



# COMBICONTROL C6

INSTRUCTIONS FOR USE | **SMART**

Translation of original manual  
Dokument 20130559 EN 04



# Preface

The described hard- and software are developments of the KEB Automation KG. The enclosed documents correspond to conditions valid at printing. Misprint, mistakes and technical changes reserved.

## Signal words and symbols

Certain operations can cause hazards during the installation, operation or thereafter. There are safety informations in the documentation in front of these operations. Security signs are located on the device or machine. A warning contains signal words which are explained in the following table:

<b>DANGER</b>	Dangerous situation, which will cause death or serious injury in case of non-observance of this safety instruction.
<b>WARNING</b>	Dangerous situation, which may cause death or serious injury in case of non-observance of this safety instruction.
<b>CAUTION</b>	Dangerous situation, which may cause minor injury in case of non-observance of this safety instruction.
<b>NOTICE</b>	Situation, which can cause damage to property in case of non-observance.

### RESTRICTION

Is used when certain conditions must meet the validity of statements or the result is limited to a certain validity range.

	Is used when the result will be better, more economic or trouble-free by following these procedures.
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## More symbols

- ▶ This arrow starts an action step.
- / - Enumerations are marked with dots or indents.
- => Cross reference to another chapter or another page.



Note to further documentation.  
[www.keb.de/nc/search](http://www.keb.de/nc/search)



## Laws and guidelines

KEB Automation KG confirms with the EC declaration of conformity and the CE mark on the device nameplate that it complies with the essential safety requirements.

The EC declaration of conformity can be downloaded on demand via our website. Further information is provided in chapter "Certification".

## Warranty and liability

The warranty and liability on design, material or workmanship for the acquired device is given in the general sales conditions.



Here you will find our general sales conditions.  
[www.keb.de/terms-and-conditions](http://www.keb.de/terms-and-conditions)



Further agreements or specifications require a written confirmation.

## Support

Through multiple applications not every imaginable case has been taken into account. If you require further information or if problems occur which are not treated detailed in the documentation, you can request the necessary information via the local KEB Automation KG agency.

**The use of our units in the target products is outside of our control and therefore lies exclusively in the area of responsibility of the customer.**

The information contained in the technical documentation, as well as any user-specific advice in spoken and written and through tests, are made to best of our knowledge and information about the intended use. However, they are regarded as being only informal and changes are expressly reserved, in particular due to technical changes. This also applies to any violation of industrial property rights of a third-party. Selection of our units in view of their suitability for the intended use must be done generally by the user.

**Tests can only be done within the intended end use of the product (application) by the customer. They must be repeated, even if only parts of hardware, software or the unit adjustment are modified.**

## Copyright

The customer may use the instructions for use as well as further documents or parts from it for internal purposes. Copyrights are with KEB Automation KG and remain valid in its entirety.

This KEB product or parts thereof may contain third-party software, including free and/or open source software. If applicable, the license terms of this software are contained in the instructions for use. The instructions for use are already available to you, can be downloaded free of charge from the KEB website or can be requested from the respective KEB contact person.

Other wordmarks or/and logos are trademarks (™) or registered trademarks (®) of their respective owners.

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## Glossary

0V	Earth-potential-free common point	KEB product	The KEB product is subject of this manual.
1ph	1-phase mains	KEB-I/O EtherCAT SPS	Small control system from the KEB-I/O system
3ph	3-phase mains	KEB-I/O EtherCAT System	I/O module family
AC	AC current or voltage	Manufacturer	The manufacturer is KEB, unless otherwise specified (e.g. as manufacturer of machines, engines, vehicles or adhesives).
Application	The application is the intended use of the KEB product.	MCM	American unit for large wire cross sections
ASCL	Asynchronous sensorless closed loop	MTTF	Mean service life to failure
AWG	American wire gauge	NN	Sea level
B2B	Business-to-business	PE	Protective earth
CAN	Fieldbus system	PELV	Protective Extra Low Voltage
CODESYS	Operating system of the standard control and programming environment	PFD	Term used in the safety technology (EN 61508-1...7) for the size of error probability
CODESYS Safety-PS	Safety programming system	PFH	Term used in the safety technology (EN 61508-1...7) for the size of error probability per hour
COM-BIVERT	KEB drive converters	PLC	Programmable logic controller
COMBIVIS	KEB start-up and parameterizing software	POU	Program Organization Unit
Customer	The customer has purchased a KEB product from KEB and integrates the KEB product into his product (customer product) or resells the KEB product (dealer)	RJ45	Modular connector with 8 lines
DC	DC current or voltage	Safety Package	Plug in for COMBIVIS studio 6 with safety functionally
DIN	German Institut for standardization	Safety PLC	Safety programmable logic controller
EMC	Electromagnetic compatibility	Safety PLCopen	Library of the certified basic level safety blocks
Emergency stop	Shutdown of a drive in emergency case (not de-energized)	SELV	Safety Extra Low Voltage (<60V)
Emergency switching off	Switching off the voltage supply in emergency case	SIL	The security integrity level is a measure for quantifying the risk reduction. Term used in the safety technology (EN 61508 -1...7)
EN	European standard	USB	Universal serial bus
End customer	The end customer is the user of the customer product.		
EtherCAT	Real-time Ethernet bus system of the company Beckhoff		
Ethernet	Real-time bus system - defines protocols, plugs, types of cables		
FE	Functional earth		
FSoE	Functional Safety over Ethernet		
GND	Reference potential, ground		
Head module	Description for the bus coupler or small control in the KEB-I/O EtherCat system		
HMI	Human machine interface (touch screen)		
IEC	International standard		
IP xx	Degree of protection (xx for level)		

## Standards for control & automation

DGUV regulation 3	Electrical installations and equipment
DIN 46228-1	Wire-end ferrules; Tube without plastic sleeve
DIN 46228-4	Wire-end ferrules; Tube with plastic sleeve
DIN IEC 60364-5-54	Low-voltage electrical installations - Part 5-54: Selection and erection of electrical equipment - Earthing arrangements, protective conductors and protective bonding conductors (IEC 64/1610/CD)
DIN VDE 0100-729	Low-voltage electrical installations - Part 7-729: Requirements for special installations or locations - Operating or maintenance gangways (IEC 60364-7-729); German implementation HD 60364-7-729
EN 1037	Safety of machinery - Prevention of unexpected start-up; German version EN 1037
EN 55011	Industrial, scientific and medical equipment - Radio frequency disturbance characteristics - Limits and methods of measurement (IEC/CISPR 11); German version EN 55011
EN 55021	Interference to mobile radiocommunications in the presence of impulse noise - Methods of judging degradation and measures to improve performance (IEC/CISPR/D/230/FDIS); German version prEN 55021
EN 60204-1	Safety of machinery - electrical equipment of machines Part 1: General requirements (VDE 0113-1, IEC 44/709/CDV)
EN 60439-1	Low-voltage switchgear and controlgear assemblies - Part 1: Type-tested and partially type-tested assemblies (IEC 60439-1); German version EN 60439-1
EN 60529	Degrees of protection provided by enclosures (IP Code) (IEC 60529)
EN 60664-1	Insulation coordination for equipment within low-voltage systems Part 1: Principles, requirements and tests (IEC 60664-1)
EN 60721-3-1	Classification of environmental conditions - Part 3-1: Classification of groups of environmental parameters and their severities - Section 1: Storage (IEC 104/648/CD)
EN 60721-3-2	Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities - Section 2: Transportation and handling (IEC 104/670/CD)
EN 60721-3-3	Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities; section 3: Stationary use at weatherprotected locations; Amendment A2 (IEC 60721-3-3); German version EN 60721-3-3
EN 61000-2-1	Electromagnetic compatibility (EMC) - Part 2: Environment - Section 1: Description of the environment - Electromagnetic environment for low-frequency conducted disturbances and signalling in public power supply systems
EN 61000-2-4	Electromagnetic compatibility (EMC) - Part 2-4: Environment; Compatibility levels in industrial plants for low-frequency conducted disturbances (IEC 61000-2-4); German version EN 61000-2-4
EN 61000-4-2	Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test (IEC 61000-4-2); German version EN 61000-4-2
EN 61000-4-3	Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test (IEC 61000-4-3); German version EN 61000-4-3
EN 61000-4-4	Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test (IEC 61000-4-4); German version EN 61000-4-4
EN 61000-4-5	Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement

EN61000-4-6	techniques - Surge immunity test (IEC 61000-4-5); German version EN 61000-4-5 Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields (IEC 61000-4-6); German version EN 61000-4-6
EN61000-4-34	Electromagnetic compatibility (EMC) - Part 4-34: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests for equipment with mains current more than 16 A per phase (IEC 61000-4-34); German version EN 61000-4-34
EN 61131-2	Programmable controllers - Part 2: Equipment requirements and tests (IEC 61131-2)
EN61373	Railway applications - Rolling stock equipment - Shock and vibration tests (IEC 61373)
EN61439-1	Low-voltage switchgear and controlgear assemblies - Part 1: General rules (IEC 121B/40/CDV); German version FprEN 61439-1
EN61508-1...7	Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 1...7 (VDE 0803-1...7, IEC 61508-1...7)
EN61800-2	Adjustable speed electrical power drive systems - Part 2: General requirements - Rating specifications for low voltage adjustable frequency a.c. power drive systems (VDE 0160-102, IEC 61800-2)
EN61800-3	Speed-adjustable electrical drives. Part 3: EMC requirements and specific test methods (VDE 0160-103, IEC 61800-3)
EN61800-5-1	Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy (IEC 61800-5-1); German version EN 61800-5-1
EN61800-5-2	Adjustable speed electrical power drive systems - Part 5-2: Safety Requirements - Functional (IEC 22G/264/CD)
EN62061	Safety of machinery - functional safety of electrical, electronic and programmable electronic safety-related systems (VDE 0113-50, IEC 62061)
EN ISO 13849-1	Safety of machinery - safety-related parts of control systems - Part 1: General principles for design (ISO 13849-1); German version EN ISO 13849-1
UL61800-5-1	American version of the EN 61800-5-1 with „National Deviations“

# 1 Basic Safety Instructions

This instructions for use contains the information necessary for the intended use of the described product (control unit, operating material, software etc.).

The safety instructions can be supplemented by local, country or application-specific safety instructions. This list is not exhaustive. Non-observance will lead to the loss of any liability claims.

## ATTENTION



### Hazards and risks through ignorance.

- ▶ Read the instruction manual!
- ▶ Observe the safety and warning instructions !
- ▶ If anything is unclear, please contact KEB !

## 1.1 Target group

This manual is written for qualified personnel from construction, project planning, service and commissioning. Qualified personnel for the purpose of this instruction manual must have the following qualifications:

Knowledge and understanding of the safety instructions.

- Knowledge of automation technology.
- Knowledge of functional safety.
- Skills for the installation and assembly of electrical equipment.
- Detection of hazards and risks of the electrical drive technology.
- Understanding of the function in the used machine.
- Knowledge of the operation of the operating system Windows.
- Knowledge of the *DIN IEC 60364-5-54*.
- Knowledge of national safety regulations (e.g. *DGUV regulation 3*).

## 1.2 Transport, storage and proper use

The transport is carried out by qualified persons in accordance with the environmental conditions specified in this manual. The devices shall be protected against excessive strains.



### Electronic devices contain electrostatic sensitive components.

- ▶ Avoid contact.
- ▶ Wear ESD-protective clothing.

Do not store the devices

- in the environment of aggressive and/or conductive liquids or gases.
- with direct sunlight.
- outside the specified environmental conditions.

### 1.3 Installation

**⚠ DANGER**



**Do not operate in an explosive environment!**

- ▶ The device is not intended for the use in potentially explosive environment.

To prevent damages to the device:

- Make sure that no components are bent and/or isolation distances are changed.
- The device must not be put into operation in case of mechanical defects. There is no compliance with applicable safety standards any more.
- Do not allow moisture or mist to penetrate the unit.
- Avoid dust permeating the device. Allow for sufficient heat dissipation if installed in a dust-proof housing.
- Note installation position and minimum distances to surrounding elements. Do not cover the ventilation openings.
- Assembly according to the specified degree of protection.
- Make sure that no small parts fall into the device during assembly and wiring (drilling chips, screws etc.). This also applies to mechanical components, which can lose small parts during operation.
- Check the reliable fit of the device connections in order to minimize contact resistance and avoid sparking.
- The safety instructions are to be kept!

### 1.4 Electrical connection

**⚠ DANGER**



**Voltage at the terminals and in the device !**

**Danger to life due to electric shock !**

- ▶ Never work on the open device or never touch exposed parts.
- ▶ For any work on the unit switch off the supply voltage and secure it against switching on.
- ▶ Install suitable protective devices for personal protection.
- ▶ Never bridge upstream protective devices (also not for test purposes).
- ▶ Install all required covers and protective devices for operation.

For a trouble-free and safe operation, please pay attention to the following instructions:

- The electrical installation shall be carried out in accordance with the relevant requirements.
- Cable cross-sections and fuses must be dimensioned according to the design of the machine manufacturer. Specified minimum / maximum values may not be fallen below /exceeded.

- Within systems or machines the person installing electrical wiring must ensure that on existing or new wired safe ELV circuits the EN requirement for safe insulation is still met!
- When using components without isolated inputs/outputs, it is necessary that equipotential bonding exists between the components to be connected (e.g. by the equipotential line). Disregard can cause destruction of the components by equalizing currents.

### 1.5 Start-up and operation

When the device is installed in machines, startup (i. e. the start of the intended use) is prohibited until it is determined that the machine complies with the machine directive; *EN 60204-1* must be observed.

- During operation, all covers and doors shall be kept closed.
- Use only approved accessories for this device.
- Never touch terminals, busbars or cable ends.

### 1.6 Maintenance

The following maintenance work has to be carried out when required, but at least once per year by authorized and trained personnel.

- ▶ Check unit for loose screws and plugs and tighten if necessary.
- ▶ Clean devices from dirt and dust deposits. Pay attention especially to cooling fins and protective grid of the fans.
- ▶ Examine and clean extracted air filter and cooling air filter of the control cabinet.

### 1.7 Preventive Maintenance

**⚠ DANGER**



---

**Unauthorized exchange, repair and modifications!**

**Unpredictable malfunctions!**

- ▶ The function of electronic devices can be affected by the setting and parameterisation. Never replace without knowledge of the application.
  - ▶ Modification or repair is permitted only by KEB Automation KG authorized personnel.
  - ▶ Only use original manufacturer parts.
  - ▶ Infringement will annul the liability for resulting consequences.
-



## 1.8 Disposal

Electronic devices of the KEB Automation KG are exclusively professional devices for further industrial processing (so-called B2B devices).

Manufacturers of B2B devices are obliged to take back and recycle devices manufactured after 14.08.2018. These devices may not be disposed at the collection centres of public sector disposal organisations.



If no deviating agreement has been made between the customer and KEB or no deviating mandatory legal regulation exists, KEB products marked in this way can be returned. Company and keyword to the return point can be taken from the list below. Shipping costs are paid by the customer. Thereupon the devices will be professionally recycled and disposed.

The entry numbers are listed country-specific in the following table. The corresponding KEB return addresses can be found on our website.

Withdrawal by	WEEE-Reg.-No.	Keyword
<b>Austria</b>		
KEB Automation GmbH	ERA: 51976	Stichwort „Rücknahme WEEE“
<b>France</b>		
RÉCYLUM - Recycle point	ADEME: FR021806	Mots clés „KEB DEEE“
<b>Germany</b>		
KEB Automation KG	EAR: DE12653519	Stichwort „Rücknahme WEEE“
<b>Italy</b>		
COBAT	AEE: (IT) 19030000011216	Parola chiave „Ritiro RAEE“

The packaging must be feed to paper and cardboard recycling.

## 2 Product Description

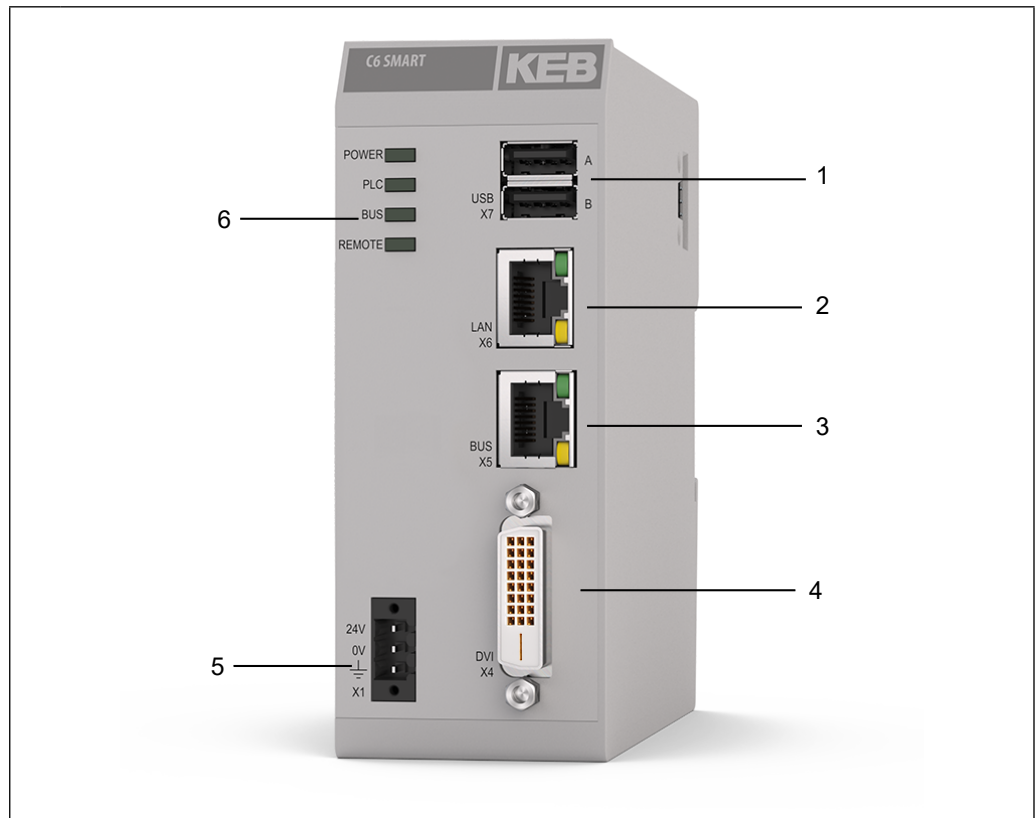
The C6 SMART is the DIN-RAIL embedded solution with RISC architecture. It enables a running PLC program, motion control, HMI and remote connection software platforms. The C6 SMART is the DIN-RAIL embedded that integrates the above mention functionality in one single product.

Based on ARM Cortex A9 processor and Microsoft Windows Embedded Compact 7 (C7P) operating system, C6 SMART is available in BASIC, PRO or ADVANCED version according to PLC and Motion functionality. For the HMI runtime, the BASIC and ADVANCED feature are supported. For the Remote maintenance, the function PRO is available.

### 2.1 Key features

Key features	C6 SMART Dual Core
O.S. Microsoft Windows Embedded Compact 7 (C7P) installed on eMMC memory.	X
KEB Real Time Extension (RTE)	X
KEB COMBIVIS studio HMI Runtime	X
KEB COMBIVIS connect Runtime	X
CPU ARM CORTEX A9 architecture	X
Multiple mass storage support:	X
• Serial NOR: Operating system Pre-Load	
• eMMC: fast access memory used for:	
• OS Image	
• Windows Registry	
• RTE	
• HMI Runtime	
• Connect Runtime	
• Repository Factory Default	
• Serial MRAM	
• Persistent Data	
• Micro SD HC (No external access):	
• DB files	
• Application files	
• PLC / Motion	
• HMI	
Frontal IP 20	X
Micro UPS	X
<i>Table 1: Dual Core / special features</i>	

## 2.2 Front view



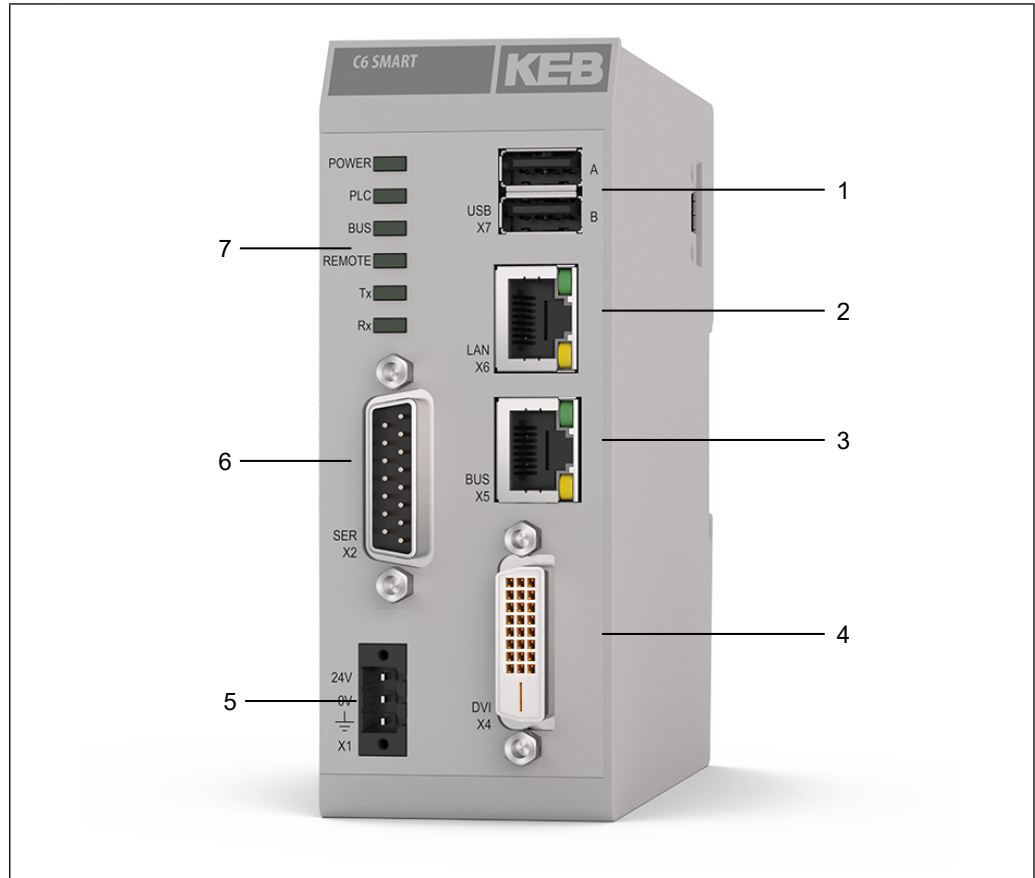
1	X7: 2 x USB 2.0
2	X6 LAN: 10/100/1000Mbps Ethernet; RJ45 socket with signal LEDs (link/speed).
3	X5 BUS: 1 x 10/100Mbps Ethernet; socket RJ45. Port is used as EtherCAT master.
4	X4 DVI-D interface: The DVI-D is used to connect a monitor.
5	X1 voltage supply via a separate power supply unit for 18-30V (protected against polarity reversal / 500V test voltage); Micro UPS with ultra capacitors.
6	Diagnosis
<i>Figure 1: Front view without options</i>	

