

Precision NIM High Voltage Supply

NHQ LOW COST series

Operators Manual

Contents:

1. General information

2. Technical Data

3. NHQ Description

4. Front panel

5. Handling

6. RS232 Interface

7. Program example

8. CE Certificate

Appendix A: Block diagram

Appendix B: Rotary switch locations

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 operators 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 reservation and without notification to the users.

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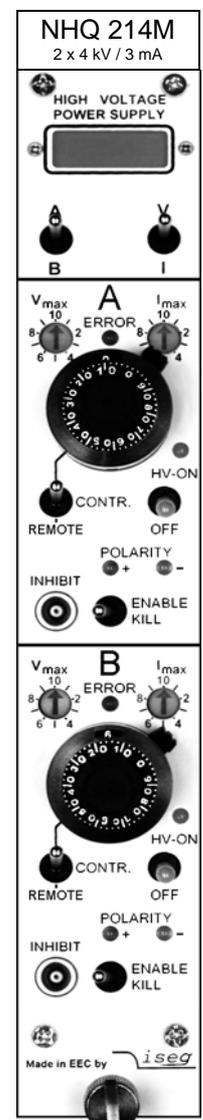
1. General information

The LOW COST NHQ is a single- or dual-channel high voltage supply in a NIM chassis, one slot wide. The unit offers manual control and remote operation via analogue set and monitor voltages.

The high voltage supplies provide a high precision output voltage together with very low ripple and noise, even under full load. Separate hardware switches allow to put voltage and current limits in 10%-steps. An INHIBIT input protects sensitive devices. The high voltage source is protected against overload and short circuit. The output polarity can be switched over. The HV-GND is connected to the chassis and the powering GND.

2. Technical Data:

One channel HV-PS	NHQ	112M	113M	114M	115M	116L
Two channel HV-PS	NHQ	212M	213M	214M	215M	216L
Output voltage V_O [kV]		0 to 2	0 to 3	0 to 4	0 to 5	0 to 6
Output current per channel I_O [mA]		0 to 6	0 to 4	0 to 3	0 to 2	0 to 1
		with option _104 : only 100 μ A				
Stability	ΔV_O	$< 2 * 10^{-4}$ (no load to load)				
	$\Delta V_O / \Delta V_{IN}$	$< 5 * 10^{-5}$				
Temperature coefficient		$< 1 * 10^{-4}$ /K				
Ripple		< 50 mV _{P-P}				
LCD Display		4 digits with sign, switch controlled -voltage display in [V] -current display in [μ A]				
Resolution of current measurement		1 μ A, with option _104 : 100 nA at $I_{out\ max} \leq 100 \mu$ A				
Resolution of voltage measurement		1 V				
Accuracy	current	$\pm (0,05\% I_O + 0,05\% I_{O\ max} + 1 \text{ digit})$ (for one year)				
	voltage	$\pm (0,05\% V_O + 0,02\% V_{O\ max} + 1 \text{ digit})$ (for one year)				
Voltage control	CONTROL switch in	upper position:		10-turn potentiometer		
		lower position:		control via analogue set- and monitor-voltages		
		NHQ x12 - x14:		$V_{SET/MON} = V_{OUT} / 400$		
		NHQ x15 - x16:		$V_{SET/MON} = V_{OUT} / 1000$		
Rate of change of output voltage		hardware ramp:		500 V/s (at HV-ON/ -OFF)		
Protection		- separate current and voltage limit (hardware, rotary switch in 10%-steps) - INHIBIT (ext. signal, TTL-level, Low = active $\Rightarrow V_{OUT} = 0$)				
Power requirements V_{IN}		± 24 V (< 800 mA; one channel < 400 mA) ± 6 V (< 100 mA), with option N24 only ± 24 V				
Packing		NIM Standard module: NIM 1/12				
Connector		NIM: 5-pin connector, HV: SHV connector Set and Monitor: 9-pin female D-Sub connector INHIBIT: 1-pin Lemo				
Operating temperature		0 ... +50 $^{\circ}$ C				
Storage temperature		-20 ... +60 $^{\circ}$ C				



3. NHQ Description

The functional principle is described in the block diagram, Appendix A.

