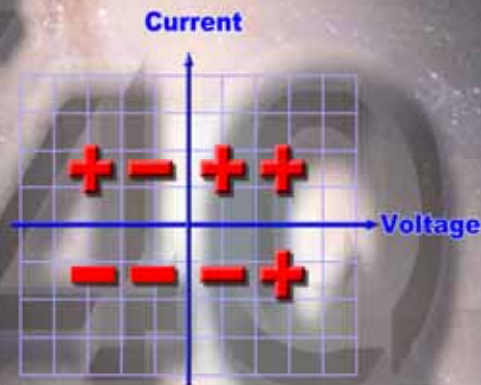
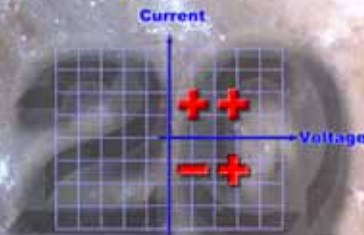


# NL Source-Sinks

**H&H**  
Höcherl & Hackl GmbH



## Description

The Source-Sinks of the NL series are four-quadrant power supply units designed for practical use within laboratories as well as in the fields of production and quality assurance.

Each linearly regulated Source-Sink is therefore a voltage/current source as well as a current sink in a single device.

The various types cover a voltage range of up to  $\pm 50V$  (bipolar) and up to 100V (unipolar), at currents of up to 320A. Power ratings ranging from 100W to 3,520W are available. If possible, we produce units with higher power ratings upon request.

The unipolar version of the Source-Sink features a restricted four-quadrant operating mode and allows a negative output voltage of up to -1V. This technical facility makes it possible to compensate voltage drops across the device's supply lines.

The required voltage/current values as well as the limit values can be entered and set via the digital user interface, the digital communication interfaces or the analog interface.

The devices feature RS232, USB as well as a practical analog interface as standard.

The devices in the NL range stand out with their excellent dynamic characteristics and rapid quadrant switching.

The Source-Sinks can also be adapted to suit your requirements at a later date.

With their robust mechanical housings, the devices are designed for industrial 19" rack installation or for use as bench-top units.



## Specifications

Power range:	100W ... 3,520W	
Voltages:	Unipolar: -1V ... +100V Bipolar: $\pm 8V$ ... $\pm 44V$	
Currents:	$\pm 2A$ ... $\pm 320A$	
Operating modes:	Current	CC
	Voltage	CV
Limitations:	Maximum voltage in CC Maximum current in CV	
Source-Sink mode:	Can be switched within a few $\mu s$	
Cooling:	Current and temperature-controlled fan cooling system	
Analog interface:	Standard (Optionally available with galvanic isolation)	
Data interfaces:	Standard: RS232 (SCPI) USB (Virtual COM Port) Software tools	
	Optional:	GPIB (SCPI)
Accessories:	Relay contacts Logic inputs Fast data acquisition	

## Applications

### For testing

- Batteries and accumulators
- Generators
- Solar panels
- Electrical drive systems
- Battery chargers
- Power supplies
- Electrical components

### As well as for carrying out

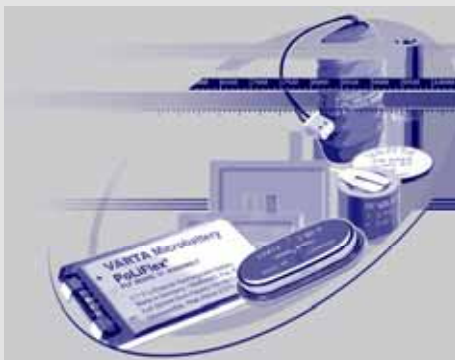
- Load simulations
- Dynamic tests
- Lifetime tests

