H&H Electronic DC Loads Model-Specific Technical Data

Rev. 0

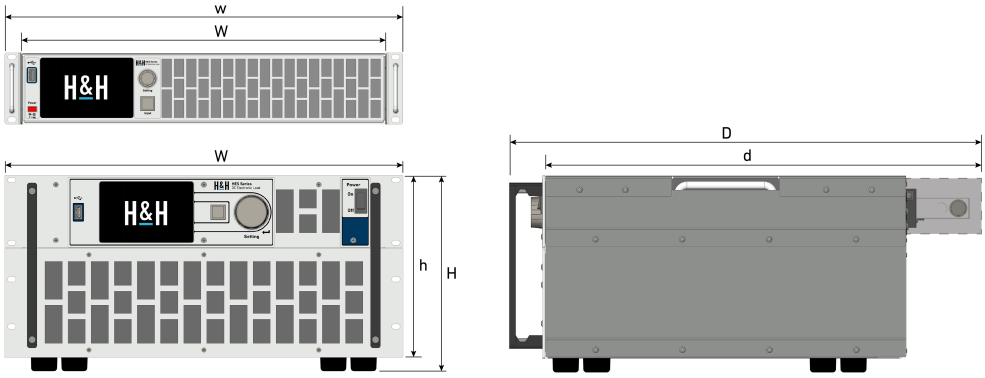
Technical specifications are subject to change without prior notice. Errors and omissions excepted.

Model:	HES12680	
Order no.:	29-055-000-01	

Information for special models (SA)	
Max. input voltage Umax	800 V
Max. load current Imax	135 A
Continuous Power Pcont	12,600 W
Max. peak power Pmax [1]	12,600 W
Voltage range	0 V ... 800 V
Current range	0 A ... 135 A
Resistance range	0.015 Ω ... 63.724 Ω
Power range [2]	0 W ... 12,600 W
Slew rate fast / medium / slow [3]	3.6 A/µs / 720 mA/µs / 54 mA/µs
Load terminals (rear) [4]	FKS25/10-SM10
Sense terminals (rear) [5]	PH2/7.62-BU16
Mains voltage [6]	1/N/PE AC 230 V 50 ... 60 Hz
Mains voltage toggleable	1/N/PE AC 115 V 50 ... 60 Hz
Power consumption	540 VA
Max. noise ca. [7]	76 dB(A)
Weight ca.	89 kg
Housing [8] / 3D model [9]	19" - 11 U / HES_M27
Dimensions W x H x D [10]	483 x 507 x 631 mm
Installation depth d [10]	588 mm

Installation height h[10]	489 mm
Standard accessories included with delivery	
CE certificate	CE certificate
Quality certificate	quality certificate
USB mass storage device	USB flash drive with user manual and technical data
FCC-N-HESxx	1 pc. factory calibration certificate for new devices
SAB-HES-5	safety cover for HES with >= 5 U with flat copper bars
LAS-M10x35	screw set consisting of 2 screws ZAM10x35, 4 washers M10, 2 spring washers M10, 2 nuts M10
K-NK-10	mains cable for max. 10 A, CEE 7/4 90° - C13
PH2/7.62-ST16	mating connector for sense terminals
2 pcs. fuse for 115 V AC	fuses for 115 V AC

1. level and duration of the peak power depend on the previous power
2. setting range extends to the maximum possible peak power
3. slew rates are determined at 10 ... 90 % of a current surge from 0 to Imax in CC mode (tolerance ±20 %) and may decrease at all other conditions
4. BPK4-30L: Touch-protected binding posts for 4 mm laboratory jacks and stripped wires with diameter up to 4 mm, max. 30 A
   BPK4-60L: Touch-protected binding posts for 4 mm laboratory jacks and stripped wires with diameter up to 6 mm, max. 60 A
   FKS20/5-SM8: Flat copper bars 20 x 5 mm vertical with hole for screw M8
   FKS25/8-SM10: Flat copper bars 25 x 8 mm vertical with hole for screw M10
   FKS25/10-SM10: Flat copper bars 25 x 10 mm vertical with hole for screw M10
   FKS40/12-SM12: Flat copper bars 40 x 12 mm vertical with hole for screw M12
   models with copper bars (FKS) are delivered with safety covers.
5. PH2/7.62-BU16: Phoenix socket strip bipolar, grid dimension 7.62 mm, max. 16 A, incl. mating connector from Phoenix Contact (Phoenix order no.: 1745629)
6. mains voltage tolerance: ±10 %
7. measured on the front from distance of 1 m
8. 1 U = 44.45 mm
9. 3D models are available at https://www.hoecherl-hackl.com/downloads/
10. Sample image (actual size may differ) to visualize dimension specifications:



