

Source-Sinks

SOURCE-SINK NL SERIES

Production Series A



- 2-quadrant or 4-quadrant versions
- Source-sink function
- Rapid regulation time
- Basic operating modes CC, CV
- Combined operating modes CC+CV, CV+CC
- 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

NL Series – Brief Profile

NL series source-sinks are power supply and electronic load in one device. They are the choice when it comes to testing energy storage devices.

The standard portfolio provides 2- or 4-quadrant devices up to 3,600 W.

Interfaces

- RS-232
- USB
- LAN
- GPIB
- CAN
- System bus
- Analog
- Analog isolated

● Standard ○ Option — not available

Operating Modes

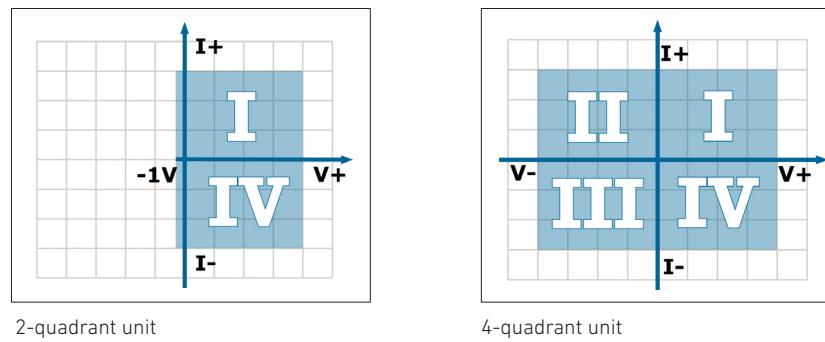
The NL source sinks can operate in constant voltage or constant current mode (CC, CV mode). In voltage mode, two current protections (source current and sink current) can be set independently of each other. In current mode, an upper and a lower voltage protection can be set. This allows the combined operating modes CC+CV and CV+CC to be realized.

Source-Sink Mode

Depending on the setting 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 Units

Devices for two-quadrant mode can supply or consume 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 set negative values as well as positive values.



I/O Port

Analog signals
in realtime!

Standard I/O port for:

- Analog load setting from -5 ... 0 ... 5 V or -10 ... 0 ... 10 V in CC, CV mode
- Analog setting for upper and lower voltage or current protection
- Operating mode selection
- Input activation
- Control speed selection
- Analog voltage monitor signal from -10 ... 0 ... 10 V
- Analog current monitor signal from -10 ... 0 ... 10 V

As an option, the I/O port is available in a galvanically isolated version (option NL06).

Factory Calibration Certificate (FCC-NLxx)

2 x for free

We supply a free Factory Calibration Certificate (FCC) with the devices. The calibration process is subject to supervision in accordance with DIN EN ISO 9001. This calibration certificate documents the traceability to national standards to illustrate the physical device in accordance with the International System of Units (SI). Within the 2-year warranty period, we will calibrate a second time free of charge if the respective device will have been registered:

<https://www.hoecherl-hackl.com/service/device-registration>

For use under laboratory conditions, H&H recommends a calibration interval of 2 years. This is an empirical value that can be used as a guide for the first period of use. Depending on the intended use, service life, relevance of the application and ambient conditions, the operator should adjust this interval accordingly.

Mechanics



Retractable handle

The ZSAC series is designed in stable 19" technology and can also be used as a desktop unit. From 5 U there are retractable heavy-duty carrying handles on the top of the unit. Castors can optionally be mounted on heavy equipment. No separate mounting kits are required for 19" installation.

Safety Covers

For devices for dangerous input voltages, safety covers for the load inputs are supplied.

Hardware Expansions

Option ZS09¹⁾

Heavy-Load Castors



Heavy-load castors

Optional castors can be mounted on heavy equipment.

Option NL06¹⁾

Galvanically isolated I/O port



If there may be potential differences between the negative output and the signals at the I/O port, the standard analog I/O card can be replaced by an isolated version. All control and measurement signals are routed via isolation amplifiers and optocouplers. The card is pin compatible to the standard analog I/O card. The insulation voltage is 500 V referred to the negative output.

