

## Software User Manual

### Control System ES6

E 865 GB

08.03.2024

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# 1 Preface

## 1.1 Legal Notice

### Contact Details

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### 1.1.1 Version Details

#### Modification History

Date	Comments / Modifications
16.06.2022	first version
31.03.2023	Power Fail Function
08.03.2024	Service mode

## 1.2 About this Manual

This technical information is primarily directed to system designers, project engineers and device developers. It does not contain any availability information. We reserve the rights for errors, omissions and modifications. Pictures are similar.

### 1.2.1 Limitation of Liability

Specifications are for description only and are not to be understood as guaranteed product properties in a legal sense. Exact properties and characteristics shall be agreed in the specific contract. Claims for damages against us - on whatever grounds - are excluded, except in instances of deliberate intent or gross negligence on our part.

### 1.2.2 Terms of Delivery

The general conditions of sales and service of Kendrion Kuhnke Automation GmbH shall apply.

### 1.2.3 Copyright

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Further information about the PLCopen organisation is available at [www.plcopen.org](http://www.plcopen.org). CiA® and CANopen® are registered Community trademarks of CAN in Automation e.V.

CODESYS® is a product of CODESYS GmbH.

i.MX6 is a registered trademark of Freescale

ARM ® and Cortex ® are registered trademarks of ARM Limited.

Modbus® is a registered trademark of the Modbus-IDA Organisation.

The terms HDMI, HDMI High-Definition Multimedia Interface, HDMI Trade dress and the HDMI Logos are trademarks or registered trademarks of HDMI Licensing Administrator, Inc.

The companies mentioned herein own the property rights in their company, product and trade names.

### 1.2.4 Licences

#### Firmware

The units' firmware contains open source software.

A list of the used software packages and their licenses is stored in the web interface under the menu item Home/Packages and Licenses.

Within three years of delivery, customers may buy the source code of the free software from Kendrion Kuhnke Support at net costs.

#### CODESYS

Like all other CODESYS products, the CODESYS runtime version installed in this system is subject to CODESYS GmbH's end user licence agreement (EULA) as published on the CODESYS website.

### 1.2.5 Warranty

Warranty is subject to the provisions of the conditions of sale of Kendrion Kuhnke Automation GmbH or any contractual agreements between the parties.

## 1.3 Reliability, Safety

### 1.3.1 Applicability

For reasons of personal safety and to avoid material damages when working with or handling this Kendrion Kuhnke product, you are advised to take heed of the notes and information contained in this instruction manual.

### 1.3.2 Target Group of the Instruction Manual

This instruction manual contains all information necessary for the use of the described product (control unit, control terminal, software, etc.) according to instructions. It is written for design, project planning, servicing and commissioning experts. For proper understanding and error-free application of technical descriptions, instructions for use and particularly of notes of danger and warning, extensive knowledge of automation technology is compulsory.

### 1.3.3 Intended Use

Kendrion Kuhnke's products are designed, developed and manufactured for standard industrial use. They must not be used for any other purposes than the ones specified in the catalogue or the associated technical documentation. Proper and safe operation depends on the products being transported, stored, lined up, mounted, installed, put into service, operated, and serviced correctly. Ambient conditions must be within the admissible limits. Notes and information in the associated documentation apply at all times.

### 1.3.4 Reliability

Reliability of Kendrion Kuhnke products is brought to the highest possible standards by extensive and cost-effective means in their design and manufacture.

These include:

- selecting high-quality components,
- quality agreements with our suppliers,
- actions to avoid static charges when handling MOS circuits,
- worst case planning and design of all circuits,
- visual inspections at various stages of fabrication,
- computer-aided tests of all assemblies and their interaction in the circuit,
- statistical assessment of the quality of fabrication and of all returned goods for the immediate taking of appropriate corrective actions.

### 1.3.5 Hazard and Other Warnings

Despite the actions described in section 0, the occurrence of faults or errors in electronic control units - even if most highly improbable - must be taken into consideration.

Please pay particular attention to the additional notices which we have marked by symbols throughout this instruction manual. While some of these notices make you aware of possible dangers, others are intended as a means of orientation. They are described further down below in descending order of importance.

Every alert and hazard warning is made up as follows:

**Type and source of risk**

*Potential consequences of non-observance*

⇒ Preventive measures


	<p><b>DANGER</b></p> <p><i>A DANGER warning makes you aware of an immediately hazardous situation which WILL cause a serious or fatal accident if not observed.</i></p>
	<p><b>WARNING</b></p> <p><i>A WARNING makes you aware of a potentially hazardous situation which MAY cause a serious or fatal accident or damage to this or other devices if not observed.</i></p>
	<p><b>CAUTION</b></p> <p><i>A CAUTION alert makes you aware of a potentially hazardous situation which MAY cause an accident or damage to this or other devices if not observed.</i></p>
	<p><b>NOTE</b></p> <p><i>A NOTE makes you aware of a potentially hazardous situation which MAY cause damage to this or other devices if not observed.</i></p>


### 1.3.6 Other Notices

	<p><b>Information</b></p> <p><i>This symbol draws your attention to additional information concerning the use of the described product. This may include cross references to information found elsewhere (e.g. in other manuals).</i></p>
--	---

### 1.3.7 Electrical Safety

Our products normally become part of larger systems or installations. The information below is intended to help you integrate the product into its environment without dangers to humans or material/equipment.

	<b>DANGER</b>
	<p><b><i>Non-observance of the instruction manual</i></b></p> <p><i>Measures for the prevention of dangerous faults or errors may be rendered ineffective or new hazard sources created.</i></p> <ul style="list-style-type: none"> <li>⇒ <i>Thoroughly read the instruction manual</i></li> <li>⇒ <i>Take particular heed of the hazard warnings</i></li> </ul>

	<b>Information</b>
	<p><i>To achieve a high degree of conceptual safety in planning and installing an electronic controller, it is essential to exactly follow the instructions given in the manual because wrong handling could lead to rendering measures against dangers ineffective or to creating additional dangers.</i></p>

### Project Planning

- 24 VDC power supply: generate as electrically safely separated low voltage. Suitable devices include split-winding transformers built in compliance with European Standard EN 60742 (corresponds to VDE 0551).
- Power breakdowns or power fades: the program structure is to ensure that a defined state at restart excludes all dangerous states.
- Emergency-off installations must comply with EN 60204/IEC 204 (VDE 0113). They must be operative at any time.
- Safety and precautions regulations for qualified applications have to be complied with.
- Please pay particular attention to the notices of warning which, at relevant places, will make you aware of possible sources of dangerous mistakes or faults.
- Relevant standards and VDE regulations are to be complied with in every case.
- Control elements are to be installed in such a way as to exclude unintended operation.
- Lay control cables such that interference (inductive or capacitive) is excluded if this interference could influence controller operation or its functionality.

