ENGINEERING
TOMORROW

Operating Guide

VLT® Motion Control Tool MCT 10

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1 Introduction

1.1 Purpose of this Operating Guide

This manual provides basic knowledge required to use the MCT 10 Set-up Software with Danfoss drives. Familiarity with the following is assumed:

- MS®-Windows™ at user level.
- Set-up, process knowledge, and operation of drive.
- Use of and linkage with communication equipment.

The manual does not provide any detailed information regarding specific applications or possible solutions and related parameter combinations in the set-up and use of a drive. Refer to the operating guide and design guide of the drive. Any update of the manual and instructions related to the MCT 10 Set-up Software is available at www.danfoss.com/en/search/?filter=type%3Adocumentation%2Csegment%3Adds.

Familiarity with the PC or PLC master of the system is assumed. Issues regarding hardware or software produced by other manufacturers are beyond the scope of this manual and are not the responsibility of Danfoss.

Refer to the appropriate manuals for more information about master-to-master communication, or communication to a non-Danfoss slave.

1.2 Manual and Software Version

This manual is regularly reviewed and updated. All suggestions for improvement are welcome.

Edition	Remarks	Software version
MG10RDxx	Upgrade to new software version. Support of VLT® Sensorless Safety MCB 159 added.	4.4X

The original language of this manual is English.

1.3 Intended Use

The MCT 10 Set-up Software enables full system configuration and control. With MCT 10, it is possible to monitor the entire system more efficiently for faster diagnosis and better preventive maintenance.

MCT 10 is designed as an interactive commissioning tool for quick and easy commissioning of the following drive series:

- VLT® 2800
- VLT® 4000.
- VLT® 5000.
- VLT® 6000.
- VLT® 8000.
- VLT® Micro Drive FC 51.
- VLT® HVAC Basic Drive FC 101.
- VLT® HVAC Drive FC 102.
- VLT® Refrigeration Drive FC 103.
- VLT® AQUA Drive FC 202.
- VLT® Midi Drive FC 280.
- VLT® AutomationDrive FC 301/FC 302.
- VLT® AutomationDrive FC 360.
- VLT® Decentral Drive FCD 302.
- VLT® DriveMotor FCM Series.
- VLT® Compressor Drive CD 302.
- VLT® Compressor Drive CDS 302.
- VLT® Compressor Drive CDS 303.
- VLT® Soft Starter MCD 500.
- VLT® Soft Starter MCD 600.
- VLT® Advanced Active Filter AAF 006.

Use cases of the MCT 10:

- For planning a new communication network offline. The MCT 10 contains a complete database with all Danfoss Drives products.
- For commissioning drives online.
- For easy replacement of drives.
- For easy expansion of networks with more drives.
- For back-up of parameter settings of drives in a communication network.
- The MCT 10 supports PROFIBUS DP-V1 communication via a master class 2 connection. This connection eliminates the need for an extra communication network.

The communication framework part of MCT 10 is handling the control of the fieldbusses. It provides enhanced capabilities allowing multiple concurrent fieldbus communication. Several fieldbusses can be configured and combined in the same network within MCT 10.

NOTICE

If several fieldbusses are created with the same type, make sure that they are configured with different scan ranges.

1.4 System Requirements

To use the VLT® Motion Control Tool MCT 10, the IBM-compatible computer must meet the following minimum system requirements:

- A Pentium PIII 350 Mhz or compatible microprocessor.
- 1 GB of RAM recommended.
- A CD-ROM drive.
- 1.4 GB of available space on the hard drive.

MCT 10 runs on the following MS Windows versions:

- Windows™ 7 32/64-bit editions.
- Windows™ 8 32/64-bit editions.
- Windows™ 10 32/64-bit editions.

1.5 Software Modules

The VLT® Motion Control Tool MCT 10 Set-up Software is supplied in 2 modules:

- MCT 10 Set-up Software for:
  - Setting the drive parameters.
  - Copying parameter sets to and from a drive.
  - Documentation/printout of set-up, including diagrams.
  - Servicing and fault analysis.
- APoss program for creating APoss programs.

1.5.1 Features of the VLT® Motion Control Tool MCT 10

- Project-oriented PC tool, 1 tool for all drive series.
- Links to all Windows applications possible.
- Supports Siemens CP PCMCIA-and PCI cards for PROFIBUS DP-V1 master class 2 connection.
- Supports standard interfaces: COMx, USB, RS232 (Flux).
- Siemens PG/Field PGs already have the required hardware.
- View is highly individually configurable.
- Downwards compatibility with Dos-Dialog (*.mnu) and WinDialog (*.vlt).
- Windows™ Explorer-like interface for quick and easy start-up and navigation.

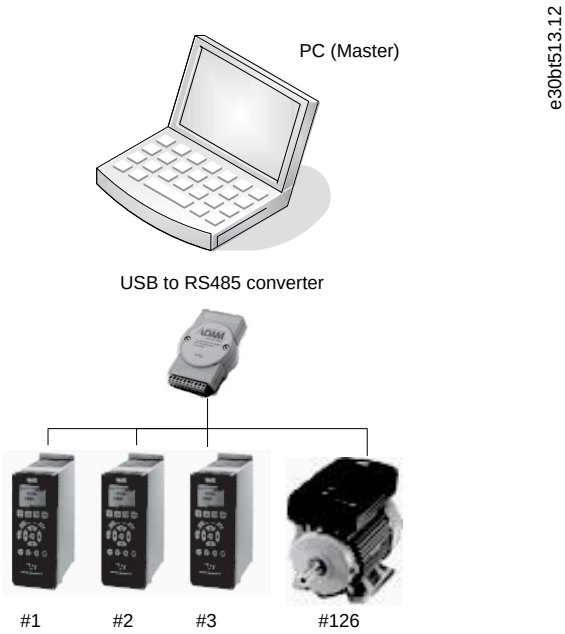


Illustration 1: Connect up to 126 Nodes with a Repeater and up to 31 Nodes without Repeater

1.6 Versions

VLT® Motion Control Tool MCT 10 is available in 2 versions:

- MCT 10 Set-up Software Basic is available free of charge. Download the program from www.danfoss.com/en/service-and-support/downloads/?sort=title_asc&filter=download-type%3Dsoftware%2Csegments%3Ddds
- MCT 10 Set-up Software Advanced can be purchased using ordering number 130B1000.

Table 1: Features of the Basic and Advanced Versions

Version supports	MCT 10 Set-up Software Advanced	MCT 10 Set-up Software Basic
Drives per project	Unlimited	4
FC protocol	✓	✓
Functional safety	✓	✗
USB	✓	✓
PROFIBUS DP-V1	✓	✓
PROFIBUS DP-V1 handling multiple Danfoss nodes concurrently	✓ (limited performance)	✗
Ethernet-TSC	✓	✓
Logging and scope function	8 channels	2 channels
Real-time logging from a drive	4 channels	✗
Alarm display	✓	View only
VLT® Motion Control Option MCO 305	✓	✓

Version supports	MCT 10 Set-up Software Advanced	MCT 10 Set-up Software Basic
Graphical smart logic control	✓	✓
VLT® 5000 to FC 302, VLT® 6000 to FC 102, and VLT® 2800 to FC 280 conversion wizards	✓	✓
FC to FC conversion wizard	✓	✓
Import 3000.XLS to FC 302	✓	✗
Motor database	✓	✗
VLT® Extended Cascade Controller MCO 101	✓	✗
Drive file system	✓	✗
VLT® Wireless Control Panel LCP 103	✓	✓
Status plug-in	✓	✓
Drive plug-in	✓	✗
VLT® Software Customizer	✓	✗

1.7 Further Information

The following manuals related to VLT® Motion Control Tool MCT 10 are available:

- VLT® PROFIBUS DP-V1 MCA 101 Installation Guide.
- Design guides for the relevant drives.

Refer to www.danfoss.com/en/about-danfoss/our-businesses/drives/ for more information.

It is also possible to find video training material on this site for operating the MCT 10.

2 Safety

2.1 Safety Symbols

The following symbols are used in this manual:

⚠ DANGER ⚠

Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING ⚠

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION ⚠

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

Indicates information considered important, but not hazard-related (for example messages relating to property damage).

2.2 Safety Precautions

⚠ WARNING ⚠

HIGH VOLTAGE

AC drives contain high voltage when connected to AC mains input , DC supply , or load sharing. Failure to perform installation, start-up, and maintenance by qualified personnel can result in death or serious injury.

- Only qualified personnel must perform installation, start-up, and maintenance.

⚠ WARNING ⚠

UNINTENDED START

When the drive is connected to the AC mains, DC supply, or load sharing, the motor may start at any time, causing risk of death, serious injury, and equipment, or property damage. The motor may start by activation of an external switch, a fieldbus command, an input reference signal from the LCP or LOP, via remote operation using MCT 10 Set-up software, or after a cleared fault condition.

- Press [Off] on the LCP before programming parameters.
- Disconnect the drive from the mains whenever personal safety considerations make it necessary to avoid unintended motor start.
- Check that the drive, motor, and any driven equipment is in operational readiness.

⚠ WARNING ⚠

DISCHARGE TIME

The drive contains DC-link capacitors, which can remain charged even when the drive is not powered. High voltage can be present even when the warning indicator lights are off.

Failure to wait the specified time after power has been removed before performing service or repair work could result in death or serious injury.

- Stop the motor.
- Disconnect AC mains, permanent magnet type motors, and remote DC-link supplies, including battery back-ups, UPS, and DC-link connections to other drives.
- Wait for the capacitors to discharge fully before performing any service or repair work. The discharge time is specified in the drive operating guides.
- Use a measuring device to make sure that there is no voltage, before opening the drive or performing any work on the cables.

3 Installation and De-installation

3.1 Introduction

The VLT® Motion Control Tool MCT 10 Set-up Software and SyncPos modules are installed via a multilingual, self-explanatory installation program.

3.1.1 Starting the Installation Program

Procedure

1. Select the submenu *Run* from *File* in Windows programming control.
2. Enter: [DRIVELETTER]:\SETUP in the command line and press <Return>.
3. Follow the instructions of the installation program.

→ When the installation process is complete, the MCT 10 Set-up Software can be found on the following path:

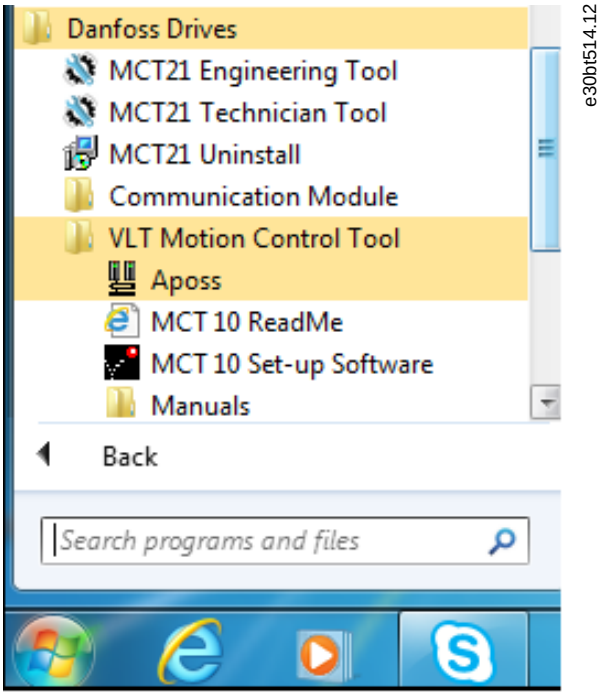


Illustration 2: Path for MCT 10 Set-up Software

3.1.2 Selecting the Software Language

Context:

The Danfoss default language is English. If another language is selected, it becomes the new default.

Procedure

1. Select *Options* from the main menu, then select *Language*.
2. Select the wanted language from the scrollbar and click *OK*.

Illustration 3: Selecting the Language

NOTICE

Changing the language affects the parameter language. If an external LCP is connected to the drive, the change of language version does not affect the language in the display.

3.1.3 Uninstalling the Software

Context:

NOTICE

The following procedure is only valid for Windows operating systems.

Procedure

1. Select *Start*.
2. Select *Settings*.
3. Select *Control Panel*.
4. Double-click *Remove/Add Programs*.
5. Select *Remove*.

4 Set-up of Communication

4.1 Communication Options

Drives in the VLT® HVAC Drive FC 102, VLT® AQUA Drive FC 202, and VLT® AutomationDrive FC 302 series are equipped with a USB port. Communication from a PC can be established using a standard A–B male-to-male USB cable connected to the drive. No extra hardware or bus configuration is required. If the PC is equipped with more than 1 USB port, several drives can be connected. The USB bus is automatically added to the network bus list.

Establish a hardwired connection through:

- Standard built-in RS485, or
- USB port.

The USB interface socket allows devices to be connected and disconnected using hot swapping. When connecting a drive using USB, MCT 10 Set-up Software automatically adds on to the bus list.

If the VLT® PROFIBUS DP-V1 MCA 101 or the VLT® EtherNet/IP MCA 121 option is mounted in the drive, establish the connection through:

- PROFIBUS master class 2 connection (MSAC 2), or
- Ethernet-based network.

NOTICE

Soft starters can only be connected through a USB cable.

NOTICE

RISK OF DAMAGE TO PC USB HOST CONTROLLER

When connecting the PC to the drive through the USB cable, there is a risk of damaging the PC USB host controller.

- Follow the recommendations for grounding described in the operating guide for the relevant drive.
- Use a USB isolator with galvanic isolation to protect the PC USB host controller from ground potential differences when connecting the PC to a drive through a USB cable.
- Do NOT use a PC power cable with a ground plug when the PC is connected to the drive through a USB cable.

Communication from a PC can be established via RS232 to RS485 converters or via USB to RS485 converters.

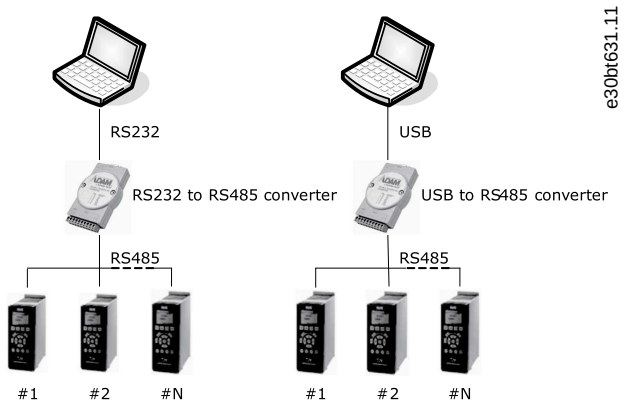


Illustration 4: Communication from a PC

4.2 Manual Fieldbus Configuration

Context:

After installation, configure the non-plug-and-play networks via the fieldbus configuration dialog.

Procedure

1. Start the MCT 10 Set-up Software.
2. Select *Network*.
3. Right-click *Network* and select *Add/Remove/Configure Busses*.

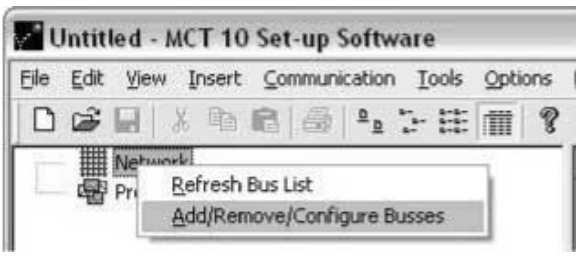


Illustration 5: Refreshing the Fieldbus List

4. Add, remove, or configure the properties for the connected busses.

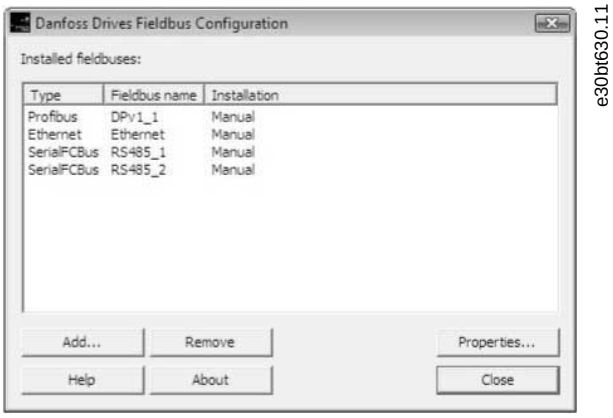


Illustration 6: Fieldbus Configuration

5. Scan the network for active drives to make MCT 10 indicate available drives on the non-plug-and-play fieldbusses.

4.3 Automatic Scan

Only the USB fieldbus is scanned automatically when a drive is connected to the PC. For non-plug-and-play fieldbusses, scan manually for active drives.

4.3.1 Scan Range Configuration

Enter the preferred scan setting by right-clicking *SerialCom* and then selecting *Configure Driver*.

Adding a standard bus RS485 or PROFIBUS to the network tree configures the scan range to scan the entire address range. The Ethernet-TSC bus is added using the current IP address settings.

The fieldbus scan range can be configured in several ways:

- Right-click the *Fieldbus* icon in the network tree and select *Configure Bus*.
- Mark the *Fieldbus* icon in the network tree and select *Configure* under *Communication* in the main menu bar.
- Open the *Fieldbus Configuration* dialog, right-click the *Network* icon, and select *Add/Remove/Configure Busses*.
- Open from the Windows panel.

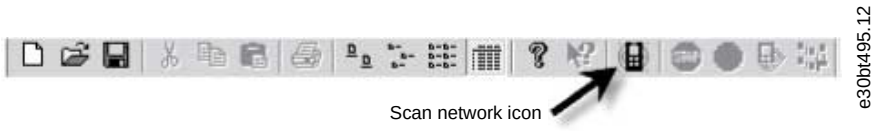


Illustration 7: Scan Network Icon

4.3.2 Scan Network

Scan a fieldbus in 3 ways:

- Right-click the *Fieldbus* icon in the network tree and select *Scan Bus* for active drives.
- Mark the *Fieldbus* icon in the network tree and select *Scan/Refresh* under *Communication* in the main menu bar.
- Mark the *Fieldbus* icon in the network tree and select the *Scan* icon on the toolbar.

The *Scanning for Drives* window appears and indicates the progress of the scan.

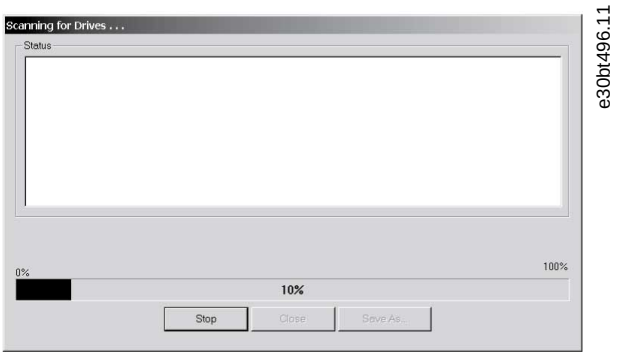


Illustration 8: Progress of Network Scanning

NOTICE

When using VLT® HVAC Drive FC 102, VLT® AQUA Drive FC 202, and VLT® AutomationDrive FC 302: FC Drive MC Protocol (*parameter 8-30 Protocol* set to *[1] FC MC*) is required for correct functionality. The parameter is only available from the LCP.

4.4 Set Up the Drive with RS485 Data Communication

All drives can be configured to 300, 1200, 4800, 9600 (default), 19200, 38400, 57600, or 115200 baud. The serial configuration is always configured with:

- 8 data bits.
- 1 stop bit.
- Even parity.

4.4.1 Configuring the Fieldbus

Context:

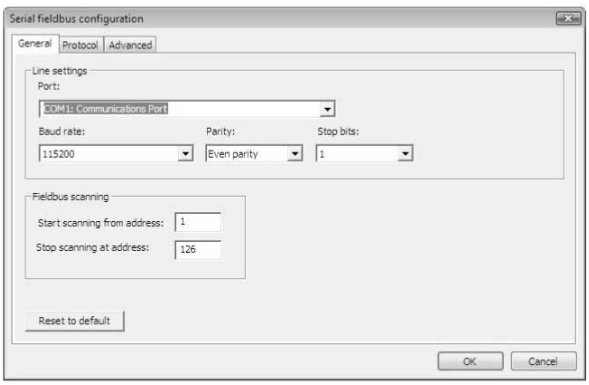
When using an RS485 converter as the Advantech ADAM converter, MCT 10 Set-up Software indicates online drives available on the fieldbus after scanning the bus.

NOTICE

Protocol and advanced settings are for performance optimization and should normally not be changed.

Procedure

1. Open the *Serial Fieldbus Configuration* dialog box or right-click the appropriate fieldbus.



e30bt629.11

Illustration 9: Serial Fieldbus Configuration

2. Set the COM port number.

   When using USB to RS485 converters, the actual COM port number can be identified from the device manager part of the Windows control panel.

3. Set the baud rate, parity, and the number of stop bits (must match the settings in the drive).
4. Set the fieldbus scanning range to the available address to limit the time scanning for active drives.
5. Press *OK* to activate settings or select to restore the default settings.

4.4.2 USB Data Communication

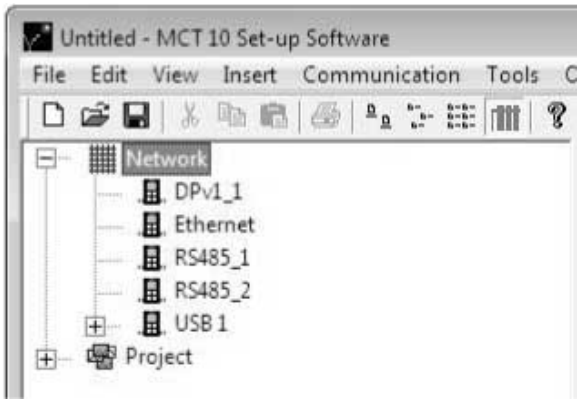


Illustration 10: Network Bus List

When the USB cable is disconnected, the drive connected via the USB port is removed from the network bus list.

NOTICE

A USB bus has no address-setting capacity and no bus name to configure. If connecting more than 1 drive through USB, the bus name is automatically incremented in the MCT 10 network bus list. Connecting more than 1 drive through a USB cable often causes computers installed with Windows XP to throw an exception and crash. Therefore, it is recommended only to connect 1 drive via USB to the PC.

4.5 Set-up of Soft Starter

Setting up connectivity to the VLT® Soft Starter MCD 500 and VLT® Soft Starter MCD 600 requires that the USB communication module is mounted on the soft starter. Communication from a PC can be established using a standard A–B male-to-male USB cable connected to the USB communication module. If the PC is equipped with more than 1 USB port or a USB HUB, several soft starters can be connected.

4.5.1 Serial Configuration

All soft starters can be configured to 300, 1200, 4800, 9600 (default), 19200, 38400, 57600, or 115200 baud. The serial configuration is always configured with:

- 8 data bits.
- 1 stop bit.
- No parity.

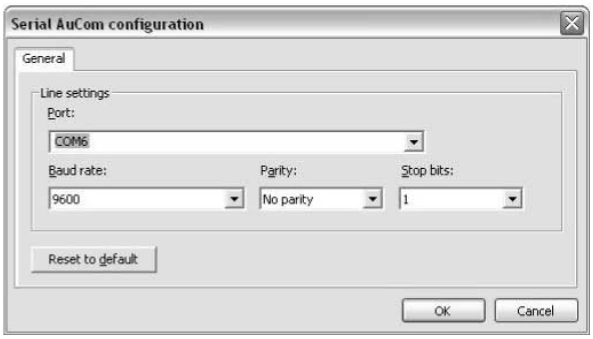


Illustration 11: Serial Configuration of Soft Starters

4.5.1.1 Configuring the Fieldbus

Procedure

1. Add and configure the bus from the *Fieldbus Configuration* dialog.

   If the bus is already added to the network, it can be reconfigured by right-clicking on the appropriate soft starter fieldbus.
2. Set the COM port number. The actual COM port number can be identified from the device manager part of the control panel.
3. Set the baud rate, parity, and the number of stop bits (must match the setting in the soft starter).
4. *Reset to Default* restores the general settings and fieldbus scanning to factory configuration values.

4.5.1.2 Using the Hilscher NetIdent Protocol

Context:

Use the tool for searching for devices and for identifying and changing IP addresses. The tool also has a filtering function.

Procedure

1. Click the *Tools* menu.
2. Select *Soft Starter Discover and Configuration Tool*.

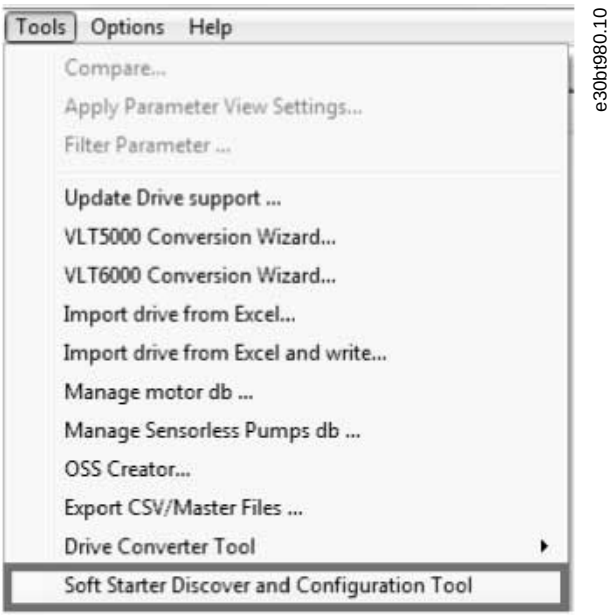


Illustration 12: Selecting the Hilscher NetIdent Tool

3. Select the soft starter for which the IP address should be configured.
4. Click *Configure*.

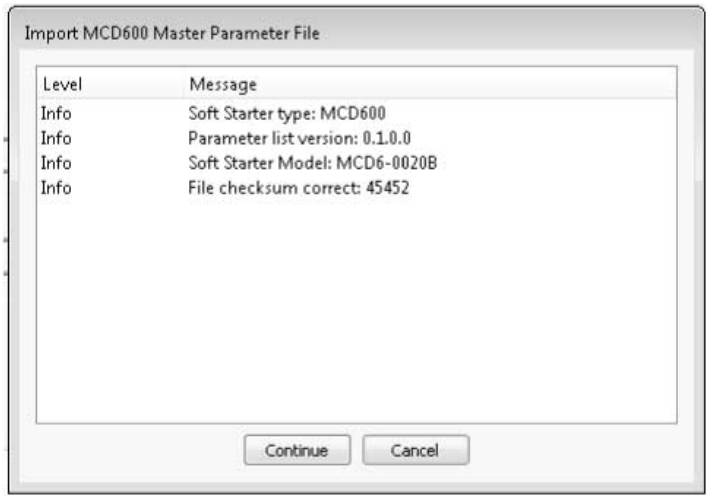
4.5.2 Importing/Exporting Parameter Files, MCD 600

Context:

As the VLT® Soft Starter MCD 600 does not support any fieldbusses, a parameter file (PAR file) is exported from the soft starter to a USB stick and copied into VLT® Motion Control Tool MCT 10. After changing the file in MCT 10, the PAR file can be copied back to the USB stick and applied to the soft starter.

Procedure

1. Create an MCD 600 project soft starter.
2. Right-click the project folder.
3. Select *Import parameters*.
4. From the dialog, select the file to import.
   → A dialog opens showing information about the selected file.



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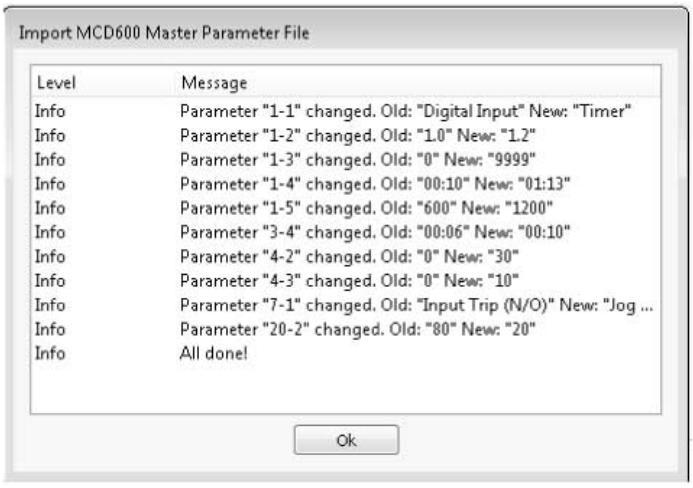
If the soft starter differs from the project, it shows up as an error or warning in this view, depending on the difference.

5. Press *Continue* to apply the file.
   → A view, which shows all changed parameters, appears.



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6. Click *Ok* to close the window.
7. Right-click the project to export from MCT 10.
8. Select the parameters to export.
9. In the file selection dialog, select where to export the file to.

→ A dialog appears when the export is completed.

4.6 PROFIBUS DP-V1 Communication

Setting up PROFIBUS DP-V1 communication requires a VLT® PROFIBUS DP-V1 MCA 101 option module. Communication from a PC using PROFIBUS DP-V1 can be established using a PROFIBUS PCMCIA card or a card installed in the PC. The PROFIBUS cable from the drive is connected to the 9-pin sub D socket connector on the card.

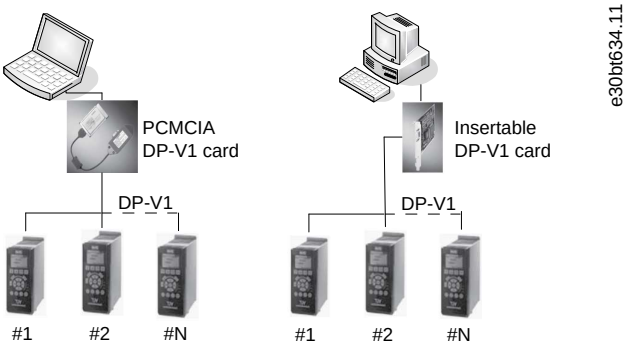


Illustration 16: PROFIBS DP-V1 Communication

Consult Siemens www.siemens.com for the latest supported cards for PCs.

NOTICE

Connectivity via PROFIBUS DP-V1 to a VLT® AutomationDrive FC 302 utilizing the VLT® PROFIBUS Converter MCA 114 with option firmware version 2.03 is not possible from MCT 10 Set-up Software. Use the fieldbus or USB bus instead.

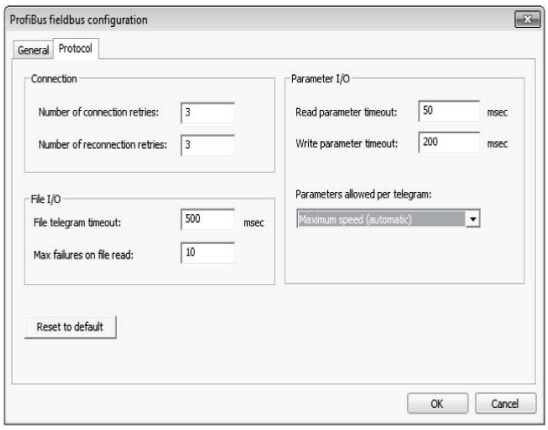
4.6.1 Configuring PROFIBUS DP-V1

Context:

When using a PROFIBUS interface card with the associated driver installed, MCT 10 Set-up Software indicates online drives available on the specific PROFIBUS after scanning the bus for active drives.

Procedure

1. Configure the bus from the *Fieldbus Configuration* dialog or by right-clicking the appropriate PROFIBUS bus.



e30bt625.13

Illustration 17: PROFIBUS Fieldbus Configuration

2. Set the board number.
3. Set the fieldbus scanning range to the available addresses only to limit the time used for scanning active drives.
4. Press *OK* to activate or reset to restore factory default settings.

4.6.2 DP-V1 Connection and PG/PC Interface

The MCT 10 Set-up Software PROFIBUS DP-V1 fieldbus plug-in utilizes the Siemens SoftNet driver available from Step7, or alternatively Simatic NET, to establish connectivity via the supported master class 2 cards such as CP5511 or CP5512.

NOTICE

STEP7 Lite version does not support the SoftNet driver.

4.6.2.1 Setting Up the PG/PC Interface

Context:

This procedure explains how to set up the PG/PC Interface from default configuration to open the PROFIBUS connection from MCT 10.

Prerequisites:

Cabling and terminations must be in accordance with wiring and cabling requirements for PROFIBUS.

Procedure

1. Open the PG/PC Interface.

Illustration 18: Set PG/PC Interface

2. Configure *Access Point of the Application* to CP_L2_1 pointing to the master class 2 card used.
3. Set *Interface Parameter Assignment Used* corresponding to the master class 2 card used.
4. Select *Properties* to configure the station- and network parameters.

   Station parameters:

   - Set *PG/PC is the only master on the bus* to *Active* if no PLC is active on the bus. Use the *Diagnostics* described later to select a valid PROFIBUS address.

   Network parameters:

   - Set the *Transmission rate* to the same baud rate as the PLC if it is active.
5. Use *DP* as *Profile* and click *OK* to close the *Properties* dialog.
6. Select *Diagnostics* in the *Set PG/PC Interface* to verify network- and bus communication.

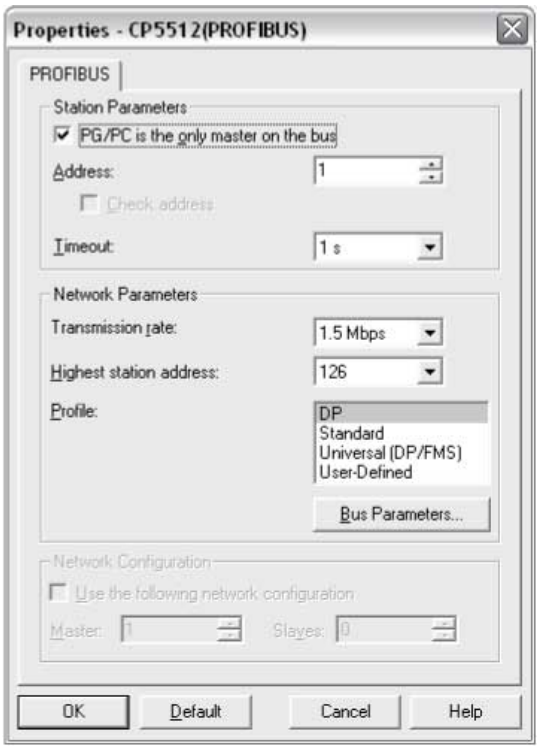


Illustration 19: Properties Dialog

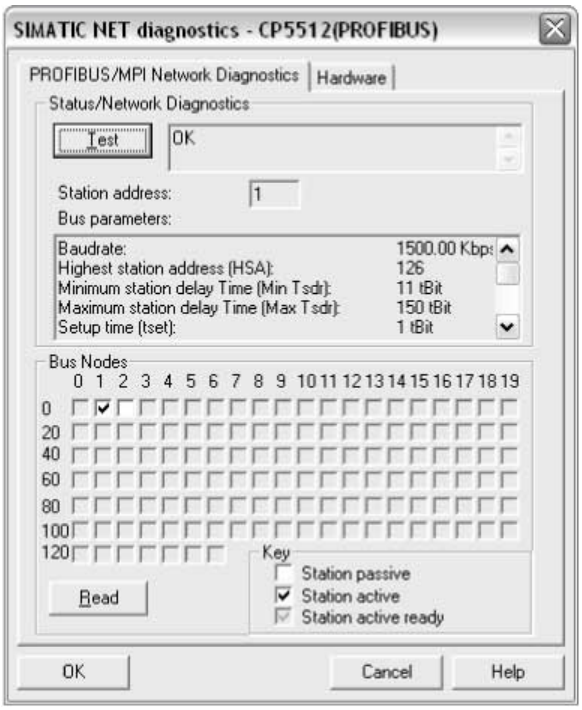


Illustration 20: Simatic Network Diagnostics Dialog

7. Select *Test* to verify the access path and network configuration. If a sharing violation is detected, the test results in an error message. When the test result is successful, select *Read* to identify the active PROFIBUS nodes available on the network. Make sure that the address defined for the PG/PC interface does not conflict with an active node.
8. Close the PG/PC interface and start MCT 10.
9. Right-click a PROFIBUS and select *Scan* for active drives. MCT 10 Set-up Software identifies the same node IDs, except PLCs.

4.6.3 PROFIBUS Multitelegrams

With the *Parameters allowed per telegram* drop-down list, it is possible to configure the number of requests to be associated within a multitelegram. The standard allows up to 40 telegrams to be associated.

The following options are available:

- *Maximum speed* (default configuration). Handles the association automatically and adapts the number of telegrams for each drive according to the series. Can be used in PROFIBUS networks containing both old and new Danfoss drives.
- *Conservative*. Always associates 10 telegrams within a multitelegram. This option is useful when communicating only with old products such as the VLT® Decentral Drives FCD 300, VLT® DriveMotor FCM 300, series derived from VLT® HVAC Drive FC 102, VLT® AQUA Drive FC 202, and VLT® AutomationDrive FC 302.
- *Single request*. Only 1 request per telegram.

4.7 Ethernet-TSC Data Communication

To set up an Ethernet-TSC (transparent socket channel) communication, the VLT® EtherNet/IP MCA 121 option module is required within the drive. Communication from a PC can be established using a standard Ethernet cable connected to the drive.

4.7.1 Ethernet-TSC Configuration

An Ethernet-TSC bus is scanned using DDP (drive discovery protocol). The protocol does not require an IP port number and IP scan range. It identifies drives based on the MAC addresses.

NOTICE

When scanning through different subnets or remotely via a VPN tunnel, it is advised not to utilize the ADDP protocol but to use an IP range.

Click *Refresh* to generate a list of all active drives in the Ethernet. The list appears in the *Ethernet Fieldbus Settings* dialog when the scan is complete.

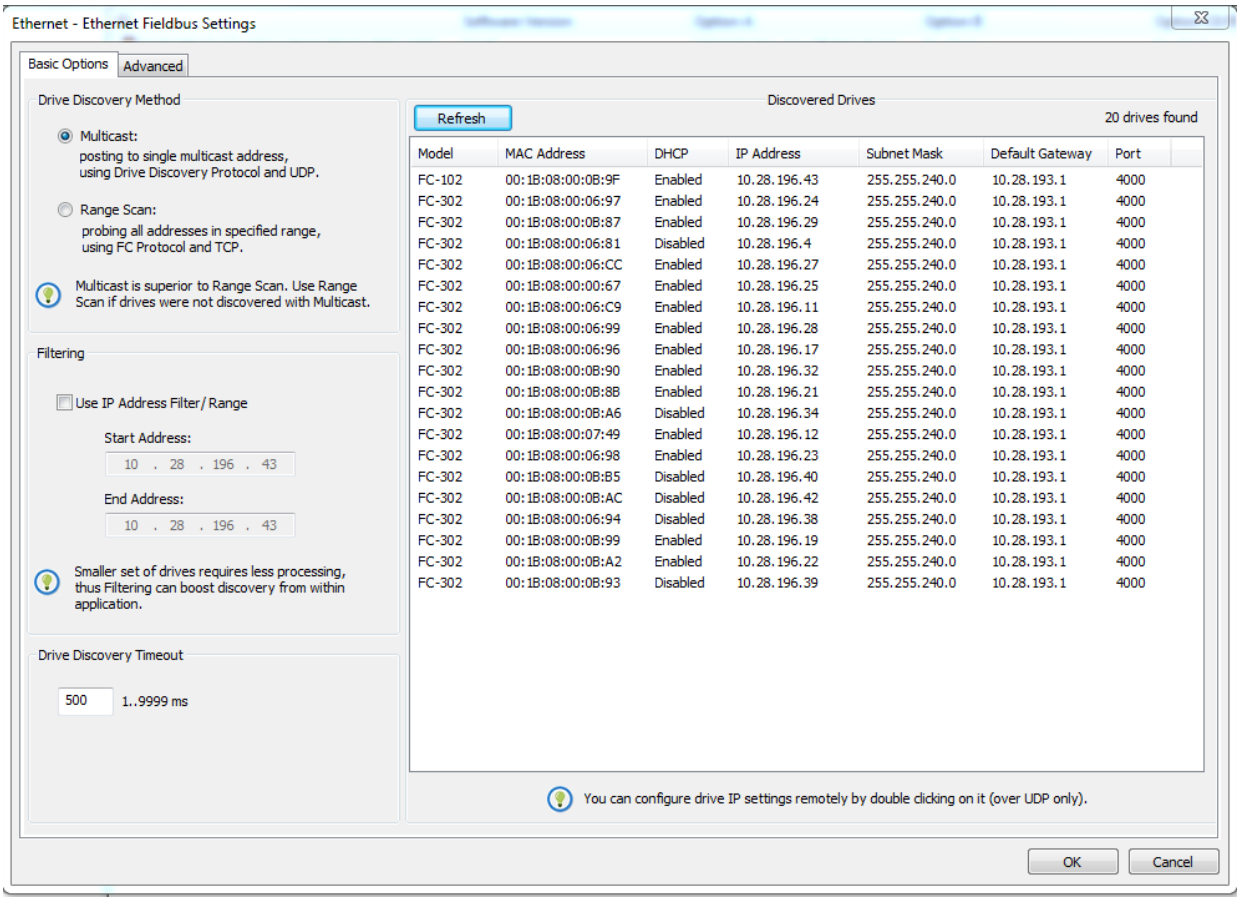


Illustration 21: ADDP Configuration

Drive types without any IP configuration use their Auto IP Class B address, which is 169.254.yy.xx, with yy.xx corresponding to the last 2 segments in the MAC address. Several uncommissioned drives without any IP configuration can be scanned on the same network.

Select a device from the *Discovered Drives* list to;

- Get more information about the device.
- Assign a static IP address, a subnet mask, or default value to the drive.
- Set up DHCP (dynamic host configuration protocol) look-up.

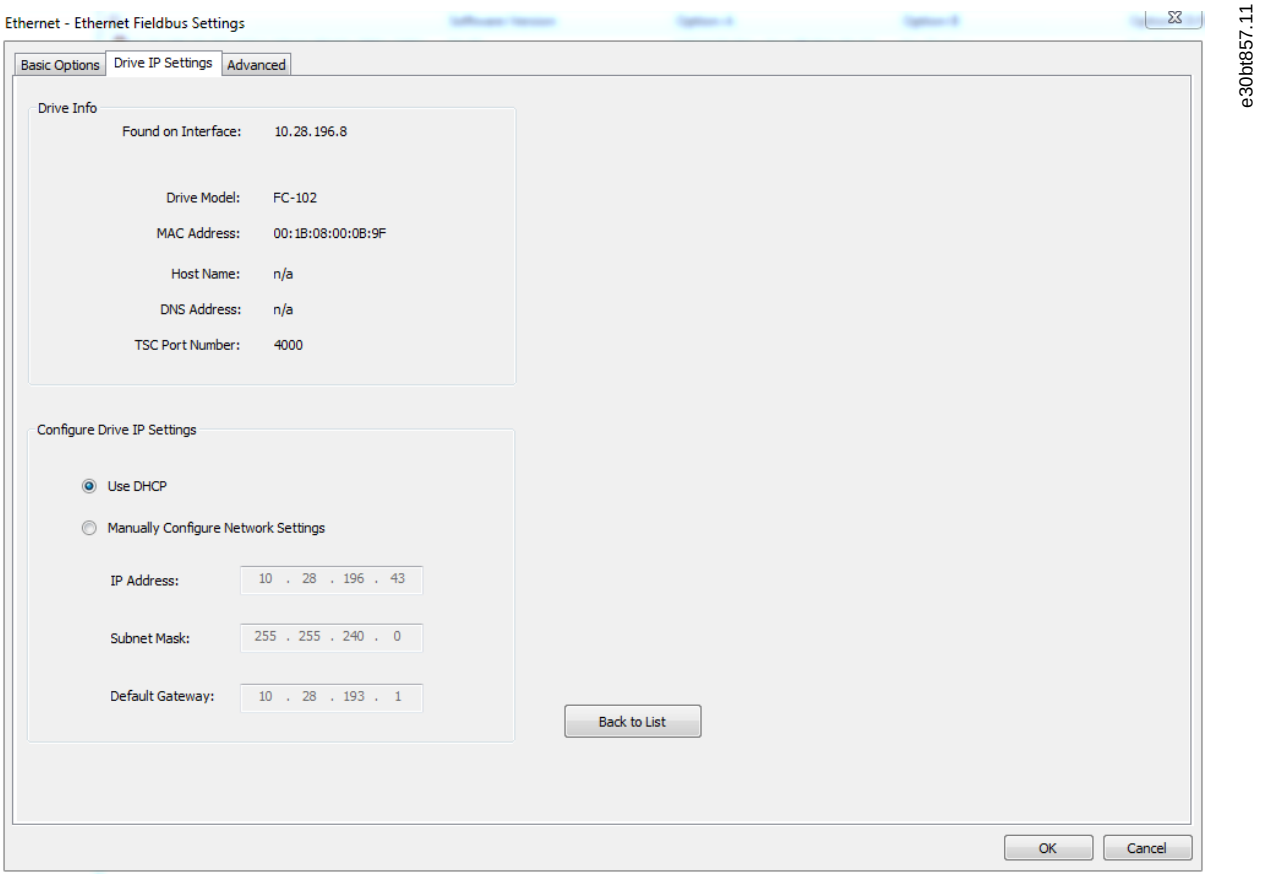


Illustration 22: TSC Configure

4.7.1.1 Scanning with IP Range

Context:

When scanning using an IP range, the Ethernet telegrams are transmitted as traditional TCP/IP packages routed out in a router, switch, or manage switch without requiring any changes. The disadvantage is an increased scanning time, and drives without IP address configured are not identified.

NOTICE

Identification of drives using the VLT® EtherNet/IP MCA 121 option is possible only from option firmware version 1.03 or newer. If using options with firmware versions earlier than 1.03, configure *parameter 12-89 Transparent Socket Channel Power* to 0 to prevent the option from failing to operate.

Procedure

1. Configure the IP start address and the transparent socket channel port (*parameter 12-89 Transparent Socket Channel Port*), which is factory default 4000 in the drive.

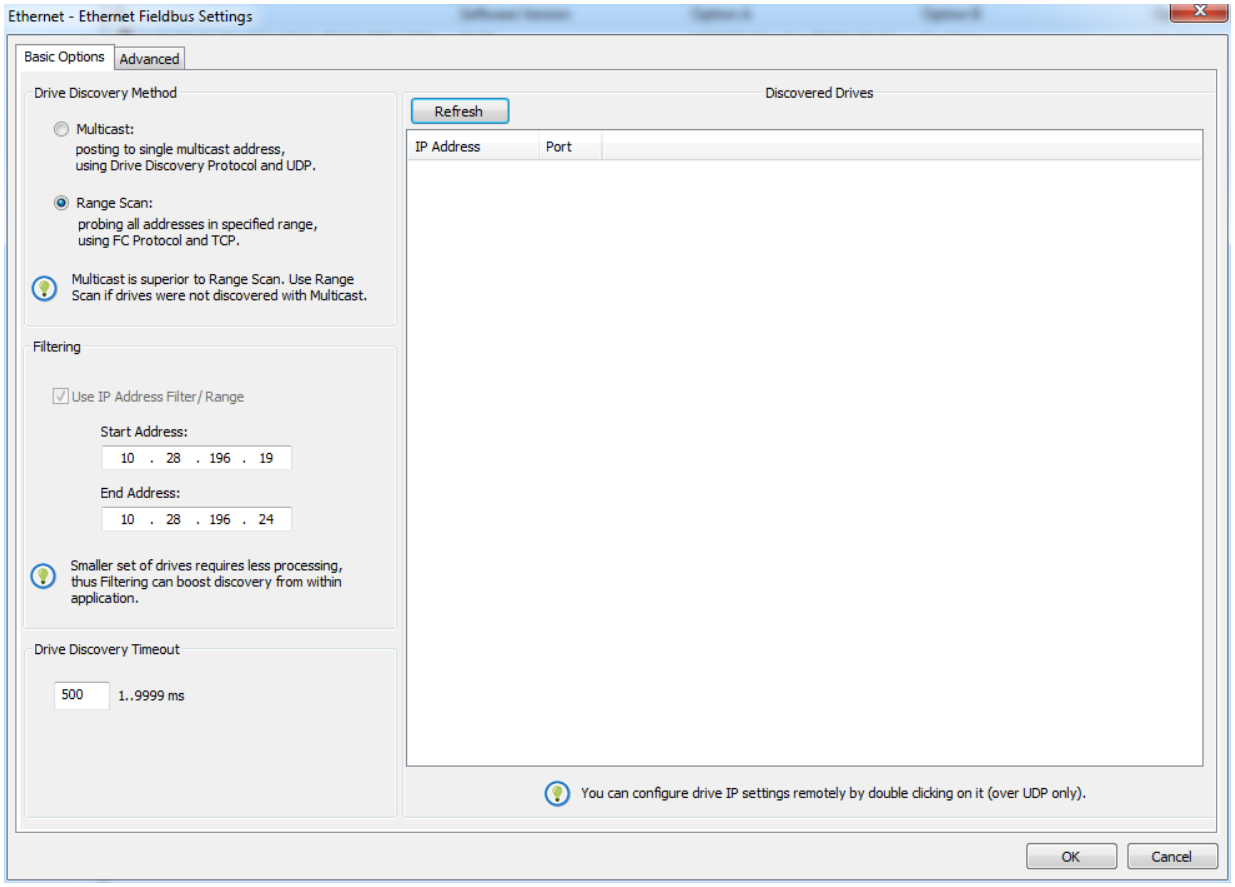


Illustration 23: Scan Range

→ After the scan, all active drives are identified.

2. Use a corresponding drive to read or write to a single drive instead of waiting for MCT 10 to scan and identify all drives.
   - **A** Open the project file and create offline drives manually.
   - **B** Configure the connection properties.
   - **C** Right-click the offline drive.
   - **D** Read and write to the drive without scanning the bus.

4.7.1.2 Filtering

When using multicast, it is possible to filter a range of IP addresses.

Also, use filtering for boosting scan performance.

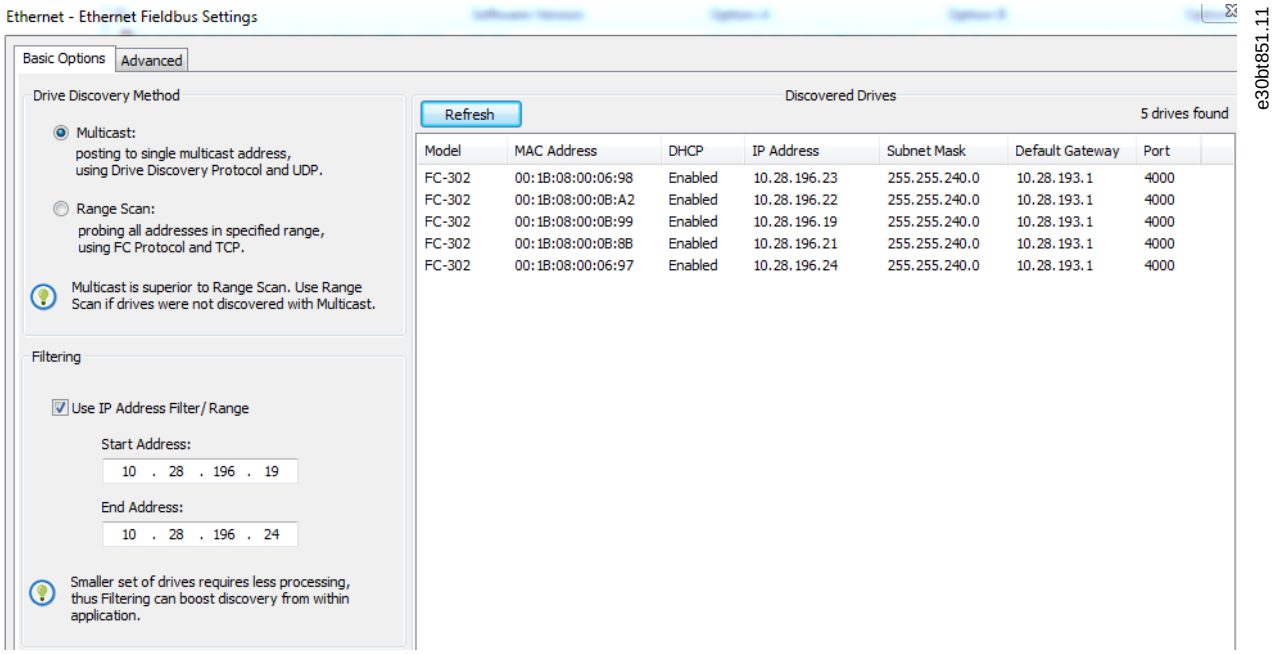


Illustration 24: Filtering

4.7.2 Wink Drive

During a commissioning process of a system containing several drives, it can be time-consuming physically to locate a drive based on the MCT 10 project. This is especially the case if the drive is not equipped with an LCP.

Through the Ethernet_TSC fieldbus, it is possible via MCT 10 to use a wink function. This function blinks with the MS, NS1, and NS2 LEDs on all Danfoss Ethernet-based fieldbus options.

On the Ethernet-based fieldbus option, the winking is recognized with all 3 LEDs blinking orange with 1-Hz interval. There is no limit to the number of drives winking and the duration of winking.

4.7.2.1 Start Winking

Context:

NOTICE

It can take up to 30 s from starting or stopping the winking, until the option responds.

Procedure

1. Right-click a drive from the Ethernet network.
2. Select *Start winking* or *Stop winking*.

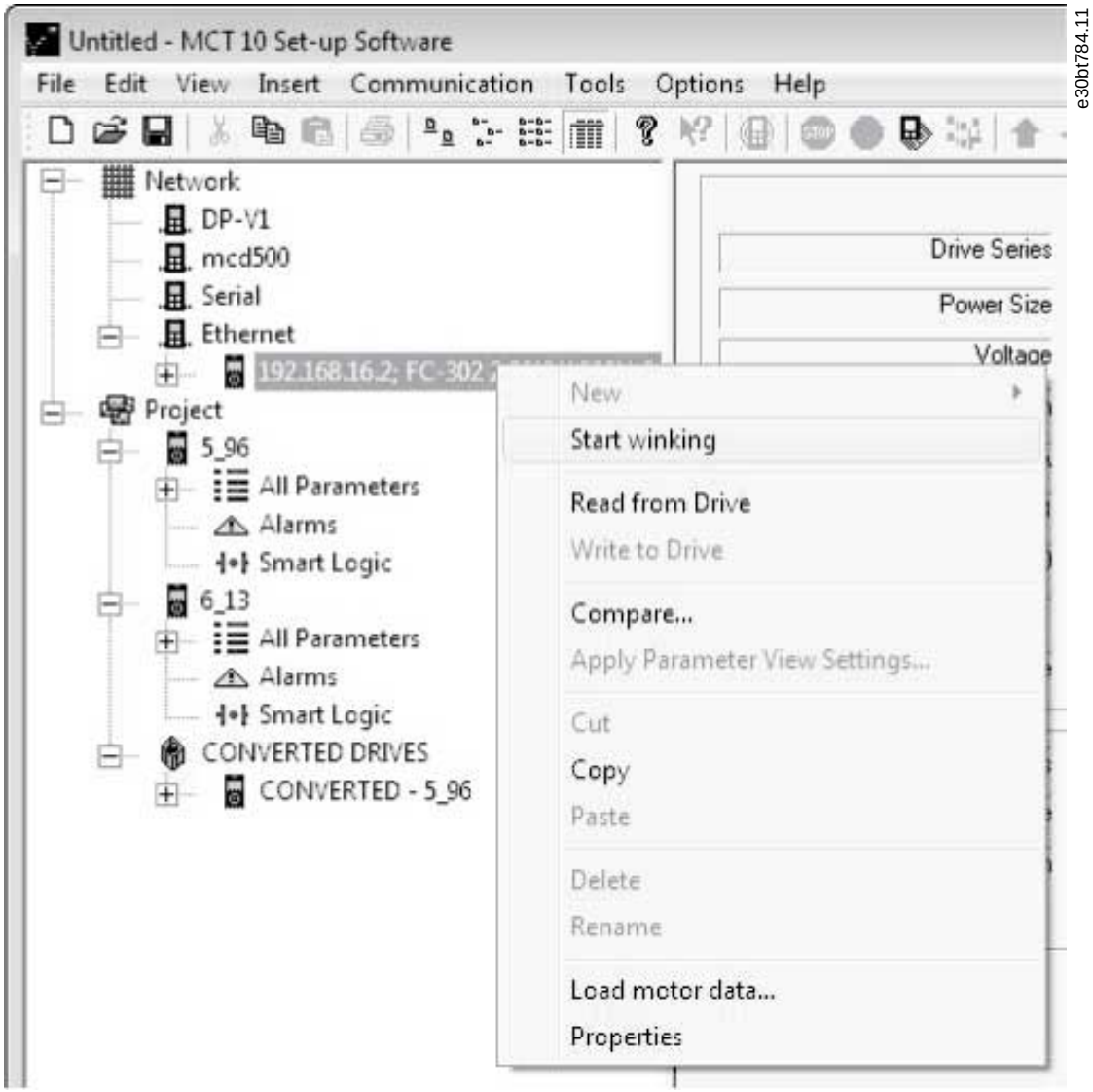


Illustration 25: Start Winking

4.7.3 Advanced

Use the *Advanced* tab:

- To configure *Port Number For Range Scan*. The default value is 4000.
- To define the *TSC Connection Allocation/Sharing*.

The drive has limited simultaneous connections, and with this function it is possible to define if the connections should be released or not. If selecting *Release Idling Connections*, the MCT 10 releases unused connections and makes them available to other users in the network after idle timeout.

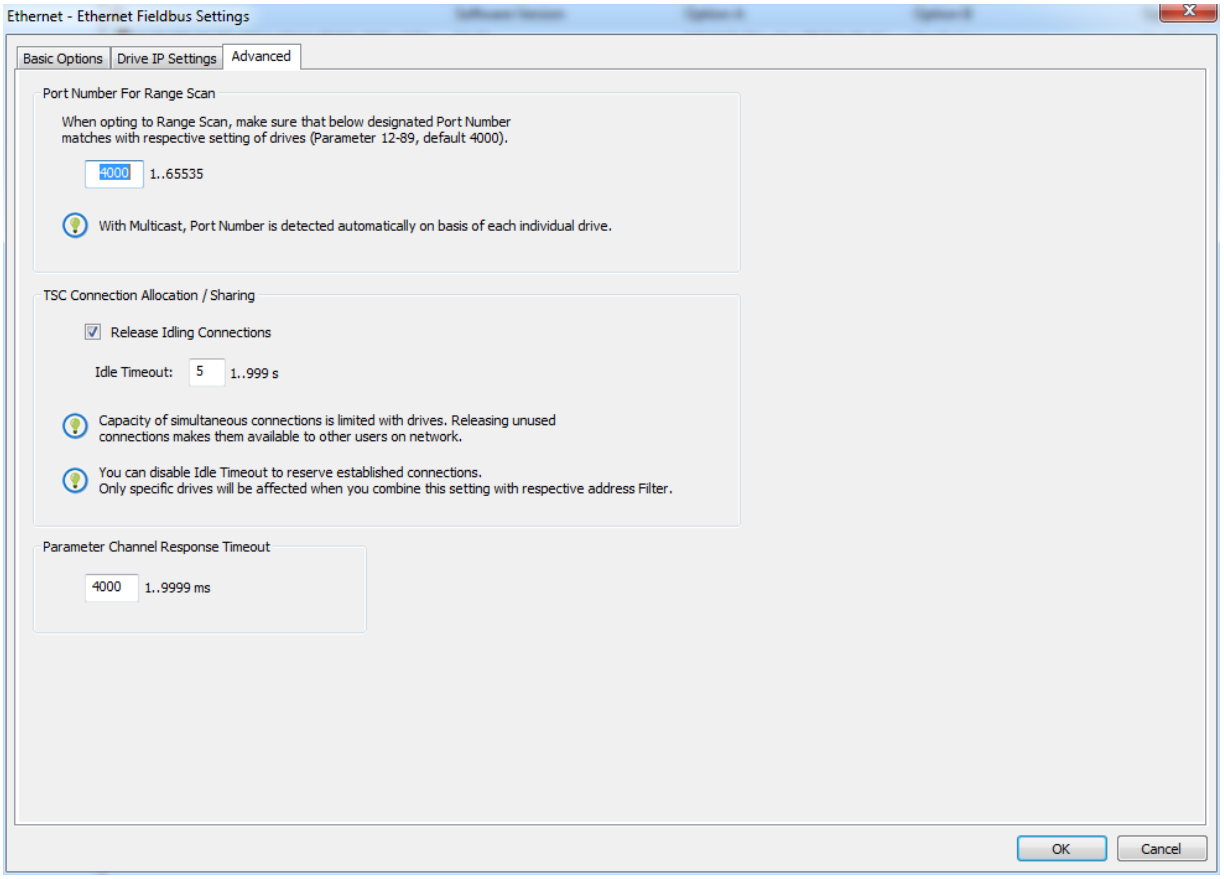


Illustration 26: The Advanced Tab

5 Parameter Set-up

5.1 Introduction

This chapter explains how to control a drive using the MCT 10 Set-up Software. After starting the MCT 10, the main window looks like the example shown in illustration 27.

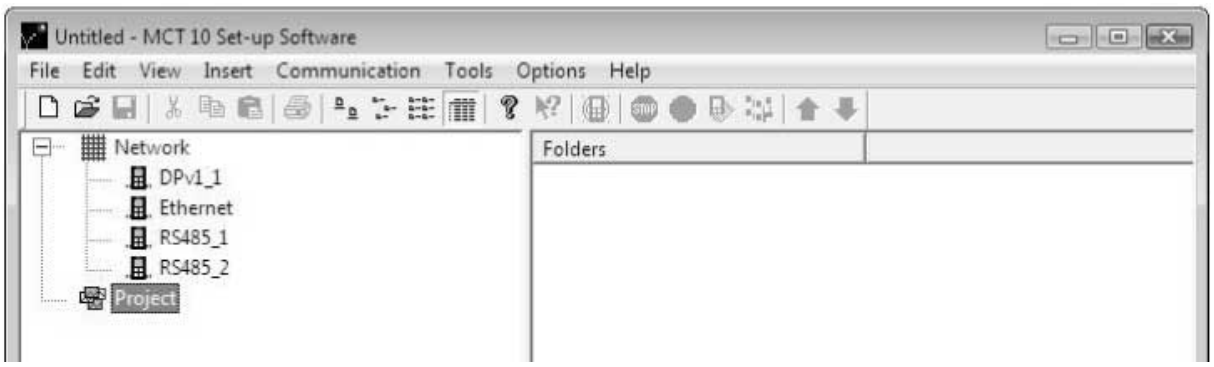


Illustration 27: MCT 10 Set-up Software Main Window

5.2 User Interface

5.2.1 Display

The MCT 10 Set-up Software has 2 views:

- Left view.
- Right view.

Left view

The left view shows the network view (real, online) and the project view (simulated, offline) of the drive network.

Use the left view to:

- Add or delete folders and elements.
- Store changes into the Project folder.

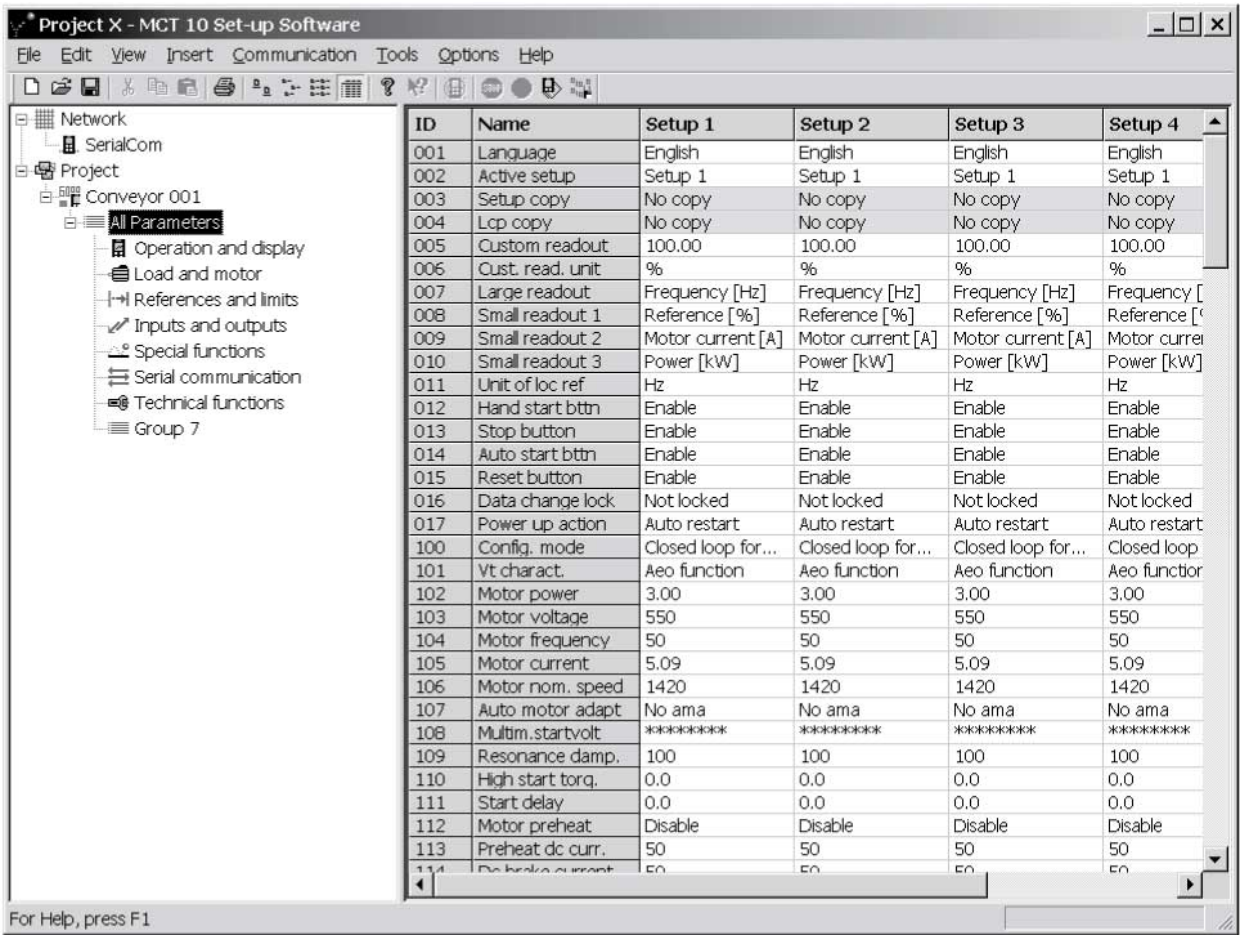
Store changes made to the real online set-up into the Project folder in the simulated, offline set-up for later use.

For more information on saving data, refer to 6.7.1.1 Saving a Project.

The left view is organized in a tree structure and contents can be expanded or collapsed as required. Click +/- to expand/collapse the folder.

Right view

The right view shows details of the element highlighted in the left view. In the right view, the elements of the drive network can be programmed.



ID	Name	Setup 1	Setup 2	Setup 3	Setup 4
001	Language	English	English	English	English
002	Active setup	Setup 1	Setup 1	Setup 1	Setup 1
003	Setup copy	No copy	No copy	No copy	No copy
004	Lcp copy	No copy	No copy	No copy	No copy
005	Custom readout	100.00	100.00	100.00	100.00
006	Cust. read. unit	%	%	%	%
007	Large readout	Frequency [Hz]	Frequency [Hz]	Frequency [Hz]	Frequency [
008	Small readout 1	Reference [%]	Reference [%]	Reference [%]	Reference [
009	Small readout 2	Motor current [A]	Motor current [A]	Motor current [A]	Motor curre
010	Small readout 3	Power [kW]	Power [kW]	Power [kW]	Power [kW]
011	Unit of loc ref	Hz	Hz	Hz	Hz
012	Hand start bttn	Enable	Enable	Enable	Enable
013	Stop button	Enable	Enable	Enable	Enable
014	Auto start bttn	Enable	Enable	Enable	Enable
015	Reset button	Enable	Enable	Enable	Enable
016	Data change lock	Not locked	Not locked	Not locked	Not locked
017	Power up action	Auto restart	Auto restart	Auto restart	Auto restart
100	Config. mode	Closed loop for...	Closed loop for...	Closed loop for...	Closed loop
101	Vt charact.	Aeo function	Aeo function	Aeo function	Aeo functior
102	Motor power	3.00	3.00	3.00	3.00
103	Motor voltage	550	550	550	550
104	Motor frequency	50	50	50	50
105	Motor current	5.09	5.09	5.09	5.09
106	Motor nom. speed	1420	1420	1420	1420
107	Auto motor adapt	No ama	No ama	No ama	No ama
108	Multim.startvolt	*********	*********	*********	*********
109	Resonance damp.	100	100	100	100
110	High start torq.	0.0	0.0	0.0	0.0
111	Start delay	0.0	0.0	0.0	0.0
112	Motor preheat	Disable	Disable	Disable	Disable
113	Preheat dc curr.	50	50	50	50

Illustration 28: Details Shown in the Right View

Toolbar

A toolbar shows icons for the most commonly used functions.

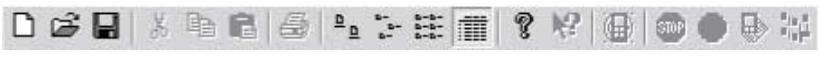


Illustration 29: Toolbar

Activate the toolbar under *View* in the main menu bar, where the toolbar is tick-marked when it is active. To deactivate the toolbar, select *View⇒Toolbar*. Check that the toolbar is no longer tick-marked.

5.2.2 Network and Project Folders

The Network folder gives access to physical devices operating in the field. Use Network to configure the physical drive as with the LCP. Configuration changes made in the Network folder are therefore saved only in the physical device in the field. The Network folder contains online data.

The Project folder contains offline data.

NOTICE

Changes made in the Network folder are not saved automatically to the Project folder.

Network mode - online

The Network folder contains the drives, low harmonic drives, active filters, and/or soft starters online connected to the PC. Monitor and change the parameter settings exactly as if operating on the control panel.

Data entered online is stored in the drive, low harmonic drive, active filter, or soft starter only, not on the hard disk. For information on saving data to the hard disk, refer to 6.7.1.1 Saving a Project.

Project mode - offline

The Project folder contains the user-defined network of drive, low harmonic drive, active filter, and/or soft starter.

Data entered offline is stored on hard disk.

Use the Project folder to:

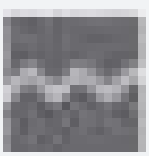
- Open a project file.
- Insert folders.
- Store project-related files in any format, for example Word or PDF.

5.2.3 Other Folders

Four folder types are available for organizing a large system into several smaller systems.

Table 2: Available Folder Types

Name	Purpose	Icon
Folder	Organize drive and/or soft starters that are part of a machine or system.	e30bt713.11
File folder	Organize files belonging to a project. Any file format can be used.	e30bt714.11
Parameter folder	Store parameter settings temporarily or for documentation purposes. The folder can contain a single parameter, subgroup, parameter group, or the entire parameter database.	e30bt523.12

Name	Purpose	Icon
Scope folder	Analyze the behavior of 1 or several parameters for diagnostic purposes by visualizing them as a curve.	 e30bt715.11

Insert any folder type in an offline project in 1 of 2 ways:

- Right-click the project or an existing folder and select *New Folder*/*New File Folder*, as shown in illustration 34.
- Alternatively, mark the project or an existing folder and select *New Folder*/*New File Folder* under *Insert* in the main menu bar.

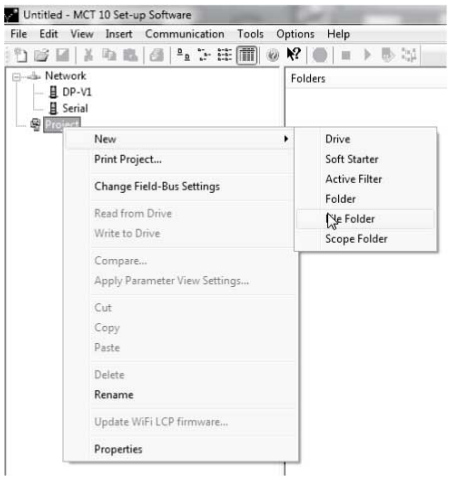


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Illustration 34: Inserting a Folder Type

5.3 Setting Up Drives and Folders

Sometimes, it is necessary to insert a new folder before setting up new drives. See 5.3.1 Inserting a New Folder for instructions.

The way to set up drives depends on the drive type. The methods are described in 5.3.2 Setting Up Drives, Active Filters, or Soft Starters and 5.3.3 Setting Up Low Harmonic Drives.

5.3.1 Inserting a New Folder

Procedure

1. Right-click the Project folder or select*Insert* in the main menu bar.
2. Select *New*.
3. Select *Folder* or *File Folder*.

5.3.2 Setting Up Drives, Active Filters, or Soft Starters

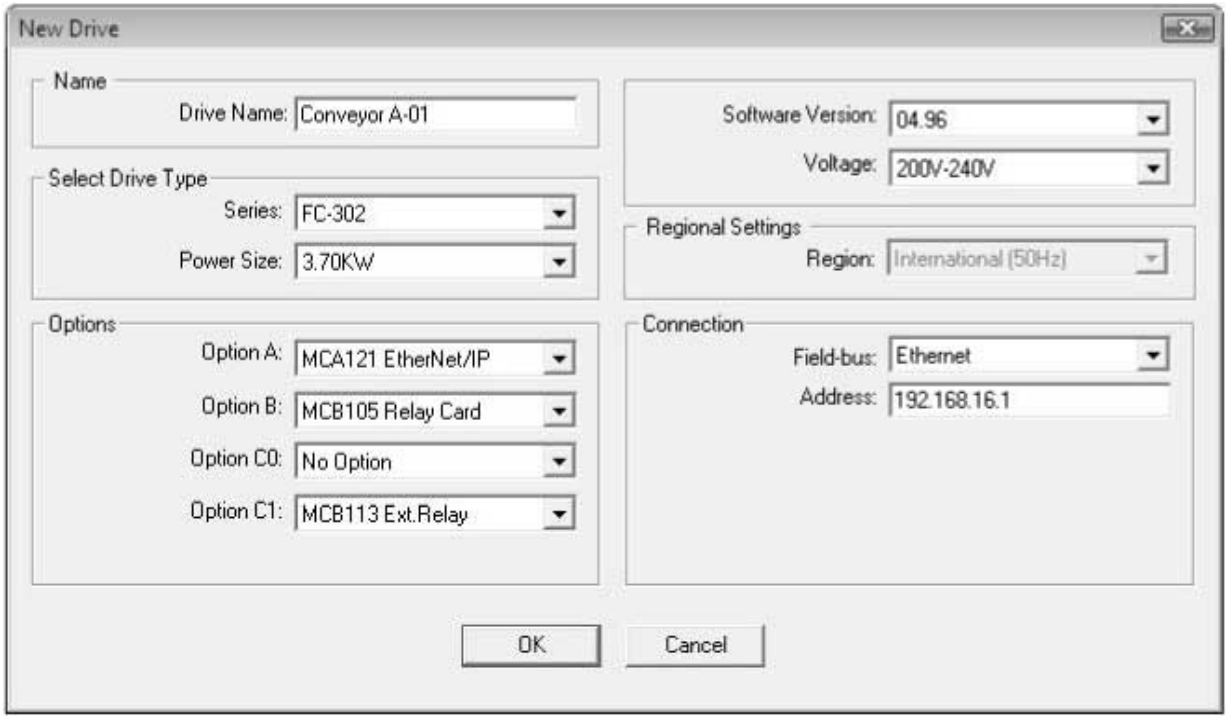
Context:

Insert the drive, the active filter, or the soft starter in a project folder as follows:

Procedure

1. Right-click in the left view or click *Insert* in the main menu bar.
2. Select *New*.
3. Select the appropriate device type.

→ Inserting a drive opens the *New Drive* window.



e30bt637.11

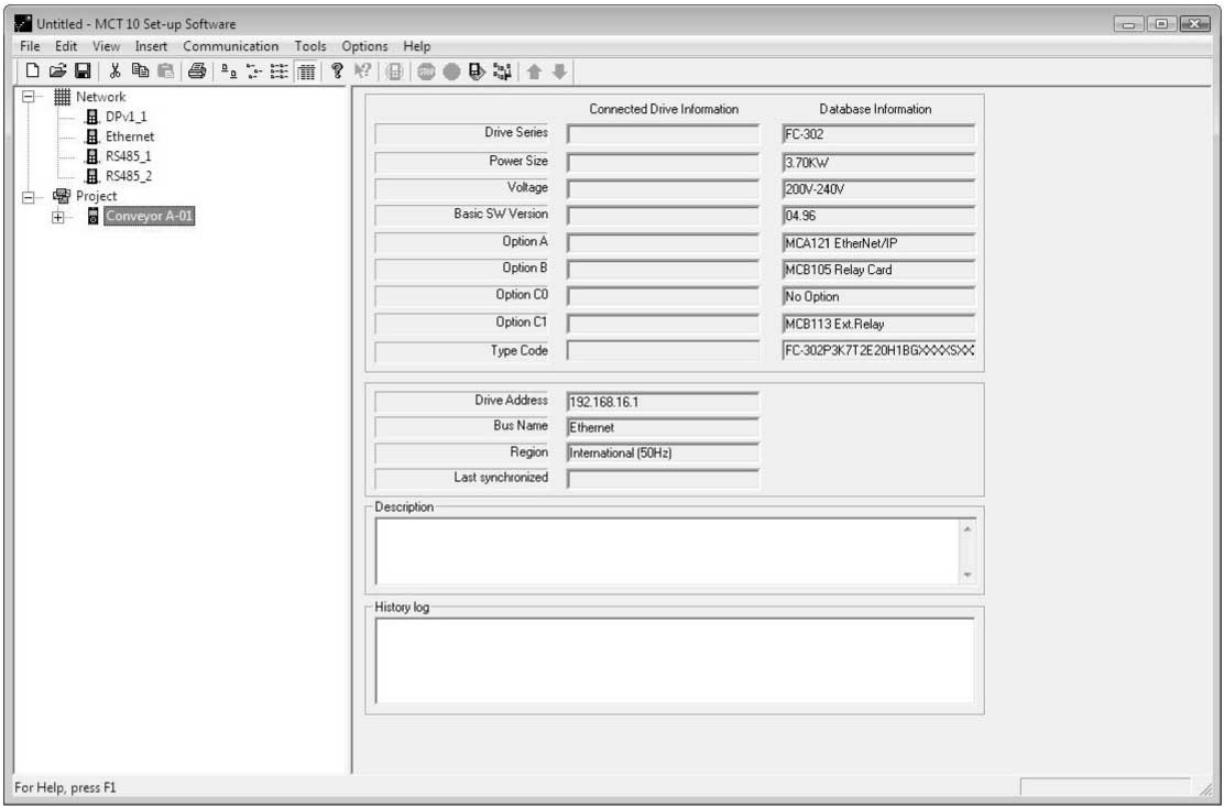
Illustration 35: New Drive Window

The *New Drive* window consists of 4 main sections:

Name	Enter a unique name for the drive. Any text/number combination is allowed. Also specify with software version and the voltage in this section.
Select Drive Type	Information about the drive series and power size. A PUD file (power unit data information) is also available. The default file is always preselected.
Options	Various information about the installed options.
Connection	The fieldbus used between the PC and the drive associated with the address to communicate. The specific fieldbus type is available from the drop-down menu.

It is mandatory to fill in all fields. The different selections are available from the drop-down menus.

Once the new drive is added to the Project folder, the drive data is stored in the offline Project folder. To view the data, click the drive icon.



e30bt636.11

Illustration 36: View the Drive Data

To change the stored drive data, right-click the specific drive icon and select *Properties*.

5.3.3 Setting Up Low Harmonic Drives

Context:

Insert a low harmonic drive in a project folder as follows:

Procedure

1. Right-click in the left view or select *Insert* in the main menu bar.
2. Select *New*.
3. Select *Drive*.
4. Enter all relevant data in the *New Drive* dialog and click *Make LHD*.

