

AMKmotion TC3 startup with AMKmotion devices Software description

Version: 2023/27 Part no.: 207197 Translation of the "Original Dokumentation"



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Product status:	Product (part Software no.)						
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		•					
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	For fast and reliable troubleshooting, you can help us by informing our Customer Service about the following:						
	Type plate data for each unit						
	Software version						
	<ul> <li>Device con</li> </ul>	figura	tion and application				
	<ul> <li>Type of fault</li> </ul>	lt/prot	plem and suspected cause				
	Diagnostic	mess	ages (error messages)				
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## 1 About this documentation

## 1.1 Display conventions

Display	Meaning
	This symbol points to parts of the text to which particular attention should be paid!
	The arrow indicates points in a software, to which must be clicked.
RMB	Click the 'right mouse button'.
'Names'	Names are represented with apostrophes e.g. parameters, variables, etc.
'Text'	Menu items and buttons in a software or on a controller, e.g.:
	Click the 'OK' button in the 'Options' menu to call up the 'Delete PLC program' function
See 'chapter name' on page x	Executable cross-reference in electronic output media

## 2 For your safety

### 2.1 Basic notes for your safety

- At electrical drive systems, hazards are present in principle that can result in death or fatal injuries:
  - Electrical hazard (e.g. electric shock due to touch on electrical connections)
  - Mechanical hazard (e.g. crush, retract due to the rotation of the motor shaft)
  - Thermal hazard (e.g. burns due to touch on hot surfaces)
- These hazards are present while starting up and operating the unit, and also during servicing or maintenance work.
- Safety instructions in the documentation and on the product warn about the hazards.
- Personnel must have read and understood the safety instructions before installing and operating the product. In the documentation about the product the usage warnings pertain to direct hazards and must therefore be followed directly when operating or handling the product by the operator.
- AMKmotion products must be kept in their original order, that means it is not allowed to do a significant constructional change on hardware side and software is not allowed to be decompiled and change the source code.
- Damaged or faulty products are not allowed to be integrated or put into operation.
- Do not start the system in which the AMKmotion products are installed (begin of intended use) until you can determine that all relevant standards, laws, and directives have been complied with, e. g. low voltage directive, EMC directive, and the machinery directive, and possible further product standards. The plant manufacturer is responsible for the compliance with the laws, directives, and standards.
- The devices must be installed, electrically connected and operated as shown in the device description documentation. The technical data and the required environmental conditions must be observed at all times.

## **3 Product description**

This document describes the startup of AMK EtherCAT devices with Beckhoff TwinCAT 3 control. Data exchange takes place via the SoE protocol (Servodrive Profile over EtherCAT) according to IEC 61800-7. The document also contains further practical examples.

### 4 ESI device description

The TwinCAT software requires the AMK ESI device description file (EtherCAT XML Device Description (ESI)) in order to create a configuration.

The AMK ESI file contains the interface description for the AMK EtherCAT devices.

Insert the AMK ESI file in the TwinCAT installation directory.

### Description:

EtherCAT XML Device Description (ESI) ESI (EtherCAT Slave Information)

#### Example AMK ESI file:

AMK\_ECsoe\_113\_205777.xml (113 = version rising)

#### Source path under AIPEX PRO:

The AMK ESI file is installed with AIPEX PRO. Make a copy. C:\Program Files (x86)\Common Files\AMK\EtherCAT

#### Target file under TwinCAT 3:

Insert the AMK ESI file in the TwinCAT installation directory. C:\TwinCAT\3.1\Config\lo\EtherCAT

## **5** Conversion AMK/TwinCAT Parameter

AMK parameter ranges:

ID00001 - ID32767, IDs defined by the SERCOS specification. ID32768 - ID65536, IDs defined by AMK.



You will find the Ids supported by AMK in the parameter descriptions.

TwinCAT parameter ranges:

S designates IDNs defined by the SERCOS specification. P designates IDNs defined by the device manufacturer.

Example:

parameter	TwinCAT	AMK	Designation
S parameter	S-0-0390	ID00390	Diagnostic number
P parameter	P-0-0007	ID32775	Number of poles of motor

#### S parameter conversion

АМК		TwinCAT
ID0xxxx	=	S-0 xxx
Example:		
ID00390	=	S-0390

TwinCAT	$\rightarrow$	AMK
S-0 xxxx	=	ID0xxxx
Example:		
P-0-0390	=	ID00390

### P parameter conversion

The difference between the P parameters and AMK ID is respectively 0x8000 (32768).

АМК	$\rightarrow$	TwinCAT
IDxxxxx - 32768 (0x8000)	=	P-0 xxxx
Example:		
ID32775 - <b>32768</b> (0x8000)	=	P-0-0007

TwinCAT	$\rightarrow$	AMK
P-0-xxxx + 32768 (0x8000)	=	IDxxxxx
Example:		
P-0-0007 <b>+ 32768</b> (0x8000)	=	ID32775

### 6 Startup list

The Startup list parameters are transferred to the AMK drive every time the TwinCAT system powers up. The parameter modifications are immediately active as soon as the bus state 'Operational' is reached



#### Exception:

The following parameters only become active after a system reset or 24 VDC OFF/ON.

ID2 'SERCOS cycle time' / S-0-0001 'SERCOS cycle time' ID34023 'BUS address participant' / S-0-1255 'BUS address participant'

#### Example:

The Startup list is extended to include ID32796 'Source RF' with Code 5 (RF via field bus). ID32796 'Source RF' = P-0-0028 'Source RF'

### Input in TwinCAT 'Run' mode

In the TwinCAT 'Run' mode the 'Edit SERCOS Startup Entry' window with online values is available.



