

Lenze

EN *Operating Instructions*



smd - frequency inverter
0.37 kW... 22 kW

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All information given in this documentation has been carefully selected and tested for compliance with the hardware and software described. Nevertheless, discrepancies cannot be ruled out. We do not accept any responsibility nor liability for damages that may occur. Any necessary corrections will be implemented in subsequent editions.

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About these instructions

This documentation applies to the *smd* frequency inverter, and contains important technical data and describes installation, operation, and commissioning.

These instructions are only valid for *smd* frequency inverters with software rev 20 (see drive nameplate).

Please read the instructions before commissioning.



V0011

A Certifications

C Input Ratings

E Hardware Version

B Type

D Output Ratings

F Software Version

Scope of delivery	Important
<ul style="list-style-type: none"> 1 <i>smd</i> inverter (ESMD...) with EPM installed (see Section 4.2) 1 Operating Instructions 	<p>After receipt of the delivery, check immediately whether the items delivered match the accompanying papers. Lenze does not accept any liability for deficiencies claimed subsequently.</p> <p>Claim</p> <ul style="list-style-type: none"> visible transport damage immediately to the forwarder. visible deficiencies/incompleteness immediately to your Lenze representative.

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1 Safety information

General

Some parts of Lenze controllers (frequency inverters, servo inverters, DC controllers) can be live, moving and rotating. Some surfaces can be hot.

Non-authorized removal of the required cover, inappropriate use, and incorrect installation or operation creates the risk of severe injury to personnel or damage to equipment.

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 VDE0110 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 installation, assembly, commissioning, and operation of the product and who have the qualifications necessary for their occupation.

Application as directed

Drive controllers are components which are designed for installation in electrical systems or machinery. They are not to be used as appliances. They are intended exclusively for professional and commercial purposes according to EN 61000-3-2. The documentation includes information on compliance with the EN 61000-3-2.

When installing the drive controllers in machines, commissioning (i.e. the 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 (2004/108/EC).

The drive controllers meet the requirements of the Low Voltage Directive 2006/95/EC. The harmonised standards of the series EN 50178/DIN VDE 0160 apply to the controllers.

Note: The availability of controllers is restricted according to EN 61800-3. These products can cause radio interference in residential areas. In this case, special measures can be necessary.

Installation

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.

Controllers 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 drive controllers, applicable national regulations for the prevention of accidents (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, grounding, filters and cables). These notes must also be observed for CE-marked controllers.

The manufacturer of the system or machine is responsible for compliance with the required limit values demanded by EMC legislation.



Safety information

Operation

Systems including controllers must be equipped with additional monitoring and protection devices according to the corresponding standards (e.g. technical equipment, regulations for prevention of accidents, etc.). You are allowed to adapt the controller to your application as described in the documentation.



DANGER!

- After the controller has been disconnected from the supply voltage, live components and power connection must not be touched immediately, since capacitors could be charged. Please observe the corresponding notes on the controller.
- Do not continuously cycle input power to the controller more than once every three minutes.
- Please close all protective covers and doors during operation.

Explosion Proof Applications

Explosion proof motors that are not rated for inverter use lose their certification when used for variable speed. Due to the many areas of liability that may be encountered when dealing with these applications, the following statement of policy applies:

Lenze AC Tech Corporation inverter products are sold with no warranty of fitness for a particular purpose or warranty of suitability for use with explosion proof motors. Lenze AC Tech Corporation accepts no responsibility for any direct, incidental or consequential loss, cost or damage that may arise through the use of AC inverter products in these applications. The purchaser expressly agrees to assume all risk of any loss, cost or damage that may arise from such application.

Note for UL approved system with integrated controllers

UL warnings are notes which apply to UL systems. The documentation contains special information about UL.



Warnings!

- Suitable for use on a circuit capable of delivering not more than 5000 rms symmetrical amperes, 240 V maximum (240 V devices) or 500 V maximum (400/500 V devices) respectively
- Use class 1 wiring with minimum 75 °C copper wire only.
- Shall be installed in a pollution degree 2 macro-environment.

1.1 Pictographs used in these instructions

Pictograph	Signal word	Meaning	Consequences if ignored
	DANGER!	Warning of Hazardous Electrical Voltage.	Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
	WARNING!	Impending or possible danger for persons	Death or injury
	STOP!	Possible damage to equipment	Damage to drive system or its surroundings
	Note	Useful tip: If observed, it will make using the drive easier	



