

KPA EtherCAT Studio 2 Advantages

KPA EtherCAT Studio 2 supports all functionality of KPA EtherCAT Studio 1 and provides a set of new features that widen the abilities of the application, makes the work with it advanced, easier, and user oriented.

In version 2 we revised architecture an do our best to avoid all limitations of previous version and improve the extend Studio functionality.

In comparison with the Studio 1 the following features were implemented in Studio 2:

Slave Library

uESI

KPA EtherCAT Studio 2 gives an opportunity to create user's slaves descriptions (uESI-s) based on ESI-s (EtherCAT Slave Information XML files) provided by vendors. uESI feature allows the user to edit slave's description: rename the slave, change PDO-s configuration and other parameters, add uESI attributes etc.

A set of uESI-s is called Slaves Library collection. The user can load it from ESI-s and load/save it from/as KPA ESIs Storage (XML file) or MS SQL Storage. It is possible to edit the collection: export, remove and clone a separate uESI or import uESI-s/ESI-s from different sources.

Slaves Modules Image: Active collection Active collection Image: Active collection New collection from Image: Active collection from Image: Active collection from Image: Active collection MSSQL Storage Image: Active collection Image: Active collection	Slaves L	Library		џ	х
Active collection	Slaves	Modules			
	±. 🗸	Active collection New collection New collection from Load collection from Save collection as Clear collection Reload collection			
Image: Section series Image: Section series Image: Section series Image: Section series	·····································	Settings View Import slave(s) from Export slave(s) Remove Del Clone slave	H Hu. Co. oHG		

The user may create a few collections but only the active one is used while scanning the bus configuration and adding a slave to the Configuration Tree with the help of the shortcut menu.

uESI attributes

It is possible to add attributes to uESI-s collection, assign them to slaves and then use these attributes according to the user's needs, for example:

- to build the collection tree
- to find a uESI in the collection
- to select a uESI while applying another ESI

Settings	- 🗆 ×
Attributes Add Edit Remove	
Name User's_group Sensors Temperature Pressure Time Velocity Speed	View Sensors Attributes tree Attributes tree Pressure Time Velocity Speed

Library loading performance

In comparison with Studio 1 in Studio 2 the Slaves Library loading became faster and the Salve Library takes up less space thanks to new function that allows to read ESI partially and load only those setting that are required.

Search

Appears the possibility to search slaves by its name or part of it or call up the history of searches.

To find the necessary Slave, user should enter the Slave name or part of it into the search bar of the Slave Library pane.

Slaves li	brary	<mark>џ</mark> х
Slaves	Modules	
EL3201		X
BECK	Beckhoff Automation GmbH & Co. KG	
ė	Analog Input Terminals (EL3xxx)	
	👜 📲 EL3201 1Ch. Ana. Input PT100 (RTD) (R: 0x160000) : "KK"	
	🛓 📲 EL3201 1Ch. Ana. Input PT100 (RTD) (R: 0x120000) : "KK"	
	👜 📲 EL3201 1Ch. Ana. Input PT100 (RTD) (R: 0x110000) : "KK"	
	🛓 📲 EL3201 1Ch. Ana. Input PT100 (RTD) (R: 0x100000) : "KK"	
	🗄 📲 EL3201-0010 1Ch. Ana. Input PT100 (RTD), High Precision (R: 0x16000A) : "KK"	
	🗄 📲 EL3201-0010 1Ch. Ana. Input PT100 (RTD), High Precision (R: 0x10000A) : "KK"	
	EL3201-0010 1Ch. Ana. Input PT100 (RTD), High Precision (R: 0x12000A): "KK"	
	EL3201-0010 1Ch. Ana. Input PT100 (RTD), High Precision (R: 0x11000A): "KK"	
	EL3201-0020 1Ch. Ana. Input PT100 (RTD), High Precision, calibrated (R: 0x160014) : "KK"	
	EL3201-0020 1Ch. Ana. Input PT100 (RTD), High Precision, calibrated (R: 0x120014) : "KK"	
	EL3201-0020 1Ch. Ana. Input PT100 (RTD), High Precision, calibrated (R: 0x110014) : "KK"	
	ia	



The search history saves the last nine quires. To call up the history of searches, right-click the search bar.

