



AG 0104 – en

System Bus

Functional Description



Documentation

Title:	AG 0104	
Order no.:	6047902	
Series:	SK 5xxP, SK 5xxE, SK 18xE, SK 2xxE, SK 25xE-FDS	
Device series:	SK 500P, SK 510P, SK 530P, SK 550P, SK 511E, SK 515E, SK 520E, SK 530E, SK 535E, SK 540E, SK 545E, SK 180E, SK 190E, SK 200E, SK 210E, SK 220E, SK 230E, SK 205E, SK 215E, SK 225E, SK 235E, SK 250E-FDS, SK 260E-FDS, SK 270E-FDS, SK 280E-FDS	
Device types:	SK 5xxP-250-123-A ... SK 5xxP-221-123-A	(0.25 – 2.2 kW, 1 ~ 200 – 240 V)
	SK 5xxP-250-340-A... SK 5xxP-222-340-A	(0.25 – 22 kW, 3 ~ 380 – 480 V)
	SK 5xxE-250-112-0 ... SK 5xxE-111-112-0	(0.25 – 1.1 kW, 1 ~ 110 – 120 V)
	SK 5xxE-250-323-A ... SK 5xxE-182-323-A	(0.25 – 18.5 kW, 1 / 3 ~ 200 – 240 V)
	SK 5xxE-550-340-A ... SK 5xxE-163-340-A	(0.55 – 160 kW, 3 ~ 380 – 400 V)
	SK 180E-250-112-0 (-C) ... SK 180E-750-112-0 (-C)	(0.25 – 0.75 kW, 1 ~ 110 – 120 V)
	SK 180E-250-323-B (-C) ... SK 180E-151-323-B (-C)	(0.25 – 1.5 kW, 1 / 3 ~ 200 – 240 V)
	SK 180E-250-340-B (-C) ... SK 180E-221-340-B (-C)	(0.25 – 2.2 kW, 3 ~ 380 – 400 V)
	SK 2xxE-250-112-0 (-C) ... SK 2xxE-750-112-0 (-C)	(0.25 – 0.75 kW, 1 ~ 110 – 120 V)
	SK 2xxE-250-323-A (-C) ... SK 2xxE-111-323-A (-C)	(0.25 – 1.1 kW, 1 ~ 200 – 240 V)
	SK 2xxE-250-323-A (-C) ... SK 2xxE-112-323-A (-C)	(0.25 – 2.2 kW, 3 ~ 200 – 240 V)
	SK 2xxE-550-340-A ... SK 2xxE-222-340-A	(0.55 – 22 kW, 3 ~ 380 – 500 V)
	SK 2xxE-FDS-370-340-A ... SK 2xxE-FDS-751-340-A	(0.37 – 7.5 kW, 3 ~ 380 – 500 V)

Version list

Title, Date	Order number	Version	Remarks
AG 0104, March 2022	6047902 / 2122	1.0	First edition

Table 1: Version list AG 0104

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Publisher

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Every care has been taken to ensure that the contents of this application description are correct. However, in case of deviations between the application description and other documentation (e.g. Manuals) the content of the other documentation has priority.

NOTICE

Application

Application

This application example is only valid in combination with the operating instructions of the respective frequency inverters and technology options. This is an essential prerequisite for the availability of all the relevant information required for the safe commissioning of the frequency inverter.

Exclusion of liability

This application document is an aid for the installation and parameterisation of an application with NORD products. The description is based on an example for a specific application and can be used as orientation for comparable applications.

As this is an example, Getriebebau NORD GmbH & Co. KG does not accept any liability for injury or material damages and does not grant any warranty, either explicitly or implicitly with regard to the information contained in this application description.

Information about this guide

This function description is intended for salespersons, planners, as well as commissioning and service personnel who are familiar with using the functions of electronic drive technology (motors and frequency inverters) from Getriebebau NORD.

This function description initially gives a brief overview of the functions themselves. In addition, further information for application and use is given.

The information and recommendations relate to currently available drive and control components or settings, preferably standard products from Getriebebau NORD. This guideline relates to the current drive technology software and hardware versions which were valid at the time of publication of the guideline.

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1 The NORD system bus

Communication between a NORD frequency inverter and connected optional modules (e.g. SK CU4-..., SK TU4-...) occurs via a dedicated NORD system bus. The SK 200E, for example, communicates with the internal SK CU4 PNT customer interface for PROFINET field bus communication via the NORD system bus. With this standardised communication channel, function extensions of frequency inverters can be implemented quickly and easily. Not only optional modules but also CANopen absolute encoders can be integrated into the drive system by way of the NORD system bus.

The NORD system bus also enables frequency inverters to communicate with each other. This lets you quickly and easily implement applications that require data interchange between frequency inverters. This is exemplified best by master/slave applications where a synchronous drive operation can be implemented.

Continuous communication via the NORD system bus makes it possible to set parameters of individual devices from a single participant. This simplifies commissioning and maintenance, in particular if some participants are hard to access.

The example of a gantry crane using two NORD drives to operate a winch shows how several NORD devices interact in a NORD system bus. The two frequency inverters controlling the drives are connected via the NORD system bus and can thus drive the winch synchronously.

The winch is operated with switches at floor level. To this purpose, the SK TU4-IOE I/O extension is installed in the vicinity of the control panel and connected to both frequency inverters via a bus cable (<20 m). In this case, the NORD system bus offers a reasonably priced data exchange option because no additional devices are required.

The system bus is active and operable even when it is switched on for the first time because addressing and terminating resistors of the I/O extension and of the two frequency inverters are optionally set with a DIP switch during installation. You can then set the drive parameters with the ParameterBox SK PAR-3H / -3E or a NORDCON PC that can be easily connected to the SK TU4-IOE I/O extension at the control panel.

