

# GETRIEBEBAU NORD

Member of the NORD DRIVESYSTEMS Group



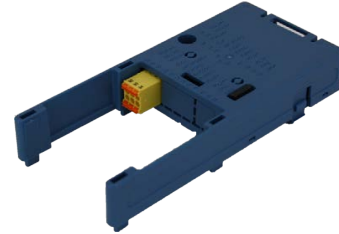
Getriebebau NORD GmbH & Co. KG

Getriebebau-Nord-Straße 1 • 22941 Bargteheide, Germany • [www.nord.com](http://www.nord.com)

## SK CU5-STO

Part number: 275 298 000

Optional modules – Functional safety



The customer unit SK CU5-STO described below may only be installed and commissioned by qualified electricians. A qualified electrician is a person who, because of their technical training and experience, has sufficient knowledge with regard to

- Switching on, switching off, disconnection, earthing and labelling of electric circuits and devices,
- Correct maintenance and use of protective devices according to specified safety standards.

### DANGER


#### Danger of electric shock

The frequency inverter has a hazardous voltage for up to 5 minutes after it has been switched off.

- Only carry out work when the frequency inverter has been disconnected and at least 5 minutes have elapsed since the mains was switched off!

### NOTICE

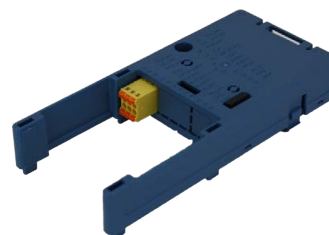
#### Validity of document

This document is only valid in combination with the operating instructions BU 0600 for the NORDAC PRO frequency inverter SK 500P and the supplementary instructions BU 0630 functional safety ( "Further documentation and software ([www.nord.com](http://www.nord.com))"). Only these documents contain all of the information that is required for safe commissioning of the modules and the frequency inverter.

Technical Information / Datasheet	SK CU5-STO			
NORDAC PRO (SK 500P)	275298000	1.0	3720	en

### Scope of delivery

1 x	Customer unit	SK CU5-STO
-----	---------------	------------



### Field of use

Plug-in customer unit for functional extension of a NORDAC PRO series frequency inverter of device types SK 530P and SK 550P. This module can be mounted on the front side of the frequency inverter. A plug-in 2-channel connection and 1 safe digital input are available on the module for functional safety requirements. The module ensures safe shut-down methods for Safe Pulse Block and Safety Digital Input to execute the STO and SS1-t stop functions.



### Technical Data


#### Module

Temperature range	-10°C ... +50°C
Temperature class	Class 3k3
Protection class	IP20
Max. installation altitude above sea level	≤ 2000 m

Vibration resistance	3M4
Hardware version	AA
Dimensions [mm] H x W x D	145 x 65 x 23

#### “Safe Pulse Block” and “Safety Digital Input”

	Safe Pulse Block	Safety Digital Input
Input voltage	+24 V ±25% (18 V ... 30 V)	+24 V -37.5% +25% (15 V ... 30 V)
Operation with OSSD	-20% ... +25% (19.2 V ... 30 V)	+24 V -37.5% +25% (15 V ... 30 V)
High level (VT+)	≥ 18 V	≥ 15 V
Low level (VT-)	≤ 3 V	≤ 3 V
Current consumption (average value)	VIS1: ≤ 28 mA VIS2: ≤ 140 mA Depending on the input voltage and application class (frequency inverter type and pulse frequency)  Supplementary instructions BU 0630 "Further documentation and software (www.nord.com)"	≤ 10 mA
Peak current (peak, when switching on or on the OSSD)	VIS1_24V: ≤ 70 mA VIS2_24V: ≤ 700 mA	≤ 25 mA
Input resistance	–	Low level: 10 kΩ High level: 3 kΩ ... 5 kΩ
Input capacitance	VIS1_24V: approx. 5 µF VIS2_24V: approx. 30 µF (downstream of inverse polarity protection)	approx. 10 nF
Cable length	≤ 100 m (shielded for compliance with EMC requirements)  Supplementary instructions BU 0630 "Further documentation and software (www.nord.com)"	
Cable capacitance	≤ 20 nF per connected frequency inverter (≤ 4 nF * tossd/ 0.1 ms (for tossd ≤ 500 µs))	
Requirements for OSSDs		

