

Technical documentation  
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# ECH 124 / 128 / 12A / 14A

MMC-Crate Series for iseg MMC High Voltage Power Supply Modules

- up to 10 MMC High Voltage Power Supply Modules
- 150 / 480 W power supply
- wide range of HV-modules (CPS, DPS, EPS series)
- for the use with MICC controller



## Document history

Version	Date	Major changes
2.2.	2022-07-13	termination CAM bus, G14A power increased to 480W, G128 techn. data fixed
2.1	2021-05-10	Improved documentation, Possible configurations, better resolution of dimension
2.0	2020-01-24	safety information, glossary
1.1	2019-07-09	Improved documentation
1.0	2019-06-24	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

<b>DANGER!</b>	
 DANGER!	<p>“Danger!” indicates a severe injury hazard. The non-observance of safety instructions marked as “Danger!” will lead to possible injury or death.</p>
<b>WARNING!</b>	
 WARNING!	<p>“Warning!” indicates an injury hazard. The non-observance of safety instructions marked as “Warning!” could lead to possible injury or death.</p>
<b>CAUTION!</b>	
 CAUTION!	<p>Advice marked as “Caution!” describe actions to avoid possible damages to property.</p>
<b>INFORMATION</b>	
 INFORMATION	<p>Advice marked as “Information” give important information.</p>



Read the manual.



Attention high voltage!

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. 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!

To avoid injury of users it is not allowed to open the unit. There are no parts which can be maintained by users inside of the unit. Opening the unit will void the warranty.

### WARNING!



WARNING!

Before connecting or disconnecting HV cables or any operation on the HV output or the application, the unit has to be switched off and discharge of residual voltage has to be finished. Depending on application residual voltages can be present for long time periods.

### WARNING!



WARNING!

Do not operate the unit in wet or damp conditions.

### WARNING!



WARNING!

Do not operate the unit in an explosive atmosphere.

### WARNING!



WARNING!

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

**WARNING!**



WARNING!

The protective conductor connection must be ensured by an appropriate mains cable. Before connecting to the local power supply, check whether the nominal voltage of the devices corresponds to the mains voltage.

**WARNING!**



WARNING!

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

**WARNING!**



WARNING!

The mains connection is made with basic insulation and protective conductor. The device may only be operated with the protective earth conductor (PE) connected!

The protective conductor connections must be checked for proper function after installation.

**CAUTION!**



CAUTION!

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

**INFORMATION**



INFORMATION

It is mandatory that the CAN BUS termination resistor (Z510245) is plugged into the device (ECH).

**INFORMATION**



INFORMATION

Please check the compatibility with the devices used.

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# 1 General description

ECH crates of 124 / 128 / 12A / 14A are ideally suited for mobile and stationary usage by its compact construction. In MMC system crates analog controlled DC/DC converters of CPS, DPS or EPS series can be digitally controlled by the MICC crate controller. Thereby versatile HV supply systems can be composed, which are either powerful (EPS), highly precise (DPS) or providing a cost saving coverage of a wide HV range (CPS).

Up to 10 slots for MMC (and 1 Hybrid MMC / MMS slot<sup>1</sup> high voltage modules are provided. The versatile combination of different modules (CPS, DPS, EPS) in the MMC system allows the user to configure the device for his needs.

Each module is connected to the backplane of the crate by a vendor specific connector, which delivers module power supply and control signals provided by a MICC controller board. Depending on modules features further digital and analog signals are provided by the connector (safety loop, Inhibit, KILL Enable etc.).

For control and network communication of the MMC modules the iseq MICC crate controller needs to be plugged into the special Controller Slot. The MICC connects the analog interfaces of the MMC HV devices in a 3U Euro cassette with digital standard interfaces. This allows devices with analog I/O to be integrated into digitally controlled systems. The high resolution of the analog inputs and outputs allows very precise control of the current and voltage of the connected devices.

