

GETRIEBEBAU NORD

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SK TU4-PNT-M12

Part number: 275 281 122

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.

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 TU4-PNT-M12 |
| 4 x | Hexagonal socket screw | M4 x 40 mm |
| Accessories required: | | |
| 1 x | Bus connection unit TI 275280000 | SK TI4-TU-BUS (Part No.: 275 280 000) |



Usage area

External technology unit for connection of a decentralised frequency inverter (NORDAC *BASE*, NORDAC *FLEX*) to a **PROFINET IO** field bus. The bus interface can be mounted on, or in the immediate vicinity of the frequency inverter. This is connected to the inverter via the system bus, and can directly access up to 4 frequency inverters. 8 digital inputs and 2 digital outputs are available.

| Technical Information / Datasheet | | SK TU4-PNT-M12 | | | |
|-----------------------------------|--------------|----------------|------|----|--|
| PROFINET IO Bus module | TI 275281122 | V 1.6 | 0623 | en | |

Technical Data

Bus interface

| | |
|-------------------|---|
| Temperature range | -25 °C...50 °C |
| Temperature class | Class 3K3 |
| Supply voltage | 24 V ± 20 %, ≈ 100 mA reverse polarity protected |

| | |
|----------------------|-----------------------------|
| Vibration resistance | 3M7 |
| Protection class | IP55 |
| Dimensions [mm]* | H x W x D: 95 x 136 x 99 |

* bus interface fitted to bus connection unit

Depth: 108 mm with cover caps on M12 connection

| | |
|--------------------------------------|---|
| Digital input - working range | Low: 0 V ... 5 V, High: 15 V ... 30 V |
| Digital input - specific data | R _i = 8 kΩ, input capacity: 10 nF, response time 10 ms, inputs as per EN 61131-2 type 1 |
| Digital output - 24 VDC power supply | ≤ 400 mA (input) |
| Digital output - working range | Low = 0 V, High = 24 V; max. 200 mA |

Bus specification

| | |
|-----------------|---|
| PROFINET IO | max. 100 MBaud |
| | electrical isolation 500 V _{eff} |
| Bus connection | 2 x M12 |
| Bus termination | performed automatically |
| Status display | 8 LEDs |
| Topology | Star, tree, ring, line |

| | |
|-------------------|-------------------------------------|
| Cable | Min. Ethernet CAT-5 |
| Max. cable length | 100 m between two bus interfaces |
| Shield | via M12 direct to PE |
| PE connection | via PE screw cap in terminal box |

Power

| | |
|---|---------|
| Update interval for process data between bus interface and frequency inverter | ≥ 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 PROFINET IO | 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 | <ul style="list-style-type: none"> • Diagnostics socket on the device (if available) and via frequency inverter • Ethernet protocols UDP or TCP/IP possible |

Installation

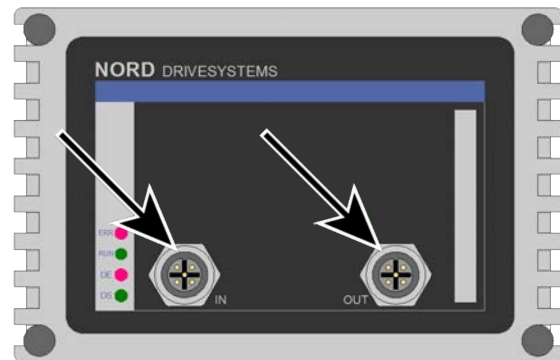
The bus interface must be attached to a suitable connection unit (SK TI4-TU...) and connected using the 4 provided M4 x 40 mm hexagon socket collar screws (Tightening torque 2 Nm). Installation details can be found in the data sheet for the relevant connection units.

