PowerXL™

drivesConnect
Parameter Configuration Program for PowerXL™ Variable Frequency Drives



Powering Business Worldwide

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Original Operating Instructions
The German-language edition of this document is the original operating manual.

Translation of the original operating manual
All editions of this document other than those in German language are translations of the original German manual.

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Danger!
Dangerous electrical voltage!

Before commencing the installation

- Disconnect the power supply of the device.
- Ensure that devices cannot be accidentally restarted.
- Verify isolation from the supply.
- Earth and short circuit the device.
- 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 equalisation. 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 automation functions.
- Install automation devices and related operating elements in such a way that they are well protected against unintentional operation.
- 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 in the automation devices.
- Ensure a reliable electrical isolation of the extra-low voltage of the 24 V supply. Only use power supply units complying with IEC 60364-4-41 (VDE 0100 Part 410) or HD384.4.41 S2.
- Deviations of the mains voltage from the rated value must not exceed the tolerance limits given in the specifications, otherwise this may cause malfunction and dangerous operation.
- Emergency stop devices complying with IEC/EN 60204-1 must be effective in all operating modes of the automation devices. Unlatching 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 installed and with the housing closed. Desktop or portable units must only be operated and controlled in enclosed housings.
- Measures should be taken to ensure the proper restart of programs interrupted after a voltage dip or failure. This should not cause dangerous operating states even for a short time. If necessary, emergency-stop devices should be implemented.
- Wherever faults in the automation system 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 (for example, by means of separate limit switches, mechanical interlocks etc.).
- Depending on their degree of protection, frequency inverters may contain live bright metal parts, moving or rotating components or hot surfaces during and immediately after operation.
- Removal of the required covers, improper installation or incorrect operation of motor or frequency inverter may cause the failure of the device and may lead to serious injury or damage.
- The applicable national accident prevention and safety regulations apply to all work carried on live frequency inverters.
- The electrical installation must be carried out in accordance with the relevant 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 drive (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 live after disconnection. Fit appropriate warning signs.

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0 General

0.1 Purpose of this document

This document explains how to use the drivesConnect parameter configuration program.

The drivesConnect program can be used to control, set the parameters, and commission DC1 and DA1 variable frequency drives.

The program has four main components:

- Parameter Editor
- Drive Control / Monitor
- Function Block Editor
- Scope / Data Logger



Figure 1: Main drivesConnect components on start screen

Note on naming convention used throughout the program: Whenever a screenshot has the word "drive" in it, it is being used to refer to a variable frequency drive.

0.2 Main components

To access the various main components, simply click on the corresponding line on the start screen (→ Figure 1).

You can also switch between the components using the toolbar or the **Tools** menu.

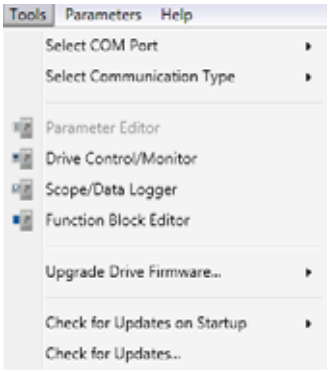


Figure 2: Components shown in the "Tools" menu

The quickest way to switch between the individual components is to use the toolbar.



Figure 3: Quick access to components

The icons on the toolbar follow general Windows standards.

If an icon is grayed out, this means that the corresponding application function is not available at the moment.

Example (Undo/Redo)



Figure 4: Example: Available (left) and not available (right)

→ The dialogs and examples in this document are standardized. Depending on selection of the controller type therefore dialogs can differ.

0.3 Writing conventions

Symbols used in this manual have the following meanings:

▶ Indicates instructions to be followed.

0.3.1 Hazard warnings of material damages

NOTICE

Warns about the possibility of material damage.

0.3.2 Hazard warnings of personal injury



CAUTION

Warns of the possibility of hazardous situations that may possibly cause slight injury.



WARNING

Warns of the possibility of hazardous situations that could result in serious injury or even death.



DANGER

Warns of hazardous situations that result in serious injury or death.

0.3.3 Tips



Indicates useful tips.

0.4 Comments about this document

Please send any comments, recommendations or suggestions relating to this document to ICDDrives@eaton.com.

0.5 Additional reference documents

The following documents may also come in handy.

Theme	Document
Basic device (variable frequency drive)	
DA1 manual	MN04020005Z
instruction leaflet DA1 IP20	IL04020010Z
instruction leaflet DA1 IP55	IL04020011Z
instruction leaflet DA1 IP66	IL04020015Z
DC1 manual	MN04020003Z
instruction leaflet DC1 IP20	IL04020009Z
instruction leaflet for IP20 DC1 for AC motors	IL04020014Z
instruction leaflet DC1 IP66	IL04020013Z
instruction leaflet for IP66 DC1 for AC motors	IL040001ZU
Accessories	
instruction leaflet for RJ45 cable and splitter	IL04012023Z
instruction leaflet DX-COM-PCKIT	IL04012022Z
instruction leaflet DX-CBL-PC-1M5	IL040002ZU
instruction leaflet DX-COM-SOFT	IL04012012Z
instruction leaflet DX-COM-STICK	IL04012021Z

For more information, please visit www.eaton.eu.

1 Installation

1.1 System requirements



You will need an Internet connection in order to be able to install the drivesConnect program.

For offline installation, you can click on the **drivesConnect software download** link on our website in order to download the latest version of the pct_…[date] ZIP file.

To start installing the program, unzip the ZIP file and run the setup.exe file.

drivesConnect is programmed to run on Windows operating systems.

- Windows 7,
- Windows XP.

Older Windows operating systems are not supported.

1.2 Installation types

If your computer meets the above system requirements, there will be a number of ways to install the drivesConnect program:

- From a CD-ROM (included with DC1 and DA1 variable frequency drives)
- Through the Internet (www.eaton.eu)
- With a DX-COM-SOFT license key (USB dongle)

1.2.1 Installing the program using the product CD

The drivesConnect program can be installed from the product CD.



This product CD is included with DC1 and DA1 variable frequency drives.

As of this writing, there are two languages available (German and English).

Provided that your Windows system is configured accordingly, the CD-ROM will start by showing its contents. After you insert the product CD, the Windows screen shown in figure 5 will be opened in order to show the data storage medium's contents.

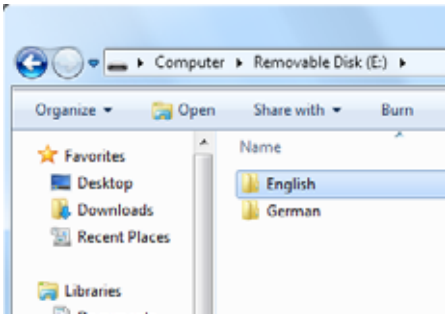


Figure 5: Storage device screen in Windows

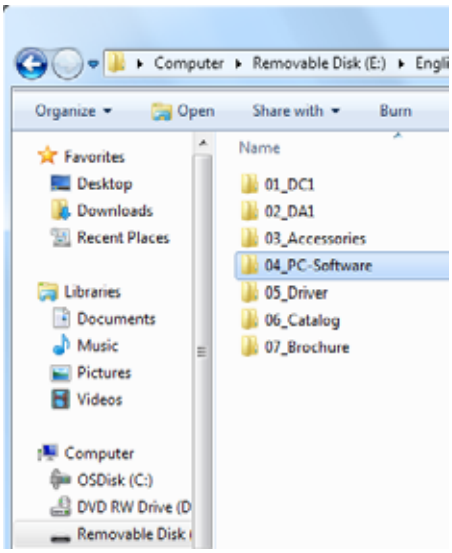


Figure 6: Storage medium contents
(this screenshot shows the contents found in the “German” folder)

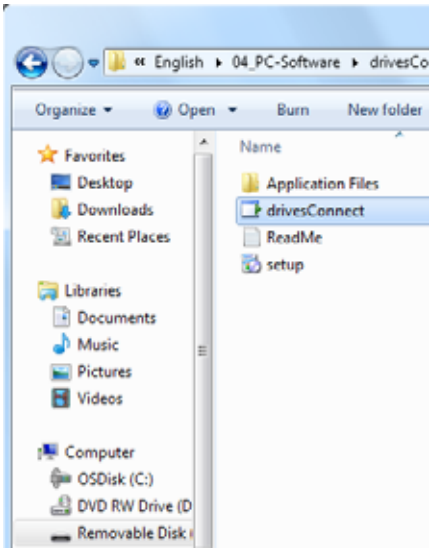


Figure 7: Running drivesConnect

Open the **04_PC-Software** folder and then run the drivesConnect file to install the program.

▶ An "Application Install – Security Warning" prompt will appear. Confirm by clicking on **Install**.

Once the software is installed and you open it, you will be asked to accept the terms of the license agreement.

▶ To do so, click on the **Accept** button.

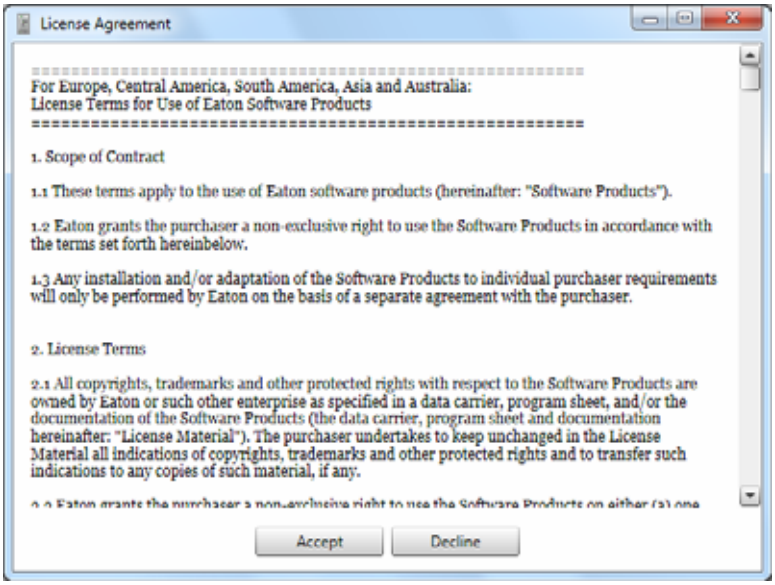


Figure 8: Accepting the license agreement

▶ Then click on **OK** when the following message appears:

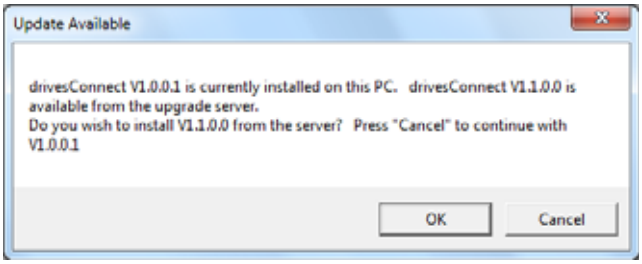


Figure 9: Confirming the installation prompt

Once the installation routine is complete, the start screen will appear again.

1.2.2 Installing the program through the Internet

You can also download the drivesConnect parameter configuration program at www.eaton.eu.

To do so, start from the homepage and click on the following in order to get to the download area:

→ Products & Services

→ **Electrical**

→ **Automation & Control**

→ **Switching, protecting and driving motors**

→ **PowerXL™ variable frequency drives**

→ **DC1 Compact variable frequency drive** or **DA1 Advanced variable frequency drive**

→ **Software**

You will get to the following page:



Figure 10:Webpage where the drivesConnect program can be downloaded
① Offline installation
② Online installation

Alternatively, you can use the following link to get to the download page directly.

http://www.eaton.eu/DE/Europe/Electrical/ProductsServices/AutomationControl/SwitchingProtectingDrivingMotors/PowerXLfrequencydrives/DC1Compactdrives/index.htm#tabs-3

▶ Click on **drivesConnect software online installation** (②) to start the installation.

The following window will appear:



Figure 11: Online installation start screen

First, start the download:

- ▶ To do so, click on **Install drivesConnect**.
  If Windows Installer 3.1 and .NET Framework 3.5 SP1 are not installed on your computer, you will have to install them first. To do so, click on **Install components** and, once these two required components have been installed, click on **Install drivesConnect**.
- ▶ An "Application Install – Security Warning" prompt will appear. Confirm by clicking on the **Install** button.

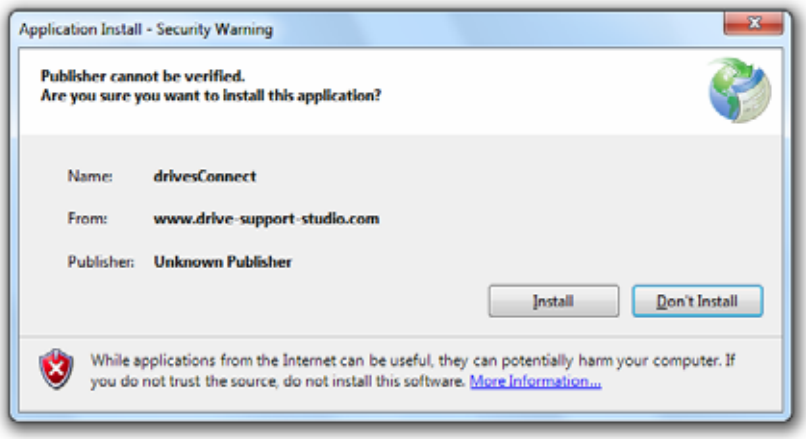


Figure 12: Confirming the prompt

Once the installation is complete, the start screen in → Figure 1 will open.

1.2.3 Installing the program using DX-COM-SOFT

You can also install drivesConnect using the DX-COM-SOFT USB dongle. The procedure is the same as that for the product CD described above.

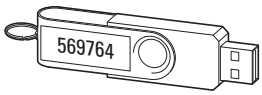


Figure 13: DX-COM-SOFT with license number

→ Section 6.1, "Licensing" provides detailed information regarding the licensing model.

1.3 Language Selection

The language used for the drivesConnect user interface will be the same as the one you have configured for Windows.

As of this writing, parameter descriptions and help texts can be displayed in German or English.

The installation routine for the drivesConnect program is exclusively in English.

In order to select a language, follow the steps below:

- Open the Windows **Control Panel** and click on **Clock, Language, and Region**.
- Open the **Formats** tab and select the language you want.

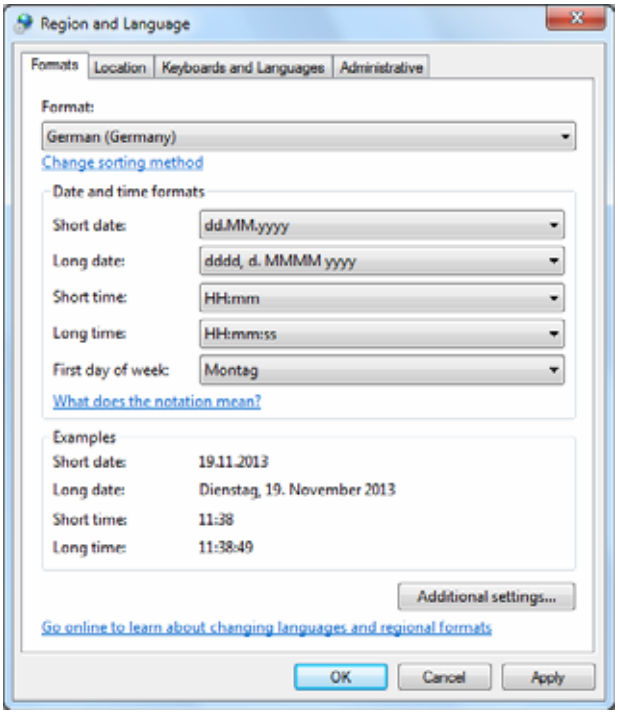


Figure 14: Selecting a language in Windows

To apply the new language setting, you will have to restart the program.

If, for example, you switch to English as the language for the user interface, the following start screen will appear when you restart the computer:



Figure 15: The start screen in English

1.4 Uninstalling

When you uninstall the program, the files and components installed by drivesConnect will be removed from your computer. If necessary, you may have to delete certain files and folders from the "Programming system" folder manually after the uninstall routine is complete.
To uninstall the drivesConnect program, follow the steps below:

- ▶ Open the Windows **Control Panel** and, under **Programs**, click on **Uninstall or change a program**.
- ▶ Select the drivesConnect program and click on **Uninstall/Change**.

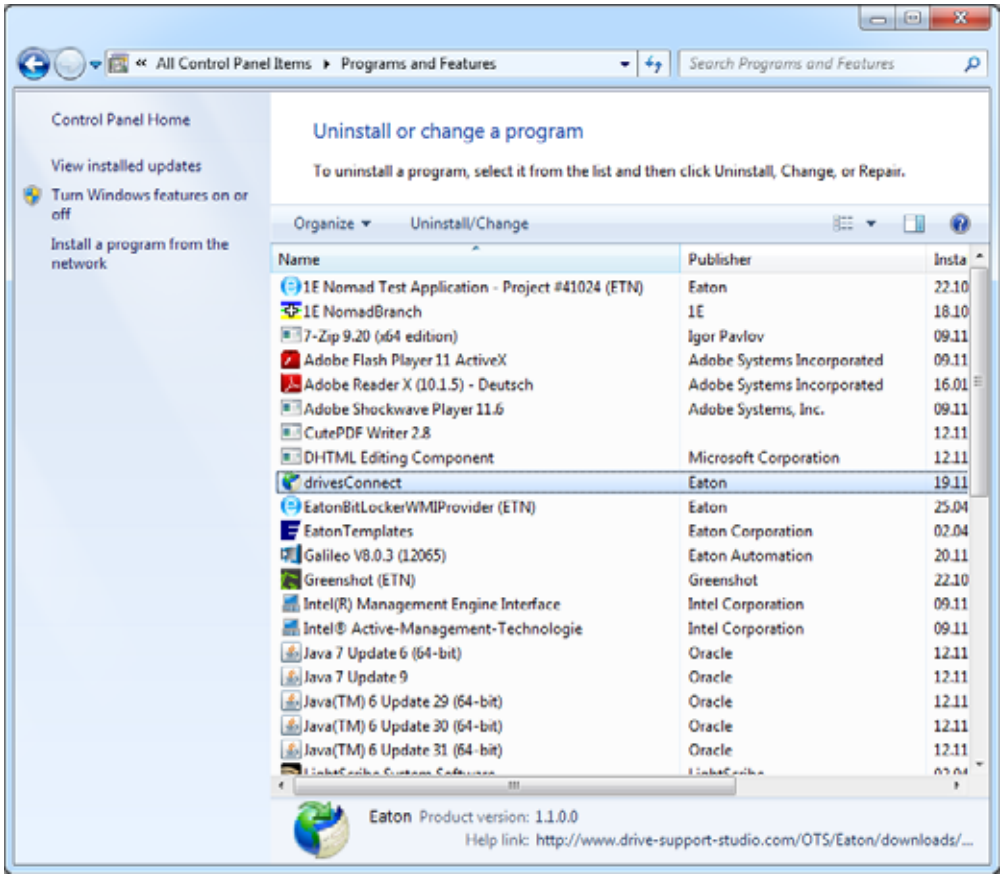


Figure 16: Uninstalling drivesConnect

- ▶ Select **Remove the application from this computer** and click on **OK**.

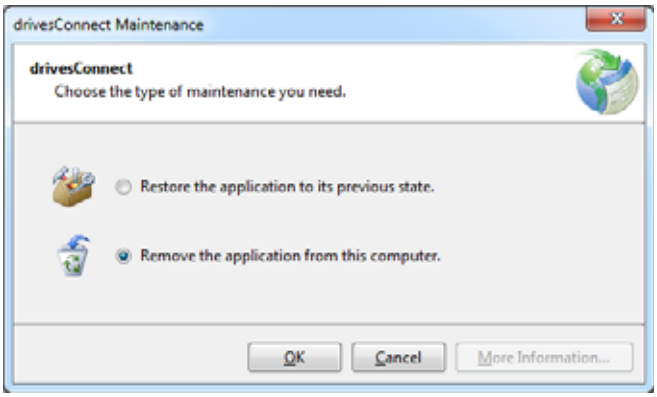


Figure 17: Starting the uninstall process

2 Establishing communications

In order to be able to establish communications between a computer with drivesConnect and a DC1 or DA1 variable frequency drive, you will need to use one of the following to establish a connection:

- DX-CBL-PC-1M5 (interface converter)
- DX-COM-PCKIT (interface converter) or
- DX-COM-STICK (Bluetooth communications stick).

> *NOTICE*
>
> The RJ45 port on DC1 and DA1 variable frequency drives must not be connected to a computer without using potential isolation.

2.1 Interface converter

2.1.1 DX-CBL-PC-1M5

DX-CBL-PC-1M5 is a 1.5 m-long connection cable with potential isolation, an RJ45 plug , and a USB plug (A-type).

→ For more information and technical data on the DX-CBL-PC-1M5 interface converter, please consult instruction leaflet IL040002ZU.

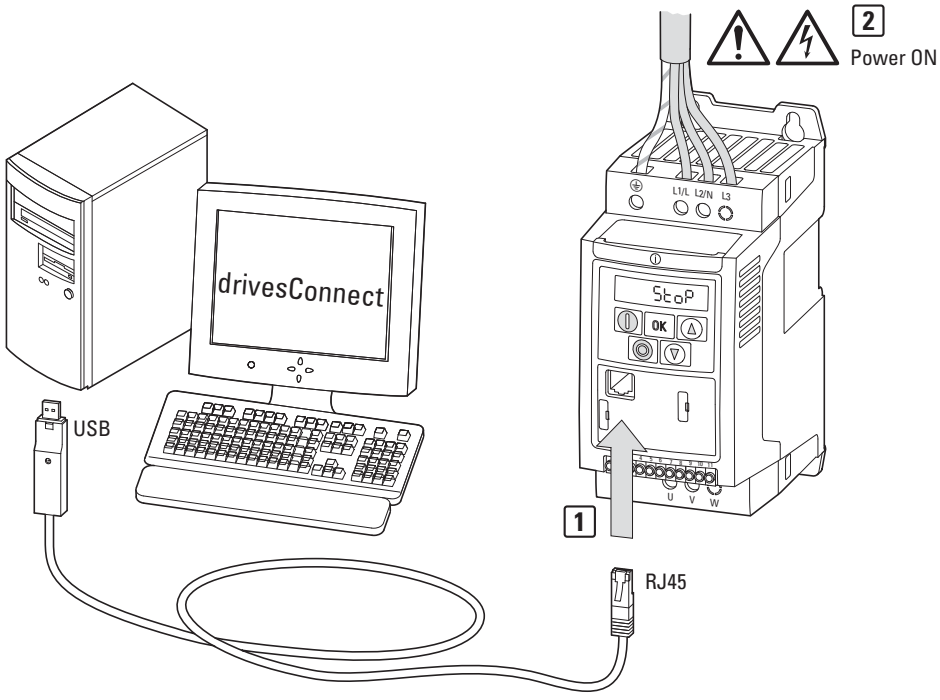


Figure 18: DX-CBL-PC-1M5 in conjunction with a DC1 variable frequency drive

2.1.2 DX-COM-PCKIT

DX-COM-PCKIT is a galvanically isolated interface converter meant for installing DC1 and DA1 variable frequency drives in a control panel.

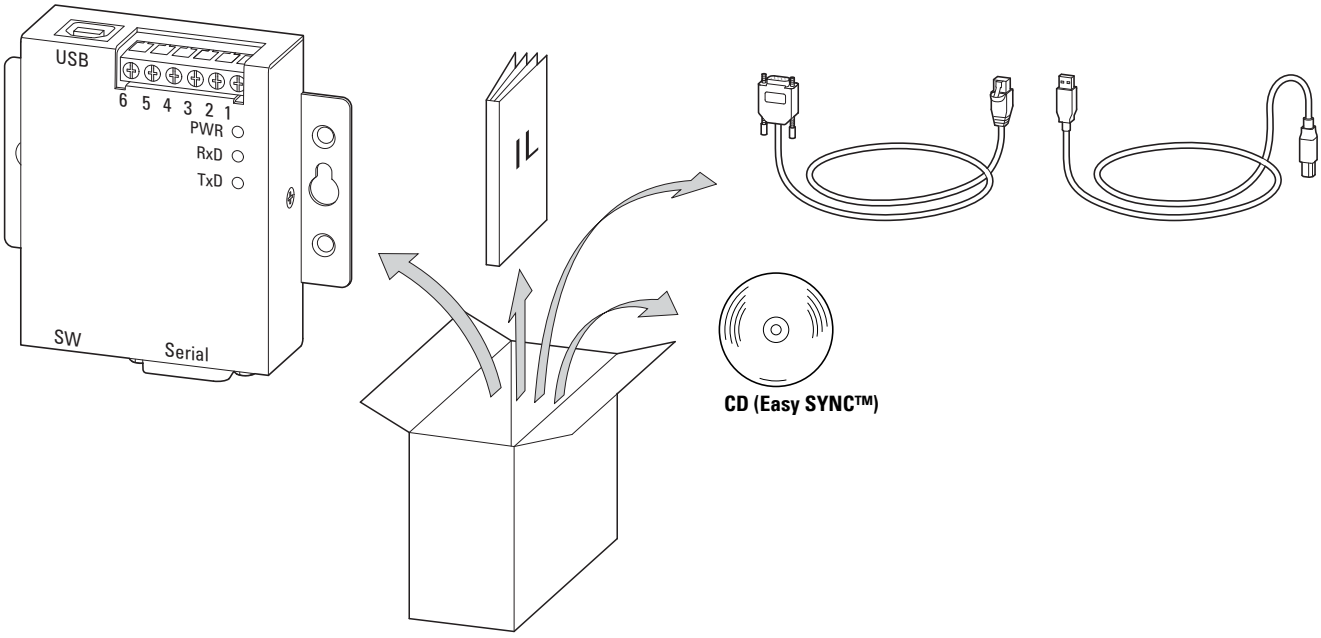


Figure 19: Equipment supplied DX-COM-PCKIT

DX-COM-PCKIT comes with the following interfaces:

- RS-422/485 (9-pin D-sub socket)
- 6-pin screw terminals
- USB socket (B-type)

The equipment supplied includes two connection cables: one with an A-type USB plug and a B-type USB plug and one with a 9-pin D-sub plug and an RJ45 plug.

→ For more information and technical data on the DX-COM-PCKIT interface converter, please consult instruction leaflet IL04012022Z.

2.1.3 DX-COM-STICK

The DX-COM-STICK Bluetooth communication stick can be used to connect to a computer with drivesConnect via Bluetooth.

In the case of DC1 and DA1 variable frequency drives, the stick is plugged into the drives' RJ45 socket.

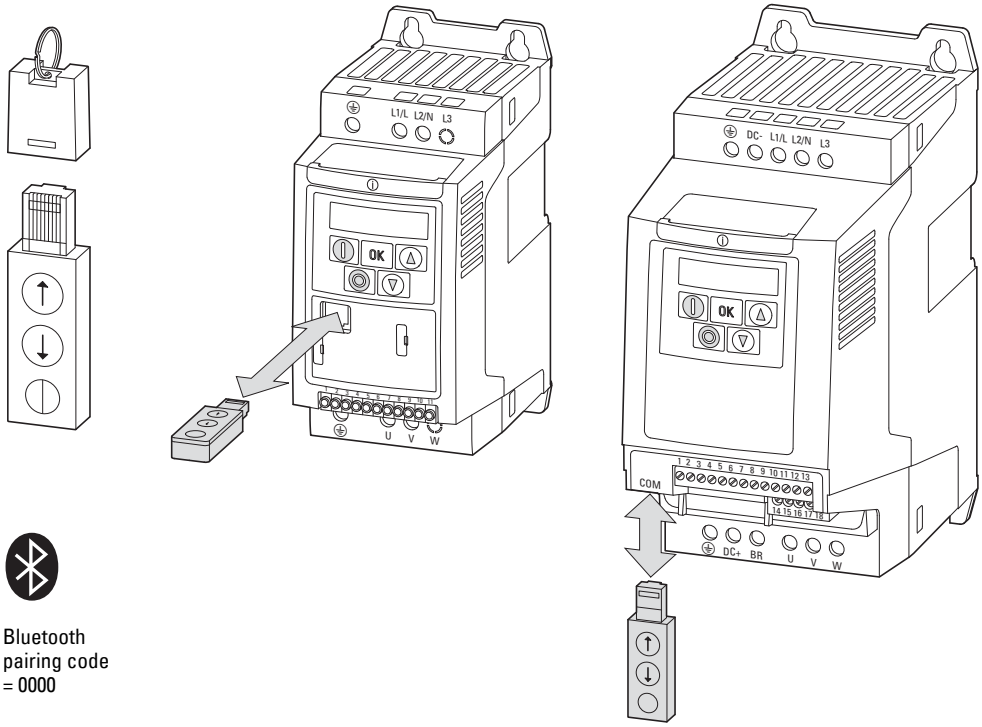


Figure 20: Slot for DX-COM-STICK in DC1 and DA1 variable frequency drives

NOTICE

The DX-COM-STICK Bluetooth communication stick is not designed for continuous operation!
Vibrations and shock may cause data transfers to be interrupted.

