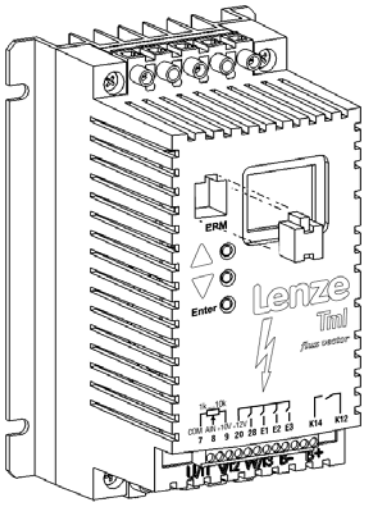
TL03C-en

Lenze

EN **Operating Instructions**



Tml001

Tml *- flux vector drive*
0.25 kW… 2.2 kW

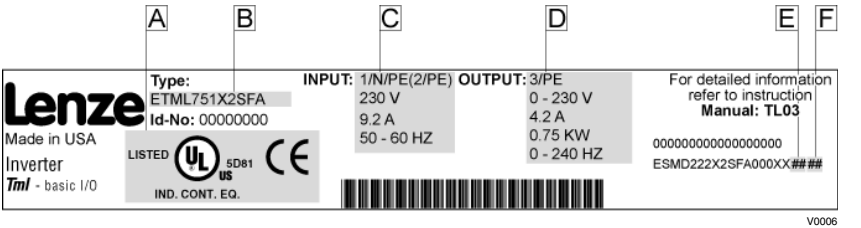
Contents

About these instructions

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

These instructions are only valid for Tml frequency inverters with software rev 10 (see drive nameplate).

Please read the instructions before commissioning.



A Certifications
B Type
C Input Ratings
D Output Ratings
E Hardware Version
F Software Version

Scope of delivery	Important
• 1 ***Tml*** vector inverter (ETML...) with EPM installed (see Section 4.2) • 1 Operating Instructions	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. **Claim** • visible transport damage immediately to the forwarder. • visible deficiencies/incompleteness immediately to your Lenze representative.

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 (89/336/EEC).

The drive controllers meet the requirements of the Low Voltage Directive 73/23/EEC. 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.

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.

WARNING!

- 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.

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 minimum 75 °C copper wire only.
- Shall be installed in a pollution degree 2 macro-environment.

Note for UL approved system with integrated controllers

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

1.1 Pictographs used in these instructions

Pictograph	Signal word	Meaning	Consequences if ignored
	**WARNING!**	Impending or possible danger for persons Possible damage to equipment	Death or injury 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 (73/23/EEC)
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...240 Hz	
Environmental conditions	Class 3K3 to EN 50178	
Temperature range	Transport	-25 … +70 °C
	Storage	-20 … +70 °C
	Operation	0 … +55 °C (with 2.5 %/°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 (EN 50178)	> 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 according to EN 61000-3-2)	Total power connected to the mains	Compliance with the requirements (2)
	< 0.5 kW	With mains choke
	0.5 … 1 kW	With active filter (in preparation)
	> 1 kW	Without additional measures

(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!