2.2.1 C6 SMART with CAN option



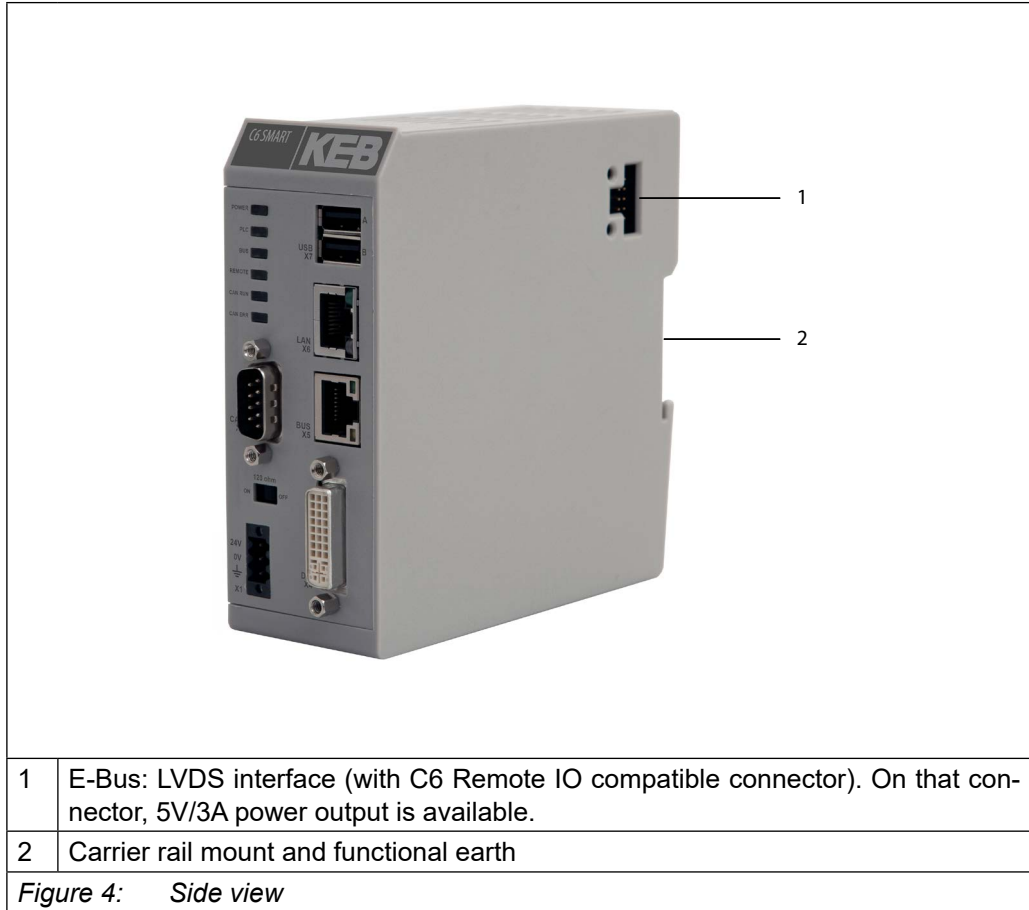
1	X7: 2 x USB 2.0
2	X6 LAN: 10/100/1000Mbps Ethernet; RJ45 socket with signal LEDs (link/speed).
3	X5 BUS: 1 x 10/100Mbps Ethernet; socket RJ45. Port is used as EtherCAT master.
4	X4 DVI-D interface: The DVI-D is used to connect a monitor.
5	X1 voltage supply via a separate power supply unit for 18-30V (protected against polarity reversal / 500V test voltage); Micro UPS with ultra capacitors.
6	Diagnosis
7	X2 CAN 2.0B: The CAN bus can be used both as master and slave; Externally accessible switch for termination setting is provided.
<i>Figure 2: Front view with CAN option</i>	

2.2.2 C6 SMART with MULTI SERIAL option

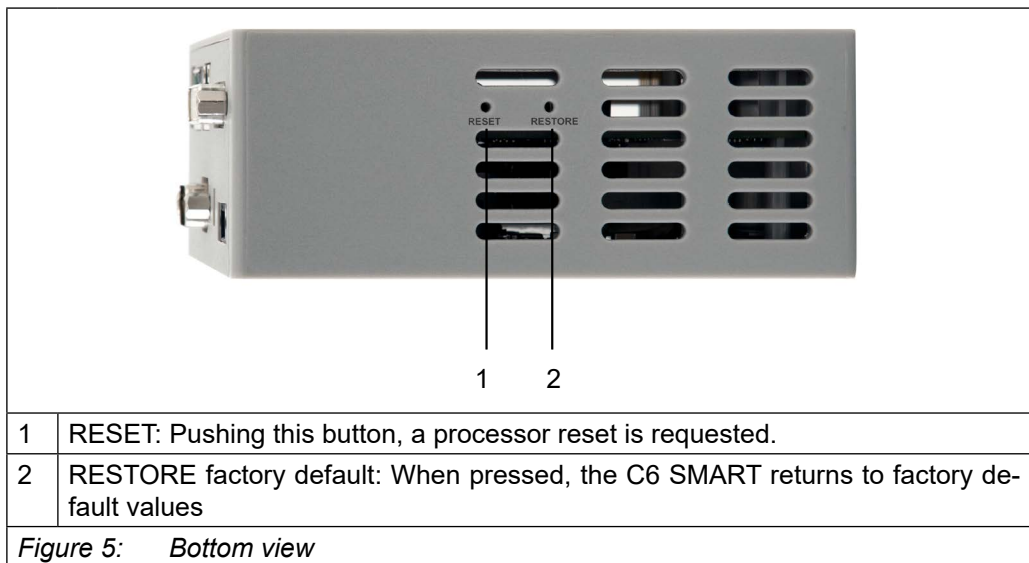


1	X7: 2 x USB 2.0
2	X6 LAN: 10/100/1000Mbps Ethernet; RJ45 socket with signal LEDs (link/speed).
3	X5 BUS: 1 x 10/100Mbps Ethernet; socket RJ45. Port is used as EtherCAT master.
4	X4 DVI-D interface: The DVI-D is used to connect a monitor.
5	X1 voltage supply via a separate power supply unit for 18-30V (protected against polarity reversal / 500V test voltage); Micro UPS with ultra capacitors.
6	X2 MULTI SERIAL: Multi-standard serial port see an isolated RS232 and isolated RS485 2-Wires and 4-Wires.
7	Diagnosis
<i>Figure 3: Front view with Multi Serial Option</i>	

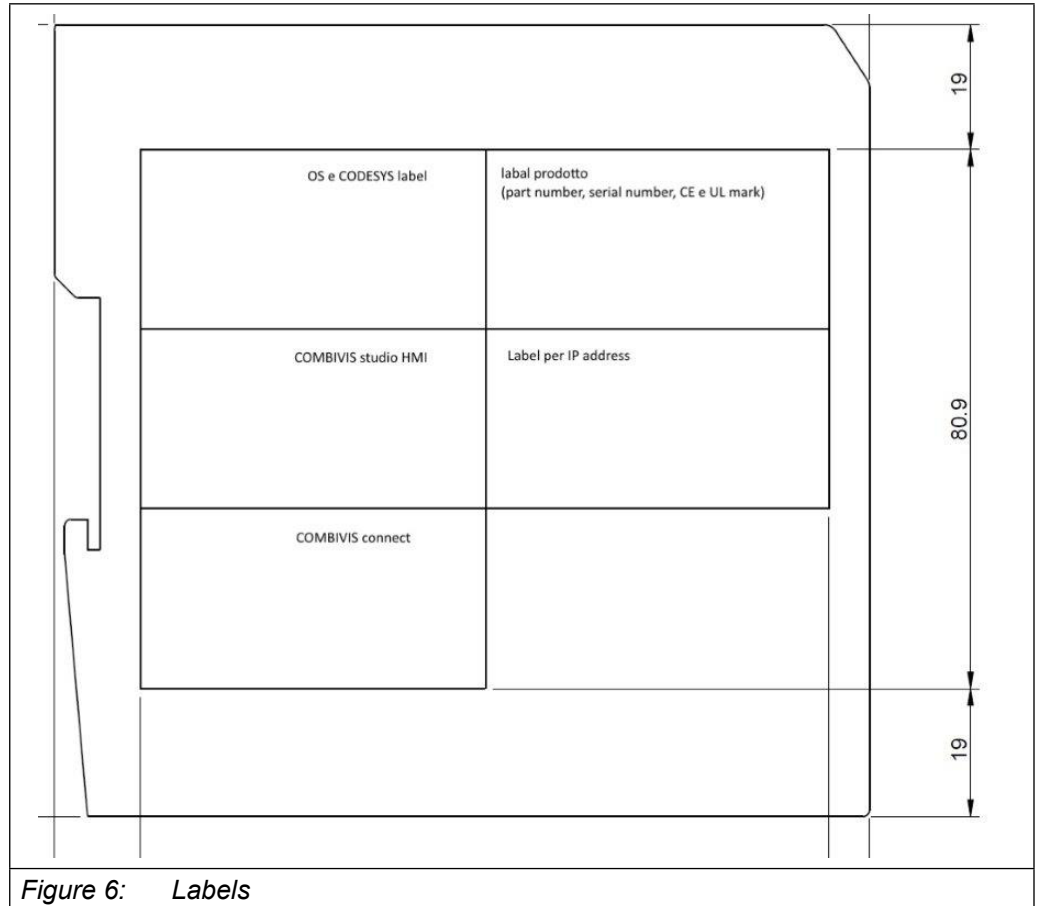
### 2.3 Side view



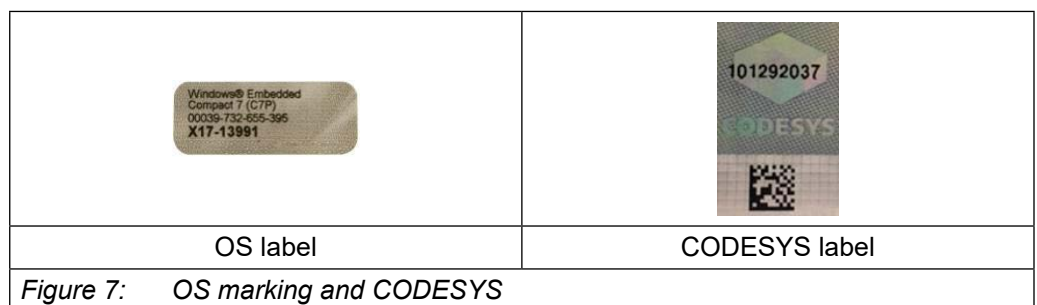
### 2.4 Bottom view



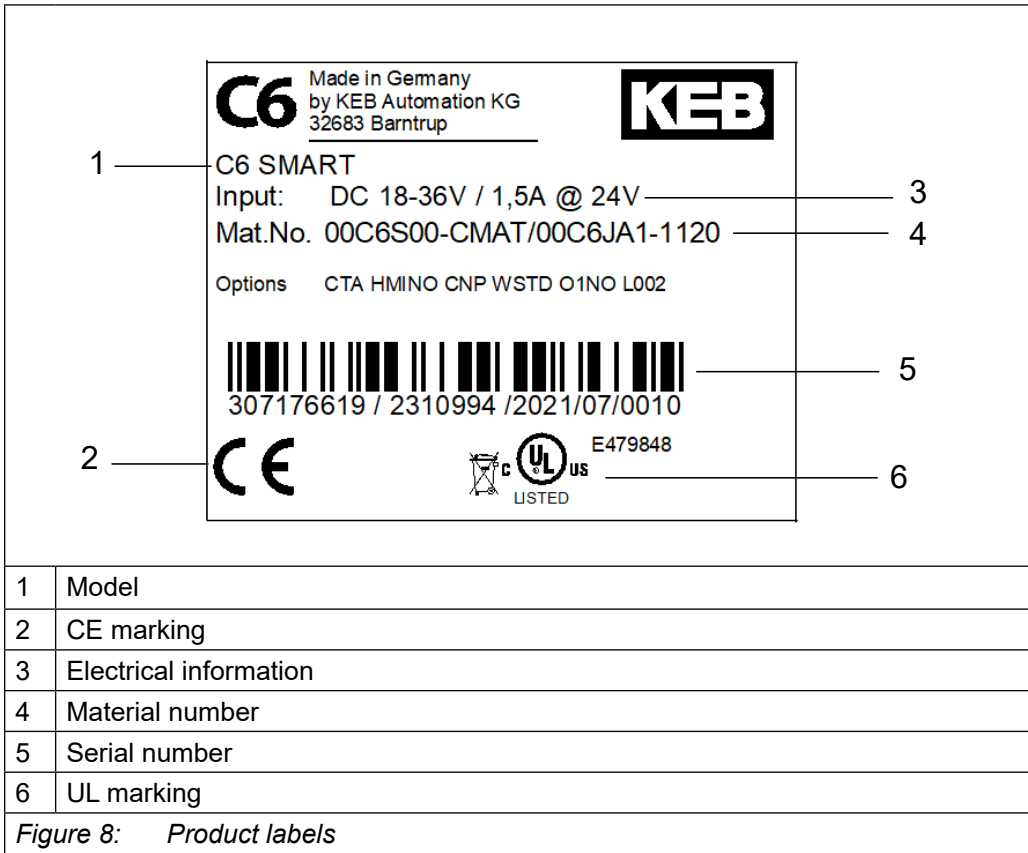
## 2.5 Labels



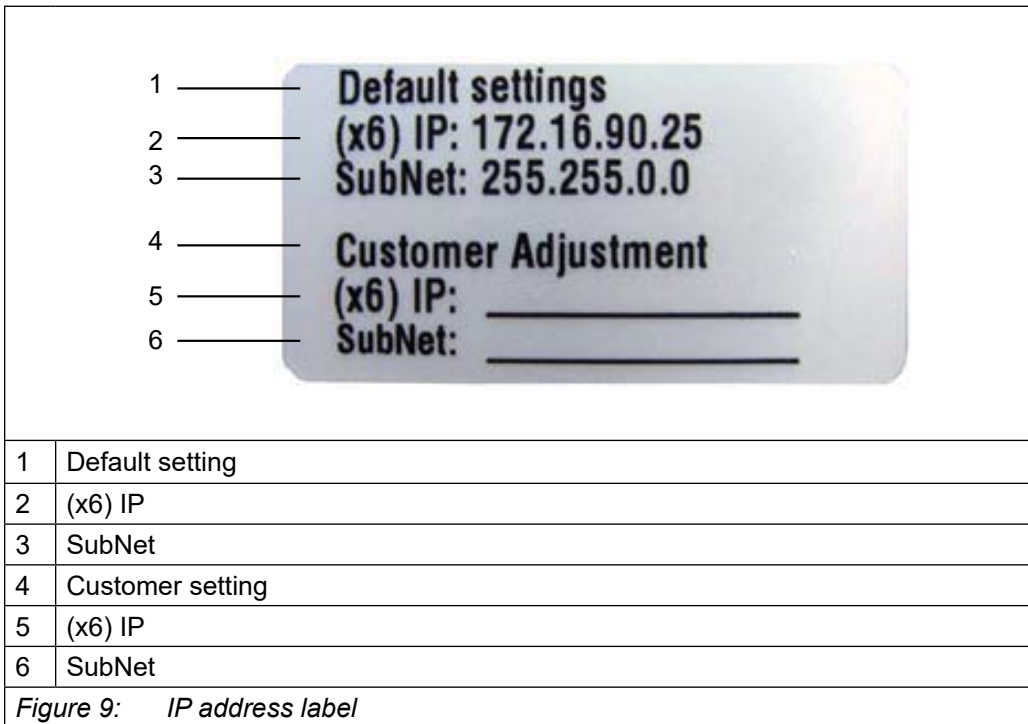
### 2.5.1 Operating System (OS) and CODESYS label



2.5.2 Product labels

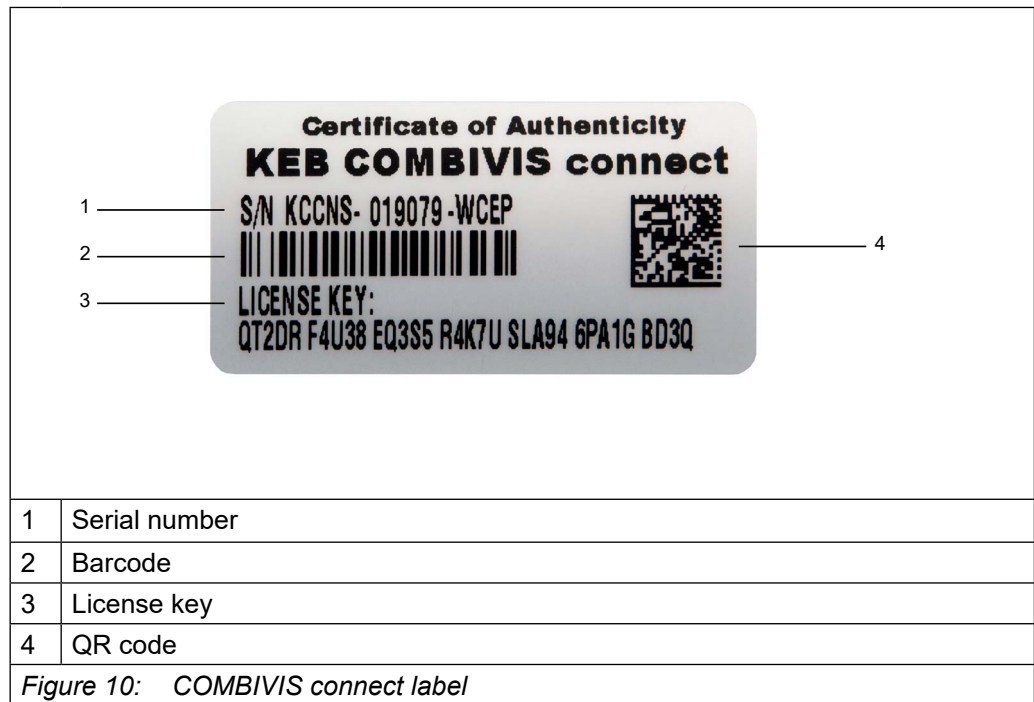


2.5.3 IP address label





2.5.4 COMBIVIS connect label



2.5.5 COMBIVIS studio HMI label



## 2.6 C6 SMART in operation

C6 SMART is a multi-purpose CPU, which can be used for control and human machine interface applications (latter on Quad Core only). The computer can be maintained remotely via COMBIVIS connect.

C6 SMART can be equipped with various IOs direct connected on the right side of the CPU. For both, PLC and HMI applications, the following actions are expected:

- Configuration and creation of the C6 SMART
- Process management

### 2.6.1 Configuration and project creation

During the configuration phase, the user creates the control project using COMBIVIS studio 6 (or the interfaces for operation and monitoring of the technical process by using COMBIVIS studio HMI). In both cases, a PC where software licenses are installed is necessary. Then the following actions can be done:

- Creating the project.
- Saving the project.
- Testing the project.
- Simulating the project.

After compiling the configuration, you load the project into the C6 SMART device.

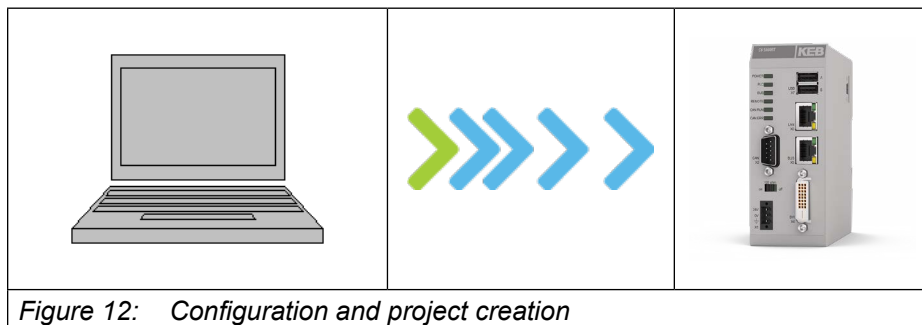


Figure 12: Configuration and project creation

### 2.6.2 Process management

Process management is a two-way communication between C6 SMART device and Panel PC, Embedded HMI (connected via Ethernet port) or Monitors (connected via DVI\_E).

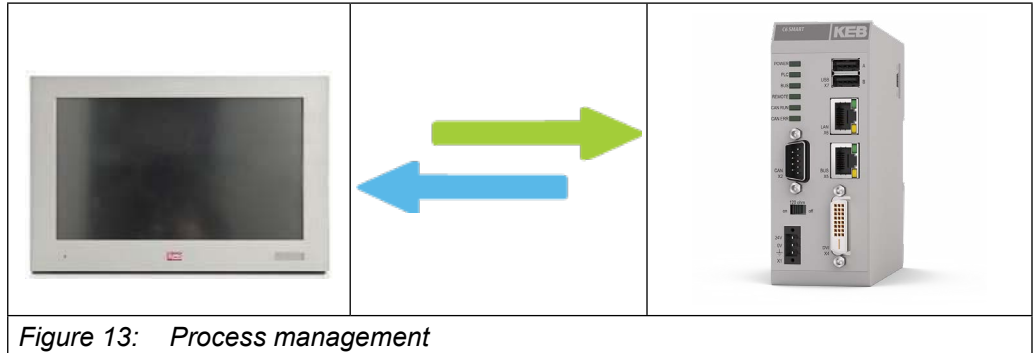


Figure 13: Process management

## 2.7 Software options

KEB wants to provide to its customers the latest technology in term of hardware and software functionality. For this reason, the products are constantly updated in both directions.

