

GETRIEBEBAU NORD

Member of the NORD DRIVESYSTEMS Group

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SK TU4-DEV-M12

Part number: 275 281 202

DeviceNet® – 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-DEV-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 connecting a decentralised frequency inverter (NORDAC *BASE*, NORDAC *FLEX*) to a **DeviceNet** 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-DEV-M12 | | | |
|-----------------------------------|--------------|----------------|------|----|--|
| DeviceNet Bus module | TI 275281202 | V 1.3 | 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 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

| DeviceNet | Max. 500 kBit/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 | | | | | | | | |
| Cable | twisted, shielded two-conductor cable | | | | | | | | |
| Cable length | depending on transmission speed: | | | | | | | | |
| | <table border="1"> <thead> <tr> <th>Bus cable length</th> <th>Transfer rate</th> </tr> </thead> <tbody> <tr> <td>Up to 100 m</td> <td>500 KBit/s</td> </tr> <tr> <td>100...250 m</td> <td>250 KBit/s</td> </tr> <tr> <td>250...500 m</td> <td>125 KBit/s</td> </tr> </tbody> </table> | Bus cable length | Transfer rate | Up to 100 m | 500 KBit/s | 100...250 m | 250 KBit/s | 250...500 m | 125 KBit/s |
| | Bus cable length | Transfer rate | | | | | | | |
| | Up to 100 m | 500 KBit/s | | | | | | | |
| 100...250 m | 250 KBit/s | | | | | | | | |
| 250...500 m | 125 KBit/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

| | | |
|--------------------------------------|--|-------------------|
| Parametrisation | DeviceNet via Explicit Messages | |
| Addressing | SK TU3-DEV | SK xU4-DEV |
| | via Rotary coding switch | via DIP switch |
| Setting the baud rate | SK TU3-DEV | SK xU4-DEV |
| | via Rotary coding switch | via DIP switch |
| Supported DeviceNet connection types | Explicit Messaging Connection | |
| | Polled I/O Connection | |
| | Bit Strobe I/O Connection | |
| | Change of State/Cyclic I/O Connection | |
| Access for NORD diagnosis tool via | diagnostics socket on the device (if available) and via frequency inverter | |

Installation

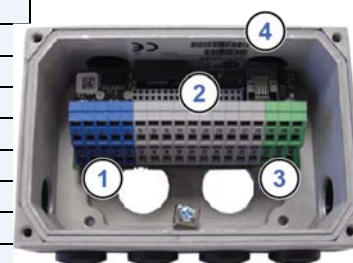
The bus interface must be attached to a suitable connection unit (SK TI4-TU...) and connected using the 4 provided M4 x 40 mm hexagon socket collar screws (Tightening torque 2 Nm). Installation details can be found in the data sheet for the relevant connection units.

