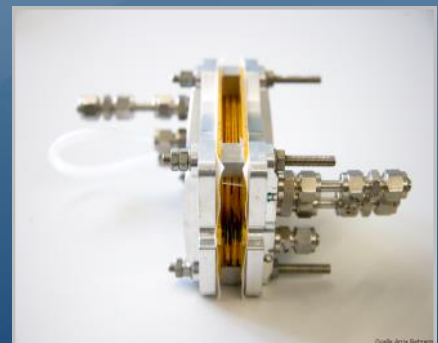


The Electronic Load



Source-Sink, NL Series

SCPI
96 Commands



Interface overview

RS-232	X
USB	X
GPIB	O
LAN	O
System bus	O
Analog	X
Analog isolated	O

X Standard O Option / not available



NL1V20C40

- 2-quadrant or 4-quadrant versions
- Source-sink function
- Rapid control time
- Current and voltage mode
- Adjustable limitations
- Analog measurement outputs for voltage and current
- Analog control inputs

- USB + RS-232 interface
- Programmable waveform
- SCPI programming with measurement function
- Software tools for battery testing

Operating Modes

The NL source-sinks can operate in constant voltage or constant current mode.

In voltage mode there are two current limiters (source current and sink current) which can be adjusted independently of one another. In current mode, an upper and a lower limit voltage can be set.

Source-sink Mode

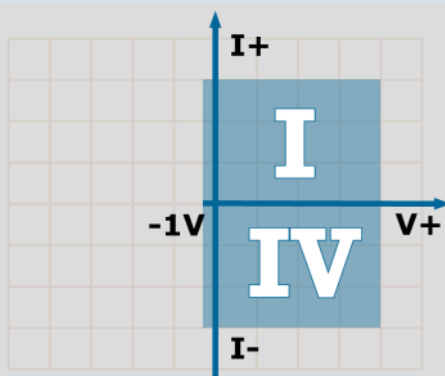
Depending on the preset output value and the characteristics of the connected test unit, the device automatically decides whether to operate as a source or a sink. Switching from source to sink mode is very rapid.

2-Quadrant / 4-Quadrant Mode

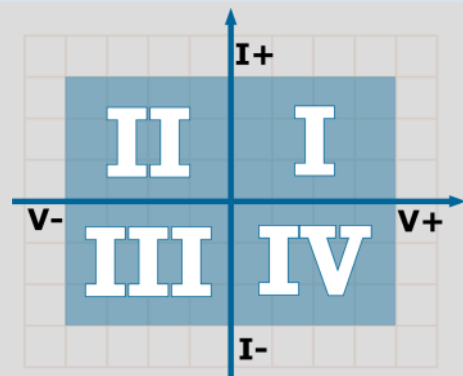
Devices for two-quadrant mode can supply or receive current with a positive output voltage. To guarantee the required function in the case of settings close to 0 V and long connection leads, the 2-quadrant devices start to operate from an output voltage of -1 V.

The 2-quadrant devices therefore also act as 4-quadrant devices but with limited negative voltage.

4-quadrant devices can be set by high negative values as well as positive values.



2-quadrant mode



4-quadrant mode

H&H
PL
ZS
ZSLC Water-cooled
ZSLV Low Voltage
PMLI Multi-channel
ZSAC AC
NL Source-Sink
Accessories
Application Notes
Software
GTC



NL1V44C22

Remote Control

All source-sink functions can be controlled remotely via the standard Analog I/O Interface. Operating mode selection, output on - off and adjustment of control speed can be set with logic levels. A version (NL06) which is electrically isolated from the output is optionally available.

3 Analog Control Inputs

Depending on the selected operating mode the output voltage or output current can be preset to a control voltage 0 ... ±5 V or 0 ... ±10 V DC. There are two further analog inputs available to limit the voltage or current.

2 Analog Measurement

Function Range for Programming

- Programming in SCPI Syntax
- Programmable voltage and current profiles
- Dynamic mode with adjustable rise and fall time
- Measured data memory
- Trigger functions
- Use of supplied software and LabVIEW driver

Outputs

For voltage and current there are 0...10 V analog measurement signals available. The signals follow the curve trajectory.

Cooling

The units are air-cooled. To keep the operating noise low, the fans are temperature and current-dependently controlled.

Mechanics

The NL series is a sturdy 19" rack design and can also be installed in a cabinet or act as a table-top device.

From 5 height units there are retractable handles on the top of the device.

Optional castors can be mount-

ed on heavy devices.

Separate installation kits are not needed for 19" rack installation.

