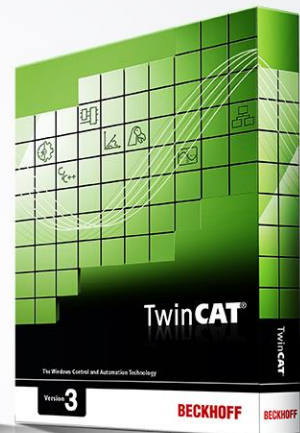
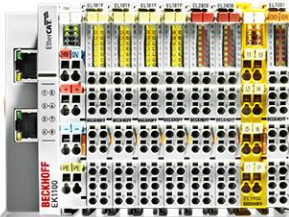


Getting started with the EK9160

BECKHOFF



This presentation shows the first steps for commissioning the EK9160.

The EK9160 documentation is in progress. These information do not claim to be complete.

The design, connection and dimensions of the EK9160 are very similar to those of the CX8190, so please refer to the following chapters of the CX8190 documentation

- For your safety https://infosys.beckhoff.com/content/1033/cx8190_hw/4932192395.html?id=7669938318419844580
- Transport and storage https://infosys.beckhoff.com/content/1033/cx8190_hw/4932877963.html?id=4245029026716479713
- Product overview https://infosys.beckhoff.com/content/1033/cx8190_hw/9007204186831755.html?id=6828851530034229880
- Commissioning https://infosys.beckhoff.com/content/1033/cx8190_hw/45036001264257419.html?id=8564970738140030495
- Care and maintenance https://infosys.beckhoff.com/content/1033/cx8190_hw/9007204343970699.html?id=7648363428189374769

Descriptions of the protocols can be found in the documentation of the software TF6701 TC3 Communication (MQTT) and TF6100 TC3 OPC-UA:

TF6701 TC3 Communication (MQTT)

https://download.beckhoff.com/download/document/automation/twincat3/TF6701_TC3_IoT_Communication_MQTT_EN.pdf

TF6100 TC3 OPC-UA

https://download.beckhoff.com/download/document/automation/twincat3/TF6100_TC3_OP-UA_EN.pdf

Protokolle:

- MQTT (data format: binary und JSON)
- OPC-UA

Supported digital / analog EL terminals:

- “simple” digital and analog EL terminals are supported
- no EL terminals with activated DC
- the new generation of power measurement terminals EL3423, EL3443, EL3453 and EL3483

The EK9160 coupler connects the EtherCAT I/Os directly to the Internet of Things (IoT) without a control program. It converts the E-bus signal representation to various IoT communication protocols. Neither a controller or programming is necessary. The I/O data are parameterised in a simple configuration dialog of the integrated web server via any browser (recommended: Mozilla Firefox or Google Chrome).

The respective cloud services and security functions (authentication, encryption, etc.) can also be conveniently configured via browser. After the parameters have been set, the coupler independently sends the digital or analog I/O values to the cloud service, including the time stamp.



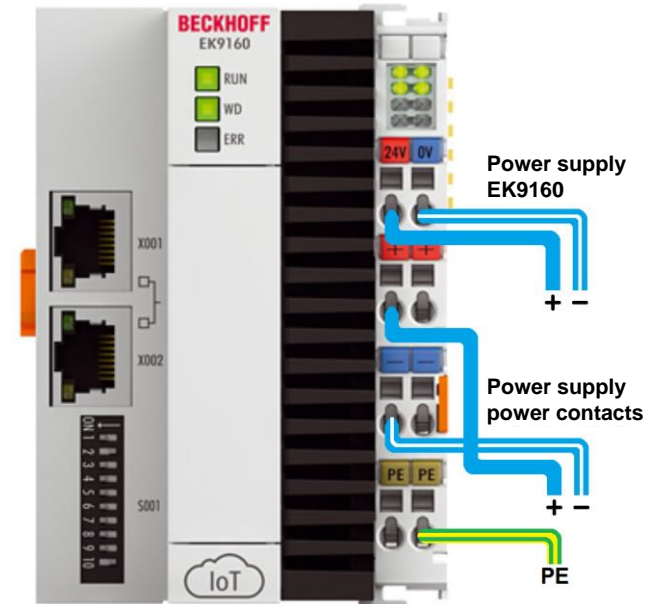
Power supply EK9160

BECKHOFF

- The EK9160 is supplied with voltage via the two connections "24V" and "0V" (U_S).

