
Setting range (min. value | unit | max. value)			**Lenze setting**
2.0	A	25.0 ECSxE040: 32.0 (from firmware V4.0)	**16.0 A**

C0023	Display of the peak current	
Note: Can be reset by writing C022		
Display range (min. value | unit | max. value)		**Information**
0.0 A 500.0		

C0024	Service code		
Note: Only the Lenze service is allowed to make changes!			
Setting range (min. value | unit | max. value)			**Lenze setting**
23	ms	10000	**50 ms**

C0028	Service code		
Note: Only the Lenze service is allowed to make changes!			
Setting range (min. value | unit | max. value)			**Lenze setting**
16	-	1216	**112**

C0029	Service code		
Note: Only the Lenze service is allowed to make changes!			
Setting range (min. value | unit | max. value)			**Lenze setting**
1	-	70	**28**

C0031	Service code		
Note: Only the Lenze service is allowed to make changes!			
Setting range (min. value | unit | max. value)			**Lenze setting**
40	-	100	**50**

C0040	Power supply enable - power supply module	
Selection list (Lenze setting printed in bold)		**Information**
0	Inhibit power supply module	
1	**Enable power supply module**	

C0043	Reset fault message	
Reset active fault message (TRIP-RESET)		
Selection list (Lenze setting printed in bold)		**Information**
0	**TRIP-RESET / no fault**	🕮 123
1	Fault active	

C0050	Mains voltage (U_{eff}) between phases L1-L2		
Display range (min. value | unit | max. value)			**Information**
-16383	V	16383	

C0051	Mains voltage (U_{eff}) between phases L2-L3		
Display range (min. value | unit | max. value)			**Information**
-16383	V	16383	

C0053	DC-bus voltage (U_G)		
Display range (min. value | unit | max. value)			**Information**
-32767	V	32767	

C0054	Mains current (r.m.s. value)		
Display range (min. value | unit | max. value)			**Information**
-1638.3	A	1638.3	

C0055	Voltage across brake resistor		
Display range (min. value | unit | max. value)			**Information**
-32767	V	32767	

C0057	Mains frequency		
Display range (min. value | unit | max. value)			**Information**
-3276.7	Hz	3276.7	

C0061	Heatsink temperature		
Display range (min. value | unit | max. value)			**Information**
-3276.7	°C	3276.7	

C0062	Interior device temp.		
Display range (min. value | unit | max. value)			**Information**
-3276.7	°C	3276.7	

C0064	Device utilisation (I x t)		

Device utilisation (I x t) over the last 180 s
- C0064 > 100 % activates OC5-TRIP.
- TRIP-RESET only is possible if C0064 < 95 %.

Display range (min. value | unit | max. value)			**Information**
0	%	65535	📖 109

C0065	External low-voltage supply (U_{24})		
Display range (min. value | unit | max. value)			**Information**
-1638.3	V	1638.3	

C0066	Load of internal brake resistor		
Display range (min. value | unit | max. value)			**Information**
0	W	65535	

C0093	Device identification (type)	
Display list		**Information**
0	No/unknown power section	
12	ECSxE012	
20	ECSxE020	
40	ECSxE040	

C0099	Firmware version		
Display range (min. value | unit | max. value)			**Information**
0.0		25.5	

C0125	LECOM baud rate (AIF)	
Baud rate for operation via AIF interface		
Selection list (Lenze setting printed in bold)		**Information**
0	**9600 bit/s**	
1	4800 bits/s	
2	2400 bits/s	
3	1200 bits/s	
4	19200 bits/s	

C0127	Function of integrated brake transistor	
Activation of brake chopper IGBT/fast discharge function (short-circuit braking)		
Selection list (Lenze setting printed in bold)		**Information**
0	**Brake chopper and short-circuit braking**	🕮 59
1	Only short-circuit braking	
2	Only brake chopper	
3	No function	

C0130	Control word "CTRL1" to power supply module		
Display range (min. value | unit | max. value)			**Information**
0x0000	hex	0xFFFF	🕮 99
Value is bit coded:			
Bit 0	Toggle bit		
Bit 1	TRIP-RESET (low active)		
Bit 2	Fast discharge (short-circuit braking)		
Bit3	Controller enable		
Bit4	Free		
...			
Bit 7			
Bit 8	Reserved		
Bit 9			
Bit10			
Bit11	Free		
...			
Bit15			

C0131	Status word 1 "Stat1" from power supply module		
Display range (min. value | unit | max. value)			**Information**
0x0000	hex	0xFFFF	📖 100
Value is bit coded:			
Bit 0	Ready for operation (RDY)		
Bit 1	Warning active		
Bit 2	Message active		
Bit3	TRIP active		
Bit4	Fast discharge (short-circuit braking)not possible		
Bit5	Fast discharge (short-circuit braking)I active		
Bit6	-UG relay closed		
Bit 7	+UG relay closed		
Bit 8	Reserved		
Bit 9			
Bit10			
Bit11	Power supply enable status X6/DI1		
Bit12	Controller enable status X6/DI2		
Bit13	Feedback of received toggle bit		
Bit14	Free		
Bit15	Free		

