ENGINEERING TOMORROW

User Guide

Danfoss DriveManager Plug-in for TwinCAT

VLT® AutomationDrive FC 301/FC 302, VLT® Decentral Drive FCD 302

drives.danfoss.com | VLT®

Contents

1 Introduction 3

1.1 Purpose of the User Guide 3

1.2 Qualified Personnel 3

1.3 Additional Resources 3

1.4 Document and TwinCAT® Version 3

1.5 Product Overview 3

1.5.1 Purpose of the Plug-in 3

1.5.2 Preconditions 4

1.5.3 Supported Drive Series 4

1.5.3.1 Supported Data Types 4

1.5.4 Limitations 4

2 Installation and Deinstallation 5

2.1 Installing the Danfoss DriveManager Plug-in for TwinCAT® 5

2.2 Deinstallation, Danfoss DriveManager Plug-in for TwinCAT® and VLT® Motion Control Tool MCT 10 6

3 User Interface 7

3.1 Description of the Danfoss DriveManager for TwinCAT® User Interface 7

4 Using the Danfoss DriveManager Plug-in for TwinCAT® 9

4.1 Scanning Devices 9

4.2 Modifying the Startup List with Danfoss DriveManager Plug-in for TwinCAT® 13

4.2.1 Grid Colors 15

4.2.2 Removing a Parameter from the Startup List 15

4.2.3 Adding a Default Value to the Startup List 16

4.2.4 Activating the Configuration 16

4.3 Working with an Online Drive 17

4.4 Modifying the Online Drive Parameters with Danfoss DriveManager Plug-in for TwinCAT® 17

4.4.1 Restricted Modification 18

4.5 Use Cases for Manual Drive Identification 20

4.5.1 Drive Identified but not Created in Danfoss DriveManager Plug-in 20

4.5.1.1 Identifying the Device 21

4.5.2 The Drive is Created, but Has Been Changed Externally 21

1 Introduction

1.1 Purpose of the User Guide

This User Guide provides:

- Step-by-step instructions on how to install the Danfoss DriveManager Plug-in for TwinCAT®.
- Description of the Danfoss DriveManager user interface.
- Use case examples of working with the Danfoss DriveManager.

The user guide is intended for use by qualified personnel.

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TwinCAT® is a registered trademark of Beckhoff Automation GmbH. Other designations used in this publication may be trademarks whose use by 3rd parties for their own purposes could violate the rights of the owners.

1.2 Qualified Personnel

Correct and reliable transport, storage, installation, operation, and maintenance are required for the trouble-free and safe operation of the drive. Only qualified personnel are allowed to install and operate this equipment.

Qualified personnel are defined as trained staff, who are authorized to install, commission, and maintain equipment, systems, and circuits in accordance with pertinent laws and regulations. Also, the qualified personnel must be familiar with the instructions and safety measures described in this manual.

1.3 Additional Resources

Resources available for the TwinCAT® software and for the drives in which the software can be installed:

- The Operating Guide of the relevant drive provides the necessary information for getting the drive up and running.
- The Design Guide of the relevant drive provides detailed information about capabilities and functionality to design motor control systems.
- The Programming Guide of the relevant drive provides greater detail on working with parameters.
- The Function Blocks with TwinCAT® User Guide provides instructions on how to integrate a Danfoss drive into a Beckhoff TwinCAT® 3 system.

1.4 Document and TwinCAT® Version

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

The original language of this manual is English.

N O T I C E

This manual contains images from previous versions. The purpose of these images is merely showing and understanding how to use the software.

Table 1: Document and TwinCAT® Version

Revision	Remarks	TwinCAT® version	Danfoss DriveManager version
BC319549253561, version 0301	Update to Danfoss DriveManager software version.	3.1	1.47

1.5 Product Overview

1.5.1 Purpose of the Plug-in

The Danfoss Drive Manager Plug-in for TwinCAT simplifies the complete commissioning of Danfoss drives without using VLT® Motion Control Tool MCT 10.

1.5.2 Preconditions

- Operating system: Windows 7 or later.
- TwinCAT 3.1 must be installed in the default folder C:\TwinCAT.

N O T I C E

It is not necessary to install Danfoss ESI files separately as they are installed with the plug-in.

1.5.3 Supported Drive Series

The Danfoss DriveManager Plug-in for TwinCAT® supports the following drive series:

- VLT® AutomationDrive FC 301
- VLT® AutomationDrive FC 302
- VLT® Decentral Drive FCD 302

1.5.3.1 Supported Data Types

The Danfoss DriveManager plug-in for TwinCAT® supports the following data types:

- INTEGER8
- INTEGER16
- INTEGER32
- UNSIGNED8
- UNSIGNED16
- UNSIGNED32
- VISIBLE_STRING
- 4 byte BYTE_STRING
- NORMAL_VALUE_N2
- BIT_SEQUENCE
- TIME_DIFFERENCE_WITH_DATE_INDICATION
- TIME_DIFFERENCE_WITHOUT_DATE_INDICATION

1.5.4 Limitations

The limitations listed apply to Danfoss DriveManager Plug-in for TwinCAT® version 1.47.
The plug-in does not support the following:

- Certain drive-specific data types:
  - TIMEOFDAY
  - TIMEOFDAY_WITHOUT_DATE
- Parameters in *parameter group 19-** User-defined Parameters*.
- Running automatic motor adaptation (AMA).
- Parameters in *parameter group 12-2* Process Data*.
- Configuring more than 1 out of 4 drive setups at a time via the plug-in.

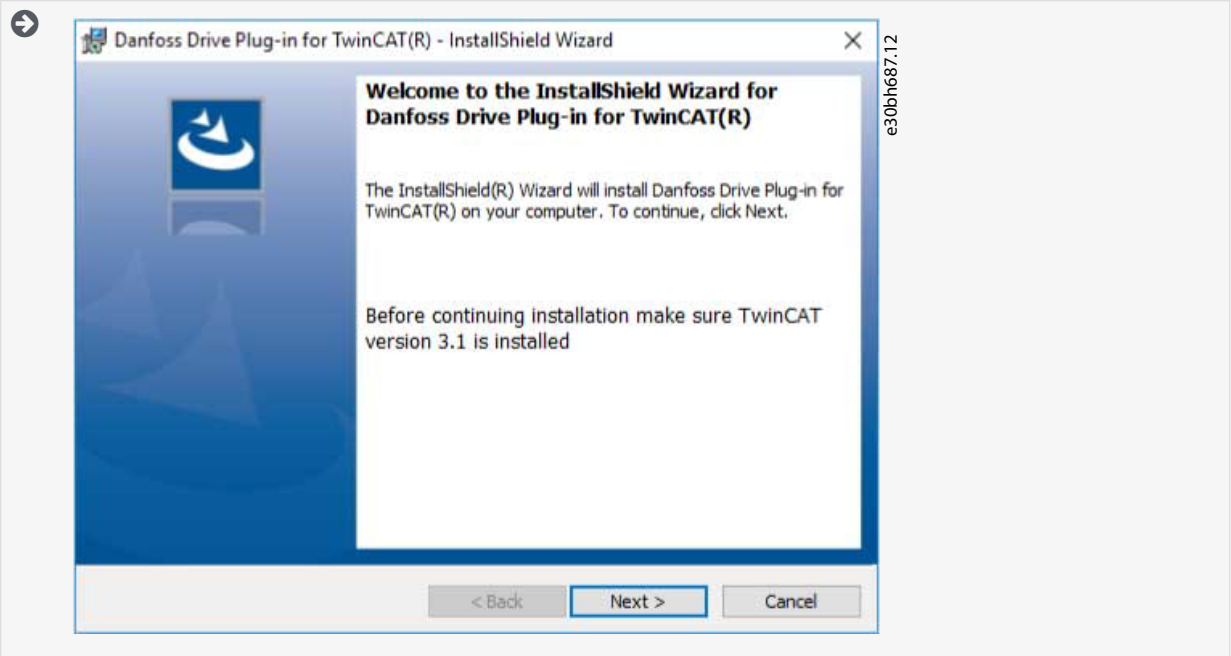
2 Installation and Deinstallation

2.1 Installing the Danfoss DriveManager Plug-in for TwinCAT®

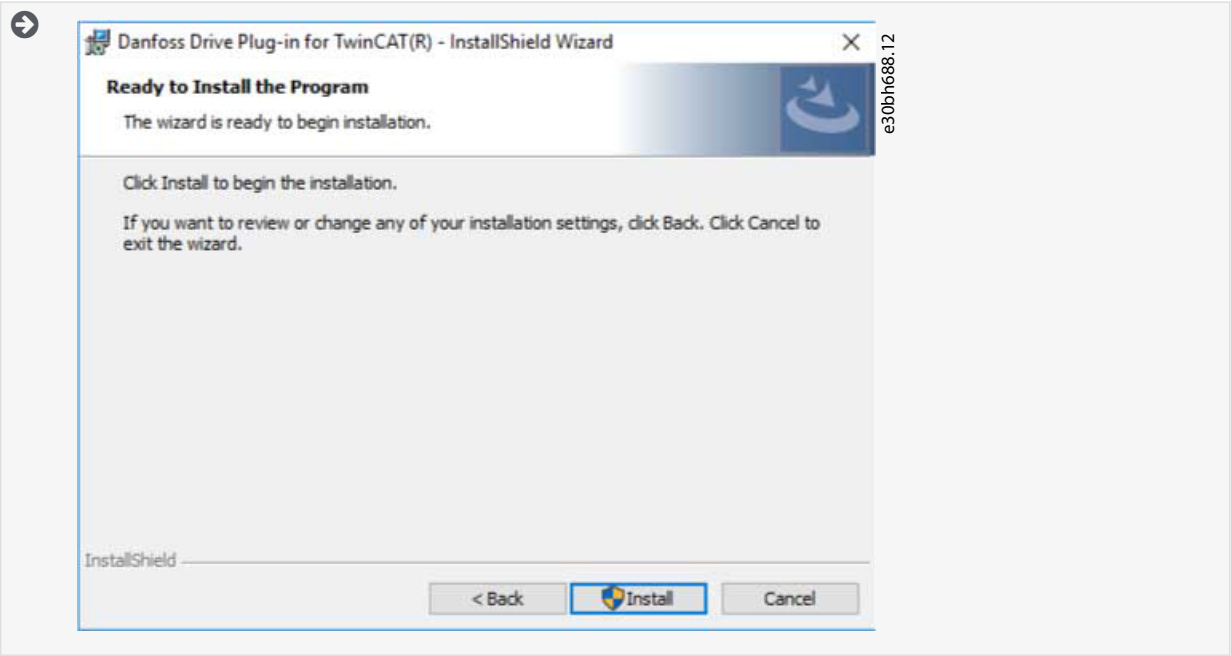
Follow the on-screen instructions for installing the plug-in.

