

GETRIEBEBAU NORD

Member of the NORD DRIVESYSTEMS Group



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SK TU4-PBR-M12

Part number: 275 281 200

PROFIBUS® DP – 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-PBR-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 **PROFIBUS DP** 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. 4 digital inputs and 2 digital outputs are available.

| Technical Information / Datasheet | | SK TU4-PBR-M12 | | | |
|-----------------------------------|--------------|----------------|------|----|--|
| PROFIBUS DP Bus module | TI 275281200 | V 1.3 | 0623 | en | |

Technical Data

Bus interface

| | |
|-------------------|--|
| Temperature range | -25 °C...50 °C |
| Temperature class | Class 3K3 |
| Supply voltage | 24 V ± 20 %, ≈ 90 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 1 ms, inputs as per EN 61131-2 type 1 |
| Digital output - 24 VDC power supply | ≤ 400 mA (input) |
| Digital input - working range | Low = 0 V, High = 24 V; max. 200 mA |

Bus specification

| PROFIBUS DP | Max. 12 MBit/s | | | | | | | | |
|-----------------|---|------------------|---------------|-------|------------|-------|-------------|-------|---------------|
| | electrical isolation 500 V _{eff} | | | | | | | | |
| Bus connection | Connection terminals | | | | | | | | |
| Bus termination | via DIP switch on the bus interface | | | | | | | | |
| Status display | 10 LEDs | | | | | | | | |
| Topology | Linear bus | | | | | | | | |
| Power setting | PROFIBUS DP-V1 | | | | | | | | |
| Cable | Cable type A according to EN 50170 (drilled, shielded two conductor cable) | | | | | | | | |
| Cable length | depending on transmission speed: | | | | | | | | |
| | <table border="1" data-bbox="470 1279 933 1406"> <thead> <tr> <th>Bus cable length</th> <th>Transfer rate</th> </tr> </thead> <tbody> <tr> <td>400 m</td> <td>500 KBit/s</td> </tr> <tr> <td>200 m</td> <td>1500 KBit/s</td> </tr> <tr> <td>100 m</td> <td>3...12 MBit/s</td> </tr> </tbody> </table> | Bus cable length | Transfer rate | 400 m | 500 KBit/s | 200 m | 1500 KBit/s | 100 m | 3...12 MBit/s |
| | Bus cable length | Transfer rate | | | | | | | |
| | 400 m | 500 KBit/s | | | | | | | |
| 200 m | 1500 KBit/s | | | | | | | | |
| 100 m | 3...12 MBit/s | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Shield | via metal cable lead-in 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 | ≈ 12 ms |
| Parameter write access with storage in EEPROM | ≈ 25 ms |

Bus interface characteristics

| Communication Performance levels DP-V0 | Cyclic useful data connection between DP master and DP slaves (point-to-point useful data communication or Multicast) | | | | | | |
|---|--|-------------------------------------|----------------|------------|---|---|-------------------------------------|
| Communication Performance levels DP-V1 | Acyclic data communication between DP master DPM1 and DP slaves | | | | | | |
| Transfer Method | RS485 | | | | | | |
| Addressing | <table border="1"> <thead> <tr> <th>SK TU3-PBR</th> <th>SK TU3-PBR-24V</th> <th>SK xU4-PBR</th> </tr> </thead> <tbody> <tr> <td>Parameter P508 at frequency inverter</td> <td>Rotary coding switch or parameter P508 at frequency inverter</td> <td>DIP switch or parameter P160</td> </tr> </tbody> </table> | SK TU3-PBR | SK TU3-PBR-24V | SK xU4-PBR | Parameter P508 at frequency inverter | Rotary coding switch or parameter P508 at frequency inverter | DIP switch or parameter P160 |
| | SK TU3-PBR | SK TU3-PBR-24V | SK xU4-PBR | | | | |
| Parameter P508 at frequency inverter | Rotary coding switch or parameter P508 at frequency inverter | DIP switch or parameter P160 | | | | | |
| Synchronisation | Sync mode (synchronisation of outputs) and Freeze mode (synchronisation of inputs) | | | | | | |
| Bus access | Token Passing procedure Master/Slave procedure Mono-Master or Multi-Master System | | | | | | |
| Access for NORD diagnosis tool via | diagnostics socket on the device (if available) and via frequency inverter | | | | | | |