→ For more information and technical data on the DX-COM-STICK Bluetooth communication stick, please consult instruction leaflet IL04012021Z.

2.2 Operating conditions

2.2.1 DC1 variable frequency drive

In order to be able to communicate with the drivesConnect program, DC1 variable frequency drives must be powered with the specified supply voltage.

Follow the applicable installation instructions and descriptions listed below:

- DC1-1D…, DC1-12…, DC1-32…, DC1-34…:
  instruction leaflet IL0402009Z, manual MN04020003Z
- DC1-S1…, DC1-S2… (single-phase motors):
  instruction leaflet IL04020014Z, manual MN04020004Z
- DC1-…A6xN (IP66 degree of protection):
  instruction leaflet IL04020013Z, manual MN04020003Z



To run the variable frequency drive with its factory configuration (via control terminals), you will need to connect terminal 1 (+24 V) to terminal 2 (FWD enable) or terminal 3 (REV enable).



In the case of devices with an IP66 degree of protection and local controls (DC1-…-A6SN), this connection is established using the FWD/REV selector switch. In the case of variable frequency drives for single-phase motors (DC1-S…), the enable signal is sent exclusively via terminal 1.

The required steps are described in manual MN04020003Z.



If you want to use the DC1 variable frequency drive's operating unit for control purposes, you will have to change the factory parameter settings with which the drive ships.

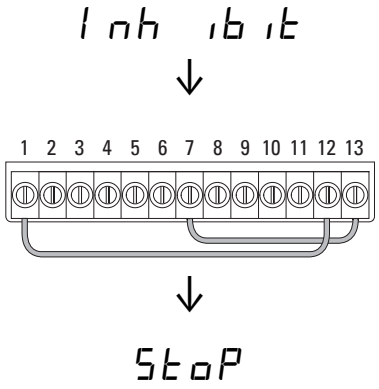
2.2.2 DA1 variable frequency drives

In order to be able to communicate with the drivesConnect program, DA1 variable frequency drives must be powered with the specified supply voltage. Alternatively, communication with the DA1 unit's control section is also possible using an external 24 V DC voltage (100 mA) (positive output connected to terminal 1, negative output connected to terminal 7).

Follow the applicable installation instructions and descriptions listed below:

- DA1-…-A20…:
  instruction leaflet IL04020010Z, manual MN04020005Z,
- DA1-…-A55…:
  instruction leaflet IL04020011Z, manual MN04020005Z,
- DA1-…-A6x…:
  instruction leaflet IL04020015Z, manual MN04020005Z.

In DA1 variable frequency drives, control terminals 12 (STO+) and 13 (STO-) always have to be connected to the control voltage potential (+24 V on 1 to 12, 0 V to 7 and 13). This connection arrangement is required at all control levels.



2.3 Enabling the communication port

Depending on the specific way your computer or Windows operating system is configured, it may be necessary for you to enable the ports on the computer (COM port) or update their drivers for the interface converter.

The port drivers are included on the enclosed CD and can also be downloaded from the Internet.

You can open the **Tools** menu in the drivesConnect program, select the COM port you will be using on the computer, and enable it:

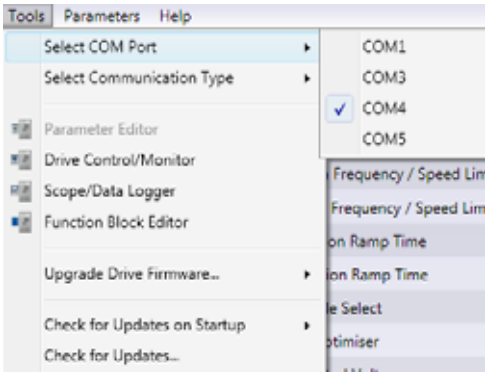


Figure 21: Selecting a COM interface

If you are using a DX-CBL-PC-1M5 or DX-COM-PCKIT interface converter, select **RS485** for **Select Communication Type.** If you are using a DX-COM-STICK Bluetooth communication stick, select **BlueTooth**.

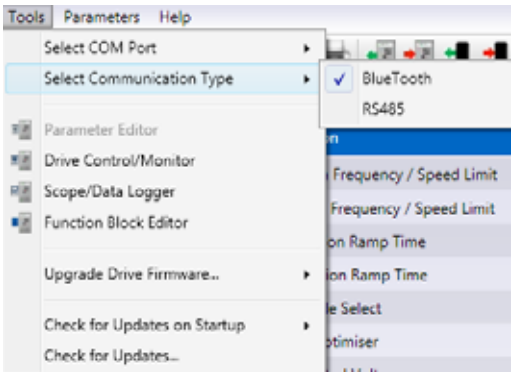


Figure 22: Selecting a communication type

The DX-COM-STICK Bluetooth communication stick needs to be listed under **Hardware and Sound / Devices and Printers** in the Windows Control Panel. Please note that it might be necessary to add it by using the **Add a device** option.

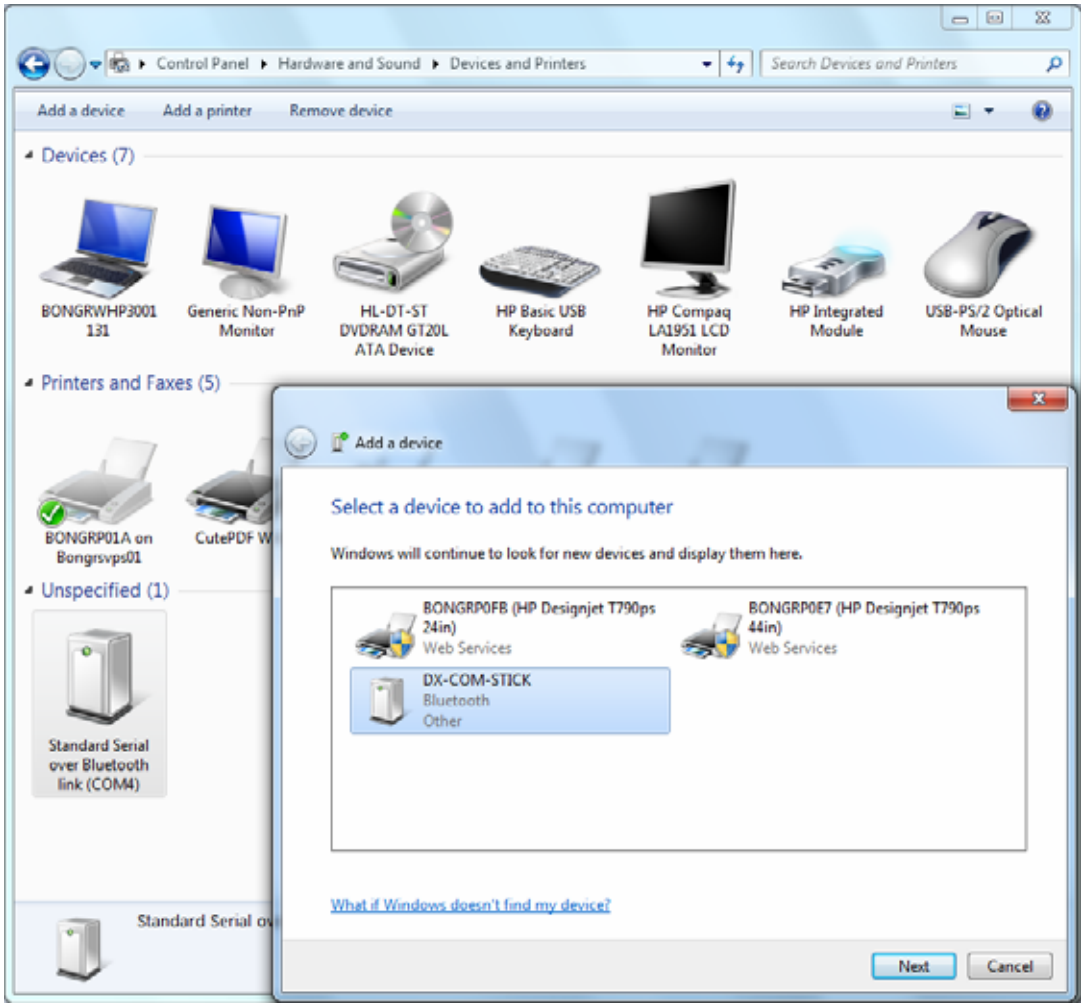


Figure 23: Add Device

▶ Click **Next**.

You will now have to select a pairing option.

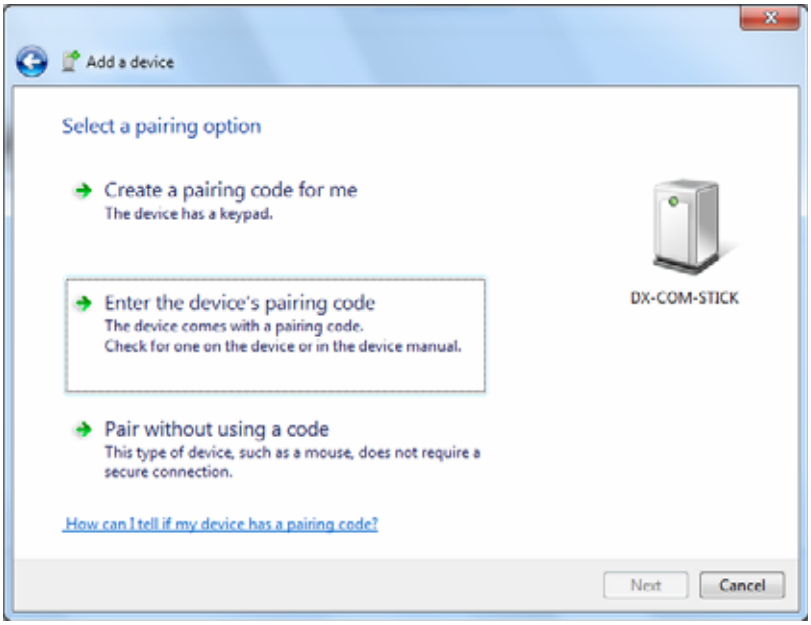


Figure 24: Entering the pairing code for DX-COM-STICK

- Select the **Enter the device's pairing code** option and click **Next**.
- Now enter code **0000** and click **Next**.

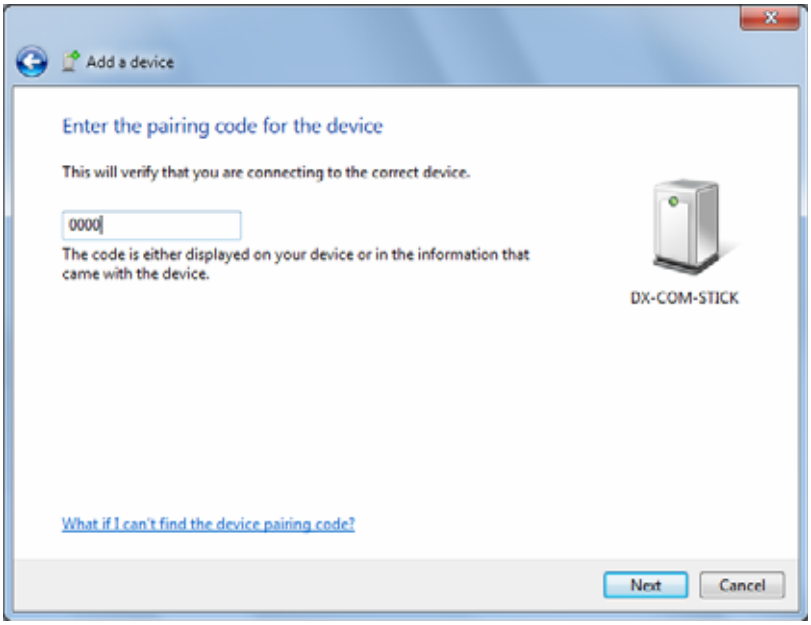


Figure 25: Standard pairing code 0000

The following window will appear:

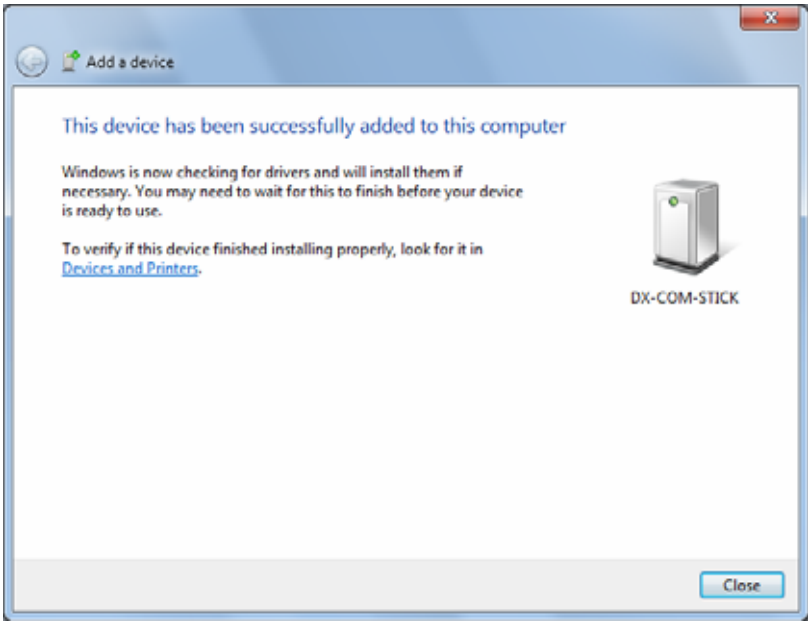


Figure 26: DX-COM-STICK successfully added

Double-click on the icon for the DX-COM-STICK device you just added.
A window in which you can find additional information (COM port) under the **Hardware** tab will appear.

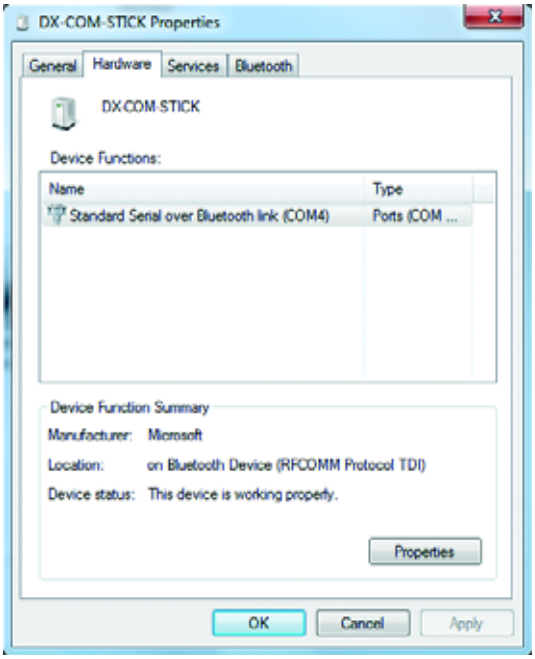


Figure 27: "Hardware" tab

Figure 27 shows the DX-COM-STICK that has been added to the computer's hardware. Right-clicking on the icon will show the corresponding device tasks.

3 Computer user interface

When you run the drivesConnect parameter configuration program by clicking on the corresponding icon, your computer screen will display the drivesConnect start screen.



Figure 28: drivesConnect start screen

To access one of the four main components, simply click on it:

- **Parameter Editor**
- **Drive Control / Monitor**
- **Function Block Editor**
- **Scope / Data Logger**

Figure 29 shows the user interface for the **Parameter Editor** component.

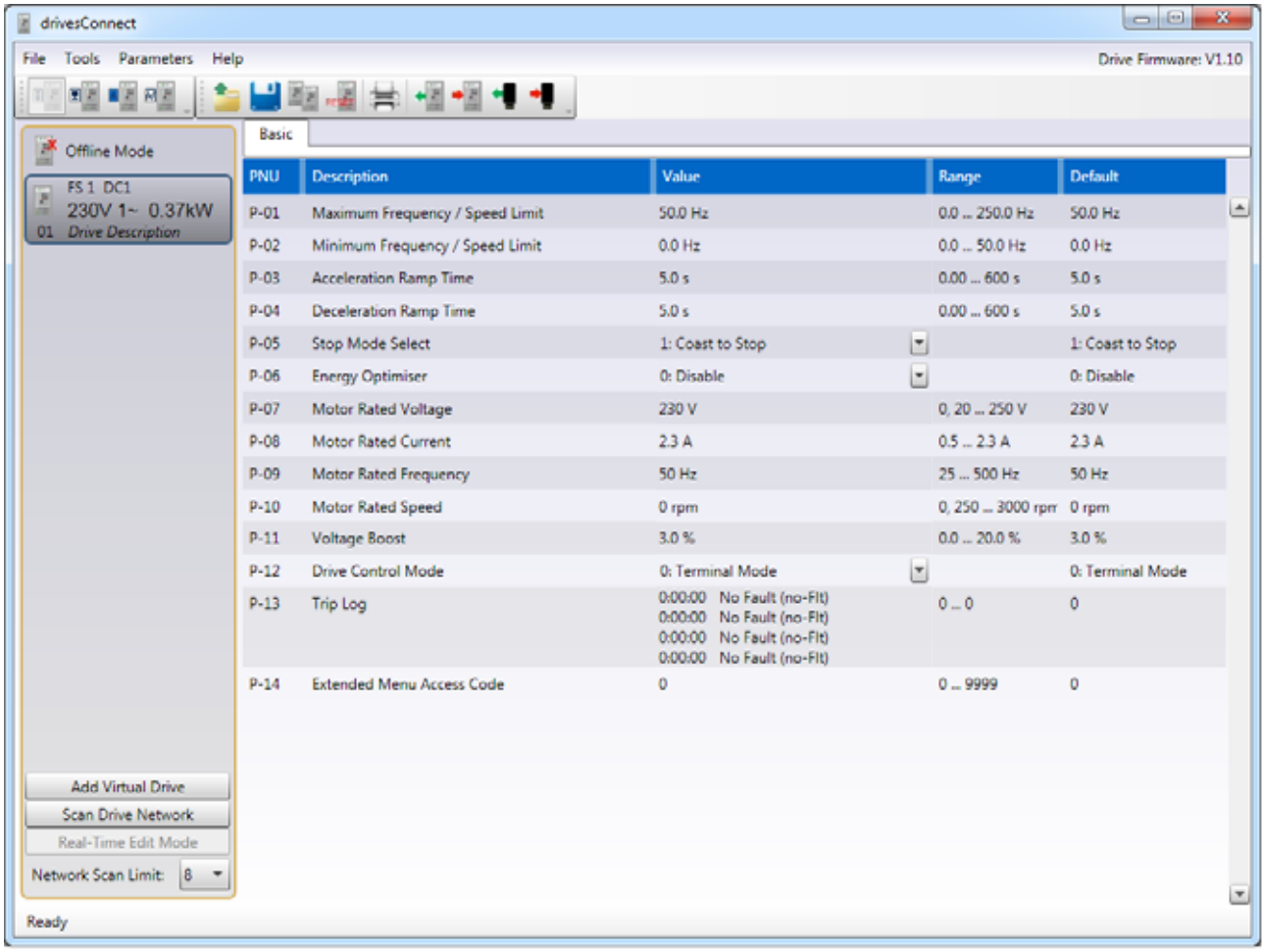


Figure 29: User interface for the "Parameter Editor" component

3.1 Menu bar

The topmost line on all four user interfaces will always show menus and icons:

- **File**
- **Tools**
- **Help**

In general, these menus contain standard computer options such as Save, Print, Help, About, etc.

The menus and options available will be expanded based on the drivesConnect component that is currently open.

3.2 Symbols

All menu levels in drivesConnect show icons with the following functions in order to make the program easier to use.

Symbol	Meaning
	Used to switch to the Parameter Editor component
	Used to switch to the Drive Control / Monitor component
	Used to switch to the Function Block Editor component
	Used to switch to the Scope / Data Logger component
	Used to load a parameter set or PLC program from a file
	Used to save a parameter set or PLC program to a file
	Start a new PLC program
	Save PLC Program as data file
	Copy parameter set to new drive descriptor
	Used to reset parameters to factory defaults
	Used to print a parameter set or PLC program
	A4 portrait format, A4 landscape format, A3 landscape format
	Used to transfer (read) the parameter set from the selected drive
	Used to transfer (read) a parameter set from a DX-COM-STICK
	Used to transfer (read) the PLC program from a drive and save it as a data file

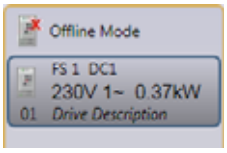
Symbol	Meaning
	Used to transfer (save) a parameter set or PLC program to the selected drive
	Used to transfer (save) a parameter set or PLC program to a DX-COM-STICK
	Used to transfer (save) a PLC file to a drive
	Used to reset the parameters to their custom default values
	Compare Parameters with factory default values
	Compare Parameters with user default values
	Delete PLC program in Drive
	Used to delete a PLC program from the DX-COM-STICK
	Undo last operation
	Used to cancel the last undo operation
The icons below are only found on the user interface for the "Function Block Editor" component	
	Used to copy the selected blocks (also possible with the Ctrl+C keyboard shortcut)
	Cut the selected blocks
	Paste the selected blocks
	Zoom In
	Zoom Out
	Used to add a new sheet
	Used to delete the selected sheet

Symbol	Meaning
	Highlight errors in the PLC diagram
	Remove error highlights in the PLC diagram
	Start Simulation
	Used to end the simulation
	Start Simulation
	Pause simulation
	Stop Simulation

3.3 Status display

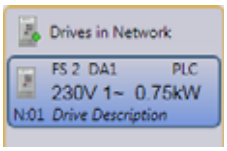
The left column on the user interface – with the exception of the interface for the **Function Block Editor** component – uses rectangular display elements to show the variable frequency drives that are connected (i.e., both physically connected and virtually present drives).

Once you establish communications between the DC1 or DA1 variable frequency drive and the drivesConnect program, the connected variable frequency drive will be shown on the **Parameter Editor**, **Drive Control / Monitor**, and **Scope / Data Logger** components in various display formats:



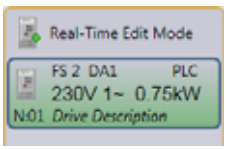
Gray background:

There are no variable frequency drives connected (virtual drives, standard type).



Blue background:

A variable frequency drive is connected.



Green background:

Real-time mode: A variable frequency drive is running: Changes to parameters will be transferred directly.

→ If you use the "fleeting pulse" trigger mode while on the **Scope / Data Logger** component, the otherwise blue frame will turn red (→ Figure 30).
This indicates that scope data is stored on the variable frequency drive.

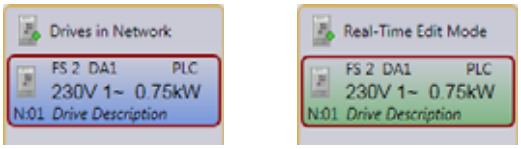


Figure 30: Indication that scope data (oscilloscope data) has been saved

→ Interface converters DX-CBL-PC-1M5 and DX-COM-PCKIT can be used to connect multiple variable frequency drives at the same time.

If you do connect multiple variable frequency drives simultaneously, make sure that none of them have the same address. In DA1 variable frequency drives, the address can be changed using parameter P5-01. In DC1 drives, it can be changed using parameter P-36. Also, when connecting multiple variable frequency drives, they have to be connected to each other with a splitter.

The parameters on the screen will be the ones that correspond to the display element with a blue border.

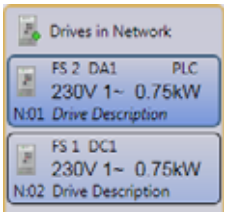


Figure 31: Two connected variable frequency drives

Make sure to change the highest drive address setting as necessary!

if, for instance, you are using eight variable frequency drives, you will have to select a value of 8 for **Highest address**.

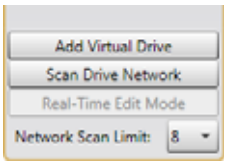


Figure 32: Specifying the highest address

4 Parameter Editor

The **Parameter Editor** component lists the parameters for the selected variable frequency drive. These parameters can be manually changed and accessed using this component.



Figure 33: drivesConnect start screen

When you open the **Parameter Editor** component, the program will show the following user interface:

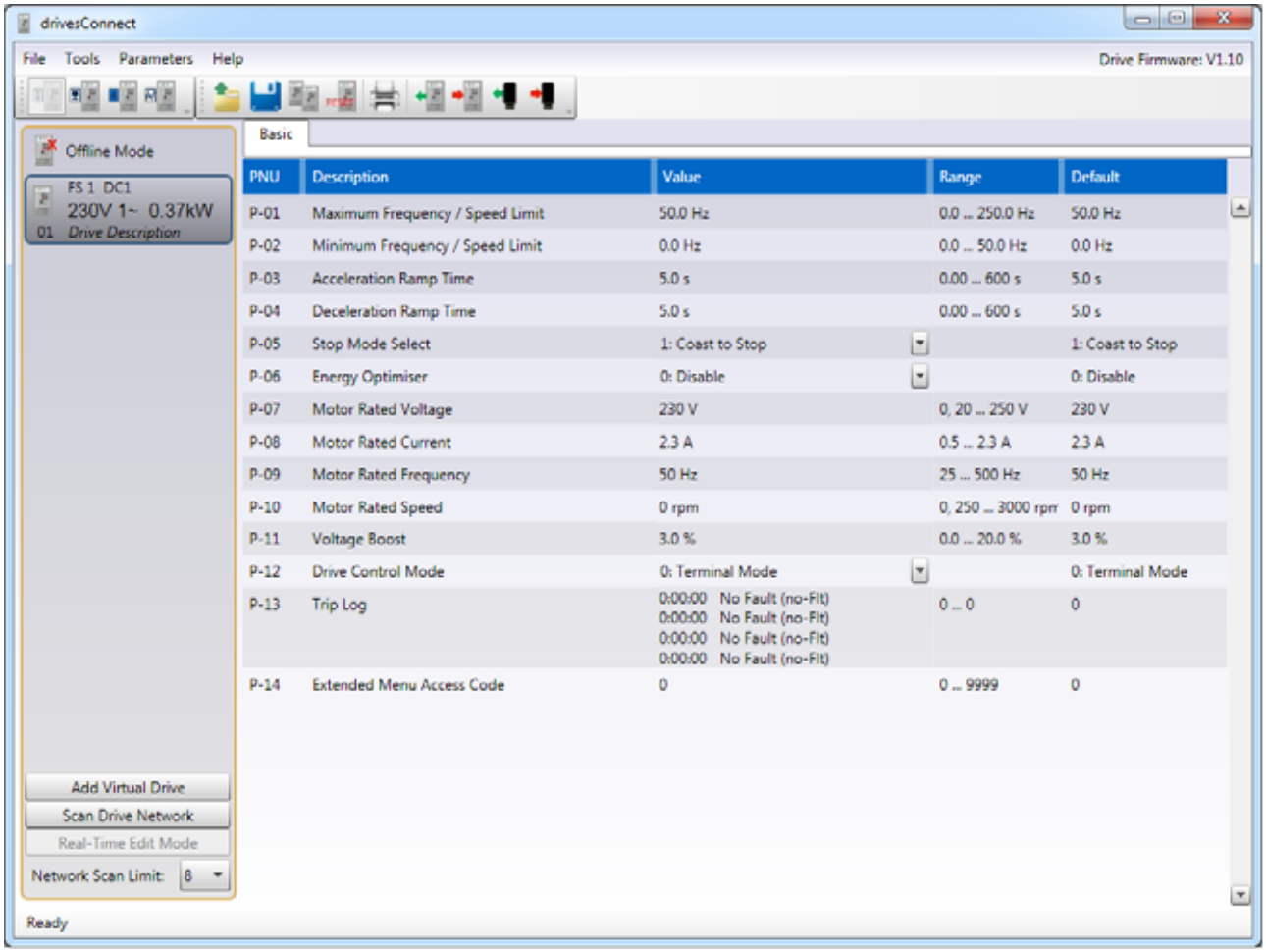


Figure 34: User interface for the "Parameter Editor" component

4.1 File

The **File** menu features the following standard options:

- Load Parameter Set
- Save Parameter Set
- Save Parameter Set As...
- Print

In addition, it includes options for restoring factory defaults, copying parameter sets, and exporting parameter sets.

- Restore Factory Defaults
- Copy Parameter Set

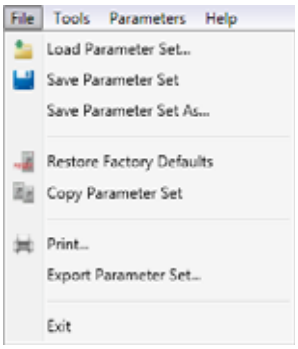


Figure 35: "File" menu

The option for restoring factory defaults does the same thing as a four-finger reset (start, stop, ▲, ▼). It will reset (P-dEF) any settings that have been saved in a DA1 variable frequency drive using the P6-29 parameter ("Save Parameter as Default") (U- dEF).

