Technical documentation
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EDS Series

Distributor High Voltage Module with Common Floating Ground

- 16 / 24 / 48 channel, 500 V – 3 kV versions
- Low cost version with reduced current measurement accuracy
- very low ripple and noise
- hardware voltage and current limit
- voltage control and current measurement per channel
- programmable parameters

Document history

Version	Date	Major changes
2.0	28.02.2017 01.10.2018	Relayouted documentation Notes revised

Disclaimer / Copyright

Important security information

It is strongly recommended to read the operator´s manual before operation. 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.

We decline all responsibility for damages and injuries caused by an improper use of the module. It is strongly recommended to read the operators manual before operation.

WARNING!
 WARNING! The non-observance of the advices marked as “Warning!” could lead to possible injury or death.

ATTENTION!
 ATTENTION! Advices marked as “Attention!” describe actions to avoid possible damages to property.

INFORMATION
 INFORMATION Advices marked as “Information” give important information.

Table of Contents

1 General description

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

EDS modules are cost effective distribution multichannel high voltage power supplies in MMS system (Eurocard format).
The modules are available as Standard version and as Low Cost version with a reduced resolution and precision of the current measurement. EDS supplies come with common floating ground to reduce the voltage noise level. With up to 48 channels each single channel has an independent voltage control.
The modules are made of high precision components such as 24 bit ADC and 20 bit DAC and provide comprehensive security features.
By offering different configurations and options this module perfectly covers various types of applications such as detector supply, experimental setup or lab use.

2 Technical data

SPECIFICATIONS	EDS STANDARD	EDS LOW COST
Polarity	Factory fixed, positive or negative	
Floating principle	Common Floating Ground	
Ripple and noise (f > 10 Hz)	< 5 mV_{p-p}	
Ripple and noise (f > 1 kHz)	< 2 mV_{p-p}	
Stablity		
Stability [ΔV_{out} vs. ΔV_{in}]	< $1 \cdot 10^{-5}$ V_{nom}	
Stability - [ΔV_{out} vs. ΔR_{load}]	< $5 \cdot 10^{-5}$ V_{nom}	
Long term stability (1h warmup) 24h	< $1 \cdot 10^{-5}$ V_{nom}	
Temperature coefficient - Voltage measurement	< 20 ppm / K	
Temperature coefficient - Current measurement	< 100 ppm / K	
Resolution - The resolution of measurable values depends on the settings of the sampling rate and the digital filter!		
Resolution voltage setting	$2 \cdot 10^{-6} \cdot V_{nom}$	
Resolution current setting	$1 \cdot 10^{-4} \cdot I_{nom}$	
Resolution voltage measurement	$2 \cdot 10^{-6} \cdot V_{nom}$	
Resolution current measurement	$1 \cdot 10^{-4} \cdot I_{nom}$	$5 \cdot 10^{-4} \cdot I_{nom}$
Measurement accuracy - The measurement accuracy is guaranteed in the range 1% • V_{nom} < V_{out} < V_{nom} and for 1 year		
Accuracy voltage measurement	± (0.01 % • V_{out} + 0.02 % • V_{nom})	
Accuracy current measurement	± (0.1 % • I_{out} + 0.1 % • I_{nom})	± (1 % • I_{out} + 1 % • I_{nom})
Sample rates ADC (SPS)	5, 10, 25, 50, 60, 100, 500	
Digital filter averages	1, 16, 64, 256, 512, 1024	
Voltage ramp up / down	up to 0.2 • V_{nom} / s | opt. up to 0.75 • V_{nom} / s	
Hardware limits	Potentiometer per module [V_{max} and I_{max}]	
Limit monitor voltage	2.5 V	
Digital interface	CAN (potential free)	

Protection	Safety loop, overload and short circuit protected
HV connector	R51 | SHV | Radiall
System connector	96 PIN (MMS HV compatible, according to DIN 41612)
Safety loop connector	Lemo 2pole
Limit monitor connector	Lemo 2pole
Case	19" plug-in cassette
Dimensions – L/W/H	220mm / 8HP / 6U
Operating temperature	0 – 40 °C
Storage temperature	-20 -60 °C
Humidity	20 - 80 %, not condensing

Table 1: Technical data: Specifications EDS

CONFIGURATIONS EDS SERIES							
Type	**V_{nom}**	**I_{nom}**	**Ch**	**Max. I_{in} (A)** at 24V	**HV connector Standard/**opt.	**Item code**	**Options**
EDS Fy 05x	500 V	1 mA	16	0.8	**R51.46,**SHV	ED161005p1050004300	SLA, SLP
EDS 18y 05x	500 V	1 mA	24	1.1	**R51.46**	ED241005p1050004300	SLA, SLP
EDS 30y 05x	500 V	1 mA	48	2.2	**R51.46**	ED481005p1050004300	SLA, SLP
EDS Fy 15x	1.5 kV	1 mA	16	1.7	**R51.46,**SHV	ED161015p1050004300	SLA, SLP
EDS 18y 15x	1.5 kV	1 mA	24	2.6	**R51.46**	ED241015p1050004300	SLA, SLP
EDS 30y 15x	1.5 kV	1 mA	48	5.2	**R51.46**	ED481015p1050004300	SLA, SLP
EDS Fy 30x	3 kV	500 µA	16	1.7	**R51.46,**SHV	ED161030p5040004300	SLA, SLP
EDS 18y 30x	3 kV	500 µA	24	2.6	**R51.46**	ED241030p5040004300	SLA, SLP
EDS 30y 30x	3 kV	500 µA	48	5.2	**R51.46**	ED481030p5040004300	SLA, SLP