High voltage supply

For the high voltage generation a patented highly efficient resonance converter circuit is used, which provides a sinusoidal voltage with low harmonics for the HV-transformer. For the high voltage rectification high speed HV-diodes are used. A high-voltage switch, connected to the rectifier allows the selection of the polarity. The consecutive active HV-filter damps the residual ripple and ensures low ripple and noise values as well as the stability of the output voltage.

A shunt resistor, which is integrated in the HV-filter provides the signal for the current measurement and the maximum current monitoring. Also integrated in the filter is a precision voltage divider to provide a feedback voltage for the output voltage control, an additional voltage divider supplies the signal for the maximum voltage monitoring. A precision control amplifier compares the feedback voltage with the set value given by the analogue interface or the potentiometer (manual control). Signals for the control of the resonance converter and the stabilizer circuit are derived from the result of the comparison. The two-stage layout of the control circuit results in an output voltage, stabilized with very high precision to the set point.

Separate security circuits prevent exceeding the front-panel switch settings for the current I_{\max} and voltage V_{\max} limits. A monitoring circuit prevents malfunction caused by low supply voltage.

The internal error detection logic evaluates the corresponding error signals and the external INHIBIT signal and impacts the output voltage according to the setup.

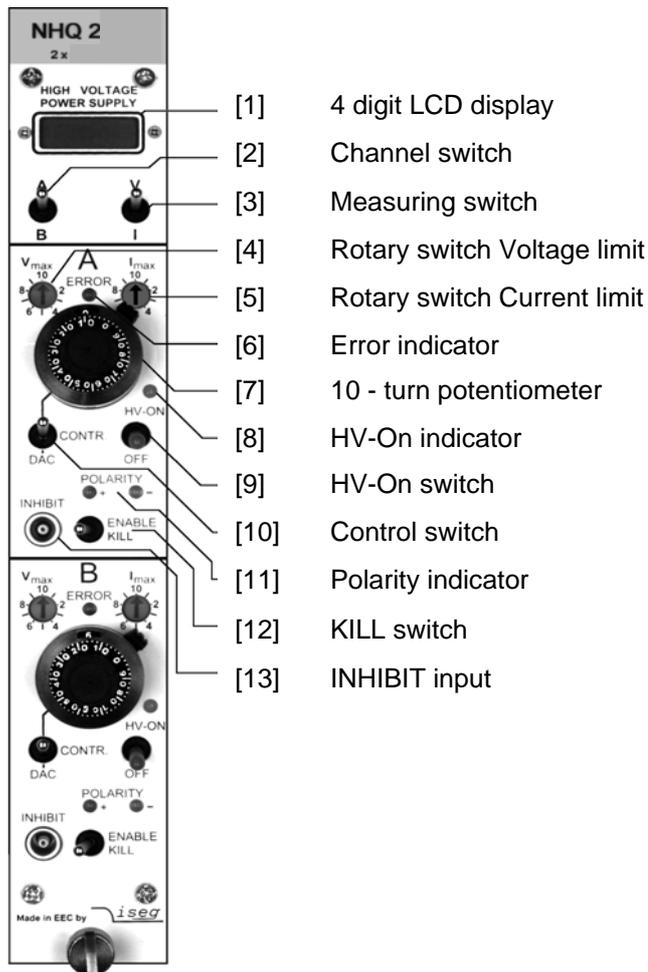
Digital control unit

A micro controller handles the internal control, evaluation and calibration functions of both channels. The actual voltages and currents are read cyclically by an ADC with a connected multiplexer. The readings are processed and displayed on the 4 digit LCD. A reference voltage source provides a precise voltage reference for the ADC and the control voltage for the manual operation mode of the unit.

Filter

A special feature of the unit is a tuned filtering concept, which prevents perturbation of the unit by external electromagnetic radiation, as well as the emittance of interferences by the module. A filtering network for the supply voltages is located next to their connectors, the converter circuits of the individual channels are protected by additional filters. The high-voltage filters are housed in individual metal enclosures to shield even minimal interference radiation.

4. Front panel



5. Handling

The NIM connector, the HV-outputs and the 9 pin female D-Sub connector for the analogue interface are located on the rear panel.

Before the unit is powered the desired output polarity must be selected by the rotary switch on the cover side (see appendix B). The chosen polarity is displayed by a LED on the front panel [11] and a sign on the LCD [1].

Attention! It is not allowed to change the polarity under power!

