Technical documentation

Last changed on: 09.10.2020

EHS/EMS "Stack" Series

Precision High Voltage Power Supply Module with stacked Output Channels

- 8 / 16 channel, 100 V – 1 kV versions
- cascadeable channels in groups of 2, 4, 8 or 16 channels with 4kV floating voltage, optional up to 5 kV floating voltage
- very low ripple and noise and low temperature coefficient
- single channel floating-ground
- hardware voltage and current limits
- voltage and current control per channel
- programmable parameters (delayed trip etc.)
- perfect for GEM detectors

Document history

Version	Date	Major changes
2.1	09.10.2020	Improved description C-RTN, CCG, RTN (Table 8: Safety Loop and Limit Connector (drawings not to scale)); R51.XX Table 12: Guideline for cable ordering
2.0	16.01.2020	safety information, glossary, Single Channel Inhibit, Improved documentation
1.3	11.09.2019	new features
1.2	18.07.2019	supplementary notes
1.1	09.07.2019	Improved documentation
1.0	04.07.2017 01.10.2018	Initial version Notes revised

Disclaimer / Copyright

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 instructuions must be read carefully before starting any operation.

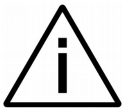
We decline all responsibility for damages and injuries caused which may arise from improper use of our equipment.

Description of the safety instructions

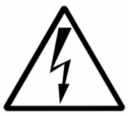
DANGER!	
 DANGER!	"Danger!" indicates a severe injury hazard. The non-observance of safety instructions marked as "Danger!" will lead to possible injury or death.

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 for the generation of high voltage 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

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!

The high-voltage cable must be professionally connected to the consumer/load and the connection insulated with the appropriate dielectric strength. Do not power the consumer/load outside of its specified range.

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.

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.

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Please check the compatibility with the devices used.

Table of Contents

1 General description

CAUTION!	
Caution!	The devices must only be used in combination with iseg approved crates.

The EHS series 7 modules are standard and EHS series 8 modules High Precision multichannel high voltage power supplies in 6U Eurocard format. The output voltage features high stability, low ripple and noise and low temperature coefficient. Each single channel has an independent voltage and current control. The data for set and measure values is given in a format of Floating Point Single Precision values. The modules are equipped with 24 bit ADC and 16 bit DAC circuits.

The outputs RETURN - floating HV-GND - of each channel are floating against each other and against ground. The channels are cascadable in groups of 2, 4, 8 or 16 Channels. The floating voltage is limited to 4kV in order to ensure lowest ripple and noise, it can be increased to 5kV with degraded ripple and noise standards. The nominal voltage of the individual channels can be configured up to 1,000V. The maximum current per channel is 1mA. Modules with mixed nominal voltages are identified by the model name EMS, the channel configuration is specified by a three-digit number contained in the item code (see table 13).

High Precision EHS modules is equipped with a second current measurement range to precisely meter low currents. Switching between the measurement ranges is performed automatically.

The high voltage output and return contacts are provided in a 51 pin REDEL HV-connector.

2 Technical data

SPECIFICATIONS	EHS series 7 Standard	EHS series 8 High Precision
Output voltage / per channel	Configurable, max. 1 kV	
Output current / per channel	max. 1 mA	
Channels	8 / 16	
Cascadability	Channels can be grouped individually (2, 4, 8, 16 channel groups)	
Polarity	Factory fixed, positive or negative	
Floating principle	Single Channel Floating Ground (FG)	
Potential difference	4 kV, optional 5kV	
Ripple and noise (f > 10 Hz) (at max. load and $\|V_{Out}\| > 2\% \cdot V_{nom}$)	5 mV_{p-p} against RTN; for modules with max. floating voltage > 4kV: 20 mV_{p-p}	
Stability		
Stability - [ΔV_{out} vs. ΔV_{in}]	$2 \cdot 10^{-4} \cdot V_{nom}$	
Stability - [ΔV_{out} vs. ΔR_{load}]	$2 \cdot 10^{-4} \cdot V_{nom}$	
Long Term Stability (1h Warmup) 24h		
Temperature coefficient	50 ppm / K	30 ppm / K
Resolution voltage setting	50 mV	
Resolution current setting	20 nA	
Resolution voltage measurement (1	5 mV	
Resolution current measurement (1	5 nA	1st measurement range: 5 nA 2nd measurement range: 100 pA [$I_{out} < 20\mu A$]
Measurement accuracy - The measurement accuracy is guaranteed in the range $1\% \cdot V_{nom} < V_{Out} < V_{nom}$ and for 1 year		
Accuracy voltage measurement	$\pm (0.01\% \cdot V_{Out} + 0.02\% \cdot V_{nom})$	
Accuracy current measurement	$\pm (0.05\% \cdot I_{Out} + 0.1\% \cdot I_{nom})$	1st measurement range: $\pm (0.02\% \cdot I_{Out} + 0.05\% \cdot I_{nom})$ 2nd measurement range: $\pm (0.02\% \cdot I_{Out} + 10\ nA)$ [$I_{out} < 20\mu A$]
Sample rates ADC (SPS)	5, 10, 20, 40, **80** (2	
Digital filter averages	1, 16, **64** (2, 256, 512, 1024	
Voltage ramp up / down [V/s]	$1 \cdot 10^{-6} \cdot V_{set}$ up to $0.5 \cdot V_{set}$	
Hardware limits	potentiometer per module (V_{max} / I_{max} is the same for all channels)	
Digital interface	CAN-Interface (potential free)	
System connector	96-pin connector according to DIN 41612	
Power requirements V_{IN}	8ch: + 24 V (< 1 A) and + 5 V (< 0.2 A) 16ch: + 24 V (< 2 A) and + 5 V (< 0.4 A)	
Protection	Safety loop, overload and short circuit protected, optionally INHIBIT per channel (ID / IU, NID / NIU) (**ATTENTION:** there is only one short circuit or arc per second allowed!)	
HV connector	51 pin REDEL HV connector (R51)	
Safety loop connector	Lemo 2pole	
Limit Monitor socket	Lemo 1pole	

SPECIFICATIONS	EHS series 7 Standard	EHS series 8 High Precision
Case	6U Euro cassette	
Dimensions – L/W/H	220mm / 8HP (40.64mm) / 6U	
Operating temperature	0 ... 40 °C	
Storage temperatures	-20 ... 60 °C	
Humidity	20 – 80 %, not condensing	
Notes: 1) The resolution of measurable values depends on the settings of the sampling rate and the digital filter! 2) Standard factory settings		

Table 1: Technical data: Specifications EHS Series 7 and 8

2.1 Configurations sample

CONFIGURATIONS (sample configuration)																
HV-CHANNEL	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
EM168n001 (2 x 8 channels cascade)																
Group	G1	G1	G1	G1	G1	G1	G1	G1	G2	G2	G2	G2	G2	G2	G2	G2
Polarity (p=positiv, n=negative)	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Output Voltage V_{nom} in V	800	400	800	400	800	400	800	400	800	400	800	400	800	400	800	400
Output current I_{nom} in mA	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Table 2: Technical data: Sample configuration of EHS series 8 High Precision modules

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The shown configuration are exemplarily. Please contact iseg to request custom configurations. **The configuration is defined when ordering and can only be changed at iseg factory.**

2.2 Options

OPTIONS	OPTION CODE	EXAMPLE	ITEM CODE HEX CODING
POLARITY	Positive: **x = p** Pegative **x = n**	EMS 87 05**p**	
SINGLE CHANNEL INHIBIT - down	**ID**		400
SINGLE CHANNEL INHIBIT - up	**IU**		800
NEGATED LOGIC INHIBIT ID, IU	**N**		80
ACTIVE SAFETY LOOP	**SLA**		001
INTERNALLY POWERED SAFETY LOOP	**SLP**		002

Table 3: Technical data: Options and order information

3 Functions & Handling

3.1 Connection

The supply voltages and the CAN interface are connected to the module via a 96-pin connector on the rear side of the module. The physical address of the module, determined by the slot position in the crate, is also read via this connector.