2 Technical data

2.1 Standards and application conditions

Conformity	CE	Low Voltage Directive (2006/95/EC)	
Approvals	UL 508C	Underwriters Laboratories - Power Conversion Equipment	
Max. permissible motor cable length ⁽¹⁾	shielded:	50 m (low-capacitance)	
	unshielded:	100 m	
Input voltage phase imbalance	≤ 2%		
Humidity	≤ 95% non-condensing		
Output frequency	0...500 Hz		
Environmental conditions	Class 3K3 to EN 50178		
Temperature range	Transport	-25 ... +70 °C	
	Storage	-20 ... +70 °C	
	Operation	0 ... +55 °C (with 5 %/°C current derating above +40 °C)	
Installation height	0 ... 4000 m a.m.s.l. (with 5 %/1000 m current derating above 1000 m a.m.s.l.)		
Vibration resistance	acceleration resistant up to 0.7 g		
⚠ Earth leakage current	> 3.5 mA to PE		
Enclosure (EN 60529)	IP 20		
Protection measures against	short circuit, earth fault, overvoltage, motor stalling, motor overload		
Operation in public supply networks (Limitation of harmonic currents)	Total power connected to the mains	Compliance with the requirements ⁽²⁾	
	EN 61000-3-2	< 0.5 kW	With mains choke
		0.5 ... 1 kW	With active filter (in preparation)
		> 1 kW	Without additional measures
EN 61000-3-12	16 ... 75A	Additional measures are required for compliance with the standard	
Supply Conditions	AC Mains	Direct Connection	
Power System	TT	For central grounded systems operation is permitted without restrictions	
	TN	For corner grounded 400/500V systems, operation is possible, but reinforced insulation to control circuits is compromised.	
	IT Mains	IT Mains power systems are not supported.	

(1) For compliance with EMC regulations, the permissible cable lengths may change.

(2) The additional measures described only ensure that the controllers meet the requirements of the EN 61000-3-2. The machine/system manufacturer is responsible for the compliance with the regulations of the machine.



Technical data

2.2 Ratings

Type	Power [kW]	Mains				Output Current ⁽³⁾							
		Voltage, frequency		Current [A] ⁽³⁾		I _N		I _{max} for 60 s					
						[A] ⁽¹⁾	[A] ⁽²⁾	[A] ⁽¹⁾	[A] ⁽²⁾	[A] ⁽¹⁾	[A] ⁽²⁾		
ESMD371L2YXA	0.37	1/N/PE 230 V OR 3/PE 230 V (180 V -0%...264 V +0%)		1~	3~	3~	3~	3~	3~	3~	3~	3~	
ESMD751L2YXA	0.75			4.7	2.7	2.2	2.0	3.3	3.0				
ESMD112L2YXA	1.1	50/60 Hz (48 Hz -0%...62 Hz +0%)		8.4	4.8	4.0	3.7	6.0	5.6				
ESMD152L2YXA	1.5			12.0	6.9	6.0	5.5	9.0	8.3				
ESMD222L2YXA	2.2	3/PE 230 V (180 V -0%...264 V +0%)		12.9	7.9	6.8	6.3	10.2	9.5				
ESMD302L2TXA	3.0			17.1	10.8	9.6	8.8	14.4	13.2				
ESMD402L2TXA	4.0	50/60 Hz (48 Hz -0%...62 Hz +0%)		13.5	12.0	11.0	18.0	16.5					
ESMD552L2TXA	5.5			17.1	15.2	14.0	23	21					
ESMD752L2TXA	7.5	3/PE 400/480 V (320 V -0%...528 V +0%)		25	22	20	33	30					
ESMD113L2TXA	11			32	28	26	42	39					
ESMD153L2TXA	15	50/60 Hz (48 Hz -0%...62 Hz +0%)		48	42	39	63	58					
ESMD223L2TXA	22			59	54	50	81	75					
				400V	480V	400V	480V	400V	480V	400V	480V	400V	480V
ESMD371L4TXA	0.37	3/PE 400/480 V (320 V -0%...528 V +0%) 50/60 Hz (48 Hz -0%...62 Hz +0%)		1.6	1.4	1.3	1.1	1.2	1.0	2.0	1.7	1.8	1.5
ESMD751L4TXA	0.75			3.0	2.5	2.5	2.1	2.3	1.9	3.8	3.2	3.5	2.9
ESMD112L4TXA	1.1			4.3	3.6	3.6	3.0	3.3	2.8	5.4	4.5	5.0	4.2
ESMD152L4TXA	1.5			4.8	4.0	4.1	3.4	3.8	3.1	6.2	5.1	5.7	4.7
ESMD222L4TXA	2.2			6.4	5.4	5.8	4.8	5.3	4.4	8.7	7.2	8.0	6.6
ESMD302L4TXA	3.0			8.3	7.0	7.6	6.3	7.0	5.8	11.4	9.5	10.5	8.7
ESMD402L4TXA	4.0			10.6	8.8	9.4	7.8	8.6	7.2	14.1	11.7	12.9	10.8
ESMD552L4TXA	5.5			14.2	12.4	12.6	11.0	11.6	10.1	18.9	16.5	17.4	15.2
ESMD752L4TXA	7.5			18.1	15.8	16.1	14.0	14.8	12.9	24	21	22	19.4
ESMD113L4TXA	11			27	24	24	21	22	19.3	36	32	34	29
ESMD153L4TXA	15			35	31	31	27	29	25	47	41	43	37
ESMD183L4TXA	18.5			44	38	39	34	36	31	59	51	54	47
ESMD223L4TXA	22			52	45	46	40	42	37	69	60	64	55

