



Operating Instruction Manual
DTM for Hilscher EtherCAT Master Device
Configuration of Hilscher Master Devices
V1.1000

Hilscher Gesellschaft für Systemautomation mbH
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1 Introduction

1.1 About this Manual

This manual provides information on how to set and configure the device parameters of a netX based EtherCAT Master device using the EtherCAT Master DTM, and what can be read from the diagnosis panes.

1.1.1 Descriptions of the Dialog Panes

The table below gives an overview for the individual dialog panes descriptions:

Section	Subsection	Page
<i>Settings</i>	<i>Overview Settings</i>	29
	<i>Driver</i>	32
	<i>Device Assignment</i>	41
	<i>Firmware Download</i>	47
	<i>Licensing</i>	100
<i>Configuration</i>	<i>Overview Configuration</i>	55
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Table 1: Descriptions Dialog Pages

1.1.2 Online Help

The EtherCAT Master DTM contains an integrated online help facility.

- To open the online help, click on **Help** or press **F1**.

1.1.3 List of Revisions

Index	Date	Version	Chapter	Revision
9	17-02-24	1.1000	1.4.1	Section <i>Requirements</i> Internet access added, Windows 8.1 and Windwos 10 added.
10	18-02-14	1.1000	2.5.1, 3.2, 4.5, 6.3	Versioning information revised: Title page and this section Safety Message or warning added: Sections <i>Power Disconnect while downloading Firmware or Configuration</i> , <i>Safety Messages on Firmware or Configuration Download</i> , <i>Firmware Download</i> and <i>Download Configuration</i> . Safety communication in the document revised in general.

Table 2: List of Revisions

1.1.4 Conventions in this Manual

Notes, operation instructions and results of operation steps are marked as follows:

Notes



Important: <important note you must follow to avoid malfunction>



Note: <general note>



<note, where to find further information>

Operation Instructions

1. <instruction>

2. <instruction>

or

➤ <instruction>

Results

↪ <result>

Positions in Figures

The *Positions* ①, ②, ③ ... or a, b, c ... or A, B, C ... refer to the figure used in that section. If the numbers reference to a section outside the current section then a cross reference to that section and figure is indicated.

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1.4 About EtherCAT Master DTM

You can use the EtherCAT Master DTM to configure the EtherCAT Master device within a FDT Framework.

1.4.1 Requirements

System Requirements

- PC with 1 GHz processor or higher
- Windows® XP SP3,
Windows® Vista (32-Bit) SP2,
Windows® 7 (32-Bit and 64-Bit) SP1,
Windows® 8 (32-Bit and 64-Bit),
Windows® 8.1 (32-Bit and 64-Bit),
Windows® 10 (32-Bit and 64-Bit)
- Administrator privilege required for installation
- Internet Explorer 5.5 or higher
- RAM: min. 512 MByte, recommended 1024 MByte
- Graphic resolution: min. 1024 x 768 pixel
- Keyboard and Mouse
- Restriction: Touch screen is not supported.



Note: If the project file is used on a further PC,

- this PC must also comply with the above system requirements,
- the device description files of the devices used in the project must be imported into the configuration software SYCON.net on the new PC,
- and the DTMs of the devices used in the project must also be installed on that further PC.

Requirements EtherCAT Master DTM

To configure the EtherCAT Master device with the EtherCAT Master DTM the following requirements have to be accomplished:

- Completed hardware installation of a netX based DTM-compatible EtherCAT Master device, inclusive loaded firmware, license and loaded cifX configuration file
- Installed FDT/DTM V 1.2 compliant frame application
- Loaded DTM in the Device Catalog of the FTD Framework



Note: If the EtherCAT Master DTM and the EtherCAT Master device are installed on the same PC, the **cifX Device Driver** must be installed on that PC, as you can connect the DTM to the device.



For more information to the hardware installation, please refer to the corresponding **User Manual** of your device.

To get information on how to order and to download the license to the device, please refer to section *Licensing* on page 100.

1.5 Dialog Structure of the EtherCAT Master DTM

The graphical user interface of the DTM is composed of different areas and elements listed hereafter:

1. A header area containing the **General Device Information**,
2. The **Navigation Area** (area on the left side),
3. The **Dialog Pane** (main area on the right side),
4. **OK, Cancel, Apply, Help**,
5. The **Status Line** containing information e. g. the online-state of the DTM.

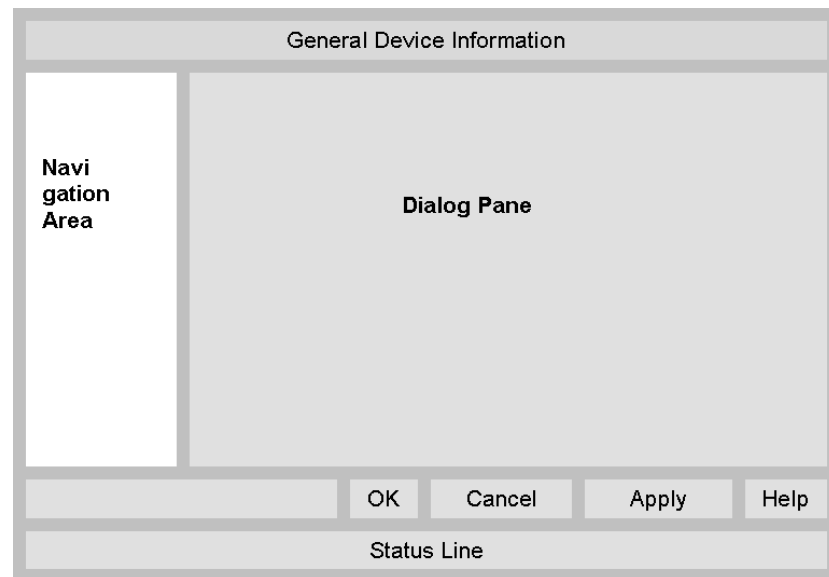


Figure 1: Dialog Structure of the EtherCAT Master DTM

1.5.1 General Device Information

Parameter	Meaning
IO Device	Name of the device
Vendor	Vendor name of the device
Device ID	Identification number of the device
Vendor ID	Identification number of the vendor

Table 3: General Device Information

1.5.2 Navigation Area

The **Navigation Area** contains folders and subfolders to open the dialog panes of the DTM.

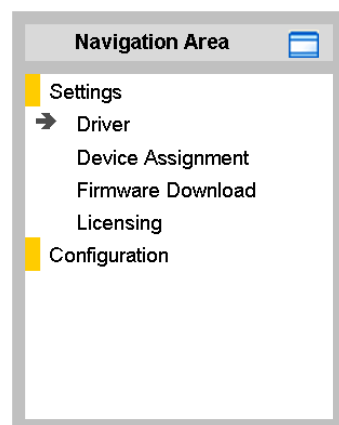


Figure 2: Navigation Area

- Select the required folder and subfolder.
- The corresponding Dialog pane is displayed.

Hide / display Navigation

	Hiding the navigation area (above right side).
Show navigation area	Opening the navigation area (below left side).

1.5.3 Dialog Panes

At the dialog pane the **Settings**, **Configuration**, **Diagnosis/Extended Diagnosis** or the **Tools** panes are opened via the corresponding folder in the navigation area.

Settings	
Driver	To establish a connection from the EtherCAT Master DTM to the EtherCAT Master device, on the pane Driver you can verify if the default driver is checked and respectively check another driver or multiple drivers. For further information, refer to section <i>Driver</i> on page 32.
Device Assignment	On the pane Device Assignment you select the device and assign the device to the driver. For further information, refer to section <i>Device Assignment</i> on page 41.
Firmware Download	The dialog on the pane Firmware Download is used to load a new firmware into the device. A detailed description can be found in section <i>Firmware Download</i> on page 47.
Licensing	Using the license dialog, you can order licenses for Master protocols or Utilities and download them to your device. A detailed description can be found in section <i>Licensing</i> on page 100.
Configuration	
General	The page " General " displays general EtherCAT Master information. For further information, refer to section <i>General</i> on page 58.
Process Data Handshake	The page " Process Data Handshake " allows to select the desired process data handshake method for the synchronization between host application and device. For further information, refer to section „ <i>Process Data Handshake</i> “ on page 62 .
Topology	The page " Topology " displays the important structural information such as the current network topology of the EtherCAT network. For further information, refer to section <i>Topology</i> on page 60.
Mailbox	The page " Mailbox " describes the CANopen over EtherCAT functionality for acyclic data communication based on mailboxes. For further information, refer to section <i>Mailbox</i> on page 70.
FMMU/ SyncMan	The page " FMMU/Sync Man " informs about the Fieldbus Memory Management Unit and the Sync Manager. For further information, refer to section <i>FMMU/SyncMan</i> on page 77 .
Process Data	The Process Data pane serves for the EtherCAT Master DTM as an external process data interface. For further information, refer to section <i>Process Data</i> on page 80.
Address Table	The page " Address Table " displays a list of all addresses used in the process data image. For further information, refer to section <i>Address Table</i> on page 82.
Init Commands	The ' Init commands ' page of the configuration dialog allows to display and edit a sequence of initialization commands. For further information, refer to section <i>Init Commands</i> on page 84.
Diagnosis	
Diagnosis/ Extended Diagnosis	At the Diagnosis panes information can be read for troubleshooting. For further information, refer to section <i>Overview Diagnosis</i> on page 113 or section <i>Overview Extended Diagnosis</i> on page 119.
Tools	
Packet Monitor/ IO Monitor/ Process Image Monitor	Under Tools the Packet Monitor and the IO Monitor are provided for test and diagnosis purposes. For further information, refer to section <i>Packet Monitor</i> on page 134, section <i>IO Monitor</i> on page 137 or section <i>Process Image Monitor</i> on page 139.

Table 4: Overview Dialog Panes



Note: Accessing the **Diagnosis** panes of the EtherCAT Master DTM requires an online connection from the EtherCAT Master DTM to the EtherCAT Master device.



For further information, refer to section *Connecting/Disconnecting Device* on page 87.

1.5.4 OK, Cancel, Apply and Help

OK, Cancel, Apply and Help you can use as described hereafter.

	Meaning
OK	To confirm your latest settings, click OK . All changed values will be applied on the frame application database. <i>The dialog then closes.</i>
Cancel	To cancel your latest changes, click Cancel . Answer to the safety query Configuration data has been changed. Do you want to save the data? by Yes , No or Cancel . Yes: The changes are saved or the changed values are applied on the frame application database. <i>The dialog then closes.</i> No: The changes are <u>not</u> saved or the changed values are not applied on the frame application database. <i>The dialog then closes.</i> Cancel: <i>Back to the DTM.</i>
Apply	To confirm your latest settings, click Apply . All changed values will be applied on the frame application database. <i>The dialog remains opened.</i>
Help	To open the DTM online help, click Help .

Table 5: OK, Cancel, Apply and Help

1.5.5 Table Lines

In the DTM dialog pane table lines can be selected, inserted or deleted.

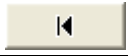


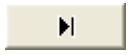


	Meaning
	To select the first line of a table use First Line .
	To select the previous line of a table use Previous Line .
	To select the next line of a table use Next Line .
	To select the last line of a table use Last Line .
	Create a new Line inserts new lines into the table.
	Delete selected Line deletes the selected line from the table.

Table 6: Selecting, inserting, deleting Table Line

1.5.6 Status Bar

The **Status Bar** displays information about the current state of the DTM. The current activity, e.g. download, is signaled graphically via icons in the status bar.

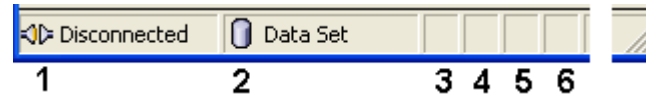
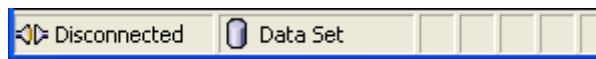


Figure 3: Status Bar – Status Fields 1 to 6

Status Field	Icon / Meaning	
1	DTM Connection States	
		Connected: Icon closed = Device is online
		Disconnected: Icon opened = Device is offline
2	Data Source States	
		Data set: The displayed data are read out from the instance data set (database).
		Device: The displayed data are read out from the device.
3	States of the instance Date Set	
		Valid Modified: Parameter is changed (not equal to data source).
4	Changes directly made on the Device	
		Load/configure diagnosis parameters: Diagnosis is activated.
6	Device Diagnosis Status	
		Save operation succeeded: The save operation has been successful. Further messages due to successful handling of device data.
		Firmware Download: Firmware Download is running
		Save operation failed: The save operation has failed. Further fail operation messages due to incorrect communication due to malfunction in the field device or its peripherals.

Table 7: Status Bar Icons [1]

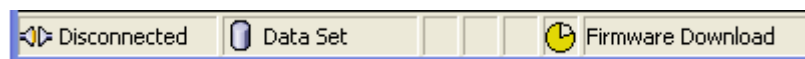
Offline State



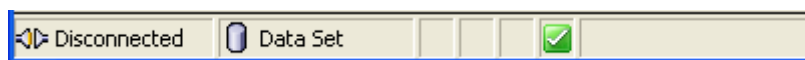
Save operation succeeded



Firmware Download



Firmware Download successful



Online State and Diagnosis

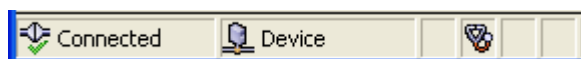


Figure 4: Status Bar Display Examples

2 Safety

2.1 General Note

The documentation in the form of a user manual, an operating instruction manual or other manual types, as well as the accompanying texts have been created for the use of the products by educated personnel. When using the products, all Safety Messages, Integrated Safety Messages, Property Damage Messages and all valid legal regulations must be obeyed. Technical knowledge is presumed. The user has to assure that all legal regulations are obeyed.

2.2 Intended Use

The EtherCAT Master DTM serves for configuration and diagnosis of EtherCAT Master devices.

2.3 Personnel Qualification

Personnel responsible for the application of the network system shall be aware of the system behavior and shall be trained in using the system.

2.4 Safety Instructions

To ensure your own personal safety and to avoid personal injury, you necessarily must read, understand, and comply with the safety instructions and safety messages in this manual before you install and operate your system.

For cases if both, personal injury as well as property damage (damage of equipment or device) may occur together, you find the safety instructions in this section.

2.4.1 Communication Stop during Firmware or Configuration Download

If you want to perform either a firmware update (as a download) or a configuration download, both via the EtherCAT Master DTM, be aware of the following:

- Together with the firmware download, an automated reset to the device is performed that will interrupt all network communication and all established connections will drop.
- If you download the configuration during bus operation, the communication between master and slaves is stopped.

Possible faulty System Operation

- An unpredictable and unexpected behavior of machines and plant components may cause personal injury and property damage.
- Stop the application program, before starting the firmware update or before downloading the configuration.
- Make sure that your equipment operates under conditions that prevent personal injury or property damage. All network devices should be placed in a fail-safe mode, before starting the firmware update or before downloading a configuration.

Loss of Device Parameters, Overwriting of Firmware

- Both the firmware download and the configuration download erase the configuration data base. The firmware download overwrites the existing firmware in the network device.
- To complete the firmware update and to make the device operable again, re-load the configuration after the firmware update has been finished.
- Device parameters that have been saved volatile, e. g. as the temporarily set IP address parameters, are getting lost during the reset.
- In order to prevent loss of configuration data, make sure that your project configuration data are saved non-volatile, before you initiate a firmware update or download the configuration.

2.4.2 Mismatching System Configuration

Mismatching system configuration loaded into the device could result in faulty data mapping in the application program and thus unexpected equipment operation may cause personal injury or damage of equipment.

- In the device use only a configuration suitable for the system.

2.5 Property Damage

To avoid property damage and damage to your system or to your equipment, you necessarily must read, understand, and comply with the safety instructions and safety messages in this manual before you configure your system.

2.5.1 Power Disconnect while downloading Firmware or Configuration

If during the process of downloading a firmware or configuration

- the power supply to a PC with the software application is interrupted,
- or the power supply to the EtherCAT Master device is interrupted,
- or a reset to the device is performed,

this may lead to the following consequences:

Loss of Device Parameters, Firmware Corruption

- The firmware download or the configuration download will be interrupted and remains incomplete.
- The firmware or the configuration database will be corrupted and device parameters will be lost.
- Device damage may occur as the device cannot be rebooted.

Whether these consequences occur depends on when the power disconnect occurs during the download.

- During configuration download process, do not interrupt the power supply to the PC, or to the device and do not perform a reset!

Otherwise you might be forced to return your device for repair.

Power Drop during Write and Delete Accesses in the File System

The FAT file system in the netX firmware is subject to certain limitations in its operation. Write and delete accesses in the file system (firmware update, configuration download etc.) can destroy the FAT (File Allocation Table) if the accesses cannot be completed if the power drops. Without a proper FAT, a firmware may not be found and cannot be started.

Make sure that the power supply to the device is not interrupted during write and delete accesses in the file system (firmware update, configuration download, etc.).

2.5.2 Invalid Firmware

Loading invalid firmware files could render your device unusable.

- Only download firmware files to the device that are valid for this device.

Otherwise you might be forced to return your device for repair.

2.6 Labeling of Safety Messages

- The **Section Safety Messages** at the beginning of a chapter are pinpointed particularly and highlighted by a signal word according to the degree of endangerment. The type of danger is specified by the safety message text
- The **Integrated Safety Messages** within an instruction description are highlighted with a signal word according to the degree of endangerment. The kind of danger is specified exactly by the safety message text.





Signal Word	Meaning (International)	Meaning (USA)
 DANGER	Indicates a direct hazard with high risk, which will have a consequence of death or grievous bodily harm if it is not avoided.	Indicates a hazardous situation which if not avoided, will result in death or serious injury.
 WARNING	Indicates a possible hazard with medium risk, which will have a consequence of death or (grievous) bodily harm if it is not avoided.	Indicates a hazardous situation which if not avoided, could result in death or serious injury.
 CAUTION	Indicates a minor hazard with medium risk, which could have a consequence of minor or moderate bodily harm if it is not avoided.	Indicates a hazardous situation which if not avoided, may result in minor or moderate injury.
 NOTICE	Indicates a property damage message.	Indicates a property damage message.

Table 8: Signal Words



Note: The ANSI Z535.6 standard specifies in section 4.8: "Messages about hazards that could result in both, physical injury and property damage are considered safety messages, not property damage messages." Thus depending of the type of danger and its consequences, warning messages marked by a signal word DANGER, WARNING or CAUTION may include both, messages on physical injury and property damage.

In this document all Safety Instructions and Safety Messages are designed according both to the international used safety conventions as well as to the ANSI Z535.6 standard, refer to safety reference [S1].

In this document the signal words 'WARNING', 'CAUTION' and 'NOTICE' are used according to ANSI Z535.6 standard. The meaning given in ISO/IEC 26514 [S4] section '11.11 Contents of warnings and cautions' is not relevant in this manual.

2.7 References Safety


- [S1] ANSI Z535.6-2011 American National Standard for Product Safety Information in Product Manuals, Instructions, and Other Collateral Materials
- [S4] 26514-2010 - IEEE Standard for Adoption of ISO/IEC 26514:2008 Systems and Software Engineering--Requirements for Designers and Developers of User Documentation




3 Getting started

3.1 Configuration Steps

The following overview provides to you the step sequence on how to configure a netX based EtherCAT Master device with EtherCAT Master DTM as it is typical for many cases. At this time it is presupposed that the hardware installation was done.

The overview lists all the steps in a compressed form. For detailed descriptions of each step refer to the sections noted in the column *For detailed information see section*.

#	Step	Short Description	For detailed information see section	Page
1	Add EtherCAT Slave in the Device Catalog	Add the Slave in the Device Catalog by importing the device description file to the Device Catalog. Depending of the FDT Container. For netDevice: - Network > Import Device Descriptions.	(See <i>Operating Instruction Manual netDevice and netProject</i>)	-
2	Load device catalog	Depending of the FDT Container: For netDevice: - select Network > Device Catalog , - select Reload Catalog .	(See <i>Operating Instruction Manual netDevice and netProject</i>)	-
3	Create new project / Open existing project	Depending of the frame application. For the configuration software: - select File > New or File > Open .	(See <i>Operating Instruction Manual of the Frame Application</i>)	-
4	Insert Master or Slave into configuration	Depending of the FDT Container: For netDevice:  Important! In order to select the desired device in the device catalog, note the details about the DTM and the device at the bottom of the window. When sorting by <i>Fieldbus</i> multiple devices with identical names by different vendors can be displayed. - in the Device Catalog click to the Master, - and insert the device via drag and drop to the line in the network view, - in the Device Catalog click to the Slave*, - and insert the device via drag and drop to the Master bus line in the network view.* (*This step won't be necessary if the network structure is scanned automatically. See <i>step 17</i> .)	(See <i>Operating Instruction Manual netDevice and netProject</i>)	-
5	Open the Master DTM configuration dialog	Open the Master DTM configuration dialog. - Double click to the device icon of the Master. - The Master DTM configuration dialog is displayed.	-	-

#	Step	Short Description	For detailed information see section	Page
6	Verify or adapt Driver Settings	<p>In the Master DTM configuration dialog: - select Settings > Driver.</p> <div>  <p>Note! For PC cards cifX the cifX Device Driver is preset as a default driver. For all the other Hilscher devices the netX Driver is preset as a default driver.</p> <ul style="list-style-type: none"> • Use the cifX Device Driver if the EtherCAT Master DTM is installed on the same PC as the EtherCAT Master device. • Use the netX Driver to establish a USB, Serial (RS232) or TCP/IP connection from the EtherCAT Master DTM to the EtherCAT Master device. • The 3SGateway Driver for netX (V3.x) is used only in relationship with CODESYS. <p>To search for devices you can check one or multiple drivers simultaneously.</p> </div> <p>- Verify that the default driver is checked. - If necessary, check another driver or multiple drivers.</p>	<p><i>Settings for Driver and Device Assignment and Driver</i></p>	<p>30</p> <p>32</p>
7	Configure Driver	<p>If you use the netX Driver, you respectively must configure it.</p> <p>For netX Driver and communication via TCP/IP set the IP address of the device: - Select Settings > Driver > netX Driver > TCP Connection. - Via  add an IP range. - Under IP Address enter the IP Address of the device or an IP range. - Click Save.</p> <p>Adjust the driver parameters netX Driver USB/RS232 only if they differ from the default settings.</p> <div>  <p>Note!</p> <ul style="list-style-type: none"> • The cifX Device Driver requires no configuration. • The configuration of the 3SGateway Driver for netX (V3.x) is carried out via the CODESYS surface. </div>	<p><i>Configuring netX Driver</i></p>	<p>35</p>
8	Assign Master device (with or without firmware)	<p>Assign the device to this driver.</p> <p>In the Master DTM configuration dialog: - select Settings > Device Assignment, - select a Master device (with or without firmware), - therefore check the appropriate checkbox, - select Apply.</p>	<p><i>Selecting the Device (with or without firmware)</i></p>	<p>44</p>

#	Step	Short Description	For detailed information see section	Page
9	Select and download firmware	<p>If not yet a firmware was loaded to the device:</p> <ul style="list-style-type: none"> - Adhere to the necessary safety precautions to prevent personnel injury and property damage. <p>In the Master DTM configuration dialog:</p> <ul style="list-style-type: none"> - select Settings > Firmware Download, - select Browse.., - select a firmware file, - select Open, - select Download and Yes. 	<p><i>Safety Messages on Firmware or Configuration Download</i></p> <p><i>Firmware Download</i></p>	<p>28</p> <p>47</p>
10	Assign Master device once more (with firmware and system channel) <i>For repeated download this step is omitted.</i>	<p>In the Master DTM configuration dialog:</p> <ul style="list-style-type: none"> - select Settings > Device Assignment, - select Scan, - select the Master device (with loaded and defined system channel), - therefore check the appropriate checkbox, - select Apply, - close the Master DTM configuration dialog via OK. 	<i>Selecting the Device once more (with Firmware)</i>	45
11	Configure Slave device* (*This step won't be necessary if the network structure is scanned automatically. See step 17.)	<p>Configure the Slave device.</p> <ul style="list-style-type: none"> - Double click to the device icon of the Slave. - The Slave DTM configuration dialog is displayed. <p>In the Slave DTM configuration dialog:</p> <ul style="list-style-type: none"> - select Configuration > Behavior, - set the Watchdog control and Interval, - set the timeout values for various state machine transitions, - specify which verifications to perform during device check-up, - choose between combined and separate EtherCAT commands for read and write accesses, - select Configuration > Process Data, - configure the process data of the Slave (PDO assignment and PDO contents), - close the Slave DTM configuration dialog via OK. 	<i>(See Operating Instruction Manual Generic Slave DTM for EtherCAT Slave Devices)</i>	-

#	Step	Short Description	For detailed information see section	Page
12	Configure Master device	<p>Configure the Master device.</p> <ul style="list-style-type: none"> - Double click to the device icon of the Master. - The Master DTM configuration dialog is displayed. <p>In the Master DTM configuration dialog:</p> <ul style="list-style-type: none"> - select Configuration > Process Data Handshake Decide to choose a process data handshake method to be applied. - select Configuration > Topology edit the network topology in the connection view according to your needs, - select Configuration > Mailbox - edit the CoE parameters only for those slaves which are configurable with respect to CoE. These entries can be found at the register cards 'Start-up' and 'Userdef Start-up'. - select Configuration > FMMU/SyncMan - set the parameters for the FMMU and the sync manager, - select Configuration > Process data, - set symbolic names for the configured modules or signals. - select Configuration > Address Table - set the address information and parameters related to the PDOs. - select Configuration > Init Commands - edit the Init Commands table according to your needs. - close the Master DTM configuration dialog via OK. 	<p><i>Configuring Device Parameters</i></p> <p><i>Process Data Handshake</i></p> <p><i>Topology</i></p> <p><i>Mailbox</i></p> <p><i>FMMU/SyncMan</i></p> <p><i>Process Data</i></p> <p><i>Address Table</i></p> <p><i>Init Commands</i></p>	<p>56</p> <p>60</p> <p>64</p> <p>70</p> <p>77</p> <p>80</p> <p>82</p> <p>84</p>
13	Save project	<p>Depending of the frame application.</p> <p>For the configuration software:</p> <ul style="list-style-type: none"> - select File > Save. 	<i>(See Operating Instruction Manual of the Frame Application)</i>	-
14	Connect Master device	<p>Depending of the FDT Container.</p> <p>For netDevice:</p> <ul style="list-style-type: none"> - right click to the device icon of the Master, - select Connect. 	<i>Connecting/Disconnecting Device</i>	87
15	Licensing	How to order licenses later and how to transfer them to the device.	<i>Licensing</i>	100
16	Download Configuration	<ul style="list-style-type: none"> - Adhere to the necessary safety precautions to prevent personnel injury and property damage. <p>Depending of the FDT Container.</p> <p>For netDevice:</p> <ul style="list-style-type: none"> - right click to the device icon of the Master, - select Download. 	<p><i>Safety Messages on Firmware or Configuration Download</i></p> <p><i>Download Configuration</i></p>	<p>28</p> <p>97</p>

#	Step	Short Description	For detailed information see section	Page
17	Network Scan	<p>As an alternative to manually configure the Slave device, you can automatically scan the network structure by using the context menu Network Scan.</p> <p>Therefore proceed the following steps:</p> <ol style="list-style-type: none"> 1. Start the Network Scan function. 2. Make the settings in the Scan Response of Device dialog. 3. Create devices. 4. Download of the Device configuration to the Master device (Download). 	<i>Network Scan</i>	89
18	Diagnosis	<p>Depending of the FDT Container.</p> <p>For netDevice:</p> <ul style="list-style-type: none"> - right click to the device icon of the Master, - select Diagnosis. <p>The Master DTM diagnosis dialog is displayed.</p> <p>(1) Check whether the communication is OK: Diagnosis > General Diagnosis > Device status "Communication" must be green!</p> <p>(2) "Communication" is green: Open the IO Monitor and test the input or output data.</p> <p>(3) "Communication" is not green: Use Diagnosis and Extended diagnosis for troubleshooting.</p> <ul style="list-style-type: none"> - close the Master DTM diagnosis dialog via OK. 	<i>Overview Diagnosis</i>	113
19	IO Monitor	<p>Depending of the FDT Container:</p> <p>For netDevice:</p> <ul style="list-style-type: none"> - right click to the device icon of the Master, - select Diagnosis, - select Tools > IO Monitor. - Check the input or output data, - close the IO Monitor dialog via OK. 	<i>IO Monitor</i>	137
20	Disconnect	<p>Depending of the FDT Container.</p> <p>For netDevice:</p> <ul style="list-style-type: none"> - right click to the device icon of the Master, - select Disconnect. 	<i>Connecting/Disconnecting Device</i>	87

Table 9: Getting started - Configuration Steps

3.2 Safety Messages on Firmware or Configuration Download

If you perform a firmware download or a configuration download via the EtherCAT Master DTM be aware of the following:

WARNING

Communication Stop caused by Firmware or Configuration Download

Initiating a firmware or configuration download process during bus operation will stop the communication and a subsequent plant stop may cause unpredictable and unexpected behavior of machines and plant components, possibly resulting in personal injury and damage to your equipment.

The firmware download overwrites the existing firmware. The communication stop may cause loss of device parameters and possible device damage may occur.

- Stop the application program, before you start the firmware or configuration download.
 - Make sure that all network devices are placed in a fail-safe condition.
-

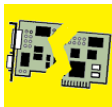
WARNING

Mismatching System Configuration

Mismatching system configuration loaded into the device could result in faulty data mapping in the application program and thus unexpected equipment operation may cause personal injury or damage of equipment.

- In the device use only a configuration suitable for the system.
-

NOTICE

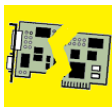


Power Disconnect while downloading Firmware or Configuration

If the power supply to the PC or device is interrupted while the firmware or configuration is being downloaded, the download will be aborted, the firmware may be corrupted, the device parameters may be lost, and the device may be damaged.

- During firmware or configuration download process do not interrupt the power supply to the PC, or to the device and do not perform a reset to the device!
-

NOTICE



Invalid Firmware

Loading invalid firmware files could render your device unusable.

- Only proceed with a firmware version valid for your device.
-

4 Settings

4.1 Overview Settings

Settings Dialog Panes

The table below gives an overview for the individual **Settings** dialog panes descriptions:

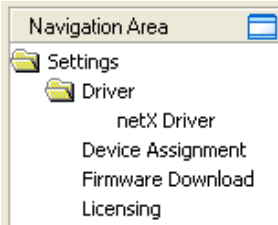
EtherCAT Master DTM	Folder Name / Section	Subsection	Manual Page
 <p>Navigation Area – Settings (Example)</p> <p>Additional drivers can be displayed.</p>	Driver		32
		Verify or adapt Driver Settings	32
		cifX Device Driver	34
		netX Driver	34
		Configuring netX Driver	35
	Device Assignment		41
		Scanning for Devices	41
		Scanning for all Devices or for suitable only	43
		Selecting the Device (with or without firmware)	44
		Selecting the Device once more (with Firmware)	45
	Firmware Download		47
	Licensing		100

Table 10: Descriptions of the Dialog Panes Settings



Note: To edit the **Settings** dialog panes you need *User Rights* for “Maintenance”.



Notice the descriptions in the section *Settings for Driver and Device Assignment* on page 30.

To access to the online help with the descriptions of the drivers:

- Select **Settings > Driver > [Name of the assigned driver]**.
- Press the **F1** key.

4.2 Settings for Driver and Device Assignment

The following steps are needed to establish a connection from the EtherCAT Master DTM to the EtherCAT Master device:

Verifying or adapting Driver Settings

Verify the Driver Settings and adapt them if necessary.

1. Open the DTM configuration dialog.
 - In the FDT container **netDevice** double click to the EtherCAT Master device icon.
2. Verify that the default driver is checked and respectively check another or multiple drivers.
 - Select **Settings > Driver**.



Note! For PC cards cifX the **cifX Device Driver** is preset as a default driver. For all the other Hilscher devices the **netX Driver** is preset as a default driver.

- Use the **cifX Device Driver** if the EtherCAT Master DTM is installed on the same PC as the EtherCAT Master device.
- Use the **netX Driver** to establish an USB, Serial (RS232) or TCP/IP connection from the EtherCAT Master DTM to the EtherCAT Master device.
- The **3SGateway Driver for netX (V3.x)** is used only in relationship with CODESYS.

To search for devices on the network you can check one or multiple drivers simultaneously.

- Verify that the default driver for your device is checked.
- If necessary, check another driver or multiple drivers.

Configuring Driver



Note!

- The **cifX Device Driver** requires no configuration.
- The configuration of the **3SGateway Driver for netX (V3.x)** is carried out via the CODESYS surface.

If you use the **netX Driver**, you respectively must configure it.

3. Configure the **netX Driver** if necessary.

For the driver **netXDriver** an individual driver dialog window can be opened where you can configure the driver.

- Select **Settings > Driver > netX Driver**.
- For netX Driver and communication via TCP/IP set the IP address of the device.

Adjust the driver parameters **netX Driver USB/RS232** only if they differ from the default settings.

Assigning the Master device to the DTM

4. Scan for and select the devices (with or without firmware).
 - Select **Settings > Device Assignment**.
 - Under **Device selection** select *suitable only* or *all* and then **Scan**.
 - In the table check the required devices.
 - Select **Apply**.

Selecting and downloading the Firmware

5. If not yet a firmware was loaded to the device, select and download the firmware.
 - Select **Settings > Firmware Download**.
 - Select and download the firmware via **Download**.
 - Select **Apply**.
6. Scan for and select the devices (with firmware and defined system channel) once more.

For repeated download this step is omitted.

 - Select **Settings > Device Assignment**.
 - Select **Scan**.
 - In the table check the required device.
7. Close the DTM configuration dialog via **OK**.

Connecting the Device

8. In **netDevice** put a right-click on the EtherCAT Master device icon.
9. Select the **Connect** command from the context menu.
- In the network view the device description at the device icon of the Master is displayed with a green colored background. The EtherCAT Master device now is connected to the EtherCAT Master DTM via an online connection.

Further Information



For descriptions about these steps refer to the sections following here-after.

4.3 Driver

The **Driver** dialog pane displays the drivers to be used for a EtherCAT Master DTM to establish a device communication connection.



Note! A **default driver** is set in the configuration software.

Driver			
	Driver	Version	ID
<input checked="" type="checkbox"/>	CIFX Device Driver	1.101.1.9801	{368BEC5B-0E92-4C0E-B4A9-64F62AE7AAFA}
<input type="checkbox"/>	3SGateway Driver for netX (V3.x)	0.9.1.2	{787CD3A9-4CF6-4259-8E4D-109B6A6BEA91}
<input type="checkbox"/>	netX Driver	1.103.2.5183	{B54C8CC7-F333-4135-8405-6E12FC88EE62}

Figure 5: Default Driver, 'cifX Device Driver' for PC cards cifX

Parameter	Meaning
Driver	Name of the driver (for more details see descriptions hereafter)
Version	ODMV3 Version of the respective driver
ID	ID of the driver (driver identification)

Table 11: Driver Selection List Parameters

To establish a connection from the EtherCAT Master DTM to the EtherCAT Master device, verify if the default driver is checked and respectively check another driver or multiple drivers.

4.3.1 Verify or adapt Driver Settings

Proceed as follows:

1. Select **Settings > Driver** in the navigation area.
- The **Driver** dialog pane is displayed with the available drivers and the setting for the default driver.

Driver			
	Driver	Version	ID
<input checked="" type="checkbox"/>	CIFX Device Driver	1.101.1.9801	{368BEC5B-0E92-4C0E-B4A9-64F62AE7AAFA}
<input type="checkbox"/>	3SGateway Driver for netX (V3.x)	0.9.1.2	{787CD3A9-4CF6-4259-8E4D-109B6A6BEA91}
<input type="checkbox"/>	netX Driver	1.103.2.5183	{B54C8CC7-F333-4135-8405-6E12FC88EE62}

Figure 6: Default Driver, 'cifX Device Driver' for PC cards cifX (example)

Driver			
	Driver	Version	ID
<input type="checkbox"/>	CIFX Device Driver	1.101.1.9801	{368BEC5B-0E92-4C0E-B4A9-64F62AE7AAFA}
<input type="checkbox"/>	3SGateway Driver for netX (V3.x)	0.9.1.2	{787CD3A9-4CF6-4259-8E4D-109B6A6BEA91}
<input checked="" type="checkbox"/>	netX Driver	1.103.2.5183	{B54C8CC7-F333-4135-8405-6E12FC88EE62}

Figure 7: Default Driver, 'netX Driver' for Hilscher devices except for PC cards cifX (example)

2. Verify that the default driver is checked.
- Verify that the default driver for your device is checked.

Default Driver (Pre-settings in the Configuration Software): For PC cards cifX the **cifX Device Driver** is preset as a default driver. For all the other Hilscher devices the **netX Driver** is preset as a default driver.

3. Respectively check another driver.



Note! The driver used for the connection from the EtherCAT Master DTM to the EtherCAT Master device must be supported by the device and must be available for the device.

- Use the **cifX Device Driver** if the EtherCAT Master DTM is installed on the same PC as the EtherCAT Master device.
- Use the **netX Driver** to establish a USB, Serial (RS232) or TCP/IP connection from the EtherCAT Master DTM to the EtherCAT Master device.
- The **3SGateway Driver for netX (V3.x)** is used only in relationship with CODESYS. The version V3.x refers to the driver version defined by 3S-Smart Software Solutions GmbH.

➤ Check the checkbox for the driver in the selection list.

4. Respectively check multiple drivers.

To search for devices on the network you can check multiple drivers simultaneously.

Driver			
	Driver	Version	ID
<input checked="" type="checkbox"/>	CIFX Device Driver	1.101.1.9801	{368BEC5B-0E92-4C0E-B4A9-64F62AE7AAFA}
<input type="checkbox"/>	3SGateway Driver for netX (V3.x)	0.9.1.2	{787CD3A9-4CF6-4259-8E4D-109B6A6BEA91}
<input checked="" type="checkbox"/>	netX Driver	1.103.2.5183	{B54C8CC7-F333-4135-8405-6E12FC88EE62}

Figure 8: Manual Selection of multiple drivers (Example)

4.3.2 cifX Device Driver

In the EtherCAT Master DTM for the **cifX Device Driver** no driver dialog pane is available, since for the **cifX Device Driver** no driver settings are required.

The **cifX Device Driver** will be used if the EtherCAT Master DTM is installed in the same PC as the EtherCAT Master device.



Note: To establish a connection from a DTM to a Master device via the **cifX Device Driver**, the **cifX Device Driver** must be installed and the driver must have access to the Master device.

4.3.3 netX Driver

The **netX Driver** is used to connect the DTM to the device via different connection types. The DTM communicates with the device via an USB connection, a serial (RS232) connection or a TCP/IP connection. The **netX Driver** establishes

- via the USB interface of the device and the USB port of the PC an USB connection to the device,
- via the RS232 interface of the device and the COM port of the PC a serial connection (RS232) to the device
- and via Ethernet a TCP/IP connection to the device.

To connect the DTM to the physical layer of the device the **netX Driver** software works in combination with the software components:

- “USB/COM connector” for the USB connection and for the serial connection (RS232) and
- “TCP/IP connector” for the Ethernet connection.

4.3.4 Configuring netX Driver

The following steps are required to configure the netX Driver:

USB/RS232 Connection

To set the driver parameters for an USB/RS232 connection note:




Note: Adjust the driver parameters netX Driver USB/RS232 only if they differ from the default settings. After saving the changed driver parameters, these parameters are used for the device assignment when scanning devices.

For setting the driver parameters for an USB connection or a serial connection:

1. Select **Settings > Driver > netX Driver > USB/RS232 Connection**.
 - Set the driver netX Driver USB/RS232 parameters.

TCP/IP Connection

For setting the driver parameters for a TCP/IP connection:

1. Select **Settings > Driver > netX Driver > TCP Connection**.
2. Set IP Address of the device:
 - Add an IP Range via **Select IP Range** .
3. Under **IP Range Configuration > IP Address** enter the IP Address of the device (**Use IP Range** is unchecked).

Or

4. Set IP Range:
 - Check **Use IP Range**.
 - Under **IP Range Configuration > IP Address** enter the start address (left side) and the ending address of the IP scanning range (right side).
 5. Click **Save**, to save the IP address or the IP range.
- After saving the changed driver parameters, these parameters are used for the device assignment when scanning devices.

4.3.5 netX Driver - USB/RS232 Connection

The communication from the DTM to the device via an **USB/RS232 Connection** is used when the DTM is installed on a PC and between the PC and the device

- an USB connection
- or a serial connection (RS232) exists.

The DTM accesses the device via the USB interface or via the RS232 interface. This requires either to connect an USB port of the PC to the USB interface of the device using an USB cable or to connect a physical COM port of the PC to the RS232 interface of the device via a serial cable.

The **netX Driver / USB/RS232 Connection** supports all physical and virtual COM ports available on the PC.

Via the RS232 interface or USB interface, the device is configured or diagnosis is performed.

4.3.5.1 Driver Parameters for netX Driver - USB/RS232 Connection

The settings of the driver parameters for the USB/RS232 connection are made via the **netX Driver / USB/RS232 Connection** configuration dialog.

- Open the **USB/RS232 Connection** dialog via navigation area **Settings > Driver > netX Driver**.

- The **USB/RS232 Connection** dialog is displayed:

The screenshot shows the 'netX Driver' configuration window with the 'USB/RS232 Connection' tab selected. The 'TCP Connection' tab is also visible. The 'Enable USB/RS232 Connector (Restart of ODM required)' checkbox is checked. The 'Select Port:' dropdown is set to 'COM1'. The 'Port Configuration' section contains a 'Disable Port' checkbox (unchecked) and several settings: 'Baud Rate' (115.2 kBit/s), 'Byte Size' (8 Byte), 'Stop Bits' (1 Stopbit), 'Parity' (No Parity), 'Send Timeout' (1000 ms), 'Keep Alive Timeout' (2000 ms), and 'Reset Timeout' (10000 ms). At the bottom, there are three buttons: 'Restore', 'Save', and 'Save All'.

