INTELLIGENT DRIVESYSTEMS, WORLDWIDE SERVICES

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NORDAC *LINK* (SK 270E-FDS ... SK 280E-FDS)

Supplementary manual for AS-Interface CTT2

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1 Introduction

1.1 General

1.1.1 Documentation

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Series: **AS-i CTT2 protocol for frequency inverter series**

NORDAC *LINK*   (SK 270E-FDS and SK 280E-FDS)

1.1.2 Document history

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1.1.3 Copyright notice

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1.1.4 About this manual

This manual is intended to assist you with the use of extended data transmission for NORDAC *LINK* SK 270E-FDS und SK 280E-FDS series from the NORD DRIVESYSTEMS Group within an AS-i 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 for field distributors from the NORD DRIVESYSTEMS Group. It does not contain any descriptions of the controllers and the necessary software for other manufacturers.

1.2 Other applicable documents

This manual is only valid in combination with the operating instructions for the relevant frequency inverter. Only these documents contain all of the information that is required for safe commissioning of the integrated AS-i bus interface in a field bus system. A list of the documents can be found in & Section 7.3 "Documents and software".

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	1. 2nd	Instructions for actions whose sequence must be complied with are numbered sequentially.
Bullet points	•	Bullet points are marked with a dot.
Parameter	**P746**	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	📖 Chapter 📖 Section	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 270E-FDS	Series SK 250E-FDS frequency inverter as field distributor with integrated AS-i interface
SK 280EFDS	Series SK 250E-FDS frequency inverter as field distributor with integrated AS-i interface and STO

1.3.4   List of abbreviations

Abbreviations used in this manual

Abbreviation	Meaning
AK	Order label/response label
CTT2	Combined Transaction Type 2
DIN	Digital input
DO	Digital output
FDS	Frequency inverter as field distributor
IND	Index
I/O	Input, Output
IW	Actual value
PKE	Parameter label
PLC	Programmable Logic Control
PKW	Parameter label value
PNU	Parameter number
PWE	Parameter value
PZD	Process data
PLC	Programmable Logical Controller
STW	Control word
SW	Setpoint
USS	Universal serial interface
ZSW	Status word

2   Safety

2.1   Intended use

The AS-Interface of the NORD DRIVESYSTEMS Group is a functional extension and can only be used in the following device versions.

Model series	Device versions
NORDAC *LINK*	SK 270E-FDS
	SK 280E-FDS

The integrated AS-i interface from the NORD DRIVESYSTEMS Group is used for communication by this devices with a PLC in an operator's AS interface field bus system. It cannot be used independently of this. Therefore the specific safety information for the particular frequency inverter applies in full. This can be obtained from the relevant manual (Section 7.3 "Documents and software").

The function extension with the CTT2 protocol is essentially used as a solution for complex drive tasks with extended functionality, which are implemented with frequency inverters with an integrated AS-i interface from NORD.

Any other use beyond this description is deemed to be incorrect use.

2.2   Selection and qualification of personnel

The function extension may only be installed and commissioned by qualified electricians. They must have the necessary knowledge of the interface function and the electronic drive technology which is used, as well as the configuration aids (e.g. NORD CON software) and the peripherals associated with the drive output (including the control unit).

In addition, the qualified electricians must also be familiar with the installation, commissioning and operation of sensors and electronic drive technology, 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 7.3 "Documents and software".

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   AS interface - Fundamentals

3.1   Characteristics

The following only describes serial communication of application traffic via the CTT2 protocol. Parameterisation of the Bus IO bits is carried out as for all NORDAC frequency inverters.

Basic information about the AS interface of the NORDAC *LINK* frequency inverter can be found in the manual of the device (📖 Section 7.3 "Documents and software").

3.2   General information about AS-i interfaces

The integrated AS interface for frequency inverter enables bidirectional communication of application data. The frequency inverter contains an AS interface double-slave, i.e. two different AS interface device profiles with extended addressing mode are existing. The AS interface of the frequency inverter always occupies two addresses in the AS-i network of the AS-i bus master.

The 1st slave has the AS interface device profile S-7.A.7.7 and therefore provides 4 BusIO bits for communication with an AS-i bus master. The 2nd slave has the device profile S-7.A.*.5 and therefore offers 1 further BusIO In bit and 2 further BusIO Out bits (from the point of view of the field distributor).

The 2nd slave also provides an additional serial communication channel for the acyclic transmission of application data for process data (PZD) and parameter orders (PKW).

The CTT2 protocol is used for this type of serial communication.

A M4 AS interface master is required for both device profiles.

ⓘ **Information**	**Device profiles**

A detailed description of the device profiles can be found in the document published by the **AS-International Association**.
Complete AS-Interface Specification (Version 3.0, Revision 5, 11. December 2013)

In general, the serial interface is suitable for applications in which non time-critical process data and parameter data orders are carried out. For one-off parameter initialisation, reading of information parameters (P7xx) for diagnosis and variable, non time-critical changes to setpoints (SW) the CTT2 protocol is a useful alternative to a higher level field bus system, especially if this can enable a reduction of the number of field bus systems.

However, time-critical control functions should be implemented via the BusIO bits of the AS interface, as due to the system, relatively long transmission times may result with the CTT2 protocol (for further details see 📖 Section 4.4 "Transmission times"). In the case of acyclic data exchange, the AS-i bus master must first send a message (order telegram) to the 2nd slave. This   slave responds to the message with a corresponding response (response telegram).

A differentiation is made between the following 4 message types:

*   **Standard Read order**

    Reading out information according to the AS-Interface specification from the frequency inverter.

*   **NORD-specific Read order**

    Reading out process data (PZD) and parameter data (PKW) from the frequency inverter.

