COMBICONTROL

Instruction Manual **C6 SMART**

Original manual		
Document	Part	Version
20130559	GBR	01

Summary

SECTION **1**

Preliminary Information

1.1 General notes

a) The information in this manual is subject to change and is in no way binding upon Karl E. Brinkmann GmbH.

b) Karl E. Brinkmann GmbH is not responsible for technical errors or other omissions in the manual, and shall not accept any responsibility deriving from its use.

1.2 Trademarks

a) All brands and product names mentioned in this manual are trademarks of their respective owners.

1.3 Instructions on disposal

EN

- The symbol on the product or in its packaging indicates that this product may not be treated as household waste. Instead it shall be handed over the applicable collection point for the recycling of electrical and electronic equipment. By ensuring this product is disposed of correctly, you will help prevent potential negative consequences for the environment and human health, which could otherwise be caused by inappropriate waste handling of this product. For more detailed information about recycling of this product, please contact your local city office, your household waste disposal service or the supplier where you purchased the product.

DE

- Das Symbol auf dem Produkt oder seiner Verpackung weist darauf hin, dass dieses Produkt nicht als normaler Haushaltsabfall zu behandeln ist, sondern an einem Sammelpunkt für das Recycling von elektrischen und elektronischen Geräten abgegeben werden muss. Durch ihren Beitrag zum korrekten Entsorgen dieses Produkts schützen Sie die Umwelt und die Gesundheit Ihrer Mitmenschen. Umwelt und Gesundheit werden durch falsches Entsorgen gefährdet. Weitere Informationen über das Recycling dieses Produkts erhalten Sie von Ihrem Rathaus, Ihrer Müllabfuhr oder den Distributoren, in dem Sie das Produkt gekauft haben.

IT

- Il simbolo sul prodotto o sulla confezione indica che il prodotto non deve essere considerato come un normale rifiuto domestico, ma deve essere portato nel punto di raccolta appropriato per il riciclaggio di apparecchiature elettriche ed elettroniche. Provvedendo a smaltire questo prodotto in modo appropriato, si contribuisce a evitare potenziali conseguenze negative per l'ambiente e la salute, che potrebbero derivare da uno smaltimento inadeguato del prodotto. Per informazioni più dettagliate sul riciclaggio di questo prodotto, contattare l'ufficio comunale, il servizio locale di smaltimento rifiuti o il fornitore da cui è stato acquistato il prodotto.

FR

- Le symbole sur le produit ou son emballage indique que ce produit ne peut être traitè comme décher ménager. It doit être remis au point de collecte dèdié à cet effect (collect et recyclage du matèriel èlectrique et èlectronique). En procèdant à la mise à la casse règlementaire de l'appareil, nous prèservons l'environnement et notre sécurité, s'assurant ainsi que les dèchets seront traitès dans des conditions appropriées. Pour obtenir plus de dètails sur le recyclage de ce produit, veuillez prendre contact avec les services de votre commune ou le distributeur où vous avez effectué l'achat.

ES

- El simbolo en el producto o en su embalaje indica que este producto no se puede tratar como desperdicios normales del hogar. Este producto se debe entregar al punto de recolección de equipos eléctricos y electrónicos para reciclaje. Al asegurarse de que este producto se deseche correctamente, usted ayudará a evitar posibles consequencias negativas para el ambiente y la salud pública, lo qual podria ocurrir si este producto no se manípula de forma adecuada. Para obtener informaciónes mas detalladas sobre el reciclaje de este producto, póngase en contacto con la adMinistraciòn de su ciudad, con su servicio de desechos del hogar o con el surtidor donde comprò el producto.

PT

- simbolo no produto ou na embalagem indica que este producto não pode ser tratado como lixo doméstico. Em vez disso, deve ser entregueado ao centro de recolha selectiva para a reciclagem de equipamento electrico e electronico. Ao garantir uma eliminação adequada deste produto, ira ajudar a evitar eventuais consequencjas negativas para o meio ambiente e para a saude publica, que, de outra forma, poderiam ser provocadas por un tratamento incorrecto do produto. Para obtener informações mais detalhadas sobre a reciclagem deste produto, contacte os serviços municipalizados locais, o centro de recolha selectiva da sua area de residência ou no distribuidor onde adquirir ou produto.

1.4 Safety symbols description

Danger	This symbol indicates a danger to life or health of personnel.
Attention	This symbol indicates a danger to the hardware, data and / or the environment.
Note	This symbol indicates additional information meant to provide a better understanding.

1.5 Qualified personnel

a) C6 SMART may be operated only by qualified personnel for the specific task in accordance with the relevant documentation for the specific task, in particular its warning notices and safety instructions.
b) Qualified personnel are those who, based on their training and experience, are able to identify risks and avoid potential hazards when working with these systems.

1.6 Basic knowledge required

a) To understand operating instructions a general knowledge of automation technology is needed.
b) Knowledge of personal computers and the Microsoft operating system is required to understand this user's guide.

1.7 Proper use of the product

a) KEB products may only be used for the applications described in the catalogue and in the technical documentation.
b) If products and components from other manufacturers are used, these must be approved by KEB.
c) Proper transport, assembly, installation, storage, commissioning, operation and maintenance are required to ensure that the product operates safely.
d) The indicated environmental conditions must be observed.
e) The information in this user's manual must be observed.

1.8 User's guide purpose

a) This user's manual contains information based on the requirements defined by DIN EN 62079 for mechanical engineering documentation.
b) These operating instructions are intended for:
    1. Users.
    2. Commissioning engineers.
    3. Maintenance personnel.
c) Pay attention at the information in the chapter "Safety instructions".
d) More information such as operating instructions, examples and reference information, are available in the online help of COMBIVIS studio 6, COMBIVIS studio HMI and COMBIVIS connect software.

1.9 Manual as a part of the system

a) This user's guide belongs to C6 SMART and is also required for commissioning.
b) Keep all supplied documentation for the whole lifetime of C6 SMART.

1.10 Figures

a) This manual contains illustrations of the described devices.
b) Some details of the illustrations may differ from the device provided.

1.11 Safety instructions

1.11.1 Installation according to the instructions

- Commissioning the device is prohibited until it has been absolutely ensured that the system in which the device is to be installed complies with all the applicable EU and international regulation.

1.11.2 Hazardous areas

- Do not use C6 SMART in hazardous areas.

1.11.3 Working on the control cabinet

- **Open equipment**
  The device is open equipment. This means that the C6 SMART may only be integrated in housings or cabinets, where it can be operated from the front view.
  The cabinet in which C6 SMART is installed may only be accessed with a key or tool and only by trained and authorized personnel.
- **Dangerous voltage**
  Opening the cabinet may expose high voltage parts. Before opening the cabinet always disconnect the power.

1.12 Notes about usage

- C6 SMART is approved for indoor use only.
- C6 SMART may be damaged if operated outdoors.

1.13 Applicable standard

Please refer to section 7 for details about the relevant standards.

SECTION **2**

Product Description

2.1 Product description

The C6 SMART is the DIN-RAIL embedded solution with RISC architecture that allows running PLC, 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.

2.2 Key features

Table 1
Key Features

KEY FEATURES	**C6 SMART Dual Core**	**C6 SMART Quad Core**
O.S. Microsoft Windows Embedded Compact 7 (C7P) installed on eMMC memory.	X	X
KEB Real Time Extension (RTE)	X	X
KEB COMBIVIS studio HMI Runtime		X
KEB COMBIVIS connect Runtime	X	X
CPU ARM CORTEX A9 architecture	X	X

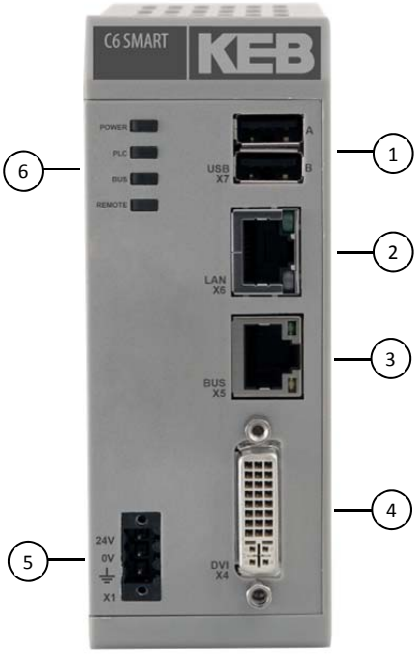
Multiple mass memories support:
• Serial NOR: Operating System Pre-Load
• eMMC: fast access memory used for:
  o OS Image
  o Windows Registry
  o RTE
  o HMI Runtime
  o Connect Runtime
  o Repository Factory Default
• Serial MRAM:
  o Persistent Data
• Micro SD HC (No external access):
  o DB files
  o Application files
  ▪ PLC / Motion
  ▪ HMI
	X	X

Frontal IP 20	X	X
Micro UPS	X	X

2.3 Front view

2.3.1 C6 SMART without options

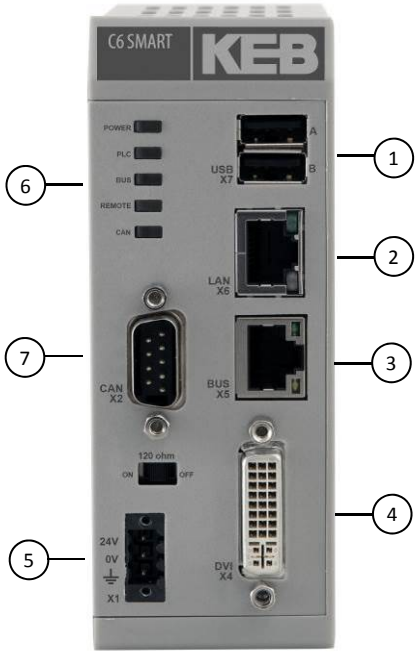
Figure 1
C6 SMART without options



1. X7: 2 x USB 2.0
2. X6 LAN: 10/100/1000Mbps Ethernet; RJ45 Connector with signaling LEDs (link/speed).
3. X5 BUS: 1 x 10/100Mbps Ethernet; Connector RJ45. Port is used as EtherCAT Master
4. X4 DVI-D interface: the DVI-D connector is used by a Monitor connection.
5. X1 PWR Supply: Isolated (500V) power supply 18V-32V (polarity inversion protected); Micro UPS with Ultra capacitors
6. Diagnostics.