(1) For rated mains voltage and carrier frequencies 4, 6, and 8 kHz

(2) For rated mains voltage and carrier frequency 10 kHz

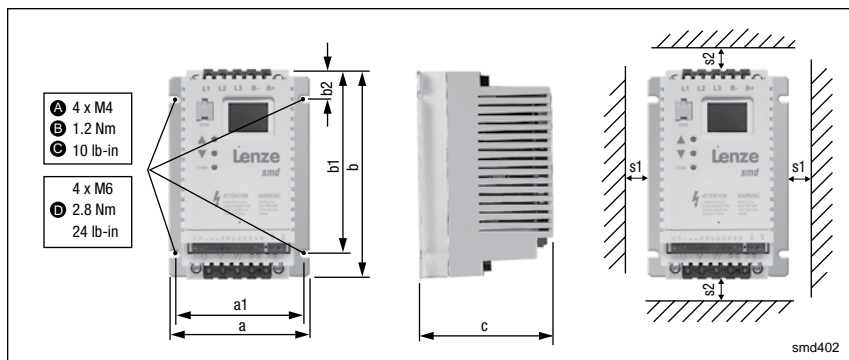
(3) Maximum current is a function of setting C90 (input voltage selection)



3 Installation

3.1 Mechanical installation

3.1.1 Dimensions and mounting



Type		a	a1	b	b1	b2	c	s1	s2	m
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[kg]
A	ESMD371L2YXA ESMD371L4TXA	93	84	146	128	17	100	15	50	0.6
	ESMD751L2YXA ESMD751L4TXA	93	84	146	128	17	120	15	50	0.9
	ESMD112L4TXA	93	84	146	128	17	146	15	50	1.0
B	ESMD112L2YXA	114	105	146	128	17	133	15	50	1.4
	ESMD152L4TXA	114	105	146	128	17	122	15	50	1.4
	ESMD222L4TXA	114	105	146	128	17	139	15	50	1.4
	ESMD152L2YXA, ESMD222L2YXA ESMD302L2TXA ESMD302L4TXA	114	105	146	128	17	171	15	50	2.0
	ESMD402L2TXA ESMD402L4TXA, ESMD552L4TXA	114	105	146	100	17	171	15	50	2.0
	ESMD552L2TXA, ESMD752L2TXA ESMD752L4TXA, ESMD113L4TXA	146	137	197	140	17	182	30	100	3.2
D	ESMD113L2TXA, ESMD153L2TXA ESMD153L4TXA... ESMD223L4TXA	195	183	248	183	23	203	30	100	6.4



WARNING!

Drives must not be installed where subjected to adverse environmental conditions such as: combustible, oily, or hazardous vapors or dust; excessive moisture; excessive vibration or excessive temperatures. Contact Lenze for more information.



Installation

3.2 Electrical installation

3.2.1 Installation according to EMC requirements

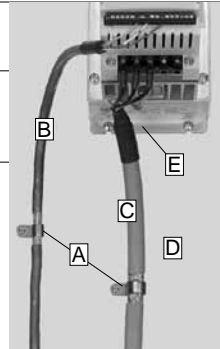
EMC

Compliance with EN 61800-3/A11

Noise emission

Compliance with limit value class A according to EN 55011 if installed in a control cabinet with the appropriate footprint filter and the motor cable length does not exceed 10m

- A** Screen clamps
- B** Control cable
- C** Low-capacitance motor cable
(core/core ≤ 75 pF/m, core/screen ≤ 150 pF/m)
- D** Electrically conductive mounting plate
- E** Filter



Tmd005

3.2.2 Fuses/cable cross-sections⁽¹⁾

Type		Recommendations					E.I.c.b. ⁽²⁾
		Fuse	Miniature circuit breaker ⁽⁵⁾	Fuse ⁽³⁾ or Breaker ⁽⁶⁾	Input Power Wiring (L1, L2/N, L3, PE)		
				(N. America)	[mm ²]	[AWG]	
1/N/PE	ESMD371L2YXA	M10 A	C10 A	10 A	2.5	14	≥ 30 mA
	ESMD751L2YXA	M16 A	C16 A	15 A	2.5	14	
	ESMD112L2YXA	M20 A	C20 A	20 A	4 ⁽⁴⁾	12	
	ESMD152L2YXA	M25 A	C25 A	25 A	6 ⁽⁴⁾	12	
	ESMD222L2YXA	M32 A	C32 A	30 A	4	10	
3/PE	ESMD371L2YXA ... ESMD751L2YXA ESMD371L4TXA ... ESMD222L4TXA	M10 A	C10 A	10 A	2.5	14	
	ESMD112L2YXA, ESMD152L2YXA ESMD302L4TXA	M16 A	C16 A	12 A	2.5	14	
	ESMD222L2YXA	M16 A	C16 A	15 A	2.5	12	
	ESMD402L4TXA	M16 A	C16 A	15 A	2.5	14	
	ESMD302L2TXA ESMD552L4TXA	M20 A	C20 A	20 A	4 ⁽⁴⁾	12	
	ESMD402L2TXA ESMD752L4TXA	M25 A	C25 A	25 A	6 ⁽⁴⁾	10	
	ESMD552L2TXA ESMD113L4TXA	M40 A	C40 A	35 A	6	8	
	ESMD752L2TXA ESMD153L4TXA	M50 A	C50 A	45 A	10	8	
	ESMD183L4TXA	M63 A	C63 A	60 A	16	6	
	ESMD113L2TXA ESMD223L4TXA	M80 A	C80 A	70 A	16	6	
	ESMD153L2TXA	M100 A	C100 A	90 A	16	4	

(1) Observe the applicable local regulations.

(2) Pulse-current or universal-current sensitive earth leakage circuit breaker.

