Intelligent Drivesystems, Worldwide Services

VERSATILE FREQUENCY INVERTER FOR CONTROL CABINET APPLICATIONS

EN

NORDAC *PRO*
FREQUENCY INVERTER SK 500P

NORD® DRIVESYSTEMS

THE PROFESSIONAL AMONG FREQUENCY INVERTERS

NORDAC *PRO*, SK 500P SERIES

NORDAC *PRO* SK 500P frequency inverters are available for motors with rated powers of 0.25 – 5.5 kW. With their very compact design they are perfect for space-saving installation in control cabinets.
Notable features across the entire product line include:

- Sensorless current vector control which ensures constant speeds in case of fluctuating loads and very high torques during start-up,
- 200% overload reserve which provides greater operational safety in cranes and lifting gear applications,
- Operation of asynchronous and synchronous motors,
- Integrated brake chopper for 4-quadrant operation,
- Integrated mains filter serving as the basis for optimal EMC performance,
- Integrated PLC, which enables convenient free programming of drive-related functions according to IEC 61131-3.

These features are as much a part of the basic configuration as the separately configurable PID or the process controller.

Functional safety is increasingly becoming the focus of attention in drive technology. To meet the various safety requirements, the NORDAC *PRO* also offers functional extensions to implement single or dual channel solutions for Safe Torque Switch-off and Safe Stop.

An optional removable operating display provides an extensive selection of operational displays and status information. Naturally, it also allows direct access to parameterisation.
As standard, the frequency inverters are equipped with an integrated mains unit to supply the control board. The **USB port**, which is provided as standard for configuration version SK 530P and higher, also provides the facility of accessing the frequency inverter control board without connection of the mains voltage.

Frequency inverters with configuration level SK 530P and higher are equipped with a separate 24 V DC connection. With these devices access to parameter data is also possible when the power is switched off and also, communication with the bus is retained. Finally, the separate control board supply forms the basis for an evacuation run which can be carried out independently by the frequency inverter, which provides an enormous increase in safety, not only for lifting gear drives.
Optional SK CU5 extensions, which can be combined with all SK 530P devices and above round off the range of functions.
These include the encoder extension or the universal encoder interface for connection of a wide range of encoders (e.g. SSI, EnDat), which in combination with the installed POSICON are the ideal solution for all types of positioning (relative and absolute). Only one SK CU5 extension can be connected between the frequency inverter and the operating display.

Basic configuration

- Sensorless current vector control (ISD control) for high precision control and fast response times
- Brake management, electromechanical holding brake
- Brake chopper to divert generated energy to a brake resistor
- CANopen including drive profile DS402
- POSICON variants with positioning function (relative and absolute)
- RS-485/RS-232 diagnostic interface
- 4 switchable parameter sets for flexible use of parameter settings (e.g. switching between drive units with different motor data)
- All common drive functions such as acceleration/braking on a ramp, S curves
- Parameters pre-set with standard values, hence immediately ready for use
- Scalable display values
- Stator resistance measurement to ensure optimal control characteristics
- Integrated PLC functionality
- Plug-in connection terminals
  Available for all devices up to 2.2 kW

Optional

- ❍ Interfaces for many Industrial Ethernet-based bus systems
- ❍ Removable operating display with extensive operating and status indicators. Parameter editing facility.
- ❍ Variants for implementation of safe drive functions (z. B. STO, SS1)
- ❍ Interface extensions for connection of encoders and IOs
  Available for SK 530P and higher

NORD provides the new SK 500P with features for easier working:

Electrical connection

Power terminals

In addition to the control terminals on the front, which are always pluggable, with the two small sizes (frequency inverters with rated powers up to 2.2 kW) all other power terminals (e.g. line and motor connections, connections to multi-function relays, etc.) can be removed for maintenance work. In this way, wiring of the very compact devices can be carried out easily and safely even in the confined spaces in control cabinets.
The architecture of Size 3 (frequency inverters with rated powers of 3 kW and above) allows so much space that a plug-in design of the power terminals would not provide any further advantage.

