Technical documentation
Last changed on: 30.07.2019

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
2.2	30.07.2019	improved documentation, add Connectors
2.1	20.05.2019	Connections added, corrections Layout
2.0	20.09.2018 01.10.2018	Relayouted documentation Notes revised
1.0	30.09.2015	Initial version

Disclaimer / Copyright

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.

Table of Contents

1 General description

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

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}
Stablity		
Stability – [ΔV_{out} vs. ΔV_{in}]	1 • 10^{-4} • V_{nom}	
Stability – [ΔV_{out} vs. ΔR_{load}]	1 • 10^{-4} • V_{nom}	
Long term stability (1h warmup) 24h	< 5 • 10^{-5} • V_{nom}	< 2 • 10^{-5} • 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 • 10^{-6} • V_{nom}	
Resolution current setting	2 • 10^{-6} • I_{nom}	
Resolution voltage measurement	2 • 10^{-6} • V_{nom}	1 • 10^{-6} • V_{nom}
Resolution current measurement – full range	2 • 10^{-6} • I_{nom}	1 • 10^{-6} • I_{nom}
Resolution current measurement – 2nd range	n/a	50 pA [I_{out} < 20 µA]
Measurement accuracy – The measurement accuracy is guaranteed in the range 1% • V_{nom} < V_{out} < V_{nom} and for 1 year		
Accuracy voltage measurement	± (0.01 % • V_{out} + 0.02 % • V_{nom})	± (0.01 % • V_{out} + 0.01 % • V_{nom})
Accuracy current measurement – full range	± (0.01 % • I_{out} + 0.02 % • I_{nom})	± (0.01 % • I_{out} + 0.01 % • I_{nom})
Accuracy current measurement – 2nd range	n/a	± (0.01 % • I_{out} + 4 nA)
Sample rates ADC (SPS)	5, 10, 25, 50, 60, 100, 500	
Digital filter averages	1, 16, 64, 256, 512, 1024	
Voltage ramp	up to 0.2 • V_{nom} /s | opt. up to 0.75 • 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: EPG.00.302.HLN	
Safety Loop socket	Lemo 2pole: FGG.00.302.CLAD30	
Single channel inhibit connector	SUB-D9 male	
Protection	INHIBIT, Safety loop, short circuit, overload, hardware V/I limits	

SPECIFICATIONS	NHS Standard	NHS High Precision
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	
Humidity	20 - 80 %, not condensing	

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 = x**	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})