Connections

The two Ethernet lines are connected exclusively via the two M12 sockets on the front. If the bus interface is the final subscriber on the line, one M12 socket can remain unoccupied. The use of EMC cable glands is recommended.

| PIN | Signal | Description |
|-----|--------|---------------------|
| 1 | TX+ | Transmission Data + |
| 2 | RX+ | Receive Data + |
| 3 | TX- | Transmission Data - |
| 4 | RX- | Receive Data - |

PIN assignment
M12-4 socket
("D"- coded)



The connection to other signal and control lines takes place via the bus connection unit **SK TI4-TU-BUS(-C)**.

| | | |
|---------------------|----------------------------|---|
| Terminals | Double-sprung terminal bar | 2 x 18 contacts |
| Cable cross section | AWG 14-26 | rigid: 0,14 ... 2,5 mm flexible: 0.14 ... 1.5 mm with wire end sleeves |
| PE connection | Via housing | |
| RJ12 | RJ45 - socket | Interface for connecting a parameterisation tool |

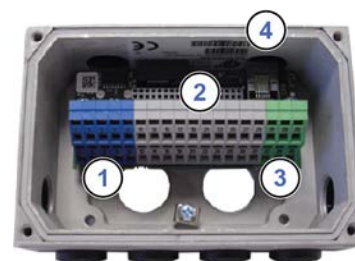
NOTICE

Short circuit possible

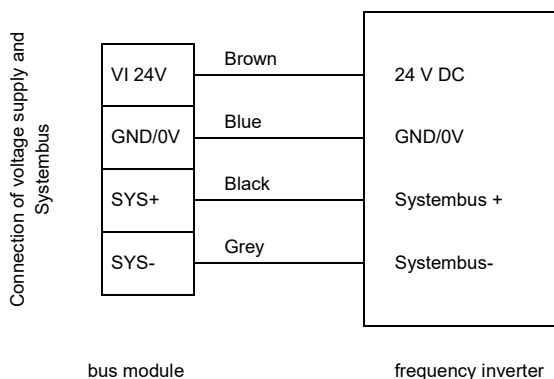
Attention must be paid to the fact that the GND connection (terminals 7 and 8) on the blue block is basically **not** short-circuit protected. In case of a short circuit between the 24 V connection (terminals 9 and 10) and the GND connection, the module may become defective.

- To remain short-circuit protected, the GND connection of the grey block must be used, even if the remaining connections are applied to the blue block.

| Potential | Contact | Designation | Description | |
|-----------|-------------------------------------|-------------|-------------|--|
| 1 | Digital inputs | 1 | 24 V | Supply potential (+24 V, ≤ 200 mA) |
| | | 2 | 24 V | Supply potential (+24 V, ≤ 200 mA) |
| | | 3 | DIN5 | Digital input 5 |
| | | 4 | DIN7 | Digital input 7 |
| | | 5 | DIN6 | Digital input 6 |
| | | 6 | DIN8 | Digital input 8 |
| | | 7 | 0 V | Reference potential (0 V / GND) |
| | | 8 | 0 V | Reference potential (0 V / GND) |
| | | 9 | 24 V | Supply potential (+24 V, ≤ 200 mA) |
| | | 10 | 24 V | Supply potential (+24 V, ≤ 200 mA) |
| 2 | System bus level and digital inputs | 11 | 24 V | Supply voltage (+24 V) |
| | | 12 | 24 V | Supply voltage (+24 V) |
| | | 13 | 24 V | Supply voltage (+24 V) |
| | | 14 | SYS + | System bus data line + |
| | | 15 | 0 V | Reference potential (0 V / GND) |
| | | 16 | SYS - | System bus data line - |
| | | 17 | 0 V | Reference potential (0 V / GND) |
| | | 18 | 0 V | Reference potential (0 V / GND) |
| | | 19 | DIN1 | Digital input 1 |
| | | 20 | DIN3 | Digital input 3 |
| | | 21 | 0 V | Reference potential (0 V / GND) |
| | | 22 | 0 V | Reference potential (0 V / GND) |
| | | 23 | 24 V | Supply voltage (+24 V) |
| | | 24 | 24 V | Supply voltage (+24 V) |
| | | 25 | DIN2 | Digital input 2 |
| | | 26 | DIN4 | Digital input 4 |
| | | 27 | 0 V | Reference potential (0 V / GND) |
| | | 28 | 0 V | Reference potential (0 V / GND) |
| | | 29 | 24 V | Supply voltage (+24 V) |
| | | 30 | 24 V | Supply voltage (+24 V) |
| 3 | Digital outputs | 31 | VI 24V2 | Supply potential (+24 V - in) of the digital outputs |
| | | 32 | 0V2 | Reference potential (0 V / GND) of the digital outputs |
| | | 33 | DOUT1 | Digital output 1 (+24 V, ≤ 200 mA) |
| | | 34 | DOUT2 | Digital output 2 (+24 V, ≤ 200 mA) |
| | | 35 | 0V2 | Reference potential (0 V / GND) of the digital outputs |
| | | 36 | 0V2 | Reference potential (0 V / GND) of the digital outputs |
| 4 | Diagnosis | RJ12 - 1 | RS485_A | Data cable RS485 |
| | | RJ12 - 2 | RS485_B | Data cable RS485 |
| | | RJ12 - 3 | GND | Reference potential (GND) |
| | | RJ12 - 4 | RS232_TxD | Data cable RS232 |
| | | RJ12 - 5 | RS232_RxD | Data cable RS232 |
| | | RJ12 - 6 | 24 V | Supply voltage (+24 V) |