Procedure

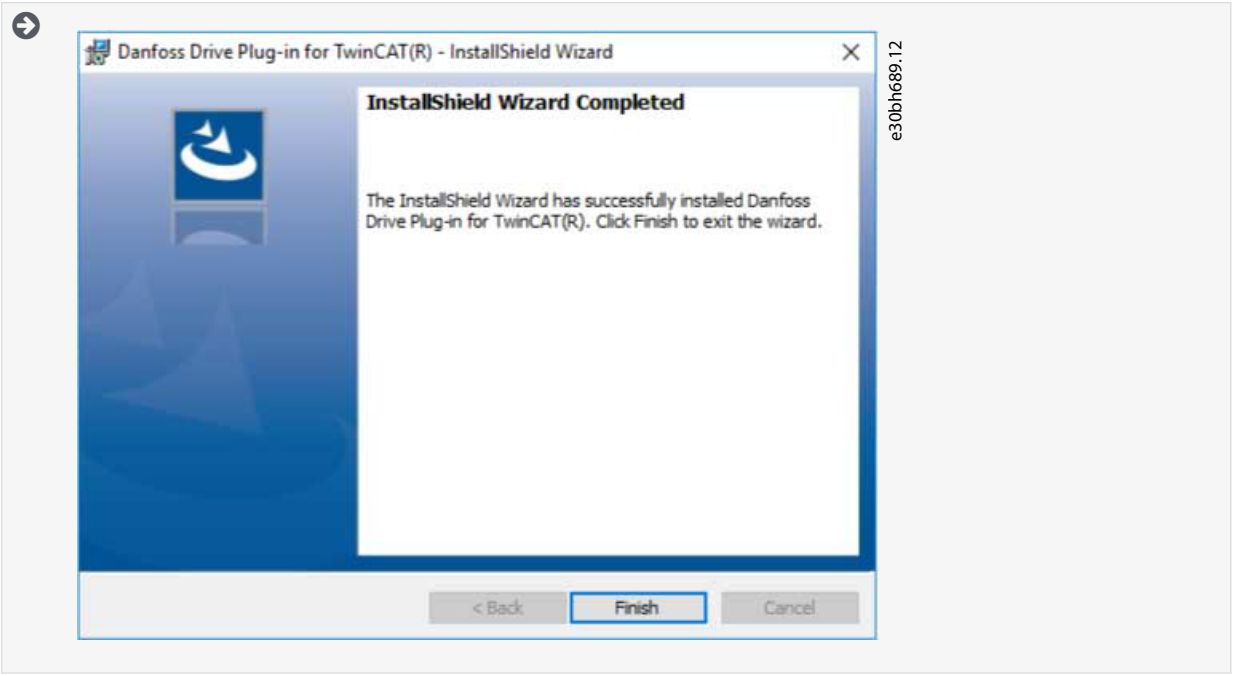
1. Double-click the *Danfoss DriveManager Plugin for TwinCAT* file to start the Installshield Wizard.



2. Click *Next*.



3. Click *Install*.



4. Click *Finish*.

2.2 Deinstallation, Danfoss DriveManager Plug-in for TwinCAT® and VLT® Motion Control Tool MCT 10

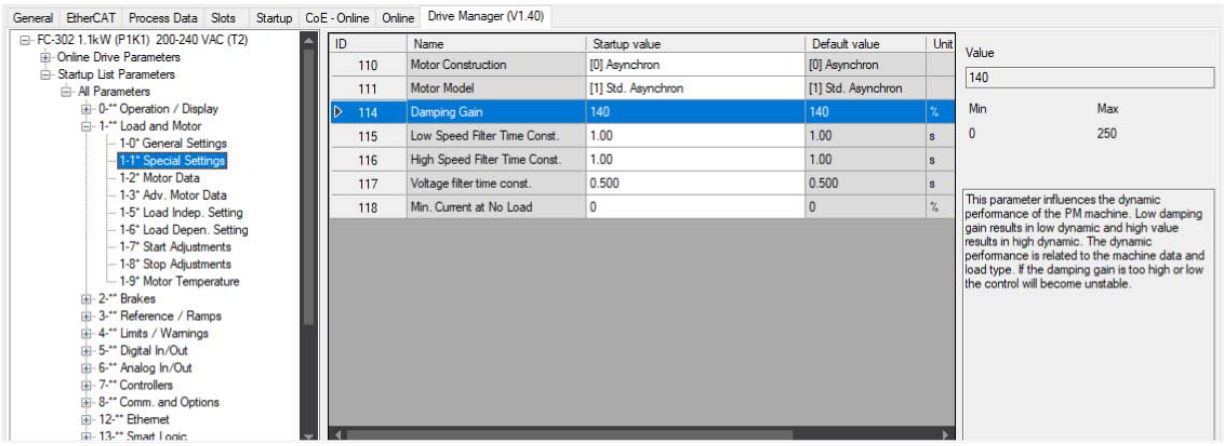
If both the Danfoss DriveManager Plug-in for TwinCAT® and the VLT® Motion Control Tool MCT 10 are installed, they share a database.

Uninstalling either program affects the operation of the other.

After uninstalling 1 of the programs, reinstall the other to continue normal operation.

3 User Interface

3.1 Description of the Danfoss DriveManager for TwinCAT® User Interface



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The interface is split into 3 views:

- The left view contains parameter groups and subgroups.
- The middle view contains the following parameter information:
  - ID (parameter number)
  - Name
  - Value
  - Default value
  - Unit
  - Data type
  - Index - start-up list index
- The right view contains parameter values, its minimum and maximum values, and the description.

Parameter values are modified via the *Edit Parameter* dialog, which can be called through a mouse double-click, or by pressing either the spacebar or the Enter key.

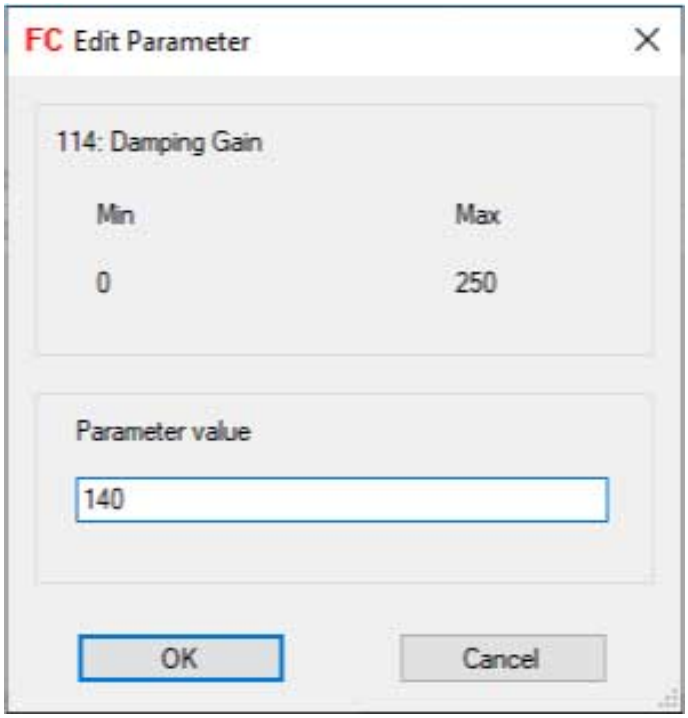


Illustration 1: Edit Parameter Dialog

4 Using the Danfoss DriveManager Plug-in for TwinCAT®

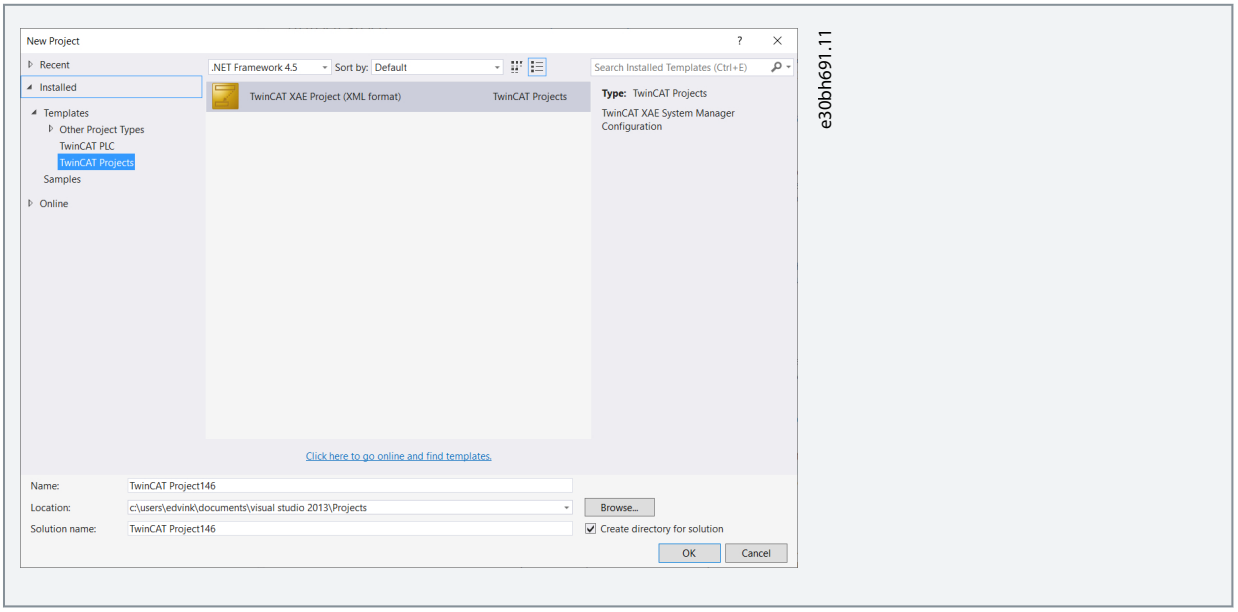
4.1 Scanning Devices

This procedure is a use case for scanning devices.