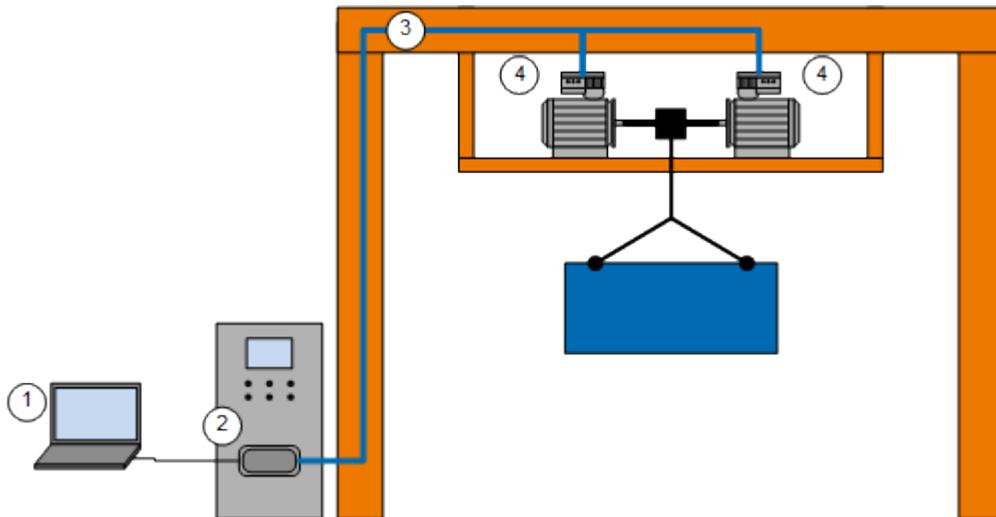


Figure 1: Gantry crane application example

Item	Description
1	NORDCON PC (Windows®-based PC where the NORDCON parameterisation and control software is installed); as an alternative, a ParameterBox SK PAR-3H / -3E or the NORDCON APP with Bluetooth stick NORDAC ACCESS BT can be used.
2	I/O expansion SK TU4-IOE
3	NORD system bus (CAN field bus)
4	Frequency inverter SK 2xxE

The NORD system bus can also be helpful when using internal or external field bus interfaces. Only one field bus interface for connection to the higher level control unit is needed because the NORD system bus takes care of communication between the individual devices. In this case, the field bus interface serves as a gateway between NORD system bus participants and the external field bus.

This configuration saves costs for the frequency inverters because it is not necessary to have a field bus interface for each frequency inverter. Please note the following restriction: A limited number of participants can be connected to the field bus interface (see "Topology"); it is therefore not possible to extend the system bus endlessly.

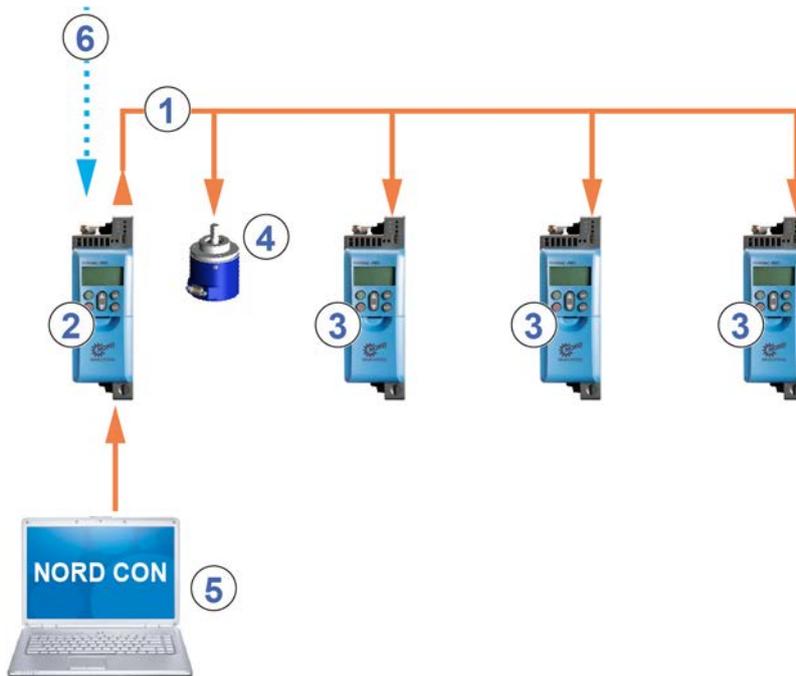


Figure 2: Example of the structure of a NORD system bus with a field bus interface

Item	Description
1	NORD system bus (CAN field bus)
2	Frequency inverter with field bus interface SK 500P
3	Frequency inverter SK 5x0P
4	CANOpen absolute encoders
5	NORDCON computer (Windows®-based PC where the NORDCON parameterisation and control software is installed)
6	Industrial Ethernet

The NORD system bus is a CAN field bus; communication is via the CANopen protocol. Compared to a standard CANopen field bus, the NORD system bus is intended for limited local data exchange. In particular, the focus is on communication between NORD frequency inverters, CANopen absolute encoders, and optional modules. For this reason, restrictions are required to ensure a smooth workflow with the NORD system bus. The maximum length of the NORD system bus is 20 m. The maximum number of participants is also restricted in order to ensure the required communication speed.

2 Technical description

2.1 Topology

The system bus participants of NORD GmbH & Co. KG are preferably connected in a line structure. Branch lines with a maximum length of 6 m are allowed. All participants to the NORD system bus must be assigned a fixed address (NODE-ID) in the NORD system bus. The system bus address of higher level field bus interfaces (such as SK CU4-PNT, SK TU4-ECT ...) is set at the factory and cannot be changed. Connected I/O extensions must be assigned to the frequency inverters. For details, please refer to the technical information for the respective I/O extension. Depending on the device, the addresses of the frequency inverters and the connected CANopen absolute encoder are set via parameter **P515** "CAN address" or via DIP switches. In this case, the CANopen absolute encoders must be directly assigned to a frequency inverter. This is carried out using the following equation:

CANopen absolute encoder address = NODE ID of the frequency inverter + 1

This results in the following matrix:

Device	FI1	AG1	FU2	AG2	...
Node ID	32	33	34	35	...

The terminating resistor of the physically first and last participant of the NORD system bus must be set with the device DIP switches. All system bus participants must be set to the same CAN baud rate. If the NORD system bus configuration contains optional modules (such as SK CU4-PNT, SK TU4 IOE...), you must set the CAN bus baud rate to "250 kBd". This also applies to any CANopen absolute encoders which are connected.