## 2 Package contents / Accessories

Hardware	included	optional
ECH 124	Genuine power cable – EU Plug (Z592069) CANbus terminating resistor Sub-D 9 male (Z510245)	MICC controller See also 12 Accesories
ECH 128	Genuine power cable – EU Plug (Z592069) CANbus terminating resistor Sub-D 9 male (Z510245)	MICC controller See also 12 Accesories
ECH 12A	Genuine power cable – EU Plug (Z592069) CANbus terminating resistor Sub-D 9 male (Z510245)	MICC controller See also 12 Accesories
ECH 14A	Genuine power cable – EU Plug (Z592069) CANbus terminating resistor Sub-D 9 male (Z510245)	MICC controller See also 12 Accesories

<sup>1</sup> Only ECH14A with hybrid MMC/MMS-3U slot (no.10)



### 3 Technical data

SPECIFICATIONS	ECH 124	ECH 128
Slots	4 x MMC modules and 1 x MMC controller see Possible configurations chapter 8.1 ECH 124  4 slots 4 • 8HP OR 2 • max. 12HP	8 x MMC modules and 1 x MMC controller  8 slots 7 • 8HP AND 1 • 12HP
Rated AC mains input	100 – 264 VAC with PFC	100 – 264 VAC with PFC
Fuse	5x20mm 4.0AT	5x20mm 4.0AT
AC power connector	IEC 320 C14	
DC module supply voltages	+24 V	
DC output power	150 W	150 W
Connection	CAN, USB <sup>(1)</sup> , Ethernet <sup>(1)</sup>	
Interfaces <sup>(1)</sup>	16 x 20 bit analog OUT 32 x 24bit analog IN 24 digital I/O	
Inhibit	Lemo-hub on the rear, connected with INHIBIT-signal from all HV-modules TTL level, LOW = active → V <sub>OUT</sub> = 0 Volt see also 10 Connectors assignments	
Operation temperature	0 °C ... 50°C	
Storage temperature	-20 °C ... 70 °C	
Dimensions (L/W/H)	315 mm / 249 mm / 3U	308 mm / 19" / 3U
Weight	3,4 kg	4,5 kg
Notes:	<sup>1)</sup> Requires the use of MICC controller, not included with ECH	

Table 1: Technical data ECH124/ ECH128

SPECIFICATIONS	ECH 12A	ECH 14A <sup>(2)</sup>
Slots	10 x MMC modules (8HP) and 1 x MMC controller (MICC)	10 x MMC modules (8HP) and 1 x MMC controller (MICC) see Possible configurations chapter 8.2 ECH 14A OR Combination of 12HP and 8HP MMC modules and 1 x MMS-3U module 1 x MMC controller (MICC)
Rated AC mains input	100 – 264 VAC with PFC	100 – 264 VAC with PFC
Fuse	5x20mm 10AT	5x20mm 10AT
AC power connector	IEC 320 C14	
DC module supply voltages	+24 V	
DC output power	480 W	480 W
Connection	CAN, USB <sup>(1)</sup> , Ethernet <sup>(1)</sup>	
Interfaces <sup>(1)</sup>	16 x 20 bit analog OUT <sup>(3)</sup> 32 x 24bit analog IN 24 digital I/O	
Inhibit	Lemo-hub on the rear, connected with INHIBIT-signal from all HV-modules TTL level, LOW = active → V <sub>OUT</sub> = 0 Volt see also 10 Connectors assignments	
Operation temperature	0 °C ... 50°C	
Storage temperature	-20 °C ... 70 °C	
Dimensions (L/W/H)	308 mm / 19" mm / 3U	308 mm / 19" / 3U
Weight	4,1 kg	4,6 kg
Notes: <sup>(1)</sup> Requires the use of MICC controller, not included in ECH delivery <sup>(2)</sup> The ECH 14A is configured for the operation with the installed modules. A modification might necessary for the operation of different module types. Please 18 Manufacturer contact our support for this. <sup>(3)</sup> For ECH 12A and 14A, I <sub>set</sub> is preset to I <sub>nom</sub> of corresponding HV-module, i.e. no current limit other that I <sub>nom</sub> can be set.		

