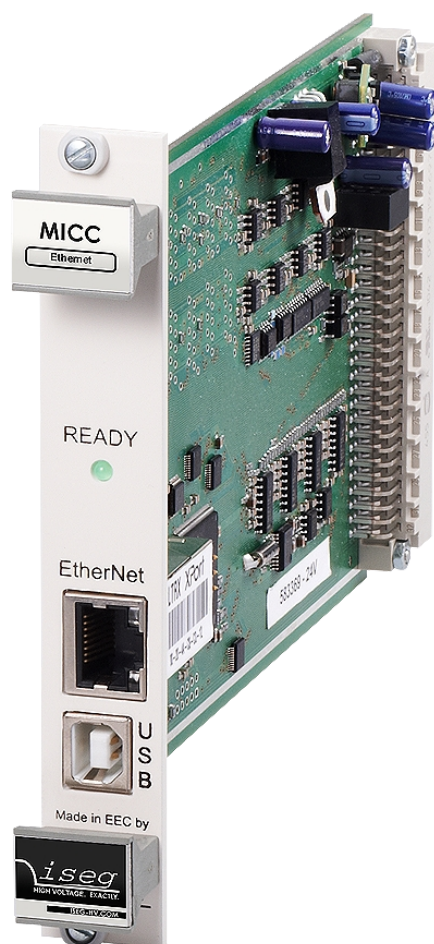


Technical documentation  
Last changed on: 13.07.2020

# MICC CONTROLLER

20/24 BIT MMC SYSTEM CONTROLLER

- CAN, USB and Ethernet interfaces
- 16 analog output with 20 Bit DAC
- 32 analog inputs with 24 Bit ADC
- 24 digital I/O ports
- MMC module ID chip support



## Document history

| Version | Date       | Major changes                    |
|---------|------------|----------------------------------|
| 1.1     | 13.07.2020 | improved documentation (Inhibit) |
| 1.0     | 13.01.2020 | Initial relayouted version       |

## Disclaimer / Copyright

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**The information in this manual is subject to change without notice. We take no responsibility for any mistake in the document. We reserve the right to make changes in the product design without reservation and without notification to the users. We decline all responsibility for damages and injuries caused by an improper use of the device.**

# Safety

This section contains important security information for the installation and operation of the device. Failure to follow safety instructions and warnings can result in serious injury or death and property damage.

Safety and operating instructions must be read carefully before starting any operation.

We decline all responsibility for damages and injuries caused which may arise from improper use of our equipment.

## Depiction of the safety instructions

### DANGER!



DANGER!

"Danger!" indicates a severe injury hazard. The non-observance of safety instructions marked as "Danger!" will lead to possible injury or death.

### WARNING!



WARNING!

"Warning!" indicates an injury hazard. The non-observance of safety instructions marked as "Warning!" could lead to possible injury or death.

### CAUTION!



CAUTION!

Advices marked as "Caution!" describe actions to avoid possible damages to property.

### INFORMATION



INFORMATION

Advices marked as "Information" give important information.



Read the manual.



HIGH VOLTAGE

Attention high voltage!



Important information.

## Intended Use

The device may only be operated within the limits specified in the data sheet. The permissible ambient conditions (temperature, humidity) must be observed. The device is designed exclusively to control high voltage systems as specified in the data sheet. It must only be used specified in 4 Technical data. Any other use not specified by the manufacturer is not intended. The manufacturer is not liable for any damage resulting from improper use.

## Qualification of personnel

A qualified person is someone who is able to assess the work assigned to him, recognize possible dangers and take suitable safety measures on the basis of his technical training, his knowledge and experience as well as his knowledge of the relevant regulations.

## General safety instructions

- Observe the valid regulations for accident prevention and environmental protection.
- Observe the safety regulations of the country in which the product is used.
- Observe the technical data and environmental conditions specified in the product documentation.
- You may only put the product into operation after it has been established that the high-voltage device complies with the country-specific regulations, safety regulations and standards of the application.
- The high-voltage power supply unit may only be installed by qualified personnel.

## Important safety instructions

### DANGER!



DANGER!

This device is part of a high voltage supplying systems.  
High voltages are dangerous and may be fatal.

USE CAUTION WHILE WORKING WITH THIS EQUIPMENT.  
BE AWARE OF ELECTRICAL HAZARDS.

Always follow at the minimum these provisions:

- High voltages must always be grounded
- Do not touch wiring or connectors without securing
- Never remove covers or equipment
- Always observe humidity conditions
- Service must be done by qualified personnel only

### WARNING



WARNING!

RAMP DOWN VOLTAGES !

Before insertion or removal of crate controller, please make sure, that all voltages are ramped down, crates are switched off and power cord is disconnected.

### WARNING!



WARNING!

