

Inverter

Servo-Inverter i700

5 to 64 A



Servo-Inverter i700

Contents



General information		Product key	4.5 - 4
		Equipment	4.5 - 7
		List of abbreviations	4.5 - 8
		Generation Easy for multi-axis applications	4.5 - 9
		Functions and features	4.5 - 10
		Operating modes	4.5 - 11
		Dimensioning of a multi-axis system	4.5 - 12
Technical data		Standards and operating conditions	4.5 - 15
		Rated data for single axes	4.5 - 16
		Rated data for double axes	4.5 - 18
		Rated data for power supply modules	4.5 - 20
		"Cold plate" design	4.5 - 22
		Push-through technique design	4.5 - 24
Interfaces		Mains connection	4.5 - 27
		Motor connection	4.5 - 28
		Connection diagrams	4.5 - 30
		Control connections	4.5 - 32
		Safety engineering	4.5 - 34
		EtherCAT® communication	4.5 - 35
Accessories	Power supply modules	Brake resistors for power supply modules	4.5 - 37
		Mains chokes for power supply modules	4.5 - 38
		Interference suppression of power supply modules	4.5 - 39
		24 V power supply unit	4.5 - 41
		Installation sets for Servo-Inverter i700	4.5 - 41
		Installation material for i700 servo inverter	4.5 - 42

Servo-Inverter i700

General information



Product key

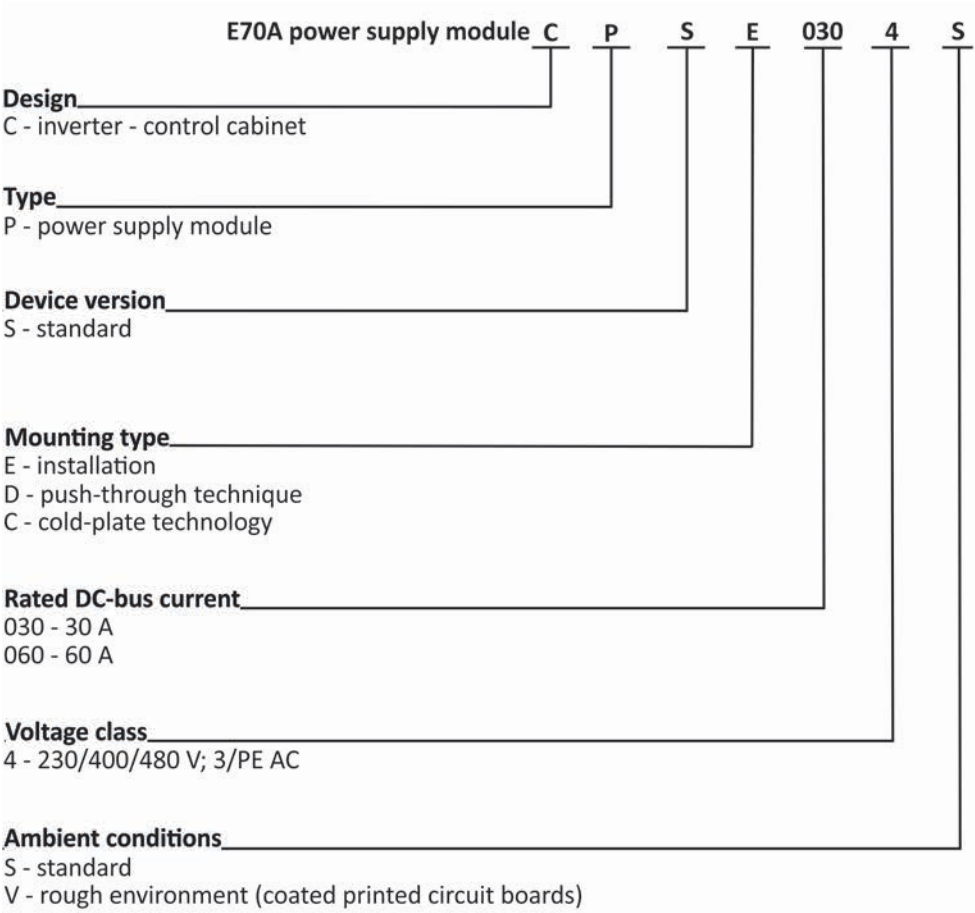
	Single/double axis E70A	C	M	S	E	005	4	S	A	1	ET	R
Design												
C - inverter - control cabinet												
Type												
M - single axis or double axis												
Device version												
D - 599 Hz												
S - up to 2000 Hz are possible												
Mounting type												
E - installation												
D - push-through technique												
C - cold-plate technology												
Max. short-time output current												
005 - 5 A												
010 - 10 A												
020 - 20 A												
032 - 32 A												
048 - 48 A												
064 - 64 A												
Voltage class												
4 - 230/400/480 V; 3/PE AC												
Ambient conditions												
S - standard												
V - rough environment (coated printed circuit boards)												
Safety engineering												
A - with Basic Safety (STO) function												
B - with Extended Safety function												
Motor outputs												
1 - single axis												
2 - double axis												
Communication												
ET - EtherCAT®												
Encoder input												
R - resolver												
E - encoder/absolute value encoder												

Servo-Inverter i700

General information



Product key



Servo-Inverter i700

General information

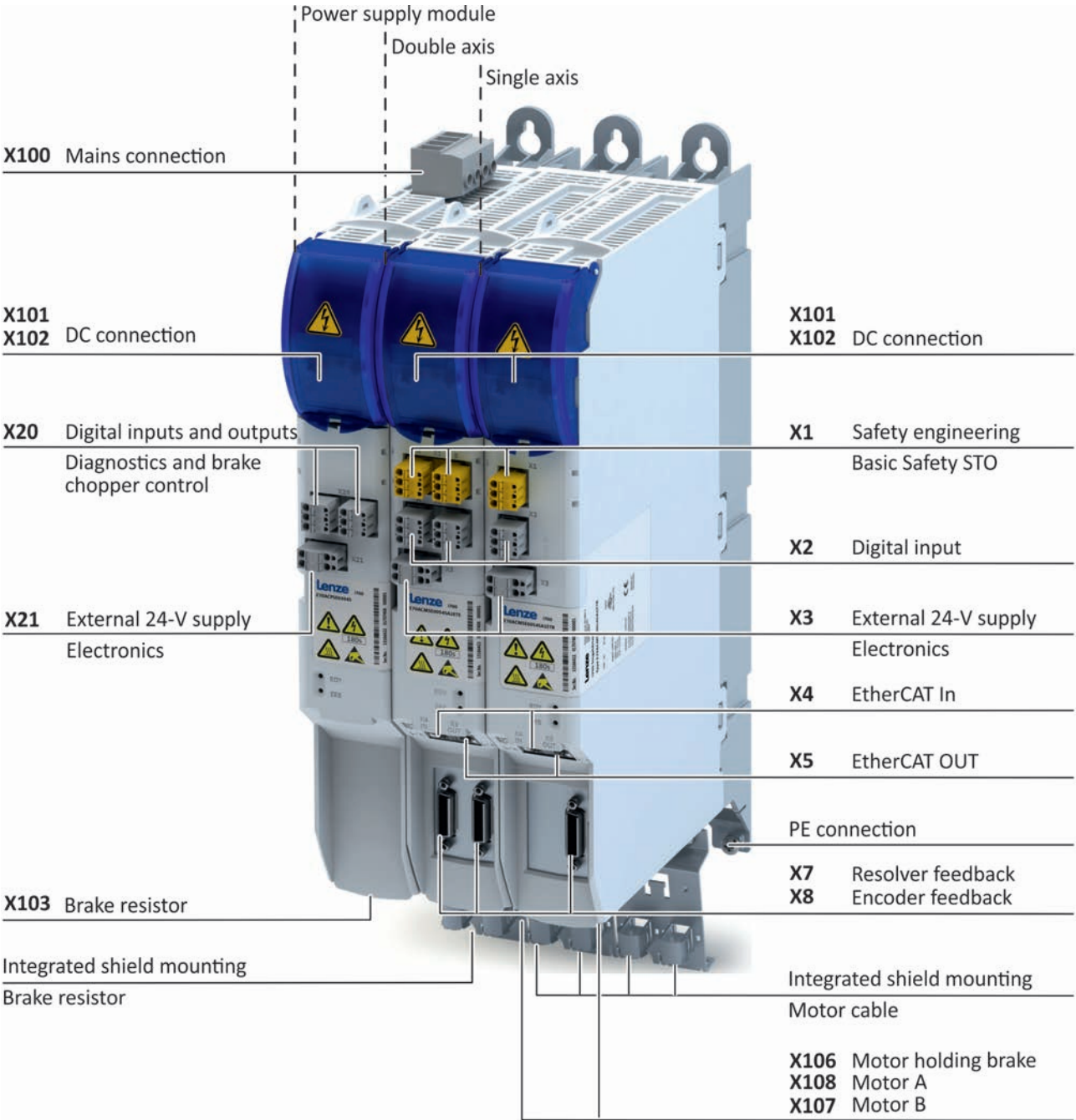


Servo-Inverter i700

General information



Equipment with Basic Safety STO





List of abbreviations

b	[mm]	Dimensions
C _{th}	[KW _s]	Thermal capacity
f _{ch}	[kHz]	Switching frequency
h	[mm]	Dimensions
H _{max}	[m]	Site altitude
I _{max}	[A]	Max. DC-bus current
I _{max, out}	[A]	Max. output current
I _{N, AC}	[A]	Rated mains current
I _{N, DC}	[A]	Rated DC-bus current
I _{N, out}	[A]	Rated output current
l _{max}	[m]	Max. cable length
m	[kg]	Mass
P	[kW]	Typical motor power
P _{max, 1}	[kW]	Max. output power
P _V	[kW]	Power loss
P _N	[kW]	Rated power
R _{min}	[Ω]	Min. brake resistance
R _N	[Ω]	Rated resistance
t	[mm]	Dimensions
U _{AC}	[V]	Mains voltage
U _{DC}	[V]	DC supply
U _{N, AC}	[V]	Rated voltage
U _{out}	[V]	Max. output voltage

