

user manual

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NHS series

Versatile High Precision HV Module in NIM Standard

- 6 channel, 100 V – 6 kV versions
- very low ripple and noise
- front panel control with 1,44" TFT display
- voltage and current control per channel
- programmable parameters
- hardware voltage and current limits



Document history

| Version | Date | Major changes |
|---------|--------------------------|---|
| 1.0 | 30.09.2015 | Initial version |
| 2.0 | 20.09.2018 01.10.2018 | Relayouted documentation Notes revised |

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The information in this manual is subject to change without notice. We take no responsibility for any mistake in the document. We reserve the right to make changes in the product design without reservation and without notification to the users. We decline all responsibility for damages and injuries caused by an improper use of the device.

Important security information

It is strongly recommended to read the operator´s manual before operation. To avoid injury of users it is not allowed to open the unit. There are no parts which can be maintained by users inside of the unit. Opening the unit will void the warranty.

We decline all responsibility for damages and injuries caused by an improper use of the module. It is strongly recommended to read the operators manual before operation.

WARNING!



WARNING!

The non-observance of the advices marked as "Warning!" could lead to possible injury or death.

ATTENTION!



ATTENTION!

Advices marked as "Attention!" describe actions to avoid possible damages to property.

INFORMATION



INFORMATION

Advices marked as "Information" give important information.

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1 General description

ATTENTION!



The devices must only be used in combination with iseg approved crates.

ATTENTION!

The iseg NHS modules are multi-channel high voltage power supplies in 1/12 NIM standard cassette format. With up to 6 channels each single channel has an independent voltage and current control. By offering different configurations and options this module perfectly covers various types of applications such as detector supply, experimental setup or lab use. Several NHS modules can be daisy-chained by CAN and controlled for example by iseg iCS system. The module is made of best components such as 24 bit ADC and 20 bit DAC, an excellent front panel control with TFT display plus comprehensive security features.

2 Technical Data

| SPECIFICATIONS | NHS Standard | NHS High Precision |
|--|--|---|
| Polarity | Factory fixed, positive or negative | |
| Floating principle | Common Ground | |
| Potential difference | none | |
| Ripple and noise (f > 10 Hz) | < 10 mV _{p-p} | < 5 mV _{p-p} |
| Ripple and noise (f > 1 kHz) | < 2-3 mV _{p-p} | < 1-2 mV _{p-p} |
| Stability | | |
| Stability [$\Delta V_{out} / \Delta V_{in}$] | $1 \cdot 10^{-4} \cdot V_{nom}$ | |
| Stability - [$\Delta V_{out} / \Delta R_{load}$] | $1 \cdot 10^{-4} \cdot V_{nom}$ | |
| Long term stability (1h warmup) 24h | < $5 \cdot 10^{-5} \cdot V_{nom}$ | < $2 \cdot 10^{-5} \cdot V_{nom}$ |
| Temperature coefficient | 50 ppm / K | 30 ppm / K 10 ppm / K (option TC) |
| Resolution - The resolution of measurable values depends on the settings of the sampling rate and the digital filter! | | |
| Resolution voltage setting | $2 \cdot 10^{-6} \cdot V_{nom}$ | |
| Resolution current setting | $2 \cdot 10^{-6} \cdot I_{nom}$ | |
| Resolution voltage measurement | $2 \cdot 10^{-6} \cdot V_{nom}$ | $1 \cdot 10^{-6} \cdot V_{nom}$ |
| Resolution current measurement - full range | $2 \cdot 10^{-6} \cdot I_{nom}$ | $1 \cdot 10^{-6} \cdot I_{nom}$ |
| Resolution current measurement - 2 nd range | n/a | 50 pA [$I_{out} < 20 \mu A$] |
| Measurement accuracy - The measurement accuracy is guaranteed in the range $1\% \cdot V_{nom} < V_{out} < V_{nom}$ and for 1 year | | |
| Accuracy voltage measurement | $\pm (0.01\% \cdot V_{out} + 0.02\% \cdot V_{nom})$ | $\pm (0.01\% \cdot V_{out} + 0.01\% \cdot V_{nom})$ |
| Accuracy current measurement - full range | $\pm (0.01\% \cdot I_{out} + 0.02\% \cdot I_{nom})$ | $\pm (0.01\% \cdot I_{out} + 0.01\% \cdot I_{nom})$ |
| Accuracy current measurement - 2 nd range | n/a | $\pm (0.01\% \cdot I_{out} + 4 \text{ nA})$ |
| Sample rates (SPS) | 5, 10, 25, 50, 60, 100, 500 | |
| Digital filter averages | 1, 16, 64, 256, 512, 1024 | |
| Voltage ramp | up to $0.2 \cdot V_{nom} / s$ opt. up to $0.75 \cdot V_{nom} / s$ | |
| Hardware limits | Potentiometer per module [V_{max} / I_{max}] | |
| Operating mode | Full module and channel control via: Front panel, USB interface: iseg SCPI, CAN interface: EDCP (Enhanced Device Control Protocol) | |
| Module status | green LED turns on if the channel has the status "Ready" yellow LED turns on if the channel has the status "HV ON" | |
| System connector | NIM standard compliant connector | |
| HV connector | BNC SHV | |
| Digital Interface | USB interface (potential free) CAN interface (potential free) | |
| Case | 1/12 NIM standard cassette | |
| Safety Loop connector | Lemo 2pole: FFA.0S.302.CLAC | |
| Safety Loop socket | Lemo 2pole: ERA.0S.302.CLL | |
| Single channel inhibit connector | SUB-D9 male | |
| Protection | INHIBIT, Safety loop, short circuit, overload, hardware V/I limits | |

| | |
|---------------------------------------|---|
| Power requirements of supply voltages | ± 24 V: 1..5 A (0.6 A for NHS 6y01x) at full load, 0.3 A with no load at nominal voltage + 6 V (< 0.3 A) |
| Operating temperature | 0 – 40 °C |
| Storage temperature | -20 - 60 °C |