If the switch setting is undefined (not at one of the end positions) high voltage cannot be switched on.

High voltage output is switched on with the HV-ON switch [9] at the front panel. The viability is signaled by the yellow LED [8].

Attention! If the CONTROL switch [10] is in upper position (manual control), high voltage is generated at the HV-output on the rear side, started with a ramp speed from 500 V/s (hardware ramp) to the set voltage chosen via the 10-turn potentiometer [7]. This is also the same, if the unit is switched from the analogue interface control to manual control.

Output voltage in [V] or output current in [μ A] will be displayed on the LCD [1] depending on the position of the Measuring switch [3].

For two channel units the Channel switch [2] selects whether channel (A) or channel (B) is displayed.

In the manual control mode the output voltage can be set via 10-turn potentiometer [7] in a range from 0 to the maximum voltage.

The maximum output voltage and current can be selected in 10%-steps with the rotary switches V_{max} [4] and I_{max} [5] (switch dialed to 10 corresponds to 100%) independently of programmable current trip. The red error LED on the front panel [6] signals if the output voltage or current approaches the limits.

The KILL switch [12] specifies the response on exceeding limits or on the external protection signal at the INHIBIT input [13] as follows:

Switch to the right position: (ENABLE KILL) When exceeding V_{max} , I_{max} or in the presence of an INHIBIT signal (Low=active) the output voltage will be shut off permanently without ramp. The output voltage is only restored after switching HV-ON [9] or KILL [12].

Note: If a capacitance is effective at the HV-output or when using a high voltage ramp speed (hardware ramp) under high loads, then the KILL function may be triggered by the capacitor charging currents. In this case ENABLE KILL should only be selected once the set voltage is reached at the output.

Switch to the left position: (DISABLE KILL) The output voltage is limited to V_{max} , the output current to I_{max} respectively; INHIBIT shuts the output voltage off without ramp, the previous voltage setting will be restored with hard- or software ramp once INHIBIT no longer being present.

6. Pin assignment analog I/O

Signal pin assignment at the 9-pin female D-Sub connector on the rear side

HV supply D-Sub 9	1	2	3	4	5	6	7	8	9
Signal	$V_{\text{SET}} - A$		$V_{\text{MONITOR}} - A$		GND		$V_{\text{SET}} - B$		$V_{\text{MONITOR}} - B$

7. CE Certificate

CE – Certificate (Copy)

This is to certify that the manufacturer

iseg Spezialelektronik GmbH
Bautzner Landstr. 23
D - 01454 Radeberg / Rossendorf
Germany