Table 2 Technical data ECH12A/ ECH14A

## 4 Options

OPTIONS	OPTION CODE	EXAMPLE	ITEM CODE HEX CODING
INHIBIT	INH		004

Table 3: order options

## 5 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.

Before operation and connecting to mains, please make sure, that all cables are connected and airflow is not impeded. The case must not be covered and installed properly. For installation in a rack, forced cooling must be provided. 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 manual.

### INFORMATION



INFORMATION

It is mandatory that the CAN BUS termination resistor (Z510245) is plugged into the device (ECH). The connection is on the back of the device (CAN-OUT).

## 6 Configuration of the HV-Modules slot position

The slot positions of the HV modules in the crate is preconfigured by the factory. This configuration has to be stored in the firmware of the controller board and may be changed through a hardware switch on the backplane. If its necessary to change HV configuration, please 18 Manufacturer contact the company´s support, in order to get the correct encoding.

## 7 Compatibility lists

MMC CRATE CONTROLLERS		NOTES
MICC controller	As of firmware 4.xx	
MMC HIGH VOLTAGE MODULES		NOTES
CPS 3U-series		
DPS 3U-series		
EPS 3U-series	60 W version only	
MMS-3U HIGH VOLTAGE MODULES		NOTES
EBS 3U-series	Only 3U version, only G14A	

Table 4: compatibility list

## 8 Possible configurations

### 8.1 ECH 124

8HP	8HP	8HP	8HP	(3)	MICC	(2)
12HP	(1)	12HP	(1)	(3)	MICC	(2)
8HP	8HP	12HP	(1)	(3)	MICC	(2)

Notes:

1) -- cover (Z515662, 4HP)

2) -- cover (Z515537, 1HP)

3) -- cover (Z514538, 5HP),

12HP – EPS 3UC (60W), CPS 3UC ( $\geq 10KV$ )

8HP – CPS 3UC ( $\leq 7kV$ ) and DPS 3UC modules

MICC – Crate Controller MICC (4HP), see 14 Appendix

Table 5: Possible Variants for G124, use of all slots

### 8.2 ECH 14A

12HP	12H P	12H P	12H P	12H P	12H P	8HP (2)	MICC		
12HP	12H P	12H P	12H P	12H P	8HP	(1)	8HP (2)	MICC	
12HP	12H P	12H P	12H P	8HP	8HP	8HP	8HP (2)	MICC	
12HP	12H P	12H P	(1)	8HP	8HP	8HP	8HP	8HP (2)	MICC
12HP	12H P	8HP	8HP	8HP	8HP	8HP	8HP	8HP (2)	MICC
12HP	(1)	8HP	8HP	8HP	8HP	8HP	8HP	8HP (2)	MICC
8HP	8HP	8HP	8HP	8HP	8HP	8HP	8HP	8HP (2)	MICC

Notes:

1) – cover (Z515662, 4HP) see 12 Accesories

2) – if slot not used with 8HP, can be install an EBS 3UC

12HP – EPS 3UC (60W), CPS 3UC ( $\geq 10KV$ )

