BU 2600 – en

DeviceNet bus interface

Supplementary manual options for NORD - Frequency Inverters

NORD DRIVESYSTEMS

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1 Introduction

1.1 General

1.1.1 Documentation

Name: **BU 2600**

Material number **6082602**

Series: **Field bus system DeviceNet™**

1.1.2 Document History

Issue	Order number	Software version	Remarks
BU 2600, October 2016	**6082602**/ 4116	V 1.5 R0	• Combination of manuals BU 0080 EN, July 2010, Part number 607 0801 / 3110 and BU 0280 EN, September 2009, Part number 607 2801 / 3709 • Extensive revision
BU 2600, August 2019	**6082602**/ 3419	V 1.5 R0	• Table „Assembly Object“ adapted
BU 2600, October 2019	**6082602**/ 4319	V 1.5 R0	• Correction version

1.1.3 Copyright notice

1.1.4 Publisher

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1.1.5 About this manual

This manual is intended to assist you in the setup of bus interfaces DeviceNet™ from Getriebebau NORD GmbH & Co. KG in a field bus system. It is intended for all qualified electricians who plan, install and set up the field bus system (🕮 Section 2.2 "Selection and qualification of personnel"). The information in this manual assumes that the qualified electricians who are entrusted with this work are familiar with the technology of the field bus system and programmable logic controllers (PLC).

This manual only contains information and descriptions of bus interfaces and frequency inverters manufactured by Getriebebau NORD GmbH & Co. KG. It does not contain any descriptions of the controllers and the necessary software for other manufacturers.

DeviceNet™ is a registered trademark.

1.2 Other applicable documents

This manual is only valid in combination with the Technical Information for the bus interface which is used and the operating instructions for the relevant frequency inverter. Only these documents contain all of the information that is required for safe commissioning of the bus interface module and the frequency inverter. A list of the documents can be found in 🕮 Section 9.3 "Documents and software".

The "Technical Information“ (TI) for the bus interface and the manuals (BU) for the NORD frequency inverters can be found under www.nord.com.

1.3 Presentation conventions

1.3.1 Warning information

Warning information for the safety of the user and the bus interfaces are indicated as follows:

DANGER

This warning information warns against personal risks, which may cause severe injury or death.

WARNING

This warning information warns against personal risks, which may cause severe injury or death.

CAUTION

This warning information warns against personal risks, which may cause slight or moderate injuries.

NOTICE

This warning warns against damage to material.

1.3.2 Other information

Information

This information shows hints and important information.

1.3.3 Text markings

The following markings are used to differentiate between various types of information:

Text

Type of information	Example	Marking
Instructions	1st 2nd	Instructions for actions whose sequence must be complied with are numbered sequentially.
Bullet points	•	Bullet points are marked with a dot.
Parameters	**P162**	Parameters are indicated by the prefix "P", a three-digit number and bold type.
Arrays	[-01])	Arrays are indicated by square brackets.
Factory settings	{ 0,0 }	Factory settings are indicated by curly brackets.
Software descriptions	**"Cancel"**	Menus, fields, buttons and tabs are indicated by quotation marks and bold type.

Numbers

Type of information	Example	Marking
Binary numbers	100001b	Binary numbers are indicated by the suffix "b"
Hexadecimal numbers	0000h	Hexadecimal numbers are indicated by the suffix "h"

Symbols used

Type of information	Example	Marking
Cross-reference	🕮 Section 4 "NORD system bus"	Internal cross-reference A mouse click on the text calls up the stated point in the document.
	🕮 Supplementary manual	External cross-reference
Hyperlink	http://www.nord.com/	References to external websites are indicated in blue and underlined. A mouse click calls up the website.

Type designations

Designation	Description
SK 1x0E	Series SK 180E frequency inverters
SK 2xxE	Series SK 200E frequency inverters
SK 2x0E-FDS	Series SK 250E-FDS frequency inverters
SK 5xxE	Series SK 500E frequency inverters
SK 54xE	SK 540E and SK 545E frequency inverters

1.3.4 List of abbreviations

Abbreviations used in this manual

Abbreviation	Meaning
AG	Absolute encoder
Bus module	Bus module
CAN	Controller Area Network
COS	Change Of State, DeviceNet communication type for the transfer of process data (with automatic detection of changed application data)
DIN	Digital input
DIP	Dual In-Line Package (= double row housing), compact switch block
DO	Digital output
EDS	Electronic Data Sheet
EMC	Electromagnetic compatibility
FI	Frequency inverters
INT	Integer, 16-bit whole number
I/O	Input, Output
IW	Actual value
LSB	Least Significant Byte, (smallest address)
OSI	Open Systems Interconnection, communication with open systems
PKW	Parameter identifier value
PPO	Parameter/Process Data Object
PZD	Process data
RO	Read Only
RW	Read Write, reading and writing rights
Rx	Receive
PLC	Programmable Logical Controller
STR	String value
STRUCT	Structure
STW	Control word
SW	Setpoint
Tx	Transmit
UCMM	Unconnected Message Manager, function of a DeviceNet bus participant for the transmission and reception of Explicit Messages
UINT	16-bit Integer, unsigned
UDINT	32 -bit Integer, unsigned
USINT	8-bit Integer, unsigned
USS	Universal serial interface
ZSW	Status word

2 Safety

2.1 Intended use

DeviceNet bus interfaces from Getriebebau NORD GmbH & Co. KG are interfaces for DeviceNet field bus communication, which may only be used in the following frequency inverters from Getriebebau NORD GmbH & Co. KG.

Bus interface	Frequency inverters
SK TU4-DEV	Series SK 180E SK 200E SK 250E-FDS SK 5xxE
SK TU4-DEV-C	
SK TU4-DEV-M12	
SK TU4-DEV-M12-C	
SK CU4-DEV	
SK CU4-DEV-C	
SK TU3-DEV	SK 500E series

DeviceNet bus interfaces from Getriebebau NORD GmbH & Co. KG are used for communication by the frequency inverter with a PLC in a DeviceNet field bus system provided by the operator.

Any other use of the bus interfaces is deemed to be incorrect use.

2.2 Selection and qualification of personnel

The bus interface may only be installed and started up by qualified electricians. These must possess the necessary knowledge with regard to the technology of the field bus system, as well as configuration software and the controller (bus master) which are used.

In addition, the qualified electricians must also be familiar with the installation, commissioning and operation of the bus interfaces and the frequency inverters as well as all of the accident prevention regulations, guidelines and laws which apply at the place of use.

2.2.1 Qualified personnel

Qualified personnel includes persons who due to their specialist training and experience have sufficient knowledge in a specialised area and are familiar with the relevant occupational safety and accident prevention regulations as well as the generally recognised technical rules.

These persons must be authorised to carry out the necessary work by the operator of the system.

2.2.2 Qualified electrician

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.
- Emergency treatment of injured persons.

2.3 Safety information

Only use bus interfaces and frequency inverters from NORD DRIVESYSTEM Group for their intended purpose, 🕮 Section 2.1 "Intended use".

To ensure safe operation of the bus interface, observe all of the instructions in this manual, and in particular the warning information in the other applicable documents, 🕮 Section 1.2 "Other applicable documents".

Only commission bus interfaces and frequency inverters in their technically unchanged form and not without the necessary covers. Take care that all connections and cables are in good condition.

Work on and with bus interfaces and frequency inverters must only be carried out by qualified personnel, 🕮 Section 2.2 "Selection and qualification of personnel".

3 DeviceNet basics

3.1 Characteristics

DeviceNet is an open communication profile for industrial automation systems which belongs to the family of CIP-based networks (CIP = Common Industrial Protocol). It is based on the CAN bus system (CAN = Controller Area Network), which describes Layers 1 (physical layer) and 2 (data communication) of the OSI model (Open Systems Interconnection Model = reference model for network protocols as system architecture (ISO 11898). The DeviceNet profiles are defined in the CIP application layer.

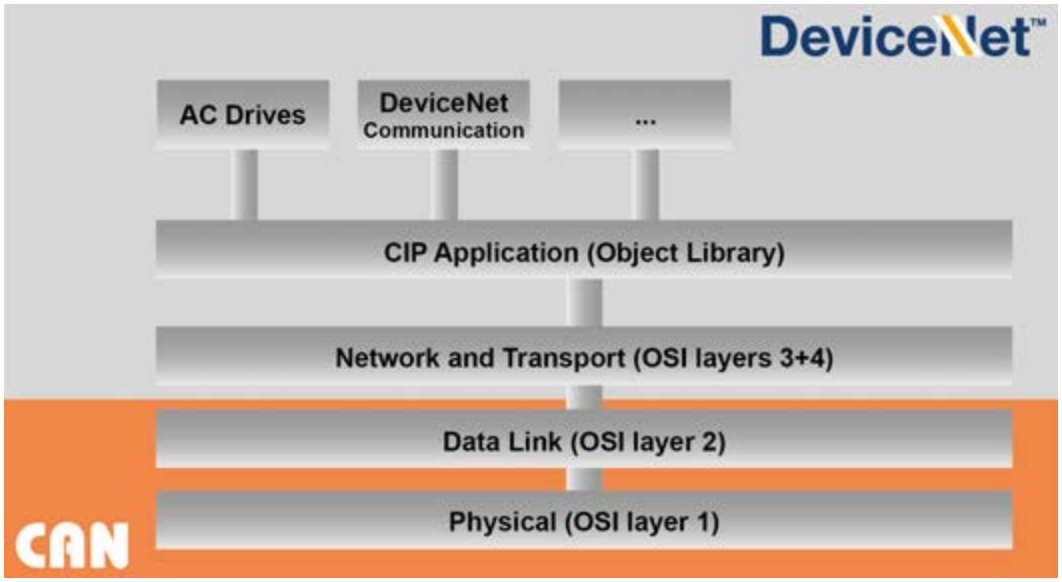

Figure 1: OSI layer model

Item	Description
Physical	Physical layer, defines the hardware, coding, speed etc. of data transfer
Data Link	Link layer, defines the communication physics (access method in the field bus and data backup).
Network and Transport	The allocation layer (network) takes over the routing of the data packages to the next bus participant, the transport layer (Transport) allocates the data packages to an application.
CIP Application	CIP application layer (object oriented), defines the interface to the application program with the application-orientated commands.
AC Drives	DeviceNet profile AC Drives
DeviceNet Communication	Communication profile DeviceNet Specification Release 2.0.

DeviceNet is managed by the association of users and manufacturers ODVA (Open DeviceNet Vendors Association) and is published in the European standard EN 50325.

DeviceNet® and CIP® are registered trademarks of the ODVA.

DeviceNet is an object oriented field bus system according to CIP, which operates with the Producer/Consumer method. In contrast to conventional transmission/reception methods, in which messages are addressed to particular recipients, with the Consumer/Producer method the field bus participants determine whether they are to process a message on the basis of the Connection ID which is contained in the data telegram.

DeviceNet bus participants can be clients (masters) or servers (slaves) or both. Clients and servers can be producers or consumers or both:

Field bus participants	Description
Client (Master)	The client is the field bus participant which sends an order to a server. The client expects a response
Server (Slave)	The server is the field bus participant which received an order from the client. The server sends a response to the client.
Producer	The producer sends a message via the field bus for processing by one or more consumers. Usually, this message is not directed to a particular receiver.
Consumer	The consumer is one of several possible field bus participants which receive a message which is sent by the producer in the field bus system.

DeviceNet devices can be integrated into a DeviceNet field bus system without configuration, however a unique bus address and a baud rate must be specified. The bus address (in the case of DeviceNet, also "MAC ID") and the baud rate of a DeviceNet device give the node address (node identifier), by which the field bus participant is identified.

Performance description

Standards	CAN: ISO 11898; DeviceNet: EN 50325		
Possible number of bus participants	max. 64		
Transfer rate	Max. 500 kBit/s		
Characteristics	Slave "Group 2 Only Server" (Support of the predefined master/ slave connection set)		
Supported connection types	• Explicit Messaging Connection (parameter data) • I/O Connection (process data) • Bit-Strobe I/O Connection (restricted gateway operation) • Change of State/Cyclic I/O Connection		
Data transmission	Transmission and reading of process and parameter data		
Transmission format	for parameter access (Requested-Message-Body format): 8/8 (8-bit Class ID/8-bit Instance ID)		
Wiring	Shielded, 5-core, in accordance with DeviceNet specification		
Cable length	depending on transmission speed:		
	kBit/s	**Bus length**	
	500	100 m	
	250	250 m	
	125	500 m	

3.2 Topology

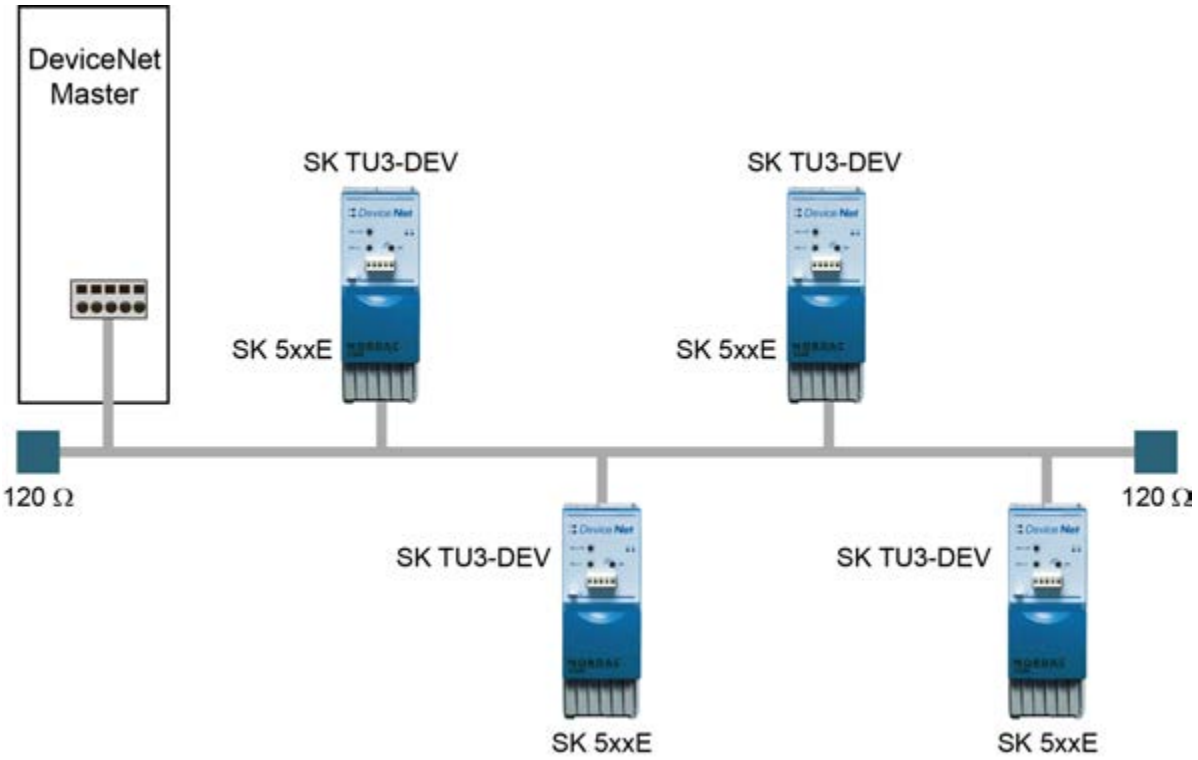

Figure 2: CANopen linear topology (example for up to 64 bus participants)

CANopen bus interfaces from Getriebebau NORD GmbH & Co. KG are connected in a linear structure.