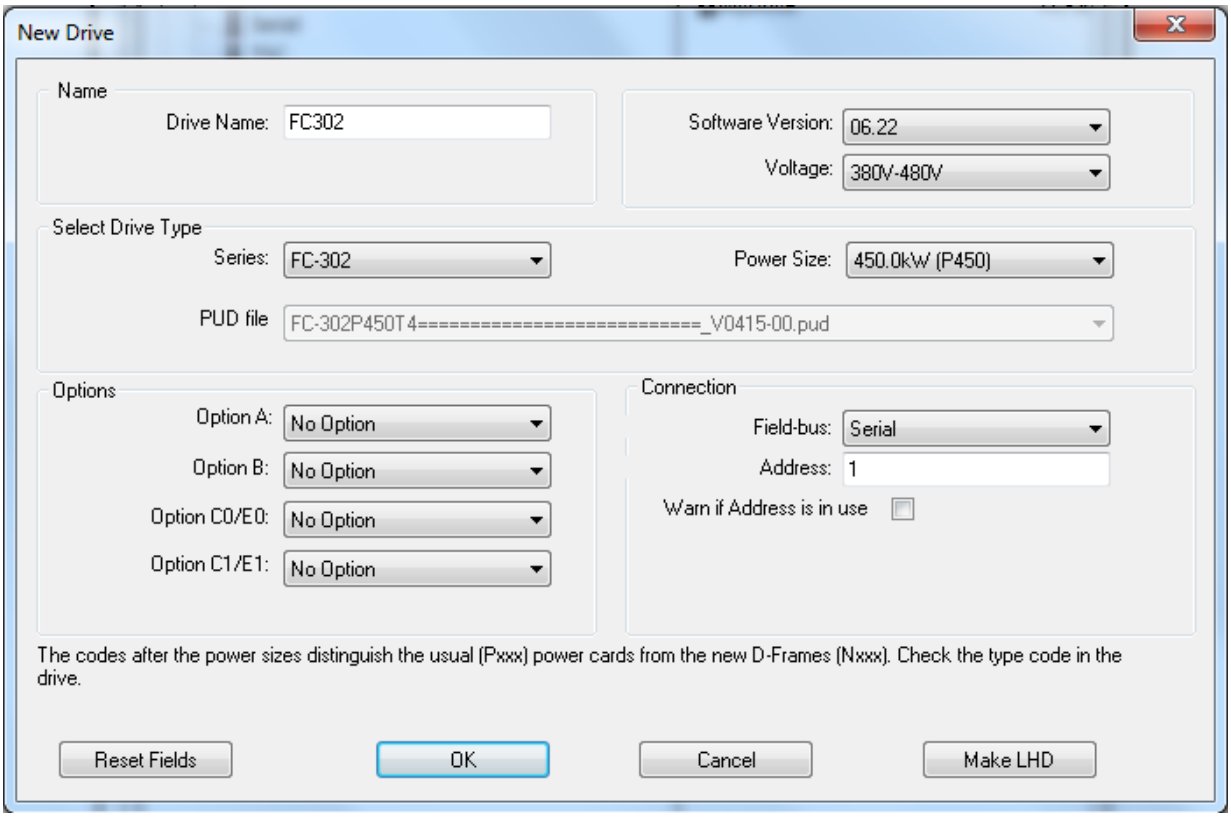


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Illustration 37: Entering Data for a New Low Harmonic Drive

NOTICE

The *Make LHD* option is only available when power size and voltage ranges of the drive correspond to the supported low harmonic drive.

5. Enter all active filter data in the *New filter* dialog. Ensure that the fieldbus address used for the active filter is not used for other components.

→ The low harmonic drive is visible in the project as a composition of the drive and the active filter.

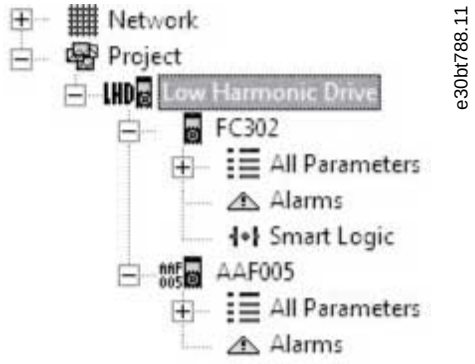

Illustration 38: Low Harmonic Drive Shown in the Project Folder

5.3.4 All Parameters Folders

A new *Drive* folder contains an *All Parameters* folder. This folder comprises a series of subfolders with generic names. There is no rename function for these folders. The generic folders within most drives consist of the following subfolders:

- Operation and display.
- Load and motor.
- References and limits.
- Inputs and outputs.
- Special functions.
- Serial communication.
- Technical functions.

The generic folders can vary according to the type of drive selected.

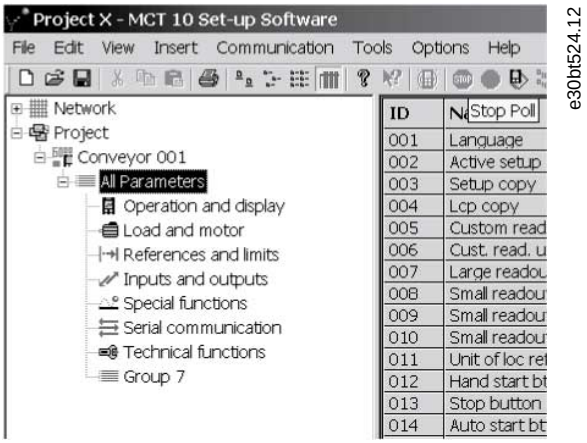

Illustration 39: Subfolders in the All Parameters Folder

The generic folders comprise parameters relevant to the drive type selected.

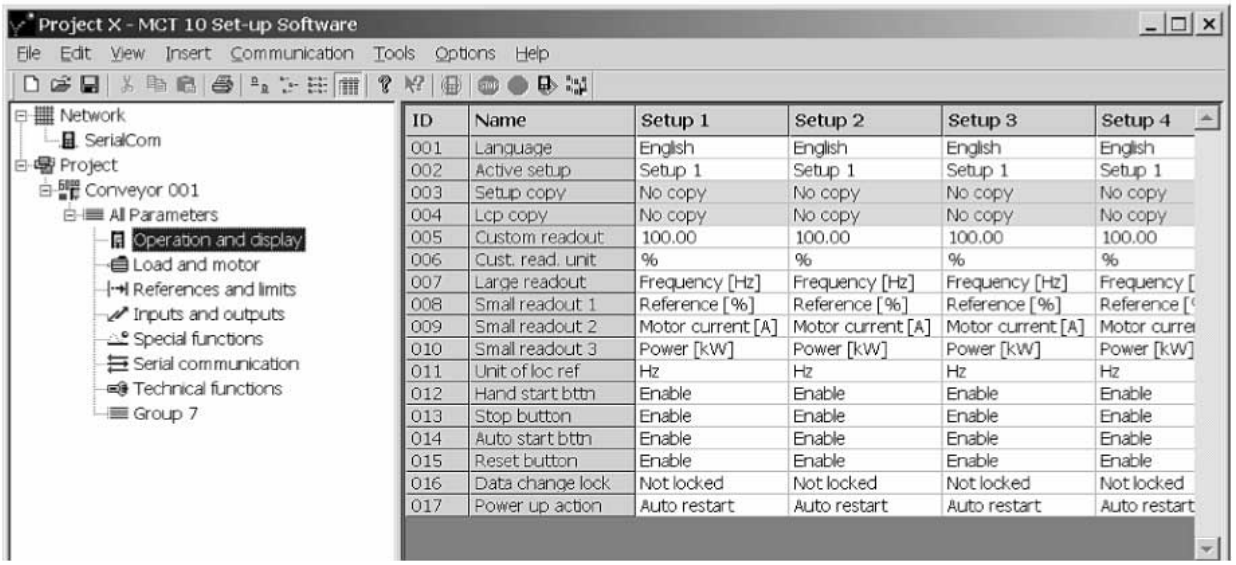

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Illustration 40: Data Example in a Generic Folder

5.3.5 Array Parameters

Parameters containing array data are shown as a matrix in the right view, where the rows of the matrix are defined as ID.1, ID.2, and so on. For example, array parameters *parameter 9-15 PCD Write Configuration* and *parameter 9-16 PCD Read Configuration* are shown over several entries as 915.1, 915.2, 915.3, and 916.1, 916.2, 916.3 in the right view.

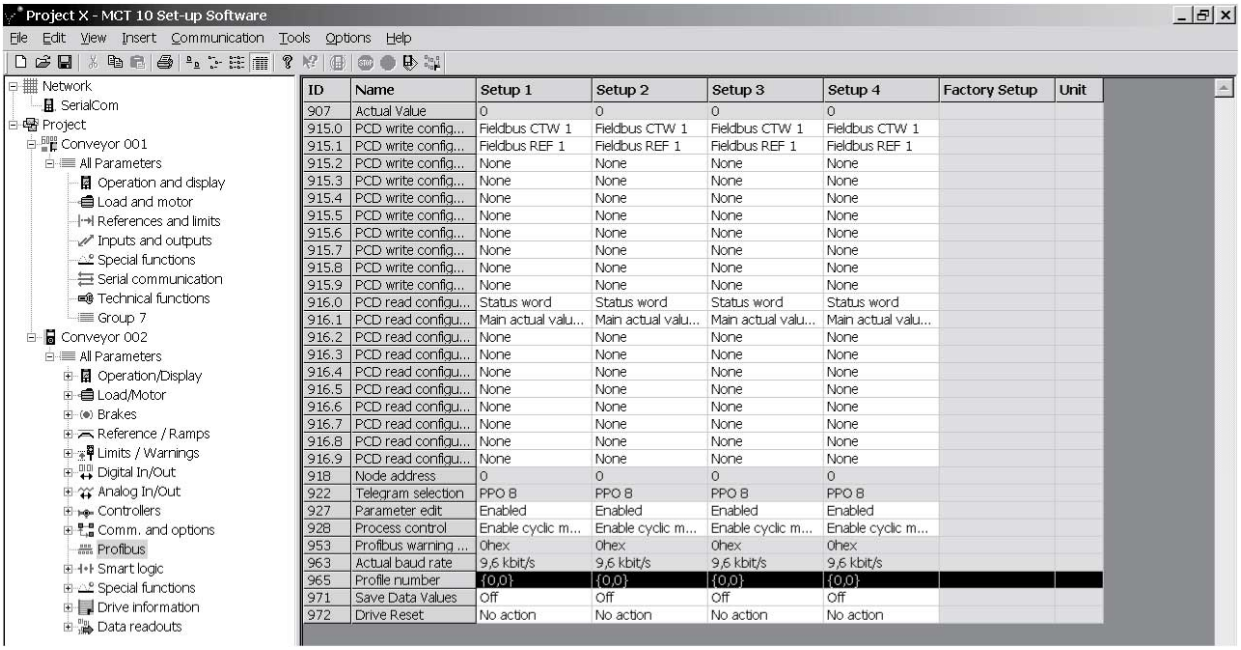

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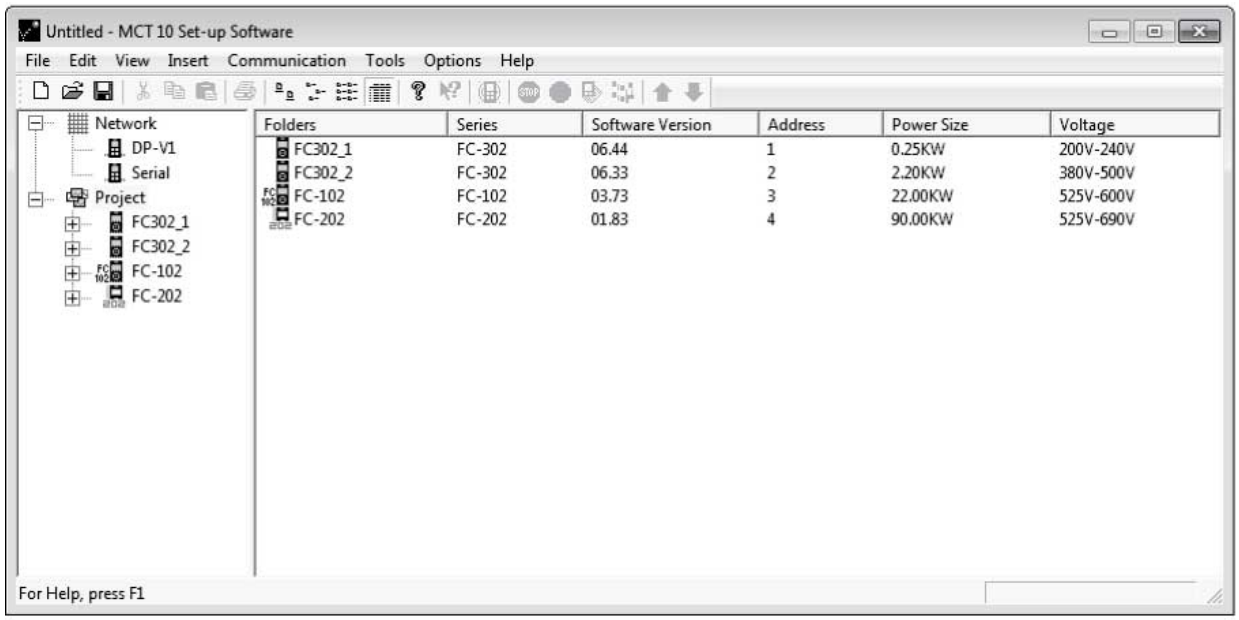
Illustration 41: Array Parameters

5.3.6 Sorting

The Danfoss products listed under *Network* or *Project* can be sorted according to:

- Folder name.
- Series.
- Software version.
- Address (communication address).
- Power size.
- Voltage.

Click the sorting bar and select the relevant sorting option.



e30bt830.10

Illustration 42: Sorting Options

5.4 Customized Views

Select *View* in the main menu bar to see the display options. The following options are available:

- Show or hide the toolbar.
- Show or hide the status bar.
- Large icons/small icons view.
- View as list of folders and elements.
- View with details of network and project elements.

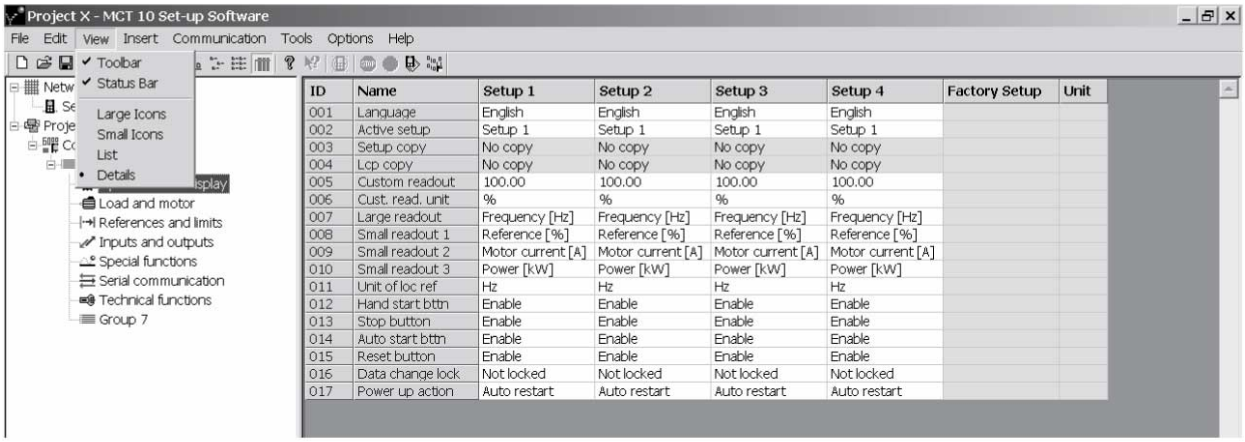


Illustration 43: The View Menu

5.4.1 Customize Parameter View Settings

Context:

Apply the selected parameter view settings to subfolders, to an entire project, or to the entire application, that is all MCT 10 Set-up Software folders in network or project mode.

Procedure

1. Right-click the parameter cell or set-up column.
2. Select *Apply Parameter View Settings*.

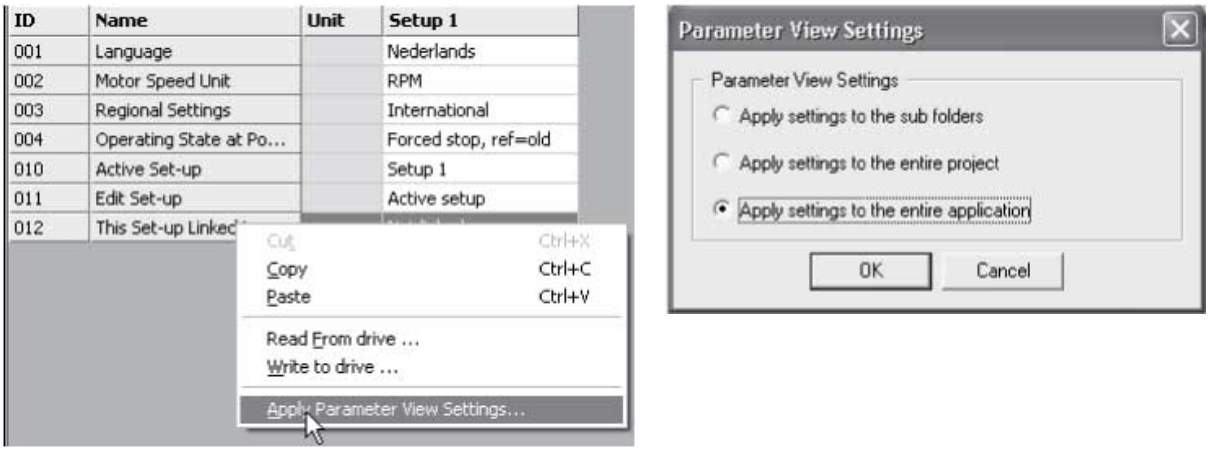


Illustration 44: Applying Parameter View Settings

3. Select the relevant option and click *OK*.

5.4.2 Customize Background Color

Context:

To customize the background color of the views, go to *Options⇒Online Parameter Grid Settings*.

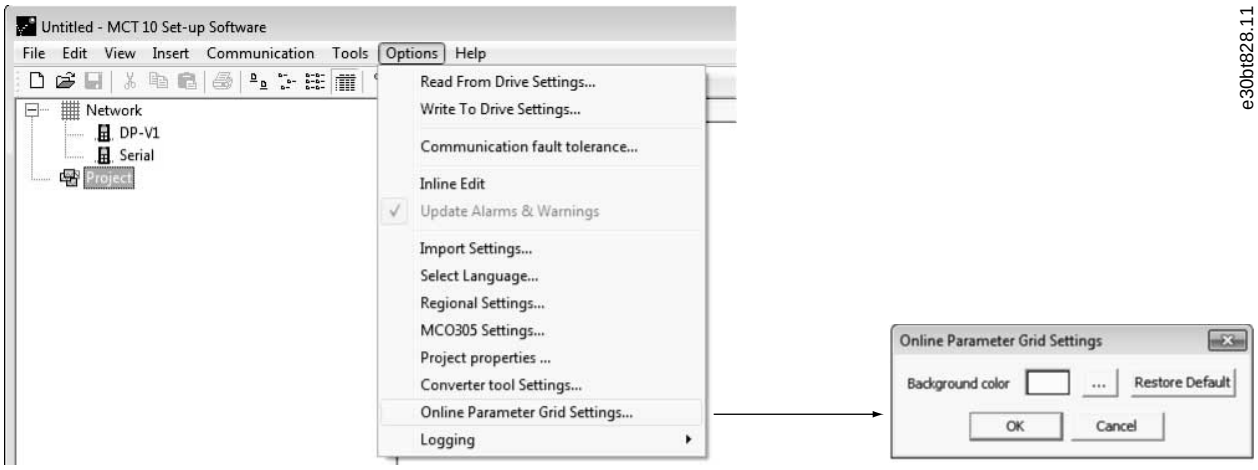


Illustration 45: Customizing Background Color

Procedure

1. Select *Restore Default* to restore factory default background color for online environment.
2. Click *[…]* to open a standard true color picker.
3. Select *Add to Custom Colors* for customizing colors for later usage.

5.4.3 Customize Parameter View

Context:

The parameters shown in the right view are presented in a series of columns, containing ID, parameter name, 4 set-ups, units, and factory set-up.

Select *Parameter view⇒Set-up⇒Remove Menu*.

NOTICE

Changes made to the removed set-up are still stored in the MCT 10 Set-up Software and can be shown by selecting *Customize Columns*.

Procedure

1. Right-click a column.
2. Select *Customize Columns*.
3. In the left view of the *Customize Columns* dialog, select the field to be added or removed.

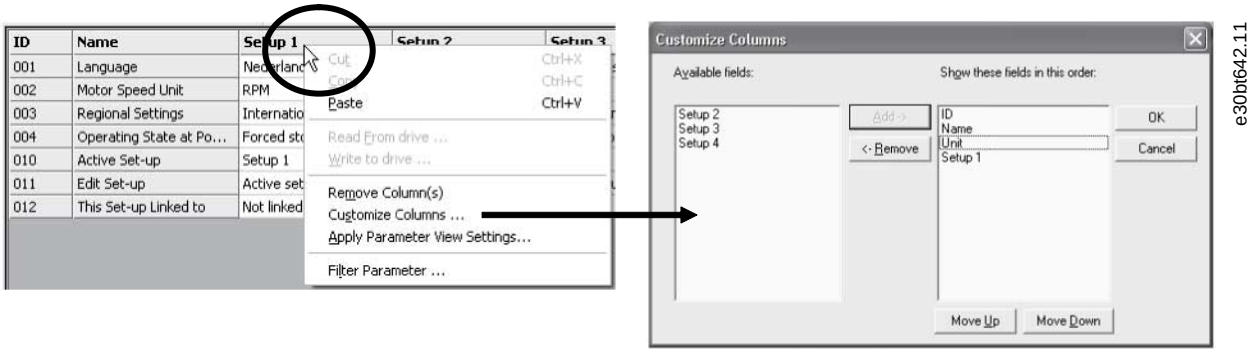


Illustration 46: Customize Columns Dialog

4. Click either *Add* or *Remove*.
5. Change the order of the fields in the right view by clicking *Move Up* or *Move Down*.
6. Right-click a column and select *Apply Parameter View Settings*.

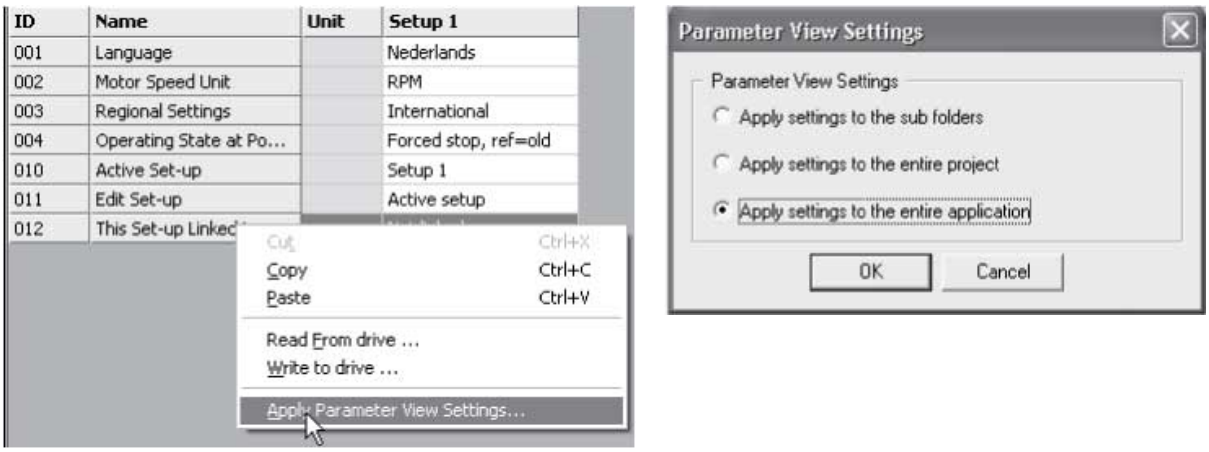


Illustration 47: Apply Parameter View Settings

7. Select if the settings should apply to the subfolders, the entire project, or the entire application.

5.4.4 Filtering Parameters

Context:

Filter the parameters in the right view according to the following settings:

Table 3: Available Filter Settings

Setting	Description
Read only	Only read-only parameters are shown.
Read & Write	Only read & write parameters are shown.
Changed parameters	Only parameters that have been changed in the current session are shown.
All	All parameter groups are shown.
Group	One or more parameter groups are shown according to selection.

Procedure

1. Right-click any column in the right view.
2. Select the appropriate filtering setting or the appropriate filtering group.

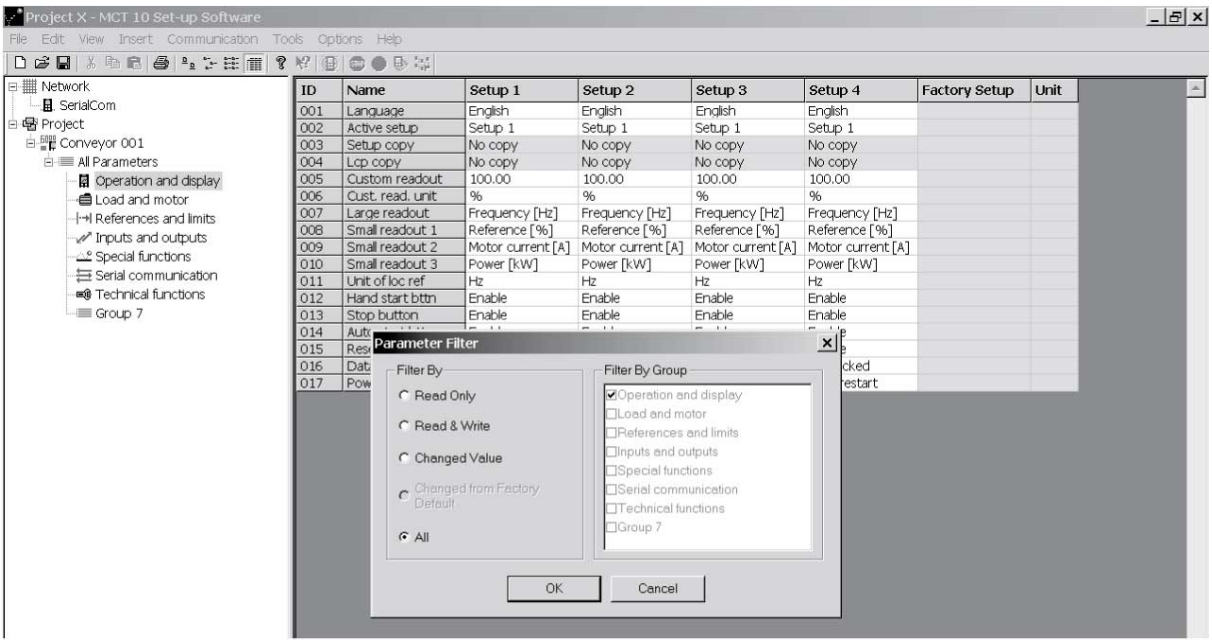


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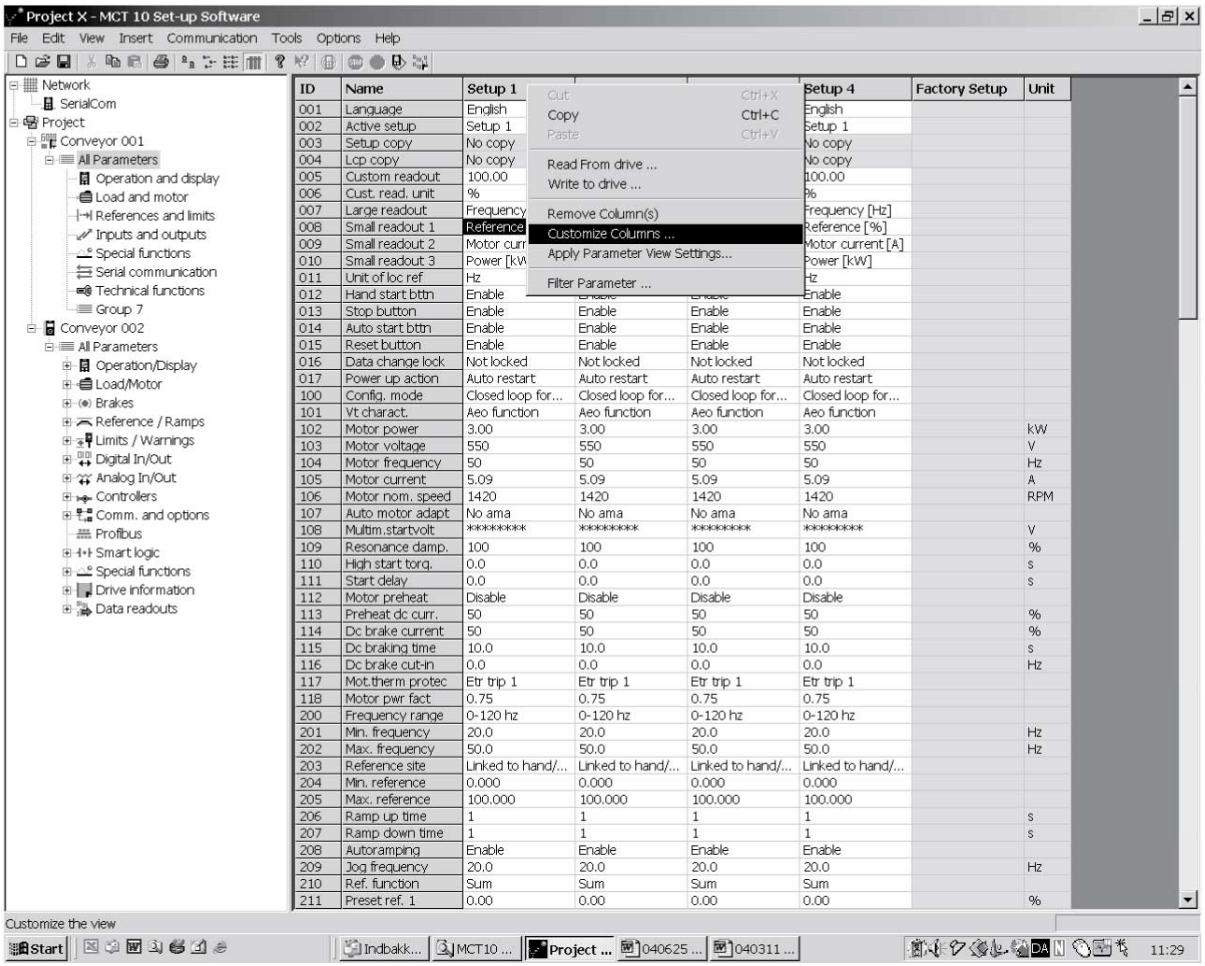
Illustration 48: Filtering Columns

5.4.5 Customize Columns

Procedure

1. Right-click any column.
2. Select *Customize Columns*.



ID	Name	Setup 1	Setup 2	Setup 3	Setup 4	Factory Setup	Unit
001	Language	English			English		
002	Active setup	Setup 1			Setup 1		
003	Setup copy	No copy			No copy		
004	Lcp copy	No copy			No copy		
005	Custom readout	100.00			100.00		
006	Cust. read. unit	%			%		
007	Large readout	Frequency			Frequency [Hz]		
008	Small readout 1	Reference			Reference [%]		
009	Small readout 2	Motor curr			Motor current [A]		
010	Small readout 3	Power [kW			Power [kW]		
011	Unit of loc ref	Hz			Hz		
012	Hand start bttn	Enable			Enable		
013	Stop button	Enable	Enable	Enable	Enable		
014	Auto start bttn	Enable	Enable	Enable	Enable		
015	Reset button	Enable	Enable	Enable	Enable		
016	Data change lock	Not locked	Not locked	Not locked	Not locked		
017	Power up action	Auto restart	Auto restart	Auto restart	Auto restart		
100	Config. mode	Closed loop for...	Closed loop for...	Closed loop for...	Closed loop for...		
101	Vt charact.	Aeo function	Aeo function	Aeo function	Aeo function		
102	Motor power	3.00	3.00	3.00	3.00		kW
103	Motor voltage	550	550	550	550		V
104	Motor frequency	50	50	50	50		Hz
105	Motor current	5.09	5.09	5.09	5.09		A
106	Motor nom. speed	1420	1420	1420	1420		RPM
107	Auto motor adapt	No ama	No ama	No ama	No ama		
108	Multim.startvolt	********	********	********	********		V
109	Resonance damp.	100	100	100	100		%
110	High start torq.	0.0	0.0	0.0	0.0		s
111	Start delay	0.0	0.0	0.0	0.0		s
112	Motor preheat	Disable	Disable	Disable	Disable		
113	Preheat dc curr.	50	50	50	50		%
114	Dc brake current	50	50	50	50		%
115	Dc braking time	10.0	10.0	10.0	10.0		s
116	Dc brake cut-in	0.0	0.0	0.0	0.0		Hz
117	Mot.therm protec	Etr trip 1	Etr trip 1	Etr trip 1	Etr trip 1		
118	Motor pwr fact	0.75	0.75	0.75	0.75		
200	Frequency range	0-120 hz	0-120 hz	0-120 hz	0-120 hz		
201	Min. frequency	20.0	20.0	20.0	20.0		Hz
202	Max. frequency	50.0	50.0	50.0	50.0		Hz
203	Reference site	Linked to hand/...	Linked to hand/...	Linked to hand/...	Linked to hand/...		
204	Min. reference	0.000	0.000	0.000	0.000		
205	Max. reference	100.000	100.000	100.000	100.000		
206	Ramp up time	1	1	1	1		s
207	Ramp down time	1	1	1	1		s
208	Autoramping	Enable	Enable	Enable	Enable		
209	Jog frequency	20.0	20.0	20.0	20.0		Hz
210	Ref. function	Sum	Sum	Sum	Sum		
211	Preset ref. 1	0.00	0.00	0.00	0.00		%

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Illustration 49: Customize Columns Menu

3. Highlight a field to change the order.

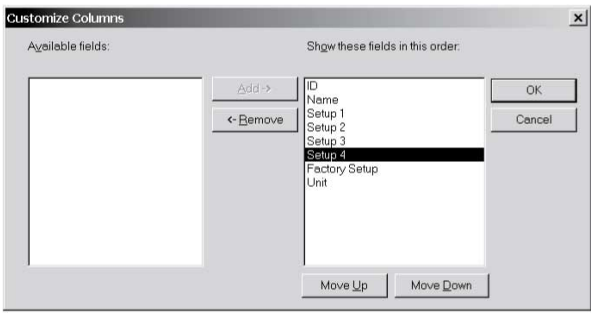


Illustration 50: Change Order of Fields

4. Select *Move Up*, *Move Down*, or *Remove*.

Removed columns are still stored in the memory and can be retrieved into the right view by highlighting the relevant field name and selecting *Add*.

5.5 Parameter Edit

The parameter structures in the MCT 10 and in the drive are the same. Modify the parameter by double-clicking the relevant parameter entry. If an entry cell is shaded, the parameter is read-only and cannot be modified.

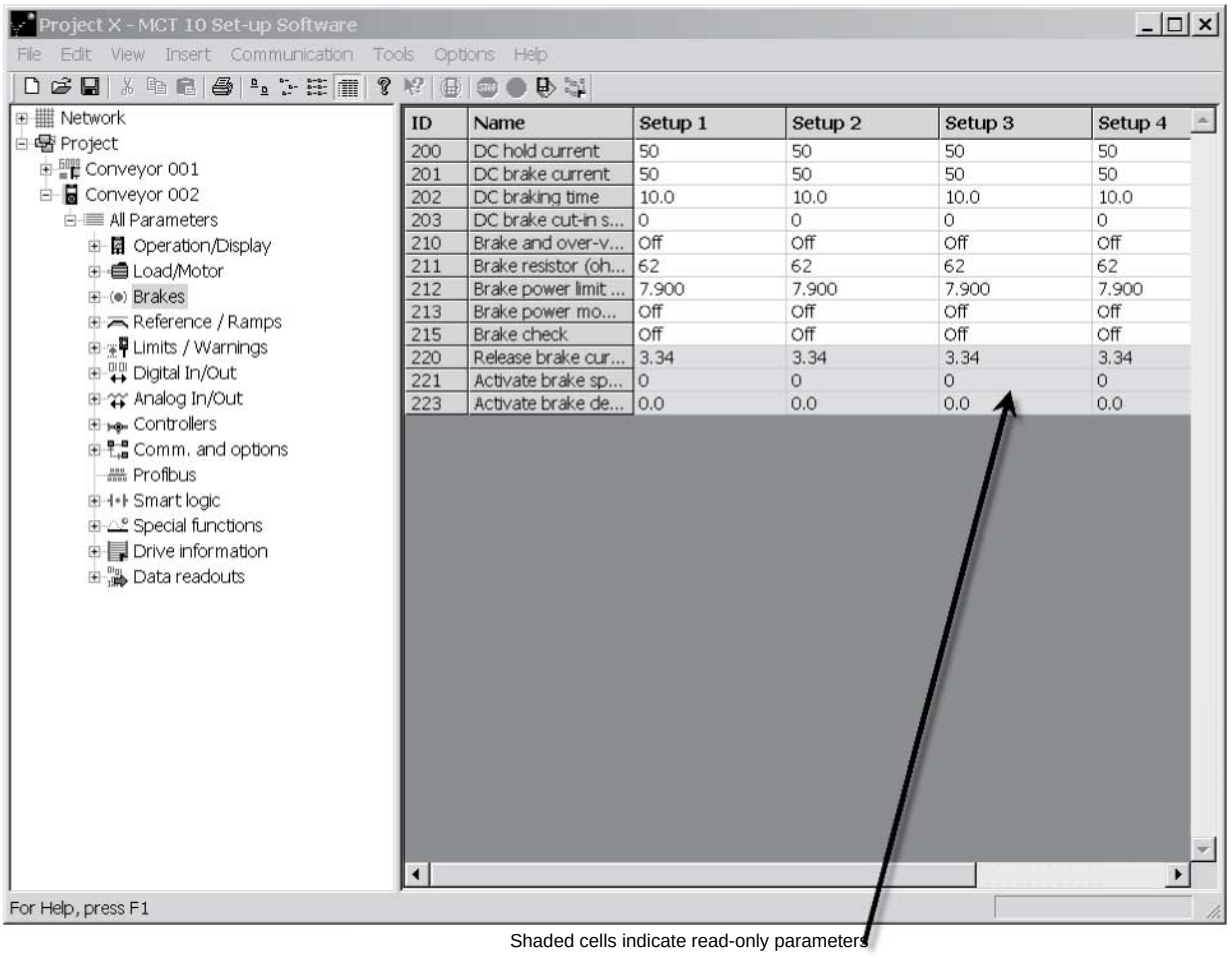


Illustration 51: Editing Parameters

Change parameter set-up by manually entering new values in the cells in the right view. Alternatively, change the parameter set-up by importing values from an active drive using the *Read From Drive* function.

If a parameter value is set to an illegal value, an error is shown. Parameters can be edited in 2 different modes:

- Inline.
- Dialog-based.

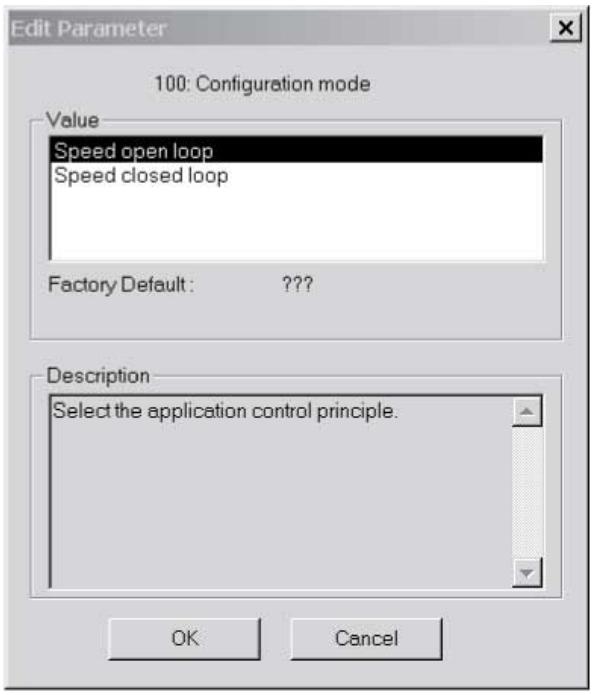


Illustration 52: Edit Parameter View

Inline edit

In inline edit mode, the available setting options are shown without any detailed descriptions of the options. Inline edit is only recommended for experienced users.

Dialog-based edit

To have details of parameters available while editing, use dialog-based edit. The parameter details are:

- Parameter options.
- Ranges.
- Functions.

Enter dialog-based edit by deselecting inline edit.

5.6 Comparison of Parameters

Context:

Parameter settings can be compared to the parameter settings in another drive. Comparisons can be made either to another drive inside the project or to an online drive. The comparison function evaluates whether settings inside the drive have been changed, or checks if 2 or more drives have the same settings.

Procedure

1. Activate the function by highlighting the base drive for comparison and select *Compare*.

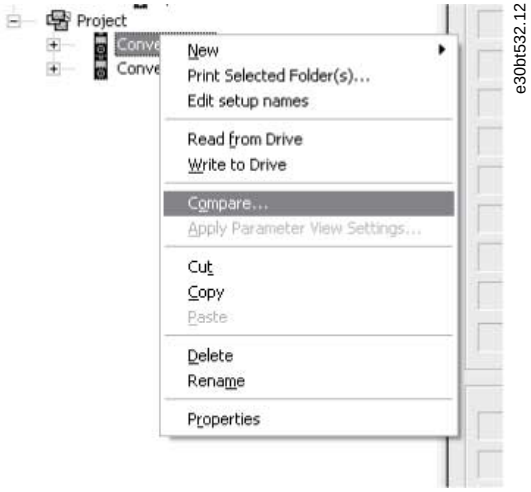


Illustration 53: Comparison

2. Select the drive to compare with.

This drive can be an online drive from the network, or it can be a drive in the offline folder (Project folder).

→ The result of a comparison can be stored in an ASCII text file for documentation or for subsequent import into a spreadsheet.

It is possible to compare all set-ups, or to compare 1 set-up to another.

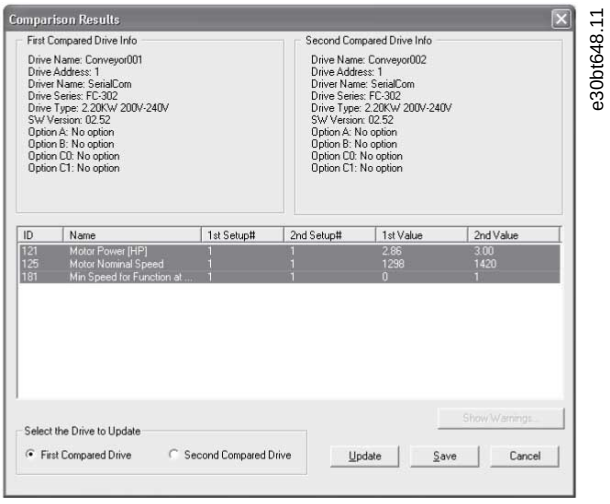


Illustration 54: Comparison Result

5.7 View Change Log

When configuring a drive, active filter, or soft starter from the project, it is possible to view the change log containing the changes made by the user only, or the changes made including the dependent parameters.

User-defined changes can be read out by right-clicking *All Parameters* and selecting *Minimal Changeset*.

Illustration 55: Minimal Changeset

Changes made including the dependent parameters can be read out by right-clicking *All Parameters* and selecting *Compare parameters with default values*.

Illustration 56: Compare Parameters with Default Values

5.8 Read Drive Operation Status

The drive can be in 2 different operating conditions:

- Auto On
- Off

The operation status can be monitored via the LCP or MCT 10. Use MCT 10 to monitor the actual operation status by clicking a drive located in the network. Select *Refresh Status* to update the status information. Parameters can only be written to drives in operation status *Off*.

6 Operation

6.1 Reading and Writing Parameters

Parameter settings can be read from or written to an online connected drive.

Most parameters are read/write and can thus be configured. Other parameters are read-only and cannot be configured. Use the filter function to view which parameters are read/write or read-only.

Select the values to be read/written and then select the *Read From Drive* or *Write To Drive* menu.

The following options are available:

- A single parameter in the right view.
- All parameters in the left view.
- A parameter group in the left view, for example the Load and Motor group.

The read-from-drive and write-to-drive functions apply to the whole section.

Select *Options* in the menu bar to access a range of functions.

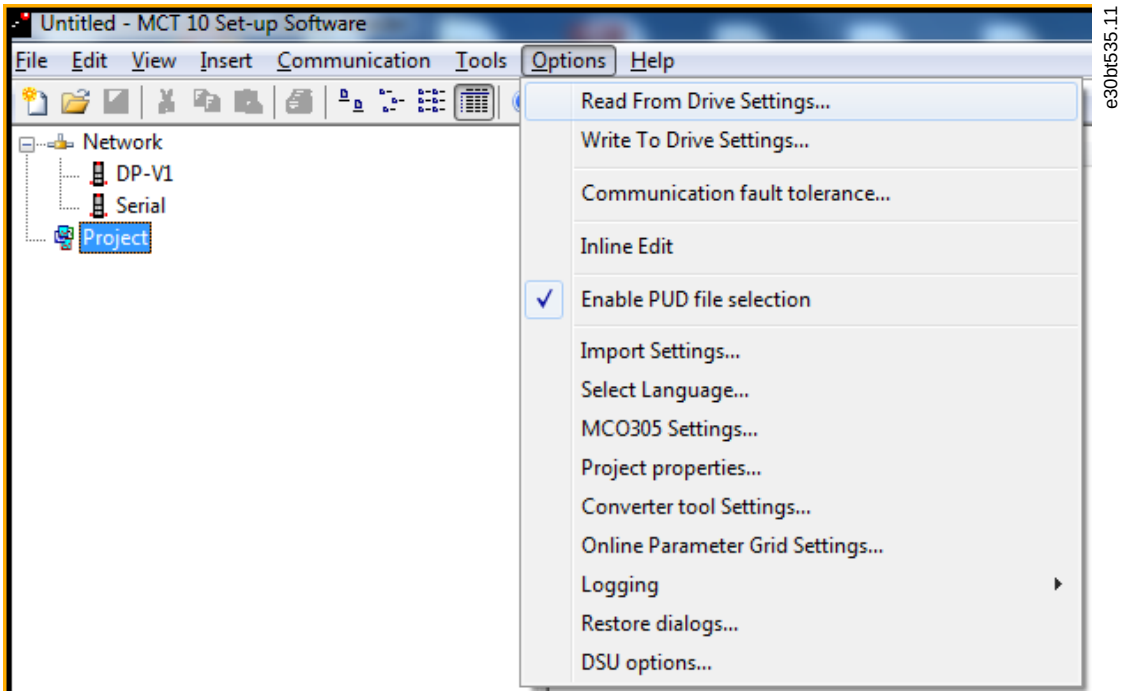


Illustration 57: Select Options

6.1.1 Read From Drive Settings

Select the required options for reading from an active drive.

Set-ups

Select to read visible set-ups only or to read all set-ups.

Drive differences

If field device software and MCT 10 Set-up Software versions are not identical, specify the acceptable level of compatibility errors.

Select *Allow drive differences* to ignore all compatibility errors.

Select *Allow drive version difference* to restrict the acceptable compatibility errors to those occurring in different software versions but same drive series. Select *Do not allow drive differences* not to accept differences between online devices and offline devices.

Save as default settings

Activate *Read From Drive* settings for all reads from the drive.

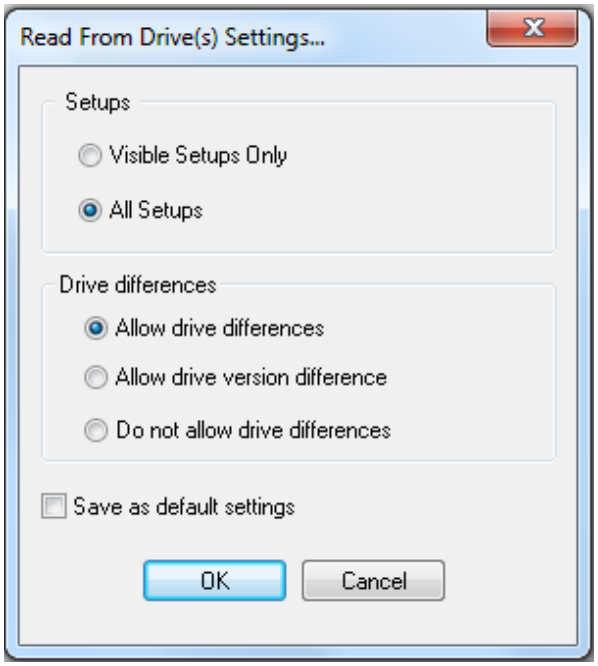


Illustration 58: Read from Drive Settings

6.1.2 Write to Drive Settings

Select the required options for writing to an active drive, which then becomes applicable for all writing to drives.

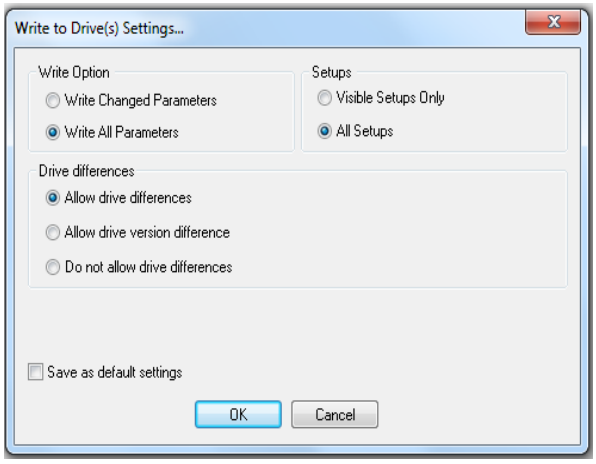


Illustration 59: Write to Drive Settings

Write option

By default, *Write All Parameters* is selected. This means that all read and write parameters are written to online drives.

If selecting *Write Changed Parameters*, only the subset of parameters different from default are written. This selection improves performance.

6.1.3 Communication Fault Tolerance

Set an acceptable number of communication faults before disconnecting. The default number of failures is 1000.

Illustration 60: Fault Tolerance

6.2 Connection Properties

To read or write between online and offline drives, configure the connection properties in the offline project. If the fieldbus does not refer to an available drive in the network tree, MCT 10 Set-up Software is not able to identify the online drive.

Reconfigure the fieldbus by right-clicking the offline project and select *Properties⇒Connection*.

Configure the fieldbusses added to the network tree in the *Fieldbus* drop-down list.

6.3 Read from Drive

Values can be read from an active drive by right-clicking a selection and then selecting *Read from drive*.

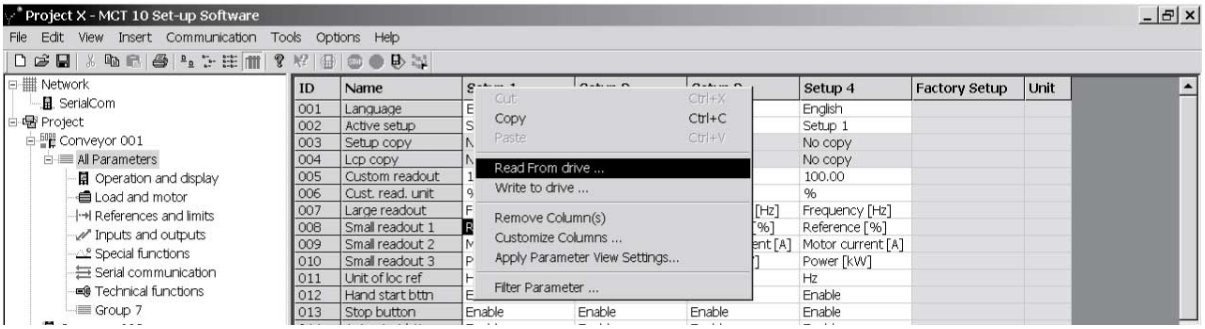


Illustration 61: Read from Drive

Once *Read from drive* is selected, the software accesses the online device and shows the *Drives Check* window. This window contains a list of drives with detected compatibility issues.

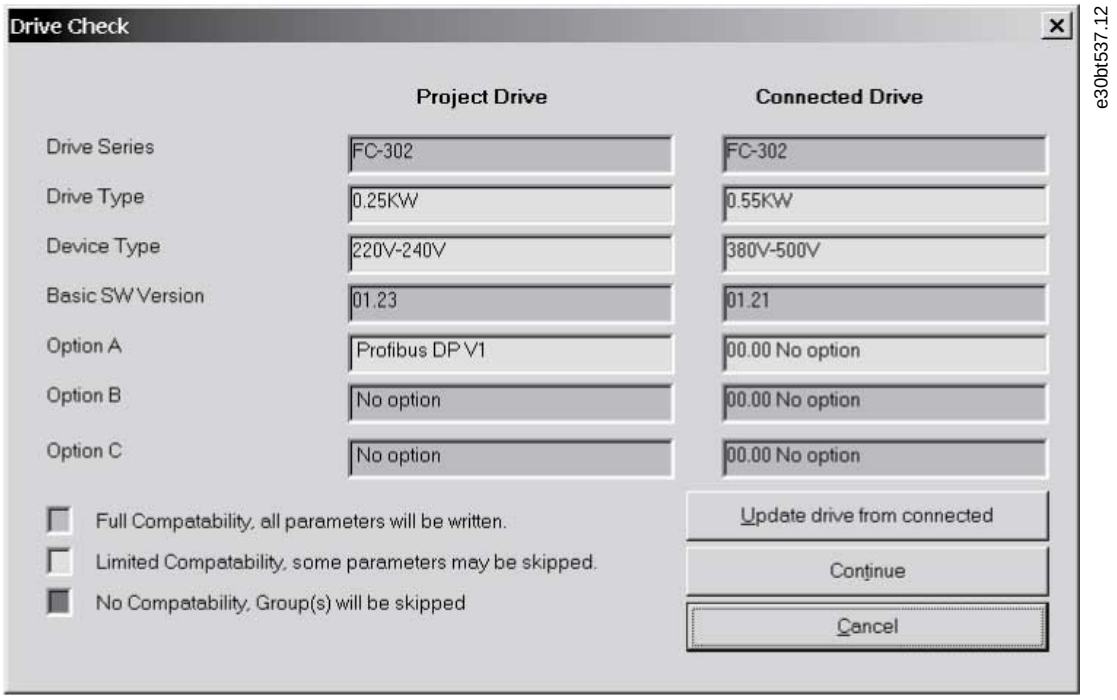


Illustration 62: Drives Check Window

Select *Details* to view details on the different properties between project device (based on database information) and online device (the connected drive).

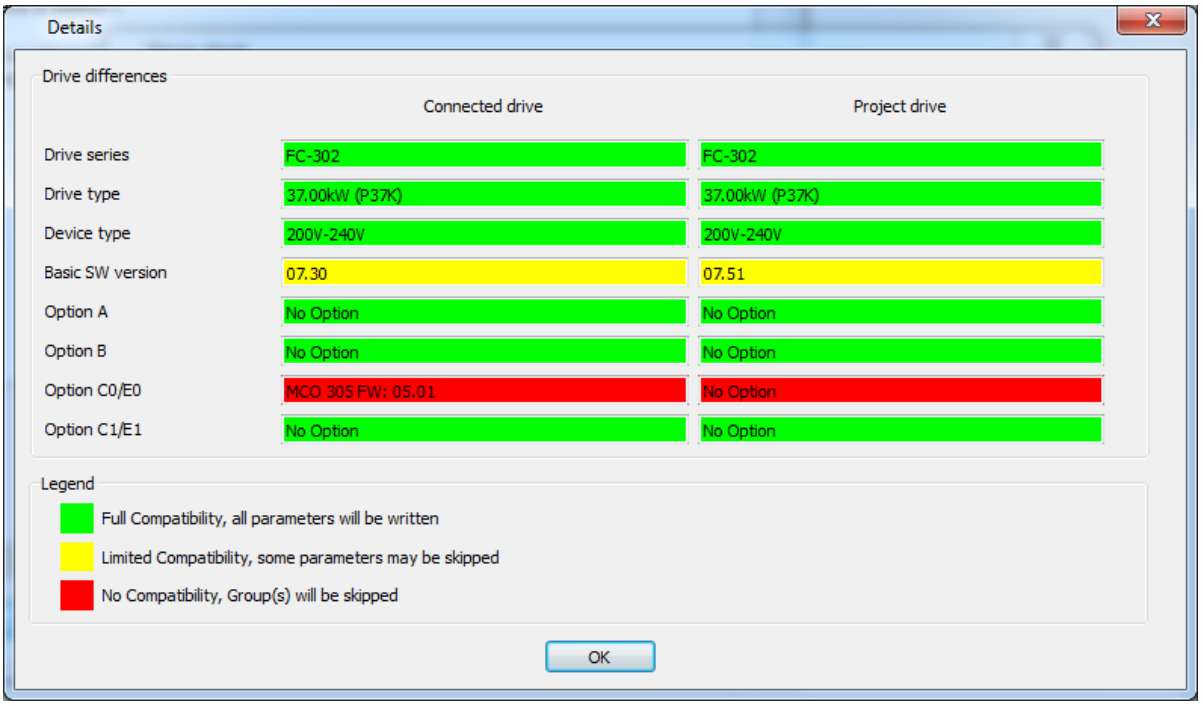


Illustration 63: Details

The color codes indicate the level of compatibility between the project drive and the connected drive for each property.

To continue the reading process, define an action in the *Drives Check* dialog. The default action is *Continue*. Other available selections are:

- Skip the drive.
- None.
- Update project and continue.

The same action can be applied to all devices at a time instead of 1 by 1.

If selecting *Skip the drive*, MCT 10 Set-up Software does not read that particular device, but continues reading the other devices.

Continue resumes reading. Acknowledge and accept any differences found.

Update project and continue activates the read-from-drive process, and it deletes the data in the project drive and replaces it with data from the connected drive.

NOTICE

The *Update from connected* selection deletes and replaces all information stored in the project drive. To retain the information entered into the project drive, select *Continue*.

Once the read-from-drive process is completed, the display shows details of both the *Connected Drive Information* and the *Database Information*.

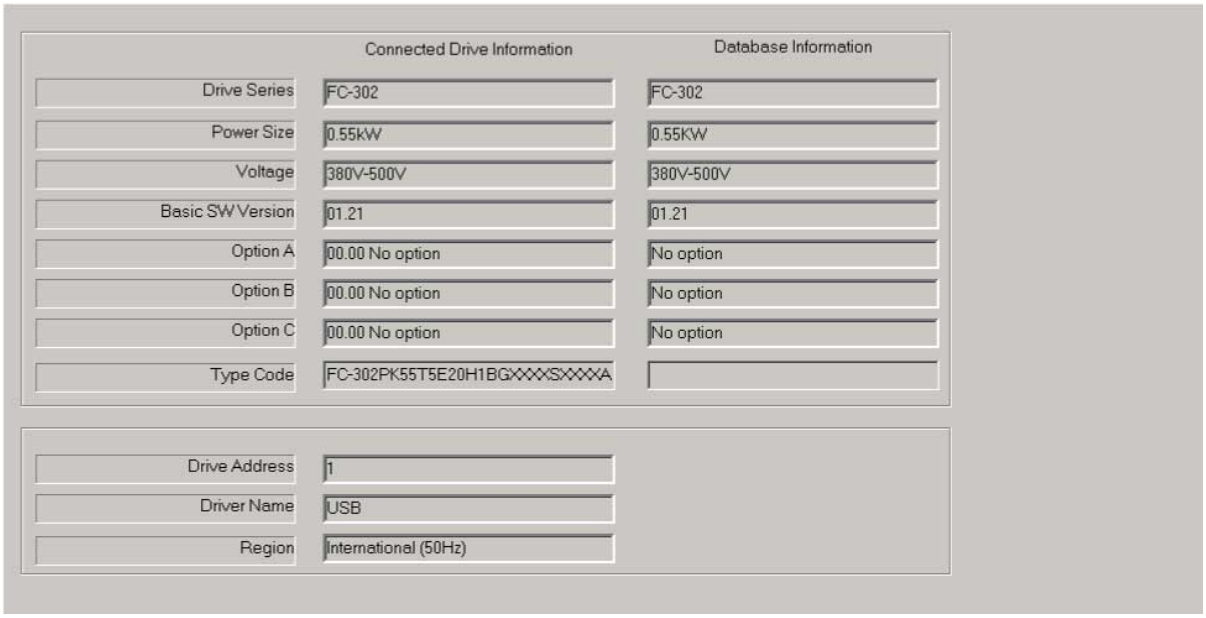


Illustration 64: Read-from-drive Process Completed

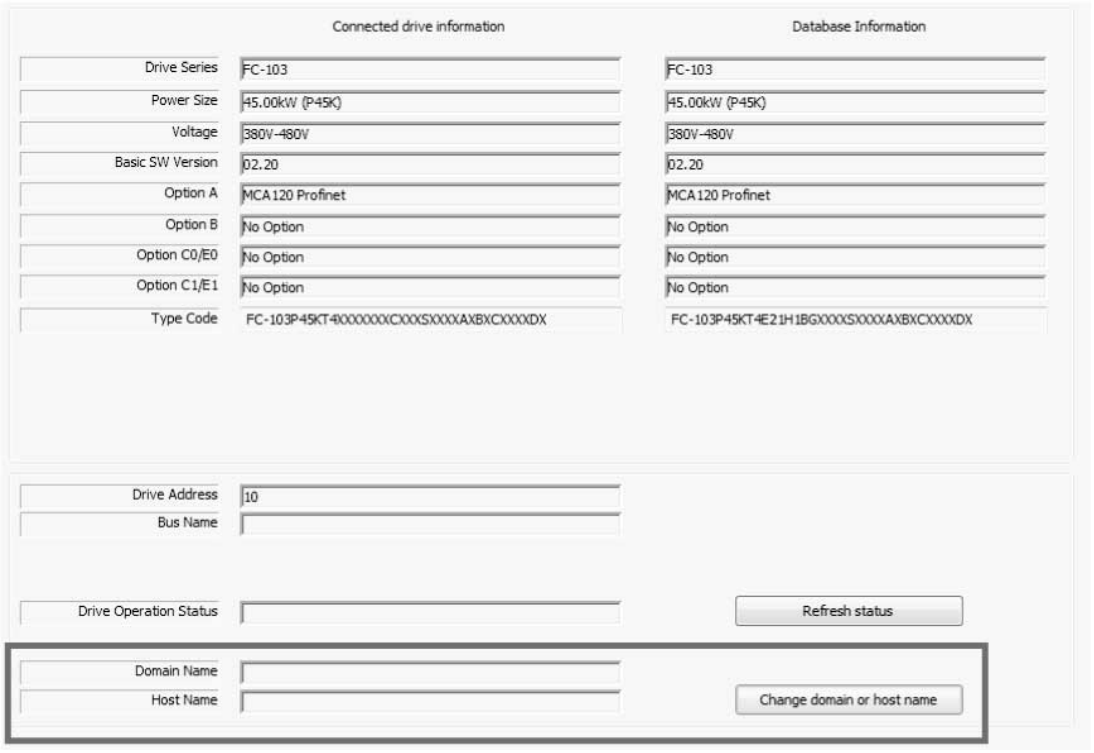
6.3.1 Changing the PROFINET Host Name

Context:

As of MCT 10 version 4.3, the domain name and host name can be changed via the Read-from-drive Process Completed dialog.

Procedure

1. Click *Change domain or host name*.



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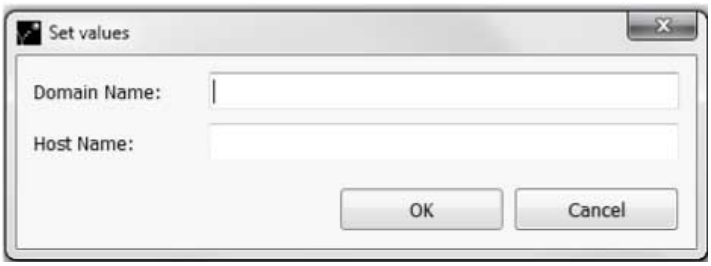
→ A dialog for entering the domain name and host name opens.



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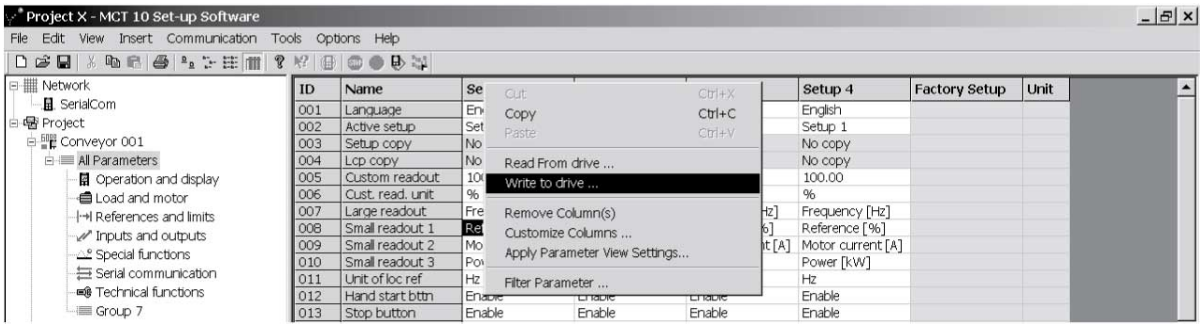
→ The values entered in the dialog are written to *parameter 12-07 Domain Name* and *parameter 12-08 Host Name*.

6.4 Write to Drive

Procedure

1. Right-click a parameter column title in the right view or click *Communication* in the main menu bar.
2. Select *Write to drive*.



e30bt538.12

Illustration 67: Write to Drive

6.5 Poll

When in network mode, MCT 10 Set-up Software automatically polls the parameters in the right view to update their status continuously to reflect live operation.

6.5.1 Stop Polling

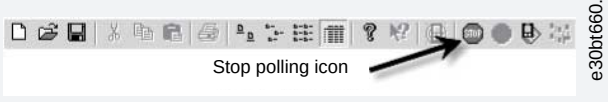
Context:

To stop polling, for example to freeze and analyze a particular moment:

Procedure

1. Click *Communication* in the main menu bar.
2. Select *Stop polling*.

Alternatively, click the *Stop polling* icon in the toolbar.



e30bt660.11

Illustration 68: Stop Polling Icon

6.5.2 Resume Polling

Procedure

1. Click *Communication* in the main menu bar.
2. Click *Resume polling*.

Alternatively, click the *Resume polling* icon in the toolbar.

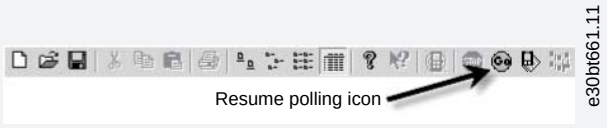


Illustration 69: Resume Polling Icon

6.5.3 Using Smart Polling (Intelligent Scan Frequency)

Context:

While the MCT 10 Set-up Software is polling the parameter grid, the LCP becomes slow. To improve LCP usability, configure MCT 10 to enable smart polling. Enabling smart polling slows down the polling when the LCP is connected.

Procedure

1. Click *Options* in the main menu bar.
2. Select *Online Parameter Grid Settings*.

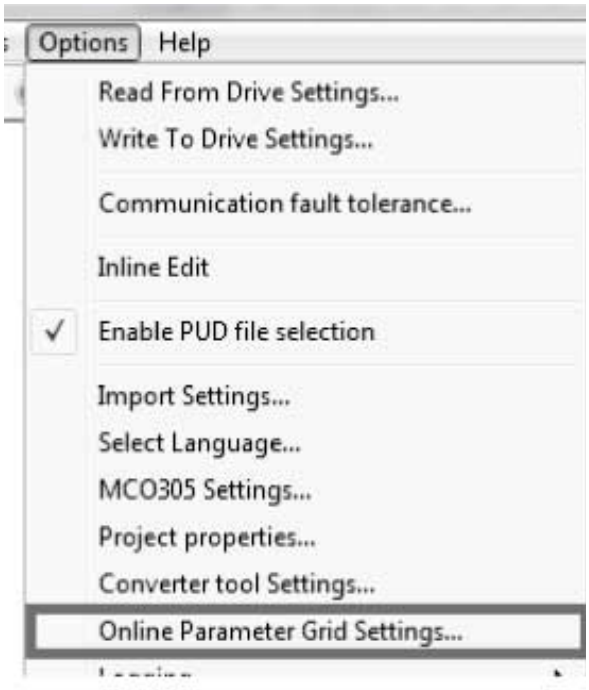


Illustration 70: Selecting Online Parameter Grid Settings

3. Tick the checkbox *Enable Smart Polling (slow down the polling when the LCP is connected)*.

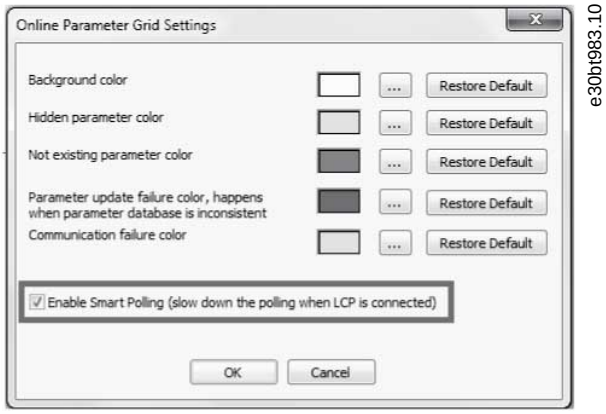


Illustration 71: Ticking the Checkbox

6.6 Changing the Set-up of a Field Device

Procedure

1. Open the Network folder.
2. Select the relevant device.
3. Select *Stop* on the toolbar to stop polling.
4. Change the settings in the set-up columns in the right view.

→ The changes are implemented online in the field device, but are not recorded.

6.7 Save Changes to a Hard Disk

6.7.1 Recoding Online Changes

Procedure

1. Select the relevant device in the Network folder.
2. Right-click the device and select *Copy*.
3. Select the Project folder.
4. Right-click and select *Paste*.
5. Select *File* from the main menu bar.
6. Select *Save As*.
7. Save the device file into a directory in the storage location.

6.7.1.1 Saving a Project

Procedure

1. Click *File* in the main menu bar.
2. Select *Save*.

   Alternatively, click the *Save* icon in the toolbar.

6.7.1.1.1 Including Drive Information

It is not possible to open a project file including a firmware version not supported by MCT 10 Set-up Software. Including the drive information in the project file makes it possible to open in other installations with MCT 10 without having the firmware installed.

By opening the project file, the drive information is updated similarly to:

- Selecting *Update Drive Support* under *Tools* in the main menu bar.
- Downloading the drive information from an online drive.

The drive information is saved in the project file.

6.7.1.1.2 Excluding Drive Information

Procedure

1. Click *Options* in the main menu bar.
2. Select *Project properties*.
3. Click *Store related technical data files into project*.

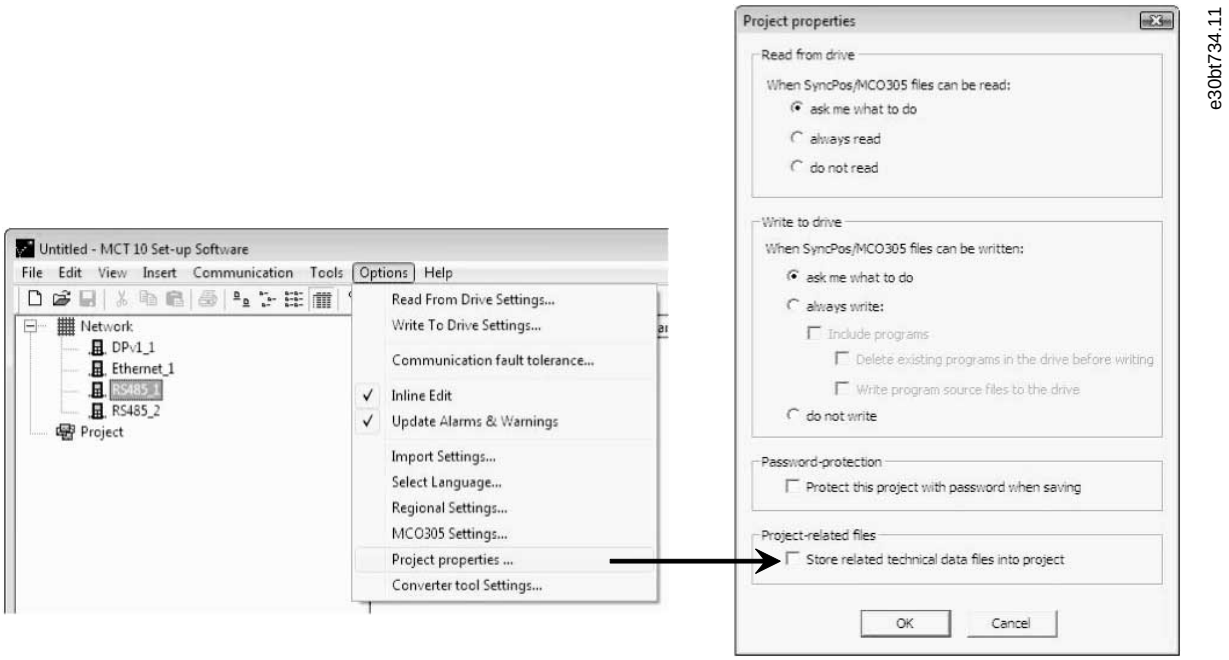


Illustration 72: Save Drive Information

6.7.2 Archive/Unarchive

Projects that include links to other documents can store the linked files.

By selecting the *Archive* function, the MCT 10 Set-up Software generates a file that contains all drives and the linked files into a *.ssa file. If this file is sent to other computers, the user gets a copy of the linked files on the computer.

6.8 Import of Older Dialog Files

For users working with VLT set-up software dialog, the files generated with these software packages can be imported into the MCT 10 Set-up Software.

Files from DOS versions and Windows versions can be imported to the MCT 10 Set-up Software. Following a successful import, the MCT 10 places the imported files in an imported files folder.

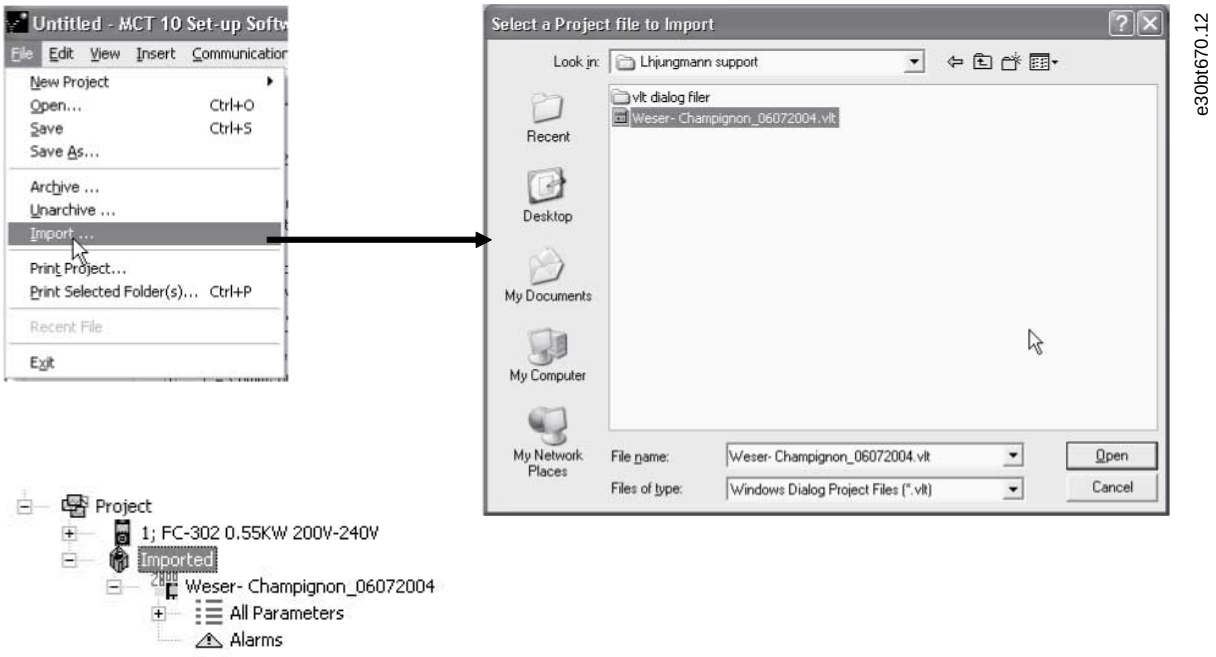


Illustration 73: Import Older Dialogs

Due to limitations in some of the former PC tools, some functionalities cannot be imported, for example, functions such as showing changed values only.

6.9 Printing

There are 2 print options in MCT 10 Set-up Software:

- Print project.
- Print selected folders.

Both options are in the *File* menu in the main menu bar. Alternatively, right-click the *Project* icon and select *Print project*.

To print a folder, right-click a folder icon within the project and select *Print selected folders*.

Select *Print project* to print parameter settings for an entire project. Select *Print selected folders* to print parameter settings for part of a project.

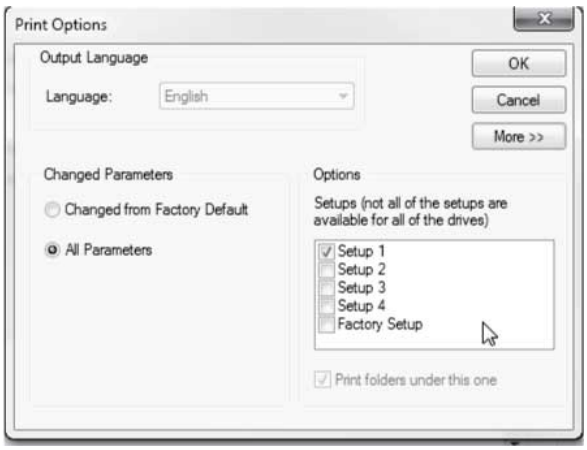


Illustration 74: Print Options

Select the desired print language from the drop-down list.

Changed parameters

Print either parameters that have been changed from factory default or all parameters.

Options

Select which set-up to print.

More

Click *More* to be able to print selected parameter groups only.

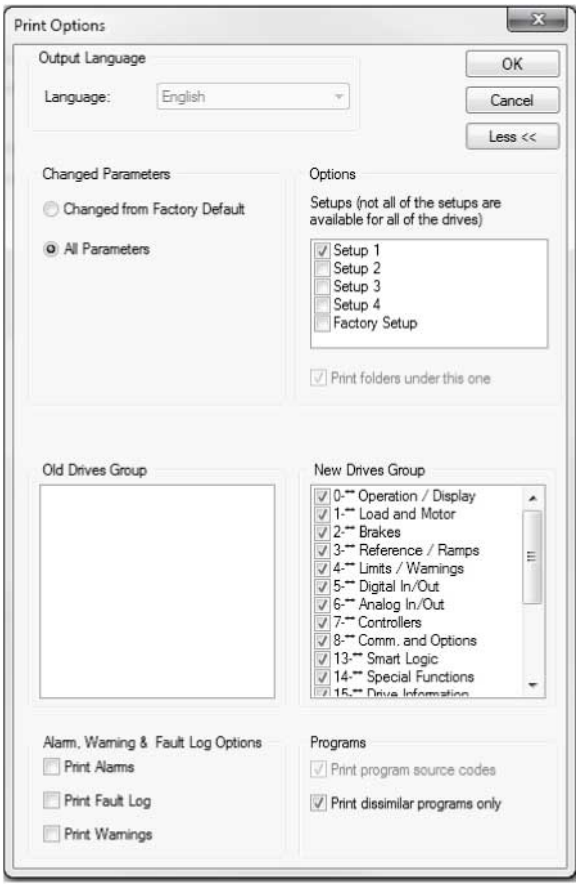
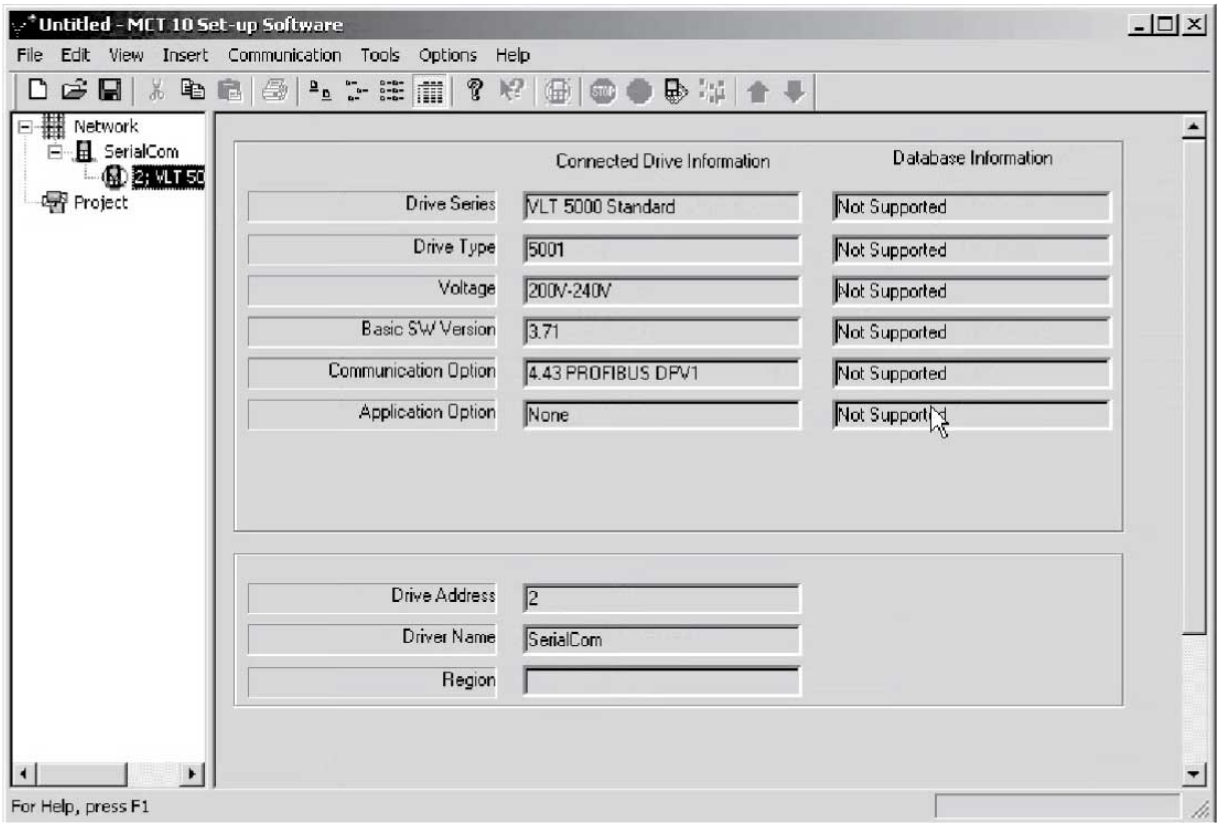


Illustration 75: Example of Print Selection

6.10 Update Database Information

If the MCT 10 Set-up Software database information is outdated, updates are available either by download from the Internet or, when this is not possible, by reading from the drive itself.