W: standard width

w: installation width incl. 19" installation kit (2U and 3U models)

H: standard height incl. feet

h: installation height without feet

D: standard depth incl. handles and safety cover, excluding cable radius

d: installation depth measured from the rear edge of the front panel to the end of the safety cover, excluding cable radius

H&H Electronic DC Loads HES Standard Series-Specific Data

Production series A, rev. 1.

The specified accuracies apply at an ambient temperature of 23 ±5 °C, with the sense lines connected, and when the devices are operated on clean power supplies (ripple and noise < 0.1%).

Accuracy may decrease at higher levels of ripple and noise.

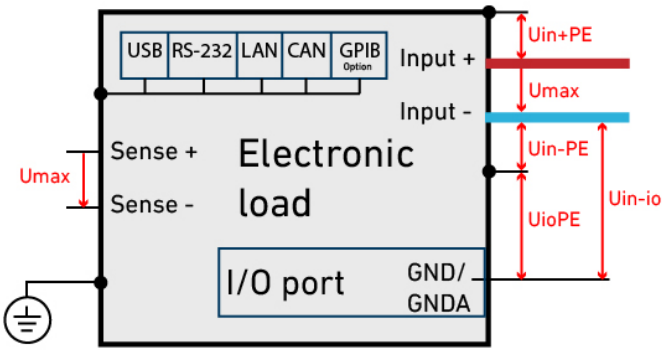
Technical specifications may vary for special devices. Technical specifications are subject to change without prior notice. Errors and omissions excepted.

Operating modes and functions	
Basic operating modes	CC, CV, CR, CP
Combined operating modes	CC+CV, CR+CC+CV, CP+CC+CV, CV+CC
Functions	DC sink MPP tracking for solar panel testing Energy storage testing Internal resistance measurement List function Square-wave function PWM function Modulation (sine, triangle, square wave) Measurement data logging (to USB flash drive or internal memory) Saving and loading device settings Watchdog function in remote-control mode Master-slave operation for power expansion SyncroLink
Accuracy of setting	
Voltage	±0.05 % of setting, ±0.05 % of range
Current	±0.2 % of setting, ±0.05 % of range
Resistance (at 5 ... 100 % of voltage range)	±1.4 % of setting, ±0.3 % of current range
Power (at U and I > 30 % of range)	±0.35 % of setting, ±0.1 % of range
Power (at U or I 5 ... 30 % of range)	±0.7 % of setting, ± 0.25 % of range
Resolution	14 bits
Accuracy of adjustable protections	
Overcurrent protection	±1.4 % of setting, ±0.3 % of range
Undervoltage protection	±0.5 % of setting, ±0.3 % of range
Resolution	12 bits
Accuracy of measurement slow	
Voltage	±0.02 % of measured value, ±0.01 % of range
Current	±0.2 % of measured value, ±0.05 % of range
Resistance	is calculated from voltage and current