Installation

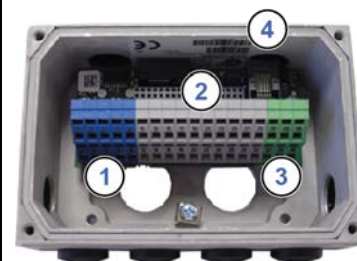
The bus interface must be attached to a suitable connection unit (SK TI4-TU...) and connected using the 4 provided M4 x 40 mm hexagon socket collar screws (Tightening torque 2 Nm). Installation details can be found in the data sheet for the relevant connection units.

Connections

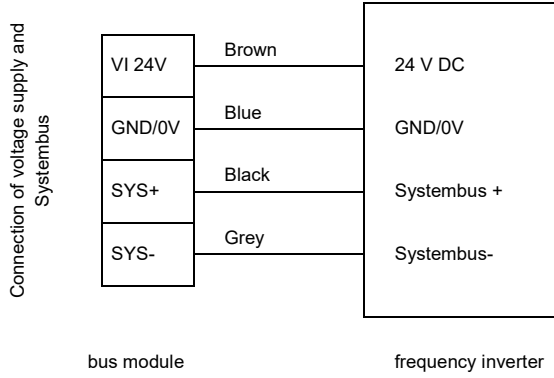
The connection of the field bus lines, signal lines and control lines takes place via the bus connection unit **SK TI4-TU-BUS(-C)**.

| | | |
|---------------------|----------------------------|---|
| 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 |

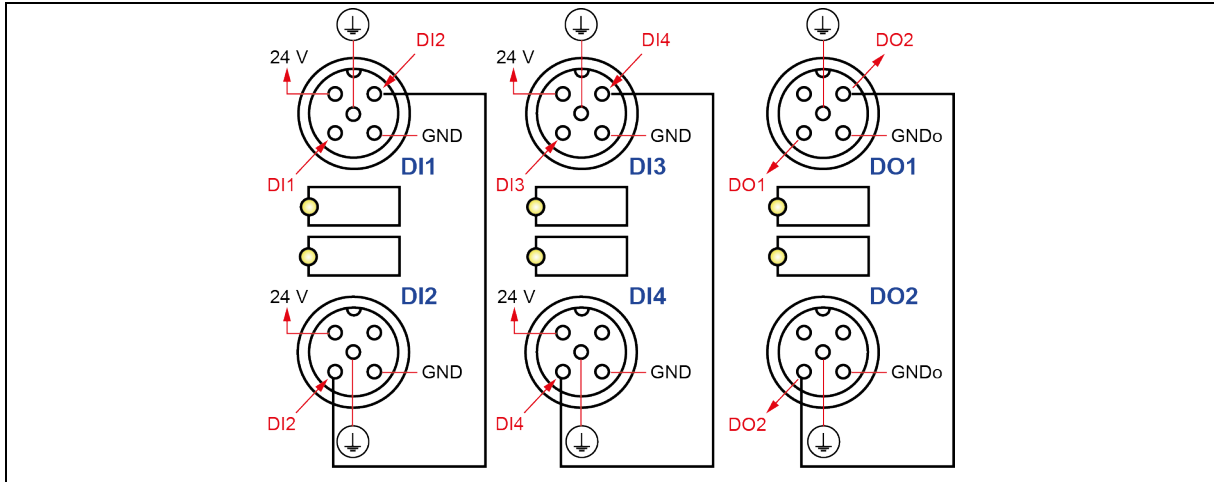
| Potential | Contact | Designation | Description | |
|-----------|-------------------------------------|-------------|-------------|--|
| 1 | PROFIBUS DP | 1 | 24 V | Supply potential (+24 V ±20%, 90 mA) |
| | | 2 | 24 V | Supply potential (+24 V ±20%, 90 mA) |
| | | 3 | PB B IN | Receive line, positive |
| | | 4 | PB B OUT | Transmit line, positive |
| | | 5 | PB A IN | Receive line, negative |
| | | 6 | PB A OUT | Transmit line, negative |
| | | 7 | 0V-B | Bus reference potential |
| | | 8 | 0V-B | Bus reference potential |
| | | 9 | RTS | Ready to send |
| | | 10 | +5 V B | +5 V bus supply voltage |
| 2 | System bus level and digital inputs | 11 | 24 V | Supply potential (+24 V) |
| | | 12 | 24 V | Supply voltage (+24 V) |
| | | 13 | 24 V | Supply voltage (+24 V) |
| | | 14 | Sys + | System bus data line + |
| | | 15 | 0V GND | Reference potential (0 V/GND) |
| | | 16 | Sys - | System bus data line - |
| | | 17 | 0V GND | Reference potential (0 V/GND) |
| | | 18 | 0V GND | Reference potential (0 V/GND) |
| | | 19 | DIN 1 | Digital input 1 |
| | | 20 | DIN 3 | Digital input 3 |
| | | 21 | 0V GND | Reference potential (0 V/GND) |
| | | 22 | 0V GND | Reference potential (0 V/GND) |
| | | 23 | 24 V | Supply potential (+24 V) |
| | | 24 | 24 V | Supply potential (+24 V) |
| | | 25 | DIN 2 | Digital input 2 |
| | | 26 | DIN 4 | Digital input 4 |
| | | 27 | 0V GND | Reference potential (0 V/GND) |
| | | 28 | 0V GND | Reference potential (0 V/GND) |
| | | 29 | 24 V | Supply potential (+24 V) |
| | | 30 | 24 V | Supply potential (+24 V) |
| 3 | Digital outputs | 31 | 24 V 2 | Supply potential (+24 V) of the digital outputs |
| | | 32 | 0 V 2 | Reference potential (0 V / GND) of the digital outputs |
| | | 33 | DO 1 | Digital output 1 (+24 V, 500 mA) |
| | | 34 | DO 2 | Digital output 2 (+24 V, 500 mA) |
| | | 35 | 0 V 2 | Reference potential (0 V / GND) of the digital outputs |
| | | 36 | 0 V 2 | 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



