

acontis technologies GmbH

SOFTWARE

# **EC-Engineer**

**User Manual** 

Version 3.9

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# **1** Introduction

# **1.1 Overview**

EC-Engineer is a configuration and diagnosis tool for EtherCAT networks that are controlled by the EC-Master.

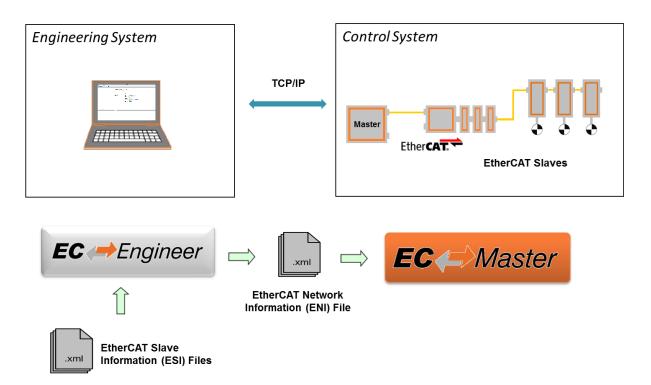
The following screenshot shows the EC-Engineer in configuration mode:

൙ EC-Engineer []			-		×
<u>File View N</u> etwork <u>S</u> ettings <u>H</u> elp					
Configuration Mode 🛛 😵 Export ENI 🛛 🔯 Export EXI	Kan Diagnosis Mode				÷
Project Explorer	Device Editor				
▼ Uass-A Master	Master Process Data Image Wate	h list Trace Data Advanced Options Slave to Slave Distributed Clocks Tasks + Sync Units Data Acquisition			
<ul> <li>Slave_1001 [EK1100] (1001)</li> </ul>					
Slave_1002 [EL2008] (1002)	General				_
Slave_1003 [EL2008] (1003)	Unit Name	Class-A Master			_
Slave_1004 [EL1014] (1004)	Cycle Time [us]	1000	_		•
Slave_1005 [EL2004] (1005) Slave_1006 [EL1034] (1006)	Source MAC address				
Slave_1006 [EL1034] (1006)					
Slave_1008 [EL2008] (1008)					
<ul> <li>Blave_1009 [EK1122-0080] (1009)</li> </ul>	Slaves connected to local system				
Slave_1020 [EK1122] (1020)	Link Layer	Ndis			Ŧ
	Network Adapter	EtherCAT-Test ( Intel(R) Ethernet Server Adapter I210-T1 )			-
			De	eselect	
					-
	Slaves connected to remote systematic	m			
	Protocol	RAS			¥
	IP Address	127.0.0.1			
	Port				
	Master-Instance				
			Se	elect	
	Slaves simulated (SiL)				
	Shaves simulated (Sie)				
	Slaves captured				
	Capture File				
Classic View Flat View Topology View			Se	elect	
			_	_	
Short Info 👻 👎	Messages				<b>~</b> 7
Information	Severity Time Message				
Name Class-A Master		ange from 'init' to 'Pre-Op'			
Description EtherCAT Master Unit (Class A)		ange from 'Unknown' to 'Init'			
Vendor acontis technologies GmbH	1. C	ange from "Unknown" to "Init"			_
	100	uccessful - 26 slaves found			
	INF 09:34:22 EC-Engineer re	ady. Version 3.8.0			
Networks: 1 Slaves: 26		State: 🔹 单	Mode: CO	NFIG	EXPERT

It runs on the Engineering System where the engineer can configure the EtherCAT network. All slaves default to settings that match the Slave's typical use case. Complex networks or installations with special requirements need adjustments to the default settings. Using the Configuration Mode, the user can configure his EtherCAT network according to the project's needs.

# As the result of his work the user can export the EtherCAT Network Information (ENI) file, which is necessary to run the EC-Master on the Control System:





If he has the possibility to connect his Engineering System to the Control System, he can also scan his existing EtherCAT network. The EC-Engineer will then read the network configuration and add all slaves to the project explorer. Now the user can fine tune the network or directly export the ENI file.

If the control system is now running, he can connect to it by using the remote diagnosis functionality and verify that everything is fine by accessing the states, variables, object dictionaries, ESC registers EEPROM data.

# **1.2 Features**

The following table shows the features of the EC-Engineer:

General features	Feature ID	Free	Standard	Plus
Classic view	100	<b>v</b>	<ul> <li></li> </ul>	<b>~</b>
Flat view	101	<b>v</b>	<ul> <li>✓</li> </ul>	<b>~</b>
Topology view	102	<b>v</b>	<ul> <li>✓</li> </ul>	<b>~</b>
Multiple Instances	103	<b>v</b>	<ul> <li>✓</li> </ul>	<b>~</b>
Different themes	104	<b>v</b>	<ul> <li>✓</li> </ul>	<b>~</b>
Different Languages	105	<b>v</b>	<ul> <li>✓</li> </ul>	<b>~</b>
Command line interface	106	<b>v</b>	<ul> <li>✓</li> </ul>	<b>~</b>
EMI Manager	107	<b>v</b>	<ul> <li>✓</li> </ul>	<b>~</b>
ESI Manager	108	<b>~</b>	<ul> <li>✓</li> </ul>	<ul> <li></li> </ul>
Expert Mode	109	<b>~</b>	<ul> <li>✓</li> </ul>	<ul> <li></li> </ul>
Edit topology view	110	<b>v</b>	<ul> <li></li> </ul>	<ul> <li></li> </ul>
Offline Diagnosis	111	×	<ul> <li>✓</li> </ul>	<ul> <li></li> </ul>
Unlimited Slave Count	112	×	<ul> <li></li> </ul>	<ul> <li></li> </ul>



Configuration features	Feature ID	Free	Standard	Plus
Set up distributed clocks	200	~	<ul> <li></li> </ul>	~
Configure MDP slaves	201	~	<ul> <li></li> </ul>	~
Custom PDO mapping	202	~	<ul> <li></li> </ul>	~
Changing name of variables	203	~	<ul> <li></li> </ul>	<ul> <li>✓</li> </ul>
Group support / Hot Connect / Pinned Group	204	~	<ul> <li></li> </ul>	~
EoE Support	205	~	<ul> <li></li> </ul>	~
Startup Commands	206	~	<ul> <li></li> </ul>	~
CoE Object-Dictionary (offline)	207	~	<ul> <li></li> </ul>	~
Enable / disable slave	208	<ul> <li>✓</li> </ul>	<ul> <li></li> </ul>	~
Slave to Slave	209	~	<ul> <li></li> </ul>	~
Support gateway slaves (EL6692, EL6224, EL6631-0010,)	210	~	<ul> <li></li> </ul>	<ul> <li>✓</li> </ul>
Export ENI-File	211	×	<ul> <li></li> </ul>	<ul> <li>✓</li> </ul>
Export Process variables	212	<ul> <li>✓</li> </ul>	<ul> <li></li> </ul>	<ul> <li>✓</li> </ul>
Multiple Cyclic Tasks	213	×	<ul> <li></li> </ul>	<ul> <li>✓</li> </ul>
Import slaves from ENI	214	<ul> <li>✓</li> </ul>	<ul> <li></li> </ul>	<ul> <li>✓</li> </ul>
SoE Object-Dictionary (offline)	215	<ul> <li></li> </ul>	<ul> <li></li> </ul>	<ul> <li>✓</li> </ul>
Change revision of slave	216	<ul> <li></li> </ul>	<ul> <li></li> </ul>	<ul> <li></li> </ul>
Scan topology of local system	217	~	<ul> <li></li> </ul>	<ul> <li></li> </ul>
Scan topology of remote system	218	×	<ul> <li>✓</li> </ul>	<ul> <li></li> </ul>
Scan PDO configuration from slave	219	~	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>
Scan MDP configuration from slave	220	~	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>
Define project templates	221	×	<ul> <li>✓</li> </ul>	~
Support gateway masters (EL6751, EL6731,)	222	×	<ul> <li>✓</li> </ul>	~
EtherCAT P support	223	~	<ul> <li>✓</li> </ul>	~
Slave to Slave in Cycle	224	×	<ul> <li>✓</li> </ul>	<b>~</b>

Diagnosis features	Feature ID	Free	Standard	Plus
Watch list with export	300	~	<ul> <li></li> </ul>	~
ESC Register	301	<ul> <li></li> </ul>	<ul> <li></li> </ul>	~
FoE support	302	×	<ul> <li></li> </ul>	<ul> <li></li> </ul>
DC Diagnosis	303	<ul> <li></li> </ul>	<ul> <li></li> </ul>	<ul> <li></li> </ul>
Extended Diagnosis	304	<ul> <li></li> </ul>	<ul> <li></li> </ul>	<ul> <li></li> </ul>
Trace Data Variables	305	<ul> <li></li> </ul>	<ul> <li></li> </ul>	<ul> <li></li> </ul>
EoE endpoint support	306	×	<ul> <li></li> </ul>	<ul> <li></li> </ul>
Export CoE Object-Dictionary	307	<ul> <li></li> </ul>	<ul> <li></li> </ul>	<ul> <li></li> </ul>
Local System with Windows Master	308	<ul> <li></li> </ul>	<ul> <li></li> </ul>	<ul> <li></li> </ul>
Remote System via RAS-Client	309	×	<ul> <li></li> </ul>	<ul> <li></li> </ul>
Reading count of slaves or frames	310	<ul> <li></li> </ul>	<ul> <li></li> </ul>	<ul> <li></li> </ul>
Compare configured and found slaves	311	<ul> <li></li> </ul>	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>
See value of variables in a list view or chart view	312	<ul> <li></li> </ul>	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>
Changing value of a variable	313	<ul> <li></li> </ul>	<ul> <li></li> </ul>	~
Reading/Writing values (CoE OD)	314	~	<ul> <li>✓</li> </ul>	~
EEPROM Reading/Writing values	315	×	<ul> <li>✓</li> </ul>	~
Reading error or frame counters	316	~	<ul> <li></li> </ul>	~
Diagnosis History of master or slave	317	~	<ul> <li>Image: A set of the set of the</li></ul>	~
Reading/Writing values (SoE OD)	318	<ul> <li></li> </ul>	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>



# **1.3 Supported Slaves of Beckhoff EL6xxx**

The following table shows the supported slaves of Beckhoff EL6xxx in the EC-Engineer:

Name	Free	Standard	Plus
EL6001 Interface (RS232)	<b>~</b>	<ul> <li></li> </ul>	<b>~</b>
EL6002 Interface 2Ch. (RS232)	<b>~</b>	<ul> <li></li> </ul>	<b>~</b>
EL6021 Interface (RS422/485)	<b>~</b>	<ul> <li></li> </ul>	<b>~</b>
EL6021-0021 Interface (RS422/485 line device)	<b>~</b>	<ul> <li>✓</li> </ul>	<b>~</b>
EL6022 Interface 2Ch. (RS422/485)	<b>~</b>	<ul> <li>✓</li> </ul>	<b>~</b>
EL6080 EtherCAT Memory Terminal (128kB)	<b>~</b>	<ul> <li>✓</li> </ul>	<b>~</b>
EL6224 / EP6224 IO-Link Gateway	<b>v</b>	<ul> <li>✓</li> </ul>	<b>~</b>
EP6228 / EPP6228 IO-Link Gateway	<b>v</b>	<ul> <li>✓</li> </ul>	<b>~</b>
EL6601 1 Port Switch (Ethernet, CoE)	<ul> <li></li> </ul>	<ul> <li>✓</li> </ul>	<ul> <li></li> </ul>
EL6614 4 Port Switch (Ethernet, CoE)	<ul> <li></li> </ul>	<ul> <li>✓</li> </ul>	<ul> <li></li> </ul>
EL6631-0010 PROFINET IO Device	<ul> <li></li> </ul>	<ul> <li>✓</li> </ul>	<ul> <li></li> </ul>
EL6690 EtherCAT Bridge terminal (Primary)	<ul> <li></li> </ul>	<ul> <li>✓</li> </ul>	<ul> <li></li> </ul>
EL6690 EtherCAT Bridge terminal (Secondary)	<b>~</b>	<ul> <li>✓</li> </ul>	<ul> <li></li> </ul>
EL6692 EtherCAT Bridge terminal (Primary)	<b>~</b>	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>
EL6692 EtherCAT Bridge terminal (Secondary)	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	<b>~</b>
EL6695 EtherCAT Bridge terminal (Primary)	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	<b>~</b>
EL6695 EtherCAT Bridge terminal (Secondary)	<ul> <li>✓</li> </ul>	<ul> <li>✓</li> </ul>	<b>v</b>
EL6731 PROFIBUS DP Master	×	×	~
EL6731-0010 PROFIBUS DP Slave	<b>~</b>	<ul> <li></li> </ul>	<b>~</b>
EL6751 CANopen Master	×	×	<b>~</b>
EL6751-0010 CANopen Slave	×	×	<ul> <li></li> </ul>

Not listed devices are not supported.

# **1.4 Requirements**

- Microsoft Windows 10 and above
- Microsoft .NET Framework 4 Client Profile
- Screen resolution at least 1024x768 pixel
- Memory as recommended for operating system
- Disk space approximately 80 MB (depend on number of ESI files)

# 1.5 EtherCAT Slave descriptions (ESI files)

The EC-Engineer needs information about each Slave Type to correctly initialize it, give reasonable default settings and present the configurable properties to the user. The knowledge about the different Slave types is gathered from ESI files. The ESI files can be managed by the *ESI-Manager*.



# 2 Installation

# 2.1 Setup Process

The product can be installed by executing the setup.exe (requires administrator privileges) and follow the screen instructions:

# Welcome page:

🔁 EC-Engineer Setup				_		×
	Welcome to Wizard	the EC-	Engine	er Set	up	
	The Setup Wizard Click Next to conti	will install E nue or Can	C-Enginee cel to exit	r on you the Setu	r compute p Wizard.	er.
		<u>B</u> ack	<u>N</u> ext		Cance	!

License Agreement:



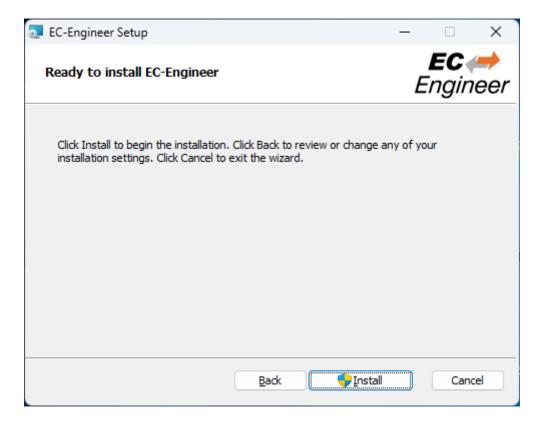
EC-Engineer Setup	_		×
End-User License Agreement Please read the following license agreement carefully	_	EC ngin	<i>⊨</i> eer
Software License and Maintena Agreement	ance		
THIS AGREEMENT is made by and between aconti technologies GmbH (hereinafter referred to as "aco Licensee (hereinafter referred to as "Customer"), th hereto hereinafter collectively referred to as the "Pa agreement is hereinafter referred to as the "Agreen Preamble	ntis") a ne part rties".	ies	
✓ I accept the terms in the License Agreement			
<u>P</u> rint <u>B</u> ack <u>N</u> ext	:	Cano	:el

# Select Installation Folder:

🛃 EC-Engineer Setup		-	· 🗆	×
Destination Folder			EC	
Destination Folder Click Next to install to the default folder or	dick Change to	choose anothe	Engir	neer
Install EC-Engineer to:				
C:\Program Files (x86)\acontis_technologie	s\EC-Engineer\			_
Change				
	Back	<u>N</u> ext	Can	cel

# **Confirm Installation:**



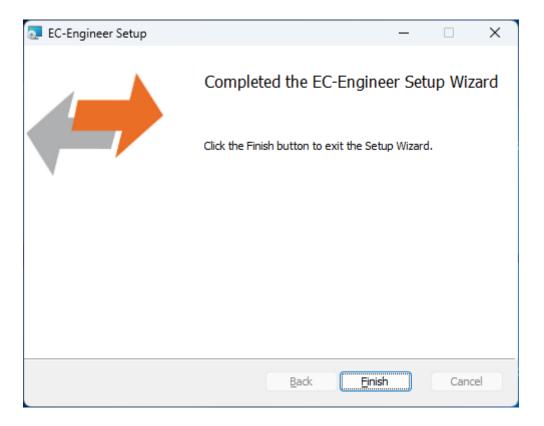


# **Installing EC-Engineer:**

🛃 EC-Engineer Setup	– 🗆 X
Repairing EC-Engineer	<b>EC (→</b> Engineer
Please wait while the Setup Wizard repairs EC-Engineer.	
Status: Updating component registration	
Back	Next Cancel

# Installation Complete:





# 2.2 Silent Installation (optional)

The product can be also installed in silent mode by using the command line parameters of msiexec.

Sample 1: Installs EC-Engineer into default installation folder

```
\ msiexec /i c:/temp/ECEngineerSetup.msi /quiet /qn /norestart /log \hookrightarrow c:/temp/install.log
```

Sample 2: Installs EC-Engineer into C:/EC-Engineer

\$ msiexec /i c:/temp/ECEngineerSetup.msi /quiet /qn /norestart /log \$\to c:/temp/install.log INSTALLLOCATION="C:/EC-Engineer"

For more information please refer command line parameters of msiexec.

Note: The system requirements Supported Slaves of Beckhoff EL6xxx will be not checked!

# 2.3 File and Folder Structure

The setup process will copy all necessary files into the following folder:

Installation directory: (Default: %ProgramFiles%/acontis\_technologies/EC-Engineer)

/Doc

Release notes and the user manual

/EEC

Files for mapping emergency error codes

/Languages



- Lanugage specific files
- EC-Engineer.exe
- EcMaster.dll

• ...

All users directory: ( %ALLUSERSPROFILE%/EC-Engineer, like C:/ProgramData/EC-Engineer)

### /CAPTURE

Capture files which can be analysed in offline diagnosis mode (see Capture File)

### /EtherCAT

EtherCAT Slave Information (ESI) Files Can be modified via ESI-Manager

#### /EMI

EtherCAT Master Information files (see Themes)

# ESICache.xml

ESI-File-Cache for faster access of ESI files

EC-Engineer.log Log file

User.myusername.xml User specific settings

# 2.4 NDIS Driver

The Network Driver Interface Specification (NDIS) is the specification for a network driver architecture that allows transport protocols like TCP/IP to communicate with an underlying physical network adapter. For sending and receiving EtherCAT frames in Windows, EC-Engineer makes use of the well-known Windows packet capture library, WinPcap. However, WinPcap was based on the NDIS 5.x driver model, and development has ceased. The latest versions of Windows 10 do not support this old NDIS 5.x version anymore, so now EC-Engineer (V3.2 and higher) includes an installation package in the install directory of EC-Engineer to install the acontis NDIS 6.x Filter Module EcatNdis.sys. With this new Filter Module and the new NDIS Link Layer emllNdis.dll, it is now possible for EC-Engineer to work without WinPcap on all Windows 10 versions.

Note: Please restart EC-Engineer after the NDIS installation.



EC	ingineer		
EtherCAT N	laster Core	pace	
OS Adaptation	Link Layer emllNdis.dll	User Space	HW driver independent
		u u	interface
Windows	NDIS 6.x Filter Module EcatNdis.sys	Spac	
functions	NDIS 6.x Miniport Ethernet Adapter	Kernel Space	
CPU RAM DISK	Standard Ethernet MAC HARDWARE	EtherCA	

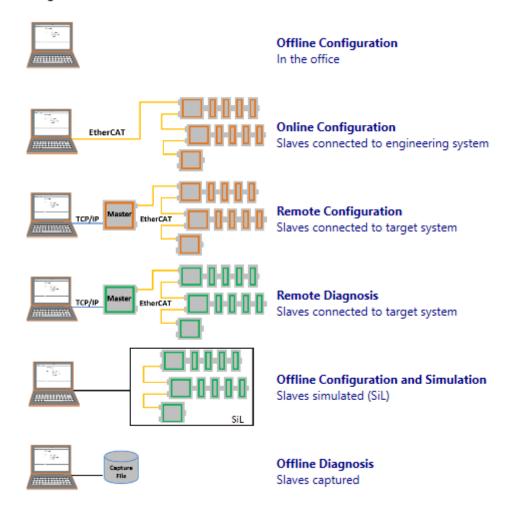
🛹 EC-Engineer []		-		×
<u>File View N</u> etwork <u>S</u> ettings <u>H</u> elp				
Configuration Mode 🐨 Export ENI 🐺 Export EXI	Kan Diagnosis Mode			÷
Project Explorer	Device Editor			
▼ Uass-A Master	Master Process Data Image Wa	tch list Trace Data Advanced Options Slave to Slave Distributed Clocks Tasks + Sync Units Data Acquisition		
<ul> <li>Islave_1001 [EK1100] (1001)</li> </ul>				
Slave_1002 [EL2008] (1002)	General			_
Slave_1003 [EL2008] (1003)	Unit Name	Class-A Master		
H Slave_1004 [EL1014] (1004)	Cycle Time [us]	1000		•
Slave_1005 [EL2004] (1005)	Source MAC address			
Islave_1006 [EL1034] (1006)				
Slave_1007 [EL1018] (1007)				
Slave_1008 [EL2008] (1008)	Slaves connected to local system	_		
<ul> <li>Slave_1009 [EK1122-0080] (1009)</li> <li>Slave_1020 [EK1122] (1020)</li> </ul>		Ndis		
Slave_1020 [EK1122] (1020)	Link Layer			
	Network Adapter	Ndis		
		WinPcap **		_
				_
	Slaves connected to remote sys			
	Protocol	RAS		-
	IP Address	127.0.0.1		
	Port	6000		
	Master-Instance	0		
			Select	



# **3 Getting Started**

For a better usability, the product comes up with a start page, where the user can choose what he wants to do:

Getting Started



# 3.1 Offline Configuration

This mode is for configuring the EtherCAT network in the office by manually adding slaves to the network.

If the user clicks on this link he will see first the *Select Master Unit Dialog* for choosing the desired master unit (at the moment he can choose between Class A and Class B master):



൙ Select Master Unit Dialog		×
Select the desired master unit f	from the list:	
EtherCAT Master Unit (Class A	)	•
	ОК	Cancel

Afterwards he will see the *Slave Select Dialog*, where he can configure his EtherCAT network:

+ Append EtherCAT Slave to 'Cl	ass-A Master'	— C	x c
Filter			
Search			
Vendors	[ALL VENDORS]		
Show Hidden Slaves			
Show Preconfigured Slaves (SCI			
Connection			
	Port B, MII		
Connect at			
Slaves			
	list and adjust the number of slaves.		
ABB ABB			^
Accelovant			
🕨 🥔 acontis technologies C	SmbH		
ACS Motion Control			
Advanced Energy Indu	istries, Inc.		
Advantech Co., Ltd.			
Applied Materials, Inc.			~
Number of Slaves	1	OK Cancel	I

If you can not find your slave or if you want to use your own ESI file, you can edit this list by using the *ESI-Manager*. After configuring the network you can select the *network* node and use the *Export ENI* button for generating an ENI file.



# 3.2 Online Configuration

This mode can be used if slaves are connected to the Engineering System by scanning the EtherCAT network configuration.

If user clicks on this link he will see first the *Select Master Unit Dialog* for choosing the desired master unit (at the moment he can choose between Class A and Class B master):

🤿 Select Master Unit Dialog		×
Select the desired master unit fro	m the list:	
EtherCAT Master Unit (Class A)		•
	ОК	Cancel

Afterwards he will see the *Master-Tab*, where he can choose the network adapter which is connected to the control system:

Device Edi	itor								
Master	Process Data Image	Watch list Trace Dat	a Advanced Options	Slave to Slave	Distributed Clocks	Tasks + Sync Units	Data Acquisition		
Genera	d.								
Unit I	Name	Class-A Maste							
Cycle	Time [us]	1000							-
Sourc	e MAC address	A0-36-9F-30-0	0-3B						
Slaves	connected to local sy	/stem							
Link L	ayer	Ndis							•
Netw	ork Adapter	EtherCAT-Test	(Intel(R) Ethernet Serv	er Adapter I210-	T1)				•
								Select	
Clause	connected to remote								
Proto		RAS							•
IP Ad		127 . 0 .	).1						
Port		6000							
Maste	er-Instance	0							
								Select	
Slaves	simulated (SiL)								
Slaves	sindlated (SIL)							Select	
Slaves	captured								
Captu	ure File								
								Select	

After selecting the network adapter, the EC-Engineer scans the control system and adds the network configuration to the project explorer. Here the user can adjust the configuration or use the *Export ENI* button for generating directly an ENI file.

Note: Please make sure that the selected network adapter is connected to the EtherCAT slaves.

# 3.3 Remote Configuration

This mode can be used if slaves are connected to the control system. Means user can connect via TCP/IP to the control system if EC-Master RAS (remote access service) server is running and scan the EtherCAT network configuration.

If user clicks on this link he will see first the *Select Master Unit Dialog* for choosing the desired master unit (at the moment he can choose between Class A and Class B master):

🛹 Select Master Unit Dialog		×
Select the desired master unit	from the list:	
EtherCAT Master Unit (Class A	.)	•
	ОК	Cancel

Afterwards he will see the *Master-Tab*, where he can enter the IP address of the remote system (and if necessary change the port and the master-instance, but normally this should not be necessary):

Device Edi	itor							
Master	Process Data Image	Watch list Trace Data Advanc	ed Options Slave to Slave	Distributed Clocks	Tasks + Sync Units	Data Acquisition		
Genera	4							
Unit I	-	Class-A Master						
		1000						5
-	Time [us]							
Sourc	e MAC address							
Slaves	connected to local sy	stem						_
Link L	ayer	Ndis						•
Netw	ork Adapter	EtherCAT-Test (Intel(R) Et	hernet Server Adapter I210-	T1)				•
							Select	
_								_
	connected to remote	-						_
Proto	col	RAS						•
IP Ad	dress	127.0.0.1						
Port		6000						
Maste	er-Instance	0						
							Select	
<u> </u>								_
Slaves	simulated (SiL)							
							Select	
Slaves	captured							
	ure File							
copie	ine nie						Select	

After entering the IP address, a click to *Select* tells the EC-Engineer to connect to and scan the remote system. The EC-Engineer adds all Slaves of the network configuration to the project explorer. Here the user can adjust the configuration or use the *Export ENI* button for generating directly an ENI file.



# 3.4 Remote Diagnosis

This mode should be used if the EC-Master is already running on the control system and the user wants to take a look into the "health" of the EtherCAT system.

If user clicks on this link he will see first the *Select Master Unit Dialog* for choosing the desired master unit (at the moment he can choose between Class A and Class B master):

🛹 Select Master Unit Dialog		×
Select the desired master unit f	rom the list:	
EtherCAT Master Unit (Class A)	)	•
	OK	Cancel

Afterwards he will see the *Master-Tab*, where he can enter the IP address of the remote system (and if necessary change the port and the master-instance, but normally this should not be necessary):

Device Ed	itor								
Master	Process Data Image	Watch list Trace	Data Advanced Options	Slave to Slave	Distributed Clocks	Tasks + Sync Units	Data Acquisition		
Genera	1								
Unit I		Class-A Ma	ster						
	Time [us]	1000							-
	e MAC address		0.00.00						
Sourc	e MAC address								
	connected to local s								
Link l	ayer	Ndis							•
Netw	ork Adapter	EtherCAT-Te	est ( Intel(R) Ethernet Sen	ver Adapter I210-	T1)				•
								Select	
									_
	connected to remote	-							
Proto		RAS							-
IP Ad	dress	127.0	. 0 . 1						
Port		6000							
Mast	er-Instance	0							
								Select	
Slaves	simulated (SiL)								
Slaves	Sindiated (SIL)							Select	
								Select	
Slaves	captured								
Captu	ure File								
								Select	

After entering the IP address, a click to *Select* switches the EC-Engineer into Diagnosis Mode. There the user sees the "health" of his EtherCAT system.

# 3.5 Offline Configuration and Simulation

This mode is for configuring the EtherCAT network in the office by manually adding slaves to the network.

If the user clicks on this link he will see first the *Select Master Unit Dialog* for choosing the desired master unit (at the moment he can choose between Class A and Class B master):

🤿 Select Master Unit Dialo	og	×
Select the desired master (	unit from the list:	
EtherCAT Master Unit (Cla	ass A)	•
	OK	Cancel

## Then the user have to select the simulator:

ice Editor		
	Watch list Trace Data Advanced Options Slave to Slave Distributed Clocks Tasks + Sync Units Data Acquis	ition
General		
Unit Name	Class-A Master	
Cycle Time [us]	1000	
Source MAC address		
Slaves connected to local s	system	
Link Layer	Ndis	
Network Adapter	EtherCAT-Test ( Intel(R) Ethernet Server Adapter I210-T1 )	
		Select
Slaves connected to remote		
Slaves connected to remot Protocol	RAS	
Protocol	RAS	
Protocol IP Address	RAS 127.0.0.1	
Protocol IP Address Port	RAS 127.0.0.1 6000	Select
IP Address Port	RAS 127.0.0.1 6000	Select
Protocol IP Address Port Master-Instance	RAS 127.0.0.1 6000	Select
Protocol IP Address Port Master-Instance Slaves simulated (SiL)	RAS 127.0.0.1 6000	
Protocol IP Address Port Master-Instance	RAS 127.0.0.1 6000	

Afterwards he will see the *Slave Select Dialog*, where he can configure his EtherCAT network:



💠 Append EtherCAT Slave to 'Class-A Master' -			- 0 X
Filter			
Search			
Vendors	[ALL VENDORS]		
Show Hidden Slaves			
Show Preconfigured Slaves (SCI			
Connection			
	Port B, MII		
Connect at			
Cl			
Slaves	list and adjust the number of slaves.		
			~
acontis technologies G	SmbH		
ACS Motion Control			
Advanced Energy Indu	istries, Inc.		
Advantech Co., Ltd.			
Applied Materials, Inc.			~
Number of Slaves	1	OK	Cancel

If you can not find your slave or if you want to use your own ESI file, you can edit this list by using the ESI-Manager.

After configuring the network you can select the *network* node and use the *Export ENI* button for generating an ENI file or switch to diagnosis mode and simulate the network.

# 3.6 Offline Diagnosis

This mode should be used if the user wants to analyse a previously created capture file. This can be done offline, which means that the "real system" no not necessary.

If user clicks on this link he will see first the *Select Master Unit Dialog* for choosing the desired master unit (at the moment he can choose between Class A and Class B master):

裙 Select Master Unit Dialo	g	×
Select the desired master u	nit from the list:	
EtherCAT Master Unit (Cla	ss A)	•
	OK	Cancel



# Afterwards he will see the *Master-Tab*, where he can enter the path to the capture, which contains one or more previously taken snapshots:

Device Editor			
Master Process Data Im	age Watc	h list Trace Data Advanced Options Slave to Slave Distributed Clocks Tasks + Sync Units Data Acquisition Mo	tion
General			
Unit Name	6	Class-A Master	
Cycle Time [us]		1000	•
Source MAC address		A0-36-9F-30-00-3B	
Slaves connected to lo	cal system		
Link Layer		Ndis	Ŧ
Network Adapter		EtherCAT-Test ( Intel(R) Ethernet Server Adapter I210-T1 )	Ŧ
			)eselect
Slaves connected to re			
Protocol	mote syste	RAS	~
IP Address		127.0.0.1	
Port			
Master-Instance		0	
		S	elect
Slaves simulated (SiL)			
Slaves Simulated (Sle)		s	elect
Slaves captured			
Capture File			
			elect

After choosing the path to the capture file, a click to *Select* switches the EC-Engineer into Diagnosis Mode. Now, the user can analyse the previously taken snapshots of a EtherCAT system.



# 4 Graphical user interface

# 4.1 Overview

This section gives an overview about the graphical user interface:

൙ EC-Engineer []		– D X			
File View Network Settings Help 🔫		Menu			
Configuration Mode 💀 Export ENI 🐺 Export EXI	📕 Diagnosis Mode 🔫	Toolbar Device Editor			
Project Explorer	Device Editor				
🔻 🖳 Class-A Master	Master Process Data Image Wat	tch list Trace Data Advanced Options Slave to Slave Distributed Clocks Tasks + Sync Units Data Acquisition Motion			
Slave_1001 [EK1100] (1001)					
Slave_1002 [EL2008] (1002)	General				
Slave_1003 [EL2008] (1003)	Unit Name	Class-A Master			
Slave_1004 [EL1014] (1004)	Cycle Time [us]	1000 *			
Slave_1005 [EL2004] (1005)	Source MAC address				
Slave_1006 [EL1034] (1006)					
Slave_1007 [EL1018] (1007)					
<ul> <li>Slave_1008 [EL2008] (1008)</li> <li>Slave_1009 [EK1122-0080] (1009)</li> </ul>	Slaves connected to local system				
<ul> <li>Slave_1009 [EK1122-0080] (1009)</li> <li>Slave_1020 [EK1122] (1020)</li> </ul>	Link Layer	Ndis			
F B Slave_1020 [ck1122] (1020)					
<b>↑</b>	Network Adapter	EtherCAT-Test ( Intel(R) Ethernet Server Adapter I210-T1 )			
		Select			
	Slaves connected to remote system				
	Protocol	RAS			
Project Explorer	IP Address	127.0.0.1			
	Port	6000			
	Master-Instance	0			
		Select			
	Slaves simulated (SiL)				
		Select			
Short Info	Slaves captured				
	Capture File				
Classic View Flat View Topology View		Select			
Short Info	Messages	÷ 9			
Information	Severity Time Message				
Name Class-A Master	INF 14:23:07 Master state cl	thange from 'Init' to 'Pre-Op' Messages			
Description EtherCAT Master Unit (Class A)		thange from 'Unknown' to 'Init'			
Vendor acontis technologies GmbH	1	thange from 'Unknown' to 'Init'			
		successful - 26 slaves found			
Networks: 1 Slaves: 26		State:			

### The graphical user interface is divided into five parts:

#### Menu/Tool/Status bar:

Shows current status or mode of the EC-Engineer and allows the user to change it.

#### **Project Explorer:**

Shows different views of the current network configuration and allows the user to change it by adding or removing devices/slaves/modules.

#### **Device Editor:**

Show information about the selected device, like process variables or PDO mappings. It allows the user also change this information.

### Short Info:

Show short information about selected device, like name, description or vendor.

# Messages:

Shows notifications which occur e.g. when the EtherCAT Master has changed its operation state or a slave has been removed from (or added to) the EtherCAT network.