Table 1: Technical data: Specifications

| CONFIGURATIONS | | | | | |
|----------------------------------|------------------|------------------|---------------------------------|---------------------|----------------|
| Type | V _{nom} | I _{nom} | Max. I _{in} (A) at 24V | Item Code | Options |
| NHS STANDARD SERIES | | | | | |
| NHS 60 01x | 100 V | 10 mA | 0.6 | NH060001x1060000100 | VCT,IU,ID |
| NHS 60 05x | 500 V | 15 mA | 1.5 | NH060005x1560000200 | VCT,IU,ID |
| NHS 60 10x | 1 kV | 8 mA | 1.5 | NH060010x8050000200 | VCT,IU,ID |
| NHS 60 20x | 2 kV | 4 mA | 1.5 | NH060020x4050000200 | VCT,IU,ID |
| NHS 60 30x | 3 kV | 3 mA | 1.5 | NH060030x3050000200 | VCT,IU,ID |
| NHS 60 40x | 4 kV | 2 mA | 1.5 | NH060040x2050000200 | VCT,IU,ID |
| NHS 60 60x | 6 kV | 1 mA | 1.5 | NH060060x1050000200 | VCT,IU,ID |
| NHS HIGH PRECISION SERIES | | | | | |
| NHS 62 01x | 100 V | 10 mA | 0.6 | NH062001x1060000100 | VCT,IU,ID,TC,L |
| NHS 62 05x | 500 V | 10 mA | 1.2 | NH062005x1560000200 | VCT,IU,ID,TC,L |
| NHS 62 10x | 1 kV | 8 mA | 1.5 | NH062010x8050000200 | VCT,IU,ID,TC,L |
| NHS 62 20x | 2 kV | 4 mA | 1.5 | NH062020x4050000200 | VCT,IU,ID,TC,L |
| NHS 62 30x | 3 kV | 3 mA | 1.5 | NH062030x3050000200 | VCT,IU,ID,TC,L |
| NHS 62 40x | 4 kV | 2 mA | 1.5 | NH062040x2050000200 | VCT,IU,ID,TC,L |
| NHS 62 60x | 6 kV | 1 mA | 1.5 | NH062060x1050000200 | VCT,IU,ID,TC,L |

Table 2: Technical data: Configurations

| OPTIONS / ORDER INFO | INFO | EXAMPLE | ITEM CODE HEX CODING |
|-----------------------------------|--|--------------------|----------------------|
| POLARITY | Positive: x = p , negative x = n , mix: x = m | NHS 60 10 p | |
| SINGLE CHANNEL INHIBIT - down | ID | | 400 |
| SINGLE CHANNEL INHIBIT - up | IU | | 800 |
| VOLTAGE CORRECTION by TEMPERATURE | VCT | | 008 |
| LOWER TEMPERATURE COEFFICIENT | TC | T10 | 004 |
| LOWER OUTPUT CURRENT | L (I _{nom} = 100 µA) | | |

Table 3: Technical data: Options and order information

3 Handling

3.1 Connection

The supply voltages are connected to the module via the NIM-connector on the rear side of the module. An USB connector and two 3,5mm audio jack connectors for the CAN interface are located on the front panel. The second CAN connector can be used to daisy-chain several NHS modules.

3.2 Front Panel Control



Context sensitive buttons left and right for navigation inside the menus

Display shows monitor and control values

Rotary encoder with push button to navigate in menu and set values

LED „OK“ signals condition of the corresponding channel
LED „HV ON“ signals a measured output voltage at the corresponding channel
On/Off switches to turn the corresponding channel on or off

Hardware limit set screws V_{max} and I_{max} to set the maximum output voltage or current relatively to the absolute maximum values of the channel (V_{nom} / I_{nom})

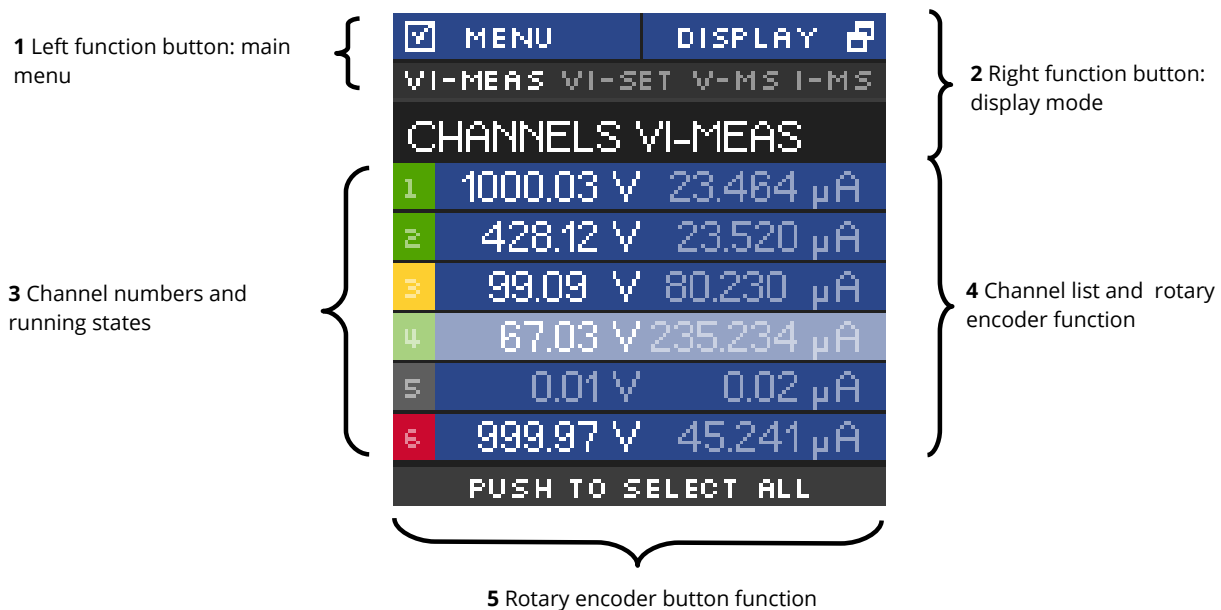
USB and Safety Loop connector

CAN connectors

Single channel Inhibit connector

3.2.1 Main screen (Channel List)

After start up of the NHS the display will show a Main screen similar to the following image which consists of 5 elements:



1. Left function button: main menu

Shows the function of the left button. If the user pushes the left button in Main screen, the display will show the Menu screen.