ASM	Asynchronous motor
DIAG	Slot for diagnostic adapter
DIN	Deutsches Institut für Normung e.V.
EN	European standard
EN 60529	Degrees of protection provided by enclosures (IP code)
EN 60721-3	Classification of environmental conditions; Part 3: Classes of environmental parameters and their limit values
EN 61800-3	Electrical variable speed drives Part 3: EMC requirements including special test methods
IEC	International Electrotechnical Commission
IEC 61508	Functional safety of electrical/electronic/programmable electronic safety-related systems
IM	International Mounting Code
IP	International Protection Code
MCI	Slot for communication module (module communication interface)
NEMA	National Electrical Manufacturers Association
UL	Underwriters Laboratory Listed Product
UR	Underwriters Laboratory Recognized Product
VDE	Verband deutscher Elektrotechniker (Association of German Electrical Engineers)

Servo-Inverter i700

General information



Generation Easy for multi-axis applications

The innovative Servo-Inverter i700 for central motion control is characterised by its compact and highly flexible design. Dual axes keep the drive size to a minimum, dynamic motor control makes it suitable for use in a wide range of applications. Drive integration, commissioning and maintenance have been substantially simplified thanks to its installation concept and easy engineering.

Highlights:

- Easy to use: from installation to service
- Compact: both in size and connection system
- Flexible: motor control for synchronous and asynchronous motors
- High performance, e. g. with real-time EtherCAT® bus system

i700 – in use

Powerful central motion control of demanding machine tasks is best achieved with our Controller-based Automation. The Servo-Inverter i700 for multiaxis application can drive all centrally controlled motors in your machine module – from three-phase AC motor to servo motor.

i700 features:

- Multi-axis system
- Single and double axes
- Power supply modules
- DC-bus connection via busbar system
- Pluggable connection system
- Automatic parameter/firmware download via the control system
- Motor control:
 - Servo with field weakening and torque pre-control
 - V/f control for standard asynchronous motors without encoder

4.5



Servo-Inverter i700

General information



Functions and features

The Servo-Inverter i700 can be directly implemented into the Controller-based Automation applications via the integrated EtherCAT® interface. The interaction of the different Lenze controllers provide for a high number of sophisticated Lenze Motion applications.

The speed and position control modes are directly executed in the servo inverter which ensures very short cycle times (0.25 ms). The selection of the right control mode for the application is determined via the application in the Controller. The "Controller-based Automation" chapter summarises which controller optimally solves the individual applications together with the i700.

Mode	Servo-Inverter i700
Control types, motor control	
Field-oriented servo control (SC)	For synchronous servo motors, asynchronous servo motors and three-phase asynchronous motors
V/f control (VFCplus)	For three-phase AC motors and asynchronous servo motor (linear or square-law)
Basic functions	
	Brake management for brake control with low rate of wear PID controller
Operating modes to CiA 402	Velocity mode (VL) - non-cyclic velocity setpoint Cyclic synchronous position (csp) - cyclic position setpoint Cyclic synchronous velocity (csv) - cyclic velocity setpoint Cyclic synchronous torque (cst) - cyclic torque setpoint
Overload behaviour	
	200% maximum current (with regard to 4kHz rated current)
Functions with FAST Application Software	
	Comprehensive library of function and technology modules e.g. for positioning, cam functions, electrical shaft etc.
Monitoring and protective measures	
	Overload Short circuit Earth fault Overvoltage Undervoltage DC-bus voltage Motor phase failure Overcurrent I² x t-Motor monitoring Overtemperature Motor overtemperature Brake chopper, brake resistance Motor stalling
Diagnostics	
	Axis modules: Error codes to CiA 402 Power supply modules: Status message via 2 digital outputs Oscilloscope functions
Status display	2 LEDs
Braking operation	
Brake chopper	Integrated in power supply module
Brake resistor	External
Mounting conditions	
Mounting type	Installation Cold plate technique (on request) Push-through technique (on request)
Mounting place	In the control cabinet
Mounting position	Vertical
Free spaces	At the top: minimum 90 mm Side-by-side mounting without any clearance At the bottom: minimum 70 mm



Operating modes

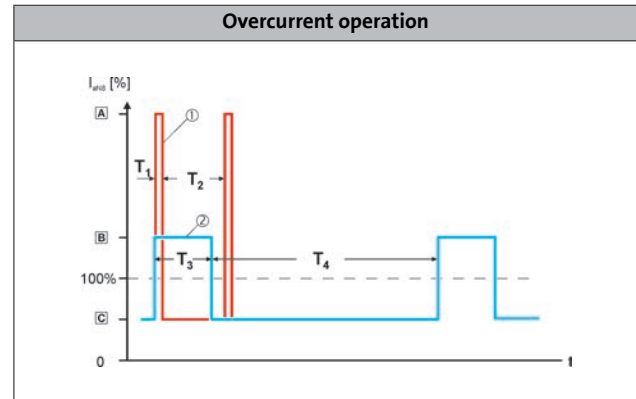
Overcurrent operation

Axis modules and power supply modules

Power supply modules and axis modules can be operated with higher currents beyond the rated current if this overcurrent is only active for a limited operating time. Within the efficiency cycles, the overcurrent can flow for a certain period of time if afterwards an accordingly long recovery phase takes place afterwards. Two efficiency cycles of 15 s [1] in red and 180 s [2] in blue are defined.

- 15-s cycle
 - 3 s (T_1) load period with peak current [A] (200 %)
 - 12 s (T_2) recovery time with limited current [C] (75 %)
- 180-s cycle
 - 60 s (T_3) load period with peak current [B] (150 %)
 - 120 s (T_4) recovery time with limited current [C] (75 %)

A load period with peak current must be followed by a recovery time. In the recovery time, the current must not exceed the given value.



- From a maximum device current of 32 A, the following restriction applies:
With field frequencies lower than 5 Hz, the cycle time of the short time behaviour is reduced from 15 s to 3 s.



Dimensioning of a multi-axis system

Drive dimensioning of multi-axis systems with Servo-Inverters i700 can be easily carried out using the DSD (Drive Solution Designer) engineering tool. This tool can be downloaded from the Lenze homepage (<http://www.lenze.com/download/software-downloads>). It considers various, frequently recurring applications, the ambient conditions and the entire mechatronic system and their operating mode as for instance coordinated or uncoordinated multi-axis operation with energy exchange in the DC-bus system. It provides comprehensible dimensioning protocols and an Energy Performance Certificate for the axes and for the multi-axis system. The Energy Performance Certificate clearly displays the energy efficiency of all drive components under the given operation modes and provides potential for energy optimisations for entire plants.

