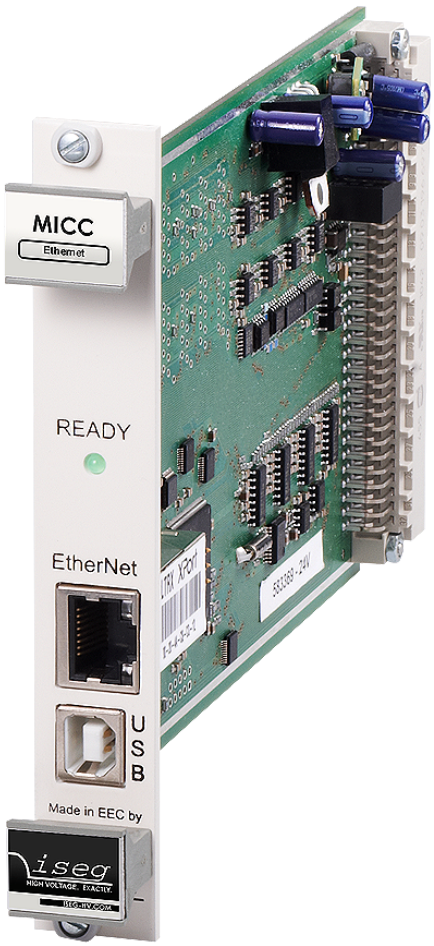
Technical documentation
Last changed on: 2021-03-25

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
1.2	2021-03-25	improved documentation, glossary, Order guides
1.1	2020-07-13	improved documentation (Inhibit)
1.0	2020-01-13	Initial relayouted version

Disclaimer / Copyright

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!

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

INFORMATION

INFORMATION

Advice marked as "Information" give important information.

Read the manual.

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.

Table of Contents

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 [1]	
Notes [1] 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 [1] 96-pin MMC connector according to DIN 41612
Digital interfaces	16x 20 bit analog OUT 32x 24bit analog IN 24 digital I/OCAN, USB, Ethernet [1]
Control input	External INHIBIT
Analog Control outputs	16x DAC with resolution 20-bit (e.g. 8x V_{set}, 8x I_{set}) [2]
Analog Control inputs	32x ADC with resolution 24-bit (e.g. 10x V_{meas}, 10x 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:
[1] Only MICCETH, controller with Option Ethernet
[2] 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.

