

# PowerXL™

## DA1 + DC1 Variable Frequency Drives and DE1 Variable Speed Starters The OP System Bus – Parameterizing – Control



Level 2	<ul style="list-style-type: none"> <li>1 – Fundamental – No previous experience necessary</li> <li>2 – Basic – Basic knowledge recommended</li> <li>3 – Advanced – Reasonable knowledge required</li> <li>4 – Expert – Good experience recommended</li> </ul>
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## Content

Danger! - Dangerous electrical voltage!.....	3
Disclaimer.....	4
General.....	5
Hardware.....	6
Addressing.....	7
Addressing of Variable Frequency Drives and Variable Speed Starters.....	7
Configuration of the keypads DX-KEY-... (Port).....	8
Changing the address of a device with an external keypad DX-KEY-... ..	8
Parameterization and Control.....	9
Selection of a device with a keypad.....	9
Selection of a device with the parameter software drivesConnect.....	9

## Danger! - Dangerous electrical voltage!

- Disconnect the power supply of the device.
- Ensure that devices cannot be accidentally restarted.
- Verify isolation from the supply.
- Cover or enclose any adjacent live components.
- Follow the engineering instructions (AWA/IL) for the device concerned.
- Only suitably qualified personnel in accordance with EN 50110-1/-2 (VDE 0105 Part 100) may work on this device/system.
- Before installation and before touching the device ensure that you are free of electrostatic charge.
- The functional earth (FE, PES) must be connected to the protective earth (PE) or the potential equalization. The system installer is responsible for implementing this connection.
- Connecting cables and signal lines should be installed so that inductive or capacitive interference does not impair the automatic control functions.
- Suitable safety hardware and software measures should be implemented for the I/O interface so that an open circuit on the signal side does not result in undefined states.
- Deviations of the mains voltage from the rated value must not exceed the tolerance limits given in the specification, otherwise this may cause malfunction and/or dangerous operation.
- Emergency stop devices complying with IEC/EN 60204-1 must be effective in all operating modes. Unlatching of the emergency-stop devices must not cause a restart.
- Devices that are designed for mounting in housings or control cabinets must only be operated and controlled after they have been properly installed and with the housing closed.
- Wherever faults may cause injury or material damage, external measures must be implemented to ensure a safe operating state in the event of a fault or malfunction (e.g. by means of separate limit switches, mechanical interlocks etc.).
- Frequency inverters may have hot surfaces during and immediately after operation.
- Removal of the required covers, improper installation or incorrect operation of motor or frequency inverter may destroy the device and may lead to serious injury or damage.
- The applicable national safety regulations and accident prevention recommendations must be applied to all work carried on live frequency inverters.
- The electrical installation must be carried out in accordance with the relevant electrical regulations (e. g. with regard to cable cross sections, fuses, PE).
- Transport, installation, commissioning and maintenance work must be carried out only by qualified personnel (IEC 60364, HD 384 and national occupational safety regulations).
- Installations containing frequency inverters must be provided with additional monitoring and protective devices in accordance with the applicable safety regulations. Modifications to the frequency inverters using the operating software are permitted.
- All covers and doors must be kept closed during operation.
- To reduce the hazards for people or equipment, the user must include in the machine design measures that restrict the consequences of a malfunction or failure of the frequency inverter (increased motor speed or sudden standstill of motor). These measures include:
  - Other independent devices for monitoring safety related variables (speed, travel, end positions etc.).
  - Electrical or non-electrical system-wide measures (electrical or mechanical interlocks).
  - Never touch live parts or cable connections of the frequency inverter after it has been disconnected from the power supply. Due to the charge in the capacitors, these parts may still be alive after disconnection. Consider appropriate warning signs.

## Disclaimer

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## General

All devices of the series DA1, DC1 and DE1 use the internal OP System Bus for parameterization and for the control with an external keypad.

The OP System Bus works with a fixed baud rate. A bus termination resistor is not needed.

This Application Note describes

- the structure of the hardware
- the bus configuration
- the handling at parameterization and control

## Hardware

Devices of the series DA1, DC1 and DE1 have an 8-pole RJ45 jack for communication of the devices on the front. Depending on the type of series, connections for different bus protocols are available. One of these protocols is the OP System Bus, which connects the devices among themselves, but also with other units like PCs (for parameterization with the parameter software drivesConnect) and keypads.

All participants can be arranged arbitrary. A bus termination resistor for the OP System Bus is not required. For connections patch cables and splitters (where required) are used.

Patch cable: DX-CBL-RJ45-xxx (xxx represents the cable length)

Splitter: DX-SPL-RJ45-3SL (8-pole, 3 jacks)

DX-SPL-RJ45-2SL1PL (8-pole, 2 jacks, 1 plug)

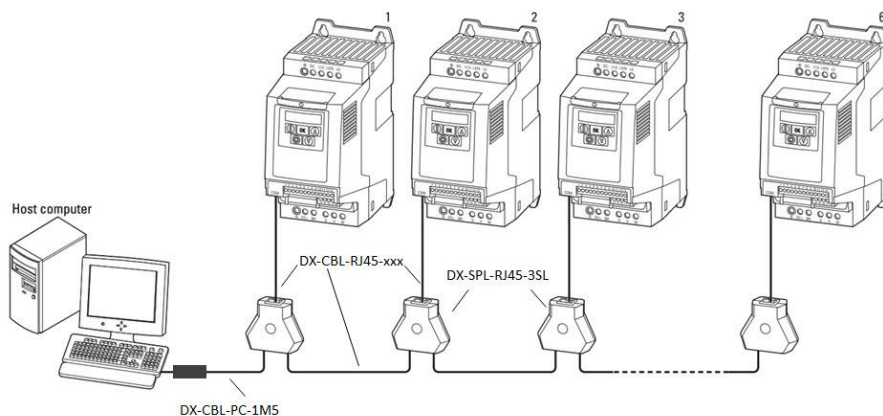
PC connection: DX-CBL-PC-1M5

Layout of the RJ45 jack:

RJ45	PIN	Configuration
	1	CAN-
	2	CAN+
	3	0 V
	4	OP Bus
	5	OP Bus
	6	24 V DC power supply for the keypads connected to the OP Systembus
	7	RS485- Modbus RTU
	8	RS485+ Modbus RTU

Please note, that the reference points (0 V) of all units at the bus are connected together. The connecting cable to the PC contains a conversion of the OP System Bus to USB as well as a galvanical separation between the bus and the USB port at the PC.