2.2 Ratings

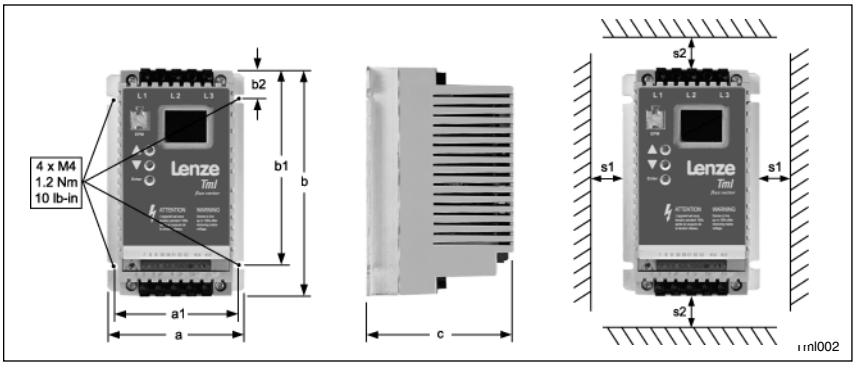
Type	Power [kW]	Mains		Output Current			
		Voltage, frequency	Current [A]	I_N		I_{max} for 60 s	
				[A] (1)	[A] (2)	[A] (1)	[A] (2)
ETML251X2SFA	0.25	**1/N/PE 230 V** (180 V -0%…264 V +0%) 50/60 Hz (48 Hz -0%…62 Hz +0%)	3.4	1.7	1.6	2.6	2.4
ETML371X2SFA	0.37		5.0	2.4	2.2	3.6	3.3
ETML551X2SFA	0.55		6.0	3.2	2.9	4.8	4.4
ETML751X2SFA	0.75		9.2	4.2	3.9	6.3	5.8
ETML112X2SFA	1.1		12.0	6.0	5.5	9.0	8.3
ETML152X2SFA	1.5		16.0	7.0	6.4	10.5	9.6
ETML222X2SFA	2.2		21	9.6	8.8	14.4	13.2

(1) For rated mains voltage and carrier frequencies 4, 6, and 8 kHz
(2) For rated mains voltage and carrier frequency 10 kHz

3 Installation

3.1 Mechanical installation

3.1.1 Dimensions and mounting



Type	a [mm]	a1 [mm]	b [mm]	b1 [mm]	b2 [mm]	c [mm]	s1 [mm]	s2 [mm]	m [kg]
ETML251X2SFA ETML371X2SFA	93	84	146	128	17	83	15	50	0.5
ETML551X2SFA ETML751X2SFA	93	84	146	128	17	92	15	50	0.6
ETML112X2SFA ETML152X2SFA	114	105	146	128	17	124	15	50	1.2
ETML222X2SFA	114	105	146	128	17	140	15	50	1.4

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.

3.2 Electrical installation

3.2.1 Installation according to EMC requirements

EMC
Compliance with EN 61800-3/A11

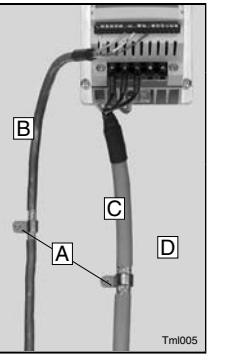
Noise emission
Drive models ending in the suffix “SFA” are in compliance with limit value class A according to EN 55011 if installed in a control cabinet and with a motor cable not longer than 10m.

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



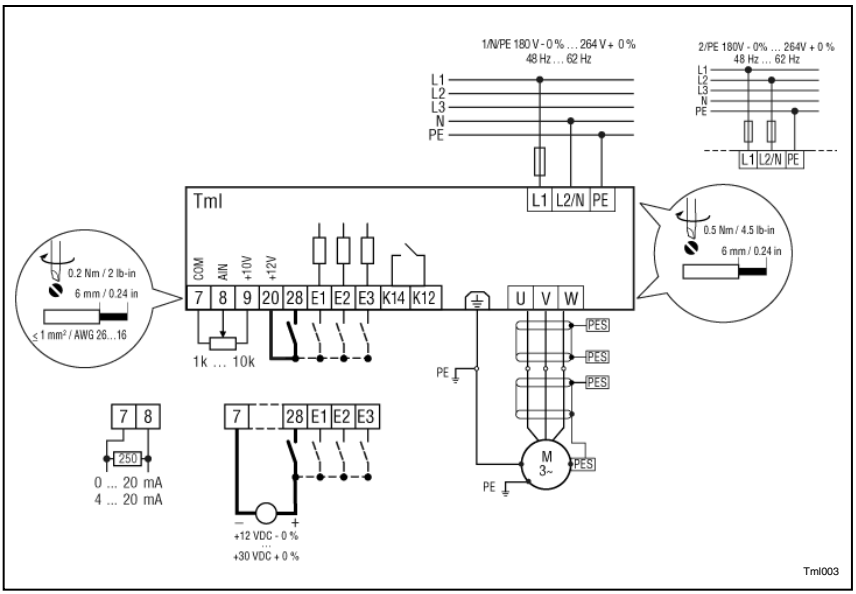
3.2.2 Fuses/cable cross-sections(1)