DeviceNet supports the so-called Trunkline/Dropline topology (Trunkline = main line, Dropline = branch line), which enables branches from a linear bus via routers and gateways.

3.3 Bus protocol

The data which are to be communicated via the DeviceNet field bus are embedded in standard CAN-specific frames (CAN specification 2.0A). A CAN standard frame is detected by from the length of the so-called "identifier" (11-bit).

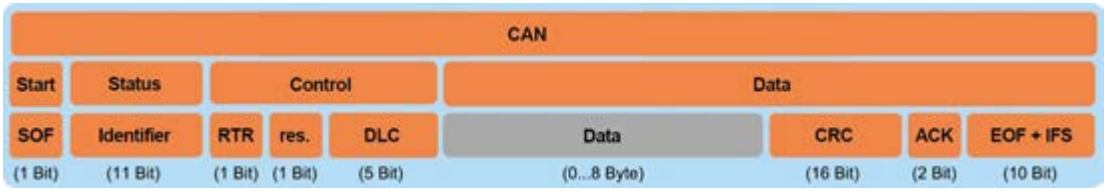

Figure 3: CAN standard frame – 11-bit identifier

Field	Designation	Description
Start	**SOF**	Start Of File = Dominant data bit for synchronisation
Status	**Identifier**	Label for transferring the priority and access rights of the recipient bus participant
Control	**RTR**	Remote Transmission Request = Recessive data bit to differentiate between the dominant data bit and the recessive data request telegram
	res.	Reserved field
	DLC	Data Length Code = Information about the length of the data telegram
Data	**Data**	Data telegram
	CRC	Cyclic Redundancy Check = Checksum which is used to detect errors
	ACK	Acknowledge = Confirmation of correct receipt by other bus participants
	EOF	End Of File = End of the data telegram (7 recessive bit)
	IFS	Inter Frame Spacing = Code for the transfer time of a correctly received message

Data communication (Network Layer and Transport Layer)

A connection between the transmitting and receiving bus participants must be established (via Unconnected Message Manager UCMM or Group 2 Unconnected Port) for the exchange of application data. A connection which has been established is used to transmit so-called "Explicit Messages" (data which is necessary for configuration, diagnosis and management) or "I/O Messages" (real time I/O data, also known as "Implicit Messages").

For communication with a field bus device, an Explicit Message Connection is first established, which is used for the exchange of data between the field bus devices or to set up an I/O connection. After the establishment of an I/O connection, the 11-bit CAN identifier field is used as a unique identifier for the data. In DeviceNet the CAN identifier is divided into four groups (Message Group 1…4).

Connection ID (CAN-Identifier) Bit 10…0											Hex range	Use
10	9	8	7	6	5	4	3	2	1	0		
0	Message ID				Source MAC ID						0000h…03FFh	Message Group 1
1	0	MAC ID						Message ID			0400h…05FFh	Message Group 2
1	1	Message ID			Source MAC ID						0600h…07BFh	Message Group 3
1	1	1	1	1	Message ID (0h…2F)						07C0h…07EFh	Message Group 4
1	1	1	1	1	1	1	X	X	X	X	07F0h…07FFh	Invalid CAN identifier

CIP protocol (Application Layer)

The CIP application layer defines the exchange of I/O Messages and Implicit Messages. Communication between two field bus participants is carried out according to a connection-oriented communication model via a point-to-point connection or a Multicast V1 connection. The data exchange is by means of objects, which are entered in the object index of the field bus device.

In the CIP protocol, each field bus participant receives an object library. CIP objects are subdivided into classes, instances and attributes. A class consists of objects which define the system components of a field bus participant. An instance is a particular object within a class. All instances of a class have the same attributes, but individual attribute values.

Objects and components are addressed according to a standardised system:

Address	Description
Node address (also MAC ID)	The DeviceNet address (integer value) of the field bus participant (can be set on the bus interface with rotary coding switches or DIP switches).
Class ID	Identifier (integer value) which is assigned to each object class which can be accessed in the field bus system.
Instance ID	Identifier (integer value), which is assigned to an object instance and which identifies this within the higher level class.
Attribute ID	Identifier (integer value) which is assigned to a class or instance attribute.
Service Code	Identifier (integer value) which identifies an order to a particular object instance or an object attribute.

Predefined Master/Slave Connection Set

To simplify the transfer of I/O data between the controller (PLC) and the field bus participants, the CIP protocol supports the following connection types:

Type of connection	Description
Explicit Messaging Connection	Exchange of configuration and diagnostic data (parameter data) without priority. This connection is always a point-to-point connection according to the client/server principle. Explicit Messages must be confirmed (response telegram).
Polled I/O Connection	I/O Messages are used to transfer process data. An I/O message has a single producer (transmitter) but may have many consumers (recipients). Process data may be up to 8 bytes long (unfragmented) or may be divided over several telegrams (fragmented). A Polled I/O Connection corresponds to a master/slave connection. The master sends cyclic data to the slave and the slave responds with its status data.
Bit Strobe I/O Connection	The master sends an 8-byte telegram to all field bus participants. Each participant is allocated exactly one bit. As all participants receive the telegram simultaneously, a synchronous response can therefore be made. The response of the individual participants is specific to the application and must be pre-defined in the master. Transfer of bit strobe telegrams is made without confirmation.
Change of State/Cyclic I/O Connection	Both communication participants produce their data independently of each other by the change-of-state or cyclic method. In the case of a change-of-state connection, it is detected whether the application data of the connection have changed. With a cyclic connection, the communication of the current data for the application object is triggered after a pre-set time has elapsed. Change-of-state/Cyclic I/= connections can be made with or without confirmation.

See 🕮 Section 6 "Data transmission" for detailed information.

4 NORD system bus

Communication between the bus interface and frequency inverters from Getriebebau NORD GmbH & Co. KG is carried out via a separate NORD system bus. The NORD system bus is a CAN field bus; communication is via the CANopen protocol.

One or more frequency inverters in the field bus system can be accessed via a bus interface.

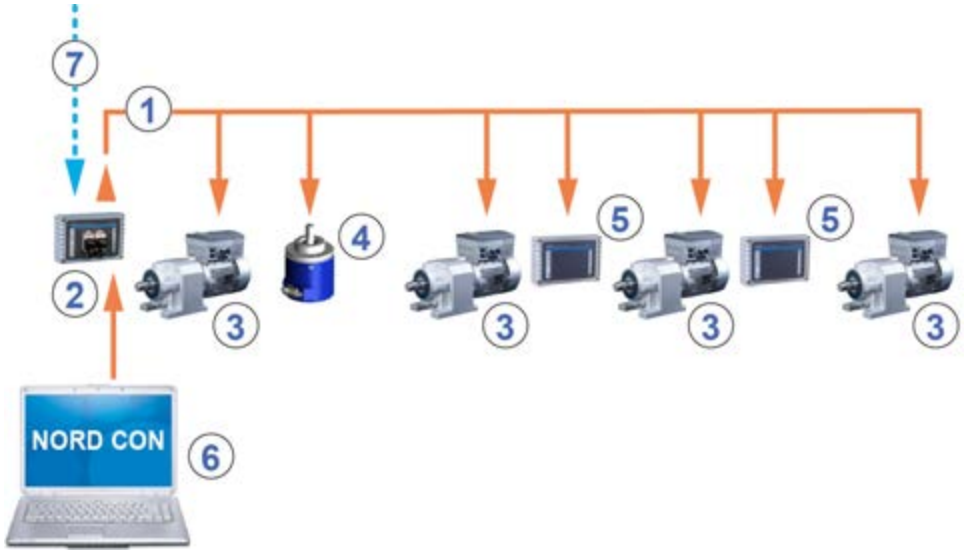

Figure 4: Example of the structure of a NORD system bus

Item	Description
1	NORD system bus (CAN field bus)
2	SK TU4 bus interface
3	Frequency inverter
4	Absolute encoder
5	Input/output extension SK TU4-IOE
6	NORD CON computer (on Windows® based PC, on which the NORD CON parameterisation and control software is installed)
7	Field bus

4.1 NORD system bus participants

Possible number of bus nodes on a system bus:

	Decentralised frequency inverters		Central frequency inverters	
	SK 1x0E	SK 2xxE	SK 500–535E	SK 54xE
Frequency inverter	4	4	1	1
Input/output extensions	8	8	—	8
CANopen encoder	4	4	1	1
Bus interface	1	1	1	1
NORD CON computer	1	1	1	1

All participants on the NORD system bus must be assigned a unique address (CAN ID). The address of the bus interface is pre-set at the factory and cannot be changed. Connected IO extensions must be assigned to the frequency inverters (🕮 Technical Information/Data Sheet of the relevant IO extension). Depending on the device, the addresses of the frequency inverter and the connected absolute encoder can be set via the parameter **P515 CAN address** or via the DIP switches.

If absolute encoders are used, these must be assigned directly to a frequency inverter. This is carried out using the following equation:

Absolute encoder address = CAN ID of the frequency inverter + 1

This results in the following matrix:

Device	FI 1	AG1	FI 2	AG2	…
CAN-ID	32	33	34	35	…

The termination resistor must be activated on the first and last participant in the system bus (🕮 Frequency inverter manual) The bus speed of the frequency inverter must be set to "250 kBaud" (**P514 CAN baud rate**) This also applies to any absolute encoders which are connected.

Information **SK 5xxE series, SK 511E and above**

Setup of a system bus with SK 5xxE series devices is only possible for SK 511E devices and above and is made via their RJ45 sockets. It must be noted that the RJ45 sockets must have a 24 V DC supply in order to enable communication via the system bus (🕮 Frequency inverter manual).

4.2 Access to parameters and control options

Communication by NORD control devices (SimpleBox and ParameterBox) and the NORD CON software with the bus interfaces and the frequency inverters on the NORD system bus is carried out via the USS protocol (🕮 Manual BU 0050)

Information **Access to bus interface parameters**

- Access to bus interface parameters is only possible via the NORD CON software or the ParameterBox, not however via the SimpleBox (SK CSX-3...).
- Access to the parameters of a SK TU4 is possible via the NORD system bus by connection to a frequency inverter or also directly by connection to the RJ12 interface of the SK TU4.
- Access to the parameters of a SK CU4 is only possible via the NORD system bus (CANopen) by connection to a frequency inverter.

4.2.1 Access via the NORD SimpleBox

By connection of the SimpleBox (🕮 Manual BU 0040) to a frequency inverter a **point-to-point USS bus communication** is established. The SimpleBox only communicates with the frequency inverter to which it is connected.

4.2.2 Access via the NORD ParameterBox

Access via the ParameterBox (🕮 Manual BU 0040) can be obtained by several methods:

- Connection of the ParameterBox to a frequency inverter for **point-to-point USS bus communication**. The ParameterBox only communicates with the frequency inverter to which it is connected.
- Connection of the ParameterBox to a frequency inverter for **USS communication** with a maximum of 6 participants (5 devices plus ParameterBox). This requires an installed USS bus:
  - Wired,
  - Termination resistors set,
  - USS bus participants addressed.
- Connection of the ParameterBox to a bus interface or frequency inverter for **system bus communication (CANopen)** with a maximum of 6 participants (5 devices plus ParameterBox).

  This requires an installed system bus:
  - Wired,
  - Termination resistors set,
  - System bus participants addressed, USS addresses set to the factory setting ("0"). If the ParameterBox detects an active system bus, a USS address is automatically assigned to all of the participants which are detected.

  Communication is via the USS protocol. The CANopen interface of the bus interface or the device with which the ParameterBox is connected acts as a gateway.

4.2.3 Access via NORDCON software

Access via the NORDCON software (📖 Manual BU 0000) can be obtained by several methods:

- Connection of the NORDCON computer to a frequency inverter for **point-to-point USS bus communication**. The NORDCON software only communicates with the frequency inverter to which it is connected.
- Connection of the NORDCON computer to a frequency inverter for **USS communication** with a maximum of 32 participants (31 devices plus ParameterBox). This requires an installed USS bus:
  - Wired,
  - Termination resistors set (only for RS485 connection. This is not necessary for an RS232 connection).

Information **USS address**

It is not necessary to set a USS address.

- Connection of the NORDCON computer to a bus interface or frequency inverter for **system bus communication (CANopen)** with a maximum of 32 participants (31 devices plus NORDCON). This requires an installed system bus:
  - Wired,
  - Termination resistors set,
  - System bus participants addressed, USS addresses set to the factory setting ("0"). If the NORDCON software detects an active system bus, a USS address is automatically assigned to all of the participants which are detected.

  Communication is via the USS protocol. The CANopen interface of the bus interface or the device with which the NORDCON software is connected acts as a gateway.

5 Initial setup

The bus interface must be set up in order to commission the field bus system. This consists of the following work:

Type of work	Description 🕮
Connect the bus interface to the frequency inverter	Section 5.1 "Connecting the bus interface"
Configure the control project	Section 5.2 "Integration into the bus master"
Assign the bus address	Section 5.2 "Integration into the bus master"
Make the required parameter settings	Section 7 "Parameters"

An example of the procedure for setting up the field bus system can be found at the end of this section (🕮 Section 5.3 "Example: Commissioning the DeviceNet bus module").

Detailed information about EMC compliant installation can be found in the Technical Information TI 80_0011 under www.nord.com

5.1 Connecting the bus interface

Information — **Bus address via DIP switch**

Before connecting the bus interface, read the information for setting the bus address in the technical information and in this manual (🕮 Section 5.2.4 "DeviceNet field bus address"). If the bus address is set with the DIP switches, this must be carried out before the bus interface is connected, as the DIP switches are no longer accessible after this.

Connection of the bus interface to the frequency inverter and the DeviceNet field bus is described in the corresponding technical information:

Bus interface	Frequency inverters	Documentation
SK TU3-DEV	SK 5xxE series	Technical Information/Data Sheet TI 275900085
SK TU4-DEV	SK 1x0E and SK 2xxE series	Technical Information/Data Sheet TI 275281102
SK TU4-DEV-M12		Technical Information/Data Sheet TI 275281202
SK TU4-DEV-C		Technical Information/Data Sheet TI 275281152
SK TU4-DEV-M12-C		Technical Information/Data Sheet TI 275281252
SK CU4-DEV		Technical Information/Data Sheet TI 275271002
SK CU4-DEV-C		Technical Information/Data Sheet TI 275271502

5.2 Integration into the bus master

The bus master must first be configured for communication with the bus interface (PLC project of the DeviceNet controller). The configuration must be produced with a software system for DeviceNet field bus systems.

5.2.1 Installing the device description file

The bus master needs a device description file so that the bus interface and the frequency inverter can be identified by the bus master during the bus scan.