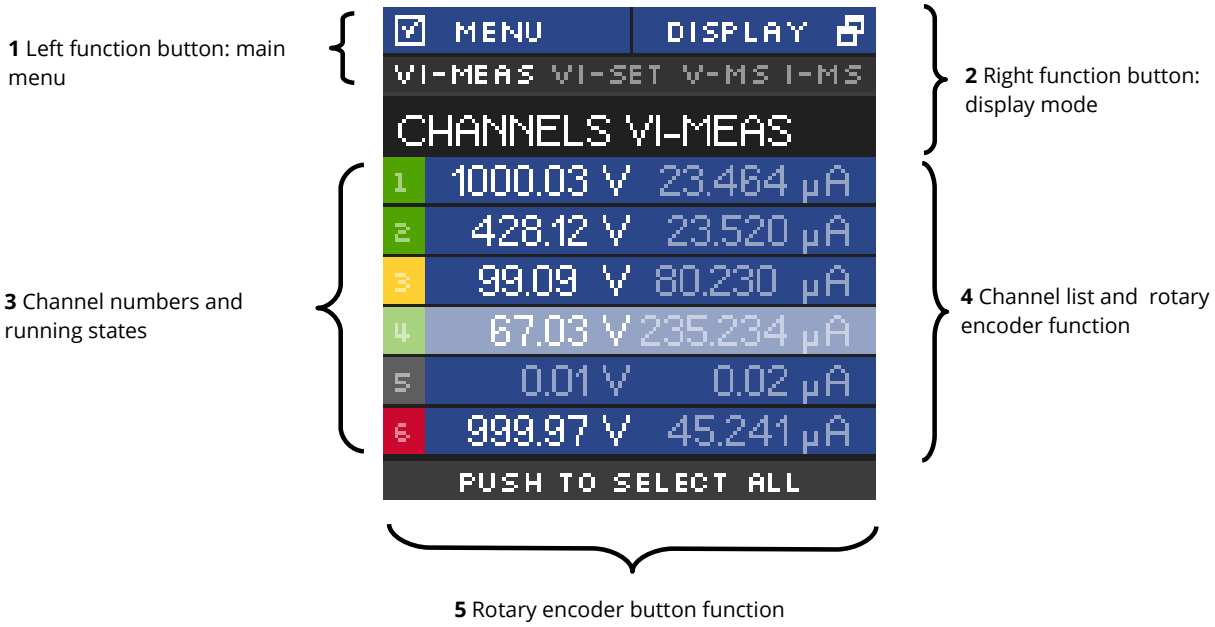
USB and **Safety Loop** connector

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.

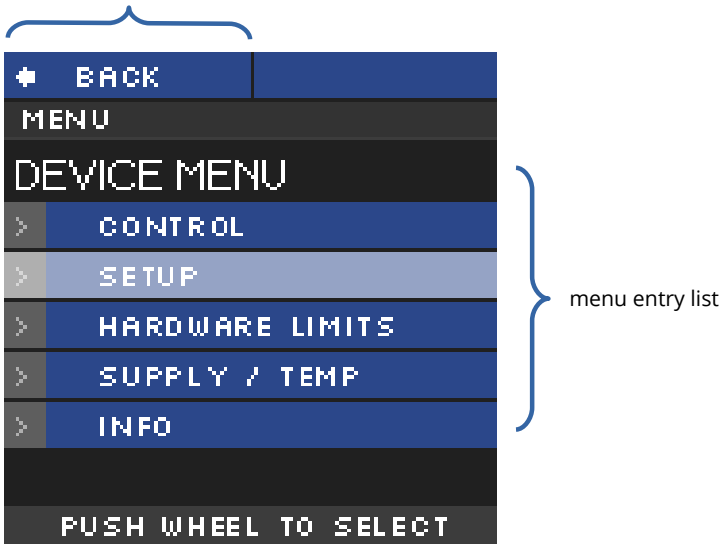
If a channel is in constant voltage regulation, V_{meas} value is white and I_{meas} value is gray

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.

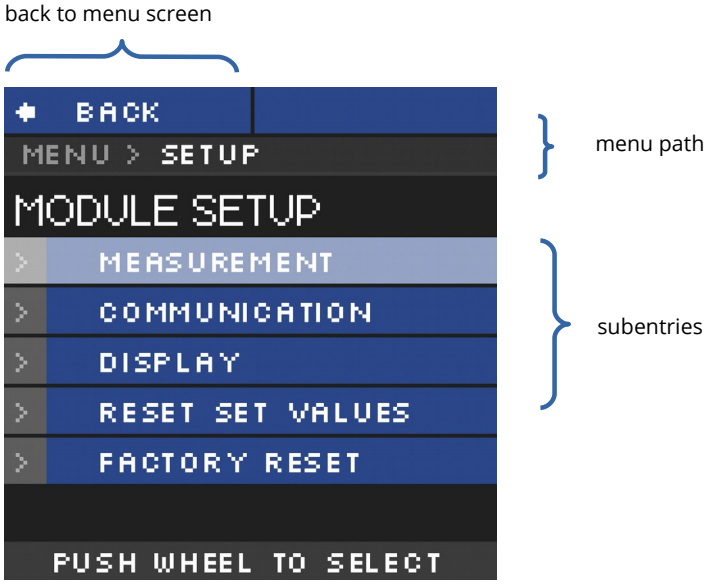
3.2.2 Menu Screen

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:

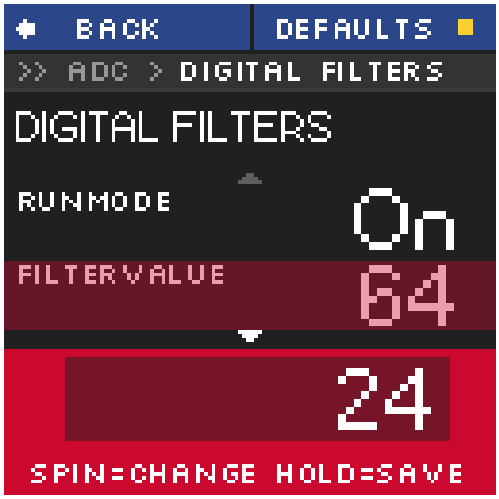
Entry	Subentry	Subentry	Content
CONTROL	VOLTAGE RAMP	–	Set voltage ramp speed
	CURRENT RAMP	–	Set current ramp speed
	CLEAR ALL EVENTS	–	Clear all events
	SET KILL ENABLE	–	Set mode Kill Enable/Disable
SETUP	MEASUREMENT	ADC SAMPLE RATE	Set ADC sample rate
		DIGITAL FILTER	Set digital filter steps
	COMMUNICATION	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.



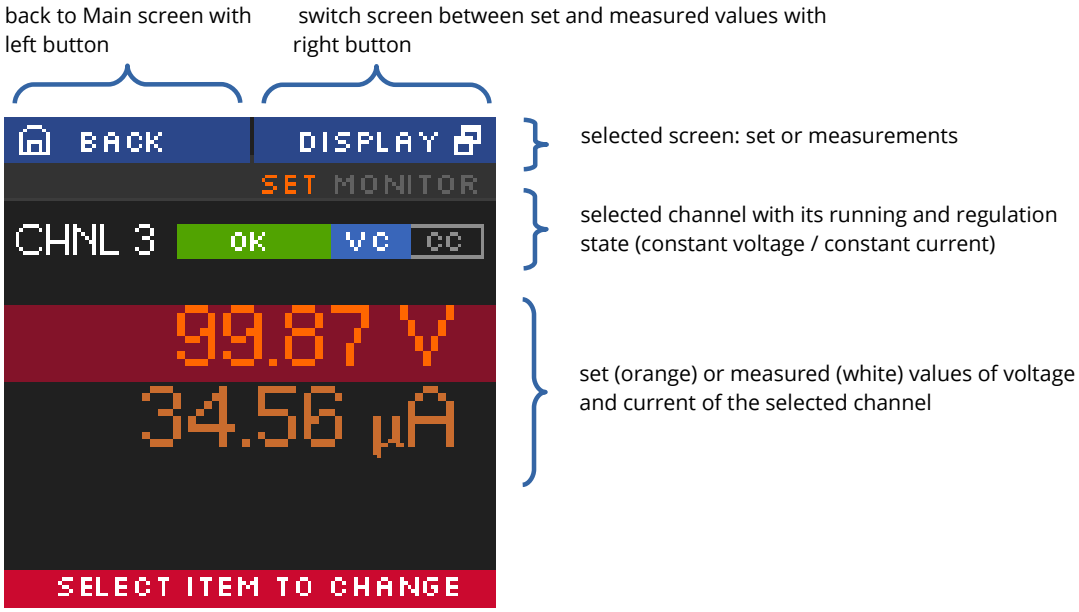
A menu entry with a none-fixed amount of values e.g. voltage ramp speed is edited a little bit different.

The selected value is also shown at the bottom of the display but with a digit hilighted 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.

