

The Electronic Load



Electronic Loads, ZS Series

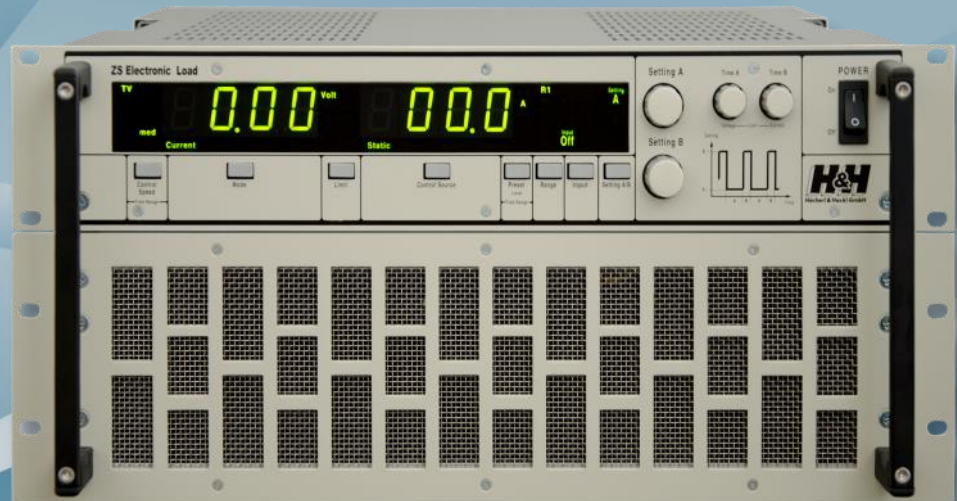
SCPI
96 Commands



Interface overview

RS-232	○
USB	○
GPIO	○
LAN	○
System bus	○
Analog	✗
Analog isolated	○

✗ Standard ○ Option / not available



ZS4812

- Voltage up to 800 V
- Currents up to 2,250 A
- Power 500 W ... 28.8 kW
- Depending on model, temporary overload capacity
- Current, voltage, resistance, power mode
- Dynamic loads
- SCPI programming with measurement function

- Full electronic protection
- Analog measurement outputs for voltage and current
- Analog control input
- MPP tracking
- Dynamic function with synchronized data logging

Operating Modes

The electronic loads of the ZS have the four operating modes constant current, voltage, power and resistance. In addition, depending on the operating mode limit values can be set for the maximum permissible current and the minimum permissible voltage.

To increase the resolution for each device, along with the full setting range, a reduced setting of $\frac{1}{3}$ of the rated current is available. The load can be pre-set even without a connected test unit. The display then shows the values directly in amps, ohms, volts or watts.

Dynamic and Control Time

The inbuilt modular enables two independently-adjustable currents and times from 100 μ s ... 1 s. The control speed of the devices can be adjusted to the test unit in three stages (fast - medium - slow).

Protective Devices

The following protective devices are built in:

- Over-current protection
- Over-power protection
- Over-temperature protection
- Over-voltage protection
- Reverse polarity protection
- Protection of the GND lines on the Analog I/O interface

Voltage Switching

A trigger voltage can be set for peak-free voltage hook-up. The current is enabled when the input voltage exceeds the trigger voltage.

Overload Capacity

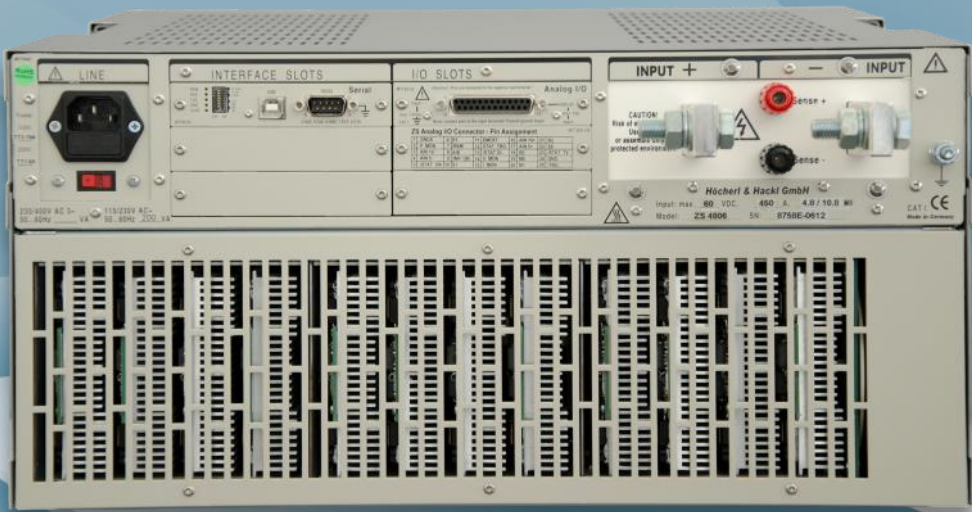
Depending on the model the devices have temporary overload capacity. The level and duration of the possible overload depends on the operating temperature of the output stage.

The device can also be used for significantly higher performance tasks.

Remote Control

All the load functions can be controlled remotely via Analog I/O Interface. The control inputs can be operated with TTL levels and 24 V from PLC controllers.

A version (ZS06) which is electrically isolated from the load input is optionally available .



ZS4812

Analog Control

In the operating modes CC, CV and CP the set value can be preset to 0...5 V or 0...10 V DC.

Analog Measurement Outputs

There are 0...10 V analog measurement signals available for voltage, current and power. The GND terminals can float ± 2 V with respect to the negative load input (also optionally isolated - Option ZS06).

Cooling

The units are air-cooled. To keep the operating noise low, the fans are temperature and current-dependently controlled. For better utilization of the maximum possible overload capacity the fans can be set to full power.

Mechanics

The ZS is a sturdy 19" rack design and can also be used as a table-top device.



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

Optional castors can be mounted on heavy devices. Separate installation kits are not needed for 19" rack installation.

Connections

All connections are at the back. The current connections are solid copper rails with screw connectors.



Safety

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



H&H

PL

ZS

ZSLC
Water-cooled

ZSLV
Low Voltage

PMLI
Multi-channel

ZSAC
AC

NL
Source-Sink

Accessories

Application Notes

Software

GTC

Data Interfaces (Accessories)

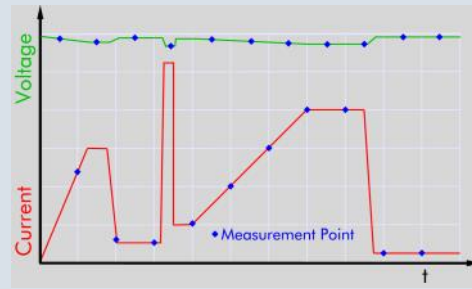
Extended Function Range When Using an Optional Data Interface

- Programming in SCPI Syntax
- Settings with 16 Bit resolution
- Measurement function for voltage, current and power
- Programmable load profile
- Dynamic operation with variable current rise and fall speed
- Measurement data memory
- Trigger functions
- Use of supplied software tools and LabVIEW® driver



The interface cards are removable and can be exchanged or expanded as required.

The devices can be fitted with the following interfaces:



Data logging with constant scanning rate

Settings	Resolution Accuracy	16 bits see Technical Data
Measurement function	Resolution	18 bits
	Sampling rate	approx. 300 ms for V+I, not synchronized
	Accuracy	Current: $\pm 0.2\%$ of MV $\pm 0.05\%$ of range Voltage: $\pm 0.1\%$ of MV $\pm 0.05\%$ of range Meas. data memory: max. 2000 V/I values + time
Load profile generator	Steps	max. 50
	Pulse duration	200 μ s ... 2000 s
	Ramp time	0 ... 2000 s
	Repetition rate	once, n times, continuous

RS-232 + USB Interface (Option ZS01) ²⁾

Option ZS01 adds an RS-232 and a USB interface (as virtual COM Port) to the device.

Programming is in SCPI.

