

Technical documentation

Last changed on: 2025-04-22

EHS Series

Versatile High Precision High Voltage Module with multiple Floating Options

- 4 / 8 / 16 / 24 / 32 / 48 channel, 100 V – 20 kV versions
- very low ripple and noise
- hardware voltage and current limits
- voltage and current control per channel
- programmable parameters (delayed trip etc.)



Document history

VERSION	DATE	MAJOR CHANGES
4.2	2025-Apr-22	Safety instructions edited, technical data thematically structured, tech. Data and configurations revised, Disposal and WEEE chapter, CG series module discontinued, VCT option only for 8-channel CFG modules, Explanation of terms in the chapter Glossary, Format of the modification date changed, chapter 2.3 Options VLN and VCT removing
4.1	2024-Jan-10	Modification of the chapter "Delayed Trip" to 4.5 Current limitation , firmware release, added manufacturer for S20 connector, small descriptions in chapter Delayed Trip
4.0	2023-Jul-05	Table 1, Resolution current setting " I_{nom} " modified, rename document to "manual"
3.9	2023-Mar-02	Chapter order guides R51.44, connection cable modified RG45_C07-LLL_RA45
3.8	2022-Sep-16	Improved description (technical Data)
3.7	2022-Mar-14	Description of VCT option removed (only on customer request), option VLN removed (only on customer request), overview with part number of connections, Pin assignment connections, new figure front view, improved description figure 7
3.6	2021-May-19	Improved description (Item code revision and customization, voltage specification for HV cables, discontinued modules EHS F1 01x, EHS 201 01x, discontinued HV Connectors I52, C15, new figures front views and dimensions)
3.5	2020-Dec-07	Improved description (Safety Current Loop, Safety Return (SRTN), F02 – High floating voltage, F20 – Very high floating voltage, Glossary)
3.4	2020-Oct-09	Improved description C-RTN, CCG, RTN (Table 14: front view 16/24/48 ch modules)
3.3	2020-Sep-23	Improved description Option Lower output current
3.2	2020-Aug-18	Improved documentation: Cable Order Guide
3.1	2020-Jun-29	Figure for Jumper configuration (CG-CFG), Improved documentation
3.0	2020-Jan-16	Improved documentation: safety information, glossary, Single Channel Inhibit
2.6	2019-Nov-12	Improved documentation: Warranty, Disposal, Accessories added, Fixed error
2.5	2019-Jul-23	Added HV connector and Figures
2.4	2019-Jun-19	Improved documentation
2.3	2019-Jun-03	Fixed Itemcodes, connector codes, Error in description
2.2	2018-Sep-17	Added Pin assignments R51.44, R51.46, I50.52
	2018-Oct-01	Notes revised
	2018-Dec-03	CFG jumper information revised
2.1	2017-Aug-03	Fixed Itemcodes EHS CFG FLEX
2.0	2017-Apr-06	Relayouted documentation & fixes

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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.

Description of the safety instructions

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

CAUTION



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

INFORMATION



Advices marked as "Information" give important information.

Description of the symbols in the manual



Warning of dangerous high voltage



Read the manual



Warning of danger spots



Further information



The crossed bin symbol indicates that the device shall not be disposed with regular.

Description of the symbols on the product



Read the manual.



Important information.



Attention high voltage!



CE marking. The product fulfils the requirements of the applicable EU directives.



The crossed bin symbol indicates that the device shall not be disposed with regular.

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



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



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



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



Do not operate the unit in wet or damp conditions.

WARNING



Do not operate the unit in an explosive atmosphere.

WARNING



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

CAUTION



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

CAUTION



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

INFORMATION



Please check the compatibility with the devices used.

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1 General description

1.1 EHS Standard series

EHS Standard modules are multichannel high voltage power supplies in MMS system (Eurocard format). The output voltage features a high stability, low ripple and noise and low temperature coefficient. With up to 48 channels each single channel has an independent voltage and current control. By offering different configurations and options this module perfectly covers various types of applications such as detector supply, experimental setup or lab use. The EHS Standard module is available in three floating versions, Common Floating Ground (CFG), Floating Ground (FG) and Common Ground (CG).

1.2 EHS High Precision series

The EHS High Precision modules are multichannel high voltage power supplies in MMS system (Eurocard format) with exceptionally high stability, very low temperature coefficients and very low ripple and noise characteristics. With up to 16 channels each single channel has an independent voltage and current control. Compared to a standard module the High Precision EHS is equipped with a second current measurement range to precisely meter low currents. Switching between measurement ranges is done automatically. By offering different configurations and options this module perfectly covers various types of applications such as detector supply, experimental setup or lab use. The EHS High Precision module is available in two floating versions, Common Floating Ground (CFG) and Floating Ground (FG).

2 Technical data

2.1 EHS Standard series

SYSTEM	EHS CFG	EHS FG
Product family	6U Multichannel System (MMS)	
Product version	Standard series	
OUTPUT		
Output voltage	V_{nom}	100V – 20kV
Output current	I_{nom}	10mA – 0.4mA
Polarity	Factory fixed, positive or negative	
Floating principle	Common Floating Ground	Single Floating Ground
Potential difference	56 V channel/GND	20 V channel/ channel/ GND, optionally up to 2 kV
Ripple and noise, $f > 10$ Hz	$\text{mV}_{\text{p-p}}$	$< 10\text{mV}_{\text{p-p}}$
Ripple and noise, $f > 1$ kHz		$< 2 - 3\text{mV}_{\text{p-p}}$
Output connector	R51 SHV	
STABILITY		
Voltage regulation	ΔV_{out} vs. ΔR_{load}	$< 2 \cdot 10^{-4} \cdot V_{\text{nom}}$
Temperature coefficient	voltage	$< 50 \text{ ppm} / K$
Long term stability 24h ¹		$< 5 \cdot 10^{-5} \cdot V_{\text{nom}}$
RESOLUTION		
Voltage Setting	$2 \cdot 10^{-6} \cdot V_{\text{nom}}$	$4 \cdot 10^{-5} \cdot V_{\text{nom}}$
Current Setting	$2 \cdot 10^{-6} \cdot I_{\text{nom}}$	$4 \cdot 10^{-5} \cdot I_{\text{nom}}$
Voltage measurement ²		$2 \cdot 10^{-6} \cdot V_{\text{nom}}$
Current measurement ³		$2 \cdot 10^{-6} \cdot I_{\text{nom}}$
ACCURACY⁴		
Voltage measurement	$\pm (0.01\% \cdot V_{\text{out}} + 0.02\% \cdot V_{\text{nom}})$	
Current measurement	$\pm (0.02\% \cdot I_{\text{out}} + 0.02\% \cdot I_{\text{nom}})$	

1 1h warm-up, constant ambient temperature

2 The resolution of measurable values depends on the settings of the sampling rate and the digital filter

3 The resolution of measurable values depends on the settings of the sampling rate and the digital filter

4 The measurement accuracy is guaranteed in the range $1\% \cdot V_{\text{nom}} < V_{\text{out}} < V_{\text{nom}}$ and for 1 year

CONTROL		EHS CFG	EHS FG
Interface ⁵	digital	CAN	
Voltage ramp	Up / down	up to $0.2 \cdot V_{\text{nom}} / \text{s}$	up to $0.2 \cdot V_{\text{nom}} / \text{s}$ optionally up to $0.75 \cdot V_{\text{nom}} / \text{s}$
Sample Rates (SPS) ⁶	Default setting	500	50
Digital Filter	Default setting		64
PROTECTION			
Safety loop		included	
Overload protected		included	
Short circuit protected ⁷		included	
Hardware limits ⁸	$V_{\text{MAX}} / I_{\text{MAX}}$	included	
Inhibit ⁹		optionally	
CASE			
Form factor		19" plug-in cassette	
Dimensions	L/W/H	220mm / 8HP / 6U	
Weight		1.1kg – 1.8kg	
Cooling		Passive, do not cover ventilation slots	
ENVIRONMENTAL			
Operating temperature		0 ... 40 °C	
Humidity in operation		≤ 80 %, not condensing	
Storage temperature		-20 ... 60 °C	
Humidity during storage		≤ 80 %, not condensing	

Table 1: Technical data: Specifications EHS Standard

5 The HV module is controlled via a controller with internal CAN. The signal is connected to the 96-pin connector.

6 See Additional explanations in the chapter Appendix 12.2 Comparison of monitor value acquisition principles

7 ATTENTION: there is only one short circuit or arc per second allowed!

8 Potentiometer per module

9 per channel (ID / IU, NID / NIU)

CONFIGURATIONS EHS STANDARD SERIES

Type	V _{nom}	I _{nom}	Ch	Max. I _{in} (A) at 24V	Ripple (mV _{p-p}) >1kHz 10Hz-1kHz	HV connector Standard/opt.	Item Code	Options	
COMMON GROUND¹⁰									
EHS F1 05x	500 V	8 mA	16	4	3	10	R51.43	EH161005x80500043rk	SLA, SLP, ID, IU
EHS 201 05x	500 V	8 mA	32	8	3	10	R51.45	EH321005x80500043rk	SLA, SLP, ID, IU
EHS F1 10x	1 kV	4 mA	16	4	2	15	R51.43	EH161010x40500043rk	SLA, SLP, ID, IU
EHS 201 10x	1 kV	4 mA	32	8	2	15	R51.45	EH321010x40500043rk	SLA, SLP, ID, IU
EHS F1 20x	2 kV	2 mA	16	4	2	20	R51.43	EH161020x20500043rk	SLA, SLP, ID, IU
EHS 201 20x	2 kV	2 mA	32	8	2	20	R51.45	EH321020x20500045rk	SLA, SLP, ID, IU
EHS F1 30x	3 kV	1.3 mA	16	4	2	20	R51.43	EH161030x13500045rk	SLA, SLP, ID, IU
EHS 201 30x	3 kV	1.3 mA	32	8	2	20	R51.45	EH321030x13500045rk	SLA, SLP, ID, IU
EHS F1 40x	4 kV	1 mA	16	4	3	20	R51.43	EH161040x10500043rk	SLA, SLP, ID, IU
EHS 201 40x	4 kV	1 mA	32	8	3	20	R51.45	EH321040x10500043rk	SLA, SLP, ID, IU

Notes: replacement characters: o – options, r – revision, k – customization, x – polarity (negative/positive/mix)

Table 2: Technical data: Configurations of Standard

10 discontinued at 2024

CONFIGURATIONS EHS STANDARD SERIES

Type	V _{nom}	I _{nom}	Ch	Max. I _{in} (A) at 24V	Ripple (mV _{p-p}) >1kHz 10Hz-1kHz	HV connector Standard/opt.	Item Code	Options
Common Floating Ground								
EHS 80 01x	100 V	10 mA	8	1	3	5	SHV, R51.41	EH080001x106000ccrk SLA, SLP, ID, IU
EHS F0 01x	100 V	10 mA	16	2	3	5	SHV, R51.43	EH160001x106000ccrk SLA, SLP, ID, IU
EHS 80 05x	500 V	15 mA	8	4	3	10	SHV, R51.41	EH080005x156000ccrk SLA, SLP, ID, IU
EHS F0 05x	500 V	15 mA	16	8	3	10	SHV, R51.43	EH160005x156000ccrk SLA, SLP, ID, IU
EHS 80 10x	1 kV	8 mA	8	4	3	10	SHV, R51.41	EH080010x805000ccrk SLA, SLP, ID, IU
EHS F0 10x	1 kV	8 mA	16	8	3	10	SHV, R51.43	EH160010x805000ccrk SLA, SLP, ID, IU
EHS 80 20x	2 kV	4 mA	8	4	3	10	SHV, R51.41	EH080020x405000ccrk SLA, SLP, ID, IU
EHS F0 20x	2 kV	4 mA	16	8	3	10	SHV, R51.43	EH160020x405000ccrk SLA, SLP, ID, IU
EHS 80 30x	3 kV	3 mA	8	4	3	10	SHV, R51.41	EH080030x305000ccrk SLA, SLP, ID, IU
EHS F0 30x	3 kV	3 mA	16	8	3	10	SHV, R51.43	EH160030x305000ccrk SLA, SLP, ID, IU
EHS 80 40x	4 kV	2 mA	8	4	3	10	SHV, R51.41	EH080040x205000ccrk SLA, SLP, ID, IU
EHS F0 40x	4 kV	2 mA	16	8	3	10	SHV, R51.43	EH160040x205000ccrk SLA, SLP, ID, IU
EHS 80 60x	6 kV	1 mA	8	3	3	10	S08	EH080060x10500003rk SLA, SLP, ID, IU
EHS F0 60x	6 kV	1 mA	16	6	3	10	S08	EH160060x10500003rk SLA, SLP, ID, IU
EHS 40 80x	8 kV	1 mA	4	2.2	3	10	S08	EH040080x10500003rk SLA, SLP, ID, IU
EHS 40 100x	10 kV	0.75 mA	4	2.2	3	10	S10	EH040100x75400004rk SLA, SLP, ID, IU
EHS 40 150x	15 kV	0.5 mA	4	2.2	3	10	S20	EH040150x50400005rk SLA, SLP, ID, IU
EHS 40 200x	20 kV	0.4 mA	4	2.2	3	10	S20	EH040200x40400005rk SLA, SLP, ID, IU
Floating Ground								
EHS 86 01x	100 V	10 mA	8	1.5	3	5	SHV, R51.47	EH086001x106000ccrk SLA, SLP, F02, F20, ID, IU
EHS F6 01x	100 V	10 mA	16	3	3	5	SHV, R51.48	EH166001x106000ccrk SLA, SLP, F02, F20, ID, IU
EHS 86 05x	500 V	15 mA	8	4.5	3	10	SHV, R51.47	EH086005x156000ccrk SLA, SLP, F02, F20, ID, IU
EHS F6 05x	500 V	15 mA	16	9	3	10	SHV, R51.48	EH166005x156000ccrk SLA, SLP, F02, F20, ID, IU
EHS 86 10x	1 kV	8 mA	8	4.5	3	10	SHV, R51.47	EH086010x805000ccrk SLA, SLP, F02, F20, ID, IU
EHS F6 10x	1 kV	8 mA	16	9	3	10	SHV, R51.48	EH166010x805000ccrk SLA, SLP, F02, F20, ID, IU
EHS 86 20x	2 kV	4 mA	8	4.5	3	10	SHV, R51.47	EH086020x405000ccrk SLA, SLP, F02, F20, ID, IU
EHS F6 20x	2 kV	4 mA	16	9	3	10	SHV, R51.48	EH166020x405000ccrk SLA, SLP, F02, F20, ID, IU
EHS 86 30x	3 kV	3 mA	8	4.5	3	10	SHV, R51.47	EH086030x305000ccrk SLA, SLP, F02, F20, ID, IU
EHS F6 30x	3 kV	3 mA	16	9	3	10	SHV, R51.48	EH166030x305000ccrk SLA, SLP, F02, F20, ID, IU
EHS 86 40x	4 kV	2 mA	8	4.5	3	10	SHV, R51.47	EH086040x205000ccrk SLA, SLP, F02, F20, ID, IU
EHS F6 40x	4 kV	2 mA	16	9	3	10	SHV, R51.48	EH166040x205000ccrk SLA, SLP, F02, F20, ID, IU
EHS 86 60x	6 kV	1 mA	8	3.5	3	10	S08	EH086060x10500003rk SLA, SLP, F02, F20, ID, IU
EHS F6 60x	6 kV	1 mA	16	7	3	10	S08	EH166060x10500003rk SLA, SLP, F02, F20, ID, IU
EHS 46 80x	8 kV	1 mA	4	2.5	3	10	S08	EH046080x10500003rk SLA, SLP, F02, F20, ID, IU
EHS 46 100x	10 kV	0.75 mA	4	2.5	3	10	S10	EH046100x75400004rk SLA, SLP, F02, F20, ID, IU
EHS 46 150x	15 kV	0.5 mA	4	2.5	3	10	S20	EH046150x50400005rk SLA, SLP, F02, F20, ID, IU
EHS 46 200x	20 kV	0.4 mA	4	2.5	3	10	S20	EH046200x40400005rk SLA, SLP, F02, F20, ID, IU