The options in the **File**, **Tools**, **Parameter Set**, and **Help** menus are also available through the corresponding icons on the toolbar.



Figure 36: Toolbar (general)

4.2 Tools

The **Tools** menu features the **Select COM Port** and **Select Communication Type** options, which are used to connect a variable frequency drive to the program.

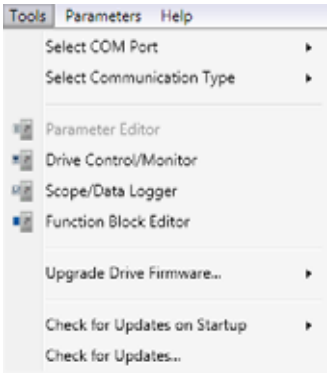


Figure 37: "Tools" menu



In addition, the menu has options for checking the variable frequency drive's firmware and updating it if necessary.

→ You will need an Internet connection in order to be able to check and update the drivesConnect program.

4.3 Parameter set

The options in the **Parameter Set** menu can be used to transfer the parameter set to the variable frequency drive or DX-COM-STICK or to download it.

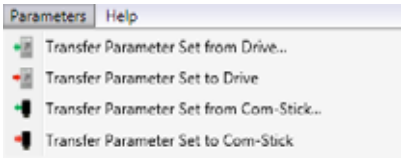


Figure 38: "Parameter Set" menu



Figure 39: Expanded toolbar for "Parameter Set" menu

4.4 Help

The options in the **Help** menu can be used to activate and deactivate your license.

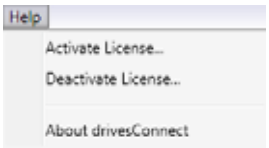


Figure 40: "Help" menu

If a DA1 variable frequency drive is connected, the following three icons will be added to the toolbar:

On one hand, the **Restore Custom Defaults** option will be added in addition to the **Restore Factory Defaults** (four-finger reset) option. This new restore option does the same thing as a three-finger reset (stop, ▲, ▼) in DA1 variable frequency drives (U-dEF).

On the other, the **Compare with Factory Defaults** and **Compare with Custom Defaults** options will also be added.

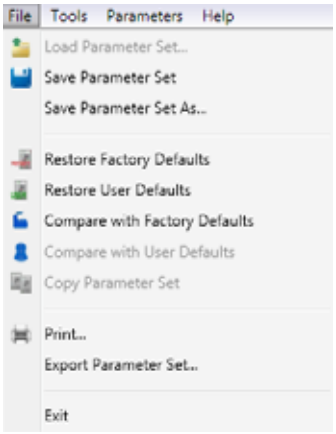


Figure 41: Expanded "File" menu



Figure 42: Custom default values

Example

Say you change parameter P1-01 from its default setting of 50 Hz to 90 Hz and you then save this new value as a default in real-time mode using P6-29. The network is then polled again.

The first screenshot in figure 43 shows the screen after the **Compare with Factory Defaults** icon is clicked on. **Default** will show the factory setting of 50 Hz.

In the next screen shot, the icon has been set to **Compare with Custom Defaults**. Accordingly, the value entered will be compared with the values saved in P6-29.

PNU	Description	Value	Range
P1-01	Maximum Frequency / Speed Limit	90.0 Hz	0.0 ... 250.0 Hz

PNU	Description	Value	Range
P1-01	Maximum Frequency / Speed Limit	90.0 Hz	0.0 ... 250.0 Hz

Figure 43: Parameter Comparison

4.5 View Mode

4.5.1 Offline mode

Offline mode can be used to load and modify virtual parameter sets without having a connected variable frequency drive.

The DC1 parameter set saved in the default settings will be opened automatically. You can use code 101 on the input screen for PNU = P-14 to add the **Monitor** and **Advanced** groups to the basic settings (**Basic**).

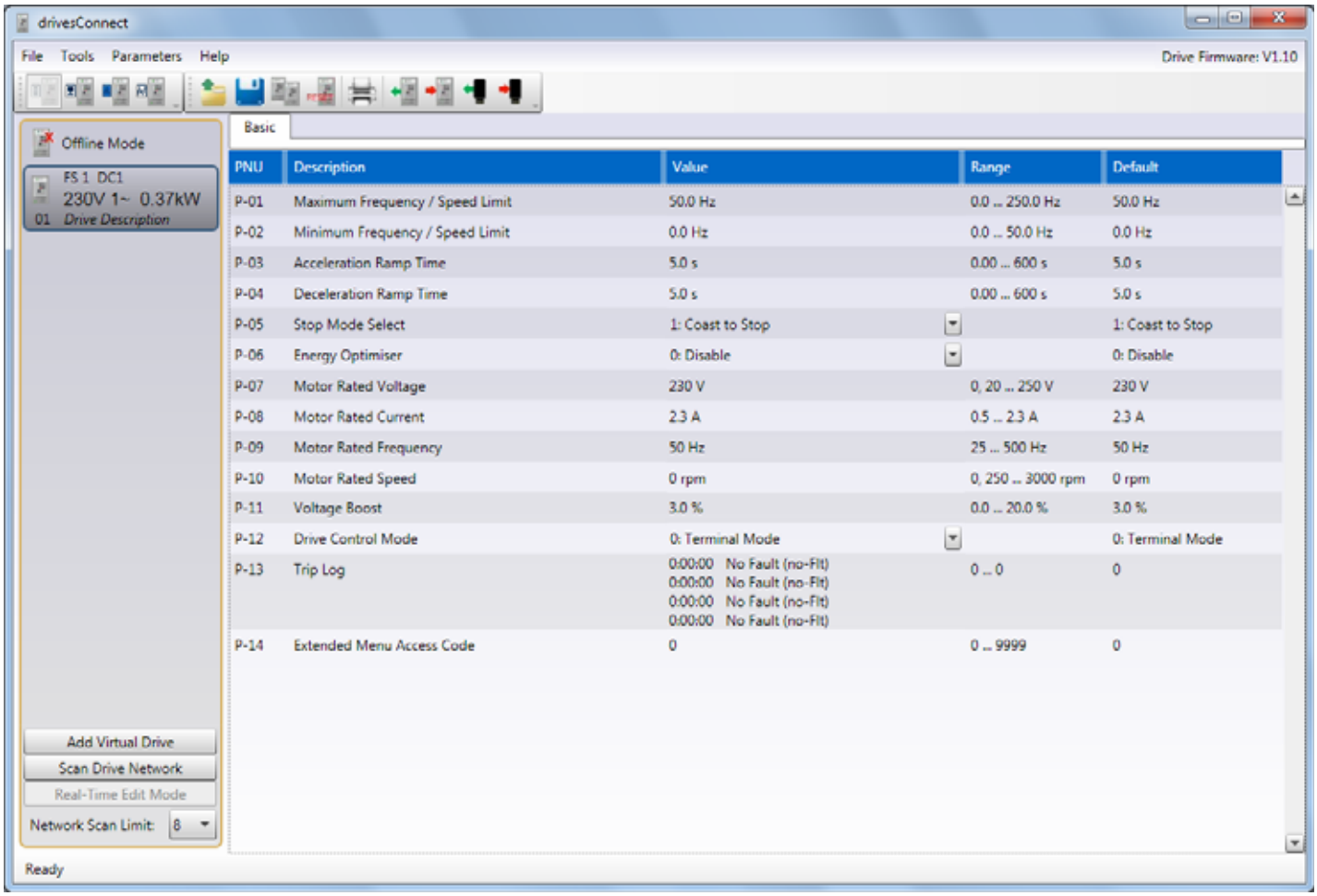


Figure 44: Virtual parameter set for a DC1 variable frequency drive

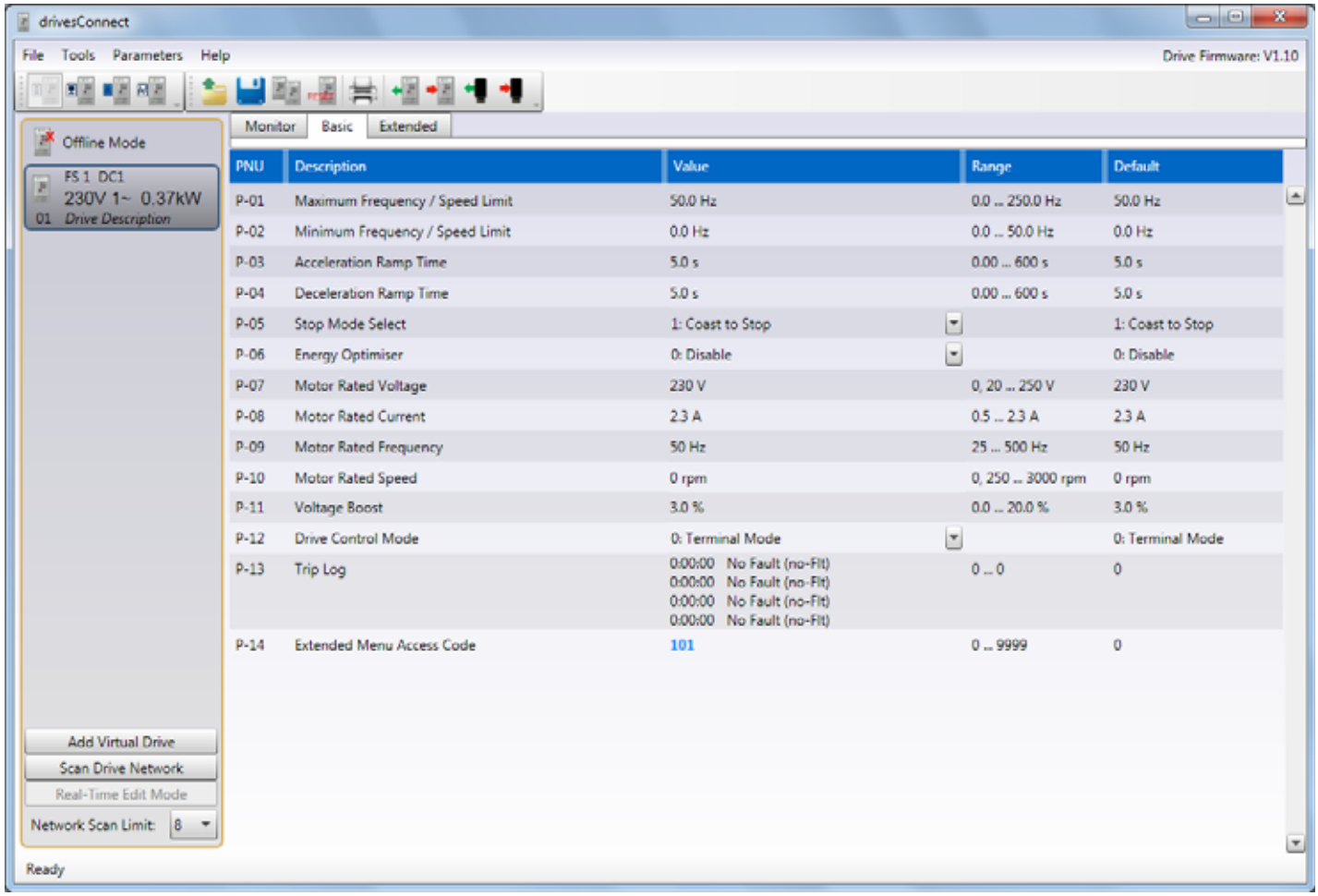


Figure 45: Advanced parameter set (P-14 = 101)
The "Motor" and "Advanced" ranges have been added for the DC1 variable frequency drive.

You can use the **Add Virtual Drive** button to add a variable frequency drive ("Creates a new drive in offline mode").

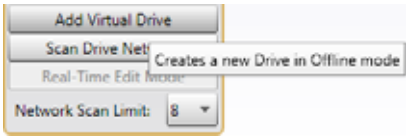


Figure 46: Adding a virtual variable frequency drive

The following dialog box for selecting a variable frequency drive type will appear:

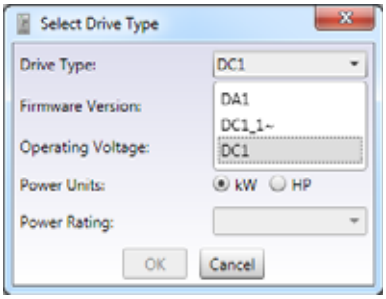


Figure 47: Selecting the type for the virtual variable frequency drive

The **Drive type** drop-down menu will have three variable frequency drive types available for selection for the (virtual) drive: DA1, DC1_1~, and DC1.

A list of **Rating** options will be generated based on the **Operational voltage** you select.

The following figure 48 shows an example of a virtual variable frequency drive for single-phase motors (DC1_1~).

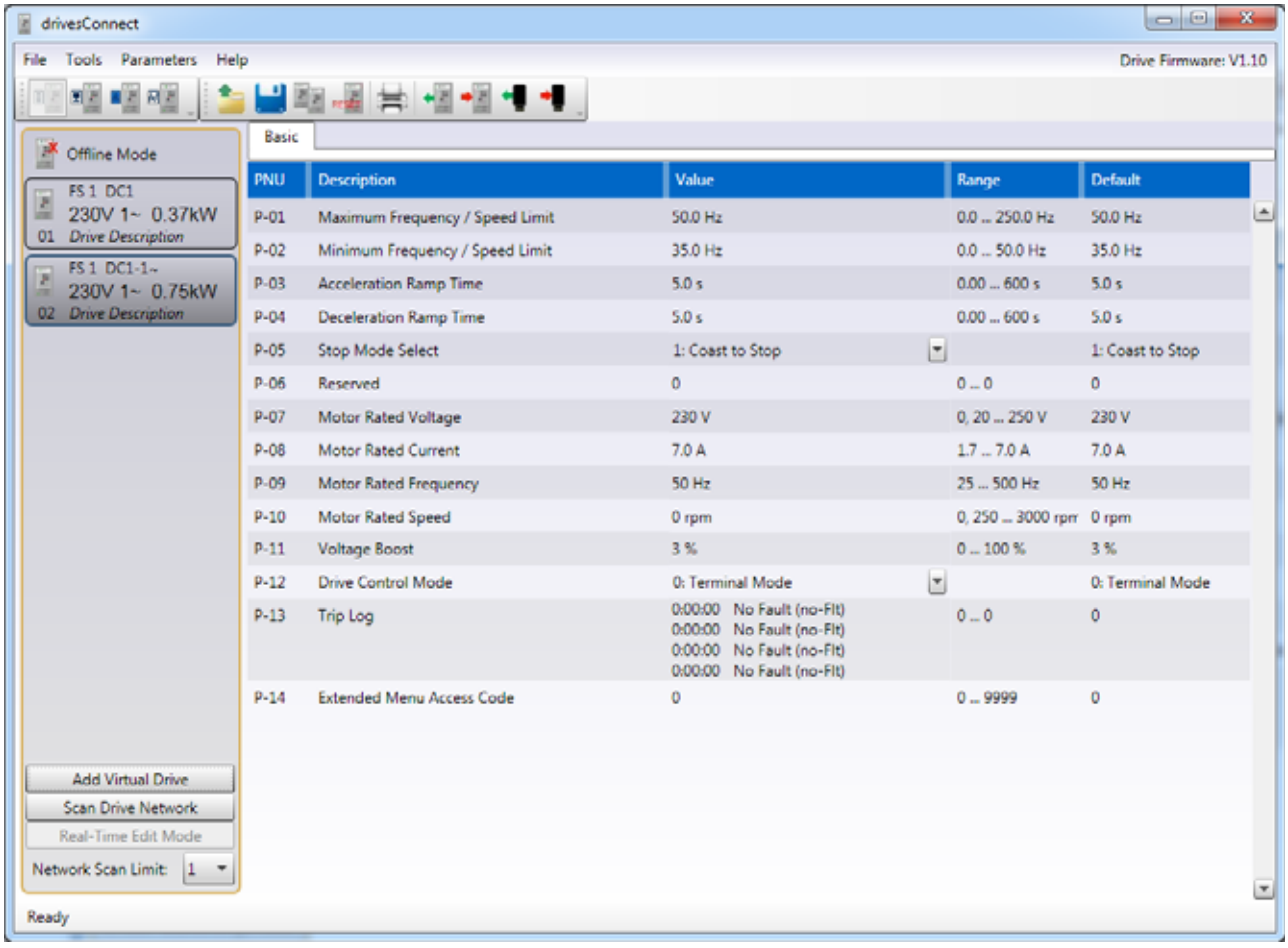


Figure 48: Default values for a second virtual variable frequency drive (FS1 DC1_1~)

If you create a DA1 virtual variable frequency drive, the following default parameters will be displayed:

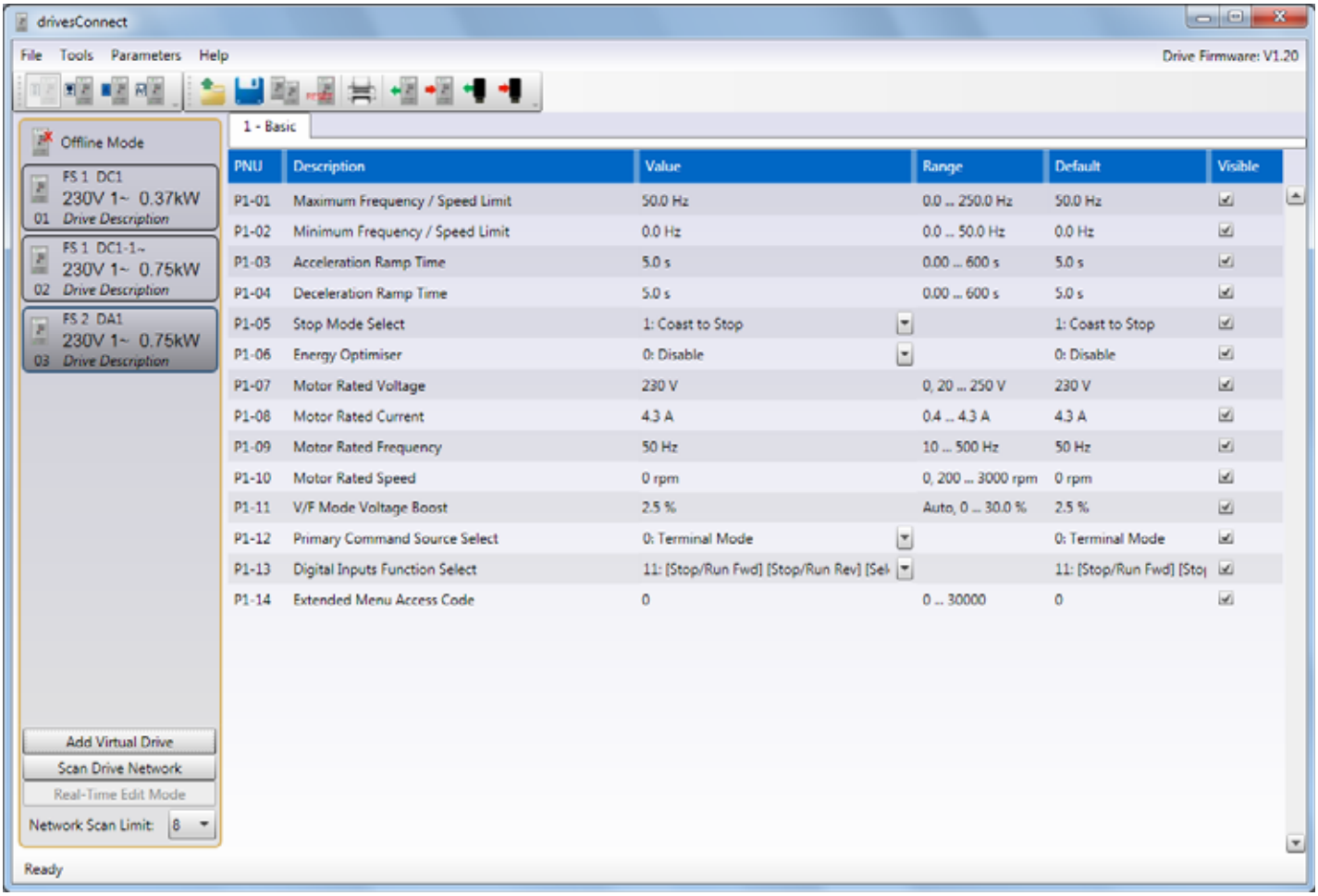


Figure 49: A third virtual variable frequency drive (FS2 DA1), type DA1

DA1 variable frequency drives not only feature code 101, but also have additional functions and parameters that can be unlocked with value 201:

Value 101 will unlock the **Monitor**, **Functions**, **PID**, **Mode**, and **Bus** groups, adding them to the **Basic** group.

To enter this value, click on parameter 0 in the **Value** column. This will open an input field highlighted in light blue where you can change the value from 0 to 101.



Figure 50: Activated input field

The groups will be shown as tabs above the list of parameters.



Figure 51: Advanced “Monitor”, “Functions”, “PID”, “Mode”, and “Bus” parameter groups for DA1 variable frequency drive (P1-14 = 101)

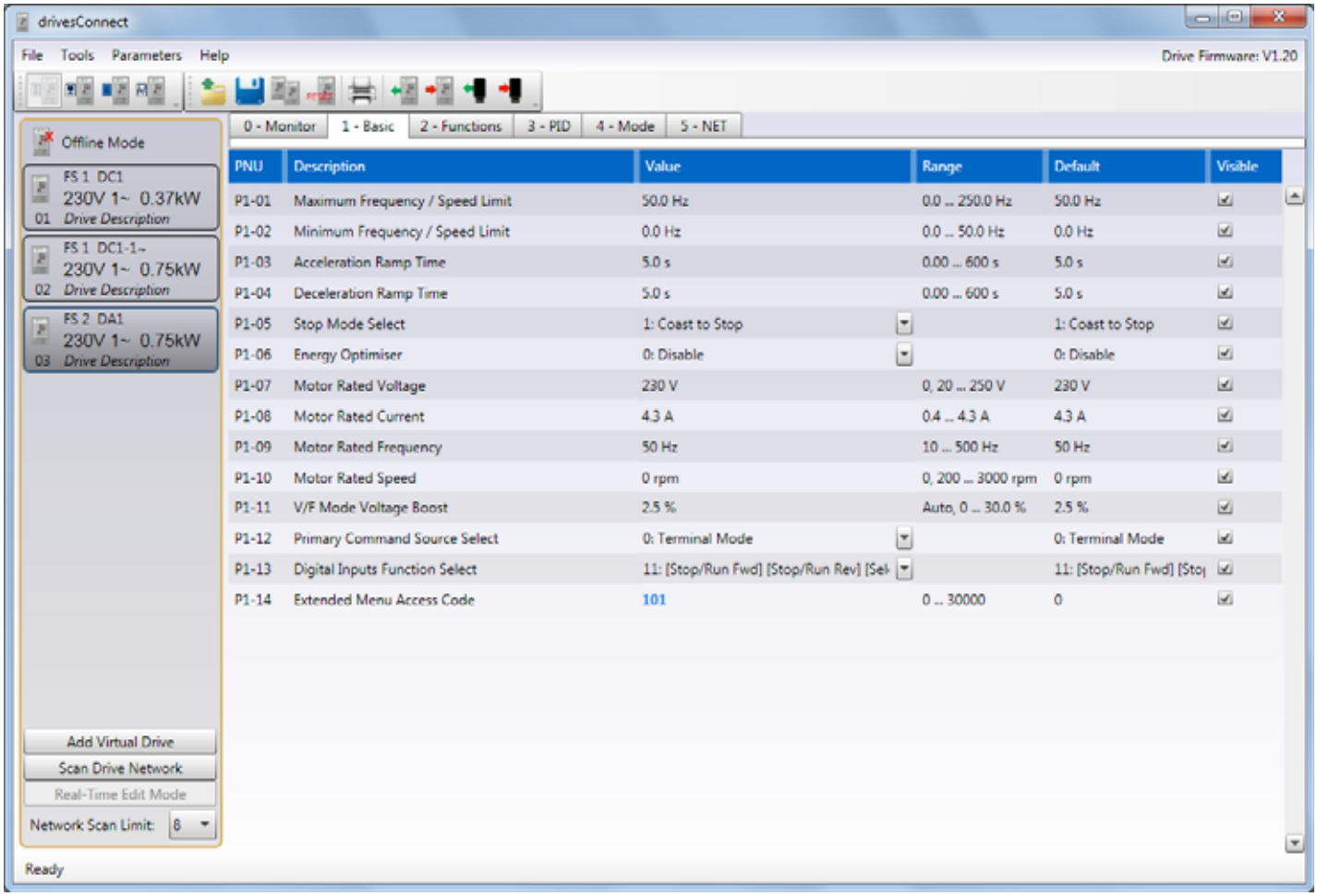


Figure 52: Advanced parameter set (P1-14 = 101):
The “Monitor”, “Functions”, “PID”, “Modbus”, and “Bus” ranges have been added.

Moreover, entering code 201 will unlock access to the **Advanced**, **Monitor**, **Ramps**, and **Control** groups.



Figure 53: Advanced “Advanced”, “Monitor”, “Ramps”, and “Control” parameter groups for DA1 variable frequency drive (P1-14 = 201)

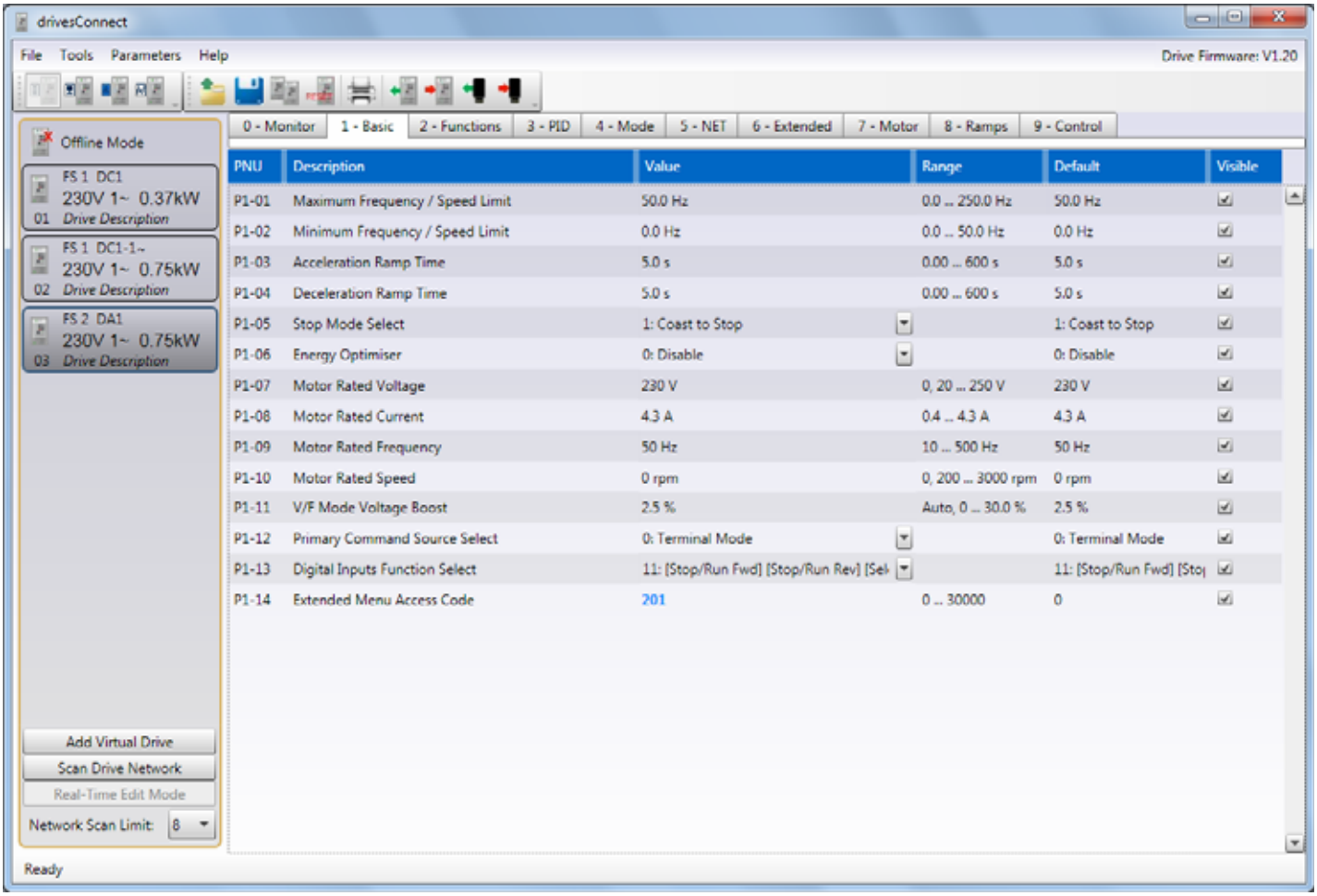


Figure 54: Advanced parameter set (P1-14 = 201):
The “Advanced”, “Monitor”, “Ramps”, and “Control” ranges have been added.