Functions and features

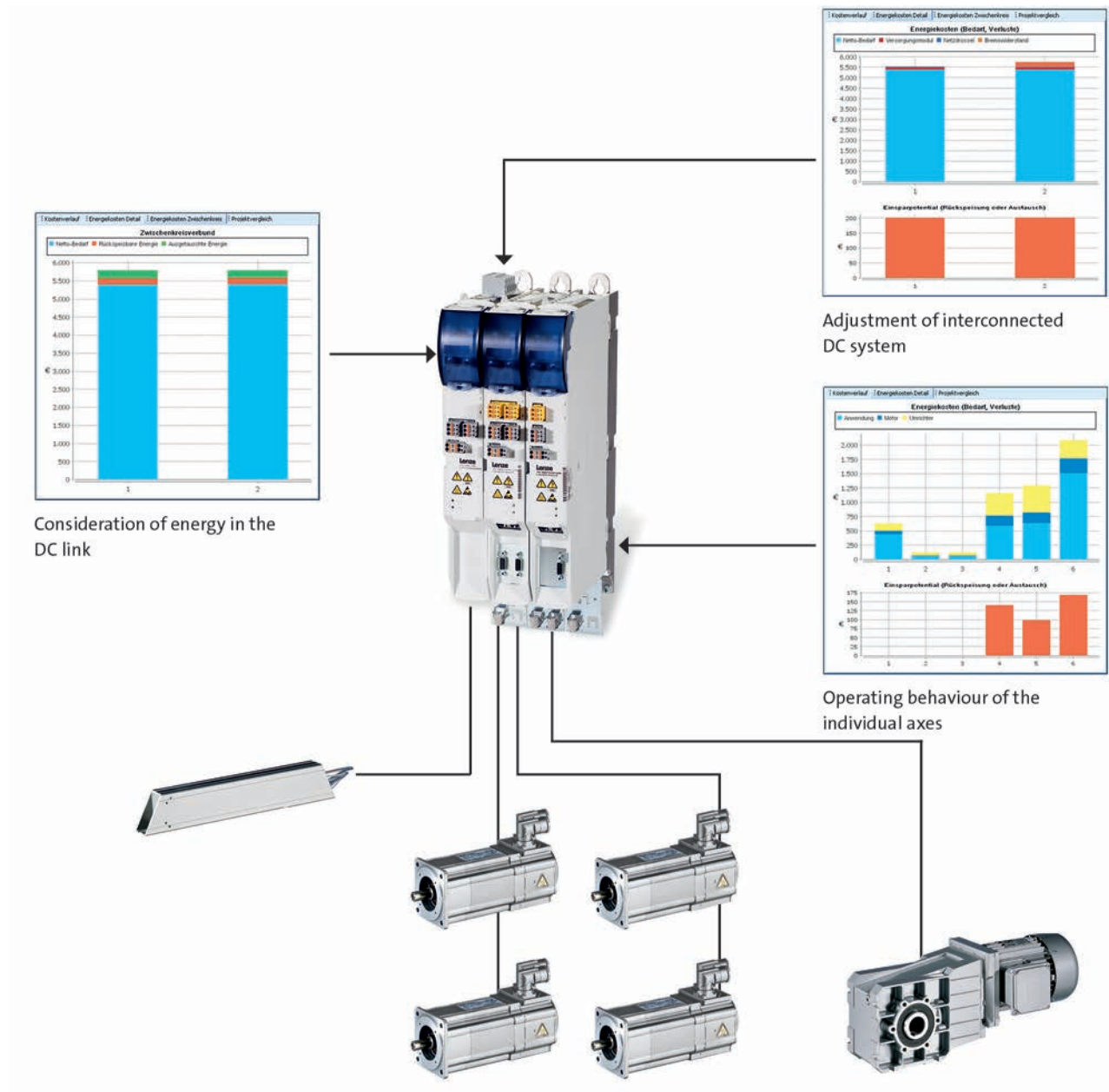
Mode	Engineering Tool DSD
Applications	Comprehensive applications as for instance linear and rotating drives, positioning-, wheel, hoist and synchronous drives, winders, pumps, fans, ...
Components	Inverter Motors (brake, feedback) Geared motors Power supply modules
Check of components and drive system	Monitoring functions of the inverters Maximum limits of the components Product data in the applications Consideration and check of the entire drive system Limit loads (electrical/mechanical) M-n characteristic fields and system checks Possible combinations of the drive components Losses and energy efficiency
Optimisation and evaluation	Energy consumption of the components and of the application Energy exchange in multi-axis applications Representation of working points, e.g. as characteristic
Presentation of the result	Evaluation of the dimensioning Representation of energy consumption Logging of dimensioning Creating CAD data
Basic functions	Metric and imperial unit systems Intuitive interfaces with simple dialogs Comprehensive online help with physical basics and overviews Fast and easy drive dimensioning and product configuration Editor for the motion sequence Creating alternative solutions with comparison operations

Servo-Inverter i700

General information



Dimensioning of a multi-axis system



4.5

Servo-Inverter i700

General information



Servo-Inverter i700

Technical data



Standards and operating conditions

Mode			
Product			Servo-Inverter i700
Conformity			
CE			Low-Voltage Directive
			2014/35/EU [UKCA: S.I. 2016/1101]
Approval			
UL 508C			Power Conversion Equipment (file no. E132659)
CSA			CSA 22.2 No. 14
Certification			
			RoHS
Degree of protection			
EN 60529			IP20
NEMA 250			Type 1
Climatic conditions			
Storage (EN 60721-3-1)			1K3 (temperature: -25 °C ... +60 °C)
Storage (EN 60721-3-1) > 6 months			1K3 (temperature: -25 °C ... +40 °C)
Transport (EN 60721-3-2)			2K3 (temperature: -25 °C ... +70 °C)
Operation (EN 60721-3-3)			3K3 (temperature: -10 °C ... +55 °C)
Current derating at over 40 °C			2.5 % / K
Site altitude			
Amsl	H _{max}	[m]	4000
Current derating at over 1000 m		[%/1000 m]	5
Vibration resistance			
Transport (EN 60721-3-2)			2M2
Operation (EN 61800-5-1)			10 Hz ≤ f ≤ 57 Hz: ±0.075 mm amplitude, 57 Hz ≤ f ≤ 150 Hz: 1.0 g
Operation (Germanischer Lloyd)			5 Hz ≤ f ≤ 13.2 Hz: ±1 mm amplitude 13.2 Hz ≤ f ≤ 100 Hz: 0.7 g

4.5

Mode	
Product	Servo-Inverter i700
Supply form	
	Systems with earthed star point (TN and TT systems) Systems with high-resistance or isolated star point (IT systems)
Mains switching	
	Cyclic mains switching of 5 times in 5 minutes is permissible without restrictions.
Noise emission	
EN 61800-3	Cable-guided disturbance: According to category C1 with special measures According to category C2 with standard accessories According to category C3 without additional measures
Insulation resistance	
EN 61800-5-1	Overvoltage category III Above 2000 m amsl overvoltage category II
Degree of pollution	
EN 61800-5-1	2
Shock current	
EN 61800-5-1	> 3.5 mA AC, > 10 mA DC
Protective insulation of control circuits	
EN 61800-5-1	Safe mains isolation: double/reinforced insulation

Servo-Inverter i700

Technical data



Rated data for single axes

					
Max. short-time output current					
	$I_{\max, \text{out}}$	[A]	5.0	10.0	20.0
Product key			E70ACM□□0054□□1ET□	E70ACM□□0104□□1ET□	E70ACM□□0204□□1ET□
DC supply			DC 260 V -0 % ... 775 V +0 %		
	U_{DC}	[V]			
Typical motor power					
4-pole asynchronous motor	P	[kW]	0.75	1.50	4.00
Rated output current					
	$I_{\text{N, out}}$	[A]	2.5	5.0	10.0
Rated switching frequency					
	f_{ch}	[kHz]	4		
Output current					
4 kHz	I_{out}	[A]	2.5	5.0	10.0
8 kHz	I_{out}	[A]	2.5	5.0	10.0
16 kHz	I_{out}	[A]	1.5	3.0	6.0
Power loss					
	P_{V}	[kW]	0.050	0.080	0.130

Dimensions and weights

Standard installation design

Dimensions			
Height	h	[mm]	350
Height, including fastening	h	[mm]	410
Width	b	[mm]	50
Depth	t	[mm]	261
Mass			
	m	[kg]	2.7

Servo-Inverter i700

Technical data



Rated data for single axes

					
Max. short-time output current					
	$I_{\max, \text{out}}$	[A]	32.0	48.0	64.0
Product key			E70ACM□□0324□□1ET□	E70ACM□□0484□□1ET□	E70ACM□□0644□□1ET□
DC supply			DC 260 V -0 % ... 775 V +0 %		
	U_{DC}	[V]			
Typical motor power					
4-pole asynchronous motor	P	[kW]	7.50	11.0	15.0
Rated output current					
	$I_{\text{N, out}}$	[A]	16.0	24.0	32.0
Rated switching frequency			4		
	f_{ch}	[kHz]			
Output current					
4 kHz	I_{out}	[A]	16.0	24.0	32.0
8 kHz	I_{out}	[A]	12.8	19.2	25.6
16 kHz	I_{out}	[A]	9.6	14.4	19.2
Power loss					
	P_{V}	[kW]	0.210	0.290	0.390

Dimensions and weights

Standard installation design

Dimensions			
Height	h	[mm]	350
Height, including fastening	h	[mm]	410
Width	b	[mm]	100
Depth	t	[mm]	261
Mass			
	m	[kg]	5.2

Servo-Inverter i700

Technical data



Rated data for double axes

				
Max. short-time output current				
	$I_{\max, \text{out}}$	[A]	5.0	10.0
Product key			E70ACM□□0054□□2ET□	E70ACM□□0104□□2ET□
DC supply			DC 260 V -0 % ... 775 V +0 %	
	U_{DC}	[V]		
Typical motor power				
4-pole asynchronous motor	P	[kW]	0.75	1.50
Rated output current				
	$I_{\text{N, out}}$	[A]	2.5	5.0
Rated switching frequency				
	f_{ch}	[kHz]	4	
Output current				
4 kHz	I_{out}	[A]	2.5	5.0
8 kHz	I_{out}	[A]	2.5	5.0
16 kHz	I_{out}	[A]	1.5	3.0
Power loss				
	P_{V}	[kW]	0.090	0.140

Dimensions and weights

Standard installation design

Dimensions			
Height	h	[mm]	350
Height, including fastening	h	[mm]	410
Width	b	[mm]	50
Depth	t	[mm]	261
Mass			
	m	[kg]	2.9

Servo-Inverter i700

Technical data



Rated data for double axes

				
Max. short-time output current				
	$I_{\text{max, out}}$	[A]	20.0	32.0
Product key			E70ACM□□0204□□2ET□	E70ACM□□0324□□2ET□
DC supply			DC 260 V -0 % ... 775 V +0 %	
	U_{DC}	[V]		
Typical motor power				
4-pole asynchronous motor	P	[kW]	4.00	7.50
Rated output current				
	$I_{\text{N, out}}$	[A]	10.0	16.0
Rated switching frequency			4	
	f_{ch}	[kHz]		
Output current				
4 kHz	I_{out}	[A]	10.0	16.0
8 kHz	I_{out}	[A]	10.0	12.8
16 kHz	I_{out}	[A]	6.0	9.6
Power loss				
	P_{V}	[kW]	0.260	0.370

Dimensions and weights

Standard installation design

Dimensions				
Height	h	[mm]	350	350
Width	b	[mm]	100	100
Depth	t	[mm]	261	261
Mass				
	m	[kg]	5.2	5.2

Servo-Inverter i700

Technical data



Rated data for power supply modules

- Operation at 3/PE AC 230/400 and 480 V possible.
- The data is valid for operation at 3/PE AC 400 V.