2. Right function button: display mode

If the user pushes the right button in Main screen, the Main screen will switch to the next display mode, which is shown directly above the channel list.

Following display modes are available:

- | | | |
|------------|---|---------------------------------------|
| 1. VI-MEAS | → | voltage and current – measured values |
| 2. VI-SET | → | voltage and current – set values |
| 3. V-MS | → | voltage – measured and set values |
| 4. I-MS | → | current – measured and set values |

3. Channel numbers and running states

This is part of the channel list (4) and shows the corresponding channel number. The background color signals the running state of each channel. The background colours means the following:

- | | | |
|--------|---|---|
| Black | → | the channel is switched off |
| Green | → | the channel is switched on |
| Yellow | → | the channel is switched on but no regulation (CV, CC) is active |
| Orange | → | the channel is switched on but has unmasked error event(s) |
| Red | → | the channel has at least one masked error event |

4. Rotary encoder button function

If the user presses the button of the rotary encoder, the menu will switch to the channel menu of the marked channel.

5. Channel list and rotary encoder function

The channel list shows-dependent on the display mode-measure and/or set values of voltage and current for each channel.

In display mode VI-MEAS the following can be seen:

If a channel is switched off, the values of V_{meas} and I_{meas} are gray.

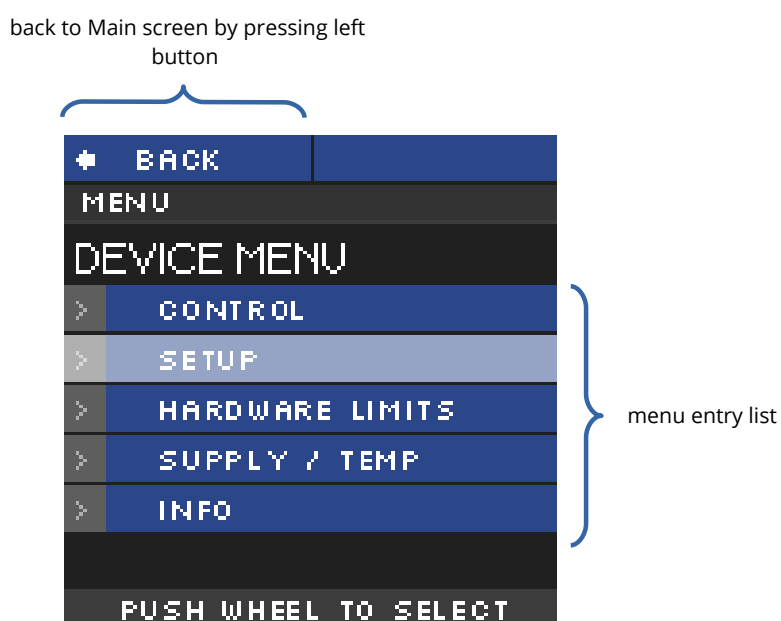
If a channel is in constant voltage regulation, V_{meas} value is white and I_{meas} value is gray

If a channel is in constant current regulation, V_{meas} value is grey and I_{meas} value is white

The channel row which is slightly brighter is the marked channel by the rotary encoder. Turning the rotary encoder counter-clockwise will mark the channel above the current channel and turning clockwise will mark the channel below the current channel.

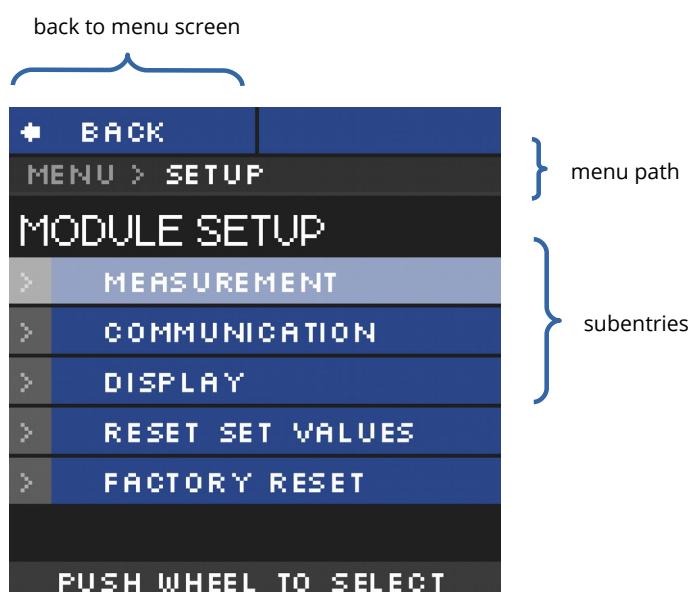
3.2.2 Menu Screen

By pressing the left button in Main screen, the display will switch to the menu screen, that looks similar to the image below:



The menu screen shows menu entries to set up behavior and check information of the device hardware.

To enter a menu entry, the user has to mark an entry by turning rotary encoder and then pressing the rotary encoder button. The selected entry is then shown in the menu path.