The current device description file which is necessary for detection of the CANopen bus interface and the frequency inverter can be downloaded from our website www.nord.com, directly under the link

NORDAC_Options.

The file (e.g. "SK2xxEDN.eds") contains a description of the device characteristics of the bus interface, the objects and the parameters of the bus interface and the connected frequency inverters.

File	Bus interface	Frequency inverters
SK500EDN.eds	SK TU3-DEV	SK 5xxE series
SK520EDN.eds		SK 52xE series
SK520EDN_POS.eds		
SK540EDN.eds		SK 54xE series
SK2xxE.eds	SK CU4-DEV and SK TU4-DEV	SK 2xxE series

Information **Number of connected frequency inverters**

As delivered, the device description file is set to a connected frequency inverter (FI1) If several frequency inverters are connected, these must be set in the configuration software after installation of the device description file.

5.2.2 Automatic device detection

In order that the bus interface and the connected frequency inverters can be automatically detected by the bus master in bus scan, the following settings must be made in the configuration software after installation of the device description file:

- Enter the bus interface in the DeviceNet field bus system
- Set the bus address of the bus interface

5.2.3 Data format of process data

For the cyclic transfer of process data for the bus interface and the frequency inverter, the data format must be specified in the configuration project. For detailed information about process data, please refer to 📖 Section 6.3 "Transfer of process data".

5.2.4 DeviceNet field bus address

In order for the bus interface and the connected frequency inverters to be detected by the bus master, the bus address and the baud rate, and if necessary the termination resistor (if the bus interface is the last participant on the bus) must be set on the bus interface.

The setting is made with rotary coding switches or DIP switches, 🕮 Technical Information/Data Sheet.

The address and the baud rate are read out by the bus interface when the bus interface is connected to the power supply ("POWER ON").

The address which is set can be read out with parameter **P180 DeviceNet address** and the set baud rate with parameter **P181 DeviceNet baud rate** (🕮 Section 7.1.4 "DeviceNet information parameters").

5.3 Example: Commissioning the DeviceNet bus module

The following example contains an overview of the necessary steps for commissioning the bus interface in a DeviceNet field bus system. The example does not include any details of application-specific settings (motor data, control parameters, etc.).

Example:
Via a bus interface, 3 frequency inverters are to be independently controlled in positioning operation with a single speed and a single position specification.

Device type	Name	Connected motor	Characteristics
Bus interface SK TU4-DEV	BusBG[1]		
SK 2x5E frequency inverter	FI 1	4-pole/n=1390 rpm/50 Hz	Motor with CANopen absolute encoder AG1
SK 2x5E frequency inverter	FI 2	4-pole/n=1390 rpm/50 Hz	Motor with CANopen absolute encoder AG2
SK 2x5E frequency inverter	FI3[1]	4-pole/n=1390 rpm/50 Hz	Motor with CANopen absolute encoder AG3

[1] The bus interface and frequency inverter FI3 are physically the last participants on the NORD system bus.

Communication	Step		Explanation
NORD system bus	1	**Before connecting the bus interface to the frequency inverter:** Set the termination resistors.	Set DIP switch 1 (of 12) on the bus interface to the "ON" position.
			Set DIP switch S2 on frequency inverter FI3 to the "ON" position.
			All other DIP switches (termination resistors) must be in the "OFF" position.
	2	Set up system bus.	A 24 V supply is required! (🕮 Technical Information for the bus interface)
	3	Set the system bus address of the frequency inverter	Preferably with the DIP switches (🕮 BU 0200):
			FI1 Address "32"
			FI2 Address "34"
			FI3 Address "36"
			AG1 Address "33"
			AG2 Address "35"
			AG3 Address "37"
			The address of the bus interface is pre-set and cannot be changed.
	4	Set the system bus baud rate.	Set "250 kBaud" on FI1 to FI3 as well as on AG1 to AG3.

Communication	Step		Explanation
	5	Set the parameters for system bus communication.	Set the following parameters on each frequency inverter:
			P509 3 (system bus)
			P510, [-01] 0 (Auto)
			P510, [-02] 0 (Auto)
			P543, [-01] 1 (actual frequency)
			P543, [-02] 10 (curr. Pos. Inc. LowWord)
			P543, [-03] 15 (cur. Pos. Inc. HighWord
			P546, [-01] 1 (set point frequency)
			P546, [-02] 23 (setp. Pos. Inc. LowWord)
			P546, [-03] 24 (set. Pos. Inc. HighWord)
DeviceNet field bus	6	Set up the bus interface for field bus communication.	🕮 Sections 5.1 "Connecting the bus interface" to 5.2 "Integration into the bus master"
			Set the following parameters on the bus interface (🕮 Section 7.1.1 "NORD standard parameters"):
			P151 200 ms (Timeout external bus)
NORD system bus	7	Set the parameters for system bus monitoring.	Set the following parameters on each frequency inverter (🕮 BU 0200)
			P120, [-01] 1 (Auto) or 2 (monitoring active immediately)
	8	Check the system bus communication.	Check the display of the following information parameters on all frequency inverters (🕮 BU 0200):
			P748 "System bus status"
			P740, [-01] "Control word"“ (047Eh = "Ready for switch-on"[1])
			P740, [-02] "Setpoint 1"
			P741, [-01] "Status word" (0B31h = "Ready for switch-on")
			P741, [-02] "Actual value 1"
			Check the display of the following bus interface information parameters (🕮 Section 7.1.3 "NORD information parameters"):
			P173 "Module status"
DeviceNet field bus	9	Check the field bus communication.	Check the display of the following bus interface information parameters (🕮 Section 7.1.3 "NORD information parameters"):
			P173 "Module status"
			P740 "Process data Bus In"
			P177 "Process data Bus Out"

[1] On condition that the PLC has already sent the control word. Otherwise "0h" is displayed in the parameter.

6 Data transmission

6.1 Introduction

With the data communication between the frequency inverter (via the bus interface) and the bus master (PLC) process data and parameter data are exchanged.

The process data are communicated after the establishment of an I/O Connection and the parameter data are communicated after establishment of an Explicit Message Connection.

6.1.1 Process data

- Process data are the control word and up to 3 setpoints, as well as the status word and up to 3 actual values. Control words and setpoints are communicated from the bus master to the frequency inverters. Status words and actual values are communicated from the frequency inverters to the bus master.
- Process data are necessary to control the frequency inverter.
- The transfer of process data is carried out cyclically with priority between the bus master and the frequency inverters.
- In the PLC the process data are stored directly in the I/O area.
- Process data are not saved in the frequency inverter.

📖 Section 6.3 "Transfer of process data".

6.1.2 Parameter data

- Parameter data are the setting values and device data for the bus interface and the connected frequency inverter.
- Transfer of the parameter data is carried out cyclically without priority.

6.2 Structure of application data

The cyclic exchange of application data between the bus master and the frequency inverters is carried out via two areas:

- PKW area = **P**arameter **L**abel **V**alue (parameter level)
- PZD area = **P**ro**c**ess**D**ata (process data level)

6.2.1 PKW area

Parameter values can be read and written via the **PKW** area. These are essentially configuration, monitoring and diagnostic tasks.

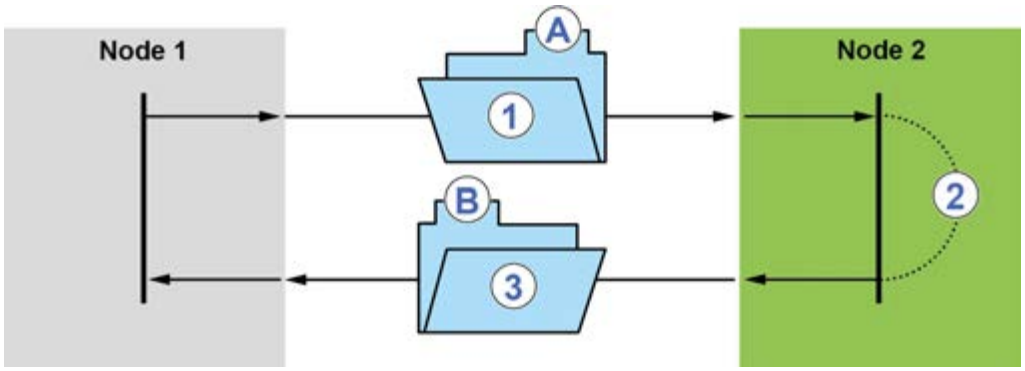

Figure 5: Telegram traffic – PKW area

Item	Meaning
A	Order telegram
1	Parameter order (PKW area)
2	Processing
B	Response telegram
3	Parameter response (PKW area)

An access always consists of an order and a response telegram. In the order telegram, the application data is transferred from the bus master (Node 1) to the field bus participant (Node 2). In the response telegram, the application data is transferred from the field bus participant to the bus master.

Processing of PKW data is carried out with low priority and can take considerably longer than the processing of process data.

6.2.2 PZD area

The frequency inverter is controlled via the **PZD** area. This is done by transfer of the control word, the status word and by setpoint and actual values. Processing of the process data is carried out in the FI with high priority, in order to ensure a rapid response to control commands or a change in status can be transmitted to the bus master without delay. Three different types of connection are used for this:

Polled I/O Connection

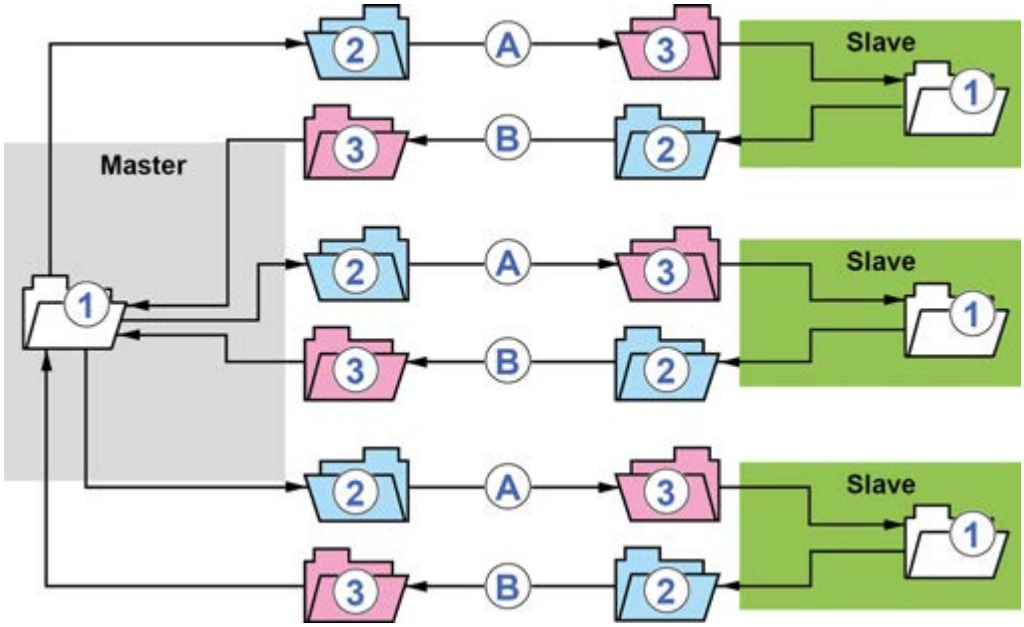

Figure 6: Polled I/O Connection

Item	Meaning
A	Poll Command Message (setpoints)
B	Poll Response Message (actual values)
1	Application object
2	Producer object
3	Consumer object

The Polled I/O Connection is a master-slave connection for the transfer of process data from a producer (transmitter) to one or more consumers (recipient(s)). The bus master sends the control data to the slave cyclically and the slave responds with its status data.

Bit Strobe I/O Connection

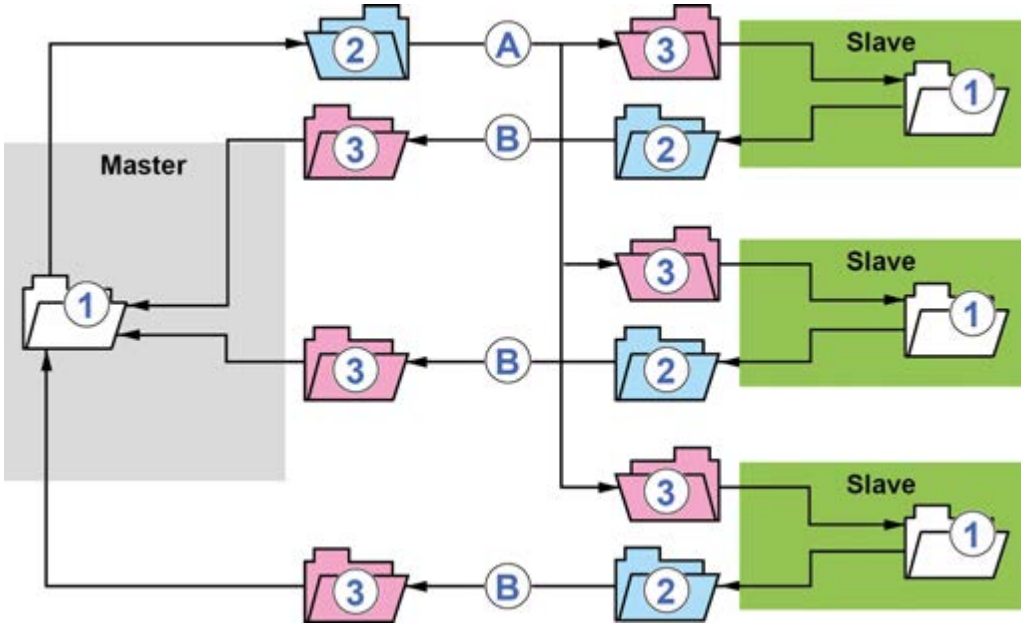

Figure 7: Bit Strobe I/O Connection

Item	Meaning
A	Bit Strobe order telegram
B	Bit Strobe response telegram
1	Application object
2	Producer object
3	Consumer object

With this connection the master transfers a telegram with process data to all slaves (max. 63) which are configured for Bit Strobe I/O Connection. The data telegram consists of 8 bytes, of which each slave is allocated 1 bit (setpoint data).

Information

Getriebebau NORD GmbH & Co. KG DeviceNet bus interfaces only accept the setpoint data (1-bit) which is assigned to them, if their Bit Strobe bit = "0".

As all slaves receive the telegram simultaneously, this connection is used to synchronise the slaves. Each slave can respond with an 8-byte telegram.