8HP – CPS 3UC ( $\leq 7kV$ ) and DPS 3UC modules

MICC – Crate Controller MICC, see 14 Appendix

Table 6: Possible Variants for G14A, use of all slots

## 9 Dimensional drawings

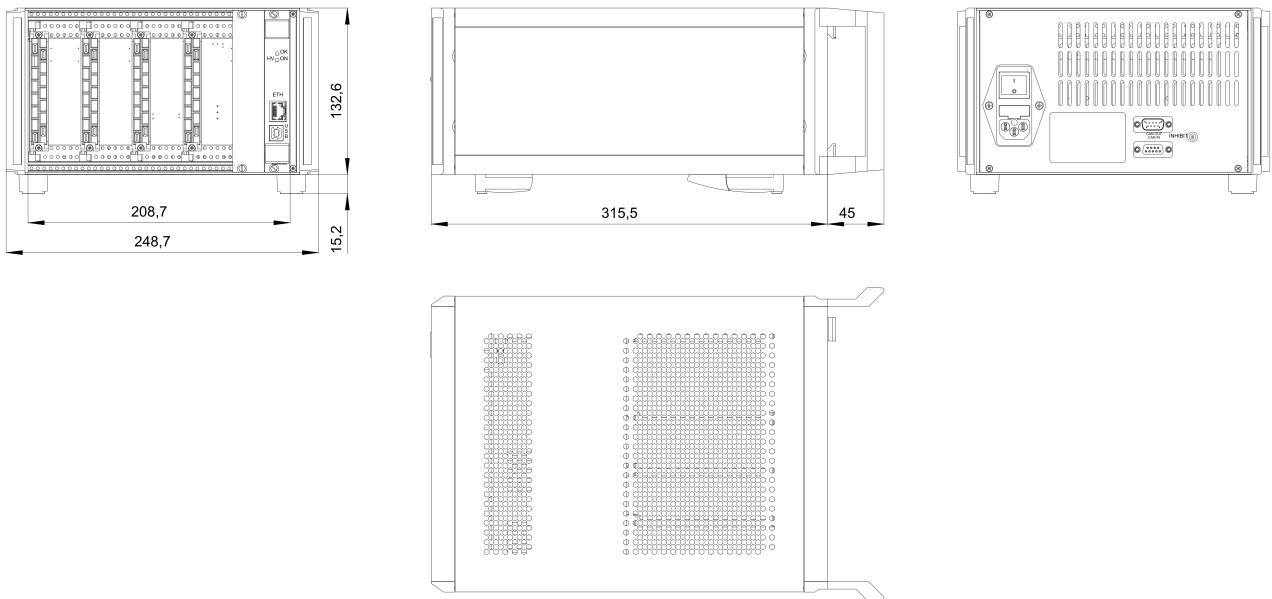