Type	Installation to EN 60204-1			Installation to UL		E.l.c.b.(2)
	Fuse	Miniature circuit breaker	L1, L2, L3, PE [mm²]	Fuse (3)	L1, L2, L3, PE [AWG]	
ETML251X2SFA ETML371X2SFA ETML551X2SFA	M10 A	C10 A	1.5	10 A	14	≥ 30 mA
ETML751X2SFA	M16 A	C16 A	2.5	15 A	14	
ETML112X2SFA	M20 A	C20 A	2.5	20 A	12	
ETML152X2SFA	M25 A	C25 A	2.5	25 A	12	
ETML222X2SFA	M30 A	C30 A	4.0	30 A	10	

(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, JJN, JJS, or equivalent

Observe the following when using E.l.c.b:
- Installation of E.l.c.b only between supplying mains and controller.
- The E.l.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

3.2.3 Connection diagram



WARNING!

- Hazard of electrical shock! Circuit potentials are up to 230 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.

3.2.4 Control terminals

Terminal	Data for control connections (printed in **bold** = Lenze setting)			
7	Reference common			
8	Analog input **0 … 10 V** (changeable under C34)	input resistance: >50 kΩ (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 input resistance = 3.3 kΩ		
E1	Digital input configurable with CE1 **Activate fixed setpoint 1 (JOG1)**	HIGH = JOG1 active	Both HIGH = JOG3 active	R_i = 3.3 kΩ
E2	Digital input configurable with CE2 **Activate fixed setpoint 2 (JOG2)**	HIGH = JOG2 active		
E3	Digital input configurable with CE3 **Activate DC injection brake (DCB)**	HIGH = DCB active		
K14 **K12**	Relay output (N.O. contact) configurable with C08 **Fault (TRIP)**	AC 250V / 3A DC 24V / 2A ... 240V / 0.22A		

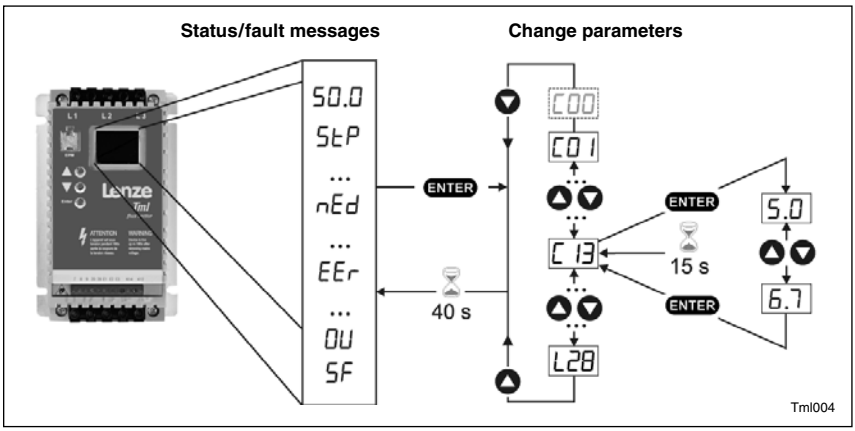
LOW = 0 … +3 V, HIGH = +12 … +30 V

Protection against contact

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

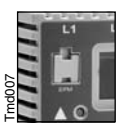
4 Commissioning

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.