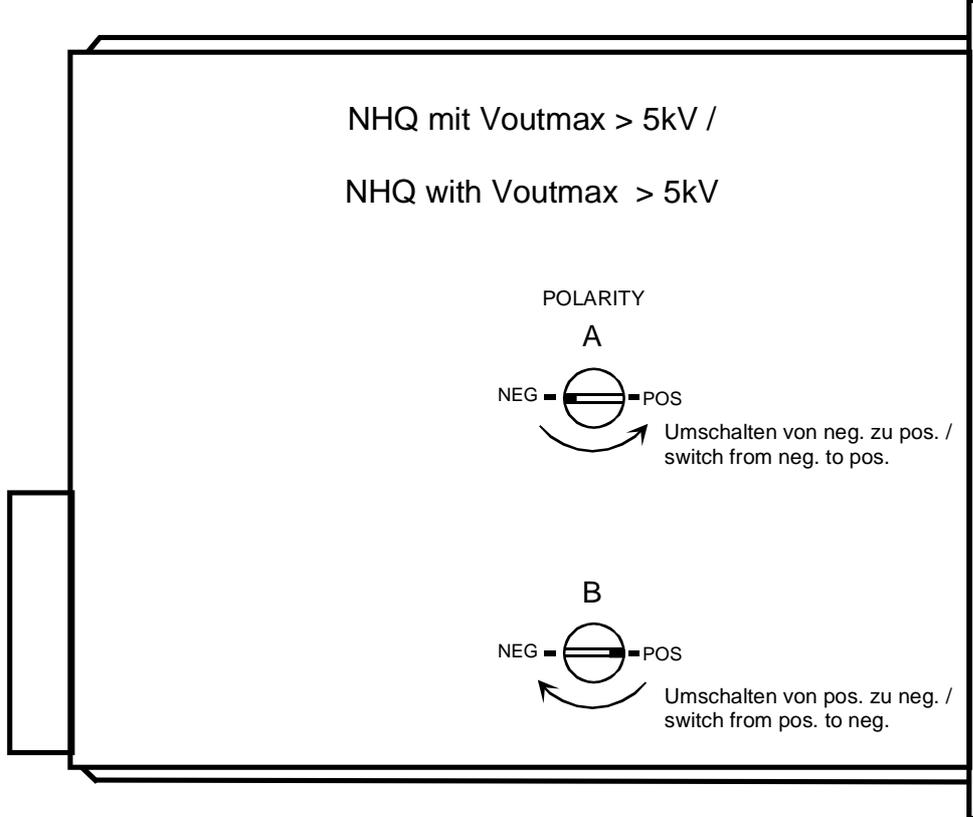
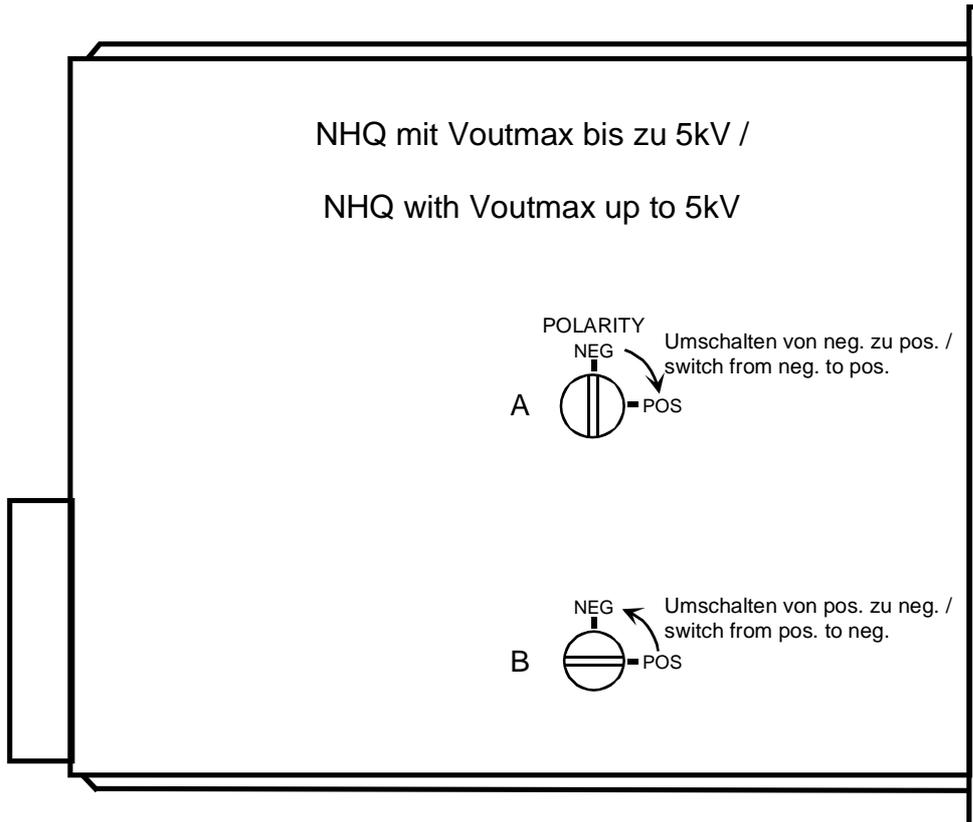
guaranties the compliance to the following:

VDE 0843 Part 3 / 02.88
VDE 0875 Part 11 / 07.92
VDE 0877 Part 1 / 03.89
EN 50082-2 / 02.96
ENV 50140 / 02.95
EN 61000 Part 4-2 / 03.96
EN 61000 Part 4-4 / 03.96
EN 61000 Part 4-6 / 04.97
EN 61000 Part 4-8 / 05.94

for the high voltage power supplies
of the NHQ LOW COST – Series.

Rossendorf, dated 30.09.98

Signed for Dr. Frank Gleisberg
 Managing director



Appendix A: NHQ side cover, Polarity rotary switch
e.g.: channel A, polarity negative
channel B, polarity positive