				
Product key				
Power supply module			E70ACP000304	E70ACP000604
Rated power				
With mains filter/mains choke	P_N	[kW]	15.4	30.9
Without mains filter/mains choke	P_N	[kW]	10.3	20.6
Max. short-term output power				
	$P_{max, 2}$	[kW]	20.6	41.2
Mains voltage range				
	U_{AC}	[V]	3/PE AC 180 V-0 % ... 528 V+0 %, 45 Hz-0 % ... 65 Hz+0 %	
Rated mains current				
	$I_{N, AC}$	[A]	24.5	49.0
Rated DC-bus current				
	$I_{N, DC}$	[A]	30.0	60.0
Max. DC-bus current				
	I_{max}	[A]	45.0	90.0
Power loss				
	P_V	[kW]	0.060	0.110

Brake chopper rated data

Rated power, Brake chopper				
	P_N	[kW]	5.0	10.1
Max. output power, Brake chopper				
	$P_{max, 1}$	[kW]	32.5	65.5
Running time				
	t_{on}	[s]	15.0	
Recovery time				
	t_{re}	[s]	82.0	
Min. brake resistance				
	R_{min}	[Ω]	18.0	9.0

Dimensions and weights

Standard installation design

Dimensions				
Height	h	[mm]	350	
Height, including fastening	h	[mm]	410	
Width	b	[mm]	50	100
Depth	t	[mm]	261	
Mass				
	m	[kg]	2.8	5.8

Servo-Inverter i700

Technical data





"Cold plate" design (on request)

Inverters in cold-plate design dissipate some of their waste heat (heat loss) via a cooler adapted to the application. For this purpose, the inverters are provided with a planed cooling plate which is connected to a separate cooler in a thermally conductive way. Using the cold plate technology, the main part of the heat energy can be transferred directly to the external cooling units.

The use of cold-plate technology is advantageous for the following application cases:

- Minimising the expense of cooling the control cabinet. Here, the main part of the power loss is directly transferred to a cooling unit outside of the control cabinet, e.g. convection cooler or water cooler.
- Heavily polluted ambient air or control cabinets with a high degree of protection which do not allow for a use of a forced air cooling of the control cabinets.
- Low mounting depth in the control cabinet.

Requirements for the cooler

When cold-plate technology is used, the following basic conditions must be considered:

- Good thermal connection to the external cooling unit, i.e. the implementation of the heat transfer resistance (R_{th}) according to the power loss.
- The contact surface must at least be as big as the cooling plate of the inverter.
- The planarity of the contact surface must not exceed 0.05 mm.
- The contact surface of the external coolers and cooling plate must be connected by means of the intended screwed connection.
- The maximum temperature of the cooling plate of the inverter ((75 °C) must not be exceeded.

Single axes

Product key	Power to be dissipated	Thermal resistance
	P_V	R_{th}
	[W]	[K/W]
E70ACM□C0054□□1ET□	25.0	≤ 1.6
E70ACM□C0104□□1ET□	50.0	≤ 0.8
E70ACM□C0204□□1ET□	95.0	≤ 0.45
E70ACM□C0324□□1ET□	140	≤ 0.25
E70ACM□C0484□□1ET□	215	≤ 0.2
E70ACM□C0644□□1ET□	290	≤ 0.15

Double axes

Product key	Power to be dissipated	Thermal resistance
	P_V	R_{th}
	[W]	[K/W]
E70ACM□C0054□□2ET□	50.0	≤ 0.8
E70ACM□C0104□□2ET□	95.0	≤ 0.45
E70ACM□C0204□□2ET□	185	≤ 0.2
E70ACM□C0324□□2ET□	275	≤ 0.15

Power supply modules

Product key	Power to be dissipated	Thermal resistance
	P_V	R_{th}
	[W]	[K/W]
E70ACP□C0304□	45.0	≤ 0.95
E70ACP□C0604□	85.0	≤ 0.45

Servo-Inverter i700

Technical data



"Cold plate" design (on request)

Dimensions and weights

Single axes

Product key			E70ACM□C0054□□1ET□	E70ACM□C0104□□1ET□	E70ACM□C0204□□1ET□
Dimensions					
Height, including fastening	h	[mm]	410		
Width	b	[mm]	50		
Depth	t	[mm]	221		
Mass					
	m	[kg]	2.3		

Product key			E70ACM□C0324□□1ET□	E70ACM□C0484□□1ET□	E70ACM□C0644□□1ET□
Dimensions					
Height, including fastening	h	[mm]	410		
Width	b	[mm]	100		
Depth	t	[mm]	221		
Mass					
	m	[kg]	5.3		

Double axes

Product key			E70ACM□C0054□□2ET□ E70ACM□C0104□□2ET□		E70ACM□C0204□□2ET□ E70ACM□C0324□□2ET□
Dimensions					
Height, including fastening	h	[mm]	410		
Width	b	[mm]	50		100
Depth	t	[mm]	221		
Mass					
	m	[kg]	2.5		5.3

Power supply modules

Product key			E70ACP□C0304□	E70ACP□C0604□
Dimensions				
Height, including fastening	h	[mm]	410	
Width	b	[mm]	50	100
Depth	t	[mm]	221	
Mass				
	m	[kg]	2.6	5.6

Servo-Inverter i700

Technical data



Push-through technique design (on request)

The inverters in push-through design reduce the waste heat in the control cabinet.

The inverter is mounted in the control cabinet so that the heatsink on the inverter is outside the control cabinet. Thus, the entire waste heat can be dissipated outside the control cabinet via convection or forced air cooling for almost all device performances.

Using the push-through technology is advantageous in the following application cases:

- Minimising the expense for control cabinet cooling. For this purpose, the main part of the power loss is directly transferred to the ambience outside the control cabinet, e.g. convection cooling.
- In case of control cabinets with a high degree of protection > IP54 by using separate mounting and cooling areas.
- Low mounting depth in the control cabinet.

Single axes

Product key	Power to be dissipated
	P_V
	[W]
E70ACM□D0054□□1ET□	25.0
E70ACM□D0104□□1ET□	50.0
E70ACM□D0204□□1ET□	95.0
E70ACM□D0324□□1ET□	140
E70ACM□D0484□□1ET□	215
E70ACM□D0644□□1ET□	290

Double axes

Product key	Power to be dissipated
	P_V
	[W]
E70ACM□D0054□□2ET□	50.0
E70ACM□D0104□□2ET□	95.0
E70ACM□D0204□□2ET□	185
E70ACM□D0324□□2ET□	275

Power supply modules

Product key	Power to be dissipated
	P_V
	[W]
E70ACP□D0304□	45.0
E70ACP□D0604□	85.0

Servo-Inverter i700

Technical data



Push-through technique design (on request)

Dimensions and weights

Single axes

Product key			E70ACM□D0054□□1ET□	E70ACM□D0104□□1ET□	E70ACM□D0204□□1ET□
Dimensions					
Height, including fastening	h	[mm]	410		
Width	b	[mm]	50		
Depth (in control cabinet)	t	[mm]	221		
Mass					
	m	[kg]	3.0		

Product key			E70ACM□D0324□□1ET□	E70ACM□D0484□□1ET□	E70ACM□D0644□□1ET□
Dimensions					
Height, including fastening	h	[mm]	410		
Width	b	[mm]	100		
Depth (in control cabinet)	t	[mm]	221		
Mass					
	m	[kg]	7.1		

Double axes

Product key			E70ACM□D0054□□2ET□	E70ACM□D0104□□2ET□
Dimensions				
Height, including fastening	h	[mm]	410	
Width	b	[mm]	50	
Depth	t	[mm]	261	
Mass				
	m	[kg]	3.2	

Product key			E70ACM□D0204□□2ET□	E70ACM□D0324□□2ET□
Dimensions				
Height, including fastening	h	[mm]	410	
Width	b	[mm]	100	
Depth	t	[mm]	261	
Mass				
	m	[kg]	7.1	

Power supply modules

Product key			E70ACP□D0304□	E70ACP□D0604□
Dimensions				
Height, including fastening	h	[mm]	410	
Width	b	[mm]	50	100
Depth (in control cabinet)	t	[mm]	221	
Mass				
	m	[kg]	2.8	5.8

Servo-Inverter i700

Technical data





Mains connection

Interference voltage categories according to the European standard EN 61800-3 are divided into category C1, C2 and the category C3.