dit SERCOS	Startup	Entry						×		
Transition I -> P S -> 0		P→S	Disa IDN: Channe	able Entry al:	P-0-00	28	Vali	Cancel date		
Data (hexbin	):	00 00						Edit		
Validate Mas	:k:									
Comment:		Quelle Reglerfrei	gabe							
IDN	Name				Unit	Value				
P-0-0010	Drehz	ahl bei 10V an A1			1/min	3000.0000				
P-0-0011	Drehz	ahl Offset an A1			1/min	0.0000				
P-0-0012	Hoch	aufzeit TH			ms	100.0				
P-0-0013	Tieflat	ufzeit TL			ms	100.0				
P-0-0014	Tieflat	ufzeit RF inakt.			ms	100.0				
P-0-0027	Quelle	• Umrichter-Ein				0				
P-0-0027 P-0-0028	Quelle	e Umrichter-Ein Reglerfreigabe	_			0 0				
P-0-0027 P-0-0028 P-0-0030	Quelle Quelle Anwei	e Umrichter-Ein Reglerfreigabe nderliste 1		Edit Va	 	0				x
P-0-0027 P-0-0028 P-0-0030 P-0-0032	Quelle Quelle Anwei AMK-I	e Umrichter-Ein Reglerfreigabe nderliste 1 Hauptbetriebsart	Ð	Edit Va	  lue	0				x
P-0-0027 P-0-0028 P-0-0030 P-0-0032 P-0-0033	Quelle Quelle Anwei AMK-I AMK-I	e Umrichter-Ein Reglerfreigabe nderliste 1 Hauptbetriebsart Nebenbetriebsart	<b>D</b>	Edit Va	  lue					×
P-0-0027 P-0-0028 P-0-0030 P-0-0032 P-0-0033 P-0-0034	Quelle Quelle Anwei AMK-I AMK-I	e Umrichter-Ein Reglerfreigabe nderliste 1 Hauptbetriebsart Nebenbetriebsart Nebenbetriebsart	<b>D</b> 1 2	Edit Va Quelle	 lue e Reglerfr	0 0 eigabe				×
P-0-0027 P-0-0028 P-0-0030 P-0-0032 P-0-0033 P-0-0034 P-0-0035	Quelle Anwei AMK-I AMK-I AMK-I	e Umrichter-Ein Reglerfreigabe nderliste 1 Hauptbetriebsart Nebenbetriebsart Nebenbetriebsart	D 1 2 3	Edit Va Quelle	 lue e Reglerfr	0 0 reigabe			OK	×
P-0-0027 P-0-0028 P-0-0030 P-0-0032 P-0-0033 P-0-0034 P-0-0035 P-0-0036	Quelle Anwei AMK-I AMK-I AMK-I AMK-I	e Umrichter-Ein Reglerfreigabe nderliste 1 Hauptbetriebsart Nebenbetriebsart Nebenbetriebsart Nebenbetriebsart	<b>D</b> 1 2 3 4	Edit Va Quello 5	 lue Reglerfi	0 0 reigabe			OK Cancel	3
P-0-0027 P-0-0028 P-0-0030 P-0-0032 P-0-0033 P-0-0034 P-0-0035 P-0-0036 P-0-0037	Quelle Anwei AMK-I AMK-I AMK-I AMK-I AMK-I	e Umrichter-Ein Reglerfreigabe nderliste 1 Hauptbetriebsart Nebenbetriebsart Nebenbetriebsart Nebenbetriebsart Nebenbetriebsart	D 1 2 3 4 5	Edit Va Quelle	 lue e Reglerfi	0 0 eigabe			OK Cance	3

In normal cases the parameter values in bus state 'P -> S' are transferred (Pre-Operational  $\rightarrow$  Safe-Operational)

Online		N	C: Online	NC: Functions		
General	EtherCAT	DC	Process Data	Startup	SoE - Online	
Transition	Protocol	Index	Data	Con	nment	
<b>S</b> <ps></ps>	SoE	S-0-0015	0x0007 (7)	Tele	egram type	
S <ps></ps>	SoE	S-0-0016	04 00 04 00 33 00 2	28 00 AT I	ist	
S <ps></ps>	SoE	S-0-0024	04 00 04 00 2F 00 2	24.00 MD	T list	
S PS	SoE	S-0-0001	0x07D0 (2000)	TN	сус	
S DC	C+F	C 0 0000	0.0700 (2000)	те		
S PS	SoE	P-0-0028	0x0005 (5)	Que	lle Reglerfreigabe	
•					•	
Maxim Ha	Maura Da		New	Delete		

### Input in TwinCAT 'Config' mode

In TwinCAT 'Config Mode', the default values must be entered manually. The initial value is predetermined in hex, Byte sequence Little-Endian.



P-0-0069 initial value 2300 [scaling 0.1 V] = Big-Endian 0x08FC; Little-Endian 0xFC08

## 7 AT/MTD configuration list

S-0-0016 / ID16 'Configuration list AT', driver telegram (AT) S-0-0024 / ID24 'Configuration list MDT' Master data telegram (MDT)

The configuration lists define which parameters are transferred cyclically when 'Configured Telegram' is selected in ID15'Telegram types parameter'.

List of configurable parameters in the driver: S-0-0187 / ID187 'List of data AT' S-0-0188 / ID188 'List of data MDT'

### Example:

Expansion of the driver telegram (AT) configuration list. The procedure for the expansion of the Master Data Telegram (MDT) is identical.



Example: S-0-0084 / ID84 'Torque feedback value'

dit Pdo Entry		×
Name:	Moment Istwert	ОК
Index (hex):	54 84	Cancel
Sub Index:	0	
Data Type:	INT 👻	
Bit Lentgh:	16	
From Dictional	y:	
S-0-0478 - Ha P-0-1287 - EF S-0-0084 - Mi P-0-0067 - Dr P-0-0123 - Dr P-0-0128 - La P-0-0128 - La P-0-0336 - La P-0-1306 - Re P-0-1307 - ak P-0-1308 - Re P-0-1309 - ak	ardware Endschalter Status Typ oment Istwert ehmoment-Sonart vischenkreisspännung ehzahl-Sollwert intern ige-Sollwert intern ige Istwert 2PI eferenzzaehler1 tueller Zaehler 1 eferenzzaehler2 tueller Zaehler 2 tueller Zaehler 2	-
icrosoft Visu	al Studio	X
Pro Re	ocess data of 'Drive 1 (KW (-R06))' may cha link with axis 'Axis 1'	anged.

Activate configuration and start TwinCAT 'Run Mode'



Ja

1

<u>N</u>ein





Function test: Display of current actual value, 'Process Data' tab

Name		Online	Туре	Size	>Addr	In/Out	User ID
📌 Drive status word	Х	32769	UINT	2.0	114.0	Input	0
📌 Position feedback value 1	Х	10244	DINT	4.0	116.0	Input	0
📌 Velocity feedback value	Х	-20	DINT	4.0	120.0	Input	0
🚰 Moment Istwert	Х	15	INT	2.0	124.0	Input	0
🔁 WcStateOut		0	BH	0.1	1522.3	Input	0

## 8 Hot Connect

Hot Connect supports the disconnection and coupling of EtherCAT devices during operation. The devices are recognized independently of their position by the address assigned in advance in the EtherCAT bus.

A fixed address can be assigned e.g. by AIPEX PRO (ID34023 'BUS address participant') or by DIP switches.

Example: AMK drive with fixed address 10 [Hex]. Address preset with AIPEX PRO 'Direct mode'. In TwinCAT, the 'Drive 1' drive is linked to address 10 [Hex] and added to the 'Hot Connect Group'.

Para		TwinCAT					
<b>ID</b>	Mame	M Value	Unit	Length	Туре	*	1 KW
34023	BUS address part.	0010 4	)	<b>1</b> 2	Hex		
34024	BUS transmit rate	0.00		9 4	Dec		KW 1151747 207061
34025	BUS mode	0002		9 2	Hex		
34026	BUS mode attribut	0000		🥑 2	Hex		Parameters
34027	BUS fail.charac.	<u> </u>		🥑 2	Dec		
34037	Offset analog input 1	0.00	۷	i 🗇 2	±Dec		O Damonics
34038	Offset analog input 2	0.00	۷	i 🗇 2	±Dec		C Communication
34045	Inductance LD	0.00	mH	i 🗇 2	Dec		C Special functions
34046	Inductance LQ	0.00	mH	i 🗇 2	Dec		O PLC
34047	Dead time meas.1	0.000	ms	2	Dec		C Systeminfo
34048	PWM frequency	8	kHz	i 🗇 2	Dec		C Functional safety
34050	TN current Q	0.0	ms	i 🗇 2	Dec		O Service-Module
34052	TN current D	0.0	ms	i 🗇 2	Dec		
34055	EF type	2		2	Dec		
34070	Home signal distance	0	incr.	<b>j</b> 4	±Dec		Initial program loading
34071	System name			*1	Ascii		System booting
34072	Data set name			*1	Ascii	-	Download parameter set t
🗊 P-9	Set 0 P-Set 1 P-Set 2 P-Set 3	🦪 🕖 In	st0 Ins	t 1 🔊 Inst 2	2   Inst 3		the device



The ID34023 'BUS address participant' / S-0-1255 'BUS address participant' only becomes active after a system reset or 24 VDC OFF/ON.