When the MCT 10 Set-up Software database for a drive is outdated, the drive icon is shown with a red line through it and the *Database information* fields show the message *Not supported*.



e30bt649.11

Illustration 76: Outdated Software Database

Update the database either by right-clicking the drive icon and selecting *Download drive info*, or by clicking *Download drive info*.

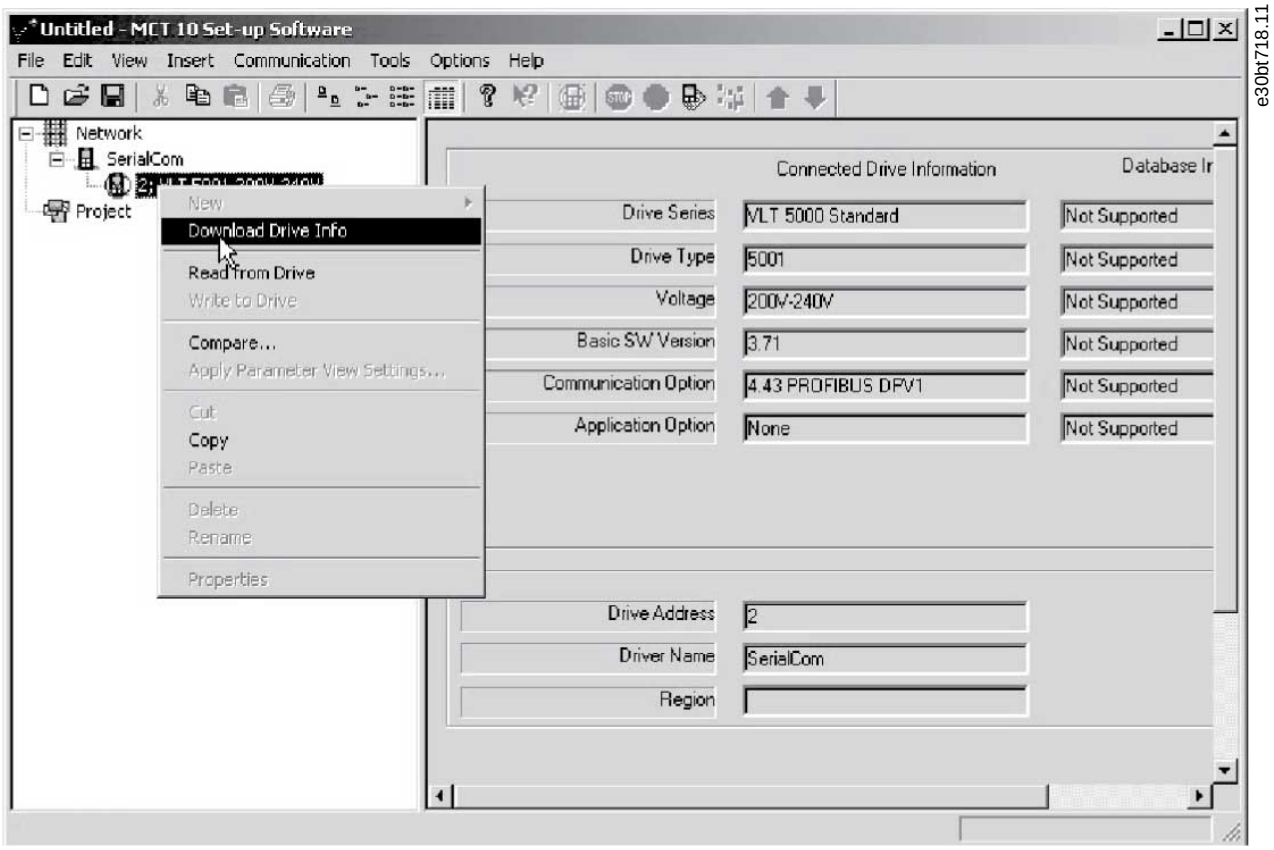


Illustration 77: Database Update

To start reading from the drive, select *Yes*.

When reading from the drive is complete, the drive icon no longer has a red line through it, and the *Database information* shows settings identical to the *Connected drive information*.

Also, the parameter settings are shown in capital letters.

6.11 Update Drives Firmware Support in MCT 10 Set-up Software

The MCT 10 Set-up Software can be updated regardless of the firmware of the drive.

Download upgrades from the Danfoss website www.danfoss.com/en/service-and-support/downloads/?sort=title_asc&filter=download-type%3Dsoftware%2Csegments%3Ddds and store them on a local disk drive.

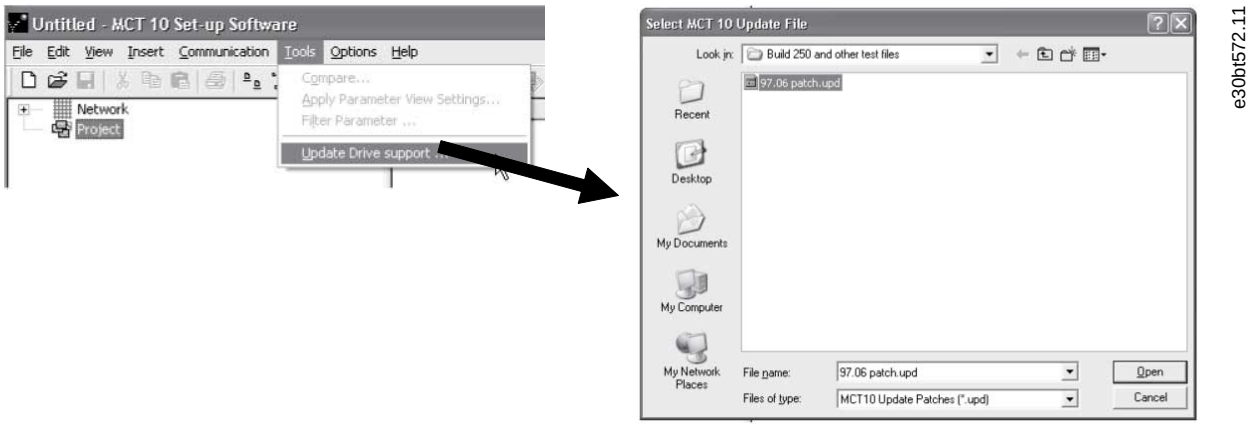


Illustration 78: Update MCT 10 Set-up Software

NOTICE

The update files can be installed without administrator rights in Microsoft operating systems.

6.12 Software Compatibility

The MCT 10 Set-up Software project files can open legacy version project files.

Table 4: Opening Legacy Versions

Software versions of MCT 10 Set-up Software and drive in existing project file	Software versions of Danfoss Set-up Software	Compatible ✓ / ✗
2.00 and 2.01	2.02	✓
2.02 and 2.51	2.00	✗

When MCT 10 Set-up Software has been updated, project files saved with a newer firmware version can be opened and used. Refer to illustration 79 for an example.

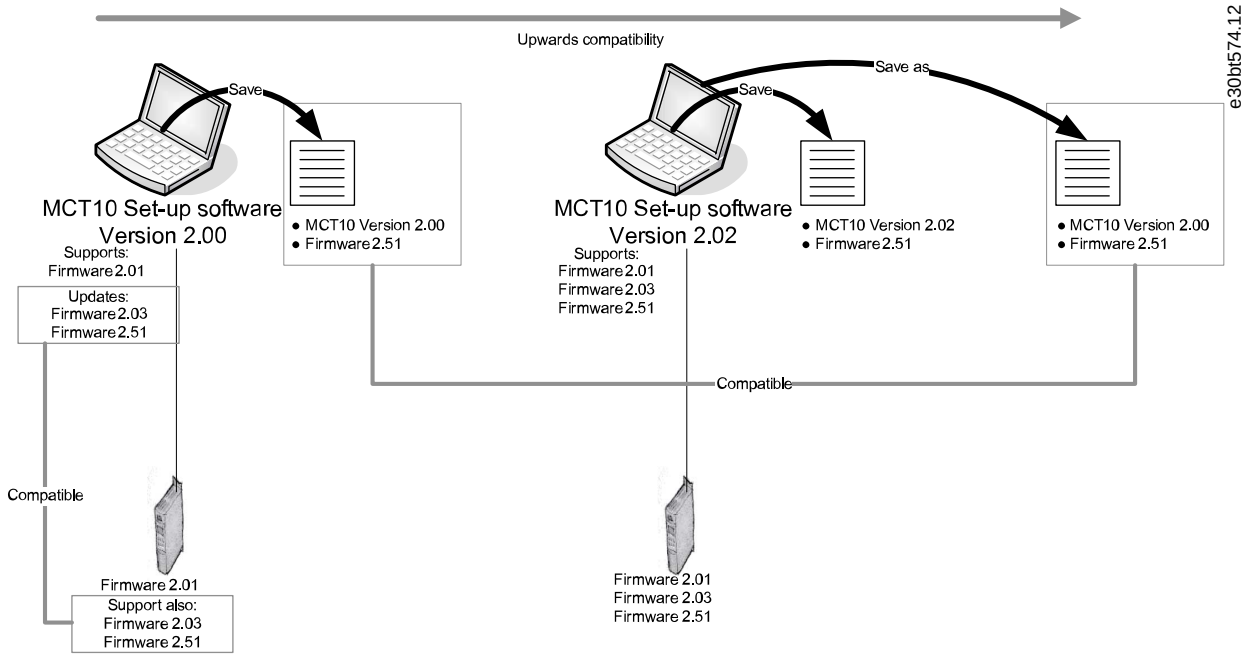


Illustration 79: Use Updated MCT 10 Set-up Software

6.12.1 Mapping to Compatible Firmware

Context:

To establish connectivity to a drive with firmware version 1.10, it is required to modify the MCT 10 Set-up Software drive database mapping to firmware version 1.05 as reference.

Procedure

1. Start the MS Explorer and open the path C:\Program Files\Common Files\Danfoss Drives\SharedSource\.
2. Open the text file ss_version_mapping.txt in Notepad by right-clicking the file and selecting *Edit*.
3. Change "Series="FC-202",AOC="01.10",Database="01.10" to Series="FC-202",AOC="01.10",Database="01.03".
4. Save and close the file.

To find out if the MCT 10 Set-up Software has been updated, check the information in the *About* box. This box shows the actual MCT 10 Set-up Software version.

NOTICE

System information can be copied directly to the Windows clipboard.

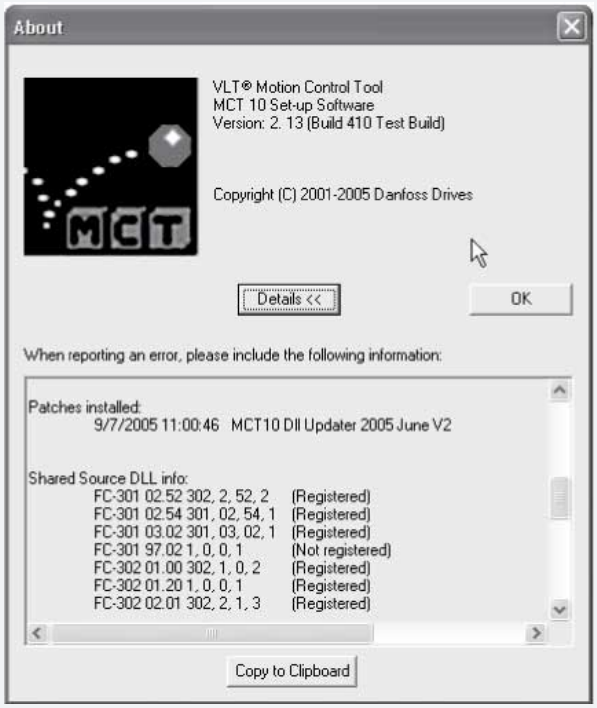


Illustration 80: Copy System Information

6.13 Conversion Wizard

6.13.1 Conversion

It is required that database versions, power size, voltage range, and option configuration of the source match the destination drive. Differences can be converted using 1 of the conversion wizards available in the MCT 10 Set-up Software:

- VLT to FC series conversion.
- FC to FC series conversion.

NOTICE

If the parameter database of a source drive is different from the database on the destination drive, it cannot be written without errors signaled during write to drive.

6.13.2 VLT to FC Series Converter Function

It is possible to convert, for example, a VLT® 5000 drive to a VLT® AutomationDrive FC 302 via the conversion matrix in the MCT 10 Set-up Software.

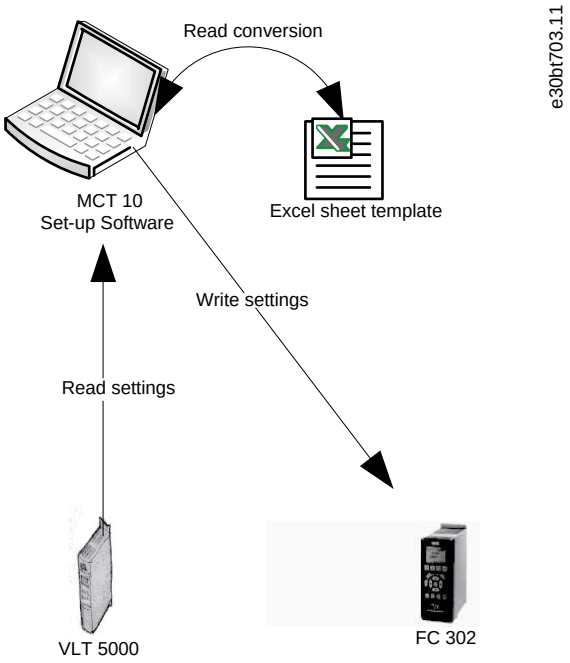


Illustration 81: Conversion

6.13.2.1 Converting Multiple Drives

Procedure

1. Select the *Tools* menu and activate *Drive Conversion Wizard*.
2. In the subsequent dialogs, select the drives for conversion.

→ When converted, a new VLT® AutomationDrive FC 302 drive is created in the Project folder.

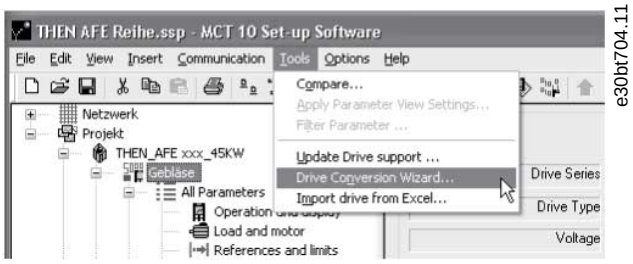


Illustration 82: Conversion of Multiple Drives

6.13.2.2 Import Drive from Excel

Use this function to create a VLT® AutomatonDrive project based on an Excel sheet. For example, import of VLT® 3000 settings from an Excel sheet into a new FC 302.

An example file is attached in the MCT 10 Set-up Software (vlt3000conversion.xls). This example file can be edited and used for converting from VLT® 3000 to FC 302.

NOTICE

Detailed knowledge of Microsoft Excel formula editing is required.

6.13.3 FC to FC Conversion

The converter tool can convert projects within the same drive series, regardless of software versions, power size, voltage range, and option configuration. It covers:

- VLT® HVAC Drive FC 102.
- VLT® Refrigeration Drive FC 103.
- VLT® AQUA Drive FC 202.
- VLT® AutomationDrive FC 301/FC 302.
- VLT® Lift Drive LD 302.
- All OEM versions based on the FC xxx series.

Differences can be matched by using the Conversion Tables Manager.

A conversion table enables conversion from:

- Online to online drive.
- Online to offline drive.
- Offline to online drive.
- Offline to offline drive.

Two user profiles are available:

- Administrator - qualifies and manages the conversion tables through access to the Conversion Tables Manager. From the Conversion Tables Manager, new conversion tables can be created and deployed to other MCT 10 Set-up Software installations.
- User - writes projects to the destination using the conversion tables transparently. The user cannot access the Conversion Tables Manager. Conversion tables can be imported to the database.

MCT 10 Set-up Software is installed with user rights. Enabling the Conversion Tables Manager is done from the checkbox in the *Converter Tool Settings* dialog.

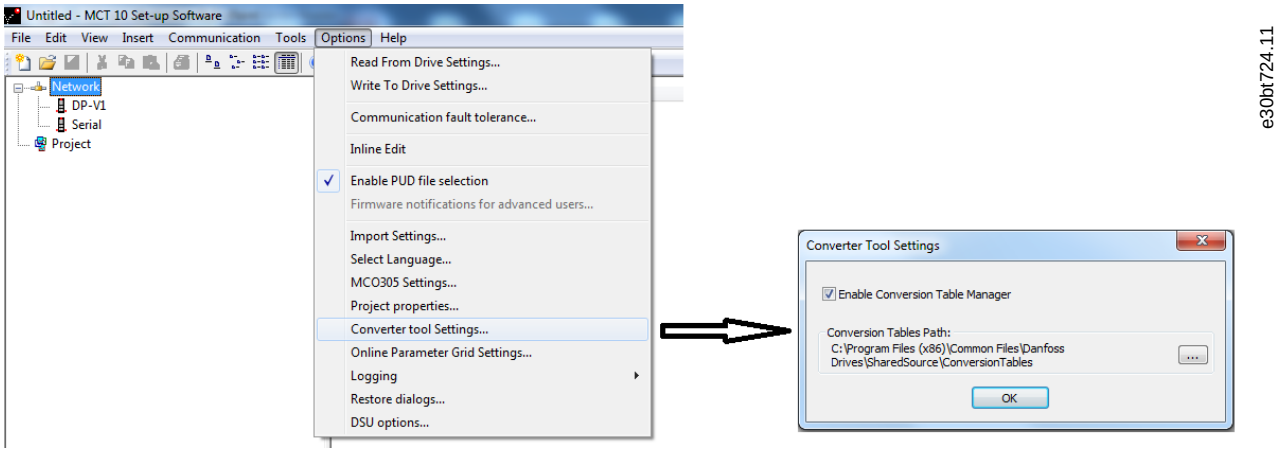


Illustration 83: Enabling Conversion Table Manager

The conversion tables are stored locally on the hard disk. Using the database non-distributed, the path to the network location can be reconfigured from the *Converter Tool Settings* dialog.

6.13.4 Conversion Tables Manager

Access the Conversion Tables Manager via the *Tools* menu in the MCT 10 Set-up Software.

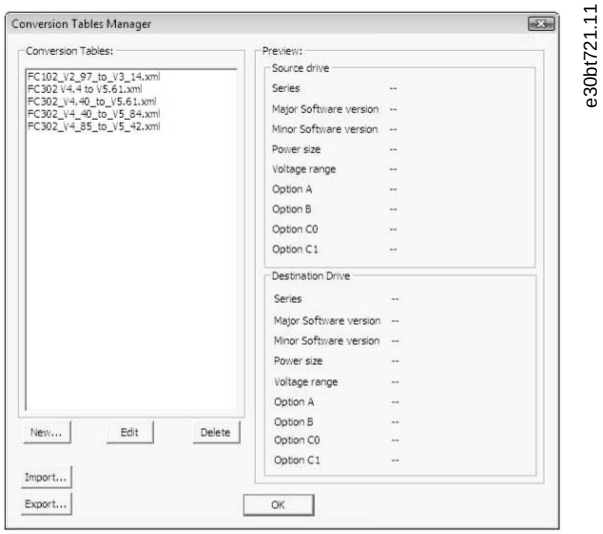


Illustration 84: Conversion Tables Manager

A dialog is divided into the following sections:

- A conversion table containing the list of conversion tables in the database.
- A preview pane.

Conversion tables can be created or imported, edited, exported, or deleted.

Exporting tables

Distribute to other MCT 10 Set-up Software installations by exporting the relevant tables to a *.cvt file. The preview pane lists the conversion table source and destination drive information.

The conversion can be as follows:

- Drive series based on the FC 102/FC 202/FC 3xx platform.
- Software version (major and minor).
- Power size.
- Voltage range.
- Option A.
- Option B.
- Option C0.
- Option C1.

Create conversion tables

To create a conversion table, open the *Conversion Tables Manager* or right-click the source drive and select *Convert drive*.

NOTICE

When using the right-click option, it is only possible to configure the information of the destination drive. Furthermore, *parameter group 19-** User-defined Parameters* is not converted. These settings are configured when writing from source to destination.

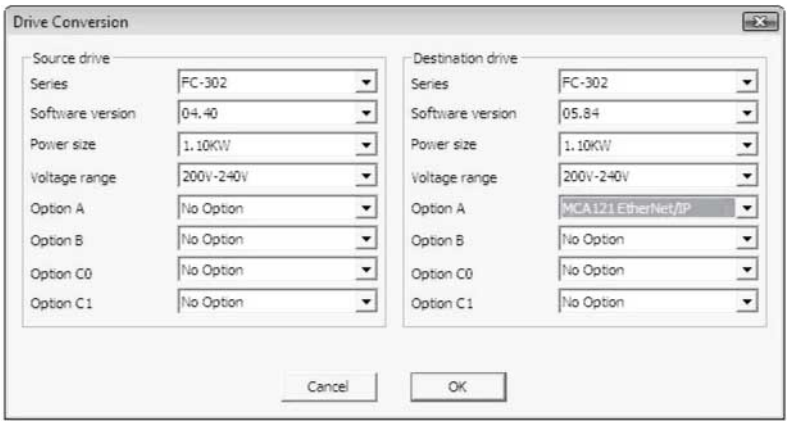


Illustration 85: Drive Conversion

Editing tables

In the *Drive conversion* view, enter the information for source and destination drives. Click *OK* to open the conversion table editor listing the parameter database differences.

Use the conversion table editor to create or load a conversion table. Ensure that the conversion table matches the drive series, software version, power size, voltage range, and option configuration. The MCT 10 Set-up Software is not able to find and load incompatible

conversion tables. After loading or creating the conversion table, it is possible to re-edit the table or to convert the source drive and store the converted drive in an offline folder.

Formulas

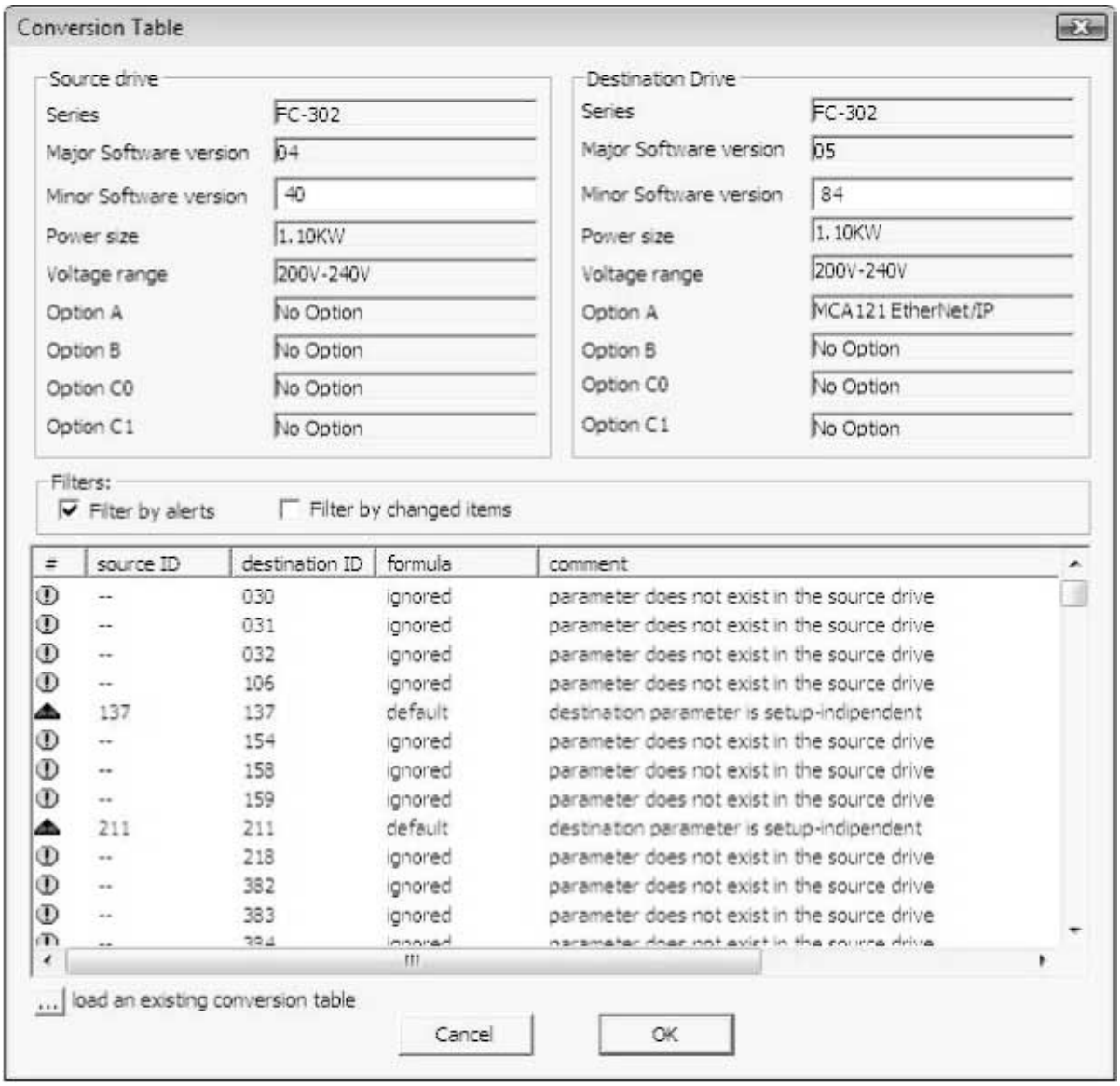
The parameter database is listed and sorted according to the parameter ID. To simplify the conversion process, filter the database to list alerts or applied changes only.

Table 5: Alert Coding

Color code	Description
Red	Difference between source database and drive. A formula is required before changes can be applied to the drive.
Blue	Difference between source database and drive. The formula is ignored and changes can be applied to the drive.

NOTICE

If a formula is applied to all alerts, the source parameter database can be converted to the destination parameter database without any further configuration.



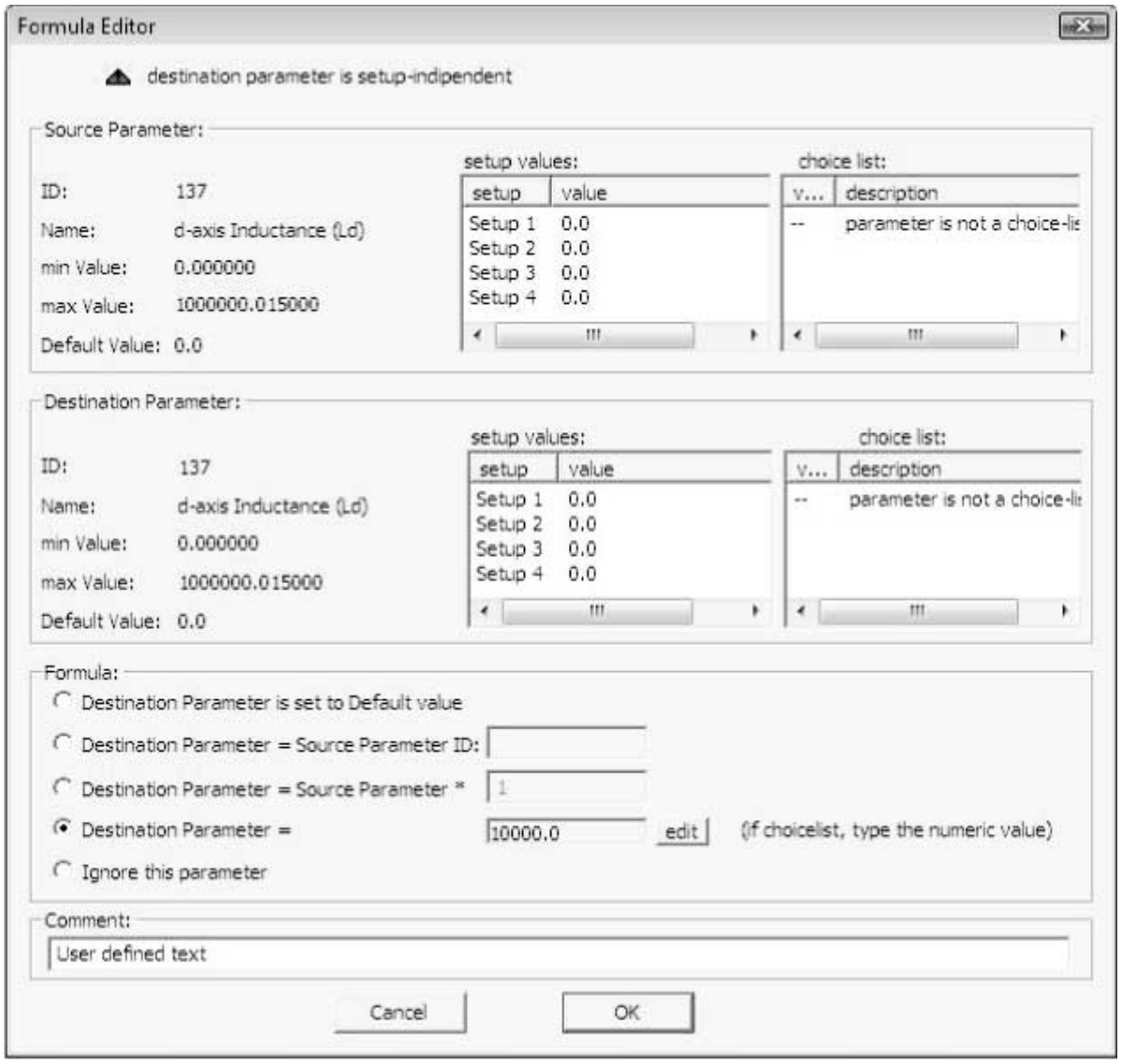
e30bt723.11

Illustration 86: Conversion Table

Double-click an alert to open the *Formula Editor* dialog and specify the destination parameter mapping. The following configurations are possible:

- Destination parameter is set to default value (factory default value. Default settings for red alerts).
- Destination parameter = source parameter ID.
- Destination parameter = source parameter multiplied by a user-defined numeric value.
- Destination parameter = destination option list or numerical value.
- Ignore this parameter. Default setting for blue alerts.

Each formula applied can be associated with a comment containing a user-defined text. The comment is optional to each alert.



e30bi725.11

Illustration 87: Formula Editor

When a formula is applied to all red alerts, assign a name to save the conversion table in the database.

If differences are detected when writing from source to destination drive, MCT 10 Set-up Software uses the following as search criteria:

- The drive series.
- Major software version.
- Power size.
- Voltage range.
- Option configuration.

With the proper conversion table in the database, any drive can be written transparently to a destination even if the minor software version does not match. If several conversion tables are found matching the criteria, MCT 10 Set-up Software uses the minor software version to find the closest match. Only 1 drive can be written transparently to the destination.

If *parameter group 19-** User-defined Parameters* is available, the settings are written transparently to the destination drive.

6.13.4.1 Converting Offline to Offline/Online to Online

Procedure

1. Mark the appropriate number of set-ups from *All Parameters*.
2. Right-click and select *Copy*.
3. Paste the parameters in the destination drive folder.

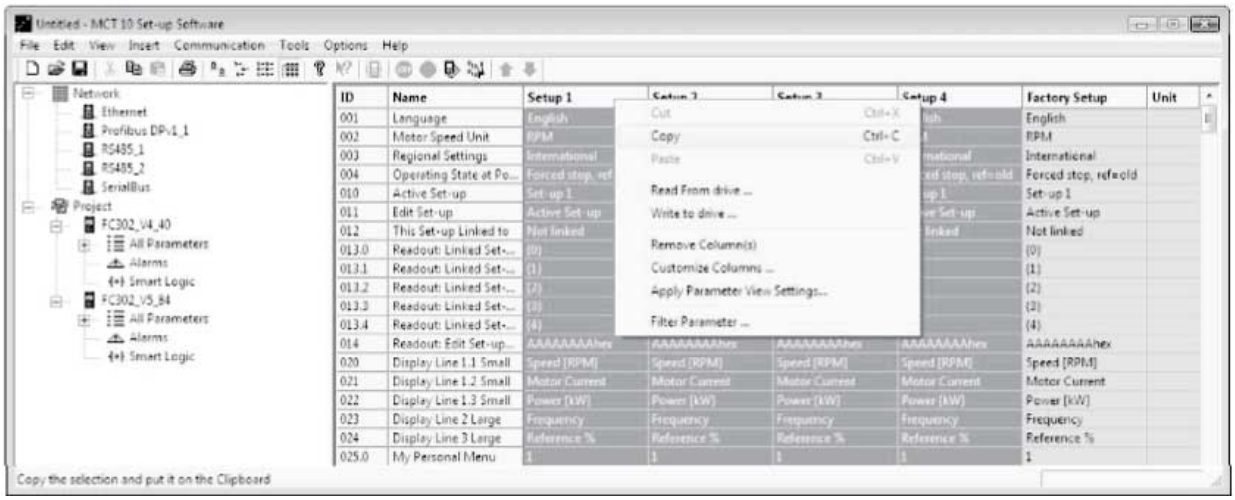


Illustration 88: Offline Online Conversion

MCT 10 Set-up Software recognizes any difference and automatically applies a matching conversion table, if available.

6.13.4.2 Converting Online to Offline/Offline to Online

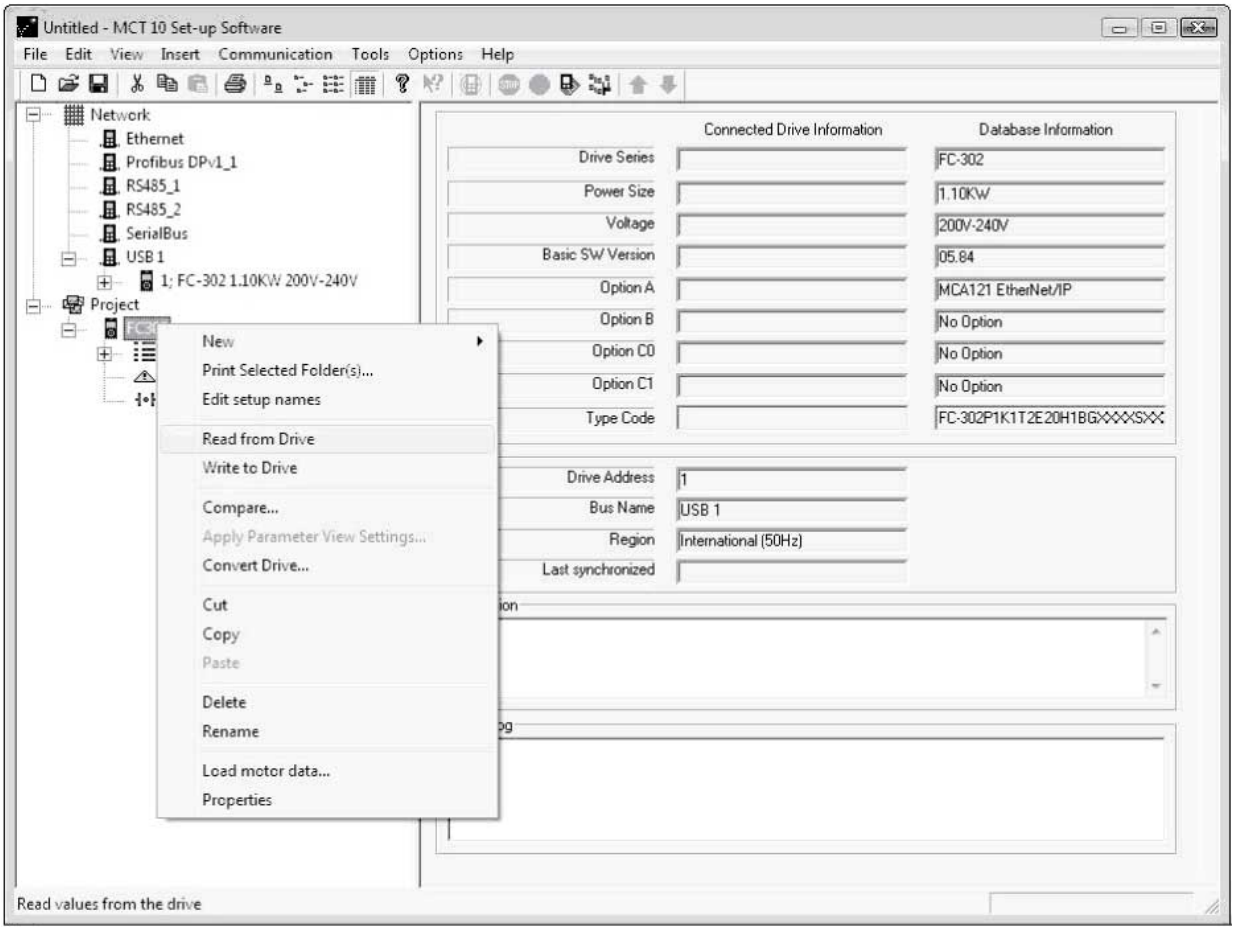
Context:

NOTICE

Before converting, ensure that offline and online drive connection properties correspond.

Procedure

1. Right-click the offline drive.
2. Select *Read from Drive*.



e30bt729.11

Illustration 89: Offline Online Conversion

→ The MCT 10 Set-up Software recognizes any difference and automatically applies a matching conversion table.

7 Diagnostics

7.1 Alarm, Warning, and Fault Log Readout

Features from version 2.0 support:

- Reading out alarms, warnings, and fault logs of the online drives.
- Quick location of alarms and warnings in the connected drive system.
- Investigation of the fault log for previous trips.
- Gathering and storing events in the project file for later evaluation.
- Sending the project file to a remote specialist for further investigation.

7.2 Localization of Alarms and Warnings

After a complete scanning of a drive network, the MCT 10 Set-up Software indicates if the connected drives have active warnings and alarms. An exclamation mark in front of the drive icon indicates a warning or an alarm.

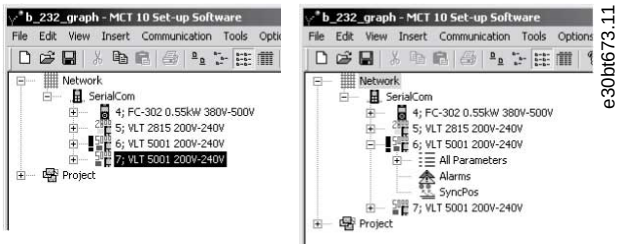


Illustration 90: Drive with Active Alarm or Warning

Expand the drive and click the alarm/warning icon.

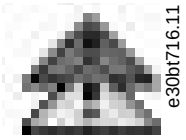
Name	Icon
Active alarms/warnings	
No active alarms/warning	

Illustration 92: Fault Log View for Control Cards Marked MKI

Illustration 93: Fault Log View for Control Cards Marked MKII

For a more detailed description of the code, refer to the operating guide for the particular drive. If the drive trips, it stores the cause for the trip in a fault log buffer. The log consists of 3 values:

- Code.
- Value.
- Time.

When the MCT 10 Set-up Software reads the fault log, it shows the time and date when the log was read.

NOTICE

The actual time when a fault occurs is not indicated.

7.3 Storing Alarms/Warnings in Project Files

Alarms/warnings and the fault loggings are stored into the Project file. The MCT 10 Set-up Software automatically reads alarms, warnings, and fault loggings at every read from/write to the drive.

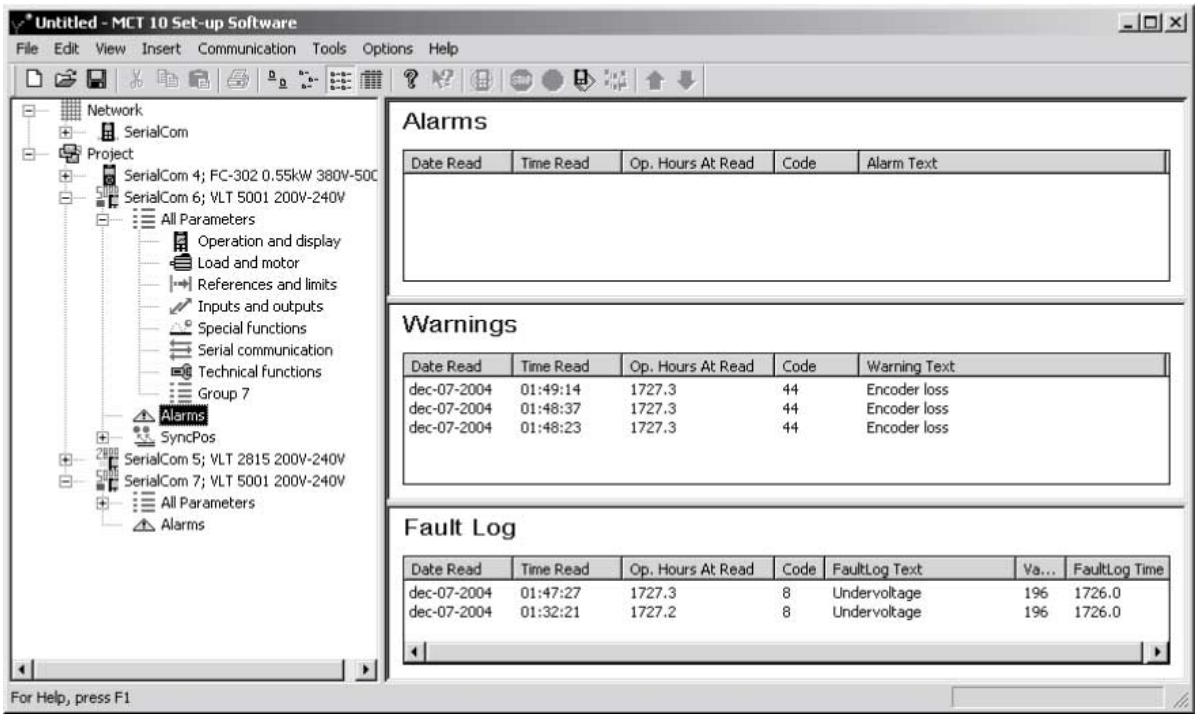
7.4 Handling the Alarms and Warnings Loggings

The MCT 10 Set-up Software allows more than 200 alarms and warnings for each drive in the project. The loggings can be cleared individually. This is done by entering the loggings to clear and then right-clicking. Clearing the log only clears the PC log while the information in the drive is unaffected by this handling.

NOTICE

There are redundant alarm entries in the log.

The MCT 10 Set-up Software stores active alarms and warnings in the Project file at each read/write command. No alarm is lost, but an alarm can have multiple entries in the log.



e30bt549.12

Illustration 94: Loggings

7.5 The Scope Function

The scope function supports monitoring and diagnosing of parameters. The function polls parameter data and dynamically shows the polled data as a curve graph.

The scope function provides 2 different channel types to sample parameters:

- PC polling channel - Channel selected when the PC SW requests the parameters from the drive. The channel does not have any time limitation, the buffer size is user-configurable and corresponds to the number of samples. Fast sampling with accurate sampling rate cannot be obtained because the Windows operating system does not support real-time extension.
- Drive real-time channel - Only available in the FC 102, FC 202, and FC 300 series - uses an internal 16-kByte buffer located in the drive. Recommended for continuously monitored applications requiring high and precise sampling rates. It is required to set up a trigger event for the drive to start filling up the buffer with samples.

7.5.1 Activating the Scope - MCT 10 Set-up Software

Insert a new scope from the *Insert* menu or by right-clicking the Project folder, Drive folder, Regular folder, or Drive.

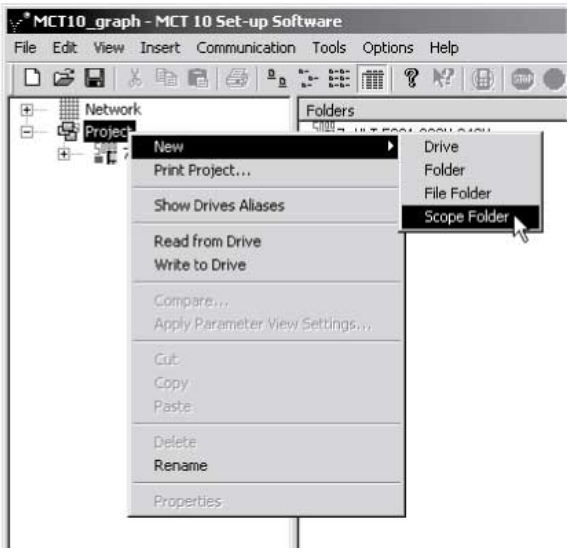


Illustration 95: New Scope

Rename the Scope folder via the *Edit* menu or by right-clicking the icon and select *Rename*.

The 1st time that the Scope folder is selected, the *Add Channel* dialog pops up. From this dialog, select the drive to monitor. Then, depending on the drive series, select the type of channel to collect samples from.

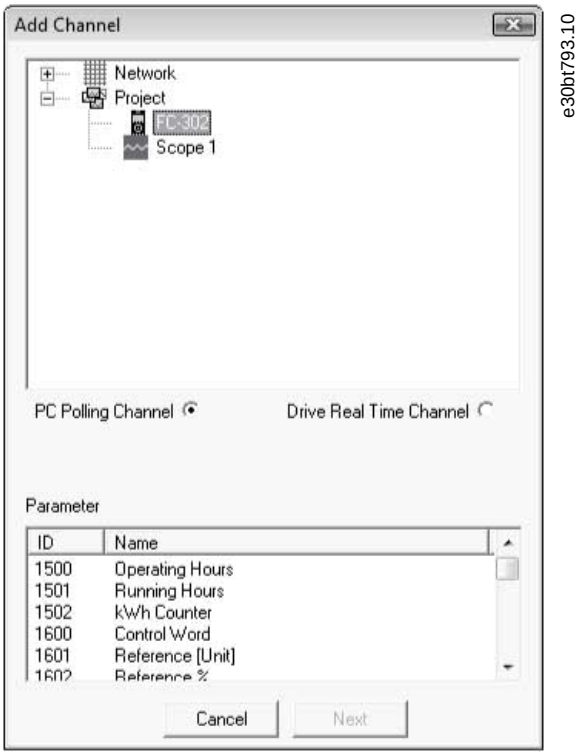


Illustration 96: Add Channel

Adding text notes

Insert additional text for later usage to each scope folder such as the type of drive monitored and diagnostic help text. Text notes are added by right-clicking the Scope folder and selecting *New⇒Text note*. The default text can be changed by right-clicking the text note and selecting *Rename*. Several text notes can be added to the same Scope folder.

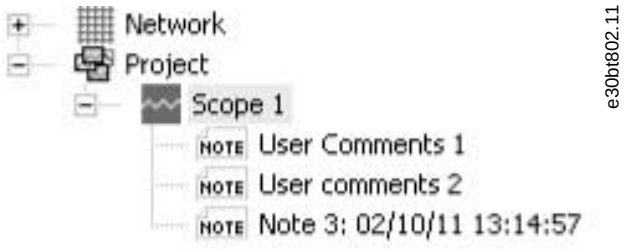


Illustration 97: Text Notes

7.5.2 Configuring the PC Polling Channel

Context:

PC polling channel is enabled by default when a drive is selected within the Network folder or Project folder. All parameters available in the list are visible by ID name and are automatically updated according to the product.

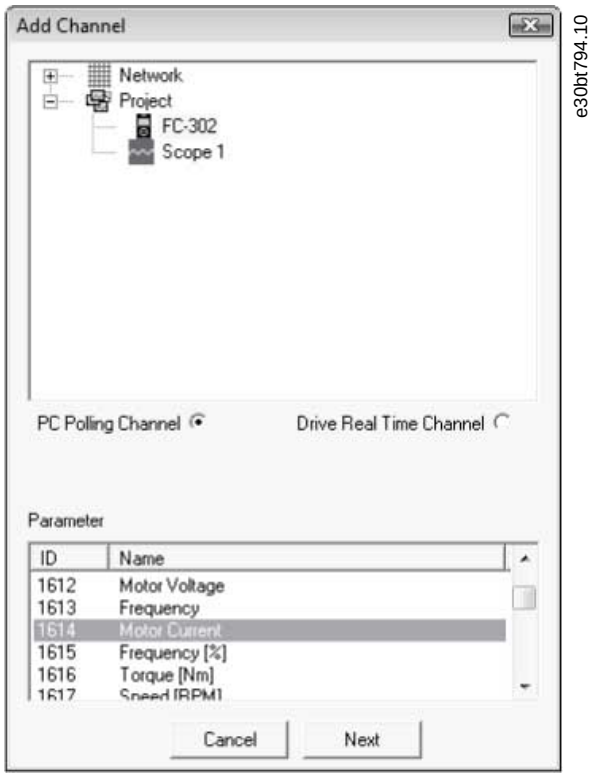


Illustration 98: Parameter ID and Name

Procedure

1. Select a parameter in the parameter list and click *Next* to update the *Add Channel* dialog.
2. Configure A/div (value/division).

NOTICE

MCT 10 Set-up Software stores the values even if they are not shown within the visible area of the curve.

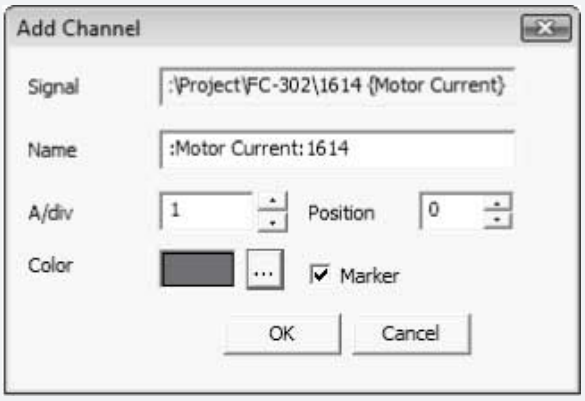
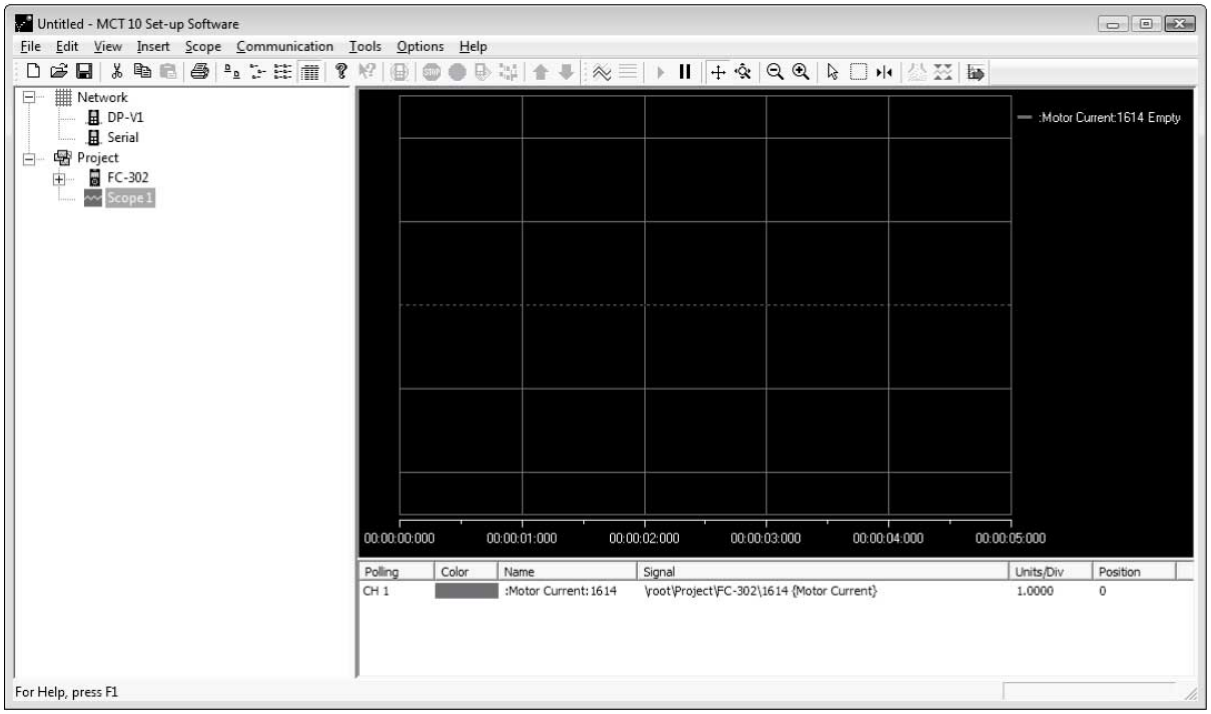


Illustration 99: Storing Values

3. Define the position number (vertical zero line on the Y axis). If there are several signals on top of each other, it is useful to have them plotted apart.
4. Set color and tick *Marker* to differentiate the different curves in a black and white printout. Each curve gets a marker as box, triangle, cross, and so on.
5. Click *OK* to generate the curve graph.



e30bf503.12

Illustration 100: Generate Curve Graph

6. Right-click the channel box to open the *Add Channel* dialog and add extra channels.

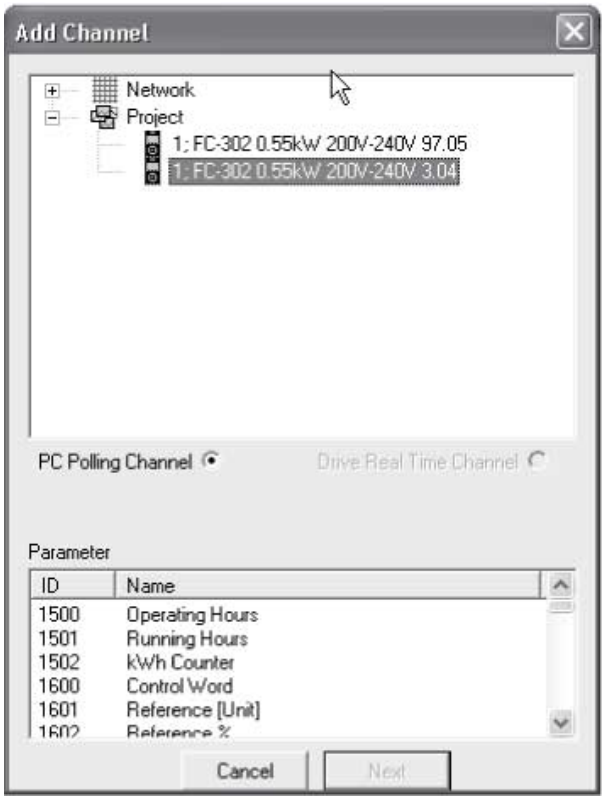


Illustration 101: Open Add Channel Dialog

7.5.3 PC Polling Channel Properties

More settings can be configured by right-clicking the *Scope* window and selecting *Properties*. It is possible to specify:

- General parameter sample settings.
- Sample trigger settings.
- Cursor settings.

General parameter sample settings

The *General* tab holds 4 basic settings for the *Scope Properties*:

- Seconds per division (SEC/DIV).
- Time format.
- Buffer size in samples.
- Polling rate in milliseconds.

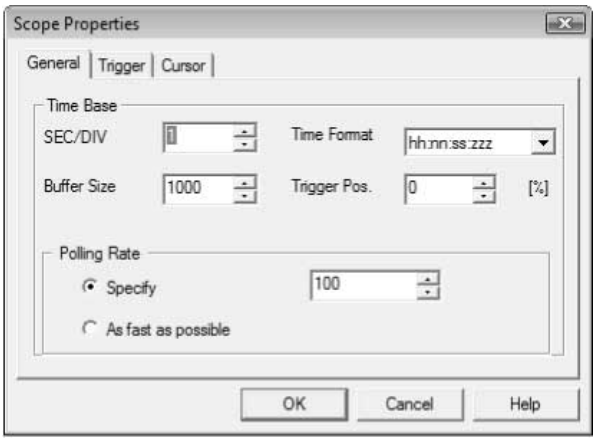


Illustration 102: Basic Scope Settings

Table 6: Format and Range of the Basic Scope Settings

Description	Format	Value range
SEC/DIV	Time base on the X-axis	0.0001–1.000.000.000 s
Time format	Year, month, date, hour, seconds, and milliseconds	–
Buffer size	Number of data sets in the buffer	0–1.000.000
Polling rate	Time in milliseconds between 2 samples	–

NOTICE

For systems with large inertia, a low sampling rate may be used since the value changes slowly. For systems with low inertia, a high sampling rate is needed.

NOTICE

Setting *Polling Rate* to *As fast as possible* means that MCT 10 Set-up Software does not control the actual time between each sample. This can lead to a high jitter between 2 samples.

Trigger

The trigger function starts the sampling of values only when a certain value is reached. This reduces the need for large buffer sizes. A trigger is also a valuable tool to see if values cross borders where the drive does not store any warnings.

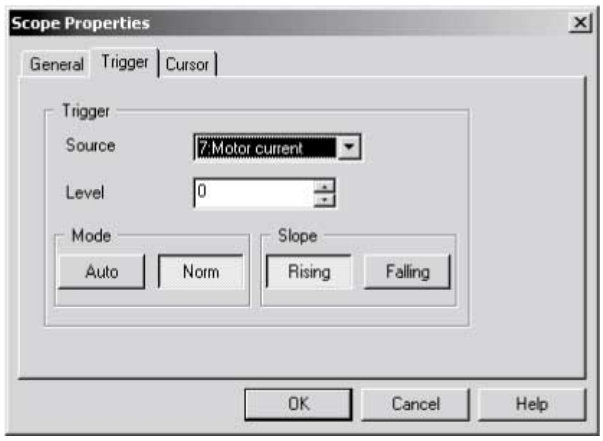


Illustration 103: Trigger Functions

Table 7: Descriptions of the Trigger Functions

Trigger functions	Description
Source	Source channel.
Level	Level where the trigger has to be activated.
Mode	Auto starts the trigger automatically when *Resume All* is pressed. The trigger line is set to the time when *Resume* was pressed. Normal (Norm) activates the trigger when level and slope settings are fulfilled.
Slope	Sets if the value must rise (source value goes from low values to high values) or the slope must fall (source value goes from high values to low values).

Cursor

Style defines the functionality or the cursor. The style contains 5 different possibilities:

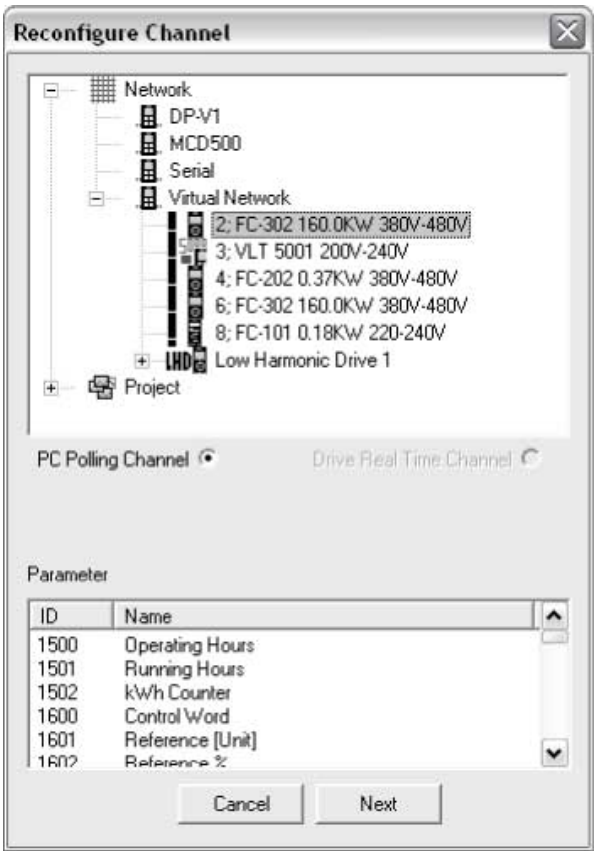
- Value XY - Shows the time and value of each signal at the cursor location.
- Value X - Shows the time only.
- Value Y - Shows the value only.
- Delta X - Shows 2 cursors, and the time between the 2 cursors is calculated.
- Delta Y - Works like Delta X, but this time the difference between 2 levels is calculated.

Pointer position defines the default position when a cursor is inserted in Scope.

7.5.4 Reuse of PC Polling Channel Settings

Often, the same settings are used when measuring with the PC polling channel on more than 1 drive. These settings can be reused either by copying an existing scope folder or by reusing an existing one.

Reconfigure the scope folder connection properties for another drive in the network by double-clicking an added channel. In the *Reconfigure Channel* dialog, another drive on the same or a different fieldbus can be selected.



e30bt803.11

Illustration 104: Reconfigure Channel

7.5.5 Configuring the Drive Real-time Channel

Context:

Drive real-time channel can be selected if the selected drive supports this functionality.

Procedure

1. Select the relevant drive.
   → *Drive Real-time Channel* opens the *Scope Properties* dialog.
2. Configure the channels depending on what the actual drive supports.

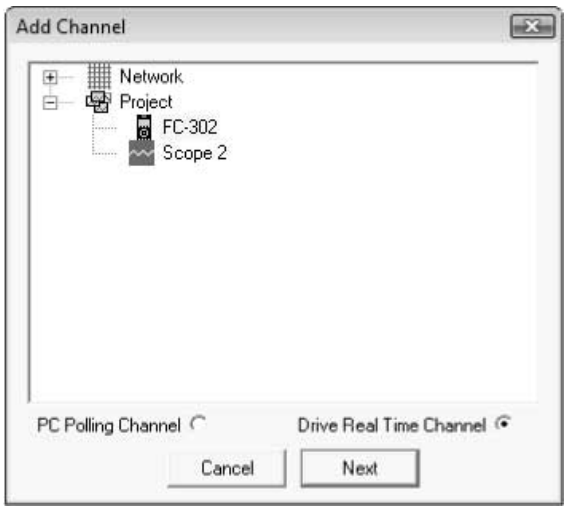


Illustration 105: Select Drive Real-time Channel

All available parameters are listed by parameter name.

3. Configure the sample rate for each channel using the time format HH:MM:SS:zzz.
4. Configure the sampling mode through:
   The trigger event.
   Logging mode.
   Samples before trigger options.

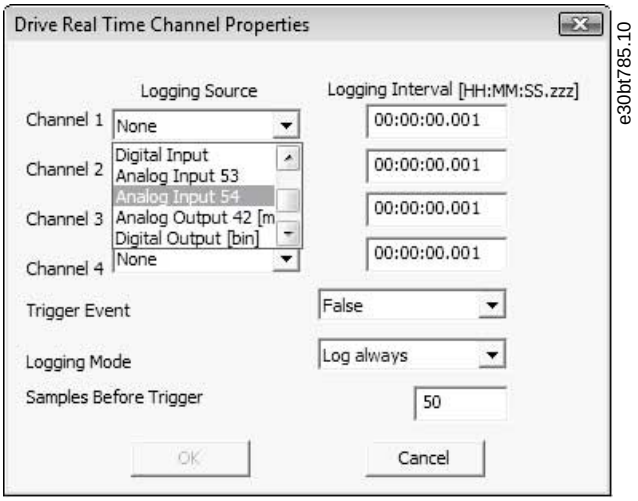


Illustration 106: Configure Sampling Mode

7.5.6 Using Advanced Triggers

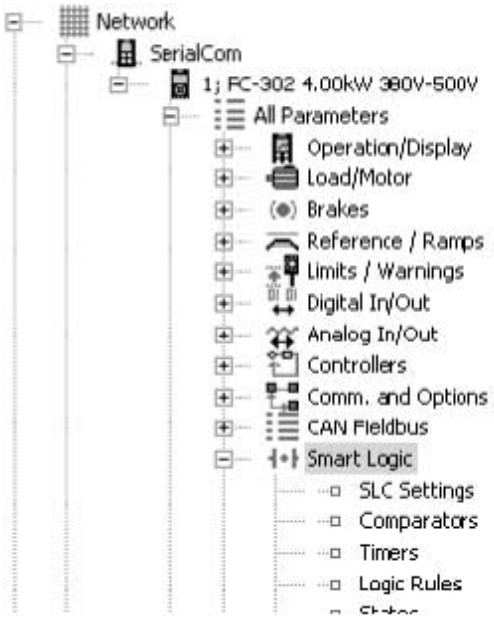
Context:

The following example explains the set-up of a trigger, which triggers the collection of data in the drive when the motor speed exceeds a certain limit.

Set up a comparator in the smart logic control to get a trigger signal when the motor speed exceeds a certain limit:

Procedure

1. Select the smart logic group.
2. Select a comparator not in use, 1310.0, and set it up to motor speed.
3. Set *Comparator Operator* 13.11.0 greater than >.

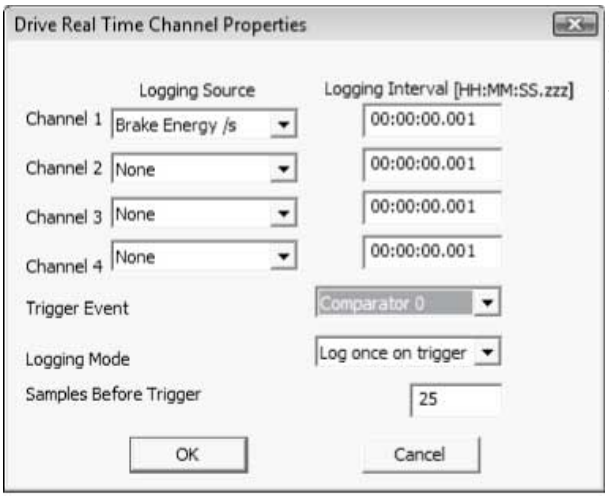


ID	Name	Setup 1
1300	SL Controller Mode	Off
1301	Start Event	Start command
1302	Stop Event	Drive stopped
1303	Reset SLC	Do not reset SLC
1310.0	Comparator Operand	Motor speed
1310.1	Comparator Operand	DISABLED
1310.2	Comparator Operand	DISABLED
1310.3	Comparator Operand	DISABLED
1311.0	Comparator Operator	>
1311.1	Comparator Operator	(equal)
1311.2	Comparator Operator	(equal)
1311.3	Comparator Operator	(equal)
1312.0	Comparator Value	777.000
1312.1	Comparator Value	0.000
1312.2	Comparator Value	0.000
1312.3	Comparator Value	0.000

e30bt558.12

Illustration 107: Smart Logic View

4. Set *Comparator Value* 1312.0 to the required value.
5. Set up the trigger event in the *Drive Real-time Channel Properties* dialog to comparator 0.
6. Set the logging mode to log once on trigger.
7. Press *OK* to enable the set-up.



e30bt796.10

Illustration 108: Trigger Event

8. Press *Start (resume) poll* to start logging.

→ The dialog for defining the real-time log style opens.

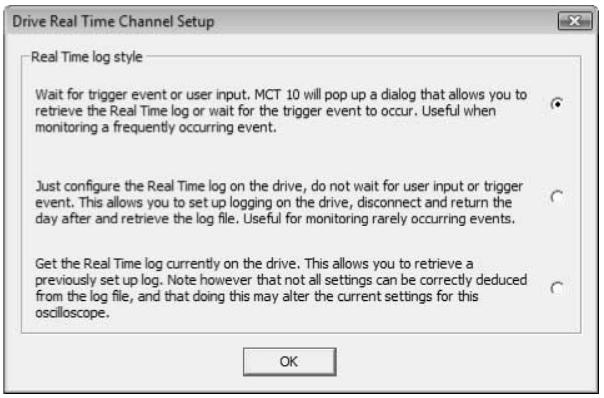


Illustration 109: Real-time Log Style

7.5.7 Drive Real-time Channel Properties

More settings can be configured by right-clicking the *Scope* window and selecting *Properties*.

It is possible to reconfigure all drive real-time channel settings and also to configure:

- SEC/DIV and time format.
- Appearance settings.
- Cursor settings.

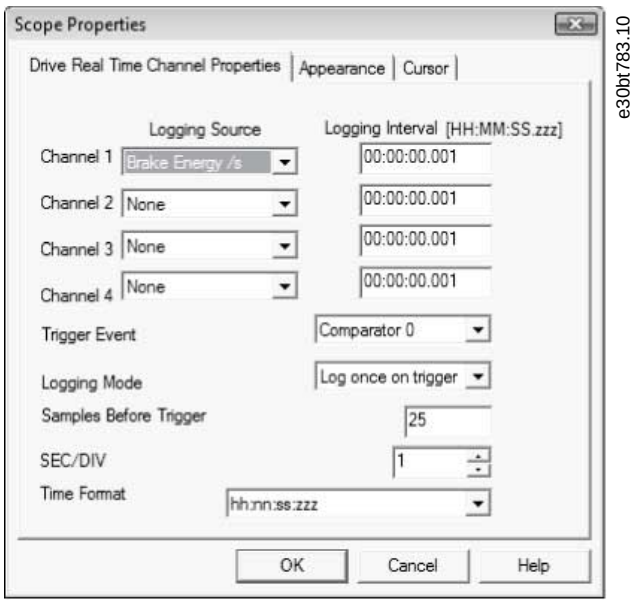


Illustration 110: Reconfigure Drive Real-time Channel Settings

Besides being able to reconfigure the settings made from the *Drive Real-time Channel Properties* dialog, SEC/DIV and the time format are configurable.

SEC/DIV

The SEC/DIV and Time format functionalities are similar to the PC polling channel functionality, see 7.5.2 Configuring the PC Polling Channel.

Appearance

Each channel name can be renamed.

The Units/Div, Position, Marker, and Color functionalities are similar to the PC polling channel functionality.

Cursor

The functionality is similar to the PC polling channel functionality.

7.5.8 Communication Control

The *Scope* toolbar has 4 main buttons for communication control.

Table 8: Functions of the Control Buttons

Control button		Function
Start (data acquisition)	e30bt560.12	MCT 10 Set-up Software scope starts collecting the requested data from the drive network.
Stop (data acquisition)	e30bt561.12	MCT 10 Set-up Software stops collecting data and there is no communication to the drive network while the scope part is active on the screen.
Start (resume) all tracking	e30bt560.12	Activates the tracking mechanism. MCT 10 Set-up Software starts the readout of variables to the screen and to the buffer. Variables are checked against the trigger settings. If the buffer has been partially filled (use of the Pause All Tracking function), MCT 10 Set-up Software continues to fill data into the buffer.
Pause all tracking	e30bt562.12	Deactivates the tracking. The buffer remains at its current state, no new data is shown. The buffer pointer keeps its current position.

7.5.9 Additional Functionality

Select *Resume* poll to start tracking. To stop tracking, click *Stop poll* or *Pause all tracking*. The tracking continues until the buffer is filled (default 1000 samples). If the tracking stops due to a filled buffer, the buffer has to be emptied before a new track can be activated. Clear the buffer and reset the scope in 1 step by clicking the icon shown in illustration 115.

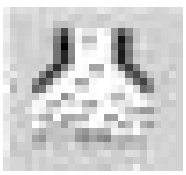


Illustration 115: Clear all Buffer for the Channel

Alternatively, the buffer can be cleared individually.

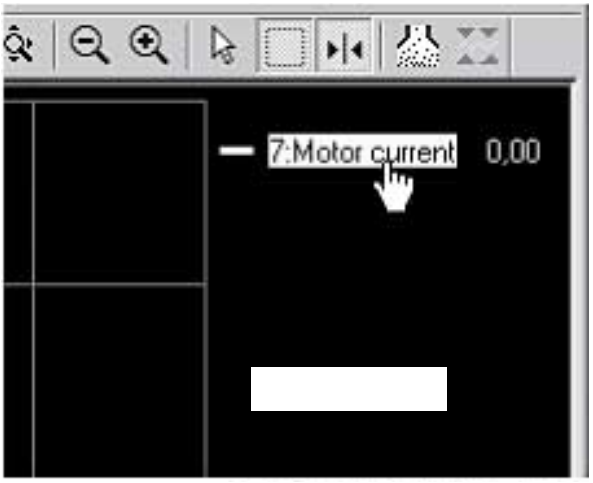


Illustration 116: Individually Clearing the Buffer

Table 9: Functions of the Main Buttons

Name		Description
Reset scope	e30bt567.12	Clears all buffers for the channel at once. This is more convenient if many channels are activated at the same time, or if a new channel is added to an existing track. Before new values can be added to a track, all channel buffers must be emptied, since MCT 10 Set-up Software requires that all buffers have the same amount of data.
Export to Excel	e30bt568.12	Enables storing scope data in a file which Microsoft Excel can open. A *Save file* dialog appears, making it possible to store the file in an appropriate location.
Open storage	e30bt858.11	Enables storing scope data in a file on the hard disk. Save to the hard disk to avoid the limitation of 1 million points in the project file.
Open scope history viewer	e30bt859.11	Open scope data saved on the hard disk.

7.5.10 Scope Storage

Enable scope storage or persistent data storage in *Scope Properties*. In *Scope Properties*, it is also possible to change and select where data should be saved.

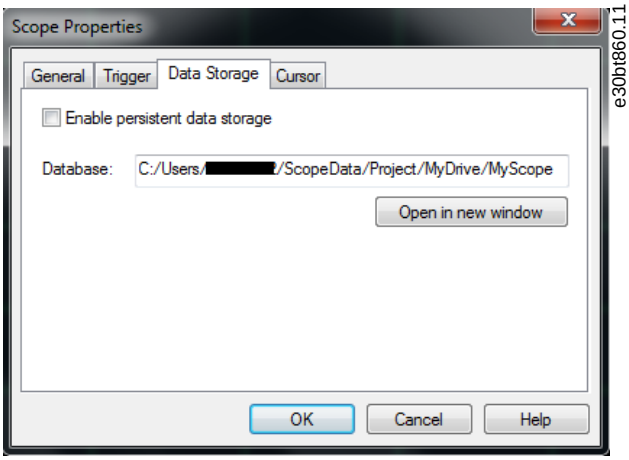


Illustration 118: Scope Properties

If polling data in scope when scope storage is selected, data is saved in both the project file and on the hard disk. However, the project file is limited to 1 million points. When the limit is exceeded, MCT 10 Set-up Software replaces the oldest point with the latest point.

8 Plug-ins

8.1 Smart Logic Controller Plug-in

From version 2.13, MCT 10 Set-up Software supports the smart logic controller plug-in. This feature enables quick set-up of logical sequence programs.

The smart logic controller monitors a predetermined event. When the specified event occurs, it performs a predetermined act and starts monitoring the next predetermined event. The smart logic controller continues like this in up to 20 different steps until it returns to step 1 – monitoring the 1st specified event.

The smart logic controller can monitor any parameter that can be characterized as true or false. This includes digital commands and logic expressions, which allow sensor outputs to determine the operation. Temperature, pressure, flow, time, load, frequency, voltage, and other parameters combined with the operators >, <, =, AND, and OR form logic expressions that control the drive logically in any application.

Refer to the relevant design guide for a full overview of the smart logic controller features.

8.2 Time-based Actions and Preventive Maintenance Plug-ins

For the VLT® HVAC Drive FC 102, VLT® AQUA Drive FC 202, and VLT® AutomationDrive FC 301/FC 302, the MCT 10 Set-up Software provides the following plug-ins:

- Clock features.
- Preventive maintenance.
- TIme-based actions.

NOTICE

Consult the relevant design guide for detailed information about the drive.

8.2.1 Clock Functions

The MCT 10 Set-up Software enables set-up of the clock functions.

The clock functions are grouped in 2 sublevels:

- Date and time.
- Working days.

8.2.1.1 Date and Time

In the *Date and time* dialog, the following groups of settings are available:

- Display format.
- Set date and time.
- Daylight saving time.
- Enable clock fault.

Display format in LCP

Select how date and time are presented in the LCP on the drive. In MCT 10 Set-up Software parameters, date and time format depends on PC regional options (date and time format).

Set date and time

Change the date and time in the drive from the PC. Normally, it should be set to use the connected PC's date and time. When the connected PC's time is in another time zone, it is beneficial to set the date and time manually. Date and time are changed in the MCT 10 Set-up Software project file or in the drive only when the *Change checkbox* is ticked.

Daylight saving time

Set the date and time for daylight saving.

Daylight saving time begins for most of the United States at 2:00 a.m. on the first Sunday of April. Time reverts to standard time at 2:00 a.m. on the last Sunday of October. In the U.S., each time zone switches at a different time. In the European Union, summer time begins and ends at 1:00 a.m. Universal Time (Greenwich Mean Time). It begins the last Sunday in March and ends the last Sunday in October. In the EU, all time zones change at the same moment.

Enable clock fault

If the clock is not set up, the drive shows a specific warning. Enable or disable the clock fault function.

8.2.1.2 Defining Working Days

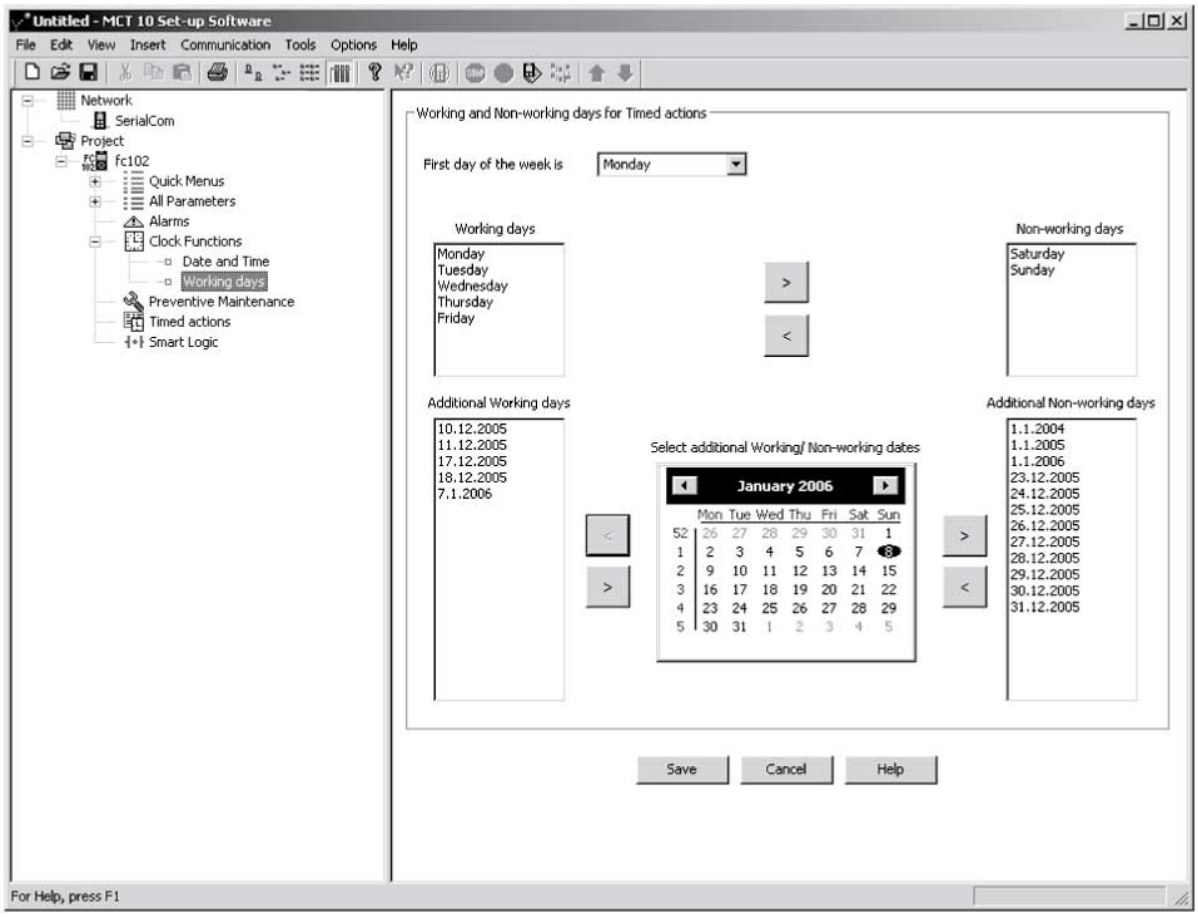
Context:

NOTICE

Additional working days and non-working days include the year and must be updated every year.

Procedure

1. Select *First day of the week* (Monday or Sunday).
2. Select working days and non-working days.
3. Set additional working days (maximum 5).
4. Set additional non-working days (maximum 15).