Change of State (COS)/Cyclic I/O Connection

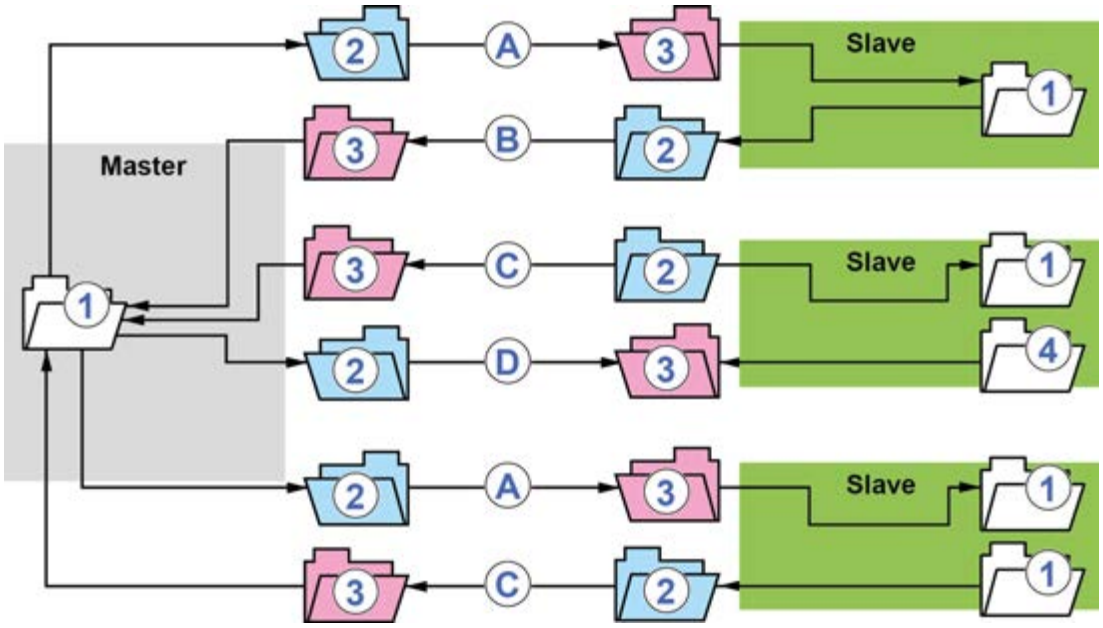

Figure 8: Change of State/Cyclic I/O Connection

Item	Meaning
A	COS/Cyclic order telegram from the master
B	COS/Cyclic response telegram (ACK) from the slave
C	COS/Cyclic order telegram from the slave
D	COS/Cyclic response telegram (ACK) from the master
1	Application object
2	Producer object
3	Consumer object
4	Acknowledge Handler object

With this connection, both the bus master and the slaves may be independent producers. With a change of state I/O connection, the connection detects that the application data which are exchanged have been changed. In a cyclic I/O connection, the current data are only transferred after the elapse of a pre-set time. The data transfer can be made with or without confirmation. With a confirmed transfer, the path for the confirmation from the consumer must be defined.

6.3 Transfer of process data

The control word (STW) and up to 3 setpoints (SW) are transferred from the bus master to the frequency inverter and the status word (ZSW) and up to 3 actual values (IW) are transferred from the frequency inverter to the bus master as process data (PZD).

The transfer of process data is via I/O messages. The transfer can be made cyclically via a polled or cyclic I/O connection or event-controlled via a change of state or bit strobe I/O connection.

The data length and profiles of the process data telegrams are specified via the instances of the "assembly object" of the bus interface (🕮 Section 6.3.1 „Assembly Object“).

Information — **"Bit Strobe I/O Connection" transfer**

With the "Bit Strobe I/O Connection" transfer type, the bus interface may only respond with data telegrams which have a maximum length of 8 bytes. This must be taken into account when setting the DeviceNet standard parameters **P160**…**P165** (🕮 Section 7.1.2 "DeviceNet standard parameters"). In the bit strobe telegram, each MAC ID (bus address) is assigned one bit, which must have the value "0" so that the process data can be forwarded to the connected frequency inverters. With the value "1" the last valid values are adopted.

The process data telegram contains 8 bytes of process data:

Byte 0	**Byte 1**	**Byte 2**	**Byte 3**	**Byte 4**	**Byte 5**	**Byte 6**	**Byte 7**
Low	**High**	**Low Low**	**Low High**	**High Low**	**High High**	**Low**	**High**
Control word		Setpoint 1		Setpoint 2		Setpoint 3	
16-bit		32-bit (e.g. position setpoint)				16-bit (e.g. speed)	

Information — **Little-endian format**

Process data must be transferred in little-endian format (This is a order system for reading bytes into the register and memory, in which the LSB (Least Significant Byte) is in the first place and is saved in the lowest memory address). Example: "047Eh" (ready for switch-on) = "7E04h".

In a fragmented process data telegram, the data for up to 5 devices is sent in the following sequence:

Area 1	**Area 2**	**Area 3**	**Area 4**	**Area 5**
Bus interface	FI 1	FI 2	FI 3	FI 4

If one of the devices is not configured, the next area moves up. E.g. if the bus interface is not accessed, the first bytes are assigned to frequency inverter FI1.

6.3.1 Assembly Object

With the assembly object (Class 4, 🕮 Section 6.5 "Object classes") data from attributes of different instances in different classes are combined to form a single attribute in an instance.

Bus interfaces SK CU4 and SK TU4 – SK 2xxE series frequency inverters

Instance	Profile	Length (Byte)	Meaning	Parameter P160[1]
20	AC Drive	4	Control word + Setpoint 1 (only one frequency inverter[2])	1
70	AC Drive	4	Status word + Actual value 1 (only one frequency inverter[2])	
21	AC Drive	4	Control word + Setpoint 1 (only one frequency inverter[2])	2
71	AC Drive	4	Status word + Actual value 1 (only one frequency inverter[2])	
100	NORD	5	Bus interface outputs + Control word + Setpoint 1 (only one frequency inverter[2])	3
110	NORD	5	Bus interface inputs + Status word + Actual value 1 (only one frequency inverter[2])	
101	NORD	8	Control word + Setpoint 1 + Setpoint 2 + setpoint 3 (only one frequency inverter[2])	4
111	NORD	8	Status word + actual value 1 + actual value 2 + actual value 3 (only one frequency inverter[2])	
102	NORD	33	Bus interface outputs + four frequency inverters[3]	5
112	NORD	33	Bus interface inputs + four frequency inverters[4]	
120	NORD	1…33	Control values[5] (all combinations possible)	—
130	NORD	1…33	Status values[5] (all combinations possible)	—

1 DeviceNet standard parameters **P160** 🕮 Section 7.1.2 "DeviceNet standard parameters"

2 As delivered, the device description file EDS file, 🕮 Section 5.2 "Integration into the bus master") is set for a connected frequency inverter. If several frequency inverters are connected, these must be set in the configuration software after installation of the device description file.

3 Structure for each frequency inverter: Control word + Setpoint 1 + Setpoint 2 + setpoint 3

4 Structure for each frequency inverter: Status word + Actual value 1 + Actual value 2 + Actual value 3

5 Setting via DeviceNet standard parameters **P161**…**P165**, 🕮 Section 7.1.2 "DeviceNet standard parameters".

Bus interface SK TU3 – SK 5xxE series frequency inverters

Instance	Profile	Length (byte)	Meaning	Parameter	
				P551[1]	P507[1]
20	AC Drive	4	Control word + Setpoint speed	1	1
21	AC Drive	4	Control word + Setpoint speed	1	2
70	AC Drive	4	Status word + Actual speed	1	1
71	AC Drive	4	Status word + Actual speed	1	2
100	NORDAC	4	Control word + Setpoint 1	0	1
101	NORDAC	8	Control word + Setpoint 1 + Setpoint 2 + Setpoint 3 (only one frequency inverter[2])	0	2
110	NORDAC	5	Status word + Actual value 1	0	1
111	NORDAC	8	Status word + actual value 1 + actual value 2 + actual value 3 (only one frequency inverter[2])	0	2

1 Additional parameters **P551 Drive profile** and **P507 PPO type** for the frequency inverter, 🕮 BU 0500. Via **P551** the drive profile AC Drive is activated or deactivated; via **P507** the instance of the assembly object is selected or the data length is specified.

2 As delivered, the device description file EDS file, 🕮 Section 5.2 "Integration into the bus master") is set for a connected frequency inverter. If several frequency inverters are connected, these must be set in the configuration software after installation of the device description file.

6.3.1.1 Instances 120 and 130

Via instances 120 and 130 variable data lengths can be created. If the DeviceNet standard parameter **P160 Assembly selection** is set to zero, the structure of the instances can be freely specified by the settings of parameter **P161**…**P165** (🕮 Section 7.1.2 "DeviceNet standard parameters"). The lengths of the transmission and reception data may be different.

Device	Parameter	Index 0 (Array [-01])	Index 1 (Array [-02])	Index 2 ([Array [-03])
Bus interface	**P161**	Input length	Output length	—
Frequency inverter FI1	**P162**	Status data length	Control data length	Drive profile
Frequency inverter FI2	**P163**			
Frequency inverter FI3	**P164**			
Frequency inverter FI4	**P165**			

Parameter	Value range	Setting	Comments
P161, Index 0	0…1	0 = Data length 0 byte 1 = Data length 1 byte 2 = Data length 2 byte 3 = Data length 3 byte 4 = Data length 4 byte 5 = Data length 5 byte 6 = Data length 6 byte 7 = Data length 7 byte 8 = Data length 8 byte	Input length for the bus module:
P162…P165, Index 0	0…8		Length of the status data (ZST | IW1 | IW2 | IW3) from frequency inverter (FU1…FU4). Data length 0 = Frequency inverter not connected
P161, Index 1	0…1		Output length for the bus module:
P162…P165, Index 1	0…8		Length of control data (STW | SW1 | SW2 | SW3) to the frequency inverters (FU1…FU4). Data length 0 = Frequency inverter not connected
P162…P165, Index 2	0…2	0 = AC Drive profile 1 1 = AC Drive profile 2 2 = NORDAC profile	Profile used by the frequency inverter on the DeviceNet bus

Setting example

Parameters	Setting values	Meaning
P161	{ 1, 1 }	Bus interface inputs and outputs
P162	{ 8, 8, 2 }	Control and status word, 3 setpoints and 3 actual values in the NORD device profile for frequency inverter FI1
P163	{ 4, 8, 2 }	Control and status word, 1 setpoint and 3 actual values in the NORD device profile for frequency inverter FI2
P164	{ 4, 4, 0 }	1 setpoint and 1 actual value in AC Drive profile 1 for frequency inverter FI3
P165	{ 0, 0, 0 }	Frequency inverter FI4 is not accessed

6.3.2 AC Drive drive profile

If the AC Drive drive profile is activated, the process data have the following meaning.

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
20	0						Fault reset		RunFwd
	1								
	2	Speed setpoint (Low byte)							
	3	Speed setpoint (High byte)							
21[1]	0		NetRef	NetCtrl			Fault reset	RunRev	RunFwd
	1								
	2	Speed setpoint (Low byte)							
	3	Speed setpoint (High byte)							
70	0						RunFwd		Faulted
	1								
	2	Actual speed (Low byte)							
	3	Actual speed (High byte)							
71[1]	0	At Reference	RefFrom Net	NetCtrl	Ready	RunRev	RunFwd	Warning	Faulted
	1	Drive State (explanation in Class 41 Attribute 6)							
	2	Actual speed (Low byte)							
	3	Actual speed (High byte)							

1 Only for bus interfaces SK CU4-DEV and SK TU4-DEV

Meaning of control and status bits

Bit	Instance	Designation	Level	Meaning
0	**20, 21**	RunFwd	High	The frequency inverter is switched on and the motor accelerates to its setpoint.
			Low	The motor is braked on the set ramp to 0 rpm and the frequency inverter is switched off.
	70, 71	Faulted	High	Fault on the frequency inverter
1	**21**	RunRev	High	The frequency inverter is switched on and the motor accelerates to its setpoint with a negative direction of rotation.
			Low	The motor is braked with a negative direction of rotation on the set ramp to 0 rpm and the frequency inverter is switched off.
	71	Warning	High	Warning on the frequency inverter, see Bit 7 in the status word (📖 Section 6.3.5 "Status word").
2	**20, 21**	Fault reset	High	A High-Low flank resets the fault on the frequency inverter.
			Low	
	71	RunFwd	—	The frequency inverter has a right-hand rotation field.
3	**71**	RunRev	—	The frequency inverter has a left-hand rotation field.

Bit	Instance	Designation	Level	Meaning
4	**71**	Ready	—	The frequency inverter is switched on (motor supplied with voltage).
5	**21**	NetCtrl	High	The control words sent via the DeviceNet field bus are valid. The settings for parameter **P509** and **P510** in the frequency inverter (🕮 BU 0200 or BU 0500) are not affected.
	71	NetCtrl	High	The frequency inverter is controlled via the DeviceNet field bus. The status of "NetCtrl" is mirrored in the control word. Parameters **P509** and **P510** in the frequency inverter (🕮 BU 0200 or BU 0500) are not queried.
6	**21**	NetRef	High	The setpoints sent via the DeviceNet field bus are valid. The settings for parameter **P509** and **P510** in the frequency inverter (🕮 BU 0200 or BU 0500) are not affected.
	71	RefFromNet	High	The setpoint is transferred to the frequency inverter via the DeviceNet field bus. The status of "NetRef" is mirrored in the control word. Parameters **P509** and **P510** in the frequency inverter (🕮 BU 0200 or BU 0500) are not queried.
7	**71**	At Reference	—	The frequency inverter has reached the speed setpoint.

6.3.3 NORDAC device profile

The NORDAC device profile contains objects which specify the data format for the exchange of data between the bus master and Getriebebau NORD GmbH & Co. KG devices.

The following table shows an example of the structure on the basis of instances 100 and 110 (for a complete list of NORDAC objects 🕮 Section 6.5.9 "Class ID 100…181: NORDAC Objects“).

If specified by the instance, the bus interface is always accessed in the first byte. Only the inputs and outputs can be set and read out. After this, the control word or the status word and the setpoints or actual values are always transferred. If several frequency inverters are accessed consecutively, the control or status word of the following frequency inverter is sent after the last setpoint or actual value.

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
100	0							OUT 2[1]	OUT 1[1]
	1	Control word (Low byte)							
	2	Control word (High byte)							
	3	Setpoint 1 (Low byte) → Parameter **P546**							
	4	Setpoint 1 (High byte) → Parameter **P546**							
110	0					IN 4[2]	IN 3[2]	IN2[2]	IN 1[2]
	1	Status word (Low byte)							
	2	Status word (High byte)							
	3	Actual value (Low byte) → Parameter **P543**							
	4	Actual value 1 (High byte) → Parameter **P546**							

1 Here, the bus interface outputs can be set

2 Here, up to four inputs of the bus interface can be read out.

6.3.4 Control word

The control word (STW) is the first word of a process data telegram which is sent from the bus master to the frequency inverter (order telegram) To switch the drive unit to standby, the frequency inverter must be set to "Ready for switch-on" status by transfer of the first control command "047Eh" ("10001111110b").