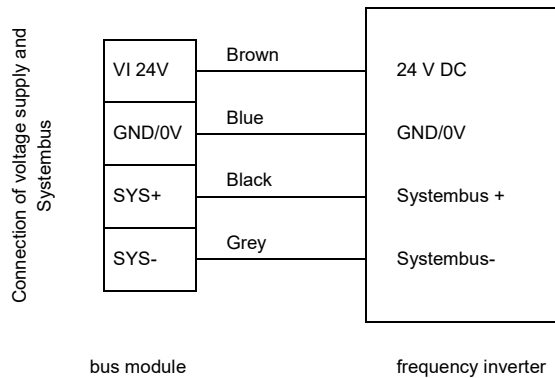
Connections

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

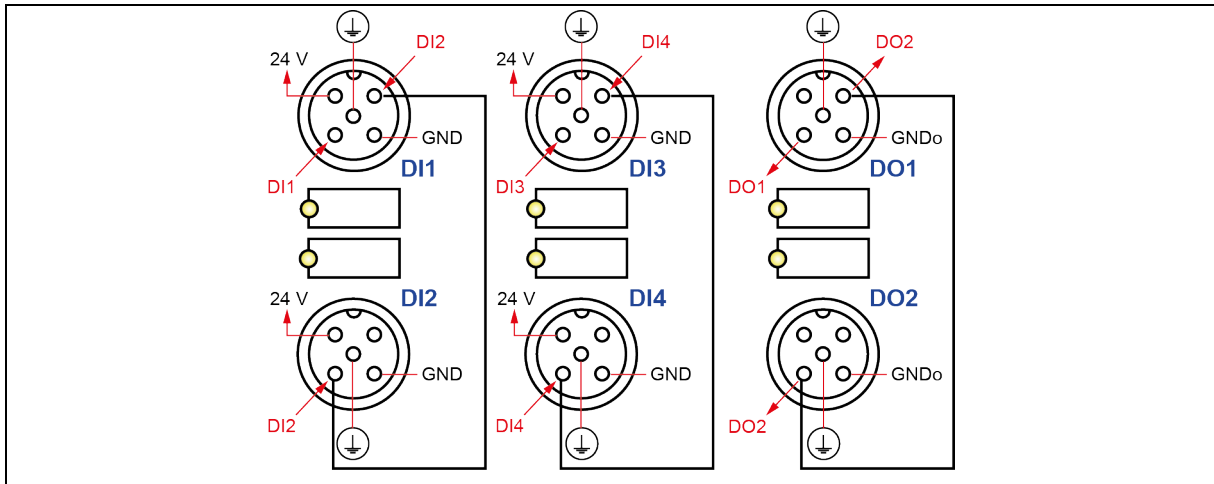
| | | |
|---------------------|----------------------------|---|
| Terminals | Double-sprung terminal bar | 2 x 18 contacts |
| Cable cross section | AWG 14-26 | rigid: 0,14 ... 2,5 mm flexible: 0.14 ... 1.5 mm with wire end sleeves |
| PE connection | Via housing | |
| RJ12 | RJ45 - socket | Interface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

| Potential | Contact | Designation | Description |
|-----------|-------------------------------------|-------------|--|
| 1 | DeviceNet | 1 | 24 V BUS External 24 V supply DeviceNet field bus |
| | | 2 | 24 V BUS External 24 V supply DeviceNet field bus |
| | | 3 | DVN + IN DeviceNet data cable + (Receive) |
| | | 4 | DVN + OUT DeviceNet data cable + (Transmit) |
| | | 5 | DVN - IN DeviceNet data cable - (Receive) |
| | | 6 | DVN - OUT DeviceNet data cable - (Transmit) |
| | | 7 | GND BUS Bus reference potential |
| | | 8 | GND BUS Bus reference potential |
| | | 9 | SHLD Bus shield |
| | | 10 | PE Earthing |
| 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 | GND Reference potential (0 V/GND) |
| | | 16 | Sys - System bus data line - |
| | | 17 | GND Reference potential (0 V/GND) |
| | | 18 | GND Reference potential (0 V/GND) |
| | | 19 | DIN 1 Digital input 1 |
| | | 20 | DIN 3 Digital input 3 |
| | | 21 | GND Reference potential (0 V/GND) |
| | | 22 | GND Reference potential (0 V/GND) |
| | | 23 | 24 V Supply voltage (+24 V) |
| | | 24 | 24 V Supply voltage (+24 V) |
| | | 25 | DIN 2 Digital input 2 |
| | | 26 | DIN 4 Digital input 4 |
| | | 27 | GND Reference potential (0 V/GND) |
| | | 28 | GND Reference potential (0 V/GND) |
| | | 29 | 24 V Supply voltage (+24 V) |
| | | 30 | 24 V Supply voltage (+24 V) |
| 3 | Digital outputs | 31 | 24V o DO Supply voltage (+24 V) |
| | | 32 | GND o DO 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 | GND o DO Reference potential (0 V / GND) of the digital outputs |
| | | 36 | GND o DO 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.