*   **NORD-specific Write order**

    Write process data (PZD) and parameter data (PKW) into the frequency inverter.

- **NORD-specific Write/Read order**

   Reading out process data (PZD) and parameter data (PKW) from the frequency inverter and write process data (PZD) and parameter data (PKW) into the frequency inverter with a single command.

3.3   Extended data transmission by double slave

Two addresses are assigned to the double slave of the frequency inverter, i.e. one address from the extended address range for the 1st slave and one for the 2nd slave. This allows the cyclic data exchange of a total of 5I and 6O bits (from the perspective of the frequency converter).

The 2nd slave provides the additional option of acyclic data communication according to the CTT2 protocol. This also enables reading and writing of process- and parameter data.

For this, the AS-i bus master transmits its USS telegram to the 2nd slave of the frequency inverter via the CTT2 protocol. This processes the protocol and sends this to the processor of the frequency inverter as a USS telegram. The response is in the reverse order.

A maximum of 31 double slaves may be present in a network. A mixture of standard slaves and slaves in extended addressing mode within a network is also permissible.

4 Data transmission

4.1 Introduction

For data transmission between the frequency inverter and the AS-i bus master, process data and parameter data are exchanged.

The process and parameter data are only transmitted via the CTT2 telegram and by the selection of the relevant message type.

4.1.1 Process data

Process data (PZD) are the control word and up to 3 setpoints (SW), as well as the status word (ZSW) and up to 3 actual values (IW). Control words and setpoints are transmitted from the AS-i bus master to the frequency inverter. Status words and actual values are transmitted from the frequency inverter to the AS-i bus master.

- Process data are necessary to control the frequency inverter.
- Transmission of process data is carried out between the AS-i bus master and the AS interface of the frequency inverter.
- Process data are not saved in the frequency inverter.
- The length and structure of process data which are transmitted in both directions are determined by channels.

4.1.2 Parameter data

- • Parameter data are the setting values and device data for the connected frequency inverter.
- • The parameter data is exclusively transferred via the second slave.
- • The parameter data is transferred acyclically and in parallel with the cyclic IO data exchange (BusIO bits).

Parameter processing can be carried out via the PKW channel (Section 4.3 "Message types"). A NORD-specific message type must be used here.

ⓘ **Information**   **Max. 100,000 permissible write cycles**

If parameter changes are made (request by the AS-i bus master via the PKW channel), the maximum number of permissible write cycles to the frequency inverter's EEPROM (100,000 cycles) must not be exceeded. That means, continuous acyclic writing must be prevented.

For certain applications it is sufficient if the values are only stored in the frequency inverter's RAM. The respective setting can be made via the parameter **P560 Save on EEPRom**.

4.2 Structure of application data

The acyclic exchange of application data between the AS-i bus master and the AS interface of the frequency inverter is carried out via two areas:

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

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

The frequency inverter is controlled via the PZD area. This is done by transmission of the control word (STW), the status word (ZSW) and by setpoint (SW) and actual values (IW).

An access always consists of an order and a response telegram. Order data are transmitted from the AS-I bus master to the 2nd slave in the order telegram. In the response telegram, the application data from the 2nd slave is transmitted to the AS-i bus master.
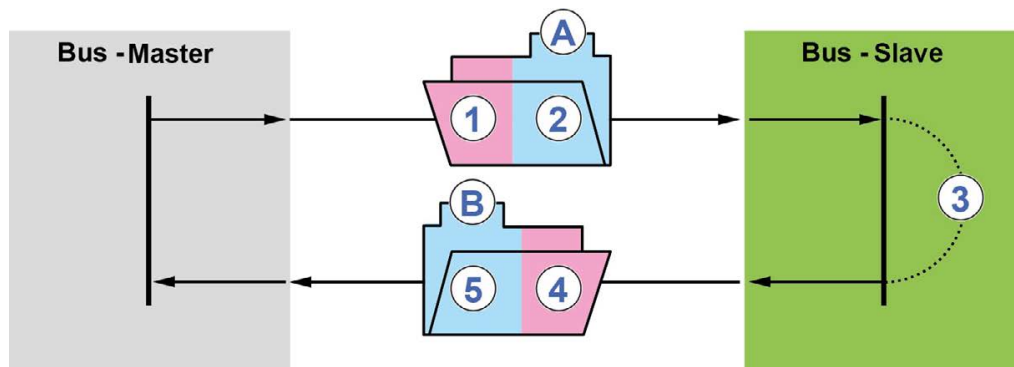

Figure 1: Structure of the application data area – Telegram traffic

Item	Meaning
A	Order telegram
1	Control word and setpoints (PZD area)
2	Parameter order (PKW area)
3	Processing
B	Response telegram
4	Status word and actual values (PZD area)
5	Parameter response (PKW area)

Processing of the process data is carried out in the frequency inverter with high priority, in order to ensure that a rapid response to control commands or a change in status can be transmitted to the AS-i bus master without delay.

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

The process and parameter data traffic is therefore carried out via the three NORD-specific message types which are defined in the CTT2 protocol, with which both process data (PZD) as well as parameter data (PKW) are acyclically transmitted from the AS-i bus master to the 2nd slave (read orders and / or write orders).

CTT2 Structure - telegram Structure

In principle, the CTT2 message from the AS-i bus master to the AS interface slave is structured as follows:

The message type is coded in the first byte; the object which is to be read or written is coded in the second byte. In the 3 following bytes the necessary data is transmitted according to the type of message. In the response from the 2nd slave to the AS-i bus master, whether or not the order has been successfully executed is coded in the first byte. In case of a successfully executed Read order, the data which are read out are returned as of the second byte. However, if a communication error occurs, a corresponding error code is returned in the second byte.