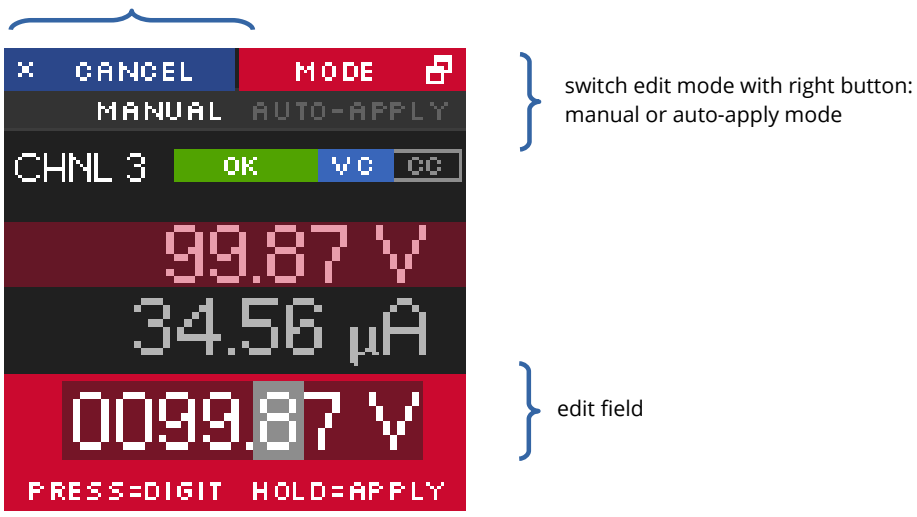
3.2.5 Channel Details

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

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*.

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: $I_{nom\text{-}low} < I_{meas} < I_{nom}$

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

The typical value for $I_{nom\text{-}low}$ 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: $I_{nom\text{-}low}$ = 20 µA ➞ current limitation is set to 24 µA if I_{set} = 10 µA

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 orded.

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 (T_{ref}) of the corresponding sensor and the set voltage as reference values.

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

$$\mathbf{V = V_{ref} + a \bullet (T - T_{ref})} \qquad \textbf{(a...VCT-coefficient)}$$

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 if 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 and in the manual iseg Hardware Abstraction Layer.

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 kΩ) the Default-State will be defined.

Case 1 - IU

INHIBIT: Default inactive (➞ high voltage is generated):

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

Switch off the HV by applying 0V on signal input

Case 2 - ID

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

➞ signal input has LOW - level ➞ 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 (➞ high voltage is generated):

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

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

Case 4 - NIU

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

➞ Signal input has HIGH - level ➞ 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 µA.