Typical configuration (example with devices of the series DA1):



## Addressing

Up to 63 participants can be connected to the OP System Bus, whereat communication can only take place simultaneously between a keypad DX-KEY-... and one drive or between a PC and one drive. With which drive the communication takes place, determines its address. It has to be unique inside the complete system.

The addressing can be done arbitrary, that means, that a consecutive numbering is not necessary. When using the series DA1 with speed control according the master and slave principle, the master drive **MUST** have the address "1" (see further below).

The devices must be addressed already before they are connected to the OP System Bus for the first time. Keypads DX-KEY-... don't need an address at the OP System Bus. It has to be noted, that in cases where two keypads are connected at the same bus, they have to be configured for different ports (see below "Configuration of the keypads DX-KEY-... (Port)"). A PC which is potentially used for parameterization or display, doesn't need to be addressed either.

### Addressing of Variable Frequency Drives and Variable Speed Starters

By default, devices of the series DA1, DC1 and DE1 are configured for address „1“. This setting doesn't have to be changed as long as there is only one device at the bus, e.g. for the parameterization of a Variable Speed Starter DE1 in connection with DX-KEY-LED. In case there are multiple devices at the same OP System Bus, they have to have unique addresses. The address can be set with a parameter:

PNU	Parameter	Name	Range	Default
918.0	DA1: P5-01	PDP-Address	1 ...63	1
	DC1: P-36			
	DE1: P-34			

Each address may exist only once. In case the OP System Bus is used for master-slave-operation of multiple devices DA1, the address of the master **MUST** be "1". The addresses of the slaves are arbitrary in the range of 2 ... 63.

The addressing has to be done **BEFORE** a connection to the OP System Bus. At devices of the series DA1 and DC1, one can use the inbuilt keypad. At DE1 the addressing is done via an external keypad DX-KEY-LED or with the parameter software drivesConnect.

Please note, that the parameter „PDP Address“ also determines the address at other fieldbuses (e.g. Modbus, CAN, Profibus, Devicenet ...) which are possibly connected to the devices. Exceptions are SmartWireDT and Ethernet based busses, e.g. Profinet.

## Configuration of the keypads DX-KEY-... (Port)

Up to two keypads DX-KEY-... can be connected to the OP System Bus. In case only one keypad is used, no configuration is necessary.

With two keypads it has to be secured, that they work with different ports. By default, all keypads DX-KEY-... are configured for Port „1“. The conversion to Port „2“ has to be done as follows:

- Press **OK** and hold it
- Press **STOP** and ▼ at the same time. Display: *Port- 1*
- Select required port with ▲ resp. ▼
- Press **OK** and hold it
- Press **STOP** and ▼ at the same time.
- The port of the keypad is now set.

## Changing the address of a device with an external keypad DX-KEY-...

It is also possible to change the address of a connected device with an external keypad DX-KEY-...

- Press **STOP** and ▼ at the same time. Display: *Adr-xx* (xx represents the address the keypad was connected to last time, e.g. *Adr-04* for address 4)
- Select the required device with the keypad (see „Selection of a device with a keypad“)
- Select parameter „PDP-Address“ and prompt new address.
- Because of the new address, the communication between the keypad and the device gets lost. Display: *Err-5c*
- Press **STOP**. The previous address will be displayed, e.g. *Adr-04*
- Select the desired (new) address with ▲ resp. ▼
- Press **STOP** and ▼ at the same time.
- The communication is now re-established.



## Parameterization and Control

The devices, which are connected to an OP System Bus, can be parameterized and controlled with the keypads and the parameter software drivesConnect.

### Selection of a device with a keypad

The keypad can only communicate with one device at the same time (no broadcast). For communication, the address of the device has to be selected (see “Addressing of Variable Frequency Drives and Variable Speed Starters”):

- Press **STOP** and **▼** at the same time. Display: *Adr-xx* (xx represents the address the keypad was connected to last time, e.g. *Adr-04* for address 4)
- Select required address with **▲** resp. **▼**
- Press **STOP** and **▼** at the same time.
- The keypad searches the selected address inside the network. Display: *ScAn*
  - In case the address exists, *LoAd* is displayed and afterwards *StoP*. The keypad communicated with the device under the selected address.
  - In case the address doesn't exist, *Adr-xx* is displayed (xx represents the latest preselected address, the keypad has communicated with). Select the right address and try again.

Hint: Keypads DX-KEY-... store the address of the latest communication. Is the stored address different to the one of the connected device *Adr-xx* is displayed (xx represents the latest preselected address, the keypad has communicated with). In this case, select the address of the connected device with the keypad. In default this address is “1”. If the address of the device was changed before, the actual value can be seen inside the parameter software drivesConnect and at devices of the series DA1 and DC1 on the keypad at the device itself. The latter is not possible with Variable Speed Starters DE1.

### Selection of a device with the parameter software drivesConnect

The selection of the device, with which a communication has to be established, is done in Real-Time Edit Mode by clicking on the respective field on the left hand side. The device is displayed in green. In the example below it is a device of the series DE1 at address 5.