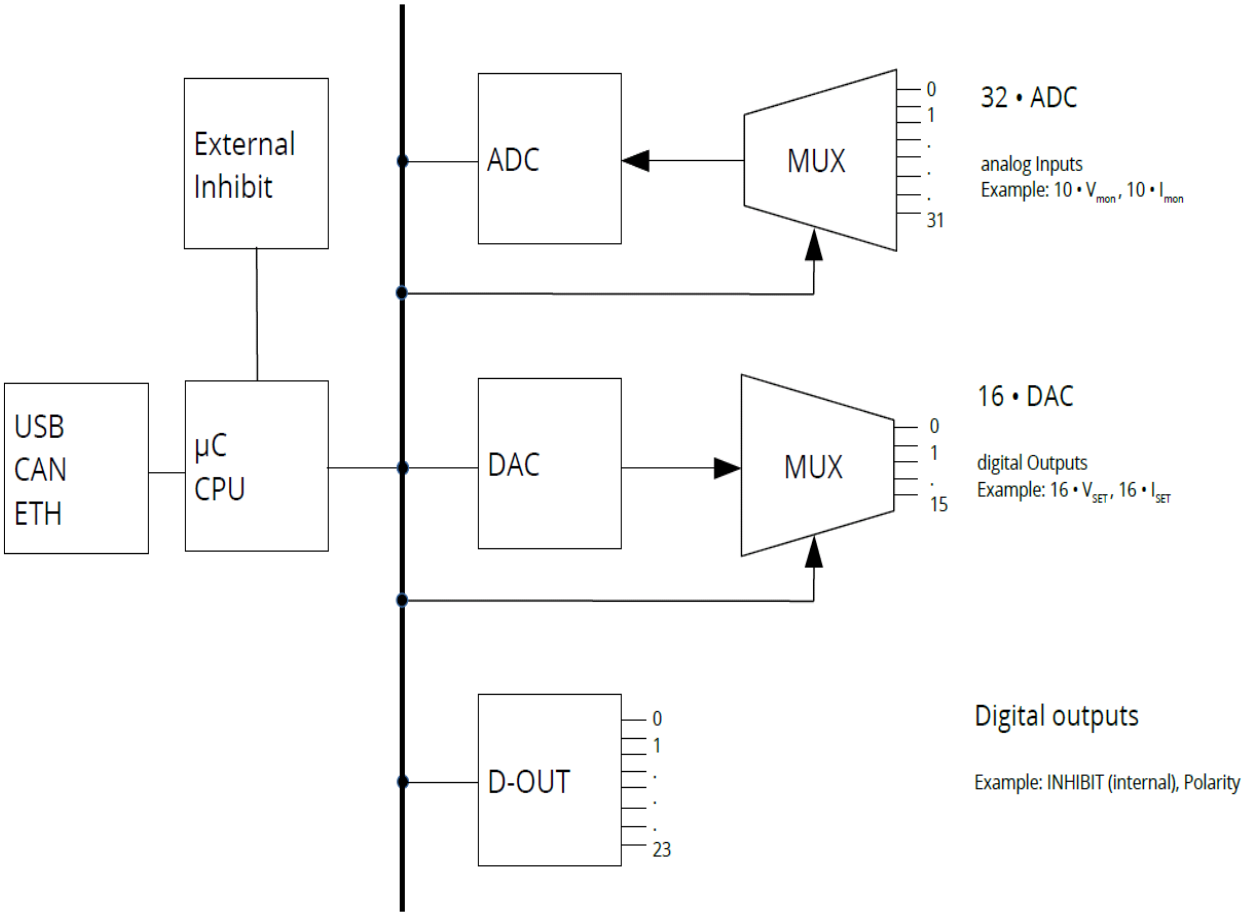


Figure 1: Schematic diagram

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!

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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.

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

7.2 USB Interface

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

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

7.2.1 Windows USB driver installation

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

7.2.2 Linux USB driver installation

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

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.

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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 iseg 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 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 iseg MICC Config and an USB connection from the computer to the MICC.

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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.

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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 iseg 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"

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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