Because of this, we can summarize the macro functionality per type of application:

PLC – motion controller:

- Multitasking controller with IEC61131-3 programming language
- Motion control functions based on PLCOpen MC (for PRO and ADVANCED version)
- Real-time communication for EtherCAT and CAN (Motion path)
- Wide range of fieldbus (directly on CPU or via expansion modules)
- Read / write file function
- Socket handling

Human machine interface (HMI):

- Vectorial graphic editor
- Wide range of file support (BMP, GIF, JPG, WMF...)
- Multilanguage (dynamic with unicode)
- Symbol management
- Alarm management
- Recipes
- Trend
- Audit, user management (CFR 21)
- Real-time database handling
- OPC protocol support
- Third parties drivers (2 or 4 in parallel)
- VBA script
- Web server
- Cross reference and debug

Remote connection with COMBIVIS Connect Runtime

- Access to the device via standard Ethernet port (X6).
- VPN
- File transfer
- Remote desktop

## 3 Installation and Connection

### 3.1 Selecting the mounting location

#### 3.1.1 Select the mounting location

- Avoid direct sunlight exposure.
- Make sure that the device is ergonomically accessible to the operator. Select a suitable installation height.
- Ventilation openings must not be covered.

### 3.2 Checking the package contents

- Check the package content for visible signs of transport damage and for completeness.
- In the case of damaged parts, contact your KEB representative. Do not install parts that were damaged during the shipment.

### 3.3 Checking the operating conditions

- Read carefully the standards, approvals, EMC parameters and technical specifications for operation of the device. This information is available in the following sections:
  - a) Certificates and approvals.
  - b) Electromagnetic compatibility .
- Check the mechanical and climatic ambient conditions for operation of the device.
- Follow the instructions for local use of the device.
- Adhere to the permissible rated voltage and the associated tolerance range.

### 3.4 Mounting position

The C6 SMART is suitable for installation in:

- Mounting cabinets
- Control cabinets
- Switchboards
- Consoles

The housing mount consists of an aluminum profile with an integral snap-on device used to snap the module to a 35mm DIN mounting rail.

### 3.5 Damage due to overheating

- The operating temperature must be between 0°C and +50°C.
- Provide space around the system for air recirculation and heat exchange.
- Mounting angle:
  - a) The system is intended to be mounted vertically.
  - b) For other installation modes contact KEB.



For installation in control cabinets and, in particular, in closed containers, make sure the recommended ambient temperature is maintained.

### 3.6 Mounting the device

#### 3.6.1 DIN-rail mounting (snap in)

- Push the C6 SMART against the mounting rail from below, allowing the metal spring to snap in between mounting rail and mounting areas as illustrated.

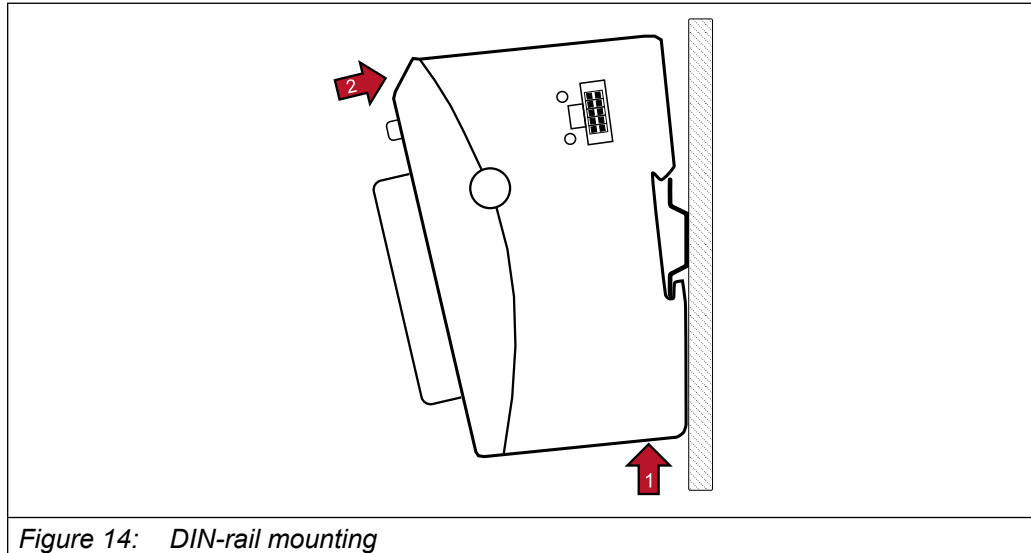


Figure 14: DIN-rail mounting

Push the module against the mounting wall until it snaps in.

### 3.6.2 To connect C6 SMART with IO modules

- After you have snapped the first module (Controller) on the mounting rail, snap the second module to the right in about 1cm distance to the first module on the mounting rail.
- Push the second module along the mounting rail towards the first module until you hear the locking device snap in.

### 3.6.3 Disconnecting two modules

- Push down the unlock button of the module that you wish to disconnect from the module to the left of it.
- Push both modules away from one another until they are about 1 cm apart.

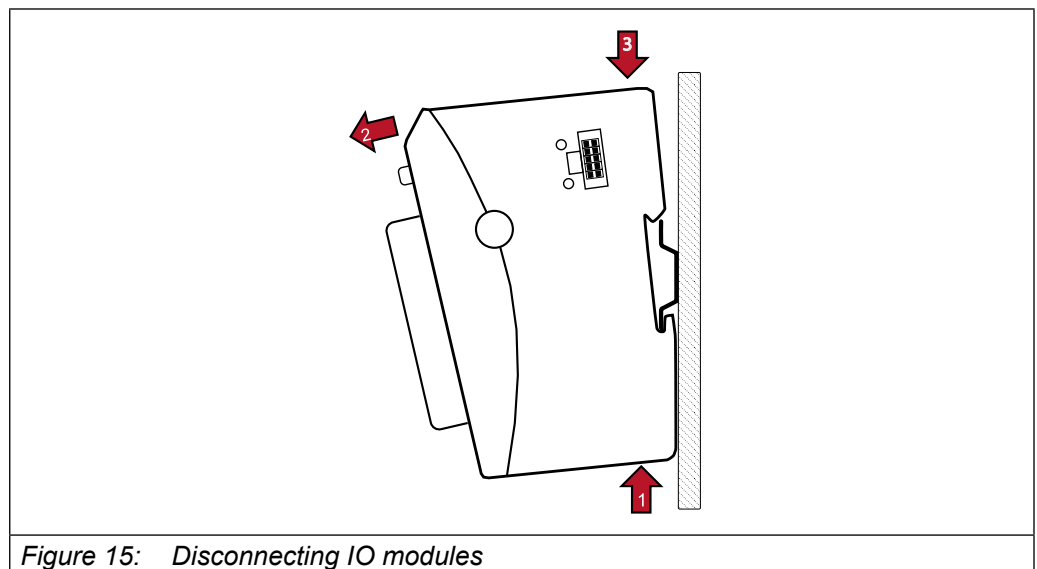


Figure 15: Disconnecting IO modules

### 3.6.4 Removing a single module

- Push the module up and against the metal spring located on the under-side of the rail guide, allowing the metal spring to snap in between mounting rail and mounting areas as illustrated.
- Tip the module away from the mounting rail as shown in the illustration. Pull the module down and out of the mounting rail.

### 3.7 Connecting the device

#### 3.7.1 Notes on connection

- C6 SMART must be installed in accordance with the indications contained in this operating instruction.
- These devices are intended to be connected to a “Secondary Circuit Overvoltage Category II”.

#### 3.7.2 Grounding and bonding

- Whenever two equipment connected to each other with wiring cables and the distance between them becomes “considerable”, it could be possible that both pieces have different potential, generating current flow. Especially low voltage signals must be treated with shielded cables where a 360° connection should drain the current flow to ground. To achieve this goal the following methods can be used:
  1. Use an equipotential bonding cable (16mm<sup>2</sup>, suitable for at least 75C°) to connect the ground of the devices to the ground of the C6 SMART.
  2. Connect the cable shield to the equipotential bonding rail on both sides before connecting the cable to the interfaces.

#### 3.7.3 Power supply connection

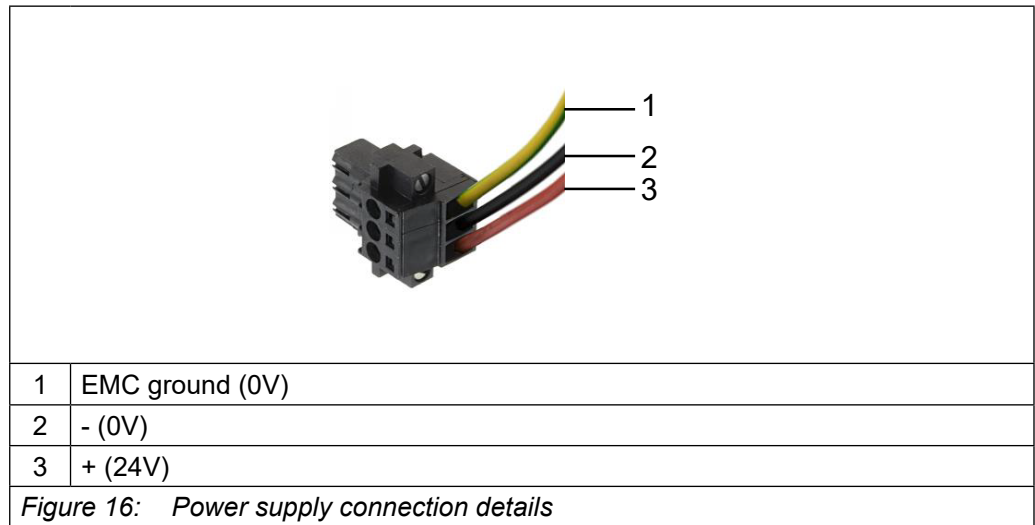
The device may only be connected to a 24V (maximum permissible operating voltage range 18V to 32V) power supply which satisfies the requirements of safe extra low voltage (SELV) in accordance with IEC/EN/DIN EN/UL60950-1.

The power supply has to fulfil the requirements NEC Class2 or LPS in accordance with IEC/EN/DIN EN/UL60950-1

Connect the device with a cable cross-section of 0.75 – 1.5 mm<sup>2</sup> (AWG18 to AWG16 suitable at least 75C°).

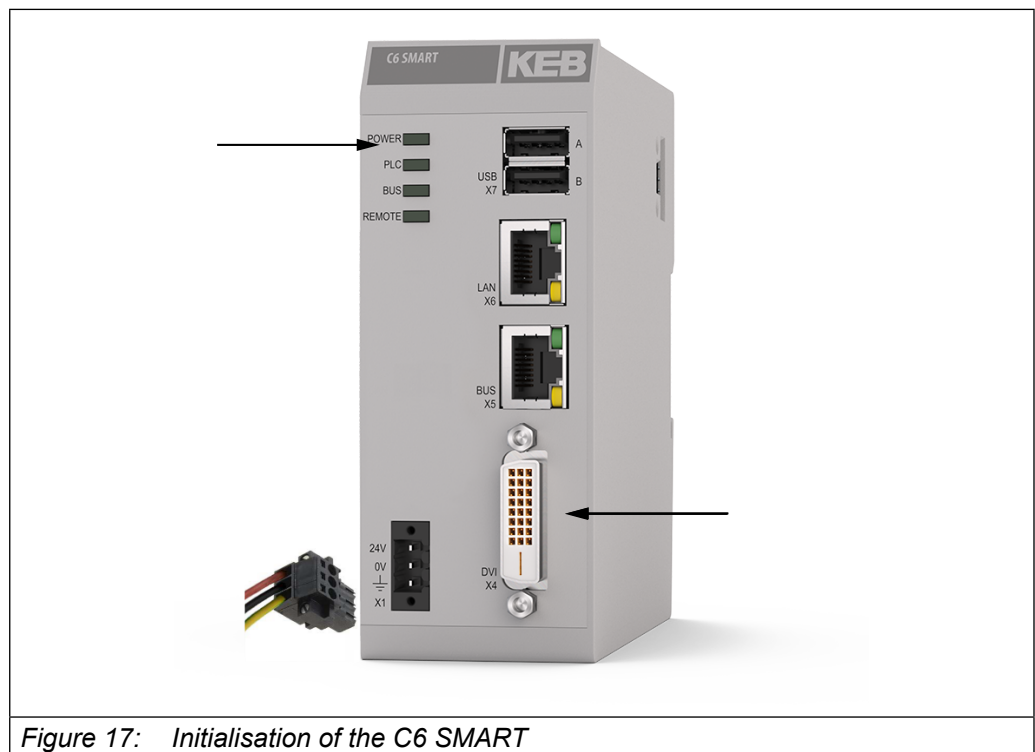
- Remove the three poles connector from the system.
- Connect the positive pole, the negative and the ground one (also refer to the label on the back of the system) to the respective terminals of the three pole connector.





### 3.7.4 Switching on and testing C6 SMART

- Connect the power supply cable to C6 SMART.
- Switch on the power supply.
- The “Power” LED will light.



If any cable is connected to the DVI port, the display will switch on accordingly, and after few seconds the operating system desktop will appear.

### 3.8 Connecting user computer to C6 SMART

You can connect the software tools to C6 SMART using an Ethernet cable connected to Ethernet port (X6).

Please note that the C6 SMART is equipped with a static IP address.

In case the user likes to change the IP address (for example to 172.17.17.182) or activate the DHCP, you can follow the procedure which is described below:

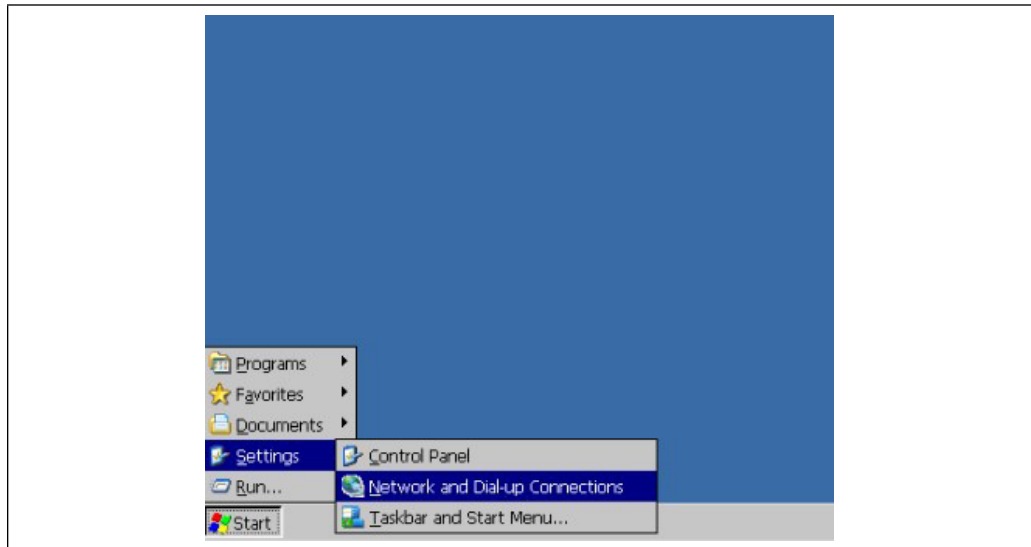


Figure 18: Start network and dial-up connections

- LAN (X6) is the only configurable port. BUS (X5) is reserved for EtherCAT communication and cannot be configured.
- Double click on the available connection icon.
- If you want to assign a static IP address choose “Specify an IP address” and write the IP Address, Subnet Mask and Default Gateway.

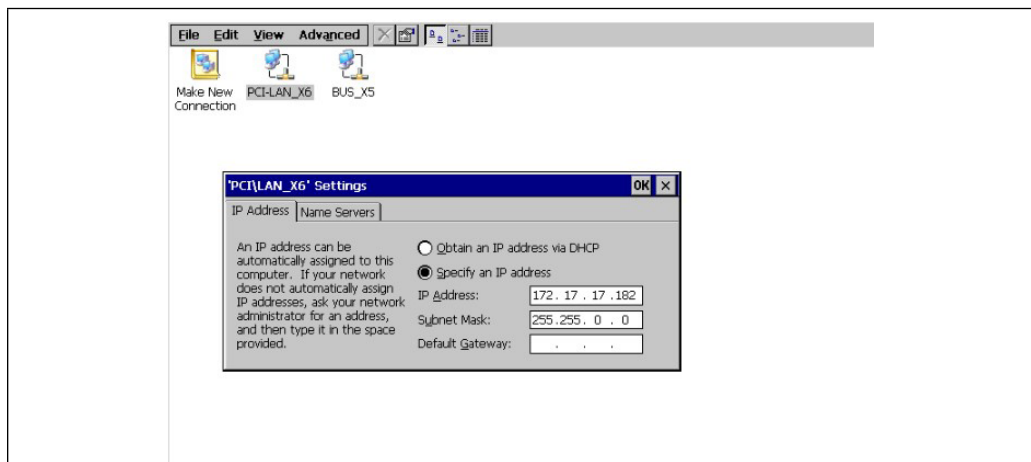


Figure 19: Definition of the IP address

- If you want to get an IP address from a DHCP server choose “Obtain an IP address via DHCP” instead.
- Click on “OK” to adopt the settings and close the dialog.
- Click on the “Start” button and select “Settings” -> “Control Panel”.

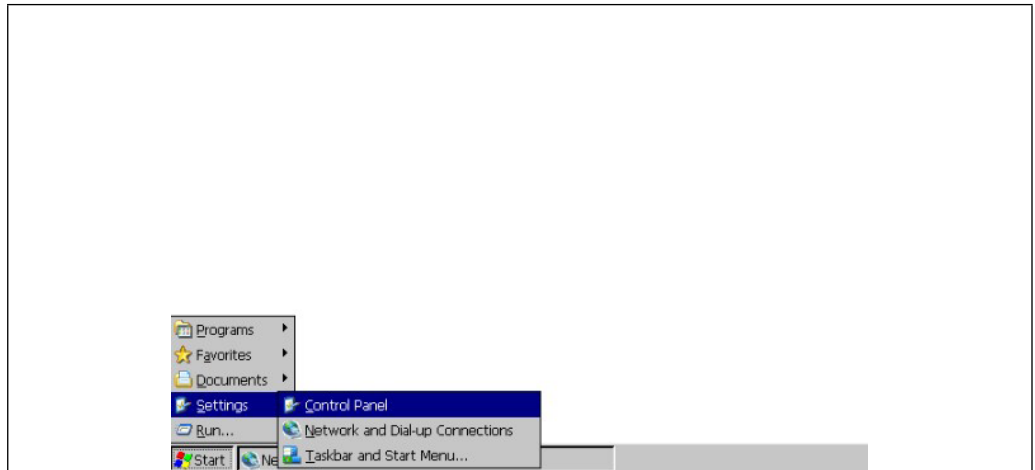


Figure 20: Opening Control Panel

- Then double click on “Registry Saver”

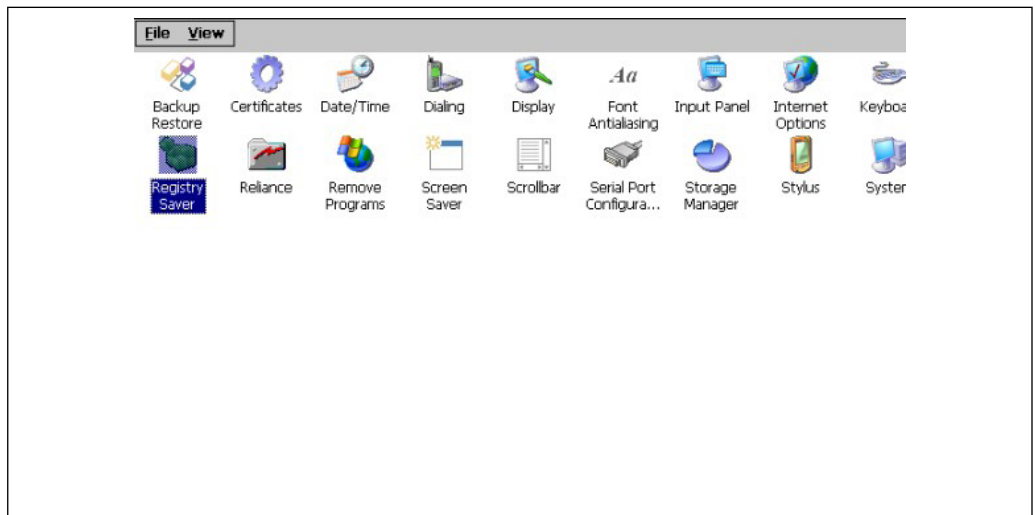


Figure 21: Starting Registry Saver

- Click on the “Save” button and confirm clicking on “Ok”. This operation will save your setting in a permanent way.

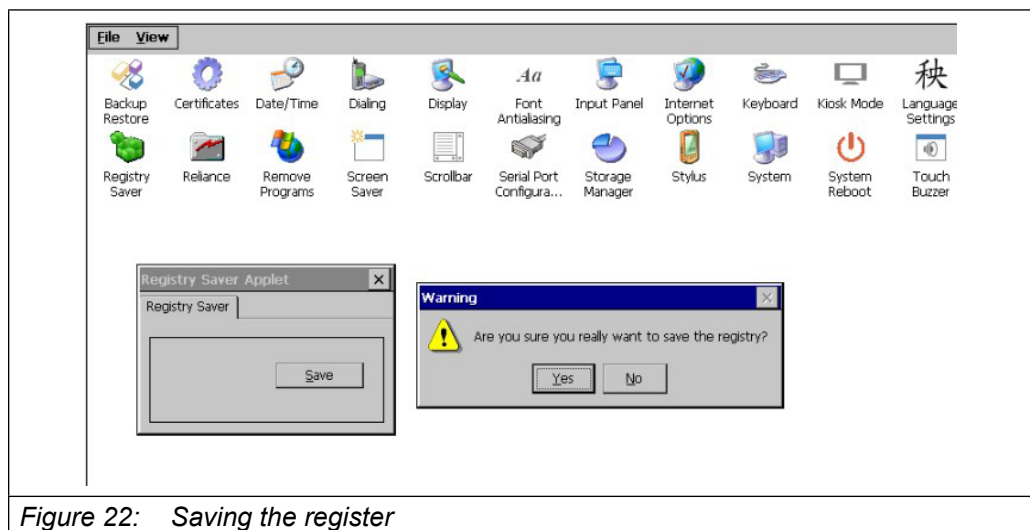


Figure 22: Saving the register

### 3.9 Activation of the touch driver

To activate the touch driver, the corresponding \*.bat file must be executed.

Tools\ mmcmemory tools\  
 ActivateEgalaxCapacitiveTouch.bat  
 ActivateEgalaxCapacitiveTouch180.bat  
 ActivateEgalaxResistiveTouch.bat

After that it is absolutely necessary to perform a "Registry-Save".The driver calibration can be carried out via Windows\eGalaxTouch.exe.

## 4 Commissioning of the device

### 4.1 Mass storage

C6 SMART comes as standard with several memories: the experience in industrial automation environments and application impose, on our development, a separation between system and application mass storage.