Notes: replacement characters: o – options, c – connector, r – revision, k – customization, x – polarity (negative/positive/mix)

Table 3: Technical data: Configurations of Standard

CONFIGURATIONS EHS STANDARD SERIES

Type	V _{nom}	I _{nom}	Ch	Max. I _{in} (A) at 24V	Ripple (mV _{p-p}) >1kHz 10Hz-1kHz	HV connector	Item Code	Options	
Common Floating Ground - (EHS FLEX)									
EHS F5 01x	100 V	10 mA	16	1	3	5	SHV	EH165001x10600002rk	SLA, SLP
EHS 185 01x	100 V	10 mA	24	1.5	3	5	R51.44	EH245001x10600044rk	SLA, SLP
EHS 305 01x	100 V	10 mA	48	3	3	5	R51.46	EH485001x10600046rk	SLA, SLP
EHS F5 05x	500 V	6 mA	16	3	3	10	SHV	EH165005x60500002rk	SLA, SLP
EHS 185 05x	500 V	6 mA	24	4.5	3	10	R51.44	EH245005x60500044rk	SLA, SLP
EHS 305 05x	500 V	6 mA	48	9	3	10	R51.46	EH485005x60500046rk	SLA, SLP
EHS F5 10x	1 kV	3 mA	16	3	3	10	SHV	EH165010x30500002rk	SLA, SLP
EHS 185 10x	1 kV	3 mA	24	4.5	3	10	R51.44	EH245010x30500044rk	SLA, SLP
EHS 305 10x	1 kV	3 mA	48	9	3	10	R51.46	EH485010x30500046rk	SLA, SLP
EHS F5 20x	2 kV	1.5 mA	16	3	3	10	SHV	EH165020x15500002rk	SLA, SLP
EHS 185 20x	2 kV	1.5 mA	24	4.5	3	10	R51.44	EH245020x15500044rk	SLA, SLP
EHS 305 20x	2 kV	1.5 mA	48	9	3	10	R51.46	EH485020x15500046rk	SLA, SLP
EHS F5 30x	3 kV	1 mA	16	3	3	10	SHV	EH165030x10500002rk	SLA, SLP
EHS 185 30x	3 kV	1 mA	24	4.5	3	10	R51.44	EH245030x10500044rk	SLA, SLP
EHS 305 30x	3 kV	1 mA	48	9	3	10	R51.46	EH485030x10500046rk	SLA, SLP

Notes: replacement characters: o – options, r – revision, k – customization, x – polarity (negative/positive/mix)

Table 4: Technical data: Configurations of Standard / Flex series

2.2 EHS High Precision series

SYSTEM	EHS CFG	EHS FG
Product family	6U Multichannel System (MMS)	
Product version	High Precision series	
OUTPUT		
Output voltage	V_{nom}	100V – 20kV
Output current	I_{nom}	10mA – 0.4mA
Polarity	Factory fixed, positive or negative	
Floating principle	Common Floating Ground	Single Floating Ground
Potential difference	56 V channel/GND	20 V channel/ channel/ GND, optionally up to 2 kV
Ripple and noise, $f > 10 \text{ Hz}$	$V_{\text{p-p}}$	$< 3 - 10 \text{ mV}_{\text{p-p}}$
Ripple and noise, $f > 1 \text{ kHz}$	$V_{\text{p-p}}$	$< 1 - 2 \text{ mV}_{\text{p-p}}$
Ripple and noise, $f < 10 \text{ Hz} - 0.1 \text{ Hz}$	$V_{\text{p-p}}$	$< 5 - 30 \text{ mV}_{\text{p-p}}$
Output connector	R51 SHV	
STABILITY		
Voltage regulation	$\Delta V_{\text{OUT}} \text{ vs. } \Delta R_{\text{LOAD}}$	$< 1 \cdot 10^{-4} \cdot V_{\text{nom}}$
Temperature coefficient	voltage	$< 30 \text{ ppm/K} < 10 \text{ ppm/K}$ ¹¹
Long term stability 24h	¹²	
RESOLUTION		
Voltage Setting	$2 \cdot 10^{-6} \cdot V_{\text{nom}}$	
Current Setting	$I_{\text{OUT}} > 20 \mu\text{A}$	$2 \cdot 10^{-6} \cdot I_{\text{nom}}$
Voltage measurement ¹³	$1 \cdot 10^{-6} \cdot V_{\text{nom}}$	
Current measurement ¹⁴	$I_{\text{OUT}} > 20 \mu\text{A}$	$1 \cdot 10^{-6} \cdot I_{\text{nom}}$
Current measurement, 2nd range ^{15 16}	$I_{\text{OUT}} < 20 \mu\text{A}$	50pA
ACCURACY ¹⁷		
Voltage measurement	$\pm (0.01\% \cdot V_{\text{OUT}} + 0.01\% \cdot V_{\text{NOM}})$	
Current measurement	$I_{\text{OUT}} > 20 \mu\text{A}$	$\pm (0.01\% \cdot I_{\text{OUT}} + 0.02\% \cdot I_{\text{NOM}})$
Current measurement, 2nd range ^{18 19}	$I_{\text{OUT}} < 20 \mu\text{A}$	$\pm (0.01\% \cdot I_{\text{OUT}} + 4 \text{nA})$

¹¹ With option T10, Lower temperature coefficient

¹² 1h warm-up, constant ambient temperature

¹³ The resolution of measurable values depends on the settings of the sampling rate and the digital filter

¹⁴ The resolution of measurable values depends on the settings of the sampling rate and the digital filter

¹⁵ The resolution of measurable values depends on the settings of the sampling rate and the digital filter

¹⁶ not available with Option L (Lower output current)

¹⁷ The measurement accuracy is guaranteed in the range $1\% \cdot V_{\text{nom}} < V_{\text{out}} < V_{\text{nom}}$ and for 1 year

¹⁸ The resolution of measurable values depends on the settings of the sampling rate and the digital filter

¹⁹ not available with Option L (Lower output current)

CONTROL		EHS CFG	EHS FG
Interface ²⁰	digital		CAN
Voltage ramp	Up / down	10mV/s	up to $0.2 \cdot V_{NOM}/s$
Sample Rates (SPS) ²¹	Default setting		50
Digital Filter	Default setting		64
PROTECTION			
Safety loop		included	
Overload protected		included	
Short circuit protected ²²		included	
Hardware limits ²³	V_{MAX} / I_{MAX}	included	
Inhibit ²⁴		optionally	
CASE			
Form factor		19"	plug-in cassette
Dimensions	L/W/H	220mm	/ 8HP / 6U
Weight		1.1kg – 1.8kg	
System connector		MMS HV compatible	96 PIN
Cooling		Passive,	do not cover ventilation slots
ENVIRONMENTAL			
Operating temperature		0 ... 40	°C
Humidity in operation		≤ 80 %,	not condensing
Storage temperature		-20 ... 60	°C
Humidity during storage		≤ 80 %,	not condensing

Table 5: Technical data: Specifications EHS High Precision

20 The HV module is controlled via a controller with internal CAN. The signal is connected to the 96-pin connector.

21 See Additional explanations in the chapter Appendix 12.2 Comparison of monitor value acquisition principles

22 ATTENTION: there is only one short circuit or arc per second allowed!

23 Potentiometer per module

24 per channel (ID / IU, NID / NIU)

CONFIGURATIONS EHS HIGH PRECISION SERIES

Type	V _{nom}	I _{nom}	Ch	Max. I _{in} (A) at 24V	Ripple (mV _{pp}) >1kHz 10Hz-1kHz 0.1-10Hz	HV Connector Standard/opt.	Item Code	Options
COMMON FLOATING GROUND								
EHS 82 01x	100 V	10 mA	8	1	2	3	5	SHV, R51.41
EHS F2 01x	100 V	10 mA	16	2	2	3	5	SHV, R51.43
EHS 82 05x	500 V	10 mA	8	4	2	5	5	SHV, R51.41
EHS F2 05x	500 V	10 mA	16	8	2	5	5	SHV, R51.43
EHS 82 10x	1 kV	8 mA	8	4	2	5	5	SHV, R51.41
EHS F2 10x	1 kV	8 mA	16	8	2	5	5	SHV, R51.43
EHS 82 20x	2 kV	4 mA	8	4	2	5	5	SHV, R51.41
EHS F2 20x	2 kV	4 mA	16	8	2	5	5	SHV, R51.43
EHS 82 30x	3 kV	3 mA	8	4	2	5	10	SHV, R51.41
EHS F2 30x	3 kV	3 mA	16	8	2	5	10	SHV, R51.43
EHS 82 40x	4 kV	2 mA	8	4	2	5	10	SHV, R51.41
EHS F2 40x	4 kV	2 mA	16	8	2	5	10	SHV, R51.43
EHS 82 60x	6 kV	1 mA	8	3	2	5	10	S08
EHS F2 60x	6 kV	1 mA	16	6	2	5	10	S08
EHS 42 80x	8 kV	1 mA	4	2.2	2	5	10	S08
EHS 42 100x	10 kV	0.75 mA	4	2.2	2	5	20	S10
EHS 42 150x	15 kV	0.5 mA	4	2.2	2	5	30	S20
EHS 42 200x	20 kV	0.4 mA	4	2.2	2	7	30	S20

Notes: replacement characters: o – options, c – connector, r – revision, k – customization, x – polarity (negative/positive/mix)

Table 6: Technical data: Configurations of Common Floating Ground

CONFIGURATIONS EHS HIGH PRECISION SERIES									
Type	V _{nom}	I _{nom}	Ch	Max. I _{in} (A) at 24V	Ripple (mV _{pp}) >1kHz 10Hz-1kHz 0.1-10Hz	HV Connector Standard/opt.	Item Code	Options	
Common Floating Ground L									
EHS 82 01x	100 V	100 µA	8	0.4	1	1	5	SHV , R51.41	EH082001x104ooocrk
EHS F2 01x	100 V	100 µA	16	0.8	1	1	5	SHV , R51.43	EH162001x104ooocrk
EHS 82 05x	500 V	100 µA	8	0.4	1	5	5	SHV , R51.41	EH082005x104ooocrk
EHS F2 05x	500 V	100 µA	16	0.8	1	5	5	SHV , R51.43	EH162005x104ooocrk
EHS 82 10x	1 kV	100 µA	8	0.4	1	5	5	SHV , R51.41	EH082010x104ooocrk
EHS F2 10x	1 kV	100 µA	16	0.8	1	5	5	SHV , R51.43	EH162010x104ooocrk
EHS 82 20x	2 kV	100 µA	8	0.4	1	5	5	SHV , R51.41	EH082020x104ooocrk
EHS F2 20x	2 kV	100 µA	16	0.8	1	5	5	SHV , R51.43	EH162020x104ooocrk
EHS 82 30x	3 kV	100 µA	8	0.4	1	5	10	SHV , R51.41	EH082030x104ooocrk
EHS F2 30x	3 kV	100 µA	16	0.8	1	5	10	SHV , R51.43	EH162030x104ooocrk
EHS 82 40x	4 kV	100 µA	8	0.5	1	5	10	SHV	EH082040x104ooo02rk
EHS F2 40x	4 kV	100 µA	16	1	1	5	10	SHV	EH162040x104ooo02rk
EHS 82 60x	6 kV	100 µA	8	0.5	1	5	10	S08	EH082060x104ooo03rk
EHS F2 60x	6 kV	100 µA	16	1	1	5	10	S08	EH162060x104ooo03rk
EHS 42 80x	8 kV	100 µA	4	0.5	1	5	10	S08	EH042080x104ooo03rk
EHS 42 100x	10 kV	100 µA	4	0.5	1	5	20	S10	EH042100x104ooo04rk
EHS 42 150x	15 kV	100 µA	4	0.8	1	5	30	S20	EH042150x104ooo05rk
EHS 42 200x	20 kV	100 µA	4	1	1	5	30	S20	EH042200x104ooo05rk

Notes: replacement characters: o – options, c – connector, r – revision, k – customization, x – polarity (negative/positive/mix)

Table 7: Technical data: Configurations of Common Floating Ground L

CONFIGURATIONS EHS HIGH PRECISION SERIES

Type	V _{nom}	I _{nom}	Ch	Max. I _{in} (A) at 24V	Ripple (mV _{pp}) >1kHz 10Hz-1kHz 0.1-10Hz	HV Connector Standard/opt.	Item Code	Options
FLOATING GROUND								
EHS 84 01x	100 V	10 mA	8	1,5	2	3	5	SHV , R51.47 EH084001x106000ccrk SLA, SLP, TC, 1CR, F02, F20, ID, IU
EHS F4 01x	100 V	10 mA	16	3	2	3	5	SHV , R51.48 EH164001x106000ccrk SLA, SLP, TC, 1CR, F02, F20, ID, IU
EHS 84 05x	500 V	10 mA	8	4.5	2	5	5	SHV , R51.47 EH084005x106000ccrk SLA, SLP, TC, 1CR, F02, F20, ID, IU
EHS F4 05x	500 V	10 mA	16	9	2	5	5	SHV , R51.48 EH164005x106000ccrk SLA, SLP, TC, 1CR, F02, F20, ID, IU
EHS 84 10x	1 kV	8 mA	8	4.5	2	5	5	SHV , R51.47 EH08410x805000ccrk SLA, SLP, TC, 1CR, F02, F20, ID, IU
EHS F4 10x	1 kV	8 mA	16	9	2	5	5	SHV , R51.48 EH16410x805000ccrk SLA, SLP, TC, 1CR, F02, F20, ID, IU
EHS 84 20x	2 kV	4 mA	8	4.5	2	5	5	SHV , R51.47 EH08420x405000ccrk SLA, SLP, TC, 1CR, F02, F20, ID, IU
EHS F4 20x	2 kV	4 mA	16	9	2	5	5	SHV , R51.48 EH16420x405000ccrk SLA, SLP, TC, 1CR, F02, F20, ID, IU
EHS 84 30x	3 kV	3 mA	8	4.5	2	5	10	SHV , R51.47 EH08430x305000ccrk SLA, SLP, TC, 1CR, F02, F20, ID, IU
EHS F4 30x	3 kV	3 mA	16	9	2	5	10	SHV , R51.48 EH16430x305000ccrk SLA, SLP, TC, 1CR, F02, F20, ID, IU
EHS 84 40x	4 kV	2 mA	8	4.5	2	5	10	SHV EH08440x20500002rk SLA, SLP, TC, 1CR, F02, F20, ID, IU
EHS F4 40x	4 kV	2 mA	16	9	2	5	10	SHV EH16440x20500002rk SLA, SLP, TC, 1CR, F02, F20, ID, IU
EHS 84 60x	6 kV	1 mA	8	3.5	2	5	10	S08 EH08460x10500003rk SLA, SLP, TC, 1CR, F02, F20, ID, IU
EHS F4 60x	6 kV	1 mA	16	7	2	5	10	S08 EH16460x10500003rk SLA, SLP, TC, 1CR, F02, F20, ID, IU
EHS 44 80x	8 kV	1 mA	4	2.5	2	5	10	S08 EH0444080x10500003rk SLA, SLP, 1CR, F02, F20, ID, IU
EHS 44 100x	10 kV	0.75 mA	4	2.5	2	5	20	S10 EH0444100x75400004rk SLA, SLP, 1CR, F02, F20, ID, IU
EHS 44 150x	15 kV	0.5 mA	4	2.5	2	5	30	S20 EH0444150x50400005rk SLA, SLP, 1CR, F02, F20, ID, IU
EHS 44 200x	20 kV	0.4 mA	4	2.5	2	7	30	S20 EH0444200x40400005rk SLA, SLP, 1CR, F02, F20, ID, IU
FLOATING GROUND L								
EHS 84 01x	100 V	100 µA	8	0.8	1	1	5	SHV , R51.47 EH084001x104000ccrk SLA, SLP, TC, F02, F20, ID, IU
EHS F4 01x	100 V	100 µA	16	1.5	1	1	5	SHV , R51.48 EH164001x104000ccrk SLA, SLP, TC, F02, F20, ID, IU
EHS 84 05x	500 V	100 µA	8	0.8	1	5	5	SHV , R51.47 EH084005x104000ccrk SLA, SLP, TC, F02, F20, ID, IU
EHS F4 05x	500 V	100 µA	16	1.5	1	5	5	SHV , R51.48 EH164005x104000ccrk SLA, SLP, TC, F02, F20, ID, IU
EHS 84 10x	1 kV	100 µA	8	0.8	1	5	5	SHV , R51.47 EH08410x104000ccrk SLA, SLP, TC, F02, F20, ID, IU
EHS F4 10x	1 kV	100 µA	16	1.5	1	5	5	SHV , R51.48 EH16410x104000ccrk SLA, SLP, TC, F02, F20, ID, IU
EHS 84 20x	2 kV	100 µA	8	0.8	1	5	5	SHV , R51.47 EH08420x104000ccrk SLA, SLP, TC, F02, F20, ID, IU
EHS F4 20x	2 kV	100 µA	16	1.5	1	5	5	SHV , R51.48 EH16420x104000ccrk SLA, SLP, TC, F02, F20, ID, IU
EHS 84 30x	3 kV	100 µA	8	0.8	1	5	10	SHV , R51.47 EH08430x104000ccrk SLA, SLP, TC, F02, F20, ID, IU
EHS F4 30x	3 kV	100 µA	16	1.5	1	5	10	SHV , R51.48 EH16430x104000ccrk SLA, SLP, TC, F02, F20, ID, IU
EHS 84 40x	4 kV	100 µA	8	1	1	5	10	SHV EH08440x10400002rk SLA, SLP, TC, F02, F20, ID, IU
EHS F4 40x	4 kV	100 µA	16	2	1	5	10	SHV EH16440x10400002rk SLA, SLP, TC, F02, F20, ID, IU
EHS 84 60x	6 kV	100 µA	8	1	1	5	10	S08 EH08460x10400003rk SLA, SLP, TC, F02, F20, ID, IU
EHS F4 60x	6 kV	100 µA	16	2	1	5	10	S08 EH16460x10400003rk SLA, SLP, TC, F02, F20, ID, IU
EHS 44 80x	8 kV	100 µA	4	0.8	1	5	10	S08 EH0444080x10400003rk SLA, SLP, F02, F20, ID, IU
EHS 44 100x	10 kV	100 µA	4	0.8	1	5	10	S10 EH0444100x10400004rk SLA, SLP, F02, F20, ID, IU
EHS 44 150x	15 kV	100 µA	4	1	1	5	10	S20 EH0444150x10400005rk SLA, SLP, F02, F20, ID, IU
EHS 44 200x	20 kV	100 µA	4	2	1	5	10	S20 EH0444200x10400005rk SLA, SLP, F02, F20, ID, IU