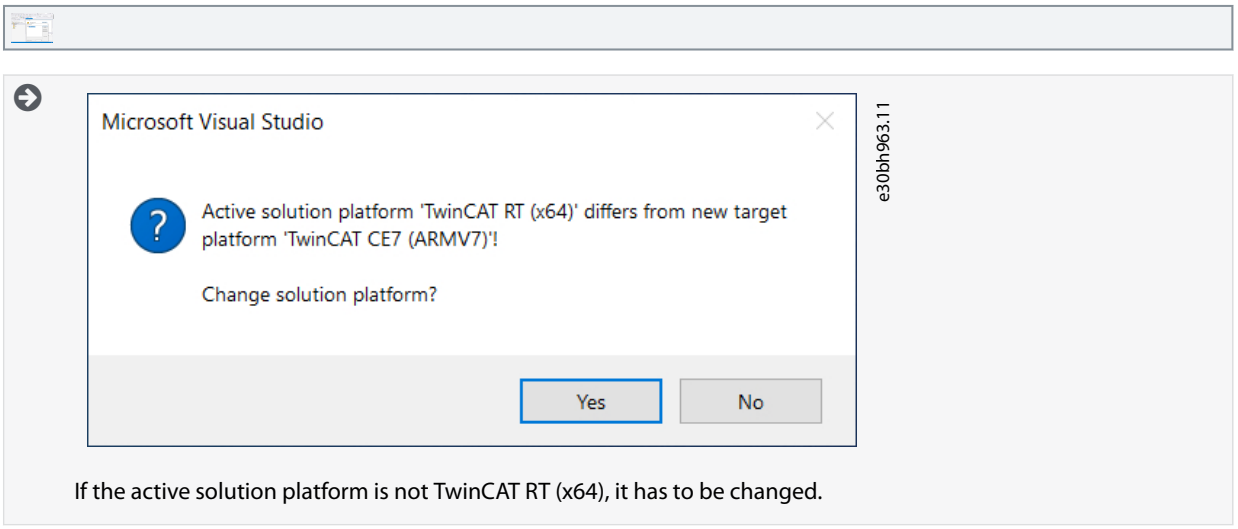
Ensure that the hardware setup is correct.

Procedure

1. Open TwinCAT®.
2. Create a new TwinCAT project.

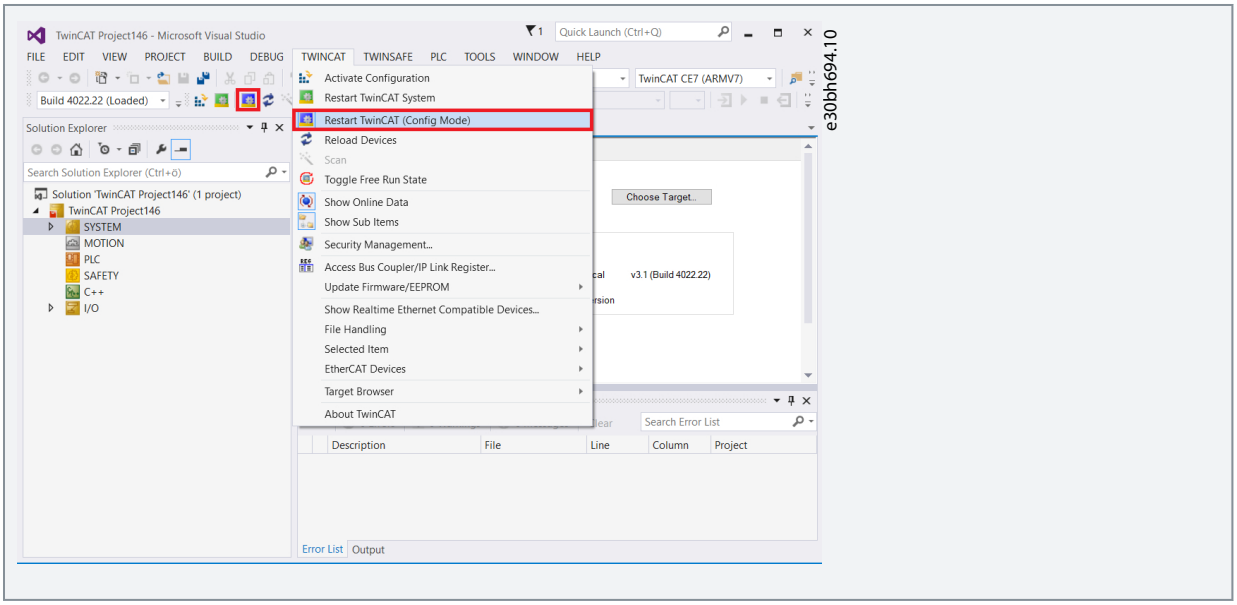


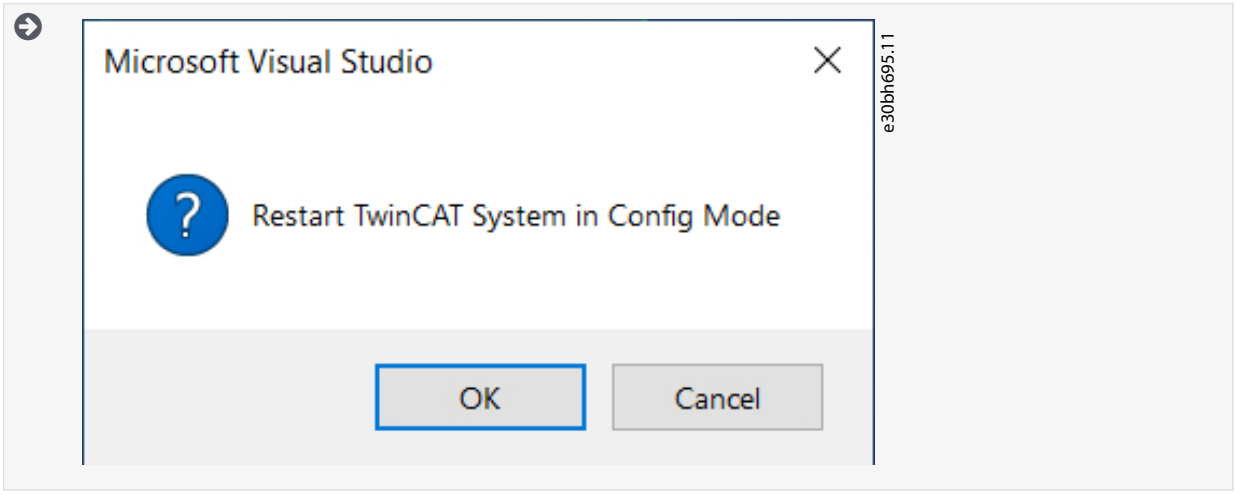
3. On the *TwinCAT Project* tab in the middle view, click *Choose Target*.
4. Select the target system and click *OK*.



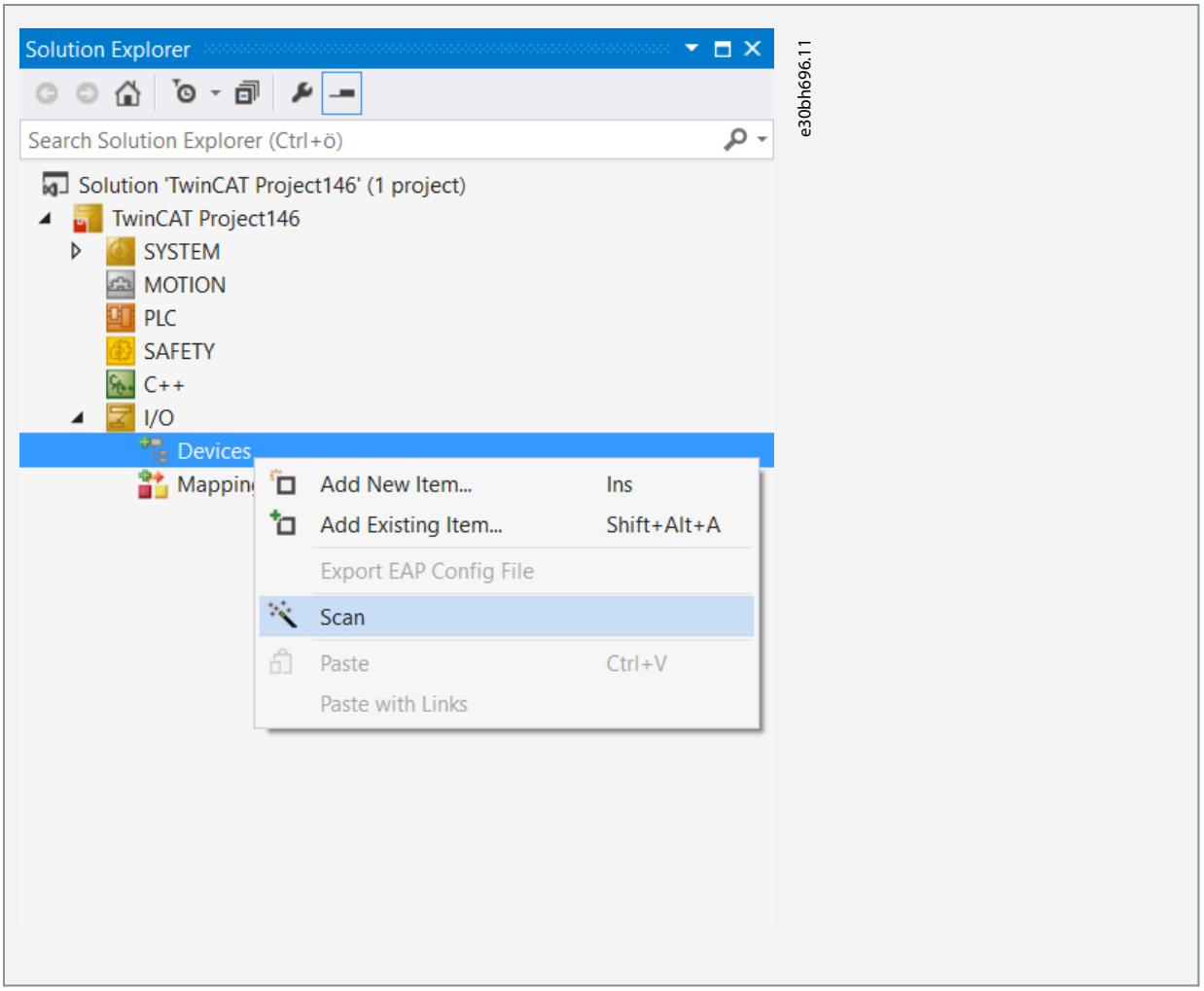
If the active solution platform is not TwinCAT RT (x64), it has to be changed.