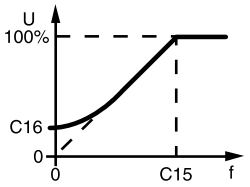
An optional EPM Programmer (model EEPM1RA) is available that allows: the controller to be programmed without power; OEM settings to be default settings; fast copying of EPMs when multiple controllers require identical settings. It can also store up to 60 custom parameter files for even faster controller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

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
			1 Code c40 / Code C47	
			2 Analog input (terminal 8; see C34)	
			3 Code c40 / Code C47	
			4 Analog input (terminal 8; see C34)	Control = terminals Programming = remote keypad Monitoring = remote keypad
			5 Code c40 / Code C47	
			6 Analog input (terminal 8; see C34)	Control = remote keypad Programming = remote keypad Monitoring = remote keypad
			7 Code c40 / Code C47	
		Note • When C01 = 1, 3, 5, or 7 and C14 = 0...4, 6, 7, use c40 for speed setpoint • When C01 = 1, 3, 5, or 7 and C14 = 5, use C47 for torque setpoint • When C01 = 4...7, terminals E2 and E3 must be used for the remote keypad, selections made for CE2 and CE3 will be ignored.		
C02	Load Lenze setting		0 No action/loading complete	• C02 = 1, 2, 3 only possible with OFF or Inh • C02 = 2 : C11, C15 and C89 = 60 Hz and C87 = 1750RPM
			1 Load 50 Hz Lenze settings	
			2 Load 60 Hz Lenze settings	
			3 Load OEM settings (if present)	
		WARNING! C02 = 1...3 overwrites all settings! TRIP circuitry may be disabled! Check codes CE1... CE3.		

Code		Possible Settings		IMPORTANT
No.	Name	Lenze	Selection	
CE1	Configuration - Digital input E1	1	1 Activate fixed setpoint 1 (JOG1)	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	2	6 CW rotation 7 CCW rotation	CW rotation = LOW and CCW rotation = LOW: Quick stop; Open-circuit protected
			8 UP (setpoint ramp-up) 9 DOWN (setpoint ramp-down)	UP = LOW and DOWN = LOW: Quick stop; Use momentary NC contacts
			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
			11 TRIP reset	see also c70
			12 Accel/decel 2	see c01 and c03
CE3	Configuration - Digital input/output E3	3	1…12 (same as above) 13...19 (reserved) 20 Ready 21 Fault 22 Motor is running 23 Motor is running - CW rotation 24 Motor is running - CCW rotation 25 Output frequency = 0Hz 26 Frequency setpoint reached 27 Frequency threshold (C17) exceeded 28 Current limit (motor or generator mode) reached 29 Dynamic braking	• 1…12 configures terminal E3 as an input. • 20…29 configures terminal E3 as a current-sourcing (PNP) output rated 12 VDC / 50 mA
			Note A CFG fault will occur under the following conditions: • 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 • When C01 = 4...7, terminals E2 and E3 must be used for the remote keypad, selections made for CE2 and CE3 will be ignored.	

Code		Possible Settings				IMPORTANT
No.	Name	Lenze	Selection			
C08	Configuration - Relay output (terminals K14 and K12	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 = 0Hz 6 Frequency setpoint reached 7 Frequency threshold (C17) exceeded 8 Current limit (motor or generator mode) reached			
C10	Minimum output frequency	0.0	0.0	{Hz}	240	• 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}	240	• 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	• C12 = frequency change 0 Hz...C11 • C13 = frequency change C11...0 Hz • For S-ramp accel/decel, adjust c82
C13	Deceleration time 1	5.0	0.0	{s}	999	
C14	Operating Mode	2	0 Linear characteristic with Auto-Boost			• 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 Vmin boost			
			3 Square-law characteristic with constant Vmin boost			
			4 Vector speed control			• Vector speed control: for single-motor applications requiring higher starting torque and better speed regulation
			5 Vector torque control			• Vector torque control: for single-motor applications requiring torque control independent of speed
			6 Enhanced linear characteristic with Auto-Boost			• Enhanced: for single or multiple motor applications that require better performance than settings 0...3, but cannot operate in vector mode
			7 Enhanced linear characteristic with constant Vmin boost			
		Note • Settings 4...7 require Motor Calibration using c48 • Settings 4 and 5 require proper setting of C86...C91 prior to calibration • Settings 6 and 7 require proper setting of C88...C90 prior to calibration				