→ For more detailed information on the advanced parameter sets, please consult the manuals for the corresponding variable frequency drives:
DA1: manual MN04020005Z
DC1: manual MN04020003Z

4.5.2 Online mode

In online mode, the parameters corresponding to the connected / currently connected variable frequency drive can be read and modified.

The program can be connected to the variable frequency drive by using a DX-COM-PCKIT, DX-CBL-PC-1M5, or DX-COM-SOFT.

Once you select a COM port and a communication type, the drive network can be polled.

The following window will appear once a connection has been established:

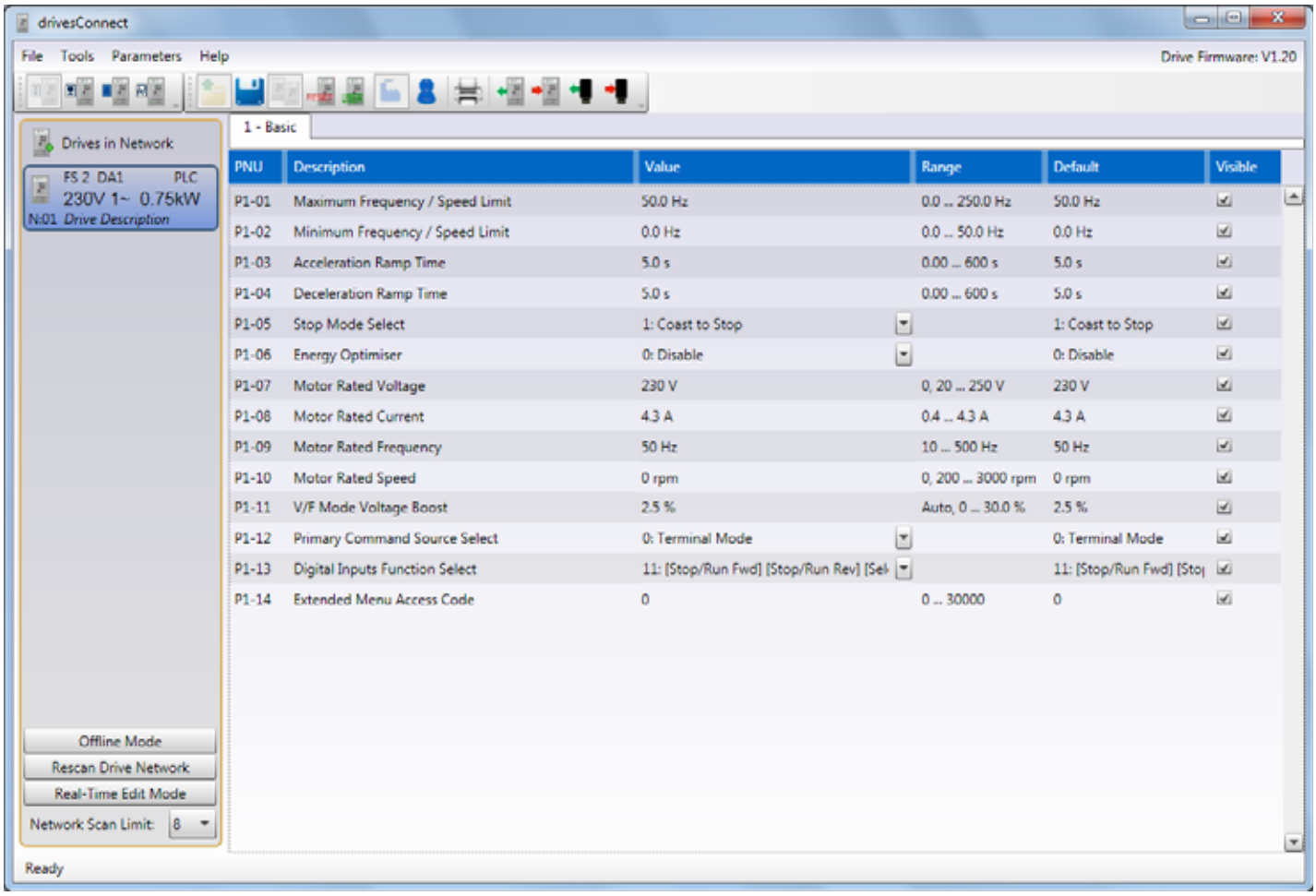


Figure 55: Start screen after a connection is established

When in online mode, you can modify the loaded parameter set and then transfer it to the selected DX-COM-STICK or directly to the variable frequency drive.



① ②

① Used to transfer the parameter set to the selected drive

② Used to transfer the parameter set to the selected DX-COM-STICK

Conversely, the parameter set can be downloaded from the DX-COM-STICK or drive.

① Used to transfer the parameter set from the selected drive.

② Used to transfer the parameter set from the DX-COM-STICK

In addition, you can also work in **real-time editing mode**. When in this mode, any changes to parameters will be immediately transferred to the variable frequency drive.

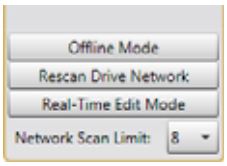


Figure 56: Real-Time Edit Mode

5 Drive Control / Monitor

The second component listed on the drivesConnect start screen is the **Drive Control / Monitor** component.



Figure 57: drivesConnect start screen

The **Drive Control / Monitor** component can be used to run the connected variable frequency drive from the drivesConnect program.

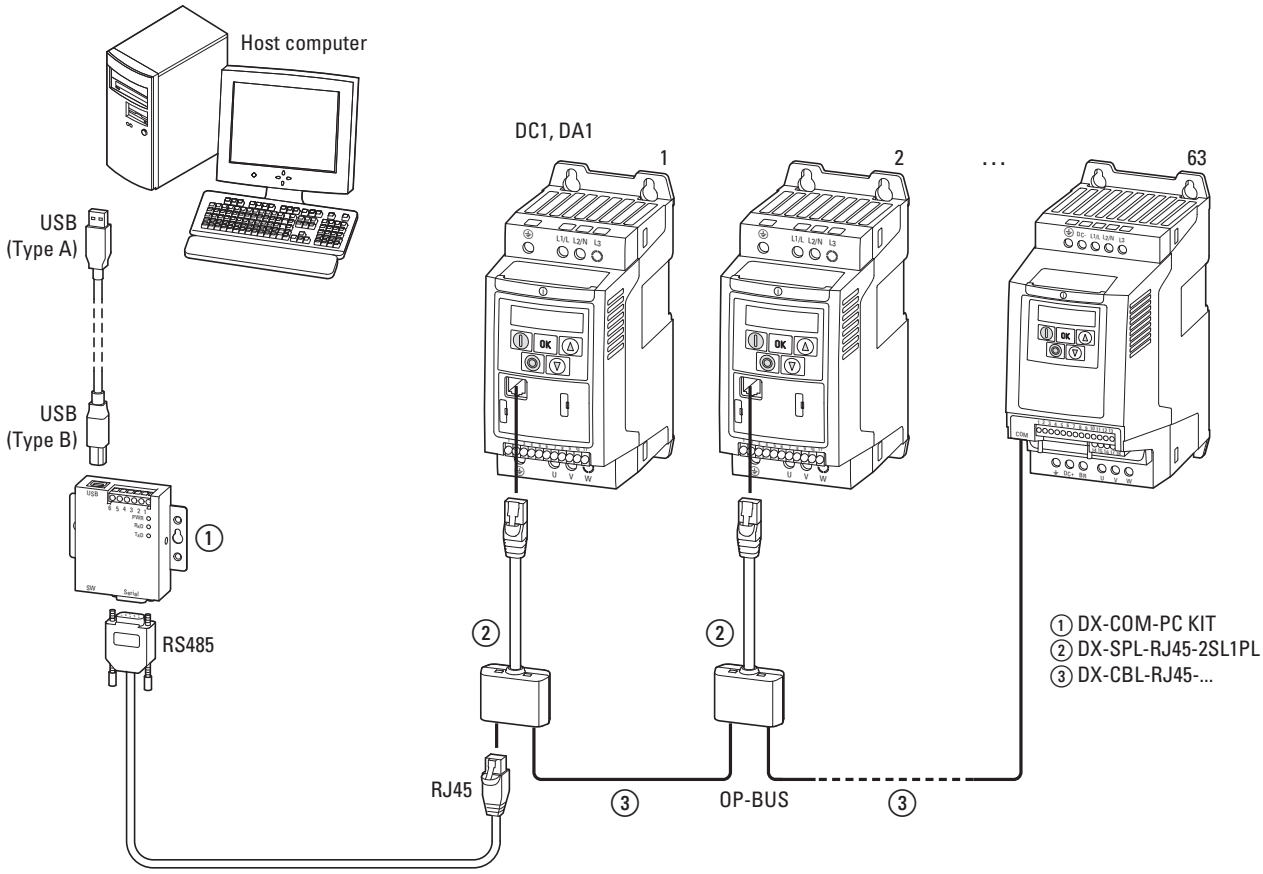


Figure 58: Connection example with multiple variable frequency drives

The selected variable frequency drives (DC1, DA1) must be connected to the computer through their communication port (RJ45 socket). In addition, their supply voltage must be switched on.

Display: StoP

When you open the **Drive Control / Monitor** component, an empty screen will appear at first.

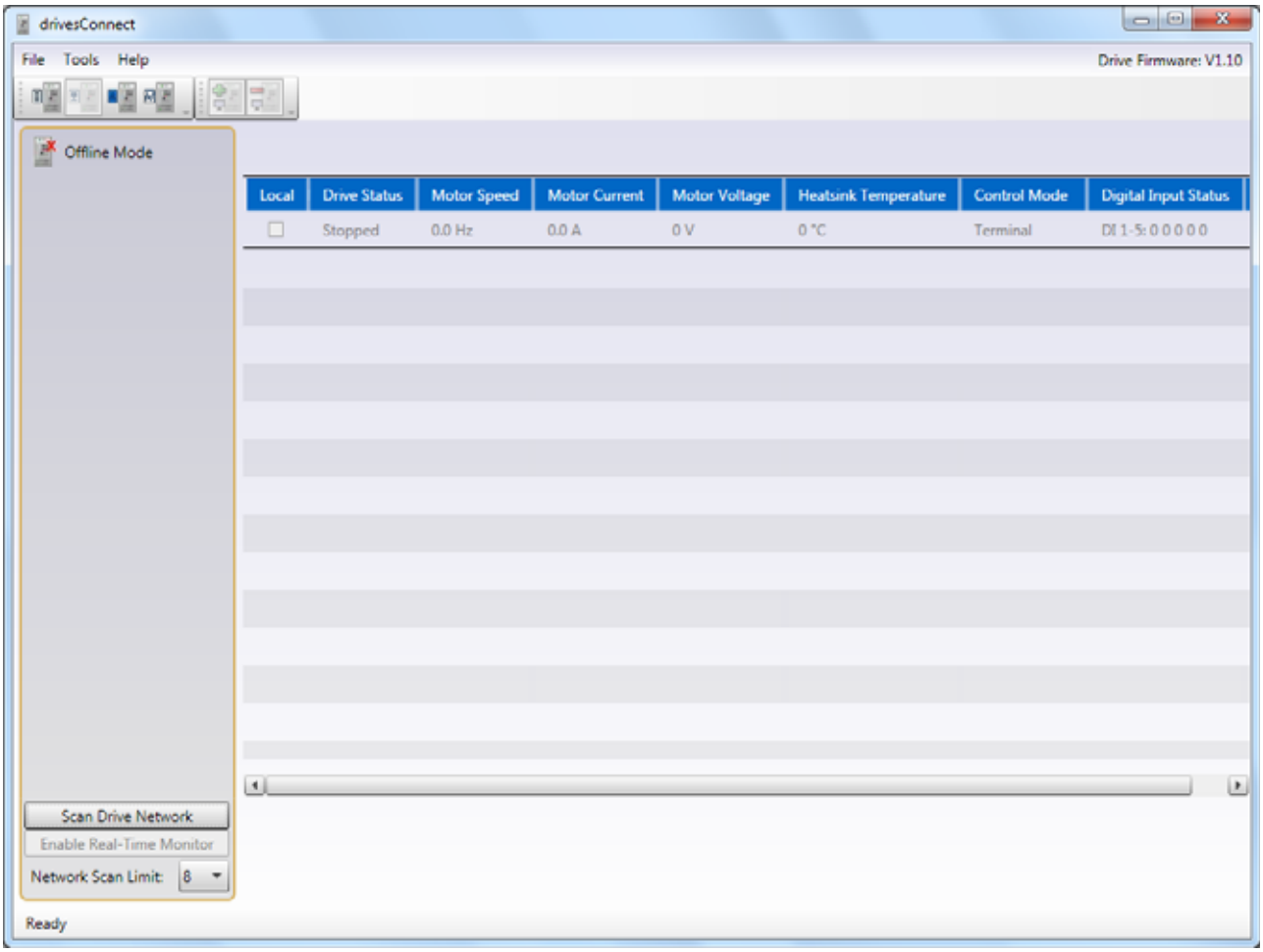


Figure 59: The user interface for the "Drive Control / Monitor" component

The component's basic functions can be used with the options in the **File**, **Tools**, and **Help** menus. The icons displayed below the menus are designed to provide quick access to individual functions.

You can set the highest address on the bottom left, in the field highlighted in gray. It will be shown on the user interface after you click on the **Poll Drive Network** button.

5.1 File

The **File** menu in the **Drive Control / Monitor** features the following options:

- **Activate Monitor for All Drives**
- **Deactivate Monitor for All Drives**
- **Exit**



These functions will not be enabled until a connection to a (non-virtual) variable frequency drive has been established.

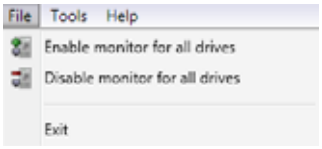


Figure 60: "File" menu

The monitor functions listed in this menu can also be activated using the corresponding icons.

5.2 Tools

The **Tools** menu features the **Select COM Port** and **Select Communication Type** options, which are used to connect a variable frequency drive to the program.

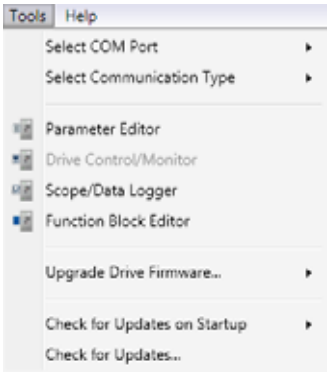


Figure 61: "Tools" menu



Figure 62: Toolbar for the "Tools" menu

In addition, the menu has options for checking the variable frequency drive's firmware and updating it if necessary.



You will need an Internet connection in order to be able to check and update the drivesConnect program.

5.3 Help

The options in the **Help** menu can be used to activate and deactivate your license.

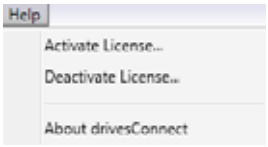


Figure 63: "Help" menu

5.4 Scan Drive Network

After you enter the **Highest address** for the connected variable frequency drives that you want the program to display, click on **Poll Drive Network** to have the program list the corresponding drives on the free display area.

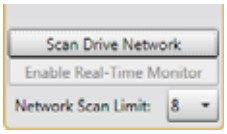


Figure 64: Scan Drive Network

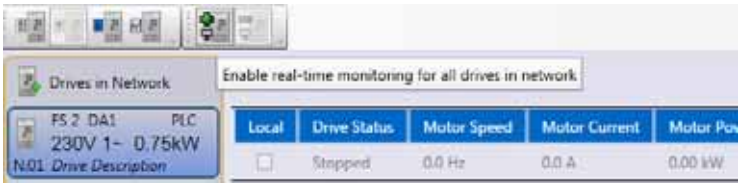


Figure 65: Selecting the "Local" option

After activating the drive control function, you will have to select the **Local** option.

The following screen will appear:



Figure 66: Stopped variable frequency drive

The motor speed setpoint will initially be 0.0 Hz. After you increase it and click on the green button (next to **Motor speed setpoint**), the connected variable frequency drive will start.

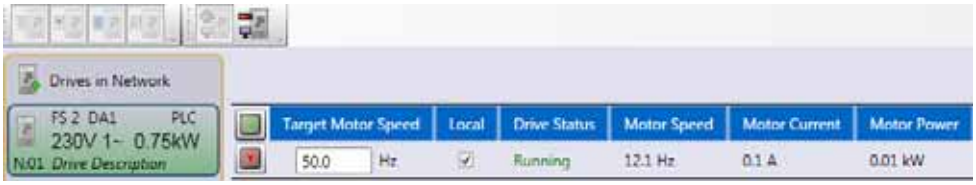


Figure 67: Running variable frequency drive (motor speed setpoint of 50.0 Hz).

if you are using a DC1 variable frequency drive, make sure that digital input 1 is active.

To stop the variable frequency drive, simply click on the red icon.

Displaying additional values

To display additional values, click on the white arrow to the far right.
A list of available parameters will be shown.

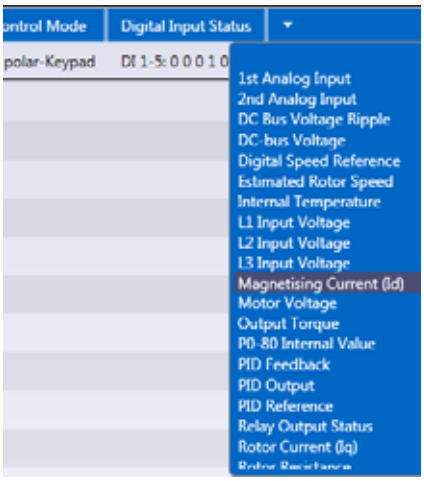


Figure 68: Additional parameters

You can deactivate the drive control function either on the bottom left or by using the toolbar.

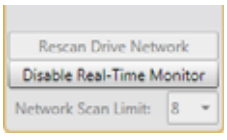


Figure 69: Deactivating the monitor

6 Function Block Editor

The third component listed on the drivesConnect start screen is the **Function Block Editor** component

The Function Block Editor component can only be used together with a DA1 variable frequency drive and a valid license number.

Without a license, you will not be able to use the Function Block Editor component's full functionality. In order to transfer programs to a connected variable frequency drive and change the program on a drive, you will need a valid license.

This license is **not** included with your DC1 or DA1 variable frequency drive (DX-COM-SOFT option).



Figure 70: The "Function Block Editor" component as the third component on the start screen

The **Function Block Editor** component can be used to add functions to a PLC program or modify existing functions.

The following prompt regarding the license will appear:

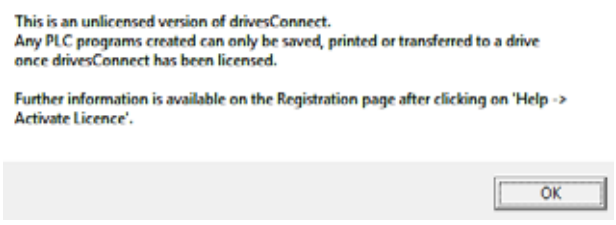


Figure 71: Licensing prompt

▶ Click on the **OK** button.

When you open the editor, the following screen will appear:

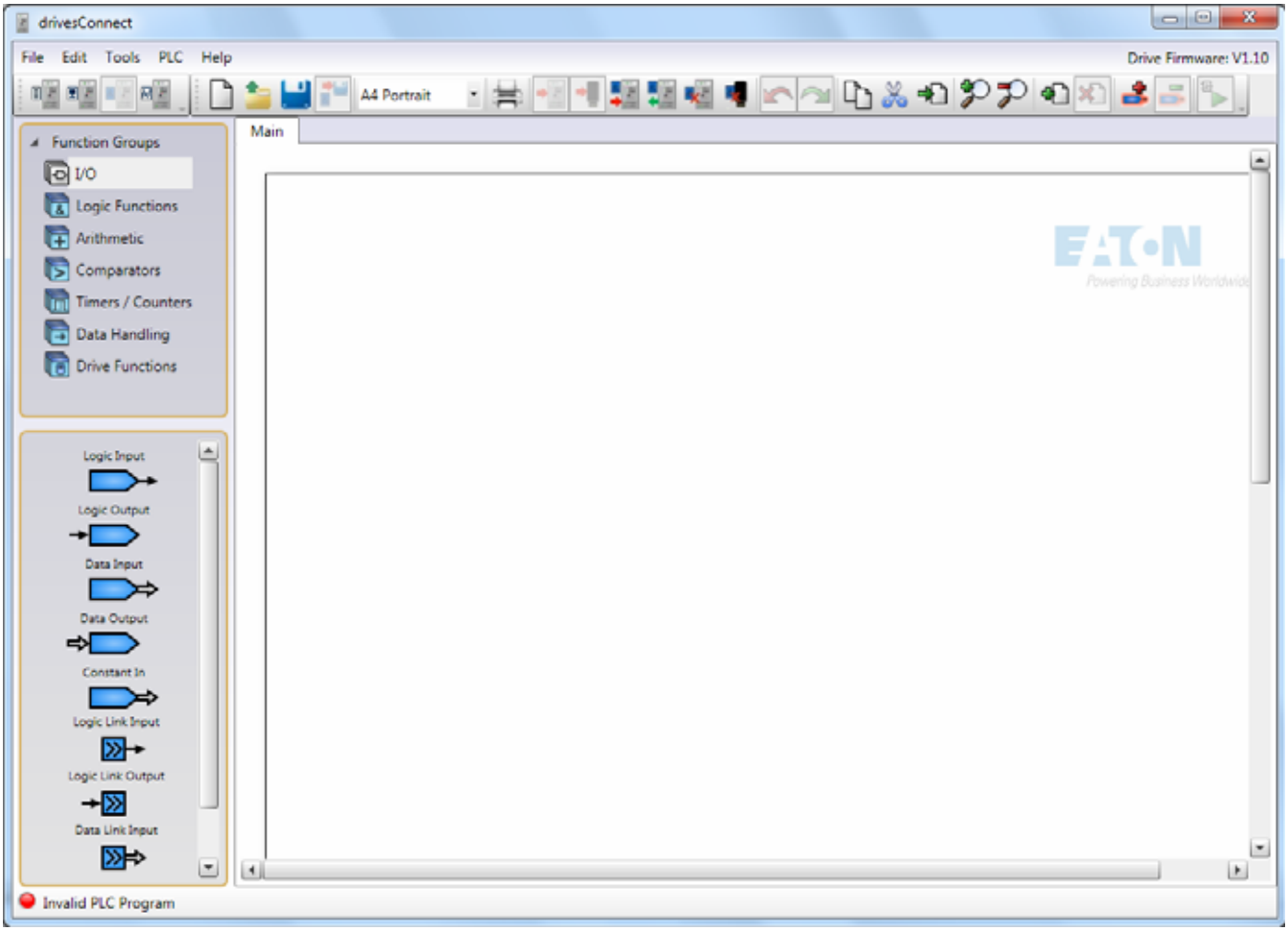
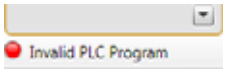


Figure 72: User interface for the "Function Block Editor" component

The "Invalid PLC program" message at the bottom left corner of the screen indicates that no licensed program is currently active.



The following section explains how the license works step by step – in line with the visual quick reference guide found in instruction leaflet IL04012012Z for DX-COM-SOFT.

6.1 Licensing

Activating a license for the drivesConnect program requires an Internet connection and a DX-COM-SOFT USB dongle.

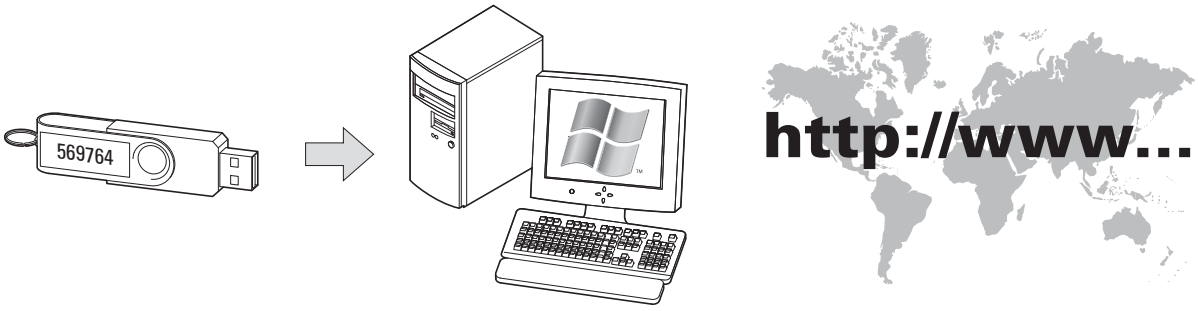


Figure 73: License activation requirements

6.1.1 Equipment supplied

DX-COM-SOFT is a USB dongle. The required order code consists of the first six numbers in the corresponding serial number.



Figure 74: DX-COM-SOFT order code

6.1.2 Activate License

To activate your license for the drivesConnect program, follow the steps below.

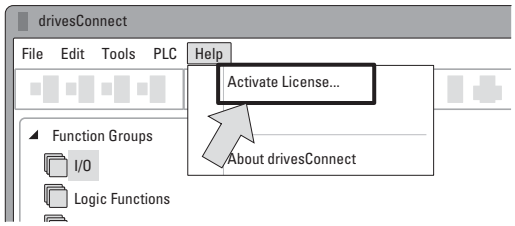


Figure 75: Activating the license in the "Help" menu

Open the **Help** menu and click on the **Activate License...** option.

The following window will appear.

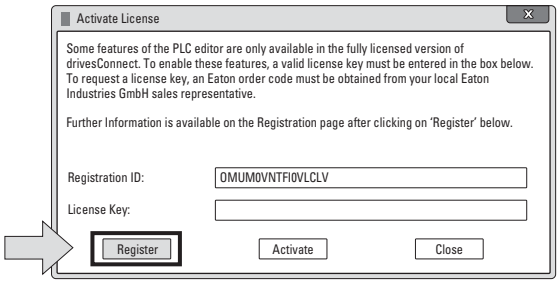


Figure 76: Requesting a license key



You do not have to enter any information on this dialog box when requesting a license!

▶ Click on the **Register** button (without entering any information into the **License Key** field) .

The registration website will be opened using your Internet connection.

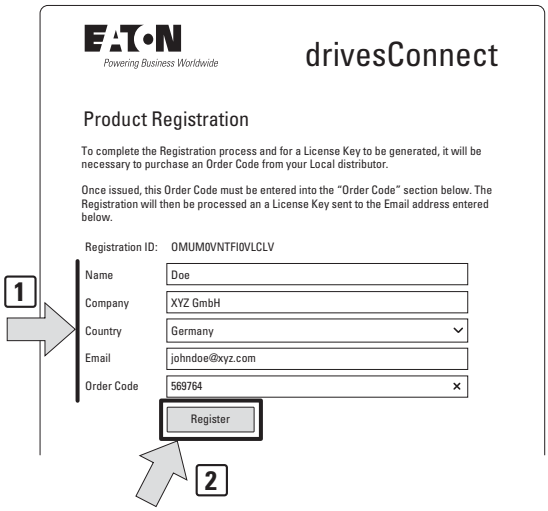


Figure 77: Registration

- Enter your name (**Name**), company (**Company**), country (**Country**), and e-mail address (**Email**).

  All fields are mandatory and must be filled out without fail before you can register.
  Please note that the e-mail address you enter will be used to send you your license key.

- Enter the first six digits of the serial No. of your DX-COM-SOFT into the **Order Code** field.
- Click on the **Register** button once you have filled out every field.