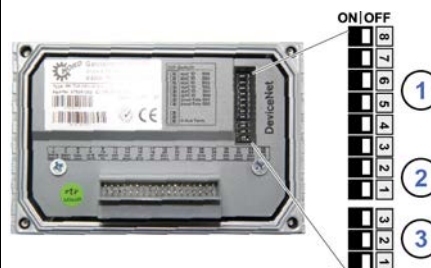


Configuration

The bus address (MAC ID), the bus interface (1) and the baud rate (2) are set via the DIP switches. The DIP switch settings are read in after a “Power On” of the bus interface.

If the bus interface is the final subscriber on the DeviceNet field bus or the NORD system bus, the terminating resistor (3) must be activated.

| DIP switch | Meaning | Department | Meaning |
|------------|-----------------|--------------|--|
| 8 | MAC ID Bit 5 | Addressing | Bus address (MAC ID) of bus interface |
| 7 | MAC ID Bit 4 | | |
| 6 | MAC ID Bit 3 | | |
| 5 | MAC ID Bit 2 | | |
| 4 | MAC ID Bit 1 | | |
| 3 | MAC ID Bit 0 | Baud rate | Bus interface baud rate |
| 2 | Baud rate bit 1 | | |
| 1 | Baud rate bit 0 | Bus terminal | Not used (position "OFF") |
| 3 | — | | Not used (position "OFF") |
| 2 | — | | Termination resistor for NORD system bus |
| 1 | S-Bus Term. | | |



Factory settings DIP switches: **OFF**

1. Addressing (DIP 8 ... 3)

The setting of the bus address takes place with binary coding using DIP switches 8...3.
Address area "0"..."63".

2. Baud rate (DIP 2 ... 1)

The setting of the node ID takes place with binary coding using DIP switches 2...1.

| DIP switch 2 | DIP switch 1 | Baud rate |
|--------------|--------------|-----------|
| OFF | OFF | 125 kBaud |
| OFF | ON | 250 kBaud |
| ON | OFF | 500 kBaud |

3. Termination resistor (DIP 3...1)

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

DIP switches “3” and “2” must be in the “OFF” position.

Information

Field bus termination

In accordance with the DeviceNet specification, an external terminating resistor of 120 Ω must be set at each physical end of the DeviceNet field bus.

LED indicators

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

| No. | Name | Colour | Meaning |
|-----|------|-----------|--------------------------|
| 1 | NS | red/green | DeviceNet Network status |
| | MS | red/green | DeviceNet Module status |
| 2 | EN | red | Device error |
| | DS | green | Device State |



DeviceNet-specific LED

| MS (DeviceNet Module status) | Meaning |
|-------------------------------------|---|
| OFF | No voltage supply |
| Steady illumination in green | Bus interface ready |
| Flashing green (0.5 s) | Bus interface in standby mode. No connection to one or more frequency inverters. No parameters exchanged, setpoint specifications via the AC profile not possible. Baud rate setting for DeviceNet field bus is invalid. |
| Steady illumination in red | A fault that cannot be acknowledged has occurred. The bus interface may be defective and must be replaced. |
| Flashing red (0.5 s) | A fault that can be acknowledged has occurred on the bus interface. |

| NS (DeviceNet Network status) | Meaning |
|-------------------------------------|--|
| OFF | No voltage supply. The bus interface has not performed the "DUP_MAC_ID" test. |
| Steady illumination in green | Normal operation, cyclic data exchange via DeviceNet field bus. |
| Flashing green (0.5 s) | Bus interface is "Online" and has performed the "Dup_Mac_ID" test but has not established a connection to field bus subscribers. |
| Steady illumination in red | A serious communication error has occurred (e.g. bus off, duplicated bus address or invalid baud rate setting). |
| Flashing red (0.5 s) | The I/O connection or the function of parameter P151 has triggered a timeout error. The flash code is displayed for at least 5 seconds. |

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 |
|--------------------------|--|-------------------------|---|
| EDS-file | Electronic Data Sheet (Object data file) | 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 275274515 | SK TIE4-M12-CAO-OUT CANopen connection expansion output |
| BU 0250 | Frequency inverter manual NORDAC <i>LINK</i> | TI 275274501 | SK TIE4-M12-CAO CANopen connection expansion entrance |
| BU 2600 | DeviceNet bus communication manual | | |