# 

'Activate EtherCAT address'

Enter fixed address for driver (example 10)

TwinCAT Project23 - Microsoft Visua	l Studio (Administrator)
FILE EDIT VIEW PROJECT BUILD	DEBUG TWINCAT TWINSAFE PLC TOOLS SCOPE
🖉 G - O   🛅 - 🗂 - 🐂 🔛 🚰   3	🖁 🗇 🏠 🦻 - 🤆 - 🕨 Attach 🔹 🔹 Relea
🐘 🔤 🗖 🌮 🌾 🎯 🚺 🐛 🗠	.ocal>
Solution Explorer 🔹 👎 🗙	TwinCAT Project23 😐 🗙
G O 🔂 To - 🗊 🖌 🗕	General EtherCAT DC Process Data Startup SoE - Online Online
Search Solution Explorer (Ctrl+ü) 🛛 🔎 🝷	Tuno: KW compact inverter module -B06 (SoF)
Solution 'TwinCAT Project23'	
TwinCAT Project23	Product/Revision: 1539/169/4085
SYSTEM	Auto Inc Addr: 0
	EtherCAT Addr: 🔽 10 🛛 3 📄 🛛 Advanced Settings.
A SAFETY	Identification Value: TU 🚔
96+ C++	Previous Port: Master
⊿ 🔀 I/O	
Device 1 (EtherCAT)	
i⊋ Image Image_Info	
SvncUnits	
Inputs	
👂 唱 Outputs 🍙	
🕨 🛄 InfoDation	
▷ ➡ Drive 1 (KW (-R06))	

The EtherCAT Master uses the stored address from the EtherCAT Slave E<sup>2</sup>PROM.

Advanced Settings	
<ul> <li>General</li> <li>Behavior</li> <li>Timeout Settings</li> <li>Identification</li> <li>FMMU / SM</li> <li>Init Commands</li> <li>Mailbox</li> <li>Distributed Clock</li> <li>ESC Access</li> </ul>	Identification Identification ADO None Configured Station Alias (ADO 0x0012) Configured Station Alias (ADO 0x0134) Data Word (2 Bytes) ADO (hex): 0x0012 Value: 10 3
	OK Abbrechen

TwinCAT Project23 - Microsoft Visua         FILE       EDIT       VIEW       PROJECT       BUIL         Image: Ima	al Stu D 光 Ć Local	dio (Adminis DEBUG T 라   '? >	strator) WINCAT TWINSAF - C - b Attach.	E PLC TOO
Solution Explorer Search Solution Explorer (Ctrl+ü) Solution 'TwinCAT Project23' (1 proje Solution 'TwinCAT Project23 SYSTEM MOTION	ect)	• ۹ ×	TwinCAT Project23 - General EtherCAT Type: Product/Revision: Auto Inc Addr:	DC Process I KW compact inv 1539 / 1697408 0
<ul> <li>PLC</li> <li>SAFETY</li> <li>C++</li> <li>I/O</li> <li>Devices</li> <li>Device 1 (EtherCAT)</li> <li>Image</li> <li>Image-Info</li> <li>SyncUnits</li> <li>Inputs</li> <li>Outputs</li> <li>InfoDal</li> </ul>		Add New It Insert New Insert Existi Remove Save Drive Copy Cut Paste Paste with Independe	tem Item ing Item 1 (KW (-R06)) As 1 (KW Tender State	Ins Del Ctrl+C Ctrl+X Ctrl+V
▶ ➡ Drive 1 (KW (-R06)) ▶ ╦ Drive 2 (KW (-R07) ( ▶ 📸 Mappings	•	Disable Change to Add to Hot Delete from	Compatible Type t <mark>Connect group</mark> n HotConnect grou	2

### Identification by: Identification Value

Enter fixed address for driver (example 10)

Add Hot Connect Group	x
Select Connected Slaves	Identification bu
	EtherCAT Addr. or previous shave.
	Cancel
	~(2)

Activate configuration and start TwinCAT 'Run Mode'







## 9 Firmware update via FoE

The example describes how to transfer AMK firmware to an AMK driver.



TwinCAT requires the AMK firmware file to be in \*.bin format.

AMK firmware files with the file extension \*.elf or \*.zip can be converted to the \*.bin format with the AMK Toolflasher (software ATF).

Organisieren 👻 🛛 N	euer Ordn	er		
Favoriten	A Na	me	Änderungsdatum	Тур
🧮 Desktop		AER5-6_SW_113_1521_205700.bin	24.06.2015 09:17	BIN-Date
Downloads Firmendaten		AER5-6_SW_114_1639_206648.bin	03.01.2017 09:30	BIN-Date
		III		
D	ateiname:	AER5-6 SW 113 1521 205700.bin	All Files (*.*)	

#### For this a password is not necessary.

Edit FoE Name		
String:	AER5-6_SW_113_1521_205700	
Hex:	41 45 52 35 2D 36 5F 53 57 5F 31 31 33 5F 31	Cancel
Length:	25	
Password (hex):	00000000	



Transferring the firmware file takes around 150 seconds.

Please wait!

Transfer completed successfully.

Microsoft Visual Studio	x
Function Succeeded	!
ОК	1

### Transfer faulty



Please contact AMK Service in the event of repeated faulty transfer.



Firmware is only activated after the device has been restarted!



After restarting, please check whether the device has restarted without a fault!

**Diagnostic message 1293 'bootstrap EEPROM'** The software has been replaced and is no longer address-compatible with the data in the parameter memory.

Execute the 'bootstrap' function.

Display of diagnosis message with TwinCAT. Alternatively, AMK software AIPEX PRO can be used.

TwinCAT Project24 - Microsoft Visual Studio (Administrator)								
FILE EDIT VIEW PROJECT BUILD	DEBUG	TWINCAT TWINSAFE	PLC	TOOLS SCOPE				
8 G - O   18 - 17 - 4 🖬 🖉 🗶	市命しつ	- C - Attach	-	- Releas				
		× -						
	ai>	<b>∓</b> ≋						
Solution Explorer 🛛 🔻 🕂 🗸	vinCAT Proje	ct24 ⊅ ×						
○ ○ ☆   `o - ฮ   ≠ _=	General Ethe	erCAT DC Process D	ata Start	up SoE - Online Online				
Search Solution Explorer (Ctrl+ü) 🛛 🔎 🕶								
Solution 'TwinCAT Project24' (1 proj	Diagnosis (I	d.95) 129300Urladen !	2	<u>~</u> 2				
A TwinCAT Project24	Reset (I	d.99) Update List	📃 Auto	Update				
SYSTEM								
A MOTION	IDN	Name	Unit	Value				
🛄 PLC	S-0-0001	NC-Zykluszeit	ms	1.000				
SAFETY	S-0-0002	SERCOS-Zykluszeit	ms	1.000				
96+ C++	S-0-0015	Telegrammart-Par.		6				
⊿ 🔽 I/O	S-0-0016	Konfigurationsliste AT		(list)				
Devices	S-0-0024	Konfigurationsliste MDT	-	(list)				
Device 1 (EtherCAT)	S-0-0017	Liste aller IDs	-	(list)				
1mage	S-0-0030	Softwareversion		KW 113 1521 205700				
timage-Info	S-0-0095	Diagnose [ASCII-Text]		129300Urladen !				
b Synclinits	S-0-0262	KMD Urladen		0000000 0000000				
h Input	S-0-0390	Diagnosenummer	-	1293				
	P-0-0072	Diagnoseliste		(list)				
	P-0-1292	Liste SEEP 1	-	(list)				
	P-0-1293	Liste SEEP 2		(list)				
P ➡ Drive 1 (KW (-R06))	P-0-1438	Produktcode	-	0x00000603				
P ➡ Drive 2 (KW (-R07)	P-0-1378	Memory Address		0x0000000				

## 10 TwinCAT 3 project with CODESYS PLC

The example describes how to generate a PLC project (without TwinCAT NC axis / CNC axis). In the PLC example project, the PLC controls and evaluates 'Master Control Word' and 'Drive Status Word'.