(3) UL Class CC or T fast-acting current-limiting type fuses, 200,000 AIC, required. Bussman KTK-R, JJJ, JJS or equivalent.

(4) Connection without end ferrules or with attached pin end connectors.

(5) Installations with high fault current due to large supply mains may require a type D circuit breaker.

(6) Thermomagnetic type breakers preferred.



Observe the following when using E.I.c.b:

- Installation of E.I.c.b only between supplying mains and controller.
- The E.I.c.b can be activated by:
 - capacitive leakage currents between the cable screens during operation (especially with long, screened motor cables)
 - connecting several controllers to the mains at the same time
 - RFI filters

Installation After a Long Period of Storage



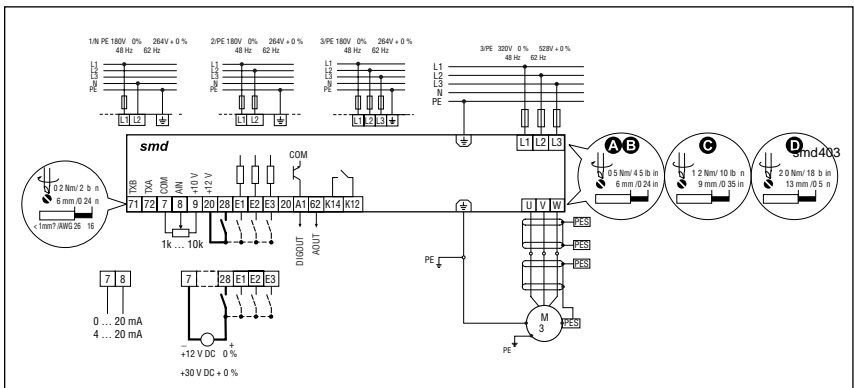
STOP!

Severe damage to the drive can result if it is operated after a long period of storage or inactivity without reforming the DC bus capacitors.

If input power has not been applied to the drive for a period of time exceeding three years (due to storage, etc), the electrolytic DC bus capacitors within the drive can change internally, resulting in excessive leakage current. This can result in premature failure of the capacitors if the drive is operated after such a long period of inactivity or storage.

In order to reform the capacitors and prepare the drive for operation after a long period of inactivity, apply input power to the drive for 8 hours prior to actually operating the motor.

3.2.3 Connection diagram



DANGER!

- Hazard of electrical shock! Circuit potentials are up to 240 VAC above earth ground. Capacitors retain charge after power is removed. Disconnect power and wait until the voltage between B+ and B- is 0 VDC before servicing the drive.
- Do not connect mains power to the output terminals (U, V, W)! Severe damage to the drive will result.
- Do not cycle mains power more than once every three minutes. Damage to the drive will result.



STOP!

If the kVA rating of the AC supply transformer is greater than 10 times the input kVA rating of the drive(s), an isolation transformer or 2-3% input line reactor must be added to the line side of the drive(s).



Installation

3.2.4 Control terminals

Terminal	Data for control connections (printed in bold = Lenze setting)		
71	RS-485 serial communication input	RXB/TXB (B+)	
72	RS-485 serial communication input	RXA/TXA (A-)	
7	Reference potential		
8	Analog input 0 ... 10 V (changeable under C34)	input resistance: >50 k Ω (with current signal: 250 Ω)	
9	Internal DC supply for setpoint potentiometer	+10 V, max. 10 mA	
20	Internal DC supply for digital inputs	+12 V, max. 20 mA	
28	Digital input Start/Stop	LOW = Stop HIGH = Run Enable	R _i = 3.3 k Ω
E1	Digital input configurable with CE1 Activate fixed setpoint 1 (JOG1)	HIGH = JOG1 active	
E2	Digital input configurable with CE2 Direction of rotation	LOW = CW rotation HIGH = CCW rotation	
E3	Digital input configurable with CE3 Activate DC injection brake (DCB)	HIGH = DCB active	
A1	Digital output configurable with c17	DC 24 V / 50 mA; NPN	
62	Analog output configurable with c08 & c11		
K14	Relay output (normally-open contact) Configurable with C08	AC 250 V / 3 A	
K12	Fault (TRIP)	DC 24 V / 2 A ... 240 V / 0.22 A	

LOW = 0 ... +3 V, HIGH = +12 ... +30 V

Protection against contact

- All terminals have basic isolation (single insulating distance)
- Protection against contact can only be ensured by additional measures (i.e. double insulation)



STOP!

In the case of a Spinning Motor:

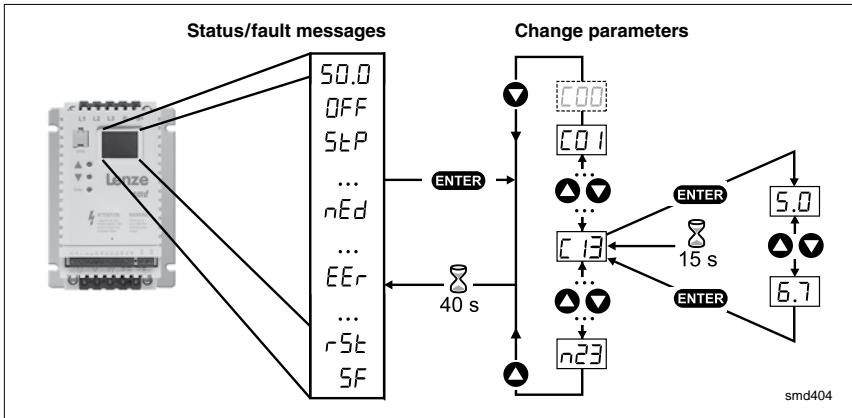
To bring free-wheeling loads such as fans to a rest before starting the drive, use the DC injection braking function ("Auto-DCB"). Starting a drive into a freewheeling motor creates a direct short-circuit and may result in damage to the drive.

