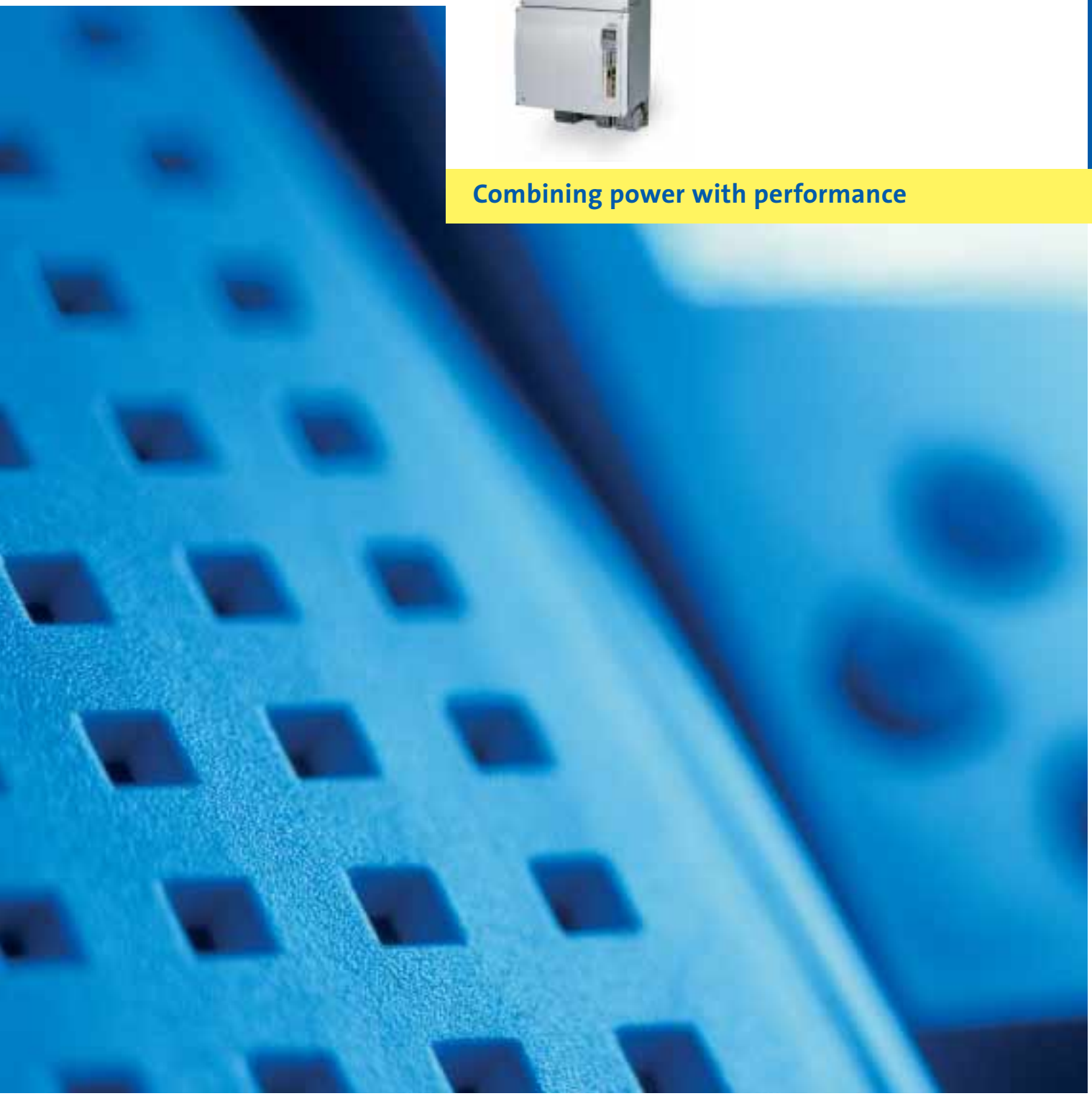
9300 vector **frequency inverter**

110 ... 400 kW

Combining power with performance



Lenze

No matter which drive solution you imagine, we make your dreams come true.

True to our slogan (one stop shopping) we offer you a complete program of electronic and mechanical drive systems which is distinguished by reliability and efficiency.

The scope of our program includes frequency inverters, servo controllers, variable-speed drives, speed reduction gearboxes, motors, brakes, clutches, decentralised I/O and operator and display units.











Many well-known companies use Lenze products in various applications.

Lenze | An introduction

Lenze is the competent partner for your application. Lenze is not only a supplier for single components but also offers solutions for complete drive systems including planning, execution and commissioning.

Furthermore, a worldwide service and distribution network lets you engage a qualified customer advisory service and an after sales service that is fast and extensive.

Our quality assurance system for design, production, sales and service is certified according to DIN ISO 9001 : 2000. Our environmental management system is also certified to DIN EN ISO 14001.
Our customers set the standards for measuring the quality of our products.
Our task is to meet your requirements, since customer orientation is a Lenze principle demanding the best quality.

See for yourself.






A worldwide service –
Our team of experts provides reliable and professional assisteance.

A true system

Drive and automation technology

Products which are setting the pace in terms of technology and complete drive solutions for machine and system production - just what Lenze is all about. We provide our customers with frequency and servo inverters with powers up to 400 kW. We support both central control cabinet solutions and decentralised drive concepts,e.g. with motor inverters with IP65 type of protection.

Both standard three-phase AC motors and synchronous and asynchronous servo motors are available to complement the various controllers, all of which can be combined with various types of gearbox. Human Machine Interfaces, decentralised I/O systems and modules for fieldbus interfacing are also available for exchanging information.

Lenze boasts extensive application know-how in all manner of industries. This knowledge has been applied in the design of the controller and PC software, providing an efficient means of implementing numerous standard applications using simple parameter settings.

An all-round service comprising component selection advice, training, commissioning support and even a helpline which can be accessed all over the world and independent system engineering complete the offer.

9300 servo inverter

ECS servo system for multi-axis application

8200 vector frequency inverter

8200 motec motor inverter

starttec motor starter

Communication modules

PC software

Software packages

Servo motors

Small drives

Brakes and clutches

9300 vector | Combining power with high performance

Do you need high power and high drive performance for motion in your machine? Lenze has designed the 9300 vector frequency inverter for this type of application. The range supports powers from 110 ... 400 kW and features optimised drive characteristics. It is ideal for example for extruders, pumps, compressors, fans or winders. Function blocks which can be interconnected freely in the software of the vector-controlled frequency inverter provide the basis for flexible applications.

The 9300 vector features a high speed control range with excellent speed stability. It responds quickly with short cycle times and is an easy-to-use and user-friendly frequency inverter. It is supplied with a number of essential drive parameters preset in predefined basic configurations and we can also provide operating and parameter setting software which you can use for quick and easy commissioning of the 9300 vector.

If necessary, the range can communicate via special plug-in modules with all current fieldbus systems. This provides the basis for integrating the 9300 vector into automation systems. The standard features built into the inverter include an incremental encoder input, a system bus based on CAN and master frequency input and output for the precision control of multiple motor systems. An optional built-in RFI filter or brake transistor can be added to the frequency inverter along with a complementary range of accessories.

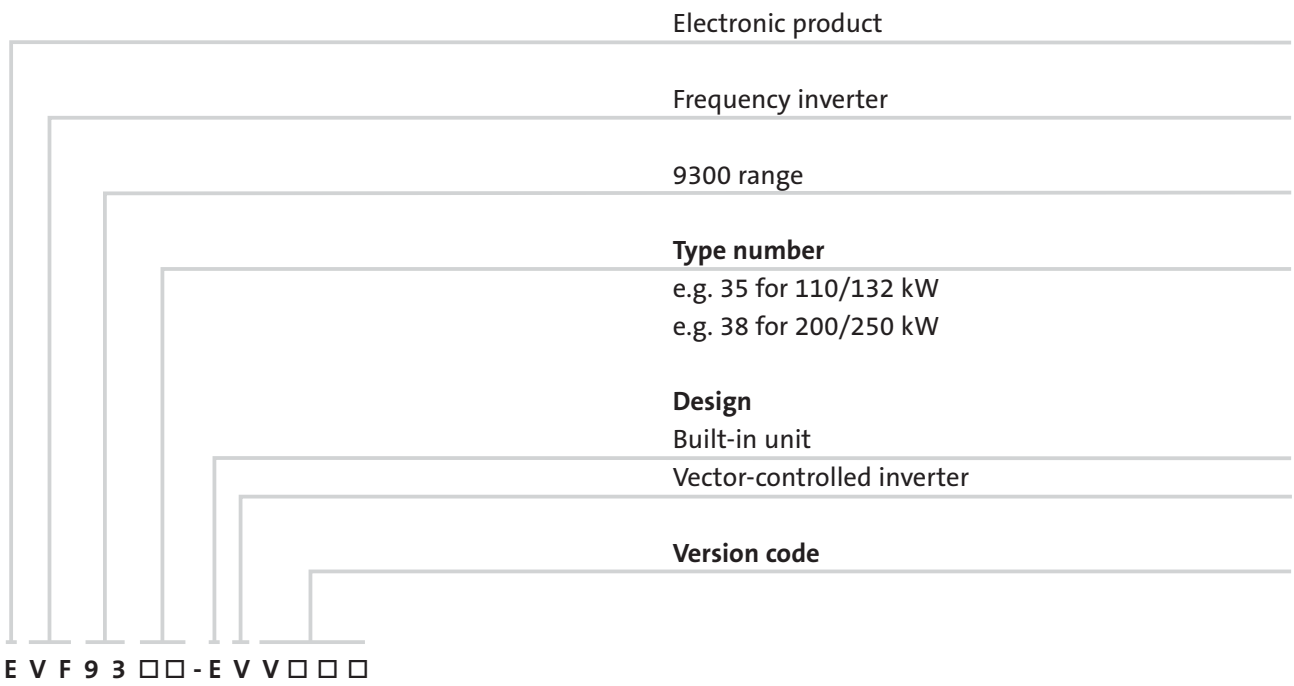
Contents | 9300 vector frequency inverter

Abbreviations used in this catalog

U_{mains}	[V]	Mains voltage
I_{mains}	[A]	Mains current
I_r	[A]	Rated output current
I_{max}	[A]	Maximum output current
P_r	[kW]	Rated motor power
P_V	[W]	Inverter power loss
M_r	[Nm]	Rated motor torque
L	[mH]	Inductance
R	[Ω]	Resistance

AC	Alternating current / voltage
DC	Direct current / voltage
DIN	Deutsches Institut für Normung
EMC	Electromagnetic compatibility
EN	European standard
IEC	International Electrotechnical Commission
IP	International Protection Code
NEMA	National Electrical Manufacturers Association
VDE	Verband deutscher Elektrotechniker
CE	Communauté Européene

Type code



We want to be sure that you receive the correct products in good time. In order to help us to do this, please make sure you provide complete order data:

- Your address and ordering data
- Our order numbers / designations for each catalog product
- Your delivery data, i.e. delivery date and delivery address

How to order

Ordering a frequency inverter is extremely easy:

- Photocopy the fax order form
  which you will find at the back of this catalog
  (→ page 69 and following).
- Enter the order data.
  Use the following pages to help you:
  - Selection of frequency inverters
    - for 400 V mains → Pages 18 to 21
    - for 500 V mains → Pages 22 and 23
    - for DC supply or DC-bus operation
      → Pages 20 to 23
  - Selection of accessories
    - Motor chokes e.g. for
      - long motor cable → Page 54 and following
      - parallel connection of EVF9381/9382/9383
        → Page 29
    - Air lock for direct heat dissipation from the control cabinet → Page 56
    - Communication modules for networking and operation → Page 38 and following
    - Overview of accessories → Page 64 and following
- Post or fax the form to your Lenze sales office.
  A list of Lenze sales offices can be found at the back of this catalog or on the Internet (www.lenze.com).

Lenze frequency inverters are used for electronic speed control on three-phase asynchronous motors in numerous industries and applications. We offer seamless standard products with flexible application options, quick and easy commissioning, reliability and of course a high level of quality. The 9300 vector is a vector-controlled frequency inverter which is ideally equipped even for demanding applications. Excellent drive characteristics even without the use of speed feedback and previously unimaginable options for open and closed-loop control tasks are just some of the features which make this frequency inverter so impressive. Typical application options for the 9300 vector include extruders, winders, pumps, compressors, fans, blowers, sawing / cutting drives, textile machines or conveyors.

The range

- Frequency inverter for three-phase mains connection
- Powers
  400 V, 110 ... 400 kW
  400 V / 500 V, 110 / 132 ... 400 / 500 kW

The 9300 vector frequency inverter is available

- With or without integrated RFI filter (limit class A)
- With or without integrated brake transistor

A complementary range of accessories completes the offer.

Stable, safe and precise processes due to excellent drive characteristics.

- Torque overload capacity of 150%
- 100% holding torque at speed 0 (with feedback)
- Speed setting range 1 :100 (1 :1000 with feedback)
- High speed stability
- Rapid adjustment of the speed on load changes
- Torque setting range up to 1 :10
  (1 :20 with feedback)
- Fast response – Cycle time digital inputs 1 ms

Adaptable

The selectable form of the V/f characteristic enables the frequency inverter to be adapted to loads with constant or square-law torque.

Operational reliability

Configurable slip compensation can be employed to compensate load-dependent fluctuations in speed without having to apply complex speed feedback.

The maximum current limiting function ensures stable operation at every operating point for both static and dynamic loads.

Energy-saving

The power is adapted to the drive requirements, i.e. the momentary torque and current requirements.

Ease of drive connection

Pluggable screw terminals for digital/analog inputs and outputs (pull-out terminal blocks) and SUB-D sockets for feedback and master frequency signals ensure that control signals can be connected quickly, easily and with protection against polarity reversal. All connections can be accessed easily from outside the unit.

Ready for immediate operation

The frequency inverters are preset for standard operation. The following parameters are also preset:

- Controlled acceleration and deceleration due to preset acceleration and deceleration times
- Assignment of standard functions to inputs and outputs

For complex applications, predefined basic configurations are available (e.g. for dancer positioning control, torque control, laying control, master frequency connection).

User-friendly

A wide variety of topic-related and application-specific menus are sure to help you solve your drive task and find the parameters required for it.
Example:

All the basic settings for standard applications can be made using the 32 parameters in the "User" menu. However, the "User" menu can also be customised by modifying and configuring parameters.

Ease of operation

The 9300 vector frequency inverter can be adapted quickly and easily to individual requirements using the PC and the "Global Drive Control" parameter setting / operating software. Simple dialog boxes (e.g. for short setup) facilitate the process. Alternatively, a plug-on operating module is available.

The correct setpoint source for every application

- Via setpoint potentiometer on the control terminals
- Via master voltage or master current on the control terminals
- Via digital frequency input
- Via the operating module
- Via a communication module directly from a host system.

Communication

The frequency inverters communicate with a higher-level host system via plug-on communication modules:

- LECOM-A/B (RS232/485)
- LECOM-LI (optical fibre)
- INTERBUS
- INTERBUS Loop
- PROFIBUS-DP
- DeviceNet/CANopen
- LON

A system bus interface (CAN) is provided on the frequency inverter as standard. This enables for example bus connections to be made between several Lenze inverters and automation components, with little cabling required.

Machine control at no extra cost.

More than 100 freely connectable function blocks such as PID controllers, flipflops, counters, comparators, delay elements, logic and mathematical functions are available. This enables the 9300 vector to perform other open and closed-loop control functions in addition to the actual drive task in the same way as a PLC. This reduces the load on - or even eliminates the need for - higher-level control systems, at no extra cost. Furthermore, the freely assignable function blocks mean that the 9300 vector can be integrated into machine, system and control concepts easily and without compromise.