### Maintenance and Servicing


- Precautions regulation BGV A3 (Elektrische Anlagen und Betriebsmittel) to be observed when measuring or checking a controller after power-up. This applies to section 8 (Admissible deviations when working on parts) in particular.
- Spare parts: Only use parts approved of by Kendrion Kuhnke. Only genuine Kendrion Kuhnke modules may be used in modular controllers.
- Modular systems: always plug or unplug modules in a power-down state. You may otherwise damage the modules or (possibly not immediately recognisably!) inhibit their functionality.
- Always dispose of (rechargeable) batteries as hazardous waste.



### 1.3.8 IT Security

Kendrion Kuhnke products are designed for use in closed (private) industrial network environments.

In case such industrial networks are open to public access (e.g. via fully accessible network interfaces) or otherwise externally accessible (e.g. via data links and public (Internet) traffic), the integrator and operator must take appropriate organisational and technical precautions to protect the in-house network and ensure IT security.

	<b>Information</b>
<i>To find information about how to safely operate equipment, systems and networks, please refer to the texts published by BSI (Federal Office for Information Security), other publicly available sources and IEC 62443.</i>	

### 1.3.9 CODESYS Security


Automation devices contain functional units that are worth protecting. These include, among other things, classic control and regulation functions and algorithms, but also production data of the plant users. Since no automation solution is error-free, there are potential vulnerabilities that pose a risk.


The threat is mainly via LAN networks, but attacks via local interfaces are also possible.

The following avenues of attack should be considered:

- Interfaces (USB, LAN, WLAN, Bluetooth,.....)
- Services, drivers, protocols (RPC, HTTP(S),...)
- Authentication, encryption (force login, encrypt PW)
- Physical access (locked rooms, cabinets)
- External systems, external employees

As far as possible, avoid exposing the PLC and control networks to open networks and the Internet. For protection, use additional security layers such as a VPN for remote access and install firewall mechanisms. As a general rule, all interfaces and services that are not required should be deactivated or access restricted. Effective protection of the automation devices can also be carried out via segmentation, e.g. routers with firewalls.

	<b>NOTE</b>
<b>Foreign access to the computer</b>	
<i>Control failure and data loss</i>	
⇒ When integrating into publicly accessible networks, the user must take appropriate measures to prevent unauthorized access.	

	<b>NOTE</b>
<b>Observe the safety information issued and continuously updated by CODESYS at:</b> <a href="https://www.codesys.com/security">https://www.codesys.com/security</a>	

## 2 System Description

### 2.1 Realtime OS

#### Linux

Linux supports a large number of CPU architectures, has an almost endless number of drivers and is highly portable and scalable, all of which make it rank among today's most powerful embedded operating systems. Linux also supports the simple implementation of systems subject to strict real-time requirements.

Advantages:

- Real-time capability
- Low memory requirements
- Large selection of drivers
- MultiCore compatibility
- Long-term availability

### 2.2 CODESYS

CODESYS is a software platform designed to handle many tasks of industrial automation technology. It is based on the IEC 61131-3 programming system. The tool benefits users with integrated solutions tailored to their practical work and aimed at providing hands-on support with whatever job needs to be done.

CODESYS supports all five languages specified in IEC 61131-3 (International Electrotechnical Commission):

- IL (Instruction List)
- ST (Structured Text), based on PASCAL for structured programming
- LD (Ladder Diagram)
- FBD (Function Block Diagram)
- SFC (Sequential Function Chart)

Apart from the standard IEC languages, CODESYS also supports:

- CFC (Continuous Function Chart) is a FD (function diagram) editor with a fully configurable graphical layout: whereas FD editors are network-based and automatically arrange the function blocks, CFC lets users place the blocks anywhere such that feedback effects can be created without any temporary variables. This feature makes the language the perfect choice for creating an overview of the application.

### 2.3 CODESYS Control

CODESYS Control is a soft PLC runtime system installed in Econo and adapted to its hardware. It turns Econo into an industrial controller in conformity with IEC 61131-3. This runtime system also features some extra functions that let the controller communicate with other components in its automation environment.

## 2.3.1 Software Releases

Various software options or combined software options are available for installation in the devices. Please ask Support for the combination that best fits your needs.

Software Options		
Option	Identification	Function
CODESYS TargetVisu	<b>TV</b>	CODESYS control unit extension for outputting visualisation screens to the control unit display. Generates the TargetVisualization immediately in the CODESYS Development System
CODESYS WebVisu	<b>WV</b>	A control unit running CODESYS WebVisu lets you display your own screens created in CODESYS in any web browser environment anywhere in the world.
CODESYS SoftMotion	<b>SM</b>	Use your standard IEC 61131-3 development interface to plan single or multi-axis movements up to and including the plotting of curves - together with the logic application.  A Motion Controller running CODESYS SoftMotion provides the PLC programming system with a kit of motion functions. Motion Controllers running CODESYS SoftMotion support many user project planning variants for the given motion tasks by providing PLCopen-certified motion modules, the entire functionality of the IEC 61131-3 programming interface and other tools.
CODESYS SoftMotion CNC+Robotics	<b>SM CNC*</b>	3D-CNC motion control for Motion Controllers with a complete set of 3D-CNC and/or robotics functions including interpolator and kinematic transformations.  CODESYS SoftMotion CNC+Robotics provides you with an editor as a convenient way of configuring complex groups of robot axles. Run the editor, choose the appropriate kinematics, set its parameters and link them to the physical robot axles. Standardised function blocks process the robot functions in conformity with PLCopen MotionControl Part 4.

- \* Please note that controllers with the SM CNS software variant require an authorization when exported from the EU (e.g. as spare parts) in accordance with item 2D002 of the Dual-Use List of Goods Annex1 Cat. 2.. Find out about the authorization procedure from the responsible office for Export Control.  
If the device is installed in a machine with the software version SM CNC, the classification of the machine automatically applies.

For further information, refer to the product pages of CODESYS Group.

## 2.3.2 Fieldbus technology

The CANopen (device variant), Modbus RTU, Modbus TCP and EtherCAT fieldbuses can be configured directly in the CODESYS programming system. In addition, protocol stacks in the form of CODESYS libraries are available for download for some systems.

### 2.3.2.1 EtherCAT Master

EtherCAT is a powerful real-time Ethernet fieldbus system with an open protocol. Short cycle times, low jitter and various network topologies have made the system a standard in many industrial automation applications.

The EtherCAT master and the connected EtherCAT slaves can be conveniently configured using the CODESYS Development System.

The configuration of EtherCAT modules is based on the device description files for the master and slave devices used and can be adapted in the project in configuration dialogues.

### Supported functions

Distributed Clocks

Different bus topologies

Bus diagnostics: in the configurator and through the PLC application

Network scan: detect and insert connected slaves

### 2.3.2.2 CANopen Master

Fully integrated in the CODESYS Development System is the CANopen master/slave configurator based on EDS or DCF files, so no external tool is required for configuring the bus system or the I/O data used.

The software offers an application interface according to CiA 405 for diagnosis and use of SDO Extensive diagnostic functions.