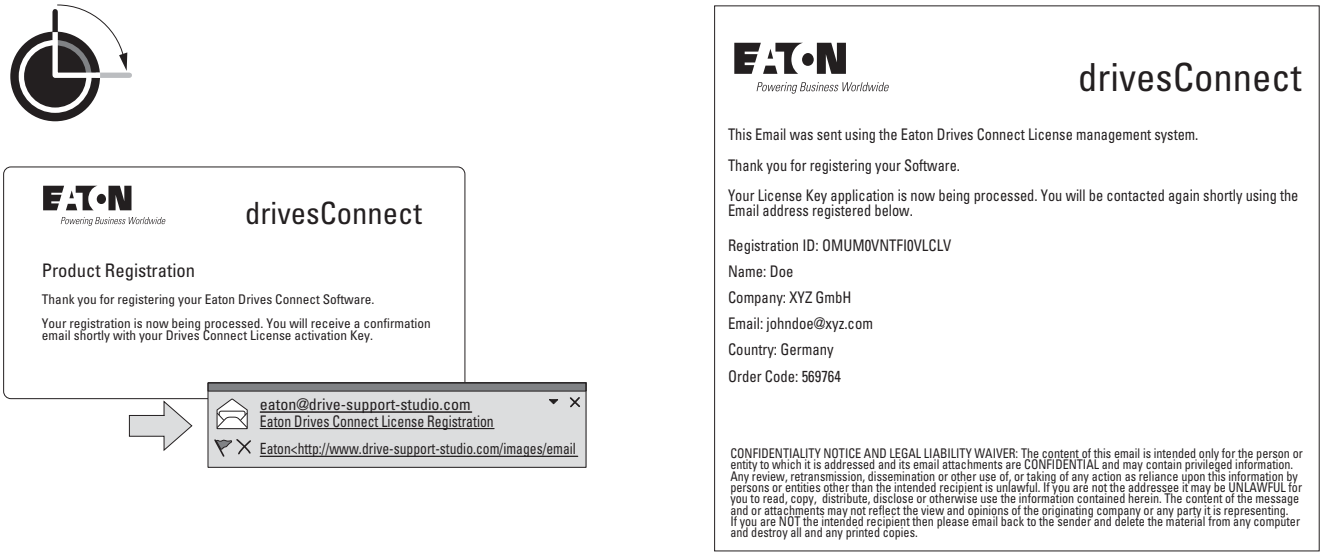


Figure 78: Product Registration

You will later receive an e-mail response containing your login registration. You will also receive your **license key** in a second e-mail.

- Once you have your license key, enter it and click on **Activate**. Restart drivesConnect by clicking on **OK**.

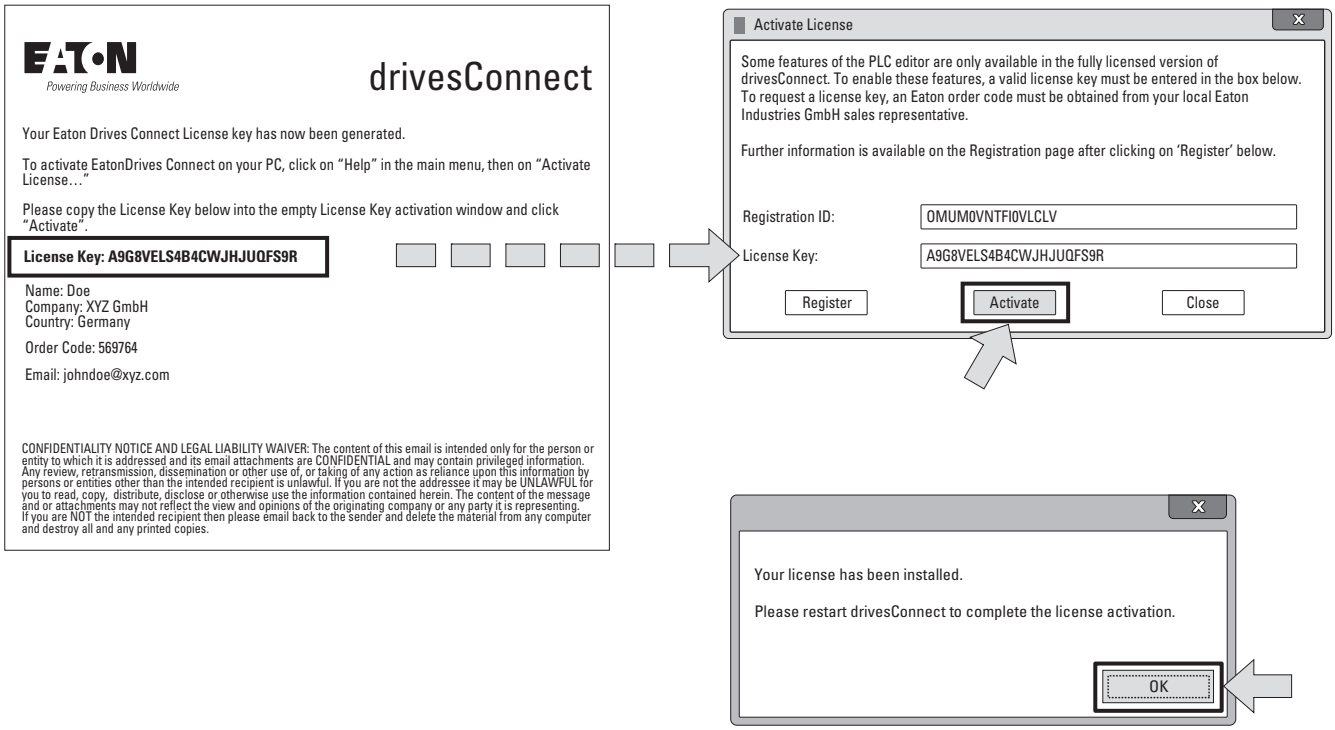


Figure 79: Entering the license key and restarting drivesConnect

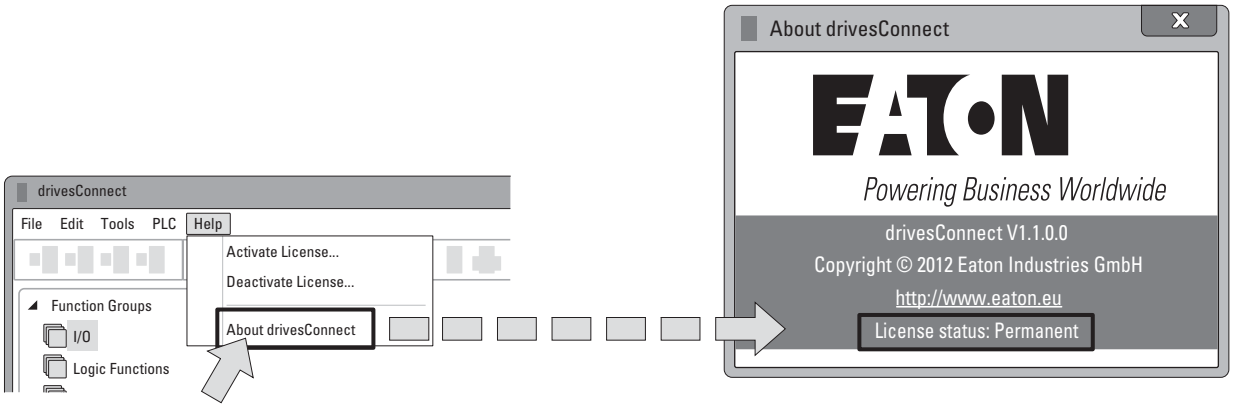


Figure 80: License status in "Help" menu

Once you restart drivesConnect, you can check the status of your license by clicking on **About drivesConnect** in **Help** menu. If the dialog box shows the text **License status: Permanent**, the Function Block Editor component's full version has been successfully activated.

6.2 Deactivating your license (to transfer it to another computer)

If you want to use an existing license on a different computer, you will first have to deactivate it on the computer where it is currently activated.

This can be done in the **Help** menu.

▶ To deactivate a license, open the **Help** menu and click on the **Deactivate License…** option.

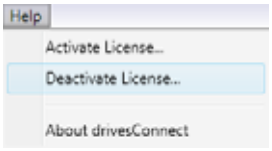


Figure 81: "Deactivate License" option in "Help" menu

An hazard warning will appear.

▶ Click **Yes**.



Figure 82: Deactivating the license on a computer

▶ Click on "Register License Deactivation".

The following message will appear.



Figure 83: Notification of incoming e-mail used to confirm license deactivation

▶ Confirm the next message.

The following window will appear.

Shortly afterwards, you will receive an e-mail with a new registration code.

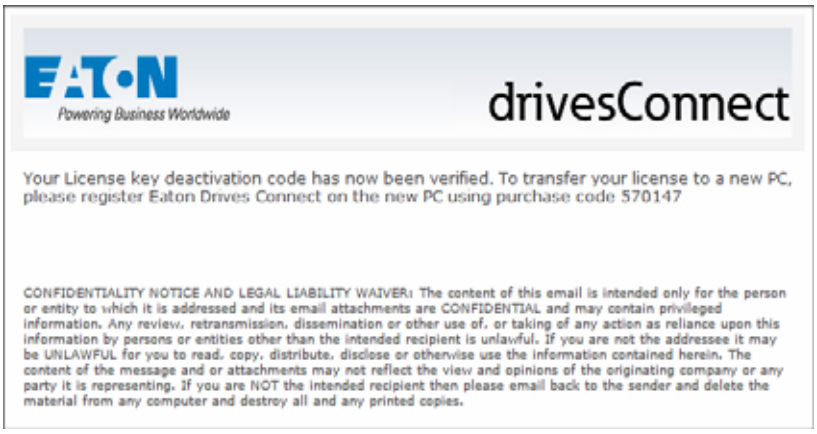


Figure 84: Message concerning new registration code

6.3 File

The **File** menu in the **Function Block Editor** component features the following options:

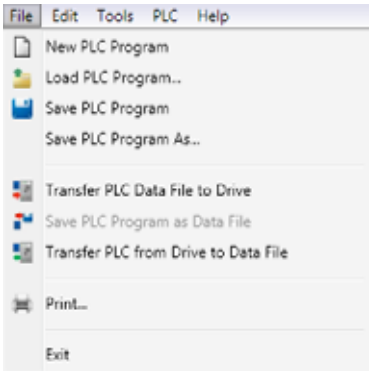


Figure 85: "File" menu



Figure 86: Toolbar for the "File" menu

6.4 Edit

The **Edit** menu can be used to undo and redo individual actions.
It can also be used to copy and cut gates, functions, and blocks, as well as to insert missing parts.

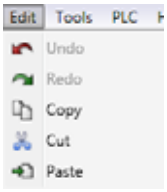


Figure 87: "Edit" menu



Figure 88: Expanded toolbar for "Edit" menu

6.5 Tools

The **Tools** menu and the toolbar can be used to switch to any of the other three components.

Moreover, you can use the **Tools** menu to select the right COM port and communication type in order to successfully establish a connection to your variable frequency drive.

Also, the menu comes with the option of checking the drivesConnect program and the drive's firmware.

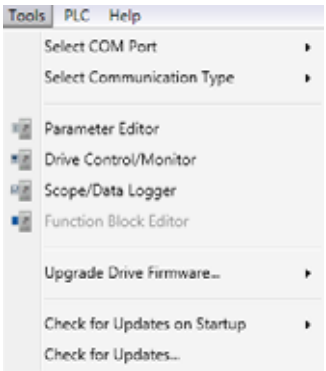


Figure 89: The "Tools" menu

6.6 PLC(S)

All the options in the **PLC** menu are also found on the corresponding toolbar.

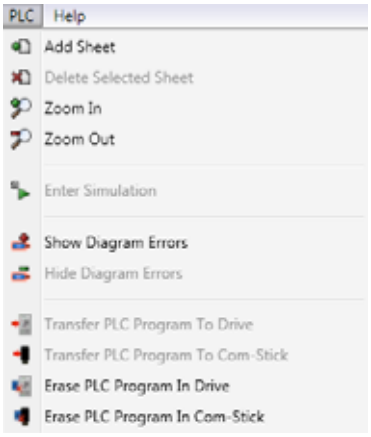


Figure 90: The "PLC" menu



Figure 91: Toolbar for the "PLC" menu

6.7 Help

The options in the **Help** menu can be used to activate and deactivate your license.

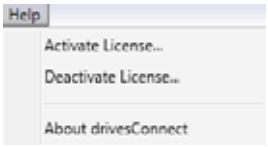
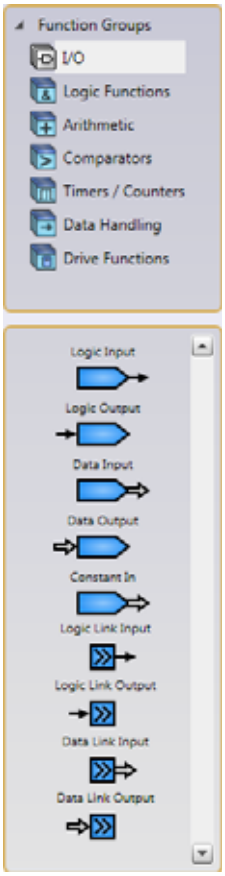


Figure 92: "Help" menu

6.8 Function Groups

You will get a different user interface with a column on the left containing functions and symbols. The area to the right will be empty and serves as a workspace canvas.



The upper left pane in the Function Block Editor component is used to display the various available function groups.

If you click on I/O (inputs/outputs), the individual functions corresponding to the selected group will be displayed in the lower pane.

To drag individual blocks to the white workspace canvas, simply drag and drop them (i.e., click on them, hold the mouse button down while moving them onto the workspace canvas, and release the button).

All blocks will have a number on their lower right corner that indicates the order in which they were created.

Figure 93: Function Groups

The next step is to connect the individual blocks on the workspace canvas to each other. If you click on an arrow, all available points where the arrow is allowed to end will be automatically highlighted in green. You can then drag the arrow that you want to connect to the ending connection point you want. When you release it, the two arrow ends will be connected.

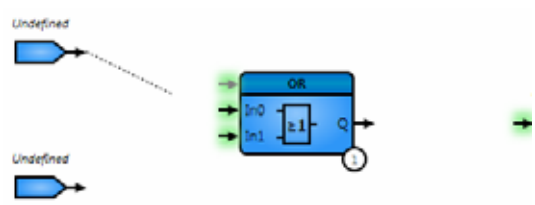


Figure 94: Block example

In addition, you will have to define the blocks' inputs. To do this, double-click on the selected block. A window where you can select inputs and outputs will appear.

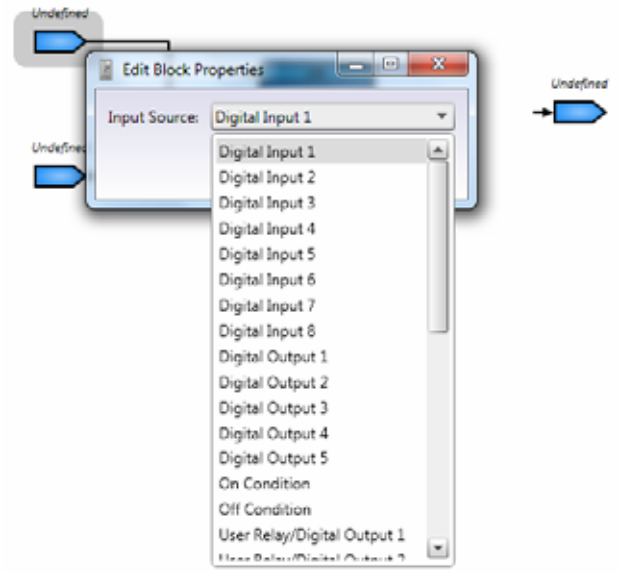


Figure 95: List of inputs and outputs

Many blocks can be modified by double-clicking on them. For example, you can increase the number of inputs, set times, and import CSV files depending on the type of block being edited.

As soon as all inputs and outputs have been selected and are complete, the status will switch from **Invalid PLC program** to **Valid PLC program**.



Figure 96: PLC program statuses

If the reason why the current PLC program is invalid is not clear, you can have the program highlight an error in the PLC diagram. To do this, click on the third icon from the right. To leave this mode, simply click on the second icon from the right.

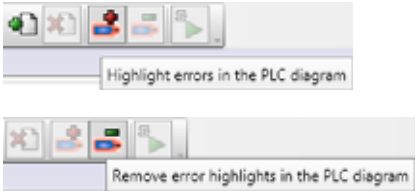


Figure 97: Highlighting an error

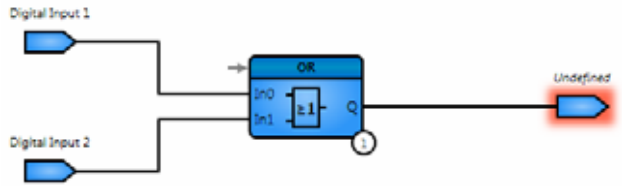


Figure 98: Highlighted error

To start the simulation for the valid PLC program, click on the rightmost icon.



Figure 99: Start Simulation

The user interface will look as follows:

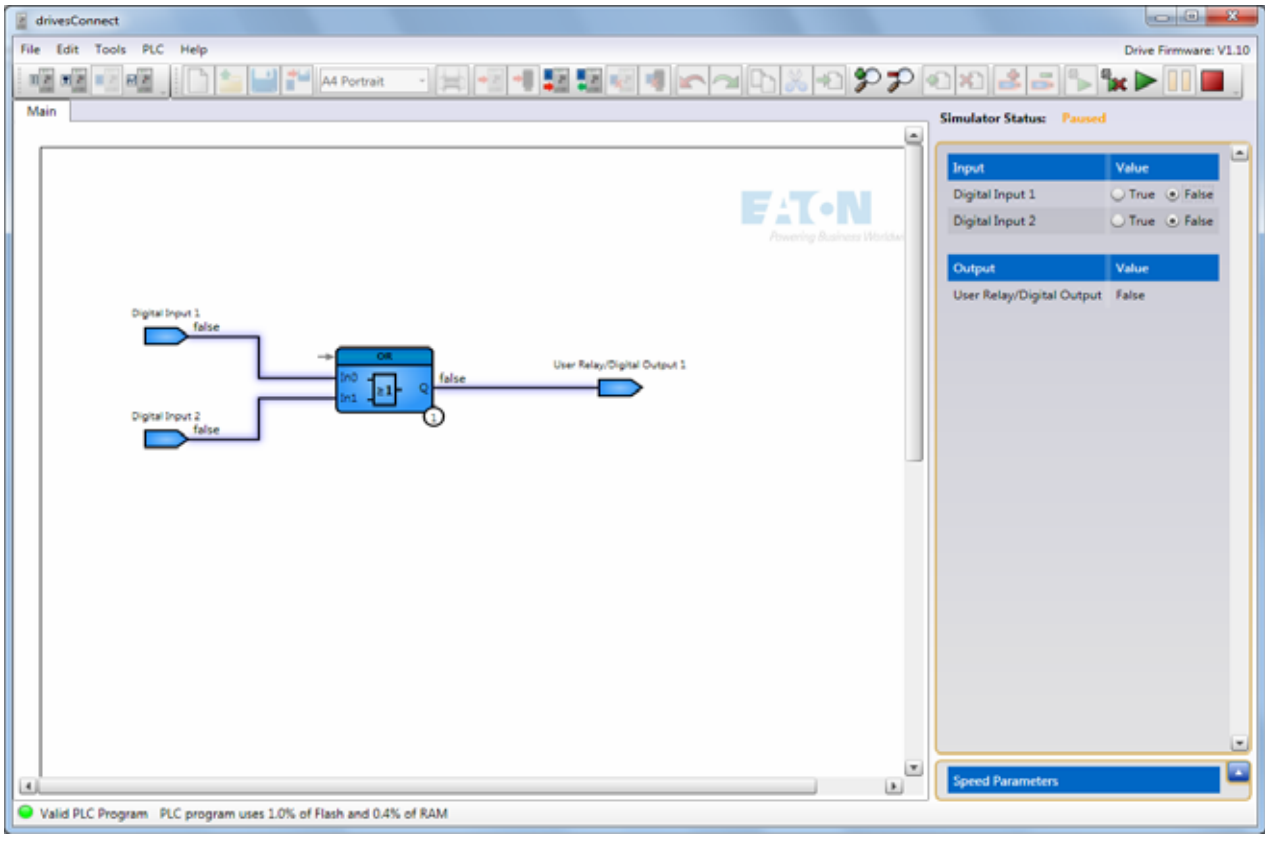


Figure 100:User interface when a simulation is started

Once you start the simulation, the following icons will be added to the toolbar:



Figure 101:Added icons

The first icon can be used to exit simulation mode. Meanwhile, the other icons behave as would generally be expected: The green icon will start the simulation, the icon after it will pause it, and the icon with the red square will stop it.

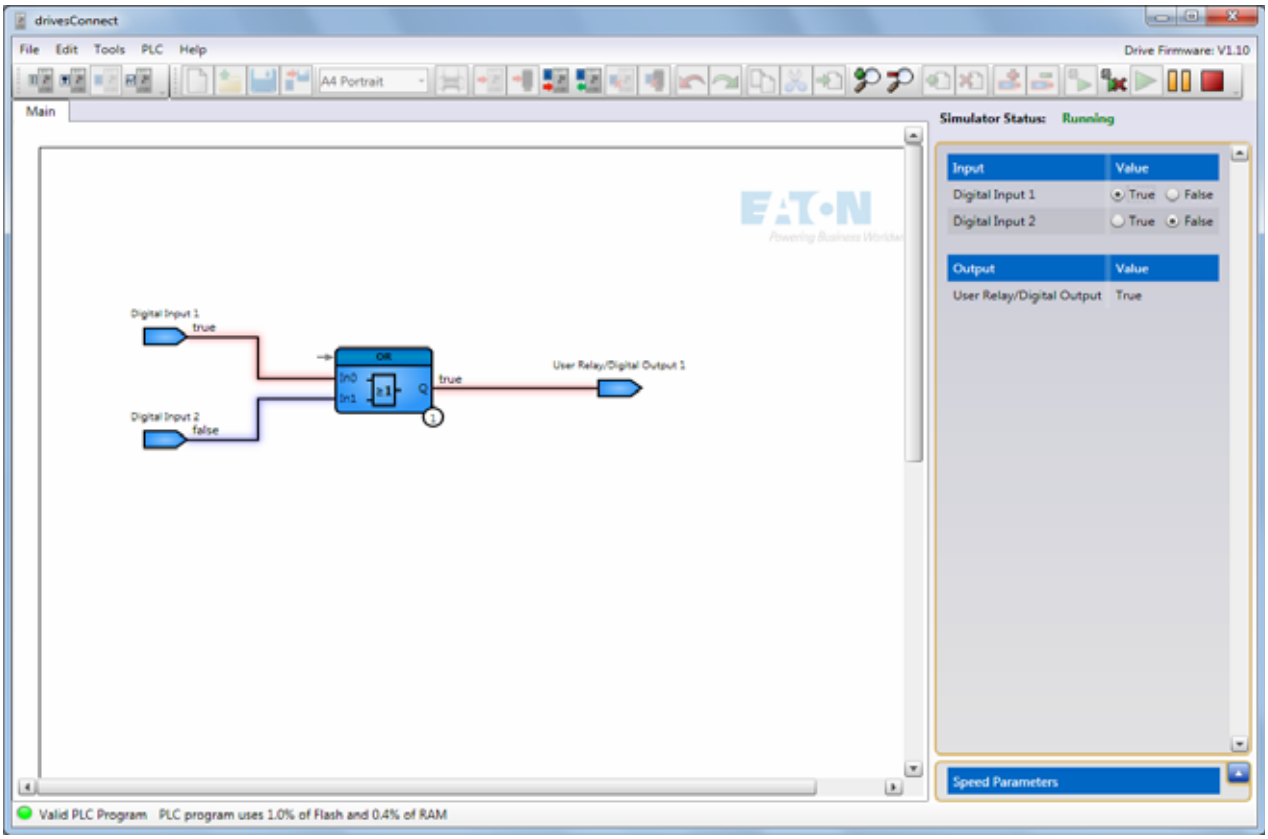


Figure 102:Simulation active

When the simulation starts, all inputs will be set to FALSE (0). You can use the pane on the right to manually change input values. The outputs will be calculated accordingly. As soon as the simulation starts running, the diagram will show the corresponding values.

Example (see figure 102):

- Input 1 active (= TRUE; High; 1)
- Input 2 not active (= FALSE; Low; 0)
- OR block: input 1 OR input 2

As soon as (at least) one input is active, the output will become active as well (= TRUE; High; 1).

The red highlighting is used to indicate the signal flow.

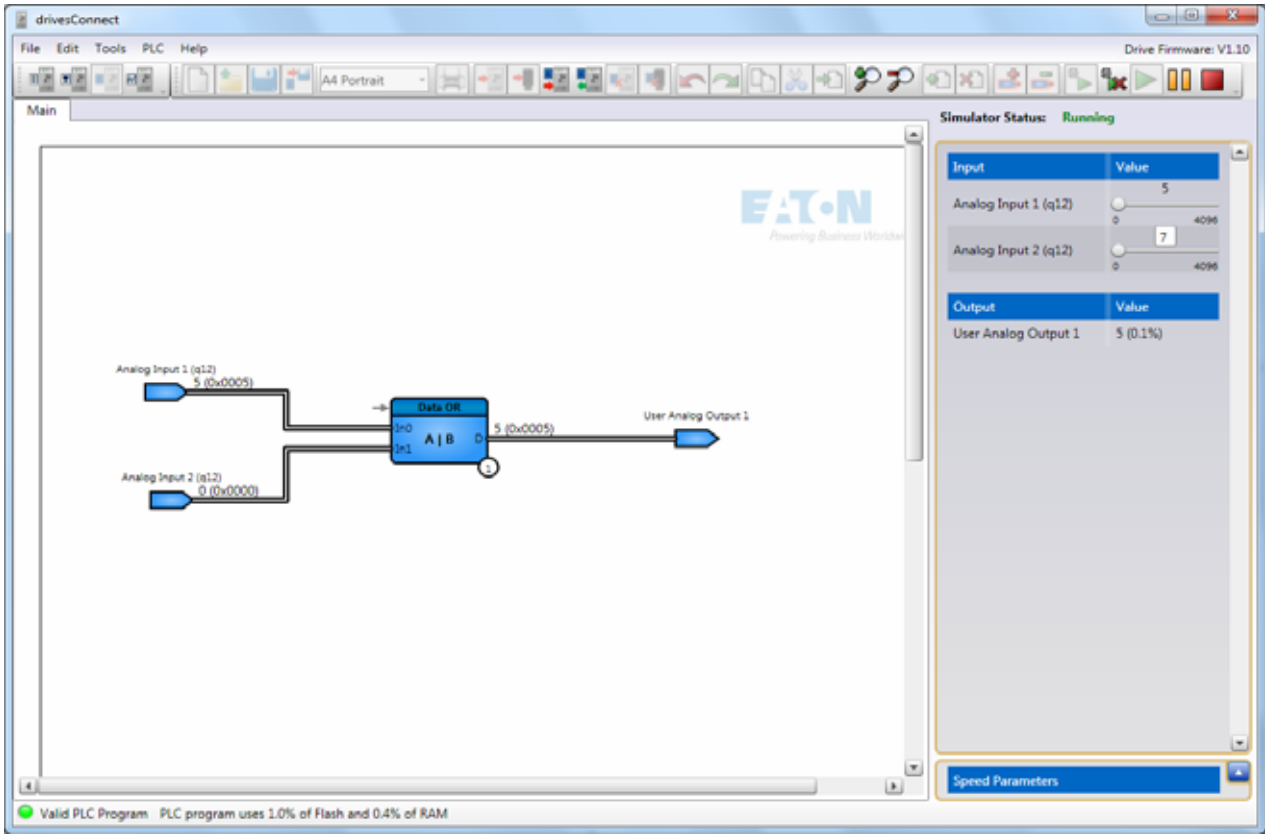


Figure 103:Example showing an analog block

The simulation interface works in a similar way when working with analog inputs and outputs:

Instead of TRUE (1) or FALSE (0), you can enter a value of 0 to 4096 (= 2^{12}) or -32767 to 32767 (= 2^{15} - 1), as applicable. To enter these values, you can either use the slider controls on the right pane or click on the corresponding number in order to enter a value manually. The simulation diagram will show the corresponding decimal values and hexadecimal values. The gray arrow on the blocks' left upper corner serves as a logic input that can be used to activate and deactivate each block. If, for example, a block is receiving a FALSE (0) signal as shown below, the output will also be FALSE, even if the function should output TRUE (1) as a result of the block's other inputs.

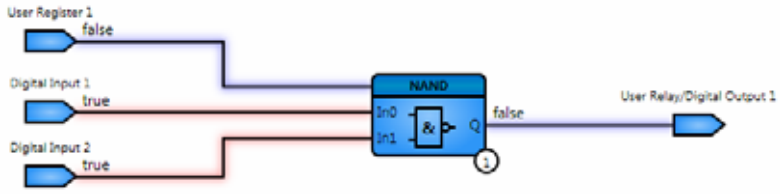
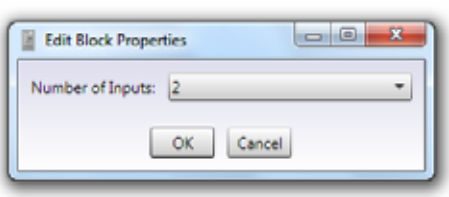
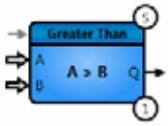
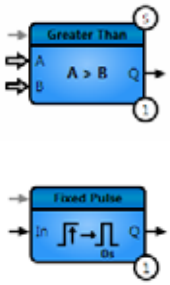


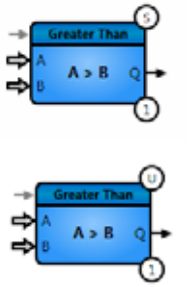
Figure 104:Deactivated AND block

Example

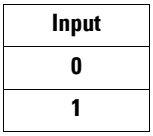
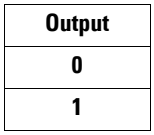
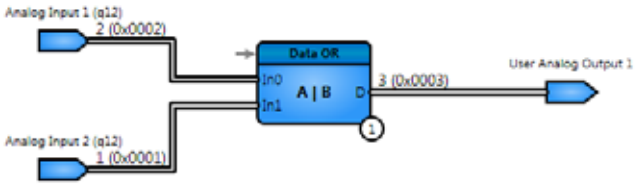
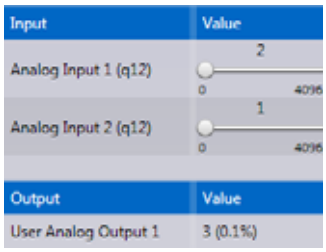
Even though the AND sequence's two inputs are active (red), the output will not be active, since the block is not activated (blue).