Notes:

replacement characters: o – options, c – connector, r – revision, k – customization, x – polarity (negative/positive/mix)

Table 8: Technical data: Configurations of Floating Ground and Floating Ground L

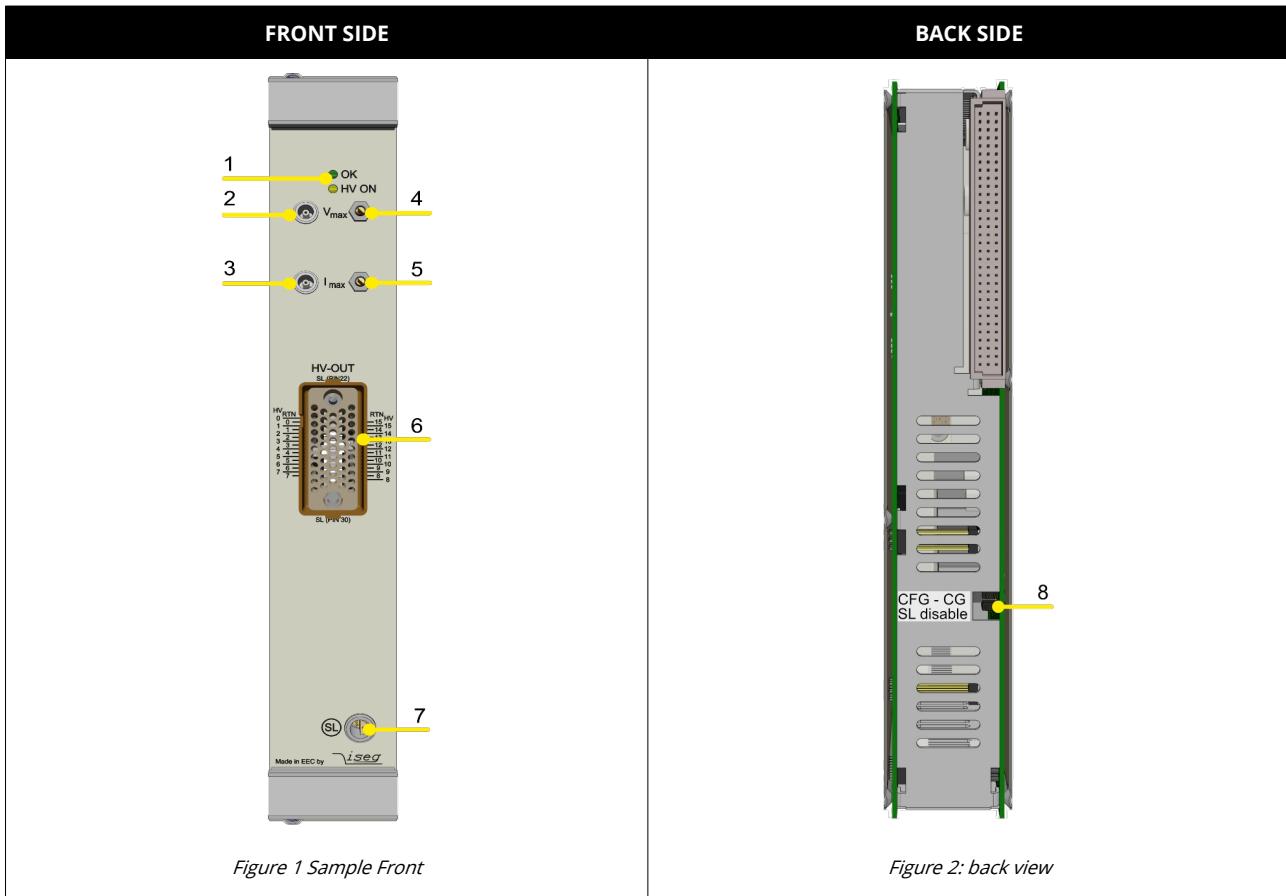
2.3 Options

OPTIONS	OPTION CODE	EXAMPLE	ITEM CODE HEX CODING
POLARITY	Positive: x = p , Negative x = n	EHS 82 05p	
SINGLE CHANNEL INHIBIT - down	ID		400
SINGLE CHANNEL INHIBIT - up	IU		800
NEGATED LOGIC INHIBIT ID, IU	N		80
LOWER TEMPERATURE COEFFICIENT	TC	T10	004
ACTIVE SAFETY LOOP	SLA		001
INTERNAL POWERED SAFETY LOOP	SLP		002
ONLY ONE CURRENT RANGE FOR HIGH PRECISION MODULES	1CR		020
200 V ISOLATION FOR FLOATING GND	F02		100
2,000 V ISOLATION FOR FLOATING GND	F20		200
LOWER OUTPUT CURRENT ²⁵	L ($I_{nom} = 100 \mu A$)		-

Table 9: Technical data: Options and order information

25 Requires option „1CR“

3 Overview



NUMBER	DESCRIPTION	DETAILED EXPLANATION IN CHAPTER
[1]	LED	4.2 Module status
[2]	V_{MAX}	4.3 Hardware Limit
[3]	I_{MAX}	4.3 Hardware Limit
[4]	V_{MAX}	4.3 Hardware Limit
[5]	I_{MAX}	4.3 Hardware Limit
[6]	HV OUT ²⁶	8 Connectors assignments
[7]	SL	4.4 Safety Loop
[8]	CFG-CG / SL disable	4.1 Connection, 4.4 Safety Loop

26 Depending on EHS type

4 Handling

4.1 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 accessible via this connector. Modules and crate controllers with different settings of bit rate do not work on the same CAN-Line.

INFORMATION



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.

INFORMATION



EHS modules with Common Floating Ground (CFG) will be delivered with a jumper, which connects the module-GND with the crate-GND. To operate in CFG configuration the jumper (CG-CFG) on the module back must be removed. (see: *Figure 3: section of back view*)

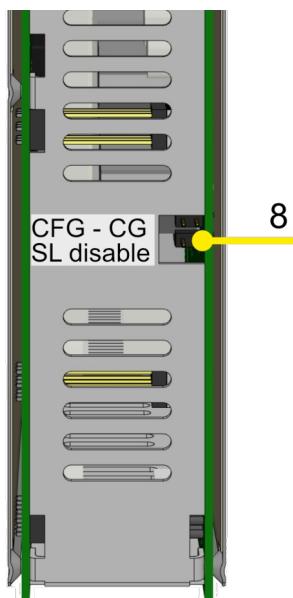


Figure 3: section of back view

4.2 Module status

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



Figure 4: Status LEDs

STATUS	DESCRIPTION
green LED „OK“ on	all channels have the status “OK”
green LED „OK“ off	an error occurred: 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” or voltage on output is greater than 56V.
Green LED blinking	Firmware update is stored into flash, do not switch off power supply, crate etc.

Table 10: Module status information

4.3 Hardware Limit

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 $102 \pm 2\% \cdot V_{NOM}$ and $102 \pm 2\% \cdot I_{NOM}$. 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.

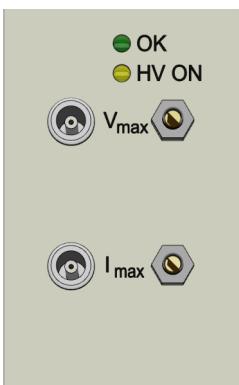


Figure 5: Sample view - Limit potentiometers and Monitor

4.4 Safety Loop

4.4.1 Safety Current Loop

A safety current loop can be implemented through the safety loop socket (SL) on the front panel (number 7 on Figure 1 Sample Front) and, if available, on the modules with 8, 16, 24 and 32 channels at the REDEL-connector between the SL contacts (pin 22 and pin 30). When the safety loop is active, high voltage can only be generated in a channel if the safety loop is completely closed (SL plug and in the case of Redel plug, pin22 and pin30 on the plug, see Fehler: Verweis nicht gefunden, in the cable or on the detector supply are bridged) and an external current in a range of 5 to 20 mA of any polarity is driven through the loop. If the safety loop is opened during the operation the output voltages will be shut off without ramp, the corresponding bit in "ModuleStatus" is canceled and in "ModuleEventStatus" is set (see chapter 11 Appendix, "CAN_EDCP_Programmers-Guide.pdf"). 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 (Figure 2: back view).

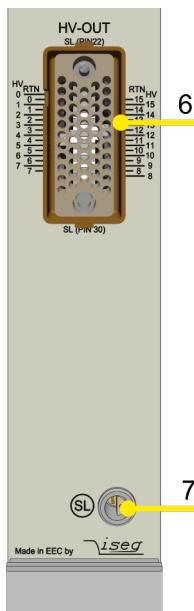


Figure 6: section of front view

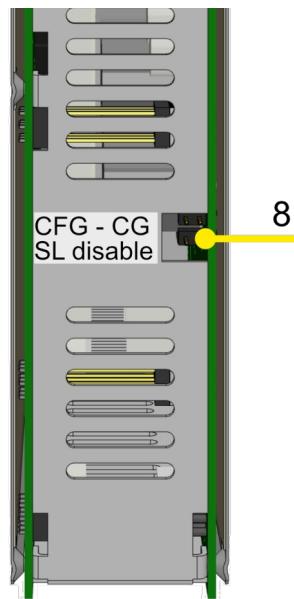


Figure 7: section of back view

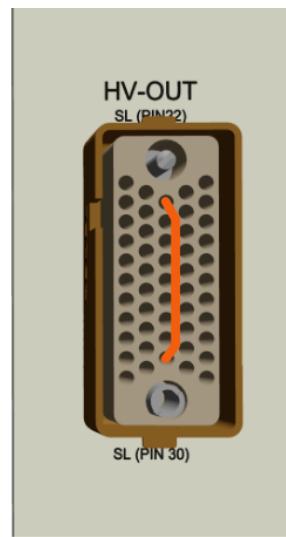


Figure 8: SL closed

4.4.2 Safety Return (SRTN)

In the case of the modules with 48 channels, safety current loop cannot be conducted over the Redel-connector because of the limited pin number. In order to only allow HV generation when the Redel plug is inserted, Pin26 of the Redel plug is used as a safety contact. Pin 26 must be connected to the RTN pins (Pin22 or Pin30) on the connector, in the cable or on the detector supply. If this connection is missing, high voltage generation is prohibited. If this connection is opened during operation, the output voltages are switched off without a ramp.

For the 48 channel modules the safety current loop is independently from the SRTN contact only to be supplied through the SL-socket. Deactivating the safety current loop by placing the "SL-disable" jumper (Figure 3: section of back view) does not deactivates the SRTN-mechanism.

4.5 Current limitation²⁷

4.5.1 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 $I_{NOM} \geq I_{SET} \geq 5E-04 \cdot I_{NOM}$. 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 functions KillEnable and Delayed Trip, described below.

Modules with two current measurement ranges can operate in CC Mode with I_{SET} values down to 200 nA. The following limitations must be considered when operating a channel with I_{SET} values in the lower current measurement range (i.e. typically <20µA):

- If $I_{SET} < 20\mu A$ 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 $> 20 \mu A$ to a value $< 20 \mu A$ 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)).

4.5.2 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 (I_{SET}) defines the trip current. An approach or exceed 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 $5E-04 \cdot I_{NOM}$ 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 trigger the hardware detection can be up to 1s.
- Modules with two current measurement ranges do not change the current measurement range if "KillEnable" is active. The channel remains in the high measurement range if $I_{SET} > 20\mu A$ and in the low measurement range for $I_{SET} \leq 20\mu A$. It is not possible to switch the current measurement while a channel is switched on and "KillEnable" is active, i.e. the set current cannot be changed from a value $> 20 \mu A$ to a value $< 20 \mu A$ or vice versa. If it is intended to switch the current measurement range, the channel must be switched off or "KillEnable" must be deactivated for altering the current set value.

²⁷ The full range of functions is only available with the latest firmware, from version 5.00 for CFG and from version 7.00 for FG modules. A 7-digit serial number and at least one firmware from version 4.00 for CFG and from version 6.00 for FG are required for the firmware update. Check the compatibility for a module update. The description of older modules can be found in the archive on the website. The link can be found in the appendix in chapter 11 Appendix.

4.5.3 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}). The response to this kind of event can be, for example, to ramp down the channel with the programmed ramp. A detailed description for the configuration can be found in the "CAN EDCP Programmers-Guide". The link for the document is available in the chapter 11 Appendix.

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.

To guarantee a sufficient resolution for the current set values, a nominal current adequate to the application should be selected. iseg offers HV modules with nominal currents reduced to 100 μ A in all voltage classes. These are designated e.g. for semiconductor detectors, which only require a few microampere operating current.

INFORMATION



An activated KillEnable feature disables the Delayed Trip function.

5 Options

5.1 Single Channel Inhibit²⁸

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 (Figure 19) or LEMO-connector (Figure 20). The assignment of the channels is described in detail in the appendix, see chapter 8 Connectors assignments and 9 PIN assignments. 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 "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 ²⁹

Only one current measurement range for High Precision Modules.

5.5 F02 – High floating voltage

200 V isolation for Modules with Floating Ground (FG).

With option "F02" the floating voltage is internally not limited. The user is responsible to limit potential differences between individual channel – GNDs and Crate – GND. Exceeding the isolation voltage can damage the module.

5.6 F20 – Very high floating voltage

2.000 V isolation for Modules with Floating Ground (FG).

With option "F20" the floating voltage is internally not limited. The user is responsible to limit potential differences between individual channel – GNDs and Crate – GND. Exceeding the isolation voltage can damage the module.

5.7 TC – Lower temperature coefficient

Improved temperature coefficient of 10ppm/K (T10). This is only for 8 channels common floating ground modules available.