Possible number of system bus participants:

	Decentralised frequency inverters			Centralised frequency inverters			
	SK 1x0E	SK 2xxE	SK 2xxE-FDS	SK 500 - SK 530E	SK 54xE	SK 500P/ SK 510P	SK 530P/ SK 550P
Frequency inverter	4	4	4	8	8	8	8
I/O extensions	8	8	8	-	8	-	8
CANopen absolute encoders	4	4	4	8	8	8	8
Field bus interfaces (SK TU4-...)	1	1	1	1 ¹⁾	1 ¹⁾	1 ²⁾	1 ²⁾
NORDCON PC/ ParameterBox/ NORDCON APP	1	1	1	1	1	1	1

1) A field bus interface (such as SK TU4-PNT) can be connected. But the preferred connection of the devices to the higher level field bus is implemented with a TU3 technology box.

2) A field bus interface (such as SK TU4-PNT) can be connected. Preferably, an SK 550P with integrated field bus interface should be used.

Information

Addressing

Make sure each address is assigned only once. Assigning addresses twice in a CAN-based network can result in data misinterpretation and, consequently, to undefined action in the system.

2.1.1 Physical structure

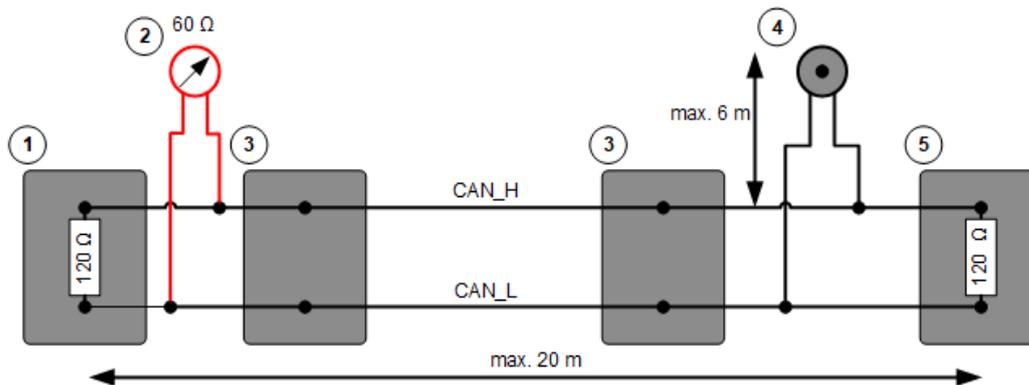


Figure 3: NORD system bus: Physical structure

Item	Description
1	First system bus participant with active terminating resistor (optional module / frequency inverter)
2	Measured resistance CAN_H - CAN_L: 60 Ohms
3	Other system bus participant (optional module / frequency inverter)
4	CANopen absolute encoder on branch line
5	Last system bus participant with active terminating resistor (optional module / frequency inverter)

2.1.1.1 Technical data

Standard	CAN
Cable, specification	2x2, twisted pair, shielded, stranded, cable cross section $\geq 0.25 \text{ mm}^2$ (AWG23), impedance approx. 120Ω
Bus length	Max. overall expansion 20 m Max. 20 m between two participants,
Topology	Preferably line structure
Branch lines	Possible (max. 6 m)
Terminating resistor	120Ω , 250 mW on both ends of the NORD system bus (can be activated with DIP switches)
Baud rate	250 kBd - preset (for SK 54XE, a value of 125 kBd is preset)

Connect the CAN_H and CAN_L signals via a twisted pair of wires. The second pair of wires is used to connect the GND potentials.



NOTICE**Communication errors in the NORD system bus**

To minimise the risk of communication errors, the GND potentials (terminal 40) of all devices in the NORD system bus must be interconnected.

In addition, the bus cable shield must be connected to functional earth on both sides.

**Information****EMC-compliant installation**

Never route the system bus cable in the same cable duct together with energy supply or motor cables. The distance to such cables must be at least 20 cm. The minimum distance can be reduced to 10 cm or 5 cm when separators made of aluminium or iron are used. In this case, however, make sure to provide sufficient earthing of the separator.

System bus and energy cables may cross, but at right angles as far as possible.

Always use shielded cables as system bus cable.

2.1.2 System bus load

Ensure a low bus load when using the system bus. It should be below 70 % where possible. For real time applications, a bus load of 50 % should not be exceeded. The following table contains some bus load guideline values for a baud rate of 250 kBd.

Originator	Bus load	Explanation
Frequency inverter peak load	± 11%	Maximum data transfer of process values and parameters via the PROFIBUS module
CANopen absolute encoders	± 17%	For the cycle time default of 2 ms
CANopen absolute encoders	± 2%	Cycle time of 20 ms. This value is sufficient for many applications.
Broadcast with 8 bytes	± 10%	Bus master cycle time of 5 ms. The control word and 3 setpoints are transferred.
Parametrisation tool (NORDCON, ParameterBox...)	± 4%	Connection of a PC with NORDCON software or a ParameterBox to the system bus.

Table 2: Bus load of individual devices

In most applications, the specified load for frequency inverters is not reached. It is reached only if new setpoints are pending every 10 ms and the setpoints change permanently.

There are two ways of reducing the bus load if bus interference occurs due to a high bus load. You can adjust the cycle of the CAN Master and the CANopen absolute encoder with parameter **P552**. A longer cycle time will reduce the bus load.

A further improvement is possible by increasing the baud rate (parameter **P514**). Please note that this is only possible for a system comprising of frequency inverters and CANopen absolute encoders. Extension modules have a fixed baud rate of 250 kBd.

2.2 Example of SK 5xxP parametrisation via the system bus

You can address several frequency inverters or technology modules with the ParameterBox SK PAR-3H / -3E, the Bluetooth stick NORDAC ACCESS BT or with the NORDCON software. To do so, the communication between the parametrisation tool and the respective devices must be tunnelled via the common NORD system bus.