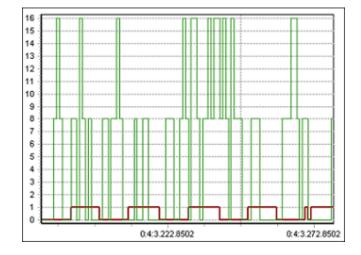
Slaves librar	у	4 х
Slaves Mo	dules	
		X
Cut		1 & Co. KG
Сору	,	Electronic GmbH
Paste		1 GmbH & Co. KG
- aste		_
Clear	history	
3102	Ctrl+1	
1904	Ctrl+2	GmbH
3210	Ctrl+3	
1100	Ctrl+4	orks
5100	Ctrl+5	esstechnik GmbH

Run time data logger

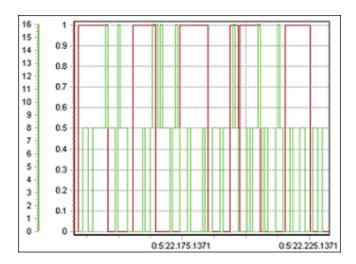
This tool, in comparison with the Data logger presented in Studio 1, permits to observe signals variation in run-time mode. As well there is an opportunity to set the type of chart: Line, Multiple axes or F(x). The set of displayed signals is selectable. It is possible to set Viewing interval before logging begins. After logging stops, logged data (changing signals) may be reviewed again. Just move on the time line.

🖌 RunTime Data	Logger	-	
Logging			
Master	Master 1		~
Chart type	F(x) axis chart		~
Time source	 Master time 	O Local time	
			Create chart

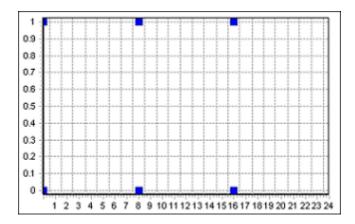
• Line chart – to display all signals in the same coordinate system. Vertical axis displays signals values, horizontal axis displays time values.



• Multiple axes chart – to display each signal in its own coordinate system. There are several vertical axes each representing values of one signal, and horizontal axis represents time values.



• F(x) chart – to display signals values as a scatter chart where each axis represents the values of a certain signal. For this type at least two signals must be selected for displaying. Then signals may be assigned to the axes.



The set of displayed signals is selectable.

Select signals				
Filter				
Slave: All	- Chan	nel:	•	
Slave 2 (EL1002).Ch Slave 2 (EL1002).Ch Slave 3 (EL3102).Ch Slave 3 (EL3102).Ch Slave 3 (EL3102).Ch Slave 3 (EL3102).Ch	nannel 2.Input nannel 1.Status nannel 1.Value nannel 2.Status	>> > < <	Slave 3 (EL3102).Channel 1 Slave 3 (EL3102).Channel 2	

The Tool gives an opportunity to set Viewing interval before logging begins. After logging stops, logged data (changing signals) may be reviewed again selecting the point on the time line and saved as *.emlog file.

Custom and virtual Master/Slave variables

There is an opportunity in Studio 2 to create custom Master and Slave variables. All variables are displayed in Master's/Slave's Variables tab.

Slave Plug-ins	Variables FMMU/SM	Mailbox	Init commands	Distribute	ed Clock	Memory
Directi	ion: Output					
Name			-	Туре	Bits	PI offset
SANC	Add to watch Get snapshot			NT	16	0x0000
	Set value Force value Unforce value	Add	E	dit	Re	move
D	Unforce all values	_				
N	Create virtual variable			Туре	Bit s	PI offset
S S S	Split variable Combine variables Change data type	ed	1	BOOL BOOL BOOL	01 01 01	0x000c 0x000d 0x000f
<						>
		Add	Ec	dit	Re	move
	Create a new virtu	ial variable		?	×	

Create a new vir	tual variable	?	\times
Name:	New Variable 1		
Category:	VirtualInput	\sim	+
Parent Variable:	Mapped to PI memory.AL Status		\sim
Offset:	0		* *
Data Type:	BOOL		\sim
	Bit Size	e: 1	
	ОК	Cano	el

Using the buttons Add, Edit, Remove, it is possible to manage the list of variables. There are several examples of these variables usage:

- 1. For customer's application needs.
- 2. Master diagnostics. You may create a pre-defined Master variable (see Master documentation) and monitor changing its value to analyze behavior/state of the bus.
- 3. For plugin's usage. Customer's plugin may store some data in these variables to be used for auxiliary calculation/processing.