The following overview shows the basic schematic telegram structure for the 4 different types of message.

Call-up telegram					Response telegram	
Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 1	Byte 2
Code (Message type)					**Code**	
Standard **Read order**	ID object / Diagnostic object	Read length			OK / Error	Data / Error code
NORD-specific **Read order**	PZD channel	Read length			OK / Error	Data / Error code
NORD-specific **Write order**	PKW channel with address	Write length	Data			
NORD-specific **Write/ Read order**	PKW channel without address	Read length	Write length	Data		

ⓘ **Information**   **Data - Data length**

The data length or the number of bytes in the above overview depends on the application data to be transmitted.

Channels

Three different channels are defined for NORD-specific message types:

Channel	Description
PZD[1]	Telegram with extended process data PZD • Control word STW and 3 setpoints SW1 – SW3 • Status word ZSW and 3 actual values IW1 – IW3
PKW With address	Telegram with PKW parameter data for a field distributor with an address
PKW Without address	Telegram with PKW parameter data for a field distributor without an address

1) Always with statement of an address

4.3 Message types

The coding for the 4 different message types, indices, response codes, the permissible data lengths and the structure of the various objects are explained in detail in the following sections.

The address of the frequency inverter, which must be stated for the channels **PZD** and **PKW (with address)** is always "1". If the channel **PKW (without address)** is used, statement of the address of the frequency inverter is not required.

The number of bytes to be transmitted is always stated in read length and write length.

4.3.1 Standard Read order

The structure or coding of the standard Read order consists of the following objects.

Code	Meaning	Contents	Index No.	Object	Length (permissible)
16	Read order	Index, length	0	ID object	max. 14
			1	Diagnostic object	max. 3
80	Read response OK	Data			
144	Read response not OK	Error code			

The standard read order has two valid indices:

- ID object
- Diagnostic object

ID object

The ID object consists of a total of 14 bytes and is structured as follows:

Byte	Meaning
1	Manufacturer ID (upper byte)
2	Manufacturer ID (lower byte)
3	Device ID (upper byte)
4	Device ID (lower byte)
5	Input/output configuration of cyclic data
6	AS-i mode
7	Firmware version of the AS interface
8	Firmware version of the field distributor
9	Firmware revision of the field distributor
10	Field distributor power (upper byte)
11	Field distributor power (lower byte)
12	Field distributor voltage range
13	Field distributor configuration (upper byte)
14	Field distributor configuration (lower byte)

Example of a query of the ID object

Order telegram			
Byte	1	2	3
Meaning	Code	Index	Length
Value	16	0	14

Response telegram					
Byte	1	2	3	…	15
Meaning	Code	Manufacturer ID High byte	Manufacturer ID Low byte	…	Configuration Low byte
Value	80	1	137		

Example of an incorrect response for the ID object with an error code with regard to utilisation

Response telegram with error	
Byte	1	2
Meaning	Code	Error code
Value	144	4

ⓘ **Information**	**Transmission rate**

To optimise the transmission speed it is recommended that only the bytes which are actually required are read out. To ensure that communication via the CTT2 protocol functions, in particular a readout of the ID object is suitable for a simple check.

Diagnostic object

The diagnostic object consists of a total of 3 bytes and is structured as follows:

Byte	Definition	
1	**Diagnosis code**	**Meaning**
	0	No error
	255	Error
2	Field distributor error number	
3	Microcontroller temperature	

Example of a query of the diagnostic object

Order telegram			
Byte	1	2	3
Meaning	Code	Index	Length
Value	16	1	3

Example of a response by the diagnostic object

Response telegram				
Byte	1	2	3	4
Meaning	Code	No error	Error no. (Frequency inverter)	Temperature
Value	80	0	0	45

4.3.2   NORD-specific read order

The structure or coding of the NORD-specific read order consists of the following objects.

Code	Meaning	Contents	Index No.	Object	Length (recommended)
18	Read order	Index, length	3	PZD channel	3, 5, 7, 9 [1]
			4	PKW channel with address	9 [2]
			47	PKW channel without address	8 [3]
82	Read response OK	Data			
146	Read response not OK	Error code			

[1]   The data length can be freely selected up to the maximum length of the channel, i.e. up to 9 bytes for PZD.

[2]   The data length can be freely selected up to the maximum length of the channel, i.e. up to 9 bytes for PKW with address.

[3]   The data length can be freely selected up to the maximum length of the channel, i.e. up to 8 bytes for PKW without address.

ⓘ **Information**   **Length of reading data**

For the selection of the length of data to be read, it is recommended that the complete area is always read. I.e. the defined data sizes should always be used, e.g. 2 bytes for the status word (ZSW).

For actual values (IW) this is also 2 bytes accordingly.

The current process data PZD can be queried at any time via the PZD channel by means of the NORD-specific Read order. In contrast, to read parameter data PKW by means of the PKW channel, a previous corresponding Write order is mandatory. The Read order returns the last response telegram of the PKW channel as often as is necessary.

Example for a query of process data ZSW, IW1, IW2 and IW3)

Order telegram			
Byte	1	2	3
Meaning	Code	Index	Length
Value	18	3	9

Example of process data response from the field distributor

Response telegram				
Byte	1	2	3	4	5
Meaning	Code	Address USS	Status word High byte	Status word Low byte	IW1 High byte
Value	82	1	*(Bit 8 to 15)*	*(Bit 0 to 7)*	*(Bit 8 to 15)*

Response telegram				
Byte	6	7	8	9	10
Meaning	IW1 Low byte	IW2 High byte	IW2 Low byte	IW3 High byte	IW3 Low byte
Value	*(Bit 0 to 7)*	*(Bit 8 to 15)*	*(Bit 0 to 7)*	*(Bit 8 to 15)*	*(Bit 0 to 7)*

Note: Byte 3 to 10 corresponding to USS – Protocol (also compare examples in 📖 chapter 5 "Examples")

4.3.3 NORD-specific write order

The structure or coding of the NORD-specific write order consists of the following objects.