C0132	Status word 2 "Stat2" from power supply module		
The current fault number is transferred in status word 2.			
Display range (min. value | unit | max. value)			**Information**
-2147483647		2147483647	📖 100 📖 121

C0150	DCTRL status word 1	
Internal status word 1		
Display range (min. value | unit | max. value)		**Information**
0x0000	hex	0xFFFF
Value is bit coded:		
Bit 0	Discharge DC bus (U_G < 60 V)	
Bit 1	Pulse inhibit (IMP)	
Bit 2	I_{max} Limit current reached	
Bit3	Charging of the DC bus completed	
Bit4	Heatsink fan on/off	• 1 = the heatsink fan is switched on if the temperature of the heatsink or the device interior exceeds 50°C. • 0 = the heatsink fan is switched off if the temperature of the heatsink or the device interior falls below 45°C.
Bit5	I x t-warning active	
Bit6	I x t-limit reached	
Bit 7	Controller inhibit (CINH)	
Bit 8	Status code (binary, LSB)	
Bit 9	Status code (binary)	
Bit10	Status code (binary)	
Bit11	Status code (binary, MSB)	
Bit12	Free	
...		
Bit15		

C0151	DCTRL status word 2 (Highword)	
Internal status word 2		
Display range (min. value | unit | max. value)		**Information**
0x0000	hex	0xFFFF
Value is bit coded:		
Bit 0	Free	
...		
Bit3		
Bit4	Fault/TRIP active	
Bit5	Short-circ. brake TRIP active	
Bit6	Free	
Bit 7	LP1 warning active	
Bit 8	Power system ready (DC bus can be charged)	
Bit 9	No earth fault	
Bit10	Heatsink fan fault (FAN)	
Bit11	DC bus is charged from externally	
Bit12	Free	
...		
Bit15		

C0161	Current TRIP fault
Display list	**Information**
TRIP, short-circ. braking TRIP	📖 121

C0168	Fault history buffer
List of the fault messages occurred	
Display list	**Information**
TRIP, short-circ. braking-TRIP, message, warning	📖 120 📖 121
Subcodes	
C0168/1	Currently active fault message
C0168/2	Last fault message
C0168/3	Second to last fault message
C0168/4	Third last fault message
C0168/5	Fourth last fault message
C0168/6	Fifth last fault message
C0168/7	Sixth last fault message
C0168/8	Seventh last fault message

C0169	Fault memory time	
Time at which the fault messages entered in the history buffer (C0168) occurred. ● Respective status of the operating hour counter C0179		
Display range (min. value | unit | max. value)		**Information**
-214748	h	214748
Subcodes		
C0168/1		Currently active fault message
C0168/2		Last fault message
C0168/3		Second to last fault message
C0168/4		Third last fault message
C0168/5		Fourth last fault message
C0168/6		Fifth last fault message
C0168/7		Sixth last fault message
C0168/8		Seventh last fault message

C0170	Fault counter	
Frequency at which the fault messages entered in the history buffer (C0168) occurred.		
Display range (min. value | unit | max. value)		**Information**
0	65535	
Subcodes		
C0168/1		Currently active fault message
C0168/2		Last fault message
C0168/3		Second to last fault message
C0168/4		Third last fault message
C0168/5		Fourth last fault message
C0168/6		Fifth last fault message
C0168/7		Sixth last fault message
C0168/8		Seventh last fault message

C0173	Mains voltage selection	
Selection list (Lenze setting printed in bold)		**Information**
0	Operation on 230 V mains	📖 58
1	Operation on 400 V mains	
2	Operation on 460 V mains	
3	Operation on 480 V mains	
4	**Automatic determination**	

C0178	Elapsed-hour meter	
Time during which the power supply module was enabled.		
Display range (min. value | unit | max. value)		**Information**
-214748	h	214748

C0179	Power-on time meter	
Time when the DC bus was charged.		
Display range (min. value | unit | max. value)		**Information**
-214748	h	214748

C0183	Module diagnostics

- Display of fault or status information.
- If several pieces of fault or status information are available at the same time, the information with the lowest number is displayed.

Display list		Information
0	No fault	
101	Initialisation phase	
102	TRIP active	
104	Message active	
142	Pulse inhibit (IMP) active	
250	Warning active	

C0200	Firmware identification (ID)
Read only	

C0201	Firmware creation date
Read only	

C0204	Device serial number	
Display range (min. value | unit | max. value)		**Information**
-214748	h	214748

C0231	Hardware version	
Display range (min. value | unit | max. value)		**Information**
-214748	h	214748

C0235	Device - month of manufacture	
Display range (min. value | unit | max. value)		**Information**
-214748	h	214748

C0236	Device - year of manufacture		
Display range (min. value | unit | max. value)			**Information**
-214748	h	214748	

C0238	Version code	
Selection list (Lenze setting printed in bold)		**Information**
0	**Default**	