Figure 1: ECH 124, with MICC controller

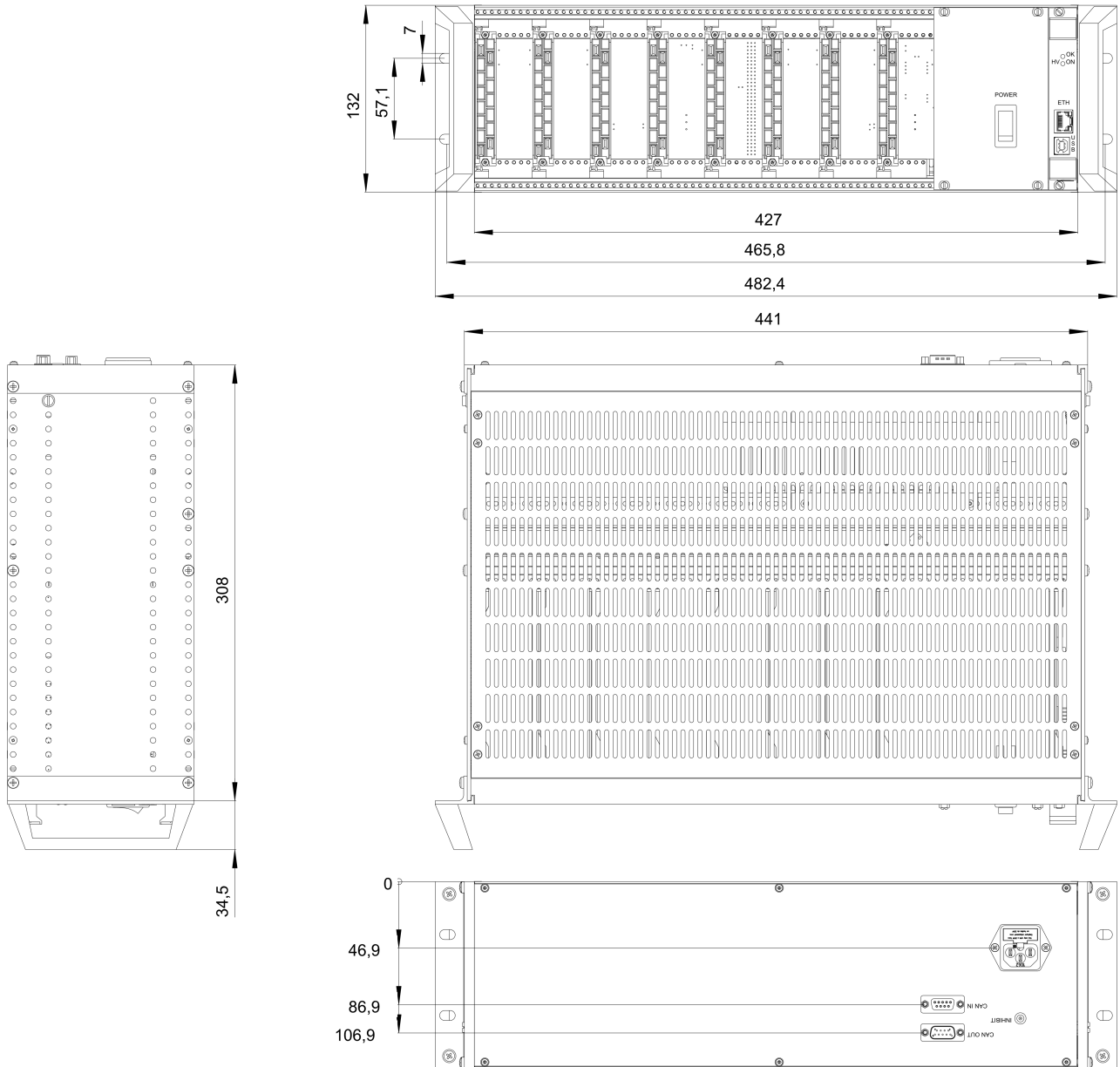


Figure 2: ECH128, with MICC controller

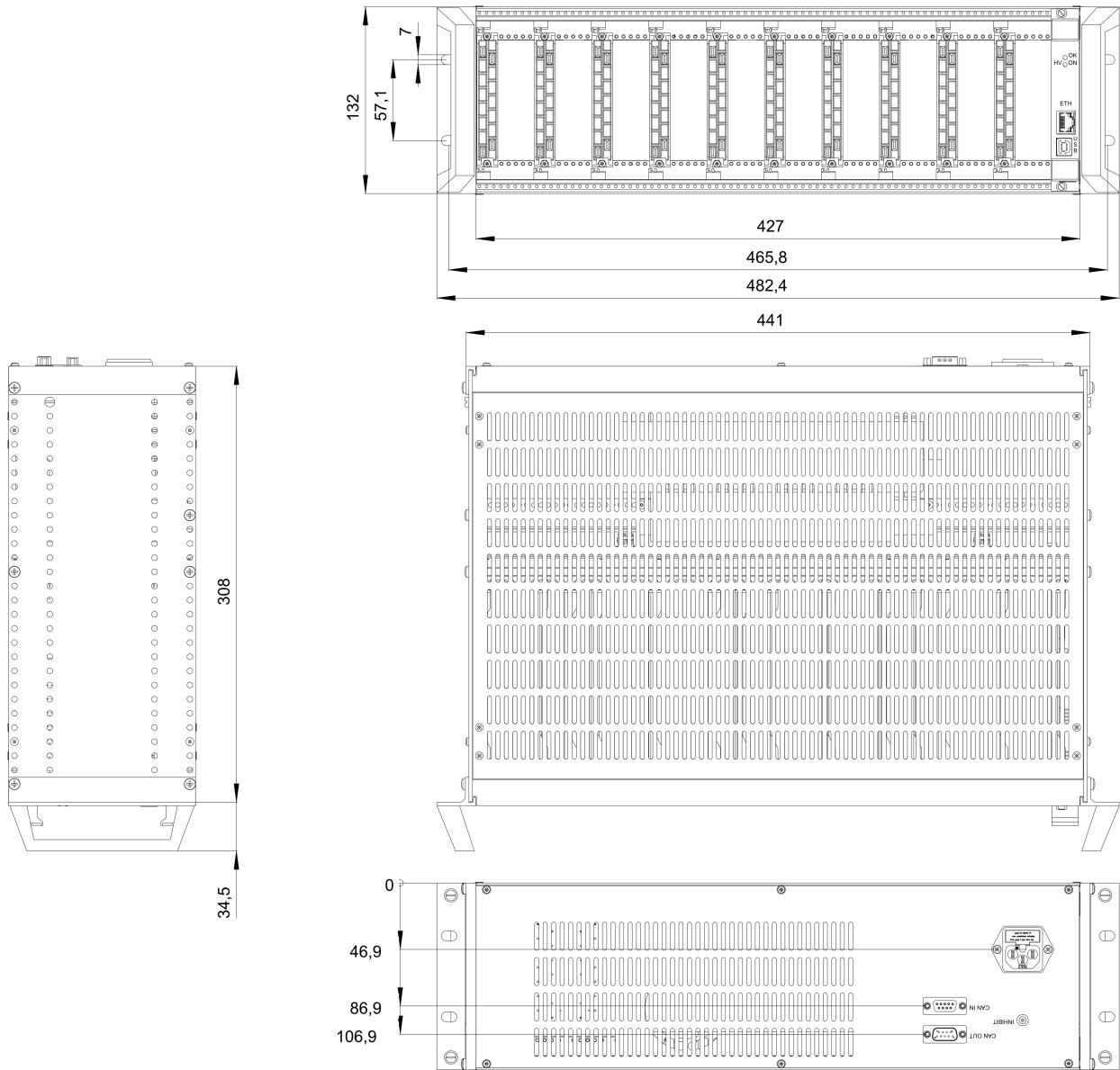


