EHS High Precision HV Modules

8 Channels with Common Floating-GND

Operator's Manual

Contents

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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 High Precision multichannel high voltage power supplies in 6U Eurocard format. The output voltage features an exceptionally high stability, lowest ripple and a very small temperature coefficient. The extreme small ripple is ensured down to very low frequencies (below 0.1Hz). Each single channel has an independent voltage and current control. The current measurement includes two measurement ranges with a resolution down to a few picoampere. 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 channels share a Common Floating-GND (C-RTN), which avoids ground loops and reduces the noise level in large systems. The Common Floating-GND is insulated from the Crate-Ground (CCG) up to ±50 V (with a 60 V hardware limit).
The HV output at the module is available as a 51 pin REDEL HV connector (up to 6 kV), isolated built-in BNC connectors (100 V), SHV connectors (500 V 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 High Precision HV Modules 16 Channels with Common Floating-GND")

2. Technical data

	EHS 82 01x[1]	EHS 82 05x[1]	EHS 82 10x[1]	EHS 82 20x[1]	EHS 82 30x[1]	EHS 82 40x[1]	EHS 82 60x[1]	EHS 82 80x[1]	EHS 42 100x[1]
HV channels per module	8	8	8	8	8	8	8	8	4
Output voltage $\mathbf{V_{O\ nom}}$ [kV]	0.1	0.5	1	2	3	4	6	8	10
Output current $\mathbf{I_{O\ nom}}$ [mA]	10	10	8	4	3	2	1	1	0.5
Resolution of [mV] voltage setting*)	0.5	1	2	5	10	10	12	20	20
current setting*) [nA]	30	30	20	10	5	4	2	2	1
voltage measurement*) [mV]	0.5	1	2	5	10	10	12	20	20
current measurement*) [nA] 1st measurement range $\mathbf{I_{O\ nom} \geq I_O \geq 20\ \mu A}$	8	8	5	4	3	2	1	1	1
current measurement*) [pA] 2nd measurement range $\mathbf{20\mu A \geq I_O} > 0$	50	50	50	50	50	50	50	50	50
Ripple and noise [mV_{P-P}]	< 3	< 5					< 20		< 30
	- at max. load and $\lvert V_O \rvert > 1\% * V_{O\ nom}$ - f > 0.1 Hz								
Stability (no load/load and ΔV_{IN})	< 0.01%∗ $V_{O\ nom}$								
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	± (0.01% ∗ V_O + 0.02% ∗ $V_{O\ nom}$)								
Accuracy of current measurement	1st measurement range ± (0.01% ∗ I_O + 0.02% ∗ $I_{O\ nom}$)					2nd measurement range ± (0.01% ∗ I_O + 4 nA)			
The measurement accuracy is guaranteed in the range 1% ∗ $V_{O\ nom} < V_O \leq V_{O\ nom}$ and for 1 year									
Voltage ramp up / down [V/s]	$1*10^{-6}$ ∗ $V_{O\ nom}$ up to 0.2 ∗ $V_{O\ nom}$								

*) with standard sample rate 50/s and digital filter 64

	EHS 82 01x)1	EHS 82 05x)1	EHS 82 10x)1	EHS 82 20x)1	EHS 82 30x)1	EHS 82 40x)1	EHS 82 60x)1	EHS 82 80x)1	EHS 42 100x)1
Floating voltage	Common-GND to System-GND: ≤ |50 V|								
Temperature coefficient	< ± 50 ∗ $10^{-6}/_{K}$								
Hardware limits V_{max} / I_{max}	potentiometer per module (V_{max} / I_{max} is the same for all channels)								
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 **ID/IU**: 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 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 BNC connector (BNC) up to 100 V isolated built-in SHV connector (SHV) 500 V 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) is 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.

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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 "Operator's Manual CAN-Interface" 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 "Operator's Manual CAN-Interface", app. B).

3.4 Option: Single Channel INHIBIT

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

INHIBIT Option _ID:
The INHIBIT pins are internally connected to the module GND with help of pull down resistors (approx. 10 kΩ). This ensures that a disconnected cable always causes an interlock. HV generation according to the settings is only possible with TTL High level on the INHIBIT pins!

INHIBIT Option _IU:
The INHIBIT pins are internally connected to 5V with help of pull up resistors (approx. 10 kΩ). HV generation according to the settings is possible with TTL High level or not connected INHIBIT pins.