Figure 9: netX Driver > USB/RS232 Connection


Parameter	Meaning	Range of Value / Default Value
Enable USB/RS232 Connector (Restart of ODM required)	checked: The netX Driver can communicate via the USB/RS232 interface. unchecked: The netX Driver can <u>not</u> communicate via the USB/RS232 interface. If the check mark for Enable USB/RS232 Connector is set or removed, then the ODM server must be restarted ¹ , to make the new setting valid. ¹ Restart the ODM server via the ODMV3 Tray Application : - In the foot line click on  using the right mouse key. - In the context menu select Service > Start .	checked, unchecked; Default: unchecked
Select Port	Depending on the COM ports (interfaces) available on the PC, they will be listed under Select Port .	COM 1 to COM N
Port Configuration		
Disable Port	checked: No connection. unchecked: The netX Driver tries to establish a connection using the configured USB/RS232 interface.	checked, unchecked (Default)
Baud rate	Transfer rate: number of bits per second. The device must support the baud rate.	9.6, 19.2, 38.4, 57.6 or 115.2 [kBit/s]; Default (RS232): 115.2 [kBit/s]
Stop bits	Number of stop bits sent after the transfer of the send data for synchronization purposes to the receiver.	Stop bit: 1, 1.5, 2; Default (RS232): 1
Send Timeout	Maximum time before the transfer of the transmission data is canceled, when the send process fails, for example, because of the transfer buffer is full.	100 ... 60.000 [ms]; Default (RS232 and USB): 1000 ms
Reset Timeout	Maximum time for a device reset, including the re-initialization of the physical interface used for the communication.	100 ... 60.000 [ms]; Default (RS232 and USB): 5000 ms
Byte size	Number of bits per byte by byte specification	7 Bit, 8 Bit; Default (RS232): 8 Bit
Parity	In the error detection in data transmission using parity bits, "parity" describes the number of bits occupied with 1 in the transmitted information word. No Parity: no parity bit Odd Parity: The parity is "odd" if the number of bits occupied with 1 in the transmitted information word will be odd. Even parity: The parity is "even" if the number of bits occupied with 1 in the transmitted information word will be even. Mark Parity: if the parity bit is always 1, this will be named mark-parity (the bit does not contain any information). Space Parity: if the parity bit always 0, this will be named space-parity (the bit represents an empty space).	No Parity, Odd Parity, Even Parity, Mark Parity, Space Parity; Default (RS232): No Parity
Keep Alive Timeout	The "Keep Alive" mechanism is used to monitor whether the connection to the device is active. Connection errors are detected using a periodic heartbeat mechanism. The heartbeat mechanism will be initiated after the set time has elapsed if the communication has failed.	100 ... 60.000 [ms]; Default (RS232 and USB): 2000 ms
Restore	Resets all settings in the configuration dialog to the default values.	
Save	Saving all settings made in the configuration dialog netX Driver > Save USB/RS232 Connection , i. e. only for the selected connection type.	
Save All	Saving all settings made in the configuration dialog netX Driver , i. e. for all connection types.	

Table 12: Parameters netX Driver > USB/RS232 Connection

4.3.6 netX Driver - TCP/IP Connection

The communication from the DTM to the device via a **TCP/IP Connection** is used in the following two typical applications:

Application 1: The device has its own Ethernet interface. The DTM is installed on a PC and the TCP/IP connection is established from this PC to the stand-alone device. The IP address of the device is used.

Application 2: The device is installed in a remote PC. The DTM is installed on an additional PC and the TCP/IP connection is established from this PC to the remote PC. The IP address of the remote PC is used. For the TCP/IP connection is made, on the remote PC the cifX TCP/IP server must be started. The cifX TCP/IP server allows the remote access to the device via a TCP/IP connection.



Note: An exe file for the cifXTCP/IP server is provided on the product CD in the *Tools* directory.




Via the TCP/IP interface of the device or of the remote PC, the device is configured or diagnosis is performed.

4.3.6.1 Driver Parameters for netX Driver - TCP/IP Connection

The settings of the driver parameters for the TCP/IP connection are made via the **netX Driver / TCP Connection** configuration dialog.

- Open the **TCP Connection** dialog via navigation area **Settings > Driver > netX Driver**.
- The dialog **netX Driver** is displayed:
- Select **TCP Connection**.

Figure 10: netX Driver > TCP Connection

Parameter	Meaning	Range of Value / Default Value
Enable TCP Connector (Restart of ODM required)	<p>checked: The netX Driver can communicate via the TCP/IP interface.</p> <p>unchecked: The netX Driver can <u>not</u> communicate via the TCP/IP interface.</p> <p>If the check mark for Enable TCP Connector is set or removed, then the ODM server must be restarted¹, to make the new setting valid.</p> <p>¹ Restart the ODM server via the ODMV3 Tray Application:</p> <ul style="list-style-type: none"> - In the foot line click on  using the right mouse key. - In the context menu select Service > Start. 	checked, unchecked; Default: unchecked
Select IP Range	<p>Via Select IP Range already created IP ranges can be selected.</p> <p>Via  an additional IP range can be added.</p> <p>Via  an IP range can be deleted.</p>	

Parameter	Meaning	Range of Value / Default Value
Scan Timeout [ms]	With Scan Timeout can be set, how long to wait for a response while a connection is established.	10 ... 10000 [ms]; Default: 100 ms
IP Range Configuration		
Disable IP Range	checked: No connection. unchecked: The netX Driver tries to establish a connection using the configured TCP/IP interface.	checked, unchecked (Default)
IP Address (left)	Enter the IP address of the device, (if Use IP Range is not checked). Enter the start address of the IP scanning range, (if Use IP Range is checked).	valid IP address; Default: 192.168.1.1
Use IP Range	checked: An IP address range is used. unchecked: Only one IP address is used.	checked, unchecked; Default: unchecked
IP Address (right)	Enter the ending address of the IP scanning range, (only if Use IP Range is checked).	valid IP address; Default: 0.0.0.0
Address Count	Displays the scanning range address count, depending on the selected IP-start or IP-end address. (For this read the note given below.)	recommended: 10
TCP Port	Identifies the endpoint of a logical connection or addresses a specific endpoint on the device or PC.	0 - 65535; Default Hilscher device: 50111
Send Timeout [ms]	Maximum time before the transfer of the transmission data is canceled, when the send process fails, for example, because of the transfer buffer is full.	100 ... 60.000 [ms]; Default (TCP/IP): 1000 ms
Reset Timeout [ms]	Maximum time for a device reset, including the re-initialization of the physical interface used for the communication.	100 ... 60.000 [ms]; Default (TCP/IP): 2000 ms
Keep Alive Timeout [ms]	The "Keep Alive" mechanism is used to monitor whether the connection to the device is active. Connection errors are detected using a periodic heartbeat mechanism. The heartbeat mechanism will be initiated after the set time has elapsed if the communication has failed.	100 ... 60.000 [ms]; Default (TCP/IP): 2000 ms
Restore	Resets all settings in the configuration dialog to the default values.	
Save	Saving all settings made in the configuration dialog netX Driver > Save TCP/IP Connection , i. e. only for the selected connection type.	
Save All	Saving all settings made in the configuration dialog netX Driver , i. e. for all connection types.	

Table 13: Parameters netX Driver > TCP Connection



Note: Do not use large IP ranges in combination with a low scan timeout. Microsoft introduced in Windows® XP SP2 a limit of concurrent half-open outbound TCP/IP connections (connection attempts) to slow the spread of virus and malware from system to system. This limit makes it impossible to have more than 10 concurrent half-open outbound connections. Every further connection attempt is put in a queue and forced to wait. Due to this limitation a large IP range used in combination with a low scan timeout could prevent the connection establishment to a device.

4.4 Device Assignment



Note: In the **Device Assignment** dialog pane you first must assign the EtherCAT Master device to the EtherCAT Master DTM by checking the check box. This is essential to establish an online connection from the EtherCAT Master DTM to the EtherCAT Master device later, as described in section *Connecting/Disconnecting Device* on page 138.

Therefore in the **Device Assignment** dialog pane you scan for the EtherCAT Master device and select it.

If the device did not get a firmware or shall get a new firmware:

1. first you scan for the device (with or without firmware) and select the device,
2. then you download a firmware to the device and
3. subsequently you scan for the device (with firmware) once more and select the device again.

4.4.1 Scanning for Devices

1. Select **Settings > Device Assignment** in the navigation area.

➤ The dialog pane **Device Assignment** is displayed.

Device Assignment

Scan progress: 3/5 Devices (Current device: -)

Device selection: suitable only

Device	Hardware Port 0/1/2/3	Slot number	Serial number	Driver	Channel Protocol	Access path
<input type="checkbox"/> Device Cl*	-/-/PROFIBUS/-	1	20148	CIFX Device Driver	Undefined Undefined	...\cifX3_SYS

Access path:

Figure 11: Device Assignment - detected Devices (* The name of the device class is displayed.) – Example for a device without firmware

2. Under **Device Selection** select *suitable only*.
3. Select **Scan**, to start the scanning process.

➤ In the table all devices are displayed, which can be connected to the EtherCAT Master DTM via the preselected driver.



Note: For devices, which have been found via the **cifX Device Driver** in the column **Access path** the indication **...\cifX[0toN]_SYS** is displayed. This is correct, as long as a device did not get a firmware. After the firmware download has been completed, in the column **Access path** the indication **...\cifX[0toN]_Ch[0to3]** is displayed.

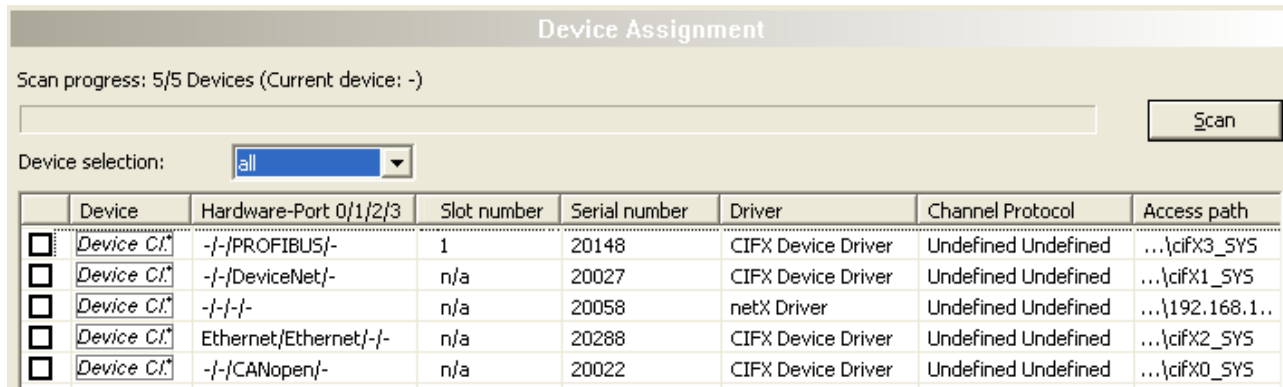
Parameter	Meaning	Range of Value / Default Value
Device selection	Selecting suitable only or all devices.	suitable only, all
Device	Device class of the EtherCAT Master Devices.	
Hardware Port 0/1/2/3	Shows, which hardware is assigned to which communication interface.	
Slot number	Shows the Slot Number (Card ID) preset at the PC card cifX via the Rotary Switch Slot Number (Card ID) . The indication n/a means, that no Slot-Nummer (Card ID) exists. This will occur if the PC card cifX is not equipped with a Rotary Switch Slot Number (Card ID) or for PC cards cifX equipped with a Rotary Switch Slot Number (Card ID) if the rotary switch is set to the value 0 (zero).	1 to 9, n/a
Serial number	Serial number of the device	
Driver	Name of the driver	
Channel Protocol	Shows, which firmware is loaded to which device channel. The data for the used channel consists of the protocol class and the communication class. a.) For devices without firmware: Undefined Undefined, b.) For devices with firmware: Protocol name corresponding to the used Firmware	
Access path (last column on the right)	Depending on the used driver in the column Access path different data to the device are displayed. For the cifX Device Driver the following data are displayed: a.) For devices without firmware: ...cifX[0toN]_SYS, b.) For devices with firmware: ...cifX[0toN]_Ch[0to3]. cifX[0toN] = Board number 0 to N Ch[0to3] = Channel number 0 to 3	Depending on the device and on the driver: board or channel number, IP address or COM interface
Access path (at the lower side of the dialog pane)	If in the table a device is checked, under Access path (at the lower side of the dialog pane) the driver identification or depending on the used driver additional data to the device will be displayed. For the cifX Device Driver the following data are displayed: a.) For devices without firmware: ...cifX[0toN]_SYS, b.) For devices with firmware: ...cifX[0toN]_Ch[0to3]. cifX[0toN] = Board number 0 to N Ch[0to3] = Channel number 0 to 3	driver identification (ID) depending on the device and on the driver: board or channel number, IP address or COM interface

Table 14: Parameters of the Device Assignment

4.4.1.1 Scanning for all Devices or for suitable only

all

1. Under **Device Selection** select *all*.
2. Select **Scan**.



Device Assignment

Scan progress: 5/5 Devices (Current device: -)

Device selection: all

	Device	Hardware-Port 0/1/2/3	Slot number	Serial number	Driver	Channel Protocol	Access path
<input type="checkbox"/>	Device Cl.*	-/-/PROFIBUS/-	1	20148	CIFX Device Driver	Undefined Undefined	...\cifX3_SYS
<input type="checkbox"/>	Device Cl.*	-/-/DeviceNet/-	n/a	20027	CIFX Device Driver	Undefined Undefined	...\cifX1_SYS
<input type="checkbox"/>	Device Cl.*	-/-/-/-	n/a	20058	netX Driver	Undefined Undefined	...\192.168.1..
<input type="checkbox"/>	Device Cl.*	Ethernet/Ethernet/-/-	n/a	20288	CIFX Device Driver	Undefined Undefined	...\cifX2_SYS
<input type="checkbox"/>	Device Cl.*	-/-/CANopen/-	n/a	20022	CIFX Device Driver	Undefined Undefined	...\cifX0_SYS

Figure 12: Device Assignment - detected Devices (* The name of the device class is displayed.) Example for Devices without Firmware

- ⇒ In the table all devices are displayed, which are attainable in the network and which can be connected to a single DTM each via the preselected drivers.



Note: During a subsequent firmware download in the selection window **Select Firmware File** all files from the selected folder are displayed, under **Files of Type** „All Files (*.*)“ is displayed and the check box **Validate the selected firmware file.** is unchecked.

suitable only

1. Under **Device Selection** select *suitable only*.
2. Select **Scan**.

- ⇒ In the table all devices are displayed, which can be connected to the EtherCAT Master DTM via the preselected drivers.



Note: During a subsequent firmware download in the selection window **Select Firmware File** only firmware files from the selected folder are displayed, under **Files of Type** „Firmware Files (*.nxm)“ or „Firmware Files (*.nxf)“ is displayed and the check box **Validate the selected firmware file.** is checked.

4.4.2 Selecting the Device (with or without firmware)



Note: A connection with the EtherCAT Master DTM can only be established with one EtherCAT Master device.

To select the physical EtherCAT Master device (with or without firmware):

1. Check the appropriate device.

Device Assignment

Scan progress: 5/5 Devices (Current device: -)

Device selection:

	Device	Hardware Port 0/1/2/3	Slot number	Serial number	Driver	Channel Protocol	Access path
<input checked="" type="checkbox"/>	Device Cl*	-/-/PROFIBUS/-	1	20148	CIFX Device Driver	PROFIBUS Master	...\cifX3_SYS

Access path:

Figure 13: Device Assignment - Selecting the Device (* The name of the device class is displayed.) – Example for a device without firmware / one Device is selected

- Under **Access path** (below in the dialog pane) the access path to the device, e. g. the driver identification, or depending on the used driver additional access data of the device are displayed.

2. Select **Apply**, to apply the selection.



Note: Before an online connection from the EtherCAT Master DTM to the EtherCAT Master device can be established, a firmware must be loaded to the device and the device must be selected once more.



For further information refer to section *Firmware Download* on page 47 or to section *Selecting the Device once more (with Firmware)* on page 45.

4.4.3 Selecting the Device once more (with Firmware)



Note: For repeated download this step is omitted.

To select the EtherCAT Master device (with firmware and defined system channel) once more, proceed as described hereafter:

all

1. Under **Device Selection** select *all*.
2. Select **Scan**.
 - In the table all devices are displayed, which are attainable in the network and which can be connected to a DTM via the preselected drivers.
3. Check the appropriate device.

Device Assignment

Scan progress: 5/5 Devices (Current device: -)

Device selection: all Scan

	Device	Hardware-Port 0/1/2/3	Slot number	Serial number	Driver	Channel Protocol	Access path
<input checked="" type="checkbox"/>	Device Cl.*	-/-/PROFIBUS/-	1	20148	CIFX Device Driver	PROFIBUS-DP Master	...\cifX3_Ch0
<input type="checkbox"/>	Device Cl.*	-/-/DeviceNet/-	n/a	20027	CIFX Device Driver	DeviceNet Master	...\cifX1_Ch0
<input type="checkbox"/>	Device Cl.*	-/-/-/-	n/a	20058	netX Driver	Undefined Undefined	...\192.168....
<input type="checkbox"/>	Device Cl.*	Ethernet/Ethernet/-/-	n/a	20288	CIFX Device Driver	PROFINET IO Device	...\cifX2_Ch0
<input type="checkbox"/>	Device Cl.*	-/-/CANopen/-	n/a	20022	CIFX Device Driver	Undefined Undefined	...\cifX0_SYS

Access path: {368BEC5B-0E92-4C0E-B4A9-64F62AE7AAFA}\cifX3_Ch0

Figure 14: Device Assignment - Selecting the Device (* The name of the device class is displayed.) – Example for Devices with and without Firmware / one Device is selected



Note: After the firmware download has been completed, for the devices which have been detected via the **cifX Device Driver** the following data are displayed:

- In the column **Channel Protocol**: the data for the firmware for the used channel
- In the column **Access path** or under **Access path** (below in the dialog pane): the data: ...\\cifX[0toN]_Ch[0to3].
 cifX[0toN] = board number 0 to N
 Ch[0to3] = channel number 0 to 3

4. Select **Apply**, to apply the selection.
5. Or select **OK**, to apply the selection and to close the DTM interface dialog.
6. Connect the DTM to the device using the context menu (right mouse click).

Or:

suitable only

1. Under **Device Selection** select *suitable only*.
2. Select **Scan**.
- In the table all devices are displayed, which can be connected to the EtherCAT Master DTM via the preselected drivers.
3. Check the appropriate device.

Device Assignment

Scan progress: 5/5 Devices (Current device: -)

Device selection: suitable only Scan

	Device	Hardware Port 0/1/2/3	Slot number	Serial number	Driver	Channel Protocol	Access path
<input checked="" type="checkbox"/>	Device Cl*	-/-/PROFIBUS/-	1	20148	CIFX Device Driver	PROFIBUS-DP Master	...\cifX3_Ch0

Access path: {368BEC5B-0E92-4C0E-B4A9-64F62AE7AAFA}\cifX3_Ch0

Figure 15: Device Assignment - Selecting the Device (* The name of the device class is displayed.) – Example for a device with firmware / one Device is selected



Note: After the firmware download has been completed, for the devices which have been detected via the **cifX Device Driver** the following data are displayed:

- In the column **Channel Protocol**: the data for the firmware for the used channel
- In the column **Access path** or under **Access path** (below in the dialog pane): the data: ...\\cifX[0toN]_Ch[0to3].
cifX[0toN] = board number 0 to N
Ch[0to3] = channel number 0 to 3

4. Select **Apply**, to apply the selection.
5. Or select **OK**, to apply the selection and to close the DTM interface dialog.
6. Connect the DTM to the device using the context menu (right mouse click).



For further information how to establish an online connection from the EtherCAT Master DTM to the EtherCAT Master device, refer to section *Connecting/Disconnecting Device* on page 87.

4.5 Firmware Download

Using the **Firmware Download** dialog a firmware can be transferred to the device.



Note: Prior to the firmware download, you must select the driver and the Master device (with or without firmware) and the device must be assigned to the hardware.



For further information refer to section **Overview Settings** on page 29.

To load the firmware to the device:

1. In the navigation area select **Settings > Firmware Download**.

➤ The dialog **Firmware-Download** pane is displayed.

Figure 16: Firmware Download

Element	Meaning
Name	The path and name of the firmware file selected are displayed.
Version	The version and build version of the firmware file selected are displayed.
Browse...	Via 'Browse...' you can select the firmware file for the download.
Download	Via 'Download' you can download the firmware to the device.

Table 15: Parameter Firmware Download

2. Select the firmware file.

➤ Select **Browse**.

Device is not assigned to the Hardware

If the device is not assigned to the Hardware, the error message 'The device is not assigned to the hardware!' is displayed:

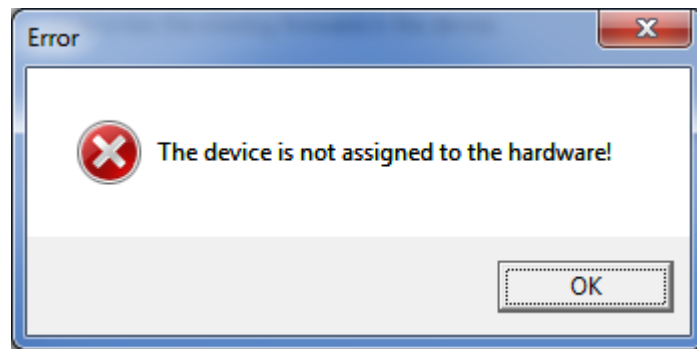


Figure 17: Error Message 'The device is not assigned to the hardware!'

- Click **OK** and select and assign the Master device as described in section *Device Assignment*.

Device is assigned to the Hardware

- The selection window **Select Firmware File** is displayed.
- Enlarge the selection window to view the columns **Hardware** and **Version**.

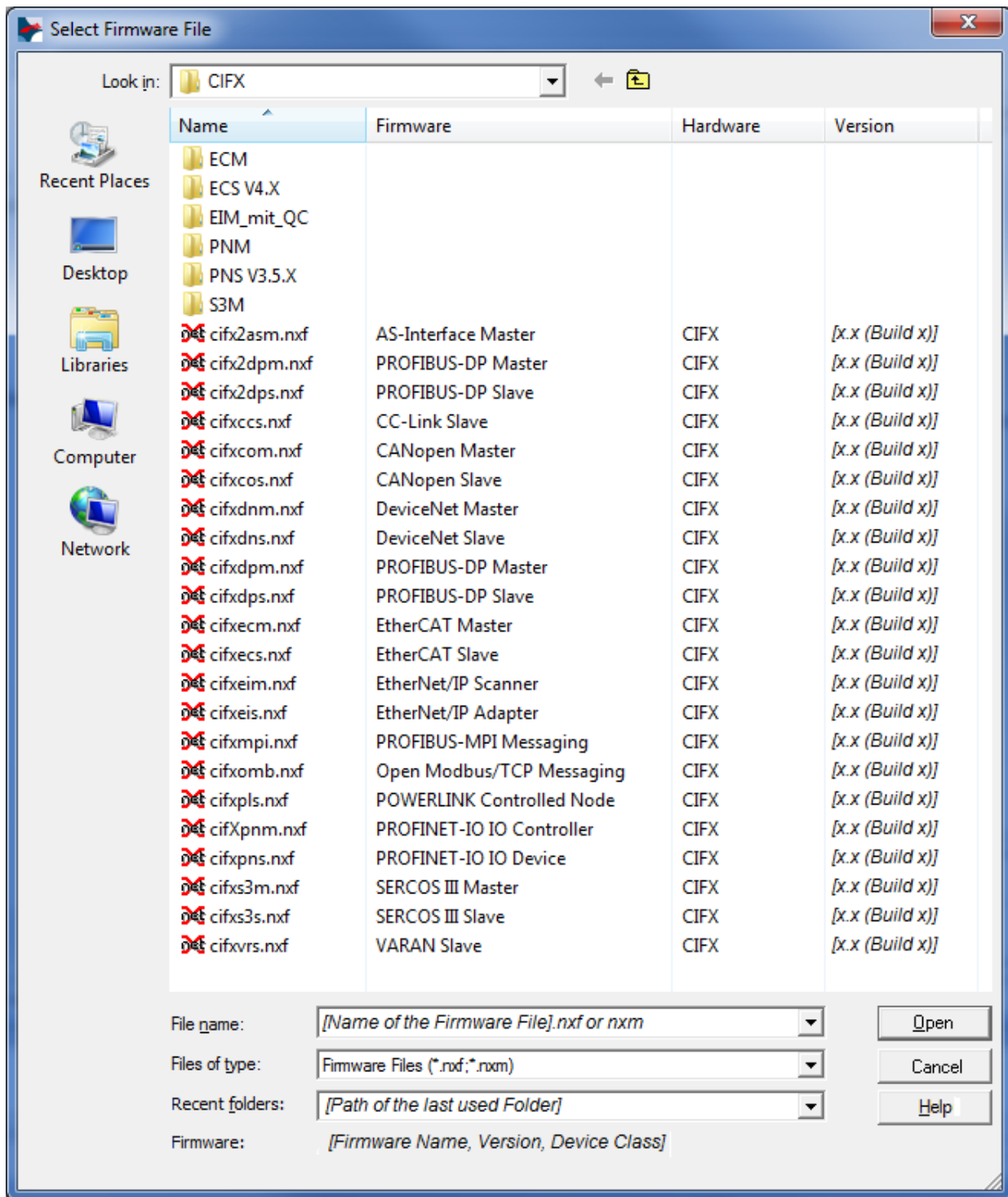


Figure 18: Window 'Select Firmware File' (Example CIFX)

Parameter	Meaning	Range of Value / Default Value
Column Name	File name of the firmware file To sort the entries of the window Select Firmware File by name click to the column head Name .	nxf, nxm
Column Firmware	Name of the firmware (consisting of the protocol name and protocol class)	
Column Hardware	Device class of the associated hardware	e. g. CIFX, COMX, COMX 51, NETJACK 10, NETJACK 50, NETJACK 51,

		NETJACK 100, NETTAP 50 (Gateway), NETTAP 100 (Gateway), NETBRICK 100 (Gateway)
Column Version	Firmware version	x.x (build x)
Tooltip	To view the tooltip information move with the mouse pointer over the selected firmware line. <div> Type: Hilscher firmware file for netX-based targets (NXF) Size: 563 KB Date of change: 2013/03/26 11:10 </div>	
Files of Type	„All Files (*.*)“ if before in the Device Assignment pane under Device selection <i>all</i> was selected. „Firmware Files (*.nxm)“ or <i>Firmware Files (*.nxf)</i> if before in the Device Assignment pane under Device selection <i>suitable only</i> was selected.	All Files (*.*), Firmware Files (*.nxm), Firmware Files (*.nxf)
Recent folders	Path of the recently opened folder	
Firmware	As soon as the firmware file has been selected, under Firmware the name, the version and the build version as well as the device class for the selected firmware is displayed.	Name, Version, Build Version, Device Class for the selected firmware
Help	Button, to open the online help of the DTM.	

Table 16: Parameters Select Firmware File




Further descriptions to the selection window **Select Firmware File** are included in the context sensitive help (**F1** key) of the Microsoft Corporation.




Note: After in the **Device Assignment** pane under **Device selection** *all* or *suitable only* has been set, during a subsequent firmware download in the selection window **Select Firmware File** the following data are displayed or set:

(for list box entry →)	all	suitable only
In the selection window Select Firmware File :	all files from the selected folder	only firmware files from the selected folder
Under Files of Type *:	„All Files (*.*)“	„Firmware Files (*.nxm)“, „Firmware Files (*.nxf)“
Validation:	A restricted validation will be performed if the selected firmware is applied for the download.	A validation is made whether the firmware file is suitable for the EtherCAT Master DTM.

*These settings in the selection window **Select Firmware File** can also be changed manually.

- In the selection window mark the firmware file to be loaded using the mouse.
-  In the selection window under **Firmware** the name and the version of the firmware are displayed.
- In the selection window select the **Open** button.

Validation

-  A validation is made, whether the selected firmware file is suitable for the EtherCAT Master device.

Invalid Firmware

NOTICE

Invalid Firmware

Loading invalid firmware files could render your device unusable.

- Only proceed with a firmware version valid for your device.
- If a firmware file is selected, which is not valid for the assigned device, the request **Select Firmware File** will be displayed.

‘Invalid firmware for assigned device!’

[detailed explication]

Shall firmware file nevertheless be applied for the download?’



Figure 19: Request Select Firmware File - Example Invalid Firmware

- Answer to the request with **No** and select a valid firmware.
- The selection window is closed.

Valid Firmware

➤ The selection window is directly closed (without dialog).

5. Start firmware upgrade.

⚠ WARNING

Communication Stop caused by Firmware Update, faulty System Operation possible, Overwriting of Firmware or Loss of Device Parameters

Before you initiate a firmware download process, while the bus is still in operation status:

- Stop the application program.
- Make sure that all network devices are placed in a fail-safe condition.

NOTICE

Firmware Corruption or Loss of Parameters caused by Power Disconnect during Firmware Download

- During firmware download process, do not interrupt the power supply to the PC, or to the device and do not perform a reset to the device!
- In the dialog pane **Firmware Download** click to the **Download** button, to download the firmware.
- The request **Do you really want to download the firmware?** is displayed.

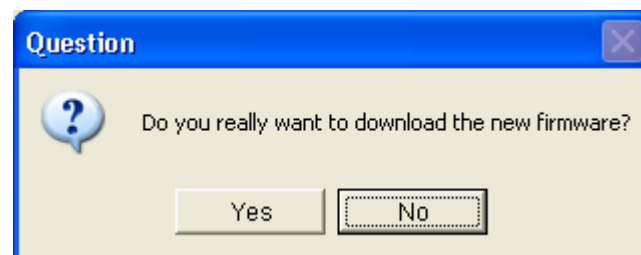


Figure 20: Request - Do you really want to download the firmware?

6. Click **Yes**.

- If you are sure, that you have selected the appropriate firmware file answer to the request with **Yes** otherwise with **No**.
- During the download a progress bar is displayed ('Download active, device performs initialization...'), in the status line a clock / green hook symbol is displayed and in the dialog pane **Firmware Download** **Download** is grayed out.

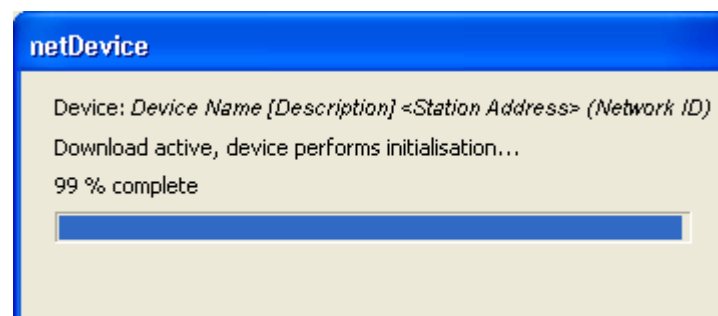


Figure 21: Firmware Download - Progress Bar

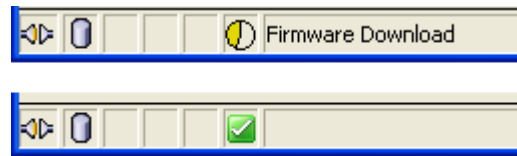


Figure 22: Clock Symbol and Hook Symbol green

- In the **Firmware-Download** dialog pane the path and name as well as the version of the selected firmware file are displayed.

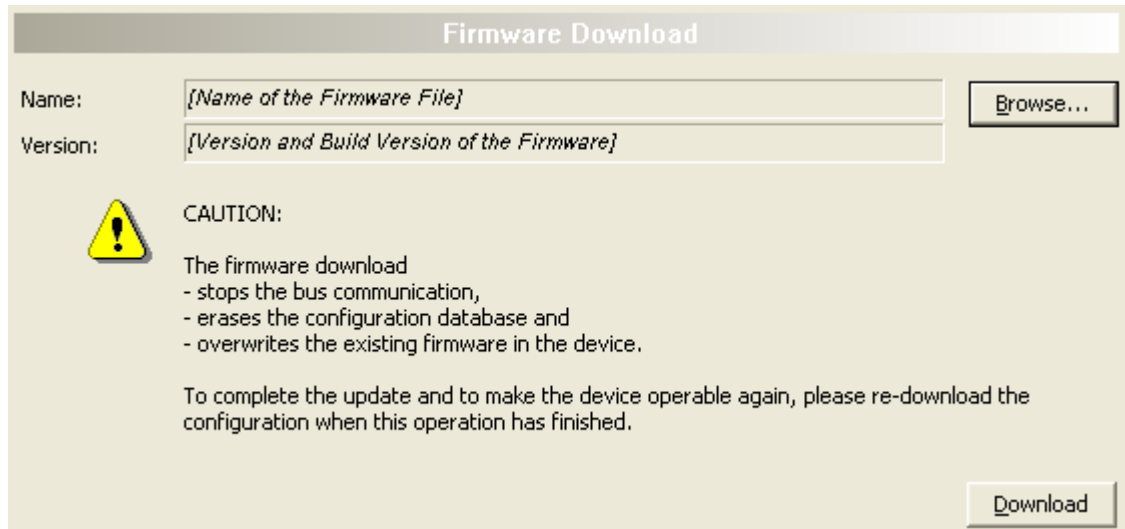


Figure 23: Firmware Download – Download

4.6 Licensing

To open the Licensing pane:

1. In the navigation area select **Settings > Licensing**.

➤ The dialog **Licensing** pane is displayed.

Licensing

License Type

	Existing	Order
Master protocols		
One General Master License	NO	<input type="checkbox"/>
Two General Master Licenses	NO	<input type="checkbox"/>
PROFIBUS Master	YES	<input type="checkbox"/>
CANopen Master	YES	<input type="checkbox"/>
DeviceNet Master	YES	<input type="checkbox"/>
AS-Interface Master	YES	<input type="checkbox"/>
PROFINET IO RT Controller	YES	<input type="checkbox"/>

Request Form, please fill out

Name	Value
License type	User Single Device License
Manufacturer*	00000001
Article number*	01250510
Serial number*	00020086
Chiptype*	00000002
Step*	00000000
Romcode revision*	00000002

Fields marked with '*' are mandatory.

Hilscher Germany

E-mail... license@hilscher.com

Print Fax Form... +49 6190 9907-50

Telephone... +49 6190 9907-0

Export License Request...

Download License

Figure 24: Licensing



For a detailed description refer to section *Licensing* on page100.

5 Configuration

5.1 Overview Configuration

Dialog Panes “Configuration”

The table below gives an overview about the available **Configuration** dialog panes descriptions:

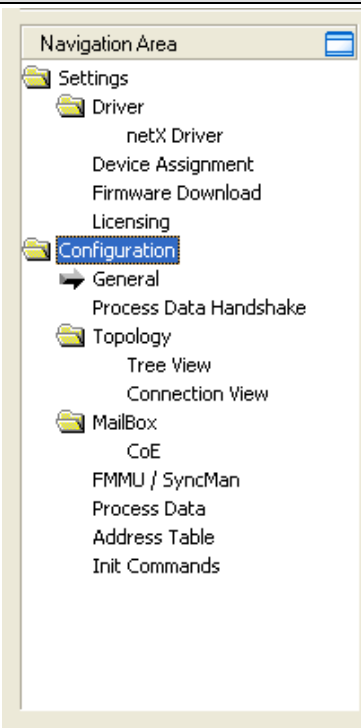
EtherCAT Master DTM	Folder Name / Section	Page
 <p>Navigation Area – Configuration</p>	General	58
	Process Data Handshake	62
	Topology	60
	Mailbox	70
	FMMU/SyncMan	77
	Process Data	80
	Address Table	82
	Init Commands	84

Table 17: Descriptions of the Dialog Panes Configuration



Have in mind the descriptions in section *Configuration Steps* on page 23.

5.2 Configuring Device Parameters

The following steps are required to configure the parameters of the EtherCAT Master device using the EtherCAT Master DTM:

In the EtherCAT Master configuration dialog:

Process Data Handshake

1. Select **Configuration > Process Data Handshake**
- in order to set the Process Data Handshake method.

Topology

2. Select **Configuration > Topology** in order to edit the network topology according to your needs. You can do this very easily in a graphical manner within the in the connection view of the topology.

FMMU/SyncMan

3. Select **Configuration > FMMU/ SyncMan**
- in order to set the parameters for the FMMU and the sync manager.

Process Data

4. Select **Configuration > Process Data** in the navigation area.
- in order to set symbolic names for the configured modules or signals.

Address Table

5. Select **Configuration > Address Table**
- in order to set the address information and parameters related to the PDOs.

Init Commands

6. Select **Configuration > Init Commands**
- in order to edit the Init Commands table according to your needs.

Close Master DTM Configuration Dialog

7. Click **OK** in order to close the Master DTM configuration dialog and to store your configuration.

Configuration Download to the EtherCAT Master Device

- Adhere to the necessary safety precautions to prevent personnel injury and property damage.



Note: In order to transfer the configuration to the EtherCAT Master device, download the data of the configuration parameters in the EtherCAT Master device. See section *Download Configuration* on page 97.

Further Information



For further information refer to section *Process Data Handshake* on page 62 ,to section *Topology* on page 64, to section *FMMU/SyncMan* on page 77, to section *Process Data* on page 80, to section *Address Table* on page 82 and to section *Init Commands* on page 84, of this document.

5.3 General

The **General** dialog page shows the current device name, and the description of the EtherCAT Master.

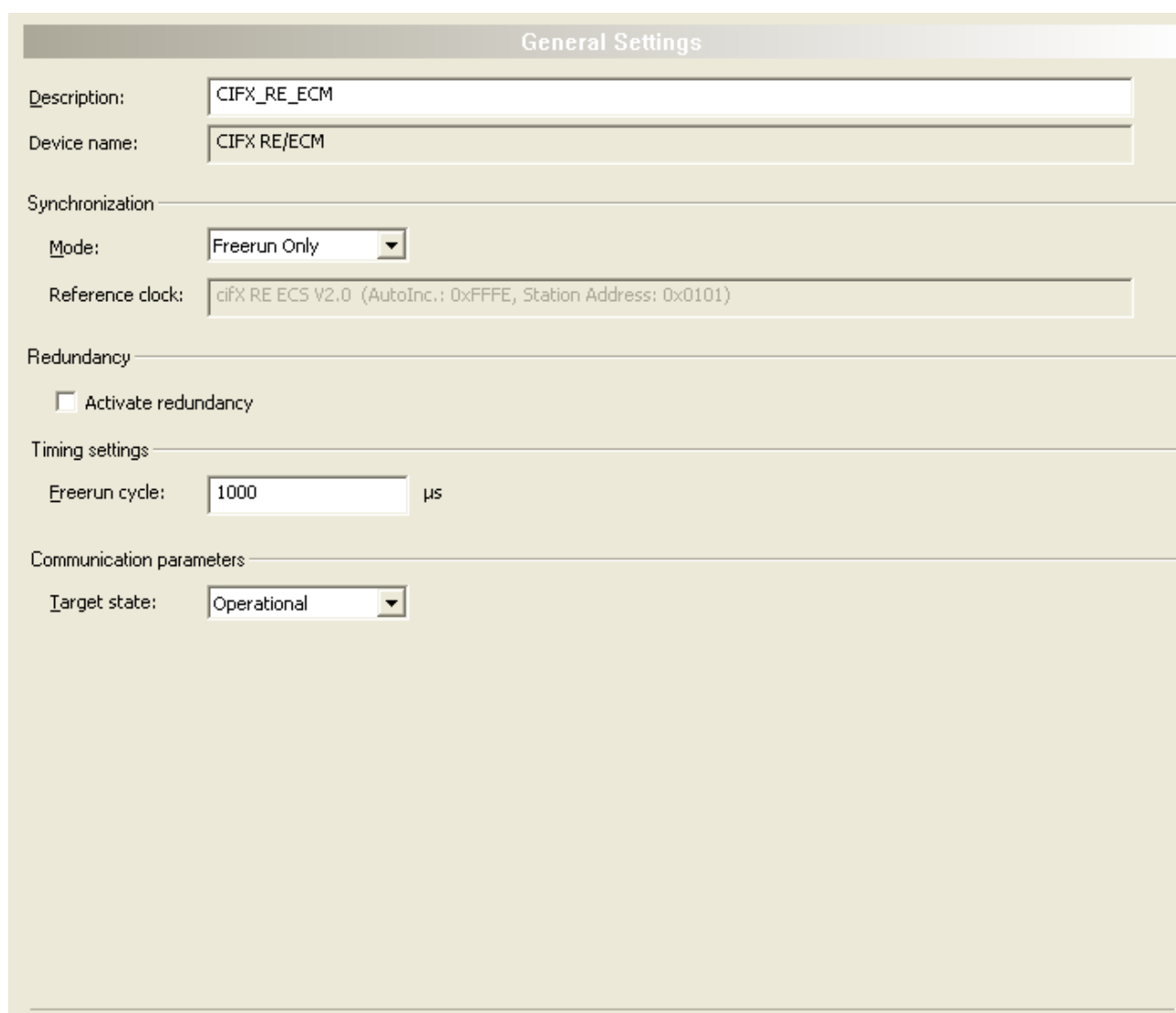
To edit the description:

➤ Select **Configuration > General** in the navigation area.

➤ The mask 'General Settings' appears.

The **General** dialog page also allows to perform basic settings for:

- Synchronization mode
- Redundancy
- Timing
- Target state



The screenshot shows the 'General Settings' dialog page. It has a title bar 'General Settings'. Below it, there are several sections:

- Description:** A text field containing 'CIFX_RE_ECM'.
- Device name:** A text field containing 'CIFX RE/ECM'.
- Synchronization:**
 - Mode:** A dropdown menu showing 'Freerun Only'.
 - Reference clock:** A text field containing 'cifX RE ECS V2.0 (AutoInc.: 0xFFFFE, Station Address: 0x0101)'.
- Redundancy:**
 - ☐ Activate redundancy
- Timing settings:**
 - Freerun cycle:** A text field containing '1000' followed by 'µs'.
- Communication parameters:**
 - Target state:** A dropdown menu showing 'Operational'.