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INFORMATION	Note: For proper operation the module must be configured with the correct CAN bitrate, which meets the configuration of the crate controller, the module will be used with. The delivery condition is shown on the modules typeplate (side plate of the module). Typically newer iseg crate controllers (CC24, CC23, CC238) are delivered with 250kBits/s standard. Wiener M-POD Controller and older iseg hardware is set on 125 kBit/s standard bitrate.

3.2 Module status

The module status is displayed by two LEDs on the front panel

green LED „OK“ on	all channels have the status “OK“
green LED „OK“ off	an error occured: safety loop is possibly not closed or the power supplies are out of tolerance or the threshold of V_{max}, I_{max}, I_{set} or I_{trip} (see function descriptions for details) has been exceeded LED will be switched off until the error has been fixed and the corresponding status bit has been erased via software interface.
yellow LED on	one or more channels have status “HV ON” (voltage on output is greater than 56V)
green LED blinking	Firmware update is stored into flash, do not switch of power supply, crate etc.

Table 4: Module status information

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INFORMATION	Note: For more information on module firmware upgrade procedure, please refer to your crate controller manual (see Appendix).

3.3 Ramping

3.3.1 Synchronized ramping

A special ramping engine allows simultaneous up- and down ramping of all channels by checking the engagement of the regulation after switch on. This allows time-wise nearly common voltage ramps.

The ramping speed can be configuered by the module datapoint **VoltageRampSpeed**. If an off channel is switched on, the voltage at time **t** during the ramp is given by

$V(t) = V_{set} \cdot VoltageRampSpeed/100/s \cdot (t - t_0)$,

where **t_o** is the time when the ramp starts. This guarantees that all channels starting to ramp at the same time will also approach their set values at the same time. An example for syncronized is shown in Figure 1.

When ramping from a set voltage **$V_{set,1}$** to a new voltage **$V_{set,2}$** the voltage ramp speed refers to the graeter of the two values, i.e. the voltage change is given by

$Max(V_{set,2}, V_{set,1}) \cdot VoltageRampSpeed/100/s$.

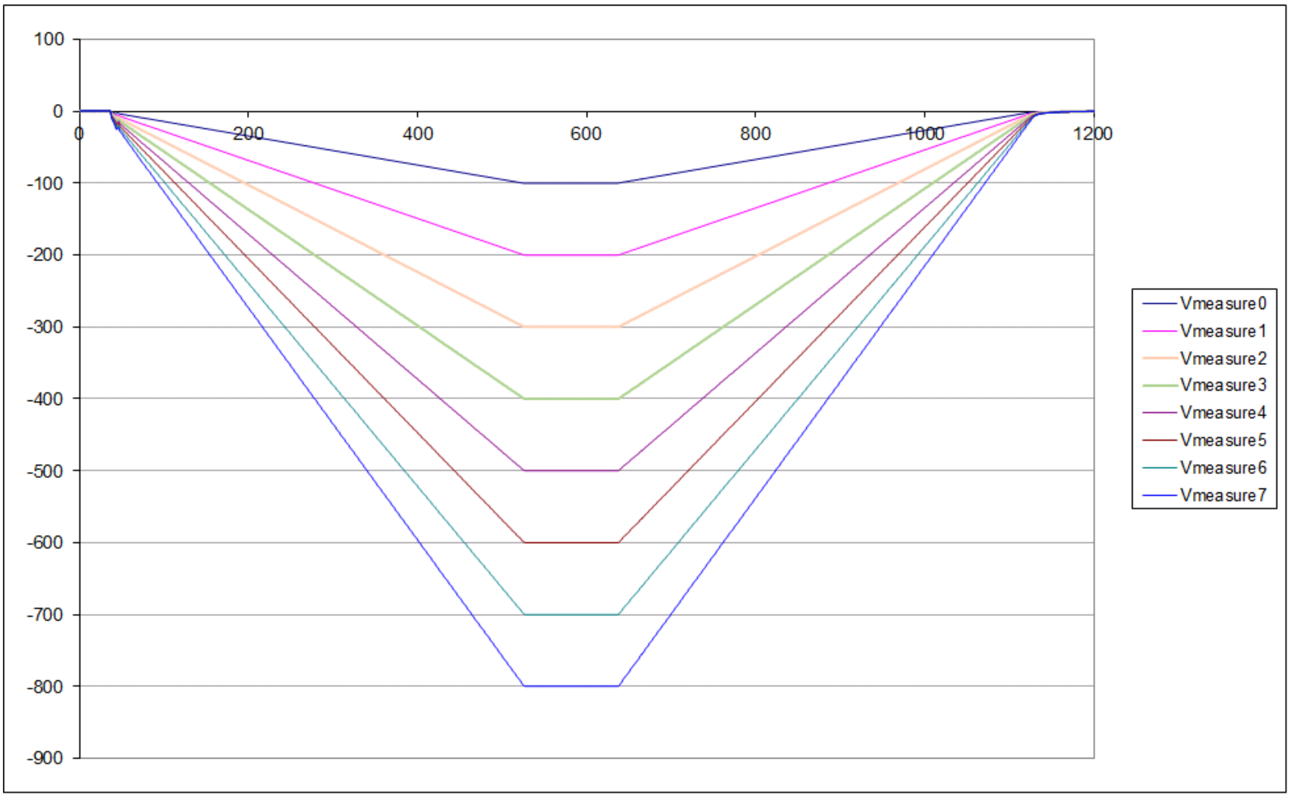

Figure 1: Example for synchronized voltage ramp (ex. EM168n001 - negative polarity)

