EHS High Precision HV Modules with I_{nom} = 100µA

16 Cannels 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 without notification to the users.

Filename EHSF2x-CFG_100µA as of 2013-03-08

1. General information

The EHS modules of this series are High Precision multichannel high voltage power supplies in 6U Eurocard format with output currents only up to 100 µA per channel. 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 include one measuement range with a resolution down to a few hundred 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 is available as a 51 pin REDEL HV connector or as isolated built-in SHV connectors.

This manual covers modules with 16 channels. These modules are also available with 8 channels (see manual "EHS High Precision HV Modules with I_{nom} = 100µA and 8 Channels with Common Floating-GND").

2. Technical data

	EHS F201x)1_104	EHS F210x)1_104	EHS F220x)1_104	EHS F240x)1_104	EHS F260x)1_104
HV channels per module	16	16	16	16	16
Output voltage $\mathbf{V_{O\ nom}}$ [kV]	0.1	1	2	4	6
Output current $\mathbf{I_{O\ nom}}$ [µA]	100	100	100	100	100
Resolution of voltage setting*) [mV]	0.5	2	5	10	12
Resolution of current setting*) [nA]	0.5	0.5	0.5	0.5	0.5
Resolution of voltage measurement*) [mV]	0.5	2	5	10	12
Resolution of current measurement*) [nA]	0.2	0.2	0.2	0.2	0.2
Ripple and noise [mV_{P-P}]	< 1	< 5			< 20
	- 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 ≤ $V_{O\ nom}$ 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	Common-GND to System-GND: ≤ |50 V|				

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

	EHS F201x[)1]_104	EHS F210x[)1]_104	EHS F220x[)1]_104	EHS F240x[)1]_104	EHS F260x[)1]_104
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)				
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 (< 1 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

[)1]x = p: polarity positive, [)1]x = 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 (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.

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

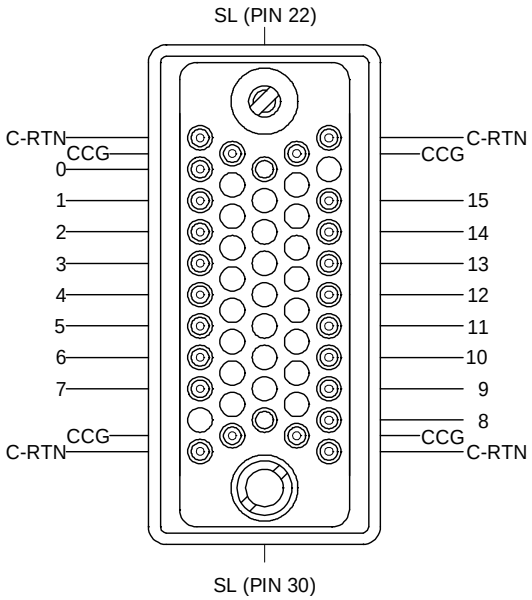
Pin assignment of the 96-pin connector according to DIN 41612:

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



CCG is connected with the Crate-GND and the shield

5. Order Information

Item Code	Type	Polarity	Channels	V_{nom}	I_{nom}	HV Connector
EH162-60p104R51	EHS F260p_104	positive	16	6000V	100 µA	REDEL)1
EH162-60n104R51	EHS F260n_104	negative	16	6000V	100 µA	REDEL)1
EH162-40p104R51	EHS F240p_104	positive	16	4000V	100 µA	REDEL)1
EH162-40n104R51	EHS F240n_104	negative	16	4000V	100 µA	REDEL)1
EH162-20p104R51	EHS F220p_104	positive	16	2000V	100 µA	REDEL)1
EH162-20n104R51	EHS F220n_104	negative	16	2000V	100 µA	REDEL)1
EH162-10p104R51	EHS F210p_104	positive	16	1000V	100 µA	REDEL)1
EH162-10n104R51	EHS F210n_104	negative	16	1000V	100 µA	REDEL)1
EH162-01p104R51	EHS F201p_104	positive	16	100V	100 µA	REDEL)1
EH162-01n104R51	EHS F201n_104	negative	16	100V	100 µA	REDEL)1

)1 Option SHV instead of R51 => Connector SHV