To monitor the variable's value changing you may use the Data Logger or Runtime Data Logger tools that allow to view a chart of the changing.

Getting list of Master parameters

Studio 2 allows to get a list of parameters from Master in online mode and view them on the Parameters Tab.

Mas	ter "Master 1"						
Master	Parameters	State	Statistics	Variab	les	PI Variables	Process Image
	lpdate data						
Co	ECompleteAccess	Timeout	ls		1200	00	
der	mo.checkperiod.m	illisecond	8		3600	0000	
dia	gnostics.slaveerro	rcounters	enable.		1		
eca	atperformance.cor	ntext			2147	7483648	
eca	atperformance.cyc	les			1000)	
eca	atperformance.sch	eduler.ad	apterindex		0		
eca	atperformance.test	s					
eca	atrouter.polling				0		
eca	atslavepdo.skipinv	alid.offset			0		
eca	atslavepdo.skipinv	alid.size			0		
eca	atslavepdo.skipinv	alid.stora	ge		0		
eca	atslavepdo.skipinv	alid.type			0		
eca	atstatistics.collect				255		
eca	atstatistics.collect	driver			1		

Diagnostics and Statistics based on Master 2.0 API

Diagnostics functionality

Diagnostics functionality (diagnostic data from Master and slaves) in Studio 2 has been implemented based on Master 2.0 Event Handler. Representation of Master's diagnostic data (Master's State Tab) has been updated as depicted below.

M	aster "Master 1"					→ ×
Master	Parameters	State Statistics	Variables	PI Variables	Process Image	Tasks/Sync Units
Ethe	rCAT state machine					
						Init
Curre	nt state:					Pre-Operational
Init						Safe-Operational
Requ	lested state					Operational
Init						Bootstrap
Dia	gnostics					
0	Send/receive error					
٥	Connection lost					
0	Wrong configuration	n				
٥	Slave to slave comm	munication timeout				
٥	Default input values	ŝ				
0	Wrong Outputs					



Statistics functionality

Statistics functionality in Studio 2 has been implemented based on Master 2.0 API. New statistics is displayed in Master's Statistics Tab and represents statistics separately (in different sub-tabs): from the bus, from main and redundant NICs that are used by Master (or only main NIC if redundant one is not used), for Default and user-created tasks.

Mast	er "Master 1'	'				
Master	Parameters	State	Statistics	Variables	PI Variables	Process Image
Bus	Local Area Co	nnection 2	Default Tas	k		
Busi	nformation					
		Send err	ors	0		
	I	Receive em	ors	0		
Bus	load (%)					
		0.00%				
CPU	usage (%)					
		0.00%				
	Reset statistics		Update s	tatistics)	

Updated Diagnostics and Statistics data are represented in Studio 2 while working with Master 2.0 or higher. In case of working with previous Master versions (for example v1.5) Studio represents the obtained data in the old style.

Tasks / Sync units Tab

Studio 2 provides an opportunity to configure PI data update in certain time by using tasks and sync units. The corresponding tab has been added and it allows to create tasks and sync units and assign them to slave's sync units (set in ESI file).