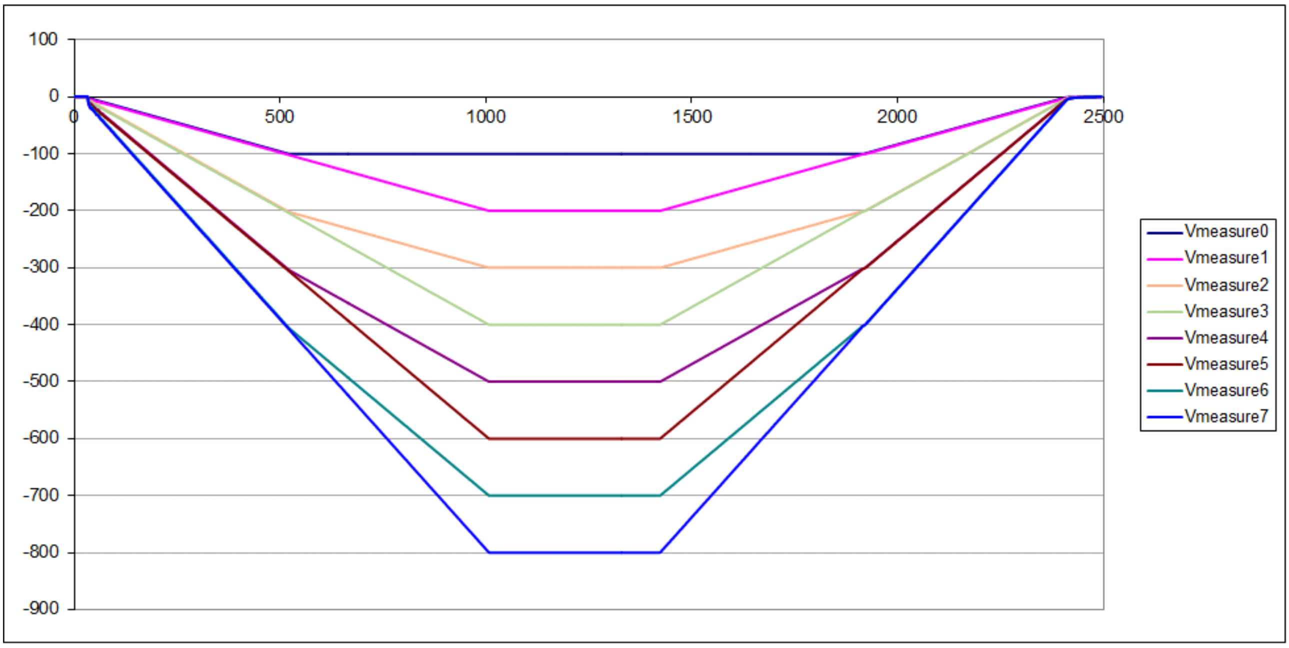

Figure 2

Channel	Priority
Ch0	0
Ch1	1
Ch2	0
Ch3	1
Ch4	0
Ch5	1
Ch6	0
Ch7	1

Table 5 - ramping sequence for the priority specification

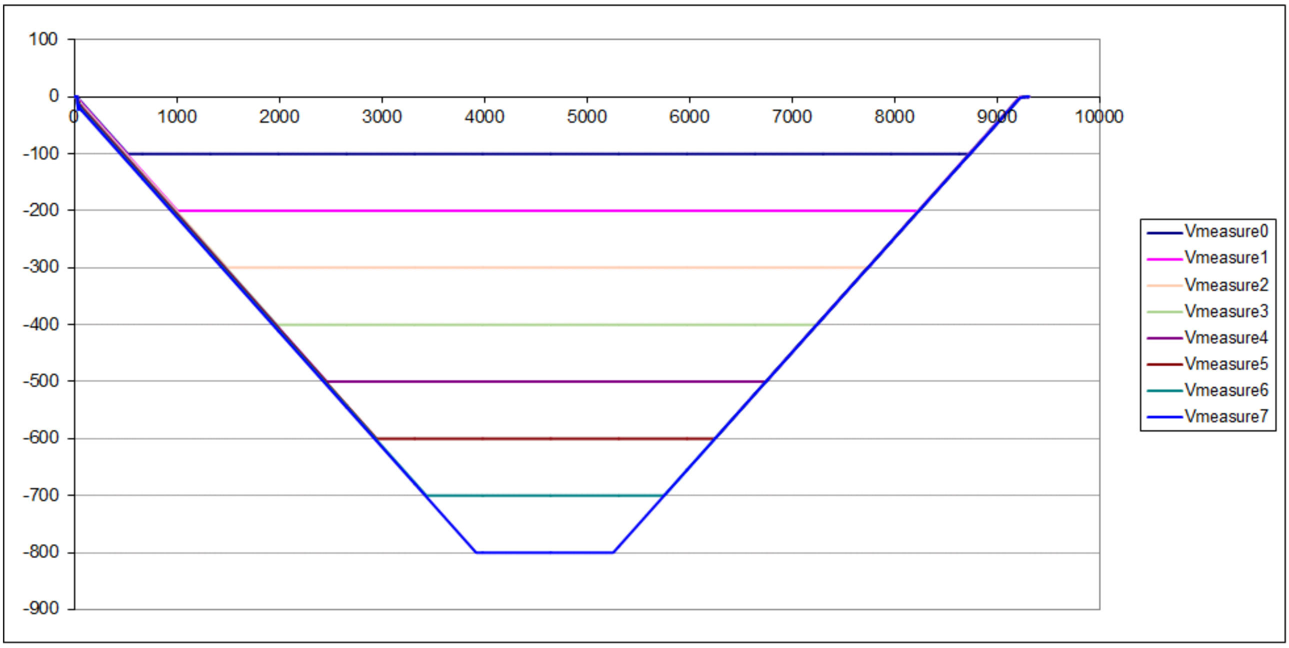

Figure 3

Channel	Priority
Ch0	0
Ch1	1
Ch2	2
Ch3	3
Ch4	4
Ch5	5
Ch6	6
Ch7	7

Table 6 - ramping sequence for the priority specification

3.3.2 Priority control of voltage ramps

For each channel a ramping priority value between **0** and **7** can be defined (lower number = higher priority). If multiple channels with different priority values are switched on at the same time, at first all channels with the lowest priority number will ramp up. Once these channel reached their set voltages the channels with the next higher priority number start ramping. This procedure repeats until all channels ramped up. When channels are switched off the sequence is inverted, i.e. the ramp down starts with the channels with the highest priority number.

An example for ramping with equal priority values in all channels is given in figure 1.

The ramping sequence for the priority specification in table 5 is shown in figure 2.

The ramping sequence for the priority specification in table 6 is shown in figure 3.

Service	SNMP	isegHAL	iCSservice
Data - point	outputVoltageRampPriority	line.device.channel.VoltageRampPriority	line.device.channel.Setup.voltageRampPriority

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More details about the datapoint configuration can be found in chapter **4.Getting started: EHS Stack configuration**.

3.4 Voltage loss compensation over external resistors

A special feature of the EHS Stack modules allows an automatic compensation of the voltage loss over external resistors, connected to the HV output in series to the actual load. The ohmic value of such resistor, can be specified for each channel.

The compensation works as follows: When the channel is operating the voltage of the HV output is increased automatically by $R \cdot I_{meas}$. The displayed value of the measured voltage is also adapted, i.e. showing the actual (calculated) voltage behind the resistor.

Service	SNMP	isegHAL	iCSservice
Data - point	outputResistance	line.device.channel.Resistance	line.device.channel.Setup.resistanceExternal

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More details about the datapoint configuration can be found in chapter **4.Getting started: EHS Stack configuration**.

3.5 Measurement range selection for all channels (HP models only)

The selection of the current measurement range (1st and 2nd measurement range, see technical data) is done automatically and for all channels at the same time. The HV channel with the highest measured current value defines the measurement range, i.e. only if the measured current in all channels is smaller 20µA the 2nd measurement range is used.

3.6 Hardware Limits

The maximum output voltage for all channels (hardware voltage limit) is defined by the position of the corresponding potentiometer V_{max}. The maximum output current for all channels (hardware current limit) is defined by the position of the corresponding potentiometer I_{max} . The highest possible set value for voltage and current is given by V_{max} – 2% and I_{max} – 2%, respectively. It is possible to measure the hardware voltage and current limits at the sockets below the potentiometer. The socket voltages are proportional to the relative limits, where 2.5 V corresponds to 102 ± 2 % • V_{nom} and 102 ± 2% • I_{nom}. The output voltage and current are limited to the specified value. If a limit is reached or exceeded in any channel the green LED "OK" at the front panel turns off.

3.7 Safety Loop

A safety loop can be implemented by the safety loop socket (SL) on the front panel and between the SLcontacts (Pin 22 and PIN 30) at the REDEL-connector, if equipped. If the safety loop is active a high voltage generation in any channel is only possible if the safety loop is closed and an external current in a range of 5 to 20 mA of any polarity is driven through the loop. (For modules with a REDEL-connector the front panel SL input must be shortened.) If the safety loop is opened during the operation the output voltages will be shut off without ramp, the corresponding bit in ModuleStatus is cancelled and in ModuleEventStatus is set (see "*CAN_EDCP_Programmers-Guide.pdf*" in the appendix). After closing the loop again the ModuleEventStatus has to be reset and the channels have to be switched ON. The loop connectors are potential free, the internal voltage drop is approx. 3 V. By factory setup the safety loop is not active (the corresponding bits are always set). The loop can be activated by removing the jumper "SL-disable" on the rear side of the module.

3.8 Protection functionality for detectors

Modules of the EHS Stack series include a number of user-configurable protection features that can prevent overcurrent, automatically decrease channel voltages as a response to increased currents, initiate automatic shut down sequences and/or prevent voltage rebounds caused by time-limited discharge events.

The following general terms are used to describe the features:

- V_{set} is the user programmable voltage set value. This value can be changed any time by the user.
- V_{setint} is the actual set value for the internal voltage regulator of a channel, generated by a DAC. In normal, voltage regulated operation it is equal to V_{set}. During voltage ramps V_{setint} continuously changes such, that the output voltage follows the specified ramp speed. Within the special operation modes described below it could also get values different from V_{set} .
- V_{meas} is the voltage at the channel output, measured by the module.
- t_{VM} is the time to obtain a new value V_{meas} after a sudden voltage change due to a discharge in the channel load. It includes internal slew rates and averaging to obtain a suffieciently stable and precise value. t_{VM} is typically below 500ms

3.8.1 Constant Current Mode

The Constant Current Mode (CC) is the default response on an increased output current. If the output current would exceed the set current (I_{set}) at the specified set voltage (V_{set}) the channel operates as a constant current source at I_{set}. For modules with one current measurement range the module can operate in CC Mode for I_{set} values in the range $\mathbf{I_{nom} \geq I_{set} \geq 5E\text{-}04 \bullet I_{nom}}$. Although the modules accepts smaller values I_{set}, the CC Mode can only operate down to the given limitation. Smaller set value will only affect the funcions **KillEnable** and **Delayed trip**, described below.

