GETRIEBEBAU NORD
Member of the NORD DRIVESYSTEMS Group

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SK TU4-PBR-M12-C

Part number: 275 281 250

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-C
4 x	Hexagonal socket screw	M4 x 40 mm
Accessories required:		
1 x	Bus connection unit TI 275280500	SK TI4-TU-BUS-C (Part No.: 275 280 500)

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 Data

Bus interface

Temperature range	-25 °C...50 °C
Temperature class	Class 3K4
Supply voltage	24 V ± 20 %, ≈ 90 mA Reverse polarity protected

Vibration resistance	3M7
Protection class	IP66
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:

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	**SK TU3-PBR**: Parameter **P508** at frequency inverter **SK TU3-PBR-24V**: Rotary coding switch or parameter **P508** at frequency inverter **SK xU4-PBR**: 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.

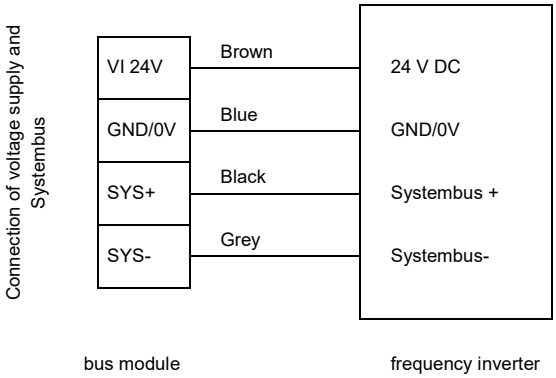
Connections

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

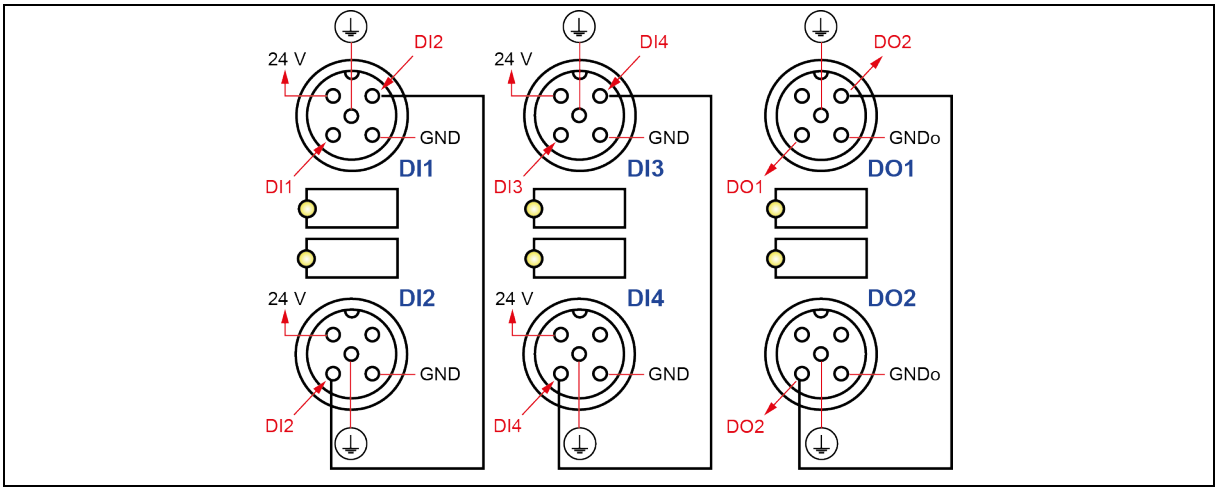
Terminals	Double-sprung terminal bar	2 x 18 contacts
Cable cross section	AWG 14-26	rigid: 0,14 … 2,5 mm flexible: 0.14 … 1.5 mm with wire end sleeves
PE connection	Via housing	
RJ12	RJ45 - socket	Interface for connecting a parameterisation tool

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.

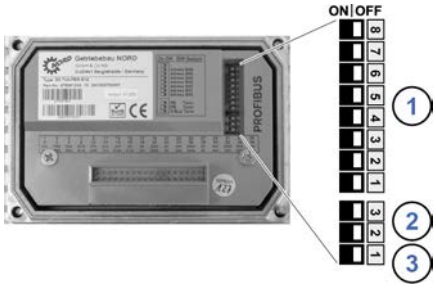


Configuration

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.		Termination resistor for NORD system bus



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.

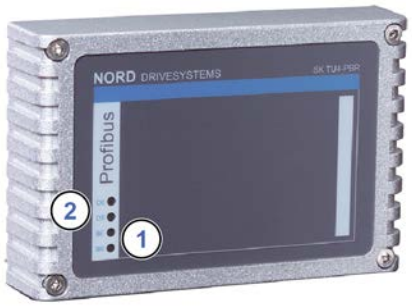
3. Termination resistor for NORD system bus (DIP 1)

   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	DE	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: • 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: • 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 • 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 - 1 s 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 - 1 s 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 - 1 s pause	System bus is in status "Bus Off" • 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 • See parameter P170
OFF	**Short flashing** Flash interval 1 x - 1 s pause	System error, internal program sequence interrupted • 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
GSD-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 *BASE*
BU 0200	Frequency inverter manual NORDAC *FLEX*
BU 0250	Frequency inverter manual NORDAC *LINK*

Document	Description
TI 275280500	Bus connection unit SK TI4-TU-BUS-C
TI 275274505	SK TIE4-M12-SYSM System bus connection expansion exit
TI 275274506	SK TIE4-M12-SYSS System bus connection expansion entrance
TI 275274500	SK TIE4-M12-PRB Ethernet connection expansion PROFIBUS DP input/output
BU 2700	PROFIBUS DP bus communication manual