AMKmotion
TC3 startup with AMKmotion devices
Software description

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

AMKmotion
MEMBER OF THE ARBURG FAMILY

Imprint

Name: PDK_207197_TC3_Inbetriebnahme_de

Version:

Version: 2023/27		
Chapter / Topic	**Change**	**Abbreviations**
	AMKmotion Design	LeS

Previous version: 2019/03

Product status:

Product (part no.)	Software
PC	TwinCAT 3.1

Reservation: We reserve the right to modify the content of the documentation as well as the delivery options for the product.

Publisher: AMKmotion GmbH + Co KG
Gaußstraße 37-39
73230 Kirchheim unter Teck
Germany

Phone +49 7021 50 05-0
Fax +49 7021 50 05-176

E-mail: info@amk-motion.com

Registration court: AG Stuttgart, HRA 230681, Kirchheim unter Teck,
Tax Id no.: DE 145 912 804

Complementary: AMKmotion Verwaltungsgesellschaft mbH, HRB 774646

Service: Phone +49 7021 50 05-190, Fax -193

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
- Device configuration and application
- Type of fault/problem and suspected cause
- Diagnostic messages (error messages)

E-mail service@amk-motion.com

Internet address: www.amk-motion.com

Content

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\Io\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

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

TwinCAT	→	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).

AMK	→	TwinCAT
IDxxxxx **- 32768** (0x8000)	=	P-0 xxxx
Example: ID32775 **- 32768** (0x8000)	= 	P-0-0007

TwinCAT	→	AMK
P-0-xxxx **+ 32768** (0x8000)	=	IDxxxxx
Example: P-0-0007 **+ 32768** (0x8000)	= 	ID32775

6 Startup list

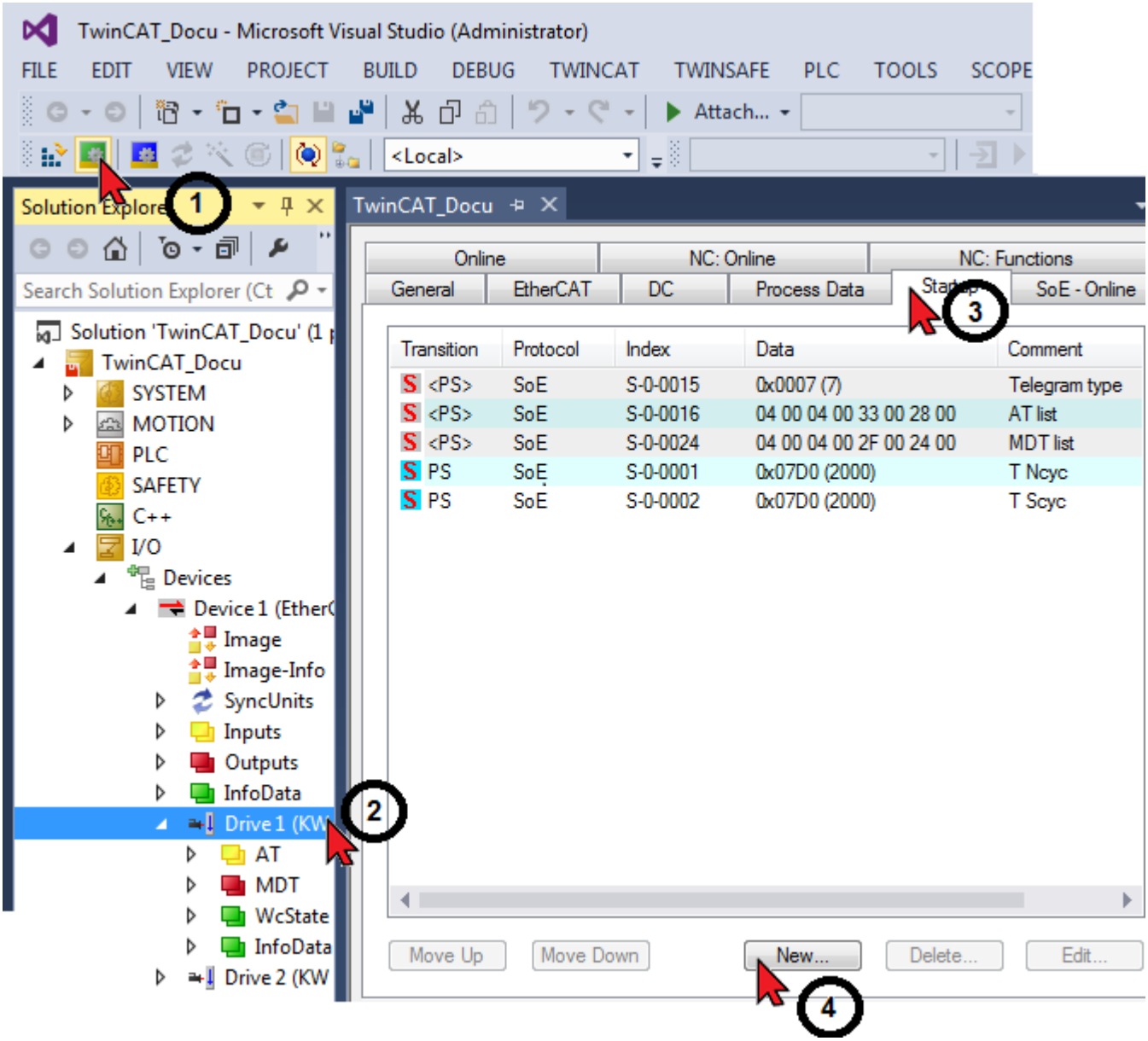
The Startup list parameters are transferred to the AMK drive every time the TwinCAT system powers up.
The parameter modifications are immediately active as soon as the bus state ‘Operational’ is reached

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

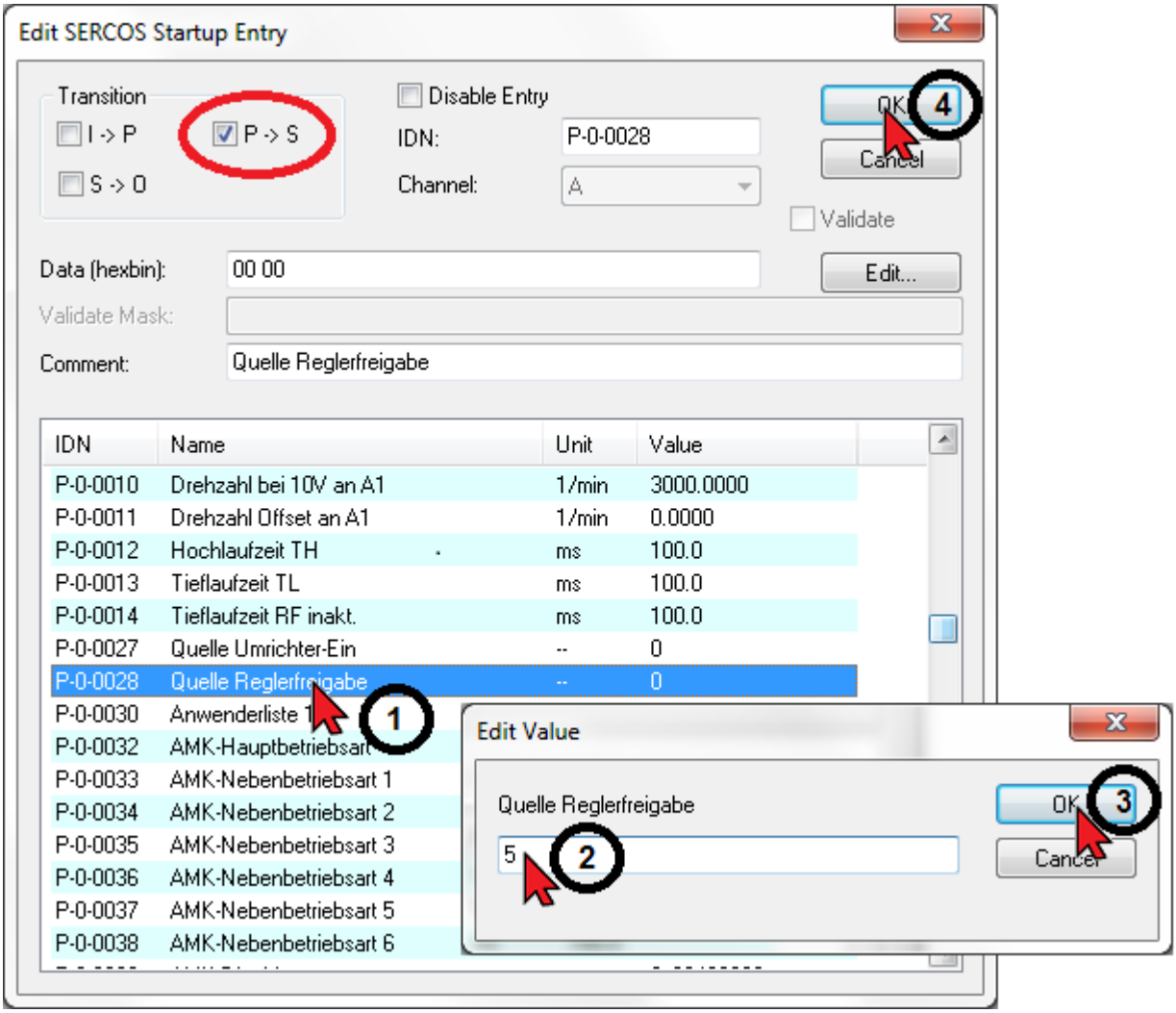
ID2 'SERCOS cycle time' / S-0-0001 'SERCOS cycle time'
ID34023 'BUS address participant' / S-0-1255 'BUS address participant'

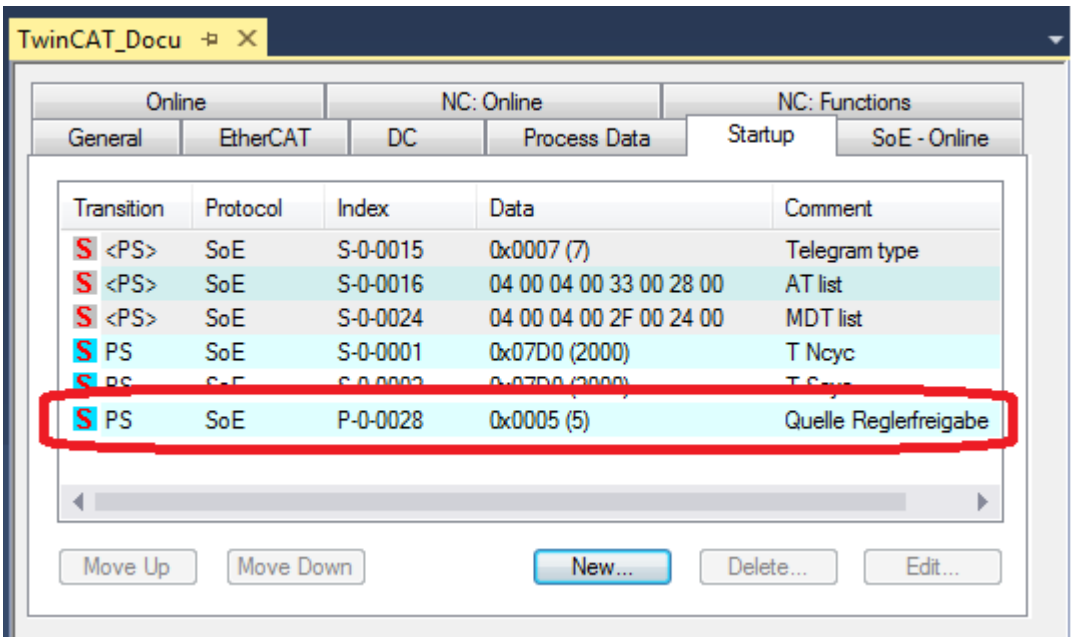
Example:
The Startup list is extended to include ID32796 'Source RF' with Code 5 (RF via field bus).
ID32796 'Source RF' = P-0-0028 'Source RF'

Input in TwinCAT ‘Run’ mode
In the TwinCAT ‘Run’ mode the ‘Edit SERCOS Startup Entry’ window with online values is available.



In normal cases the parameter values in bus state ‘P -> S’ are transferred (Pre-Operational → Safe-Operational)



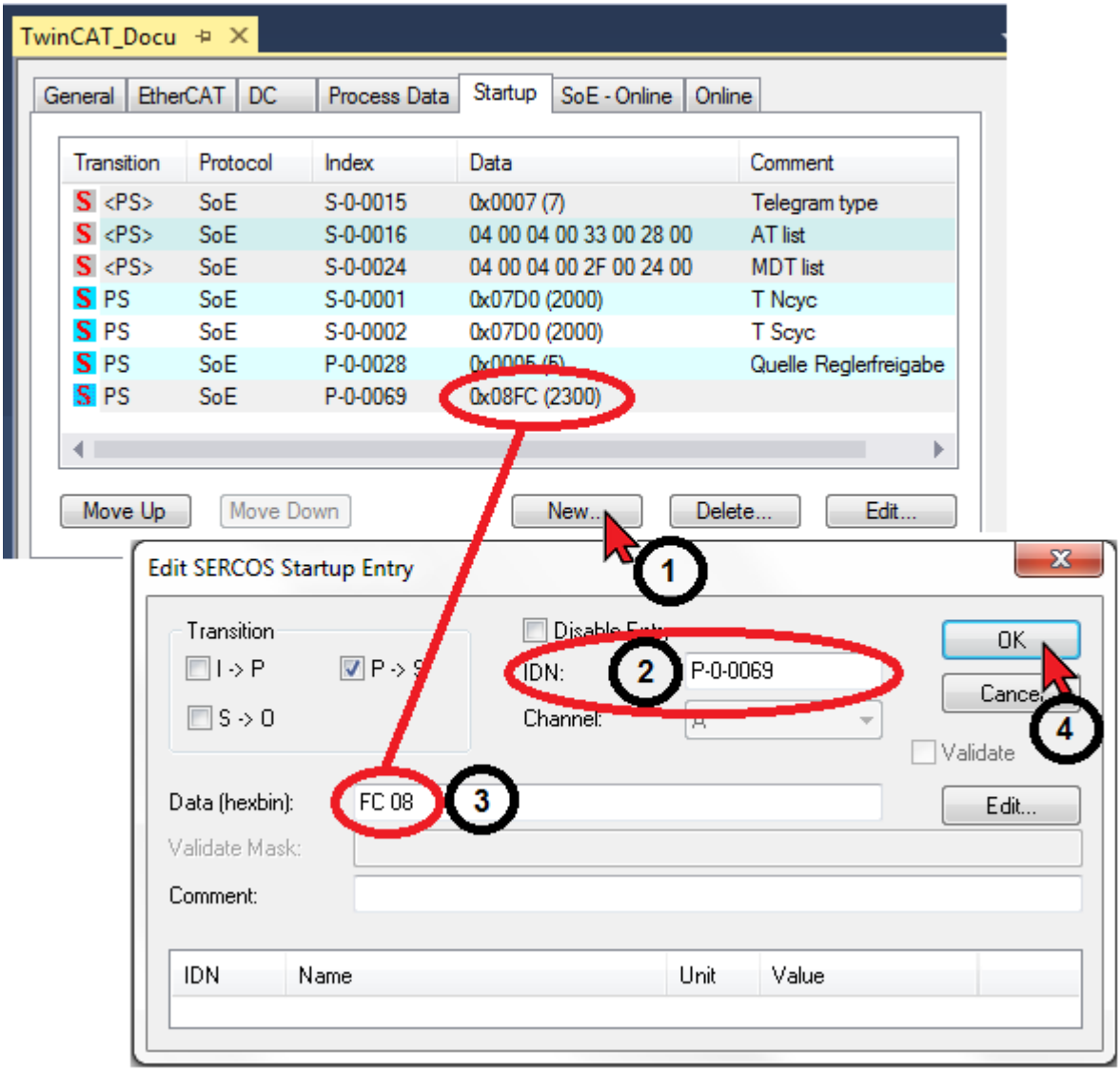


Input in TwinCAT ‘Config’ mode

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'.

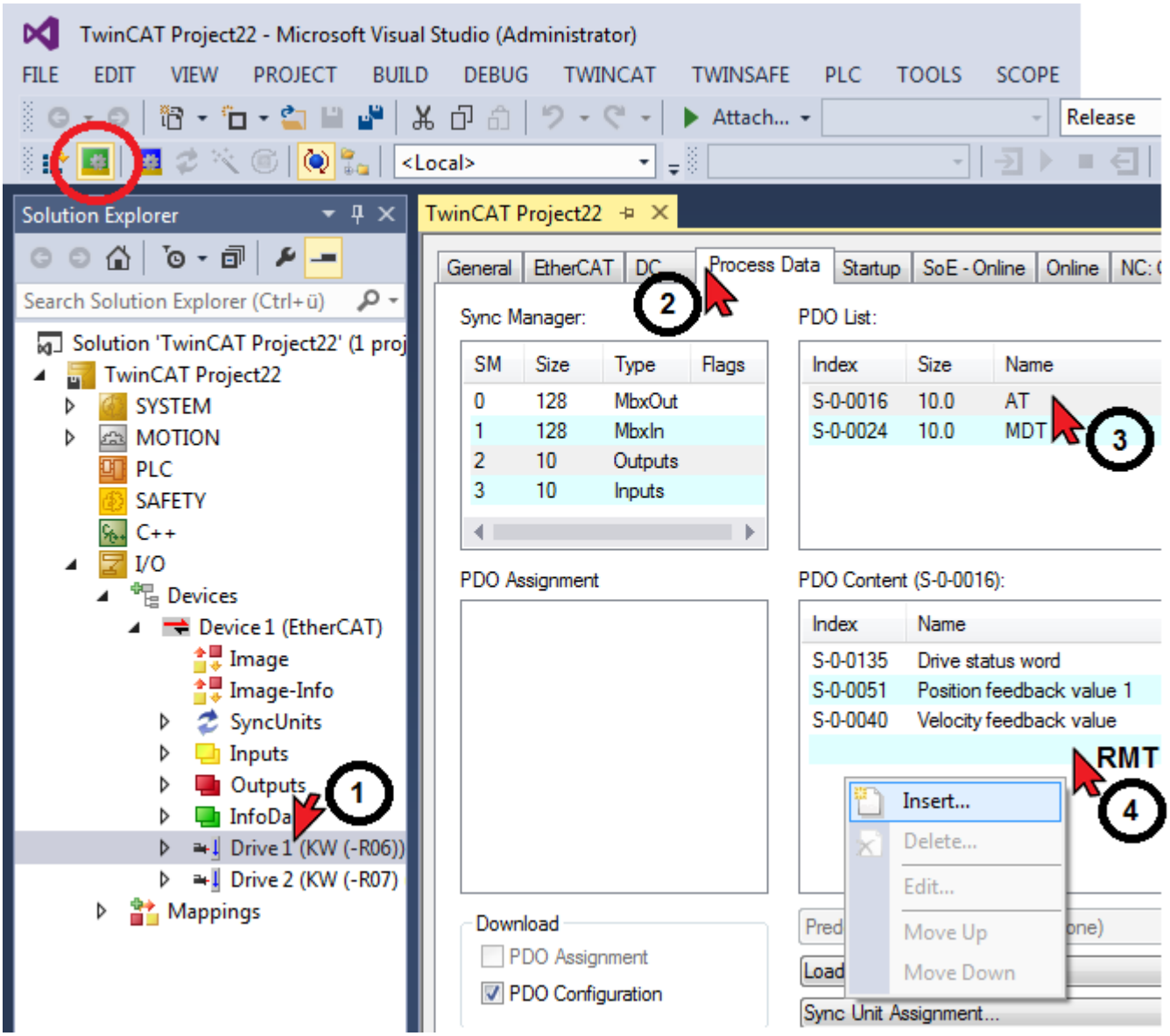
List of configurable parameters in the driver:

S-0-0187 / ID187 'List of data AT'

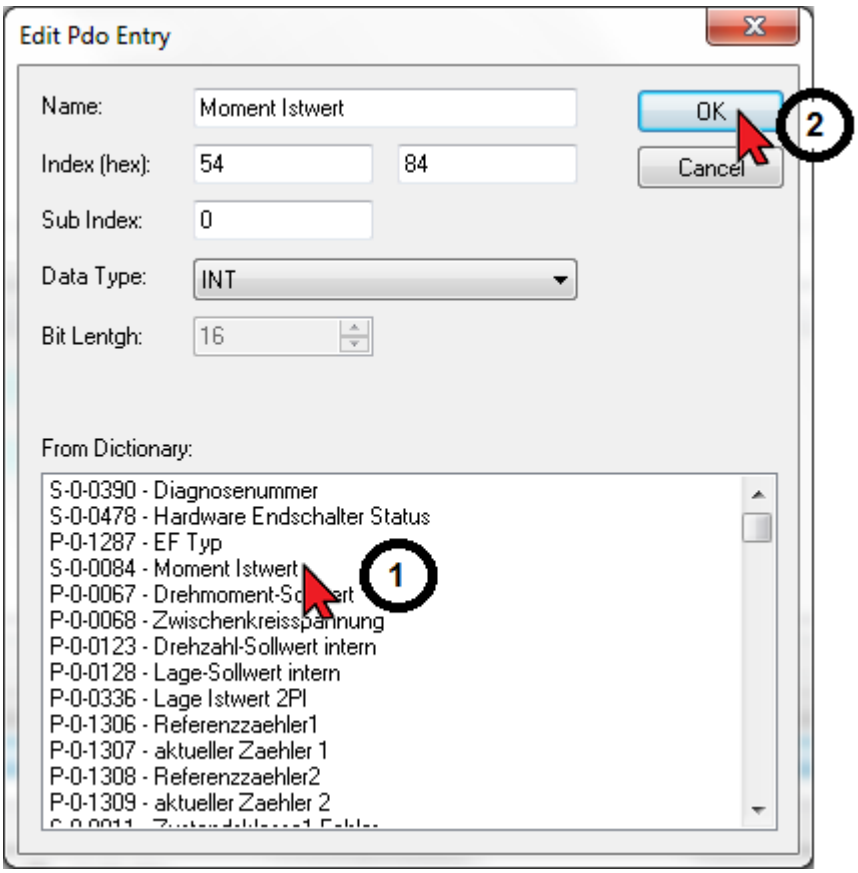
S-0-0188 / ID188 'List of data MDT'

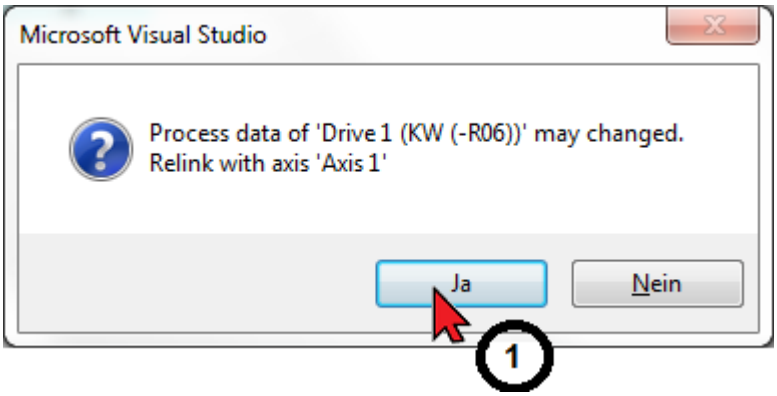
Example:

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

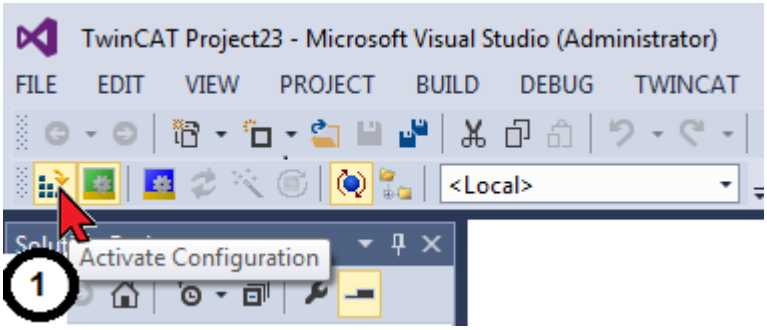


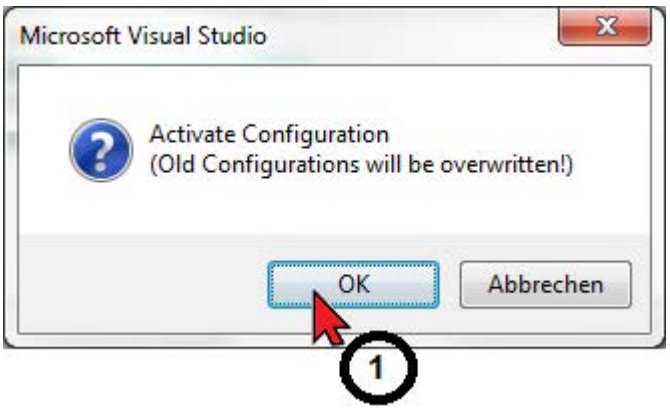
Example: S-0-0084 / ID84 'Torque feedback value'

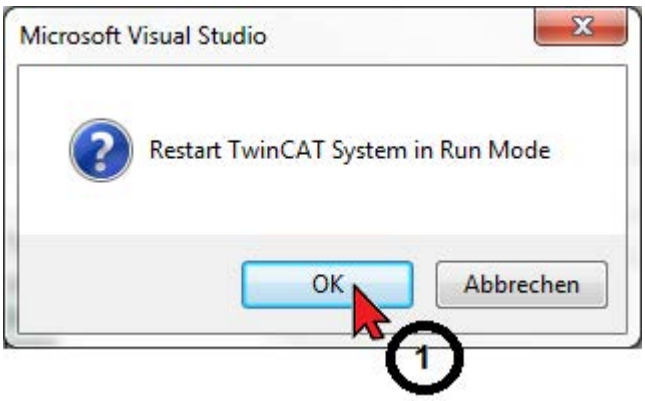




Activate configuration and start TwinCAT 'Run Mode'







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

Name		Online	Type	Size	>Addr...	In/Out	User ID
Drive status word	X	32769	UINT	2.0	114.0	Input	0
Position feedback value 1	X	10244	DINT	4.0	116.0	Input	0
Velocity feedback value	X	-20	DINT	4.0	120.0	Input	0
Moment Istwert	X	15	INT	2.0	124.0	Input	0
WcStateOut		0	BIT	0.1	1522.3	Input	0

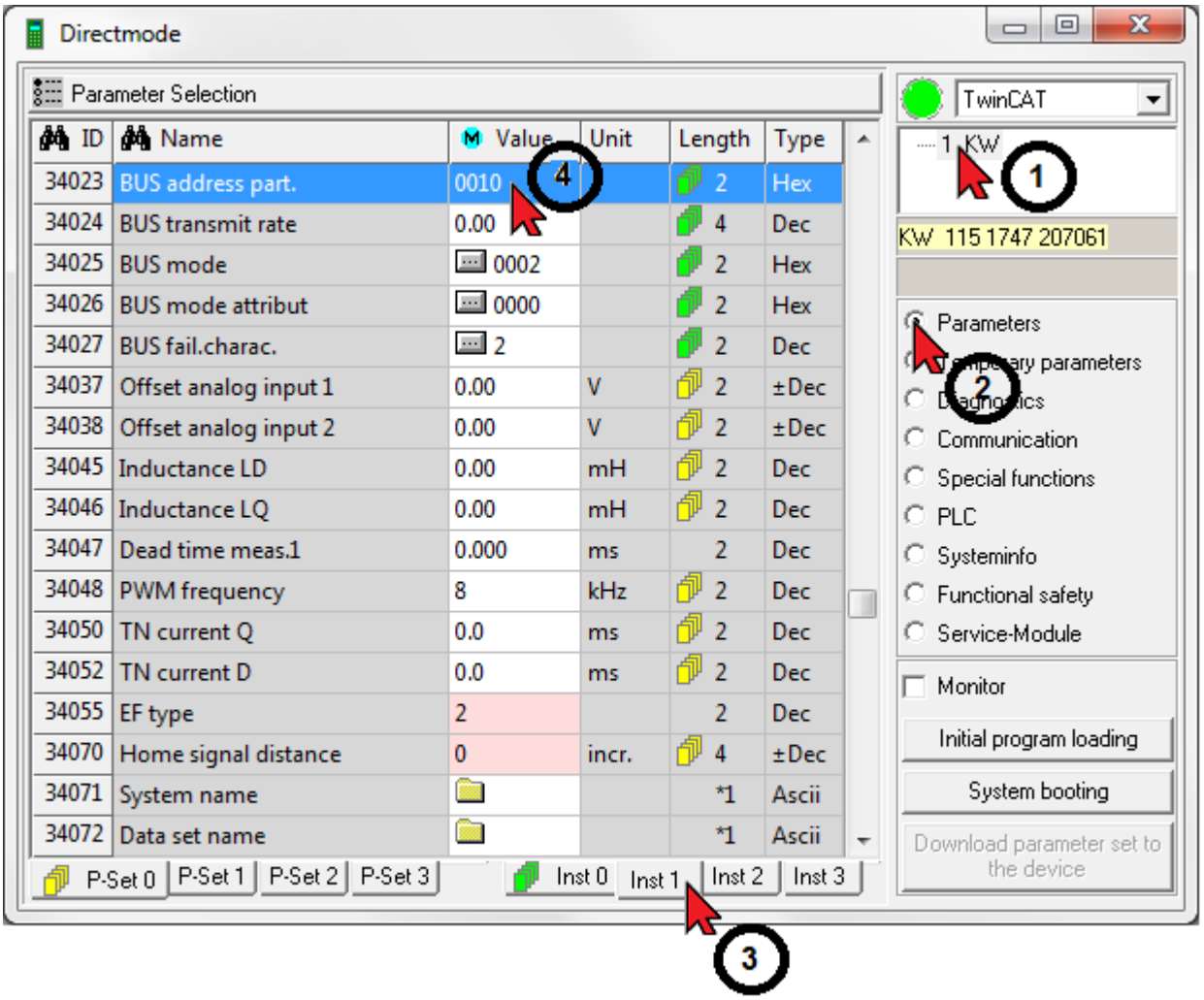
8 Hot Connect

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.