For modules with two current measurement ranges, the following limitations must be considered when operating a channel with $\mathbf{I_{set}}$ values in the lower current measurement range (i.e. typically < 20µA):

- If I_{set} < 20µA the maximum voltage ramp speed is limited to 1 % of V_{nom}. If the load has a significant capacitance it might be necessary to further reduce the voltage ramp speed to avoid ramp instabilities.
- While a channel is operating in CC Mode it is not possible to switch between the two current measurement ranges, i.e. the set current cannot be changed from a value > 20 µA to a value < 20 µA or vice versa. To change the set current across the measurement range boundary the channel must stop operation in CC mode (i.e. by switching off the channel or reducing the voltage such, that it operates in Constant Voltage Mode (CV)).

While a channel operates in CC mode, within the time t_{VM} the corresponding output voltage V_{meas} is obtained. Once V_{meas} is available, V_{setint} is lowered to an (absolute) value slightly above V_{meas}. For the case the output current decreases again, this prevents that the output voltage suddenly jumps back (rebounds) to V_{set}. Instead, it will ramp up from V_{setint} to V_{set} with the specified ramp speed.

3.8.2 KillEnable

The function KillEnable forces the shut down of a channel at the fastest hardware response time (smaller than 1 ms) if a specified trip current is exceeded. If *KillEnable* is active the value of the set current ($\mathbf{I_{set}}$) defines the trip current. An approach or exceedance of this current (detected by a hardware signal) will immediately shut off the channel without ramp. However, the actual discharge time strongly depends on the connected load.

The following limitations must be considered if the function KillEnable is activated:

- Maximum voltage ramp speed is limited to 1 % of V_{nom}. To avoid unintended current trips during ramps it might be necessary to further reduce the ramp speed for very small trip currents or capacitive loads. Alternatively KillEnable can be activated only after the completion of the ramp.
- The minimum trip currents for a hardware detection is 5E-04 • I_{nom} for modules with one current measurement range and 200 nA for modules with two current measurement ranges. It is possible to specify smaller trip values, however there is no hardware current limitation below the hardware detection limits. Also, the response time on a trip that does not triggers the hardware detection can be up to 1s.
- Modules with two current measurement ranges do not change the current measurement range automatically if KillEnable is active. The channel remains in the high measurement range if I_{set} > 20µA and in the low measurement range for $I_{set} \leq$ 20µA.

3.8.3 Delayed Trip

The function "*Delayed Trip*" provides a user-configurable, time-delayed response to an increased output current (I_{out}) higher than the set current (I_{set}).

By a programmable timeout with one millisecond resolution, the trip can be delayed up to four seconds. During this time, the output current is limited to the value of I_{set} (constant current mode).

The hardware regulation signals, constant voltage (CV) or constant current (CC), are sampled every millisecond by the microprocessor. Once the constant current mode is active, the programmed timeout counter is decremented. If the HV channel returns to constant voltage mode before timeout (i.e. $I_{out} < I_{set}$), the counter will be reset. So this process can be restarted if the current rises again.

While the channel operates in CC mode, within the time t_{VM} the corresponding output voltage V_{meas} is obtained. Once V_{meas} is available (and the channel still in CC mode), V_{setint} is lowered to an (absolute) value slightly higher than V_{meas}. In case the channel returns to CV mode before the timeout counter approaches zero, it will ramp up from V_{setint} to V_{set} with the specified ramp speed. In this case the counter is only reset once the voltage is back at V_{set}.

3.8.4 Delayed Trip with Bottom Voltage

The usage of a bottom voltage is a special feature to avoid voltage rebound effects that might follow a discharge in GEM detectors.

A bottom voltage (**V_{bottom}**) can be specified for each channel in as a relative value from 0% to 100%, referring to the programmed set voltage (**V_{set}**) of the channel.

If a channel switches to constant current mode, e.g. caused by a discharge, V_{setint} of the channel is immediately decreased to V_{bottom}. A bottom voltage of 0% is equivalent to a shut down of the channel, while 100% does not reduce the set voltage (followed by procedure described in section 3.8.3 Delayed Trip). For bottom voltages between 0 and 100% the discharge event can result in three different operational sequences:

a) If the absolute value of the specified bottom voltage is below the voltage resulting in the constant current mode ($|V_{bottom}| < |V_{CC}|$), the channel will immediately return to constant voltage (CV) operation, at the bottom voltage. In this case no further reaction takes place, see Figure 4.

Without user intervention the channel remains at V_{bottom}. If the voltage bottom event is deleted, the channel will ramp back to the specified value V_{set}.

Service	SNMP	isegHAL	iCSservice
Data - point	outputVoltageBottom outputVoltageBottomReached	line.device.channel.VoltageBottom line.device.channel.EventStatus:25	line.device.channel.Setup.voltageBottom line.device.channel.Event.voltageBottom

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More details about the datapoint configuration can be found in chapter **4.Getting started: EHS Stack configuration**.

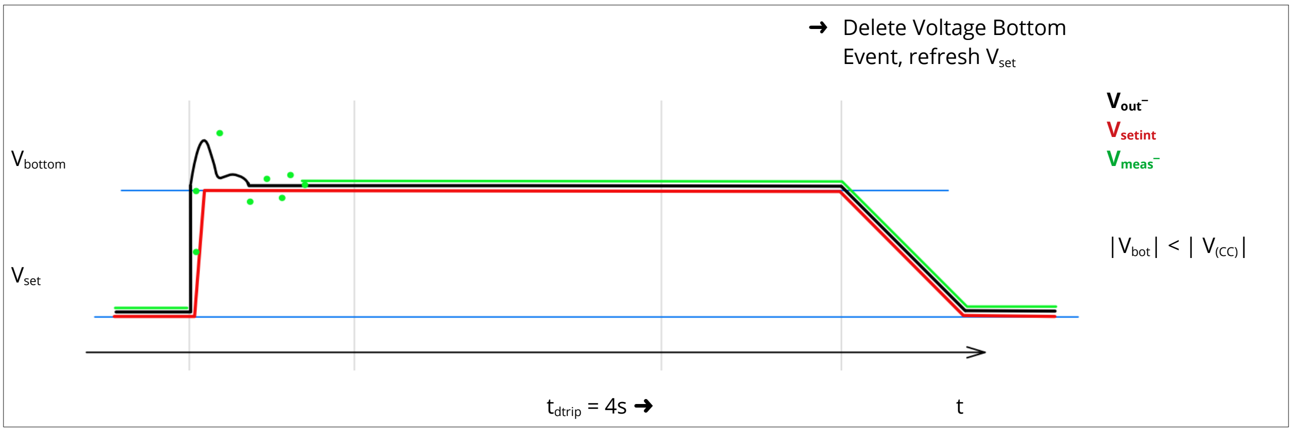

Figure 4: Discharge with $|V_{bottom}| < |V_{CC}|$, shown for a channel with negative output voltage

b) For |V_{bottom}| > |V_{CC}| the channel will remain in CC operation as long as the discharge goes on. If the discharge stopps before trip timeout (i.e. the channel returns to CV mode at V_{setint} = V_{bottom}) the channel voltage remains at V_{bottom} until the voltage bottom event is deleted.

If the time the channel operates in CC mode is greater t_{VM}, V_{setint} is lowered accordingly and the channel voltage returns to V_{bottom} with the specified ramp speed (instead of rebounding) once the discharge stopps. This case is illustrated in Figure 5.