### 2.3.2.3 Modbus TCP/RTU Master

The entire configuration of the CODESYS Modbus master (TCP / RTU) takes place directly in the CODESYS Development System.

The parameters for communication with Modbus RTU are specified in the configurator, e.g. the settings of the serial port such as baud rate or port number.

The parameters for communication with Modbus TCP, such as the settings of the Ethernet adapter or the port number, are specified in the TCP configurator.

So-called Modbus channels are defined in the configurator Behind a Modbus channel is a single Modbus command (read/write data) and the associated I/O channels. Please refer to the documentation of the connected Modbus slave to find out which commands are supported.

### 2.3.3 Visualisation

Directly in the CODESYS Development System, the user can create complex visualisation masks with the integrated visualisation editor, link them to the application variables and animate them. Integrated visualisation elements are available for this purpose. The generated masks can be used, for example, for application tests and during commissioning in the online mode of the programming system. With the optional visualisation clients **CODESYS TargetVisu**, **CODESYS WebVisu** and **CODESYS HMI**, the created masks can also be used to operate the machine or system.

#### 2.3.3.1 Visualisation in the Development System

The integrated visualisation in the development system is ideal for application tests, service or diagnostic purposes as well as for commissioning a system. As soon as you are connected to the control, the visualisation editor switches over and animates the displayed elements. This variant is part of the free CODESYS Development System and can always be used regardless of the control system used.

#### 2.3.3.2 CODESYS TargetVisu (Option TV)

This variant runs on control systems with integrated display (Scout). Logic application & user interface run on the same device, the user interface is displayed directly on the control system. This variant is suitable for operating and monitoring machines and systems. An optional extension of the runtime system is required to use CODESYS TargetVisu.

#### 2.3.3.3 CODESYS WebVisu (Option WV)

This variant means web-based display of the user interface in a standard browser (PCs, tablets, smartphones). This enables remote access, remote monitoring as well as service and diagnosis of a system via the internet. A standard web browser communicates via JavaScript (optionally with SSL encryption) with the web server in the control unit and displays the visualisation using HTML5. This technology is supported on almost all browsers and is therefore also available on end devices with iOS or Android.

Kendrion offers devices with CODESYS WebVisu as an option for all control systems. In the type designation of the device, this function is identified with the abbreviation "WV".

#### 2.3.3.4 CODESYS HMI

This variant visualisation or display on dedicated display devices (Vico). This enables access to the process data of several controllers via the same user interface.

The user interfaces created with CODESYS are displayed on a remote display device. This eliminates the computing load on the control. Communication with the controller takes place via the data source manager. This variant is ideal for operating and monitoring the machine on site, whereby the values of several controls can also be displayed in one visualisation. The display is on one or more operating panels without control functionality and I/O control.

Kendrion offers devices with CODESYS HMI functionality under the device designation "Vico HMI".

## 2.3.4 SoftMotion (design variant)

Single-axis or multi-axis movements up to curve writing can be configured in the familiar IEC 61131-3 development interface together with the logic application.

Controls with CODESYS SoftMotion allow the user extensive project planning variants for his motion tasks. Among other things, certified motion modules according to PLCopen and the full scope of the IEC 61131-3 programming interface are available for this purpose.

- Function blocks for single-axis and multi-axis traverse movements
- Visualisation templates for simple and fast commissioning

### 2.3.4.1 CODESYS SoftMotionLight

CODESYS SoftMotionLight is a functionally reduced motion solution for single axis movements. It enables a large number of axes to be controlled with a small controller.

The controller and the fieldbus are relieved by shifting the movement execution to the axes. Only the status updates and movement commands are sent via the fieldbus. The familiar PLCopen function blocks for motion control (such as MC\_Home, MC\_MoveAbsolute, MC\_ReadStatus) are implemented for commanding and monitoring the axes. In addition, a simplifying functionality is provided.

For use with CODESYS SoftMotionLight, a drive must support EtherCAT or CAN fieldbus and various CiA 402 operating modes. The SML\_CompatibilityCheck\_DS402.project can be used to check whether a drive is suitable for use with CODESYS SoftMotionLight.

### 2.3.4.2 CODESYS SoftMotion (Option SM)

Single-axis or multi-axis movements up to curve writing can be configured in the familiar IEC 61131-3 development interface together with the logic application.

Controls with CODESYS SoftMotion allow the user extensive project planning variants for his motion tasks. Among other things, certified motion modules according to PLCopen and the full scope of the IEC 61131-3 programming interface are available for this purpose.

- Function blocks for single-axis and multi-axis traverse movements
- Visualisation templates for simple and fast commissioning
- Integrated graphical cam editor with extensive configuration options

### 2.3.4.3 CODESYS SoftMotion CNC+Robotics (Option CNC)

Single- or multi-axis movements up to curve writing can be configured in the familiar IEC 61131-3 development interface - together with the logic application. Kuhnke controllers with CODESYS SoftMotion allow the user extensive project planning variants for his motion tasks. Among other things, certified motion modules according to PLCopen and the full scope of the IEC 61131-3 programming interface are available for this purpose.

- Single-axis or multi-axis movements with PLCopen® Motion blocks
- Multidimensional CNC control
- Multi-axis robot controllers with convenient project planning

## 2.3.5 OPC UA Server

Platform-independent standard access to variable data.

OPC UA (Unified Architecture) is a new development of the OPC specifications with which data from machines and plants is not only transported, but also semantically described in a machine-readable manner. The data exchange can take place manufacturer-independently and is thus one of the most important communication protocols for Industry 4.0 and the IoT.

The CODESYS OPC UA server is integrated on the ES6 device family as a component of the runtime system. The powerful controller can transmit data from the controller to OPC UA clients such as a visualisation. The data to be published is defined in the symbol configuration. The data transmission can be secured and encrypted. A known OPC client can request the defined data.

## 2.4 Power Fail

"Powerfail" is a function in CODESYS that enables the system to shut down properly in the event of a power failure or other unexpected loss of power.


The controller detects that the power supply has been interrupted for more than 10 ms and automatically saves all relevant data in the non-volatile memory and stops running CODESYS processes. The "Run / Stop" LED flashes 2 times if the undervoltage persists.

This functionality ensures that the system can be quickly and easily restored to its previous state as soon as the power supply is restored, and the controller is started.

Overall, the power fail function in CODESYS helps to ensure the reliability and stability of industrial automation systems even in the event of unexpected power failures.

If other functions in the application must be handled in the event of a power fail, such as writing large log files, stopping axes or sending the power fail signal to other participants, the automatic CODESYS "Powerfail" function can be deactivated by the "PowerFailToManual" system function. In this case, only the "Powerfail" event is generated and all necessary steps for a proper shutdown must be handled in a function module to be created in CODESYS.