ster	Variables	Init commands	Mailbox	Process Ima	age Tasks/Sy	ync Units	Cyclic Di	stributed Clocks Power	
Slave	es								
Dev	vice		Sync Uni	t Name	Task				
Slav	ve 2 (EL6900)		Default S	yncUnit	Cyclic Task 1				
Slav	ve 3 (EL2904)		Default S	iyncUnit	Cyclic Task 2	2			
Sla	ve 4 (EL1904)		Default S	iyncUnit	Cyclic Task 3	3			
Sla	ve 5 (EL3102)		Default S	iyncUnit					
1		lt SyncUnit (Slave	5 (EL3102))) ~	Task:	<u> </u>	~		
1		lt SyncUnit (Slave	5 (EL3102))) ~	Task:	Sync	∽ c Units		
1		lt SyncUnit (Slave Name	5 (EL3102)) Priority	Cyclic Time	Task:	Sync		Name	Separate Sync Unit
asks	3					Sync	c Units	Name Default SyncUnit (Slave 2 (Separate Sync Unit Yes
asks	Order in Pi	Name	Priority	Cyclic Time	Cyclic Tim		c Units Order in PI		
asks ♠	Order in Pi	Name Default Task	Priority 1	Cyclic Time 1000	Cyclic Tim 0		c Units Order in PI 0	Default SyncUnit (Slave 2 (
asks	Order in Pi 0 1	Name Default Task Cyclic Task 1	Priority 1	Cyclic Time 1000 5000	Cyclic Tim 0 2000	•	C Units Order in PI 0 0	Default SyncUnit (Slave 2 (Default SyncUnit (Slave 3 (Yes No
asks	Order in Pi 0 1 2	Name Default Task Cyclic Task 1 Cyclic Task 2	Priority 1 2 1	Cyclic Time 1000 5000 12000	Cyclic Tim 0 2000 4000	•	C Units Order in PI 0 0 0	Default SyncUnit (Slave 2 (Default SyncUnit (Slave 3 (Default SyncUnit (Slave 4 (Yes No No
Sync Tasks	Order in Pi 0 1 2	Name Default Task Cyclic Task 1 Cyclic Task 2 Cyclic Task 3	Priority 1 2 1 1	Cyclic Time 1000 5000 12000 3000	Cyclic Tim 0 2000 4000 1000	•	C Units Order in PI 0 0 0	Default SyncUnit (Slave 2 (Default SyncUnit (Slave 3 (Default SyncUnit (Slave 4 (Yes No No

In Studio 2 Slave's sync units are displayed in the slave's FMMU/SM tab:

MMU/SM PD	C				
Sync Managers	configurat	ion			
SM	P. start	Length	Data	Buffer mode	Sync Unit
SM0:MBoxOut	0x1800	246	0x26000100	1-buffer	
SM1:MBoxIn	0x18F6	246	0x22000100	1-buffer	
SM2:Outputs	0x1000	0	0x24000000	3-buffer	Default SyncUnit
SM3:Inputs	0x1100	6	0x20000100	3-buffer	Default SyncUnit

Global search

This feature provides a text search among the EtherCAT objects (e.g. slave name, PDO/PDO Entry name, Master/slave variables etc.). To set parameters of search and run it, click the Find button on the buttons toolbar.

i 🗋 🖻 💾 🗳 🌡 🗟 ¥ 🔗 🧶 🎝	;≓⊳ ⊴ ∣≎
Find Global	×
Find what: CAN gateway	~ Match case
 Everywhere ∴ Configuration Tree ∴ Properties Viewer ∴ Slaves Library 	
Find	Cancel

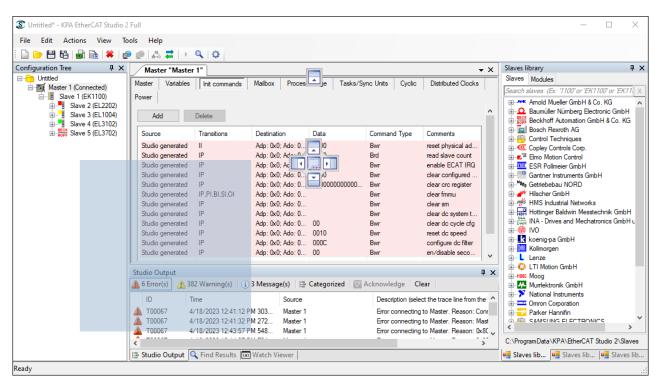
The result of search is shown in the separate window Find Results and allows viewing the result by double-click the item.

Find Results				
Find what	Туре	Control	Path	
KPA EtherCAT 4-CAN Gateway	SlaveName	Slaves Library	Slaves library\koenig-pa GmbH\EtherCAT CAN gateway\KPA EtherCAT 4-CAN Gateway Rev:1	
KPA EtherCAT 4-CAN Gateway	SlaveName	Slaves Library	Slaves library 1\koenig-pa GmbH\EtherCAT CAN gateway\KPA EtherCAT 4-CAN Gateway Rev:1	
KPA EtherCAT 4-CAN Gateway	SlaveName	Slaves Library	Slaves library 2\koenig-pa GmbH\EtherCAT CAN gateway\KPA EtherCAT 4-CAN Gateway Rev:1	



Dockable windows

In Studio 2 all parts of main window (Configuration tree pane, Configuration window, Slaves Library pane, Outputs window, Watch Viewer window) are dockable – may be docked to one of the sides of the main window or used as separate windows.