Code	Meaning	Contents	Index No.	Object	Length (mandatory)
19	Write order	Index, length, data	3	PZD channel	3, 5, 7, 9
			4	PKW channel with address	9
			47	PKW channel without address	8
83	Write response OK				
147	Write response not OK	Error code			

In the case of process data PZD, with a NORD-specific Write order via the PZD channel, the control word STW and up to 3 setpoints (SW1 – SW3) can be transmitted. For parameterisation of the frequency inverter via the PKW channel, the USS telegram is attached as a data package.

I.e. the parameter order always contains the PKW area at the end of the telegram.

Two transmission options are available with the PKW channel:

- PKW channel with address
- PKW channel without address

With Index No. 4, i.e. PKW channel with address, the address of the frequency inverter is stated in the first byte of the data (i.e. Byte 4). Subsequently (from byte 5) the PKW of the USS telegram follow. In the case of index 47, however, the address is omitted. The PKW of the USS telegram thus start from the byte 4.

Example of the use of the PKW channel without address

Order telegram				
Byte	1	2	3	4 … 11
Meaning	Code	Index	Data length	USS telegram (PKW)
Value	19	47	8	

> **Note:** Byte 4 to 11 corresponding to USS – Protocol (also compare examples in 📖 chapter 5 "Examples")

Example for the response after a successful write order via the PKW channel with response code from the frequency inverter

Response telegram	
Byte	1
Meaning	Code
Value	83

Here it should be noted that the response code does not state whether the parameter order has been executed by the frequency inverter. For this a NORD-specific Read order must be explicitly carried out with the PKW channel.

4.3.4   NORD-specific write/read order

The structure or coding of the NORD-specific write/read order consists of the following objects.

Code	Meaning	Contents	Index No.	Object	Length (mandatory)
29	Write/read order	Index, data, write length, read length	3	PZD channel	3, 5, 7, 9 [1]
			4	PKW channel with address	9 [2]
			47	PKW channel without address	8 [3]
93	Write/read response OK	Data			
177	Write/read response not OK	Error code			

[1]   The data length can be freely selected up to the maximum length of the channel, i.e. up to 9 bytes for PZD.

[2]   The data length can be freely selected up to the maximum length of the channel, i.e. up to 9 bytes for PKW with address.

[3]   The data length can be freely selected up to the maximum length of the channel, i.e. up to 8 bytes for PKW without address.

ⓘ   Information   **Length of reading data**

For the selection of the length of data to be read, it is recommended that the complete area is always read. I.e. the defined data sizes should always be used, e.g. 2 bytes for the status word (ZSW).

For actual values (IW) this is also 2 bytes accordingly.

For a NORD-specific Write/Read order, the two message types or orders are executed with a single telegram order. To write the control word STW, write three setpoints SW1 – SW3 and to read e.g. only two of the actual values IW1 and IW2, the following telegram structure would be selected.

Example for query of process data (writing of STW and SW1, SW2, SW3)

Order telegram					
Byte	1	2	3	4	5
Meaning	Code	Index	Read length	Write length	Address (Frequency inverter)
Value	29	3	7	9	1

Order telegram					
Byte	6	7	8	9	10
Meaning	Control word High byte	Control word Low byte	SW1 High byte	SW1 Low byte	SW2 High byte
Value	(Bit 8 to 15)	(Bit 0 to 7)	(Bit 8 to 15)	(Bit 0 to 7)	(Bit 8 to 15)

Order telegram		
Byte	11	12	13
Meaning	SW2 Low byte	SW3 High byte	SW3 Low byte
Value	(Bit 0 to 7)	(Bit 8 to 15)	(Bit 0 to 7)

Note: Byte 6 to 13 corresponding to USS – Protocol (also compare examples in 📖 chapter 5 "Examples")

Example for process data response (reading of ZSW, IW2 and IW2)

Response telegram					
Byte	1	2	3	4	5
Meaning	Code	Address (Frequency inverter)	Status word High byte	Status word Low byte	IW1 High byte
Value	93	1	(Bit 8 to 15)	(Bit 0 to 7)	(Bit 8 to 15)

Response telegram		
Byte	6	7	8
Meaning	IW1 Low byte	IW2 High byte	IW2 Low byte
Value	(Bit 0 to 7)	(Bit 8 to 15)	(Bit 0 to 7)

Note: Byte 3 to 8 corresponding to USS – Protocol (also compare examples in 📖 chapter 5 "Examples")

4.3.5 Error messages

In the case of data transmission, there may be transmission errors and thus corresponding error messages.

Error code

The following error codes may occur in the response telegram:

Error code	Meaning
1	Invalid index
2	Invalid length
3	Order not implemented
4	Full capacity (order not completely executed within the time window)
5	The last acyclic order has not yet been executed

Example response telegram with error message

Response telegram with error	
Byte	1	2
Meaning	Code	Error code
Value	144	4

Error code "1" "Invalid index" occurs if an index is accessed, which is not implemented in the frequency inverter. The indices "0" and "1" for standard Read orders and indices "3", "4" and "47" for the three NORD-specific message types are implemented in the frequency inverter. All other indices are invalid and are indicated acknowledged with a corresponding error message or indicated with error code 1.