Supporting functions are collected in the system library. → 4.2 CODESYS System Library

	<b>HINWEIS</b>
	<p><b><i>Damage to the control system or machine</i></b>  <i>PLC failure and data loss</i></p> <ul style="list-style-type: none"> <li>⇒ The residual energy in the buffer capacitors and thus the functionality of the system is limited.</li> <li>⇒ Check the manual shutdown and thus individual power fail solution extensively.</li> </ul>

For more information on the topic of power fail, please contact the Control Technology Support of Kendrion Kuhnke.

## 3 System configuration

The Controller ES system can be configured via web interface or USB stick

### 3.1 Web Interface.

#### 3.1.1 IP Address


The Controller ES6 family are set to a permanent IP address and subnet mask in the factory.

IP address LAN 1 (X2): 192.168.0.216

Subnet mask: 255.255.255.0

To connect to the unit for the first time, mind that your PC's IP address must be in the same range as that of the unit.


This may involve changing your PC's IP address.

	<b>NOTE</b>
	<p><b>Duplicate IP addresses</b></p> <p><i>Assigning the same IP address to two different devices may cause serious network problems.</i></p> <ul style="list-style-type: none"> <li>⇒ Check your network for duplicate IP addresses.</li> <li>⇒ To put the unit into operation, we recommend using a direct network connection between the unit and your programming PC and assign set IP addresses to both. You may have to use a cross-over network cable.</li> </ul>

Unique assignment of the network address of the Ethernet interfaces.

If both network interfaces receive the same network address (Net-ID) and operate in the same subnet, it is not certain which of the two interfaces is used for data traffic. For secure operation, the network addresses (Net-ID) of the interfaces must be different. The network address (Net-ID) refers to computers and not to an Ethernet interface.

If the units connected to the Ethernet interfaces must work in a network, an external switch can be used for this purpose.


	<b>HINWEIS</b>
	<p><b>Same network addresses (Net-ID) at the interfaces of a unit</b></p> <p><i>If the network interfaces of a unit are operated with the same network addresses, interference may occur.</i></p> <ul style="list-style-type: none"> <li>⇒ Make sure that the Ethernet interfaces of a unit have different network addresses (Net-ID).</li> </ul>



### 3.1.2 Web interface

To access the web interface of the ES6 device family, start a web browser on your PC. The Microsoft Edge browser, Internet Explorer, Chrome and Firefox are currently supported. Enter the following IP address in the address line of your web browser:

When connecting via LAN 1 (X2)  
<http://192.168.0.216>

	<b>Information</b>
	<p>Configuration pages are provided with a login.</p> <p><b>Name:</b> root</p> <p><b>Password:</b> Password: root</p> <p>As of 09/2023 this is the serial number of the device* there follows the request to set up a personal password</p>

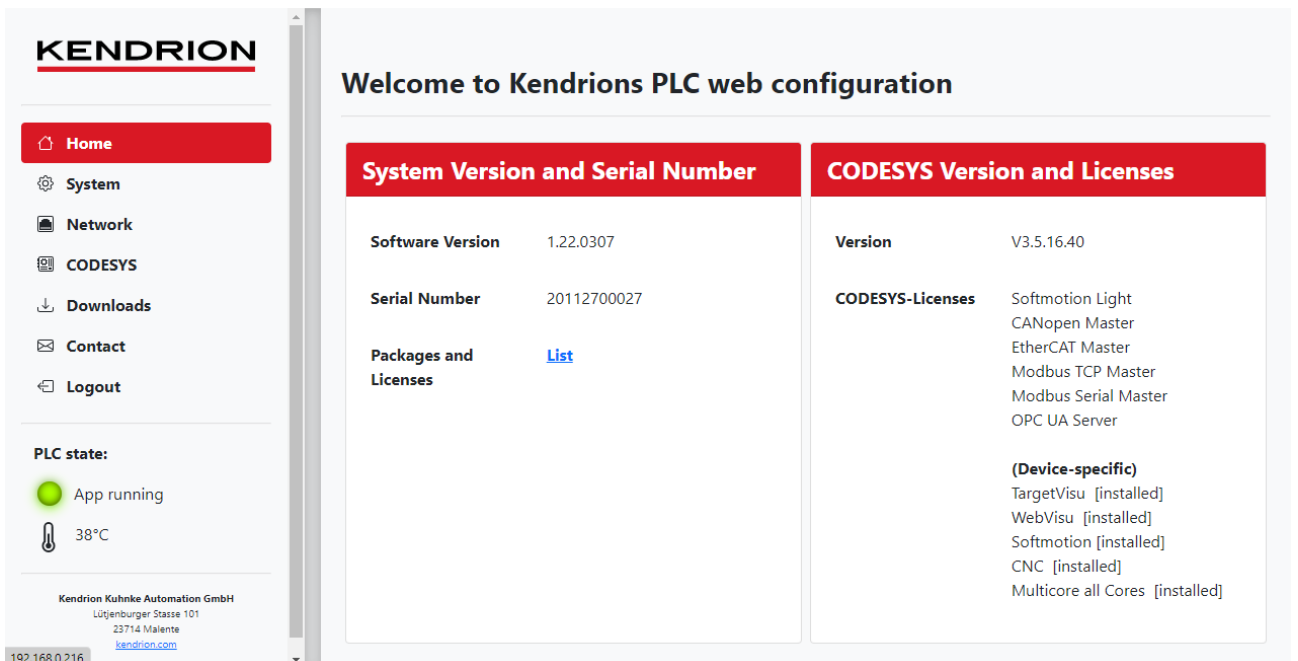
\* All devices that are designed with additional safety-related measures are identified by the addition "secured" next to the hardware version HW on the revision plate.