# 4.2 Menu/Tool/Status bar

# 4.2.1 File

### New / Open / Save / Save As / Print: Start new configuration or open/save/print existing configuration

## Add Master-Unit:

### Add a new Master-Unit to the configuration. At the moment we have three Master-Units:

- EtherCAT Master Unit (Class A)
- EtherCAT Master Unit (Class B)

### **ESI-Manager:**

Add, delete or export ESI and SCI files (see: *ESI-Manager*)

#### **EMI-Manager:**

Add, delete or modify EMI files (see: *EMI-Manager*)

#### **Recent Projects:**

Open recent project

### Exit:

Closes the EC-Engineer

# 4.2.2 View

#### **Message Window:**

Shows/Hides the message window

# Short-Info Window:

Shows/Hides the short-info window

### **Expert Mode:**

(De-)Activates expert mode

#### **Motion Mode:**

(De-)Activates motion mode

#### **Refresh:**

Updates the current view

# 4.2.3 Network

#### Scan EtherCAT Network:

Scans the connected network for slaves

# **Edit Topology:**

Opens a dialog to change the current topology of the project and a bus merge is possible (for more information see *EoE Endpoint Configuration*)

### Export ENI File / Export ENI Variants / Import ENI File / Process Variables / EEPROM File

Creates an ENI file, or ENI variants (see *Export ENI Variants*) / imports an ENI file or export the process variables or the eeprom to a file

## Network Mismatch Analyzer (active only in diagnosis mode):

Compares the configured slaves with the connected slaves. See Network Mismatch Analyzer



#### Line Crossed Analyzer (active only after scan):

Shows wrong connected slaves. See Line Crossed Analyzer

#### Inspection Report (active only in diagnosis mode):

Opens a statistic about the state of the network. Collects some useful data like error counters and so on. Possibility to print a PDF. See *Inspection Report* 

#### Clear Error Counters (active only in diagnosis mode):

Clears the error counters of all connected slaves (for more information about the extended diagnosis, see *Extended Diagnosis (Expert)*)

#### Acknoledge all warnings (active only in diagnosis mode):

Clears the yellow warning icon of all slaves

### Self Test Scan:

Executes a self test routine for EC-Master and the network

#### **Rescue Scan:**

Executes the rescue scan. Can help if frames get lost with a switch for example

#### Take Snapshot (active only for local or remote system):

Takes a snapshot from the current diagnosis state and saves it into a capture file (for more information about the snapshots and capture files, see *Capture File*)

# Automatic Snapshot Mode (active only for local or remote system):

Activates the automatic snapshot mode to take snapshots based on the configured rules

# Snapshot (active only for offline diagnosis system):

Changes the active snapshot

#### **EoE Endpoint Configuration (active only for local or remote system):**

Activates EoE Endpoint support in diagnosis mode

## 4.2.4 Settings

### Language:

Changes the current language

#### Theme:

Changes the current theme

#### Message Level:

Change the current message level

### **Capture File:**

Shows capture file settings dialog

### **Project Template:**

Shows project template settings dialog

# 4.2.5 Help

Show User Manual: Shows this user manual

# Show Log File:

Shows the log file

### Check for updates:

Enable / disable automatic update check (once per month). Also a manual update check is performed on activation.

# About ...:

Show the about dialog



# 4.3 Project Explorer

# 4.3.1 Configuration Mode

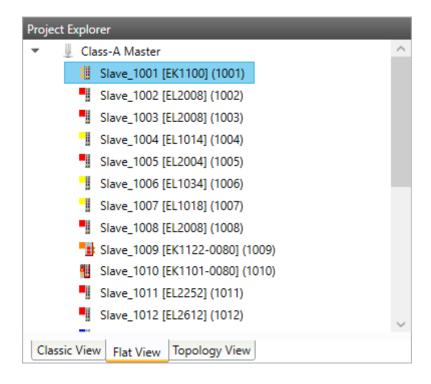
There are three topology visualisation views:

# **Classic View**

Project Explorer
<ul> <li>Class-A Master</li> </ul>
<ul> <li>Slave_1001 [EK1100] (1001)</li> </ul>
Slave_1002 [EL2008] (1002)
Slave_1003 [EL2008] (1003)
Slave_1004 [EL1014] (1004)
Slave_1005 [EL2004] (1005)
Slave_1006 [EL1034] (1006)
Slave_1007 [EL1018] (1007)
Slave_1008 [EL2008] (1008)
Slave_1009 [EK1122-0080] (1009)
Slave_1020 [EK1122] (1020)
Classic View Flat View Topology View

This is a tree view which has two levels. In the first level you can find coupler slaves or MDP slaves and in the second level you will see the connected slaves/modules.

# Flat View



This view shows all slaves in a flat list, as they are connected in the EtherCAT network.

# **Topology View**



Project Explorer	^
100% ~ <	~
Classic View Flat View Topology View	

This view shows a graphical tree of all slaves, as they are connected in the EtherCAT network.

## The context menu of one or more selected slaves has the following entries:

### **Append Slaves:**

Appends a new slaves

Remove Slaves: Deletes the selected slaves

# Cut/Copy/Paste:

Extended clipboard operations, which should help the user to move or multiply existing slave definitions.

#### **Enable Slaves:**

Appends disabled slaves to the process image at the previous position. If this is not possible, the slave will be marked as "not connected" and the user can append the slave by using "cut" & "paste".

# **Disable Slaves:**

Removes the slaves from process image and from the exported ENI file, but keeps the slave as "disabled"



in the project.

### **Reload ESI data:**

Reloads ESI data which are stored in the project file from global ESI cache (after adding a slave to the project the ESI data will be stored in the project file).

### **Export SCI:**

Exports a SCI file. A SCI file is like an ESI file but preconfigured. So it is possible to create a fixed slave which can be added to the configuration and is working out of the box.

### **Change Slave:**

Opens the following dialog, where the user can select a compatible slave (this is helpful, if the user wants to update the slave to a new revision and keeps his configuration). This is also used to change from an ESI to a SCI file.

	ual used revision: 0x00100000		
EL2008	EL2008 8Ch. Dig. Output 24V, 0.5A	0x00100000	0 (1048576)
EL2008	EL2008 8Ch. Dig. Output 24V, 0.5A	0x00110000	) (1114112)
EL2008	EL2008 8Ch. Dig. Output 24V, 0.5A	0x00120000	) (1179648)
EL2008-0015	EL2008-0015 8Ch. Dig. Output 24V DC, 0.35A, not short-circuit proof	0x0010000F	(1048591)

## Import Beckhoff Slave Description, to import slave settings from TwinCAT (or ET9000)

### Import slave settings from "Beckhoff Slave Description" files

- Open project in TwinCAT
- · Select slave to export
- Main menu "TwinCAT"
- Selected Item
- Export XML Description
- Import the exported file (imported will be MDP configuration, PDOs, DC settings, ...)



## Import init commands of slave from "Beckhoff Init Command Description" files

- Open project in TwinCAT
- Select slave to export
- Open tab "Startup"
- Context menu: "Export to XML"
- Import the exported file (imported will be the exported init commands)

### If user tries to append slave he will see the following dialog:

💠 Append EtherCAT Slave to 'Class-A Master' -		
Filter Search Vendors [ALL VENDORS]  Show Hidden Slaves Show Preconfigured Slaves (SCI)  Connection Port B, MII		
Connect at Slaves Select a specific slave from the list and adjust the number of slaves.		
► ABB ABB		~
Accelovant		
🕨 🛹 acontis technologies GmbH		
ACS Motion Control		
Advanced Energy Industries, Inc.		
Advantech Co., Ltd.		
Applied Materials, Inc.		$\sim$
Number of Slaves 1	Ca	ncel

#### Filter

Search: Keyword to filter the slaves by type name. Vendors: List of all available vendors. User can filter all slaves by selecting the desired vendor from the list. If it makes sense, the recommended vendor is already preselected, e.g. if you try to append a slave to an E-Bus. Show Hidden Slaves: Shows also hidden slaves (e.g. with older revisions, if newer slaves are available) Show Preconfiguren Slaves: Shows also slaves from SCI files

### Connection

Select the port where the predecessor device is connected (see General).

### List of available slaves

User can select the slave which he wants, be expanding the three levels: vendors, groups and the slaves themselves. The 3<sup>rd</sup> level consists of three parts: Type name, description and the revision number.



### Number of slaves

User can change this value if he wants to add more than one slave of the same type.

# 4.3.2 Diagnosis Mode

There are three topology visualisation views:

# **Classic View**

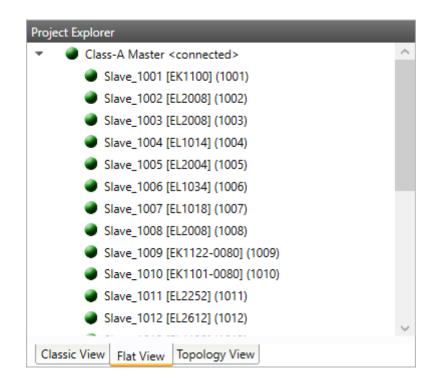
Project Explorer
<ul> <li>Class-A Master <connected></connected></li> </ul>
<ul> <li>Slave_1001 [EK1100] (1001)</li> </ul>
Slave_1002 [EL2008] (1002)
Slave_1003 [EL2008] (1003)
Slave_1004 [EL1014] (1004)
Slave_1005 [EL2004] (1005)
Slave_1006 [EL1034] (1006)
Slave_1007 [EL1018] (1007)
Slave_1008 [EL2008] (1008)
Slave_1009 [EK1122-0080] (1009)
<ul> <li>Slave_1020 [EK1122] (1020)</li> </ul>
Classic View Flat View Topology View

This is a tree view which has two levels. In the first level you can find coupler slaves and in the second level you will see the connected slaves.









This view shows all slaves in a flat list, as they are connected in the EtherCAT network.

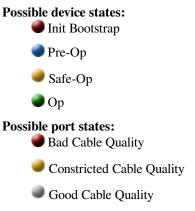


**Topology View** 



Project Explorer
M1 1001 8 8 8 8 8 1009 1020
A65 A62
100% ✓         >
Classic View Flat View Topology View

This view shows a graphical tree of all slaves, as they are connected in the EtherCAT network.



If cable quality is constricted or bad, please check the error counters of the slave (for more information about the extended diagnosis, see *Extended Diagnosis (Expert)*).



# 4.4 Device Editor

This Editor gives the user the possibility to read and write information of the selected master or slave:

Device Editor	
General E-Bus Current Adv	red Options Motion
Address	
Station Address	1001 🚭
Information	
Name	Slave_1001 [EK1100]
Description	EK1100 EtherCAT Coupler (2A E-Bus)
Vendor	Beckhoff Automation GmbH & Co. KG (0x0000002)
Product Code	0x044C2C52 (72100946)
Revision Number	0x00110000 (1114112)
ESI File	Beckhoff EK11xx.xml
Identification Value	Not Used
Ports	
A [X1 IN]	Class-A Master
D	Not Available
В	Slave_1002 [EL2008] (1002)
C [X2 OUT]	Not Connected

Some tabs in the Device Editor are Expert Settings. The menu item *View Expert Settings* enables or disables the Expert Settings' visibility. Some tabs appear when configuring the first Slave.

# 4.5 Short Info

This window shows short information about selected device, like name, description or vendor:

Short Info		•	д
Information			
Name	Slave_1001 [SGDV-E1 CoE Drive]		
Description	SGDV-E1 EtherCAT(CoE) SERVOPACK Rev3		
Vendor	Yaskawa Electric Corporation (0x00000539)		
Physical Address	1001		
AutoInc Address	0x00 / 0		
			_



# 4.6 Message Window

Shows notifications which occur e.g. when the EtherCAT Master has changed its operation state or a slave has been removed from (or added to) the EtherCAT network:

Messages 🗸 🗸			
	Severity	Time	Message
0	INF	14:21:16	Master state change from 'Init' to 'Pre-Op'
0	INF	14:21:13	Master state change from 'Unknown' to 'Init'
0	INF	14:21:12	Master state change from 'Unknown' to 'Init'
0	INF	14:21:09	Network scan successful - 26 slaves found



# **5** Configuration Mode

# 5.1 Overview

The EC-Master needs the EtherCAT-Network-Information (ENI) file to initialize and control the EtherCAT network. In most cases the automatically generated Slave settings can be used to run the EtherCAT network. In this chapter you can read how EC-Engineer helps you to view or adjust those settings.

🛹 EC-Engineer []				- 0	נ	×
<u>File View Network Settings H</u> elp						
Configuration Mode 🛛 🖗 Export ENI 🛛 🖗 Export EXI	📕 Diagnosis Mode					÷
Project Explorer	Device Editor					
	Start Page					
	EC 📥 Engli	inoor				
	EC 🛹 Engi					
	Add Master Unit G	Setting Started				
	🛹 EtherCAT Master Unit (Class A)					^
	<ul> <li>EtherCAT Master Unit (Class B)</li> <li>EtherCAT Master Unit (LxWin)</li> </ul>		Offline Configuration In the office			
	EtherCAT Master Unit (Exwin)		in the blice			
	Attention of the temperature of temperate					
	A EtherCAT Monitor	EtherCAT	Online Configuration			
	Recent Projects		Slaves connected to engineering system			
	C:\Users\\project.ecc					
	C:\Users\\SpencerPM2.ecc	TCD/IP Master TherCAT	Remote Configuration			
			Slaves connected to target system			
			Remote Diagnosis			
			Slaves connected to target system			
			Offline Configuration and Simulation			
			Slaves simulated (SiL)			
		SiL SiL				
Classic View Flat View Topology View						~
Short Info 👻 👎	Messages					<b>→</b> #
Information	Severity Time Message					
	INF 15:12:28 EC-Engineer ready. Version 3.8.0					
Networks: 0 Slaves: 0			State: 👄 👄	vlode: CONF	IG EX	(PERT

# It consists of three sections:

- Add Master Unit: List of available master units
- Recent Projects: List of the last five opened projects
- Getting Started: List of available run modes

If the user clicks on one of the links, it runs a new master unit, opens an already existing project or switches in the "Getting Started" mode.



# 5.2 Master Settings

This section includes network related or master related settings. Some of those settings will also affect the "Master" section of the ENI.

# 5.2.1 Master

In this tab, the user can configure the name of the master and the cycle time. If he wants to connect to a control system, this can be also configured:

Device Ed	itor									
Master	Process Data Image	Watch list	EtherCAT P	Trace Data	Advanced Options	Slave to Slave	Distributed Clocks	Tasks + Sync Units	Data Acquisitio	n
Genera										
	Name	Class	s-A Master							_
Cycle	Time [us]	1000	)							•
Source	ce MAC address									
Slaves	connected to local sy	ystem								
Link l	Layer	Ndis	;							•
Netw	ork Adapter	Ethe	rCAT-Test ( In	tel(R) Ethern	et Server Adapter I2	IO-T1)				-
									Select	
Slaves	connected to remote	e system								
Proto	ocol	RAS								•
IP Ad	dress	127	. 0 . 0	. 1						
Port		6000	)							
Mast	er-Instance	0								
									Select	
_										
Slaves	simulated (SiL)									
									Select	
Slaves	captured									
	ure File									
Capti	ure rile								Select	

# General

#### Unit Name:

Name of the master device

#### Cycle Time:

Interval in microseconds in which all EtherCAT commands will be sent from the master. The user can choose between the following values: 125, 250, 500, 1000, 2000 and 4000.

## Source MAC address:

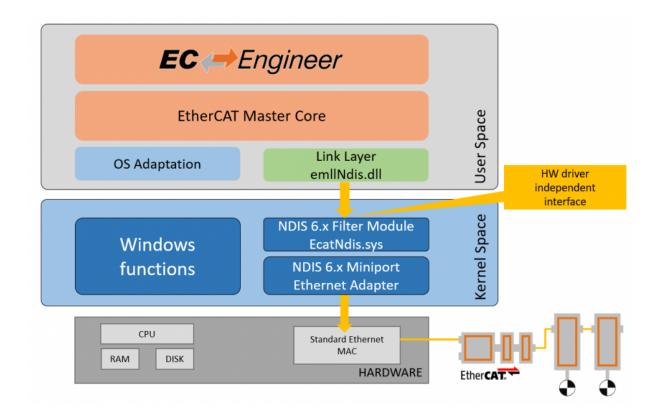
MAC address of the connected system (will be filled during bus scan)

# Slaves connected to local system

#### **Network Adapter:**

Network adapter which is connected to the control system. In newer versions it is also a possibility to select the Link-Layer.





## Slaves connected to remote system

#### **Protocol:**

#### Protocol of the remote system

- RAS (Default port is 6000)
- Mailbox Gateway (Default port is 34980)
  - EC-Master V3.0.1.22 and above
  - TwinCAT 3.1.4024 or TwinCAT 3.1.4022.30 and above

#### **IP Address:**

IP address of the remote system, which is connected to the control system

#### **Port:**

Port of the remote system, which is connected to the control system

# Master-Instance:

Used to determine which master instance should be used in the remote system (Master supports up to 10 instances).

# Data to load from capture file

## **Capture File:**

Path to the capture file, which contains one ore more snapshots

# 5.2.2 Process Data Image

In this tab, the user can see all variables of the process data image. If he wants, he can also export the list:

riable											
abie	•								Đ	xport	
	Name						Datatype	Master Sync Unit	Offset	*	Size
9	Slave_1002 [IndraDrive	MPC17 (1 CC	D Master +0 C	D Slaves)].AT	(CCD Master).Drive st	atus word	UINT	ld 0: Default 0	IN:	0.0	2.0
9	Slave_1002 [IndraDrive	MPC17 (1 CC	D Master +0 C	D Slaves)].AT	(CCD Master).Position	n feedback value 1	DINT	ld 0: Default 0	IN:	2.0	4.0
5	Slave_1003 [EPP2308-0	001].Channel	1.Input				BOOL	Id 0: Default 0	IN:	6.0	0.1
9	Slave_1003 [EPP2308-0	001].Channel	2.Input				BOOL	Id 0: Default 0	IN:	6.1	0.1
5	Slave_1003 [EPP2308-0001].Channel 3.Input Slave_1003 [EPP2308-0001].Channel 4.Input Slave_1005 [EPP1004-0061].Channel 1.Input Slave_1005 [EPP1004-0061].Channel 2.Input							Id 0: Default 0	IN:	6.2	0.1
5	Slave_1003 [EPP2308-0	001].Channel	4.Input				BOOL	Id 0: Default 0	IN:	6.3	0.1
5	Slave_1005 [EPP1004-0	061].Channel	1.Input				BOOL	Id 0: Default 0	IN:	7.0	0.1
9	Slave_1005 [EPP1004-0	061].Channel	2.Input				BOOL	Id 0: Default 0	IN:	7.1	0.1
9	Slave_1005 [EPP1004-0	061].Channel	3.Input				BOOL	Id 0: Default 0	IN:	7.2	0.1
9	Slave_1005 [EPP1004-0	061].Channel	4.Input				BOOL	Id 0: Default 0	IN:	7.3	0.1
9	Slave_1006 [EPP1004-0	061].Channel	1.Input				BOOL	Id 0: Default 0	IN:	7.4	0.1
9	Slave_1005 [EPP1004-0061].Channel 3.Input Slave_1005 [EPP1004-0061].Channel 4.Input Slave_1006 [EPP1004-0061].Channel 1.Input Slave_1006 [EPP1004-0061].Channel 2.Input Slave_1006 [EPP1004-0061].Channel 3.Input							Id 0: Default 0	IN:	7.5	0.1
9	Slave_1005 [EPP1004-0061].Channel 1.Input Slave_1005 [EPP1004-0061].Channel 3.Input Slave_1005 [EPP1004-0061].Channel 4.Input Slave_1006 [EPP1004-0061].Channel 4.Input Slave_1006 [EPP1004-0061].Channel 3.Input Slave_1006 [EPP1004-0061].Channel 3.Input Slave_1006 [EPP1004-0061].Channel 4.Input						BOOL	Id 0: Default 0	IN:	7.6	0.1
9	Slave_1006 [EPP1004-0	061].Channel	4.Input				BOOL	Id 0: Default 0	IN:	7.7	0.1
5	Slave_1007 [EPP1004-0	061].Channel	1.Input				BOOL	Id 0: Default 0	IN:	8.0	0.1
									Add to v	watch	list

If user wants to export the variables, he will see the following dialog:

裙 Export	Process Data Image	×
Format:	CSV	•
To File	To Clipboard	Cancel

# **Export Formats:**

- CSV File (Semicolon separated text file)
- CSV PLC File (Semicolon separated text file, where offsets are in PLC format)
- PD Layout File (C-Header file which can be used from EC-Master-Demo application)
- XML File (Like ProcessImage in ENI)

# 5.2.3 Watchlist

In this tab, the user can see all variables which were added to the watchlist in config mode:

Name				Datatype	Master Sync Unit	Offset		Siz
Slave_1007 [EL1018].Ch	annel 6.Input			BOOL	ld 0: Default 0	IN :	154.5	0.1
Slave_1003 [EL2008].Ch	annel 3.Output			BOOL	ld 0: Default 0	OUT :	154.2	0.1

The variables can be edited and removed from the watchlist.

# 5.2.4 EtherCAT P Overview

In this tab, the user can check the EtherCAT P system, if there are EtherCAT P slaves in the configuration. For those EtherCAT P slaves, he can calculate and check the power consumptions in the EtherCAT P segments based on cables and loads:



aster Process Data Image Watch list EtherC	AT P Trace Data	Advanced O	ptions    Slav	e to Slave	Distributed Clo	cks Tasks	+ Sync Units	Data Acquisition
nerCAT P Checking								
Slave_1004 [EPP1322-0001]	ourcing Devices)							Valida
Name	Us(V)	Up(V)	ls(A)	Ip(A)	Us Load	Up Load	Us Load Type	Up Load Type
Slave_1004 [EPP1322-0001]	24,00	24,00	0,342	0				
Slave_1003 [EPP2308-0001]	23,92	24,00	0,242	0	0 W 0	0 W	Sw Regulator	Sw Regulator
Slave_1005 [EPP1004-0061]	23,86	24,00	0,181	0	0 W		Sw Regulator	
Slave_1006 [EPP1004-0061]	23,82	24,00	0,121	0	0 W		Sw Regulator	
Slave_1007 [EPP1004-0061]	23,80	24,00	0,061	0	0 W		Sw Regulator	

In the ComboBox the user can switch between all Power Sourcing Devices (PSD) in the configuration. In the grid are shown all the supplied slaves from the selected PSD, with the calculated voltages and currents and the selected loads. The values which are to high or to low are marked red.

**Hint:** These values are not relevant for the ENI-File. They are just a help for the user what might not work. The ENI File can be exported anyway.

On the *Validate* Button, the user can check the whole configuration. If there is an error somewhere, the correspondending PSD is selecte. If there are no errors the user will get a message box.

# 5.2.5 Trace Data (Expert)

In this tab, the user can add trace variables:



Name				Datatype	Offset		Siz
Variable 0				BOOL	OUT:		-
Variable 1				BOOL	OUT :	14.1	0.1
Variable 2				BYTE	OUT :	15.0	1.0

#### **Trace Data**

Trace variables which can be added from the user.

# Buttons

#### New/ Edit/Delete:

Used for changing the list.

# Up/Down:

Moving the selected variable up or down

# 5.2.6 Advanced Options (Expert)

In this tab, the user can change master specific settings or he can change slave specific settings which will be applied to all slaves:



Device Editor		
Master Process Data Image Watch list Trace Data Advanced Options	Slave to Slave Distributed Clocks Tasks + Sync U	nits Data Acquisition
Master Settings		
Init Command Retries: 3		
Slave Settings		
Startup Checking	Timeouts	
✓ Check Vendor ID	SDO Access:	0 🔤 [ms]
Check Product Code	Init->Pre-Op/Init->Bootstrap:	3000 🔤 [ms]
Check Revision Number	Pre-Op->Safe-Op/Safe-Op->Op:	10000 🚔 [ms]
==  Check Serial Number	Back to Pre-Op, Init:	5000 🚔 [ms]
	Op->Safe-Op:	200 🚔 [ms]
Identification Checking	Mailbox Mode	
Check Identification	Cyclic	10 🔤 [ms]
<ul> <li>Use Current Values</li> <li>Copy Station Address -&gt; Identification Value</li> </ul>	State Change	—
Copy Identification Value -> Station Address		
Process Data Mode	Overwrite Mailbox Size	
Disable LRW	Output Size:	0 🔤 [bytes]
	Input Size:	0 🔤 [bytes]
Overwrite Watchdog	Process Data Sync Manager Mode	
Set Multiplier (Reg.: 0x400): 2498	Default	
Set PDI Watchdog (Reg.: 0x410): 1000	<ul> <li>Buffered (3 buffer mode)</li> </ul>	
Set SM Watchdog (Reg.: 0x420): 1000	<ul> <li>Mailbox (Single buffer mode)</li> </ul>	
		Apply changes to all slaves

#### **Master Settings**

Init Command Retries: Number of retries, to handle transmission errors.

# **Slave Settings**

- Slave settings can be applied to all slaves with one click on the button *Apply changes to all slaves*. For a detailed description of the Advanced Slave Options, see *Advanced Slave Options (Expert)*.
- Identification Checking

Use Current Values Identification Checking will be activated for all slaves with the current values

	Important:	If current is 0, the Identification is not activated!
--	------------	---

Copy Station Address -> Identification Checking will be activated for all slaves with the station address as identification value

Copy Identification Value -> Identification Checking will be activated for all slaves and the identification value is also used as station address



# 5.2.7 Slave to Slave (Expert)

In this tab, the user can configure the slave to slave communication by connecting 2 variables or PDOs.

This tab consists of 2 views:

#### **Default view**

In this view, the user can configure the slave to slave communication by using copy infos in ENI file. This is the default way.

<ul> <li>Slave_1002 [EL1002]</li> <li>Channel 1 [1 Bits]</li> <li>Channel 2 [1 Bits]</li> <li>Slave_1003 [EL1014]</li> <li>Slave_1004 [EL1809]</li> </ul>		** X	•	Slave_10           >         ✓ Chan            ✓ Chan	05 [EL2008] 06 [EL2008] mel 1 [1 Bits] mel 2 [1 Bits] mel 3 [1 Bits] mel 4 [1 Bits] mel 4 [1 Bits] mel 6 [1 Bits] mel 7 [1 Bits] mel 8 [1 Bits] 07 [EL4004]		
Input	Offset	Output				Offset	BitSize

### In cycle view

In this view, the user can configure the on cycle slave to slave communication by setup the process image and the FMMU in a way that inputs of the source slave will be directly written into the outputs of the destination slave during one cycle.



ster    Process Data Image    Watch list    Trace Data    /	Advanced Options S	plave to	lave Distributed Clocks Tasks + Sync Units Data Ac	quisition    Mo	tion
				Default	In Cy
ve to Slave					
h active S2S connections it is not possible to change	PDOs and some othe	r settin			
puts			Outputs		
<ul> <li>Slave_1002 [EL1002]</li> </ul>			Slave_1005 [EL2008]		
A Channel 1 [1 Bits]			<ul> <li>Slave_1006 [EL2008]</li> </ul>		
Channel 2 [1 Bits]		>:	Channel 1 [1 Bits]		
Slave_1003 [EL1014]		Х	Channel 2 [1 Bits]		
Slave_1004 [EL1809]			🕨 💉 Channel 3 [1 Bits]		
			🕨 💉 Channel 4 [1 Bits]		
			Channel 5 [1 Bits]		
			🕨 💉 Channel 6 [1 Bits]		
			🕨 💉 Channel 7 [1 Bits]		
			🕨 💉 Channel 8 [1 Bits]		
			Slave_1007 [EL4004]		
nnections					
nput	Offset	0	put	Offset	BitSize
Slave_1002 [EL1002].Channel 1	3.0	>> SI	e_1006 [EL2008].Channel 1	9.0	1
Slave 1002 [EL1002].Channel 2	2.1		e 1006 [EL2008].Channel 2	9.1	1

# Limitations of one cycle slave to slave communication:

- Input slave must be located before output slave
- Complete sync unit of the slave must be connected (this means all PDOs of a sync unit must be connected and not only one variable)

# 5.2.8 Distributed Clocks (Expert)

In this tab, the user can change distributed clock related settings:



Device Editor		_	_			
Master Process Data Image	Watch list Trace Data	Advanced Options	Slave to Slave	Distributed Clocks	Tasks + Sync Units	Data Acquisition
Reference Clock						
Name	Slave_1011 [EL22	52] (1011)			<ul> <li>Auto select</li> </ul>	
Clock Adjustment						
O Master Shift (Master clo	ck follows reference cloo	k) or				
Master Reference Clock	(System time provided b	oy master device) or				
Link Layer Reference Cl	ock (System time provide	d by network device)	or			
Off						
Bus Shift (Reference clo	ck follows master clock)					
DCX (Master and refere	nce clock follow external	clock)				
			*			
Options						
Sync Window Monitori	ng					
Show 64Bit System Tim	e					
Slaves with active DC						
Slave_1011 [EL2252] (1011						
Slave_1022 [EL2202-0100]						
Slave_1023 [EL2202-0100]						
Slave_1026 [EL7201] (1026	))					

# **Reference Clock**

#### Name:

Name of the reference clock. By default, this is the first slave with DC support.

# **Clock Adjustment**

#### **Master Shift:**

The reference clock controls the Master time

#### **Bus Shift:**

The Master time controls the reference clock

# **External Mode:**

The reference clock is controlled by an external sync device

## Options

#### Sync Window Monitoring:

A command (datagram) will be inserted in the cyclic frame to read the ESC registers 0x092C. If this is selected the master will throw a notification.

## Show 64Bit System Time:

Master supports slaves with 32bit and 64bit system time register (0x0910). If this is selected he will interpret it as 64bit system time.

### Slaves with active DC

Shows a list of all slaves with active DC.

# 5.2.9 Tasks + Sync Units (Expert)

In this tab, the user can define additional cyclic tasks and master sync units. After adding a new master sync unit, the user can assign one or more slave sync units on tab *Slave Sync* > *Units* to this master sync unit:

	Process	Data Image Watch list	Trace Data	Advanced Options	Slave to Sla	ve Distributed	Clocks	Tasks + Sync Un	its Data Acquisi	tion Motion
sks										
	Task Id	Comment		Cycle Tir	me [us] Input	PDO Size [bytes]	Outpu	t PDO Size [bytes]	] Ethernet Size [b	ytes] Frame Cour
•	0	Task 0		1000	2		10		81	1
	MSU Id	Name						Offset [bytes]	Input Size [bytes]	Output Size [byte
	0	Default 0						0	3	10
	1000	MasterSyncUnit 1000						0	0	0
•	1	Task 1		1000	0		0		0	0
	MSU Id	Name						Offset [bytes]	Input Size [bytes]	Output Size [bytes
	- 6-									Frame Coun
lit Ta	SK									

# Tasks:

List of cyclic tasks and master sync units.

#### **Buttons:**

New/Edit/Delete: Used for changing the list.

# If user wants to edit a task, he will see the following dialog:

ल Edit Task		_	×
Comment	Task 0		
Cycle Time [us]	1000		•
	ОК	Cancel	

#### **Comment:**

Comment of this task (will be written to ENI file)

# Cycle Time:

Cycle time of this task



#### If user wants to edit a master sync unit, he will see the following dialog:

裙 Edit Master S	ync Unit	-		×
Name	MasterSyncUr	nit 1000		
MSU Id			10	00 🖨
Task Id	0			•
Offsets				
Input	0		Dec	Hex
Output	0		Dec	Hex
	ОК	Cancel		

#### Name:

Name of this master sync unit (will be written to ENI file)

# Sync Unit Id:

#### Id of this master sync unit (will be written to ENI file).

- ID 0 .. 9: Generated / internal master sync unit
- ID 10 .. 999: Generated / internal master sync unit for groups
- ID 1000 .. 1999: User defined master sync unit

#### Task Id:

Task Id to which is this master sync unit assigned

# Offsets:

Activate to pin this master sync unit to a specific offset

#### Input:

Input offset of pinned master sync unit

### **Output:**

Output offset of pinned master sync unit

# 5.2.10 Data Acquisition (Expert)

In this tab, the user can configure our Data Acuisition (DAQ) library. This library can used from EC-Master to record process data in realtime.

# After adding a new *recorder*, the user can select the variables which should be recorded and specify some triggers:



aster	Process Data Image	Watch list	frace Data	Advanced Optio		Distributed Clocks	,					
ariable	25						Exp	port	Recorde	er 1	•	ŝ
Name							Datatype	Offset	<u>م</u>	Size Reco	orded	T
Slave_	1025 [EL7031].STM Cor	trol.Control_	Reset				BOOL	OUT :	143.1 (	0.1		
Slave_	1025 [EL7031].STM Cor	ntrol.Control_	Reduce torqu	e			BOOL	OUT :	143.2 (	0.1		
Slave_	1025 [EL7031].STM Vel	ocity.Velocity					INT	OUT :	145.0	2.0		
Slave_	1026 [EL7201].DRV Cor	trolword.Con	trolword				UINT	OUT :	147.0	2.0		
Slave_	1026 [EL7201].DRV Targ	get velocity.Ta	rget velocity				DINT	OUT :	149.0 4	4.0		
Slave_	1002 [EL2008].Channel	1.Output					BOOL	OUT :	153.0 (	0.1		1
	1002 [EL2008].Channel	2.Output					BOOL	OUT :	153.1 (	).1 No longer	record	d
iggers		2.Output		Operator	Right Operand		BOOL	OUT :	1		record	
<b>iggers</b> Left O <sub>l</sub>	5			Operator =	Right Operand		BOOL		1	No longer	record	
iggers Left Op Slave_	; iperand	1.Value					BOOL	Enable	e Start	Duration	record	
iggers Left Of Slave_ Slave_	perand 1014 [EL3162].Channel	1.Value 1.Output		=	3	i].Channel 3.Output	BOOL	Enable True	e Start True True	Duration	n Cou	
iggers Left Of Slave_ Slave_	9 iperand 1014 [EL3162].Channel 1002 [EL2008].Channel	1.Value 1.Output		=	3	i].Channel 3.Output	BOOL	Enable True True	e Start True True	Duration 10	n Cou 0 0	
iggers Left Of Slave_ Slave_	9 iperand 1014 [EL3162].Channel 1002 [EL2008].Channel	1.Value 1.Output		=	3	i].Channel 3.Output	BOOL	Enable True True	e Start True True	Duration 10	n Cou 0 0	
iggers Left Of Slave_ Slave_	9 iperand 1014 [EL3162].Channel 1002 [EL2008].Channel	1.Value 1.Output		=	3	].Channel 3.Output	BOOL	Enable True True	e Start True True	Duration 10	n Cou 0 0	
iggers Left Of Slave_ Slave_	perand 1014 [EL3162].Channel 1002 [EL2008].Channel 1002 [EL2008].Channel	1.Value 1.Output		=	3	i).Channel 3.Output	BOOL	Enable True True	e Start True True	Duration 10	n Cou 0 0	

# Variables:

# Add/Remove:

Used for adding or removing the selected variable to the recording.