C0240	Overflow of elapsed-hour meter		
Display range (min. value | unit | max. value)			**Information**
0	h	4294967295	

C0241	Overflow of op. hour meter		
Display range (min. value | unit | max. value)			**Information**
0	h	4294967295	

C0349	DIP switch - system bus (CAN)		
Display of the DIP switch settings for the system bus (CAN)			
Display range (min. value | unit | max. value)			**Information**
0		63	🕮 90
Subcodes			
C0349/1			CAN node address
C0349/2			CAN baud rate

C0350	CAN node address		
Note: ● This code is not active if one of the switches 2 ... 7 of the DIP switch is set to "ON". (🕮 90) ● After the setting, a reset node is required.			
Setting range (min. value | unit | max. value)			**Lenze setting**
1		63	**32**

C0351	CAN baud rate	
Note: ● The baud rate must be set identically for all CAN nodes. ● This code is not active if one of the switches 2 ... 7 of the DIP switch is set to "ON". ● After the setting, a reset node is required.		
Selection list (Lenze setting printed in bold)		**Information**
0	**500 kbit/s**	🕮 90
1	250 kbit/s	
2	125 kbit/s	
3	50 kbit/s	
4	1000 kbit/s	

C0352	CAN master/slave boot-up configuration	
Note: After the setting, a reset node is required.		
Selection list (Lenze setting printed in bold)		**Information**
0	**Slave**	🕮 95
1	Master (CAN network PDO enable)	
2	Slave node guarding	

C0353	Mode CAN_IN/OUT ID creation (COB-IDs)	

Note:
- This code is not active if one of the switches 2 ... 7 of the DIP switch is set to "ON".
- After the setting, a reset node is required.

Selection list (Lenze setting printed in bold)		**Information**
0	**COB-ID = basic identifier + C0350**	🕮 88
1	COB-ID = 384 + C0354	🕮 93
Subcodes		
C0353/1		ID creation CAN1_IN/OUT (cyclic operation (sync-controlled))
C0353/2		ID creation CAN2_IN/OUT (reserved)
C0353/3		ID creation CAN3_IN/OUT (event-controlled/cyclic operation without sync)

C0354	CAN_IN/OUT ID offset	

ID offset for calculating individual COB-IDs: COB-ID = 384 + ID offset

Note:
- This code is not active if one of the switches 2 ... 7 of the DIP switch is set to "ON".
- After the setting, a reset node is required.

Setting range (min. value | unit | max. value)			**Information**
0		513	🕮 93
Subcodes	**Lenze setting**		
C0354/1	32		ID offset for COB-ID CAN1_IN
C0354/2	160		ID offset for COB-ID CAN1_OUT
C0354/3	288		ID offset for COB-ID CAN2_IN
C0354/4	289		ID offset for COB-ID CAN2_OUT
C0354/5	416		ID offset for COB-ID CAN3_IN
C0354/6	417		ID offset for COB-ID CAN3_OUT

C0355	CAN_IN/OUT identifier (COB-IDs)		
Display range (min. value | unit | max. value)			**Information**
0		2047	🕮 93
Subcodes			
C0355/1			COB-ID CAN1_IN
C0355/2			COB-ID CAN1_OUT
C0355/3			COB-ID CAN2_IN
C0355/4			COB-ID CAN2_OUT
C0355/5			COB-ID CAN3_IN
C0355/6			COB-ID CAN3_OUT

C0356	CAN time settings		
Setting range (min. value | unit | max. value)			**Information**
0	ms	65000	🕮 93
Subcodes	**Lenze setting**		
C0356/1	3000 ms		CAN boot-up time ● Delay time after mains connection for the initialisation by the master. ● Only valid if C0352 = 1 (master).
C0356/2	0 ms		Cycle time for CAN2_OUT ● No function (reserved)
C0356/3	0 ms		Cycle time for CAN3_OUT in cyclic operation (without sync) ● 0 ms = event-controlled data transmission (the output data will only be transmitted if a value changes in the output object)
C0356/4	20 ms		Delay time for transmitting process data via CAN2/3_OUT ● When the NMT status "Operational" (after "Pre-Operational") is reached, the delay time is started. After the delay time has elapsed, the PDO CAN2/3_OUT is transmitted for the first time.