(Including 2m RS-232 cable)

GPIO + RS-232 + USB Interface (Option ZS02) ²⁾

The GPIO interface also includes the RS-232 + USB interface (Option ZS01).

(Including 2m RS-232 cable, no GPIO cable.)

GPIO Interface Expansion (Option ZS03) ^{1) 3)}

If there is an existing RS-232 interface (Option ZS01), option ZS03 can be upgraded to the GPIO interface. Simply insert the card.

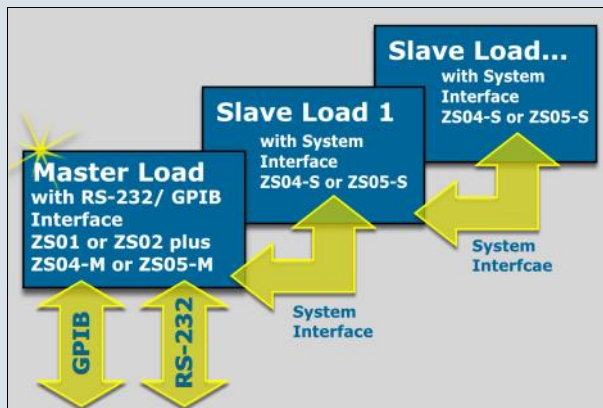
(Supplied without GPIO cable.)

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

Data is sent via the LAN card to the serial interface of the unit. Option ZS01 is needed for this. If option ZS01 is already available the device can be easily upgraded with the ZS15 option.



To Create Multi-Channel Systems



Order example for 3 loads:
Master with RS-232, connection via cable:
Load 1+ZS01+ZS04-M,
Load 2+ZS04-S,
Load 3+ZS04-S

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

System Interface Cable (Option ZS04-M, ZS04-S) (-M for master unit ³⁾, -S for slave unit)

To build multi-channel systems, additional loads can be connected to the master device via the system interface. For this, the master unit is fitted with the system interface ZS04-M1 ³⁾ and the slave units with ZS04-S ²⁾.

All units can then be programmed via the master interface. Connection is via the standard LAN cable. The load inputs remain electronically isolated. (Including 1 m cable.)



Fiber Optic System Interface (Option ZS05-M, ZS05-S) (-M for master unit ³⁾, -S for slave unit)

For greater distances (> 3 m) and more than three connected devices a fiber optic system interface is recommended.

Simply replace the cable version option ZS04 with the fiber optic version ZS05.

The fiber optic connection is also recommended for higher EMC load.

(Including 5 m optical cable.)



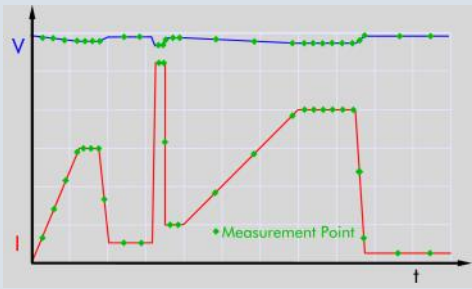
Data Acquisition Tool (Option)

Data Acquisition Tool

(Option ZS13-15) ^{1) 2)}

The Data Acquisition Tool expands the range of the device by the following functions:

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



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

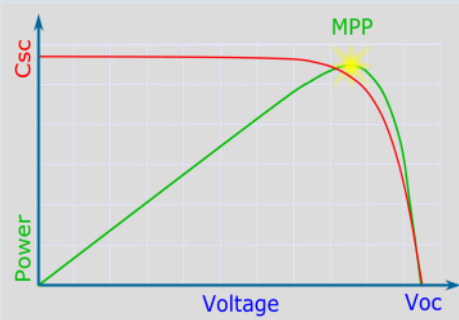
Converter (in addition to 18 Bit standard A/D converter)	fast 15 Bit A/D converter Simultaneous measurement of voltage and current
Sampling rate Synchronization Measurement data memory	min 200 μ s, can be programmed separately for each wave section and synchronized with waveform generator 2000 V/I value pairs with timestamp

Solar Panel Test

The unit automatically searches for the Maximum Power Point in solar panels and self-adjusts as the sun's radiation changes.

Measures Ah and Wh.

Simultaneous recording of voltage and current is possible.



Battery Capacity Test

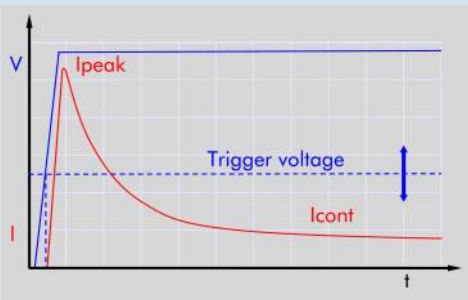
The device discharges a battery in any operating mode down to the preset cut-off voltage. When the cut-off voltage is reached the current is switched off. Measures Ah and Wh.

The measurement function can be started simultaneously in order to record the discharge curve.

Exponential Starting Processes

When the input voltage is switched on the unit generates an exponentially falling wave trajectory with adjustable time constant.

Peak current, time constant (min. 2 ms) and continuous current are programmable.



Supplied Drivers

You can find the latest LabVIEW[®] driver at:

www.hoecherl-hackl.com/

or

www.ni.com/downloads/instrument-drivers/d/

LabVIEW[®]

1) Can only be retrofitted or produced by H&H.
2) Requires ZS01 or ZS02

Hardware Expansions

Electrically Isolated Analog I/O Interface ¹⁾ (Option ZS6)

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.



Analog I/O Extension Card ¹⁾ (Option ZS08)

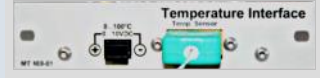
The Analog I/O Extension card provides additional control inputs for analog presetting of trigger voltage and the current limiter. The card also has three relay outputs which are activated in the event of "Input on", reaching "Trigger voltage" or "Overload". The signals are electrically isolated from the load input via the isolation amplifier. 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.



Zero-Volt Option ²⁾ (Option ZS12)

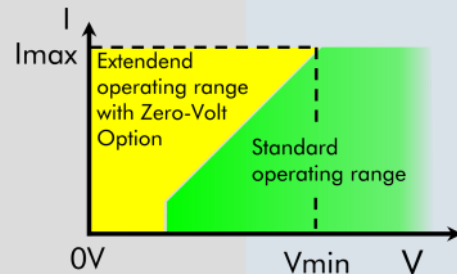
The zero-volt option expands the operating range of the electronic load up to the short circuit (approx. 10 mV). It can also compensate for voltage drops on power leads up to 0.5 V.

The zero-volt option is ideal for testing fuel cells in conjunction with adjusted measuring ranges. The available zero-volt options are listed in the technical overview.

The load capacity drops by approx. $3 V \times$ the set current.

Reverse polarity protection and mains voltage switching is not available if you install a zero-volt option. The fans of the zero-volt option generate a continuous operating sound.

A zero-volt option is available up to 150 A.



Calibration

Factory Calibration Certificate (Option FCC-ZSxx) ⁵⁾

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 nation-

al 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.

- Can be retrofitted at any time.
- Can only be retrofitted or produced by H&H.
- Requires ZS01 or ZS02
- Requires option ZS13

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



Software Tools

The following SW tools and drivers are delivered as standard with the interfaces:

Load Control

Individual devices and multi-channel systems can be controlled via the tool.

The range of functions includes PC device set-up with the option to save, data logging with graphical display and saving data for other programs.

Data Acquisition

As well as device control, measured data can be logged and saved.

The following measured values can be selected: Current - Voltage - Time.

Waveform Editor

The Waveform Editor permits the intelligent generation of load profiles in the form of straight sections. The load waveform is displayed on entry. The profiles can be saved.