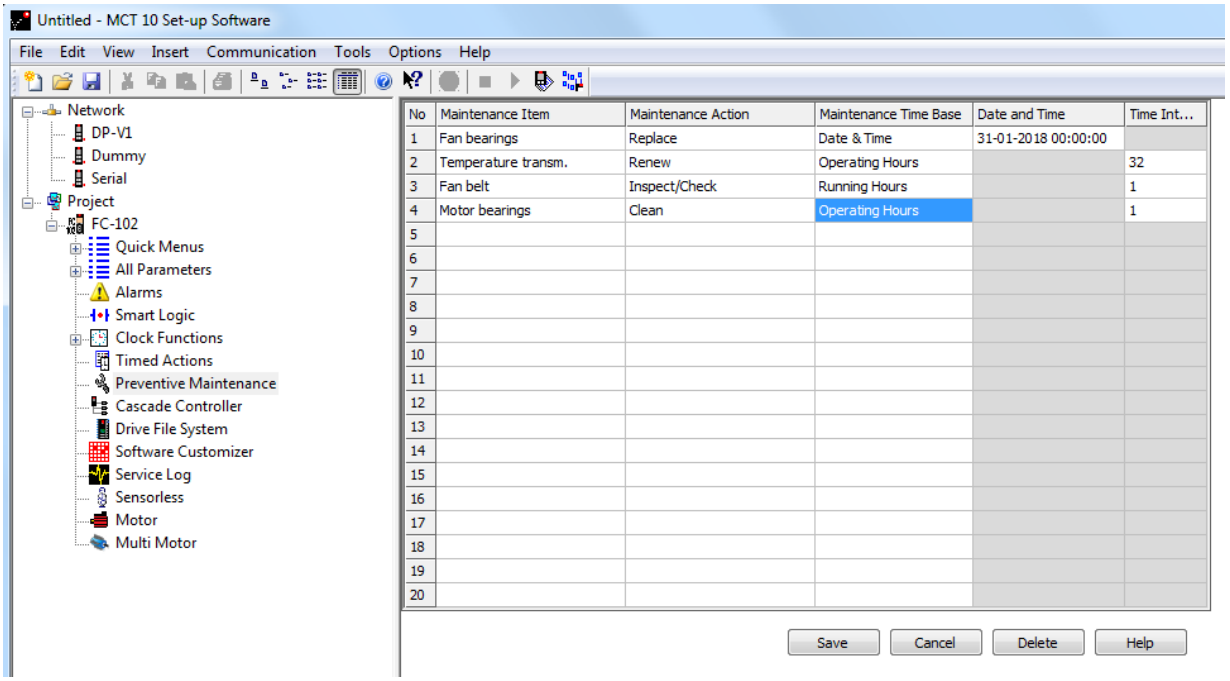
e30bt708.11

Illustration 119: Define Working Days

8.2.2 Preventive Maintenance

Context:

The preventive maintenance feature supports the planning of periodic maintenance of both the drive and other technical equipment. If the defined date and time of preventive maintenance is passed, the item is marked red.



e30bt709.11

Illustration 120: Preventive Maintenance

NOTICE

Program the clock parameters (parameters in the Clock functions folder) for preventive maintenance to function correctly.

Procedure

1. Double-click the cells in the right view to specify application item, action, and interval.
2. Reset Maintenance Word (in *parameter 23-15 Reset Maintenance Word*) and write to the drive.

8.2.3 Timed Actions

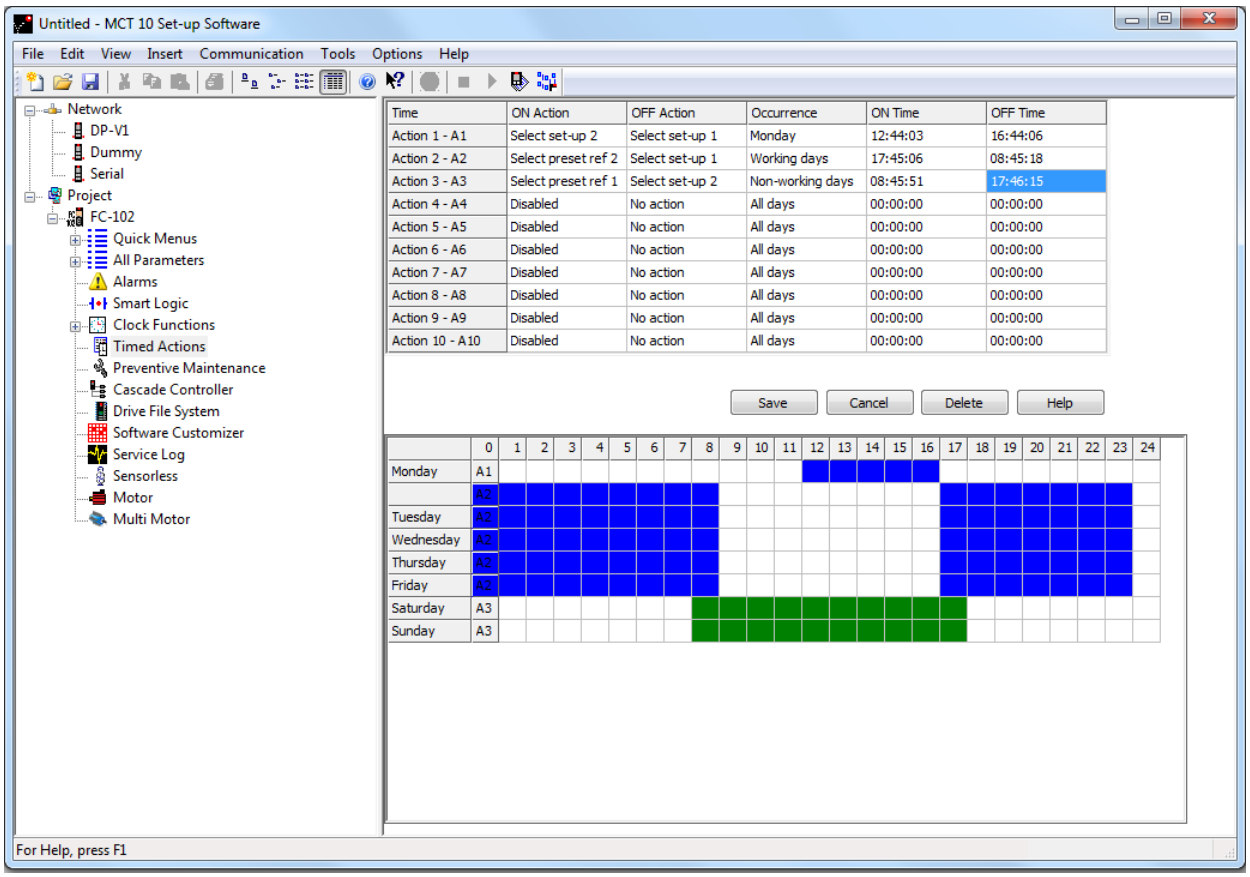
Context:

The time-based actions function enables automation of real-time controlled events.

Actions, which can be programmed, are the same as known from the SLC (smart logic controller), see 8.1 Smart Logic Controller Plug-in.

NOTICE

The clock parameters (parameters in the Clock functions folder) must be correctly programmed for timed actions to function correctly.



e30bt710.11

Illustration 121: Time-based Actions

Procedure

1. Select *Timed Actions* in the product folder.
2. Double-click the cells in the right view to specify:

   Action.

   Time.

   Recurrence.

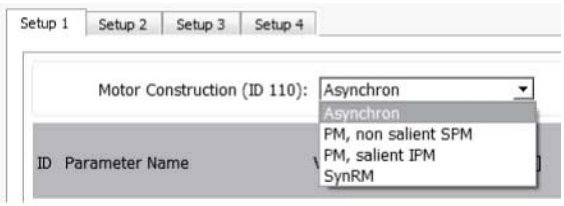
8.3 Motor Plug-in

The Motor plug-in is an offline plug-in showing relevant parameters for commissioning of the motor. Select the plug-in from the structure.

e30bt990.10

Illustration 122: Selecting the Motor Plug-in

The parameters shown depend on the setting in *parameter 1-10 Motor Construction*.



e30bt991.10

Illustration 123: Select Motor Type

8.3.1 Asynchronous Motors

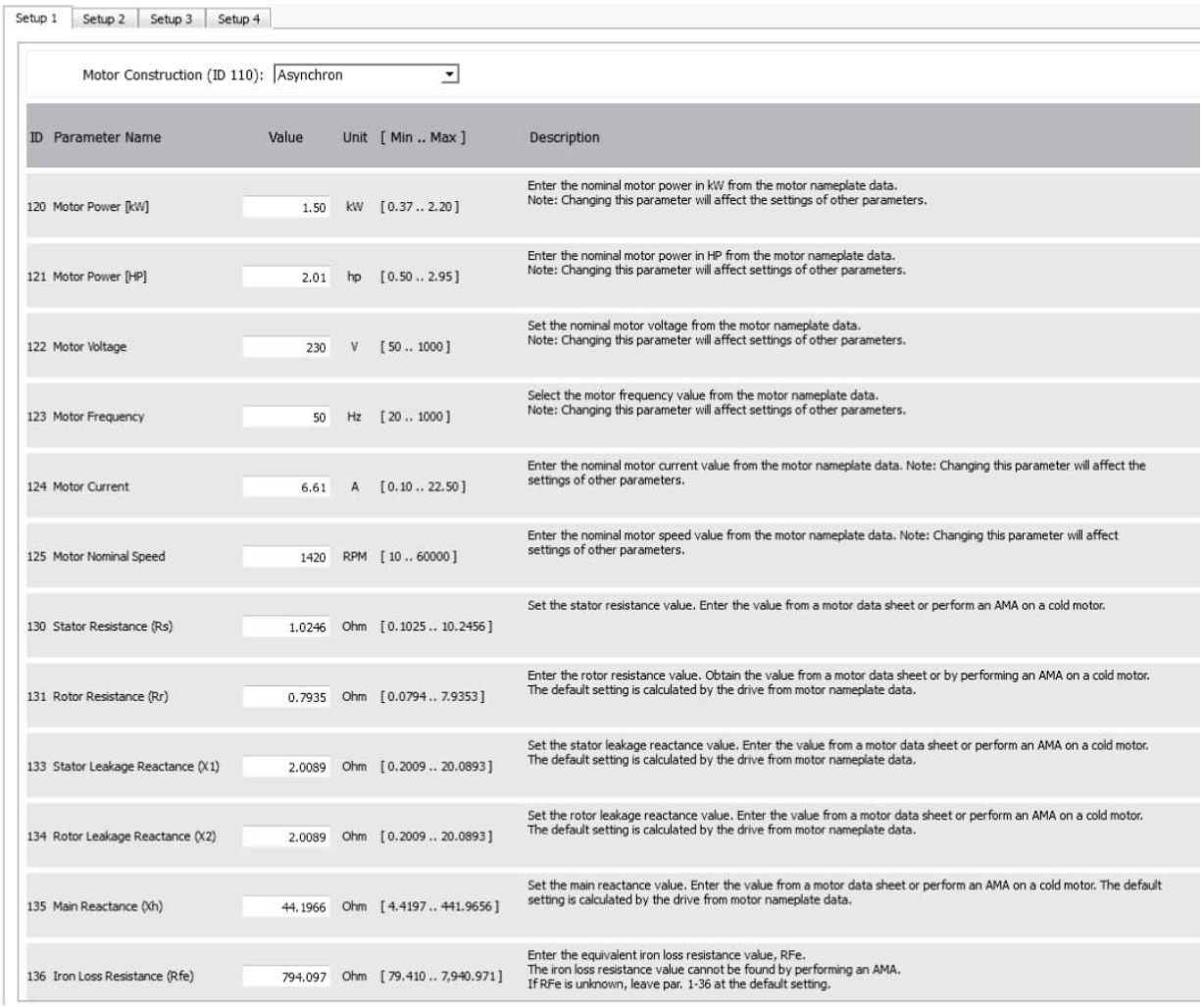


Illustration 124: Example of Settings for an Asynchronous Motor

8.3.2 PM Non-salient SPM

Context:

For PM motors, calculation buttons are available. Below is an example of how to set *parameter 1-25 Motor Nominal Speed*.

Illustration 125: Example of Settings for a Non-salient SPM Motor

Procedure

1. Enter the frequency and the number of pole pairs.

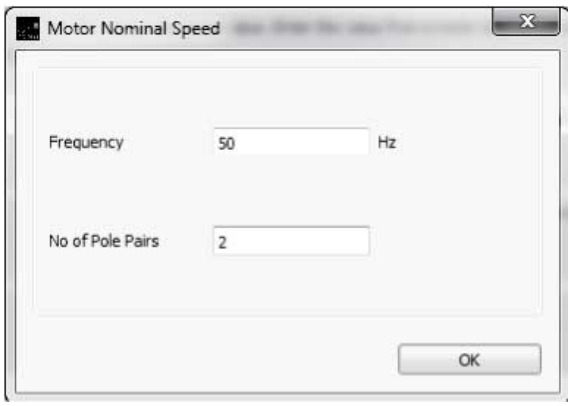


Illustration 126: Enter Data for Nominal Speed

2. Click *OK* to get the value.

   → When the value is calculated, a notification appears. If the value is out of range, an error message appears and the value reverts to the previous value.

Illustration 127: Notification Stating that the Value has Changed

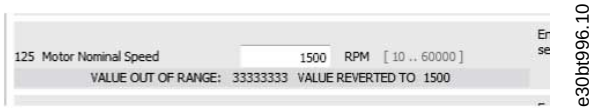


Illustration 128: Error Message when the Value is out of Range

Changing the number of pole pairs in *parameter 1-25 Motor Nominal Speed* also changes the value of *parameter 1-39 Motor Poles*.

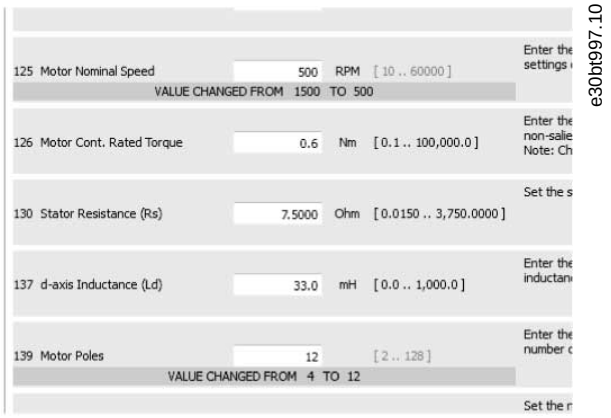


Illustration 129: Changing Number of Pole Pairs Affects 2 Parameters

8.3.3 PM Salient IPM

Same functions and behavior as PM, non-salient SPM.

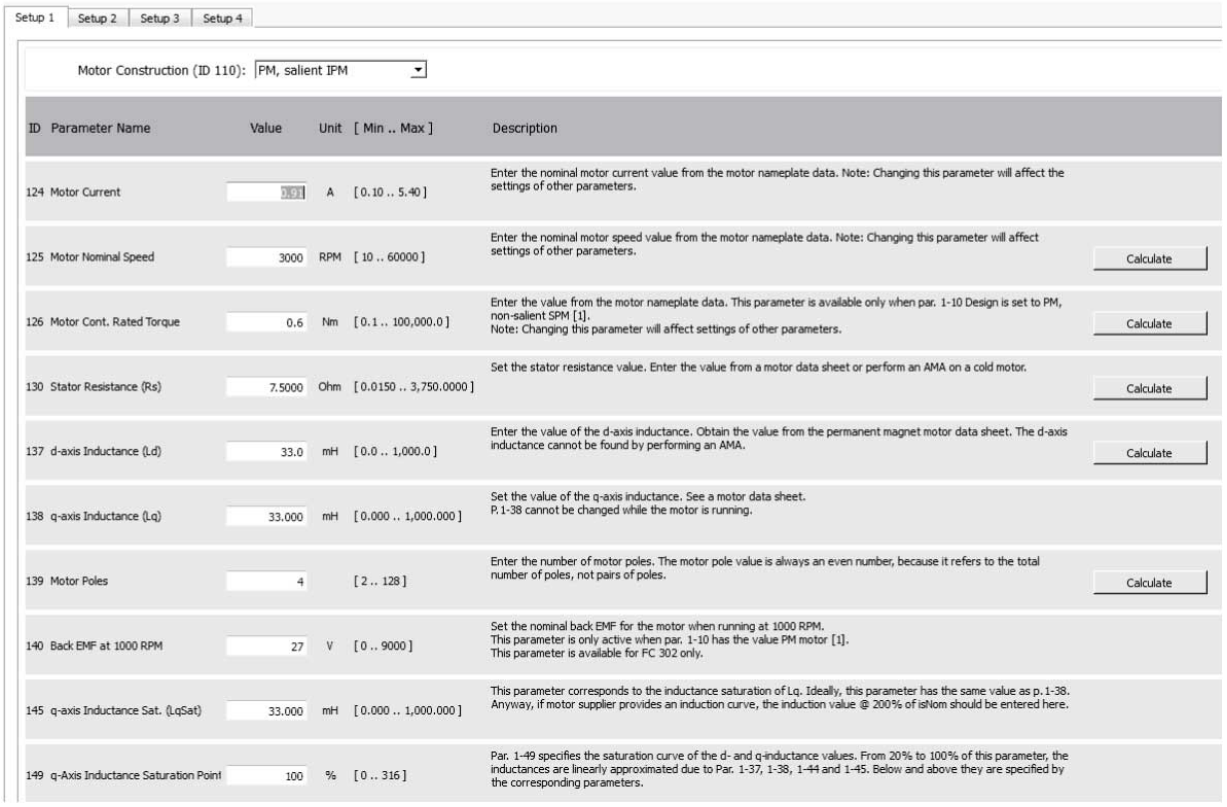
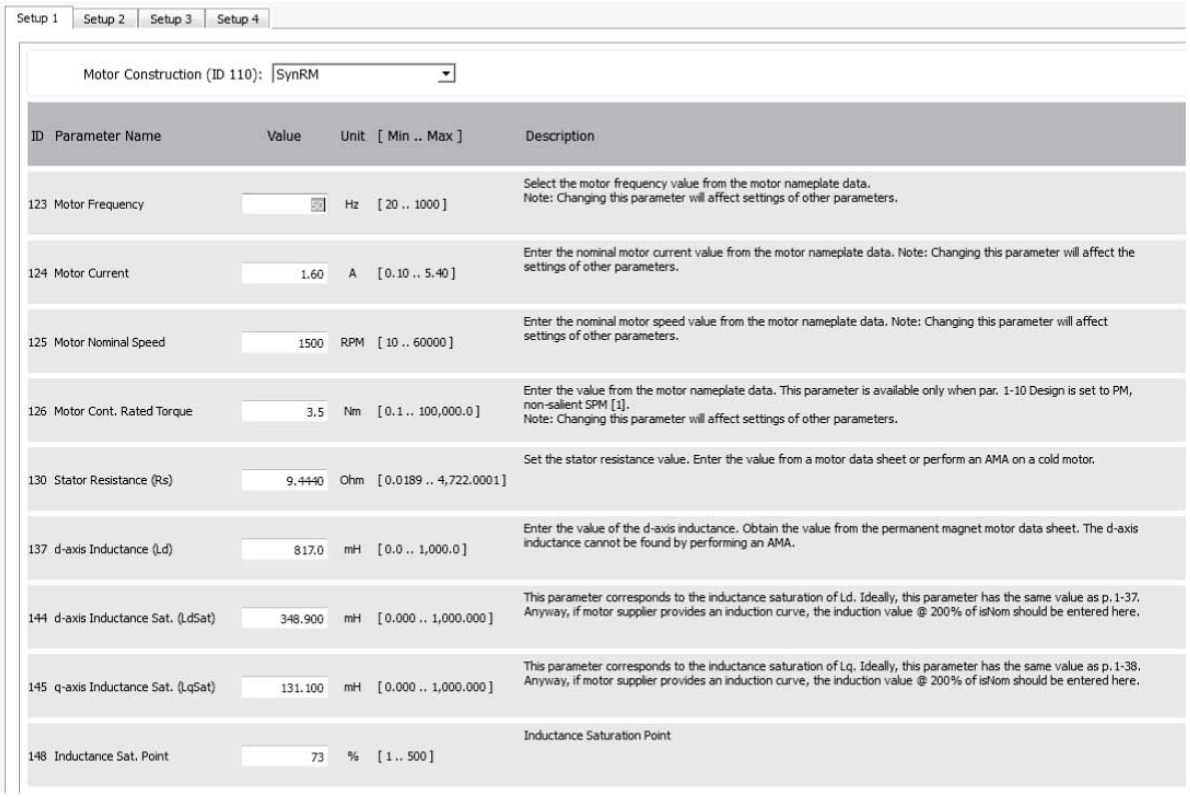


Illustration 130: Examples of Settings for a Non-salient IPM Motor

8.3.4 SynRM



ID	Parameter Name	Value	Unit	[Min .. Max]	Description
123	Motor Frequency		Hz	[20 .. 1000]	Select the motor frequency value from the motor nameplate data. Note: Changing this parameter will affect settings of other parameters.
124	Motor Current	1.60	A	[0.10 .. 5.40]	Enter the nominal motor current value from the motor nameplate data. Note: Changing this parameter will affect the settings of other parameters.
125	Motor Nominal Speed	1500	RPM	[10 .. 60000]	Enter the nominal motor speed value from the motor nameplate data. Note: Changing this parameter will affect settings of other parameters.
126	Motor Cont. Rated Torque	3.5	Nm	[0.1 .. 100,000.0]	Enter the value from the motor nameplate data. This parameter is available only when par. 1-10 Design is set to PM, non-salient SPM [1]. Note: Changing this parameter will affect settings of other parameters.
130	Stator Resistance (Rs)	9.4440	Ohm	[0.0189 .. 4,722.0001]	Set the stator resistance value. Enter the value from a motor data sheet or perform an AMA on a cold motor.
137	d-axis Inductance (Ld)	817.0	mH	[0.0 .. 1,000.0]	Enter the value of the d-axis inductance. Obtain the value from the permanent magnet motor data sheet. The d-axis inductance cannot be found by performing an AMA.
144	d-axis Inductance Sat. (LdSat)	348.900	mH	[0.000 .. 1,000.000]	This parameter corresponds to the inductance saturation of Ld. Ideally, this parameter has the same value as p.1-37. Anyway, if motor supplier provides an induction curve, the induction value @ 200% of isNom should be entered here.
145	q-axis Inductance Sat. (LqSat)	131.100	mH	[0.000 .. 1,000.000]	This parameter corresponds to the inductance saturation of Lq. Ideally, this parameter has the same value as p.1-38. Anyway, if motor supplier provides an induction curve, the induction value @ 200% of isNom should be entered here.
148	Inductance Sat. Point	73	%	[1 .. 500]	Inductance Saturation Point

Illustration 131: Examples of Settings for a SynRM Motor

8.4 Multi-motor Plug-in

In applications where 1 drive controls multiple motors/fans, a motor or motor/fan coupling failure may pass unnoticed due to missing feedback from the controlled fan. One or a few motor failures may be less critical during low or normal operating load, but it can lead to a full stop of the system in high-load situations. The multi-motor plug-in monitors and diagnoses the fan/motor state. The plug-in is limited to 8 motors of equal size and type. The multi-motor calculation tool is only for variable torque applications.

Find the multi-motor plug-in in the drive folder on the left side of the screen. Use the plug-in either online directly connected to a drive or offline for download later. Find the relevant parameters in *parameter group 24-9* Application Functions 2*.

NOTICE

The multi-motor plug-in does not work on motors connected in parallel.

To get the right values, measure the current throughout the whole frequency band (from 0 Hz to maximum), also below the normal operating points.

Failures or underload of motors issue a missing motor warning. The drive continuously checks if the total motor current is below the expected value, which indicates situations where:

- One or more motors are missing/disconnected.
- One or more fans are loose.

Overload of motors issues a locked rotor warning. The drive continuously checks if the total motor current is above the expected value, which indicates situations where:

- A rotor is locked.
- A fan touches the housing.

NOTICE

During start-up or dynamic events like changes in speed references, the current may be below/above the current threshold. Consider and evaluate whether such situations may occur.

8.4.1 Defining Normal Operation Curve

Context:

The plug-in provides an easy way to find the coefficients of the 3rd order polynomial by measuring currents on different frequencies.

NOTICE

To avoid wrong logical minimum in the 3rd order polynomial, enter the lowest possible frequency into the tool.

NOTICE

Points can be inserted at any frequency, but the defaults are recommended as the points are not saved. Only calculated coefficients are saved and used to recalculate the points on default frequencies after closing and opening the view.

Procedure

1. Measure normal operation currents on 5 different frequencies.
2. Insert the frequencies in *Normal operation currents*.

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Illustration 132: Normal Operation Currents

8.4.2 Threshold

Measured points show normal operation curves. Settings in *Motor Data* define the threshold of the upper and lower limits.

Illustration 133: Threshold

- Number of motors is a convenience value to reduce the tolerance bandwidth, dividing it by the number of motors used (maximum 8 motors).
- Tolerance defines the bandwidth as a percentage of the highest measured current.

NOTICE

These settings are not saved and are recalculated after closing and opening the view. If the values are different after recalculation, they still define the same tolerance. Example: 4 motors with 20% tolerance produce the same bandwidth as 2 motors with 10% tolerance.

8.4.3 Coefficients

Locked Rotor Detection and *Missing Motor Detection* show parameter values exactly as they are written to the drive. The values are synchronized automatically.

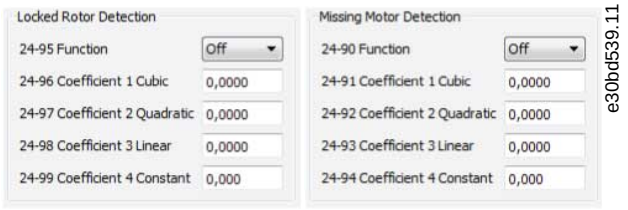

Illustration 134: Locked Rotor Detection and Missing Motor Detection

NOTICE

Cubic and quadratic coefficients are multiplied by 1000 to overcome precision limitation of parameters.

8.4.4 Modified Curves

Changing the frequency of a measured point moves the point along the defined curve. As the point follows the previously defined curve, the change of frequency only causes a slight change to the curve.

8.5 Cascade Controller Plug-in

The cascade controller is intended for pump applications where multiple motors control a common flow, level, or pressure. By varying the speed of the motors, variable speed control is provided for the system. This maintains constant pressure while eliminating pressure surges, resulting in reduced system stress and quieter operation.

Three versions of cascade controllers are available:

- Basic cascade controller
  - Delivered as part of the software in the VLT® HVAC Drive FC 102 and VLT® AQUA Drive FC 202. The 2 relays on the power card control the speed of a device connected to the drive output and on/off control devices.
- Extended cascade controller
  - Allows more devices to be applied to the control circuitry and offers more cascade principles. It is available only in the FC 202 with a VLT® Extended Cascade Controller MCO 101 option card installed.
- Advanced cascade controller
  - Offers the cascade principles similar to extended cascade, but allows extra devices to be applied to the control circuitry. It is available only in the FC 202 by using the VLT® Advanced Cascade Controller MCO 102 option card.

The add-on option cards MCO 101 and MCO 102 can be used with the basic cascade controller (*parameter group 25- ** Cascade Controller*) and with the extended/advanced cascade controller (*parameter group 27-** Cascade CTL Option*).

The cascade controller can be configured in MCT 10 Set-up Software from the cascade controller plug-in. Basic mode supports the basic cascade controller, and extended mode supports the extended/advanced cascade options MCO 101/MCO 102.

The MCT 10 Cascade Controller view is divided into 4 tabs in both cascade modes:

- Preconditions.
- Set-up.
- System Optimizing.
- Service.

8.5.1 The Preconditions Tab

The *Preconditions* tab contains the general set-up required for the cascade controller to operate in an application. It can also be used in general to set up the closed loop for other applications without the need for the cascade control. Use *Preconditions* to configure:

- General configuration.
- Setpoint and feedback.
- Digital input.

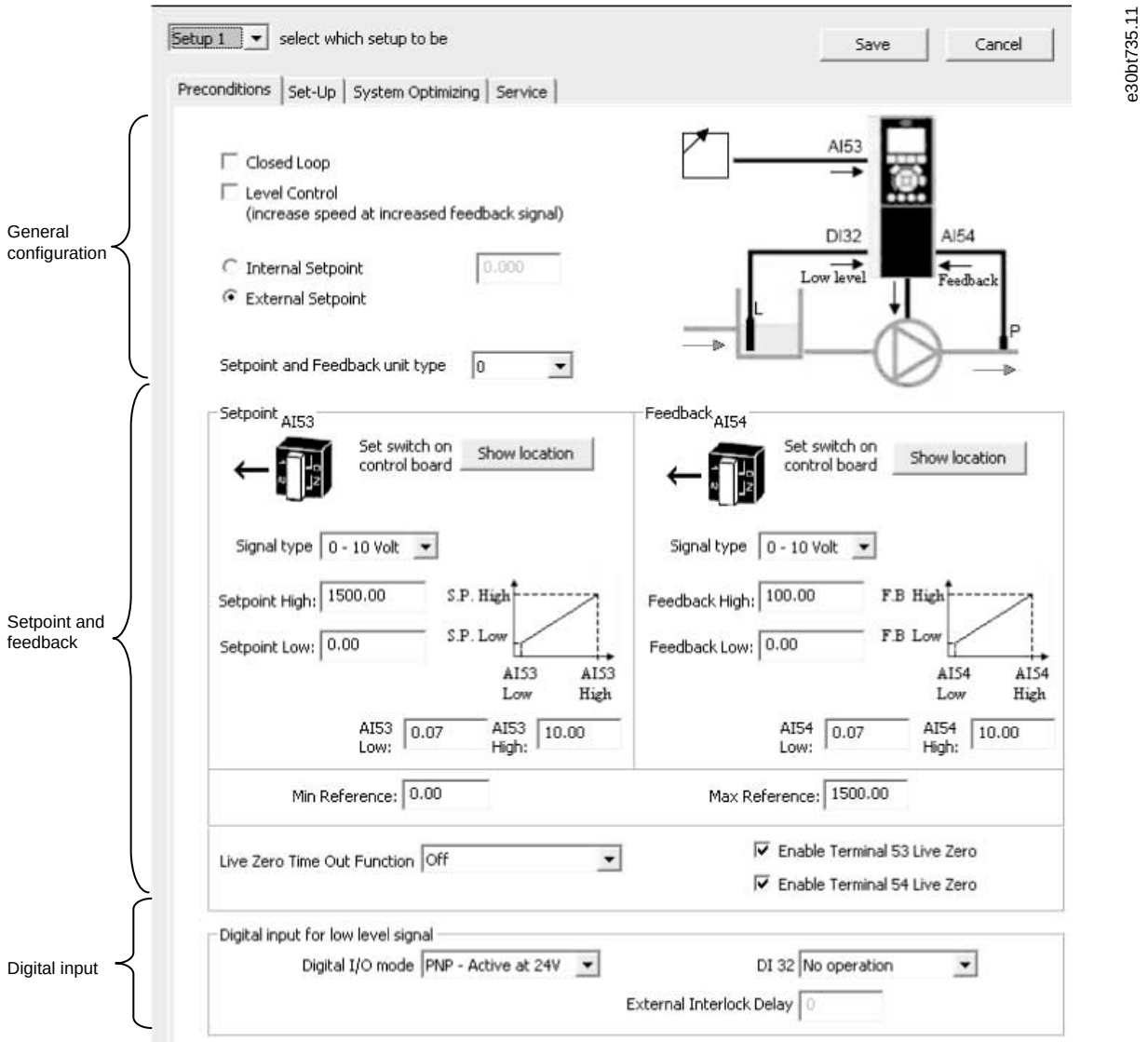

Illustration 135: Preconditions.

8.5.1.1 General Configuration

Closed loop is the configuration mode of the drive. Enabling or disabling the checkbox changes *parameter 1-00 Configuration Mode*.

Table 10: Closed-loop Checkbox Options

Options	*Parameter 1-00 Configuration Mode*
Enabled	*[1] Closed loop*
Disabled	*[0] Speed open loop*

Level control configures the inverse mode of the PID controller. It causes the drive output frequency to increase when the feedback is greater than the setpoint reference. If the checkbox is disabled, the PID is configured to normal control. Digital I/O mode and DI 32 are enabled.

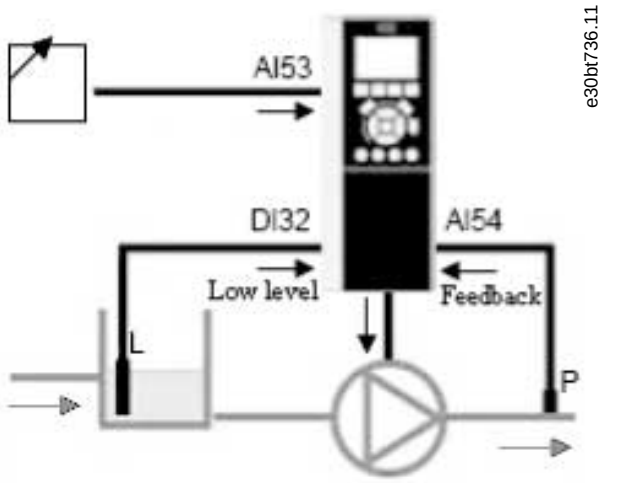

Illustration 136: Level Control

Enabling the checkbox configures the PID to inverse control and digital I/O mode and DI 32 are disabled. The drive graphic is updated to reflect the general configuration.

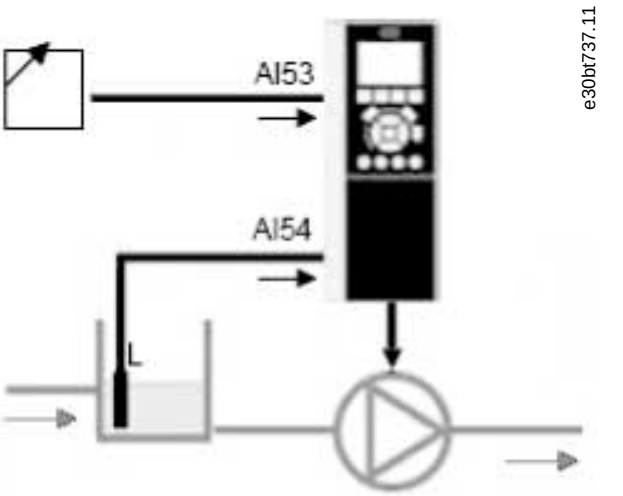

Illustration 137: General Configuration

The setpoint is used in closed loop as the reference to compare the feedback values. It can be offset with the digital, analog, or bus references. Enabling the internal setpoint allows for entering a numerical value for the reference source. If the external setpoint is selected, the reference source is set to AI53. The internal setpoint settings remain in the field allowing to switch between a preset- or an external setpoint.

Setpoint and feedback unit type configures the pressure unit for the closed-loop setpoint and feedback. The pressure unit can be defined in:

- %.
- mbar.
- bar.
- Pa.
- kPa.
- m WG.
- psi.
- lb/in^2.
- in WG.
- ft WG.

General configuration affected parameters

- *Parameter 1-00 Configuration Mode*.
- *Parameter 20-81 PID Normal/ Inverse Control*.
- *Parameter 3-15 Reference 1 Source*.
- *Parameter 20-12 Reference/Feedback Unit*.

8.5.1.2 Setpoint and Feedback

Configure the analog input used as setpoint and feedback. The general configuration assumes the AI 53 (analog input 53) is used for the setpoint and the AI 54 (analog input 54) is used as feedback. The signal type can only be changed from current to voltage input with the switches on the control board of the drive. Click *Show location* to see the specific location on the drive.

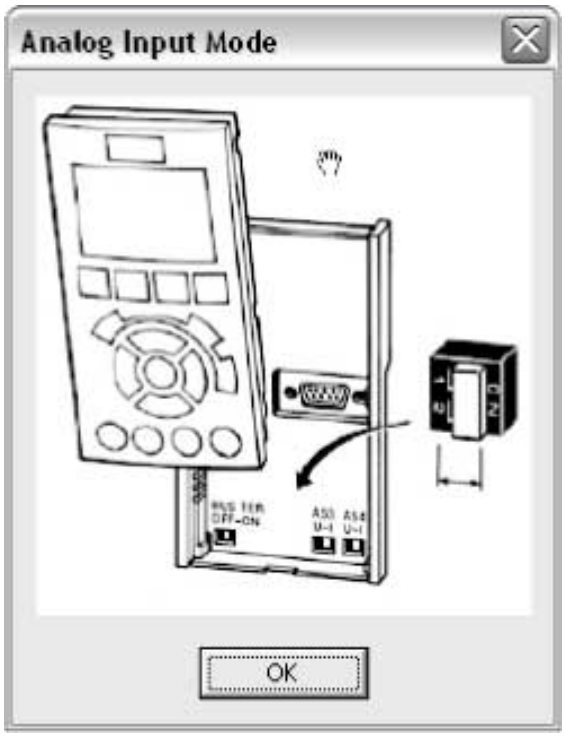

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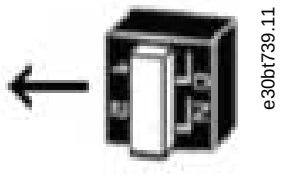
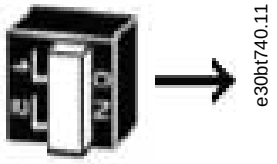
Illustration 138: AI53 and AI54

Configure the signal type in accordance with the hardware switches.

	
Push the switch to the left to get a 0–10 V signal type.	Push the switch to the right to get a 0–20/4–20 mA signal type.

Setpoint high and *Feedback high* configure the analog input scaling value corresponding to the maximum reference feedback value. *Setpoint low* and *Feedback low* are used to configure the analog input scaling value corresponding to the minimum reference feedback value. The minimum and maximum references are the lowest and highest values obtainable by adding all references together.

To receive notification of a missing or defective transmitter, define live zero among the functions:

- Off.
- Freeze output.
- Stop.
- Jogging.
- Maximum speed.
- Stop and trip.
- Select set-up 1.
- Select set-up 2.
- Select set-up 3.
- Select set-up 4.

The function is activated if the signal on terminal AI 53 or AI 54 is below 50% of the value defined in AI 53 low or AI 54 low. Default Live Zero Timeout time is 10 s and can be reconfigured in *parameter 6-00 Live Zero Timeout Time*.

Enable *Terminal 53 live zero* and *Terminal 54 live zero* to disable the live zero monitoring if the analog outputs are used as part of a decentral I/O system. As default, both checkboxes are enabled.

Setpoint and feedback affected parameters

- *Parameter 3-02 Minimum Reference*.
- *Parameter 3-03 Maximum Reference*.
- *Parameter 6-01 Live Zero Timeout Function*.
- *Parameter 6-10 Terminal 53 Low Voltage*.
- *Parameter 6-11 Terminal 53 High Voltage*.
- *Parameter 6-12 Terminal 53 Low Current*.
- *Parameter 6-13 Terminal 53 High Current*.
- *Parameter 6-14 Terminal 53 Low Ref./Feedb. Value*.
- *Parameter 6-15 Terminal 53 High Ref./Feedb. Value*.
- *Parameter 6-17 Terminal 53 Live Zero*.
- *Parameter 6-20 Terminal 54 Low Voltage*.
- *Parameter 6-21 Terminal 54 High Voltage*.
- *Parameter 6-22 Terminal 54 Low Current*.
- *Parameter 6-23 Terminal 54 High Current*.
- *Parameter 6-24 Terminal 54 Low Ref./Feedb. Value*.
- *Parameter 6-25 Terminal 54 High Ref./Feedb. Value*.
- *Parameter 6-27 Terminal 54 Live Zero*.

8.5.1.3 Digital Input

If a low-level signal is available, the DI32 (digital input 32) can be programmed to stop inverse or to external interlock, and an external interlock delay can be configured. The type of pulse to trigger can be configured from the digital I/O mode drop-down list.

8.5.2 The Set-up Tab

The *Set-up* tab contains the configuration interface for the cascade controller, *parameter group 25-** Cascade Controller*. The cascade principle can be configured to *Basic Cascade Ctrl* or *Motor Alternation Only* (VLT® AQUA Drive FC 202 only).

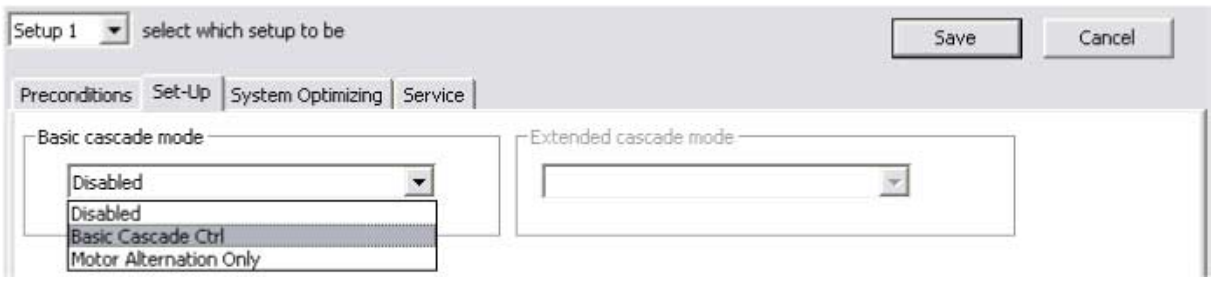


Illustration 141: Configuration Interface for Parameter Group 25- Cascade Controller**

8.5.2.1 Basic Cascade Control

Select basic cascade control to configure:

- Motor start.
- Pump configuration.
- Staging/destaging settings.

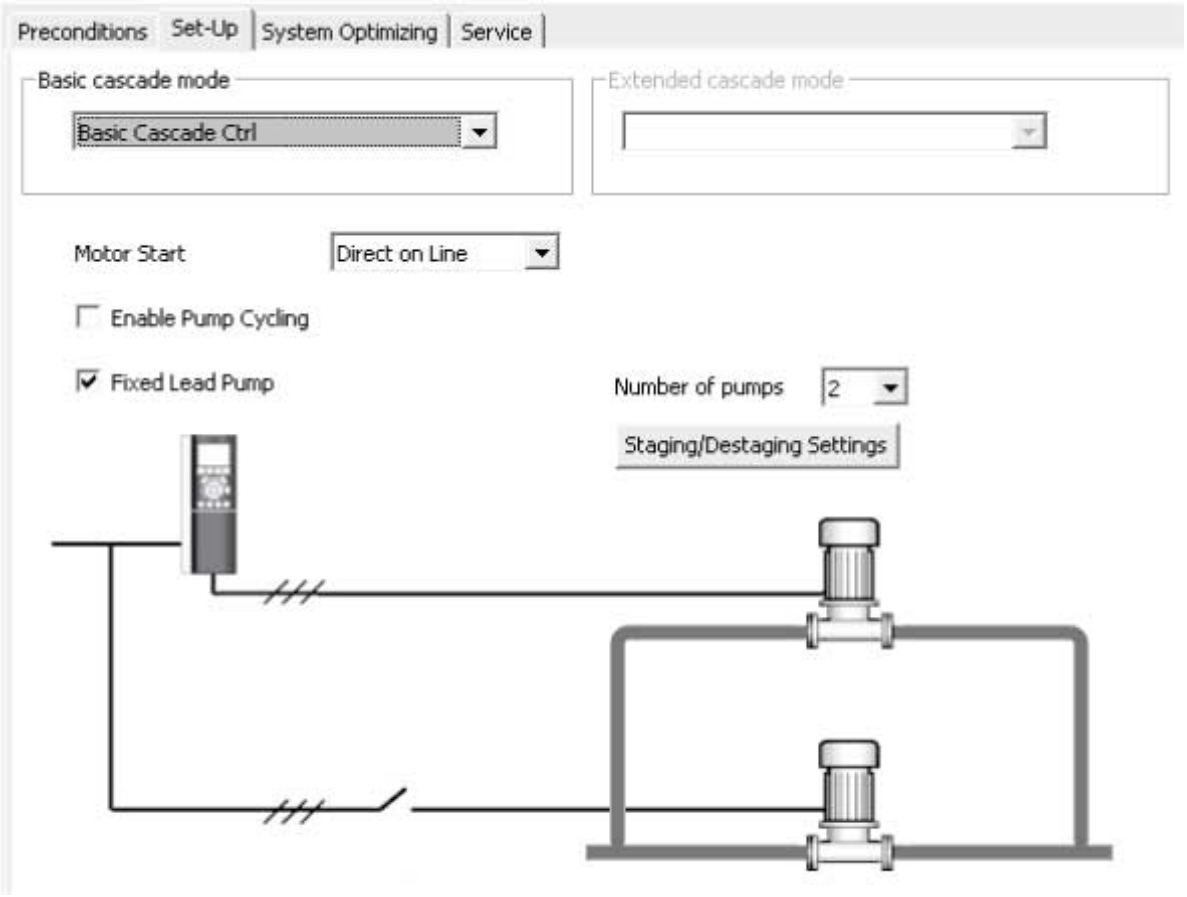


Illustration 142: View of Basic Cascade Control Set-up Tab

Table 11: View and Selection Descriptions

View	Description
Motor start	The view defines the configuration principle: • Direct on line – each lag pump is cut in directly via a contactor. • Soft starter – must be used for all fixed speed pumps and can be used to replace traditional contactors. When using soft starters, a delay is added from the staging signal occurs until staging takes place. The delay is required due to the ramp time of the fixed speed pump.
Enable pump cycling	The view defines whether the pump cycling is enabled or not: • Disabled – lag and lead pumps are cut in to have equal hours run for each pump. • Enabled – lag pumps are cut in according to the first-in, last-out principle.

View	Description
Fixed lead pump	This view defines whether a drive uses a fixed lead pump or not. The lead pumps are connected directly to the relays on the drive control card. This is shown in illustration 142. To obtain equal hours of operation within the fixed speed pumps, the lead pump can be alternated. Timers on the relay outputs monitor the hours run of each pump. When a pump is not operating for a long time, corrosion may become an issue. When it is configured for alternating lead pump, select Alternation details to set up principles for alternation.
Lead pump alternation	This view instructs the drive to change the lead pump so all pumps run for the same period. The following options are available: • Off - no lead pump alternation occurs. • At staging - lead pump alternation occurs at pump staging. • At command - lead pump alternation occurs at explicit commands. • At staging or command - lead pump alternation occurs at pump staging and at explicit commands.
Alternation time interval	In this view, define the time period between automatic alternation of the lead pump: • 1–999.9 h - when the time expires, the lead pump alternates.
Alternation time value	This view contains the actual value of the alternation timer.
Alternation predefined time	In this view, set the time to perform an alternation. The time format depends on the settings configured in the drive.
Alternate if load <50%	In this view, define whether the lead pump must be alternated: • Enabled - pump alternation is carried out only if the capacity is equal to or below 50%.
Staging mode at alternation	In this view, configure the staging mode at alternation and determine the time of the variable speed pump deceleration: • Quick. • Slow.
Delay before cutting in next pump	In this view, set the time between stopping the old lead pump and starting another. Range: 0.1–5.0 s.
Delay before cutting in on mains	Time delay before a fixed speed pump is staged on according to normal staging sequence. When it expires, a fixed speed pump must be staged on according to normal staging. Range: 0.1–5.s.
Staging/destaging settings	In this view, configure when to add and remove a stage from a running application. A stage is a representation of a 100% pump.
Staging bandwidth (SBW)	In this view, define the band around the head setpoint and configure it as a percentage of the maximum reference. If the actual head exceeds the bandwidth for a specified time and the speed is at motor speed high limit, a stage is added. If the speed is at motor speed low limit, a stage is removed. Range: 1–100%.
Override bandwidth (OBW)	Preserves a stable head in the application. When quick changes in the system demands occur, the override bandwidth must add/remove a stage immediately when the actual exceeds override bandwidth. To avoid unintended staging until the head has settled after start, override bandwidth has a delay until the lead pump has reached motor nominal speed or motor speed high limit after a start command. Range: SBW to 100%.
Fixed speed pumps staging bandwidth (FSBW)	Ensures that the cascade controller continues if the drive issues an alarm. Keeping the head on the setpoint requires a frequent staging and destaging. When only fixed speed pumps are running, a wider bandwidth (FSBW) is used instead of SBW. Range: SBW to OBW.
OBW timer	Avoids frequent staging/destaging. The OBW timer prevents staging a pump until the application pressure is stabilized. Range: 0–300 s.

View	Description
SBW staging delay	Delay between the feedback signal being below the staging bandwidth and a lag pump being added. SBW destaging delay is the time between when the feedback signal is above the staging bandwidth and when a lag pump is removed. Range: 0–3000 s.
Ramp-down delay and ramp-up delay	For use with soft starters. The ramp-down delay is for setting the lead pump ramp-down delay before staging a fixed speed pump on. Ramp-up delay is for setting the lead pump ramp-up delay before a fixed speed pump is destaged.
Stage- and destage threshold	The percentage of maximum pump speed to stage on and to destage fixed speed pump. The thresholds must be configured as a percentage of motor speed high limit.
Destaging speed	To prevent an overshoot when adding a fixed speed pump, the variable speed pump ramps to motor speed low limit. When the variable pump reaches staging speed, the fixed speed pump is staged on. To prevent an undershoot when removing a fixed speed pump, the variable speed pump ramps to motor speed high limit. Available options: RPM or Hz.
Enable staging function	Avoids frequent staging of fixed speed pumps. Enabling the checkbox starts the stage function timer. Enable destage function ensures that the lowest numbers of pumps are running to save energy and to avoid dead head water circulation in the variable speed pump. Enabling the checkbox starts the destage function timer.

Table 12: Number of Pumps Configurable from the Drop-down List

Function	Number of pumps
Fixed lead pump	2–3
Alternating lead pump	2

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Illustration 143: Alternation Details

If configuring the lead pump alternation *At command* or *At staging or command*, the alternation event can be configured to:

- External - Alternation takes place when a signal is applied to 1 of the digital inputs in the terminal strip.
- Alternation time interval - Alternation takes place every time the alternation time interval expires.
- Sleep mode - Alternation takes place each time the lead pump goes into sleep mode. The no-flow function must be set to sleep mode or an external signal applied for this function.
- Predefined time - Alternation takes place at a defined time of the day. If *Alternation predefined time* is set, the alternation is carried out every day at the specified time.

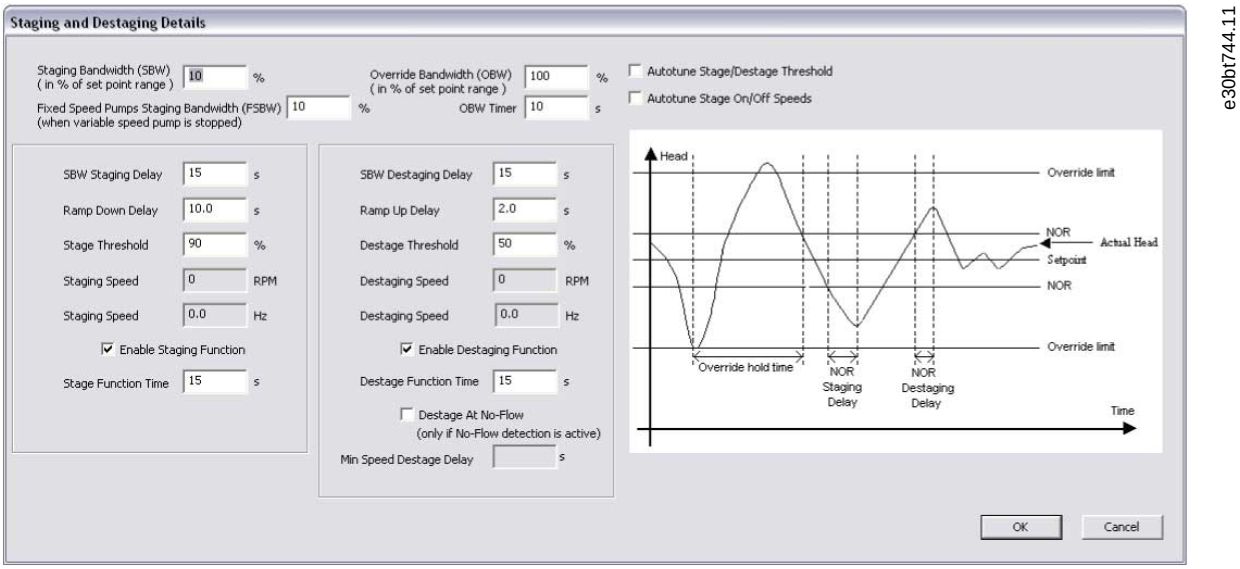


Illustration 144: Staging and Destaging Details

Stage function time is the time before staging on a fixed speed if the lead pump is at maximum speed. The stage timer starts when the adjustable speed pump is running at motor speed high limit with 1 or more constant speed pumps stopped. When the timer expires, a fixed speed pump is staged. The destage function time is the time before staging on a fixed speed if the lead pump is at minimum speed. It starts when the adjustable speed pump is running at motor speed low limit with 1 or more fixed speed pumps in operation. When the timer expires, a stage is removed avoiding dead head water circulation within the adjustable speed pump.

If the *Destage at no-flow* checkbox is enabled, a stage is removed when there is a no-flow situation.

8.5.2.2 Motor Alternation Only

In *Motor alternation only*, 1 drive and 2 pumps are connected through contactors to both the drive and to mains. The functionality is used to allow the alternation between pumps that share a drive. The alternation takes place at an external command signal or a preprogrammed event.

8.5.3 The System Optimizing Tab

The *System optimizing* tab provides a simple way to start and stop the cascade controller. It allows configuration of:

- PID controller.
- Feedback low-pass filter.

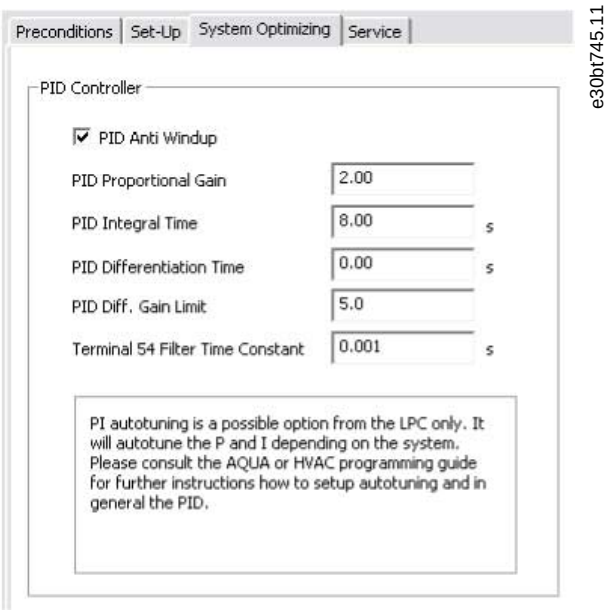


Illustration 145: Start and Stop Cascade Controller

Table 13: Description of PID functions

Field	Description
PID anti-windup	Controls the integration of the PID controller. If the checkbox is enabled, the PID controller stops integrating the error between the feedback and the setpoint reference if it is not possible to adjust the output frequency of the drive to correct the error. This situation can occur when the drive has reached the minimum or maximum output frequency, or when the drive is stopped. If the checkbox is disabled, the PID controller continues integrating the error between the feedback and setpoint reference, even though the drive cannot adjust its output frequency to correct this error.
PID proportional gain	Adjusts the output of the drive's PID controller based on the error between the feedback and the setpoint reference. Quick PID controller response is obtained using a large value. If too large, the drive output frequency may become unstable. The value is configurable from 0–10.00.
PID integral time	The duration of integrating the error between the feedback and the setpoint reference to ensure the error approaches 0. Quick speed adjustments are obtained using a short duration. At a too short value, the drive output frequency may become unstable. The time is configurable from 0.01–10000.00 s.
PID differentiation time	The time the differentiator monitors the rate of change of the feedback. If it is quickly changing, it adjusts the output of the PID controller to reduce the rate of change of the feedback. Quick PID controller responses are obtained using a long duration of time. However, at too large values, the drive output frequency may become unstable. Differential time is useful in situations where fast responses and precise speed control are required. The time is configurable from 0.00–10.00 s.
Terminal 54 Filter Time Constant	A first-order digital low-pass filter constant for suppressing electrical noise from terminal 54. A high time constant improves the dampening, but also increases the time delay through the filter. The value can only be adjusted while the drive is stopped. The time constant can be configured from 0.001–10.000 s.

8.5.4 The Service Tab

The *Service* tab provides a simple way to make cascade controller service.

Table 14: Service Tab Views

View	Description	Basic cascade controller	Extended cascade controller
Cascade status	–	✓	✓
Pump status	Readout of the status for each pump selected with a string, which consists of the pump number and the current status of the pump. A readout with 2 pumps could be 1:D 2:O. • 1:D – Pump 1 running on drive. • 2:O – Pump 2 off.	✓	✓
Lead pump	Shows the actual lead pump in the application. When an alternation takes place, the field is updated to reflect the current lead pump.	✓	✓
Manual alternation	Select a new lead pump. The items available from the drop-down list are *Off* for the number of pumps.	✓	✗
Relay status	Select relay status to update the status of the relays. The status can be • On - the relay is activated. • Off - the relay is deactivated. The values can only be updated if the drive is online.	✓	✓
Relay ON time	Monitors the total hours run of the connected relay. The resolution is in hours run. Reset relay counter resets all relay on-times. It is only available, if the drives are connected online.	✓	✗
Pump interlock	Disables a certain pump and is configurable from a checkbox at each pump.	✓	✗
Pump ON time	Monitors the total hours run of the connected pump. The resolution is in hours run. *Reset* clears the hours run of a specific pump.	✓	✗
Current run-time hours	Readout of the total number of hours run for each pump since last reset. The time is used to balance the hours run between pumps.	✗	✓
Pump total lifetime hours	Total hours run for each connected pump.	✗	✓
Manual pump control	Readout of the command parameter that allows manual control of individual pump states.	✗	✓
Reset relay counter	Resets all relay on-times. Only available if the drive is online.	✗	✓

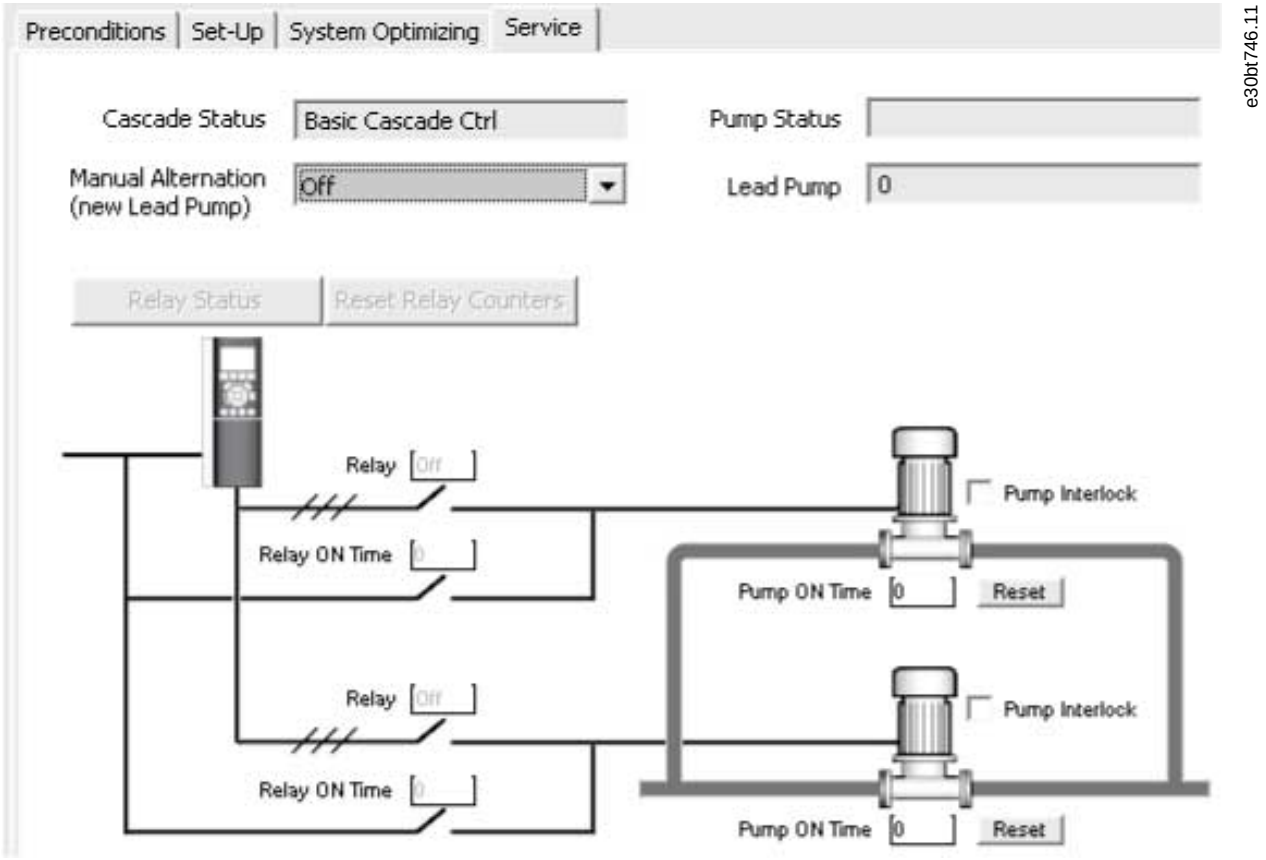


Illustration 146: Service Tab Basic Cascade Controller

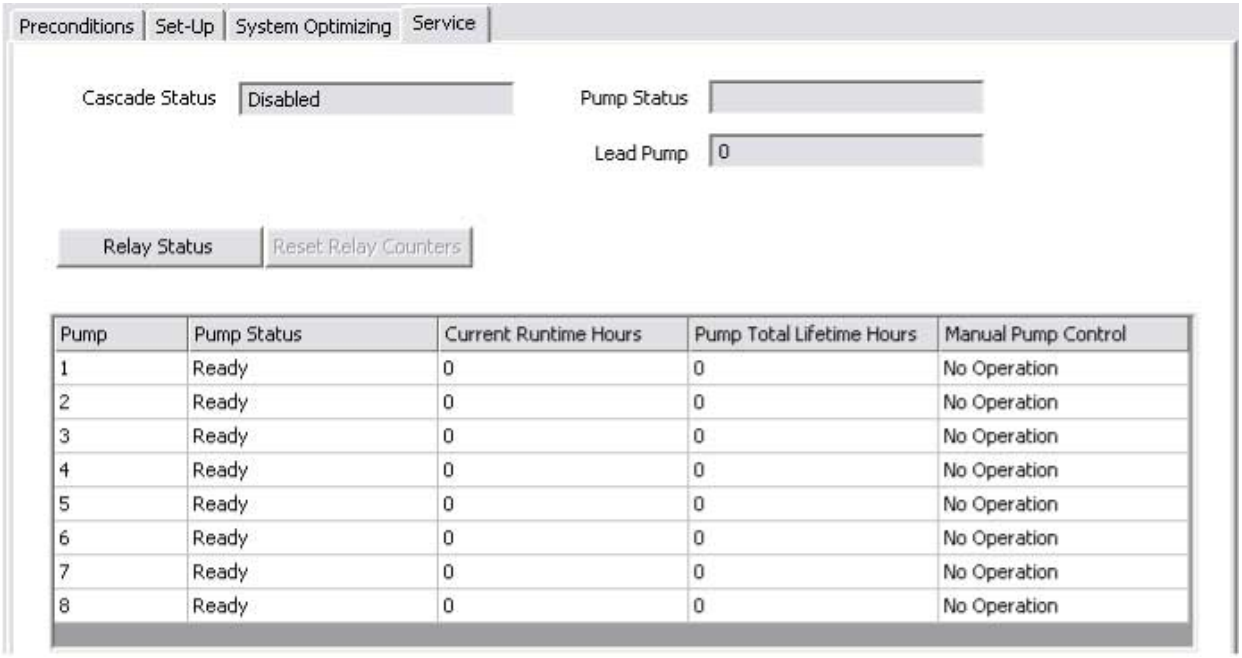


Illustration 147: Service Tab Extended Cascade Controller

Table 15: Status Descriptions

View	Status	Status description
Cascade status	Disabled	The cascade controller is disabled.
	Emergency	All pumps have been stopped by a coast/coast inverse or an external interlock command applied to the drive.
	Off	All pumps have been stopped by a stop command applied to the drive.
	In open loop	Configuration mode has been set for open loop. All fixed speed pumps are stopped, and the variable speed pump continues to run.
	Frozen	Staging/destaging of pumps has been locked and the reference is locked.
	Jogging	All fixed speed pumps are stopped. When stopped, the variable speed pump runs at jog speed.
	Running	A start command is applied to the drive and the cascade controller controls the pumps.
	Running FSBW	The drive is tripped and the cascade controller controls the fixed speed pumps based on fixed speed bandwidth.
	Staging	The cascade controller is staging fixed speed pumps.
	Destaging	The cascade controller is destaging fixed speed pumps.
	Alternating	The lead pump alternation selection is different than *Off* and an alternation sequence is taking place.
	Lead not set	No pump available to be assigned as variable speed pump.

View	Status	Status description
Pump status	X	Disabled. The pump is interlocked either via pump interlock or signal on a digital input programmed for pump interlock in digital inputs.
	Off	Stopped by the cascade controller, but not interlocked.
	D	Running on drive, regardless of whether the variable speed pump is connected directly or controlled via relay in the drive.
	R	Running on mains. Fixed speed pump running.
Relay Status [1]	On	The relay is activated.
	Off	The relay is deactivated.
Manual pump control [2]	No operation	The function is disabled.
	Online	Makes the pump available to the cascade controller.
	Alternate On	Forces the selected pump to be the lead pump.
	Offline-Off	Turns off the pump and makes the pump unavailable for cascading.
	Offline-On	Turns on the pump and makes the pump available for cascading.
	Offline-Spin	Initiates a pump spin.

[1] *Only available in basic cascade controller.*

[2] *Only available in extended cascade controller.*

Relay status enables readout of the function and status of each relay.

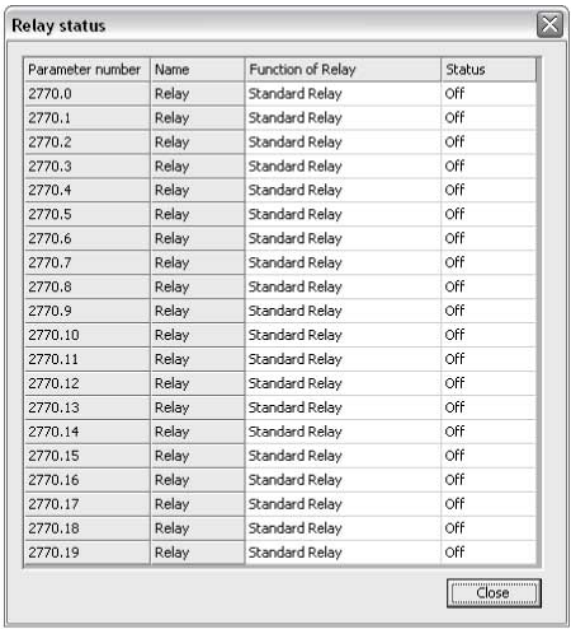


Illustration 148: Relay Status

8.5.5 Extended Cascade Controller Options

The extended cascade controller offers 2 cascade modes that are not available in basic cascade control. The 2 modes are:

- Master/Follower.
- Mixed Pumps.

8.5.5.1 Set-up

Set-up is the interface for setting up the add-on cascade controller option. The *Cascade mode* drop-down list is extended with *Master/Follower* and *Mixed Pumps*.

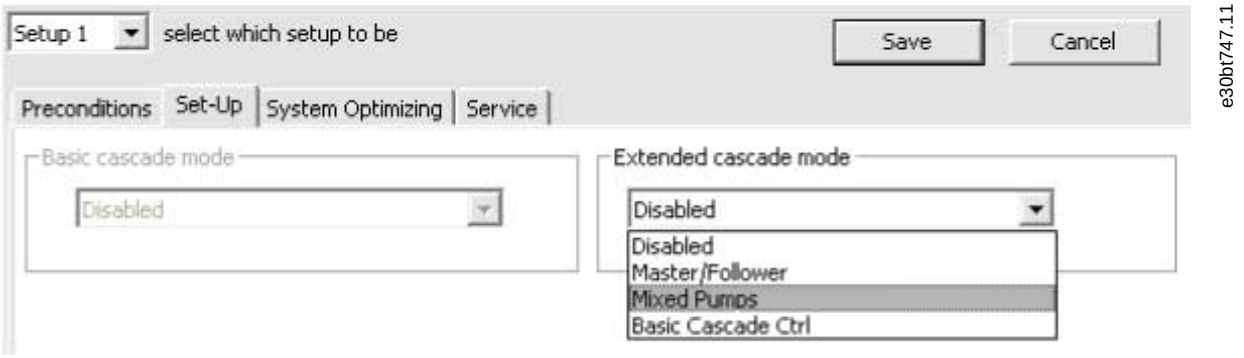


Illustration 149: Cascade Mode Drop-down List

8.5.5.2 Master/Follower

The master/follower function allows configuring:

- Motor start.
- Pump configuration.
- Connections.
- Staging/destaging.
- Master pulse output signal.
- Spin time unused pump.
- Run-time balancing.

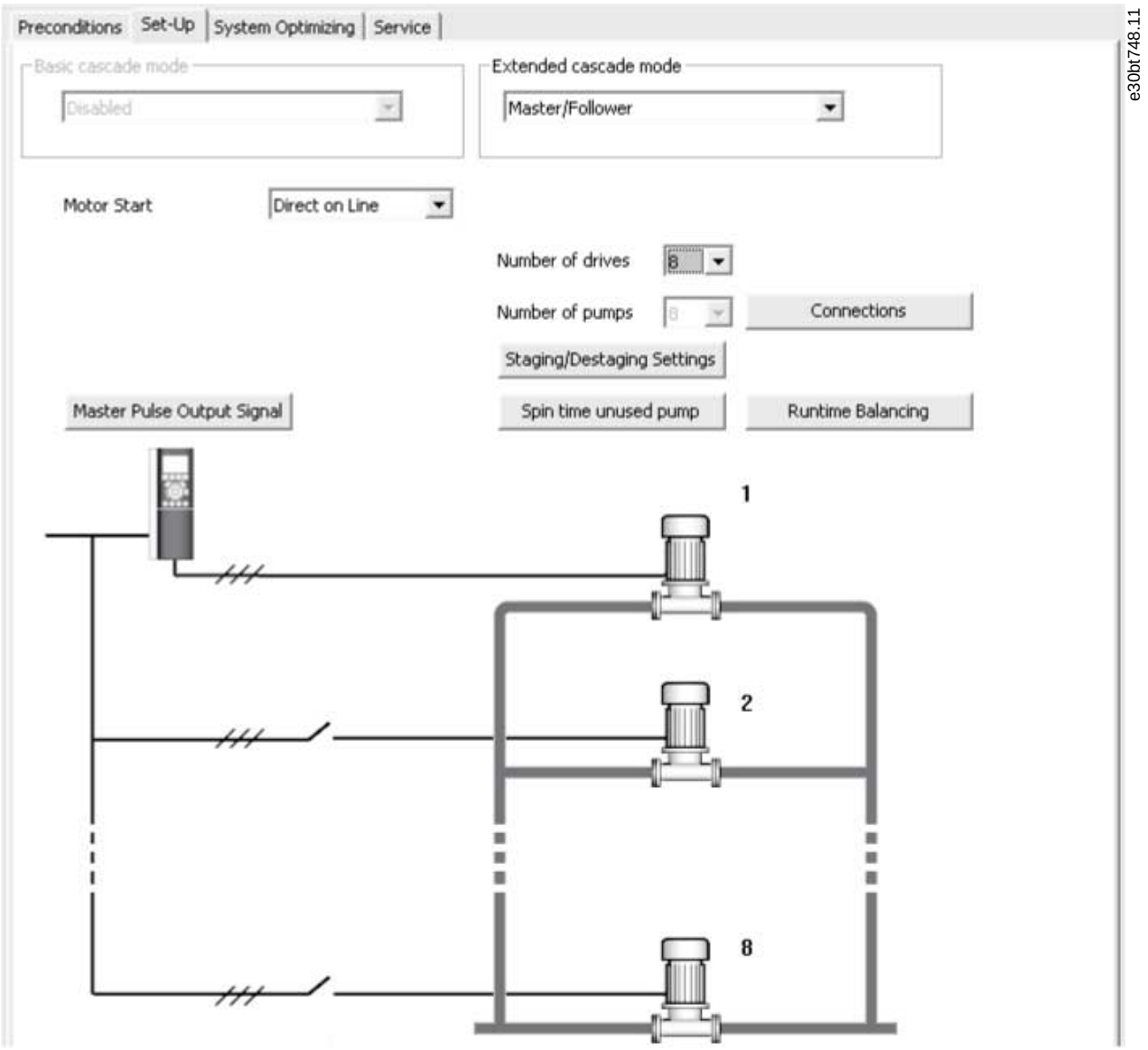


Illustration 150: Master/Follower

The motor start drop-down list is similar to the configuration available in 8.5.2.1 Basic Cascade Control.

Each pump is controlled by a drive and the number of drives correspond to the number of pumps. Staging and destaging are done based on the speed of the drive. The constant pressure is controlled by the master drive operating in closed loop. Up to 6 pumps can be controlled with VLT® Extended Cascade Controller MCO 101 and up to 8 pumps with the VLT® Advanced Cascade Controller MC 102.

Select *Connections* to configure the relay function for each relay in the application.

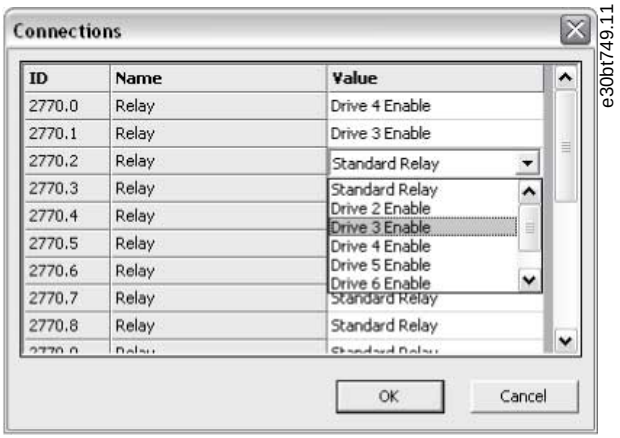


Illustration 151: Configure Relay Options

NOTICE

The number of available relays depends on the add-on option.

To set up the function of each relay, double-click the *Value* field and select the relay from the drop-down list. If add-on option MCO 102 is installed, the relay option VLT® Relay Card MCB 105 may also be used as an expansion.

Select *Staging/Destaging settings* to configure when to add and remove a stage from a running application. All stages are a representation of 100% pumps in *Master/Follower*.

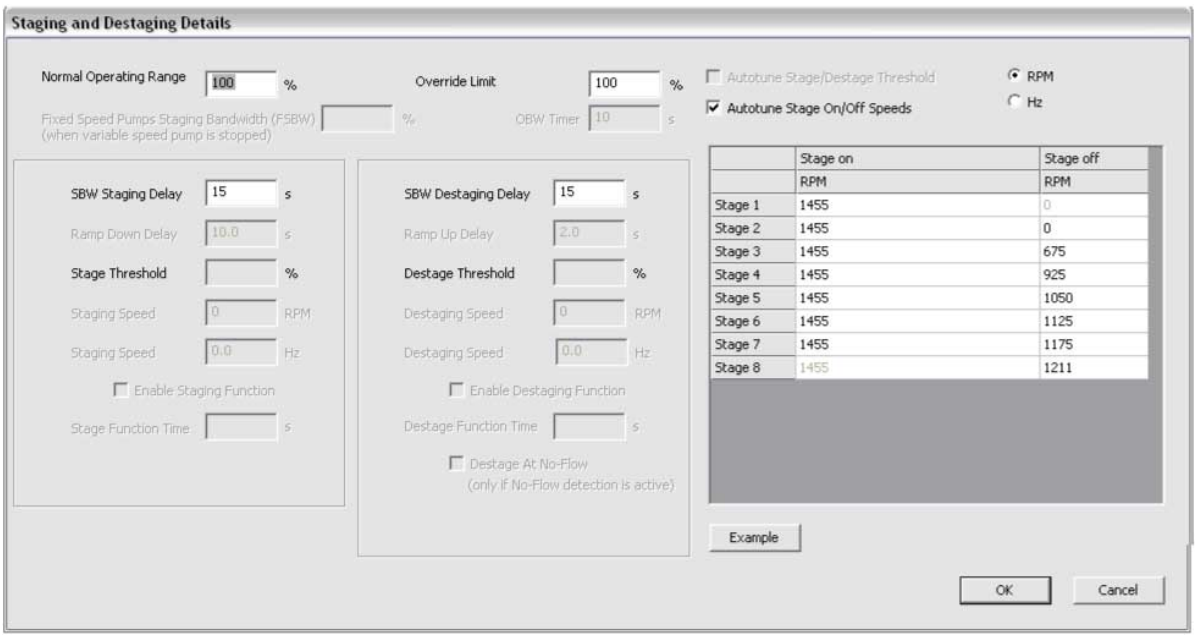


Illustration 152: Staging and Destaging Details

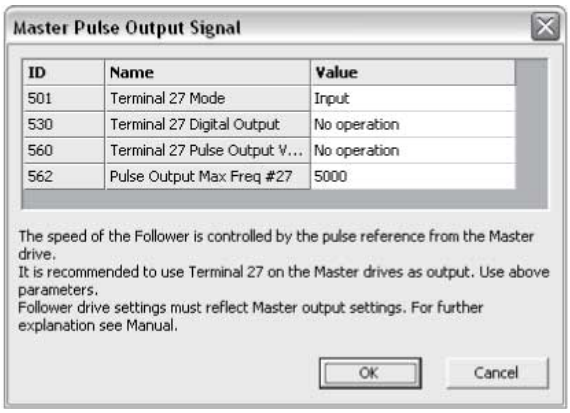
Table 16: Staging and Destaging Description

Field	Description
Normal operating range	The allowed offset from the setpoint before a pump may be added or removed. The system must be outside of the limit for the time specified in *Staging delay*.
Override limit	The allowed offset from the setpoint before a pump immediately is added or removed.
Autotune stage/ destage threshold	Optimizes the threshold values during operation. The settings are updated to prevent pressure over-shoots and undershoots when staging and destaging.
Autotune stage on/off speeds	Stage on and off speeds are continually autotuned during operation. Settings are optimized to ensure high performance and low energy consumption.

All supported stages On and Off settings can be configured in RPM or Hz. Select *Example* to see a configuration example of 3 pumps.

Ramp-down delay and ramp-up delay are only configurable when motor start is configured to soft starter.

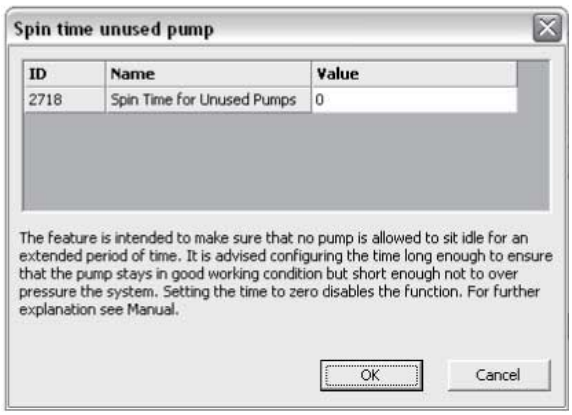
Select *Master pulse output signal* to configure terminal 27 on the master drive.



e30bt751.11

Illustration 153: Master Pulse Output Signal

In some applications, not all pumps are used regularly. Select *Spin time unused pump* to configure the time a pump is allowed to idle.



e30bt752.11

Illustration 154: Spin Time Unused Pump

Select *Runtime balancing* to balance the running hours of the available pumps. Three balancing priorities are available for each pump.

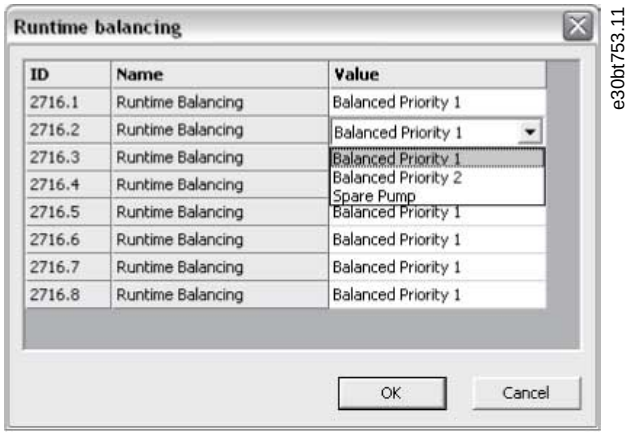


Illustration 155: Balancing Running Hours

8.5.5.3 Mixed Pumps

Select *Mixed pumps* to configure:

- Motor start.
- Pump configuration.
- Pump size.
- Connections.
- Alternation details.
- Staging/destaging settings.
- Spin time unused pump.
- Runtime balancing.

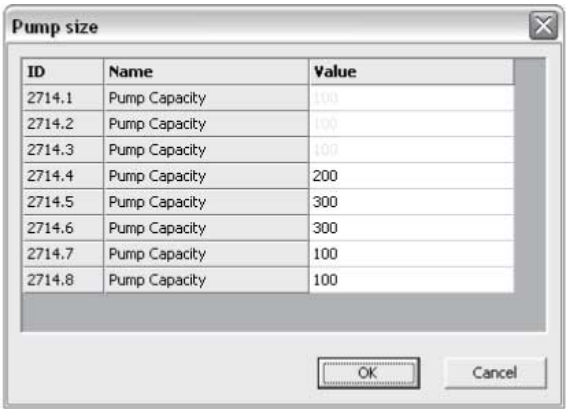
The motor start drop-down list is similar to 8.5.2.1 Basic Cascade Control, but with the additional possibility to configure star/delta.