5.8 VLN

Reduced ripple see chapter 2 Technical data.

5.9 L – Lower output current ³⁰

The output current is limited to a lower value, e.g. 100 µA. With this option only one current measurement range available.

29 only High Precision series

30 only High Precision series

6 Front panel versions

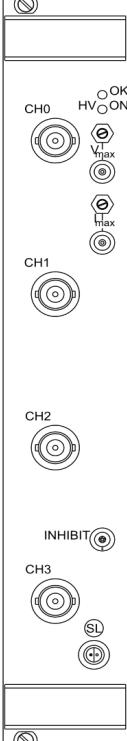
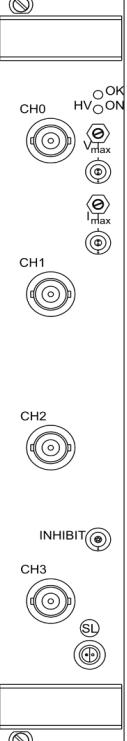
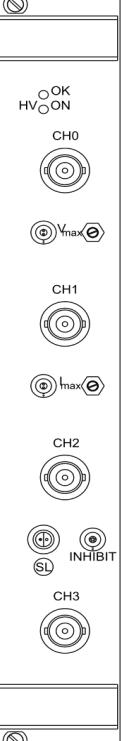
FRONT PANELS				
Channels	4	4	4	
Floating	FG / CFG	FG / CFG	FG / CFG	
HV Connector	SHV	S10	S20	
Options	INHIBIT	INHIBIT	INHIBIT	
Figure				
Notes:	<p>CFG: Common Floating Ground FG: Floating Ground CG: Common Ground</p>			

Table 11: front view 4ch modules

FRONT PANELS

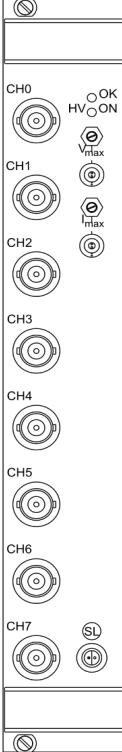
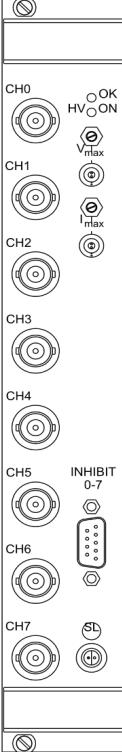
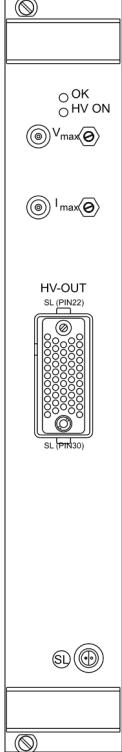
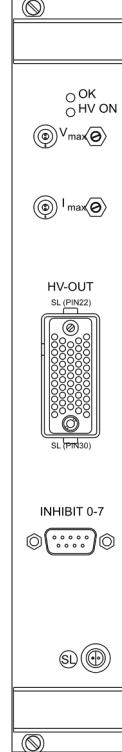
Channels	8	8	8	8
Floating	FG / CFG	FG / CFG	FG / CFG	FG / CFG
HV Connector	SHV	SHV	R51	R51
Options	-	INHIBIT	-	INHIBIT
Figure				
Notes:	<p>CFG: Common Floating Ground</p> <p>FG: Floating Ground</p> <p>CG: Common Ground</p>			

Table 12: front view 8ch modules

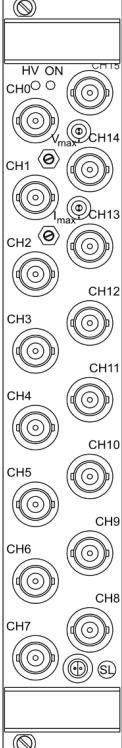
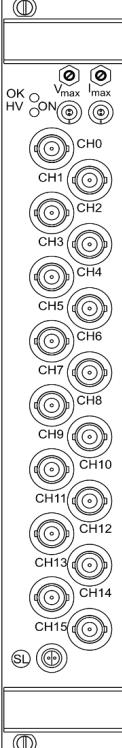
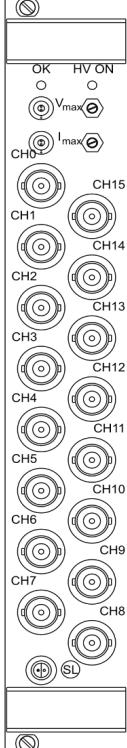
FRONT PANELS				
Channels	16	16	16	
Floating	FG / CFG	CG	FLEX	
HV Connector	SHV	SHV	SHV	
Options	-	-	-	
Figure				
Notes:				
CFG: Common Floating Ground				
FG: Floating Ground				
CG: Common Ground				

Table 13: front view 16ch modules

FRONT PANELS

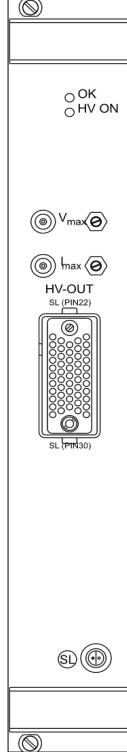
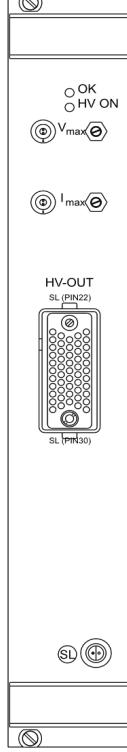
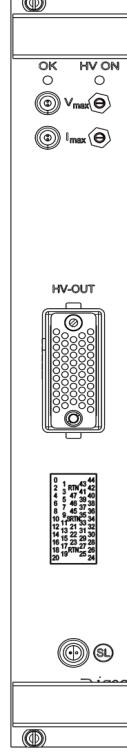
Channels	16 / 32	16	16 / 48	16 / 24 /48
Floating	CG	CFG	CFG / FG	FLEX
HV Connector	R51	R51	R51	R51
Options	-	INHIBIT	-	-
Figure				
Notes:				
CFG: Common Floating Ground				
FG: Floating Ground				
CG: Common Ground				