Confirm motor suitability for use with DC injection braking.



4 Commissioning

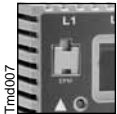
4.1 Parameter setting



Note

If the password function is enabled, the password must be entered into C00 to access the parameters. C00 will not appear unless the password function is enabled. See C94.

4.2 Electronic programming module (EPM)



The EPM contains the controller's memory. Whenever parameter settings are changed, the values are stored in the EPM. It can be removed, but must be installed for the controller to operate (a missing EPM will trigger an **F I** fault). The controller ships with protective tape over the EPM that can be removed after installation.

An optional EPM Programmer (model **EEPM1RA**) is available that allows: the controller to be programmed without power; OEM settings to be default settings; fast copying of EPMs when multiple controllers require identical settings. It can also store up to 60 custom parameter files for even faster controller programming.




Commissioning

4.3 Parameter menu

Code		Possible Settings		IMPORTANT
No.	Name	Lenze	Selection	
C00	Password entry	0	0 999	Visible only when password is active (see C94)
C01	Setpoint and control source	0	Setpoint source:	Control configuration:
			0 Analog input (terminal 8; see C34)	Control = terminals Programming = keypad Monitoring = LECOM
			1 Code c40	Control = terminals Programming = LECOM / keypad Monitoring = LECOM
			2 Analog input (terminal 8; see C34)	Control = terminals Programming = LECOM / keypad Monitoring = LECOM
			3 LECOM	Control = LECOM Programming = LECOM / keypad Monitoring = LECOM
			4 Analog input (terminal 8; see C34)	Control = terminals Programming = remote keypad Monitoring = remote keypad
			5 Code c40	Control = remote keypad Programming = remote keypad Monitoring = remote keypad
			6 Analog input (terminal 8; see C34)	Control = terminals Programming = Modbus / keypad Monitoring = Modbus
			7 Code c40	Control = Modbus Programming = Modbus / keypad Monitoring = Modbus
			8 Analog input (terminal 8; see C34)	
			9 Code c40	
			10 Analog input (terminal 8; see C34)	
11 Code c40				
		Note	<ul style="list-style-type: none"> • When C01 = 1, 5, 7, 9, or 11, use c40 for speed setpoint • When C01 = LECOM (3), write speed command to C46 	
C02	Load Lenze setting		0 No action/loading complete	<ul style="list-style-type: none"> • C02 = 1...4 only possible with OFF or Inh • C02 = 2 : C11, C15 = 60 Hz
			1 Load 50 Hz Lenze settings	
			2 Load 60 Hz Lenze settings	
			3 Load OEM settings (if present)	
			4 Translate	
			WARNING! C02 = 1...3 overwrites all settings! TRIP circuitry may be disabled! Check codes CE1...CE3.	
			NOTE If an EPM that contains data from a previous software version is installed, C02 = 4 converts the data to the current version.	



Code		Possible Settings		IMPORTANT	
No.	Name	Lenze	Selection		
CE1	Configuration - Digital input E1	1	1 Activate fixed setpoint 1 (JOG1)	<ul style="list-style-type: none"> Use C37...C39 to adjust fixed setpoints Activate JOG3: Both terminals = HIGH 	
			2 Activate fixed setpoint 2 (JOG2)		
			3 DC braking (DCB)	See also C36	
			4 Direction of rotation	LOW = CW rotation HIGH = CCW rotation	
			5 Quick stop	Controlled deceleration to standstill, active LOW; Set decel rate in C13 or c03	
CE2	Configuration - Digital input E2	4	6 CW rotation	CW rotation = LOW and CCW rotation = LOW: Quick stop; Open-circuit protected	
			7 CCW rotation		
			8 UP (setpoint ramp-up)	UP = LOW and DOWN = LOW: Quick stop; Use momentary NC contacts	
			9 DOWN (setpoint ramp-down)		
			10 TRIP set	Active LOW, triggers EEr (motor coasts to standstill) NOTE: NC thermal contact from the motor can be used to trigger this input	
CE3	Configuration - Digital input E3	3	11 TRIP reset	See also c70	
			12 Accel/decel 2	See c01 and c03	
			13 Deactivate PI	Disables PI function for manual control	
			14 Activate fixed PI setpoint 1	<ul style="list-style-type: none"> Use C37...C39 to adjust fixed setpoints Activate fixed PI setpoint 3: Both terminals = HIGH 	
			15 Activate fixed PI setpoint 2		
			 Note	A CFG fault will occur under the following conditions: <ul style="list-style-type: none"> E1...E3 settings are duplicated (each setting can only be used once) One input is set to UP and another is not set to DOWN, or vice-versa 	
COB	Configuration - Relay output	1	Relay is energized if		
			0 Ready		
			1 Fault		
			2 Motor is running		
			3 Motor is running - CW rotation		
			4 Motor is running - CCW rotation		
			5 Output frequency = 0 Hz		
			6 Frequency setpoint reached		
			7 Threshold (C17) exceeded		
			8 Current limit (motor or generator mode) reached		
			9 Feedback within min/max alarm (d46, d47) range		
10 Feedback outside min/max alarm (d46, d47) range					
CO9	Network address	1	1	247	Each controller on network must have unique address