Mixed Pumps Cascade Mode can be configured to:

Table 17: Mixed Pump Cascade Mode

Mode	Description
Mixed pump	A mix of variable speed pumps connected to drives and more fixed speed pumps.
Unequal size pump	Limited mix of fixed speed pumps in different sizes.
Mixed pump with alternation	Alternates the drive between 2 pumps along with controlling more fixed speed pumps.

Select *Pump size* to configure the fixed pump capacity in the application. All variable speed pumps are read-only and 100% in capacity.

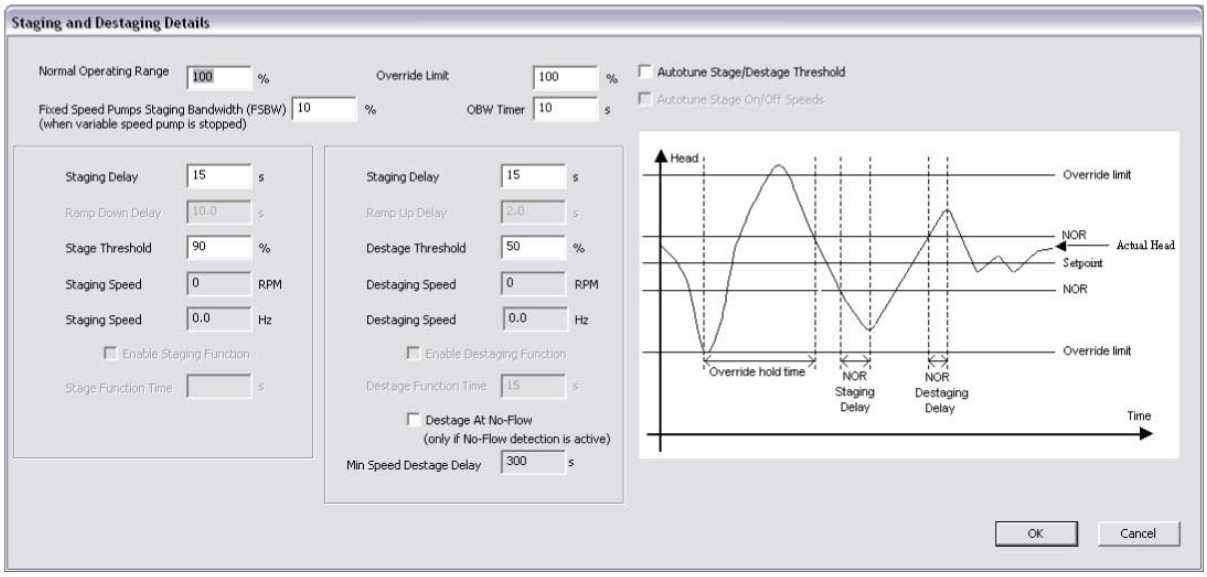


e30bt754.11

Illustration 156: Configure Fixed Pump Capacity

For configuration of connection, refer to 8.5.5.2 Master/Follower. For mixed pump alternation details configuration, refer to 8.5.2.1 Basic Cascade Control.

The dialog *Staging and destaging details* is similar to 8.5.2.1 Basic Cascade Control with the additional option to configure minimum speed destage delay. Configure for how many seconds the lead pump must run at minimum speed while system feedback is in normal operation band. When the time has elapsed, the pump turns off to save energy.



e30bt755.10

Illustration 157: Staging/Destaging

Spin time unused pump and *Runtime balancing* configurations are similar to the master/follower configuration.

8.6 Drive File Manager Plug-in

8.6.1 Customer-specific Initialization Values - CSIV

The Drive file manager provides the functionality to download files containing customer-specific initialization values (CSIV), language files, and application wizard files to the drive. CSIV files contain parameter sets that can be used to initialize the drive to reduce the time for commissioning. Files can only be flashed via the fieldbus RS485 and USB with the drive serial address configured to 1.

Table 18: Available Features

	View drive flash file system	Download CSIV files	Delete CSIV files	Download language files	Delete language files	Download application wizard files	Delete application wizard files	Splash screen
VLT® Micro Drive FC 51	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
VLT® HVAC Basic Drive FC 101	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
VLT® HVAC Drive FC 102	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
VLT® AQUA Drive FC 202	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
VLT® Automation-Drive FC 302	Yes	Yes	Yes	Yes	Yes	Yes [1]	Yes [1]	Yes
Derived versions of the FC Series	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
VLT® Advanced Filter AAF 006	Yes	Yes	Yes	Yes	Yes	N/A	N/A	N/A

[1] *Only FC 302 from firmware version 6.6x.*

The functionality is available as a plug-in named Drive file system and is accessible both from the network and project nodes.

Illustration 158: Drive File Manager Plug-in

From the network node, it is only possible to view the content in the Drive flash system. It requires a change of the drive serial protocol *parameter 8-30 Protocol* to *[1] FC MC*. CSIV and language files can only be downloaded from the project node.

8.6.2 Creating New CSIV Files

Context:

NOTICE

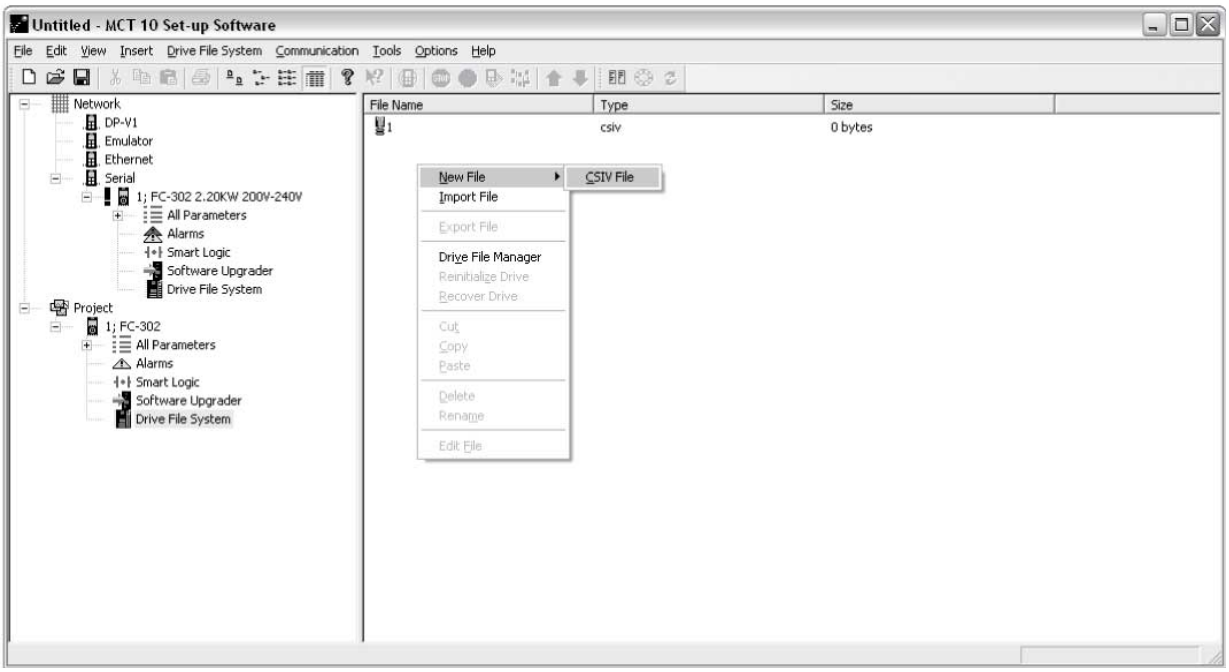
To import existing CSIV files or language files to the list, select *Import file* from the menu.

NOTICE

To export CSIV files containing initialization values to a file, select *Export file* from the menu. From the file menu, it is possible to cut, copy, paste, delete, or renaming existing files from the list.

Procedure

1. Right-click the right pane of the Drive file manager.
2. Select *New File* and *CSIV File*.



e30bt816.11

Illustration 159: Create CSIV Files

→ An empty CSIV file is created and listed in the right view with the default name starting from 1.

8.6.3 Configuration of CSIV Files

The CSIV file content is autogenerated based on the settings configured in the *File* menu.

- *Full change set* builds up the CSIV file content based on the user-made changes in the project including all the dependent parameters.
- *Minimal change set* builds up the CSIV file content based on user-made changes only. Selecting this option, the CSIV files are independent of the drive firmware version, except if 1 of the user-configured parameters is not available.

Use an editor to configure the CSIV file. To open the editor, double-click a file from the list or select *Edit File* from the menu.

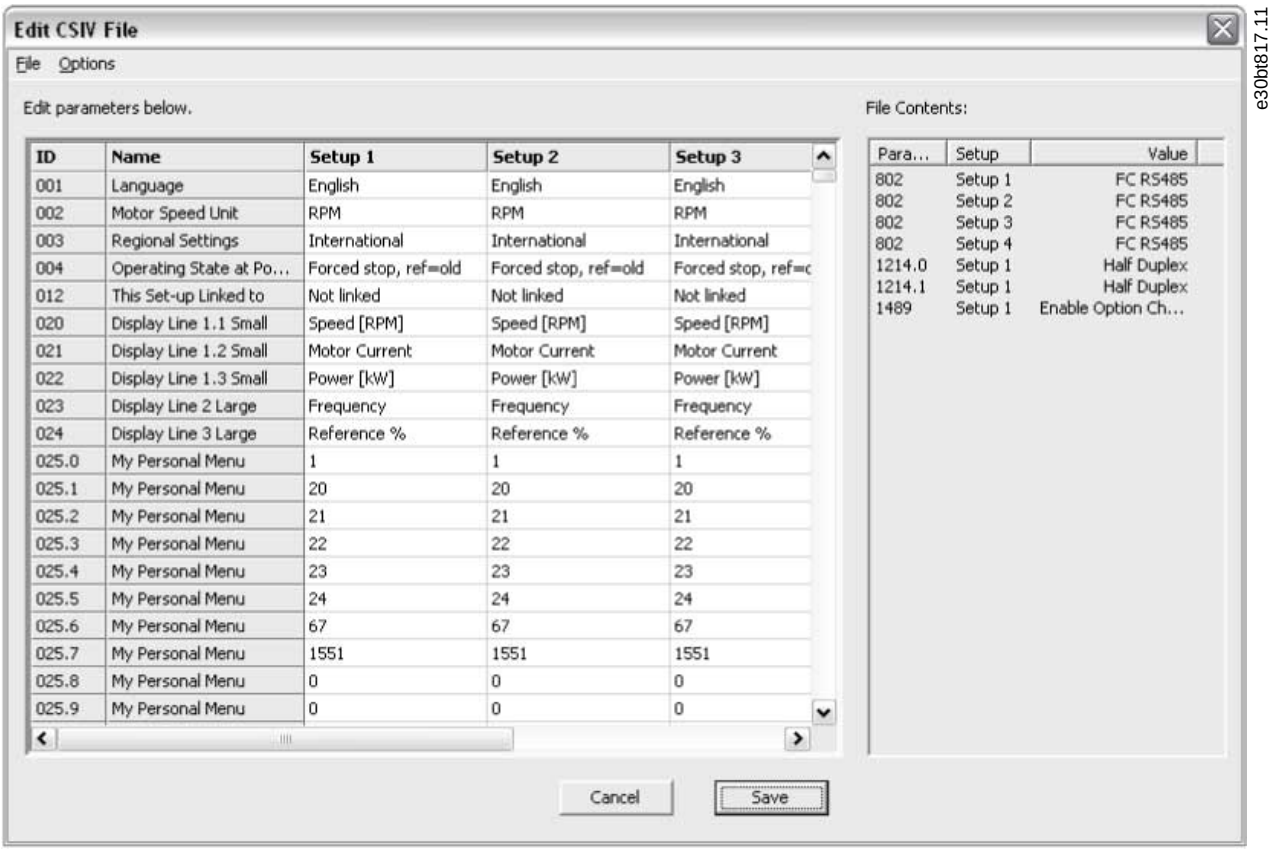
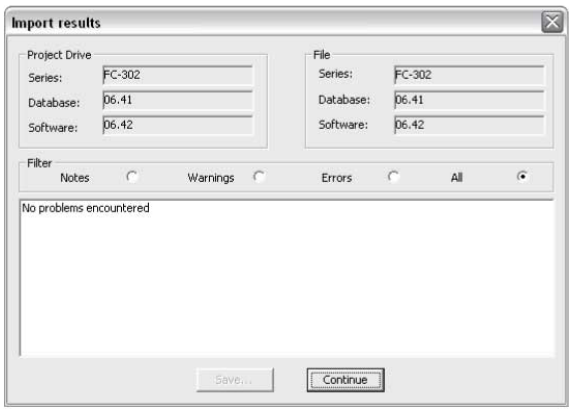


Illustration 160: Parameter Settings Imported from the Project and the Actual CSIV File Content

The left view contains the parameter settings imported from the project. The right view lists the actual CSIV file content.

- Edit the relevant parameter settings in the *Edit parameters below* view.
- It is possible to undo the changes made from the *Options* menu.
- *Revert parameters to project drive* settings apply to initialization values to CSIV file contents corresponding to the original project.
- *Reset to default values* resets all parameters to factory configuration and erases the CSIV file content.
- Click *Save* to save parameter settings from the file content to the CSIV file.
- Click *Cancel* to discard all changes and close the CSIV editor.

As part of the CSIV content, the drive information is also saved to the file. When opening the file in the CSIV editor, a validation is made to check for compatibility.



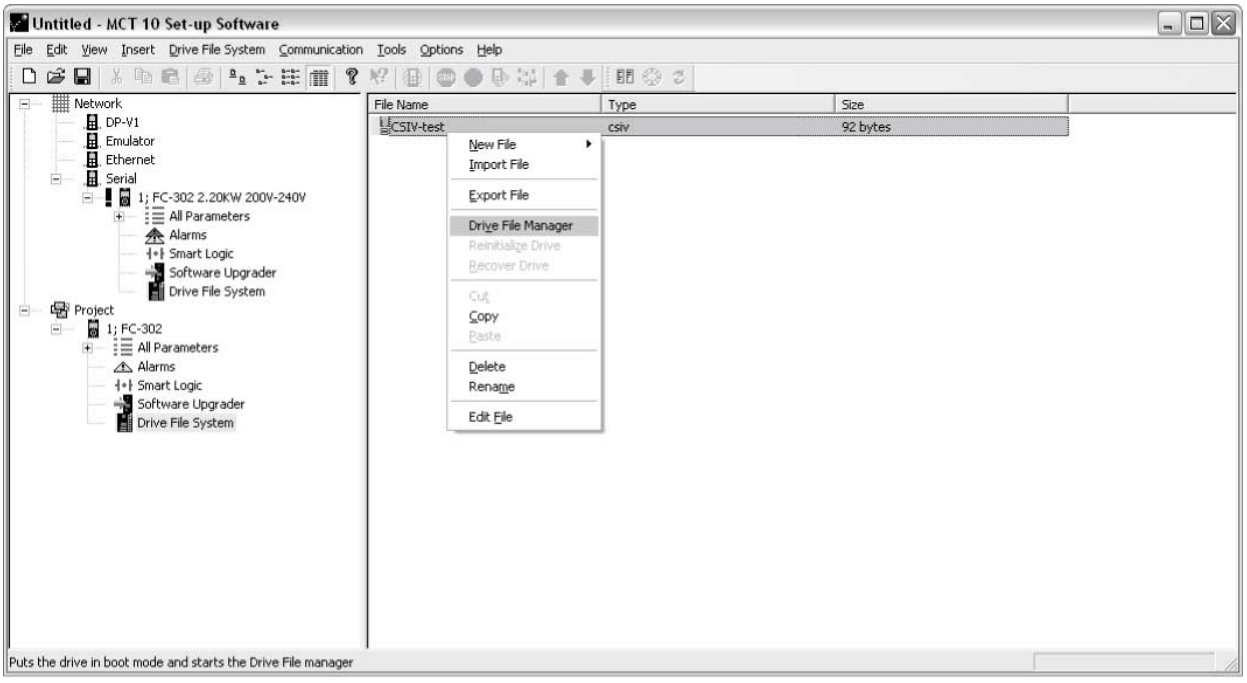
e30bi818.11

Illustration 161: Validation

When parameter settings have been saved to the file, open it for validation.

8.6.4 Drive File Manager

Files can be downloaded or existing files deleted in the drive via the *Drive File Manager* available from the menu.



e30bi819.11

Illustration 162: Drive File Manager

The drive is set into service mode when opening the Drive file manager.

NOTICE

If the connection is lost, or the drive is power cycled, the drive remains in service mode. It can be forced back to normal mode with the Software upgrade plug-in.

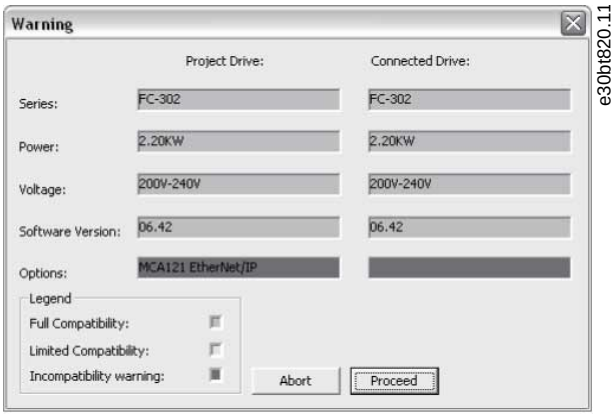


Illustration 163: Service Mode

The Drive file manager is divided into a left pane named *Project drive* and a right pane named *Connected drive*.

- *Project drive* lists the files in the project.
- *Connected drive* lists the files present in the drive flash file system.

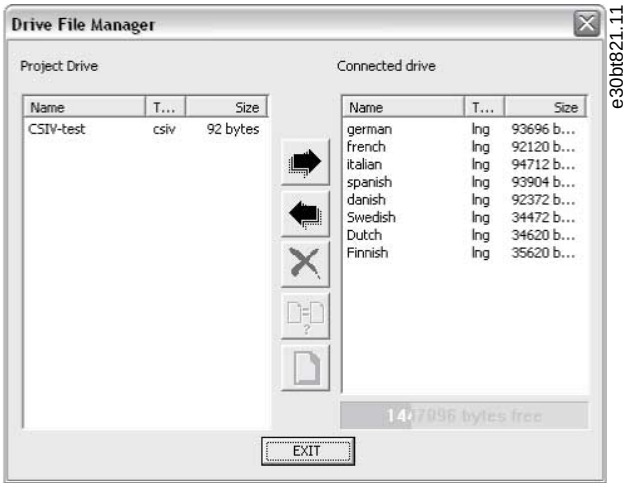


Illustration 164: Present Files

Three buttons are located in the middle of the view. The right arrow transfers the files from the project to the drive flash file system.

Illustration 165: Right Arrow

The left arrow transfers the files from the drive flash file system to the project.

Illustration 166: Left Arrow

The Exit button closes the Drive file manager and switches the drive back to normal mode.

Illustration 167: Exit

8.7 Functional Safety Configuration Plug-in

8.7.1 Introduction

The VLT® Safety Option MCB 15x Series is defined in the safety configuration plug-in:

- Configuration of the safety functions for safe motion shuts down the drive if an error occurs.
- Setting of:
  - Limit values.
  - Braking ramps for the safety functions.
  - Monitoring of motion sequences.

The VLT® AutomationDrive FC 301/FC 302 Operating Guide contains important information about safety systems that must be used to mount and set up the speed monitoring safety functions of the MCB 15x module.

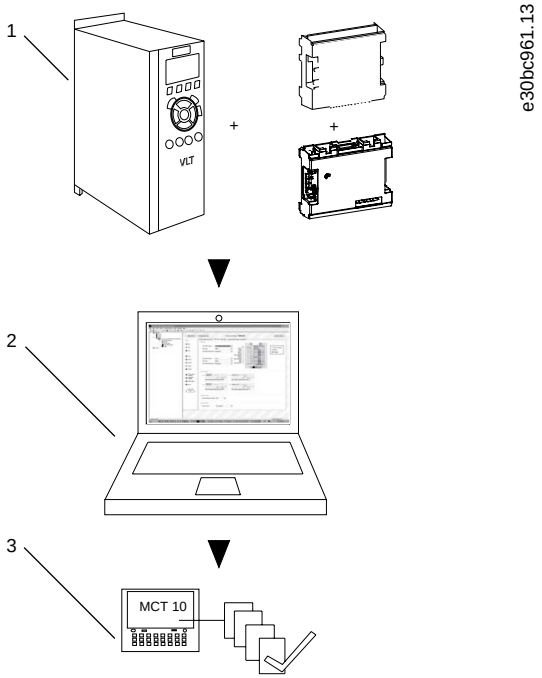


Illustration 168: System Overview

8.7.1.1 Safe Option Compatibility

The VLT® Safety Option MCB 15x Series is supported from SW version 6.64 of VLT® AutomationDrive FC 301/FC 302. Previous versions are not supported. MCB 15x Safe Plug-in supports the following fieldbusses:

- Serial communications:
  - RS232 to RS485
  - USB to RS485
- USB
- PROFIBUS DP-V1

The MCT 10 safe plug-in for the VLT® Safety Option MCB 15x Series offers the following features:

- Offline project planning and preparation for safety functions.
- Commissioning of safety configurations.
- Creating back-ups of safety configurations.
- Safe option diagnosis.
- Monitoring the behavior and fault codes of active drives.

8.7.2 Access

8.7.2.1 Password Management

Access to the VLT® Safety Option MCB 15x Series is restricted with passwords. The password is requested at every commissioning of a new set-up for the device.

8.7.2.2 Accessing the Safe Plug-in for VLT® Safety Option MCB 15x Series

Procedure

1. Expand the drive's network or project view.
2. Expand the relevant drive to show its contents.

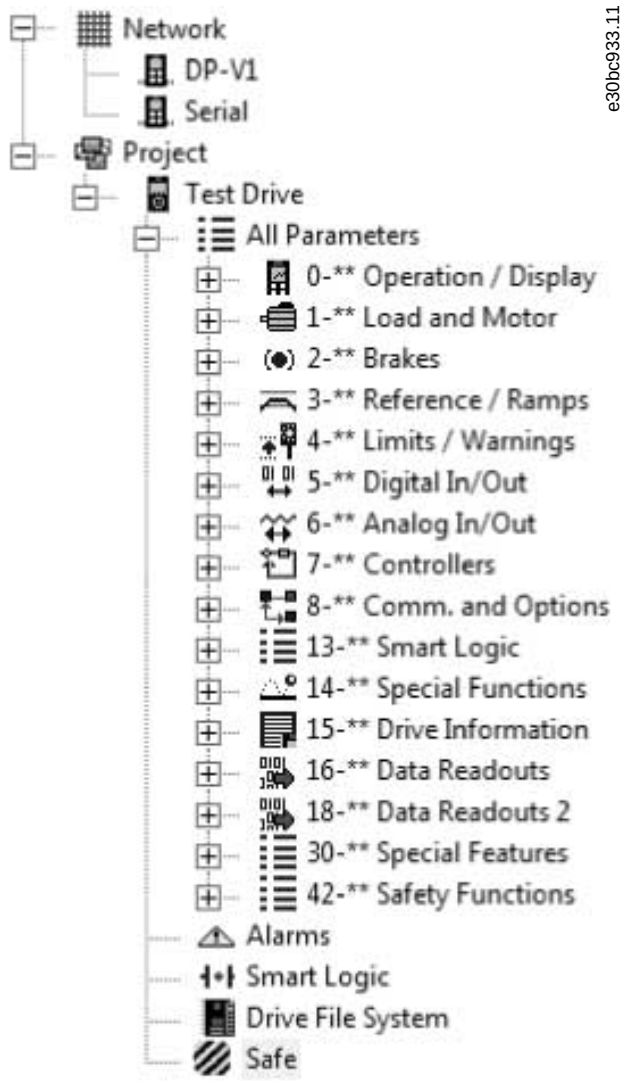


Illustration 169: The Safe Plug-in for MCB 15x (Safe) shown with Functional Safety Icon in Project Tree

If there are multiple separate online or offline drives, select the relevant drive to monitor from the structure tree.

NOTICE

The parameters that can be edited using the safe plug-in for MCB 15x are also included in *parameter group 42-** Safety Functions* in the *All Parameters* group of the structure tree. These parameters can only be edited using the safe plug-in for MCB 15x.

To review *Parameter group 42-** Safety Functions* in the *All parameters* view, expand the *All parameters* group beneath the wanted drive and select the *42-** Safety Functions* entity. The parameter grid is shown on the right.

8.7.3 Safe Plug-in Interface

The layout of the plug-in is divided into separate sections that are all described in more details in this chapter.

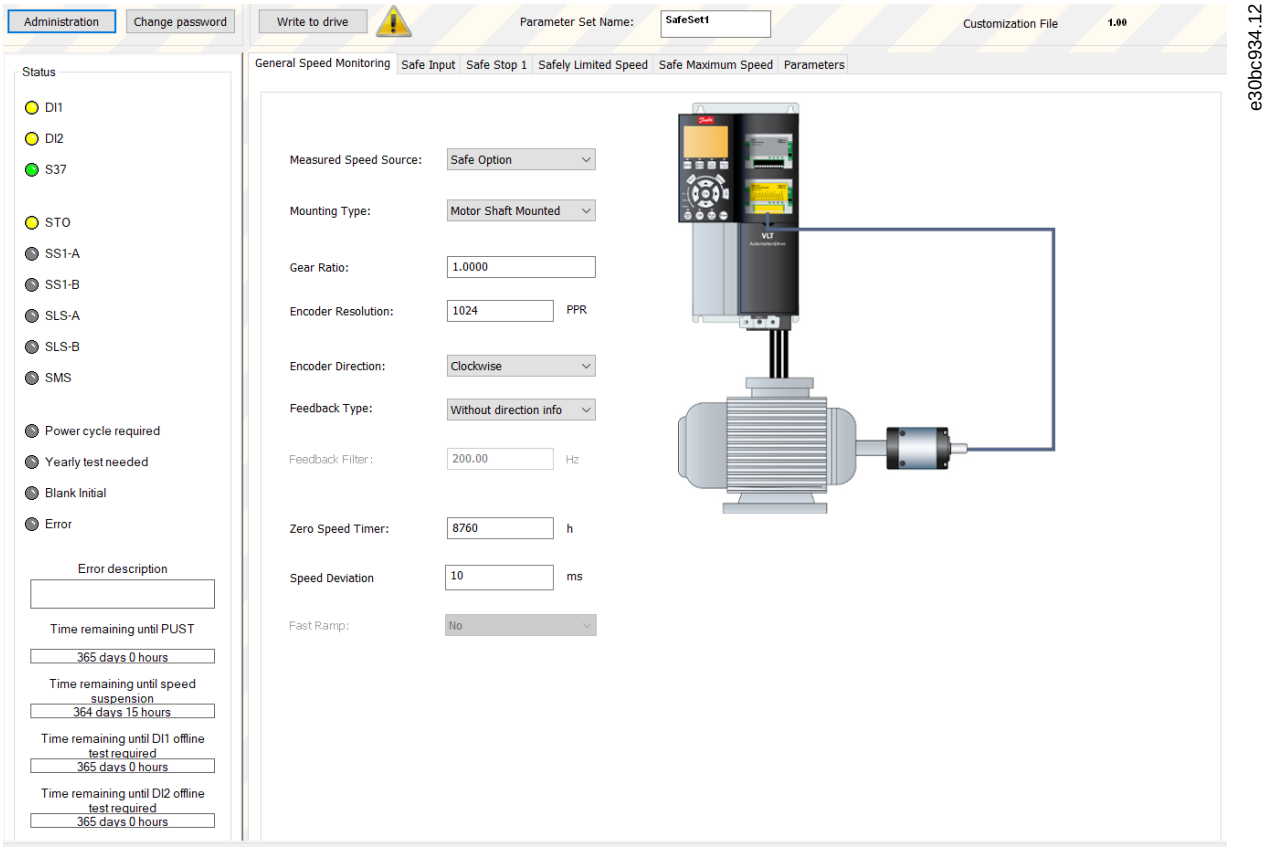


Illustration 170: The Opening Tab of the Safe Plug-in for VLT® Safety Option MCB 15x Series Plug-in Interface (Operating in Offline Mode)

The safe plug-in for the MCB 15x features tooltips for all plug-in interface components. Briefly hovering the mouse cursor over any interface component reveals a tooltip detailing the current option, LED, or tab header. Refer to these tooltips for quick and easy help information.

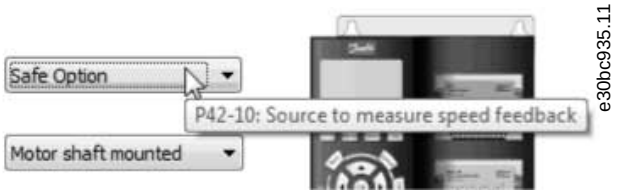


Illustration 171: Tooltip Example

8.7.3.1 Information and Administration Area

Illustration 172: Safe Plug-in for VLT® Safety Option MCB 15x Series Information and Administration Area

The information area at the top of the plug-in interface shows the current safe plug-in for MCB 15x profile name and notifies about pending changes.

Depending on the mode, further options are available in the information area.

- Offline mode: If a drive is connected, press *Write to drive* and upload the configuration to the MCB 15x.
- Online mode: Two more selections are present in the Information area:
  - Administration
  - Change password

The *Notification* icon is shown when there are changes pending for the drive that have not yet been written to it. This icon is shown at every configuration update. The icon is removed from the view only after a successful commissioning procedure.

8.7.3.2 LED Status Area

The left-hand side of the safe plug-in for the VLT® Safety Option MCB 15x Series contains the *Status* pane. The *Status* pane contains informative LED status icons that help to monitor the functionality and status of the safe plug-in for MCB 15x configuration entities.

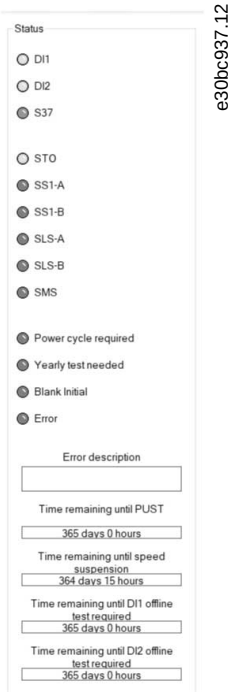


Illustration 173: LED Status Area

NOTICE

The LED icons are active only when the safe plug-in for MCB 15x is accessed in online network mode. When working in offline project mode, the LEDs remain inactive (gray).

Table 19: LED Status Information

LED status	Description
Green	OK state - the option is enabled or active.
Flashing green	Pending state - the option is pending. This applies only to DI1 and DI2 LEDs.
Yellow	Active state - the option is active.
Flashing red	Warning state - the option has encountered a warning state.
Red	Error state - the option has encountered an error.
Gray	Off state - the option is either disabled, offline, or inactive.

Table 20: LED Status Information

LED	Status
DI1	Status of digital input 1.
DI2	Status of digital input 2.
S37	Status of S37 safe output for terminal T37 on the drive.
STO	Status of Safe Torque Off.
SS1-A	Status of Safe Stop 1 A.
SS1-B	Status of Safe Stop 1 B.
SLS-A	Status of Safely Limited Speed A.
SLS-B	Status of Safely Limited Speed B.
SMS	Status of Safe Maximum Speed
Power cycle required	This LED lights up when the device requires a power cycle.
Yearly test needed	Digital inputs must be tested once a year. A warning indicates when it is time to perform the test.
Blank initial	If the LED lights up, the MCB 15x is in a blank initial state, that means in factory settings. When writing to the MCB 15x for the 1st time, provide a new password.
Error	The MCB 15x has detected an error. The specific fault code is shown in the fault code display below the error LED: For more information regarding fault codes, refer to 13.3.3 Warnings and Alarms.

8.7.3.3 Configuration Area

The configuration area contains dedicated sections/tabs for configuring the safety functions.

The sequence of tabs shows the order in which the settings should be configured.

The following sections detail the contents of the configuration tabs:

- General speed monitoring.
- Safe input.
- Safe Stop 1.
- Safely limited speed.
- Safe Maximum Speed

The last tab, *Parameters*, contains a table layout of all configuration options, intended for advanced users.

8.7.3.4 General Speed Monitoring

The *General Speed Monitoring* tab contains primary and general information regarding the encoder/proximity switch feedback set-up details.

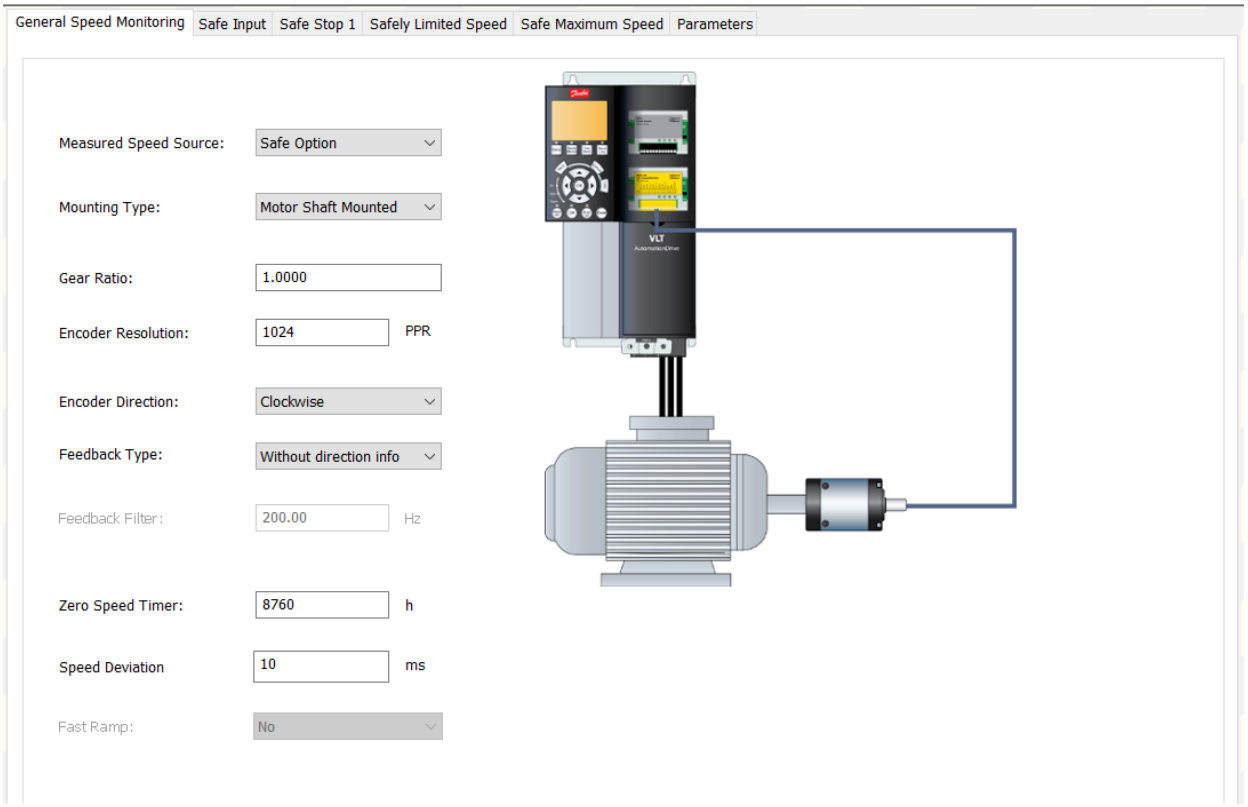


Illustration 174: Speed Monitoring Configuration Tab

The left side of the tab contains the following configuration options:

Table 21: Options for General Speed Monitoring

Option	Description
Measured speed source	This option defines the measured speed feedback source. The following options are available: • Safe plug-in for VLT® Safety Option MCB 15x Series - the feedback source is safe plug-in for MCB 15x. • None - no feedback source is used. • Factory default: [Safe plug-in for MCB 15x].

Option	Description
Mounting type	This option defines where the encoder is mounted. The following options are available: • Gear mounted - the encoder reading the speed is mounted on a shaft using a gear system. • Motor shaft mounted - the encoder is mounted directly to the motor shaft. • Sensorless - the drive is mounted with the VLT® Sensorless Safety MCB 159 option. The encoder senses the motor speed via back EMF.
Gear ratio	This option defines the ratio between motor shaft and the encoder speed. 0.0001 and 32.0000. Factory default: 1.0000.
VLT® Safety Option MCB 150 encoder resolution	This option defines the encoder resolution connected to the safe plug-in for MCB 15x. Range: 1 and 4096 PPR for HTL, and 1 and 1000 PPR for TTL. Factory default: 1024 PPR.
Encoder direction	This option provides the option to change the detected encoder rotation direction without altering the wiring to the encoder itself. The following options are available: • Clockwise - that is positive feedback when the encoder rotates clockwise. • Counterclockwise - that is positive feedback when the encoder rotates counterclockwise. Factory default: [Clockwise].
Feedback type	This option defines the feedback type. The following options are available: • With direction info - the feedback provides direction information, for example an encoder. • Without direction info - the feedback does not provide direction information (proximity switch configuration). Factory default: [With direction info].
Feedback filter	This option defines the frequency used by the feedback filter for low-resolution encoder or proximity switch if the resolution is low. Range: 0.01–200 Hz (off). Factory default: [200 Hz (off)].
Zero speed timer	This option allows the speed to be below 120 RPM when SLS is active before STO is engaged. Range: 0 s and 10000 s. Factory default: [10].

8.7.3.5 Safe Input

The *Safe input configuration* tab details the input channel, settings, failure reaction, and reset functions that are mapped into the VLT® Safety Option MCB 15x Series.

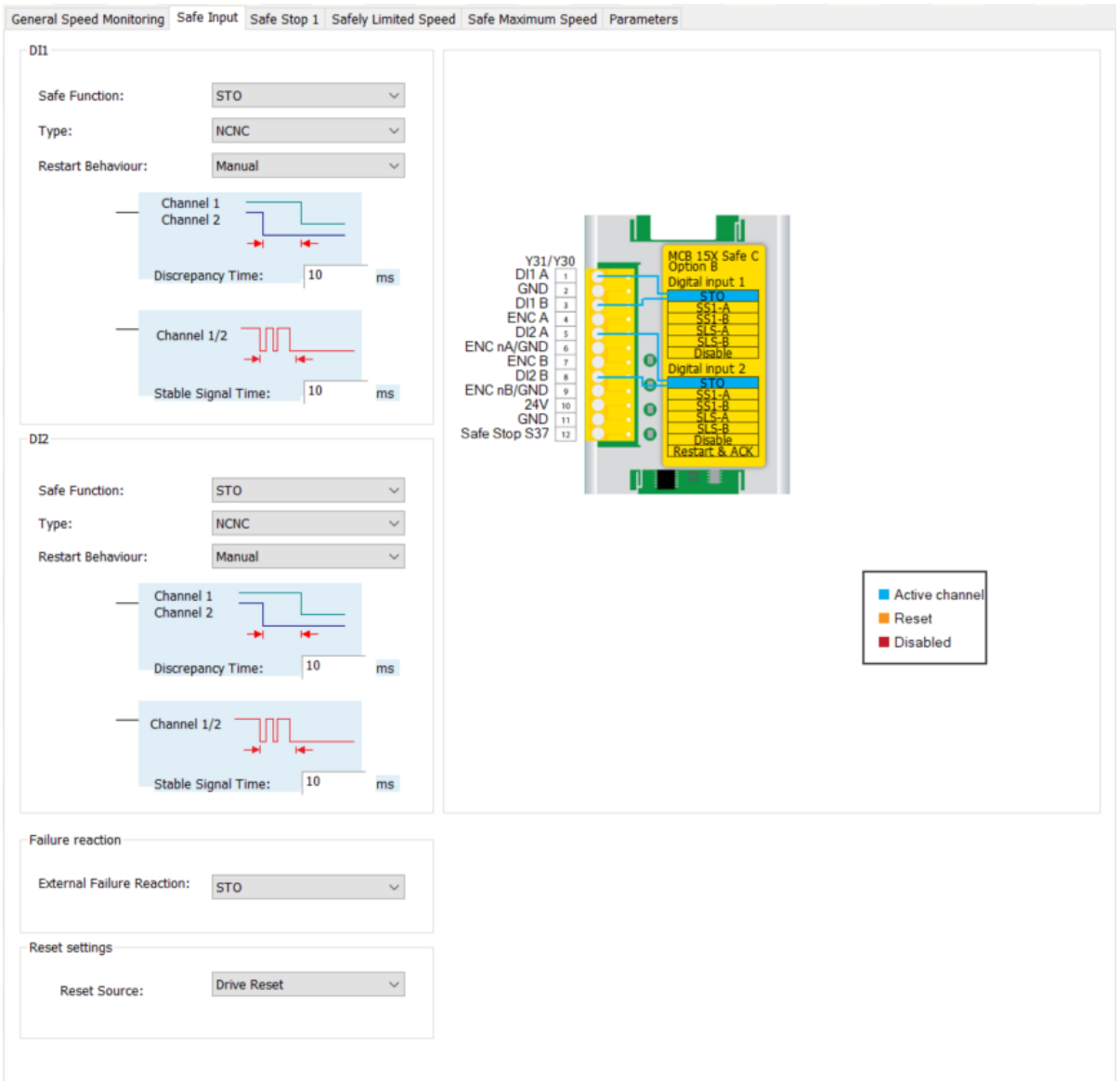


Illustration 175: Safe Input Configuration Tab

The *Safe input* tab contains several sections and configuration possibilities.

Table 22: Options for Safe Input

Option	Description
DI1 safe function	This option defines the safe function used by DI1. The following options are available: • STO - Safe Torque Off is used as the safe functions by DI1. • SS1-A - Safe Stop 1 A is used as the safe function by DI1. • SS1-B - Safe Stop 1 B is used as the safe function by DI1. • SLS-A - Safely Limited Speed A is used as the safe function by DI1. • SLS-B - Safely Limited Speed B is used as the safe function by DI1. • Disabled - The DI1 safe function is disabled. Factory default: STO.
DI1 type	This option defines the DI type used. The following options are available: • NCNC - NCNC type is used. • Antivalent - NO/NC (antivalent) type is used. • NC - 1 NC input type is used.
DI1 restart behavior	Restart of the MCB 15x configured the DI1 start behavior. The following options are available: • Manual - The restart is performed manually. • Automatic - The restart is performed automatically. Factory default: Manual.
DI2	This option defines the safety function used by DI2. The following options are available: • STO - Safe Torque Off is used as the safe functions by DI2. • SS1-A - Safe Stop 1 A is used as the safe function by DI2. • SS1-B - Safe Stop 1 B is used as the safe function by DI2. • SLS-A - Safely Limited Speed A is used as the safe function by DI2. • SLS-B - Safely Limited Speed B is used as the safe function by DI2. • Disabled - The DI2 safe function is disabled. Factory default: STO.
DI2 type	The option defines the DI2 type used. The following options are available: • NCNC - NCNC type is used. • Antivalent - NO/NC (antivalent) type is used. • NC - 1 NC input type is used.
DI2 restart behavior	This option defines the DI2 restart behavior. The following options are available: • Manual – The restart is performed manually. • Automatic – The restart is performed automatically. Factory default: Manual.

Table 23: Options for Input Settings

Option	Description
DI1 discrepancy time	This option defines the time for the DI1 signal discrepancy. Range: 0–5000 ms. Factory default: 10 ms.

Option	Description
DI1 stable signal time	This option defines the time for the DI1 signal to become stable. Range: 0–5000 ms. Factory default: 10 ms.
DI2 discrepancy time	This option defines the time for the DI2 signal discrepancy. Range: 0–5000 ms. Factory default: 10 ms.
DI2 stable signal time	This option defines the time for the DI2 signal to become stable. Range 0–5000 ms. Factory default: 10 ms.

Table 24: Options for Failure Reaction

Option	Description
External failure reaction	This option defines the reaction that is executed if there is an external failure. The following options are available: • STO - STO is executed. • SS1-A - SS1-A is executed. • SS1-B - SS1-B is executed. Factory default: STO.

Table 25: Options for Reset Settings

Option	Description
Reset source	This option defines the source for the reset signal for safe plug-in for MCB 15x. The following options are available: • Drive Reset - The source is a drive reset. • Drive Safe Reset - The source is a safe drive reset. • Safe Option DI2_A - The source is MCB 15x DI2_A. Factory default: Drive Reset.

8.7.3.6 Safe Stop 1

The *Safe Stop 1* tab allows setting specific scenarios for safe stopping of the drive using designated conditions.

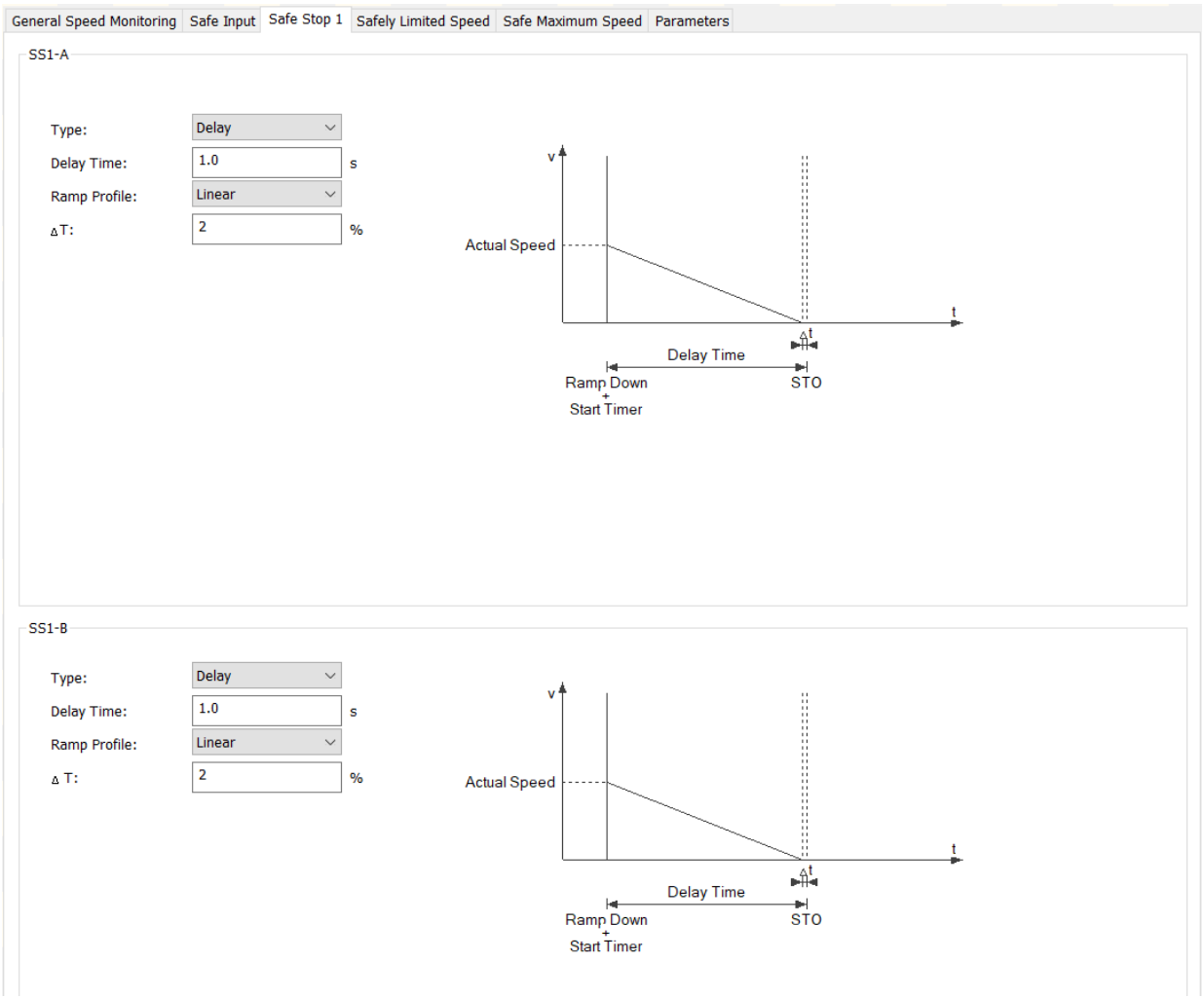


Illustration 176: Safe Stop 1 Tab

The *Safe Stop 1* tab contains the following separated sections with the following configuration possibilities:

Table 26: Options for SS1-A

Option	Description
Type	This option defines the type for the safe stopping configuration. The following options are available: • Delay - a delay is used to stop the drive safely. • Ramp - a ramp is used to stop the drive safely. Factory default: Delay.

Option	Description	
Type: Delay	The following configuration options are available when the type is set to delay:	
	Delay time	This option defines the amount of time that is used by the SS1 delay function to ramp the speed down to 0 RPM. Range: 0.1–3600 s. Factory default: 1 s.
	Ramp profile	This option defines the ramp profile setting. The following options are available: • Linear - a linear ramp is used for the delay. • S-ramp const. time - a constant time ramp is used to stop the drive safely. Factory default: Linear.
	Delta time	This option defines buffer time that is added to the delay time before activating STO. Range: 0–99%.
	S-ramp Ratio start	This option is configurable only when S-ramp constant time is selected as the ramp profile. This option defines the proportion of the total ramp-down time where the deceleration torque increases. The greater the percentage value, the greater the jerk compensation achieved, and thus the lower the torque jerks in the application. Range: 1–50%. Factory default: 50%.
	S-ramp Ratio end	This option is configurable only when S-ramp constant time is selected as the ramp profile. This option defines the proportion of the total ramp-down time where the deceleration torque increases. The greater the percentage value, the greater the jerk compensation achieved, and thus the lower the torque jerks in the application. Range: 1–50%. Factory default: 50%.

Option	Description	
Type: Ramp	The following configuration options are available when the type is set to ramp:	
	Ramping set-up	This option defines the ramping set-up used. The following options are available: • Slope - a sloping ramp is used. • Time - a time ramp is used.
	Deceleration rate	This option is configurable only when slope is selected for the ramping set-up. This option defines the deceleration rate for the SS1 slope-based ramp style. Range: 1–30000 RPM/s. Factory default: 1500 RPM/s.
	Ramp time	This option is configurable only when time is selected for the ramping set-up. It defines the time after which the safe plug-in for VLT® Safety Option MCB 15x Series engages the STO.
	Delta V	This option defines the tolerance between the calculated speed and the actual speed that the safe plug-in for MCB 15x allows. Range: 1–10000 RPM. Factory default: 120 RPM.
	Zero speed	This option defines the speed at which safe plug-in for MCB 15x engages the STO. Range: 1–600 RPM. Factory default: 10 RPM.

Table 27: Options for SS1-B

Option	Description
Type	This option defines the type for the safe stopping configuration. The following options are available: • Delay - a delay is used to stop the drive safely. • Ramp - a ramp is used to stop the drive safely. Factory default: Delay.

Option	Description	
Type: Delay	The following configuration options are available when the type is set to delay:	
	Delay time	This option defines the amount of time that is used by the SS1 delay function to ramp the speed down to 0 RPM. Range: 0.1–3600 s. Factory default: 1 s.
	Ramp profile	This option defines the ramp profile setting. The following options are available: • Linear - a linear ramp is used for the delay. • S-ramp const. time - a constant time ramp is used to stop the drive safely. Factory default: Linear.
	Delta time	This option defines buffer time that is added to the delay time before activating STO. Range: 0–99%.
	S-ramp Ratio start	This option is configurable only when S-ramp constant time is selected as the ramp profile. This option defines the proportion of the total ramp-down time where the deceleration torque increases. The greater the percentage value, the greater the jerk compensation achieved, and thus the lower the torque jerks in the application. Range: 1–50%. Factory default: 50%.
	S-ramp Ratio end	This option is configurable only when S-ramp constant time is selected as the ramp profile. This option defines the proportion of the total ramp-down time where the deceleration torque increases. The greater the percentage value, the greater the jerk compensation achieved, and thus the lower the torque jerks in the application. Range: 1–50%. Factory default: 50%.

Option	Description	
Type: Ramp	The following configuration options are available when the type is set to ramp:	
	Ramping set-up	This option defines the ramping set-up used. The following options are available: • Slope - a sloping ramp is used. • Time - a time ramp is used.
	Deceleration rate	This option is configurable only when slope is selected for the ramping set-up. This option defines the deceleration rate for the SS1 slope-based ramp style. Range: 1–30000 RPM/s. Factory default: 1500 RPM/s.
	Ramp time	This option is configurable only when time is selected for the ramping set-up. It defines the time after which the safe plug-in for VLT® Safety Option MCB 15x Series engages the STO.
	Delta V	This option defines the tolerance between the calculated speed and the actual speed that the safe plug-in for MCB 15x allows. Range: 1–10000 RPM. Factory default: 120 RPM.
	Zero speed	This option defines the speed at which safe plug-in for MCB 15x engages the STO. Range: 1–600 RPM. Factory default: 10 RPM.

8.7.3.7 Safely Limited Speed

The *Safely Limited Speed* tab allows setting specific scenarios for safely limited speeds of the drives using designated conditions.

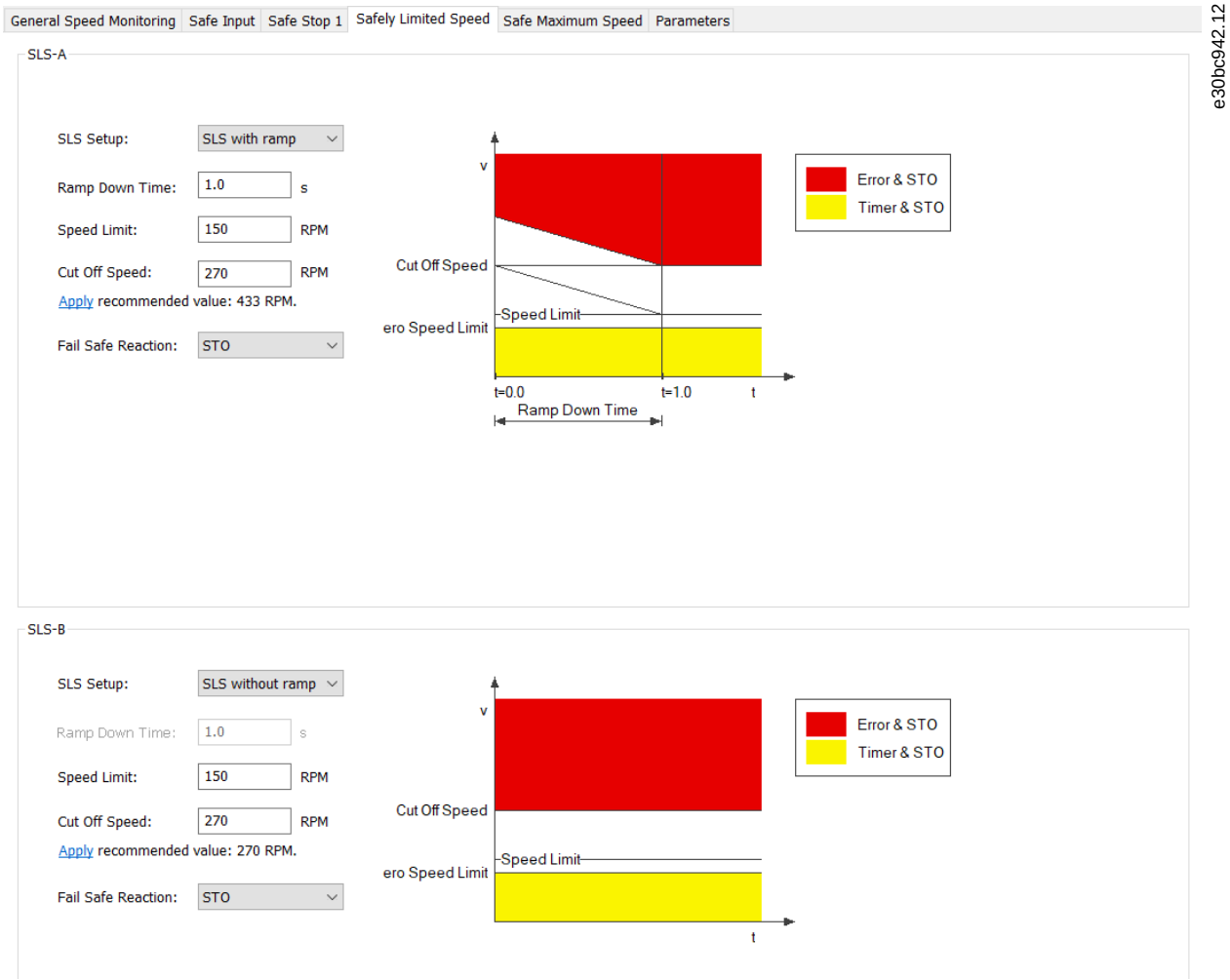


Illustration 177: Safely Limited Speed Tab

The safely limited speed contains the following separated sections with the following configuration possibilities:

Table 28: Options for SLS-A

Option	Description
SLS set-up	This option defines the type of the safely limited speed set-up. The following options are available: • SLS without ramp. • SLS with ramp.
Ramp-down time	This option is configurable only when the SLS with ramp is selected in SLS set-up. It defines the ramp-down time for start ramp. Range: 0.1–3600 s. Factory default: 1 s.

Option	Description
Cutoff speed	This option defines the speed at which the fail-safe reaction is activated. This setting should equal the value of the speed limit parameter plus tolerance. Range: 1–10000 RPM.
Speed limit	This option defines the maximum allowed speed when the SLS function is engaged. This is a speed unit measured in RPM.
Fail-safe reaction	This option defines the safety function that is engaged when the maximum speed is exceeded. The following options are available: • STO - Safe Torque Off is used. • SS1-A - Safe Stop 1-A is used. • SS1-B - Safe Stop 1-B is used.

Table 29: Options for SLS-B

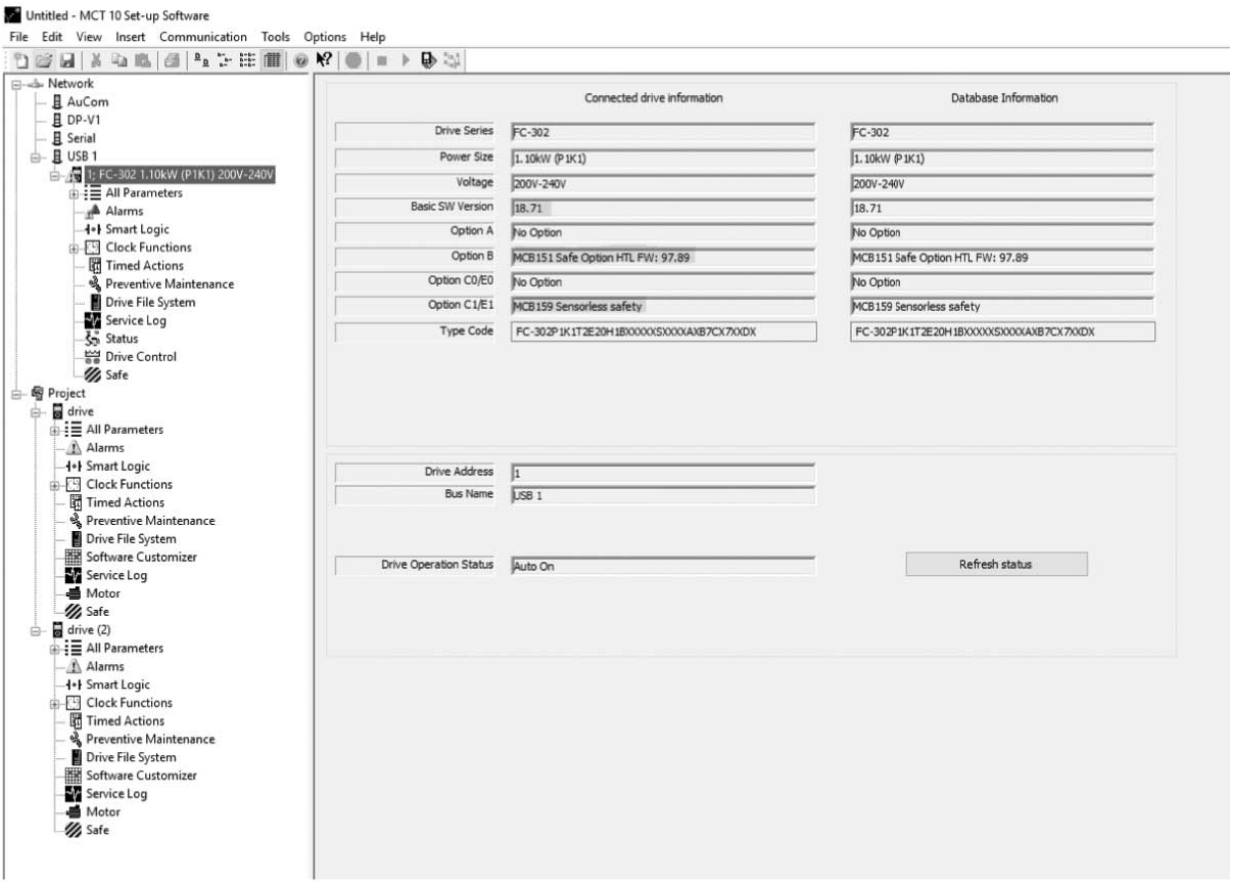
Option	Description
SLS set-up	This option defines the type of the safely limited speed set-up. The following options are available: • SLS without ramp. • SLS with ramp.
Ramp-down time	This option is configurable only when the SLS with ramp is selected in SLS set-up. It defines the ramp-down time for start ramp. Range: 0.1–3600 s. Factory default: 1 s.
Cutoff speed	This option defines the speed at which the fail-safe reaction is activated. This setting should equal the value of the speed limit parameter plus tolerance. Range: 1–10000 RPM.
Speed limit	This option defines the maximum allowed speed when the SLS function is engaged. This is a speed unit measured in RPM.
Fail-safe reaction	This option defines the safety function that is engaged when the maximum speed is exceeded. The following options are available: • STO - Safe Torque Off is used. • SS1-A - Safe Stop 1-A is used. • SS1-B - Safe Stop 1-B is used.

8.7.3.8 Safe Maximum Speed - SMS

NOTICE

SOFTWARE VERSION

The SMS function is only available in drives with software version 8.31 or newer.

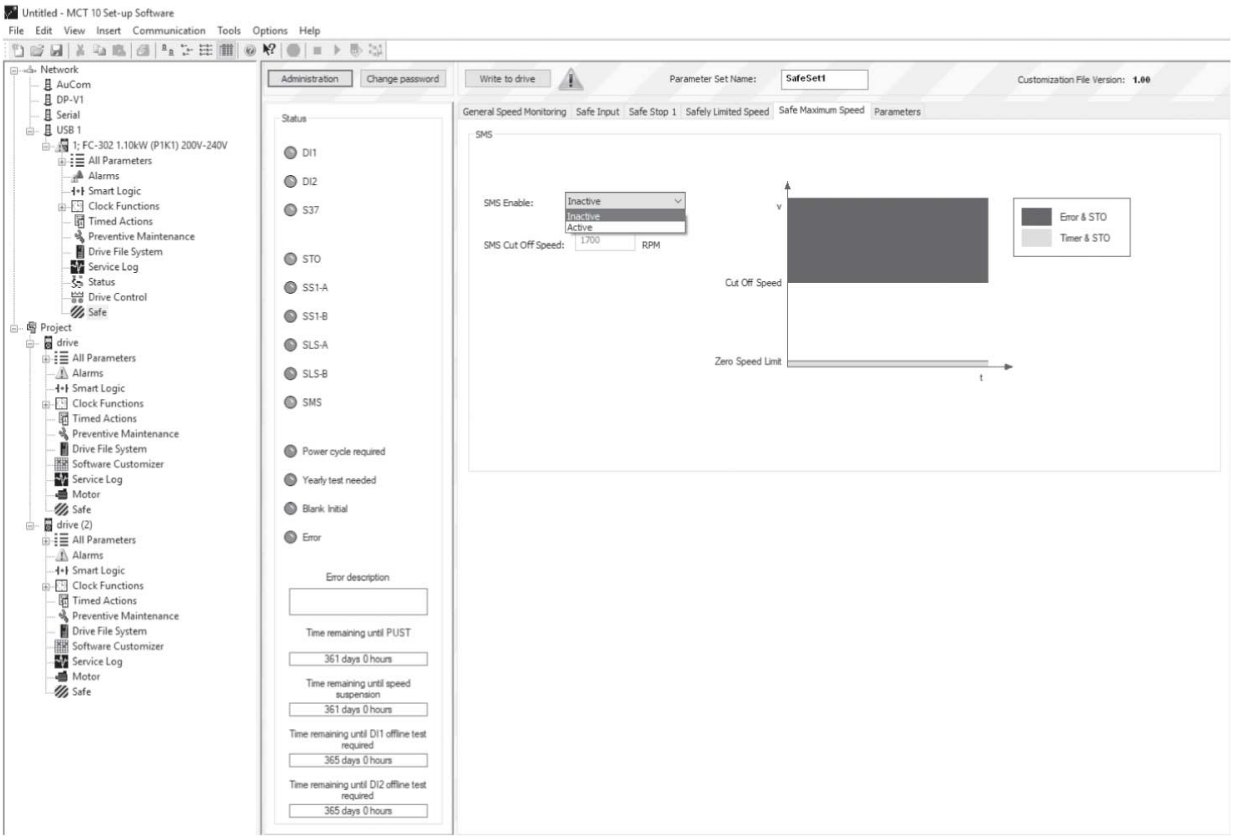


e30bu305.10

Illustration 178: Identification of Drive Software Version

If a VLT® AutomationDrive FC 302 has the VLT® Sensorless Safety MCB 159 option installed, the Safe Maximum Speed function is available. The MCB 159 offers safe speed monitoring and prevents continuously exceeding a defined speed value.

Use the SMS function to monitor machine speed. When maximum allowed speed is exceeded, STO is activated as fail-safe reaction. In the *Safe Maximum Speed* tab, it is possible to enable or disable the SMS function and to set the cutoff speed in RPM.



e30bu306.10

Illustration 179: Safe Maximum Speed Configuration Tab

Table 30: Options for Safe Maximum Speed

Option	Description
SMS enable	The setting of this option selects whether or not the SMS function is enabled: • Inactive - the SMS function is not enabled. • Active - the SMS function is enabled.
SMS Cut off Speed	Set at which RPM the SMS function should cut off the drive.

8.7.4 Configuration

Configure the safe plug-in in online mode (PC connected to drive) or in offline mode (no PC connected to drive). In both cases, enter the required values in the configuration dialogs to configure the plug-in.

NOTICE

Multiple value entry fields in the configuration tabs are accompanied by recommended value settings that appear below the text field. The recommended values are generated dynamically based on the user input of related and dependent configuration options. To apply a recommended value to a field, press the underlined *Apply* link as it appears below the desired field.

Offline configuration

When configuring the VLT® Safety Option MCB 15x Series in an offline project mode, the configuration is stored in the project. After completing the configuration, connect to the PC and write to the drive.

NOTICE

The LED status icons are not active in offline mode.

Online configuration

Changed settings within safe plug-in for MCB 15x are not applied before they are written to the device.

NOTICE

If the safe plug-in for the MCB 15x interface is closed before the changes have been written to the drive, the changes are lost.

8.7.4.1 Configuring the Safe Plug-in Online

Procedure

1. Connect the safe plug-in for MCB 15x to the drive.
2. Click *Write to drive* to apply changed settings in the safe plug-in. Writing the values to the drive always updates the entire device package and not just the changed value.

8.7.4.2 Dependencies

Multiple configurable safety parameters depend on other safety parameter values. The safe plug-in for VLT® Safety Option MCB 15x Series features notification dialogs that inform about the possible consequences. It is then possible to verify the changes and either accept or discard the change.

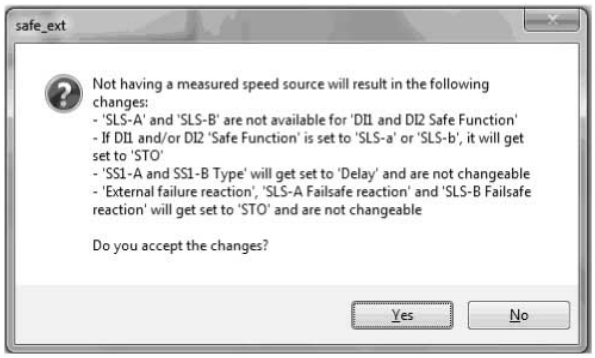
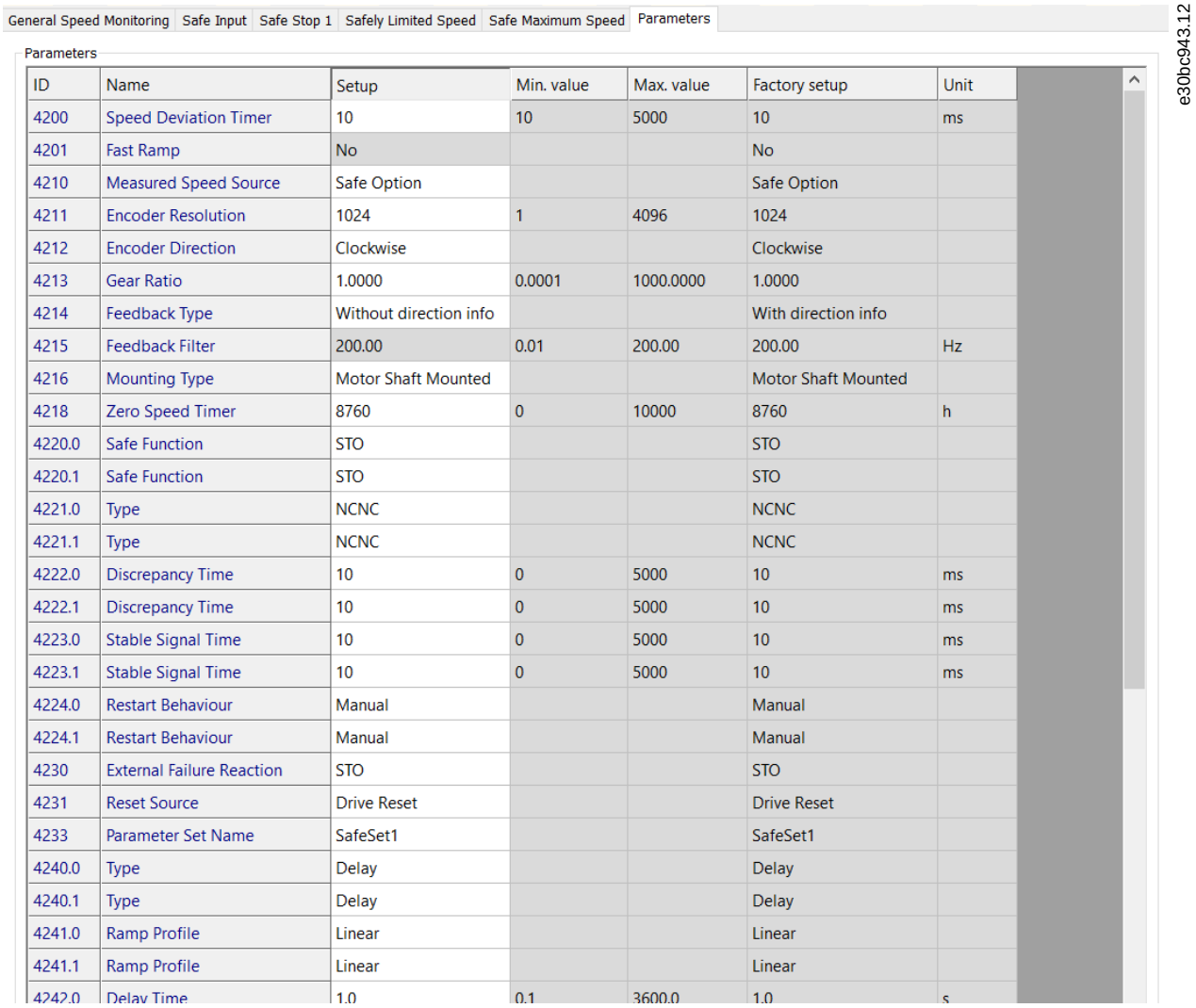


Illustration 180: Dependencies Confirmation Dialog

When accepting the dependency dialog, both the change that caused the dependency dialog and all other configuration items listed in the dependency dialog are applied.

8.7.4.3 Advanced Configuration Parameters

In the configuration area, the parameters section is a table format value entry for all configuration settings intended for advanced users.



ID	Name	Setup	Min. value	Max. value	Factory setup	Unit
4200	Speed Deviation Timer	10	10	5000	10	ms
4201	Fast Ramp	No			No	
4210	Measured Speed Source	Safe Option			Safe Option	
4211	Encoder Resolution	1024	1	4096	1024	
4212	Encoder Direction	Clockwise			Clockwise	
4213	Gear Ratio	1.0000	0.0001	1000.0000	1.0000	
4214	Feedback Type	Without direction info			With direction info	
4215	Feedback Filter	200.00	0.01	200.00	200.00	Hz
4216	Mounting Type	Motor Shaft Mounted			Motor Shaft Mounted	
4218	Zero Speed Timer	8760	0	10000	8760	h
4220.0	Safe Function	STO			STO	
4220.1	Safe Function	STO			STO	
4221.0	Type	NCNC			NCNC	
4221.1	Type	NCNC			NCNC	
4222.0	Discrepancy Time	10	0	5000	10	ms
4222.1	Discrepancy Time	10	0	5000	10	ms
4223.0	Stable Signal Time	10	0	5000	10	ms
4223.1	Stable Signal Time	10	0	5000	10	ms
4224.0	Restart Behaviour	Manual			Manual	
4224.1	Restart Behaviour	Manual			Manual	
4230	External Failure Reaction	STO			STO	
4231	Reset Source	Drive Reset			Drive Reset	
4233	Parameter Set Name	SafeSet1			SafeSet1	
4240.0	Type	Delay			Delay	
4240.1	Type	Delay			Delay	
4241.0	Ramp Profile	Linear			Linear	
4241.1	Ramp Profile	Linear			Linear	
4242.0	Delay Time	1.0	0.1	3600.0	1.0	s

Illustration 181: Parameters Configuration Tab

NOTICE

Prepare a complete list of all configuration items and their respective values before commissioning.

8.7.4.4 Parameter Lists

NOTICE

Parameters ending with .0 are used for either SS1-A or SLS-A. Parameters ending with .1 are used for either SS1-B or SLS-B in the *parameter groups 42-4* SS1* and *42-5* SLS*. For *parameter group 42-2* Input*, .0 refers to DI1 and .1 to DI2.

Table 31: Complete List of Parameters for Configuring via the Safe Plug-in

Parameter	Description	Factory value
4200	Speed Deviation Timer - The amount of time for which a speed diviation above 120 RPM between estimated and measured speed is allowed.	10 ms
4201	Fast Ramp - Use when fast ramping is needed with poor resolution of measured speed.	No
4210	Measured speed source – The source of the speed feedback.	Safe option
4211	Encoder resolution – The resolution of the encoder connected to the safe plug-in for MCB 15x.	1024
4212	Encoder direction.	Clockwise
4213	Gear ratio – The ratio between the motor speed and the encoder speed.	10.000
4214	Feedback type.	With direction info
4215	Feedback filter – The frequency of the feedback filter.	200.00
4216	Mounting Type - Location where the measured speed source is mounted.	Motor shaft mounted
4218	Zero speed timer – The timer for the zero speed activation.	10
4220.0	Safe function – The safe function selected.	STO
4220.1	Safe function – The safe function selected.	STO
4221.0	Type – The type of the safe input.	NCNC
4221.1	Type – The type of the safe input.	NCNC
4222.0	Discrepancy time – The time amount allowed for discrepancy.	10
4222.1	Discrepancy time – The amount of time allowed for discrepancy.	10
4223.0	Stable signal time – The amount of time for a stable signal.	10
4223.1	Stable signal time – The amount of time for a stable signal.	10
4224.0	Restart behavior – The restart behavior of the safe plug-in for MCB 15x, automatic or with user input.	Manual
4224.1	Restart behavior – The restart behavior of the safe plug-in for MCB 15x, automatic or with user input.	Manual
4230	External failure reaction – The safety function that is executed if there is an external failure.	STO
4231	Reset source – The source for the reset signal.	Drive reset
4233	Parameter set name – The title for the current safe plug-in for MCB 15x configuration. The maximum length of the parameter set name is 8 symbols.	–
4240.0	Type – Type of the safe stop function.	Delay
4240.1	Type – Type of the safe stop function.	Delay
4241.0	Ramp profile – The ramp profile that is either defined by the safe plug-in for MCB 15x or within the drive itself.	Linear

Parameter	Description	Factory value
4241.1	Ramp profile – The ramp profile that is either defined by the safe plug-in for MCB 15x or within the drive itself.	Linear
4242.0	Delay time – The amount of time spent by the safe stop function to ramp the speed down to 0 RPM.	1.0
4242.1	Delay time – The amount of time spent by the safe stop function to ramp the speed down to 0 RPM.	1.0
4243.0	Delta T – The buffer time that is added to the delay time before activating STO.	2
4243.1	Delta T – The buffer time that is added to the delay time before activating STO.	2
4244.0	Deceleration rate – The deceleration rate for the safe stop slope ramp type.	1500
4244.1	Deceleration rate – The deceleration rate for the safe stop slope ramp type.	1500
4245.0	Delta V – The tolerance between the calculated and actual speeds allowed by the safe plug-in for MCB 15x.	120
4245.1	Delta V – The tolerance between the calculated and actual speeds allowed by the safe plug-in for MCB 15x.	120
4246.0	Zero speed – The zero speed limit that the safe plug-in for MCB 15x uses to engage STO.	10
4246.1	Zero speed – The zero speed limit that the safe plug-in for MCB 15x uses to engage STO.	10
4247.0	Ramp time – The ramp time that the safe plug-in for MCB 15x uses to engage STO.	1.0
4247.1	Ramp time – The ramp time that the safe plug-in for MCB 15x uses to engage STO.	1.0
4248.0	S-ramp Ratio at deceleration start – The proportion of the total ramp-down time wherein the deceleration torque increases. The greater the percentage value, the greater the jerk compensation achieved.	50
4248.1	S-ramp Ratio at deceleration start – The proportion of the total ramp-down time wherein the deceleration torque increases. The greater the percentage value, the greater the jerk compensation achieved.	50
4249.0	S-ramp Ratio at deceleration end – The proportion of the total ramp-down time wherein the deceleration torque decreases. The greater the percentage value, the greater the jerk compensation achieved.	50
4249.1	S-ramp Ratio at deceleration end – The proportion of the total ramp-down time wherein the deceleration torque decreases. The greater the percentage value, the greater the jerk compensation achieved.	50
4250.0	Cutoff speed – The speed at which the fail-safe reaction is engaged.	–
4250.1	Cutoff speed – The speed at which the fail-safe reaction is engaged.	–
4251.0	Speed limit – The maximum speed allowed when the safe limited-speed function is engaged.	–
4251.1	Speed limit – The maximum speed allowed when the safe limited-speed function is engaged.	–
4252.0	Fail-safe reaction – The safety function that is activated when the speed exceeds the limit set.	STO
4252.1	Fail-safe reaction – The safety function that is activated when the speed exceeds the limit set.	STO
4253.0	Start ramp – If the speed at the activation of safe limited speed is greater than the speed limit, the function either ramps down to the speed limit (Yes value) or activates the STO (No value.).	No
4253.1	Start ramp – If the speed at the activation of safe limited speed is greater than the speed limit, the function either ramps down to the speed limit (Yes value) or activates the STO (No value.).	No

Parameter	Description	Factory value
4254.0	Ramp-down time – The ramp-down time for starting the ramp.	1.0
4254.1	Ramp-down time – The ramp-down time for starting the ramp.	1.0
4270	Activation - Use for activating or deactivating Safe Maximum Speed.	Inactive
4271	Cut Off Speed - The maximum allowed speed.	1500 RPM

8.7.5 Commissioning

Procedure

1. Configure a safe plug-in for VLT® Safety Option MCB 15x Series.
2. Click *Write to drive* to upload to the drive.
   → The status window opens.

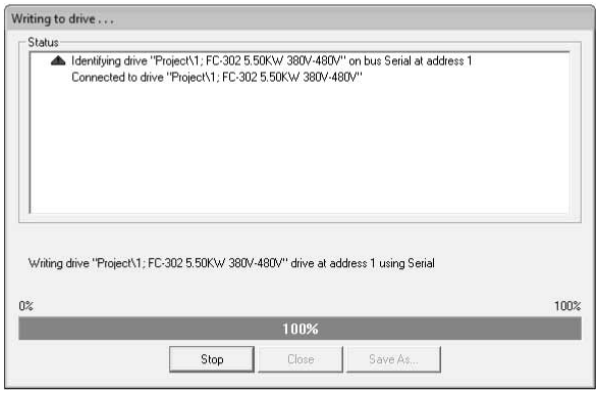


Illustration 182: Writing to Drive Status Window

3. Enter the password when the *Confirm password* dialog pops up (default password: 12345678).

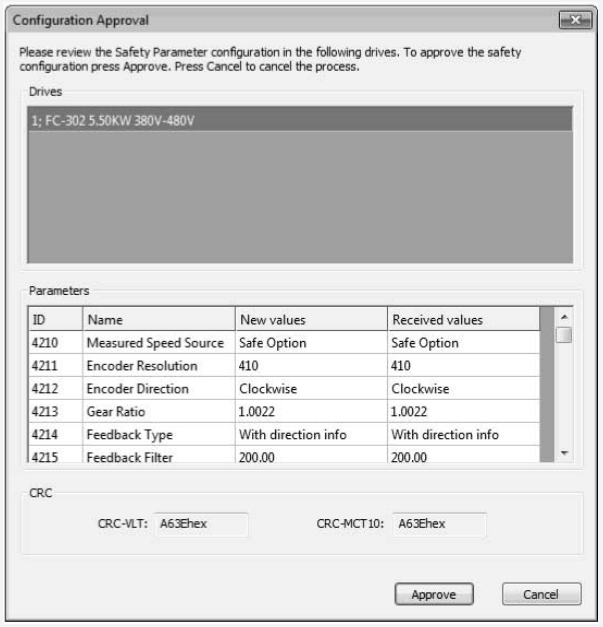
For more information on changing password, refer to 8.7.6.3 Change Password.