# **Triggers:**

# New/Edit/Delete:

Used for changing the trigger list.

# If user wants to edit a recorder, he will see the following dialog:

൙ Edit Recorder		_	×
General			
Name	Recorder 1	1	
File	Recorder.r	nf4	
Format	MDF		•
Frequency			
Sample rate			1 🖨
Cycle time	1000		[µs]
Sample time	1000		[µs]
Optional			
Real time stamp			
Cycle counter			
Auto start			
c	ОК	Cancel	

# Name:

Name of the recorder

#### File:

Absolute path of the recorder file on the master system

# Format:

## Format of the recorder file, e.g.

- MDF (Measurement Data Format)
- CSV (Comma Separated Values)

# Sample Rate:

Sample rate of the recorded data e.g. every cycle or every second cycle, ...

# **Real time stamp:**

Adds a real time stamp to the recorded data

#### Cycle counter:

Adds a cycle counter to the recorded data

# If user wants to edit a trigger, he will see the following dialog:

൙ Edit Trigger		_		×
General				
Left variable		Slave_1014 [EL3162].Channel 1.Value		
Operator		=		•
Right value	۲	3		
Right variable	$^{\circ}$			
Enable				
Start		$\checkmark$		
Optional	_			
Duration			10 🖨 0 🖨	[ms]
Count			0 🖨	
		OK Cancel		

# General

#### Left variable:

Name of the left variable

#### **Operator:**

Operator of the trigger (e.g. =, >, >=, <, <=, !=)

#### **Right value:**

Value of the right operand to compare the left variable against a static value e.g. trigger, if variable is greater than 5

# **Right variable:**

Name of the right variable to compare the left variable against the value of another variable e.g. trigger, if variable 1 is smaller than variable 2

#### **Enable:**

Enabled or disabled trigger (can be enabled from application later)

#### Start:

Start or stop trigger

# Optional

### **Duration:**

Duration in ms (0 = infinite) e.g. trigger should start recording for 500 ms

#### **Count:**

Trigger count (0 = infinite) e.g. trigger should hit only for 5 times

For more information please refer the manual of the EC-Master-Data-Acquisition-Library.

# 5.2.11 Motion Settings (Motion Mode only)

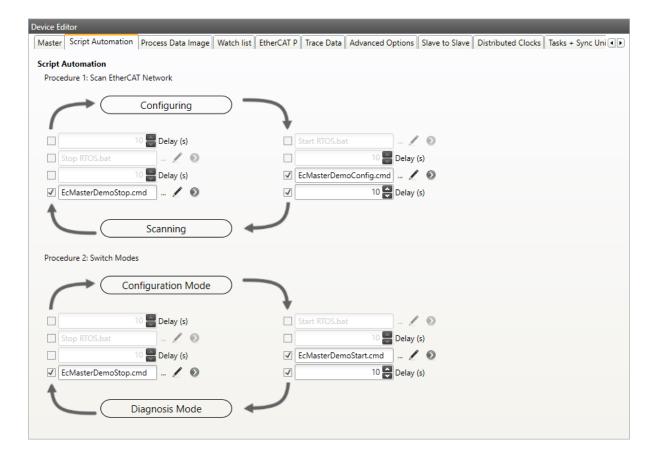
In this tab, the user change settings for the EcMasterDemoMotion Configuration. It is also possible to export the DemoMotionConfig.xml file:

Device Editor	
Process Data Image Watch list Et	herCAT P Trace Data Advanced Options Slave to Slave Distributed Clocks Tasks + Sync Units Data Acquisition Motion
Common Settings	
Use local EcMasterDemoMotion	V
Export	
EcMasterDemoMotion Config	
Enable RAS	V Port 6000
Use Aux Clock	
CPU affinity	
Link Layer	-ndis 192.168.1.1 1
Verbosity level	1
ENI Path	C:\ProgramData\EC-Engineer\Motion\eni.xml
Performance Measurement	

Fig. 1: When "Use local EcMasterDemoMotion" is selected, the ENI and the config files are automatically exported to the EC-Engineer Motion folder in ProgramData when switching to diagnosis mode. With the Motion EMI, the script automation is activated. Per default when switching to diagnosis mode the EcMasterDemoMotion.exe is started and EC-Engineer connects with RAS. So it is very simple to start with Motion directly in EC-Engineer.

# 5.2.12 Scripts

In this tab, the user can select scripts that are executed in the different modes. The tab is only visible when the script mode is activated in the EMI file:



The first procedure is for scanning the network. There is the possibility of starting two scripts before the scan, and two scripts after the scan. It is also possible to set a delay between them. A usecase for this could be to start e.g.  $LxWin \rightarrow$  then start the master on the real-time system  $\rightarrow$  scan the network  $\rightarrow$  stop the master  $\rightarrow$  stop LxWin.

The second procedure is for switching the modes (configuration and diagnosis). The user can e.g. start LxWin  $\rightarrow$  start the master  $\rightarrow$  switch to diagonis. On switching back the user can stop the master and stop LxWin. Or it is also possible not to stop the LxWin for example.

The *Configuration* and *Configuration Mode* circles are the starting points. Then the scripts are called clockwise following the arrows and the red numbers.

# 5.2.13 Simulator Settings

In this tab, the user can change the settings for the simulator. The tab is only visible when the user uses EC-Simulator EMI or when the Master Unit has an linked simulator unit. The linked simulator unit can be created through the context menu of the master unit, or when the simulator link layer is selected:



Device Editor	
Image Watch list EtherCAT P Trace Data Advanced Options	Slave to Slave Distributed Clocks Tasks + Sync Units Data Acquisition Motion Simulator
Master Settings	
Simulator RAS Port 6001	
License key:	
Slave Settings	
Operation Mode  Guerright Gradient Stream S	Starting Position Power off
CoE Settings	EEPROM Settings
<ul> <li>Use generic Object Dictionary</li> <li>Create from ESI</li> </ul>	Use ESI EEPROM  Create from ESI
Create from ESI Load from Slave	Create from ESI Load from Slave
Register Settings	
Use default register values	
	Apply changes to all slaves
	Apply changes to an sieves

#### **Simulator RAS Port:**

The port which is opend through the simulator link layer

#### License key:

The license key for the simulator

# **Slave Settings:**

Operation Mode: Ignore Download Error

#### **CoE Settings:**

Select which CoE should be used in  $\ensuremath{\texttt{EXI}}$ 

# **Register Settings:**

Select if register should be in EXI

## Starting Position: Select if slave shall be powered on or off on start

EEPROM Settings:

# Select which EEPROM values should be used

The EXI file can be exported through the *Export EXI* button right from the *Export ENI* Button or through the context menu.



# 5.3 Slave Settings

This section includes slave related settings. The most of all settings will affect the "Slave" section of the ENI.

# 5.3.1 General

In this tab, the user can change general slave settings like station address or the name of the slave. He has also the possibility to change his predecessor device:

Device Editor	
General Modules PDO Mapping	Variables Advanced Options Init Commands CoE Object-Dictionary Sync Units Motion
Address	
Station Address	1019 🚭
Information	
Name	Slave_1019 [VIPA 053-1EC00]
Description	VIPA 053-1EC00 EtherCAT Fieldbus coupler (MDP)
Vendor	VIPA GmbH (0x0000AFFE)
Product Code	0x0531EC00 (87157760)
Revision Number	0x0000012 (18)
ESI File	Vipa 053-1EC00 MDP.xml
Identification Value	Not Used
Ports	
А	Slave_1018 [BK1120] (1018) / Port B
D	Not Available
В	Not Connected
с	Not Available

# Address

#### Station Address:

Station address of the slave. By default, the first station address is 1001.

# Information

# Name:

Name of the slave. By default the following format is used "Slave\_N [TYPE]"

#### **Description:**

Description of the slave (Read from ESI file)

#### Vendor:

Name of the vendor the slave

#### Product Code:

Product Code of the slave



#### **Revision Number:**

Revision Number of the slave

#### **ESI File:**

Name of the ESI `file where the description of the slave is stored. :file:`ESI files can be managed by using the *ESI-Manager* 

## **Identification Value:**

Identification Value of the slave

## Ports

#### **Connected Devices:**

List of connected devices

#### **Predecessor Device:**

Name of the predecessor device. If topology should be changed, please use the Edit Topology dialog

# 5.3.2 Modules

In this tab, the user has can assign modules into the specific slots. He can also change the setting for downloading the slot configuration to the slave:

001 : Terminals [022-18D00] (VIPA 022-18D00, DO 4xDC 24		🝷 👔 SM 021 - Digital Ir	nput Modules
002 : Terminals [021-18D00] (VIPA 021-18D00, DI 4xDC 24V		1 021-1BB00	(VIPA 021-1BB00, DI 2xDC 24V)
003 : Terminals [022-1BD00] (VIPA 022-1BD00, DO 4xDC 24	<<	1 021-1BB10	(VIPA 021-1BB10, DI 2xDC 24V 2µs4
004 : Terminals [032-1BB30] (VIPA 032-1BB30, AO 2x12Bit 0	x	1 021-1BB50	(VIPA 021-1BB50, DI 2xDC 24V NPN)
1 005 : Terminals [021-1BD00] (VIPA 021-1BD00, DI 4xDC 24V	A	1 021-1BB70	(VIPA 021-1BB70, DI 2xDC 24V ETS)
006 : Terminals [022-1BB70] (VIPA 022-1BB70, DO 2xDC 24)		1 021-1BD00	(VIPA 021-1BD00, DI 4xDC 24V)
007 : Terminals [022-1BD00] (VIPA 022-1BD00, DO 4xDC 24		1 021-1BD10	(VIPA 021-1BD10, DI 4xDC 24V 2µs4
1 008 : Terminals [021-1BD00] (VIPA 021-1BD00, DI 4xDC 24V		1 021-1BD40	(VIPA 021-1BD40, DI 4xDC 24V 3 wire
1 009 : Terminals [021-1BB70] (VIPA 021-1BB70, DI 2xDC 24V		1 021-1BD50	(VIPA 021-1BD50, DI 4xDC 24V NPN)
010 : Terminals []		1 021-1BD70	(VIPA 021-1BD70, DI 4xDC 24V ETS)
011 : Terminals []		1 021-1BF00	(VIPA 021-1BF00, DI 8xDC 24V)
012 : Terminals []		1 021-1BF01	(VIPA 021-1BF01, DI 8xDC 24V 0.5ms
013 : Terminals []		1 021-1BF50	(VIPA 021-1BF50, DI 8xDC 24V NPN)
014 : Terminals []		1 021-1DF00	(VIPA 021-1DF00, DI 8xDC 24V Diagn
015 : Terminals []		🝷 丰 SM 022 - Digital O	utput Modules
016 : Terminals []		1 022-1BB00	(VIPA 022-1BB00, DO 2xDC 24V 0.5A
017 : Terminals []		1 022-1BB20	(VIPA 022-1BB20, DO 2xDC 24V 2A)
018 : Terminals []		1 022-1BB50	(VIPA 022-1BB50, DO 2xDC 24V 0.5A
019 : Terminals []		1 022-1BB70	(VIPA 022-1BB70, DO 2xDC 24V 0.5A
020 : Terminals []		↓ 022-1BB90	(VIPA 022-1BB90, DO 2xDC 24V 0.5A
021 : Terminals []		1 022-1BD00	(VIPA 022-1BD00, DO 4xDC 24V 0.5A
		4	

# Connect module to slot ("<<")

Used for connecting the selected module (from the right list) to the selected slot (from the left list). If the slot is already connected, the module will be inserted and the subsequent modules will be moved (if this is supported from the slave)

#### **Disconnect module from slot ("X")**

Used for disconnecting the selected slot (left list)



Note: The modules can be also connected and disconnected by using the context menu in the project explorer.

# 5.3.3 PDO Mapping

This tab consists of 2 views:

# PDO

In this tab, the user can see the current PDO mappings. For some Slave types the user can activate or deactivate some PDO configurations:

eneral	Valia	Auvanceu (			comm	ands CoE Object-Dicti	onary Sync onits	PDC	FMMU/S
puts					Outpu	**		PDC	FMIMU/S
T T	1st Transmit PDO r	napping (excluded b	oy 0x1A01)	0x1A00 ^	-		napping (excluded b	y 0x1601)	0x1600 ^
	Name	Index	Bit Length			Name	Index	Bit Length	
	Status word	0x6041:00	16			Control word	0x6040:00	16	
	Position actual value	0x6064:00	32			Target position	0x607A:00	32	
	Torque actual value	0x6077:00	16			Target velocity	0x60FF:00	32	
	Following error actual v	0x60F4:00	32			Target torque	0x6071:00	16	
	Modes of operation dis	0x6061:00	8			Max torque	0x6072:00	16	
		0x0000:00	8			Modes of operation	0x6060:00	8	
	Touch probe status	0x60B9:00	16				0x0000:00	8	
	Touch probe 1 position	0x60BA:00	32			Touch probe function	0x60B8:00	16	
•	2nd Transmit PDO	mapping		0x1A01		2nd Receive PDO	mapping		0x1601
	Name	Index	Bit Length			Name	Index	Bit Length	
	Status word	0x6041:00	16			Control word	0x6040:00	16	
	Position actual value	0x6064:00	32			Target position	0x607A:00	32	
-	3rd Transmit PDO	mapping (excluded l	by 0x1A01)	0x1A02	•	3rd Receive PDO	mapping (excluded b	y 0x1601)	0x1602
	Name	Index	Bit Length			Name	Index	Bit Length	_
	Status word	0x6041:00	16			Control word	0x6040:00	16	
	Position actual value	0x6064:00	32			Target velocity	0x60FF:00	32	
-	Ath Transmit DDO	nanning (oveluded)	by 0v1A01)	0~1402	-	Ath Deceive RDO	manning (oveluded b	0.0.1601)	0+1602

# Lists of inputs or outputs

# Checkbox:

Signals if PDO will be used for the current configuration or not.

# Buttons (Expert mode only!)

#### Add/Delete/Edit:

Used for changing the lists, if it is allowed by the ESI. First the list which should be changed must be selected.

## **Up/Down:**

Moving the selected PDO in the selected list up or down



# Load PDO information:

If EC-Engineer is connected to the control system, the user can load the PDO information directly from the slave

# **Context Menu**

# Both lists provide a context menu:

eneral	PDO Mapping Var	iables Advanced Opti	ons    Distribute	d Clocks	Init Com	mands    CoE	Object-Dictio	onary Sync Units		
puts					Out	puts			PD	O FMMU/
•	1st Transmit PDO     Name     Status word	mapping (excluded by 0 Ir Expand All Ov Collapse Al	th	0x1A00	^	Ist     Name     Control w		napping (excluded by Index 0x6040:00	y 0x1601) Bit Length 16	0x1600
	Position actual value Torque actual value	0x Select All Unselect Al 0x6077:00	16			Target po Target ve		0x607A:00 0x60FF:00	32 32	
	Following error actual Modes of operation di		32 8			Target to Max torg		0x6071:00 0x6072:00	16 16	
	 Touch probe status	0x0000:00 0x60B9:00	8			Modes of	foperation	0x6060:00 0x0000:00	8	
•	Touch probe 1 position 2nd Transmit PD0		32	0x1A01			obe function	0x60B8:00 mapping	16	0x1601
	Name	Index	Bit Length			Name		Index	Bit Length	
	Status word Position actual value	0x6041:00 0x6064:00	16 32			Control v Target po		0x6040:00 0x607A:00	16 32	
•	3rd Transmit PDC	mapping (excluded by 0	x1A01) Bit Length	0x1A02		3rd     Name	Receive PDO n	napping (excluded b Index	y 0x1601) Bit Length	0x1602
	Status word Position actual value	0x6041:00 0x6064:00	16 32			Control v Target ve		0x6040:00 0x60FF:00	16 32	
-	Ath Transmit DDC	manning (oveluded by 0	w1A01)	0+1402	$\sim$	- 4+b	Docoivo DDO e	espering (oveluded b	0.0.1501)	0-1602

If user wants to add or edit a PDO, he will see the following dialog:



🛹 Edit PDO				-		×
General				Option	al	
Name	1st Transm	Exclude:				
Index	Index 0x1A00		Dec Hex		1A01	
Flags	Di	rection			1A02	
_				~	1A03	
Mandatory Fixed Content	TxPdo           RxPdo					
		- KAPGO				
Virtual PDO						
Entries						
		Index	Bit Length	Con	nment	^
Entries		Index 0x6041:00	Bit Length 16	Con	nment	^
Entries Name			_	Con	nment	
Entries Name Status word		0x6041:00	16	Con	nment	^
Entries Name Status word Position actual value	i value	0x6041:00 0x6064:00	16 32	Con	nment	
Entries Name Status word Position actual value Torque actual value	I value Delete	0x6041:00 0x6064:00 0x6077:00 0x60F4:00	16 32 16		nment	

# General:

Name:

Name of the PDO

# Index:

Index of the PDO (can be entered in hexadecimal or decimal)

# Flags:

Mandatory:

PDO cannot be deleted

# **Fixed Content:**

Content of PDO cannot be changed

# Virtual PDO:

PDO has no entries

# **Direction:**

TxPdo:

Input PDO

# **RxPdo:**

Output PDO

# Sync Manager:

Selected the Sync Manager, which should be used (only visible if more than one can be used)

# Exclude:

Select the PDOs which cannot be activated if this PDO is activated

#### **Entries:**

List of configured PDO entries

# If user wants to add a PDO entry, he will see the following dialog:

裙 Add	PDO Entry	/	-						
General									
Name		Error code	rror code						
Comment									
Swapp	ing	None					-		
Settings									
Index		0x603F Dec Hex	SubIndex	0		Dec H	ex		
Dataty	pe	UINT -	Bit Length	16					
Show E	ase Datat	types							
CoE Obj	ect-Dictio	onary							
	Index	Name				Туре	$\sim$		
+	0x2720	Safety module monitors				UDINT			
± 🕨	0x603F	Error code				UINT			
•	0x6040	Controlword				UINT			
•	0x6041	Statusword				UINT			
•	0x6060	Modes of operation				SINT			
•	0x6061	Modes of operation display				SINT			
•	0x6062	Position demand value				DINT	$\sim$		
		ОК	Cancel						

# General

#### Name:

Name of the PDO entry

# **Comment:**

Commet of the PDO entry

# Swapping:

Swapping mode of the PDO entry

# Settings

# Index:

Index of the PDO entry (can be entered in hexadecimal or decimal)

# Subindex:

Subindex of the PDO entry (hexadecimal)

# Datatype:

List of available datatypes

# **Bit Length:**

Length of the PDO entry in bits

CoE Object-Dictionary (loaded only if Object-Dictionary is supported by slave)

# If user wants to edit a PDO entry without a CoeOD, he will see the following dialog:

裙 Edit I	PDO Entry	,		_		×
General						
Name		Max torque				
Comm	ent					
Swapp	ing	None				-
Settings	;					
Index		0x6072 Dec Hex	SubIndex	0	Dec H	Hex
Dataty	pe	UINT 🝷	Bit Length	16		
Show I	Base Datat	types				
CoE Obj	ect-Dictio	onary				
	Index	Name			Туре	$\sim$
+	0x6063	Position actual internal value			DINT	
•	0x6064	Position actual value			DINT	
•	0x606B	Velocity demand value			DINT	
•	0x606C	Velocity actual value			DINT	
•	0x6071	Target torque INT				
± 🕨	0x6072	Max torque UINT				
+	0x6074	Torque demand value			INT	$\sim$
		ОК	Cancel			

# General

# Name:

Name of the PDO entry

# Comment:

Commet of the PDO entry

### Swapping:

Swapping mode of the PDO entry



# FMMU/SM

In this tab, the user can see some information about FMMU and SyncManager:

enera	Modules	FDO Wapping	variables	Advanced Options	Init Commands	CoE Object-Dictionary	Sync Oni	-		PDO	FMMU	
имu										100	T IVIIVIC	
No	Туре					Logical Start Address	Length	Logical End	Bit Phy	sical Address	Sm 9	Su
0	Outputs					0x10000004.0	127	7	0x1	000		
1	Inputs					0x10000004.0	135	7	0x1	500		-
2	Mailbox State					0x0900000.2	1	2	0x0	BOD		-
												_
1	-											
No	Туре									Buffer Mode		ble
No 0	Mailbox Outp						C	x1C00	512	1	1	ole
No 0 1	Mailbox Outp Mailbox Inpu						C	x1C00 x1E00	512 512	1	1	ble
No 0 1 2	Mailbox Outp Mailbox Inpu Outputs						c c	x1C00 x1E00 x1000	512 512 127	1 1 3	1 1 1	ble
No 0 1	Mailbox Outp Mailbox Inpu						c c	x1C00 x1E00	512 512	1	1	ble
No 0 1 2	Mailbox Outp Mailbox Inpu Outputs						c c	x1C00 x1E00 x1000	512 512 127	1 1 3	1 1 1	ble
No 0 1 2	Mailbox Outp Mailbox Inpu Outputs						0 0 0	x1C00 x1E00 x1000	512 512 127	1 1 3	1 1 1	ble

#### Lists of FMMUs

Available FMMUs comes from the ESI file.

# Lists of SyncManagers

Available SyncManagers comes from the ESI file.

# 5.3.4 Variables

In this tab, the user can see the variables of the slave and if it is allowed he can also add/edit/delete/move variables. Also "Add to watchlist" is possible:



Name					Datatype	Master S	iync Unit	Offset	*	Size
Slave_1019	[VIPA 053-1EC00].Inp	outs.Hardwa	re Interrupt Counter		UDINT	ld 1000:	MasterSyncUnit 1000	IN :	38.0	4.0
Slave_1019	[VIPA 053-1EC00].Inp	outs. Diagnos	tic Interrupt Counter		UDINT	ld 1000:	MasterSyncUnit 1000	IN:	42.0	4.0
Slave_1019	[VIPA 053-1EC00].Mc	odule 2 (021	-1BD00).Inputs.DI 0		BOOL	Id 1000:	MasterSyncUnit 1000	IN:	46.0	0.1
Slave_1019	[VIPA 053-1EC00].Mc	odule 2 (021	-18D00).Inputs.DI 1		BOOL	ld 1000:	MasterSyncUnit 1000	IN:	46.1	0.1
Slave_1019	[VIPA 053-1EC00].Mc	odule 2 (021	-1BD00).Inputs.DI 2		BOOL	ld 1000:	MasterSyncUnit 1000	IN:	46.2	0.1
Slave_1019	[VIPA 053-1EC00].Mc	dule 2 (021	-1BD00).Inputs.DI 3		BOOL	Id 1000:	MasterSyncUnit 1000	IN:	46.3	0.1
Slave_1019	[VIPA 053-1EC00].Mc	dule 4 (040	-1BA00).Inputs.Status	byte	USINT	ld 1000:	MasterSyncUnit 1000	IN:	47.0	1.0
Slave_1019	[VIPA 053-1EC00].Mc	odule 4 (040	-1BA00).Inputs.Input	byte 1	USINT	ld 1000:	MasterSyncUnit 1000	IN:	48.0	1.0
Slave_1019	[VIPA 053-1EC00].Mc	odule 4 (040	-1BA00).Inputs.Input	byte 2	USINT	ld 1000:	MasterSyncUnit 1000	IN:	49.0	1.0
Slave_1019	[VIPA 053-1EC00].Mc	odule 4 (040	-1BA00).Inputs.Input	byte 3	USINT	ld 1000:	MasterSyncUnit 1000	IN:	50.0	1.0
Slave_1019	[VIPA 053-1EC00].Mc	odule 4 (040	-1BA00).Inputs.Input	byte 4	USINT	ld 1000:	MasterSyncUnit 1000	IN:	51.0	1.0
Slave_1019	[VIPA 053-1EC00].Mc	odule 4 (040	-1BA00).Inputs.Input	byte 5	USINT	ld 1000:	MasterSyncUnit 1000	IN:	52.0	1.0
Slave_1019	[VIPA 053-1EC00].Mc	odule 4 (040	-1BA00).Inputs.Input	byte 6	USINT	ld 1000:	MasterSyncUnit 1000	IN:	53.0	1.0
Slave_1019	[VIPA 053-1EC00].Mc	odule 4 (040	-1BA00).Inputs.Input	byte 7	USINT	ld 1000:	MasterSyncUnit 1000	IN:	54.0	1.0
Slave_1019	[VIPA 053-1EC00].Mc	odule 4 (040	-1BA00).Inputs.Input	byte 8	USINT	ld 1000:	MasterSyncUnit 1000	IN:	55.0	1.0
								Add to v	watch	list

# Lists of Variables

Variables comes from the  ${\tt ESI}$  file or will be generated from the configurator.

## Buttons

#### New/Edit/Delete:

Used for changing the list.

# Up/Down:

Moving the selected variable up or down

## New/Edit/Delete Alias:

Used for changing alias variables

# If user wants to add a variable, he will see the following dialog:

ल Add Variable		_		×
Group	2nd Transmit	PDO mapp	oing	•
Datatype	ARRAY [015]	] OF BYTE		•
Count				1 🖨
Combine				
	OK	Cancel		

# Options

#### Group:

List of possible groups, where the new variable should be added

#### Datatype:

List of possible datatypes of the new variable

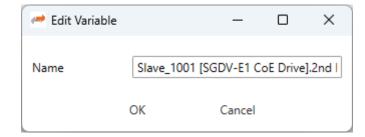
#### Count:

Number of variables, which should be added

## **Combie:**

Combines all variables to an array

If user wants to edit a variable, he will see the following dialog:



# Options

#### Name:

Name of the variable, which can be changed from the user

If user wants split a variable into multiple parts to build e.g. a structure, he can add an alias to a vailable. In that case he will see the following dialog:

븓 Add Alias		-	$\times$
Name	Alias 0		
Datatype	BOOL		•
Offset	0		
	ОК	Cancel	

# Options

### Name:

Name of the alias

# Datatype:

List of possible datatypes of the new alias

## **Offset:**

Bit offset of the alias

If user wants to edit a alias, he will see the following dialog:

븓 Edit Alias		_	×
Name	Alias 0		
	ОК	Cancel	

# Options

Name:

Name of the alias, which can be changed from the user

# 5.3.5 EtherCAT P

In this tab, the user can configure the selected EtherCAT P slave. The Tab is only visible when the selected slave is an EtherCAT P slave:

Device Editor				
General PDO Mapping	Variables EtherCAT P Advan	ced Options Sync Units		
Input Cable				
Wire Gauge	22 [AWG] 🔹			
Wire Length (m)	1,00			
Slave				
Powered Device				$\searrow$
Us: System Voltage		Up: Peripheral Voltage		
Actual Voltage	23,98	Actual Voltage	24	
Min Voltage	20,4	Min Voltage	20,4	
Load	0,00	Load	0,00	
Load Type	Sw Regulator [W] 🔹	Load Type	Sw Regulator [W] 🔻	
Supplied Slaves				
Name				

# Wire Gauge:

The wire type of the input cable

## Wire Length:

The wire length of the input cable

Us:

System Voltage



The system voltage shall supply all internal and externally connected types of sensors and inputs. All bus system relevant parts of the device shall completely be powered by the Us.

#### **Actual Voltage:**

The actual voltage at the slave

# Min Voltage:

The min Voltage the slave needs. Value is from ESI but also editable.

Load:

The Load which is externally needed.

Load Type:

The Load Type of the externally needed load

## Up:

# **Peripheral Voltage:**

Up is used to supply internal and externally connected actuators and outputs.

#### **Actual Voltage:**

The actual voltage for the outputs

# Min Voltage:

The min Voltage the slave needs. Value is from ESI but also editable.

#### Load:

The Load which is externally needed.

# Load Type:

The Load Type of the externally needed load

### Load Types:

Sw Regulator in Watt LDO in Ampere Resistor in Ohm

# 5.3.6 Advanced Slave Options (Expert)

In this tab, the user can change advanced options of the slave:



Device Editor					
General PDO Mapping Variables Group Advanced Options Distributed C	locks Init Commands CoE Object-Diction	ary Sync Units			
Startup Checking	Timeouts				
Check Vendor ID	SDO Access:	0 💽 [ms]			
Check Product Code	Init->Pre-Op/Init->Bootstrap:	3000 🚭 [ms]			
Check Revision Number	Pre-Op->Safe-Op/Safe-Op->Op:	10000 😜 [ms]			
Check Serial Number	Back to Pre-Op, Init:	5000 🚭 [ms]			
	Op->Safe-Op:	200 💽 [ms]			
Identification Checking	Mailbox Mode				
Check Identification	O Cyclic	10 🜉 [ms]			
0 Dec Hex Write to EEPROM	<ul> <li>State Change</li> </ul>				
Select Local Address					
0x0012 Dec Hex					
Process Data Mode	Overwrite Mailbox Size				
✓ Disable LRW	Output Size:	128 🔛 [bytes]			
	Input Size:	128 🔤 [bytes]			
Overwrite Watchdog	Process Data Sync Manager Mode				
Set Multiplier (Reg.: 0x400): 2498 🚭	<ul> <li>Default</li> </ul>				
Set PDI Watchdog (Reg.: 0x410): 1000 🚔	<ul> <li>Buffered (3 buffer mode)</li> </ul>				
Set SM Watchdog (Reg.: 0x420): 1000	<ul> <li>Mailbox (Single buffer mode)</li> </ul>				
Distributed Clocks					

## **Startup Checking**

# Master will check the Vendor ID, Product code, Revision number if the state machine changes from INIT to PREOP of the slave. Revision number can be verified by six ways:

- "==" -> HI word is equal, LO word is equal
- ">=" -> HI word is equal or greater, LO word is equal or greater
- "LW ==" -> HI word is equal
- "LW ==, HW >=" -> LO word is equal, HI word is equal or greater
- "HW ==" -> LO word is equal
- "HW ==, LW >=" -> HI word is equal, LO word is equal or greater

#### **Identification Checking**

If 'Check Identification is selected, the Identification Value of the slave is checked. In the 'Select Local Address' Box is the register of the Identification Value.

#### **Process Data Mode**

Disable LRW: Determines whether LRD/LWR command or the LRW command is used for accessing process data. Cable redundancy needs LRD/LWR, Slave-to-slave-copy needs LRW.

# Watchdog

#### Set Multiplier:

Writes the configured value to the corresponding slave register: 0x0400

#### Set PDI Watchdog:

Writes the configured value to the corresponding slave register: 0x0410 (0 = Watchdog is disabled)



### Set SM Watchdog:

Writes the configured value to the corresponding slave register: 0x0420 (0 = Watchdog is disabled)

#### Distributed Clocks

#### Potential Reference Clock: Set to use slave as a potential reference clock

- This might be useful, if e.g. a hot connect slave, which is used as reference clock, was disconnected from the network
- In that case the EC-Master searches for the first potential reference clock
- If no potential reference clock slave was found, the first DC slave will be used

# Timeouts

#### **SDO Access:**

Internal master timeout which is used for accessing the SDO (0 = Use internal default value of the master)

#### Init -> PreOp:

Internal master timeout with is used for changing slave state

# **Pre-Op -> Save-Op or Safe-Op ->Op:**

Internal master timeout with is used for changing slave state

## Back to Pre-Op, Init:

Internal master timeout with is used for changing slave state

#### **Op** -> **Safe-Op**:

Internal master timeout with is used for changing slave state

#### **Mailbox Mode**

## Cyclic:

Interval in milliseconds within the input mailbox will be read (polling mode)

#### State Change:

The input mailbox will be read only if the status bit is set

## **Overwrite Mailbox Size**

#### **Output Size:**

Overwrites mailbox output size

#### **Input Size:**

Overwrites mailbox input size

#### Process Data Sync Manager Mode

## **Default:**

Uses sync manager mode from ESI file

## **Buffered (3 buffer mode):** Enables 3 buffer mode

## Mailbox (Single buffer mode):

Enables single buffer mode



# 5.3.7 (Hot Connect) Groups

In this tab, the user can choose if this group has a fixed offset in the process data image or if this group is a hot connect group:

Device Editor	
General PDO Mapping Variables	Group Advanced Options Distributed Clocks Init Commands CoE Object-Dictionary Sync Units
General	
MSU Id	10 Dec Hex
Name	Group 0
Pinned Group	
Input Offset (byte)	0 Dec Hex
Output Offset (byte)	0 Dec Hex
Hot Connect Group	
Identification Offset	0x0012
Identification Value	0 Dec Hex
Position in Topology	Fixed to 'Class-A Master'

Note: Tab is only visible if slave is the first member of a group.