Example: **HW: 1.20 secured**

### 3.1.3 Web interface - Home

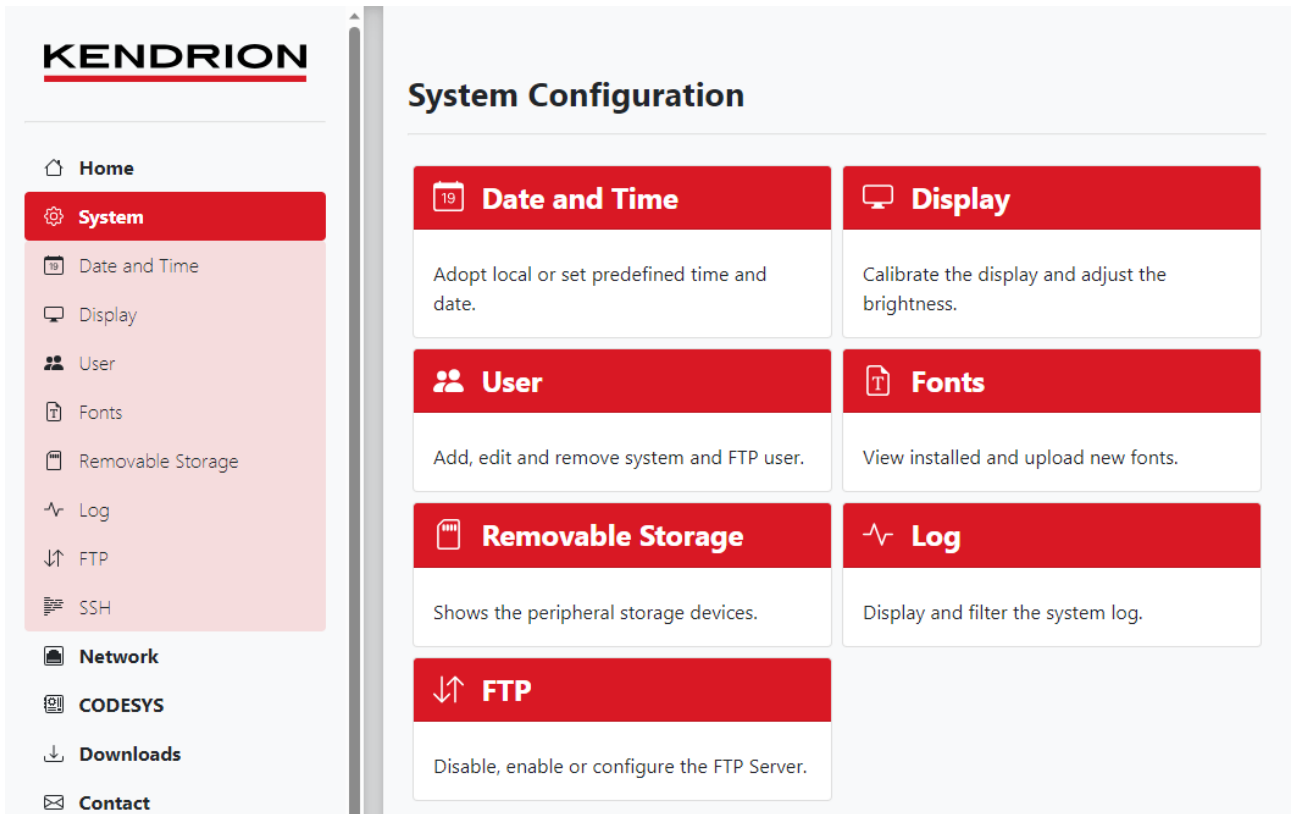
The start page displays general information about the unit.

- Software version installed on the unit
- Serial number of the device
- CODESYS runtime version
- Interfaces and fieldbus support included in the standard
- Optional licences Interfaces and fieldbus support



\* Display in the web interface depending on the available options and web browser


### 3.1.4 Webinterface – System



#### Settings

- Date and time
- Starting the touch calibration, brightness of the screen
- Enable FTP and set up user
- Enable SSH
- Installed fonts, reloading fonts
- Contents of USB stick/SD card
- Log data
- FTP settings (FTP is deactivated in the delivery status)

The set data is permanently saved when you leave the page

	<p><b>Information (Fonts)</b></p> <p>The following fonts are pre-installed in the factory version:</p> <p>LiberationMono, LiberationSans, LiberationSerif each (Regular, Bold, Italic, Bold-Italic).</p> <p>Further fonts can be installed via the web interface.</p>
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### 3.1.5 Webinterface – Network

The screenshot displays the 'Network' configuration page in the Kendrion web interface. On the left is a navigation menu with 'Network' selected. The main content area is divided into three panels for network interfaces: eth0, eth1, and wlan0. Each panel includes a DHCP checkbox, IP Address, Subnet Mask, and Default Gateway fields, and a MAC Address field. The wlan0 panel is marked as 'link down' and has a note about DHCP capabilities.

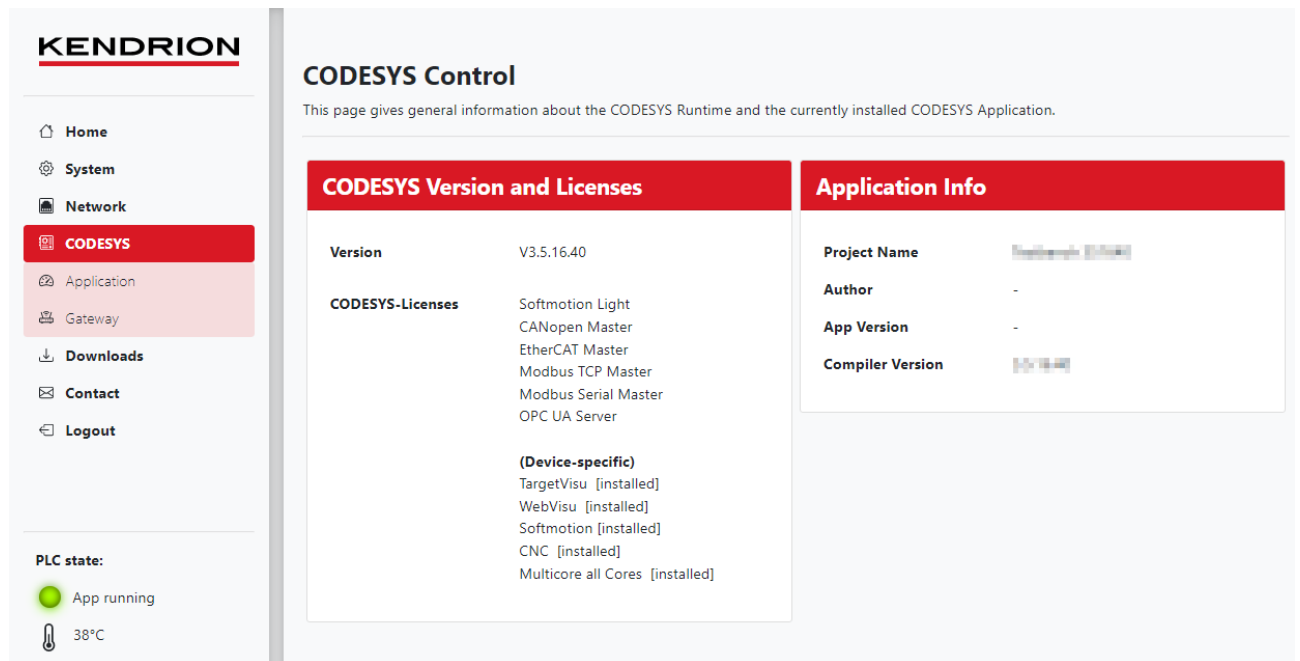
Interface	DHCP	IP Address	Subnet Mask	Default Gateway	MAC Address
eth0	<input type="checkbox"/>	192 . 169 . 0 . 216	255 . 255 . 255 . 0	192 . 169 . 0 . 1	40 : ED : 98 : 40 : FF : FE
eth1	<input type="checkbox"/>	192 . 168 . 0 . 216	255 . 255 . 255 . 0	192 . 168 . 0 . 1	40 : ED : 98 : 40 : FF : FF
wlan0 (link down) - AP	<input type="checkbox"/>	192 . 167 . 0 . 216	255 . 255 . 255 . 0	192 . 167 . 0 . 1	40 : ED : 98 : 40 : FF : FF