Basic Communication Tool

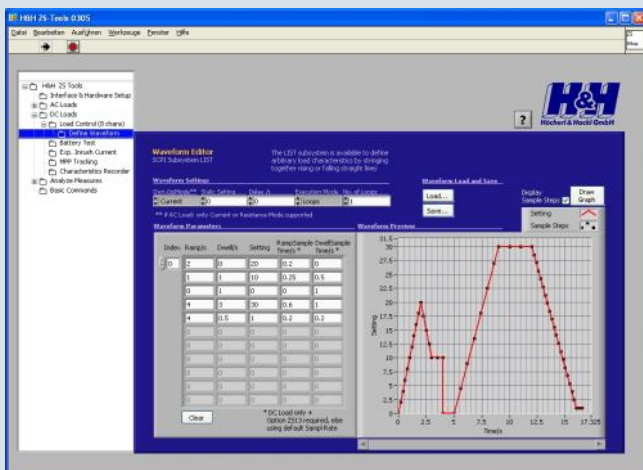
The Basic Communication Tool can be used to send any commands for test purposes and for commissioning of test systems.

MPP Tracking

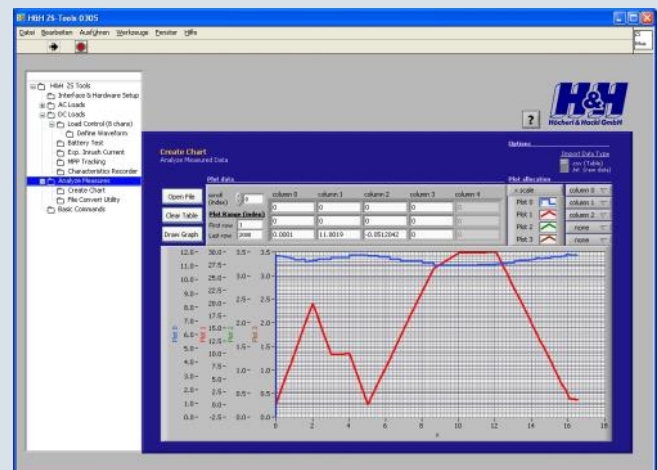
Solar panels can be tested in combination with Option ZS13. Voltage, current and power are displayed numerically.

Battery Test

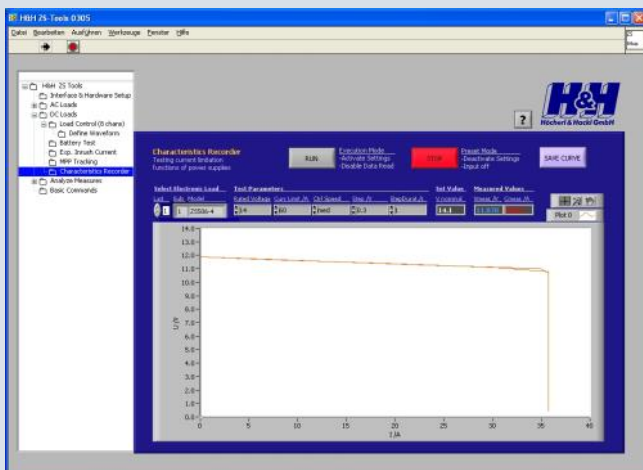
All standard battery types can be discharged with the battery tool. The discharge curves are recorded and displayed. Ah and Wh are also logged.



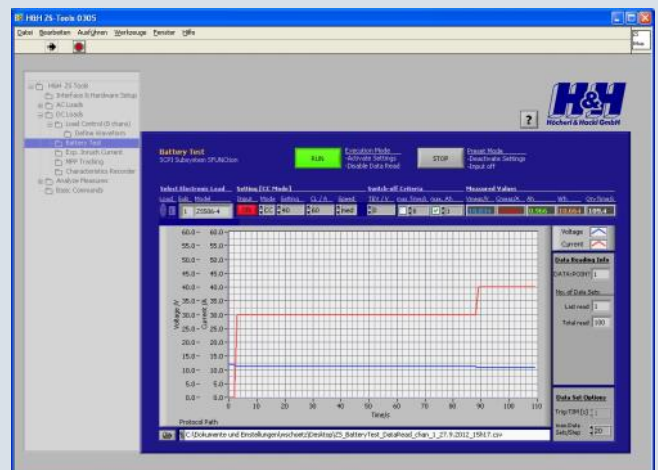
Waveform Editor



Measurement Data Analysis



Characteristics Recorder



Battery Test

500 W ... 800 W DC

Model (order number)	ZS506-4	ZS506	ZS512-4	ZS530-3	ZS560-3	ZS580-3
	4 ranges	1 range	4 ranges	3 ranges	3 ranges	3 ranges
Voltage	60 V	60 V	120 V	300 V	600 V	800 V
Current ¹⁾	60 mA 0.6 A 6 A 60 A	80 A	30 mA 0.3 A 3 A 30 A	120 mA 1.2 A 12 A	60 mA 0.6 A 6 A	45 mA 0.45 A 4.5 A
Continuous power	500 W	500 W	500 W	500 W	500 W	500 W
Short-time power ²⁾	1,000 W	1,000 W	1,000 W	-	-	-
Current setting	0 ... 60 mA 0 ... 0.6 A 0 ... 6 A 0 ... 60 A	0 ... 26.7 A 0 ... 80 A	0 ... 30 mA 0 ... 0.3 A 0 ... 3 A 0 ... 30 A	0 ... 120 mA 0 ... 1.2 A 0 ... 12 A	0 ... 60 mA 0 ... 0.6 A 0 ... 6 A	0 ... 45 mA 0 ... 0.45 A 0 ... 4.5 A
Resistance setting	33.3 Ω ... 11.1 kΩ (max. 60 mA) 3.33 Ω ... 1.11 kΩ (max. 0.6 A) 0.33 Ω ... 111 Ω (max. 6 A) 0.033 Ω ... 11.1 Ω (max. 60 A)	0.075 Ω ... 25 Ω (max. 26.7 A) 0.025 Ω ... 8.3 Ω (max. 80 A)	67 Ω ... 44.4 kΩ (max. 30 mA) 6.7 Ω ... 4.44 kΩ (max. 0.3 A) 0.67 Ω ... 444 Ω (max. 3 A) 0.067 Ω ... 44.4 Ω (max. 30 A)	16.7 Ω ... 27.7 kΩ (max. 120 mA) 1.67 Ω ... 2.77 kΩ (max. 1.2 A) 0.167 Ω ... 277 Ω (max. 12 A)	33.3 Ω ... 111 kΩ (max. 60 mA) 3.33 Ω ... 11.1 kΩ (max. 0.6 A) 0.33 Ω ... 1.11 kΩ (max. 6 A)	44.4 Ω ... 197 kΩ (max. 45 mA) 4.44 Ω ... 19.7 kΩ (max. 0.45 A) 0.44 Ω ... 1.97 kΩ (max. 4.5 A)
Power setting ³⁾	0 ... 1 W 0 ... 10 W 0 ... 100 W 0 ... 1,000 W	0 ... 333 W 0 ... 1,000 W	0 ... 1 W 0 ... 10 W 0 ... 100 W 0 ... 1,000 W	0 ... 5 W 0 ... 50 W 0 ... 500 W	0 ... 5 W 0 ... 50 W 0 ... 500 W	0 ... 5 W 0 ... 50 W 0 ... 500 W
Rise/fall time ⁴⁾	60 μs	60 μs	60 μs	60 μs	60 μs	60 μs
Load connections ⁵⁾	FK15	FK15	FK15 with cover	SB4	SB4	SB4
Zero-Volt option ⁶⁾	NV60	NV80	NV60	-	-	-
Power consumption	50 VA	50 VA	50 VA	50 VA	50 VA	50 VA
Noise max. ⁷⁾	53 dB(A)	53 dB(A)	53 dB(A)	53 dB(A)	53 dB(A)	53 dB(A)
Weight	13 kg	13 kg	13 kg	13 kg	13 kg	13 kg
Housing ⁸⁾	19" - 2 HU	19" - 2 HU	19" - 2 HU	19" - 2 HU	19" - 2 HU	19" - 2 HU