Control terminals

Pluggable control terminals are nothing special. However, the fact that the NORDAC *PRO* is equipped with an integrated "3rd hand" which simply fixes the spring terminals for wiring will probably be gladly welcomed by most technicians.

Parameter setup

... do you want to view operating values or error messages or access and modify frequency inverter parameter settings?

Use the right method for you:

- Direct access with the snap-on SK TU5-CTR technology unit (optional)
- Separate SK PAR-3E or SK CSX-3E (optional) control and parameterisation units which can be mounted in the control cabinet doors
- NORDCON software (free) for connection to a Windows computer
- NORDCON *APP* (free) for connection to a mobile terminal device via NORDCON *ACCESS BT* (optional)

STANDARDS
AND APPROVALS

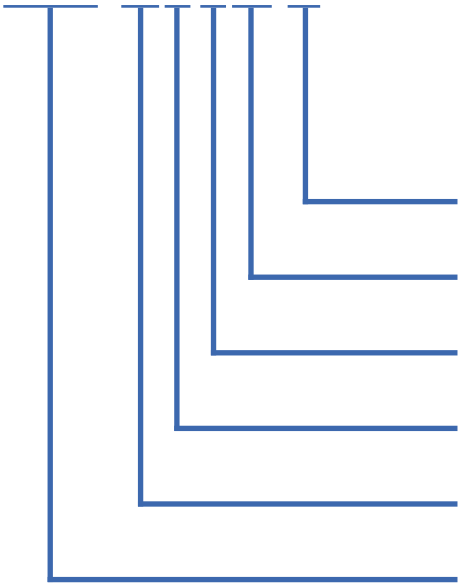
All devices of the entire series comply with the standards and directives listed below.

Approval	Directive	Applied standards	Certificates	Code
CE(European Union)	Low Voltage Directive 2014/35/EU EMC 2014/30/EU RoHS 2011/65/EU	EN 61800-5-1 EN 60529 EN 61800-3 EN 50581	C310601	CE
UL (USA)		UL 61800-5-1	Currently in preparation	
CSA (Canada)		C22.2 No.274-13	Currently in preparation	
C-Tick (Australia)			Currently in preparation	
EAC (Eurasia)	TR CU 004/2011, TR CU 020/201	IEC 61800-5-1 IEC 61800-3	Currently in preparation	

DESIGNATIONS OF FREQUENCY INVERTERS AND TECHNOLOGY UNITS

Frequency inverter

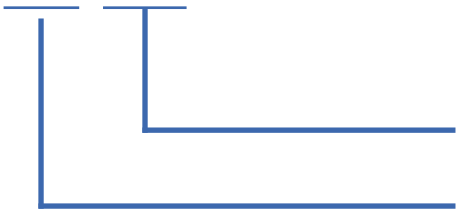
SK 530P-370-340-A



- Radio interference filter: O = without, **A** = Class A1(C2) or B (C1)
- Mains voltage: x23 = 230 V, x**40** = 400 V,
- Number of mains phases: 1xx = 1-phase, **3**xx = 3-phase
- Digits before decimal point for power: **0** = 0.xx, 1 = 0x,x0.2 = 0xx.0
- Rated power of device: 250 = 0.25 kW, **37**0 = 0.37 kW, ... 551 = 5.5 kW
- Frequency inverter series: SK 500P, SK 510P, SK 530P, SK 550P

Technology units

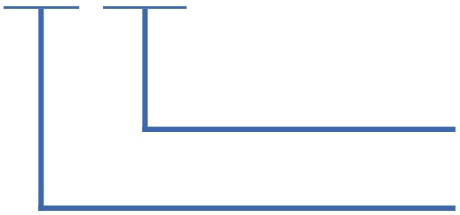
SK TU5-CTR



- Option type: **CTR** = ControlBox
- Group: **TU** = Technology unit

Customer units

SK CU5-STO



- Option type: **STO** = Safe Stop, ENC = Encoder, MLT = Multi IO
- Group: **CU** = Customer interface