5. Click *Yes* to change the solution platform.
6. Select the tab *TwinCAT*.
7. Select *Reset TwinCAT (Config Mode)*.





8. Click *OK*.
9. In the *Solution Explorer* window, right-click *Devices* and select *Scan*.


Solution Explorer
Search Solution Explorer (Ctrl+ö)
Solution 'TwinCAT Project146' (1 project)
TwinCAT Project146
SYSTEM
MOTION
PLC
SAFETY
C++
I/O
Devices
Mapping
Add New Item... Ins
Add Existing Item... Shift+Alt+A
Export EAP Config File
Scan
Paste Ctrl+V
Paste with Links
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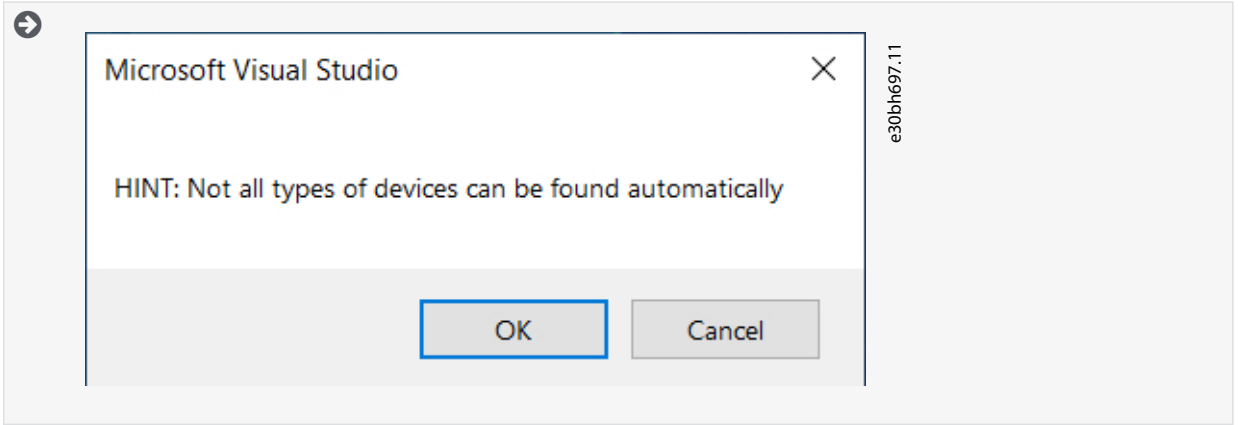
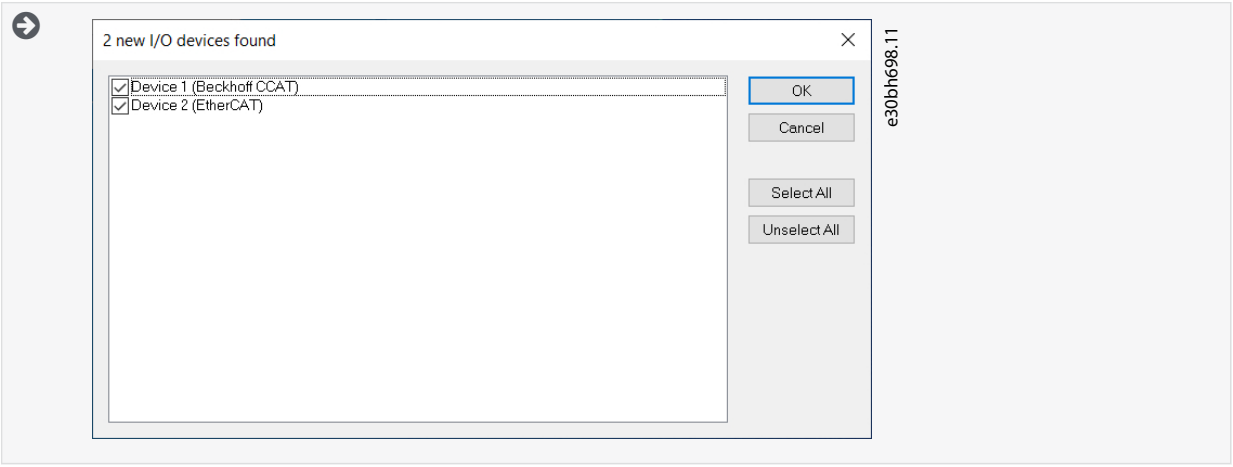
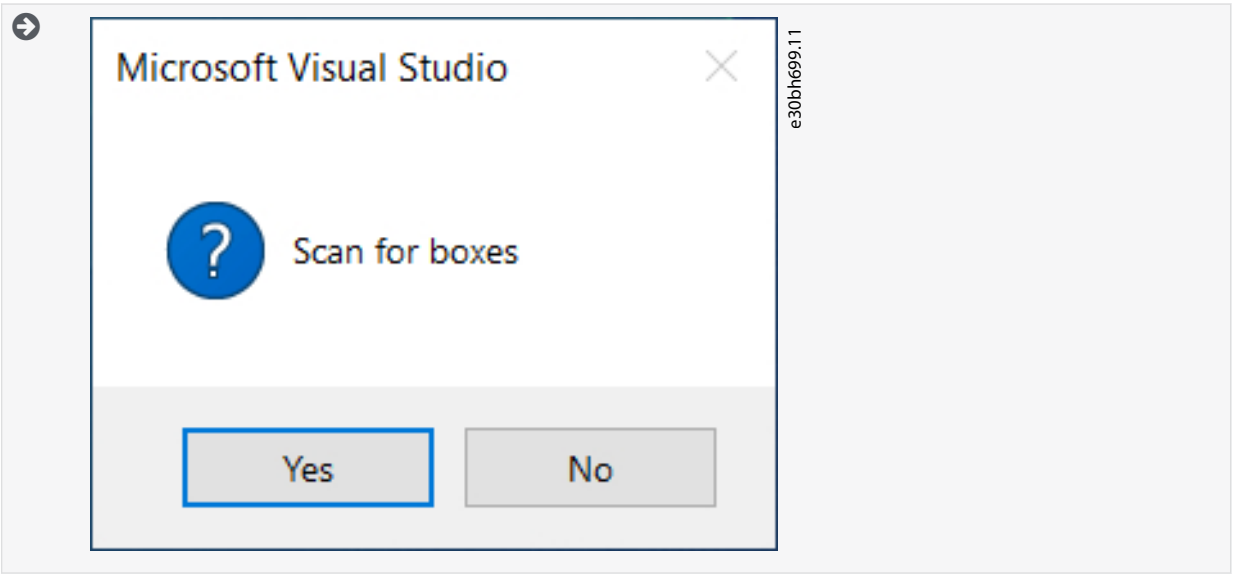

Microsoft Visual Studio
HINT: Not all types of devices can be found automatically
OK
Cancel
e30bh697.11

