

Technical information

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RS-232 Interface Programmers Guide for SHQ Devices

Document history

Version	Date	Major changes
1.0	30.09.2009	Initial version
2.0	09.08.2016	Relayouted documentation

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1 RS-232 Interface

The following functionality is provided for the operation of the high voltage units via the RS232 interface.

1.1 RS-232 Control Mode

- Write function: set voltage; ramp speed; maximal output current (current trip); auto start
- Switch function: output voltage = set voltage, output voltage = 0
- Read function: set voltage; measured output voltage; ramp speed; measured output current; current trip; auto start; hardware limits current and voltage; status

Front panel switches have priority over software control.

1.2 Manual Control Mode

While the unit is operated in manual control mode, only RS-232 read cycles are interpreted. Commands are accepted, but do not result in an output voltage change.

1.3 RS-232 Interface Specification

The RS-232 interface is located at a D-SUB-9 connector on the back panel.

The electric transfer is performed via RxD and TxD, related to floating GND of the interface. The D-SUB-9 pin assignment is given in the following table.

The cable connection to the computer is 1:1 (no null modem-cable!). If no 9-pin cable is available, connections must be set up as shown in the table.

	Signal	HV-supply		PC	PC	Connection
	RS-232	D-SUB-9	Internal	D-SUB-9	D-SUB-25	3-lead cable
Signal pin assignment	RxD	2		2	3	
	TxD	3		3	2	
	GND	5		5	7	
		4	-□	4	20	-□
		6	-□	6	6	-□
		8	-□	8	5	-□

1.4 Interface Programming

The serial interface is set to 9600 Bit/s, 8 Bit/character, no parity, 1 Stop-Bit.

The data transfer is character based, with echos as handshake between the computer and the HV power supply unit (Input direction). The transfer direction "HV power supply to computer" (Output direction) is free running.

Between two characters, a programmable delay time is included to allow the computer to receive and evaluate the incoming data. The default delay time setting is 3 ms.

The command transfer uses ASCII characters. Commands are terminated by <CR><LF> (\$0D \$0A or 13 10). Leading zeros can be omitted on input, output is in fixed format.

In order to assure synchronisation between the computer and the supply, <CR><LF> has to be sent as first command.

1.5 Command Set

Command	Computer	HV-supply	Description
Read module identifier	# *	# * nnnnnn;m.mm;Vmax;lmax *	Serial number; software release; $V_{out\ max}$; $I_{out\ max}$
Read answer delay time	W *	W * nnn *	Answer delay time $0 \leq W \leq 255$ ms
Write answer delay time	W=nnn *	W=nnn * *	Answer delay time $0 \leq W \leq 255$ ms
Read measured voltage channel 1	U1 *	U1 * { pol. / mantissa / signed exp. } *	(in V)
Read measured current channel 1	I1 *	I1 * { mantissa / signed exp. } *	(in A)
Read voltage limit channel 1	M1 *	M1 * nnn *	(in % of $V_{out\ max}$)
Read current limit channel 1	N1 *	N1 * nnn *	(in % of $I_{out\ max}$)
Read set voltage channel 1	D1 *	D1 * { mantissa / signed exp. } *	(in V)
Write set voltage channel 1	D1=nnnn.nn *	D1=nnnn.nn * *	(in V; $0 \leq D1 \leq M1$)
Read ramp speed channel 1	V1 *	V1 * nnn *	(in V/s)
Write ramp speed channel 1	V1=nnn *	V1=nnn * *	(in V/s; $2 \leq V1 \leq 255$)
Start voltage ramp channel 1	G1 *	G1 * S1=xxx *	see Status information
Write current trip channel 1	L1=nnnnn *	L1=nnnnn * *	Trip in resolution of range mA ¹⁾
Range "mA"	LB1=nnnnn *	LB1=nnnnn * *	Trip in resolution of range mA ¹⁾
Range "µA"	LS1=nnnnn *	LS1=nnnnn * *	Trip in resolution of range µA ¹⁾
Read current trip channel 1	L1 *	L1 * { mantissa / signed exp. } *	(in A) ¹⁾
Range "mA"	LB1 *	LB1 * { mantissa / signed exp. } *	(in A) ¹⁾
Range "µA"	LS1 *	LS1 * { mantissa / signed exp. } *	(in A) ¹⁾
Read status word channel 1	S1 *	S1 * xxx *	see Status Information
Read module status channel 1	T1 *	T1 * nnn *	Code 0...255, see Module Status
Write auto start channel 1	A1=nn *	A1=nn * *	Conditions, see Auto Start
Read auto start channel 1	A1 *	A1 * nnn *	8 = Auto start is active; 0 = inactive

* = <CR><LF>

The channel 2 of the supply is addressed by replacing 1 with 2.

¹⁾The current trip function is disabled if the current trip value is zero.

1.6 Status Information

The answer for the command S1 or S2 is one of the following:

ON<SP>	Output voltage according to set voltage
OFF	Channel front panel switch off
MAN	Channel is on, set to manual mode
ERR	V_{max} or I_{max} is or was exceeded
INH	Inhibit signal is or was active
QUA	Quality of output voltage not given at present
L2H	Output voltage increasing

H2L	Output voltage decreasing
LAS	Look at Status (only after G-command)
TRP	Current trip was active

<SP> = 0x30 = Space

If output voltage has been shut off permanently (by ERR or INH at KILL-ENABLE or TRP) the command "Read Status Word" must be executed before the output voltage can be restored.

1.7 Error codes

????	Syntax error
?WCN	Wrong channel number
?TOT	Timeout error (with following reinitialization)
?<SP>UMAX=nnnn	Set voltage exceeds voltage limit, max. possible value is nnnn

<SP> = 0x30 = Space

1.8 Module Status

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
QUA	ERR	INH	KILL_ENA	OFF	POL	MAN	0

Status-Bit	Description	Bit is 0	Bit is 1
QUA	Quality of output voltage	guaranteed	not guaranteed
ERR	V_{max} or I_{max}	is not exceeded	is or was exceeded
INH	External INHIBIT signal	is inactive	is or was active
KILL_ENA	KILL-ENABLE is	off	on
OFF	Front panel HV-ON switch is	in ON position	in OFF position
POL	Polarity is set to	negative	positive
MAN	Control	via RS-232 interface	manual

Reading the Module Status ("Tx") does not reset the flags "ERR" and "INH". This can be done by reading the corresponding channels status word ("Sx").

1.9 Auto Start

When writing to this register, the corresponding values are permanently stored (a minimum of one million write cycles is guaranteed). The stored values are read back into the registers after POWER-ON.

Bit 7...4	Bit 3	Bit 2	Bit 1	Bit 0
reserved	Enable Auto Start ^{*)}	Save Current Trip	Save Set Voltage	Save Ramp Speed

^{*)} If the precondition for Auto start (module status: OFF + ERR + INH + MAN = 0) is satisfied, the output voltage is automatically ramped to the set voltage. Thus the G-command or POWER-ON and OFF → ON are not required.

If output voltage has been shut off permanently (by ERR or INH at KILL-ENABLE or TRP), the previous voltage setting will be restored with software ramp after "Read status word".

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