Table 14: front view 16/24/48 ch modules

7 Dimensional Drawings

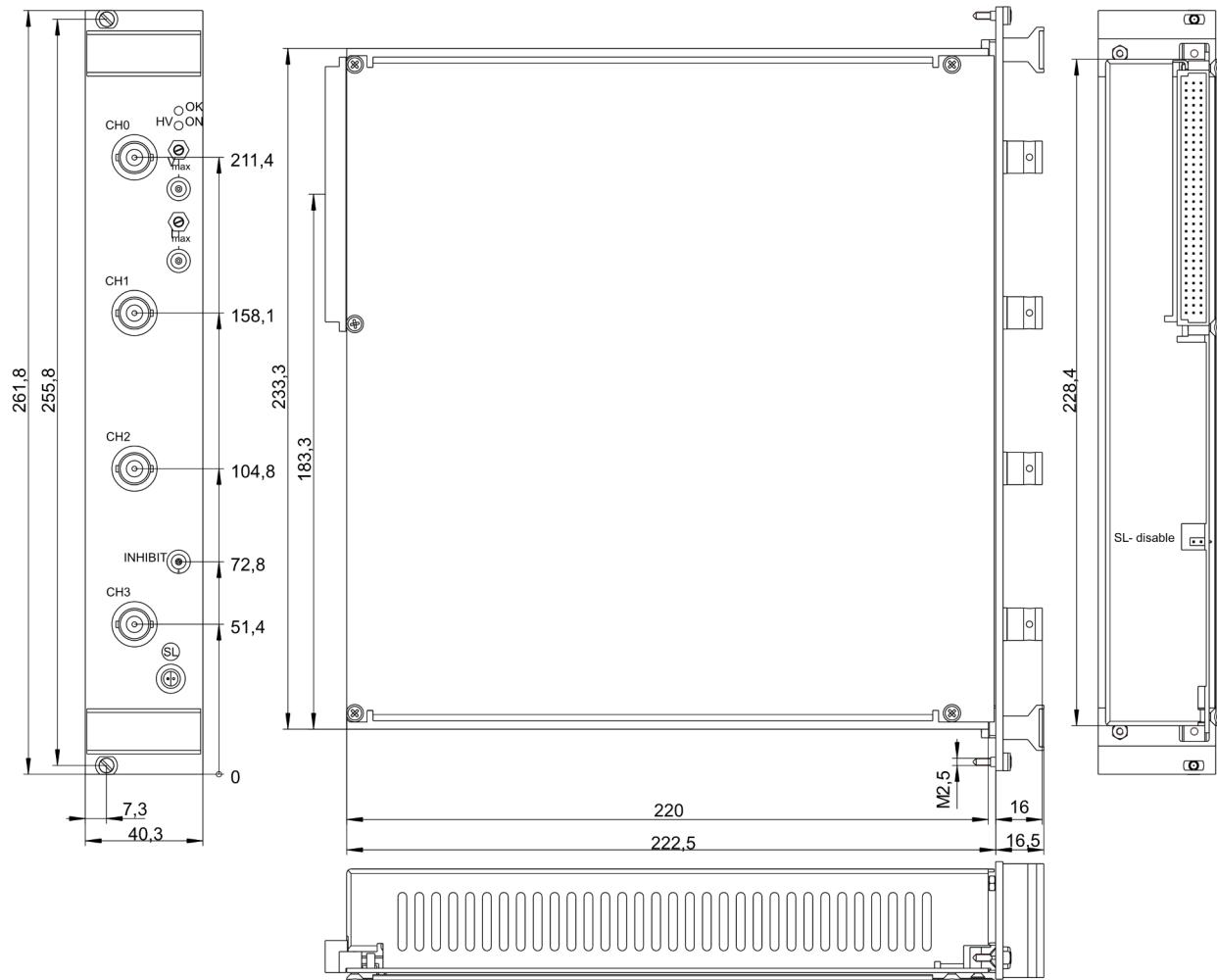


Figure 9: 4 channels with SHV in Floating Ground / Common Floating Ground

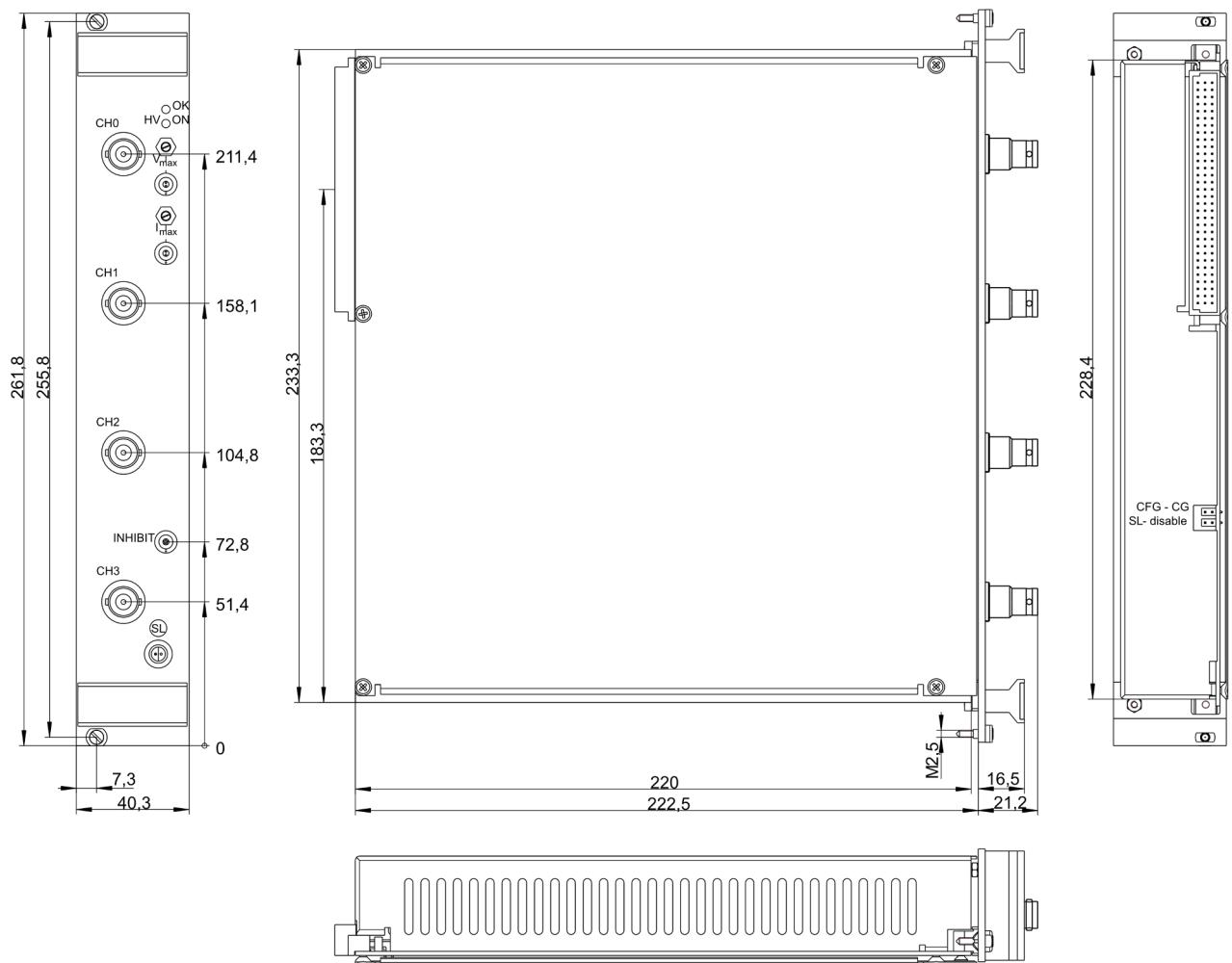


Figure 10: 4 channels with S10 in Floating Ground or Common Floating Ground

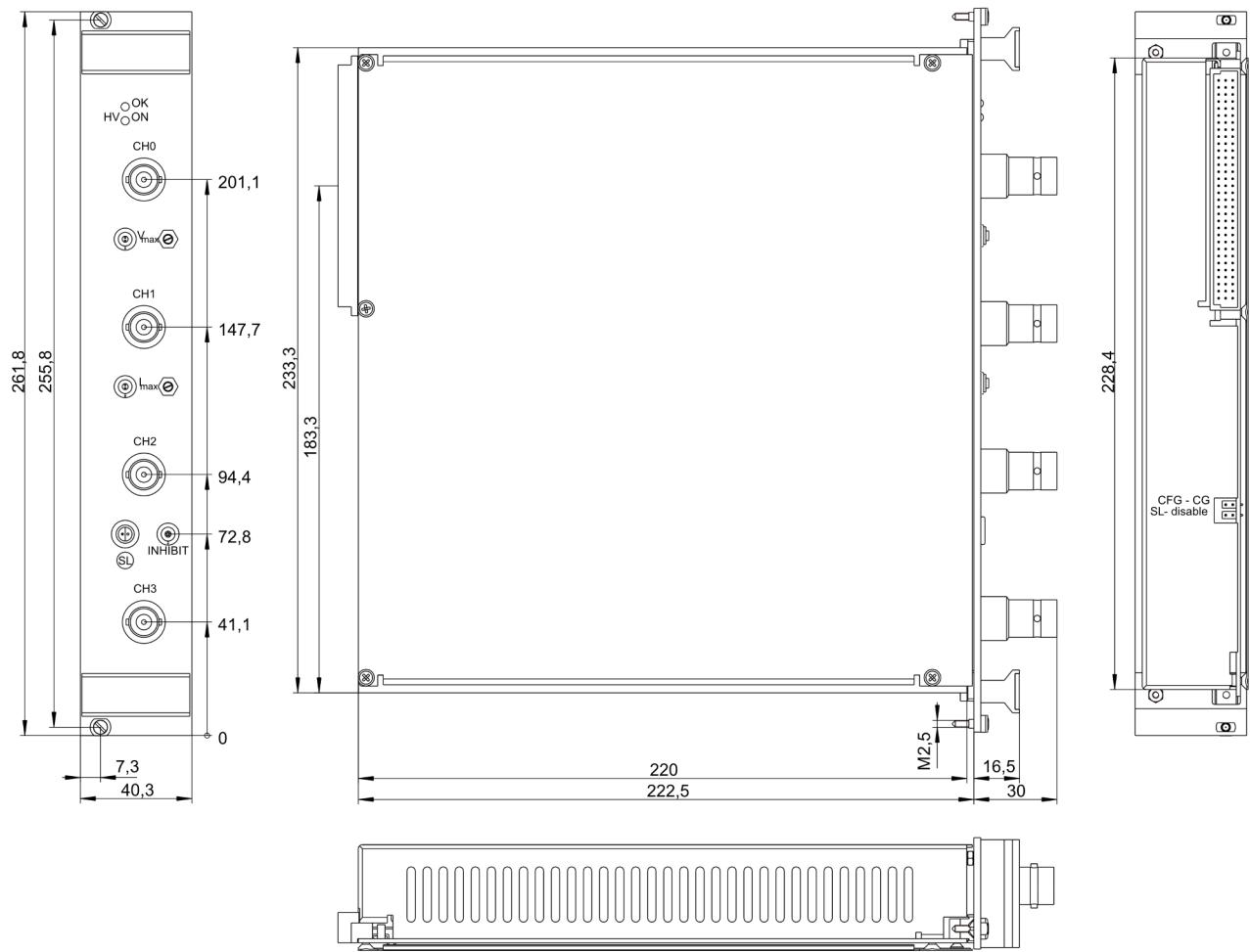


Figure 11: 4 channels with S20 in Floating Ground or Common Floating Ground

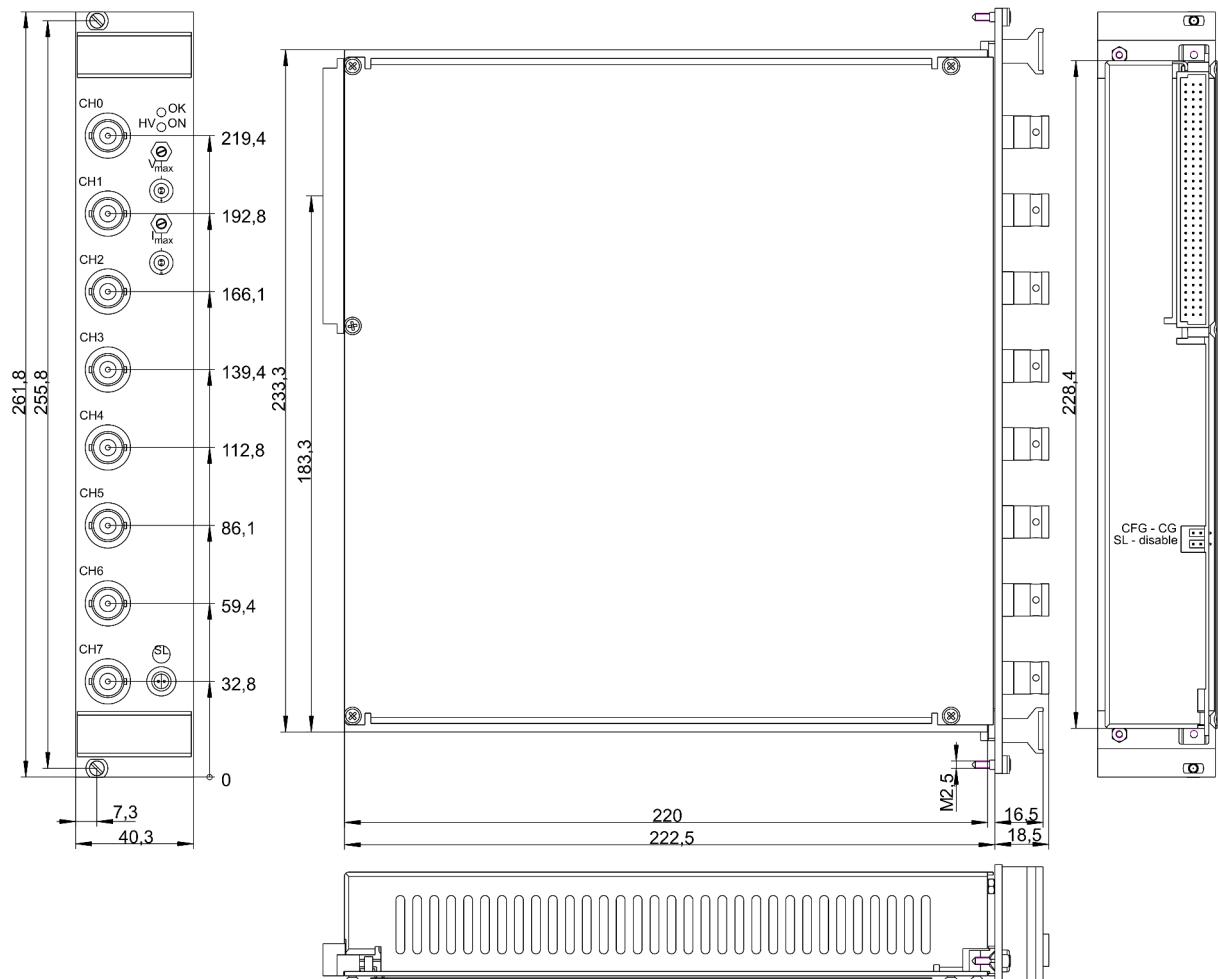


Figure 12: 8 channels with SHV in Floating Ground or Common Floating Ground

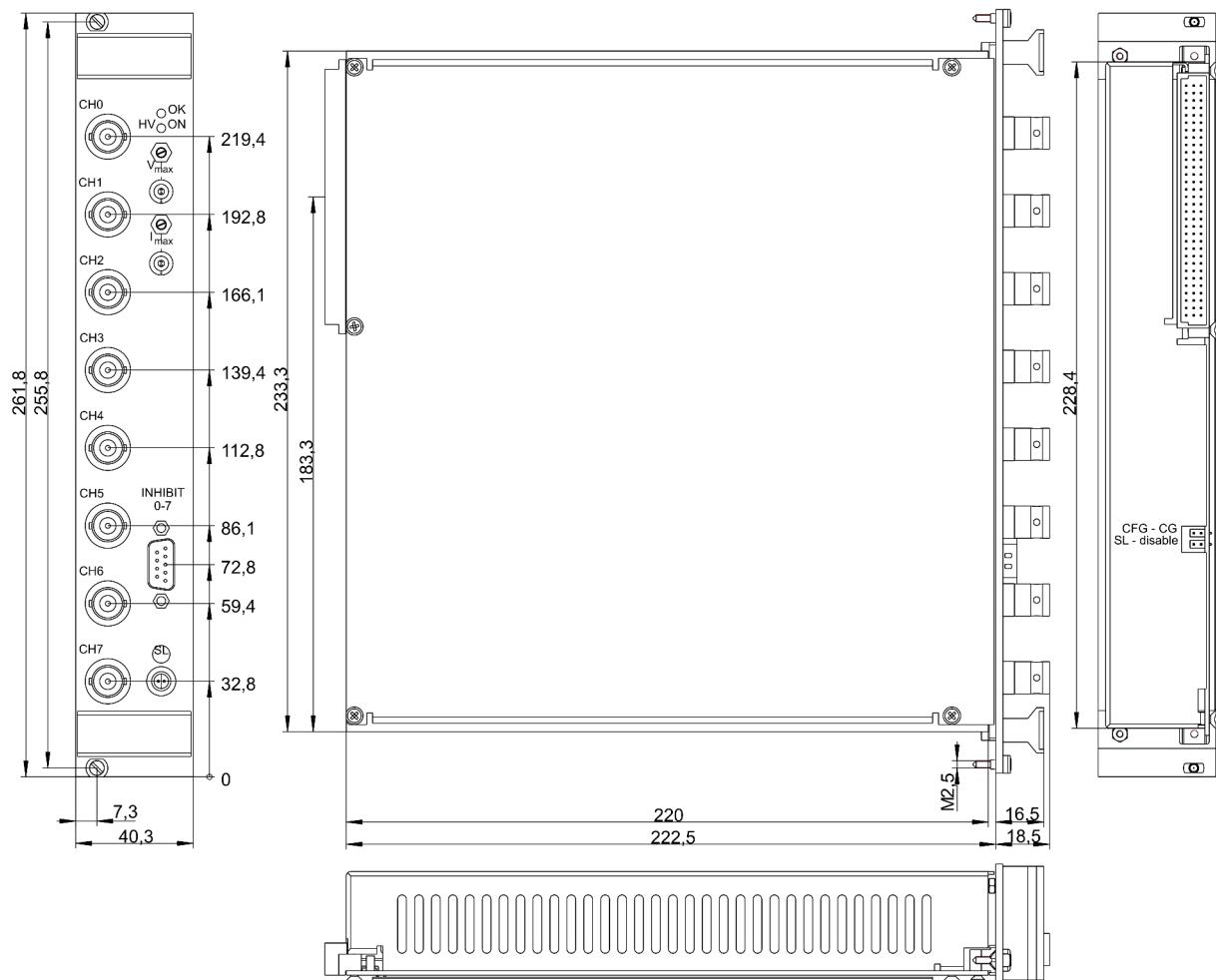


Figure 13: 8 channels with SHV in Floating Ground or Common Floating Ground and Inhibit