C0357	CAN_IN monitoring times (CE1 ... CE3)		
Monitoring times for process data input objects ● If no telegram arrives within the time set, CE1 ... CE3-TRIP is enabled. ● Setting "0 ms" = monitoring is switched off			
Setting range (min. value | unit | max. value)			**Information**
0	ms	65000	🕮 110
Subcodes	**Lenze setting**		
C0356/1	0 ms		CAN1_IN monitoring time CE1 (cyclic operation (sync-controlled))
C0356/2	0 ms		CAN2_IN monit. time CE2 (reserved)
C0356/3	0 ms		CAN3_IN monitoring time CE3 (event-controlled/cyclic operation without sync)

C0358	CAN reset node	
Make a reset node for the CAN node.		
Selection list (Lenze setting printed in bold)		**Information**
0	**No function**	🕮 98
1	CAN reset	

C0359	CAN status	
Operating status of the system bus (CAN)		
Display list		**Information**
0	Operational	🕮 101
1	Pre-operational	
2	Warning	
3	Bus off	
4	Stopped	

C0360	CAN PDOs/mode selection	
Selection of CAN PDOs/mode for process data transfer via system bus (CAN)		
Selection list (Lenze setting printed in bold)		**Information**
		📖 96
0	CAN3_IN/OUT	event-controlled/cyclic without sync
1	**CAN1_IN/OUT**	cyclic (sync-controlled)

C0370	SDO Gateway	
Activate address gateway/remote parameterisation ● C0370 ≠ 0: All code write/read accesses are redirected to the CAN node with the CAN node address set here. ● The corresponding code is accessed to the parameter data channel 1 of the target device. ● C0370 = 0: remote parameterisation is deactivated		
Setting range (min. value | unit | max. value)		**Lenze setting**
0	63	**0**

C0382	CAN Node Guarding: ”Node Guard Time”	
Time interval of the status enquiry of the master (📖 97) ● Only relevant if C0352 = 2.		
Setting range (min. value | unit | max. value)		**Lenze setting**
0 ms	65535	**0**

C0383	CAN Node Guarding: ”Node Life Time Factor”	
Factor for monitoring time ”Node Life Time” (📖 97) ● Node Life Time = C0383 x C0382 ● Only relevant if C0352 = 2.		
Setting range (min. value | unit | max. value)		**Lenze setting**
0	255	**0**

C0384	Response - CAN node guarding	
Response to a ”Life Guarding Event” if no node guarding telegram has been received during ”Node Life Time” (C0382 x C0383). ● When C0382 = 0 or C0383 = 0, the monitoring function is not active (no node guarding fault message is enabled). ● Only relevant if C0352 = 2.		
Selection list (Lenze setting printed in bold)		**Information**
0	TRIP	📖 97
1	Message	
2	Warning	
3	**Off**	

C0390	Diagnostics via CAN (Lenze Service)	
Selection list (Lenze setting printed in bold)		**Information**
0	**Off**	
1	On	Conditions: C0360=0 and CAN bus Operational

C0400	A/D values	
Display range (min. value | unit | max. value)		**Information**
-214748	214748	
Subcodes		
C0400/1		Interior device temp.
C0400/2		Design ID of the power stage
C0400/3		External low-voltage supply
C0400/4		Mains current
C0400/5		Mains voltage L2_L3
C0400/6		Mains voltage L1_L2
C0400/7		Voltage across the brake resistor
C0400/8		DC-bus voltage

C0443	Status of digital inputs	
Display range (min. value | unit | max. value)		**Information**
0x0000	hex 0xFFFF	
Value is bit coded:		
Bit 0	X6/T1, T2	Temperature of ext. brake resistor
Bit 1	X6/DI2	Controller enable (axis module)
Bit 2	X6/DI1	Mains enable
Bit3	Heatsink fan	
Bit4	Thyristor driver (LOW-active)	
Bit5	Free	
...		
Bit15		

C0444	Status of digital outputs	
Display range (min. value | unit | max. value)		**Information**
0x0000	hex 0xFFFF	
Value is bit coded:		
Bit 0	Trigger signal - +UG-relay	
Bit 1	Trigger signal - -UG-relay	
Bit 2	Trigger signal - IGBT	
Bit3	Trigger signal - thyristor (LOW-active)	
Bit4	Internal signal ready for operation (RDY)	
Bit5	Status of green LED (LOW-active)	
Bit6	Status of red LED (LOW-active)	
Bit 7	Trigger signal - heatsink fan (LOW-active)	
Bit 8	IGBT gate driver Reset (LOW-active)	
Bit 9	Free	
...		
Bit15		

C0468	Function of power supply enable (X6/DI1)	
Note: The parameters can only be changed if the controller is inhibited.		
Selection list (Lenze setting printed in bold)		**Information**
0	Mains disconnection (slow discharge)	📖 60
1	**Mains disconnection and TRIP-RESET**	
2	Mains disconnection and fast discharge (short-circuit braking)	
3	Mains disconnection, fast discharge (short-circuit braking), and TRIP-RESET	

C0469	Function of keypad key "STOP" for ECSxE	
Note: The parameters can only be changed if the controller is inhibited.		
Selection list (Lenze setting printed in bold)		**Information**
0	No function	📖 60
1	**Mains disconnection (slow discharge)**	
2	Fast discharge (short-circuit braking)	

C0579	Response - monitoring of internal brake resistor (OC6)	
Monitoring response of the internal brake resistor (fault message OC6)		
Selection list (Lenze setting printed in bold)		**Information**
0	**TRIP**	📖 108
3	No response	

C0595	Response - bus-off/toggle bit monitoring (CE4)	
Bus-off/toggle bit monitoring response of the CAN bus (fault message CE4)		
Selection list (Lenze setting printed in bold)		**Information**
0	**TRIP**	📖 110
3	No response	