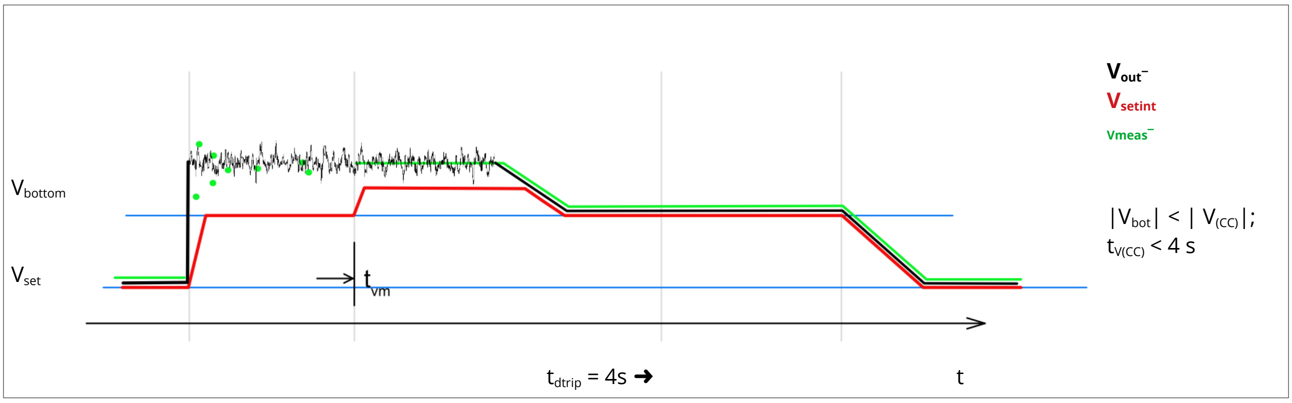

*Figure 5: Discharge with |**V_{bottom}**| > |**V_{CC}**| and recovery before trip timeout, shown for a channel with negative output voltage*

c) For |V_{bottom}| > |V_{CC}| the channel will remain in CC operation. If at the end of the delayed trip time the channel is still in CC mode all channels of the stack group are ramped down and a trip event will be generated.

If the trip delay time is greater t_{VM} , V_{setint} is lowered accordingly. The ramp down of the tripped channel starts from this value.

This case is illustrated in Figure 6. Figure 7 shows the shut down behaviour of all channels after a trip in channel 3.

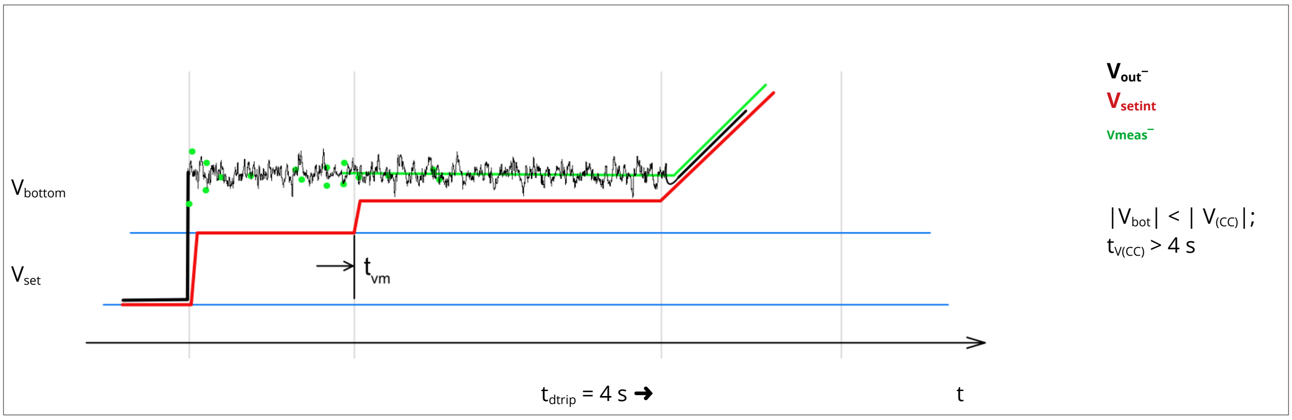

*Figure 6: Discharge with |**V_{bottom}**| > |**V_{CC}**| without recovery before trip timeout, shown for a channel with negative output voltage*

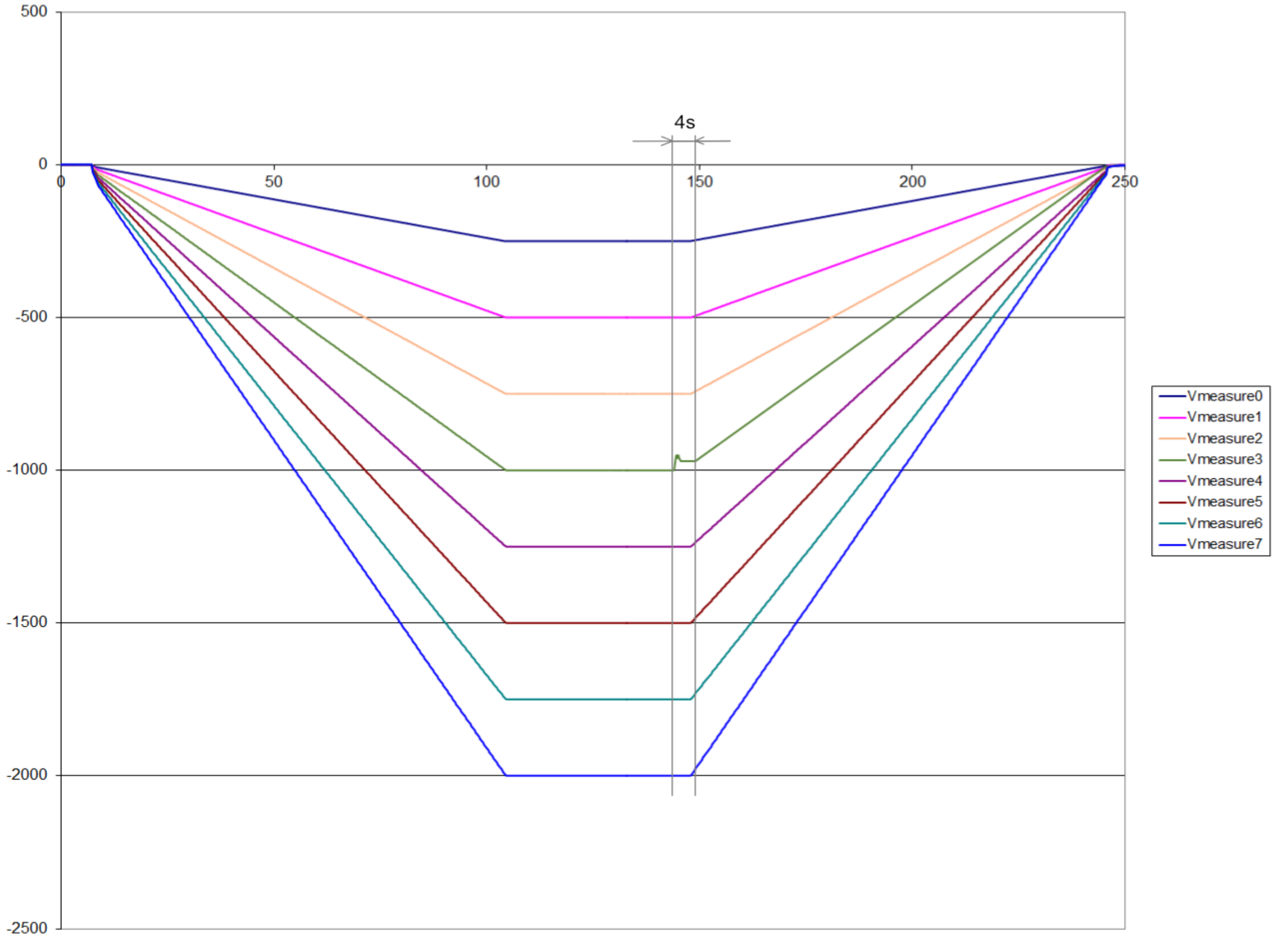

Figure 7

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INFORMATION	**An activated** KillEnable feature disables the Delayed Trip function.

An active *KillEnable* function disables the *Delayed Trip* function.

4 Getting started: EHS Stack configuration

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Please read CC24 manual as a general description of iCS2 - iseg Communication Server 2 first. The manual can be downloaded at https://iseg-hv.com/de/products/detail/MMS-Controller.