Do not operate the unit if you suspect the unit or the connected equipment to be damaged.

### CAUTION!



CAUTION!

When installing the units, make sure that an air flow through the corresponding air inlet and outlet openings is possible.

### CAUTION!



CAUTION!

When controlling, with software, the high voltage systems, make sure that nobody is near the high voltage or can be injured.

### INFORMATION



INFORMATION

Please check the compatibility with the devices used.

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# 1 General description

The universal MICC (Multichannel Interface Crate Controller) interface board connects the analog ports of MMC HV modules in 3U cassettes (CPS, DPS, EPS) with digital standard interfaces. Available interfaces are CAN bus (at the 96 pin 96-pin connector according to DIN 41612), USB and Ethernet.

This allows to integrate the devices with an analog interface into computer-based control systems. The high resolution of analog inputs and outputs allows a very precise control of current and voltage of connected devices. For DPS cassette modules it is also possible to switch the polarity via interface.

To digitally control the HV modules over their analog interface, a user calibration is necessary first. For completely delivered system, this is already done at the factory. If MMC devices are added or exchanged later, the user calibration has to be repeated.

The MICC supports the following functions:

- Setting and reading of voltage/current/ramp
- Setting HV on/off
- External INHIBIT input
- Electronic polarity switching for DPS
- Detecting connected modules by ID chip

Package contents / Accessories

| Hardware | included        | optional              |
|----------|-----------------|-----------------------|
| MICC     | MICC controller | See also 8 Accesories |
| MICCETH  |                 |                       |

Table 1: Package contents

# 2 Compatibility

The MICC controller can be used in the following MMC crates:

| SYSTEM                                                                                                        | NUMBER OF SLOTS                     | LIMITATIONS                                                                                                         |
|---------------------------------------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| ECH 124                                                                                                       | 4                                   | Full $V_{set}$ / $I_{set}$ capability                                                                               |
| ECH 128                                                                                                       | 8                                   | Full $V_{set}$ / $I_{set}$ capability                                                                               |
| ECH 12A                                                                                                       | 10                                  | $I_{set}$ is preset to $I_{nom}$ of the corresponding HV-module, i.e. no adjustable constant current mode possible. |
| ECH 14A                                                                                                       | 10 + 1 EBS 4 channel <sup>(1)</sup> |                                                                                                                     |
| Notes                                                                                                         |                                     |                                                                                                                     |
| <sup>1)</sup> External INHIBIT in ECH14A is not supported, the EBS module will not shut off with the INHIBIT. |                                     |                                                                                                                     |

Table 2: Compatible MMC crates

# 3 Order options

| OPTIONS  | OPTION CODE | EXAMPLE |
|----------|-------------|---------|
| Ethernet | ETH         | MICCETH |

Table 3: Order options

## 4 Technical data

| SPECIFICATIONS                                                                                                                                                                                                                     | MICC                                                                                             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| Connection                                                                                                                                                                                                                         | CAN, USB, Ethernet <sup>1)</sup><br>96-pin MMC connector according to DIN 41612                  |
| Digital interfaces                                                                                                                                                                                                                 | 16x 20 bit analog OUT<br>32x 24bit analog IN<br>24 digital I/OCAN, USB, Ethernet <sup>1)</sup>   |
| Control input                                                                                                                                                                                                                      | External INHIBIT                                                                                 |
| Analog Control outputs                                                                                                                                                                                                             | 16x DAC with resolution 20-bit<br>(e.g. $8 \times V_{setr}$ , $8 \times I_{set}$ ) <sup>2)</sup> |
| Analog Control inputs                                                                                                                                                                                                              | 32x ADC with resolution 24-bit<br>(e.g. $10 \times V_{measr}$ , $10 \times I_{meas}$ )           |
| Digital signals                                                                                                                                                                                                                    | 24 digital I/O channels                                                                          |
| Voltage setting                                                                                                                                                                                                                    | via software interface                                                                           |
| Voltage measurement                                                                                                                                                                                                                | via software interface                                                                           |
| Current setting                                                                                                                                                                                                                    | via interface                                                                                    |
| Current measurement                                                                                                                                                                                                                | via interface                                                                                    |
| Operation temperature                                                                                                                                                                                                              | 0 ... 50°C ambient without derating                                                              |
| Storage temperature                                                                                                                                                                                                                | -20 °C ... 70 °C                                                                                 |
| Humidity                                                                                                                                                                                                                           | 20 ... 80 %, not condensing                                                                      |
| Dimensions (L/W/H)                                                                                                                                                                                                                 | 160mm / 4HP / 3U                                                                                 |
| Weight                                                                                                                                                                                                                             | 0.2 kg                                                                                           |
| Notes:<br><sup>1)</sup> Only MICCETH, controller with Option Ethernet<br><sup>2)</sup> For ECH 12A and 14A, $I_{set}$ is preset to $I_{nom}$ of the corresponding HV-module, i.e. no adjustable constant current mode is possible. |                                                                                                  |

Table 4: Technical data

## 5 Operation principle

The heart of the MICC is the Microcontroller CPU. It combines the digital interfaces (CAN, USB, Ethernet) with the analog-to-digital and digital-to-analog components, as shown in the following schematic diagram.

