GETRIEBEBAU NORD
Member of the NORD DRIVESYSTEMS Group

NORD DRIVESYSTEMS

SK TU3-PNT

Part number: 275 900 190

PROFINET IO® – External Bus Interface

The bus interface may only be installed and commissioned by qualified electricians. An electrician is a person who, because of their technical training and experience, has sufficient knowledge with regard to

- Switching on, switching off, isolating, earthing and marking power circuits and devices,
- Proper maintenance and use of protective devices in accordance with defined safety standards.

DANGER — **Danger of electric shock**

The frequency inverter carries hazardous voltage for up to 5 minutes after being switched off.

- Work must not be carried out unless the frequency inverter has been disconnected from the voltage and at least 5 minutes has elapsed since the mains was switched off!

NOTICE — **Validity of document**

This document is only valid in conjunction with the operating instructions of the respective frequency inverter and the bus communication manual for this bus interface (📖 See overview at end of document). These documents contain all of the information that is required for safe commissioning of the bus interface module and the frequency inverter.

Scope of delivery

1 x	Bus interface	SK TU3-PNT

Usage area

Technology unit for connecting a frequency inverter (SK 5xxE) to a **PROFINET IO** field bus. The bus interface must be directly plugged into the technology slot of the frequency inverter.

Technical Data

Bus interface

Temperature range	0 °C...40 °C
Temperature class	Class 3K3
Protection class	IP20
Supply voltage	24 V ± 20 %, ≈ 100 mA reverse polarity protected

Vibration resistance	2M1
Firmware version	V1.4 R4
Hardware version	AA
Dimensions [mm]	H x W x D: 27 x 73 x 101

Bus specification

PROFINET IO	max. 100 MBaud
	electrical isolation 500 V_{eff}
Bus connection	2 x RJ45
Bus termination	performed automatically
Status display	4 LEDs
Topology*	Star, tree, ring, linear bus

Cable	Min. Ethernet CAT-5
Max. cable length	100 m between two bus interfaces
Shield	via RJ sockets, high-impedance and capacitive to PE
PE connection	via PE plug pin (below 24 V. connection)

Power

Update interval for process data between bus interface and frequency inverter	≤ 2.5 ms
Parameter read access on the frequency inverter	≈ 15 ms
Parameter write access with storage in EEPROM	≈ 25 ms
Cycle times	≥ 1 ms

Bus interface characteristics

Communication	RT (Real Time) → Real time communication of process data
	IRT (Isochronous Real Time) → Isochronous real time communication of synchronised process data
Addressing	Automatic address assignment via IO controller using DCP (Discovery Configuration Protocol)
Data transfer	via Switched Ethernet
Autonegotiation	Negotiation of transfer parameters
Autocrossover	Transmission and receiver cables are automatically crossed in the switch as necessary
Conformity classes	CC-B and CC-C
Access for NORD diagnosis tool via	• Diagnostics socket on the device (if available) and via frequency inverter • Ethernet protocols UDP or TCP/IP possible

Installation

Information — Installing the SK TU3-... technology unit

Modules should not be inserted or removed unless the device is free of voltage. The slots may only be used for the intended modules.

Installation of a technology unit **separate** from the frequency inverter is not possible. It must be connected directly to the frequency inverter.

The technology units must be **installed** as follows:

1. Switch off the mains voltage, observe the waiting period.
2. Push the control terminal cover down slightly or remove.
3. Remove the **dummy cover** by activating the release mechanism at the lower edge and removing it with an upwards rotating movement.
4. Hook the **technology unit** onto the upper edge and press in lightly until it engages.

   Take care that the plug connection bar is properly contacted and if necessary fix it with a suitable screw (self-tapping screw 2.9 mm x 9.5 mm, included in the scope of delivery of the frequency inverter).

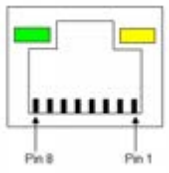
5. Close the control terminal cover again.

Connections

The two Ethernet lines are connected exclusively via the two RJ45 sockets on the front. If the bus interface is the final subscriber on the line, one RJ45 socket can remain unoccupied.

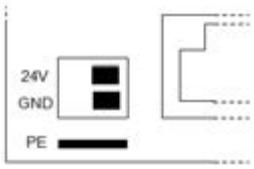
(1) RJ45 socket detail

RJ45 Pin	Signal	Description
1	TX+	Transmission Data +
2	TX-	Transmission Data -
3	RX+	Receive Data +
6	RX-	Receive Data -



(2) Power supply detail

Terminal	Name	Description
45	+ 24 V	24 V supply
46	GND	Earth



Configuration

The bus interface is configured for remote maintenance via the DIP switches. The DIP switch settings are read after a "Power On" of the bus interface.