Model (order number)	ZS806	ZS812	ZS830	ZS860	ZS880
Voltage	60 V	120 V	300 V	600 V	800 V
Current ¹⁾	100 A	60 A	24 A	12 A	9 A
Continuous power	800 W	800 W	800 W	800 W	800 W
Short-time power ²⁾	1,600 W	1,600 W	-	-	-
Current setting	0 ... 33 A 0 ... 100 A	0 ... 20 A 0 ... 60 A	0 ... 8 A 0 ... 24 A	0 ... 4 A 0 ... 12 A	0 ... 3 A 0 ... 9 A
Resistance setting	0.06 Ω ... 20 Ω (max. 33 A) 0.02 Ω ... 6.67 Ω (max. 100 A)	0.1 Ω ... 66.7 Ω (max. 20 A) 0.03 Ω ... 22.2 Ω (max. 60 A)	0.25 Ω ... 416 Ω (max. 8 A) 0.08 Ω ... 139 Ω (max. 24 A)	0.5 Ω ... 1.67 kΩ (max. 4 A) 0.17 Ω ... 555 Ω (max. 12 A)	0.66 Ω ... 2.96 kΩ (max. 3 A) 0.22 Ω ... 986 Ω (max. 9 A)
Power setting ³⁾	0 ... 533 W 0 ... 1,600 W	0 ... 533 W 0 ... 1,600 W	0 ... 267 W 0 ... 800 W	0 ... 267 W 0 ... 800 W	0 ... 267 W 0 ... 800 W
Rise/fall time ⁴⁾	60 μs	60 μs	60 μs	60 μs	60 μs
Load connections ⁵⁾	FK15	FK15 with cover	FK15 with cover	SB4	SB4
Zero-Volt option ⁶⁾	-	NV60	-	-	-
Power consumption	65 VA	65 VA	65 VA	65 VA	65 VA
Noise max. ⁷⁾	58 dB(A)	58 dB(A)	58 dB(A)	58 dB(A)	58 dB(A)
Weight	13 kg	13 kg	13 kg	13 kg	13 kg
Housing ⁸⁾	19" - 2 HU	19" - 2 HU	19" - 2 HU	19" - 2 HU	19" - 2 HU

1) Each range of the higher voltage classes of the same device power can also be selected as current range.

2) Level and duration of the peak power, see diagram on page 31

3) The setting range extends max. to the possible peak power.

4) Rise and fall times are defined of 10 % ... 90 % and 90 % ... 10 % of the maximum current. (current mode FAST, tolerance ±20 %)

5) SB4: 4 mm safety socket
BM8: M8 screw fitting

FK15: Flat copper rail 15x5 mm with 4 mm hole and M8 bolt
6) There is no reverse polarity protection with the zero-volt option.

7) Measured on the front from distance of 1 m

8) 1 HU = 44.45 mm

1,800 W ... 4,800 W DC

Model (order number)	ZS1806	ZS1812	ZS1830	ZS1860	ZS1880
Voltage	60 V	120 V	300 V	600 V	800 V
Current ¹⁾	150 A	75 A	30 A	20 A	15 A
Continuous power	1,800 W	1,800 W	1,800 W	1,800 W	1,800 W
Short-time power ²⁾	4,200 W	4,200 W	2,800 W	-	-
Current setting	0 ... 50 A 0 ... 150 A	0 ... 25 A 0 ... 75 A	0 ... 10 A 0 ... 30 A	0 ... 6,67 A 0 ... 20 A	0 ... 5 A 0 ... 15 A
Resistance setting	0.04 Ω ... 13.3 Ω (max. 50 A) 0.013 Ω ... 4.44 Ω (max. 150 A)	0.08 Ω ... 53.3 Ω (max. 25 A) 0.03 Ω ... 17.7 Ω (max. 75 A)	0.2 Ω ... 333 Ω (max. 10 A) 0.07 Ω ... 111 Ω (max. 30 A)	0.3 Ω ... 1.0 kΩ (max. 6.67 A) 0.1 Ω ... 333 Ω (max. 20 A)	0.4 Ω ... 1.77 kΩ (max. 5 A) 0.13 Ω ... 592 Ω (max. 15 A)
Power setting ³⁾	0 ... 1,400 W 0 ... 4,200 W	0 ... 1,400 W 0 ... 4,200 W	0 ... 933 W 0 ... 2,800 W	0 ... 600 W 0 ... 1,800 W	0 ... 600 W 0 ... 1,800 W
Rise/fall time ⁴⁾	50 μs	80 μs	50 μs	70 μs	70 μs
Load connections ⁵⁾	BM8	BM8 with cover	BM8 with cover	BM8 with cover	BM8 with cover
Zero-Volt option ⁶⁾	NV150	NV80-E	-	-	-
Power consumption	100 VA	100 VA	100 VA	100 VA	100 VA
Noise max. ⁷⁾	71 dB(A)	71 dB(A)	71 dB(A)	71 dB(A)	71 dB(A)
Weight	19 kg	19 kg	19 kg	19 kg	19 kg
Housing ⁸⁾	19" - 3 HU	19" - 3 HU	19" - 3 HU	19" - 3 HU	19" - 3 HU

Model (order number)	ZS3206	ZS3212	ZS3030	ZS3060	ZS3080
Voltage	60 V	120 V	300 V	600 V	800 V
Current ¹⁾	300 A	150 A	60 A	40 A	30 A
Continuous power	3,200 W	3,200 W	3,000 W	3,000 W	3,000 W
Short-time power ²⁾	7,800 W	7,800 W	5,200 W	-	-
Current setting	0 ... 100 A 0 ... 300 A	0 ... 50 A 0 ... 150 A	0 ... 20 A 0 ... 60 A	0 ... 13.3 A 0 ... 40 A	0 ... 10 A 0 ... 30 A
Resistance setting	0.02 Ω ... 6.67 Ω (max. 100 A) 7 mΩ ... 2.22 Ω (max. 300 A)	0.04 Ω ... 26.6 Ω (max. 50 A) 0.013 Ω ... 8.89 Ω (max. 150 A)	0.1 Ω ... 167 Ω (max. 20 A) 0.033 Ω ... 55.5 Ω (max. 60 A)	0.15 Ω ... 500 Ω (max. 13.3 A) 0.05 Ω ... 167 Ω (max. 40 A)	0.2 Ω ... 888 Ω (max. 10 A) 0.06 Ω ... 296 Ω (max. 30 A)
Power setting ³⁾	0 ... 2,600 W 0 ... 7,800 W	0 ... 2,600 W 0 ... 7,800 W	0 ... 1,733 W 0 ... 5,200 W	0 ... 1,000 W 0 ... 3,000 W	0 ... 1,000 W 0 ... 3,000 W
Rise/fall time ⁴⁾	50 μs	40 μs	40 μs	40 μs	40 μs
Load connections ⁵⁾	FK25	FK25 with cover	FK25 with cover	FK25 with cover	FK25 with cover
Power consumption	145 VA	145 VA	145 VA	145 VA	145 VA
Noise max. ⁷⁾	71 dB(A)	71 dB(A)	71 dB(A)	71 dB(A)	71 dB(A)
Weight	34 kg	35.5 kg	34 kg	35.5 kg	34 kg
Housing ⁸⁾	19" - 5 HU	19" - 5 HU	19" - 5 HU	19" - 5 HU	19" - 5 HU