C0599	Delay time - system disturbance (LP1)		
If an LP1 warning or LP1 message is active for the set time, an LP1-TRIP is enabled. (📖 106) ● Value < 65535 ms: LP1-TRIP ● Value = 65535 ms: LP1 warning/LP1 message			
Setting range (min. value | unit | max. value)			**Lenze setting**
0	ms	65535	**65535**

C0866	Process data input words CAN1_IN		
Display range (min. value | unit | max. value)			**Information**
0x0000	hex	0xFFFF	
Value is bit coded:			
Bit 0			
...			
Bit15			
Subcodes	**Lenze setting**		
C0866/1	0		CAN1_IN.W0 (word 1, control word "Ctrl1")
C0866/2	0		CAN1_IN.W1 (word 2)

C0868	Process data output words CAN1_OUT		
Display range (min. value | unit | max. value)			**Information**
0x0000	hex	0xFFFF	
Value is bit coded:			
Bit 0			
...			
Bit15			
Subcodes	**Lenze setting**		
C0868/1	0		CAN1_OUT.W0 (word 1, status word 1 "Stat1")
C0868/2	0		CAN1_OUT.W1 (word 2, status word 2 "Stat2")

11.2 Table of attributes

The table of attributes contains information required for communicating with the ECSxE power supply module via parameters.

How to read the table of attributes:

Column		Meaning	Entry	
Code		Name of the Lenze code	Cxxxx	
Name		Parameter short text	Text	
Index	dec	Index under which the parameter is addressed. The subindex for array variables corresponds to the Lenze subcode number.	24575 - Lenze code number	Only required for control via bus system.
	hex		5FFFh - Lenze code number	
Data	DS	Data structure	E	Single variable (only one parameter element)
			A	Array variable (several parameter elements)
	DA	Number of array elements (subcodes)	Quantity	
	Data type	Indication of the data type	BITFIELD_8	1 byte bit coded
			BITFIELD_16	2 byte bit coded
			BITFIELD_32	4 byte bit coded
			INTEGER_8	1 byte with sign
			INTEGER_16	2 bytes with sign
			INTEGER_32	4 bytes with sign
			UNSIGNED_8	1 byte without sign
			UNSIGNED_16	2 bytes without sign
			UNSIGNED_32	4 bytes without sign
			VISIBLE_STRING	ASCII string
	Factor	Factor for data transmission via bus system, depending on the number of decimal positions	1, 10, 100, or 1000	1 ≡ no decimal position 10 ≡ 1 decimal position 100 ≡ 2 decimal positions 1000 ≡ 3 decimal positions
Access	R	Read access	✓ Reading allowed	
	W	Write access	✓ Writing allowed	
	CINH	Controller inhibit required	✓ Writing only possible when controller is inhibited	

Code	Name	Index		Data				Access		
		dec	hex	DS	DA	Data type	Factor	R	W	CINH
C0001	Operating mode	24574	5FFE	E	1	INTEGER_32	10000	✓	✓	
C0002	Load Lenze setting	24573	5FFD	E	1	INTEGER_32	10000	✓	✓	✓
C0003	Save parameter set	24572	5FFC	E	1	INTEGER_32	10000	✓	✓	
C0004	Selection of keypad XT status display	24571	5FFB	E	1	INTEGER_32	10000	✓	✓	
C0009	LECOM device address	24566	5FF6	E	1	INTEGER_32	10000	✓	✓	
C0022	Max. charging current after power supply enable	24553	5FE9	E	1	INTEGER_32	10000	✓	✓	
C0024	Service code	24551	5FE7	E	1	INTEGER_32	10000	✓	✓	
C0040	Power supply enable - power supply module	24535	5FD7	E	1	INTEGER_32	10000	✓	✓	
C0043	Reset fault message	24532	5FD4	E	1	INTEGER_32	10000	✓	✓	
C0050	Mains voltage (U_{eff}) between phases L1-L2	24525	5FCD	E	1	INTEGER_32	10000	✓		
C0051	Mains voltage (U_{eff}) between phases L2-L3	24524	5FCC	E	1	INTEGER_32	10000	✓		
C0053	DC-bus voltage (U_G)	24522	5FCA	E	1	INTEGER_32	10000	✓		
C0054	Mains current (r.m.s. value)	24521	5FC9	E	1	INTEGER_32	10000	✓		
C0055	Voltage across brake resistor	24520	5FC8	E	1	INTEGER_32	10000	✓		
C0057	Mains frequency	24518	5FC6	E	1	INTEGER_32	10000	✓		
C0061	Heatsink temperature	24514	5FC2	E	1	INTEGER_32	10000	✓		
C0062	Interior device temp.	24513	5FC1	E	1	INTEGER_32	10000	✓		