The length of the data which can be written or read is specified separately for each index and can be obtained from the relevant chapters for the message types. For Read orders in which fewer data are requested than are defined for the particular index, only the requested data without error message (without error code) are returned. If more data are requested, only the defined data without error messages (no error code) are returned.

For Write orders in which more data are to be written than is specified for the relevant index, the error object with error code "2" is returned. Only complete parameter data PKW orders can be executed, therefore for the PKW channel, all data lengths which do not correspond to the defined length receive a response with error code "2".

For the PZD channel, the Write order must consist of at least the address and the control word STW. The number of setpoints SW can be varied as required between 0 to 3 setpoints, however both of the bytes (High and low byte) of which the setpoint consists must be transmitted.

If the data length for the PZD channel does not comply with the defined requirement or the stated length in the CTT2 protocol, error code "2" is returned.

Orders which are not implemented in the double slave receive the response "Standard Read response not OK" and error code "3".

Each order must be responded to by the double slave before a new order can be sent. If this rule is breached, the slave returns the error code "5" after the second order has been received.

Orders which are received by the double slave must be responded to by the 2nd slave within 200 ms. For the measurement of the timeout, the period between receipt of the complete order telegram and the start of the response telegram is decisive. If the time is exceeded, the double slave signals a timeout to the AS-i bus master. Error code "4" is returned. The frequency inverter is overloaded and could not process the request within the specified time window.

ⓘ **Information**	**Transmission rate**

To minimise the transmission speed it is recommended that only the bytes which are actually required are read out with Read orders.

4.4 Transmission times

Transmission times for the transmission of application data depend on the size of the message and the total number of connected AS interface slaves. The following overview shows the minimum transmission times per byte, depending on the number of AS interface slaves.

Number of AS interface slaves	Transmission time per byte
1	> 7.4 ms
2	> 9.86 ms
3	> 12.32 ms
…	
30	> 78.85 ms
31	> 81.31 ms
32	> 83.78 ms
…	
60	> 152.77 ms
61	> 155.23 ms
62	> 157.7 ms

Figure 2: Overview of transmission times

The transmission time can be calculated as follows:

16 x 154 µs x (2 + number of slaves)

Example

With 31 AS interface slaves connected, the transmission time is:

16 x 154 µs x (2 + 31) = 81.31 ms

4.5 Structure of the process data

4.5.1 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 inhibit").	**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 inhibit" 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 to 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 faults 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		—
		1		
15	Parameter set Bit 1 On	0		
		1		

Bit 15	Bit 14	it activates the parameter set
0	0	Parameter set 1
0	1	Parameter set 2
1	0	Parameter set 3
1	1	Parameter set 4

[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.

4.5.2 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 to switch-on".

Bit	Meaning	Value	Status message
0	Ready to switch-on	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 inhibit".
		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 inhibit".
4	Voltage enabled	0	"Disable voltage" command present.
		1	
5	Emergency stop	0	"Emergency stop" command present.
		1	
6	Switch-on inhibit	0	
		1	With the command "Standby" the frequency goes into status "Ready to 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

4.5.3 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.
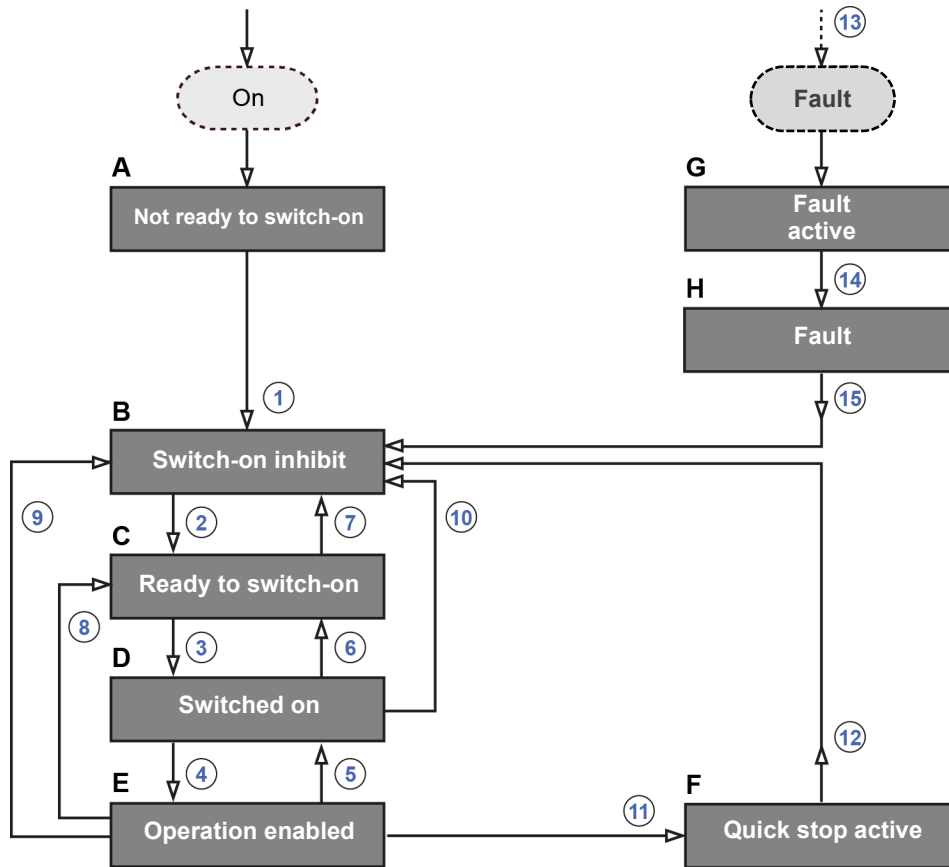