The input current is approx. 150 mA. In addition, the entire E-bus current / 4 is required to supply the EtherCAT Terminals.

- The connections "+" and "-" serve to supply the power contacts (U_P).

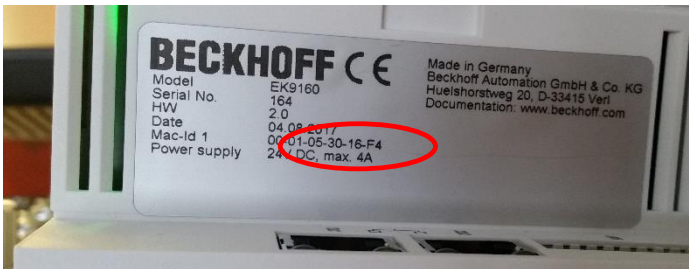


Host name, MAC address and IP address

BECKHOFF

To configure the EK9160, the IP address or the host name for networks with DHCP server is required.

- The MAC address is printed on the side of the EK9160 nameplate.
- The hostname is formed from "EK-" and the last 3 bytes of the MAC address:
E.g. MAC address 00-01-05-30-16-F4 => Hostname "EK-3016F4"
- The IP address can be found as follows:
 - Ping command e.g. "ping EK-3016F4", if a DHCP server is in the network
 - With TwinCAT 3 "Add Route Dialogue"
 - Dip switches (page 9), if no DHCP is in the network



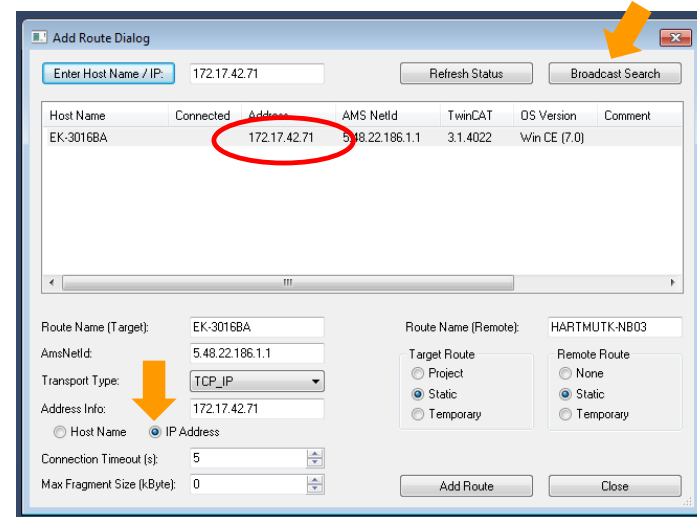
```
Administrator: C:\Windows\system32\cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. Alle Rechte vorbehalten.

C:\Users\Hartmutk>ping EK-3016BA

Ping wird ausgefuehrt fuer EK-3016BA [172.17.42.71] mit 32 Bytes Daten:
Antwort von 172.17.42.71: Bytes=32 Zeit=1ms TTL=128
Antwort von 172.17.42.71: Bytes=32 Zeit<1ms TTL=128
Antwort von 172.17.42.71: Bytes=32 Zeit=1ms TTL=128
Antwort von 172.17.42.71: Bytes=32 Zeit=1ms TTL=128

Ping-Statistik fuer 172.17.42.71:
    Pakete: Gesendet = 4, Empfangen = 4, Verloren = 0
    (0% Verlust)
    Ca. Zeitangaben in Millisek.:
    Minimum = 0ms, Maximum = 1ms, Mittelwert = 0ms

C:\>
```



It is recommended to open the web configuration page "Device Manager" of the EK9160 with the current versions of the web browsers Mozilla Firefox or Google Chrome.

- `https://` "host name or IP address" followed by `/config` in the URL line of the web browser.