Code		Possible Settings		IMPORTANT
No.	Name	Lenze	Selection	
C15	V/f reference point	50.0	25.0 {Hz} 999 Set the rated motor frequency (nameplate) for standard applications	 smd006
C16	V_{min} boost (optimization of torque behavior)		0.0 {%} 40.0 C16 not active in Vector mode (see C14) 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} 240	See C08 selection 7, and CE3 selection 27
C18	Chopper frequency	2	0 4 kHz 1 6 kHz 2 8 kHz 3 10 kHz	• As chopper frequency is increased, motor noise is decreased • Observe derating in Section 2.2 • C18 = 1, 2, 3: Automatic derating to 4 kHz at 1.2 x I_N
C21	Slip compensation	0.0	0.0 {%} 40.0 C21 not active in Vector mode (see C14)	Change C21 until the motor speed no longer changes between no load and maximum load
C22	Current limit	200	30 {%} 200 Reference: ***Tml*** rated output current	• When the limit value is reached, either the acceleration time increases or the output frequency decreases • When c73 = 0, max setting is 167%
C24	Accel boost	0.0	0.0 {%} 20.0	Accel boost is only active during acceleration
C34	Configuration - analog input	0	0 0...10 V 1 0...5 V 2 Reserved 3 0...20 mA 4 4...20 mA 5 4...20 mA monitored	• With 250 Ω resistance between terminals 7 and 8 • C34 = 5 will trigger **5d5** fault if signal falls below 2 mA
C36	Voltage - DC injection brake (DCB)	4.0	0.0 {%} 50.0	• See CE1...CE3 and c06 • Confirm motor suitability for use with DC braking
C37	Fixed setpoint 1 (JOG 1)	20.0	0.0 {Hz} 240	Lenze setting: active at E1 = HIGH
C38	Fixed setpoint 2 (JOG 2)	30.0	0.0 {Hz} 240	Lenze setting: active at E2 = HIGH
C39	Fixed setpoint 3 (JOG 3)	40.0	0.0 {Hz} 240	Lenze setting: active at E1 = HIGH and E2 = HIGH
C46	Frequency setpoint		0.0 {Hz} 240	Display: Setpoint via analog input, function UP/DOWN
C47	Torque setpoint/range	100	0 {%} 400	• When C14 = 5 and C01 = 1, 3, 5, 7 sets the torque setpoint • When C14 = 5 and C01 = 0, 2, 4, 6 sets the torque range for C34

Code		Possible Settings				IMPORTANT
No.	Name	Lenze	Selection			
C50	Output frequency		0.0	{Hz}	240	Display
C52	Motor voltage		0	{V}	999	Display
C53	DC bus voltage		0	{V}	999	Display
C54	Motor current		0.0	{A}	400	Display
C56	Controller load		0	{%}	255	Display
C57	Motor torque		0	{%}	400	Display: vector mode only (C14 = 4, 5)
C65	Vector speed control loop gain	30.0	0.0		100	Optimizes dynamic performance in vector mode
C66	Vector speed stability	30.0	0.0		100	Optimizes steady-state speed stability in vector mode
C77	I_{max} gain	0.25	0.00		16.0	For most applications, there is no need to change the Lenze settings (1)
C78	Integral action time	65	12	{ms}	9990	
C84	Motor stator resistance	0.00	0.00	{W}	64.0	Will be automatically programmed by c48 (1)
C86	Motor rated power		0.00	{kW}	99.9	• Set to motor nameplate kW • Lenze setting = ***Tml*** rated kW
C87	Motor rated speed	1390	300	{RPM}	65000	Set to motor nameplate speed
C88	Motor rated current	0.0	0.0	{A}	480	Set to motor nameplate current
C89	Motor rated frequency	50	10	{Hz}	999	Set to motor nameplate frequency
C90	Motor rated voltage	0	0	{V}	600	Set to motor nameplate voltage
C91	Motor cosine phi	0.80	0.40		1.00	Set to motor power factor
		Note If motor power factor is not known, use the following formulas: cos phi = motor Watts / (motor efficiency X C90 X C88 X 1.732) cos phi = cos [$\sin^{-1}$ (magnetizing current / motor current)]				
C92	Motor stator inductance	0.0	0.0	{mH}	2000	Will be automatically programmed by c48 (1)
C93	Drive identification					• Indicates controller rating, format: x.yz, or x.y.z • x. = voltage (2. = 200/240V, 1~) • yz or y.z = kW rating **Example:** 2.0.3 = 200/240 V, 1~, 0.37 kW
C94	User password	0	0 Changing from "0" (no password), value will start at 763		999	When set to a value other than 0, must enter password at C00 to access parameters
C99	Software version					Display, format: x.yz
c01	Acceleration time 2	5.0	0.0	{s}	999	• Activated using CE1...CE3 • c01 = frequency change 0 Hz...C11 • c03 = frequency change C11...0 Hz • For S-ramp accel/decel, adjust c82
c03	Deceleration time 2	5.0	0.0	{s}	999	