#### General

# MSU Id:

Generated Master Sync Unit Id

### Name:

Name of the group

# **Pinned Group**

# Input Offset:

Fixed input offset of the group in the process data image in bytes

### **Output Offset:**

Fixed output offset of the group in the process data image in bytes

### **Hot Connect Group**

# Identification Offset:

Register offset where the identification can be read from the slave



# **Identification Value:**

Hardware identification value or configured station alias address can be used. For more information about the configured station alias address, see *EEPROM (Expert)* 

A new group can be created by selecting all slaves (by using the SHIFT key or the CTRL key), open the context menu and select *Create Group* in the project explorer:

产 EC-Engineer []		- 0	×
File View Netw	rork Settings Help		
Configuration M	Aode 🛛 💇 Export ENI 🛛 🐺 Export EXI	K Diagnosis Mode	-
Project Explorer		Device Editor	
👻 🕘 Class-A Ma	ster	General PDO Mapping Variables Advanced Options Sync Units Motion	
	001 [EK1100] (1001)	Address	
	Append Slave(s)	ns Station Address 1011	
Slav		el	
I Slav		nformation           X         Name         Slave_1011 [EL1002]	- I
Slave_10		C Jave_forf[cerode]	_
N., Slave_10			
R, Slave_10	013   🔶 Enable Slave(s)	Vendor Beckhoff Automation GmbH & Co. KG (0x0000002)	
N., Slave_10	014   🗱 Disable Slave(s)	Product Code 0x03EA3052 (65679442)	
	🕐 Reload ESI data	Revision Number 0x00120000 (1179648)	
	Export SCI	ESI File Beckhoff EL1xxxxml	
	Change Slave	Identification Value 🕒 Not Used	
	Select from Project Template	Ports	
	Import Beckhoff Slave Description	A Slave_1010 [EL1002] (1010) / Port B	
	Create Group  Remove Group	D 🕘 Not Available	
	Creat	te Hot Connect- or Pinning-Group 🕘 Not Connected	
	Cleach HC Group	C 🕒 Not Available	
	Attach He Group		
	iew Topology View		
Short Info	<del>,</del> 4		<b>-</b> ↓
Information		Severity Time Message	
Name	Slave_1011 [EL1002]		
Description Vendor	EL1002 2Ch. Dig. Input 24V, 3ms		
Vendor Physical Address	Beckhoff Automation GmbH & Co. KG (0x0000		
AutoInc Address	1011 0xFFF7 / -9		
	VALLET / 2		
Networks: 1 Slaves: 1	4	State: 🔍 🔍 Mode: CONFIG	G EXPERT

The new group can be modified by selecting the head slave of this group and open tag *Group*:

#### User Manual



븓 EC-Engineer []		– 🗆 X	
File View Netv	vork Settings Help		
Configuration N	Mode 🛛 🛷 Export ENI 🛛 🐺 Export EXI	Kan Diagnosis Mode	÷
Project Explorer		Device Editor	
	001 [EK1100] (1001) e_1002 [EK1100] (1002) Slave_1009 [EL1002] (1009) Slave_1010 [EL1002] (1010) Slave_1011 [EL1002] (1011) 00 [EK1100] (1003) 012 [SGDV-E1 CaE Drive] (1012)	General     Group     E-Bus Current     Advanced Options     Motion       General     10     10       Name     Group 0       Pinned Group     1       Input Offset (byte)     0       Output Offset (byte)     0	Ren Hex Ren Hex
f , Slave_1013 (SGDV-E1 CoE Drive) (1013)		Hot Connect Group Identification Offset 0x0012 Identification Value 1002 Position in Topology Fixed to 'Slave_1001 [EK1100] (1001)'	Dec Hex
Classic View Flat \	/iew Topology View		
Short Info 👻 👎		Messages	<b>▲</b> †
Information		Severity Time Message	
Name Description Vendor Physical Address	Slave_1002 [EK1100] EK1100 EtherCAT Coupler (2A E-Bus) Beckhoff Automation GmbH & Co. KG (0x0000) 1002	ERR         103312         Invalid topology from Slave_1003 [EKT100]' (slave connected to HC group).           ERR         103312         Invalid topology from Slave_1003 [EKT100]' (slave connected to HC group).           ERR         103259         Invalid topology from Slave_1003 [EKT100]' (slave connected to HC group).           ERR         103259         Invalid topology from Slave_1003 [EKT100]' (slave connected to HC group).           ERR         103259         Invalid topology from Slave_1003 [EKT100]' (slave connected to HC group).           ERR         103259         Invalid topology from Slave_1003 [EKT100]' (slave connected to HC group).	
AutoInc Address	0xFFF6 / -10	State: • • •	Node: CONFIG   EXPERT

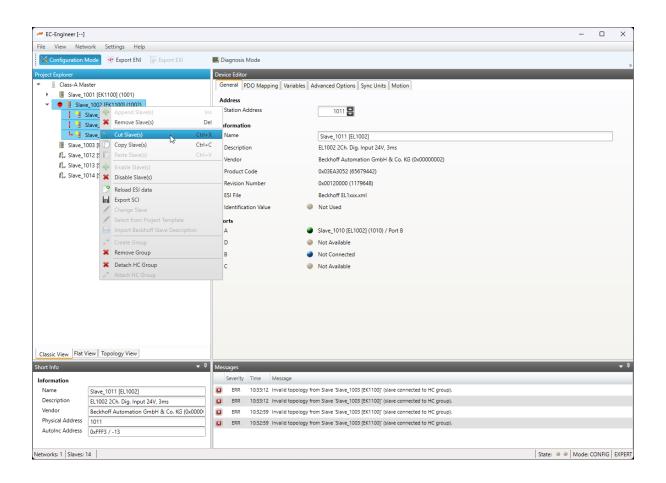
On this tab, the user can pin this group of slaves to a specific offset in the process image and / or build a hot connect group. If we do this, in that case this will generate an invalid topology error, because a normal slave is still connected to this hot connected, which is not allowed.

# In that case we can use "cut & paste" to solve this issue by connecting this hot connect group to the end of the slaves:

### User Manual



🛹 EC-Engineer []		- 0 ×
<u>File View N</u> etwork <u>S</u> ettings <u>H</u> elp		
Configuration Mode 🛛 😵 Export ENI 🛛 🐺 Export EXI	Kan Diagnosis Mode	
Project Explorer	Device Editor	
<ul> <li>Class-A Master</li> <li>Slave_1001 [KK100] (1001)</li> <li>Slave_1003 [KK100] (1003)</li> <li>Slave_1012 [SGDV-E1 CcE Drive] (1012)</li> <li>Slave_1013 [SGDV-E1 CcE Drive] (1014)</li> <li>Slave_1014 [SGDV-E1 CcE Drive] (1014)</li> <li>Slave_10102 [EK1100] (1002)</li> <li>Slave_1009 [EL1002] (1009)</li> <li>Slave_1010 [EL1002] (1010)</li> <li>Slave_1011 [EL1002] (1011)</li> </ul>	General Group, E-Bus Current, Advanced Options, Motion         Address         Station Address         Station Address         Information         Name       Slave_1002 [EK1100]         Description       EK1100 EtherCAT Coupler (2A E-Bus)         Vendor       Beckhoff Automation GmbH & Co. KS (0x0000002)         Product Code       0x0442C252 (72100946)         Revision Number       0x00120000 (1179648)         ESI File       Beckhoff EK11sourni         Identification Value       Not Used         Ports       A [X1 IN]         Q       Slave_1014 [SGDV-E1 CoE Drive] (1014) / Port B         D       Not Available         8       Slave_1009 [EL1002] (1009)         C [X2 OUT]       Not Connected	
Classic View Flat View Topology View		
Short Info	Messages	<b>→</b> ‡
Information	Severity Time Message	-
Name Slave_1002 [EK1100]	INF 10:35:22 All pending errors were solved.	
Description EK1100 EtherCAT Coupler (2A E-Bus)	INF 10:35:22 All pending errors were solved.	
Vendor Beckhoff Automation GmbH & Co. KG (0x0000	ERR 10:33:12 Invalid topology from Slave 'Slave_1003 [EK1100]' (slave connected to HC group).	
Physical Address 1002	ERR 10:33:12 Invalid topology from Slave 'Slave_1003 [EK1100]' (slave connected to HC group).	
AutoInc Address 0xFFF6 / -10	ERR 10:32:59 Invalid topology from Slave 'Slave_1003 [EK1100]' (slave connected to HC group).	
	ERR 10:32:59 Invalid topology from Slave 'Slave_1003 [EK1100]' (slave connected to HC group).	
Networks: 1 Slaves: 14		Mode: CONFIG EXPER





Now, we have a hot connect group which is connectable only to slave 1011. If we want to connect this group to any slave on the network, we have to detach the group:

൙ EC-Engineer []			-		×
<u>File View N</u> etv	vork <u>S</u> ettings <u>H</u> elp				
Configuration N	Aode 🛛 😵 Export ENI 🛛 🐺 Export EXI	Diagnosis Mode			÷
Project Explorer		Device Editor			
👻 🎚 Class-A Ma	ster	General Group E-Bus Current Advanced Options Motion			
Ill Slave_1	001 [EK1100] (1001)	Address			
	003 [EK1100] (1003)	Station Address 1002			
	012 [SGDV-E1 CoE Drive] (1012)				
	013 [SGDV-E1 CoE Drive] (1013)	Information			
	014 [SGDV-E1 CoE Drive] (1014)	Name Slave_1002 [EK1100]			
👻 🌻 📗 Slav	21002 [EK1100] (1002)	Description EK1100 EtherCAT Coupler (2A E-Bus)			
	blave	Vendor Beckhoff Automation GmbH & Co. KG (0x00000002)			
11:	Juve	Product Code 0x044C2C52 (72100946)			
	Slave Cut Slave(s) Ctrl+X	Revision Number 0x00120000 (1179648)			
	Paste Slave(s) Ctrl+V	ESI File Beckhoff EK11xxxml			
	Enable Slave(s)     Disable Slave(s)	Identification Value 🔍 Not Used			
		<sup>2</sup> orts			
	P Reload ESI data	A [X1 IN] Slave_1014 [SGDV-E1 CoE Drive] (1014) / Port B			
	Export SCI	D 🔷 Not Available			
	Change Slave	B Slave_1009 [EL1002] (1009)			
	Select from Project Template	C [X2 OUT]   Not Connected			
	Import Beckhoff Slave Description				
	🖉 Create Group				
	🗱 Remove Group				
	X Detach HC Group				
	Attach HC Group				
	a 1 m i ia 1				
	/iew Topology View				
Short Info	<del>~</del> †	Messages			<b>→</b> ₽
Information		Severity Time Message			1
Name	Slave_1002 [EK1100]	INF 10:35:22 All pending errors were solved.			- 11
Description	EK1100 EtherCAT Coupler (2A E-Bus)	INF 10:35:22 All pending errors were solved.			
Vendor	Beckhoff Automation GmbH & Co. KG (0x0000)	ERR 10:33:12 Invalid topology from Slave 'Slave_1003 [EK1100]' (slave connected to HC group).			
Physical Address	1002	ERR 10:33:12 Invalid topology from Slave 'Slave_1003 [EK1100]' (slave connected to HC group).			
AutoInc Address	0xFFF6 / -10	ERR 10:32:59 Invalid topology from Slave 'Slave_1003 [EK1100]' (slave connected to HC group).			
		ERR 10:32:59 Invalid topology from Slave 'Slave_1003 [EK1100]' (slave connected to HC group).			V
Networks: 1 Slaves:	14	State: 👁 👁	Mode: C	ONFIG	EXPERT

A group can be deleted by selecting the head slave of this group, open the context menu and select "Remove Group" in the project explorer (only attached HC groups can be deleted).

### Possible group related error messages:

- Detached group can not be attached to the old position in the tree (e.g. previous slaves was deleted or disabled) the head slave of the group will be reported as "not connected". In that case the user can connect the head slave by using "cut" and "paste".
- Invalid topology from slave (fixed HC group on master) was displayed: this means that the first HC group which is connected to the master should be detached, because this is not valid in the ENI file
- Invalid topology from slave (slave connected to HC group) was displayed: this means that a normal slave is connected to a hot connect group and should be also moved also into a hot connect group or moved to another position in the tree

# 5.3.8 Ethernet (EoE)

In this tab, the user can activate EoE support and change the settings:

Device Editor	
General PDO Mapping Variables	Ethernet Advanced Options Distributed Clocks Init Commands Sync Units
Ethernet	V
Virtual MAC address	02 00 00 03 EA 🗸 🗸 Auto
Time Stamp Requested	
Port Mode	○ Switch Port
Overwrite IP Settings	
IP Address	1.0.0.0
Subnet Mask	1.0.0.0
Default Gateway	1.0.0.0
DNS Server	1.0.0.0
DNS Name	

### **Ethernet (activates EoE support):**

### Virtual MAC address:

Virtual MAC address. If "Auto" is checked, the Virtual MAC address will be generated from the Station Address, e.g. Station Address is "1010" (= 0x03F2), will generate the Virtual MAC address: "01 00 00 00 03 F2"

### **Time Stamp Requested:**

Slave will response with the exact send time and the same Frame Number and he should response as soon as possible

## **Port Mode:**

Slave can run in "Switch Port" or in "IP Port" mode

### **Override IP Settings:**

All IP settings will be overwritten from master like IP Address, Subnet Mask, Default Gateway, DNS Server and DNS Name.



# 5.3.9 Distributed Clock (Expert)

In this tab, the user can change distributed clock related settings:

Device Editor		_	_		
General PDO Mapping Variable	s Group Advanced Option:	s Distributed Clocks	Init Commands	CoE Object-Dictionary	Sync Units
Distributed Clocks					
Operation Mode	DC for synchronization	•			
Sync Unit Cycle (us)	1000				
Overwrite Mode					
✓ Sync Units					
Sync Unit 0					
Cycle Time Sync Unit Cyc	cle x 1 ×	1000 us			
User defined		1000 us			
	1000				
Shift Time (us)					
Sync Unit 1					
Cycle Time					
Sync Unit Cyc		0 us			
Sync 0 Cycle		0 us			
User defined					
Shift Time (us)					

### **Reference Clock**

### **Operation Mode:**

Selectable DC operation modes. The modes cannot be edited.

### Sync Unit Cycle:

Base interval in microseconds which will be used from master (see Master)

## **Overwite Mode:**

Overwrites the settings of the selected operation mode (might be necessary, if the slave doesn't offer the right operation mode)

# Sync Units

Sync Unit 0

Cycle Time

### Sync Unit Cycle:

Unit is synchronized relative to the Unit Cycle

### User defined: Unit has its own interval

Unit has its own inte

### Shift Time

Unit is adjusted by the shift time



# Sync Unit 1

**Cycle Time** 

Sync Unit Cycle: Unit is synchronized relative to the Unit Cycle

Sync 0 Cycle: Unit is synchronized relative to the first Sync Unit

User defined: Unit has its own interval

**Shift Time** Unit is adjusted by the shift time

# 5.3.10 Init Commands (Expert)

In this tab, the user can view the current configured init commands and if it is allowed he can also add/edit/delete init commands:

Transition	Protocol	Index	Value Comment	Access	
Pre-Op->Safe-Op	CoE	0x1C12:000	0 ciear sm pdos (0x1C12)	RO	
Pre-Op->Safe-Op	CoE	0x1C13:000	0 clear sm pdos (0x1C13)	RO	
Pre-Op->Safe-Op	CoE	0x1A00:000	0 clear pdo 0x1A00 entries	RO	
Pre-Op->Safe-Op	CoE	0x1A00:001	1614872592 download pdo 0x1A00 entry	RO	
Pre-Op->Safe-Op	CoE	0x1A00:002	1617166368 download pdo 0x1A00 entry	RO	
Pre-Op->Safe-Op	CoE	0x1A00:003	1618411536 download pdo 0x1A00 entry	RO	
Pre-Op->Safe-Op	CoE	0x1A00:004	1626603552 download pdo 0x1A00 entry	RO	
Pre-Op->Safe-Op	CoE	0x1A00:005	1616969736 download pdo 0x1A00 entry	RO	
Pre-Op->Safe-Op	CoE	0x1A00:006	8 download pdo 0x1A00 entry	RO	
Pre-Op->Safe-Op	CoE	0x1A00:007	1622736912 download pdo 0x1A00 entry	RO	
Pre-Op->Safe-Op	CoE	0x1A00:008	1622802464 download pdo 0x1A00 entry	RO	
Pre-Op->Safe-Op	CoE	0x1A00:000	8 download pdo 0x1A00 entry cour	t RO	
Pre-Op->Safe-Op	CoE	0x1A01:000	0 clear pdo 0x1A01 entries	RO	
Pre-Op->Safe-Op	CoE	0x1A01:001	1614872592 download pdo 0x1A01 entry	RO	
Pre-Op->Safe-Op	CoE	0x1A01:002	1617166368 download pdo 0x1A01 entry	RO	

### **Lists of Init Commands**

Init Commands comes from the ESI file or will be generated from the configurator. The "Access" column tells the user if this Init Command can be edited (RW = Read/Write) or not (RO = Read-Only).

### Buttons

### New/Copy/Edit/Delete:

Used for changing the list

### **Up/Down:**

Moving the selected Init Command up or down

At the moment only Init Commands of the CoE- and SoE- Protocol can be added or changed. If the user wants to do this he will see the following dialog (CoE):

裙 Add	l CoE Init	t Command		_		×
Genera	I .					
Index		0x0000 Dec Hex	SubIndex	0	Dec I	Hex
Value						
Comn	nent					
√ P	nit->Pre	Safe-Op Safe-Op->Pre-Op				
Further	Setting	s	Direction			
	Complete	Access	Download			-
V	/alidate v	value				
CoE Ob	ject-Dic	tionary		Filter S	etting F	lag
	Index	Name	Flags	Туре	Value	^
►	0x1010	Store Parameters	( RO RO RO )	USINT	-	
•	0x1011	Restore Default Parameters	( RO RO RO )	USINT	-	
►	0x10F1	Sync Error Settings	( RO RO RO )	USINT	-	
•	0x1600	1st receive PDO Mapping	( RW RW RW )	USINT	-	
•	0x1601	2nd receive PDO Mapping	( RW RW RW )	USINT	-	
•	0x1602	3rd receive PDO Mapping	( RW RW RW )	USINT	-	
_ <b>.</b>						$\sim$
		OK	Cancel			

### General

### Index:

CoE-Index of the Init Command

### SubIndex:

CoE-SubIndex of the Init Command

#### Value:

Value of the Init Command, which should be written in the chose transition (only available if direction is set to "Download"). If type of value is unknown, the hex format must be used like "00 11 22 33 ...".

### **Comment:**

Comment of the Init Command

# Transition

Determines in which transition the Init Command will be executed

### **Further Settings**

Determines if the complete SDO object should be written/read

## Direction

## Determines the direction of the Init Command

### Download:

Writes value to slave

### Upload:

Reads value from slave (e.g. necessary if value must be confirmed)

# For SoE the user will see the following dialog:

裙 Edit Co	oE Init	Command		_		×
General						
Index		0x6060 Dec Hex	SubIndex	0	Dec I	lex
Value		8				÷
Commer	nt	Op mode				
✓ Pre-	->Pre- -Op->	Safe-Op Safe-Op->Pre-Op				
Safe	e-Op->	>Op Op->Safe-Op				
Further Se	etting	s	Direction			
Con	mplete	Access	Download			•
Vali	idate v	alue				
CoE Objec	ct-Dict	tionary		Filter S	etting F	lag
In	dex	Name	Flags	Туре	Value	^
0x	x605A	Quick stop option code	( RW RW RW )	INT	-	
Ox	x605B	Shutdown option code	( RW RW RW )	INT	-	
0x	x605C	Disable operation option code	( RW RW RW )	INT	-	
Ox	x605D	Halt option code	( RW RW RW )	INT	-	
0x	x605E	Fault reaction option code	( RW RW RW )	INT	-	
Ox	x6060	Modes of operation	RX TX ( RW RW RW )	SINT	-	
						~
		ОК	Cancel			

### General



# Index:

SoE Idn of the Init Command

### Channel:

The channel of the Init Command

### Value:

Value of the Init Command

## **Comment:**

Comment of the Init Command

### Transition

Determines in which transition the Init Command will be executed

# 5.3.11 CoE Object-Dictionary (Expert)

In this tab, the user can see and edit the offline CoE object dictionary.

					Filter Setting F	lag
	Index	Name	Value	Туре	Flags	-
	0x1000	Device Type	131474 (0x20192)	UDINT	( RO RO RO )	
	0x1001	Error Register	-	USINT	( RO RO RO )	
	0x1008	Manufacturer Device Name	-	STRING(1)	( RO RO RO )	
	0x100A	Manufacturer Software Version	-	STRING(1)	( RO RO RO )	
►	0x1010	Store Parameters	-	USINT	( RO RO RO )	
►	0x1011	Restore Default Parameters	-	USINT	( RO RO RO )	
►	0x1018	Identity Object	-	USINT	( RO RO RO )	
►	0x10F1	Sync Error Settings	-	USINT	( RO RO RO )	
►	0x1600	1st receive PDO Mapping	-	USINT	( RW RW RW )	
•	0x1601	2nd receive PDO Mapping	-	USINT	( RW RW RW )	
•	0x1602	3rd receive PDO Mapping	-	USINT	( RW RW RW )	
►	0x1603	4th receive PDO Mapping	-	USINT	( RW RW RW )	
►	0x1A00	1st transmit PDO Mapping	-	USINT	( RW RW RW )	
•	0x1A01	2nd transmit PDO Mapping	-	USINT	( RW RW RW )	
•	0x1A02	3rd transmit PDO Mapping	-	USINT	( RW RW RW )	
►	0x1A03	4th transmit PDO Mapping	-	USINT	( RW RW RW )	

## Lists of CoE Object-Dictionary entries

- Entries comes from the ESI file or will be generated from the configurator.
- The "Flags" column tells the user if this entry is an PDO entry and if it can be edited
  - "AA BB C D (EE FF GG)"
  - AA = Mapping as RX PDO or not
  - BB = Mapping as TX PDO or not



- C = Backup Flag
- D = Settings Flag
- EE = Access rights for PreOp (RO, WO, RW)
- FF = Access rights for SafeOp (RO, WO, RW)
- GG = Access rights for Op (RO, WO, RW)

# Buttons

Update:

Changes the selected entry

**Reset:** 

Resets the selected entry to ESI default

# 5.3.12 SoE Object-Dictionary (Expert)

In this tab, the user can see and edit the offline SoE object dictionary.

		Channel A
Index	Name	Value
S-0-0001	Control unit cycle time (TNcyc)	1000 (0x3E8)
S-0-0002	Communication cycle time (tSync)	1000 (0x3E8)
S-0-0007	Feedback acquisition capture point (t4)	-
S-0-0011	Class 1 diagnostic (C1D)	-
S-0-0012	Class 2 diagnostic (C2D)	-
S-0-0015	Telegram type	7 (0x07)
S-0-0016	Configuration list of AT	(list)
S-0-0017	IDN-list of all operation data	(list)
S-0-0018	IDN-list of operation data for CP2	(list)
S-0-0019	IDN-list of operation data for CP3	(list)
S-0-0020	IDN-list of operation data for CP4	(list)
S-0-0021	IDN-list of invalid operation data for CP2	(list)
S-0-0022	IDN-list of invalid operation data for CP3	(list)
S-0-0024	Configuration list of MDT	(list)
S-0-0025	IDN-list of all procedure commands	(list)
S-0-0029	MDT error counter	-

# Lists of SoE Object-Dictionary entries

Entries comes from the ESI file

# Buttons

Update:

Changes the selected entry



**Reset:** 

Resets the selected entry to ESI default

# 5.3.13 Sync Units (Expert)

In this tab, the user can assign a slave sync unit to a specific master sync unit by using the combobox column "Master Sync Unit" (only visible if user has defined additional master sync units).

e S	ync Units												
	Name					Input Size [by	tes]	Output Si	ze [bytes]	Master Syn	c Unit		
Ŧ	SyncUnit 0				135.0		127.0		Id 1000: M	asterSyr	ncUnit 1	000	
	Slave_1019 [\	/IPA 053-1EC00]	Inputs.Hardw	are Interrupt Counter					UDINT	IN:	38.0	4.0	
	Slave_1019 [\	/IPA 053-1EC00]	Inputs.Diagno	ostic Interrupt Counte	r					UDINT	IN:	42.0	4.0
	Slave_1019 [\	/IPA 053-1EC00]	Module 2 (02	1-1BD00).Inputs.DI 0						BOOL	IN:	46.0	0.1
	Slave_1019 [\	/IPA 053-1EC00]	Module 2 (02	1-1BD00).Inputs.DI 1						BOOL	IN:	46.1	0.1
	Slave_1019 [\	/IPA 053-1EC00]	Module 2 (02	1-1BD00).Inputs.DI 2						BOOL	IN:	46.2	0.1
	Slave_1019 [\	/IPA 053-1EC00]	Module 2 (02	1-1BD00).Inputs.DI 3						BOOL	IN:	46.3	0.1
	Slave_1019 [\	/IPA 053-1EC00]	Module 4 (04	0-1BA00).Inputs.Statu	s byte					USINT	IN:	47.0	1.0
	Slave_1019 [\	/IPA 053-1EC00]	Module 4 (04	0-1BA00).Inputs.Input	t byte 1					USINT	IN:	48.0	1.0
	Slave_1019 [\	/IPA 053-1EC00]	Module 4 (04	0-1BA00).Inputs.Inpu	t byte 2					USINT	IN:	49.0	1.0
	Slave_1019 [\	/IPA 053-1EC00]	Module 4 (04	0-1BA00).Inputs.Inpu	t byte 3					USINT	IN:	50.0	1.0
	Slave_1019 [\	/IPA 053-1EC00]	Module 4 (04	0-1BA00).Inputs.Inpu	t byte 4					USINT	IN:	51.0	1.0
	Slave_1019 [\	/IPA 053-1EC00]	Module 4 (04	0-1BA00).Inputs.Input	t byte 5					USINT	IN:	52.0	1.0
	Slave_1019 [\	/IPA 053-1EC00]	Module 4 (04	0-1BA00).Inputs.Inpu	t byte 6					USINT	IN:	53.0	1.0
	Slave_1019 [\	/IPA 053-1EC00]	Module 4 (04	0-1BA00).Inputs.Inpu	t byte 7					USINT	IN:	54.0	1.0
	Slave_1019 [\	/IPA 053-1EC00]	Module 4 (04	0-1BA00).Inputs.Input	t byte 8					USINT	IN:	55.0	1.0
	Slave_1019 [\	/IPA 053-1EC00]	Module 4 (04	0-1BA00).Inputs.Inpu	t byte 9					USINT	IN:	56.0	1.0
	Slave_1019 [\	(IPA 053-1EC00]	Module 4 (04	0-1BA00).Inputs.Input	t byte 10					USINT	IN:	57.0	1.0

# 5.3.14 Slave Specific Tabs (Expert)

Some slaves needs special configuration options. If this is necessary we display a slave specific tab.

Important: At first "Activate" have to be set, to activate the automatism for generating PDOs and Init Commands.

This tab will be displayed for the following slaves:

EL6731-0010 PROFIBUS DP Slave

General:



De	vice Ed	itor			
0	General	PDO Mapping Variables Advanced Options Init Commands CoE Object-Dictionary Sync Units Motion EL6731-0010			
				eneral	Modules
١	/alues				
	_				
		Name			
	•	General			
		Name	Value	Туре	Access
		Activate	0	INT32	RW
	•	DP Slave Parameter Set			
		Name	Value	Туре	Access
		Station Address	0	UINT32	RW
		Device Type	2399	UINT32	RW
		Change of DP inputs after DP fault	0	INT32	RW
E	dit Val	ue			
		Value: 0	Dec	Hex	Write

Activate: Activates the automatism for generating PDOs and Init Commands

# **DP Slave Parameter Set**

## **Station Address:**

DP station address of the DP slave (permitted values: 0-125)

# **Device Type:**

DP Ident Number of the DP slave

# Modules:



eral	PDO Mapping	Variables	Advanced Options	Init Command	COE Object	-Dictionary	Sync Units	Motion	EL6731-0010		
										General	Modu
ign tl	he modules										
Ś	😺 000: Termina	I [1 BYTE SIa	ve-In/Master-Out]	^		-	📱 BYTE Slav	ve-In/Mas	ter-Out		~
1	🖉 001: Termina	I []					🛛 👤 1 BYT	TE Slave-Ir	n/Master-Out		
1	🤌 002: Termina	I []			<<		2 BYT	E Slave-Ir	n/Master-Out		
1	🤌 003: Termina	I []			x		📱 3 BYT	E Slave-Ir	n/Master-Out		
1	🤌 004: Termina	I []					4 BY1	E Slave-Ir	n/Master-Out		
1	🤌 005: Termina	I []					5 BY1	E Slave-Ir	n/Master-Out		
1	🖉 006: Termina	I []					6 BY1	E Slave-Ir	n/Master-Out		- 1
÷	🖉 007: Termina	I []					🐰 7 BY1	E Slave-Ir	n/Master-Out		
1	🤌 008: Termina	I []					8 BYT	E Slave-Ir	n/Master-Out		
3	🤌 009: Termina	I []					9 BYT	E Slave-Ir	n/Master-Out		
3	🤌 010: Termina	I []					10 BY	TE Slave-	In/Master-Out		
1	🖉 011: Termina	I []					🚽 11 BY	TE Slave-	In/Master-Out		
1	🖉 012: Termina	I []					12 BY	TE Slave-	In/Master-Out		
1	🖉 013: Termina	I []					13 BY	TE Slave-	In/Master-Out		
1	🖉 014: Termina	I []					14 BY	TE Slave-	In/Master-Out		
1	🖉 015: Termina	I []					15 BY	TE Slave-	In/Master-Out		
	🖉 016: Termina	I []					16 BY	TE Slave-	In/Master-Out		
1	🖉 017: Termina	I []				-	WORD S	lave-In/M	aster-Out		
	🤌 018: Termina	I []					1 WC	RD Slave	-In/Master-Out		
	🖉 019: Termina	I []					2 WC	RD Slave	-In/Master-Out		
	🤌 020: Termina	I []					3 WC	RD Slave	-In/Master-Out		
	Ø21: Termina	[]					4 WC	RD Slave	-In/Master-Out		

## Connect modules to slot ("<<")

Used for connecting the selected modules (from the right list) to the selected slot (from the left list).

## Disconnect module from slot ("X")

Used for disconnecting the selected slot (left list)

# EL6631-0010 PROFINET IO Device

General:



De	vice Ed	itor									
G	ieneral	PDO Mapping Variables A	dvanced Options	Init Commands	CoE Object-Dictionary	Sync Units	Motion	EL6631-0010			
										eneral	Modules
v	alues										
	_										
		Name									_
	•	General									
		Name							Value	Туре	Access
		Activate							0	INT32	RW
	•	IO Device Parameter Set									
		Name							Value		Access
		Module DAP Version							0	UINT32	RW
		Station Name								STRING	RW
		IP Address								STRING	RW
		Subnet								STRING	RW
		Gateway								STRING	RW
E	dit Val	ue									
		Value: 0							Dec	Hex	Write

Activate: Activates the automatism for generating PDOs and Init Commands

# **IO Device Parameter Set**

### **Module DAP Version:**

Module DAP version of the DP slave (0 = Auto, 1 = V2.0, 2 = V2.25, 3 = V2.3, at least FW 02, 4 = V2.31, at least FW 03, 5 = V2.32, at least FW 08, 6 = V2.33, at least FW 10, 7 = V2.33, at least FW 14)

**Station Name:** 

Station name of the DP slave (max: 240 chars)

Modules:



eneral	PDO Mapping	Variables	Advanced Options	Init Commands	CoE Object-Dict	ionary	Sync Units	Motion	EL6631-0010		
										General	Module
ssign t	he modules										
5	😺 000: Terminal	[1 BYTE Inp	out]	^		*	BYTE Ing	put			^
	💣 001: Terminal	[]					🛛 👤 1 BY	TE Input			
1	🤌 002: Terminal	[]			<<		🐰 2 BY	TE Input			
	🤌 003: Terminal	[]			х		4 BY	TE Input			
	🤌 004: Terminal	[]					🐰 8 BY	TE Input			
1	🤌 005: Terminal	[]					👢 10 B	YTE Input			
	🤌 006: Terminal	[]					📗 16 B	YTE Input			
	🖉 007: Terminal	[]					🚽 32 B	YTE Input			
	🤌 008: Terminal	[]					🧕 64 B	YTE Input			
	🤌 009: Terminal	[]					100	BYTE Input	t		
	🖉 010: Terminal	[]					200	BYTE Input	t		
	🖉 011: Terminal	[]				-	WORD I	nput			
	🖉 012: Terminal	[]					1 W	ORD Input			
	🖉 013: Terminal	[]					2 W	ORD Input			
	🖉 014: Terminal	[]					4 W	ORD Input			
	🖉 015: Terminal	[]					8 W	ORD Input			
	🖉 016: Terminal	[]					📗 10 V	VORD Inpu	t		
	🖉 017: Terminal	[]					📗 16 V	VORD Inpu	t		
	🖉 018: Terminal	[]					🚽 32 V	VORD Inpu	t		
	🖉 019: Terminal	[]					64 V	VORD Inpu	t		
	🖉 020: Terminal	[]					100	WORD Inp	ut		
	🖉 021: Terminal	[]				-	DWORD	) Input			

### Connect module to slot ("<<")

Used for connecting the selected module (from the right list) to the selected slot (from the left list).

### Disconnect module from slot ("X")

Used for disconnecting the selected slot (left list)

# K-bus Coupler / IP Link Coupler

## Supported devices:

**K-bus Coupler** 

- BK1120
- BK1150
- BK1250

# **IP Link Coupler**

- IL2300-B110
- IL2301-B110
- IL2302-B110

## General:

## Activate:

Activates the automatism for generating PDOs and Init Commands

### Check Terminals at Startup:

Activates the automatism for checking terminals at startup



Device	Editor			
Gen	eral PDO Mapping Variables Advanced Options Init Commands Sync Units Motion BK1120			
		Ge	neral	Modules
Valu	es			
	Name			
	General			
	Name			Access
	Activate	0	INT32	
	Check Terminals at Startup	0	INT32	RW
Edit	Value			
	Value: 0	Dec	Hex	Write

# **Terminals:**

eral PDO Mapping V	/ariables	Advanced Options	Init Commands	Sync Units	Motion	BK1120			
								General	Modul
gn the modules									
🛫 000: Terminal [-	-]		~			Virt	tual Terminals (CP1xxx)		^
🛫 001: Terminal [-	-]					1.0	CP9940-0001 40 Ch. Input		
🤌 002: Terminal [-	-]			<<		1.0	CPx9xx-4 LEDs/Buttons		
🤌 003: Terminal [-	-]			х		1.0	CPx9xx-8 LEDs/Buttons		
🤌 004: Terminal [-	-]					1	CPx9xx-12 LEDs/Buttons		
🤌 005: Terminal [-	-]					1	CPx9xx-16 LEDs/Buttons		
🤌 006: Terminal [-	-]					1.0	CPx9xx-20 LEDs/Buttons		
🤌 007: Terminal [-	-]					1.0	CPx9xx-24 LEDs/Buttons		
🥢 008: Terminal [-	-]						CPx9xx-28 LEDs/Buttons		
🤌 009: Terminal [-	-]					1.0	CPx9xx-3-2 LEDs/Buttons/Inputs		
🥢 010: Terminal [-	-]						CPx9xx-4-2 LEDs/Buttons/Inputs		
🤌 011: Terminal [-	-]						CPx9xx-E-Stop		
🥢 012: Terminal [-	-]				-	📗 Dig	ital Input Terminals (KL1xxx)		
🥢 013: Terminal [-	-]						KL 1002, 2 Ch. Input (24V, 3.0ms)		
🥢 014: Terminal [-	-]						KL 1012, 2 Ch. Input (24V, 0.2ms)		
🤌 015: Terminal [-	-]						KL 1032, 2 Ch. Input (48V, 3.0ms)		
🔌 016: Terminal [-	-]					1	KL 1052, 2 Ch. Input +/- (24V, 3.0m	s)	
🤌 017: Terminal [-	-]					1	KL 1104, 4 Ch. Input (24V, 3.0ms)		
🤌 018: Terminal [-	-]					1	KL 1114, 4 Ch. Input (24V, 0.2ms)		
🖉 019: Terminal [-	-]					1	KL 1124, 4 Ch. Input (5V, 0.2ms)		
🔌 020: Terminal [-	-]					1	KL 1154, 4 Ch. Input +/- (24V, 3.0m	s)	
🤌 021: Terminal [-	-]					1	KL 1164, 4 Ch. Input +/- (24V, 0.2m	s)	

Connect terminials to slot ("<<")

Used for connecting the selected terminal (from the right list) to the selected slot (from the left list).

```
Disconnect terminals from slot ("X")
```

Used for disconnecting the selected slot (left list)

# 5.3.15 IO-Link

In this tab, the user can configure the IO-Link terminal EL6224, EP6224 and EP(P)6228. He can add different devices to the ports (IODD). The user can see 4 or 8 ports. Depends on the configured slave.