Figure 3: Frequency inverter status machine

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 ready to switch-on	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 inhibit".
B	Switch-on inhibit	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	Ready to switch-on	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	Switched on	Frequency inverter ready for operation.
E	Operation enabled	The frequency inverter receives and processes setpoints.
F	Quick stop active	Quick stop function is being executed (the drive is stopped), the frequency inverter changes to the status "Switch-on inhibit".
G	Fault active	If a fault error occurs, the frequency inverter changes to this status and all functions are blocked.
H	Fault	After processing of the response to the fault (fault active), 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 to switch-on" to "Switch-on inhibit"	—				—				
	Automatic activation of the charging relay									
2	From "Switch-on inhibit" to "Ready to switch-on"	Shut down	X	X	X	X	X	**1**	**1**	**0**
3	From "Ready to 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 to switch-on"	Shut down	X	X	X	X	X	**1**	**1**	**0**
	Voltage enabled at "f = 0 Hz"									
7	From "Ready to switch-on" to "Switch-on inhibit"	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 to switch-on"	Shut down	X	X	X	X	X	**1**	**1**	**0**
9	From "Operation enabled" to "Switch-on inhibit"	Disable voltage	X	X	X	X	X	X	**0**	X
10	From "Switched on" to "Switch-on inhibit"	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 "Quick stop active"	Quick stop	X	X	X	X	X	**0**	**1**	X
12	From "Quick stop active" to "Switch-on inhibit"	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 (Fault active)	—				—				
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 4.5.1 "Control word".

[1] Complete list of control bits (Bit 0…15) 📖 Section 4.5.1 "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 to switch-on	0	X	X	0	0	0	0
Switch-on inhibit	1	X	X	0	0	0	0
Ready to switch-on	0	1	1	0	0	0	1
Switched on	0	1	1	0	0	1	1
Operation enabled	0	1	1	0	1	1	1
Fault	0	X	X	1	0	0	0
Fault active	0	X	X	1	1	1	1
Quick stop active	0	0	1	0	1	1	1

[1]   Complete list of status bits (Bit 0…15) 📖 Section 4.5.2 "Status word".

4.5.4   Setpoints and actual values

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

Direction of transmission	Process value	Parameter
		SK 270E-FDS, SK 280E-FDS
To slave / frequency inverter	Setpoint 1	**P546, Array [-01]**
	Setpoint 2	**P546, Array [-02]**
	Setpoint 3	**P546, Array [-03]**
To AS-i bus master	Actual value 1	**P543, Array [-01]**
	Actual value 2	**P543, Array [-02]**
	Actual value 3	**P543, Array [-03]**

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:

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

*   16 Bit- setpoint or actual value which is transmitted 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

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	SK 270E-FDS, SK 280E-FDS			
	1st word	**2nd word**	**3rd word**	**4th word**
To slave / frequency inverter	Control word	32 Bit setpoint		Setpoint 3
To AS-i bus master	Status word	Actual value 1	32 Bit actual value	

Only the "Low" word for the position can also be transmitted. 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 Ratio** and **P608 Reduction Ratio**), however this reduces the resolution accordingly.

4.6   Parameter data transmission

Transmission of parameter data is carried out acyclically. In contrast, process data are only transmitted cyclically. Process data PZD as well as parameter data PKW can be transmitted via the relevant message type.

Using the PKW area, parameter processing can also be carried out. For this, the AS-i bus master formulates a corresponding message type (code), sends this to the 2nd slave and the frequency inverter formulates the appropriate response. The PKW area is only used for the transmission of NORD-specific message types.

In principle, the PKW area consists of

- A **parameter identification (PKE)**, in which the type of order (Write, Read etc.) and the relevant parameters are specified.
- An **Index (IND)**, with which the individual parameter sets or arrays are addressed,
- The **Parameter value (PWE)**, which contains the value which is to be read or written.

Field[1]		Data size	Explanation
PKE	Parameter label (Order label **AK** and parameter number **PNU**)	2 Byte	Parameter of the frequency inverter. The parameter number. The order label is attached to the parameter number (upper nibble).
IND	Parameter index	2 Byte	Parameter sub-index
PWE	Parameter value	4 Byte	New setting value

1   Description of the fields in the following sections.

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

If parameter changes are made (order by the AS-i bus master via the PKW channel), the maximum number of permissible writing cycles to the frequency inverter EEPROM (100,000 cycles) must not be exceeded. I.e. continuous **acyclic** 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 can be made by selecting the appropriate function setting or via the parameter **P560 Save in EEPROM**.

4.6.1 Details of the PKW area

4.6.1.1 Parameter label PKE

The order or response and the associated parameters are encrypted in the parameter label PKE.

PKE																IND	PWE1	PWE2
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0			
AK				SPM	PNU													

The parameter label (PKE) is always a 16 bit value.

PNU	Bits 0…10 contain the number of the required parameters in the response telegram from the frequency inverter. Parameter numbers can be found in 📖 manual frequency inverter.
SPM	Bit 11 is the toggle-bit for spontaneous messages. This function is **not** supported.
AK	Bits 12...15 contain the order or response label.

Order label and response label AK

A total of 15 parameter orders can be transmitted from the AS-i bus master to the frequency inverter.

- • Parameter order with order codes 0…14 are available for selection.

The right-hand column of the following table lists the corresponding label of a positive response. The label of a positive response depends on the order label.