The access the configuration, open a browser and enter the IP-adress of the CC24 controller

- Login with user name and password (admin, password).
- Select iCSconfig folder

4.1 EHS Stack configuration via Web-browser

The iCSconfig - hardware dialog is the easiest way to access the special setup data points for EHS Stack modules.

- Priority ➜ voltage ramp priority for the channel
- V_{bottom} ➜ specify bottom voltage (percentage of V_{set})
- ext. Resistance ➜ specify external resistors (unit: Ohm) for automatic voltage loss compensation

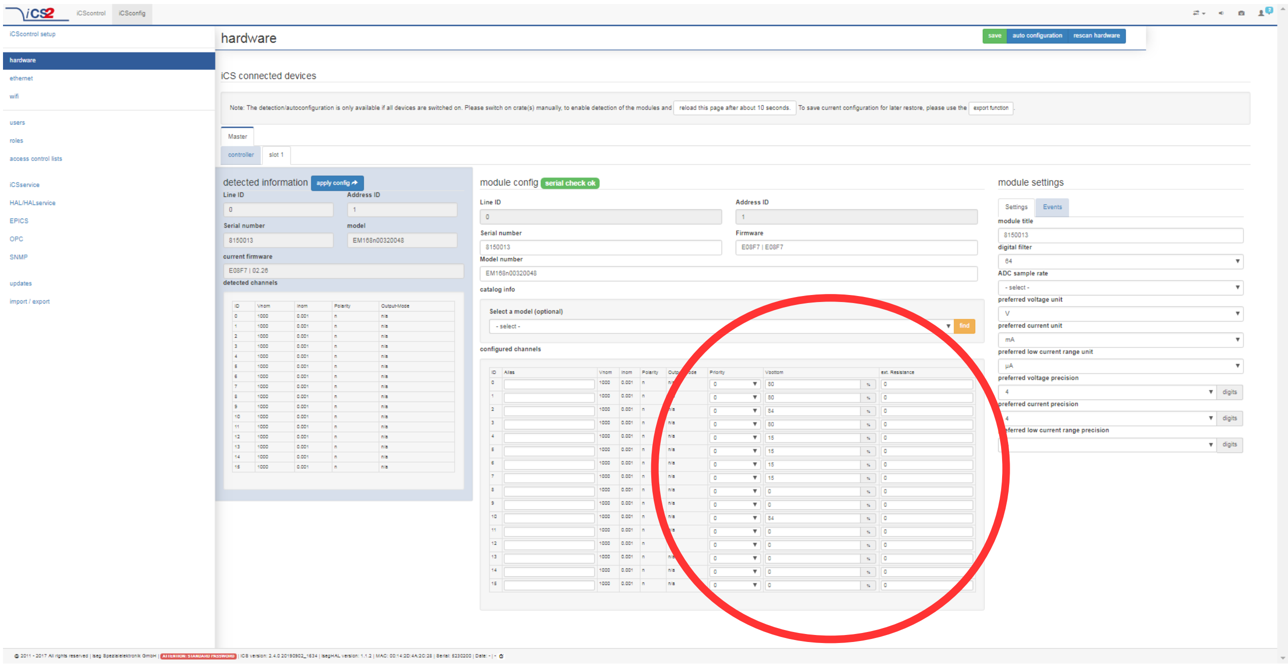


Figure 8: sows the iCSconfig hardware configuration dialog to configure setup data like Priority, Bbottom and external resistance.

configured channels

ID	Alias	Vnom	Inom	Polarity	Output-Mode	Priority	ext. Resistance
0		800	0.001	n	n/a	0	9900
1		400	0.001	n	n/a	1	9900
2		800	0.001	n	n/a	0	9900
3		400	0.001	n	n/a	1	9900
4		800	0.001	n	n/a	0	9900
5		400	0.001	n	n/a	1	9900
6		800	0.001	n	n/a	0	9900
7		400	0.001	n	n/a	1	9900

Figure 9: Detail of Figure 8

4.2 EHS Stack configuration via SNMP

Before using SNMP commands the service must be enabled in the iCSconfig - SNMP dialog:

- click "Generate configuration"
- switch on "autostart SNMP interface"
- click "start SNMP"
- click "save"
- the file WIENER-CRATE-MIB.txt can be downloaded

The current WIENER-CRATE-MIB.txt file contains additional SNMP item for EHS Stack module:

- outputVoltageRampPriority
- outputVoltageBottom
- outputResistance
- outputVoltageBottomReached of outputStatus

5 Options

5.1 Single Channel Inhibit (IU, ID, NIU, NID)

INFORMATION

INFORMATION

INHIBIT is an external signal, that switches off the high voltage for the device or a specific channel.

Optionally it is possible to equip modules with an *INHIBIT* for each channel via a Sub-D connector. Channel 0 to 7 corresponds to Pin 1 to 8 at the Sub-D connector, Pin 9 is connected to GND.

The INHIBIT signals are TTL-level, the signal logic and default states can be configured. The following settings are possible:

Option – IU (default)

INHIBIT signal logic:	LOW-active (LOW ➜ HV-generation stopped)
default state:	HIGH (internal pull-up resistor applied)
open INHIBIT signal input:	HV enabled

Option – ID

INHIBIT signal logic:	LOW-active (LOW ➜ HV-generation stopped)
default state:	LOW (internal pull-down resistor applied)
open INHIBIT signal input:	HV disabled

Option – NIU

INHIBIT signal logic:	HIGH-active (HIGH ➜ HV-generation stopped)
default state:	HIGH (internal pull-up resistor applied)
open INHIBIT signal input:	HV disabled

Option – NID

INHIBIT signal logic:	HIGH-active (HIGH ➜ HV-generation stopped)
default state:	LOW (internal pull-down resistor applied)
open INHIBIT signal input:	HV enabled

The INHIBIT signal must be applied for at least 100 ms to guarantee a detection. If an Inhibit signal is detected, the channel status bit 'Is External Inhibit' and the channel event status bit 'Event External Inhibit' are set. One of the following reactions to this signal can be programmed (see chapter "6.5.1.7 External channel inhibit" in the CAN_EDCP_Programmers-Guide.pdf):

- No Action (default)
- Turn off the channel with ramp
- Shut down the channel without ramp
- Shut down all channels without ramp

When the INHIBIT is no longer active, the Inhibit flag must be reset before the voltage can be switched on again.

5.2 SLA – Active safety loop

Actively opens the Safety loop in case of a trip or a delayed trip. This option allows to shut down other modules and devices by interrupting the SL when a trip is detected.

5.3 SLP – Internally powered safety loop

Internal current source for the Safety Loop (no galvanic isolation of the SL and the crate GND).

5.4 1CR – One current measurement range only (HP)

Only one current measurement range for High Precision Modules

6 Front panel

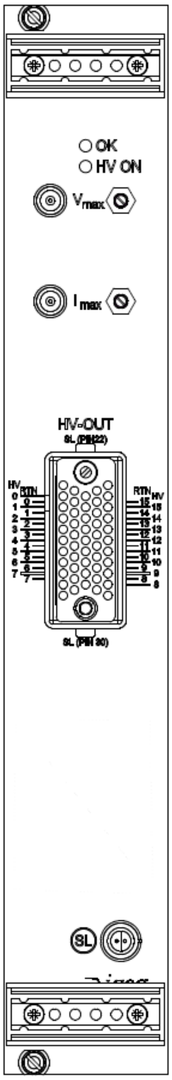
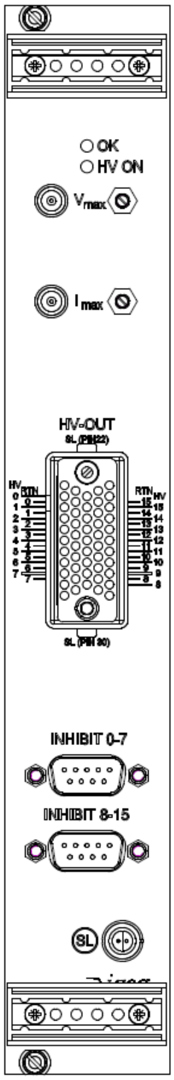
FRONT PANELS		
Channels	8 / 16	8 / 16
HV Connector	R51	R51
Options	–	INHIBIT
Figure		