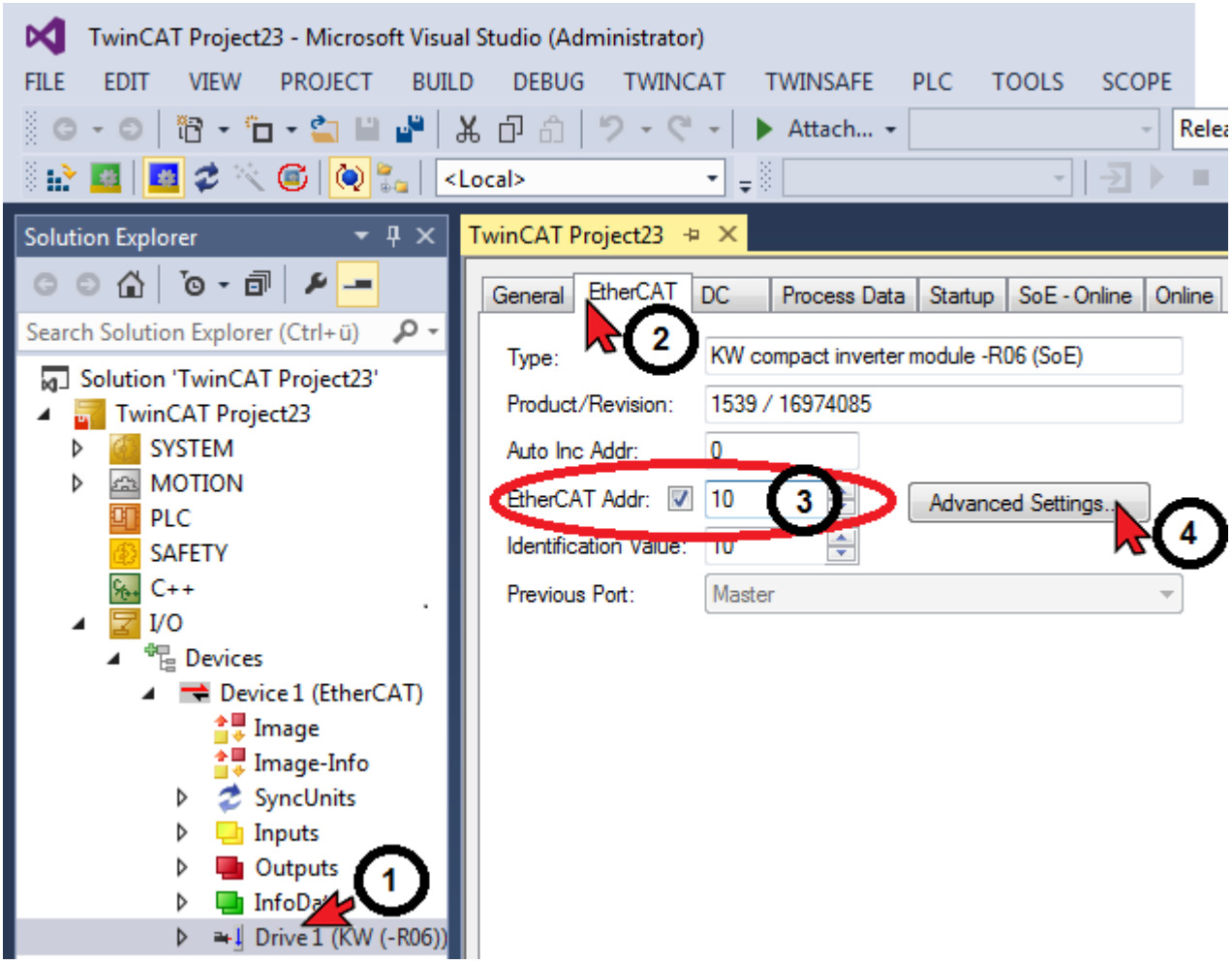
Example: AMK drive with fixed address 10 [Hex]. Address preset with AIPEX PRO ‘Direct mode’.

In TwinCAT, the 'Drive 1' drive is linked to address 10 [Hex] and added to the 'Hot Connect Group'.

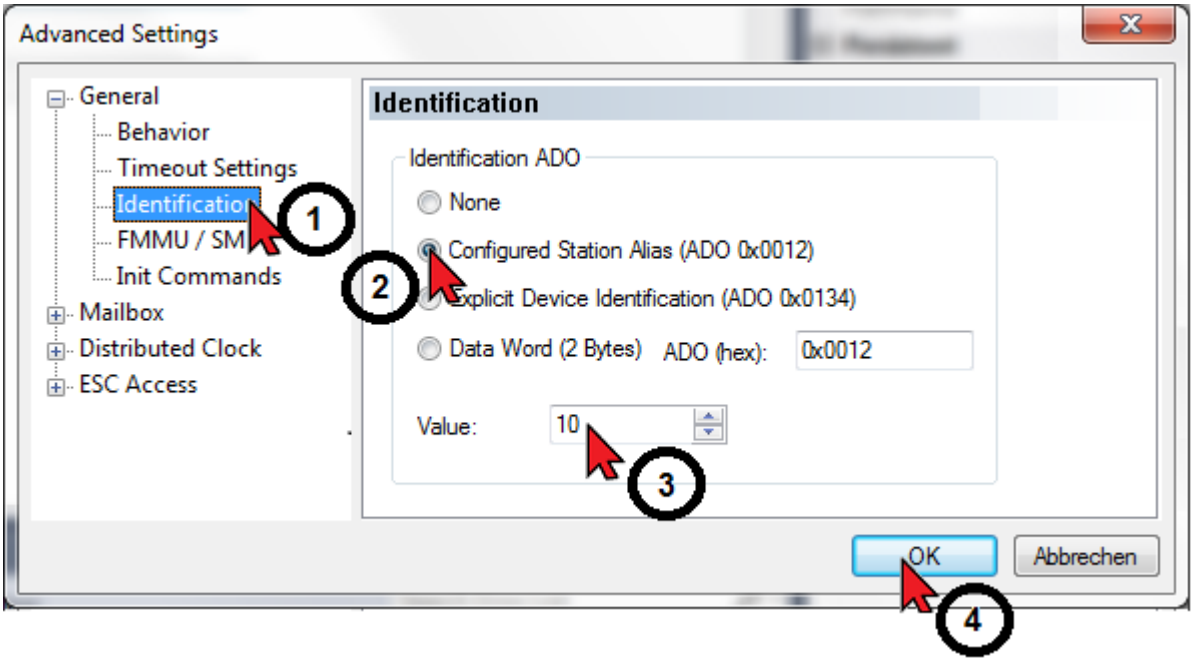


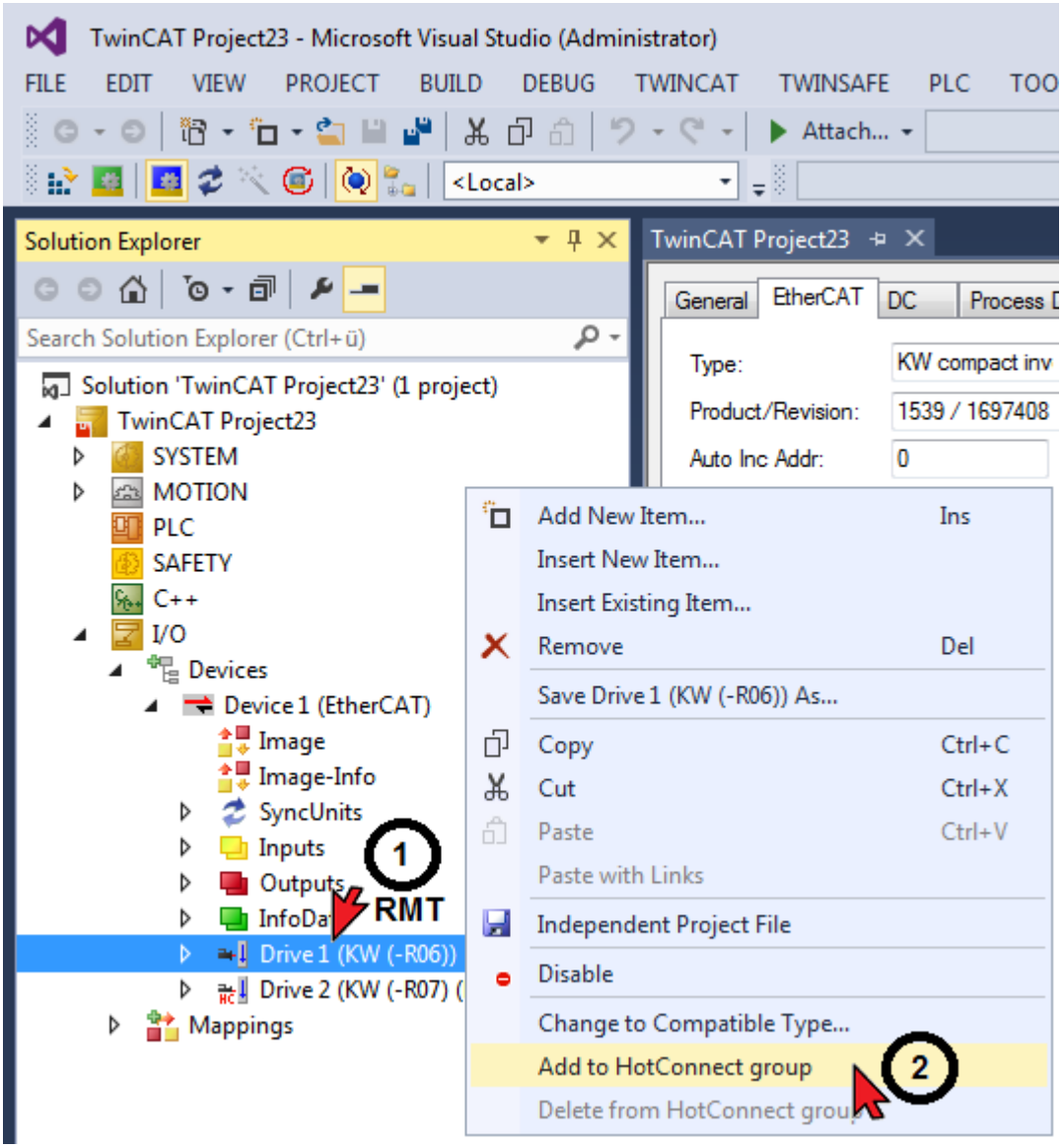
The ID34023 'BUS address participant' / S-0-1255 'BUS address participant' only becomes active after a system reset or 24 VDC OFF/ON.

'Activate EtherCAT address'
Enter fixed address for driver (example 10)

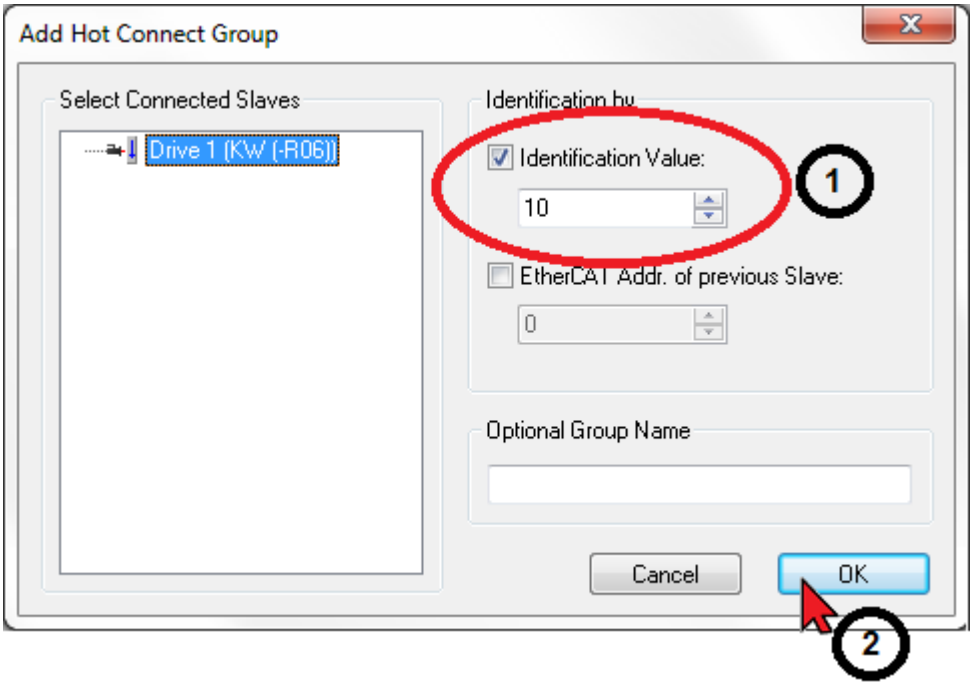


The EtherCAT Master uses the stored address from the EtherCAT Slave E²PROM.

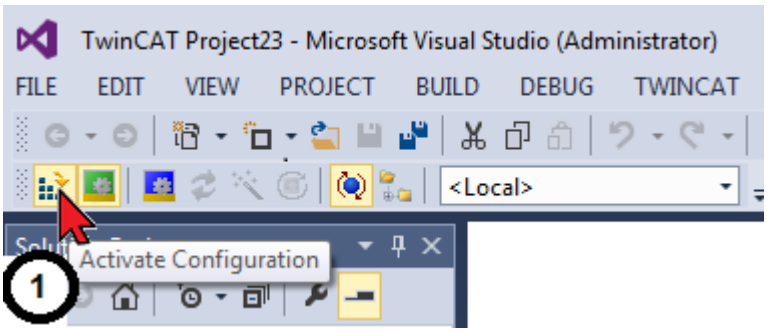


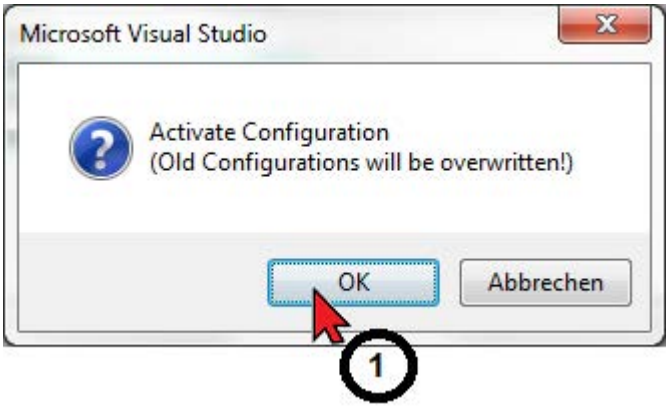

TwinCAT Project23 - Microsoft Visual Studio (Administrator)
FILE EDIT VIEW PROJECT BUILD DEBUG TWINCAT TWINSAFE PLC TOO
Attach...
<Local>
Solution Explorer
Search Solution Explorer (Ctrl+ü)
Solution 'TwinCAT Project23' (1 project)
TwinCAT Project23
SYSTEM
MOTION
PLC
SAFETY
C++
I/O
Devices
Device 1 (EtherCAT)
Image
Image-Info
SyncUnits
Inputs
Outputs
InfoDa
Drive 1 (KW (-R06))
Drive 2 (KW (-R07) (
Mappings
1
RMT
TwinCAT Project23
General
EtherCAT
DC
Process D
Type:
KW compact inv
Product/Revision:
1539 / 1697408
Auto Inc Addr:
0
Add New Item... Ins
Insert New Item...
Insert Existing Item...
Remove Del
Save Drive 1 (KW (-R06)) As...
Copy Ctrl+C
Cut Ctrl+X
Paste Ctrl+V
Paste with Links
Independent Project File
Disable
Change to Compatible Type...
Add to HotConnect group
Delete from HotConnect grou
2

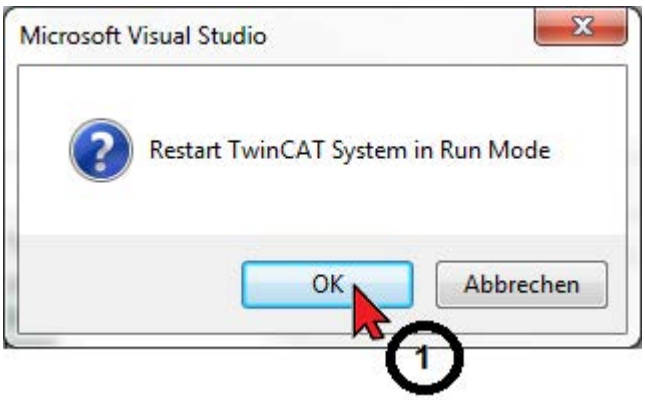
Identification by: Identification Value
Enter fixed address for driver (example 10)



Activate configuration and start TwinCAT 'Run Mode'

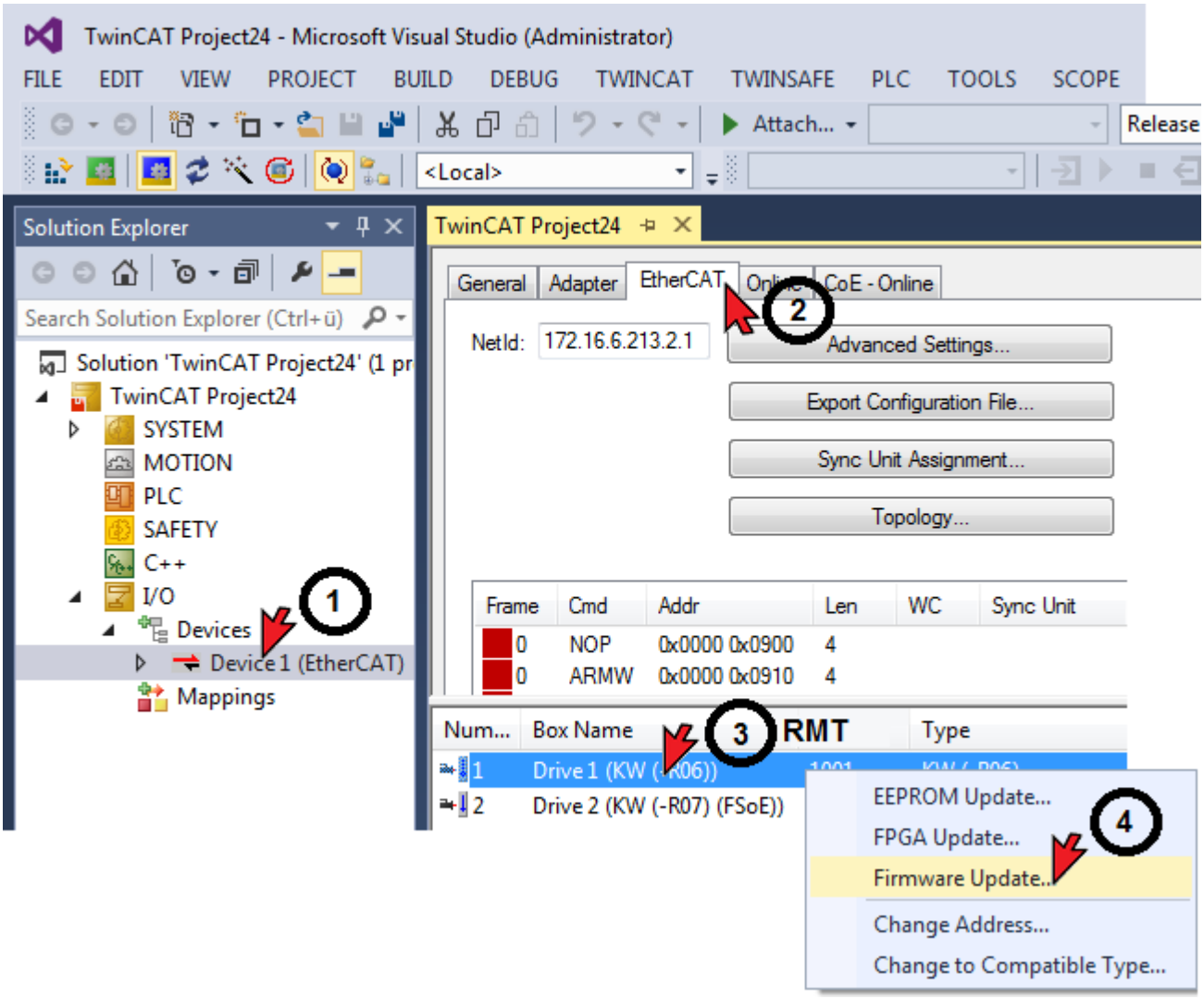





Microsoft Visual Studio
Restart TwinCAT System in Run Mode
OK
Abbrechen
1

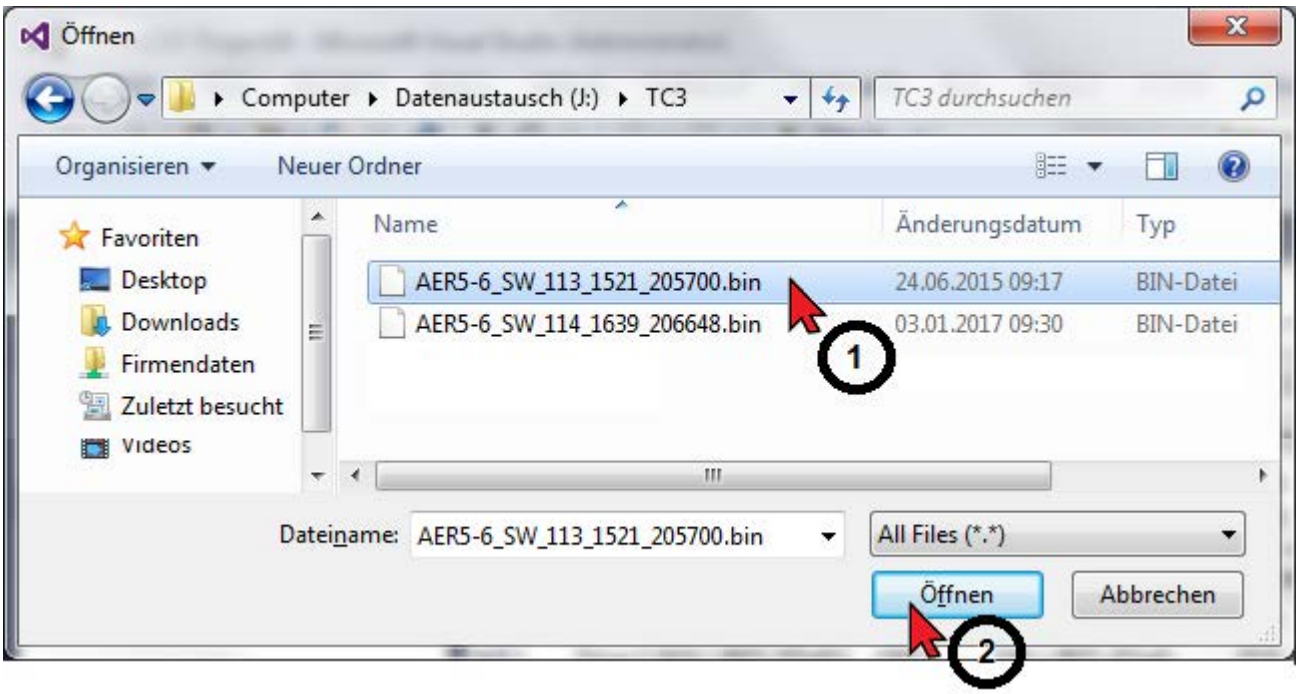
9 Firmware update via FoE

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

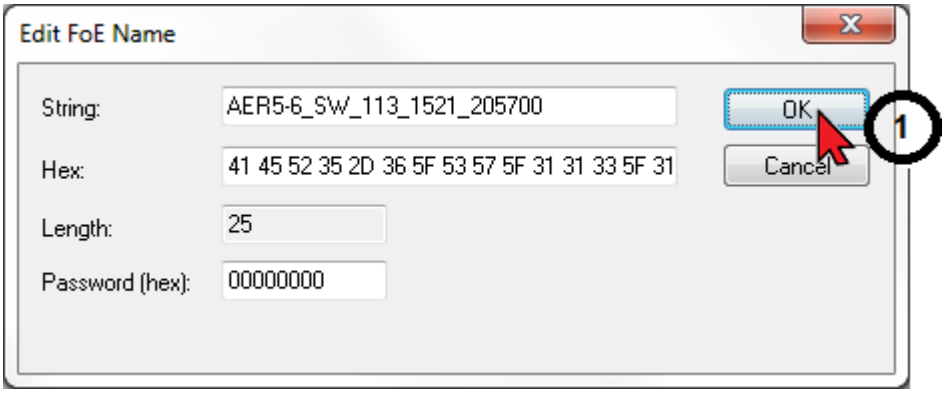


TwinCAT requires the AMK firmware file to be in *.bin format.

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



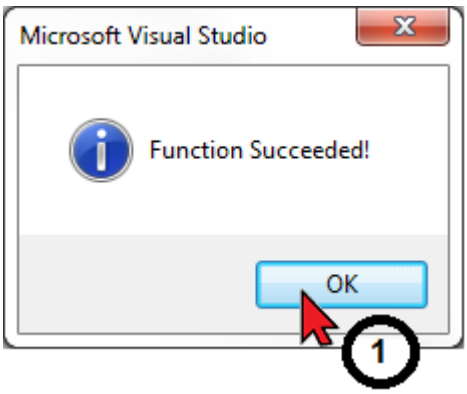
For this a password is not necessary.