3.2.3 Menu Structure

Available Menu entries are:

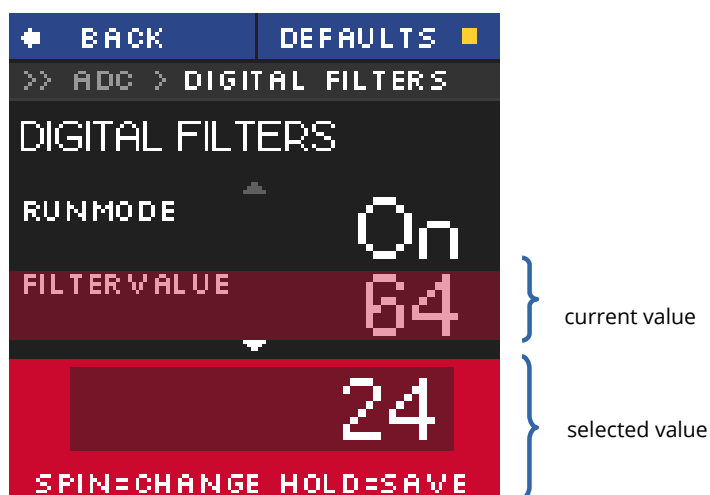
| Entry | Subentry | Subentry | Content |
|-----------------|------------------|---------------------------------------|--|
| CONTROL | VOLTAGE RAMP | - | Set voltage ramp speed |
| | CURRENT RAMP | - | Set current ramp speed |
| | CLEAR ALL EVENTS | - | Clear all events |
| | SET KILL ENABLE | - | Set mode Kill Enable/Disable |
| SETUP | MEASUREMENT | ADC SAMPLE RATE | Set ADC sample rate |
| | | DIGITAL FILTER | Set digital filter steps |
| | COMMUNICATION | CAN BUS BITRATE | Set CAN bus bitrate |
| | | CAN BUS ADDRESS | Set CAN bus ID |
| | DISPLAY | POWER SAVE | Set display power safe mode |
| | RESET SET VALUES | - | Reset all set values |
| FACTORY RESET | - | Reset all settings to factory default | |
| HARDWARE LIMITS | - | - | Shows hardware limits V_{max} and I_{max} . This screen is automatically shown, if the hardware limits were changed. |
| SUPPLY / TEMP | - | - | Shows supply voltages and temperature |
| INFO | - | - | Shows serial number, firmware name and release, nominal voltage and current |

3.2.4 Editing Menu Entries

A Menu entry that has a fixed amount of possible values can be easily edited by turning the rotary encoder, the selected value will be shown at the bottom of display screen.

A submit and save of the selected value is done by pressing the rotary encoder button.

A reset to its default value is done by pressing the right button.



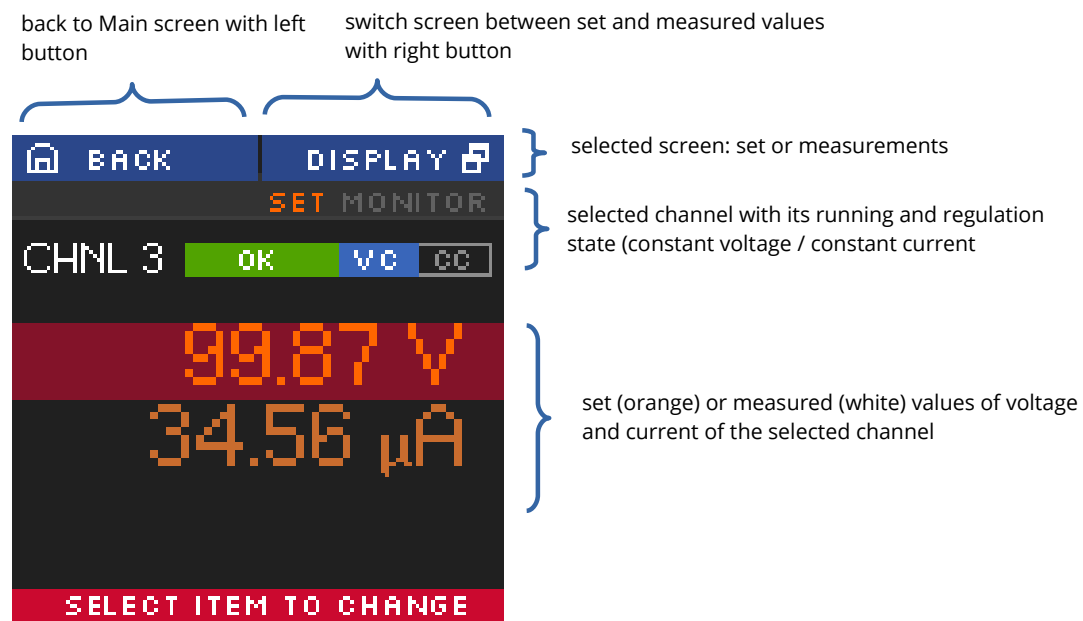
A menu entry with a none-fixed amount of values e.g. voltage ramp speed is edited a little bit different.

The selected value is also shown at the bottom of the display but with a digit highlighted by a cursor. A short press on the rotary encoder button and the cursor will jump to the next lower digit. Turning the rotary encoder changes the selected value in the resolution of the corresponding digit.

A submit and save of the selected value is done by pressing and holding the rotary encoder button for more than one second.

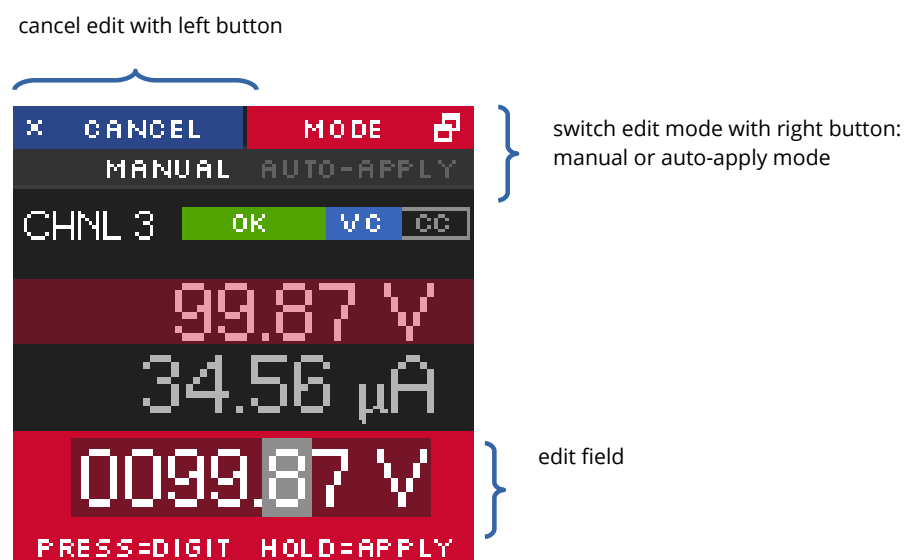
3.2.5 Channel Details

To change the set values of a channel or to monitor one single channel with larger digits, the Channel screen needs to be entered. This can be done in Main screen by turning the rotary encoder until the wished channel is marked and then pressing the rotary encoder button to select it. A screen similar to the following will be shown.