\*Display in the web interface depending on the available options

#### Settings

- Network configuration LAN1 and LAN2
- WLAN (external WLAN stick)

### 3.1.6 Webinterface – CODESYS



#### Settings / displays

- Integrated CODESYS licenses and versions
- CODESYS Application Information
- Information on the CODESYS Edge Gateway

### 3.1.7 Webinterface – Downloads

Download of the ControllerES6 CODESYS Package


The CODESYS package contains the following device descriptions and libraries required for the device:

- CODESYS device description ControllerES6
- Device Description ControllerES6IO
- Device Description KICS\_ModbusComPort
- System Library ControllerES6

### 3.1.8 Webinterface – Contact

Contact information

### 3.1.9 Webinterface – Logout

	<p><b>Information (Logout)</b></p> <p>Log out of the unit again when you have completed your setting work.</p>
---	--

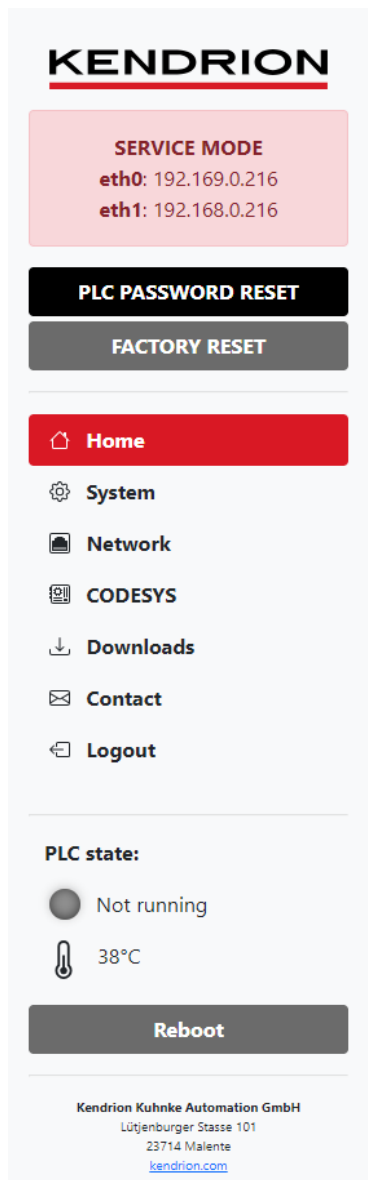
## 3.2 Web interface – Service Mode

In service mode, the IP addresses can be read out in the web interface, the application can be deleted, and the controller can be reset to the delivery state.

To start the web interface in the service mode, follow the instructions below 4.2 Service Mode (RESET Taste).

In service mode, the web interface can be accessed using the default IP address of the device and the serial number as password. Both information can be found on the nameplate.

The web interface starts in Service Mode with additional information and functions.



**KENDRION**

**SERVICE MODE**  
eth0: 192.169.0.216  
eth1: 192.168.0.216

**PLC PASSWORD RESET**

**FACTORY RESET**

**Home**

**System**

**Network**

**CODESYS**

**Downloads**

**Contact**

**Logout**

**PLC state:**

● Not running

🌡️ 38°C

**Reboot**

Kendrion Kuhnke Automation GmbH  
Lütjenburger Stasse 101  
23714 Malente  
[kendrion.com](http://kendrion.com)

⇒ Display of the current IP addresses


⇒ PLC Passwort Reset

⇒ Factory Reset

⇒ Reboot

## 3.3 USB Update functions

Using the USB update functions, you can load customised system configurations, play the CODESYS boot application on the device or carry out a complete system update. A template for the system configuration and loading a CODESYS boot application can be found on the Internet in our product finder.

	<b>HINWEIS</b>
	<p><b><i>Incorrect or faulty update</i></b>  <i>Control failure and data loss</i></p> <ul style="list-style-type: none"> <li>⇒ Make sure that you use the correct update file for your device with correct system configuration for an update.</li> <li>⇒ For a USB update, use a USB stick with SLC or pSLC technology in industrial design, a status LED in the USB stick simplifies the tracking of the update process.</li> </ul>

### 3.3.1 Update the system

A system update is provided as an archive file on request. This must be unpacked onto a USB stick. The update can also update the system configuration.

### 3.3.2 Update the system configuration

The update of the system configuration is configured in the file "sysconf". This file must be located in the root directory of the USB stick. Since the file "sysconf" is only a text file with a special formatting, it can be edited with any text editor. The file contains sections [section] and keys, similar to the structure of a \*.ini file. System configurations can also be carried out during operation. If a stick with the file "sysconf" is inserted, the running CODESYS application is terminated and the update is processed. The CODESYS application is then restarted.

#### Sektion [users]

Add users by listing the desired users below the [users] section line by line with the corresponding password separated by spaces, e.g.

```
[users]
Username Password
```

#### Sektion [ts\_conf]

Here you have the option of saving the touchscreen calibration, e.g. before you carry out a system update.

```
[ts_conf]
save
```

If the previously saved touchscreen calibration is to be restored during a system update. Enter the following in the "sysconf":

```
[ts_conf]
load
```

The key "calibrate\_on\_plugin" causes the touchscreen calibration to be started when the USB stick is inserted.

```
[ts_conf]
calibrate_on_plugin
```

## Sektion [autocopy]

Files can be copied to the unit with the help of the [autocopy] section. Knowledge of the directory structure on the control unit is essential. There must be a "root" directory on the USB stick containing the directory structure and the files that are to be copied to the unit. Example:

```
[autocopy]
/usr/bin/codesys
## !! DO NOT REMOVE "list_end" !! ##
list_end
```

Copies all files and subdirectories from <USB>:\root\usr\bin\codesys to the device in /usr/bin/codesys.

## Sektion [ip\_conf]

Changes the setting of the available Ethernet interfaces. The key below the [ip-conf] section is structured as follows:

<Name> <IP-Adresse>/<NetMask Bit kodiert> <Optional: Gateway IP-Adresse>

Example

```
[ip_conf]
eth0 192.168.0.215/24 192.168.0.1
eth1 192.168.0.216/24 192.168.0.1
wlan0 192.169.0.1/24
```

## Sektion [codesys\_control]

This section contains control commands for external control of the CODESYS Runtime. Only activate one key in this section at a time

- stop: leaves the CODESYS boot application in the stop state during and after inserting the USB stick.
- disable: switches off the codesyscontrol service
- enable: activates the codesyscontrol service
- deny\_start: prevents the start of a boot application
- enable\_start: enables the start of a boot application (again)
- remove\_app: deletes the current boot application
- deploy\_app: deploys a plclogic.tar as an app (plclogic.tar can be created via the web server)
- enable\_webvisu:
- disable\_webvisu:
- enable\_codesysedge:
- disable\_codesysedge:

```
[codesys_control]
#stop
#disable
#enable
#deny_start
#enable_start
#remove_app
#deploy_app
#enable_webvisu
#enable_codesysedge
```

### Sektion [log]

Copies the log files dmesg and /var/log/messages to the storage medium to ./log/.

```
[log]
copy_logs
```

### Sektion [vsftpd\_control]

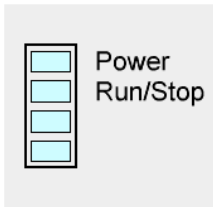
Activates or deactivates the FTP service vsftpd

```
[vsftpd_control]
#enable_vsftpd
#disable_vsftpd
```

## 3.3.3 Status message during update

Depending on the update, the progress of the update is signalled via the jam LEDs.