Figure 25: Configuration > General (*The current device name is displayed.)

The fields contained in the mask **General Settings** have the following meaning:

Parameter	Meaning	Range of Value / Value
Name of Station	Network name of the EtherCAT Master station. Must be a DNS compatible name.	1 - 240 characters
Device Name	Symbolic Name of the EtherCAT Master DTM.	
Synchronization Mode	There is the choice between 3 Synchronization Modes. These modes are required for the distributed clocks features.	Freerun only Freerun with DC DC Synchronized
Reference clock	In this field, the DTM automatically displays the device name with appended <i>AutoInc</i> and <i>Station Addresses</i> values.	
Activate redundancy	This checkbox shall be marked if working with redundancy is intended. If you use distributed clocks or do not intend working with redundancy, then do not mark this checkbox.	checked, not checked
Freerun cycle (µs)	Cycle time of the EtherCAT-Master running free. This parameter is only relevant when running the <i>EtherCAT Master firmware V3</i> and configuring it via *.nxd file (not *.xml).	>= 250 µs Default: 1000 µs
Target state	Desired state of the EtherCAT-Master This parameter is only relevant when running the <i>EtherCAT Master firmware V3</i> and configuring it via *.nxd file (not *.xml).	Init Pre-Operational Safe-Operational Operational

Table 18: Configuration > General – Parameters

- Edit the text in the *Description* field to change the name of the device according to your needs.

The following synchronization modes can be selected under *Synchronization*:

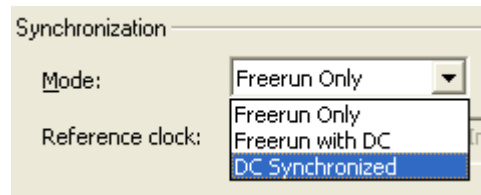


Figure 26: EtherCAT Master DTM, “General” page, Synchronization Modes

These have the following meaning:

EtherCAT slave devices can operate in different synchronization modes, for more information see below:

- „Free Run“ -> no synchronization
- „SM Synchronous“ -> synchronized on SyncManager event when process data is written (read)
- „DC-Synchronous,“ -> synchronized on DC sync event

The following actions only apply to the *EtherCAT Master firmware V3*.

- In case **Freerun with DC** or **DC Synchronization** is activated, the first EtherCAT slave with DC enabled will be used as the reference clock. EtherCAT Master cyclically has to read the bus time from the appropriate register of the clock master and write this value in the corresponding registers of all other DC slaves.
- Adjust the desired cycle time of the EtherCAT Master for free running operation. Values lower than 250 µs are not permitted. Avoid larger values of the free running cycle time than 5000 µs as there is no experience with such long cycle times, these have not been tested.
- Adjust the desired target state of the EtherCAT-Master.

Synchronization Modes

In general, there are three synchronization modes:

1. Free run – Local timer

Synchronization mode *Free run* means the EtherCAT Slave exclusively uses local timers and does not synchronize with any external time sources at all.

2. Sync. With SM

Synchronization mode *Sync. With SM2/3 SyncManager Event* means the EtherCAT Slave synchronizes with sync managers for output or input.

3. Sync. With DC Sync Event (Sync0/Sync1 Hardware Signals)

Synchronization mode *Sync. With DC Sync Event* means the EtherCAT Slave synchronizes with the Sync0/Sync1 Hardware Signals by the EtherCAT Slave hardware.

Error Messages

The following error messages may be issued when errors occur while specifying data:

Invalid cycle time for free run (i.e. value too small (< 250) or too large (>65535)):

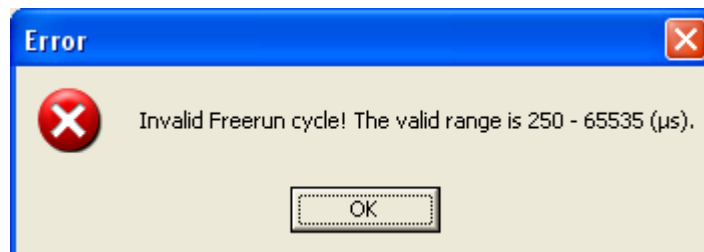


Figure 27: Error "Invalid Freerun Cycle"

Action to be done:

Put in a value within the specified range of permitted values between 250 and 65535.

When synchronization mode is [Freerun with DC] or [DC Synchronized], it is not allowed to activate redundancy!

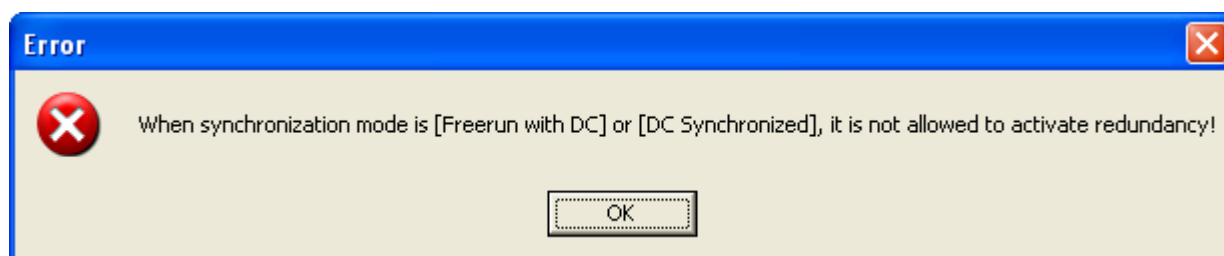


Figure 28: Error "When synchronization mode is [Freerun with DC] or [DC Synchronized], it is not allowed to activate redundancy!"

Action to be done:

Distributed clocks and redundancy exclude each other. Decide, whether you prefer working with distributed clocks or with redundancy and select the settings accordingly!

5.4 Process Data Handshake

Various types of Process Data Handshakes are used for setting the handshake of the process data for the netX EtherCAT Master device. The selection of the used process data handshake is important for the correct data exchange between the application program and the device.

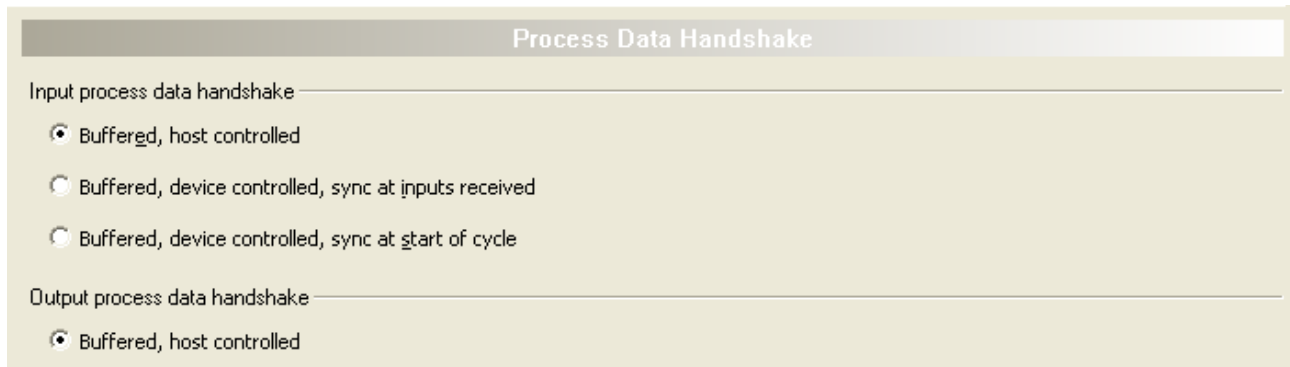


Figure 29: Process Data Handshake

Process data exchange between the netX-based protocol stack (Device) and host based application (Host) can be controlled either by the one or by the other side over Process Data Handshakes in DPM:

The host application can exchange the process data with the protocol stack over DPM in host controlled mode.

In buffered mode without synchronization the data exchange between netX based protocol stack and host based application is decoupled from each other (not synchronized). In this case, the stack handles the reception and transmission of the data from/to the bus/network automatically and uses buffers to handle data consistently. Independently of the bus/network state (i.e. cycle start, incoming data, requests etc.) the host application can access the already completely received data or provide to netX the data required to send, which will be processed with the next bus cycle.

In buffered mode with synchronization the process data exchange between netX based protocol stack and host based application is linked (synchronized) to the bus communication. In this case the stack handles the receiving and transmission of the data from/to the bus/network and process data exchange with the host application is synchronized with protocol specific bus/network event.

EtherCAT Master supports the following handshake modes:

- buffered host controlled mode without synchronization
(Default, the data exchange by is decoupled from bus cycle.)
- buffered device controlled mode with synchronization at input received.
(Mode 1)
- buffered device controlled mode with synchronization at start of cycle.
(Mode 2)

The latter two process data handshake modes are only applicable for input data handshake. These are explained in the following:

Mode 1**(Device controlled Mode with Synchronization at Input received)**

Mode 1 provides the synchronization event to the host after all frames were transmitted and received by the master. Master updates the input image in DPM (Bus -> Host) with received data and toggles handshake. This handshake toggle serves as the synchronization event (i.e. interrupt) for the host application to start the “read-calculate-write” process.

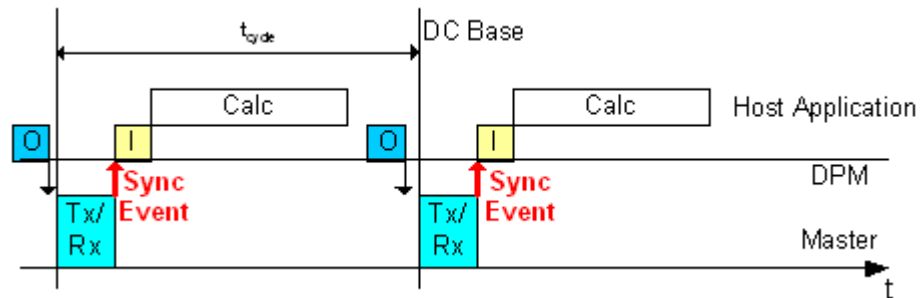


Figure 30: Data Exchange Timing in Mode 1



Note: EtherCAT master starts the bus cycle based on the internal timer

EtherCAT master sends the old data again if the host application does not finish the data update in DPM until the start of the next bus cycle. Diagnosis is reported in this case.

Mode 2**(Device controlled Mode with Synchronization at Start of Cycle)**

Mode 2 provides the synchronisation event to the host at bus cycle start. Before that the master has updated the input image in DPM (Bus -> Host) with data received in previous cycle and toggles handshake. This handshake toggle serves as the synchronisation event (i.e. interrupt) for the host application to start the “read-calculate-write” process. In the same time starts the master to transmit and receive the frames on the bus.

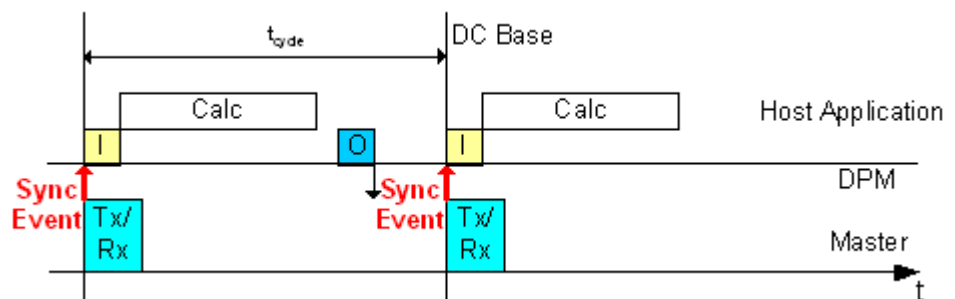


Figure 31: Data Exchange Timing in Mode 2



Note: EtherCAT master starts the bus cycle based on the internal timer

EtherCAT master sends the old data again if the host application does not finish the data update in DPM until the start of the next bus cycle. Diagnosis is reported in this case.

5.5 Topology

5.5.1 Tree View

The upper part of the page displays the 'Tree View' of the topology providing an overview about the structure of the EtherCAT network.

To access the tree view of the topology:

- Select **Topology > Tree View** in the navigation area.

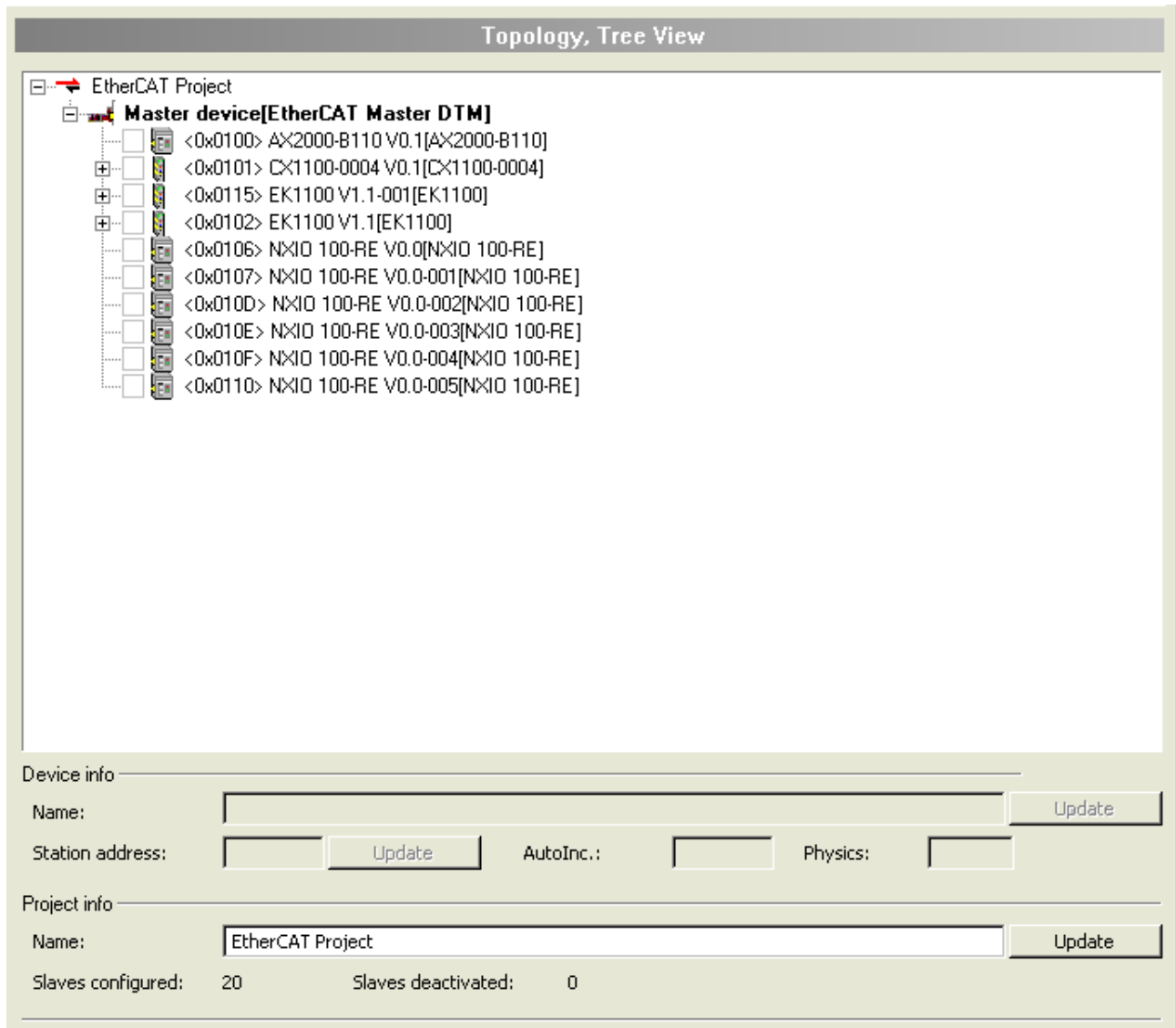


Figure 32: Topology >Tree View

The first element of the tree is the EtherCAT project, which is located on the highest hierarchy level. One level below you find the EtherCAT master device. A further level below you can find simple and complex EtherCAT slaves.

For all slaves the station address and both the short and the long form of the device name are included in the tree view. Complex slaves can be recognized by expandable entries while the entries belonging to simple slaves cannot be expanded.

Left of the device entry in the tree there is a checkbox. Checking it denotes deactivating the slave that is the slave device will be excluded from the configuration, removing also all ports' connection information. If you do so, the device entries' checkbox is marked with a red cross. In order to activate the device again, it is just necessary to uncheck the box and reconnect the device as needed.

If you click at a slave's entry in the screen with right mouse button, a context menu appears.

Choosing the '*Open DTM*' entry will open the configuration dialog of the corresponding EtherCAT slave's DTM. This allows quickly adjusting slave parameters when checking the EtherCAT master's configuration.

If you click at any entry in the screen with left mouse button, the entry will be highlighted. If the entry was not the project entry, the name of the device is displayed in an editable field within the '*Device info*' area of the page. This allows to change the name of device, if necessary. Changes made by editing the field are stored by clicking the '*Update*' button. The corresponding entries in the tree view of the network topology are adapted accordingly then. An '*Update*' button is available for the following input fields:

- Name in '*Device info*' area
- Station address in '*Device info*' area
- Name in '*Project info*' area

About possible errors during updating, see below.

The '*Device info*' area also provides the following information besides the name of the device:

- The '*Station address*' (only if an EtherCAT slave has been selected previously). This field is also editable and has an '*Update*' button allowing to store changes, if necessary.
- The read-only '*Auto Increment*' Value according to the EtherCAT specification. This field is not editable.
- The read-only field '*Physics*' denotes the physical medium (and thus the port type) used for the connections . Also this field is not editable.

Physics in the context of EtherCAT Port configuration is described by a sequence of up to four characters (depending on the number of ports) indicating the port type(s) to be applied. The coding is as follows:

Physics	Port type
K	E-Bus
Y	100Base-TX
F	100Base-FX

Table 19: Coding of Parameter "*Physics*"

The '*Project info*' area always shows the name of the project in an editable field, again along with a respective '*Update*' button. It also displays both the number of configured and of deactivated slaves.

The following error messages may be issued when errors occur while updating:

1. Wrong station address (i.e. value too small or too large):

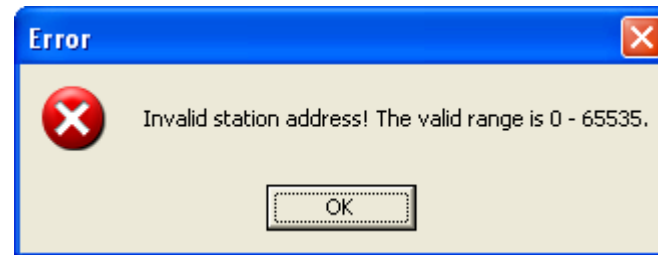


Figure 33: Error "Wrong station address"

Action to be done:

- Put in a value within the specified range of permitted values between 0 and 65535.

2. Wrong station name:

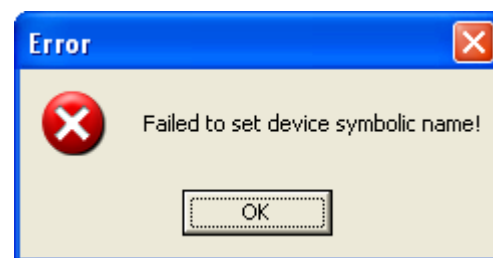


Figure 34: Error "Wrong station name "

Action to be done:

- Put in a valid name (i.e. not empty, does not contain any special characters).

5.5.2 Connection View

The upper part of the page displays the topology tree in connection view allowing you to check how all EtherCAT slave devices configured for use with the EtherCAT master are connected.

To access the connection view of the topology:

- Select **Topology > Connection View** in the navigation area.
- A screen similar to the following will appear:

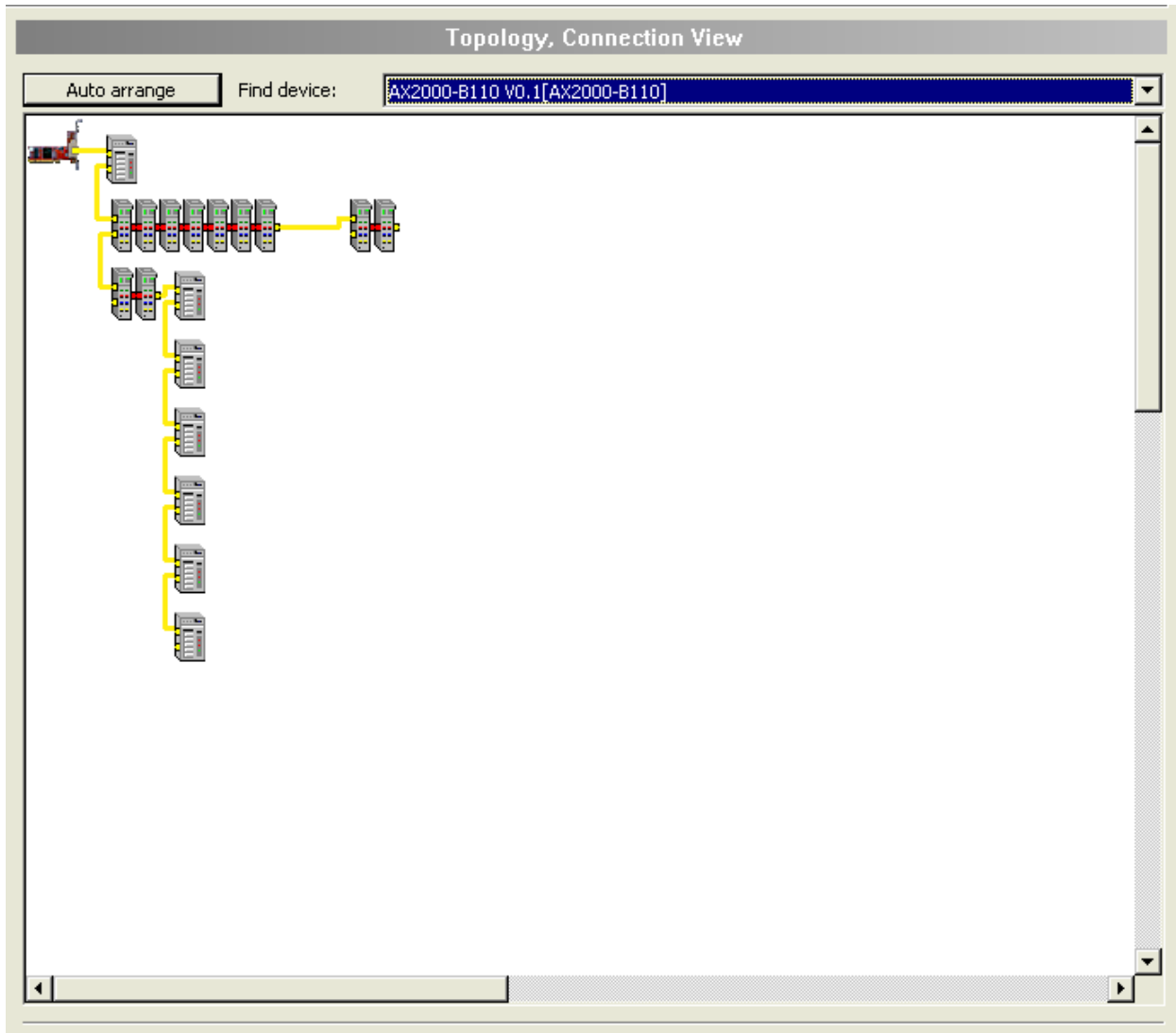


Figure 35: Topology > Connection View

The color coding is:

- Yellow lines indicate Ethernet connections (such as 100-TX).
- Red lines indicate Beckhoff E-Bus connections.



Note: To fix or pin a device's position in the view, right-click on it and choose the option "*Pin device*" from the context menu appearing then. Fixed devices are marked with a blue arrow symbol. To unpin it, right-click on it and choose the option "*Unpin device*" from the context menu in the same manner, also see below.

In order to restore the initial state of the arrangement after reordering EtherCAT slave devices of the EtherCAT network, do the following:

- Click at the 'Auto arrange' button
- The initial state of the arrangement is restored then.

The 'Find device' functionality allows you to easily locate any EtherCAT slave device in the graphical representation of the EtherCAT network topology.

- Just select the desired device in the drop-down list. All devices of the network should be listed there.
- An additional lamp symbol will indicate the location of the chosen device in the connection view of the EtherCAT network topology

Multiple tool tip for devices is available which is composed of the title "Selected device's info"

Selected Device's Info	
Descr.:	NT 100-RE/ECS V1.0[NT 100-RE/ECS]
Physics:	YY
AutoInc:	0xFFFFE
Logical:	0x103

The following information about this device is displayed:

Item	Meaning
Descr.	Description, i.e. long and short form of device name
Physics	Used port type, see below
AutoInc	Auto increment address as described in the EtherCAT specification.
Logical	Logical address (i.e. station address)

Table 20: Information displayed when pointing at Symbol of a Device

Physics in the context of EtherCAT Port configuration is described by a sequence of up to four characters (depending on the number of ports) indicating the port type(s) to be applied. The coding is as follows:

Physics	Port type
K	E-Bus
Y	100Base-TX
F	100Base-FX

Table 21: Coding of Parameter "Physics"

In order to open the context menu of any EtherCAT Slave device, proceed as follows:

- Perform a mouse click with the right mouse button at the graphical representation of the desired EtherCAT slave device.
- The context menu will be opened.

If the selected EtherCAT slave device has not been fixed previously (i.e. it has not been marked with a blue arrows), the context menu offers the following entries



	'Pin device'
	Fixes (or pins) the device in the connection view.
	'Open Slave DTM'
	If you choose this context menu option, the configuration dialog of the corresponding EtherCAT slave's DTM will be opened. This allows quickly adjusting slave parameters when checking the EtherCAT master's configuration.

Table 22: Context Menu Entries for unpinned EtherCAT Slave Devices in Connection View

If the selected EtherCAT slave device has been fixed previously (i.e. it has been marked with a blue arrows), the context menu offers the following entries



	'Unpin device'
	Inhibits fixing (pinning) the device in the connection view.
	'Open Slave DTM'
	If you choose this context menu option, the configuration dialog of the corresponding EtherCAT slave's DTM will be opened, see above.

Table 23: Context Menu Entries for pinned EtherCAT Slave Devices in Connection View

5.6 Mailbox

5.6.1 CoE

The CoE page displays information about the CoE (*CANopen over EtherCAT*) functionality for acyclic, mailbox-based communication.

To access the CoE page:

- Select **Mailbox >CoE** in the navigation area.
- The CoE page appears. It looks like this:

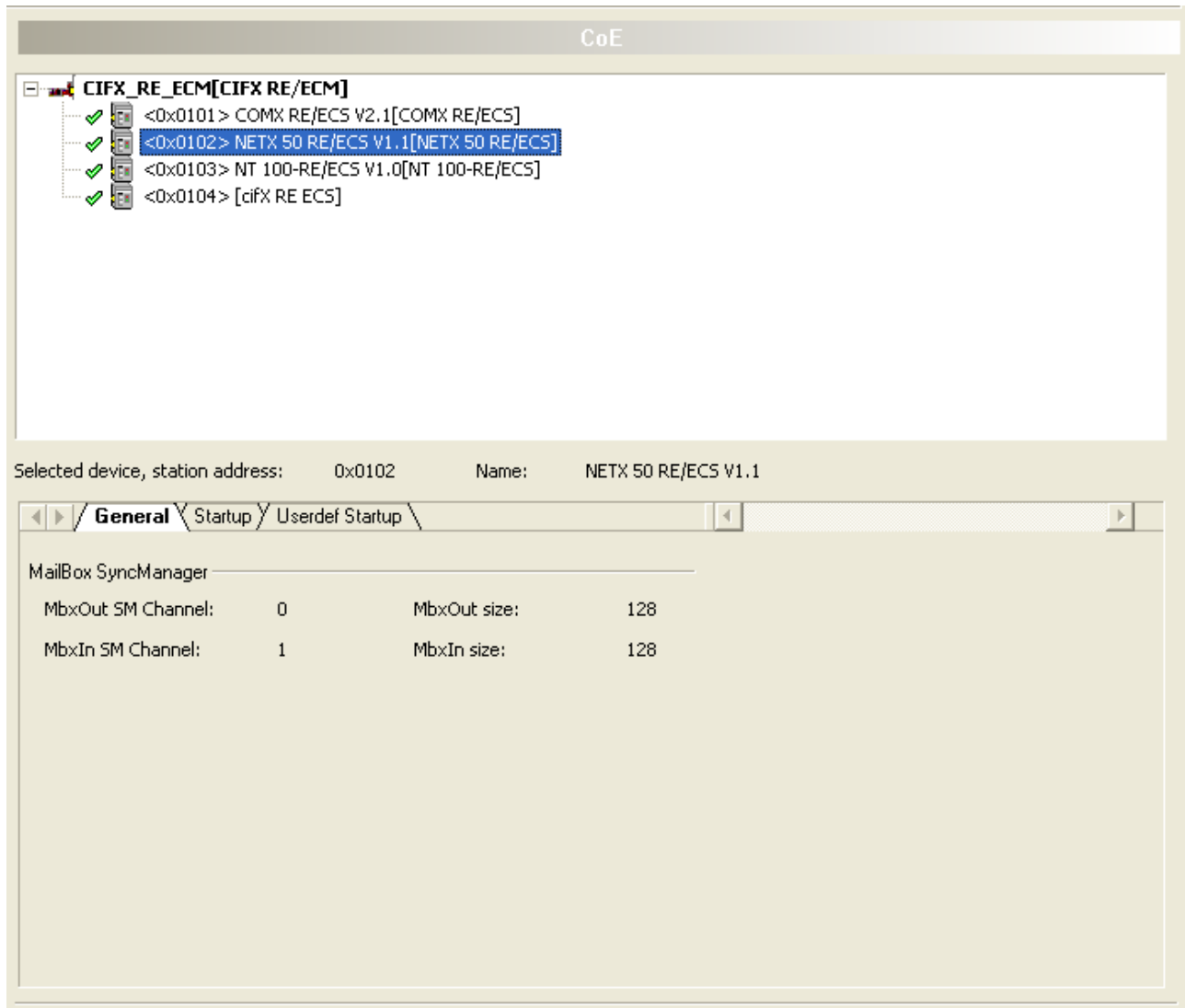


Figure 36: Mailbox > CoE

The upper part of the page displays a topology tree allowing an easier access to the configured slaves.

For each EtherCAT slave device, the station address and name of the slave will be displayed. Items which are deactivated are present in the tree structure, but the description text is displayed in red color.

Configurable slaves with respect to CoE are marked with a check mark (indicated in green color). If you select the master or a slave which has not been checked, then the lower part of the page will be simply grey and the text “No CoE configuration needed” will appear in the center of this area:

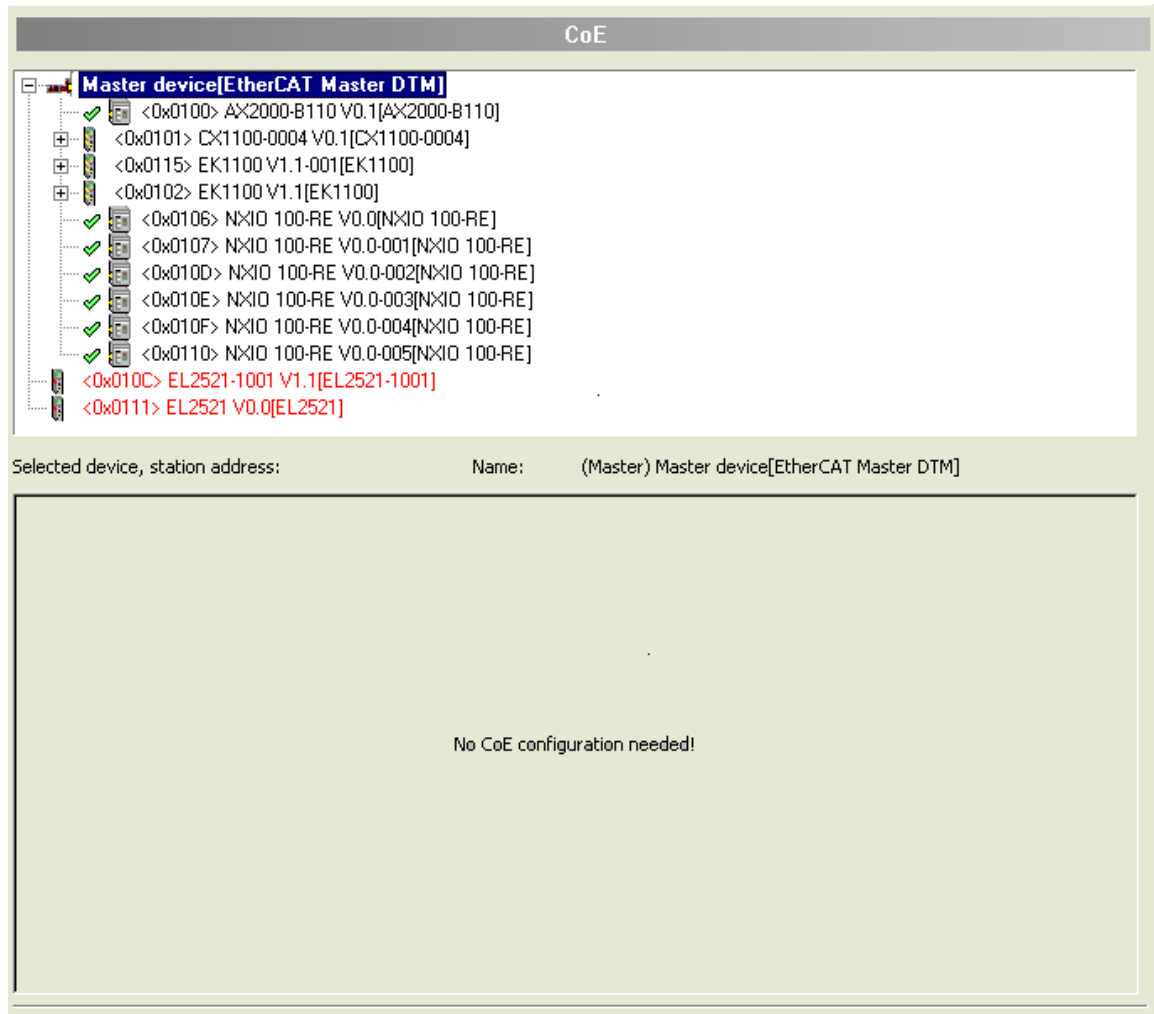


Figure 37: Mailbox > CoE:

Otherwise, the following will happen:

- The station address and name of the selected EtherCAT slave device will be displayed
- A register consisting of 3 register cards will appear:
 - General
 - Start-up
 - Userdef Start-up

5.6.1.1 'General' Register Card

The general page displays some important general information concerning mailboxes. In detail, these are:

- The Sync Manager Channel Number of the Input Mailbox
- The Sync Manager Channel Number of the Output Mailbox
- The size of the Input Mailbox and the Output Mailbox

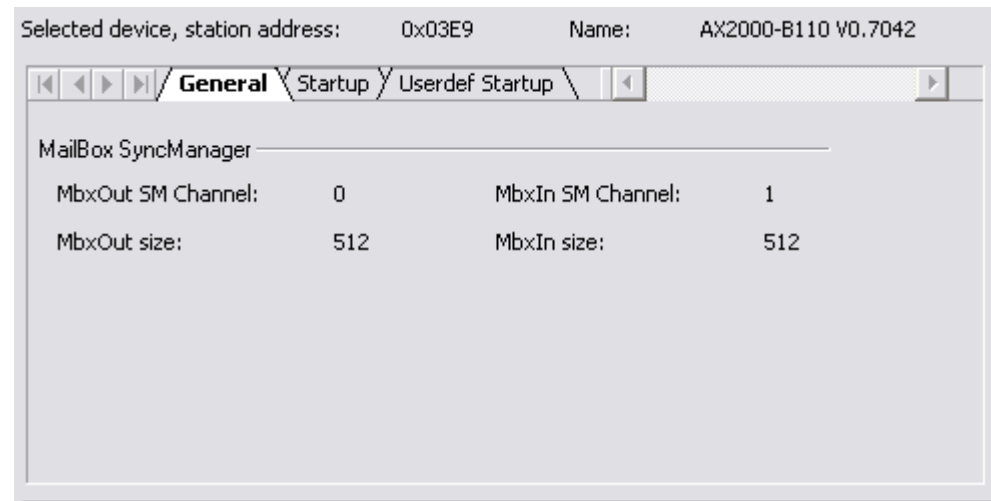


Figure 38: Mailbox > CoE, 'General' Register Card

5.6.1.2 Start-up Register Card

The start-up page allows to specify which data should be written into the EtherCAT object dictionary of the selected device (whose station address and name are displayed at the top of the register card) when particular changes of state of the EtherCAT device take place.

In detail, the following information may be specified

Transition

The transition which triggers the write access to the object dictionary.

Index and subindex

Index and subindex are used for addressing objects within the object dictionary. Refer to the EtherCAT specification for more information about the object dictionary.

Data

The data to write to the location specified using index and subindex within the object dictionary upon occurrence of the specified transition. The length depends on the chosen index and subindex.

Comment

Description of start-up command.



Note: A key symbol in front of the line denotes a fixed startup command.

Selected device, station address: 0x03E9 Name: AX2000-B110 V0.7042

GeneralStartupUserdef Startup

Transition	Index.Subindex	Data	Comment
PS	0x1C12.00	00	clear sm pds (0x1C12)
PS	0x1C12.01	1702	download pdo 0x1C12 index
PS	0x1C12.00	00	download pdo 0x1C12 count
PS	0x1C13.00	00	clear sm pds (0x1C13)
PS	0x1C13.01	1B03	download pdo 0x1C13 index
PS	0x1C13.00	00	download pdo 0x1C13 count
PS	0x6060.00	FE	Op mode
PS	0x60C2.01	02	Cycle time
PS	0x60C2.02	FD	Cycle exp

Figure 39: Mailbox > CoE, 'Start-up' Register Card

5.6.1.3 'User defined Start-up' Register Card

Similarly, the Userdefined start-up page allows to specify data to be written to a specific location within the object dictionary addressed by index and subindex triggered by a transition that also can be explicitly specified. Again, a comment can be added to the entry.

Transition

You can select which transition triggers the write access to the object dictionary. by marking the corresponding check box. The following state transitions are available to be chosen as triggering event for writing into the object dictionary:

State transition	Meaning
I2P	Init state to Pre-Operational State
P2S	Pre-Operational State to Safe-Operational State
S2P	Safe-Operational State to Pre-Operational State
O2S	Operational State to Safe-Operational State
S2O	Safe-Operational State to Operational State

Table 24: Mailbox > CoE, 'Start-up' Register Card, Meaning of State Transitions



Note: It is also possible to mark more than one check box to trigger the same action by separate state transitions.

- **SDO** (Index and subindex)
The SDO input area is used to specify which index and subindex should be used for addressing the desired object within the object dictionary.
- The **index** is specified hexadecimally within the left field of the SDO input area. At maximum 4 positions can be specified here for input.
- The **sub-index** is specified decimally within the right field of the SDO input area. At maximum 3 positions can be specified here for input. Refer to the EtherCAT specification or the EtherCAT Protocol API Reference Manuals for more information about the object dictionary.
- **Data**
The data to write to the location specified using index and subindex within the object dictionary upon occurrence of the specified transition. The length depends on the chosen index and subindex.
You may specify a string here as it is converted if necessary.
- **Comment**
Description of start-up command.

Add CoE Start-up Command Button

You have to click this button to add a newly defined SDO to the list of start-up commands shown in page 'Startup'.

If the data are not correctly entered in hexadecimal format at 'Add CoE Start-up', the following error message box will be displayed:

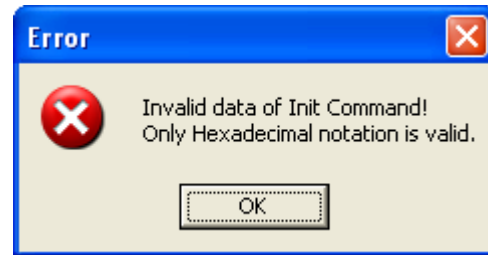


Figure 40: Error Message Box at incorrect Input of Init Command Data



Note: Omit the leading '0x' when entering hexadecimal data 'Add CoE Start-up'. Otherwise, this message box might also be displayed.

If at 'Add CoE Start-up' no transition at all has been specified, the following error message box will be displayed:

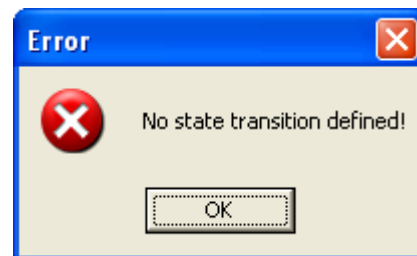


Figure 41: Error Message Box at incorrect Input of Init Command Data

'Load Object Dictionary from DDF' Button

The object dictionary can be loaded from the Device Description XML file if available and displayed here. Objects can be directly selected from the dictionary for further editing of its data and comment and for defining transition states for its transfer!

The list box in the lower part of the register card may contain a part of the contents of the object dictionary.

Selected device, station address: 0x03E9 Name: AX2000-B110 V0.7042

General Startup **Userdef Startup**

SDO Transition

Index.Subindex: 0x1004 02 ☐ I2P ☐ P2S ☐ S2P ☐ S2O ☐ O2S

Data, hexBinary: 03000300

Comment:

Add CoE Startup Command

Load Object Dictionary from DDF

Index.S...	Name:	Flags	Value
1000	Device Type	rw	92010200
1001	Error Register	rw	00
1002	Manufacturer Status Register	rw	
1003	Pre-defined Error Field		
1003.00	Number of Errors	ro	00
1003.01	Elements	rw	00000000
1004	Number of PDOs supported		
1004.00	Number of RxPDOs/TxPDOs	ro	03000300
1004.01	Elements	rw	00000000
▶ 1004.02	Elements	rw	03000300
1005	COB-ID SYNC-Message	rw	80000000
1006	Communication Cycle Period	rw	
1007	Synchronous Window Length	rw	
1008	Manufacturer Device Name	rw	
100A	Manufacturer Software Version	rw	
100B	Node-ID	rw	

Figure 42: Mailbox > CoE, 'Userdef Start-up' Register Card

5.7 FMMU/SyncMan

5.7.1 FMMU and SyncMan Common View

The **FMMU/ Sync Man** dialog page displays a combined view of all Fieldbus Memory Management Units defined in the EtherCAT Master configuration together with the associated sync managers.