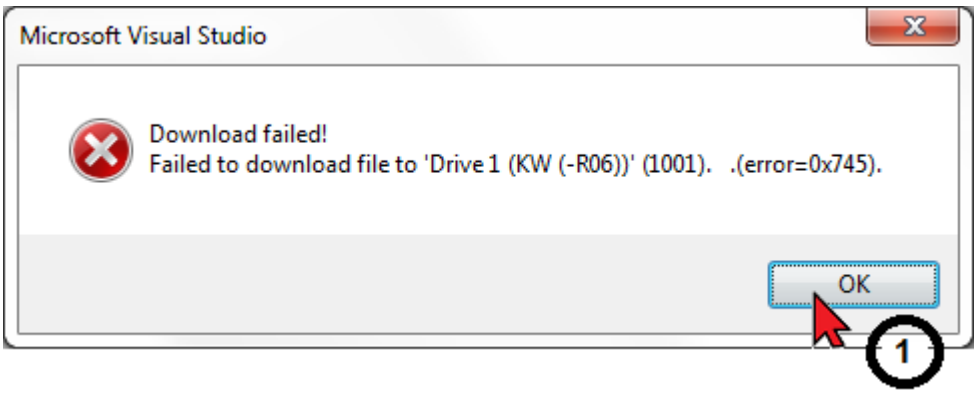
Transferring the firmware file takes around 150 seconds.

Please wait!

Transfer completed successfully.



Transfer faulty



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

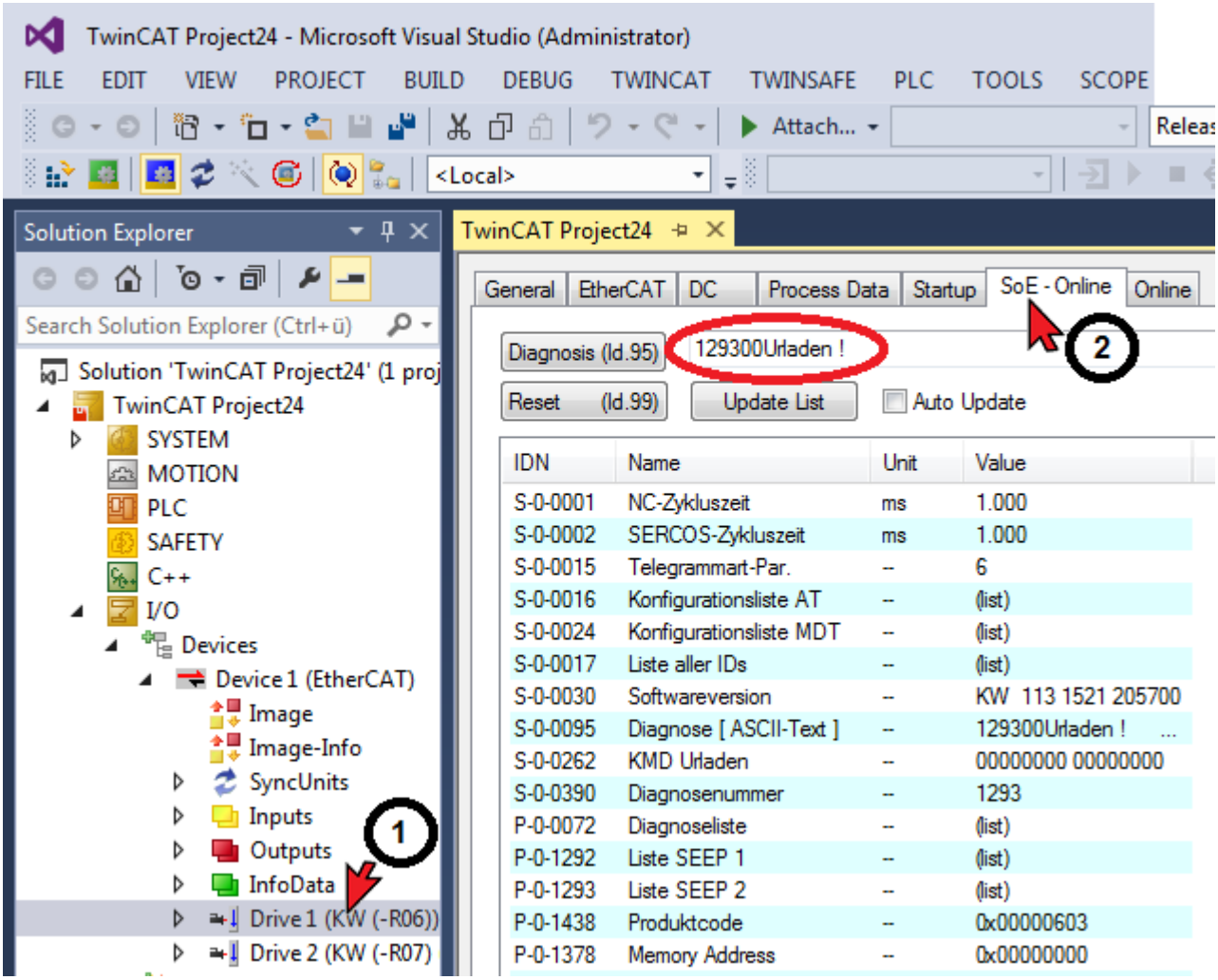
Firmware is only activated after the device has been restarted!

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.

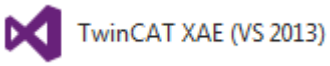
Display of diagnosis message with TwinCAT. Alternatively, AMK software AIPEX PRO can be used.


TwinCAT Project24 - Microsoft Visual Studio (Administrator)
FILE EDIT VIEW PROJECT BUILD DEBUG TWINCAT TWINSAFE PLC TOOLS SCOPE
Attach...
<Local>
Solution Explorer
Search Solution Explorer (Ctrl+ü)
Solution 'TwinCAT Project24' (1 proj
TwinCAT Project24
SYSTEM
MOTION
PLC
SAFETY
C++
I/O
Devices
Device 1 (EtherCAT)
Image
Image-Info
SyncUnits
Inputs
Outputs
InfoData
Drive 1 (KW (-R06))
Drive 2 (KW (-R07)
1
TwinCAT Project24
General EtherCAT DC Process Data Startup SoE - Online Online
Diagnosis (Id.95)
129300Urladen !
2
Reset (Id.99)
Update List
Auto Update
IDN Name Unit Value
S-0-0001 NC-Zykluszeit ms 1.000
S-0-0002 SERCOS-Zykluszeit ms 1.000
S-0-0015 Telegrammart-Par. -- 6
S-0-0016 Konfigurationsliste AT -- (list)
S-0-0024 Konfigurationsliste MDT -- (list)
S-0-0017 Liste aller IDs -- (list)
S-0-0030 Softwareversion -- KW 113 1521 205700
S-0-0095 Diagnose [ASCII-Text] -- 129300Urladen !
S-0-0262 KMD Urladen -- 00000000 00000000
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-0-1438 Produktcode -- 0x00000603
P-0-1378 Memory Address -- 0x00000000

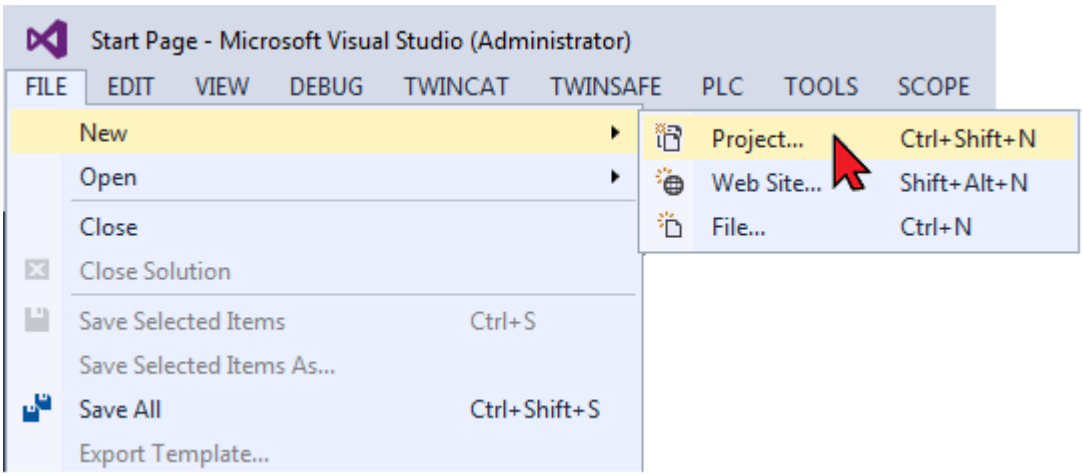
10 TwinCAT 3 project with CODESYS PLC

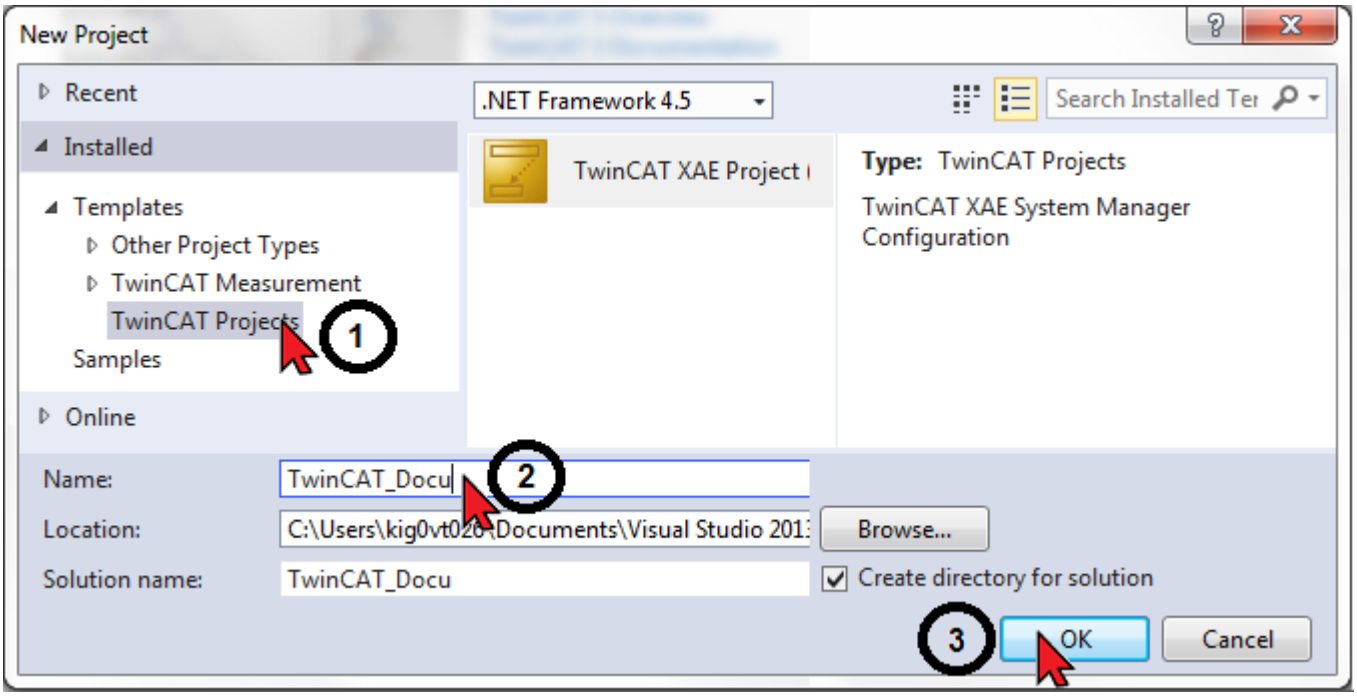
The example describes how to generate a PLC project (without TwinCAT NC axis / CNC axis).
In the PLC example project, the PLC controls and evaluates 'Master Control Word' and 'Drive Status Word'.

Start TwinCAT XAE (VS 2013)



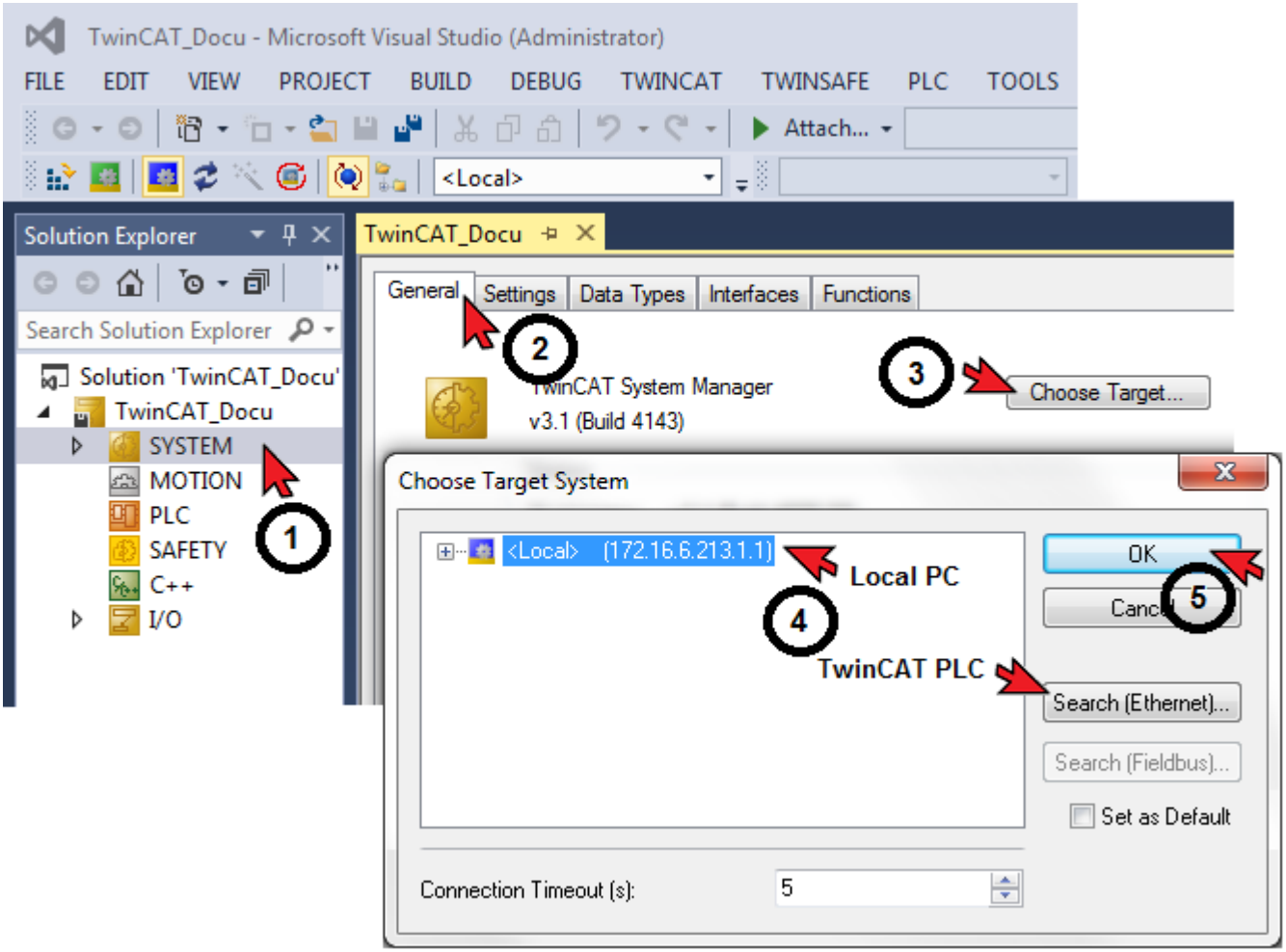
Create a new project



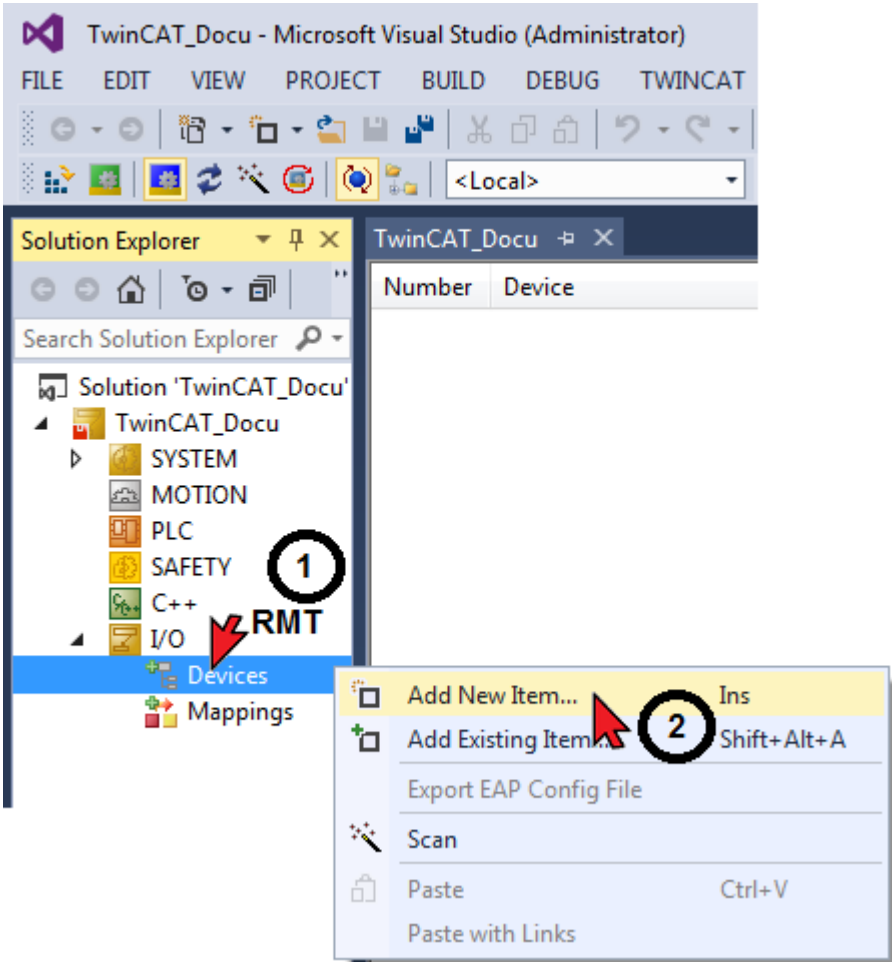


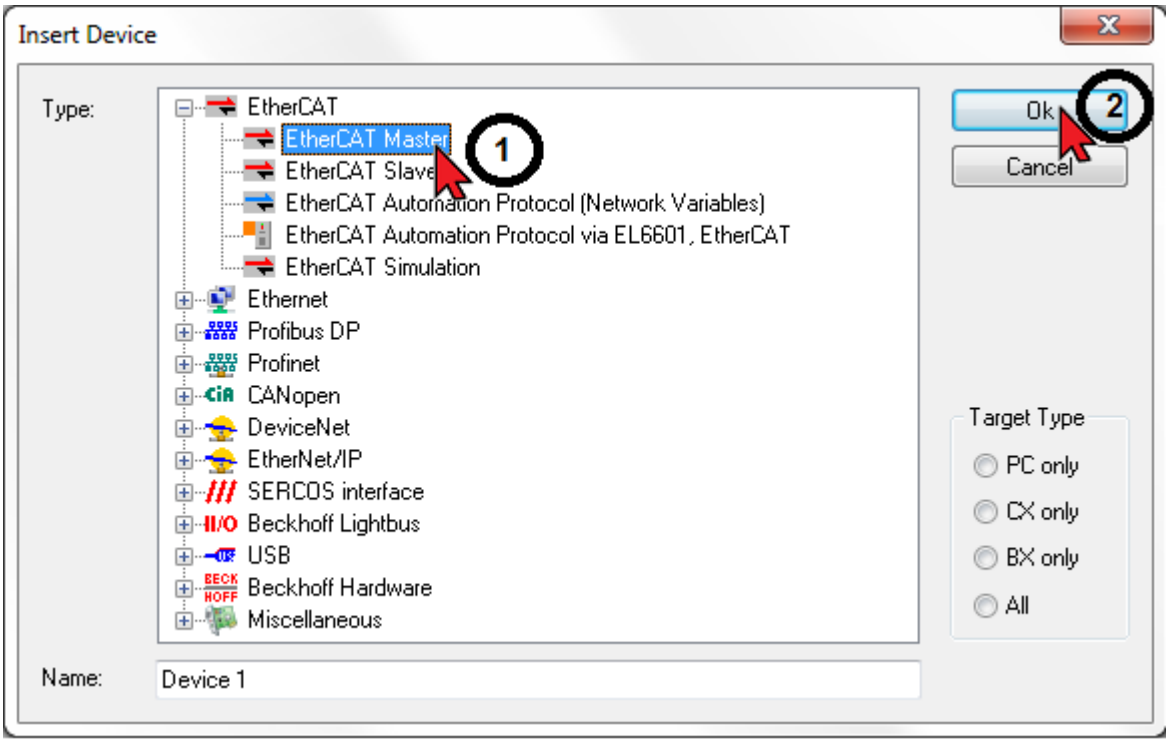
Select the target system:

- Local (own PC)
- TwinCAT PLC

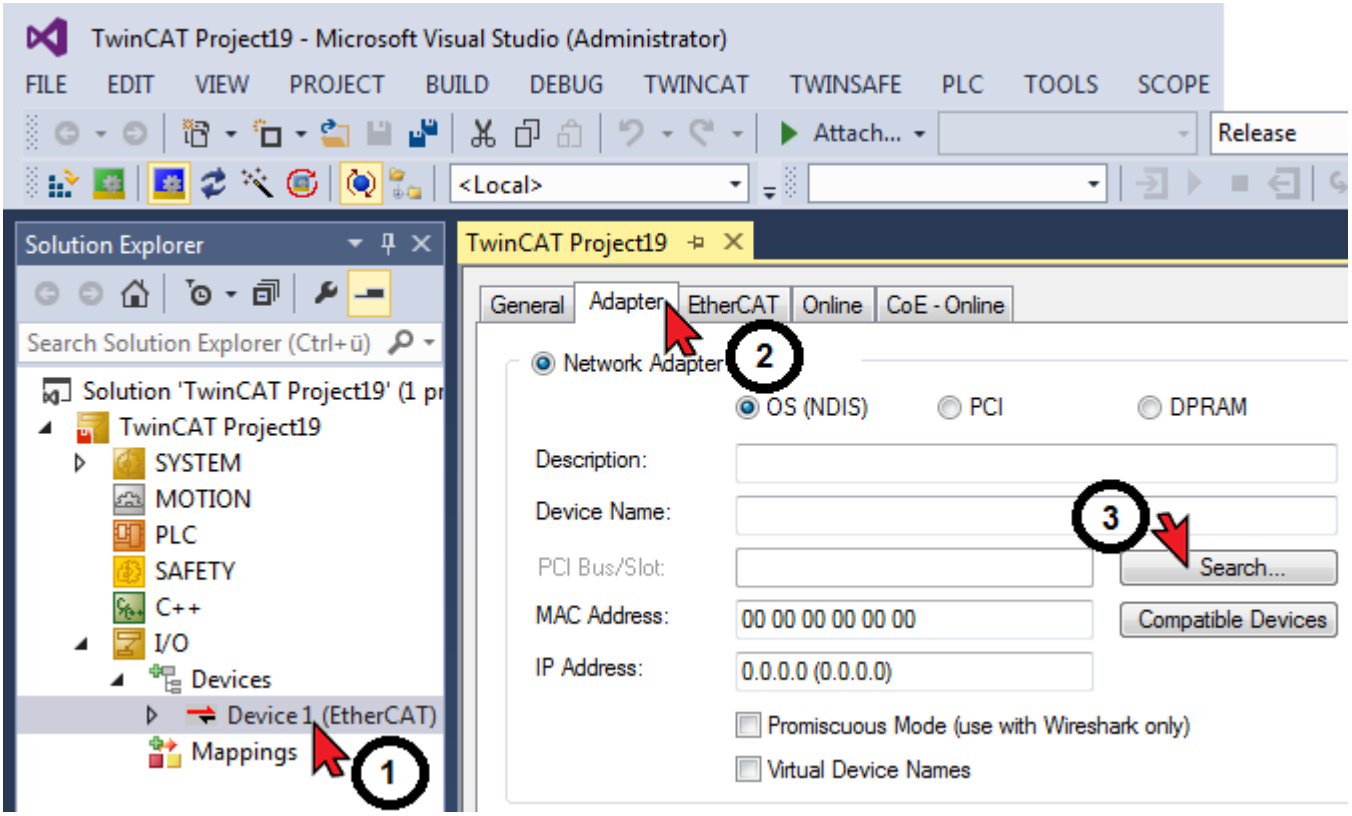


Add the EtherCAT Master functionality to the ‘Device’ icon



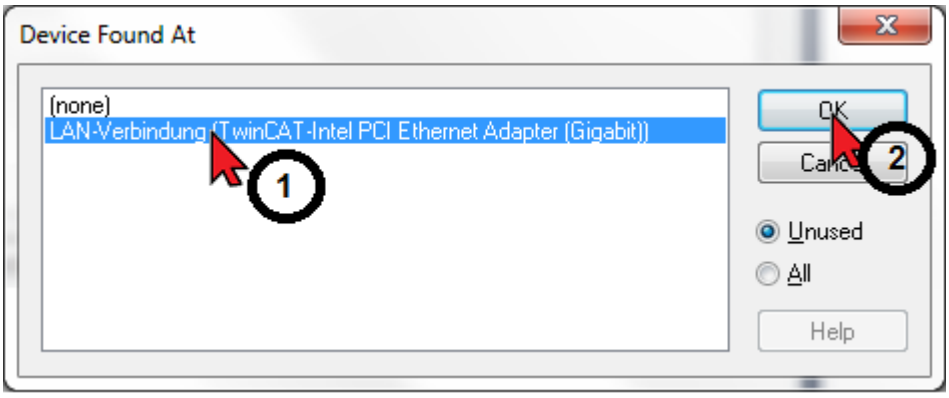


Activate existing network adapter



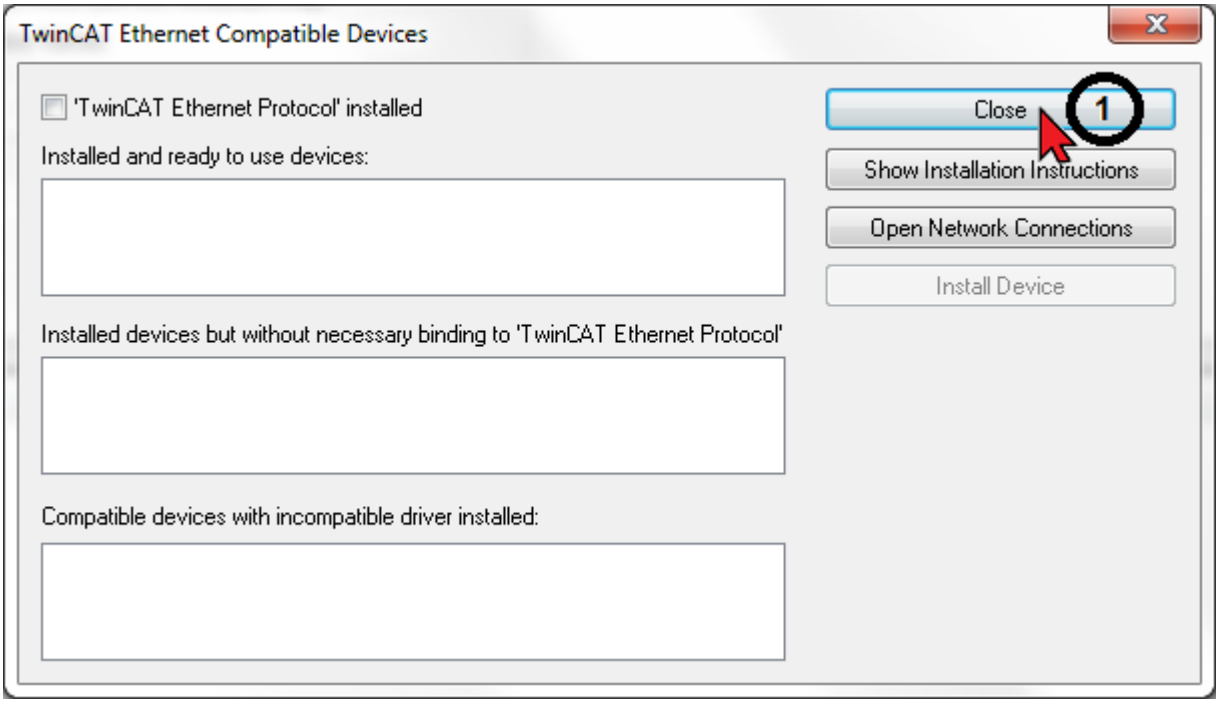
Driver installed

Activate the adapter



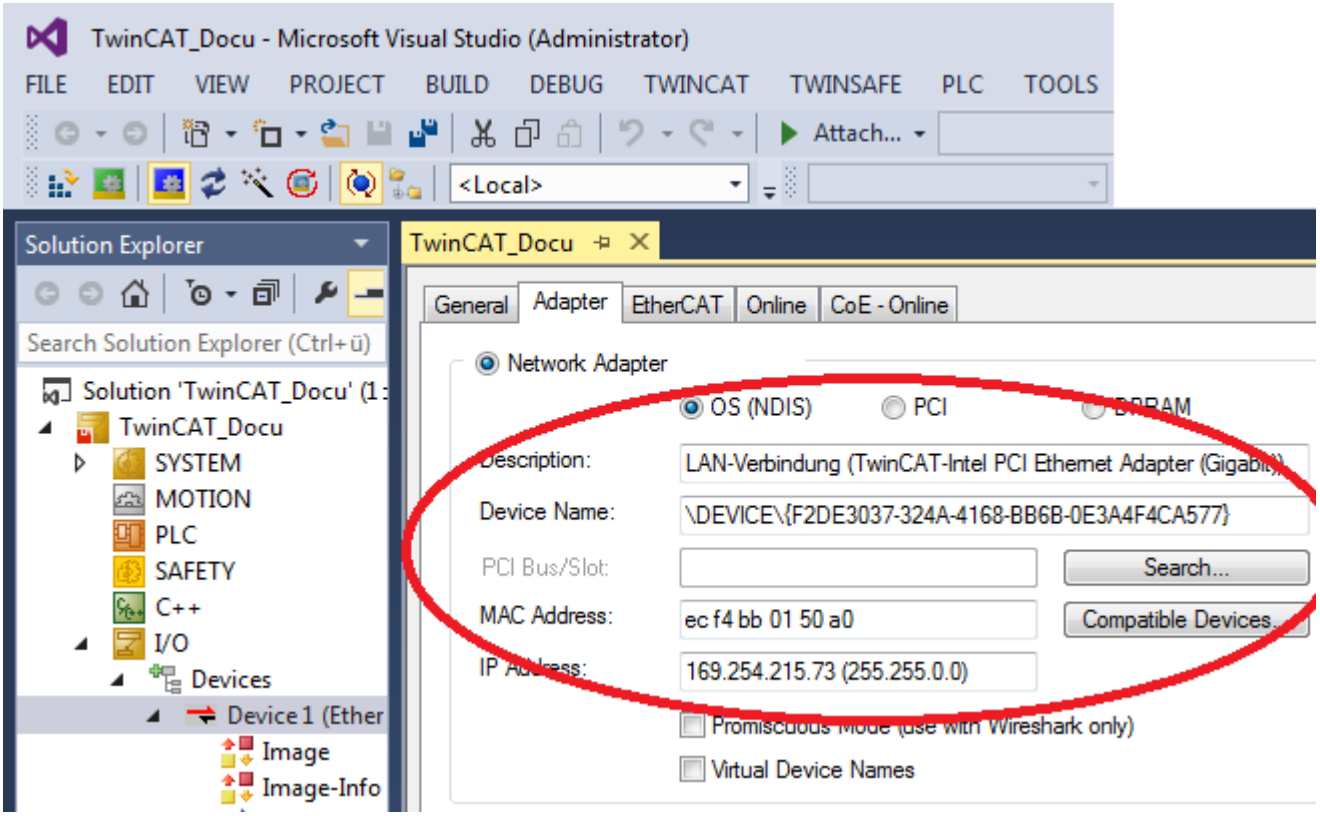
Driver not installed

Siehe Adapter settings auf Seite 52.

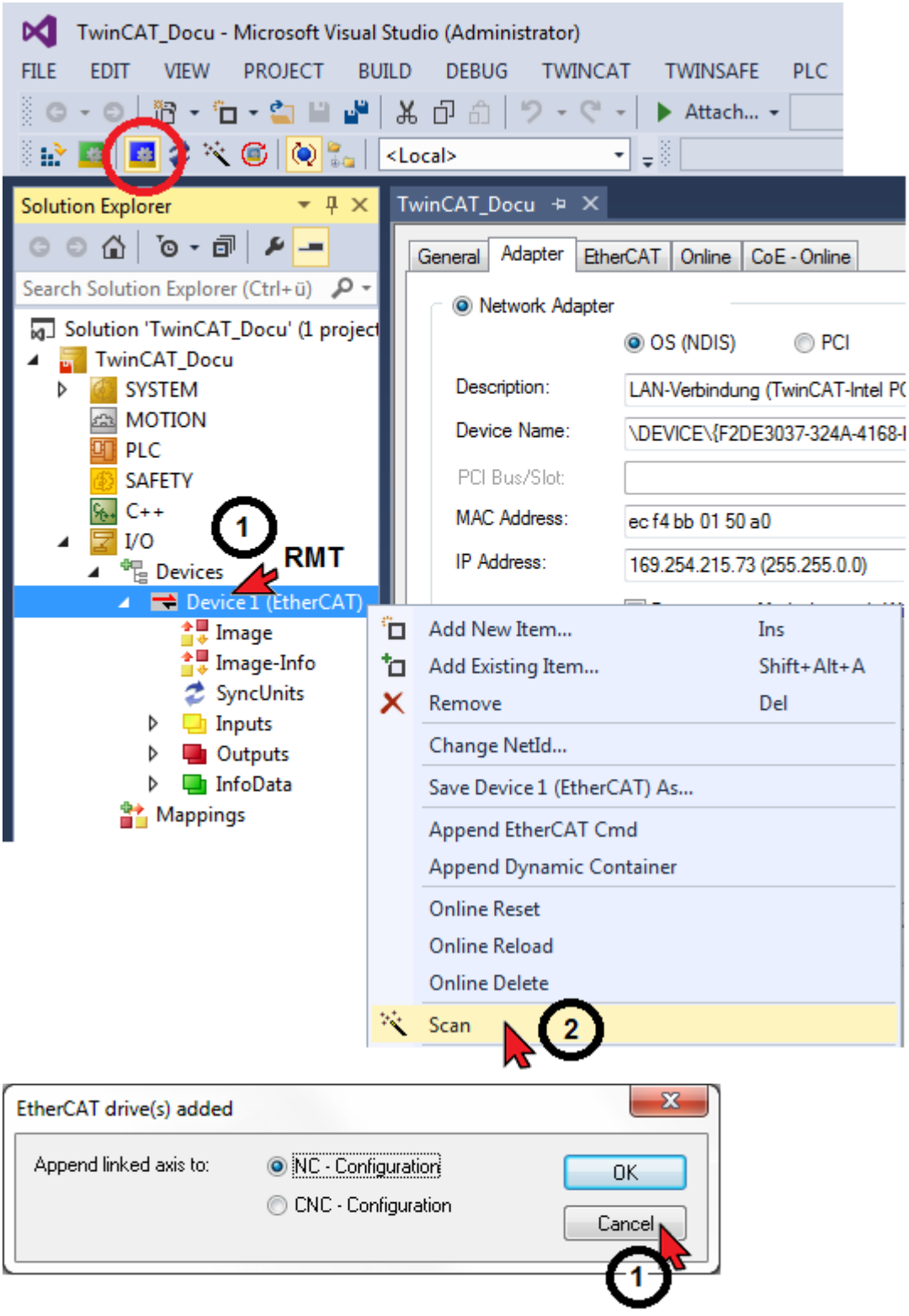


Scanning a network

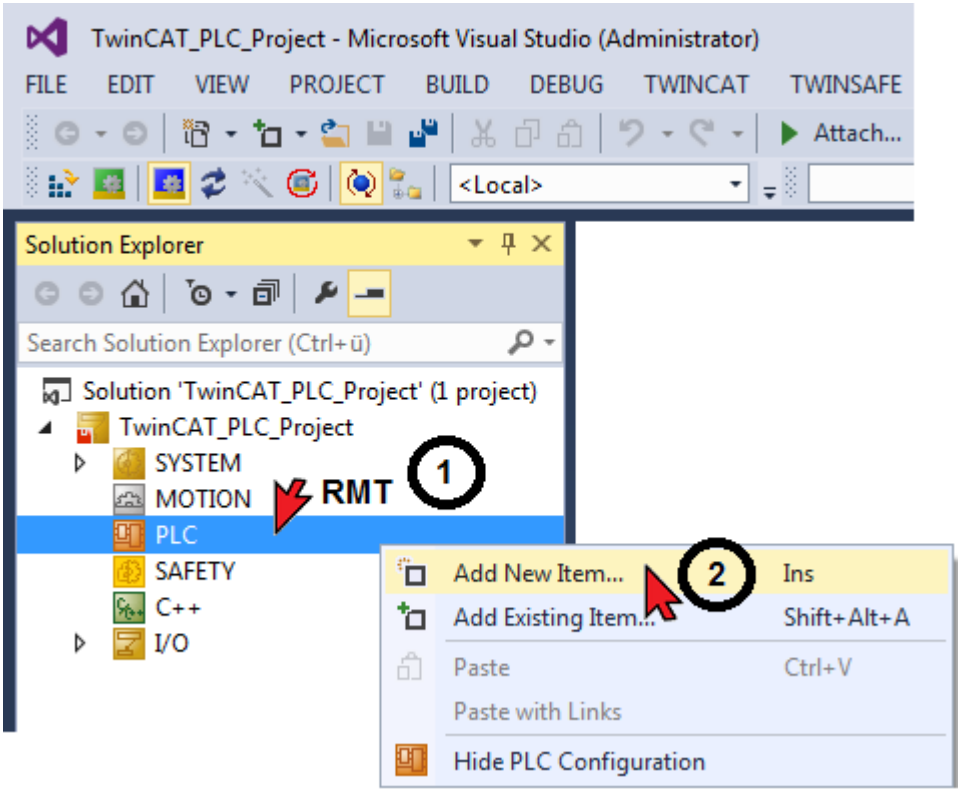
Scanning is only possible with an activated network adapter.

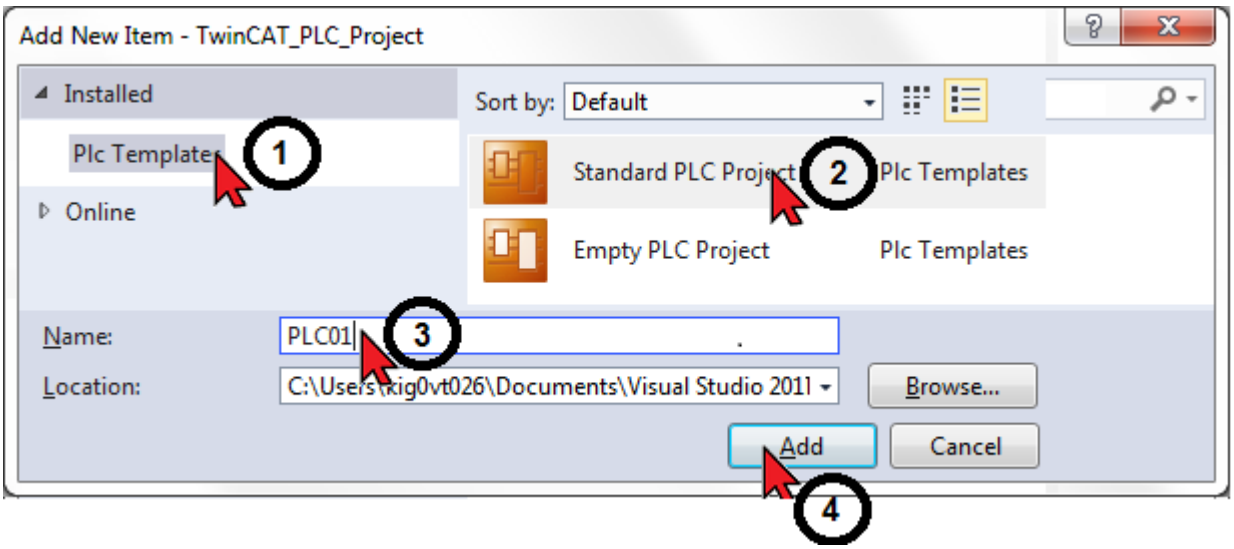


Scanning is only possible in TwinCAT ‘Config Mode’.

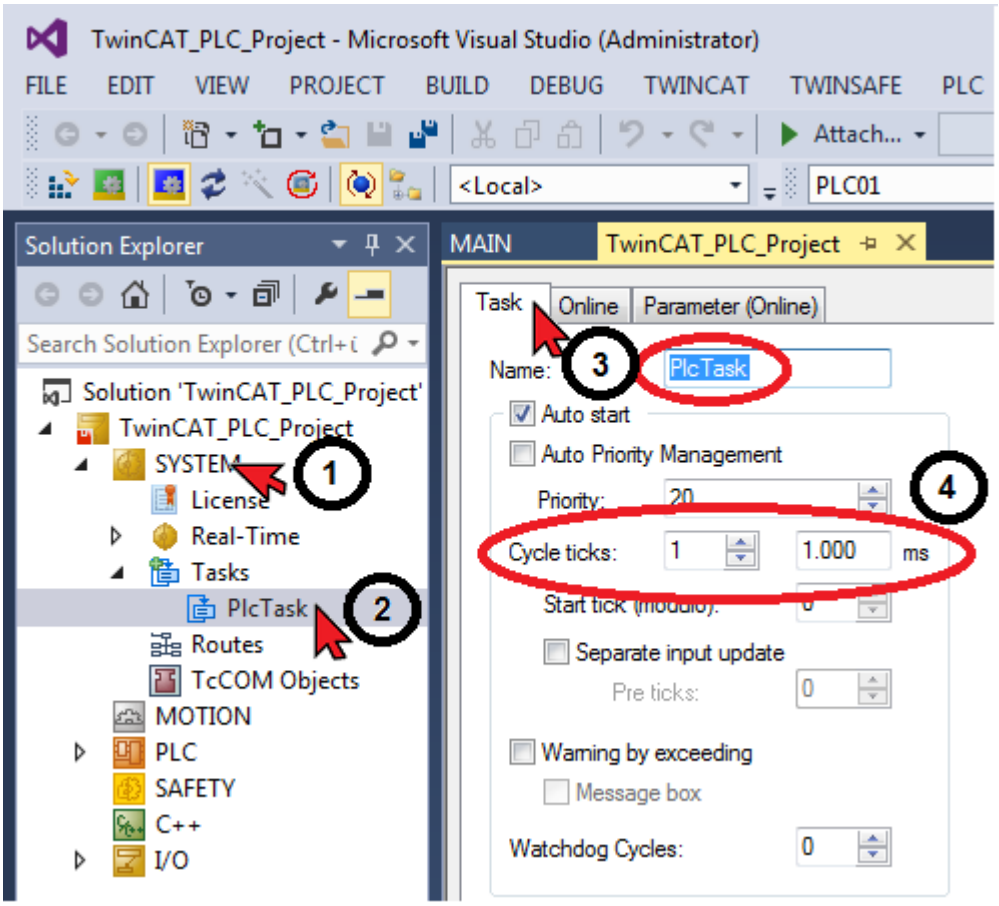

TwinCAT_Docu - Microsoft Visual Studio (Administrator)
FILE EDIT VIEW PROJECT BUILD DEBUG TWINCAT TWINSAFE PLC
Attach...
<Local>
Solution Explorer
Search Solution Explorer (Ctrl+ü)
Solution 'TwinCAT_Docu' (1 project
TwinCAT_Docu
SYSTEM
MOTION
PLC
SAFETY
C++
I/O
Devices
Device 1 (EtherCAT)
Image
Image-Info
SyncUnits
Inputs
Outputs
InfoData
Mappings
1
RMT
TwinCAT_Docu
General Adapter EtherCAT Online CoE - Online
Network Adapter
OS (NDIS) PCI
Description: LAN-Verbindung (TwinCAT-Intel PC
Device Name: \DEVICE\{F2DE3037-324A-4168-I
PCI Bus/Slot:
MAC Address: ec f4 bb 01 50 a0
IP Address: 169.254.215.73 (255.255.0.0)
Add New Item... Ins
Add Existing Item... Shift+Alt+A
Remove Del
Change NetId...
Save Device 1 (EtherCAT) As...
Append EtherCAT Cmd
Append Dynamic Container
Online Reset
Online Reload
Online Delete
Scan
2
EtherCAT drive(s) added
Append linked axis to:
NC - Configuration
CNC - Configuration
OK
Cancel
1

Creating a PLC project





The standard value of the TwinCAT PLC task is 10 ms.
The cycle time is entered via the 'PlcTask' icon.

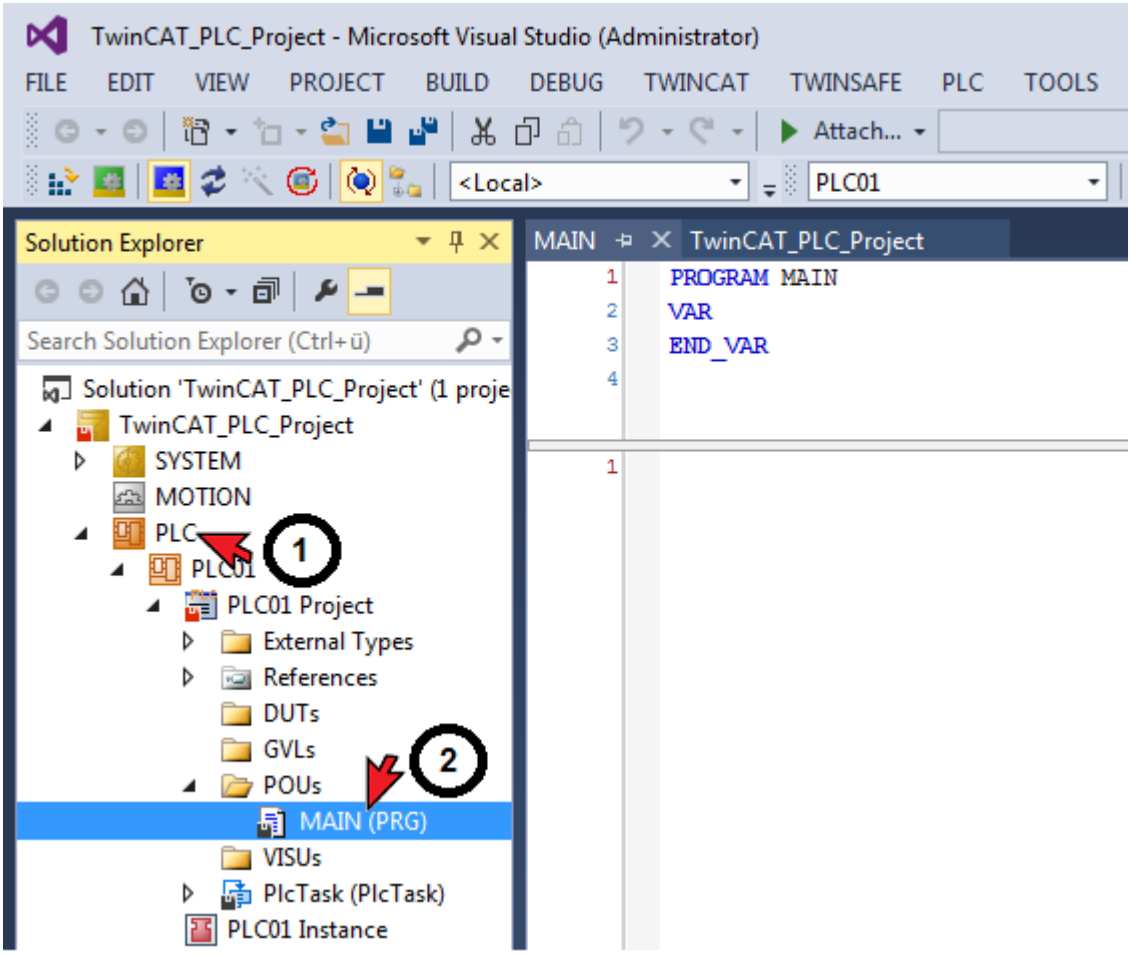


When the TwinCAT 'Activate Configuration' function is executed, the set PLC task value (cycle time) is automatically transferred to the AMK drive (ID1 'NC cycle time' and 'SERCOS cycle time')

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



PLC variables

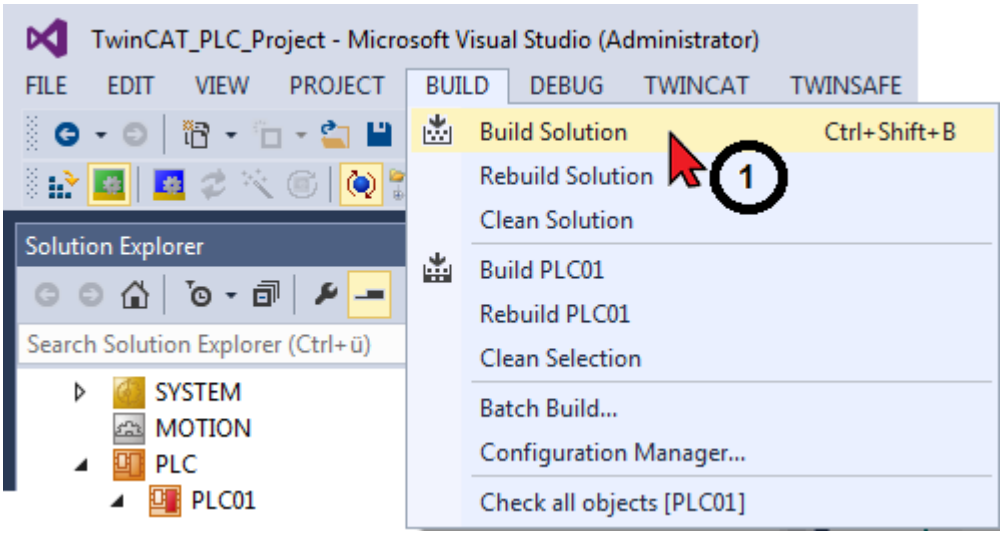
Variables declaration	Direction	
'Variable name' AT %I* : 'Declaration'	Input variable	Axis → PLC
'Variable name' AT %Q* : 'Declaration'	Output variable	PLC → axis

Library Manager | MAIN | TwinCAT_PLC_Project

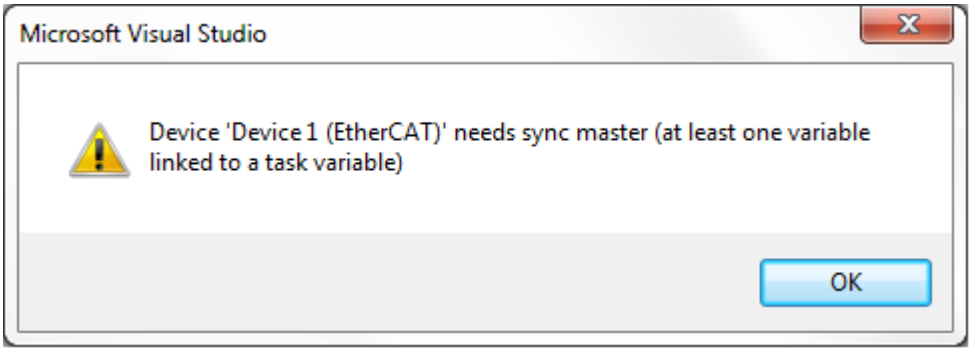
```
PROGRAM MAIN
VAR

    w_MasterControlWord                 AT %Q*  : WORD; // AMK ID134
    w_DriveStatusWord                   AT %I*  : WORD; // AMK ID135
    di_PositionFeedbackValue_Drive1     AT %I*  : DINT; // AMK ID51

    bo_SBM      : BOOL;
    bo_QUE      : BOOL;
    bo_QRF      : BOOL;
    bo_UE       : BOOL;
    bo_RF       : BOOL;
END_VAR
```

```
// Drive Status
IF              NOT w_DriveStatusWord.14 AND NOT w_DriveStatusWord.15 THEN
                    bo_SBM := FALSE;

    ELSIF           w_DriveStatusWord.14 AND NOT w_DriveStatusWord.15 THEN
                    bo_SBM := TRUE;

    ELSIF       NOT w_DriveStatusWord.14 AND     w_DriveStatusWord.15 THEN
                    bo_QUE := TRUE;

    ELSIF           w_DriveStatusWord.14 AND     w_DriveStatusWord.15 THEN
                    bo_QRF := TRUE;

END_IF

// Master Control
w_MasterControlWord.14 := bo_UE; // DC Bus ON
w_MasterControlWord.15 := bo_RF; // Drive ON
```

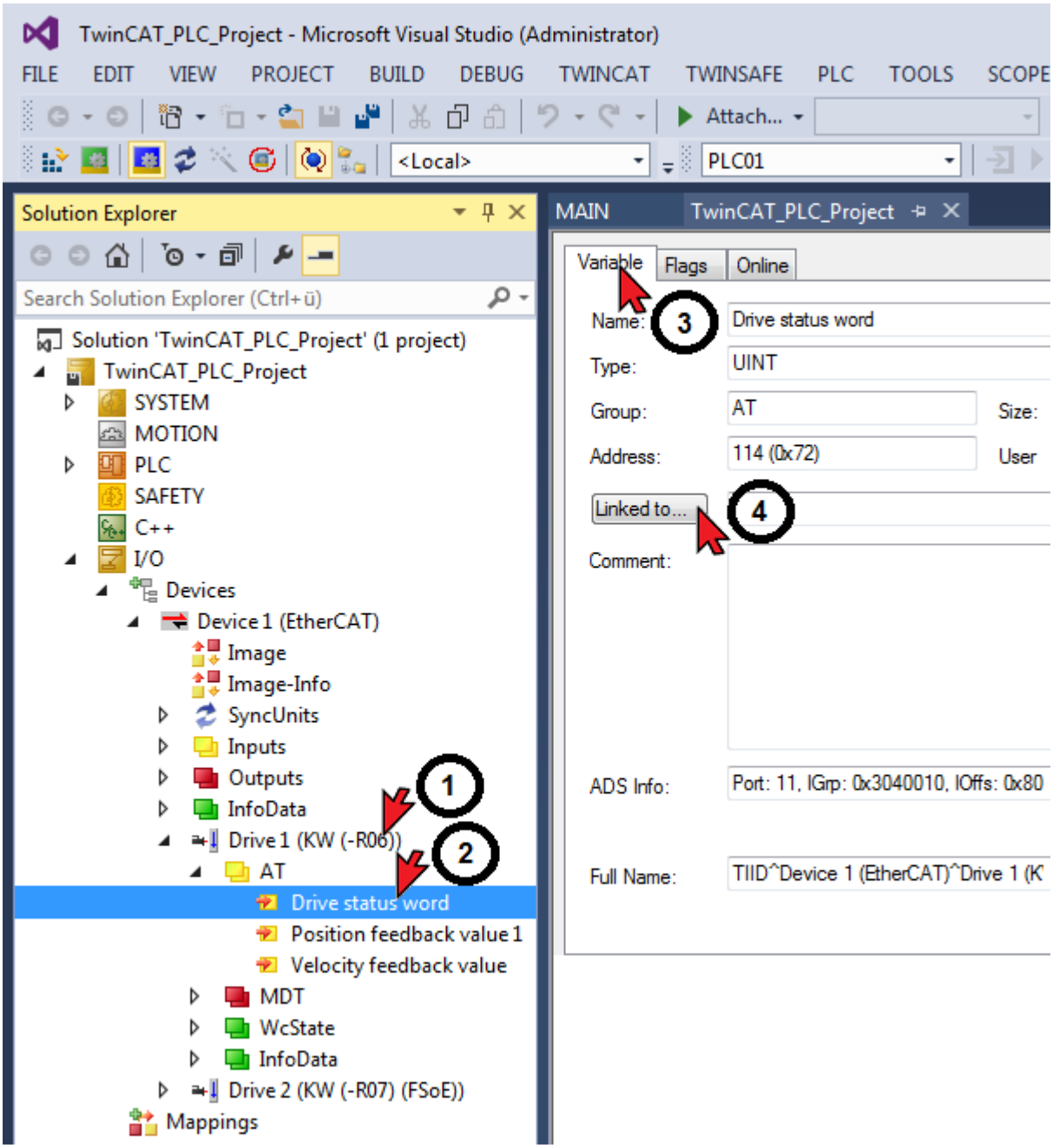
PLC project ‘Transfer’