# Model Overview - NL Series

Unipolar *			Bipolar		
Voltage	Current	Model	Voltage	Current	Model
8V	±80A	NL1V8C80	±8V	±40A	NL8V8C40
8V	±160A	NL1V8C160	±8V	±80A	NL8V8C80
8V	±240A	NL1V8C240	±8V	±120A	NL8V8C120
8V	±320A	NL1V8C320	±8V	±160A	NL8V8C160
10V	±20A	NL1V10C20	±10V	±10A	NL10V10C10
10V	±60A	NL1V10C60	±10V	±30A	NL10V10C30
10V	±120A	NL1V10C120	±10V	±60A	NL10V10C60
10V	±180A	NL1V10C180	±10V	±90A	NL10V10C90
10V	±240A	NL1V10C240	±10V	±120A	NL10V10C120
20V	±10A	NL1V20C10	±20V	±5A	NL20V20C5
20V	±40A	NL1V20C40	±20V	±20A	NL20V20C20
20V	±80A	NL1V20C80	±20V	±40A	NL20V20C40
20V	±120A	NL1V20C120	±20V	±60A	NL20V20C60
20V	±160A	NL1V20C160	±20V	±80A	NL20V20C80
			±24V	±18A	NL24V24C18
			±24V	±36A	NL24V24C36
			±24V	±54A	NL24V24C54
			±24V	±72A	NL24V24C72
26V	±30A	NL1V26C30			
26V	±60A	NL1V26C60			
26V	±90A	NL1V26C90			
26V	±120A	NL1V26C120			
30V	±8A	NL1V30C8	±30V	±3.5A	NL30V30C3.5
42V	±6A	NL1V42C6			
44V	±20A	NL1V44C20	±44V	±10A	NL44V44C10
44V	±40A	NL1V44C40	±44V	±20A	NL44V44C20
44V	±60A	NL1V44C60	±44V	±30A	NL44V44C30
44V	±80A	NL1V44C80	±44V	±40A	NL44V44C40
			±50V	±2A	NL50V50C2
80V	±3A	NL1V80C3			
80V	±10A	NL1V80C10			
80V	±20A	NL1V80C20			
80V	±30A	NL1V80C30			
80V	±40A	NL1V80C40			
100V	±2A	NL1V100C2			

\* The operating range of the unipolar devices starts at -1V

## Areas of Application



Testing batteries and accumulators



Testing the lifetime of energy storage devices



Testing electrical drive systems





## Operating modes

The NL Source-Sinks are capable of operating in constant voltage or constant current mode. When a device is operating in voltage mode, two current limitations (source current and sink current) can be set independently of each other. In contrast, an upper and a lower voltage limitation can be set when a device is operating in current mode.

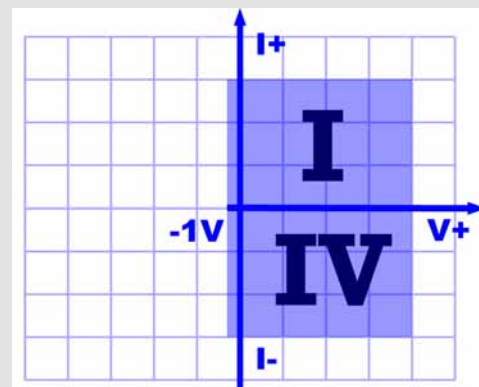
## Source-Sink mode

Depending on the output setting and the characteristics of the item being tested, the device automatically determines whether it will operate as a source or as a sink. The switch from the source to sink mode occurs rapidly.

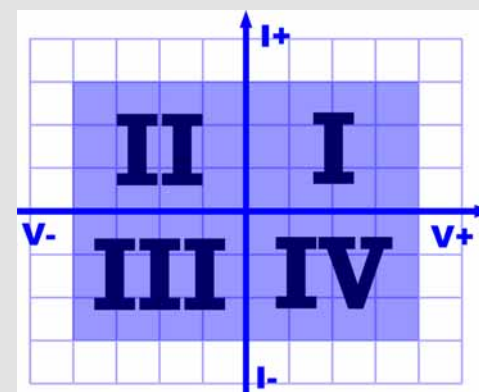
## Two-quadrant / four-quadrant mode

Devices designed for two-quadrant operation can supply current or be fed with current in a reverse direction when the output voltage is positive. In order to ensure that the two-quadrant devices function properly when the voltage is set close to 0V and long connecting cables are used, they are able to operate from an output voltage of -1V. As a result, the two-quadrant devices are also capable of functioning as four-quadrant devices, albeit with a limited negative voltage range.

Four-quadrant devices can be set to negative and positive values of equal magnitude.