Meaning of order labels

Order label	Function	Response label (positive)
0	No order	0
1	Request parameter value	1 or 2
2	Change parameter value (word)	1
3	Change parameter value (double word)	2
4	Reserved	—
5	Reserved	—
6	Request parameter value (array)	4 or 5
7	Change parameter value (array, word)	4
8	Change parameter value (array, double word)	5
9	Request the number of array elements	6
10	Reserved	—
11	Change parameter value (array, double word) without writing to the EEPROM	5
12	Change parameter value (array, word) without writing to the EEPROM	4
13	Change parameter value (double word) without writing to the EEPROM	2
14	Change parameter value (word) without writing to the EEPROM	1

Meaning of response labels

Response label	Meaning
0	No response
1	Transmit parameter value (word)
2	Transmit parameter value (double word)
4	Transmit parameter value (array, word)
5	Transmit parameter value (array, double word)
6	Transmit the number of array elements
7	**Order cannot be executed (with error number in PWE2)**

ⓘ **Information**   **Plausibility check**

As long as an order has not been executed, the frequency inverter sends the response for the previous order. Therefore the AS-i bus master must always check whether the received response matches the order which was sent. For the plausibility check, the value in the response label (AK), the received parameter number (PNU) with the corresponding Index (IND) as well as the current parameter value (PWE) can be used.

The label for a negative response is always the value "7" (order cannot be executed) for all order labels. In case of a negative response, an error message is also listed in the response from the field distributor in PWE2.

Meaning of error messages in parameter value PWE2

Error message	Meaning
0	Invalid parameter number
1	Parameter value cannot be changed
2	Lower or upper value limit exceeded
3	Incorrect sub-index
4	No array
5	Invalid data type
6	Only resettable (only 0 may be written)
7	Description element cannot be changed
9	Description data not available or for acyclic access a READ command was triggered without a previous WRITE command
101	Addressed field distributor does not exist
102	
103	Addressed field distributor exists, but access blocked by another bus participant.
201	Invalid order element in the last order received
202	Internal response label cannot be depicted

ⓘ **Information**   **Order and response labels**

Both the order label and the response label are abbreviated as "AK" in the data telegram. Because of this, especially the response or order labels "AK1", "AK2" and "AK4" to "AK7" must be carefully interpreted.

4.6.1.2 Parameter index IND

The structure and function of the parameter index depends on the type of parameter to be transmitted.

PKE	IND																PWE1	PWE2
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0		
							P1…P4		No information (all "0")									
	Arrays 1…64						**P1…P4**											
	Sub-index																	

For **values which depend on the parameter set**, the parameter set can be selected via Bit 8 and Bit 9 of the index (0 = Parameter set 1, 1 = Parameter set 2 etc.).

For **array parameters** the sub-index can be addressed via Bit 10 to Bit 15 (0 = Array element 1, 1 = Array element 2 etc.).

For **parameters which do not depend on the parameter set**, Bit 8 to Bit 15 are used for the sub-index. In order for the sub-index to be effective, the corresponding order label (numbers 6, 7, 8 and 11 and 12) must be used.

Examples for address formation for array parameters which depend on parameter sets

Array element						Parameter set									
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	1	0	1	0	1	No information (all "0")							
5 (0001 01b)						2 (01b)									

Array element						Parameter set		No information							
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	1	0	1	0	1	1	1	No information (all "0")							
21 (0101 01b)						4 (11b)									

Structure of parameter and sub-index values 📖 Manual for the relevant frequency inverter.

4.6.1.3 Parameter value PWE

According to the parameter, parameter values are transmitted as a word (16 Bit) or as a double word (32 Bit). For negative values, the High bytes must be filled up with "FFh"

The parameter value is transferred as an integer value.

For parameters with resolutions "0.1" or "0.01" the parameter value must be multiplied by the inverse of the resolution.

Example

A run-up time of 99.99 seconds is to be set.

$$99.99s \; = \; \frac{99.99 \; \times \; 1}{0.01} = 99.99 \; \times \; 100 = 9999$$

The value "9999" (270Fh) must be transferred.

5 Examples

Various examples are shown below to clarify the control and parameterisation of the frequency inverter with the bus system. Please note that the **datas concerning the word or byte** depends on the selected message type (code) according to 📖 section 4.3 "Message types". Therefore they are **to be considered as examples.**

5.1 Example telegrams

5.1.1 Switch-on block → Standby

After the frequency inverter is switched on, it is in the "switch-on block" state (Control Bit 0 = "0") and is to be set to the state "Standby" (Control Bit 0 = "1").

Transmission is carried out with PPO type PPO1; parameter set 1 is valid; only the PZD channel is depicted.

Procedure

1. Check the last status word (e.g. "0B70h").

Status word (status "switch-on block")			
Bit	Value	Value	Meaning
15	0	0h	Parameter set Bit 1 = Off
14	0		Parameter set Bit 0 = Off
13	0		Reserved
12	0		Rotation left = Off
11	1	Bh	Rotation right = On
10	0		Reference value undershot
9	1		Bus control
8	1		Setpoint = actual value
7	0	7h	No warning
6	1		Starting disabled
5	1		No emergency stop
4	1		Voltage enabled
3	0	0h	No error
2	0		Operation disabled
1	0		Not ready for operation
0	0		Not on standby

Telegram			
Byte	1	2	3	4
Type	ZSW		IW1	
Value	0Bh	70h	00h	00h

2. Generate control word ("**047Eh**").

   To switch the frequency inverter to the "Standby" status, the following telegram must be sent:

Telegram			
Byte	1	2	3	4
Type	STW		SW1	
Value	04h	7Eh	00h	00h

3. Check the response telegram (status word "**0B31h**").

   As soon as the frequency inverter is in "Standby" status, it sends a response telegram:

Telegram			
Byte	1	2	3	4
Type	ZSW		IW1	
Value	**0Bh**	**31h**	00h	00h

5.1.2 Enable with 50% setpoint

The frequency inverter is in "Standby" status (Control Bit 0 = "1") and is to be enabled in the right-hand direction with a setpoint of 50%.