Bit	Designation	Value	Control command	Priority[1]
0	Ready for operation	0	Reverse with brake ramp, with voltage enabled at f=0 Hz (ready for operation)	**3**
		1	Set the frequency inverter to standby.	**5**
1	Disable voltage	0	Switch off the frequency inverter output voltage (the frequency inverter goes into the status "Switch-on block").	**1**
		1	Cancel "Disable voltage"	—
2	Emergency stop	0	Emergency stop with programmed emergency stop time. At f = 0 Hz voltage enable (the FI goes into "Switch-on block" status	**2**
		1	Cancel operating condition "Emergency stop"	—
3	Enable operation	0	Block voltage: Switch off the frequency inverter output voltage (the frequency inverter goes into the status "Ready for switch-on").	**6**
		1	Enable output voltage Acceleration of the frequency inverter to the present setpoint.	**4**
4	Enable pulses	0	Acceleration encoder is set to zero; at f = 0 Hz no voltage enable (FI remains in "Operation enabled" status).	—
		1	Enable acceleration encoder	
5	Enable ramp	0	Freeze the setpoint currently provided by the acceleration encoder (maintain frequency).	—
		1	Enable setpoint on acceleration encoder	
6	Enable setpoint	0	Set the selected setpoint on the acceleration encoder to 0	—
		1	Activate the selected setpoint on the acceleration encoder.	
7	Acknowledge the error (0→1)	0	With the switch from 0 to 1, inactive errors are acknowledged.	**7**
		1	**Note:** If a digital input has been programmed for the "ack.fault" function, this bit must not permanently be set to 1 via the bus, as otherwise, flank evaluation would be prevented.	
8	Start function 480.11	0		—
		1	Bus bit 8 of the control word is set 🕮 Parameter **P480** in the frequency inverter manual.	
9	Start function 480.12	0		—
		1	Bus bit 9 of the control word is set 🕮 Parameter **P480** in the frequency inverter manual.	
10[2]	Control data valid	0	The transmitted process data are invalid.	—
		1	The bus master transfers valid process data	
11[3]	Rotation right is on	0		—
		1	Switch on rotation right.	
12[3]	Rotation left is on	0		—
		1	Switch on rotation left (priority).	
13	Reserved			
14	Parameter set Bit 0 On	0	<table><tr><th>Bit 15</th><th>Bit 14</th><th>it activates the parameter set</th></tr><tr><td>0</td><td>0</td><td>Parameter set 1</td></tr><tr><td>0</td><td>1</td><td>Parameter set 2</td></tr><tr><td>1</td><td>0</td><td>Parameter set 3</td></tr><tr><td>1</td><td>1</td><td>Parameter set 4</td></tr></table>	—
		1		
15	Parameter set Bit 1 On	0		
		1		

[1] If several control bits are set simultaneously, the priority stated in this column applies.

[2] The telegram is only interpreted as valid by the frequency inverter and the setpoints which are communicated via the field bus are only set if control bit 10 is set to 1.

[3] If Bit 12 = 0, "rotational direction right ON" applies.
If Bit 12 = 1, "rotational direction left ON" applies, irrespective of Bit 11.

6.3.5 Status word

The status word (ZSW) is the first word of a process data telegram which is sent from the frequency inverter to the bus master (response telegram). With the status word, the status of the frequency inverter is reported to the bus master. As the response to the control word command "047Eh" the frequency inverter typically responds with "0B31h" ("101100110001b") and therefore indicates the status "Ready for switch-on".

Bit	Meaning	Value	Status message
0	Ready to start	0	
		1	Initialisation completed, charging relay switched on, output voltage disabled
1	Ready for operation	0	No switch-on command present, or there is a fault, of the command "Disable voltage" or "Emergency stop" is present, or the status is "Switch-on block".
		1	There is a switch-on command and there is no fault. The inverter can be started with the command "Enable operation"
2	Operation enabled	0	
		1	The output voltage is enabled; ramp of the frequency inverter up to the existing setpoint
3	Fault	0	
		1	Drive unit defective and therefore "Not ready for operation". After acknowledgement, the frequency goes into status "Switch-on block".
4	Voltage enabled	0	"Disable voltage" command present.
		1	
5	Emergency stop	0	"Emergency stop" command present.
		1	
6	Starting disabled	0	
		1	With the command "Standby" the frequency goes into status "Ready for switch-on".
7	Warning active	0	
		1	Drive operation continues, no acknowledgement necessary
8	Setpoint reached	0	Actual value does not correspond to the setpoint With use of POSICON: Setpoint position not reached.
		1	Actual value matches the setpoint (setpoint reached) With use of POSICON: setpoint position has been reached
9	Bus control active	0	Control on local device active
		1	The master has been requested to take over control.
10	Start function 481.9	0	
		1	Bus bit 10 of the status word is set 🕮 Parameter **P481** in the frequency inverter manual.
11	Rotation right is on	0	
		1	The frequency inverter output voltage has a right-hand rotation field.
12	Rotation left is on	0	
		1	The frequency inverter output voltage has a left-hand rotation field.
13	Start function 481.10	0	
		1	Bus bit 13 of the status word is set 🕮 Parameter **P481** in the frequency inverter manual.
14	Parameter set Bit 0 ON	0	
		1	
15	Parameter set Bit 1 On	0	
		1	

Bit 15	Bit 14	parameter set, that is active
0	0	Parameter set 1
0	1	Parameter set 2
1	0	Parameter set 3
1	1	Parameter set 4

6.3.6 Frequency inverter status machine

The frequency inverter passes through a status machine. The changes between various states are triggered automatically or by control commands in the process data control word. The present status is returned in the process data status word.

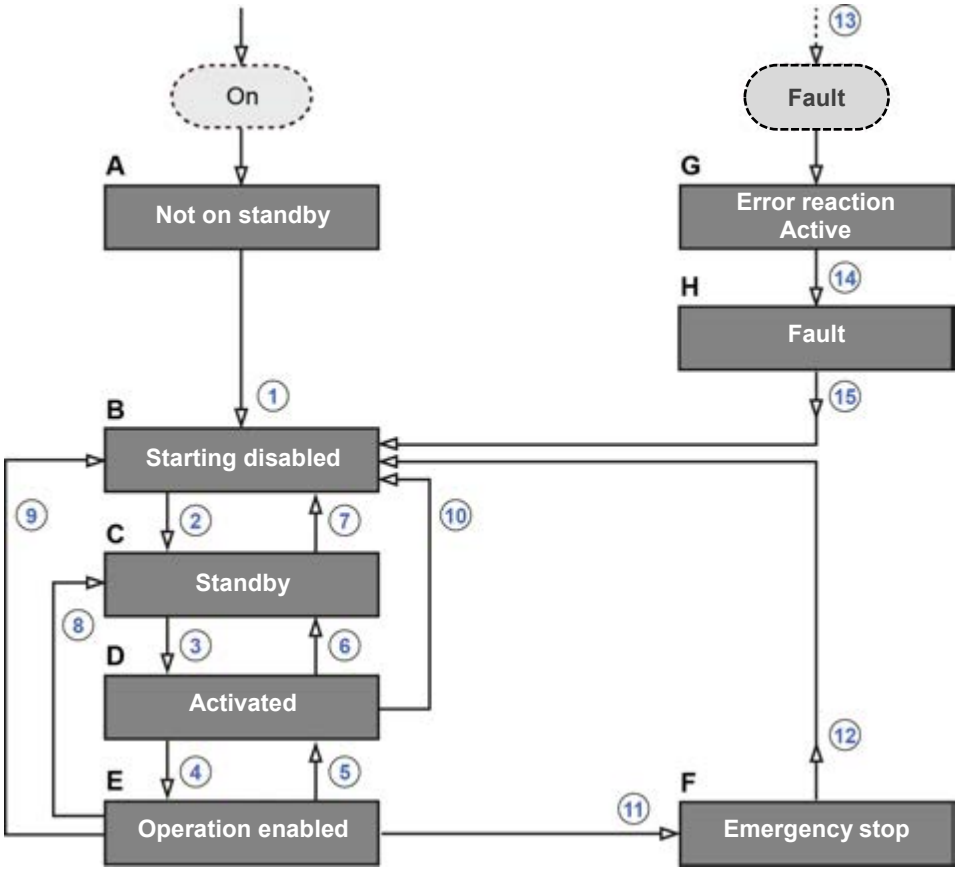

Figure 9: Frequency inverter status machine

Item	Meaning
A…H	Frequency inverter statuses (🕮 Table "Frequency inverter statuses**")**
1…15	Status transitions (🕮 Table "Status transitions**"**)

Frequency inverter statuses

Status		Description
A	Not on standby	Initial state after switching on the frequency inverter. As soon as the loading relay engages, the frequency inverter automatically changes to the status "Switch-on block".
B	Switch-on block	Second status after switching on the frequency inverter, which can only be exited with the control command "Shut-down". The charging relay is switched on.
C	Standby	In this status, initialisation of the frequency inverter is complete. The output voltage is blocked. **Information** During the initialisation process the response to a bus master telegram does not yet contain the response to the control command which has been issued. On the basis of the response from the bus participant, the control system must determine whether the control command has been executed.
D	Activated	Frequency inverter ready for operation.
E	Operation enabled	The frequency inverter receives and processes setpoints.
F	Emergency stop active	Emergency stop function is being executed (the drive is stopped), the frequency inverter changes to the status "Switch-on block".
G	Error reaction active	If an error occurs, the frequency inverter changes to this status and all functions are blocked.
H	Fault	After processing of the response to the fault, the frequency inverter changes to this status, which can only be exited with the control command "Acknowledge fault".

Status transitions

Triggered status transition		Control command	Bit 7…0 of the control word[1]							
			7	6	5	4	3	2	1	0
1	From "Not ready for switch-on" to "Switch on block"	—	—							
	Automatic activation of the charging relay									
2	From "Switch-on block" to "Ready for switch-on"	Shut down	X	X	X	X	X	**1**	**1**	**0**
3	From "Ready for switch-on" to "Switched on"	Switch on	X	X	X	X	X	**1**	**1**	**1**
4	From "Switched on" to "Operation enabled"	Enable operation	X	**1**	**1**	**1**	**1**	**1**	**1**	**1**
	Output voltage is enabled									
5	From "Operation enabled" to "Switched on"	Disable operation	X	X	X	X	**0**	**1**	**1**	**1**
	Output voltage is disabled									
6	From "Switched on" to "Ready for switch-on"	Shut down	X	X	X	X	X	**1**	**1**	**0**
	Voltage enabled at "f = 0 Hz"									
7	From "Ready for switch-on" to "Switch-on block"	Disable voltage	X	X	X	X	X	X	**0**	X
		Quick stop	X	X	X	X	X	**0**	**1**	X
8	From "Operation enabled" to "Ready for switch-on"	Shut down	X	X	X	X	X	**1**	**1**	**0**
9	From "Operation enabled" to "Switch on block"	Disable voltage	X	X	X	X	X	X	**0**	X
10	From "Switched on" to "Switch on block"	Disable voltage	X	X	X	X	X	X	**0**	X
		Quick stop	X	X	X	X	X	**0**	**1**	X
11	From "Operation enabled" to "Emergency stop active"	Quick stop	X	X	X	X	X	**0**	**1**	X
12	From "Emergency stop active" to "Switch on block"	Disable voltage	X	X	X	X	X	X	**0**	X
13	Automatically, after the occurrence of a fault from any status	—	—							
14	Automatically after completion of the response to a fault	—	—							
15	End fault	Acknowledge error	**0**	X	X	X	X	X	X	X
			→							
			1	X	X	X	X	X	X	X

X = The bit status (0 or 1) is not important for achieving the status. Please also note the list of control bits, 📖 Section 6.3.4 "Control word".

[1] Complete list of control bits (Bit 0…15) 📖 Section 6.3.4 "Control word".

Information — **Control bit 10**

Control bit 10 "Control data valid" must always be set to 1. Otherwise the process data will not be evaluated by the frequency inverter.

Decoded frequency inverter statuses

Status	Status bit[1]						
	6	5	4	3	2	1	0
Not ready for switch-on	0	X	X	0	0	0	0
Starting disabled	1	X	X	0	0	0	0
Ready to start	0	1	1	0	0	0	1
Activated	0	1	1	0	0	1	1
Operation enabled	0	1	1	0	1	1	1
Fault	0	X	X	1	0	0	0
Error active	0	X	X	1	1	1	1
Emergency stop active	0	0	1	0	1	1	1

[1] Complete list of status bits (Bit 0…15) 🕮 Section 6.3.5 "Status word".

6.3.7 Setpoints and actual values

Setpoints (from the bus master to the frequency inverter) and actual values (from the frequency inverter to the bus master) are specified via the following parameters of the frequency inverter:

Direction of transmission	Process value	Parameters		
		SK 1x0E, SK 2xxE frequency inverters	SK 500E…SK 535E frequency inverters	SK 54xE frequency inverters
To bus interface	Setpoint 1	**P546, Array [-01]**	**P546**	**P546, Array [-01]**
	Setpoint 2	**P546, Array [-02]**	**P547**	**P546, Array [-02]**
	Setpoint 3	**P546, Array [-03]**	**P548**	**P546, Array [-03]**
	Setpoint 4	—	—	**P546, Array [-04]**
	Setpoint 5	—	—	**P546, Array [-05]**
From bus interface	Actual value 1	**P543, Array [-01]**	**P543**	**P543, Array [-01]**
	Actual value 2	**P543, Array [-02]**	**P544**	**P543, Array [-02]**
	Actual value 3	**P543, Array [-03]**	**P545**	**P543, Array [-03]**
	Actual value 4	—	—	**P543, Array [-04]**
	Actual value 5	—	—	**P543, Array [-05]**

Setpoints and actual values are transmitted by three different methods:

Percentage transmission

The process value is transmitted as an integer with a value range of -32768 to 32767 (8000 hex to 7FFF hex). The value "16384" (4000 hex) corresponds to 100%. The value "-16384" (C000 hex) corresponds to -100%.

For frequencies, the 100% value corresponds to parameter **P105 Maximum frequency** of the frequency inverter. For current, the 100% value corresponds to parameter **P112 Torque current limit** of the frequency inverter.

Frequencies and currents result from the following formulae:

$$Frequency = \frac{Value^{*} \times P105}{16384} \qquad Current = \frac{Value^{*} \times P112}{16384}$$

* 16 Bit- setpoint or actual value which is transferred via the bus.

Binary transmission

Inputs and outputs as well as digital input bits and bus output bits are evaluated bit-wise.

Transmission of positions (SK 1x0E, SK 2xxE and SK 530E and above)

In the frequency inverter, positions have a value range of -50000.00....50000.00 rotations. A rotation of the motor can be subdivided into a maximum of 1000 increments. The subdivision depends on the encoder which is used.

The 32 Bit value range is divided into a "Low" and a "High" word, so that two setpoints or actual values are required for the transmission.

Direction of transmission	**Transmitted data**					
	SK 1x0E, SK 2xxE, SK 5xxE frequency inverters				**Only frequency inverters SK 540E…SK 545E**	
	1st word	**2nd word**	**3rd word**	**4th word**	**5th word**	**6th word**
To bus interface	Control word	32 Bit setpoint		Setpoint 3	Setpoint 4	Setpoint 5
From bus interface	Status word	Actual value 1	32 Bit actual value		Actual value 4	Actual value 5

Only the "Low" word for the position can also be transferred. This results in a limited value range from 32,767 to -32,768 rotations. This value range can be extended with the ratio factor (**Parameter P607 speed ratio** and **P608 Reduction**), however this reduces the resolution accordingly.

6.4 Parameter data transmission

Access to all parameters of the bus interface and the connected frequency inverters is via Explicit Messages. A point-to-point connection is established according to the Client/Server principle for the transmission.