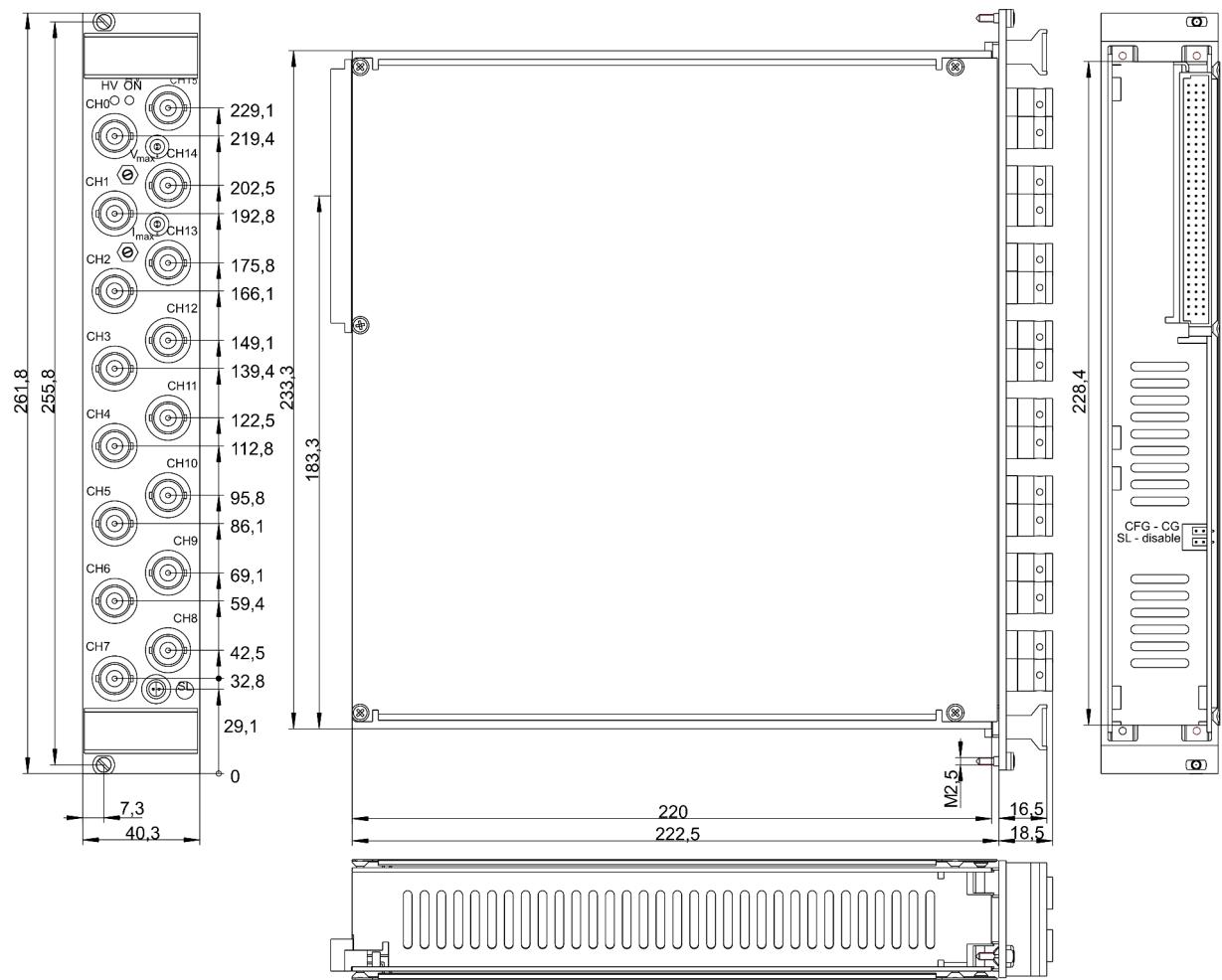


Figure 14: 16 channels in Floating Ground or Common Floating Ground with SHV

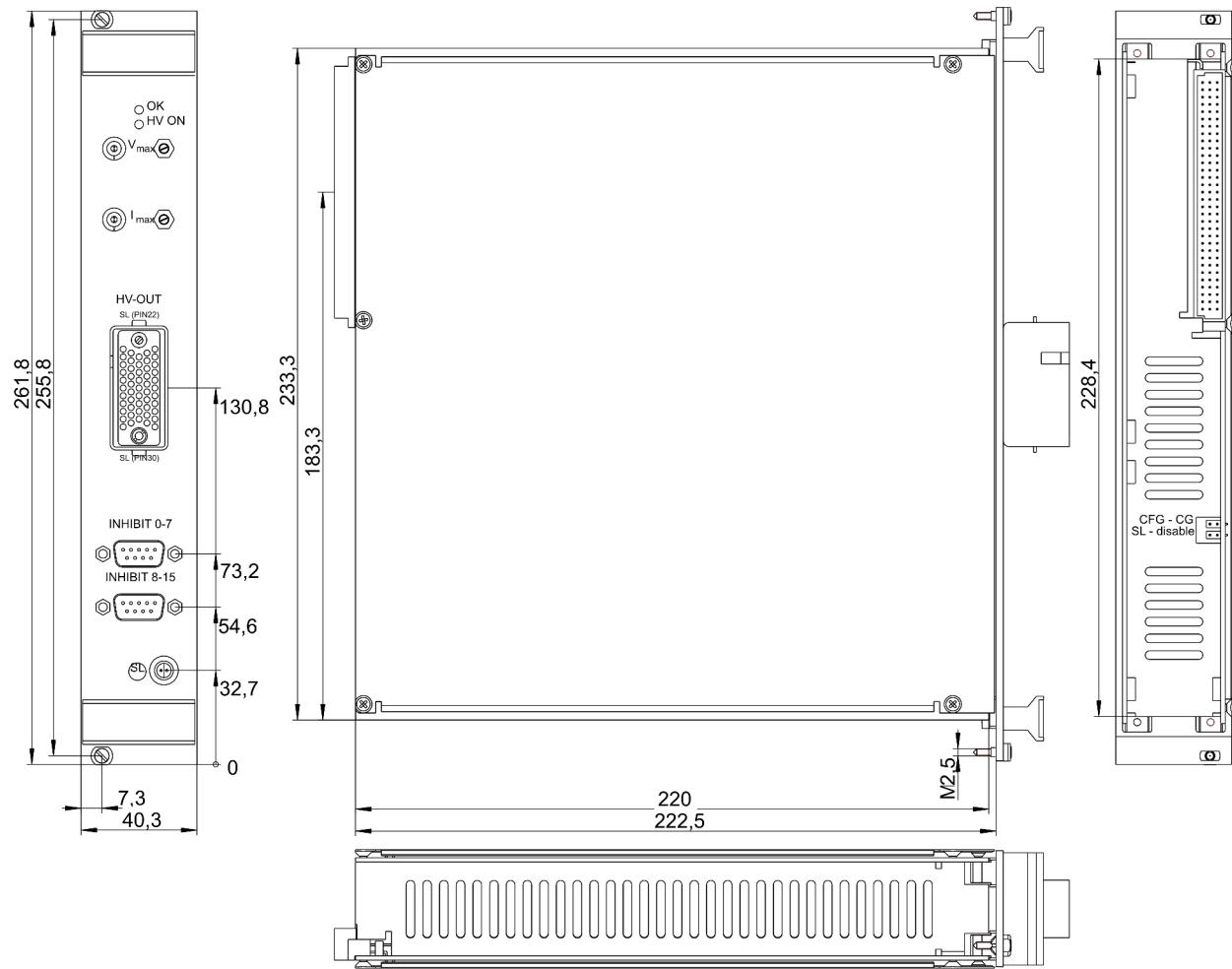


Figure 15: 16 channels in Common Floating Ground with Redel and Inhibit

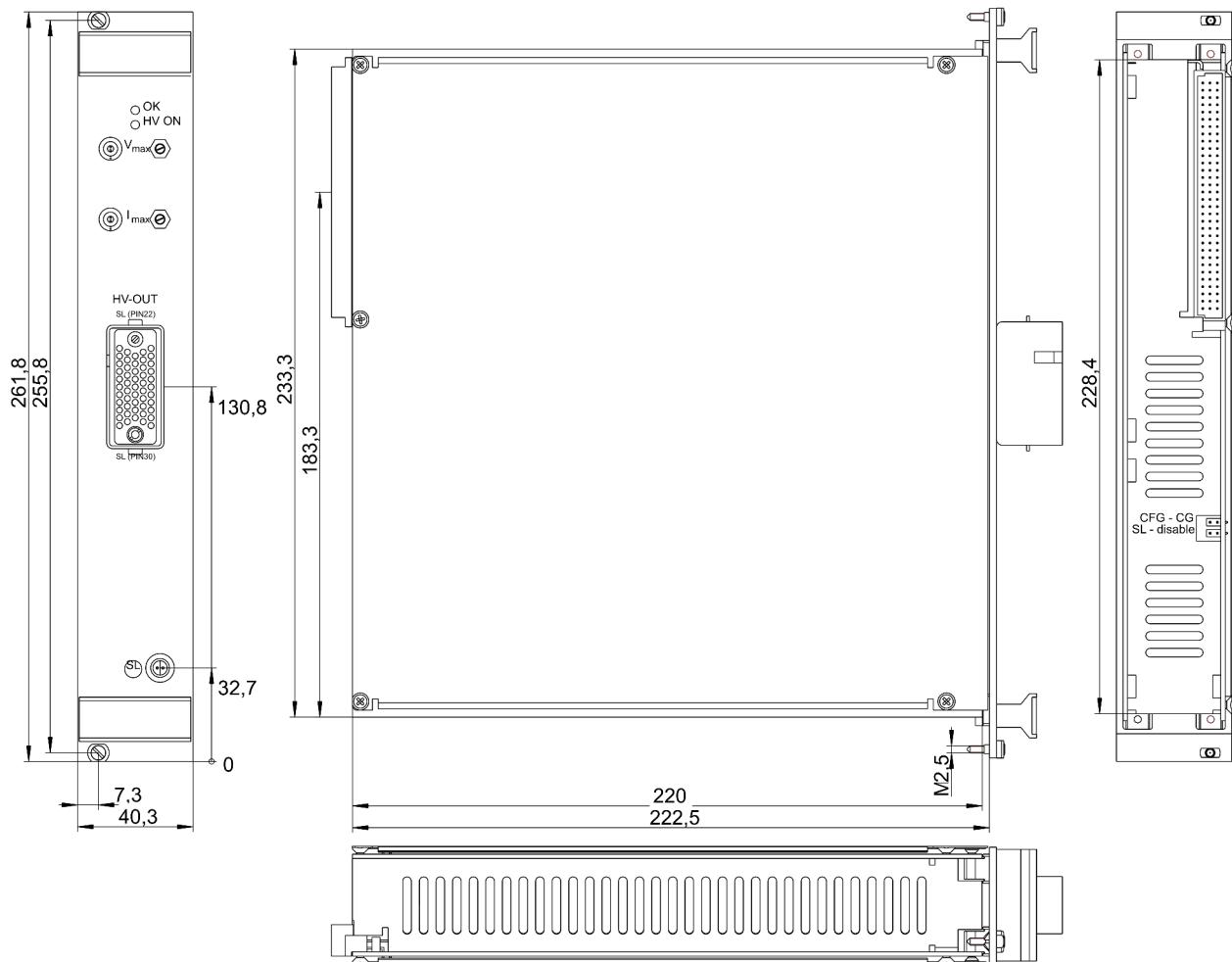


Figure 16: 8, 16, 48 channels in Floating Ground or Common Floating Ground with Redel

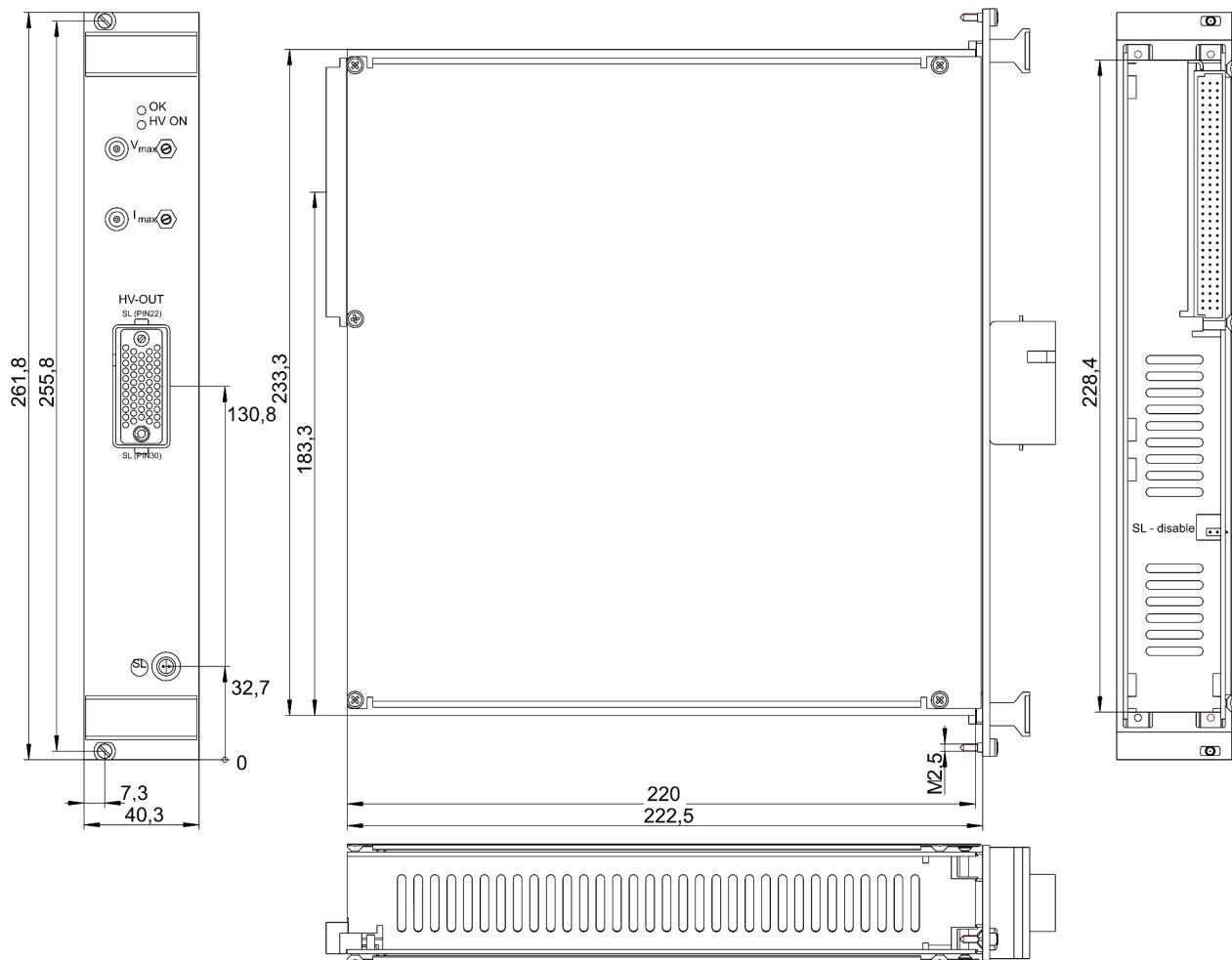


Figure 17: 16, 32 channels in Common Ground with Redel

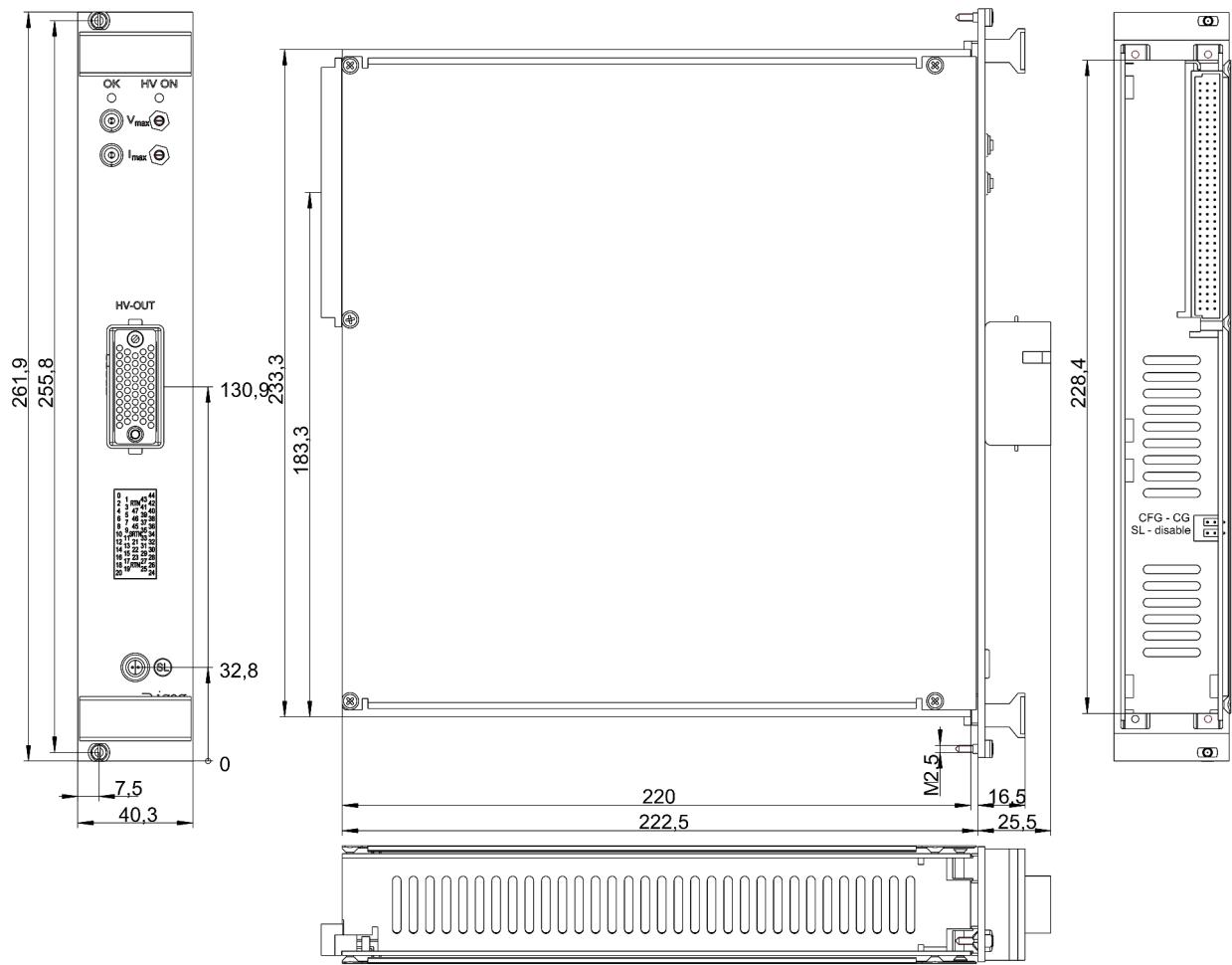
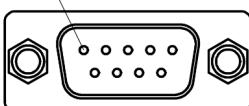
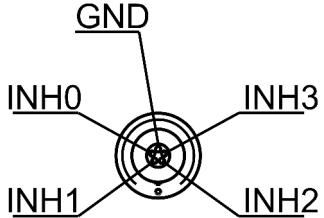
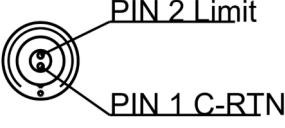
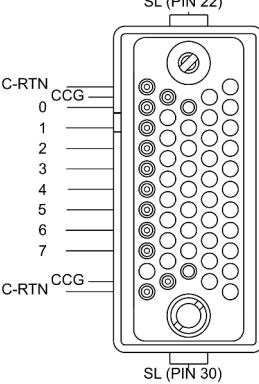


Figure 18: 6, 24, 48 channels in FLEX with Redel

8 Connectors assignments

CONNECTORS - POWER SIDE		PART NUMBERS (manufacturer code / iseg accessory parts item code)	
INHIBIT	D-SUB9 – male	CABLE SIDE	
PIN 1		connector	D SUD9
		manufacturer	Female, (DIN 41652) different producers
		iseg part number	
<i>Figure 19</i>			
INHIBIT	socket 5pol	CABLE SIDE	
GND		part number	FGG.00.305.CLAD35
INH0		manufacturer	LEMO Elektronik GmbH
INH1		iseg part number	Z592723
INH2			
<i>Figure 20</i>			
SAFETY LOOP		CABLE SIDE	
1	PIN	part number	FFA.0S.302.CLAC
		manufacturer	LEMO Elektronik GmbH
		iseg part number	Z592312
<i>Figure 21</i>			
LIMIT monitor	socket 1pol CG/FG	CABLE SIDE	
	PIN 1	part number	FFA.00.250.CTAC31
		manufacturer	LEMO Elektronik GmbH
		iseg part number	Z200793
<i>Figure 22</i>			
LIMIT monitor	socket 2pol CFG	CABLE SIDE	
	PIN 2 Limit	part number	FGG.00.302.CLAD30
	PIN 1 C-RTN	manufacturer	LEMO Elektronik GmbH
		iseg part number	Z201466
<i>Figure 23</i>			

CONNECTORS - POWER SIDE		PART NUMBERS (manufacturer code / iseg accessory parts item code)	
SHV		CABLE SIDE	
	<p><i>Figure 24</i></p>	part number	R317.005.000
		manufacturer	Radiall
		iseg part number	Z592474
S10		CABLE SIDE	
	<p><i>Figure 25</i></p>	part number	1065-1QD
		manufacturer	Kings Electronics
		iseg part number	Z592512
S20		CABLE SIDE	
	<p><i>Figure 26</i></p>	part number	HC52P
		manufacturer	hivolt
		iseg part number	Z592910
R51.41	Redel	CABLE SIDE	
	<p><i>Figure 27</i></p>	connector	iseg part number
	Straight plug with key and cable collect	SAG.H51.LLZBG	Z200325
	Connector contacts (female)	ERA.05.403.ZLL1	Z592263
	Contacts Safety Loop (female)	EGG.3B.665.ZZM	Z592262
	manufacturer	LEMO Elektronik GmbH	
	Notes:		
	SL: Safty Loop	C-RTN: Common Return	CCG: Common Crate Ground