Connections



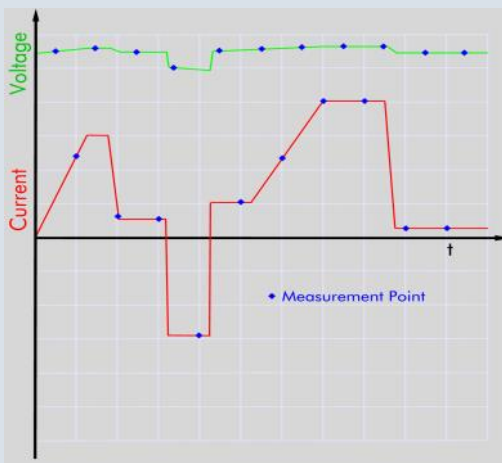
All connections are at the back. The current connections are pole terminals or solid copper rails with screw terminals.

4mm plugs, forked cable lugs and stripped cables can be used.



Safety

Covers are available for outputs as contact protection for units for dangerous contact voltages .



Data logging with constant scanning rate

LabVIEW®

H&H

PL

ZS

ZSLC
Water-cooled

ZSLV
Low Voltage

PMLI
Multi-channel

ZSAC
AC

NL
Source-Sink

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Hardware Expansions

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GPIO Interface Expansion ¹⁾ (Option ZS03)

With the ZS03 option the device can be expanded by a GPIO interface.

Simply insert the card.

(Supplied without GPIO cable.)



Ethernet-RS-232 ^{1) 3)} Converter (Option ZS15)

Data is sent via the LAN card to the serial interface of the unit.



Electrically Isolated Analog I/O Interface ¹⁾ (Option NL06)

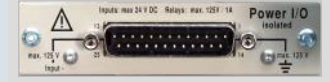
In the case of potential differences between the negative load input and the signals on the Analog I/O Interface the standard Analog I/O card can be replaced with an isolated version. All measurement and control signals are transmitted via isolation amplifiers and opto-couplers. The card is pin-compatible with the standard Analog I/O card. The isolation voltage is 500 V DC with respect to the negative load input.



Power I/O Card ^{1) 3)} (Option ZS07)

The Power I/O card can be expanded to control external devices. 8 relay contacts (N/O 125 V/1 A) can be actuated via the data interface and 8 logical inputs (5V ... 24V, shared GND) can be queried.

The inputs and outputs are isolated from the load input. The isolation voltage is 500 V DC with respect to the negative load input.



Temperature Interface ^{1) 3) 4)} (Option ZS16)

With the temperature interface card temperatures from 0...100 °C are captured by a NiCr-Ni (Type K) sensor and transformed into a 0 ... 10 VDC analog voltage. This analog voltage can be fed to the analog control input of the Analog I/O interface and read out via the data interface.



Castors ¹⁾ (Option ZS09)

Steerable castors can be screwed onto large devices for easier transport. A 19" rack can then often be dispensed with.

This option is available for devices from 5HU and is suitable only for hard floors.



Data Acquisition Tool (Option NL13) ^{2,3)}

The Data Acquisition Tool adds the following functions to the range of the device:

- Fast synchronized data logging for waveform generation with data memory
- Exponential inrush processes
- Battery capacity test
- MPP Tracking for solar panel test



Synchronized data logging with variable scanning rate for waveform. Simultaneous measurement of voltage and current.

Converter (in addition to 18 Bit standard A/D converter)	Fast A/D converter 13 Bit, measures voltage and current simultaneously
Sampling rate, Synchronization	min 200 µs, can be programmed separately for each wave section and synchronized with waveform generator
Measured data memory	2,000 V/I value pairs with timestamp

- 1) Can be retrofitted at any time.
- 2) Can only be retrofitted or produced by H&H.
- 3) Requires ZS01 oder ZS02
- 4) Requires Option NL13

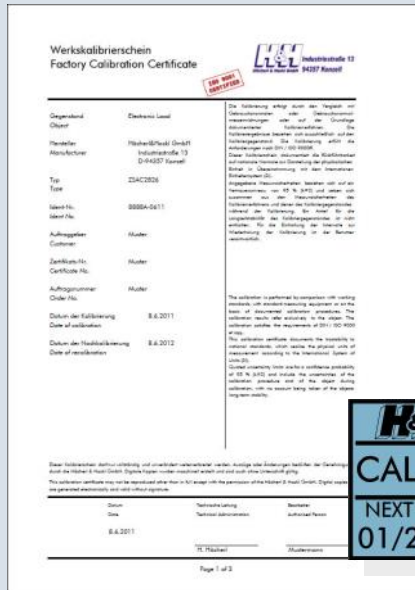
Calibration

Factory Calibration Certificate (Option FCC-NLxx) ¹⁾

A Factory Calibration Certificate (FCC) can be supplied with the devices.

The FCC meets the requirements according to DIN EN ISO 9000ff. This calibration certificate documents the traceability to national standards to illustrate the physical unit in accordance with the international device system (SI).

The recommended calibration interval is 1 year. We would be happy to calibrate your devices at regular intervals.



Software Tools

Control Tool (Universal Control Program)

Tool supplied as standard can be used to control single device.