The following table wants to show the components available for both Controller type (Dual and Quad core).

The purpose of the eMMC memory is to store the operating system and all the system requirements.

The internal micro SD Card is used to store application data. You can read and write to the read and write to the micro SD card at any time. In case of voltage drop, C6 SMART has two levels of data writing protection:

- Micro UPS which triggers the event, stops the PLC and writes the Persistent variables into MRAM (max. 128KB in approx. 50ms).
- Special file system "Reliance Nitro", which has a special technology to protect the data from damage, even during voltage drops.

<b>C6 SMART Memory topology</b>	
<b>SPI NOR</b>	<b>eMMC</b>
1 MB	4 GB
Uboot	Files system Reliance Nitro
Pre-Load OS	OS Image
	Windows register
	Control RTE
	HMI Runtime (only Quad-Core)
	Connect Runtime
	Source for factory setting
<i>Table 2: Memory topology</i>	

<b>SPI MRAM</b>	<b>Micro SD</b>
512 kB	8 GB
Persistent data (128 kB)	Files system Reliance Nitro
	DB files
	Control application
	HMI application
<i>Table 3: Memory topology</i>	

## 4.2 Signaling and diagnostic LEDs

The following table describes all the LEDs meaning and behaviors.

Name	Description	
Operation	Display	
	• Green, on	C6 SMART and C6 Remote IO module is ready for operation.
	• Red, on	The C6 SMART is not ready for operation. Typically, that is a temporary status, when C6 SMART power-up procedure is running (typical duration 100ms).
	• Red BLINK	The C6 SMART is ready for operation. C6 Remote IO module is not ready for operation (e.g. too low, because too much current is drained).
	• Yellow, on	the ultra-capacitors of the micro-UPS are not charged.
PLC status	Run/Stop display	
	• Green, on	PLC Run
	• Red, on	PLC Stop / Breakpoint
	• Red BLINK	PLC stop due to persistent data corruption.
	• Yellow, on (all LEDs on)	PLC Stopped for Runtime exception.
	• OFF	CONTROL Runtime not running.
Bus status	Indicates the status of the fieldbus	
	• Green, on	Bus OK
	• Red, on	Bus Fail.
Remote status	This LED is activated according to COMBIVIS Connect status.	
	• Green, on	Device available on domain.
	• Blue ON	A user is connected via remote access.
Serial status	It indicates the serial communication activity.	
	• Green	RX activated
	• Yellow	TX activated
CAN status	The 2 LEDs indicate the CAN bus status.	
	• Green, on	CAN Run
	• Red, on	CAN Error
Ethernet status	The 2 LEDs are on the RJ45 (10/100/1000 Mbps) connector.	
	• Yellow/Green	Speed
	• Green	Link/Act
EtherCAT status	The 2 LEDs are on the RJ45 (10/100/1000 Mbps) connector.	
	• Yellow	Unused
	• Green	Link/Act

Table 4: LED meaning

### 4.3 Push-buttons

C6 SMART is equipped with two push buttons located on the bottom side of the device. These buttons can be useful for CPU reset or even restore default setup.

The following table provides more details:

Name	Description
RESET	Reset of the control (Restart of the PLC)
RESTORE	<ul style="list-style-type: none"> <li>• Press briefly: PLC switches from start to stop mode or vice versa.</li> <li>• Press 5 sec: PLC reset (to origin).</li> <li>• Keep on pressing this button during power on, the C6 SMART will be reset to factory default values.</li> </ul>

Table 5: Push buttons functions



The push-buttons dimension and position avoid accidental misuse.

#### NOTICE

##### RESET

- ▶ For machines in operation “Reset” will cause unpredictable behavior.

#### NOTICE

##### Restore factory default

- ▶ The content of all storage memories of the device is lost in “Restore factory default”!

# 5 Commissioning a Project

## 5.1 COMBIVIS studio 6 project

### 5.1.1 Project implementation

The CONTROL PLC runs as a thread with “real time” priority.

The execution model is based on the “task” concept; the program execution requires the definition of tasks and the assignment of priority and execution cycle according to the following figure (see below in this manual about how to configure COMBIVIS studio 6 for use with C6 SMART system).

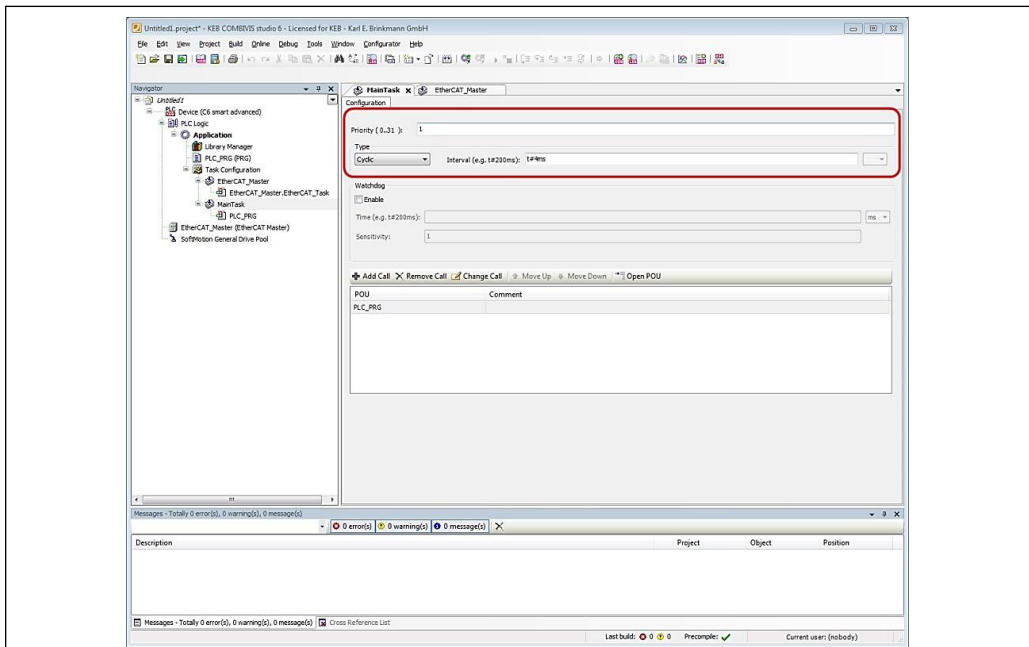


Figure 23: Task configuration



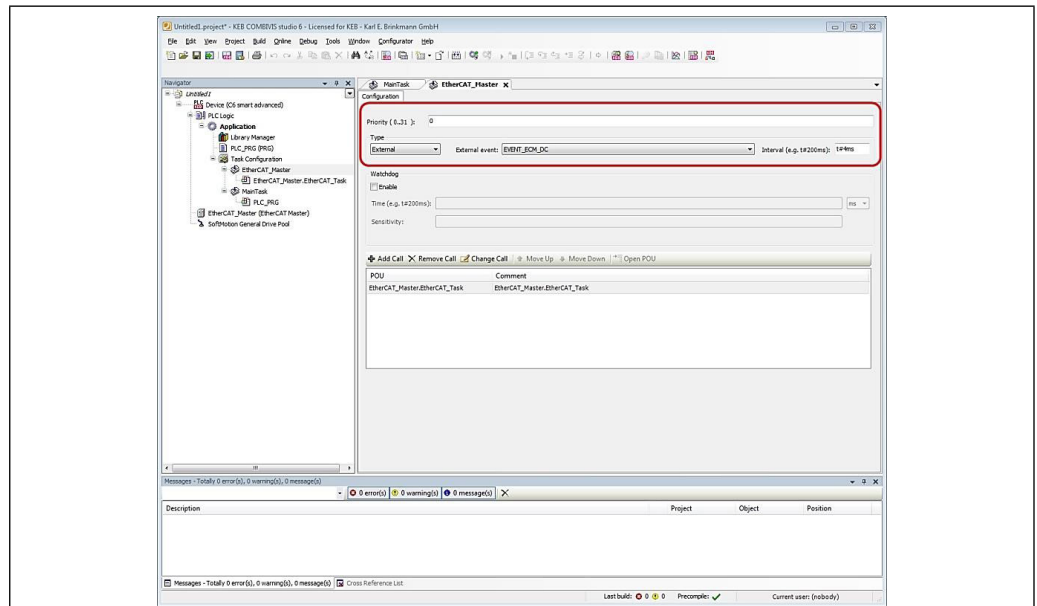


Figure 24: Task configuration for EtherCAT master task

Each task is executed at the specified time interval and according to the assigned priority. Only when all the COMBIVIS studio 6 activities are over, the CPU time goes to the other processes, as they are assigned to an inferior priority.



The task configuration for the EtherCAT master task must be set to type = "External" and External event = "EVENT\_ECM\_DC"!



Each task cycle time must be properly assigned according to the general performances required by the BASIC / PRO / ADVANCED itself, by the HMI runtime, by the COMBIVIS connect runtime and by any other application or process running in the system. A too short task cycle time may introduce an undesired slowdown in the general reaction of the system. If this is the case, the task cycle time should be properly increased until you reach the proper balancing between performances and reactivity of the whole system.



To avoid cycletime overflows the KEB gateway must not run in the EtherCAT task!



Trace is not running properly on EtherCAT external task, if task load is higher than 50%! Then there are gaps in measurement expected!

5.1.2 Transferring the COMBIVIS studio 6 application to the target system

To transfer a valid “COMBIVIS studio 6” application to the target system, follow these steps:

- Ensure the C6 SMART device is connected to the same sub network of the PC where you have running the COMBIVIS studio 6 programming tool (same network mask, e.g. “192.168.1.xx”)
- Double click on the device icon from the COMBIVIS studio 6 project tree; the right part of the workspace will show the “Communication settings” tab contents.
- Select the Gateway and click on the “Scan network” button.
- The box will be populated with the list of available CONTROL runtimes.
- Click on the one you want to connect and click then on the “Set active path” button.
- Click Online\Login to start the communication.

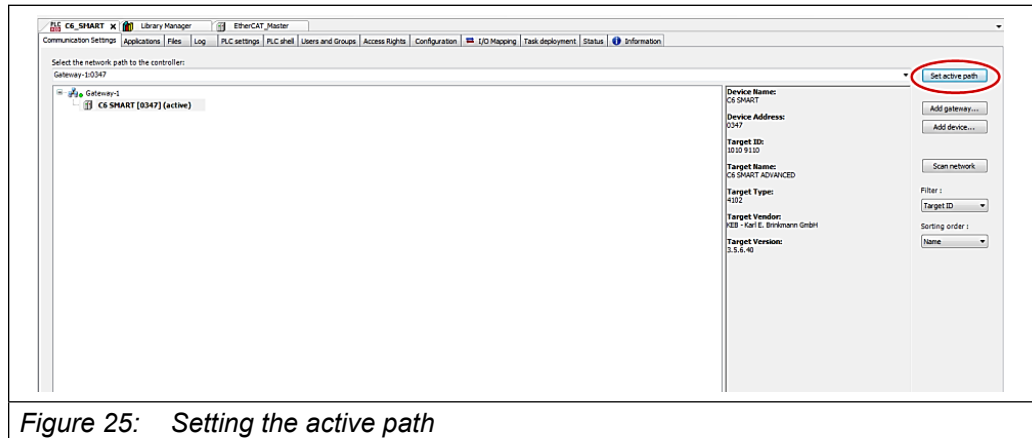


Figure 25: Setting the active path

5.1.3 I/O fieldbus

The COMBIVIS studio 6 implementation for C6 SMART system supports the following I/O fieldbuses:

- EtherCAT with on X5 BUS
- Modbus TCP on X6 LAN
- Modbus RTU (C6 SMART with MULTI SERIAL option)
- CAN (C6 SMART with CAN option)

To insert the I/O master - right click on the C6 SMART device icon on the project tree, select “Add Device” from the “Vendor” list box. The list will be populated with the available master devices. Select the device you need for your application.

C6 SMART systems are featuring two Ethernet interfaces. One of them is exclusively reserved for EtherCAT (X5).

For Modbus TCP I/O fieldbus the “LAN X6” interface has to be used. It is shared for Modbus and Ethernet communication than.



Current implementation if affected by a jitter of about +/- 2 ms when working with I/O over Ethernet interface.

### 5.1.4 Support for retentive data

C6 SMART systems are equipped with a Micro UPS specifically designed to support the data memory retention.

In COMBIVIS studio 6 the retentive variables can retain their value throughout the usual program run period. They are declared as “Retain Variables” or even more stringent as “Persistent Variables”. For each case a separate memory area is used.

Please check the COMBIVIS studio 6 manual for any additional detail about retentive data.

The use of the retentive areas does not require any specific configuration except for declaring the variable in the proper area according to the COMBIVIS studio 6 programming manual.

At the moment of a power failure when the voltage is below the threshold for more than 50ms the UPS triggers an event and the system will follow a four step sequence to save data:

- The panel display and the USB ports are turned off in order to save energy.
- All running IEC tasks are terminated. Thus the retentive areas are consistent.
- The system stores the retentive data in the MRAM of the C6 SMART.
- The PLC control is terminated.

The charging status of the UPS can be checked by means of the UpsInterface object (IoDrvUPS), which is coupled to the target device C6 SMART.

Variable	Mapping	Channel	Address	Type	Current Value	Description
status		Power status	%IW2	Enumeration of int.	Half charge	UPS charging level
		24 Vdc power input status	%IX6.0	Enumeration of bool	0=FF power state	Power Supply status (TRUE = active)
		24 Vdc power fail counter	%IW4	INT	0	Power supply interruptions counter

Figure 26: Support for retentive data

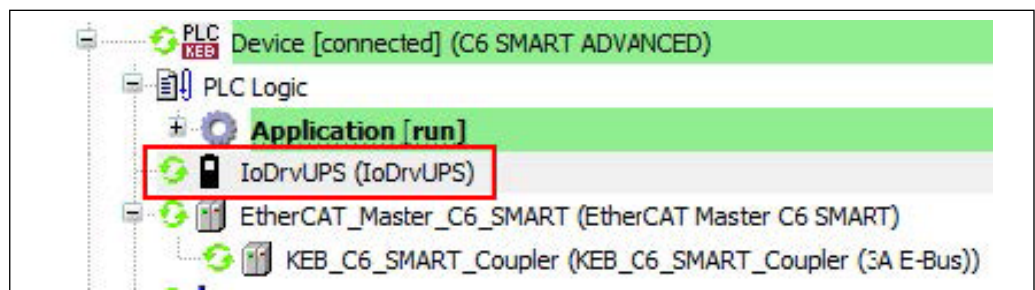


Figure 27: Support for retentive data



To start the backup process, the capacitors must be fully charged (after charging, the Power LED must be switched from yellow to green).



The available retentive memory size is 64kB for the RETAIN memory type and 64kB for the PERSISTENT memory type.



If the power supply returns before the energy inside the Micro UPS is finished, and actually C6 SMART has not been switched off, the following operations are carried on:

- The display is switched on.
- The USB ports are powered.
- CONTROL runtime behavior can be selected in between 3 possible models:
  - a. CONTROL runtime does not start and no message is returned.
  - b. CONTROL runtime does not start and returns a warning message.
  - c. CONTROL runtime restarts normally (default option).

The COMBIVIS STUDIO 6 restart behavior can be configured directly by the user by means of the COMBIVIS STUDIO 6 launcher manager program.

The launcher manager of the CONTROL runtime is an application stored in the "\MMC-Memory\CoDeSys3" folder as shown in the following figure.

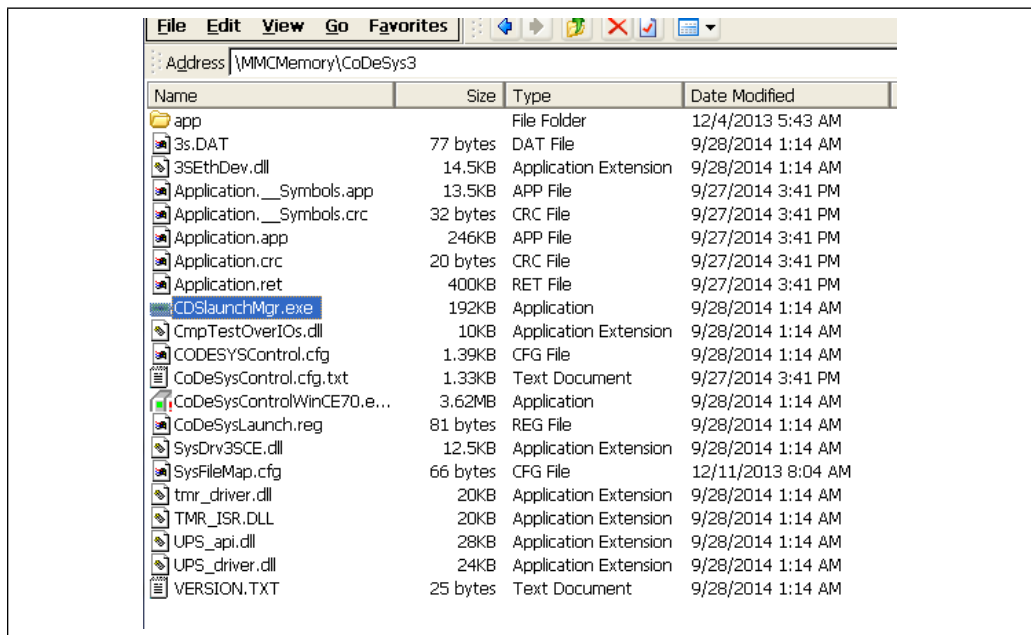


Figure 28: Start CDSlaunchMgr.exe

To start it, double click on the file name.

The launcher manager interface is shown in the following figure.

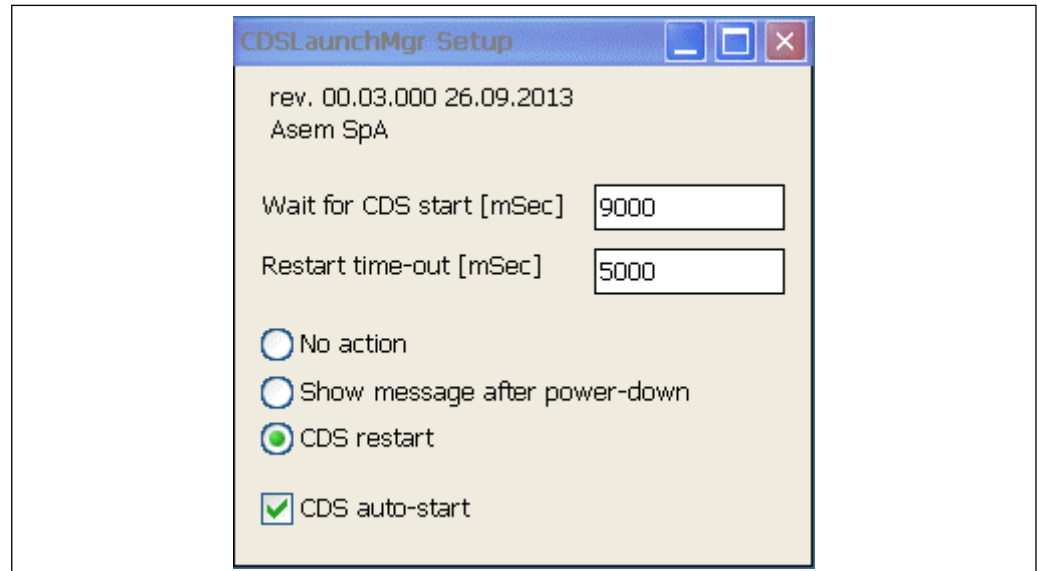


Figure 29: CDS Launch Manager

The parameter "Wait for CDS start" is the time the launcher waits before starting the CONTROL runtime.

"Restart timeout" is the time the launcher waits before restarting CONTROL runtime.

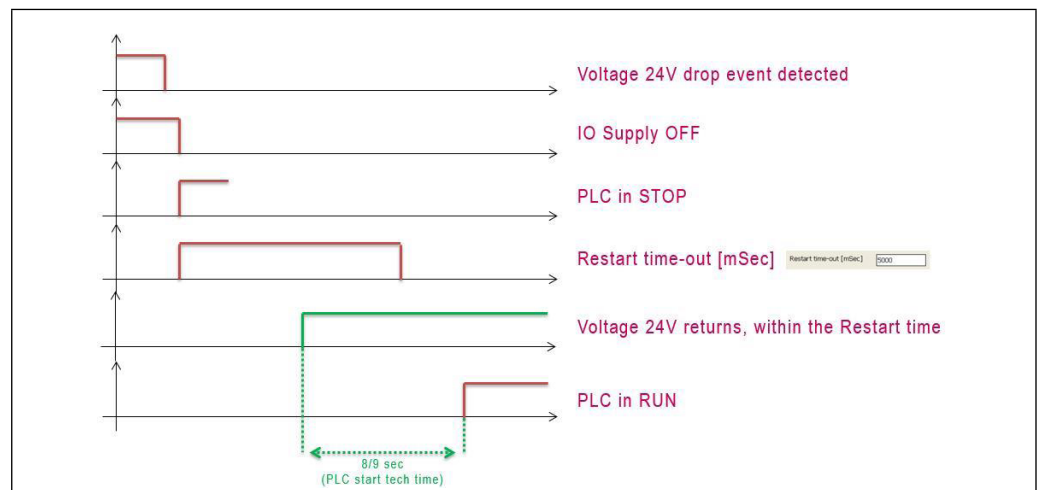
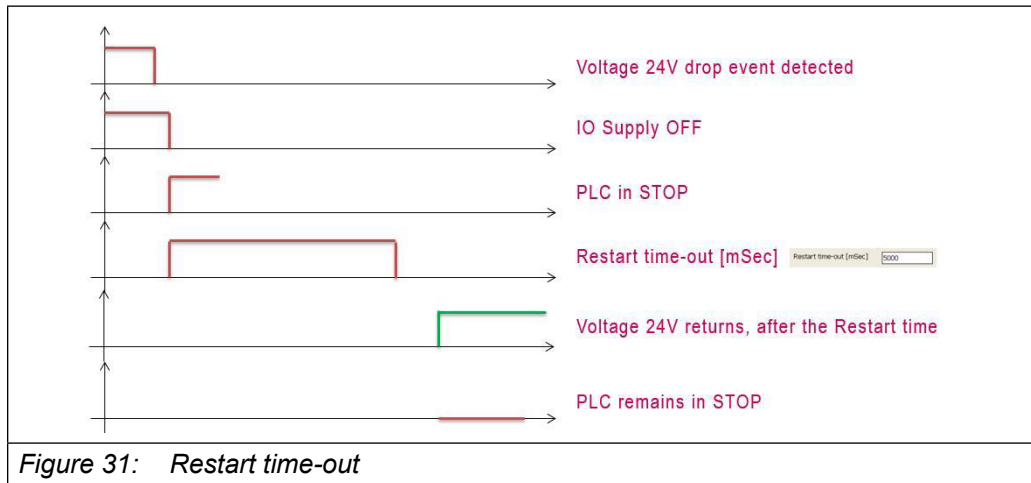


Figure 30: Restart time-out

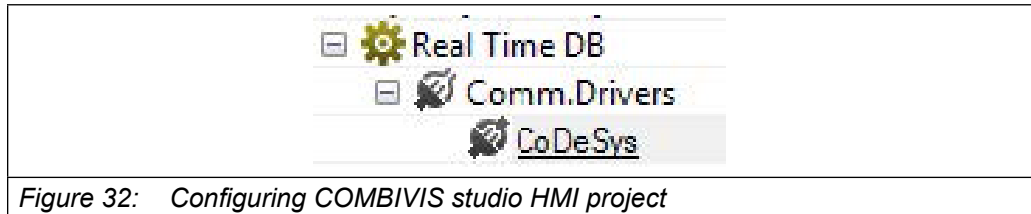


**5.1.5 Use in combination with COMBIVIS HMI Runtime**

COMBIVIS HMI Runtime can be of course configured to communicate with the “COMBIVIS studio 6” application.