NORDAC *PRO*

ALL VERSIONS AT A GLANCE

		SK 500P	SK 510P	SK 530P	SK 550P
Basic functions	Sensorless current vector control (ISD control)	✓	✓	✓	✓
	Brake management for mechanical holding brake	✓	✓	✓	✓
	Brake chopper (brake resistor optional)	✓	✓	✓	✓
	RS-232 diagnostic interface	✓	✓	✓	✓
	4 switchable parameter sets	✓	✓	✓	✓
	All normal drive functions	✓	✓	✓	✓
	Parameters pre-set with standard values	✓	✓	✓	✓
	Scalable display values	✓	✓	✓	✓
	Stator resistance measurement	✓	✓	✓	✓
	Energy-saving function, optimised efficiency in partial load operation	✓	✓	✓	✓
	Line filter class C2, up to 20 m motor cable Class C1 up to 5 m motor cable (devices above 0.75 kW)	✓	✓	✓	✓
	Shielding plate for connection of shielded control cables for EMC-compliant wiring.	✓	✓	✓	✓
	Monitoring functions	✓	✓	✓	✓
	Load monitor	✓	✓	✓	✓
	Link circuit coupling	✓	✓	✓	✓
	Lifting gear functionality	✓	✓	✓	✓
	Process controller / PID controller	✓	✓	✓	✓
	Synchronous motor operation (PMSM)	✓	✓	✓	✓
	Incremental encoder input (HTL / TTL) for speed feedback - servo mode	✓[1]	✓[1]	✓	✓
	POSICON	✓	✓	✓	✓
	PLC functionality	✓	✓	✓	✓
Bus systems	USS, Modbus RTU (RJ12)	✓	✓	✓	✓
	CANopen (connection terminals)	✓	✓	✓	✓
	EtherCat, Ethernet IP, PROFINET IO, POWERLINK				✓
Options	"Safe Torque Switch-off" and "Safe Stop" (STO, SS1) functions		✓[2]	❍	❍
	Evacuation run			✓	✓
	Internal 24 V power supply unit to supply the control board	✓	✓	✓	✓
	External 24 V DC supply for the control board voltage supply with automatic switch-over between the internal and external 24 V DC control voltage			✓	✓
	Universal encoder interface			❍	❍
	Removable data carrier (microSD) for backup and transfer of parameter data sets			❍	❍
	Operating display, removable for display of status and operating information and for control	❍	❍	❍	❍
	Communication interface, removable, for wireless communication between the frequency inverter and mobile terminal devices (tablet, smartphone)	❍	❍	❍	❍

[1] Only HTL
[2] Single channel

✓ Available as standard
❍ Optional

		SK 500P	SK 510P	SK 530P	SK 550P
Control terminals	DIN	5	5	6[1]	6[1]
	DOUT	0	0	2	2
	Signal relay[2] (… 230 V AC, 2 A)	2	2	2	2
	AIN[3]	2	2	2	2
	AOUT[3]	1	1	1	1
	Temperature sensor (PTC)	1[4]	1[4]	1	1
Encoder interfaces	TTL RS422			✓	✓
	HTL[4]	✓	✓	✓	✓
	SIN/COS			❍[5]	❍[5]
	SSI			❍[5]	❍[5]
	BISS			❍[5]	❍[5]
	Hiperface			❍[5]	❍[5]
	Endat 2.1			❍[5]	❍[5]
	CANopen	✓	✓	✓	✓
Communication	CAN / CANopen	✓	✓	✓	✓
	RS-485 / RS-232	✓	✓	✓	✓
	Modbus RTU	✓	✓	✓	✓