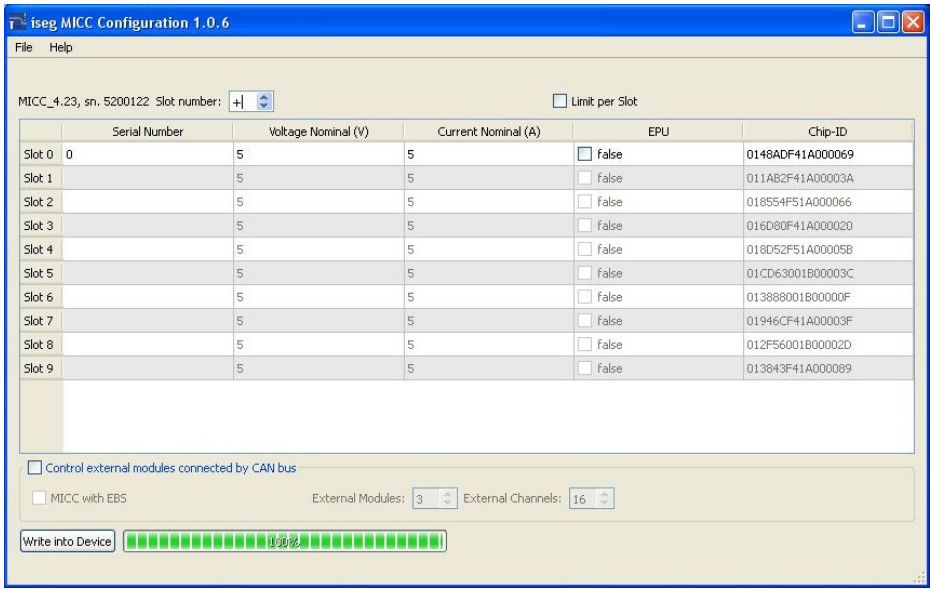

Figure 2: Program showing the default MICC configuration

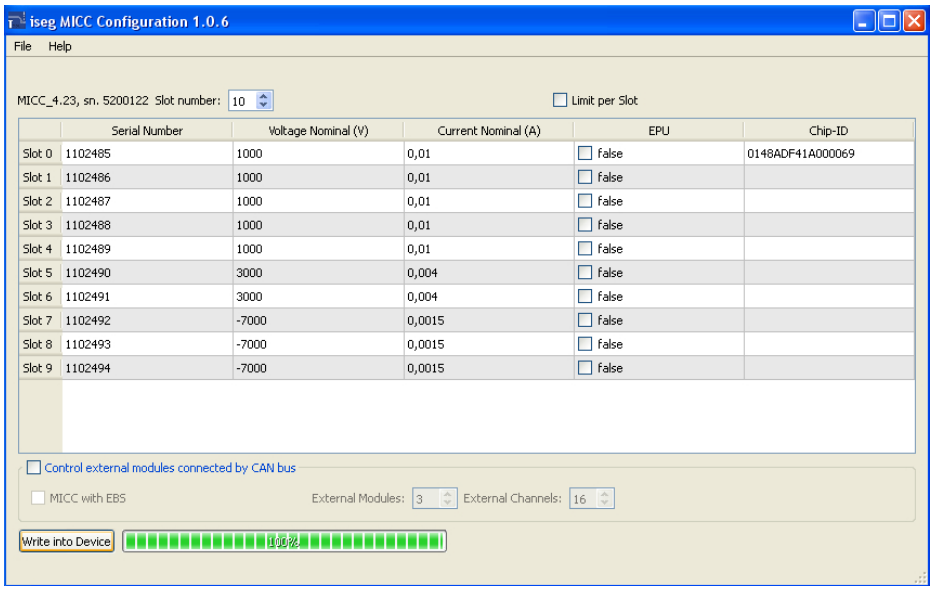

Figure 3: A sample configuration

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The checkbox “Control external modules connect by CAN bus” is a customer specific extension. For further questions please contact the iseg 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.