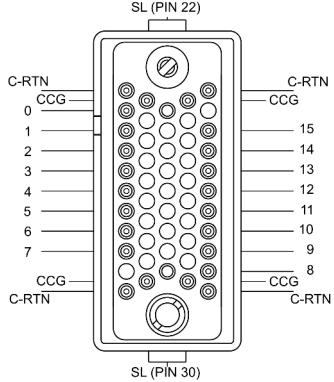
CONNECTORS - POWER SIDE		PART NUMBERS (manufacturer code / iseg accessory parts item code)	
R51.43	Redel	CABLE SIDE	
		connector	iseg part number
	Straight plug with key and cable collect	SAG.H51.LLZBG	Z200325
	Connector contacts (female)	ERA.05.403.ZLL1	Z592263
	Contacts Safety Loop (female)	EGG.3B.665.ZZM	Z592262
	manufacturer	LEMO Elektronik GmbH	
	Notes:		
	SL: Safty Loop	C-RTN: Common Return	CCG: Common Crate Ground

Figure 28

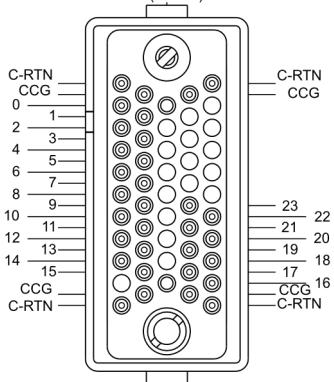
R51.44	Redel	CABLE SIDE	
		connector	iseg part number
	Straight plug with key and cable collect	SAG.H51.LLZBG	Z200325
	Connector contacts (female)	ERA.05.403.ZLL1	Z592263
	Contacts Safety Loop (female)	EGG.3B.665.ZZM	Z592262
	manufacturer	LEMO Elektronik GmbH	
	Notes:		
	SL: Safty Loop	CCG: Common Crate Ground	C-RTN: Common Return

Figure 29

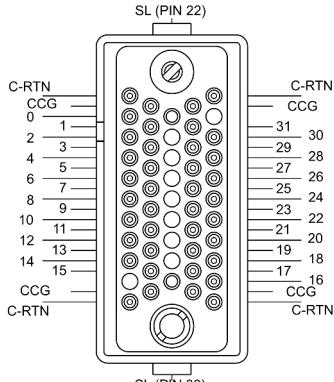
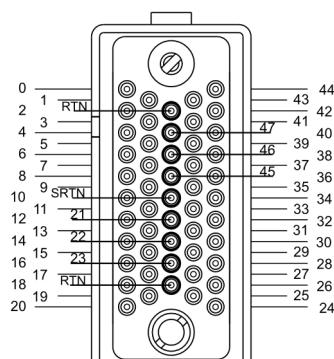
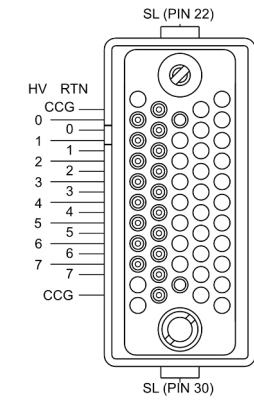
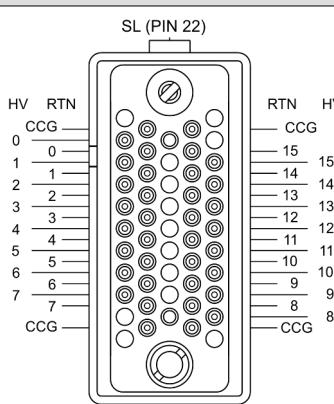
R51.45	Redel	CABLE SIDE	
		connector	iseg part number
	Straight plug with key and cable collect	SAG.H51.LLZBG	Z200325
	Connector contacts (female)	ERA.05.403.ZLL1	Z592263
	Contacts Safety Loop (female)	EGG.3B.665.ZZM	Z592262
	manufacturer	LEMO Elektronik GmbH	
	Notes:		
	SL: Safty Loop	CCG: Common Crate Ground	C-RTN: Common Return

Figure 30

CONNECTORS - POWER SIDE		PART NUMBERS (manufacturer code / iseg accessory parts item code)	
R51.46	Redel	CABLE SIDE	
		connector	iseg part number
	Straight plug with key and cable collect	SAG.H51.LLZBG	Z200325
	Connector contacts (female)	ERA.05.403.ZLL1	Z592263
	Contacts Safety Loop (female)	EGG.3B.665.ZZM	Z592262
	manufacturer	LEMO Elektronik GmbH	
	Notes:		
	RTN: Return	SRTN: Safety Return	
Figure 31		PIN 21, 22, 23, 45, 46, 47, RTN, SRTN middle row, marked	
R51.47	Redel	CABLE SIDE	
		connector	iseg part number
	Straight plug with key and cable collect	SAG.H51.LLZBG	Z200325
	Connector contacts (female)	ERA.05.403.ZLL1	Z592263
	Contacts Safety Loop (female)	EGG.3B.665.ZZM	Z592262
	manufacturer	LEMO Elektronik GmbH	
	Notes:		
	RTN: Return	CCG: Common Crate Ground	
Figure 32			
R51.48	Redel	CABLE SIDE	
		connector	iseg part number
	Straight plug with key and cable collect	SAG.H51.LLZBG	Z200325
	Connector contacts (female)	ERA.05.403.ZLL1	Z592263
	Contacts Safety Loop (female)	EGG.3B.665.ZZM	Z592262
	manufacturer	LEMO Elektronik GmbH	
	Notes:		
	RTN: Return	CCG: Common Crate Ground	
Figure 33			

9 PIN assignments

9.1 INHIBIT – D-SUB9

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

9.2 INHIBIT – socket 5pol

PIN	NAME	DESCRIPTION
1	GND	Ground
2	Inhibit 0	Inhibit channel 0
2	Inhibit 1	Inhibit channel 1
3	Inhibit 2	Inhibit channel 2
4	Inhibit 3	Inhibit channel 3

9.3 Safety Loop socket

PIN	NAME	DESCRIPTION
1	Safety loop	Safety loop
2	Safety loop	Safety loop

9.4 Limit monitor – socket 1pol

PIN	NAME	DESCRIPTION
1	Limit	Limit (I_{max} or V_{max})
2	GND	Ground

9.5 Limit monitor – socket 2pol

PIN	NAME	DESCRIPTION
1	C-RTN	Common Return
2	Limit	Limit

9.6 Redel – R51.41

PIN	NAM	DESCRIPTION	PIN	NAME	DESCRIPTION	PIN	NAM	DESCRIPTION
E						E		
2	Ch0	Output Channel 0				1	C-RTN	Common Return
3	Ch1	Output Channel 1				11	C-RTN	Common Return
4	Ch2	Output Channel 2				12	CCG	Common Crate Ground
5	Ch3	Output Channel 3				21	CCG	Common Crate Ground
6	Ch4	Output Channel 4				22	SL	Safty Loop
7	Ch5	Output Channel 5				30	SL	Safty Loop
8	Ch6	Output Channel 6						
9	Ch7	Output Channel 7						

Table 15: pin assignment, Redel – R51.41

9.7 Redel – R51.43

PIN	NAME	DESCRIPTION	PIN	NAME	DESCRIPTION	PIN	NAME	DESCRIPTION
2	Ch0	Output Channel 0	50	Ch8	Output Channel 8	1	C-RTN	Common Return
3	Ch1	Output Channel 1	49	Ch9	Output Channel 9	11	C-RTN	Common Return
4	Ch2	Output Channel 2	48	Ch10	Output Channel 10	41	C-RTN	Common Return
5	Ch3	Output Channel 3	47	Ch11	Output Channel 11	51	C-RTN	Common Return
6	Ch4	Output Channel 4	46	Ch12	Output Channel 12	12	CCG	Common Crate Ground
7	Ch5	Output Channel 5	45	Ch13	Output Channel 13	21	CCG	Common Crate Ground
8	Ch6	Output Channel 6	44	Ch14	Output Channel 14	31	CCG	Common Crate Ground
9	Ch7	Output Channel 7	43	Ch15	Output Channel 15	40	CCG	Common Crate Ground
						22	SL	Safty Loop
						30	SL	Safty Loop

Table 16: pin assignment, Redel – R51.43

9.8 Redel – R51.44

PIN	NAME	DESCRIPTION	PIN	NAME	DESCRIPTION	PIN	NAME	DESCRIPTION		
2	Ch0	Output Channel 0		13	Ch1	Output Channel 1		1	C-RTN	Common Return
3	Ch2	Output Channel 2		14	Ch3	Output Channel 3		11	C-RTN	Common Return
4	Ch4	Output Channel 4		15	Ch5	Output Channel 5		41	C-RTN	Common Return
5	Ch6	Output Channel 6		16	Ch7	Output Channel 7		51	C-RTN	Common Return
6	Ch8	Output Channel 8		17	Ch9	Output Channel 9		12	CCG	Common Crate Ground
7	Ch10	Output Channel 10		18	Ch11	Output Channel 11		21	CCG	Common Crate Ground
8	Ch12	Output Channel 12		19	Ch13	Output Channel 13		31	CCG	Common Crate Ground
9	Ch14	Output Channel 14		20	Ch15	Output Channel 15		40	CCG	Common Crate Ground
50	Ch16	Output Channel 16		39	Ch17	Output Channel 17		22	SL	Safty Loop
49	Ch18	Output Channel 18		38	Ch19	Output Channel 19		30	SL	Safty Loop
48	Ch20	Output Channel 20		37	Ch21	Output Channel 21				
47	Ch22	Output Channel 22		36	Ch23	Output Channel 23				

Table 17: pin assignment, Redel – R51.44

9.9 Redel – R51.45

PIN	NAME	DESCRIPTION	PIN	NAME	DESCRIPTION	PIN	NAME	DESCRIPTION		
2	Ch0	Output Channel 0		13	Ch1	Output Channel 1		1	C-RTN	Common Return
3	Ch2	Output Channel 2		14	Ch3	Output Channel 3		11	C-RTN	Common Return
4	Ch4	Output Channel 4		15	Ch5	Output Channel 5		41	C-RTN	Common Return
5	Ch6	Output Channel 6		16	Ch7	Output Channel 7		51	C-RTN	Common Return
6	Ch8	Output Channel 8		17	Ch9	Output Channel 9		12	CCG	Common Crate Ground
7	Ch10	Output Channel 10		18	Ch11	Output Channel 11		21	CCG	Common Crate Ground
8	Ch12	Output Channel 12		19	Ch13	Output Channel 13		31	CCG	Common Crate Ground
9	Ch14	Output Channel 14		20	Ch15	Output Channel 15		40	CCG	Common Crate Ground
50	Ch16	Output Channel 16		39	Ch17	Output Channel 17		22	SL	Safty Loop
49	Ch18	Output Channel 18		38	Ch19	Output Channel 19		30	SL	Safty Loop
48	Ch20	Output Channel 20		37	Ch21	Output Channel 21				
47	Ch22	Output Channel 22		36	Ch23	Output Channel 23				
46	Ch24	Output Channel 24		35	Ch25	Output Channel 25				
45	Ch26	Output Channel 26		34	Ch27	Output Channel 27				
44	Ch28	Output Channel 28		33	Ch29	Output Channel 29				
43	Ch30	Output Channel 30		32	Ch31	Output Channel 31				

Table 18: pin assignment, Redel – R51.45

9.10 Redel – R51.46

PIN	NAME	DESCRIPTION	PIN	NAME	DESCRIPTION	PIN	NAME	DESCRIPTION
1	Ch0	Output Channel 0	12	Ch1	Output Channel 1	22	RTN	Return
2	Ch2	Output Channel 2	13	Ch3	Output Channel 3	26	SRTN	Safety Return
3	Ch4	Output Channel 4	14	Ch5	Output Channel 5	30	RTN	Return
4	Ch6	Output Channel 6	15	Ch7	Output Channel 7			
5	Ch8	Output Channel 8	16	Ch9	Output Channel 9			
6	Ch10	Output Channel 10	17	Ch11	Output Channel 11			
7	Ch12	Output Channel 12	18	Ch13	Output Channel 13			
8	Ch14	Output Channel 14	19	Ch15	Output Channel 15			
9	Ch16	Output Channel 16	20	Ch17	Output Channel 17			
10	Ch18	Output Channel 18	21	Ch19	Output Channel 19			
11	Ch20	Output Channel 20	27	Ch21	Output Channel 21			
28	Ch22	Output Channel 22	29	Ch23	Output Channel 23			
51	Ch24	Output Channel 24	40	Ch25	Output Channel 25			
50	Ch26	Output Channel 26	39	Ch27	Output Channel 27			
49	Ch28	Output Channel 28	38	Ch29	Output Channel 29			
48	Ch30	Output Channel 30	37	Ch31	Output Channel 31			
47	Ch32	Output Channel 32	36	Ch33	Output Channel 33			
46	Ch34	Output Channel 34	35	Ch35	Output Channel 35			
45	Ch36	Output Channel 36	34	Ch37	Output Channel 37			
44	Ch38	Output Channel 38	33	Ch39	Output Channel 39			
43	Ch40	Output Channel 40	32	Ch41	Output Channel 41			
42	Ch42	Output Channel 42	31	Ch43	Output Channel 43			
41	Ch44	Output Channel 44	25	Ch45	Output Channel 45			
24	Ch46	Output Channel 46	23	Ch47	Output Channel 47			

Table 19: pin assignment, Redel – R51.46

9.11 Redel – R51.47

PIN	NAME	DESCRIPTION	PIN	NAME	DESCRIPTION	PIN	NAME	DESCRIPTION		
2	Ch0	Output Channel 0		13	Ch0	Return, Channel 0		12	CCG	Common Crate Ground
3	Ch1	Output Channel 1		14	Ch1	Return, Channel 1		21	CCG	Common Crate Ground
4	Ch2	Output Channel 2		15	Ch2	Return, Channel 2				
5	Ch3	Output Channel 3		16	Ch3	Return, Channel 3				
6	Ch4	Output Channel 4		17	Ch4	Return, Channel 4				
7	Ch5	Output Channel 5		18	Ch5	Return, Channel 5				
8	Ch6	Output Channel 6		19	Ch6	Return, Channel 6				
9	Ch7	Output Channel 7		20	Ch7	Return, Channel 7				

Table 20: pin assignment, Redel – R51.47

9.12 Redel – R51.48

PIN	NAME	DESCRIPTION	PIN	NAME	DESCRIPTION	PIN	NAME	DESCRIPTION		
2	Ch0	Output Channel 0		13	Ch0	Return, Channel 0		12	CCG	Common Crate Ground
3	Ch1	Output Channel 1		14	Ch1	Return, Channel 1		21	CCG	Common Crate Ground
4	Ch2	Output Channel 2		15	Ch2	Return, Channel 2		31	CCG	Common Crate Ground
5	Ch3	Output Channel 3		16	Ch3	Return, Channel 3		40	CCG	Common Crate Ground
6	Ch4	Output Channel 4		17	Ch4	Return, Channel 4				
7	Ch5	Output Channel 5		18	Ch5	Return, Channel 5				
8	Ch6	Output Channel 6		19	Ch6	Return, Channel 6				
9	Ch7	Output Channel 7		20	Ch7	Return, Channel 7				
50	Ch8	Output Channel 8		39	Ch8	Return, Channel 8				
49	Ch9	Output Channel 9		38	Ch9	Return, Channel 9				
48	Ch10	Output Channel 10		37	Ch10	Return, Channel 10				
47	Ch11	Output Channel 11		36	Ch11	Return, Channel 11				
46	Ch12	Output Channel 12		35	Ch12	Return, Channel 12				
45	Ch13	Output Channel 13		34	Ch13	Return, Channel 13				
44	Ch14	Output Channel 14		33	Ch14	Return, Channel 14				
43	Ch15	Output Channel 15		32	Ch15	Return, Channel 15				