New automation interface (API).

In Studio 2 a new extended API based on EtherCAT Specification has been implemented.

Dashboard

In a version 2 of KPA EtherCAT Studio appears a new Dashboard tab. The window was added to display bus slaves properties and bus ports parameters. Ports searching includes diagnostic, in online mode the user can detect the errors in the ports.

User can select General (slave properties) or Port statics (ports parameters) mode.

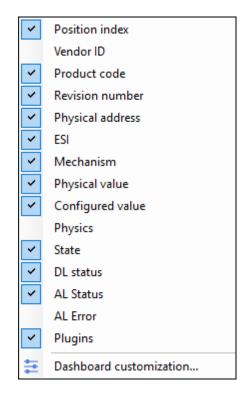
· - ·· · ·	0.1			ena ena									
Dashboard mode	General		🖌 🗧 🖛 🖃 📂	88									
Slave name	Position index	Vendor ID	Product code	Revision number	Physical address	ESI	Mechanism	Physical value	Configured value	Phy	State	DL status	AL Error
Slave 5 (EK1100)	0 (0x0)	2 (0x2)	72100946 (0x44C2C52)	1179648 (0x120000)	1001 [0x3E9]	Yes	Configured station alias	0x00000000	0x00000000	YKY	UNDEFINED	No signals detected	No
Slave 8 (EL2004)	1 (0x1)	2 (0x2)	131346514 (0x7D430	1179648 (0x120000)	1002 [0x3EA]	Yes	Configured station alias	0x00000000	0x00000000	KK	UNDEFINED	No signals detected	No
Slave 7 (EL2004)	2 (0x2)	2 (0x2)	131346514 (0x7D430	1179648 (0x120000)	1003 [0x3EB]	Yes	Configured station alias	0x00000000	0x00000000	KK	UNDEFINED	No signals detected	No
Slave 3 (EK1100)	3 (0x3)	2 (0x2)	72100946 (0x44C2C52)	1179648 (0x120000)	1004 [0x3EC]	Yes	Configured station alias	0x00000000	0x00000000	YKY	UNDEFINED	No signals detected	No
Slave 4 (EK1122)	4 (0x4)	2 (0x2)	73542738 (0x4622C52)	1179648 (0x120000)	1005 [0x3ED]	Yes	Configured station alias	0x00000000	0x00000000	KYKY	UNDEFINED	No signals detected	No
Slave 2 (EK1100)	5 (0x5)	2 (0x2)	72100946 (0x44C2C52)	1179648 (0x120000)	1006 [0x3EE]	Yes	Configured station alias	0x00000000	0x00000000	YKY	UNDEFINED	No signals detected	No
Slave 6 (EK1100)	6 (0x6)	2 (0x2)	72100946 (0x44C2C52)	1179648 (0x120000)	1007 [0x3EF]	Yes	Configured station alias	0x00000000	0x00000000	YKY	UNDEFINED	No signals detected	No
Slave 10 (EL2004)	7 (0x7)	2 (0x2)	131346514 (0x7D430	1179648 (0x120000)	1008 [0x3F0]	Yes	Configured station alias	0x00000000	0x00000000	KK	UNDEFINED	No signals detected	No
Slave 11 (EL2004)	8 (0x8)	2 (0x2)	131346514 (0x7D430	1179648 (0x120000)	1009 [0x3F1]	Yes	Configured station alias	0x00000000	0x00000000	KK	UNDEFINED	No signals detected	No
Slave 9 (EL2004)	9 (0x9)	2 (0x2)	131346514 (0x7D430	1179648 (0x120000)	1010 [0x3F2]	Yes	Configured station alias	0x00000000	0x00000000	KK	UNDEFINED	No signals detected	No
Slave 1 (EK1100)	10 (0xA)	2 (0x2)	72100946 (0x44C2C52)	1179648 (0x120000)	1011 [0x3F3]	Yes	Configured station alias	0x00000000	0x00000000	YKY	UNDEFINED	No signals detected	No