Temperature sensor (PTC)
SK 530P and above

TTL encoder interface
SK 530P and above

1 Extendable with the optional SK CU5-... customer interface
2 with parameterisable DOUT functions
3 AIN/AOUT can also be used for digital signals
AIN: 0(2) – 10 V, 0(4) – 20 mA,
AOUT: 0 – 10 V, 0 – 20 mA
4 Function can only be implemented through a digital input
5 Available via optional customer interface

Signal relay

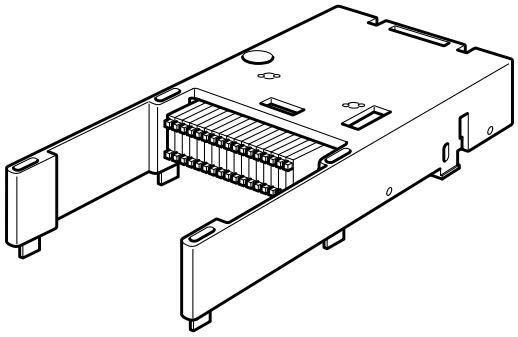
Communication

Control terminals AIN/ AIN / DIN

Additional control terminals DIN / DOUT
SK 530P and above

OPTIONAL MODULES
FOR FUNCTION EXTENSION

Frequency inverters with configuration versions SK 530P and higher can be extended with a plug-in option module. This increases the installation depth by 23 mm.
One of the following variants can be selected.



Type	Material No.	Functions	IOs	Comments
SK CU5-ENC	275 298 100	Encoder interface: TTL, SIN/COS, Hiperface, Endat, Biss, SSI	-	-
SK CU5-MLT	275 298 200	Encoder interface: TTL, SIN/COS, Hiperface, Endat, Biss, SSI Functional safety: STO, SS1	4 IO (usable as DIN or DOUT)	Functional safety: 2-channel connection
SK CU5-STO	275 298 000	Functional safety: STO, SS1	1 Safe DIN	Functional safety: 2-channel connection


NORDAC PRO
OK
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NORD
DRIVESYSTEMS
DANGER!

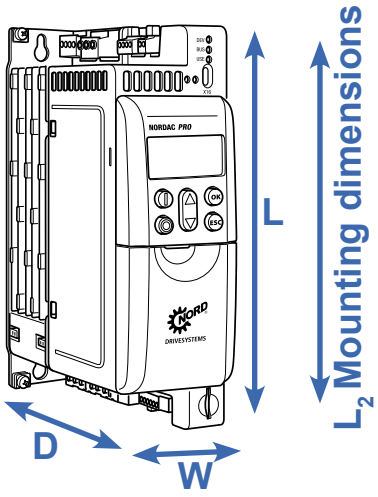
NORDAC *PRO* SK 500P FREQUENCY INVERTER

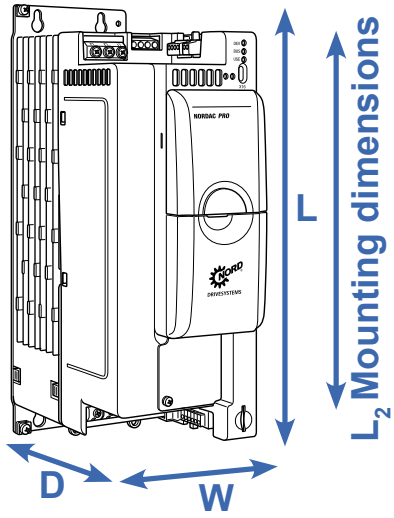
1~ 200 ... 240 V, 3~ 380 ... 480 V

Output frequency	0.0 ... 400.0 Hz
Pulse frequency	3.0 ... 16.0 kHz
Typical overload capacity	150 % for 60 s, 200 % for 3.5 s,
Frequency inverter efficiency	approx. 95 %
Ambient temperature	-10 °C ... +40 °C (S1) -10 °C ... +50 °C (S3, 70 % ED)
Protection class	IP20
Regulation and control	Sensorless current vector control (ISD), linear V/f characteristic
Motor temperature monitoring	I^2t Motor PTC / bi-metal switch
Leakage current	<30 mA, may be considerably less depending on the size and configuration of the frequency inverter (refer to the manual for details)