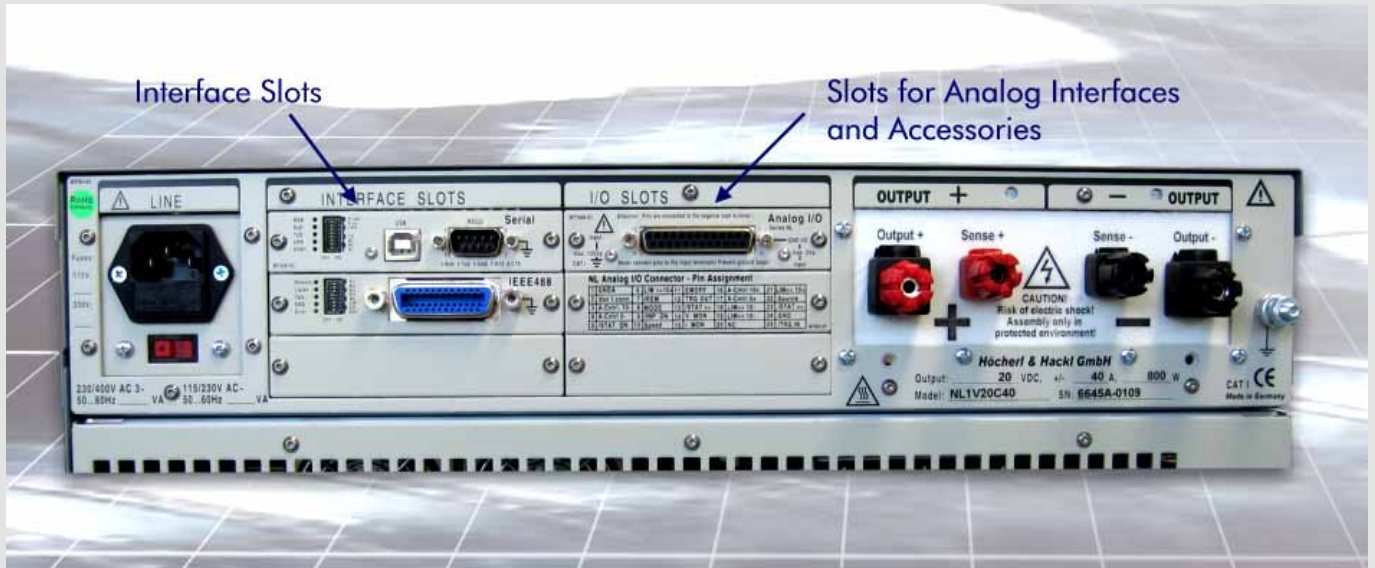


Two-quadrant mode



Four-quadrant mode





## Remote control

All of the Source-Sink's functions can be remote controlled via the analog I/O connector provided as standard. The operating mode and output on/off functions as well as the settings for the control rate can be configured on the basis of logic levels. A version which is galvanically isolated from the output is optionally available (NL06).

## Analog control inputs

Depending on the operating mode selected, the output voltage or the output current can be regulated with a control voltage of 0 ...  $\pm 5V$  or 0 ...  $\pm 10V$  DC. Two additional analog inputs are available for limiting voltage or current.

## Analog measurement outputs

Analog measurement signals (0 ...  $\pm 10V$ ) are available for voltage and current. The signals follow the waveform.

## Cooling

The devices are air-cooled. In order to minimize operating noise, the fans are controlled according to power and current.

## Mechanical housings

The devices of the NL series are supplied in robust 19" rack mount case. They are also suitable for use as bench-top units and for installation in cabinets. For models measuring five height units or more, retractable heavy-duty carrying handles are provided on the top of the device. Castors can optionally be fitted to heavy devices. No additional installation sets are required for 19" installation.



Retractable handles

## Terminals

All terminals are arranged at the rear of the device. The current connections are in the form of pole binders or solid copper bars with screw terminals. 4 mm connectors, forked lugs and stripped cables can be used.



Device terminals

## Safety

Covers to prevent accidental contact with the outputs are available for devices designed to handle dangerous output voltages.

## Interfaces

### RS232 + USB interface

RS232 + USB<sup>1)</sup> interfaces are installed as standard. The interface connectors are galvanically isolated from the device's output terminals.

The interfaces are programmed in SCPI. An RS232 cable is supplied.



Plug-in interface boards

If necessary, the GPIB interface (option ZS03) can be retrofitted by plugging in an additional board.

<sup>1)</sup> Controllable as virtual COM port with WIN98 / ME / 2000 / XP / VISTA / WIN7



## GPIB interface extension<sup>1)</sup> (Option ZS03)



The ZS03 option enables you to upgrade your device by adding a GPIB interface. The board is simply plugged into the free interface slot. No GPIB cable included.

## Galvanically isolated analog interface<sup>1)</sup> (Option NL06)



If there are potential differences between GND of the Source-Sink and the signals at the Analog I/O connector, the standard Analog I/O card can be exchanged for an isolated version. All measuring and controlling signals are connected via isolating amplifiers and optocouplers. The card is pin compatible with the standard Analog I/O card.

The isolation voltage is 125 V DC against Output -.

## Power I/O board<sup>1)</sup> (Option ZS07)



In order to control external equipment, the load can be upgraded with the Power I/O board. 8 relay contacts (make contact 125V/1A) can be triggered and 8 logic inputs (5V ... 24V, common GND) can be queried via the data interface. The outputs and inputs are isolated from the device output.

The isolation voltage is 125 V DC against Output -.

## Castors<sup>1)</sup> (Option ZS09)



Castors can be fitted to heavier devices for easier transportation. As a result, a 19" cabinet is often not required. This option is available for devices with at least 5HUs and is suitable for hard floors only.