2.3.2 C6 SMART with CAN option

Figure 2
C6 SMART with CAN



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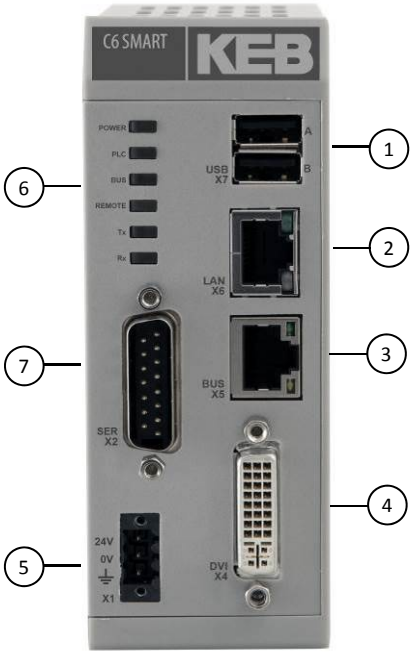
4. X4 DVI-D interface: the DVI-D connector is used by a Monitor connection.
5. X1 PWR Supply: Isolated (500V) power supply 18V-32V (polarity inversion protected); Micro UPS with Ultra capacitors
6. Diagnostics.
7. X2 CAN 2.0B: The CAN bus can be used both as master and slave; Externally accessible switch for termination setting is provided.

2.3.3 C6 SMART with MULTI SERIAL option

Figure 3
C6 SMART with MULTI SERIAL



1. X7: 2 x USB 2.0
2. X6 LAN: 10/100/1000Mbps Ethernet; RJ45 Connector with signaling LEDs (link/speed).
3. X5 BUS: 1 x 10/100Mbps Ethernet; Connector RJ45. Port is used as EtherCAT Master
4. X4 DVI-D interface: the DVI-D connector is used by a Monitor connection.
5. X1 PWR Supply: Isolated (500V) power supply 18V-32V (polarity inversion protected); Micro UPS with Ultra capacitors
6. Diagnostics.
7. X2 MULTI SERIAL: Multi-standard serial port see an isolated RS232 and isolated RS485 2-Wires and 4-Wires.

2.4 Side view

Figure 4
C6 SMART side view

1. E-Bus: LVDS interface (with C6 Remote IO compatible connector). On that connector, 5V/3A power output is available
2. Carrier rail mount and functional earth

2.5 Bottom view

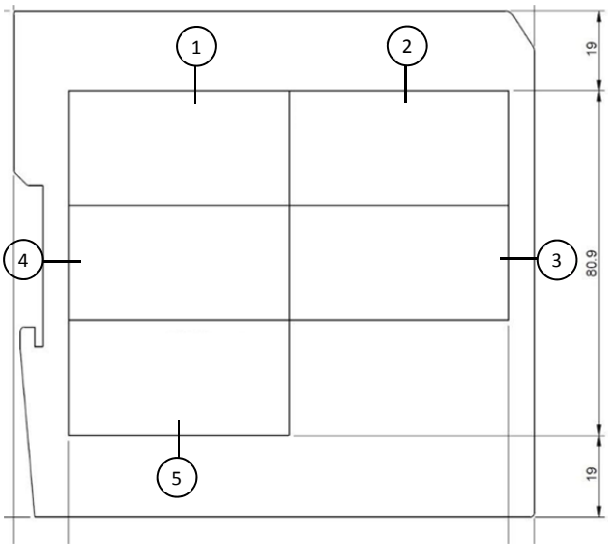
Figure 5
C6 SMART bottom view

1. RESET: pushing this button, a processor reset is requested
2. RESTORE factory default: When pressed, the C6 SMART returns to factory default values

2.6 Labels

On the left side of the CPU are located the following label and approvals.

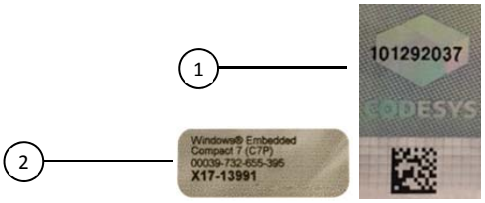
Figure 6
C6 SMART labels



1. Operating System and CODESYS label
2. Product label
3. IP address label
4. COMBIVIS connect label
5. COMBIVIS studio HMI label

2.6.1 Operating System (OS) and CODESYS label

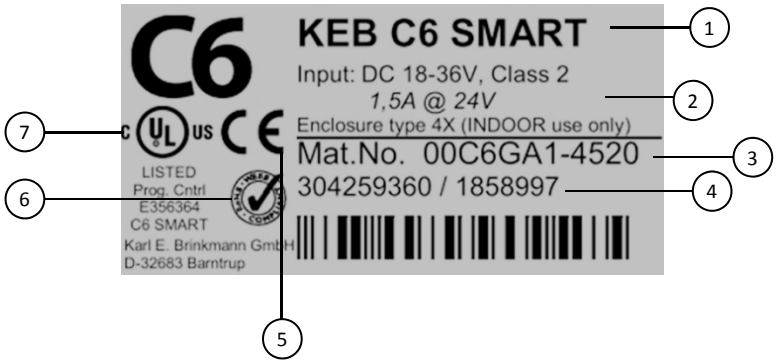
Figure 7
OS and CODESYS label detail



1. CODESYS label
2. OS label

2.6.2 Product label

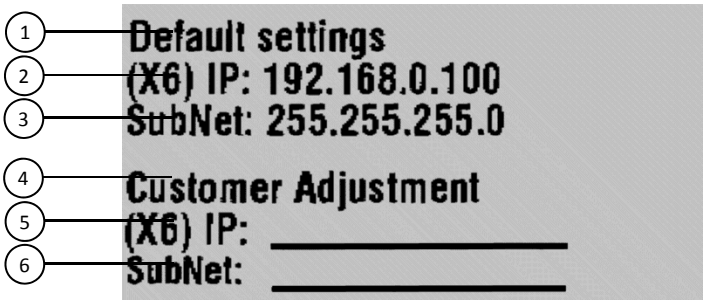
Figure 8
Product label detail



1. Model
2. Electrical information
3. Mat. number
4. Serial number
5. CE marking
6. RoHS marking
7. UL marking

2.6.3 IP address label

Figure 9
IP address label



1. Default settings
2. (x6) IP
3. SubNet
4. Customer adjustment
5. (x6) IP
6. SubNet

2.6.4 COMBIVIS connect label

Figure 10
COMBIVIS label detail

1. Serial number
2. Barcode
3. License key
4. QR code

2.6.5 COMBIVIS studio HMI label

Figure 11
COMBIVIS studio HMI label detail

1. Serial number
2. Barcode

2.7 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). Thanks to the COMBIVIS connect utility; remote connection to the device can also be done. C6 SMART can be equipped with various IO 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 project.
- Process management.

2.7.1 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. Than 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.

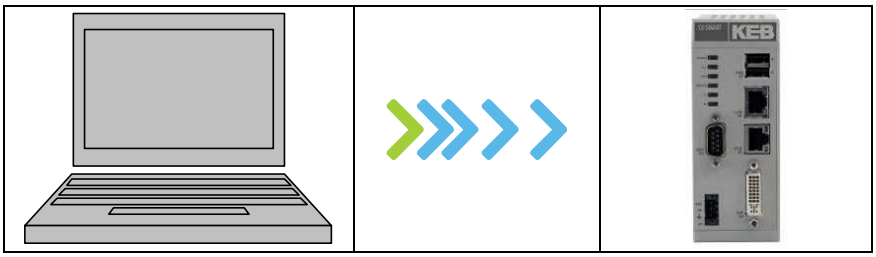


Figure 12
Configuration and project creation

2.7.2 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).

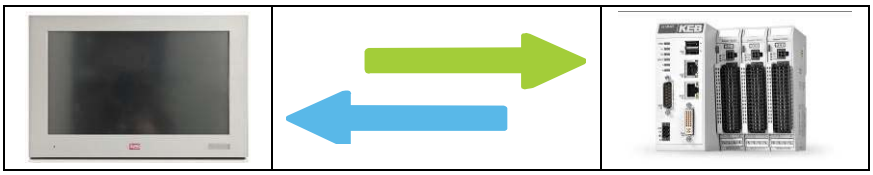


Figure 13
Process management

2.8 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 files function
- Socket handling

Human machine interface:

- Vectorial Graphic Editor
- Wide range of file support (BMP, GIF, JPG, WMF…)
- Multilanguage (Dynamic with Unicode)
- Symbols 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

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

SECTION **3**

Installation and Connection

3.1 Preparation for installation

3.1.1 Select the mounting location

The C6 SMART and its I/O modules are intended for mounting rail installation (according DIN EN50022, 35 x 7.5 mm).
Some Points must be observed on selecting the mounting location:

a) C6 SMART Position should avoid direct sunlight exposure.
b) C6 SMART Position should be ergonomically accessible for the operator.
c) Choose a suitable mounting height.
d) Ensure that the aeration holes are not 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 damaged during shipment.

3.3 Checking the operating conditions

- Read carefully the standards, approvals, EMC parameters and technical specifications for operation of the C6 SMART device. These information are available in the following sections:
    - Certificates and approvals (see section 7.2).
    - Electromagnetic compatibility (see section 7.2).
- Check the mechanical and climatic environmental conditions for operation of the C6 SMART device: Environment conditions (see section 7.1).
- Follow the instructions for local use of C6 SMART device: Notes about usage.
- Adhere to the permissible rated voltage and the associated tolerance range:
    - 24V
    - Range: 18-32 V_{DC}

3.4 Mounting Location

C6 SMART s 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.