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

7.6 MICC-CAN-Bus-Coupling

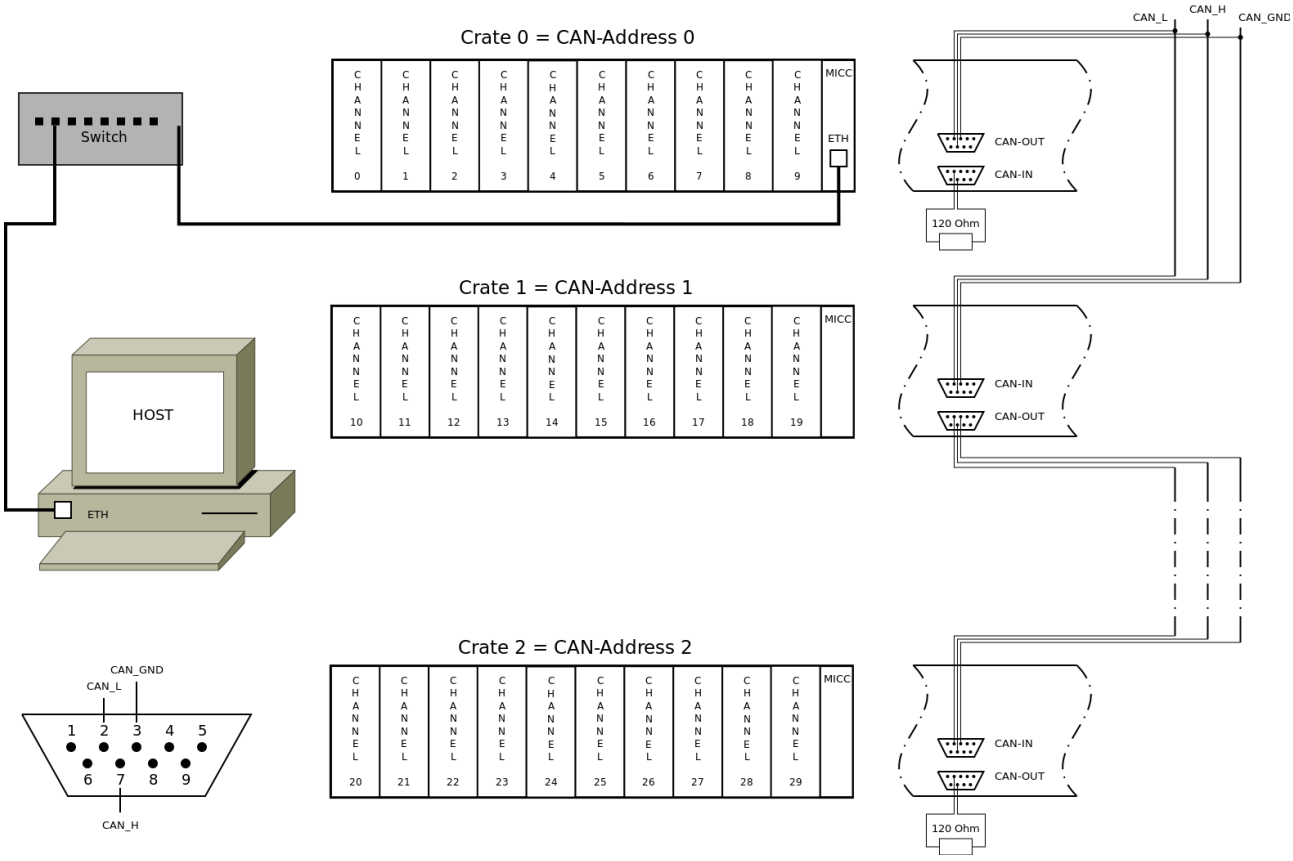

Figure 4: CAN-Bus-Coupling

7.7 Dimensional drawings

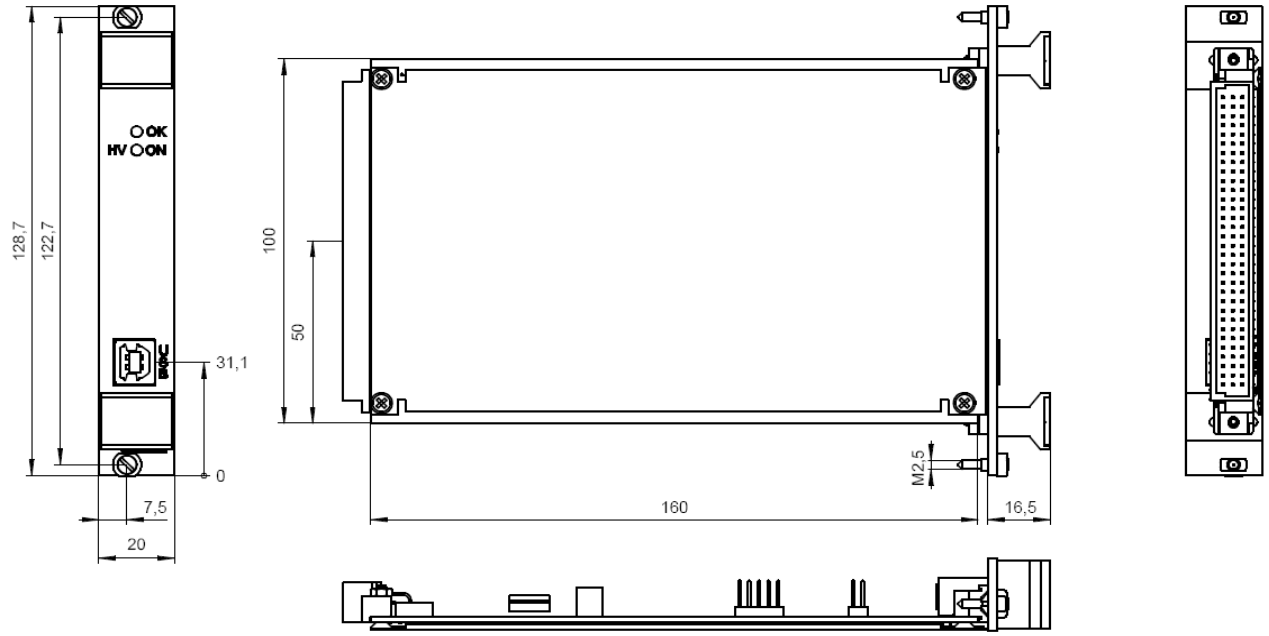

Figure 5: MICC without Ethernet

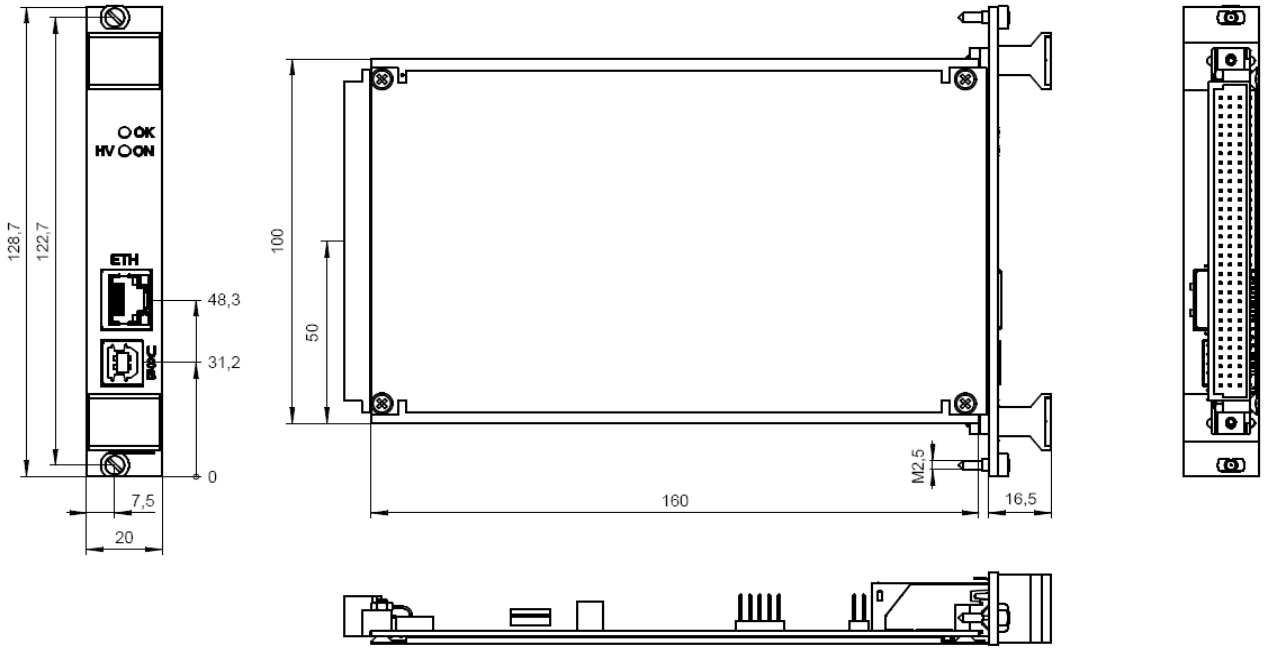

Figure 6: MICC with Ethernet

8 Accesories

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**	**000**
Type	System	Options
system controller	C = for MMC system	See chapter 3 Order options

Table 7: Order guides

10 Appendix

For more information please use the following download links:

This document
https://iseg-hv.com/download/SYSTEMS/MMC/MICC/iseg_manual_MICC_en.pdf
Archive
https://iseg-hv.com/download/SYSTEMS/MMC/MICC/archive
CPS
https://iseg-hv.com/de/products/detail/CPS
DPS
https://iseg-hv.com/de/products/detail/DPS
EPS
https://iseg-hv.com/de/products/detail/EPS
SCPI_Programmers-Guide.pdf
https://iseg-hv.com/download/?dir=SOFTWARE/isegSCPI/
SCPI control
https://iseg-hv.com/download/?dir=SOFTWARE/isegSCPIcontrol/
CAN HV control
https://iseg-hv.com/download/?dir=SOFTWARE/isegCANcontrol/
MICC config
https://iseg-hv.com/download/?dir=SOFTWARE/isegMICCconfig/
FTDI-USB-Serial-Driver
https://iseg-hv.com/download/?dir=SOFTWARE/Tools/
Lantronix / XPORT Device Installer
https://www.lantronix.com/resources/product-index/?p=XPORT
EDCP
https://iseg-hv.com/download/?dir=SOFTWARE/isegEDCP
ISEG Control 1
https://iseg-hv.com/download/?dir=SOFTWARE/isegControl

11 Glossary

SHORTCUT	MEANING