Category C1

- Describes the use in public networks.

Category C2

- Describes the use of devices intended for industrial purposes in areas also comprising residential areas.

Category C3

- Describes the use of devices intended for industrial purposes only.



28 - The interference voltage categories achievable due to the filter measures are shown in conjunction with the motor cables.

With an upstream mains choke or mains filter, the maximum continuous power of the power supply modules can be used since the effective current will be reduced.

If no filter or an RFI filter is used, the permissible continuous power (rated power) of the power supply module is reduced.

The mains choke and the RFI filter can also be combined without any restrictions.



38 - Mains chokes, RFI filters, Mains filters

Mains fuses and cable cross-sections

- The mains fuse and cable cross-section specifications apply to a mains connection of 3AC 230/400/480 V.
- Class gG/gI fuses or class gRL semiconductor fuses.
- The cable cross-sections apply to PVC-insulated copper cables.
- Use for installation with UL-approved cables, fuses and brackets.

Mains voltage	Product key	Circuit breaker	Fuse		Mains connection
			EN 60204-1	UL ¹⁾	
U _{AC}	Power supply module	I	I	I	Cross-section (with mains choke)
[V]		[A]	[A]	[A]	q
3 AC 180 ... 528	E70ACP□□0304□	C40	40		10.0
	E70ACP□□0604□	C63	63		16.0

¹⁾ In preparation.



Motor connection

- ▶ Electric strength of the motor cable: 1 kV as per VDE 250-1.
- ▶ Keep motor cables as short as possible, as this has a positive effect on the drive behaviour.
- ▶ Maximum motor cable length 50 m per axis.
- ▶ With group drives (multiple motors on one inverter), the resulting cable length is the key factor. This can be calculated using the hardware manual.

Motor cable lengths and interference voltage categories

When using the i700 system, use external filters to comply with the EMC Directives.

Category C1

- With special measures; please contact your Lenze sales office.

Category C2

- With RFI filters, 6 axes with 50 m motor cable each
- With mains filters, 10 axes with 50 m motor cable each

Category C3

- Without external measures, 4 axes with 50 m motor cable each
- With mains choke, 10 axes with 50 m motor cable each



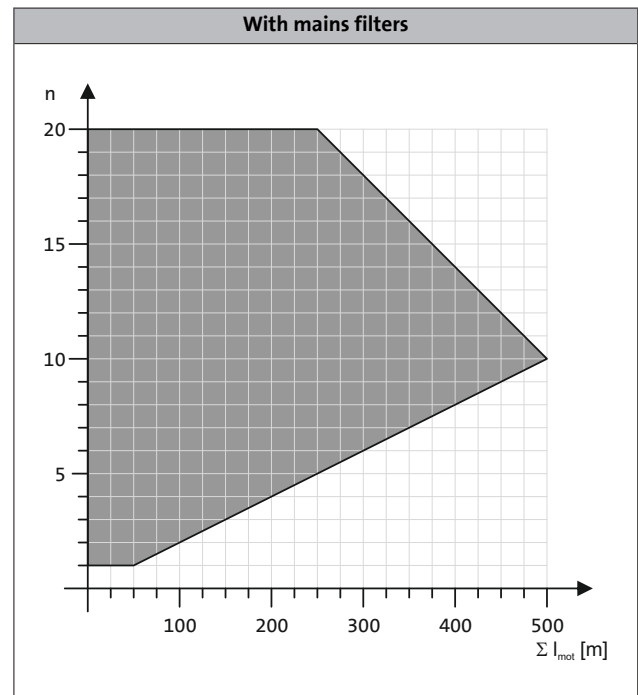
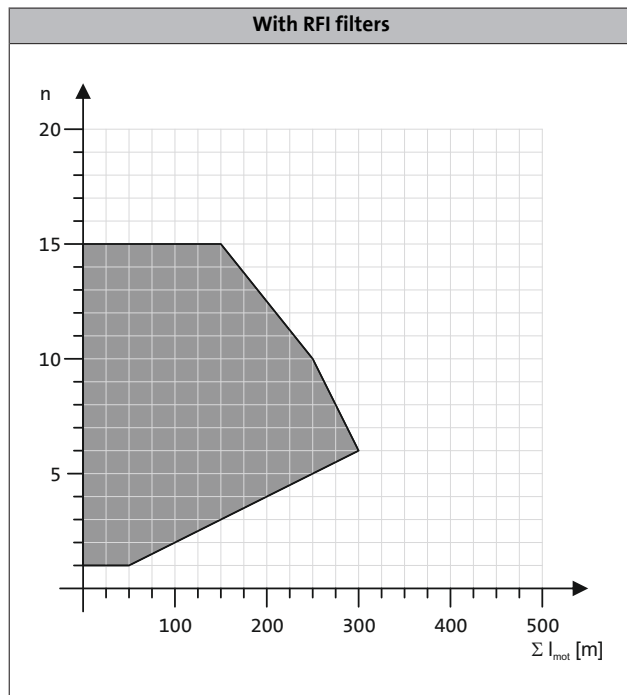


Motor connection

The following diagrams show the possible number of axes and the possible sum of motor cable lengths to ensure compliance with interference suppression according to category .

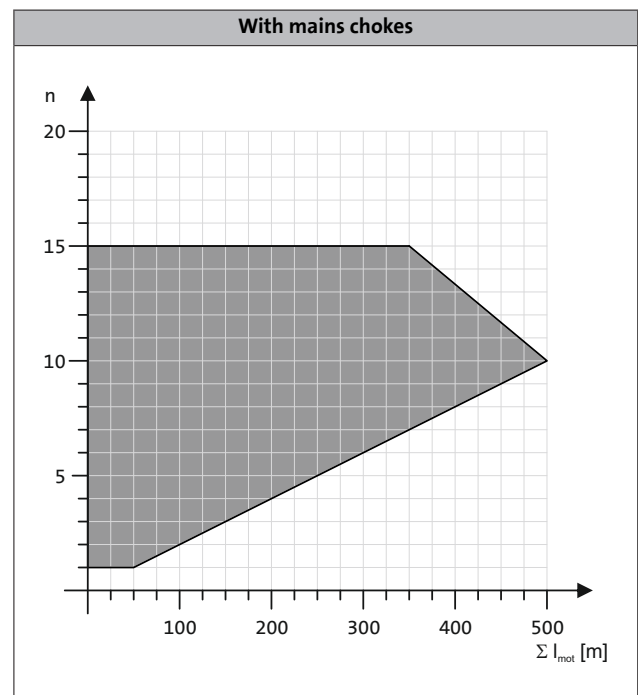
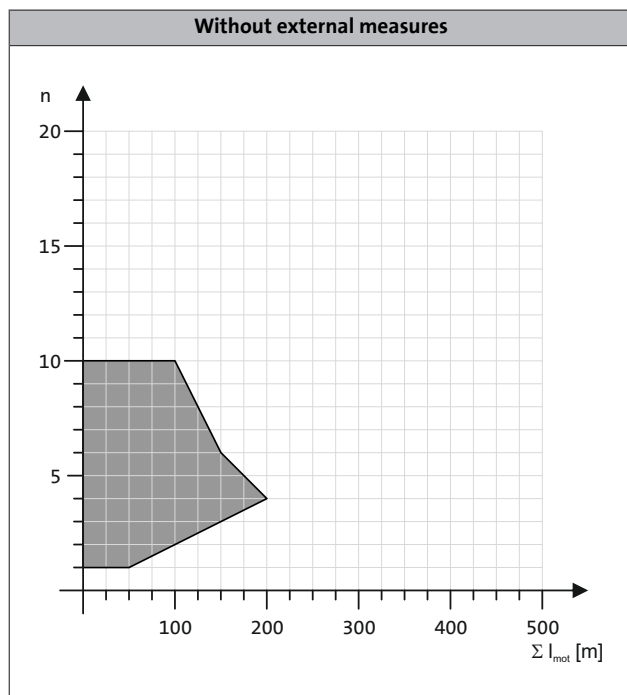
- Number of axes (n) / sum of the motor cable length (l)