3.4.1 Damage due to overheating

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

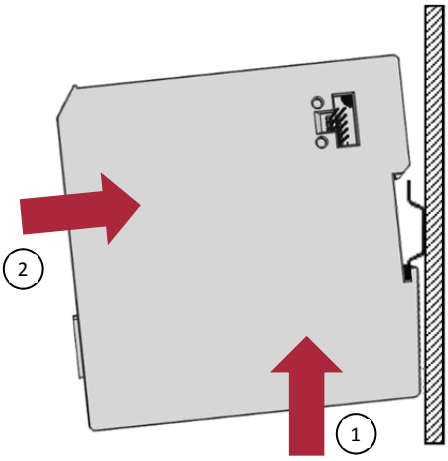
- The operative temperature must be between 0° and 50°C.
- An inclined installation reduces the thermal convection by the C6 SMART device and the maximum permissible ambient temperature for operation. Please contact KEB for details.
- The C6 SMART device may otherwise be damaged and its certifications and warranty will be void.

3.5 Mounting the device

3.5.1 DIN-Rail mounting (to snap on)

1. 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



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

3.5.2 To connect C6 SMART with IO modules

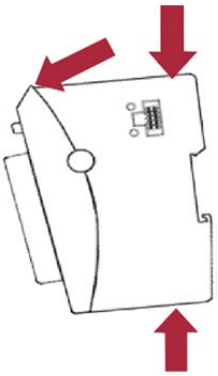
Note:
The number of IO modules must not exceed 20.

- 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.

3.5.3 To disconnect IO 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



3.5.4 To take down a single module

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

3.6 Connecting the device

3.6.1 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”

3.6.2 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 treat 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^2, suitable at least 75C°) to connect the equipment’s ground to C6 SMART’s ground.
2. Connect the cable shield to the equipotential bonding rail on both sides before connecting the cable to the interfaces.

Attention:
The system must be powered with a voltage of 24V (18V÷32V).

3.6.3 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^2 (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.

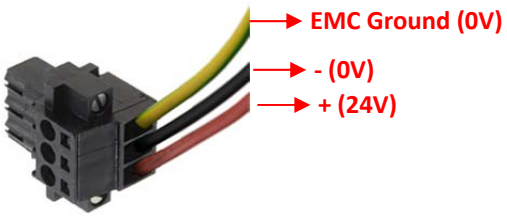


Figure 16
Power supply connection detail

3.6.4 Switching on and testing C6 SMART

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

Figure 17
Initial start of C6 SMART

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.

3.7 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 C6 SMART comes with static IP address as describe on the picture in chapter 2.6.3.

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:

- Click on the start Button, select “Settings” -> “Network and Dial-up Connections”

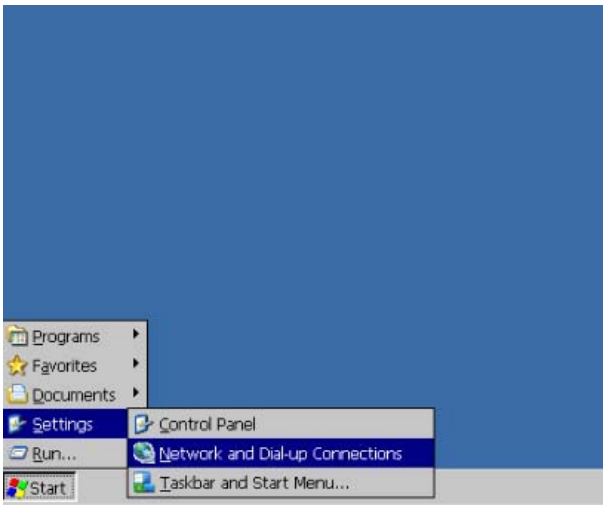


Figure 18
Start Network and Dial-up Connections

- 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 like in the figure below.

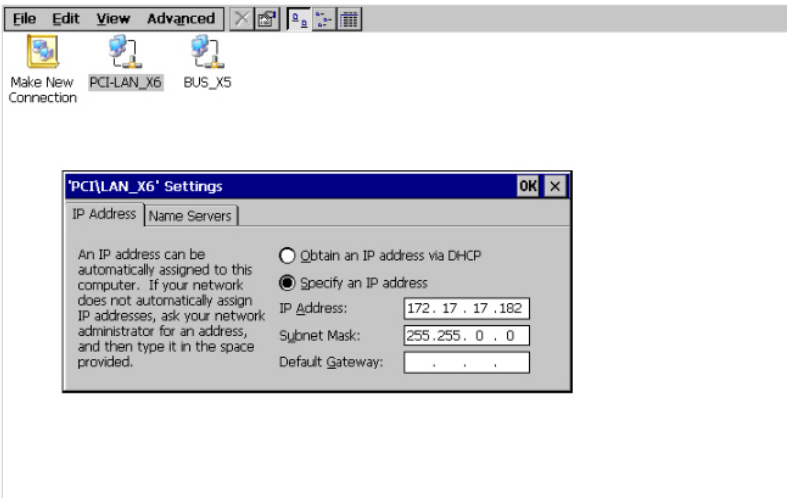
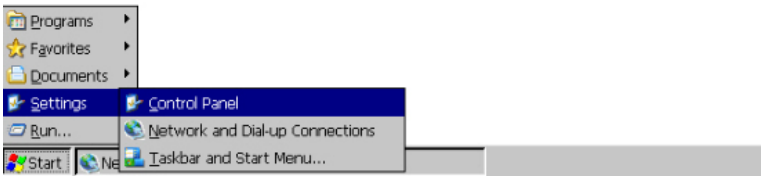


Figure 19
Specify IP address

- 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
Open 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.

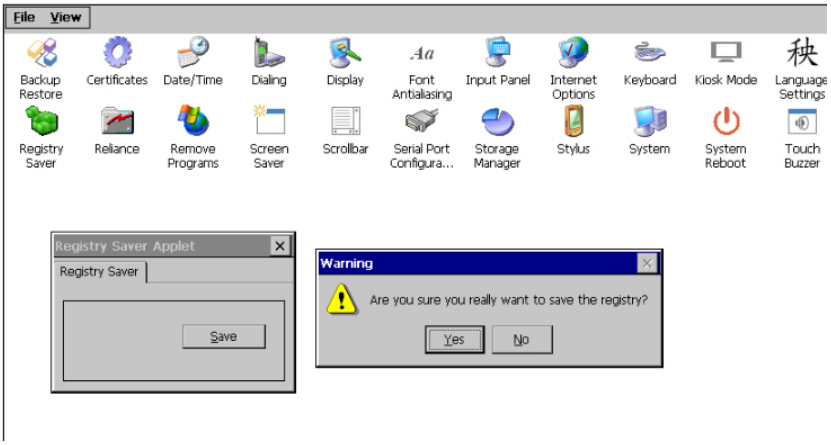


Figure 22
Save the Registry

SECTION 4

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

1. Micro UPS which triggers the event, stops the PLC and writes the Persistent variables into MRAM (max. 128KB in approx. 50ms).
2. Special file system “Reliance Nitro” which has special technics to protecting the data from corruption even during voltage drop event.

Table 2
Memory topologie

C6 SMART Memory topology		
SPI NOR	**eMMC**	
1MB	4GB	
Uboot	Files system Reliance Nitro	
Pre-Load OS	OS Image	
	Windows registry	
	Control RTE	
	HMI runtime (only Quad Core)	
	Connect runtime	
	Repository FACTORY DEFAULT	
SPI MRAM	**Micro SD**	
512KB	8GB	
Persistent Data (128KB)	Files system Reliance Nitro	
	DB files	
	Control Application	
	HMI Application	

4.2 Signaling and diagnostic LEDs

The following table describes all the LEDs meaning and behaviors.

Table 3
LED meanings

Name	Description
Power	Power indication: - Green ON: C6 SMART and C6 Remote IO module power is OK. - Red ON: C6 SMART power is not OK. Typically, that is a temporary status, when C6 SMART power-up procedure is running (typical duration 100ms). - Red BLINK: C6 SMART power is OK. C6 Remote IO module power is not OK (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 indication: - Green ON: PLC Run; - Red ON: PLC Stop/Breakpoint; - Red BLINK: PLC Stop due to Persistent Data Corruption; - Amber ON (both LEDs ON): PLC Stopped for Runtime exception - OFF: CONTROL Runtime not running
Bus status	It indicates the status of 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 Mbps) connector. - Yellow: Unused; - Green: Link/Act;

Note:
The push-buttons dimension and position avoid accidental misuse.

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:

Attention:
For machines in operation "Reset" will cause unpredictable behavior!

Table 4
Push buttons functions

Name	Description
Reset	It resets the Controller.
Restore Factory Default	▪ Short press: PLC passes from start to stop mode or vice versa. ▪ Press 5 sec: PLC reset (to origin). ▪ Keep on pressing this button during power on, the C6 SMART returns to factory default values.

Attention:
The content of all storage memories of the device is lost in "Restore Factory Default"!