3.2.6 Editing Channel Set Values

In the channel screen it is possible to edit set values of the selected channel. This is done by marking current or voltage value by turning rotary encoder and applying this by pressing the rotary encoder button. An edit field beneath the shown values will be displayed. The edit value is shown with a digit hi-lighted by a cursor. A short press on the rotary encoder button and the cursor will jump to the next lower digit. Turning the rotary encoder changes the selected value in the resolution of the digit. Submit and apply of the edit value is done by pressing and holding the rotary encoder button for more than one second. There are two modes of editing available: manual and auto-apply. In manual mode, the edited value is not accepted until the user applied it with pressing and holding the rotary encoder button. In auto-apply mode the edit value is immediately accepted as turning the rotary encoder.



3.3 Channel Switches and LEDs

For each channel of the NHS device there is one “On/Off” switch to turn the channel on and off and there are two LEDs (“OK” and “HV ON”) to signal status of the channel.

The green LED “OK” signals the general condition of the channel and the yellow LED “HV ON” signals measured output voltage at the corresponding channel or is flashing shortly every time the user presses the corresponding “On/Off” switch.

Following behaviors are possible:

| LED “OK” | LED “HV ON” | Meaning |
|-----------------|-----------------|---|
| not illuminated | not illuminated | An error event occurred, the channel cannot be switched on. |
| not illuminated | illuminated | An error occurred but there is still a measured voltage at the channel. |
| illuminated | not illuminated | The channel is switched off and can be turned on. |
| illuminated | illuminated | The channel is turned on and there is output voltage at the channel. |
| | flashing | The channel is ramping up or down |

3.4 Remote Control

The NHS devices offer two remote control interfaces: USB and CAN.

With the USB connector, one NHS can be controlled with the iseg SCPI instruction set. Available control applications are iseg Terminal and iseg SCPI Control. Please consider the SCPI for NHS Programmers-Guide (*see appendix*) document for further details.

With the CAN interface connectors, up to 64 NHR/NHS devices can be controlled on one CAN line. Therefore every device has to have a unique CAN Bus address, which can be configured in the Device Menu. Please consider *CAN EDCP Programmers-Guide* (*see appendix*) for further details.

3.5 Protection Features

3.5.1 Hardware Limit

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. 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.

3.5.2 Safety Loop

A safety loop can be implemented via the safety loop socket (SL) on the front panel.

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. The loop can be activated by removing the internal jumper. The jumper can be accessed via a ventilation slot on the bottom of the module.

If the safety loop is opened during the operation, the output voltages are shut off without ramp. Furthermore, the corresponding bits in the „ModuleStatus“ and „ModuleEventStatus“ registers are set (*CAN EDCP Programmers-Guide* (*see appendix*)). After closing the loop again, the „ModuleEventStatus“ register must be reset to turn the channels on again.

By factory setup the safety loop is not active (the corresponding bits are always set). The loop can be activated by removing the internal jumper. The jumper can be accessed via a ventilation slot on the bottom of the module (*see dimensional drawings for exact position*).

3.5.3 Single channel Inhibit

INFORMATION



INHIBIT is an external signal, that switches off the high voltage for the device or a specific channel

INFORMATION

The Sub-D connector on the bottom of the front panel allows to install an Inhibit for each channel. The pin assignment is as follows:

| | | | | | | | | | |
|----------------------|---|---|---|---|---|---|-----|---|---|
| Channel 0-5 / GND | 0 | 1 | 2 | 3 | 4 | 5 | GND | | |
| SUB-D9 connector pin | 1 | 2 | 3 | 6 | 7 | 8 | 4 | 5 | 9 |

INHIBIT Option-ID: The INHIBIT pins are internally connected to the module GND via 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 if the corresponding INHIBIT pin is actively pulled to TTL High level.

INHIBIT Option-IU: The INHIBIT pins are internally connected to 5V via pull up resistors (approx. 10 kΩ). HV generation according to the settings is possible with TTL High level or open INHIBIT pins. If the INHIBIT contact pin (n) is connected to the module GND or a TTL-LOW potential for at least 100 milliseconds, an Inhibit signal is generated. The channel status bit `isExternalInhibit` and the channel event status bit `EExternalInhibit` are set. One of the following reactions to this signal can be programmed:

- No Action (default)
- Turn off the channel with ramp
- Shut down the channel without ramp
- Shut down all channels without ramp

These reactions can be programmed by the CAN interface, see chapter Delayed Trip in the *CAN EDCP Programmers-Guide* (see *apenndix*) for reference.

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 (*CAN EDCP Programmers-Guide* (see *apenndix*)).

3.6 The function "Delayed Trip"

3.6.1 Operating principle

The function "*Delayed Trip*" provides a user-configurable, time-delayed response to an increased output current (I_{out}) higher than the set current (I_{set}). The response to this kind of event can be, for example, to ramp down the channel with the programmed ramp. A detailed description for the configuration can be found in the *CAN EDCP Programmers-Guide* (see *apenndix*).

By a programmable timeout with one millisecond resolution, the trip can be delayed up to four seconds. During this time, the output current is limited to the value of I_{set} (constant current mode).