Frequency inverters SK 5xxP ...	Nominal motor power		Nominal output current rms [A]	Mains voltage	Output voltage
	230 V [kW]	240 V [hp]			
-250-123-A	0.25	1/3	1.7	1~ 200 ... 240 V, +/- 10 %, 47 ... 63 Hz	3~ 0 up to mains voltage
-370-123-A	0.37	1/2	2.4		
-550-123-A	0.55	3/4	3.2		
-750-123-A	0.75	1	4.2		
-111-123-A	1.1	1 1/2	5.7		
-151-123-A	1.5	2	7.3		
-221-123-A	2.2	3	9.6		

Frequency inverters SK 5xxP ...	Nominal motor power		Nominal output current rms [A]	Mains voltage	Output voltage
	400 V [kW]	480 V [hp]			
-250-340-A	0.25	1/3	1.0	3~ 380 ... 480 V, -20 % / +10 %, 47 ... 63 Hz	3~ 0 up to mains voltage
-370-340-A	0.37	1/2	1.3		
-550-340-A	0.55	3/4	1.8		
-750-340-A	0.75	1	2.4		
-111-340-A	1.1	1 1/2	3.1		
-151-340-A	1.5	2	4.0		
-221-340-A	2.2	3	5.6		
-301-340-A	3.0	4	7.5		
-401-340-A	4.0	5	9.5		
-551-340-A	5.5	7 1/2	12.5		





Frequency inverters SK 5xxP ...	Weight [kg]	Dimensions L (L_2) x W (W_2) x D [mm]	Size
-250-123-A	1.2	200 (186) x 66 (22) x 141	1
-370-123-A	1.2		
-550-123-A	1.2		
-750-123-A	1.2		
-111-123-A	1.6	240 (226) x 66 (22) x 141	2
-151-123-A	1.6		
-221-123-A	1.6		

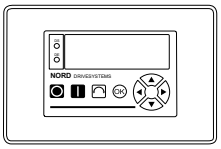
Frequency inverters SK 5xxP ...	Weight [kg]	Dimensions L (L_2) x W x D [mm]	Size
-250-340-A	1.2	200 (186) x 66 (22) x 141	1
-370-340-A	1.2		
-550-340-A	1.2		
-750-340-A	1.2		
-111-340-A	1.6	240 (226) x 66 (22) x 141	2
-151-340-A	1.6		
-221-340-A	1.6		
-301-340-A	2.6	286 (266) x 90 (50) x 175	3
-401-340-A	2.6		
-551-340-A	2.6		

INTERFACES FOR
OPERATION, PARAMETERISATION AND COMMUNICATION

Operation and parameterisation

Optional modules with up to 14 languages for displaying status and operational indications, parameterisation and operation of the frequency inverter. In addition to variants for direct mounting on the device or installation in a control cabinet door, handheld versions are also available.