If the INHIBIT contact pin (n) is connected to the CF-GND or a TTL-LOW potential the behavior of HV-PS in this channel depends on the following setting (5.5.2.2 ModuleControl, bit setKILena):

KILL-enable = 1: Voltage is switched off permanently without ramp. ChannelEventStatus flag 'EEINH' is set. The green LED at the front panel turns off.

KILL-enable = 0: ChannelStatus flag 'isEINH' and ChannelEventStatus flag EEINH are set. The action of the HV channel can be defined via the Monitoring group (5.5.3.3 Monitoring group, MonitorIsExternalInhibit) . The green LED at the 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

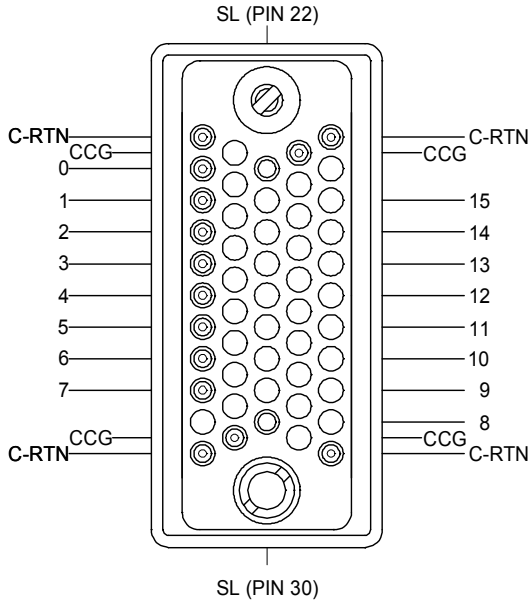
Pin assignment of the 96-pin connector according to DIN 41612:

pin		pin		pin		comment
a1	+5V	b1	+5V	c1	+5V	power supply
a2	GND	b2	GND	c2	GND	
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: set module address (A0 ... A5); pin connected to GND => address bit = 0 pin open => address bit = 1
a31	A2	b31	A3	c31	GND	
a32	A0	b32	A1	c32	GND	

/RESET — active low; global reset of the module; HV generation is stopped immediately

/HW_RMPDWN — pulse form: high – low – high with a puls-width from 1µs to 100 µs
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



CCG is connected with the Crate-GND and the shield

5. Order Information

Item Code	Type	Polarity	Channels	V_{nom}	I_{nom}	HV Connector
EH042100p504KNG	EHS 42100p	positiv	4	10000V	0.5mA	KINGS
EH042100n504KNG	EHS 42100n	negativ	4	10000V	0.5mA	KINGS
EH082-80p105SHV	EHS 8280p	positiv	8	8000V	1mA	SHV
EH082-80n105SHV	EHS 8280n	negativ	8	8000V	1mA	SHV
EH082-60p105R51	EHS 8260p	positiv	8	6000V	1mA	REDEL)1
EH082-60n105R51	EHS 8260n	negativ	8	6000V	1mA	REDEL)1
EH082-40p205R51	EHS 8240p	positiv	8	4000V	2mA	REDEL)1
EH082-40n205R51	EHS 8240n	negativ	8	4000V	2mA	REDEL)1
EH082-30p305R51	EHS 8230p	positiv	8	3000V	3mA	REDEL)1
EH082-30n305R51	EHS 8230n	negativ	8	3000V	3mA	REDEL)1
EH082-20p405R51	EHS 8220p	positiv	8	2000V	4mA	REDEL)1
EH082-20n405R51	EHS 8220n	negativ	8	2000V	4mA	REDEL)1
EH082-10p805R51	EHS 8210p	positiv	8	1000V	8mA	REDEL)1
EH082-10n805R51	EHS 8210n	negativ	8	1000V	8mA	REDEL)1
EH082-05p106R51	EHS 8205p	positiv	8	500V	10mA	REDEL)1
EH082-05n106R51	EHS 8205n	negativ	8	500V	10mA	REDEL)1
EH082-01p106R51	EHS 8201p	positiv	8	100V	10mA	REDEL)1
EH082-01n106R51	EHS 8201n	negativ	8	100V	10mA	REDEL)2

)1 Option SHV instead of R51 => Connector SHV
)2 Option BNC instead of R51 => Connector BNC

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