Scope of functions:

- Device settings
- Data logging with numerical display
- Trigger source selection
- Activation of cut-off criteria
- Data logging



Dynamic List and Data Acquisition Tool

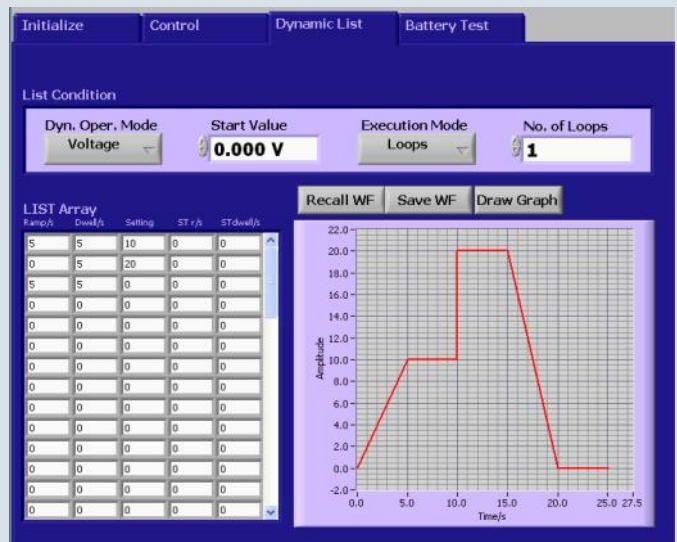
The Tool Dynamic List permits the intelligent generation of profiles in the form of straight sections.

The wave trajectory can be graphically displayed before testing.

The profiles set can be stored and re-activated when need-

ed.

If the NL13 option is installed, fast synchronous data logging can be carried out for the programmed wave trajectory. The measurement points can be imported directly after the end of the measurement.



1) Can only be produced by H&H.
(the FCC is more economical if ordered together with a new device)

H&H
PL
ZS
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ZSLV Low Voltage
PMLI Multi-channel
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Software Tools

Battery Test Tool

- Charging
- Discharging
- Cycling
- Capacity determination
- Logging
- Cut-off criteria
- Dynamic test

The Battery Test Tool enables the testing of the most diverse energy storage units to be tested with the NL series.

Different storage types and their technical data can be

saved in a library.¹⁾

At the end of charging or discharging phases there are different monitoring criteria.

- Current
- Time
- Capacity
- -dV/Cell
- External event (Option ZS07 required)²⁾

To test the DUT for specific requirement it is possible to apply a predefined waveform.

The most important current test information is available at a glance.

A report can be produced for documentation of the test.

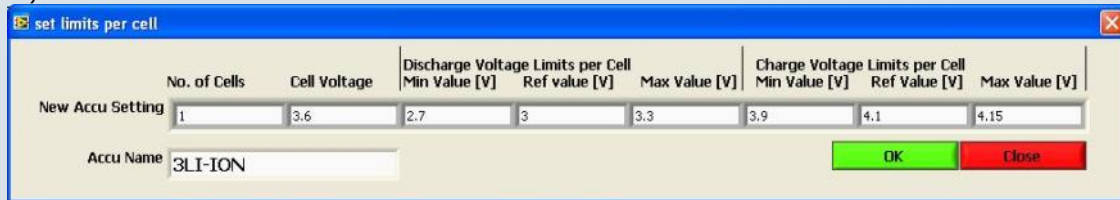
The time resolution can be adjusted from 300 ms onwards.

The data can be backed up to a text file for further processing, e.g. with MS Excel.