Category C2



4.5

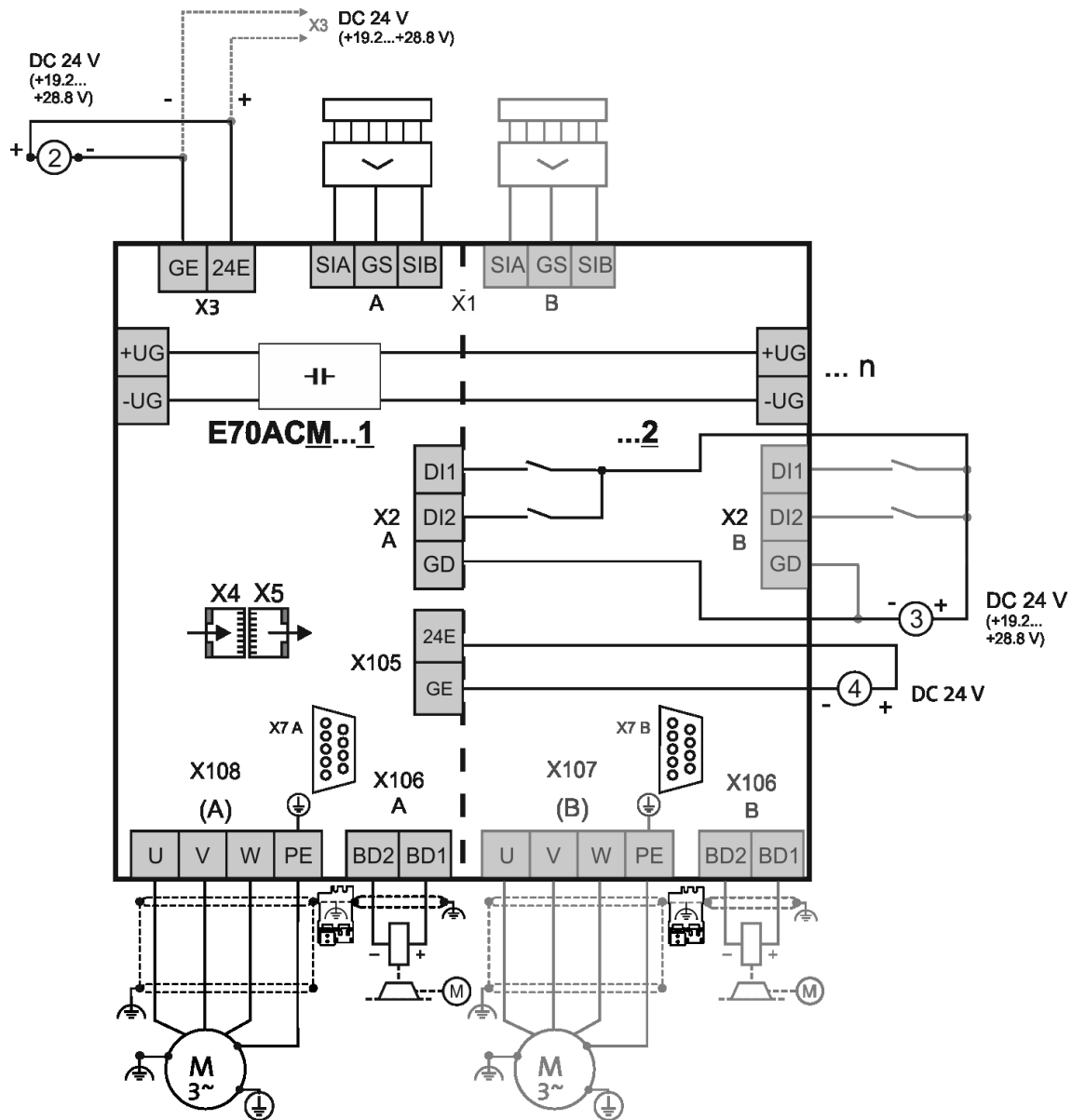
Category C3





Connection diagrams

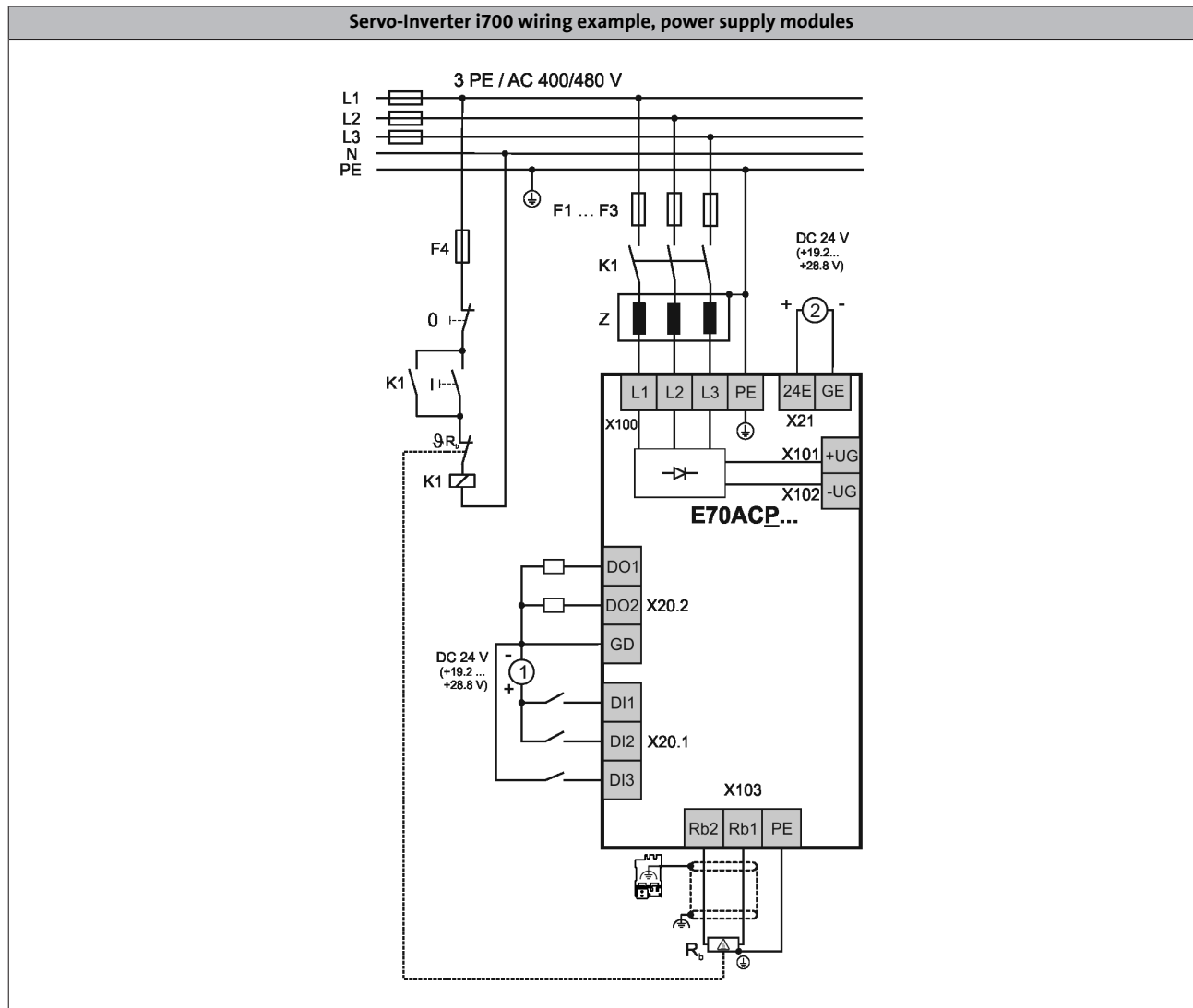
Wiring example for i700 servo inverter, axis modules, Basic Safety STO



- [2] 24 V supply for control electronics
- [3] 24 V supply for digital inputs
- [4] 24 V supply for motor holding brake(s)



Connection diagrams



- [1] 24 V supply for digital inputs
- [2] 24 V supply for control electronics

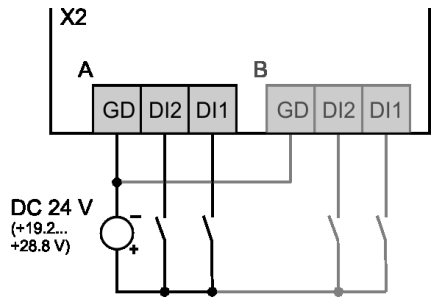


Control connections

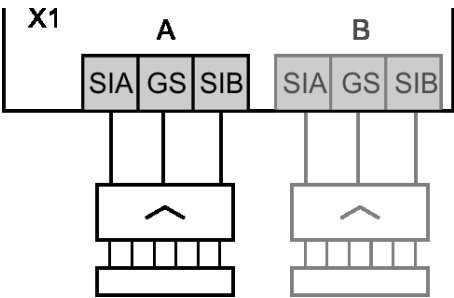
Mode	Servo-Inverter i700
Digital inputs	
Number	2
Touch-probe-capable	2 with time and position stamp
Switching level	PLC (IEC 61131-2)
Max. input current	8 mA
External DC supply	
Rated voltage	24 V in accordance with IEC 61131-2
Voltage range	19.2 ... 28.8 V, max. residual ripple $\pm 5\%$
Interfaces	
EtherCAT	2 (in/out)
Safety engineering	Safe torque off (STO) 2 channel design
Drive interface	
Resolver input	Sub-D, 9-pin
Encoder input	Sub-D, 15-pin SinCos absolute value encoder single-turn (with zero pulse) or multi-turn (Hyperface®)
Motor brake	24V holding brake per axis can be directly controlled

4.5

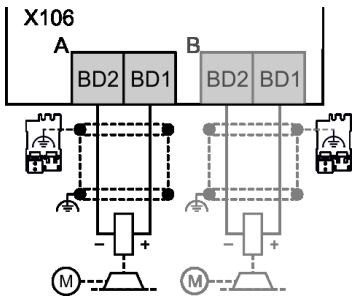
Connection of digital inputs



Connection of Basic Safety STO safety system



Motor brake connection





Control connections

External 24 V supply

The control electronics of the Servo-Inverter i700 has to be supplied with an external 24-V supply. For this purpose, Lenze provides power supply units. The following table shows the corresponding current consumptions of the devices.