The hardware regulation signals, constant voltage (CV) or constant current (CC), are sampled every millisecond by the microprocessor. Once the constant current mode is active, the programmed timeout counter is decremented. If the HV channel returns to constant voltage mode before timeout (i.e. $I_{out} < I_{set}$), the counter will be reset. So this process can be restarted if the current rises again.

To guarantee a sufficient resolution for the current set values, a nominal current adequate to the application should be selected. iseg offers HV modules with nominal currents reduced to 100 μA in all voltage classes. These are designated e.g. for semiconductor detectors, which only require a few microampere operating current.

3.6.2 Modules with two current measurement ranges

High Precision HV modules with two current ranges are a particular case. In these HV modules the high current output is combined with a picoampere resolution in the low current measurement range. The range switching is done by the microprocessor depending on I_{meas} :

High measuring range: $I_{nom-low} < I_{meas} < I_{nom}$

Low measuring range: $0 < I_{meas} < I_{nom-low}$

The typical value for $I_{nom-low}$ is 20 μA .

As long as a set current in the high measuring range is used, everything is working as described above. If a set current in low measuring range is specified, the current limitation is set to 120 % of the low measuring range.

Example: $I_{nom-low} = 20 \mu A \rightarrow$ current limitation is set to 24 μA if $I_{set} = 10 \mu A$

Now the channel operates in the low measuring range only. A software comparison of set current I_{set} and measured current I_{meas} is performed in addition to the described hardware CC and CV signals sampling.

With this principle, two requirements are met:

- the output current will not exceed 24 μA even during fast changes and
- the delayed trip function is extended into the region of very small currents (picoampere) for these HV modules.

For the software comparison, a delay between 80 milliseconds and 1 second must be expected. This depends on the modules ADC (Analog-to-digital-converter) configuration.

This time can be adjusted by changing the ADC sample rate to meet the requirements of the application. Higher ADC sample rates lead to shorter delays but also reduce the resolution.

If the *Delayed Trip* function is activated the voltage ramp should be limited to 1 % of V_{nom} before. Higher values could trigger a trip by internal charge balancing during a ramp, even though the output current does not exceed the set value I_{set} .

If the connected load contains capacities or if I_{set} is very small, it might be necessary to further reduce the ramp speed. Alternatively, the *Delayed Trip* can be activated only after the completion of the ramp.

INFORMATION



An activated KillEnable feature disables the Delayed Trip function.

INFORMATION

An active *KillEnable* function disables the *Delayed Trip* function. If *KillEnable* is active and a trip occurs, the channel is shut down without ramp at the fastest hardware response time (smaller than 1 ms). However, the actual discharge time strongly depends on the connected load.

4. Options

4.1 VCT – voltage correction by temperature

This option allows a temperature dependent correction of the output voltage. The temperatures are measured with a distinct sensor for each channel. An user-adjustable VCT-coefficient allows to specify a linear relationship between the measured temperature and the output voltage. As an option one sensor per module can be ordered.

4.1.1 Technical data

| | |
|-------------------|-----------------------|
| Sensor type | EPCOS B57867S0502F140 |
| Temperature range | -40 ... 80°C |

| | |
|--|---------------------|
| Accuracy of temperature measurement | ±0.5 K (0 ... 60°C) |
| Resolution of temperature measurement | 1 mK (0 ... 60°C) |
| Temperature update rate | 15 updates/min |

Table 5: Technical data VCT sensor

4.1.2 Operation

The connector of the temperature sensor must be plugged in the slot of the corresponding channel on the VCT-connector at the rear panel of the HV-module.

A programmable VCT-coefficient for each channel defines the rate and the direction of the voltage correction. The temperatures, measured at the sensors can be read out from the module.

At the time a HV-channel is switched on or the output voltage is set by the user, the module registers the temperature of the corresponding sensor and the set voltage as reference values.

If the temperature at the sensor changes, the output voltage is automatically adjusted according to the formula:

$$V = V_{\text{ref}} + a \cdot (T - T_{\text{ref}}) \quad (\mathbf{a \dots VCT\text{-coefficient}})$$

Example: A channel is set to 60V. At the time it is switched on a temperature of 25°C is measured. The VCT-coefficient is set to +1V/K. If the temperature now increases to 26°C the output voltage will increase to 61V. (For channels with a negative output voltage the voltage changes from -60V to -61V).

A VCT-coefficient of -1V/K would decrease the voltage to 59V.

Notes:

- During operation the values for V_{set} are adjusted. If a channel is switched off the adjusted set value will be kept, not the original value set by the user.
- If the VCT-coefficient is modified during operation, V_{ref} and T_{ref} are reset to the present values to prevent a sudden voltage change.
- If the temperature sensor is dis- and reconnected during operation, V_{ref} and T_{ref} are reset to the present values to prevent a sudden voltage change.
- The temperature dependent voltage correction can be deactivated by setting the VCT-coefficient to 0 or by disconnecting the temperature sensor. If this is done during operation, the channel will keep the actual voltage set.
- If the temperature sensor is disconnected a temperature of -273.15°C is shown for that channel.
- The VCT data points are described in the reference manual "**CAN EDCP Programmers-Guide**" (*see appendix*) and in the manual "**iseq Hardware Abstraction Layer**" (*see appendix*).

4.2 Single Channel Inhibit (IU, ID, NIU, NID)

INFORMATION



INHIBIT is an external signal, that switches off the high voltage for the device or a specific channel

INFORMATION

Optionally it is possible to equip modules with an *INHIBIT* for each channel via a Sub-D connector. Channel 0 to 7 corresponds to Pin 1 to 8 at the Sub-D connector, Pin 9 is connected to GND.

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. 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.

4.2.1 Logic / Signal Level Standard

The INHIBIT - signal has negative logic, which means it is LOW-active. When applying a TTL-low-level on INHIBIT input the signal will be rated as ACTIVE, the high voltage generation will be switched off. (*see chapter connectors and pin assignment*)

Default state = state at non wired signal input: By applying of Pull-Up or Pull-Down resistors (approx. 10 k Ω) the Default-State will be defined.