The transfer format for parameter access is the "Requested Message Body Format" is 8/8 (8-bit Class ID / 8-bit Instance ID).

A data telegram for a parameter request contains 8 bytes of parameter data:

Byte offset	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	
0	Frag [0]	XID	MAC ID (bus address)						Message header
1	R/R [0]	Service Code							Message body
2	Class ID								
3	Instance ID								
4	Service data								
5									
6									
7									

In the response telegram to a parameter request the consumer sets the R/R bit (Request/Response) and repeats the service code of the parameter request. Optional response data are entered in the "Service data" field.

Byte offset	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	
0	Frag [0]	XID	MAC ID (bus address)						Message header
1	R/R [1]	Service Code							Message body
2	Class ID								
3	Instance ID								
4	Service data (optional)								
5									
6									
7									

Information **Max. 100,000 permissible writing cycles**

If parameter changes are made (order by the bus master), the maximum number of permissible writing cycles to the frequency inverter EEPROM (100,000 cycles) must not be exceeded. I.e. continuous cyclical writing must be prevented.

For certain applications it is sufficient if the values are only saved in the RAM of the frequency inverter. The corresponding setting is made via parameter **P560 Save in EEPROM**.

If the bus interface parameters are changed, these are only saved in the EEPROM if access was made via the NORD CON software or the ParameterBox.

6.5 Object classes

6.5.1 Class ID 1: Identity Object

The "Identity Object" is used to identify field bus participants within the DeviceNet system.

<table>
<tr><th>Instance</th><th>Attribute</th><th>Name</th><th>Description</th><th>Access</th><th>Type</th></tr>
<tr><td rowspan="8">1</td><td>1</td><td>Vendor ID</td><td>Manufacturer identification number</td><td>RO</td><td>UINT</td></tr>
<tr><td>2</td><td>Device type</td><td>Device type</td><td>RO</td><td>UINT</td></tr>
<tr><td>3</td><td>Product code</td><td>Device identification</td><td>RO</td><td>UINT</td></tr>
<tr><td rowspan="3">4</td><td rowspan="3">Revision</td><td>Software version</td><td>RO</td><td>STRUCT</td></tr>
<tr><td>Number of main version</td><td>RO</td><td>USINT</td></tr>
<tr><td>Number of ancillary version</td><td>RO</td><td>USINT</td></tr>
<tr><td>5</td><td>Status</td><td>Device condition:<table><tr><th>Bit</th><th>Meaning</th></tr><tr><td>0</td><td>Device is accessed via the master</td></tr><tr><td>2</td><td>Configuration is loaded from the frequency inverters</td></tr><tr><td>8</td><td>Error on a connected frequency inverter</td></tr></table></td><td>RO</td><td>UINT</td></tr>
<tr><td>6</td><td>Serial number</td><td>Serial number</td><td>RO</td><td>UDINT</td></tr>
<tr><td>7</td><td>Product Name</td><td>Device name</td><td>RO</td><td>SHORTSTR</td></tr>
</table>

6.5.2 Class ID 3: DeviceNet Object

The DeviceNet object is used to read out bus-specific settings.

<table>
<tr><th>Instance</th><th>Attribute</th><th>Name</th><th>Description</th><th>Access</th><th>Type</th></tr>
<tr><td rowspan="10">1</td><td>1</td><td>MAC ID</td><td>Field bus address of the bus interface</td><td>RO</td><td>USINT</td></tr>
<tr><td>2</td><td>Baud rate</td><td>Bus interface baud rate</td><td>RO</td><td>USINT</td></tr>
<tr><td>3</td><td>BOI</td><td>Behaviour on failure of the bus system:
<table><tr><th>Value</th><th>Meaning</th></tr><tr><td>FALSE</td><td>After a bus failure, the CAN driver remains in this state; the bus interface must be reset.</td></tr><tr><td>TRUE</td><td>After a bus failure, the CAN driver resets automatically.</td></tr></table></td><td>RO</td><td>BOOL</td></tr>
<tr><td>4</td><td>Bus-Off Counter</td><td>Counter for the number of bus failures Can only be written with 0 for a reset.</td><td>RW</td><td>USINT</td></tr>
<tr><td>5</td><td>Allocation Information</td><td>Allocation of active communication
<table><tr><th>Bit</th><th>Meaning</th></tr><tr><td>0</td><td>Explicit Message</td></tr><tr><td>1</td><td>Polled</td></tr><tr><td>2</td><td>Bit Strobe</td></tr><tr><td>3</td><td>Multicast</td></tr><tr><td>4</td><td>Change of State</td></tr><tr><td>5</td><td>Cyclic</td></tr><tr><td>6</td><td>Acknowledge Suppression</td></tr><tr><td>7</td><td>Reserved</td></tr></table></td><td>RO</td><td>STRUCT</td></tr>
<tr><td>6</td><td>MAC ID Switch Changed</td><td>TRUE if the field bus address has been changed since the last reset or switch-on of the bus interface.</td><td>RO</td><td>BOOL</td></tr>
<tr><td>7</td><td>Baud Rate Switch Changed</td><td>TRUE if the baud rate has been changed since the last reset or switch-on of the bus interface.</td><td>RO</td><td>BOOL</td></tr>
<tr><td>8</td><td>MAC ID Switch Value</td><td>Current setting of the field bus address on the DIP switches</td><td>RO</td><td>USINT</td></tr>
<tr><td>9</td><td>Baud Rate Switch Value</td><td>Current setting of the baud rate on the DIP switches</td><td>RO</td><td>USINT</td></tr>
</table>

6.5.3 Class ID 4: Assembly Object

The process data is mapped in the assembly object

Instance	Attribute	Description	Access	Type
20	3	Write AC Drive profile 1 into the frequency inverter	RW	UINT
21[1]	3	Write AC Drive profile 2 into the frequency inverter	RW	UINT
70	3	Read AC Drive profile 1 from the frequency inverter	RO	UINT
71[1]	3	Read AC Drive profile 2 from the frequency inverter	RO	UINT
100	3	Write NORD profile 1 into the frequency inverter	RW	UINT
101	3	Write NORD profile 2 into the frequency inverter	RW	UDINT
102	3	Write NORD profile 3 into the frequency inverter	RW	UDINT
110	3	Read NORD profile 1 from the frequency inverter	RO	UINT
111	3	Read NORD profile 2 from the frequency inverter	RO	UDINT
112	3	Read NORD profile 3 from the frequency inverter	RO	UDINT
120	3	Write variables from the NORD profile into the frequency inverter	RW	UDINT
130	3	Read NORD profile variables from the frequency inverter	RO	UDINT

1 Bus interfaces SK CU4-DEV and SK TU4-DEV only

Information **Instances of the assembly object**

If an I/O message is received, instances 70, 71, 110, 111, 112 and 130 are updated. Sending to instances 20, 70, 100, 101, 102 and 120 should only made if no I/O message is sent, as this overwrites the contents of an Explicit Response Message.

6.5.4 Class ID 5: DeviceNet Connection Object

The DeviceNet Connection shows the present connection:

- Instance 1: Explicit Message Connection
- Instance 2: Polled I/O Connection
- Instance 3: Bit Strobe I/O Connection
- Instance 4: Change of State/Cyclic I/O Connection

Instance	Attribute	Name	Access	Type
1…4	1	State	RO	USINT
	2	Instance Type	RO	USINT
	3	transportClass_trigger	RO	BYTE
	4	produced_connection_id	RO	UINT
	5	consumed_connection_id	RO	UINT
	6	initial_comm_characteristic	RO	BYTE
	7	produced_connection_size	RO	UINT
	8	consumed_connection_size	RO	UINT
	9	expected_packet_rate	RW	UINT
	12	watchdog_timeout_action	RO	USINT
	13	produced_con_path_length	RO	UINT
	14	produced_connection_path	RO	EPATH
	15	consumed_con_path_length	RO	UINT
	16	consumed_connection_path	RO	UINT
	17	produced_inhibit_time	RO	UINT

6.5.5 Class ID 40: Motor Data Object

The motor data object is used to set and read in motor-specific data.

Information — **Validity**

The motor data object is only valid if the AC profile is activated (Parameter **P551** and **P507** of the frequency inverter, 🕮 BU 0500). If the AC profile is deactivated, exchange of data can only be carried out via the NORD system bus.

Instance	Attribute	Name	Description	Access	Type
1…4	3	Motor type	Only type 7 motors (asynchronous motors) are supported	RO	USINT
	6	RatedCurrent	Stator current [0.1 A]	RO	UINT
	7	RatedVoltage	Rated voltage [V]	RW	UINT
	8	RatedPower	Rated motor power [W]	RW	UDINT
	9	RatedFreq	Nominal frequency [Hz]	RW	UINT
	12	PoleCount	Number of poles of motor	RO	UINT

Information — **Instances 1...4**

Instances 1...4 of the motor data object are assigned to the up to four frequency inverters which are connected to the NORD system bus (e.g. frequency inverter FI2 is access via instance 2).

6.5.6 Class ID 41: Control Supervisor Object

The control supervisor object is used to set the controller of the field device and to read out its status.

Information — **Validity**

The control supervisor object is only valid if the AC profile is activated (Parameter **P551** and **P507** of the frequency inverter, 🕮 BU 0500). If the AC profile is deactivated, exchange of data can only be carried out via the NORD system bus.

Instance	Attribute	Name	Description	Access	Type
1…4	3	RunFwd	Setpoint direction of rotation right	RW	BOOL
	4	RunRev	Setpoint direction of rotation left	RW	BOOL
	5	NetCtrl	Control via DeviceNet	RW	BOOL
	6	Drive State	Status of the frequency inverter in the AC Drive profile	RO	USINT
	7	Running Fwd	Actual direction of rotation right	RO	BOOL
	8	Running Rev	Actual direction of rotation left	RO	BOOL
	9	Ready	Ready for switch-on	RO	BOOL
	10	Faulted	Error	RO	BOOL
	11	Warning	Warning	RO	BOOL
	12	Fault reset	Fault acknowledgement	RW	BOOL
	13	Fault Code	Actual error	RO	UINT

Information — **Instances 1...4**

Instances 1...4 of the control supervisor object are assigned to the up to four frequency inverters which are connected to the NORD system bus (e.g. frequency inverter FI2 is access via instance 2).

6.5.7 Class ID 42: AC Drive Object

The AC Drive object is used to set the setpoint source of the field device and to read out the actual value.

Information **Validity**

The control AC Drive object is only valid if the AC profile is activated (Parameter **P551** and **P507** of the frequency inverter, 🕮 BU 0500). If the AC profile is deactivated, exchange of data can only be carried out via the NORD system bus.

Instance	Attribute	Name	Description	Access	Type
1…4	3	At Reference	Actual value corresponds to the setpoint	RO	BOOL
	4	NetRef	Setpoint source	RW	BOOL
	6	DriveMode	Operating mode, can be determined via parameter **P509**	RO	USINT
	7	SpeedActual	Actual speed [rpm]	RO	INT
	8	SpeedRef	Setpoint speed [rpm]	RO	INT
	9	CurrentActual	Actual current in the motor [0.1 A]	RO	INT
	15	PowerActual	Actual power [W]	RO	INT
	16	InputVoltage	Input voltage [V]	RO	INT
	17	OutputVoltage	Output voltage [V]	RO	INT
	18	AccelTime	Acceleration time [ms]	RW	UINT
	19	DecelTime	Deceleration time [ms]	RW	UINT
	20	LowSpdLimit	Minimum speed [rpm]	RW	UINT
	21	HighSpdLimit	Maximum speed [rpm]	RW	UINT
	29	RefFromNet	Setpoint via DeviceNet	RO	BOOL

Information **Instances 1...4**

Instances 1...4 of the AC Drive object are assigned to the up to four frequency inverters which are connected to the NORD system bus (e.g. frequency inverter FI2 is access via instance 2).

6.5.8 Class ID 43: Acknowledge Handler Object

The acknowledge handler object is used to manage the reception of so-called "Message Acknowledgements" (confirmations of receipt).

Instance	Attribute	Name	Description	Access	Type
1	1	Acknowledge Timer	Time before sending the acknowledge signal (1 ms…65535 ms)	RO	UINT
	2	Retry Limit	Number of timeouts before a "RetryLimit_Reached" event is executed	RW	USINT
	3	COS Production Connection Instance	Path of the I/O application object which is informed by the acknowledge handler.	RO	UINT

6.5.9 Class ID 100…181: NORDAC Objects

All of the parameters of the bus interface and the connected frequency inverters can be accessed via the DeviceNet field bus by means of NORDAC objects.

The bus interface and the connected frequency inverters are accessed via the various class areas.

Class	Accessed device	FI offset
100…107	Frequency inverter FI1	0
110…117	Frequency inverter FI2	10
120…127	Frequency inverter FI3	20
130…137	Frequency inverter FI4	30
181	Bus interface	—

Class	Name	Instance	Attribute	Description
100, 110, 120, 130	NORDAC Operation	1…255	0…99	Operating displays
101, 111, 121, 131	NORDAC Basic	1…255	0…99	Basic parameters
102, 112, 122, 132	NORDAC Motor	1…255	0…99	Motor data
103, 113, 123, 133	NORDAC Control	1…255	0…99	Speed control
104, 114, 124, 134	NORDAC Terminal	1…255	0…99	Control terminal settings
105, 115, 125, 135	NORDAC Additional	1…255	0…99	Additional functions
106, 116, 126, 136	NORDAC Positioning	1…255	0…99	Positioning parameters
107, 117, 127, 137	NORDAC Information	1…255	0…99	Information parameter

NORD parameter numbers (referred to below as "Pno.") must be converted into the DeviceNet format as follows:

DeviceNet	Formula	Comments	DeviceNet to Pno:
Class	$\left(\frac{\text{Pno.}}{100}\right) + 100 + \text{FU Offset}$	Integer value	((Class – FI Offset) – 100) x 100 + Attribute
Attribute	Pno. mod 100	Modulo Operation (Division mit Rest)	
Instance	Sub-index + 1		Sub-index = Instance – 1

Calculation example for parameter P745, sub-index 2, frequency inverter FI1:

Class	$\left(\frac{745}{100}\right) + 100 + 0 = 107$
Attribute	$\frac{745}{100} = 7.45 = 45$
Instance	$2 + 1 = 3$

6.5.10 Class ID 199: NORDAC Index Object

All parameters of the frequency inverters connected to the NORD system bus can be accessed via the NORD index object. Access to the bus interface parameters is not possible.

After setting the required parameter number and the sub-index, the parameter can be read out or written via attribute 3 or 4.

Instance	Attribute	Description	Access	Type
1…4	1	Parameter number	RW	UINT
	2	Parameter sub-index	RW	USINT
	3	Read/write 16-bit parameter	RW	INT
	4	Read/write 32-bit parameter	RW	DINT

Information — **Instances 1...4**

Instances 1...4 of the NORDAC index object are assigned to the up to four frequency inverters which are connected to the NORD system bus (e.g. frequency inverter FI2 is access via instance 2).