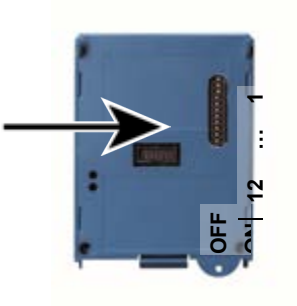
DIP switch												Meaning
12	11	10	9	8	7	6	5	4	3	2	1	
X	X	X	No function									
Access rights for remote maintenance												
		0										Only read access to parameters possible.
		1										Read and write access to parameters possible.
	0											No control possible.
	1											Control is possible.
0												TCP/IP open connection.
1												Secure TCP/IP connection.

1. (DIP 1 ... 9)

   No function.

2. Access rights for remote maintenance (DIP 10 ... 12)

   The bus interface and the connected frequency inverter can be accessed using remote maintenance via the Ethernet TCP and UDP protocols. The type of access is defined via the DIP switch with inputs 10 to 12.



LED indicators

The operating statuses of the bus interface are visualised using LED indicators.

No.	Name	Colour	Meaning
1	RUN	green	Ethernet State
	BF	red	Ethernet Error
	DS	green	Device State
	EN	red	Device error
2	Link	green	Link
	Activity	yellow	Activity

PROFINET-specific LED

RUN (Ethernet State)	**Meaning**
OFF	No operating voltage Initialisation
Flashing green	No connection to PROFINET IO controller No parameter communication No process data communication
Green ON	Parameter communication active Process data communication active

BF (Ethernet Error)	**Meaning**
OFF	No error
Flashing red	No process data communication → e.g. incorrect GSDML file
Red ON	Ethernet error → there is no physical connection to a further subscriber
Double-flashing red (2 x 0.25 s,+ 1sec pause)	PROFINET or FU timeout, (see also P151, P513)

Link (Green LED)	**Activity** (Yellow LED)	**Meaning**
OFF	**OFF**	• Bus interface not ready, no control voltage, • No bus connection (check cable connection)
ON	**OFF**	• Bus connection (cable connection) to another Ethernet device exists • No bus activity present
ON	**Flashing** **(Blinking)**	• Bus connection (cable connection) to another Ethernet device exists • Bus activity present

NORD-specific LEDs

DS (**D**evice **S**tate)	**EN** (**D**evice **E**rror)	**Meaning** long flashing = 0.5 s on / 1 s off short flashing = 0.25 s on / 1 s off
OFF	**OFF**	Bus interface not ready, no control voltage
ON	**OFF**	Bus interface ready, no error, at least one frequency inverter is communicating via the system bus
ON	**Short flashing**	Bus interface ready, but • One or more of the connected frequency inverters has fault status
Long flashing	**OFF**	Bus interface ready and at least one other subscriber is connected to the system bus, but • No frequency inverter on the system bus (or connection interrupted) • One or more system bus subscriber has an address error • Software incompatible (bus interface software and FI software incompatible - update required)
Long flashing	**Short flashing** Flash interval **1** x - 1s pause	System bus is in status "Bus Warning" • Communication on system bus disrupted • No other subscribers present on system bus • Module not inserted correctly or no connection to system bus • Frequency inverter has no supply voltage
Long flashing	**Short flashing** Flash interval **2** x - 1s pause	System bus is in status "Bus Off" • The system bus 24 V power supply has been interrupted during operation
Long flashing	**Short flashing** Flash interval **3** x - 1s pause	System bus is in status "Bus Off" • The 24V voltage supply of the system bus is missing
Long flashing	**Short flashing** Flash interval **4** x - 1s pause	Bus interface error • See parameter **P170**
OFF	**Short flashing** Flash interval **1…7** - 1s pause	System error, internal program sequence interrupted • EMC interference (observe the wiring guidelines!) • Bus interface defective

Error messages

Error messages from the bus interface - current or archived message relating to the last fault - can be read out via bus interface parameter **P170**. The error messages are lost if the bus interface is switched off.

Error	Meaning	Remarks
100.0	EEPROM error	EMC fault, bus interface defective
101.0	System bus 24 V missing	No 24 V voltage on bus, connections not correct
102.0	Bus timeout **P151**	By means of timeout supervision parameter **P151/P513**
103.0	System bus Off	No 24 V voltage on bus, connections not correct
104.0	Overtemp. Module	Only SK CU4-PNT bus interface (see **E10.7**)
550.0	General configuration error	No Ethernet connection (see **E10.5**)
550.1	IO hardware error	Error on IO interfaces (see **E10.4**)
550.2	CAN hardware error	EMC fault (see **E10.6**)
550.3	SAFE hardware error	Error in the safety module
550.4	FI lost	Connection to system bus participant (FI) lost
550.5	AR lost	PROFINET telegram failure, connection to the IO controller lost (see **E10.2**)
564.0	MAC address error	MAC address defective

Errors which occur in relation to the bus interface are depicted as follows in the error memory of the frequency inverter (P700 / P701).