SECTION **5**

Commissioning a Project

5.1 COMBIVIS studio 6 BASIC / PRO / ADVANCED 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).

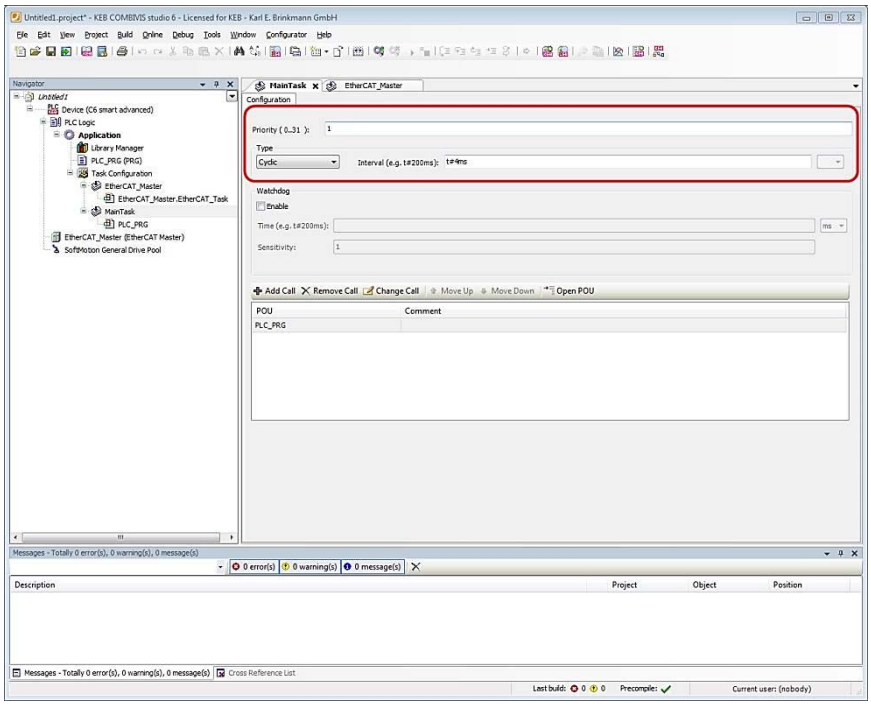
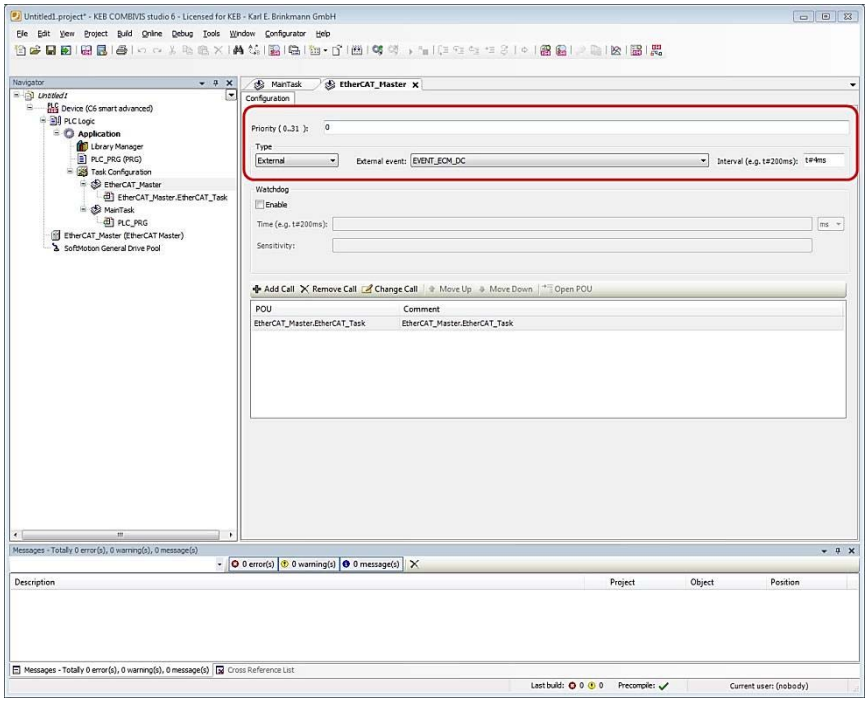


Figure 23
Task configuration

Note:
*For C6 SMART the task configuration for the EtherCAT Master task must be set to Type = "**External**" and External event = "**EVENT_ECM_DC**"!*

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.

Note:
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.

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

Note:
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
-

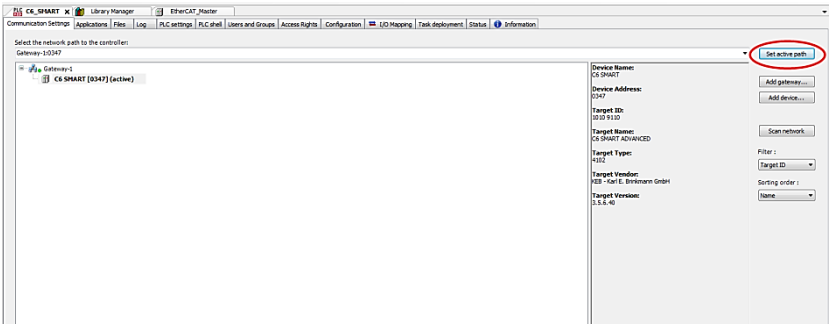


Figure 25
Setting active path

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” and select from the “Vendor” list box “3S Smart Software Solutions GmbH”. The list will be populated with the available master devices. Select the one required by your application in between:

- EtherCAT Master
- Modbus COM (for Modbus based I/O both serial and TCP)
- CANbus

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.

Note: Current implementation if affected by a jitter of about +/- 2ms 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:

1. The panel display and the USB ports are turned off in order to save energy
2. All running IEC tasks are terminated so the retentive areas are consistent
3. The system flushes the retentive data to a file which is saved in the MRAM of the C6 SMART.
4. The CONTROL PLC is terminated

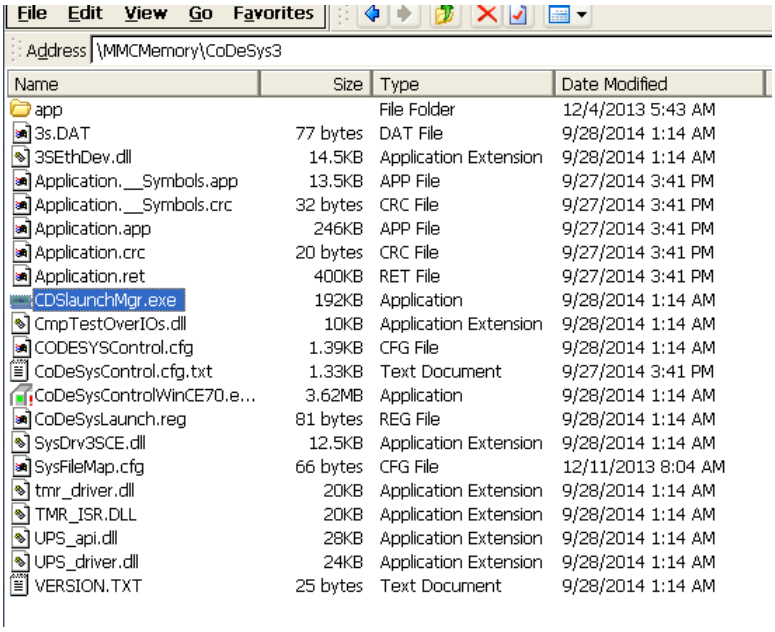
Note: To start the save procedure the ultra-capacitors must be fully charged. (about 2 min. after power on, Power LED must be switched from yellow to green)

Note: The available retentive memory size is of 64KB for the RETAIN memory type and 64KB for the PERSISTENT memory type.

Note: 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 "\MMCMemory\CoDeSys3" folder as shown in the following figure.



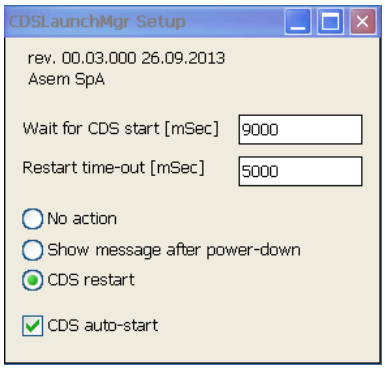
Name	Size	Type	Date Modified
app		File Folder	12/4/2013 5:43 AM
3s.DAT	77 bytes	DAT File	9/28/2014 1:14 AM
3SEthDev.dll	14.5KB	Application Extension	9/28/2014 1:14 AM
Application.__Symbols.app	13.5KB	APP File	9/27/2014 3:41 PM
Application.__Symbols.crc	32 bytes	CRC File	9/27/2014 3:41 PM
Application.app	246KB	APP File	9/27/2014 3:41 PM
Application.crc	20 bytes	CRC File	9/27/2014 3:41 PM
Application.ret	400KB	RET File	9/27/2014 3:41 PM
CDSlaunchMgr.exe	192KB	Application	9/28/2014 1:14 AM
CmpTestOverIOs.dll	10KB	Application Extension	9/28/2014 1:14 AM
CODESYSControl.cfg	1.39KB	CFG File	9/28/2014 1:14 AM
CoDeSysControl.cfg.txt	1.33KB	Text Document	9/27/2014 3:41 PM
CoDeSysControlWinCE70.e...	3.62MB	Application	9/28/2014 1:14 AM
CoDeSysLaunch.reg	81 bytes	REG File	9/28/2014 1:14 AM
SysDrv3SCE.dll	12.5KB	Application Extension	9/28/2014 1:14 AM
SysFileMap.cfg	66 bytes	CFG File	12/11/2013 8:04 AM
tmr_driver.dll	20KB	Application Extension	9/28/2014 1:14 AM
TMR_ISR.DLL	20KB	Application Extension	9/28/2014 1:14 AM
UPS_api.dll	28KB	Application Extension	9/28/2014 1:14 AM
UPS_driver.dll	24KB	Application Extension	9/28/2014 1:14 AM
VERSION.TXT	25 bytes	Text Document	9/28/2014 1:14 AM

Figure 26
Start CDSlaunchMgr.exe

To start it, simply double click on the file name.

The launcher manager interface is shown in the following figure.

Figure 27
CDS Launch Manager



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

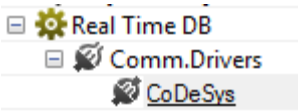
"Restart timeout" is the time the launcher waits before restarting CONTROL runtime.

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.

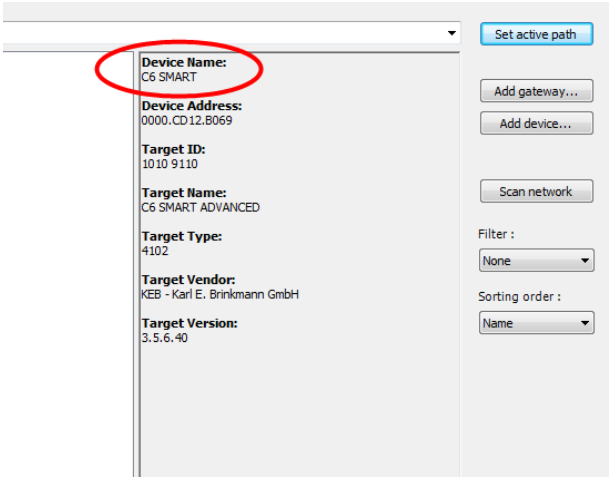
Figure 28
Configuring COMBIVIS studio HMI project



The protocol uses a socket to communicate with the CONTROL Runtime through the Gateway component.