All values shown here cannot be edited.

To access the **FMMU/ Sync Man** dialog page:

- Select **FMMU / Sync Man** in the navigation area.
- The dialog pane **FMMU / Sync Man** will be displayed.

FMMU / SyncMan

Fieldbus Memory Management Unit:

	Station address	L start	Length	L EndBit	P start	Flags	Sm	Su
▶	0x0101	0x00200000.0	0x00C8	7	0x1100.0		2	
🔑	0x0101	0x00100000.0	0x00C8	7	0x1358.0		3	
🔑	0x0101	0x00400000.0	0x0000.1	0	0x080D.0		1	
🔑	0x0102	0x002000C8.0	0x00C8	7	0x1100.0		2	
🔑	0x0102	0x001000C8.0	0x00C8	7	0x1D00.0		3	
🔑	0x0102	0x00400000.1	0x0000.1	1	0x080D.0		1	
🔑	0x0103	0x00200190.0	0x00C8	7	0x1100.0		2	
🔑	0x0103	0x00100190.0	0x00C8	7	0x1358.0		3	
🔑	0x0103	0x00400000.2	0x0000.1	2	0x080D.0		1	
🔑	0x0104	0x00200258.0	0x0064	7	0x1100.0		2	
🔑	0x0104	0x00100258.0	0x0064	7	0x1358.0		3	
🔑	0x0104	0x00400000.3	0x0000.1	3	0x080D.0		1	

Sync Manager:

	Station address	Channel	start	Length	Buffer	Access	Watchdog	Master
▶	0x0101	0	0x1000	0x0080	1	Write	Disabled	
	0x0101	1	0x1080	0x0080	1	Read	Disabled	
	0x0101	2	0x1100	0x00C8	3	Write	Enabled	
	0x0101	3	0x1358	0x00C8	3	Read	Disabled	
	0x0102	0	0x1000	0x0080	1	Write	Disabled	
	0x0102	1	0x1080	0x0080	1	Read	Disabled	
	0x0102	2	0x1100	0x00C8	3	Write	Enabled	
	0x0102	3	0x1D00	0x00C8	3	Read	Disabled	

Figure 43: Configuration > FMMU/ SyncMan

The upper part of the page displays a table containing information related to the Fieldbus Memory Management Units.



Note: The contents of this table can be sorted in ascending (arrow upwards) or descending order (arrow downwards) of the following columns by clicking once or twice at the respective column head:

Station address, L start, Length, L EndBit, P start, Sm

A *Fieldbus Memory Management Unit*, shortly FMMU, provides a mapping between logical addresses within the EtherCAT network on one hand and physical addresses on the various slaves within the EtherCAT network on the other hand.

EtherCAT supports combining information from multiple slaves even within one single data telegram. This central feature of EtherCAT is achieved by the use of the FMMU logically mapping physical addresses from different slaves into one combined space of memory.

The FMMU provides up to 16 FMMU channels depending on the device. Each FMMU channel defines a specific memory assignment (denominated as memory translation) between a contiguous area of logical memory of the EtherCAT network and another contiguous area of physical memory of the slave device.

Aim of this concept is mapping any memory area within an EtherCAT slave to any logical memory area within the address space of the EtherCAT network . bit-wise mapping is supported.

Parameter	Meaning	Range of Value / Default Value
Station Address	This parameter denotes the station address which has been assigned to the EtherCAT slave by the master at initialization and which has been stored in the configured station address register of the slave.	0-65535/None
Logical Start Address	This parameter contains the byte address in the logical memory area of the memory translation where the contiguous area to be mapped starts.	0-2 ³² -1/None
Length	This parameter contains the size in bytes of the translated memory area.	0-65535/None
Logical End Bit	This parameter contains the bit offset of the logical end address, i.e. the address where the contiguous memory area ends..	0-255/None
Physical Start Address	This parameter contains the byte address in the physical memory area of the memory translation where the contiguous area to be mapped starts.	0-65535/None
Flags	See explanations just below.	True or false/None
Sync Manager	Number of sync manager, see explanation below	0-31/None
Sync unit	Sync unit	

Table 25: FMMU-related Information

The flags each stored within a single bit of its own have the following meaning:

- Read Enable

This flag contains the information whether a read operation is currently allowed, or not. If set to 1, reading will be enabled, otherwise disabled.



Note: A read operation in this context denotes a data transfer where the physical memory is the source and the logical memory is the destination.

- Write Enable

This flag contains the information whether a write operation is currently allowed, or not. If set to 1, writing will be enabled, otherwise disabled.



Note: A write operation in this context denotes a data transfer where the logical memory is the source and the physical memory is the destination.

- Channel Enable

This flag contains the information whether the memory translation defined in the channel is currently active, or not. If set to 1, writing will be enabled, otherwise disabled.

The lower part of the page displays a table containing information related to the sync managers.



Note: The contents of this table can be sorted in ascending (arrow upwards) or descending order (arrow downwards) of the following columns by clicking once or twice at the respective column head:

Station address, Channel, Start Address, Length, Buffer Type, Access

According to the EtherCAT specification, the main task of a sync manager is the coordination of access to concurrently used objects.

In order to perform this coordination task, a sync manager is organized as a collection of control elements, these are usually denominated as channels.

A sync manager channel defines a consistent area of application memory.

Parameter	Meaning
Station Address	This parameter denotes the station address which has been assigned to the EtherCAT slave by the master at initialization and which has been stored in the configured station address register of the slave.
Channel	Channel number (Allowed range of values: 0...3)
Start Address	This parameter contains the start address of the consistent application memory area.
Length	This parameter contains the size of the consistent application memory area (specified in bytes).
Buffer Type	This parameter contains the information whether the access type to the consistent application memory area is queued or buffered.
Access	This parameter contains the information if the consistent application memory area is read or written by the master.
Watchdog	This parameter contains the information if the monitoring of an access to the consistent application memory area is enabled. Values are <i>Enabled</i> and <i>Disabled</i> .
Master	This parameter may contain additional data associated with the EtherCAT Master.

Table 26: SyncManager-related Information

The connection used for logically joining the FMMU channels to the sync manager channels is the station address.

5.8 Process Data

For the EtherCAT Master DTM the **Process Data** pane serves as an external process data interface, e. g. for data transfer to a PLC unit. The process data pane lists the Slave devices connected to the Master, as well as the configured modules or input or output signals of the devices. This makes the fieldbus structure visible.

For the configured modules or signals names can be set (Column *Tag*).

In addition signal data available to the OPC server can be checked (Column *SCADA*).




Process Data				
		Type	Tag	SCADA
+		COMX 100XX-RE/ECS <0x0101>	COMX 100XX-RE/ECS V0.2-001	<input type="checkbox"/>
		Outputs0 <RxPdo 0x1600>	Outputs0	<input type="checkbox"/>
		Inputs0 <TxPdo 0x1A00>	Inputs0	<input type="checkbox"/>
+		NETX 50 RE/ECS <0x0100>	NETX 50 RE/ECS V1.0	<input type="checkbox"/>
		Outputs0 <RxPdo 0x1600>	Outputs0	<input type="checkbox"/>
		Outputs0 <TxPdo 0x1A00>	Outputs0_01	<input type="checkbox"/>
+		NT 100-RE/ECS <0x0102>	NT 100-RE/ECS V0.0	<input type="checkbox"/>
		Outputs0 <RxPdo 0x1600>	Outputs0	<input type="checkbox"/>
		Inputs0 <TxPdo 0x1A00>	Inputs0	<input type="checkbox"/>
		[0x3000:01] 1 Byte In (0)	1_Byte_In_0	<input type="checkbox"/>
		[0x3000:02] 1 Byte In (1)	1_Byte_In_1	<input type="checkbox"/>
		[0x3000:03] 1 Byte In (2)	1_Byte_In_2	<input type="checkbox"/>
		[0x3000:04] 1 Byte In (3)	1_Byte_In_3	<input type="checkbox"/>
		[0x3000:05] 1 Byte In (4)	1_Byte_In_4	<input type="checkbox"/>
		[0x3000:06] 1 Byte In (5)	1_Byte_In_5	<input type="checkbox"/>
		[0x3000:07] 1 Byte In (6)	1_Byte_In_6	<input type="checkbox"/>
		[0x3000:08] 1 Byte In (7)	1_Byte_In_7	<input type="checkbox"/>
		[0x3000:09] 1 Byte In (8)	1_Byte_In_8	<input type="checkbox"/>
		[0x3000:10] 1 Byte In (9)	1_Byte_In_9	<input type="checkbox"/>
		[0x3000:11] 1 Byte In (10)	1_Byte_In_10	<input type="checkbox"/>
		[0x3000:12] 1 Byte In (11)	1_Byte_In_11	<input type="checkbox"/>
		[0x3000:13] 1 Byte In (12)	1_Byte_In_12	<input type="checkbox"/>
		[0x3000:14] 1 Byte In (13)	1_Byte_In_13	<input type="checkbox"/>
		[0x3000:15] 1 Byte In (14)	1_Byte_In_14	<input type="checkbox"/>
		[0x3000:16] 1 Byte In (15)	1_Byte_In_15	<input type="checkbox"/>
		[0x3000:17] 1 Byte In (16)	1_Byte_In_16	<input type="checkbox"/>
		[0x3000:18] 1 Byte In (17)	1_Byte_In_17	<input type="checkbox"/>
		[0x3000:19] 1 Byte In (18)	1_Byte_In_18	<input type="checkbox"/>
		[0x3000:20] 1 Byte In (19)	1_Byte_In_19	<input type="checkbox"/>
		[0x3000:21] 1 Byte In (20)	1_Byte_In_20	<input type="checkbox"/>
		[0x3000:22] 1 Byte In (21)	1_Byte_In_21	<input type="checkbox"/>
		[0x3000:23] 1 Byte In (22)	1_Byte_In_22	<input type="checkbox"/>

Figure 44: Process Data (*The name of the Slave device is displayed.)








Column	Symbol	Meaning
Type	 device	Device labeling* provided by the hardware followed by the device's name of station in pointy brackets
	 module, submodule	Description of the modules or input or output signals configured to the device (not editable)
	 I/O signal	
Tag	 device	Symbolic name* of the device
	 module, submodule	Symbolic name for the modules or for the input or output signals configured to the device (editable)
	 I/O signal	
	 warning	Duplicate Tag at the same level can cause errors by use of OPC!
SCADA	Option which module or signal data shall be provided for the OPC server. „SCADA“ (= Supervisory Control and Data Acquisition), here used with the meaning „to provide for visualizing purposes“.	
*Depending on the protocol, either the device name or the symbolic name can be edited via the device symbol context menu.		

Table 27: Process Data

5.9 Address Table

The **Address Table** dialog page shows a list of all addresses used in the process data image. The displayed addresses refer to the used EtherCAT Master. They can be displayed in decimal or hexadecimal representation.

- The upper part of the page displays the address list related to the inputs.
- The lower part of the page does the same for the outputs.

To access the **Address Table** dialog page:

- Select **Address Table** in the navigation area.
- The **Address Table** dialog page is displayed then:

The screenshot shows the 'Address Table' dialog page. At the top, there is a 'Display mode:' dropdown set to 'Hexadecimal' and a 'CSV Export' button. Below this, the 'Inputs:' section contains a table with columns: Device, Station address, PDO index, PDO name, PDO-Entry index, PDO-Entry name, Type, Address, and Length. The table lists several input devices and their corresponding PDOs. Below the 'Inputs' table is a horizontal scrollbar. The 'Outputs:' section contains a similar table with columns: Device, Station address, PDO index, PDO name, PDO-Entry index, PDO-Entry name, Type, Address, and Length. This table lists output devices and their corresponding PDOs. Below the 'Outputs' table is another horizontal scrollbar.

Inputs:

Device	Station address	PDO index	PDO name	PDO-Entry index	PDO-Entry name	Type	Address	Length
CX1100-0004 V0.4	0x010A	0x1600	wIn0	0x2004	Input	DINT	0x0000	0x0004
EL2032 V0.0	0x0105	0x1A00	Diag 1	0x3101	Diag	BOOL	0x0004	0x0000.1
EL2032 V0.0	0x0105	0x1A01	Diag 2	0x3101	Diag	BOOL	0x0004.1	0x0000.1
AX2000-B110 V0.7042	0x0100	0x1B03	Inputs	0x6064	Position actual value	DINT	0x0004.2	0x0004
AX2000-B110 V0.7042	0x0100	0x1B03	Inputs	0x6077	Torque actual value	INT	0x0008.2	0x0002
AX2000-B110 V0.7042	0x0100	0x1B03	Inputs	0x6041	Status word	UINT	0x000A.2	0x0002

Outputs:

Device	Station address	PDO index	PDO name	PDO-Entry index	PDO-Entry name	Type	Address	Length
AX2000-B110 V0.7042	0x0100	0x1702	Outputs	0x6040	Control word	UINT	0x0008.6	0x0002
AX2000-B110 V0.7042	0x0100	0x1702	Outputs	0x606B	Velocity demand value	DINT	0x0004.6	0x0004
CX1100-0004 V0.4	0x010A	0x1A00	wOut0	0x2003	Output	DINT	0x0000	0x0004
EL2004 V16.0	0x0104	0x1603	Channel 4	0x7030	Output	BOOL	0x0004.5	0x0000.1
EL2004 V16.0	0x0104	0x1602	Channel 3	0x7020	Output	BOOL	0x0004.4	0x0000.1
EL2004 V16.0	0x0104	0x1601	Channel 2	0x7010	Output	BOOL	0x0004.3	0x0000.1
EL2004 V16.0	0x0104	0x1600	Channel 1	0x7000	Output	BOOL	0x0004.2	0x0000.1
EL2032 V0.0	0x0105	0x1600	Channel 1	0x3001	Output	BOOL	0x0004	0x0000.1
EL2032 V0.0	0x0105	0x1601	Channel 2	0x3001	Output	BOOL	0x0004.1	0x0000.1

Figure 45: Configuration > Address Table



Note: The contents of these two tables can be sorted in ascending (arrow upwards) or descending order (arrow downwards) of any column by clicking once or twice at the respective column head.

5.9.1 Explanation of Parameters

Parameter	Meaning
Device	Descriptive name of a device
Station address	The station address having been assigned to the EtherCAT slave by the master at initialization and which has been stored in the configured station address register of the slave.
PDO index	Index of Process Data Object within object dictionary
PDO name	Name of Process Data Object
PDO-Entry index	Index of Process Data Object Entry within object dictionary
PDO-Entry name	Descriptive name of Process Data Object Entry
Type	Data type (such as integer or Boolean).
Address	Address
Length	Length in bytes or bits (if specified after decimal point).

Table 28: Address Table Page Parameters - Inputs / Outputs

5.9.2 Display Mode and CSV Export

Display Mode

- Use the Display Mode drop-down list to select the decimal or hexadecimal data display mode.

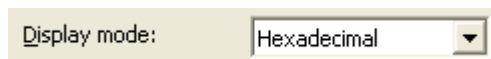


Figure 46: Configuration > Address Table - Display Mode

CSV Export

The **CSV Export** option allows to export input- and output addresses as CSV file (CSV = comma separated value). Therefore:

- Click to the CSV Export button.
- A file saving dialog opens.
- Save the data as *.csv file.

You can open the generated data by means of a spreadsheet application.

Sort Addresses

- To sort the address data, click on the respective column header.

5.10 Init Commands

The **Init commands** page of the configuration dialog allows to display a sequence of initialization commands.

To access the **Init commands** dialog page:

- Select **Init commands** in the navigation area.
- The **Init commands** screen will appear.

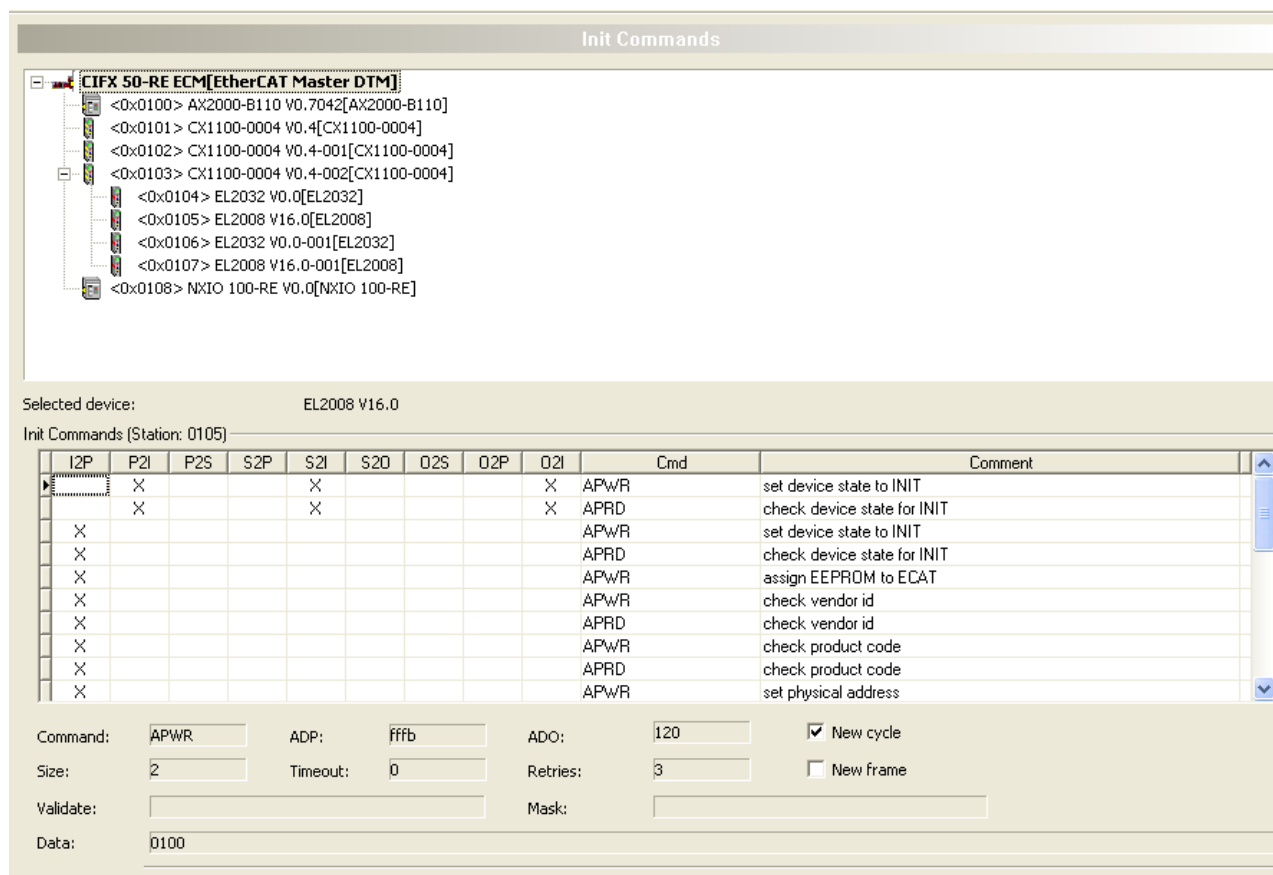


Figure 47: 'Init Commands' Page

The upper part of the '*Init commands*' page displays the structure of the EtherCAT network in a very similar manner as the '*Topology>TreeView*' page does. The only relevant difference is the absence of the project item, so only the master and all of its slaves are present in this structure tree of the EtherCAT network.

The lower part of the '*Init Commands*' page displays:

- The long form of the name of the selected EtherCAT (master or slave) device.
- The heading '*Init Commands*'



Note: In case a slave has been selected for display, the station address uniquely identifying this slave. This is displayed directly subsequent to the heading '*Init Commands*'.

- A table indicating the sequence of command execution and the dependence from state transition of the device's EtherCAT state machine.
- An area containing some fields displaying the parameters of the selected command.

The table shows the sequence how the commands are executed and the information at which state transitions this happens. For each command the following information is displayed:

- *Whether the command should be executed at 9 specific state transitions (first 9 columns)*
- *The command code*
- *A comment (short text describing the intention of the command)*

🔗 These 9 state transitions are in this sequence:

- *Init to Pre-Operational*
- *Pre-Operational to Init*
- *Pre-Operational to Safe- Operational*
- *Safe- Operational to Pre-Operational*
- *Safe- Operational to Init*
- *Safe- Operational to Operational*
- *Operational to Safe- Operational*
- *Operational to Pre-Operational*
- *Operational to Init*

Possible command codes are:

Command code	Meaning
APRD	Auto-Increment Read
APWR	Auto-Increment Write
NPRD	Node-addressed Physical Read
NPWR	Node-addressed Physical Write
BRD	Broadcast Read
BWR	Broadcast Write
LRD	Logical Read
LWR	Logical Write

Table 29: Possible Command Codes in Init Commands



For more information on this topic see section 7.1.3 “EtherCAT telegram structure” of the EtherCAT specification, version 1.0, on page 70.

The parameter area contains the following items:

Parameters	Description
Command code	The command code of the selected line (one of the codes from the table just above)
ADP	This numeric parameter contains the configured station address.
ADO	This numeric parameter contains the physical memory address
New Cycle	An Boolean parameter whether a new cycle should be started.
New Frame	An Boolean parameter whether a new frame should be started.
Size	The size of the command.
Timeout	The timeout value valid for the command
Retries	The valid retry limit for the command (i.e. the maximum number of allowed retries)
Validate	Validation data
Mask	A mask indicating which bits are valid.
Data	The relevant data.

Table 30: Parameters of EtherCAT Command

6 Online Functions

Getting Access to SYCON.net Online Functions



Note! If under 'Configuration' > 'Master Settings' > 'Start of bus communication' > 'Controlled by application' is selected, after 'Power on Reset' the Master device is in 'Offline' state! In this state you can not use the SYCON.net online function 'Network Scan'. To get access to this online function in case the Master device is used together with an application program, you must make sure that the application program will start the communication. Alternatively you can start the communication manually from the context menu 'Start communication' of the the Master device.

6.1 Connecting/Disconnecting Device



Note: Several EtherCAT Master DTM functions e. g. **Diagnosis** or the configuration download in the FDT Framework require an online connection from the EtherCAT Master DTM to the EtherCAT Master device.

Connecting Device

The following steps are needed to establish a connection from the EtherCAT Master DTM to a EtherCAT Master device:

Under **Settings** in the **Driver** pane:

1. Verify that the default driver is checked and respectively check another or multiple drivers.
2. Configure the driver if necessary.

Under **Settings** in the **Device Assignment** pane:

3. Scan for the devices (with or without firmware).
4. Select the device (with or without firmware) and apply the selection.



Before you download the firmware adhere to the necessary safety precautions to prevent personnel injury and property damage. For more refer to section *Safety Messages on Firmware or Configuration Download* on page 28.

Under **Settings** in the **Firmware Download** pane if not yet a firmware was loaded to the device:

5. Select and download the firmware.

Under **Settings** in the **Device Assignment** pane if not yet a firmware was loaded to the device:

6. Scan for the device (with firmware) once more.
7. Select the device (with firmware) once more.



An overview of the descriptions for these steps you find in the section *Overview Settings* on page 29.

8. In the DTM interface dialog select the **OK** button, to apply the selection and to close the DTM interface dialog.
 9. Put a right-click on the EtherCAT Master device icon.
 10. Select the **Connect** command from the context menu.
- ⇒ The EtherCAT Master device now is connected to the EtherCAT Master DTM via an online connection. In the network view the device description at the device icon of the Master is displayed with a green colored background.

Disconnecting Device

To disconnect an online connection from the EtherCAT Master device to a EtherCAT Master DTM take the following steps:

1. In the DTM interface dialog select the **OK** button, to close the DTM interface dialog.
 2. Right-click on the EtherCAT Master device icon.
 3. Select the **Disconnect** command from the context menu.
- ⇒ In the network view the device description at the device icon of the Master is not any more displayed with a green colored background. Now the EtherCAT Master device is disconnected from the DTM.

6.2 Network Scan

With the function **Network Scan...** of the EtherCAT Master DTM you can find out automatically which EtherCAT Slaves are attached to the EtherCAT Master device and how these devices are configured. During the network scan the Master device requests the ident codes of the Slave devices found at the bus. For each connected Slave device its ident code is read out.

In the **Scan Response** dialog of the Master DTM the assigned device description files or DTM devices are displayed. Exactly one ident code is assigned to each device description file and to each DTM device. Different versions (also language versions) of the same device description file are defined by the same ident code. For every identified device you can select the assigned DTM device according to the firmware loaded in that Slave device. Via **Create Devices** for each Slave device the selected DTM device is created.

Requirements

The EtherCAT Master device must be configured.



Important: The configuration of the Master device must be downloaded in the Master device. For more see section *Configuration Steps* on page 23 .

Overview of the Steps

1. Starting the **Network Scan** function of the Master DTM.
2. Make the settings in the **Scan Response** dialog of the Master DTM.
3. Click **Create Devices**.
4. Via the **Download** function of the Master DTM, download the current configurations of the Slave devices to the Master device.

6.2.1 Starting 'Network Scan'

1. Starting the **Network Scan** function of the Master DTM.

- In netDevice: right-click on the device symbol of the EtherCAT Master DTM.
- Select **Network Scan...** from the context menu.

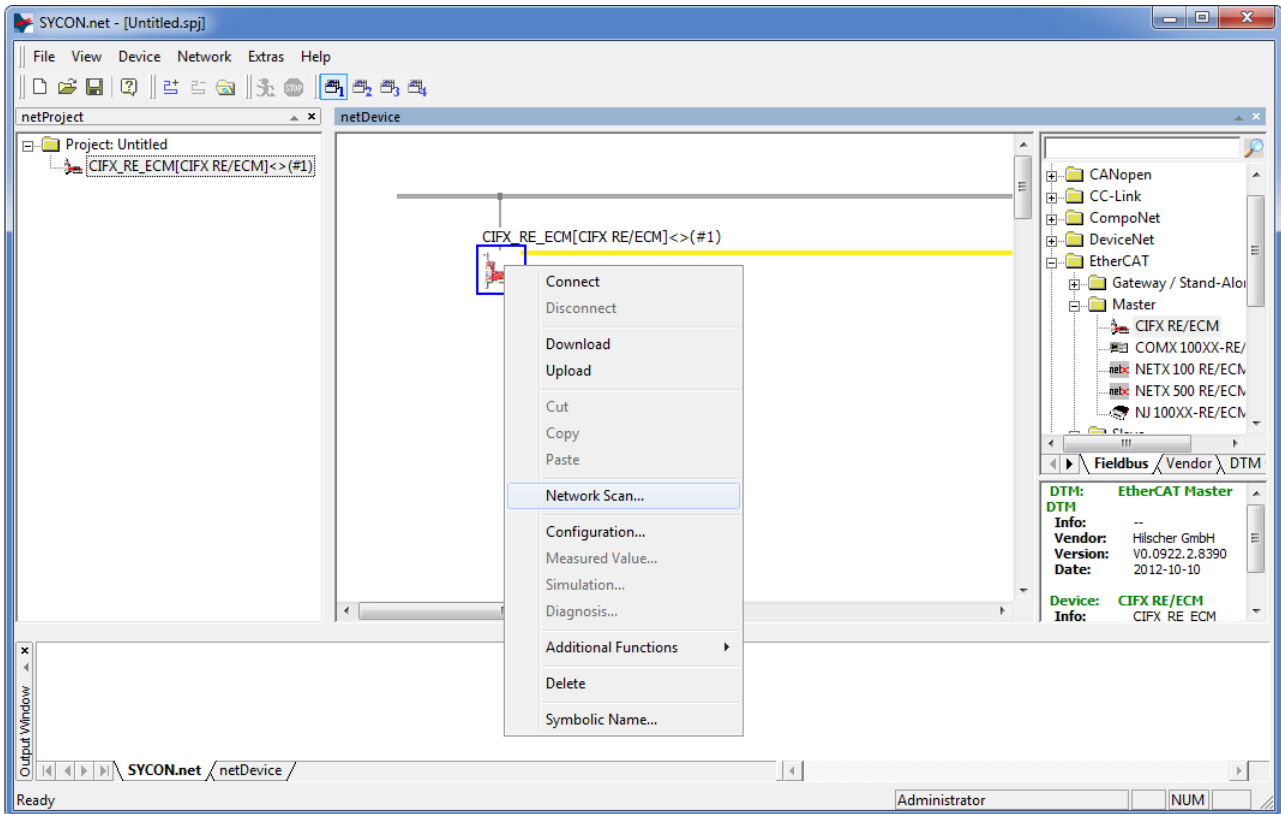


Figure 48: Starting 'Network Scan' (Example)

- Wait for a short time.
- If the query is displayed if the IO communication shall be stopped, click **Yes**.



Note: It can last some seconds, until the **Network Scan...** dialog is displayed.

Via **Network Scan...** an online connection from the EtherCAT Master DTM to the EtherCAT Master device is established. The configuration software scans, which EtherCAT Slaves are attached to the EtherCAT network or to the EtherCAT Master device.

➤ The **Scan Response** dialog of the Master DTM is displayed.

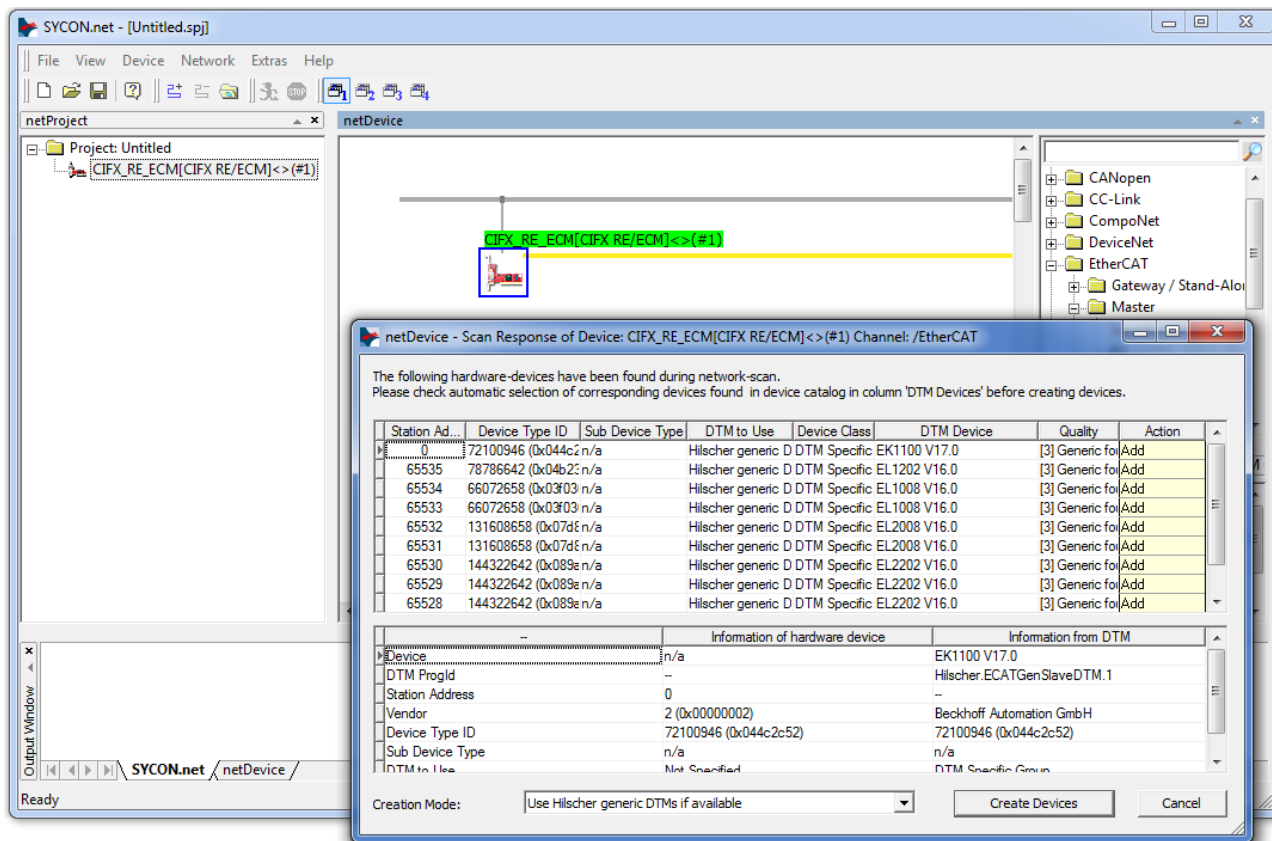


Figure 49: Scan Response dialog of the Master DTM (Example)

6.2.2 Settings in the Scan Response Dialog of the Master DTM

2. Make the settings in the **Scan Response** dialog of the Master DTM

- In the **DTM to Use** column the DTM devices assigned to the found ident codes appear.

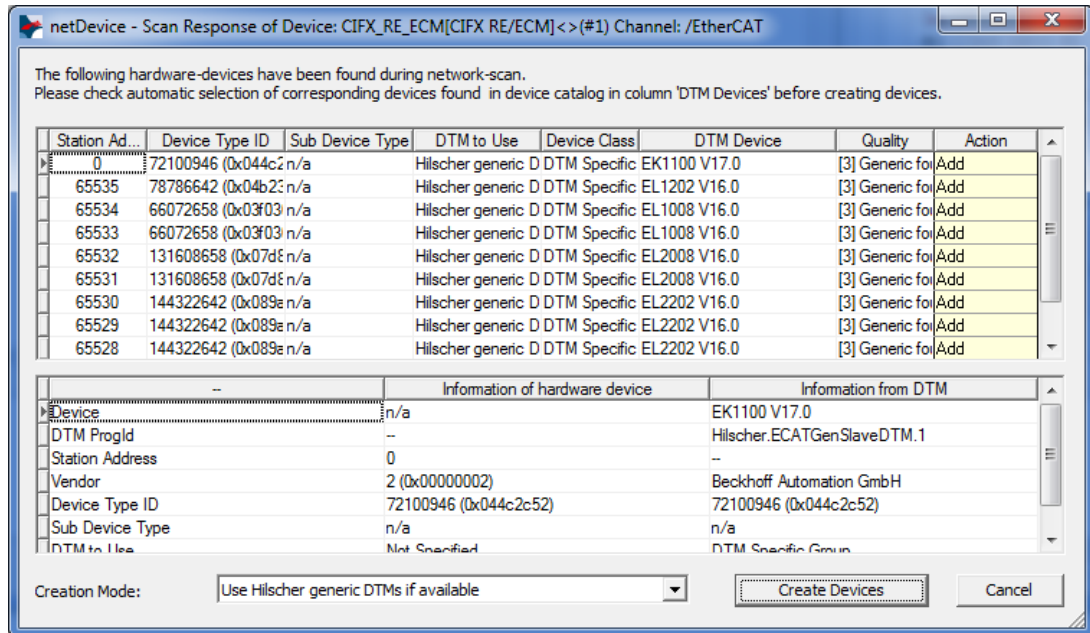


Figure 50: Scan Response dialog of the Master DTM (Example)

- In the **DTM to Use** column select for every identified device the DTM device corresponding to the firmware loaded in this Slave device (only if the corresponding DTM devices are in use).
- If in the **DTM to Use** column no DTM device or a DTM device not desired is displayed, add the required DTM devices to the device catalog.
- or adapt the creation mode under **Creation Mode**.
- In the **Action** column select, whether the found DTM device shall be:
 - *added* or *skipped*
(if a device is not yet present in the project),
 - *replaced* or *skipped*
(if a device is already present in the project)

6.2.3 Description on the Scan Response dialog of the Master DTM

In the following table you find a description about the **Scan Response** dialog of the Master DTM.

Column	Description
Title Bar	With the text: <i>Symbolic Name of the Master Device [Device Description] <Device Address> (#Network ID) channel: /EtherCAT.</i>
Instruction	In the Network Scan window the instruction text is displayed: The following hardware-devices have been found during network scan. Please check automatic selection of corresponding devices found in device catalog in column 'DTM Devices' before creating devices.
Station Address	EtherCAT station address, which displays the logical sequence of the devices within a EtherCAT network.
Colors	Meaning of colors in the Scan Response dialog of the Master DTM: <div style="display: flex; align-items: flex-start;"> <div style="margin-right: 10px;"> <div style="background-color: red; width: 20px; height: 15px; display: inline-block;"></div> Red <div style="background-color: yellow; width: 20px; height: 15px; display: inline-block;"></div> Yellow </div> <div> <p>If a field marked in red appears in column Station address, the respective DTM device is already present on the network.</p> <p>If a field appears marked in yellow, a selection can be made by a combo box.</p> </div> </div>
Device Type ID	Value of the EtherCAT Slave device parameter „I/O Configuration“ according to the first position of the Slave profile.
Sub Device Type	Value of the EtherCAT Slave device parameter „I/O Code“ according to the second position of the Slave profile.
DTM to Use	<p>Display of the DTM devices, which are assigned to the ident codes found during scanning:</p> <p>If <u>Use Hilscher generic DTMs if available</u> is displayed <i>without color marking</i>, there is no selection possibility.</p> <p>If <u>Use Hilscher generic DTMs if available</u> is displayed <i>marked in yellow</i>, the following selection can be made:</p> <div style="display: flex; align-items: center;"> <div style="border: 1px solid gray; padding: 2px; margin-bottom: 2px;">Use Hilscher generic DTMs if available</div> <div style="border: 1px solid gray; padding: 2px; margin-bottom: 2px;">Use Hilscher generic DTMs if available</div> <div style="border: 1px solid gray; padding: 2px; margin-bottom: 2px;">Use vendors DTMs if available</div> <div style="margin-left: 10px;">(In the figure shown example DTMs are displayed.)</div> </div> <p>A selection will only be displayed if under Creation Mode > Choose for each device was selected and if another DTM has been found for the respective device.</p>
Device Class	DTM Specific Group (Information from DTM)
DTM Device	<p>Found DTM device (the device name as taken from the DTM)</p> <p>Only the device description files or DTM devices can be displayed within the column DTM Devices:</p> <ul style="list-style-type: none"> • Which are available in the device catalog for the scanned ident code, • Respectively, which belong to the selection made under Creation Mode • and which belong to the selection made under Creation Mode > Choose for each device under DTM to create. <div style="display: flex;"> <div style="flex: 1;"> <p>For each device type ID in the column DTM Device the following is displayed:</p> <ul style="list-style-type: none"> • <u>no</u> device, • <u>one</u> single device • or <u>multiple</u> devices (within a combobox). </div> <div style="flex: 1; margin-left: 20px;"> <p>This means, within the device catalog of netDevice for the found ident code and the selected Creation Mode these alternatives are available:</p> <ul style="list-style-type: none"> • no DTM • A device description file or a DTM device of the manufacturer • One or more device description files or DTM devices of a manufacturer </div> </div>
Quality	Associated quality information Display: [1] DTM found, [3] Generic found


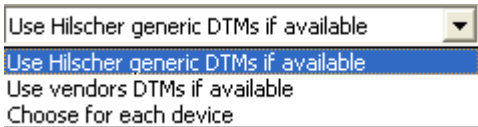
Column	Description
Action	<p>The action to be performed with the corresponding device during the process of device creation.</p> <ul style="list-style-type: none"> If no device is present within the current project, the selection Add/Skip will appear. If there is already a device present within the current project, the selection Replace/Skip will appear. <p>Add adds a new instance for the selected DTM during the process of creation of a device.</p> <p>Skip skips the process of creation of a device for the respective device address.</p> <p>Replace erases the instance of the DTM currently located at this address during the process of creation of a device, and replaces it with the instance of the chosen DTM.</p>
Table below	<p>The lower table in the Scan Response dialog of the Master DTM shows a comparison of possible differences in device information taken from:</p> <ul style="list-style-type: none"> The hardware device (displayed in central column of 3) and the DTM (displayed in right column of 3) <p>The left column contains which information is compared between the information sources 'Hardware Device' and 'DTM'.</p> <hr/> <p> Note: If a field contains the text 'n/a', the corresponding information is not applicable in the current context (fieldbus).</p>
Creation Mode	<p>Under Creation Mode one of the following options can be selected:</p> <ul style="list-style-type: none"> User Hilscher generic DTM if available Use vendors DTMs if available Choose for each device <div data-bbox="379 996 858 1122">  </div> <p><i>Scan Response dialog of the Master DTM > 'Creation Mode'</i></p>
Create Devices	<p>About Create Devices ...</p> <ul style="list-style-type: none"> for each Slave device the previously selected DTM device is created. the Slave device configuration is uploaded to the created Slave-DTM and thereby the module configuration is generated. <p>In case a conflict occurs between a device description file and a device, the Upload dialog appears, where conflicts are displayed in red.</p>
Cancel	Click Cancel to leave the dialog without creating a Device.

Table 31: Description on the Scan Response dialog of the Master DTM

6.2.4 Creating Devices

3. Click **Create Devices**

- In the **Scan Response** dialog of the Master DTM click **Create Devices**.
- For each Slave device the previously selected DTM device is created.
- The dialog **netDevice** appears showing the progress bar **Creating DTM Device**. The dialog shows the the progress of the device creating process.



Note: Depending on the manufacturer of the respective device, also a dialog with some slight deviations from this one may be displayed.