A versatile frequency inverter for three-phase mains connection available in two designs:

- 3 ~ 400 V, 110 ... 400 kW
- 3 ~ 400 V/500 V, 110/132 ... 400/500 kW

Product features (selection)

- Incremental encoder input (connection of a feedback system)
- Master frequency input/output (e.g. precise, speed synchronous control of multiple motor systems)
- System bus interface (CAN)
- 7 digital inputs (6 can be freely assigned)
- 4 digital outputs (can be freely assigned)
- 2 bipolar analog inputs
- 2 bipolar analog outputs (can be freely assigned)
- Level inversion of digital inputs/outputs
- Optional inverse setpoint processing
- Input for PTC or thermal contact
- Integrated DC-bus choke (mains choke not required)
- Optional integrated brake transistor
- Optional integrated RFI filter (limit class A)
- Vector control or V/f characteristic control (linear/quadratic) can be selected
- Sensorless speed control
- Slip compensation
- 150 % rated torque for 60 s
- Adjustable current limitation
- Torque control
- Predefined basic configurations (e.g. for dancer positioning control, torque control, traversing control, step control)
- Freely assignable function blocks (logic, arithmetic, flipflop, counter, etc.)
- Automatic detection of motor parameters (at standstill)
- 2 PID controllers
- Smooth start/stop along S ramps
- 3 skip frequencies (elimination of mechanical resonances)
- 4 parameter sets
- Up to 15 fixed speeds per parameter set
- Password protection
- Electronic motor potentiometer
- DC braking
- Error history buffer
- Motor phase failure monitoring
- Mains failure control
- Switching frequency 1, 2 or 4 kHz
- Output frequency up to 300 Hz
- TRIP set and TRIP reset function
- Connection for DC supply or DC-bus operation (EVF93xx-EV**V210**, EVF93xx-EV**V240**, EVF93xx-EV**V270**, EVF93xx-EV**V300** only)

Communication modules (option)

- Keypad XT operating module for control and parameter setting with memory for parameter transfer (copy function)
- LECOM-A/B (RS232/485)
- LECOM-LI (optical fibre)
- INTERBUS
- INTERBUS Loop
- PROFIBUS-DP
- DeviceNet/CANopen
- LON

Standards and operating conditions

Conformance	CE	Low-Voltage Directive (73/23/EEC)	
Max. permissible motor cable length[1] (without additional output circuit)	Shielded: Unshielded	100 m 200 m	
Max. permissible motor cable length (with motor choke)	Shielded: Unshielded	200 m 400 m	Observe the operating conditions of the motor chokes (see page 54)
Vibration resistance	EN 50178		
Climatic conditions	Class 3K3 to EN 50178 (without condensation, average relative humidity 85 %)		
Pollution degree	VDE 0110 Part 2, pollution degree 2		
Packaging (DIN 4180)	Shipping container		
Permissible temperature ranges	Transport	-25 °C ... +70 °C	
	Storage	-20 °C ... +60 °C	
	Operation	0 °C ... +50 °C At temperatures above +40 °C, the rated output current should be derated by 2.5%/°C (current derating not required on EVF9335-EV types).	
Permissible installation height	0 ... 4000 m amsl Above 1000 m amsl, the rated output current should be derated by 5%/1000 m.		
Mounting position	Vertical		
Mounting space	Above and below: See page 22		
	To the side: See page 22		
DC-bus operation	Possible on EVF93xx-EV**V210**, EVF93xx-EV**V240**, EVF93xx-EV**V270**, EVF93xx-EV**V300**		
Protection of the connected motor	In order to avoid bearing currents, we recommend the use of motors with isolated non-drive end bearing. Motor chokes are an alternative method of reducing bearing currents (see page 54)		

[1] Permissible cable lengths may be affected if EMC conditions have to be met.

General electrical data

EMC	Compliance with requirements to EN 61800-3/A11		
Noise emission	Compliance with limit class A to EN 55011		
	▶ Only with integrated RFI filter (optional) ▶ Max. permissible motor cable length: 50 m, shielded		
Noise immunity	Requirements to EN 61800-3 incl. A11		
	Requirements	**Standard**	**Severity**
	ESD	EN 61000-4-2	3, i.e. 8 kV with air discharge 6 kV with contact discharge
	Cable-guided high frequency	EN 61000-4-6	150 kHz ... 80 MHz, 10 V/m 80 % AM (1 kHz)
	RF interference (housing)	EN 61000-4-3	80 MHz ... 1000 MHz, 10 V/m 80 % AM (1 kHz)
	Burst	EN 61000-4-4	3/4, i.e. 2 kV/5 kHz
	Surge (voltage surge on mains cable)	EN 61000-4-5	3, i.e. 1.2/50 µs, 1 kV phase-phase, 2 kV phase-PE
Insulation resistance	Overvoltage category III to VDE 0110		
Discharge current to PE (to EN 50178)	> 3.5 mA		
Enclosure	IP20		
Protection measures against	Short circuit, short to earth (protected against short to earth during operation, limited protection against short to earth on mains connection), overvoltage, overcurrent, motor stalling, motor overtemperature (input for PTC or thermal contact, I^2t monitoring)		
Protective insulation of control circuits	Mains isolation: Double/reinforced insulation to EN 50178 for digital inputs and outputs		
Cooling	Internal fan (volume flow: 975 m^3/h per unit), flow direction from bottom to top [1]		

[1] We recommend the use of air locks for dissipating heat loss from the control cabinet (see page 56).

Open and closed-loop control

Open and closed-loop control methods		V/f characteristic control (linear or quadratic), vector control
Switching frequency		1 kHz, 2 kHz or 4 kHz
Torque characteristics	Holding torque	1.0 x M_r (with feedback)
	Maximum torque	1.5 x M_r for 60 s, if rated motor power = rated power 9300 vector
	Setting range	Up to 1 : 10 (1 : 20 with feedback) in speed setting range 3 ... 50 Hz
Sensorless speed control	Min. motor speed	1 % rated motor speed (0 ... M_r)
	Setting range	1 :100 (related to 50 Hz and M_r)
	Accuracy	± 0.5 % in speed setting range 3 ... 50 Hz
Speed control with feedback	Min. motor speed	0 % rated motor speed (0 ... M_r)
	Setting range	1 :1,000 (related to 50 Hz and M_r)
	Accuracy	± 0.1 % in speed setting range 3 ... 50 Hz
Output frequency	Range	- 300 Hz ... + 300 Hz
	Absolute resolution	0.06 Hz
	Standardised resolution	Parameter data: 0.01 %, process data: 0.006% (= 2^{14})
Digital setpoint selection	Accuracy	± 0.005 Hz (= ± 100 ppm)
Analog setpoint selection	Linearity	± 0.15 % Signal level: 5 V or 10 V
	Temperature sensitivity	+ 0.1 % 0 ... 50 °C
	Offset	± 0 %

Inputs and outputs

Analog inputs/outputs		▶ 2 inputs (bipolar) ▶ 2 outputs (bipolar)
Digital inputs/outputs		▶ 6 inputs (can be freely assigned) ▶ 1 input for controller inhibit ▶ 4 outputs (can be freely assigned) ▶ 1 incremental encoder input (500 kHz, TTL level); Version: 9-pin Sub-D connector ▶ 1 master frequency input (500 kHz, TTL level or 200 kHz, HTL level); Version: 9-pin Sub-D connector; can also be used as an incremental encoder input (200 kHz, HTL level) ▶ 1 master frequency output (500 kHz, TTL level); Version: 9-pin Sub-D socket
Cycle time	Digital inputs	1 ms
	Digital outputs	1 ms
	Analog inputs	1 ms
	Analog outputs	1 ms (smoothing time: τ = 10 ms)
Operation in generator mode		Integrated brake transistor (option)

9300 vector for AC power supply

Typical motor power		**P_r [kW]**	**110**	**132**	**160**	**200**
		P_r [hp]	148	177	215	268
9300 vector		**Type/ Order no.**	**EVF9335-EV**	**EVF9336-EV**	**EVF9337-EV**	**EVF9338-EV**
9300 vector with integrated RFI filter A		**Type/ Order no.**	**EVF9335-EVV030**	**EVF9336-EVV030**	**EVF9337-EVV030**	**EVF9338-EVV030**
9300 vector with integrated brake transistor		**Type/ Order no.**	**EVF9335-EVV060**	**EVF9336-EVV060**	**EVF9337-EVV060**	**EVF9338-EVV060**
9300 vector with integrated RFI filter A with integrated brake transistor		**Type/ Order no.**	**EVF9335-EVV110**	**EVF9336-EVV110**	**EVF9337-EVV110**	**EVF9338-EVV110**
Mains voltage range		U_{mains} [V]	3/PE AC 340 V - 0 % ... 456 V + 0 % (45 Hz - 0 % ... 65 Hz + 0 %)			
Alternative DC power supply		U_{DC} [V]	Not possible (see page 20)			
			Data for operation at 3/PE 400 V AC			
Rated mains current		I_{mains} [A]	200	238	285	356
Rated output current at switching frequency...	1 kHz	I_{r1} [A]	210	250	300	375
	2 kHz	**I_{r2} [A]**	**210**	**250**	**300**	**375**
	4 kHz	I_{r4} [A]	210	250	270	330
Max. permissible output current for 60 s at switching frequency...	1 kHz	I_{max1} [A]	315	375	450	560
	2 kHz	**I_{max2} [A]**	**315**	**375**	**450**	**560**
	4 kHz	I_{max4} [A]	315	375	405	495
Power loss		P_v [kW]	2.8	3.3	4	5
Dimensions H x W x D		[mm]	1145 x 500 x 436			
Weight		m [kg]	160			200
Weight with integrated RFI filter A		m [kg]	175			215

9300 vector for AC power supply

Typical motor power		**P_r [kW]**	**250**	**315**	**400**
		P_r [hp]	335	422	536
9300 vector		**Type/ Order no.**	**EVF9381-EV**	**EVF9382-EV**	**EVF9383-EV**
9300 vector with integrated RFI filter A		**Type/ Order no.**	**EVF9381-EVV030**	**EVF9382-EVV030**	**EVF9383-EVV030**
9300 vector with integrated brake transistor		**Type/ Order no.**	**EVF9381-EVV060**	**EVF9382-EVV060**	**EVF9383-EVV060**
9300 vector with integrated RFI filter A with integrated brake transistor		**Type/ Order no.**	**EVF9381-EVV110**	**EVF9382-EVV110**	**EVF9383-EVV110**
Mains voltage range		U_{mains} [V]	3/PE AC 340 V - 0 % ... 456 V + 0 % (45 Hz - 0 % ... 65 Hz + 0 %)		
Alternative DC power supply		U_{DC} [V]	Not possible (see page 21)		
			Data for operation at 3/PE 400 V AC		
Rated mains current		I_{mains} [A]	475	570	713
Rated output current at switching frequency...	1 kHz	I_{r1} [A] 500	600	750	
	2 kHz	**I_{r2} [A]**	**500**	**600**	**750**
	4 kHz	I_{r4} [A]	500	540	660
Max. permissible output current for 60 s at switching frequency...	1 kHz	I_{max1} [A]	750	900	1125
	2 kHz	**I_{max2} [A]**	**750**	**900**	**1125**
	4 kHz	I_{max4} [A]	750	810	990
Power loss		P_v [kW]	6.6	8	10
Dimensions H x W x D		[mm]	1145 x 1050 x 436[1)]		
Weight		m [kg]			320 400
Weight with integrated RFI filter A		m [kg]			350 430

1) Drive consists of two units (master and slave) connected in parallel. The components required for parallel connection (DC connection mounting set) are included in the scope of supply. The units should be mounted with a clearance of 50 mm to the side. Notes about parallel connection → Page 29

Note:
The currents listed are total currents for master and slave.

Master Slave

9300 vector for AC and DC power supply

Typical motor power		**P_r [kW]**	**110**	**132**	**160**	**200**
		P_r [hp]	148	177	215	268
9300 vector		**Type/ Order no.**	**EVF9335-EVV210**	**EVF9336-EVV210**	**EVF9337-EVV210**	**EVF9338-EVV210**
9300 vector with integrated RFI filter A		**Type/ Order no.**	**EVF9335-EVV240**	**EVF9336-EVV240**	**EVF9337-EVV240**	**EVF9338-EVV240**
9300 vector with integrated brake transistor		**Type/ Order no.**	**EVF9335-EVV270**	**EVF9336-EVV270**	**EVF9337-EVV270**	**EVF9338-EVV270**
9300 vector with integrated RFI filter A with integrated brake transistor		**Type/ Order no.**	**EVF9335-EVV300**	**EVF9336-EVV300**	**EVF9337-EVV300**	**EVF9338-EVV300**
Mains voltage range		U_{mains} [V]	3/PE AC 340 V - 0 % ... 577 V + 0 % (45 Hz - 0 % ... 65 Hz + 0 %)			
Alternative DC power supply		U_{DC} [V]	DC 480 V - 0 % ... 800 V + 0 %			
			Data for operation at 3/PE 400 V AC or 565 V DC			
Rated mains current		I_{mains} [A]	200	238	285	356
Rated output current at switching frequency...	1 kHz	I_{r1} [A]	210	250	300	375
	2 kHz	**I_{r2} [A]**	**210**	**250**	**300**	**375**
	4 kHz	I_{r4} [A]	210	250	270	330
Max. permissible output current for 60 s at switching frequency...	1 kHz	I_{max1} [A]	315	375	450	560
	2 kHz	**I_{max2} [A]**	**315**	**375**	**450**	**560**
	4 kHz	I_{max4} [A]	315	375	405	495
Power loss		P_v [kW]	2.8	3.3	4	5
Dimensions H x W x D		[mm]	1145 x 500 x 436			
Weight		m [kg]	160			200
Weight with integrated RFI filter A		m [kg]	175			215

Note:
Other inverters in the 9300 range (servo or vector) can also be used for the DC supply or DC-bus operation with the types shown on this page.

9300 vector for AC and DC power supply

Typical motor power		**P_r [kW]**	**250**	**315**	**400**
		P_r [hp]	335	422	536
9300 vector		**Type/ Order no.**	**EVF9381-EVV210**	**EVF9382-EVV210**	**EVF9383-EVV210**
9300 vector with integrated RFI filter A		**Type/ Order no.**	**EVF9381-EVV240**	**EVF9382-EVV240**	**EVF9383-EVV240**
9300 vector with integrated brake transistor		**Type/ Order no.**	**EVF9381-EVV270**	**EVF9382-EVV270**	**EVF9383-EVV270**
9300 vector with integrated RFI filter A with integrated brake transistor		**Type/ Order no.**	**EVF9381-EVV300**	**EVF9382-EVV300**	**EVF9383-EVV300**
Mains voltage range		U_{mains} [V]	3/PE AC 340 V - 0 % ... 577 V + 0 % (45 Hz - 0 % ... 65 Hz + 0 %)		
Alternative DC power supply		U_{DC} [V]	DC 480 V - 0 % ... 800 V + 0 %		
			Data for operation at 3/PE 400 V AC or 565 V DC		
Rated mains current		I_{mains} [A]	475	570	713
Rated output current at switching frequency...	1 kHz	I_{r1} [A]	500	600	750
	2 kHz	**I_{r2} [A]**	**500**	**600**	**750**
	4 kHz	I_{r4} [A]	500	540	660
Max. permissible output current for 60 s at switching frequency...	1 kHz	I_{max1} [A]	750	900	1125
	2 kHz	**I_{max2} [A]**	**750**	**900**	**1125**
	4 kHz	I_{max4} [A]	750	810	990
Power loss		P_v [kW]	6.6	8	10
Dimensions H x W x D		[mm]	1145 x 1050 x 436[1)]		
Weight		m [kg]	320		400
Weight with integrated RFI filter A		m [kg]	350		430

1) Drive consists of two units (master and slave) connected in parallel. The components required for parallel connection (DC connection mounting set) are included in the scope of supply. The units should be mounted with a clearance of 50 mm to the side. Notes about parallel connection → Page 29

Note:

- The currents listed are total currents for master and slave.
- Other inverters in the 9300 range (servo or vector) can also be used for the DC supply or DC-bus operation with the types shown on this page.