Error (E010)	Meaning	Remarks
10.0	Connection error	• Contact to bus interface lost
10.2	PROFINET telegram failure	• Check physical bus connections • Check the status of the PROFINET IO controller
10.3	Timeout through **P151**	• System bus monitoring has triggered. – Check time setting parameter **P151** • Telegram transfer is faulty. – Reception of cyclic telegrams • Check physical bus connections
10.4	Hardware error, IOs	• An error has occurred in the IO hardware – Remedy EMC fault – Restart the bus interface
10.5	General PROFINET configuration error	• No Ethernet detected at the port This error only occurs if there had previously been a connection to another IO device or switch
10.6	System bus hardware error	• Remedy EMC fault
10.7	CU4 temperature too high	*Only SK CU4-PNT bus interface:* • Excess bus interface temperature
10.8	Timeout connection error	• Connection between bus interface and frequency inverter interrupted due to timeout.
10.9	Module missing **P120**	*Bus interfaces SK CU4-PNT and SK TU4-PNT only:* • The module entered in parameter **P120** is not available.

Parameters

Frequency inverter: The following frequency inverter parameters must be adapted for setting up communication between the frequency inverter and the bus interface (for details please refer to the frequency inverter manual).

Parameter [-Array]	Meaning	Remarks	
P120 [-01]	Option monitoring	**"Auto"** (default setting)	Only SK xU4
P509	Source Control Word	SK TU3-… on SK 5xxE: **"Ethernet TU"** SK xU4-… on SK 180/SK 2xxE: **"System bus"**	
P510 [-01]…[-02]	Setpoint source	**"Auto"** (default setting)	
P513	Time-out	Monitoring of the SK TU3 bus interface	Only SK 5xxE
P543 [-01]…[-03] ([-05]) and **P543**…**P545**	Bus actual value (1...3 (...5))	Possible settings according to **P418**	
P546 [-01]…[-03] ([-05]) and **P546**…**P548**	Bus setpoint value (1...3 (...5))	Possible settings according to **P400**	
P700 [-01]/**P701**	Current/last faults	Information parameter	
P740/**P741**	Process data bus In / Out	Information parameter	
P745	Module version	Information parameter	Only SK TU3
P746	Module status	Information parameter	Only SK TU3
P748	CANopen/System bus status	Information parameter	

Bus interface: The bus interface provides a selection of appropriate parameters for setting or displaying special operating values. Parameters can be adapted using the NORDCON software or an SK PAR-3H / -3E parameter box. All parameters can still be read from and written to by the bus master via PROFINET IO.

Parameter [-Array]	Meaning	Remarks	-TU3-	-TU4-	-CU4-
P150	Set relays	Set DOUT directly or control via bus		X	
P151	External bus time-out	Monitoring of SK xU4 bus interface		X	X
P152	Factory setting	Reset bus interface parameters	X	X	X
P153 [-01 …]	Minimum system bus cycle	Reduction of bus load on the system bus caused by the bus interface		X	X
P154 [-01 …]	Access to option card I/O	Administration of read and write permissions to the IOs of the bus interface		X	X
P160 [-01…]	IP address		X	X	X
P161 [-01…]	IP subnet mask		X	X	X
P162	Device name	Up to 240 characters (ASCII codes 45 … 122), save by entering "0" as the final character	X	X	X
P163 [-01 …]	Alarm test	Sets a diagnostic alarm	X	X	X
P164 [-01 …]	IP Gateway	IP-Address for Gateway functionality	X	X	X
P170 [-01 …]	Present errors	Indication of a bus interface error	X	X	X
P171 [-01 …]	Software version	Firmware version/Revision	X	X	X
P172	Configuration	Bus interface type	X	X	X
P173 [-01 …]	Module status	Status of system bus or the connected FI	X	X	X
P174	Status of digital inputs	Image of the switching status of DIN		X	X
P175	Digital output state	Image of the switching status of DOUT		X	
P176 [-01…]	Process data bus In	Information parameter	X	X	X
P177 [-01…]	Process data bus Out	Information parameter	X	X	X
P178	Internal temperature	Information parameter			X
P180 [-01 …]	PPO Type	Information parameter	X	X	X
P181 [-01 …]	MAC address	Information parameter	X	X	X
P185 [-01 …]	Present IP address	Information parameter	X	X	X
P186 [-01 …]	Current IP subnet mask	Information parameter	X	X	X
P187 [-01 …]	Actual IP Gateway	Information parameter	X	X	X
P190	Status DIP-switches	Information parameter	X	X	X

Parameter access and diagnostics

The NORD CON software and optional control units such as the SK PAR-3H parameter box provide convenient access to the parameters of the bus interface and allow status information to be read out.

SK TU3-	SK TU4-	SK CU4- / SK TU4-
Access via RJ12 diagnostics socket of the SK 5xxE 	Access via RJ12 diagnostics socket of the bus connection unit **SK TI4-TU-BUS(-C)** 	Access via RJ12 frequency inverter diagnostics socket, if connected to the bus interface via the system bus. 

Further documentation and software (www.nord.com)

Software	Description
GSDML-file	Device characteristics and parameters

Software	Description
NORD CON	Parametrisation and diagnostic software

Document	Description
BU 0000	Description of NORD CON software
BU 0040	Parameter box manual
BU 0500	Frequency inverter manual SK 500E…SK 535E

Document	Description
BU 0505	SK 54xE frequency inverter manual
BU 2400	PROFINET IO bus communication manual