SK TU5-CTR



SK PAR-3E

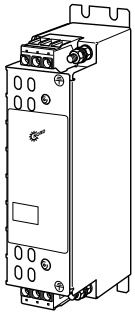
Type Designation Material No.	Description	Remarks
ControlBox SK TU5-CTR 275 297 000	Suitable for operation and parameterisation, LCD screen (illuminated), 5-digit, 7-segment display, display of measurement unit, various status and operating displays, display of utilisation level, convenient keypad.	Installation in the SK TU5 slot on the device.
ParameterBox SK PAR-3E 275 281 414	Suitable for control and parameterisation, LCD screen (illuminated), plain text display in 14 languages, direct control of up to 5 devices, memory for 5 device data sets, convenient control keypad, for installation in a control cabinet door.	Connection for data exchange with NORDCON on a PC via RS-232 (USB 2.0), including 1 m connection cable, 4.5 … 30 V DC/1.3 W Supply e.g. directly via the frequency inverter Control cabinet installation
Simple Control Box SK CSX-3E 275 281 413	Suitable for control and parameterisation, 4-digit, 7-segment display, direct control of a frequency inverter, convenient control keypad, for installation in control cabinet doors.	Electrical data: 4.5 … 30 V DC / 1.3 W, Supply e. g. directly via the frequency inverter Control cabinet installation
Control and parameterisation software NORDCON	Software for control and parameterisation as well as support for commissioning and fault analysis of NORD electronic drive technology. Parameter names in 14 languages	Free download: www.nord.com
Bluetooth stick NORDAC *ACCESS BT* SK TIE5-BT-STICK 275 900 120	Interface for wireless connection to a mobile terminal device (e.g. tablet or smartphone) via Bluetooth. With the aid of the NORDCON *APP*, the NORDCON software for mobile terminal devices, enables smart operation and parameterisation as well as commissioning assistance and fault analysis of NORD electronic drive technology.	Available free of charge for Android and iOS

LINE FILTER
IMPROVEMENT OF EMC

General

Line filters are used to reduce the emission of electromagnetic interference. NORDAC *PRO* SK 5xxP series frequency inverters are equipped with an integrated class C2 (max. 20 m shielded motor cable) or class C1 (devices above 0.75 kW, max. 5 m shielded motor cable) line filter.
For longer cable lengths or to improve radio interference suppression an optional chassis line filter (SK HLD) is available.

The line filter meets protection class IP20 and enables interference suppression Class C1 with max. 25 m shielded motor cable and Class C2 with max. 50 m cable. The line filters are installed separately from the frequency inverter.



Frequency inverters SK 5xxP ...		Line filter type Material No.	Continuous current [A]	Leakage current[1] [mA]	L x W x D [mm]
3~ 400 V	0.25 + 2.2 kW	SK HLD 110-500/8 278 272 008	8	20 / 190	190 x 45 x 75
	3.0 + 5.5 kW	SK HLD 110-500/16 278 272 016	16	21 / 205	250 x 45 x 75

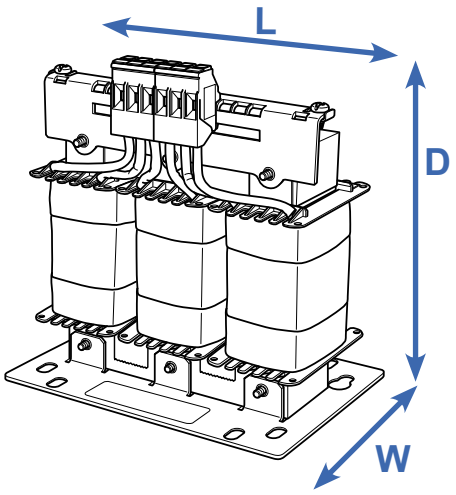
[1] Leakage current 1st value: Rated for the maximum permissible input voltagae fluctuation according to IEC 38 + 10%
Leakage current 2nd value: calculated at maximum input voltage and failure of 2 phases (typically at 50 Hz)

MAINS-SIDE INPUT CHOKES

REDUCTION OF MAINS FEEDBACK

General

It may be necessary for some drive systems to use mains chokes to reduce dangerous mains current peaks.
With their use, external mains feedback effects are considerably reduced and the proportion of current harmonics is reduced to a minimum. The input current is reduced to approximately the value of the output current. This will have an additional positive effect on device protection and EMC behaviour. All chokes have protection class IP00 and are UL certified.