Procedure

1. Check the last status word (ZSW "0B31h").

Telegram			
Byte	1	2	3	4
Type	ZSW		IW1	
Value	0Bh	31h	00h	00h

2. Generate the control word ("**047Fh**") and specify the setpoint (SW1 "2000h" = 50%).

   To switch the frequency inverter to "Operation enabled" status and set the setpoint, the following telegram must be sent:

Telegram			
Byte	1	2	3	4
Type	STW		SW1	
Value	04h	7Fh	20h	00h

3. The frequency inverter accelerates the motor in the ramp. As soon as the frequency inverter has reached the 50% setpoint, it sends a response telegram:

Telegram			
Byte	1	2	3	4
Type	ZSW		IW1	
Value	0Bh	37h	20h	00h

5.1.3 Parameter changes

When transmitting parameter orders it must be considered that the frequency inverter resp. the AS-Interface slave respond the data with low priority.

Parameter orders must by transmitted via. The PKW-channel.

The parameter **P102 Acceleration time** (PNU = "66h") of a frequency inverter is to be set to the value "10 s" in parameter set 3. As the acceleration time has an internal resolution of "0.01s", the parameter value "3E8h" (10 divided by 0.01 = 1000) must be transmitted for 10 seconds.

Procedure

- • Specify the order label (Change parameter value = 7),
- • Select the parameter (P102 = "66h").
- • Select parameter set 3 (IND = 02h)
- • Set the parameter value ("3E8h").

Telegram								
Byte	1	2	3	4	5	6	7	8
Type	PKE		IND		PWE		PWE	
Value	70h	66h	00h	02h	00h	00h	03h	E8h

- • When the order has been fully implemented by the frequency inverter, it sends the response telegram:

Telegram								
Byte	1	2	3	4	5	6	7	8
Type	PKE		IND		PWE		PWE	
Value	40h	66h	00h	02h	00h	00h	03h	E8h

5.1.4   Reading of parameter P701 actual error, Index 0 (last fault)

Example telegram

Field	Data size	Byte	Value		Explanation
Order label AK	1 Byte (upper Nibble)	0	1h		Order parameter value (read)
and parameter value PWE	1 Byte	1		2BDh	Parameter number P701 = 2BDh
			12BDh		
Parameter index	2 Byte	2	00h		Parameter sub-index
		3	00h		
Parameter value	4 Byte	4	00h		Setting value not set with read order
		5	00h		
		6	00h		
		7	00h		

5.1.5   Writing of parameter P102 acceleration time, Index 1

Example telegram

Field	Data size	Byte	Value		Explanation
Order label AK	1 Byte (upper Nibble)	0	2h		Order parameter value (read)
and parameter value PWE	1 Byte	1		66h	Parameter number P102 = 66h
			2066h		
Parameter index	2 Byte	2	01h		Parameter sub-index
		3	00h		
Parameter value	4 Byte	4	00h		The time "2.5 s" (250 = FAh) is to be set.
		5	00h		
		6	00h		
		7	FAh		

6 Parameters

The 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 frequency inverter.

The parameters can be set with

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

Parameter settings on the frequency inverter

After connecting and addressing the bus interface, the following additional parameters of the frequency inverter must be set.

A detailed description of the parameters can be found in the related 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	Comment
P509	Source control word	Factory setting [1]	See Manual BU 0250
P510	Source Setpoints	Factory setting	
P543	Bus actual value	O[2]	
	[-01] Bus actual value 1		
	[-02] Bus actual value 2		
	[-03] Bus actual value 3		
P546	Func. bus-setpoint	O[2]	
	[-01] Func. bus-setpoint 1		
	[-02] Func. bus-setpoint 2		
	[-03] Func. bus-setpoint 3		

O[1]   To write and read parameters and to control the frequency inverter via AS-i bits, the factory setting should be kept for P509. Only if the frequency inverter shall be controlled via CTT2, the setting 5 "AS-i" must be selected.

O[2]   Depending on the function: Setting required depending on the required function(s).

Information parameter

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.

No.	Parameter name	SK 270E-FDS, SK 280E-FDS
P700	Current fault	Array [-01]
	Actual warning	Array [-02]
	Reason FI blocked	Array [-03]
P701	Last fault	Array [-01] to Array [-05]
P740	PZD bus in	No display if **P509** is set to "0"
P741	PZD bus out	
P744	Configuration	

7 Appendix

7.1 Repair information

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

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

NORD Electronic DRIVESYSTEMS GmbH

Tjüchkampstraße 37

26606 Aurich

ⓘ Information

Third party accessories

Getriebebau NORD GmbH & Co. KG cannot accept liability for third party accessories if these are returned with the device.

ⓘ Information

Accompanying document

Please complete the accompanying document for the return. This can be found on our homepage www.nord.com or directly under the link Warenbegleitschein

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In case of queries about repairs please contact:

Getriebebau NORD GmbH & Co. KG

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

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

7.2 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

7.3 Documents and software

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

Other applicable documents and further information

Documentation	Contents
BU 0250	Manual for NORDAC *LINK* **SK 250E-FDS**, frequency inverter as field distributor
BU 0000	Manual for use of NORD CON software
BU 0040	Manual for use of NORD parameterisation units

Software

Software	Description
NORD CON	Parametrisation and diagnostic software

Key word index

NORD DRIVESYSTEMS Group

Headquarters and Technology Centre
in Bargteheide, close to Hamburg

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