10. Click *OK*.

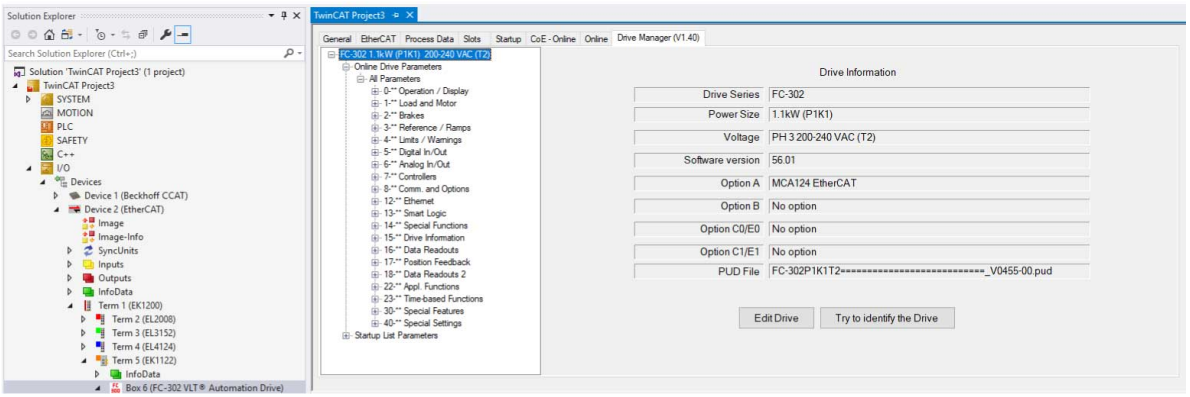


11. Click *OK*.



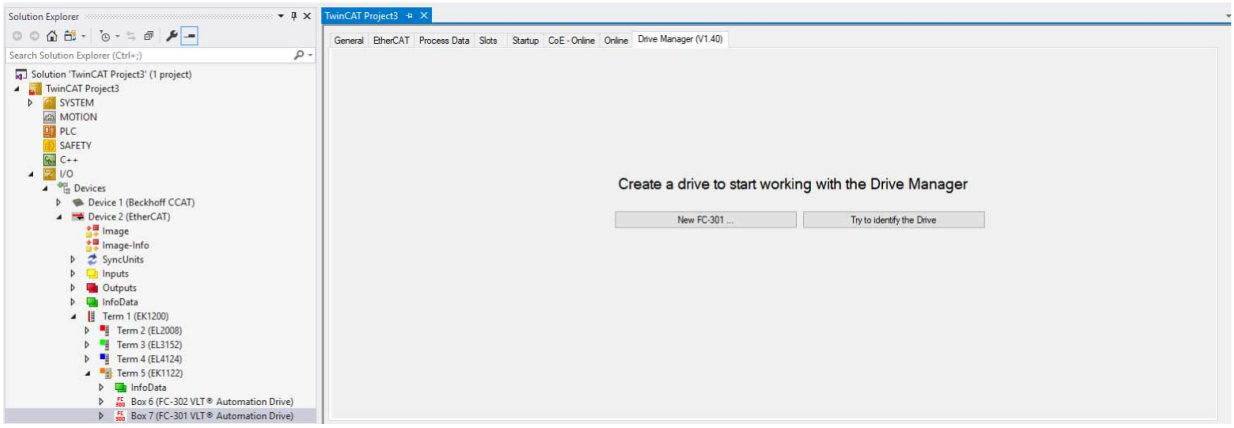
12. Click *Yes*.

If the network was set up correctly, all drives are found and identified, and the Danfoss DriveManager Plug-in for TwinCAT® is ready to be used.



N O T I C E

If the drive software version is not supported (for example, if it is a new software version), the project drive can be created manually.



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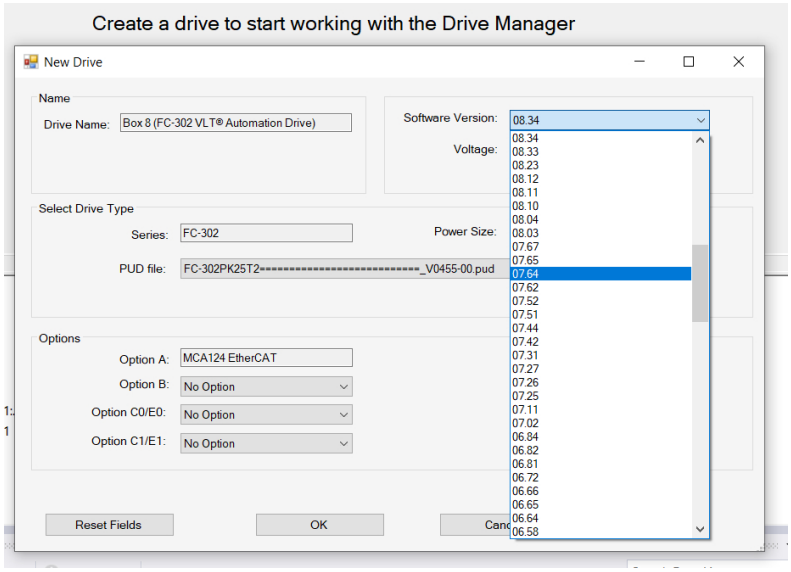
If the software version is not supported, contact Danfoss help desk to find the most compatible software version from the list of supported firmware, or to receive software support.



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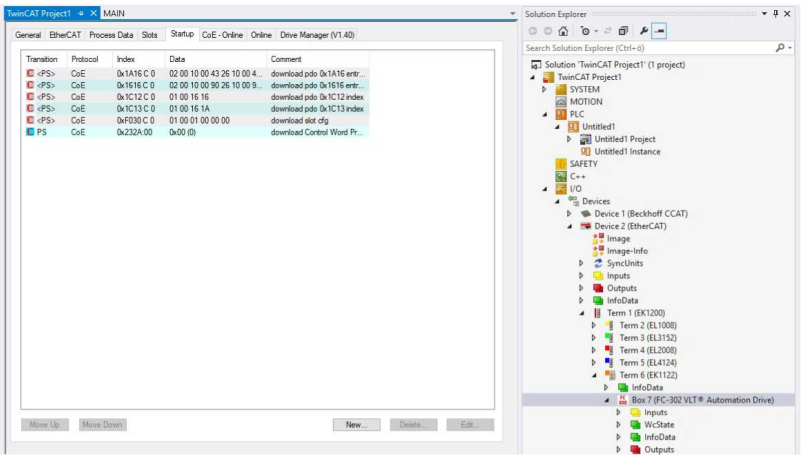
4.2 Modifying the Startup List with Danfoss DriveManager Plug-in for TwinCAT®

The startup list may already contain values that were configured by the system manager based on the ESI specifications. More application-specific entries can be created.

To edit the start-up list parameters, use either the *Startup* tab or the *Drive Manager* tab.



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The Danfoss DriveManager Plug-in makes easy to work with parameters. The parameters are easily found, selections can be made from dropdown lists, and values can be entered directly.

Example

Example of selecting an option in a parameter via the Danfoss DriveManager:

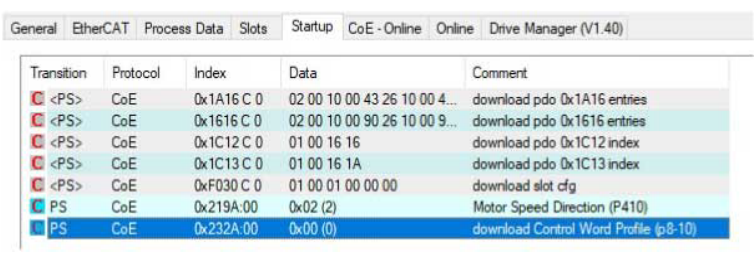

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Illustration 2: Parameter Selected in Startup List

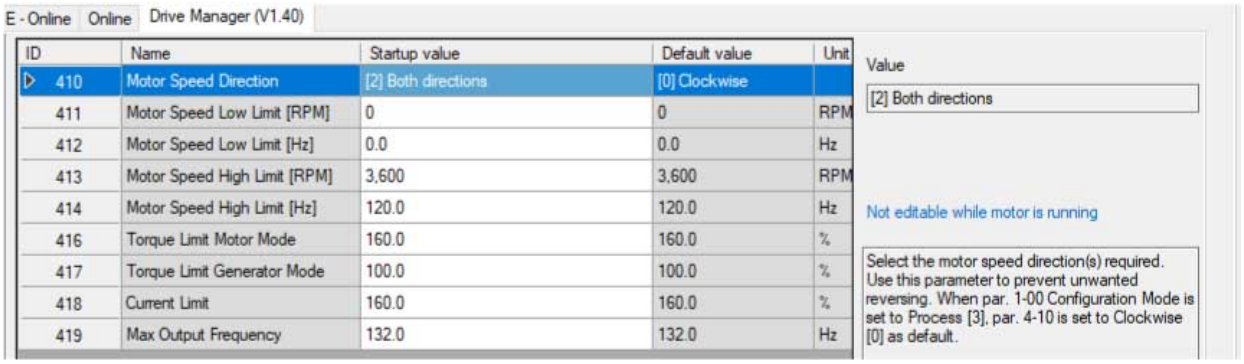

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Illustration 3: Option Selected for Parameter in Danfoss DriveManager

Example

Example of setting a value for a parameter via the Danfoss DriveManager:

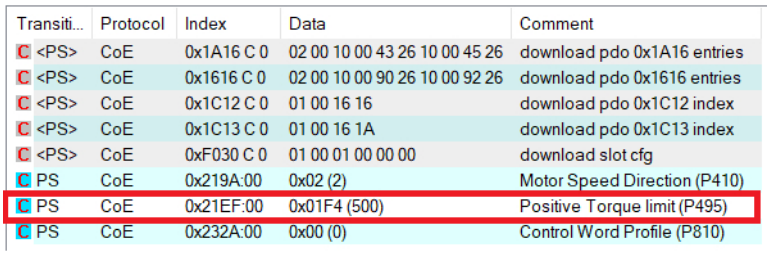

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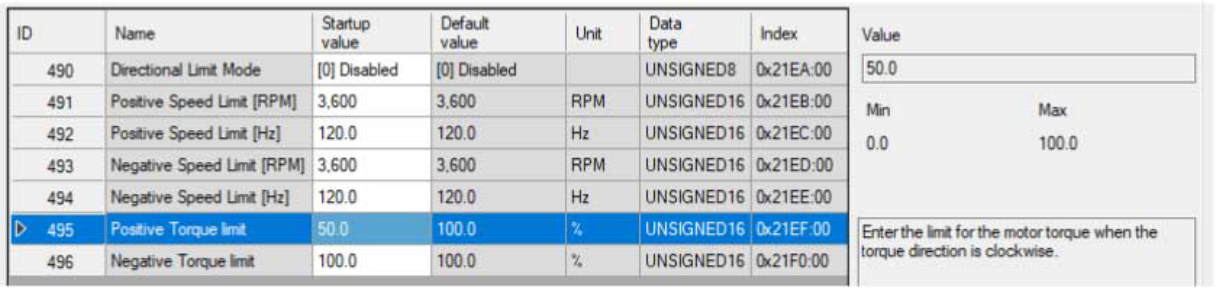
Illustration 4: Parameter Selected in Startup List



e30bh707.11

Illustration 5: Parameter Value Added in DriveManager

4.2.1 Grid Colors

In the *DriveManager* view, the values of the parameters are color-coded depending on whether they are default or non-default values, or if they have been added to the startup list with or without a default value.