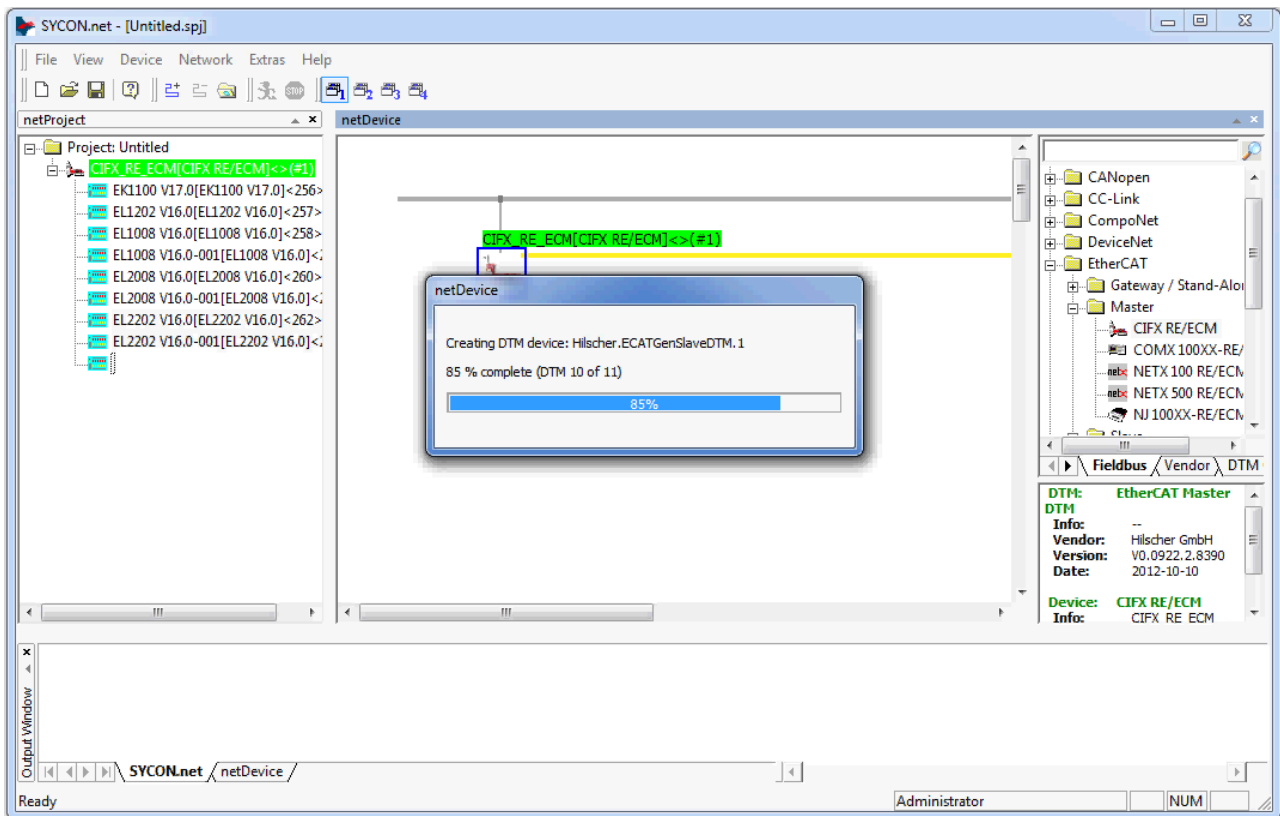


Figure 51: Creating the DTM devices (Example)

➤ The generated Slave devices are added to the Master bus in the network.

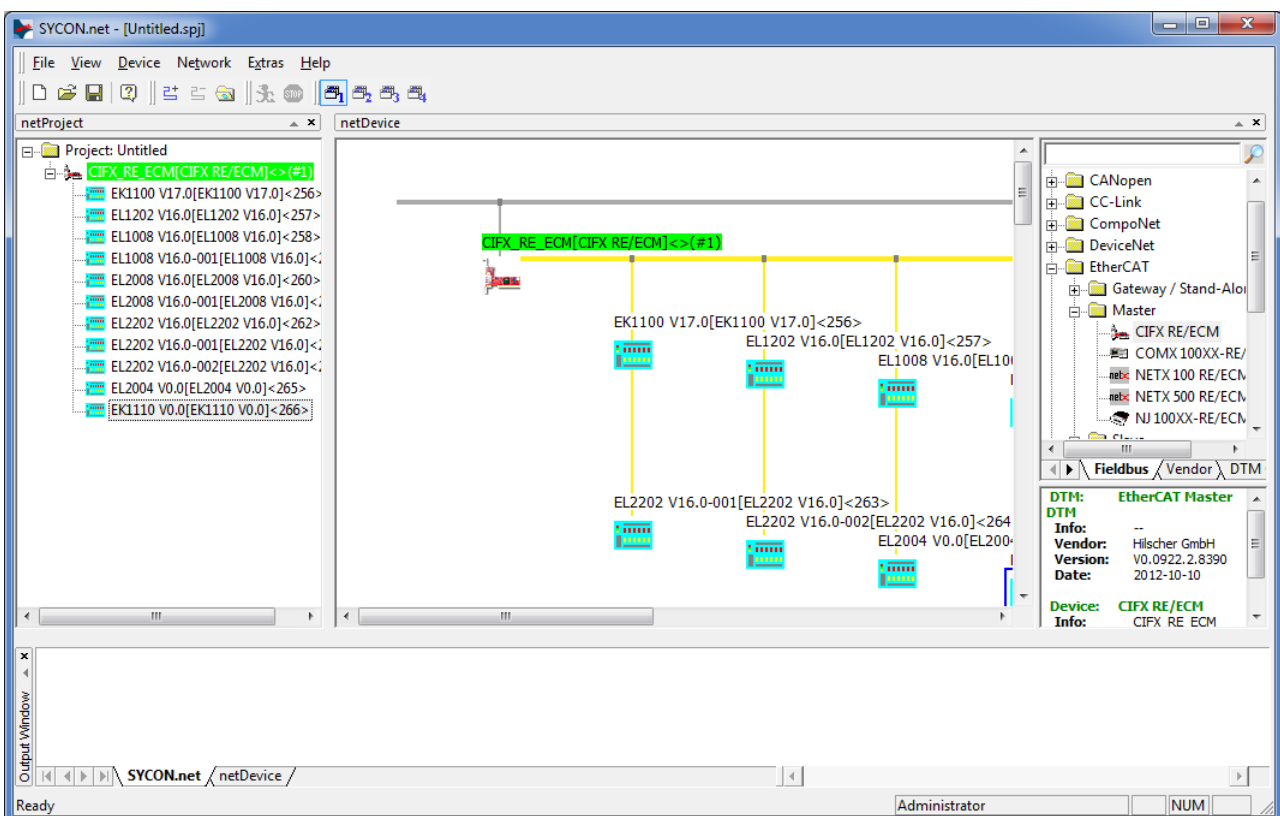


Figure 52: Created Slave Devices in the Network (Example)

6.2.5 Download to the EtherCAT Master Device



Adhere to the necessary safety precautions to prevent personnel injury and property damage. For more refer to section *Safety Messages on Firmware or Configuration Download* on page 28.



Adhere to the necessary safety precautions to prevent personnel injury and property damage that may occur in consequence of a communication stop or in consequence of a mismatching system configuration. For more refer to section *Safety Messages on Firmware or Configuration Download* on page 28.

4. Via the **Download** function of the Master DTM, download the current configurations of the Slave devices to the Master device.

- In **netDevice**: right-click on the device symbol of the EtherCAT Master DTM.
- Select **Download** from the context menu.

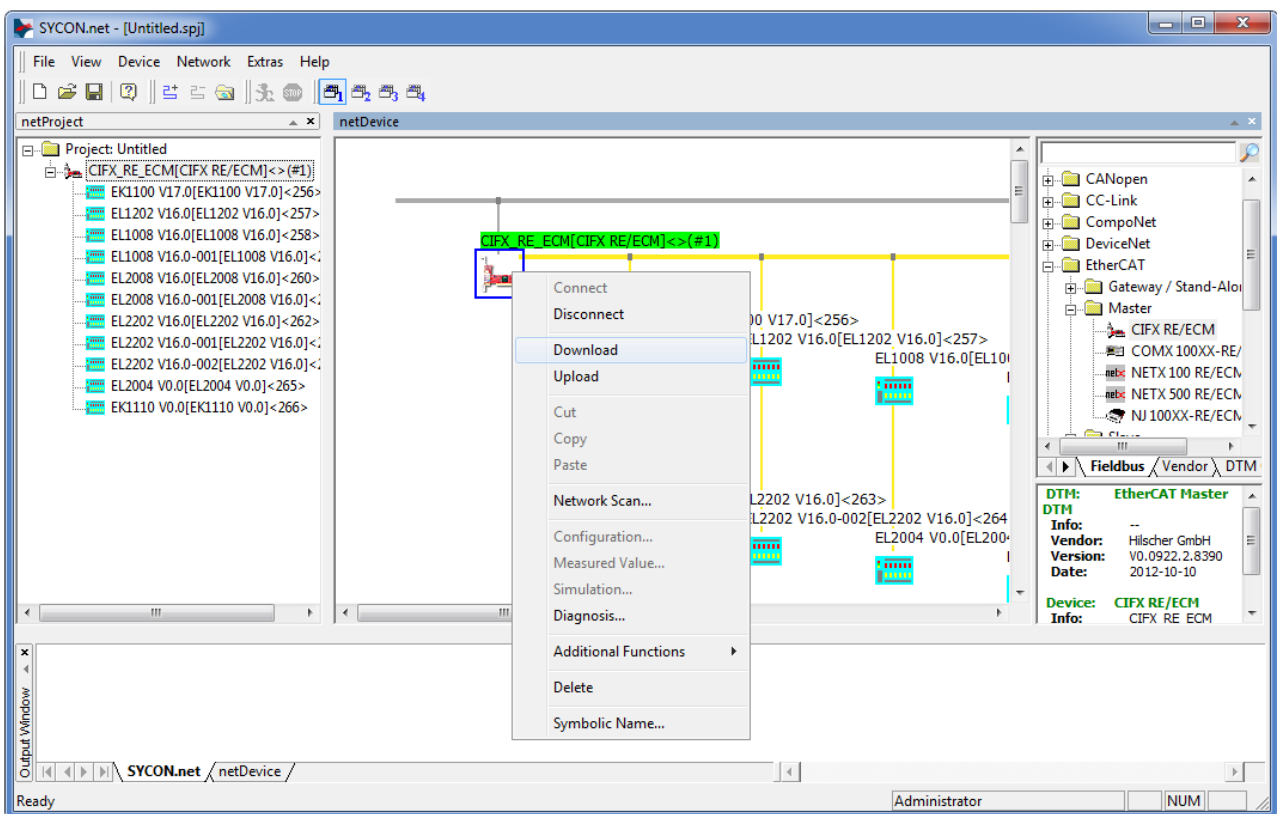


Figure 53: 'Download' current Configuration to EtherCAT Master (Example)

- The Dialog **netDevice - Download** appears:

If you attempt to download during bus operation, communication between master and slaves is stopped.

Do you really want to download?

- Click **Yes**.
- The dialog **netDevice** appears showing the progress bar **Download active, device performs initialisation...**
- The **netDevice** window shows the message (example): **Download succeeded to device CIFS_RE_ECM[CIFS RE/ECM]<>(# 1).**

6.3 Download Configuration

The device configuration is created *offline* in the DTM (application program). A download to the device is required, to transfer the configuration with the parameter data to the device.



Note: To download configuration parameter data to the EtherCAT Master device an online connection from the EtherCAT Master DTM to the EtherCAT Master device is required. Further information can be found in the *Connecting/Disconnecting Device* section on page 87.

Safety Precautions

If you plan to perform a configuration download via the EtherCAT Master DTM be aware of the following:

⚠ WARNING

Communication Stop caused by Configuration Download, faulty System Operation possible or Loss of Device Parameters

Before you initiate a configuration download process, while the bus is still in operation status:

- Stop the application program.
- Make sure that all network devices are placed in a fail-safe condition.

⚠ WARNING

Mismatching System Configuration, faulty System or Device Operation possible

- In the device use only a configuration suitable for the system.

NOTICE

Loss of Parameters caused by Power Disconnect during Configuration Download

- During configuration download process, do not interrupt the power supply to the PC, or to the device and do not perform a reset to the device!

For more see next page.

Download Steps

To transfer the configuration with the corresponding parameter data to the EtherCAT Master device you download the data using the frame application of the configuration software.

For netDevice the download is made via **Device > Download** or use the context menu with **Download**.

1. Select **Download** in the context menu of the device.

⇒ If the download is started as long as the Slave devices are connected to the Master device, the following message is displayed: 'If you attempt to download during bus operation, communication between Master and Slaves is stopped. Do you really want to download?'

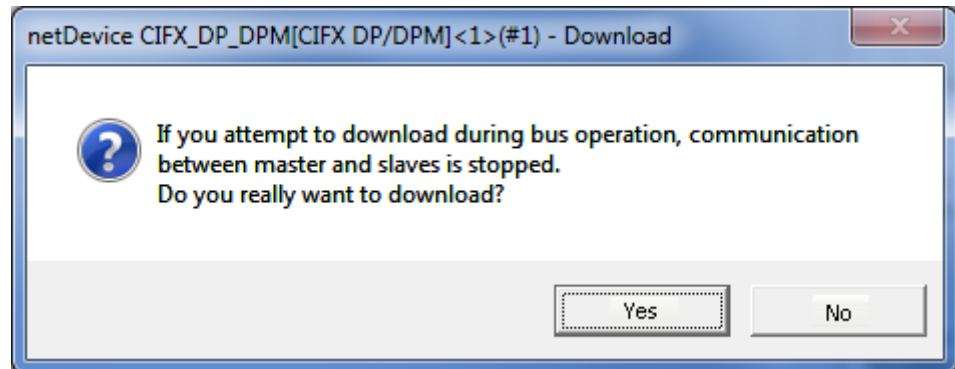


Figure 54: netDevice Message: Download



Important: If the communication between the Master and the Slave devices is stopped, the data exchange between the Master device and the Slave devices is stopped.

2. Click to **Yes** if you intend to download the configuration.
- ⇒ Then the current configuration in the application program is downloaded to the device.
3. Otherwise click to **No**.

6.4 Start/Stop Communication

You can manually start or stop the communication between a EtherCAT Master device and EtherCAT Slave devices.

- **Start Communication** can be enabled if the communication was stopped before or if the configuration requires this (Controlled release of communication).
 - **Stop Communication** can be enabled if the communication was started.
- To start or to stop the communication, proceed as follows:

Start Communication

1. Connecting device:



Note: To start the communication of the device at the bus manually, an online connection from the EtherCAT Master DTM to the EtherCAT Master device is required. Further information can be found in the *Connecting/Disconnecting Device* section on page 87.

2. Select **Additional Functions > Service > Start Communication** from the context menu (right mouse click).
- The device communicates at the bus.

Stop Communication



Faulty System Operation possible, Overwriting of Firmware or Loss of Device Parameters

Before you stop the communication:

- Stop the PLC program.
 - Make sure that all network devices are placed in a fail-safe condition.
1. Select **Additional Functions > Service > Stop Communication** from the context menu (right mouse click).
- The communication of the device at the bus is stopped.

6.5 Licensing

Using the license dialog, you can order licenses for **Master protocols** or **Utilities** and download them to your device.

6.5.1 Open License Dialog

You first open the **License** window.



Note: You first need to assign the Master device to the DTM. Only then, the device data and the licenses already present in the device are displayed in the **License** dialog.

How to proceed:

A.) Assigning the Master device to the DTM

1. Open the DTM configuration dialog.
 - In the FDT container **netDevice** double click to the device icon.
2. Select one or several drivers.
 - Select **Settings > Driver**.
 - Check the drivers.
3. Configure the driver if necessary.
 - Select **Settings > Driver > [Name of the assigned driver]**.
 - Configure the driver settings.
4. Scan for and select the devices.
 - Select **Settings > Device Assignment**.
 - Under **Device selection** select *suitable only* or *all* and then **Scan**.
 - In the table, check the required devices.
 - Select **Apply**.
5. Close the DTM configuration dialog via **OK**.



For details to the device assignment, refer to section *Device Assignment* in this manual.

B.) Open the License pane

- In the FDT container **netDevice** right click to the device icon.
- From the context menu select **Additional Functions > License**.
- The **License pane** opens.

6.5.2 License Dialog

In the **License**¹ pane you can:

- check, which licenses for Master protocols or Utilities are present in the device (Position ① in the figure below),
- order licenses (Positions ② to ⑪),
- transfer licenses to the device ⑫.

License Type

	Existing	Order
Master protocols		
One General Master License	NO	<input type="checkbox"/>
Two General Master Licenses	NO	<input type="checkbox"/>
PROFIBUS Master	YES	<input type="checkbox"/>
CANopen Master	YES	<input type="checkbox"/>
DeviceNet Master	YES	<input type="checkbox"/>
AS-Interface Master	YES	<input type="checkbox"/>
PROFINET I/O RT Controller	YES	<input type="checkbox"/>

Request Form, please fill out

Name	Value
License type	User Single Device License
Manufacturer*	0x0001
Article number*	1251100
Serial number*	20007
Chiptype*	0x00000001
Step*	0x00000000
Romcode revision*	0x00000000

Fields marked with "*" are mandatory.

④ [Dropdown menu] ⑤ E-mail... ⑨ [Text field]
 ⑥ Print Fax Form... ⑩ [Text field]
 ⑦ Telephone... ⑪ [Text field]
 ⑧ Export License Request... ⑫ Download License

Close Help

Figure 55: License Pane



Note: To display further entries under **License Type**, move the scroll box ① downwards or upwards. To display further entries under **Request Form, please fill out**, move the scroll box ② downwards or upwards.

¹ The title bar contains the notation of the **device description**:
Symbolic Name [Device Description] <Station Address> (#Network ID).

6.5.3 Which Licenses are present in the Device?

Check, which licenses are present in the device.

How to proceed:

- Open the **License** pane as described.

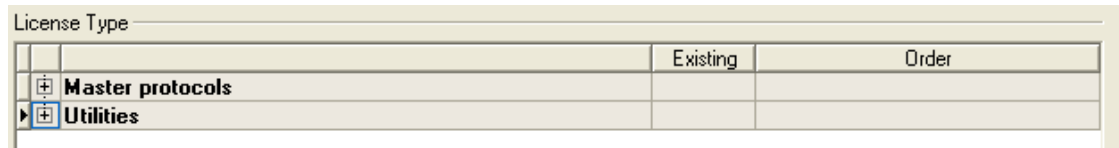


Figure 56: License Pane - License Type

- Under **License Type** click at **Master protocols**.

➤ The **Master protocols** overview opens:

	Existing	Order
One General Master License	NO	<input type="checkbox"/>
Two General Master Licenses	NO	<input type="checkbox"/>
PROFIBUS Master	YES	<input type="checkbox"/>
CANopen Master	YES	<input type="checkbox"/>
DeviceNet Master	YES	<input type="checkbox"/>
AS-Interface Master	YES	<input type="checkbox"/>
PROFINET I/O RT Controller	YES	<input type="checkbox"/>

Figure 57: License Pane – License Type / Master protocols

- Or click at **Utilities**.

➤ The **Utilities** overview opens:

	Existing	Order
OPC Server	NO	<input type="checkbox"/>
SYCON.net	NO	<input type="checkbox"/>
QVis Minimum Size	NO	<input type="checkbox"/>
QVis Standard Size	NO	<input type="checkbox"/>
QVis Maximum Size	NO	<input type="checkbox"/>
CoDeSys Minimum Size	NO	<input type="checkbox"/>

Figure 58: License Pane – License Type / Utilities

➤ The column **Existing** indicates which licenses are present in the device.

Yes = License is present in the device.

No = License is not present in the device.



Note: In newer versions of the present configuration software under **License Type** may be displayed additional licenses or other protocols that can be ordered later.

6.5.3.1 License for Master Protocols

One General Master License:

On the device maximally 1 communication protocol with master function can be implemented.

Two General Master Licenses:

On the device maximally 2 communication protocols with master function can be implemented.

The license includes the following Master protocols:

- AS-Interface Master
- CANopen Master
- DeviceNet Master
- EtherCat Master
- EtherNet/IP Scanner
- PROFIBUS Master
- PROFINET IO RT Controller
- Sercos Master

6.5.3.2 License for Utilities

- SYCON.net
- OPC Server
- QVis Minimum Size
- QVis Standard Size
- QVis Maximum Size
- CoDeSys Minimum Size
- CoDeSys Standard Size
- CoDeSys Maximum Size

For the utilities QVis and CoDeSys, only one license each may be chosen alternatively as:

- *Minimum Size,*
- *Standard Size or*
- *Maximum Size.*

6.5.4 How to order a License


To order a license, proceed as follows:

	<i>Refer to Section:</i>	<i>Page</i>
1. Open the license dialog.	<i>Open License Dialog</i>	100
2. Select the required licenses.	<i>Selecting License</i>	104
3. Enter the ordering data.	<i>Ordering Data</i>	105
4. Place your order.	<i>Ordering the License</i>	107


6.5.5 Selecting License(s)

You can select licenses for Master protocols and / or utilities.

1. Selecting license(s) for Master protocol(s):

- Under **License Type** click  at **Master protocols** in the **License** pane.
- Under **Order** check as many licenses must run simultaneously on your device:
*One General Master License or
Two General Master Licenses.*

2. And/or select license(s) for utility(utilities):

- In the **License** pane under **License Type** click  at **Utilities**.
- Under **Order** check the required utility(utilities)
(*single or several*)²:
 - SYCON.net
 - OPC Server
 - QVis Minimum Size*
 - QVis Standard Size*
 - QVis Maximum Size*
 - CoDeSys Minimum Size**
 - CoDeSys Standard Size**
 - CoDeSys Maximum Size**

2 For *) and **) minimum size, standard size or maximum size can be selected only as an alternative.

6.5.6 Ordering Data

1. Device Information

➤ The *Device Information* required for the order are read from the device and automatically filled in the order.

2. Ordering Data

Enter the *Ordering Data* into the **License** pane.

➤ Enter the **Data to manage the Order**.

6.5.6.1 Device Information (Ordering data read from the Device)

The following ordering data are read from the device and displayed in the **License** pane:

- Manufacturer
- Device number
- Serial number
- Chiptype
- Step (chip revision)
- Romcode revision
- Checksum (checksum of the device data)

➤ The gray fields under **Request Form, please fill out** contain the ordering data read from the device:

Request Form, please fill out

Name	Value
Manufacturer*	0x0001
Article number*	1251100
Serial number*	20007
Chiptype*	0x00000001
Step*	0x00000000
Romcode revision*	0x00000000
Checksum*	G

Fields marked with '*' are mandatory.

Figure 59: License Pane - Request Form, please fill out / Device Information

➤ These ordering data read out from the device are displayed automatically from the device.

6.5.6.2 Data to manage the Order (License Information)

For your order you must enter the following data to the **License** pane:

1. License Type (User Single Device License).

Name	Value
License type	User Single Device License

Figure 60: License Pane - Request Form, please fill out / License Type

- Select the license type under **Request Form, please fill out > Value**, (for future application, currently only *User Single Device License* can be selected).
- 2. Mandatory data to the order request (editable fields):
 - First Name
 - Surname
 - E Mail (address, to which the license download link shall be send.)
 - Telephone
 - Company
 - Address
 - Country
 - City, State, Zip

Name	Value
First name*	John
Surname*	Doe
E-Mail*	License@doe.com
Telephone*	0011223344-55
Fax	0011223344-100
Customer number	123456789
Company*	Doe Example LTD

Fields marked with '*' are mandatory.

Figure 61: License Pane - Request Form, please fill out / Mandatory data

- Enter all mandatory fields under **Request Form, please fill out > Value** (marked with*).
- 3. Additional order data, not mandatory (editable fields):
 - Fax
 - Customer Number
 - Order Number
 - Value added tax identification number
- Under **Request Form, please fill out > Value** enter all fields for the additional data, which are not mandatory.

6.5.7 Ordering the License

Place your order in the **License** pane. Therefore:



Figure 62: License Pane – Selecting the Subsidiary / Ordering / Contacts

1. Select the **Subsidiary** (4), to which the order shall be send.
2. Place the order:

- | | <i>Refer to Section:</i> | <i>Page</i> |
|---|---|-------------|
| • by E-Mail (5), | <i>Ordering the License <u>by E Mail</u></i> | 108 |
| • or by Fax (6)
or by Telephone (7), | <i>Ordering the License <u>by Fax or by Telephone</u></i> | 109 |
| • or in a File (8). | <i><u>Exporting License Request to a File</u></i> | 111 |
- The **Contact Data** of the selected subsidiary are displayed under Position (9), (10) and (11).

6.5.7.1 Ordering the License by E Mail

You can place your order by e-mail.



Figure 63: License Pane – placing the order by E-mail

- Click **E-mail...** 5.
- The order E-mail **License request** opens:

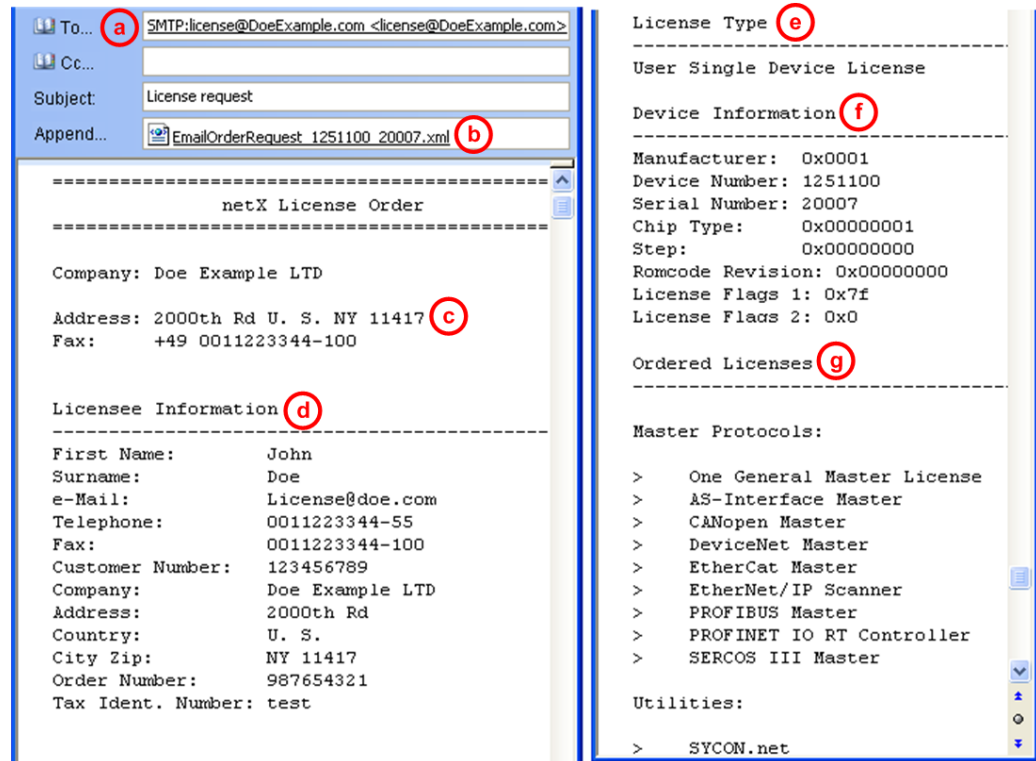


Figure 64: Example: Order E-Mail License request

- The order e-mail **License request** contains:
 - the **E-mail...** of the selected subsidiary a,
 - the automatically generated **XML file** b *EmailOrderRequest_[Devicenumbr][Serialnumber].xml* with a summary info of the **order information**,
 - the **Order Address** c,
 - the **License Information** d,
 - the **License Type** e,
 - the **Device Data** f,
 - the **ordered Licenses** g.
- Send the order e-mail **License request**.
- The order process is complete.

6.5.7.2 Ordering the License by Fax or by Telephone

You can place your order by Fax or by Telephone.



Figure 65: License Pane - placing the order by Fax or by Telephone

- Click **Print Fax Form** ⑥ or **Telephone...** ⑦.
- The summary of the ordering data *PrintOrderRequest_[Devicenum-ber]_[Serialnumber].html* is opened in a browser window.



Note: If your browser does not display the order data or the window **Move Element** or **Copy Element** are displayed, check the safety settings of your system.

netX License Order Form

Doe Example LTD
2000th Rd

NY 11417
U. S.
fax: +11223344-100

Licensee Information ④

<i>First Name:</i>	John
<i>Surname:</i>	Doe
<i>e-Mail:</i>	License@doe.com
<i>Telephone:</i>	0011223344-55
<i>Fax:</i>	0011223344-100
<i>Customer No:</i>	123456789
<i>Company:</i>	Doe Example LTD
<i>Address:</i>	2000th Rd
<i>Country:</i>	U. S.
<i>City Zip:</i>	NY 11417
<i>Order Number:</i>	987654321
<i>Tax Ident. Number:</i>	test

License Type ⑤

User Single Device License

Device Information ⑥

<i>Manufacturer:</i>	0x0001
<i>Device Number:</i>	1251100
<i>Serial Number:</i>	20007
<i>Chip Type:</i>	0x00000001
<i>Step:</i>	0x00000000
<i>Romcode Revision:</i>	0x00000000
<i>License Flags 1:</i>	0x7f
<i>License Flags 2:</i>	0x0

Ordered Licenses ⑦

Master Protocols

- One General Master License
- Sercos III Master

Utilities

- SYCON.net

Date: _____

Signature: _____

Figure 66: Example: Order Data Form *PrintOrderRequest*

- The order data form contains:
- the **Order Address** ^c,
- the **License Information** ^d,
- the **License Type** ^e,
- the **Device Data** ^f,
- the **ordered Licenses** ^g.
- Print the order data form, sign it and send it by Fax.



Figure 67: License Pane – Fax Number of the selected Subsidiary

- Use the Fax number ¹⁰, which is displayed after the subsidiary was selected in the **License** pane.

Or:

- Keep ready the order data form and communicate the order data via telephone.



Figure 68: License Pane – Telephone Number of the selected Subsidiary

- Use the telephone number ¹¹, which is displayed after the subsidiary was selected in the **License** pane.
- The order process is complete.

6.5.7.3 Exporting License Request to a File

If you are working on a process computer without an e-mail client, you can export your order information to a file, save the file to a removable disk and place your order manually via e-mail from a different PC.



Figure 69: License Pane - Ordering by exported File and E-Mail

- Click **Export License Request...** 8.
- The window **Browse For Folder** is displayed.
- Choose for or create a new folder on a removable disk.
- Save the automatically generated **XML file** *EmailOrderRequest_- [Devicenumbr]_[Serialnumber].xml* with a summary info of the **order information** to this folder.
- Send this file from a PC with an e-mail client manually via e-mail.
- Therefore, use an e-mail address, which is displayed after the subsidiary was selected in the **License** pane (see Position 9 Figure *License Pane*).
- The order process is complete.

6.5.8 How to get the License and transfer it to the Device



Note: License files can only be delivered via e-mail. The e-mail contains a link to download the license file.

According to the license you ordered, you will receive an e-mail containing a **Link to download the License File**. This leads to a server PC on which the license file is provided. Using the received link you will have to save the license file on your PC and then transfer the license to your device. If your e-mail client is on another PC as your device, you must save your license file e. g. to an USB stick.

Steps how to proceed


1. Save the license file to a PC or a disk.
 - Click to the **Link to download the License File** in the e-mail.
 - Save the license file *.nxl to a PC or a removable disk.
2. Download the license file to the device.
 - Respectively connect the removable disk with the license file to the PC, which is connected to your device.
 - Click **Download License**  in the **License** pane in the configuration software.



Figure 70: License Pane - Download License

- The File selection window **Open** is displayed.
 - Therein select the license file *netX License Files (*.nxl)*.
 - Click **Open**.
 - The license file is transferred to the device.
 - After this the license is present in the device and is activated with the next device reset.
3. Activate Device Reset



Hint: To activate the license in the first device, a device reset is required.

- To check whether the license has been activated, follow the steps in section *Which Licenses are present in the Device?*

7 Diagnosis

7.1 Overview Diagnosis

The dialog **Diagnosis** serves to diagnose the device behavior and communication errors. For diagnosis the device must reside in online state.

Diagnosis Panes

The table below gives an overview for the individual **Diagnosis** dialog panes descriptions:

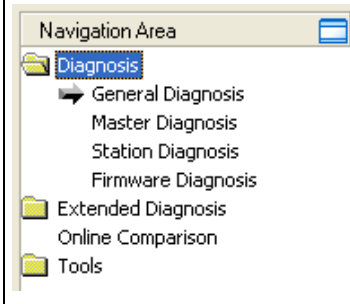
EtherCAT Master DTM	Folder Name / Section	Manual Page
	<i>General Diagnosis</i>	114
	<i>Master Diagnosis</i>	116
	<i>Station Diagnosis</i>	117
	<i>Firmware Diagnosis</i>	118
Navigation Area - Diagnosis		

Table 32: Descriptions of the Diagnosis Panes

Online Connection to the Device



Note: Accessing the **Diagnosis** panes of the EtherCAT Master DTM requires an online connection from the EtherCAT Master DTM to the EtherCAT Master device. For further information refer to section *Connecting/Disconnecting Device* on page 138.

How to proceed

1. In the Master DTM diagnosis dialog check whether the communication is OK:

Diagnosis > General Diagnosis > Device status "Communication" must be green!

2. **"Communication"** is green: Open the **IO Monitor** and test the input or output data..
3. **"Communication"** is not green: Use **Diagnosis** and **Extended diagnosis** for troubleshooting.

Extended Diagnosis

The **Extended Diagnosis** helps to find communication and configuration errors, when default diagnosis fails. For further information refer to section *Overview Extended Diagnosis* on page 119.

7.2 General Diagnosis

Information regarding the Device State and other general diagnosis parameters are displayed in the **General Diagnosis** dialog.

General Diagnosis

Device state

- ☐ Communication
- ☒ Run
- ☐ Ready
- ☐ Error

Network state

- ☒ Operate
- ☐ Idle
- ☐ Stop
- ☐ Offline

Configuration state













- ☐ Configuration locked
- ☐ New configuration pending
- ☐ Reset required
- ☒ Bus ON

Communication error:

Watchdog time:

Error count:

Figure 71: General Diagnosis

LED	Meaning	Color	State
Device State			
Communication	Shows whether the EtherCAT device executes the network communication.	 (green)	In COMMUNICATION state
		 (gray)	Not in COMMUNICATION state
Run	Shows whether the EtherCAT device has been configured correctly.	 (green)	Configuration OK
		 (gray)	Configuration not OK
Ready	Shows whether the EtherCAT device has been started correctly. The EtherCAT device waits for a configuration.	 (yellow)	Device READY
		 (gray)	Device not READY
Error	Shows whether the EtherCAT device records a device status error. For further information about the error characteristics and the number of counted errors refer to the extended diagnosis.	 (red)	ERROR
		 (gray)	No ERROR
Network State			
Operate	Shows whether the EtherCAT device is in data exchange. In a cyclic data exchange the input data or the output data of the EtherCAT Master are transmitted to the EtherCAT Slave.	 (green)	In OPERATION state
		 (gray)	Not in OPERATION state
Idle	Shows whether the EtherCAT device is in idle state.	 (yellow)	In IDLE state
		 (gray)	Not in IDLE state













LED	Meaning	Color	State
Stop	Shows whether the EtherCAT device is in Stop state: There is no cyclic data exchange at the EtherCAT network. The EtherCAT device was stopped by the application program or it changed to the Stop state because of a bus error.	 (red)	In STOP state
		 (gray)	Not in STOP state
Offline	The EtherCAT Master is offline as long as it does not have a valid configuration.	 (yellow)	In OFFLINE state
		 (gray)	Not in OFFLINE state
Configuration State			
Configuration locked	Shows whether the EtherCAT device configuration is locked, to avoid the configuration data are typed over.	 (yellow)	Configuration LOCKED
		 (gray)	Configuration not LOCKED
New Configuration pending	Shows whether a new EtherCAT device configuration is available.	 (yellow)	New Configuration pending
		 (gray)	No new Configuration pending
Reset required	Shows whether a firmware reset is required as a new EtherCAT device configuration has been loaded into the device.	 (yellow)	RESET required
		 (gray)	No RESET required
Bus ON	Shows whether the bus communication was started or stopped. I. e., whether the device is active on the bus or no bus communication to the device is possible and no response telegrams are sent.	 (green)	Bus ON
		 (gray)	Bus OFF

Table 33: Indication General Diagnosis

Parameter	Meaning
Communication Error	Shows the name of the communication error. If the cause of error is resolved, the value will be set to zero again.
Watchdog time	Shows the watchdog time in ms.
Error Count	This field holds the total number of errors detected since power-up, respectively after reset. The protocol stack counts all sorts of errors in this field no matter whether they were network related or caused internally.

Table 34: Parameter General Diagnosis

7.3 Master Diagnosis

Information regarding the Slave State, slave errors and slaves configured, active or in diagnostic are displayed in the **Master Diagnosis** dialog.


Master Diagnosis	
Slave state	failed
Slave error log indicator	available
Configured slaves	2
Active slaves	0
Slaves with diagnostic	2

Figure 72: Master Diagnosis

Parameter	Meaning	Range of Value / Default Value
Slave state	Shows whether slave state is ok or not. The Slave state field for Master diagnosis shows whether the Master is in cyclic data exchange to all configured slaves. In case there is at least one slave missing or if the slave has a diagnostic request pending, the status will be set to FAILED. For protocols that support non-cyclic communication only, the slave state is set to OK as soon as a valid configuration is found.	UNDEFINED, OK, FAILED
Slave error log indicator	Shows whether the Slave Error Log Indicator is available. The error log indicator field holds the number of entries in the internal error log. If all entries are read from the log, the field will be set to zero.	EMPTY, AVAILABLE
Configured slaves	Shows number of configured slaves. Number of configured slaves in the network according to the slave list derived from the configuration database created by the configuration software. The list includes the slaves to which the Master has to open a connection.	
Active slaves	Shows number of active slaves. Number of slaves in data exchange mode. The list includes the slaves to which the Master has successfully opened a connection.	
Slaves with diagnostic	Shows number of slaves with diagnostic. Number of Slaves with diagnosis or error slaves.	

Table 35: Parameter Master Diagnosis

7.4 Station Diagnosis

Station Diagnosis			
Status	StationAddress	AutoIncAddress	SlaveName
	256	0	cifX RE ECS V2.0





 Running	 Diagnosis	 Not found	 Error
---	---	---	---

Figure 73: Station Diagnosis

The **Station Diagnosis** shows the status for all EtherCAT Slave device which are configured in the EtherCAT Master. The DTM updates this display cyclically.

Column	Meaning
Status	The current status of the device assigned to the displayed station address, see <i>Table 37: Possible</i> .
Station Address	Station address, to which the device is assigned.
AutoIncAddress	Auto Increment Address (Auto-increment addressing means addressing of the slave devices according to their physical position in the communication ring.)
SlaveName	The name of the device assigned to the displayed station address

Table 36: Columns of table 'Station Diagnosis'

The legend below describes the possible values for the state of a device, which is assigned to a station address.

Color	Name	Meaning
green	Running	The device assigned to this station address is running.
yellow	Diagnosis	Diagnosis is available for the device assigned to this station address.
blue	Not found	The device assigned to this station address was parameterized, but not found.
red	Error	An error message is available for the device assigned to this station address.

Table 37: Possible Values for the Status

7.5 Firmware Diagnosis

In the dialog **Firmware Diagnosis** the current task information of the firmware is displayed.

Under **Firmware** or **Version** the name of the firmware and version (including the date) are indicated.

[illegible]

Figure 74: Firmware-Diagnose (* Der Name der Firmware erscheint.)

Task Information:

The table **Task Information** is listing the task information of the single firmware tasks.

Column	Meaning
Task	Task number
Name of task	Name of the task
Version	Version number of the task
Prio	Priority of the task
Description	Description of the task
Status	Current status of the task

Table 38: Description Table Task Information

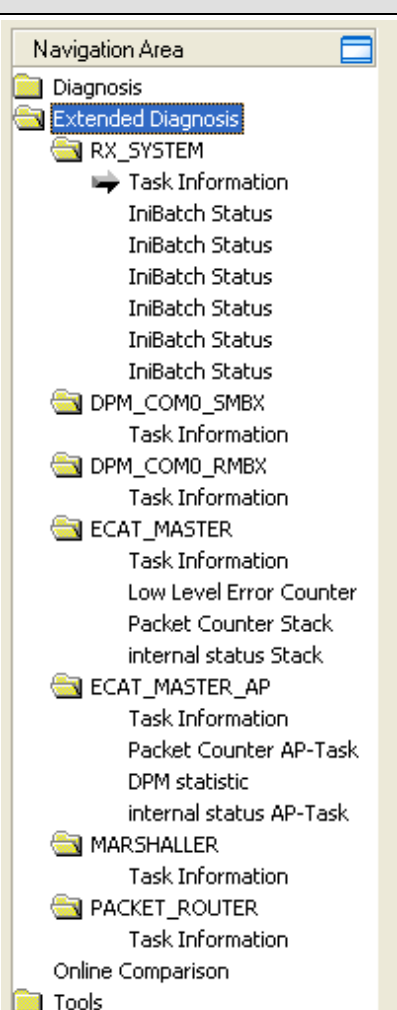
8 Extended Diagnosis

8.1 Overview Extended Diagnosis

The **Extended Diagnosis** of the EtherCAT Master DTM helps to find communication and configuration errors. Therefore it contains a list of diagnosis structures as online counter, states and parameters.

Dialog Panes “Extended Diagnosis”

The table below gives an overview for the **Extended Diagnosis** dialog panes descriptions:

EtherCAT Master DTM	Folder Name in the Navigation Area	Dialog Pane	Manual Page
	RX-SYSTEM	Task Information	120
		IniBatch Status	121
	DPM_COMO_SMBX	Task Information	120
	DPM_COMO_RMBX	Task Information	120
	ECAT_MASTER	Task Information	120
		Low Level Error Counter	122
		Packet Counter Stack	123
		Internal Status Stack	125
	ECAT_MASTER_AP	Task Information	120
		Packet Counter AP-Task	126
		DPM Statistics	128
		Internal Status of AP-Task	129
	MARSHALLER	Task Information	120
	PACKET_ROUTER	Task Information	120

Navigation Area - Extended Diagnosis

Table 39: Descriptions of the Dialog Panes Extended Diagnosis

Online Connection to the Device



Note: Accessing the **Extended Diagnosis** dialog panes of the EtherCAT Master DTM requires an online connection from the EtherCAT Master DTM to the EtherCAT Master device. For further information refer to section *Connecting/Disconnecting Device* on page 87.