## Factory calibration report<sup>2)</sup> (Option NL11)

A factory calibration report is available for all devices. The recommended calibration interval is one year. We will be pleased to calibrate your devices at regular intervals.



NL1V10C20

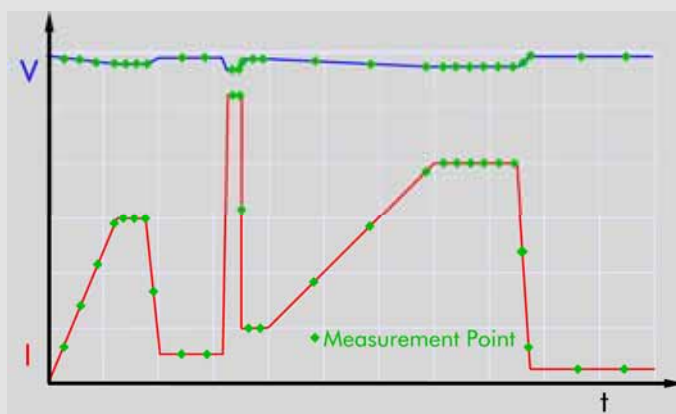
## Data acquisition tool (Option NL13)<sup>2)</sup>

The Data acquisition tool extends the function scope of the devices by the following:

- Fast data acquisition with memory, synchronized to the waveform generator

### Fast data acquisition (switchable)

Converter: (in addition to the standard 18 bit AD converter)	13 bit fast AD measures voltage and current simultaneously
Reading rate, synchronisation:	min 200µs, independently programmable for any section of the waveform, and can be synchronized with the waveform generator
Memory <sup>3)</sup> (internal):	2000 V/I values with timestamp



Data acquisition with variable reading rate synchronized with the programmed waveform. Simultaneous reading of voltage and current.



- 1) Can be retrofitted at any time.
- 2) Can be retrofitted only on H&H's premises.
- 3) Can be read out after processing.

The following software tools and drivers are included along with the interfaces:

## Control Tool (universal control program)

This tool allows you to control a single device

Functions:

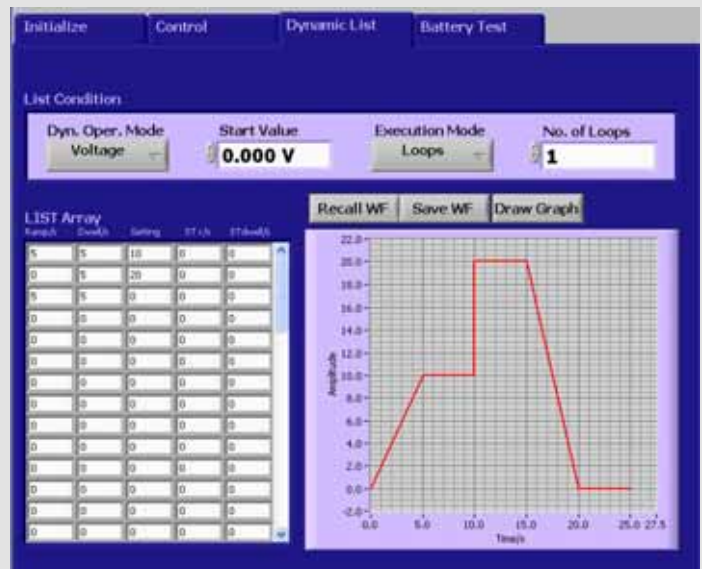
- Device settings
  - Operating mode
  - Limit values
  - Control source
  - Regulation speed
- Measurement data acquisition with numerical display
- Trigger source
- Activating switch-off criteria
  - Time
  - Upper/lower limitation
- Logging date
  - Time
  - Voltage
  - Current
  - Status



## Dynamic List and Data Acquisition Tool

The Dynamic List Tool provides a convenient way of producing profiles in the form of straight sections. You can display the load curve in graphical form before testing is carried out. The profiles can also be saved and called up again at a later date

If the NL13 option is installed, you can also program the values obtained via fast measurement data acquisition for the load waveform displayed. The measuring points recorded can be read in as soon as the measuring process is complete.