Mas	ster 1 'Ports diagno	ostic' dashboard					
Da	shboard mode	orts diagnostic	~ 🔁	+ -	🗁 💾	6	
Sla	ve name	Physical address	Diagnostics	Rx Errors	Fwd Errors	Invalid Frames	Lost Links
	Slave 1 (EK1100)	0x3E9	Offline	0	0	0	0
	port 0: Y (X1 IN	[]		0	0	0	0
	port 1: K			0	0	0	0
	port 2: Y (X			0	0	0	0
	Slave 2 (EL2252)	0x3EA	Offline	0	0	0	0
	port 0: K			0	0	0	0
	port 1: K			0	0	0	0
	Slave 3 (EL2002)	0x3EB	Offline	0	0	0	0
	port 0: K			0	0	0	0
	port 1: K			0	0	0	0
	Slave 4 (EL2202)	0x3EC	Offline	0	0	0	0
	port 0: K			0	0	0	0
	port 1: K			0	0	0	0
	Slave 5 (EK1100)	0x3ED	Offline	0	0	0	0
	port 0: Y (X1 IN	[]		0	0	0	0
	port 1: K			0	0	0	0
	port 2: Y (X			0	0	0	0
	Slave 6 (EL4132)	0x3EE	Offline	0	0	0	0
	port 0: K			0	0	0	0
	port 1: K			0	0	0	0
±	Slave 7 (EL3102)	0x3EF	Offline	0	0	0	0
±	Slave 8 (EL3702)	0x3F0	Offline	0	0	0	0
±	Slave 9 (EL1004)	0x3F1	Offline	0	0	0	0

In KPA EtherCAT Studio Premium it is possible to create new dashboard by clicking 📳

There is an opportunity to load another settings from the folder by clicking b. As well, the user can save current settings to the XML file to use them in the future by clicking the terms of terms

Besides, the user can select which column should be displayed in the dashboard window, right click any column name and fill corresponding check boxes.



Dashboard customization is accessible in KPA EtherCAT Studio Premium by clicking 들.

	?	×
Dashboard name: General Dashboard name: General Column customization Visible columns: Visible columns: Position index Vendor ID Product code Revision number Physical address ESI Mechanism Physical value Physics State DL status AL Status AL Error Plugins	? Check al Uncheck a Invert all	l
Reset column width		
Ok	Cance	

Detailed progress dialogs

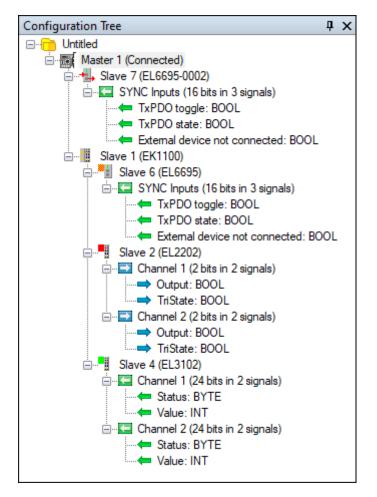
In Studio 2 we decide to visulize the project opening, PDO loading, bus scanning, and attaching the Master processes to let user know about the status of the loading. During project opening, PDO loading, bus scanning or attaching the Master, appear the progress dialogs where user can oversee the progress or break up the process.

Attach Master 1	Attach Master 1
Upload Eni to Master Cancel	Reading online configuration from Slave 1 (EL6695-0002) Completed: 0/1 Cancel

As can be seen, additionally, were added messages about reading OD via SDO while attaching.

Arrays elements

Studio 2 provides the ability to observe array variables in the Configuration tree. The user can see the type, length, and signals quantity there.



Additionally, the user can set default value for array elements.

Plugins

M2M

In comparison with Studio 1 in Studio 2 appears automatic configuration for secondary device during M2M plugin activation and support of arrays for EL6692/EL6695 including arrays > 255 bits.

CAN interface

In Studio 2 the ESD CAN-EtherCAT device is supported in the CAN interface plugin. This update allows to configure the ESD CAN-EtherCAT device to work with a CAN bus.

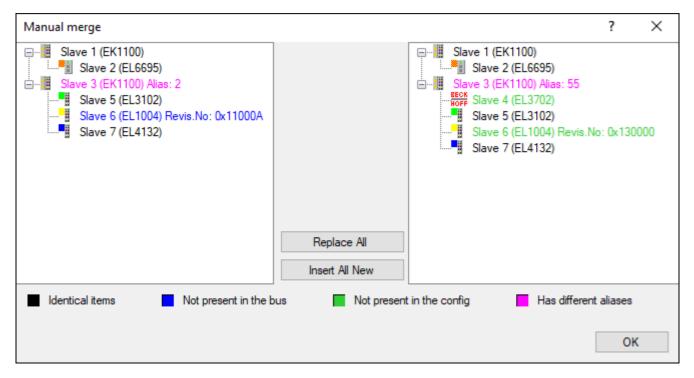
Master Init commands

In Studio 2 appears new feature and corresponding tab that provides the possibility to add Init command to Master.