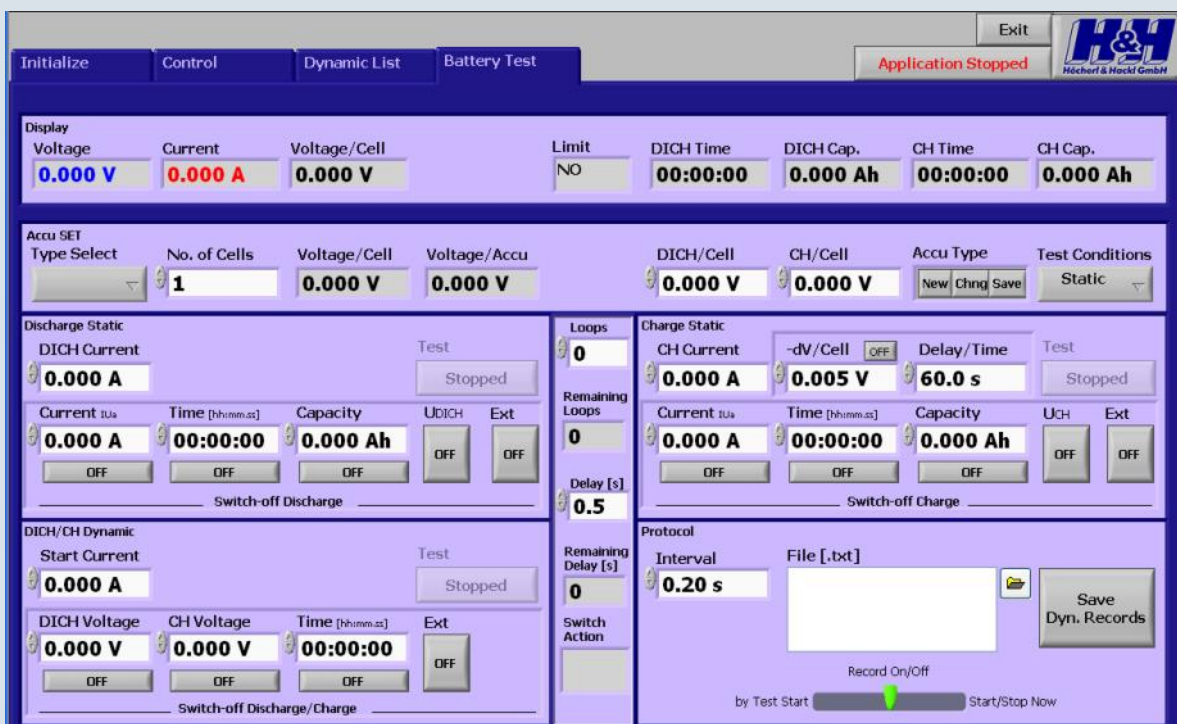
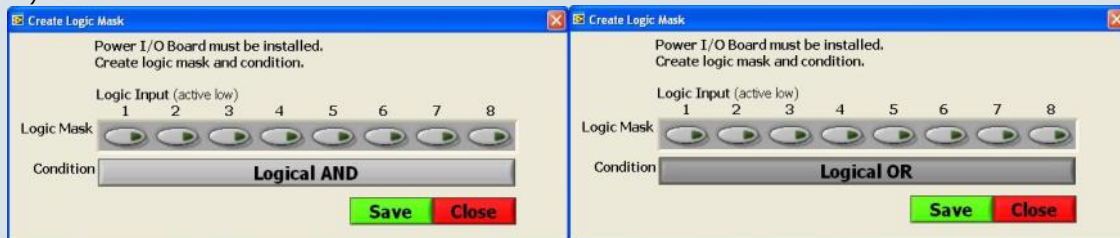
The following are logged:

- Voltage
- Current
- Time
- Capacity
- Status
- Test conditions
- Switch-off criteria

1)



2)



Type Overview of Unipolar Devices

Models up to 10 kW
on request

Model (order number)	NL1V10C20	NL1V20C10	NL1V30C8	NL1V42C6	NL1V80C3	NL1V100C2
Voltage	-1 V ... +10 V	-1 V ... +20 V	-1 V ... +30 V	-1 V ... +42 V	-1 V ... +80 V	-1 V ... +100 V
Current	±20 A	±10 A	±8 A	±6 A	±3 A	±2 A
Power	200 W	200 W	240 W	252 W	240 W	200 W
Rise/fall time ¹⁾	200 µs	200 µs	200 µs	200 µs	200 µs	200 µs
Connection ²⁾	PK4	PK4	PK4	PK4	PK4	PK4
Power consumption	426 VA	380 VA	380 VA	414 VA	380 VA	310 VA
Mains supply	115/230 VAC	115/230 VAC	115/230 VAC	115/230 VAC	115/230 VAC	115/230 VAC
W x H x D (mm) ³⁾	483 x 88 x 520	483 x 88 x 520	483 x 88 x 520	483 x 88 x 520	483 x 88 x 520	483 x 88 x 520
Weight	13 kg	13 kg	13 kg	13 kg	13 kg	13 kg
Housing ⁴⁾	19" - 2 HU	19" - 2 HU	19" - 2 HU	19" - 2 HU	19" - 2 HU	19" - 2 HU

Model (order number)	NL1V8C80	NL1V10C60	NL1V20C40	NL1V26C32	NL1V44C22	NL1V80C11	NL1V200C4	NL1V400C2
Voltage	-1 V ... +8 V	-1 V ... +10 V	-1 V ... +20 V	-1 V ... +26 V	-1 V ... +44 V	-1 V ... +80 V	-1 V ... +200 V	-1 V ... +400 V
Current	±80 A	±60 A	±40 A	±32 A	±22 A	±11 A	±4 A	±2 A
Power	640 W	600 W	800 W	832 W	968 W	880 W	800 W	800 W
Rise/fall time ¹⁾	200 µs	200 µs	200 µs	200 µs	200 µs	200 µs	400 µs	400 µs
Connection ²⁾	FK25	PK60	PK60	BM8	BM8	BM8	SB4	SB4
Power consumption	1,400 VA	1,325 VA	1,400 VA	1,300 VA	1,400 VA	1,255 VA	1,000 VA	1,000 VA
Mains supply	115/230 VAC	115/230 VAC	115/230 VAC	115/230 VAC	115/230 VAC	115/230 VAC	115/230 VAC	115/230 VAC
W x H x D (mm) ³⁾	483 x 222 x 561	483 x 222 x 520	483 x 222 x 520	483 x 132 x 520	483 x 132 x 520	483 x 132 x 520	483 x 132 x 520	483 x 132 x 520
Weight	32 kg	32 kg	32 kg	23 kg	23 kg	23 kg	35 kg	35 kg
Housing ⁴⁾	19" - 5 HU	19" - 5 HU	19" - 5 HU	19" - 3 HU	19" - 3 HU	19" - 3 HU	19" - 3 HU	19" - 3 HU

