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MVHV-4
(Data sheet V1.0_00)

4 channel, 800 V
detector bias supply

mesytec MVHV-4 is a modern VME 4-channel high precision bias supply unit for detector bias voltages up to 800 V. It is designed to supply highly stable bias voltage for all types of silicon and gas detectors. The output current is limited to 20 µA.

Features:

- Precise voltage setting up to 800 V, in steps of 12.5 mV

- lowest noise voltage of < 1 mV rms at 400 V

- Read current with 1 nA resolution

- Adjustable HV ramp speed

- Output connectors: SHV or BNC

- Adjustable current threshold and voltage limit for each channel.

- Individual polarity select for each channel via register setting

- Remote control and monitoring via VME bus and USB

- Settings are permanently stored and recovered after power up.

- LED Indicators for Polarity and channel status

- VME access: Address format: A24, A32
                Data format: D16

Technical Data

Power consumption

- +5 V   +200 mA
- +12 V   –50 mA
- -12V   –70 mA
- due to low power consumption no cooling fans necessary

Voltage Output

- Voltage range: 0 … ±800 V
- adjustable in steps of 12.5 mV
- Typical noise N < 1 mV (400 V, 5 Hz
- to 100 MHz)
- Voltage stability: typ 0.015 %/ ^{0}C
- Calibration precision: 0.5 %
- Output current max. 20 µA per channel, limited
- Adjustable voltage ramp up and down of 5 V/s up to 500 V/s
- Voltage off after power failure

Connectors

- HV outputs: BNC or SHV
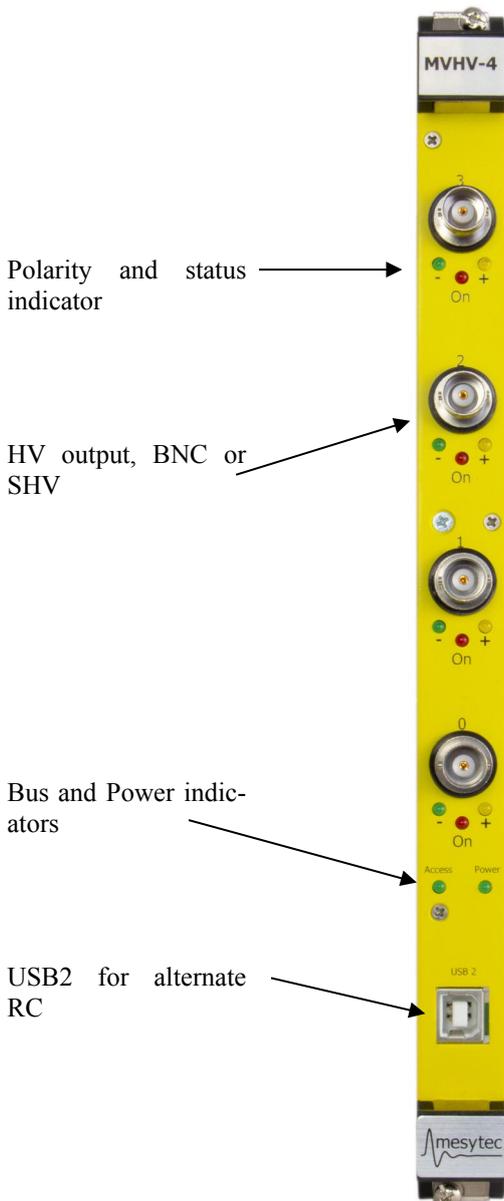- USB remote control: standard USB B

Auto Shutdown

MHV-4 offers an automatic shutdown of channel voltage in case current exceeds the given current limit.
Shut down channels are switched off automatically and remain off until switched on again.
When current limit is set to 0, Auto Shutdown is disabled.