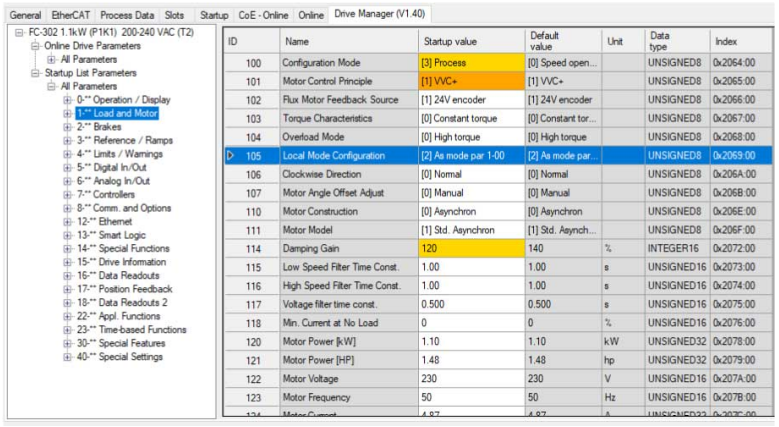


Illustration 6: Example of Color-coded Values in the DriveManager View

Table 2: Grid Color Legend

Color	Description
White	The parameter has the default value and is not in the startup list.
Golden	If the parameter value is different from the default value, this parameter value, and all other parameters depending on that one, are added to the startup list and marked with a golden color.
Orange	By right-clicking, the parameter is added to the startup list whether it has a default value or not.
Gainsboro (dark gray)	The parameter is read-only.
Red	Occurs if an error takes place and a parameter value cannot be read from the drive.
Yellow	Occurs if a parameter value cannot be applied because the parameter depends on the values of other parameters.

4.2.2 Removing a Parameter from the Startup List

When removing a parameter, the context menu depends on whether the parameter value is default or not. If the parameter value is not default, the parameter is reset to default before it is removed from the startup list.

Procedure

1. Right-click the parameter to be removed from the startup list.
2. Click the context menu.

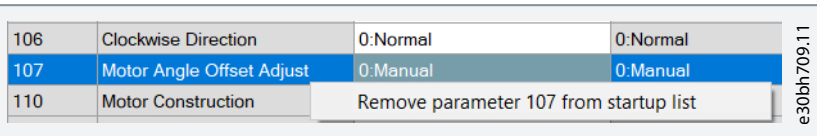


Illustration 7: Example of Parameter with Default Value

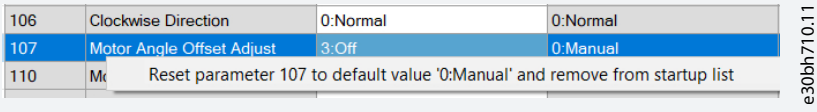


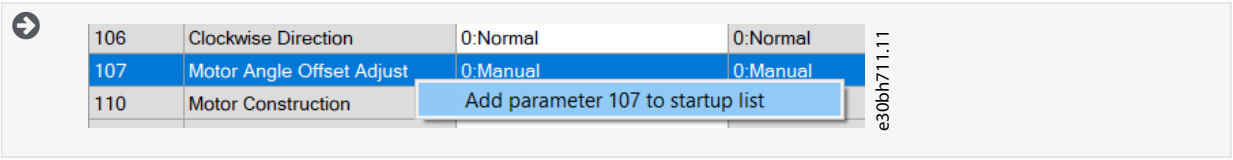
Illustration 8: Example of Parameter with Non-default Value

4.2.3 Adding a Default Value to the Startup List

To initialize drives, the parameters must have default values.

Procedure

1. Right-click the parameter to be added to the startup list.



2. Select the parameter appearing in the context menu.

4.2.4 Activating the Configuration

To apply the startup list to the PLC, activate the configuration as described in this procedure.

NOTICE

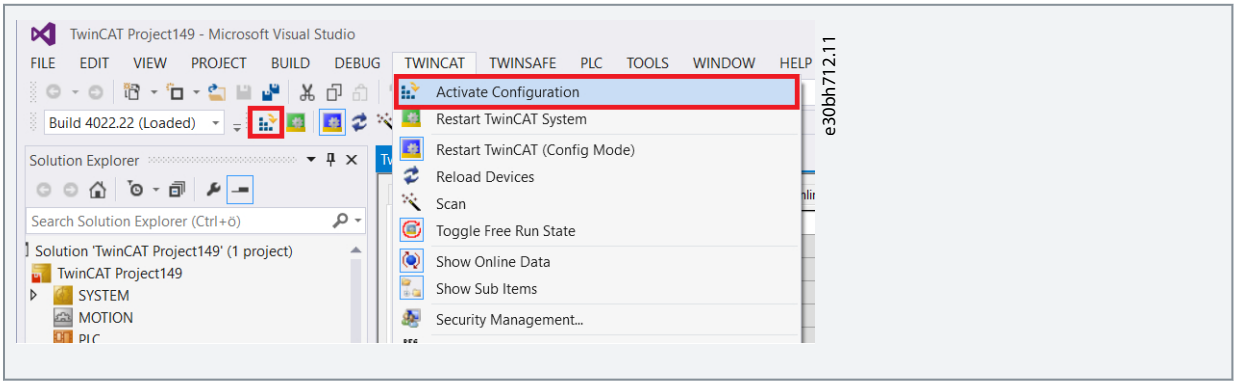
The startup list must be applied to the drive RAM. After a power cycle, reapply the list to the RAM.

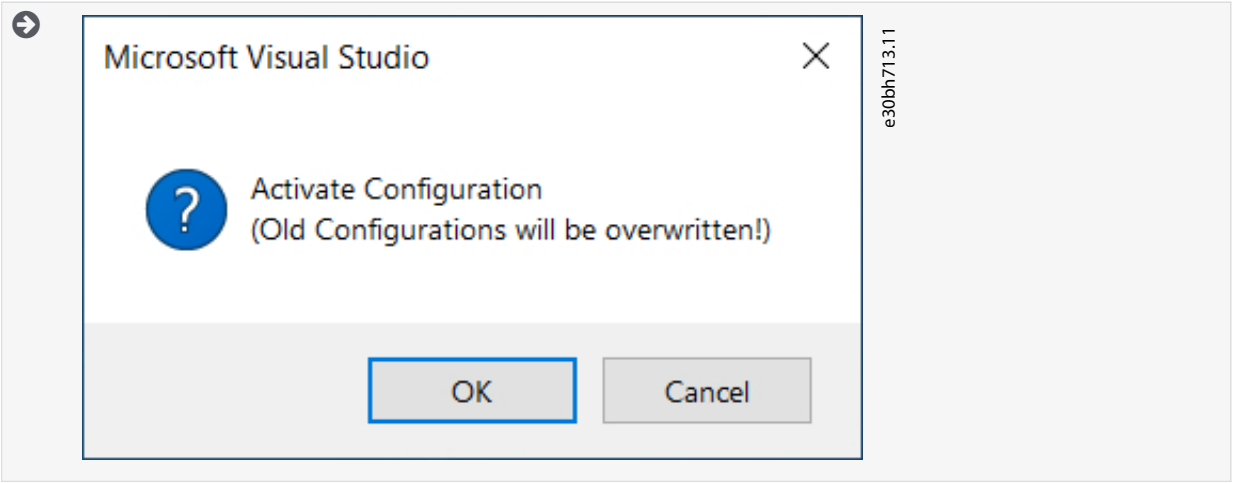
NOTICE

To ensure that the correct values are applied to the startup list, initialize the drive before using it.

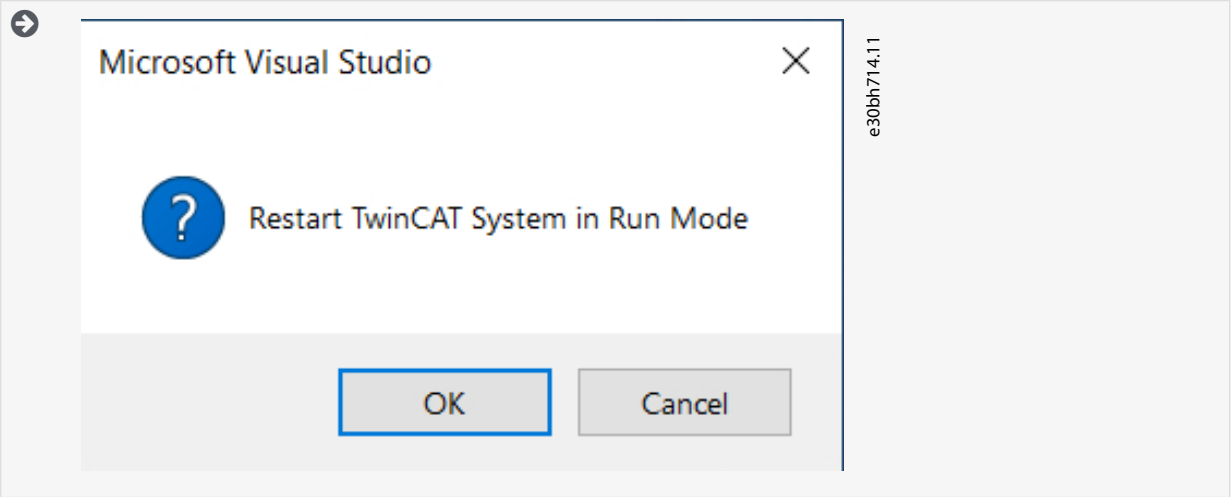
Procedure

1. Select the *TwinCAT* tab.
2. Select *Activate Configuration*.





3. Click *OK*.



4. Click *OK*.

4.3 Working with an Online Drive

This procedure is a use case for working with online drives.

Ensure that the proper hardware setup is in place.

Procedure

1. Scan for devices (see 4.1 Scanning Devices).
2. Select the scanned device and go to the *DriveManager* tab.
3. Select a parameter group under *Online Drive Parameters*.