Option ZS07¹⁾

Power I/O Card



The Power I/O card can be added to control external equipment. 8 relay contacts (make contact 125 V/1 A) can be controlled and 8 logic inputs (5 ... 24 V, common GND) can be queried via the data interface of the load. The outputs and inputs are isolated from the load input. The insulation voltage is 500 V DC against the negative load input.

1) can be retrofitted at any time

2) can only be retrofitted or produced by H&H

Data Interfaces



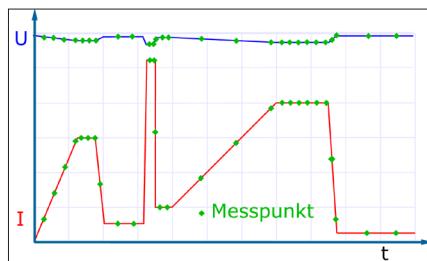
All optional interface cards are pluggable and can be exchanged or extended if required.
The combined RS-232/USB interface is standard in the NL series.

Option ZS03¹⁾ GPIB Interface Expansion



With the option ZS03 you can upgrade to the GPIB interface. The card is simply plugged in.
Delivery without GPIB cable.

Option NL13²⁾ Data Acquisition Tool



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

The Data Acquisition Tool extends the range of functions of the devices with fast measurement data acquisition with data memory synchronized for waveform generation. The measurement intervals can be defined independently for each curve section.

Drivers



Current NI-certified LabVIEW drivers can be downloaded here:
www.ni.com/downloads/instrument-drivers/

Watchdog Function

In digital remote control mode, the electronic load has a watchdog function that switches off the load input when the previously programmed watchdog delay time expires without a valid command arriving via the data interface.

1) can be retrofitted at any time

2) can only be retrofitted or produced by H&H

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

The waveform can be graphically displayed before testing.

The profiles set can be stored and reactivated when needed.

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

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.

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

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

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 saved to a text file for further processing, e.g. with MS Excel.

The following data are logged:

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

Model (Order number)	NL10V10C10	NL20V20C5	NL30V30C3.5	NL50V50C2	NL8V8C46	NL10V10C38
Voltage range	±10 V	±20 V	±30 V	±50 V	±8 V	±10 V
Current range	±10 A	±5 A	±3,5 A	±2 A	±46 A	±38 A
Power	100 W	100 W	105 W	100 W	368 W	380 W
Rise/fall time ¹⁾ current	85 µs	120 µs	85 µs	200 µs	85 µs	200 µs
Rise/fall time ¹⁾ voltage	70 µs	100 µs	75 µs	200 µs	60 µs	200 µs
Load terminals ²⁾ rear	PK4-35L-1	PK4-35L-1	PK4-35L-1	PK4-35L-1	BO-M8x20	BO-M8x20
Power consumption	250 VA	205 VA	205 VA	215 VA	800 VA	750 VA
Mains voltage ³⁾	1/N/PE AC 230 V 50 ... 60 Hz					
Mains voltage toggleable ³⁾	1/N/PE AC 115 V 50 ... 60 Hz					
Weight ca.	13 kg	13 kg	13 kg	13 kg	23 kg	23 kg
Housing ⁴⁾	19", 2 U	19", 2 U	19", 2 U	19", 2 U	19", 3 U	19", 3 U
Model (Order number)	NL20V20C24	NL30V30C16	NL44V44C11	NL8V8C80	NL10V10C60	NL20V20C40
Voltage range	±20 V	±30 V	±44 V	±8 V	±10 V	±20 V
Current range	±24 A	±16 A	±11 A	±80 A	±60 A	±40 A
Power	480 W	432 W	484 W	640 W	600 W	800 W
Rise/fall time ¹⁾ current	70 µs	200 µs	90 µs	200 µs	80 µs	125 µs
Rise/fall time ¹⁾ voltage	60 µs	200 µs	90 µs	200 µs	70 µs	95 µs
Load terminals ²⁾ rear	BO-M8x20	BO-M8x20	BO-M8x20	FKS25/8-SM10	BPK4-60L	BPK4-60L
Power consumption	770 VA	770 VA	740 VA	1.360 VA	1.250 VA	1.390 VA
Mains voltage ³⁾	1/N/PE AC 230 V 50 ... 60 Hz					
Mains voltage toggleable ³⁾	1/N/PE AC 115 V 50 ... 60 Hz					
Weight ca.	23 kg	23 kg	23 kg	54 kg	55 kg	55 kg
Housing ⁴⁾	19", 3 U	19", 3 U	19", 3 U	19", 8 U	19", 8 U	19", 8 U
Model (Order number)	NL30V30C32	NL44V44C20	NL8V8C120	NL10V10C90	NL20V20C60	NL30V30C48
Voltage range	±30 V	±44 V	±8 V	±10 V	±20 V	±30 V
Current range	±32 A	±20 A	±120 A	±90 A	±60 A	±48 A
Power	960 W	880 W	960 W	900 W	1,200 W	1,440 W
Rise/fall time ¹⁾ current	50 µs	200 µs	200 µs	200 µs	200 µs	200 µs
Rise/fall time ¹⁾ voltage	50 µs	200 µs	200 µs	200 µs	200 µs	200 µs
Load terminals ²⁾ rear	BPK4-60L	BPK4-60L	FKS25/8-SM10	FKS25/8-SM10	FKS25/8-SM10	FKS25/8-SM10
Power consumption	1.560 VA	1.400 VA	2.200 VA	2.088 VA	2.200 VA	2.340 VA
Mains voltage ³⁾	1/N/PE AC 230 V 50 ... 60 Hz					
Mains voltage toggleable ³⁾	1/N/PE AC 115 V 50 ... 60 Hz	1/N/PE AC 115 V 50 ... 60 Hz	-	-	-	-
Weight ca.	55 kg	55 kg	80 kg	80 kg	80 kg	80 kg
Housing ⁴⁾	19", 8 U	19", 8 U	19", 11 U	19", 11 U	19", 11 U	19", 11 U
Model (Order number)	NL44V44C30	NL8V8C160	NL10V10C120	NL20V20C80	NL30V30C64	NL44V44C40
Voltage range	±44 V	±8 V	±10 V	±20 V	±30 V	±44 V
Current range	±30 A	±160 A	±120 A	±80 A	±64 A	±40 A
Power	1,320 W	1,280 W	1,200 W	1,600 W	1,920 W	1,760 W
Rise/fall time ¹⁾ current	200 µs	60 µs	200 µs	200 µs	200 µs	200 µs
Rise/fall time ¹⁾ voltage	200 µs	65 µs	200 µs	200 µs	200 µs	200 µs
Load terminals ²⁾ rear	FKS25/8-SM10	FKS25/8-SM10	FKS25/8-SM10	FKS25/8-SM10	FKS25/8-SM10	FKS25/8-SM10
Power consumption	2.200 VA	2.700 VA	2.550 VA	2.700 VA	3.020 VA	2.700 VA
Mains voltage ³⁾	1/N/PE AC 230 V 50 ... 60 Hz					
Mains voltage toggleable ³⁾	-	-	-	-	-	-
Weight ca.	80 kg	92 kg				
Housing ⁴⁾	19", 11 U	19", 14 U				

1. Rise and fall times are defined from 10 ... 90 % and 90 ... 10 % of maximum current at "fast" regulation speed. Tolerance ±20 %. Measured at short-circuited output terminals (current) and open output terminals (voltage). Other loads may increase the rise/fall times.
2. Description of available terminals starting at page 109. Models with bolts (BO) or copper bars (FKS) are delivered with safety covers.
3. Mains voltage tolerance: ±10 %
4. Detailed dimensions by means of 3D models at www.hoecherl-hackl.com/downloads.

