EHS Standard HV Modules

8 Channels with Single Channel Floating-GND

Operator's Manual

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Attention!

-It is not allowed to use the unit if the covers have been removed.

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

Note

The information in this manual is subject to change without notice. We take no responsibility for any error in the document. We reserve the right to make changes in the product design without notification to the users.

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1. General information

The EHS modules of this series are Standard multichannel high voltage power supplies in 6U Eurocard format. The output voltage features a high stability, low ripple and noise and low temperature coefficient. Each single channel has an independent voltage and current control. The data for set and measure values is given in a format of Floating Point Single Precision values. The modules are equipped with 24 bit ADC and 20 bit DAC circuits.

The outputs RTN - floating HV-GND - of each channel are floating against each other and against ground (with a 25 V hardware limit). Optional the floating Voltage can be increased to up to 2 kV.

The HV output at the module is available as a 51 pin REDEL HV connector (up to 6 kV), isolated built-in SHV connectors (up to 8 kV) or KINGS connectors (10 kV).

This manual covers modules with 4 or 8 channels. For output voltages up to 6 kV these modules are also available with 16 channels (see manual "EHS Standard HV Modules 16 Channels with Single Channel Floating-GND")

2. Technical data

	EHS 8605x-F[)1]	EHS 8610x-F[)1]	EHS 8620x-F[)1]	EHS 8630x-F[)1]	EHS 8640x-F[)1]	EHS 8660x-F[)1]	EHS 46100x-F[)1]
HV channels per module	8	8	8	8	8	8	4
Output voltage $V_{O\ nom}$ [kV]	0.5	1	2	3	4	6	10
Output current $I_{O\ nom}$ [mA]	15	8	4	3	2	1	0.5
Resolution of voltage setting[*)] [mV]	20	40	80	120	160	240	400
current setting[*)] [nA]	600	320	160	120	80	40	20
voltage measurement[*)] [mV]	2	4	5	10	10	15	30
current measurement[*)] [nA]	150	80	40	30	20	10	5
[*)] with standard sample rate 500/s and digital filter 64							
Ripple and noise [mV$_{P-P}$]	< 10						< 30
	- at max. load and $\left|V_O\right| > 2\% * V_{O\ nom}$ - f > 10 Hz						
Stability(no load/load and ΔV_{IN})	0.02%* $V_{O\ nom}$						
Sample rates [samples/s]	5, 10, 25, 50, 60, 100, 500						
Digital filter averages	1, 16, 64, 256, 512, 1024						
The resolution of measurable values depends on the settings of the sampling rate and the digital filter!							
Accuracy of voltage measurement	$\pm (0.01\% * V_O + 0.02\% * V_{O\ nom})$						
Accuracy of current measurement	$\pm (0.02\% * I_O + 0.02\% * I_{O\ nom})$						
The measurement accuracy is guaranteed in the range $2\% * V_{O\ nom} < V_O \leq V_{O\ nom}$ and for 1 year							
Voltage ramp up / down [V/s]	$1*10^{-6} * V_{O\ nom}$ up to $0.2 * V_{O\ nom}$						
Floating voltage	Connector RTN to GND: $\leq \left| 20\ V \right|$						
Temperature coefficient	$< \pm 50 * 10^{-6}/_K$						
Hardware limits V_{max} / I_{max}	potentiometer per module (V_{max} / I_{max} is the same for all channels)						

	EHS 8605x-F[)1]	EHS 8610x-F[)1]	EHS 8620x-F[)1]	EHS 8630x-F[)1]	EHS 8640x-F[)1]	EHS 8660x-F[)1]	EHS 46100x-F[)1]
Interface	CAN-Interface (potential free)						

Operating mode	Full module and channel control via CAN interface in
	    EHS mode: EDCP (Enhanced Device Control Protocol)
	  or
	    EHQ mode: DCP (Device Control Protocol)
	    see manual "CAN-Interface Operator's Manual"						

Module status	green LED turns on if all channels have the status "ready"						
Protection loop (I_s) potential free (2 pin Lemo-socket and REDEL SL)	5 mA < I_s < 20 mA ⇒ module on I_s < 0.5 mA ⇒ module off						
Option **K**: INHIBIT per channel	Via Sub-D-9 connector INHIBIT (TTL level)						
INHIBIT 0-7 / Channel	0	1	2	3	4	5	6	7	GND
Sub-D-9 connector / PIN	1	2	3	4	5	6	7	8	9
Power requirements V_{INPUT}	+ 24 V (< 4,2 A) and + 5 V (< 0.2 A)						
Packing	6U Euro cassette (40.64 mm wide and 220 mm deep)						
Connector on the rear	96-pin connector according to DIN 41612						
HV connector	51 pin REDEL HV connector (R51) up to 6 kV isolated built-in SHV connector (SHV) up to 8 kV Isolated built-in KINGS connector (KNG) 10 kV						
Operating temperature	0 ... +40 °C						
Storage temperature	-20 ... +60 °C						

)1 x=p polarity positiv, x=n polarity negativ

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 module is controlled in the selected CAN operating mode (EHS or EHQ), the factory setting is "EHS mode".

3.2   Limits

The maximum output voltage for all channels (hardware voltage limit) s defined through the position of the corresponding potentiometer V_{max} .
The maximum output current for all channels (hardware current limit) is defined through the position of the corresponding potentiometer I_{max} .
The greatest 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 % $V_{O\,nom}$ and 102 ± 2 % $I_{O\,nom}$.
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.