Commissioning

Code		Possible Settings				IMPORTANT
No.	Name	Lenze	Selection			
C10	Minimum output frequency	0.0	0.0	{Hz}	500	<ul style="list-style-type: none"> Output frequency at 0% analog setpoint C10 not active for fixed setpoints or setpoint selection via c40
C11	Maximum output frequency	50.0	7.5	{Hz}	500	<ul style="list-style-type: none"> Output frequency at 100% analog setpoint C11 is never exceeded
			WARNING! Consult motor/machine manufacturer before operating above rated frequency. Overspeeding the motor/machine may cause damage to equipment and injury to personnel!			
C12	Acceleration time 1	5.0	0.0	{s}	999	<ul style="list-style-type: none"> C12 = frequency change 0 Hz...C11 C13 = frequency change C11...0 Hz For S-ramp accel/dec, adjust c82
C13	Deceleration time 1	5.0	0.0	{s}	999	
C14	Operating Mode	2	0	Linear characteristic with Auto-Boost	999	<ul style="list-style-type: none"> Linear characteristic: for standard applications Square-law characteristic: for fans and pumps with square-law load characteristic Auto boost: load-dependent output voltage for low-loss operation
			1	Square-law characteristic with Auto-Boost		
			2	Linear characteristic with constant V_{min} boost		
			3	Square-law characteristic with constant V_{min} boost		
C15	V/f reference point	50.0	25.0	{Hz}	999	<p style="text-align: right;">smd006</p>
C16	V_{min} boost (optimization of torque behavior)	4.0	0.0	{%}	40.0	
			Set the rated motor frequency (nameplate) for standard applications			
			Set after commissioning: The unloaded motor should run at slip frequency (approx. 5 Hz), increase C16 until motor current (C54) = 0.8 x rated motor current			
C17	Frequency threshold (Q_{min})	0.0	0.0	{Hz}	500	See C08 and c17, selection 7 Reference: setpoint
C18	Chopper frequency	2	0	4 kHz	500	<ul style="list-style-type: none"> As chopper frequency is increased, motor noise is decreased Observe derating in Section 2.2 Automatic derating to 4 kHz at $1.2 \times I_r$
			1	6 kHz		
			2	8 kHz		
			3	10 kHz		
C21	Slip compensation	0.0	0.0	{%}	40.0	Change C21 until the motor speed no longer changes between no load and maximum load
C22	Current limit	150	30	{%}	150	<ul style="list-style-type: none"> When the limit value is reached, either the acceleration time increases or the output frequency decreases When C90 = 2, max setting is 180%
			Reference: smd rated output current			
C24	Accel boost	0.0	0.0	{%}	20.0	Accel boost is only active during acceleration


Commissioning



Code		Possible Settings			IMPORTANT	
No.	Name	Lenze	Selection			
C31	Analog input dead band	0	0	Enabled	C31 = 0 activates dead band for analog input. When analog signal is within dead band, controller's output = 0.0 Hz and display will read StP	
			1	Disabled		
C34	Configuration - analog input	0	0	0...10 V	Will trigger Sds fault if signal falls below 2 mA	
			1	0...5 V		
			2	0...20 mA		
			3	4...20 mA		
		4	4...20 mA monitored			
C36	Voltage - DC injection brake (DCB)	4.0	0.0	{%}	50.0	<ul style="list-style-type: none"> See CE1...CE3 and c06 Confirm motor suitability for use with DC braking
C37	Fixed setpoint 1 (JOG 1)	20.0	0.0	{Hz}	999	When PI is active (see d38), C37...C39 are fixed PI setpoints
C38	Fixed setpoint 2 (JOG 2)	30.0	0.0	{Hz}	999	
C39	Fixed setpoint 3 (JOG 3)	40.0	0.0	{Hz}	999	
C46	Frequency setpoint		0.0	{Hz}	500	Display: Setpoint via analog input, function UP/DOWN, or LECOM
C50	Output frequency		0.0	{Hz}	500	Display
C53	DC bus voltage		0.0	{%}	255	Display
C54	Motor current		0.0	{%}	255	Display
C59	PI feedback		c86	{%}	c87	Display
C70	Proportional gain	5.0	0.0	{%}	99.9	
C71	Integral gain	0.0	0.0	{s}	99.9	
C90	Input voltage selection		0	Auto	Automatically sets to Low (1) or High (2) upon next power-up, depending on input voltage	
			1	Low	For 200 V or 400 V input	
			2	High	For 240 V or 480 V input	
			Note	<ul style="list-style-type: none"> To simplify commissioning, the Lenze setting is preset at the factory, depending on model: C90 = 1 for 400/480 V models C90 = 2 for 230/240 V models Upon reset (C02 = 1, 2), C90 = 0. Confirm correct setting after next power-up. 		
C94	User password	0	0		999	When set to a value other than 0, must enter password at C00 to access parameters
			Changing from "0" (no password), value will start at 763			
C99	Software version					Display, format: x.yz
c01	Acceleration time 2	5.0	0.0	{s}	999	<ul style="list-style-type: none"> Activated using CE1...CE3 c01 = frequency change 0 Hz...C11
c03	Deceleration time 2	5.0	0.0	{s}	999	<ul style="list-style-type: none"> c03 = frequency change C11...0 Hz For S-ramp accel/dec, adjust c82