Model (Order number)	NL1V10C20	NL1V20C10	NL1V30C8	NL1V42C6	NL1V80C3	NL1V100C2
Voltage range	-1 ... 10 V	-1 ... 20 V	-1 ... 30 V	-1 ... 42 V	-1 ... 80 V	-1 ... 100 V
Current range	±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⁾ current	110 µs	110 µs	35 µs	200 µs	200 µs	200 µs
Rise/fall time ¹⁾ voltage	30 µs	60 µs	25 µs	200 µs	200 µs	200 µs
Load terminals ²⁾ rear	PK4-35L-1	PK4-35L-1	PK4-35L-1	PK4-35L-1	PK4-35L-1	PK4-35L-1
Power consumption	430 VA	380 VA	400 VA	400 VA	350 VA	310 VA
Mains voltage ³⁾	1/N/PE AC 230 V 50 ... 60 Hz					
Mains voltage toggleable ³⁾	1/N/PE AC 115 V 50 ... 60 Hz					
Weight ca.	13 kg					
Housing ⁴⁾	19", 2 U					
Model (Order number)	NL1V8C80	NL1V10C60	NL1V20C40	NL1V26C32	NL1V44C22	NL1V60C16
Voltage range	-1 ... 8 V	-1 ... 10 V	-1 ... 20 V	-1 ... 26 V	-1 ... 44 V	-1 ... 60 V
Current range	±80 A	±60 A	±40 A	±32 A	±22 A	±16 A
Power	640 W	600 W	800 W	832 W	968 W	960 W
Rise/fall time ¹⁾ current	200 µs	200 µs	200 µs	80 µs	50 µs	200 µs
Rise/fall time ¹⁾ voltage	200 µs	200 µs	200 µs	75 µs	50 µs	200 µs
Load terminals ²⁾ rear	FKS25/8-SM10	BPK4-60L	BPK4-60L	BO-M8x20	BO-M8x20	BO-M8x20
Power consumption	1.400 VA	1.200 VA	1.300 VA	1.200 VA	1.400 VA	1.200 VA
Mains voltage ³⁾	1/N/PE AC 230 V 50 ... 60 Hz					
Mains voltage toggleable ³⁾	1/N/PE AC 115 V 50 ... 60 Hz					
Weight ca.	39 kg	33 kg	33 kg	23 kg	23 kg	23 kg
Housing ⁴⁾	19", 5 U	19", 5 U	19", 5 U	19", 3 U	19", 3 U	19", 3 U
Model (Order number)	NL1V80C11	NL1V8C160	NL1V10C120	NL1V20C80	NL1V26C60	NL1V44C40
Voltage range	-1 ... 80 V	-1 ... 8 V	-1 ... 10 V	-1 ... 20 V	-1 ... 26 V	-1 ... 44 V
Current range	±11 A	±160 A	±120 A	±80 A	±60 A	±40 A
Power	880 W	1,280 W	1,200 W	1,600 W	1,560 W	1,760 W
Rise/fall time ¹⁾ current	200 µs	65 µs	95 µs	75 µs	200 µs	200 µs
Rise/fall time ¹⁾ voltage	200 µs	60 µs	80 µs	85 µs	200 µs	200 µs
Load terminals ²⁾ rear	BO-M8x20	FKS25/8-SM10	FKS25/8-SM10	FKS25/8-SM10	BPK4-60L	BPK4-60L
Power consumption	1.330 VA	2.700 VA	2.400 VA	2.725 VA	2.550 VA	2.500 VA
Mains voltage ³⁾	1/N/PE AC 230 V 50 ... 60 Hz					
Mains voltage toggleable ³⁾	1/N/PE AC 115 V 50 ... 60 Hz	-	-	-	-	-
Weight ca.	23 kg	57 kg	55 kg	55 kg	51 kg	52 kg
Housing ⁴⁾	19", 3 U	19", 8 U				