Master Slave

9300 vector for AC and DC power supply

Typical motor power		**P_r [kW]**	**132**	**160**	**200**	**250**
		P_r [hp]	177	215	268	335
9300 vector		**Type/ Order no.**	**EVF9335-EVV210**	**EVF9336-EVV210**	**EVF9337-EVV210**	**EVF9338-EVV210**
9300 vector with integrated RFI filter A		**Type/ Order no.**	**EVF9335-EVV240**	**EVF9336-EVV240**	**EVF9337-EVV240**	**EVF9338-EVV240**
9300 vector with integrated brake transistor		**Type/ Order no.**	**EVF9335-EVV270**	**EVF9336-EVV270**	**EVF9337-EVV270**	**EVF9338-EVV270**
9300 vector with integrated RFI filter A with integrated brake transistor		**Type/ Order no.**	**EVF9335-EVV300**	**EVF9336-EVV300**	**EVF9337-EVV300**	**EVF9338-EVV300**
Mains voltage range		U_{mains} [V]	3/PE AC 340 V - 0 % ... 577 V + 0 % (45 Hz - 0 % ... 65 Hz + 0 %)			
Alternative DC power supply		U_{DC} [V]	DC 480 V - 0 % ... 800 V + 0 %			
			Data for operation at 3/PE 500 V AC or 705 V DC			
Rated mains current		I_{mains} [A]	200	238	285	356
Rated output current at switching frequency...	1 kHz	I_{r1} [A]	210	250	300	375
	2 kHz	**I_{r2} [A]**	**210**	**250**	**300**	**375**
	4 kHz	I_{r4} [A]	210	250	270	330
Max. permissible output current for 60 s at switching frequency...	1 kHz	I_{max1} [A]	315	375	450	560
	2 kHz	**I_{max2} [A]**	**315**	**375**	**450**	**560**
	4 kHz	I_{max4} [A]	315	375	405	495
Power loss		P_v [kW]	3	3.5	4.3	5.3
Dimensions H x W x D		[mm]	1145 x 500 x 436			
Weight		m [kg]	160			200
Weight with integrated RFI filter A		m [kg]	175			215

Note:
Other inverters in the 9300 range (servo or vector) can also be used for the DC supply or DC-bus operation with the types shown on this page.

9300 vector for AC and DC power supply

Typical motor power		**P_r [kW]**	**315**	**400**	**500**
		P_r [hp]	422	536	671
9300 vector		**Type/ Order no.**	**EVF9381-EVV210**	**EVF9382-EVV210**	**EVF9383-EVV210**
9300 vector with integrated RFI filter A		**Type/ Order no.**	**EVF9381-EVV240**	**EVF9382-EVV240**	**EVF9383-EVV240**
9300 vector with integrated brake transistor		**Type/ Order no.**	**EVF9381-EVV270**	**EVF9382-EVV270**	**EVF9383-EVV270**
9300 vector with integrated RFI filter A with integrated brake transistor		**Type/ Order no.**	**EVF9381-EVV300**	**EVF9382-EVV300**	**EVF9383-EVV300**
Mains voltage range		U_{mains} [V]	3/PE AC 340 V - 0 % ... 577 V + 0 % (45 Hz - 0 % ... 65 Hz + 0 %)		
Alternative DC power supply		U_{DC} [V]	DC 480 V - 0 % ... 800 V + 0 %		
			Data for operation at 3/PE 500 V AC or 705 V DC		
Rated mains current		I_{mains} [A]	475	570	713
Rated output current at switching frequency...	1 kHz	I_{r1} [A]	500	600	750
	2 kHz	**I_{r2} [A]**	**500**	**600**	**750**
	4 kHz	I_{r4} [A]	500	540	660
Max. permissible output current for 60 s at switching frequency...	1 kHz	I_{max1} [A]	750	900	1125
	2 kHz	**I_{max2} [A]**	**750**	**900**	**1125**
	4 kHz	I_{max4} [A]	750	810	990
Power loss		P_v [kW]	7	8.6	10.6
Dimensions H x W x D		[mm]	1145 x 1050 x 436[1)]		
Weight		m [kg]	320		400
Weight with integrated RFI filter A		m [kg]	350		430

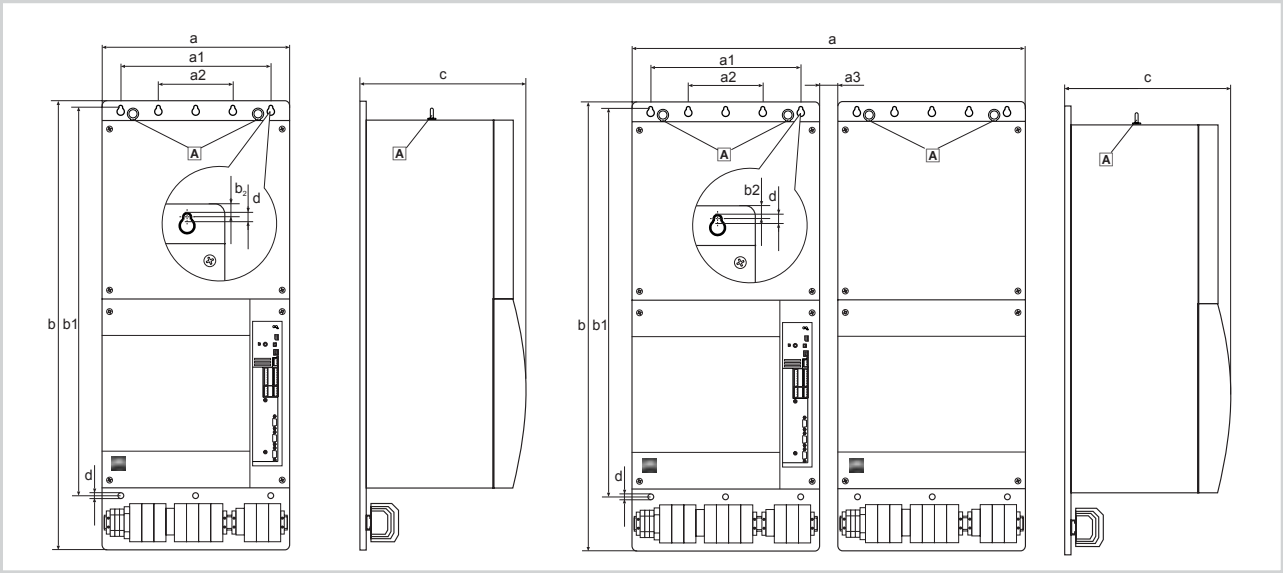
1) Drive consists of two units (master and slave) connected in parallel. The components required for parallel connection (DC connection mounting set) are included in the scope of supply. The units should be mounted with a clearance of 50 mm to the side. Notes about parallel connection → Page 29

Note:

- The currents listed are total currents for master and slave.
- Other inverters in the 9300 range (servo or vector) can also be used for the DC supply or DC-bus operation with the types shown on this page.

Master Slave

Mounting



A Lifting rings for the frequency inverter

9300 vector	Dimensions [mm]								
Type	a	a_1	a_2	a_3	b	b_1	b_2	c	d
EVF9335-EV	500	450	225	–	1145	1005	15	436	9 (8x)
EVF9336-EV									
EVF9337-EV									
EVF9338-EV									
EVF9381-EV	1050	450	225	50	1145	1005	15	436	9 (16x)
EVF9382-EV									
EVF9383-EV									

Mounting space

Observe the specified clearances to ensure sufficient cooling for the frequency inverter.

Clearance	Minimum distance
To the left/right of another inverter	30 mm [1]
To the left/right of a wall that does not dissipate heat	100 mm
Above/below	200 mm [1]

[1] If you are using the air lock (accessories, see page 56), other clearances apply.

Fuses and cable cross-sections for the mains supply

The following fuses (utilisation category gG/gL) can be used to protect the mains cable with the appropriate cable cross-sections:

9300 vector type	Fuse VDE		Cable cross-section [mm²] 1) L1, L2, L3		PE	
EVF9335-EV	250 A		150		95	
EVF9336-EV	315 A		150		95	
EVF9337-EV	315 A		150		95	
EVF9338-EV	400 A		240		150	
	Master 2)	Slave 2)	Master 2)	Slave 2)	Master 2)	Slave 2)
EVF9381-EV	315 A	315 A	150	150	95	95
EVF9382-EV	315 A	315 A	150	150	95	95
EVF9383-EV	400 A	400 A	240	240	150	150

Please observe national and regional regulations.

1) The cable cross-sections listed are recommended values and are based on installation in accordance with EN 60204-1.
– The cables should be located at least one cable cross-section away from the control cabinet.
– The ambient temperature must not exceed 40 °C.

2) Separate power supplies must be used for both the master and the slave.

Note:
The frequency inverter can only be protected using semiconductor fuses (utilisation category gRL).

Standard fuses and suitable holders (e.g. disconnectors or bases) may be used if they have suitable features.

We recommend the following l.v. h.b.c. fuses and l.v. h.b.c. fuse disconnectors to DIN 43620 manufactured by Siba (www.siba.de):

l.v. h.b.c. fuse 1)			l.v. h.b.c. fuse disconnector	Size
Rated current [A]	Voltage [V]	Siba order no.	Siba order no.	l.v. h.b.c.
250	690	20 211 34.250	2100321	1
315		20 212 34.315	2100421	2
400		20 213 34.400	2100521	3

1) Semiconductor fuse (utilisation category gRL, rated breaking capacity 100 kA)

Fuses and cable cross-sections for the DC supply

Other Lenze inverters, e. g. from the 9300 drive range (servo or vector), can be used for the DC supply or DC-bus operation on 9300 vector frequency inverters with type designations EVF93xx-EV**V210**, EVF93xx-EV**V240**, EVF93xx-EV**V270** and EVF93xx-EV**V300**.

Semiconductor fuses (utilisation category gRL) are required to protect the DC cables and the frequency inverter.

We recommend the following fuses with appropriate cable cross-sections:

9300 vector type	**Fuse** VDE		**Cable cross-section** [mm²] 1) $+U_{DC}$, $-U_{DC}$		PE	
EVF9335-EV	315 A		150		95	
EVF9336-EV	350 A		150		95	
EVF9337-EV	400 A		240		95	
EVF9338-EV	500 A		240		150	
	Master 2)	Slave 2)	Master 2)	Slave 2)	Master 2)	Slave 2)
EVF9381-EV	350 A	350 A	150	150	95	95
EVF9382-EV	400 A	400 A	240	240	95	95
EVF9383-EV	500 A	500 A	240	240	150	150

Please observe national and regional regulations.

1) The cable cross-sections listed are based on installation in accordance with EN 60204-1.
– The cables should be located at least one cable cross-section away from the control cabinet.
– The ambient temperature must not exceed 40 °C.

2) Separate power supplies must be used for both the master and the slave.

Note:
Use a two-pole fuse for the DC cable ($+U_{DC}$, $-U_{DC}$).

Standard fuses and suitable holders (e.g. disconnectors or bases) may be used if they have suitable features.

We recommend the following l.v. h.b.c. fuses and l.v. h.b.c. fuse disconnectors to DIN 43620 manufactured by Siba (www.siba.de):

l.v. h.b.c. fuse 1)			**l.v. h.b.c. fuse disconnector**	**Size**
Rated current [A]	Voltage [V]	Siba order no.	Siba order no.	l.v. h.b.c.
315	690	20 212 34.315	2100421	2
350		20 213 34.350	2100521	3
400		20 213 34.400	2100521	3
500		20 213 34.500	2100521	3

1) Semiconductor fuse (utilisation category gRL, rated breaking capacity 100 kA)

General

- Both multi-wire cables and single-cores can be used.
- If the cable comprises a number of cores per phase, it may be necessary to use standard cable junctions for the frequency inverter connection.

Cable cross-sections

- Maximum connectable cable cross-section for power terminals (screw terminals)

9300 vector Type	Maximum connectable cable cross-section [mm²] L1, L2, L3, BR1, BR2, U, V, W		$+U_{DC}$, $-U_{DC}$		PE	
EVF9335-EV	150 (2 x 50) [1]		150 (2 x 50) [1]		95	
EVF9336-EV	150 (2 x 50) [1]		150 (2 x 50) [1]		95	
EVF9337-EV	150 (2 x 50) [1]		240 (2 x 95) [1]		95	
EVF9338-EV	240 (2 x 95) [1]		240 (2 x 95) [1]		150	
	Master	Slave	Master	Slave	Master	Slave
EVF9381-EV	150 (2 x 50) [1]	150 (2 x 50) [1]	150 (2 x 50) [1]	150 (2 x 50) [1]	95	95
EVF9382-EV	150 (2 x 50) [1]	150 (2 x 50) [1]	240 (2 x 95) [1]	240 (2 x 95) [1]	95	95
EVF9383-EV	240 (2 x 95) [1]	240 (2 x 95) [1]	240 (2 x 95) [1]	240 (2 x 95) [1]	150	150

[1] Multi-conductor connection (two conductors with the same cross-section)

- The actual cable cross-section required can be determined e.g. by the application, the ambient and operating conditions or the type of cable used.
  The same cable cross-sections do not have to be used for the input and output.

Important:
When laying out cables, ensure adherence to national and local regulations.

Mains cable/DC cable

- Shielding is not required for the mains cable.
- We recommend the use of shielded DC cables for DC-bus operation and DC supplies.

Motor cable

- A fuse is not required for the motor cable.
- For reasons of EMC, we recommend the use of shielded motor cables.
- Suppliers of shielded motor cables include Bruns Spezialkabel (www.brunskabel.de).
- Use commercially available metal clips to connect the motor cable shield connection.

9300 vector frequency inverters with type designations EVF93**81**-EV, EVF93**82**-EV and EVF93**83**-EV comprise two units (master and slave).

Following mechanical installation, the master and slave are connected electrically (parallel connection):

DC bus connection

The DC bus is connected via two DC busbars. The bars and corresponding screws are part of the scope of supply (DC connection mounting set).

Important:
You must ensure the correct mounting distance between the master and the slave (50 mm) for the trouble-free installation of the DC busbars.

Control signal connection

The frequency inverter control electronics are located in the master.

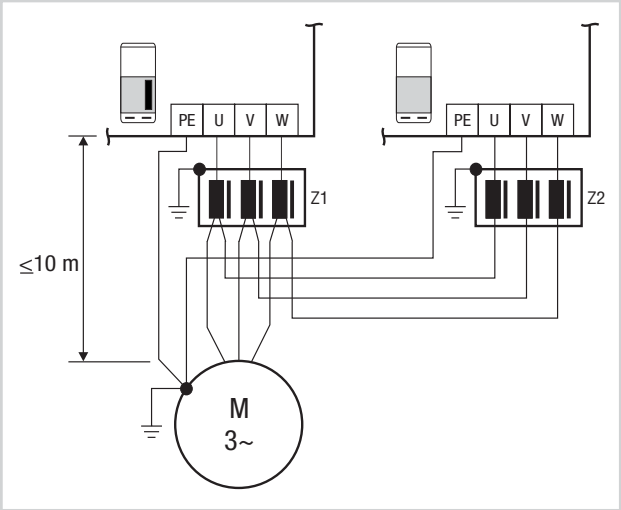
The control signals are connected to the slave via polarised plug connections.

Motor-side connection

The motor-side parallel connection can only be made via an inductance at the outputs of the master and slave.

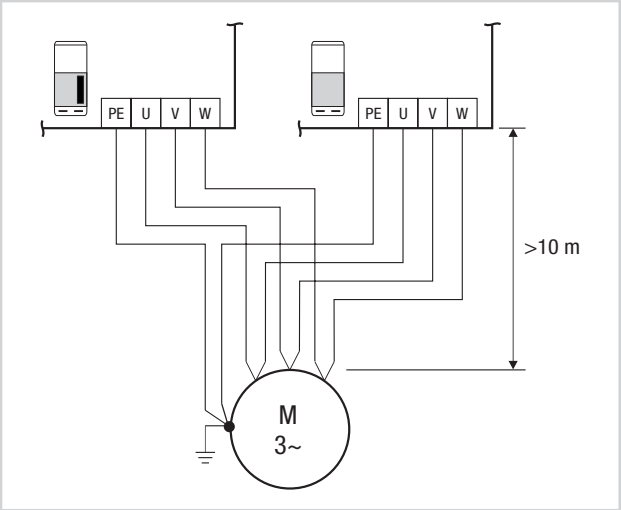
The length of the motor cable determines whether the cable inductance is sufficient or if additional motor chokes are required:

Connection for motor cable length ≤ 10 m



For motor cable lengths ≤ 10 m, the master and slave must be connected in parallel on the motor side using motor chokes (Z1, Z2). Observe the operating conditions of the motor chokes (see page 55).