Please be careful when using the EP(P)6228 that there are no double assignments through the Modules-Tab:

Device Editor			Ŷ					·	
General PDO N	lapping Variab	les Advanced Op	otions Distrib	outed Clocks Init	t Commands 0	CoE Object-Dictiona	ry Sync Units	Motion IO-Lin	k
IO-Link									
Port 1		Port 2		Port 3		Port 4		I	
Add device	Clear	Add device	Clear	Add device	Clear	Add device	Clear		
Port 5		Port 6		Port 7		Port 8			
Add device	Clear	Add device	Clear	Add device	Clear	Add device	Clear	I	
Add device	Clear	Add device	Clear	Add device	Clear	Add device	Clear		

# 5.3.16 Profibus Master (EL6731)

In this tab, the user can configure the Profibus Master EL6731. New Profibus modules can be added in the tree. Right click and then 'Append module'.

Each module has an own EL6731 tab with settings and the possibility to load a GSD file. After the GSD file was loaded the user gets also PRM data settings and the possibility to add a submodule (e.g. K-Bus) via the tree.

-							
	Name						
•	General				Mala	T	
	Name					e Type	Access
	Activate				1	BOOL	RW
•	DP Slave Paramete	er Set					
	Name				Value		Access
	Station Address				1	UINT32	
	Baudrate				8	UINT32	RW
	Slot Time				1000	UINT32	RW
	Min. TSDR				11	UINT32	RW
	Max. TSDR				800	UINT32	RW
	Quiet Time				9	UINT32	RW
	Setup Time				16	UINT32	RW
	Target Token Rotat	ion Time			3461	7 UINT32	RW
	GAP Update Facto	r			100	UINT32	RW
	HSA				126	UINT32	RW
	Max Retry Limit				4	UINT32	RW
					10		

# 5.3.17 CANopen Master (EL6751)

In this tab, the user can configure the CANopen Master EL6751. He can add Modules, PDOs, SDOs and variables by clicking the right mouse button. To activate the master, the user have to go to the general settings of the EL6751 entry, and set activated to '1'. If activated is '1' all init commands and PDOs will be activated automatically.

Also the user can rename and delete modules, PDOs, SDOs, and variables:



Dev	ice Ed	itor								
G	eneral	Modules	PDO Mapping	Variabl	es Advanced Options	Distributed Clocks	Init Commands	CoE Object-Dictionary	Sync Units Motion	EL6751
Fi	ter									
	F1 675				6-W					
	EL675				Settings					
		pen Module								
	CANo	pen Module	2							
Se	tting	5								
		Name								^
	Ŧ	General								
		Name							Value	e Type
		Activate							0	BOOL
		Control							0	BOOL
		CAN Bus Par	ramator Eat						Ŭ	DOOL
	•	Name	ameter set						Valu	e Type
		CAN Bus Par	Cat							
									17	UINT32
		Master Nod	e Address						127	UINT32
Fr	lit Val	Raudrata							2	LIINIT22
			alum 0							A Maile
		v	alue: 0						Dec	Hex Write

# 5.3.18 CANopen Slave (EL6751-0010)

In this tab, the user can configure the CANopen Slave EL675-0010. He can add PDOs and variables by clicking the right mouse button. To activate the gateway, the user have to go to the general settings of the EL6751-0010 entry, and set activated to '1'. If activated is '1' all init commands and PDOs will be activated automatically.

Also the user can rename and delete PDOs and variables:



Dev	vice Ed	itor											
G	ieneral	PDO Mapping	Variables	Advan	ced Options	Init Commands	CoE Obje	ect-Dictionary	Sync Units	Motion	EL6751-0010		
F	ilter												
	F1 675	1 0010			C-Winner								
	EL6/5	1-0010			Settings								
					TxPDOs								
					RxPDOs								
s	etting	5											
		Name											^
	Ŧ	General											
		Name										Value	Туре
												1	BOOL
		Activate											BOOL
	•	Settings											
		Name										Value	Туре
		Node Id										1	UINT32
		Baudrate										2	UINT32
	L .	Cycle Time										1000000	UINT32
		Chiff Time										600000	
E	dit Val	ue											_
		Value:	True										<ul> <li>Write</li> </ul>

# 5.3.19 Motion (Motion Mode only)

On this tab the user can change the and activate the axis for the motion. The settings are used in the xml file which can be exported from the master motion tab, to configure the Demo Motion:



Axis 1       Axis 2         Iode of Operation       8         iccrements per mm       1000         iccrements per mm       1000         iccrement Factor       0         0x6040       Dec         Dec       Hex       0x00         0x6041       Dec       Hex       0x00         iccrement Value Object       0x6064       Dec       Hex       0x60841       Dec       Hex       0x00       Dec       Hex         icostion Actual Value Object       0x607A       Dec       Hex       0x00	Axis 1       Axis 2         de of Operation       8         ements per mm       1000         ements per mm       1000         ement Factor       0         introlword Object       0x6040         0x6041       Dec         introlword Object       0x60641         0x6041       Dec         introlword Object       0x60641         0x6064       Dec         0x6064       Dec         0x6064       Dec         0x6064       Dec         0x607A       Dec         0x60FF       Dec         0x60FF <td< th=""><th>Indee of Operation       8         Accrements per mm       1000         Increment Factor       0         Increment Factor       0x6040         Increment Factor       0         Increment Factor       0x6040         Increment Factor       0x6041         Increment Factor       0x6041         Increment Factor       0x6064         Increment Factor       0x6064         Increment Factor       0x6064         Increment Factor       0x607A         Increment Factor       0x607A         Increment Factor       0x607A         Increment Factor       0x607A         Incret Hex       0x00</th><th>al Modules PDO Mappir</th><th>ng Variables</th><th>Advan</th><th>ced Options</th><th>Init Comman</th><th>ds    CoE O</th><th>bject-l</th><th>Dictionar</th><th>y    S</th><th>nc Units</th><th>Motion</th><th></th></td<>	Indee of Operation       8         Accrements per mm       1000         Increment Factor       0         Increment Factor       0x6040         Increment Factor       0         Increment Factor       0x6040         Increment Factor       0x6041         Increment Factor       0x6041         Increment Factor       0x6064         Increment Factor       0x6064         Increment Factor       0x6064         Increment Factor       0x607A         Increment Factor       0x607A         Increment Factor       0x607A         Increment Factor       0x607A         Incret Hex       0x00	al Modules PDO Mappir	ng Variables	Advan	ced Options	Init Comman	ds    CoE O	bject-l	Dictionar	y    S	nc Units	Motion	
Image: Constraint of Operation	de of Operation       8         ements per mm       1000         ements per mm       1000         itrolword Object       0x6040         0x6041       Dec         0x6064       Dec         0x6064       Dec         0x6064       Dec         0x6064       Dec         0x6064       Dec         0x607A       Dec         0x607F       Dx607A         0x607F       Dec	Image: Constraint of Operation	sterDemoMotion Config S	lave Settings										
Node of Operation       8         accements per mm       1000         1000       1000         accements per mm       1000         1000       10000	de of Operation       8         ements per mm       1000         ements per mm       1000         ement Factor       0         otrolword Object       0x6040         0x6041       Dec         trolword Object       0x6041         0x6041       Dec         tion Actual Value Object       0x6064         0x607A       Dec         typet Position Object       0x607A         0x60FF       Dec         0x60	Adde of Operation       8         Accements per mm       1000         1000       1000         Accements per mm       1000         Accement Factor       0         0 controlword Object       0x6040         0 x6041       Dec         0 x6041       Dec         0 x6041       Dec         0 x6064       Dec         0 x6064       Dec         0 x6064       Dec         0 x607A       Dec         0 x6087A       Dec         0 x6087F       0x6087F         0 x6087F       Dec         0 x607F       Dec												
Increments per mm       1000 Image: 10	ements per mm       1000 P       1000 P         rement Factor       0 P       0 P         introlword Object       0x6040 Dec Hex       0x00 Dec Hex       0x6840 Dec Hex       0x00 Dec Hex         usword Object       0x6041 Dec Hex       0x00 Dec Hex       0x6841 Dec Hex       0x00 Dec Hex         usword Object       0x6064 Dec Hex       0x00 Dec Hex       0x6841 Dec Hex       0x00 Dec Hex         usword Object       0x6064 Dec Hex       0x00 Dec Hex       0x6847 Dec Hex       0x00 Dec Hex         usword Object       0x607A Dec Hex       0x00 Dec Hex       0x687A Dec Hex       0x00 Dec Hex         ust Velocity Object       0x60FF Dec Hex       0x00 Dec Hex       0x68FF Dec Hex       0x00 Dec Hex	Increments per mm       1000 Image: 10	de of Operation				8 🗲					8		
Image: Normal Sector       Image: Normal Sector <th< td=""><td>Image: Constraint of the constraint</td><td>Orement Factor       O Image: Controlword Object       Ox6040       Dec       Hex       Ox00       Dec       Hex       Ox60840       Dec       Hex       Ox00       Dec       Hex       Ox60840       Dec       Hex       Ox00       Dec       Hex       Ox6040       Dec       Hex       Ox60840       Dec       Hex       Ox00       Dec       Hex       Ox600       Dec       Hex       Ox00       Dec       Hex       Ox00</td><td>ements per mm</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>1000</td><td></td><td></td></th<>	Image: Constraint of the constraint	Orement Factor       O Image: Controlword Object       Ox6040       Dec       Hex       Ox00       Dec       Hex       Ox60840       Dec       Hex       Ox00       Dec       Hex       Ox60840       Dec       Hex       Ox00       Dec       Hex       Ox6040       Dec       Hex       Ox60840       Dec       Hex       Ox00       Dec       Hex       Ox600       Dec       Hex       Ox00	ements per mm									1000		
ontrolword Object       0x6040       Dec       Hex       0x00       Dec       Hex       0x60840       Dec       Hex       0x00       Dec       Hex       0x60840       Dec       Hex       0x00       Dec       Hex       0x60841       Dec       Hex       0x00       Dec       Hex       0x60841       Dec       Hex       0x00       Dec       Hex       0x6064       Dec       Hex       0x6064       Dec       Hex       0x6074       Dec       Hex       0x6074       Dec       Hex       0x00       Dec       Hex       0x60674       Dec       Hex       0x00       Dec       Hex       0x6074       Dec       Hex       0x00       Dec       Hex       0x6874       Dec       Hex       0x00       Dec       Hex       0x6874       Dec       Hex       0x00       Dec       Hex       0x6876       Dec       Hex       0x00       Dec       Hex       Dec       Hex       Dec       Hex       Dec       Hex       Dec       Hex	http://www.ord Object       0x6040       Dec       Hex       0x00       Dec       Hex       0x6040       Dec       Hex       0x00       Dec       Hex       0x	ontrolword Object       0x6040       Dec       Hex       0x00       Dec       Hex       0x000       Dec       Hex       Dec       Hex       0x000       Dec       Hex       0x000       Dec       Hex       <	ement Factor									0		
December     Decem	ion Actual Value Object     0x6064     Dec     Hex     0x00     Dec     Hex     0x6864     Dec     Hex     0x00     Dec     Hex       get Position Object     0x607A     Dec     Hex     0x00     Dec     Hex     0x687A     Dec     Hex     0x00     Dec     Hex       get Velocity Object     0x60FF     Dec     Hex     0x00     Dec     Hex     0x68FF     Dec     Hex     0x00     Dec     Hex	ostion Actual Value Object     0x6064     Dec     Hex     0x00     Dec     Hex     0x00     Dec     Hex       arget Position Object     0x607A     Dec     Hex     0x00     Dec     Hex     0x00     Dec     Hex       arget Velocity Object     0x60FF     Dec     Hex     0x00     Dec     Hex     0x00     Dec     Hex	trolword Object	0x6040	Dec	Hex 0x00		0x6840	Dec	Hex 0	×00	Dec Hex		
arget Position Object 0x607A Dec Hex 0x00 Dec Hex 0x687A Dec Hex 0x00 Dec Hex 0x687A Dec Hex 0x00 Dec Hex 0x687F Dec Hex 0x00 Dec Hex 0x68FF Dec Hex 0x00	get Position Object     0x607A     Dec     Hex     0x00     Dec     Hex     0x687A     Dec     Hex     0x00     Dec     Hex       get Velocity Object     0x60FF     Dec     Hex     0x00     Dec     Hex     0x00     Dec     Hex	arget Position Object     0x607A     Dec     Hex     0x00     Dec     Hex     0x00     Dec     Hex       arget Velocity Object     0x60FF     Dec     Hex     0x00     Dec     Hex     0x68FF     Dec     Hex	usword Object	0x6041	Dec	Hex 0x00	Dec Hex	0x6841	Dec	Hex 0	×00	Dec Hex		
arget Velocity Object 0x60FF Dec Hex 0x00 Dec Hex 0x68FF Dec Hex 0x00 Dec Hex	pet Velocity Object Ox60FF Dec Hex Ox00 Dec Hex Ox68FF Dec Hex Ox00 Dec Hex	arget Velocity Object 0x60FF Dec Hex 0x00 Dec Hex 0x68FF Dec Hex 0x00 Dec Hex	tion Actual Value Object	0x6064	Dec	Hex 0x00	Dec Hex	0x6864	Dec	Hex 0	×00	Dec Hex		
			et Position Object	0x607A	Dec	Hex 0x00	Dec Hex	0x687A	Dec	Hex 0	x00	Dec He	c	
	des of operation Object 0x6060 Dec Hex 0x00 Dec Hex 0x6860 Dec Hex 0x00 Dec Hex	todes of operation Object 0x6060 Dec Hex 0x00 Dec Hex 0x6860 Dec Bes	et Velocity Object	0x60FF	Dec	Hex 0x00	Dec Hex	0x68FF	Dec	Hex 0	c00	Dec Hex		
lodes of operation Ubject 0x6060 Dec Hex 0x00 Dec Hex 0x6860 Dec Hex 0x00 Dec Hex			des of operation Object	0x6060	Dec	Hex 0x00	Dec Hex	0x6860	Dec	Hex 0	×00	Dec Hex		

# 5.3.20 Simulation Settings

On this tab the user can change the simulator settings for the slave:



Device Editor		
General PDO Mapping Variable	Advanced Options Distributed Clocks Init Commands CoE Object-Dictionary Sync Units Motion Simulator	
	General CoE EEPROM Registe	r
Operation Mode		
-		
Application Name	None  Name	
✓ Ignore CoE Download Error		
✓ Simulated		
Starting Position		
Power off		
Custom previous port	B Address	
	Address Contraction of the	

# **Application Name:**

The application name for the EXI file

## **Ignore Download Error:**

Ignores errors on download

## **Starting Position**

### **Power Off:**

Select if slave should be powered on or off on start

# **Custom previous port:**

manipulate the topology

# CoE Tab



eneral	PDO Ma	pping Variables	Advanced Options	Distributed Clocks	Init Commands	CoE Object-Dictionary	Sync Units Motio		
							General	OE EEPROM Re	egist
oE Sett	tings								
	Use gener	ric Object Dictionar	У				Create f	rom ESI Load from S	lave
	Index	Name				Value	Туре	Flags	_
	0x1000	Device Type				131474 (0	x20192) UDINT	( RO RO RO )	
	0x1001	Error Register				0 (0x00)	USINT	( RO RO RO )	
	0x1008	Manufacturer Devi	ce Name				STRING(1)	( RO RO RO )	
	0x100A	Manufacturer Softv	vare Version				STRING(1)	( RO RO RO )	
►	0x1010	Store Parameters				0 (0x00)	USINT	( RO RO RO )	
►	0x1011	Restore Default Par	ameters			0 (0x00)	USINT	( RO RO RO )	
•	0x1018	Identity Object				0 (0x00)	USINT	( RO RO RO )	
•	0x10F1	Sync Error Settings				0 (0x00)	USINT	( RO RO RO )	
•	0x1600	1st receive PDO Ma	apping			0 (0x00)	USINT	( RW RW RW )	)
►	0x1601	2nd receive PDO M	lapping			0 (0x00)	USINT	( RW RW RW )	)
•	0x1602	3rd receive PDO M	apping			0 (0x00)	USINT	( RW RW RW )	)
•	0x1603	4th receive PDO M	apping			0 (0x00)	USINT	( RW RW RW )	)
•	0x1A00	1st transmit PDO N	lapping			0 (0x00)	USINT	( RW RW RW )	)
►	0x1A01	2nd transmit PDO I	Mapping			0 (0x00)	USINT	( RW RW RW )	)
►	0x1A02	3rd transmit PDO N	lapping			0 (0x00)	USINT	( RW RW RW )	) ~
lit Valı	ue								
		Value: 0						Dec Hex W	/rite

The simulated CoE can be changed here.

**EEPROM** Tab



			General CoE	EPROM Reg
ROM Settings				-
Use ESI EEPROM			Create from ESI	Land from Cla
				Load from Sia
Index	Name	Value	Туре	
0x0000	PDI Control	6 (0x0006)	UINT	
0x0001	PDI Configuration	60929 (0xEE01)	UINT	
0x0002	Pulse Length of SYNC Signals	1000 (0x03E8)	UINT	
0x0003	Extended PDI Configuration	0 (0x0000)	UINT	
0x0004	Configured Station Alias	0 (0x0000)	UINT	
0x0005	Reserved	0 (0x0000000)	UDINT	
0x0007	Checksum	61 (0x003D)	UINT	
0x0008	Vendor ID	1337 (0x00000539)	UDINT	
0x000A	Product Code	35651585 (0x02200001)	UDINT	
0x000C	Revision Number	196613 (0x00030005)	UDINT	
0x000E	Serial Number	0 (0x0000000)	UDINT	
0x0010	Execution Delay	0 (0x0000)	UINT	
0x0011	Port0 Delay	0 (0x0000)	UINT	
0x0012	Port1 Delay	0 (0x0000)	UINT	
0x0013	Reserved	0 (0x0000)	UINT	
t EEPROM Value				

The simulated EEPROM can be changed here.

Register Tab



s ult register values	Name Type	Value	Туре	Load from Slave
-			Туре	Load from Slave
			Туре	^
	Туре			
		1 (0x01)	USINT	
	Revision	1 (0x01)	USINT	
	Build	12 (0x000C)	UINT	
	FMMUs supported	2 (0x02)	USINT	
	SyncManagers supported	4 (0x04)	USINT	
	RAM Size	4 (0x04)	USINT	
	Port Descriptor	0 (0x00)	USINT	
	ESC Features supported	0 (0x0000)	UINT	
	Configured Station Address	1013 (0x03F5)	UINT	
	Configured Station Alias	0 (0x0000)	UINT	
	Write Register Enable	0 (0x00)	USINT	
	Write Register Protection	0 (0x00)	USINT	
	ESC Write Enable	0 (0x00)	USINT	
	ESC Write Protection	0 (0x00)	USINT	
	ESC Reset ECAT	0 (0x00)	USINT	~
		RAM Size Port Descriptor ESC Features supported Configured Station Address Configured Station Alias Write Register Enable Write Register Protection ESC Write Enable ESC Write Protection	RAM Size     4 (0x04)       Port Descriptor     0 (0x00)       ESC Features supported     0 (0x0000)       Configured Station Address     1013 (0x03F5)       Configured Station Alias     0 (0x0000)       Write Register Enable     0 (0x00)       Write Register Protection     0 (0x00)       ESC Write Enable     0 (0x00)       ESC Write Enable     0 (0x00)       ESC Write Protection     0 (0x00)	RAM Size     4 (0x04)     USINT       Port Descriptor     0 (0x00)     USINT       ESC Features supported     0 (0x000)     UINT       Configured Station Address     1013 (0x03F5)     UINT       Configured Station Alias     0 (0x000)     UINT       Write Register Enable     0 (0x00)     USINT       Write Register Protection     0 (0x00)     USINT       ESC Write Enable     0 (0x00)     USINT       ESC Write Enable     0 (0x00)     USINT       ESC Write Enable     0 (0x00)     USINT

The simulated Registers can be changed here.

# 5.4 Export ENI

To run the EC-Master you basically need an EtherCAT-Network-Information (ENI) file to initialize and control an EtherCAT network. After configuring the EtherCAT network with EC-Engineer, you can export this ENI file and copy it on the control system to run the EC-Master.

Note: The EtherCAT-Network-Information (ENI) File will be generated according to ETG.2100 standard V1.0.1

# 5.5 Export EXI

To run the EC-Simulator you basically need an ENI or better an EXI file to simulate an EtherCAT network. After configuring the EtherCAT network with EC-Engineer, you can export this EXI file and use it to start the EC-Simulator.



# 6 Diagnosis Mode

# 6.1 Overview

EC-Engineer is also a diagnosis application specifically developed to analyze EtherCAT networks that are controlled by the EC-Master. Automated control systems usually require high availability of the whole system. Due to the rough industrial environment this is often hardly to achieve.

If high availability shall be guaranteed for an automated control system it is important to verify and maintain the field bus. Using EC-Engineer it is possible to take a look into the "health" of the EtherCAT system. Detection of signs of system degradation prior to running into a system failure will be of great benefit. In that case it is possible to exchange the problematic components (cables, slave devices).

Many aspects of diagnosis are covered by the EC- Engineer:

- Useful for setting up the system
- System analysis and maintenance
- Error detection
- Documentation

After switching into diagnosis mode of EC-Engineer, the user will see this page:

൙ EC-Engineer []						- 0	×
<u>File View Network Settings H</u> elp							
Configuration Mode 🛛 Export ENI 💮 Export EXI	Diagnosis Mode 🕼 Take Snap	shot 🕑 Run 🕕 Break					÷
Project Explorer	Device Editor						
	Device Editor           General         Process Data Image         Will           State Machine         Current State         Will           Current State         Change State         Change State           Information         Master Version         Number of found slaves           Number of found slaves in configuratio         Number of DC slaves         DC in-sync           Topology Ok         Link Connected         Slaves in Master State	Op     Op       Op     Init       Bootstrap     Pre-Op       Op     Safe-Op       Op     22.0.3       26     26	Pata CoE Object-Dicti Frame Counter Sent frames Lost frames Cyclic frames Acyclic frames Acyclic frames Current [kB] Max [kB]	onary History			• 1
Networks: 1 Slaves: 26					State: 🔍 单	Mode: DIAGNOSIS	EXPERT



# 6.2 Master

This section shows the current "health" state of the master and helps the user to analyze master related problems.

# 6.2.1 General (Master)

In this tab, the user can see and change the current state of the state machine of the master. He has also an overview over the current "health" state of his EtherCAT network:

Device Editor				
General Process Data Image Wat	ch list Performance Trace [	Data CoE Object-Dictionar	History	
State Machine				
Current State	Ор			
Requested State	Ор			
hequested state	Init Bootstrap			
Change State	Pre-Op Safe-Op			
	Ор			
Information		Farmer Country		
		Frame Counter		
Master Version	3.2.0.3		101094	
Number of found slaves	26	-	3	
Number of slaves in configuration	26	Cyclic frames	73520	
Number of DC slaves	4	Acyclic frames	27574	
DC in-sync	Yes		Clear counters	
Topology Ok	Yes	Memory Usage		
Link Connected	Yes	Current [kB]	860	
Slaves in Master State	Yes	Max [kB]	861	

# State Machine

## **Current State:**

Current state of the master

## **Requested State:**

Requested state of the master

### **Change State:**

Master can reach the states INIT, PRE-OP, SAFE-OP and OP.

# Information

### Master version:

Version number of the running master

## Number of found slaves:

Number of slaves, which were found from master on the network

### Number of slaves in configuration:

Number of slaves, which are configured in the  ${\tt ENI}$  file



### Number of DC slaves:

Number of slaves with DC support, which were found from master on the network

#### DC in-sync:

Signals that all slaves with DC support are correctly synchronized or not. If not all slaves are correctly synchronized, please refer the *Message Window* for more information.

### **Topology OK:**

Signals that topology is "okay" or not. If topology is not "okay", you have a mismatch between the configured bus and the currently connected bus. Please open the 'Network Mismatch Analyzer' (Menu Network Network Mismatch Analyzer) to solve the problem.

### Link Connected:

Signals the link is connected.

### Slaves in Master State:

Signals that all slaves are in master state.

### **Frame Counter**

Sent frames: Number of sent frames

Lost frames:

Number of lost frames

## **Cyclic frames:**

Number of cyclic frames

### Acyclic frames:

Number of acyclic frames

## Memory Usage

### **Current:**

Current memory usage in bytes

### Max:

Maximum memory usage in bytes

# 6.2.2 Process Data Image

In this tab, the user can see and change the values of the process variables. The variables will be forced to the value the user entered. The user can press release to release the variable. If one or two variables are selected, a chart of the values is shown. Also resize and zoom is possible to see more details. The chart will be updated every 250 milliseconds:



									Release	e all		Expo	ort	
	Name							Datatype	Offset	*	Size	Value	Forced	I
	Slave_1010	[EK1101-0080].	ID.ID					UINT	IN :	155.0	2.0	1		
	Slave_1014	[EL3162].Chanr	nel 1.Status					BYTE	IN :	157.0	1.0	0		
	Slave_1014	[EL3162].Chann	nel 1.Value					INT	IN :	158.0	2.0	0		
	Slave_1014	[EL3162].Chanr	nel 2.Status					BYTE	IN :	160.0	1.0	0		1
	Slave_1014	[EL3162].Chanr	nel 2.Value					INT	IN :	161.0	2.0	0		
	Slave_1015	[EL1008].Chanr	nel 1.Input					BOOL	IN :	163.0	0.1	0		
	Slave_1015	[EL1008].Chanr	nel 2.Input					BOOL	IN :	163.1	0.1	0		
	Slave_1015	[EL1008].Chanr	nel 3.Input					BOOL	IN:	163.2	0.1	0		
o <b>rt</b> 5 0	pallar	m.M.n	Mungan	1	ula a pMa a	1	White a ru	adha/An A	uw1Ņ	\_ <b>I</b> /	. I.m.	d to wat		
	0	50	100	150	200	250	300	350	40	0	45	50		

It is also possible to add the variables to a watch list (next chapter).

# 6.2.3 Watch list

In this tab, the user can monitor selected variables. He can go through the slaves and add variables to the watch list to monitor them. The user can also export or import the watch list, so changes can be saved:



riables								R	elease a	all i		Ex	port	
Name								Dai	atype	Offset	*	Size	Value	Force
Slave_1019 [	VIPA 053-1EC	0].Modu	ule 4 (040-1BA)	00).Inputs.Status	byte			US	INT	IN :	13.0	1.0	136	
Slave_1014 [i	EL3162].Chani	el 1.Valu	ie					IN	r	IN:	158.0	2.0	0	
Slave_1013 [i	EL4132].Chani	el 2.Out	put					IN	r	OUT :	170.0	2.0	0	
							Save v	vatch list	Load	watch lis	t Re	emove	from wa	atch lis
art							Save v	vatch list	Load	watch lis	t Re	emove	from wa	atch lis
160							Save v	vatch list	Load	watch lis	t Re	emove	from wa	
<b>art</b> 160 140							Save v	vatch list	Load	watch lis	t Re	:move	from wa	
160 140 120													from w	
160 140	50		100	1	200	250	Save v	vatch list		watch lis 400		emove	from w	

# 6.2.4 Performance

This tab is split into two sub tabs. On one the user can see the busload per cycle and per second:



Device Edit	or			_								
General	Process Data Ima	ge Watch list	Performance	Trace Data	CoE Obje	ct-Dictionar	y His	tory				
											CPU Load	Busload
Busload								Reset				
CycleTir	me [us]		Bytes per cyc	e		Bytes per	secon	d				
2000	)		Average	313		Averag	e	142361				
			Max	1677		Max		314244				
Busload	l per cycle (100% :	= 20000 B/Cycl	e)									
	0 10	20	30	40	50	60	70	80	90	100		
Busload	l per second (1009	6 = 10 MB/s)										
	0 10	20	30	40	50	60	70	80	90	100		

On the other tab the user can the CPU load. In the grid is a list of all running jobs and how long they take. In the diagram above is a summary of all jobs. When a job is selected, the chart shows how many times a job has taken how long to complete.

Device Eo	ditor												
Genera	I Pro	cess Data Im	age Watch list	Performance	Trace Data	CoE Object-Dictio	onary Hist	ory					
												CPU Loa	Busload
CPU Lo	oad							Reset					
Cycle	Overv	view [us]								_			
0		250	500	750	1000	1250	1500	17	'50	2000			
Detai	ils	Name					Min [us]	Avg [us]	Max [us]	^			
		Cycle Time					55,5		19386,4				
		Task Duration	n (JOB_Total + Ap	p)			11,9	63,4	5976				
Σ	Σ	JOB_Total					8,3	61	5972,6				
->		JOB_Process/	AllRxFrames Offse	t			0,1	0,7	225,4				
		JOB_Process/	AllRxFrames Dura	tion			0,3	8,5	562,8	$\sim$			
	ogariti Time	hmic Represe [us]	ntation										
Í-													
						- h.	а.						
							h.,						
100	0 11	00 1200	1200 1400	1500 1600	1700 1800	1900 2000	2100.22	00.220	2400	2500	2600.2	700 2800 2	000
1000	0 110	00 1200	1300 1400	1200 1000	1700 1800	1900 2000	2100 22	00 2300	5 2400	2300	2000 27	2800 2	900



# 6.2.5 Trace Data (Expert)

In this tab, the user can see and change the values of the trace variables. If he selects a variable he will see a chart of the values. The chart will be updated every 250 milliseconds:

Device E										
Genera	Process Data Image	Watch list Performance	Trace Data	CoE Object-Dictionary	History					
Variab	es									
Nam	e					Datatype	Offset	*	Size	Value
Inpu	ts.DevicesState					UINT	IN :	173.0	2.0	8
Inpu	ts.BusTime					UDINT	IN :	179.0	4.0	3904556720
Chart										
	•									
500	0									
	)									
Edit Va	riable									
	Value: 39045	556720					Der	Hex		Write
	value, 55045	150120					Dec	mex		

# 6.2.6 CoE Object-Dictionary (Expert)

In this tab, the user can see and change the values of the object dictionary of the master:



	1		-		CoE Object-Diction	D	escription fr	rom Master Single
Jes							comptionin	Single
Jes								
	Index	Name				Value	Туре	Flags
	0x1000	Device ty	pe			1100 (0x44C)	UDINT	( RO RO RO )
	0x1008	Device na	ame			EC-Master	STRING(9)	( RO RO RO )
	0x1009	Hardware	e version			V3.2.0.03	STRING(9)	( RO RO RO )
	0x100A	Software	version			V3.2.0.03	STRING(9)	( RO RO RO )
•	0x1018	Identity				4 (0x04)	USINT	( RO RO RO )
•	0x10F3	History				18 (0x12)	USINT	( RO RO RO )
	0x2000	Master St	tate Change Com	mand		0 (0x00)	UDINT	( RW RW RW )
	0x2001	Master St	tate Summary			79745 (0x13781)	UDINT	( RO RO RO )
•	0x2002	Bus Diag	nosis Object			14 (0x0E)	USINT	( RO RO RO )
►	0x2003	Redunda	ncy Diagnosis Ob	ject		4 (0x04)	USINT	( RO RO RO )
•	0x2004	Notificati	ion Counter Obje	t		15 (0x0F)	USINT	( RO RO RO )
•	0x2005	MAC Add	dress Object			4 (0x04)	USINT	( RO RO RO )
•	0x2006	Mailbox 9	Statistics Object			65 (0x41)	USINT	( RO RO RO )
•	0x2007	Add Histe	ory Diagnosis Me	ssage Command		5 (0x05)	USINT	( WO WO WO
	0x2010	Debug Re	egister			5 (0x05)	ULINT	( RW RW RW )
	lue							

# Lists of CoE Object-Dictionary entries

- Entries are uploaded by the master from the slave
- The "Flags" column tells the user if this entry is an PDO entry and if it can be edited
  - "AA BB (CC DD EE)"
  - AA = Mapping as RX PDO or not
  - BB = Mapping as TX PDO or not
  - CC = Access rights for PreOp (RO, WO, RW)
  - DD = Access rights for SafeOp (RO, WO, RW)
  - EE = Access rights for Op (RO, WO, RW)

## Buttons

### Update:

Changes the selected entry



# 6.2.7 Master History (Expert)

In this tab, the user can see and change the diagnosis history of the master (Supported from EC-Master V2.7 and above). It is also possible to export the data:

etting	Is						
Show	Info Mes	sages	True				
Show	Warning	Messages	True				
Show	Error Me	ssages	True				
Show	Emerger	cy Messages	False				
Curre	nt Mode		Overv	vrite Mode			
essa	ges					Exp	00
	Severity	Time 🔹	ID	Acknowledged	Code	Message	
X	ERR	11.05.2023 09:55:4	1 022	No	0x0001000A	A (0x0219) Unexpected response on cyclic Ethernet frame	
X	ERR	11.05.2023 09:55:4	1 021	No	0x0001000A	(0x0219) No response on cyclic Ethernet frame	
×	ERR	11.05.2023 09:55:3	9 020	No	0x0001000A	(0x0219) Unexpected response on cyclic Ethernet frame	
X	ERR	11.05.2023 09:55:3	9 019	No	0x0001000A	(0x0219) No response on cyclic Ethernet frame	
×	ERR	11.05.2023 09:53:0	8 018	No	0x0001000A	(0x0219) Unexpected response on cyclic Ethernet frame	
X	ERR	11.05.2023 09:53:0	8 017	No	0x0001000A	(0x0219) No response on cyclic Ethernet frame	
×	ERR	11.05.2023 09:52:1	7 016	No	0x0001000A	(0x0219) Unexpected response on cyclic Ethernet frame	
	ERR	11.05.2023 09:52:1	7 015	No	0x0001000A	(0x0219) No response on cyclic Ethernet frame	
×	ERR	11.05.2023 09:52:1	6 014	No	0x0001000A	(0x0219) Unexpected response on cyclic Ethernet frame	
						Number of messages: 17	1

### Settings

### Show Info Messages:

Info messages will be collected from master

### **Show Warning Messages:**

Warning messages will be collected from master

### **Show Error Messages:**

Error messages will be collected from master

### Show Emergency Messages:

Not supported from master

### **Current Mode:**

Overwrite Mode: Messages will be overwritten if buffer is full Acknowledge Mode: Not supported from master

#### Messages

List of history messages

### **Change Message Handling**

### Enable/Disable Info Messages:

Enable or disable info messages



Enable/Disable Warning Messages: Enable or disable warning messages

Enable/Disable Info Messages: Enable or disable info messages

Enable/Disable Error Messages: Enable or disable error messages

Enable Acknowledge Mode: Enable acknowledge mode

Clear All Messages: Clear all messages

# 6.3 Slave

This section shows the current "health" state of the selected slave and helps the user to analyze slave related problems.