Table 7: EHS Front panel layout

7 Dimensional Drawings

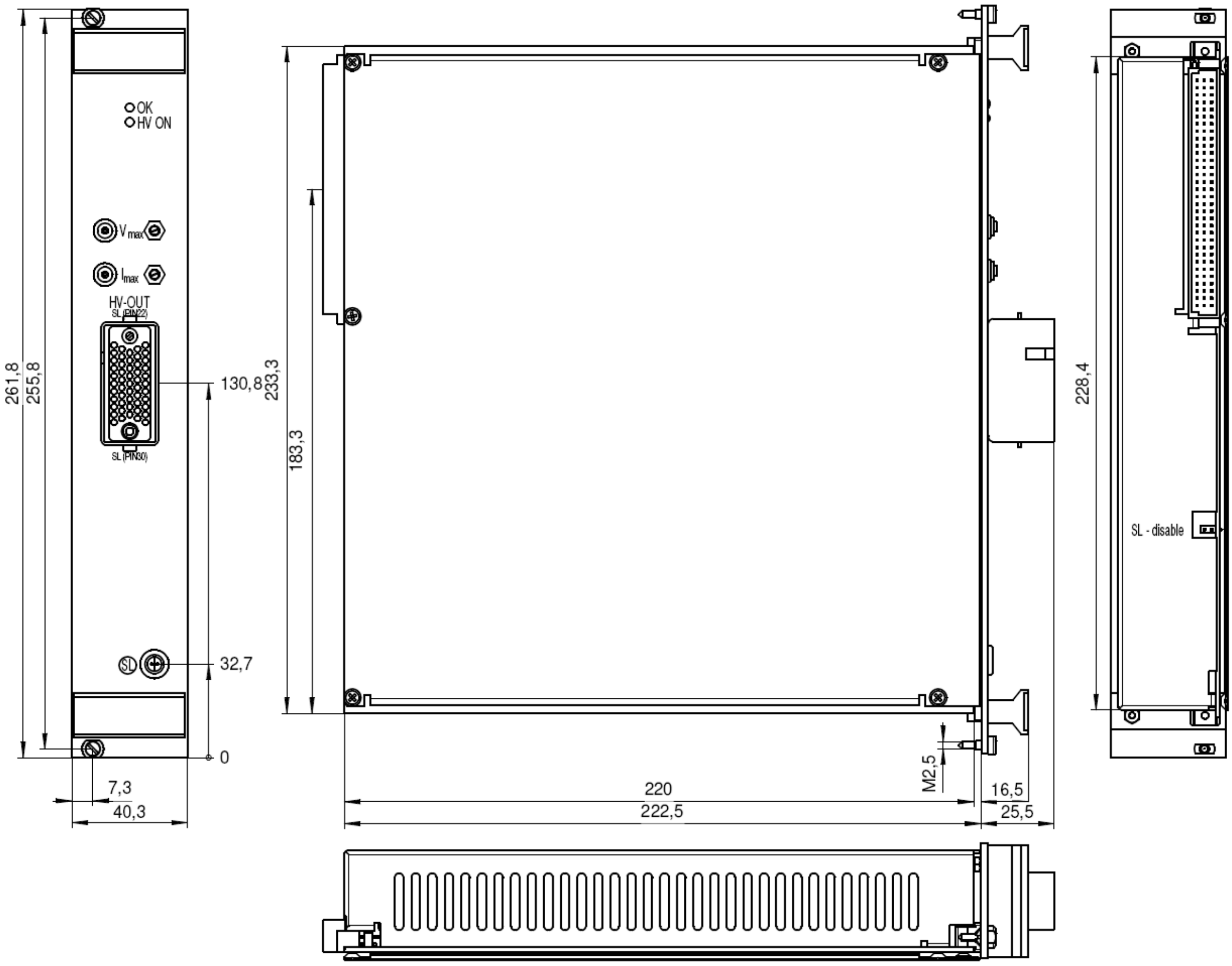


Figure 10: EHS, without Inhibit

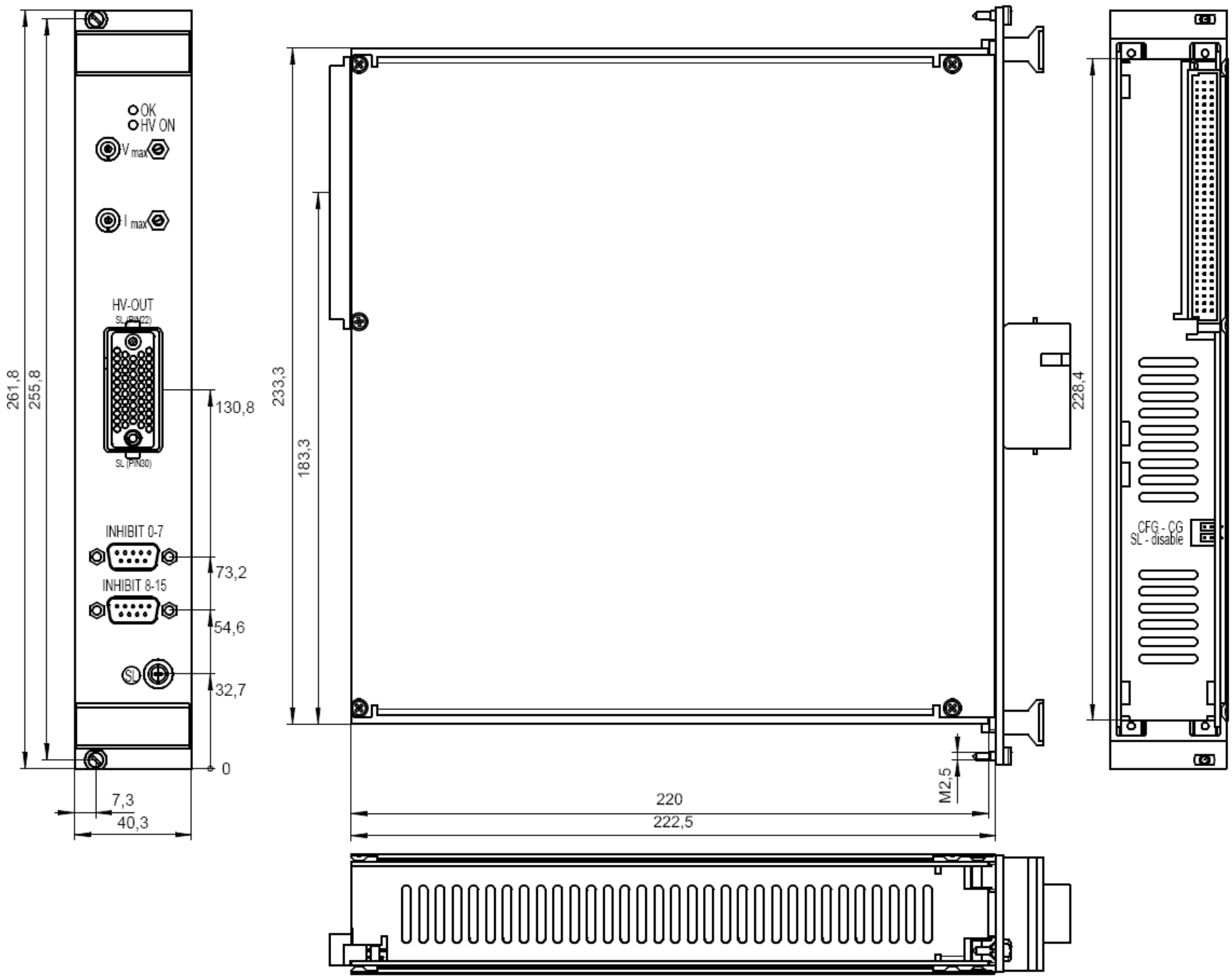
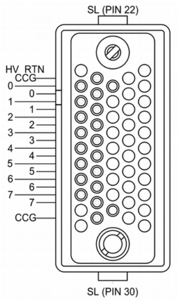