Connection examples



Configuration

Configuration of the bus interface module for remote maintenance or for the system bus is carried out 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 | | | | | | | | | X | |
| | | | | | | | | | | | | 0 | System bus terminating resistor not set. |
| | | | | | | | | | | | | 1 | System bus terminating resistor set. |
| Access rights for remote maintenance | | | | | | | | | | | | | |
| | | 0 | | | | | | | | | | 0 | Only read access to parameters possible. |
| | | 1 | | | | | | | | | | 1 | Read and write access to parameters possible. |
| | | 0 | | | | | | | | | | 0 | No control possible. |
| | | 1 | | | | | | | | | | 1 | Control is possible. |
| 0 | | | | | | | | | | | | 0 | TCP/IP open connection. |
| 1 | | | | | | | | | | | | 1 | Secure TCP/IP connection. |

1. System bus (DIP 1)

The system bus must be terminated at both physical ends.

2. (DIP 2 ... 9)

No function.

3. 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.



Factory settings DIP switches: **OFF**

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 |
| | Act | 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,+ 1 s 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 (Device State) | EN (Device Error) | 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 <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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" <ul style="list-style-type: none"> • 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" <ul style="list-style-type: none"> • 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" <ul style="list-style-type: none"> • The 24V voltage supply of the system bus is missing |
| Long flashing | Short flashing Flash interval 4 x - 1s pause | Bus interface error <ul style="list-style-type: none"> • See parameter P170 |
| OFF | Short flashing Flash interval 1...7 - 1s pause | System error, internal program sequence interrupted <ul style="list-style-type: none"> • EMC interference (observe the wiring guidelines!) • Bus interface defective |

Parameter access and diagnosis

The NORDCON software or optional control units such as the SK PAR-3H ParameterBox provide convenient access to the parameters of the bus interface and allow status information to be read out. In addition, the NORDCON *APP* – in connection with the NORDAC *ACCESS BT* Bluetooth stick – offers a practical way of mobile and wireless maintenance as well as commissioning of NORD frequency inverters.

Access is via the RJ12 diagnostics socket of the frequency inverter. The prerequisite for this is that the bus interface is connected to the frequency inverter via the system bus.

Direct access via the RJ12 diagnostic socket of the bus connection unit is also possible.

Further documentation and software (www.nord.com)

| Software | Description |
|----------------------------|---------------------------------------|
| GSDML-file | Device characteristics and parameters |

| Software | Description |
|-------------------------|---|
| NORDCON | Parametrisation and diagnostic software |

| Document | Description |
|-------------------------|--|
| BU 0000 | Description of NORDCON software |
| BU 0040 | Parameter box manual |
| BU 0180 | Frequency inverter manual NORDAC <i>BASE</i> |
| BU 0200 | Frequency inverter manual NORDAC <i>FLEX</i> |
| BU 0250 | Frequency inverter manual NORDAC <i>LINK</i> |

| Document | Description |
|------------------------------|---|
| BU 2400 | PROFINET IO bus communication manual |
| TI 275280000 | Bus connection unit SK TI4-TU-BUS |
| TI 275274505 | SK TIE4-M12-SYSM System bus connection expansion exit |
| TI 275274506 | SK TIE4-M12-SYSS System bus connection expansion entrance |