Case 1 - IU

INHIBIT: Default inactive (\Rightarrow high voltage is generated):

\Rightarrow signal input has HIGH - level \Rightarrow pull-up resistor after V_{cc}

Switch off the HV by applying 0V on signal input

Case 2 - ID

INHIBIT: Default active (\Rightarrow high voltage is not been generated):

\Rightarrow signal input has LOW - level \Rightarrow pull-down resistor after 0V

Switch on the HV by applying V_{cc} on signal input

4.2.2 Logic / Signal Level Negated

The INHIBIT signal has positive logic, that means it is HIGH-active. By applying of TTL-High-Level on INHIBIT input the signal will be rated as ACTIVE, the high voltage generation will be switched off.

Default-State = state at non wired signal input:

Case 3 - NID

INHIBIT: Default inactive (\Rightarrow high voltage is generated):

\Rightarrow Signal input as LOW - level \Rightarrow Pull-Down resistor after 0V

Switch off the HV by applying of V_{cc} (5V) on signal input

Case 4 - NIU

INHIBIT: Default active (\Rightarrow high voltage is not been generated):

\Rightarrow Signal input has HIGH - level \Rightarrow Pull-Up resistor after V_{cc} (5V)

Switch on the HV by applying of 0V on signal input

4.3 L – Lower output current (HP only)

The output current is limited to a lower value, e.g. 100 μ A.

4.4 T10 – Lower temperature coefficient (HP only)

Improved temperature coefficient of 10ppm/K

5. Dimensional Drawings

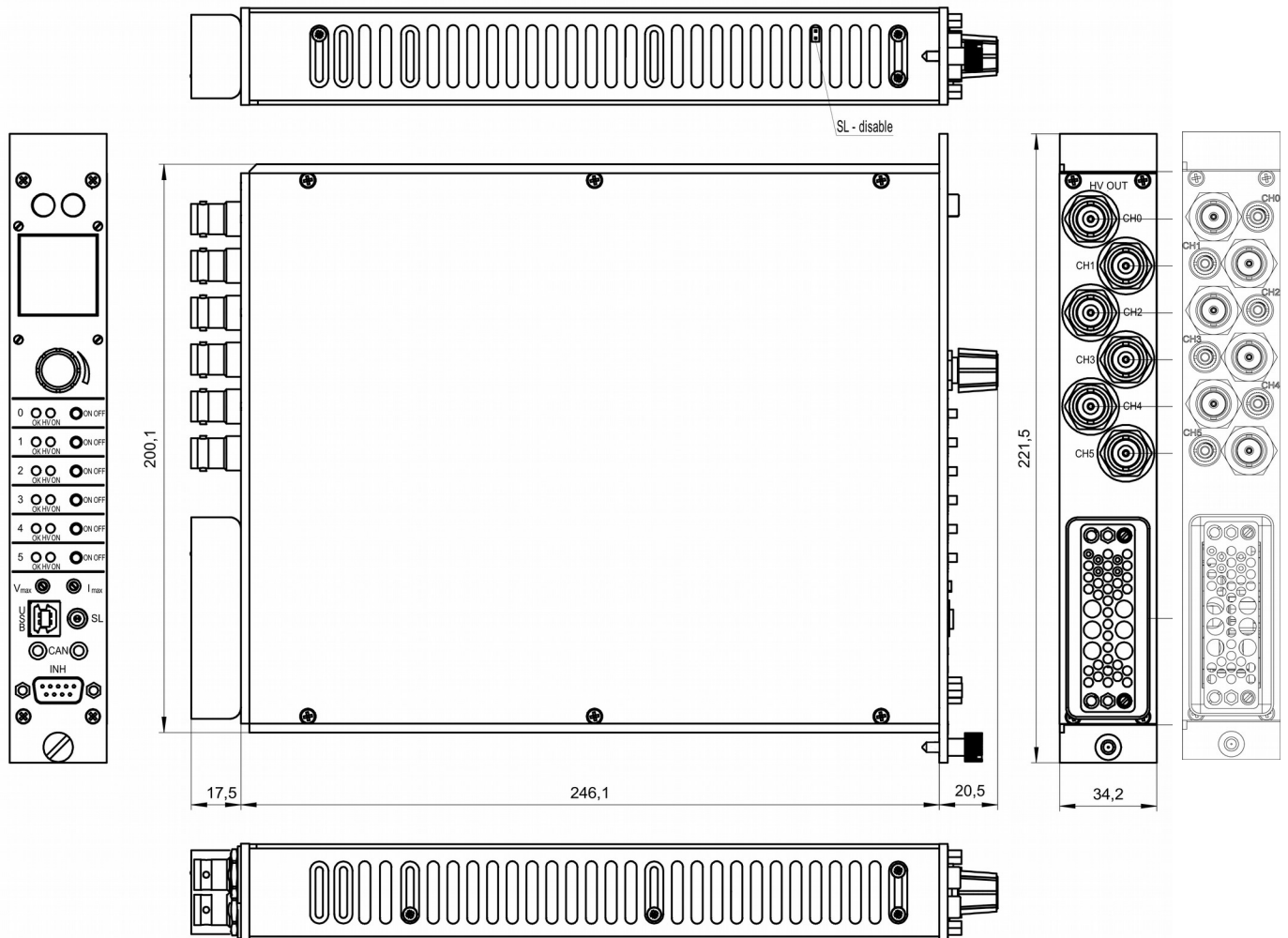


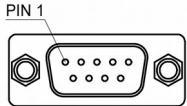


Figure 1: Dimensional Drawing NHS without / with VCT option

6. Connectors and PIN assignments

| HV CONNECTOR ASSIGNMENTS | | |
|--------------------------|---|---|
| Name | SHV / S08 | BNC |
| Figure |  |  |