Connection for motor cable length > 10 m

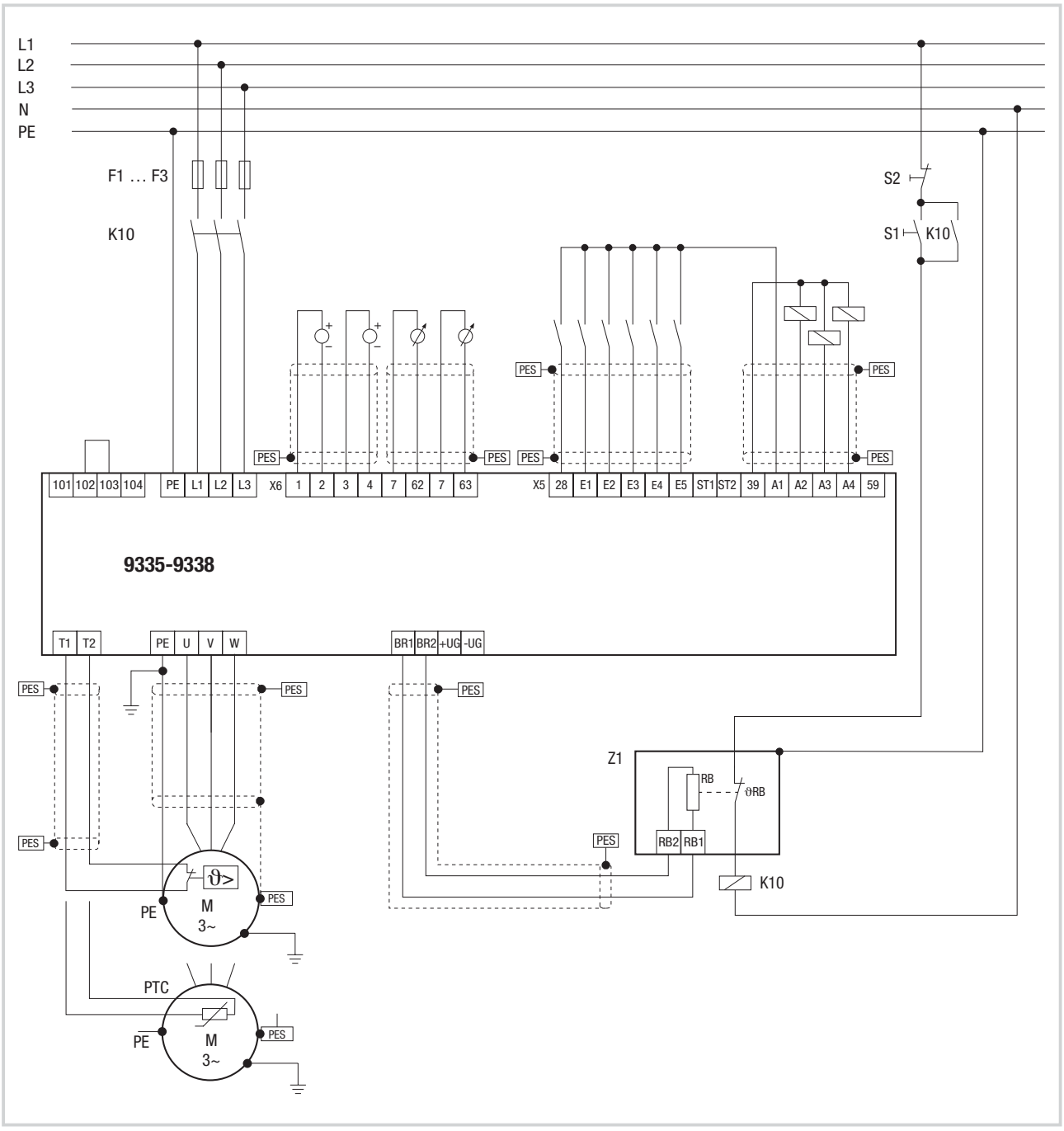


For motor cable lengths > 10 m, the motor cables for the master and slave may be connected in parallel on the motor.

Important

- **Separate** mains supplies must be used for both the master and the slave. This also applies if a DC supply or DC-bus operation is being used.
- If a brake resistor is used for braking, the braking energy is usually dissipated equally via the master and the slave (**no** coupling).

The example below illustrates the 9300 vector connection in full detail.

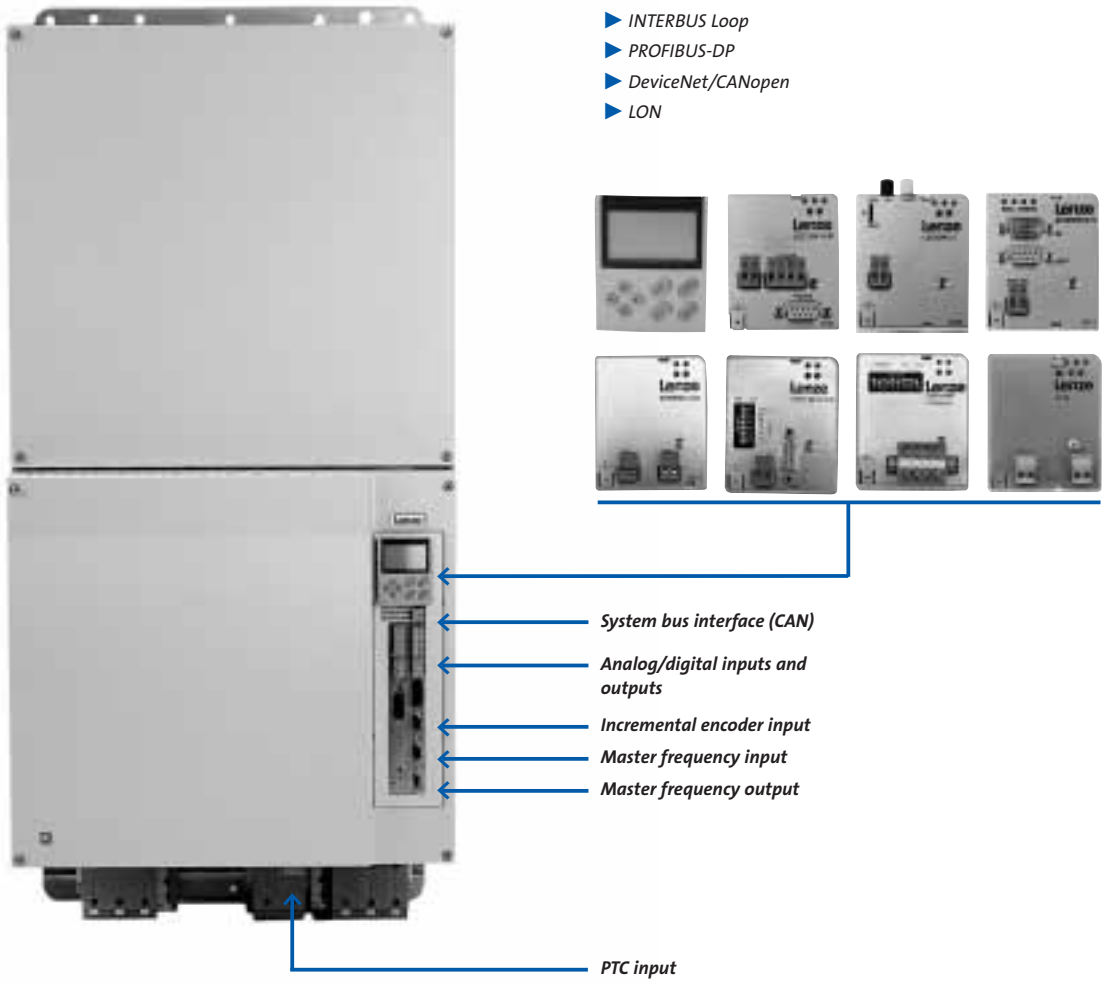


F1 ... F3	Fuse
K10	Mains contactor
Z1	Brake resistor
S1	Switch on mains contactor
S2	Switch off mains contactor
PES	RF shield termination by means of wide contact with PE

The 9300 vector frequency inverter is controlled and integrated into automation and control concepts using analog/digital inputs and outputs, an incremental encoder input, one master frequency input and one master frequency output and a system bus interface (CAN).

In addition, depending on the application, it may also be possible to establish communication with a higher-level host system using plug-on communication modules. This provides a high level of flexibility for various drive and automation tasks.

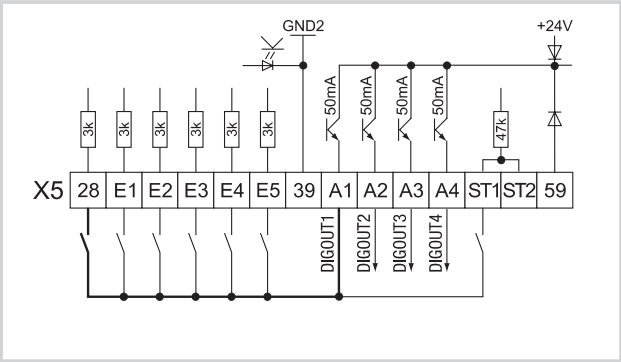
Overview: 9300 vector control options



The 9300 vector frequency inverter has 7 digital inputs (e.g. to activate functions in the frequency inverter) and 4 digital outputs (e.g. to output messages).

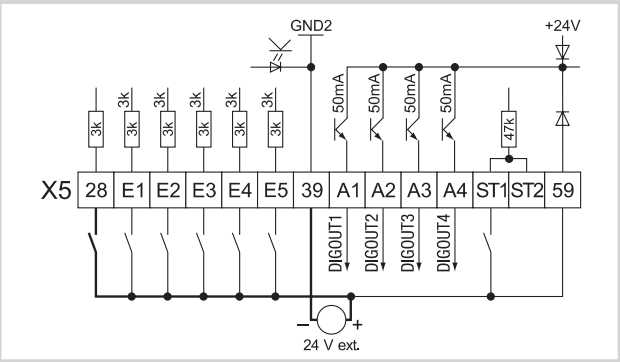
Terminal assignment

Supply via internal voltage source



——— Minimum wiring required for operation

Supply via external voltage source



——— Minimum wiring required for operation

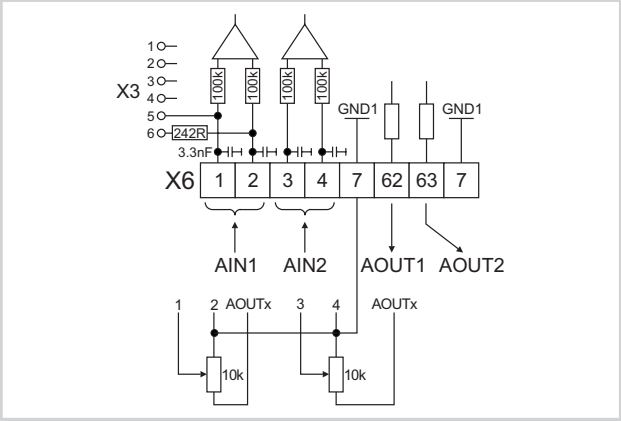
X5/	Signal type	Function (bold print = Lenze setting)	Level	Technical data
28	Digital inputs	Controller inhibit	HIGH = Start	LOW: 0 ... +3 V HIGH: +12 ... +30 V Input current at +24 V: 8 mA per input Read and process inputs: every ms (mean value)
E1		Can be freely assigned **CW rotation**	HIGH	
E2		Can be freely assigned **CCW rotation**	HIGH	
E3		Can be freely assigned **Activate JOG setpoint 1**	HIGH	
E4		Can be freely assigned **Set error message**	LOW	
E5		Can be freely assigned **Reset error message**	LOW-HIGH edge	
ST1 ST2		Can be freely assigned Additional digital input (E6)	–	
A1	Digital outputs	Can be freely assigned **Error message pending**	LOW	LOW: 0 ... +3 V HIGH: +12 ... +30 V Load capacity: Max. 50 mA per output (external resistance at least 480 Ω at 24 V) Update outputs: every ms (mean value)
A2		Can be freely assigned **Switching threshold: Actual speed < Setpoint**	LOW	
A3		Can be freely assigned **Ready for operation**	HIGH	
A4		Can be freely assigned **Maximum current reached**	HIGH	
39	–	GND2, reference potential for digital signals	–	Isolated to GND1
59	–	DC supply for backup operation of the 9300 vector in the event of a mains failure	+24 V external	Current requirement: Min. 1A

Electrical connection	Pluggable screw terminals		
Connection options	Rigid: 2.5 mm² (AWG 14)		
	Flexible:		
	2.5 mm² (AWG 14)	without wire end ferrule	
	2.5 mm² (AWG 14)	with wire end ferrule without plastic sleeve	
	2.5 mm² (AWG 14)	with wire end ferrule and plastic sleeve	
Tightening torques	0.5 ...0.6 Nm (4.4 ...5.3 lb-in)		

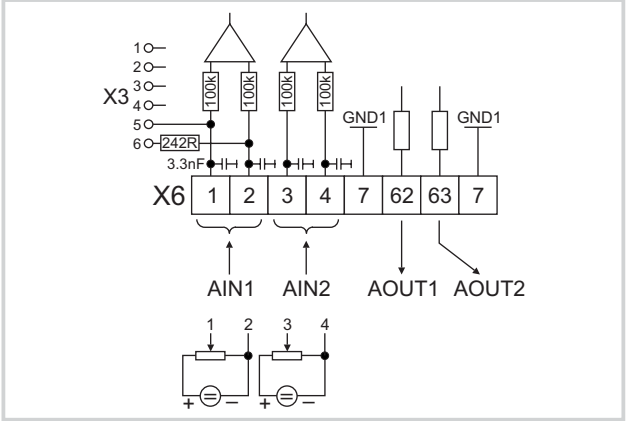
The 9300 vector frequency inverter has 2 bipolar analog inputs (e.g. for setpoint selection) and 2 bipolar analog outputs (e.g. to output actual values).

Terminal assignment

Supply via internal voltage source



Supply via external voltage source



X6/	Signal type	Function (bold print = Lenze setting)		Level	Technical data
1 2	Analog input 1	Differential input master voltage **Main setpoint**	 Jumper X3[1)]	-10 V to +10 V	Resolution: 5 mV (11 bits + sign)
		Differential input master current	 Jumper X3[1)]	-20 mA to +20 mA	Resolution: 20 µA (10 bits + sign)
3 4	Analog input 2	Differential input master voltage **Not active**	Jumper X3 has no effect	-10 V to +10 V	Resolution: 5 mV (11 bits + sign)
62	Analog output 1	**Actual speed value**		-10 V to +10 V; max. 2 mA	Resolution: 20 mV (9 bits + sign)
63	Analog output 2	**Actual motor current value**		-10 V to +10 V; max. 2 mA	Resolution: 20 mV (9 bits + sign)
7	–	GND1, reference potential for analog signals		–	–

[1)] Jumper X3 is located on the front panel of the control electronics.

Electrical connection	Pluggable screw terminals	
Connection options	Rigid: 2.5 mm² (AWG 14)	
	Flexible:	
	2.5 mm² (AWG 14)	without wire end ferrule
	2.5 mm² (AWG 14)	with wire end ferrule without plastic sleeve
	2.5 mm² (AWG 14)	with wire end ferrule and plastic sleeve
Tightening torques	0.5 ... 0.6 Nm (4.4 ... 5.3 lb-in)	

The 9300 vector frequency inverter has an incremental encoder input for control feedback. Feedback is required for example for applications which require high levels of accuracy, wide setting ranges or holding torques at speed 0.