Power	is calculated from voltage and current
Resolution	23 bits
Sampling time	250 ms, not triggerable
Accuracy of display	
Number of decimal places	5
Accuracy	Accuracy of measurement slow ±1 digit of the display value
Accuracy of measurement fast	
Voltage	±0.2 % of measured value, ±0.1 % of range
Current	±0.2 % of measured value, ±0.1 % of range
External control voltage reading 0 ... 10 V	±0.2 % of the measured value, ±0.1 % of the range
Resistance	is calculated from voltage and current
Power	is calculated from voltage and current
Resolution	16 bits
Sampling time	200 µs ... 1,000 s, resolution 200 µs
Accuracy of trigger voltage and current measurement	
Trigger voltage	±1 % of voltage range
Trigger current	±1 % of current range
Sampling time	200 µs
Dynamic function LIST	
Operating modes	CC, CV, CR, CP
Number of load levels	max. 300, with ramp, dwell and sampling times
Accuracy of load levels	see setting accuracy
Dwell times[1]	0.2 ms ... 1,000 s
Ramp times[1]	0 s ... 1,000 s
Resolution	0.2 ms
Accuracy of setting times	±0.02 %
Sampling times	200 µs ... 1,000 s, resolution 200 µs
Delay at triggered start	max. 300 µs
Dynamic function rectangular	

Operating modes	CC, CV
Number of load levels	2
Accuracy of load levels	see setting accuracy
Pulse durations[1]	1 µs ... 9,999.999 ms
Resolution	1 µs
Accuracy of setting times	±0.02 %
Dynamic function PWM	
Operating modes	CC, CV, CR
Number of load levels	2
Accuracy of load levels	see setting accuracy
Frequency[1]	0.1 Hz ... 10,000 Hz
Resolution	0.1 Hz
Accuracy of frequency	0.02 %
Duty cycle	1 % ... 99 %
Resolution	1 %
Dynamic function modulation	
Operating modes	CC, CV
Waveforms	sine, triangle, square wave
Frequency[1]	0.1 Hz ... 10,000 Hz
Resolution	0.1 Hz
Accuracy of frequency	0.02 %
Modulation depth	0 % ... 100 %
Synchronism	
Synchronism between load channels (jitter) to further systems using SyncroLink	250 µs
Data acquisition (DAQ)	
To external flash drive	
Sampling time	0.1 s ... 30 s, resolution 0.1 s, synchronized with dynamic function
Measurement data	timestamp, voltage, current

Number of measurement points	limited by flash drive memory size
File format	.csv
Accuracy	see accuracy of measurement slow
To internal memory	
Sampling time	200 µs ... 1,000 s, resolution 200 µs
Measurement data	timestamp, voltage, current
Number of measurement points	max. 40,000
Accuracy	see accuracy of measurement fast
Settings memory	
Number of memory positions (incl. programmed list)	9 selectable, 1 for last device settings at power off or power failure
I/O port: inputs and outputs	
Inputs	analog load setting I and U analog setting of I and U protections load input activation (low active) operating mode selection CC/CV control speed selection remote shut-down (high active) readable digital input (by SCPI command) trigger input (edge triggered, positive/negative/either selectable) control input (activates I/O port, low active)
Digital input levels	logical low: 0 V ... 0.8 V, logical high: 3 V ... 30 V
Outputs	analog voltage monitor output analog current monitor output load input activation state (low active) status overload (OV, OCP, OPP, OTP, low active) programmable logic output (by SCPI command) trigger output (low active)
Digital output levels	logical low: 0 V ... 0.8 V, logical high: 5 V/24 V,logical high selectable, max. 10 mA (push-pull)
I/O port: accuracy analog control 0 ... 10 V	
Voltage	±0.1 % of setting, ±0.1 % of range
Current	±0.2% of setting, ±0.1% of range
Resistance at U > 5 % of voltage range	±1.6% of setting, ±% of current range
Power at U and I > 30 % of corresponding range	±0.55% of setting, ±0.2% of range
Power at U and I > 5 % and < 30 % of corresponding range	±0.9% of setting, ±0.35% of range

Overcurrent protection	±1% of setting, ±0.4% of range
Undervoltage protection	±0.5% of setting, ±0.3% of range
	Input resistance of analog inputs > 10 kΩ
I/O port: accuracy analog monitor outputs 0 ... 10 V	
Voltage	±0.1% of analog signal of real value, ±15 mV offset voltage
Current	±0.2% of analog signal of real value, ±15 mV offset voltage
	2,000 Ω minimum load
I/O port: permissible voltages	
	