Table 2: Technical data: Configurations of EDS series

OPTIONS	**OPTION CODE**	**EXAMPLE**	**ITEM CODE HEX CODING**
POLARITY	Positive: **x = p**, negative **x = n**	EDS F1 05**p**	
LOW COST	Standard: **y=1,** low cost: **y=3**	EDS F**3** 05p	
ACTIVELY SAFETY LOOP	**SLA**		001
INTERNAL SOURCED SAFETY LOOP	**SLP**		002

Table 3: Technical data: Options and order information

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

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).
INFORMATION	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 voltage on output is more than 56V
Green LED blinking slow	prepares firmware update
Green LED blinking fast	Firmware update is stored into flash, do not switch of power supply, crate etc.

Table 4: Module status information

3.3 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 ± 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 on the front panel turns off.

3.4 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 and the corresponding bits in the ModuleStatus and ModuleEventStatus are cancelled (see "*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.

3.5 Delayed Trip

3.5.1 Operating principle

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 manual **CAN_EDCP_Programmers-Guide.pdf (see appendix).**

By a programmable timeout with one millisecond resolution, the trip can be delayed up to four seconds. If the measured current exceeds the set current the programmed timeout counter is decremented, keeping the output voltage. If the current returns to a value $<I_{set}$ before timeout the counter will be reset. So this process can be restarted if the current rises again.

Note that the actual current is acquired approximately every 150ms, which can lead to delays in the detection of an exceeded or again reduced current.

If the current at any time exceeds the hardware current limit (about 30% above the current limit value set by the limit potentiometer) the channel will be shut off without delay and ramp.

If the *Delayed Trip* function is activated the voltage ramp should be limited to 1 % of V_{nom} before. Higher values could trigger a trip by internal charge balancing during a ramp, even though the output current does not exceed the set value I_{set}.

If the connected load contains capacities or if I_{set} is very small, it might be necessary to further reduce the ramp speed. Alternatively, the *Delayed Trip* can be activated only after the completion of the ramp.

INFORMATION

An activated KillEnable feature disables the Delayed Trip function.

INFORMATION

An active *KillEnable* function disables the *Delayed Trip* function. If *KillEnable* is active and a trip occurs, the channel is shut down without ramp. However, the actual discharge time strongly depends on the connected load.

4 Options

4.1 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.

4.2 SLP – Internally powered safety loop

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

5 Front panel versions

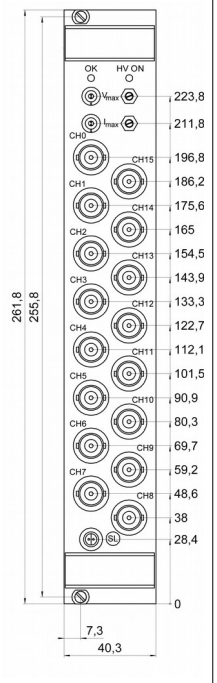
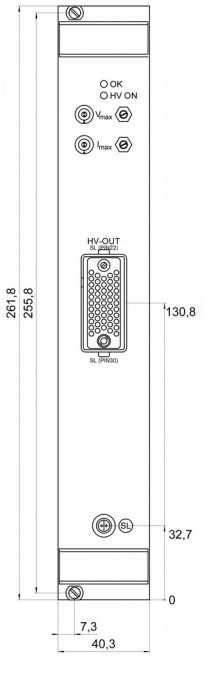
FRONT PANELS			
Channels	16	16 / 24 / 48	
Floating	CFG	CFG	
HV Connector	SHV	R51	
Figure			