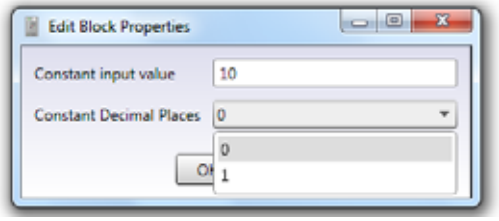
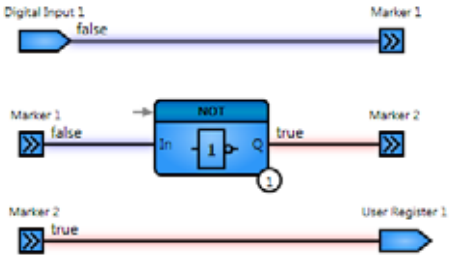
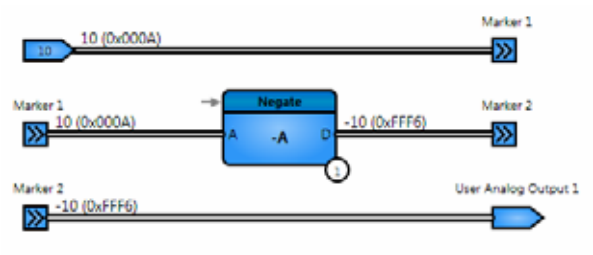
6.9 General notes

Symbol	Explanation
	Thin black arrow = Digital
	Thick white arrow = Analog
	To edit a block in greater detail (e.g., to edit the number of inputs or the length of pulses), simply double-click on it.
	The gray arrow on each block serves as a logic input that can be used to activate and deactivate the block (FALSE or 0 = deactivated; TRUE or 1 = Activated). If the arrow is not used (not connected), the block will automatically be active.
	The number in the lower right corner indicates the block's place in the order of blocks found in the PLC program.
	Inputs and outputs can be disabled by right-clicking on them.

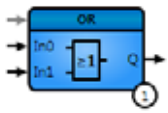
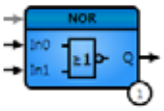
Symbol	Explanation
	An "S" in the upper right corner stands for "signed". A "U" stands for "unsigned". Double-clicking on the blue symbol will change the setting.
OR	OR operation
AND	AND sequence
NOR	OR logic gate with output negated
NAND	AND sequence with output negated
XOR	Exclusive OR logic gate
>>	Right bit shift
<<	Left bit shift
In, In1, In2, … A, B	input
Q	Digital output
D	Data output
R(Reset)	Reset
C	Dead time
P	Period duration, time input in timer blocks
T, T1, T2	Time input (switch-on delay and off-delay)
TRUE = 1 = High	Activated
FALSE = 0 = Low	Deactivated

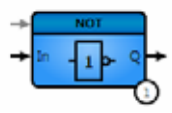
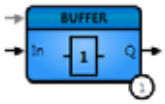
6.9.1 Input/Output

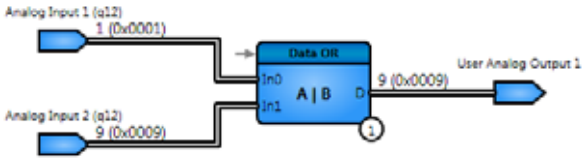
Symbol	Example	Explanation
Logic Input 		Binary digital input 0 or 1 / TRUE or FALSE
Logic Output 		Binary digital output 0 or 1 / TRUE or FALSE
Data input 	Example showing an OR logic gate 	Can be edited by double-clicking on it
Data Output 		Can be edited by double-clicking on it

Symbol	Example	Explanation
Constant In 		You can double-click on the block in order to enter a value and a fixed number of decimal places.
Lo. Link (in) 		This digital marker will store the value of 1 (or TRUE) or 0 and provide it at a different location.
Data link (in) 		This analog marker will store a value and provide it at a different location.

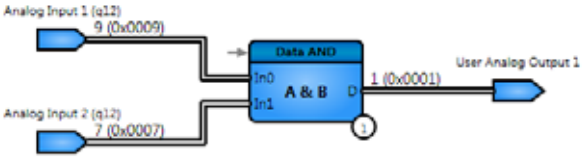
6.9.2 Logic functions

Symbol	Example	Explanation
OR gate 	In0 | In1 | IQ 0 | 0 | 0 0 | 1 | 1 1 | 0 | 1 1 | 1 | 1	Output value Q will have a signal value of TRUE (1) if one of the input variables has a signal value of TRUE (1) (max. 4 inputs).
NOR gate 	In0 | In1 | IQ 0 | 0 | 1 0 | 1 | 0 1 | 0 | 0 1 | 1 | 0	OR logic gate with output negated (max. 4 inputs).
AND gate 	In0 | In1 | IQ 0 | 0 | 1 0 | 1 | 0 1 | 0 | 0 1 | 1 | 0	Output value Q will have a signal value of TRUE (1) if all input variables have a signal value of TRUE (1) (max. 4 inputs).
NAND gate 	In0 | In1 | IQ 0 | 0 | 1 0 | 1 | 1 1 | 0 | 1 1 | 1 | 0	AND sequence with output negated (max. 4 inputs).
XOR gate 	In0 | In1 | IQ 0 | 0 | 0 0 | 1 | 1 1 | 0 | 1 1 | 1 | 0	Output value Q in an XOR gate with two input variables will have a signal value of TRUE (1) if the signal values of the two input variables are different from each other (max. 2 inputs).

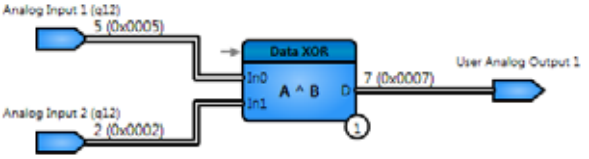
Symbol	Example	Explanation
NOT gate 	<table><tr><th>In</th><th>IQ</th></tr><tr><td>0</td><td>1</td></tr><tr><td>1</td><td>0</td></tr></table>	Negates the input value.
BUFFER gate 	<table><tr><th>In</th><th>IQ</th></tr><tr><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td></tr></table>	Reproduces the input value at the output.

Symbol	Example	Explanation
Data OR function 		The OR function will be applied to at least two data inputs (binary comparison with up to a max. of 8 inputs).

16-bits	decimal	2^{15}	2^{14}	…	2^3	2^2	2^1	2^0
In0	1	0	0	0	0	0	0	1
In1	9	0	0	0	1	0	0	1
Result	9	0	0	0	1	0	0	1

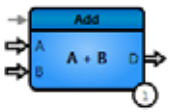
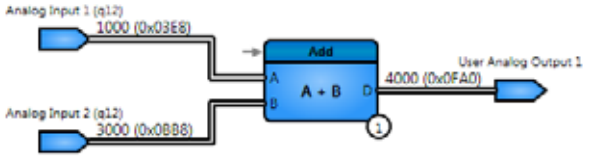
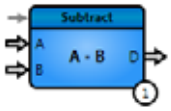
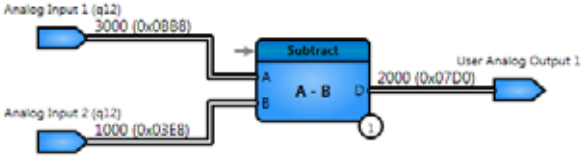
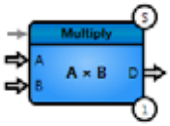
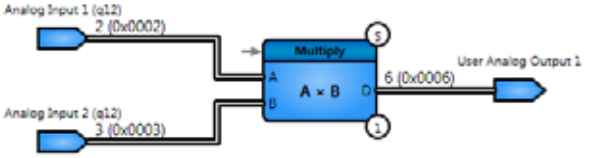
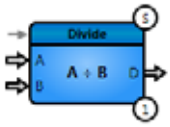
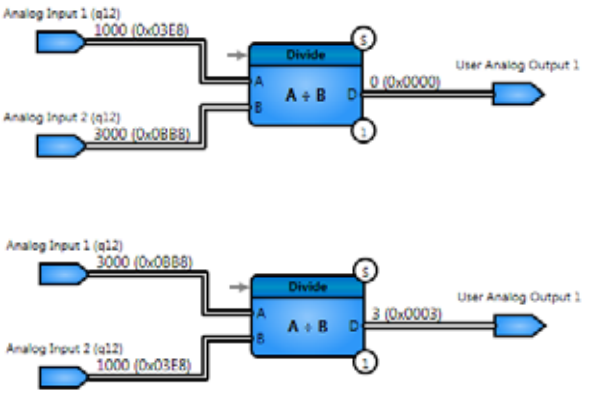
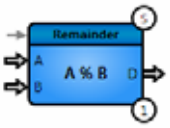
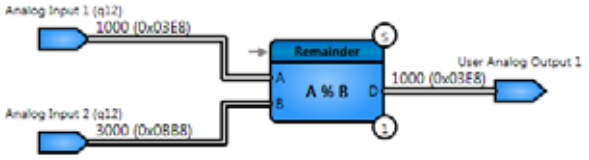
Data AND function 		The AND function will be applied to at least two data inputs (binary comparison with up to a max. of 8 inputs).

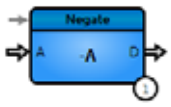
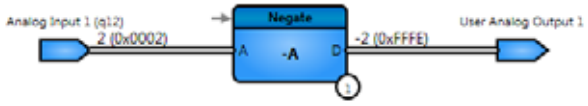
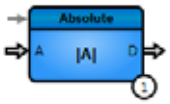
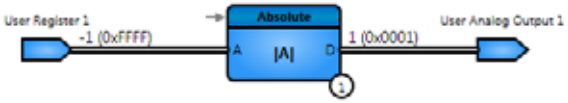
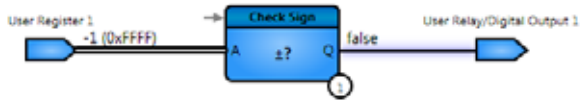
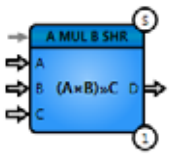
16-bits		2^{15}	2^{14}	…	2^3	2^2	2^1	2^0
In0	9	0	0	0	1	0	0	1
In1	7	0	0	0	0	1	1	1
Result	1	0	0	0	0	0	0	1

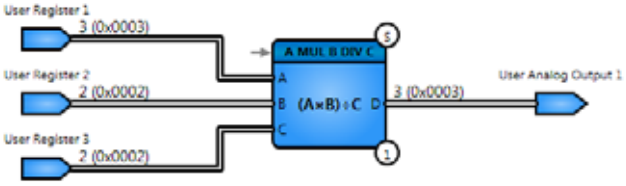
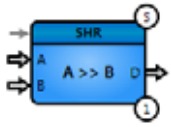
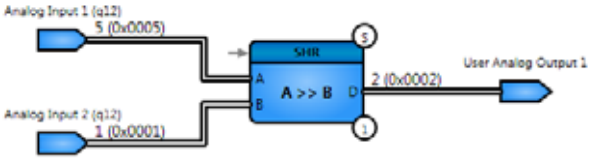
Data XOR function 		The XOR function will be applied to at least two data inputs (binary comparison with up to a max. of 8 inputs).

16-bits		2^{15}	2^{14}	…	2^3	2^2	2^1	2^0
In0	5	0	0	0	0	1	0	1
In1	2	0	0	0	0	0	1	0
Result	7	0	0	0	0	1	1	1

6.9.3 Arithmetic

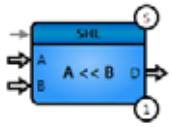
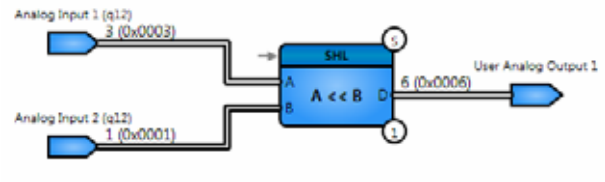
Symbol	Example	Explanation
Adding 		Adds analog inputs 1 and 2 (max. 2 inputs).
Subtracting 		Subtracts analog input 2 from analog input 1 (max. 2 inputs).
Multiply 		Multiplies analog inputs 1 and 2 (max. 2 inputs).
Divide 		Divides data input 1 by data input 2. The result will be an integer (quotient) without the remainder (max. 2 inputs).
Remainder 	 Example: 1 : 3 = 1 -> 10 : 3 = 9 -> The remainder to 10 is 1.	Modulo operation: The result that is output will be the remainder obtained when data input 1 is divided by data input 2.

Symbol	Example	Explanation
Negate 	 **16-bits** | **2¹⁵** | **2¹⁴** | **…** | **2³** | **2²** | **2¹** | **2⁰** **A** 2 0 0 0 0 0 1 0 **Result** -2 1 0 0 0 0 0 1 0	Inverts the data input's value.
Absolute 	 **16-bits** | **2¹⁵** | **2¹⁴** | **…** | **2³** | **2²** | **2¹** | **2⁰** **A** -1 1 0 0 0 0 0 1 **Result** 1 0 0 0 0 0 0 1	The absolute function determines the magnitude (absolute value) of the input value. The leading bit will be set to 0.
Check Sign 	 	The sign function will return TRUE (1) if the input value is greater than or equal to 0 and FALSE (0) if the input value is less than 0.
Multiplication and right shift function 	 **16-bits** | **2¹⁵** | **2¹⁴** | **…** | **2³** | **2²** | **2¹** | **2⁰** **A** 3 0 0 0 0 0 1 1 **B** 2 0 0 0 0 0 1 0 **provisional result** 6 0 0 0 0 1 1 0 **Cc** 1 0 0 0 0 0 0 1	Multiplies input values A and B and then shifts the result to the right by the value at input C. (A x B) >> C Shift by 1

Symbol	Example	Explanation
Multiplication and division function 		Multiplies input values A and B and then divides the result by C. (A x B) ÷ C
Right shift function 		Shifts input A to the right by the value at input B.

16-bits		2^{15}	2^{14}	…	2^{3}	2^{2}	2^{1}	2^{0}
In0	5	0	0	0	0	1	0	1
In1	1	0	0	0	0	0	0	1
Result	2	0	0	0	0	0	1	0

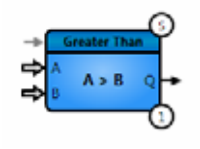
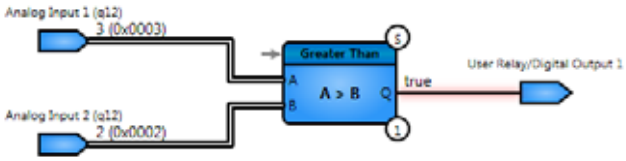
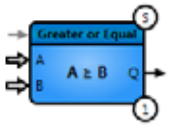
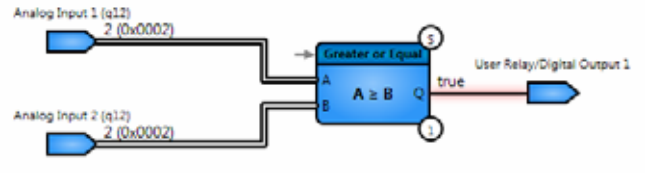
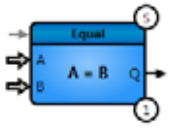
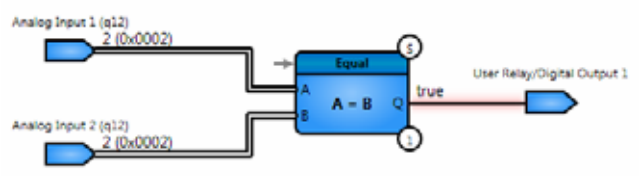
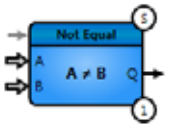
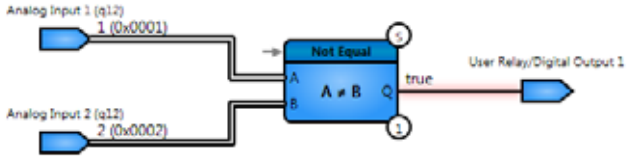
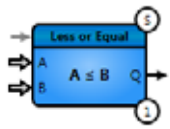
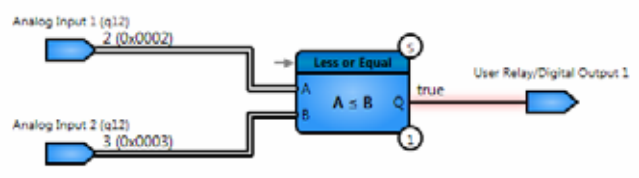
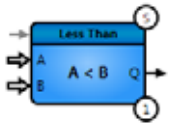
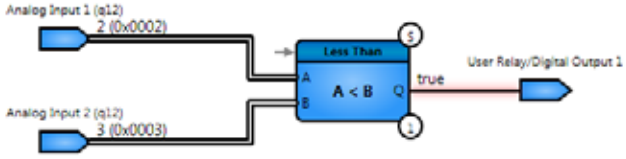
Shift by 1

Left shift function 		Shifts input A to the left by the value at input B.

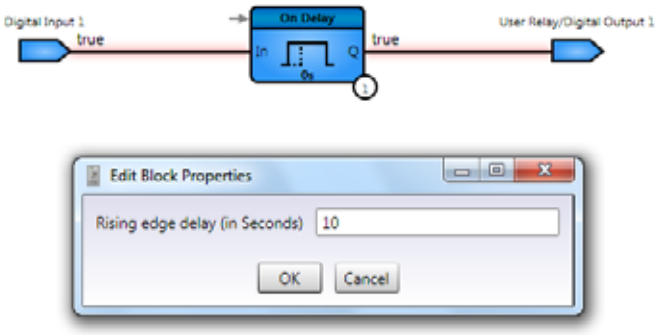
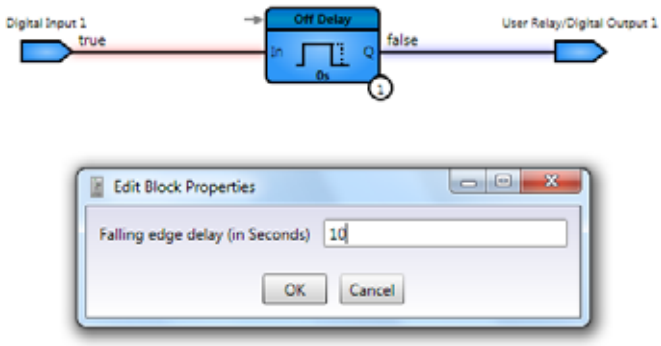
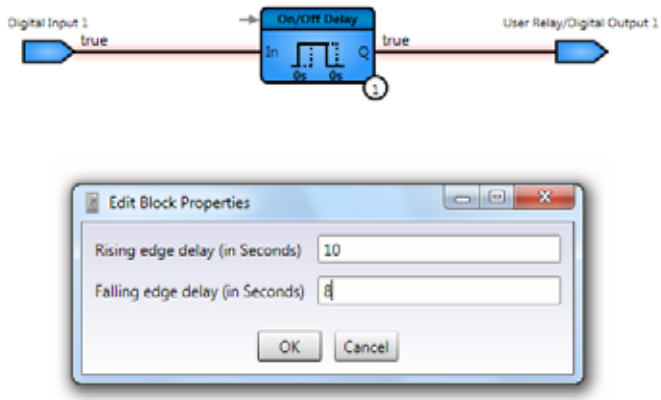
16-bits		2^{15}	2^{14}	…	2^{3}	2^{2}	2^{1}	2^{0}
In0	3	0	0	0	0	0	1	1
In1	1	0	0	0	0	0	0	1
Result	6	0	0	0	0	1	1	0

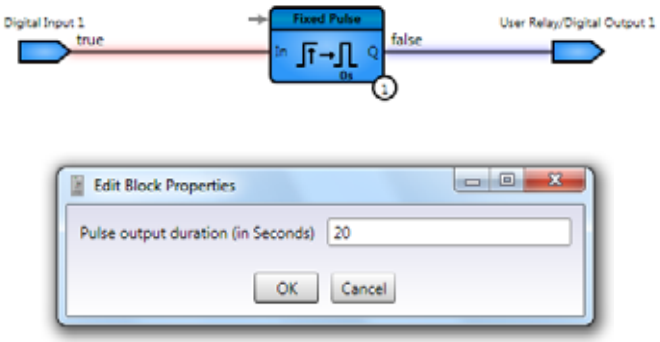
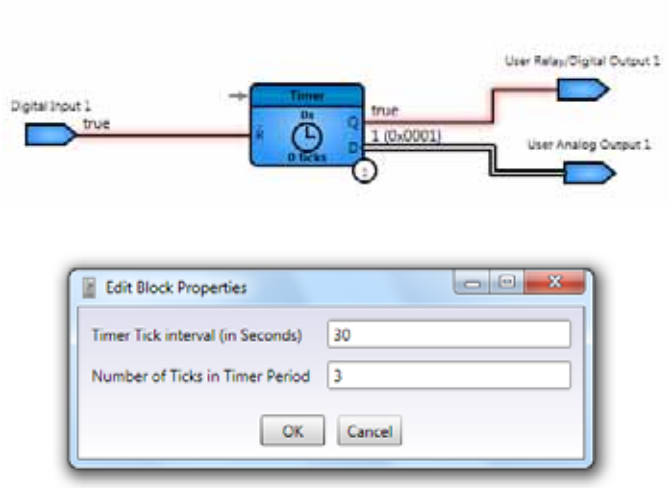
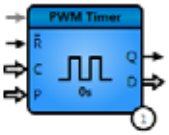
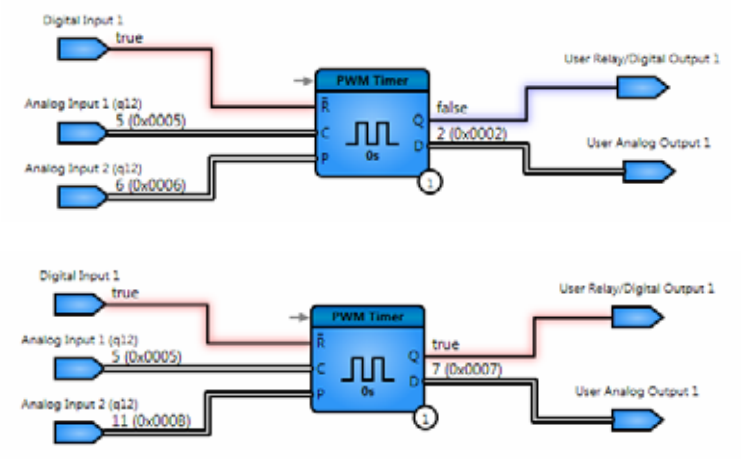
Shift by 1

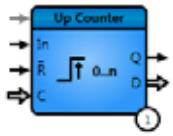
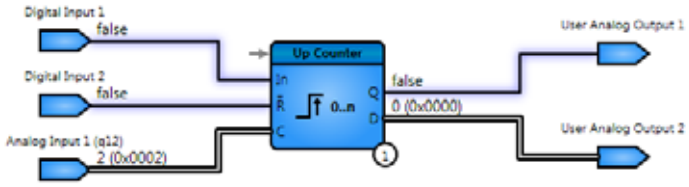
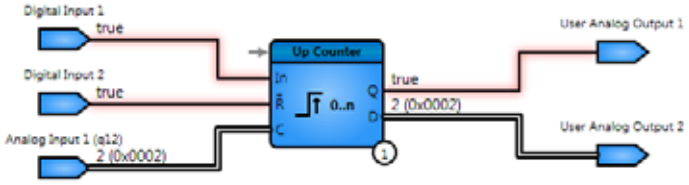
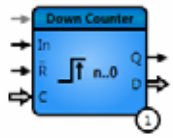
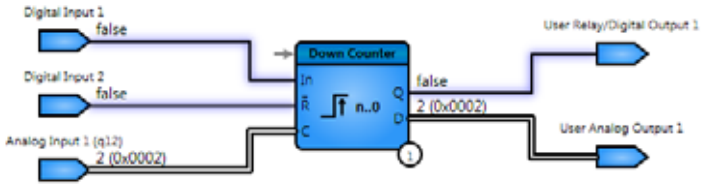
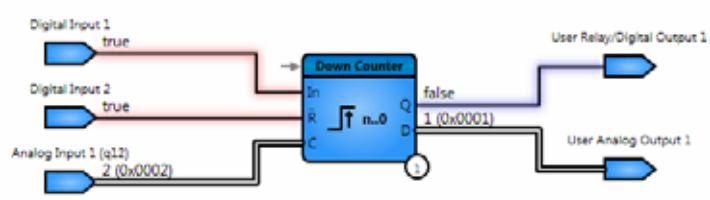
6.9.4 Compare

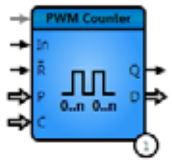
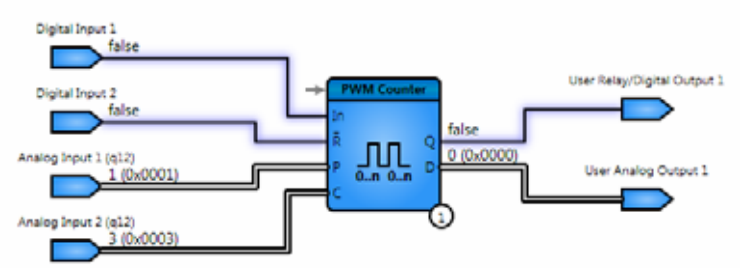
Symbol	Example	Explanation
Larger 		The "greater than" function will return TRUE (1) if A is greater than B and FALSE (0) if A is less than or equal to B.
Greater or Equal 		The "greater than or equal to" function will return TRUE (1) if A is greater than or equal to B and FALSE (0) if A is less than B.
Equal 		The "equal to" function will return TRUE (1) if A is equal to B and FALSE (0) if A is not equal to B.
Not Equal 		The "not equal to" function will return TRUE (1) if A is not equal to B and FALSE (0) if A is equal to B.
Less or Equal 		The "less than or equal to" function will return TRUE (1) if A is less than or equal to B and FALSE (0) if A is greater than B.
Less Than 		The "less than" function will return TRUE (1) if A is less than B and FALSE (0) if A is greater than or equal to B.

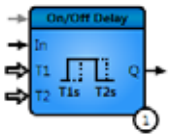
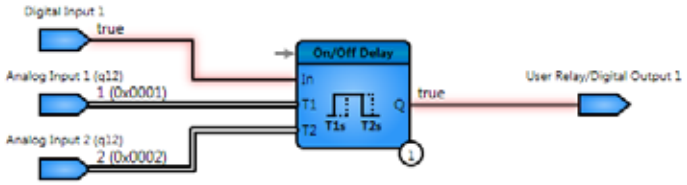
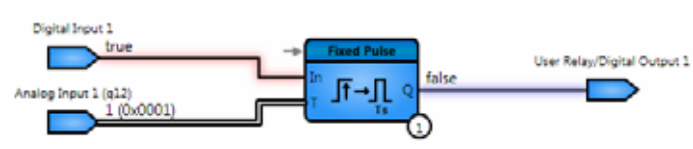
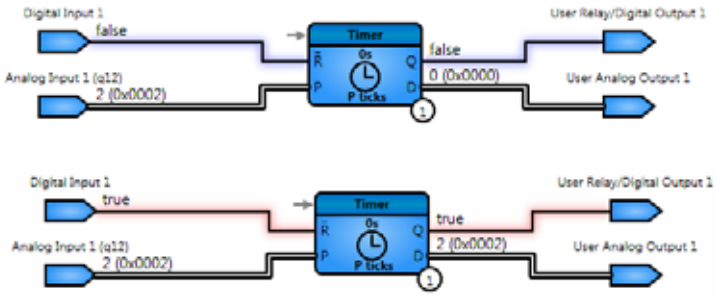
6.9.5 Timers / Counters

Symbol	Example	Explanation
Switch-on delay 		Delays the rising edge at the input by the specified time (double-click to specify the delay time) before outputting it.
OFF-Delay 		Delays the falling edge at the input by the specified time (double-click to specify the delay time).
Switch-on delay/off delay 		Combines the switch-on delay and off-delay functions.