# 6.3.1 General (Slave)

In this tab, the user can see and change the current state of the state machine of the slave. He can see and clear also the current error state of the slave:

Device Editor	
General Variables E	SC Register EEPROM Extended Diagnosis DC Diagnosis CoE Object-Dictionary FoE
State Machine	
Current State	Op
Requested State	Op
	Init Bootstrap
Change State	Pre-Op Safe-Op
	Ор
Software Diagnostics	s (?)
State Machine Error	No error
Hardware Diagnostic	s (?)
Summary	No error
A	No error
D	Not available
В	No error
С	Not available
	Acknowledge

# State Machine

**Current State:** 

Current state of the selected slave

### **Requested State:**

Requested state of the selected slave

### **Change State:**

Slave can reach the states INIT, BOOTSTRAP, PRE-OP, SAFE-OP and OP.

Note: The BOOTSTRAP mode can only be reached from the INIT state.

### **Software Diagnostics**

**State Machine Error:** 

Slave error which occurred during state transition

### **Hardware Diagnostics**

### **Summary:**

Summary of hardware diagnostics

### Port A:

Port specific error

#### Port D:

Port specific error

#### Port B:

Port specific error

#### Port C:

Port specific error

### Buttons

### Acknowledge:

Acknowledge the current error state and notify the user again if error state was changed again.

### Possible warning and errors:

### **Disturbed Connection:**

There may be problems in the connection between two slaves. The message will tell either that there is a problem between two slaves or two ports. The warning appears if error counters are increased (Invalid Frame: 0x300-0x306, RX Errors: 0x301-0x307, Lost Link: 0x308-0x30B). The value from which a warning is issued can be set in the User.xml files in C:ProgramDataEC-Engineer. More information below.

### **Bad Connection:**

The same as "Disturbed Connection" but the error counters are higher. The value from which an error is issued can be set in the User.xml files in C:ProgramDataEC-Engineer. More information below.

### Line break:

A line break is detected before a slave. This error is detected by looking at the topology.

#### Link missing:

A link is missing on input port of the slave. This error is detected by looking at the topology.

# Multiple warnings:

There are multiple warning for this port.

#### Multiple errors:

There are multiple errors for this port.

### Multiple warnings and errors:

There are multiple warning and errors for this port.



### State Machine:

See ETG1020 "Description of AL Status Codes" or ETG.1000.6. This error is detected by looking at the AL Status (0x130).

### How to solve errors?

- Lost Link errors are often caused by the power supply system
- Helpful might be the usage of an extra power supply
- It is recommended to clear all error counters after startup

# How to change amount of errors leading to a warning or error:

- Open C:ProgramDataEC-Engineer
- Search for DiagGeneral
- Change the values which should be adjusted
  - LostLink: The value entered is used
  - All others are calculated depending on the amount of cyclic frames: (Value / CyclicFrames) x 10<sup>6</sup>

Note: Please refer also the "ETG.1600 EtherCAT Installation Guideline": http://www.ethercat.org/ETG1600.

# 6.3.2 Variables

In this tab, the user can see and change the values of the process variables. The variables will be forced to the value the user entered. The user can press release to release the variable. If one or two variables are selected, a chart of the values is shown. Also resize and zoom is possible to see more details. The chart will be updated every 250 milliseconds:



	Name							Datatype	Offset	*	Size	Value	Forced
	Slave_1019	VIPA 053-1EC	00].Inputs.Hardw	are Interrupt Co	unter			UDINT	IN:	4.0	4.0	0	
	Slave_1019	VIPA 053-1EC	00].Inputs.Diagno	ostic Interrupt Co	ounter			UDINT	IN:	8.0	4.0	0	
	Slave_1019	VIPA 053-1EC	00].Module 2 (02	1-1BD00).Inputs	.DI 0			BOOL	IN :	12.0	0.1	0	
	Slave_1019	VIPA 053-1EC	00].Module 2 (02	1-1BD00).Inputs	.DI 1			BOOL	IN:	12.1	0.1	0	
	Slave_1019	VIPA 053-1EC	00].Module 2 (02	1-1BD00).Inputs	.DI 2			BOOL	IN:	12.2	0.1	0	
Slave_1019 [VIPA 053-1EC00].Module 2 (021-18D00).inputs.DI 3									IN:	12.3	0.1	0	
	Slave_1019 [VIPA 053-1EC00].Module 4 (040-1BA00).Inputs.Status byte									13.0	1.0	136	
Slave_1019 [VIPA 053-1EC00].Module 4 (040-1BA00).Inputs.Input byte 1									IN:	14.0	1.0	0	
Slave_1019 [VIPA 053-1EC00].Module 4 (040-1BA00).Inputs.Input byte 2								USINT	IN:	15.0	1.0	0	
art 1												d to wat	
0,5													
0	0	50	100	150	200	250	300	350	400		45	50	
			200	200	200	200							

# 6.3.3 ESC Register (Expert)

In this tab, the user can see and change the values of the registers. In the settings section he can set the offset and the length. If he activates the compact view, he will only see the registers which have a description:



ettings						
Offset		0x0000				Dec Hex
Length		0x0400				Dec Hex
Compact	1	4				
egisters						
Inc	dex	Name		Value	Туре	1
► 0x0	0000	Туре		18 (0x12)	USINT	
► Ox	0001	Revisio	n	0 (0x00)	USINT	
► Ox(	0002	Build		3 (0x0003)	UINT	
► Ox(	0004	FMMU	s supported	3 (0x03)	USINT	
► Ox(	0005	SyncMa	anagers supported	4 (0x04)	USINT	
► Ox	0006	RAM S	ize	1 (0x01)	USINT	
► 0x0	0007	Port De	escriptor	74 (0x4A)	USINT	
► Ox	0008	ESC Fe	atures supported	252 (0x00FC)	UINT	
► 0x0	0010	Config	ured Station Address	1011 (0x03F3)	UINT	
► Ox(	0012	Config	ured Station Alias	0 (0x0000)	UINT	
► Ox(	0020	Write F	Register Enable	0 (0x00)	USINT	
► Ox(	0021	Write F	Register Protection	0 (0x00)	USINT	
► Oxt	0030	ESC W	rite Enable	0 (0x00)	USINT	

# 6.3.4 EEPROM (Expert)

This tab consists of 2 views:

# **Smart View**

In this view, the user can see and change the values of the EEProm.



EPROM Values				
Index	Name	Value	Туре	^
0x0000	PDI Control	260 (0x0104)	UINT	
0x0001	PDI Configuration	128 (0x0080)	UINT	
0x0002	Pulse Length of SYNC Signals	1000 (0x03E8)	UINT	
0x0003	Extended PDI Configuration	65535 (0xFFFF)	UINT	
0x0004	Configured Station Alias	0 (0x0000)	UINT	
0x0005	Reserved	0 (0x0000000)	UDINT	
0x0007	Checksum	199 (0x00C7)	UINT	
0x0008	Vendor ID	2 (0x0000002)	UDINT	
0x000A	Product Code	147599442 (0x08CC3052)	UDINT	
0x000C	Revision Number	1245184 (0x00130000)	UDINT	
0x000E	Serial Number	0 (0x0000000)	UDINT	
0x0010	Execution Delay	0 (0x0000)	UINT	
0x0011	Port0 Delay	0 (0x0000)	UINT	
0x0012	Port1 Delay	0 (0x0000)	UINT	
0x0013	Reserved	0 (0x0000)	UINT	
0x0014	Bootstrap Receive Mailbox Offset	0 (0x0000)	UINT	~

# Hex View

In this view, the user can create an EEPROM from an ESI file, upload the EEPROM from the slave, load an EEPROM from the disk, download the EEPROM to the slave or save the EEPROM to disk.

vice Edito	r																	_	_	
General 🛛	Variab	les	ESC	Regi	ster	EEPF	ROM	Exte	ended	Diag	ynosi	s D	C Dia	agno	sis					
																			Smart	<b>View</b> Hex Vie
EPROM																				
0000:	04	01	80	00	E8	03	FF	FF	00	00	00	00	00	00	C7	00				
0010:		00	00		52			08	00	00	13	00	00	00	00	00	R0			
0020:	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00				
0030:	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00				
0040:	00	00	06	00	8D	0E	00	00	00	00	00	00	00	00	00	00				
0050:	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00				
0060:	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00				
0070:	00	00	00	00	00	00	00	00	00	00	00	00	0F	00	01	00				
0080:	A0	00	6F	00	10	06	45	4C	32	32	35	32	06	44	69	67	oEL	2252.Dig		
0090:	4F	75	74	20	44	69	67	69	74	61	6C	65	20	41	75	73	Out.Digi	tale.Aus		
00A0:	67	61	6E	67		6C		6D	6D		6E	20	28	45	4C	32		men.(EL2		
00B0:	78	78	78	29		45		32	32	35	32	20	32	4B	2E	20	xxx) OEL2	252.2K		
00C0:					20				67						34	56	DigAus	gang.24V		
00D0:											20				65		,.0.5A,.			
00E0:											6D							TimeStam		
00F0:											46						p.SysTim			
0100:					43		53			63			63	74	69	76	-	nc.Activ		
0110:		74	65		41		74	69		61	74		0D	44		20	ate.Acti			
0120:		79	6E					61	72	74		53	74	61	72	74	Sync.Sta			
0130:		69	6D							6E	65			31		4F		nnel.1.0		
0140:										53				65	09		utput.Tr			
0150:											65		_				hannel.2			
0160:	64	FF	1 E	00	10	00	02	00	01	04	0C	00	00	00	00	00	d			
EPROM	Opera	tions	5																	
Timeout																				60000 🚭
Data Size	e (byte	•)				-														2048
0000 0120	c (bytt	· ·																		2048
																		Create from ESI	Upload from Slave	Load from File
																			Download to Slave	Save to File



# 6.3.5 Extended Diagnosis (Expert)

In this tab, the user can see the extended diagnosis information:

Device Editor								
General Variables ESC Register	EEPROM	Extended Diagnosis DC Diagnosis						
Common Error Counter	Common Error Counter Clear Error Counters							
Processing Unit Error (0x030C)	0	Clear Error (	Counters					
PDI Error (0x030D)	0	ĺ						
Port 0 counters (In port)		Port 1 counters						
Invalid Frame, CRC error (0x0300)	0	Invalid Frame, CRC error (0x0302)	0					
RX Error (0x0301)	0	RX Error (0x0303)	0					
Lost Link (0x0310)	0	Lost Link (0x0311)	0					
Forwarded RX Error (0x0308)	2	Forwarded RX Error (0x0309)	2					
Port 2 counters		Port 3 counters						
Invalid Frame, CRC error (0x0304)		Invalid Frame, CRC error (0x0306)						
RX Error (0x0305)		RX Error (0x0307)						
Lost Link (0x0312)		Lost Link (0x0313)						
Forwarded RX Error (0x030A)		Forwarded RX Error (0x030B)						

# **Common Error Counter**

#### **Processing Error Counter:**

Indicates that slave received "not EtherCAT frames", which are not allowed in the EtherCAT segment (of course acceptable in a test environment)

# **PDI Error Counter:**

Counts if a PDI access has an interface error (read from register: 0x30D)

# Port 0..3

- Invalid Frame Counter of Port y (read from register: 0x0300+y\*2)
- RX Error Counter of Port y (read from register: 0x0300+y\*2+8Bit)
- Lost Link Counter of Port y (read from register: 0x0310+y)
- Forwarded RX Error Counter of Port y (read from register: 0x0308+y)

Note: All error counters can be cleared by clicking on *Clear Error Counters* of the context menu of the master.



# 6.3.6 DC Diagnosis (Expert)

# In this tab, the user can see all DC related values of the slave:

Device Editor	
General Variables ESC Register EEF	PROM Extended Diagnosis DC Diagnosis
Distributed Clocks	
Sync Pulse Active	Yes
DC Sync 0 Period	2000000 [µs]
DC Sync 1 Period	0 [µs]
System Time Difference	0 [ns]
Please activate 'Sync Window Monito	ring' option!

# **Distributed Clock**

Sync Pulse Active: Sync pulse was received or not

- **DC Sync 0 Period:** Configured period for sync unit 0
- DC Sync 1 Period: Configured period for sync unit 1

System Time Difference: Time difference of slave clock to reference clock

Note: The option "Sync Window Monitoring" must be enabled (see Distributed Clocks (Expert)).

# 6.3.7 CoE Object-Dictionary

This tab consists of 3 modes (in user mode, only the description from ESI or slave is available):

#### **Description from ESI**

In this tab, the user can see the description of the object dictionary from ESI and the values from the slave. He can also change the values.

Values								
					Filter Setting I			
	Index	Name	Value	Туре	Flags			
	0x1000	Device Type	5001 (0x1389)	UDINT	( RO RO RO )			
	0x1008	Device Name	VIPA 053-1EC00	STRING(17)	( RO RO RO )			
	0x1009	Hardware Version	03	STRING(3)	( RO RO RO )			
	0x100A	Software Version	1.30	STRING(12)	( RO RO RO )			
	0x100B	System Version	3 (0x03)	USINT	( RO RO RO )			
۲	0x1018	Identity	4 (0x04)	USINT	( RO RO RO )			
۲	0x1600	RxPDO Map	5 (0x05)	USINT	( RO RO RO )			
۲	0x1602	RxPDO Map	5 (0x05)	USINT	( RO RO RO )			
۲	0x1603	RxPDO Map	60 (0x3C)	USINT	( RW RW RW )			
۲	0x1604	RxPDO Map	2 (0x02)	USINT	( RO RO RO )			
۲	0x1606	RxPDO Map	45 (0x2D)	USINT	( RW RW RW )			
۲	0x1607	RxPDO Map	5 (0x05)	USINT	( RO RO RO )			
۲	0x1A01	TxPDO Map	5 (0x05)	USINT	( RO RO RO )			
۲	0x1A03	TxPDO Map	60 (0x3C)	USINT	( RW RW RW )			
۲	0x1A05	TxPDO Map	5 (0x05)	USINT	( RO RO RO )			

# Lists of CoE Object-Dictionary entries

- Entries comes from ESI
- The "Flags" column tells the user if this entry is an PDO entry and if it can be edited
  - "AA BB C D (EE FF GG)"
  - AA = Mapping as RX PDO or not
  - BB = Mapping as TX PDO or not
  - C = Backup Flag
  - D = Settings Flag
  - EE = Access rights for PreOp (RO, WO, RW)
  - FF = Access rights for SafeOp (RO, WO, RW)
  - GG = Access rights for Op (RO, WO, RW)

# Buttons

# Write:

Writes the selected entry



#### **Description from Slave**

In this tab, the user can see the description of the object dictionary and the values from slave. He can also change the values and has the possiblility to export the object dictionary.

ies				Evno	rt OD Filter Setting F
	Index	Name	Value	Туре	Flags
	0x1000	Device Type	5001 (0x1389)	UDINT	( RO RO RO )
	0x1008	Device Name	VIPA 053-1EC00	STRING(30)	( RO RO RO )
	0x1009	Hardware Version	03	STRING(8)	( RO RO RO )
	0x100A	Software Version	1.30	STRING(8)	( RO RO RO )
	0x100B	System Version	3 (0x03)	USINT	( RO RO RO )
►	0x1018	Identity	4 (0x04)	USINT	( RO RO RO )
•	0x1600	RxPDO Map	5 (0x05)	USINT	( RO RO RO )
►	0x1602	RxPDO Map	5 (0x05)	USINT	( RO RO RO )
Þ	0x1603	RxPDO Map	60 (0x3C)	USINT	( RW RO RO )
•	0x1604	RxPDO Map	2 (0x02)	USINT	( RO RO RO )
•	0x1606	RxPDO Map	45 (0x2D)	USINT	( RW RO RO )
•	0x1607	RxPDO Map	5 (0x05)	USINT	( RO RO RO )
•	0x1A01	TxPDO Map	5 (0x05)	USINT	( RO RO RO )
•	0x1A03	TxPDO Map	60 (0x3C)	USINT	( RW RO RO )
•	0x1A05	TxPDO Map	5 (0x05)	USINT	( RO RO RO )

# Lists of CoE Object-Dictionary entries

- Entries are uploaded from the slave (if "SDO Information Service" is supported)
- The "Flags" column tells the user if this entry is an PDO entry and if it can be edited "AA BB C D (EE FF GG)" - AA = Mapping as RX PDO or not - BB = Mapping as TX PDO or not - C = Backup Flag - D = Settings Flag - EE = Access rights for PreOp (RO, WO, RW) - FF = Access rights for SafeOp (RO, WO, RW) - GG = Access rights for Op (RO, WO, RW)

# Buttons

#### Write:

Writes the selected entry

# Single Object

In this tab, the user can read and write the values of the object dictionary of the slave.



General       Variables       ESC Register       EEPROM       Extended Diagnosis       DC Diagnosis       CoE Object-Dictionary       FoE         Description from ESI       Description from ESI       Description from Slave       Single Object         Settings	
Settings	t
Index 0x1018 Dec Hex	
SubIndex 0 Dec Hex	
Size 1 Dec Hex	
Complete Access	
Operation	
Write	
Read	

# Settings

# Index:

Index of the CoE value

# SubIndex:

SubIndex of the CoE value

# Size:

Size of the CoE value (only used for reading)

# **Complete Access:**

Activate, if complete access mode should be used for reading or writing the CoE value (can be used only if it is supported from slave)

# Operation

# Write:

Writes the value to the slave (Hex format, like: "00 11 22 33 ...")

# Read:

Reads the value from slave (Hex format, like: "00 11 22 33 ...")



# 6.3.8 SoE Object-Dictionary

lues		Description from ESI Single Obje
iues		Channel A 🔻
Index	Name	Value
S-0-0001	Control unit cycle time (TNcyc)	1000 (0x3E8)
S-0-0002	Communication cycle time (tSync)	1000 (0x3E8)
S-0-0007	Feedback acquisition capture point (t4)	
S-0-0011	Class 1 diagnostic (C1D)	
S-0-0012	Class 2 diagnostic (C2D)	-
S-0-0013	Class 3 diagnostic (C3D)	
S-0-0015	Telegram type	7 (0x07)
S-0-0016	Configuration list of AT	(list)
S-0-0017	IDN-list of all operation data	(list)
S-0-0018	IDN-list of operation data for CP2	(list)
S-0-0019	IDN-list of operation data for CP3	(list)
S-0-0020	IDN-list of operation data for CP4	(list)
S-0-0021	IDN-list of invalid operation data for CP2	(list)
S-0-0022	IDN-list of invalid operation data for CP3	(list)
S-0-0024	Configuration list of MDT	(list) 🗸

# Lists of SoE Object-Dictionary entries

- Values are uploaded by the master from the slave
- Entries comes from the ESI

# Buttons

#### Write:

Writes the selected entry

## **Expert View**

In this tab, the user can read and write the values of the object dictionary of the slave:



Device Editor					
General Variables ESC Register	EEPROM Extended Diagnosis So	oE-Object-Dictionary	FoE		
				Description from ESI	Single Object
Settings					
Channel	0				
IDN	0				Dec Hex
Size	2				Dec Hex
Operation					
					Write
					Read

# Settings

#### Channel:

Channel of the SoE value

# **IDN:**

Index of the CoE value

#### Size:

Size of the CoE value (only used for reading)

# Operation

# Write:

Writes the value to the slave (Hex format, like: "00 11 22 33 ...")

# Read:

Reads the value from slave (Hex format, like: "00 11 22 33 ...")

# 6.3.9 File over Ethernet (FoE)

In this tab, the user has the possibility to download or upload a file to the slave:



Device Editor		
General Variables ESC Register	r EEPROM Extended Diagnosis DC Diagnosis CoE Object-Dictionary FoE	
FoE Download		
Local Filename		
Slave Filename		
Password (hex)	0x0000000	Dec Hex
Timeout (s)		60 🖨
		Download to Slave
FoE Upload		
Local Filename		
Slave Filename		
Password (hex)	0x0000000	Dec Hex
Timeout (s)		60 🗲
Max File Size (kb)		3000 🗲
		Upload from Slave

# **FoE Operations**

# Local Filename:

Name of the file on the harddrive

# Slave Filename:

Name of the file on the slave

# **Password:**

Password on the slave as a hex-number

# **Timeout:**

Timeout for downloading or uploading the file in milliseconds

# Max File Size:

Maximal file size which should be uploaded from the slave in kilo bytes



# 6.3.10 Slave History (Expert)

In this tab, the user can see and change the diagnosis history of the slave. It is also possible to export the data:

ettin	js							
Shov	Info Mes	sages	True					
Shov	/ Warning	Messages	True					
Shov	/ Error Me	ssages	True					
Shov	/ Emergen	cy Messages	False					
Curre	ent Mode		Overv	vrite Mode				
essa	ges							Expor
	Severity	Time 💌	ID	Acknowledged	Code	Message		
1	INF	11.05.2023 09:52:14	055	No	0x1B77E000	(0x1100) Detection of operation mode compl	leted: 0x100, 0	
0	INF	11.05.2023 09:52:14	006	No	0x1B77E000	(0x1135) Cycle time o.k.: 2652		
1	INF	11.05.2023 08:45:42	2 053	No	0x1B77E000	(0x1100) Detection of operation mode compl	leted: 0x100, 0	
0	INF	11.05.2023 08:45:42	2 054	No	0x1B77E000	(0x1135) Cycle time o.k.: 2634		
0	INF	11.05.2023 08:45:27	052	No	0x1B77E000	(0x1135) Cycle time o.k.: 2705		
1	INF	11.05.2023 08:45:26	5 051	No	0x1B77E000	(0x1100) Detection of operation mode compl	leted: 0x100, 0	
0	INF	11.05.2023 08:45:09	049	No	0x1B77E000	(0x1100) Detection of operation mode compl	leted: 0x100, 0	
0	INF	11.05.2023 08:45:09	050	No	0x1B77E000	(0x1135) Cycle time o.k.: 2614		
0	INF	11.05.2023 08:44:54	047	No	0x1B77E000	(0x1100) Detection of operation mode compl	leted: 0x100, 0	
							Number of m	essages: 50 /

# Settings

# Show Info Messages:

Info messages will be collected from slave

# Show Warning Messages:

Warning messages will be collected from slave

#### **Show Error Messages:**

Error messages will be collected from slave

#### Show Emergency Messages:

Emergency messages will be collected from slave

#### **Current Mode:**

Overwrite Mode: Messages will be overwritten if buffer is full Acknowledge Mode: Messages will be discarded if buffer is full

# Messages

List of history messages

# **Change Message Handling**

#### Enable/Disable Info Messages:

Enable or disable info messages

# **Enable/Disable Warning Messages:**

Enable or disable warning messages



Enable/Disable Info Messages: Enable or disable info messages

Enable/Disable Error Messages: Enable or disable error messages

Enable/Disable Emergency Messages: Enable or disable emergency messages

Enable Acknowledge Mode: Enable acknowledge mode

Enable Overwrite Mode: Enable overwrite mode

Clear All Messages: Clear all messages (only available if "Overwrite Mode" is active)

# **Clear All Acknowledged Messages:**

Clear all acknowledged messages (only available if "Acknowledge Mode" is active)

#### Acknowledge All Messages:

Acknowledge all messages, that they can be overwritten from new messages (only available if "Acknowledge Mode" is active)

# 6.3.11 Motion (Motion Mode only)

In this tab, the user can see and change the motion settings of the slave. He can read important variables and change velocity and direction of the axis. Also gearing and camming are possible to use:

Device Editor			
General Variables ESC Regis	ter EEPROM Extended I	Diagnosis DC D	Viagnosis Motion
Administrative			
Station Address Axis	1004 🚔	Axis Index	0
Increment	1000 🚭 [mm]		
Power-On Power-Off			
Status Word	Reset	Control Word	
	-		-
Drive State		Result	Read axis state failed!
PLCOpen State	-		
Actual Position	_ [INC]	-	[mm]
Target Position	- [INC]	-	[mm]
Trajectory Parameters			
Acceleration	1.000,00 🎴 [mm/s^2]	Deceleration	1.000,00 [mm/s^2]
Velocity	100,00 🖨 [mm/s]	Jerk	0,00 [mm/s^3]
Move distance	100,00 🖨 [mm]		
Move to position	0,00 🖨 [mm]		
Move Velocity (-) Move	Velocity (+) Move Relati	ve Move Ab	solute Stop Halt
Parameters for Sychronized I	Votion		
Station Address Master Axis	1001 🚔	Axis Index	0
Gearing		Camming	
Gear In Ratio Numerator	3 🗸	Camming P	eriodic
Gear In Ratio Denoniator	4	Camming St	tart Mode 0
Gear In Gear Out		Cam Table	Select Cam In Cam Out



# 6.3.12 Simulator (Simulator only)

In this tab, the user can see and change the simulator settings of the slave. He can manipulate the slave e.g. power, disconnect and produce errors:

Device Editor
General Variables ESC Register EEPROM Extended Diagnosis CoE Object-Dictionary Simulator
State Machine
Current State Op
Slave Power
Change the power condition of the slave. After a power cycle the slave is in INIT.
Power off Power on
Slave Connection
Change slave connection. Unplug or change connection to previous slave. Does not power off the slave.
Connect to Slave Address: 1001 🖨 Port: B
Disconnect Connect
CRC Error
Generate a CRC error at a specific port (once or probability).
Port: A   Probability (%): 0,01
Set once Set random Reset random
Link Loss
Generate a Link Loss at a specific port for a specific time (once or probability).
Port: A   Down time (s): 5,0   Probability (%): 0,01
Set once Set random Reset all ports

# State Machine

Shows the current state of the slave

#### **Slave Power**

#### Power off:

Turn the slave power off

#### Power on:

Turn the slave on to Init state

# **Slave Connection**

# **Disconnect:**

Disconnect the slave. Slave will not be turned off

# **Connect:**

Connect slave to selected address and port. Default is the port where the slave was connected before

# **CRC Error**

#### Set once:

Create one CRC error at the selected port

#### Set random:

Generate CRC errors at the selected port with the selected probability until reset is executed



# **Reset random:**

Reset the CRC generation

# Link Loss

# Set once:

Create one Link Loss at the selected port for the selected time

# Set random:

Generate Link Losses at the selected port with the selected probability for the selected time until reset is executed

# **Reset random:**

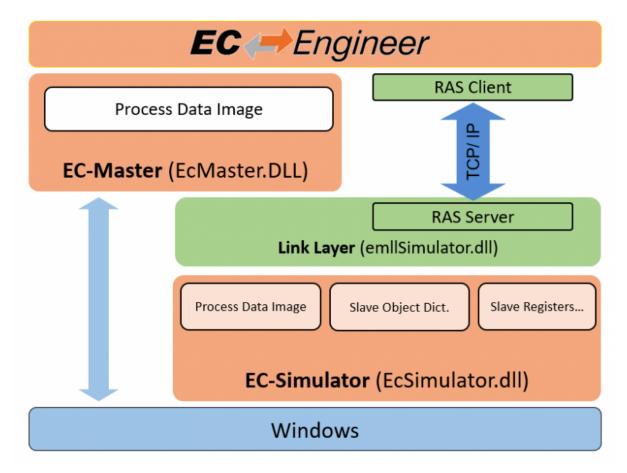
Reset the Link Loss on all ports

# 7 Simulator Mode

With the new EC-Engineer it is possible to use the EC-Simulator.

There are two possibilities:

- 1. The user can use the Simulator EMI file and create an EXI File to start the simulator. It is also possible to connect to a remote system with the running Simulator. More information about offline configuration and remote diagnosis can be found in the Getting Started Chapter.
- 2. The second possibility is, that the user has already a configuration with a master unit. Now the user can do a right click on the master unit and select: "Add EC-Simulator Unit (linked)". A linked simulator unit is added. The user can change the connection settings of the simulator. Now, it is possible to start the master with the simulator link layer and also connect via RAS with the simulator node.





# 8 Additional Tools

# 8.1 ESI-Manager

ESI-Manager can be found through the main menu File -> ESI-Manager.

This dialog helps the use	r to administrate his	ESI and SCI file	s. Here, he can	add/delete/export ESI a	nd
SCI files.					

-	ESI	Mana	ager					_		×
-	t <b>er</b> earc /endo			[ALL VEND	OORS]	[,	•			
ES	File	5								
S	elect	t an E	ESI file which shou	ld be delete	d or exported	or add new ESI files.				
	•	ASS .	ABB							
	•		acontis technologi	es GmbH						
	۲	*4	ACS Motion Contro	ol						
	•	<u>⊿</u> =	Advanced Energy I	ndustries, In	ε,					
	۲		Applied Materials,	Inc.						
	•	Ð	ATI Industrial Auto	mation						
	۲		Auris Surgical							
	•	×	avateramedical Me	echatronics G	mbH					
	۲	B	Balluff GmbH							
	•	۵	Baumueller Nuern	berg GmbH						
	►	BECK	Beckhoff Automati	ion GmbH &	Co. KG					$\sim$
								Number of		
								Number of (	devices:	4217
	A	Add F	ile Add Fo	older	Delete	Export			Close	

# 8.2 EMI-Manager

EMI-Manager can be found through the main menu File -> EMI-Manager.

This dialog helps the user to administrate his EtherCAT Master Information (EMI) files.

븓 EMI Manager	🖛 EMI Manager – 🗆						
EMI Files							
Select an EMI file whic	ch should be copied or d	leleted or add new El	VI files.				
🔻 🧀 EtherCAT N	Master Unit (Class A)					^	
Master							
▶ Local System							
Remote System							
Offline Dia	agnosis						
Simulator	Functions						
Distributed	d Clocks						
Features							
Scripts							
Parameter							
🕨 🧀 EtherCAT N	Master Unit (Class B)						
🕨 🧀 EtherCAT N	Master Unit (LxWin)						
► 🦛 EtherCAT N	Master Unit (Motion)					$\sim$	
				Number of	f EMI fil	es: б	
Edit EMI File							
New	Сору	Delete	Import	Exp	port		
Edit EMI Group							
Add Property	Delete Property						
			ОК	Can	cel		

EMI files, are files which are specify the master features. Means that options and dialogs can be restricted to those features which are supported by the control system, e.g. available cycle times, support of scan for MDP modules or DC synchronization.

# 8.2.1 Administration

This dialog helps the user to administrate his EtherCAT Master Information (EMI) files.

# By default EC-Engineer has two files included (read-only):

EtherCATMaster\_ClassA.emi: EMI template which is prepared for configuring a "Class A" master EtherCATMaster\_ClassB.emi: EMI template which is prepared for configuring a "Class B" master

If the user wants to customize EC-Engineer, he can create a new EMI file with defaults, copy an existing EMI template or import an EMI file.

If he wants to add new properties to a group, he can add this only to the group "Parameters". This group is by default empty, but if user has added some properties, he will see the list of properties on tab "Advanced Options (Expert)" of the master, where the values can be modified.