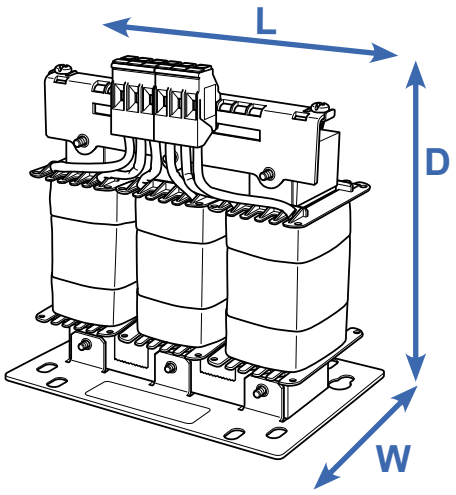
Frequency inverters SK 5xxP ...		Choke type Material No.	Continuous current [A]	Inductance [mH]	L x W x D [mm]
1~ 230 V	0.25 + 0.75 kW	SK CI1-230/8-C 278 999 030	8	2 x 1.0	65 x 78 x 89
	1.1 + 2.2 kW	SK CI1-230/20-C 278 999 040	20	2 x 0.4	90 x 96 x 106
3~ 400 V	0.25 + 2.2 kW	SK CI1-480/6-C 276 993 006	6	3 x 4.88	96 x 60 x 117
	3.0 + 4.0 kW	SK CI1-480/11-C 276 993 011	11	3 x 2.93	120 x 85 x 140
	5.5 kW	SK CI1-480/20-C 276 993 020	20	3 x 1.47	155 x 110 x 177

MOTOR-SIDE CHOKES
COMPENSATION FOR CABLE CAPACITANCES

General

Long motor cable lengths (cable capacity) often require the use of additional motor chokes (output chokes) on the frequency inverter output.
In addition, the use of motor chokes has a positive effect on device protection and EMC characteristics.

The specified motor chokes are rated for a pulse frequency of 3 to 6 kHz and an output frequency of 0 to 120 Hz. All chokes have protection class IP00 and are UL certified.

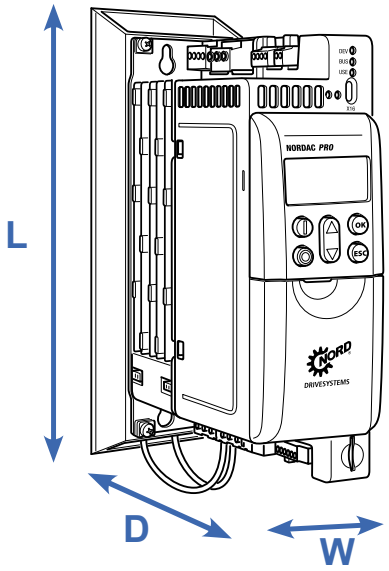


Frequency inverters SK 5xxP ...		Choke type Material No.	Continuous current [A]	Inductance [mH]	L x W x D [mm]
1~ 230 V	0.25 + 0.75 kW	SK CO1-460/4-C 276 996 004	4	3 x 3.5	120 x 104 x 140
	1.1 + 1.5 kW	SK CO1-460/9-C 276 996 009	9	3 x 2.5	155 x 110 x 160
	2.2 kW	SK CO1-460/17-C 276 996 017	17	3 x 1.2	185 x 102 x 201
3~ 400 V	0.25 + 1.5 kW	SK CO1-460/4-C 276 996 004	4	3 x 3.5	120 x 104 x 140
	2.2 + 4.0 kW	SK CO1-460/9-C 276 996 009	9	3 x 2.5	155 x 110 x 160
	5.5 kW	SK CO1-460/17-C 276 996 017	17	3 x 1.2	185 x 102 x 201

BRAKE RESISTORS
FOR DYNAMIC DRIVE CHARACTERISTICS

Bottom-mounted brake resistors SK BRU5

These are available in three sizes The brake resistor can be mounted flat underneath the frequency inverter. Although this increases the installation length and depth by a few centimetres, the basic installation surface in the control cabinet is considerably reduced. The specified resistance values are electrically matched to standard applications. Brake resistors have protection class IP40 and are UL certified.