Information — **Settings in the device description file**

- The device description file (EDS file, 🕮 Section 5.2 "Integration into the bus master") does not contain an entry for attribute 4 (32-bit access) as otherwise there would be simultaneous access to attributes 3 and 4 on starting and an error message (32-bit access to a 16-bit parameter) would be triggered.
- To avoid error messages, the factory setting of attribute 1 in the device description file and the bus interface is "0". Parameter access to parameter number "0" are ignored and always give a positive response, even if the frequency inverter which is accessed is not "online".

6.6 Example of setpoint specification

The following example shows the specification of a setpoint for switching a frequency inverter on and off. The frequency inverter is operated with a setpoint (setpoint frequency) and responds with an actual value (actual frequency). The maximum frequency is set to 50 Hz.

Parameter settings on the frequency inverter:

Parameter No.	Parameter name	Setting value
P105	Maximum frequency	50 Hz
P543	Actual bus value 1	1 (= Actual frequency)
P546	Function bus setpoint 1	1 (= Setpoint frequency)

Example

Order to FI		Response from the FI		Remarks
Control word	**Setpoint 1**	**Status word**	**Actual value 1**	
—	—	0000h	0000h	
—	—	xx40h	0000h	The mains voltage is switched on at the frequency inverter
047Eh	0000h	xx31h	0000h	The frequency inverter switches to "Ready for switch-on" status
047Fh	2000h	xx37h	2000h	The frequency inverter is set to "Operation enabled" status and controlled with a 50 % setpoint.
The frequency inverter is enabled, the motor is supplied with current and rotates with a frequency of 25 Hz.				
0047Eh	2000h	xx31h	0000h	The frequency inverter switches to "Ready for switch-on" status The motor brakes to a standstill according to the parameterised ramp and is disconnected from the power supply.
The frequency inverter is blocked again and the motor is without current.				
047Fh	1000h	xx37h	1000h	The frequency inverter is set to "Operation enabled" status and controlled with a 25% setpoint.
The frequency inverter is enabled, the motor is supplied with current and rotates with a frequency of 12.5 Hz.				

7 Parameters

The bus interface and frequency inverter parameters are communicated as words (16 Bit/Word). Exceptions to this are position values (POSICON), which are communicated as double words (32 Bit).

For field bus operation, several parameters must be set on the bus interface and the frequency inverter.

The parameters can be set with

- An external control or ParameterBox (🕮 Manual BU 0040),
- NORD CON software (🕮 Manual BU 0000) or
- The operator's PLC project.

7.1 Parameter setting on the bus interface

The parameters of the bus interface are divided into NORD-specific standard parameters and NORD-specific field-bus specific information parameters:

Parameter No.	Description
P15x	NORD standard parameter (can be set and saved)
P16x	DeviceNet standard parameter (can be set and saved)
P17x	NORD information parameter (display)
P18x	DeviceNet information parameter (display)

- Bus interface SK TU3-DEV does not have its own parameters. It is set via the parameters of the connected frequency inverter.
- The NORD standard parameters **P151** to **P154** must be set on the bus interfaces SK CU4-DEV and SK TU4-DEV. In addition, depending on the use and configuration, the DeviceNet standard parameters **P160**…**P168** must be set.

A detailed description of the bus interface parameters can be found in the following sections.

7.1.1 NORD standard parameters

The basic settings of the bus interface can be made via NORD standard parameters.

P150	Set relay
Setting range	0…4
Factory setting	{ 0 }
Bus interface	**SK TU4-DEV**
Description	The setting of this parameter determines the switching state of each digital output.

Setting values

Value	Meaning	Comments
0	Via bus	All digital outputs are controlled via the PROFINET. The functions are defined in the frequency inverter (**P480**).
1	Outputs Off	All digital outputs are set to "Low" (0 V)
2	Output 1 On (DO1)	Digital output DO1 is set to "High" (active), digital output DO2 is set to "Low" (0 V).
3	Output 2 On (DO2)	Digital output DO2 is set to "High" (active), digital output DO1 is set to "Low" (0 V).
4	Outputs 1 and 2 ON	All digital outputs are set to "High" (active)

P151	Timeout for external bus
Setting range	0…32767 ms
Factory setting	{ 0 }
Bus interface	**SK CU4-DEV, SK TU4-DEV**
Description	Monitoring function of the bus interface After receipt of a valid telegram, the next telegram must arrive within the set time. Otherwise the bus interface or the connected frequency inverter reports an error (E010/10.3 "Time Out") and switches off. See also parameter **P513 Telegram timeout time** for the frequency inverter.
Setting values	0 = Monitoring Off

P152	Factory setting
Setting range	0…1
Factory setting	{ 0 }
Bus interface	**SK CU4-DEV, SK TU4-DEV**
Description	Reset the present parameter settings of the bus interface to the factory setting.

Setting values

Value	Meaning	Remarks
0	No change	Current parameter settings will not be changed
1	Load factory setting	All bus interface parameters will be reset to the factory setting. The setting of parameter **P152** then automatically changes back to { 0 }.
2	Basic parameters	All basic parameters of the bus interface will be reset to the factory setting. The setting of parameter **P152** then automatically changes back to { 0 }.
3	i-Parameters	The individual safety parameters (P800 … P830) of the bus interface will be reset to the factory setting. The setting of parameter **P152** then automatically changes back to { 0 }.

P153	Min. system bus cycle
Setting range	0…250 ms
Arrays	[-01] = TxSDO Inhibit Time [-02] = TxPDO Inhibit Time
Factory setting	{ [-01] = 10 } { [-02] = 5 }
Bus interface	**SK CU4-DEV, SK TU4-DEV**
Description	Set the pause time for the system bus in order to reduce the bus load.

P154	TB-IO access	
Setting range	0…5	
Arrays	[-01] = Access to inputs [-02] = Access to outputs	
Factory setting	{ [-01] = 0 } { [-02] = 0 }	
Bus interface	**SK CU4-DEV, SK TU4-DEV**	
Description	Assign reading and writing rights of each connected frequency inverter to 2 inputs and 2 outputs of the bus interface. This is carried out via the following frequency inverter parameters:	
	Input 1	Evaluation via **P480 Funct. BusIO In Bits**, Array [-11]
	Input 2	Evaluation via **P480 Funct. BusIO In Bits**, Array [-12]
	Output 1	Evaluation via **P481 Funct. BusIO Out Bits**, Array [-09]
	Output 2	Evaluation via **P481 Funct. BusIO Out Bits**, Array [-10]

Setting values

Value	Meaning	Comments
0	No access	No influence by the frequency inverter.
1	Broadcast (inputs)	All connected frequency inverters read the inputs (Array [-02] = No function).
2	FI 1	Frequency inverter 1 reads and writes to the inputs and outputs.
3	FI 2	Frequency inverter 2 reads and writes to the inputs and outputs.
4	FI 3	Frequency inverter 3 reads and writes to the inputs and outputs.
5	FI 4	Frequency inverter 4 reads and writes to the inputs and outputs.

7.1.2 DeviceNet standard parameters

Field-bus specific settings of the bus interface are made via the DeviceNet standard parameters.

P160	Assembly selection	
Setting range	0…5	
Factory setting	{ 3 }	
Bus interface	**SK CU4-DEV, SK TU4-DEV**	
Description	Specification of the assignment of instances of Class 4 assembly objects for the connected frequency inverters and bus interface.	
Setting values	Value / Meaning: 0 – Instances 120 &130; 1 – Instances 20 &70; 2 – Instances 21 &71; 3 – Instances 100 &110; 4 – Instances 101 &111; 5 – Instances 102 &112	
Note	🕮 Section 6.3 "Transfer of process data" and 🕮 Section 6.5 "Object classes".	

P161	Config PZD BusBG	
Setting range	0…1	
Arrays	[-01] = Input	[-02] = Output
Factory setting	{ [-01] = 0 }	{ [-02] = 0 }
Bus interface	**SK CU4-DEV, SK TU4-DEV**	
Description	Determines the length of process data (status data and control data) for the bus interface	
Setting values	0 = 0 byte (bus interface does not transmit) 1 = 1 byte	
Note	If parameter **P160 Assembly selection** is set to "0" via parameter **P161** the structure of instances 120 and 130 can be freely determined, 🕮 Section 6.3 "Transfer of process data".	

P162	Config PZD FU1	
Setting range	0…8	
Arrays	[-01] = Output	[-02] = Input
	[-03] = Profile	
Factory setting	{ [-01]…[-03] = 0 }	
Bus interface	**SK CU4-DEV, SK TU4-DEV**	
Description	Determines the length of the process data (status data from the frequency inverter and control data to the frequency inverter) for frequency inverter FI1.	

Setting values

Value	Meaning of arrays [-01] and [-02]
0	FI1 not connected
1	1 Byte
2	2 Byte
3	3 Byte
4	4 Byte
5	5 Byte
6	6 Byte
7	7 Byte
8	8 Byte

Value	Meaning of Array [-03]
0	AC drive profile 1
1	AC drive profile 2
2	NORDAC profile

Note	If parameter **P160 Assembly selection** is set to "0" via parameter **P162** the structure of instances 120 and 130 can be freely determined, 🕮 Section 6.3 "Transfer of process data".

P163	Config PZD FI2
Description	Determines the length of the process data (status data from the frequency inverter and control data to the frequency inverter) for frequency inverter FI2. Details: See🕮 parameter **P162**.

P164	Config PZD FI3
Description	Determines the length of the process data (status data from the frequency inverter and control data to the frequency inverter) for frequency inverter FI3. Details: See🕮 parameter **P162**.

P165	Config PZD FI4
Description	Determines the length of the process data (status data from the frequency inverter and control data to the frequency inverter) for frequency inverter FI4. Details: See🕮 parameter **P162**.

P166	DeviceNet baud rate
Setting range	0…3
Factory setting	{ 0 }
Bus interface	**SK CU4-DEV, SK TU4-DEV**
Description	Set the bus address of the bus interface After setting, restart the bus interface (switch the power supply off and on again) so that the parameter setting is read in.
Setting values	Value: 0 – Meaning: The baud rate is set with the positions of the DIP switches Value: 1 – Meaning: 125 kBaud Value: 2 – Meaning: 250 kBaud Value: 3 – Meaning: 500 kBaud
Note	If the DeviceNet baud rate is set via this parameter, DIP switches "2"...."1" of the bus interface (🕮 Technical Information/Data Sheet) must be in the "OFF" position. Otherwise the setting of this parameter will be ignored and the DeviceNet baud rate will be read from the setting of the DIP switches.

P167	DeviceNet address
Setting range	0…63
Factory setting	{ 0 }
Bus interface	**SK CU4-DEV, SK TU4-DEV**
Description	Setting the DeviceNet address (MAC ID) of the bus interface. After setting, restart the bus interface (switch the power supply off and on again) so that the parameter setting is read in.
Setting values	Value: 0 – Meaning: The DeviceNet address is set with the positions of the DIP switches Value: 1…63 – Meaning: DeviceNet address
Note	If the DeviceNet address is set via this parameter, DIP switches "8"...."3" of the bus interface (🕮 Technical Information/Data Sheet) must be in the "OFF" position. Otherwise the setting of this parameter will be ignored and the DeviceNet address will be read from the setting of the DIP switches.

7.1.3 NORD information parameters

NORD information parameters are used to display current and archived error messages, as well as current operating states.

P170	Actual error
Display range	0...9999
Arrays	[-01] = Actual error in bus interface [-02] = Last error in bus interface
Bus interface	**SK CU4-DEV, SK TU4-DEV**
Description	Display of the actual error present. For a list of possible error messages please refer to 🕮 Section 8 "Error monitoring and error messages".
Note	The error message is reset when the supply voltage is switched off.

P171	Software version
Display range	0.0…9999.9
Arrays	[-01] = Software version [-02] = Software revision [-03] = Special version
Bus interface	**SK CU4-DEV, SK TU4-DEV**
Description	Display of the software version and revision number of the bus interface. Array [-03] shows possible special versions (0 = standard version).

P172	Configuration level
Display range	0…
Bus interface	**SK CU4-DEV, SK TU4-DEV**
Description	Display of the bus interface identifier.

Display values

Value	Meaning	
0	CU4 (internal)	Bus interfaceSK CU4-DEV,
1	TU4 (external)	Bus interfaceSK TU4-DEV

P173	Module status
Display range	0…FFFFh
Bus interface	**SK CU4-DEV, SK TU4-DEV**
Description	Displays the operating state of the bus interface.

Display values

Bit	Meaning
0	Initialisation (bus status “Online/Not connected”)
1	Bus status "Online/Connected"
2	Timeout (DeviceNet monitoring or time set in parameter **P151**)
3	Incorrect DIP switch setting
4	DeviceNet "Warning"
5	DeviceNet "Bus Off"
6	System bus "Warning"
7	System bus "Bus OFF"
8	FI1 status
9	
10	FI 2 status
11	
12	FI 3 status
13	
14	FI 4 status
15	

Status for frequency inverter Bit 8…Bit 15:

Bit "High"	Bit "Low"	Meaning
0	0	Frequency inverter "offline"
0	1	Unknown frequency inverter
1	0	Frequency inverter "online"
1	1	Frequency inverter lost or switched off

P174	Digital input status
Display range	0…255 (00000000…11111111b)
Bus interface	**SK CU4-DEV, SK TU4-DEV**
Description	Display of the actual switching status of the digital bus interface inputs.

Display values

Bit	Meaning
0	Input 1 (DIN1) of the bus interface
1	Input 2 (DIN2) of the bus interface
2	Input 3 (DIN3) of the bus interface[1]
3	Input 4 (DIN4) of the bus interface[1]

[1] Only bus interface , SK TU4-DEV

P175	Relay status
Display range	0…3 (00…11b)
Bus interface	**SK TU4-DEV**
Description	Display of the actual switching status of the relay outputs of the bus interface.

Display values

Bit	Meaning
0	Output 1 (DO1) of the bus interface
1	Output 2 (DO2) of the bus interface

P176	Process data Bus In				
Display range	-32768…32767				
Arrays	[-01] =	Bus module outputs			
	[-02] =	Control word	[-03]…[-05] =	Setpoint 1…3	to FI1
	[-06] =	Control word	[-07]…[-09] =	Setpoint 1…3	to FI2
	[-10] =	Control word	[-11]…[-13] =	Setpoint 1…3	to FI3
	[-14] =	Control word	[-15]…[-17] =	Setpoint 1…3	to FI4
Bus interface	**SK CU4-DEV, SK TU4-DEV**				
Description	Display of data received from the DeviceNet-Busmaster.				

P177	Process data Bus Out				
Display range	-32768…32767				
Arrays	[-01] =	Bus module inputs			
	[-02] =	Status word	[-03]…[-05] =	Actual value 1…3	from FI1
	[-06] =	Status word	[-07]…[-09] =	Actual value 1…3	from FI2
	[-10] =	Status word	[-11]…[-13] =	Actual value 1…3	from FI3
	[-14] =	Status word	[-15]…[-17] =	Actual value 1…3	from FI4
Bus interface	**SK CU4-DEV, SK TU4-DEV**				
Description	Display of the data sent from the bus interface to the DeviceNet-Busmaster.				

7.1.4 DeviceNet information parameters

DeviceNet information parameters are used to display statuses and settings which are specific to the field bus.