4.4 T10 – Lower temperature coefficient (HP only)

Improved temperature coefficient of 10ppm/K

5. Dimensional Drawings

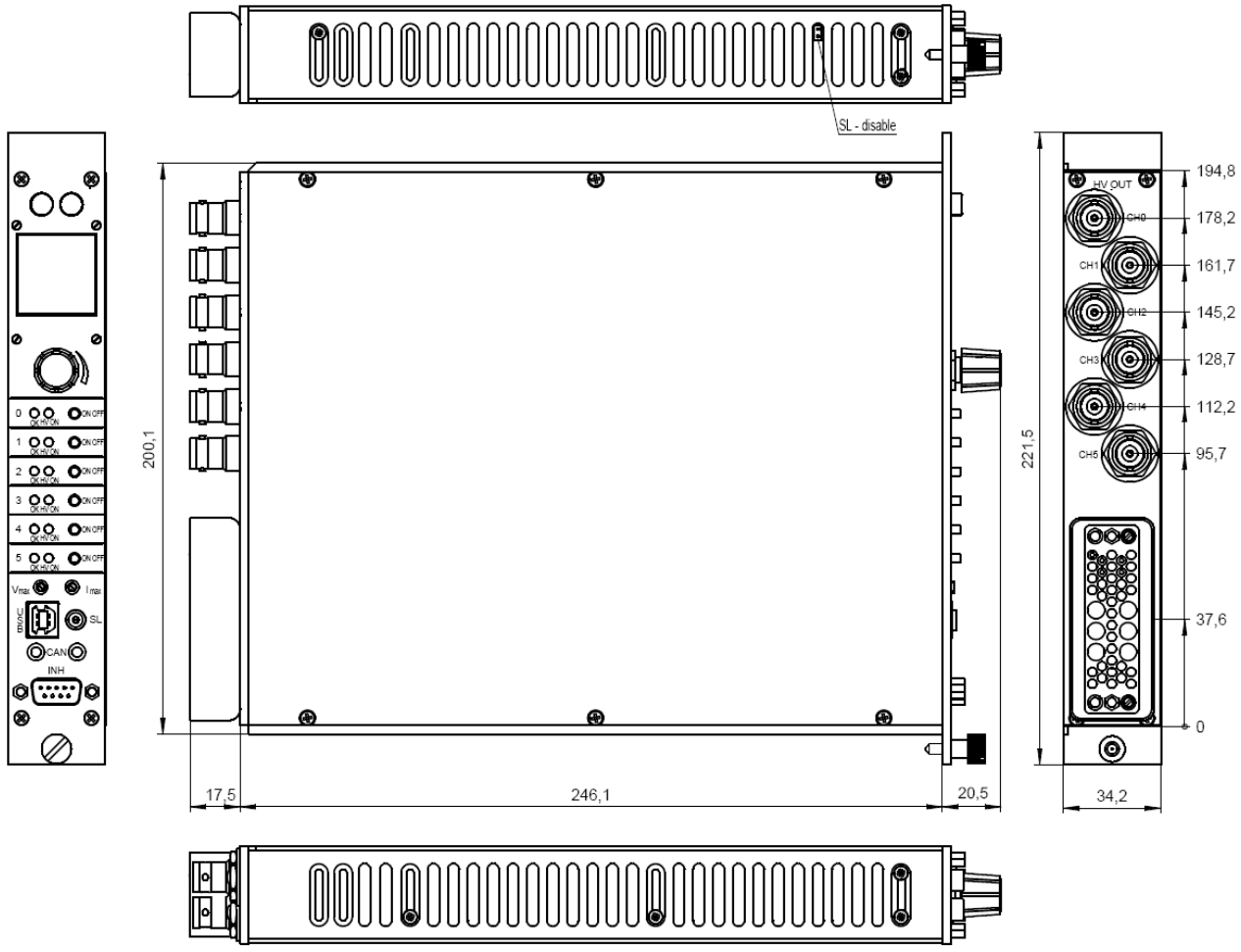


Figure 1: Dimensional Drawing NHS

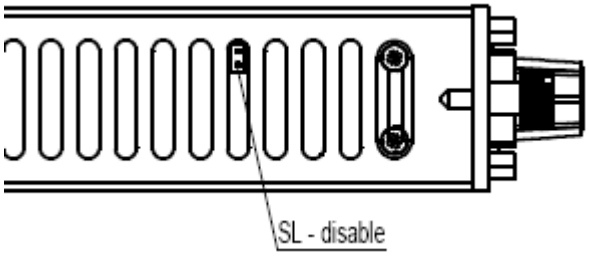


Figure 2: detailed view of Figure 1, Safety Loop (SL)

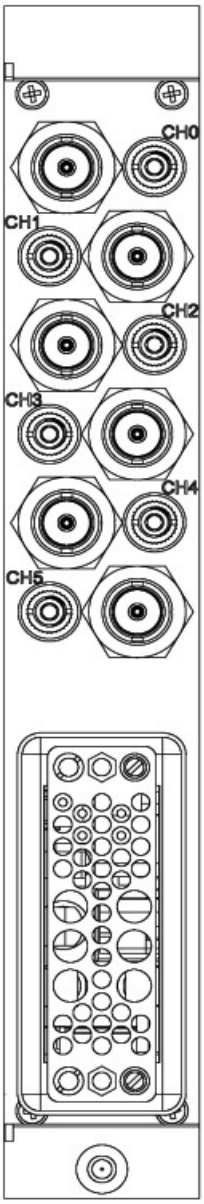
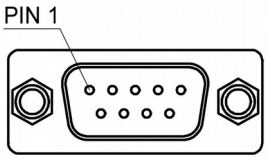