Table 21: pin assignment, Redel – R51.48

10 Order guides

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

CABLE ORDER GUIDE					
POWER SUPPLY SIDE CONNECTOR	V _{max}	CABLE CODE	CABLE DESCRIPTION	LOAD SIDE CONNECTOR	ORDER CODE <i>LLL = length in m</i> ³¹
R51.41-G	≤ 4 kV	07	HV cable 6kV Kerpen SL-v2YCeHI 37xAWG26/7red	R51.41-A	RG41_C07-LLL_RA41
R51.43-G	≤ 4 kV	07	HV cable 6kV Kerpen SL-v2YCeHI 37xAWG26/7red	R51.43-A	RG43_C07-LLL_RA43
R51.44-G	≤ 4 kV	07	HV cable 6kV Kerpen SL-v2YCeHI 37xAWG26/7red	R51.44-A	RG45_C07-LLL_RA45
R51.45-G	≤ 4 kV	07	HV cable 6kV Kerpen SL-v2YCeHI 37xAWG26/7red	R51.45-A	RG45_C07-LLL_RA45
R51.46-G	≤ 4 kV	08	HV cable 6kV Kerpen SL-v2YCeHI 56xAWG26/7red	R51.46-A	RG46_C08-LLL_RA46
R51.47-G	≤ 4 kV	07	HV cable 6kV Kerpen SL-v2YCeHI 37xAWG26/7red	R51.46-A	RG47_C07-LLL_RA47
R51.48-G	≤ 4 kV	07	HV cable 6kV Kerpen SL-v2YCeHI 37xAWG26/7red	R51.48-A	RG45_C07-LLL_RA45
SHV	≤ 5 kV	04	HV cable shielded 30kV (HTV-30S-22-2)	open	SHV_C04-LLL
S08	≤ 8 kV	04	HV cable shielded 30kV (HTV-30S-22-2)	open	S08_C04-LLL
S10	≤ 10 kV	04	HV cable shielded 30kV (HTV-30S-22-2)	open	S10_C04-LLL
S20	≤ 20 kV	02	Lemo HV cable shielded 30kV (Lemo 130660)	open	S20_C02-LLL

Table 22: Guideline for cable ordering

31 Length building examples: 10cm → 0.1, 2.5m → 2.5, 12m → 012, 999m → 999

CONFIGURATION ORDER GUIDE (item code parts)

EH	16	0	030	P	305	000	02	0	0
High Voltage, Distinct Source	No. of channels	Class	V _{NOM}	Polarity	I _{NOM} (nA)	Option (hex)	HV Connector	Revision	Customized Version
	04 = 4 ch. 08 = 8 ch. 16 = 16 ch. 24 = 24 ch. 48 = 48 ch.	0 = Standard (CFG) 1 = Standard (CG) 2 = High Precision (CFG) 4 = High Precision (FG) 5 = Flex channels (CFG) 6 = Standard (FG)	three significante digits • 100V	p = positive n = negative x = mix	two significante digits + number of zeros.	Sum of the hex codes	02 / 03 = SHV 04 = S10 05 = S20 41 to 48 = Redel Multipin	one digit 0 = no revision	one digit 0 = no customization

Table 23: Item code parts for different configurations

11 Appendix

For more information please use the following download links:

This document
https://iseg-hv.com/download/SYSTEMS/MMS/EHS/iseg_manual_EHS_en.pdf
EHS series (Website)
https://iseg-hv.com/de/products/detail/EHS
Archiv
http://download.iseg-hv.com/SYSTEMS/MMS/EHS/archive
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
iCS (iseg Communication Server)
https://iseg-hv.com/download/?dir=SOFTWARE/iCS

Manufacturers website (connectors)
LEMO ELEKTRONIK GMBH https://www.lemo.com
hivolt.de GmbH & Co. KG https://www.hivolt.de
Radiall GmbH https://www.radiall.com

12 Glossary

12.1 Shortcuts

SHORTCUT	MEANING
$\Delta V_{\text{OUT}} - [\Delta V_{\text{IN}}]$	deviation of V_{out} depending on variation of supply voltage
$\Delta V_{\text{OUT}} - [\Delta R_{\text{load}}]$	deviation of V_{out} depending on variation of output load
0V	Supply ground
I_{bounds}	current bounds, a tolerance tube $I_{\text{SET}} \pm I_{\text{bounds}}$ around I_{SET}
I_{IN}	input / supply current
I_{limit}	current limit
I_{MAX}	limit (max.) value of output current
I_{meas}	digital measured value of current
I_{MON}	monitor voltage of output current
I_{NOM}	nominal output current
I_{OUT}	output current
I_{SET}	set value of output current
I_{TRIP}	current limit to shut down the output voltage
P_{IN}	input power
$P_{\text{IN_NOM}}$	nominal input power
P_{NOM}	nominal output power
T	temperature
T_{REF}	reference temperature
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
V_{bounds}	voltage bounds, a tolerance tube $V_{\text{SET}} \pm V_{\text{bounds}}$ around V_{SET}
V_{IN}	input / supply voltage
$V_{\text{IN_S}}$	$V_{\text{in_s}}$ Supply voltage
V_{LIMIT}	voltage limit
V_{MAX}	limit (max.) value of output voltage
V_{MEAS}	digital measured value of output voltage
V_{MON}	monitor voltage of output voltage
V_{NOM}	nominal output voltage
V_{OUT}	output voltage
$V_{\text{P-P}}$	peak to peak ripple voltage
V_{REF}	internal reference voltage
V_{SET}	set value of output voltage
V_{SETINT}	is the actual set value for the internal voltage regulator of a channel
V_{TYPE}	type of output voltage (AC, DC)

Table 24: shortcut

SHORTCUT	MEANING
CH	channel(s)
GND	signal ground
INH	Inhibit Modules equipped with the option INHIBIT provide the possibility to shut down single channels, a group of channels (monitor group) or the entire module with or without ramp, triggered by an external signal.
KILL	KillEnable Is a global control signal for the module. It defines the behavior as a consequence to the exceedance of a given limit (VMAX, IMAX, ISET, ITRIP). If KILL-ENABLE is activated a channel that exceeds one of the limits (VMAX, IMAX, ISET) will be shut down within a hardware response time of < 1 ms. A channel that exceeds the limit ITRIP will be shut down after a software response time of 10 to 1000 ms, depending on the ADC sampling rate.
OFF	HV OFF
ON	HV ON
POL	Polarity
SLA	Active Safety Loop
SLP	Internal powered safety loop SLA and SLP are hardware variants. With the SLA option, the customer can configure the conditions that lead to an interruption of the safety loop. With SLP, the internal power source is always active.
SL	Safety Loop The Safety Loop (SL) is a galvanically isolated current loop. With an activated Safety Loop High-Voltage can only be switched on if the loop is closed and fed with a current between 5 and 20 mA. Opening the loop will immediately shut down the high voltage generation. The Safety Loop can be deactivated with a jumper on the back side of the module. The safety loop connector is located on the front panel. Modules with a multipin HV connector provide additional SL-contacts on this connector.

Table 25: shortcut

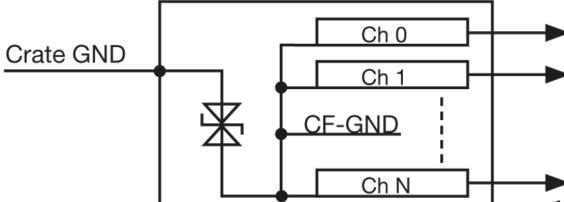
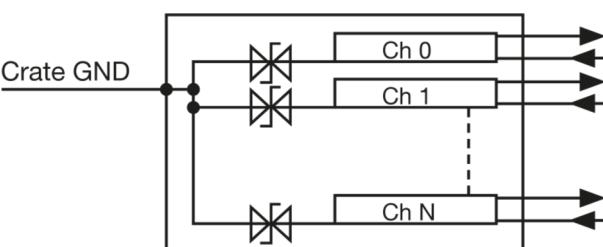
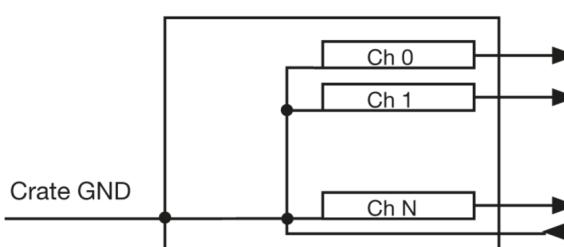
SHORTCUT	MEANING
CFG	<p>Common Floating-GND https://iseg-hv.com/en/knowledge/floating</p>  <p>Modul CF- GND</p> <p>All channels and the processing unit are galvanically connected. The module GND is isolated from the GND of the crate. Within a crate all modules with CFG are galvanically isolated. A protection circuit prevents differences in the potentials between the module CF-GND and the crate GND of more than 60 V.</p>
FG	<p>Floating-GND https://iseg-hv.com/en/knowledge/floating</p>  <p>Modul F- GND</p> <p>All channels are galvanically isolated from each other and from the module GND. By default a protection circuit prevents differences in the potentials between the channels and the module GND of more than 25 V. As an option this isolation can be designed to enable potential differences up to 2,000 V. With this option the user is responsible not to exceed the maximum ground potential differences!</p>
CG	<p>Common-GND https://iseg-hv.com/en/knowledge/floating</p>  <p>Modul C - GND</p> <p>All channels and the processing unit are galvanically connected. Within a crate all CG modules are galvanically connected.</p>

Table 26: CG, CFG, FG

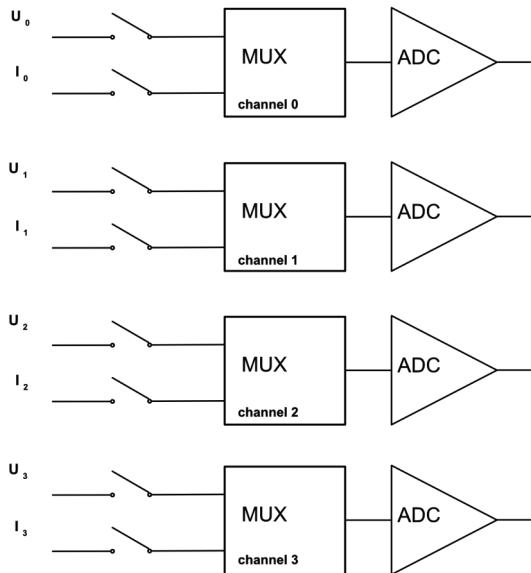
12.2 Comparison of monitor value acquisition principles

The ADCs used are based on a high-resolution measuring principle for recording the monitor values.

Example: Voltage and current monitor value acquisition principle of a 4 channel HV module:

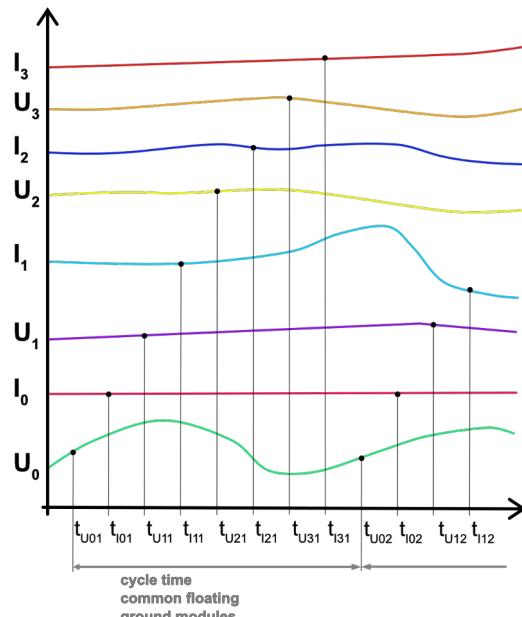
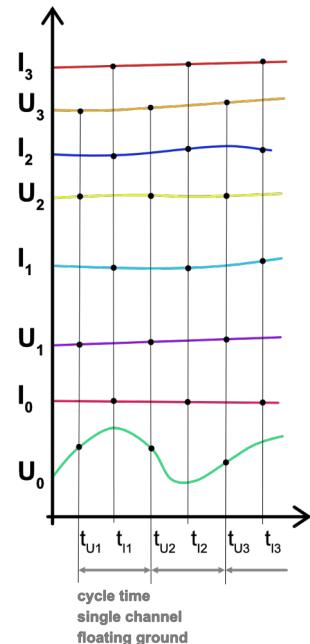
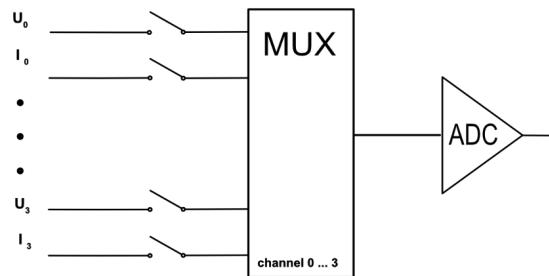
Single channel floating ground (FG)

Each High Voltage channel is equipped with an ADC: The measurement cycles of the current or the voltage take place almost simultaneously.



Common floating ground modules (GFG)

Each High Voltage board is equipped with one ADC only: The measurement cycles for recording the current and voltage monitor values take place consecutively across all high-voltage channels.



The different principles of monitor value acquisition and the channel number per module results in different times for the complete measurement cycle time. Note that up to two High Voltage boards can be combined in one module.

Module	Grounding principle	Channel I	ADC principle	ADC SPS	ADC cycle time per channel	ADC cycle time per module	isegHAL Cycletime ³²	iCSservice Cycletime	iseg Http Cycletime
EHS	CFG HP	4	per module	50	50ms	200ms	50ms	500ms	500ms
EHS	CFG HP	8 / 16	per module	50	50ms	400ms	50ms	500ms	500ms
EHS	CFG STD	8 / 16	per module	500	10ms	80ms	50ms	500ms	500ms
EHS	FG HP	8 / 16	per channel	50	50ms	50ms	50ms	500ms	500ms
EHS	FG STD	8 / 16	per channel	50	50ms	50ms	50ms	500ms	500ms
EHS	CFG STD	24 / 48	per module	500	10ms	240ms	150ms	600ms	600ms
EBS	CFG STD	12 / 24	per module	500	10ms	120ms	80ms	500ms	500ms

Table 27 Overview of the data acquisition time of different iseg High Voltage MMS modules types

After switching an internal or external multiplexer, an additional waiting time is required before the next ADC measurement can be started. This increases the total time of the current and voltage measurement of one channel.

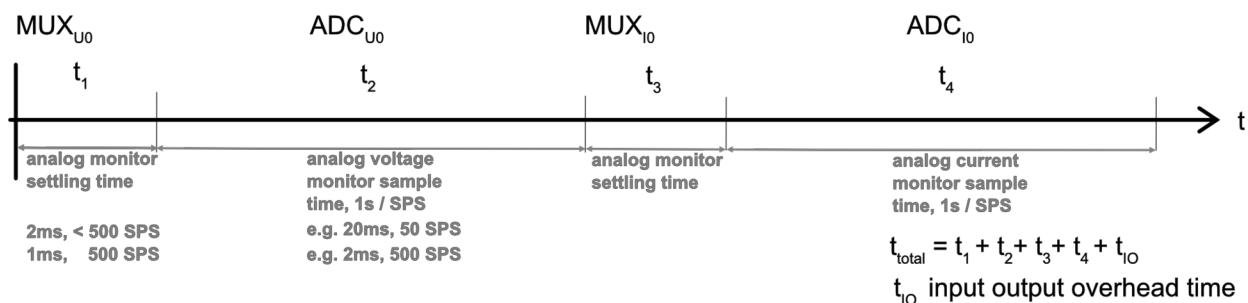


Diagram 1 Monitor value acquisition time for one channel

SPS = ADC Sample rate (Samples per Second)

The ADC samples per second configure a notch filter in the ADC device. For high precision modules the notch should be configured with 60 samples per second using an 110V line with 60Hz and 50 samples per second using a 230V line with 50Hz in order to improve the common-mode rejection of these frequencies.

³² The following services are based directly on isegHAL and should not cause a delay compared to the cycle time of isegHAL during network accesses: SNMP, EPICS, isegHAL-service, SCPI

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



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



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.

This device is only intended for professional use or as an built-in component for devices in the research/development sector and is sold exclusively B2B (only to commercial end customers). The device may only be disposed of properly and not in normal household waste.

As an alternative to proper self-disposal, we offer a free disposal option for the device. Before sending in the device, please send an email to recycling@iseg-hv.de stating the device article and serial number to receive further information on the process. Further information can be found at <https://iseg-hv.com/en/support/recycling>.

15 Conformity

The declaration of the product is available on our website.

16 WEEE registration

iseg Spezialelektronik GmbH, with headquarters in Radeberg, is registered as a manufacturer with the stiftung elektro-altgeräte (<https://www.stiftung-ear.de>) under registration number DE 51452207.

17 Manufacturer contact

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