Device Editor							
Master Process Data Ima	ge Watch list Trace Data A	dvanced Options	Slave to Slave	Distributed Clocks	Tasks + Sync Un	its Data Acquisition	
Master Settings							
Init Command Retries:	3 🗬						
Properties:	Name						Value
	MyTestProperty						
	ing restricted by						
Slave Settings							
			T.	neouts			$\sim$
Startup Checking	D			neouts O Access:		0 🚔 [ms]	
✓ Check Product	Code			t->Pre-Op/Init->Boo	-	3000 <b>[ms]</b>	
Check Revision	Number				· ·	10000 [ms]	
==	T			e-Op->Safe-Op/Safe	-Op->Op:		
Check Serial Nu	imber			ck to Pre-Op, Init:	-	5000 🚔 [ms]	
			Op	o->Safe-Op:		200 🚔 [ms]	
Identification Chec			M	ailbox Mode		_	
Check Identifica				Cyclic		10 🔤 [ms]	
Copy Static	on Address -> Identification Va		۲	State Change			
Copy Iden	tification Value -> Station Addr	ess					
Process Data Mode				verwrite Mailbox Si	ze		
Disable LRW				Output Size:		0 🔤 [bytes]	
				Input Size:		0 🔤 [bytes]	~
						Apply changes t	o all slaves



# 8.2.2 Supported Entries

The following EMI entries are supported:

# Master Group

Device E	ditor		
Maste	Script Automation Proces	s Data Image Watch list EtherCAT P Trace Data Advanced Options Slave to Slave Distributed Clocks Task	s + Sync Uni 💶 🕨
Gene	ral		
	t Name	Class-A Master	
	le Time [us]	1000	
		1000	
Sou	rce MAC address		
Slave	s connected to local system		
Linl	Layer	Ndis	•
Net	work Adapter	EtherCAT-Test ( Intel(R) Ethernet Server Adapter I210-T1 )	•
			Select
	s connected to remote syste		
	tocol	RAS	-
IP A	ddress	127.0.0.1	
Por		6000	
Ma	ster-Instance	0	
			Select
Slave	s simulated (SiL)		
Sidic	Simulated (SIE)		Select
			Select
Slave	s captured		
Cap	ture File		
			Select

# **Display Group:**

Shows or hides group

#### Lock Group:

Locks or unlocks group

# Name of Master-Unit:

Default Master-Unit name

# Show name of Master-Unit:

Enable if user should be able to view and change the name of the Master-Unit

# Lock name of Master-Unit:

Enable if user should not be able to change the name of the Master-Unit

# Cycle Time:

Default Cycle Time

#### Show Cycle Time:

Enable if user should be able to view and change the Cycle Time

# Lock Cycle Time:

Enable if user should not be able to change the Cycle Time

# List values of Cycle Time: Enter possible values of Cycle Time

#### Frequency:

Default Frequency



# Show Frequency:

Enable if user should be able to view and change the Frequency

#### Lock Frequency:

Enable if user should not be able to change the Frequency

#### List values of Frequency:

Enter possible values of Frequency

# **Cycle Time Mode:**

Enter Cycle Time Mode (0 = Cycle Time, 1 = Frequency)

#### **Init Command Retries:**

Init Command Retries

#### Maximal Slave Count:

Enter maximal count of slaves which are allowed to configure (0 = use default limit of master)

#### Slave Start Address:

Enter default start address for all slaves

## Scan for MDP slaves:

Enable for activating MDP-Scan if it is supported from slave

#### **PDO Upload:**

Enable for activating PDO upload during scan if it is supported from slave

#### **Byte-Align Process Data Image:**

Enable if process data image should be byte aligned and not as small as possible

#### **Edit Complete Variable Name:**

Enable if user should be able to edit the complete variable name

#### **Process Image Layout:**

Enter process image layout features (0 = default, 0x1 = with protocol data, 0x2 = with VLAN tag, 0x4 = without frame alignment, 0x8 = alphabetic port order, 0x10 = Compatibility to ENI spec V1.0.0, 0x20 = Moves AL Status command to the end), 0x40 = Disable command splitting

#### **Output Port Vendor Id:**

Enter output port vendor id of the master (0 = All Vendors, 1..n = Specific Vendor)

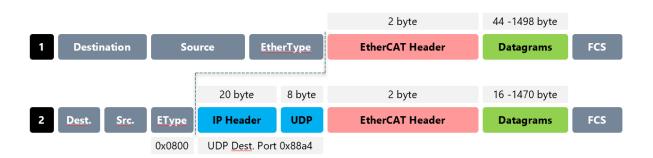
#### Word-Aligned EtherCAT Datagrams:

Enable if EtherCAT datagrams should be word aligned

#### **Cyclic Frame Layout:**

Enter cyclic frame layout mode (0 = default, 1 = single logical command per frame)

#### **Ethernet Type UDP:**



### **Remove DC NOP Command:**

Does not include NOP Command in ENI

#### Cable Red active:

Sets disable LRW for all slaves to use cable redundancy



# Local System

Device Editor						
Master Process	Data Image 🛛 W	/atch list Trace Data Advanced Options Slave to Slave Distributed Clocks Tasks + Sync Units Data Acquisition	1			
General						
Unit Name		Class-A Master				
Cycle Time [us]		1000	-			
Source MAC ac	dress	A0-36-9F-30-00-3B				
Slaves connecte	d to local syste	em				
Link Layer		Ndis	-			
Network Adapt	er	EtherCAT-Test ( Intel(R) Ethernet Server Adapter I210-T1 )	•			
			Select			
Slaves connecte	d to comoto cu					
Protocol	a to remote sy	RAS	•			
IP Address		127.0.0.1				
Port		6000				
Master-Instanc	e	0				
		·	Select			
Slaves simulated						
Slaves simulated	I (SIL)		Select			
			Select			
Slaves captured						
Capture File						
			Select			

# **Display Group:**

Shows or hides group

#### Lock Group:

Locks or unlocks group

# **Network Adapter:**

Enter index of Network Adapter in the Network Adapter List

# Show Network Adapter:

Enable if user should be able to view and change the Network Adapter

# Lock Network Adapter:

Enable if user should not be able to change the Network Adapter

# DCM on:

EC-Engineer deactivated DCM on default. Enable if it should be turned off

# **Remote System**



#### User Manual

Device Editor		
Master Process Data Image	Watch list Trace Data Advanced Options Slave to Slave Distributed Clocks Tasks + Sync Units Date	ata Acquisition
General		
Unit Name	Class-A Master	
Cycle Time [us]	1000	•
Source MAC address	A0-36-9F-30-00-3B	
Slaves connected to local sy	stem	
Link Layer	Ndis	•
Network Adapter	EtherCAT-Test ( Intel(R) Ethernet Server Adapter I210-T1 )	•
		Select
Slaves connected to remote	system	
Protocol	RAS	•
IP Address	127.0.0.1	
Port	6000	
Master-Instance	0	
		Select
Slaves simulated (SiL)		
		Select
Slaves captured		
Capture File		
		Select
Display Group Shows or I	: nides group	
Lock Group: Locks or u	inlocks group	
Protocol: Select prot	tocol for Remote System	
Show Protocol: Enable if u	: user should be able to view and change the protocol	
Lock Protocol:	· · · · · · · · · · · · · · · · · · ·	

Enable if user should be not able to change the protocol

# **IP Address:**

Enter IP Address for Remote System

# Show IP Address:

Enable if user should be able to view and change the IP Address

# Lock IP Address:

Enable if user should be not able to change the IP Address

# Port:

Enter Port for Remote System

# Show Port:

Enable if user should be able to view and change the Port"

# Lock Port:

Enable if user should be not able to change the Port

# Master-Instance:

Enter Master-Instance number



# Show Master-Instance:

Enable if user should be able to view and change the Master-Instance

# Lock Master-Instance:

Enable if user should be not able to change the Master-Instance

# **Offline Diagnosis**

Device Editor			
Master Process Data Im	age Watc	h list Trace Data Advanced Options Slave to Slave Distributed Clocks Tasks + Sync Units Data Acquisition Mot	ion
General			
Unit Name	$\square$	Class-A Master	
Cycle Time [us]		1000	•
Source MAC address		A0-36-9F-30-00-3B	
Slaves connected to lo	cal system		
Link Layer		Ndis	-
Network Adapter		EtherCAT-Test ( Intel(R) Ethernet Server Adapter I210-T1 )	-
		De	eselect
Slaves connected to re	mote syste	m	
Protocol	more syste	IRAS	-
IP Address		127.0.0.1	
Port			
Master-Instance			
		Se	lect
Slaves simulated (SiL)			
		Se	lect
Slaves captured			
Capture File			
		Se	lect

## **Display Group:**

Shows or hides group

# Lock Group:

Locks or unlocks group

# **Simulator Functions**

#### **Display Group:**

Shows or hides group

# Lock Group:

Locks or unlocks group

# **Distributed Clocks**



ice Editor		
	age    Watch list    Trace Data    Advanced Options    Slave to S	lave Distributed Clocks Tasks + Sync Units Data Acquisition
eference Clock		
Name	Slave_1011 [EL2252] (1011)	✓ 🖌 Auto select
lock Adjustment		
O Master Shift (Master	clock follows reference clock) or	
Master Reference CI	ock (System time provided by master device) or	
Link Layer Reference	Clock (System time provided by network device) or	
Off		
	clock follows master clock)	
DCX (Master and ref	erence clock follow external clock)	
Options		
Sync Window Monit	-	
Show 04bit System	inite .	
laves with active DC		
Slave_1011 [EL2252] (1 Slave_1022 [EL2202-01		
Slave_1023 [EL2202-01		
Slave_1026 [EL7201] (1	026)	
Display Gro Shows	or hides group	
Clock Adjus		Agetar Shift 2 - Rue Shift
		laster Shift, 2 – Dus Shift
	Adjustment: if user should not be able to change cloc	k adjustment
	Adjustment: if clock adjustment should be visible	
	<b>Propagation Compensation:</b> lefault value of Continuous Propagation G	Compensation
	nuous Propagation Compensation: if user should be able to change value of	<sup>2</sup> Continuous Propagation Compensation
	w Monitoring: lefault value of Sync Window Monitoring	5
Show Exter Enable	nal Mode: if user should be able to use an external	sync device as reference clock

# System Time 64 Bit:

Enter default value of System Time 64 Bit

# Features

# AoE:

Enable if master supports AoE

# EoE:

Enable if master supports EoE



#### FoE:

Enable if master supports FoE

#### SoE:

Enable if master supports SoE

#### VoE:

Enable if master supports VoE

#### **Export Variables:**

Enable if user should be able to export variables

#### Show Enable Column: Shows column for enable variables on XML export

# Generate Slave Name with Type:

Enable if type of slave should be added to slave names on generating ENI file

### Lock Variables:

Locks or unlocks variables for editing in diagnosis mode

#### Show Variable Chart:

Enable if user should be able to view the chart of a variable

# Show Variable Comments:

Enable if user should be able to view and edit the comments of a variable

# Allow E-Bus as HC Head:

Enable if Ebus shall be allowed as HC Head

#### **ENI** Deployment:

yes: something is done with ENI after export, no: nothing done ask: you will be ask to deploy

# **Deployment Mode:**

0: copy to path, 1: execute batch at path

#### **Deployment Path:**

Path to copy ENI or to batch for execution

# Hot Connect:

Enable if master supports hot connect

# Scripts

**Display Group:** Shows or hides the Scripts Tab

#### P1:

Scan Start Script 1: First script executed before scanning

Scan Start Script 2: Second script executed before scanning

Scan Stop Script 3: First script executed after scanning

Scan Stop Script 4: Second script executed after scanning

# P2:

**Diag Start Script 1:** First script executed before switch to diag

Diag Start Script 2:

Second script executed before switch to diag

# Diag Stop Script 3: First script executed before switching to config

# Diag Stop Script 4:

Second script executed before switching to config

# Parameters

Device Editor							
Master Process Data Ima	ge Watch list Trace Data A	dvanced Options	Slave to Slave	Distributed Clocks	Tasks + Sync Units	Data Acquisition	
Master Settings							
Init Command Retries:	3						
	<sup>3</sup> 🔽						
Properties:	Name						Value
	MyTestProperty						
Slave Settings							
Startup Checking			🗌 Ti	neouts			^
Check Vendor I	D		SD	O Access:		0 🚔 [ms]	
Check Product			Ini	t->Pre-Op/Init->Boo	otstrap:	3000 🚔 [ms]	
Check Revision	Number		Pro	e-Op->Safe-Op/Safe	e-Op->Op:	10000 🚔 [ms]	
Check Serial Nu	ımber		Ba	ck to Pre-Op, Init:		5000 🚔 [ms]	
			Op	o->Safe-Op:		200 🚔 [ms]	
Identification Chec	king		M	ailbox Mode			
Check Identifica				Cyclic		10 🔤 [ms]	
<ul> <li>Use Currer</li> <li>Copy Stati</li> </ul>	nt Values on Address -> Identification Val	ue		🖲 State Change			
	tification Value -> Station Addre						
Process Data Mode			0	verwrite Mailbox Si	ze		
Disable LRW				Output Size:		0 🔤 [bytes]	
				Input Size:		0 🔤 [bytes]	~
						Apply changes	to all slaves

User defined properties, which will be written into ENI file and can be interpreted by the application inside EC-Master.

# 8.3 Network Mismatch Analyzer

If you have a network mismatch in your EtherCAT network it is not so easy to find the problem. For this you have the Network Mismatch Analyzer. You find it in the network main menu. If you see here some "red" entries, means that this is the start point of your network mismatch:



onfiguration mis	the configured slaves w match!	ith the conne	ected slav	es. If something is re	d, you have a	network	
Slave	Config	Config	Config	Network	Network	Network	1
Name Slave_TOTO [ELTO	Type EL1094 [1016]	Revision	ldent.	Type EL1094 [1016]	Revision	Ident.	
Slave_1017 [EK11	EK1110 [1017]	0x00100000	0	EK1110 [1017]	0x00100000	0	
Slave_1018 [BK11	BK1120 [1018]	0x00120000	0	BK1120 [1018]	0x00120000	1019	
Slave_1019 [VIPA	VIPA 053-1EC00 [1019]	0x00000012	0	EK1122 [1020]	0x00120000	0	
Slave_1020 [EK11	EK1122 [1020]	0x00120000	0	EK1100 [1021]	0x00120000	2001	
Slave_1021 [EK11	EK1100 [1021]	0x00120000	0	EL2202-0100 [1022]	0x00100064	0	
Slave_1022 [EL22	EL2202-0100 [1022]	0x00100064	0	EL2202-0100 [1023]	0x00100064	0	
Slave_1023 [EL22	EL2202-0100 [1023]	0x00100064	0	EL1114 [1024]	0x00110000	0	
Slave_1024 [EL11	EL1114 [1024]	0x00110000	0	EL7031 [1025]	0x00170000	0	
Slave_1025 [EL70	EL7031 [1025]	0x00170000	0	EL7201 [1026]	0x00130000	0	
Slave_1026 [EL72	EL7201 [1026]	0x00130000	0				~

# 8.4 Line Crossed Analyzer

If you have connected a line to a wrong port, you can see in the Line Crossed Analyzer which slave is incorrectly connected. The wron entries will be red:

n the list you can see all connected slaves. Th	e red ones are incorrectly connected		
AutoInc Address	Station Address	Туре	^
65521	16	EL1094	
65520	17	EK1110	
65519	18	BK1120	
65518	19	VIPA 053-1EC00	
65517	20	EK1122	
65516	21	EK1100	
65515	22	EL2202-0100	
65514	23	EL2202-0100	
65513	24	EL1114	
65512	25	EL7031	
65511	26	EL7201	~

# 8.5 Inspection Report

If you want to print or show a report about the actual session, it is possible with the inspection report. I shows a lot of different data about the network communication. It is also possible to print a PDF.



lease, select the statistic	of which you want to see the details. The	complete network	status can b	e also	
orinted.					
			General		
Category	Name	Value			1
Information	Master Version	3.2.0.3			
Information	Cycle Time	2000			
Information	Number of found slaves	26			
Information	Number of slaves in configuration	n 26			
Information	Number of DC slaves	4			
Information	DC in-sync	Yes			
Information	Topology Ok	Yes			
Information	Link Connected	Yes			
Information	Slaves in Master State	Yes			
Frame Counter	Sent frames	22305			1

# 8.6 EoE Endpoint Configuration

If you want to use EoE slaves with your local master, you can activate the EoE Endpoint.

**Note:** This feature is only available if the package "Tap-Windows" from OpenVPN is installed: http://openvpn.net/index.php/download/community-downloads.html

If this package is installed, you will see the following dialog:



൙ EoE Endpoint Configurati	on	_		×
State Please, activate the EoE End	point support and choose a network adapter.			
Settings Use EoE Endpoint Network Adapter IP Address	LAN-Verbindung ( TAP-Windows Adapter V9 ) 169.254.153.176			•
	ОК	С	ancel	

# Settings

# **Use EoE Endpoint:**

Activate EoE Endpoint support for the selected device

# **Network Adapter:**

List of installed network adapters (TAP)

# **IP Address:**

IP Address of the selected network adapter



# 8.7 Edit Topology

Edit Topology		- 0	×
dit Topology			
The topology can be expanded here.			
Configuration		Scanned configuration	
🖳 Class-A Master		🖳 Class-A Master	~
Islave_1001 [EK1100]		Slave_1001 [EK1100]	
Slave_1004 [EL2004]	<< Add Slave	Slave_1002 [EL2008]	
Slave_1005 [EL2004]		Slave_1003 [EL2008]	
Slave_1006 [EL2004]		Slave_1004 [EL1014]	
Slave_1007 [EL2004]		Slave_1005 [EL2004]	
Slave_1008 [EL2004]		Slave_1006 [EL1034]	
Slave_1003 [EK1100]		Slave_1007 [EL1018]	
1, Slave_1012 [SGDV-E1 CoE Drive]		Slave_1008 [EL2008]	
🖺, Slave_1013 [SGDV-E1 CoE Drive]		📑 Slave_1009 [EK1122-0080]	
N., Slave_1014 [SGDV-E1 CoE Drive]		🗓 Slave_1010 [EK1101-0080]	
Slave_1002 [EK1100]		Slave_1011 [EL2252]	
Slave_1009 [EL1002]		Slave_1012 [EL2612]	
Slave_1010 [EL1002]		Slave_1013 [EL4132]	
Slave_1011 [EL1002]		Slave_1014 [EL3162]	
		Slave_1015 [EL1008]	
		Slave_1016 [EL1094]	
		Slave_1017 [EK1110]	
		Slave 1018 [BK1120]	~
Scan		Apply	Cance

# **Disconnect:**

Disconnets the selected port

# **Connect:**

Connects the selected slave in the not connect slaves list, with the selected port in the configuration

# Up: Moves the slave up in the configuration

#### Down:

Moves the slave down in the configuration

#### Scan:

Scans the network. The network is shown by the scanned configuration. It is possible to add slave to the configuration with "Add Slave".

# Apply:

The configuration will be applied to the EC-Engineer (only possible if all slaves are connected)

# 8.8 Capture File

A capture file could be helpful, if you have a very large system or system is not always available. In that case you can connect to your system, save one or more snapshots into a capture file and analyse the created capture file later.

Another use case is, that your system from time to time some problems. In that case you can activate the automatic mode and create the snapshots every specific interval or based on specific master notifications.

At the moment there are the following options:

🧀 Capture File	_						
Filename							
Folder	D:\prj\atctk\UI\EcEngineer\Run\Capture\						
Base file name	CaptureFile						
Date	$\checkmark$						
Time	4						
IP Address	1						
Preview	2023-05-11_12-00_CaptureFile_	127.0.0.1.ecd					
Content							
Process data	1						
EEPROM size	0x0086	Dec Hex					
ESC Register size	0x0400	Dec Hex					
CoE OD of slaves	None	•					
CoE OD objects							
SDO Info Service							
Automatic Mode		~					
Interval (min)		5 📮					
Maximum Snapshots		50 🖨					
Notifications		•					
	ОК	Cancel					

#### Filename

#### Folder:

Path, where the capture files should be saved



#### Base file name:

Base file name of the generated capture file name

#### Date:

Activate, to add the date to the generated capture file name

# Time:

Activate, to add the time to the generated capture file name

# **IP Address:**

Activate, to add the IP address to the generated capture file name

#### **Preview:**

Shows a preview of the generated capture file name

# Content

# Process data:

Activate to add process data to the capture file (read-only)

#### **EEPROM size:**

Enter size of the EEPROM (0x86 = default, 0 = no EEPROM)

#### **ESC Register size:**

Enter size of the ESC Registers (0x400 = default, 0 = no ESC register)

# CoE OD of slaves:

# Select the slaves of which the CoE OD information will be captured

#### None:

CoE OD will be not captured

#### All:

CoE OD will be captured of all slaves

#### User defined:

CoE OD will be captured of the defined slaves by physical address (e.g. 1001-1003; 1005)

#### **CoE OD objects:**

Enter index of specific objects or all objects will be collected (e.g. 0x1018; 0x7000-0x7FFF)

#### **SDO Info Service:**

Activate to use the SDO Info Service for loading the CoE Object Dictionary instead of readying the information from the ESI file.

## Automatic Mode

# Interval (min):

Time to wait until next snapshot will be taken

# **Maximum Snapshots:**

Enter count of maximum snapshots

## Notifications:

Select the notifications, which will trigger a snapshot. The following notifications are availabe (for more information about notifications please refer the manual of EC-Master):

- STATECHANGED
- ETH\_LINK\_CONNECTED
- ETH\_LINK\_NOT\_CONNECTED



- SLAVE\_STATECHANGED
- SLAVE\_PRESENCE
- SLAVE\_INITCMD\_RESPONSE\_ERROR
- STATUS\_SLAVE\_ERROR
- SLAVE\_UNEXPECTED\_STATE
- DC\_SLV\_SYNC
- DCM\_SYNC

# 8.9 Project Templates

If you have a lot of slaves with the same configuration (e.g. PDOs, InitCmds) you can use a project template. In that case new slaves will be first copied from this template (if available) and then taken from the ESI cache. This behaviour is also used for the bus scan.

#### At the moment there are the following options:

൙ Project Template			_		×
Choose Path					
Choose an existing config configured slaves.	guration file as projec	t template, which will be u	used for lo	ading pr	e-
C:\Users\k.feifel\Desktop	o\project.ecc				
Settings					
Activate					
Ignore Revision					
		ОК	C	ancel	

Path: Path to the selected project template

#### Settings

#### Activate:

True, for activating this project template (necessary if you want to turn it temporary off)

#### **Ignore Revision:**

The revision will be not used as search criteriom

# If the project template mode is active, it will be displayed in the status bar:



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· · · · · · ·			
C-Engineer []			- 🗆 X
<u>File View N</u> etwork <u>S</u> ettings <u>H</u> elp			
Configuration Mode 🕜 Export ENI 🕞 Export EXI	Kan Diagnosis Mode		÷
Project Explorer	Device Editor		
🖳 Class-A Master	Master		
	General		
	Unit Name	Class-A Master	
	Cycle Time [us]	1000	•
	Source MAC address		
	Slaves connected to local syst	tem	
	Link Layer	Ndis	•
	Network Adapter	EtherCAT-Test ( Intel(R) Ethernet Server Adapter I210-T1 )	•
			Select
	Slaves connected to remote s		
	Protocol	RAS	•
	IP Address Port	127 . 0 . 0 . 1	
	Master-Instance	0	
	master mathice	v	Select
	Slaves simulated (SiL)		
			Select
	Slaves captured		
	Capture File		
a second the second			Select
Classic View Flat View Topology View			
Short Info			<del>~</del> †
Information	Severity Time Message		
Name Class-A Master Description EtherCAT Master Unit (Class A)	INF 15:12:28 EC-Enginee	r ready, version 5.6.0	
Description EtherCAT Master Unit (Class A) Vendor acontis technologies GmbH			
aconta technologica ambri			
Networks: 1 Slaves: 0			State:    Mode: TEMPLATE EXPERT

Normally the first match will be taken from project template. If this is wrong, you can open the context menu *Select from Project Template* and select another one:

🔸 Se	lect Slave from Proje	ct Template			_		×	
omp	atible Slaves in Pro	ject Template						
Select a slave from project template. Actual revision: 1048576								
•	Slave_1002 [EL2008]	EL2008 8Ch. Dig. Output 24V, 0	.5A		0x001000	00 (10485	76)	
•	Slave_1003 [EL2008]	EL2008 8Ch. Dig. Output 24V, 0	.5A		0x001000	00 (10485	76)	
•	Slave_1008 [EL2008]	EL2008 8Ch. Dig. Output 24V, 0	.5A		0x001000	00 (10485	76)	
				OK	C	ancel		

# 8.10 Real-time Support

Normally on Windows you do not have real-time support, but to get DCM in sync you can install the "ECAT driver" in the following modes:

### Network driver

The network driver can be used from the optimized link layers

The real-time support is normally hidden in EC-Engineer. It can be activate by copying the specific link layer libraries into the installation directory of EC-Engineer.

For the local system, EC-Engineer will turn on DCM and use the real-time clock for generating the job task cylces. For more information about how to install the "ECAT driver" please refer the manual of EC-Master Class A DCM on Windows

# 8.10.1 Optimized Link Layers

After activating the real-time support the optimized link layer can be selected in the option "Link Layer":



Device Ed	itor									
Master	Process Data Image	Watch list	Trace Data	Advanced Options	Slave to Slave	Distributed Clocks	Tasks + Sync Units	Data Acquisition		
Genera										^
Unit I	Name	Class	-A Master							
Cycle	Time [us]	1000							•	J
Source	e MAC address									
Slaves	connected to local sy	/stem								
Link l		18254	x						•	n II
Insta									1 🖨	
Insta	nce									i i
								S	elect	
	connected to remote	•								
Proto	col	RAS							•	j –
IP Ad	dress	127 .	. 0 . 0	. 1						
Port		6000								
Mast	er-Instance	0								
								S	elect	
Slaves	simulated (SiL)									
								S	elect	
	captured									
Captu	ure File									
								S	elect	~

Depending on the link layer type the user can chose the network adapter or the instance.

The following optimized link layers are currenty supported:

emll18254x.dll (Intel PRO/1000 Network Adapters)

emll18255x.dll (Intel PRO/100 Network Adapters)

emllIRTL8139.dll (Realtek 8139 Fast Ethernet Adapters)

emllIRTL8169.dll (Realtek Gigabit Ethernet Adapters)

emllICCAT.dll (BECKHOFF CCAT)

For more information about optimized link layers and how to install the ECAT driver please refer the manual of EC-Master Class B EcatDrv for Optimized Link Layers

# 8.11 Export ENI Variants

With this function it is possible to export different ENI file variants of an config. Therefore a xml file has to be created. Then it is possible to select this xml file and create more ENI files at once. The xml file should look like this:



🖉 xml	version="1.0" encoding="utf-8"
🖻 🗝 ConfigVariants	
🥌 xmlns:xsi	http://www.w3.org/2001/XMLSchema-instance
🥌 xmlns:xsd	http://www.w3.org/2001/XMLSchema
🚊 📖 🧰 General	
🗄 🕒 RenumberBus	true
🗄 🕒 ExportPath	D:\temp\enis
🗄 🕒 ExportEcc	true
🗄 🛲 🛅 Configs	
🚊 🛅 Config	
🕂 🛶 🕒 Name	Config1
🕀 😡 CycleTime	1000
🖻 🗁 Slaves	
🖻 🖳 🔂 Exclude	
🖻 🔤 Entry	
🥌 Name	Slave1
🗄 🔚 Entry	
🗄 🔂 Entry	
🗄 🔂 Entry	
🗄 🔂 Entry	
🚊 🔤 Config	
🗄 📖 🕒 Name	Config2
🗄 🥌 CycleTime	4000
🗄 🛁 Slaves	

RenumberBus: If this is true, all slaves will be enumerated in a row. Otherwise each slave stays with his address.

Export Path: The path were the ENI / ECC files should be saved.

ExportEcc: If true, also the ECC file be exported and not only the ENI.

Each Config needs a name. This name is used for the ENI file and the optional ECC file.

CycleTime (optional): If this is set the cycle time will be changed to this value.

Exclude: To find a slave in the config the name is required. With that it is possible to remove some slaves from a big config for example.

Include: To find a slave in the config the name is required. With the include it is possible to easy delete all slaves in the config despite except the include ones.

Warning: Please use Exclude OR Include. Both in the same config does not work



# 9 Command Line Interface

For helping users in some special situations and to do not confuse other users the EC-Engineer supports a small command line interface:

### /HELP, /?

Shows the help dialog

```
/CFG = config.ecc
Open a specific configuration file config.ecc directly after starting EC-Engineer
```

```
/EMI = emi.xml
```

Sets the path to the EMI file which should be used (Mandatory if ecc does not already exist)

```
/REMOTE = "127.0.0.1:6000:0"
```

Activates the remote system, where IP address is "127.0.0.1", port is 6000, master instance is set to 0

```
/ENIEXPORT = config.eni
Activates an automatic ENI export on close
```

/EXIEXPORT = config.exi
Activates an automatic EXI export on close

```
/CYCLETIME = "2000"
Changes the cycle time from ecc or EMI in config
```

#### /DIAG

Activates diagnosis mode

#### /CAPTURE= capture.ecd

Open a specific capture file capture.ecd directly after starting EC-Engineer and activates the diagnosis mode

### /ENIBUILDER

Activates the EniBuilder support, means two additional context menu entries of the device will be available to export and import the configuration file for the EniBuilder

### /PROJECTTEMPLATEPATH

Opens a specific configuration file as project template

#### /FORCECFG= config.ecc

Activates the "integration" mode, to be able create an ENI file automatically on closing EC-Engineer

#### Some menu entires are also hidden, like

- "New/Open/Save"
- "EMI Manager"
- "Export Process Variables / Import ENI file / Export ENI file"
- Toolbar

Further supported parameters:

```
/EMI = emi.xml
```

Sets the path to the EMI file which should be used (Mandatory)

```
/LOCAL = "127.0.0.1"
```

```
Activates the local system and the network adapter with IP address "127.0.01" will be chosen. If you use the optimized LinkLayer you can write /LOCAL ="I8254x" or /LOCAL ="RTL8169" (/LOCAL or /REMOTE or /CAPTURE is mandatory).
```

### **/REMOTE** = "127.0.0.1:6000:0:0"

Activates the remote system, where IP address is "127.0.0.1", port is 6000, master instance is set to 0 and protocol is 0 (RAS). It is also supported to use the DNS name instead of the IP address (*/LOCAL* or */REMOTE* or */CAPTURE* is mandatory). It is also possible to set the parameter for more master instances (only if ecc exists with more master units). Therefore just add the additional parameter with a ';'. E.g.: */REMOTE* ="127.0.0.1:6000:1;127.0.0.2:6001:2" or */REMOTE* ="127.0.0.1:6000:1:0;127.0.0.2:6001:2:0"

### /CAPTURE = C:/myfile.ccd:0

Activates the offline diagnosis system, where the path to the capture file is c:/myfile.ccd and the selected snapshot is "0" (/LOCAL or /REMOTE or /CAPTURE is mandatory)

/ENIEXPORT = config.eni
Activates the ENI export (Optional)

/EXIEXPORT = config.exi
Activates the EXI export (Optional)

**/VAREXPORT** = config.var

Activates the process variables export (Optional)

**/VARTYPE** = "csv|plc|pd|xml" (default=csv) Sets the format of the process variables export slave (for more information about the supported formats

### /EBIEXPORT = config.ebi

Activates the EBI (EniBuilder input file) export

#### /SCAN

Scans the bus after startup

#### /FORCEDIAG

Activates the diagnosis mode after startup. If diagnosis mode can not be activated the application will be closed.

```
/CYCLETIME ="1000"
```

Sets the master cycle time and locks it for the user

#### /AUTOSAVE

Current configuration will be saved automatically on exit (without asking the user if he want to discard all changes)

#### /ALLMASTERUNITS

If there is more than one master unit in the ecc, you can create an ENI file and variable export for all with this paramter

#### Samples

Run "EC-Engineer", scan automatically the local system with IP address 127.0.0.1, export ENI file and export process variables (as CSV Format) on closing

 $\hookrightarrow$  /VARTYPE="csv"

Run "EC-Engineer", scan automatically the remote system with IP address 127.0.0.1, Port 6000, MasterInstance 0, export ENI file and export process variables (as PLC Format) on closing

```
> EcEngineer.exe /FORCECFG="cfg_remote.ecc" /EMI="emi.xml"
```

→ /REMOTE=127.0.0.1:6000:0:0 /SCAN /ENIEXPORT="cfg\_remote.eni"

```
→ /VAREXPORT="cfg_remote.var" /VARTYPE="plc"
```

#### Run EC-Engineer and switch to diagnosis mode



# Run EC-Engineer and switch to offline diagnosis mode

## In case of an error, EC-Engineer will do the following

- Add error message to the log file (message level must be set to "All Messages")
- If the GUI is already visible, he will show a message box
- Set exit code to "-1"



# 10 Customization

# 10.1 Multi-Language-Support

EC-Engineer supports multiple languages, which can be changed at runtime. Adding support for further lanuages is quite easy because it is just a simple XML file which must be added to the kit.

All language files are stored in: "%ProgramFiles%/acontis\_technologies/EC-Engineer/ Languages/...

# EC-Engineer has also full UNICODE support, which means that it is also possible to support Asian languages:

൙ EC-Engineer []			– 🗆 X				
Datei <u>A</u> nsicht	<u>N</u> etzwerk <u>E</u> instellungen <u>H</u> ilfe						
Konfiguration	🛷 ENI-Export 🛛 🐺 EXI Export 🛛 💻 D	iagnose					
Projekt-Explorer		Geräte-Editor					
<ul> <li>Class-A Ma</li> </ul>	ster		ungsliste Trace-Daten Erweiterte Einstellungen Slave zu Slave Verteilte Uhren Tasks + Sync Units Daten Akquisition Motion				
	001 [EK1100] (1001)						
Slav	re_1002 [EL2008] (1002)	Allgemein					
Slav	re_1003 [EL2008] (1003)	Name	Class-A Master				
-	re_1004 [EL1014] (1004)	Zykluszeit [us]	1000 -				
	re_1005 [EL2004] (1005) re_1006 [EL1034] (1006)	Quell-MAC-Adresse					
	re_1007 [EL1018] (1007)						
-	re_1008 [EL2008] (1008)						
-	re_1009 [EK1122-0080] (1009)	Slaves sind mit dem lokalen Syst					
Slav	re_1020 [EK1122] (1020)	Link Layer	Ndis				
		Netzwerkadapter	EtherCAT-Test ( Intel(R) Ethernet Server Adapter I210-T1 )				
			Abwählen				
		Slaves sind mit einem Remotesy:					
		Protokoll	RAS *				
		IP-Adresse 127.0.0.1					
		Port	6000				
		Master-Instanz					
			Auswählen				
		Slaves simuliert (SiL)					
			Auswählen				
		Slaves sind aufgezeichnet					
		Aufzeichnungsdatei					
		Autzeichnungsdatei					
Klassische Ansicht	Flache Ansicht Topologie-Ansicht						
Informationen	<b>↓</b> ‡	Meldungen	<b>▼</b> [				
Gerätedaten		Severity Time Message					
Name	Class-A Master	INF 10:53:58 Master state ch	hange from 'Init' to 'Pre-Op'				
Beschreibung	EtherCAT Master Unit (Class A)	INF 10:53:54 Master state ch	hange from "Unknown" to "Init"				
Hersteller	acontis technologies GmbH	INF 10:53:54 Master state ch	hange from "Unknown" to "Init"				
		INF 10:53:50 Network scan s	successful - 26 slaves found				
		INF 10:35:22 All pending err					
	1	INF 10:35:22 All pending err					
Netzwerke: 1 Slaves:	26		Status: 🔷 🔍 Modus: KONFIGURATION   EXPERT				

# **10.2 Themes**

EC-Engineer supports multiple themes, which can be changed during compile time. Adding support for further themes is quite easy because a theme consists of a couple of XAML files which must be added to the kit.