8.2 Task Information

Task Information	
Task states	
Name	Value
Identifier	
Major version	<i>[The displayed values depend from the corresponding task]</i>
Minor version	
Maximum Packet size	
Default Que	
Unique identifier	
Init result	

Figure 75: Extended Diagnosis > [Folder Name] > Task Information Example Display

Name	Description
Identifier	Identification number of the task
Major version	Task version, contains incompatible changes
Minor version	Task version, contains compatible changes
Maximum packet size	Maximum packet size, which the task sends
Default Queue	Queue handle, which is accessible via DPM by mailbox.
UUID	Unique user ID, 16 Byte indicator used for task identification and its affiliation e. g. to a stack (therein different identification data are coded in).
Init result	Error Code, 0= no Error The description of the error codes can be found in this manual or in the corresponding software reference manuals.

Table 40: Extended Diagnosis > [Folder Name] > Task Information

8.3 IniBatch Status

IniBatch-Status	
Task states	
Name	Value
Communication Channel	0
Current State	Error
IniBatch Result	No DBM file
OpenDbm Result	24975
SendPacket Result	0
Confirmation Result	0
Last Packet Number	0
Last Packet Command	0
Last Packet Length	0
Last Packet Destination	0

Figure 76: Extended Diagnosis > [Folder Name] > IniBatch Status Example Display

Name	Description
Communication Channel	Number of the communication channel used by the device.
Current State	Idle; IniBatch packets in progress; Retrying to send last packet; Error
IniBatch Result	Ok; No DBM file; No Packet table; No data set available; Data set is shorter than packet length; Packet Buffer is shorter than Packet length; Invalid packet destination; Logical queue not defined Send packet failed; Too many retries; Error in confirmation packet status
OpenDbm Result	Error when opening the IniBatch data base Under "OpenDbm Result" the error code is typed in, when "IniBatch Result" == "No DBM file" (1) is.
SendPacket Result	Error when sending a packet Under "SendPacket Result" the error code is typed in, when "IniBatch Result" == "send packet failed" (8) is.
Confirmation Result	Confirmation error when sending packets Under "Confirmation Result" the packet specific error code from the ulSta is typed in, when "IniBatch Result" == "Error in confirmation packet status" (10) is.
Last Packet Number	Value depends by the communication system.
Last Packet Command	Value depends by the communication system.
Last Packet Length	Value depends by the communication system.
Last Packet Destination	Value depends by the communication system.

Table 41: Extended Diagnosis > [Folder Name] > IniBatch Status

The task status "Confirmation Result" is bus specific. The other task statuses are rcx-related error codes.

8.4 ECAT_MASTER

8.4.1 Low Level Error Counter

Low Level Error Counter	
Task states	
Name	Value
CYCCMD_WKC_ERROR counter	62185
MASTER_INITCMD_WKC_ERROR counter	0
SLAVE_INITCMD_WKC_ERROR counter	0
EOE_MBXRCV_WKC_ERROR counter	0
COE_MBXRCV_WKC_ERROR counter	0
FOE_MBXRCV_WKC_ERROR counter	0
EOE_MBXSNL_WKC_ERROR counter	0
COE_MBXSNL_WKC_ERROR counter	0
FOE_MBXSNL_WKC_ERROR counter	0
FRAME_RESPONSE_ERROR counter	0
SLAVE_INITCMD_RESPONSE_ERROR counter	0
MASTER_INITCMD_RESPONSE_ERROR counter	0
CMD_MISSING counter	0
MBSLAVE_INITCMD_TIMEOUT counter	0
NOT_ALL_DEVICES_OPERATIONAL counter	0
ETH_LINK_NOT_CONNECTED counter	0
CYCCMD_TIMEOUT counter	0
RED_LINEBRK counter	0
STATUS_SLAVE_ERROR counter	0
SLAVE_ERROR_STATUS_INFO counter	0
SLAVE_NOT_ADDRESSABLE counter	0

Figure 77: Extended Diagnosis > ECAT_MASTER > Low Level Error Counter

Name	Description
CYCCMD_WKC_ERROR counter	Counter for CYCCMD_WKC_ERROR
MASTER_INITCMD_WKC_ERROR counter	Counter for MASTER_INITCMD_WKC_ERROR
SLAVE_INITCMD_WKC_ERROR counter	Counter for SLAVE_INITCMD_WKC_ERROR
EOE_MBXRCV_WKC_ERROR counter	Counter for EOE_MBXRCV_WKC_ERROR
COE_MBXRCV_WKC_ERROR counter	Counter for COE_MBXRCV_WKC_ERROR
FOE_MBXRCV_WKC_ERROR counter	Counter for FOE_MBXRCV_WKC_ERROR
EOE_MBXSNL_WKC_ERROR counter	Counter for EOE_MBXSNL_WKC_ERROR
COE_MBXSNL_WKC_ERROR counter	Counter for COE_MBXSNL_WKC_ERROR
FOE_MBXSNL_WKC_ERROR	Counter for FOE_MBXSNL_WKC_ERROR
FRAME_RESPONSE_ERROR	Counter for FRAME_RESPONSE_ERROR
SLAVE_INITCMD_RESPONSE_ERROR	Counter for SLAVE_INITCMD_RESPONSE_ERROR
MASTER_INITCMD_RESPONSE_ERROR counter	Counter for MASTER_INITCMD_RESPONSE_ERROR
CMD_MISSING counter	Counter for CMD_MISSING
MBSLAVE_INITCMD_TIMEOUT counter	Counter for MBSLAVE_INITCMD_TIMEOUT
NOT_ALL_DEVICES_OPERATIONAL counter	Counter for NOT_ALL_DEVICES_OPERATIONAL
ETH_LINK_NOT_CONNECTED counter	Counter for ETH_LINK_NOT_CONNECTED
CYCCMD_TIMEOUT counter	Counter for CYCCMD_TIMEOUT
RED_LINEBRK counter	Counter for RED_LINEBRK

Name	Description
STATUS_SLAVE_ERROR counter	Counter for STATUS_SLAVE_ERROR
SLAVE_ERROR_STATUS_INFO counter	Counter for SLAVE_ERROR_STATUS_INFO
SLAVE_NOT_ADDRESSABLE counter	Counter for SLAVE_NOT_ADDRESSABLE

Table 42: Extended Diagnosis > ECAT_MASTER > Low Level Error Countern

8.4.2 Packet Counter Stack

Packet Counter Stack	
Task states	
Name	Value
ulEthercatMasterCmdRegisterAtStackReq	1
ulEthercatMasterCmdSetBusparamReq	1
ulEthercatMasterCmdBusOnReq	2
ulEthercatMasterCmdBusOffReq	2
ulEthercatMasterCmdHostWdgTimeoutReq	0
ulRcxGetSlaveHandleReq	0
ulRcxGetSlaveConnInfoReq	0
ulConfigurationReloadReq	0
ulEthercatMasterCmdUpdateCommunicationStateRes	10
ulEthercatMasterCmdUpdateGlobalSlaveInfoRes	2
ulUnknownCommandReq	0
ulEthercatMasterCmdSdoUploadReq	0
ulEthercatMasterCmdSdoDownloadReq	0
ulEthercatMasterCmdGetOdListReq	0
ulEthercatMasterCmdGetObjectDescReq	0
ulEthercatMasterCmdGetEntryDescReq	0
ulEthercatMasterCmdReadEmergencyReq	0
ulEthercatMasterCmdGetDcDeviationReq	0
ulEthercatMasterCmdStartBusScanReq	0
ulEthercatMasterCmdBusScanInfoReq	0

Figure 78: Extended Diagnosis > ECAT_MASTER > Packet Counter Stack

Name	Description
ulEthercatMasterCmdRegisterAtStackReq	Counter for ulEthercatMasterCmdRegisterAtStackReq
ulEthercatMasterCmdSetBusparamReq	Counter for ulEthercatMasterCmdSetBusparamReq
ulEthercatMasterCmdBusOnReq	Counter for ulEthercatMasterCmdBusOnReq
ulEthercatMasterCmdBusOffReq	Counter for ulEthercatMasterCmdBusOffReq
ulEthercatMasterCmdHostWdgTimeoutReq	Counter for ulEthercatMasterCmdHostWdgTimeoutReq
ulRcxGetSlaveHandleReq	Counter for ulRcxGetSlaveHandleReq
ulRcxGetSlaveConnInfoReq	Counter for ulRcxGetSlaveConnInfoReq
ulConfigurationReloadReq	Counter for ulConfigurationReloadReq
ulEthercatMasterCmdUpdateCommunicationStateRes	Counter for ulEthercatMasterCmdUpdateCommunicationStateRes
ulEthercatMasterCmdUpdateGlobalSlaveInfoRes	Counter for ulEthercatMasterCmdUpdateGlobalSlaveInfoRes
ulUnknownCommandReq	Counter for ulUnknownCommandReq
ulEthercatMasterCmdSdoUploadReq	Counter for ulEthercatMasterCmdSdoUploadReq

Name	Description
ulEthercatMasterCmdSdoDownloadReq	Counter for ulEthercatMasterCmdSdoDownloadReq
ulEthercatMasterCmdGetOdListReq	Counter for ulEthercatMasterCmdGetOdListReq
ulEthercatMasterCmdGetObjectDescReq	Counter for ulEthercatMasterCmdGetObjectDescReq
ulEthercatMasterCmdGetEntryDescReq	Counter for ulEthercatMasterCmdGetEntryDescReq
ulEthercatMasterCmdReadEmergencyReq	Counter for ulEthercatMasterCmdReadEmergencyReq
ulEthercatMasterCmdGetDcDeviationReq	Counter for ulEthercatMasterCmdGetDcDeviationReq
ulEthercatMasterCmdStartBusScanReq	Counter for ulEthercatMasterCmdStartBusScanReq
ulEthercatMasterCmdBusScanInfoReq	Counter for ulEthercatMasterCmdBusScanInfoReq

Table 43: Extended Diagnosis > ECAT_MASTER > Packet Counter Stack

8.4.3 Internal Status Stack

[illegible]

Figure 79: Extended Diagnosis > ECAT_MASTER > Internal Status Stack

Name	Description
Current state	<p>Current state of EtherCAT Stack:</p> <p>Possible Values:</p> <p>ETHERCAT_MASTER_NOT_INIT</p> <p>ETHERCAT_MASTER_WAIT_FOR_BUSPARAM</p> <p>ETHERCAT_MASTER_CONFIGURED</p> <p>ETHERCAT_MASTER_WAIT_FOR_LINK</p> <p>ETHERCAT_MASTER_RUNNING</p> <p>ETHERCAT_MASTER_COMMUNICATING</p> <p>ETHERCAT_MASTER_IDLE</p> <p>ETHERCAT_MASTER_WATCHDOG_ERROR</p> <p>ETHERCAT_MASTER_BUS_SCAN</p>
Error during reset	If an error occurred during reset, ist error code is displayed here. In case of successful reset, the value 0x0 is displayed here.
Link	<p>Status of link</p> <p>Possible Values:</p> <p>down</p> <p>up</p>
Hard reset required	<p>A hard reset is required</p> <p>Possible Values:</p> <p>no</p> <p>yes</p>

Table 44: Extended Diagnosis > ECAT_MASTER > Internal Status Stack

8.5 ECAT_MASTER_AP

8.5.1 Packet Counter AP-Task

Packet Counter AP-Task	
Task states	
Name	Value
ulDiagInfoGetCommonStateReq	4732
ulDiagInfoGetWatchdogTimeReq	0
ulDiagInfoSetWatchdogTimeReq	0
ulRcxGetSlaveHandleReq	0
ulRcxGetSlaveHandleCnf	0
ulRcxGetSlaveConnInfoReq	0
ulRcxGetSlaveConnInfoCnf	0
ulUnknownCommandReq	0
ulEthercatMasterCmdSetBusparamReq	1
ulEthercatMasterCmdSetBusparamCnf	1
ulEthercatMasterCmdBusOnCnf	2
ulEthercatMasterCmdBusOffCnf	2
ulEthercatMasterCmdUpdateCommunicationStateInd	10
ulEthercatMasterCmdUpdateGlobalSlaveInfoInd	2
ulConfigurationReloadReq	0
ulConfigurationReloadCnf	0
ulEthercatMasterApCmdHostWdgTimeoutReq	0
ulEthercatMasterCmdHostWdgTimeoutCnf	0
ulEthercatMasterCmdRegisterAtStackCnf	1
ulEthercatMasterCmdSdoUploadReq	0
ulEthercatMasterCmdSdoDownloadReq	0
ulEthercatMasterCmdGetOdListReq	0
ulEthercatMasterCmdGetObjectDescReq	0
ulEthercatMasterCmdGetEntryDescReq	0
ulEthercatMasterCmdReadEmergencyReq	0
ulEthercatMasterCmdGetDcDeviationReq	0
ulEthercatMasterCmdStartBusScanReq	0
ulEthercatMasterCmdBusScanInfoReq	0
ulRcxStartStopCommReq	0

Figure 80: Extended Diagnosis > ECAT_MASTER_AP > Packet Counter AP-Task

Name	Description
ulDiagInfoGetCommonStateReq	Counter for ulDiagInfoGetCommonStateReq
ulDiagInfoGetWatchdogTimeReq	Counter for ulDiagInfoGetWatchdogTimeReq
ulDiagInfoSetWatchdogTimeReq	Counter for ulDiagInfoSetWatchdogTimeReq
ulRcxGetSlaveHandleReq	Counter for ulRcxGetSlaveHandleReq
ulRcxGetSlaveHandleCnf	Counter for ulRcxGetSlaveHandleCnf
ulRcxGetSlaveConnInfoReq	Counter for ulRcxGetSlaveConnInfoReq
ulRcxGetSlaveConnInfoCnf	Counter for ulRcxGetSlaveConnInfoCnf
ulUnknownCommandReq	Counter for ulUnknownCommandReq
ulEthercatMasterCmdSetBusparamReq	Counter for ulEthercatMasterCmdSetBusparamReq
ulEthercatMasterCmdSetBusparamCnf	Counter for ulEthercatMasterCmdSetBusparamCnf
ulEthercatMasterCmdBusOnCnf	Counter for ulEthercatMasterCmdBusOnCnf
ulEthercatMasterCmdBusOffCnf	Counter for ulEthercatMasterCmdBusOffCnf
ulEthercatMasterCmdUpdateCommunicationStateInd	Counter for ulEthercatMasterCmdUpdateCommunicationStateInd
ulEthercatMasterCmdUpdateGlobalSlaveInfoInd	Counter for ulEthercatMasterCmdUpdateGlobalSlaveInfoInd
ulConfigurationReloadReq	Counter for ulConfigurationReloadReq

Name	Description
ulConfigurationReloadCnf	Counter for ulConfigurationReloadCnf
ulEthercatMasterApCmdHostWdgTimeoutReq	Counter for ulEthercatMasterApCmdHostWdgTimeoutReq
ulEthercatMasterCmdHostWdgTimeoutCnf	Counter for ulEthercatMasterCmdHostWdgTimeoutCnf
ulEthercatMasterCmdRegisterAtStackCnf	Counter for ulEthercatMasterCmdRegisterAtStackCnf
ulEthercatMasterCmdSdoUploadReq	Counter for ulEthercatMasterCmdSdoUploadReq
ulEthercatMasterCmdSdoDownloadReq	Counter for ulEthercatMasterCmdSdoDownloadReq
ulEthercatMasterCmdGetOdListReq	Counter for ulEthercatMasterCmdGetOdListReq
ulEthercatMasterCmdGetObjectDescReq	Counter for ulEthercatMasterCmdGetObjectDescReq
ulEthercatMasterCmdGetEntryDescReq	Counter for ulEthercatMasterCmdGetEntryDescReq
ulEthercatMasterCmdReadEmergencyReq	Counter for ulEthercatMasterCmdReadEmergencyReq
ulEthercatMasterCmdGetDcDeviationReq	Counter for ulEthercatMasterCmdGetDcDeviationReq
ulEthercatMasterCmdStartBusScanReq	Counter for ulEthercatMasterCmdStartBusScanReq
ulEthercatMasterCmdBusScanInfoReq	Counter for ulEthercatMasterCmdBusScanInfoReq
ulRcxStartStopCommReq	Counter for ulRcxStartStopCommReq

Table 45: Extended Diagnosis > ECAT_MASTER_AP > Packet Counter AP-Task

8.5.2 DPM Statistics

[illegible]

Figure 81: Extended Diagnosis > ECAT_MASTER_AP > DPM Statistics

Name	Description
cyclic input data exchange requested counter	Counter for requested cyclic input data exchanges
cyclic output data exchange requested counter	Counter for requested cyclic output data exchanges
cyclic input data exchange executed counter	Counter for executed cyclic input data exchanges
cyclic output data exchange executed counter	Counter for executed cyclic output data exchanges
size of input process image	Size of input process image
size of output process image	Size of output process image

Table 46: Extended Diagnosis > ECAT_MASTER_AP > DPM Statistics

8.5.3 Internal Status of AP-Task

[illegible]

Figure 82: Extended Diagnosis > ECAT_MASTER_AP > Internal Status of AP-Task

Name	Description
hard reset required	<p>A hard reset is required</p> <p>Possible Values:</p> <p>no</p> <p>yes</p>

Table 47: Extended Diagnosis > ECAT_MASTER_AP > Internal Status of AP-Task

9 Online Comparison

SYCON.net offers the possibility to compare online between the configured devices and the scanned devices on the other hand.

Online Connection to the Device



Note: Accessing the **Online Comparison** dialog panes of the EtherCAT Master DTM requires an online connection from the EtherCAT Master DTM to the EtherCAT Master device. For further information refer to section **Connecting/Disconnecting Device** on page 138.

To access the online comparison of the topology:

- Select **Online Comparison** in the navigation area.
- A 'split screen' display appears allowing to precisely compare:
 1. The device information stored in the configuration of SYCON.net on the left half of the window.
 2. The device information scanned from the network presented on the right half of the window.

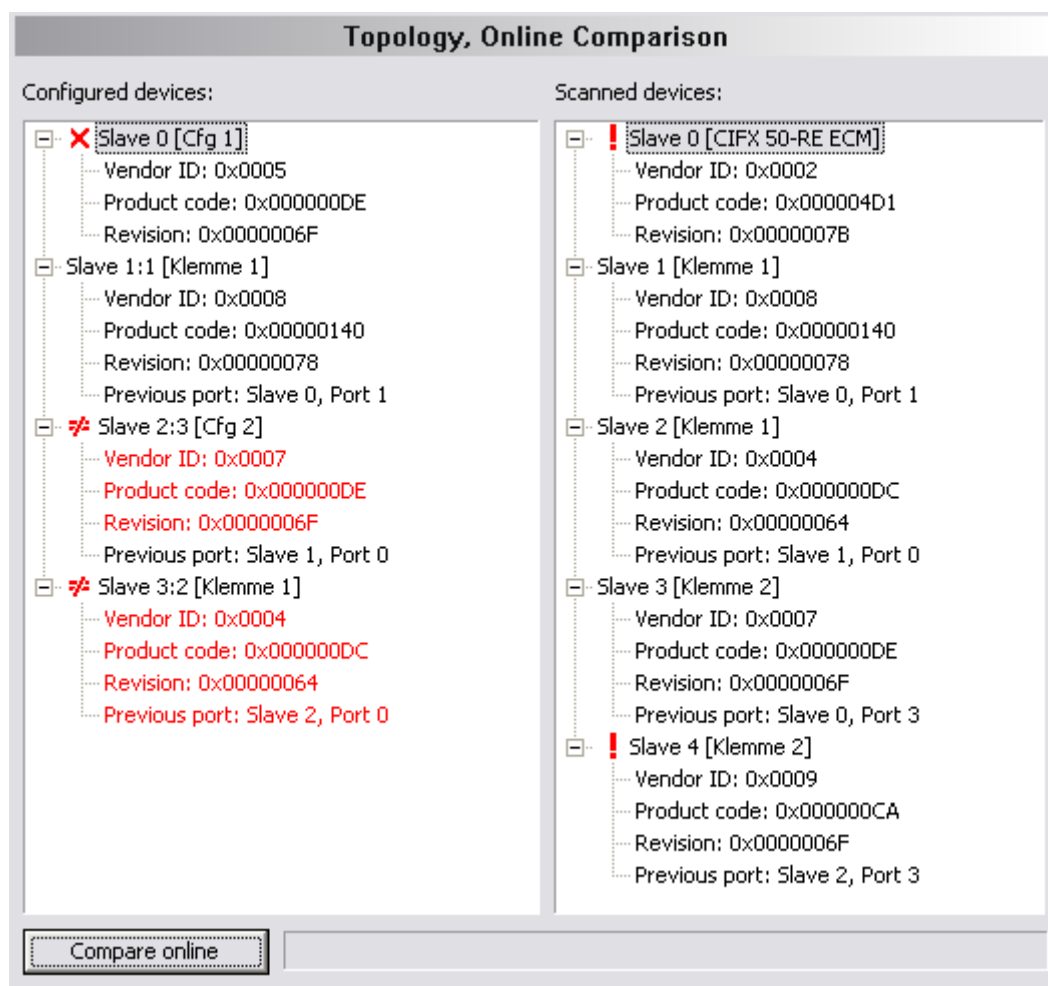


Figure 83: Online Comparison (before pressing button 'Compare online')

At the bottom you find a button

In order to start the comparison process between the configuration information stored internally in SYCON.net and the current configuration information derived by an EtherCAT network scan, proceed as follows:

- Click at the button 'Compare online', which you can find at the bottom of the window.
- The text in the button will immediately change to 'Stop process' then. The display will look like this:

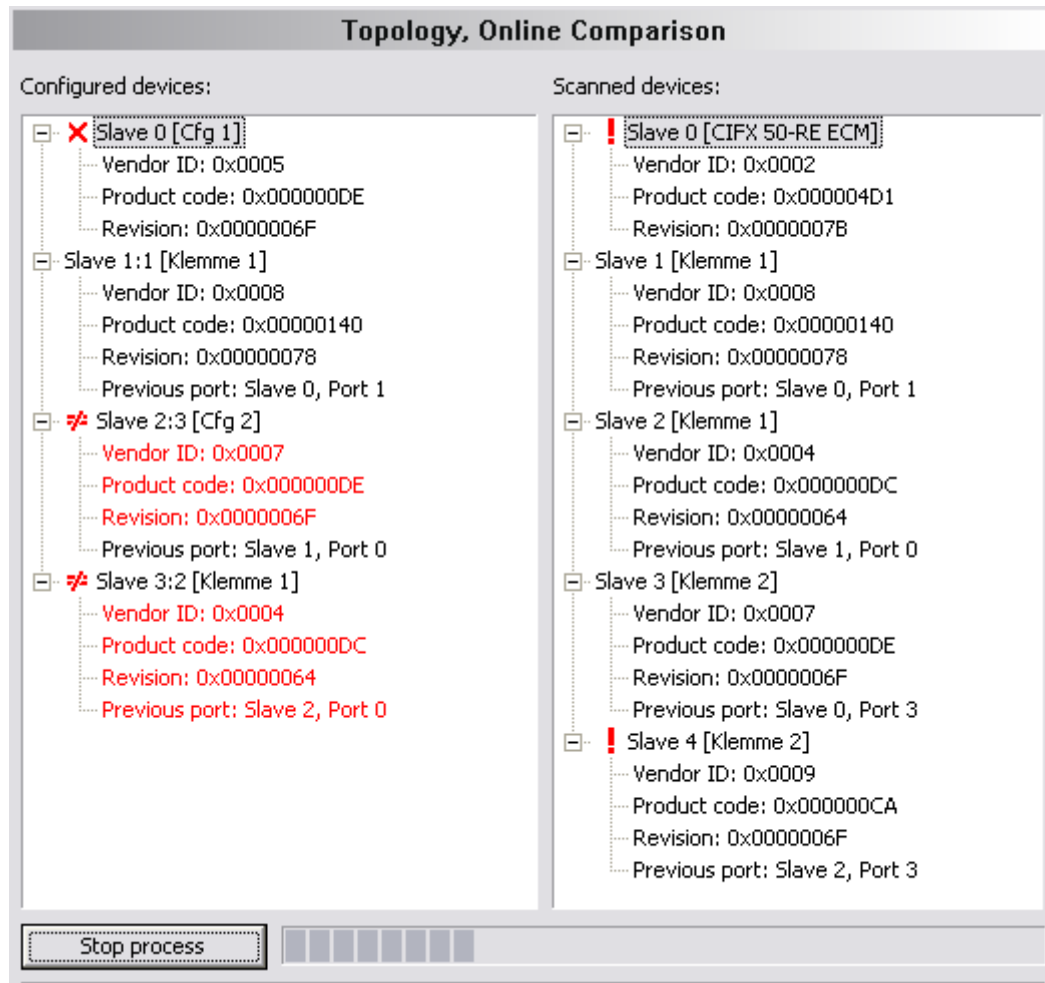


Figure 84: Online Comparison (after pressing button 'Compare online')

In order to stop the comparison process described above:

- Just click the button again.
- The comparison process will be interrupted.

The information which is displayed for each device may include:

- The Vendor ID
- The Product Code
- The Revision number
- Information on previously used ports

Information items differing between configuration and network scan are displayed in red. If the results are equal, they are displayed by black text.

In front of the name of the respective slave device additional information can be displayed. The meaning is:




Sign	Description
	A red x indicates that the configured devices could not be discovered on the bus.
No sign at all	The configured device exactly matches the scanned information about the device in the same position, i.e. the position addresses are equal.
	The configured device matches the scanned information about the device, but in a different position, i.e. the position addresses are not equal. Both values are displayed separated by a colon (for instance, 2.3 means, the device configured at position 2 could be found by the network scan, but under position 3)
	A red exclamation mark indicates a slave has been discovered by the network scan which has not been configured at all. This can only appear on the right part of the screen.

Table 48: Meaning of signs in Online Comparison

10 Tools

10.1 Overview Tools

Under **Tools** the Packet Monitor and the IO Monitor are provided for test and diagnosis purposes.

Tools Panes

The table below gives an overview for the individual **Tools** dialog panes descriptions:

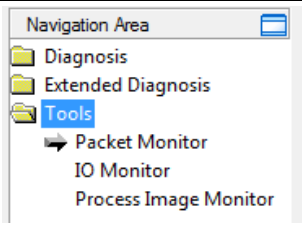
EtherCAT Master DTM	Folder Name / Section	Manual Page
 <p>Navigation Area - Tools</p>	Packet Monitor	134
	IO Monitor	137
	Process Image Monitor	139

Table 49: Descriptions of the Diagnosis Panes

Online Connection to the Device



Note: Accessing the **Tools** dialog panes of the EtherCAT Master DTM requires an online connection from the EtherCAT Master DTM to the EtherCAT Master device. For further information refer to section *Connecting/Disconnecting Device* on page 138.

10.2 Packet Monitor

The **Packet Monitor** serves for test and diagnosis purposes.

Data packets, i. e. messages are self-contained blocks of defined data length. The packets are used to communicate with the firmware and they are exchanged between the application (configuration software) and the firmware in the device. Packets can be sent once or cyclically to the connected device controlled by the user and packets received can be displayed.

Data packets comprise from a **Packet Header** and the **Send Data** or from a **Packet Header** and the **Receive Data**. The packet header can be evaluated by the receiver of the packet and contain the sender and receiver address, the data length, an ID number, status and error messages and the command or response code. The minimum packet size amounts 40 Byte for the packet header. The sending and receiving data are added.



For further information to the packet description refer to the *Protocol API Manual*.

- Open the **Packet Monitor** via **Tools > Packet Monitor**.

Figure 85: Packet Monitor

Display Mode switches the representation of the send and reception data between decimal and hexadecimal.

- Select **Reset Counter** to reset the packet counter.

10.2.1 Sending Packet

The screenshot shows the 'Send' dialog box with the following fields and values:

- Packet header:**
 - Dest: 00000001
 - Src: 00000000
 - Dest ID: 00000000
 - Src ID: 00000000
 - Len: 00000012
 - ID: 00000001
 - State: 00000000
 - Cmd: 00002F00
 - Ext: 00000000
 - Rout: 00000000
 - Auto Increment ID: ☒
- Send data:**
 - Counter: 0
 - A grid for entering data bytes (0-9 for each of 0-60 rows).
 - Buttons: 'Put cyclic' and 'Put packet'.

Figure 86: Send > Packet Header and Send Data

Packet Header

Under **Send > Packet Header** the elements of the packet header of the sending packet are displayed, which is transmitted from the application (configuration software) to the device. The packet header of the sending packets contain the elements described in the following table.

Element		Description
Dest	Destination Queue Handle	Contains the identifier of the receiver for the packet (destination task queue of the firmware).
Src	Source Queue Handle	Contains the identifier of the sender of the packet (sending task).
Dest ID	Destination Queue Reference	Contains an identifier for the receiver of unsolicited sent packets from the firmware to the application (configuration software).
Src ID	Source Queue Reference	Contains an identifier of the sender.
Len	Packet Data Length (in Bytes)	Length of the send respectively receive data.
ID	Packet Identification As Unique Number	Identifies identical data packets among each other.
State	Status / Error Code	Transmits status or error codes to the packet sender.
Cmd	Command / Response Code	Command or respond code.
Ext	Extension	Field for extensions (reserved).
Rout	Routing Information	Internal value of the firmware.

Table 50: Descriptions Packet Header

- Under **Dest** select the receiver (*destination task queue*).
- Under **Cmd** select the command identification (*Request*).

Auto Increment ID is an increment for the identifier of the data packets and increments the ID by 1 for each newly sent packet.

Send Data

- Under **Send > Send data** enter the send data of the packet, which shall be transmitted from the application (configuration software) to the mailbox of the device. The meaning of the transmitted data depends on the command or response code.

Sending Packets once or cyclic

- To send packet once, select **Put packet**.
- To send packet cyclic, select **Put cyclic**.

10.2.2 Receiving Packet

Figure 87: Packet Header and Receive Data

Packet Header

Under **Receive > Packet Header** the elements of the packet header of the receiving packet are displayed, which are transmitted back from the device to the application (configuration software). The packet header of the receiving packets contain the elements described in the following table.

Element		Description
Dest	Destination Queue Handle	Contains the identifier of the receiver for the packet (destination task queue of the firmware).
Src	Source Queue Handle	Contains the identifier of the sender of the packet (sending task).
Dest ID	Destination Queue Reference	Contains an identifier for the receiver of unsolicited sent packets from the firmware to the application (configuration software).
Src ID	Source Queue Reference	Contains an identifier of the sender.
Len	Packet Data Length (in Bytes)	Length of the send respectively receive data.
ID	Packet Identification As Unique Number	Identifies identical data packets among each other.
State	Status / Error Code	Transmits status or error codes to the packet sender.
Cmd	Command / Response Code	Command or respond code.
Ext	Extension	Field for extensions (reserved).
Rout	Routing Information	Internal value of the firmware.

Table 51: Descriptions Packet Header

Receive Data

Under **Receive > Receive Data** the receiving data of the packet, which is transmitted back from the device to the application (configuration software) are displayed.

10.3 IO Monitor

The **IO Monitor** serves for test and diagnosis purposes. It provides to view data of the process data image and to change output data easily. The display is always in a Byte manner.



Note: Only change and write output data if you know that no plant disturbances are caused by this. All output data written by the IO Monitor are transmitted at the bus and have effect on subordinate drives, IO etc.

IO Monitor

Columns: 10 Display mode: Decimal

Input data

Offset: 0 Go

	0	1	2	3	4	5	6	7	8	9
0	227	207	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0
60	n	n	n	n	n	n	n	n	n	n

Output data

Offset: 0 Go

	0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0
60	n	n	n	n	n	n	n	n	n	n

Update

Figure 88: IO Monitor

Columns switches the number of columns.

Display mode switches the representation of the input and output data between decimal and hexadecimal.

Offset / Go moves the indication of the data to the entered offset value.

➤ Enter the output value and select **Update**.

➤ Always the data of the process image are displayed, also when these Bytes have not been reserved by the configuration.



Note: Extra data are added to the input area. This allows to easily identify slave problems. The following data are added

- One or more Logical Memory Read commands to read slave mailbox states. The number of commands and the data length of each command depend on the number of slaves which support the mailbox state.
- One Broadcast Read command to read the Register AL Status of all slaves.

10.4 Process Image Monitor

The window **Process Image Monitor** lists the Slave devices connected to the Master, as well as the configured modules or input or output signals of the devices. This makes visible the fieldbus structure and the data structure of the device's input and output data transmitted at the bus. Furthermore the values of the signal data provided to the OPC server are displayed here.

➤ Open **Tools > Process Image Monitor**.

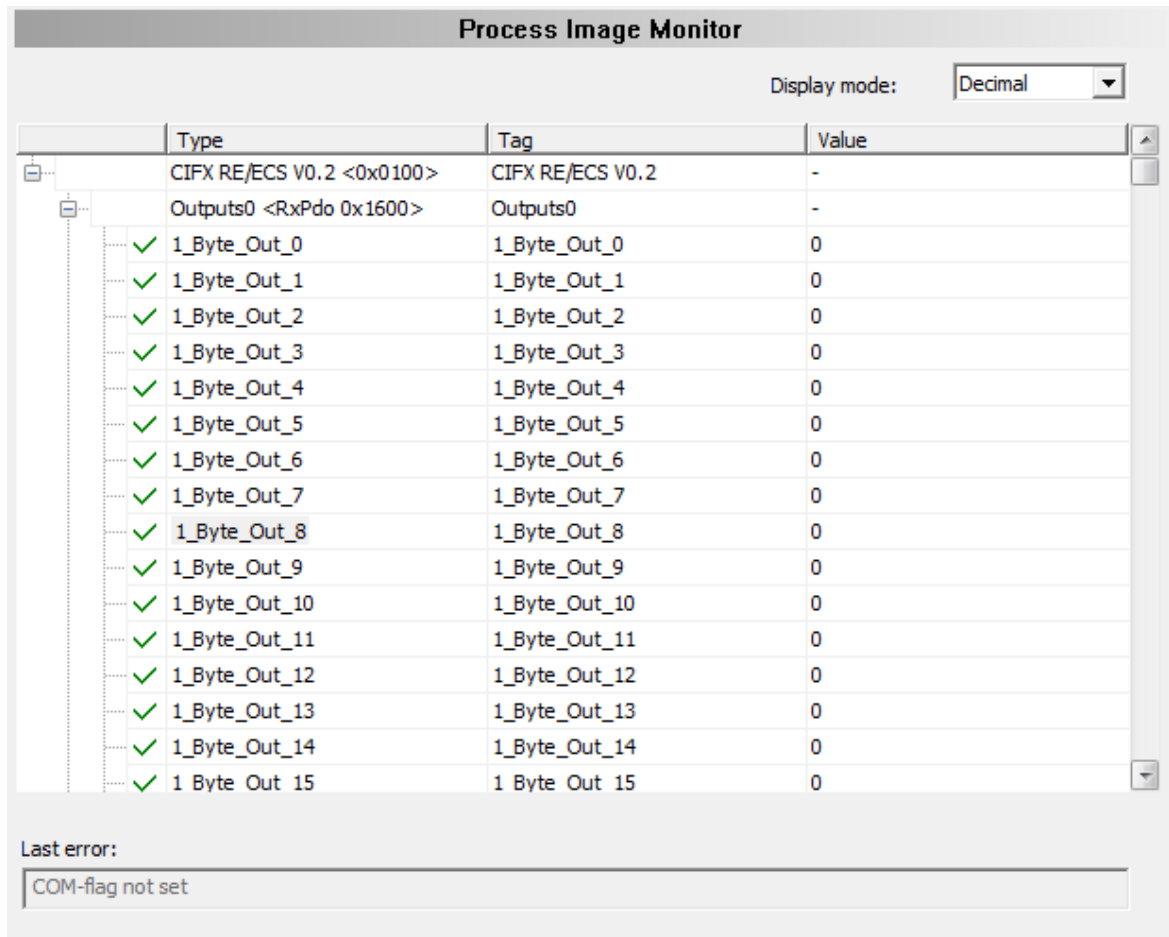


Figure 89: Window 'Process Image Monitor'

Parameter	Meaning	Range of Value / Value
Display Mode	Display of the values in the column Value in decimal or hexadecimal mode.	Decimal (Default), Hexadecimal
	The tree shows the structure of the devices (1), modules (2) and the input data (3) and output data (4).	
	Display when the input and output data are not completely read and analyzed.	
	Display when the input and output data are not valid.	
	Display when the input and output data are valid.	
Typ	Device labeling provided by the hardware: Also description of the modules or input or output signals configured to the device.	

Parameter	Meaning	Range of Value / Value
TAG	Device name provided by the hardware (not changeable in the FDT container) or symbolic name for the modules configured to the device or for the input or output signals (changeable in the window Configuration > Process Data).	
Value	Display of the valid input and output data values.	
Last Error	Last occurred error (Description see appropriate Application Programming Manual)	

Table 52: Notes to the Window 'Process Image Monitor'

11 Error Codes

11.1 Error Code Definition

For COM based application, like the ODM Server and ODM drivers, a common error definition is used, similar to the Microsoft Windows® HRESULT definition.

Error Code Structure:

COM Errors are HRESULTs, which are 32 bit values using the following layout:

```

3 3 2 2 2 2 2 2 2 2 2 2 1 1 1 1 1 1 1 1 1 1
1 0 9 8 7 6 5 4 3 2 1 0 9 8 7 6 5 4 3 2 1 0
+---+---+---+---+---+---+---+---+---+---+
|Sev|C|R|      Facility      |      Code      |
+---+---+---+---+---+---+---+---+---+---+

```

where

Sev - is the severity code:

00 - Success

01 - Informational

10 - Warning

11 - Error

C - is the Customer code flag

R - is a reserved bit

Facility - is the facility code

Code - is the facility's status code

In this common error definition, several error code regions are already reserved by Windows® itself, the ODM and some other modules.

11.2 Overview Error Codes

Overview Error Codes	Range
General Hardware Errors RCX Operating System	<i>RCX General Task:</i> 0xC02B0001 to 0xC02B4D52
	<i>RCX Common Status & Errors Codes:</i> 0x00000000 to 0xC002000C
	<i>RCX Status & Error Codes:</i> 0x00000000 to 0xC0000008
EtherCAT Master / Status /Error Codes EtherCAT Master	<i>EtherCAT Master Task Status/Error Codes:</i> 0xC00C0001 to 0xC00C0053
	<i>EtherCAT Master AP Task Status/Error Codes</i> 0xC0640001 to 0xC064000B
ODM Server	<i>General ODM Error Codes:</i> 0x8004C700 to 0x8004C761
	<i>General ODM Driver Error Codes:</i> 0x8004C7A0 to 0x8004C7C2
ODM Drivers	<i>cifX Driver Specific ODM Error:</i> 0x8004C001 to 0x8004C0A4
cifX Device Driver and netX Driver	<i>Generic Error:</i> 0x800A0001 bis 0x800A0017
	<i>Generic Driver Error:</i> 0x800B0001 bis 0x800B0042
	<i>Generic Device Error:</i> 0x800C0010 bis 0x800C0041
netX Driver	<i>CIFX API Transport:</i> 0x800D0001 bis 0x800D0013
	<i>CIFX API Transport Header State Error:</i> 0x800E0001 bis 0x800E000B
DBM	<i>ODM Error Codes:</i> 0xC004C810 to 0xC004C878

Table 53: Overview Error Codes and Ranges



Further fieldbus specific error codes are described in the manuals of the corresponding protocol tasks.