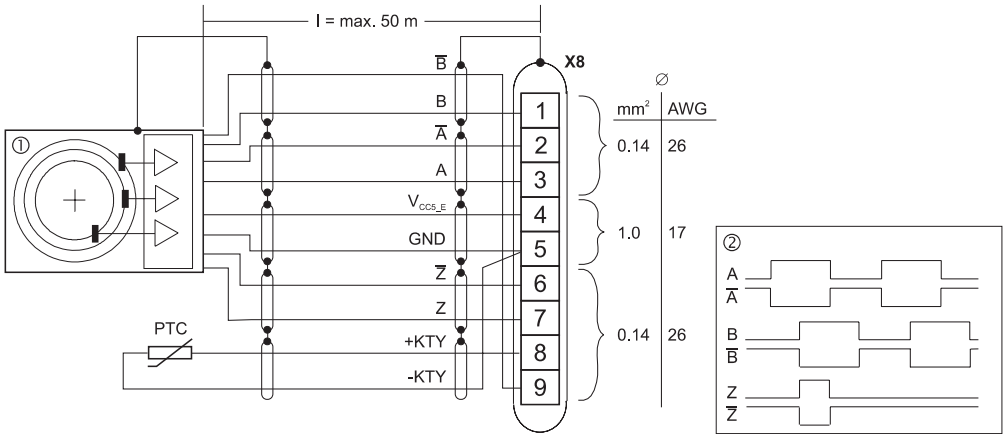
The incremental encoder signal can be output again at the master frequency output for slave drives.

Technical data

Connection to the 9300 vector	9-pin Sub-D connector
Incremental encoder level	TTL (5 V)[1)]
Input frequency	0 ... 500 kHz
Current consumption per channel	6 mA

[1)] Incremental encoders with HTL level can be connected to the master frequency input (X9).

Connecting an incremental encoder to the incremental encoder input (X8).



① Incremental encoder with TTL level ② Signals for CW rotation
Connecting an incremental encoder with HTL level at the master frequency input (X9):
– Connect the external supply voltage for the incremental encoder to GND and V_{CC5_E} (do not use X9/4).
– Do not use X9/8

Tip:
When connecting the incremental encoder, use a pre-assembled Lenze encoder cable (EWLExxxGX-T). The cables have a connector at one end for connection to the 9300 vector.

Encoder cables

Type/Order no.	Length [m]	No. of cores/ Cross-section [mm²]	Cable diameter [mm]	Bending radius Rigid installation	Bending radius Flex. installation [1)]	Weight [kg]
EWLE002GX-T	2.5	1x(2x1.0) + 4x(2x0.14)	10.7	7.5 x d	15 x d	0.3
EWLE005GX-T	5.0	1x(2x1.0) + 4x(2x0.14)	10.7	7.5 x d	15 x d	0.6
EWLE010GX-T	10.0	1x(2x1.0) + 4x(2x0.14)	10.7	7.5 x d	15 x d	1.3
EWLE015GX-T	15.0	1x(2x1.0) + 4x(2x0.14)	10.7	7.5 x d	15 x d	2.0
EWLE020GX-T	20.0	1x(2x1.0) + 4x(2x0.14)	10.7	7.5 x d	15 x d	2.7
EWLE025GX-T	25.0	1x(2x1.0) + 4x(2x0.14)	10.7	7.5 x d	15 x d	3.3
EWLE030GX-T	30.0	1x(2x1.0) + 4x(2x0.14)	10.7	7.5 x d	15 x d	4.0
EWLE035GX-T	35.0	1x(2x1.0) + 4x(2x0.14)	10.7	7.5 x d	15 x d	4.7
EWLE040GX-T	40.0	1x(2x1.0) + 4x(2x0.14)	10.7	7.5 x d	15 x d	5.4
EWLE045GX-T	45.0	1x(2x1.0) + 4x(2x0.14)	10.7	7.5 x d	15 x d	6.1
EWLE050GX-T	50.0	1x(2x1.0) + 4x(2x0.14)	10.7	7.5 x d	15 x d	6.8

[1)] Continuous alternating bending not permissible.

The 9300 vector frequency inverter has one master frequency input and one master frequency output.

They can be used for example for the precise and speed-synchronous control of multiple motor systems.

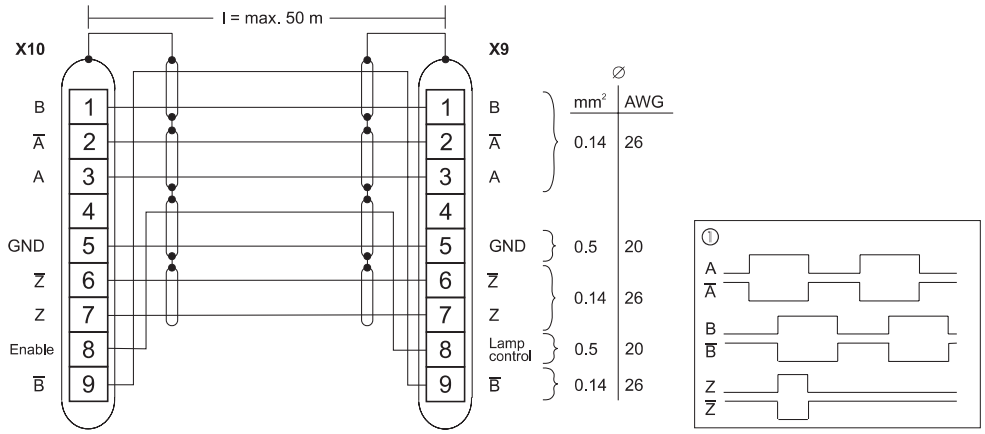
Technical data/Product features

Master frequency output (X10)

- 9-pin Sub-D socket
- Output frequency: 0 ... 500 kHz
- Current carrying capacity per channel: Max. 20 mA
- Two-track with inverse 5 V signals and zero track
- Load capacity:
  In a parallel connection, a maximum of 3 slave drives may be connected.

Master frequency input (X9)

- 9-pin Sub-D socket
- Can also be used as an incremental encoder input
- Input frequency:
  –0 ... 500 kHz at TTL level
  –0 ... 200 kHz at HTL level
- Two-track with inverse signals and zero track



X10 Master drive
X9 Slave drive
① Signals for CW rotation

Tip:
Use Lenze's pre-assembled cable when setting up a master frequency connection. The cable has connectors on both sides for connection to two frequency inverters.

Connecting cable for master frequency connection

Type/Order no.	Length [m]	No. of cores/Cross-section [mm²]	Cable diameter [mm]	Bending radius		Weight [kg]
				Rigid installation	Flex. installation	
EWLD002GGBS93	2.5	1 x (2x0.5) + 3 x (2x0.14)	9.3	7.5 x d	15 x d	0.4

The 9300 vector frequency inverter features a system bus interface as standard via which the vector can be connected to the CAN (Controller Area Network) serial communication system.

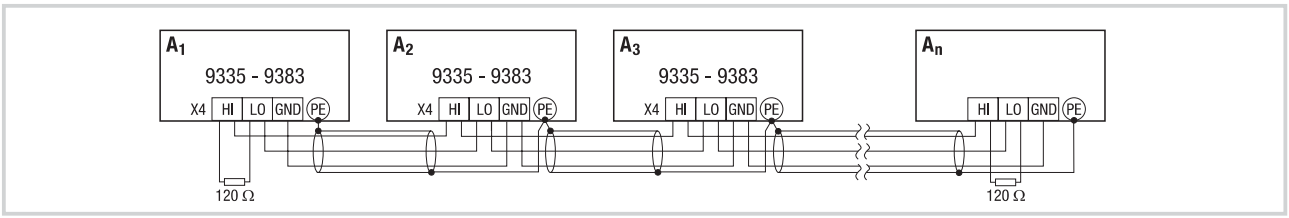
Functions supported by the system bus (CAN) include:
- Parameter preselection/remote parameter setting
- Data transfer between inverters
- Connection to external controllers and host systems
- Options for connection to
  - Decentralised I/O systems
  - Operator/display units

General data

Communication medium	DIN ISO 11898				
Communication profile	Based on CANopen (CiA DS301)				
Network topology	Line (terminated at both ends with 120 Ω)				
System bus stations	Master or slave				
Max. no. of stations	63				
Max. distance between two stations	Unlimited, determined by max. bus length				
Baud rate [kbps]	50	125	250	500	1000
Max. bus length [m]	1000	550	250	120	25
No. of logic process data channels	3				
No. of logic parameter data channels	2				
Electrical connection	Pluggable screw terminals				
Connection options	 Rigid: 2.5 mm² (AWG 14)				
	Flexible:  2.5 mm² (AWG 14) without wire end ferrule  2.5 mm² (AWG 14) with wire end ferrule without plastic sleeve  2.5 mm² (AWG 14) with wire end ferrule and plastic sleeve				
Tightening torques	0.5 ... 0.6 Nm (4.4 ... 5.3 lb-in)				

Terminal assignment

Basic structure



A_1 bus station 1 A_2 bus station 2 A_3 bus station 3 A_n bus station n (e.g. PLC), n = max. 63

Terminal	Designation	Explanation
X4/GND	CAN-GND	System bus reference potential
X4/LO	CAN-LOW	System bus LOW (data line)
X4/HI	CAN-HIGH	System bus HIGH (data line)

Wiring notes

We recommend the following signal cable:

System bus cable specification	Total length up to 300 m	Total length up to 1000 m
Cable type	LIYCY 2 x 2 x 0.5 mm^2 (shielded twisted pairs)	CYPIMF 2 x 2 x 0.5 mm^2 (shielded twisted pairs)
Cable resistance	≤ 40 Ω/km	≤ 40 Ω/km
Capacitance per unit length	≤ 130 nF/km	≤ 60 nF/km
Connection	Pair 1 (white/brown): CAN-LOW and CAN-HIGH Pair 2 (green/yellow:) CAN-GND	

Possible applications

The default factory settings (Lenze standard configuration) of the 9300 vector meet the requirements of many common applications. Therefore, the drive can be put into operation immediately after installation. Simply connect the Keypad XT, LECOM-A/B or LECOM-LI communication modules to the frequency inverter to adapt the 9300 vector to your own specific requirements.

A wide variety of topic-related and application-specific menus are sure to help you solve your drive task and find the parameters required for it. Predefined basic configurations are available for complex applications.

	Keypad XT operating module	**LECOM-A/B (RS232/485) or LECOM-LI (optical fibre)**
Description	Can be used to operate the 9300 vector via a keypad	Connects the 9300 vector to a higher-level host computer (e.g. a PC)
Function	You can use these communication modules for example ▶ to set parameters on and configure your 9300 vector ▶ to control (e.g. inhibit and enable) your 9300 vector ▶ to display operating data ▶ to select setpoints ▶ to transfer parameters to other 9300 vector inverters	

Note:
With a PC and the LECOM-A/B or LECOM-LI communication modules, it is also possible to set parameters using the "Global Drive Control" parameter setting/operating software.

Alternatively, the device can be operated with a PC and "Global Drive Control" via the system bus interface (CAN). For this option, a PC system bus adapter is required instead of a LECOM module.

PC system bus adapter

Alternatively, parameter setting/operation/configuration can be carried out with the PC and the "Global Drive Control" parameter setting/operating software via the system bus interface (CAN) of the 9300 vector. For this option, a PC system bus adapter is required instead of a LECOM-A/B or LI module. This adapter simply plugs into the parallel interface/USB connection on the PC. The corresponding drivers are installed automatically. Depending on the version, the adapter power supply is provided via the DIN or PS2 connection/ the USB connection on the PC.

Advantage:

- Operation/diagnostics possible even if a communication module is connected (e.g. PROFIBUS-DP)
- On networked systems, up to 63 inverters can be addressed from a single location (remote parameter setting)

EMF2173IB-V003 adapter

EMF2177IB adapter

Type/Order no.	Selection
EMF2173IB	PC system bus adapter (voltage supply via DIN connection on PC)
EMF2173IB-V002	PC system bus adapter (voltage supply via PS2 connection on PC)
EMF2173IB-V003	PC system bus adapter (voltage supply via PS2 connection on PC, electrically isolated from system bus)
EMF2177IB	USB PC system bus adapter (voltage supply via USB connection on PC, electrically isolated from system bus)

Global Drive Control – GDC (type / order no. ESP-GDC2)

The "Global Drive Control" PC program is an easy-to-understand user-friendly tool for the operation, parameter setting, configuration and diagnostics of the 9300 vector.

GDC features include:

- Quick and easy setup of the drive by means of the short setup function
- Intuitive operation even for inexperienced users
- Extensive help functions
- User-friendly diagnostics options via several monitor windows and oscilloscope functions mean that external measuring instruments are no longer required
- Connection of function blocks without programming knowledge using the function block editor

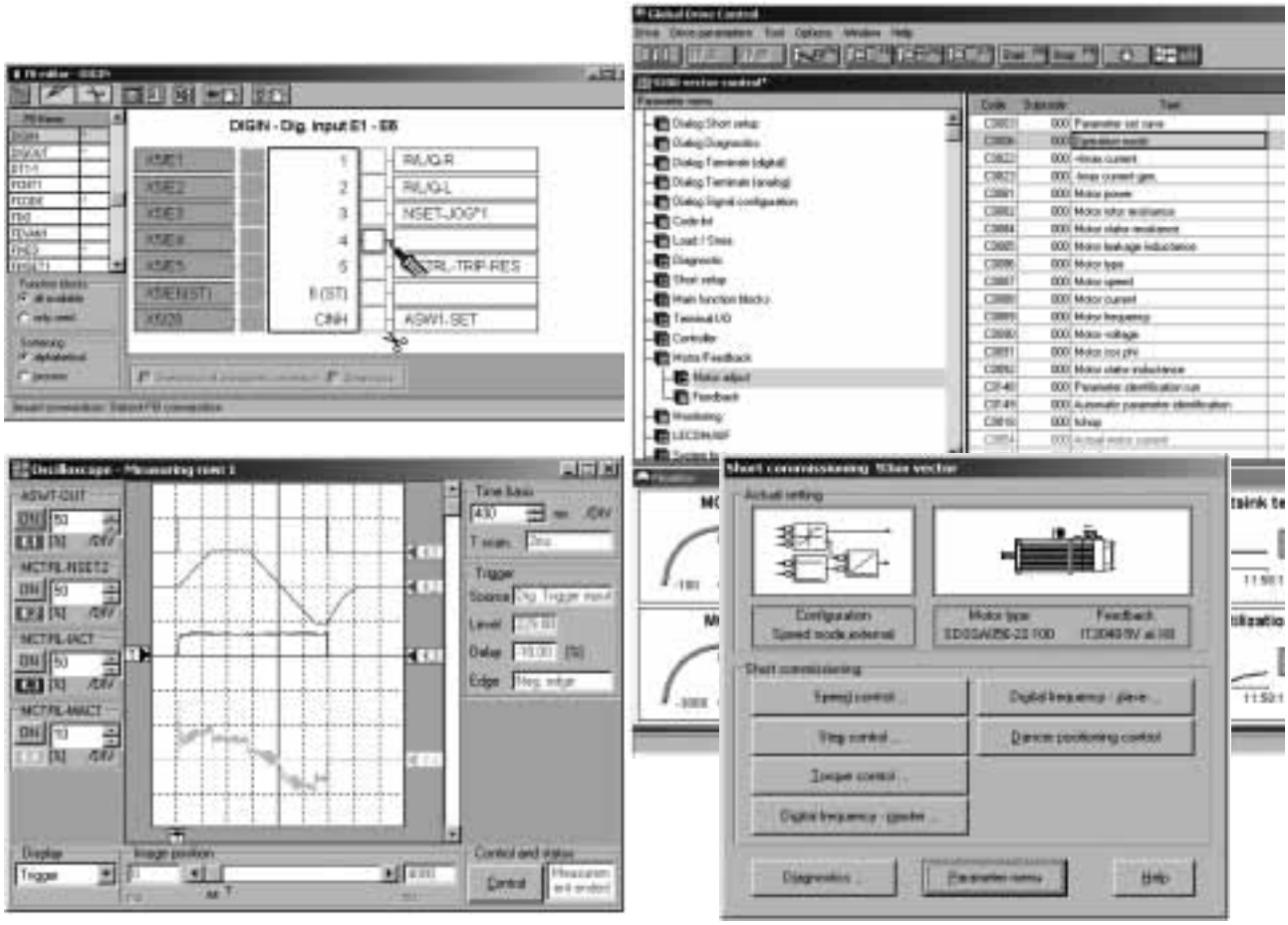
GDC system requirements

Hardware:

- IBM-AT or compatible PC
- CPU: Pentium 90 or higher
- RAM: 64 MB
- 180 MB free hard disk space
- Super VGA screen
- CD-ROM drive
- One free serial interface for RS232 or one free parallel interface for PC system bus adapter

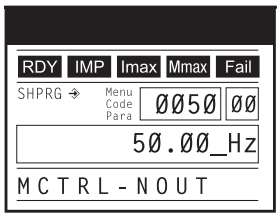
Software:

- Windows 95 / 98 / Me / NT 4.0 / 2000 / XP



The short setup function enables the entire drive to be set up quickly and easily, supported by self-explanatory dialog boxes. For complex applications, the links between function blocks are stored in predefined basic configurations (e.g. for dancer positioning control, torque control, traversing control, master frequency connection).