Code	Name	Index		Data				Access		
		dec	hex	DS	DA	Data type	Factor	R	W	CINH
C0064	Device utilisation (I x t)	24511	5FBF	E	1	INTEGER_32	10000	✓		
C0065	External low-voltage supply (U_{24})	24510	5FBE	E	1	INTEGER_32	10000	✓		
C0066	Load of internal brake resistor	24509	5FBD	E	1	INTEGER_32	10000	✓		
C0093	Device identification (type)	24482	5FA2	E	1	INTEGER_32	10000	✓		
C0099	Firmware version	24476	5F9C	E	1	INTEGER_32	10000	✓		
C0125	LECOM baud rate (AIF)	24450	5F82	E	1	INTEGER_32	10000	✓	✓	
C0127	Function of integrated brake transistor	24448	5F80	E	1	INTEGER_32	10000	✓	✓	
C0130	Control word "CTRL1" to power supply module	24445	5F7D	E	1	UNSIGNED_16	1	✓		
C0131	Status word 1 "Stat1" from power supply module	24444	5F7C	E	1	UNSIGNED_16	1	✓		
C0132	Status word 2 "Stat2" from power supply module	24443	5F7B	E	1	INTEGER_32	1	✓		
C0150	DCTRL status word 1	24425	5F69	E	1	UNSIGNED_16	1	✓		
C0151	DCTRL status word 2 (Highword)	24424	5F68	E	1	UNSIGNED_16	1	✓		
C0161	Current TRIP fault	24414	5F5E	E	1	INTEGER_32	10000	✓		
C0168	Fault history buffer	24407	5F57	A	8	INTEGER_32	10000	✓		
C0169	Fault memory time	24406	5F56	A	8	INTEGER_32	10000	✓		
C0170	Fault counter	24405	5F55	A	8	INTEGER_32	10000	✓		
C0173	Mains voltage selection	24402	5F52	E	1	INTEGER_32	10000	✓	✓	
C0178	Elapsed-hour meter	24397	5F4D	E	1	INTEGER_32	10000	✓		
C0179	Power-on time meter	24396	5F4C	E	1	INTEGER_32	10000	✓		
C0183	Module diagnostics	24392	5F48	E	1	INTEGER_32	10000	✓		
C0200	Firmware identification (ID)	24375	5F37	E	1	VISIBLE_STRING		✓		
C0201	Firmware creation date	24374	5F36	E	1	VISIBLE_STRING		✓		
C0204	Device serial number	24371	5F33	E	1	INTEGER_32	10000	✓		
C0231	Hardware version	24344	5F18	E	1	INTEGER_32	10000	✓		
C0235	Device - month of manufacture	24340	5F14	E	1	INTEGER_32	10000	✓		
C0236	Device - year of manufacture	24339	5F13	E	1	INTEGER_32	10000	✓		
C0238	Version code	24337	5F11	E	1	INTEGER_32	10000	✓		
C0240	Overflow of elapsed-hour meter	24335	5F0F	E	1	UNSIGNED_32	1	✓		
C0241	Overflow of op. hour meter	24334	5F0E	E	1	UNSIGNED_32	1	✓		
C0349	DIP switch - system bus (CAN)	24226	5EA2	A	2	INTEGER_32	10000	✓		
C0350	CAN node address	24225	5EA1	E	1	INTEGER_32	10000	✓	✓	
C0351	CAN baud rate	24224	5EA0	E	1	INTEGER_32	10000	✓	✓	
C0352	CAN master/slave boot-up configuration	24223	5E9F	E	1	INTEGER_32	10000	✓	✓	
C0353	Mode CAN_IN/OUT ID creation (COB-IDs)	24222	5E9E	A	3	INTEGER_32	10000	✓	✓	
C0354	CAN_IN/OUT ID offset	24221	5E9D	A	6	INTEGER_32	10000	✓	✓	
C0355	CAN_IN/OUT identifier (COB-IDs)	24220	5E9C	A	6	INTEGER_32	10000	✓		
C0356	CAN time settings	24219	5E9B	A	4	INTEGER_32	10000	✓	✓	
C0357	CAN_IN monitoring times (CE1 ... CE3)	24218	5E9A	A	3	INTEGER_32	10000	✓	✓	
C0358	CAN reset node	24217	5E99	E	1	INTEGER_32	10000	✓	✓	
C0359	CAN status	24216	5E98	E	1	INTEGER_32	10000	✓		
C0360	CAN PDOs/mode selection	24215	5E97	E	1	INTEGER_32	10000	✓	✓	
C0370	SDO Gateway	24205	5E8D	E	1	INTEGER_32	10000	✓	✓	
C0382	CAN Node Guarding: "Node Guard Time"	24193	5E81	E	1	INTEGER_32	10000	✓	✓	