The C6 SMART includes the COMBIVIS studio 6 Gateway which is then used as communication interface.

The COMBIVIS studio HMI project must be configured to communicate with a generic CoDeSys controller inserting in the “Real Time DB” resource the driver called “CoDeSys” as shown in the following figure.



The protocol uses a socket to communicate with the CONTROL runtime through the gateway component.

The station must be configured to connect to “localhost”. The device name is the one shown by the programming system COMBIVIS studio 6 when connected online with the C6 SMART device from the “Communication settings” window as shown in the following figure.

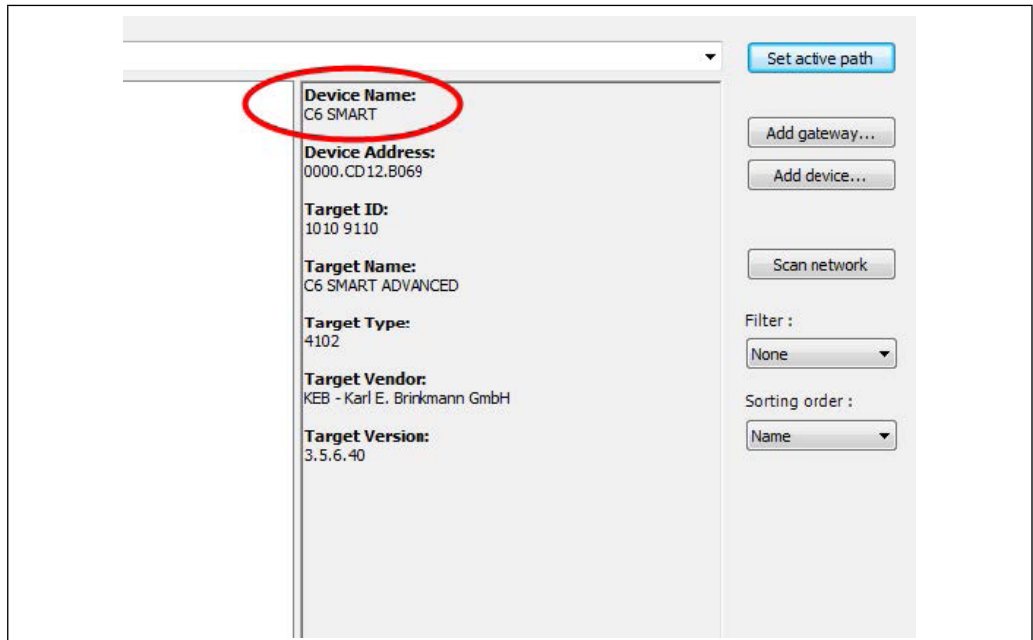


Figure 33: Device Name in COMBIVIS studio 6

The HMI Station properties will result as following.

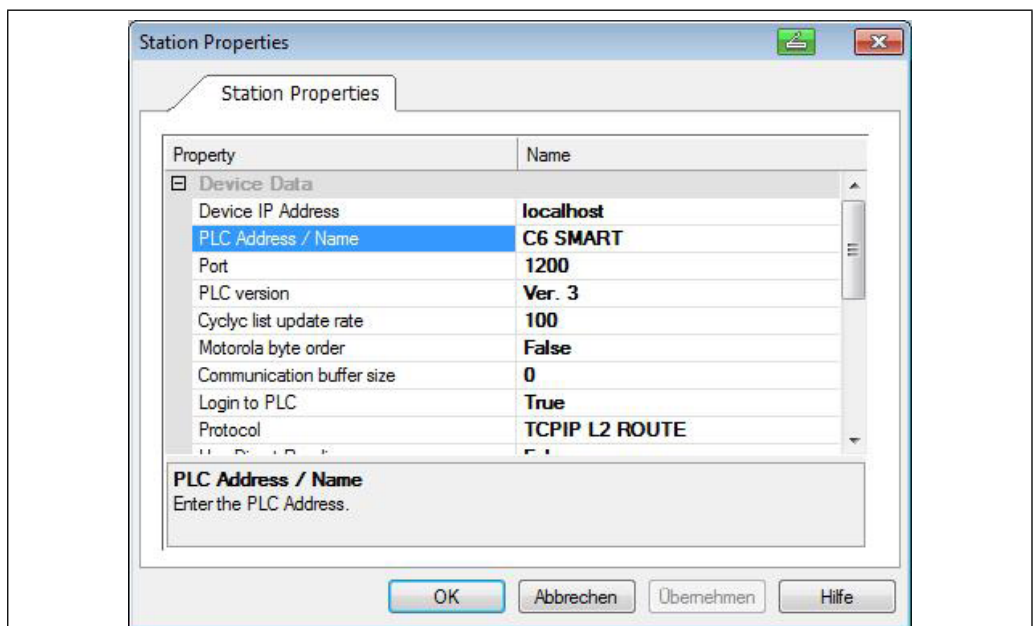


Figure 34: Station properties

The CONTROL Runtime running on a C6 SMART device can be reached also from a panel which has been configured to belong to the same sub network.

When having on the same sub network more than one C6 SMART system, you need to assign different names to them.



---

The COMBIVIS studio HMI project can be configured to communicate with more than one controller; in these cases the system can act as a gateway and transfer data through the different channels. For further information about this feature consult the COMBIVIS studio HMI online manual searching for “Variable Commands” and then “Move Value”.

---

### 5.1.6 Use in combination with COMBIVIS connect

The C6 SMART systems are featuring COMBIVIS connect Runtime as preloaded and pre-configured.

The COMBIVIS connect VPN connection can be naturally used to connect from remote to the CONTROL PLC through the integrated gateway. Once the VPN is activated, just follow the usual steps to get the online connection.

Please see the COMBIVIS connect control center online manual for further information about how to use the COMBIVIS connect software.

### 5.1.7 Limitations and recommendations

In order to get the best balancing between functionalities and performances we strongly suggest to follow some guidelines when designing the applications for COMBIVIS STUDIO 6 and COMBIVIS studio HMI.

- The PLC cycle time must be greater or equal than 1ms.



---

The maximum CPU time usable for the COMBIVIS studio 6 application is fixed from a system parameter; in case the PLC program gets more than 25% of the CPU time, the CONTROL PLC will be stopped. The user shall then properly change the PLC task timing in order to respect the limitation.

---

- The COMBIVIS studio 6 application shall use only one at a time of the two available I/O fieldbuses (EtherCAT and CAN) in synchronous mode.
- The maximum number of bytes exchanged between COMBIVIS studio HMI Runtime and COMBIVIS studio 6 runtime shall not be greater than 1024.
- The sampling time specified for data acquisition shall not be less than 15s.
- The scripting shall be carefully used in order to leave enough time to the other tasks to run without impacting too much with the general reaction of the entire system.
- If the project has been configured to use the Web Client, you should consider that when an external client is connect you may experience a slowdown of the page change performance of the COMBIVIS studio HMI Runtime.
- The “S7-MPI COMx” communication protocol from COMBIVIS studio HMI is not supported.



## 5.2 COMBIVIS studio HMI project

### 5.2.1 Overview

#### Configuration phase

A project includes screen, alarms, variables used to represent the real plant of machine. The configuration phase is the creation of the project according to the user needs and interaction between the humans and the machine.

#### Transferring the project to C6 SMART

You can transfer a project to C6 SMART as follows:

- Transfer from the configuring PC by using an Ethernet connection.
- Copy the project by using a USB key.

#### Process control phase

After the project is transferred, C6 SMART is ready to communicate to one or more PLCs and to visualize the screens according to the configured project.



---

If you need to communicate with a device connected to the serial port you must configure the serial port.

---

#### Commissioning and re-commissioning

When you switch on the first time C6 SMART, there is no project inside. At first you need to transfer a project into C6 SMART.

After you have loaded a project, you can transfer back another project or another version of the same project (without setting to a special operating mode); this is also possible while the project is running on C6 SMART.

### 5.2.2 Transfer

C6 SMART is always ready for accepting the download of a project; even when a project is running. In this way, if C6 SMART is connected by means of Ethernet to the configuration PC, you are able to download a new project or a new version of the same project even without stopping the project.

### 5.2.3 Configuration of the serial port

If your project need to communicate with a device connected to the serial port, you need to configure the serial port according to the type of serial connection you use for your communication. The following types of communications are supported by the serial port of C6 SMART:

- RS 232
- RS 422
- RS 485

C6 SMART comes as default with the serial port set as RS 232. If you want to change the type of serial communication you must do the following:

- Go to "Control Panel"

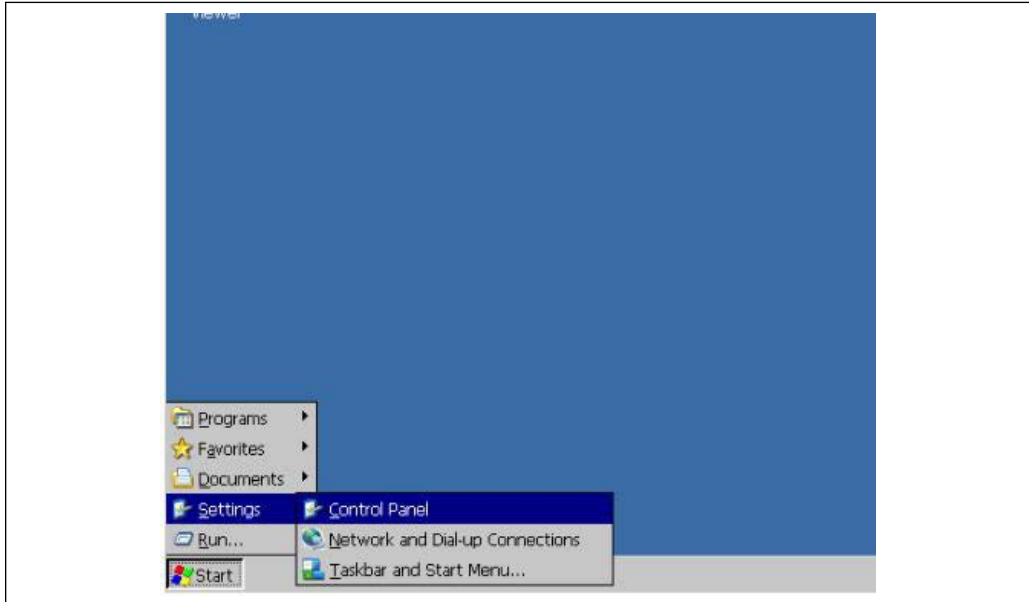


Figure 35: Opening Control Panel

- Double click on "Serial Port Configuration"

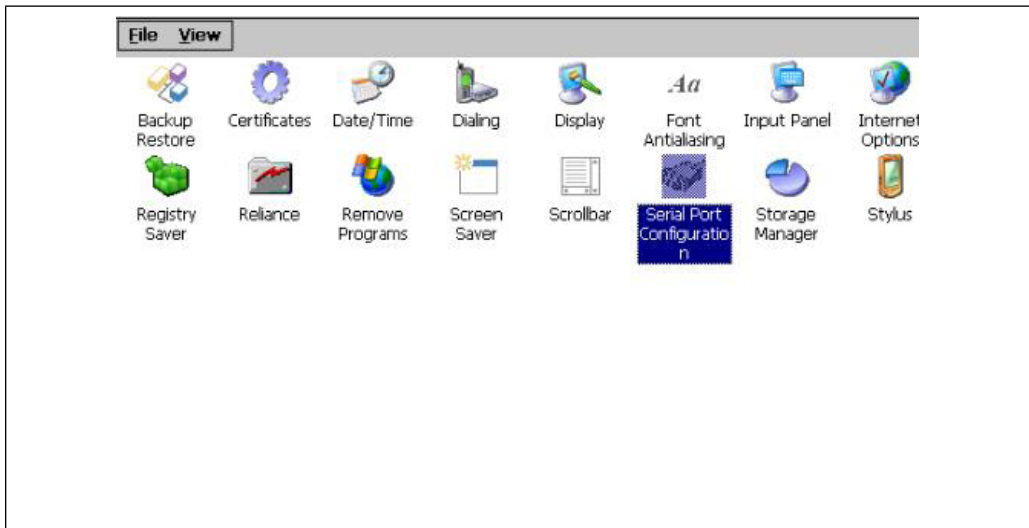


Figure 36: Starting the configuration for the serial port

- Selection of the serial port

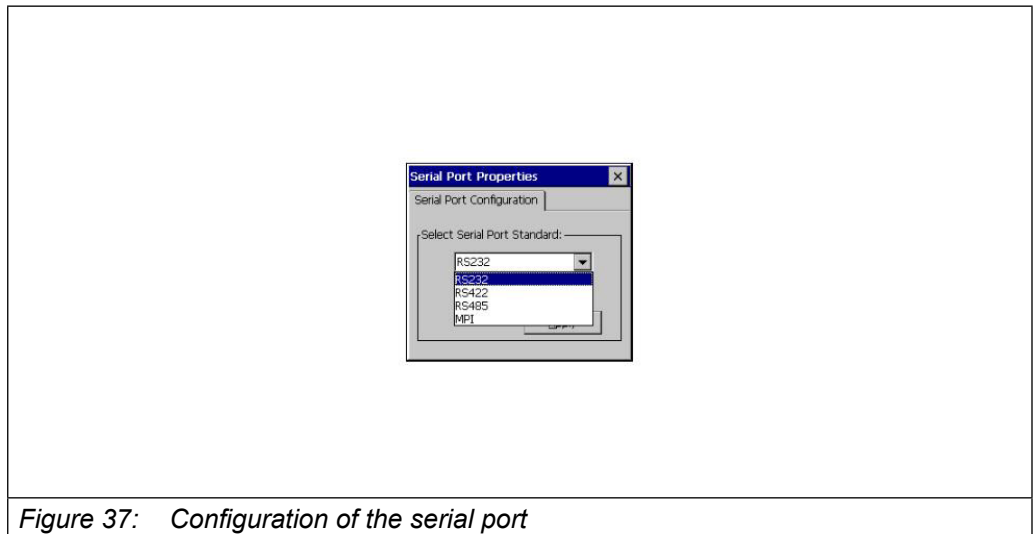


Figure 37: Configuration of the serial port



This applet can be used to check which serial communication mode is active. In this case it is sufficient to click on the red cross in the field on the top right.

And confirm by pressing the “Apply” button. A warning message will rise, advising to store that new configuration is active and saved a permanent way.

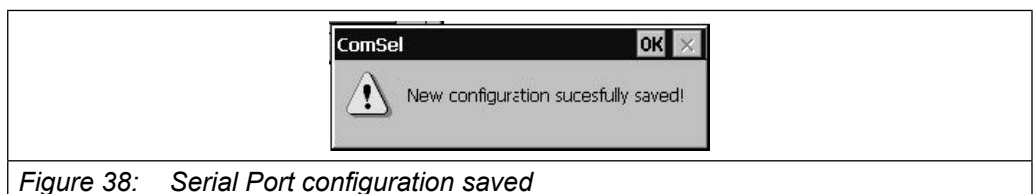


Figure 38: Serial Port configuration saved

Please note that the MPI mode cannot be selected, if this protocol is used by the HMI software, all necessary settings are applied automatically.

#### 5.2.4 Connecting the serial port

A special DB15 connector supports all serial protocols. Therefore it is necessary to adapt the connections to the technical requirements; KEB can supply connector adapters as optional parts but user can adapt DB15 connector by himself.

#### 5.2.5 Managing the project

C6 SMART has powerful tools to manage a running project. With the same mask used to transfer the project (see below) you can also:

- Stop the C6 SMART project from the configuration PC.
- Start the C6 SMART project from the configuration PC.
- Debug the project from the configuration PC.
- Transfer the project from C6 SMART to the configuration PC.

5.2.6 Stopping the running project

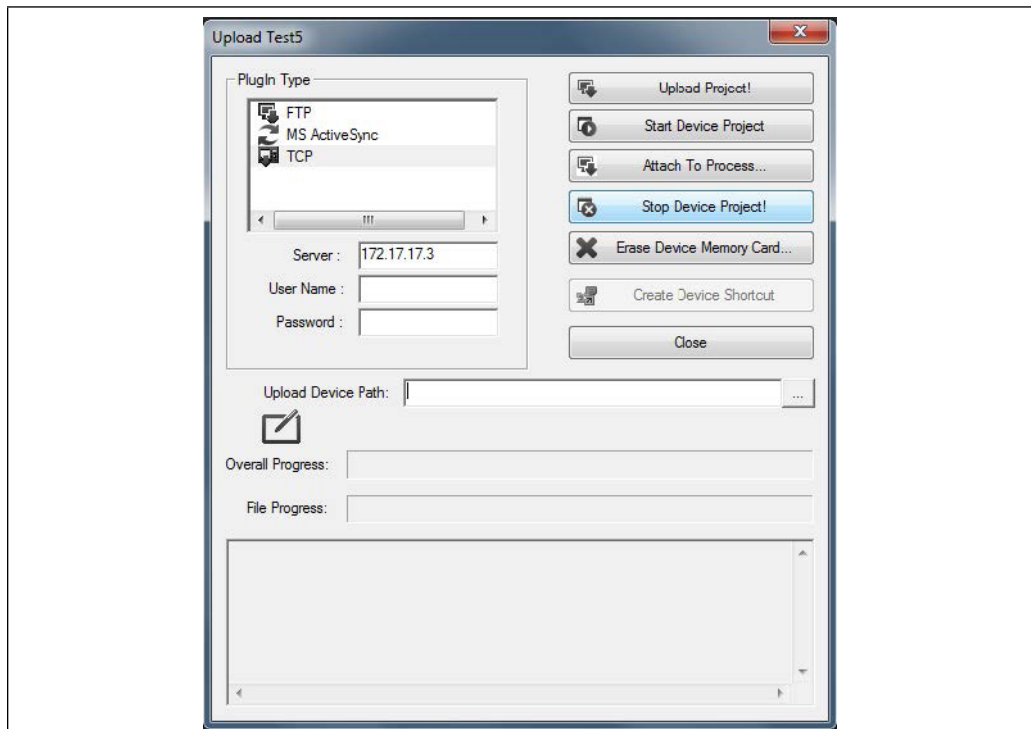


Figure 39: Stopping the running project

To stop a project running in C6 SMART you must:

- Select TCP in the upper left list.
- Write the IP address of C6 SMART.
- Click on the button “Stop Device Project!”

You will see the project in C6 SMART stopping (see below).

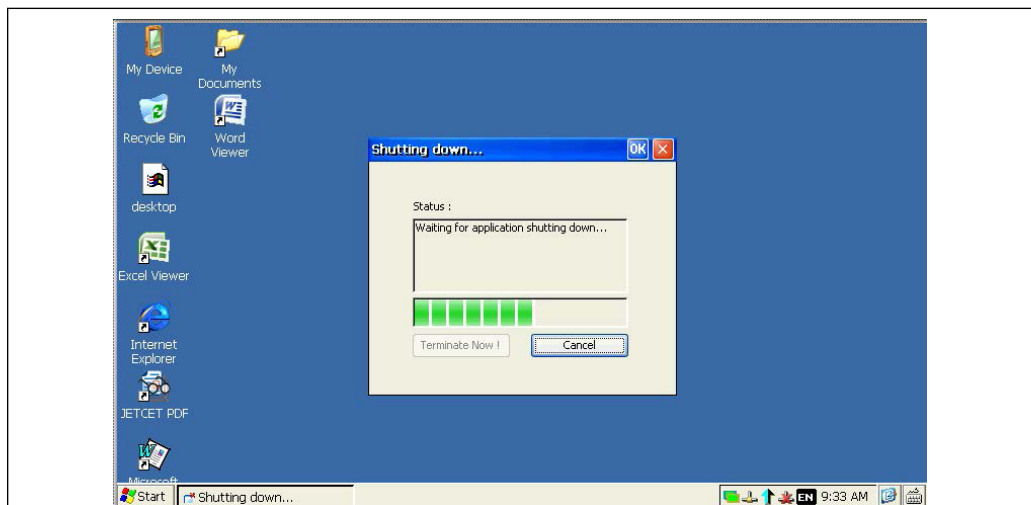


Figure 40: Project shut down

### 5.2.7 Starting the project

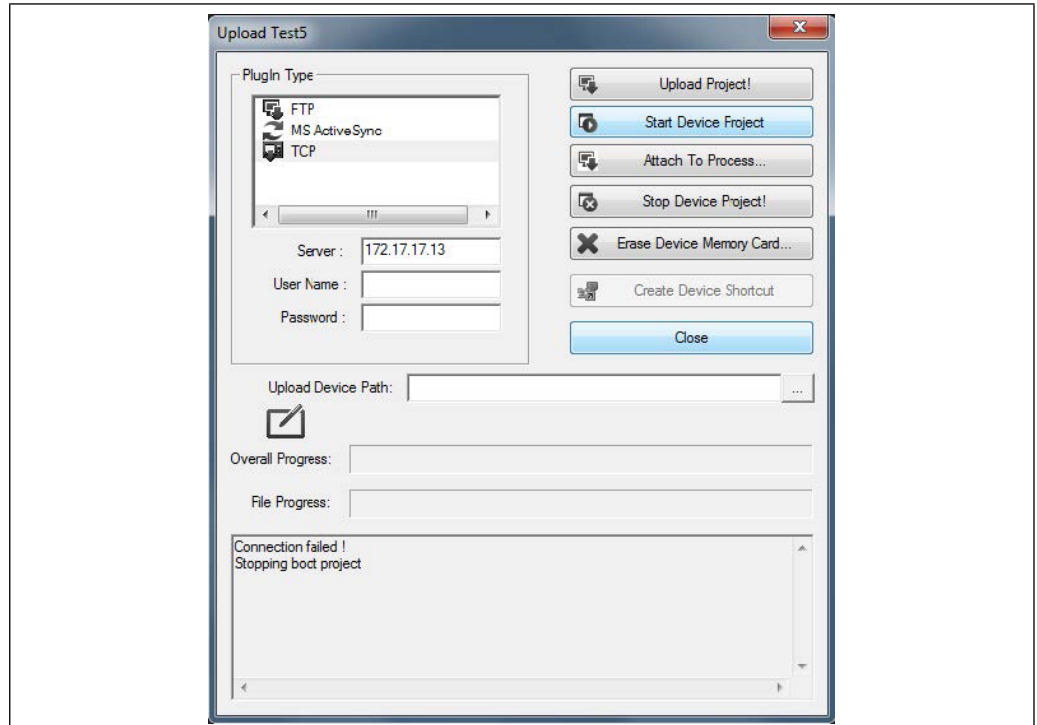


Figure 41: Starting the project

To start a project in C6 SMART by using the configuration PC you must:

- Select TCP in the upper left list.
- Write the IP address of C6 SMART.
- Click on the button “Start Device Project”

The C6 SMART project starts.