Figure 3: backplane with VCT option

6. Connectors and PIN assignments

HV CONNECTOR ASSIGNMENTS				
Name	SHV	S08	BNC	
Figure				

	INHIBIT		SAFETY LOOP	
Name	INHIBIT connector- DSUB9	INHIBIT connector- DSUB9	Safety Loop socket	
Figure				

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
S08 (RADIALL)			
Socket	R317.580.000	Connector	R317.005.000 / Z592474
BNC			
Socket	J01001C0028	Connector	J01000A0606
CAN			
Socket		Connector	KLS44
VCT sensor connector			
Socket		Connector	Jack plug 2.5mm
Safety Loop (LEMO)			
Socket		Connector	FGG.00.302.CLAD30

7. Accesories

CAUTION!
 CAUTION! Only use genuine iseg parts like power cables, CAN cables and terminators for stable and safe operation.

ACCESSORY ITEM	ORDER ITEM CODE
CAN to host: from Jack plug 3.5mm to D-SUB female	Z515404
CAN daisy-chain: from Jack plug 3.5mm to Jack plug 3.5mm	Z515554
VCT Sensor cable: 10m: from Jack plug 2.5mm (2pol) to Probe	Z585877
Lemo plug 2-pole (Safety Loop)	Z201466
SHV coupler screw for RG58	Z590162
SHV coupler screw for RG58 (>5kV)	Z592474

8. 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_C04-*LLL*
BNC	01	HV cable shielded 9kV (Lemo 106330)	open	BNC_C01-LLL
Notes: (*) *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 Series	Numbers of channels	Class	V_{nom}	Polarity	I_{nom} (nA)	Option (hex)	HV-Connector	Customized Version
		0 = Standard 2 = High Precision	three significante digits • 100V For Examle: 060 = 6000V	p = positive n = negative x = mix	two significante digits + number of zeros For Examle: 105 = 1mA	Sum of the hex codes (see Technical data: Options and order information)	01 = BNC 02 = SHV	00 = none

Table 10: Item code parts for different configurations

9. Appendix

For more information please use the following download links:

This document
https://iseg-hv.com/download/SYSTEM/NHS/iseg_manual_NHS_en.pdf
iCS (iseg Communication Server)
https://iseg-hv.com/download/?dir=SOFTWARE/iCS
SCPI Programmers-Guide
https://iseg-hv.com/download/SOFTWARE/isegSCPI/SCPI_Programmers-Guide.pdf
CAN EDCP Programmers-Guide
https://iseg-hv.com/download/SOFTWARE/isegEDCP/CAN_EDCP_Programmers-Guide.pdf
isegHAL (Hardware Abstraction Layer)
https://iseg-hv.com/download/SOFTWARE/iCS/doc/isegHAL/index.html
iCSservice-API
https://iseg-hv.com/download/SOFTWARE/iCS/doc/iCSservice/iCSapiWebsocket_Docu.html https://iseg-hv.com/download/SOFTWARE/iCS/doc/iCSservice/iCSapiWebsocket_Example.html
isegIOC (EPICS Input / Output Controller)
https://iseg-hv.com/download/SOFTWARE/iCS/doc/isegIOC/isegIOC_doc.pdf https://iseg-hv.com/download/SOFTWARE/iCS/doc/isegIOC/isegIOC_sampleScript.zip
isegTERMINAL
https://iseg-hv.com/download/SOFTWARE/isegTERMINAL/current/isegTerminal-win32-1.0.20.zip

10. 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 iseg 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.iseg-hv.com/en/support/rma

11. Manufacturer´s contact

iseg Spezialelektronik GmbH
Bautzner Landstr. 23
01454 Radeberg / OT Rossendorf
GERMANY
FON: +49 351 26996-0 | FAX: +49 351 26996-21
www.iseg-hv.com | info@iseg-hv.de |sales@iseg-hv.de