The following example shows how to set up the parameters of an SK 550P and an SK 500P with the NORDCON software. But this procedure can be easily adapted to other NORD frequency inverters or technology modules. When doing so, make sure to heed the conditions and restrictions of the device in question mentioned in the respective instructions.

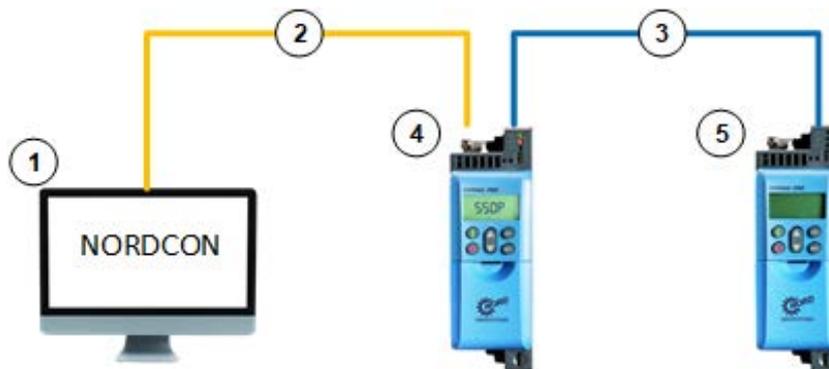


Figure 4: Example: SK 5xxP

Item	Description
1	NORDCON computer
2	Serial connection
3	NORD system bus
4	Frequency inverter SK 550P
5	Frequency inverter SK 500P

Step 1: Physical structure

First, connect terminals X15 of both frequency inverters with each other. This means:

X15-40	GND
X15-76	CAN-
X15-75	CAN+
X15-90	SHD

Table 3: Terminal assignment NORD system bus (CANopen) SK 5XXP

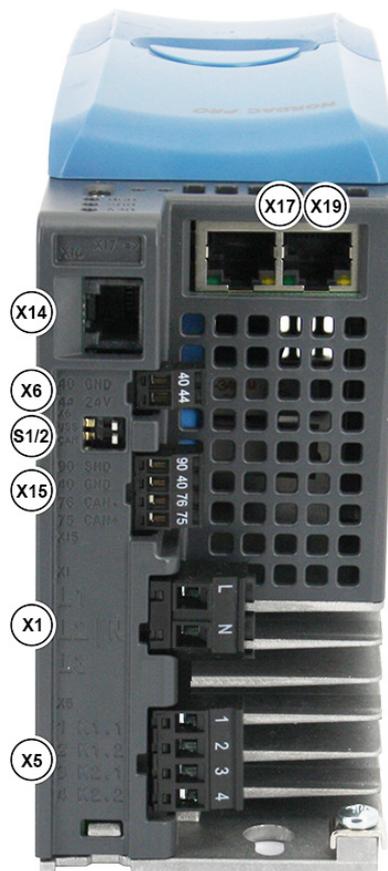


Figure 5: Connector X15

Step 2: Terminating resistors

Then set the terminating resistors of the NORD system bus to ON with DIP switch S2. Make sure to set the terminating resistors to ON only for the first and last physical NORD system bus participant.



Figure 6: Terminating resistor setting

Step 3: Supply of the frequency inverters

To set up frequency inverter parameters, switch on the power supply for the frequency inverters. Then connect your PC to the frequency inverter via the RS232 interface and start the NORDCON software.

Step 4: SK 500P parameter set-up

Start the NORDCON software and go to “Extras / Communication settings” to set up the parameters for the interface in question, then run a bus scan in “Device / Bus Scan”.

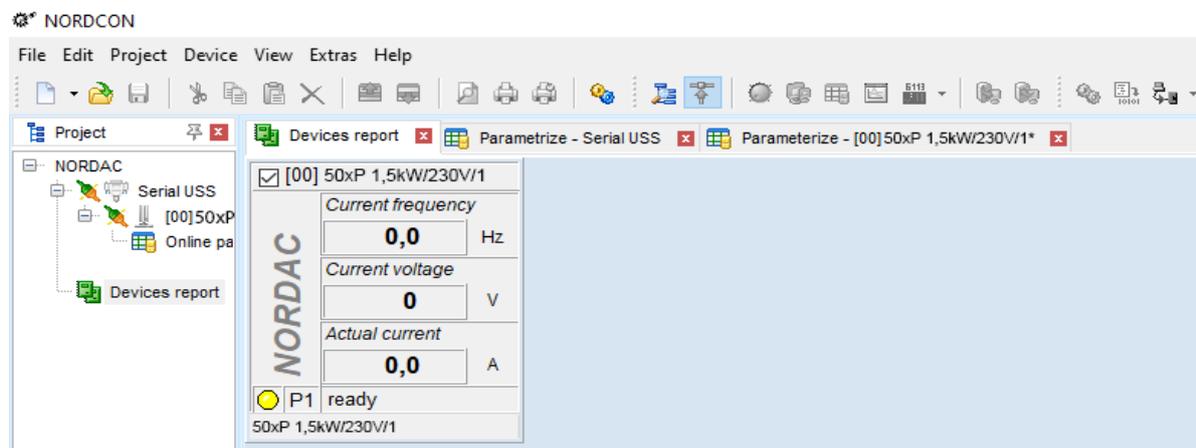


Figure 7: Connecting the PC to an SK 500P

Set the communication parameters as follows in the “Extra functions” tab to enable the NORD system bus:

Parameter No. [array]	Name [unit]	Factory setting	Setting
Extra functions			
P503	Leading func. output	0 (OFF)	0 → 4 (system bus active)
P513 [-03]	Telegram time-out [s] CANopen / CAN	0	0 (do not change)
P514	CAN baud rate [kBd]	5 (250 kBd)	5 (250 kBd), like SK 550P (do not change)
P515 [-01]	CAN bus address Slave address	32	32 (FU1) → 34 (FU2)