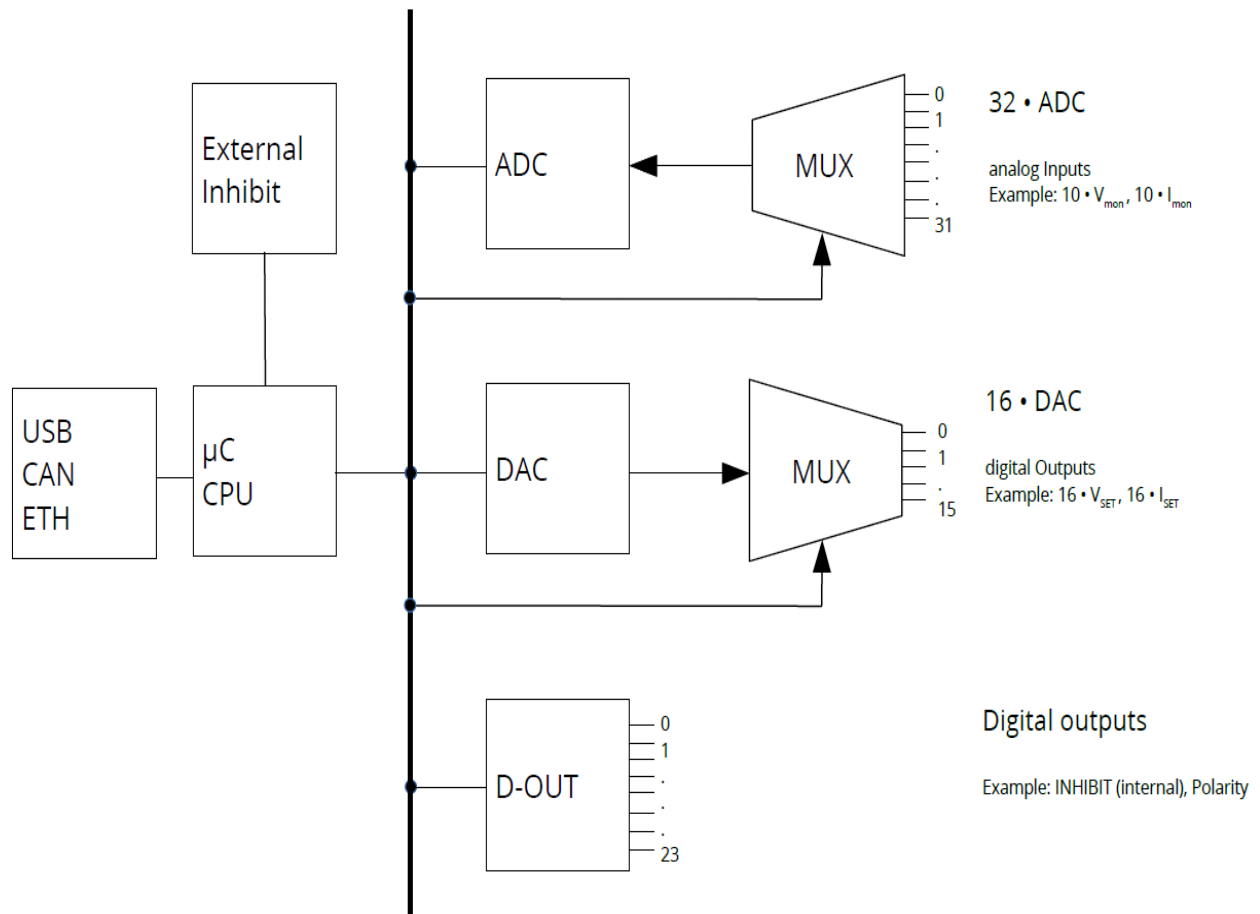


Figure 1: Schematic diagram

## 6 Operation and maintenance

The following safety instructions are intended to ensure the personal safety of the user, operating personnel as well as the safety of the product described and of the devices connected to it. Failure to observe the safety regulations and warnings can result in serious bodily injury or death and damage to property.

### WARNING!



WARNING!

The high voltage supply may only be installed, commissioned, and operated by qualified personnel. Qualified specialists are able, based on their training and experience, to identify risks in handling these products/systems and to avoid possible hazards.

### WARNING!



WARNING!

Risk of death due to electric shock!  
Disconnect the device from the mains before starting any work. Do not open the housing of the unit!