Start TwinCAT XAE (VS 2013)

TwinCAT XAE (VS 2013)

#### Create a new project

X

	Start Page - Microsoft Visual Studio (Administrator)									
FILE	EDIT VIEW	DEBUG	TWINCAT	TWINSA	FE	PLC	TOOI	LS	SCOPE	
	New			+	ïð	Proje	ect		Ctrl+Shif	t+N
	Open			•	÷	Web	Site	2	Shift+Alt	+N
	Close				õ	File			Ctrl+N	
X	Close Solution									
	Save Selected Iter	ms	Ctrl+S	5						
	Save Selected Iter	ms As								
	Save All		Ctrl+S	Shift+S						
	Export Template.									

New Project				<u></u> ବ 🗙
▷ Recent	1.	NET Framework 4.5	•	📰 🔚 Search Installed Ter 🔎 -
<ul> <li>Installed</li> <li>Templates         <ul> <li>Other Project Types</li> <li>TwinCAT Measurement</li> <li>TwinCAT Projects</li> <li>Samples</li> </ul> </li> </ul>		TwinCAT XAE Project (		Type: TwinCAT Projects
				Configuration
▷ Online		-		
Name:	TwinCAT_Docu	2		
Location:	C:\Users\kig0vt020	Documents\Visual Stu	dio 201:	Browse
Solution name:	TwinCAT_Docu			Create directory for solution

Select the target system:

• Local (own PC) TwinCAT PLC TwinCAT\_Docu - Microsoft Visual Studio (Administrator) EDIT PROJECT BUILD FILE VIEW DEBUG TWINCAT TWINSAFE PLC TOOLS G - O 🛅 - 🖆 - 🍟 💾 👗 🗗 A - C -り Attach... -🖪 🥩 🔨 i 🖉 🕲 🔁 ê 🔛 🚾 | <Local> TwinCAT\_Docu 👳 🗡 Solution Explorer G O 🟠 🐻 - 🗊 General Settings Data Types Interfaces Functions Search Solution Explorer 🔑 -2 Solution 'TwinCAT\_Docu' winCAT System Manager Choose Target. TwinCAT\_Docu 4 v3.1 (Build 4143) ⊳ SYSTEM A MOTION Choose Target System PLC SAFETY 0K Local PC C++ 9<sub>6++</sub> Cano I/O ⊳ TwinCAT PLC 🚽 Search (Ethernet)... Search (Fieldbus).. 📃 Set as Default 5 \* Connection Timeout (s):

TwinCAT\_Docu - Microsoft Visual Studio (Administrator) FILE EDIT VIEW PROJECT BUILD DEBUG TWINCAT 8 - 6 1 📅 - 🗂 - 🚔 🔛 🔏 🛛 A 🗍 9-0-ें 🔛 🧾 💋 🛠 🌾 🎯 🚫 🏪 🛛 <Local> • 4 × TwinCAT\_Docu + × Solution Explorer © ⊃ ☆ 'o - i Number Device Search Solution Explorer 🔑 -Solution 'TwinCAT\_Docu' 🔺 \overline TwinCAT\_Docu ⊳ SYSTEM A MOTION PLC SAFETY C++ I/O Add New Item... Ins 📸 Mappings 눱 🛛 Add Existing Item 🔊 Shift+Alt+A Export EAP Config File 👯 Scan Paste Ctrl+V Paste with Links



Add the EtherCAT Master functionality to the 'Device' icon

Activate existing network adapter

TwinCAT Project19 - Microsoft Visu	ual Studio (Administrato	n)	
FILE EDIT VIEW PROJECT BUI	LD DEBUG TWIN	CAT TWINSAFE PLC	TOOLS SCOPE
0 - 0   🔁 - 🖆 - 😩 🔛 🚰	<b>光口</b> 山 ワ・マ	- 🕨 Attach	- Release
	<local></local>	▼ = 8	-  -] ▶ ■
Solution Explorer 🛛 🔻 🕂 🗙	TwinCAT Project19 👳	×	
© ⊙ ☆   ™ - ■   ≁	General Adapter Et	herCAT Online CoE - Online	
Search Solution Explorer (Ctrl+ü) 👂 -	Network Adapte	er <b>(2)</b>	
Solution 'TwinCAT Project19' (1 pr		OS (NDIS)     OS (NDIS)	C DPRAM
TwinCAT Project19	Deservations		
	Description:		$\sim$
	Device Name:		(3)
SAFETY	PCI Bus/Slot:		Search
₩ C++	MAC Address:	00 00 00 00 00 00	Compatible Devices
▲ <sup>1</sup> /0 ▲ <sup>4</sup> <sup>1</sup> / <sub>4</sub> Devices	IP Address:	0.0.0.0 (0.0.0.0)	
Device 1 (EtherCAT)		Promiscuous Mode (use	with Wireshark only)
Mappings 1		Virtual Device Names	

## Driver installed

### Activate the adapter

Device Found At	×
(none) LAN-Verbindung (TwinCAT-Intel PCI Ethernet Adapter (Gigabit))	Cark 2
	Help

### Driver not installed

vinCAT Ethernet Compatible Devices	
'TwinCAT Ethernet Protocol' installed Installed and ready to use devices:	Close 1 Show Installation Instructions
	Open Network Connections
	Install Device
Installed devices but without necessary binding to T winLAT Ethernet Protoc	
Compatible devices with incompatible driver installed:	

#### Scanning a network

Scanning is only possible with an activated network adapter.





Scanning is only possible in TwinCAT 'Config Mode'.

TwinCAT_Docu - Microsoft Visual         FILE       EDIT       VIEW       PROJECT       BU         Image: Constraint of the second secon	l Stud UILD   よ <lo< th=""><th>dio (Administrator) DEBUG TWINCA ロロロロクマママ ocal&gt;</th><th>T TWINSAFE PLC</th></lo<>	dio (Administrator) DEBUG TWINCA ロロロロクマママ ocal>	T TWINSAFE PLC
Solution Explorer		vinCAT_Docu + X General Adapter Ethe Oescription: Description: Device Name: PCI Bus/Slot: MAC Address: IP Address: IP Address: IP Address: Add New Item Add Existing Item Remove Change NetId Save Device 1 (EtherC Append EtherCAT Cn Append Dynamic Con Online Reset Online Reload Online Delete Scan	erCAT Online CoE - Online  OS (NDIS) PCI  LAN-Verbindung (TwinCAT-Intel PC \DEVICE\{F2DE3037-324A-4168-I ec f4 bb 01 50 a0 169.254.215.73 (255.255.0.0)  Ins Shift+Alt+A Del CAT) As nd ntainer
EtherCAT drive(s) added Append linked axis to:	igurat nfigura	ion Ca	

Creating a PLC project







When the TwinCAT 'Activate Configuration' function is executed, the set PLC task value (cycle time) is automatically transferred to the AMK drive (ID1 'NC cycle time' and 'SERCOS cycle time')

The cycle times become active with the next initialization in the AMK drive. (System reset command, or 24 VDC OFF/ON)

For differing values, TwinCAT generates the status code '0x0037 - invalid SYNC1 cycle time'.