	Safe Pulse Block	Safety Digital Input
Test pulse width	$200 \mu\text{s} \leq t_{\text{OSSD}} \leq 500 \mu\text{s}$  Supplementary instructions BU 0630 "Further documentation and software (www.nord.com)"	
Duty (High level)	$\geq 90\%$	
Time between double pulses	$\geq 2 \cdot t_{\text{OSSD}}$ (note the duty factor)	
Switch-on delay (time between input change from Low to High level and the time at which enabling of the frequency inverter is possible.)	$\leq 25 \text{ ms}$	$\leq 15 \text{ ms}$
Response time (time between input change from High to Low level and triggering of the safety sub-function.)	$\leq 140 \text{ ms}$	$\leq 10 \text{ ms}$
Cycle time (time between two identical flanks at the input)	$\geq 1 \text{ s}$	
Fault response time (The time between detection of a fault and triggering of the fault response function.)		$\leq 35 \text{ ms}$
Fault response function		Inverter shut-down (behaviour as for STO)
Priority	Highest	Low
Source of failure rates	SN 29500 at ambient temperature: $40^\circ\text{C}$ (S1 operation) or $50^\circ\text{C}$ (S3 operation with ED = 70%) Special device SK 5x0P-751-340-S3: $40^\circ\text{C}$ (S3 operation with ED = 70%) or $50^\circ\text{C}$ (S3 operation with ED = 50%)	
Conformant object	Type B	
Hardware error tolerance	HFT 0	
Proportion of safe failures	SFF = 100%	SFF = 97.89 %
Probability of a hazardous failure per hour	PFH = 0	PFH = 11.33 FIT
Mean time until hazardous failure	MTTF <sub>d</sub> = "High" (> 100 years)	
Diagnostic coverage level	cannot be determined (PFH = 0)	DC = 92.85% ("average")
Safety integrity level (as per IEC 61508:2010 + IEC 61800-5-2:2016)	SIL 3	SIL 2
Category (as per EN ISO 13849-1:2016)	Category 4	Category 2
Performance level (as per EN ISO 13849-1:2016)	PL e	PL d
Proof test interval	TM = 20 years (duration of use, "Mission time")	

## Installation

Installation of the SK CU5-STO must be carried out as follows:

1. Switch off the mains voltage and observe the waiting period.
2. Push the control terminal cover down and remove it.
3. Remove the blank cover by activating the release mechanism at the lower edge and removing it with an upward rotating movement.
4. Break out the internal jumper of the STO contact with the aid of a small screwdriver or small needle-nose pliers. Otherwise the customer unit cannot be installed.



Screwdriver max.  
2.5 mm



Needle-nosed pliers



STO contact jumper



Frequency inverter  
without STO contact  
jumper

5. Hook the customer unit onto the upper edge and press in lightly until it engages. Take care that the connector strip makes proper contact.
6. Install the control terminals and blank cover.



Remove the control  
terminals and blank  
cover.



Remove the STO  
contact jumper.



Install the SK CU5-STO  
customer unit.




Install the control  
terminals and blank  
cover.

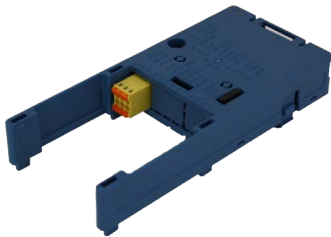
## Information

Once the jumper of the STO contact has been removed, the frequency inverter cannot be operated with functional safety without customer unit SK CU5-STO.

## Wiring guidelines

If flexible cables (multiple strand or fine-wire) are used for connections on the terminal block X20, wire end sleeves must be used. In addition, the wiring guidelines in the SK 500 frequency inverter manual BU 0600 and the supplementary instructions BU 630  "Further documentation and software (www.nord.com)" apply.

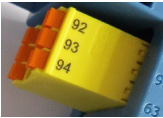

**Electrical connection**



X20: Functional safety: STO, SS1-t

The electrical connection of the functional safety is established at the customer unit SK CU5-STO via connection terminals on the terminal block X20.

The appropriate contacts must be used depending on the functional safety function in use.