As an alternative to connecting to the bus connection unit, up to 4 sensors (digital inputs DI1...DI4) and up to 2 actuators (digital outputs DO1...DO2) can be connected via the M12 sockets at the front of the bus interface with normal commercial M12 system connectors. Contacts 19, 20, 25, 26, 33 and 34 of the bus connecting unit may not be used in this case.

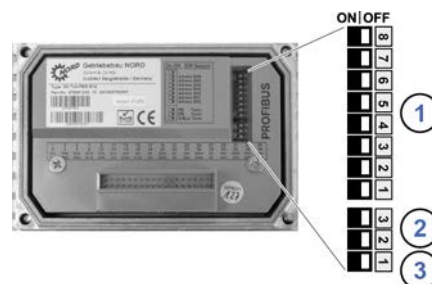


Configuration

The PROFIBUS address of the bus interface (1) is set via the DIP switches. If the bus interface is the final subscriber on the PROFIBUS field bus or the NORD system bus, the terminating resistors (2) and (3) must be activated.

The DIP switch settings are read in after a “Power On” of the bus interface.

| DIP switch | Meaning | Department | Meaning |
|------------|---------------|--------------|---|
| 8 | — | Addressing | Bus interface PROFIBUS address |
| 7 | Address bit 6 | | |
| 6 | Address bit 5 | | |
| 5 | Address bit 4 | | |
| 4 | Address bit 3 | | |
| 3 | Address bit 2 | | |
| 2 | Address bit 1 | | |
| 1 | Address bit 0 | | |
| 3 | PB Term. | Bus terminal | Terminating resistor for PROFIBUS field bus |
| 2 | PB Term. | | |
| 1 | S-Bus Term. | | |



Factory settings DIP switches: **OFF**

1. Addressing (DIP 7 ... 1)

The PROFIBUS is set with binary coding using DIP switches 7...1. Address area "3"..."125".