11.3 General Hardware Error Codes

11.3.1 RCX General Task Errors

Error Code (Definition)	Value	Description
RCX_E_QUE_UNKNOWN	0xC02B0001	Unknown Queue
RCX_E_QUE_INDEX_UNKNOWN	0xC02B0002	Unknown Queue Index
RCX_E_TASK_UNKNOWN	0xC02B0003	Unknown Task
RCX_E_TASK_INDEX_UNKNOWN	0xC02B0004	Unknown Task Index
RCX_E_TASK_HANDLE_INVALID	0xC02B0005	Invalid Task Handle
RCX_E_TASK_INFO_IDX_UNKNOWN	0xC02B0006	Unknown Index
RCX_E_FILE_XFR_TYPE_INVALID	0xC02B0007	Invalid Transfer Type
RCX_E_FILE_REQUEST_INCORRECT	0xC02B0008	Invalid File Request
RCX_E_TASK_INVALID	0xC02B000E	Invalid Task
RCX_E_SEC_FAILED	0xC02B001D	Security EEPROM Access Failed
RCX_E_EEPROM_DISABLED	0xC02B001E	EEPROM Disabled
RCX_E_INVALID_EXT	0xC02B001F	Invalid Extension
RCX_E_SIZE_OUT_OF_RANGE	0xC02B0020	Block Size Out Of Range
RCX_E_INVALID_CHANNEL	0xC02B0021	Invalid Channel
RCX_E_INVALID_FILE_LEN	0xC02B0022	Invalid File Length
RCX_E_INVALID_CHAR_FOUND	0xC02B0023	Invalid Character Found
RCX_E_PACKET_OUT_OF_SEQ	0xC02B0024	Packet Out Of Sequence
RCX_E_SEC_NOT_ALLOWED	0xC02B0025	Not Allowed In Current State
RCX_E_SEC_INVALID_ZONE	0xC02B0026	Security EEPROM Invalid Zone
RCX_E_SEC_EEPROM_NOT_AVAIL	0xC02B0028	Security EEPROM Eeprom Not Available
RCX_E_SEC_INVALID_CHECKSUM	0xC02B0029	Security EEPROM Invalid Checksum
RCX_E_SEC_ZONE_NOT_WRITEABLE	0xC02B002A	Security EEPROM Zone Not Writeable
RCX_E_SEC_READ_FAILED	0xC02B002B	Security EEPROM Read Failed
RCX_E_SEC_WRITE_FAILED	0xC02B002C	Security EEPROM Write Failed
RCX_E_SEC_ACCESS_DENIED	0xC02B002D	Security EEPROM Access Denied
RCX_E_SEC_EEPROM_EMULATED	0xC02B002E	Security EEPROM Emulated
RCX_E_INVALID_BLOCK	0xC02B0038	Invalid Block
RCX_E_INVALID_STRUCT_NUMBER	0xC02B0039	Invalid Structure Number
RCX_E_INVALID_CHECKSUM	0xC02B4352	Invalid Checksum
RCX_E_CONFIG_LOCKED	0xC02B4B54	Configuration Locked
RCX_E_SEC_ZONE_NOT_READABLE	0xC02B4D52	Security EEPROM Zone Not Readable

Table 54: RCX General Task Errors

11.3.2 RCX Common Status & Errors Codes

Error Code (Definition)	Value	Description
RCX_S_OK	0x00000000	Success, Status Okay
RCX_E_FAIL	0xC0000001	Fail
RCX_E_UNEXPECTED	0xC0000002	Unexpected
RCX_E_OUTOFMEMORY	0xC0000003	Out Of Memory
RCX_E_UNKNOWN_COMMAND	0xC0000004	Unknown Command
RCX_E_UNKNOWN_DESTINATION	0xC0000005	Unknown Destination
RCX_E_UNKNOWN_DESTINATION_ID	0xC0000006	Unknown Destination ID
RCX_E_INVALID_PACKET_LEN	0xC0000007	Invalid Packet Length
RCX_E_INVALID_EXTENSION	0xC0000008	Invalid Extension
RCX_E_INVALID_PARAMETER	0xC0000009	Invalid Parameter
RCX_E_WATCHDOG_TIMEOUT	0xC000000C	Watchdog Timeout
RCX_E_INVALID_LIST_TYPE	0xC000000D	Invalid List Type
RCX_E_UNKNOWN_HANDLE	0xC000000E	Unknown Handle
RCX_E_PACKET_OUT_OF_SEQ	0xC000000F	Out Of Sequence
RCX_E_PACKET_OUT_OF_MEMORY	0xC0000010	Out Of Memory
RCX_E_QUE_PACKETDONE	0xC0000011	Queue Packet Done
RCX_E_QUE_SENDPACKET	0xC0000012	Queue Send Packet
RCX_E_POOL_PACKET_GET	0xC0000013	Pool Packet Get
RCX_E_POOL_GET_LOAD	0xC0000015	Pool Get Load
RCX_E_REQUEST_RUNNING	0xC000001A	Request Already Running
RCX_E_INIT_FAULT	0xC0000100	Initialization Fault
RCX_E_DATABASE_ACCESS_FAILED	0xC0000101	Database Access Failed
RCX_E_NOT_CONFIGURED	0xC0000119	Not Configured
RCX_E_CONFIGURATION_FAULT	0xC0000120	Configuration Fault
RCX_E_INCONSISTENT_DATA_SET	0xC0000121	Inconsistent Data Set
RCX_E_DATA_SET_MISMATCH	0xC0000122	Data Set Mismatch
RCX_E_INSUFFICIENT_LICENSE	0xC0000123	Insufficient License
RCX_E_PARAMETER_ERROR	0xC0000124	Parameter Error
RCX_E_INVALID_NETWORK_ADDRESS	0xC0000125	Invalid Network Address
RCX_E_NO_SECURITY_MEMORY	0xC0000126	No Security Memory
RCX_E_NETWORK_FAULT	0xC0000140	Network Fault
RCX_E_CONNECTION_CLOSED	0xC0000141	Connection Closed
RCX_E_CONNECTION_TIMEOUT	0xC0000142	Connection Timeout
RCX_E_LONELY_NETWORK	0xC0000143	Lonely Network
RCX_E_DUPLICATE_NODE	0xC0000144	Duplicate Node
RCX_E_CABLE_DISCONNECT	0xC0000145	Cable Disconnected
RCX_E_BUS_OFF	0xC0000180	Network Node Bus Off
RCX_E_CONFIG_LOCKED	0xC0000181	Configuration Locked
RCX_E_APPLICATION_NOT_READY	0xC0000182	Application Not Ready
RCX_E_TIMER_APPL_PACKET_SENT	0xC002000C	Timer App Packet Sent

Table 55: RCX Common Status & Errors Codes

11.3.3 RCX Status & Error Codes

Error Code (Definition)	Value	Description
RCX_S_OK	0x00000000	SUCCESS, STATUS OKAY
RCX_S_QUE_UNKNOWN	0xC02B0001	UNKNOWN QUEUE
RCX_S_QUE_INDEX_UNKNOWN	0xC02B0002	UNKNOWN QUEUE INDEX
RCX_S_TASK_UNKNOWN	0xC02B0003	UNKNOWN TASK
RCX_S_TASK_INDEX_UNKNOWN	0xC02B0004	UNKNOWN TASK INDEX
RCX_S_TASK_HANDLE_INVALID	0xC02B0005	INVALID TASK HANDLE
RCX_S_TASK_INFO_IDX_UNKNOWN	0xC02B0006	UNKNOWN INDEX
RCX_S_FILE_XFR_TYPE_INVALID	0xC02B0007	INVALID TRANSFER TYPE
RCX_S_FILE_REQUEST_INCORRECT	0xC02B0008	INVALID FILE REQUEST
RCX_S_UNKNOWN_DESTINATION	0xC0000005	UNKNOWN DESTINATION
RCX_S_UNKNOWN_DESTINATION_ID	0xC0000006	UNKNOWN DESTINATION ID
RCX_S_INVALID_LENGTH	0xC0000007	INVALID LENGTH
RCX_S_UNKNOWN_COMMAND	0xC0000004	UNKNOWN COMMAND
RCX_S_INVALID_EXTENSION	0xC0000008	INVALID EXTENSION

Table 56: RCX Status & Error Codes

11.3.3.1 RCX Status & Error Codes Slave State

Error Code (Definition)	Value	Description
RCX_SLAVE_STATE_UNDEFINED	0x00000000	UNDEFINED
RCX_SLAVE_STATE_OK	0x00000001	OK
RCX_SLAVE_STATE_FAILED	0x00000002	FAILED (at least one slave)

Table 57: RCX Status & Error Codes Slave State

11.4 Status /Error Codes EtherCAT Master

11.4.1 EtherCAT Master Task Status/Error Codes

Error Code (Definition)	Value	Description
TLR_E_ETHERCAT_MASTER_COMMAND_INVALID	0xC0650001	Invalid command received.
TLR_E_ETHERCAT_MASTER_NO_LINK	0xC0650002	No link exists.
TLR_E_ETHERCAT_MASTER_ERROR_READING_BUSCONFIG	0xC0650003	Error during reading the bus configuration.
TLR_E_ETHERCAT_MASTER_ERROR_PARSING_BUSCONFIG	0xC0650004	Error during processing the bus configuration.
TLR_E_ETHERCAT_MASTER_ERROR_BUSSCAN_FAILED	0xC0650005	Existing bus does not match configured bus.
TLR_E_ETHERCAT_MASTER_NOT_ALL_SLAVES_AVAILABLE	0xC0650006	Not all slaves are available.
TLR_E_ETHERCAT_MASTER_STOPMASTER_ERROR	0xC0650007	Error during Reset (stopping the master).
TLR_E_ETHERCAT_MASTER_DEINITMASTER_ERROR	0xC0650008	Error during Reset (deinitialize the master).
TLR_E_ETHERCAT_MASTER_CLEANUP_ERROR	0xC0650009	Error during Reset (cleanup the dynamic resources).
TLR_E_ETHERCAT_MASTER_CRITICAL_ERROR_STATE	0xC065000A	Master is in critical error state, reset required.
TLR_E_ETHERCAT_MASTER_CRITICAL_ERROR_STATE	0xC065000B	The requested bus cycle time is invalid.
TLR_E_ETHERCAT_MASTER_INVALID_BROKEN_SLAVE_BEHAVIOUR_PARAMETER	0xC065000C	Invalid parameter for broken slave behaviour.
TLR_E_ETHERCAT_MASTER_WRONG_INTERNAL_STATE	0xC065000D	Master is in wrong internal state.
TLR_E_ETHERCAT_MASTER_WATCHDOG_TIMEOUT_EXPIRED	0xC065000E	The watchdog expired.
TLR_E_ETHERCAT_MASTER_COE_INVALID_SLAVEID	0xC065000F	Invalid SlaveId was used for CoE.
TLR_E_ETHERCAT_MASTER_COE_NO_RESOURCES	0xC0650010	No available resources for CoE Transfer.
TLR_E_ETHERCAT_MASTER_COE_INTERNAL_ERROR	0xC0650011	Internal error during CoE usage.
TLR_E_ETHERCAT_MASTER_COE_INVALID_INDEX	0xC0650012	Invalid Index on Slave requested.
TLR_E_ETHERCAT_MASTER_COE_INVALID_COMMUNICATION_STATE	0xC0650013	Invalid bus communication state for CoE-Usage.
TLR_E_ETHERCAT_MASTER_COE_FRAME_LOST	0xC0650014	Frame with CoE data is lost.
TLR_E_ETHERCAT_MASTER_COE_TIMEOUT	0xC0650015	Timeout during CoE service.
TLR_E_ETHERCAT_MASTER_COE_SLAVE_NOT_ADDRESSABLE	0xC0650016	Slave is not addressable (not on bus or power down?).
TLR_E_ETHERCAT_MASTER_COE_INVALID_LIST_TYPE	0xC0650017	Invalid list type requested (during GetOdList).
TLR_E_ETHERCAT_MASTER_COE_SLAVE_RESPONSE_TOO_BIG	0xC0650018	Data in Slave Response is too big for confirmation packet.

Error Code (Definition)	Value	Description
TLR_E_ETHERCAT_MASTER_COE_INVALID_ACCESSBITMASK	0xC0650019	Invalid access mask selected (during GetEntryDesc).
TLR_E_ETHERCAT_MASTER_COE_WKC_ERROR	0xC065001A	Slave Working Counter Error during CoE service.
TLR_E_ETHERCAT_MASTER_SERVICE_IN_USE	0xC065001B	The service is already in use.
TLR_E_ETHERCAT_MASTER_INVALID_COMMUNICATION_STATE	0xC065001C	Command is not usable in the communication state.
TLR_E_ETHERCAT_MASTER_DC_NOT_ACTIVATED	0xC065001D	Distributed Clocks must be activated for this command.
TLR_E_ETHERCAT_MASTER_BUS_SCAN_CURRENTLY_RUNNING	0xC065001E	The scan is already running. It cannot be started twice at the same time.
TLR_E_ETHERCAT_MASTER_BUS_SCAN_TIMEOUT	0xC065001F	Timeout during bus scan. But at least a link is established.
TLR_E_ETHERCAT_MASTER_BUS_SCAN_NOT_READY_YET	0xC0650020	The bus scan was not started before or is not finished yet.
TLR_E_ETHERCAT_MASTER_BUS_SCAN_INVALID_SLAVE	0xC0650021	The requested slave is invalid.
TLR_E_ETHERCAT_MASTER_COE_INVALIDACCESS	0xC0650022	Slave does not allow reading or writing (CoE-Access).
TLR_E_ETHERCAT_MASTER_COE_NO_MBX_SUPPORT	0xC0650023	Slave does not support a mailbox.
TLR_E_ETHERCAT_MASTER_COE_NO_COE_SUPPORT	0xC0650024	Slave does not support CoE.
TLR_E_ETHERCAT_MASTER_TASK_CREATION_FAILED	0xC0650025	Task could not be created during runtime.
TLR_E_ETHERCAT_MASTER_INVALID_SLAVE_SM_CONFIGURATION	0xC0650026	The Sync Manager configuration of a slave is invalid.
TLR_E_ETHERCAT_MASTER_SDO_ABORTCODE_TOGGLE	0xC0650027	SDO abort code: Toggle bit not alternated.
TLR_E_ETHERCAT_MASTER_SDO_ABORTCODE_TIMEOUT	0xC0650028	DO abort code: SDO protocol timed out.
TLR_E_ETHERCAT_MASTER_SDO_ABORTCODE_CCSCS	0xC0650029	SDO abort code: Client/server command specifier not valid or unknown.
TLR_E_ETHERCAT_MASTER_SDO_ABORTCODE_BLK_SIZE	0xC065002A	SDO abort code: Invalid block size (block mode only).
TLR_E_ETHERCAT_MASTER_SDO_ABORTCODE_SEQNO	0xC065002B	SDO abort code: Invalid sequence number (block mode only).
TLR_E_ETHERCAT_MASTER_SDO_ABORTCODE_CRC	0xC065002C	SDO abort code: CRC error (block mode only).
TLR_E_ETHERCAT_MASTER_SDO_ABORTCODE_MEMORY	0xC065002D	SDO abort code: Out of memory.
TLR_E_ETHERCAT_MASTER_SDO_ABORTCODE_ACCESS	0xC065002E	SDO abort code: Unsupported access to an object.
TLR_E_ETHERCAT_MASTER_SDO_ABORTCODE_WRITEONLY	0xC065002F	SDO abort code: Attempt to read a write only object.
TLR_E_ETHERCAT_MASTER_SDO_ABORTCODE_READONLY	0xC0650030	SDO abort code: Attempt to write a read only object.
TLR_E_ETHERCAT_MASTER_SDO_ABORTCODE_INDEX	0xC0650031	SDO abort code: Object does not exist in the object dictionary.
TLR_E_ETHERCAT_MASTER_SDO_ABORTCODE_PDO_MAP	0xC0650032	SDO abort code: Object cannot be mapped to the PDO.
TLR_E_ETHERCAT_MASTER_SDO_ABORTCODE_PDO_LEN	0xC0650033	SDO abort code: The number and length of the objects to be mapped would exceed PDO length.
TLR_E_ETHERCAT_MASTER_SDO_ABORTCODE_P_INCOMP	0xC0650034	SDO abort code: General parameter incompatibility reason.

Error Code (Definition)	Value	Description
TLR_E_ETHERCAT_MASTER_SDO_ABORTCODE_I_INCOMP	0xC0650035	SDO abort code: General internal incompatibility in the device.
TLR_E_ETHERCAT_MASTER_SDO_ABORTCODE_HARDWARE	0xC0650036	SDO abort code: Access failed due to an hardware error.
TLR_E_ETHERCAT_MASTER_SDO_ABORTCODE_DATA_SIZE	0xC0650037	SDO abort code: Data type does not match, length of service parameter does not match.
TLR_E_ETHERCAT_MASTER_SDO_ABORTCODE_DATA_SIZE1	0xC0650038	SDO abort code: Data type does not match, length of service parameter too high.
TLR_E_ETHERCAT_MASTER_SDO_ABORTCODE_DATA_SIZE2	0xC0650039	SDO abort code: Data type does not match, length of service parameter too low.
TLR_E_ETHERCAT_MASTER_SDO_ABORTCODE_OFFSET	0xC065003A	SDO abort code: Sub-index does not exist.
TLR_E_ETHERCAT_MASTER_SDO_ABORTCODE_DATA_RANGE	0xC065003B	SDO abort code: Value range of parameter exceeded (only for write access).
TLR_E_ETHERCAT_MASTER_SDO_ABORTCODE_DATA_RANGE1	0xC065003C	SDO abort code: Value of parameter written too high.
TLR_E_ETHERCAT_MASTER_SDO_ABORTCODE_DATA_RANGE2	0xC065003D	SDO abort code: Value of parameter written too low.
TLR_E_ETHERCAT_MASTER_SDO_ABORTCODE_MINMAX	0xC065003E	SDO abort code: Maximum value is less than minimum value.
TLR_E_ETHERCAT_MASTER_SDO_ABORTCODE_GENERAL	0xC065003F	SDO abort code: general error.
TLR_E_ETHERCAT_MASTER_SDO_ABORTCODE_TRANSFER	0xC0650040	SDO abort code: Data cannot be transferred or stored to the application.
TLR_E_ETHERCAT_MASTER_SDO_ABORTCODE_TRANSFER1	0xC0650041	SDO abort code: Data cannot be transferred or stored to the application because of local control.
TLR_E_ETHERCAT_MASTER_SDO_ABORTCODE_TRANSFER2	0xC0650042	SDO abort code: Data cannot be transferred or stored to the application because of the present device state.
TLR_E_ETHERCAT_MASTER_SDO_ABORTCODE_DICTIONARY	0xC0650043	SDO abort code: Object dictionary dynamic generation fails or no object dictionary is present (e.g. object dictionary is generated from file and generation fails because of an file error).
TLR_E_ETHERCAT_MASTER_SDO_ABORTCODE_UNKNOWN	0xC0650044	SDO abort code: unknown code.
TLR_E_ETHERCAT_MASTER_DEVICE_STATUS_CODE_ERROR	0xC0650045	Slave status code: Unspecified error.
TLR_E_ETHERCAT_MASTER_DEVICE_STATUS_CODE_INVREQSTATECNG	0xC0650046	Slave status code: Invalid requested state change.
TLR_E_ETHERCAT_MASTER_DEVICE_STATUS_CODE_UNKREQSTATE	0xC0650047	Slave status code: Unknown requested state.
TLR_E_ETHERCAT_MASTER_DEVICE_STATUS_CODE_BOOTSTRAPNSUPP	0xC0650048	Slave status code: Bootstrap not supported.
TLR_E_ETHERCAT_MASTER_DEVICE_STATUS_CODE_NOVALIDFW	0xC0650049	Slave status code: No valid firmware.
TLR_E_ETHERCAT_MASTER_DEVICE_STATUS_CODE_INVALIDMBXCNF1	0xC065004A	Slave status code: Invalid mailbox configuration1.
TLR_E_ETHERCAT_MASTER_DEVICE_STATUS_CODE_INVALIDMBXCNF2	0xC065004B	Slave status code: Invalid mailbox configuration2.
TLR_E_ETHERCAT_MASTER_DEVICE_STATUS_CODE_INVALIDSMCNF	0xC065004C	Slave status code: Invalid sync manager configuration.

Error Code (Definition)	Value	Description
TLR_E_ETHERCAT_MASTER_DEVICE_STATUS_CODE_NOVALIDIN	0xC065004D	Slave status code: No valid inputs available.
TLR_E_ETHERCAT_MASTER_DEVICE_STATUS_CODE_NOVALIDOUT	0xC065004E	Slave status code: No valid outputs.
TLR_E_ETHERCAT_MASTER_DEVICE_STATUS_CODE_SYNCERROR	0xC065004F	Slave status code: Synchronization error.
TLR_E_ETHERCAT_MASTER_DEVICE_STATUS_CODE_SMWATCHDOG	0xC0650050	Slave status code: Sync manager watchdog.
TLR_E_ETHERCAT_MASTER_DEVICE_STATUS_CODE_INVSMTYPES	0xC0650051	Slave status code: Invalid Sync Manager Types.
TLR_E_ETHERCAT_MASTER_DEVICE_STATUS_CODE_INVOUTCONFIG	0xC0650052	Slave status code: Invalid Output Configuration.
TLR_E_ETHERCAT_MASTER_DEVICE_STATUS_CODE_INVINCONFIG	0xC0650053	Slave status code: Invalid Input Configuration.
TLR_E_ETHERCAT_MASTER_DEVICE_STATUS_CODE_INVWDCONFIG	0xC0650054	Slave status code: Invalid Watchdog Configuration.
TLR_E_ETHERCAT_MASTER_DEVICE_STATUS_CODE_SLVNEEDCOLDRS	0xC0650055	Slave status code: Slave needs cold start.
TLR_E_ETHERCAT_MASTER_DEVICE_STATUS_CODE_SLVNEEDINIT	0xC0650056	Slave status code: Slave needs INIT.
TLR_E_ETHERCAT_MASTER_DEVICE_STATUS_CODE_SLVNEEDPREOP	0xC0650057	Slave status code: Slave needs PREOP.
TLR_E_ETHERCAT_MASTER_DEVICE_STATUS_CODE_SLVNEEDSAFEOP	0xC0650058	Slave status code: Slave needs SAFEOP.
TLR_E_ETHERCAT_MASTER_DEVICE_STATUS_CODE_INVOUTFMMUCNFG	0xC0650059	Slave status code: Invalid Output FMMU Configuration.
TLR_E_ETHERCAT_MASTER_DEVICE_STATUS_CODE_INVINFMMUCNFG	0xC065005A	Slave status code: Invalid Input FMMU Configuration.
TLR_E_ETHERCAT_MASTER_DEVICE_STATUS_CODE_INVDCSYNCCNFG	0xC065005B	Slave status code: Invalid DC SYNCH Configuration.
TLR_E_ETHERCAT_MASTER_DEVICE_STATUS_CODE_INVDCATCHCNFG	0xC065005C	Slave status code: Invalid DC Latch Configuration.
TLR_E_ETHERCAT_MASTER_DEVICE_STATUS_CODE_PLLERROR	0xC065005D	Slave status code: PLL Error.
TLR_E_ETHERCAT_MASTER_DEVICE_STATUS_CODE_INVDCIOERROR	0xC065005E	Slave status code: Invalid DC IO Error.
TLR_E_ETHERCAT_MASTER_DEVICE_STATUS_CODE_INVDCIOERROR	0xC065005F	Slave status code: Invalid DC Timeout Error.
TLR_E_ETHERCAT_MASTER_DEVICE_STATUS_CODE_MBX_EOE	0xC0650060	Slave status code: MBX_EOE.
TLR_E_ETHERCAT_MASTER_DEVICE_STATUS_CODE_MBX_COE	0xC0650061	Slave status code: MBX_COE.
TLR_E_ETHERCAT_MASTER_DEVICE_STATUS_CODE_MBX_FOE	0xC0650062	Slave status code: MBX_FOE.
TLR_E_ETHERCAT_MASTER_DEVICE_STATUS_CODE_MBX_SOE	0xC0650063	Slave status code: MBX_SOE.
TLR_E_ETHERCAT_MASTER_DEVICE_STATUS_CODE_MBX_VOE	0xC0650064	Slave status code: MBX_VOE.
TLR_E_ETHERCAT_MASTER_DEVICE_STATUS_CODE_OTHER	0xC0650065	Slave status code: vendor specific error code.
TLR_E_ETHERCAT_MASTER_PREVIOUS_PORT_MISSING	0xC0650066	Slave status code: PreviousPort configuration missing in bus configuration file (outdated configurator).
TLR_E_ETHERCAT_MASTER_CONFIG_ALREADY_STARTED	0xC0650067	Configuration already started, cannot be started again.

Error Code (Definition)	Value	Description
TLR_E_ETHERCAT_MASTER_CONFIG_NOT_STARTED	0xC0650068	Configuration was not started before.
TLR_E_ETHERCAT_MASTER_CONFIG_SLAVE_INDEX_ALREADY_EXISTS	0xC0650069	Slave index already exists, cannot be created again.
TLR_E_ETHERCAT_MASTER_CONFIG_SLAVE_PHYS_ADDR_ALREADY_EXISTS	0xC065006A	Slave physical address already exists, cannot be created again.
TLR_E_ETHERCAT_MASTER_CONFIG_SLAVE_AUTOINC_ADDR_ALREADY_EXISTS	0xC065006B	Slave auto increment address already exists, cannot be created again.
TLR_E_ETHERCAT_MASTER_CONFIG_SLAVE_INDEX_NOT_EXISTS	0xC065006C	Slave index does not exist, must be created before.
TLR_E_ETHERCAT_MASTER_WRONG_VALIDATE_DATA_LEN	0xC065006D	Wrong length value for validate data.
TLR_E_ETHERCAT_MASTER_INVALID_ECAT_CMD	0xC065006E	Invalid value for EtherCAT command.
TLR_E_ETHERCAT_MASTER_PRECONFIGURED_DATA_CURRENTLY_NOT_SUPPORTED	0xC065006F	Sending preconfigured cyclic data is currently not supported.
TLR_E_ETHERCAT_MASTER_INVALID_STATE	0xC0650070	Invalid value for EtherCAT state.
TLR_E_ETHERCAT_MASTER_INVALID_TRANSITION	0xC0650071	Invalid value for EtherCAT transition.
TLR_E_ETHERCAT_MASTER_COPY_INFOS_EXCEEDED	0xC0650072	Maximum amount of copy infos exceeded.
TLR_E_ETHERCAT_MASTER_REDUNDANCY_AND_DC_ENABLED	0xC0650073	Redundancy and Distributed clocks enabled at the same time (not possible).
TLR_E_ETHERCAT_MASTER_NO_SLAVES_CONFIGURED	0xC0650074	At least one slave must be configured.
TLR_E_ETHERCAT_MASTER_STATE_CHANGE_BUSY	0xC0650075	State change is currently busy.
TLR_E_ETHERCAT_MASTER_INVALID_TARGET_PHASE	0xC0650076	Parameter target phase is invalid.

Table 58: EtherCAT Master Task Status/Error Codes

11.4.2 EtherCAT Master AP Task Status/Error Codes

Error Code (Definition)	Value	Description
TLR_E_ETHERCAT_MASTER_AP_COMMAND_INVALID	0xC0640001	Invalid command received.
TLR_E_ETHERCAT_MASTER_AP_DPM_WATCHDOG_TIMEOUT_EXPIRED	0xC0640002	The watchdog expired.
TLR_E_ETHERCAT_MASTER_AP_WATCHDOG_TIME_TOO_SMALL	0xC0640003	The requested Watchdog time is too small.
TLR_E_ETHERCAT_MASTER_AP_WATCHDOG_TIME_TOO_LARGE	0xC0640004	The requested Watchdog time is too large.
TLR_E_ETHERCAT_MASTER_AP_WATCHDOG_RESET_ERROR	0xC0640005	Error during Reset (resetting watchdog).
TLR_E_ETHERCAT_MASTER_AP_CLEANUP_ERROR	0xC0640006	Error during Reset (cleanup the dynamic resources).
TLR_E_ETHERCAT_MASTER_AP_CRITICAL_ERROR_STATE	0xC0640007	Master is in critical error state, reset required.
TLR_E_ETHERCAT_MASTER_AP_WATCHDOG_ACTIVATE_ERROR	0xC0640008	Error activating the watchdog.
TLR_E_ETHERCAT_MASTER_AP_INPUT_DATA_TOO_LARGE	0xC0640009	Size of configured input data is larger as cyclic DPM input data size.
TLR_E_ETHERCAT_MASTER_AP_OUTPUT_DATA_TOO_LARGE	0xC064000A	Size of configured output data is larger as cyclic DPM output data size.
TLR_E_ETHERCAT_MASTER_AP_ENABLE_BUS_SYNC_FAILED	0xC064000B	Bus Synchronous could not be activated.
TLR_E_ETHERCAT_MASTER_AP_TASK_CREATION_FAILED	0xC064000C	Task could not be created during runtime.
TLR_E_ETHERCAT_MASTER_AP_BROKEN_RELATION_DEVICE_ECS	0xC064000D	NXD: 1:1 relation broken DEVICE -> ECS.
TLR_E_ETHERCAT_MASTER_AP_BROKEN_RELATION_CONTROLLER_ECM	0xC064000E	NXD: 1:1 relation broken DEVICE -> ECM.
TLR_E_ETHERCAT_MASTER_AP_BROKEN_RELATION_ECS_MBX	0xC064000F	NXD: relation broken ECS -> MBX.
TLR_E_ETHERCAT_MASTER_AP_BROKEN_RELATION_ECS_PROCESSDATA	0xC0640010	NXD: relation broken ECS -> PROCESSDATA.
TLR_E_ETHERCAT_MASTER_AP_BROKEN_RELATION_ECS_PREVIOUSPORT	0xC0640011	NXD: relation broken ECS -> PREVIOUSPORT.
TLR_E_ETHERCAT_MASTER_AP_BROKEN_RELATION_MBX_COE	0xC0640012	NXD: relation broken MBX -> COE.
TLR_E_ETHERCAT_MASTER_AP_BROKEN_RELATION_COE_INITCMDSCOE	0xC0640013	NXD: relation broken COE -> COEINITCMD.
TLR_E_ETHERCAT_MASTER_AP_BROKEN_RELATION_CYCLIC_FRAME	0xC0640014	NXD: relation broken CYCLIC -> FRAME.
TLR_E_ETHERCAT_MASTER_AP_BROKEN_RELATION_FRAME_CYCLICCMD	0xC0640015	NXD: relation broken FRAME -> CYCLICCMD.
TLR_E_ETHERCAT_MASTER_AP_NXD_INTERRUPT_INITCMD	0xC0640016	NXD: internal error on INITCMD handling.
TLR_E_ETHERCAT_MASTER_AP_NXD_INTERRUPT_CYCLIC	0xC0640017	NXD: internal error on CYCLIC handling.
TLR_E_ETHERCAT_MASTER_AP_NXD_INTERRUPT_FRAME	0xC0640018	NXD: internal error on FRAME handling.
TLR_E_ETHERCAT_MASTER_AP_NXD_INTERRUPT_CYCLICCMD	0xC0640019	NXD: internal error on CYCLICCMD handling.
TLR_E_ETHERCAT_MASTER_AP_NXD_INTERRUPT_DEVICES	0xC0640020	NXD: internal error on DEVICES handling.

Error Code (Definition)	Value	Description
TLR_E_ETHERCAT_MASTER_AP_NXD_INTERR OR_STATE	0xC0640021	NXD: internal error, wrong state.
TLR_E_ETHERCAT_MASTER_AP_NXD_INTERR OR_COE_INITCMD	0xC0640022	NXD: internal error on COE_INITCMD handling.
TLR_E_ETHERCAT_MASTER_AP_NXD_INTERR OR_ECM	0xC0640023	NXD: internal error on ECM handling.
TLR_E_ETHERCAT_MASTER_AP_NXD_INTERR OR_SYNC	0xC0640024	NXD: internal error on SYNC handling.
TLR_E_ETHERCAT_MASTER_AP_CHDIR_FAILE D	0xC0640025	NXD: Change Directory failed.
TLR_E_ETHERCAT_MASTER_AP_INVALID_INIT CMD_LEN	0xC0640026	Invalid InitCmd length configuration.
TLR_E_ETHERCAT_MASTER_AP_INVALID_CYC LICCMD_LEN	0xC0640027	Invalid CyclicCmd length configuration.
TLR_E_ETHERCAT_MASTER_AP_CONFIG_BY_ FILE	0xC0640028	Configuration is done by "ethercat.xml" or "config.nxd", packet interface inactive.
TLR_E_ETHERCAT_MASTER_AP_INVALID_COE _INITCMD_LEN	0xC0640029	Invalid CoE-InitCmd length configuration.
TLR_E_ETHERCAT_MASTER_AP_NXD_IDENTIF Y_FAILED_CONTROLLERORADAPTER	0xC064002A	NXD: table CONTROLLERORADAPTER missing.
TLR_E_ETHERCAT_MASTER_AP_NXD_IDENTIF Y_FAILED_DEVICES	0xC064002B	NXD: table DEVICES missing.
TLR_E_ETHERCAT_MASTER_AP_NXD_IDENTIF Y_FAILED_ECM	0xC064002C	NXD: table ECM missing.
TLR_E_ETHERCAT_MASTER_AP_NXD_IDENTIF Y_FAILED_ECS	0xC064002D	NXD: table ECS missing.
TLR_E_ETHERCAT_MASTER_AP_NXD_IDENTIF Y_FAILED_INITCMDS	0xC064002E	NXD: table INITCMDS missing.
TLR_E_ETHERCAT_MASTER_AP_NXD_IDENTIF Y_FAILED_CYCLIC	0xC064002F	NXD: table CYCLIC missing.
TLR_E_ETHERCAT_MASTER_AP_NXD_IDENTIF Y_FAILED_FRAME	0xC0640030	NXD: table FRAME missing.
TLR_E_ETHERCAT_MASTER_AP_NXD_IDENTIF Y_FAILED_CYCLICCMD	0xC0640031	NXD: table CYCLICCMD missing.
TLR_E_ETHERCAT_MASTER_AP_NXD_IDENTIF Y_FAILED_PROCESSDATA	0xC0640032	NXD: table PROCESSDATA missing.
TLR_E_ETHERCAT_MASTER_AP_NXD_IDENTIF Y_FAILED_PREVIOUSPORT	0xC0640033	NXD: table PREVIOUSPORT missing.
TLR_E_ETHERCAT_MASTER_AP_NXD_IDENTIF Y_FAILED_MBX	0xC0640034	NXD: table MBX missing.
TLR_E_ETHERCAT_MASTER_AP_NXD_IDENTIF Y_FAILED_COE	0xC0640035	NXD: table COE missing.
TLR_E_ETHERCAT_MASTER_AP_NXD_IDENTIF Y_FAILED_INITCMDS_COE	0xC0640036	NXD: table INITCMDS_COE missing.
TLR_E_ETHERCAT_MASTER_AP_NXD_NO_SLA VES_CONFIGURED	0xC0640037	At least one slave must be configured.

Table 59: EtherCAT Master AP Task Status/Error Codes

11.5 ODM Error Codes

11.5.1 General ODM Error Codes

Error Code (Definition)	Value	Description
CODM3_E_INTERNALERROR	0x8004C700	Internal ODM Error
ODM3_E_DESCRIPTION_NOTFOUND	0x8004C701	Description not found in ODM database
CODM3_E_WRITEREGISTRY	0x8004C710	Error writing to the registry
CODM3_E_BAD_REGULAR_EXPRESSION	0x8004C711	Invalid regular expression
CODM3_E_COMCATEGORIE_MANAGER_FAILED	0x8004C712	Component Category Manager could not be instantiated
CODM3_E_COMCATEGORIE_ENUMERATION_FAILED	0x8004C713	Driver could not be enumerated by the Category Manager
CODM3_E_CREATE_LOCAL_BUFFER	0x8004C714	Error creating local buffers
CODM3_E_UNKNOWNHANDLE	0x8004C715	Unknown handle
CODM3_E_QUEUE_LIMIT_REACHED	0x8004C717	Queue size limit for connection reached
CODM3_E_DATASIZE_ZERO	0x8004C718	Zero data length passed
CODM3_E_INVALID_DATA	0x8004C719	Invalid data content
CODM3_E_INVALID_MODE	0x8004C71A	Invalid mode
CODM3_E_DATABASE_READ	0x8004C71B	Error reading database
CODM3_E_CREATE_DEVICE_THREAD	0x8004C750	Error creating device thread
CODM3_E_CREATE_DEVICE_THREAD_STOP_EVENT	0x8004C751	Error creating device thread stop event
CODM3_E_CLIENT_NOT_REGISTERED	0x8004C752	Client is not registered at the ODM
CODM3_E_NO_MORE_CLIENTS	0x8004C753	Maximum number of clients reached
CODM3_E_MAX_CLIENT_CONNECTIONS_REACHED	0x8004C754	Maximum number of client connections reached
CODM3_E_ENTRY_NOT_FOUND	0x8004C755	Driver/device not found
CODM3_E_DRIVER_NOT_FOUND	0x8004C757	The requested driver is unknown to the ODM
CODM3_E_DEVICE_ALREADY_LOCKED	0x8004C758	Device is locked by another process
CODM3_E_DEVICE_UNLOCKED_FAILED	0x8004C759	Device could not be unlocked, lock was set by another process
CODM3_E_DEVICE_LOCK_NECESSARY	0x8004C75A	Operation requires a device lock to be set
CODM3_E_DEVICE_SUBSCRIPTIONLIMIT	0x8004C75B	Maximum number of servers registered for this device reached
CODM3_E_DEVICE_NOTSUBSCRIBED	0x8004C75C	Process is not registered as a server on this device
CODM3_E_DEVICE_NO_MESSAGE	0x8004C75D	No message available
CODM3_E_TRANSFERTIMEOUT	0x8004C760	Message transfer timeout
CODM3_E_MESSAGE_INSERVICE	0x8004C761	Message in service

Table 60: ODM Error Codes - General ODM Error Codes

11.5.2 General ODM Driver Error Codes

Error Code (Definition)	Value	Description
CODM3_E_DRV_OPEN_DEVICE	0x8004C7A0	Packet type unsupported by driver
CODM3_E_DRV_INVALID_IDENTIFIER	0x8004C7A1	Invalid device identifier
CODM3_E_DRV_DEVICE_PARAMETERS_MISMATCH	0x8004C7A3	Parameters differ from requested device
CODM3_E_DRV_BROWSE_NO_DEVICES	0x8004C7A4	No devices found
CODM3_E_DRV_CREATE_DEVICE_INST	0x8004C7A5	Device instance could not be created
CODM3_E_DRV_DEVICE_NOMORE_TX	0x8004C7A6	Device connection limit reached
CODM3_E_DRV_DEVICE_DUPLICATE_TX	0x8004C7A7	Duplicate transmitter ID
CODM3_E_DRV_DEVICE_NOT_CONFIGURED	0x8004C7A8	Device is not configured
CODM3_E_DRV_DEVICE_COMMUNICATION	0x8004C7A9	Device communication error
CODM3_E_DRV_DEVICE_NO_MESSAGE	0x8004C7AA	No message available
CODM3_E_DRV_DEVICE_NOT_READY	0x8004C7AB	Device not ready
CODM3_E_DRV_INVALIDCONFIGURATION	0x8004C7AC	Invalid driver configuration
CODM3_E_DRV_DLINVALIDMODE	0x8004C7C0	Invalid download mode
CODM3_E_DRV_DLINPROGRESS	0x8004C7C1	Download is active
CODM3_E_DRV_ULINPROGRESS	0x8004C7C2	Upload is active