Keypad XT operating module



The Keypad XT operating module is available as an alternative to PC-based operation. Eight keys and a display in plain text provide quick and easy access to the inverter parameters via the transparent menu structure. The Keypad XT is also used for the purposes of status display and error diagnostics. In addition, its built-in memory can be used to transfer parameters to other inverters. Customised level-specific password protection prevents illegal access.

The Keypad XT can also be used on drives from the 9300 vector, 9300 servo and Drive PLC ranges, as well as on decentralised 8200 motec motor inverters (via diagnosis terminal).

To facilitate handling, a connecting cable can be used to plug the Keypad into a hand-held unit so that it can be used as a diagnosis terminal.

Selection	Type/Order no.
Keypad XT	**EMZ9371BC**
Diagnosis terminal (hand-held Keypad XT, IP20)	**E82ZBBXC**
2.5 m connecting cable [1)]	**E82ZWL025**
5 m connecting cable [1)]	**E82ZWL050**
10 m connecting cable [1)]	**E82ZWL100**

[1)] The connecting cable is required to connect the diagnosis terminal to the 9300 vector.

9300 vector frequency inverters can be networked with a host system (PLC or PC) via plug-on communication modules.

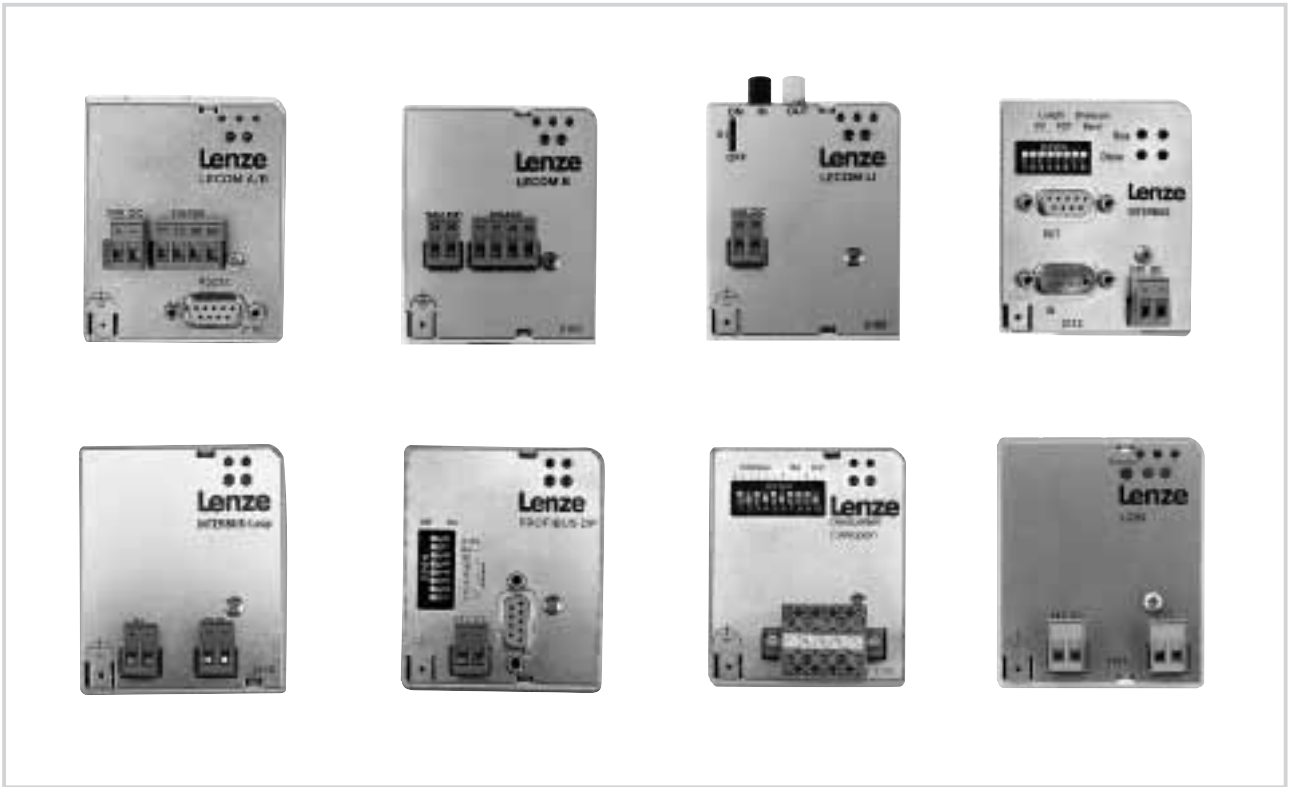
Networking via RS232/485
Three options are available:
- RS232/485 (LECOM-A/B)
  The RS232 and RS485 interfaces are designed as 9-pin Sub-D sockets. For the RS485 interface, a screw terminal is also available for connecting through to the next frequency inverter.
- RS485 (LECOM-B)
- Optical fibre (LECOM-LI)
  A plastic core provides a noise-free and cost-effective means of networking via optical fibres. The optical fibre can be adapted easily via an optical fibre socket on the module. For the host system we offer optical fibre adapters which can be plugged into the interface of the host computer.

All three interfaces communicate using the Lenze LECOM protocol. The LECOM protocol is completely open for your applications.

Networking via LON
The LON module is used in building automation and environment management.

Networking via CANopen or DeviceNet
On the DeviceNet/CANopen module, the data transfer speed and the address can be set using DIP switches. This module can be particularly useful in the event of service operations. It is possible to switch between DeviceNet and CANopen via a DIP switch. The DeviceNet fieldbus has been particularly successful in the American and Asian markets.

Networking via host systems at high process speed
- INTERBUS
  INTERBUS is connected directly to the remote bus. The DRIVECOM profile 21 is supported for this connection. 9-pin SUB-D plugs are provided for easy networking.
- INTERBUS Loop
- PROFIBUS
  Slave interface module with the PROFIBUS-DP communication profile.



Communication modules

LECOM-B (RS485)

General data and operating conditions

Communication medium	RS485 (LECOM-B)
Communication protocol	LECOM A/B V2.0
Transfer character format	7E1: 7-bit ASCII, 1 stop bit, 1 start bit, 1 parity bit (even)
Baud rate [bps]	1200, 2400, 4800, 9600, 19200
LECOM-B station	Slave
Network topology	Without repeaters: Line With repeaters: Line or tree
Max. no. of stations	32 (= 1 bus segment) including host system With repeaters: 90
Max. cable length per bus segment	1200 m (depending on the baud rate and the type of cable used)
Electrical connection	Pluggable screw terminals
DC voltage supply	▶ Internal ▶ External, only required if: – Bus stations which have been disconnected from the mains need to maintain communication with the master – Power is being provided via a separate power supply – +24 V DC ± 10 %, max. 80 mA per module
Ambient temperature	Operation: 0 ... +55 °C Transport: -25 ... +70 °C Storage: -25 ... +60 °C
Climatic conditions	Class 3K3 to EN 50178 (without condensation, average relative humidity 85 %)
Type/Order no.	EMF2102IBCV002

Note:
One of the features on the communication module is a set of three LEDs to indicate the communication status.

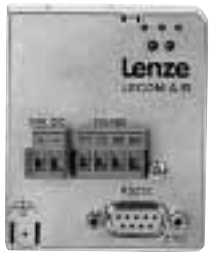
LECOM-A/B (RS232/485)

In addition to the RS485 interface (see LECOM-B for data and operating conditions) the LECOM-A/B communication module also features an additional RS232 interface with the following features:

Note:
One of the features on the communication module is a set of three LEDs to indicate the communication status.

General data and operating conditions

Communication medium	RS232 (LECOM-A)
Network topology	Point-to-point
Max. no. of stations	1
Max. cable length	15 m
Electrical connection	Sub-D socket (9-pin)
Type/Order no.	EMF2102IBCV001



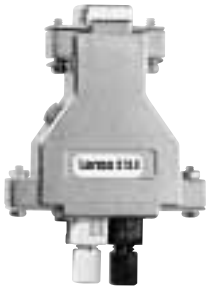
LECOM-LI (optical fibre)

General data and operating conditions

Communication medium	Optical fibre
Communication protocol	LECOM-A/B V2.0
Transfer character format	7E1: 7-bit ASCII, 1 stop bit, 1 start bit, 1 parity bit (even)
Baud rate [bps]	1200, 2400, 4800, 9600, 19200
LECOM-LI station	Slave
Network topology	Ring
Max. no. of stations	52
Max. cable length per bus segment	0 ... 40 m (standard output power) / 10 ... 66 m (increased output power)
Electrical connection	Pluggable screw terminal and screw-type crimp connections
DC voltage supply	▶ Internal ▶ External, only required if: – Bus stations which have been disconnected from the mains need to maintain communication with the master – Power is being provided via a separate power supply – +24 V DC ± 10 %, max. 70 mA per module
Ambient temperature	Operation: 0 ... +55 °C Transport: -25 ... +70 °C Storage: -25 ... +60 °C
Climatic conditions	Class 3K3 to EN 50178 (without condensation, average relative humidity 85 %)
Type / Order no.	EMF2102IBCV003

Note:
One of the features on the communication module is a set of three LEDs to indicate the communication status.

Tip:
Use the optical fibre adapter (RS232 / optical fibre converter) for adaptation to the host computer:
- ▶ Standard output power (0 ... 40 m between two optical fibre stations): EMF2125IB
- ▶ Increased output power (30 ... 66 m between two optical fibre stations): EMF2126IB
- ▶ Screw-type crimp connection for optical fibre cable with an external diameter of 2.2 mm
- ▶ Power supply for optical fibre adapter: EJ0013



Optical fibre adapter

Optical fibre cable:
- ▶ Single-core, black PE sleeve (basic protection)
  Sold by the metre: EWZ0007
- ▶ Single-core, red PUR sleeve (reinforced protection for installation outside the control cabinet)
  Sold by the metre: EWZ0006

LON

General data and operating conditions

Communication medium	FTT - 10 A (Free Topology Transceiver)
Communication profile	LONMARK® "Variable Speed Motor Drive" functional profile
Network topology	Free topology (line, tree / line, star, ring)
Possible no. of nodes	64
Max. cable length	2700 m for bus topology (line) 500 m for mixed topology
Baud rate [kbps]	78
Electrical connection	Pluggable screw terminals
DC voltage supply	▶ Internal ▶ External, only required if: – A bus station is switched off or fails but communication with this station needs to be maintained – Power is being provided via a separate power supply – +24 V DC ± 10 %, max. 120 mA per module
Ambient temperature	Operation: 0 ... +55 °C Transport: -25 ... +70 °C Storage: -25 ... +60 °C
Climatic conditions	Class 3K3 to EN 50178 (without condensation, average relative humidity 85 %)
Type / Order no.	EMF2141IB

Note:

- One of the features on the communication module is a set of two LEDs to indicate the communication status.
- In order that the new LON station can be integrated quickly, a service button is located on the LON module. Press this button to register the new LON station on the network so that it will be detected by all other stations.
- A configuration diskette for LON containing the description file for the devices and the plug-in for the LonMaker software is included in the scope of supply.

CANopen

General data and operating conditions

Communication medium	DIN ISO 11898						
Communication profile	CANopen (CiA DS301 V4.01)						
Network topology	Line (terminated at both ends with 120 Ω)						
Station	Slave						
Max. no. of stations	63						
Max. distance between two stations	Unlimited, determined by max. bus length						
Baud rate [kbps]	10	20	50	125	250	500	1000
Max. bus length [m]	7450	3950	1550	630	290	120	25
No. of logic process data channels	1						
No. of logic parameter data channels	2						
Electrical connection	Pluggable screw terminals						
DC voltage supply	▶ Internal ▶ External, only required if: – A bus station is switched off or fails but communication with this station needs to be maintained – Power is being provided via a separate power supply – + 24 V DC ± 10 %, max. 100 mA per module						
Ambient temperature	Operation: 0 ... +55 °C Transport: -25 ... +70 °C Storage: -25 ... +60 °C						
Climatic conditions	Class 3K3 to EN 50178 (without condensation, average relative humidity 85 %)						
Type / Order no.	EMF2175IB						

Note:

- ▶ The module can be switched over to DeviceNet using a DIP switch (see next page).
- ▶ The address and the baud rate can be set using a DIP switch.
- ▶ One of the features on the communication module is a set of two LEDs to indicate the communication status.
- ▶ A configuration diskette for CANopen containing the description file for the devices (ESD file) is included in the scope of supply.

DeviceNet

General data and operating conditions

Communication medium	DIN ISO 11898		
Communication profile	DeviceNet		
DeviceNet stations	Slave		
Network topology	Line (terminated at both ends with 120 Ω)		
Process data words (PCD) (16 bits)	4		
Max. no. of stations	63		
Baud rate [kbps]	125	250	500
Max. bus length (thin cable) [m]	100	100	100
Max. bus length (thick cable) [m]	500	250	100
Electrical connection	Pluggable screw terminals		
DC voltage supply	▶ Internal ▶ External, only required if: – A bus station is switched off or fails but communication with this station needs to be maintained – Power is being provided via a separate power supply – + 24 V DC ± 10 %, max. 100 mA per module		
Ambient temperature	Operation: 0 ... +55 °C Transport: -25 ... +70 °C Storage: -25 ... +60 °C		
Climatic conditions	Class 3K3 to EN 50178 (without condensation, average relative humidity 85 %)		
Type / Order no.	EMF2175IB		

Note:

- ▶ The module can be switched over to CANopen using a DIP switch.
- ▶ The address and the baud rate can be set using a DIP switch.
- ▶ One of the features on the communication module is a set of two LEDs to indicate the communication status.
- ▶ A configuration diskette for DeviceNet containing the description file for the devices (ESD file) is included in the scope of supply.

INTERBUS

General data and operating conditions

Communication medium	RS485
Selectable drive profile	▶ Lenze device control ▶ DRIVECOM profile "Drive technology 21"
Baud rate	500 kbps (2113IB: 500 kbps or 2 Mbps)
INTERBUS station	Slave
Network topology	Ring (go and return lines in the same bus cable)
Process data words (PCD) (16 bits)	2 ... 3 words (2113IB: 1 ... 4 words)
Parameter data words (PCP) (16 bits)	1 word (2113IB: 4)
Maximum PDU length	64 bytes
PCP services supported	Initiate, Abort, Status, Identify, Get-OV-Long, Read, Write
No. of stations	Depends on host system (I/O area), max. 63
Max. distance between 2 stations	400 m
Electrical connection	Pluggable screw terminal and Sub-D socket / plug (9-pin)
DC voltage supply	▶ Internal ▶ External, only required if: – The communication ring must not be interrupted by a bus station being switched off or failing – Power is being provided via a separate power supply – +24 V DC ± 10 %, max. 150 mA per module
Ambient temperature	Operation: 0 ... +55 °C Transport: -25 ... +70 °C Storage: -25 ... +60 °C
Climatic conditions	Class 3K3 to EN 50178 (without condensation, average relative humidity 85 %)
Type / Order no.	EMF2111IB / EMF2113IB

Note:

- ▶ One of the features on the communication module is a set of two LEDs to indicate the communication status.
- ▶ EMF2113IB: Baud rate, process data words / parameter data words can be set via DIP switch.