Commissioning

Code		Possible Settings			IMPORTANT
No.	Name	Lenze	Selection		
c06	Holding time - automatic DC injection brake (Auto-DCB)	0.0	0.0 {s}	999	<ul style="list-style-type: none"> Automatic motor braking below 0.1 Hz by means of motor DC current for the entire holding time (afterwards: U, V, W inhibited) Confirm motor suitability for use with DC braking
c08	Analog output scaling	100	1.0	999	When 10 VDC is output at terminal 62, it will equal this value (see c11)
c11	Configuration - Analog output (62)	0	0 None		Use c08 to scale signal Example: c11 = 1 and c08 = 100: At 50 Hz, terminal 62 = 5 VDC At 100 Hz, terminal 62 = 10 VDC
			1 Output frequency 0-10 VDC		
			2 Output frequency 2-10 VDC		
			3 Load 0-10 VDC		
			4 Load 2-10 VDC		
5 Dynamic braking	Only used with DB option				
c17	Configuration - Digital output (A1)	0	Output is energized if 0 Ready 1 Fault 2 Motor is running 3 Motor is running - CW rotation 4 Motor is running - CCW rotation 5 Output frequency = 0 Hz 6 Frequency setpoint reached 7 Frequency threshold (C17) exceeded 8 Current limit (motor or generator mode) reached 9 Feedback within min/max alarm (d46, d47) range 10 Feedback outside min/max alarm (d46, d47) range		
c20	I ² t switch-off (thermal motor monitoring)	100	30 {%}	100	<ul style="list-style-type: none"> Triggers OC6 fault when motor current exceeds c20 for too long Correct setting = (motor nameplate current) / (smd output current rating) X 100% Example: motor = 6.4 amps and smd = 7.0 amps; correct setting = 91% (6.4 / 7.0 = 0.91 x 100% = 91%)
			 WARNING! Do not set above rated motor current as listed on the motor dataplate. Does not provide full motor protection!		
c25	Serial baud rate	0	0 LECOM: 9600 bps Modbus: 9600,8,N,2		<ul style="list-style-type: none"> See C01 LECOM if C01 = 0...3 Modbus if C01 = 8...11
			1 LECOM: 4800 bps Modbus: 9600,8,N,1		
			2 LECOM: 2400 bps Modbus: 9600,8,E,1		
			3 LECOM: 1200 bps Modbus: 9600,8,O,1		
c38	Actual PI setpoint		c86	c87	Display

Commissioning



Code		Possible Settings			IMPORTANT	
No.	Name	Lenze	Selection			
c40	Frequency setpoint via keys or Modbus	0.0	0.0	{Hz}	500	Only active if C01 is set properly (C01 = 1,5,7,9,11)
c42	Start condition (with mains on)	1	0	Start after LOW-HIGH change at terminal 28		See also c70
			1	Auto start if terminal 28 = HIGH		
				WARNING! Automatic starting/restarting may cause damage to equipment and/or injury to personnel! Automatic starting/restarting should only be used on equipment that is inaccessible to personnel.		
c60	Mode selection for c61	0	0	Monitoring only		c60 = 1 allows the keys to adjust speed setpoint (c40) while monitoring c61
			1	Monitoring and editing		
c61	Present status/error		status/error message			<ul style="list-style-type: none"> • Display • Refer to Section 5 for explanation of status and error messages
c62	Last error		error message			
c63	Last error but one					
c70	Configuration TRIP reset (error reset)	0	0	TRIP reset after LOW-HIGH change at terminal 28, mains switching, or after LOW-HIGH change at digital input "TRIP reset"		<ul style="list-style-type: none"> • Auto-TRIP reset after the time set in c71 • More than 8 errors in 10 minutes will trigger r5t fault
			1	Auto-TRIP reset		
				WARNING! Automatic starting/restarting may cause damage to equipment and/or injury to personnel! Automatic starting/restarting should only be used on equipment that is inaccessible to personnel.		
c71	Auto-TRIP reset delay	0.0	0.0	{s}	60.0	See c70
c78	Operating time counter		Display Total time in status "Start"		0...999 h: format xxx 1000...9999 h: format x.xx (x1000) 10000...99999 h: format xx.x (x1000)	
c79	Mains connection time counter		Display Total time of mains = on			
c81	PI setpoint	0.0	c86		c87	
c82	S-ramp integration time	0.0	0.0	{s}	50.0	<ul style="list-style-type: none"> • c82 = 0.0: Linear accel/decel ramp • c82 > 0.0: Adjusts S-ramp curve for smoother ramp
c86	Minimum feedback	0.0	0.0		999	<ul style="list-style-type: none"> • Select feedback signal at C34 • If feedback is reverse-acting, set c86>c87
c87	Maximum feedback	100	0.0		999	
d25	PI setpoint accel/ decel	5.0	0.0	{s}	999	Sets rate of change for PI setpoint
d38	PI mode	0	0	PI disabled		
			1	PI enabled: normal-acting		When feedback (terminal 8) exceeds setpoint, speed decreases
			2	PI enabled: reverse-acting		When feedback (terminal 8) exceeds setpoint, speed increases