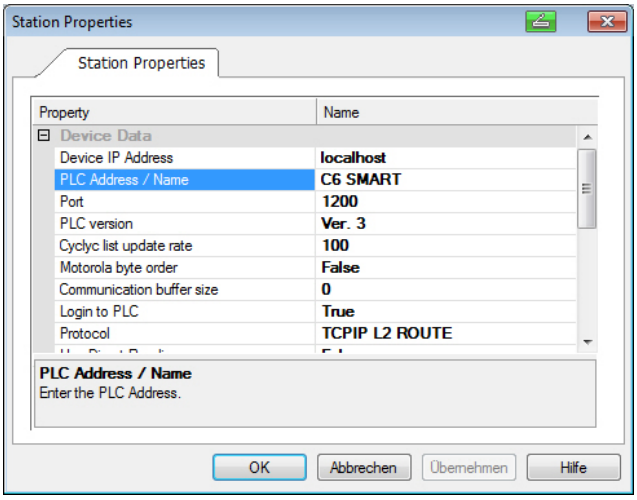
The station must be configured to connect to "localhost". The device name is the one shown by the programming system COMBIVIS studio 6 when connected online with the C6 SMART device from the "Communication settings" window as shown in the following figure.

Figure 29
Device Name in COMBIVIS studio 6



The HMI Station Properties will result as following.

Figure 30
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.

Note: 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;

Note: 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 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 overall 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.
ATTENTION: 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 download a project you can retransfer another project or another version of the same project without any special operation, also 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 Configuring 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 in control panel

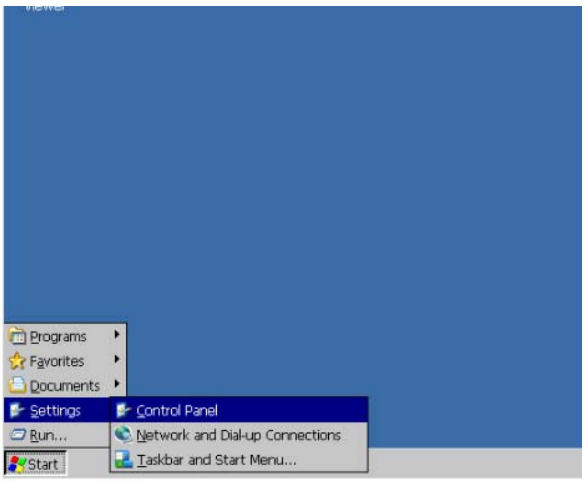


Figure 31
Opening Control Panel

Double click on “Serial Port Configuration”

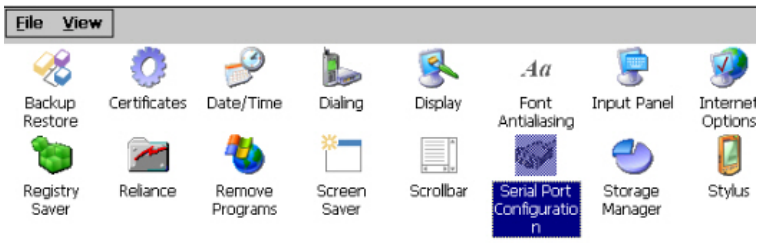


Figure 32
Starting Serial Port Configuration

Choose the type of serial communication

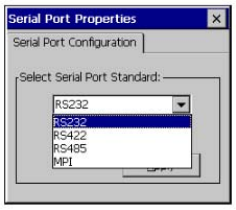
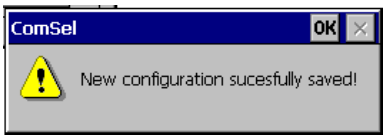


Figure 33
Configuring the serial port

Note:
This applet can be used just to check which serial communication mode is active; in this case it is enough to push the “close cross” on the high right side of the panel

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 34
Serial Port configuration saved



Please note that MPI mode cannot be selected: when this protocol will be used by HMI software all required settings will be applied automatically.

5.2.4 Connecting the serial port

A unique DB15 male connector hosts all serial protocols (please check par. 7.5.2 for pin-out details) so it is necessary to adapt this connection to plant needs; 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:

1. Stop the C6 SMART project from the configuration PC
2. Start the C6 SMART project from the configuration PC
3. Debug the project from the configuration PC
4. Transfer the project from C6 SMART to the configuration PC.

5.2.6 Stopping the running project

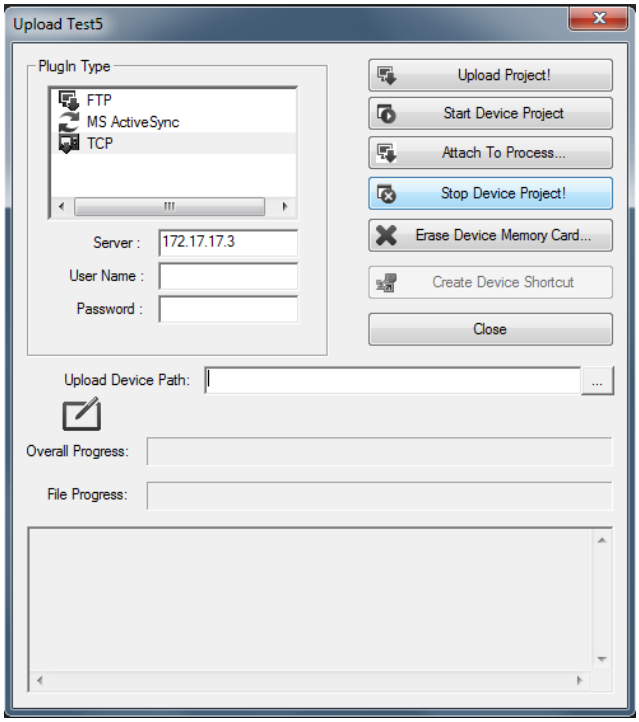


Figure 35
Stopping the running project

To stop a project running in C6 SMART you must:

5. Select TCP in the upper left list
6. Insert the IP address of C6 SMART
7. Click on the button "Stop Device Project!"

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

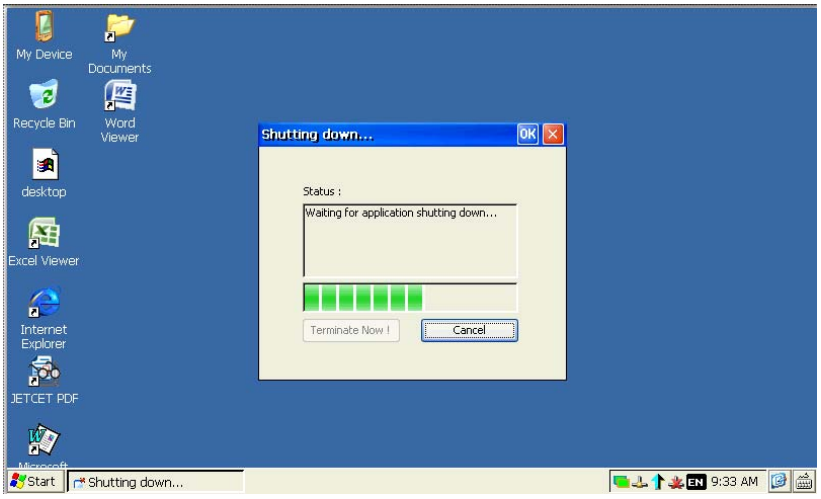


Figure 36
Project shut down

5.2.7 Starting the project

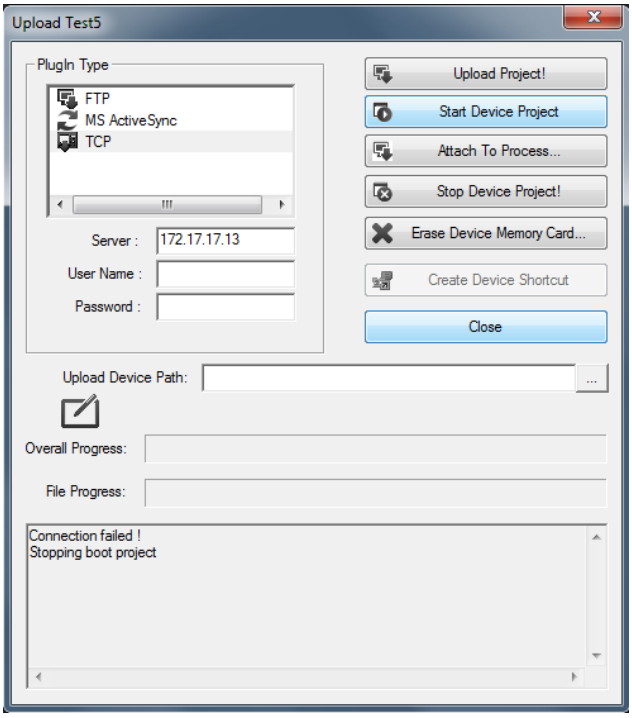


Figure 37
Starting the project

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

8. Select TCP in the upper left list
9. Insert the IP address of C6 SMART
10. Click on the button “Start Device Project”

You will see the C6 SMART project starting

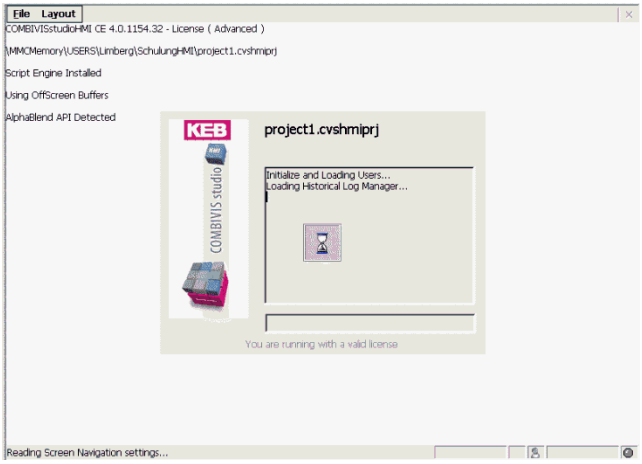


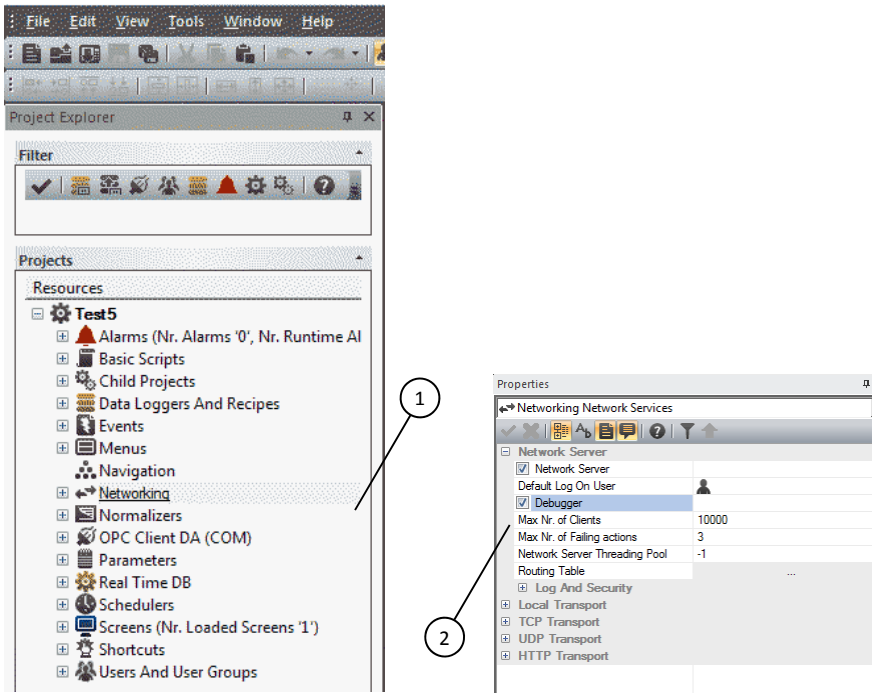
Figure 38
Starting the project

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:

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

Figure 39
Debugging the project



Transfer the project to C6 SMART and start running.
NOTE: Be sure that the project is running otherwise you cannot debug the project

To debug the project running in C6 SMART from the configuration PC you must:

1. Select TCP in the upper left list
2. Insert the IP address of C6 SMART

Click on the button “Attach To Process…”

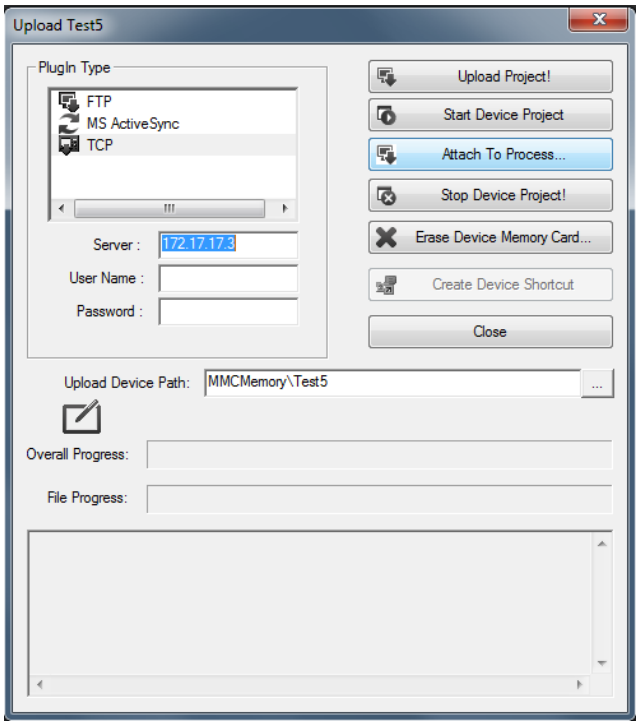


Figure 40
Debugging the project

The following window will appear

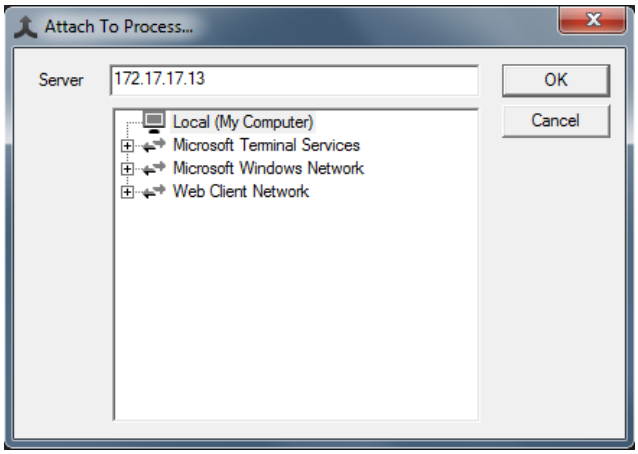


Figure 41
Debugging the project

Write the IP address of C6 SMART and click on the “OK” button. A new window opens that asks for user and password

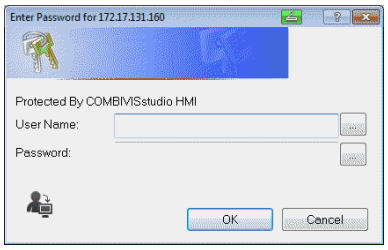


Figure 42
Enter Password

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.

You will see that a debug session will start in COMBIVIS studio HMI on the configuration PC. Now you are able to:

- See the project screens and navigate between them. 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
- Put breakpoint and debug Visual Basic scripts running in the project

5.2.9 Transfer the project from C6 SMART to the configuration PC

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.

Hint: 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.

Be sure that the project is not running on C6 SMART, run COMBIVIS studio HMI on the configuration PC, click on the “File” menu and select “Open Device Project…”

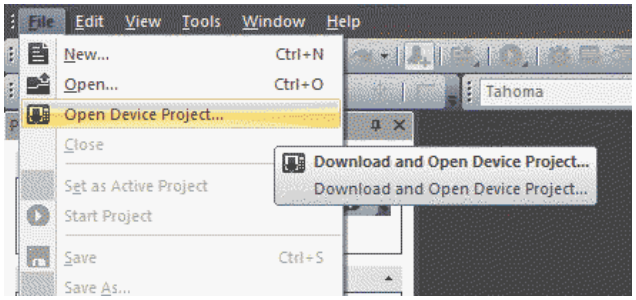


Figure 43
Debugging the project

1. Select TCP in the upper left list
2. Write the IP address of C6 SMART
3. Write the path on which you want to store the project on your configuration PC
4. Click on the button “Get Project from Device!”

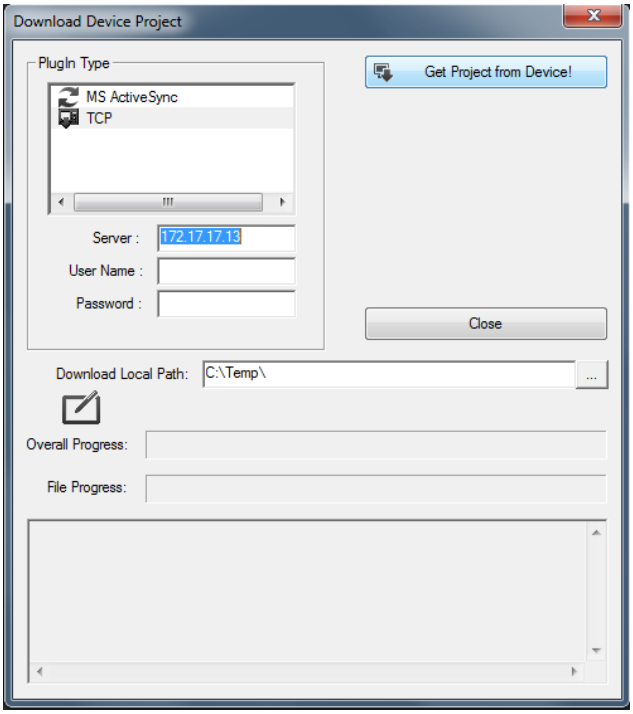


Figure 44
Debugging the project

After the transfer of the project you will see the project explorer containing the project resources in COMBIVIS studio HMI and you will 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.

SECTION 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 and comes as built-in component of the operating system image.
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:

Figure 45
System Manager Control Panel Applets

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

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

6.1.1 Backup Restore

The "Backup Restore" utility interface is shown in the following figure.
The utility provides two functionalities:

System clone and restore
Selective feature backup and selective restore

6.1.2 System clone and Restore

To store Clone snapshots and selective feature backup, the System manager utility uses a single file container with extension ".ASR" which includes all the information and data required later for the restore operation.

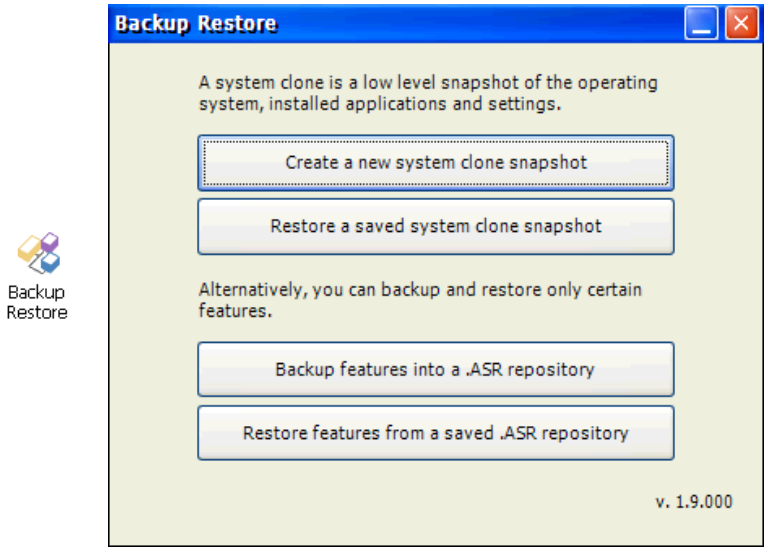


Figure 46
Backup Restore

Note:
The settings saved by the clone process are those related to the system (IP address, network configuration, system time, etc.) and those related to the application installed (Control project, HMI, Connect). Any specific user setting, except for the autorun keys) are not saved.