Five themes are already included into EC-Engineer:

# IG Theme





🔎 EC-Engineer []		- D X					
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Configuration Mode 🛷 Export ENI 🛛 🐺 Export EXI	Kan Diagnosis Mode						
Project Explorer	Device Editor						
<ul> <li>Ulass-A Master</li> </ul>	Master Process Data Image Wa	tch list Trace Data Advanced Options Slave to Slave Distributed Clocks Tasks + Sync Units Data Acquisition Motion					
<ul> <li>Slave_1001 [EK1100] (1001)</li> </ul>	General	^					
Slave_1002 [EL2008] (1002)	Unit Name	Class-A Master					
Slave_1003 [EL2008] (1003)							
Slave_1004 [EL1014] (1004)	Cycle Time [us]	1000 •					
Slave_1005 [EL2004] (1005) Slave_1006 [EL1034] (1006)	Source MAC address						
Slave_1006 [EL1034] (1006)							
Slave_1008 [EL2008] (1008)							
<ul> <li>Slave_1000 [EE1000] (1000)</li> <li>Slave_1009 [EK1122-0080] (1009)</li> </ul>	Slaves connected to local syste	m					
<ul> <li>Slave_1020 [EK1122] (1020)</li> </ul>	Link Layer	Ndis					
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	Port						
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		Select					
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		Select					
	Slaves captured						
	Capture File						
Classic View Flat View Topology View		Select					
Short Info	<sup>‡</sup> Messages						
onore mile	Severity Time Message						
Information	seventy time wessage						
Name Class-A Master Description EtherCAT Master Unit (Class A)							
Vendor acontis technologies GmbH							
Networks: 1 Slaves: 26		State:    Mode: CONFIG EXPER					

Office 2010 Blue Theme



🛹 EC-Engineer []		- 0	×
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Project Explorer	Device Editor		
🔻 📙 Class-A Master	Master Process Data Image Wa	tch list Trace Data Advanced Options Slave to Slave Distributed Clocks Tasks + Sync Units Data Acquisition Motion	
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Slave_1002 [EL2008] (1002)	General		_
Slave_1003 [EL2008] (1003)	Unit Name	Class-A Master	
Slave_1004 [EL1014] (1004)	Cycle Time [us]	1000	•
Slave_1005 [EL2004] (1005)	Source MAC address	A0-36-9F-30-00-3B	
Slave_1006 [EL1034] (1006)			
Slave_1007 [EL1018] (1007)			
Slave_1008 [EL2008] (1008)	Slaves connected to local syster	_	
<ul> <li>Slave_1009 [EK1122-0080] (1009)</li> <li>Slave_1020 [EK1122] (1020)</li> </ul>			
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	Slaves captured		
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Description EtherCAT Master Unit (Class A)	1		
Vendor acontis technologies GmbH	]		
Networks: 1 Slaves: 26		State: • • Mode: CONFIG	EXPERT

Office 2007 Black Theme



← EC-Engineer []		- 0	×
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<ul> <li>Slave_1001 [EK1100] (1001)</li> </ul>			^
Slave_1002 [EL2008] (1002)	General		_
Slave_1003 [EL2008] (1003)	Unit Name	Class-A Master	
Slave_1004 [EL1014] (1004)	Cycle Time [us]	1000	-
Slave_1005 [EL2004] (1005)	Source MAC address	A0-36-9F-30-00-3B	
Slave_1006 [EL1034] (1006)			_
Slave_1007 [EL1018] (1007)			
Slave_1008 [EL2008] (1008)			
Slave_1009 [EK1122-0080] (1009)	Slaves connected to local system		
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		Deselect	
	Slaves connected to remote syste		
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	Slaves simulated (SiL)		
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	Slaves captured		
	Capture File		
Classic View Flat View Topology View		Select	~
Short Info 🗸 🔻	Messages		• 4
Information	Severity Time Message		
Name Class-A Master			
Description EtherCAT Master Unit (Class A)			
Vendor acontis technologies GmbH			
Networks: 1 Slaves: 26	l	Stater 🖉 🖉 Moder CONFIG	EVDERT

Office 2007 Sliver Theme



← EC-Engineer []			– 🗆 X				
<u>File View Network S</u> ettings <u>H</u> elp							
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💌 😃 Class-A Master	Master Process Data Image	Watch list Trace Data Advanced Options Slave to Slave Distributed Clocks	Tasks + Sync Units				
Slave_1001 [EK1100] (1001)			^				
Slave_1002 [EL2008] (1002)	General						
Slave_1003 [EL2008] (1003)	Unit Name	Class-A Master					
H Slave_1004 [EL1014] (1004)	Cycle Time [us]	1000					
Slave_1005 [EL2004] (1005)	Source MAC address	A0-36-9F-30-00-3B					
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Slave_1007 [EL1018] (1007)							
Slave_1008 [EL2008] (1008)							
Slave_1009 [EK1122-0080] (1009)	Slaves connected to local system						
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	Network Adapter	EtherCAT-Test ( Intel(R) Ethernet Server Adapter I210-T1 )	Ψ				
			Deselect				
	Slaves connected to remote system						
	Protocol	RAS	· · · · · · · · · · · · · · · · · · ·				
	IP Address	127.0.0.1					
	Port	6000					
	Master-Instance	0					
			Select				
	Slaves simulated (SiL)						
			Select				
	Slaves captured						
	Capture File						
Classic View Flat View Topology View	Capture The						
Short Info 🗸 🖡	Messages		<b>~</b> ↓				
Information	Severity Time Message						
Name Class-A Master							
Description EtherCAT Master Unit (Class A)							
Vendor acontis technologies GmbH							
Networks: 1 Slaves: 26		State:	Mode: CONFIG   EXPERT				

# Luna Theme

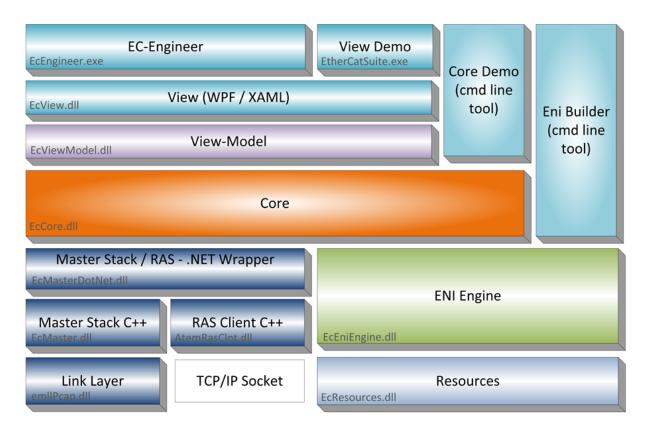


🛹 EC-Engineer []						- 0	×
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Configuration Mode 🔗 Export ENI 🛛 🐺 Export EXI	📕 Diagnosis Mode						
Project Explorer	Device Editor						÷
Class-A Master	Master Process Data Image	Watch list Trace Dat	Advanced Options	Slave to Slave	Distributed Clocks	Tasks + Sync Units	[4]
<ul> <li>Slave_1001 [EK1100] (1001)</li> </ul>	Master Process Data Image	Watch list linde bat	Advanced Options	Slave to Slave	Distributed clocks	lasks + Sync Onits	
Slave_1002 [EL2008] (1002)	General						
Slave_1003 [EL2008] (1003)	Unit Name	Class-A Master					
	Cycle Time [us]	1000					•
Slave_1005 [EL2004] (1005)	Source MAC address	A0-36-9F-30-00-3B					
Slave_1006 [EL1034] (1006)							
Slave_1007 [EL1018] (1007)							
Slave_1008 [EL2008] (1008)							
<ul> <li>Slave_1009 [EK1122-0080] (1009)</li> <li>Slave_1020 [EK1122] (1020)</li> </ul>	Slaves connected to local system						
P Slave_1020 [EK1122] (1020)	Link Layer	Ndis					·
	Network Adapter	EtherCAT-Test (Intel(R) Ethe	met Server Adapter I210-T1				·
						Deselect	
	Slaves connected to remote syst	am					
	Protocol	RAS					-
	IP Address	127.0.0.1					-
	Port	6000					
	Master-Instance						
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	Slaves simulated (SiL)						
						Select	
	Slaves captured						
Classic View Flat View Topology View	Capture File						
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Vendor acontis technologies GmbH							
Networks: 1 Slaves: 26					State	e: 🕘 🌒 Mode: CONFI	al 🕼 🤇

# **10.3 Integration into 3rd-Party Applications**

The software architecture of EC-Engineer is keept very modular:





This allows us adjust to customer needs and to integrate it into nearly every customer engineering environment. We can integrate the complete product or only parts of it, like:

### **View-Layer**

Only changes on XAML-level needed, only a few changes are necessary to get your own look and feel

#### ViewModel-Layer

For a customer which has already his own GUI or wants to be very flexible

#### **Core-Layer**

- Used with CoreDemo as a commandline tool
- Used directly as library by adding the C# assembly as reference to the exisiting project

#### **EniEngine-Layer**

- Used with EniBuilder as a commandline tool
- Used directly as library by adding the C# assembly as reference to the exisiting project

If you are interested in integrating the product or parts of the product into your existing framework, please contact us.



# **11 Licensing**

# 11.1 Third party Software

EC-Engineer is using the following third party software:

• Infragistics

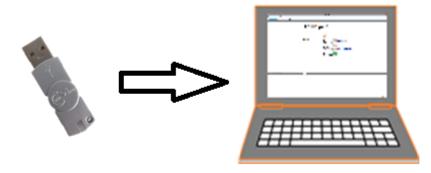
# **11.2 EC-Engineer License**

For EC-Engineer we have two license models:

- Node Locked License
- Floating License

# 11.3 Node Locked License

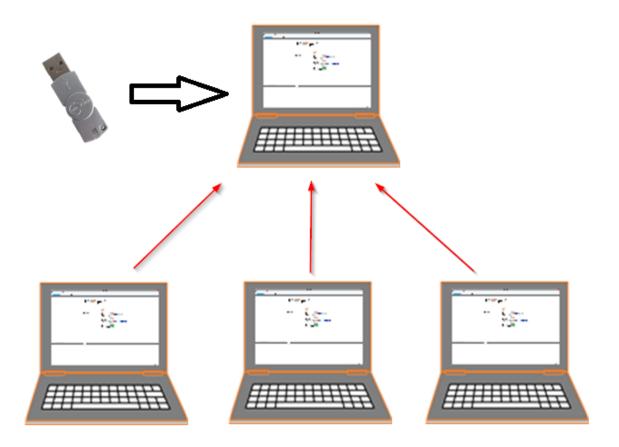
If you choose this license model, you need an USB dongle for every single computer. This dongle must be plugged into the computer where you want to use EC-Engineer.



# **11.4 Floating License**

If you choose this license model, you need only one USB dongle with multiple floating licenses. This dongle must be plugged into your license server and all client computers will connect to this license server.

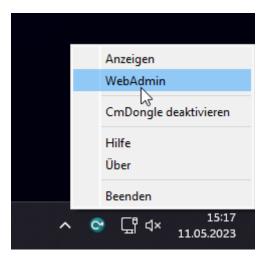




**Note:** This requires that the "WebAdmin" of the "Code Meter" is installed on the system. Please download and install the "Code Meter Runtime" from WIBU: https://www.wibu.com/

# **11.4.1 Configure License Server**

Install the "Dongle-Version" of EC-Engineer on your license server, plug-in your USB dongle and open the "WebAdmin":

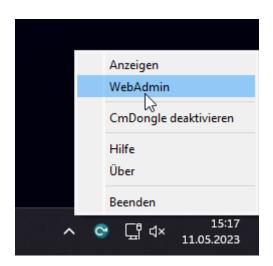


In the "WebAdmin" navigate to "Configuration Server", select the option "Run Network Server" and press *Apply*:

dmin   Server Access x + C (i) localhost 22352/configuration/server_access.html			✓ - Image: I
LUIBU Codel	Meter WebAc	dmin	C
Dashboard Container - License Monitoring - Diagnosis -	<ul> <li>Configuration 1 In</li> </ul>	fo	
Server Configuration Server Access	Basic >	<b>Ø</b>	📟 English (US) 🗡
Server Access License Access Permissions	Server 2 >	Server Access	
Network Server	Advanced	License Access Permissions	
O Disable			
3 O Enable Network Port: 22350			
• Enable	Apply Restore Defau	ults	

# **11.4.2 Configure Client Computer**

Install the "Dongle-Version" of EC-Engineer and open the "WebAdmin":



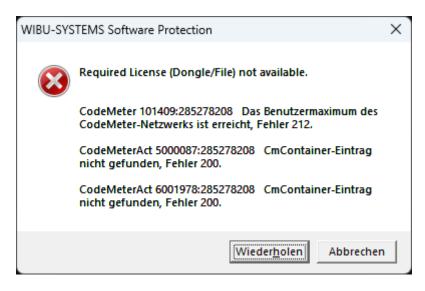
In the "WebAdmin" navigate to "Configuration Network", press *add*, enter your IP address of your license server and press *Apply*:



S WebAdmin   Server Search List x +			✓ – □ X	
← → C ③ localhost:22352/configuration/server_search_list.html			🖻 🖈 🔲 K 🗄	
	LUIBU CodeMeter WebAdmin			
SYSTEMS				
Dashboard Container v License Monitoring v Diagnosis v	Configuration 1	nfo	*	
Basic Configuration Server Search List	Basic 2	Server Search List	😮 🔤 English (US) 🗡	
Server Search List Proxy WebAdmin Backup	Server >	Proxy		
Server Search List	Advanced	WebAdmin		
1. Automatic server search (255.255.255)	<b>(iii</b> )	Backup		
et add new Server				
5 Ap	Restore Defaul	lts		
localhost22352/configuration/server_search_list.html (127.0.0.1) 🤣 🕕	Web	Admin Version: 7.20		

Now, you should be able to start EC-Engineer.

Note: If too many clients are connected you will, you will receive the following error message:



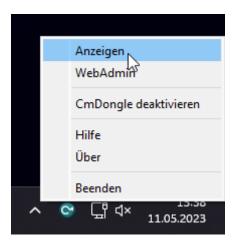
In that case, you should try to close unused EC-Engineer instances or buy more floating licenses.



# 11.5 License Update

# 11.5.1 Request License Update

Step 1: Install the "Dongle-Version" of EC-Engineer and open the "CodeMeter Control Center":



If the selected license is a virtual dongle, simply drag and drop the WibuCmLIF file onto the CodeMeter Control Center. Otherwise, the dongle should already be visible.

# Step 2: In the "CodeMeter Control Center" open the "CmFAS Assistent" by clicking on License Update:

😋 CodeMeter Kontrollzentrum			-		×
<u>D</u> atei A <u>k</u> tion <u>A</u> nsicht <u>H</u> ilfe					
Lizenz Ereignisse					
CmStick 3-6146866	Name:	CmStick			
	Serien-Nr.:	3-6146866			9
	Version:	CmStick 4.40			U
	Kapazität:	99 % frei (313400 Bytes)			
	Status:	🔿 😋 Deaktiviert			
		🔾 😋 Aktiviert solange angeschlossen			
		O 😋 Aktiviert			
	Lizenzaktualisierung	Auswerfen Kennwort ändern			
Der CodeMeter-Dienst wird ausgefü	hrt.			Web	Admin

Step 3: Now, follow the assistant until you can select a file name:



	?	×
<ul> <li>CmFAS Assistent</li> </ul>		
Willkommen beim CmFAS Assistenten!		
Der CodeMeter Field Activation Service (CmFAS) Assistent unterstützt Sie beim Hinzufügen, Ände von Lizenzen im Lizenzverwaltungssystem CodeMeter.	rn und Lösc	hen
Mit dem CmFAS Assistenten können Sie Lizenzanfragen erzeugen, die Sie z.B. per Email an den He Software schicken können. Sie können die erhaltenen Lizenzaktualisierungsdateien mit dem CmFA: Ihre Lizenzverwaltung einspielen und dem Hersteller das Einspielen mittels einer Quittung bestätig	S Assistente	
<u>W</u> eiter >		fe

Step 4: Select "Create license request":

	?	×
← ⓒ CmFAS Assistent		
Wählen Sie die gewünschte Aktion		
Lizenzanforderung erzeugen		
Wählen Sie diese Option, wenn Sie eine Lizenzanforderungsdatei erzeugen möchten, um diese Softwarehersteller zu schicken.	e an den	
🔿 Lizenzaktualisierung einspielen		
Wählen Sie diese Option, wenn Sie eine Lizenzaktualisierungsdatei vom Softwarehersteller erh diese einspielen möchten.	alten habe	n und
🔿 Quittung erzeugen		
Wählen Sie diese Option, wenn Sie dem Softwarehersteller das erfolgreiche Einspielen einer Lizenzaktualisierungsdatei quittieren möchten.		
<u>W</u> eiter >		lfe

Step 5: Select "Extend existing license":



	?	×
← ⓒ CmFAS Assistent		
Wählen Sie die Option für die Lizenzanforderung		
O Bestehende Lizenz erweitern		
Wählen Sie diese Option, wenn Sie eine bereits bestehende Lizenz verändern oder zu einer bere Lizenz eine weitere Lizenz des gleichen Herstellers hinzufügen möchten.	ts bestel	henden
🔘 Lizenz eines neuen Herstellers hinzufügen		
Wählen Sie diese Option, wenn Sie eine neue Lizenz hinzufügen möchten und von diesem Softwa noch keine Lizenz in dem ausgewählten Lizenzcontainer vorhanden ist.	reherste	ller
Weiter >	Hilt	fe

# **Step 6: Keep the selected the vendor:**

	?	×
← S CmFAS Assistent		
Wählen Sie den Softwarehersteller		
Acontis Firm Item (6001978) acontis technologies GmbH (101409)		
Wählen Sie den Softwarehersteller, an den Sie die Lizenzanforderungsdatei schicken möchten. Der He nur die Daten, die Sie hier auswählen. Sie können damit sicherstellen, dass der Hersteller nicht sieht, v Lizenzen Sie von anderen Anbietern besitzen.		sieht
<u>W</u> eiter >	Hil	fe

# Step 7: Select the file name:



		?	×
←	CmFAS Assistent		
	Wählen Sie den Dateinamen		
	:\Users\k.feifel\Desktop\3-6146866.WibuCmRaC		
	Wählen Sie den Dateinamen, unter dem Sie die Lizenzanforderungsdatei speichern möchten. Klicken Sie 'Fertigstellen', um die Datei zu erzeugen. Diese Datei können Sie dann z.B. per Email an den Softwareh schicken.	erstelle	auf r
	Anwenden	Hilf	è

# **Step 8: Finish the assistant:**

	?	$\times$
<ul> <li>CmFAS Assistent</li> </ul>		
Die Lizenzanforderungsdatei wurde erfolgreich erzeugt.		
Die Lizenzanforderungsdatei wurde erfolgreich erzeugt. Sie können diese Datei nun per Email an den		
Softwarehersteller schicken.		
Abschließen	н	ilfe
Abschilebert		

Step 9: Your license request file \* . WibuCmRaC has been successfully created. Please send it to sales@acontis.com



# 11.5.2 Install License Update

After you have been sent your license request file you will receive the license update file \* .WibuCmRaU.

Step 1: Connect your dongle.

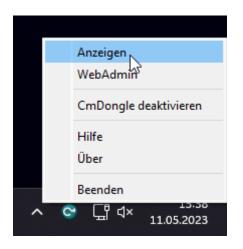
Step 2: Copy the license update file to your desktop.

# Step 3: Double-click on the license update file:



# **11.6 Dongle Firmware Update**

Step 1: Install the "Dongle-Version" of EC-Engineer and open the "CodeMeter Control Center":



Step 2: In the "CodeMeter Control Center" click on Update Firmware of selected Cm Dongle:



S CodeMeter Kontrollzentrum			_		×
<u>D</u> atei A <u>k</u> tion <u>A</u> nsicht <u>H</u> ilfe					
Lizenz Ereignisse					
CmStick 3-6146866	Name:	CmStick			
	Serien-Nr.:	3-6146866			9
	Version:	CmStick 4.40			U
	Kapazität:	99 % frei (313384 Bytes)			
	Status:	S Deaktiviert     S Aktiviert solange angeschlossen     S Aktiviert			
	Lizenzaktualisierung	Auswerfen Kennwort ändern			
Der CodeMeter-Dienst wird ausgefül	hrt.			Web	Admin

Step 3: Execute firmware update by pressing *OK*:

🞯 CodeMet	er	?	×
	Firmware-Aktualisierung	CarDonala	
	Die CodeMeter Firmware Aktualisierung aktualisiert Ihren ermöglicht Ihnen neue Funktionen bzw. behebt ggf. Prob Sie OK falls Sie Ihren CmDongle auf die neueste Version ak wollen. Die Aktualisierung kann einige Minuten dauern. B den CmDongle nicht ab, bevor der Vorgang beendet ist.	leme. Drücl ctualisieren	ken
	ОК	Abbre	chen

Step 4: Wait until firmware update was executed:



S CodeMeter Kontrollzentrum		—		$\times$
<u>D</u> atei A <u>k</u> tion <u>A</u> nsicht <u>H</u> ilfe				
Lizenz Ereignisse				
CmStick 3-6146866	Name: CmStick Serien-Nr.: 3-6146866 Version: CmStick 4.40 ©© CodeMeterCC ? × Firmware wird aktualisiert CmDongle nicht abziehen! Kap Status: ©© Deaktiviert ©© Aktiviert solange angeschlossen ©© Aktiviert solange angeschlossen			
Der CodeMeter-Dienst wird ausgefül	ırt.		Web	Admin

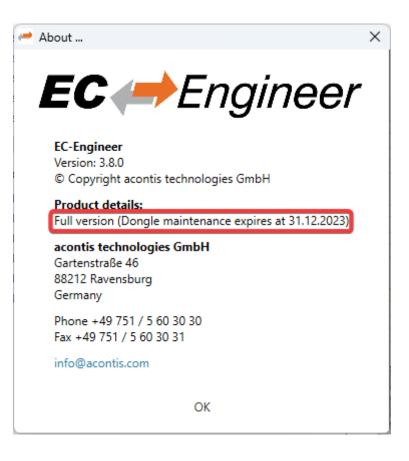
# Step 5: Firmware update was done and dongle can be removed:

🞯 CodeMete	r	?	×
i	<b>Information:</b> Die Firmware-Aktualisierung für den CmDongle 3-6146866 w	ar erfol	greich.
		0	

# **11.7 Expiration Date Dongle**

If you chosed a expiration dongle you can find your expiration date in the 'About Dialog'. If you have an unlimited dongle you will not see a date in the dialog.





If you see this date you can not use an Engineer which was released after the expiration date, but all older ones are possible.

### If you try to start an Engineer which is newer than the expiration date, you will get the following error:



# WIBU-SYSTEMS Software Protection



Required License (Dongle/File) not available.

CodeMeter 101409:285278208 Das Releasedatum befindet sich außerhalb des geforderten Intervalls, Fehler 77.

CodeMeterAct 5000087:285278208 CmContainer-Eintrag nicht gefunden, Fehler 200.

CodeMeterAct 6001978:285278208 CmContainer-Eintrag nicht gefunden, Fehler 200.





# 12 FAQ, Tips

# 12.1 Problems with install or uninstall

If you have a problem with the setup of the EC-Engineer remove the following keys and folders to uninstall EC-Engineer manually:

C:/Program Files (x86)/acontis\_technologies/EC-Engineer

C:/ProgramData/EC-Engineer

C:/Windows/Installer/{07985CE9-9024-422C-8E72-C449BFC33CA0}

#### &temp%

```
HKEY_LOCAL_MACHINE/SOFTWARE/Microsoft/Windows/CurrentVersion/Uninstall/
{07985CE9-9024-422C-8E72-C449BFC33CA0}
```

```
HKEY_LOCAL_MACHINE/SOFTWARE/acontis technologies/EC-Engineer
HKEY_LOCAL_MACHINE/SOFTWARE/Classes/Installer/Products/
9EC589704209C224E8274C94FB3CC30A
```

After these steps try to install EC-Engineer again.

# 12.2 Help in case of a problem

If you have a problem with EC-Engineer or something does not run as expected, please try first the following things:

- · Read messages in message window
- Increase message level Menu Settings All Messages
- Read log file for more information Menu Help Show Log File
- · Restart EC-Engineer and try to do it again
- Contact support by sending a mail to ecsupport@acontis.com and attach the following information
  - Project file .ecc
  - EC-Engineer Version Menu + Help + About
  - Log file Menu + Help + Show Log File
  - Short description how the reproduce it

# **12.3 Shortcuts**

EC-Engineer supports shortcuts for the most commonly used actions, like:

### Menu

- Ctrl + N: Create new project
- Ctrl + O: Open project
- Ctrl + S: Save project
- Alt + F4: Exit program



### Context menu of project explorer

- Ctrl + X: Cut slave including all subslaves
- Ctrl + C: Copy slave including E-Bus subslaves
- Ctrl + V: Paste (previously cut or copied) slave

# **12.4 Internal User Specific Settings**

EC-Engineer saves all user specific settings in a subfolder of the all users directoy %ALLUSERSPROFILE%/EC-Engineer like C:/ProgramData/EC-Engineer.

In this directory there is a XML file called User.myusername.xml. In this file, the user can find additional settings, which can be helpful for solving some problems:

### MasterUnitLocalCycleTime = 1

Bus cycle time of the internal master in milliseconds

# MasterUnitLocalWorkerSleepTimeMs = 100

Cycle time of the local master thread in milliseconds

### MasterUnitRemoteWorkerSleepTimeMs = 300

Cycle time of the remote master thread in milliseconds

### MasterUnitTimerNormalCount = 4

- Time shift to cycle time of the normal refresh cycle
- E.g. local master = 100 ms, normal refresh cycle is every 400 ms
- Used e.g. for updating master information, error counters of slave, ...

### MasterUnitTimerSlowerCount = 20

- Time shift to cycle time of the slower refresh cycle
- E.g. local master = 100 ms, slower refresh cycle is every 2 seconds
- Used e.g. for updating the slave information, EEPROM data, register data, ...

# MasterUnitTimerSlowestCount = 120

- Time shift to cycle time of the slowest refresh cycle
- E.g. local master = 100 ms, slower refresh cycle is every 12 seconds
- Used e.g. for updating the CoE Object Dictionary, ...

#### MasterUnitScanBusTimeout = 5000

Timeot for bus scan in milliseconds

#### MasterUnitMailboxTimeout = 5000

Timeout for mailbox access in milliseconds

#### MasterUnitStateChangeTimeout = 5000

Timeout for changing state machines in milliseconds

### MasterUnitRegisterTimeout = 3000

Timeout for register access in milliseconds

### MasterUnitProcessDataTimeout = 1000

Timeout for process data access in milliseconds



MasterUnitEepromTimeout = 3000 Timeout for EEPROM access in milliseconds

- MasterUnitRasCycleTime = 0 Internal RAS cycle time for polling
- MasterUnitRasWatchDog = 0 Internal RAS watchdog interval
- MasterUnitRasWdToLimit = 0 Internal RAS watchdog limit
- DiagGeneralErrorLvlLostLink = 10 Theshold value for the "Lost Link Errors", which leads to an error
- **DiagGeneralWarningLvlLostLink = 1** Theshold value of the "Lost Link Errors", which leads to a warning
- **DiagGeneralErrLvlRxError = 10** Theshold value for the "RX Errors", which leads to an error
- **DiagGeneralWarnLvlRxError = 0.001** Theshold value of the "RX Errors", which leads to a warning
- **DiagGeneralErrLvlInvalidFrame = 10** Theshold value for the "Invalid Frames", which leads to an error
- **DiagGeneralWarnLvlInvalidFrame = 0.001** Theshold value of the "Invalid Frames", which leads to a warning
- DiagGeneralErrLvlProcUnitErr = 1000 Theshold value for the "Processing Unit Errors", which leads to an error
- DiagGeneralWarnLvlProcUnitErr = 100
  - Theshold value of the "Processing Unit Errors", which leads to a warning

### MasterDebugMessageLevel = 0

Activates extended debug messages of the EC-Master (0 = Silent, 1 = Any, 2 = Critical, 3 = Error, 4 = Warning, 5 = Info, 6 = InfoApi, 7 = Verbose, 8 = VerboseCyc)

# GuiDebugMessageLevel = 0

Activates extended debug messages of the GUI (0 = Off, 1 = Errors, 2 = All)

### IndentXmlFiles = False

Activates indenting of XML files (makes exported XML files readable, but increases size)

### EnhancedUtf8Support = False

Activates the enhanced UTF-8 support, which might be necessary if characters will be not displayed correctly

# 12.5 FAQ

Here you can find solutions of possible problems:

- The integrated EC-Master does not react as estimated Increase the message level (Menu Settings All Messages) and try it again.
- EC-Engineer reports a message with ErrCode: 0x...

Error Codes comes directly from the EC-Master. If you want to know what to know how to solve this problem, please refer the manual of EC-Master.

• EC-Engineer reports the following message: Not all EtherCAT slave devices are in operational state Check if all slaves have a green icon. If the color is not green, open tab "Diagnosis Slave General". Here you can see the error state of the slave. If it has no error, try to change the state to OP again.



• EC-Engineer reports the following message: Changing topology failed: Bus configuration mismatch (ErrCode: 0x9811001E)

The configured bus and the currently connected bus does not match. Please open the 'Network Mismatch Analyzer' (Menu Network Network Mismatch Analyzer) to solve the problem.

• EC-Engineer reports the following message: Slave '...' has unexpected state (Current state: '...', Expected state: '...')

Select the slave and open the tab "General". Here you can see the error state of the slave. If it has no error, try to change the state again.

- Slave reports the error state: "Sync manager watchdog" (Diagnosis Slave General) You need a realtime operating system. If you still want to use your slave on Windows, you can turn off this watchdog (Slave->Advanced Settings: Set SM Watchdog = 0).
- How can I configure the modules of a BK1120 slave?

EC-Engineer supports only the MDP-Version of BK1120 slave. If you want to add this slave, enter "BK1120" into the search field, enable option "Show Hidden Slaves" and double-click on slave "BK1120 EtherCAT Fieldbus Coupler (MDP)" (Revision Number: 0x120001). The modules of this slave can be configured in tab "Modules" like in all other MDP slaves.

If you have one of the other versions of BK1120 and you want to use it, please contact our support.

• How can I update the firmware of my slave via FoE?

### For updating the firmware of your slave via FoE, please follow these steps:

- Enable diagnosis mode
- Set master state to INIT
- Select your slave, and set his state machine to BOOTSTRAP
- Enter path of file on slave (optional)
- Enter password (optional)
- Press button "Download" (it will open the FileOpen-Dialog, where you can choose the file which contains the new firmware and uploads this file)
- · Connect to local system is not possible

Is WinPcap / Npcap / NDIS installed?

Is at least one network adapter installed?

#### • Why is the process image size different between EC-Engineer and EC-Master?

EC-Engineer shows on tab *Process Data Image* not the real size of the process data image. It show only the offsets and the size of the variables.

If you want to get the real size of the process data image, which is used from EC-Master, you have to look into the ENI file: EtherCATConfig/Config/ProcessImage/Inputs/ByteSize or EtherCATConfig/Config/ProcessImage/Outputs/ByteSize. This is the offset + size of the last variable and additional administration data depending on the slaves which are used (ALStatus, DC Support, Mailbox, ...).

• EC-Engineer reports the following message: Failed to query EtherCAT Slaves. No slaves found. Verify that WinPcap is correctly installed.

Try to restart you operating system, because this is sometimes necessary if you e.g. using a USB network adapter

Increase the message level (Menu Settings All Messages)

# Turn on debug message of the master

- Stop "EC-Engineer"



- Set "MasterDebugMessageLevel" to "7" (verbose) in %ProgramData%/EC-Engineer/ user.myusername.xml
- Start "EC-Engineer" again
- EC-Engineer reports the following message: Network scan successful 0 slaves found. Make sure you have connected the input and not the output port of your first slave to the computer.

Open "Network and Internet Connections Network Connections" and open the properties of your network adapter and uncheck all protocols except "Internet Protocol (TCP/IPv4)"

Eigenschaften von EtherCAT-Test
Netzwerk Freigabe
Verbindung herstellen über:
Intel(R) Ethemet Server Adapter I210-T1
Konfigurieren
Diese Verbindung verwendet folgende Elemente:
<ul> <li>Qo S-Paketplaner</li> <li>Internetprotokoll, Version 4 (TCP/IPv4)</li> <li>Microsoft-Multiplexorprotokoll für Netzwerkadapter</li> <li>Microsoft-LLDP-Treiber</li> <li>ECAT Protocol Driver for NDIS</li> <li>Internetprotokoll, Version 6 (TCP/IPv6)</li> <li>Antwort für Verbindungsschicht-Topologieerkennung</li> </ul>
Installieren Deinstallieren Eigenschaften
Beschreibung A NDIS 6 filter driver and WFP callout driver to support packet capturing and sending
OK Abbrechen

Do you have TwinCAT installed on this machine?

**Open "Compatible Devices":** 



General Adapter Et	herCAT Online CoE - Online
Network Adapte	er
	OS (NDIS) OPCI OPRAM
Description:	EtherCAT (TwinCAT-Intel PCI Ethernet Adapter (Gigabit))
Device Name:	\DEVICE\{C3BBE6DD-ADC2-4306-AA82-07F84E7E1BEF}
PCI Bus/Slot:	Search
MAC Address:	00 15 17 86 81 b7 Compatible Devices
IP Address:	192.168.1.23 (255.255.255.0)
	Promiscuous Mode (use with Wireshark only)
	Virtual Device Names
Adapter Referen	nce
Adapter:	
Adaptor.	
Freerun Cycle (ms):	4

# Uninstall or disable the "TwinCAT RT-Ethernet Adapter" for your network adapter:



Installation of TwinCAT RT-Ethernet Adapters	×
Ethernet Adapters          Installed and ready to use devices(realtime capable)         Installed and ready to use devices(for demo use only)         Installed and ready to use devices(for demo use only)         Compatible devices         Compatible devices         Ethernet - Thinkpad USB 3.0 Ethernet Adapter         Ethernet 2 - Npcap Loopback Adapter         Ethernet 3 - Npcap Loopback Adapter         Disabled devices         Ethernet 3 - TwinCAT-Intel PCI Ethernet Adapter         Ethernet 3 - Npcap Loopback Adapter         Ethernet 3 - TwinCAT-Intel PCI Ethernet Adapter (Gigabit) #2	Update List Install Update Bind Unbind Enable Disable Show Bindings

If this doesn't help, try to disable the "TwinCAT RT-Ethernet Driver" in the properties of your network adapter and reboot your system.

Run EC-Engineer with administrative rights? Does it help?

Do you have a some kind of security software (like firewall, antivirus, ...) installed on this machine?

Try to turn it off and check if problem is solved

**Do you have problems on sending or receiving pakets?** Install "Wireshark" and check which pakets are missing

### Do you have only problems on sending packets?

Try to exclude ethernet protocol type "0x88a4" from your firewall. For more information see https://en.wikipedia.org/wiki/EtherCAT/

Try it with Npcap instead of WinPcap. Make sure you chose "Install Npcap in WinPcap API-compatible Mode"

• How can I create ENI files for slaves from the Beckhoff CX5000 series?

The ENI file of those slaves must start with an Ebus slave, but EC-Master exports only an MII port. This problem can be solved by first adding a helper slave "EK1200". The "real" EBus slaves can be connected afterwords to this helper slave.

• WebAdmin in Dongle-Version shows page not found, what can I do? You have to download and install the Code Meter Runtime from WIBU https://www.wibu.com/

# • UTF8 characters e.g. in variables or PDOs will be not displayed correctly

This requires the enhanced UTF-8 support and can be enabled by setting "EnhancedUtf8Support = True", (see *Internal User Specific Settings*)