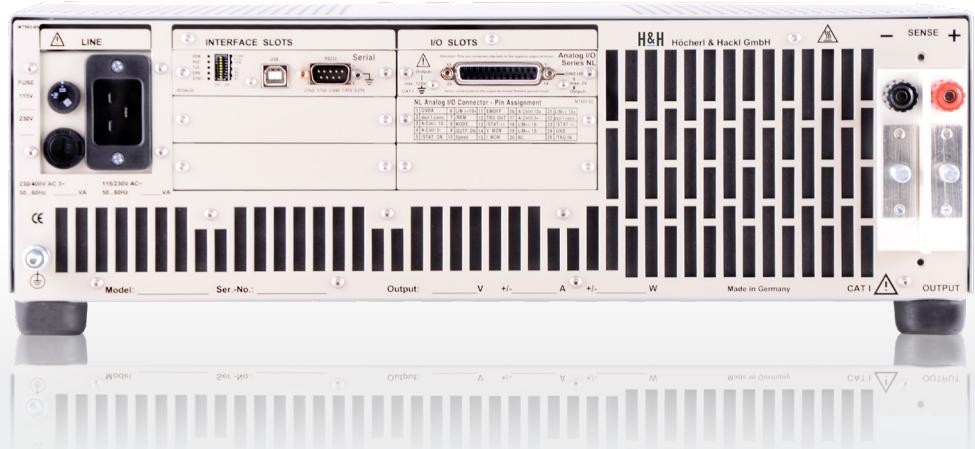
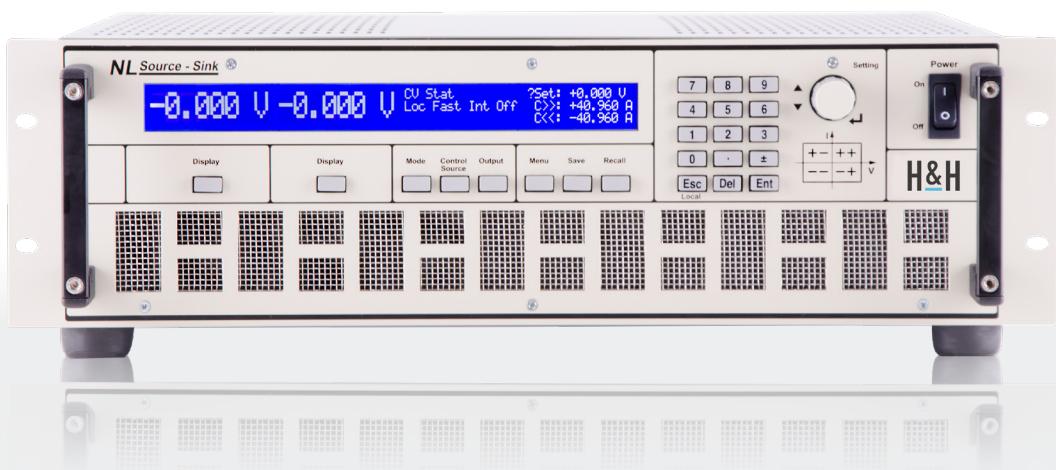
1. Rise and fall times are defined from 10 ... 90 % and 90 ... 10 % of maximum current at "fast" regulation speed. Tolerance ±20 %. Measured at short-circuited output terminals (current) and open output terminals (voltage). Other loads may increase the rise/fall times.
2. Description of available terminals starting at page 109. Models with bolts (BO) or copper bars (FKS) are delivered with safety covers.
3. Mains voltage tolerance: ±10 %
4. Detailed dimensions by means of 3D models at www.hoecherl-hackl.com/downloads.