Commissioning

Code		Possible Settings			IMPORTANT
No.	Name	Lenze	Selection		
d46	Feedback minimum alarm	0.0	0.0	999	See C08 and c17, selections 9 and 10
d47	Feedback maximum alarm	0.0	0.0	999	
n20	LECOM power up state	0	0	Quick stop	
			1	Inhibit	
n22	Serial time-out action	0	0	Not active	Selects controller reaction to serial timeout
			1	Inhibit	
			2	Quick stop	
			3	Trip fault FC3	
n23	Serial fault time	50	50	{ms} 65535	Sets the serial timeout length



5 Troubleshooting and fault elimination

	Status	Cause	Remedy
e.g. 50.0	Present output frequency	Trouble free operation	
OFF	Stop (outputs U, V, W inhibited)	LOW signal at terminal 28	Set terminal 28 to HIGH
Inh	Inhibit (outputs U, V, W inhibited)	Controller is set up for remote keypad or serial control (see C01)	Start the controller via the remote keypad or serial link
StP	Output frequency = 0 Hz (outputs U, V, W inhibited)	Setpoint = 0 Hz (C31 = 0)	Setpoint selection
		Quick stop activated through digital input or serial link	Deactivate Quick stop
br	DC-injection brake active	DC-injection brake activated <ul style="list-style-type: none"> via digital input automatically 	Deactivate DC-injection brake <ul style="list-style-type: none"> digital input = LOW automatically after holding time c06 has expired
CL	Current limit reached	Controllable overload	Automatically (see C22)
LU	Undervoltage on DC bus	Mains voltage too low	Check mains voltage
dEC	Overvoltage on DC bus during deceleration (warning)	Excessively short deceleration time (C13, c03)	Automatically if overvoltage < 1 s, OU , if overvoltage > 1 s
nEd	No access to code	Can only be changed when the controller is in OFF or Inh	Set terminal 28 to LOW or inhibit by serial link
rC	Remote keypad is active	Attempt to use buttons on front of controller	Buttons on front of controller are disabled when remote keypad is active

	Error	Cause	Remedy ⁽¹⁾
cF	Data on EPM not valid	Data not valid for controller	<ul style="list-style-type: none"> Use EPM providing valid data Load Lenze setting
CF		Data error	
GF		OEM data not valid	
F I	EPM error	EPM missing or defective	Power down and replace EPM
CFG	Digital inputs not uniquely assigned	E1...E3 assigned with the same digital signals	Each digital signal can only be used once
		Either just "UP" or "DOWN" used	Assign the missing digital signal to a second terminal
dF	Dynamic braking fault	Dynamic braking resistors are overheating	Increase deceleration time
EEr	External error	Digital input "TRIP set" is active	Remove external error
F2...F0	Internal fault		Please contact Lenze
FE3	Communication error	Serial timer has timed out	Check serial link connections
FES	Communication error	Serial communication failure	Please contact Lenze
JF	Remote keypad fault	Remote keypad disconnected	Check remote keypad connections
LC	Automatic start inhibited	c42 = 0	LOW-HIGH signal change at terminal 28

(1) The drive can only be restarted if the error message has been reset; see c70



Troubleshooting and fault elimination

Error		Cause	Remedy ⁽¹⁾
OC 1	Short-circuit or overload	Short-circuit	Find reason for short-circuit; check motor cable
		Excessive capacitive charging current of the motor cable	Use shorter motor cables with lower charging current
		Acceleration time (C12, c01) too short	<ul style="list-style-type: none">• Increase acceleration time• Check controller selection
		Defective motor cable	Check wiring
		Internal fault in motor	Check motor
		Frequent and long overload	Check controller selection
OC 2	Earth fault	Grounded motor phase	Check motor/motor cable
		Excessive capacitive charging current of the motor cable	Use shorter motor cables with lower charging current
OC 6	Motor overload (I ² t overload)	Motor is thermally overloaded, due to: <ul style="list-style-type: none">• impermissible continuous current• frequent or too long acceleration processes	<ul style="list-style-type: none">• Check controller selection• Check setting of c20
OH	Controller overtemperature	Controller too hot inside	<ul style="list-style-type: none">• Reduce controller load• Improve cooling
OU	Overvoltage on DC bus	Mains voltage too high	Check mains voltage
		Excessively short deceleration time or motor in generator mode	Increase deceleration time or use dynamic braking option
		Earth leakage on the motor side	Check motor/motor cable (separate motor from controller)
rSt	Faulty auto-TRIP reset	More than 8 errors in 10 minutes	Depends on the error
SdS	Loss of 4-20 mA reference	4-20 mA signal is below 2 mA (C34 = 4)	Check signal/signal wire
SF	Single phase fault	A mains phase has been lost	Check mains voltage

(1) The drive can only be restarted if the error message has been reset; see c70