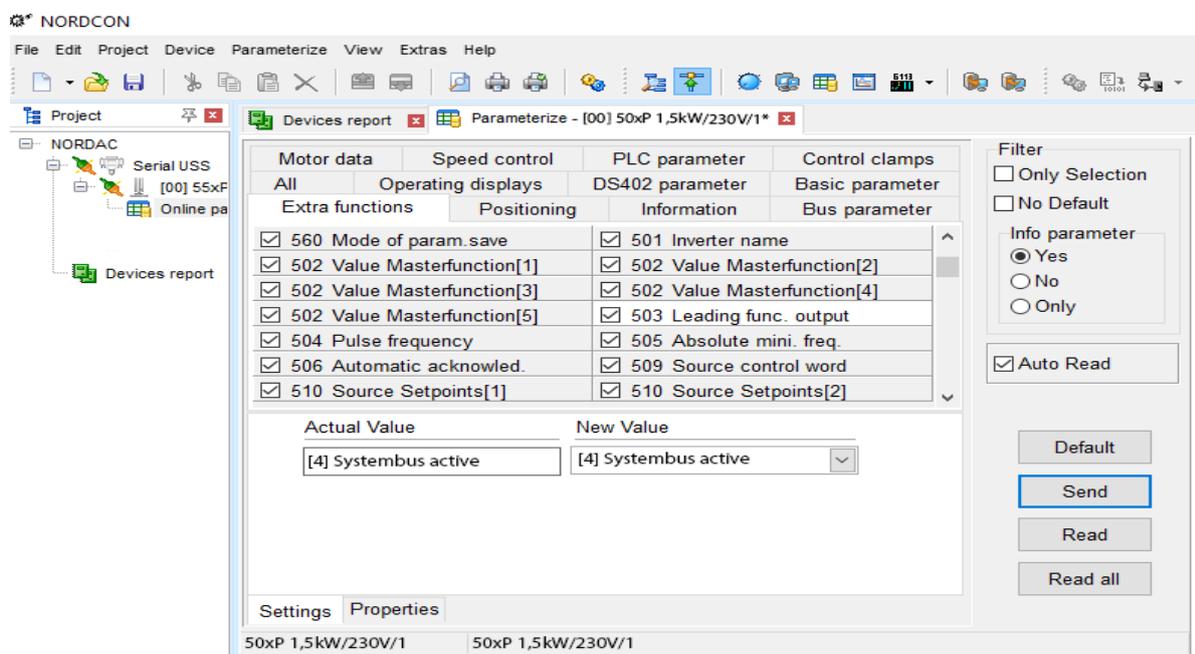


Figure 8: SK 500P parameter set-up

Step 5: SK 550P parameter set-up

When the parameters for the SK 550P frequency inverter have been set up, connect the PC and the SK 550P frequency inverter via the RS232 interface.

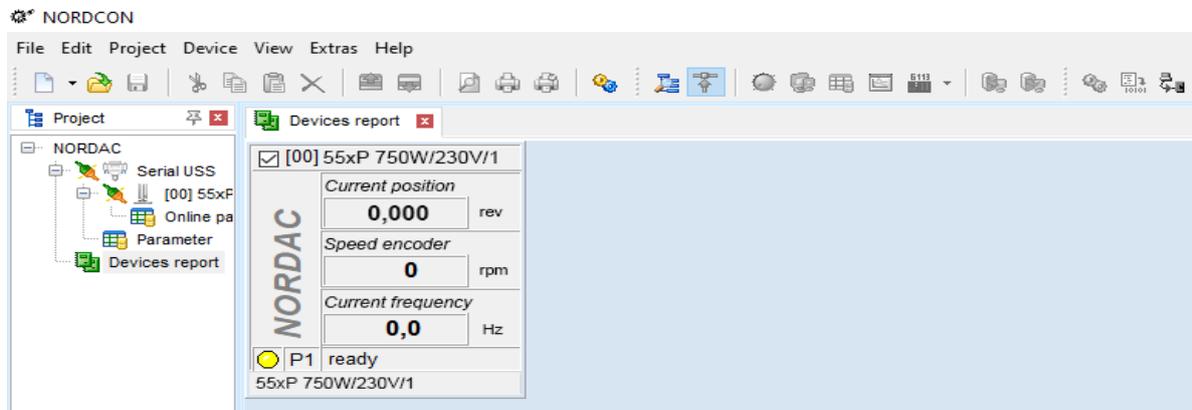


Figure 9: Connecting the PC to an SK 550P

Set the communication parameters as follows in the “Extra functions” tab to also enable the NORD system bus for SK 550P:

Parameter No. [array]	Name [unit]	Factory setting	Setting
			Related to the parameter record (P1, ... , P4)
Extra functions			
P503	Leading func. output	0 (OFF)	0 → 4 (system bus active)
P513 [-03]	Telegram time-out [s] CANopen / CAN	0	0 (do not change)
P514	CAN baud rate [kBd]	5 (250 kBd)	5 (250 kBd), like SK 500P (do not change)
P515 [-01]	CAN bus address Slave address	32	32 (FU1) (do not change)

Step 6: Switching the power supply on and off

Following parametrisation, the frequency inverter must be power cycled to complete the adoption of parameters and to restart the connection to the system bus.

If the PC is connected with the SK 550P, both frequency inverters can be further parameterised and monitored.