3.3 Safety Loop

A safety loop can be implemented via the safety loop socket (SL) on the front panel and between the SL-contacts (Pin 22 and PIN 30) at the REDEL-connector if equipped. If the safety loop is active then an output voltage in any channel is only present 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 other SL input must be closed.) If the safety loop is opened during the operation the output voltages are shut off without ramp and the corresponding bits in the 'ModuleStatus' (see manual "CAN-Interface Operator's Manual" 5.5.2.1 ModuleStatus) and ModuleEventStatus (5.5.2.3 ModuleEventStatus) are cancelled. 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. In the factory setup the safety loop is not active (the corresponding bits are always set). The loop can be activated by removing the internal jumper. (see manual "CAN-Interface Operator's Manual", app. B).

3.4 Option: Single Channel INHIBIT

Optionally it is possible to install an INHIBIT for each channel via the Sub-D connector. Channel 0 to 7 corresponds to Pin 1 to 8 at the Sub-D connector, Pin 9 is connected to GND. Internally the inputs can be connected either with a pull down (option IND) or a pull up resistor (option INU).

If the INHIBIT contact pin (n) is connected to the GND or a TTL-LOW potential then the HV-PS on this channel is switched OFF permanently without ramp and the green LED on front panel turns off.

The INHIBIT active time (LOW potential) must be at least 100 ms!

When the INHIBIT is no longer active (TTL-HIGH potential or not connected), the INHIBIT flag must be reset before the voltage can be switched ON again (5.5.1.3 Channel event status).

4. Pin assignment and connector layout

Pin assignment of the 96-pin connector according to DIN 41612:

pin		pin		pin		comment
a1	+5V	b1	+5V	c1	+5V	
a2	GND	b2	GND	c2	GND	power supply
a3	+24V	b3	+24V	c3	+24V	
a5	GND	b5	GND	c5	GND	
a11	@CAN_GND	b11	@CAN_L	c11	@CAN_H	CAN bus interface, potential free
a13	/RESET	b13	/HW_RMPDWN			external control signals
a30	A4	b30	A5			address field:
a31	A2	b31	A3	c31	GND	set module address (A0 ... A5); pin connected to GND => address bit = 0
a32	A0	b32	A1	c32	GND	pin open => address bit = 1

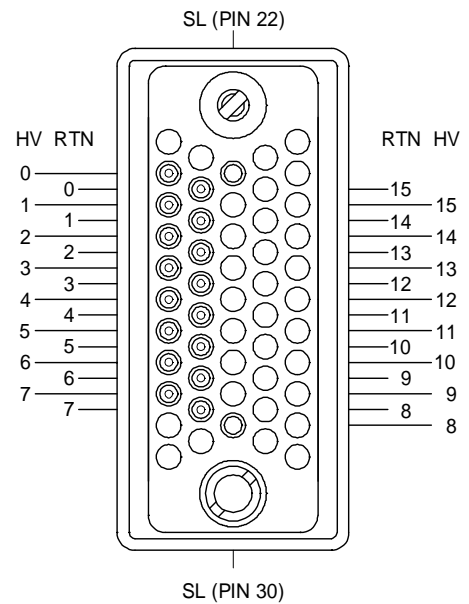|		
/RESET		active low; global reset of the module; HV generation is stopped immediately
/HW_RMPDWN	pulse form:	high – low – high
	pulse-width:	1µs … 100µs
	function:	ramp down all channels immediately with a ramp speed of $V_{nom}/50s$
		Note: after activating this signal the ramp speed is set to $V_{nom}/50s$

51 pin REDEL HV connector

SL (PIN 22)

HV RTN   RTN HV
0   15
  0   15
1   14
  1   14
2   13
  2   13
3   12
  3   12
4   11
  4   11
5   10
  5   10
6   9
  6   9
7   8
  7   8

SL (PIN 30)

5. Order Information

Item Code	Type	Polarity	Channels	V_{nom}	I_{nom}	HV Connector
EH046100p504FKNG	EHS 46100p-F	positive	4	10000V	0.5mA	KINGS
EH046100n504FKNG	EHS 46100n-F	negative	4	10000V	0.5mA	KINGS
EH086-60p105FR51	EHS 8660p-F	positive	8	6000V	1mA	REDEL[1]
EH086-60n105FR51	EHS 8660n-F	negative	8	6000V	1mA	REDEL[1]
EH086-40p205FR51	EHS 8640p-F	positive	8	4000V	2mA	REDEL[1]
EH086-40n205FR51	EHS 8640n-F	negative	8	4000V	2mA	REDEL[1]
EH086-30p305FR51	EHS 8630p-F	positive	8	3000V	3mA	REDEL[1]
EH086-30n305FR51	EHS 8630n-F	negative	8	3000V	3mA	REDEL[1]
EH086-20p405FR51	EHS 8620p-F	positive	8	2000V	4mA	REDEL[1]
EH086-20n405FR51	EHS 8620n-F	negative	8	2000V	4mA	REDEL[1]
EH086-10p805FR51	EHS 8610p-F	positive	8	1000V	8mA	REDEL[1]
EH086-10n805FR51	EHS 8610n-F	negative	8	1000V	8mA	REDEL[1]
EH086-05p805FR51	EHS 8605p-F	positive	8	500V	10mA	REDEL[1]
EH086-05n805FR51	EHS 8605n-F	negative	8	500V	10mA	REDEL[1]

[1] Option SHV instead of R51 => Connector SHV