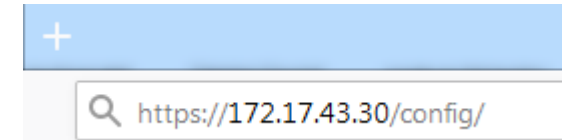
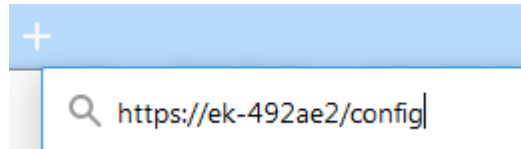
Hostname e.g.: ek-492ae2

or

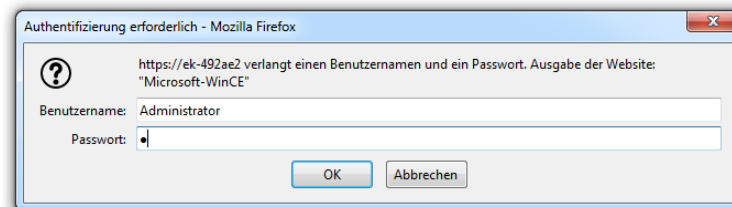
e.g.: 172.17.43.30

<https://ek-492ae2/config>

<https://172.17.43.30/config>



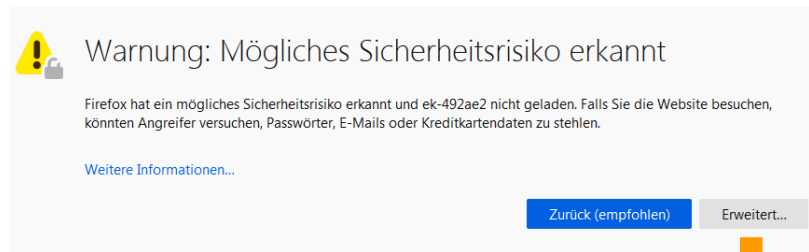
- Username: Administrator
- Passwort: 1



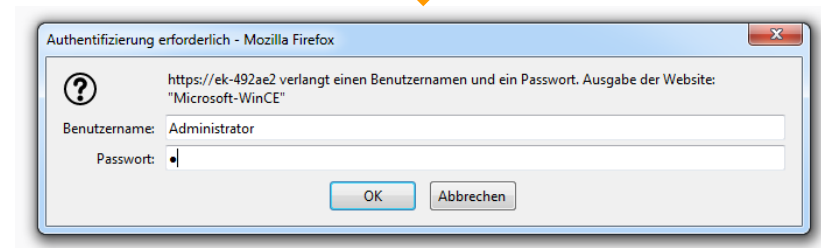
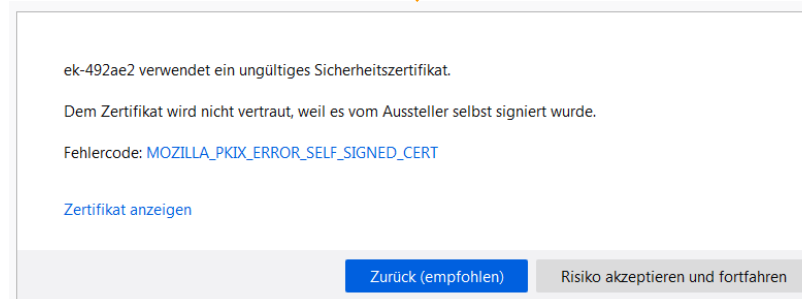
Warning about possible safety risk

BECKHOFF

The first time you open the Device Manager of the EK9160 from your browser, a security warning will probably appear.



The EK9160 uses a self-signed certificate. Since the browser does not know this certificate, you are requested to trust this certificate and continue.



Change IP address of the EK9160

BECKHOFF

Delivery status:

By default the EK9160 is set to DHCP (DIP switch 9 to "off" and 10 to "on"). If the EK9160 is connected to an Ethernet network, it expects to be assigned an IP address.

If no DHCP server is available, a random IP address is selected 192.168.1.xxx.

Set IP address with DIP switches

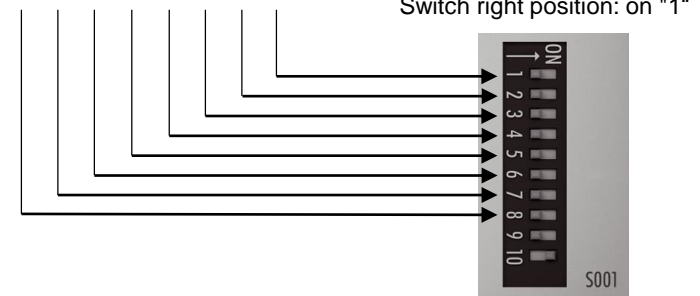
With the DIP switches S001 you can set the IP address for the switched Ethernet interfaces X001/X002.