Opening PLC MAIN program module

TwinCAT_PLC_Project - Microsoft Visual Studio (Administrator)					
FILE EDIT VIEW PROJECT BUILD	DEBUG TWINCAT TWINSAFE PLC TOOLS				
📄 🛛 - 🖸   🛅 - 🖆 - 🚔 💾 🚜	🗇 🏦 🦻 - 🦿 - 🕨 Attach				
👘 🔛 🧧 🖉 🛠 🌾 🎯 🔯 🛼 🛛 <loca< td=""><td>al&gt; PLC01 -  </td></loca<>	al> PLC01 -				
Solution Explorer 🔹 👎 🗙	MAIN -= × TwinCAT_PLC_Project				
G O 🟠 To - 🗊 🖌 🗕	1 PROGRAM MAIN				
Search Solution Explorer (Ctrl+ü)	2 VAR 3 END VAR				
Solution 'TwinCAT_PLC_Project' (1 proje	4 -				
TwinCAT_PLC_Project					
SYSTEM	1				
PLC01 Project					
External Types					
References					
🚮 MAIN (PRG)					
🚞 VISUs					
PIcTask (PIcTask)					
PLC01 Instance					

PLC variables

Variables declaration	Direction		
'Variable name' AT %I* : 'Declaration'	Input variable	$Axis \to PLC$	
'Variable name' AT %Q* : 'Declaration'	Output variable	$PLC \to axis$	

Libr	ary M	nager 🖯 MAIN 👳 🗙 TwinCAT_PLC_Project	-
	1	PROGRAM MAIN	
	2	VAR	
	3		
	4	w_MasterControlWord AT %Q* : WORD; // AMK ID134	
	5	w_DriveStatusWord AT %I* : WORD; // AMK ID135	
	6	di_PositionFeedbackValue_Drive1 AT %I* : DINT; // AMK ID51	
	- 7		
	8	bo_SBM : BOOL;	
	9	bo_QUE : BOOL;	
	10	bo_QRF : BOOL;	
	11	bo_UE : BOOL;	
	12	bo_RF : BOOL;	
	13	END_VAR	
	14		
	1		
	2	// Drive Status	
	з	<pre>IF NOT w_DriveStatusWord.14 AND NOT w_DriveStatusWord.15 THEN</pre>	
	4	bo_SBM := FALSE;	
	5		
	6	ELSIF w_DriveStatusWord.14 AND NOT w_DriveStatusWord.15 THEN	
	7	bo_SBM := TRUE;	
	8		
	9	ELSIF NOT w_DriveStatusWord.14 AND w_DriveStatusWord.15 THEN	
	10	bo_QUE := TRUE;	
	11		
	12	ELSIF w_DriveStatusWord.14 AND w_DriveStatusWord.15 THEN	
	13	bo_QRF := TRUE;	
	14		
	15	END_IF	
	16		
	17	// Master Control	
	18	<pre>w_MasterControlWord.14 := bo_UE; // DC Bus ON</pre>	
	19	<pre>w_MasterControlWord.15 := bo_RF; // Drive ON</pre>	

### PLC project 'Transfer'



Connection between EtherCAT slave device and a task variable is missing, so that the cycle time cannot be determined. Bus start-up remains stuck in PREOP bus state.

Options for a solution can be, e.g. to connect the Status Word drive in the AT with a PLC variable or using the NC/CNC axis.



Linking variables



Search: PLC PLC01 Instance MAIN w DriveStatusWord > IB 512030.0 w/ORD [2:0] MAIN w DriveStat
Cancel

#### Creating a network configuration



#### Start TwinCAT 'Run Mode'





When the TwinCAT 'Activate Configuration' function is executed, the set PLC task value (cycle time) is automatically transferred to the AMK drive (ID1 'NC cycle time' and 'SERCOS cycle time')

The cycle times become active with the next initialization in the AMK drive. (System reset command, or 24 VDC OFF/ON)

For differing values, TwinCAT generates the status code '0x0037 - invalid SYNC1 cycle time'.

TwinCAT_PLC_Project - Microsoft Visual Studio (Administrator)						
FILE EDIT VIEW PROJECT BUILD	DEBUG	TWINCAT TWINSAFE PLC TOOLS SCOPE				
🖉 🚽 🖸 🖓 🕶 🔁 🖓 💾 🖉 🕹 🛣	00	🍤 🗣 👻 🕨 Attach 👻 💎 Release				
🔄 💽 🖉 🛠 🌀 🚺 🐛 🛛 🕹	al>	PLC01 - 🛃 🕨 = 🕣				
Solution Explorer 🛛 🔻 🕂 🗙	MAIN*	+ × TwinCAT_PLC_Project				
C O 🟠   To - 🗊   🛩 🗕	3	w MasterControlWord				
Search Solution Explorer (Ctrl+ü)	5	w_DriveStatusWord AT %I* :				
<ul> <li>Solution 'TwinCAT_PLC_Project' (1 proje</li> <li>TwinCAT_PLC_Project</li> <li>SYSTEM</li> </ul>	6 7 8	di_PositionFeedbackValue_Drive1 AT %I* :				
	1	// Drive Status				
PLC01	■ 3 4	<pre>IF NOT w_DriveStatusWord.14 AND bo_SBM := FALSE;</pre>				
External Types     References     DUTc	5	ELSIF w_DriveStatusWord.14 AND bo_SBM := TRUE;				
	8 9 10	ELSIF NOT w_DriveStatusWord.14 AND				
📑 MÁIN (PRG)	10	bb_vor ikor,				

#### Log-in: transfer PLC program to the control unit

### Start PLC

TwinCAT_PLC_Project - Microsoft Visua         FILE       EDIT       VIEW       PROJECT       BUILD         O → O       I       →       I       I       I       I	I Studio (Adminis DEBUG TWIM 口 合   ウ - (	trator) ICAT TWINSAFE र - Þ Attach	PLC TOOLS	S SCOPE
🕴 🔛 🧧 🥔 🖄 🐨 🔤 🛃 < Loc	al>	- 🚽 🖗 PLC01		•   - 2] 🕨 = 🗲
Solution Explorer 🛛 👻 무 🗙	MAIN [Online]	🕂 🗙 TwinCAT_PI	LC_Project	1 Start (F5)
© © 🟠   To - 🗇   🛩 🗕	TwinCAT_De	vice.PLC01.MAIN		
Search Solution Explorer (Ctrl+ü)	Expression	Туре	Value	Prepared
👦 Solution 'TwinCAT_PLC_Project' (1 proje	w_Maste	erCo WORD	0	
TwinCAT_PLC_Project	🔷 w_Drive	Stat WORD	0	
SYSTEM	🔷 di_Posit	ionF DINT	0	
A MOTION	4			A.
✓ III PLC	1			
PLC01	2 //	Drive Status		
PLC01 Project	⊟ 30 Ir	N	OF w_DriveStat	usWord 0 .14
External Types	5		DO_SDM_FALSE	:= FALSE;
P P References		ELSIF	w DriveStat	usWord 0.14
GVIs	7		bo_SBM FALSE	:= TRUE;
A De POUs	8			_
MAIN (PRG)	9 •	ELSIF N	OT w_DriveStat	usWord 0.14