Model (order number)	NL1V8C160	NL1V10C120	NL1V20C80	NL1V26C60	NL1V44C40	NL1V80C20
Voltage	-1 V ... +8 V	-1 V ... +10 V	-1 V ... +20 V	-1 V ... +26 V	-1 V ... +44 V	-1 V ... +80 V
Current	±160 A	±120 A	±80 A	±60 A	±40 A	±20 A
Power	1,280 W	1,200 W	1,600 W	1,560 W	1,760 W	1,600 W
Rise/fall time ¹⁾	200 µs	200 µs	200 µs	200 µs	200 µs	200 µs
Connection ²⁾	FK25	FK25	FK25	PK60	PK60	PK60
Power consumption	2,700 VA	2,550 VA	2,700 VA	2,550 VA	2,700 VA	2,500 VA
Mains supply	230 VAC	230 VAC	230 VAC	230 VAC	230 VAC	230 VAC
W x H x D (mm) ³⁾	483 x 355 x 561	483 x 355 x 561	483 x 355 x 561	483 x 355 x 520	483 x 355 x 520	483 x 355 x 520
Weight	55 kg	55 kg	55 kg	55 kg	55 kg	55 kg
Housing ⁴⁾	19" - 8 HU	19" - 8 HU	19" - 8 HU	19" - 8 HU	19" - 8 HU	19" - 8 HU

Model (order number)	NL1V8C240	NL1V10C180	NL1V20C120	NL1V26C90	NL1V44C60	NL1V80C30
Voltage	-1 V ... +8 V	-1 V ... +10 V	-1 V ... +20 V	-1 V ... +26 V	-1 V ... +44 V	-1 V ... +80 V
Current	±240 A	±180 A	±120 A	±90 A	±60 A	±30 A
Power	1,920 W	1,800 W	2,400 W	2,340 W	2,640 W	2,400 W
Rise/fall time ¹⁾	200 µs	200 µs	200 µs	200 µs	200 µs	200 µs
Connection ²⁾	FK25	FK25	FK25	FK25	FK25	FK25
Power consumption	4,000 VA	3,775 VA	4,000 VA	3,775 VA	4,000 VA	3,350 VA
Mains supply	230/400 VAC - 16 A	230/400 VAC - 16 A	230/400 VAC - 16 A	230/400 VAC - 16 A	230/400 VAC - 16 A	230/400 VAC - 16 A
W x H x D (mm) ³⁾	483 x 488 x 561	483 x 488 x 561	483 x 488 x 561	483 x 488 x 561	483 x 488 x 561	483 x 488 x 561
Weight	80 kg	80 kg	80 kg	80 kg	80 kg	80 kg
Housing ⁴⁾	19" - 11 HU	19" - 11 HU	19" - 11 HU	19" - 11 HU	19" - 11 HU	19" - 11 HU

Model (order number)	NL1V8C320	NL1V10C240	NL1V20C160	NL1V26C120	NL1V44C80	NL1V80C40
Voltage	-1 V ... +8 V	-1 V ... +10 V	-1 V ... +20 V	-1 V ... +26 V	-1 V ... +44 V	-1 V ... +80 V
Current	±320 A	±240 A	±160 A	±120 A	±80 A	±40 A
Power	2,560 W	2,400 W	3,200 W	3,120 W	3,520 W	3,200 W
Rise/fall time ¹⁾	200 µs	200 µs	200 µs	200 µs	200 µs	200 µs
Connection ²⁾	FK25	FK25	FK25	FK25	FK25	FK25
Power consumption	5,300 VA	5,000 VA	5,300 VA	5,000 VA	5,100 VA	4,800 VA
Mains supply	230/400 VAC - 16 A	230/400 VAC - 16 A	230/400 VAC - 16 A	230/400 VAC - 16 A	230/400 VAC - 16 A	230/400 VAC - 16 A
W x H x D (mm) ³⁾	483 x 622 x 561	483 x 622 x 561	483 x 622 x 561	483 x 622 x 561	483 x 622 x 561	483 x 622 x 561
Weight	105 kg	105 kg	105 kg	105 kg	105 kg	105 kg
Housing ⁴⁾	19" - 14 HU	19" - 14 HU	19" - 14 HU	19" - 14 HU	19" - 14 HU	19" - 14 HU

1) Measured at short-circuited output terminals (current) and open output terminals (voltage). Tolerance ±20 %

2) FK25: Flat copper rail 25x10 mm with 4 mm hole and M10 and M12 screw fastenings

PK4: 4mm pole terminals
BM8: M8 screw fitting
PK60: Pole terminals for forked cable lug and 4mm jack

3) 19" rack installation, approx. 100 mm should be added to installation depth for rear cable connections. The weight of the devices means that sliding rails must be used for 19" rack installation.