Model (order number)	ZS4806	ZS4812	ZS4230	ZS4260	ZS4280
Voltage	60 V	120 V	300 V	600 V	800 V
Current ¹⁾	450 A	225 A	90 A	60 A	45 A
Continuous power	4,800 W	4,800 W	4,200 W	4,200 W	4,200 W
Short-time power ²⁾	10,800 W	10,800 W	7,200 W	-	-
Current setting	0 ... 150 A 0 ... 450 A	0 ... 75 A 0 ... 225 A	0 ... 30 A 0 ... 90 A	0 ... 20 A 0 ... 60 A	0 ... 15 A 0 ... 45 A
Resistance setting	0.013 Ω ... 4.44 Ω (max. 150 A) 4.4 mΩ ... 1.48 Ω (max. 450 A)	0.026 Ω ... 17.7 Ω (max. 75 A) 8.9 mΩ ... 5.93 Ω (max. 225 A)	0.067 Ω ... 111 Ω (max. 30 A) 0.022 Ω ... 37 Ω (max. 90 A)	0.1 Ω ... 333 Ω (max. 20 A) 0.033 Ω ... 111 Ω (max. 60 A)	0.133 Ω ... 592 Ω (max. 15 A) 0.044 Ω ... 197 Ω (max. 45 A)
Power setting ³⁾	0 ... 3,600 W 0 ... 10,800 W	0 ... 3,600 W 0 ... 10,800 W	0 ... 2,400 W 0 ... 7,200 W	0 ... 1,400 W 0 ... 4,200 W	0 ... 1,400 W 0 ... 4,200 W
Rise/fall time ⁴⁾	80 μs	50 μs	50 μs	50 μs	50 μs
Load connections ⁵⁾	FK25	FK25 with cover	FK25 with cover	FK25 with cover	FK25 with cover
Power consumption	200 VA	200 VA	200 VA	200 VA	200 VA
Noise max. ⁷⁾	71 dB(A)	71 dB(A)	71 dB(A)	71 dB(A)	71 dB(A)
Weight	39 kg	39 kg	39 kg	39 kg	39 kg
Housing ⁸⁾	19"-5 HU	19"-5 HU	19"-5 HU	19"-5 HU	19"-5 HU

1) Each range of the higher voltage classes of the same device power can also be selected as current range.

2) Level and duration of the peak power, see diagram on page 31

3) The setting range extends max. to the possible peak power.

4) Rise and fall times are defined of 10 % ... 90 % and 90 % ... 10 % of the maximum current. (current mode FAST, tolerance ±20 %)

5) SB4: 4 mm safety socket
BM8: M8 screw fitting
FK15: Flat copper rail 15x5 mm with 4 mm hole and M8 bolt
FK25: Flat copper rail 25x10 mm with 4 mm hole and M10 and M12 bolt

6) There is no reverse polarity protection with the zero-volt option.

7) Measured on the front from distance of 1 m

8) 1HU = 44.45mm

5,600 W ... 9,600 W DC

Model (order number)	ZS6406	ZS6412	ZS5630	ZS5660	ZS5680
Voltage	60 V	120 V	300 V	600 V	800 V
Current ¹⁾	600 A	300 A	120 A	80 A	60 A
Continuous power	6,400 W	6,400 W	5,600 W	5,600 W	5,600 W
Short-time power ²⁾	14,400 W	14,400 W	9,600 W	-	-
Current setting	0 ... 200 A 0 ... 600 A	0 ... 100 A 0 ... 300 A	0 ... 40 A 0 ... 120 A	0 ... 26.7 A 0 ... 80 A	0 ... 20 A 0 ... 60 A
Resistance setting	0.01 Ω ... 3.33 Ω (max. 200 A) 3.3 mΩ ... 1.11 Ω (max. 600 A)	0.02 Ω ... 13.3 Ω (max. 100 A) 6.7 mΩ ... 4.44 Ω (max. 300 A)	0.05 Ω ... 83.3 Ω (max. 40 A) 0.016 Ω ... 27.7 Ω (max. 120 A)	0.075 Ω ... 250 Ω (max. 26.7 A) 0.025 Ω ... 83.3 Ω (max. 80 A)	0.1 Ω ... 444 Ω (max. 20 A) 0.033 Ω ... 148 Ω (max. 60 A)
Power setting ³⁾	0 ... 4,800 W 0 ... 14,400 W	0 ... 4,800 W 0 ... 14,400 W	0 ... 3,200 W 0 ... 9,600 W	0 ... 1,867 W 0 ... 5,600 W	0 ... 1,867 W 0 ... 5,600 W
Rise/fall time ⁴⁾	100 μs	80 μs	60 μs	60 μs	60 μs
Load connections ⁵⁾	FK40	FK25 with cover	FK25 with cover	FK25 with cover	FK25 with cover
Power consumption	275 VA	275 VA	275 VA	275 VA	275 VA
Noise max. ⁶⁾	73 dB(A)	73 dB(A)	73 dB(A)	73 dB(A)	73 dB(A)
Weight	56 kg	52 kg	52 kg	52 kg	52 kg
Housing ⁷⁾	19" - 8 HU	19" - 8 HU	19" - 8 HU	19" - 8 HU	19" - 8 HU

Model (order number)	ZS8006	ZS8012	ZS7030	ZS7060	ZS7080
Voltage	60 V	120 V	300 V	600 V	800 V
Current ¹⁾	750 A	375 A	150 A	100 A	75 A
Continuous power	8,000 W	8,000 W	7,000 W	7,000 W	7,000 W
Short-time power ²⁾	18,000 W	18,000 W	12,000 W	-	-
Current setting	0 ... 250 A 0 ... 750 A	0 ... 125 A 0 ... 375 A	0 ... 50 A 0 ... 150 A	0 ... 33 A 0 ... 100 A	0 ... 25 A 0 ... 75 A
Resistance setting	8 mΩ ... 2.67 Ω (max. 250 A) 2.7 mΩ ... 0.89 Ω (max. 750 A)	0.016 Ω ... 10.6 Ω (max. 125 A) 5.3 mΩ ... 3.56 Ω (max. 375 A)	0.04 Ω ... 66.7 Ω (max. 50 A) 0.013 Ω ... 22.2 Ω (max. 150 A)	0.06 Ω ... 200 Ω (max. 33 A) 0.02 Ω ... 66.7 Ω (max. 100 A)	0.08 Ω ... 355 Ω (max. 25 A) 0.027 Ω ... 118 Ω (max. 75 A)
Power setting ³⁾	0 ... 6,000 W 0 ... 18,000 W	0 ... 6,000 W 0 ... 18,000 W	0 ... 4,000 W 0 ... 12,000 W	0 ... 2,333 W 0 ... 7,000 W	0 ... 2,333 W 0 ... 7,000 W
Rise/fall time ⁴⁾	100 μs	80 μs	60 μs	60 μs	60 μs
Load connections ⁵⁾	FK40	FK25 with cover	FK25 with cover	FK25 with cover	FK25 with cover
Power consumption	320 VA	320 VA	320 VA	320 VA	320 VA
Noise max. ⁶⁾	74 dB(A)	74 dB(A)	74 dB(A)	74 dB(A)	74 dB(A)
Weight	59 kg	57 kg	57 kg	57 kg	57 kg
Housing ⁷⁾	19" - 8 HU	19" - 8 HU	19" - 8 HU	19" - 8 HU	19" - 8 HU

Model (order number)	ZS9606	ZS9612	ZS8430	ZS8460	ZS8480
Voltage	60 V	120 V	300 V	600 V	800 V
Current ¹⁾	900 A	450 A	180 A	120 A	90 A
Continuous power	9,600 W	9,600 W	8,400 W	8,400 W	8,400 W
Short-time power ²⁾	21,600 W	21,600 W	14,400 W	-	-
Current setting	0 ... 300 A 0 ... 900 A	0 ... 150 A 0 ... 450 A	0 ... 60 A 0 ... 180 A	0 ... 40 A 0 ... 120 A	0 ... 30 A 0 ... 90 A
Resistance setting	6.7 mΩ ... 2.22 Ω (max. 300 A) 2.2 mΩ ... 0.74 Ω (max. 900 A)	0.013 Ω ... 8.89 Ω (max. 150 A) 4.4 mΩ ... 2.96 Ω (max. 450 A)	0.033 Ω ... 55.6 Ω (max. 60 A) 0.011 Ω ... 18.5 Ω (max. 180 A)	0.05 Ω ... 167 Ω (max. 40 A) 0.016 Ω ... 55.6 Ω (max. 120 A)	0.067 Ω ... 296 Ω (max. 30 A) 0.022 Ω ... 98.6 Ω (max. 90 A)
Power setting ³⁾	0 ... 7,200 W 0 ... 21,600 W	0 ... 7,200 W 0 ... 21,600 W	0 ... 4,800 W 0 ... 14,400 W	0 ... 2,800 W 0 ... 8,400 W	0 ... 2,800 W 0 ... 8,400 W
Rise/fall time ⁴⁾	100 μs	100 μs	60 μs	80 μs	80 μs
Load connections ⁵⁾	FK40	FK25 with cover	FK25 with cover	FK25 with cover	FK25 with cover
Power consumption	380 VA	380 VA	380 VA	380 VA	380 VA
Noise max. ⁶⁾	74 dB(A)	74 dB(A)	74 dB(A)	74 dB(A)	74 dB(A)
Weight	63 kg	61 kg	61 kg	61 kg	61 kg
Housing ⁷⁾	19" - 8 HU	19" - 8 HU	19" - 8 HU	19" - 8 HU	19" - 8 HU

1) Each range of the higher voltage classes of the same device power can also be selected as current range.