Figure 3: ECH12A, with MICC controller

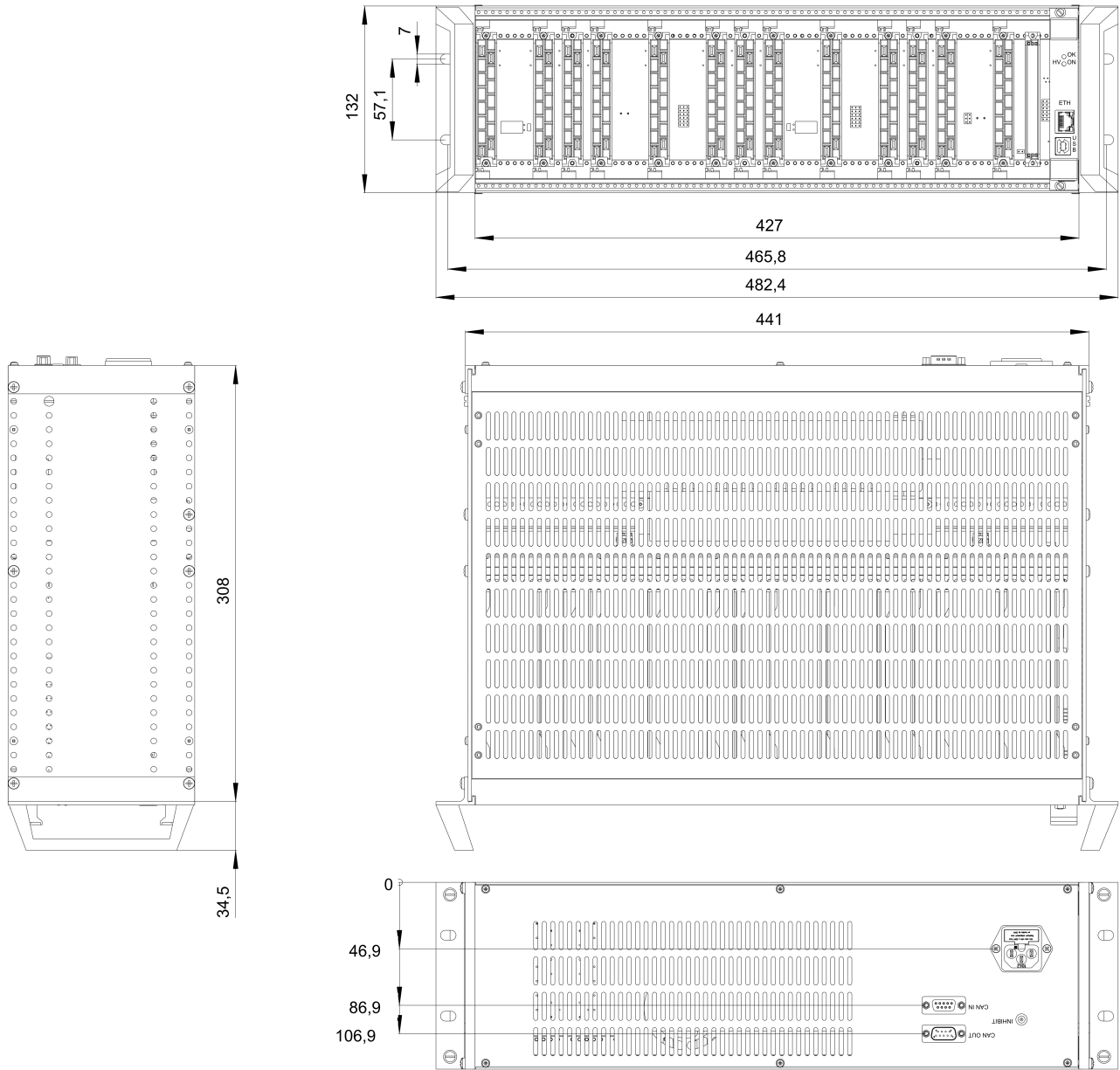
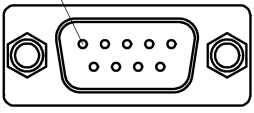
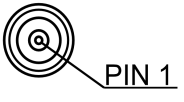
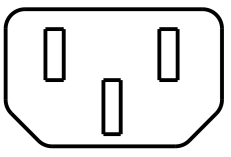