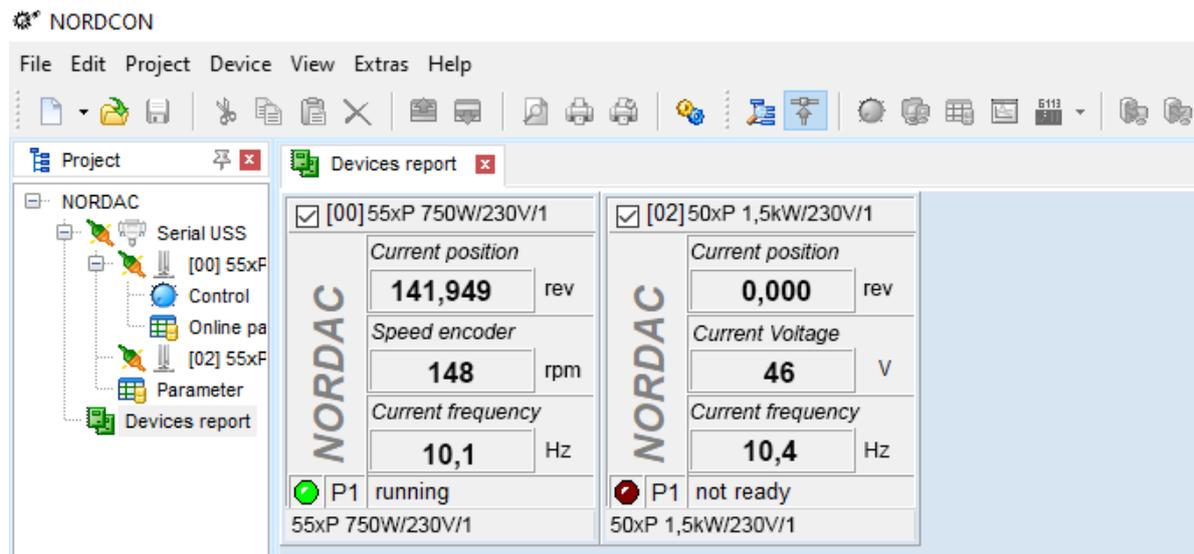


Figure 10: Connecting the PC to an SK 550P after parameterisation

When the PC is connected to the SK 500P, only NORDCON will detect it because the SK 500P does not support NORDCON tunnelling. In this case, the SK 500P parameters cannot be set up.

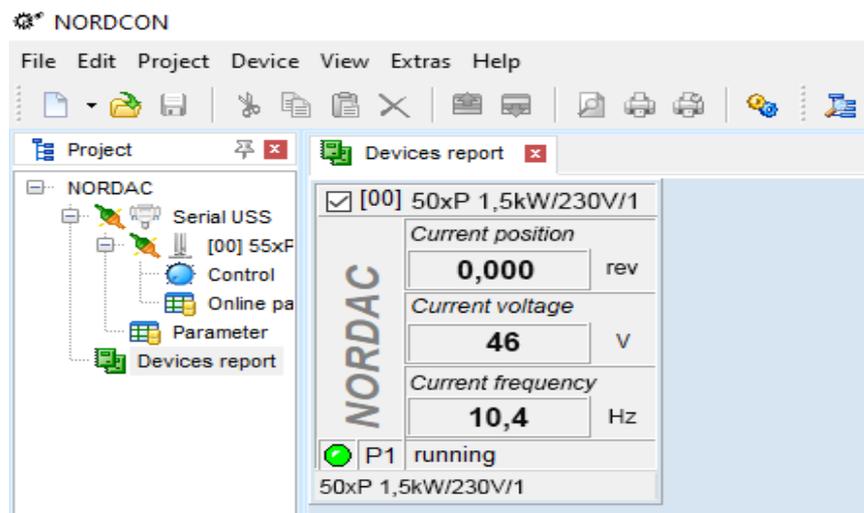


Figure 11: Connecting the PC to an SK 500P after parameterisation

2.3 Field bus gateway to system bus

You can implement a bus interface for connection to the following field bus systems in NORD frequency inverters:

- EtherCAT
- EtherNet/IP
- POWERLINK
- PROFINET IO
- PROFIBUS DP
- DeviceNet
- CANopen

This field bus interface lets you connect several NORD devices with each other and thus integrate them indirectly in a higher level field bus system.

This example shows how to commission an external technology box SK TU4-PNT. In this case, two additional SK 215E frequency inverters are connected to the technology box. In the example, the connection to the higher level control unit is implemented via PROFINET IO, and the setpoint frequencies of both drives are sent over the NORD system bus in addition to the control word. The status word and the actual drive frequency are also to be sent.

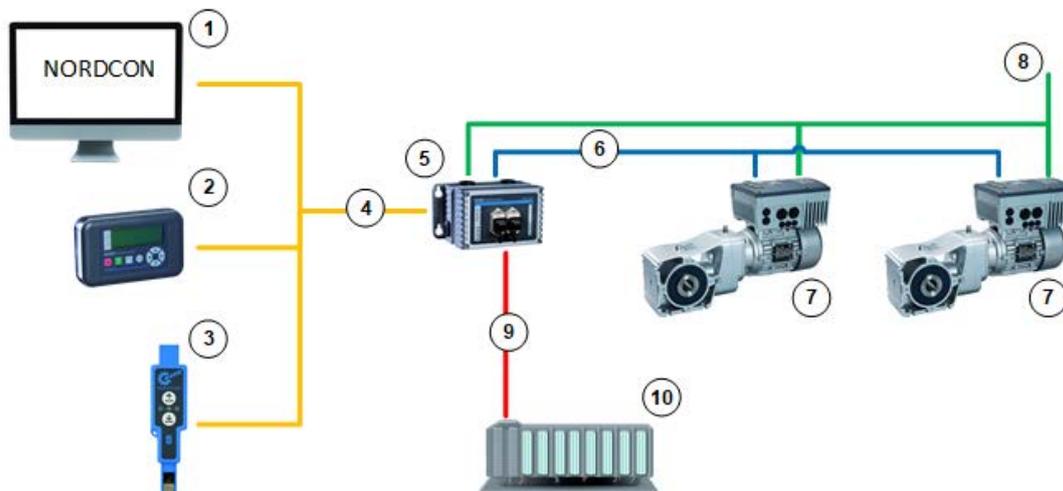


Figure 12: Example: Field bus gateway with system bus

Item	Description
1	NORDCON computer
2	ParameterBox SK PAR-3H / -3E
3	Bluetooth stick NORDAC ACCESS BT
4	Serial connection
5	SK TU4-PNT
6	NORD system bus
7	Frequency inverter SK 215E
8	External 24V power supply
9	PROFINET Ethernet connection
10	Higher level control unit

2.3.1 Procedure of setting up a field bus interface as a gateway

Step 1: Set the termination resistors

First set the termination resistor on the physically first and last bus participant. In this example, the termination resistor at the technology box SK TU4-PNT is set with DIP switch DIP1, and on the second SK 215E with DIP switch S2. DIP switch S2 on the first SK 215E must be set to OFF.