Configuration W	/indow				-
Naster Parameters	s Variables	Init commands Mailt	oox Process Image	Tasks/Sync Units	Cyclic Distributed Clocks Power
Add	Delete				
-	_	_	_		-
Source	Transitions	Destination	Data	Command Type	Comments
Studio generated	11	Adp: 0x0; Ado: 0	0000	Bwr	reset physical address
Studio generated	IP	Adp: 0x0; Ado: 0	0000	Brd	read slave count
Studio generated	IP	Adp: 0x0; Ado: 0	0400	Bwr	enable ECAT IRQ
Studio generated	IP	Adp: 0x0; Ado: 0	0000	Bwr	clear configured addresses
Studio generated	IP	Adp: 0x0; Ado: 0	000000000000000000000000000000000000000	Bwr	clear crc register
Studio generated	IP,PI,BI,SI,OI	Adp: 0x0; Ado: 0		Bwr	clear fmmu
Studio generated	IP	Adp: 0x0; Ado: 0		Bwr	clear sm
Studio generated	IP	Adp: 0x0; Ado: 0		Bwr	clear dc system time
Studio generated	IP	Adp: 0x0; Ado: 0	00	Bwr	clear dc cycle cfg
Studio generated	IP	Adp: 0x0; Ado: 0	0010	Bwr	reset dc speed
Studio generated	IP	Adp: 0x0; Ado: 0	000C	Bwr	configure dc filter
Studio generated	IP	Adp: 0x0; Ado: 0		Bwr	en/disable second physical address

Manual merge

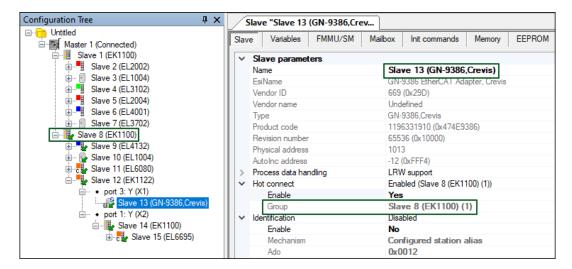
In Studio 2 appears an opportunity of the Slaves manual merge during the bus configuration in online mode. The window allows the user to add slaves to the resulting configuration manually. To replace all items in the manual configuration by the bus configuration items use the Replace All button. The items stand in the same order as on the bus. The Insert All New button allows to add to the current Studio configuration the items that are missed there. The items inserted to the places corresponding to their places on the bus.



The current Studio configuration is displayed in the left pane while the bus configuration – in the right one. The colors of the slaves show the slaves status in the configurations.

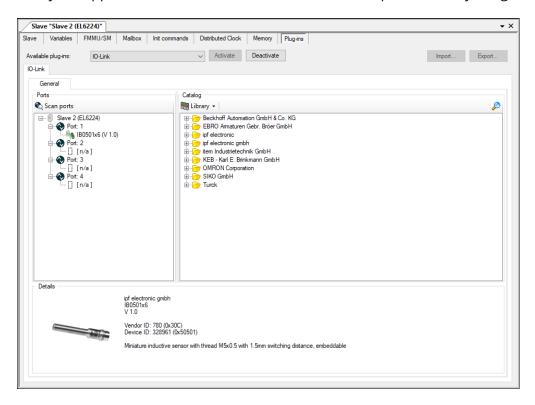
Hot-connected groups

In EtherCAT Studio 2 was added a possibility to create not only hot-connected slaves or segments, but also hot-connected groups.



IO-Link

Support for IO-Link protocol devices was added to enhance flexibility in managing and automating industrial devices. It is now possible to configure IO-Link device directly within the plugin. A built-in expandable library of supported IO-Link devices was also added for quick and easy integration.



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email: sales@koenig-pa.de tel.: +49 9128 725 631 tel.: +49 9123 960 5796 All company processes, from a product order to technical support, are managed according to our quality management system.

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