Figure 11: EHS, with Inhibit

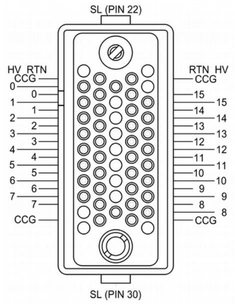
8 Connectors and PIN assignments

HV CONNECTOR ASSIGNMENTS			
Name	R51.47	R51.48	
Figure			

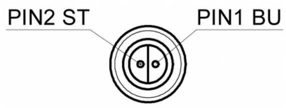
R51.47:



R51.48:



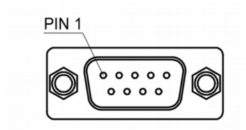
SAFETY LOOP			
Name	Safety Loop socket		
Figure			



LIMIT MONITOR			
Name	Limit monitor socket		
Figure			

IINHIBIT			
Name	INHIBIT connector- DSUB9	DSUB9	
Figure			

PIN	INHIBIT 1	INHIBIT 2
1	CHANNEL 0	CHANNEL 8
2	CHANNEL 1	CHANNEL 9
3	CHANNEL 2	CHANNEL 10
4	CHANNEL 3	CHANNEL 11
5	CHANNEL 4	CHANNEL 12
6	CHANNEL 5	CHANNEL 13
7	CHANNEL 6	CHANNEL 14
8	CHANNEL 7	CHANNEL 15
9	GND	GND



Notes:
C-RTN: Common Return
CCG: Common Crate Ground
HV: High Voltage
RTN: Return
SRTN: Special Return, checks if the contact is plugged in
SL: Safty Loop

Table 8: Safety Loop and Limit Connector (drawings not to scale)

CONNECTORS PART NUMBERS (manufacturer code / iseg accessory parts item code)			
POWER SUPPLY SIDE		**CABLE SIDE**	
R51 (REDEL 51 PINS)			
Socket	SLG.H51.LLZG	Connector	SAG.H51.LLZBG / Z200325
Socket contacts (male)	FFA.05.403.ZLA1 / Z592189	Connector contacts (female)	ERA.05.403.ZLL1 / Z592263
Contacts Saf. Loop (male)	FGG.2B.565.ZZC / Z592261	Contacts Saf. Loop (female)	EGG.3B.665.ZZM / Z592262
		Socket Load Side	SLA.H51.LLZBG / Z201035
Safety Loop (LEMO)			
Socket	ERA.0S.302.CLL	Connector	FFA.0S.302.CLAC / Z592312
Limit monitor 1pol. (LEMO)			
Socket	ERN.00.250.CTL	Connector	FFA.00.250.CTAC31 / Z200793

Tabelle 9: Connectors part number information

HV - OUT (high voltage)	Pin	RETURNs	Pin
Channel 0 – HV_{out}	2	**Channel 0 - RETURN**	13
Channel 1 – HV_{out}	3	**Channel 1 - RETURN**	14
Channel 2 – HV_{out}	4	**Channel 2 - RETURN**	15
Channel 3 – HV_{out}	5	**Channel 3 - RETURN**	16
Channel 4 – HV_{out}	6	**Channel 4 - RETURN**	17
Channel 5 – HV_{out}	7	**Channel 5 - RETURN**	18
Channel 6 – HV_{out}	8	**Channel 6 - RETURN**	19
Channel 7 – HV_{out}	9	**Channel 7 - RETURN**	20
Channel 8 – HV_{out}	50	**Channel 8 - RETURN**	39
Channel 9 – HV_{out}	49	**Channel 9 - RETURN**	38
Channel 10 – HV_{out}	48	**Channel 10 - RETURN**	37
Channel 11 – HV_{out}	47	**Channel 11 - RETURN**	36
Channel 12 – HV_{out}	46	**Channel 12 - RETURN**	35
Channel 13 – HV_{out}	45	**Channel 13 - RETURN**	34
Channel 14 – HV_{out}	44	**Channel 14 - RETURN**	33
Channel 15 – HV_{out}	43	**Channel 15 - RETURN**	32
FUNCTION	**Pin**	**FUNCTION**	**Pin**
CCG (Crate GND)	12	**CCG (Crate GND)**	21
CCG (Crate GND)	31	**CCG (Crate GND)**	40
SAFETY LOOP	22	**SAFETY LOOP**	30
Notes: To reduce cost Pins 14 to 20 and 32 to 38 can be omit			

Table 10: Assignment REDEL Connector R51.R48, 2 groups of 8 channels (ex. EM168n001)

9 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
REDEL coupling Socket, without contacts	Z200325
REDEL pin contact	Z592189
REDEL Socket contact, ERA.05.403.ZLL1	Z592263
REDEL SL pin contact	Z592261
REDEL SL sockets Contact, EGG.3B.665.ZZM	Z592262
REDEL socket carrier red SLA.H51.LLZG	Z201035
Lemo plug 2-pole without collet chuck (SL)	Z592312
1-pin LEMO connector, FFA.00.250.CTAC31	Z200793

Table 11: Accesories

10 Order guides

CABLE ORDER GUIDE				
POWER SUPPLY SIDE CONNECTOR	**CABLE CODE**	**CABLE DESCRIPTION**	**LOAD SIDE CONNECTOR**	**ORDER CODE** ***LLL = length in m*** [1]
R51.47-G	07	HV cable 6kV Kerpen SL-v2YCeHI 37xAWG26/7red	R51.46-A	RG47_C07-*LLL*_RA47
R51.48-G	07	HV cable 6kV Kerpen SL-v2YCeHI 37xAWG26/7red	R51.48-A	R45G_C07-*LLL*_RA45
Notes: [1] Length building examples: 10cm ➜ 0.1, 2.5m ➜ 2.5, 12m ➜ 012, 999m ➜ 999				

Table 12: Guideline for cable ordering

CONFIGURATION ORDER GUIDE (item code parts)								
EH	**16**	**8**	**010**	**P**	**105**	**000**	**48**	**00**
High Voltage, Distinct Source	Numbers of channels	Class	V_{nom}	Polarity	I_{nom}	Option (hex)	HV-Connector	Customized Version
	8 16	7 = Standard 8 = High Precision	three significante digits •100V For Example: 008 = 800V	p = positive n = negative	two significante digits + number of zeros For Example: 105 = 1mA	Sum of the hex codes see Table 3: Technical data: Options and order information For Example: IU + TC = 804	47 / 48 = Redel Multipin see Table 8: Safety Loop and Limit Connector (drawings not to scale)	00 = none
EM	**16**	**8**	**XXX**	**p**		**000**	**48**	**00**
High Voltage, Distinct Source mixed Channels	Numbers of channels	Class	Channel-Configuration	Polarity	not applicable	Option (hex)	HV-Connector	Customized Version
	8 16	7 = Standard 8 = High Precision	Sample 001 see Table 2: Technical data: Sample configuration of EHS series 8 High Precision modules	p = positive n = negative		Sum of the hex codes see Table 3: Technical data: Options and order information For Example: IU + TC = 804	47 / 48 = Redel Multipin see Table 8: Safety Loop and Limit Connector (drawings not to scale)	00 = none

Table 13: Item code parts for different configurations

11 Appendix

For more information please use the following download links:

This document
http://download.iseg-hv.com/SYSTEMS/MMS/EHS/iseg_datasheet_EHS-stack_en.pdf
CAN EDCP Programmers-Guide
http://download.iseg-hv.com/SYSTEMS/MMS/CAN_EDCP_Programmers-Guide.pdf
iseg Hardware Abstraction Layer
http://download.iseg-hv.com/SYSTEMS/MMS/isegHardwareAbstractionLayer.pdf
Crate Controller CC24/23 manual
http://download.iseg-hv.com/SYSTEMS/MMS/EHS/iseg_manual_CC2x_en.pdf

12 Glossary

SHORTCUT	MEANING
V_{nom}	nominal output voltage
V_{out}	output voltage
V_{set}	set value of output voltage
V_{mon}	monitor voltage
V_{meas}	digital measured value of 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} – [ΔV_{in}]	deviation of V_{out} dep. on variation of supply voltage
ΔV_{out} – [ΔR_{load}]	deviation of V_{out} dep. 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

13 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

14 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.

15 Manufacturer´s contact

iseg Spezialelektronik GmbH
Bautzner Landstr. 23
01454 Radeberg / OT Rossendorf

GERMANY

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