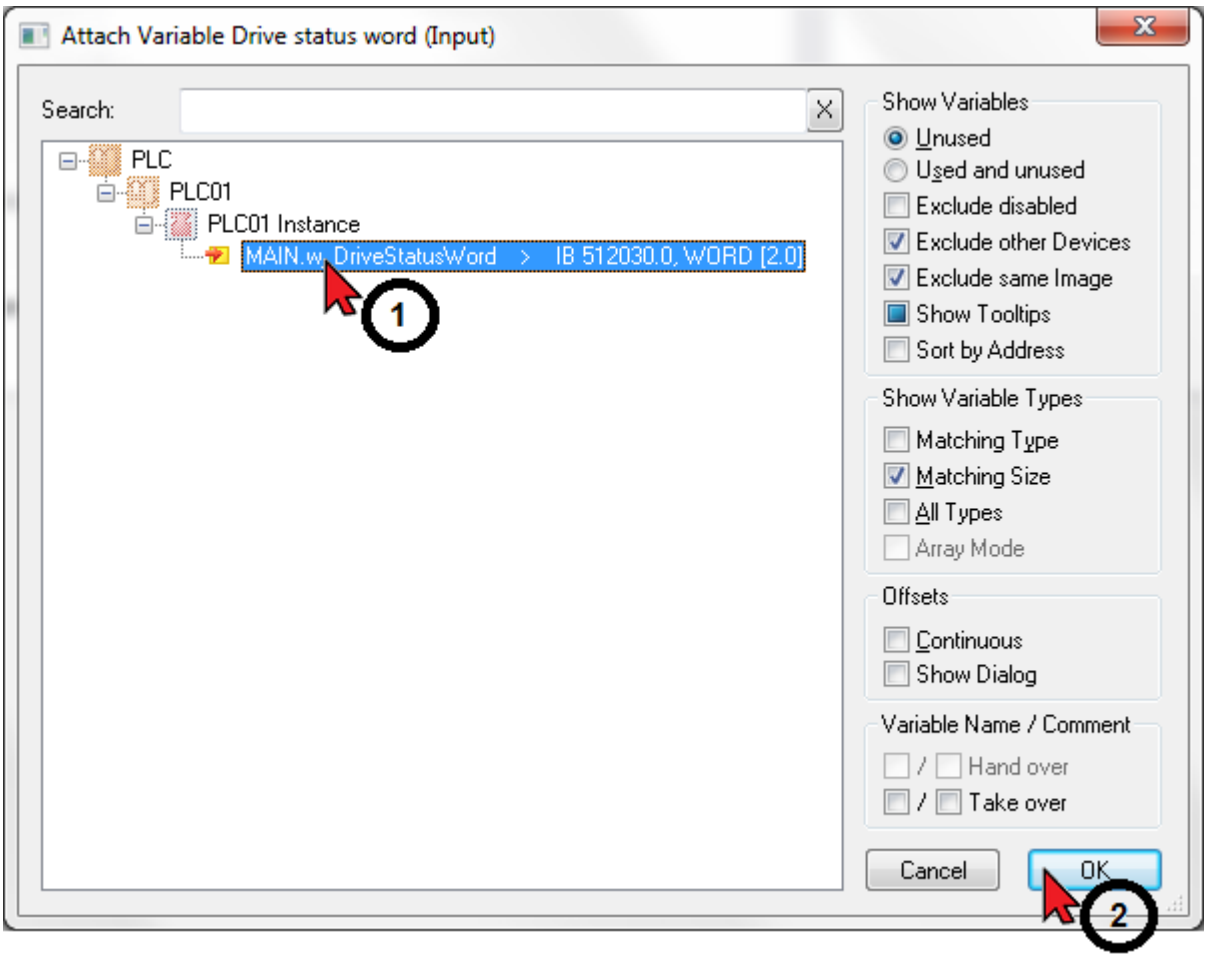


Connection between EtherCAT slave device and a task variable is missing, so that the cycle time cannot be determined.
Bus start-up remains stuck in PREOP bus state.
Options for a solution can be, e.g. to connect the Status Word drive in the AT with a PLC variable or using the NC/CNC axis.

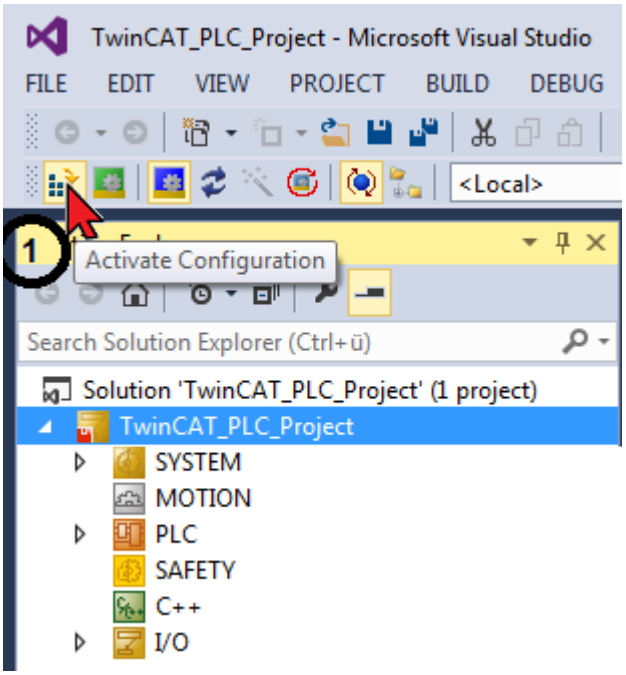


Linking variables

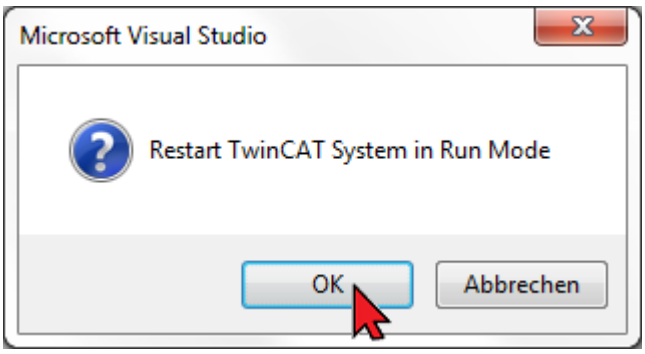




Creating a network configuration



Start TwinCAT 'Run Mode'

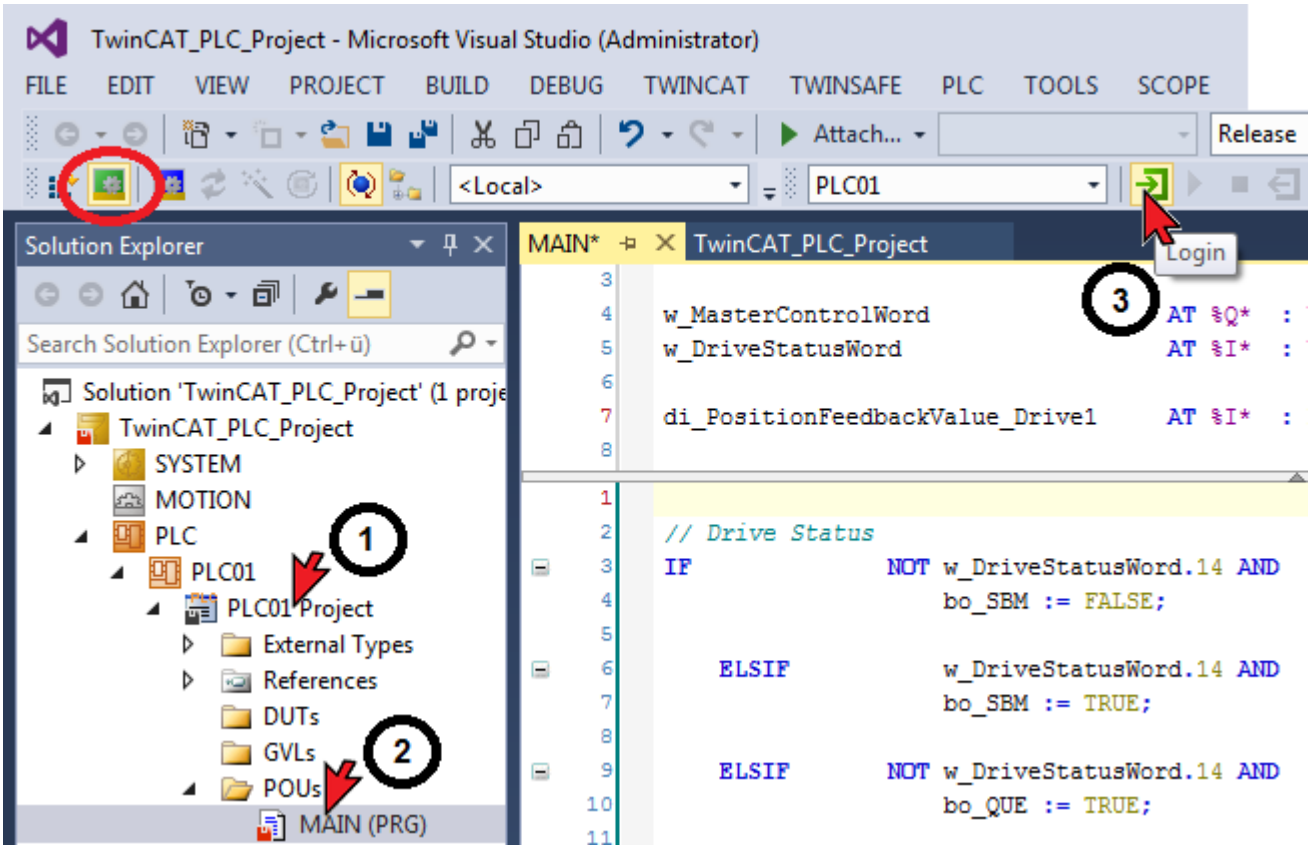


When the TwinCAT ‘Activate Configuration’ function is executed, the set PLC task value (cycle time) is automatically transferred to the AMK drive (ID1 'NC cycle time' and 'SERCOS cycle time')

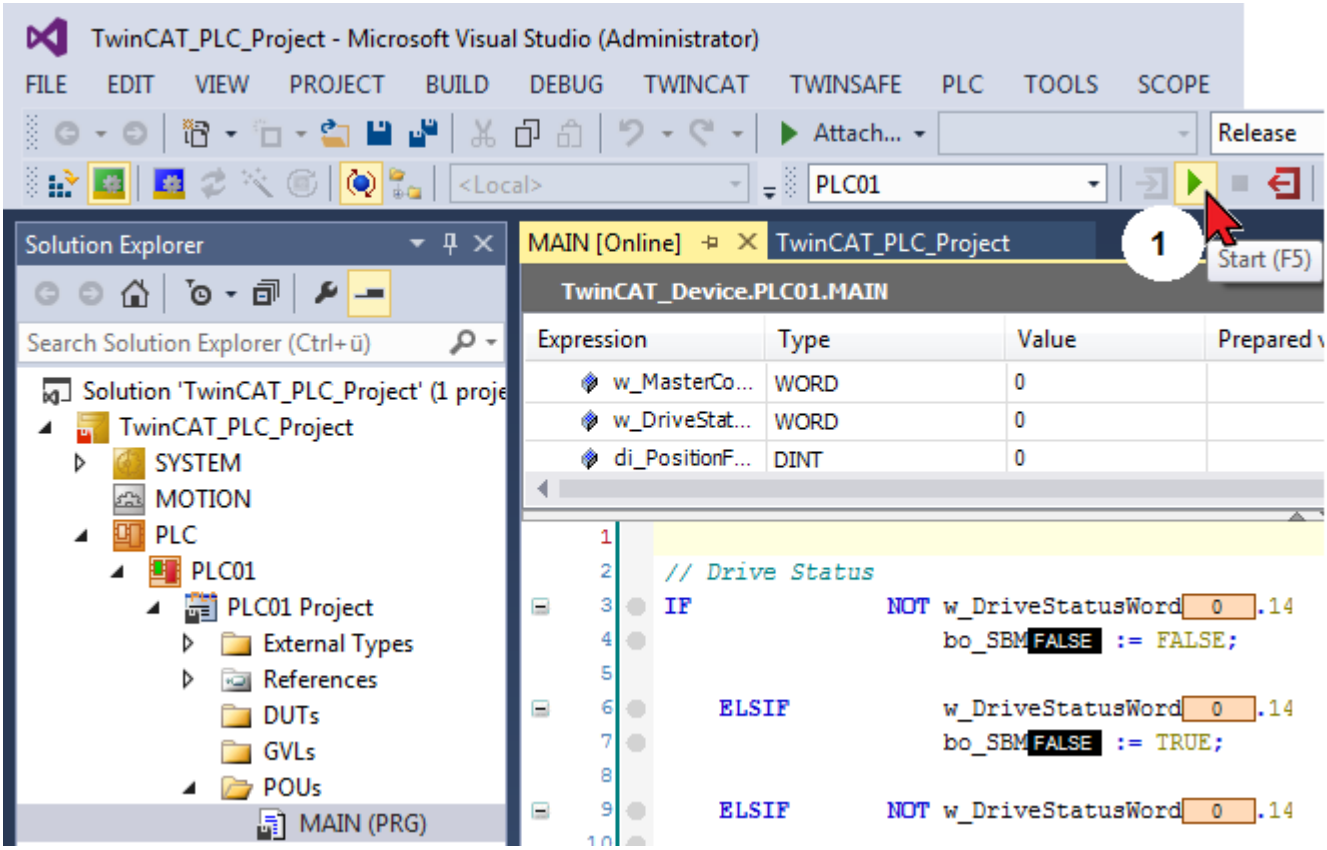
The cycle times become active with the next initialization in the AMK drive.
(System reset command, or 24 VDC OFF/ON)

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

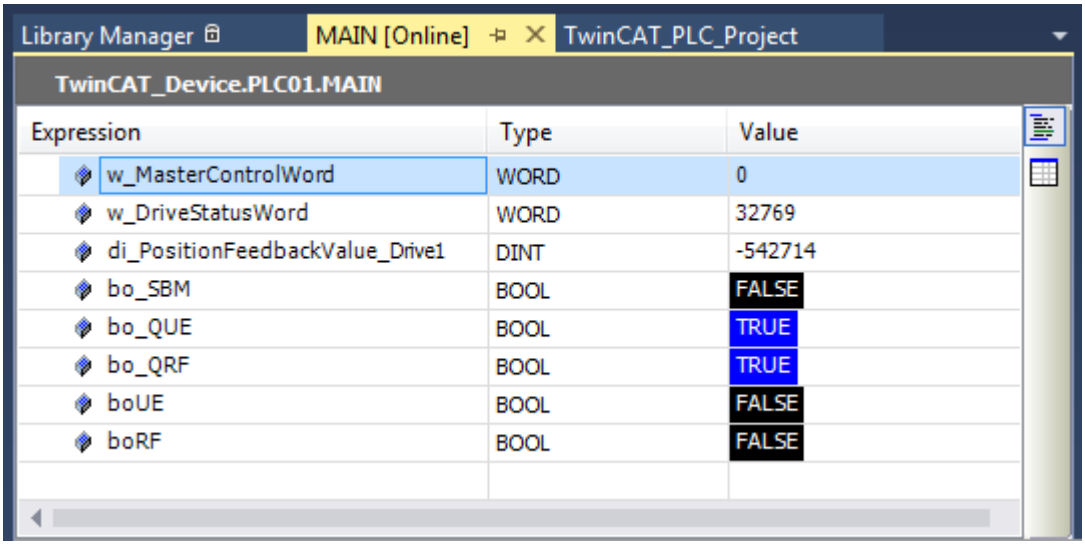
Log-in: transfer PLC program to the control unit



Start PLC



Function test: online values are displayed and updated

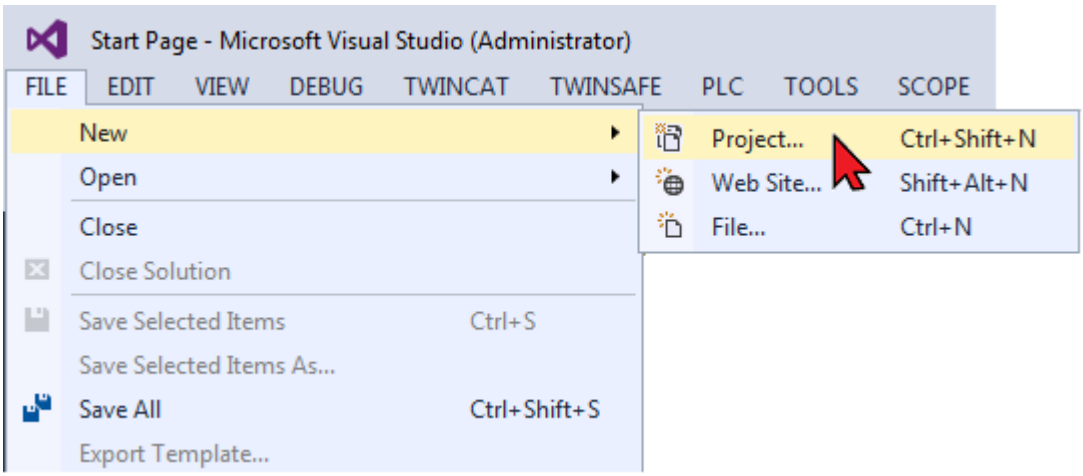


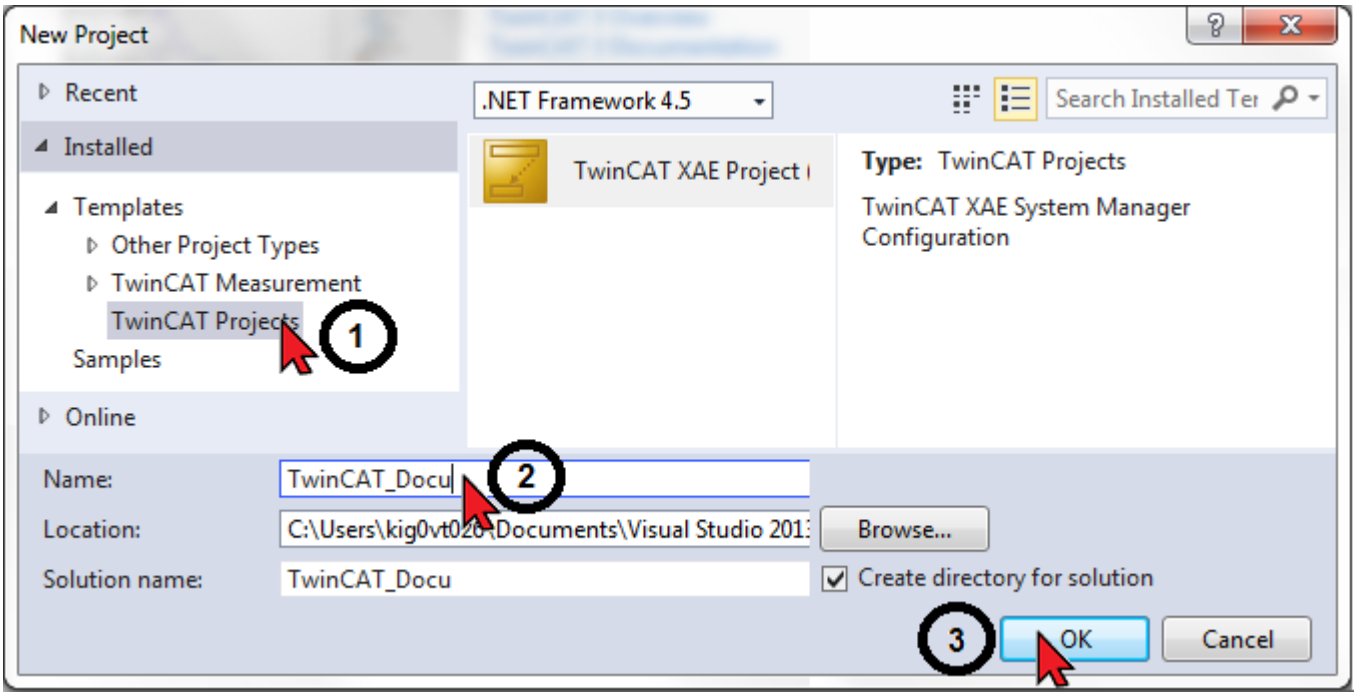
11 TwinCAT 3 project with NC axis

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)

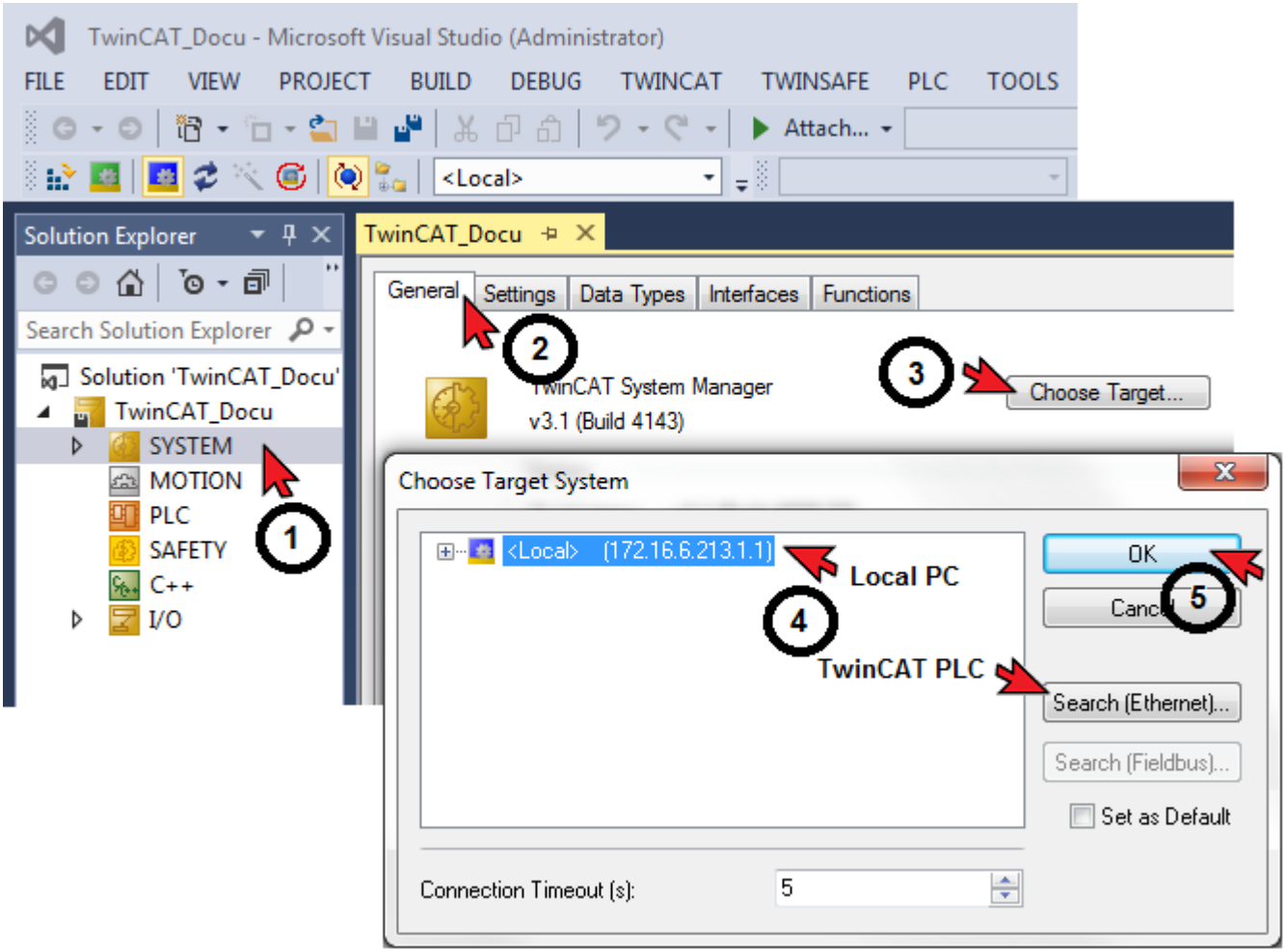
Create a new project



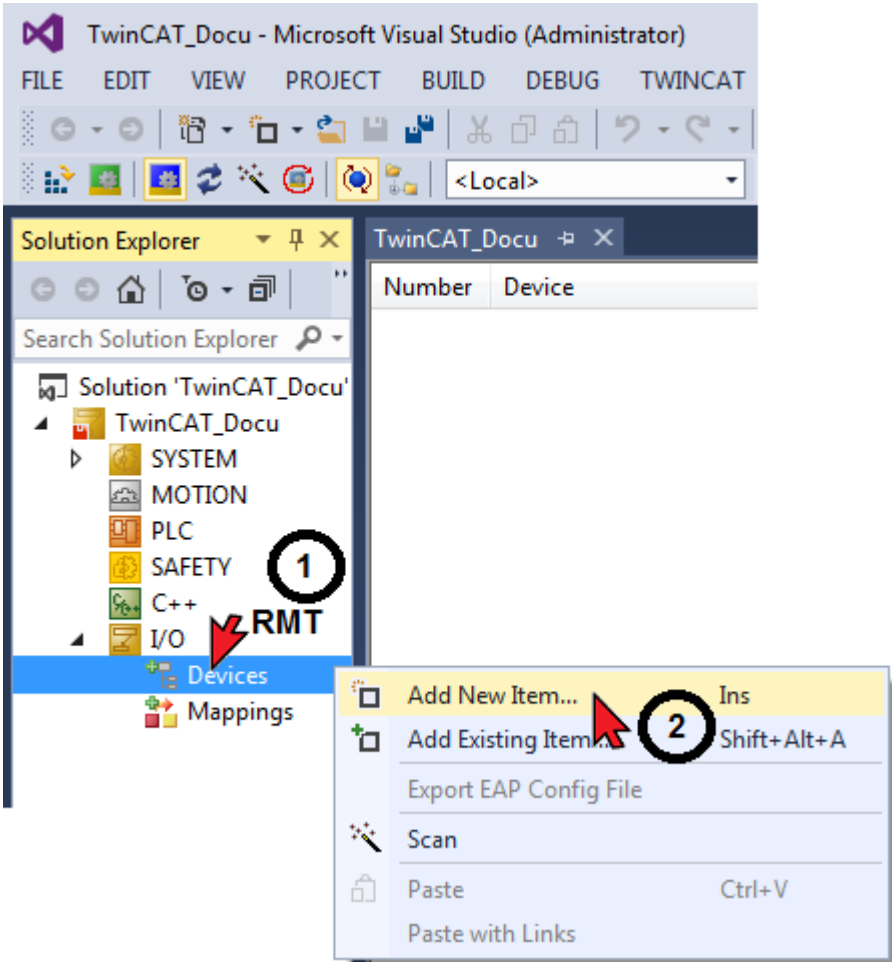


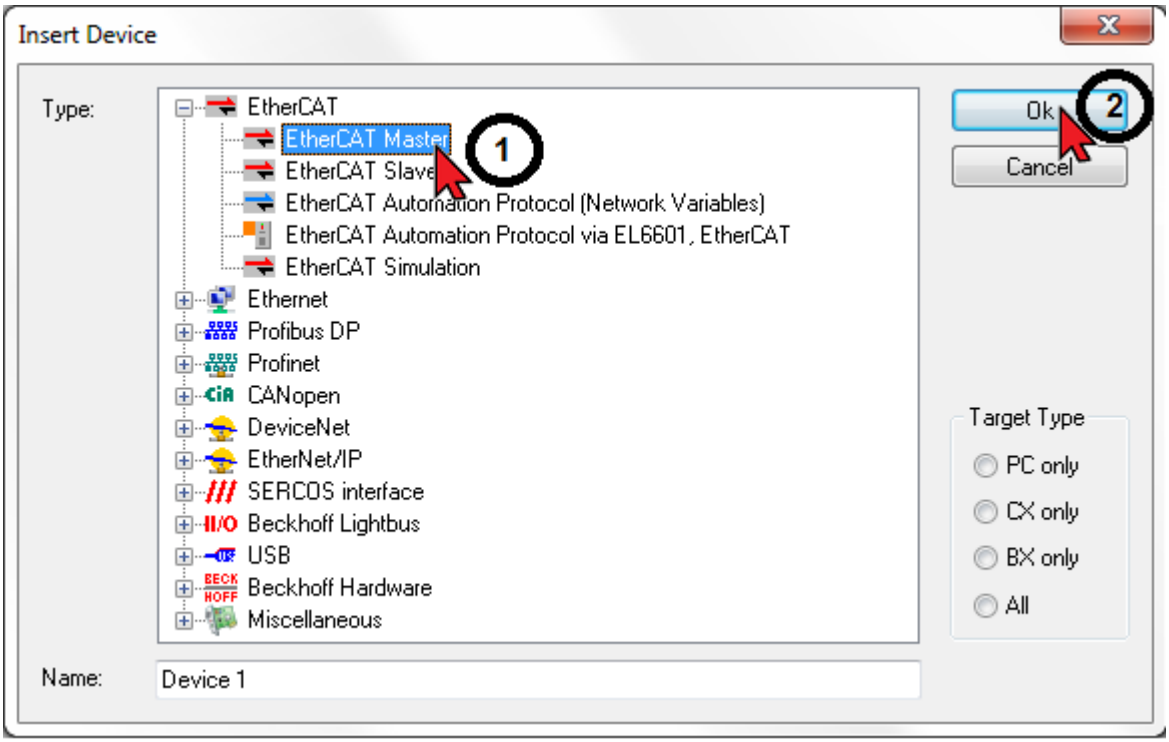
Select the target system:

- Local (own PC)
- TwinCAT PLC

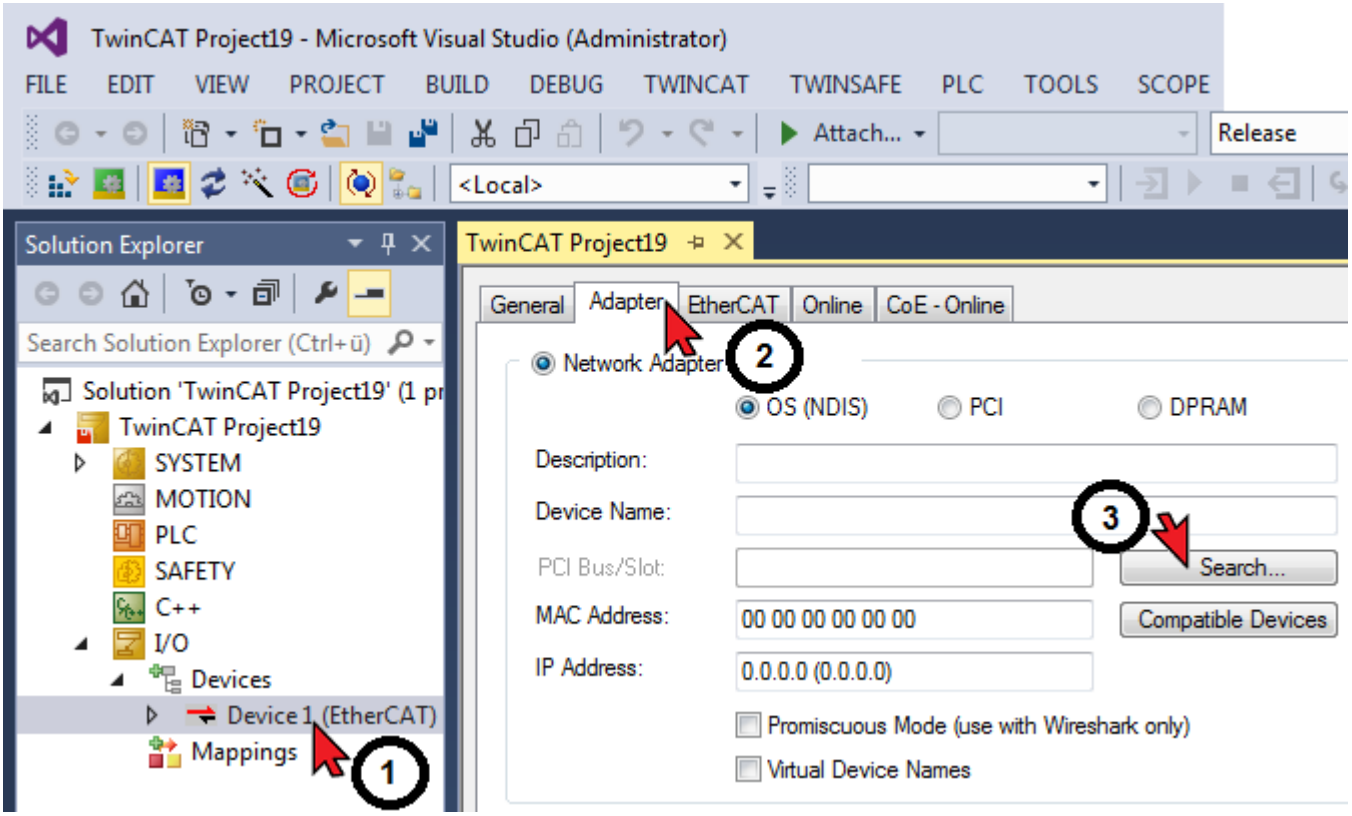


Add the EtherCAT Master functionality to the ‘Device’ icon



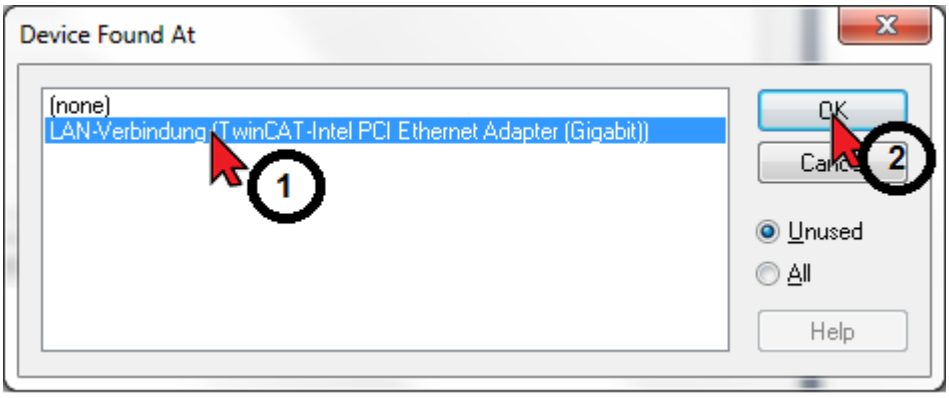


Activate existing network adapter



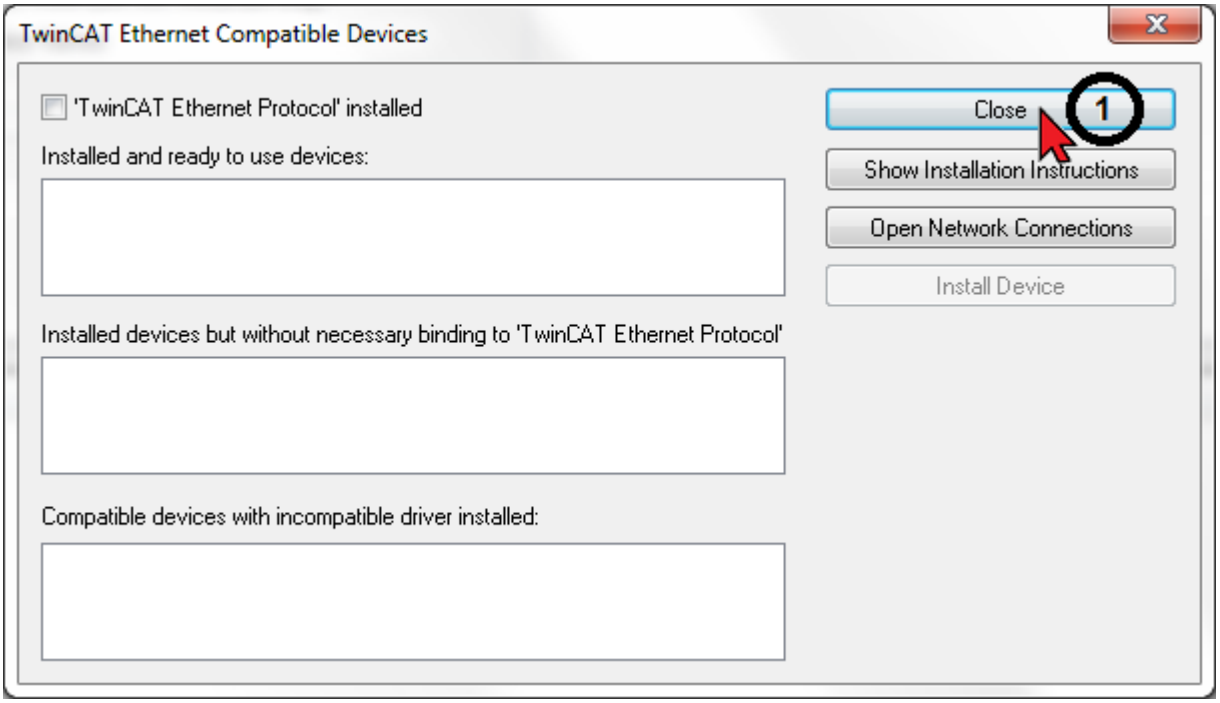
Driver installed

Activate the adapter



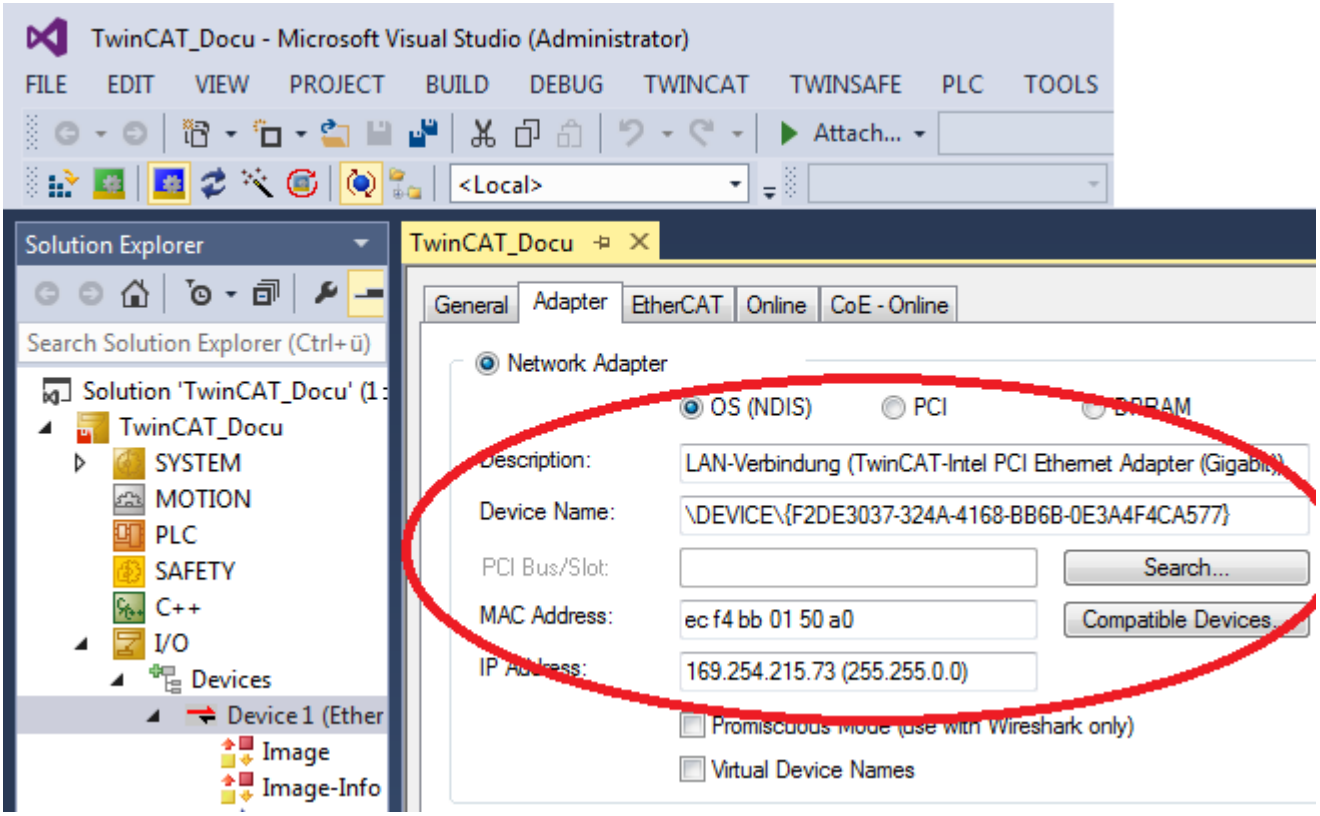
Driver not installed

Siehe Adapter settings auf Seite 52.

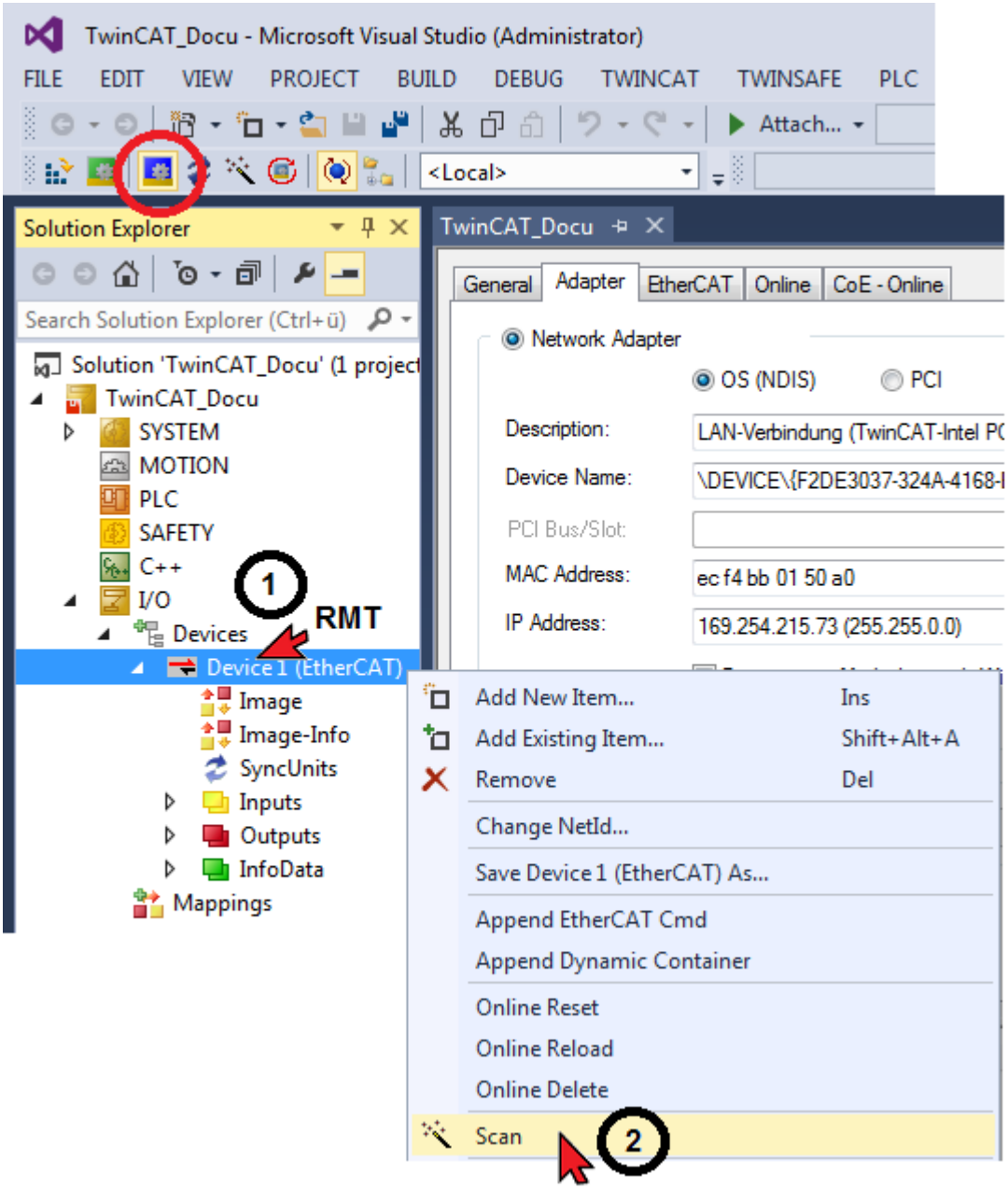


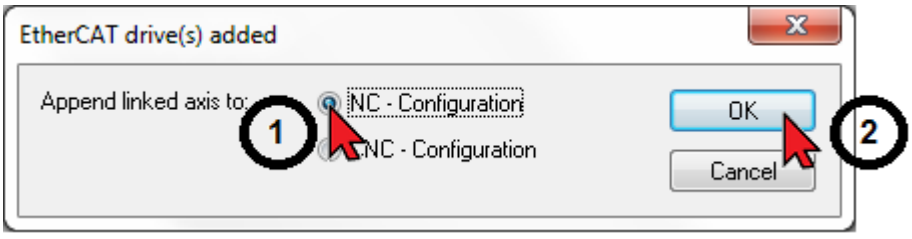
Scanning a network

Scanning is only possible with an activated network adapter.



Scanning is only possible in TwinCAT ‘Config Mode’.





TwinCAT/AMK cycle time

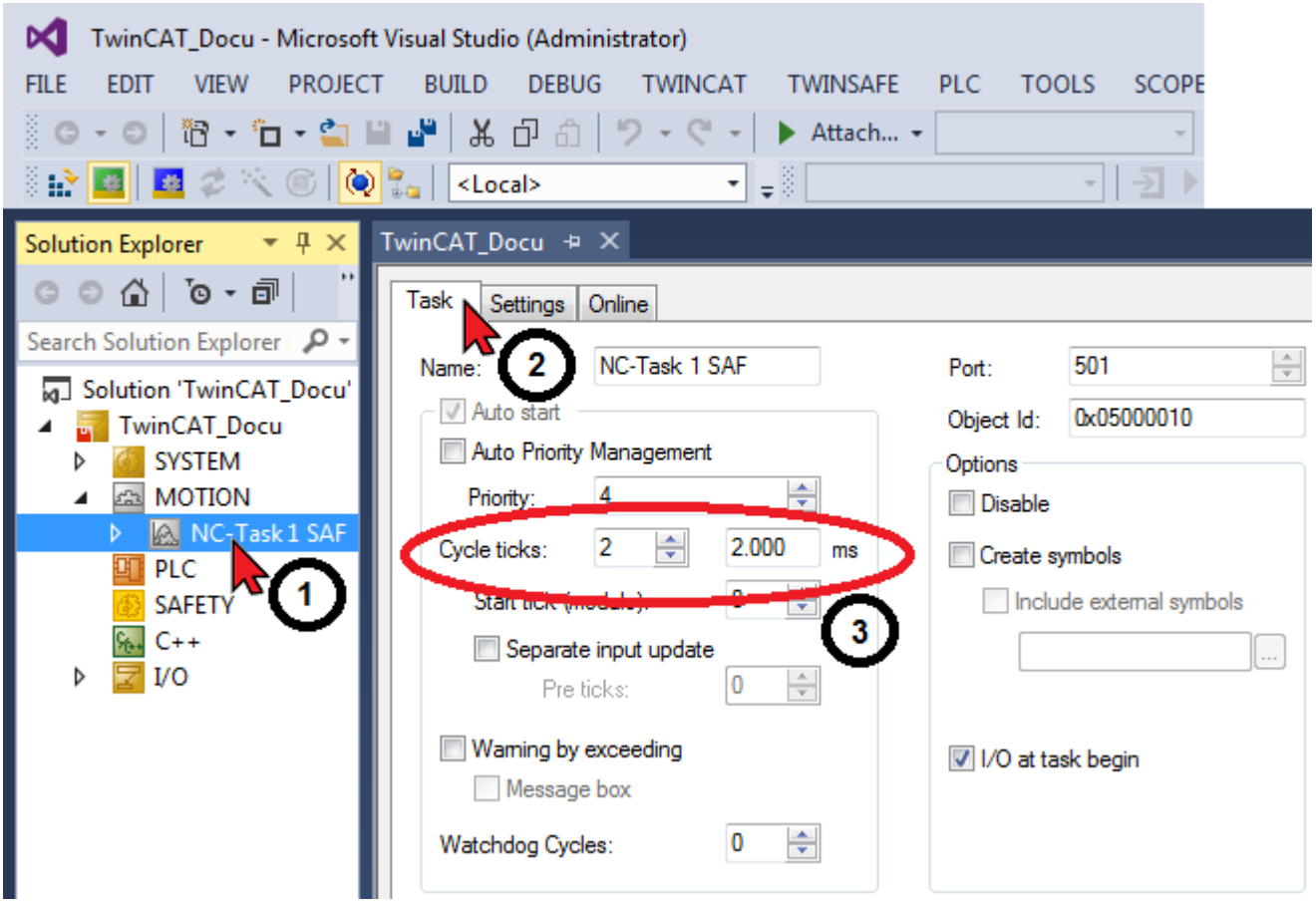
The following cycle times must be set to identical values.

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

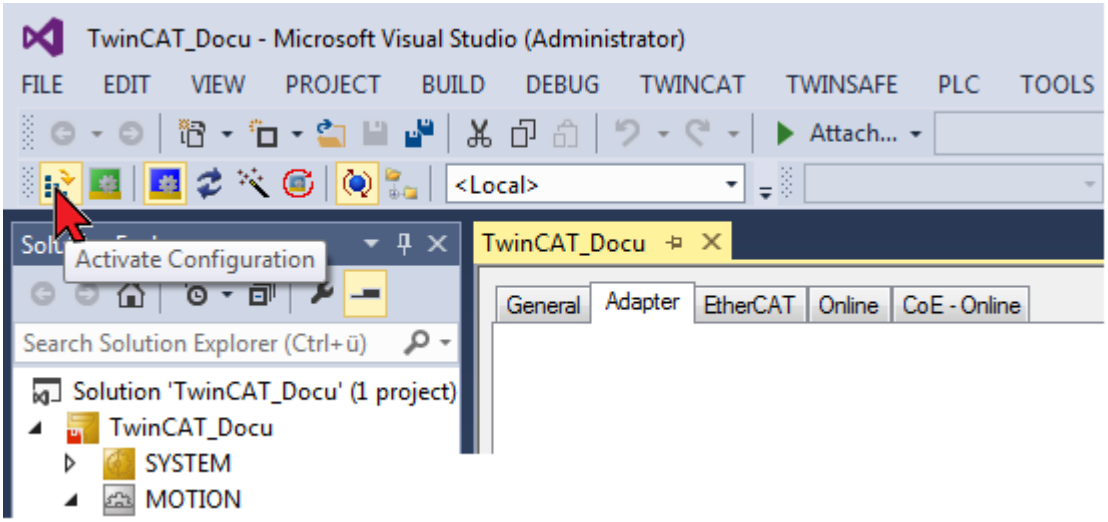
When the TwinCAT function ‘Activate Configuration’ is executed, the value from the NC task 1 SAF is automatically transferred to the AMK drive.