2. Terminating resistors for PROFIBUS field bus (DIP 2 and 3).

Both DIP switches 2 and 3 must be moved to the “ON” position if the bus interface is the final subscriber on the bus.

3. Termination resistor for NORD system bus (DIP 1)

Set DIP switch 1 to the “ON” position if the bus interface is the final subscriber on the bus.

LED indicators

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

| No. | Name | Colour | Meaning |
|-----|------|-----------|--------------------|
| 1 | EN | red | Device error |
| | DS | green | Device State |
| 2 | BE | red/green | PROFIBUS DP Error |
| | BR | green | PROFIBUS DP Status |



PROFIBUS DP-specific LED

| BR (Bus Ready, PROFIBUS DP Status) | BE (Bus Error, PROFIBUS DP Error) | Meaning |
|---|--|---|
| OFF | OFF | Bus interface not ready, no voltage supply or signalling of a system fault via the "DS" and "DE" LEDs. |
| Steady illumination in green | OFF | Normal operation, cyclic data exchange via PROFIBUS DP. |
| Flashing green (0.5 s) | OFF | Technology unit has not been configured by the DP master, no cyclic data exchange: <ul style="list-style-type: none"> • PROFIBUS DP cable not connected • Addressing error • PROFIBUS DP-Master in "STOP" state • Defective hardware configuration (e.g. More than 4 connected frequency inverters) |
| Steady illumination in red | Steady illumination in red | Communication timeout: Address monitoring time in PROFIBUS DP master expired. |
| Steady illumination in red | Flashing red (0.5 s) | Timeout during process data reception: The time set in parameter P151 External bus timeout has elapsed without new process data being received. |
| Flashing red (0.5 s) | Flashing red (0.5 s) | No communication between bus interface and PROFIBUS DP master: <ul style="list-style-type: none"> • Incorrect address range (permitted range "3"..."125") • Bus interface defective |

NORD-specific LEDs

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

Digital input and output LEDs

| LED (yellow) | Display | Meaning |
|-----------------|---------|--|
| DI1 | ON | "High" potential present at terminal 19 or M12 socket "DI1". |
| | OFF | "Low" potential present at terminal 19 or M12 socket "DI1". |
| DI2 | ON | "High" potential present at terminal 25 or M12 socket "DI2". |
| | OFF | "Low" potential present at terminal 25 or M12 socket "DI2". |
| DI3 | ON | "High" potential present at terminal 20 or M12 socket "DI3". |
| | OFF | "Low" potential present at terminal 20 or M12 socket "DI3". |
| DI4 | ON | "High" potential present at terminal 26 or M12 socket "DI4". |
| | OFF | "Low" potential present at terminal 26 or M12 socket "DI4". |
| DO1 | ON | "High" potential output at terminal 33 or M12 socket "DO1". |
| | OFF | "Low" potential output at terminal 33 or M12 socket "DO1". |
| DO2 | ON | "High" potential output at terminal 34 or M12 socket "DO2". |
| | OFF | "Low" potential output at terminal 34 or M12 socket "DO2". |



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 | Software | Description |
|--------------------------|---------------------------------------|-------------------------|---|
| GSD-file | Device characteristics and parameters | NORDCON | Parametrisation and diagnostic software |

| Document | Description | Document | Description |
|-------------------------|--|------------------------------|--|
| BU 0000 | Description of NORDCON software | TI 275280000 | Bus connection unit SK TI4-TU-BUS |
| BU 0040 | Parameter box manual | TI 275274505 | SK TIE4-M12-SYSM System bus connection expansion exit |
| BU 0180 | Frequency inverter manual NORDAC <i>BASE</i> | TI 275274506 | SK TIE4-M12-SYSS System bus connection expansion entrance |
| BU 0200 | Frequency inverter manual NORDAC <i>FLEX</i> | TI 275274500 | SK TIE4-M12-PRB Ethernet connection expansion PROFIBUS DP input/output |
| BU 0250 | Frequency inverter manual NORDAC <i>LINK</i> | BU 2700 | PROFIBUS DP bus communication manual |