INTERBUS Loop

INTERBUS Loops can be integrated within the INTERBUS network. Here, the DC voltage supply to the communication modules is provided via the bus line of the INTERBUS Loop.

General data and operating conditions

Communication medium	RS485
Selectable drive profile	▶ Lenze device control ▶ DRIVECOM profile "Drive technology 20"
Baud rate [kbps]	500
INTERBUS station	Slave
Network topology	Ring
Process data words (PCD) (16 bits)	2 words
Parameter data words (PCP) (16 bits)	Not supported
Maximum PDU length	4 bytes
PCP services supported	None
Max. no. of stations	36 Lenze inverters
Max. Loop length	200 m
Max. distance between 2 stations	20 m
Electrical connection	Pluggable screw terminals
DC voltage supply	Via the bus
Ambient temperature	Operation: 0 ... +55 °C Transport: -25 ... +70 °C Storage: -25 ... +60 °C
Climatic conditions	Class 3K3 to EN 50178 (without condensation, average relative humidity 85 %)
Type / Order no.	EMF2112IB

Note:
One of the features on the communication module is a set of two LEDs to indicate the communication status.

PROFIBUS-DP

General data and operating conditions

Communication medium	RS485
Communication profile	PROFIBUS-DP (DIN 19245 Part 1 and Part 3)
Selectable drive profile	▶ DRIVECOM profile "Drive technology 20" ▶ PROFIDRIVE ▶ Lenze device control
Baud rate [kbps]	9.6 ... 12000 (automatic detection)
PROFIBUS-DP station	Slave
Network topology	Without repeaters: Line With repeaters: Line or tree
Process data words (PCD) (16 bits)	1 ... 4 words
DP user data length	Parameter channel that can be deactivated (4 words) + process data words
Max. no. of stations	Standard: 32 (= 1 bus segment) including host system With repeaters: 125 slaves
Max. cable length per bus segment	1200 m (depending on the baud rate and the type of cable used)
Electrical connection	Pluggable screw terminal and Sub-D socket (9-pin)
DC voltage supply	▶ Internal ▶ External, only required if: – Bus stations which have been disconnected from the mains need to maintain communication with the master – Power is being provided via a separate power supply – +24 V DC ± 10 %, max. 120 mA per module
Ambient temperature	Operation: 0 ... +55 °C Transport: -25 ... +70 °C Storage: -25 ... +60 °C
Climatic conditions	Class 3K3 to EN 50178 (without condensation, average relative humidity 85 %)
Type / Order no.	EMF2133IB

Note:

- ▶ One of the features on the communication module is a set of two LEDs to indicate the communication status.
- ▶ A configuration diskette for PROFIBUS-DP containing the description file for the devices is included in the scope of supply.
- ▶ The address can be set using a DIP switch.
- ▶ The module can be switched over to function as a 2131IB communication module using a DIP switch.

CAN repeater

The CAN repeater can be used to electrically isolate two segments on a CAN network (CAN1 and CAN2) and to access CAN communication partners during operation (service interface).

This repeater can isolate a faulty CAN segment from the rest of the network. The rest of the stations on the network can continue to operate. Once the fault has been eliminated, the segment concerned can be reconnected to the CAN network.

Due to the physical features of the CAN bus, the use of a CAN repeater does not increase the maximum network area. However, the overall area of the network can be expanded by selecting an appropriate topology.

Star and tree topologies can be set up using the repeater.

General data and operating conditions

Communication medium	DIN ISO 11898
Baud rate	Up to 500 kbps
Signal runtime in repeater	Approx. 150 ns from CAN1 to CAN2, thereby reducing the maximum bus length by approx. 30 m
Voltage supply	9 ... 35 V DC, 150 mA typical
Ambient temperature	Operation: 0 ... +55 °C Transport: -25 ... +70 °C Storage: -25 ... +60 °C
Dimensions	Approx. 110 x 75 x 22 mm
Other features	▶ DC / DC converters are used to isolate CAN1 and CAN2 from the voltage supply ▶ CAN1 is electrically isolated from CAN2 ▶ Terminating resistors are integrated in the repeater in CAN1 and in CAN2
Type / Order no.	EMF2176IB

EMF2176IB

Setpoint potentiometer

Speeds can be preset using an external potentiometer. For this purpose, the setpoint potentiometer is connected to the analog control terminals of the 9300 vector. A scale and a rotary knob are also available.

Designation	Order no.	Data	Dimensions
Setpoint potentiometer	ERPD0010K0001W	10 kΩ / 1 W	6 mm x 35 mm
Rotary knob	ERZ0001		36 mm diameter
Scale	ERZ0002	0 ... 100 %	62 mm diameter

Digital display

A voltmeter can be connected to an analog output of the 9300 vector to display the output frequency or the motor speed.

Designation	Order no.	Measuring ranges	Mounting cut-out	Installation space
Voltmeter 3 1/2 digits	EPD203	0 ... 6 V 0 ... 20 V 0 ... 200 V	91 mm x 22.5 mm	81.5 mm

General

A motor choke is an inductive resistor which is connected to the frequency inverter output in the motor cable.

The principle of a frequency inverter is based on a switched output voltage with fast voltage rise time (du / dt).

As a consequence, the cable capacitances of the motor cable cause discharge currents between the motor phases or to PE. These currents increase the load on the frequency inverter and this may lead to fault shut-downs.

The amount of current is determined by the voltage slope and the chopper frequency of the frequency inverter as well as by the effective capacitances of the motor cable. Motor chokes should therefore be used on long motor cables.

Motor chokes reduce the voltage slope at the frequency inverter output and therefore the capacitive discharge currents. This leads to a reduction in the frequency inverter load and the parasitic currents and makes it possible to use a long motor cable.

Depending on the installation, it may also be necessary to use motor chokes for the parallel connection of the master and slave on frequency inverters with type designations EVF93**81**-EV, EVF93**82**-EV and EVF93**81**-EV (see page 29).

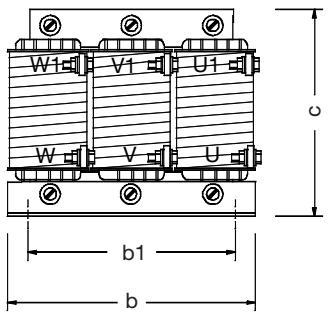
Motor chokes can also be used to reduce currents in motor bearings.

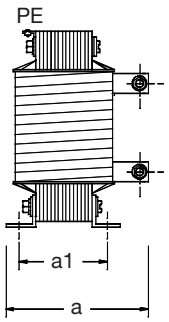
General data and operating conditions

Motor choke required for motor cable lengths equal to and greater than	▶ 100 m shielded ▶ 200 m unshielded
Maximum motor cable length	▶ 200 m shielded ▶ 400 m unshielded
Max. mains voltage	577 V AC + 0 %
Temperature range	0 ... 40 °C
Type of connection	Screw connections
Type of protection	IP00
Operating conditions for the 9300 vector combined with a motor choke	▶ Maximum output frequency: 100 Hz ▶ Maximum switching frequency: 2 kHz ▶ Operating mode: V/f characteristic control (linear or quadratic)

Selection and dimensions

9300 vector	Motor choke, dimensions [mm]									
Type	**Type / Order no.**	**Number required**	**a**	**a_1**	**b**	**b_1**	**c**	**Fasten-ing**	**Connection**	**Weight [kg]**
EVF9335-EV	ELM3-0003H275	1	170	95	230	180	200	M6	M10	18.4
EVF9336-EV										
EVF9337-EV	ELM3-0002H320									18.9
EVF9338-EV	ELM3-0002H410		180	96	240	185	210	M8	M12	22.6
EVF9381-EV	ELM3-0003H275	2	170	95	230	180	200	M6	M10	18.4
EVF9382-EV	ELM3-0002H320									18.9
EVF9383-EV	ELM3-0002H410		180	96	240	185	210	M8	M12	22.6





Input: U, V, W
Output: U1, V1, W1

Note:
Install the motor choke as close as possible to the frequency inverter.

General

We recommend the use of an air lock for dissipating heat loss directly from the control cabinet.

It comprises an air duct (Figure 1), which is assembled directly on the frequency inverter heatsink, and an air lock cover (Figure 2).

The frequency inverter has a heatsink fan which dissipates the heat outwards via the air lock.

The assembly kit is part of the scope of supply.

Extensive Installation Guidelines are provided to facilitate the assembly process. The guidelines can be downloaded from the Internet from the "Downloads" area at http://www. Lenze.de.

Selection

9300 vector	Air lock
Type	Type / Order no.
EVF9335-EV	E93ZWL
EVF9336-EV	
EVF9337-EV	
EVF9338-EV	
EVF9381-EV	E93ZWL02
EVF9382-EV	
EVF9383-EV	

Figure 1

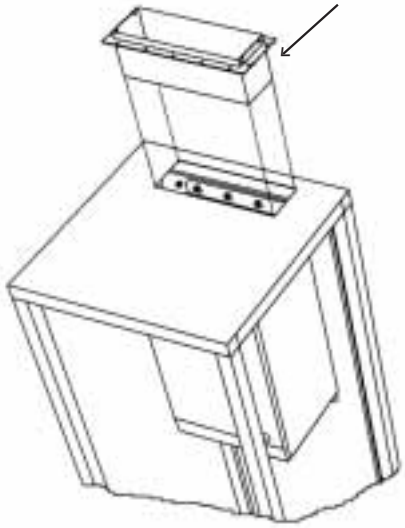
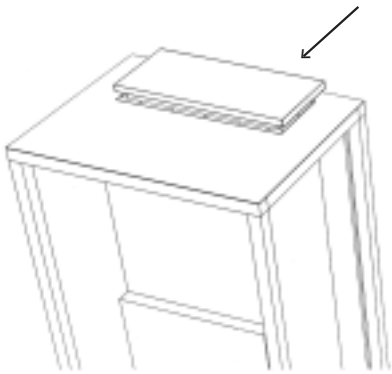


Figure 2



Note:

- Ensure there are sufficient air inlets in the control cabinet as appropriate for the volume flow of the fan in the frequency inverter (975 m³/h per unit).
- You can use a template to help you mark out the drilled holes and the recess in the roof of the control cabinet. The template can be downloaded as a dxf file from the "Downloads" area at http://www. Lenze.de.

External brake resistors may be required to brake high moments of inertia or for extended operation in generator mode. They convert mechanical braking energy into heat.

The brake transistor integrated in the 9300 vector frequency inverter as an option connects the external brake resistor when the DC bus voltage exceeds a certain switching threshold. This prevents the frequency inverter from setting a pulse inhibit because of an overvoltage, which would cause the drive to coast to standstill. Braking is always controlled when using an external brake resistor.

Selection of brake resistors

The suitable brake resistor must meet the following requirements:

Brake resistor	Application	
Criterion	With active load	With passive load
Permanent power [W]	$\geq P_{max} \cdot \eta_e \cdot \eta_m \cdot \frac{t_1}{t_{cycl}}$	$\geq \frac{P_{max} \cdot \eta_e \cdot \eta_m}{2} \cdot \frac{t_1}{t_{cycl}}$
Thermal capacity [Ws]	$\geq P_{max} \cdot \eta_e \cdot \eta_m \cdot t_1$	$\geq \frac{P_{max} \cdot \eta_e \cdot \eta_m}{2} \cdot t_1$
Resistance [Ω]	$R_{min} \leq R \leq \frac{U_{DC}^2}{P_{max} \cdot \eta_e \cdot \eta_m}$	

Active load — Can set itself in motion without any influence from the drive (e.g. unwinder)

Passive load — Stops by itself without any influence from the drive (e.g. horizontal motion drives, centrifuges, fans)

U_{DC} [V] — Switching threshold for brake transistor → Page 58 and following

P_{max} [W] — Maximum braking power defined by the application
Important: On EVF93**81**-EV/EVF93**82**-EV/EVF93**83**-EV type frequency inverters, only use **P_{max}/2** for calculation purposes because the braking energy is usually dissipated equally via the master and the slave on these units. At a lower braking power, the braking energy may be dissipated either only via the master or only via the slave; in this case use P_{max} for calculation purposes.

η_e — Electrical efficiency (frequency inverter + motor) guide value: 0.94

η_m — Mechanical efficiency (gearbox, machine)

t_1 [s] — Braking time

t_{cycl} [s] — Cycle time = Time between two consecutive braking cycles (= t_1 + break time)

R_{min} — Minimum permissible brake resistance (see the rated data for the integrated brake transistor)

Rated data for the integrated brake transistor (optional)

The following data is valid for EVF93xx-EV**V060** and
EVF93xx-EV**V110** type frequency inverters

Brake transistor		9300 vector			
		EVF9335-EV	EVF9336-EV	EVF9337-EV	EVF9338-EV
Switching threshold U_{DC}	[V DC]	685			
Peak braking current	[A DC]	315	375	450	560
Max. continuous current	[A DC]	210	250	300	375
Minimum permissible brake resistance [1)]	[Ω]	2.2	1.8	1.5	1.2
Current derating		▶ At temperatures above 40 °C, derate the peak braking current by 2.5 % / °C. ▶ Above 1000 m amsl, derate the peak brake current by 5 % / 1000 m.			
Switch-on cycle[3)]		Max. 60 s braking at peak braking power, then at least 30 s recovery time			

Brake transistor		9300 vector		
		EVF9381-EV [2)]	EVF9382-EV [2)]	EVF9383-EV [2)]
Switching threshold U_{DC}	[V DC]	685		
Peak braking current	[A DC]	2 x 375	2 x 450	2 x 560
Max. continuous current	[A DC]	2 x 250	2 x 300	2 x 375
Minimum permissible brake resistance per unit[1)]	[Ω]	1.8	1.5	1.2
Current derating		▶ At temperatures above 40 °C, derate the peak braking current by 2.5 % / °C. ▶ Above 1000 m amsl, derate the peak brake current by 5 % / 1000 m.		
Switch-on cycle[3)]		Max. 60 s braking at peak braking power, then at least 30 s recovery time		

[1)] For longer connecting cables, take the cable resistance into account. It is added to the value of the brake resistance and has a considerable effect on the total resistance.
[2)] Drive consists of two units (master and slave) connected in parallel. The braking energy is usually dissipated equally via the master and slave (see also "Selection of brake resistors" on page 57).
[3)] Take the switch-on cycle of the brake resistor used into account.

Rated data for the integrated brake transistor (optional)

The following data is valid for

- EVF93xx-EV**V270** and EVF93xx-EV**V300** type frequency inverters
- 400 V or 460 V rated mains voltage

Brake transistor		9300 vector			
		EVF9335-EV	EVF9336-EV	EVF9337-EV	EVF9338-EV
Switching threshold U_{DC}	[V DC]	755			
Peak braking current	[A DC]	315	375	450	560
Max. continuous current	[A DC]	210	250	300	375
Minimum permissible brake resistance [1)]	[Ω]	2.5	2.1	1.8	1.4
Current derating		▶ At temperatures above 40 °C, derate the peak braking current by 2.5 % / °C. ▶ Above 1000 m amsl, derate the peak brake current by 5 % / 1000 m.			
Switch-on cycle[3)]		Max. 60 s braking at peak braking power, then at least 30 s recovery time			

Brake transistor		9300 vector		
		EVF9381-EV [2)]	EVF9382-EV [2)]	EVF9383-EV [2)]
Switching threshold U_{DC}	[V DC]	755		
Peak braking current	[A DC]	2 x 375	2 x 450	2 x 560
Max. continuous current	[A DC]	2 x 250	2 x 300	2 x 375
Minimum permissible brake resistance per unit[1)]	[Ω]	2.1	1.8	1.4
Current derating		▶ At temperatures above 40 °C, derate the peak braking current by 2.5 % / °C. ▶ Above 1000 m amsl, derate the peak brake current by 5 % / 1000 m.		
Switch-on cycle[3)]		Max. 60 s braking at peak braking power, then at least 30 s recovery time		

[1)] For longer connecting cables, take the cable resistance into account. It is added to the value of the brake resistance and has a considerable effect on the total resistance.
[2)] Drive consists of two units (master and slave) connected in parallel. The braking energy is usually dissipated equally via the master and slave (see also "Selection of brake resistors" on page 57).
[3)] Take the switch-on cycle of the brake resistor used into account.