Function test: online values are displayed and updated

Library Manager 🗊 MAIN [Online]	😐 🗙 TwinCAT_PLC_	Project	•			
TwinCAT_Device.PLC01.MAIN						
Expression	Туре	Value				
w_MasterControlWord	WORD	0				
< w_DriveStatusWord	WORD	32769				
di_PositionFeedbackValue_Drive1	DINT	-542714				
< bo_SBM	BOOL	FALSE				
bo_QUE	BOOL	TRUE				
ø bo_QRF	BOOL	TRUE				
boUE	BOOL	FALSE				
ø boRF	BOOL	FALSE				

## 11 TwinCAT 3 project with NC axis

The example describes how to generate a project with a TwinCAT NC axis. The drives are controlled via the "Online" function of the NC axis.

Start TwinCAT XAE (VS 2013)

TwinCAT XAE (VS 2013)

#### Create a new project

X



New Project	2	Same of the second	-	ି <mark>×</mark>
▷ Recent		.NET Framework 4.5	•	📰 📃 Search Installed Ter 👂 -
▲ Installed		TwinCAT XAE	Project (	Type: TwinCAT Projects
<ul> <li>▲ Templates</li> <li>▶ Other Project Types</li> <li>▶ TwinCAT Measurement</li> <li>TwinCAT Projects</li> <li>Samples</li> </ul>			-	TwinCAT XAE System Manager Configuration
▷ Online		•		
Name:	TwinCAT_Docu	2		
Location:	C:\Users\kig0vt0	20 Documents Visual Stu	udio 201	Browse
Solution name:	TwinCAT_Docu			Create directory for solution

Select the target system:

• Local (own PC) TwinCAT PLC TwinCAT\_Docu - Microsoft Visual Studio (Administrator) EDIT PROJECT BUILD FILE VIEW DEBUG TWINCAT TWINSAFE PLC TOOLS G - O 🛅 - 🖆 - 🍟 💾 👗 🗗 A - C -り Attach... -🖪 🥩 🔨 i 🖉 🕲 🔁 ê 🔛 🚾 | <Local> TwinCAT\_Docu 👳 🗡 Solution Explorer G O 🟠 🐻 - 🗊 General Settings Data Types Interfaces Functions Search Solution Explorer 🔑 -2 Solution 'TwinCAT\_Docu' winCAT System Manager Choose Target. TwinCAT\_Docu 4 v3.1 (Build 4143) ⊳ SYSTEM A MOTION Choose Target System PLC SAFETY 0K Local PC C++ 9<sub>6++</sub> Cano I/O ⊳ TwinCAT PLC 🚽 Search (Ethernet)... Search (Fieldbus).. 📃 Set as Default 5 \* Connection Timeout (s):

TwinCAT\_Docu - Microsoft Visual Studio (Administrator) FILE EDIT VIEW PROJECT BUILD DEBUG TWINCAT 8 - 6 1 📅 - 🗂 - 🚔 🔛 🔏 🛛 A 🗍 9-0-ें 🔛 🧾 💋 🛠 🌾 🎯 🚫 🏪 🛛 <Local> • 4 × TwinCAT\_Docu + × Solution Explorer © ⊃ ☆ 'o - i Number Device Search Solution Explorer 🔑 -Solution 'TwinCAT\_Docu' 🔺 \overline TwinCAT\_Docu ⊳ SYSTEM A MOTION PLC SAFETY C++ I/O Add New Item... Ins 📸 Mappings 눱 🛛 Add Existing Item 🔊 Shift+Alt+A Export EAP Config File 👯 Scan Paste Ctrl+V Paste with Links



Add the EtherCAT Master functionality to the 'Device' icon

Activate existing network adapter

TwinCAT Project19 - Microsoft Visu	al Studio (Administrato	or)	
FILE EDIT VIEW PROJECT BUIL	LD DEBUG TWIN	CAT TWINSAFE PLC	TOOLS SCOPE
0 - 0   📅 - 🖆 - 🖕 🔛 💾	メロ む ワ・マ	🗧 🔸 Attach 👻	- Release
-    🔐 🔟 💋 🌾 🎯   🙋 🛼   🧧	<local></local>	• •	- ∋ - ∈ 9
Solution Explorer 🔹 👎 🗙	TwinCAT Project19 🛛 🕫	×	
C ⊃ ☆   ™	General Adapter Et	herCAT Online CoE - Onli	ne
Search Solution Explorer (Ctrl+ü) 👂 🗸	C  Network Adapt	er <b>(2)</b>	
👦 Solution 'TwinCAT Project19' (1 pr		OS (NDIS)      O P	
TwinCAT Project19		000 ((1010))	
SYSTEM	Description:		
MOTION	Device Name:		
PLC	DCI D JCI		
O SAFETY	PCI Bus/SIOC		• Search
₩ C++	MAC Address:	00 00 00 00 00 00	Compatible Devices
<ul> <li>I/O</li> <li>I/O</li></ul>	IP Address:	0.0.0.0 (0.0.0.0)	
Device 1 (EtherCAT)		Promiscuous Mode (us	e with Wireshark only)
Mappings		Virtual Device Names	

## Driver installed

### Activate the adapter

Device Found At	<b>— X</b>
(none) LAN-Verbindung TwinCAT-Intel PCI Ethernet Adapter (Gigabit))	Carke 2 Carke 2 O LInused O All Help

### Driver not installed

vinCAT Ethernet Compatible Devices	
'TwinCAT Ethernet Protocol' installed Installed and ready to use devices:	Close 1 Show Installation Instructions
	Open Network Connections
	Install Device
Installed devices but without necessary binding to T winLAT Ethernet Protoc	
Compatible devices with incompatible driver installed:	

#### Scanning a network

Scanning is only possible with an activated network adapter.





Scanning is only possible in TwinCAT 'Config Mode'.

TwinCAT_Docu - Microsoft Visua         FILE       EDIT       VIEW       PROJECT       E         Image: Imag	al Stud BUILD   ¥   ×	dio (Administrator) DEBUG TWINCA 」 ロ 合   フ - で ocal>	T TWINSAFE PLC → Attach →
Solution Explorer Search Solution Explorer (Ctrl+ü) Search Solution TwinCAT_Docu' (1 projection) Solution 'TwinCAT_Docu' (1 projection) Solution 'TwinCAT_Docu' Solution 'TwinCAT_Docu' Soluti		winCAT_Docu       P         General       Adapter       Ethe         Image: Construction in the sect of the sect	erCAT Online CoE - Online OS (NDIS) PCI LAN-Verbindung (TwinCAT-Intel F \DEVICE\{F2DE3037-324A-4168 ec f4 bb 01 50 a0 169.254.215.73 (255.255.0.0) Ins Shift+Alt+A Del CAT) As nd ntainer
EtherCAT drive(s) added	figurat		

Cancel

### TwinCAT/AMK cycle time

The following cycle times must be set to identical values.