| INHIBIT | | | | | | | | | | | | | | | | | | | | | | | |
|---------|--|-----|--------------------------|---|-----------|---|-----------|---|-----------|---|-----|---|-----|---|-----------|---|-----------|---|-----------|---|-----|---|--|
| Name | INHIBIT connector- DSUB9 | | INHIBIT connector- DSUB9 | | | | | | | | | | | | | | | | | | | | |
| Figure | <table border="1"> <thead> <tr> <th>PIN</th> <th>INHIBIT 1</th> </tr> </thead> <tbody> <tr><td>1</td><td>CHANNEL 0</td></tr> <tr><td>2</td><td>CHANNEL 1</td></tr> <tr><td>3</td><td>CHANNEL 2</td></tr> <tr><td>4</td><td>GND</td></tr> <tr><td>5</td><td>GND</td></tr> <tr><td>6</td><td>CHANNEL 3</td></tr> <tr><td>7</td><td>CHANNEL 4</td></tr> <tr><td>8</td><td>CHANNEL 5</td></tr> <tr><td>9</td><td>GND</td></tr> </tbody> </table> | PIN | INHIBIT 1 | 1 | CHANNEL 0 | 2 | CHANNEL 1 | 3 | CHANNEL 2 | 4 | GND | 5 | GND | 6 | CHANNEL 3 | 7 | CHANNEL 4 | 8 | CHANNEL 5 | 9 | GND |  | |
| PIN | INHIBIT 1 | | | | | | | | | | | | | | | | | | | | | | |
| 1 | CHANNEL 0 | | | | | | | | | | | | | | | | | | | | | | |
| 2 | CHANNEL 1 | | | | | | | | | | | | | | | | | | | | | | |
| 3 | CHANNEL 2 | | | | | | | | | | | | | | | | | | | | | | |
| 4 | GND | | | | | | | | | | | | | | | | | | | | | | |
| 5 | GND | | | | | | | | | | | | | | | | | | | | | | |
| 6 | CHANNEL 3 | | | | | | | | | | | | | | | | | | | | | | |
| 7 | CHANNEL 4 | | | | | | | | | | | | | | | | | | | | | | |
| 8 | CHANNEL 5 | | | | | | | | | | | | | | | | | | | | | | |
| 9 | GND | | | | | | | | | | | | | | | | | | | | | | |

| CONNECTORS PART NUMBERS (manufacturer code / iseg accessory parts item code) | | | |
|--|--------------|------------|------------------------|
| POWER SUPPLY SIDE | | CABLE SIDE | |
| SHV (ROSENBERGER) | | | |
| Socket | 57S501-200N3 | Connector | 57K101-006N3 / Z590162 |
| CAN | | | |
| | | Connector | Jack plug 3.5mm |
| VCT sensor connector | | | |
| | | Connector | Jack plug 2.5mm |

7. Order guides

| CABLE ORDER GUIDE | | | | |
|-----------------------------|------------|---------------------------------------|----------------------------|--|
| POWER SUPPLY SIDE CONNECTOR | CABLE CODE | CABLE DESCRIPTION | APPLICATION SIDE CONNECTOR | ORDER CODE LLL = length in m [*] |
| SHV | 04 | HV cable shielded 30kV (HTV-30S-22-2) | open | SHV_1C04-LLL |
| Jack plug 3.5mm | | CAN to host | D-SUB female | Z515404 |
| Jack plug 3.5mm | | CAN daisy-chain | Jack plug 3.5mm | Z515554 |
| Jack plug 2.5mm (2pol) | | VCT Sensor cable | Probe | Z585877 |

^{*} Length building examples: 10cm => 0.1, 2.5m => 2.5, 12m => 012, 999m => 999

Table 9: Guideline for cable ordering

| CONFIGURATION ORDER GUIDE (item code parts) | | | | | | | | |
|---|---------------------|------------------------|---|------------------------------|---|-----------------------------------|--------------|--------------------|
| NH | 06 | 0 | 060 | P | 105 | 000 | 02 | 00 |
| NIM High Voltage | Numbers of channels | Class | V _{nom} | Polarity | I _{nom} (nA) | Option (hex) | HV-Connector | Customized Version |
| | | 0 = Standard 2 = HP | three significant digits *100V For Example: 060 = 6000V | p = positive n = negative | two significant digits + number of zeros For Example: 105 = 1mA | Sum of the hex codes (s. table 3) | 02 = SHV | 00 = none |

Table 10: Item code parts for different configurations

8. Appendix

For more information please use the following download links:

| |
|---|
| This document |
| https://iseq-hv.com/download/SYSTEM/NHS/iseq_manual_NHS_en_2.0.pdf |
| iCS (iseq Communication Server) |
| https://iseq-hv.com/download/?dir=SOFTWARE/iCS |
| SCPI Programmers-Guide |
| https://iseq-hv.com/download/SOFTWARE/iseqSCPI/SCPI_Programmers-Guide.pdf |
| CAN EDCP Programmers-Guide |
| https://iseq-hv.com/download/SOFTWARE/iseqEDCP/CAN_EDCP_Programmers-Guide.pdf |
| iseqHAL (Hardware Abstraction Layer) |
| https://iseq-hv.com/download/SOFTWARE/iCS/doc/iseqHAL/index.html |
| iCSservice-API |
| https://iseq-hv.com/download/SOFTWARE/iCS/doc/iCSservice/iCSapiWebsocket_Docu.html |
| https://iseq-hv.com/download/SOFTWARE/iCS/doc/iCSservice/iCSapiWebsocket_Example.html |
| iseqIOC (EPICS Input / Output Controller) |

https://iseq-hv.com/download/SOFTWARE/iCS/doc/iseglOC/iseglOC_doc.pdf

https://iseq-hv.com/download/SOFTWARE/iCS/doc/iseglOC/iseglOC_sampleScript.zip

9. Warranty & Service

This device is made with high care and quality assurance methods. The factory warranty is up to 36 months, starting from date of issue (invoice). Within this period a 5 years warranty extension can be ordered at additional charge. Please contact iseq sales department.

ATTENTION



Repair and maintenance may only be performed by trained and authorized personnel.

For repair please follow the RMA instructions on our website: www.iseq-hv.com/en/support/rma

10. Manufacturer's contact

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