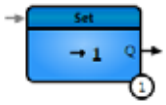
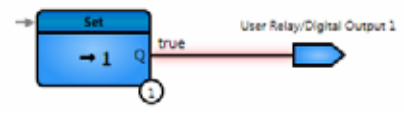
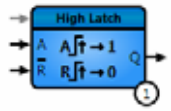
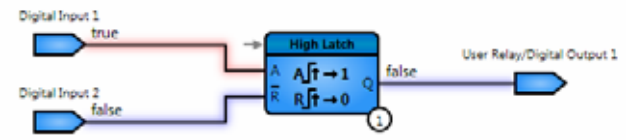
Symbol	Example	Explanation
Pulse with defined length 		A Rising Edge triggered Preset Pulse Width output.
Multi-purpose timer function 	 Note: The duration of the pauses and the number of pulses can be defined by double-clicking on the symbol.	Output Q will be set to 1 (TRUE) when the specified timer time elapses. Output D outputs the timer cycle counter signal.
PWM generator with internal clock 		Frequency generator with period duration (input P) and dead time (input C). Activated with an input signal of TRUE (1) at input R. Output Q is the frequency output. Data output D functions as a counter.

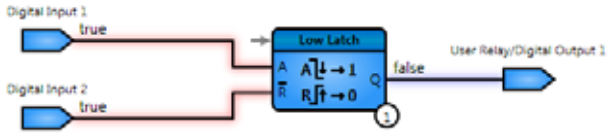
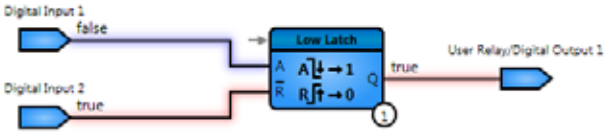
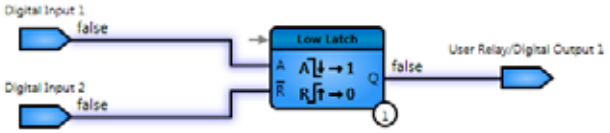
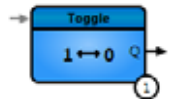
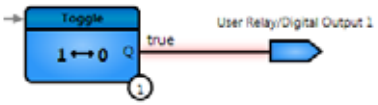
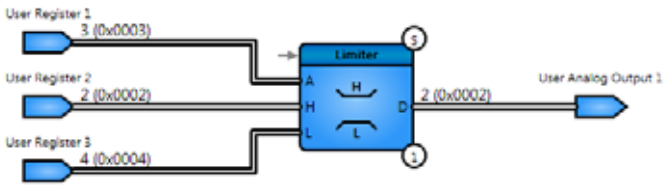
Symbol	Example	Explanation
Up Counter 	 	Up counter with counter input In and counter value input C. Activated with an input signal of TRUE (1) at input R. Output Q will be set to TRUE (1) when the counter value is reached. Data output D functions as a counter.
Down Counter 	After an edge  	Down counter with counter input In and counter value input C. Activated with an input signal of TRUE at input R. Output Q will be set to TRUE (1) when the counter value is counted down to 0.

Symbol	Example	Explanation
PWM generator with clock input 	 The ratio of P to C defines how input frequency In is divided and the result output at Q.	Frequency generator with duty cycle (input P) and dead time (input C). Activated with an input signal of TRUE (1) at input R. Input In functions as a counter input. Output Q is the frequency output. Data output D functions as a counter.

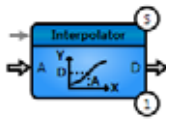
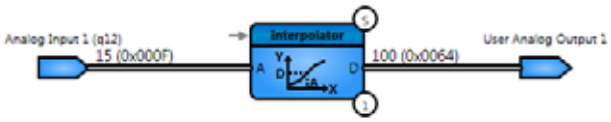
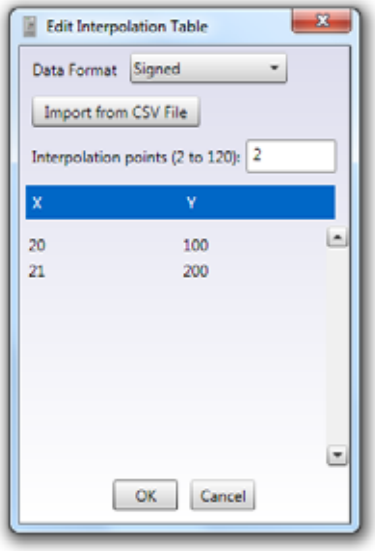
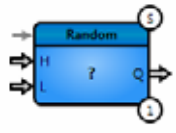
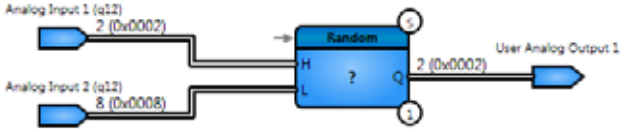
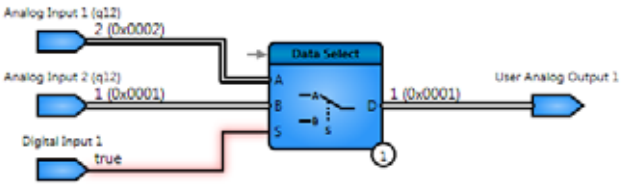
Symbol	Example	Explanation
Switch-on delay/off-delay 		Delays the rising edge at the output by the value at input T1. Delays the falling edge at the output by the value at input T2.
Pulse with defined length 		A rising edge will trigger a defined pulse width at the output. The pulse width at the output is defined by the value at input T.
Multi-purpose timer function 		Output Q will be set to TRUE (1) when the timer period specified by the value at input P elapses. Output D is the timer cycle counter.

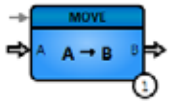
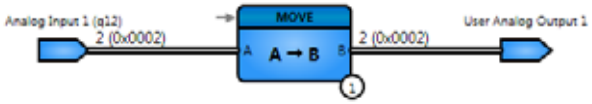
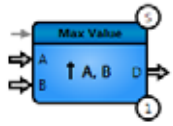
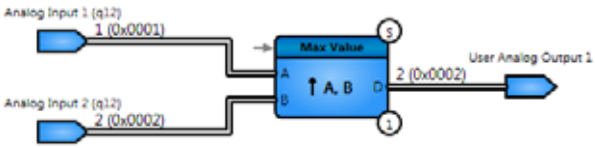
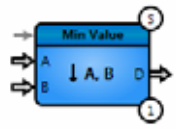
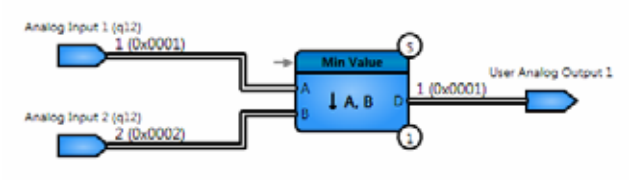
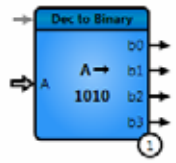
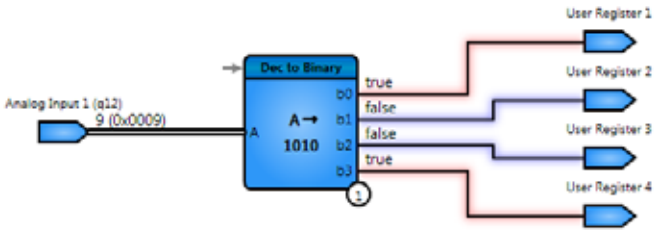
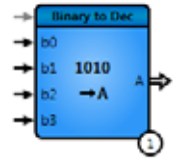
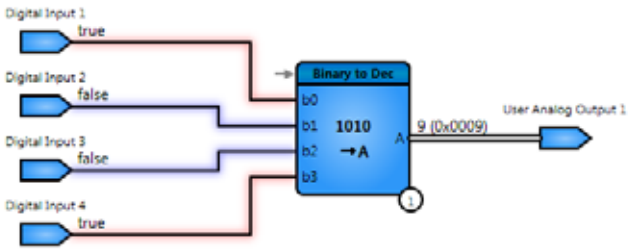
6.9.6 Data manipulation

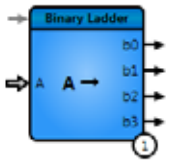
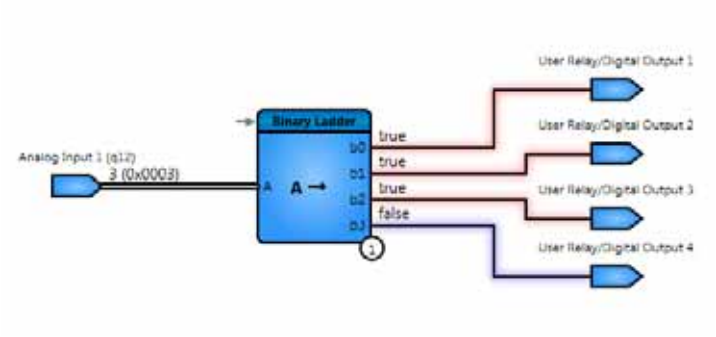
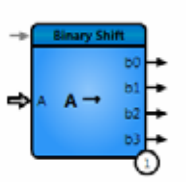
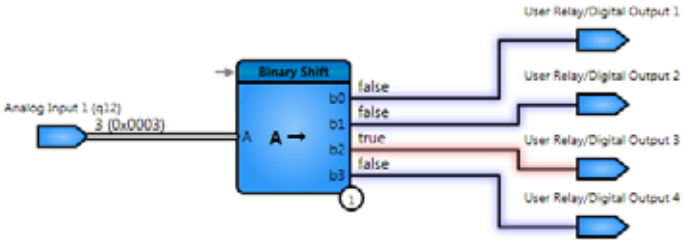
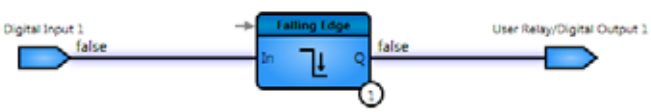
Symbol	Example	Explanation
Set 		Sets output Q to a logical 1 (TRUE).
Reset 		Sets output Q to a logical 0.
High Latch 	 A: Change from 0 to 1:  R(Reset): Change from 1 to 0: 	Flip-flop: The output will be set to a logical 1 (TRUE) when input A's state changes from 0 (FALSE) to 1 (TRUE). If input R's (Reset) state changes from 1 (TRUE) to 0 (FALSE), the output will be set to a logical 0 (FALSE).

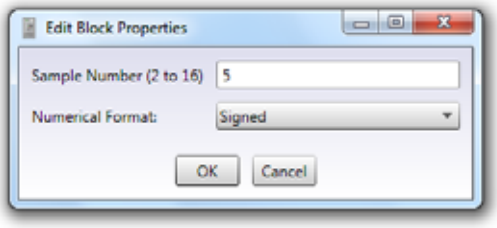
Symbol	Example	Explanation
Low Latch 	 A: Change from 1 to 0:  R(Reset): Change from 1 to 0: 	Flip-flop with negated input: The output will be set to a logical 1 (TRUE) when input A's state changes from 1 (TRUE) to 0 (FALSE). If input R's (Reset) state changes from 1 (TRUE) to 0 (FALSE), the output will be set to a logical 0 (FALSE).
Toggle 		Frequency generator (flashing signal generator) with constant frequency
Limit 		Output D will be set to the high limit if A > H and to the low limit if A < L. Otherwise, output D will replicate the value at A.

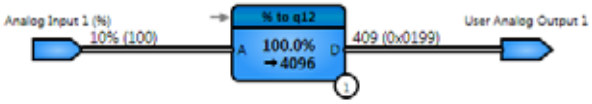
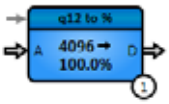
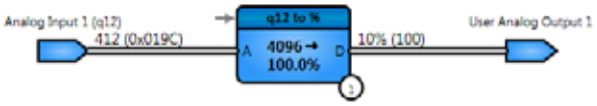
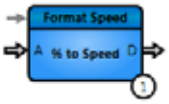
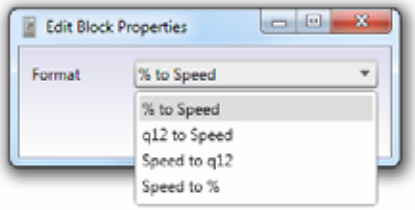
Symbol	Example	Explanation
Lookup table function 	  **Note:** When you import a lookup table, the first column will always be used as an index column (input value A) and the second column as the corresponding output value D. The index values must start at 0 and increase one by one. The number of table entries must not exceed 240. Use commas as a separator.	Double-clicking on the block will open the **Edit Lookup Table** window. Click on **Import from CSV File** to add the table.

Symbol	Example	Explanation
Interpolation 	 15 < 20 -> D = 100 	The output value will be calculated using linear interpolation based on the two nearest index values in the lookup table, with one being calculated above the input value and another below. The maximum number of table entries is limited to 120. Use commas as a separator.
Random generator function 		Output value Q will be a randomly generated 16-bit value between upper limit H and lower limit L.
Data Select 		Output D will be set to the value at A if there is a 0 (FALSE) at S and to the value at B if there is a 1 (TRUE) at S.

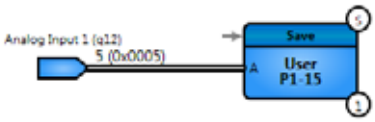
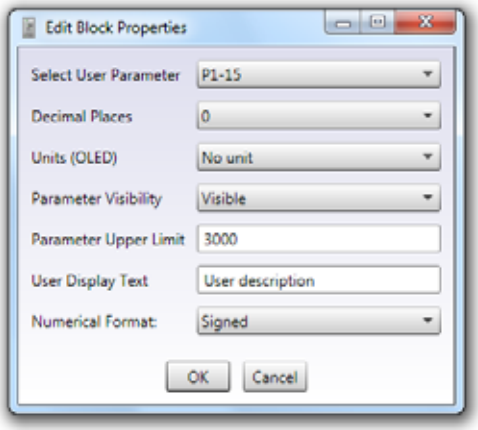
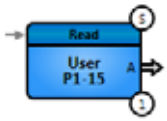
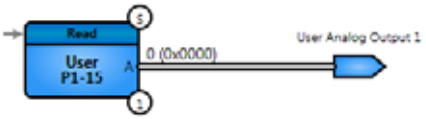
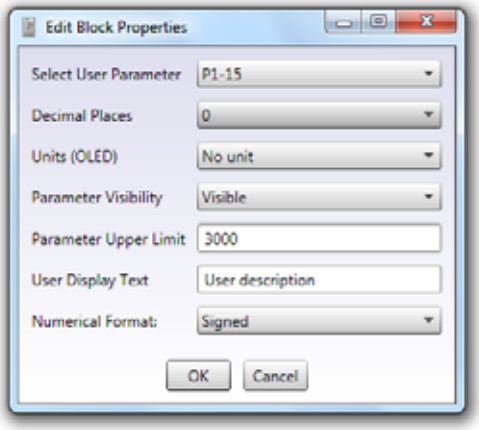
Symbol	Example	Explanation
Move 		The move function copies the value at data input A to analog output B. (Evaluating input R is a good idea.)
Max Value 		Sets analog output D to the maximum value between inputs A and B.
Min Value 		Sets analog output D to the minimum value between inputs A and B.
Decimal to binary 		Converts the decimal number at input A into a binary number. To add outputs (max. 16 outputs), double-click on the block.
Binary to decimal 		Converts the binary number defined with inputs b0 through b3 into a decimal number. To add inputs (max. 16 inputs), double-click on the block.

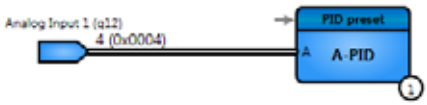
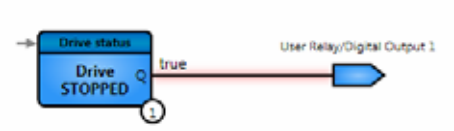
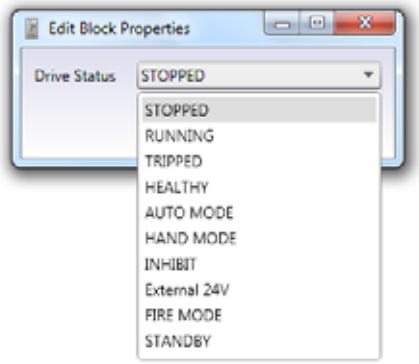
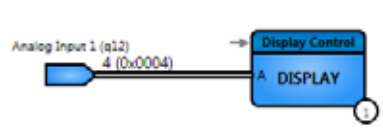
Symbol	Example	Explanation
Bargraph conv. 	 A = 0 -> b0, … , bn = 0 A = 1 -> b0 = 1, b1, …, bn = 0 A = 2 -> b0, …, b1 = 1; b2, …, bn = 0 ….	Activates outputs one after the other based on the value at input A.
Binary Shift 	 A = 0 -> b0, …, bn = 0 A = 1 -> b1 = 1; otherwise 0 A = 2 -> b2 = 1; otherwise 0 ….	Input A has value X. The Xth output will be switched to TRUE (1) accordingly.
Rising Edge 		A rising edge (0 to TRUE (1)) will trigger a single pulse at the output.
Falling Edge 		A falling edge (TRUE (1) to 0) will trigger a single pulse at the output.

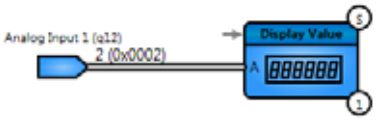
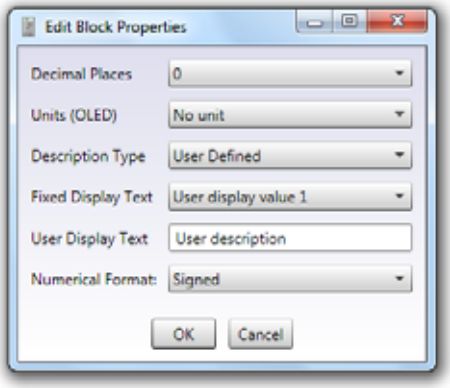
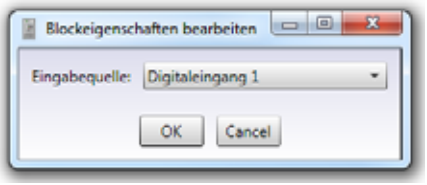
Symbol	Example	Explanation
Edge Detect 		A falling and a rising edge will trigger a single pulse at the output.
Mean value 	 	Sets the output to the average value of 2 to 16 polled values.

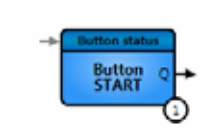
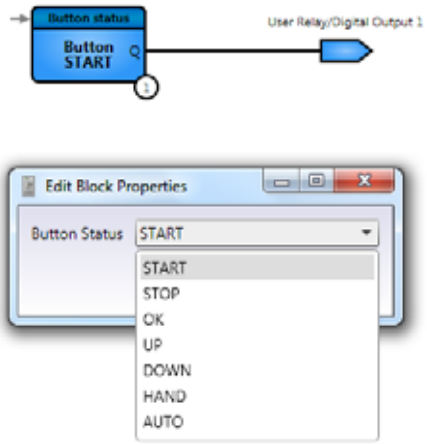
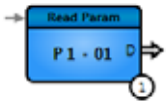
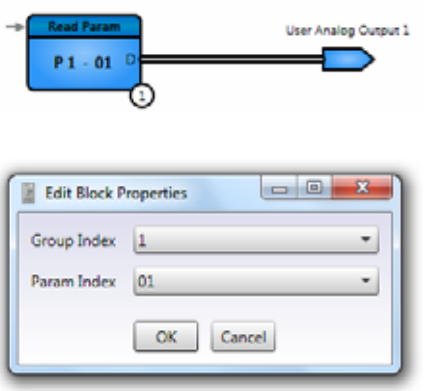
Symbol	Example	Explanation
Conversion from % to q12 		Converts the input value from a percentage format (100.0%) to a Q12 format (4096).
Conversion from q12 to % 		Converts the input value from a Q12 format (4096) to a percentage format (100.0%).
Format Speed 	 	Converts a percentage value into a Q12 value and vice versa. The internal drive value will be used as the speed indicator. 100% speed corresponds to the value in P1-01.

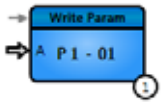
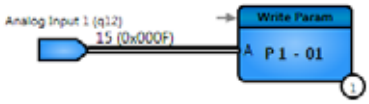
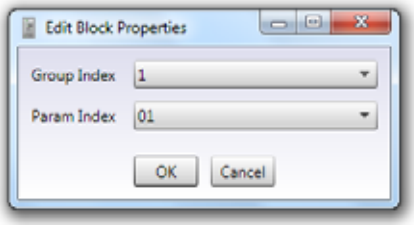
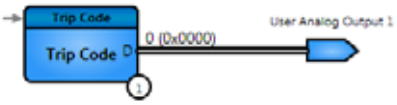
6.9.7 Drive Functions

Symbol	Example	Explanation
Save 	 	Creates a user-defined parameter, P1-15 to P1-22, that can be read with the keypad and adjusted with the programming in the function block.
Read 	 	Creates a user-defined parameter, P1-15 to P1-22, that can be adjusted and read with the keypad.

Symbol	Example	Explanation
PID preset 		This block is used to set the integrator in the PID controller.
Drive status 	 	Sets output Q to a logical 1 (TRUE) if the selected drive condition is TRUE.
Display Control 	 	The operating value defined with the value at input A (0 to 5) will be looked up and shown on the drive display.

Symbol	Example	Explanation
Display Value	 	Shows a user-defined text on the drive display (OLED).
User messages	  	Shows a user-defined or default message and identifies it as a warning, alarm, or trip.

Symbol	Example	Explanation
Switching function status 		Sets the output to a logical 1 (TRUE) when the selected button on the drive is pressed.
Read Param 		Reads the value for the selected drive parameter from groups 1 through 9.

Symbol	Example	Explanation
Write Param 	 	Writes the value to the selected drive parameter from groups 1 through 9.
Automatic mode 		Switches the drive to AUTO mode when the input changes from a logical 0 (FALSE) to a logical 1 (TRUE) (rising edge).
Trip Code 		Reads the failure code that corresponds to the drive trip (see column 2 in the error message table in manual MN04020005Z).

6.10 Use

To connect the functions and gates you just created to the current PLC program, you will have to carry out the steps below.

Use code 201 on parameter P-14 to expand the **Basic** parameter range.

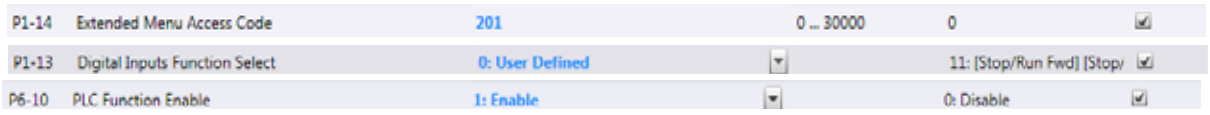


Figure 105:Expanded "Basic" parameter range

- Set parameter P1-13 to **0: User Defined**.
- Set parameter P6-10 to **1: Activate**.

You will now be able to use parameter group 9 to select the parameters that should be added to the PLC function as inputs and outputs.

→ For a more detailed description, please consult manual MN04020005Z for DA1 variable frequency drives.

7 Scope / Data Logger



Figure 106:drivesConnect start screen

The **Scope / Data Logger** component works the same way as an oscilloscope (informally referred to as a "scope"). You can use this component to view up to four curves for selected parameters.

When you open the **Scope / Data Logger** component, the following screen will appear:

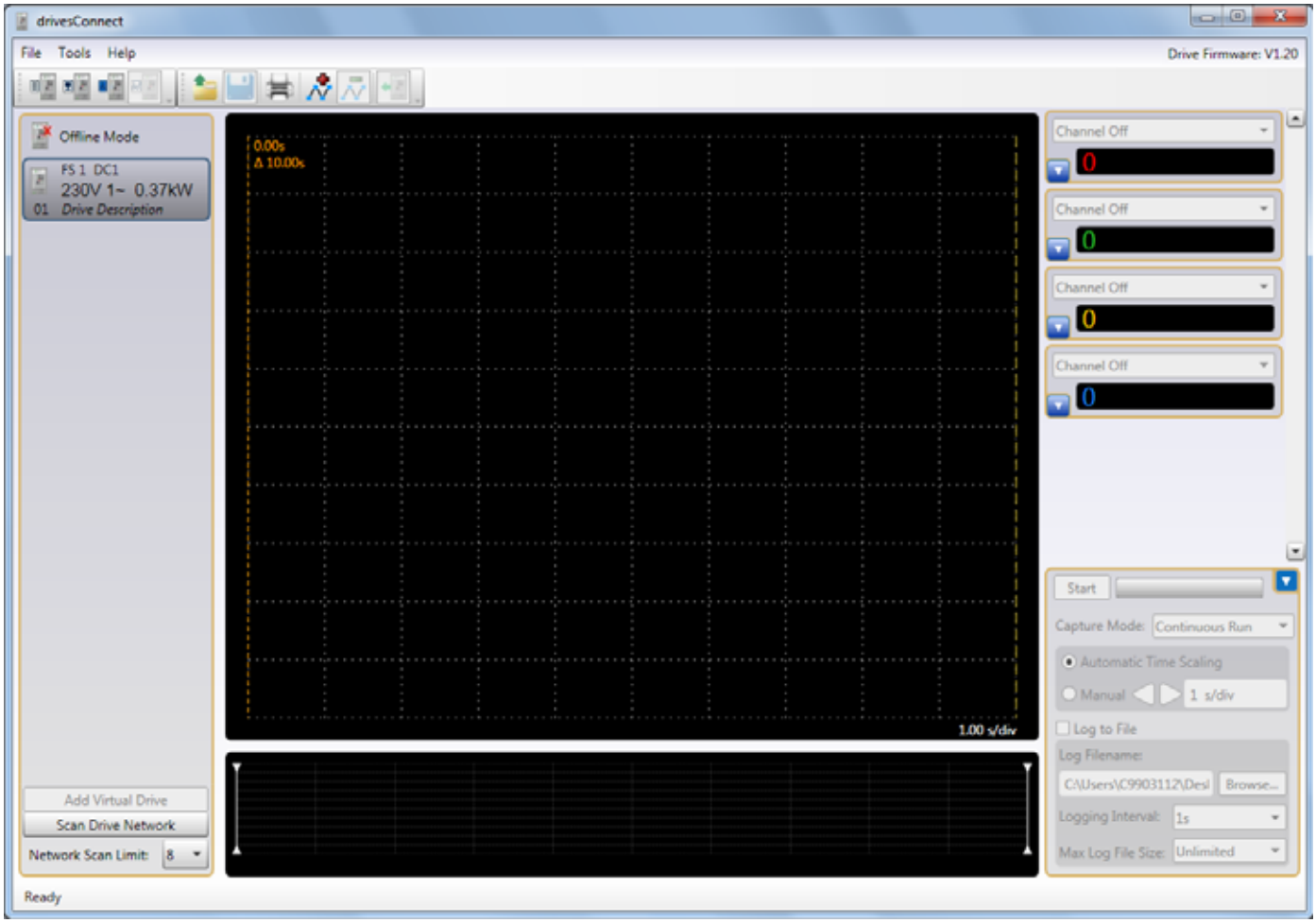


Figure 107:Start screen for "Scope / Data Logger" component

7.1 File

The **File** menu in the "Scope / Data Logger" component features the following standard options:

- **Load Scope Data**,
- **Save Scope Data**,
- **Print,**
- **Exit**.

In addition, the menu has an option for exporting scope data.

- Export Scope Data…

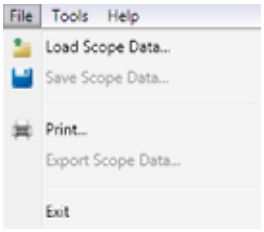


Figure 108:"File" menu in the "Scope / Data Logger" component

7.2 Tools

You can use the **Tools** menu to select the right COM port and communication type in order to successfully establish a connection to your variable frequency drive.

In addition, the menu comes with the option of checking the drivesConnect program and the drive's firmware.

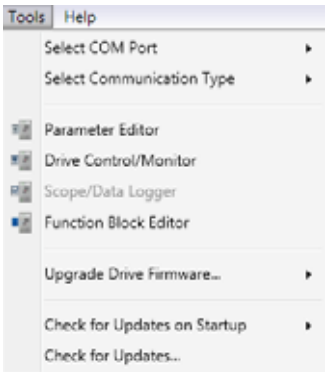


Figure 109:The "Tools" menu

7.3 Help

The options in the **Help** menu can be used to activate and deactivate your license.

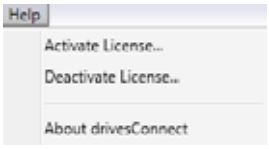


Figure 110: "Help" menu

7.4 Use

You can use the pane on the right to set the four parameters that you want to measure. Moreover, you can use the lists for the individual channels in order to select the display value you want.