2) Level and duration of the peak power, see diagram on page 31

3) The setting range extends max. to the possible peak power.

4) Rise and fall times are defined of 10 % ... 90 % and 90 % ... 10 % of the maximum current. (current mode FAST, tolerance ±20 %)

5) SB4: 4 mm safety socket
BM8: M8 screw fitting
FK25: Flat copper rail 25x10 mm with 4 mm hole and M10 and M12 bolt
FK40: Flat copper rail 40x12 mm with 4 mm hole and M12 and M16 bolt

6) Measured on the front from distance of 1 m
7) 1HU = 44.45 mm

9,800 W ... 14,400 W DC

Model (order number)	ZS11206	ZS11212	ZS9830	ZS9860	ZS9880
Voltage	60 V	120 V	300 V	600 V	800 V
Current ¹⁾	1,050 A	525 A	210 A	140 A	105 A
Continuous power	11,200 W	11,200 W	9,800 W	9,800 W	9,800 W
Short-time power ²⁾	25,200 W	25,200 W	16,800 W	-	-
Current setting	0 ... 350 A 0 ... 1,050 A	0 ... 175 A 0 ... 525 A	0 ... 70 A 0 ... 210 A	0 ... 47 A 0 ... 140 A	0 ... 35 A 0 ... 105 A
Resistance setting	5.7 mΩ ... 1.9 Ω (max. 350 A) 2 mΩ ... 0.63 Ω (max. 1,050 A)	0.011 Ω ... 7.62 Ω (max. 175 A) 3.8 mΩ ... 2.54 Ω (max. 525 A)	0.028 Ω ... 47 Ω (max. 70 A) 0.01 Ω ... 15.8 Ω (max. 210 A)	0.043 Ω ... 142 Ω (max. 47 A) 0.014 Ω ... 47 Ω (max. 140 A)	0.057 Ω ... 253 Ω (max. 35 A) 0.019 Ω ... 84.3 Ω (max. 105 A)
Power setting ³⁾	0 ... 8,400 W 0 ... 25,200 W	0 ... 8,400 W 0 ... 25,200 W	0 ... 5,600 W 0 ... 16,800 W	0 ... 3,267 W 0 ... 9,800 W	0 ... 3,267 W 0 ... 9,800 W
Rise/fall time ⁴⁾	100 μs	80 μs	60 μs	60 μs	60 μs
Load connections ⁵⁾	FK40	FK40 with cover	FK25 with cover	FK25 with cover	FK25 with cover
Power consumption	450 VA	450 VA	450 VA	450 VA	450 VA
Noise max. ⁶⁾	75 dB(A)	75 dB(A)	75 dB(A)	75 dB(A)	75 dB(A)
Weight	80 kg	80 kg	76 kg	76 kg	76 kg
Housing ⁷⁾	19" - 11 HU	19" - 11 HU	19" - 11 HU	19" - 11 HU	19" - 11 HU

Model (order number)	ZS12806	ZS12812	ZS11230	ZS11260	ZS11280
Voltage	60 V	120 V	300 V	600 V	800 V
Current ¹⁾	1,200 A	600 A	240 A	160 A	120 A
Continuous power	12,800 W	12,800 W	11,200 W	11,200 W	11,200 W
Short-time power ²⁾	28,800 W	28,800 W	19,200 W	-	-
Current setting	0 ... 400 A 0 ... 1,200 A	0 ... 200 A 0 ... 600 A	0 ... 80 A 0 ... 240 A	0 ... 53 A 0 ... 160 A	0 ... 40 A 0 ... 120 A
Resistance setting	5 mΩ ... 1.67 Ω (max. 400 A) 1.7 mΩ ... 0.56 Ω (max. 1,200 A)	0.01 Ω ... 6.67 Ω (max. 200 A) 3.3 mΩ ... 2.22 Ω (max. 600 A)	0.025 Ω ... 41.7 Ω (max. 80 A) 8.3 mΩ ... 13.9 Ω (max. 240 A)	0.037 Ω ... 125 Ω (max. 53 A) 0.012 Ω ... 41.7 Ω (max. 160 A)	0.05 Ω ... 222 Ω (max. 40 A) 0.017 Ω ... 74 Ω (max. 120 A)
Power setting ³⁾	0 ... 9,600 W 0 ... 28,800 W	0 ... 9,600 W 0 ... 28,800 W	0 ... 6,400 W 0 ... 19,200 W	0 ... 3,733 W 0 ... 11,200 W	0 ... 3,733 W 0 ... 11,200 W
Rise/fall time ⁴⁾	100 μs	80 μs	60 μs	60 μs	60 μs
Load connections ⁵⁾	FK40	FK40 with cover	FK25 with cover	FK25 with cover	FK25 with cover
Power consumption	505 VA	505 VA	505 VA	505 VA	505 VA
Noise max. ⁶⁾	76 dB(A)	76 dB(A)	76 dB(A)	76 dB(A)	76 dB(A)
Weight	82 kg	82 kg	80 kg	79 kg	79 kg
Housing ⁷⁾	19" - 11 HU	19" - 11 HU	19" - 11 HU	19" - 11 HU	19" - 11 HU

Model (order number)	ZS14406	ZS14412	ZS12630	ZS12660	ZS12680
Voltage	60 V	120 V	300 V	600 V	800 V
Current ¹⁾	1,350 A	675 A	270 A	180 A	135 A
Continuous power	14,400 W	14,400 W	12,600 W	12,600 W	12,600 W
Short-time power ²⁾	32,400 W	32,400 W	21,600 W	-	-
Current setting	0 ... 450 A 0 ... 1,350 A	0 ... 225 A 0 ... 675 A	0 ... 90 A 0 ... 270 A	0 ... 60 A 0 ... 180 A	0 ... 45 A 0 ... 135 A
Resistance setting	4.4 mΩ ... 1.48 Ω (max. 450 A) 1.5 mΩ ... 0.49 Ω (max. 1,350 A)	8.9 mΩ ... 5.9 Ω (max. 225 A) 2.9 mΩ ... 1.98 Ω (max. 675 A)	0.022 Ω ... 37 Ω (max. 90 A) 7.4 mΩ ... 12.3 Ω (max. 270 A)	0.033 Ω ... 111 Ω (max. 60 A) 0.011 Ω ... 37 Ω (max. 180 A)	0.044 Ω ... 197 Ω (max. 45 A) 0.014 Ω ... 65.6 Ω (max. 135 A)
Power setting ³⁾	0 ... 10,800 W 0 ... 32,400 W	0 ... 10,800 W 0 ... 32,400 W	0 ... 7,200 W 0 ... 21,600 W	0 ... 4,200 W 0 ... 12,600 W	0 ... 4,200 W 0 ... 12,600 W
Rise/fall time ⁴⁾	100 μs	80 μs	60 μs	60 μs	60 μs
Load connections ⁵⁾	FK40	FK40 with cover	FK25 with cover	FK25 with cover	FK25 with cover
Power consumption	540 VA	540 VA	540 VA	540 VA	540 VA
Noise max. ⁶⁾	76 dB(A)	76 dB(A)	76 dB(A)	76 dB(A)	76 dB(A)
Weight	89 kg	87 kg	85 kg	84 kg	84 kg
Housing ⁷⁾	19" - 11 HU	19" - 11 HU	19" - 11 HU	19" - 11 HU	19" - 11 HU

1) Each range of the higher voltage classes of the same device power can also be selected as current range.