Model (Order number)	NL1V60C30	NL1V80C20	NL1V8C240	NL1V10C180	NL1V20C120	NL1V26C90
Voltage range	-1 ... 60 V	-1 ... 80 V	-1 ... 8 V	-1 ... 10 V	-1 ... 20 V	-1 ... 26 V
Current range	±30 A	±20 A	±240 A	±180 A	±120 A	±90 A
Power	1,800 W	1,600 W	1,920 W	1,800 W	2,400 W	2,340 W
Rise/fall time ¹⁾ current	120 µs	200 µs	45 µs	200 µs	200 µs	200 µs
Rise/fall time ¹⁾ voltage	165 µs	200 µs	55 µs	200 µs	200 µs	200 µs
Load terminals ²⁾ rear	BPK4-60L	BPK4-60L	FKS25/8-SM10	FKS25/8-SM10	FKS25/8-SM10	FKS25/8-SM10
Power consumption	2,750 VA	2,200 VA	4,340 VA	3,800 VA	3,800 VA	3,775 VA
Mains voltage ³⁾	1/N/PE AC 230 V 50 ... 60 Hz	1/N/PE AC 230 V 50 ... 60 Hz	3/N/PE AC 400/230 V 16 A 50 ... 60 Hz	3/N/PE AC 400/230 V 16 A 50 ... 60 Hz	3/N/PE AC 400/230 V 16 A 50 ... 60 Hz	3/N/PE AC 400/230 V 16 A 50 ... 60 Hz
Mains voltage toggleable ³⁾	-	-	-	-	-	-
Weight ca.	52 kg	50 kg	81 kg	76 kg	76 kg	73 kg
Housing ⁴⁾	19", 8 U	19", 8 U	19", 11 U	19", 11 U	19", 11 U	19", 11 U
Model (Order number)	NL1V44C60	NL1V60C45	NL1V80C30	NL1V8C320	NL1V10C240	NL1V20C160
Voltage range	-1 ... 44 V	-1 ... 60 V	-1 ... 80 V	-1 ... 8 V	-1 ... 10 V	-1 ... 20 V
Current range	±60 A	±45 A	±30 A	±320 A	±240 A	±160 A
Power	2,640 W	2,700 W	2,400 W	2,560 W	2,400 W	3,200 W
Rise/fall time ¹⁾ current	200 µs	80 µs	200 µs	100 µs	200 µs	200 µs
Rise/fall time ¹⁾ voltage	200 µs	55 µs	200 µs	55 µs	200 µs	200 µs
Load terminals ²⁾ rear	FKS25/8-SM10	FKS25/8-SM10	FKS25/8-SM10 with safety cover	FKS25/8-SM10	FKS25/8-SM10	FKS25/8-SM10
Power consumption	4,000 VA	4,060 VA	3,200 VA	5,300 VA	4,500 VA	5,100 VA
Mains voltage ³⁾	3/N/PE AC 400/230 V 16 A 50 ... 60 Hz	3/N/PE AC 400/230 V 16 A 50 ... 60 Hz	3/N/PE AC 400/230 V 16 A 50 ... 60 Hz	3/N/PE AC 400/230 V 16 A 50 ... 60 Hz	3/N/PE AC 400/230 V 16 A 50 ... 60 Hz	3/N/PE AC 400/230 V 16 A 50 ... 60 Hz
Mains voltage toggleable ³⁾	-	-	-	-	-	-
Weight ca.	73 kg	75 kg	73 kg	99 kg	100 kg	96 kg
Housing ⁴⁾	19", 11 U	19", 11 U	19", 11 U	19", 14 U	19", 14 U	19", 14 U
Model (Order number)	NL1V26C120	NL1V44C80	NL1V60C60	NL1V80C40		
Voltage range	-1 ... 26 V	-1 ... 44 V	-1 ... 60 V	-1 ... 80 V		
Current range	±120 A	±80 A	±60 A	±40 A		
Power	3,120 W	3,520 W	3,600 W	3,200 W		
Rise/fall time ¹⁾ current	200 µs	100 µs	130 µs	150 µs		
Rise/fall time ¹⁾ voltage	200 µs	80 µs	160 µs	170 µs		
Load terminals ²⁾ rear	FKS25/8-SM10	FKS25/8-SM10	FKS25/8-SM10	FKS25/8-M10 with safety cover		
Power consumption	4,800 VA	4,900 VA	4,800 VA	4,400 VA		
Mains voltage ³⁾	3/N/PE AC 400/230 V 16 A 50 ... 60 Hz	3/N/PE AC 400/230 V 16 A 50 ... 60 Hz	3/N/PE AC 400/230 V 16 A 50 ... 60 Hz	3/N/PE AC 400/230 V 16 A 50 ... 60 Hz		
Mains voltage toggleable ³⁾	-	-	-	-		
Weight ca.	96 kg	90 kg	93 kg	96 kg		
Housing ⁴⁾	19", 14 U	19", 14 U	19", 14 U	19", 14 U		