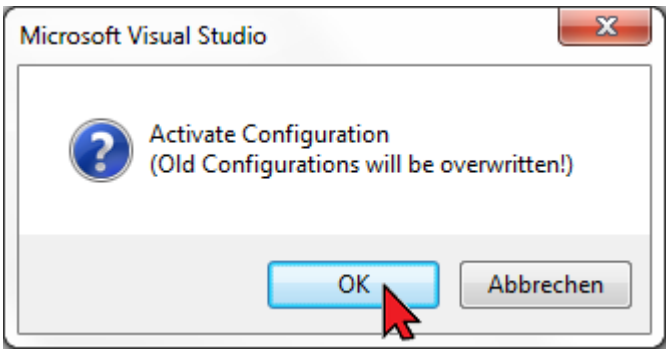
The cycle times become active with the next initialization in the AMK drive.
(System reset command, or 24 VDC OFF/ON)

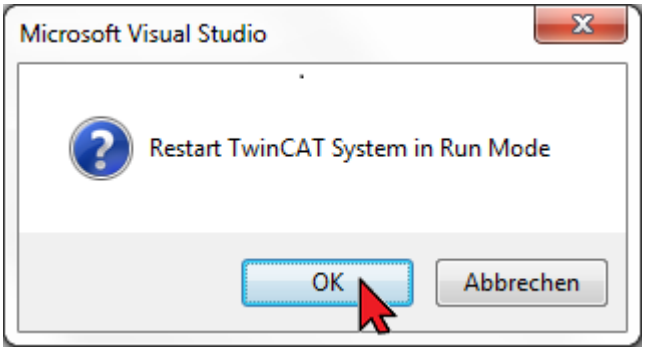
For differing values, TwinCAT generates the status code ‘0x0037 - invalid SYNC1 cycle time’ and AMK the diagnostic message 2572, Info 27



Creating configuration and log-in

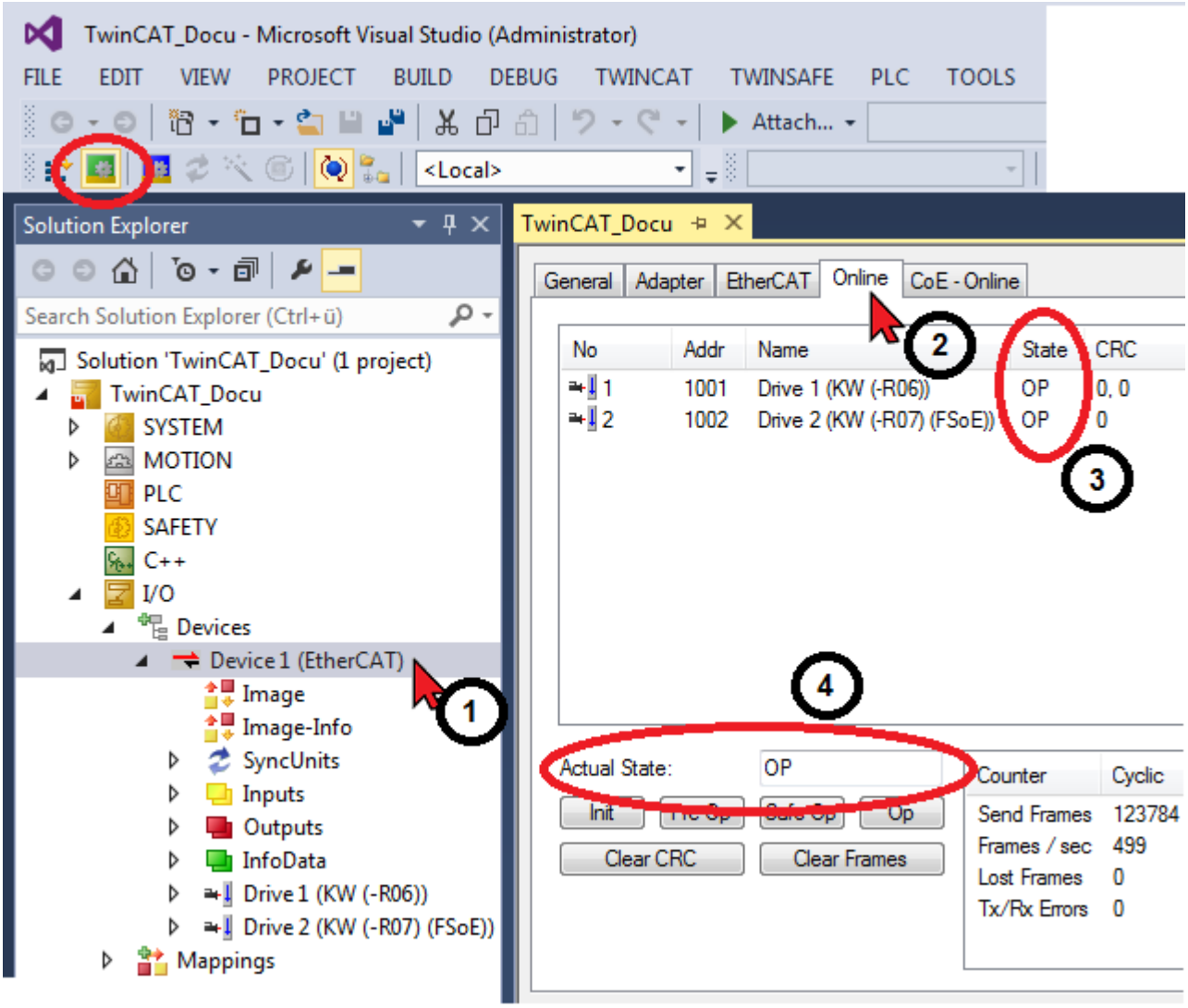



Microsoft Visual Studio
Activate Configuration
(Old Configurations will be overwritten!)
OK
Abbrechen

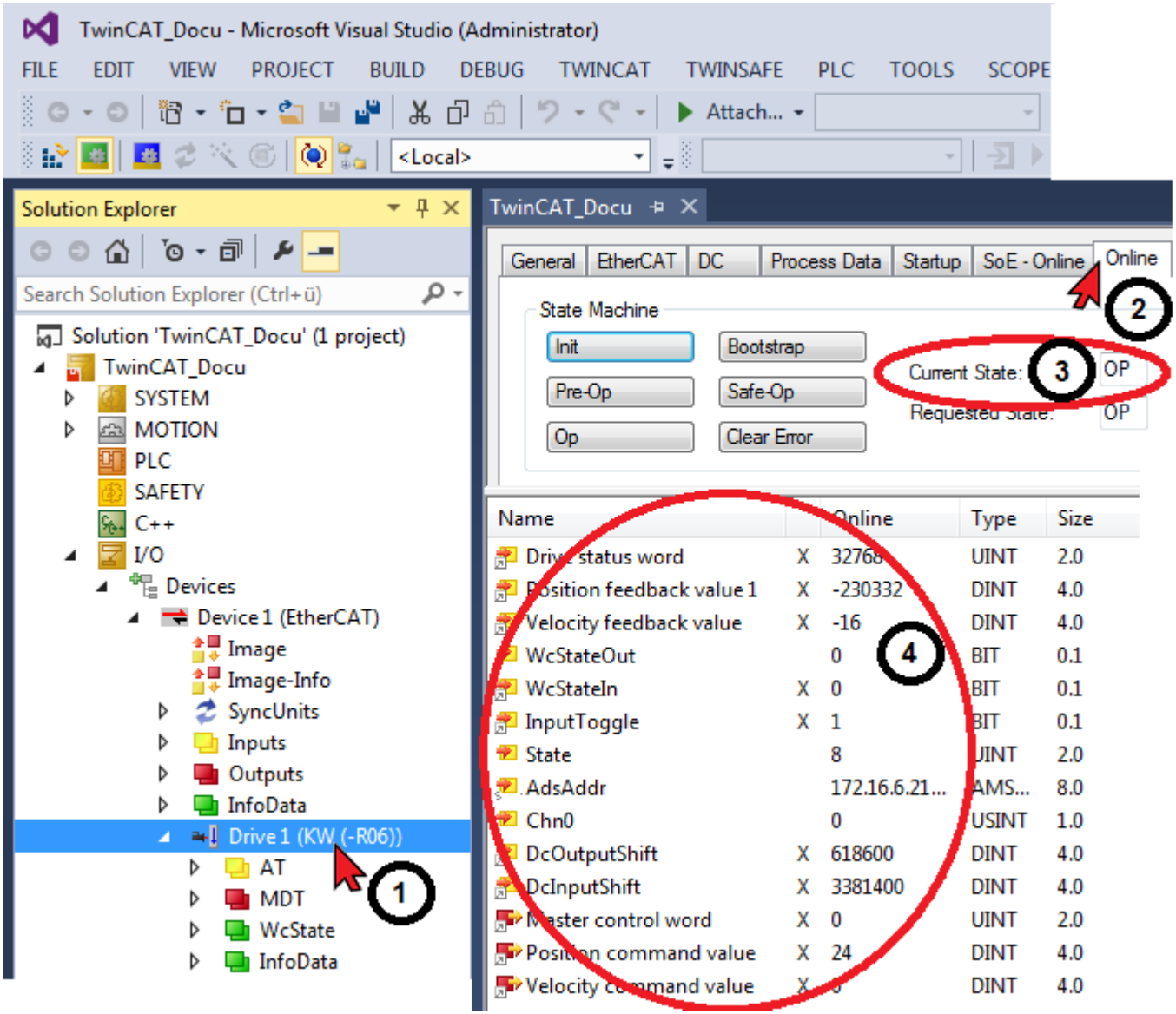

Microsoft Visual Studio
Restart TwinCAT System in Run Mode
OK
Abbrechen

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.



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.

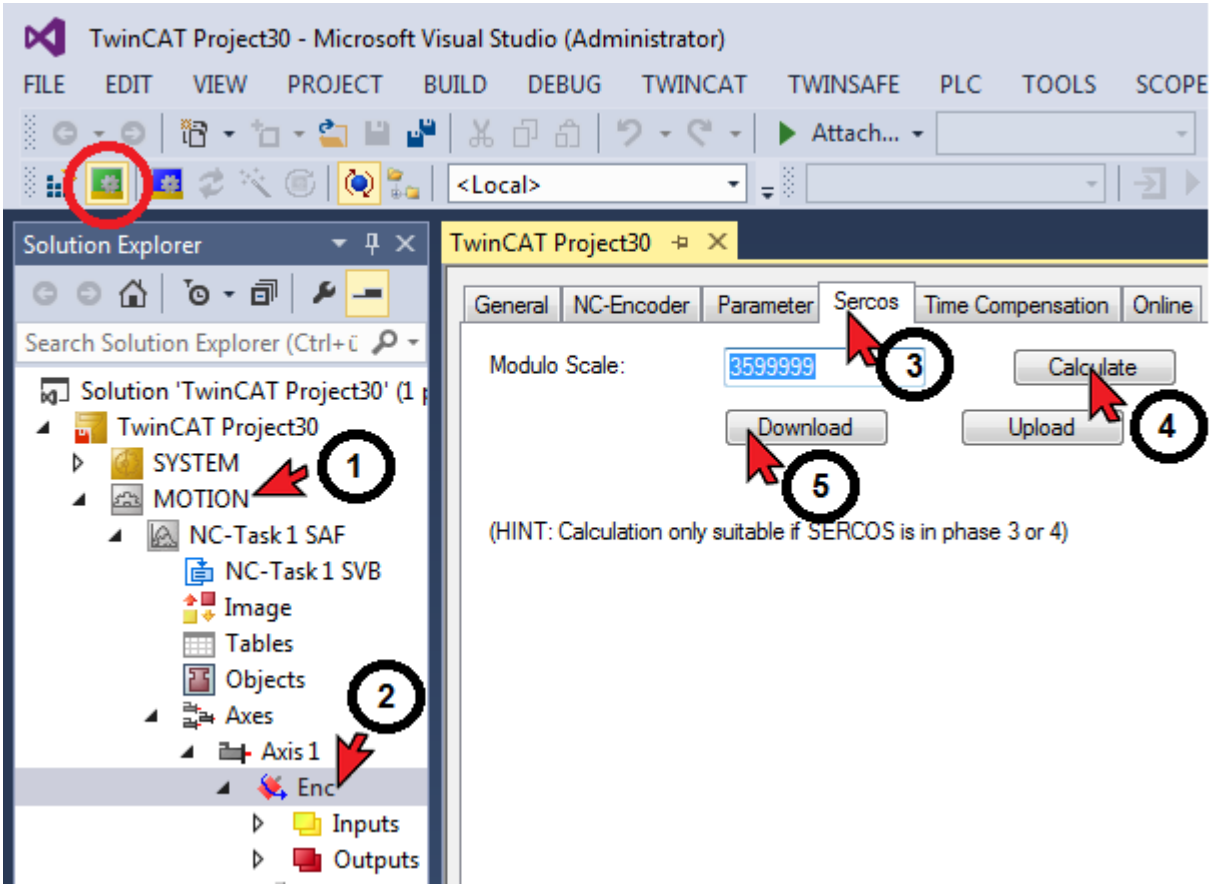
Requirement:
The direct-current link is charged
Acknowledgment DC converter ON (QUE) = 1

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')



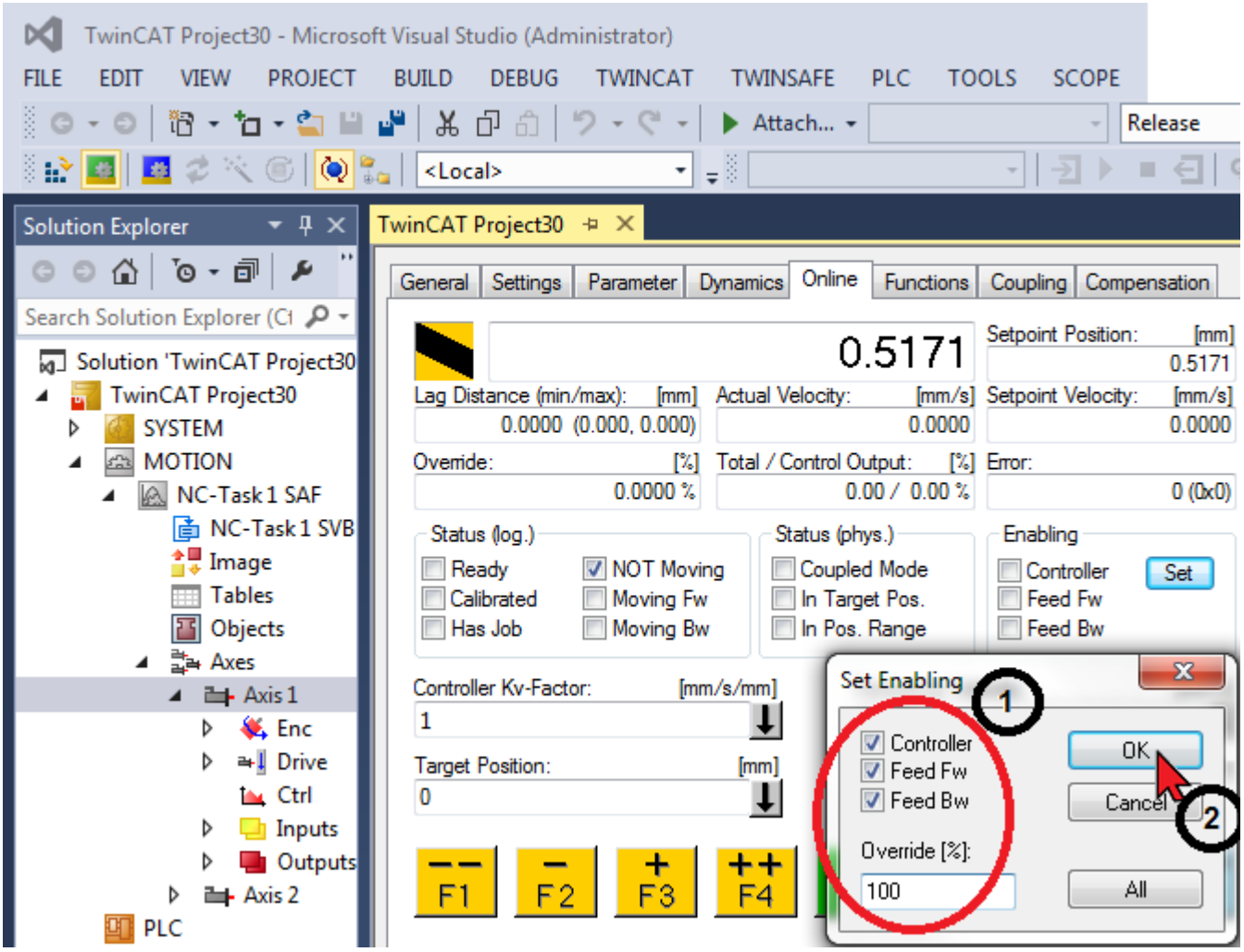
AMK drive:

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)

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)

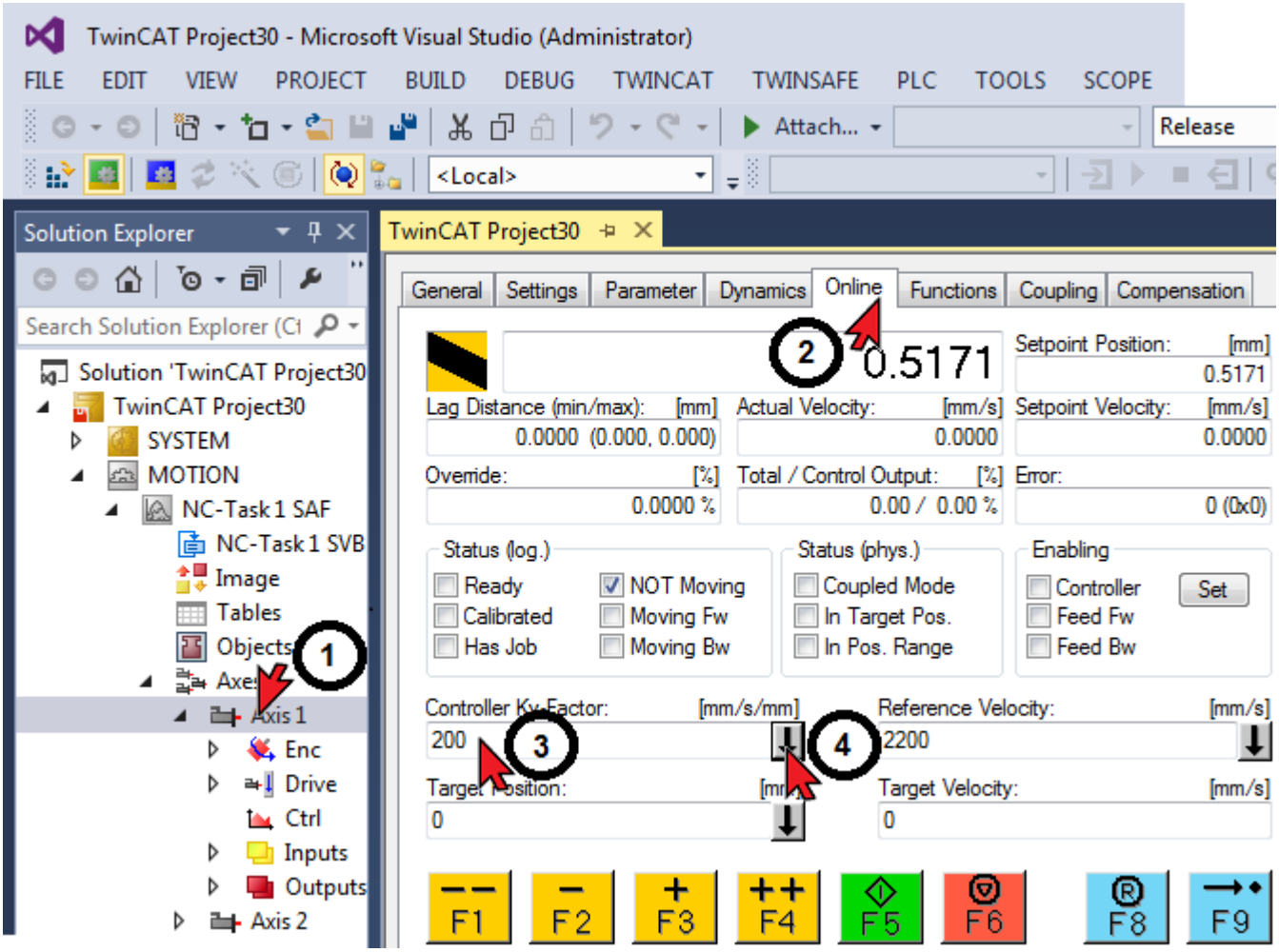
ID32800 'AMK main operating mode': 00410003 (cyclic nominal value input via EtherCAT, rotational speed control mode)

TwinCAT NC:

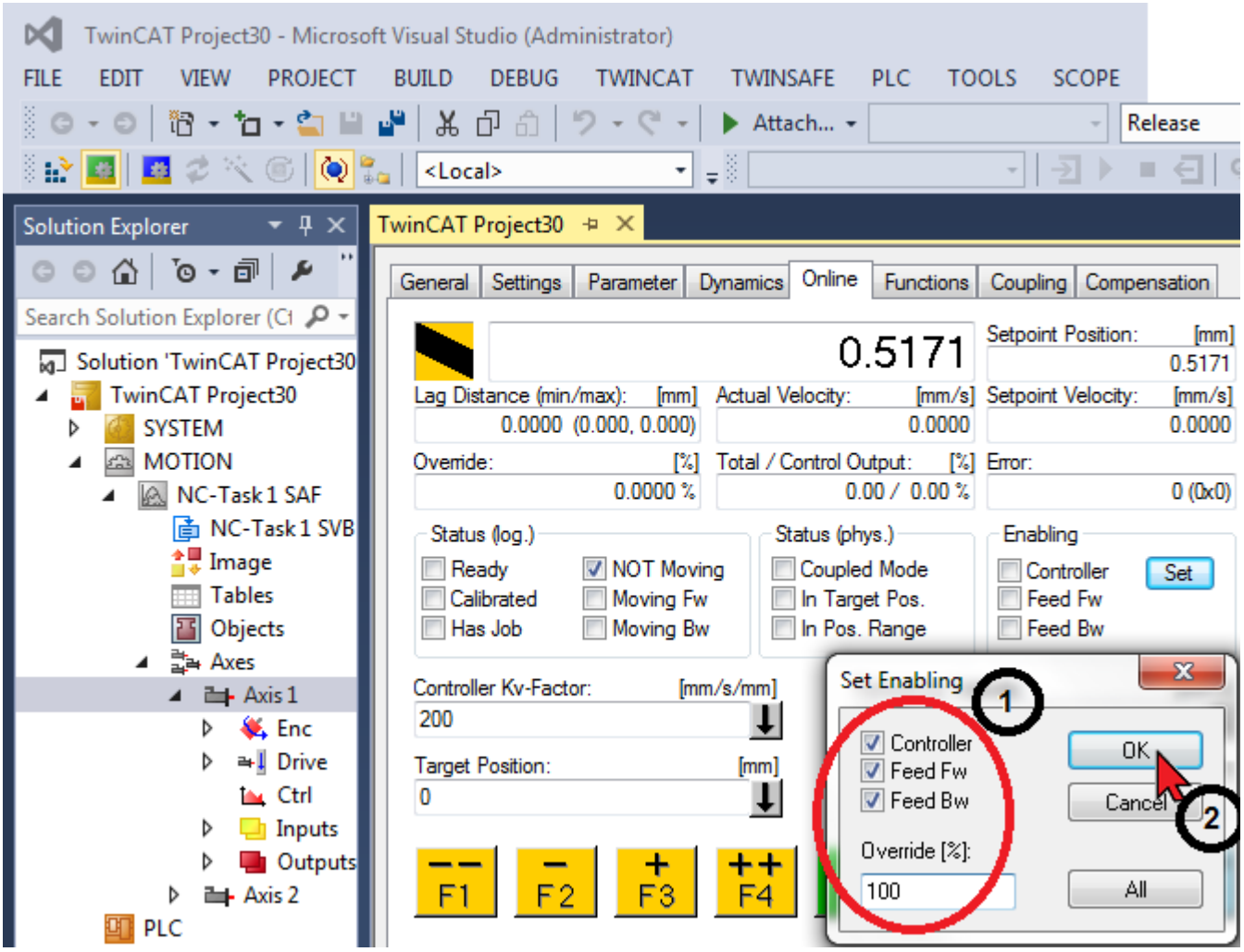
Set the ‘Controller Kv-Factor’ to a value adequate to the application.

Value too low: large lag distance, lag error

Value too high: drive oscillates

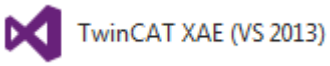


Energize motor (activate RF), enable direction of rotation and set Override.

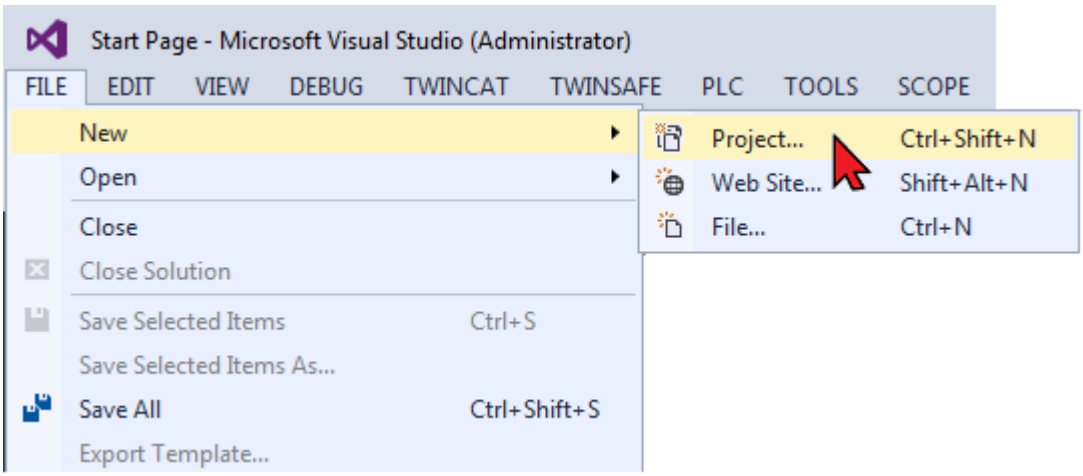

TwinCAT Project30 - Microsoft Visual Studio (Administrator)
FILE EDIT VIEW PROJECT BUILD DEBUG TWINCAT TWINSAFE PLC TOOLS SCOPE
Attach...
Release
<Local>
Solution Explorer
Search Solution Explorer (Ct
Solution 'TwinCAT Project30
TwinCAT Project30
SYSTEM
MOTION
NC-Task 1 SAF
NC-Task 1 SVB
Image
Tables
Objects
Axes
Axis 1
Enc
Drive
Ctrl
Inputs
Outputs
Axis 2
PLC
TwinCAT Project30
General Settings Parameter Dynamics Online Functions Coupling Compensation
0.5171
Setpoint Position: [mm]
0.5171
Lag Distance (min/max): [mm]
0.0000 (0.000, 0.000)
Actual Velocity: [mm/s]
0.0000
Setpoint Velocity: [mm/s]
0.0000
Override: [%]
0.0000 %
Total / Control Output: [%]
0.00 / 0.00 %
Error:
0 (0x0)
Status (log.)
Ready
Calibrated
Has Job
NOT Moving
Moving Fw
Moving Bw
Status (phys.)
Coupled Mode
In Target Pos.
In Pos. Range
Enabling
Controller
Feed Fw
Feed Bw
Set
Controller Kv-Factor: [mm/s/mm]
200
Target Position: [mm]
0
F1
F2
F3
F4
Set Enabling
1
Controller
Feed Fw
Feed Bw
Override [%]:
100
OK
Cancel
All
2

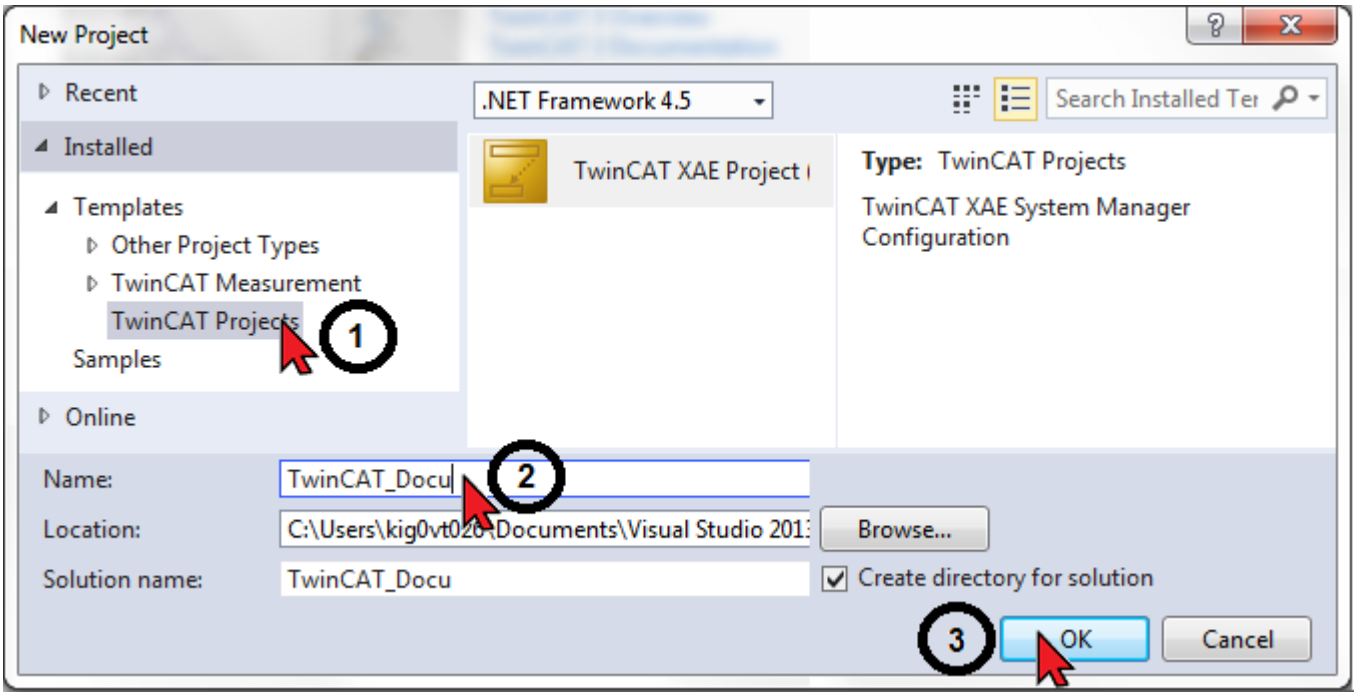
12 Adapter settings

Start TwinCAT XAE (VS 2013)