Code	Name	Index		Data				Access		
		dec	hex	DS	DA	Data type	Factor	R	W	CINH
C0383	CAN Node Guarding: "Node Life Time Factor"	24192	5E80	E	1	INTEGER_32	10000	✓	✓	
C0384	Response - CAN Node Guarding	24191	5E7F	E	1	INTEGER_32	10000	✓	✓	
C0400	A/D values	24175	5E6F	A	8	INTEGER_32	10000	✓		
C0443	Status of digital inputs	24132	5E44	E	1	UNSIGNED_16	1	✓		
C0444	Status of digital outputs	24131	5E43	E	1	UNSIGNED_16	1	✓		
C0468	Function of power supply enable (X6/DI1)	24107	5E2B	E	1	INTEGER_32	10000	✓	✓	✓
C0469	Function of keypad key "STOP" for ECSxE	24106	5E2A	E	1	INTEGER_32	10000	✓	✓	✓
C0579	Response - monitoring of internal brake resistor (OC6)	23996	5DBC	E	1	INTEGER_32	10000	✓	✓	
C0595	Response - bus-off/toggle bit monitoring (CE4)	23980	5DAC	E	1	INTEGER_32	10000	✓	✓	
C0599	Delay time - system disturbance (LP1)	23976	5DA8	E	1	INTEGER_32	10000	✓	✓	
C0866	Process data input words CAN1_IN	23709	5C9D	A	2	UNSIGNED_16	1	✓	✓	
C0868	Process data output words CAN1_OUT	23707	5C9B	A	2	UNSIGNED_16	1	✓	✓	

11.3 Overview of accessories

The accessories are not included in the scope of supply. Lenze's basic devices and accessories are carefully matched to each other. With the basic device and the accessories, all components for a complete drive system are available. The component selection must be matched to the respective application.

11.3.1 Connector sets

To make purchasing easy, the connector sets are available as separate delivery units for the ECS power supply, capacitor and axis modules:

- ECSZ**E**000X0B (connector set for ECS power supply modules)
- ECSZ**K**000X0B (connector set for ECS capacitor modules)
- ECSZ**A**000X0B (connector set for ECS axis modules)

11.3.2 Shield mounting kit

The shield mounting kit ECSZS000X0B001 contains components for reliable and quick fixing of the cable shields. The scope of supply includes:

- Shield sheet for motor cable
- Wire clamp for shield connection of motor cable
- Wire clamp for shield connection of control cables
- Wire clamp for shield connection of motor monitoring cable

11.3.3 Axis modules

For the control of a drive axis:

- ECSx☐004
- ECSx☐008
- ECSx☐016
- ECSx☐032
- ECSx☐048
- ECSx☐064

x	Design/mounting technology:	E = standard installation	D = push-through technique
		C = cold-plate technique	
Lenze	Application software:	S = Speed & Torque	P = Posi & Shaft
		M = Motion	A = Application

11.3.4 Capacitor modules

For backing up the DC-bus voltage for the drive system:

- ECSXK001
- ECSxK002

x Design/mounting technology: E = standard installation
C = cold-plate technique
D = push-through technique

11.3.5 Components for operation and communication

Operating and communication modules

Operating/communication module	Type/order number	Can be used together with	
		ECSxE	ECSxS/P/M/A
Keypad XT	EMZ9371BC	✓	✓
Diagnosis terminal (keypad XT with hand-held)	E82ZBBXC	✓	✓
LECOM-A (RS232)	EMF2102IB-V004	✓	✓
LECOM-B (RS485)	EMF2102IB-V002	✓	✓
LECOM-A/B (RS232/485)	EMF2102IB-V001	✓	✓
LECOM-LI (optical fibre)	EMF2102IB-V003	✓	✓
LON	EMF2141IB	–	✓
INTERBUS	EMF2113IB	–	✓
PROFIBUS-DP	EMF2133IB	–	✓
CANopen/DeviceNet	EMF2178IB, EMF2179IB	–	✓

System bus components

PC system bus adapter	Type/order number
Voltage supply via DIN connection	EMF2173IB
Voltage supply via PS2 connection	EMF2173IB-V002
Voltage supply via PS2 connection (electrical isolation to CAN bus)	EMF2173IB-V003
USB system bus adapter	EMF2177IB

Components for digital frequency coupling

Digital frequency distributor/cables	Type/order number
Digital frequency distributor	EMF2132IB
Master digital frequency cable	EYD0017AxxxxW01W01 [1]
Slave digital frequency cable	EYD0017AxxxxW01W01 [1]

[1] ”xxxx” = Cable length in decimetre (example: ”xxxx” = ”0015” → length = 15 dm)

11.3.6 Brake resistor

Assignment of external brake resistors

Brake resistor	Ω	P_d [kW]	Power supply module								
			ECSEE...			ECSDE...			ECSCE...		
			012	020	040	012	020	040	012	020	040
ERBM082R100W	82	0.10							●		
ERBM039R120W	39	0.12								●	
ERBM020R150W	20	0.15									●
ERBD082R600W	82	0.60	●			●			●		
ERBD047R01K2	47	1.20		●			●			●	
ERBD022R03K0	22	3.00			●			●			●
ERBS082R780W	82	0.78	●			●			●		
ERBS039R01K6	39	1.64		●			●			●	
ERBS020R03K2	20	3.20			●			●			●

P_d Continuous power

Brake resistors of type ERBM...