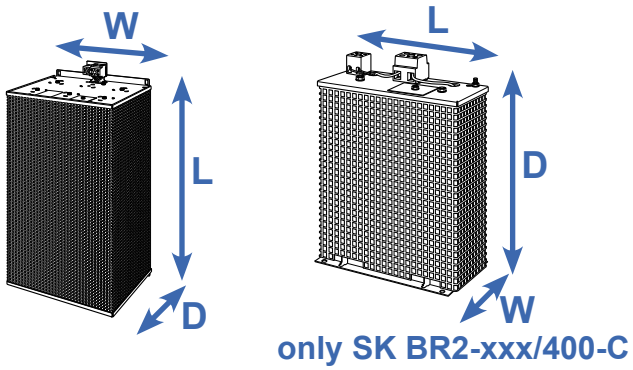


Frequency inverters SK 5xxP ...		Resistor type Material No.	Resistance [Ω]	Continuous output [W]	Short-term power [kW][1]	L x W x D [mm]
230 V	0.25 + 0.37 kW	SK BRU5-1-240-050 275 299 004	240	50	0.75	240 x 66 x 181
	0.55 + 0.75 kW	SK BRU5-1-150/100 275 299 107	150	100	1.5	240 x 66 x 181
	1.1 + 2.2 kW	SK BRU5-2-075-200 275 299 210	75	200	3.0	280 x 66 x 181
400 V	0.55 + 0.75 kW	SK BRU5-1-400-100 275 299 101	400	100	1.5	240 x 66 x 181
	1.1 + 2.2 kW	SK BRU5-2-220-200 275 299 205	220	200	3.0	280 x 66 x 181
	3.0 + 4.0 kW	SK BRU5-3-100-300 275 299 309	100	300	4.5	340 x 91 x 225
	5.5 kW	SK BRU5-3-060-400 275 299 411	60	400	6.0	340 x 91 x 225

[1] Once within 120 s, for a maximum duration of 1.2 s

Chassis brake resistors, SK BR2

The resistor elements are integrated into a housing cage and must be connected to the particular frequency inverter via a separate connecting cable.
The brake resistors must be mounted horizontally (apart from SK BR2-xxx/400-C).
A shielded cable which is as short as possible should be used for this purpose.
The brake resistors have protection class IP20.



only SK BR2-xxx/400-C

Frequency inverters SK 5xxP ...		Resistor type Material No.	Resistance [Ω]	Continuous output [W]	Short-term power [kW][2]	L x W x D [mm]
400 V	3.0 ... 4.0 kW	SK BR2-100/400-C[1] 278 282 040	100	400	12	178 x 100 x 252
	5.5 kW	SK BR2-60/600-C 278 282 060	60	600	18	385 x 110 x 120
	Temperature monitoring for SK BR2 resistors integrated (2 terminals 4 mm²)		Bimetallic switch as opener			

[1] Type of assembly: vertical

[2] Once within 120 s, for a maximum duration of 1.2 s

ACCESSORIES

RJ45 WAGO connection module

Adapter to implement a plug-in connection solution for CANopen via RJ45, snap-on rail mounting.
Material No.: 278 910 300

Signal converter +/- 10 V

For connection of a bipolar analogue signal to the unipolar analogue input of a frequency inverter, top-hat rail mounting.
Material No.: 278 910 320

Electronic brake rectifier SK EBGR-1

For direct control and supply of an electromagnetic holding brake.
Material No.: 19 140 990

NORDAC ACCESS BT

Bluetooth adapter SK TIE5-BT-STICK to establish wireless connection between the frequency inverter and mobile terminal devices (e.g smartphone, tablet). Together with the free NORDCON *APP* for Android or iOS, NORD therefore provides a smart aid for control, parameterisation and troubleshooting of frequency inverters.
Material No.: 275 900 120

micoSD card, 128 MB

Removable data carrier for archiving and transfer of parameter data sets for the frequency inverter.
Material No.: 201 130 300

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Getriebebau NORD GmbH & Co. KG
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T +49 4532 2890, F +49 4532 289 2253
info@nord.com

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