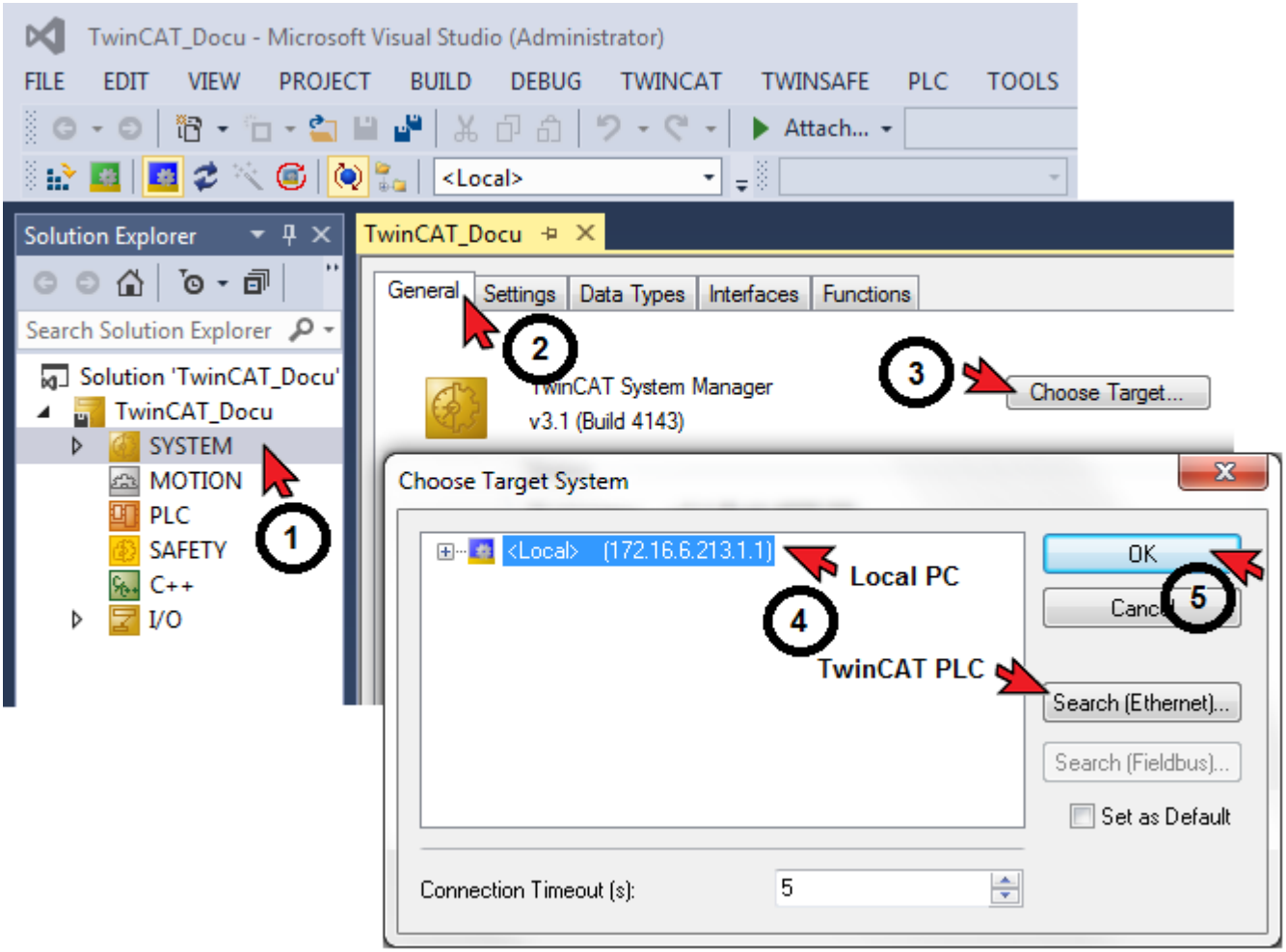
Create a new project



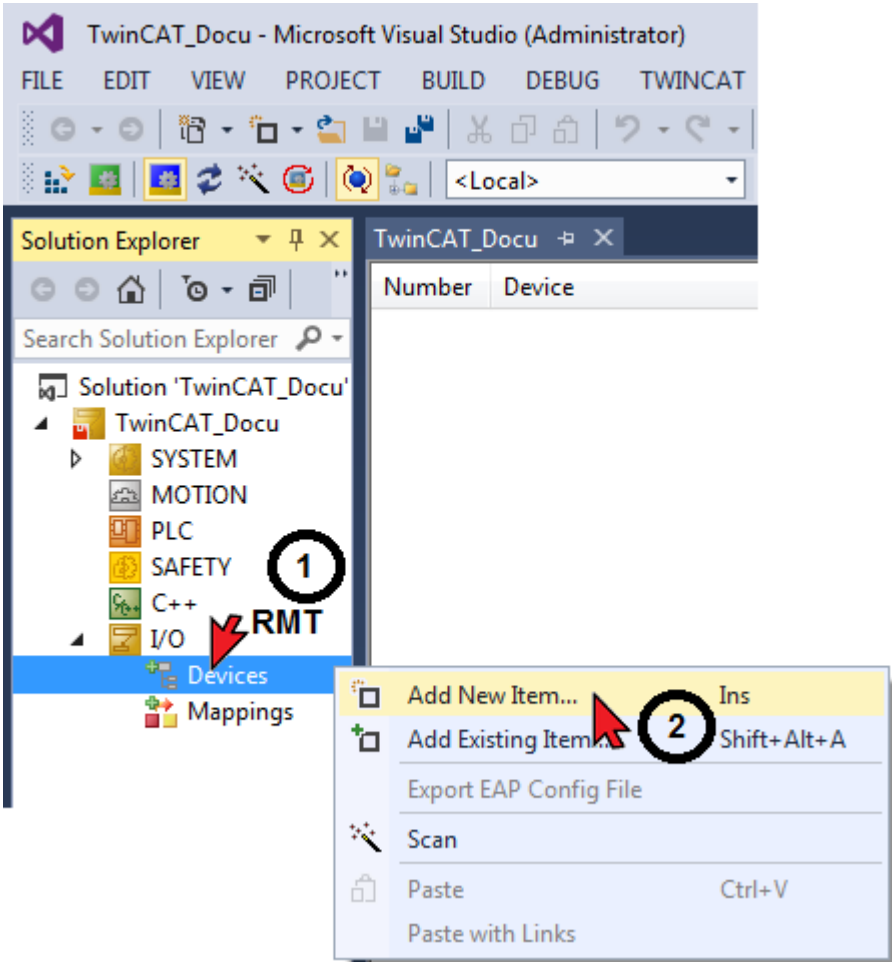


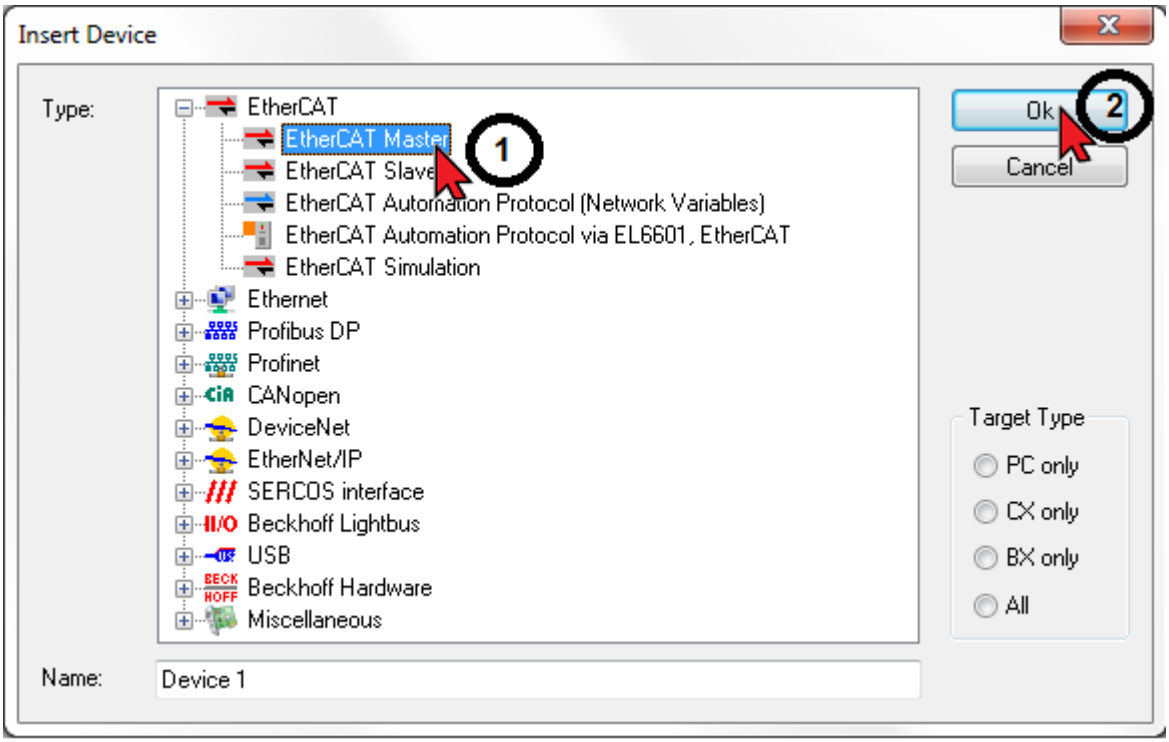
Select the target system:

- Local (own PC)
- TwinCAT PLC



Add the EtherCAT Master functionality to the ‘Device’ icon



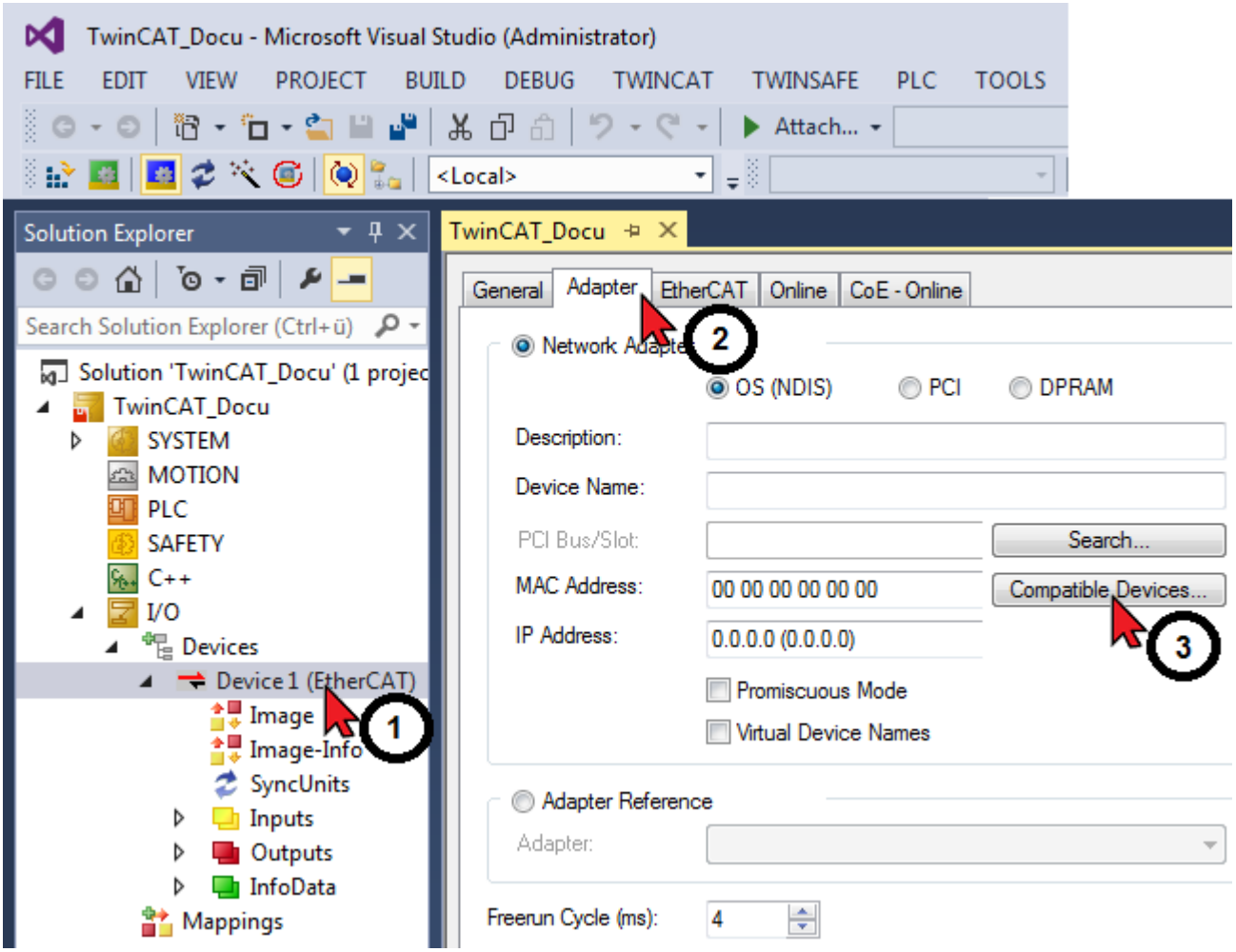


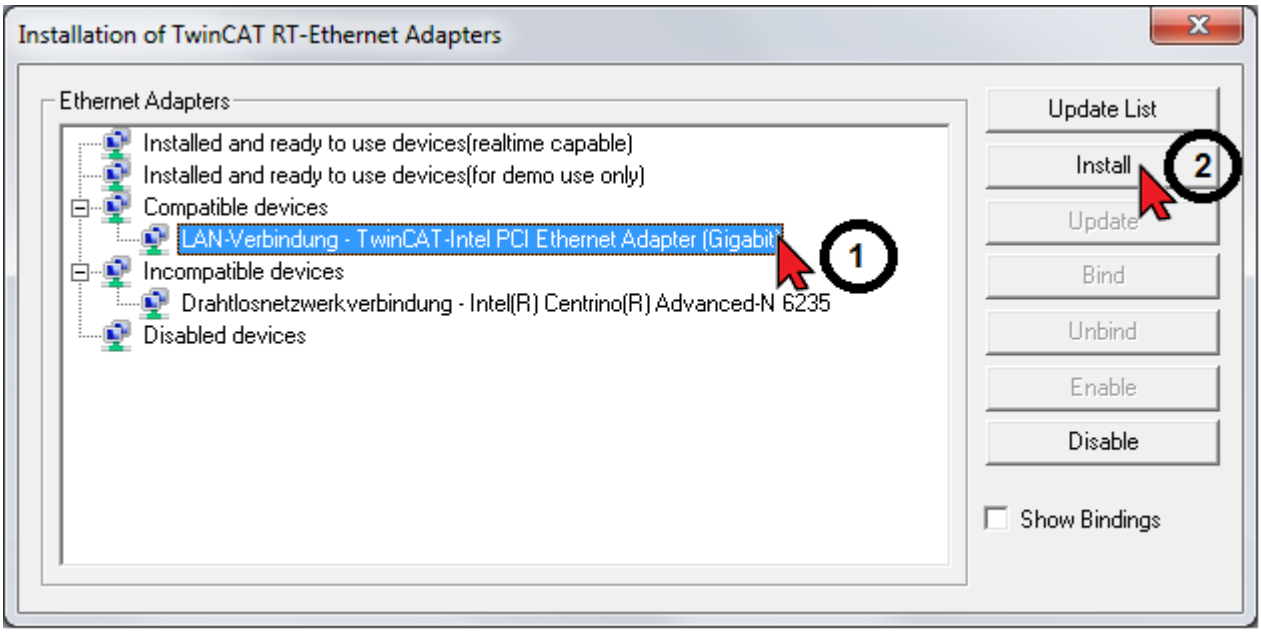
Configuration of the PC network card (one time)

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

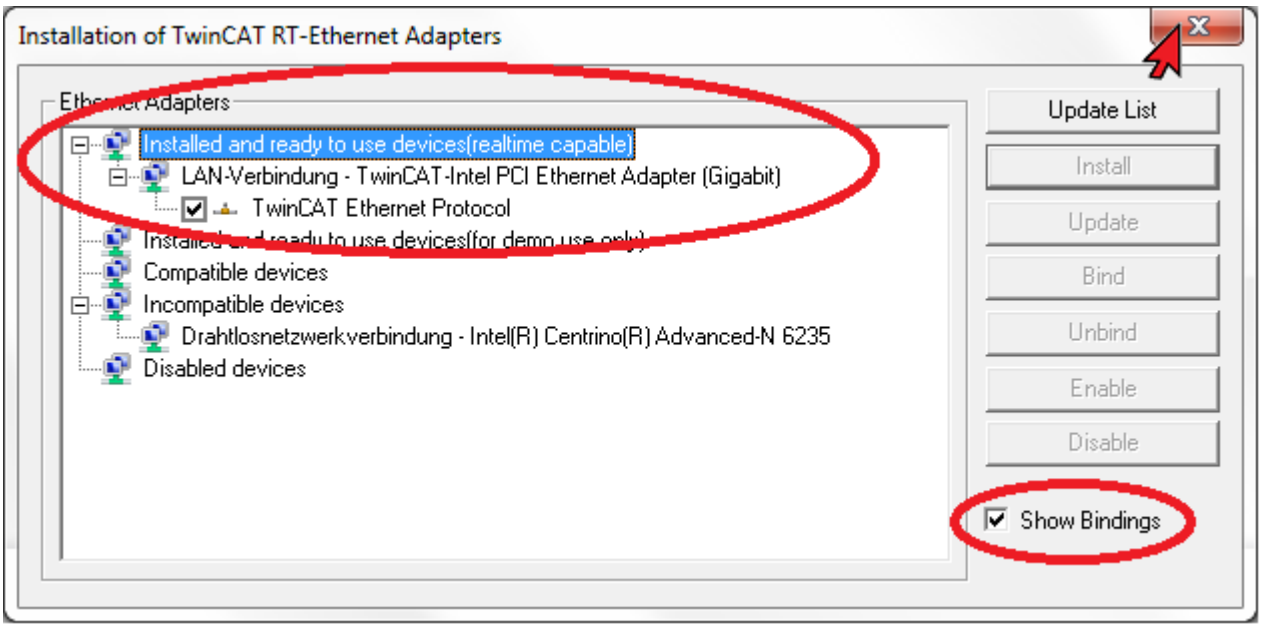
Requirement:
The TwinCAT driver for real-time Ethernet communication is installed.
The TwinCAT driver for real-time Ethernet only works with Ethernet cards with an Intel chip set.

Install TwinCAT Intel PCI Ethernet adapter

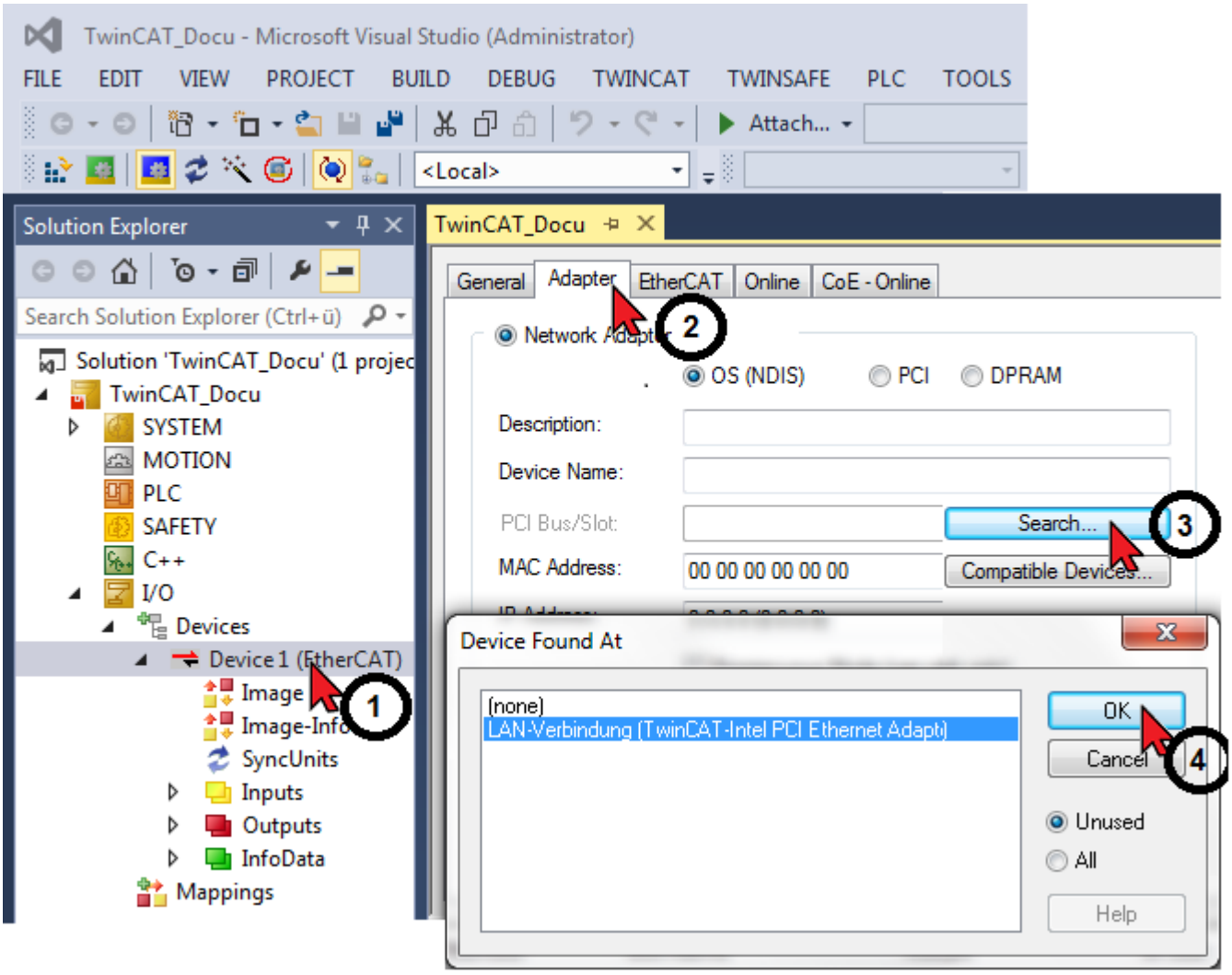




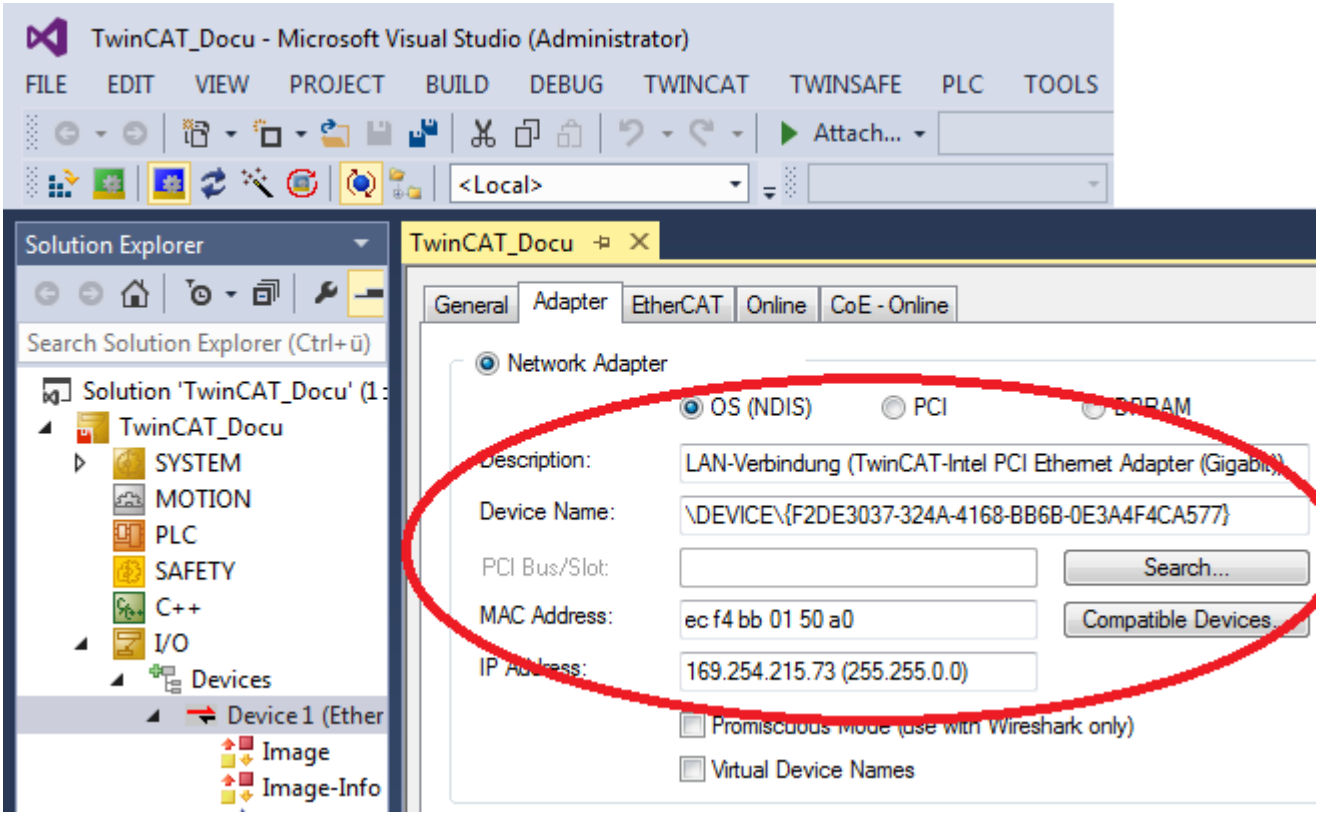
Feedback message: TwinCAT Intel PCI Ethernet adapter installed



Activate EtherCAT adapter



Feedback message: adapter activated



Glossary

A

AT
Drive telegram from slave to master

C

CNC
Computerized Numerical Control

E

ESI
EtherCAT Slave Information / EtherCAT XML Device Description

E2PROM
Electrically erasable programmable read-only memory

I

ID
Parameter identification numbers acc. to SERCOS Standard

M

MDT
Master Data Telegram from master to slave

N

NC
Numerical Control

P

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)

T

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.

e-mail: Documentation@amk-motion.com
or
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

AMKmotion GmbH + Co KG
Phone : +49 7021/50 05-0, fax: +49 7021/50 05-199
E-Mail: info@amk-motion.com
Homepage: www.amk-motion.com