The DIP switches have priority over the Device Manager settings. After a change, a reboot must be performed (Open Device Manager => Device => Boot => Reboot).

DIP switch S001	Meaning
DIP 1 to 8 all on 9 off and 10 off	The complete IP address is taken from the configuration (Beckhoff Device Manager)
9 off and 10 off	DHCP inactive. The fixed IP address 192.168.1.xxx and subnet mask 255.255.255.0 are used as standard. The last byte of the IP address 192.168.1.xxx is edited with DIP switches 1 to 8. You can change the first three bytes of the IP address in the operating system or via the web interface (Beckhoff Device Manager).
9 off and 10 on	DHCP active. Standard setting ex factory. The DIP switches 1 to 8 then have no meaning.

z.B. 222

1 1 0 1 1 1 1 0

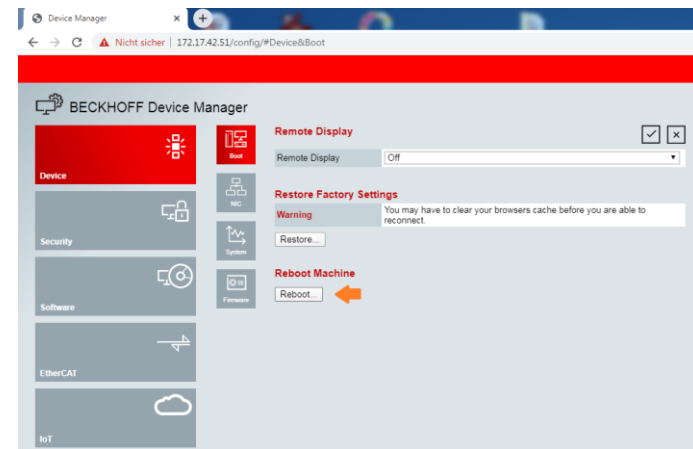
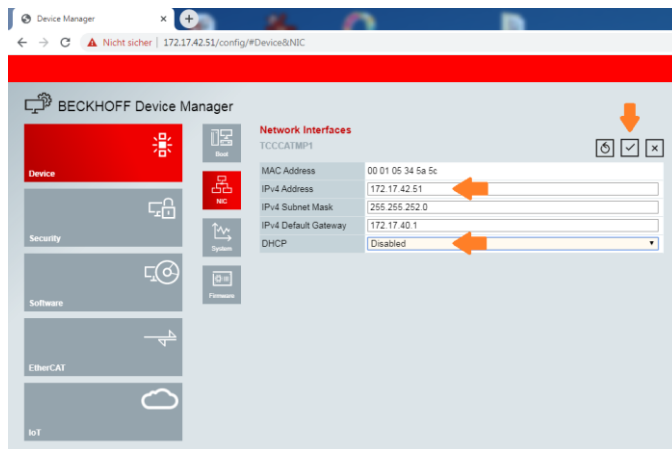


Change IP address of the EK9160

BECKHOFF

The complete IP address can also be set via the Beckhoff Device Manager:

- Open the device manager of the EK9160. Use either the assigned DHCP address or the basic IP address listed in the table (line 2).
- Deactivate DHCP and enter the desired IP address. Accept the configuration. Set DIP switches 9 and 10 to "off" and 1-8 to "on" and reboot the EK9160.



- After the reboot you can call the device manager of the EK9160 again under the new IP address.

- Configure EK9160 – Device Manager – IoT Broker:

The screenshot shows the Beckhoff Device Manager web interface for configuring an IoT Broker. The browser address bar shows `https://192.168.1.2/config/#IoT&IoT Broker`. The interface includes a sidebar with navigation options: Device, Security, Software, EtherCAT, and IoT. The main content area is titled "Device 1" and contains a configuration table. Annotations with arrows point to specific elements: "Saving the configuration" points to the save icon; "Accepting the configuration" points to the checkmark icon; "Connection selection" points to the "General MQTT" dropdown; "Address of the messaging broker or cloud" points to the "192.168.1.50" input field; "Transmission interval in ms of the data" points to the "1000" input field; "Binary / JSON data format" points to the "Binary" dropdown; and "Indicates when connection is established" points to the green "Connected" status bar.

