SK TU4-ECT-C

Part number: 275 281 167

EtherCAT® – 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-ECT-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 connecting a decentralised frequency inverter (NORDAC *BASE*, NORDAC *FLEX*) to an **EtherCAT** 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 Data

Bus interface

Temperature range	-25 °C … 50 °C
Temperature class	Class 3K4
Supply voltage	24 V ± 20 %, ≈ 100 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: 10nF, sampling rate 1 ms, reaction time 1 ms, inputs according to 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

EtherCAT	max. 100 MBaud
	electrical isolation 500 V_{eff}
Bus connection	2 x M12 sockets
Bus termination	performed automatically
Status display	6 LEDs
Topology	Linear bus
Process data	8 bytes per FI + 2 bytes for IOs Total length 2 ... 34 Bytes

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 of process data for 1000 devices	≈ 1 ms
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

Bus interface characteristics

| Parametrisation	via CoE (CANopen over EtherCat)
Error Messages (Emergency Messages)	in acc. with CANopen DS-301
EtherCAT Addressing (Second Address)	DIP switch or bus interface parameters
Distributed Clocks	not supported
Access for NORD diagnosis tool via	diagnosis 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 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)
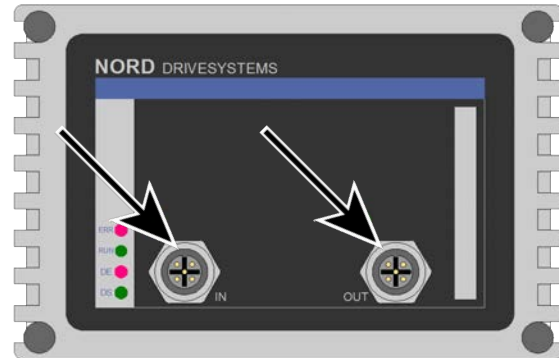
The connection to other signal and control lines takes place via the bus connection unit **SK TI4-TU-BUS(-C)**.

| 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

bus module   frequency inverter
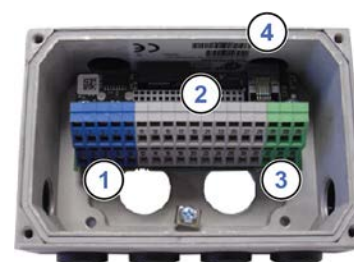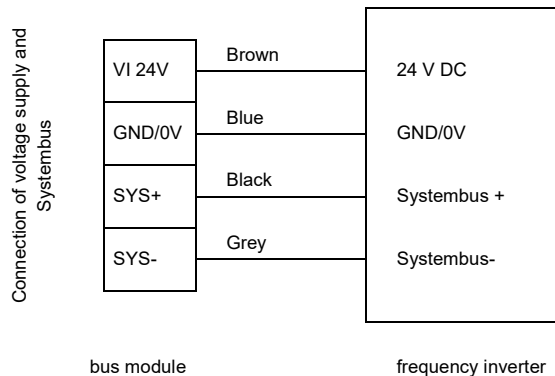
Configuration

No settings need to be made on the device. However, the bus interface can be configured with a fixed address because of the "Hot Connection Group" functionality, the so-called "Second Address". This takes place using the DIP switches of the bus interface. 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	Address
X	X	0	0	0	0	0	0	0	0	0	X	0
X	X	0	0	0	0	0	0	0	0	1	X	1
X	X	0	0	0	0	0	0	0	1	0	X	2
X	X	-	-	-	-	-	-	-	-	-	X	-
X	X	1	1	1	1	1	1	1	1	1	X	511
											0	System bus terminating resistor not set.
											1	System bus terminating resistor set.
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.

1. System bus (DIP 1)

   The system bus must be terminated at both physical ends.

2. Second Address (DIP 2…10)

   The „Second Address" can be set via this switch and controlled in parameter **P181**.
   If all DIP switches 2…10 are moved to the "OFF" position, the „Second Address" can be set via parameter **P160**.

3. Access rights for remote maintenance (DIP 11…12)

   The bus interface and the connected frequency inverter can be accessed via remote maintenance using the TCP Ethernet protocol. The type of access is defined via the DIP switch with inputs 10 to 11.

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
	ERR	red	Ethernet Error
	DS	green	Device State
	DE	red	Device Error
2	Link/Act	green	Link/Activity

EtherCAT-specific LED

RUN	State	Meaning
OFF	Init	• No communication of process data and parameters
Flashing	Pre-Operational	• Parameter communication active • No process data communication
Single Flash	Save Operational	• Parameter communication active • Restricted process data communication • No restrictions to actual values • Setpoints not evaluated
ON	Operational	• Parameter communication active • Unrestricted process data communication

ERR	State	Meaning
OFF	No Error	• EtherCAT functioning normally on the bus interface
Flashing	Invalid Configuration	• General EtherCAT configuration error, may be generated because of an erroneous XML file
Single Flash	Unsolicited State Change	• Bus interface has changed the EtherCAT state without authorisation
Double Flash	Application Watchdog Timeout	• EtherCAT or FI timeout (P513 or P151)

L/A (Green LED)	State	Meaning
OFF	No Connection	• Bus interface not ready, no control voltage, • No bus connection (check cable connection)
Flashing	Active	• Bus interface connected and active
ON	Inactive	• Bus interface ready for operation, but no 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 • 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

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
XML-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
BU 2300	EtherCAT bus communication manual