4) 1 HU = 44.45 mm

H&H

PL

ZS

ZSLC
Water-cooled

ZSLV
Low Voltage

PMLI
Multi-channel

ZSAC
AC

NL
Source-Sink

Accessories

Application Notes

Software

GTC

Models up to 10 kW
on request

Type Overview of Bipolar Devices

H&H
PL
ZS
ZSLC Water-cooled
ZSLV Low Voltage
PMLI Multi-channel
ZSAC AC
NL Source-Sink
Accessories
Application Notes
Software
GTC

Model (order number)	NL10V10C10	NL20V20C5	NL30V30C3.5	NL50V50C2
Voltage	±10 V	±20 V	±30 V	±50 V
Current	±10 A	±5 A	±3,5 A	±2 A
Power	100 W	100 W	105 W	100 W
Rise/fall time ¹⁾	200 µs	200 µs	200 µs	200 µs
Current Voltage	200 µs	200 µs	200 µs	200 µs
Connection ²⁾	PK4	PK4	PK4	PK4
Power consumption	270 VA	250 VA	235 VA	220 VA
Mains supply	115/230 VAC	115/230 VAC	115/230 VAC	115/230 VAC
W x H x D (mm) ³⁾	483 x 88 x 520	483 x 88 x 520	483 x 88 x 520	483 x 88 x 520
Weight	13 kg	13 kg	13 kg	13 kg
Housing ⁴⁾	19" - 2 HU	19" - 2 HU	19" - 2 HU	19" - 2 HU

Model (order number)	NL8V8C46	NL10V10C38	NL20V20C24	NL30V30C16	NL44V44C11	NL100V100C4	NL200V200C2
Voltage	±8 V	±10 V	±20 V	±30 V	±44 V	±100 V	±200 V
Current	±46 A	±38 A	±24 A	±16 A	±11 A	±4 A	±2 A
Power	368 W	380 W	480 W	432 W	484 W	400 W	400 W
Rise/fall time ¹⁾	200 µs	200 µs	200 µs	200 µs	200 µs	400 µs	400 µs
Current Voltage	200 µs	200 µs	200 µs	200 µs	200 µs	400 µs	400 µs
Connection ²⁾	BM8	BM8	BM8	BM8	BM8	SB4	SB4
Power consumption	740 VA	763 VA	770 VA	770 VA	710 VA	600 VA	600 VA
Mains supply	115/230 VAC	115/230 VAC	115/230 VAC	115/230 VAC	115/230 VAC	115/230 VAC	115/230 VAC
W x H x D (mm) ³⁾	483 x 132 x 520	483 x 132 x 520	483 x 132 x 520	483 x 132 x 520	483 x 132 x 520	483 x 132 x 520	483 x 132 x 520
Weight	23 kg	23 kg	23 kg	23 kg	23 kg	35 kg	35 kg
Housing ⁴⁾	19" - 3 HU	19" - 3 HU	19" - 3 HU	19" - 3 HU	19" - 3 HU	19" - 3 HU	19" - 3 HU

Model (order number)	NL8V8C80	NL10V10C60	NL20V20C40	NL30V30C32	NL44V44C20
Voltage	±8 V	±10 V	±20 V	±30 V	±44 V
Current	±80 A	±60 A	±40 A	±32 A	±20 A
Power	640 W	600 W	800 W	960 W	880 W
Rise/fall time ¹⁾	200 µs	200 µs	200 µs	200 µs	200 µs
Current Voltage	200 µs	200 µs	200 µs	200 µs	200 µs
Connection ²⁾	FK25	PK60	PK60	PK60	PK60
Power consumption	1,500 VA	1,425 VA	1,500 VA	1,660 VA	1,380 VA
Mains supply	115/230 VAC	115/230 VAC	115/230 VAC	115/230 VAC	115/230 VAC
W x H x D (mm) ³⁾	483 x 355 x 561	483 x 355 x 520	483 x 355 x 520	483 x 355 x 520	483 x 355 x 520
Weight	55 kg	55 kg	55 kg	55 kg	55 kg
Housing ⁴⁾	19" - 8 HU	19" - 8 HU	19" - 8 HU	19" - 8 HU	19" - 8 HU