P180	DeviceNet address
Display range	1…63
Bus interface	**SK CU4-DEV, SK TU4-DEV**
Description	Display of the currently set bus bus address (MAC ID) of the bus interface.

P181	DeviceNet baud rate
Display range	0…2
Bus interface	**SK CU4-DEV, SK TU4-DEV**
Description	Display of the currently set baud rate (🕮 Technical Information/Data Sheet).
Display values	

Value	Meaning
0	125 kBaud
1	250 kBaud
2	500 kBaud

7.2 Parameter settings on the frequency inverter

After connection and addressing of the bus interface, the additional parameters of the frequency inverter must be set as listed below. The additional parameters of the frequency inverter are used to set the bus interface, the pulse frequency and acknowledgement of errors.

A detailed description of the parameters can be found in the relevant manual for the frequency inverter.

Additional parameters

The following table contains a list of additional parameters which are relevant for the bus interface.

No.	Parameter name	Recommended setting			Comments
		SK CU4/SK TU4	SK TU3		
		SK 1x0E, SK 2xxE	SK 500E–SK 535E	SK 54xE	
P507	PPO Type	—	"2" = AC profile 2	"2" = AC profile 2	If **P551** is set to "1"
P509	Source Control Word	"3" = System bus	"7" = DeviceNet	"7" = DeviceNet	SK 511E frequency inverters and above: Communication with the bus interface via the system bus is possible with setting "6" = CANopen.
P510	Setpoint source	"0" = Auto	"0" = Auto	"0" = Auto	If **P509** is set to "3", "6" or "7"
P513	Telegram timeout	—	○[1]	○[1]	
P514	CAN bus baud rate	"5" = 250 kBaud	"5" = 250 kBaud	"5" = 250 kBaud	
P515	CAN address (Array [-01])	32, 34, 36 or 38	32, 34, 36 or 38*	32, 34, 36 or 38*	System bus address
P543	Actual bus value Arrays [-01]…[-03]	○[2]	○[2]	○[2]	Refer to the relevant frequency inverter operating manual
	Actual bus value Arrays [-04]…[-05]	—	—	○[2]	
P543	Actual bus value 1	—	○[2]	—	
P544	Actual bus value 2	—	○[2]	—	
P545	Actual bus value 3	—	○[2]	—	
P546	Function Bus setpoint Arrays [-01]…[-03]	○[2]	—	○[2]	Refer to the relevant frequency inverter operating manual
	Function Bus setpoint Arrays [-04]…[-05]	—	—	○[2]	
P546	Function Bus setpoint 1	—	○[2]	—	
P547	Function Bus setpoint 2	—	○[2]	—	
P548	Function Bus setpoint 3	—	○[2]	—	
P551	Drive profile	—	"1" = On	"1" = On	

* Only necessary if **P509** is set to "6" (= CANopen), i.e. for communication with a bus interface via system bus.

○[1] Depending on the application: Change the settings according to the requirements of the application.

○[2] Depending on the function: Setting according to the required function(s) is necessary.

Information parameters

Information parameters are used to display current and archived error messages, as well as current operating states and settings.

The following table contains a list of information parameters which are relevant for the bus interface.

<table>
<tr><th>No.</th><th>Parameter name</th><th>SK TU3</th><th>SK CU4</th><th>SK TU4</th></tr>
<tr><td rowspan="3">P700</td><td>Current error</td><td colspan="3">Array [-01]</td></tr>
<tr><td>Current warning</td><td colspan="3">Array [-02]</td></tr>
<tr><td>Reason for switch-on block</td><td colspan="3">Array [-03]</td></tr>
<tr><td>P701</td><td>Last fault</td><td colspan="3"></td></tr>
<tr><td>P740</td><td>Process data Bus In</td><td colspan="3">No display if P509 is set to "0"</td></tr>
<tr><td>P741</td><td>Process data Bus Out</td><td colspan="3"></td></tr>
<tr><td>P744</td><td>Configuration</td><td colspan="3"></td></tr>
<tr><td>P745</td><td>Module version</td><td colspan="2"></td><td>—</td></tr>
<tr><td>P746</td><td>Module status</td><td colspan="2">Possible values:<table><tr><th>Bit</th><th>Meaning</th></tr><tr><td>0</td><td>Bus interface ready</td></tr><tr><td>1</td><td>Bus interface in status “Operational”</td></tr><tr><td>2</td><td>Initialisation active</td></tr><tr><td>3</td><td>Reserved</td></tr><tr><td>4</td><td>Bus interface error</td></tr><tr><td>5</td><td>Timeout error</td></tr><tr><td>6</td><td>Initialisation error</td></tr><tr><td>7</td><td>Reserved</td></tr><tr><td>8…15</td><td>Bus interface ID (Device Net = 0Eh)</td></tr></table></td><td>—</td></tr>
<tr><td>P748</td><td>CANopen status</td><td colspan="3">Displays the system bus status</td></tr>
</table>

8 Error monitoring and error messages

Bus interfaces and frequency inverters are equipped with monitoring functions and generate error messages in case of deviations from the normal operating state.

8.1 Bus operation monitoring function

Independent of the specific bus watchdogs, comprehensive monitoring functions are integrated into Getriebebau NORD GmbH & Co. KG frequency inverters and bus interfaces. With the aid of this "Timeout" monitoring, communication problems are detected, which are either related to general functionalities ("No bus communication") or are related to special modules ("Failure of a participant").

Monitoring of communication at the field bus level is primarily carried out via the bus interface. Field bus communication faults are registered in the bus interface. If an error at field bus level causes an error in the frequency inverter, the frequency inverter also displays a corresponding error. The frequency inverter itself does not monitor communication on the field bus level.

Monitoring of communication on the NORD system bus level (between the frequency inverter and the bus interface) is carried out by the frequency inverter. An error in the system bus communication is registered in both the bus interface and the frequency inverter and results in specific error messages.

Function	**Parameter**					
	Bus interface	**SK CU4 and SK TU4 via NORD system bus**			**SK TU3[1]**	**SK TU3 via CANopen/NORD system bus[2]**	
	Frequency inverters	**SK 1x0E SK 2xxE**	**SK 511E … SK 535E**	**SK 54xE[3]**	**SK 5xxE**	**SK 511E … SK 535E**	**SK 54xE**
Field bus timeout		**P151**	**P151**	**P151**	**P513**	**P513**	**P513**
Optional monitoring (system bus timeout)		**P120**	**P513**	**P120**	**—[4]**	**P513**	**P120**
Bus interface error display		**P170 (P700)**	**P170 (P700)**	**P170 (P700)**	**P170[2] P700**	**P170 P700**	**P170 P700**
Error display for frequency inverter and communication errors between the frequency inverter and the bus interface.		**P700**	**P700**	**P700**	**P700**	**P700**	**P700**

1) Only for communication between the SK TU3 bus interface and the frequency inverter on which which the bus interface is mounted.
2) Only for Ethernet-based bus interfaces
3) Connection for CANopen (Parameter **P509**)
4) Monitoring is automatic and cannot be set.

Information — **Parameter P513**

The setting ("-0.1" = No error) of parameter **P513 Telegram timeout time** ensures that the frequency inverter ignores all communication errors on both the field bus and the system bus level. The frequency inverter maintains its operating status.

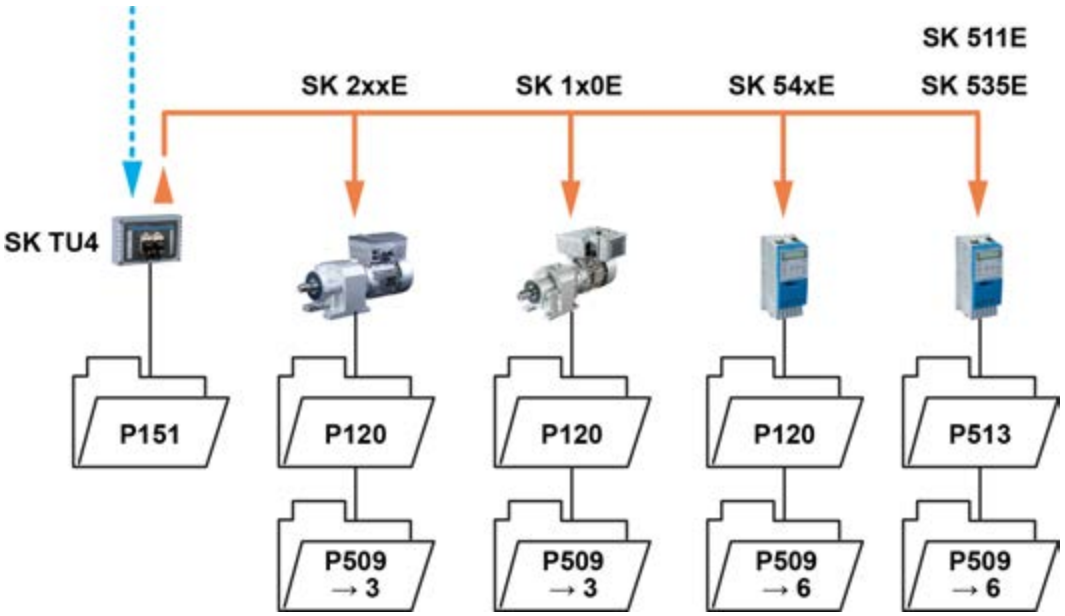

Figure 10: Examples of monitoring parameter settings – SK TU4 bus interface

Setting values for parameter **P509 Control word source**:

3 = System bus

6 = CANopen

8.2 Resetting error messages

There are several methods for resetting (acknowledging) an error message.

On the frequency inverter:

- Switch the mains voltage off and on again, or
- Actuate the programmed digital input with parameter **P420 Digital inputs** (Setting 12 = Acknowledge error), or
- Switch off "Enable" on the frequency inverter (if no digital input is parameterised to the function "Acknowledge errors"), or
- By carrying out a bus acknowledgement, or
- Automatic error acknowledgement by activating parameter **P506 Auto. error acknowledgement**.

On the bus interface

The error message (via information parameter **P170**, [-01]) is automatically reset if the error is no longer active. Otherwise:

- Switch the voltage supply to the bus interface off and on again, or
- Acknowledge the error via the field bus.

Information

Archiving error messages

An error message (display via parameter **P170**) is only displayed as long as it is active. After the error has been remedied, the message is deleted and is archived as the last error message in parameter **P170**, Array [-02]. If the mains supply is interrupted before the error is remedied, the message is lost, i.e. it is not archived.

Information

Error display in the SimpleBox

An error message is displayed in the operating display of the SimpleBox SK CSX-3H by display of the error group number "E1000". The bus interface parameter **P170**, Array [-01] must be selected to determine the actual error.

8.3 Error messages

Error messages from the bus interface can be read out via parameter **P170** of the bus interface (Array [-01] = Actual error, Array [-02] = Previous error).

Error	Meaning	Comments
100.0	EEPROM error	EMC fault, bus interface defective
101.0	System bus 24 V missing	No 24 V voltage on bus, connections not correct
102.0	Bus timeout P151	By means of timeout supervision parameter **P151/P513**
103.0	System bus Off	No 24 V voltage on bus, connections not correct
511.0	CANopen bus OFF	Bus subscriber not connected to bus
511.1	CANopen warning	Bus error
511.2	CANopen overrun	Message buffer of bus interface overwritten with new telegram before processing
511.3	CANopen address error	Incorrect/duplicated bus address
512.0	CANopen timeout	Telegram transfer error

Error messages which occur in relation to the bus interface are depicted as follows in the error memory of the frequency inverter (Parameter **P700** and **P701**).

Error (E010)	Meaning	Comments
10.2	External bus interface telegram timeout	• Telegram transfer error. – Check the connections and links and the program sequence in the Bus Master.
10.3	Timeout by **P151**/**P513**	• Telegram transfer error. – Check watchdog time (**P151**). – Check the connections and links and the program sequence in the Bus Master. • The enable bit is missing in the control word.
10.4	External bus interface initialisation error	• Unable to communicate with the bus interface. – Check parameter **P746** setting. – Check the bus interface power supply. – Check the connections and links.
10.8	External bus interface communication error	*Only SK TU3-CAO bus interface:* • Connection between bus interface and frequency inverter interrupted.
10.9	Missing bus interface	*Bus interfaces SK CU4-DEV and SK TU4-DEV only:* • Connection between bus interface and frequency inverter interrupted (see setting of parameter **P120**).

9 Appendix

9.1 Repair information

In order to keep repair times as short as possible, please state the reasons for the return of the device and at least one contact partner in case of queries.

In case of repairs, please send the device to the following address:

NORD Electronic DRIVESYSTEMS GmbH

Tjüchkampstraße 37

26606 Aurich, Germany

Information **Third party accessories**

Before returning a bus interface and/or a frequency inverter, please remove any external accessories such as mains cables, potentiometers, external displays, etc., which were not supplied by Getriebebau NORD GmbH & Co. KG No liability can be accepted by Getriebebau NORD GmbH & Co. KG for devices which are returned with third party accessories.

Information **Accompanying document**

Please use the filled-in accompanying document for returns, You can find this on our homepage www.nord.com or directly under the link Warenbegleitschein.

For queries about repairs, please contact:

Getriebebau NORD GmbH & Co. KG

Tel.: +49 (0) 45 32 / 289-2515

Fax: +49 (0) 45 32 / 289-2555

9.2 Service and commissioning information

In case of problems, e.g. during commissioning, please contact our Service department:

☎ +49 4532 289-2125

Our Service department is available 24/7 and can help you best if you have the following information about the device and its accessories to hand:

- Type designation,
- Serial number,
- Firmware version

9.3 Documents and software

Documents and software can be downloaded from our website www.nord.com .

Other applicable documents and further information

Documentation	Contents
TI 275271002	Technical Information/Data Sheet for bus interface **SK CU4-DEV** (for IP55 devices)
TI 275271502	Technical Information/Data Sheet for bus interface SK CU4-DEV-C (for IP66 devices)
TI 275281102	Technical Information/Data Sheet for bus interface **SK TU4-DEV** (for IP55 devices)
TI 275281152	Technical Information/Data Sheet for bus interface **SK TU4-DEV-C** (for IP66 devices)
TI 275281202	Technical Information/Data Sheet for bus interface **SK TU4-DEV-M12** (for IP55 devices with M12 round plug connectors)
TI 275281252	Technical Information/Data Sheet for bus interface **SK TU4-DEV-M12-** (for IP66 devices with M12 round plug connectors)
TI 275900085	Technical Information/Data Sheet for bus interface **SK TU3-**DEV (for IP20 devices)
BU 0180	Manual for **SK 1x0E** frequency inverters
BU 0200	Manual for **SK 2xxE** frequency inverters
BU 0250	Manual for **SK 2xxE-FDS** frequency inverters
BU 0500	Manual for frequency inverters **SK 500E to SK 535E**
BU 0505	Manual for **SK 54xE** frequency inverters
BU 0000	Manual for use of NORD CON software
BU 0040	Manual for use of NORD parameterisation units

Software

Software	Description
EDS file	Device description file for DeviceNet configuration software
NORDCON	Parametrisation and diagnostic software

Key word index

NORD DRIVESYSTEMS Group

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