Drivers

# LabVIEW®



# Software Tools

## Battery Test Tool

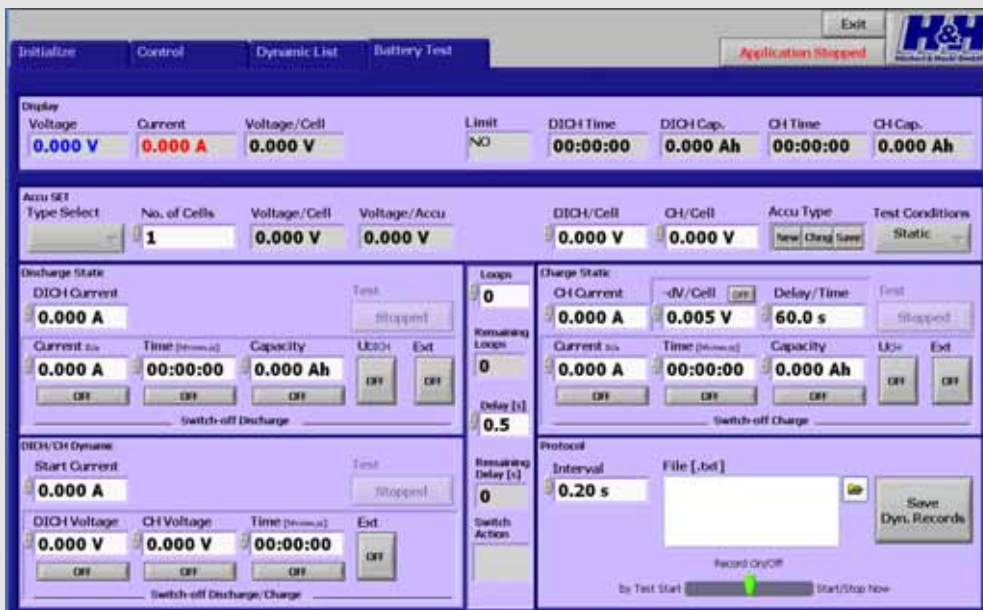
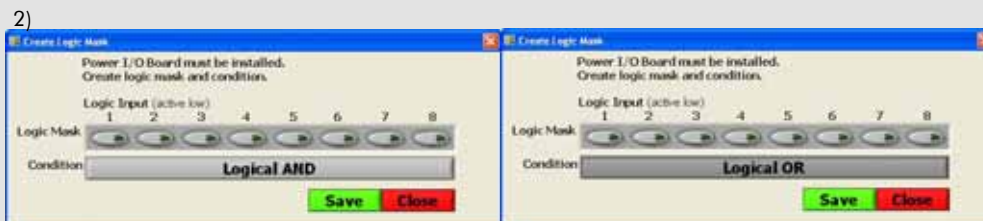
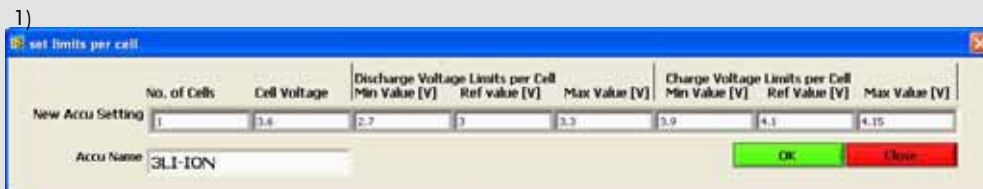
- Charging
- Discharging
- Cycling
- Determining capacity
- Logging
- Switch-off criteria
- Dynamic test

The battery test tool enables you to test an extremely wide range of energy storage devices using the devices of the NL series

- Various storage device types and their limit values can be saved in a library.<sup>1)</sup>
- There are various monitoring criteria for ending the charging or discharging phases :
  - Current
  - Time
  - Capacity
  - -dV/cell
  - External event (Option ZS07 required)<sup>2)</sup>

- You can also apply a predefined waveform to an item in order to test it for specific requirements.
- The most important current testing information is available at a glance.
- You can produce a log in order to document the test procedure. The time resolution is variable and can be set to 300ms or higher. The data are saved in a text file and can subsequently be edited using MS Excel for example .

- The following data are logged :
  - Voltage
  - Current
  - Time
  - Capacity
  - Status
  - Test conditions
  - Switch-off criteria



# Type Overview - Unipolar Devices

Model (Order-No.)	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 <sup>1)</sup>	Current	200 µs	200 µs	200 µs	200 µs	200 µs
	Voltage	200 µs	200 µs	200 µs	200 µs	200 µs
Terminals <sup>2)</sup>	PK4	PK4	PK4	PK4	PK4	PK4
Power consumption	450 VA	400 VA	460 VA	438 VA	415 VA	363 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) <sup>3)</sup>	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
Case <sup>4)</sup>	19"-2 HU	19"-2 HU	19"-2 HU	19"-2 HU	19"-2 HU	19"-2 HU