Figure 13: SK TU4-PNT: Set the termination resistor with DIP switch DIP1

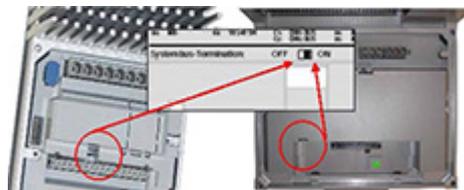


Figure 14: SK 215E: DIP switch S2 setting

Step 2: Pre-settings via DIP switch S1

The SK 215E lets you set addresses, baud rate and the source for the control word/setpoints via DIP switch S1. The example uses the addresses 32 and 34, and a baud rate of 250 kBd. In addition, the source for the control word and the setpoints is to be set to “System bus” by way of the DIP switches. This results in the following settings for both frequency inverters:

Function	DIP	ON	OFF
Int. braking resistor	8	<input type="checkbox"/>	<input type="checkbox"/>
50/60 Hz-operation	7	<input type="checkbox"/>	<input type="checkbox"/>
EEPROM copy	6	<input type="checkbox"/>	<input type="checkbox"/>
I/O via potentiometer	5	<input type="checkbox"/>	<input type="checkbox"/>
I/O via potentiometer	4	<input type="checkbox"/>	<input type="checkbox"/>
Source control word	3	<input type="checkbox"/>	<input type="checkbox"/>
System bus bit 1	2	<input type="checkbox"/>	<input type="checkbox"/>
System bus bit 0	1	<input type="checkbox"/>	<input type="checkbox"/>

Table 4: DIP switch S1 settings on the SK 215E 1 (address 32)

Function	DIP	ON	OFF
Int. braking resistor	8	<input type="checkbox"/>	<input type="checkbox"/>
50/60 Hz-operation	7	<input type="checkbox"/>	<input type="checkbox"/>
EEPROM copy	6	<input type="checkbox"/>	<input type="checkbox"/>
I/O via potentiometer	5	<input type="checkbox"/>	<input type="checkbox"/>
I/O via potentiometer	4	<input type="checkbox"/>	<input type="checkbox"/>
Source control word	3	<input type="checkbox"/>	<input type="checkbox"/>
System bus bit 1	2	<input type="checkbox"/>	<input type="checkbox"/>
System bus bit 0	1	<input type="checkbox"/>	<input type="checkbox"/>

Table 5: DIP switch S1 settings on the SK 215E 2 (address 34)

As an alternative, you can also set the system bus address, the baud rate, and the source for control word/setpoints with the NORDCON software, Bluetooth stick NORDAC ACCESS BT or ParameterBox SK PAR-3H / -3E. To do so, DIP Nos. 1-3 must be set to “OFF”. Refer to the instructions in Step 6.

Step 4: Set up system bus

In the next step, connect bus module SK TU4-PNT for PROFINET IO and the two SK 215E with the external 24 V control voltage supply. The NORD system bus is also set up via the optional M12 system bus connectors.

Step 5: Supply the CAN bus with power

After having checked the cabling, you can supply the devices with the 24 V control voltage.

Step 6: Set the parameters for system bus communication

In this step, you set up the parameters for the two frequency inverters via the NORDCON software, the Bluetooth stick NORDAC *ACCESS BT* or the ParameterBox SK PAR-3H / -3E. To do so, make the following settings on each frequency inverter:

Parameter No. [array]	Name [unit]	Factory setting	Setting
			Related to the parameter record (P1, ... , P4)
Extra functions			
P503	Leading func. output	0 (OFF)	0 → 4 (system bus active)
P512	USS address	0	0 (Auto) (do not change)
P513]]	Telegram time-out [s]	0	0 (Off) (do not change)
P543 [-01]	Bus actual value [1]	0 (OFF)	0 → 1 (actual frequency)
P546 [-01]	Func. bus setpoint [1]	0 (OFF)	0 → e.g. 1 (setpoint frequency)

If the settings were not already made with the DIP switches in Step 2, you must also make changes to the following parameters:

Parameter No. [array]	Name [unit]	Factory setting	Setting
			Related to the parameter record (P1, ... , P4)
Extra functions			
P509	Source control word	0	0 → 3 (system bus)
P510 [-01]	Setpoint source [1]	0	0 (Auto) (do not change)
P510 [-02]	Setpoint source [2]	0	0 (Auto) (do not change)
P514	CAN baud rate [kBd]	5 (250 kBd)	5 (250 kBd) (do not change)
P515 [-01]	CAN address/slave address	32	32 (FU1) → 32(FU1), 32 (FU1) → 34(FU2)

Step 7: Interrupt the CAN bus power supply

To restart the NORD system bus and to adopt the device addresses, switch off the 24 V power supply completely for approx. 30 s and then turn it on again.

Step 8: Set up the field bus communication

Set up the field bus communication in line with the additional instructions  [BU2400](#) for the PROFINET IO bus interface.

Step 9: Enable system bus monitoring

Monitoring of the NORD system bus communication between the frequency inverters and bus module SK TU4-PNT for PROFINET IO is enabled with the following parameter:

Parameter No. [array]	Name [unit]	Factory setting	Setting
Basic parameter			
P120 [-01]	Option monitoring	1	1 (Auto) (do not change)

Step 10: Check the NORD system bus communication

The example ends with a check of the NORD system bus communication. For this purpose, the frequency inverters provide the following parameters:

Parameter No. [array]	Name [unit]	Factory setting	Setting
Information			
P740 [-01]	Bus In process data [1]	0	Control word
P740 [-02]	Bus In process data [2]	0	Setpoint 1
P741 [-01]	Bus Out process data [1]	0	Status word
P742 [-02]	Bus Out process data [2]	0	Actual value 1
P748 [-01]	Status CANopen	0	Status CANopen

For details on each of the values, refer to the pertaining [BU 0200 manual](#).