Table 6: Front panel versions

6 Dimensional Drawings

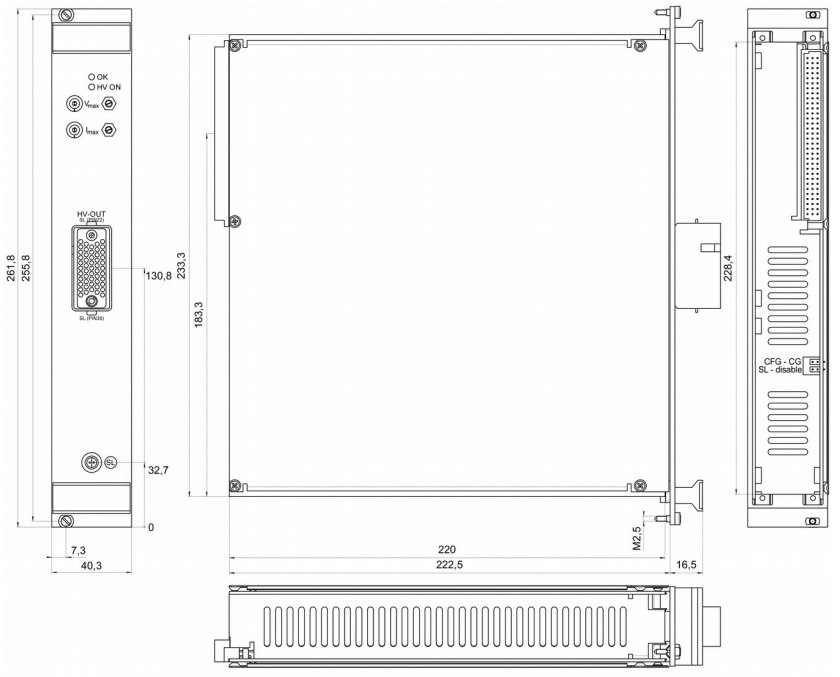
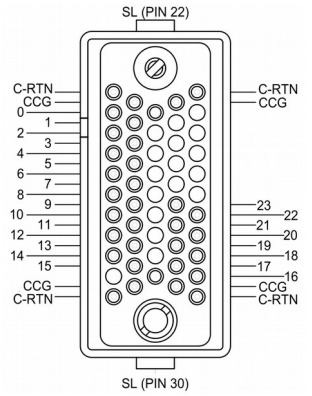
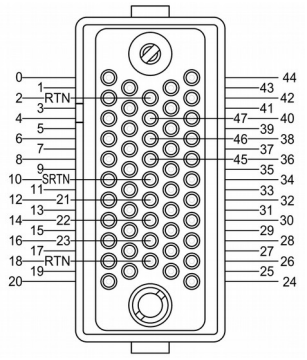
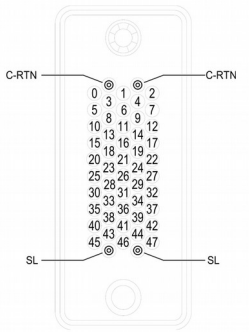


Figure 1: Dimensional Drawing (ex. R51)

7 Connectors and PIN assignments

HV CONNECTOR ASSIGNMENTS				
Name	R51.44 (REDEL)	R51.46 (REDEL)	I52 (RADIALL)	SHV
Figure				

	SAFETY LOOP	LIMIT MONITOR
Name	Safety Loop socket	Limit monitor socket 2pol
Figure		

Table 7: Connector and pin assignments

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
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
I52 (RADIALL 52 PINS)			
Socket	691803004	Connector	691802002
Socket Contacts	691804200	Contacts	691804300
Socket Contacts Safety Loop	691804230	Connector contacts (SL)	691804300
SHV (ROSENBERGER)			
Socket	57S501-200N3	Connector	57K101-006N3 / Z590162
Safety Loop (LEMO)			
Socket	ERA.0S.302.CLL	Connector	FFA.0S.302.CLAC / Z592312
Limit monitor 2pol. (LEMO)			
Socket	EGG.00.302.CLL	Connector	FGG.00.302.CLAD

Table 8: Connectors part number information

8 Order guides

CABLE ORDER GUIDE				
POWER SUPPLY SIDE CONNECTOR	**CABLE CODE**	**CABLE DESCRIPTION**	**LOAD SIDE CONNECTOR**	**ORDER CODE** ***LLL = length in m*** [*]
R51.44-G	07	HV cable 6kV Kerpen SL-v2YCeHI 37xAWG26/7red	R51.44-A	R44G_C07-*LLL*_R44A
R51.46-G	08	HV cable 6kV Kerpen SL-v2YCeHI 56xAWG26/7red	R51.46-A	R46G_C07-*LLL*_R46A
SHV	04	HV cable shielded 30kV (HTV-30S-22-2)	open	SHV_1C04-*LLL*
[*] *Length building examples: 10cm => 0.1, 2.5m => 2.5, 12m => 012 , 999m => 999*				

Table 9: Guideline for cable ordering

CONFIGURATION ORDER GUIDE (item code parts)								
ED	**48**	**1**	**030**	**P**	**504**	**000**	**02**	**00**
High Voltage, Distributor	Numbers of channels	Class	V_{nom}	Polarity	I_{nom} (nA)	Option (hex)	HV-Connector	Customized Version
		1 = normal Current Measurement 3 = Low Cost Current Measurement	three significante digits *100V For Examle: 030 = 3000V	p = positive n = negative	two significante digits + number of zeros For Examle: 305 = 3mA	Sum of the hex codes (s. table 3) For Example: SLP = 002	02 = SHV 5kV 44 and 46 = Redel Multipin (s. Table 4) 17 = Radiall Multipin"	00 = none

Table 10: Item code parts for different configurations

9 Appendix

For more information please use the following download links:

This document
http://download.iseg-hv.com/SYSTEMS/MMS/EDS/iseg_datasheet_EDS_en_2.0.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

Warranty & service

This device is made with high care and quality assurance methods. The factory warranty is up to 36 months, starting from date of issue (invoice). Within this period a 5 years warranty extension can be ordered at additional charge. Please contact iseg sales department.

ATTENTION

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

10 Manufacturer´s contact

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