(1) Changing these settings can adversely affect performance. Contact Lenze technical support prior to changing.

Code		Possible Settings				IMPORTANT
No.	Name	Lenze	Selection			
c06	Holding time - automatic DC injection brake (Auto-DCB)	0.0	0.0	{s}	999 0.0 = not active 999 = continuous brake	• Automatic motor braking after StP by means of motor DC current for the entire holding time (afterwards: U, V, W inhibited) • Confirm motor suitability for use with DC braking
c20	I^2t switch-off (thermal motor monitoring)	100	30	{%}	100 100% = *Tml* rated output current	• Triggers OC6 fault when motor current exceeds c20 for too long • Correct setting = (motor nameplate current) / (*Tml* output current rating) X 100% • **Example:** motor = 6.4 amps and *Tml* = 7.0 amps; correct setting = 91% (6.4 / 7.0 = 0.91 x 100% = 91%)
		WARNING! Maximum setting is rated motor current (see nameplate). Does not provide full motor protection!				
c40	Frequency setpoint via keys ▲▼	0.0	0.0	{Hz}	240	Only active if C01 is set properly (C01 = 1, 3, 5,7)
c42	Start condition (with mains on)	1	0	Start after LOW-HIGH change at terminal 28		See also c43 and c70
			1	Auto start if terminal 28 = HIGH		
			2	Flying restart (auto start disabled)		
			3	Auto start if terminal 28 = HIGH, with flying restart		
		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.				
c43	Flying restart selection	0	0	Search range: C11...0 Hz		If c42 = 2 or 3, the controller will start the motor speed search at C11, or at the last output frequency before the fault, depending on the setting of c43
			1	Search range: last frequency...0 Hz		
c48	Motor auto-calibration	0	0	Calibration not done		• If C14 = 4...7, motor calibration must be performed, but C86...C91 must be programmed first (see C14) • If motor calibration is attempted before programming C86...C91, triggers nId fault
			1	Calibration enabled		
			2	Calibration complete		
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			• Display • Refer to Section 5 for explanation of status and error messages
c62	Last error		error message			
c63	Last error but one					
c64	Last error but two					

Code		Possible Settings				IMPORTANT
No.	Name	Lenze	Selection			
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”		
			1	Auto-TRIP reset		• Auto-TRIP reset after the time set in c71 • More than 8 errors in 10 minutes will trigger rSt fault
		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
c73	Input voltage selection		0	Low (for 200 V input)		• Lenze setting depends on C93 • During commissioning, confirm correct setting based on mains voltage
			1	High (for 230 V input)		
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			
c82	S-ramp integration time	0.0	0.0	{s}	50.0	• c82 = 0.0: Linear accel/decel ramp • c82 > 0.0: Adjusts S-ramp curve for smoother ramp
L25	Skip frequency 1	0.0	0.0	{Hz}	240	• L25 and L26 define the start of the skip range • L28 defines the bandwidth of the skip range
L26	Skip frequency 2	0.0	0.0	{Hz}	240	
L28	Skip frequency bandwidth	0.0	0.0	{Hz}	10.0	
		Note Bandwidth (Hz) = f_s (Hz) + L28 (Hz) f_s = L25 or L26 **Example:** L25 = 18 Hz and L28 = 4 Hz; the bandwidth = 18...22 Hz				