Global Settings	
Symbol Name Separator	.

Device 1	
Connection Type	General MQTT
MQTT Broker	192.168.1.50
Tcp Port	1883
ClientID	
Cycle Time (ms)	1000
Watchdog Mode	Disabled
Watchdog Timeout (ms)	5000
Retain	Allow retained messages
Data Format	Binary
Main Topic	EK9160
Publish Topic	EK9160/EK-492AE6/Stream1/Bin/Tx/Data
Subscribe Topic	EK9160/EK-492AE6/Stream1/Bin/Rx/Data
Username	
Password	
SAS-Token	
Connection Status	Connected
Publisher Send Count	14
Subscriber Receive Count	0
SSL/TLS-Mode	No Certificate

Selection of data channels

- Each channel or measured value to be transmitted must be enabled:

The screenshot shows the Beckhoff Device Manager IoT configuration interface. The main content area is titled "Configure I/O" and "Select Bus Terminal". It displays a grid of bus terminals: EL1809, EL2809, EL3255, and EL3318. The EL1809 terminal is selected, and a callout box labeled "Terminal selection" points to it. Below the grid, the configuration for "Bus Terminal - EL1809" is shown. A callout box labeled "Enabling the entire terminal" points to the "Enabled" checkbox, which is checked. To the right, a callout box labeled "Accepting the configuration" points to the checkmark and close buttons. Below this, a table lists the channels for the selected terminal. A callout box labeled "Enable individual channels" points to the "Enabled" checkbox for Channel 1.

Input	Publisher Symbol	Enabled	Device
Channel 1			
Input	Slave 1 (EL1809).Channel 1.Input	<input checked="" type="checkbox"/>	
Channel 2			
Input	Slave 1 (EL1809).Channel 2.Input	<input checked="" type="checkbox"/>	Device 1
Channel 3			
Input	Slave 1 (EL1809).Channel 3.Input	<input checked="" type="checkbox"/>	Device 1
Channel 4			
Input	Slave 1 (EL1809).Channel 4.Input	<input checked="" type="checkbox"/>	Device 1
Channel 5			
Input	Slave 1 (EL1809).Channel 5.Input	<input checked="" type="checkbox"/>	Device 1

Terminal parameter settings

BECKHOFF

- E.g. Configure TC Element Type J

1. select EtherCAT

2. select terminal

3. select Index

4. select thermocouple

BECKHOFF Device Manager

Slave 4 EL3318

Name: Slave 4 (EL3318)
Type: EL3318
Address: 1004
Vendor ID: 2
Hardware Version: 01
Software Version: 01

EtherCAT State

State Machine: [Init] [Pre-Op] [Safe-Op] [Op] [Boot]

Parameter

Index	Parameter	Value
8000	TC Settings Ch.1	> 25 <
8000: 01	Enable user scale	0
8000: 02	Presentation	signed
8000: 05	Siemens bits	0
8000: 06	Enable filter	0
8000: 0A	Enable user calibration	0
8000: 0B	Enable vendor calibration	1
8000: 0C	Coldjunction compensation	intern
8000: 11	User scale offset	0x0000 (0)
8000: 12	User scale gain	0x00010000 (65536)
8000: 15	Filter settings	50 Hz
8000: 17	User calibration offset	0x0000 (0)
8000: 18	user calibration gain	0xFFFF (65535)
8000: 19	TC Element	J -100...1200°C
> 8010	TC Settings Ch.2	K -200...1370°C
> 8020	TC Settings Ch.3	J -100...1200°C
> 8030	TC Settings Ch.4	L 0...900°C
> 8040	TC Settings Ch.5	E -100...1000°C
> 8050	TC Settings Ch.6	T -200...400°C
> 8060	TC Settings Ch.7	N -100...1300°C
> 8070	TC Settings Ch.8	U 0...600°C

Process Data

TC Channel 1

Underrange	0	
Overrange	0	+/-30mV 1µV resolution
Error	0	+/-60mV 2µV resolution
TxPDO State	0	+/-75mV 4µV resolution