Model (Order-No.)	NL1V8C80	NL1V10C60	NL1V20C40	NL1V26C30	NL1V44C20	NL1V80C10
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	±80 A	±60 A	±40 A	±30 A	±20 A	±10 A
Power	640 W	600 W	800 W	780 W	880 W	800 W
Rise-/fall time <sup>1)</sup>	Current	200 µs	200 µs	200 µs	200 µs	200 µs
	Voltage	200 µs	200 µs	200 µs	200 µs	200 µs
Terminals <sup>2)</sup>	FK25	PK60	PK60	PK60	PK60	PK60
Power consumption	1,400 VA	1,325 VA	1,400 VA	1,325 VA	1,400 VA	1,250 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) <sup>3)</sup>	483 x 222 x 561	483 x 222 x 520	483 x 222 x 520	483 x 222 x 520	483 x 222 x 520	483 x 222 x 520
Weight	32 kg	32 kg	32 kg	32 kg	32 kg	32 kg
Case <sup>4)</sup>	19"-5 HU	19"-5 HU	19"-5 HU	19"-5 HU	19"-5 HU	19"-5 HU

Model (Order-No.)	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 <sup>1)</sup>	Current	200 µs	200 µs	200 µs	200 µs	200 µs
	Voltage	200 µs	200 µs	200 µs	200 µs	200 µs
Terminals <sup>2)</sup>	FK25	FK25	FK25	PK60	PK60	PK60
Power consumption	2,700 VA	2,550 VA	2,700 VA	2,550 VA	2,700 VA	2,400 VA
Mains supply	230 VAC	230 VAC	230 VAC	230 VAC	230 VAC	230 VAC
W x H x D (mm) <sup>3)</sup>	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
Case <sup>4)</sup>	19"-8 HU	19"-8 HU	19"-8 HU	19"-8 HU	19"-8 HU	19"-8 HU

Model (Order-No.)	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 <sup>1)</sup>	Current	200 µs	200 µs	200 µs	200 µs	200 µs
	Voltage	200 µs	200 µs	200 µs	200 µs	200 µs
Terminals <sup>2)</sup>	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) <sup>3)</sup>	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
Case <sup>4)</sup>	19"-11 HU	19"-11 HU	19"-11 HU	19"-11 HU	19"-11 HU	19"-11 HU

Model (Order-No.)	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 <sup>1)</sup>	Current	200 µs	200 µs	200 µs	200 µs	200 µs
	Voltage	200 µs	200 µs	200 µs	200 µs	200 µs
Terminals <sup>2)</sup>	FK25	FK25	FK25	FK25	FK25	FK25
Power consumption	5,300 VA	5,000 VA	5,300 VA	5,000 VA	5,300 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) <sup>3)</sup>	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
Case <sup>4)</sup>	19"-14 HU	19"-14 HU	19"-14 HU	19"-14 HU	19"-14 HU	19"-14 HU

- 1) Measured with short-circuited output terminals (current) and with open output terminals (voltage).  
Other loads can increase the rise time.
- 2) FK25: Flat copper bar 25x10mm with 4mm bore,  
M10 and M12 screws  
PK4: 4mm pole binders

- PK60: Pole binders for forked lug and 4mm plug
- 3) For 19" installation, approx. 100mm in depth should be added to accommodate the cable connections at the rear. For 19" installation, slide bars must also be used owing to the weight of the devices.
- 4) 1HU = 44.45mm



# Type Overview - Bipolar Devices

Model (Order-No.)	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 <sup>1)</sup>	Current	200 µs	200 µs	200 µs
	Voltage	200 µs	200 µs	200 µs
Terminals <sup>2)</sup>	PK4	PK4	PK4	PK4
Power consumption	288 VA	250 VA	251 VA	235 VA
Mains supply	115/230 VAC	115/230 VAC	115/230 VAC	115/230 VAC
W x H x D (mm) <sup>3)</sup>	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
Case <sup>4)</sup>	19"-2 HU	19"-2 HU	19"-2 HU	19"-2 HU

Model (Order-No.)	NL8V8C40	NL10V10C30	NL20V20C20	NL24V24C18	NL44V44C10
Voltage	±8 V	±10 V	±20 V	±24 V	±44 V
Current	±40 A	±30 A	±20 A	±18 A	±10 A
Power	320 W	300 W	400 W	432 W	440 W
Rise-/fall time <sup>1)</sup>	Current	200 µs	200 µs	200 µs	200 µs
	Voltage	200 µs	200 µs	200 µs	200 µs
Terminals <sup>2)</sup>	PK60	PK60	PK60	PK60	PK60
Power consumption	800 VA	763 VA	800 VA	808 VA	800 VA
Mains supply	115/230 VAC	115/230 VAC	115/230 VAC	115/230 VAC	115/230 VAC
W x H x D (mm) <sup>3)</sup>	483 x 222 x 520	483 x 222 x 520	483 x 222 x 520	483 x 222 x 520	483 x 222 x 520
Weight	32 kg	32 kg	32 kg	32 kg	32 kg
Case <sup>4)</sup>	19"-5 HU	19"-5 HU	19"-5 HU	19"-5 HU	19"-5 HU