Table 61: ODM Error Codes - General ODM Driver Error Codes

11.5.3 cifX Driver Specific ODM Error Codes

cifX Driver Specific ODM Error Codes		
Error Code (Definition)	Value	Description
DRV_E_BOARD_NOT_INITIALIZED	0x8004C001	DRIVER Board not initialized
DRV_E_INIT_STATE_ERROR	0x8004C002	DRIVER Error in internal init state
DRV_E_READ_STATE_ERROR	0x8004C003	DRIVER Error in internal read state
DRV_E_CMD_ACTIVE	0x8004C004	DRIVER Command on this channel is active
DRV_E_PARAMETER_UNKNOWN	0x8004C005	DRIVER Unknown parameter in function
DRV_E_WRONG_DRIVER_VERSION	0x8004C006	DRIVER Version is incompatible with DLL
DRV_E_PCI_SET_CONFIG_MODE	0x8004C007	DRIVER Error during PCI set configuration mode
DRV_E_PCI_READ_DPM_LENGTH	0x8004C008	DRIVER Could not read PCI dual port memory length
DRV_E_PCI_SET_RUN_MODE	0x8004C009	DRIVER Error during PCI set run mode
DRV_E_DEV_DPM_ACCESS_ERROR	0x8004C00A	DEVICE Dual port ram not accessible(board not found)
DRV_E_DEV_NOT_READY	0x8004C00B	DEVICE Not ready (ready flag failed)
DRV_E_DEV_NOT_RUNNING	0x8004C00C	DEVICE Not running (running flag failed)
DRV_E_DEV_WATCHDOG_FAILED	0x8004C00D	DEVICE Watchdog test failed
DRV_E_DEV_OS_VERSION_ERROR	0x8004C00E	DEVICE Signals wrong OS version
DRV_E_DEV_SYSERR	0x8004C00F	DEVICE Error in dual port flags
DRV_E_DEV_MAILBOX_FULL	0x8004C010	DEVICE Send mailbox is full
DRV_E_DEV_PUT_TIMEOUT	0x8004C011	DEVICE PutMessage timeout
DRV_E_DEV_GET_TIMEOUT	0x8004C012	DEVICE GetMessage timeout
DRV_E_DEV_GET_NO_MESSAGE	0x8004C013	DEVICE No message available
DRV_E_DEV_RESET_TIMEOUT	0x8004C014	DEVICE RESET command timeout
DRV_E_DEV_NO_COM_FLAG	0x8004C015	DEVICE COM-flag not set. Check if Bus is running
DRV_E_DEV_EXCHANGE_FAILED	0x8004C016	DEVICE I/O data exchange failed
DRV_E_DEV_EXCHANGE_TIMEOUT	0x8004C017	DEVICE I/O data exchange timeout
DRV_E_DEV_COM_MODE_UNKNOWN	0x8004C018	DEVICE I/O data mode unknown
DRV_E_DEV_FUNCTION_FAILED	0x8004C019	DEVICE Function call failed
DRV_E_DEV_DPMSIZE_MISMATCH	0x8004C01A	DEVICE DPM size differs from configuration
DRV_E_DEV_STATE_MODE_UNKNOWN	0x8004C01B	DEVICE State mode unknown
DRV_E_DEV_HW_PORT_IS_USED	0x8004C01C	DEVICE Output port already in use
DRV_E_USR_OPEN_ERROR	0x8004C01E	USER Driver not opened (device driver not loaded)
DRV_E_USR_INIT_DRV_ERROR	0x8004C01F	USER Can't connect to device
DRV_E_USR_NOT_INITIALIZED	0x8004C020	USER Board not initialized (DevInitBoard not called)
DRV_E_USR_COMM_ERR	0x8004C021	USER IOCTL function failed
DRV_E_USR_DEV_NUMBER_INVALID	0x8004C022	USER Parameter DeviceNumber invalid
DRV_E_USR_INFO_AREA_INVALID	0x8004C023	USER Parameter InfoArea unknown
DRV_E_USR_NUMBER_INVALID	0x8004C024	USER Parameter Number invalid
DRV_E_USR_MODE_INVALID	0x8004C025	USER Parameter Mode invalid
DRV_E_USR_MSG_BUF_NULL_PTR	0x8004C026	USER NULL pointer assignment
DRV_E_USR_MSG_BUF_TOO_SHORT	0x8004C027	USER Message buffer too small

cifX Driver Specific ODM Error Codes		
Error Code (Definition)	Value	Description
DRV_E_USR_SIZE_INVALID	0x8004C028	USER Parameter Size invalid
DRV_E_USR_SIZE_ZERO	0x8004C02A	USER Parameter Size with zero length
DRV_E_USR_SIZE_TOO_LONG	0x8004C02B	USER Parameter Size too long
DRV_E_USR_DEV_PTR_NULL	0x8004C02C	USER Device address null pointer
DRV_E_USR_BUF_PTR_NULL	0x8004C02D	USER Pointer to buffer is a null pointer
DRV_E_USR_SENDSIZE_TOO_LONG	0x8004C02E	USER Parameter SendSize too large
DRV_E_USR_RECVSIZE_TOO_LONG	0x8004C02F	USER Parameter ReceiveSize too large
DRV_E_USR_SENDBUF_PTR_NULL	0x8004C030	USER Pointer to send buffer is a null pointer
DRV_E_USR_RECVBUF_PTR_NULL	0x8004C031	USER Pointer to receive buffer is a null pointer
DRV_E_DMA_INSUFF_MEM	0x8004C032	DMA Memory allocation error
DRV_E_DMA_TIMEOUT_CH4	0x8004C033	DMA Read I/O timeout
DRV_E_DMA_TIMEOUT_CH5	0x8004C034	DMA Write I/O timeout
DRV_E_DMA_TIMEOUT_CH6	0x8004C035	DMA PCI transfer timeout
DRV_E_DMA_TIMEOUT_CH7	0x8004C036	DMA Download timeout
DRV_E_DMA_DB_DOWN_FAIL	0x8004C037	DMA Database download failed
DRV_E_DMA_FW_DOWN_FAIL	0x8004C038	DMA Firmware download failed
DRV_E_CLEAR_DB_FAIL	0x8004C039	DMA Clear database on the device failed
DRV_E_DEV_NO_VIRTUAL_MEM	0x8004C03C	DMA USER Virtual memory not available
DRV_E_DEV_UNMAP_VIRTUAL_MEM	0x8004C03D	DMA USER Unmap virtual memory failed
DRV_E_GENERAL_ERROR	0x8004C046	DRIVER General error
DRV_E_DMA_ERROR	0x8004C047	DRIVER General DMA error
DRV_E_WDG_IO_ERROR	0x8004C048	DRIVER I/O WatchDog failed
DRV_E_WDG_DEV_ERROR	0x8004C049	DRIVER Device Watchdog failed
DRV_E_USR_DRIVER_UNKNOWN	0x8004C050	USER Driver unknown
DRV_E_USR_DEVICE_NAME_INVALID	0x8004C051	USER Device name invalid
DRV_E_USR_DEVICE_NAME_UNKNOWN	0x8004C052	USER Device name unknown
DRV_E_USR_DEVICE_FUNC_NOTIMPL	0x8004C053	USER Device function not implemented
DRV_E_USR_FILE_OPEN_FAILED	0x8004C064	USER File could not be opened
DRV_E_USR_FILE_SIZE_ZERO	0x8004C065	USER File size zero
DRV_E_USR_FILE_NO_MEMORY	0x8004C066	USER Not enough memory to load file
DRV_E_USR_FILE_READ_FAILED	0x8004C067	USER File read failed
DRV_E_USR_INVALID_FILETYPE	0x8004C068	USER File type invalid
DRV_E_USR_FILENAME_INVALID	0x8004C069	USER Invalid filename
DRV_E_FW_FILE_OPEN_FAILED	0x8004C06E	USER Firmware file could not be opened
DRV_E_FW_FILE_SIZE_ZERO	0x8004C06F	USER Not enough memory to load firmware file
DRV_E_FW_FILE_NO_MEMORY	0x8004C070	USER Not enough memory to load firmware file
DRV_E_FW_FILE_READ_FAILED	0x8004C071	USER Firmware file read failed
DRV_E_FW_INVALID_FILETYPE	0x8004C072	USER Firmware file type invalid
DRV_E_FW_FILENAME_INVALID	0x8004C073	USER Firmware file name not valid
DRV_E_FW_DOWNLOAD_ERROR	0x8004C074	USER Firmware file download error
DRV_E_FW_FILENAME_NOT_FOUND	0x8004C075	USER Firmware file not found in the internal table
DRV_E_FW_BOOTLOADER_ACTIVE	0x8004C076	USER Firmware file BOOTLOADER active

cifX Driver Specific ODM Error Codes		
Error Code (Definition)	Value	Description
DRV_E_FW_NO_FILE_PATH	0x8004C077	USER Firmware file no file path
DRV_E_CF_FILE_OPEN_FAILED	0x8004C078	USER Configuration file could not be opened
DRV_E_CF_FILE_SIZE_ZERO	0x8004C079	USER Configuration file size zero
DRV_E_CF_FILE_NO_MEMORY	0x8004C07A	USER Not enough memory to load configuration file
DRV_E_CF_FILE_READ_FAILED	0x8004C07B	USER Configuration file read failed
DRV_E_CF_INVALID_FILETYPE	0x8004C07C	USER Configuration file type invalid
DRV_E_CF_FILENAME_INVALID	0x8004C07D	USER Configuration file name not valid
DRV_E_CF_DOWNLOAD_ERROR	0x8004C07E	USER Configuration file download error
DRV_E_CF_FILE_NO_SEGMENT	0x8004C07F	USER No flash segment in the configuration file
DRV_E_CF_DIFFERS_FROM_DBM	0x8004C080	USER Configuration file differs from database
DRV_E_DBM_SIZE_ZERO	0x8004C083	USER Database size zero
DRV_E_DBM_NO_MEMORY	0x8004C084	USER Not enough memory to upload database
DRV_E_DBM_READ_FAILED	0x8004C085	USER Database read failed
DRV_E_DBM_NO_FLASH_SEGMENT	0x8004C086	USER Database segment unknown
DEV_E_CF_INVALID_DESCRIPTOR_VERSION	0x8004C096	CONFIG Version of the descriptor table invalid
DEV_E_CF_INVALID_INPUT_OFFSET	0x8004C097	CONFIG Input offset is invalid
DEV_E_CF_NO_INPUT_SIZE	0x8004C098	CONFIG Input size is 0
DEV_E_CF_MISMATCH_INPUT_SIZE	0x8004C099	CONFIG Input size does not match configuration
DEV_E_CF_INVALID_OUTPUT_OFFSET	0x8004C09A	CONFIG Invalid output offset
DEV_E_CF_NO_OUTPUT_SIZE	0x8004C09B	CONFIG Output size is 0
DEV_E_CF_MISMATCH_OUTPUT_SIZE	0x8004C09C	CONFIG Output size does not match configuration
DEV_E_CF_STN_NOT_CONFIGURED	0x8004C09D	CONFIG Station not configured
DEV_E_CF_CANNOT_GET_STN_CONFIG	0x8004C09E	CONFIG Cannot get the Station configuration
DEV_E_CF_MODULE_DEF_MISSING	0x8004C09F	CONFIG Module definition is missing
DEV_E_CF_MISMATCH_EMPTY_SLOT	0x8004C0A0	CONFIG Empty slot mismatch
DEV_E_CF_MISMATCH_INPUT_OFFSET	0x8004C0A1	CONFIG Input offset mismatch
DEV_E_CF_MISMATCH_OUTPUT_OFFSET	0x8004C0A2	CONFIG Output offset mismatch
DEV_E_CF_MISMATCH_DATA_TYPE	0x8004C0A3	CONFIG Data type mismatch
DEV_E_CF_MODULE_DEF_MISSING_NO_SI	0x8004C0A4	CONFIG Module definition is missing,(no Slot/Idx)

Table 62: cifX Driver Specific ODM Error Codes

11.6 Error Codes cifX Device Driver and netX Driver

11.6.1 Generic Error Codes

Error Code (Definition)	Value	Description
CIFX_INVALID_POINTER	0x800A0001L	Invalid pointer (NULL) passed to driver
CIFX_INVALID_BOARD	0x800A0002L	No board with the given nameindex available
CIFX_INVALID_CHANNEL	0x800A0003L	No channel with the given index available
CIFX_INVALID_HANDLE	0x800A0004L	Invalid handle passed to driver
CIFX_INVALID_PARAMETER	0x800A0005L	Invalid parameter
CIFX_INVALID_COMMAND	0x800A0006L	Invalid command
CIFX_INVALID_BUFFERSIZE	0x800A0007L	Invalid buffer size
CIFX_INVALID_ACCESS_SIZE	0x800A0008L	Invalid access size
CIFX_FUNCTION_FAILED	0x800A0009L	Function failed
CIFX_FILE_OPEN_FAILED	0x800A000AL	File could not be opened
CIFX_FILE_SIZE_ZERO	0x800A000BL	File size is zero
CIFX_FILE_LOAD_INSUFF_MEM	0x800A000CL	Insufficient memory to load file
CIFX_FILE_CHECKSUM_ERROR	0x800A000DL	File checksum compare failed
CIFX_FILE_READ_ERROR	0x800A000EL	Error reading from file
CIFX_FILE_TYPE_INVALID	0x800A000FL	Invalid file type
CIFX_FILE_NAME_INVALID	0x800A0010L	Invalid file name
CIFX_FUNCTION_NOT_AVAILABLE	0x800A0011L	Driver function not available
CIFX_BUFFER_TOO_SHORT	0x800A0012L	Given buffer is too short
CIFX_MEMORY_MAPPING_FAILED	0x800A0013L	Failed to map the memory
CIFX_NO_MORE_ENTRIES	0x800A0014L	No more entries available
CIFX_CALLBACK_MODE_UNKNOWN	0x800A0015L	Unkown callback handling mode
CIFX_CALLBACK_CREATE_EVENT_FAILED	0x800A0016L	Failed to create callback events
CIFX_CALLBACK_CREATE_RECV_BUFFER	0x800A0017L	Failed to create callback receive buffer

Table 63: Generic Error Codes

11.6.2 Generic Driver Error Codes

Error Code (Definition)	Value	Description
CIFX_DRV_NOT_INITIALIZED	0x800B0001L	Driver not initialized
CIFX_DRV_INIT_STATE_ERROR	0x800B0002L	Driver init state error
CIFX_DRV_READ_STATE_ERROR	0x800B0003L	Driver read state error
CIFX_DRV_CMD_ACTIVE	0x800B0004L	Command is active on device
CIFX_DRV_DOWNLOAD_FAILED	0x800B0005L	General error during download
CIFX_DRV_WRONG_DRIVER_VERSION	0x800B0006L	Wrong driver version
CIFX_DRV_DRIVER_NOT_LOADED	0x800B0030L	CIFx driver is not running
CIFX_DRV_INIT_ERROR	0x800B0031L	Failed to initialize the device
CIFX_DRV_CHANNEL_NOT_INITIALIZED	0x800B0032L	Channel not initialized (xOpenChannel not called)
CIFX_DRV_IO_CONTROL_FAILED	0x800B0033L	IOControl call failed
CIFX_DRV_NOT_OPENED(0x800B0034L	Driver was not opened
CIFX_DRV_DOWNLOAD_STORAGE_UNKN OWN	0x800B0040L	Unknown download storage type (RAMFLASH based) found
CIFX_DRV_DOWNLOAD_FW_WRONG_CHA NNEL	0x800B0041L	Channel number for a firmware download not supported
CIFX_DRV_DOWNLOAD_MODULE_NO_BAS EOS	0x800B0042L	Modules are not allowed without a Base OS firmware

Table 64: Generic Driver Error Codes

11.6.3 Generic Device Error Codes

Error Code (Definition)	Value	Description
CIFX_DEV_DPM_ACCESS_ERROR	0x800C0010L	Dual port memory not accessible (board not found)
CIFX_DEV_NOT_READY	0x800C0011L	Device not ready (ready flag failed)
CIFX_DEV_NOT_RUNNING	0x800C0012L	Device not running (running flag failed)
CIFX_DEV_WATCHDOG_FAILED	0x800C0013L	Watchdog test failed
CIFX_DEV_SYSERR	0x800C0015L	Error in handshake flags
CIFX_DEV_MAILBOX_FULL	0x800C0016L	Send mailbox is full
CIFX_DEV_PUT_TIMEOUT	0x800C0017L	Send packet timeout
CIFX_DEV_GET_TIMEOUT	0x800C0018L	Receive packet timeout
CIFX_DEV_GET_NO_PACKET	0x800C0019L	No packet available
CIFX_DEV_MAILBOX_TOO_SHORT	0x800C001AL	Mailbox too short
CIFX_DEV_RESET_TIMEOUT	0x800C0020L	Reset command timeout
CIFX_DEV_NO_COM_FLAG	0x800C0021L	COM-flag not set
CIFX_DEV_EXCHANGE_FAILED	0x800C0022L	IO data exchange failed
CIFX_DEV_EXCHANGE_TIMEOUT	0x800C0023L	IO data exchange timeout
CIFX_DEV_COM_MODE_UNKNOWN	0x800C0024L	Unknown IO exchange mode
CIFX_DEV_FUNCTION_FAILED	0x800C0025L	Device function failed
CIFX_DEV_DPMSIZE_MISMATCH	0x800C0026L	DPM size differs from configuration
CIFX_DEV_STATE_MODE_UNKNOWN	0x800C0027L	Unknown state mode
CIFX_DEV_HW_PORT_IS_USED	0x800C0028L	Device is still accessed
CIFX_DEV_CONFIG_LOCK_TIMEOUT	0x800C0029L	Configuration locking timeout
CIFX_DEV_CONFIG_UNLOCK_TIMEOUT	0x800C002AL	Configuration unlocking timeout
CIFX_DEV_HOST_STATE_SET_TIMEOUT	0x800C002BL	Set HOST state timeout
CIFX_DEV_HOST_STATE_CLEAR_TIMEOUT	0x800C002CL	Clear HOST state timeout
CIFX_DEV_INITIALIZATION_TIMEOUT	0x800C002DL	Timeout during channel initialization
CIFX_DEV_BUS_STATE_ON_TIMEOUT	0x800C002EL	Set Bus ON Timeout
CIFX_DEV_BUS_STATE_OFF_TIMEOUT	0x800C002FL	Set Bus OFF Timeout
CIFX_DEV_MODULE_ALREADY_RUNNING	0x800C0040L	Module already running
CIFX_DEV_MODULE_ALREADY_EXISTS	0x800C0041L	Module already exists

Table 65: Generic Device Error Codes

11.7 Error Codes netX Driver

11.7.1 CIFS API Transport Error Codes

Error Code (Definition)	Value	Description
CIFS_TRANSPORT_SEND_TIMEOUT	0x800D0001L	Time out while sending data
CIFS_TRANSPORT_RECV_TIMEOUT	0x800D0002L	Time out waiting for incoming data
CIFS_TRANSPORT_CONNECT	0x800D0003L	Unable to communicate to the device no answer
CIFS_TRANSPORT_ABORTED	0x800D0004L	Transfer has been aborted due to keep alive timeout or interface detachment
CIFS_CONNECTOR_FUNCTIONS_READ_ERROR	0x800D0010L	Error reading the connector functions from the DLL
CIFS_CONNECTOR_IDENTIFIER_TOO_LONG	0x800D0011L	Connector delivers an identifier longer than 6 characters
CIFS_CONNECTOR_IDENTIFIER_EMPTY	0x800D0012L	Connector delivers an empty identifier
CIFS_CONNECTOR_DUPLICATE_IDENTIFIER	0x800D0013L	Connector identifier already used

Table 66: CIFS API Transport Error Codes

11.7.2 CIFS API Transport Header State Error Codes

Error Code (Definition)	Value	Description
CIFS_TRANSPORT_ERROR_UNKNOWN	0x800E0001L	Unknown error code in transport header
CIFS_TRANSPORT_CHECKSUM_ERROR	0x800E0002L	CRC16 checksum failed
CIFS_TRANSPORT_LENGTH_INCOMPLETE	0x800E0003L	Transaction with incomplete length detected
CIFS_TRANSPORT_DATA_TYPE_UNKNOWN	0x800E0004L	Device does not support requested data type
CIFS_TRANSPORT_DEVICE_UNKNOWN	0x800E0005L	Device not available unknown
CIFS_TRANSPORT_CHANNEL_UNKNOWN	0x800E0006L	Channel not available unknown
CIFS_TRANSPORT_SEQUENCE	0x800E0007L	Sequence error detected
CIFS_TRANSPORT_BUFFER_OVERFLOW	0x800E0008L	Buffer overflow detected
CIFS_TRANSPORT_RESOURCE	0x800E0009L	Device signals out of resources
CIFS_TRANSPORT_KEEPALIVE	0x800E000AL	Device connection monitoring error (Keep alive)
CIFS_TRANSPORT_DATA_TOO_SHORT	0x800E000BL	Received transaction data too short

Table 67: CIFS API Transport Header State Error Codes

11.8 ODM Error Codes DBM V4

ODM Error Codes DBM V4		
Error Code (Definition)	Value	Description
CDBM_E_MD5_INVALID	0XC004C810	Checksum invalid
CDBM_E_INTERNALERROR	0XC004C811	Internal Error
CDBM_W_WRITEREGISTRY	0X8004C812	Error writing to the registry
CDBM_E_UNEXPECTED_VALUE_IN_OLD_HEADER_FORMAT	0XC004C813	Error in a file containing the old DBM Header format.
CDBM_E_CHECKSUM_INVALID	0XC004C814	The Checksum of the old Header is invalid
CDBM_E_DB_ALREADY_LOADED_FORMAT	0XC004C815	A database is already loaded
CDBM_E_NO_VALID_TRANSACTION	0XC004C816	No valid transaction handle given
CDBM_E_STD_STRUCT_ERROR	0XC004C817	An error occurred during validation of data
CDBM_E_UNSUPPORTED_DATA_TYPE_FORMAT	0XC004C818	Unsupported DataType
CDBM_W_CLASS_DELETED_FORMAT	0X8004C819 (Warning)	Using an Object which is marked as deleted
CDBM_W_CLIENT_DISCONNECTED	0X8004C81A (Warning)	A Client has already an outstanding connection to a Table. The connection is now destroyed.
CDBM_E_STRUCTURE_DEFINITION_INVALID	0XC004C81B	A structure definition of an Element in a Table is invalid
CDBM_E_NO_DATA_AVAILABLE	0XC004C81C	No data available for this operation
CDBM_E_NO_VALID_STRUCTURE	0XC004C81D	No valid structure available for this operation
CDBM_E_NO_TOGGLE_STRING_FOUND	0XC004C81E	No Toggle string found for this number
CDBM_E_ELEMENT_OUT_OF_RANGE	0XC004C81F	An element wasn't found in the Record of a Table
CDBM_E_ELEMENT_NOT_IN_TABLE	0XC004C820	The element is not part of the Table
CDBM_E_CANNOT_CONVERT_INTO_CLIENT_TYPE	0XC004C821	The data can't be converted into the Client type
CDBM_E_TRANSACTION_ALREADY_OPEN	0XC004C822	A transaction is already open. Please close this one first before opening a new one.
CDBM_I_OLD_WITHOUT_HEADER	0X4004C823 (Informational)	Use of an old DBM file Format without Header
CDBM_E_HR_FROM	0XC004C824	An HRESULT was received from a Subroutine
CDBM_E_PARAMETER	0XC004C825	A Parameter is invalid
CDBM_E_NOTIMPL	0XC004C826	Method is currently not implemented
CDBM_E_OUTOFMEMORY	0XC004C827	Out of memory
CDBM_E_NO_OPEN_TRANSACTION	0XC004C828	No transaction open
CDBM_E_NO_CONTENTS	0XC004C829	No contents available
CDBM_REC_NO_NOT_FOUND	0XC004C82A	Record not found
CDBM_STRUCTURE_ELEMENT_NOT_FOUND	0XC004C82B	Element of the Structure not found
CDBM_E_NO_MORE_RECORDS_IN_TABTYPE	0XC004C82C	Table type 3 can contain only one record
CDBM_E_WRITE	0XC004C82D	The data in the VARIANT must be given in a SafeArray
CDBM_E_WRITE_NO_PARRAY	0XC004C82E	The VARIANT contains no valid [parray] element

ODM Error Codes DBM V4		
Error Code (Definition)	Value	Description
CDBM_E_WRITE_CANT_ACCESS_DATA	0XC004C82F	Unable to access SafeArray Data in the VARIANT
CDBM_E_WRITE_DATA	0XC004C830	To write the data of this Element it must be given as a BSTR, or as an Array of VT_UI1/VT_I1
CDBM_E_WRITE_BSTR_E1	0XC004C831	The BSTR string must have an even length.
CDBM_E_WRITE_BSTR_E2	0XC004C832	The BSTR string must contain only hex digits (0..9 and a/A..f/F).
CDBM_E_WRITE_CANT_INTERPRET_ARRAY	0XC004C833	Unable to interpret data in the SafeArray.
CDBM_E_WRITE_VT_ERROR	0XC004C834	Data type in the SafeArray is not VT_UI1 or VT_I1.
CDBM_E_WRITE_LENGTH	0XC004C835	Data length is invalid for write operation of this type.
CDBM_WRITE_ELEMENT	0XC004C836	Element not found in the Record of the Table
CDBM_MIN_MAX_ERROR	0XC004C837	Can't write data because of min underflow or max overflow
CDBM_TABLE_EXIST	0XC004C838	Table already exist in the database
CDBM_MIN_MAX_INVALID	0XC004C839	The Min value is greater than the Max Value
CDBM_DEF_MIN_MAX_INVALID	0XC004C83A	The Default Value is not in the range between the Min value and the Max Value
CDBM_CANT_CHANGE_STRUCTURE_WHILE_RECORDS_EXIST	0XC004C83B	It's not allowed to change the structure while Records exist in the Table
CDBM_NEW_STRUCT_NEEDS_TYPE	0XC004C83C	In a newly added structure the data type must be set also
CDBM_VALUE_ERROR	0XC004C83D	Range error while validating a value
CDBM_DATATYPE_UNSUPPORTED_IN_RCS	0XC004C83E	The data type is unsupported in the RCS file format
CDBM_I_COUNT_OF_TABLES_EXCEEDS_RCS_RANGE	0X4004C83F (Informational)	The count of Tables exceeds the RCS range of Tables. This can cause problems if the file is downloaded to RCS Systems
CDBM_I_COUNT_OF_TABLES_EXCEEDS_OLDDBM_RANGE	0X4004C840 (Informational)	The count of Tables exceeds the DBM32.DLL range of Tables. This can cause problems if the file is used with older Tools using the DBM32.DLL
CDBM_UNSUPPORTED_DATATYPE_IN_RCS_MODE	0XC004C841	The Data type is not compatible with the old database format
CDBM_WRITE_UNSTRUCTURED_1	0XC004C842	The data of an unstructured record can only be written with the 'Write' Method not with 'WriteElement'.
CDBM_READ_UNSTRUCTURED_1	0XC004C843	The data of an unstructured record can only be read with the 'Read' Method not with 'ReadElement'
CDBM_WRITE_DATA_LENGTH_INVALID	0XC004C844	The given data length doesn't correspond with the expected data length.
CDBM_UNKNOWN_VIEW_MODE	0XC004C845	The View Mode is unknown.
CDBM_E_DIAG_TABLE	0XC004C846	It doesn't make much sense to add or delete records from a diagnostic table because those changes are never saved.

ODM Error Codes DBM V4		
Error Code (Definition)	Value	Description
CDBM_E_ADR_STRING_ERROR	0XC004C847	The given Address string doesn't fit the required format of this type where all address bytes must be in the range between 0 and FF
CDBM_ERROR_FROM_VAR_CHANGE_TYPE	0XC004C848	Function VariantChangeType return an error when trying to convert the Parameter
CDBM_E_MINERROR	0XC004C849	Error while comparing the Value with the lower range
CDBM_E_MAXERROR	0XC004C84A	Error while comparing the Value with the upper range
CDBM_E_RANGE_ERROR	0XC004C84B	Value out of Range
CDBM_E_TABLE_TYPE1	0XC004C84C	Table type 1 doesn't have a unique record length over all records
CDBM_E_TABLE_TYPE3_ADDREC	0XC004C84D	Table type 3 doesn't allow to insert more than one Record
CDBM_E_TABTYPE1	0XC004C84E	It's not allowed to insert more Records than structure definitions in Table Type 1
CDBM_E_TOGGLE_NOT_FOUND	0XC004C84F	Could not find the string for this value in the list of valid toggle strings
CDBM_E_TOGGLE_VALUE_IS_EMPTY_STRING	0XC004C850	The toggle string for this value is empty.
CDBM_VARIANT2BYTEARRAY_ERROR	0XC004C851	Error during conversion of Variant to byte array
CDBM_E_SET_ELEM_PROP_DEPENDENCY	0XC004C852	The Toggle Type needs also the additional string and the additional number entries in the Method
CDBM_E_TABTYPE1_REC_DOESNT_CORRESPOND_WITH_ELEMENT	0XC004C853	When reading the records of Table type 1 elementwise the record number must correspond with the element number
CDBM_TABTYPE1_NO_DATA_FOUND_FOR_RECORD	0XC004C854	When reading the records of Table type 1 and structure definitions are present it's assumed that for each structure element a corresponding record must exist
CDBM_E_TABTYPE1_WRITE_ELEMENT_NE_RECORD	0XC004C855	When writing the records of Table type 1 elementwise and structure definitions are present it's only allowed to write the corresponding element number in each record
CDBM_E_TABTYPE1_WRITE_ELEMENT_NOT_FOUND	0XC004C856	When writing the records of Table type 1 with an array and structure definitions are present it's assumed that a corresponding element number of this record exist
CDBM_I_TABLE_NAME_EXCEEDS_RCS_RANGE	0X4004C857 (Informational)	The Table name exceeds the maximum length of RCS compatible Table names
CDBM_W_CUT_STRING	0X8004C858 (Warning)	The string exceeds the maximum length and will be limited to the maximum length
CDBM_I_STRING_TOO_SHORT	0X4004C859 (Informational)	The string is below the minimum length. The minimum length will be reduced.
CDBM_I_STRING_TOO_LONG	0X4004C85A (Informational)	The string is exceeding the maximum. The maximum length will be extended.
CDBM_E_STRING_TOO_SHORT	0XC004C85B (Error)	The string is below the minimum length.
CDBM_E_STRING_TOO_LONG	0XC004C85C (Error)	The string is exceeding the maximum length

ODM Error Codes DBM V4		
Error Code (Definition)	Value	Description
CDBM_E_WRONG_TYPE_FOR_WRITE	0XC004C85D	Writing on the Element type with the given Data type is not implemented
CDBM_E_NO_APPEND_IN_STRUCTURED_RECORDS	0XC004C85E	Method IDbmRecord::AppendData is not allowed for structured records
CDBM_E_DATA_UNAVAILABLE	0XC004C85F	No data available
CDBM_E_CANT_CONVERT_INTO	0XC004C860	Unable to convert the value into the Element type
CDBM_E_DBM_FILE_OVERFLOW	0XC004C861	You try to write a RCS like database which needs too much bytes
CDBM_E_PW_ERROR	0XC004C862	Password not correct
CDBM_E_FILELENGTH_CORRUPT	0XC004C863	The file length doesn't correspond to the length given in the Header.
CDBM_E_STRUCT_TYPE	0XC004C864	Error in the file.
CDBM_E_MD5SUM_INVALID	0XC004C865	MD5 sum invalid
CDBM_E_STRUCT_LENGTH	0XC004C866	Error in the expected and given structure length at a specific offset in the file.
CDBM_E_APPEND	0XC004C867	Append of data is only allowed if the Record contains only one data field and the field type will support this
CDBM_APPEND_NOT_SUPPORTED	0XC004C868	Append of Data not supported by this filed type
CDBM_DATA_TYPE_APPEND_ERROR	0XC004C869	Can't append Data of this type.
CDBM_E_UNSTRUCTURED_TABLE_DOESNT_SUPPORT_LENGTH	0XC004C86A	A Table without structure information doesn't support a record length
CDBM_E_DISABLED_WHILE_TRANSACTION_IS_OPEN	0XC004C86B	The Method is disabled while a transaction is open. Please close this one first and call the Method again.
CDBM_E_UNABLE_TO_CALL_READ_ON_LINKED_LIST	0XC004C86C	The Method is disabled on a LinkedList type. Please use the IRecordCollection on this type.
CDBM_E_ELEMENT_HAS_NO_SUBSTRUCTURE	0XC004C86D	An Element from a Table has no substructure
CDBM_STRUCT_ERROR_FROM_VAR_CHANGE_TYPE	0XC004C86E	Error from calling VariantChangeType
CDBM_E_FOREIGNKEY_DEF	0XC004C86F	The definition of a FOREIGNKEY must contain the name of the related Table in the description and this Table must exist at this time
CDBM_E_FOREIGNKEY_REF_TAB	0XC004C870	The description of a FOREIGNKEY must refer to a Table of type 'eDbmTableTypeLinkedList'
CDBM_E_KEY	0XC004C871	To create a Record Collection with a KEY it's necessary to have the data type KEY at the first position in all Records of the searched Table
CDBM_E_KEY_TABLE_TYPE	0XC004C872	This Method needs a Table of type 'eDbmTableTypeLinkedList'
CDBM_DATATYPE_NOT_IMPLEMENTED	0XC004C873	This data type is currently not implemented
CDBM_INSERT_POS_NOT_FOUND	0XC004C874	The position of the Record where the new one should be inserted wasn't found
CDBM_E_INSERT_REC_QI	0XC004C875	Error during insertion of a Record
CDBM_E_TAB_PROP	0XC004C876	Invalid Property in Table
CDBM_E_KEY_NOT_FOUND	0XC004C877	The KEY wasn't found in the Table

ODM Error Codes DBM V4		
Error Code (Definition)	Value	Description
CDBM_E_KEY_INVALID	0XC004C878	The KEY is invalid for this operation

Table 68: ODM Error Codes DBM V4

12 Appendix

12.1 User Rights

User-rights are set within the FDT-container. Depending on the level the configuration is accessible by the user or read-only.

To access the **Settings**, **Configuration** and **Diagnosis** panes of the EtherCAT Master DTM you do not need special user rights. Also all users can select the decimal or hexadecimal Display mode or sort table entries.



Note: To edit, set or configure the parameters of the **Settings** and **Configuration** panes, you need user rights for *Maintenance*, for *Planning Engineer* or for *Administrator*.

The following tables give an overview of the user right groups and which user rights you need to configure the single parameters.

12.1.1 Settings

	Observer	Operator	Maintenance	Planning Engineer	Administrator
<i>Driver</i>	D	D	X	X	X
<i>Verify or adapt Driver Settings</i>	-	-	X	X	X
<i>Configuring netX Driver</i>	-	-	X	X	X
<i>Device Assignment</i>	D	D	X	X	X
<i>Scanning for Devices</i>	-	-	X	X	X
<i>Selecting the Device (with or without firmware)</i>	-	-	X	X	X
<i>Selecting the Device once more (with Firmware)</i>	-	-	X	X	X
<i>Firmware Download</i>	D	D	X	X	X

Table 69: Settings (D = Displaying, X = Editing, Configuring)

12.1.2 Configuration

	Observer	Operator	Maintenance	Planning Engineer	Administrator
<i>General</i>	D	D	X	X	X
<i>Process Data Handshake</i>	D	D	X	X	X
<i>Mailbox</i>	D	D	X	X	X
<i>FMMU/SyncMan</i>	D	D	X	X	X
<i>Address Table</i>	D	D	X	X	X
<i>Init Commands</i>	D	D	X	X	X

Table 70: Configuration (D = Displaying, X = Editing, Configuring)

12.2 Object Dictionary

The object dictionary is a special area for the storage of parameters, application data and the PDO mapping, i.e. the mapping information between process data and application data. The object dictionary functionality is similar to the one defined in the CANopen standard in order to use CANopen-based device and application profiles in EtherCAT. Access to the object dictionary is possible via Service Data Objects (SDO) which provide a mailbox-based access functionality.

All CANopen-related data objects are contained in the object dictionary and can be accessed in a standardized manner. You can view the object dictionary as a container for device parameter data structures.

The following SDO services are provided for maintaining the object dictionary:

- SDO Upload
- SDO Download

12.2.1 General Structure

The object dictionary is structured in separate areas. Each area has its own range of permitted index values and its special purpose as defined in the table below:

Index Range	Area Name	Purpose
0x0000 – 0x0FFF	Data Type Area	Definition and description of data types.
0x1000 – 0x1FFF	CoE Communication Area	Definition of generally applicable variables (communication objects for all devices as defined by CANopen standard DS 301).
0x2000 – 0x5FFF	Manufacturer-specific Area	Definition of manufacturer-specific variables
0x6000 – 0x9FFF	Profile Area	Definition of variables related to a specific profile
0xA000 – 0xFFFF	Reserved Area	This area is reserved for future use

Table 71: General Structure of Object Dictionary

12.2.2 Objects

The following kinds of objects may be defined within the object directory:

Object Code	Object Name
0002	DOMAIN
0005	DEFTYPE
0006	DEFSTRUCT
0007	VAR
0008	ARRAY
0009	RECORD

Table 72: Definition of Objects

12.2.3 Data Types

Data types can be defined in the data type area of the object dictionary using object DEFTYPE as follows:

Data Type Index	Name
0001	BOOLEAN
0002	INTEGER8
0003	INTEGER16
0004	INTEGER32
0005	UNSIGNED8
0006	UNSIGNED16
0007	UNSIGNED32
0008	REAL32
0009	VISIBLE_STRING
000A	OCTET_STRING
000B	UNICODE_STRING
000C	TIME_OF_DAY
000D	TIME_DIFFERENCE
000E	Reserved
000F	DOMAIN
0010	INTEGER24
0011	REAL64
0012	INTEGER40
0013	INTEGER48
0014	INTEGER56
0015	INTEGER64
0016	UNSIGNED24
0017	Reserved
0018	UNSIGNED40
0019	UNSIGNED48
001A	UNSIGNED56
001B	UNSIGNED64
001C-001F	Reserved for future use

Table 73: Available Data Type Definitions – Part 1

Data Type Index	Name	Object
0020	Reserved	
0021	PDO_MAPPING	DEFSTRUCT
0022	Reserved	
0023	IDENTITY	DEFSTRUCT
0024	Reserved	
0025	COMMAND_PAR	DEFSTRUCT
0026	IP_PAR	DEFTYPE
0027-003F	Reserved	
0040-005F	Manufacturer Specific Complex Data Types	DEFSTRUCT
0060-007F	Device Profile 0 Specific Standard Data Types	DEFTYPE
0080-009F	Device Profile 0 Specific Complex Data Types	DEFSTRUCT
00A0-00BF	Device Profile 1 Specific Standard Data Types	DEFTYPE
00C0-00DF	Device Profile 1 Specific Complex Data Types	DEFSTRUCT
00E0-00FF	Device Profile 2 Specific Standard Data Types	DEFTYPE
0100-011F	Device Profile 2 Specific Complex Data Types	DEFSTRUCT
0120-013F	Device Profile 3 Specific Standard Data Types	DEFTYPE
0140-015F	Device Profile 3 Specific Complex Data Types	DEFSTRUCT
0160-017F	Device Profile 4 Specific Standard Data Types	DEFTYPE
0180-019F	Device Profile 4 Specific Complex Data Types	DEFSTRUCT
01A0-01BF	Device Profile 5 Specific Standard Data Types	DEFTYPE
01C0-01DF	Device Profile 5 Specific Complex Data Types	DEFSTRUCT
01E0-01FF	Device Profile 6 Specific Standard Data Types	DEFTYPE
0100-021F	Device Profile 6 Specific Complex Data Types	DEFSTRUCT
0220-023F	Device Profile 7 Specific Standard Data Types	DEFTYPE
0240-025F	Device Profile 7 Specific Complex Data Types	DEFSTRUCT
0260-0FFF	Reserved	Reserved

Table 74: Available Data Type Definitions – Part 2

12.2.4 The CoE Communication Area

The CoE Communication Area is structured according to the definitions in this table:

CoE Communication Area				
Data Type Index	Object	Name	Type	M/O/C
1000	VAR	Device Type	UNSIGNED32	M
1001		Reserved		
....	
1007		Reserved		
1008	VAR	Manufacturer Device Name	String	O
1009	VAR	Manufacturer Hardware Version	String	O
100A	VAR	Manufacturer Software Version	String	O
100B		Reserved		
....
1017		Reserved		
1018	RECORD	Identity Object	Identity (23h)	M
101A		Reserved		
....

Table 75: CoE Communication Area - General Overview

For index values larger than 0x1100 refer to the EtherCAT specification.

The sections below show for the single items of the CoE Communication Area the following information:

- Name
- Object code
- Data type
- Category (Mandatory or optional)
- Access (Read-only or Read/Write)
- PDO mapping (Yes/No)
- Allowed values

12.2.4.1 Device Type

Index	0x1000
Name	Device Type
Object code	VAR
Data type	UNSIGNED32
Category	Mandatory
Access	Read only
PDO mapping	No
Value	Bit 0-15: contain the used device profile or the value 0x0000 if no standardized device is used

Table 76: CoE Communication Area - Device Type

12.2.4.2 Manufacturer Device Name

Index	0x1008
Name	Manufacturer Device Name
Object code	VAR
Data type	VISIBLE_STRING
Category	Optional
Access	Read only
PDO mapping	No
Value	Name of the device (specified as non zero terminated string)

Table 77: CoE Communication Area – Manufacturer Device Name

12.2.4.3 Manufacturer Hardware Version

Index	0x1009
Name	Manufacturer Hardware Version
Object code	VAR
Data type	VISIBLE_STRING
Category	Optional
Access	Read only
PDO mapping	No
Value	Hardware version of the device (specified as non zero terminated string)

Table 78: CoE Communication Area – Manufacturer Hardware Version

12.2.4.4 Manufacturer Software Version

Index	0x100A
Name	Manufacturer Software Version
Object code	VAR
Data type	VISIBLE_STRING
Category	Optional
Access	Read only
PDO mapping	No
Value	Software version of the device (specified as non zero terminated string)

Table 79: CoE Communication Area – Manufacturer Software Version

12.2.4.5 Identity Object

Index	0x1018
Name	Identity Object
Object code	RECORD
Data type	IDENTITY
Category	Mandatory

Table 80: CoE Communication Area – Identity Object

Number of entries

Sub Index	0
Description	Number of entries
Data type	UNSIGNED8
Entry Category	Mandatory
Access	Read only
PDO mapping	No
Value	4

Table 81: CoE Communication Area – Identity Object - Number of entries

Vendor ID

Sub Index	1
Description	Vendor ID
Data type	UNSIGNED32
Entry Category	Mandatory
Access	Read only
PDO mapping	No
Value	Vendor ID assigned by the CiA organization

Table 82: CoE Communication Area – Identity Object - Vendor ID

Product Code

Sub Index	2
Description	Product Code
Data type	UNSIGNED32
Entry Category	Mandatory
Access	Read only
PDO mapping	No
Value	Product code of the device

*Table 83: CoE Communication Area – Identity Object - Product Code***Revision Number**

Sub Index	3
Description	Revision Number
Data type	UNSIGNED32
Entry Category	Mandatory
Access	Read only
PDO mapping	No
Value	Bit 0-15: Minor Revision Number of the device Bit 16-31: Major Revision Number of the device

*Table 84: CoE Communication Area – Identity Object - Revision Number***Serial Number**

Sub Index	4
Description	Serial Number
Data type	UNSIGNED32
Entry Category	Mandatory
Access	Read only
PDO mapping	No
Value	Serial Number of the device

Table 85: CoE Communication Area – Identity Object - Serial Number

12.3 References

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- [2] EtherCAT Communication Specification, August 2007
- [3] IEC 61158 Part 2-6 Type 12 documents
- [4] EtherCAT Master Protocol API Manual (V3), Revision 5, Hilscher GmbH 2013

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12.6 Glossary

CoE

CANopen over EtherCAT

CoE denominates a method for accessing an object dictionary which has been adopted for use in EtherCAT from CANopen.

DDF

Device Description File.

DTM

Device Type Manager.

The Device Type Manager (DTM) is a software module with graphical user interface for the configuration or for diagnosis of devices.

E²PROM

Electronically erasable Programmable Read-Only Memory

E-Bus

Bus system based on LVDS standard

EDS

Electronic Data Sheet

EtherCAT-Master

A device which is responsible for the configuration, parameterization of the EtherCAT segment, all connected devices' controllers, and cyclic process data exchange, mailbox and diagnostics services.

EtherCAT-Port

Physical type of data transmission used by EtherCAT. An EtherCAT Slave Controller can have up to 4 EtherCAT ports. Can be one of the following three alternatives:

- E-Bus
- 100Base-TX
- 100Base-FX

EtherCAT-Slave

A device which is configured by the Master, receives telegrams with output data, commands from it and provides input and status data.

FDT

Field Device Tool

FDT specifies an interface, in order to be able to use DTM (Device Type Manager) in different applications of different manufacturers

FMMU

Fieldbus Memory Management Unit

A field bus memory management unit organizes a mapping of EtherCAT logical addresses to physical addresses.

LVDS

Low Voltage Differential Signals

A data transmission standard specified in ANSI/TIA/EIA-644-1995 and used in Beckhoff's E-Bus.

Object Dictionary

An object dictionary is a storage area for device parameter data structures. It is accessed in standardized manner very similarly as this is done in CANopen..

ODMV3

The Online-Data-Manager Version 3 (ODMV3) is an application interface. The ODMV3 works as a server, which can be run as an out-proc server or system service. Its task is to provide different applications (e. g. SYCON.net), access to multiple devices and even share one device amongst several applications.

PDO

Process Data Object

Specific data object for cyclic data communication.

SDO

Service Data Object

Specific data object for acyclic data communication, i.e. mailbox-based communication. It is typically used for accessing the object dictionary.

Sync Manager

Synchronization Manager

A sync manager synchronizes the data communication on a specific communication channel. It is configured for managing either input or output and for working either cyclically or acyclically based on mailboxes. Configuration is done within the DDF file. Up to 4 sync managers numbered 0 to 3 can be configured.

XML

Extensible Markup Language

A versatile data storage format defined by the World Wide Web Consortium (W3C). It is based on elements and attributes. In EtherCAT, it is used in device descriptions stored in DDF files.

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