TwinCAT		АМК
NC Task 1 SAF	=	ID1 'NC cycle time'
		ID2 'SERCOS cycle time'



When the TwinCAT function 'Activate Configuration' is executed, the value from the NC task 1 SAF is automatically transferred to the AMK drive.

The cycle times become active with the next initialization in the AMK drive. (System reset command, or 24 VDC OFF/ON)

For differing values, TwinCAT generates the status code '0x0037 - invalid SYNC1 cycle time' and AMK the diagnostic message 2572, Info 27



#### Creating configuration and log-in





Microsoft V	isual Studio	×
?	Restart TwinCAT System in Run Mod	le
	OK	:hen

Function test 'General'

In TwinCAT 'Run Mode' the Slave devices are automatically switched to the Bus State OP (Operational) (3). For faultless operation, the EtherCAT Master must be in OP state (4).



#### Function test 'Drive'

Display of bus status (3) and current values of linked variables.

TwinCAT_Docu - Microsoft Visual Studio (A         FILE       EDIT       VIEW       PROJECT       BUILD       DI         Image:	dministrator) EBUG TWINCAT TWINSAFE 合   ウ - ペ -   ト Attach 	E P 	PLC TOOLS	SCOP - - ] -⊇ ▶	E
Solution Explorer 🔹 👎 🗙	TwinCAT_Docu 👳 🗙				
C O A   O → A   I → Search Solution Explorer (Ctrl+ü)	General EtherCAT DC F	roces	s Data Startup	SoE - C	
J Solution 'TwinCAT_Docu' (1 project)	Init Bootst	rap		_	$\sim$
▲ TwinCAT_Docu ► Ø SYSTEM	Pre-Op Safe-C	Do	Currer	nt State:	3 00
MOTION		Fror	Requ	esteu otati	. OP
PLC					
SAFETY SAFETY			Mar II.	<b>T</b>	C:
<u>%</u> C++	Name		Inline	Туре	Size
▲ <u>≥</u> 1/0	Drive status word	X	32/68	UINT	2.0
Devices	Fosition feedback value 1	X	-230332	DINT	4.0
	Webster	~			4.0
anage anage-Info	WcStateOut	v	° U	DIT	0.1
SyncUnits		Ŷ	1	BIT	0.1
👂 🛄 Inputs	* State	^	8	JINT	2.0
Outputs	AdsAddr		172.16.6.21	AMS	8.0
InfoData	2 Chn0		0	USINT	1.0
▲ ➡ Drive 1 (KW (-R06))	DcOutputShift	х	618600	DINT	4.0
	DcInputShift	Х	3381400	DINT	4.0
	Provide the ster control word	Х	0	UINT	2.0
	🖙 Position command value	Х	24	DINT	4.0
	Velocity command value	Х	0	DINT	4.0

### 11.1 Startup the NC axis

The NC axis operates in position control mode, independently of the operating mode (speed or position control) set for the drive. If the rotational speed control mode is active in the drive, the position control loop in the NC axis is automatically closed. The nominal value specified by the NC axis depends on the operating mode set in the drive and is adapted automatically. Non-adapted control parameters quickly generate a lag distance error, since this is monitored by the NC axis as standard.



### Requirement: The direct-current link is charged Acknowledgment DC converter ON (QUE) = 1

#### AMK position control mode



To operate the NC axis, the encoder overflow value for modulo operation must be calculated and transmitted.

An incorrect value leads to AMK diagnostic message 2318 'Control deviation' during operation.

TwinCAT 'Run Mode' is required (there is no confirmation after 'Download') M TwinCAT Project30 - Microsoft Visual Studio (Administrator) FILE DEBUG EDIT VIEW PROJECT BUILD TWINCAT TWINSAFE PLC TOOLS SCOPE 9-0 😩 🔛 📲 X 0 6 Attach... -Θ -18 - 19 -. 🗉 🚫 🐾 <Local> 载 -= TwinCAT Project30 👎 Solution Explorer X 004 <u>ت</u>و - و - 4 General NC-Encoder Parameter Sercos Time Compensation Online Search Solution Explorer (Ctrl+ü 🔑 🕶 Modulo Scale: 359999 Calculate Solution 'TwinCAT Project30' (1 TwinCAT Project30 Download Upload 4 SYSTEM Þ 1 5 MOTION 22 (HINT: Calculation only suitable if SERCOS is in phase 3 or 4) 🖳 NC-Task 1 SAF 💼 NC-Task 1 SVB 🚛 Image Tables Objects 26 쿱<sub>목</sub> Axes 🖦 Axis 1 4 End ۶. Þ Inputs Outputs Þ

### AMK drive:



NC axis lag distance (error code 0x4550)

Set ID104 'Position loop factor KV' to a value adjusted to the application. Activate the SAK (lag distance compensation)

ID104 'Position loop factor KV'

ID32796 'Source RF': 5 (RF via field bus)

ID32800 'AMK main operating mode': 00410004 (cyclic nominal value input via EtherCAT, position control mode)

Alternatively:

ID32800 'AMK main operating mode': 00410204 (cyclic nominal value input via EtherCAT, position control mode, SAK active)

TwinCAT Project30 - Microsof         FILE       EDIT       VIEW       PROJECT         O - O       In -	t Visual Studio (Administrator) BUILD DEBUG TWINCAT TWINSAFE PLC TOOLS SCOPE
Solution Explorer	TwinCAT Project30 + X
Search Solution Explorer (C1 P - Solution 'TwinCAT Project30 Figure TwinCAT Project30	O.5171         Setpoint Position:         [mm]           Lag Distance (min/max):         [mm]         Actual Velocity:         [mm/s]         Setpoint Velocity:         [mm/s]
<ul> <li>SYSTEM</li> <li>MOTION</li> <li>MC-Task 1 SAF</li> <li>NC-Task 1 SVB</li> </ul>	0.0000 (0.000, 0.000)         0.0000         0.0000           Override:         [%]         Total / Control Output:         [%]         Error:           0.0000 %         0.00 / 0.00 %         0 (0x0)           Status (log )         Status (obys )         Enabling
tmage Tables ☐ Objects	Ready       NOT Moving       Coupled Mode       Controller       Set         Calibrated       Moving Fw       In Target Pos.       Feed Fw         Has Job       Moving Bw       In Pos. Range       Feed Bw
<ul> <li>▲ Axes</li> <li>▲ Axes</li> <li>▲ Axis 1</li> <li>▶ ♣ Enc</li> <li>▶ ➡ Drive</li> <li>▲ Ctrl</li> <li>▶ ➡ Inputs</li> <li>▶ ➡ Outputs</li> <li>▶ ➡ Axis 2</li> <li>■ PLC</li> </ul>	Controller Kv-Factor:       [mm/s/mm]         1       ↓         Target Position:       [mm]         0       ↓         F1       F2         F3       F4

#### Energize motor (activate RF), enable direction of rotation and set Override.

### AMK rotational speed control mode

The position control loop is closed by the control unit. The control unit determines the nominal rotational speeds.

#### AMK drive:

ID32796 'Source RF': 5 (RF via field bus) ID32800 'AMK main operating mode': 00410003 (cyclic nominal value input via EtherCAT, rotational speed control mode)

### TwinCAT NC:

Set the 'Controller Kv-Factor' to a value adequate to the application. Value too low: large lag distance, lag error Value too high: drive oscillates



Energize motor (activate RF), enable direction of rotation and set Override.