### INFORMATION



INFORMATION

The MICC translates between the MMC modules physical voltage and current values and their digital representation to the interfaces. As the MICC cannot know the physical values, a careful user calibration is needed. During this calibration, the MICC is programmed to the correct values for every slot.

In most cases this user calibration was already made during the factory process. Only if a HV unit will be changed by another one with different nominal values or a free slot will be used the first time, a user calibration of this slot is necessary.

As the MICC cannot detect if MMC modules are exchanged, the user calibration has to be confirmed on every power on cycle with the HV\_OK command. See section 7 Interfaces for more information.

Before operation and connecting to mains, make sure, that all cables are connected and airflow is not impeded. The case must not be covered and installed properly. After turning on the mains switch of the crate, the controller will start up in standby mode. For more details and handling please read the corresponding crate manual.

## 7 Interfaces

The three available interfaces CAN, USB and Ethernet are described in the following sections. iseg provides applications to remote control the MICC, these are shown in the following table.

Further information can be found in the documentation in the 10 Appendix.

| Application         | Platform       | CAN (EDCP) | USB (SCPI) | Ethernet (SCPI) |
|---------------------|----------------|------------|------------|-----------------|
| iseg CAN HV Control | Windows        | Yes        | –          | –               |
| iseg Control 1      | Windows, Linux | Yes        | Yes        | Yes             |
| iseg HAL            | Windows, Linux | Yes        | Yes        | Yes             |
| iseg SCPI Control   | Windows, Linux | –          | Yes        | Yes             |
| iseg Terminal       | Windows, Linux | –          | Yes        | Yes             |

Table 5: Compatible iseg applications

### 7.1 CAN Interface

The CAN interface is available at the 96-pin MICC back connector and from there connected to the backpanel of the ECH crate.

**INFORMATION**


A detailed description can be found in the manual of the corresponding device. See 10 Appendix.

INFORMATION

### 7.2 USB Interface

The USB interface is realized with a female USB-B connector on the devices front panel.

**INFORMATION**


A detailed description of the USB interface can be found in the SCPI manual. See 10 Appendix.

INFORMATION

#### 7.2.1 Windows USB driver installation

**INFORMATION**


A detailed description of the USB driver installation can be found in the SCPI manual. See 10 Appendix.

INFORMATION

#### 7.2.2 Linux USB driver installation

**INFORMATION**


A detailed description of the Linux USB installation can be found in the SCPI manual. See 10 Appendix.

INFORMATION

## 7.3 Ethernet Interface

The Ethernet interface can be used to send SCPI commands through raw TCP sockets. On device side, the TCP port 10001 is used. The Ethernet interface is implemented by a Lantronix XPort Ethernet hardware with serial protocol based software stack in the microcontroller.

The device can be connected to a switch via patch cable. If it shall be connected to a PC directly, a crossover cable has to be used.

The Ethernet settings can be adjusted with a web browser. Connect to the device's current IP address, login is possible without password.

### INFORMATION



INFORMATION

If the IP address is unknown, the Lantronix Device Installer can be used to scan for the device in the local network. The Lantronix Device Installer can be found on the attached CD or from the Lantronix home page. See 10 Appendix.

## 7.4 User Calibration with iseq MICC Config

To control the HV modules over their analog interface, the MICC converts between the physical values of the HV module and the logical values of the HV slots. This is done by the means of a user calibration.

For delivered system consisting of MICC and ECH crate, this is already done at the factory. If HV modules are added, removed or exchanged later, the user calibration has to be repeated.

The user calibration can be done with the program iseq MICC Config and an USB connection from the computer to the MICC.

### INFORMATION



INFORMATION

To use the USB remote control, it is necessary to install the corresponding [FTDI USB driver](#) files, see 10 Appendix. These driver files can be found on the attached CD or web page.

### INFORMATION



INFORMATION

The MICC cannot check if another HV module was plugged in. The MICC converts between the physical values of the HV module and the logical values of the HV slots. In most cases this user calibration was already made during the factory process. Only if a HV unit will be changed by another one with different nominal values or a free slot will be used the first time, a user calibration of this slot is necessary.

When the controller delivered together with the ECH crate, it is already configured at the factory. The following settings are only necessary if HV modules are added, removed or exchanged. Please download, unzip and start iseq MICC config. See 10 Appendix.