Uin-io (GND I/O port - neg. load input)	standard I/O port: max. 2 V* isolated I/O port: max. 800 V*
UioPE (GND I/O port - PE)	standard I/O port: max. 125 V* isolated I/O port: max. 50 V*
	*) positive or negative DC voltage
Input	
Input resistance	> 50 kΩ when load input is off standard models with diode function at reverse polarity up to nominal current ZV models have no reverse polarity protection!
Parallel operation	up to 5 units in master-slave mode
Input: permissible voltages	
Uin-PE (neg. load input - PE)	standard I/O port: max. 125 V* isolated I/O port (option HES06): max. 800 V*
Uin+PE (pos. load input - PE)	standard I/O port: Umax + max. 125 V* isolated I/O port (option HES06): Umax + max. 800 V*
	*) positive or negative DC voltage
Power	

Power derating	-1.2 % / °C for Ta > 21 °C
Protection and monitoring	
Protective devices	overcurrent overpower overtemperature
Monitoring signals	overvoltage indication reverse polarity indication undervoltage indication (if the input voltage is too low for the set current)
Operating conditions	
Operating temperature	5 °C ... 40 °C
Storage temperature	-25 °C ... 65 °C
Max. operating height	2,000 m above sea level
Pollution degree	2
Overvoltage category of mains	II
Max. humidity	80 % at 31 °C, linear derating to 50 % at 40 °C
Min. distance rear panel - wall or other objects	70 cm
Cooling	continuously controlled by temperature and current
Mains cable	length max. 3 m cross-section of mains leads min. 1.5 sq mm
Safety and EMC	
Protection class	1
Measuring category	O (CAT I according to EN 61010-1:2004)
Electrical safety	EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019 EN IEC 61010-2-030:2021 + A11:2021
EMC	immunity: EN 61326-1:2013 Industrial environment (for use in industrial and domestic establishment) emission: EN 61326-1:2013 Group 1 class B (for use in domestic establishment) EN 61000-3-2:2014 EN 61000-3-3:2013
Interfaces installed as standard	
Data interfaces	RS-232/SyncroLink USB LAN CAN
I/O port	standard type (not isolated)
Available options	
HES02	GPIB interface

HES06	galvanically isolated I/O port for retrofitting of existing device
HES06-N	galvanically isolated I/O port instead of standard I/O port (only for new device)
HES10	19" installation kit for 1 device with ½ 19", 2 U
HES11	19" installation kit for 2 devices with ½ 19", 2 U
HES12	19" installation kit for 1 device with 19", 2 U
HES14	castors for devices up from 5 U (1 set = 4 pcs.)
Further accessories available for purchase	
PH2/7.62-ST16	mating connector for sense terminals
K-RS-SNM 9-9	RS-232 cable (nullmodem cable)
K-MS-CAN	master-slave cable CAN (2 m)
D-Sub25 doubler	adaptor 1x D-Sub 25 male connector to 2x D-Sub 25 female connector for I/O port
FCC-HESxx	1 pc. factory calibration certificate
FCC-N-HESxx	1 pc. factory calibration certificate for new devices
K-MS-HES	master-slave cable I/O port (2 m)
K-MS-HES+K-MS-CAN	cable set master-slave, consisting of K-MS-HES and K-MS-CAN (each 2 m)
SAB-HES-2CU	safety cover for 2 U HES with flat copper bars
SAB-HES-2PK	safety cover for 2 U HES with binding posts
SAB-HES-2SB	safety cover for 2 U HES with touch-protected binding post for 4 mm plugs
SAB-HES-3	safety cover for 3 U HES with flat copper bars
SAB-HES-3PK	safety cover for 3 U HES with binding posts
SAB-HES-3S	safety cover for 3 U HES sense terminal
SAB-HES-5	safety cover for HES with >= 5 U with flat copper bars
SAB-HES-REMA	safety cover for HES with >= 5 U with REMA-connector
Calibration	
Recommended calibration interval	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.
Warranty	
Warranty	2 years

1. The applicable time or frequency range is limited by the rise/fall time of the respective model.