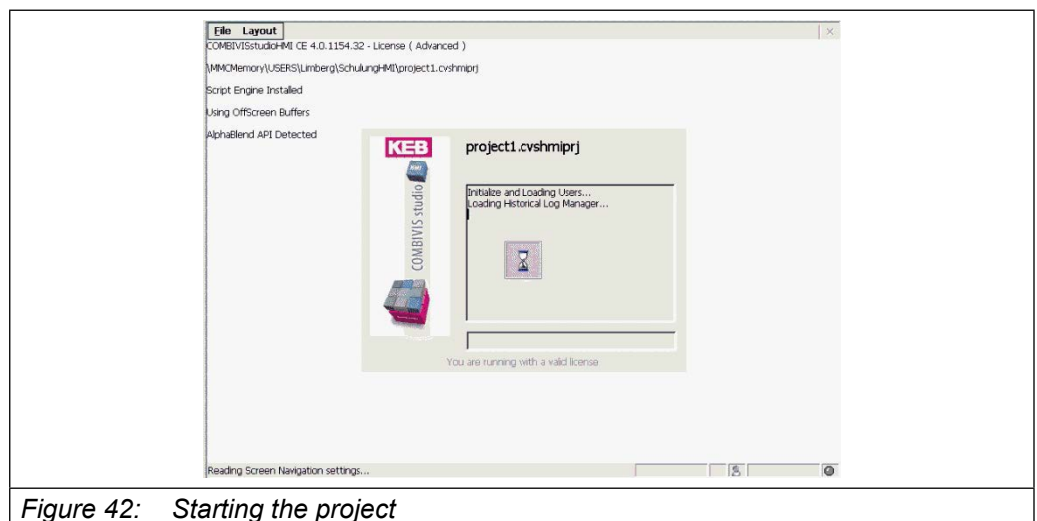
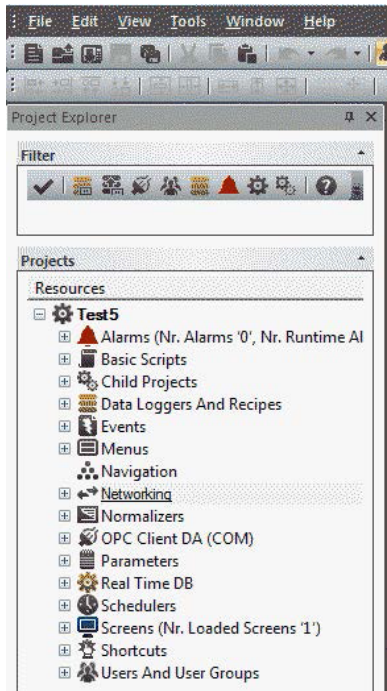
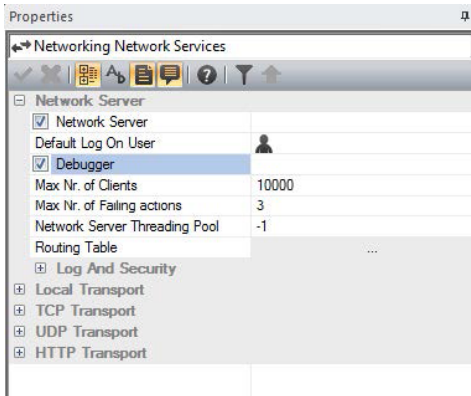


Figure 42: Starting the project

5.2.8 Debugging the project

You can debug the project in C6 SMART by connecting with the configuration PC. In order to be able to use the debugging functionality you must prepare your project as follows:

- Select “Networking” in the project explorer window of COMBIVIS studio HMI.
- Enable the property “Debugger” in the "Properties" window of COMBIVIS studio HMI.

	
<p>Select TCP in the upper left list.</p>	<p>Insert the IP address of the C6 SMART.</p>
<p><i>Figure 43: Debugging the project</i></p>	

Click on the button “Attach To Process...”

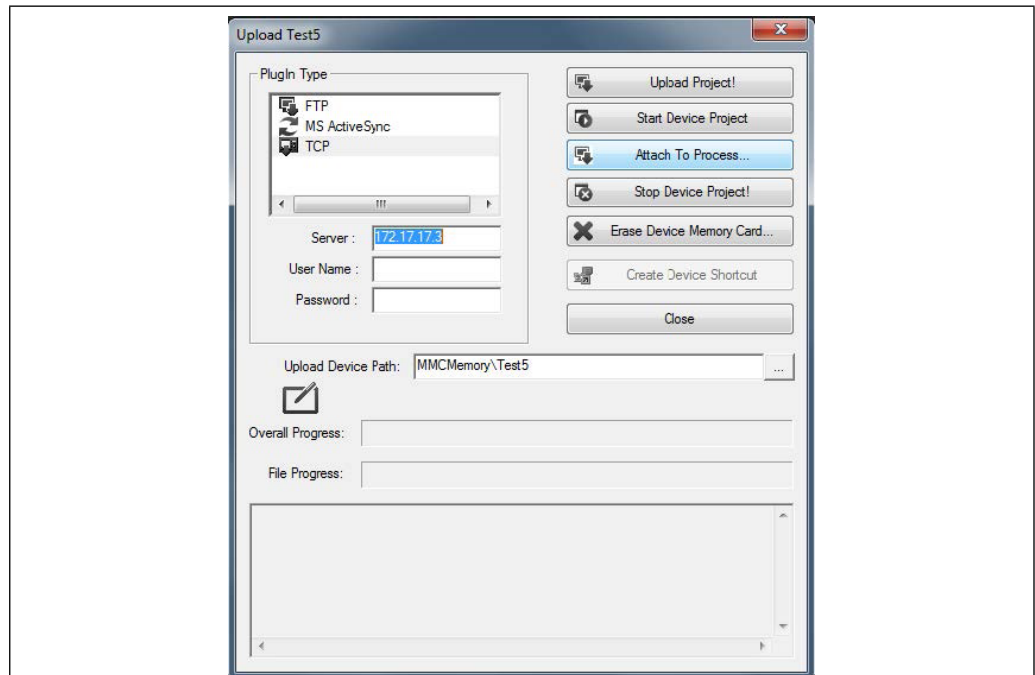


Figure 44: Debugging the project

The following window will appear:

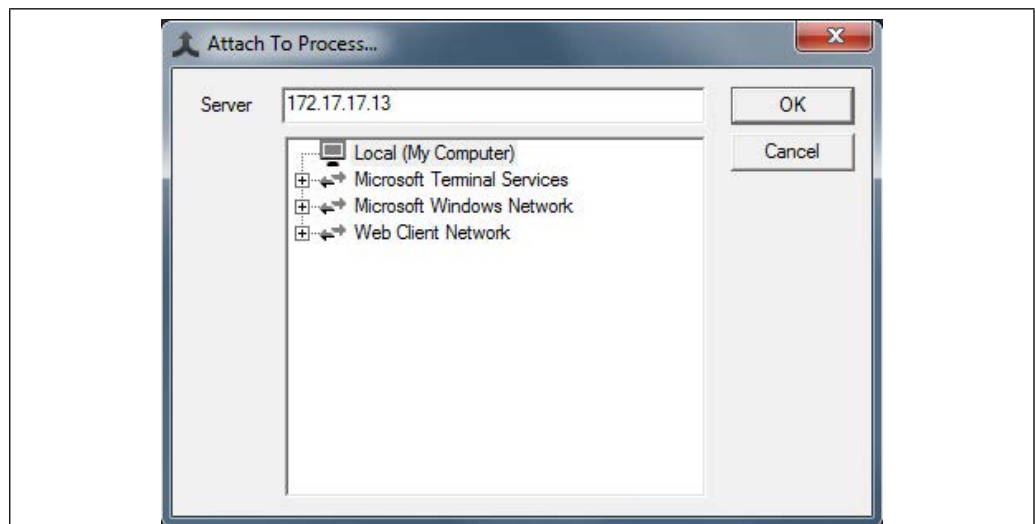


Figure 45: Debugging the project

Enter the IP address of the C6 SMART and click "OK". A new window opens and asks for the user and password.

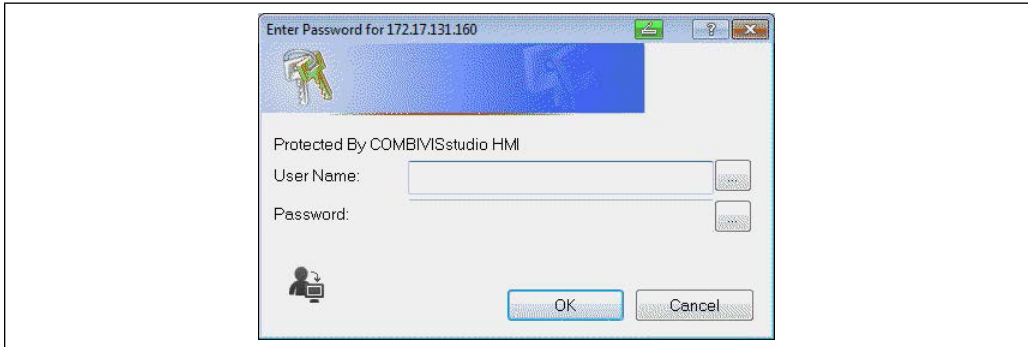


Figure 46: Enter password

In case the project is not protected, just click on the “OK” button, otherwise insert the name and password of a project user that has the rights to change the project.

A debug session starts in COMBIVIS studio HMI on the configuration PC. Now you are able to:

- see the project view and navigate between projects. Please note that you can see different screen from those seen on C6 SMART and that your debugging is not affecting the normal running of C6 SMART project.
- See and change the value of the variables.
- set a breakpoint and debug the Visual Basic scripts running in the project.

**5.2.9 Transfer the project from the C6 SMART to the configuration computer**

This option allows you to transfer the project from C6 SMART to the configuration PC in order to check or change and hence transfer again into C6 SMART.



It is always suggested to protect the project with a password in order to don't allow changes to the project by not authorized users.

Make sure that the project is not running on C6 SMART, start COMBIVIS studio HMI on the configuration PC. Click on the “File” menu and select “Open Device...”

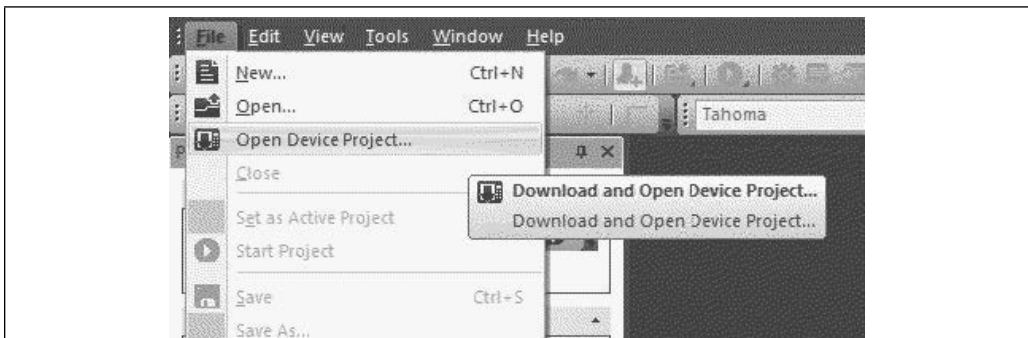


Figure 47: Debugging the project

- Select TCP in the upper left list.



- Write the IP address of C6 SMART.
- Write the path on which you want to store the project on your configuration PC.
- Click on the "Get Project from Device!" button.

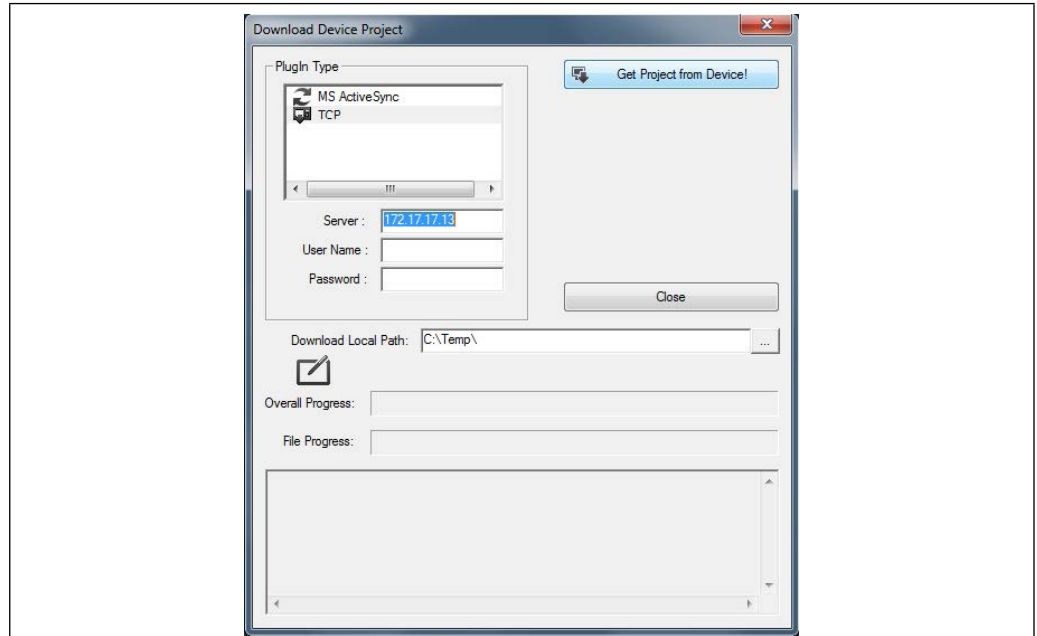


Figure 48: Debugging the project

After the transfer of the project you will see the project explorer containing the project resources in COMBIVIS studio HMI and you will be able to check, test and change the resources of the project.

#### 5.2.10 Backup and restore

C6 SMART has tools to backup and restore the contents of its internal memory in order to manage the project and the operating system of C6 SMART. For more information please contact the support center of KEB.

#### 5.2.11 Updating the operating system

Please contact the support center of KEB.









# 6 System Manager

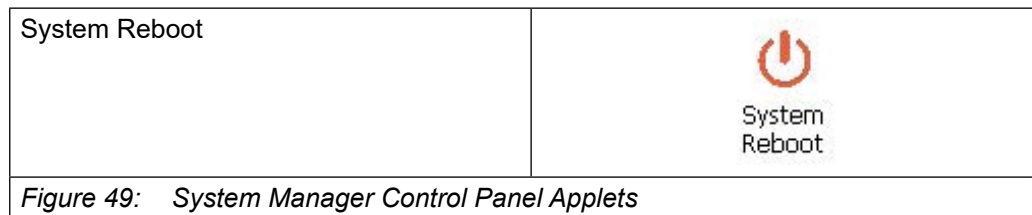
## 6.1 System Manager

The system manager is a utility which is available for all ARM and x86 based KEB systems with WinCE operating system. It is available as built-in component of the operating system.

The system manager aims to provide a comprehensive support to manage system specific features, such as clone, selective system components backup and related restore operations, system font quality settings and screen saver options.

It is available as a set of control panel applications:

Backup Restore	
Font Antialiasing	
Screen Saver	
Touch Buzzer	
EMMC Usage	
Kiosk Mode	
Language Settings	
Scrollbar	



### 6.1.1 Backup Restore

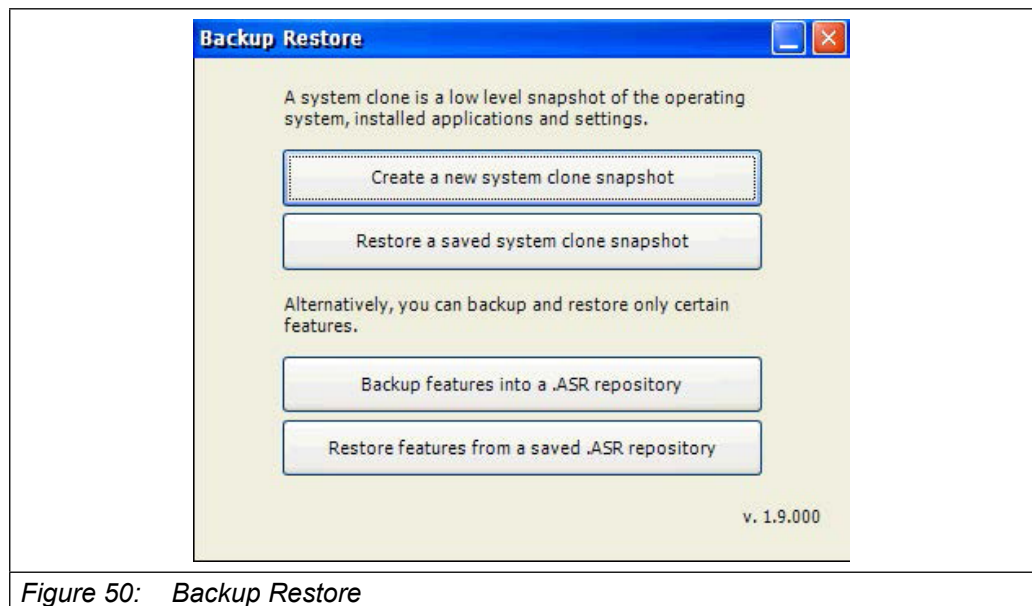
The “Backup Restore” utility interface is shown in the following figure. The utility provides two functions:

- System clone and Restore
- Selective functions Backup and Restore



Before starting Backup or Restore operations the CONTROL runtime should be stopped. Otherwise Backup or Restore operation can take very long time!

### 6.1.2 System clone and Restore



The system clone creates a low level snapshot of:

- All the files on disk
- The operating system configuration from the registry
- The applications configurations from the registry

To work with the clone process, click on the “Create a new system clone snapshot” button.

The clone operation has two optional settings:

- Operating system image: allows to create a clone of the operating system ROM image.
- Custom registry keys: allow to specify custom keys to be saved in the backup.

Click “Run” to start the process.

You will be asked to provide a path where to store the clone snapshot.




---

Target path for the clone file can only be an external storage device such as a USB stick.

---

Once the process is started the status bar at the bottom of the system manager application informs on the operation in progress.

To restore a clone snapshot you can simply click on the “Restore a saved system clone snapshot” button and locate the “.ASR” repository file. The status bar at the bottom of the system manager application informs on the operation in progress.

The restore process provides the automatic shutdown of the running processes (Control project, HMI, connect). The file replacement from the archive and the processes restart at the end.

#### Compatibility check

A clone snapshot can be restored to the same system from where it comes as well to another device. When doing the restore operation, the System manager utility will verify if the snapshot provided is compatible with the actual hardware.




---

The restore of a clone snapshot cannot be selective.

---

## NOTICE

**When restoring a clone snapshot of a system associated to a COMBIVIS connect Domain, please consider that the COMBIVIS connect Identity is also restored.**

- ▶ This means that if the target device was also already associated to a COMBIVIS connect Domain, it will lose its original identity.
  - ▶ In case you need to keep it, it is suggested to save the “auth.bin” file from the COMBIVIS connect runtime installation folder before restoring the clone snapshot. When restoring a feature backup, the COMBIVIS connect identity of the target device is instead maintained.
- 

#### Selective Backup and Restore processes

The selective backup provides support to backup only specific and selected features, files and application settings.




---

If the system manager cannot determine the compatibility conditions, it will display a warning message and the user will have the final decision.

---

To start the selective backup, click the button "Backup features into a .ASR repository". The utility will display a list of available features and settings to be saved. The window is self-explain, follow the instructions on the screen and mark the check box of the desired features you need to backup.

Once the selection is completed, press Run to select the target path and to start the process.

## NOTICE

**The backup of the studio HMI application provides the backup of all the user's applications present on the "MMCMemory" flash disk.**

- ▶ In case the data folder has been moved out of the default path, it will NOT be saved in the backup.

Once the process is started the status bar at the bottom of the system manager application informs on the operation in progress.

To restore a selective backup click on the button "Restore features from a saved .ASR repository" and locate the archive. Once the archive has been loaded, you can press the "Details" button to check the archive contents. A complete list of all the features available in the .ASR archive, including application version, will be displayed.

The restore process provides the automatic shutdown of the running processes (Control project, HMI, connect), the file replacement from the archive and the new processes restart at the end.

The restore process may require several system restarts; the process is fully automated.

### Compatibility check

A selective backup can be restored to the same system from where it comes as well to another device. When doing the restore operation of the operating system component the System manager utility verifies if the archive content is compatible or not with the actual hardware.



Target file for the selective backup file can be an internal or external storage disk.



If the system manager cannot determine the compatibility conditions, it will display a warning message and the user will have the final decision.

**6.1.3 Font Antialiasing**

The utility allows to set the font quality rendering options.  
 Double click on the Control Panel icon and select the desired rendering option.  
 Click OK to confirm.  
 The settings are automatically saved to the registry and no manual saving is required.