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MHV-4 Front panel

Polarity and status indicator

HV output, BNC or SHV

Bus and Power indicators

USB2 for alternate RC

Remote control via USB

- MVHV-4 can be remote controlled via USB, e.g. using a standard ASCII terminal program. (FTDI virtual com port)
- Baud rate: 9.600 Bd
- Data Format: 8N1 (8 bit, no parity, 1 stoppbitt),
- input characters are echoed

Commands

c = channel number 0...3, 4/a = all

USB Set Commands

ON c	switch channel *n* on
OFF c	switch channel *n* off
SU c vvvv	set voltage of channel *n* *vvvv* = voltage in 0.1 V e.g.: *SU 0 4000* sets channel 0 to 400V
SIL c iiii	set current limit of channel *n* *iiii* = current in nA e.g.: *SIL 0 4000* sets current limit channel 0 to 400 V
SP c p	set polarity of channel *n* *p* = polarity: p/+/1 or n/-/0 e.g.: *SP 0 n* sets polarity channel 0 to negative For security reasons: if HV is on, it will be switched off automatically, HV preset will be set to 0 V, polarity is switched when HV is down. After switching: set presets again to desired values.
AS c n	enable (n=1)/disable (n=0) auto shutdown of channel c
SRA n	set HV ramp speed *n* = 0: 5 V/s, 1: 25 V/s, 2: 100 V/s, 3: 500 V/s

Read Commands

RU c	read voltage channel *c*
RUP c	read voltage preset channel *c*
RI c	read current channel *c*
RIL c	read current limit channel *c*
RP c	read polarity channel *c*
RRA	read HV ramp speed

Remote Control via VME bus

Value	Register Address	Direction	Comment
• Write addresses can be read and written. • Read on write addresses delivers written value (possibly corrected by boundary check). • Read addresses are „read only" and deliver current hardware status which might deviate from written value.			
Voltage 0	0	r/w	Set / read channel voltage
Voltage 1	2	r/w	Write: 0... 8000 = 0 … 800.0 V
Voltage 2	4	r/w	Read: 0 … (-)8000 = 0 … (-) 800.0 V
Voltage 3	6	r/w	(also indicating polarity)
On/Off 0	8	r/w	1 = switch on HV
On/Off 1	10	r/w	
On/Off 2	12	r/w	
On/Off 3	14	r/w	
Cur. Lim. 0	16	r/w	Set / read current limit. Shuts off channel when exceeded.
Cur. Lim. 1	18	r/w	Read / Write: 0 … 20.000 = 0 … 20.000 nA (0 … 20 uA)
Cur. Lim. 2	20	r/w	Writing 0 disables auto shutdown → 20uA current
Cur. Lim. 3	22	r/w	limit.
Polarity 0	28	r/w	Set / read channel polarity
Polarity 1	30	r/w	**Sets all voltages to 0, performs off instruction, when all voltages = 0V changes polarity. → Set polarity before any other instruction.**
Polarity 2	32	r/w	Read / Write: 0 = negative, 1 = positive
Polarity 3	34	r/w	Switching polarity automatically includes: channel switched off, voltage preset = 0 for security reasons. Switching may take time depending on HV ramp speed.
Current 0	36	r	Read channel current
Current 1	38	r	
Current 2	40	r	Read: 0 … 20.000 nA
Current 3	42	r	
HV prec. 0	74	r/w	Alternate binary set and read of voltage: Read / set voltage in binary units, 1 = 12.5 mV
HV prec. 1	76	r/w	
HV prec. 2	78	r/w	Read / write: 0 … 64.000 = 0.0 … 800.0 V
HV prec. 3	80	r/w	
Ramp Speed	82	r/w	Read / set HV ramp speed

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Value	Register Address	Direction	Comment
			Read / write: 0 … 3 0 = 5 V /s, 1 = 25 V /s, 2 = 100 V /s, 3 = 500 V /s
Hw_Rev	84	r	Hardware Revision
CPU_Rev	86	r	CPU Firmware Revision
CPLD_Rev	88	r	CPLD Firmware Revision
Harware_ID	0x0108	r	Shows 0x5009 for identification of MVHV-4
Firmware Rev.	0x010E	r	{cpld_firmware_revision[7:0],cpu_fw_revision[7:0]}

Up to 64 write instructions can be sent at any frequency. Thats enough for any initialisation.
If periodic changes are required, this can be done, but care has to be taken that MVHV can follow the modifications on the long term. For example changing polarity requires from MVHV to ramp down, then change polarity. This can take some seconds depending on ramp speed.
VME read instructions are instantaneous and can be issued at any frequency. But write instructions may need some time to have an effect. So instantaneous write and then read back may not give the written value.

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