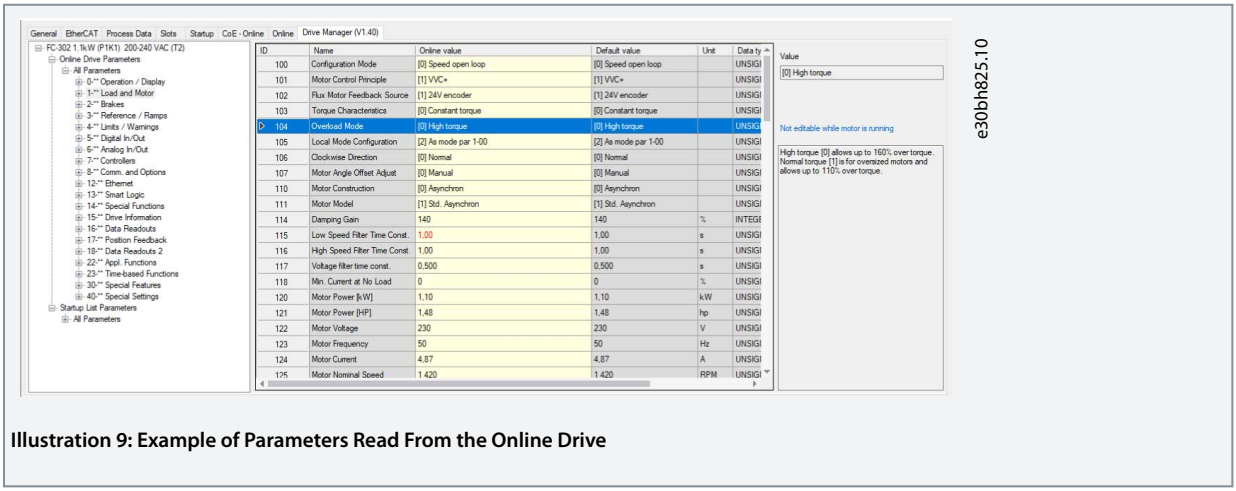


Illustration 9: Example of Parameters Read From the Online Drive

4.4 Modifying the Online Drive Parameters with Danfoss DriveManager Plug-in for TwinCAT®

Parameters under *Online Drive Parameters* allow interaction with an online drive in a more convenient way so that the parameters in the parameter grid show the actual values read from the drive. Parameter values of an online drive can be edited in the same way as the parameters under *Startup List Parameters*.

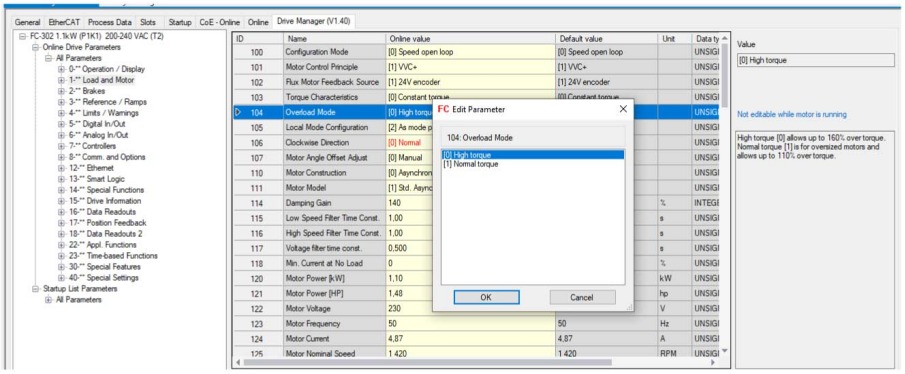


Illustration 10: Example of a Parameter Modification From the Online Drive

4.4.1 Restricted Modification

Restrictions on the modification of online drive parameters often occur in the following situations:

- The parameter is read-only.

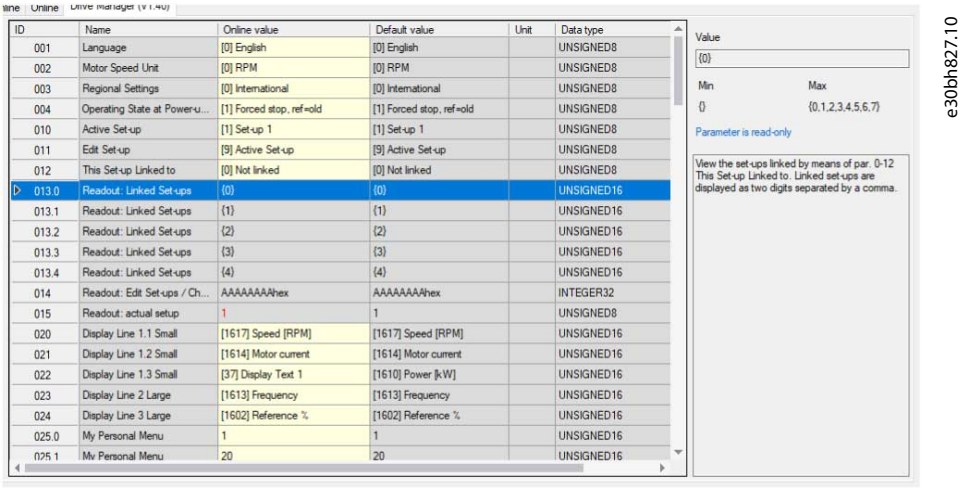
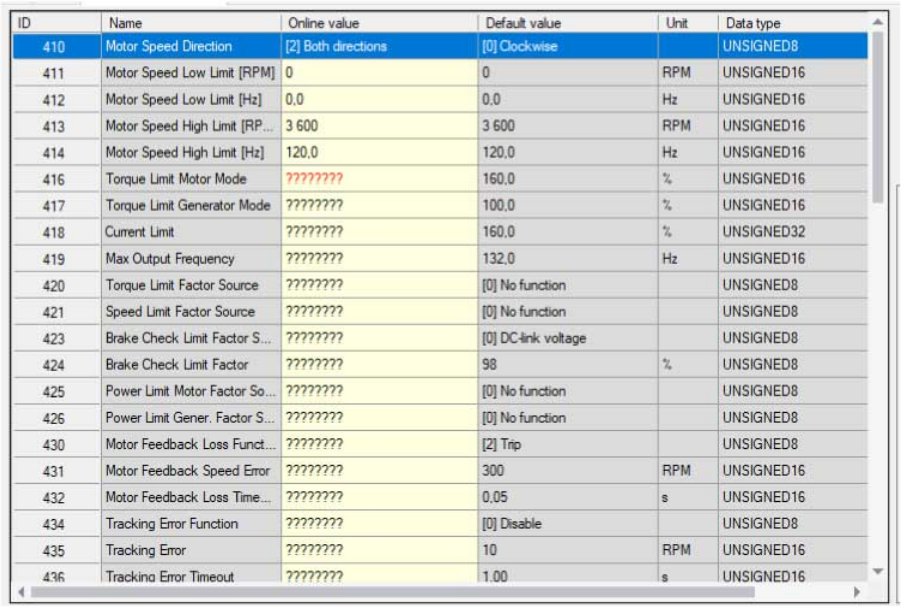


Illustration 11: Examples of Read-only Parameters with Corresponding Label Shown in the Right View

- The parameter is not editable while the motor is running. An example of such a parameter is shown in Illustration 9. The corresponding label is shown in the right view.
- The parameter value is not read. Parameter polling is not instant and performed starting from the top row so that if a parameter is yet to be read, its value is shown as "????????".



ID	Name	Online value	Default value	Unit	Data type
410	Motor Speed Direction	[2] Both directions	[0] Clockwise		UNSIGNED8
411	Motor Speed Low Limit [RPM]	0	0	RPM	UNSIGNED16
412	Motor Speed Low Limit [Hz]	0,0	0,0	Hz	UNSIGNED16
413	Motor Speed High Limit [RP...	3 600	3 600	RPM	UNSIGNED16
414	Motor Speed High Limit [Hz]	120,0	120,0	Hz	UNSIGNED16
416	Torque Limit Motor Mode	????????	160,0	%	UNSIGNED16
417	Torque Limit Generator Mode	????????	100,0	%	UNSIGNED16
418	Current Limit	????????	160,0	%	UNSIGNED32
419	Max Output Frequency	????????	132,0	Hz	UNSIGNED16
420	Torque Limit Factor Source	????????	[0] No function		UNSIGNED8
421	Speed Limit Factor Source	????????	[0] No function		UNSIGNED8
423	Brake Check Limit Factor S...	????????	[0] DC-link voltage		UNSIGNED8
424	Brake Check Limit Factor	????????	98	%	UNSIGNED8
425	Power Limit Motor Factor So...	????????	[0] No function		UNSIGNED8
426	Power Limit Gener. Factor S...	????????	[0] No function		UNSIGNED8
430	Motor Feedback Loss Funct...	????????	[2] Trip		UNSIGNED8
431	Motor Feedback Speed Error	????????	300	RPM	UNSIGNED16
432	Motor Feedback Loss Time...	????????	0,05	s	UNSIGNED16
434	Tracking Error Function	????????	[0] Disable		UNSIGNED8
435	Tracking Error	????????	10	RPM	UNSIGNED16
436	Tracking Error Timeout	????????	1,00	s	UNSIGNED16

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Illustration 12: Example of Read and Unread Parameters in the Grid

- The parameter value cannot be read. Typically, such an issue occurs if there are network problems. A corresponding message is shown in the parameter grid indicating the exact cause for the issue.