Terminal block X20	Designation	No.	Description
 Top view	VIS2_24V	92	24 V STO input 2 (SI2)
	VIS12_0V	93	Reference potential for STO inputs (SI1/2)
	VISD_24V	94	Safety Digital Input
 Bottom view	VIS12_0V	93	Reference potential for STO inputs(SI1/2)
	VIS1_24V	91	24 V STO input 1 (SI1)
	VISD_0V	95	Reference potential for the Safety Digital Input

**Terminals:** Push-in, wire stripping length 10 mm  
**Cross section:** 0.2 mm<sup>2</sup>... 1.5 mm<sup>2</sup>, AWG 24 ... 16, rigid  
 0.25 mm<sup>2</sup>... 1.5 mm<sup>2</sup>, AWG 24 ... 16, flexible with wire end sleeve

Cross section [mm <sup>2</sup> ]	Wire end sleeve length without insulating collar according to DIN 46228-1 [mm]	Wire end sleeve length with insulating collar according to DIN 46228-4 [mm]
0.25	5 ... 7	8 ... 10
0.34	7	8 ... 10
0.50	8 ... 10	8 ... 10
0.75	8 ... 10	8 ... 10
1.00	8 ... 10	-
1.50	10	-

Two wires with the same cross section are not possible.

** Information**

All information on electrical connections can be found in the SK 500P frequency inverter manual BU 0600 as well as in the supplementary instructions BU 0630  "Further documentation and software (www.nord.com)".

### EMC-compliant shield connection

If shielded connection cables are used, the terminal connection cables must always be connected on both sides. The connection can be made as follows:

- Shielding on the rear wall of the control cabinet
- Use of EMC kits

Depending on size and type or configuration level of the frequency inverter, two different optional EMC kits of type SK HE5-EMC-... can be used for connection. The EMC kits are divided into three different categories and depend on size.



SK 550P without blank covers



SK 550P with mounted SK CU5-STO




SK HE5-EMC-MS-HS12  
SK HE5-EMC-CS-HS23




Detailed view of mounted EMC kits

### Information

The EMC kits used for connection to the customer unit (SK HE5-EMC-CS-...) can only be mounted and used in conjunction with those for motor connection (SK HE5-EMC-MS-...). Detailed information can be found in the technical information on EMC kits  "Further documentation and software (www.nord.com)".

### Commissioning of functional safety

### Information

All information on the commissioning of the device, operating status messages or error messages related to the customer unit or the functional safety function can be found in the SK 500P frequency inverter manual BU 0600 as well as in the supplementary instructions BU 0630  "Further documentation and software (www.nord.com)".

## Parameter overview

Only the parameters specific to **functional safety** as well as display and setting options are listed below.

### Operating displays

P000 (parameter number)	Operating para. disp (parameter name)	S <sup>1</sup>	P <sup>2</sup>
P001	Select of disp.value		
P003	Supervisor-Code		

<sup>1</sup> S corresponds to supervisor password

<sup>2</sup> P is depending on parameter set

### Control terminals

P423	Safety SS1 max. time		
P424	Safe Dig.input	S	P
P426	Quick stop time		P
P428	Automatic starting	S	
P434	Digital out function		P
P481	Funct-BusIO Out Bits	S	
P497	Safety password	S	
P498	Change safety passw.	S	
P499	Safety CRC		


### Additional parameters

P506	Automatic acknowledged.	S	
P559	DC Run-on time	S	P

### Information

P700	Actual operating status		
P701	Last fault		


## Information

All information on parametrisation can be found in the SK 500P frequency inverter manual BU 0600 as well as in the supplementary instructions BU 0630  "Further documentation and software (www.nord.com)".

### Error messages

Error messages that occur in connection with the customer unit are displayed in the frequency inverter's error memory in parameter **P700/P701**.

### Information

Error messages of the optional modules can be found in the SK 500 frequency inverter manual BU 0600 and the supplementary instructions BU 0630  "Further documentation and software (www.nord.com)".

### Further documentation and software ([www.nord.com](http://www.nord.com))

Software	Description
<a href="#">NORDCON</a>	Parametrisation and diagnostic software

Software	Description
<a href="#">NORDCON APP</a>	Parametrisation and diagnostic software for mobile terminal devices

Document	Description
<a href="#">BU 0000</a>	Description of NORDCON software
<a href="#">BU 0040</a>	Parameter box manual
<a href="#">BU 0600</a>	Manual for frequency inverter NORDAC PRO SK 5xxP
<a href="#">BU 0630</a>	Supplementary instructions for frequency inverter NORDAC PRO SK 5xxP Functional safety

Document	Description
<a href="#">BU 0960</a>	Manual NORDAC ACCESS BT SK TIE5-BT-STICK for NORDCON APP
<a href="#">S9090</a>	NORDAC ACCESS BT and NORDCON APP QUICK START
<a href="#">in preparation</a>	Technical information NORDAC PRO EMC kits for SK 5xxP frequency inverter

Flyer	Description
<a href="#">E3000</a>	NORDAC Electronic drive technology