  41 - 24 V power supply unit

Single axes

Max. short-time output current	Product key	External DC supply
		Current
$I_{\max, \text{out}}$		
[A]		
5.0	E70ACM□□0054□□1ET□	1.0 A
10.0	E70ACM□□0104□□1ET□	
20.0	E70ACM□□0204□□1ET□	
32.0	E70ACM□□0324□□1ET□	2.0 A
48.0	E70ACM□□0484□□1ET□	
64.0	E70ACM□□0644□□1ET□	

4.5

Double axes

Max. short-time output current	Product key	External DC supply
		Current
$I_{\max, \text{out}}$		
[A]		
5.0	E70ACM□□0054□□2ET□	1.0 A
10.0	E70ACM□□0104□□2ET□	
20.0	E70ACM□□0204□□2ET□	
32.0	E70ACM□□0324□□2ET□	2.0 A

Servo-Inverter i700

Interfaces



Safety engineering

Safety engineering has been certified acc. to EN ISO 13849-1 (cat. 4, PL e), EN 61508/EN 62061 (SIL 3).

Basic Safety STO

By default, the i700 servo inverters are available with the "safe torque off, STO" safety function. This helps reduce the control system costs, save space in the control cabinet and keep wiring to a minimum. A "safe stop 1, SS1" can be implemented easily using a safety switching device.

The product key of the inverter has an ""A"" as the 14th character. For example, a servo inverter 5A, built-in unit with Basic Safety STO safety engineering would be: E70ACMSE0054SA1ETR



Double axis with connection for "Basic Safety STO" safety system



EtherCAT® communication

EtherCAT enables the i700 servo inverter to be controlled with digital control signals via the EtherCAT® bus system. It is integrated in the i700 servo inverter. It can be seen in the product key at the positions 16 and 17: E70ACM□□□□4S□□ET□.

The advantages of the system are:

- fast and very powerful bus system
- ideally suited for Controller-based Automation solutions
- easy system integration since a wide range of sensors and actuators is available on the market.
- the basic features of a servo drive are available in the axes according to the CiA402 device profile and can be easily used via the EtherCAT®.

Mode	Features
Communication	
EtherCAT ¹⁾	• CANopen over EtherCAT (CoE) • Distributed clock • 2 RJ45 connections with LEDs for link and activity

¹⁾ EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

Technical data

Product key			
Communication			
Medium			CAT5e S/FTP according to ISO/ICE11801 (2002)
Communication profile			CoE (CANopen over EtherCAT)
Baud rate			
	b	[MBit/s]	100
Node			
			Slave
Network topology			
			Line (internal ring)
Number of logical process data channels			
			1
Process data words (PCD)			
16 Bit			1 ... 32
Number of bus nodes			
			Max. 65535
Max. cable length			
between two nodes	I _{max}	[m]	100
Rated voltage			
	U _{N, DC}	[V]	24.0

Servo-Inverter i700

Interfaces





Brake resistors for power supply modules

The assignment of brake resistors to the power supply modules is shown in the following tables.



Brake resistor 27 ohms

Product key		Rated resistance	Rated power	Thermal capacity	Dimensions	Mass
Power supply module	Brake resistor					
		R_N	P_N	C_{th}	$h \times b \times t$	m
		[Ω]	[kW]	[KWs]	[mm]	[kg]
E70ACP□□0304□	ERBP027R200W	27.0	0.20	30.0	320 x 41 x 122	1.0
	ERBS027R600W		0.60	90.0	550 x 110 x 105	3.1
	ERBS027R01K2		1.20	180	1020 x 110 x 105	5.6
E70ACP□□0604□	ERBG012R01K9	12.0	1.90	285	486 x 236 x 302	13.0
	ERBG012R05K2		5.20	750	486 x 426 x 302	28.0



Mains chokes for power supply modules

A mains choke is an inductive resistor which is connected in the mains cable of the power supply module. The use of a mains choke provides the following advantages:

- **Fewer effects on the mains:**
The wave form of the mains current is a close approximation to a sine wave.
- **Reduction in the effective mains current:**
Reduction of mains, cable and fuse loads
- **Current balancing of power supply modules connected in parallel**

Mains chokes can be used without restrictions in conjunction with RFI filters.

Please note:

The use of a mains choke slightly reduces the mains voltage at the input of the power supply module – the typical voltage drop across the mains choke at the rated values is around 5%.

The selection of the correct mains chokes for the power supply modules depends on the number of connected axes. For this purpose, different mains chokes are available. For the following efficiencies of the power supply modules, we have dimensioned model mains chokes:

- Power supply modules for 30 A operation with rated data
- Power supply modules for 60 A operation with rated data

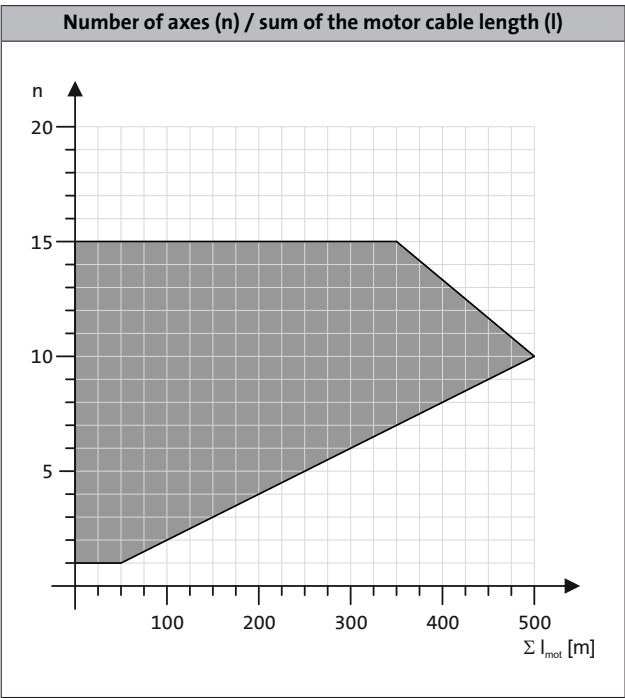


Mains choke

4.5

Product key		Output power	Rated current	Dimensions	Mass
Power supply module	Mains choke	at 400 V			
		P_{out}	I_N	$h \times b \times t$	m
		[kW]	[A]	[mm]	[kg]
E70ACP□□0304□	EZAELN3025B122	15.4	25.0	110 x 155 x 170	5.8
E70ACP□□0604□	EZAELN3050B591	30.9	50.0	112 x 185 x 210	8.4

The following diagram shows the possible number of axes and the possible sum of motor cable lengths to ensure compliance with interference suppression according to category C3.





Interference suppression of power supply modules

RFI filters

RFI filters are primarily capacitive accessory components which can be connected directly upstream from the power supply modules. This measure enables compliance with the corresponding conducted noise emission requirements according to EN 61800-3.

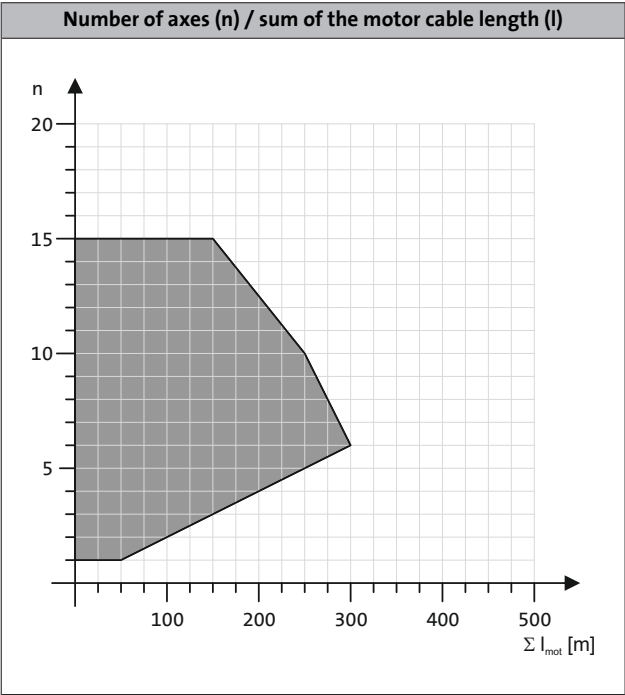


RFI filter, can be mounted beside the power supply module

Product key		Output power	Rated current	Power loss	Max. cable length	Dimensions	Mass
Power supply module	RFI filter	at 400 V			Reference group C2		
		P_{out}	I_N	P_V	I_{max}	$h \times b \times t$	m
		[kW]	[A]	[kW]	[m]	[mm]	[kg]
E70ACP□□0304□	E94AZRP0084	3.60	8.00	0.020	6 axes of 50 m each	485 x 60 x 261	4.2
	E94AZRP0294	10.3	29.0	0.050			4.5
E70ACP□□0604□	E94AZRP0824	20.6	82.0	0.080		490 x 209 x 272	18.5

4.5

The following diagram shows the possible number of axes and the possible sum of motor cable lengths to ensure compliance with interference suppression according to category C2.