1. Rise and fall times are defined from 10 ... 90 % and 90 ... 10 % of maximum current at "fast" regulation speed. Tolerance ±20 %. Measured at short-circuited output terminals (current) and open output terminals (voltage). Other loads may increase the rise/fall times.
2. Description of available terminals starting at page 109. Models with bolts (B0) or copper bars (FKS) are delivered with safety covers.
3. Mains voltage tolerance: ±10 %
4. Detailed dimensions by means of 3D models at www.hoecherl-hackl.com/downloads.

Options (Summary) and Accessories

Order number	Article	Description
67-004-030-15	K-RS-SNM 9-9	RS-232 Cable (nullmodem cable) NL series
52-200-001-15	ZS03	GPIB interface extension
54-500-001-15	NL13	Data Acquisition Tool - fast data logging
52-500-001-15	NL25	External Ethernet-RS-232 Converter
53-100-004-15	NL06-N	Galvanically isolated I/O port instead of standard I/O port
53-100-003-15	NL06	Galvanically isolated I/O port for retrofitting of existing device
54-001-000-15	ZS07	Power I/O board 8 relay contacts 1x ON, 8 logic inputs
64-400-000-15	ZS09	Heavy-load castors for devices from 5 U (1 set = 4 pieces)
65-002-000-15	FCC-NLxx	Factory Calibration Certificate
64-401-000-15	SAB-NL-2	Additional safety cover for load terminals for devices with 2 U
64-402-000-15	SAB-NL-3	Additional safety cover for load terminals for devices with 3 U
64-403-000-15	SAB-NL-5	Additional safety cover for load terminals for devices from 5 U
67-003-020-15	K-MS-NL-2	Master-Slave cable for 2 devices (2 m)
67-003-040-15	K-MS-NL-3	Master-Slave cable for 3 devices (2 x 2 m)
63-000-001-00	SENSADAPT/4BAN/ PH2/60V	Sense-Adapter from 4 mm banana plugs to Phoenix PH2, max. 60 V
63-000-002-00	SENSADAPT/4BAN/ PH2/1200V	Sense-Adapter from 4 mm safety plugs to Phoenix PH2, max. 1200 V
		Load cables see starting at page 113



Operating modes		
Basic operating modes	CC, CV	
Combined operating modes	CC+CV, CV+CC	
Setting accuracy		
	of setting	of corresponding range
Voltage	±0.1 %	±0.05 %
Current	±0.2 %	±0.05 %
Current protection	±0.2 %	±0.05 %
Voltage protection	±0.1 %	±0.05 %
Setting resolution	16 bits	
Ripple	0.05 % RMS of range	
Load Effect 0 ... 100 %	0.1 % of range	
Line Effect ±10 %	0.02 % of range	
Display accuracy		
	of measured value (real value)	of corresponding range
Voltage	±0.1 %	±0.05 % ±1 digit
Current	±0.2 %	±0.05 % ±1 digit
Resistance	calculated of voltage and current	
Power	calculated of voltage and current	
Accuracy of standard measurement, read out via data interface		
	of measured value (real value)	of 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 option NL13, read out via data interface		
	of measured value (real value)	of corresponding range
Voltage	±0.15 %	±0.07 %
Current	±0.3 %	±0.07 %
Resolution	13 bits	
Sampling rate (programmable)	minimum 200 µs (to memory) triggerable	
Dynamic function in digital remote control with option NL13		
No. of load levels	50	
	min.	max.
Dwell time	200 µs	2.000 s
Ramp time	0 s	2.000 s
Resolution	200 µs	
I/O port: accuracy analog control -5 ... 0 ... 5 V / -10 ... 0 ... 10 V		
	of setting	of corresponding range
Voltage	±0.2 %	±0.15 %
Current	±0.4 %	±0.15 %
Current protection ¹⁾	±0.2 %	±0.15 %
Voltage protection ¹⁾	±0.4 %	±0.15 %
	Input resistance of analog inputs >10 kΩ	