Status LEDs:



LED-Bedeutung		
Step	LED	Bedeutung
1	Power Run/Stop	uboot
2	Power Run/Stop	uboot → Linux
3	Power Run/Stop	(Flash code 1 Hz) USB/SD working
4	Power Run/Stop	reboot
5	Power Run/Stop	uboot
6	Power Run/Stop	Uboot –Linux
7	Power Run/Stop	(Flash code 1 Hz) USB / SD working
8	Power Run/Stop	(Flash code 1 Hz) Update done



## 4 System functions

### 4.1 Operating system functions

#### 4.1.1 SSH Connection

SSH refers to a network protocol that can be used to establish an encrypted network connection with the machine in a secure manner.

An SSH client is required under Windows (e.g. Putty).

The SSH connection is deactivated when the device is delivered.

To log in via SSH, the following information is required:

Server-Adresse:	<IP- Adresse>, as delivered 192.168.0.216
Username:	root
Password:	-
Port	22

#### 4.1.2 AutoStart

If further programmes are to be started on the system, this is configured by configuring the background programme "systemd". The configuration requires experience. Our control technology support team will be happy to assist you.

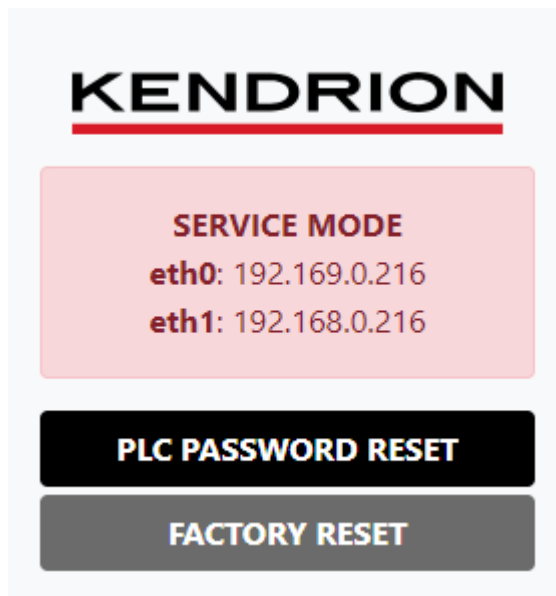
### 4.1.3 Kernel Update Tool

If a kernel / operating system update is necessary, please contact the Control Technology Support at Kendrion Kuhnke.

## 4.2 Service Mode

The Service Mode differs from the normal operation mode in the following points:

- The CODESYS V3 runtime is not executed, so no control programs are running. The factory settings are loaded during network configuration so that each controller can be addressed via a uniquely defined IP address. Information on this network configuration can be found in chapter → 3.1 Web Interface.
- - The text "Service Mode" appears in the Web Interface.



- To enter the service mode, the device must be switched off.
- Subsequently, the S/R button is kept pressed and the device is switched on again.
- The button must be held down until the Run/Stop LED and the LED below it light up yellow (approx. 5s).
- The service mode is ready when the Run/Stop LED lights up yellow.

### 4.3 CODESYS System Library

Hardware-specific functions of the device are to be used with the library "KICS Controller ES6 System Library" in CODESYS. The library must be integrated into the project via the library manager.

Short documentations for all usable function blocks and functions are stored in the library manager. For further information, please contact the Control Technology Support of Kendrion Kuhnke.

#### FUNCTION PowerFailToManual

Changes the PowerFail mode of the PLC to manual. In this case, the PLC only sends the PowerFail event and does not stop the application or save the retains. Saving the retains must be done with the SaveRetains function.

Input parameters: BOOL

- TRUE for manual PowerFail,
- FALSE for automatic PowerFail.

Return value: BOOL

PowerFailToManual  
Successful: TRUE, Faulty: FALSE

### FUNCTION SaveRetains

Function to save the retains and terminate the application.

Return value: BOOL  
Successful: TRUE, faulty: FALSE

### FUNCTION SysGetMountableDevices

Reads the volume/destination. The returned device names can be used to unmount a specific device (SysUnmountDevice).

Return value: STRING  
Array of strings with the currently mounted devices.

### FUNCTION SysGetSerialNumber

Query the serial number of the system

Return value: STRING  
Serial number of the device

### FUNCTION SysGetTemperature

Query CPU temperature

Return value: INT  
Temperature [°C]

### FUNCTION SysGetVersion

Query the controller version of the system

Return value: STRING  
Controller version

### FUNCTION SysReboot

Restart of the control

Return value: Reset of the control

### FUNCTION SysSetEthAddr

Set Ethernet interface

The gateway can be omitted by setting the leading GW byte to zero.

Possible interfaces are eth0, eth1 and wlan0.

Input parameters: STRING + 3 x array  
Ethernet name, IP Address, Subnet Mask, Gateway

Return value: BOOL  
TRUE

### FUNCTION SysStartTouchCalibration

Starts the touch calibration

Input parameter

Return value: BOOL  
Successful: TRUE, faulty: FALSE

## FUNCTION SysUmountDevice

Switch off a unit

Input parameter: STRING

    Name of the device

Return value: BOOL

    Successful: TRUE, Faulty: FALSE

## 5 CODESYS V3 Development Environment

### 5.1 Installing CODESYS on the Project Engineering PC



#### HINWEIS

*For development, only use the CODESYS version that matches the released runtime version of the controller. The version is located on the device housing and in the web interface.*

CODESYS is a device-independent system for programming control units. It conforms to standard IEC 61131-3 and supports all standardised IEC programming languages plus the integration of C code routines and object-orientated programming.

In conjunction with runtime system CODESYS Control Win V3 it also allows the use of "multi-device" and "multi-application" programs. Owing to its component-based architecture, it supports customer-specific configurations of and extensions to the user interface.

Before installing CODESYS, please read and take note of the system requirements.

#### System requirements

##### Operating system

Windows 8 / 10 / 11 (64 bit operating system)

The versions maintained by Microsoft are supported.

##### Recommended system properties

2.5 GHz processor

8 GB RAM

12 GB free hard disk space

##### Additional requirements

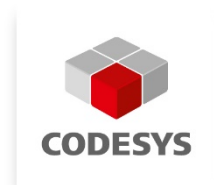
Microsoft Internet Explorer 11, or higher

##### Note

No license needed

Please note the license agreement with CODESYS Group

The development environment can be downloaded in different versions from the CODESYS Store.