Interference suppression of power supply modules

Mains filters

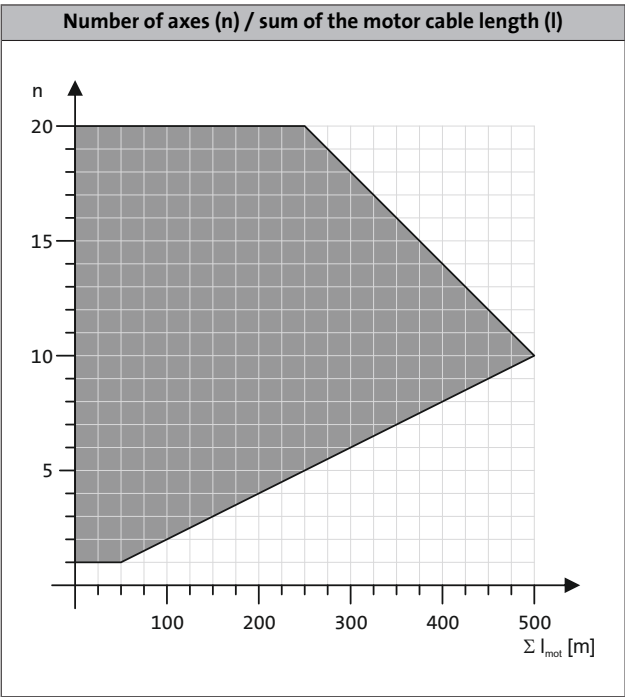
A mains filter is a combination of mains choke and RFI filter in one housing. It reduces the conducted interference emission into the mains in order that the conducted interference voltage is reduced to the area permissible according EN61800-3.

This results in the following advantages:

- Fewer effects on the mains:
The wave form of the mains current is a close approximation to a sine wave.
- Reduction in the effective mains current:
Reduction of mains, cable and fuse loads
- Current balancing when power supply modules are connected in parallel

Product key		Output power	Rated current	Voltage drop	Max. cable length	Dimensions	Mass
Power supply module	Mains filter	at 400 V			Reference group C2		
		P_{out}	I_N	U	I_{max}	h x b x t	m
		[kW]	[A]	[V]	[m]	[mm]	[kg]
E70ACP□□0304□	E94AZMP0084	4.90	8.00	10.0	10 axes of 50 m each	485 x 90 x 261	8.6
	E94AZMP0294	15.4	29.0	7.3		485 x 120 x 261	16.5
E70ACP□□0604□	E94AZMP0824	30.6	82.0	6.4		490 x 270 x 272	29.0

The following diagram shows the possible number of axes and the possible sum of motor cable lengths to ensure compliance with interference suppression according to category C2.



Servo-Inverter i700

Accessories



24 V power supply unit

The control electronics of the axis and power supply modules must be supplied by external 24-V power supply units. For this purpose, various power supply units are available. The power supply units can be supplied with AC voltage and DC voltage from the DC bus of the drive system. This ensures a continuous supply of the electronics in case of mains failure to ensure a controlled braking process.

Electrical isolation

The i700 components have a "safe separation" between mains and electronic potential according to IEC 61131-2. For maintaining this feature, the successive power supply units can be used with SELV (Safety Extra Low Voltage) or PELV (Protective Extra Low Voltage).



24 V power supply unit

Product key			EZV1200-000	EZV2400-000	EZV4800-000	EZV1200-001	EZV2400-001	EZV4800-001
Rated voltage								
AC	$U_{N, AC}$	[V]	230			400		
Input voltage								
	U_{in}	[V]	AC 85 ... 264 DC 90 ... 350			AC 320 ... 575 DC 450 ... 800		
Rated mains current								
	$I_{N, AC}$	[A]	0.8	1.2	2.3	0.3	0.6	1.0
Output voltage								
	U_{out}	[V]	DC 22.5 ... 28.5					
Rated output current								
	$I_{N, out}$	[A]	5.0	10.0	20.0	5.0	10.0	20.0
Dimensions								
Height	h	[mm]	130					
Width	b	[mm]	55	85	157	73	85	160
Depth	t	[mm]	125					
Mass								
	m	[kg]	0.8	1.2	2.5	1.0	1.1	1.9

4.5

Installation sets for Servo-Inverter i700

The installation sets include:

- All plug-in terminals
- Shield sheets plus shield terminals
- EtherCAT® cable (100 mm) for connecting the next axis

Mode	Features	Product key
Installation set for single axes	• For axes 5 to 20 A	E70AZEVK001
	• For axes 32 to 64 A	E70AZEVK003
Installation set for double axes	• For axes 5 to 10 A	E70AZEVK002
	• For axes 20 to 32 A	E70AZEVK004
Installation set for power supply modules	• For power supply module 30 A	E70AZEVK005
	• For power supply module 60 A	E70AZEVK006
	• For parallel connection	E70AZEVK007
Infeed adapter i700 DC Terminal	• For extending the DC-bus connection, energy exchange	E70AZEVE001

Servo-Inverter i700

Accessories



Installation material for i700 servo inverter

- For customers who order large quantities.

Single axes 5 to 20 A

Mode	Packaging	Product key
	VPE	
	[Stück]	
STO terminal	50	EZAEVE001/M
DigIN terminal	50	EZAEVE002/M
Terminal - external 24-V supply	50	EZAEVE003/M
Brake terminal	50	EZAEVE004/M
Motor terminal 2.5 mm ²	50	EZAEVE005/M
Shield plate BF1	25	EZAMBHXM008/M
Fixing clip	20	EZAMBHXM007/M
Wire clamp	10	EZAMBHXM006/M
EtherCAT® cable 100 mm (connection to the next axis)	10	EYC0000A0000X001/M

Single axes 32 to 64 A

Mode	Packaging	Product key
	VPE	
	[Stück]	
STO terminal	50	EZAEVE001/M
DigIN terminal	50	EZAEVE002/M
Terminal - external 24-V supply	50	EZAEVE003/M
Brake terminal	50	EZAEVE004/M
Motor terminal 6.0 mm ²	25	EZAEVE006/M
Shield plate BF2	25	EZAMBHXM009/M
Fixing clip	20	EZAMBHXM007/M
Wire clamp	10	EZAMBHXM003/M
EtherCAT® cable 100 mm (connection to the next axis)	10	EYC0000A0000X001/M

Double axes 5 to 10 A

Mode	Packaging	Product key
	VPE	
	[Stück]	
STO terminal	50	EZAEVE001/M
DigIN terminal	50	EZAEVE002/M
Terminal - external 24-V supply	50	EZAEVE003/M
Brake terminal	50	EZAEVE004/M
Motor terminal 2.5 mm ²	50	EZAEVE005/M
Shield plate BF1	25	EZAMBHXM008/M
Fixing clip	20	EZAMBHXM007/M
Wire clamp	10	EZAMBHXM006/M
EtherCAT® cable 100 mm (connection to the next axis)	10	EYC0000A0000X001/M

Servo-Inverter i700

Accessories



Installation material for i700 servo inverter

- For customers who order large quantities.

Double axes 20 to 32 A

Mode	Packaging	Product key
	VPE	
	[Stück]	
STO terminal	50	EZAEVE001/M
DigIN terminal	50	EZAEVE002/M
Terminal - external 24-V supply	50	EZAEVE003/M
Brake terminal	50	EZAEVE004/M
Motor terminal 2.5 mm ²	50	EZAEVE005/M
Shield plate BF2	25	EZAMBHXM009/M
Fixing clip	20	EZAMBHXM007/M
Wire clamp	10	EZAMBHXM003/M
EtherCAT® cable 100 mm (connection to the next axis)	10	EYC0000A0000X001/M

Power supply module 30 A

Mode	Packaging	Product key
	VPE	
	[Stück]	
Terminal - external 24-V supply	50	EZAEVE003/M
Mains terminal	50	EZAEVE008/M
DigIN terminal	50	EZAEVE009/M
DigOUT terminal	50	EZAEVE010/M
Brake resistor terminal	50	EZAEVE011/M
Shield plate BF1	25	EZAMBHXM008/M
Fixing clip	20	EZAMBHXM007/M
Wire clamp	10	EZAMBHXM006/M

Power supply module 60 A

Mode	Packaging	Product key
	VPE	
	[Stück]	
Terminal - external 24-V supply	50	EZAEVE003/M
Mains terminal	50	EZAEVE008/M
DigIN terminal	50	EZAEVE009/M
DigOUT terminal	50	EZAEVE010/M
Brake resistor terminal	50	EZAEVE011/M
Shield plate BF2	25	EZAMBHXM009/M
Fixing clip	20	EZAMBHXM007/M
Wire clamp	10	EZAMBHXM003/M

Servo-Inverter i700

Accessories



Internet version

Lenze SE
Hans-Lenze-Straße 1
D-31855 Aersen
Phone: +49 (0)5154 82-0
Telefax: +49 (0)5154 82 28 00

www.Lenze.com

Lenze