Brake resistors with specifically adapted pulse capability in IP50 design

Rated data	Type	Brake resistor		
		ERBM082R100W	ERBM039R120W	ERBM020R150W
Resistance	R_B [Ω]	82	39	20
Continuous power	P_d [W]	100	120	150
Thermal capacity	C_B [kWs]	3	6	13
Max. on-time	t_e [s]	5		
Required recovery time	t_a [s]	90		
Operating voltage	U_{max} [V_{DC}]	1000		
Max. braking power	P_{Bmax} [kW]	$P_{Bmax} = \frac{\text{Thermal capacity } C_B}{\text{On} - \text{time}}$		

Brake resistors of type ERBD...

Brake resistors with increased power loss in IP20 design (protection against accidental contact acc. to NEMA 250 type 1)

Rated data	Type	Brake resistor		
		ERBD082R600W	ERBD047R01K2	ERBD022R03K0
Resistance	R_B [Ω]	82	47	22
Continuous power	P_d [W]	600	1200	3000
Thermal capacity	C_B [kWs]	87	174	375
Max. on-time	t_e [s]	15		
Required recovery time	t_a [s]	135		
Operating voltage	U_{max} [V_{DC}]	800		
Max. braking power	P_{Bmax} [kW]	$P_{Bmax} = \frac{\text{Thermal capacity } C_B}{\text{On} - \text{time}}$		

Brake resistors of type ERBS...

Brake resistors with increased power loss in IP65 design (NEMA 250 type 4x)

Rated data	Type	Brake resistor		
		ERBS082R780W	ERBS039R01K6	ERBS020R03K2
Resistance	R_B [Ω]	82	39	20
Continuous power	P_d [W]	780	1640	3200
Thermal capacity	C_B [kWs]	117	246	480
Max. on-time	t_e [s]	15		
Required recovery time	t_a [s]	135		
Operating voltage	U_{max} [V_{DC}]	800		
Max. braking power	P_{Bmax} [kW]	$P_{Bmax} = \frac{\text{Thermal capacity } C_B}{\text{On} - \text{time}}$		

11.3.7 Mains fuses

Fuses are not offered by Lenze. Please use standard fuses.

Observe the national and regional regulations (VDE, UL, EVU, ...).

Only circuit-breakers or UL-approved fuses can be used for cable protection.

In UL-approved systems, only UL-approved cables, fuses and fuse holders are to be used.

11.3.8 Mains chokes

It is not mandatory to use a mains choke for operating the ECS modules. The respective application determines whether a mains choke is required or not.

Advantages when using a mains choke:

- Lower system perturbations
  - The waveform of the mains current is approximated to the sinusoidal shape.
  - Reduction of the effective mains current by up to 25%.
  - Reduction of the mains, cable and fuse load.
- The effective DC-bus current also decreases by up to 25%.
- Increased service life of the connected axis modules
  - A mains choke reduces the AC current load of the DC-bus capacitors and thus increases their service life.
- Low-frequency radio interference voltages are reduced.

Please note:

- With mains choke operation the maximally possible output voltage does not fully reach the value of the mains voltage.
- For operation of drives for accelerating duty with high peak currents, it is recommended to use mains chokes with linear L/I characteristic (Lenze types ELN3...).
- The choke rating is to be checked and adapted to the respective conditions.

Mains chokes for the power supply modules:

Power supply module type	Mains choke type	I_r [A]	L_r [mH]	Short-circuit voltage (U_k)
ECSxE012	ELN3-0150H024	3 x 24	3 x 1.5	4 %
ECSxE020	ELN3-0088H035	3 x 35	3 x 0.88	
ECSxE040	ELN3-0055H055	3 x 55	3 x 0.55	

11.3.9 RFI filters

According to the application, different measures for reducing the mains current and for radio interference suppression are required on the supply side for servo systems. As a rule, these measures are not mandatory, but protect the universal application of a servo system.

Lenze offers a built-on filter for each power supply module for the interference level A. The RFI filters are designed for the ECS power supply module assigned and up to 10 axes with a motor cable length of 25 m each (Lenze system cable). The interference level A is observed as long as the motor cable length per axis module is 25 m at a maximum (Lenze sytem cables) and the number of the ECS axis modules is maximally 10.

RFI filter type	ECS power supply module type
ECSZZ020X4B	ECSxE012
	ECSxE020
ECSZZ040X4B	ECSxE040

Type of RFI filter	U [V]	I [A]	P_{loss} [W]	Weight [kg]
ECSZZ020X4B	3/PE AC 500 V at 50 ... 60 Hz	16	6.2	3.0
ECSZZ040X4B		32	9.3	

U Rated mains voltage
I Rated mains current
P_{loss} Power loss

11.3.10 Motors

Matched motors can be obtained under the following type designations:

- MCA series asynchronous motor (high speeds by means of wide field weakening range)
- MCS series synchronous motor (for high-dynamic applications)
- MDxMA series asynchronous motor (cost-effective)

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