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 process with the clone process, click on the "Create a new system clone snapshot" button.

The clone operation has two optional settings:

1) Operating system image: allows to create a clone of the operating system ROM image.

2) 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.

Note:
Destination path for the clone file can be only an external storage disk such a USB pen drive.

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.

Note:
The restore of a clone snapshot cannot be selective.

The status bar at the bottom of the system manager application informs on the operation in progress.

Attention:
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 COMBISVIS connect Domain, it will lose it 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.

The restore process provides the automatic shutdown of the running processes (Control project, HMI, connect), the file replacement form 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.

Note:
If the System manager is not able to determine the compatibility condition, it will display a warning message and final decision is left to the user.

Selective backup and restore

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

To start the selective backup, click on 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.

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

Note:
Destination path for the selective backup file can be internal or external storage disk.

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 reboot to complete; 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.

Note:
If the System manager is not able to determine the compatibility condition, it will display a warning message and final decision will be left to the user.

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.

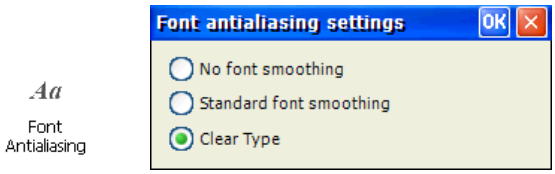
6.1.3 Font Antialiasing

The utility allows to set the font quality rendering options.

Note:
Font Antialiasing is ONLY supported by ARM based devices (C6 HMI, C6 HMI LC, C6 SMART).

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

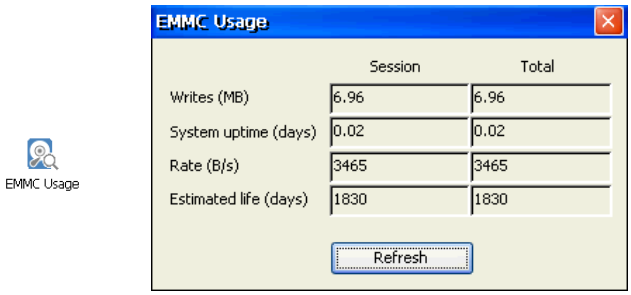
Figure 47
Font Antialiasing



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 48
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.

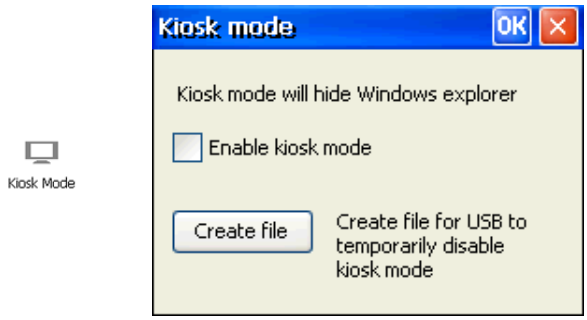


Figure 49
Kiosk Mode

To enable kiosk mode, just open the utility and mark the “Enable kiosk mode” 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 pen drive into an USB port and store the file directly on the root of the USB disk.
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.

Note:
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.

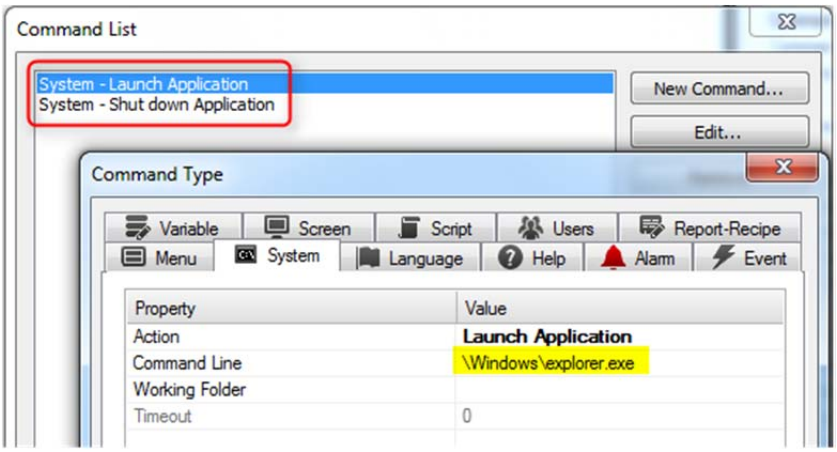


Figure 50
Launch Explorer from COMBISVIS studio HMI

6.1.6 Language settings

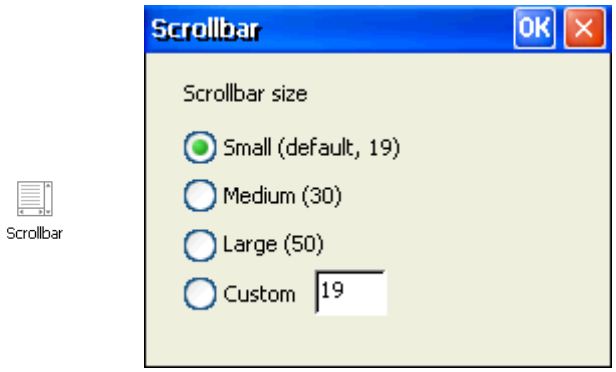
The utility provides fonts installation for the Chinese, Japanese and Korean languages

Figure 51
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 52
Configuring Scrollbar

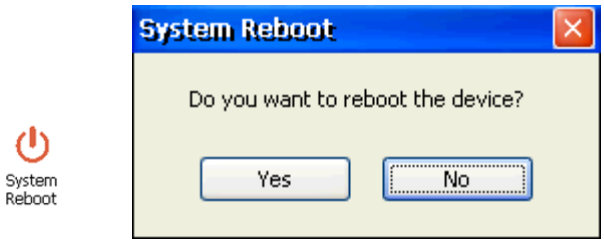


From the window, just select the desired size of the scrollbars and confirm.

6.1.8 System reboot

The utility allows to reboot the system.

Figure 53
System Reboot



SECTION 7

Maintenance and Care

7.1 Opening C6 Smart

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

Figure 54
Opening C6 Smart

Figure 55
Opening C6 Smart

- Carefully extract the cover.

Figure 56
Opening C6 Smart

- Carefully extract the system from the chassis.

Figure 57
Opening C6 Smart

Figure 58
Opening C6 Smart

Danger
Risk of explosion if the battery is replaced with an incorrect type. Dispose of used batteries according to the instructions

7.2 Backup battery replacement (CR2032 3V)

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 59
Battery area

Figure 60
Battery detail

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

Note:
For further details on battery refer to section 7.3 ***Battery technical data***

Figure 61
Battery replace

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

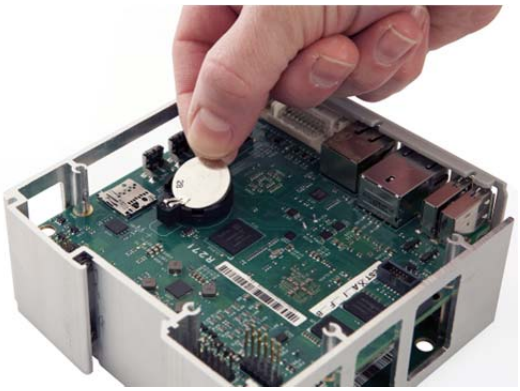


Figure 62
Battery replace

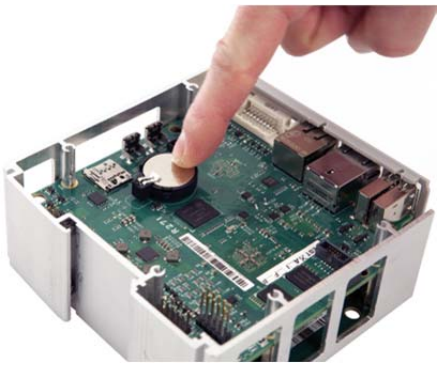


Figure 63
Battery replace

Attention:
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.

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).

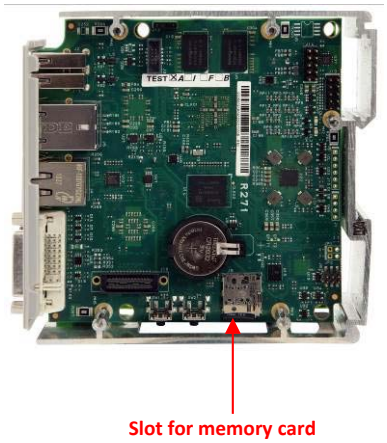


Figure 64
Slot for memory card

This card is not accessible from external

- See paragraph 6.1 to correctly open the system.
- Extract the Micro SD by pushing to release it from the holder.

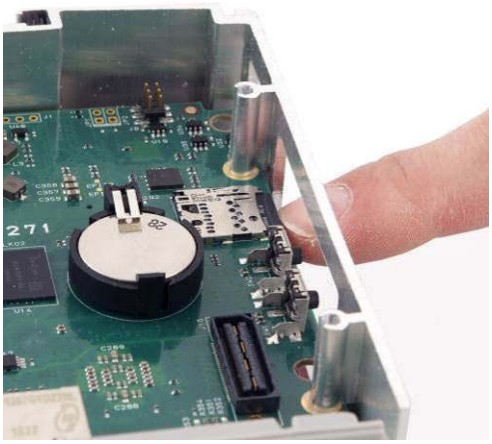


Figure 65
Pushing memory card

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

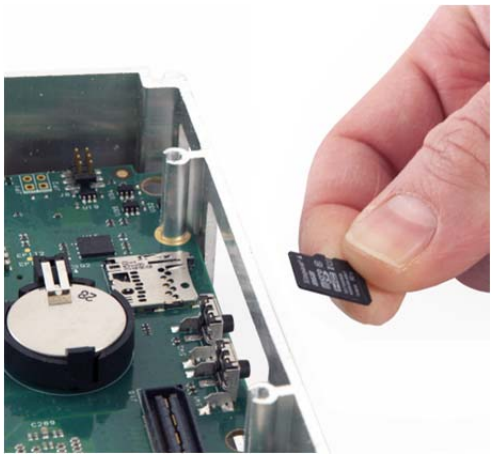


Figure 66
Remove memory card

7.4 Recycling and disposal

C6 SMART can be recycled due to the use of materials with low environmental impact. Contact a certified disposal service company for environmentally sound recycling and disposal of your old devices.