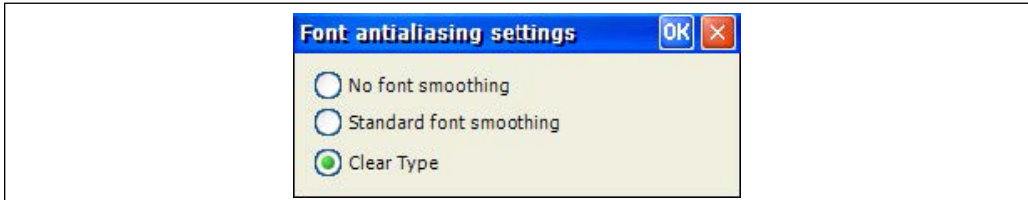


Figure 51: Font Antialiasing

**6.1.4 EMMC Usage**

The utility provides useful information on the usage of the eMMC memory together with an indication of its health status.



Figure 52: EMMC Usage

The information provided are divided per current session (since last power cycle) and in total since the installation of the System Manager utilities.

The utility provides the following information.

**Writes (MB)**

Written data to the eMMC memory in MB.

**System uptime (days)**

Days since last power cycle

**Rate (B/s)**

Average writing speed in B/s calculated considering the amount of data written and the uptime.

**Estimated life (days)**

Estimation of the memory life time calculated considering the maximum number of writes supported by the physical device (information from the memory manufacturer) and the rate of writes generated.

### 6.1.5 Kiosk mode

The utility allows to enable the kiosk mode.

When enabled, the panel will start directly the HMI Runtime with related project without showing the Windows CE Explorer.

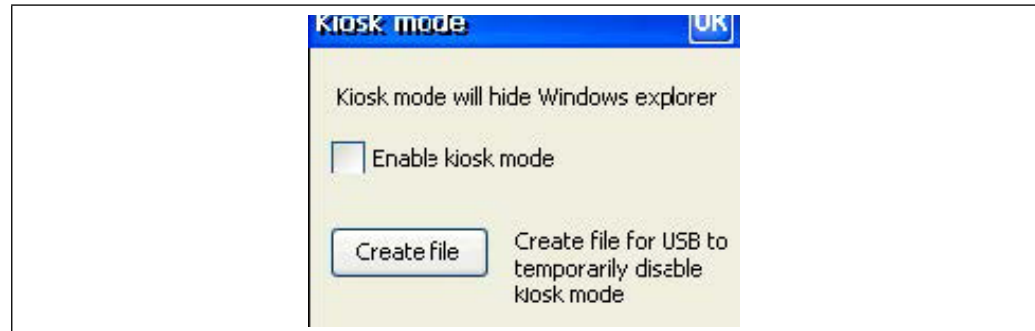


Figure 53: Kiosk mode

To enable kiosk mode, just open the utility and mark the “Enable kiosk mode” in the check box.

At the moment you enable the kiosk mode, you can also create a file which allows temporarily kiosk mode deactivation. The file is created using the “Create file” button. Plug a USB stick into an USB port and store the file directly on the root directory of the USB stick.

If the USB pen drive is plugged in, the file is automatically recognized and kiosk mode will be disabled immediately until the next power cycle.

If you had forgotten to create the file at the moment the kiosk mode was enabled, you can simply make it manually by yourself.

Create a text file named “SystemManager.xml”. Open it with any text editor and copy in, the following text.

```
<?xml version="1.0" encoding="utf-8"?>
<SystemManager>
<Commands>
<Command Type="RunProcess" FilePath="explorer.exe" Arguments=""
WaitCompletion="0"/>
</Commands>
</SystemManager>
```

Save the file and use it as explained before.



If Kiosk mode is enabled and the HMI Runtime is terminated, or simply closed with the proper command, Explorer will not be started automatically and you will apparently end up in a situation where the screen is frozen and not reacting.

To avoid this annoying condition it is enough to include the launch Explorer command before the Runtime shutdown as shown in the figure below.

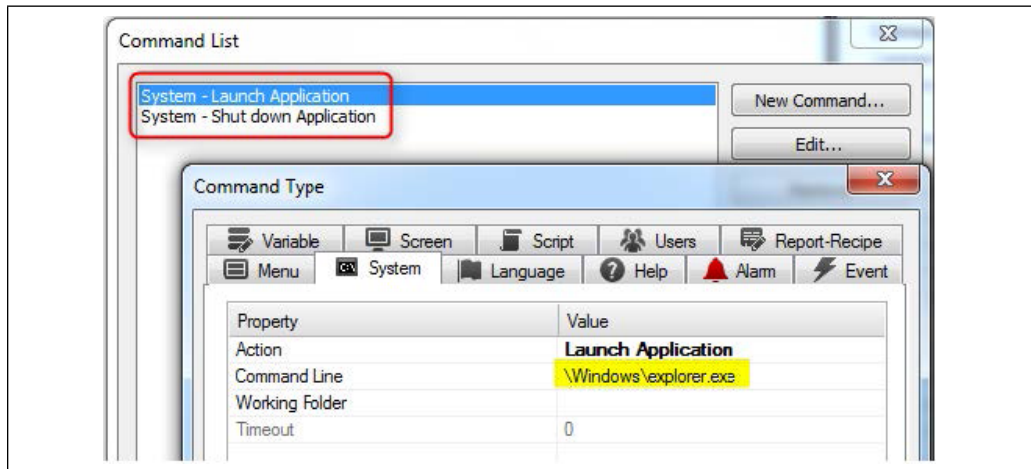


Figure 54: Launch Explorer from COMBIVIS connect HMI

6.1.6 Language settings

The utility provides fonts installation for the Chinese, Japanese and Korean languages.

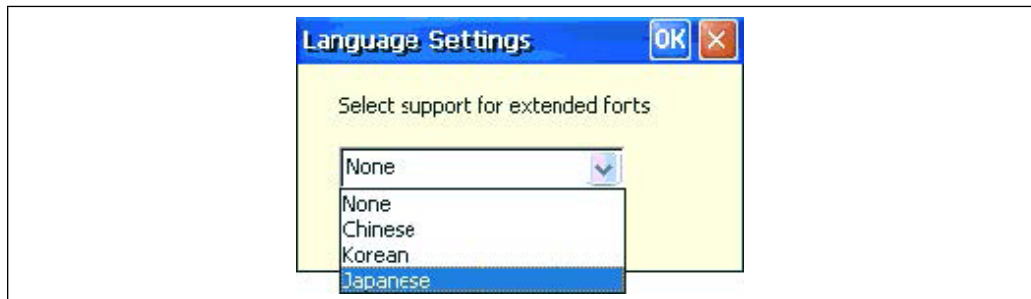


Figure 55: Language settings

6.1.7 Scrollbar

The utility allows to change the size of the windows scrollbars. This is useful when creating applications with HMI because some of the standard controls get the scrollbar size information from the operating system.



Figure 56: Configuring Scrollbar

From the window, just select the desired size of the scrollbars and confirm.



### 6.1.8 System Reboot

The utility allows to reboot the system.

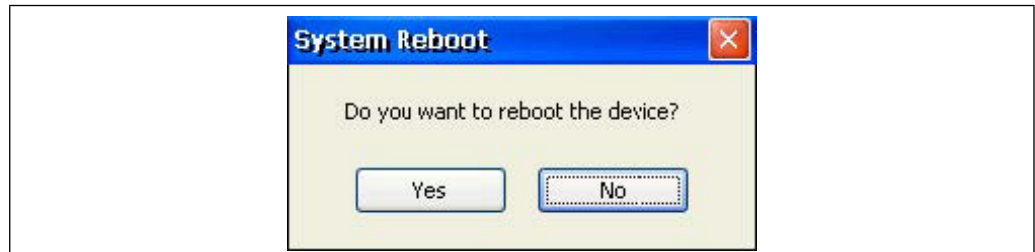


Figure 57: System Reboot

### 6.1.9 Assign network settings via text file to the USB stick

You have the option of assigning the network settings by using a USB stick that contains a file called IPConfig.csv.

The CSV file must be formatted as follows:

**DHCP, IP address, subnet, gateway**

Here are a few examples:

```
1
0,172.19.17.27
0,172.19.17.27, 255.255.255.0
0,172.19.17.27,255.255.255.0,172.19.16.1
1,172.19.17.27
```

The program looks for a CSV file called Ipconfig.csv, which is located in the same path and starts as soon as the USB stick is inserted.

## 7 Maintenance

### 7.1 Opening the C6 Smart

With a screwdriver slightly force the side cover as shown in the following figures taking care not to damage it.

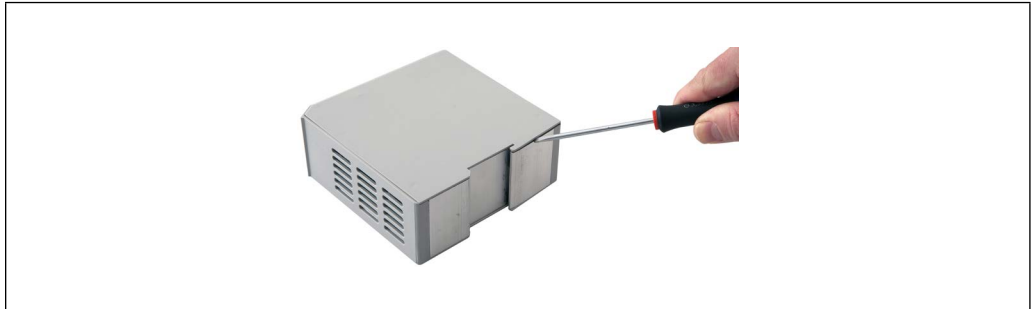


Figure 58: Opening the C6 Smart



Figure 59: Opening the C6 Smart

Carefully extract the cover.



Figure 60: Opening the C6 Smart

Carefully extract the system from the chassis.

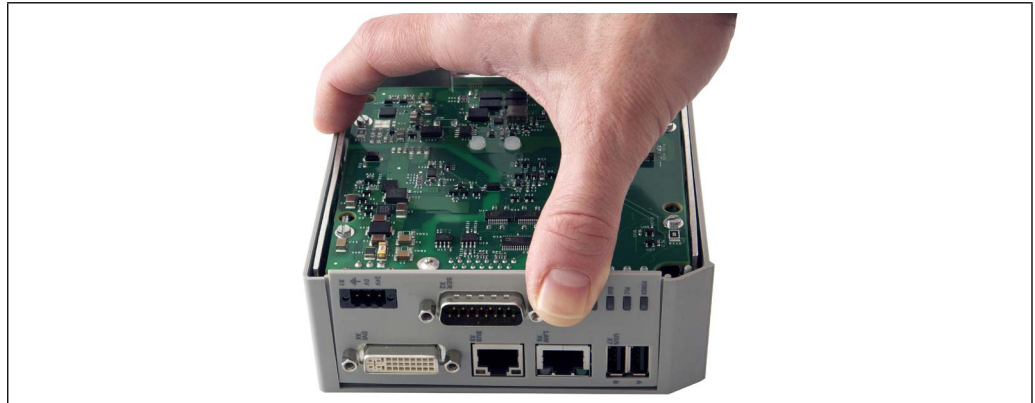


Figure 61: Opening the C6 Smart



Figure 62: Opening the C6 Smart

## 7.2 Backup battery replacement

C6 SMART has a battery for storing settings during power off phases. For a stock temperature of 25°C the life time of the battery is >10 years.

The user can replace the battery with a new one based on the same model (Lithium CR2032 3V Coin).

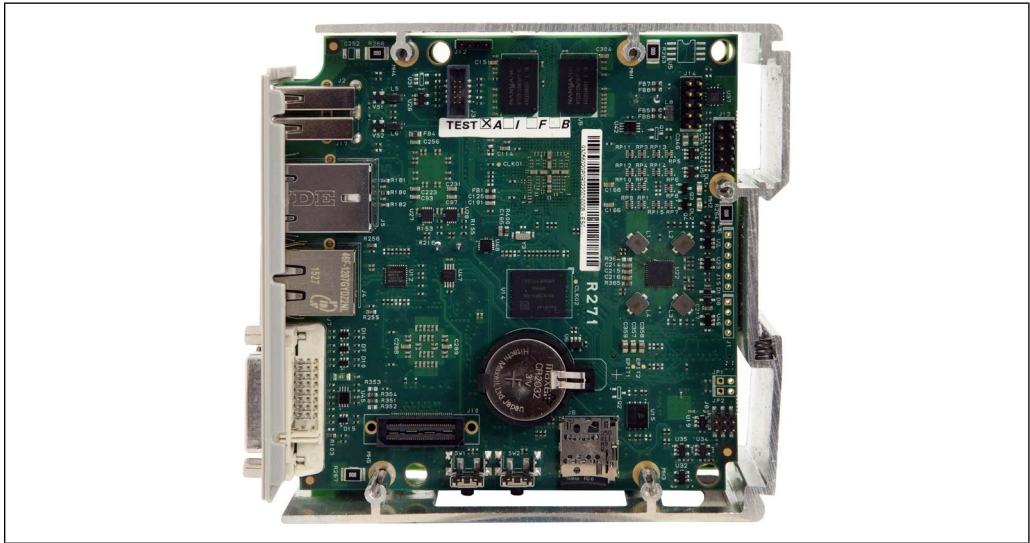


Figure 63: Battery area

**⚠ DANGER**

**Risk of explosion!**

- ▶ Risk of explosion if the battery is replaced with an incorrect type.

Dispose of used batteries according to the instructions.



Figure 64: Battery details

- Turn off the system and disconnect the power supply.
- Remove the battery from the battery holder.

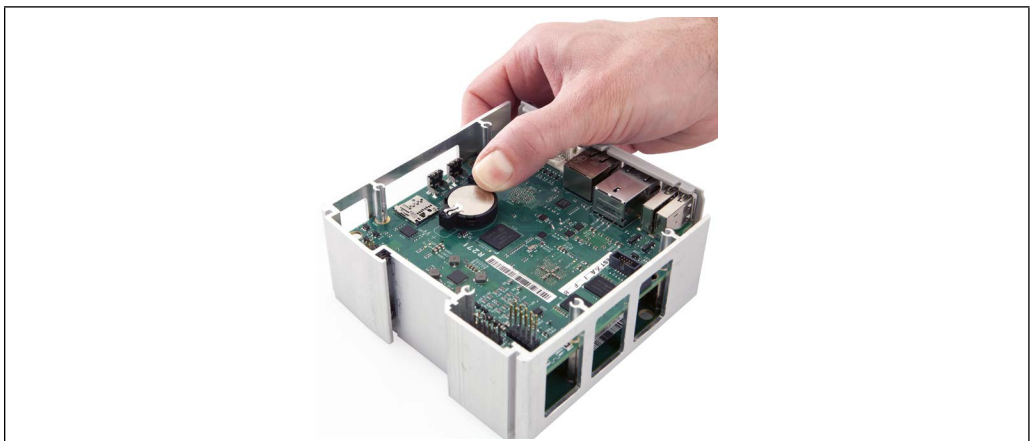


Figure 65: Battery replacement

- Replace it with one of the same model (Lithium CR2032 3V Coin).

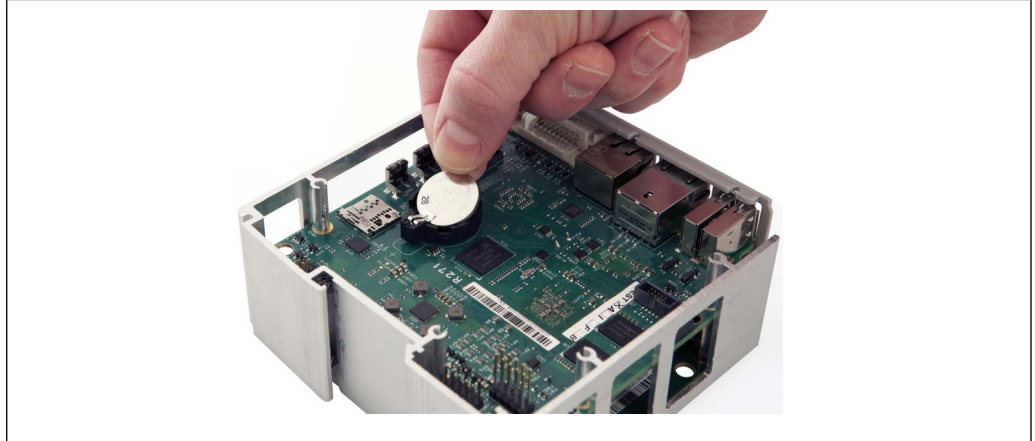


Figure 66: Battery replacement

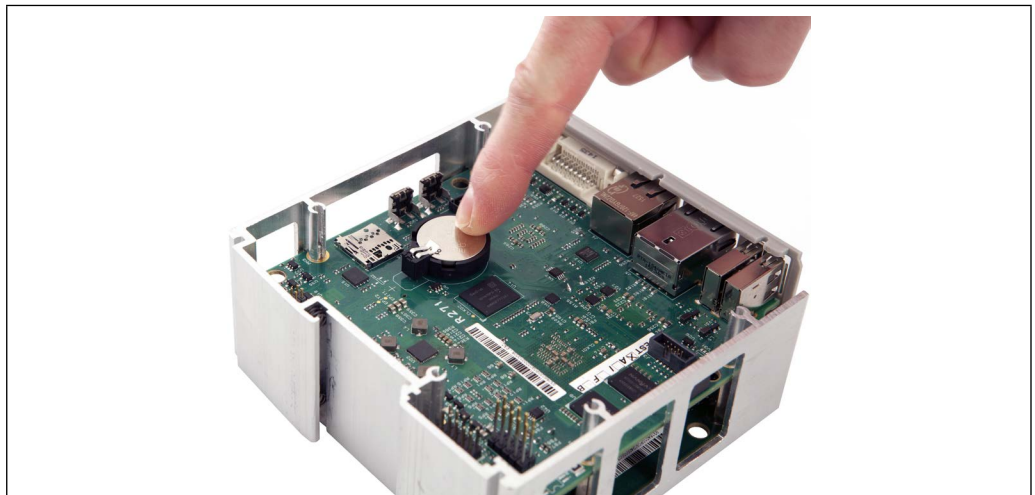
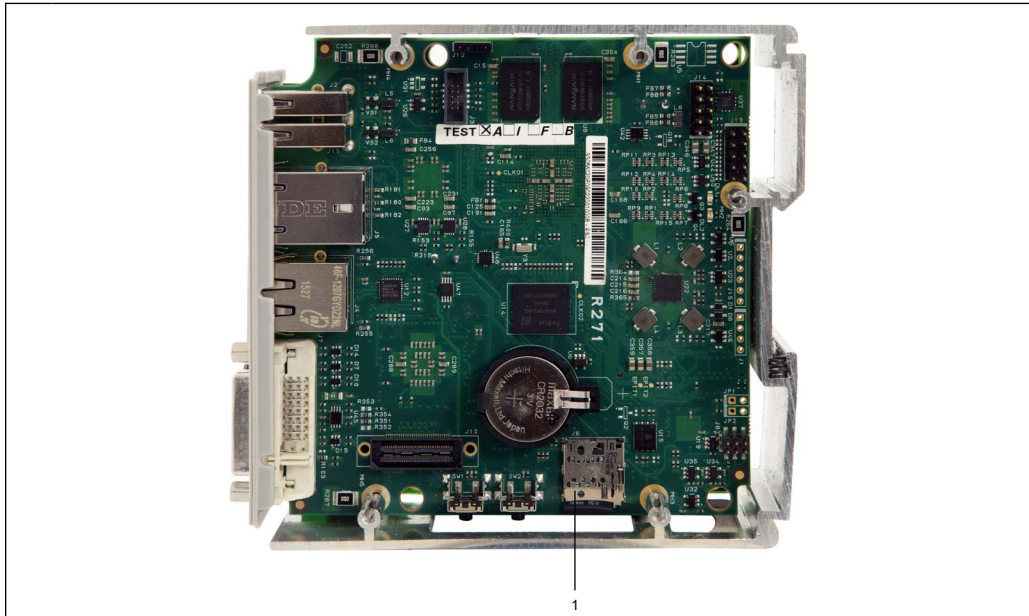


Figure 67: Battery replacement

### 7.3 MicroSD replacement

C6 SMART has an internal micro SD Card connector to accommodate a MicroSD/SDHC card slot V. 2.0 (push-push type).



1	Slot for memory card
---	----------------------

Figure 68: Slot for memory card

This card is not accessible from external.

- See chapter Opening the C6 Smart to open the system properly.
- Extract the Micro SD by pushing to release it from the holder.

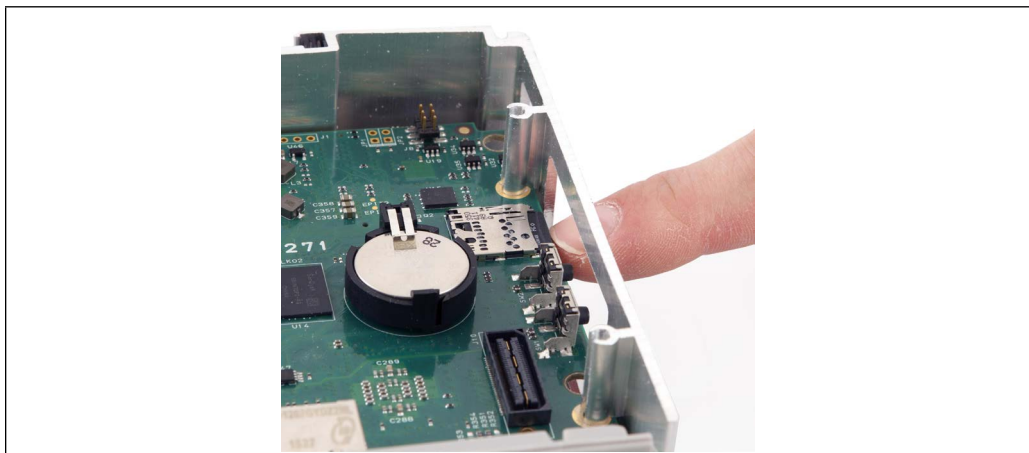


Figure 69: Pushing memory card

**NOTICE****Potential data loss !**

- ▶ Do not remove the memory card while data is being accessed.
- ▶ Data on the memory card is lost if you attempt to remove it while C6 SMART is accessing its data.

- Now the Micro SD is released and it is possible to remove it.