## 5.2 Preparing CODESYS

### 5.2.1 Device Description in CODESYS V3

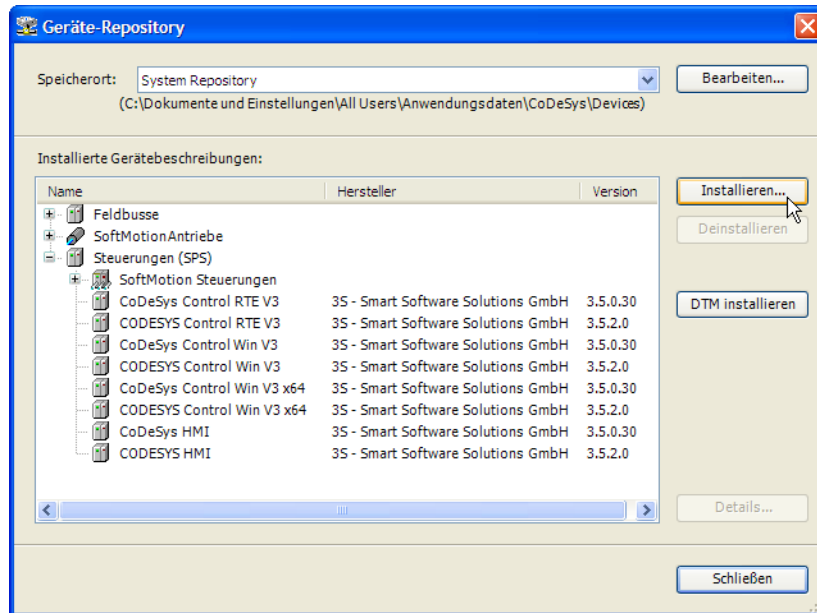
Before the IEC 61131-3 development tool can be used to operate a device, CODESYS V3 is to be made known to the device as the runtime system.

A separate plug-in, the Device Repository, provides the local system and your projects with the device definition management functions. Among other features, it contains commands of category Devices which you will normally find in the Tools menu.

- Open the Tools menu and pick Device Repository...
- Screen Device Repository is displayed.
- Expand the tree at node Control Units (PLC).

The Device Repository hosts the descriptions of all devices currently installed on the local system and makes the devices available for CODESYS programming. Devices are installed in and uninstalled directly from the Device Repository.

Screen Device Descriptions Installed displays the Name, Vendor and Version of every device that is currently installed. Click on the plus and minus signs to expand or collapse the branches.



## Device description

All Scout variants equipped with an iMX6 processor system use Device Description "ContollerES6". Run the Web Configurator and open its Download menu to load this Device Description and the one for the integrated optional 4DI/4DO from the unit.

Geräteversion	Device Id	Device Name
Econo XX6 Scout XXX6	64	ControllerES6
Optional interne 4DI/4DO	1064	ControllerES6IO

## To install a device description

Click on Install... to install a new device on the local system and make it available for use in the programming system.

Screen Install Device Description is displayed to let you search the system for the associated device description file. If you are looking for a standard device, set the file type filter to **\*.devdesc.xml** (device description). Another option is to find vendor-specific description files such as \*.gsd files of Profibus DP modules or \*.eds and \*.dcf files of CAN devices.

Clicking on OK confirms your settings, closes the screen and adds the device to the tree shown on screen Device Repository. Look at the bottom of screen Device Repository to find messages on any installation error (e.g. missing files referenced by the device description).

## To download a Device Description

The matching Device Description is stored on the device. Display the web configuration page and open the Downloads menu to load it.

On the web configuration screen, go to tab Download and tap on Download DevDescr.

## 5.2.2 Special features of the unit description

There is only one device description for the ControllerES6 platform. It is therefore no longer necessary to differentiate between standard and softmotion devices or between single and multi-core devices. This reduces the software maintenance effort. Depending on the use, however, certain settings must be made.

### Activate Softmotion

To use CODESYS Softmotion, select the menu item "Activate SoftMotion" in the "Project" menu.

The command causes the SoftMotion General Axis Pool device to be added below the control configuration if the object is still missing. There is a maximum of one SoftMotion General Axis Pool per PLC device. In addition, the SoftMotion libraries (with prefix SM3\_) are added in the library manager.

If your device is deactivated for SoftMotion and you add any SoftMotion object under the device, the command Activate SoftMotion is immediately executed implicitly. A SoftMotion object is a cam object, a CNC object, an axis group object or any SoftMotion axis.

### Single Core

For controllers with single core processors, task groups cannot be assigned to specific processor cores. By default, the device description creates the task group "IEC tasks" with the core setting "FixedPinned". No further settings need to be made.

### Multi Core

For controllers with multi core processors and multi core soft PLCs it is possible to assign task groups to specific processor cores.

The following "Core" settings are possible:

- FreeFloating: All tasks are dynamically bound to different processor cores - the user cannot influence this, the allocation is done by the operating system.
- SequentialPinned: All tasks are bound to different processor cores - the user cannot influence this.
- FixedPinned: All tasks are pinned to one processor core. Which processor core this is is decided in the runtime system (default setting).
- <Core number>: Fixed processor core. If the processor core is not present, an error message is displayed.

## 5.2.3 Physical interfaces

### EtherCAT

General

Sync Unit Assignment


Log

EtherCAT I/O Mapping

EtherCAT IEC Objects

Status

Information



Autoconfig master/slaves

**EtherCAT NIC Settings**

Destination address (MAC)   Broadcast  Redundancy

Source address (MAC)

Network name

Select network by MAC  Select network by name

Select Network Adapter

MAC address	Name	Description
0005510D1760	eth0	
F2BA509184B5	eth1	

### CAN Bus

In the device tree, add the device "CAN Bus" below the control. Set the assigned CAN bus interface under "Network".

Assignment of the CAN bus interfaces :

CAN 1 (X8): Network 0

CAN 2 (X7): Network 1

### Serial interfaces (RS232, RS485)

The serial interfaces are assigned to the COM ports as follows:

RS485 (X7): COM port 1

RS232 (X8): COM port 2

When using Modbus RTU via the RS485 interfaces, add the device "KICS Modbus COM" below the controller in the device tree. In the settings, select "1" for the COM port.



#### Information

**For Modbus RTU, always use the "KICS Modbus COM" device, as this sets the device-specific setting (`RTS_CONTROL = TOGGLE`) correctly.**

### Internal IO (4DI / 4DO)

The internal IO module does not require any configuration. It is automatically hooked into the device tree.



## 6 Security

Due to the increasing networking of control systems and plants, the threat potential is also increasing rapidly! Therefore, deal intensively with the possible security measures!

Security measures are absolutely necessary to protect data and communication paths from unauthorized access.

Kendrion Kuhnke Automation GmbH  
Industrial Control Systems

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