2) Level and duration of the peak power, see diagram on page 31

3) The setting range extends max. to the possible peak power.

4) Rise and fall times are defined of 10 % ... 90 % and 90 % ... 10 % of the maximum current. (current mode FAST, tolerance ±20 %)

5) SB4: 4 mm safety socket
BM8: M8 screw fitting
FK25: Flat copper rail 25x10 mm with 4 mm hole and M10 and M12 bolt
FK40: Flat copper rail 40x12 mm with 4 mm hole and M12 and M16 bolt

6) Measured on the front from distance of 1 m

7) 1HU = 44.45 mm

14,000 W ... 19,200 W DC

Model (order number)	ZS16006	ZS16012	ZS14030	ZS14060	ZS14080
Voltage	60 V	120 V	300 V	600 V	800 V
Current ¹⁾	1,500 A	750 A	300 A	200 A	150 A
Continuous power	16,000 W	16,000 W	14,000 W	14,000 W	14,000 W
Short-time power ²⁾	36,000 W	36,000 W	24,000 W	-	-
Current setting	0 ... 500 A 0 ... 1,500 A	0 ... 250 A 0 ... 750 A	0 ... 100 A 0 ... 300 A	0 ... 67 A 0 ... 200 A	0 ... 50 A 0 ... 150 A
Resistance setting	4 mΩ ... 1.33 Ω (max. 500 A) 1.3 mΩ ... 0.44 Ω (max. 1,500 A)	8 mΩ ... 5.33 Ω (max. 250 A) 2.7 mΩ ... 1.78 Ω (max. 750 A)	0.02 Ω ... 33.3 Ω (max. 100 A) 6.7 mΩ ... 11.1 Ω (max. 300 A)	0.03 Ω ... 100 Ω (max. 67 A) 0.01 Ω ... 33.3 Ω (max. 200 A)	0.04 Ω ... 177 Ω (max. 50 A) 0.013 Ω ... 59 Ω (max. 150 A)
Power setting ³⁾	0 ... 12,000 W 0 ... 36,000 W	0 ... 12,000 W 0 ... 36,000 W	0 ... 8,000 W 0 ... 24,000 W	0 ... 4,667 W 0 ... 14,000 W	0 ... 4,667 W 0 ... 14,000 W
Rise/fall time ⁴⁾	100 μs	80 μs	60 μs	60 μs	60 μs
Load connections ⁵⁾	FK40	FK40 with cover	FK25 with cover	FK25 with cover	FK25 with cover
Power consumption	600 VA	600 VA	600 VA	600 VA	600 VA
Noise max. ⁶⁾	77 dB(A)	77 dB(A)	77 dB(A)	77 dB(A)	77 dB(A)
Weight	104 kg	104 kg	91 kg	91 kg	91 kg
Housing ⁷⁾	19" - 14 HU	19" - 14 HU	19" - 14 HU	19" - 14 HU	19" - 14 HU
Model (order number)	ZS17606	ZS17612	ZS15430	ZS15460	ZS15480
Voltage	60 V	120 V	300 V	600 V	800 V
Current ¹⁾	1,650 A	825 A	330 A	220 A	165 A
Continuous power	17,600 W	17,600 W	15,400 W	15,400 W	15,400 W
Short-time power ²⁾	39,600 W	39,600 W	26,400 W	-	-
Current setting	0 ... 550 A 0 ... 1,650 A	0 ... 275 A 0 ... 825 A	0 ... 110 A 0 ... 330 A	0 ... 73 A 0 ... 220 A	0 ... 55 A 0 ... 165 A
Resistance setting	3.6 mΩ ... 1.21 Ω (max. 550 A) 1.2 mΩ ... 0.4 Ω (max. 1,650 A)	7.3 mΩ ... 4.85 Ω (max. 275 A) 2.4 mΩ ... 1.62 Ω (max. 825 A)	0.018 Ω ... 30.3 Ω (max. 110 A) 6 mΩ ... 10.1 Ω (max. 330 A)	0.027 Ω ... 90.9 Ω (max. 73 A) 9 mΩ ... 30.3 Ω (max. 220 A)	0.036 Ω ... 161 Ω (max. 55 A) 0.012 Ω ... 53.6 Ω (max. 165 A)
Power setting ³⁾	0 ... 13,200 W 0 ... 39,600 W	0 ... 13,200 W 0 ... 39,600 W	0 ... 8,800 W 0 ... 26,400 W	0 ... 5,133 W 0 ... 15,400 W	0 ... 5,133 W 0 ... 15,400 W
Rise/fall time ⁴⁾	100 μs	80 μs	60 μs	60 μs	60 μs
Load connections ⁵⁾	FK40	FK40 with cover	FK25 with cover	FK25 with cover	FK25 with cover
Power consumption	660 VA	660 VA	660 VA	660 VA	660 VA
Noise max. ⁶⁾	77 dB(A)	77 dB(A)	77 dB(A)	77 dB(A)	77 dB(A)
Weight	106 kg	106 kg	98 kg	98 kg	98 kg
Housing ⁷⁾	19" - 14 HU	19" - 14 HU	19" - 14 HU	19" - 14 HU	19" - 14 HU
Model (order number)	ZS19206	ZS19212	ZS16830	ZS16860	ZS16880
Voltage	60 V	120 V	300 V	600 V	800 V
Current ¹⁾	1,800 A	900 A	360 A	240 A	180 A
Continuous power	19,200 W	19,200 W	16,800 W	16,800 W	16,800 W
Short-time power ²⁾	43,200 W	43,200 W	28,800 W	-	-
Current setting	0 ... 600 A 0 ... 1,800 A	0 ... 300 A 0 ... 900 A	0 ... 120 A 0 ... 360 A	0 ... 80 A 0 ... 240 A	0 ... 60 A 0 ... 180 A
Resistance setting	3.3 mΩ ... 1.11 Ω (max. 600 A) 1.1 mΩ ... 0.37 Ω (max. 1,800 A)	6.7 mΩ ... 4.44 Ω (max. 300 A) 2.2 mΩ ... 1.48 Ω (max. 900 A)	0.017 Ω ... 27.7 Ω (max. 120 A) 5.6 mΩ ... 9.3 Ω (max. 360 A)	0.025 Ω ... 83.3 Ω (max. 80 A) 8.3 mΩ ... 27.8 Ω (max. 240 A)	0.033 Ω ... 148 Ω (max. 60 A) 0.011 Ω ... 49.3 Ω (max. 180 A)
Power setting ³⁾	0 ... 14,400 W 0 ... 43,200 W	0 ... 14,400 W 0 ... 43,200 W	0 ... 9,600 W 0 ... 28,800 W	0 ... 5,600 W 0 ... 16,800 W	0 ... 5,600 W 0 ... 16,800 W
Rise/fall time ⁴⁾	100 μs	80 μs	80 μs	80 μs	80 μs
Load connections ⁵⁾	FK40	FK40 with cover	FK25 with cover	FK25 with cover	FK25 with cover
Power consumption	700 VA	700 VA	700 VA	700 VA	700 VA
Noise max. ⁶⁾	77 dB(A)	77 dB(A)	77 dB(A)	77 dB(A)	77 dB(A)
Weight	111 kg	111 kg	106 kg	106 kg	106 kg
Housing ⁷⁾	19" - 14 HU	19" - 14 HU	19" - 14 HU	19" - 14 HU	19" - 14 HU

1) Each range of the higher voltage classes of the same device power can also be selected as current range.