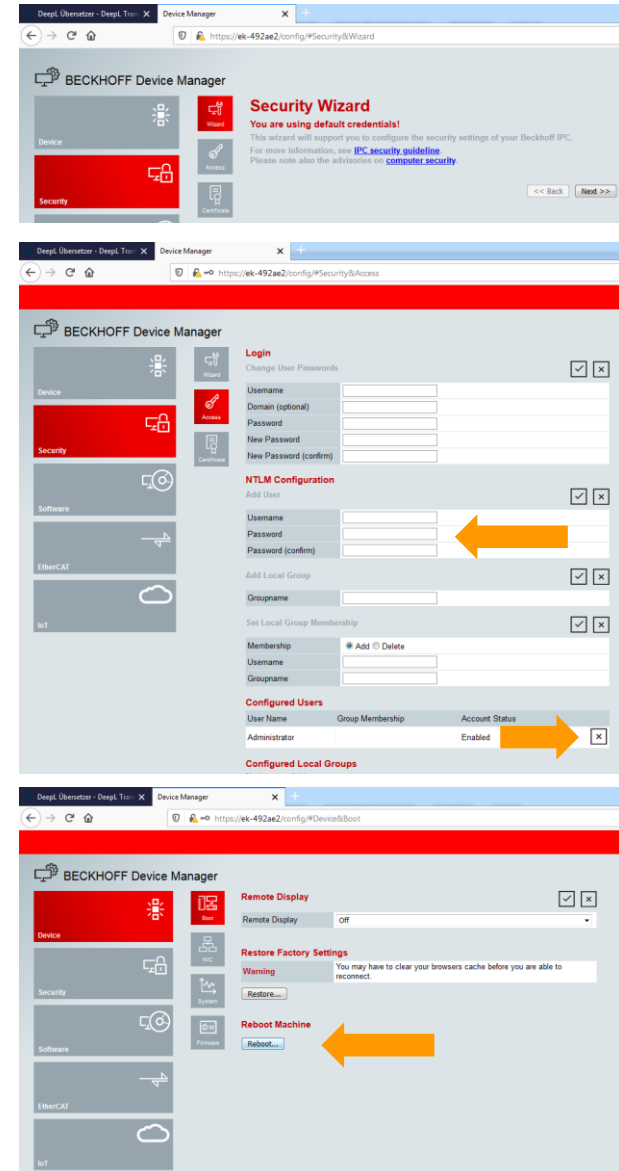
Value: 0x0103 (259)

Change User and Password:

BECKHOFF

To increase security for access to the Device Manager, change the username and password:

1. Open the Security Wizard
2. Create new User and set a new password
3. Delete the default User Administrator
4. Reboot the EK9160



Check the current firmware and update:

BECKHOFF

Via the Device Manager you can check the current firmware version:

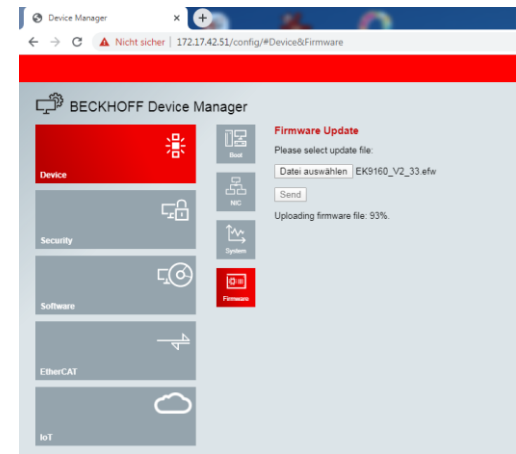
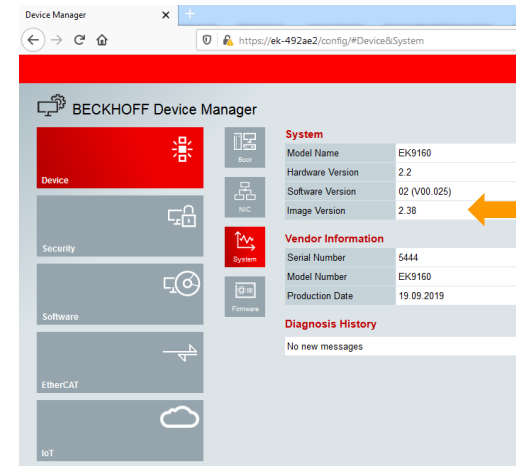
- Device Manager => Device => System
- The firmware version can be found under Image Version