ID	Name	Online value	Default value	Unit	Data type
126	Motor Cont. Rated Torque	Ads-Error 0x712 : Server is in in...	5,0	Nm	UNSIGNED32
129	Automatic Motor Adaptation...	Ads-Error 0x712 : Server is in in...	[0] Off		UNSIGNED8
130	Stator Resistance (Rs)	Ads-Error 0x712 : Server is in in...	0,0384	Ohm	UNSIGNED32
131	Rotor Resistance (Rr)	Ads-Error 0x712 : Server is in in...	0,0327	Ohm	UNSIGNED32
133	Stator Leakage Reactance ...	Ads-Error 0x712 : Server is in in...	0,2182	Ohm	UNSIGNED32
134	Rotor Leakage Reactance (...	Ads-Error 0x712 : Server is in in...	0,2618	Ohm	UNSIGNED32
135	Main Reactance (Xh)	Ads-Error 0x712 : Server is in in...	6,7628	Ohm	UNSIGNED32
136	Iron Loss Resistance (Rfe)	Ads-Error 0x712 : Server is in in...	139,894	Ohm	UNSIGNED32
137	d-axis Inductance (Ld)	Ads-Error 0x712 : Server is in in...	0,0	mH	INTEGER32
138	q-axis Inductance (Lq)	Ads-Error 0x712 : Server is in in...	0,000	mH	INTEGER32
139	Motor Poles	Ads-Error 0x712 : Server is in in...	4		UNSIGNED8
140	Back EMF at 1000 RPM	Ads-Error 0x712 : Server is in in...	230	V	UNSIGNED16
141	Motor Angle Offset	Ads-Error 0x712 : Server is in invalid state. (Ads-Error 0x712 : Server is in invalid state.)			
144	d-axis Inductance Sat. (LdS...	Ads-Error 0x712 : Server is in in...	0,000	mH	INTEGER32
145	q-axis Inductance Sat. (LqS...	Ads-Error 0x712 : Server is in in...	0,000	mH	INTEGER32
146	Position Detection Gain	Ads-Error 0x712 : Server is in in...	120	%	UNSIGNED16
147	Torque Calibration	Ads-Error 0x712 : Server is in in...	[0] Off		UNSIGNED8
148	Inductance Sat. Point	Ads-Error 0x712 : Server is in in...	35	%	INTEGER16
149	q-axis Inductance Sat. Point	Ads-Error 0x712 : Server is in in...	100	%	UNSIGNED16
150	Motor Magnetisation at Zero...	Ads-Error 0x712 : Server is in in...	100	%	UNSIGNED16
151	Min Speed Normal Magnetis...	Ads-Error 0x712 : Server is in in...	15	RPM	UNSIGNED16

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Illustration 13: Example of a Situation Where a Parameter Cannot be Read

- The parameter has a dependency. It could be that a parameter depends on the values of other parameters that have not been read yet. In this case, the cell will be highlighted in yellow, and the mouse hover will trigger a tooltip message.

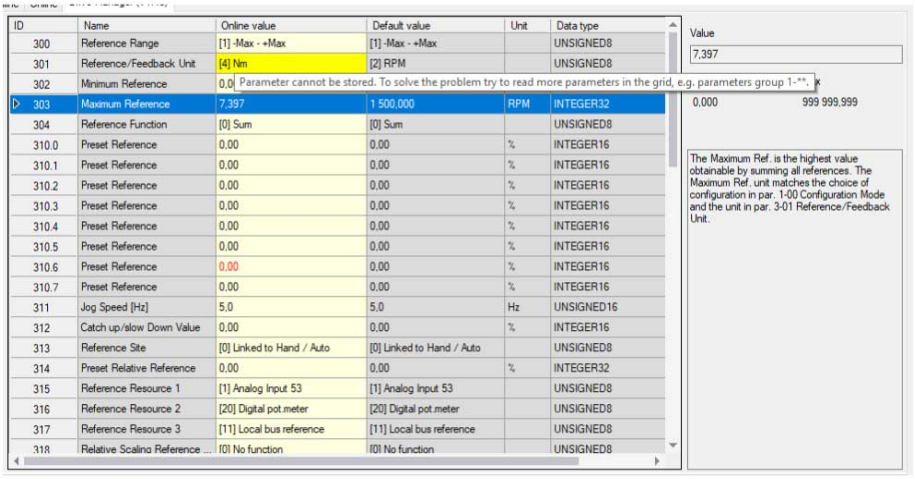

Illustration 14: Example of a Situation Where a Parameter Cannot be Stored due to Being Dependent on Other Parameters

To handle restricted parameters, manually read the parameters of the drive.

4.5 Use Cases for Manual Drive Identification

4.5.1 Drive Identified but not Created in Danfoss DriveManager Plug-in

The problem in this use case is that, even though the devices are identified and created at the scanning, they may be unvisited after saving and closing the project. This can occur if, for example, many devices are connected. In these cases, the previously unvisited devices in the solution explorer do not have the project drives created automatically the next time the project is opened.

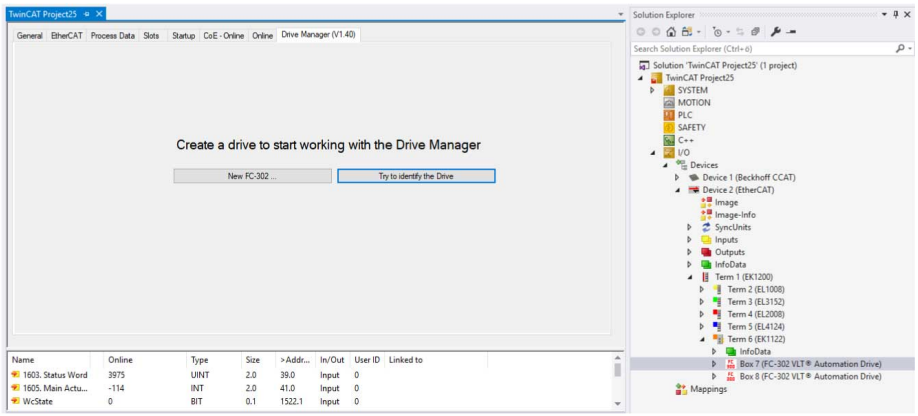

Illustration 15: Resulting View of a Device Being Previously Identified, but not Created in the Danfoss DriveManager Plug-in

Solution

Try to identify the drive by clicking the *Try to identify the Drive* button. On a successful drive identification, the drive is created automatically as shown in Illustration 16. If the identification fails, a corresponding error message is shown with hints to troubleshooting.

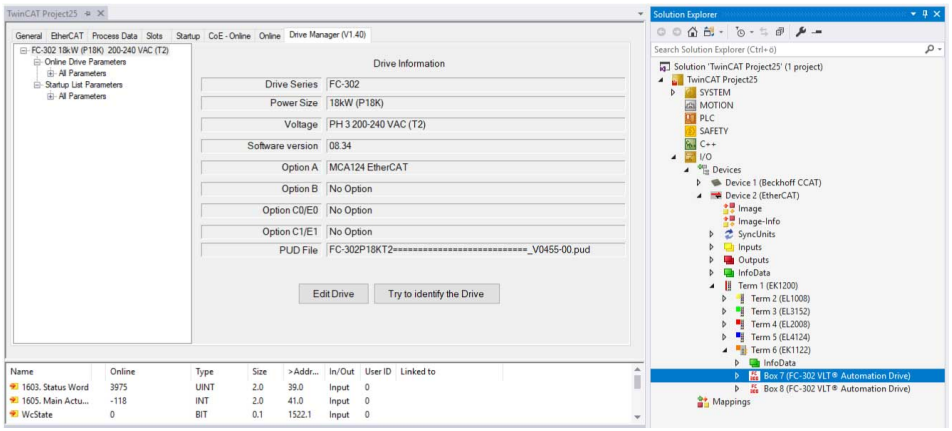

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Illustration 16: Device Created Successfully via the Manual Drive Identification Feature

4.5.1.1 Identifying the Device

Procedure

1. Scan for devices.
2. Select the scanned device and go to the *DriveManager* tab.
3. Click the *Try to identify the Drive* button.

4.5.2 The Drive is Created, but Has Been Changed Externally

The problem in this use case is that, while the project is open with previously scanned devices, some of the devices may have been changed externally. For example, a software version has been updated by VLT® Motion Control Tool MCT 10, which causes the drive information in the plug-in to stay outdated.

Solution

Try to identify the drive by clicking the *Try to identify the Drive* button on the drive information panel. The identification result is shown at the bottom of the panel. There are 4 possible outcomes:

- The configuration is identical. The project is up-to-date and no changes to the projects are done.
- The configuration is different.
  - The project update is possible. In such case, the *Danfoss DriveManager* updates the project to the up-to-date state. To see an example where the updated information text appears in green, refer to Illustration 17.
  - The project update is not possible. No changes to the project are done and an error message is shown.
- Identification has failed. No changes to the projects are done and an error message is shown.

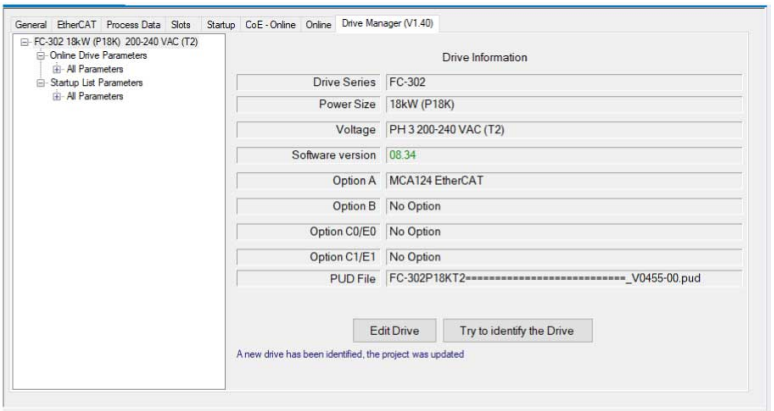

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Illustration 17: Drive Information has been Successfully Identified and Updated

Index

A

Activate configuration....16
Active solution platform....9
Additional resources....3
Apply startup list to PLC....16

C

Color code....15

E

ESI files....

L

Limitations of the Danfoss DriveManager....4

N

New project....9

O

Online drive....17

P

Preconditions....4

Q

Qualified personnel....3

S

Scanning....9
Startup list....13

T

Target system....9

U

User interface....7

ENGINEERING
TOMORROW

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