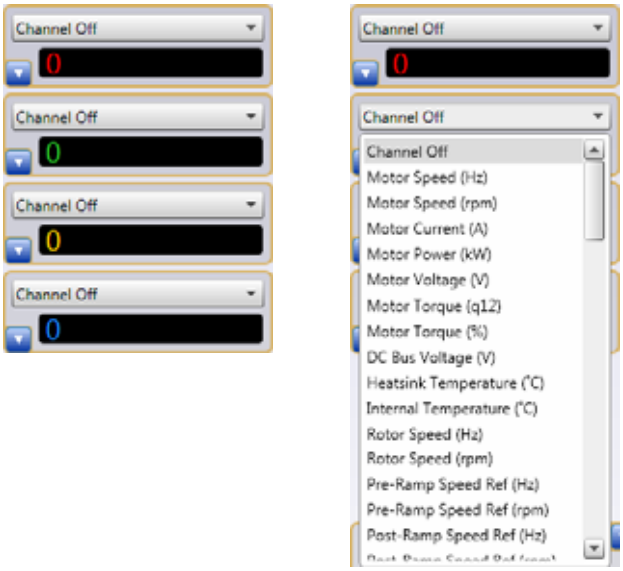


Figure 111: Drop-down list for a display channel

The following parameters and display values will be available for selection:

Mode parameter	Unit	Explanation
Motor speed	Hz, rpm	
Motor current	A	
Motor power	kW	
Motor voltage	V	
Motor torque	q12, %	
DC link voltage	V	
Variable frequency drive temperature	°C	
Internal temperature	°C	
Rotor speed	Hz, rpm	
Speed reference value before the ramp	Hz, rpm	
Speed reference value after the ramp	Hz, rpm	P0-63
DC link voltage ripple	V	

Mode parameter	Unit	Explanation
User speed reference	Hz, rpm	Defined in the Function Block Editor
User torque reference	q12, %	Defined in the Function Block Editor
Analog output 1	q12	
Analog output 2	q12	
Value of analog input 1	q12, %	
Value of analog input 2	q12, %	
Speed reference value	Hz, rpm	
Digital pot. speed	Hz, rpm	
Fieldbus speed	Hz, rpm	
Master speed	Hz, rpm	
Slave speed	Hz, rpm	
Speed reference for frequency input	Hz, rpm	
Measured encoder speed	q12, %	
Torque controller setpoint value	q12, %	
Master torque setpoint value	q12, %	
Field bus torque setpoint value	q12, %	
PID setpoint value selection	q12, %	
PID Feedback	q12, %	
PID Output	q12, %	
Phase U output current	A	
Phase V output current	A	
Phase W output current	A	
P0-77 Low value		Pulse generator counter value Content defined in parameter group 0
P0-77 High value		Pulse generator counter value Content defined in parameter group 0
P0-78 Low value		Dummy
P0-78 High value		Dummy
User register 1 - 15		Defined in the Function Block Editor

In addition, "continuous operation" and "fleeting pulse" can be recorded in **trigger mode.**

In the case of continuous operation, you can select between "automatic" (**Automatic Time Scaling**) and "manual" (**Manual**) scaling. Moreover, you can save the scope file (**Record to File**).

In "fleeting pulse" **trigger mode**, you can select the input you want under **Trigger type**. You can also select between a positive edge and a negative edge under **Trigger edge**. **Pre-trigger** refers to the interval recorded before the trigger signal. It can be adjusted manually, just like the **Scan time** and the **Trigger level**. You will only be able to adjust the trigger level manually if the level is set to channel 1.

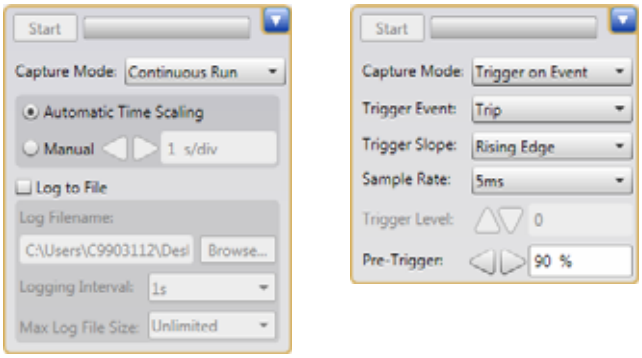


Figure 112:Setting options for the “continuous operation” and "fleeting pulse" trigger modes

The motor voltage and motor current will be used below as examples in order to explain, first, how “continuous operation” works and, second, how “fleeting pulse” works.

The **Start** button is used to start recording.

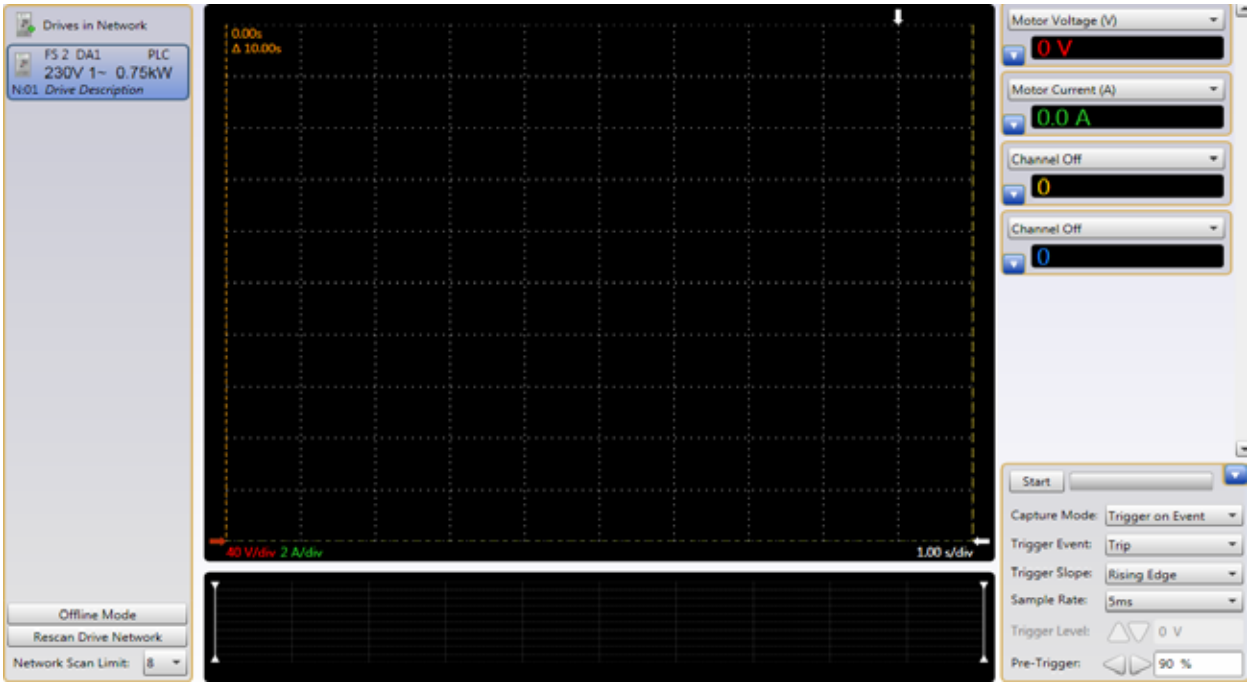


Figure 113:Start screen when recording

After approximately 2.5 seconds, the motor is started as well.

The voltage increases in the form of a ramp within 20 seconds as defined in the P1-03 parameter configured in the **Parameter Editor** component.



Figure 114:The acceleration ramp time is 20 seconds

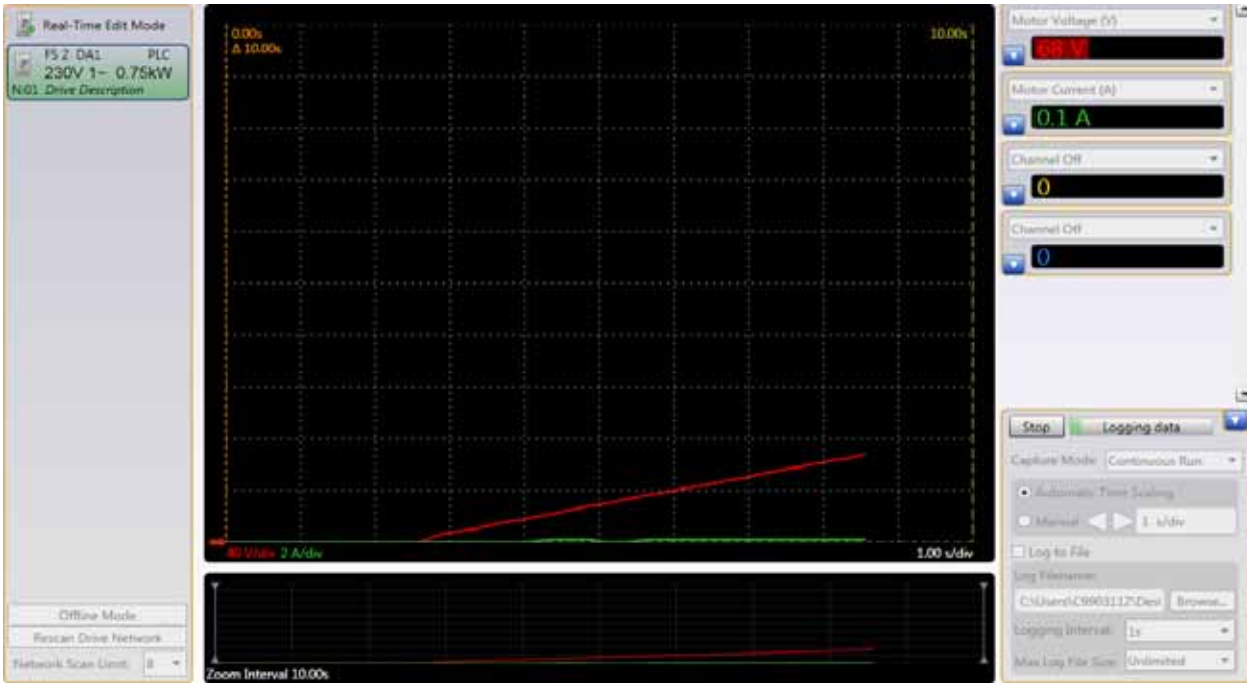


Figure 115:The zoom interval is 10 seconds

At the beginning, the graph has a recording time of 10 seconds with 1 s/div scaling. As soon as this time has elapsed, the interval is increased and the scaling decreased.

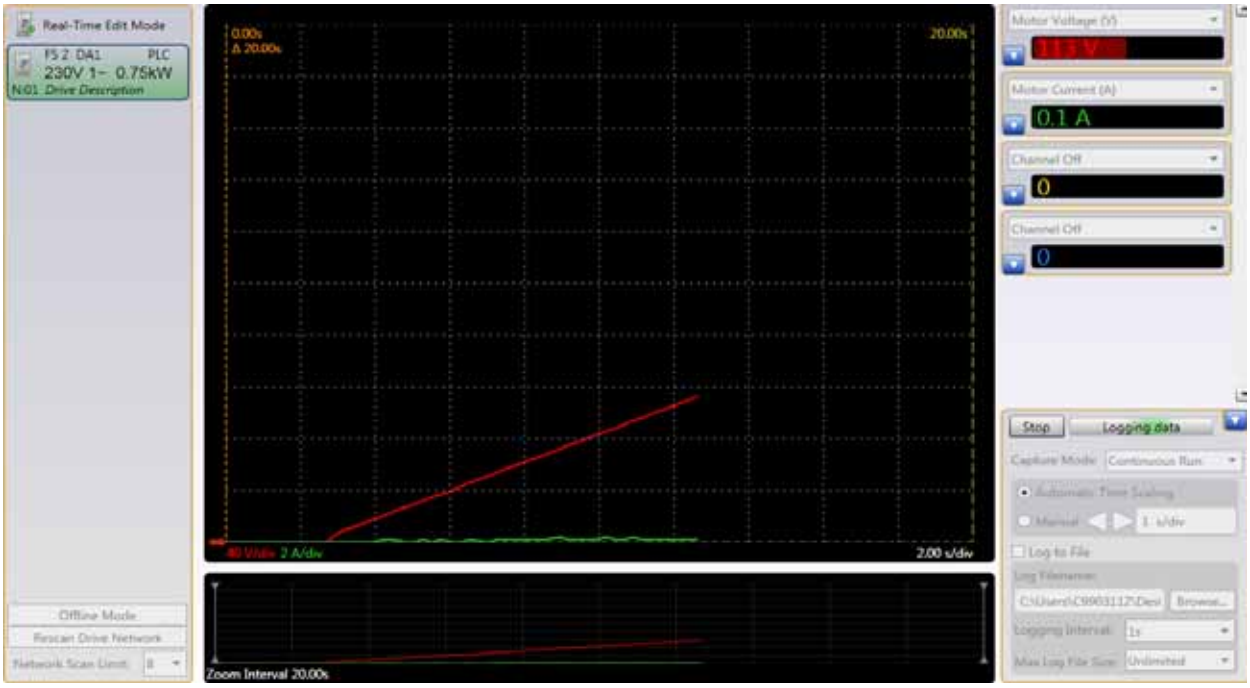


Figure 116:Voltage value after approx. 20 seconds

After 20 seconds, the voltage reaches approx. 230 V. The current corresponding to the motor connected in this example is very small.

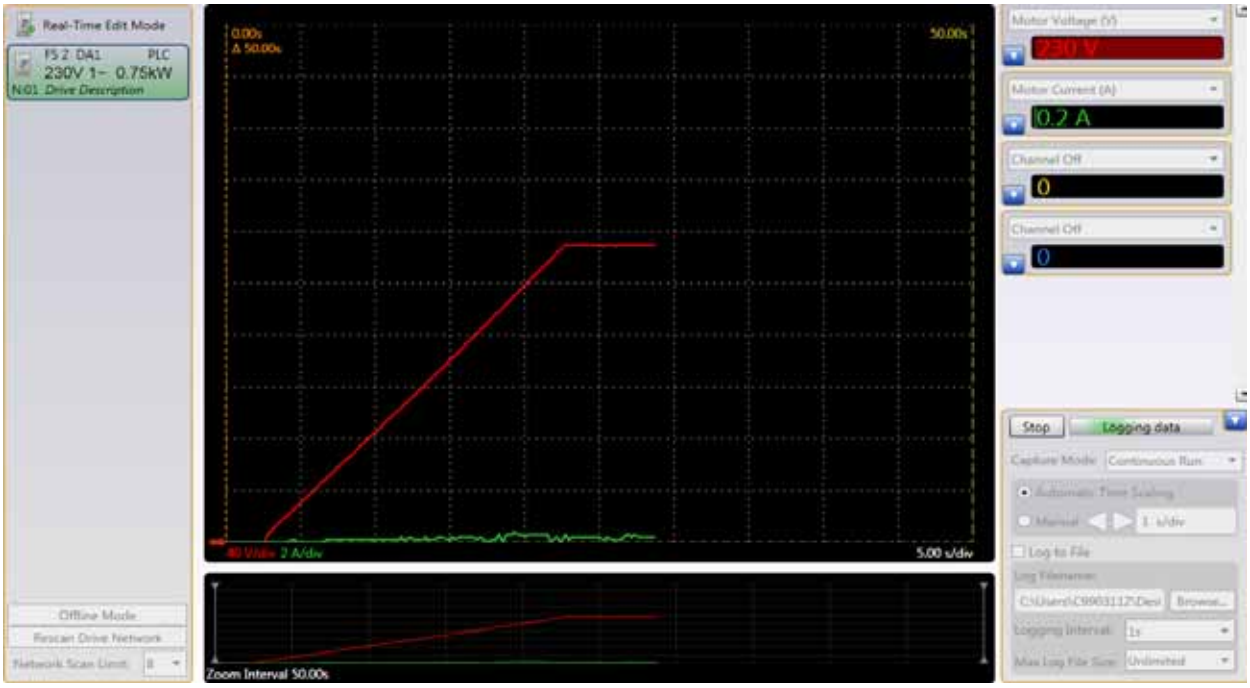


Figure 117:Ramp-up characteristic curve for output voltage (red)

The graph on the bottom shows the zoom interval. Moving the white bars makes it possible to adjust the section that will be shown on the upper graph. The interval between the red and the yellow dashed lines is shown on the red line as being Δ 20.06 s. These lines can be moved as well. Moving the red line will show the current value on the right-hand side display; the same applies to the yellow line. The last value will always be shown.

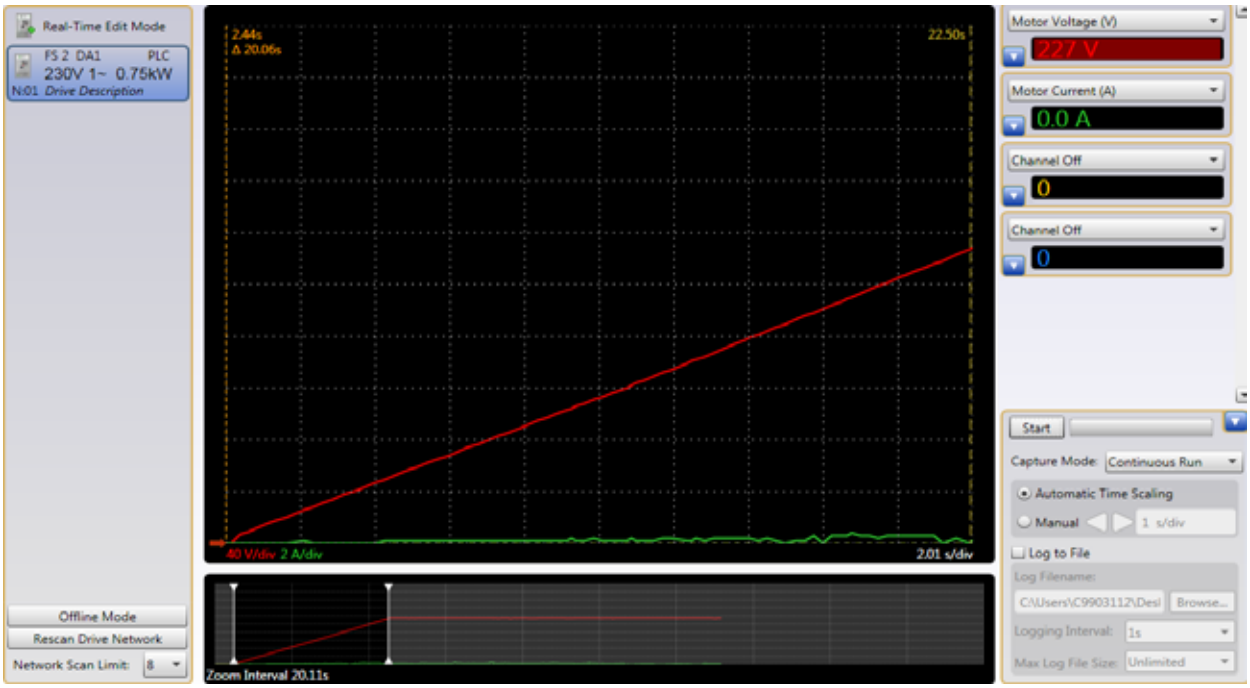


Figure 118:Display value scaling

Recorded graphs can also be manipulated.

This is shown below, using the current as an example.

As a first step, the scale is increased from 2 A/Div to 0.1 A/Div.



Figure 119:Increased resolution for the start signal (green)

In the next step, the **Offset** is used to move the origin.



Figure 120:Moving the origin for the current signal

The “fleeting pulse” trigger mode type is also started with **Start**. Real-time recording will run in the background on the variable frequency drive while the status is “Waiting for trigger”.

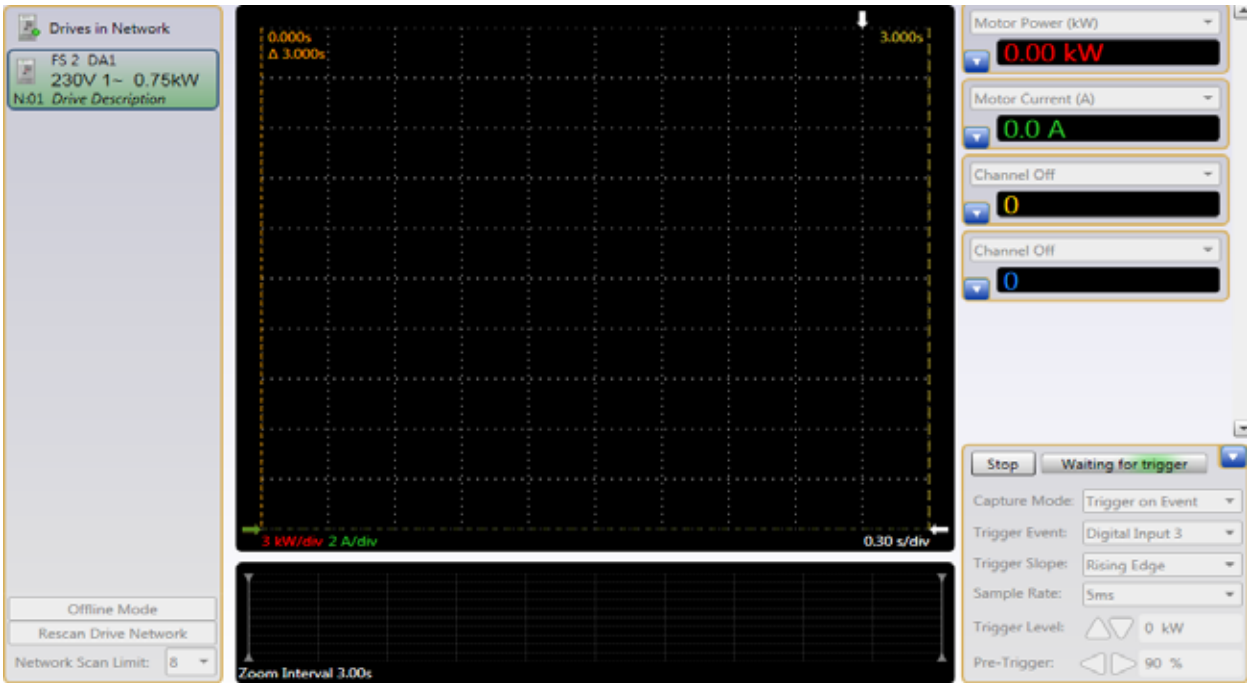


Figure 121: “Trigger mode” operation

A green indeterminate progress bar (**Waiting for trigger**) on the right-hand side pane indicates that the program is waiting for the trigger signal.

As soon as there is a rising edge at digital input 3, the recorded information, including the pre-trigger interval, is stored in the variable frequency drive.

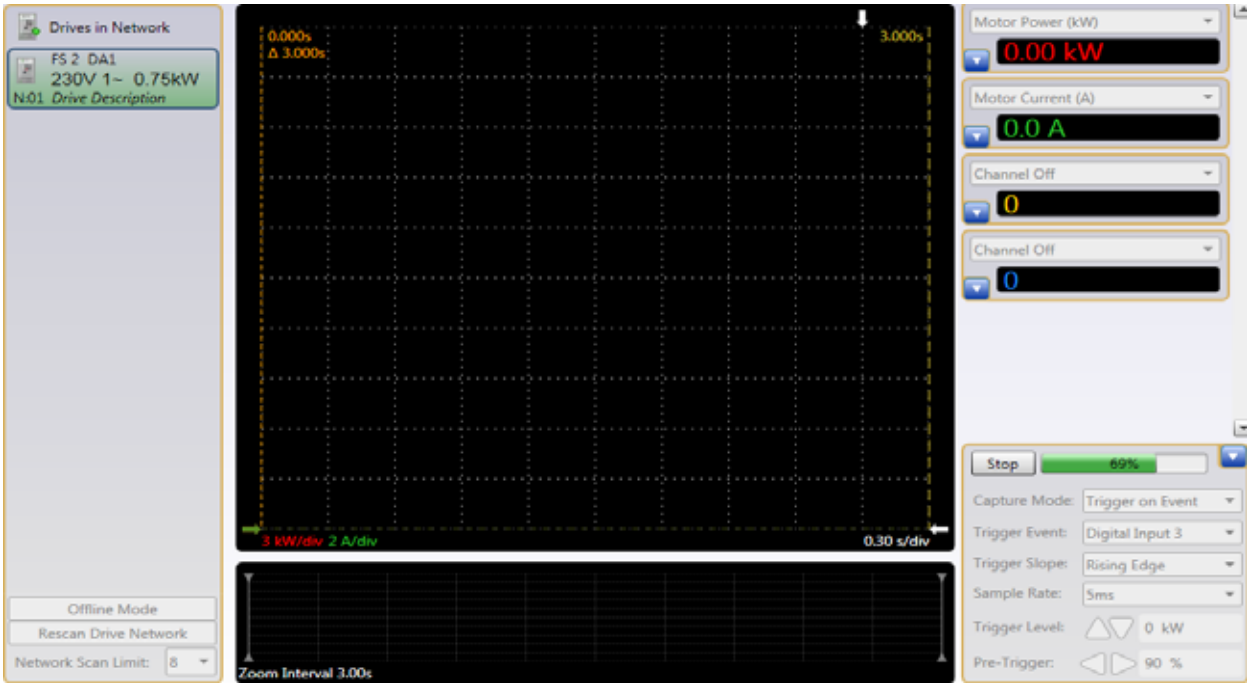


Figure 122:Recording after trigger signal

A green progress bar showing a recording percentage value is used to indicate that the component is recording after the trigger signal.

Once recording is complete, the recorded signal is shown.

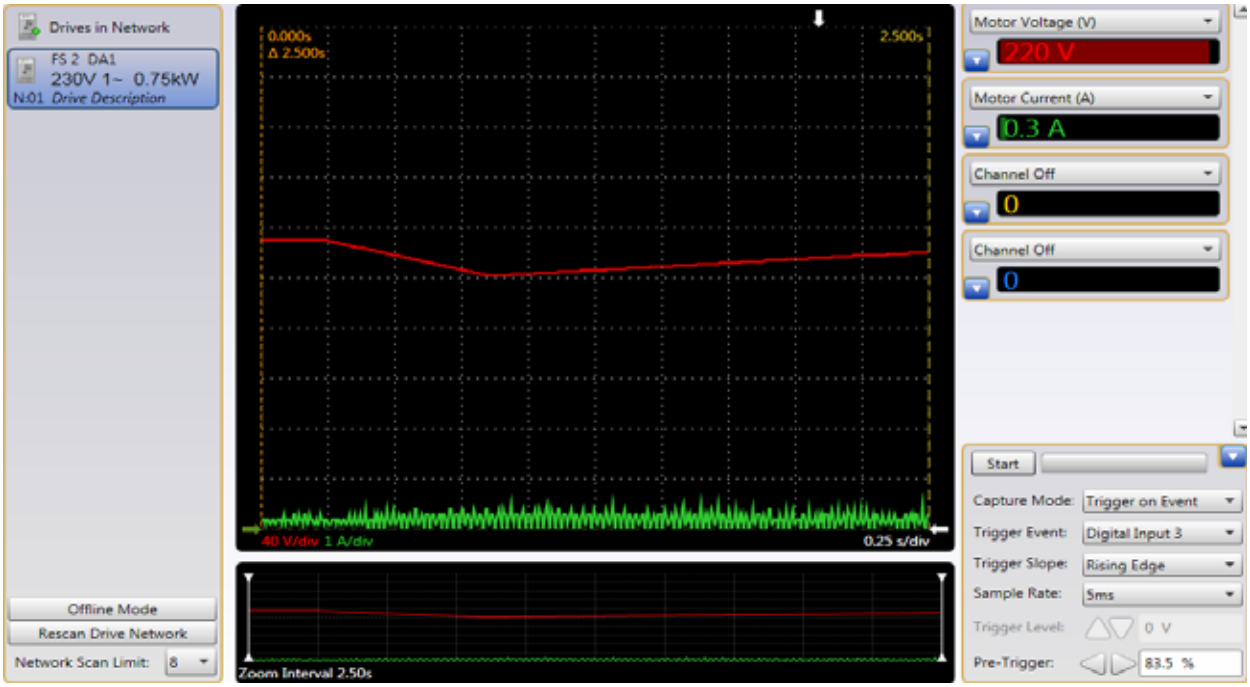


Figure 123:Recorded signal shown

The scope file remains stored in the variable frequency drive. This is indicated by the fact that the drive display element has a red border after the drive is polled again. – Recording a file is only possible with a connected DA1 variable frequency drive!

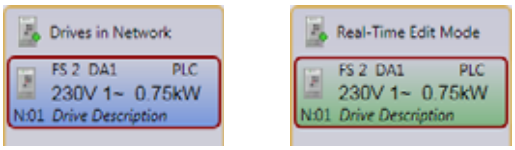


Figure 124:Red border indicating that the scope file has been saved

The recording length will depend on the set scan time. The duration will be 500 times the scan time. The maximum scan time is 1000 ms.

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