Firmware update with a NK.bin file (for firmware less than 2.33):

- Remove the MicroSD card
- Insert the MicroSD card into a USB reader and format the MicroSD card
- Copy the new firmware (NK.bin) to the memory card
- Insert the memory card back into the EK9160
- The first startup will take a little longer

Firmware update with an EK9160_Vx_xx.efw file (firmware 2.33 or higher):

- Open the device manager of the EK9160 (slide 6)
- Select Device => Firmware
- Use "Select file" to search for the firmware file with the extension .efw
- Send the firmware to the EK9160
- You will then be prompted to perform a reboot



Firmware versions and bootloader are available under the following link :

<https://download.beckhoff.com/download/software/ethercat/ekxxxx/ek9160>

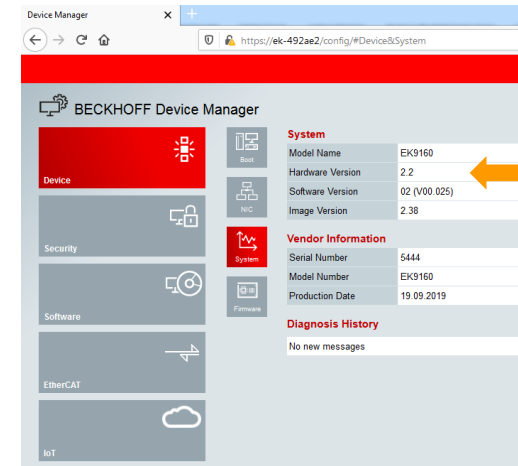
Bootloader update for hardware version 2.0

BECKHOFF

Via the Device Manager you can check the current hardware version:

- Device Manager => Device => System => Hardware Version

If you have an EK9160 with hardware version 2.0, the bootloader must be upgraded before a firmware update. If the new firmware starts, the bootloader is already up-to-date.

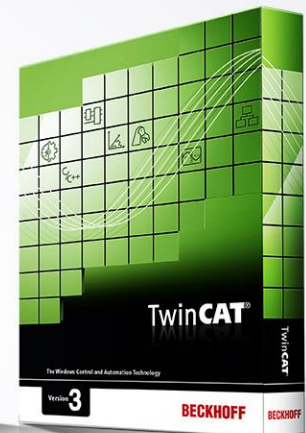
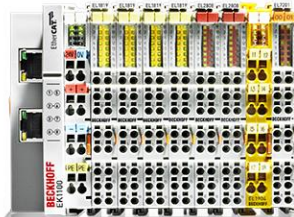


Bootloader update for EK9160 hardware version 2.0:

- If the EK9160 does not start with the new firmware, you have to update the bootloader
- Copy the three files from "Bootloader_v1_15" into the root directory of your μ SD card.
- Switch on the EK9160 - the EK9160 updates the bootloader and restarts (wait at least 15 seconds)
- After a successful bootloader update, the file "eboot_mpl.bin" has been renamed to "_boot_mpl.bin"
- Now you can delete "_boot_mpl.bin" and the two *.rbf files from the root directory of your μ SD card
- Firmware versions and bootloaders are available under the following link :

<https://download.beckhoff.com/download/software/ethercat/ekxxxx/ek9160>

- Update the firmware with an NK.bin file. See previous page.



Beckhoff Automation GmbH & Co. KG

Headquarters
Huelshorstweg 20
33415 Verl
Germany

Phone: +49 5246 963-0
E-mail: info@beckhoff.com
Web: www.beckhoff.com

© Beckhoff Automation GmbH & Co. KG

All images are protected by copyright. The use and transfer to third parties is not permitted.

Beckhoff®, TwinCAT®, EtherCAT®, EtherCAT G®, EtherCAT G10®, EtherCAT P®, Safety over EtherCAT®, TwinSAFE®, XFC®, XTS® and XPlanar® are registered trademarks of and licensed by Beckhoff Automation GmbH. Other designations used in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owners.

The information provided in this presentation contains merely general descriptions or characteristics of performance which in case of actual application do not always apply as described or which may change as a result of further development of the products. An obligation to provide the respective characteristics shall only exist if expressly agreed in the terms of contract.