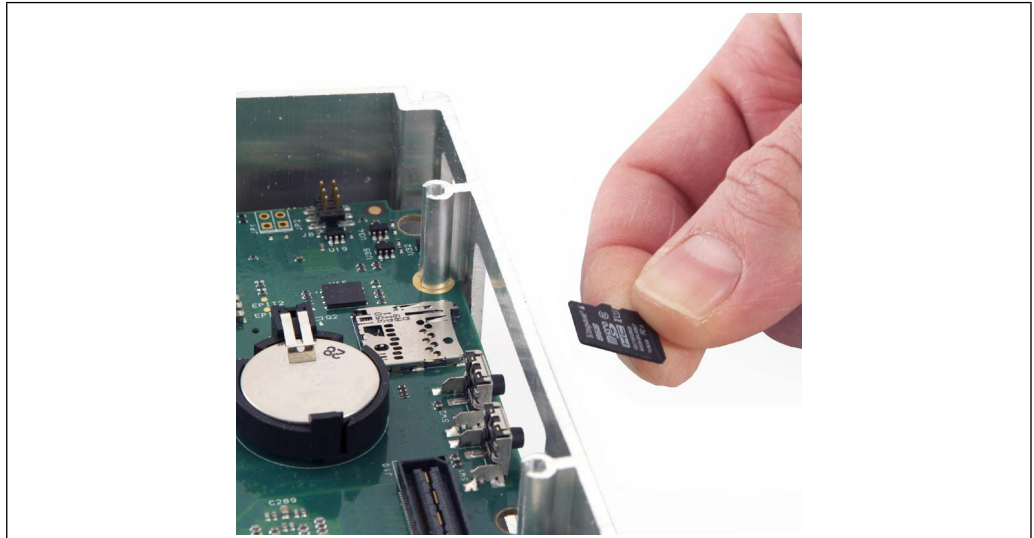


Figure 70: Remove memory card.

## 8 Technical Specifications

### 8.1 System software characteristics

Integrated system software	Operating System	Microsoft Embedded Compact 7 (C7P)		
	HMI (only for quad core)	COMBIVIS HMI Runtime (BASIC, ADVANCED versions)		
	Remote control	COMBIVIS connect runtime		
	Control RTE	KEB Real Time Extension		
CONTROL RTE characteristics		BASIC	PRO	ADVANCED
COMBIVIS connect characteristics		PRO		
COMBIVIS HMI characteristics (only quad core)		BASIC	ADVANCED	
<i>Table 6: System software characteristics</i>				

### 8.2 Main features of PLC control

PLC Programming		IEC61131-3, COMBIVIS studio 6
Supported protocols		EtherCAT Master, MODBUS TCP Master, MODBUS RTU Master
Retain variables	Size	64KB RETAIN + 64KB PERSISTENT
	management	Automatic backup of the retain variables on MRAM at every switch-off and/or power supply interruption.
Project	Cycle time	≥ 1ms, 8 ms recommended
	CPU occupation	max. 80 %
	Variable exchanged with DIN-RAIL IPC	max. recommended 1024
	Datalogging interval	Suggested > 1s
	PRO functions	yes
	ADVANCED functions	yes
<i>Table 7: Main features of PLC control</i>		



### 8.3 Mechanical characteristics

Case	Type	DIN-Rail mounting IPC
	Material	External plastic housing MAKROLON 2407
	Mounting	35 mm DIN rail (top hat rail attachment, EN50022).
	Protection	IP20
	Vibration / shock resistance	EN 60068-2-6, vibration EN 60068-2-27, shock
	Dimension	Height 122 mm (same as C6 Remote IO modules) Width: 47.0 mm. Depth: 124 mm weight: 420 g

Table 8: Mechanical characteristics

### 8.4 System hardware characteristics

Motherboard	Model	KEB C6 SMART
	RTC	Hardware with battery backup
CPU	Processor	ARM Cortex A9 - Freescale i.MX6 - 1 GHz (Dual Lite and Quad Core Plus)
	Memory bus	400 - 533 MHz
Graphic	Controller	GPU with integrated LCD controller
System memory	Type / Size / Socket	1 or 2 GB / DDR3-800 / DDR3L-1066 Soldered
Serial interfaces	Type	1 x RS232/422/485 (DB15M) adjustable via software (optional).
	Galvanic isolation	yes
CAN Interface	Type	CAN 2.0B (up to 1Mbps) DB9M with signaling bi-color LED and termination setting. The CAN bus can be used both as master and slave (optional).
	Galvanic isolation	yes
Ethernet interface	Type	1 x 10/100/1000 Mbps (RJ45) with Link/Activity LEDs 1 x 10/100Mbps (RJ45) with Link/Activity LEDs (Ethercat Master Port)
E-bus port	Type	1 E-bus (LVDS) port. The connector complies with C6 Remote IO module connector.
USB interfaces	Type	2 x USB 2.0 (rear, TYPE-A, Host Port, single channel software switch off).
Mass storage	Internal / not removable	eMMC:4 GB - 8 bit v. 4.4 compatible
	Internal access / removable	8 GB SD/SDHC card - slot V. 2.0 (push-push type)
Battery	Type	Coin (CR2032 3V) removable
	Lifetime	3 years
Buttons, LEDs and keys	Reset button	see chapter pushbuttons

Table 9: Mechanical characteristics

### 8.5 Electrical characteristics

Power supply	Type	Integrated on board, auto ranging	
	Input voltage	18...32 VDC with 3-pole connector	
	Power consumption	C6 SMART	19 W / 24V DC
		C6 SMART CAN	20 W / 24V DC
		C6 SMART SERIAL	20 W / 24V DC
	Protection	Reverse polarity protection, overvoltage, fuse soldered on the board	
	Micro UPS	500ms of back up time after 7 years of life at an average temperature of 45°C First load: 6 minutes Rearm time: 90 seconds	
These devices are intended to be connected to a "Secondary Circuit Overvoltage Category II".			

Table 10: Electrical characteristics

### 8.6 Environmental characteristics

Temperature	Operation	0° ... +50°C
	Storage	-20° ... +60°C
Humidity	Operation/Storage	5 to 95% (non-condensing)

Table 11: Environmental characteristics

### 8.7 Warranty & approvals

CE	Emission	Conforms to EN 55022 Information technology equipment – Radio disturbance characteristics - Limits and methods of measurement.
	Interference immunity	Conforms to EN 55024 Information technology equipment – Immunity characteristics.
	Safety	Conforms to EN 60950-1 – Information technology equipment – Safety.

Table 12: Warranty and approvals

### 8.8 Battery technical data



Figure 71: Battery CR2032 detail

<b>Model</b>	<b>CR2032 MFR renata</b>
Chemical System	Li / MnO <sub>2</sub>
Nominal Voltage	3 V
Rated Capacity	225 mAh
Temperature range	-30°C - +70°C
Self discharge at 23°C	< 1% / year

Table 13: Battery technical data

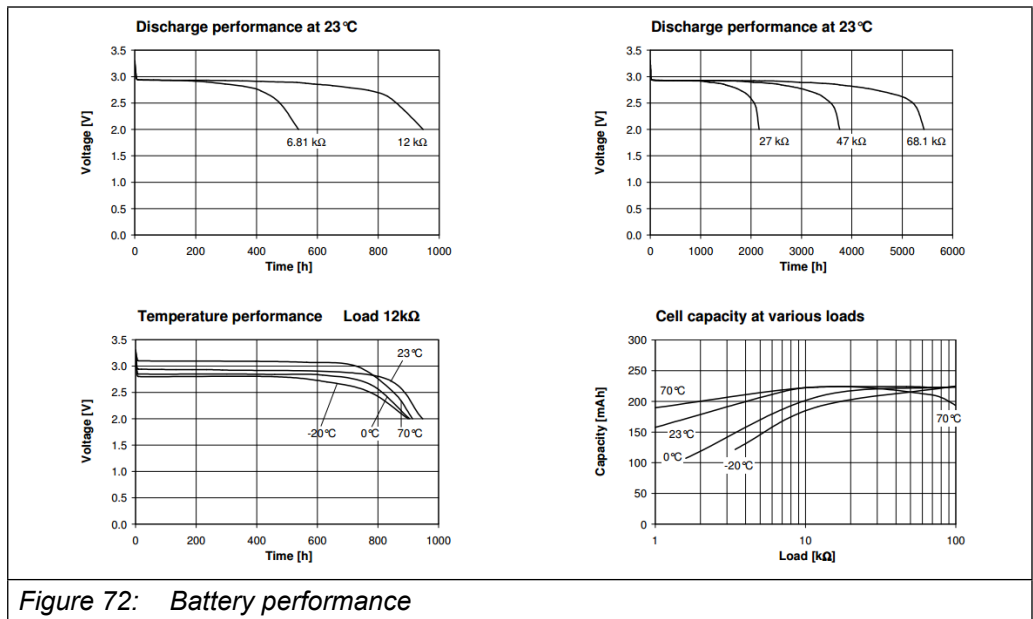


Figure 72: Battery performance

### 8.9 Dimension drawings

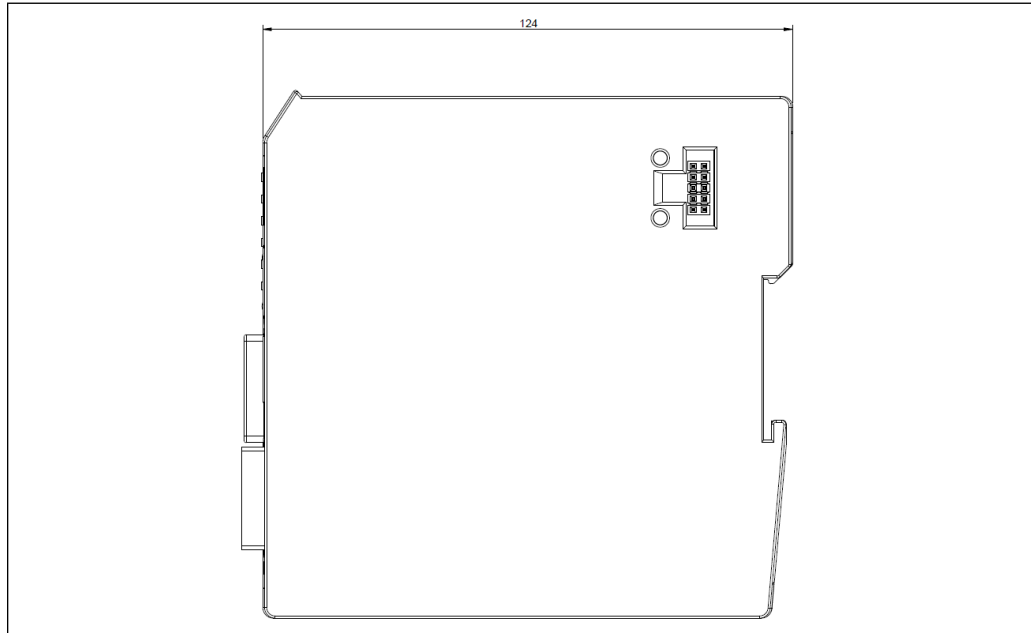


Figure 73: C6 SMART side view

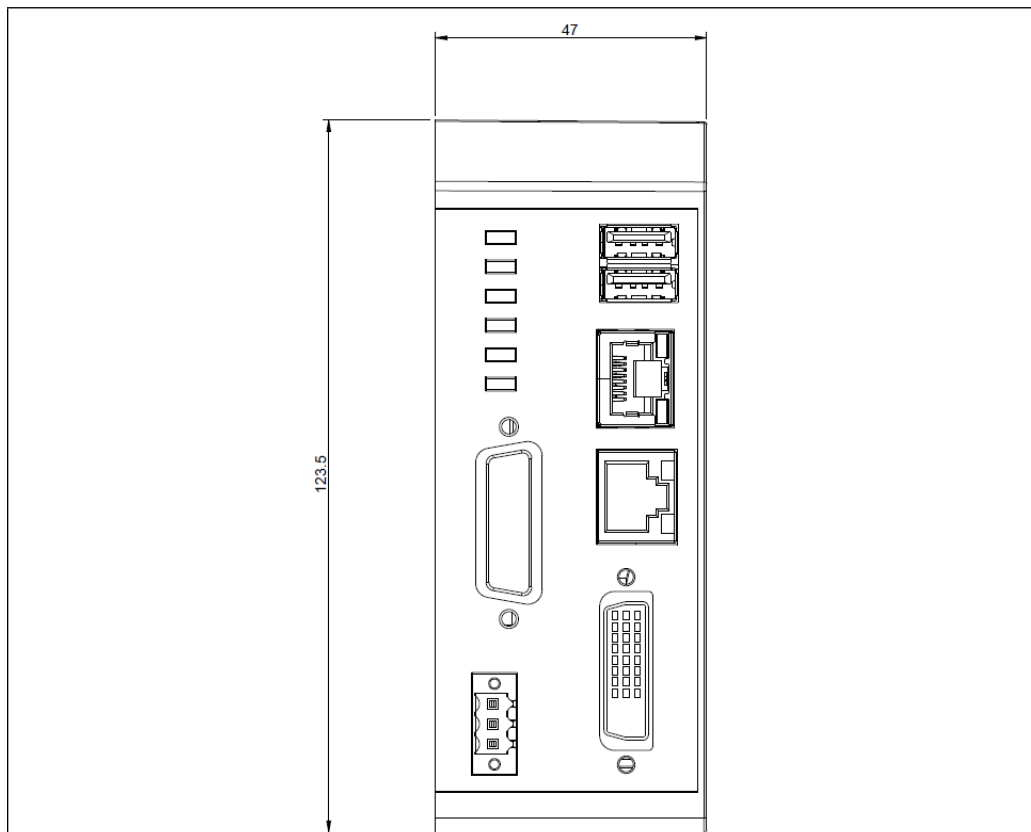


Figure 74: C6 SMART front view

### 8.10 Ports PINOUT

PIN	Signal USB A
1	+5 Vcc
2	USB Data -
3	USB Data +
4	GND
<i>Table 14: USB A</i>	

PIN	Signal USB B
1	+5 Vcc
2	USB Data -
3	USB Data +
4	GND
<i>Table 15: USB A</i>	

#### 8.10.1 CAN X2

PIN	Signal
1	-
2	CAN_L
3	CAN_GND
4	-
5	CAN_SHLD
6	CAN_GND
7	CAN_H
8	-
9	CAN_V+
<i>Table 16: CAN</i>	

8.10.2 DVI-D X4

PIN	Signal	PIN	Signal
1	TMDS DATA 2-	16	HOT PLUG DETECT
2	TMDS DATA 2+	17	TMDS DATA 0-
3	TMDS DATA 2/4 SHIELD	18	TMDS DATA 0+
4	NC	19	TMDS DATA 0/5 SHIELD
5	NC	20	NC
6	DDC CLOCK	21	NC
7	DDC DATA	22	TMDS CLOCK SHIELD
8	NC	23	TMDS CLOCK +
9	TMDS DATA 0-	24	TMDS CLOCK -
10	TMDS DATA 1+		
11	TMDS DATA 1/3 SHIELD	C1	NC
12	NC	C2	NC
13	NC	C3	NC
14	+5V POWER	C4	NC
15	GND	C5	NC

*Table 17: DVI*

8.11 Technical support & repairs

KEB offers complete after-sales technical support. The staff who deal with this handle questions on the entire range of products skillfully, quickly, and efficiently.

You can phone our staff in the service department, and they will give you complete, prompt advice on how to resolve your problems.

telephone: +49 (0)5263 401-0  
 fax: +49 (0) 5263 401-116  
 e-mail: [combicontrol@keb.de](mailto:combicontrol@keb.de)

# 9 Certification

## 9.1 Mark of conformity



## EU DECLARATION OF CONFORMITY

Document No. / month.year: ce\_ca\_remv-C5-C6Smart-c\_en.docx / 11.2022

Manufacturer: KEB Automation KG  
Südstraße 38  
32683 BARNTRUP  
Germany

Product type: Control type yy**C5**xxx – xxxx or  
yy**C6B**xx – xxxx or  
yy**C6G**xx – xxxx  
Control size yy = 00  
Voltage category 24 V

The above given product is in accordance with the following directives of the European Union

Number: **EMC : 2014 / 30 / EU**  
Text: Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility.

Number: **Hazardous Substances: 2011 / 65 / EEC ( incl. 2015 / 863 / EU )**  
Text: Directive on the approximation of the laws of the Member States relating on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

Responsible: KEB Automation KG  
Südstraße 38  
32683 BARNTRUP

Place, date Barntrup, 19. October 2022

Issued by:

  
 \_\_\_\_\_  
 i. A. W. Hovestadt / Conformance Officer

  
 \_\_\_\_\_  
 W. Wiele / Technical Manager

This declaration certifies the conformity with the named directives, but does not contain any assurance of quality.

The safety instructions, described in the instruction manual are to be followed.

---

KEB Automation KG, Südstr. 38, D-32683 Barntrup [www.keb.de](http://www.keb.de) E-Mail: [info@keb.de](mailto:info@keb.de) Tel.: +49 5263 401-0 Fax: -116

# EU DECLARATION OF CONFORMITY



## Annex 1

Document-No. / month.year: ce\_ca\_remv-C5-C6Smart-d\_en.docx / 11.2022

Product type:	Control Series	yy <b>C5</b> xxx – xxxx or yy <b>C6B</b> xx – xxxx or yy <b>C6G</b> xx – xxxx
	Size	yy = 00
	Voltage category	24 Vdc

The conformity of the above given product to the European Directive 2014/30/EU ( for electromagnetic compatibility ) is given by complete approval / testing to the following European harmonized standards. Base for the complete approval is the definition of a complete PDS ( power drive system ). For not exceeding the required limits or minimum levels of immunity it is necessary to use the KEB defined filters and observe the given wiring specifications. These will be delivered with every product as part 1 of the documents.

EN - Standard	Text
EN 61000 – 6 – 4 / 2020	Electromagnetic compatibility (EMC) – Part 6-4: Generic Standard – Emission standard for industrial environment
EN 61000 – 6 – 2 / 2019	Electromagnetic compatibility (EMC) – Part 6-2: Generic Standard – Immunity standard for industrial environment

The conformity of the above given product to the European Directive 2011/65/EU incl. changes by 2015/863/EU ( for restrictions of the use for certain hazardous substances in electrical and electronic equipment ) is given by qualification of components and manufacturing process within the ISO 9001 QM system. The necessary information and declarations are documented and memorized.

EN 63000: 2018 Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

The above given product was developed, manufactured and tested within an internal quality management system. This ISO 9001 QM system was approved by:

Notified body:	TÜV - CERT
Adress:	Zertifizierungsstelle des RWTÜV Steubenstrasse 53 D - 45138 Essen
No. of approval	041 004 500
Dated:	20.10.1994
Valid until:	December 2024



## 9.2 TÜV Certificate

UL Product iQ™

# NRAQ.E479848 - Programmable Controllers

## Programmable Controllers

[See General Information for Programmable Controllers](#)

**KEB AUTOMATION KG**  
SUEDSTRASSE 38  
32683 BARNTRUP, GERMANY

E479848

### Investigated to ANSI/UL 508

**Front-Panel Mounting Display, for use on a flat surface of a type 1 and 4X INDOOR enclosure,** Model(s) aaC6AF1-44xx Where "a" may be any character for different sizes of panel display. Where ?xx? can be 02 or 05 representing SW Configuration.

aaC6AF1-45xx Where "a" may be any character for different sizes of panel display. Where ?xx? can be 02 or 05 representing SW Configuration.

**Open type, Programmable controllers** Model(s) 00C6CB1-0100, 00C6CB1-0200, 00C6CB1-0300, 00C6CB1-0400, 00C6CB1-0500, 00C6CB1-0600, 00C6CB1-0700, 00C6CB1-0800, 00C6CB1-0900, 00C6CB1-1000, 00C6CB1-1100, 00C6CB1-1200, 00C6CB1-1300, 00C6CB1-1400, 00C6CB1-1600, 00C6CB1-1700, 00C6CB1-1800, 00C6CB1-1900, 00C6CB1-2000, 00C6CB1-2100, 00C6CC1-0100, 00C6CC1-0200, 00C6CC1-0300, 00C6CC1-0400, 00C6CC1-0500, 00C6CC1-0700, 00C6CC1-0800, 00C6CC1-0900, 00C6CC1-1000, 00C6CC1-1100, 00C6CC1-1200, 00C6CC1-1300, 00C6CC1-1400, 00C6CC1-1500, 00C6CC1-1600, 00C6CC1-1700, 00C6CC1-1800, 00C6CC1-1900, 00C6CE1-0100, 00C6CE1-0200, 00C6CF1-0200, 00C6CH1-0100, 00C6CJ1-0100, 00C6HA1-xxxx, 00C6HB1-xxxx

**Programmable Controllers** Model(s) 00C6CA1-0100 where xy may be 00,02,03,04,06,07,08,09 or 10.

00C6CF1-0100 where xy may be 00,02,03,04,06,07,08,09 or 10.

**Programmable controllers** Model(s) aaC6HA1-xxxx Where "a" may be any character for different sizes of panel display.

aaC6HB1-xxxx Where "a" may be any character for different sizes of panel display.

### Investigated to UL 61010-1 and UL 61010-2-201

**Programmable Automation Controller, PAC** Model(s) C6 Smart, xxC6Gxx-xxxx

### Investigated to UL 61010-1, 3rd Edition and UL 61010-2-201, 1st Edition

**Front-Panel Mounting or Open type Industrial PC** Model(s) 00C6HM1-xxxx Where "xxxx" is a 4 digit / letter combination for different software configurations.

00C6HN1-xxxx Where "xxxx" is a 4 digit / letter combination for different software configurations.

aaC6HM1-xxxx Where "a" may be any character for different sizes of panel display. Where "xxxx" is a 4 digit / letter combination for different software configurations.

aaC6HN1-xxxx Where "a" may be any character for different sizes of panel display. Where "xxxx" is a 4 digit / letter combination for different software configurations.

**Industrial PC** Model(s) 00C6HL1-xxxx Where "xxxx" is a 4 digit / letter combination for different software configurations.

**Industrial PC** Model(s) 00C6HP1-xxxx Where "xxxx" is a 4 digit / letter combination for different software configurations.

00C6HQ1-xxxx Where "xxxx" is a 4 digit / letter combination for different software configurations.

**Programmable controllers** Model(s) aaC6JF1-110x Where "a" may be any character for different sizes of panel display. Where ?x? is any digit representing Customer ID.

aaC6JF1-111x Where "a" may be any character for different sizes of panel display. Where ?x? is any digit representing Customer ID.

aaC6JF1-112x Where "a" may be any character for different sizes of panel display. Where ?x? is any digit representing Customer ID.

### Investigated to UL 61010-1, 3rd Edition and UL 61010-2-201, 2nd Edition

**Programmable Controllers, "Multi Fieldbus Interface C6 Remote I/O5"** Model(s) 00C6CH1-0200, 00C6CH1-0300, 00C6CH1-0400, 00C6CH1-0500

### Investigated to

**Industrial PC** Model(s) 00C6HC1-xxxx

[Last Updated](#) on 2020-03-11

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