1. Connect the MICC controller to the Computer with an USB cable.
2. Choose the COM Port that was assigned for the USB serial converter.
3. Choose the number of slots depending on the used ECH crate, see 4 Technical data.
4. HV module with ID chip (as from 2015) will be scanned from the MICC automatically. The ID will be displayed in the last column.
5. The user can optionally fill the serial number according to the used HV module in the first column. It will be stored in the configuration file together with the ID. This entry is just for information, it allows to read out the used serial number by the interface.
6. Fill in the nominal values for voltage ( $V_{nom}$  in Volt) and current ( $I_{nom}$  in Ampere) for every channel according to the used HV modules. Please note the polarity: If the module has a negative output voltage, this polarity is defined with a minus sign "-" before the voltage. Example "-1000".
7. Click on the EPU checkbox according to the channels with used DPR module with EPU. The output polarity of these modules can later be changed by the sign of  $V_{set}$ .
8. Save the given configuration as XML file: file.xml → Save Configuration
9. Write the given configuration into the MICC with file.xml → "Write into Device"
- 10.

### INFORMATION



INFORMATION

Writing the data into the MICC will take approximately 10 seconds, please do not interrupt the process during this time!

When the configuration is written in the MICC, the following standard settings are configured for all channels:

- $V_{set}$  to 0
- $I_{set}$  to  $I_{nom}$
- $V_{bounds}$  to 0
- $I_{bounds}$  to 0

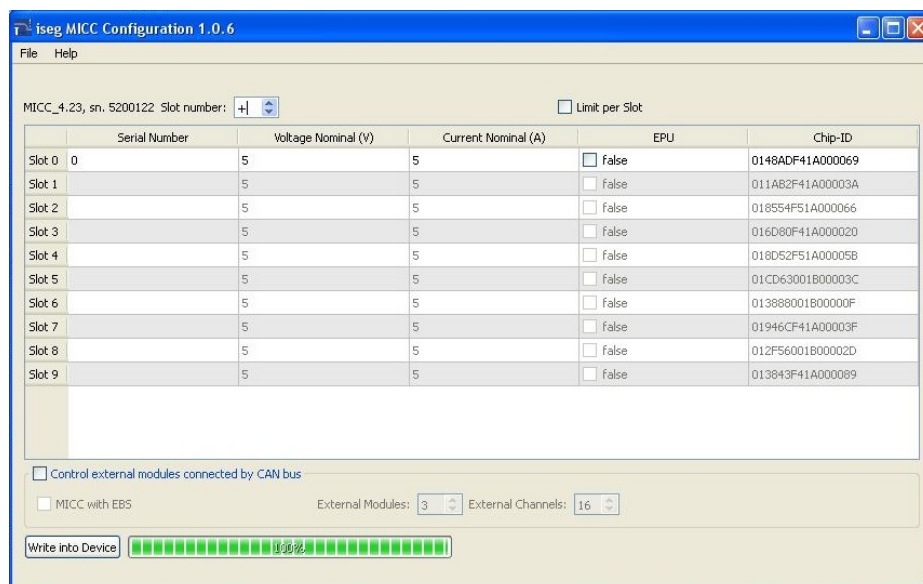


Figure 2: Program showing the default MICC configuration

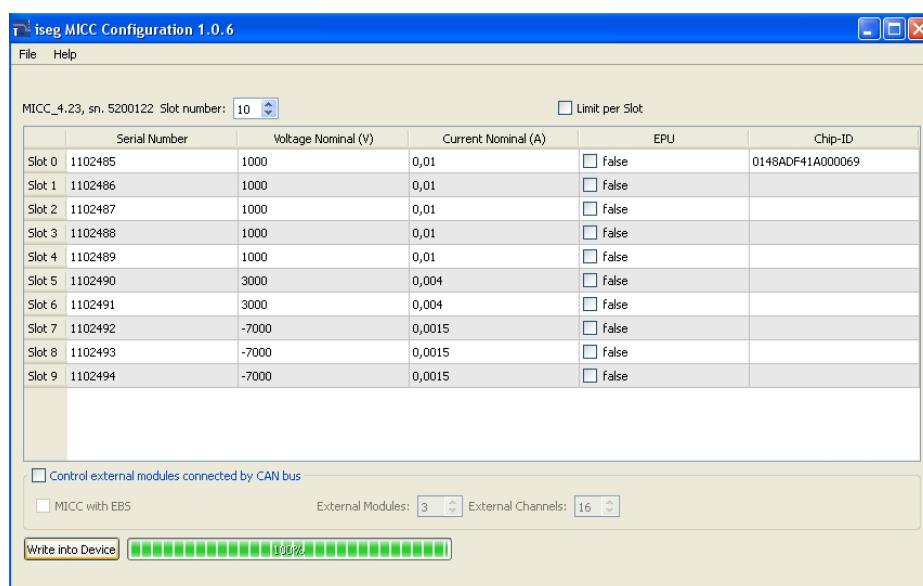


Figure 3: A sample configuration

## INFORMATION



## INFORMATION

The checkbox "Control external modules connect by CAN bus" is a customer specific extension. For further questions please contact the [iseq](#) support.