Illustration 183: Password Entry Dialog

4. Press *OK* to continue OR press *Cancel* to discard the process and perform a rollback.

NOTICE

When writing to a device in blank state, the user is prompted to provide a new password for the device. Have the appropriate default password available at hand.



e30bc946.11

Drives The top section of the summary shows all drives affected by the write procedure. If there are multiple drives, press the drive titles in the window to update parameters and CRC accordingly.	**Parameters** This section details all the updated parameters that were written to the drive.
ID The parameter ID written.	**Name** The name of the parameter written.
New values The value of the parameter that was designated to be written to the drive. This column must have the same value as *Received values*. If not, an error is shown.	**Received values** The value that was received from the drive after the update procedure. This column must have the same value as *New values*. If not, an error is shown.
CRC This section shows the CRC values that were generated from the application side and the drive side. These values must match. If not, an error is shown.	

Illustration 184: Configuration Approval Dialog and Summary

5. When the configuration approval pops up, review the included summary.
6. Click *Approve* to confirm the changes and close the dialog window, OR click *Cancel* to discard the process and perform a rollback.
   → When the configuration is approved, the commissioning report is generated and shown.

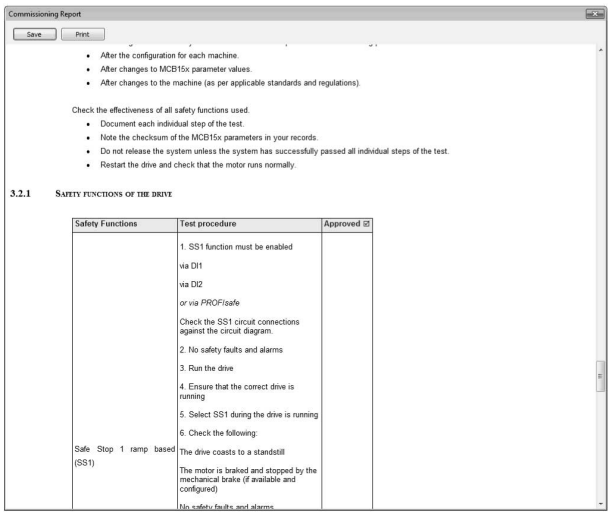


Illustration 185: Commission Report Review, Save, and Print Dialog

7. Click *Save* to save the commission report in Rich Text Format.
8. Click *Print* to print the report.
9. When the commissioning process is complete, press [Reset] on the drive to reboot.

8.7.5.1 Commissioning Report

During the commission process, the commission report is generated based on a fixed template within the MCT 10 application. The report contains all data written to the drive.

The report is generated during the write-to-drive procedure and the data is gathered at the moment the report is generated. This report contains the functions that must be tested, see more details in VLT® Safety Option MCB 15x Installation Guide and in VLT® Safety Option MCB 152 Operating Instructions.

The contents and structure of the commissioning report are as follows:

- General introduction - general information and details about the report itself.
- Commissioning configuration - details regarding the commissioned set-up and parameter configurations.
- Commissioning test - specific testing scenarios for the current set-up. This section also contains CRC check procedure descriptions.

8.7.6 Operation

The following sections describe how to use the diagnostics function, how to reset, and how to change password.

8.7.6.1 Using the Diagnostics Function

Procedure

1. Open the Safe Plug-in for VLT® Safety Option MCB 15x Series plug-in interface in network online mode.
2. Click *Administration* in the upper section of the interface.
   → The Safe Plug-in for MCB 15x Administration Window opens.

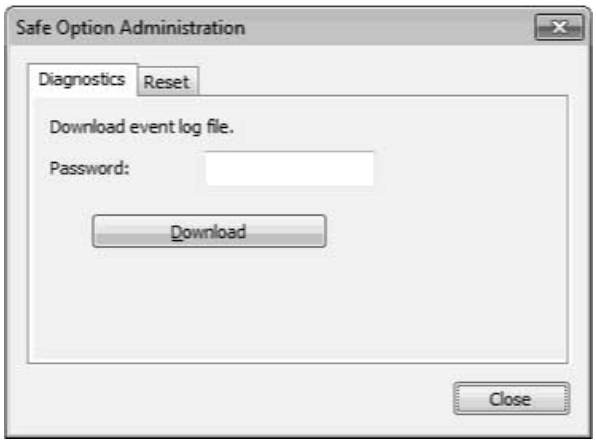


Illustration 186: Safe Plug-in for MCB 15x Administration Window

3. Enter the Safe Plug-in for MCB 15x password configured for the drive.
4. Click *Download* to download the Safe Plug-in for MCB 15x event log.
5. Select a location to save the log file. The log is presented in simple text file format.

8.7.6.2 Using the Reset Function

Context:

NOTICE

Resetting the device restores factory settings and erases any customized configuration on the device. To ensure rollback possibility, back up the customized configuration before resetting.

Procedure

1. Open the safe plug-in for VLT® Safety Option MCB 15x Series plug-in interface in network online mode.
2. Click *Administration* in the upper section of the interface.
3. Click the Reset tab header to open the *Reset* tab.
   → The *Reset Password* window opens.

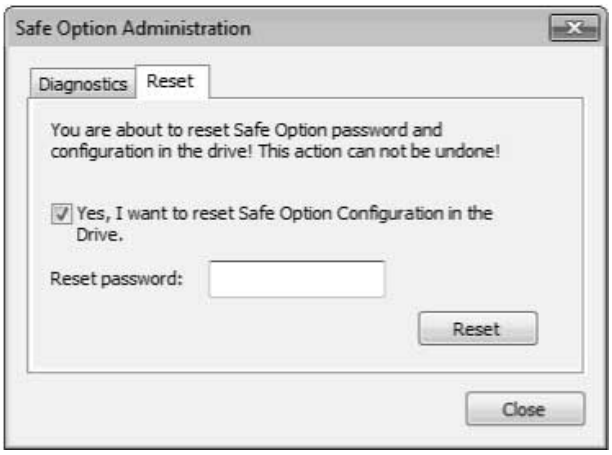


Illustration 187: Reset Password Window

4. Tick *Yes, I want to reset Safe Option Configuration in the Drive* for the drive to continue.
5. Enter the master password configured for the drive to continue.
6. Click *Reset* to reset the drive password and configuration.
7. Press [Reset] on the drive to reboot.

8.7.6.3 Change Password

Context:

When working with the safe plug-in for VLT® Safety Option MCB 15x Series plug-in in network online mode, *Change password* is shown in the information area of the plug-in interface.

Illustration 188: Safe Plug-in for MCB 15x Password Changing Window

Procedure

1. Click *Change password*.
2. Enter the current password into the *Current password* field.
3. Enter the new password into the *New password* field. The password length must be exactly 8 characters. The password is case sensitive.
4. Confirm the new desired password by entering it again into the *Confirm new password* field.
5. If necessary, select the option *Confirm to all blank initial drives* to apply the new password to all new drives in the network.
6. Click *Cancel* to discard the procedure.

8.8 Status Plug-in

The Status plug-in is an online plug-in that shows the digital status words, control words, and alarm words.

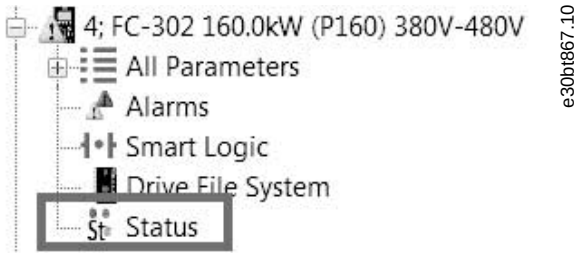


Illustration 189: Selecting the Status Plug-in

The plug-in only shows the available parameters. For each control word and status word, it shows the value in hex, reference, and control word profile. The plug-in shows all bits. Green LEDs indicate active bits (value = 1), while gray LEDs indicate inactive bits. The highlighted text shows the meaning of the bit status.

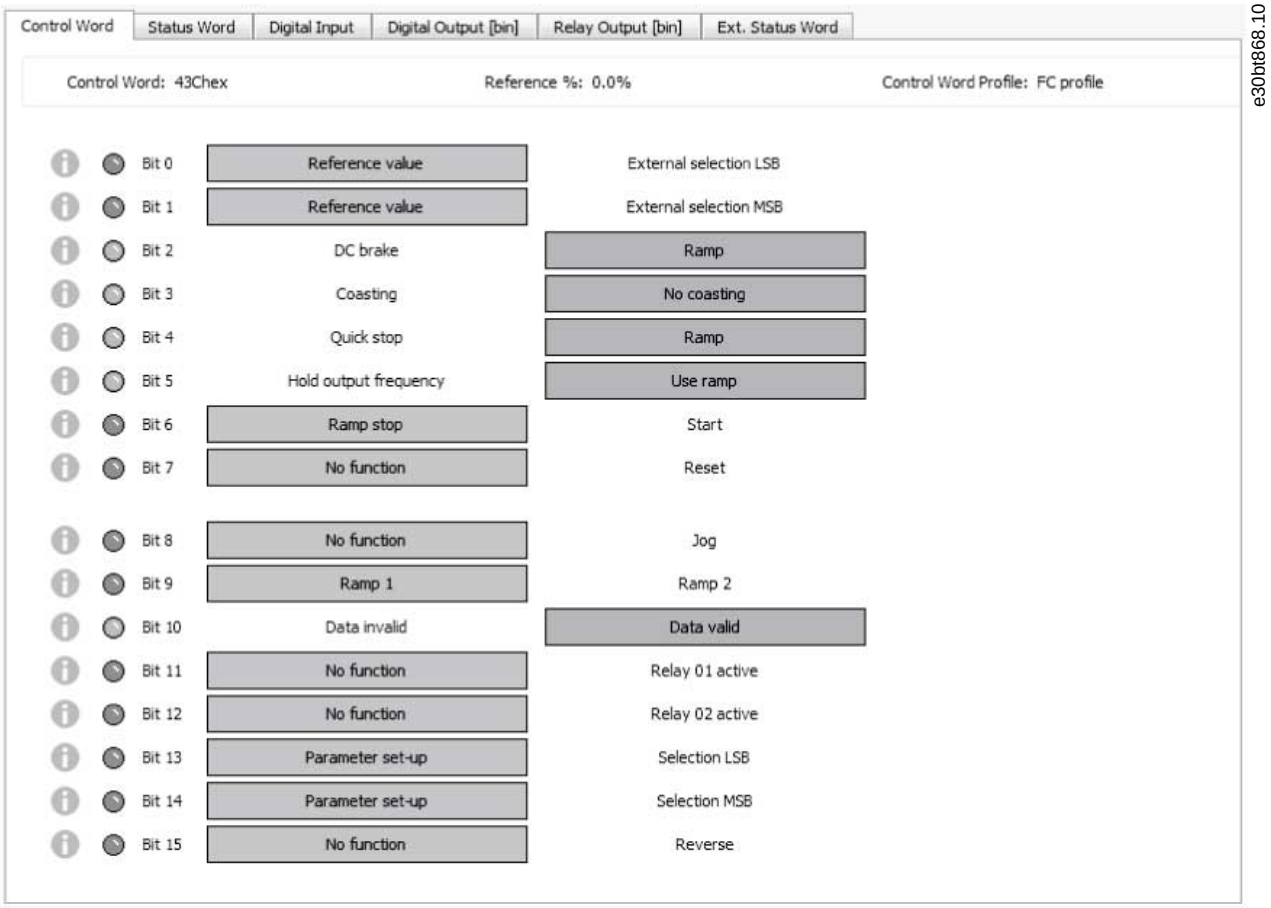


Illustration 190: Example of Bit Status for Control Word

An information symbol in the left column of the screen indicates that a parameter has extra information. See illustration 190 for an example. Click the information symbol to get information about a bit.

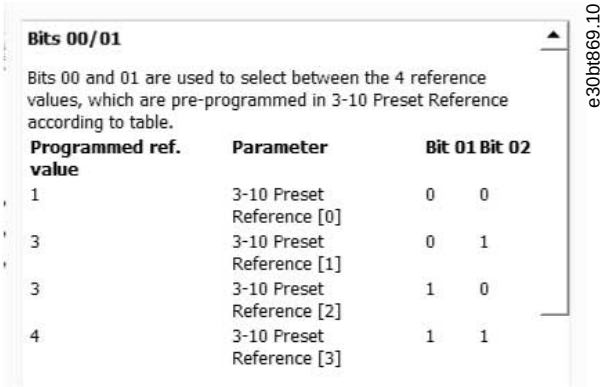


Illustration 191: Example of Bit Information

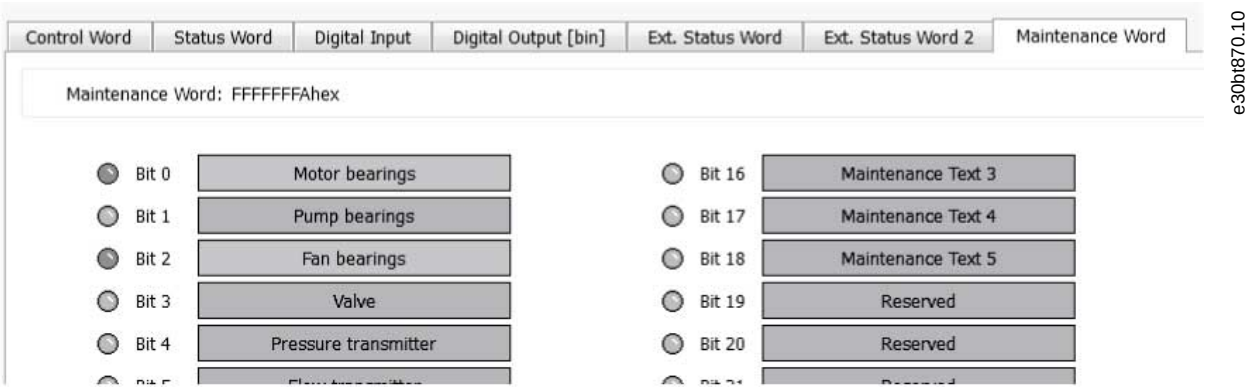


Illustration 192: Example of Maintenance Word

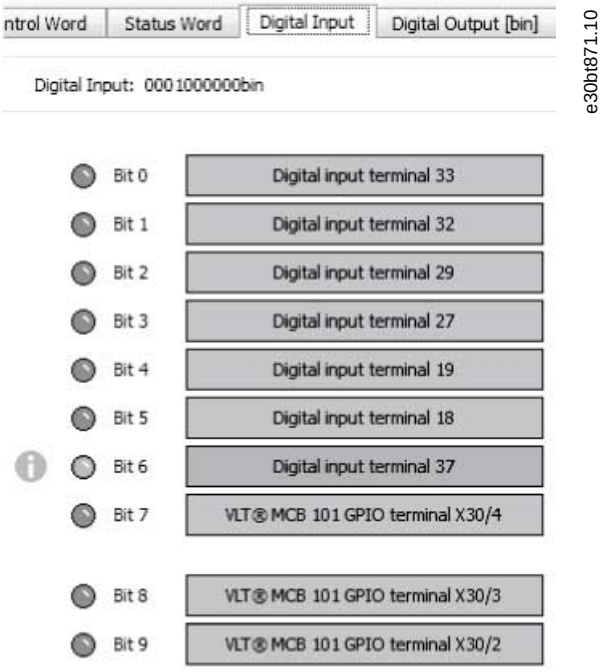


Illustration 193: Example of Digital Input

NOTICE

When bit 6 is active, the signal on DI 37 is inactive, meaning that there is no signal present on the input.

Status plug-in used with fieldbusses

All fieldbusses supported by MCT 10 Set-up Software support the Status plug-in. While the plug-in is open, MCT 10 reads the visible parameter constantly. This way, the plug-in updates automatically when values change.

Loss of communication

If communication is lost, the plug-in turns yellow and sends a notification. The latest values are kept as they were before the communication loss. When communication is recovered, the plug-in recovers automatically.

8.9 Drive Control Plug-in

The Drive Control plug-in is available for online drive in the following product series:

- VLT® HVAC Drive FC 102.
- VLT® AQUA Drive FC 202.
- VLT® AutomationDrive FC 301/FC 302.

The plug-in is supported by serial communication and USB.

For the plug-in to work, it is required to be connected to the drive that should be controlled.

To open the plug-in, select *Drive control* in the structure in the left window.

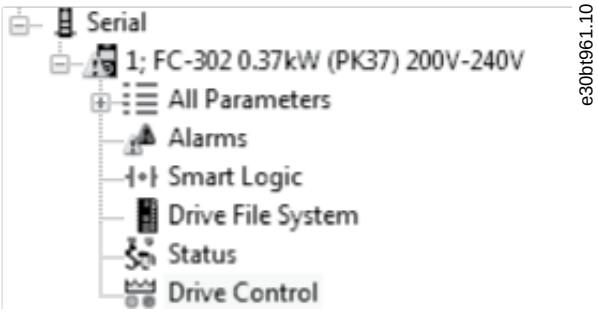


Illustration 194: Drive Control in Structure

A temporary page opens for accepting risks and configuring important parameters.

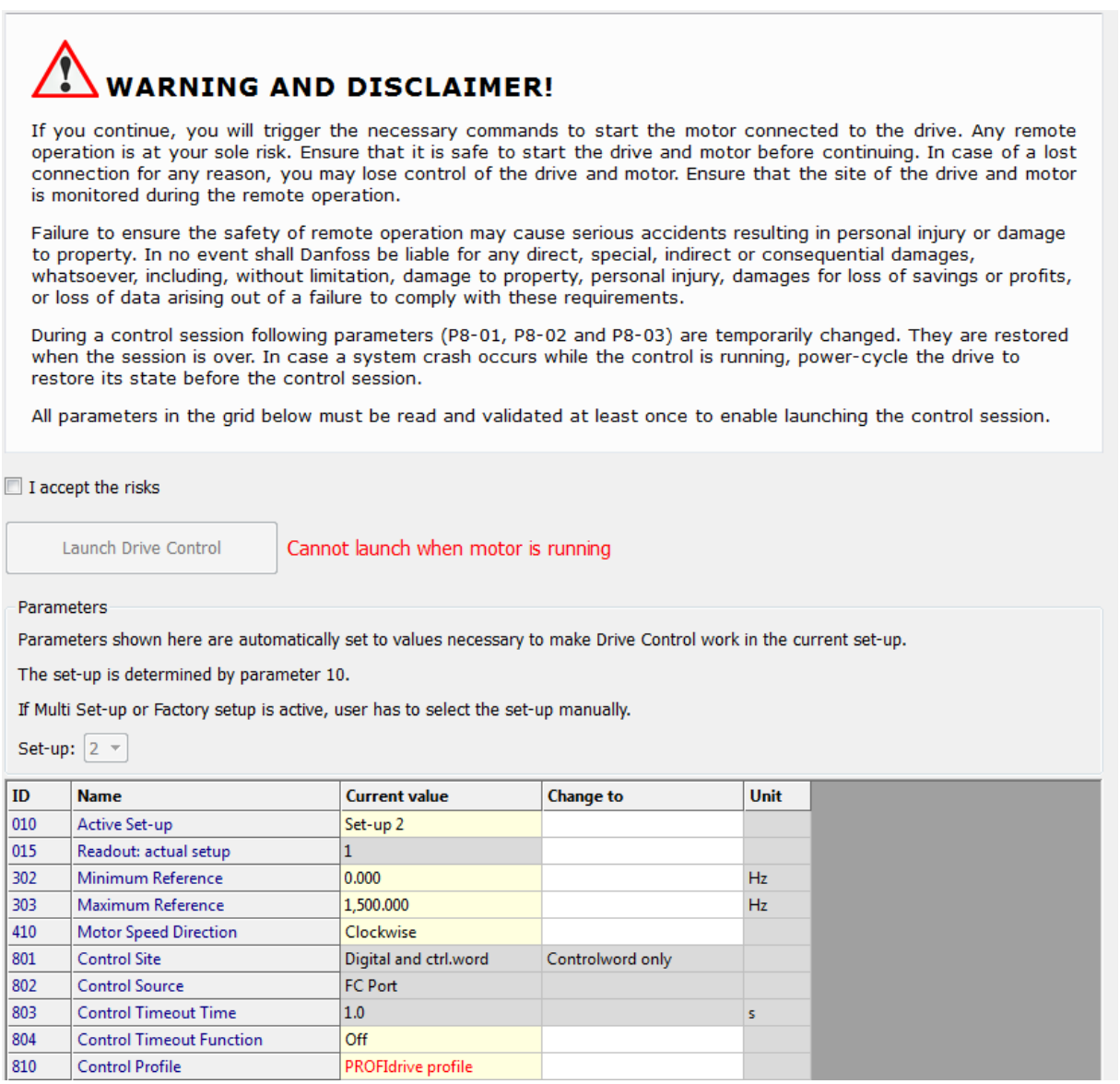


Illustration 195: Risks to Accept

8.9.1 Launching the Drive Control Plug-in

Prerequisites:

To be able to launch the Drive Control plug-in, it is required to accept the risk.

Procedure

1. Tick *I accept the risks*.
2. Click *Launch Drive Control*.

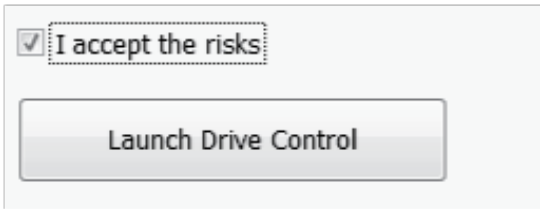


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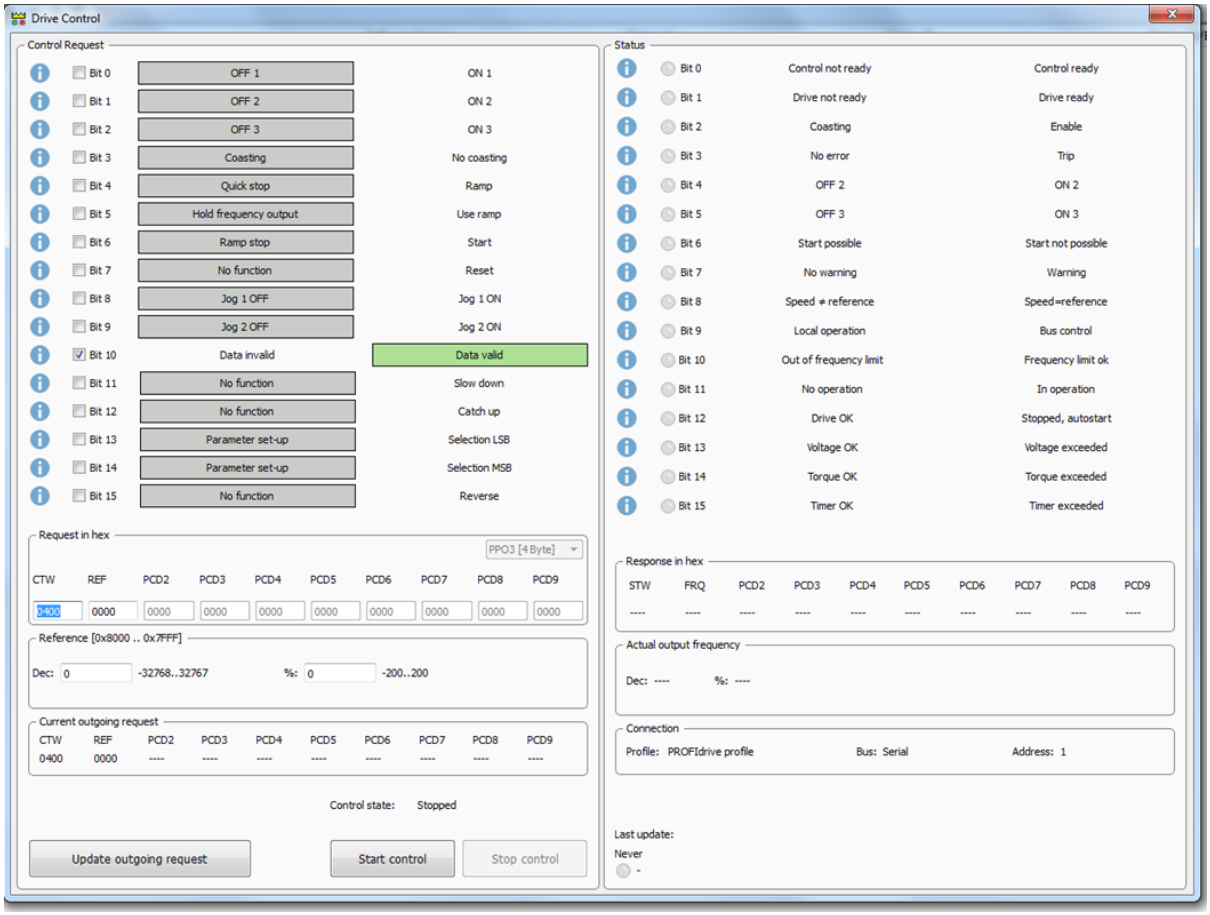
Illustration 196: Launch Drive Control Button

→ The *Drive Control* window opens.



e30bt964.10

Illustration 197: Drive Control Window

8.9.2 Setting the Control Word

Context:

At launch, the control word is set to 0400 but is not yet sent to the drive.

Procedure

1. Set the control word in 1 of 2 ways:
   Use the checkboxes.

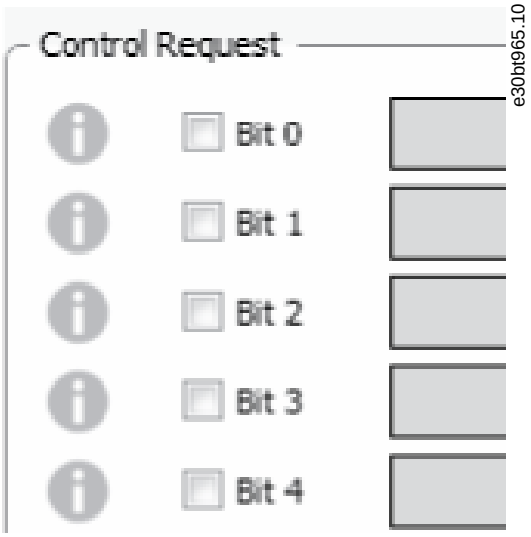


Illustration 198: Checkboxes for Setting Control Word

Type the value directly in the *Request in Hex* field.

Illustration 199: Type in the Value Directly

→ The control word is now set.

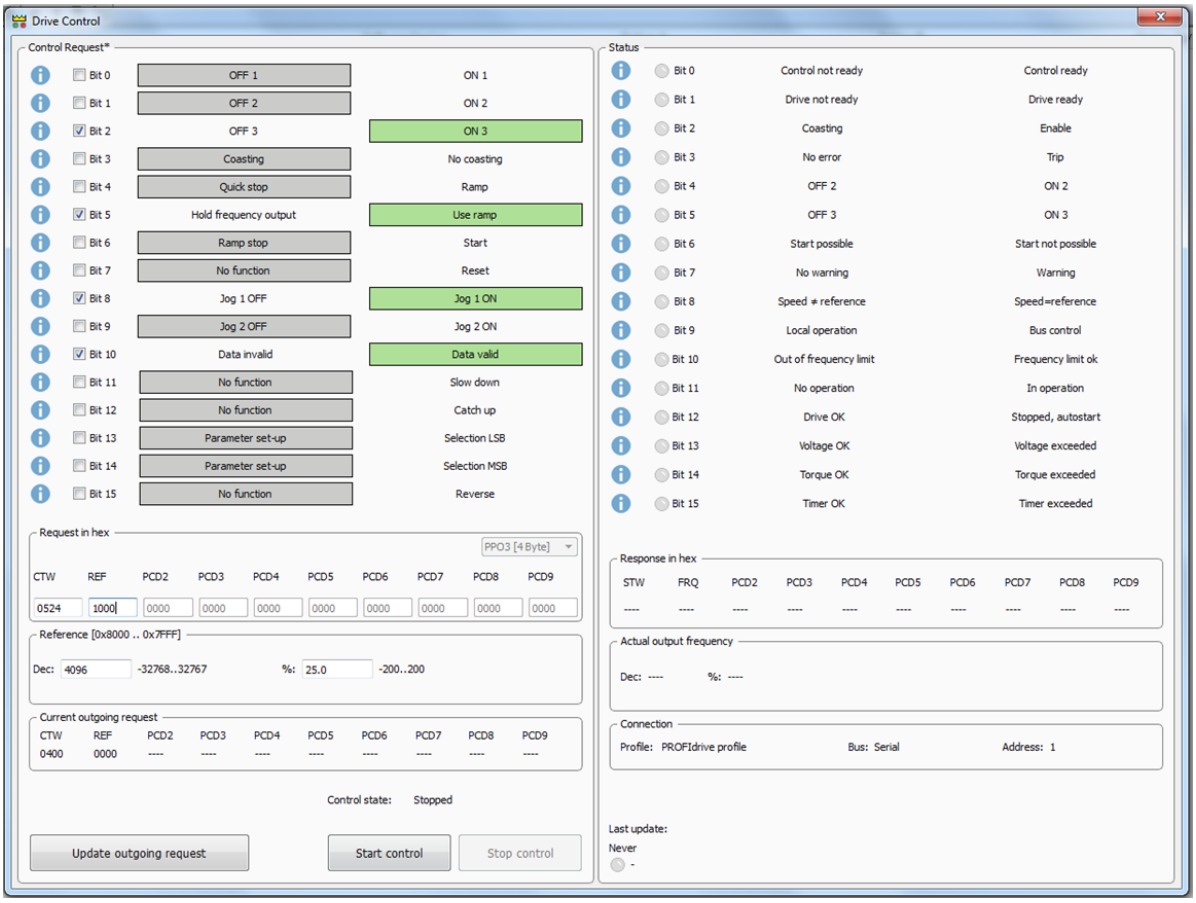


Illustration 200: Control Word Set

8.9.3 Start Drive Control

Prerequisites:

The control word must be set before starting the drive control.

Procedure

1. Click *Start control*.

   → The plug-in starts sending the control word and then reads the status word.

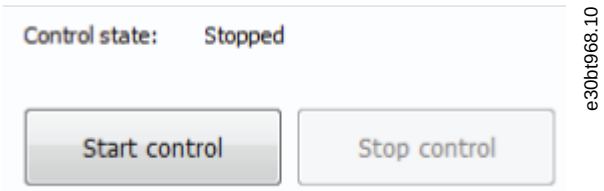


Illustration 201: Start Control Button

→ The control word is sent cyclically until clicking *Stop control* or until communication fails. The control state bar runs while the control word is being sent.

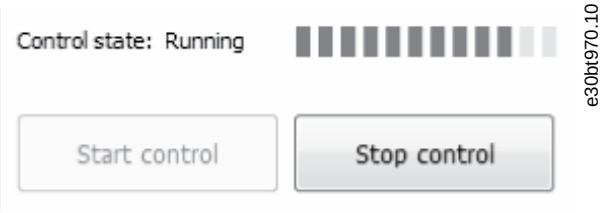


Illustration 202: Control State Bar Running

After a successful reading of a status, a notification is sent.

Illustration 203: Last Status Read Successfully

At loss of communication, the bits of the status view turn yellow, and an error appears.

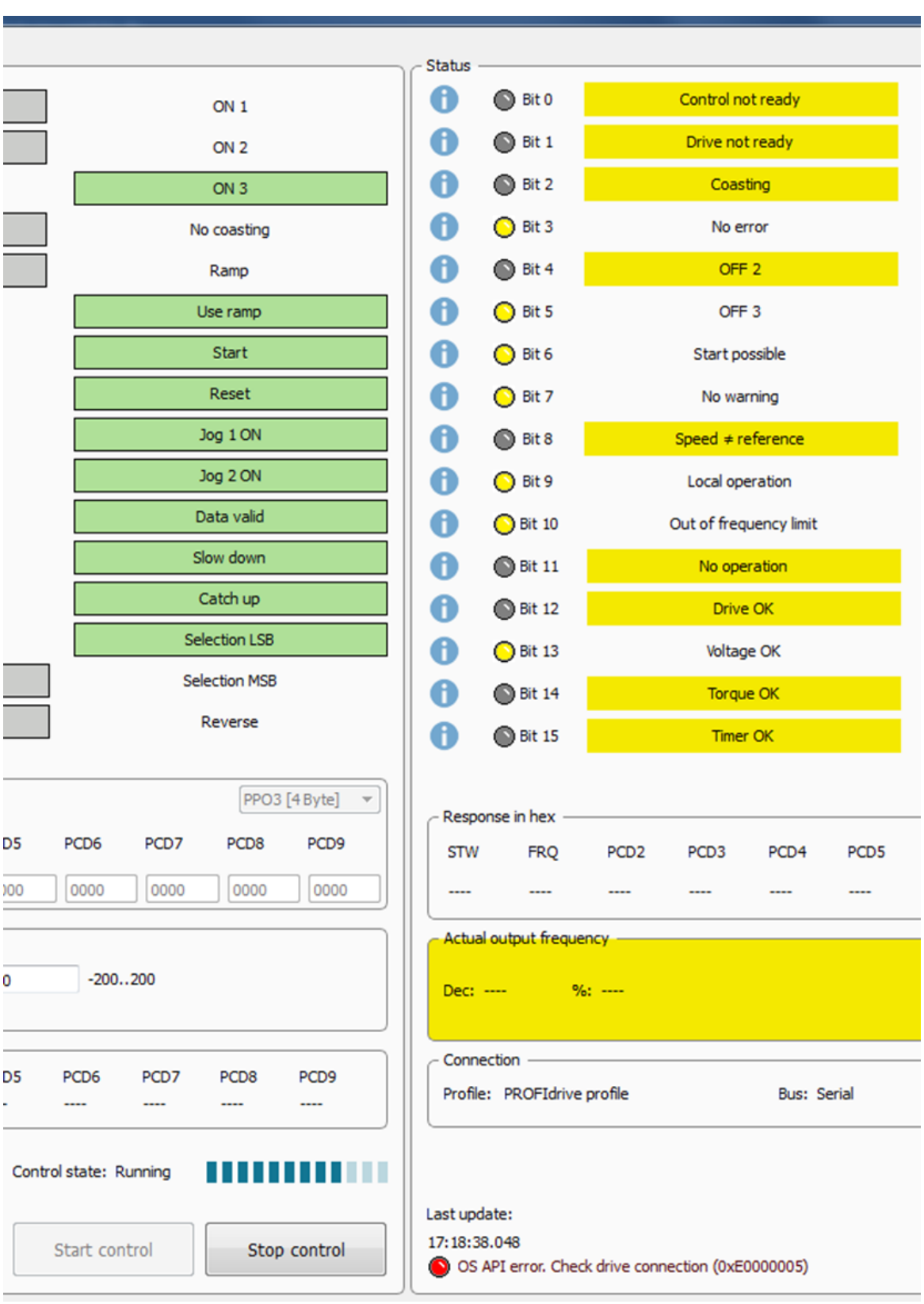


Illustration 204: Loss of Communication

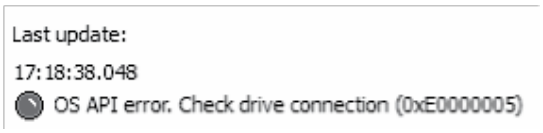


Illustration 205: Error at Loss of Communication

8.9.4 Changing Control Word Bits

Context:

Control word bits can be changed while the control word is being sent. While changing the control word, the values of *Request in hex* and *Current outgoing request* differ.

Illustration 206: Request in Hex

Illustration 207: Values of Current Outgoing Request

Procedure

1. Enter the new value of the control word.
2. Click *Update outgoing request*.

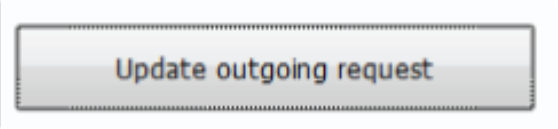


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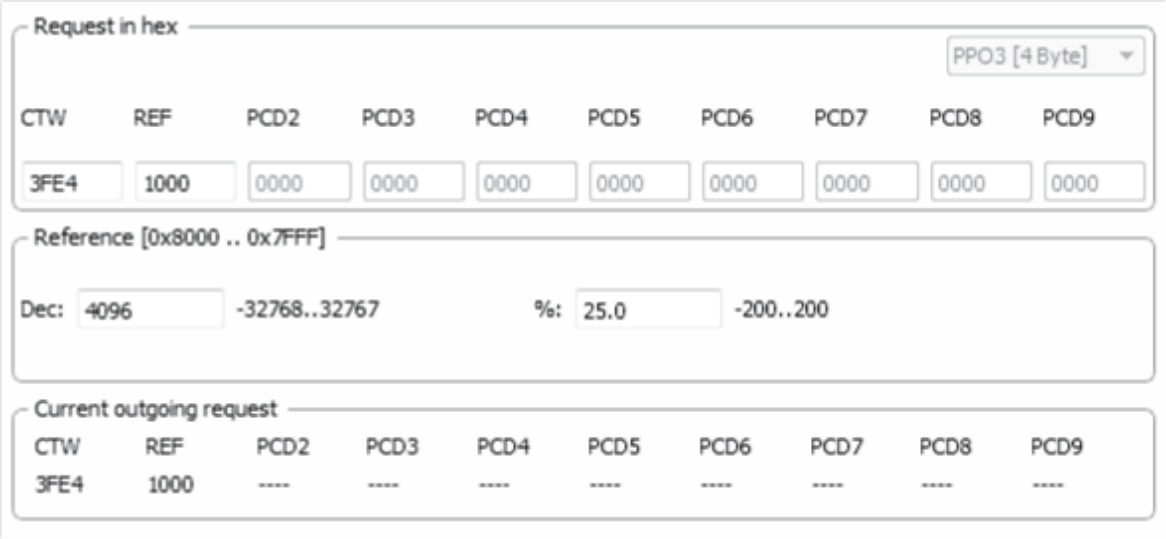
Illustration 208: Update Outgoing Request Button

→ After clicking *Update outgoing request*, the values are the same.



e30bt977.10

Illustration 209: Values Aligned in Request in Hex and Current Outgoing Request

8.9.5 Changing the Reference

Procedure

1. Change the reference in 1 of 2 ways:
   Enter the hex value directly in *Request in hex*.
   Enter the value in either decimal or percentage.

Values out of range are shown in pink.

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Illustration 210: Value Out of Range

The *Update outgoing request* button is disabled until a valid value is set.

8.9.6 Open Drive Control Plug-in

When the Drive Control plug-in is open, the bus is locked, and it is not possible to scan or change parameter values.

It is possible to create a scope folder in a project that allows monitoring of relevant parameters while changing the control word via Drive Control.

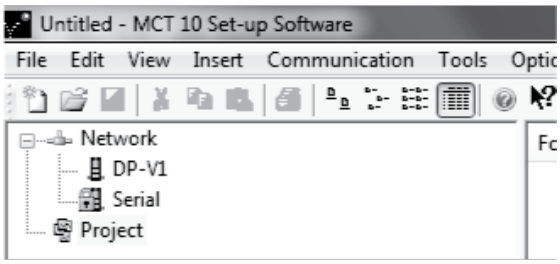


Illustration 211: Create Scope Folder in Project

Once the Drive Control plug-in is closed, the control word is restored to the value it had before starting the plug-in. Also other parameters are only changed temporarily.

NOTICE

Control word and other parameters used by Drive Control are written to flash instead of EEPROM. When power cycling the drive, these values are restored to the values they had before the Drive Control was started. If Drive Control of MCT 10 Set-up Software closes abnormally, the parameter restore process is not done. To restore the values after an abnormal shutdown, power cycle the drive.

8.10 Decoder Plug-in

Use the Decoder plug-in for decoding Safe Option log files. The decoded log files are shown both inline (all information shown in 1 line) and as an overview of a selected line.

8.10.1 Starting the Decoder Plug-in

Procedure

1. Click the *Tools* menu.
2. Select *SafeOption Log Viewer*.

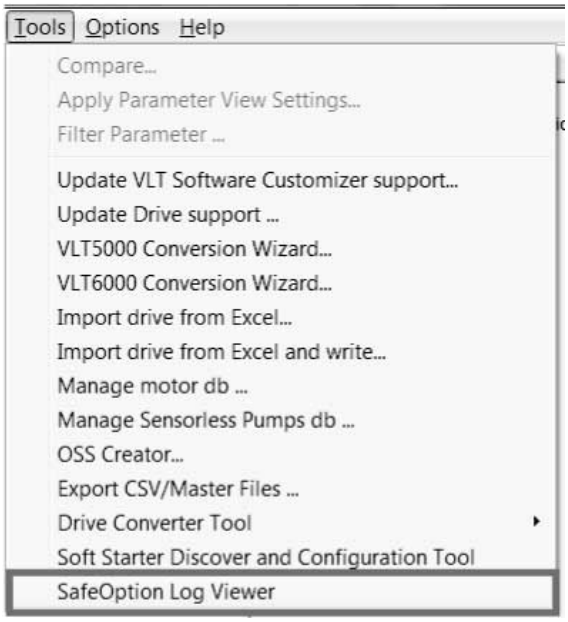


Illustration 212: Selecting the Plug-in

3. Click *Browse* to select a file.

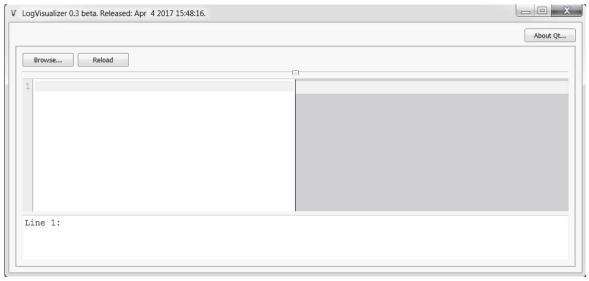
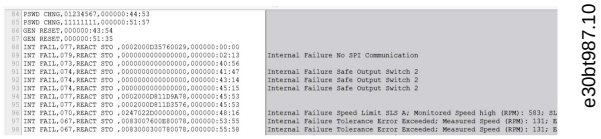


Illustration 213: View of the Log Visualizer

4. Click the arrow button to expand the log area or the explanation area.

Illustration 214: Expanding the Views

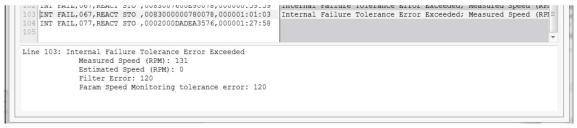


e30bt987.10

Illustration 215: Log File Shown in Log Visualizer

Files that require decoding have a 1-line explanation in the explanation area (right window). To get a better overview of a failure description, select the failure to see an overview of the description at the bottom of the window.

Illustration 216: Failure Shown as Inline Text



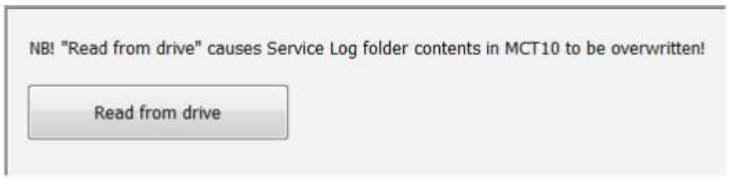
e30bt989.10

Illustration 217: Overview of Failure Description

8.11 Service Log

The Service Log plug-in is available offline. It enables reading from the drive in the right view of the MCT 10 screen.

Pressing *Read from drive* overwrites any log files that are already in the log.



e30bu309.10

Illustration 218: Read from Drive Overwrites Log Files

9 Support of VLT® Wireless Communication Panel LCP 103

9.1 Introduction

MCT 10 Set-up Software supports the VLT® Wireless Communication Panel LCP 103. There are 2 different approaches depending on the MCT 10 version used.

9.1.1 Using LCP 103 with MCT 10 Set-up Software Basic Version

Procedure

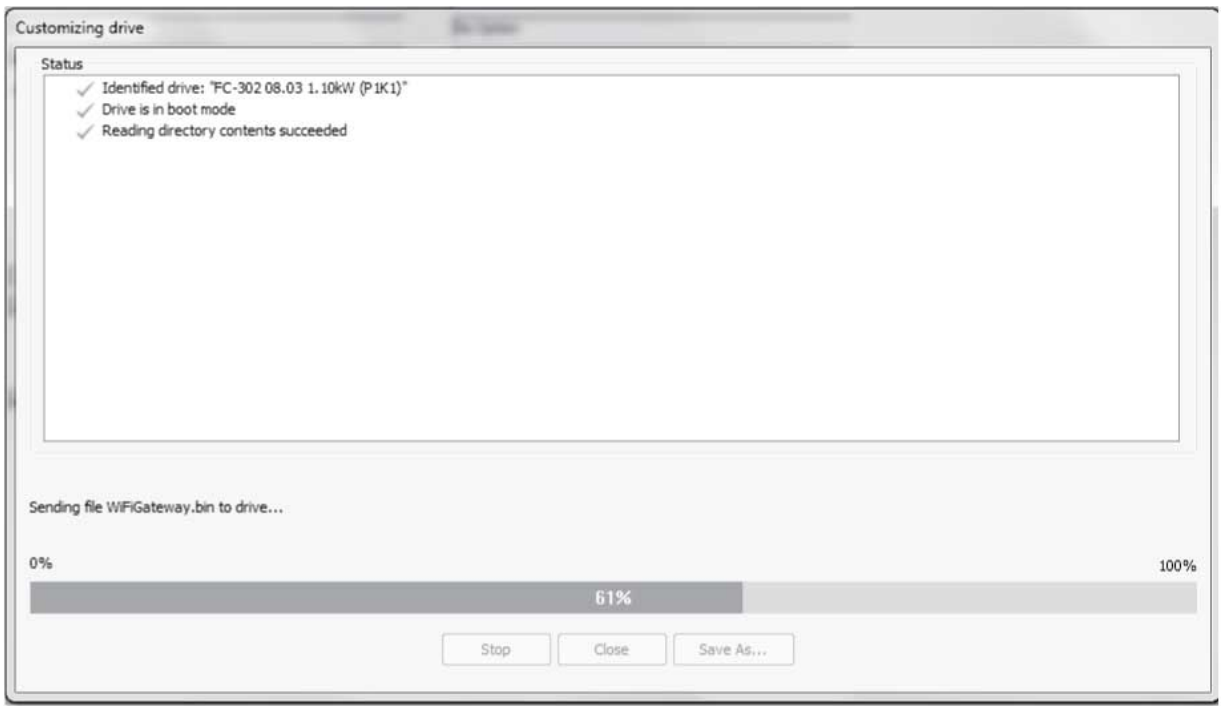
1. Right-click the drive that has the LCP 103 plugged in.
2. Select *Update WIFI LCP firmware*.
3. In the dialog box, select a file (*.bin is already selected).

e30bt879.10

Illustration 219: Dialog for Selecting *.bin Files

4. Press [OK].

→ When the procedure is completed, the writing starts and the progress is visible.



e30bt880.10

Illustration 220: Progress Bar Showing While Writing to the Drive

NOTICE

If errors occur, they are shown in the *Customizing drive* dialog box. If writing is successful, the dialog box closes automatically.

9.1.2 Using LCP 103 with MCT 10 Set-up Software Advanced Version

Context:

With the advanced version of the MCT 10 Set-up Software, the Drive File Manager Plug-in can be used for connecting the LCP 103.

Procedure

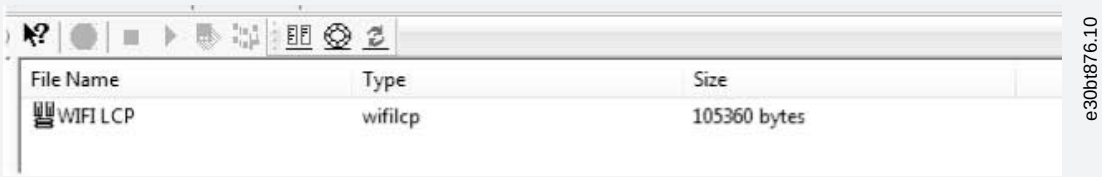
1. In the offline drive, select *Drive File System*.
2. Right-click in the right window and select *Import File* from the context menu.

3. In the dialog box, select binary files (*.bin).

4. Select the correct binary file.

Selecting a wrong file issues an error message.

After a successful file import, the Drive File System shows information about the file.



5. Click the Drive File Manager icon.

6. Via the Drive File Manager, write the *.bin file to the drive.

10 VLT® Software Customizer

10.1 Introduction

The VLT® Software Customizer is available from MCT 10 Set-up Software version 4.00. The tool enables customization of the drive by modifying or creating unique splash screens, initial values, and SmartStart wizards.

The plug-in contains 3 independent features:

- SplashScreen: Add a custom logo that is shown during initialization of the drive. The SplashScreen supports:
  - jpeg.
  - png.
  - bmp.
  - gif.
- InitialValues: Define unique parameter default values based on application needs in a customer-specific initial values (CSIV) format. Every time the drive is initialized, it starts with the custom values.
- SmartStart: Create custom SmartStart wizards that guide through predefined application steps, which simplifies the commissioning process.

Furthermore, it is possible to write to the drive and test in the simulator. The *Write to drive* function writes files that have been created or imported into VLT® Software Customizer. *Test in simulator* launches the LCP simulator for simulating a connection to a drive. In the *Settings* menu, it is possible to show or hide the disclaimer.

Illustration 226: Tool Tips for Navigation and Support

Illustration 227: A Mouseover Highlights the Area Pointed at

When doing a mouseover on 1 of the 3 features, the feature is highlighted, and a button is available. Click the button to open the functions currently available for the selected feature.

Illustration 228: Button for Opening Available Functions

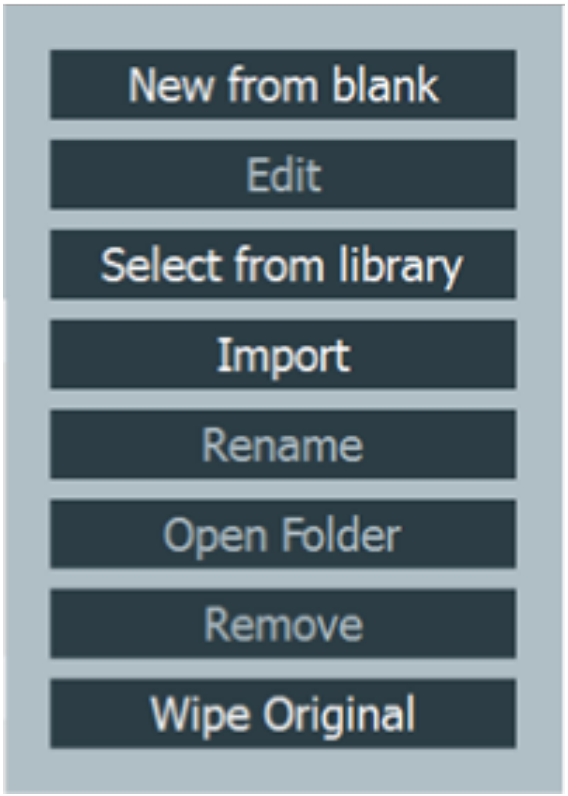


Illustration 229: Example of Available Options for a Feature

10.1.1 Activation Key

The VLT® Software Customizer is an advanced tool that requires an activation key. To obtain the activation key, contact the local Danfoss representative.

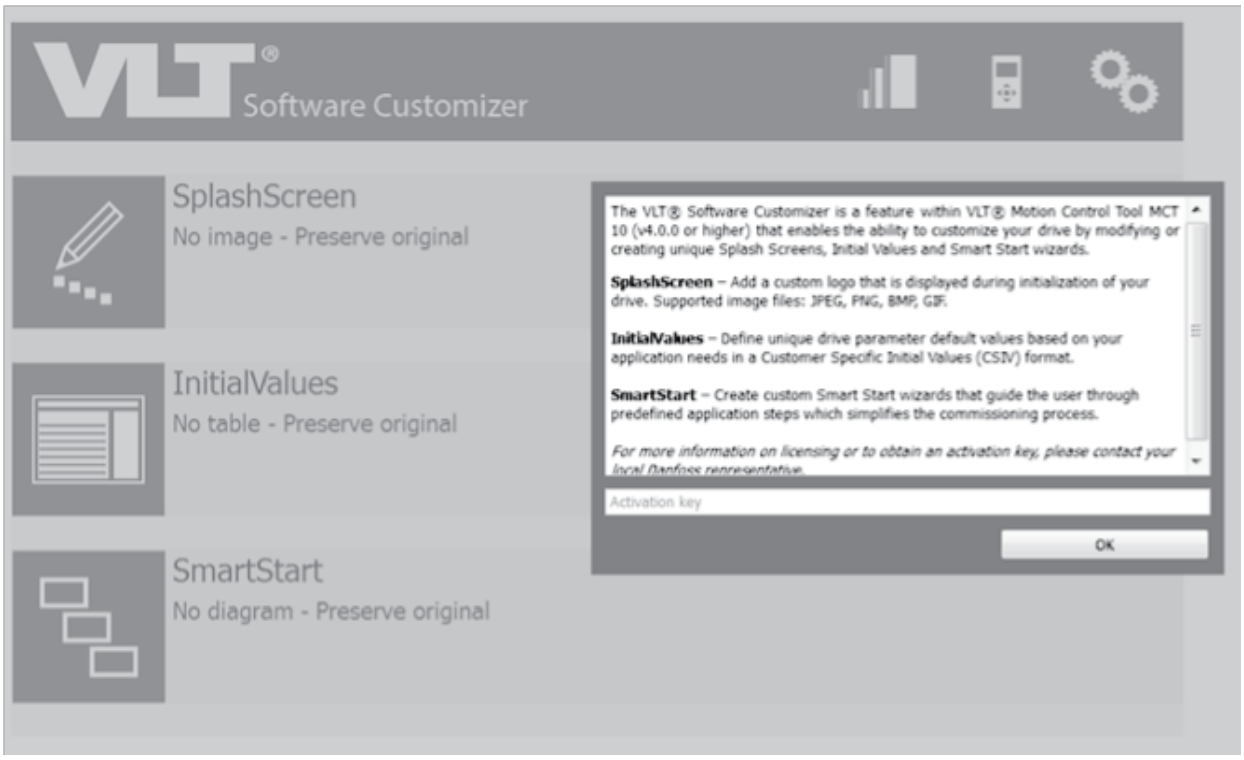


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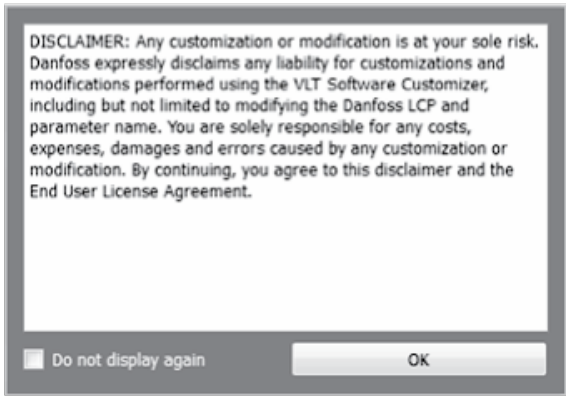
Illustration 230: Dialog Box for Entering the Activation Key

10.1.2 Disclaimer

When the activation key is active, a disclaimer appears.



e30bt887.10

Illustration 231: Disclaimer

Click *OK* to make the disclaimer disappear until the next restart of MCT 10 Set-up Software.

To avoid seeing the disclaimer at each start-up, tick the *Do not display again*.

10.1.2.1 Changing the Disclaimer Settings

Context:

The settings for the disclaimer can be set at a later point.

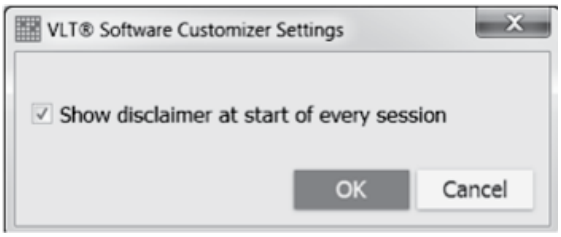
Procedure

1. Select *Settings* in the top menu.

e30bt888.10

Tick and click *OK* to show the disclaimer at each start-up.

Remove the check mark and click *OK* not to show the disclaimer at each start-up.



e30bt889.10

10.2 SplashScreen

Use the SplashScreen tool to create images to be shown on the LCP while the drive initializes.

Either create a splash screen from new, import an existing SplashScreen file, or import a picture.

10.2.1 Creating a Project from Blank

Procedure

1. Select *New from blank* to open the editor with an empty project.

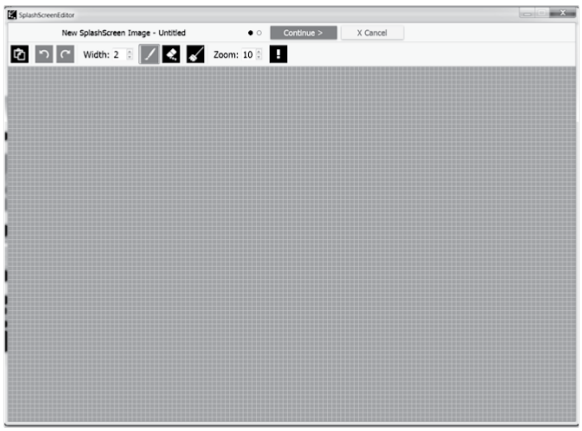


Illustration 234: Empty Project in Editor

2. Use the different tools in the menu to create the drawing. *Width* increases/decreases brush line thickness, left mouse button is for freehand line, right mouse button for straight lines.

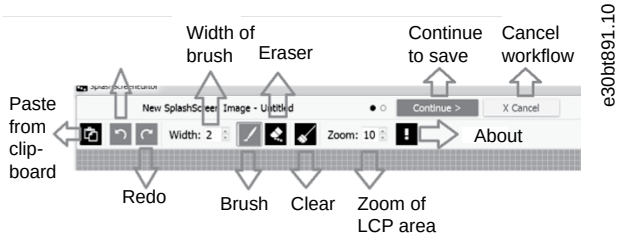


Illustration 235: Drawing Tools

3. When finished, click *Continue*.
4. In the dialog box, enter a file name and click *Finish*. Clicking *Back* returns to the editor, clicking *Cancel* cancels saving of the file.

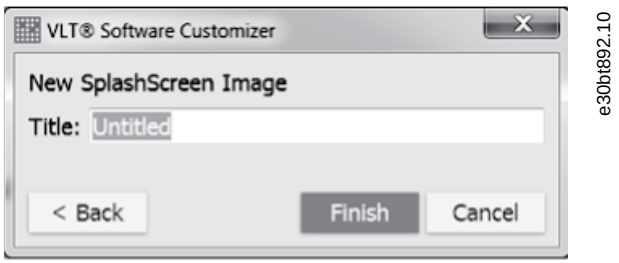


Illustration 236: Dialog Box for Saving a SplashScreen Image

10.2.2 Selecting from Library

Procedure

1. Click *Select from Library* to open an already saved SplashScreen file (*.spla).

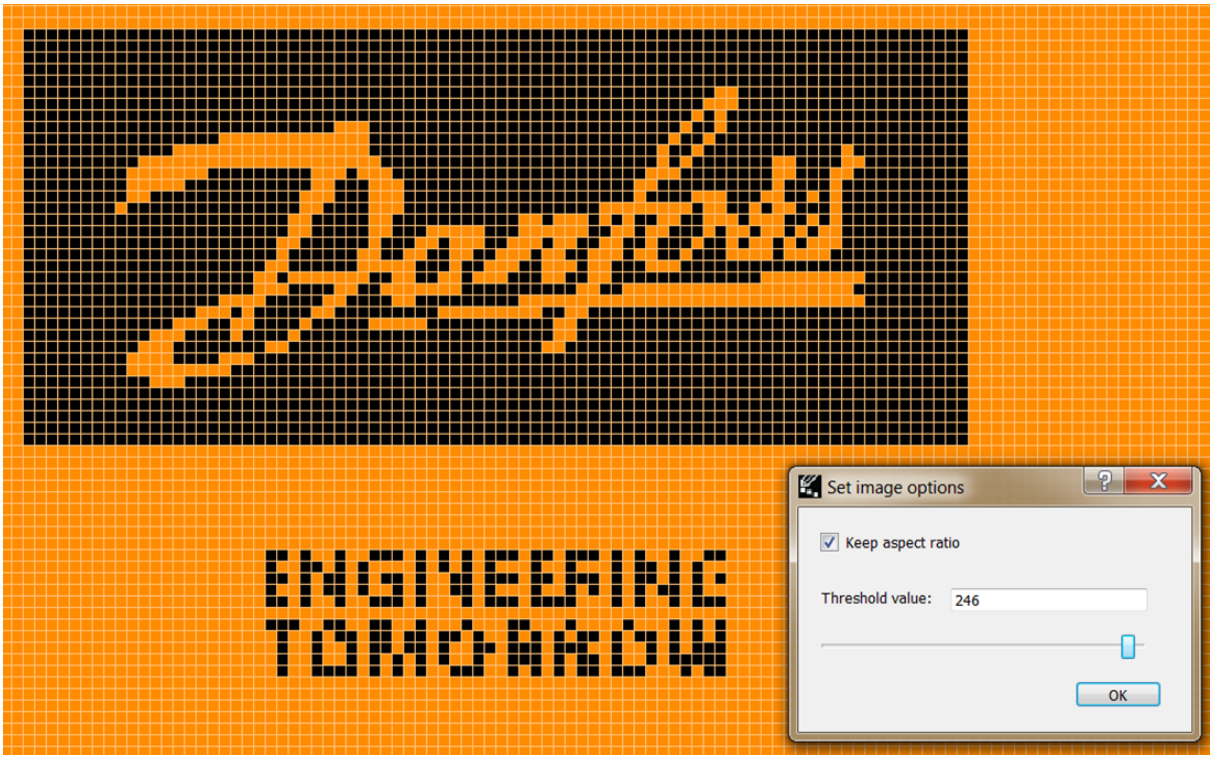
   Select from Library is also used for editing already saved SplashScreen files.

10.2.3 Import

The import function allows import of:

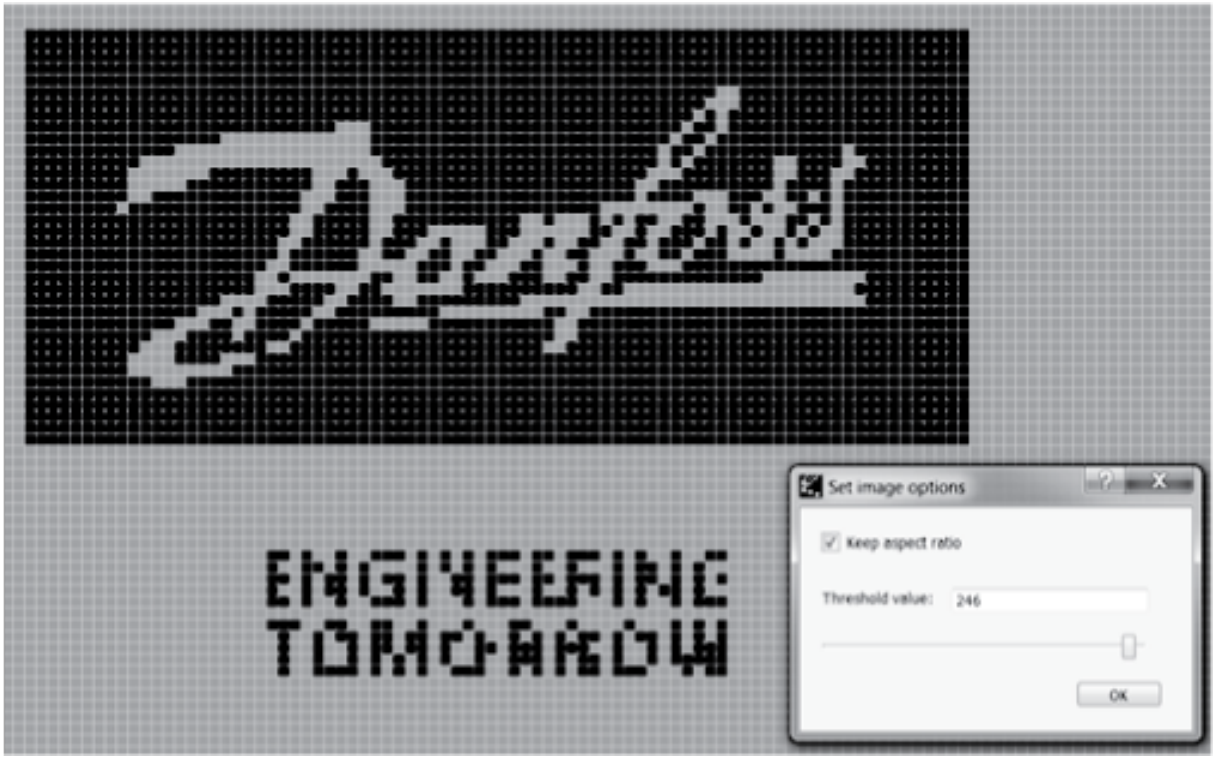
- jpeg.
- jpg.
- bmp.
- png.
- tif.
- gif.
- spla.
- splash.

At import, the picture resizes to fit the LCP. If the entire picture is not visible, set the threshold value of the imported image.



e30bt893.10

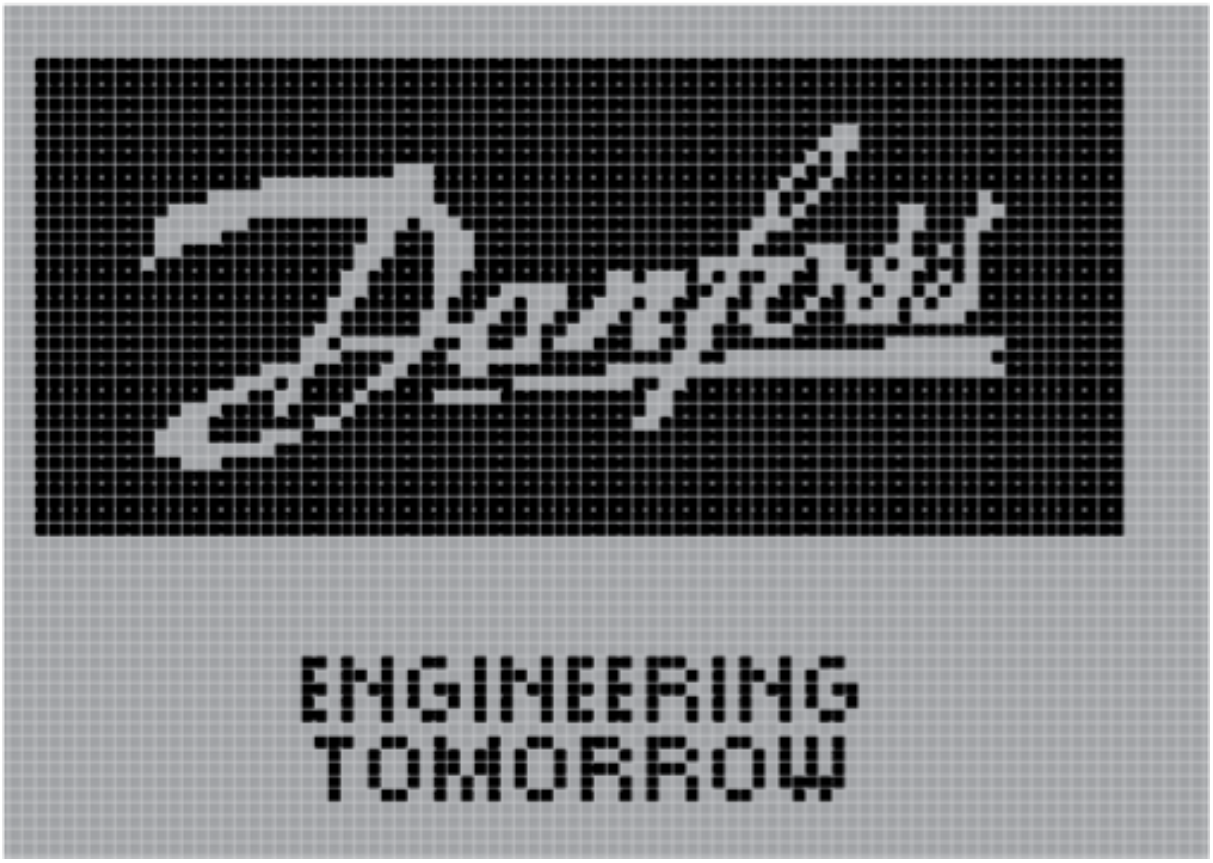
Illustration 237: SplashScreen with Original Threshold Value



e30bt895.10

Illustration 238: SplashScreen Improved with Higher Threshold Values

The quality of the picture can be improved further by using the brush.



e30bt896.10

Illustration 239: SplashScreen Improved with the Brush Tool

When the picture is saved, the SplashScreen is added into the VLT® Software Customizer project along with a date and time stamp. It is possible to edit and save more SplashScreen files, but only 1 appears in the project.

e30bt897.10

Illustration 240: SplashScreen and Preview Added to Project

Adding a SplashScreen to the project, changes the menu to offer the functions in Illustration 19.14.

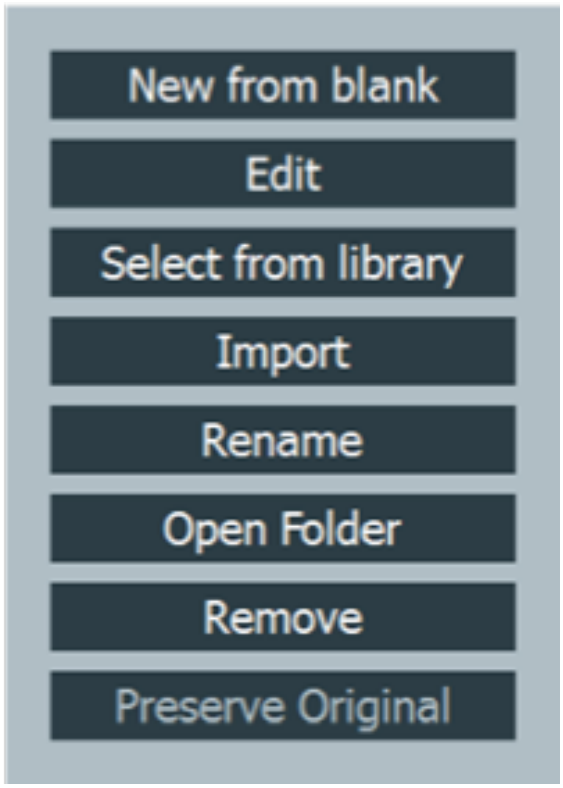


Illustration 241: Functions in the SplashScreen Menu

10.3 LanguageChanger

The LanguageChanger enables editing or creating a language by translating group names, subgroup names, help texts, and parameter names.

When there is no file in the project, the menu is the same as in SplashScreen.

Illustration 242: Overview of the LanguageChanger Menu

10.3.1 New from Blank

Selecting *New from Blank* opens the editor.

The editor contains tooltips about the *Base Dictionary* and the *Base Dictionary Function*.

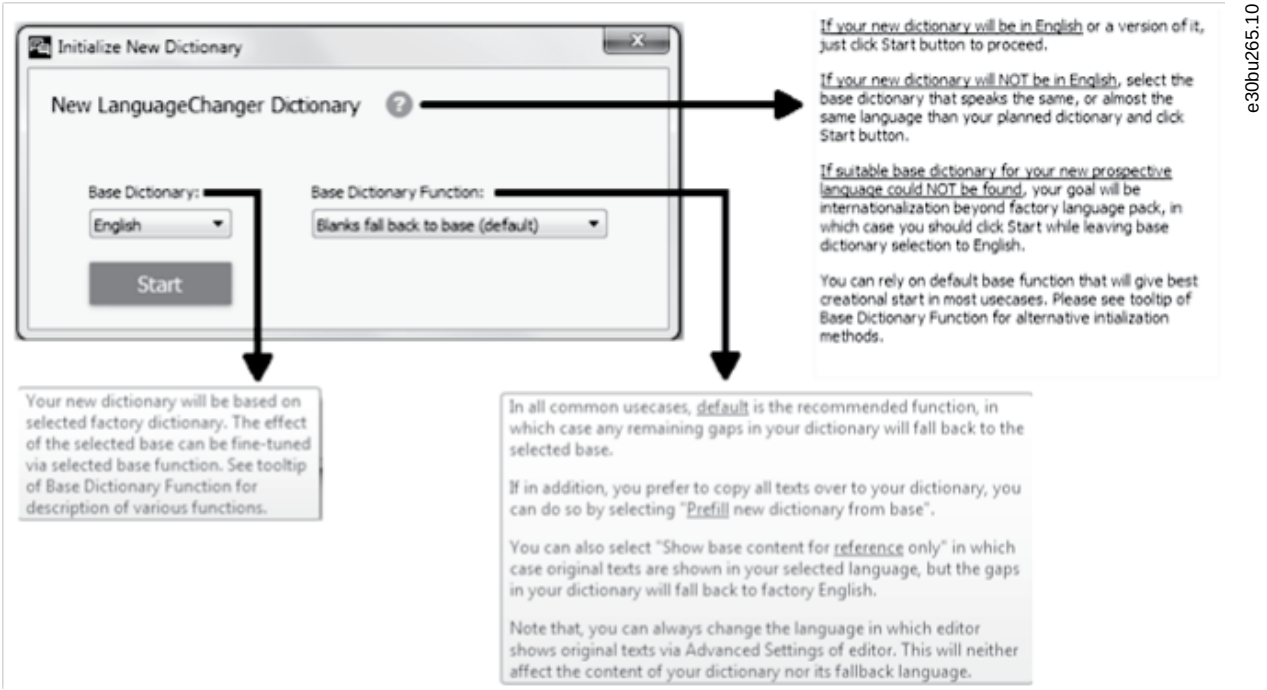


Illustration 243: Tooltips in the Editor

Base Dictionary

Use the *Base Dictionary* for selecting which dictionary (LNG file) the LanguageChanger should load. For example, for translating into Spanish, select Spanish in the *Base Dictionary*. The LanguageChanger then loads parameter names, help texts, ad other texts in Spanish.

Base Dictionary Function

Use the *Base Dictionary Function* for defining if the LanguageChanger should prefill the translations with texts from the *Base Dictionary*. If selecting *Blanks fall back to base*, the LanguageChanger leaves the translation field empty.

Illustration 244: Example of Base Dictionary set to English

Illustration 245: Example of Base Dictionary set to German

If selecting *Prefill new dictionary from base*, the LanguageChanger prefills the translation field with texts from the *Base Dictionary*.

Illustration 246: Example of Prefilled Translation Field with English Base

Illustration 247: Example of Prefilled Translation Field with German Base

After selecting *Base Dictionary* and *Base Dictionary Function*, and after pressing *Start*, the LanguageChanger opens.

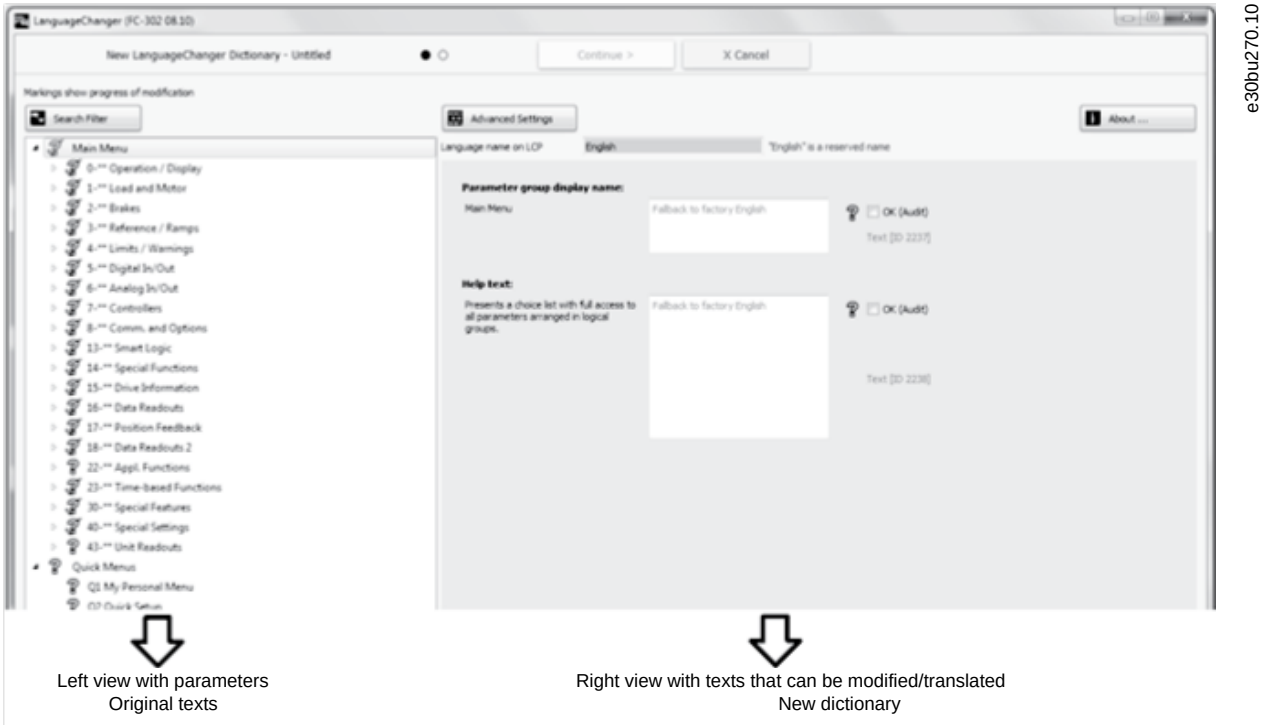


Illustration 248: Overview of the LanguageChanger

NOTICE

Language name on LCP comes from *Base Dictionary*. The name *English* is reserved for Danfoss. The name can be changed, for example to *English_Australia*. This name is then shown in the LCP.

Illustration 249: Language Name on LCP

Illustration 250: Language Name Shown on the LCP

Once *Language Name on LCP* is set, it is possible to start modifying and translating.

NOTICE

Not all parameters can be modified/translated. Parameters shown are the ones that can be modified or translated.

If clicking *Cancel*, a dialog appears.

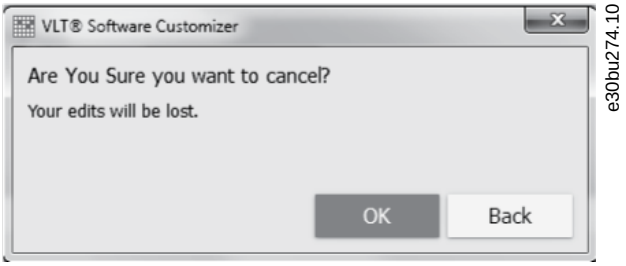
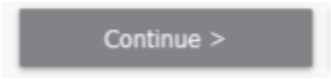


Illustration 251: Cancel Dialog

Clicking *OK* closes the LanguageChanger without saving any changes.

Clicking *Back* goes back to the LanguageChanger editor.

When editing is done, press *Continue* and assign a name to the new dictionary file.



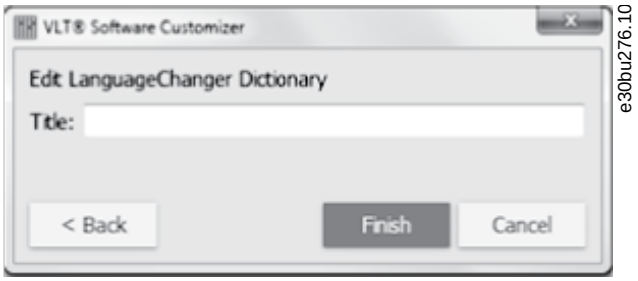


Illustration 253: LanguageChanger Project Name

The name is for the specific LanguageChanger project and is shown on the dashboard.

Illustration 254: LanguageChanger Dashboard with Project Name

10.3.2 Search Filter

To easily find parameter names or texts to be translated, click the *Search filter* button.