4.4 Vector mode

Use the following procedures to select either Vector mode or Enhanced V/Hz mode. Enhanced V/Hz mode should be used in the following cases:

1. Multiple motor applications
2. Where required motor data is not available (especially C91)
3. Where running in Vector mode causes unstable motor operation

4.4.1 Vector speed and torque modes

1. Connect the controller to the motor according to the diagram in Section 3.2.3.
2. Apply power to the controller.
3. Set C14 to 4 for Vector speed mode, or 5 for Vector torque mode.
4. Set C86...C91 according to the motor's nameplate data.
5. Set c48 to 1 to enable the motor calibration function.
6. Make sure the motor is cold (rotor and windings are at room temperature of 20° to 25° C), and apply a HIGH signal at terminal 28. The display will show CAL for about 40 seconds. Once the calibration is complete, the display will show OFF or Inh. Apply another HIGH signal to terminal 28 to actually start the motor.

4.4.2 Enhanced V/Hz mode

Follow the procedure in 4.4.1 above, replacing steps 3 and 4 with those below:

3. Set C14 to 6 for Enhanced with Auto-Boost, or 7 for Enhanced with constant boost.
4. Set C88...C90 according to the motor's nameplate data.

Note

- If the motor is hot when the motor calibration is performed, the controller will not be able to achieve maximum performance.
- In Vector speed and Vector torque modes, if an attempt is made to start the controller before performing the motor calibration, the controller will display n Id and the motor will not operate.

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 (see C01)	Start the controller via the remote keypad
StP	Output frequency = 0 Hz (outputs U, V, W inhibited)	Quick stop activated through digital input	Deactivate Quick stop
FSt	Flying restart attempt	c42 = 2, 3	
br	DC-injection brake active	DC-injection brake activated • via digital input • automatically	Deactivate DC-injection brake • digital input = LOW • automatically after holding time c06 has expired
CAL	Motor calibration is in process	c48 = 1 and terminal 28 = HIGH	Only perform the motor calibration when C14 = 4...7
CL, FCL	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
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)
Ad	A/D converter error		Please contact Lenze
bF	Identification fault	C93 value stored on EPM does not match controller model	• Use EPM providing valid data • Load Lenze setting
cF	Data on EPM not valid	Data not valid for controller	
CF		Data error	
GF		OEM data not valid	
LC	Automatic start inhibited	c42 = 0, 2	LOW-HIGH signal change at terminal 28
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
FCS, F2...F0	Internal fault		Please contact Lenze

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

Error		Cause	Remedy (1)
JF	Remote keypad fault	Remote keypad disconnected	Check remote keypad connections
n Id	Drive identification fault	Attempt was made to perform motor calibration before setting C86...C91	Must set C86...C91 before performing motor calibration (see c48)
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	• Increase acceleration time • Check controller selection
		Defective motor cable	Check wiring
		Internal fault in motor	Check motor
		Frequent and long overload	Check controller selection
OC2	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
OC6	Motor overload (I^2t overload)	Motor is thermally overloaded, due to: • impermissable continuous current • frequent or too long acceleration processes	• Check controller selection • Check setting of c20
OH	Controller overtemperature	Controller too hot inside	• 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)
rF	Flying restart fault	Controller was unable to synchronize with motor during restart attempt	Check motor/load
rSt	Faulty auto-TRIP reset	More than 8 errors in 10 minutes	Depends on the error
Sd5	Loss of 4-20 mA reference	4-20 mA signal (terminal 8I) is below 2 mA (C34 = 5)	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

Notes

AC Technology Corporation • 630 Douglas Street • Uxbridge, MA 01569 • USA
☎ +1 (508) 278-9100