Figure 4: ECH14A, with MICC controller



## 10 Connectors assignments

CONNECTORS – POWER SIDE		PART NUMBERS (manufacturer code / iseg accessory parts item code)	
<b>CAN</b>	D-SUB9 – male	<b>CABLE SIDE</b>	
PIN 1  <i>Figure 5</i>	connector	D SUD9	
	manufacturer	various manufacturer	
	iseg part number		
<b>LIMIT monitor</b>	socket 1pol	<b>CABLE SIDE</b>	
 <i>Figure 6</i>	part number	FFA.00.250.CTAC31	
	manufacturer	LEMO Elektronik GmbH	
	iseg part number	Z200793	
<b>AC POWER</b>		<b>CABLE SIDE</b>	
 <i>Figure 7</i>	connector	IEC 60320-C13	
	manufacturer	various manufacturer	
	iseg part number	Z592069	

## 11 PIN assignments

PIN	NAME	DESCRIPTION	VALUE
2	CAN_L	CAN low	
3	CAN_GND	CAN ground	
7	CAN_H	CAN high	

Table 7: CAN Interface connector (DSUB9)

PIN	NAME	DESCRIPTION	VALUE
1	INHIBIT		TTL level, LOW = active → V <sub>OUT</sub> = 0
2	GND		

Table 8: INHIBIT

PIN	NAME	DESCRIPTION	VALUE
8	REF	V <sub>ref</sub> Internal reference voltage	5 V
10	0V	Supply ground	
12	GND	Signal ground	
14	IMON	I <sub>mon</sub> Monitor voltage of output current	0 ... 5 V
16	ON	HV ON/OFF with voltage ramp	TTL-level, LOW → HV ON HIGH or n.c. → HV OFF
18 <sup>[2]</sup>	VIN	V <sub>in</sub> Supply voltage	+24 V DC
20	VSET	V <sub>set</sub> Set value of output voltage	0 ... 5 V
22	POL	Polarity	HIGH or n.c. → positive LOW → negative
24	VMON	V <sub>mon</sub> Monitor voltage	0 ... 5 V
26	VIN	V <sub>in</sub> Supply voltage	+24 V DC
28	ISET <sup>[1]</sup>	I <sub>set</sub> Set voltage of output current	0 ... 5 V
30	KILL_ENA	Killenable, high active	TTL-level
32	INH	Inhibit, LOW = active, shut down the output voltage	TTL-level, LOW → HV OFF HIGH or n.c. → HV ON

Notes:

<sup>[1]</sup> For ECH 12A and 14A, I<sub>set</sub> is preset to I<sub>nom</sub> of corresponding HV-module, i.e. no current limit other than I<sub>nom</sub> can be set.