## 7.5 External Inhibit

The External Inhibit is available at the back panel of the ECH crates. By pulling the connector low, the Channel Status “External Inhibit” is generated for all channels and the high voltage is shut down without ramp.

### INFORMATION



INFORMATION

A detailed description can be found in the manual of the corresponding device.

## 7.6 MICC-CAN-Bus-Coupling

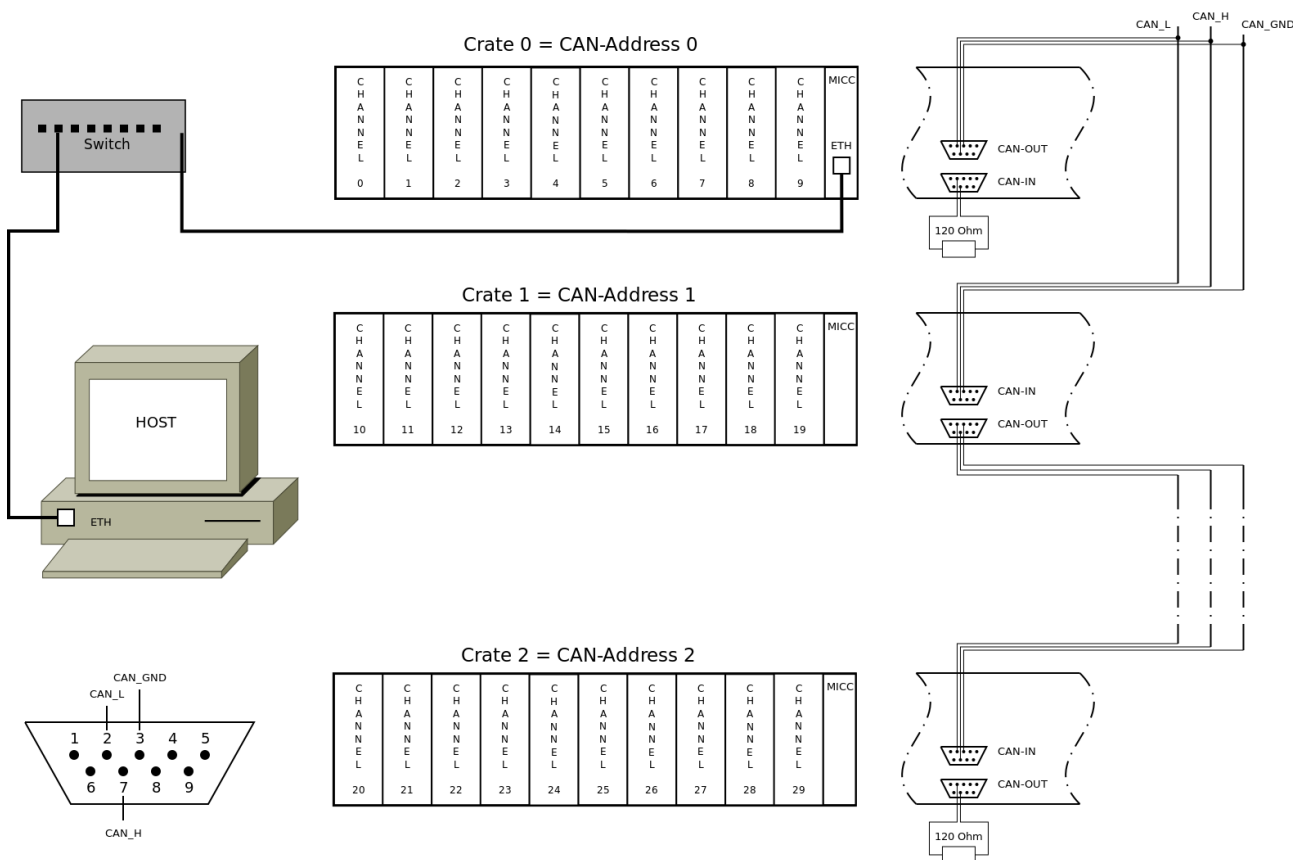


Figure 4: CAN-Bus-Coupling

## 7.7 Dimensional drawings

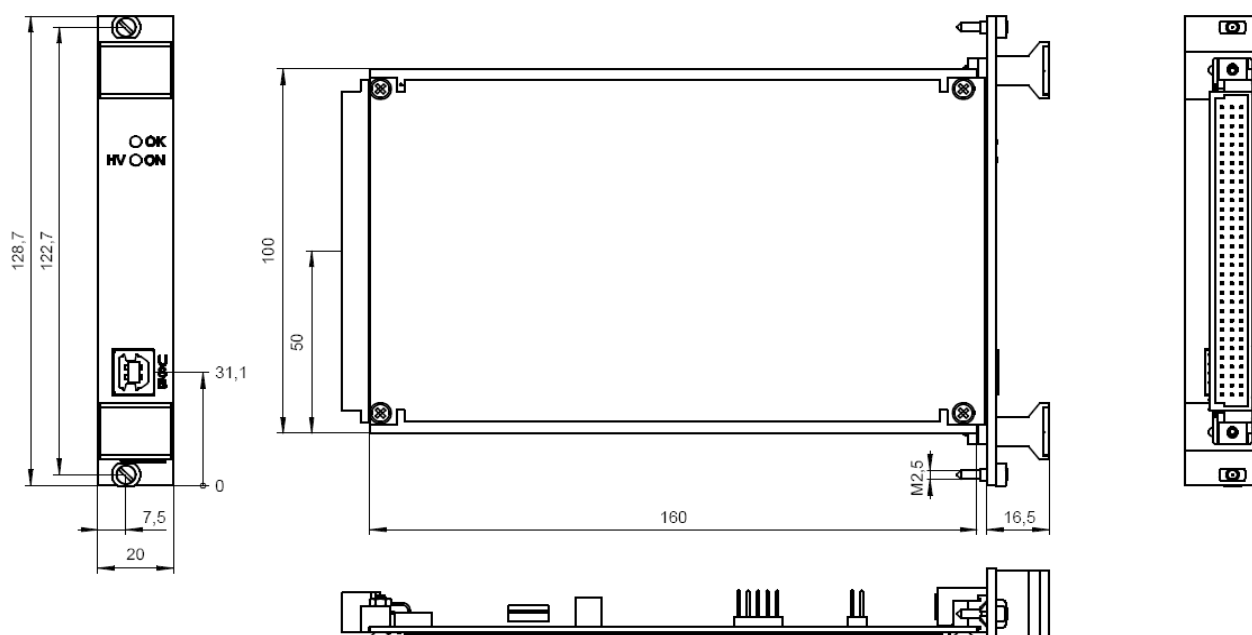


Figure 5: MICC without Ethernet

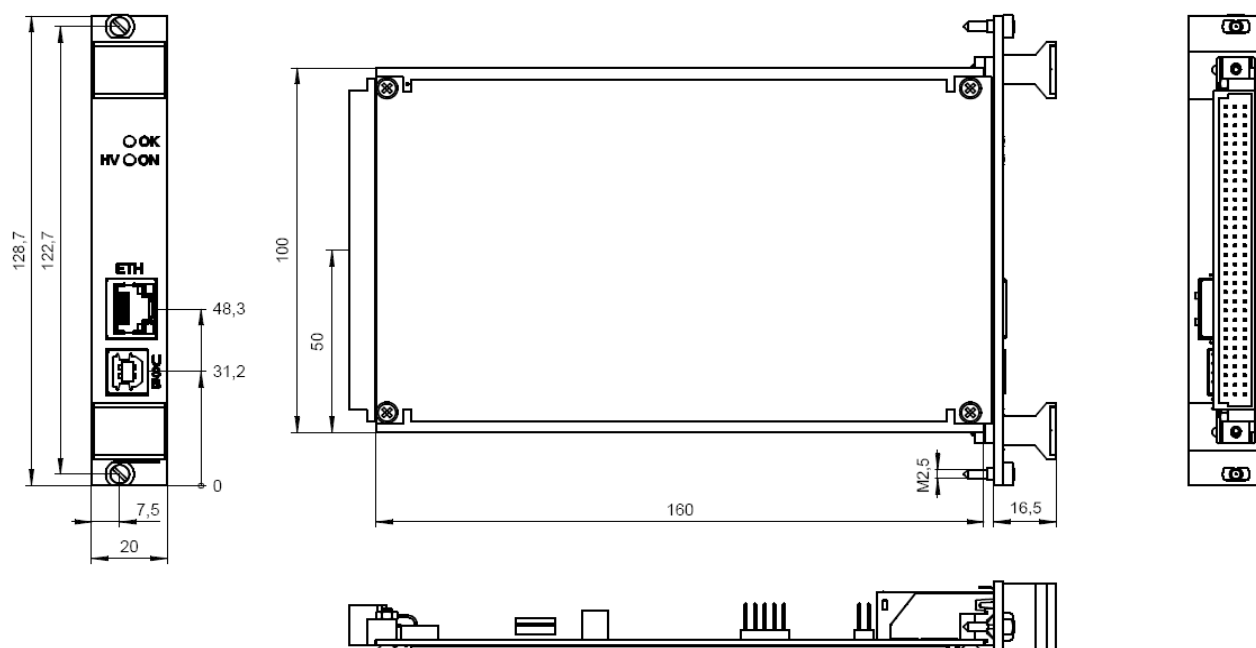


Figure 6: MICC with Ethernet

## 8 Accessories

### CAUTION!



CAUTION!