Model (order number)	NL8V8C120	NL10V10C90	NL20V20C60	NL30V30C48	NL44V44C30
Voltage	±8 V	±10 V	±20 V	±30 V	±44 V
Current	±120 A	±90 A	±60 A	±48 A	±30 A
Power	960 W	900 W	1,200 W	1,440 W	1,320 W
Rise/fall time ¹⁾	200 µs	200 µs	200 µs	200 µs	200 µs
Current Voltage	200 µs	200 µs	200 µs	200 µs	200 µs
Connection ²⁾	FK25	FK25	FK25	FK25	FK25
Power consumption	2,200 VA	2,088 VA	2,200 VA	2,340 VA	2,200 VA
Mains supply	230 VAC	230 VAC	230 VAC	230 VAC	230 VAC
W x H x D (mm) ³⁾	483 x 488 x 561	483 x 488 x 561	483 x 488 x 561	483 x 488 x 561	483 x 488 x 561
Weight	80 kg	80 kg	80 kg	80 kg	80 kg
Housing ⁴⁾	19" - 11 HU	19" - 11 HU	19" - 11 HU	19" - 11 HU	19" - 11 HU

Model (order number)	NL8V8C160	NL10V10C120	NL20V20C80	NL30V30C64	NL44V44C40
Voltage	±8 V	±10 V	±20 V	±30 V	±44 V
Current	±160 A	±120 A	±80 A	±64 A	±40 A
Power	1,280 W	1,200 W	1,600 W	1,920 W	1,760 W
Rise/fall time ¹⁾	200 µs	200 µs	200 µs	200 µs	200 µs
Current Voltage	200 µs	200 µs	200 µs	200 µs	200 µs
Connection ²⁾	FK25	FK25	FK25	FK25	FK25
Power consumption	2,900 VA	2,750 VA	2,900 VA	3,120 VA	2,900 VA
Mains supply	230 VAC	230 VAC	230 VAC	230 VAC	230 VAC
W x H x D (mm) ³⁾	483 x 622 x 561	483 x 622 x 561	483 x 622 x 561	483 x 622 x 561	483 x 622 x 561
Weight	105 kg	105 kg	105 kg	105 kg	105 kg
Housing ⁴⁾	19" - 14 HU	19" - 14 HU	19" - 14 HU	19" - 14 HU	19" - 14 HU

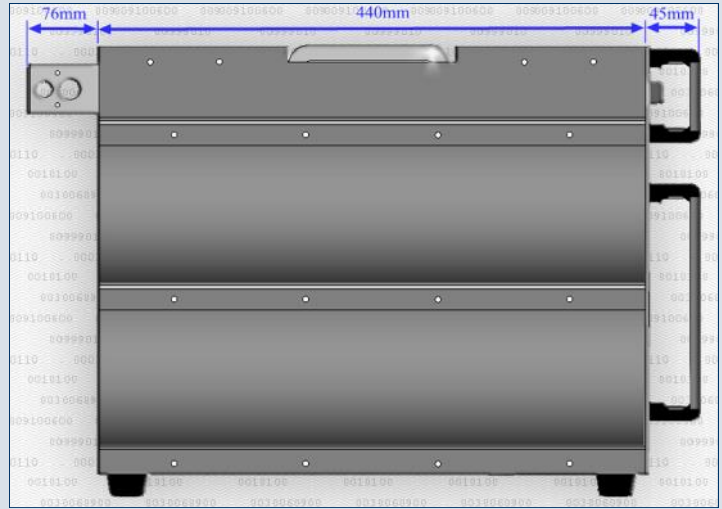
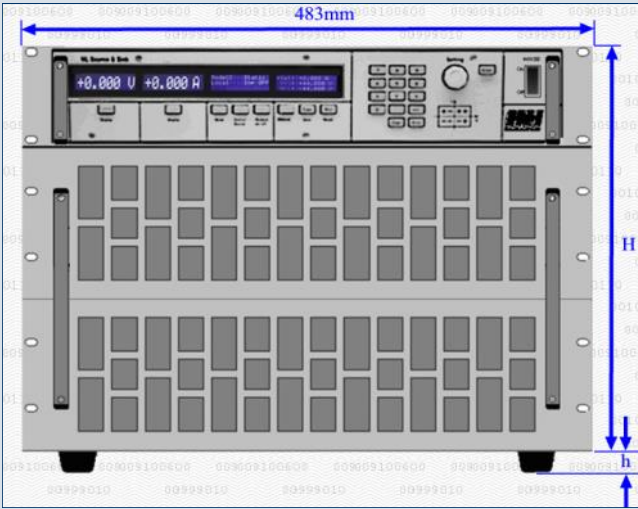
1) Measured at short-circuited output terminals (current) and open output terminals (voltage). Tolerance ±20 %
 2) FK25: Flat copper rail 25x10 mm with 4 mm hole and M10 and M12 screw fastenings

PK4: 4mm pole terminals
 BM8: M8 screw fitting
 PK60: Pole terminals for forked cable lug and 4mm jack

3) 19" rack installation, approx. 100 mm should be added to installation depth for rear cable connections. The weight of the devices means that sliding rails must be used for 19" rack installation.