SECTION 8

Technical Specification

8.1 Technical specifications

Table 5
System Software Characteristics

System software characteristics				
Integrated system software	Operating System	Microsoft Windows Embedded Compact 7 (C7P)		
	HMI (Only for Quad Core)	COMBIVIS HMI Runtimes (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 for Quad Core)		***BASIC***		***ADVANCED***

Table 6
Main Features of CONTROL PLC

MAIN FEATURES of CONTROL PLC		
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, 8ms recommend
	CPU occupation	max 80%
	Variable exchanged with DIN-RAIL IPC	max suggested 1024
	Datalogging interval	Suggested > 1s
	PRO functions	Yes
	ADVANCED funct.	Yes

Table 7
Mechanical characteristics

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 re-sistance	EN 60068-2-6, vibration EN 60068-2-27, shock
	Dimension	Height: 122.0 mm (the same of C6 Remote IO module) Width: 47.0 mm. Depth: 124.0 mm.

Table 8
System hardware characteristics

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 – 533MHz
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) software se-lectable. (Optional)
	Galvanic Isolation	Yes
CAN Interface		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 interfaces	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 re-movable	**eMMC**: 4 GB - 8 bit v. 4.4 compatible (see Chapter 4.1)
	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 buttons	See chapter 4.3
	LEDs	See chapter 4.2

Table 9
Electrical characteristics

Electrical characteristics		
Power supply	Type	Integrated on board, auto ranging
	Input voltage	18÷32 VDC with 3 poles connector
	Protections	Anti-inversion polarity, over-voltage, 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 min Rearm time: 90 sec
These devices are intended to be connected to a "Secondary Circuit Overvoltage Category II"		

Table 10
Environmental characteristics

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

Table 11
Warranty and approvals

Warranty & approvals		
CE	Emission	Conforms to EN 55022 Information technology equipment – Radio disturbance characteristics
	Immunity	Conforms to EN 55024 Information technology equipment – Immunity characteristics
	Safety	Conforms to EN 60950-1 – Information technology equipment – Safety
c UL us LISTED	Programmable Controllers 4WZ2 E356364	

8.2 Certificates and approvals

- KEB's products are compliant with European Directive 2014/30/EU concerning electromagnetic compatibility and Directive 2014/35/EU concerning the safety of electrical products, and subsequent variations.

- Emission
  Conforms to EN 55022 Information technology equipment – Radio disturbance characteristics
- Conforms to EN 61000-3-2 – Limits for harmonic current emissions
- Conforms to EN 61000-3-3 – Limits of voltage fluctuation and flicker

- Immunity
  Conforms to EN 55024 Information technology equipment – Immunity characteristics

- Safety Conforms to EN 60950-1 – Information technology equipment – Safety

- Programmable Controllers NRAQ E479848

8.3 Battery technical data

Figure 67
Battery CR2032 detail

Table 12
Battery technical data

Model	***CR2032 MFR renata***
Chemical System	Li / MnO2
Nominal Voltage	3 V
Rated Capacity	225 mAh
Temperature Range	-30°C - +70°C
Self Discharge at 23°C	< 1% / year

Battery performance

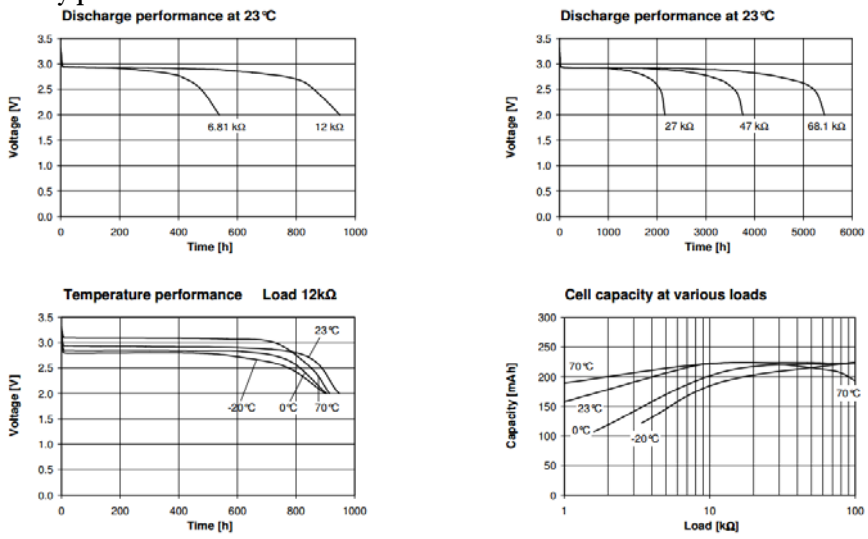


Figure 68
Battery performance

Battery dimensions

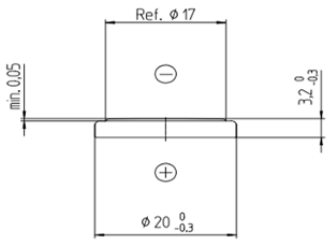


Figure 69
Battery dimensions

8.4 Dimension drawings

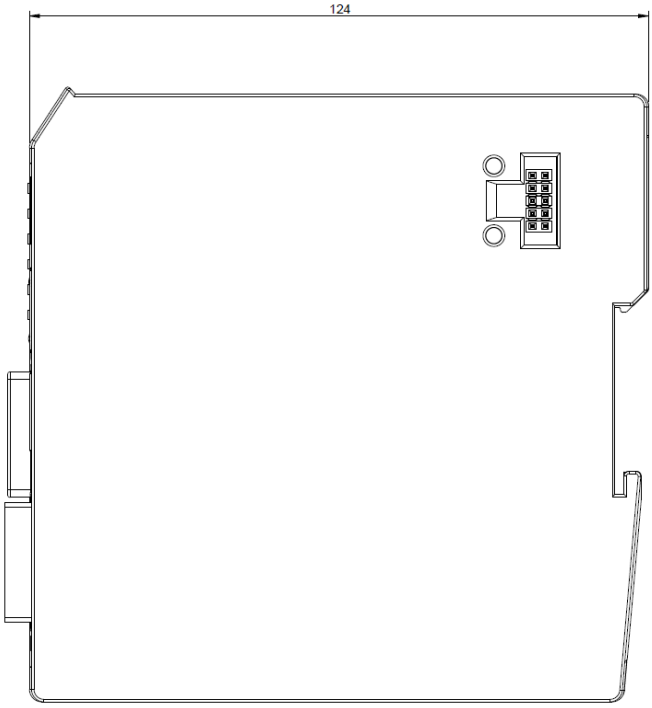


Figure 70
C6 SMART side view

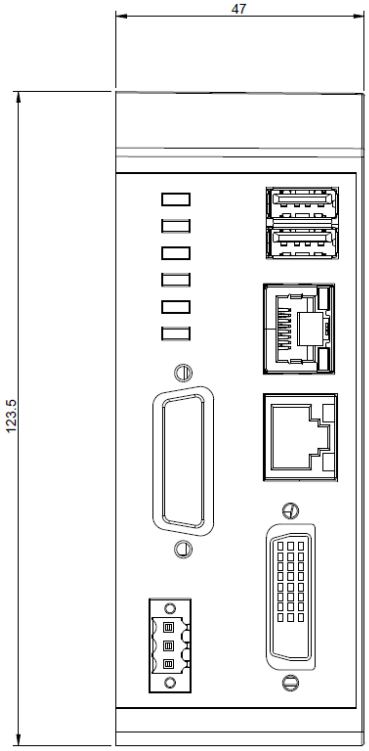


Figure 71
C6 SMART front view

8.5 Ports PINOUT

8.5.1 Power supply X1

Table 13 Power supply

PIN	Signal
1	24V
2	0V
3	GND

8.5.2 SER X2

Table 14 SER

PIN	Signal	I/O
1	+5 VDC	OUT
2	Transmit Data (RS-232)	OUT
3	Receive Data (RS-232)	IN
4	Request To Send	OUT
5	Clear To Send	IN
6	Data Set Ready	IN
7	Ground	—
8	Data Terminal Ready	OUT
9	Carrier Detect	IN
10	Transmit Data +/Receive Data + (RS-485/RS-422)	I/O
11	Transmit Data -/Receive Data - (RS-485/RS-422)	I/O
12	Ring Indication (RS-232)	IN
13	Receive Data + (RS-422)	IN
14	Receive Data - (RS-422)	IN
15	N.C.	N.C.

Note:
Any polarization or termination resistor is connected to RS422/485 channel so, if required, it has to be provided by the user into the plant con-nector.

8.5.3 LAN X5

Table 15 LAN

PIN	Signal
1	TX+
2	TX-
3	RX+
4	Shield
5	Shield
6	RX-
7	Shield
8	Shield

8.5.4 BUS X5

Table 16 BUS

PIN	Signal
1	TX+
2	TX-
3	RX+
4	BI3+
5	BI3-
6	RX-
7	BI4+
8	BI4-

8.5.5 USB X7

Table 17 USB A

PIN	Signal USB A
1	+5 Vcc
2	USB Data -
3	USB Data +
4	GND

Table 18 USB B

PIN	Signal USB B
1	+5 Vcc
2	USB Data -
3	USB Data +
4	GND

8.5.6 CAN X2

Table 19 CAN

PIN	Signal
1	-
2	CAN_L
3	CAN_GND
4	-
5	CAN_SHLD
6	CAN_GND
7	CAN_H
8	-
9	CAN_V+

8.5.7 DVI-D X4

Table 20 DVI

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 1-	**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

8.6 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.

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