Model (Order-No.)	NL8V8C80	NL10V10C60	NL20V20C40	NL24V24C36	NL44V44C20
Voltage	±8 V	±10 V	±20 V	±24 V	±44 V
Current	±80 A	±60 A	±40 A	±36 A	±20 A
Power	640 W	600 W	800 W	864 W	880 W
Rise-/fall time <sup>1)</sup>	Current	200 µs	200 µs	200 µs	200 µs
	Voltage	200 µs	200 µs	200 µs	200 µs
Terminals <sup>2)</sup>	FK25	PK60	PK60	PK60	PK60
Power consumption	1,500 VA	1,425 VA	1,500 VA	1,515 VA	1,500 VA
Mains supply	115/230 VAC	115/230 VAC	115/230 VAC	115/230 VAC	115/230 VAC
W x H x D (mm) <sup>3)</sup>	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
Case <sup>4)</sup>	19"-8 HU	19"-8 HU	19"-8 HU	19"-8 HU	19"-8 HU

Model (Order-No.)	NL8V8C120	NL10V10C90	NL20V20C60	NL24V24C54	NL44V44C30
Voltage	±8 V	±10 V	±20 V	±26 V	±44 V
Current	±120 A	±90 A	±60 A	±54 A	±30 A
Power	960 W	900 W	1.200 W	1.296 W	1.320 W
Rise-/fall time <sup>1)</sup>	Current	200 µs	200 µs	200 µs	200 µs
	Voltage	200 µs	200 µs	200 µs	200 µs
Terminals <sup>2)</sup>	FK25	FK25	FK25	FK25	FK25
Power consumption	2,200 VA	2,088 VA	2,200 VA	2,223 VA	2,200 VA
Mains supply	230 VAC	230 VAC	230 VAC	230 VAC	230 VAC
W x H x D (mm) <sup>3)</sup>	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
Case <sup>4)</sup>	19"-11 HU	19"-11 HU	19"-11 HU	19"-11 HU	19"-11 HU

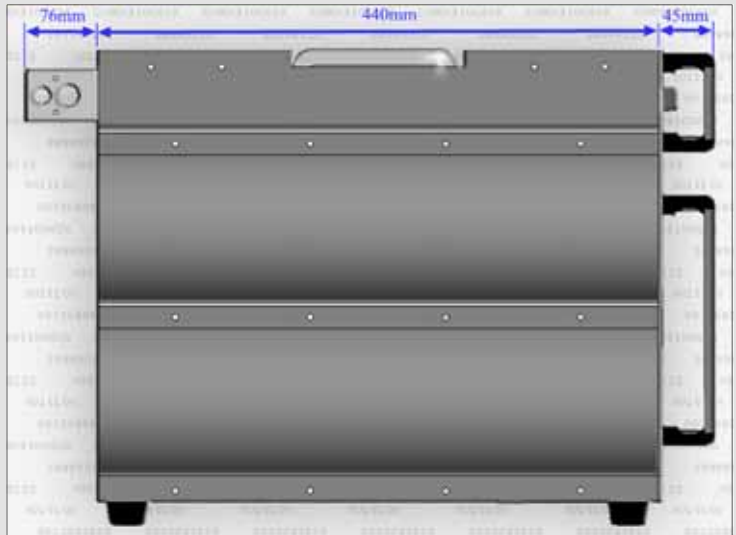
Model (Order-No.)	NL8V8C160	NL10V10C120	NL20V20C80	NL24V24C72	NL44V44C40
Voltage	±8 V	±10 V	±20 V	±24 V	±44 V
Current	±160 A	±120 A	±80 A	±72 A	±40 A
Power	1,280 W	1,200 W	1,600 W	1,728 W	1,760 W
Rise-/fall time <sup>1)</sup>	Current	200 µs	200 µs	200 µs	200 µs
	Voltage	200 µs	200 µs	200 µs	200 µs
Terminals <sup>2)</sup>	FK25	FK25	FK25	FK25	FK25
Power consumption	2,900 VA	2,750 VA	2,900 VA	2,930 VA	2,900 VA
Mains supply	230 VAC	230 VAC	230 VAC	230 VAC	230 VAC
W x H x D (mm) <sup>3)</sup>	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
Case <sup>4)</sup>	19"-14 HU	19"-14 HU	19"-14 HU	19"-14 HU	19"-14 HU