4) 1 HU = 44.1 HE = 44,45 mm

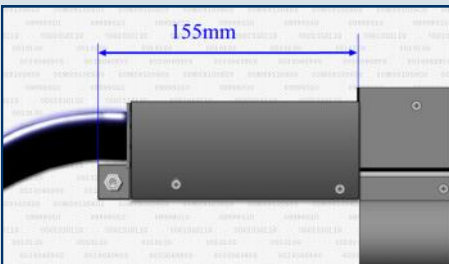
Dimensions



NL device with FK25 connections

h: Standard:	15 mm
Mit ZS09 option (castors):	45 mm

Size	2 HU	3 HU	5 HU	8 HU	11 HU	14 HU
H (mm)	88	133	222	355	488	622



Dimension of terminals when using protective cover

In the case of 19" rack systems, sliding rails are needed due to weight.

H&H
PL
ZS
ZSLC Water-cooled
ZSLV Low Voltage
PMLI Multi-channel
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Technical Data NL series

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Accuracy of setting		
	of the setting value	of the corresponding range
Voltage	±0.1 %	±0.05 %
Current	±0.2 %	±0.05 %
Voltage protection	±0.1 %	±0.05 %
Current protection	±0.2 %	±0.05 %
Resolution of setting	16 Bits	
Ripple	0.05 % RMS from range	
Load Effect 0-100 %	0.1 %	
Line Effect ±10 %	0.02 %	
Accuracy of display		
	of the measured value (real value)	of the corresponding range
Voltage	±0.1 %	±0.05 % ±1 digit
Current	±0.2 %	±0.05 % ±1 digit
Resistance	Quotient of voltage and current	
Power	Product of voltage and current	
Accuracy analog control -5 V ... 0 ... +5 V / -10 V ... 0 ... +10 V for current, voltage		
	of the setting value	of the corresponding range
Voltage	±0.2 %	±0.15 %
Current	±0.4 %	±0.15 %
Voltage protection * (upper and lower)	±0.2 %	±0.15 %
Current protection * (upper and lower)	±0.4 %	±0.15 %
* -10 V ... 0 ... +10 V only Input resistance of analog inputs >10 kΩ GND max. ±2 V with respect to negative load input ¹⁾		
Accuracy of analog measurement outputs		
	of analog signal of real value	Offset voltage
Voltage	±0.1 %	±15 mV
Current	±0.2 %	±15 mV
GND max. ±2 V with respect to negative output ¹⁾ Minimum load capacity 2kΩ		
Output		
Input resistance	>50 kΩ in standby	
Input capacity	approx. 1.5 μF / 1,400 W	
Parallel operation	up to 3 devices in Master-Slave mode (hardware-controlled only in current mode)	
Permissible operating voltage	negative input - case: ±125 V DC GND Analog I/O interface - neg. output: ±2 V DC with option NL06 GND Analog I/O interface - neg. output: ±125 V DC	
Protective devices	Over-current and over-power protection Over-temperature cut-off	
Rated power	up to T _A = 21 °C	
Derating	-1.2 %/°C for T _A > 21 °C	
External control functions	Standby Operating mode change Trigger input and output Remote shut down	

Accuracy of measurement		
	of the measured value (real value)	of the corresponding range
Voltage	±0.1 %	±0.05 %
Current	±0.2 %	±0.05 %
Resolution	18 bits	
Sampling rate (not synchronized)	330 ms, not triggerable	
Accuracy of measurement with Data Acquisition Tool (Option NL13), read out via data interface		
	of the measured value (real value)	of the corresponding range
Voltage	±0.15 %	±0.07 %
Current	±0.3 %	±0.07 %
Resolution	13 bits	
Sampling rate (programmable)	minimal 200 μs (in memory) triggerable	
Operating conditions		
Operating temperature	5 °C ... 40 °C	
Cooling	Current and temperature-controlled fans (airflow from front panel to back panel)	
Noise	see type overview	
Supply voltage	115/230 V~ ±10 %, 50 ... 60 Hz 230/400 V AC - 16 A CEE ²⁾	
Dimensions, weight	see type overview and table, page 51/52	
Color: Front panel side panels, top	RAL7032 (pebble grey) RAL7037 (stone grey)	
Electrical safety	DIN EN 61010-1	
EMC, CE mark	DIN EN 61326-1 DIN EN 61000-3-2 DIN EN 61000-3-3	
Measuring instrument category	CAT I	
Warranty	2 years	

1) ±125 V with NL06 option
2) Class C protective equipment recommended due to high switch-on currents

Subject to technical modifications



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