# 

TwinCAT Project30 - Microsoft	t Visual Studio (Administrator)
FILE EDIT VIEW PROJECT	BUILD DEBUG TWINCAT TWINSAFE PLC TOOLS SCOPE
G - O   📅 - 📩 🖬	📲 👗 🗇 🏦 🦻 - 🤍 - 🕨 Attach 🦷 Release
) 🗄 🔛 🖪 🖉 🛠 🌀 🔯 🛼	ר <local> ד = €   פ</local>
Solution Explorer 🔹 무 🗙 🕇	TwinCAT Project30 👳 🗙
◎ ⊖ ☆   ™ - ๗   ♪ "	General Settings Parameter Dynamics Online Functions Coupling Compensation
Search Solution Explorer (Cl D -	0.5171 Setpoint Position: [mm]
<ul> <li>TwinCAT Project30</li> <li>SYSTEM</li> </ul>	Lag Distance (min/max):         [mm]         Actual Velocity:         [mm/s]         Setpoint Velocity:         [mm/s]           0.0000         (0.000, 0.000)         0.0000         0.0000         0.0000
	Override: [%] Total / Control Output: [%] Error:
A 🖳 NC-Task 1 SAF	0.0000 % 0.00 / 0.00 % 0 (0x0)
NC-Task 1 SVB	Status (log.) Enabling
Tabler	Ready V NOT Moving Coupled Mode Controller Set
	Has Job Moving Rw In Parget Pos. Feed Rw
⊿ ∄a Axes	
🔺 📬 Axis 1	Controller Kv-Factor: [mm/s/mm] Set Enabling
👂 👯 Enc	
Þ ≇ <mark>⊥</mark> Drive	Target Position: [mm] V Feed Fw
🛌 Ctrl	0 V Feed Bw Cancel
Inputs	
P Uutputs	

## 12 Adapter settings

Start TwinCAT XAE (VS 2013)



TwinCAT XAE (VS 2013)

#### Create a new project

	Start Page - Microsoft Visual Studio (Administrator)							
FILE	EDIT VIEW DEBU	G TWINCAT	TWINSA	FE	PLC	TOOLS	SCOPE	
	New		•	ïð	Proje	ct 📐	Ctrl+Shif	t+N
	Open		•	÷	Web	Site 💦	Shift+Alt	+N
	Close			õ	File		Ctrl+N	
X	Close Solution							
	Save Selected Items	Ctrl+S						
	Save Selected Items As							
	Save All	Ctrl+S	hift+S					
	Export Template							

New Project	2	Same of Charles	-	ନ <mark>×</mark>
▶ Recent		.NET Framework 4.5	•	📰 📃 Search Installed Ter 🔎 -
▲ Installed		TwinCAT XAE	Project (	Type: TwinCAT Projects
<ul> <li>▲ Templates</li> <li>▶ Other Project Ty</li> <li>▶ TwinCAT Measu</li> <li>TwinCAT Project</li> <li>Samples</li> </ul>	/pes urement			TwinCAT XAE System Manager Configuration
▷ Online				
Name:	TwinCAT_Docu	2		
Location:	C:\Users\kig0vt0	20 Documents Visual Stu	ıdio 201: (	Browse
Solution name:	TwinCAT_Docu		[	<ul> <li>Create directory for solution</li> </ul>
				3 OK Cancel

Select the target system:

• Local (own PC) TwinCAT PLC TwinCAT\_Docu - Microsoft Visual Studio (Administrator) EDIT PROJECT BUILD FILE VIEW DEBUG TWINCAT TWINSAFE PLC TOOLS G - O 🛅 - 🖆 - 🍟 💾 👗 🗗 A - C -り Attach... -🖪 🥩 🔨 i 🖉 🕲 🔁 ê 🔛 🚾 | <Local> TwinCAT\_Docu 👳 🗡 Solution Explorer G O 🟠 🐻 - 🗊 General Settings Data Types Interfaces Functions Search Solution Explorer 🔑 -2 Solution 'TwinCAT\_Docu' winCAT System Manager Choose Target. TwinCAT\_Docu 4 v3.1 (Build 4143) ⊳ SYSTEM A MOTION Choose Target System PLC SAFETY 0K Local PC C++ 9<sub>6++</sub> Cano I/O ⊳ TwinCAT PLC 🚽 Search (Ethernet)... Search (Fieldbus).. 📃 Set as Default 5 \* Connection Timeout (s):

Add the EtherCAT Master functionality to the 'Device' icon

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Configuration of the PC network card (one time)

The TwinCAT software system can be used on virtually all PC-based systems as a real-time control.

Requirement:

The TwinCAT driver for real-time Ethernet communication is installed.

The TwinCAT driver for real-time Ethernet only works with Ethernet cards with an Intel chip set.

Install TwinCAT Intel PCI Ethernet adapter



Enable Disable

Show Bindings

## Feedback message: TwinCAT Intel PCI Ethernet adapter installed

Installation of TwinCAT RT-Ethernet Adapters	X
Ether an Adapters	Update List
Installed and ready to use devices(realtime capable)	Install
TwinCAT Ethernet Protocol	Update
Compatible devices	Bind
Incompatible devices     Prahtlosnetzwerkverbindung - Intel(R) Centrino(R) Advanced-N 6235	Unbind
Usabled devices	Enable
	Disable
	Show Bindings

### Activate EtherCAT adapter

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Inputs		41
Outputs	O Unused	
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Feedback message: adapter activated



## Glossary

### Α

### AT

Drive telegram from slave to master

### С

### CNC

**Computerized Numerical Control** 

## Ε

## ESI

EtherCAT Slave Information / EtherCAT XML Device Description

### E2PROM

Electrically erasable programmable read-only memory

### ID

Parameter identification numbers acc. to SERCOS Standard

## Μ

### MDT

Master Data Telegram from master to slave

### Ν

### NC

Numerical Control

Ρ

### PLC

Programmable Logic Controller

## R

### RF

Command 'Controller enable'; the drive is energized and will be controlled depending on the selected operation mode. Controller enable can only be set if the device is error-free (SBM = TRUE) and acknowledgement DC bus on is set (QUE = TRUE).Acknowledgement controller enable (QRF) is set.

### S

### SoE

Servodrive Profile (SERCOS) over EtherCAT (Acc. to IEC 61800-7-300)

## т

# TC3

TwinCAT 3

## Your opinion is important!

With our documentation we want to offer you the highest quality support in handling the AMKmotion products. That is why we are now working on optimizing our documentation.

Your comments or suggestions are always of interest to us.

We would be grateful if you take a bit of time and answer our questions. Please return a copy of this page to us.



or

e-mail: Documentation@amk-motion.com

fax no.: +49 7021/50 05-199

### Thank you for your assistance. Your AMKmotion documentation team

- 1. How would you rate the layout of our AMKmotion documentation?
  - (1) very good (2) good (3) satisfactory (4) less than satisfactory (5) poor

#### 2. Is the content structured well?

- (1) very good (2) good (3) moderate (4) hardly (5) not at all
- 3. How easy is it to understand the documentation?
  - (1) very easy (2) easy (3) moderately easy (4) difficult (5) extremely difficult
- 4. Did you miss any topics in the documentation?
  - (1) no (2) if yes, which ones:
- 5. How would you rate the overall service at AMKmotion?
  - (1) very good (2) good (3) satisfactory (4) less than satisfactory (5) poor

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