Rated data for the integrated brake transistor (optional)

The following data is valid for

- EVF93xx-EV**V270** and EVF93xx-EV**V300** type frequency inverters
- 480 V rated mains voltage

Brake transistor		9300 vector			
		EVF9335-EV	EVF9336-EV	EVF9337-EV	EVF9338-EV
Switching threshold U_{DC}	[V DC]	785			
Peak braking current	[A DC]	315	375	450	560
Max. continuous current	[A DC]	210	250	300	375
Minimum permissible brake resistance [1)]	[Ω]	2.5	2.1	1.8	1.4
Current derating		▶ At temperatures above 40 °C, derate the peak braking current by 2.5 % / °C. ▶ Above 1000 m amsl, derate the peak brake current by 5 % / 1000 m.			
Switch-on cycle[3)]		Max. 60 s braking at peak braking power, then at least 30 s recovery time			

Brake transistor		9300 vector		
		EVF9381-EV [2)]	EVF9382-EV [2)]	EVF9383-EV [2)]
Switching threshold U_{DC}	[V DC]	785		
Peak braking current	[A DC]	2 x 375	2 x 450	2 x 560
Max. continuous current	[A DC]	2 x 250	2 x 300	2 x 375
Minimum permissible brake resistance per unit[1)]	[Ω]	2.1	1.8	1.4
Current derating		▶ At temperatures above 40 °C, derate the peak braking current by 2.5 % / °C. ▶ Above 1000 m amsl, derate the peak brake current by 5 % / 1000 m.		
Switch-on cycle[3)]		Max. 60 s braking at peak braking power, then at least 30 s recovery time		

[1)] For longer connecting cables, take the cable resistance into account. It is added to the value of the brake resistance and has a considerable effect on the total resistance.
[2)] Drive consists of two units (master and slave) connected in parallel. The braking energy is usually dissipated equally via the master and slave (see also "Selection of brake resistors" on page 57).
[3)] Take the switch-on cycle of the brake resistor used into account.

Rated data for the integrated brake transistor (optional)

The following data is valid for

- EVF93xx-EV**V270** and EVF93xx-EV**V300** type frequency inverters
- 500 V rated mains voltage

Brake transistor		9300 vector			
		EVF9335-EV	EVF9336-EV	EVF9337-EV	EVF9338-EV
Switching threshold U_{DC}	[V DC]	885			
Peak braking current	[A DC]	315	375	450	560
Max. continuous current	[A DC]	210	250	300	375
Minimum permissible brake resistance [1)]	[Ω]	2.8	2.3	1.9	1.6
Current derating		▶ At temperatures above 40 °C, derate the peak braking current by 2.5 % / °C. ▶ Above 1000 m amsl, derate the peak brake current by 5 % / 1000 m.			
Switch-on cycle[3)]		Max. 60 s braking at peak braking power, then at least 30 s recovery time			

Brake transistor		9300 vector		
		EVF9381-EV [2)]	EVF9382-EV [2)]	EVF9383-EV [2)]
Switching threshold U_{DC}	[V DC]	885		
Peak braking current	[A DC]	2 x 375	2 x 450	2 x 560
Max. continuous current	[A DC]	2 x 250	2 x 300	2 x 375
Minimum permissible brake resistance per unit[1)]	[Ω]	2.3	1.9	1.6
Current derating		▶ At temperatures above 40 °C, derate the peak braking current by 2.5 % / °C. ▶ Above 1000 m amsl, derate the peak brake current by 5 % / 1000 m.		
Switch-on cycle[3)]		Max. 60 s braking at peak braking power, then at least 30 s recovery time		

[1)] For longer connecting cables, take the cable resistance into account. It is added to the value of the brake resistance and has a considerable effect on the total resistance.
[2)] Drive consists of two units (master and slave) connected in parallel. The braking energy is usually dissipated equally via the master and slave (see also "Selection of brake resistors" on page 57).
[3)] Take the switch-on cycle of the brake resistor used into account.

Lenze brake resistor

Rated data

Lenze brake resistor (IP20)							
	R	Continuous power [1]	Thermal capacity	Switch-on cycle	Cable cross-section to be connected		Weight
Type / Order no.	[Ω]	[kW]	[kWs]	1:10 Brake for a maximum of 19 / 15 / 14 / 11 s, then apply a recovery time of at least 131 / 135 / 136 / 139 s [2]	[mm²]	AWG	[kg]
ERBD015R04K0	15	4.0	600		6	10	12.4

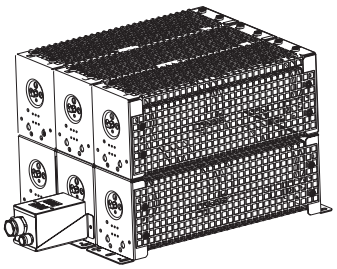
Please observe national and regional regulations.

[1] The permanent power is a reference variable for selecting the brake resistor. Peak brake power is applied during braking (U^2_{DC}/R).
[2] Data for brake transistor switching threshold U_{DC} = 685 / 755 / 785 / 885 V (see pages 58 to 61)

Note:
The brake resistor is fitted with a thermostat as standard (potential-free NC contact, max. 250 V AC, 0.5 A).

Dimensions of ERBD015R04K0 brake resistor

- Dimensions:
  (length x width x height): 640 x 265 x 229 mm
- Fastening dimensions:
  536 x 240 mm
- Minimum free space:
  25 mm to the side, 100 mm to the front, 200 mm to the rear



Selection
The appropriate brake resistor for each application is created by connecting a number of ERBD015R04K0 type brake resistors in parallel.

The number of resistors to be connected in parallel is calculated by applying the formula 1/4 x required permanent power (round the result up to a whole number).
See page 57 for the calculation for the continuous power required.

Caution! The resistance must be at least equal to the minimum permissible value.

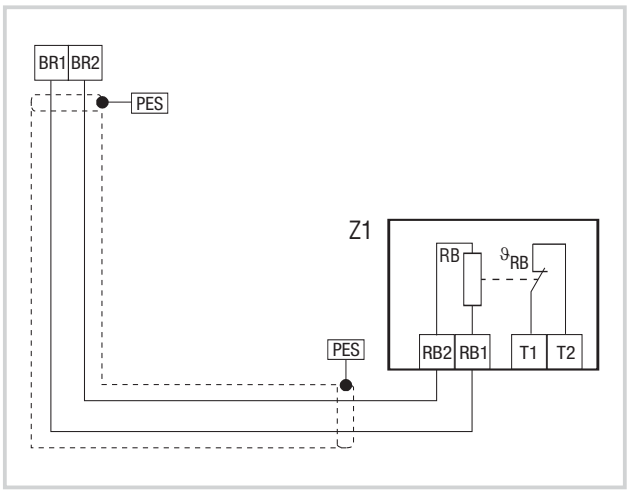
Guide value for the number of ERBD015R04K0 type resistors to be connected in parallel:

9300 vector Type	No. of ERBD015R04K0 brake resistors (guide value)
EVF9335-EV	4
EVF9336-EV	5
EVF9337-EV	6
EVF9338-EV	8
EVF9381-EV	10
EVF9382-EV	12
EVF9383-EV	16

Note: The guide values listed are only intended to provide a rough guide. The number may be significantly lower depending on the application.

We therefore recommend that the number of brake resistors required is calculated individually.

Connection diagram



PES RF shield termination by means of PE connection via shield clamp

- Brake resistors are connected to terminals BR1 and BR2 of the frequency inverter.
- Provide a safety shutdown if the brake resistor overheats.
- Use the brake resistor temperature contacts (e.g. T1/T2) as control contacts in order to isolate the frequency inverter from the mains (see page 30)!

Accessories	Designation		Order no.
Communication modules	LECOM-LI (optical fibre)		EMF2102IBCV003
	LECOM-B (RS485)		EMF2102IBCV002
	LECOM-A/B (RS232/485)		EMF2102IBCV001
	LON		EMF2141IB
	INTERBUS		EMF2113IB
	INTERBUS Loop		EMF2112IB
	PROFIBUS-DP		EMF2133IB
	DeviceNet / CANopen		EMF2175IB
	Keypad XT operating module		EMZ9371BC
	Diagnosis terminal (hand-held Keypad XT, IP20) [1]		E82ZBBXC
Miscellaneous	Connecting cable	2.5 m	E82ZWL025
		5 m	E82ZWL050
		10 m	E82ZWL100
	"Global Drive Control" (GDC) parameter setting / operating software		ESP-GDC2
	PC system bus adapter (voltage supply via DIN connection)		EMF2173IB
	PC system bus adapter (voltage supply via PS2 connection)		EMF2173IB-V002
	PC system bus adapter (voltage supply via PS2 connection, electrical isolation)		EMF2173IB-V003
	USB PC system bus adapter		EMF2177IB
	CAN repeater		EMF2176IB
	PC system cable RS232	5 m	EWL0020
		10 m	EWL0021
	Optical fibre adapter (standard output power)		EMF2125IB
	Optical fibre adapter (increased output power)		EMF2126IB
	Power supply for optical fibre adapter		EJ0013
	Optical fibre, single-core, black PE sleeve (basic protection), sold by the metre		EWZ0007
	Optical fibre, single-core, red PUR sleeve (reinforced protection), sold by the metre		EWZ0006
	Setpoint potentiometer		ERPD0010K0001W
	Rotary knob for setpoint potentiometer		ERZ0001
	Scale for setpoint potentiometer		ERZ0002
	Digital display		EPD203
	Encoder cable	2.5 m	EWLE002GX-T
		5.0 m	EWLE005GX-T
		10.0 m	EWLE010GX-T
		15.0 m	EWLE015GX-T
		20.0 m	EWLE020GX-T
		25.0 m	EWLE025GX-T
		30.0 m	EWLE030GX-T
		35.0 m	EWLE035GX-T
		40.0 m	EWLE040GX-T
		45.0 m	EWLE045GX-T
		50.0 m	EWLE050GX-T
	Connecting cable for master frequency connection (2.5 m)		EWLD002GGBS93
Braking operation	Brake resistor		ERBD015R04K0

[1] Additional connecting cable required

For us, service is more than just supporting the use of our drives. The Lenze system approach begins with your enquiry. Next you get technical information and advice from a network of sales outlets staffed by knowledgeable engineers. If you want, we follow up with training, commissioning, maintenance and repair. Our service is always at your disposal.

With passion
The Lenze team does not just offer the necessary manpower and technical know-how – we are passionate and meticulous about what we do. We will only be happy once you are entirely satisfied with our work. Our team of professionals provides assistance over the telephone or on site, ensures the express delivery of spare parts and carries out repairs with incredible urgency. We're fast and reliable.

Someone to talk to
Expert advice is available for all your technical queries via our helpline. In cases of urgent need, call 008000 24 hours (008000 24 46877), Lenze's worldwide expert helpline – 24 hours a day, 365 days a year. For more direct assistance, you can of course contact your local Lenze service support centre. We can tell you where it is – or you can find out for yourself by visiting us on the Internet at www.Lenze.com.

Around the world
Our products are available for speedy delivery worldwide. Lenze companies, Lenze factories and sales agencies are based in major industrial countries around the world. Contact them through our website **www.Lenze.com**, which also gives you 24-hour access to technical instructions and product manuals. Local support, on site if you need it, is available.

Technical documentation

The technical documentation provides more detailed information about our products:

- Installation guidelines in three languages are supplied with our products.
- Our system manuals for controllers, our communication manuals for bus systems and our operating instructions for electromechanical products and accessories provide the information required for planning, designing and developing machines and systems. System Manuals and communication Manuals are supplied in loose-leaf format. Operating Instructions are bound.
- Our user's Manuals for our controllers are designed for the operators and users of machines and systems. The information in user's Manuals has been put together so that it can be integrated directly into the machine or system documentation.

All our technical documentation is available free of charge in PDF format

- Via Internet download from "www.lenze.de", "Downloads" area
- On the "Lenze Library" CD

System Manuals and communication Manuals can also be supplied in ring binder format for a nominal fee.

Technical documentation at a glance

Documentation	Contents	Target group	Available languages
Installation guidelines	Safety instructions, handling and installation	Installation personnel	In three languages: German, English, French
System manual **Communication manual** **Operating instructions**	Extensive and comprehensive information for design, construction, development and programming	Planning engineers, design engineers and developers of machines and systems	Single-language version: German, English or French
User's manual	Safety instructions, handling troubleshooting and fault elimination	Operators and users of machines and systems	Single-language version German, English or French. Other languages will shortly be available on request

To the Lenze sales office

Page __ of __

☐ **Order**

☐ **Quotation**

Fax no. _____

From

_____
Company

_____
Street / PO Box

_____
Postcode City

_____
Date Signature

Customer no.

_____
Order no.

_____
Name

_____
Department

_____
Tel. no.

Delivery address (if different)

_____
Street

_____
Postcode City

Invoice to (if different)

_____
Street / PO Box

_____
Postcode City

Requested delivery date _____

Despatch information _____

_____

_____

Customer no.

Page __ of __

Order no.

9300 vector frequency inverter, 110 ... 400 kW, 400 V

EVF □□□□-EV

Power	
9335	= 110 kW
9336	= 132 kW
9337	= 160 kW
9338	= 200 kW
9381	= 250 kW
9382	= 315 kW
9383	= 400 kW

9300 vector frequency inverter
without RFI filter A, without brake transistor

Type / Order no.	Items	Price €
EVF93 _ _ -EV		
EVF93 _ _ -EV		

9300 vector frequency inverter
with integrated RFI filter A

Type / Order no	Items	Price €
EVF93 _ _ -EVV030		
EVF93 _ _ -EVV030		

9300 vector frequency inverter
with integrated brake transistor

Type / Order no	Items	Price €
EVF93 _ _ -EVV060		
EVF93 _ _ -EVV060		

9300 vector frequency inverter
with integrated RFI filter A,
with integrated brake transistor

Type / Order no	Items	Price €
EVF93 _ _ -EVV110		
EVF93 _ _ -EVV110		

Customer no.

Page __ of __

Order no.

9300 vector frequency inverter, 110/132 ... 400/500 kW, 400 V/500 V

EVF □□□□-EV

Power				
9	3	3	5	= 110/132 kW
9	3	3	6	= 132/160 kW
9	3	3	7	= 160/200 kW
9	3	3	8	= 200/250 kW
9	3	8	1	= 250/315 kW
9	3	8	2	= 315/400 kW
9	3	8	3	= 400/500 kW

9300 vector frequency inverter [1)]
without RFI filter A, without brake transistor

Type / Order no	Items	Price €
EVF93 _ _ -EVV210		
EVF93 _ _ -EVV210		

9300 vector frequency inverter [1)]
with integrated RFI filter A

Type / Order no	Items	Price €
EVF93 _ _ -EVV240		
EVF93 _ _ -EVV240		

9300 vector frequency inverter [1)]
with integrated brake transistor

Type / Order no	Items	Price €
EVF93 _ _ -EVV270		
EVF93 _ _ -EVV270		

9300 vector frequency inverter [1)]
with integrated RFI filter A,
with integrated brake transistor

Type / Order no	Items	Price €
EVF93 _ _ -EVV300		
EVF93 _ _ -EVV300		

[1)] DC supply or DC-bus operation possible.

Customer no.

Page __ of __

Order no.

Miscellaneous

Designation	Type / Order no.	Items	Price €

Lenze AG
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E-Mail: Lenze@Lenze.de
Internet: www.Lenze.com

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Lenze Bremsen GmbH
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Telefax +49 (0)51 54 / 82-11 04

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Electronic Drives
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Schänzle 8
71332 Waiblingen
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