<sup>[2]</sup> Only ECH14A.

Table 9: System connector H15

## 12 Accessories

### CAUTION!



CAUTION!

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

ACCESSORY ITEM	ORDER ITEM CODE
CANbus-Adapter RJ45 to SUB-D-9 male	Z583382
CANbus-Adapter RJ45 to SUB-D-9 female	Z583401
Genuine power cable – EU Plug	Z592069
Front panel (blind) RAL9001 3U/ 1HP	Z515537
Front panel (blind) RAL9001 3U/ 4HP	Z515662
Front panel (blind) RAL9001 3U/ 5HP	Z514538
Front panel (blind) RAL9001 3U/ 8HP	Z580789
CANbus terminating resistor Sub-D 9 male	Z510245

Table 10: Accessory items

## 13 Order guides

CONFIGURATION ORDER GUIDE (item code parts)						
G	1	2	4	151	000	00
Type	System height	System modules	Number of available inserts	Output Power	Option	Customized Version
Crate	1 = 3U	2 = MMC 4 = MMS HV	one significant digits  4 = 4 Slot 8 = 8 Slot A = 10 Slot	two significant digits • exponent  For Example: 151 = 15 • 10 <sup>1</sup> [W] = 150W	See 4 Options  For Example: 004 = INHIBIT	00 = none

Table 11: Configuration item code

## 14 Appendix

For more information please use the following download links:

<b>This document</b>
<a href="https://iseg-hv.com/download/SYSTEMS/MMC/ECH/iseq_manual_ECH12x-14x_en.pdf">https://iseg-hv.com/download/SYSTEMS/MMC/ECH/iseq_manual_ECH12x-14x_en.pdf</a>
<b>Archive</b>
<a href="https://iseg-hv.com/download/SYSTEMS/MMC/ECH/archive">https://iseg-hv.com/download/SYSTEMS/MMC/ECH/archive</a>
<b>Crate Controller MICC</b>
<a href="https://iseg-hv.com/de/products/detail/MMC-Controller">https://iseg-hv.com/de/products/detail/MMC-Controller</a>
<b>CPS Series</b>
<a href="https://iseg-hv.com/en/products/detail/CPS">https://iseg-hv.com/en/products/detail/CPS</a>
<b>DPS Series</b>
<a href="https://iseg-hv.com/en/products/detail/DPS">https://iseg-hv.com/en/products/detail/DPS</a>
<b>EPS Series</b>
<a href="https://iseg-hv.com/en/products/detail/EPS">https://iseg-hv.com/en/products/detail/EPS</a>
<b>EBS Series</b>
<a href="https://iseg-hv.com/en/products/detail/EBS">https://iseg-hv.com/en/products/detail/EBS</a>
Manufacturers website (connectors)
LEMO Elektronik GmbH <a href="https://www.lemo.com/">https://www.lemo.com/</a>

## 15 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
$\Delta V_{out} - [\Delta V_{in}]$	deviation of $V_{out}$ depending on variation of supply voltage
$\Delta V_{out} - [\Delta R_{load}]$	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

## 16 Warranty & Service

This device is made with high care and quality assurance methods. The standard factory warranty is 36 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)

## 17 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.

## 18 Manufacturer contact

**iseg Spezialelektronik GmbH**

Bautzner Landstr. 23

01454 Radeberg / OT Rossendorf

GERMANY

FON: +49 351 26996-0 | FAX: +49 351 26996-21

[www.iseg-hv.com](http://www.iseg-hv.com) | [info@iseg-hv.de](mailto:info@iseg-hv.de) | [sales@iseg-hv.de](mailto:sales@iseg-hv.de)