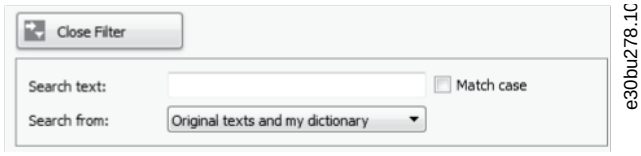
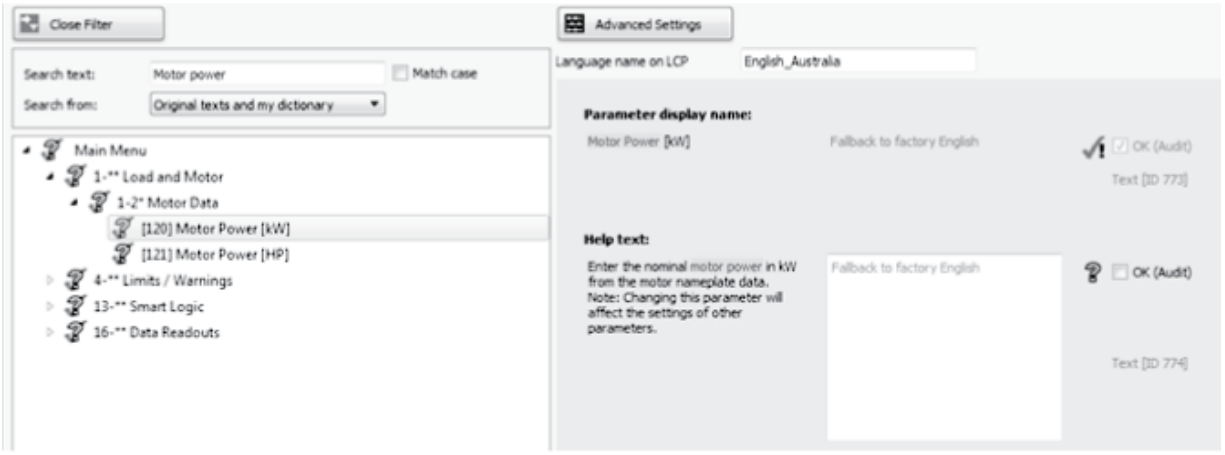


Illustration 255: Search Filter

Select to search in:

- Original texts and new dictionary,
- Original texts only, or
- New dictionary only.

For example, searching for *motor power* only shows the parameters that contain *motor power* in the name or in the help text.

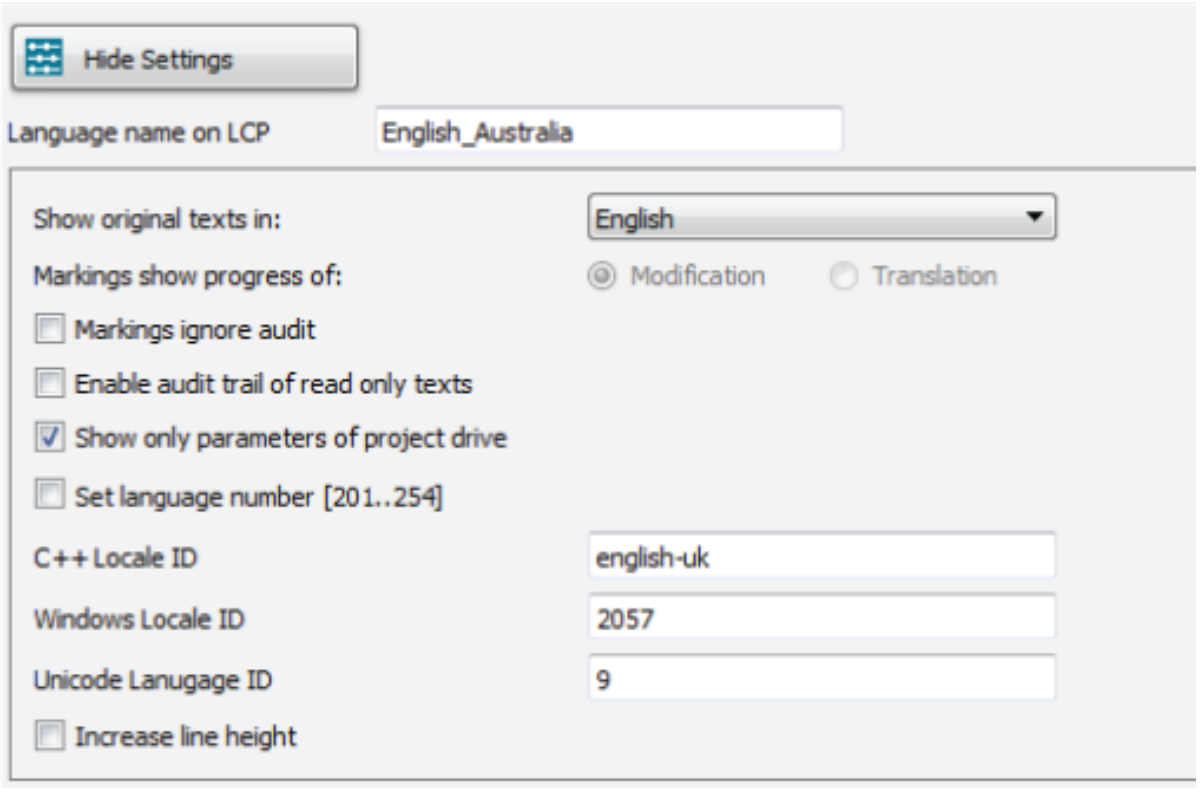


e30bu279.10

Illustration 256: Search Result for Motor Power

10.3.3 Advanced Settings

Advanced settings contains tooltips for each possible setting and is helpful at the creation of dictionary.



e30bu280.10

Illustration 257: Overview of the Advanced Settings

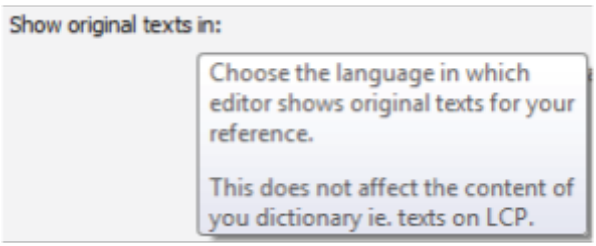


Illustration 258: Tooltip Example

10.3.4 Audit

Clicking *Audit* accepts the original text as it is and marks it completed without modifications or translations.

10.3.5 Markings

To visualize the progress of translation or creation of a dictionary, LanguageChanger shows different markups.

	Text has not been modified or translated.
	Text has been modified or translated.
	Text has been accepted as is via the *Audit* function.

If *Markings ignore audit* is selected in the advanced settings, the marking only shows modified texts. All other texts are shown as

10.4 InitialValues

Use *InitialValues* to create CSIV files. Without a CSIV file, all parameters are reset to default values during initialization of the drive. With a CSIV file, parameter values are initialized with the values defined in the CSIV file.

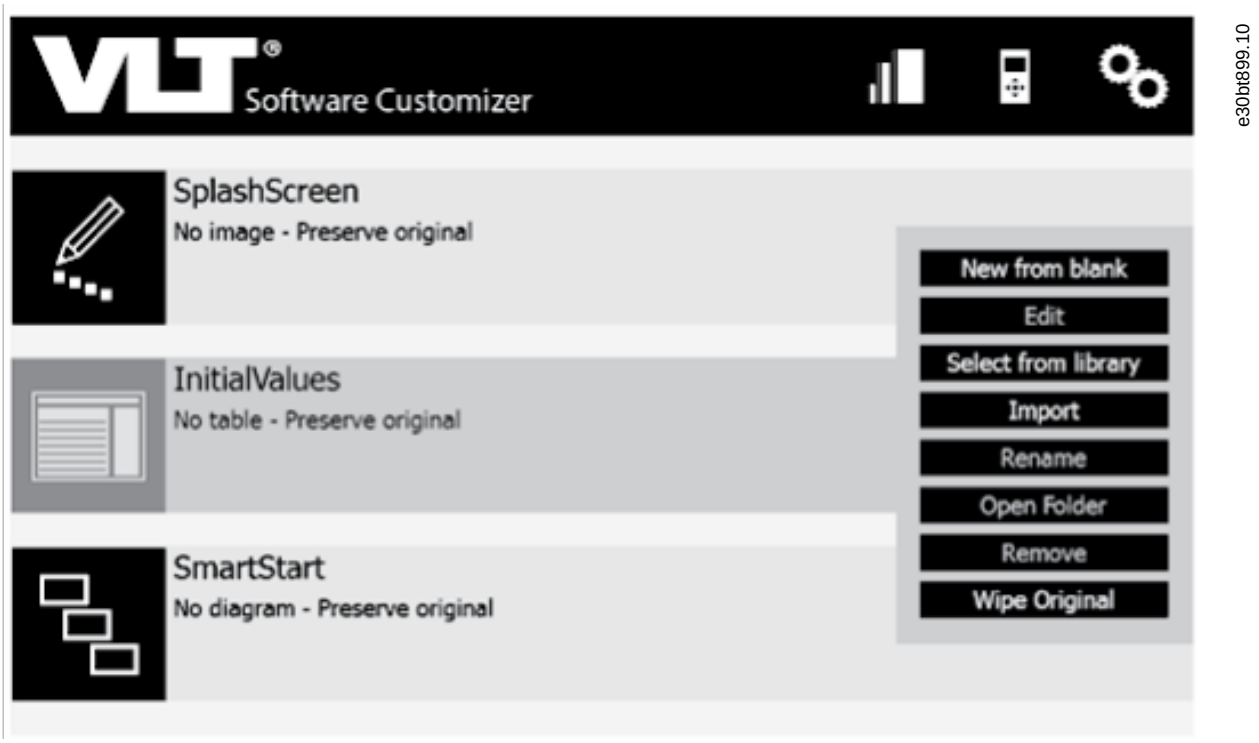


Illustration 262: InitialValues Menu

10.4.1 Creating a Project from Blank

Procedure

1. Select *New from Blank* to open an empty project in the editor.

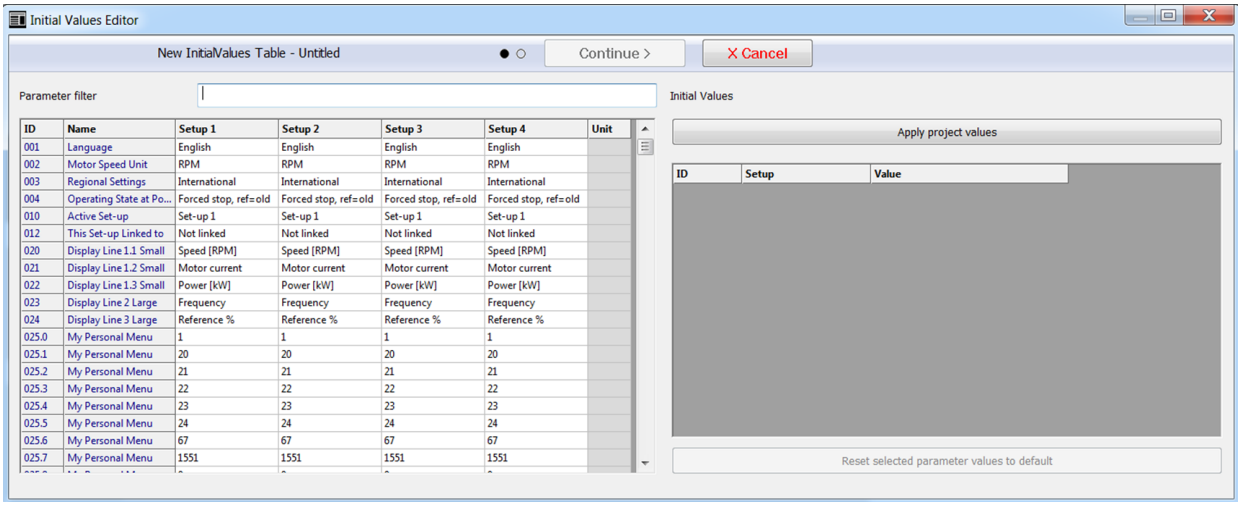


Illustration 263: Example of Empty Project

2. To add parameters, double-click in a parameter and change a value. For example, add German to the CSIV.

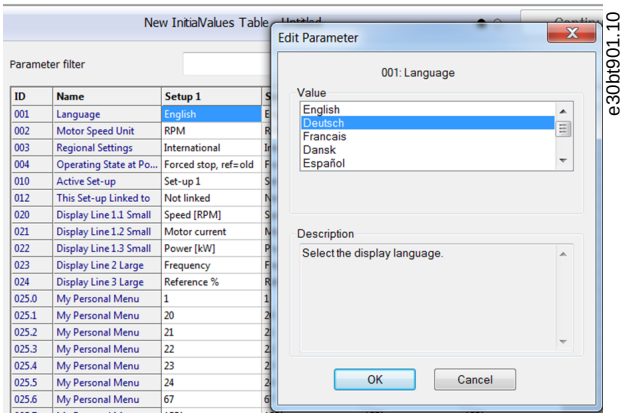


Illustration 264: Setting a Value for the CSIV File

3. Click *OK* to add the value to the CSIV file.

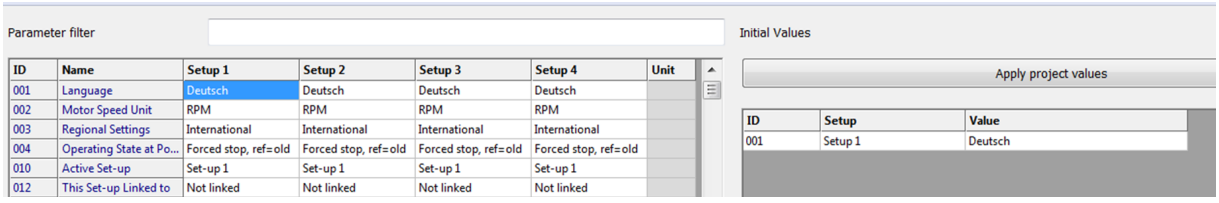
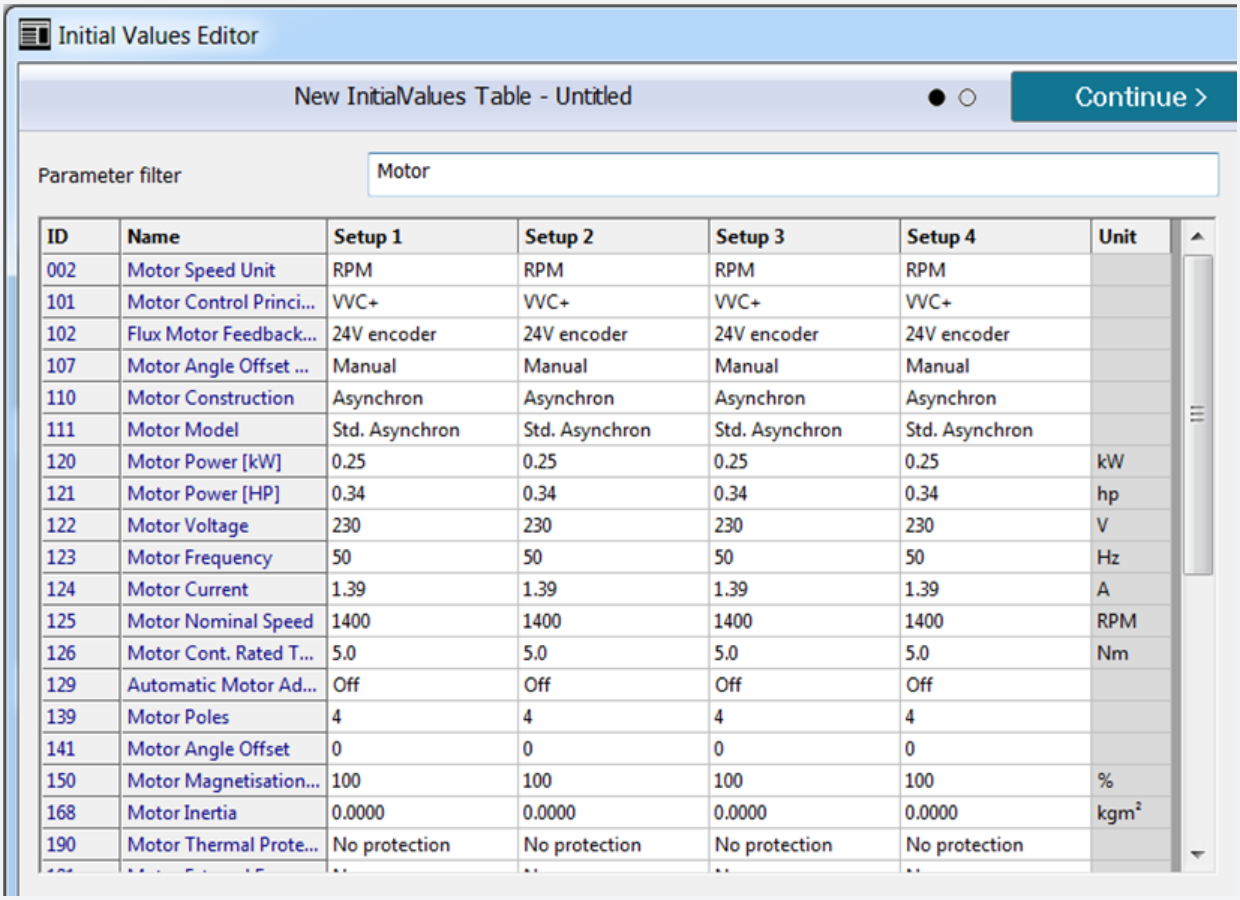


Illustration 265: Value Added to CSIV File

Alternatively, use filters to easily find parameters to add to the CSIV file. Search by the parameter name or ID.



ID	Name	Setup 1	Setup 2	Setup 3	Setup 4	Unit
002	Motor Speed Unit	RPM	RPM	RPM	RPM	
101	Motor Control Princi...	VVC+	VVC+	VVC+	VVC+	
102	Flux Motor Feedback...	24V encoder	24V encoder	24V encoder	24V encoder	
107	Motor Angle Offset ...	Manual	Manual	Manual	Manual	
110	Motor Construction	Asynchron	Asynchron	Asynchron	Asynchron	
111	Motor Model	Std. Asynchron	Std. Asynchron	Std. Asynchron	Std. Asynchron	
120	Motor Power [kW]	0.25	0.25	0.25	0.25	kW
121	Motor Power [HP]	0.34	0.34	0.34	0.34	hp
122	Motor Voltage	230	230	230	230	V
123	Motor Frequency	50	50	50	50	Hz
124	Motor Current	1.39	1.39	1.39	1.39	A
125	Motor Nominal Speed	1400	1400	1400	1400	RPM
126	Motor Cont. Rated T...	5.0	5.0	5.0	5.0	Nm
129	Automatic Motor Ad...	Off	Off	Off	Off	
139	Motor Poles	4	4	4	4	
141	Motor Angle Offset	0	0	0	0	
150	Motor Magnetisation...	100	100	100	100	%
168	Motor Inertia	0.0000	0.0000	0.0000	0.0000	kgm^2
190	Motor Thermal Prote...	No protection	No protection	No protection	No protection	

Illustration 266: Example of Using Filters for Finding Parameters

To import a parameter available in the offline MCT 10 Setup Software project, click *Apply project values*.

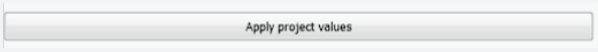


Illustration 267: Apply Project Values Button

10.4.2 Removing Parameters

Procedure

1. Select the parameter to be removed.
2. Click *Reset selected parameter values to default*.

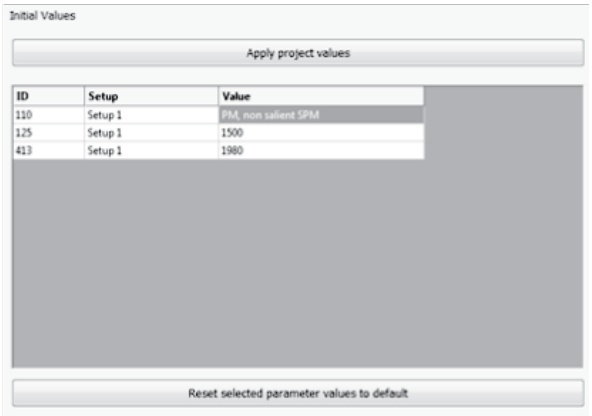


Illustration 268: Removing a Parameter

NOTICE

When resetting a parameter, other parameters may disappear from the CSIV file or change their values due to dependencies.

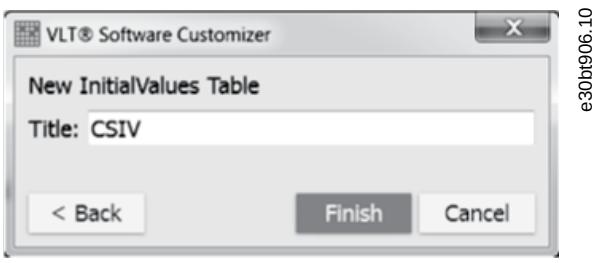
10.4.3 Saving the CSIV File

Prerequisites:

All values must be entered in the Initial Values editor before saving the CSIV file.

Procedure

1. Click *Continue*.
2. In the dialog box, enter a file name.



3. Click *Finish*.

Clicking *Back* returns to the editor, clicking *Cancel* cancels saving of the CSIV file.

→ When saving the CSIV file has completed, a preview of the file is shown in the project along with a date and time stamp.

Illustration 270: Preview of CSIV File in Project

10.4.4 Validation of Parameters During Import

Parameters are validated during import of a CSIV file. Incompatible parameters cannot be imported and are highlighted. Incompatibilities can be caused by, for example, missing parameters or a CSIV file created for a different product series.

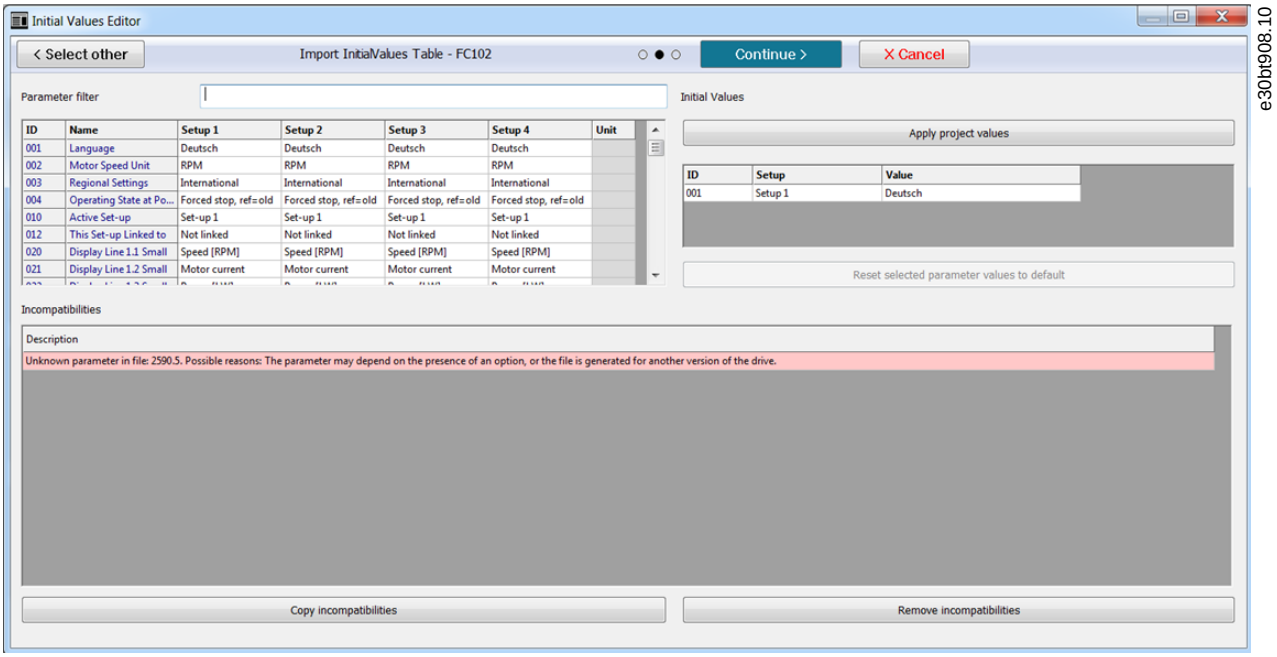


Illustration 271: Example of Incompatible Parameter

To copy the shown incompatibilities into Word or Notepad, click *Copy incompatibilities*.

To remove the incompatible parameters, click *Remove incompatibilities*.

It is possible to check the content of multiple CSIV files at import. Click *Select other* in the top left corner to open a Windows folder for selecting other CSIV files.

10.5 SmartStart

Use SmartStart to create set-up wizards that make commissioning of the drives easier and faster. The SmartStart wizard is a series of steps ensuring accurate and efficient motor control.

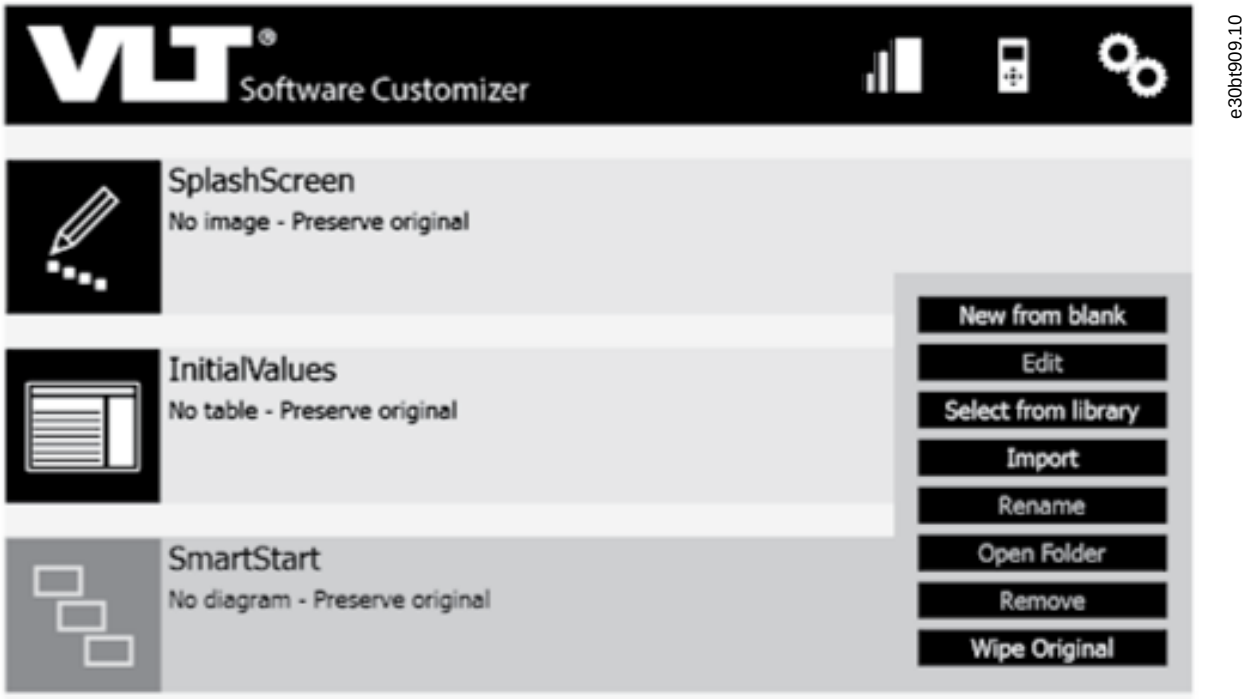


Illustration 272: SmartStart Menu in Project

NOTICE

In SmartStart, it is not possible to import existing binary files (*.sas files). First, create a wizard model. This model is converted into WDL scripting language, which is then compiled into a .sas binary file.

The SmartStart feature is based on the Model Drive Architecture® (MDA) standard by Object Management Group (OMG).

MDA

Illustration 273: MDA Logo

MDA® is a set of guidelines for structuring specifications that are expressed as models.

MCT 10 Set-up Software allows OEMs to participate in the process of SAS engineering and specifying Smart Set-up behavior as model. MDA defines 4 model layers, where the wizard designer operates on layer M1.

OMG

Illustration 274: OMG Logo

OMG® is an international non-profit technology standards consortium and is best known for standards distributed computing (CORBA) and modeling (UML).

OMG develops standards for a wide range of technologies and industries but does not provide implementations of them.

10.5.1 Creating a Project from Blank

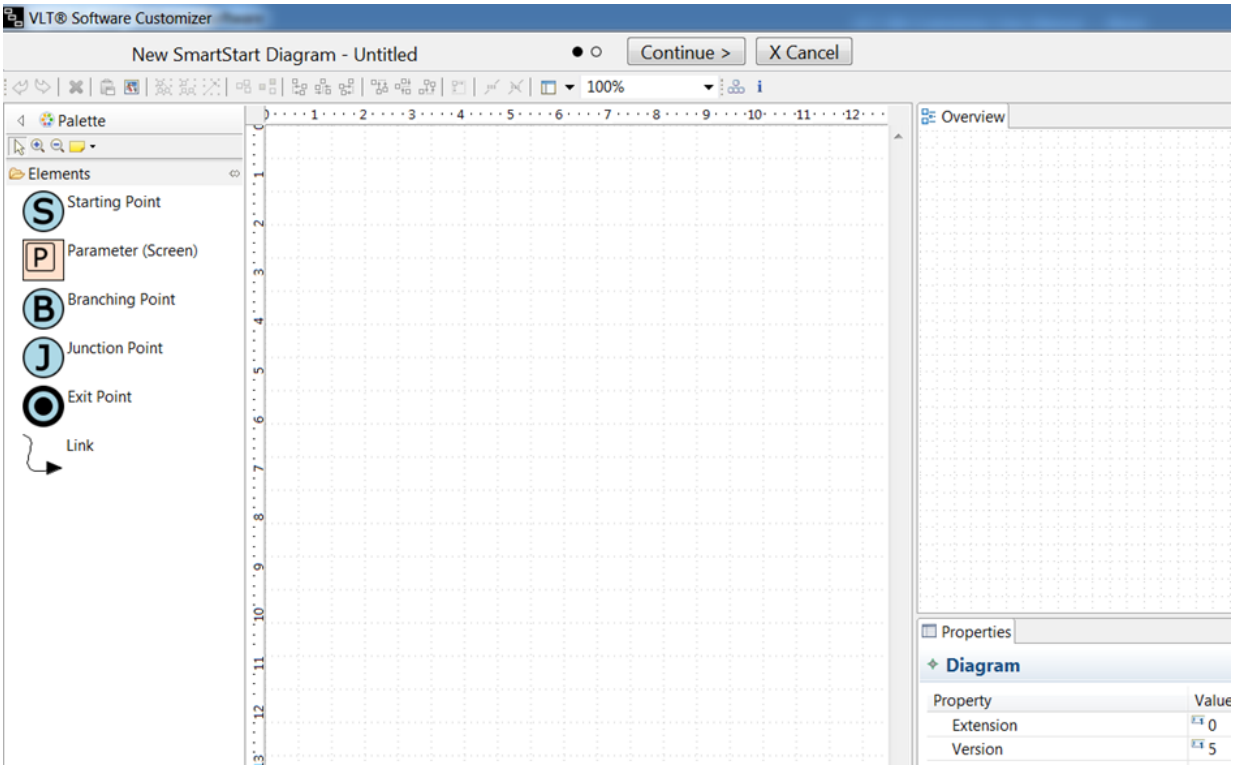
Context:

The SmartStart tool is organized in the following areas:

- Palette.
- Menu.
- Overview.
- Properties.
- Main/design area.

Procedure

1. Select *New from Blank* to open an empty project in the editor.

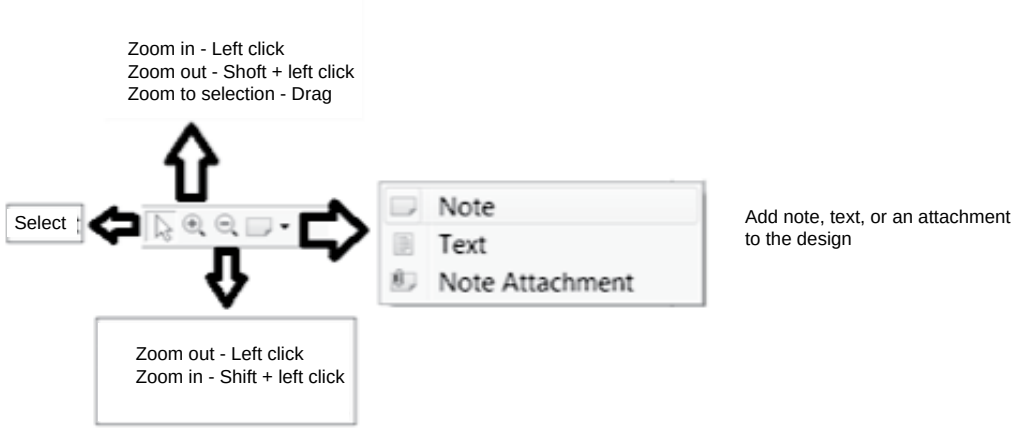


e30bi912.10

Illustration 275: Empty Project

2. Create the diagram in the main/design area.

10.5.1.1 Palette



e30bi913.10

Illustration 276: Description of Icons in the Menu

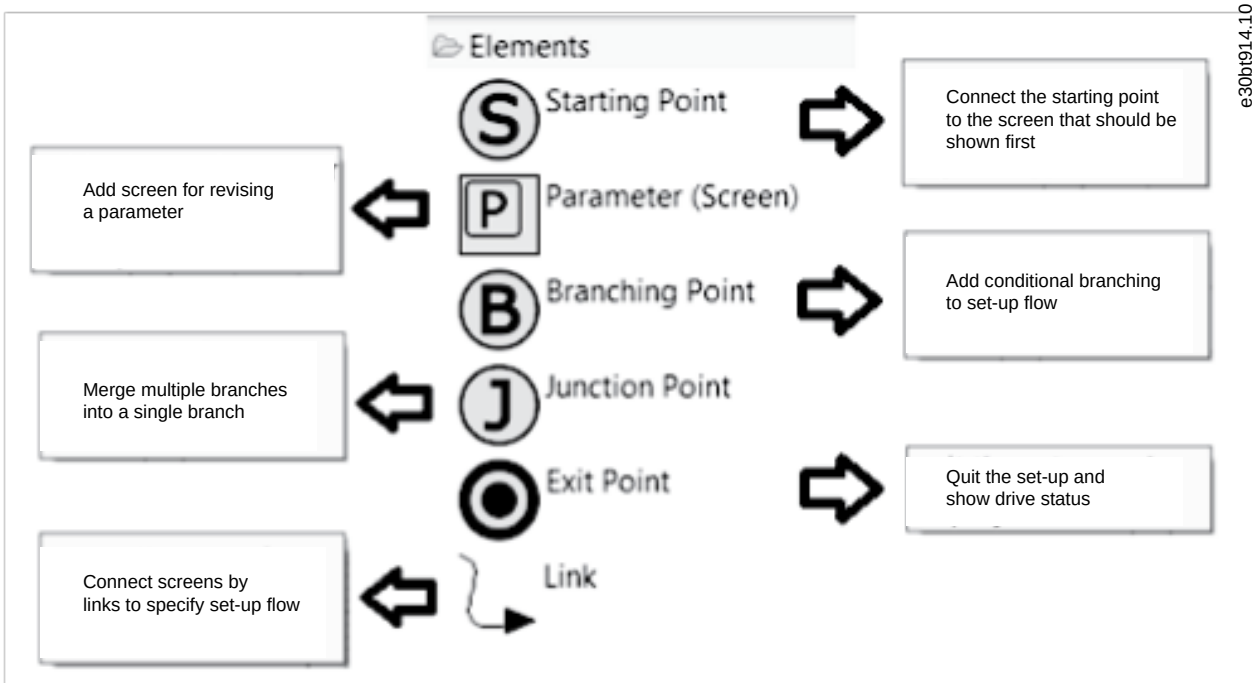


Illustration 277: Description of the Elements for Creating Diagrams

10.5.1.2 Menu

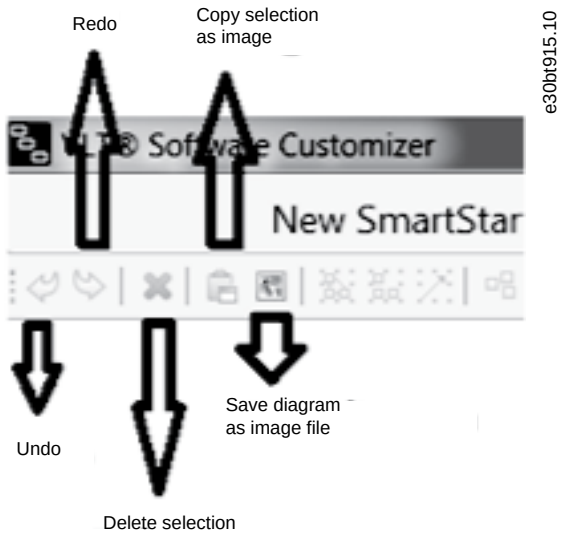


Illustration 278: Description of the Elements for Creating Diagrams

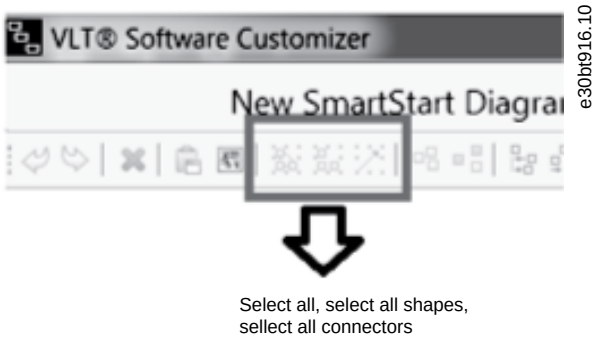


Illustration 279: Description of the Select Section in the Menu

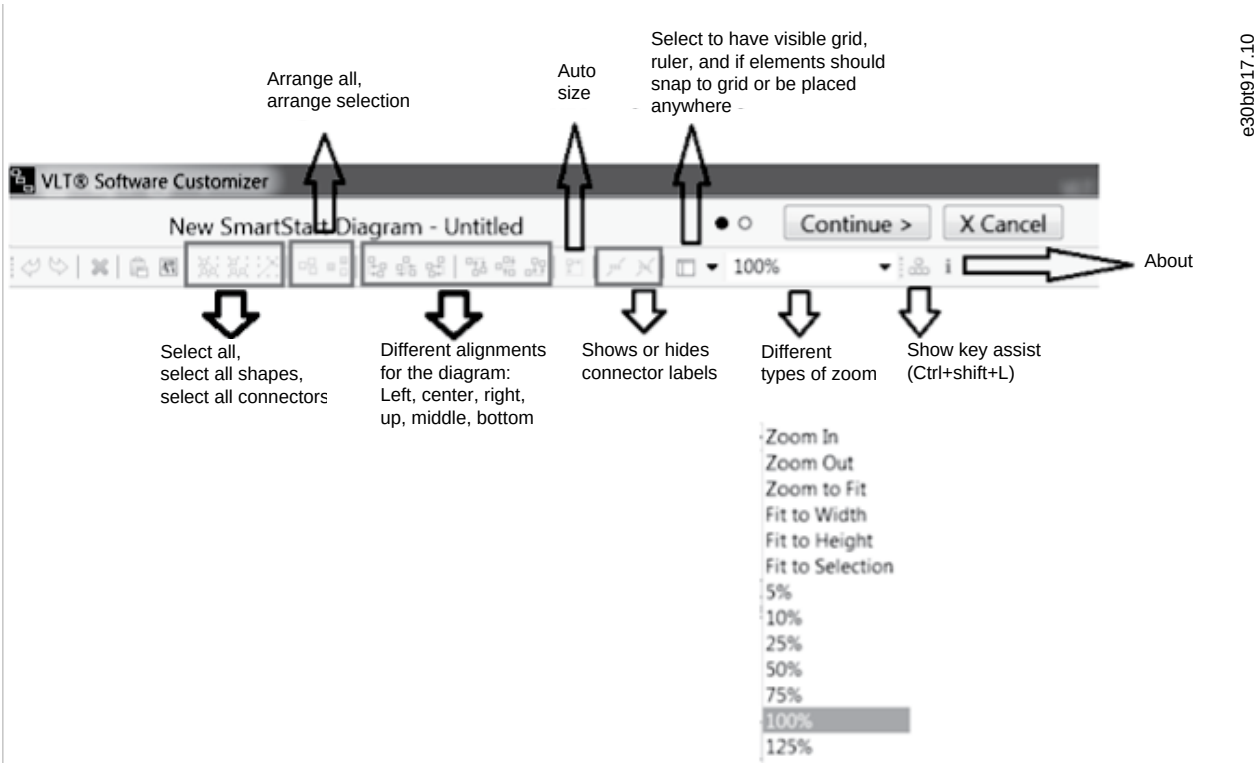


Illustration 280: Description of Icons the Menu

10.5.1.3 Overview

The overview section gives an overview of the diagram as it starts to grow. The overview makes it easier to navigate.

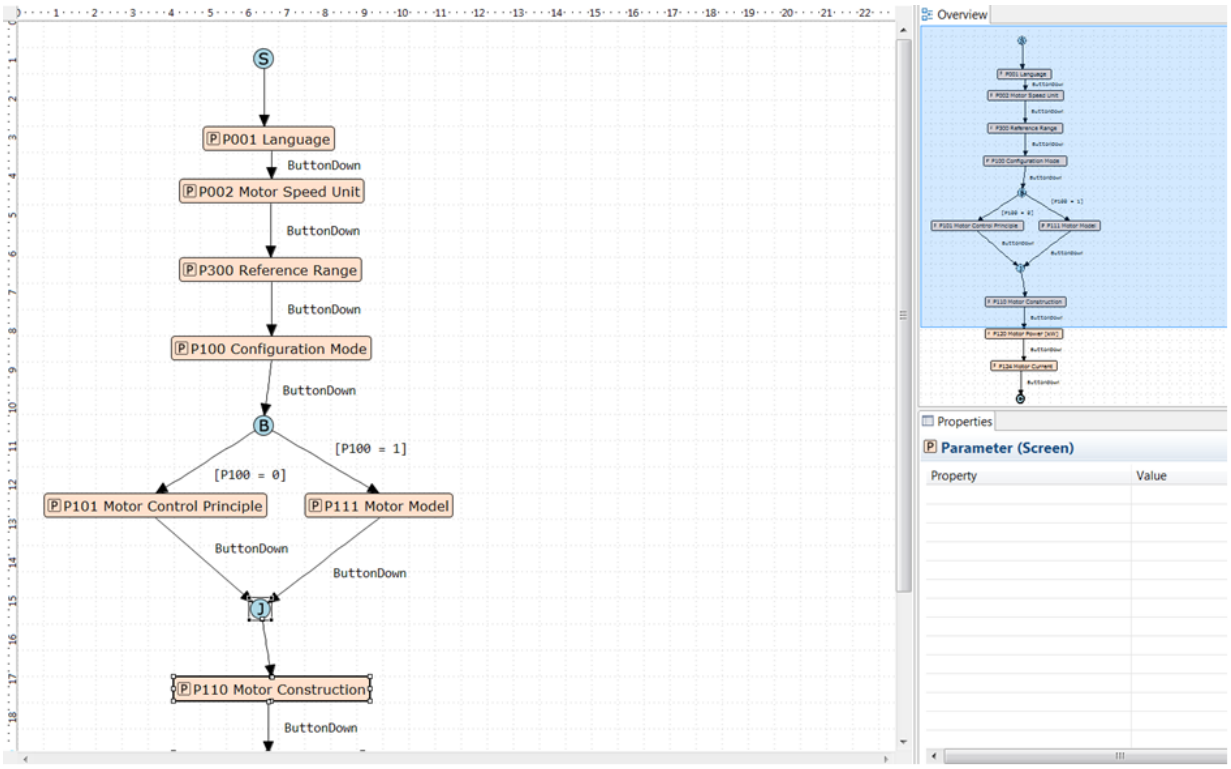


Illustration 281: Example of Diagram Shown in the Main/Design Area and in the Overview

10.5.1.4 Properties

The Properties view shows the property of a selected element in a diagram.

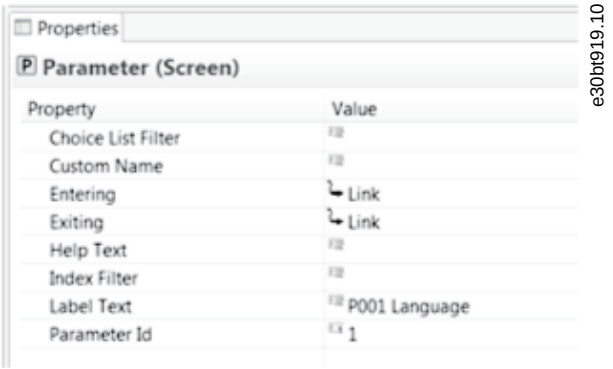


Illustration 282: Example of Properties for Parameter (Screen)

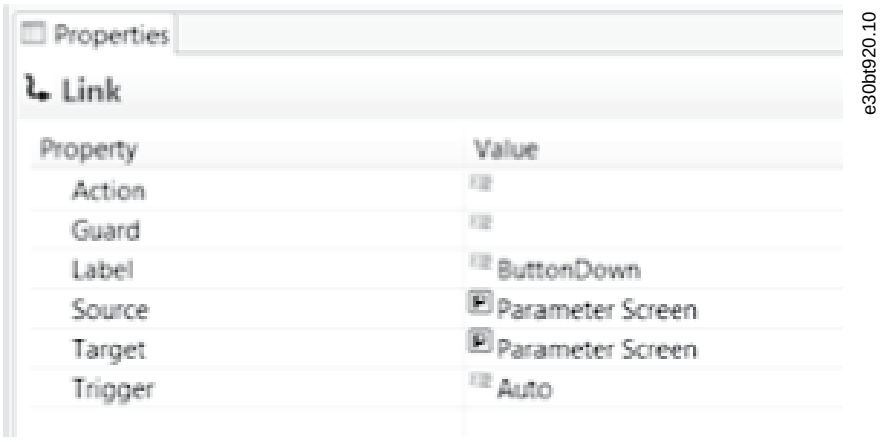


Illustration 283: Example of Properties for Link

10.5.2 Create Diagram

Create a diagram in any of 3 ways:

- Drag and drop the element into the Design area.
- Select an element by clicking it and then click in the Design area where the element should be placed.
- Leave the mouse cursor for 1 s on the Design area and small elements appear. Then select the needed element.

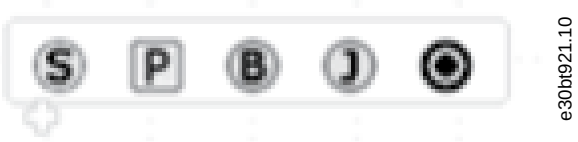
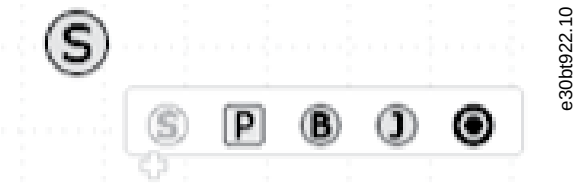


Illustration 284: Elements for Creating Diagrams

NOTICE

It is only possible to have 1 starting point. Once a starting point is inserted in the diagram, the element is grayed out in the element list.



10.5.3 Create Parameter Screen

After selecting or dropping a parameter screen into a diagram, a *Create parameter screen* dialog appears.

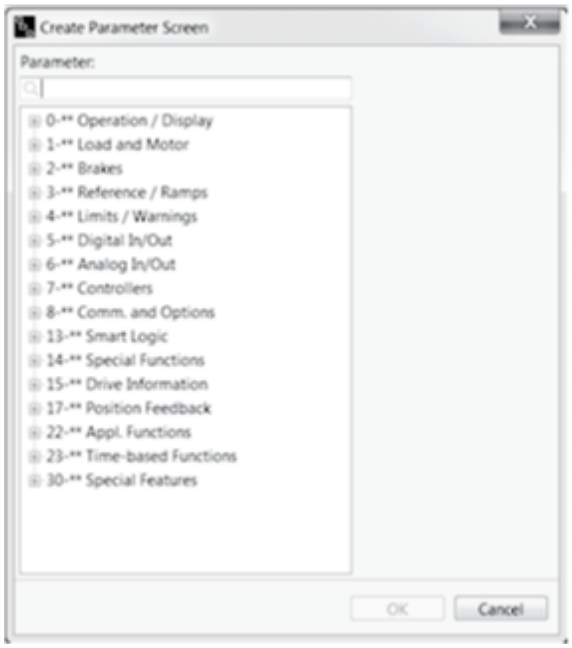


Illustration 286: Create Parameter Screen Dialog

10.5.3.1 Filter

Filter parameters by typing the parameter name or ID.

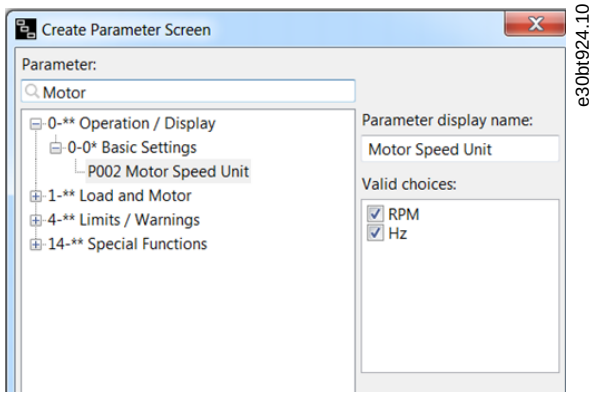


Illustration 287: Example of Filtering

Filtering the 1st parameter that matches the search and the groups and subgroups where the match is available.

While creating *Parameter Screen*, it is possible to filter choice lists and index parameters available in the wizard. Make the selection from *Valid choices*.

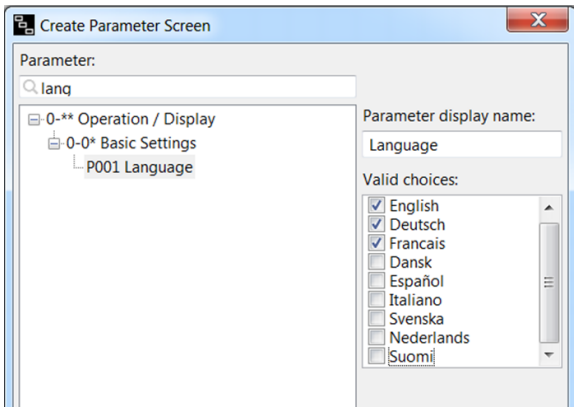


Illustration 288: Example Showing Available Languages

For index parameters, an index filter dialog box is shown. By default, all possible indices are selected. Use "-" for a range of filters, or use "," for selecting individual indices. It is also possible to combine the selections.

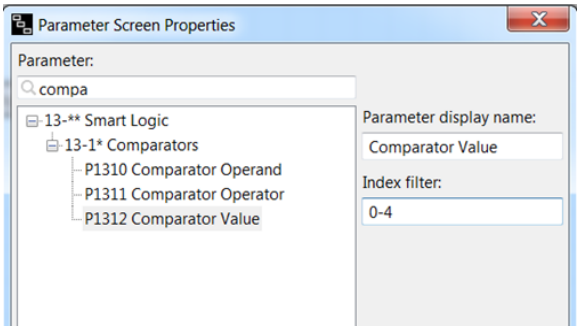


Illustration 289: Example of Index Parameter with Index Filter

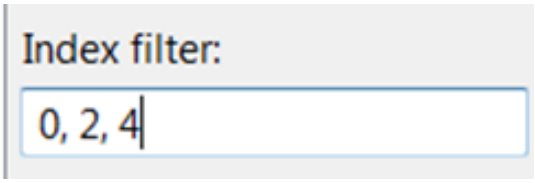


Illustration 290: Example of Individual Selection

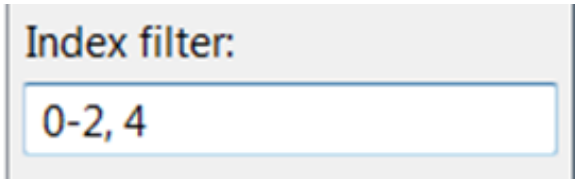


Illustration 291: Example of Combined Selection

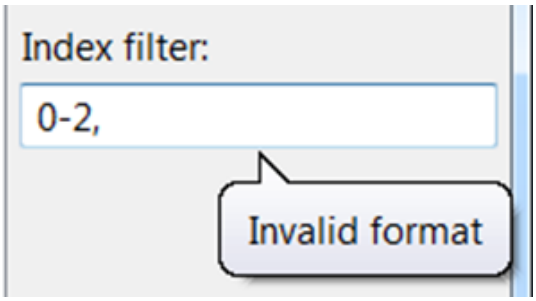


Illustration 292: Error Message when Filter is Wrong

NOTICE

When the filter is wrong, it is not possible to click OK until the error has been corrected.

10.5.3.2 Customize Parameter Display Name

Parameter names can be customized and shown in the wizard. Type the new parameter name in the field *Parameter display name*.

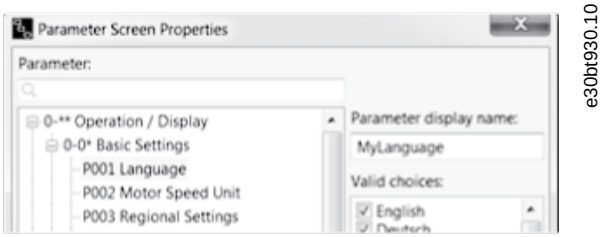


Illustration 293: Example of a Customized Parameter Name

Illustration 294: Customized Parameter Name Shown in the LCP

Illustration 295: Example of Customized String Shown in the LCP

A customized name is shown in the diagram and in *Properties*.

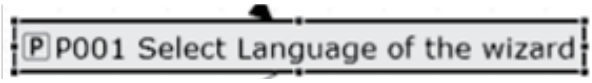


Illustration 296: Customized Name Shown in the Diagram

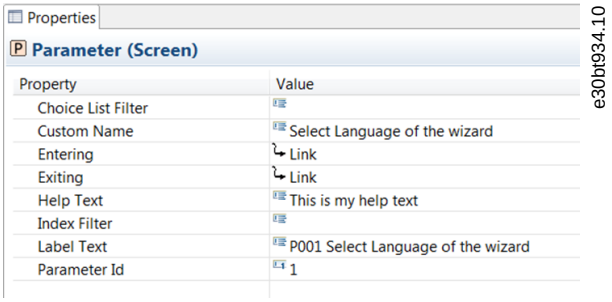


Illustration 297: Customized Name Shown in Properties

10.5.3.3 Help Text

It is possible to define help texts for the parameter screens. The maximum character number for a help text is 511. To show a help text, press the [Info] key on the LCP.

Illustration 298: Example of Help Text

Illustration 299: Help Text Shown in LCP After Pressing Info

10.5.4 Link Screens

Link between screens can be created in 2 ways:

- Select the *Link* icon from the palette.
- Use connectors to link elements.

10.5.4.1 Linking via the Palette

Procedure

1. Drag the *Link* icon and drop it on the element to link from.
   Drag down to the element to link to.

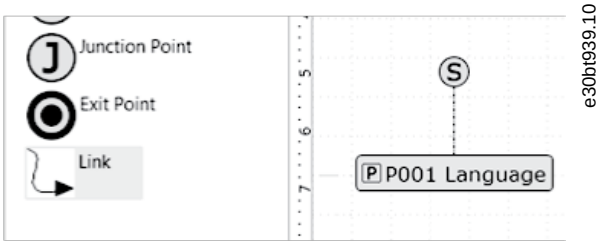
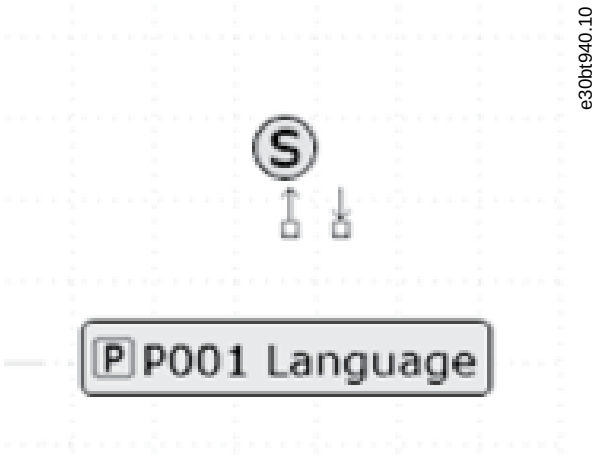


Illustration 300: Link from the Palette

10.5.4.2 Linking via Connectors

Procedure

1. Select the elements to connect (leave the cursor over the element for connectors to appear).



2. When the connector is shown, drag and drop it on the element to connect to.

→ When the connection is established, an arrow is shown and a label is added.

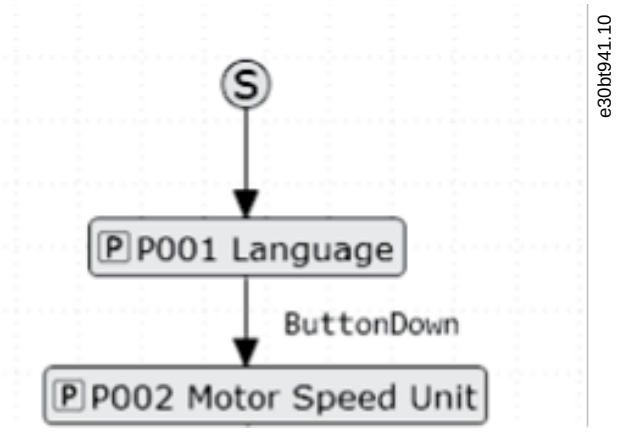


Illustration 302: Established Connections with Label Added

Double-clicking the link opens the link properties. Use the link properties to add action scripts.

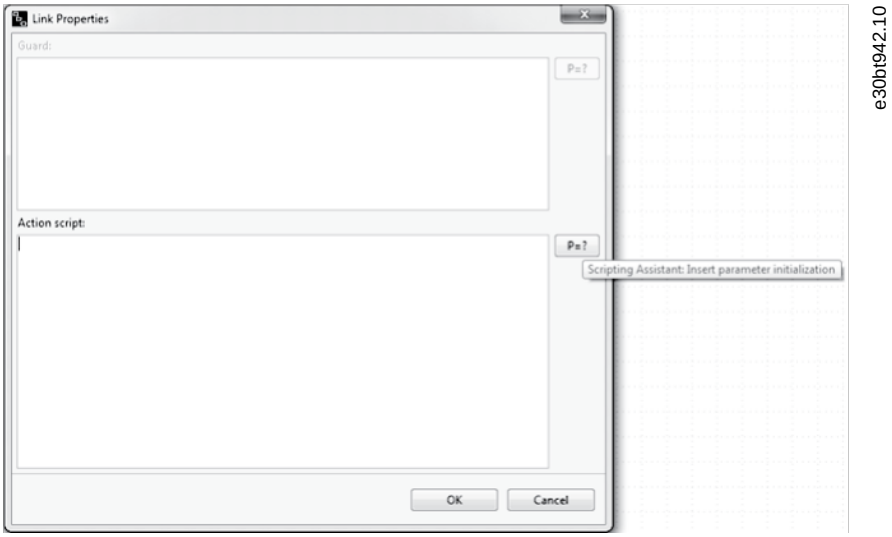


Illustration 303: Link Properties

10.5.4.3 Action Scripts

Action scripts are for advanced users. Knowledge of the expected format is required.

Use the scripting assistant to create an action script for parameter initialization in any place where parameters are selected from a list.

Example

- Initialize parameters: P=value.
- Comments: Comments start with ";".

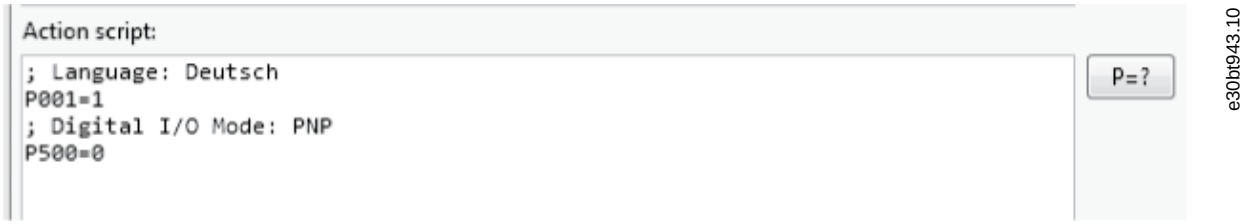


Illustration 304: Example of Action Script

The action script is added to the diagram as a label.

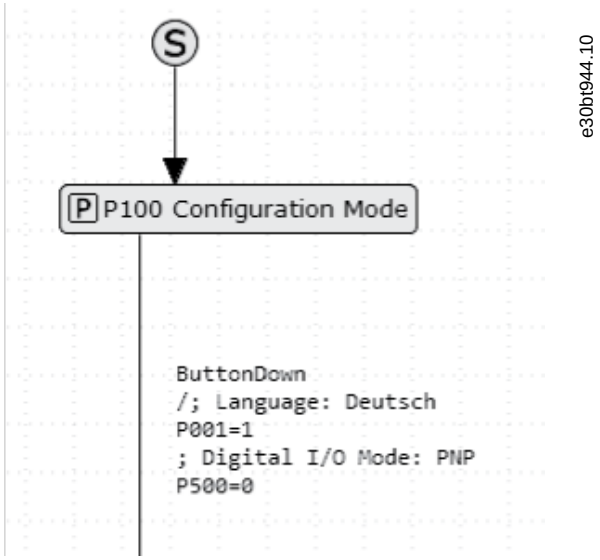


Illustration 305: Action Script Added to Diagram as Label

10.5.5 Branching

Context:

Use branching for having 1 point with several options. Each point has a guard condition that must be fulfilled for that option to be selected. Click [TODO] to specify the guard condition.

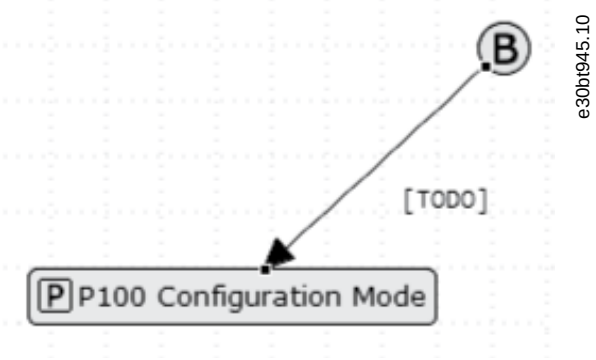


Illustration 306: Click [TODO]

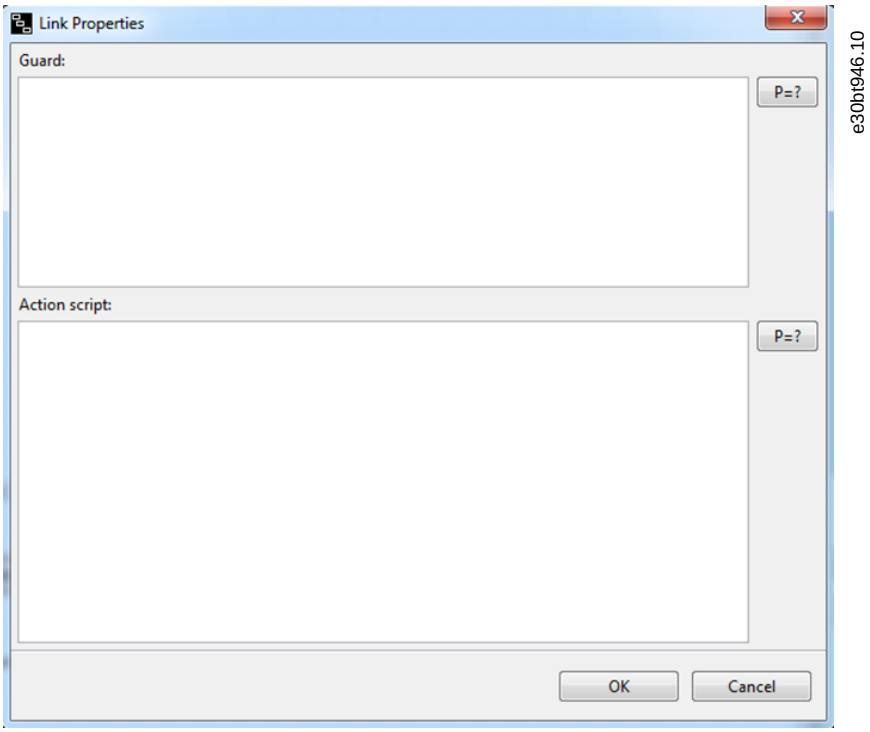
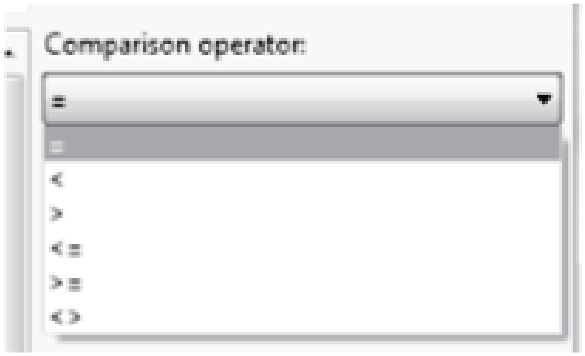


Illustration 307: Window for Defining Guard Conditions

The scripting assistant for guard conditions opens a dialog.

Procedure

1. Select the parameter number.
2. Select the comparison operator.



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3. Select value.

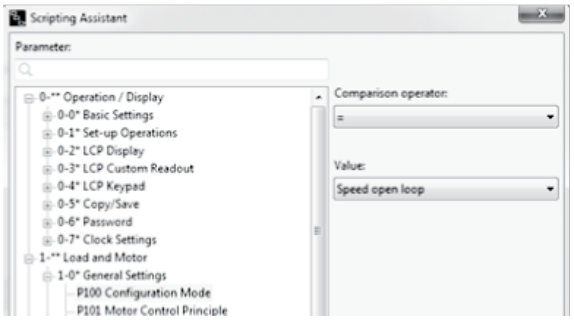

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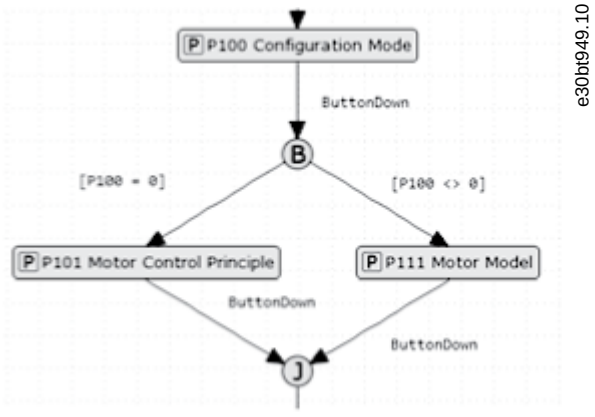
Illustration 309: Example of the Guard Scripting Assistant

Example:



e30bt949.10

Illustration 310: Example of Branching with 2 Options

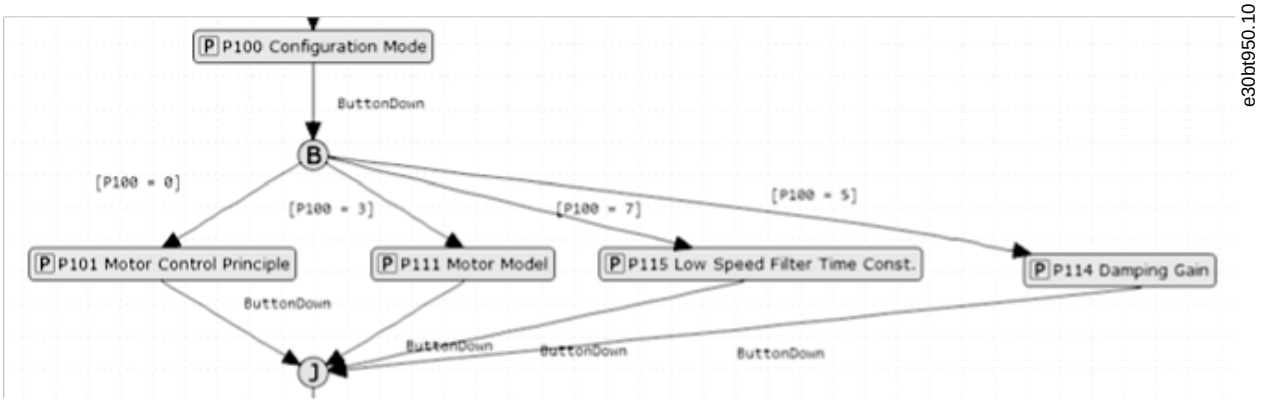


Illustration 311: Example of Branching with 4 Options

10.5.6 Junction

Junction is used for chaining multiple transitions. A single junction can have 1 or more incoming transitions.

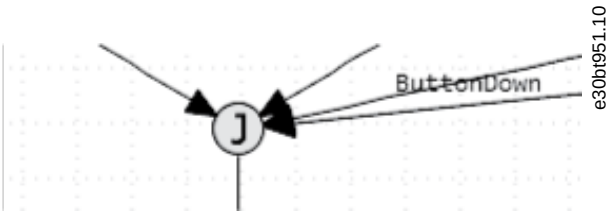


Illustration 312: Example of Junction with Several Transitions

10.6 Writing to Drive

NOTICE

TURN OFF THE DRIVE

Writing to drive puts the drive in test monitor mode. This is a special mode where it is possible to write files to flash the file system. It is important to turn off the drive.

Writing to drive writes files from the VLT® Software Customizer.

If a file is already in the drive, it is overwritten by the new file.

10.6.1 Preserve Original vs. Wipe Original

Write to drive writes all files. If a feature does not contain any files, select either to keep the original file in the drive, or to delete it (*Wipe Original*). By default, *Preserve Original* is selected. To change this setting, select it from the menu of the given feature.

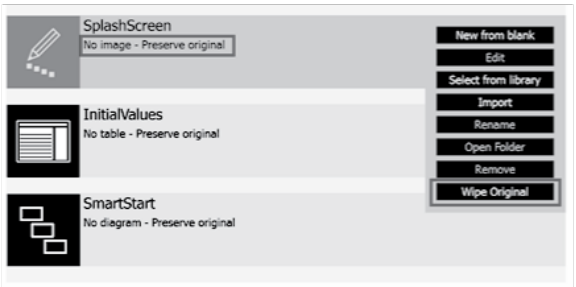


Illustration 313: Menu for SplashScreen

Changing from *Preserve Original* to *Wipe Original* issues a notification.

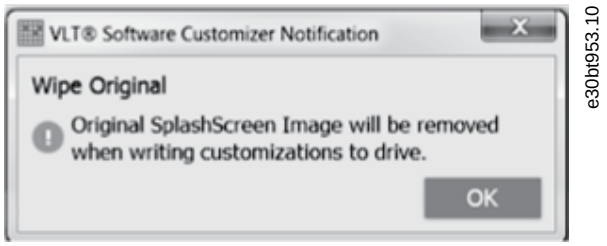


Illustration 314: Notification when Changing Setting

After clicking [OK], the new setting is shown in the project.

Illustration 315: New Setting Shown in Project

The settings are individual for each feature. If a feature has a file in the project, this setting is irrelevant and therefore grayed out.

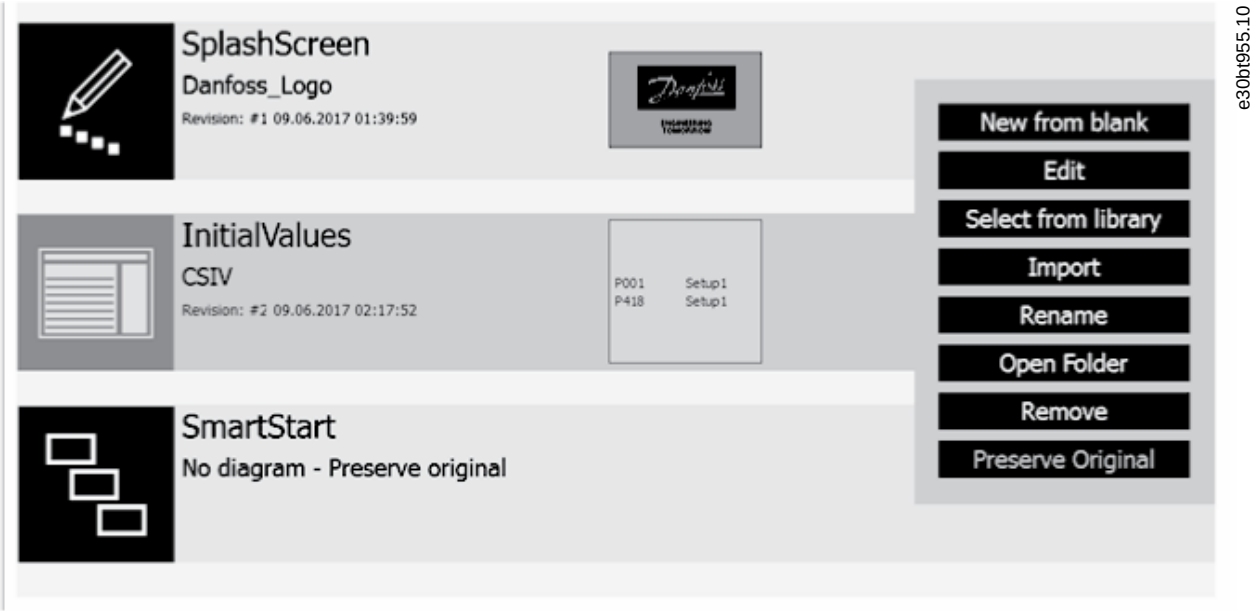


Illustration 316: Example of Grayed-out Setting

NOTICE

To make back-up of files in the file system, use the Drive File System and the Drive File Manager.

10.6.1.1 Removing Files

Procedure

1. Select *Remove* from the given feature menu in the project.

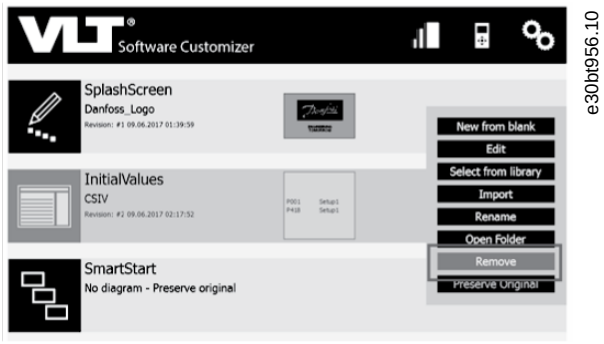


Illustration 317: Removing a File

10.7 Testing in Simulator

Use the simulator to test created files without being connected to a real drive and a real LCP. The simulator is an app that emulates LCP behavior.

Illustration 318: Select Test in Simulator in the Top Menu

Each drive series and each software version have different simulators.

If the simulator is not available when selecting *Test in Simulator*, a message is shown.

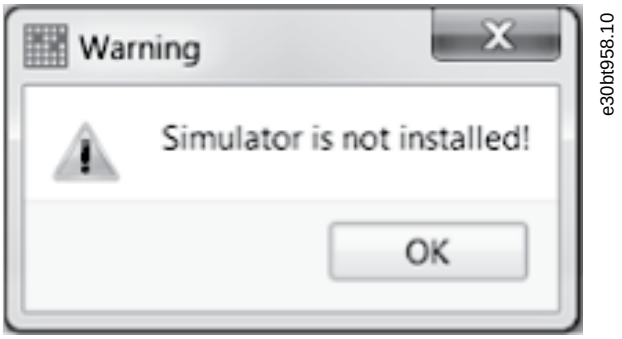


Illustration 319: Warning Message - Simulator is not Installed

If the simulator is not available, contact a local Danfoss representative who can provide a zip file.

10.7.1 Installing the Simulator

Procedure

1. Save the zip file locally on a PC.
   Open the *Tools* menu in MCT 10 Set-up Software.
   Select *Update VLT Software Customizer support...*.

Illustration 320: Selecting the Update VLT Software Customizer Support

Example:

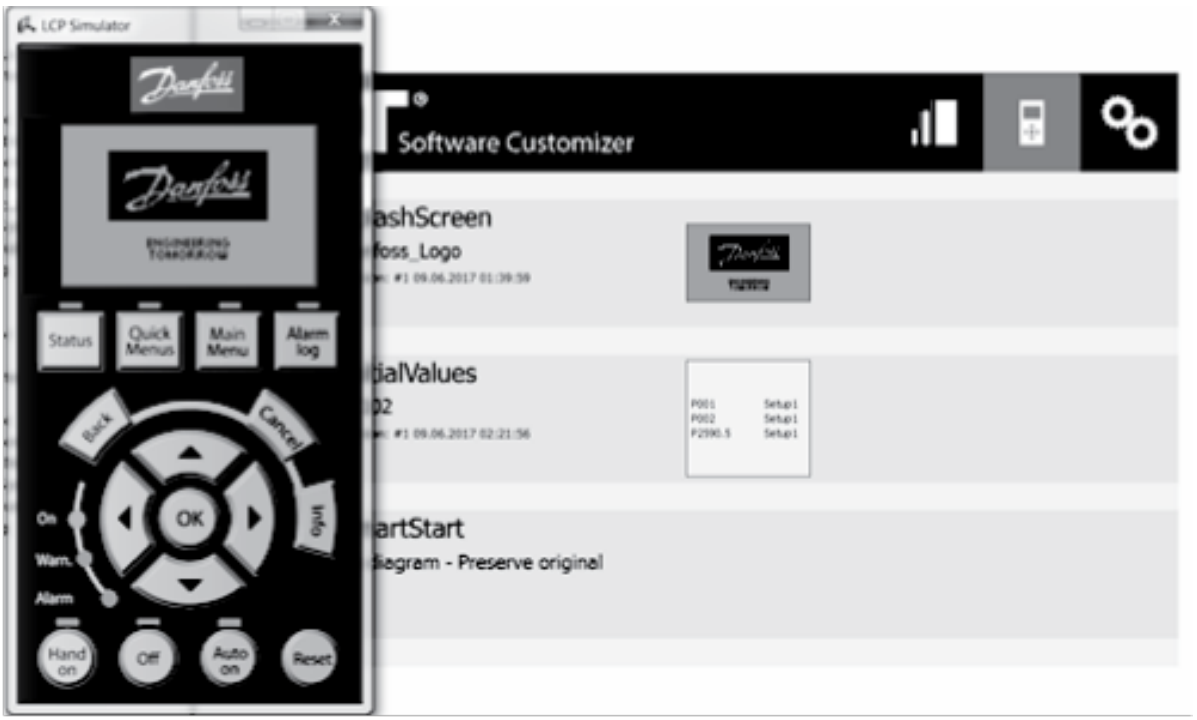


Illustration 321: LCP Simulator

11 Tool Calling Interface (TCI)

11.1 Introduction

The TCI is an interface between the programming tool (TIA/Step 7) for the PLC and the MCT 10 Set-up Software and it supports fieldbus communication over network boundaries.

The TCI is available in the MCT 10 Set-up Software from version 4.20.

When installing the MCT 10, a program interface description (PID) file is created. This file acts as an interface between the TIA portal and MCT 10. When MCT 10 is opened via the PLC, information about the drive and the parameter database are placed in a temporary parameter (TPF) file.

Benefits

- Data is inside the programming file of the PLC.
- There is no risk of selecting the wrong MCT 10 project file.
- Exact match between the controller hardware configuration and MCT 10.
- The PLC calls MCT 10.
- Reduction of faults.

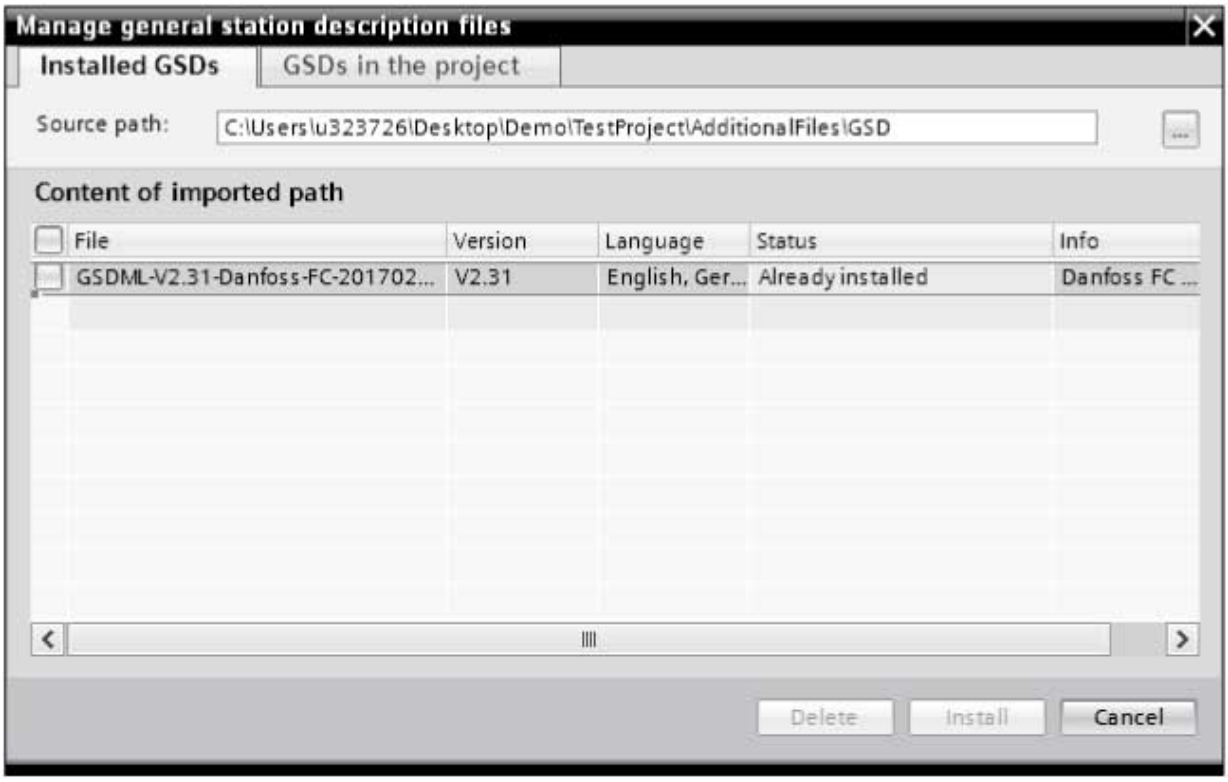
11.2 Installing the GSD/GSDML File

Context:

The GSD/GSDML file is required for the TCI interface to work. Danfoss provides the file.

