EHS High Precision HV Modules
16 Channel with Single Channel 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

This EHS is a High Precision multichannel high voltage power supply in 6U Eurocard format. The output voltage has extraordinary high stability, lowest ripple and noise and very low temperature coefficient. Each single channel is independently controllable with voltage and current control. The current measurement includes two measurement ranges with 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 outputs RTN - floating HV-GND - of each channel are floating against each other and against the ground (with a 25 V hardware limit). Optional the floating voltage can be increased to up to 200 V.

The HV output at the module is available as a 51 pin REDEL HV connector or isolated built-in SHV connectors. This manual covers modules with 16 channels. These modules are also available with 8 channels (up to 8 kV) and 4 channels (10 KV) (see manual “EHS High Precision HV Modules 8 Channels with Single Channel Floating-GND”)

2. Technical data

	EHS F201x-F)1	EHS F205x-F)1	EHS F210x-F)1	EHS F220x-F)1	EHS F230x-F)1	EHS F240x-F)1	EHS F260x-F)1
HV channels per module	16	16	16	16	16	16	16
Output voltage $V_{O\ nom}$ [kV]	0.1	0.5	1	2	3	4	6
Output current $I_{O\ nom}$ [mA]	10	10	8	4	3	2	1
Resolution of voltage setting*) [mV]	0.5	1	2	5	10	10	12
current setting*) [nA]	30	30	20	10	5	4	2
voltage measurement*) [mV]	0.5	1	2	5	10	10	12
current measurement*) [nA] 1st measurement range **$I_{O\ nom} \geq I_O \geq$ 20 µA**	8	8	5	4	3	2	1
current measurement*) [pA] 2nd measurement range **20µA $\geq I_O$** > 0	50	50	50	50	50	50	50
Ripple and noise [mV_{P-P}]	< 3	< 5					< 20
	- at max. load and $\lvert V_O \rvert > 1\% * V_{O\ nom}$ - f > 10 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	$\pm (0.01\% * V_O + 0.02\% * V_{O\ nom})$						
Accuracy of current measurement	1st measurement range $\pm (0.01\% * I_O + 0.02\% * I_{O\ nom})$			2nd measurement range $\pm (0.01\% * I_O + 4\ nA)$			
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 $0.2 * V_{O\ nom}$						
Floating voltage	Connector RTN to GND: $\leq \lvert 20\ V \rvert$						

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

	EHS F201x-F)1	EHS F205x-F)1	EHS F210x-F)1	EHS F220x-F)1	EHS F230x-F)1	EHS F240x-F)1	EHS F260x-F)1
Temperature coefficient	$< \pm 50 \ast 10^{-6}/_{K}$						
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
1st. Sub-D-9 connector / PIN	1	2	3	4	5	6	7	8	9
INHIBIT 8-15 / Channel	8	9	10	11	12	13	14	15	GND
2nd. Sub-D-9 connector / PIN	1	2	3	4	5	6	7	8	9

Power requirements V_{INPUT}	+ 24 V (< 8,5 A) and + 5 V (< 0.3 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) isolated built-in SHV connector (SHV)
Operating temperature	0 ... +40 °C
Storage temperature	-20 ... +60 °C

)1x = p: polarity positive,)1x = n: polarity negative

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, 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.

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 two Sub-D connectors. Channel 0 to 7 corresponds to Pin 1 to 8 at the 1st Sub-D connector, Pin 9 is connected to GND. Channel 8 to 15 corresponds to Pin 1 to 8 at the 2nd 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).

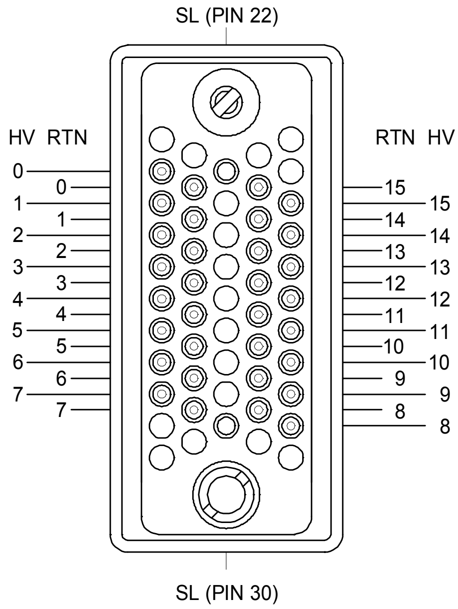
4. Pin assignment and connector layout

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



5. Order Information

Item Code	Type	Polarity	Channels	V_{nom}	I_{nom}	HV Connector
EH162-62p105FR51	EHS F260p-F	positive	16	6000V	1mA	REDEL)1
EH162-62n105FR51	EHS F260n-F	negative	16	6000V	1mA	REDEL)1
EH162-40p205FR51	EHS F240p-F	positive	16	4000V	2mA	REDEL)1
EH162-40n205FR51	EHS F240n-F	negative	16	4000V	2mA	REDEL)1
EH162-30p305FR51	EHS F230p-F	positive	16	3000V	3mA	REDEL)1
EH162-30n305FR51	EHS F230n-F	negative	16	3000V	3mA	REDEL)1
EH162-20p405FR51	EHS F220p-F	positive	16	2000V	4mA	REDEL)1
EH162-20n405FR51	EHS F220n-F	negative	16	2000V	4mA	REDEL)1
EH162-10p805FR51	EHS F210p-F	positive	16	1000V	8mA	REDEL)1
EH162-10n805FR51	EHS F210n-F	negative	16	1000V	8mA	REDEL)1
EH162-05p106FR51	EHS F205p-F	positive	16	500V	10mA	REDEL)1
EH162-05n106FR51	EHS F205n-F	negative	16	500V	10mA	REDEL)1
EH162-01p106FR51	EHS F201p-F	positive	16	100V	10mA	REDEL)1
EH162-01n106FR51	EHS F201n-F	negative	16	100V	10mA	REDEL)1

)1 Option SHV instead of R51 => Connector SHV