Step 11: Check field bus communication

To check communication via PROFINET IO, you can set the following parameters of bus module SK TU4-PNT for PROFINET IO. For more details, refer to the additional instructions [BU2400](#) for the PROFINET IO bus interface:

Parameter No. [array]	Name [unit]	Factory setting	Setting
Information			
P173 [-01]+[-02]	Option status	0	Operating state of the bus interface
P176 [-02]	Bus In process data [-02]	0	Control word FU1
P176 [-03]	Bus In process data [-03]	0	Setpoint 1 FU1
P176 [-08]	Bus In process data [-08]	0	Control word FU2
P176 [-09]	Bus In process data [-09]	0	Setpoint 1 FU2
P177 [-02]	Bus Out process data [-02]	0	Status word FU1
P177 [-03]	Bus Out process data [-03]	0	Actual value 1 FU1
P177 [-08]	Bus Out process data [-08]	0	Status word FU2
P177 [-09]	Bus Out process data [-09]	0	Actual value 1 FU2

3 Special features

To benefit from the full range of frequency inverter functions via the NORD system bus, the current software version of the parametrisation tool (NORDCON, NORDAC ACCESS BT, ParameterBox) should be used. The following must also be heeded:

3.1 SK 5xxP

1. To use the ParameterBox, the software version of the ParameterBox must be higher than 4.6 R2.
2. Device variants SK 510P and SK 500P offer only a limited range of system bus functions. For example, it is not possible to set up parameters for other system bus participants when connecting an SK 510P or SK 500P with NORDCON or a ParameterBox. Neither is it possible to connect CU4 or TU4 bus modules (e.g. SK EBIOE-2, TU4-PBR)
3. There are no restrictions to master/slave applications in the system bus cluster via master functions. In this context, every device of the SK 5xxP series can be operated as master or slave.
4. By default, the system bus transmits only three setpoints via the PDO messages. An additional PDO message is generated and setpoints 4 and 5 are transmitted only if the fourth or fifth setpoint is enabled in parameter **P502 [-04]** or **P502 [-05]**. This is to keep the bus load as low as possible and to avoid sending unnecessary messages.
5. A combination of SK 5xxP and SK 5xxE can be configured in the system bus cluster. The SK 550P should preferably be used as master or interface to the Industrial Ethernet network. Make sure the frequency inverters always use the latest firmware.

3.2 SK 5xxE

1. To use the ParameterBox, the software version of the ParameterBox must be higher than 4.5 R3.
2. The first frequency inverter (FU1) must have at least Firmware Version 2.2 R0 (SK 54xE) or 3.0 R0 (all other SK 5xxE devices).
3. To correctly display devices 5...8, all other connected frequency inverters of this series should at least have a Firmware Version 2.1 R0. Devices with Firmware Versions lower than 1.8 R0 do not offer this function.
4. When NORDCON is connected to another frequency inverter than FU1, the status of FU1 will be "not ready". The status of devices 5...8 will also be "not ready" if these devices feature a software version earlier than 2.1 R0.
5. The system bus, and thus also the absolute encoder, can also be connected to a 24 V power supply. We recommend using an RJ45 adapter module.

3.3 Combination SK 5xxP and SK 5xxE

A combination of SK 5xxP and SK 5xxE can be configured in the system bus cluster. The SK 550P should preferably be used as master or interface to the Industrial Ethernet network. Make sure the frequency inverters always use the latest firmware. The particular features of the field bus systems are explained below:

PROFINET IO				
Bus head	SK 550P	SK 550P	SK TU3-PNT	SK TU3-PNT
Frequency inverter 1	SK 550P	SK 550P	SK 5xxE	SK 5xxE
Frequency inverters 2- 8	SK 5xxP	SK 5xxE	SK 530P/550P	SK 510P/500P
NORDCON tunnel via Ethernet	X	X	X	X
Field bus gateway to system bus	X	X	X	X
Note				

EtherCAT				
Bus head	SK 550P	SK 550P	SK TU3-ECT	SK TU3-ECT
Frequency inverter 1	SK 550P	SK 550P	SK 5xxE	SK 5xxE
Frequency inverters 2- 8	SK 5xxP	SK 5xxE	SK 530P/550P	SK 510P/500P
NORDCON tunnel via Ethernet				
Field bus gateway to system bus	X	X*	X*	X*
Note	* The gateway function can only be used with restrictions. Exchanging process data is possible. Exchanging only parameter data does not represent the full range of functions because the device description file does not provide for a combination of SK 5xxP and SK 5xxE.			

Ethernet/IP				
Bus head	SK 550P	SK 550P	SK TU3-EIP	SK TU3-EIP
Frequency inverter 1	SK 550P	SK 550P	SK 5xxE	SK 5xxE
Frequency inverters 2- 8	SK 5xxP	SK 5xxE	SK 530P/550P	SK 510P/500P
NORDCON tunnel via Ethernet	X	X	X	X
Field bus gateway to system bus	X	X	X	X
Note				

Ethernet POWERLINK				
Bus head	SK 550P	SK 550P	SK TU3-POL	SK TU3-POL
Frequency inverter 1	SK 550P	SK 550P	SK 5xxE	SK 5xxE
Frequency inverters 2- 8	SK 5xxP	SK 5xxE	SK 530P/550P	SK 510P/500P
NORDCON tunnel via Ethernet				
Field bus gateway to system bus	X	X	X	X
Note				

3.4 SK 2xxE

1. The system bus, and thus also the absolute encoder, can be supplied from the 24 V power outputs of the frequency inverter.
2. System bus communication is only possible if an extension module is connected to it or if the Master of a Master/Slave system is set to **P503=3** and the Slave to **P503=2**. This is particularly important if several frequency inverters connected to the system bus are to be read out using the NORDCON parameterisation software in parallel.

3.5 SK 2xxE-FDS

1. To integrate devices of the SK 2xxE-FDS type into a system bus, these devices must feature the respective connectors of type SYSS (M7) or SYSM (M5) on option slots M7 and M5 where applicable. The system bus, and thus also the absolute encoder, can be supplied with 24 V power directly via the SYSM connector.
2. System bus communication is only possible if an extension module is connected to it or if the Master of a Master/Slave system is set to **P503=3** and the Slave to **P503=2**. This is particularly important if several frequency inverters connected to the system bus are to be read out using the NORDCON parameterisation software in parallel.

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