V_{nom}	nominal output voltage
V_{out}	output voltage
V_{set}	set value of output voltage
V_{mon}	monitor voltage of output voltage
V_{meas}	digital measured value of output voltage
V_{p-p}	peak to peak ripple voltage
V_{in}	input / supply voltage
V_{type}	type of output voltage (AC, DC)
V_{ref}	internal reference voltage
V_{max}	limit (max.) value of output voltage
ΔV_{out} – $[\Delta V_{in}]$	deviation of V_{out} depending on variation of supply voltage
ΔV_{out} – $[\Delta R_{load}]$	deviation of V_{out} depending on variation of output load
V_{bounds}	voltage bounds, a tolerance tube $V_{set} \pm V_{bounds}$ around V_{set}.
I_{nom}	nominal output current
I_{out}	output current
I_{set}	set value of output current
I_{mon}	monitor voltage of output current
I_{meas}	digital measured value of current
I_{trip}	current limit to shut down the output voltage
I_{in}	input / supply current
I_{max}	limit (max.) value of output current
I_{limit}	current limit
I_{bounds}	current bounds, a tolerance tube $I_{set} \pm I_{bounds}$ around I_{set}.
P_{nom}	nominal output power
P_{in}	input power
P_{in_nom}	nominal input power
T	temperature
T_{REF}	reference temperature
ON	HV ON/OFF
/ON	HV OFF/ON
CH	channel(s)
HV	high voltage
LV	low voltage
GND	signal ground
INH	Inhibit
POL	Polarity
KILL	KillEnable

12 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

13 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.

14 Manufacturer‘s contact

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