Procedure

1. Unzip the file.
2. Open the TIA portal.
3. Click the *Options* menu.
4. Click *Manage*.
5. Select the file and install it.



e30bu287.10

Illustration 322: Installing the GSD/GSDML File

11.3 Creating a Project in TIA

Prerequisites:

The following files must be installed before creating projects:

- TIA Portal tool version 14 or higher, or Step 7 version 5.6 or higher.
- VLT® Motion Control Tool MCT 10 version 4.20 or higher.
- GSD/GSDML file provided by Danfoss.

Procedure

1. Click *Create project*.
2. Expand the project in the project tree.
3. Click *Devices & Networks*.
4. Click *Add new device*.
5. Select the PLC.

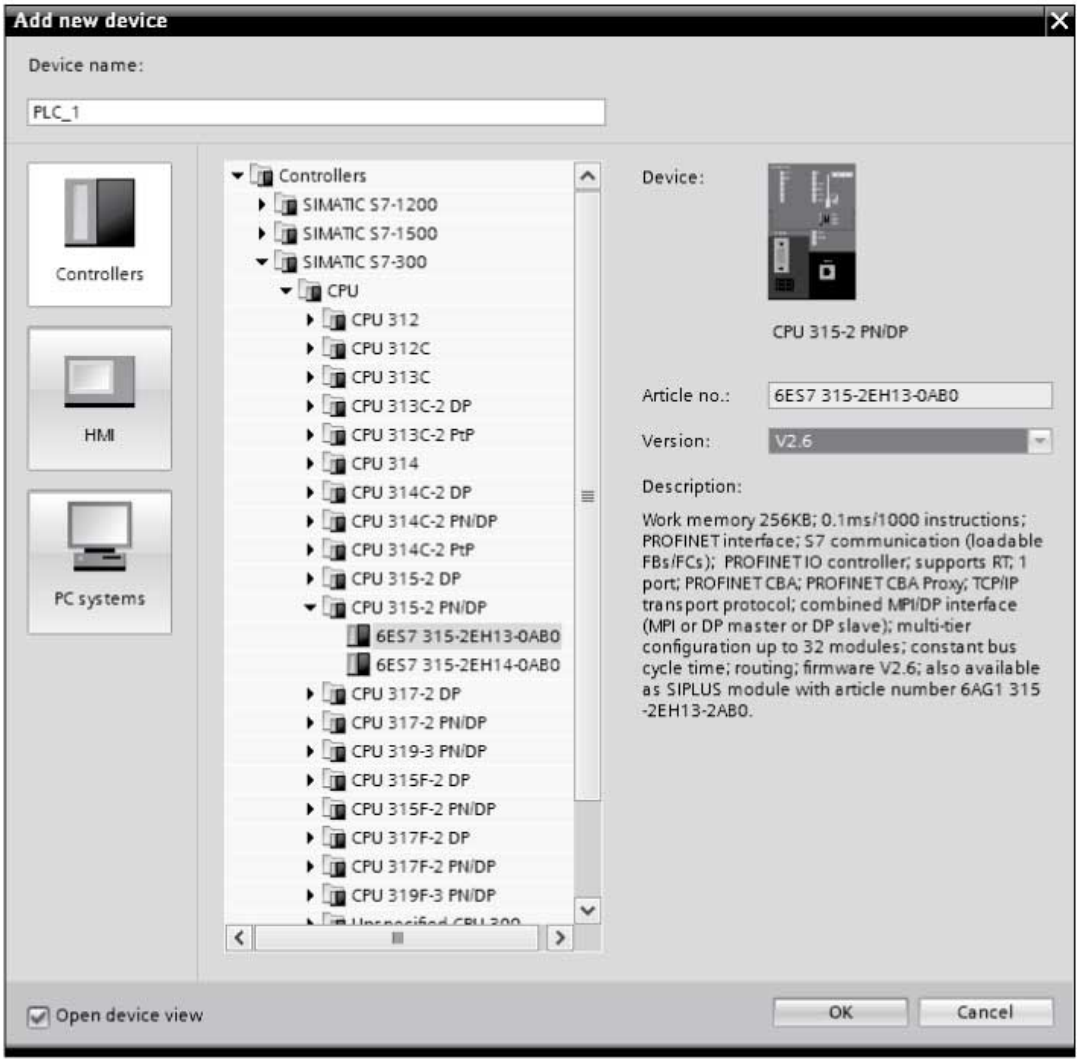


Illustration 323: Add New Device

11.4 Use Cases

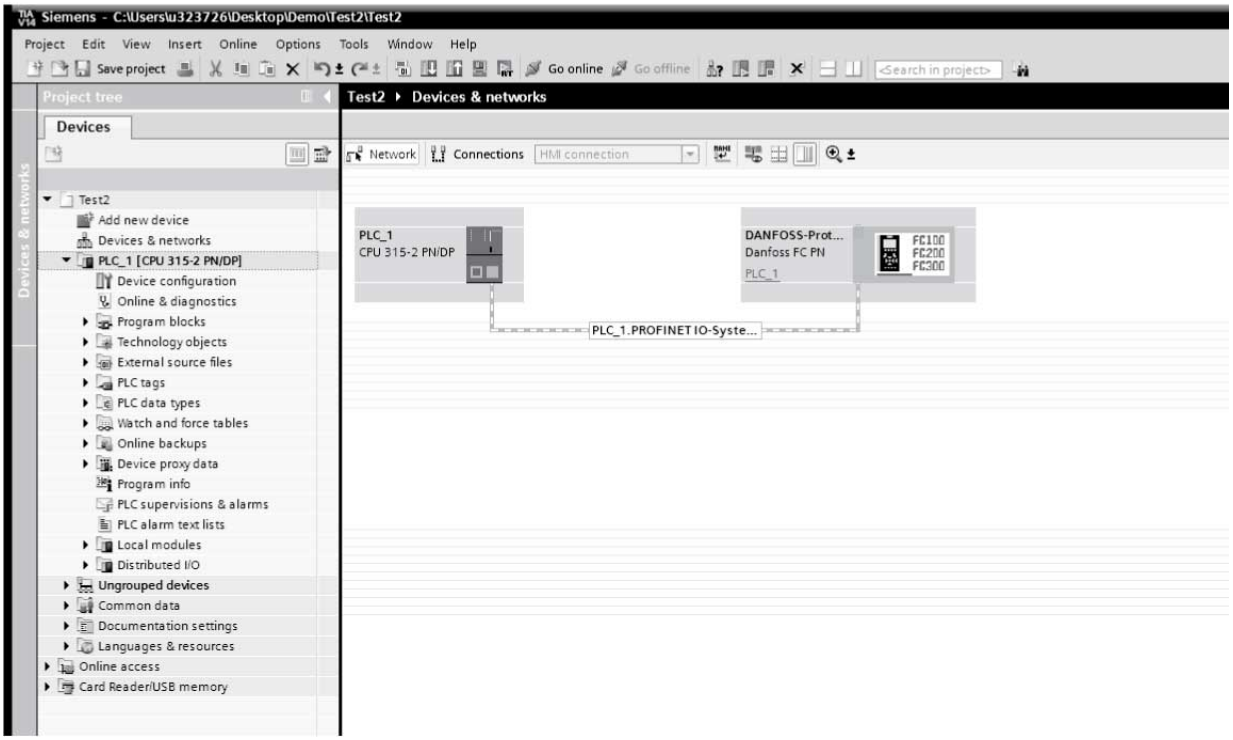
11.4.1 Doing the Initial Connection

Prerequisites:

The PLC must be added before the initial connection can be established.

Procedure

1. Click the *Network* icon at the top left corner of the right view.
2. Enter *Danfoss* in the search field.
   → The GSD file appears.
3. Build the drive network in the PLC via drag and drop.



e30bu289.10

Illustration 324: Initial Connection

11.4.2 Configuring the TCI

Prerequisites:

The PLC must be programmed before starting the configuration.

Procedure

1. Right-click the drive icon and start the device tool.
   → A dialog box shows for opening Danfoss Set-up Software.

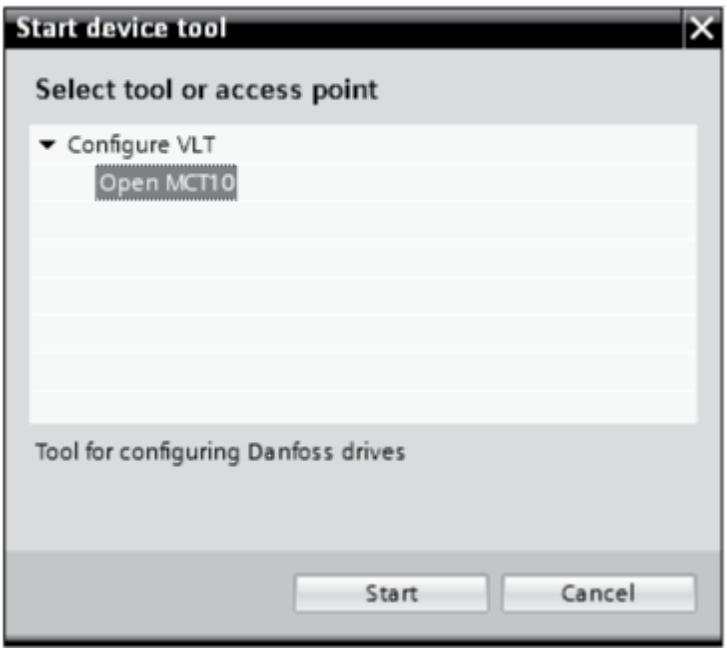


Illustration 325: Start Device Tool

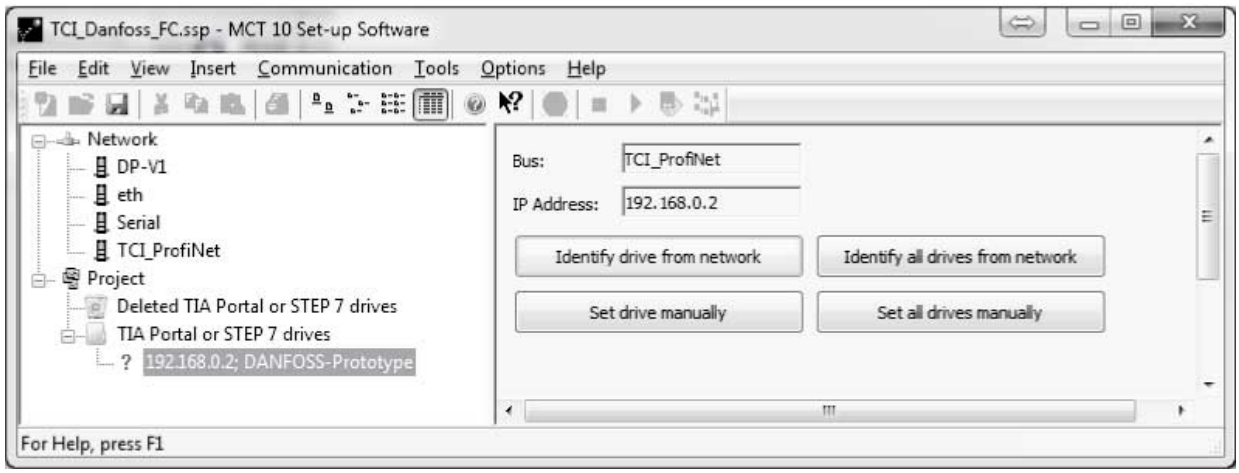


Illustration 326: Configuration

2. **For online network**: Select the network, for example TCI_Profinet.
   → The tool scans drives which are mapped to the TCI interface. A drive appears if it is connected to the PLC.
3. **For offline project**: Identify all drives in offline mode.

   This step is applicable for creating a project with drives that are not physically connected.

Illustration 327: Set Drive Manually

→ Once the MCT 10 parameters are configured and the tool is closed without saving the MCT 10 project, data goes to the TIA portal and is saved as a TIA project.

When opening the drive from TIA, MCT 10 opens with the saved data and appears in MCT 10.

12 SyncPos

12.1 SyncPos Handling

The VLT® 5000 and VLT® 5000 FLUX series have a SyncPos application option, which consists of a print card with a processor. For detailed information, refer to *Programmable SyncPos Motion Controller Operating Instructions*.

MCT 10 Set-up Software can directly modify, read from, and write to SyncPos files. SyncPos files are stored within the MCT 10 Set-up Software files and do not require separate handling.

When a VLT® 5000 has a SyncPos option installed, the MCT 10 Set-up Software shows 2 icons after the drive has been selected:

- An *All parameters folder* icon.
- A separate *SyncPos* icon.

*Parameter group 7-** Controllers* is incorporated under *All Parameters* and applies to SyncPos.

NOTICE

MCT 10 Set-up Software does not fully support the SyncPos application versions 1.xx and 2.xx. The SyncPos folder is available due to the lack of functionality in these initial versions.

12.2 Programs and Configuration File

The SyncPos program consists of 2 main parts:

- Configuration file (*.cnf).
- Program files (*.m).

A configuration file consists of a series of SyncPos parameters which can be programmed. MCT 10 Set-up Software allows importing, exporting, and setting up SyncPos configuration files.

12.2.1 Programs

Programs can be inserted in the MCT 10 Set-up Software Project folder. When a new SyncPos program is selected, an untitled program is inserted in the SyncPos folder. The program can be edited, written, and exported as in the standalone SyncPos program. If a SyncPos program exists, it can be imported into the MCT 10 Set-up Software project.

12.2.2 Viewing the Configuration File

Procedure

1. Select *Configuration* to view the drive configuration file in the right view of the screen.
2. To change the SyncPos settings, select the relevant drive in the right view to open a new editor (Cam Editor).

   Refer to the Programmable SyncPos Motion Controller Operating Instructions for details on using the editor.
3. Change the settings.
4. Select *Compile* (in *Settings* in the main menu) or *Exit Program* (in *File* in the main menu).
5. When selecting *Exit Program*, select *Read* or *Write*.

   → The *Confirm SyncPos write* (or read) window pops up with 2 options for saving the SyncPos card.
6. Select the wanted option and select *Yes* or *No*.

   When selecting *Yes*, the information is written to the drive.

   NOTICE

   If *Write to Drive* is selected at the root of the drive, the MCT 10 Set-up Software also writes the SyncPos files to the SyncPos options. This can lead to an unattended stop of the SyncPos card.

12.2.3 Importing and Exporting a Configuration File

Context:

This procedure describes how to import a configuration file to a SyncPos card. Exporting a file is done in the same way, but select *Export* instead of *Import*.

Procedure

1. Click the configuration file shown in the right view.

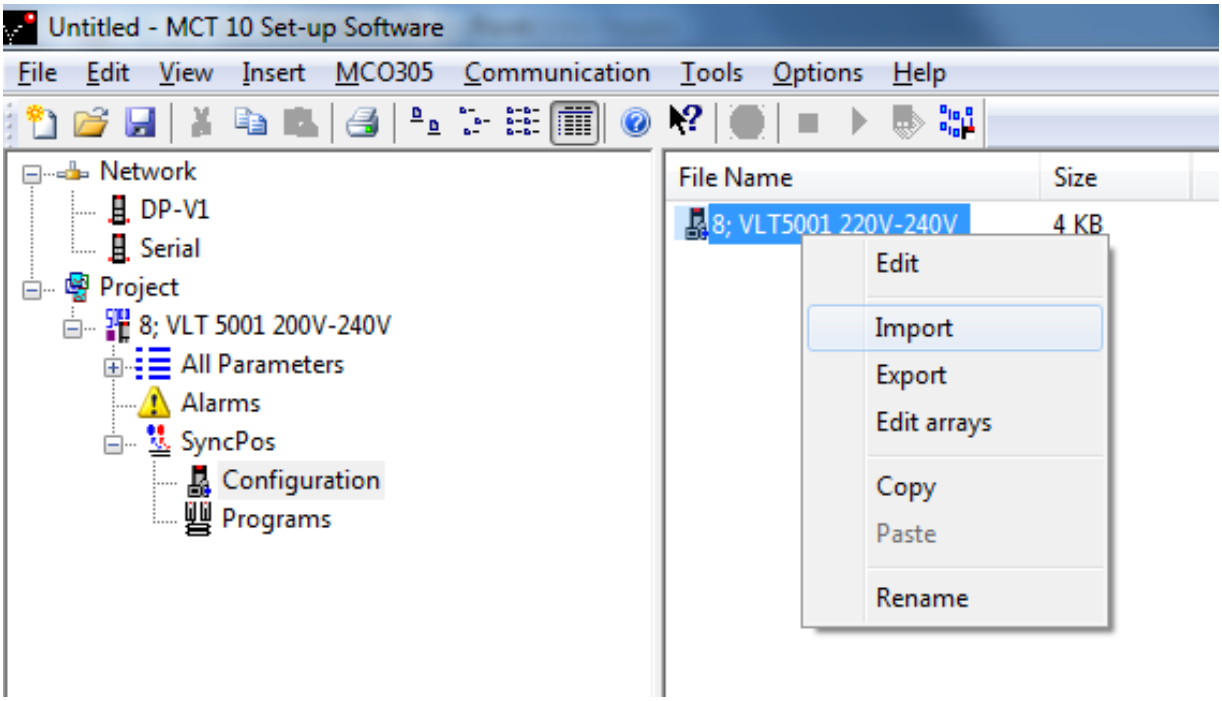


Illustration 328: Import Configuration File

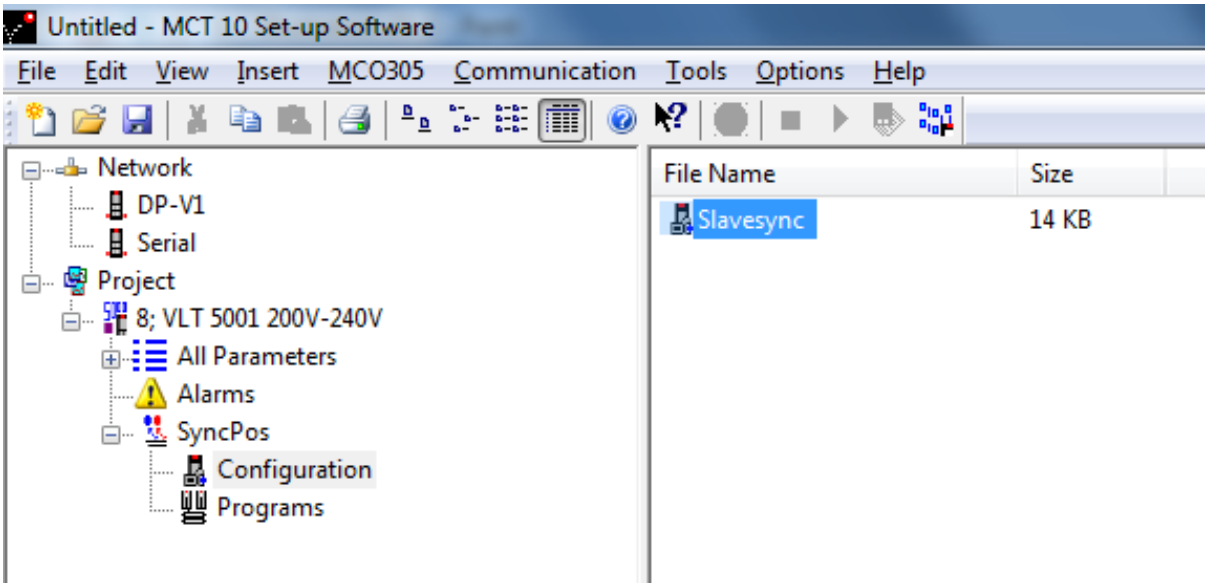


Illustration 329: Import Configuration File

2. Select a configuration file for import from the computer directory.
3. Select the desired file and click *Open* to import the file to the Configuration folder.

12.2.4 Editing and Saving a Configuration File

Procedure

1. Select the configuration file to view and edit.
   → The configuration editor opens.
2. Make the required changes to the configuration file.
3. Close the SyncPos application.
   → The SyncPos Application Closed dialog appears.

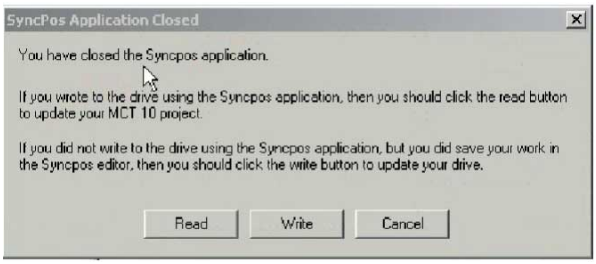


Illustration 330: SyncPos Application Closed

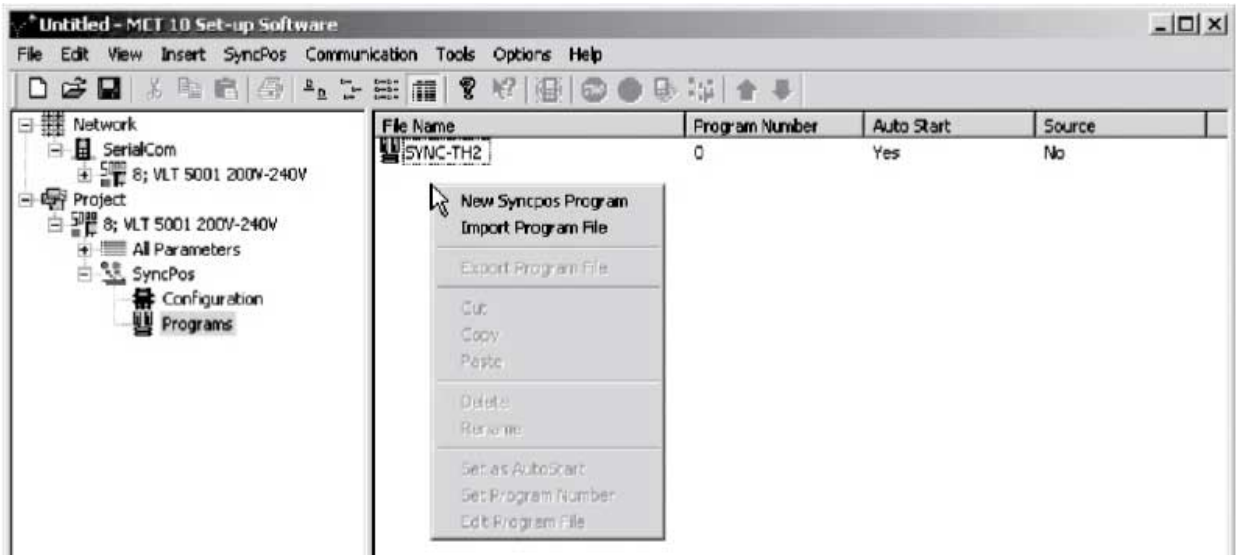
4. Select
   Read to save changes to the MCT 10 Set-up Software.
   Write to save changes to the drive.

   Reading or writing can take some time.

12.2.5 Importing Program Files

Procedure

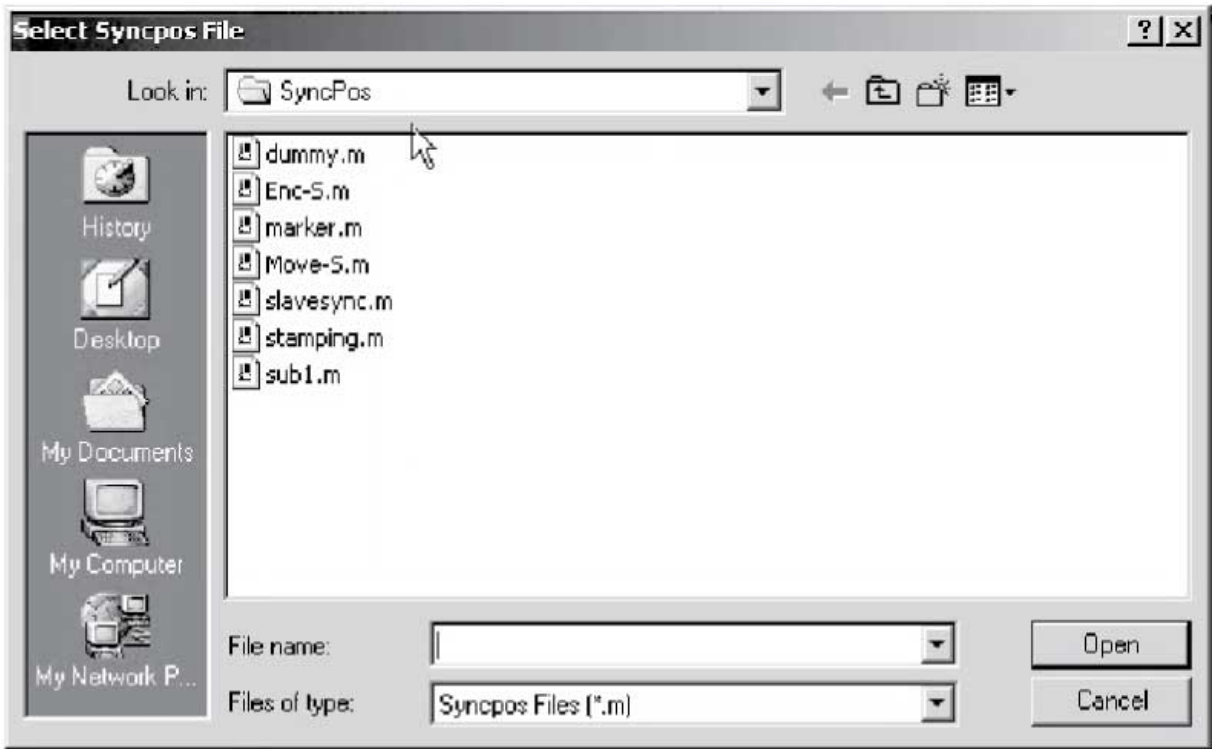
1. Click a program shown in the right view.



e30bt663.10

Illustration 331: Import Program to SyncPos Card

2. Browse the computer to find the program to import.



e30bt504.12

Illustration 332: Browse

3. Select the wanted program.
4. Click *Open* to import the program in the Programs folder.

→ The import is now complete.

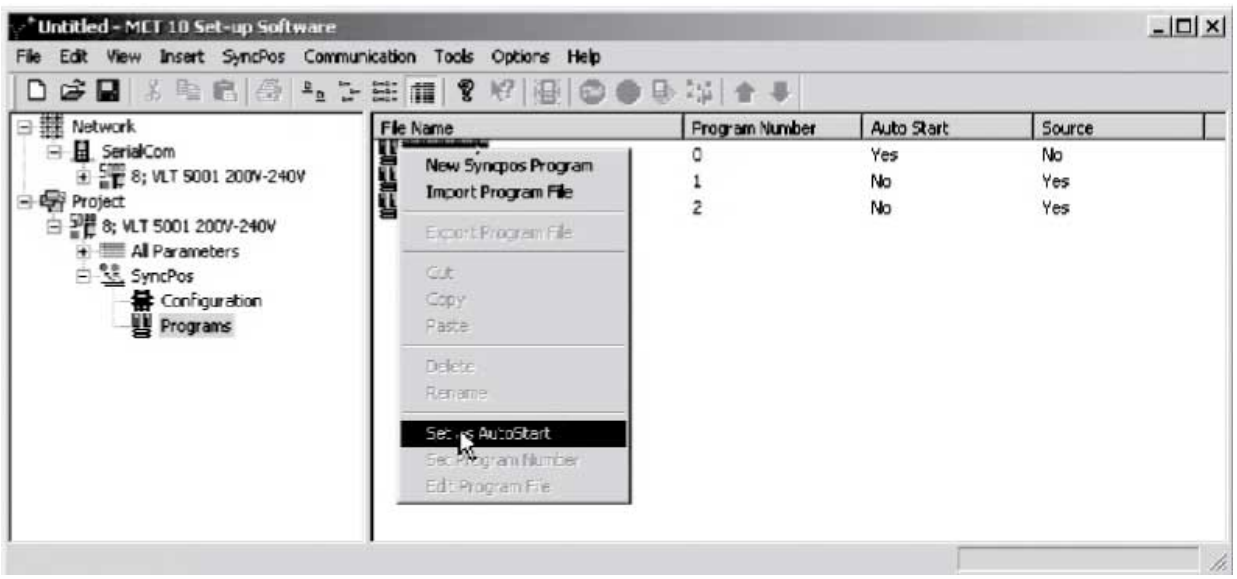
12.2.6 Setting a Program to Auto Start

Context:

If more than 1 program is stored in the Programs folder, it is possible to set 1 of them to start automatically when the device is turned on.

Procedure

1. Select the start-up program in the right view of the screen.
2. Right-click and select *Set As Auto Start*.



e30bt664.11

Illustration 333: Auto Start

→ The program selected is then indicated with *Yes* in the *Auto Start* column.

12.2.7 Editing Source Code

Context:

For detailed information about the source code, refer to Programmable SyncPos Motion Controller Operating Instructions. To view or edit the source code, follow this procedure:

Procedure

1. Double-click *Program* in the right view.

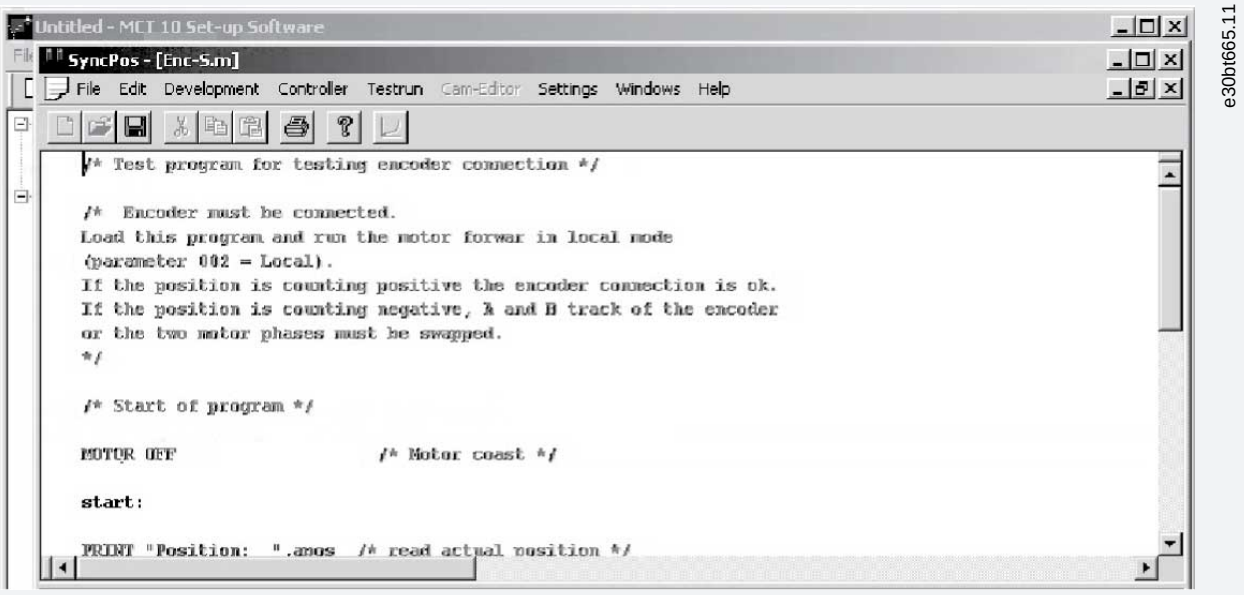


Illustration 334: View/Edit Source Code

A range of editing operations are possible, described in detail in the Programmable SyncPos Motion Controller Operating Instructions.

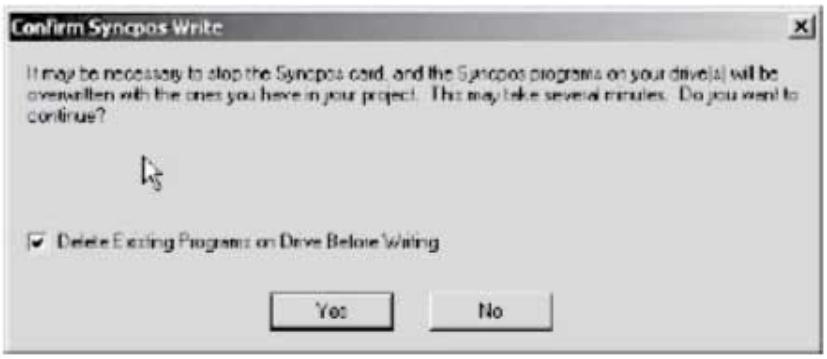
12.2.8 Saving and Exiting Program

Context:

When editing a configuration file, a *SyncPos Application Closed* dialog box pops up. Select *Read* or *Write* according to the instructions in the box.

NOTICE

If there are programs in the SyncPos card, they are deleted without further warning.

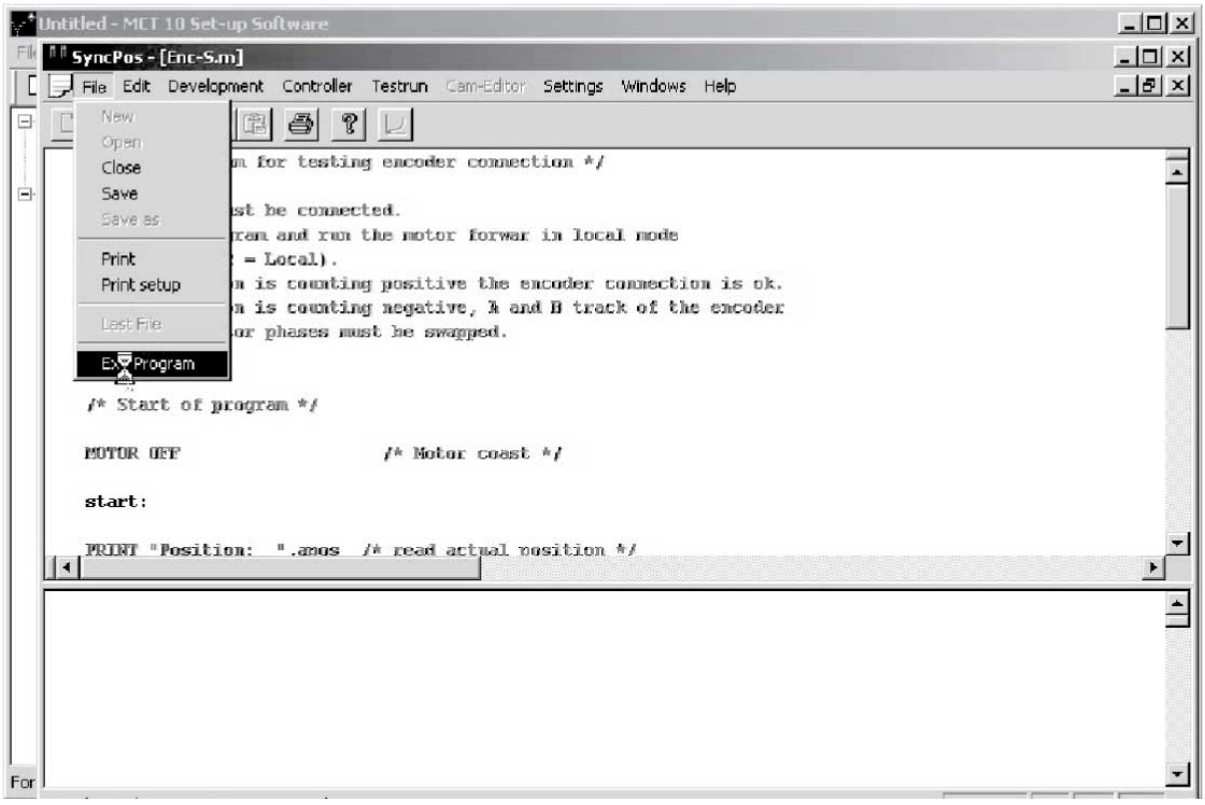


e30bt546.12

Illustration 335: Confirm SyncPos Write

Procedure

1. Select *File⇒Save* in the menu bar to save the changes to the program file opened from the MCT 10 Set-up Software project.
2. Select *File⇒Exit program* in the menu bar to exit SyncPos.



e30bt666.11

Illustration 336: Exit Program

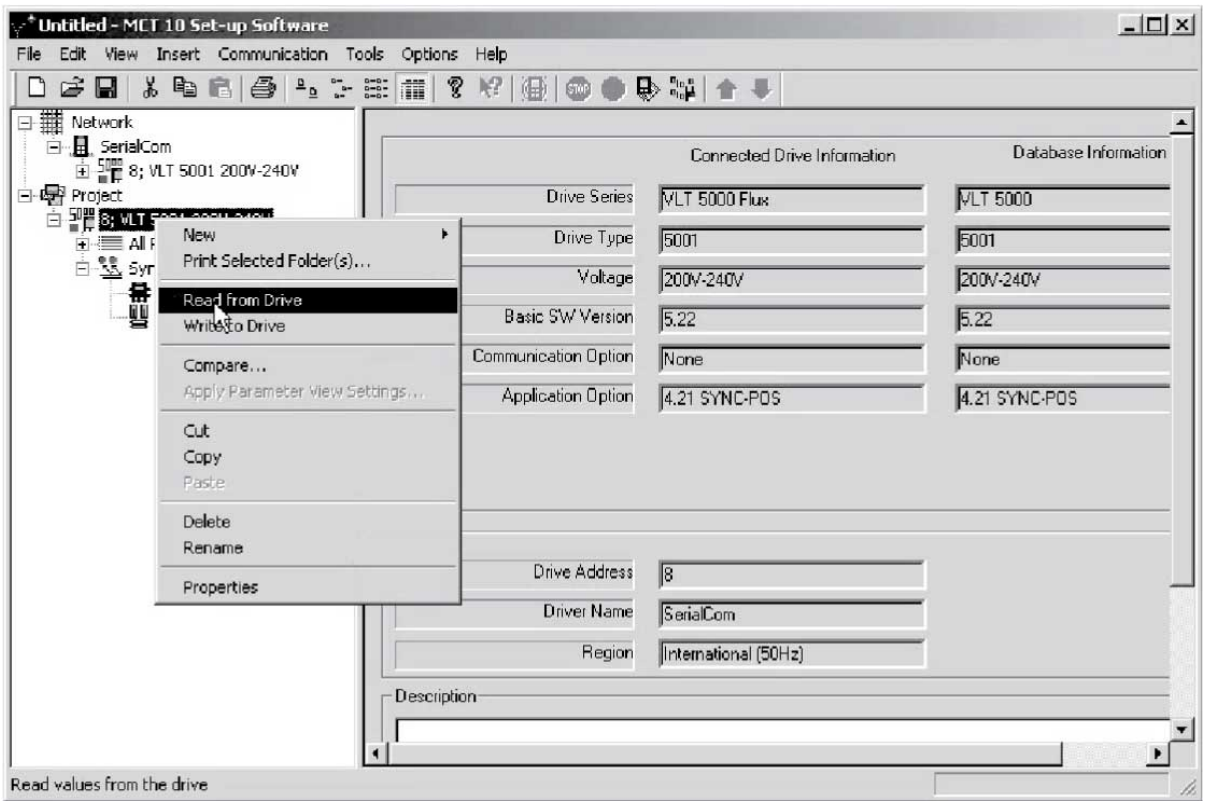
12.3 SyncPos Read From Drive

Context:

Parameters and SyncPos files can be read from a drive to a project.

Procedure

1. Right-click the root drive.
2. Select *Read from Drive*.

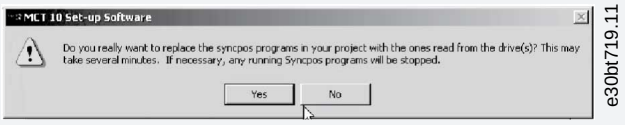


e30bt510.12

Illustration 337: SyncPos Read From Drive

NOTICE

Files in the project can be permanently lost as files of the same name are overwritten:



e30bt719.11

Illustration 338: Files Overwritten

3. Select *Yes* to start reading and saving the configuration files and programs from the drive to the project.

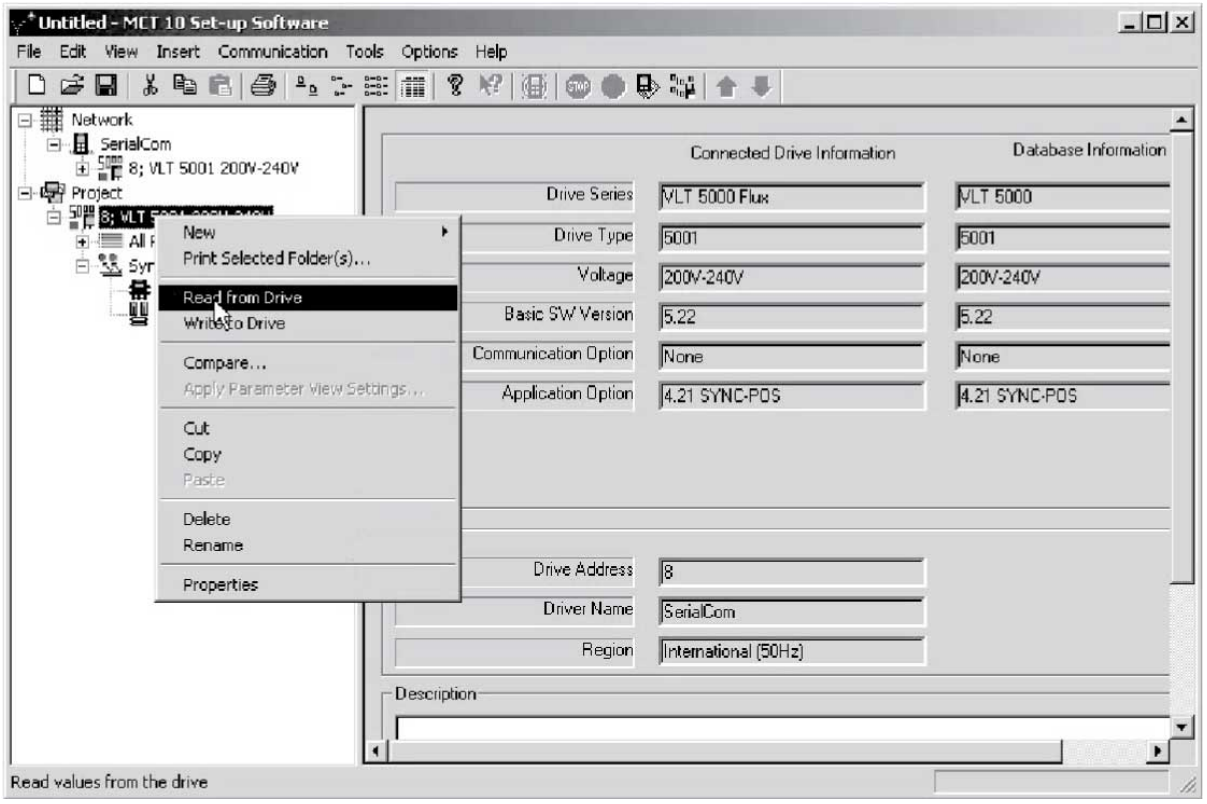
12.4 SyncPos Write to Drive

Context:

All parameters and SyncPos files can be written to a drive.

Procedure

1. Right-click the root drive.
2. Select *Write to Drive*.

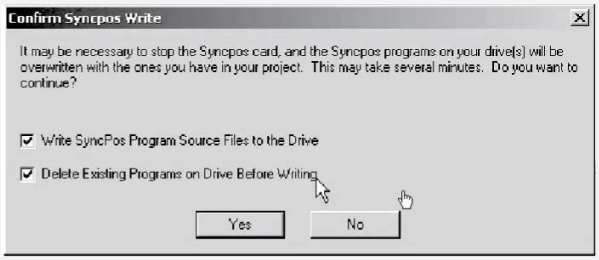


e30bt668.11

Illustration 339: Write to Drive

NOTICE

Use this feature with caution. If incorrectly used, files on the drive can be permanently lost. The following warning appears, explaining that files of the same name are overwritten:



e30bt669.11

Illustration 340: Warning Files Overwritten

3. Select the required settings.
4. Select *Yes* to start writing.

→ For the above settings, the existing programs are deleted. Then the SyncPos program source files are written to the drive. Once the write is complete, check the contents of the Network folder to confirm that the write to drive was successful.

13 Troubleshooting

13.1 Save Error Dialog

When an error dialog appears on the screen, MCT 10 Set-up Software can save the error to a text file to record the error message for later reference, for example to obtain help from support. Within the error dialog window, select *Save As* to record the error message as a text file with free choice of file name and location.

For example, when scanning the network for drives, an error dialog appears, showing the drives which are not detected.

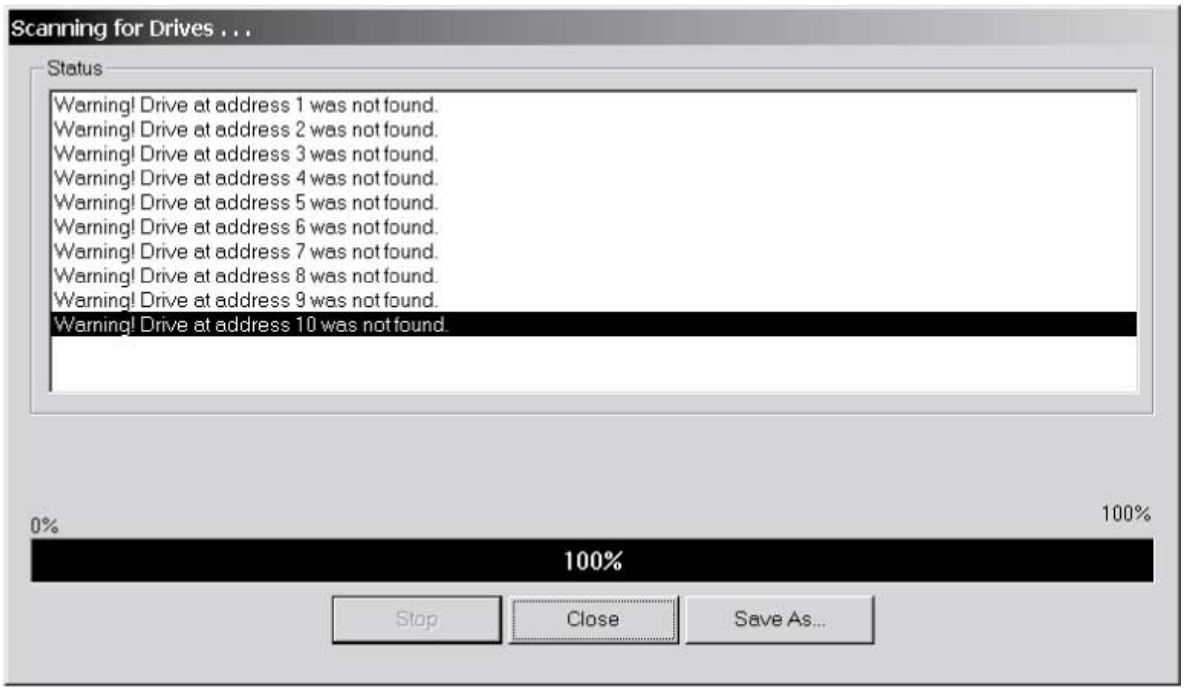


Illustration 341: Drives not Detected

To store the error log, select *Save As*.

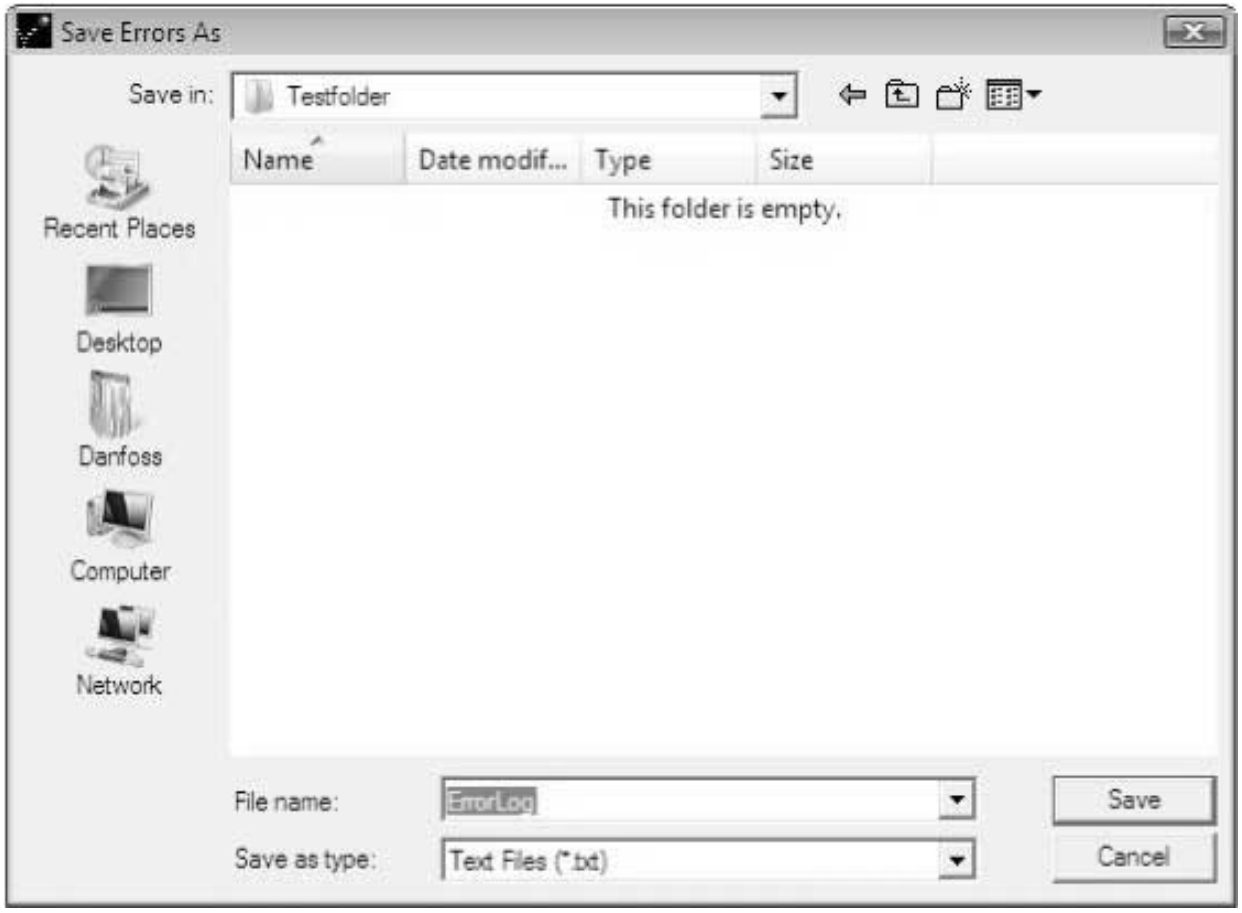


Illustration 342: Store Error Log

13.2 Common Problems and Solutions

13.2.1 Changes are not Saved to PC

Check that changes made in the Network folder have been copied to the Project folder and then saved to a hard disk. Changes made in the Network folder are implemented in the field device only and are not automatically saved to a PC.

13.2.2 Error Message While Installing MCT 10 Set-up Software

A message such as MCT 10 SET-UP SOFTWARE ERROR OPENING FC DRIVER may occur, if there is another PC program installed using the same COM port of the PC. Such a program could be a PLC programming tool, palm pilot driver, or cellular phone driver. Investigate whether other programs use the same COM port. If so, ensure that the other PC tool does not lock or reserve the COM port.

13.2.3 Error Message Communication Failed

Sporadic communication errors

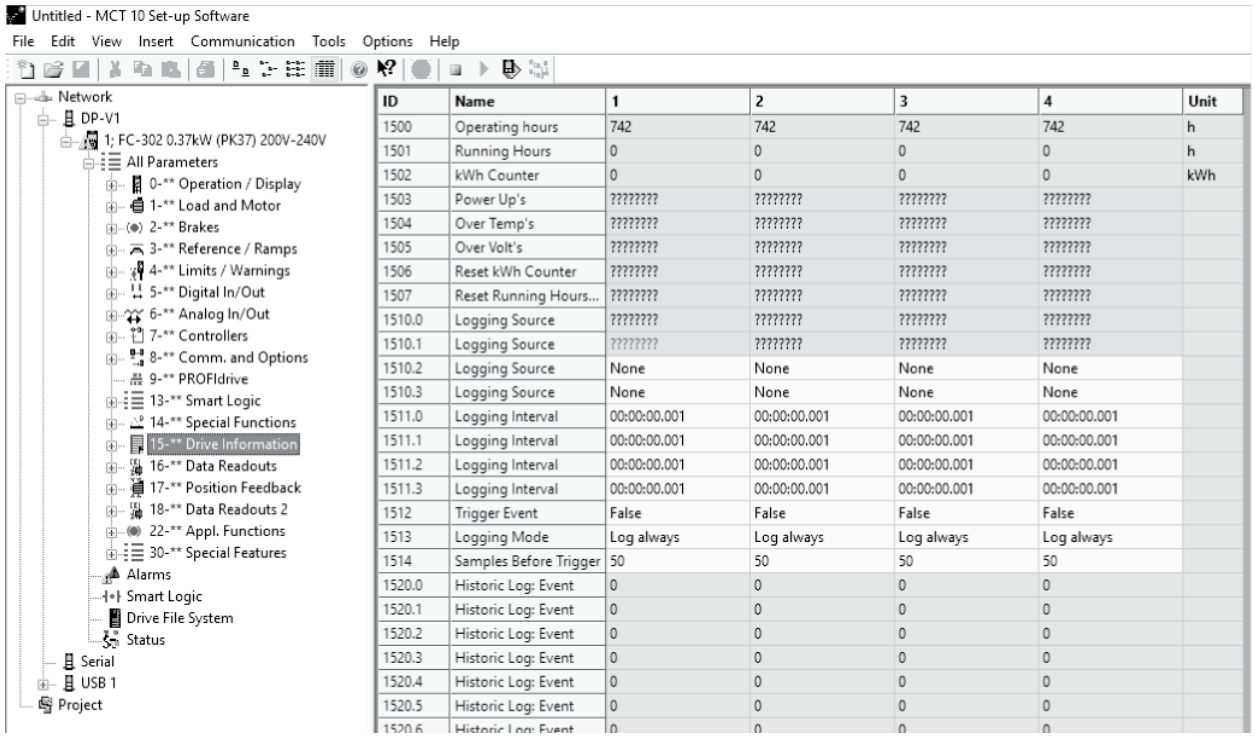
This type of communication error typically occurs when cables are inadequately shielded, in which case EMC noise can affect the communication. Check that the cables are installed according to the guidelines in the *operating guide* for the drive.

The communication error is permanent

This type of communication error is typically due to an error in network configuration. Check that the network configuration is in accordance with the drive operating guide.

Communication failed

The *Communication failed* error message appears in the status bar.



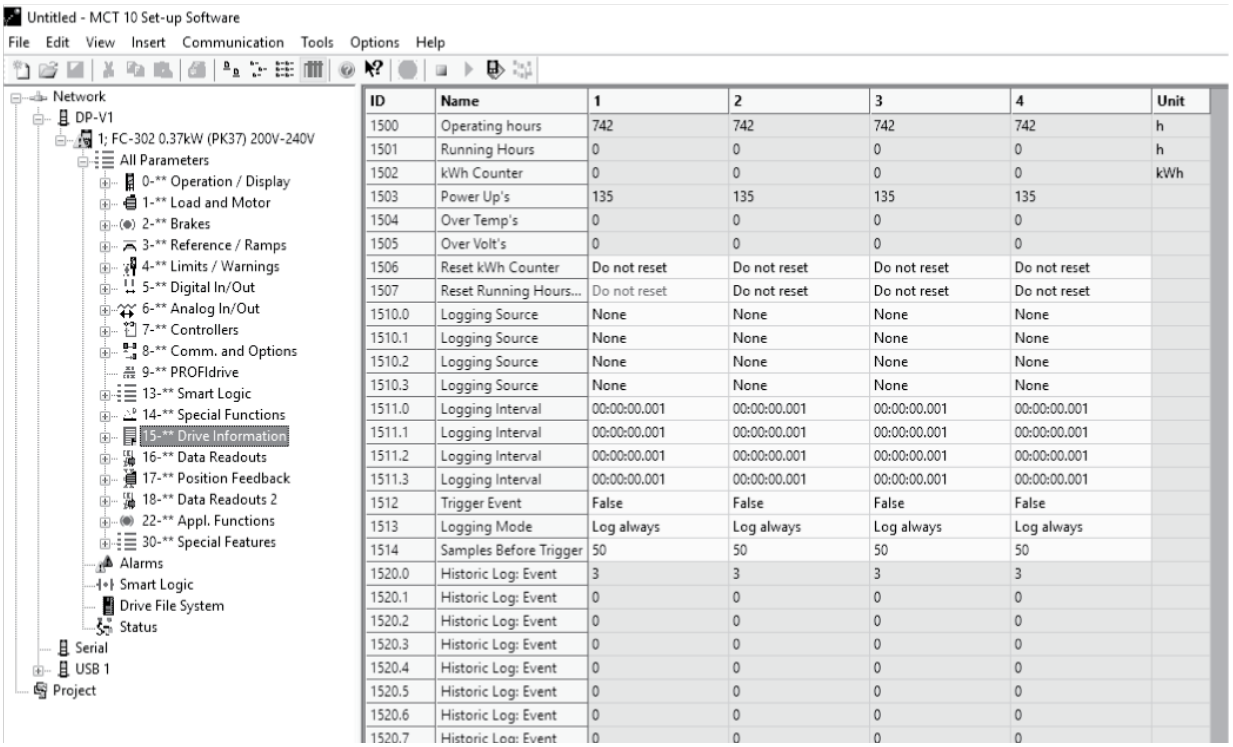
ID	Name	1	2	3	4	Unit
1500	Operating hours	742	742	742	742	h
1501	Running Hours	0	0	0	0	h
1502	kWh Counter	0	0	0	0	kWh
1503	Power Up's	????????	????????	????????	????????	
1504	Over Temp's	????????	????????	????????	????????	
1505	Over Volt's	????????	????????	????????	????????	
1506	Reset kWh Counter	????????	????????	????????	????????	
1507	Reset Running Hours...	????????	????????	????????	????????	
1510.0	Logging Source	????????	????????	????????	????????	
1510.1	Logging Source	????????	????????	????????	????????	
1510.2	Logging Source	None	None	None	None	
1510.3	Logging Source	None	None	None	None	
1511.0	Logging Interval	00:00:00.001	00:00:00.001	00:00:00.001	00:00:00.001	
1511.1	Logging Interval	00:00:00.001	00:00:00.001	00:00:00.001	00:00:00.001	
1511.2	Logging Interval	00:00:00.001	00:00:00.001	00:00:00.001	00:00:00.001	
1511.3	Logging Interval	00:00:00.001	00:00:00.001	00:00:00.001	00:00:00.001	
1512	Trigger Event	False	False	False	False	
1513	Logging Mode	Log always	Log always	Log always	Log always	
1514	Samples Before Trigger	50	50	50	50	
1520.0	Historic Log: Event	0	0	0	0	
1520.1	Historic Log: Event	0	0	0	0	
1520.2	Historic Log: Event	0	0	0	0	
1520.3	Historic Log: Event	0	0	0	0	
1520.4	Historic Log: Event	0	0	0	0	
1520.5	Historic Log: Event	0	0	0	0	

Illustration 343: Error Message: Communication Failed

13.2.4 Communication Errors

If an erroneous/illegal action has been attempted, an error highlight appears in the status bar at the bottom of the MCT 10 Set-up Software window.

When a communication error occurs, the status bar at the bottom of the MCT 10 Set-up Software window is highlighted and shows a *Communication failed* error message.



ID	Name	1	2	3	4	Unit
1500	Operating hours	742	742	742	742	h
1501	Running Hours	0	0	0	0	h
1502	kWh Counter	0	0	0	0	kWh
1503	Power Up's	135	135	135	135	
1504	Over Temp's	0	0	0	0	
1505	Over Volt's	0	0	0	0	
1506	Reset kWh Counter	Do not reset	Do not reset	Do not reset	Do not reset	
1507	Reset Running Hours...	Do not reset	Do not reset	Do not reset	Do not reset	
1510.0	Logging Source	None	None	None	None	
1510.1	Logging Source	None	None	None	None	
1510.2	Logging Source	None	None	None	None	
1510.3	Logging Source	None	None	None	None	
1511.0	Logging Interval	00:00:00.001	00:00:00.001	00:00:00.001	00:00:00.001	
1511.1	Logging Interval	00:00:00.001	00:00:00.001	00:00:00.001	00:00:00.001	
1511.2	Logging Interval	00:00:00.001	00:00:00.001	00:00:00.001	00:00:00.001	
1511.3	Logging Interval	00:00:00.001	00:00:00.001	00:00:00.001	00:00:00.001	
1512	Trigger Event	False	False	False	False	
1513	Logging Mode	Log always	Log always	Log always	Log always	
1514	Samples Before Trigger	50	50	50	50	
1520.0	Historic Log: Event	3	3	3	3	
1520.1	Historic Log: Event	0	0	0	0	
1520.2	Historic Log: Event	0	0	0	0	
1520.3	Historic Log: Event	0	0	0	0	
1520.4	Historic Log: Event	0	0	0	0	
1520.5	Historic Log: Event	0	0	0	0	
1520.6	Historic Log: Event	0	0	0	0	
1520.7	Historic Log: Event	0	0	0	0	

e30bt602.12

Illustration 344: Error Message: Communication Failed

When no communication error has occurred, the same window appears as:

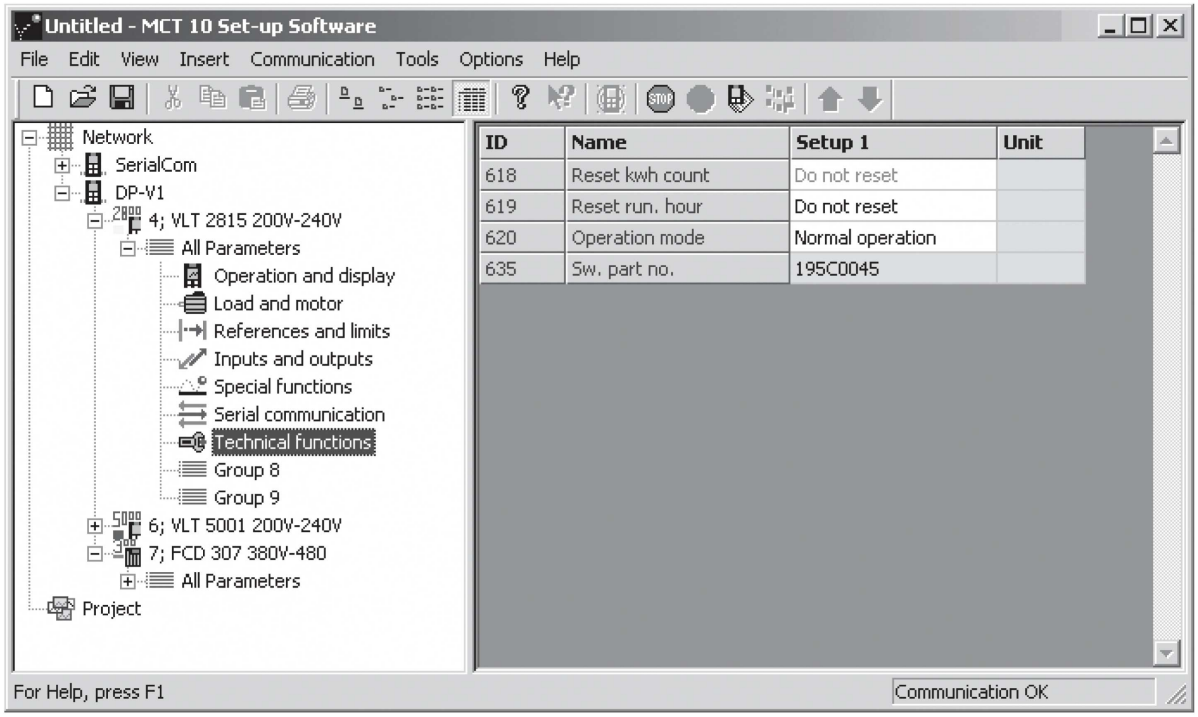


Illustration 345: Communication OK

Communication errors typically occur due to inadequate shielding of cables, that is the cable is not installed in accordance with the installation instructions.

13.2.5 Help

Select *Help⇒Help* in the main menu. A help file opens and shows the MCT 10 Set-up Software manual in .pdf format. Acrobat Reader software is required to open the manual. It can be downloaded free of charge at www.adobe.com.

13.3 Safe Plug-in

This section contains common troubleshooting and descriptions of known errors.

13.3.1 Troubleshooting Communication Errors

During commission, the communication between MCT 10 Set-up Software and the drive can fail. Failed communication issues an error message.

Confirm the status of the communication devices and the drive and the status of the drive to guarantee proper communication.

13.3.2 Troubleshooting CRC Errors

CRC errors can occur during the write-to-drive procedure. If a CRC error occurs, try to write to the drive again.

When the CRC errors persist, verify the integrity of the devices and communication.

13.3.3 Warnings and Alarms

NOTICE

The errors are listed numerically.

Table 32: LED Indications, Errors 1–68

Error number	Description	LED indicators				
				LED1	LED2	LED4
	Internal failure	**Reason**	**Action**			Green constant
1	Diagnostic in progress			Status of LED 1 and LED2 depends on safety sub-function state assigned to DI1 and DI2.		Green constant
67	Int Fail tolerance error exceeded: Reaction STO	• Check that data for feedback (PPR., type of feedback, and gear ratio) is entered correctly. • Direction of feedback is wrong. • Due to use of feedback filter the dynamic of the system does not match with dynamic of feedback filter (*parameter 42-15 Feedback Filter*). System is ramping too fast. • Feedback signals are not received at all. • No proper shielding of feedback cables.	• Make a recustomization with correct data if needed. • Set *parameter 42-12 Encoder Direction* to the opposite value. • Decrease the ramping time on the drive. • Try to run the system at, for example, 60 RPM. If *error 99, Int Fail Feedback error* occurs, this is the reason. • Improve shielding of feedback cables and motor cables.			Red constant
68	Int fail Speed limit SS1a Ramp: Reaction STO	• The value of Delta V is too small. For closed-loop system, it must often be larger than the recommended value. • Due to use of feedback filter the dynamic of the system does not match with dynamic of feedback filter (*parameter 42-15 Feedback Filter*). • Load change takes place during ramping.	• If running in closed loop, try to adjust PID setting and if needed increase SS1 ramping time. • Try to increase *parameter 42-15 Feedback Filter*, but this might cause *error 67, Int Fail tolerance error exceeded: Reaction STO* to occur. • Otherwise increase *parameter 42-45 Delta V*.			Red constant

Table 33: LED Indications, Errors 69–72

Error number	Description	LED indicators				
				LED1	**LED2**	**LED4**
	Internal failure	**Reason**	**Action**			Green constant
69	Int fail Speed limit SS1b Ramp: Reaction STO	See 68.	See 68.	Status of LED 1 and LED 2 depends on safety sub-function state assigned to DI1 and DI2.		Red constant
70	Int fail speed limit SLSa: Reaction STO	Happens during ramping to SLS limit, see 68. Happens during speed below SLS limit: • If speed is above cut-off speed at activation point and *parameter 42-53 Start Ramp* is set to *No*, this error occurs. • Noise on the feedback signal (incl. quantization noise) is larger than expected. • Load change takes place, do as in above point.	• Change *parameter 42-53 Start Ramp* to *Yes* and set *parameter 42-54 Ramp Down Time* accordingly. • Increase *parameter 42-50 Cut Off Speed* or decrease *parameter 42-51 Speed Limit* to get a larger tolerance.			Red constant
71	Int fail speed limit SLSb: Reaction STO	See 70.	See 70.			Red constant
72	Internal failure MCB 150/151		• First, power cycle the drive or restart the safety option via *parameter 42-90 Restart Safe Option*. Second, try to make a general reset of the safety option with the *Administration* button (safety option goes back to blank initial state). • If the problem persists, contact Danfoss.			Red constant

Table 34: LED Indications, Errors 73–77

Error number	Description	LED indicators				
				LED1	LED2	LED4
	Internal failure	**Reason**	**Action**			Green constant
73	Internal failure MCB 150/151		• First, power cycle the drive or restart the safety option via *parameter 42-90 Restart Safe Option*. • If the problem persists, contact Danfoss.	Status of LED 1 and LED 2 depends on safety sub-function state assigned to DI1 and DI2.		Red constant
74	Internal failure MCB 150/151		• First, power cycle the drive or restart the safety option via *parameter 42-90 Restart Safe Option*. • If the problem persists, contact Danfoss.			Red constant
75	Int Fail DI2 in PUST: Reaction STO	• Safety input connected to DI2 has illegal signal level. • Sensor is broken.	• Check that the configuration of DI2 *parameter 42-21 Type* is set correctly or that the connected sensor is installed according to specification. • Extend discrepancy time on the safe input tab in the MCT 10 Safe Plug-in via *parameter 14-22 Operation Mode*.			Red constant
76	Int Fail DI1 in PUST: Reaction STO	• Safety input connected to DI1 has illegal signal level. • Sensor is broken.	• Check that the configuration of DI1 *parameter 42-21 Type*, sub-index [0], is set correctly or that the connected sensor is installed according to specification. • Extend discrepancy time on the safe input tab in the MCT 10 Safe Plug-in via *parameter 14-22 Operation Mode*.			Red constant
77	Int Fail fail-safe data CRC mismatch: Reaction STO	The CRC of the safety option does not match the stored CRC value on the drive.	Configure the safety option with MCT 10 Safe Plug-in or by CRC select/LCP copy.			Red constant

Table 35: LED Indications, Errors 78–85

Error number	Description	LED indicators				
				LED1	LED2	LED4
	Internal failure	**Reason**	**Action**			Green constant
78	Internal failure safety option		• First, power cycle the drive or restart the safety option via *parameter 42-90 Restart Safe Option*. • If the problem persists, contact Danfoss.	Status of LED 1 and LED 2 depends on safety sub-function state assigned to DI1 and DI2.		Red constant
79	Internal failure safety option		Contact Danfoss.			Red constant
80	Internal failure safety option		Contact Danfoss.			Red constant
81	Internal failure safety option		• First, power cycle the drive. • If the problem persists, contact Danfoss.			Red constant
82	Internal failure safety option		• First, power cycle the drive. • If the problem persists, contact Danfoss.			Red constant
83	Internal failure safety option		• First, power cycle the drive. • If the problem persists, contact Danfoss.			Red constant
84	Internal failure safety option		• First, power cycle the drive. • If the problem persists, contact Danfoss.			Red constant
85	Internal failure safety option		• First, power cycle the drive. • If the problem persists, contact Danfoss.			Red constant

Table 36: LED Indications, Errors 86–93

Error number	Description	LED indicators				
				LED1	LED2	LED4
	Internal failure	Reason	Action			Green constant
86	Internal failure safety option		• First, power cycle the drive. • If the problem persists, contact Danfoss.	Status of LED 1 and LED 2 depends on safety subfunction state assigned to DI1 and DI2.		Red constant
87	Internal failure safety option		• First, power cycle the drive. • If the problem persists, contact Danfoss.			Red constant
88	Internal failure safety option		• First, power cycle the drive. • If the problem persists, contact Danfoss.			Red constant
89	Internal failure safety option		• Perform a general reset of the safety option with the *Administration* button. • If the problem persists, contact Danfoss.			Red constant
90	Internal failure safety option		• Perform a general reset of the safety option with the *Administration* button. • If the problem persists, contact Danfoss.			Red constant
91	Internal failure safety option		• First, power cycle the drive. • If the problem persists, contact Danfoss.			Red constant
92	Internal failure safety option		• First, power cycle the drive. • If the problem persists, contact Danfoss.			Red constant
93	Internal failure safety option		• First, power cycle the drive. • If the problem persists, contact Danfoss.			Red constant

Table 37: LED Indications, Errors 94–102

Error number	Description	LED indicators				
				LED1	LED2	LED4
	Internal failure	**Reason**	**Action**			Green constant
94	Internal failure safety option		• First, power cycle the drive. • If the problem persists, contact Danfoss.	Status of LED 1 and LED 2 depends on safety sub-function state assigned to DI1 and DI2.		Red constant
95	Internal failure safety option		• First, power cycle the drive. • If the problem persists, contact Danfoss.			Red constant
96	Internal failure safety option		• First, power cycle the drive. • If the problem persists, contact Danfoss.			Red constant
97	Internal failure safety option		Contact Danfoss.			Red constant
98	Int fail invalid customer file version	Version of customization file of safety option stored in EEPROM does not match the customization file supported by the SW version of safety option.	Do a new configuration with MCT 10 Safe Plug-in, which supports the SW version of safety option.			
99	Int Fail Feedback error	The connected feedback source does not give any signal.	Check that the connection is done according to the specification or if the feedback source is broken.			Red
102	Int Fail Speed Limit SMS: Reaction STO	• Speed is above cut-off speed. • Noise on the feedback signal (incl. quantization noise) is larger than expected.	Check the value of *parameter 42-71 Cut Off Speed*.			Red constant

Table 38: LED Indications, Errors 113–135

Error number	Description	LED indicators				
				LED1	**LED2**	**LED4**
	Internal failure	**Reason**	**Action**			Green constant
113	Ext Fail DI1: Reaction STO	• Safety input connected to DI1 has illegal signal level. • Sensor is broken.	• Check that configuration of DI1 *parameter 42-21 Type* is set correctly or the connected sensor is installed according to the specification.	Red constant.	Status depends on safety sub-function state assigned to DI2.	Red flashing, cycle (on 500 ms, off 500 ms)
114	Ext Fail DI2: Reaction STO	• Safety input connected to DI2 has illegal signal level. • Sensor is broken.	• Check that configuration of DI2 *parameter 42-21 Type* is set correctly or the connected sensor is installed according to the specification. • Extend discrepancy time on safe input tab in MCT 10 Safe Plug-in *parameter 14-22 Operation Mode*.	Status depends on safety sub-function state assigned to DI1.	Red constant.	Red flashing, cycle (on 500 ms, off 500 ms)
115	Ext Fail Prec Thresh Timer Elapsed: Reaction STO	The drive has been running below 120 RPM for more than the time entered in *parameter 42-18 Zero Speed Timer* with safe function SLS active.	Increase speed to above 120 RPM.	Status of LED 1 and LED 2 depends on safety sub-function state assigned to DI1 and DI2.		Red flashing, cycle (on 500 ms, off 500 ms)
116	Ext Fail SF activation Speed Suspension: Reaction STO	The drive has been running below 120 RPM for more that 1 year and a safety sub-function that needs speed feedback is activated.	Increase speed to above 120 RPM.			Red flashing, cycle (on 500 ms, off 500 ms)
134	Int fail speed limit SLSa: Reaction SS1a	See 70.	See 70.			Red constant
135	Int fail speed limit SLSb: Reaction SS1a	See 70.	See 70.			Red constant

Table 39: LED Indications, Errors 177–252

Error number	Description	LED indicators				
				LED1	LED2	LED4
	Internal failure	**Reason**	**Action**			Green constant
177	Ext Fail DI1: Reaction SS1a	See 113.	See 113.	Red constant.	Status depends on safety sub-function state assigned to DI2.	Red flashing, cycle (on 500 ms, off 500 ms)
178	Ext Fail DI2: Reaction SS1a	See 114.	See 114.	Status depends on safety sub-function state assigned to DI1.	Red constant.	Red flashing, cycle (on 500 ms, off 500 ms)
179	Ext Fail Prec Thresh Timer Elapsed: Reaction SS1a	See 115.	See 115.	Status of LED 1 and LED 2 depends on safety sub-function state assigned to DI1 and DI2.		Red flashing, cycle (on 500 ms, off 500 ms)
180	Ext Fail SF activation Speed Suspension: Reaction SS1a	See 116.	See 116.			Red flashing, cycle (on 500 ms, off 500 ms)
198	Int fail speed limit SLSa: Reaction SS1b	See 70.	See 70.			Red constant
199	Int fail speed limit SLSb: Reaction SS1b	See 70.	See 70.			Red constant
241	Ext Fail DI1: Reaction SS1b	See 113.	See 113.	Red constant.	Status depends on safety sub-function state assigned to DI2.	Red flashing, cycle (on 500 ms, off 500 ms)
242	Ext Fail DI2: Reaction SS1b	See 114.	See 114.	Status depends on safety sub-function state assigned to DI1.	Red constant.	Red flashing, cycle (on 500 ms, off 500 ms)
243	Ext Fail Prec Thresh Timer Elapsed: Reaction SS1b	See 115.	See 115.			Red flashing, cycle (on 500 ms, off 500 ms)
244	Ext Fail SF activation Speed Suspension: Reaction SS1b	See 116.	See 116.			Red flashing, cycle (on 500 ms, off 500 ms)
252	Internal failure safety option		Power cycle the drive. If the problem persists, contact Danfoss.			

13.3.3.1 Safety Option Warning

A warning message notifies that an issue exists on the safety option. It is not handled as an internal or external failure. These messages are defined to indicate that a manual user action is required.

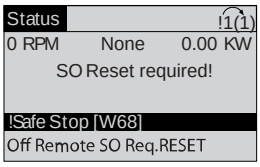
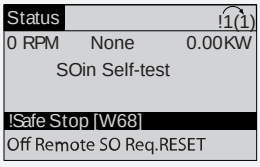
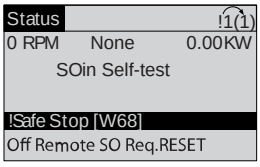
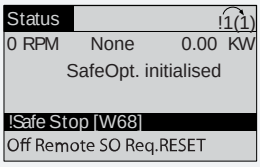
NOTICE

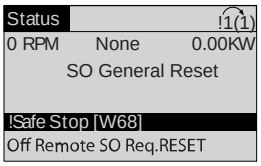
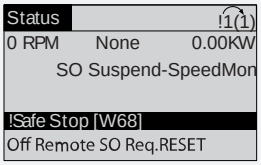
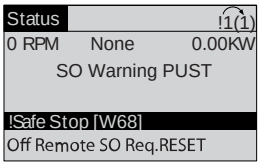
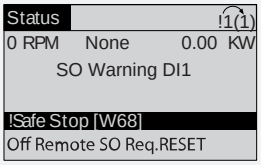
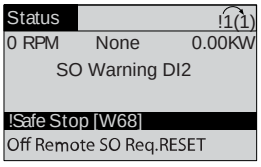
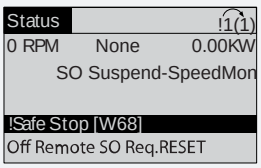
At any possible failure or warning indicated from the safety option, the LCP shows *warning, !Safe Option Failure [W252]* at the least.

13.3.3.2 Safety Option Reset Message

For some messages, the safety option requires an acknowledgement of an ongoing action or failure on the safety option. The safety option uses *Safe Option RESET* as a *Restart and Failure Acknowledgement*.

Table 40: LCP Reset Messages

LCP message	Description
 e30bd126.11	In the following cases, the safety option requests a restart and failure acknowledgement signal: • The safety option is in safety sub-function pending-state (remark: Occurs only if reset behavior is set/configured to *Manual*). • After a power cycle with a safety sub-function. • In PUST (power up self-test), if an external failure occurred before power cycle. • When an external failure occurred. • When customization was aborted or completed. • At the reception of a general reset (required after blank initial state or in the customization state).
 e30bd127.11	The safety option indicates that it is in PUST State (Power Up Self Test). • Ensure that no safe function is active after a power cycle.
 e30bd127.11	A safety sub-function is pending at the start-up, if the drive was powered down while a safety function was active. It is also pending, when the drive was powered down while the safety option has detected a failure during an active safety sub-function.
 e30bd129.11	The safety option requests a Restart and Failure Acknowledge signal, which is always required after a PUST and when a safety sub-function gets released and is configured to be confirmed that the motor is able to run.

LCP message	Description
 e30bd130.11	Occurs only if general reset is performed from MCT 10. It is an indication to the user. The safety option is set to blank initial state and safe parameters are set to default.
 e30bd131.11	Zero speed timer contains the remaining time until the fail prec thresh timer elapsed after the monitoring time expires. The safety option signals Warning.
 e30bd132.11	PUST warning has occurred. Warning cause: Expiry of PUST timer. Memory test required, perform power cycle.
 e30bd133.11	DI1 offline warning has occurred. Warning cause: Expiry of offline timer for DI1.
 e30bd134.11	DI2 offline warning has occurred. Warning cause: Expiry of offline timer for DI2.
 e30bd131.11	Speed monitoring suspension warning has occurred. Warning cause: Suspension of speed monitoring for a certain duration.

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