I/O port: Accuracy of analog monitor outputs 0 ... 10 V		
	of analog signal of real value	offset voltage
Voltage	±0.1 %	±15 mV
Current	±0.2 %	±15 mV
	Minimum load capacity 2 kΩ	
I/O port: outputs and inputs		
Control inputs	control output on (low active) selection of operating mode selection of control time constant trigger input (low active) remote shut-down input (high active) trigger output (list cycle trigger, high active) status output for protections (low active)	
Status outputs		
I/O port: permissible potentials		
	standard I/O port	isolated I/O port (option NL06)
GND - neg. output	max. 2 V ²⁾	max. 125 V ²⁾
GND - PE	max. 125 V ²⁾	max. 125 V ²⁾
Output		
Output resistance	> 50 kΩ in standby	
Output capacity	ca. 1.5 µF/1,400 W	
Parallel operation	up to 3 devices in Master-Slave mode (hardware-controlled only in current mode)	
Output: permissible potentials		
	standard I/O port	isolated I/O port (option NL06)
neg. output - PE	max. 125 V ²⁾	max. 125 V ²⁾
Power		
Nominal power	see model overview (at Ta = 21 °C)	
Derating	-1.2 %/°C for Ta > 21 °C	
Protection and monitoring		
Protective devices	overcurrent protection overtemperature cut-off	
Monitoring signals	overvoltage indication	
Terminals		
Output	see model overview	
Sense	PK4-30L (see starting at page 109)	
Operating conditions		
Operating temperature	5 ... 40 °C	
Stock temperature	-25 ... 65 °C	
Max. operating height	2,000 m above sea level	
Pollution degree	1	
Max. humidity	80 % at 31 °C, linear decreasing to 50 % at 40 °C	
Min. distance rear panel - wall or other objects	70 cm	
Cooling	temperature-controlled air cooling	
Noise	see model overview	
Mains voltage	see model overview	
Power consumption	see model overview	

The specified accuracies refer to an ambient temperature of 23 ± 5 °C. The specified accuracies are valid when the sense lines are connected and when the unit is connected to undisturbed voltages (ripple and noise < 0.1 %). At voltages with higher disturbance values the accuracy can change for the worse.

- 10 ... 0 ... +10 V only
- positive or negative DC voltage or RMS value of a sinusoidal AC voltage

Technical Data (continued)

Housing	
Dimensions, weight	see model overview
Color	
Front	RAL7032 (pebble grey)
Rear	RAL7032 (pebble grey)
Side panels, top	RAL7037 (dusty grey)
Safety and EMC	
Protection class	1
Protection	IP20
Measuring category	0 (CAT I according to EN 61010:2004)
Electrical safety	DIN EN 61010-1 DIN EN 61010-2-030
EMC	DIN EN 61326-1 DIN EN 55011 DIN EN 61000-3-2 DIN EN 61000-3-3
Standard interfaces	
Data interfaces	RS-232, USB
I/O port	Standard I/O port (not isolated)
Available options	
Data interfaces ZS03 NL25	GPIB LAN (external Ethernet-RS-232 converter)
Mechanic options ZS09	Heavy-load castors for devices from 5 U
Hardware and function extensions NL06 NL13 ZS07	galvanically isolated I/O port DAQ Tool (fast data acquisition) Power I/O board (8 relay contacts 1x ON, 8 logic inputs)
Calibration, warranty	
FCC-NLxx	Factory Calibration Certificate, twice free of charge
Warranty	2 years

NL
source-sink