Only use genuine iseg parts like power cables, CAN cables and terminators for stable and safe operation.

| ACCESSORY ITEM                                   | ORDER ITEM CODE |
|--------------------------------------------------|-----------------|
| USB cable USB-A plug to USB-B plug, 0.5m         | Z592674         |
| CAN/RS232 cable, SUB-D-9 socket/plug, length 2m  | Z592341         |
| CAN/RS232 cable, SUB-D-9 socket/plug, length 10m | Z592610         |

Table 6: Accessory

## 9 Order guides

| CONFIGURATION ORDER GUIDE (item code parts) |                                                                |                       |
|---------------------------------------------|----------------------------------------------------------------|-----------------------|
| MIC                                         | C                                                              | ETH                   |
| Type                                        | System                                                         | Options               |
| system controller                           | C = for MMC system<br>P = for MMP system<br>E = for MME system | ETH = Option Ethernet |

Table 7: Order guides

## 10 Appendix

For more information please use the following download links:

|                                                                                                                                       |
|---------------------------------------------------------------------------------------------------------------------------------------|
| <b>This document</b>                                                                                                                  |
| <a href="https://iseq-hv.com/de/products/detail/MMC-Controller">https://iseq-hv.com/de/products/detail/MMC-Controller</a>             |
| <b>CPS</b>                                                                                                                            |
| <a href="https://iseq-hv.com/de/products/detail/CPS">https://iseq-hv.com/de/products/detail/CPS</a>                                   |
| <b>DPS</b>                                                                                                                            |
| <a href="https://iseq-hv.com/de/products/detail/DPS">https://iseq-hv.com/de/products/detail/DPS</a>                                   |
| <b>EPS</b>                                                                                                                            |
| <a href="https://iseq-hv.com/de/products/detail/EPS">https://iseq-hv.com/de/products/detail/EPS</a>                                   |
| <b>SCPI_Programmers-Guide.pdf</b>                                                                                                     |
| <a href="https://iseq-hv.com/download/?dir=SOFTWARE/iseqSCPI/">https://iseq-hv.com/download/?dir=SOFTWARE/iseqSCPI/</a>               |
| <b>SCPI control</b>                                                                                                                   |
| <a href="https://iseq-hv.com/download/?dir=SOFTWARE/iseqSCPIcontrol/">https://iseq-hv.com/download/?dir=SOFTWARE/iseqSCPIcontrol/</a> |
| <b>CAN HV control</b>                                                                                                                 |
| <a href="https://iseq-hv.com/download/?dir=SOFTWARE/iseqCANcontrol/">https://iseq-hv.com/download/?dir=SOFTWARE/iseqCANcontrol/</a>   |
| <b>MICC config</b>                                                                                                                    |
| <a href="https://iseq-hv.com/download/?dir=SOFTWARE/iseqMICCconfig/">https://iseq-hv.com/download/?dir=SOFTWARE/iseqMICCconfig/</a>   |
| <b>FTDI-USB-Serial-Driver</b>                                                                                                         |
| <a href="https://iseq-hv.com/download/?dir=SOFTWARE/Tools/">https://iseq-hv.com/download/?dir=SOFTWARE/Tools/</a>                     |
| <b>Lantronix / XPORT Device Installer</b>                                                                                             |
| <a href="https://www.lantronix.com/resources/product-index/?p=XPORT">https://www.lantronix.com/resources/product-index/?p=XPORT</a>   |
| <b>EDCP</b>                                                                                                                           |
| <a href="https://iseq-hv.com/download/?dir=SOFTWARE/iseqEDCP">https://iseq-hv.com/download/?dir=SOFTWARE/iseqEDCP</a>                 |
| <b>ISEG Control 1</b>                                                                                                                 |
| <a href="https://iseq-hv.com/download/?dir=SOFTWARE/iseqControl">https://iseq-hv.com/download/?dir=SOFTWARE/iseqControl</a>           |

## 11 Warranty & service

This device is made with high care and quality assurance methods. The factory warranty is Standard 12 months. Please contact the iseg sales department if you wish to extend the warranty.

### CAUTION!



CAUTION!

Repair and maintenance may only be performed by trained and authorized personnel.

For repair please follow the RMA instructions on our website: [www.iseg-hv.com/en/support/rma](http://www.iseg-hv.com/en/support/rma)

## 12 Disposal

### INFORMATION



INFORMATION

All high-voltage equipment and integrated components are largely made of recyclable materials. Do not dispose the device with regular residual waste. Please use the recycling and disposal facilities for electrical and electronic equipment available in your country.

## 13 Manufacturer's contact

**iseg Spezialelektronik GmbH**

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01454 Radeberg / OT Rossendorf

GERMANY

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