- 1) Measured with short-circuited output terminals (current) and with open output terminals (voltage).  
Other loads can increase the rise time.
- 2) FK25: Flat copper bar 25x10mm with 4mm bore,  
M10 and M12 screws  
PK4: 4mm pole binders

- PK60: Pole binders for forked lug and 4mm plug
- 3) For 19" installation, approx. 100mm in depth should be added to accommodate the cable connections at the rear. For 19" installation, slide bars must also be used owing to the weight of the devices.
- 4) 1HU = 44.45mm

# Dimensions

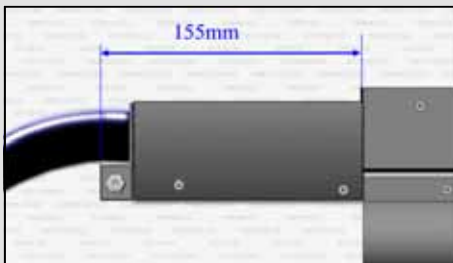


h: Standard: 15mm  
 With ZS09 Option  
 (Castors): 45mm

NL device with FK25 terminals

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

Dimension of the terminals with touch protection:



For a 19" rack mounting, slide bars have to be used because of the weight.



# Technical Data

Accuracy of Setting		
	of setting	of corresponding range
Voltage	±0.1%	±0.05%
Current	±0.2%	±0.05%
Voltage Limitation	±0.1%	±0.05%
Current Limitation	±0.2%	±0.05%
Resolution Setting	16 Bit	
Ripple	0.05% RMS of range	
Load Effect 0-100%	0.1%	
Line Effect AC ±10%	0.02%	

Accuracy of the Display:		
	of measured value (real value)	of corresponding range
Voltage	±0.1%	±0.05%
Current	±0.2%	±0.05%
Resistance	Quotient of voltage and current	
Power	Product of voltage and current	

Accuracy of Analog Programming: -5V ... 0 ... +5V / -10V ... 0 ... +10V for Current, Voltage		
	of setting	of corresponding range
Voltage	±0,2%	±0,15%
Current	±0,4%	±0,15%
Voltage Limitation* (upper and lower)	±0,2%	±0,15%
Current Limitation* (upper and lower)	±0,4%	±0,15%

\* only -10V ... 0 ... +10V  
Input impedance of the analog inputs: > 10kΩ  
GND max. ±2V against negative output terminal<sup>1)</sup>

Accuracy of Analog Monitor Outputs: -10V ... 0 ... +10V for Current, Voltage		
	of analog signal of the real value	offset voltage
Voltage	±0.1%	±15mV
Current	±0.2%	±15mV

GND max. ±2V against negative output terminal<sup>1)</sup>  
Minimum loading capacity 2kΩ

Accuracy of Measurement, Reading via Data Interface:		
	of measured value (real value)	of corresponding range
Voltage	±0.1%	±0.05%
Current	±0.2%	±0.05%
Resolution Measurement	18 Bit	
Reading Rate (free running)	330ms not triggerable	

Accuracy of Measurement, Reading via Data Interface: NL13 Option		
	of measured value (real value)	of corresponding range
Voltage	±0.15%	±0.07%
Current	±0.3%	±0.07%
Resolution Measurement	13 Bit	
Reading Rate (programmable)	min. 200µs (in memory) triggerable	

Power	
Nominal Power	up to T <sub>A</sub> = 21°C
Derating	-1.2% / °C for T <sub>A</sub> > 21°C

Input Impedance	>50kΩ in stand-by
Operating temperature	5°C ... 40°C

External Control Functions	<ul style="list-style-type: none"> <li>• Stand-by</li> <li>• Mode switching</li> <li>• Trigger input and output</li> <li>• Emergency shutdown</li> </ul>
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Protection Equipment	<ul style="list-style-type: none"> <li>• Current and voltage limitation</li> <li>• Over-temperature deactivation</li> </ul>
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Parallel Operation	up to 3 devices in master-slave-operation (hardware-controlled in current mode only)
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Cooling	Current and temperature-controlled fans
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Dimensions, Weight	see type overview and table on page 11
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Mains Supply	115/230VAC ±10%, 50 ... 60Hz 230/400VAC - 16A CEE
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Electric Safety	DIN EN 61010-1
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EMC, CE-Mark	DIN EN 61326-1 DIN EN 61000-3-2 DIN EN 61000-3-3
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Measuring Device Category	CAT I
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Permissible Operating Voltage: Negative Output Terminal - Case	±125V DC
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Permissible Operating Voltage: Analog Interface - Negative Output Terminal	
Standard	±2V DC
with NL06 Option	±125V DC

Colour	
Front Panel	RAL7032 (pebble grey)
Sides, Lid	RAL7037 (stone grey)

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1) ±125V with NL06 Option