2) Level and duration of the peak power, see diagram on page 31

3) The setting range extends max. to the possible peak power.

4) Rise and fall times are defined of 10 % ... 90 % and 90 % ... 10 % of the maximum current. (current mode FAST, tolerance ±20 %)

5) SB4: 4 mm safety socket
BM8: M8 screw fitting
FK25: Flat copper rail 25x10 mm with 4 mm hole and M10 and M12 bolt
FK40: Flat copper rail 40x12 mm with 4 mm hole and M12 and M16 bolt

6) Measured on the front from distance of 1 m

7) 1HU = 44.45 mm

18,200 W ... 24,000 W DC

Model (order number)	ZS20806	ZS20812	ZS18230	ZS18260	ZS18280
Voltage	60 V	120 V	300 V	600 V	800 V
Current ¹⁾	1,950 A	975 A	390 A	260 A	195 A
Continuous power	20,800 W	20,800 W	18,200 W	18,200 W	18,200 W
Short-time power ²⁾	46,800 W	46,800 W	31,200 W	-	-
Current setting	0 ... 650 A 0 ... 1,950 A	0 ... 325 A 0 ... 975 A	0 ... 130 A 0 ... 390 A	0 ... 87 A 0 ... 260 A	0 ... 65 A 0 ... 195 A
Resistance setting	3 mΩ ... 1 Ω (max. 650 A) 1 mΩ ... 0.34 Ω (max. 1,950 A)	6 mΩ ... 4.1 Ω (max. 325 A) 2 mΩ ... 1.37 Ω (max. 975 A)	0.015 Ω ... 25.6 Ω (max. 130 A) 5 mΩ ... 8.55 Ω (max. 390 A)	0.023 Ω ... 76.9 Ω (max. 87 A) 7.7 mΩ ... 25.6 Ω (max. 260 A)	0.03 Ω ... 136 Ω (max. 65 A) 0.01 Ω ... 45.3 Ω (max. 195 A)
Power setting ³⁾	0 ... 15,600 W 0 ... 46,800 W	0 ... 15,600 W 0 ... 46,800 W	0 ... 10,400 W 0 ... 31,200 W	0 ... 6,067 W 0 ... 18,200 W	0 ... 6,067 W 0 ... 18,200 W
Rise/fall time ⁴⁾	100 μs	100 μs	80 μs	80 μs	80 μs
Load connections ⁵⁾	FK40	FK40 with cover	FK25 with cover	FK25 with cover	FK25 with cover
Power consumption	805 VA	805 VA	805 VA	805 VA	805 VA
Noise max. ⁶⁾	78 dB(A)	78 dB(A)	78 dB(A)	78 dB(A)	78 dB(A)
Weight	122 kg	122 kg	116 kg	116 kg	116 kg
Housing ⁷⁾	19" - 17 HU	19" - 17 HU	19" - 17 HU	19" - 17 HU	19" - 17 HU
Model (order number)	ZS22406	ZS22412	ZS19630	ZS19660	ZS19680
Voltage	60 V	120 V	300 V	600 V	800 V
Current ¹⁾	2,100 A	1,050 A	420 A	280 A	210 A
Continuous power	22,400 W	22,400 W	19,600 W	19,600 W	19,600 W
Short-time power ²⁾	50,400 W	50,400 W	33,600 W	-	-
Current setting	0 ... 700 A 0 ... 2,100 A	0 ... 350 A 0 ... 1,050 A	0 ... 140 A 0 ... 420 A	0 ... 93 A 0 ... 280 A	0 ... 70 A 0 ... 210 A
Resistance setting	2.9 mΩ ... 0.95 Ω (max. 700 A) 1 mΩ ... 0.32 Ω (max. 2,100 A)	5.7 mΩ ... 3.81 Ω (max. 350 A) 1.9 mΩ ... 1.27 Ω (max. 1,050 A)	0.014 Ω ... 23.8 Ω (max. 140 A) 4.7 mΩ ... 7.94 Ω (max. 420 A)	0.021 Ω ... 71.4 Ω (max. 93 A) 7.1 mΩ ... 23.8 Ω (max. 280 A)	0.028 Ω ... 126 Ω (max. 70 A) 9.5 mΩ ... 42 Ω (max. 210 A)
Power setting ³⁾	0 ... 16,800 W 0 ... 50,400 W	0 ... 16,800 W 0 ... 50,400 W	0 ... 11,200 W 0 ... 33,600 W	0 ... 6,533 W 0 ... 19,600 W	0 ... 6,533 W 0 ... 19,600 W
Rise/fall time ⁴⁾	120 μs	100 μs	80 μs	80 μs	80 μs
Load connections ⁵⁾	FK40	FK40 with cover	FK25 with cover	FK25 with cover	FK25 with cover
Power consumption	875 VA	875 VA	875 VA	875 VA	875 VA
Noise max. ⁶⁾	78 dB(A)	78 dB(A)	78 dB(A)	78 dB(A)	78 dB(A)
Weight	129 kg	129 kg	123 kg	123 kg	123 kg
Housing ⁷⁾	19" - 17 HU	19" - 17 HU	19" - 17 HU	19" - 17 HU	19" - 17 HU
Model (order number)	ZS24006	ZS24012	ZS21030	ZS21060	ZS21080
Voltage	60 V	120 V	300 V	600 V	800 V
Current ¹⁾	2,250 A	1,125 A	450 A	300 A	225 A
Continuous power	24,000 W	24,000 W	21,000 W	21,000 W	21,000 W
Short-time power ²⁾	54,000 W	54,000 W	36,000 W	-	-
Current setting	0 ... 750 A 0 ... 2,250 A	0 ... 375 A 0 ... 1,125 A	0 ... 150 A 0 ... 450 A	0 ... 100 A 0 ... 300 A	0 ... 75 A 0 ... 225 A
Resistance setting	2.7 mΩ ... 0.89 Ω (max. 750 A) 0.89 mΩ ... 0.3 Ω (max. 2,250 A)	5.3 mΩ ... 3.56 Ω (max. 375 A) 1.8 mΩ ... 1.19 Ω (max. 1,125 A)	0.013 Ω ... 22.2 Ω (max. 150 A) 4.4 mΩ ... 7.41 Ω (max. 450 A)	0.02 Ω ... 66.7 Ω (max. 100 A) 6.7 mΩ ... 22.2 Ω (max. 300 A)	0.026 Ω ... 118 Ω (max. 75 A) 8.8 mΩ ... 39.3 Ω (max. 225 A)
Power setting ³⁾	0 ... 18,000 W 0 ... 54,000 W	0 ... 18,000 W 0 ... 54,000 W	0 ... 12,000 W 0 ... 36,000 W	0 ... 7,000 W 0 ... 21,000 W	0 ... 7,000 W 0 ... 21,000 W
Rise/fall time ⁴⁾	100 μs	100 μs	100 μs	100 μs	100 μs
Load connections ⁵⁾	FK40	FK40 with cover	FK25 with cover	FK25 with cover	FK25 with cover
Power consumption	900 VA	900 VA	900 VA	900 VA	900 VA
Noise max. ⁶⁾	77 dB(A)	77 dB(A)	77 dB(A)	77 dB(A)	77 dB(A)
Weight	136 kg	136 kg	130 kg	130 kg	130 kg
Housing ⁷⁾	19" - 17 HU	19" - 17 HU	19" - 17 HU	19" - 17 HU	19" - 17 HU

1) Each range of the higher voltage classes of the same device power can also be selected as current range.

2) Level and duration of the peak power, see diagram on page 31

3) The setting range extends max. to the possible peak power.

4) Rise and fall times are defined of 10 % ... 90 % and 90 % ... 10 % of the maximum current. (current mode FAST, tolerance ±20 %)

5) SB4: 4 mm safety socket
BM8: M8 screw fitting
FK25: Flat copper rail 25x10 mm with 4 mm hole and M10 and M12 bolt
FK40: Flat copper rail 40x12 mm with 4 mm hole and M12 and M16 bolt

6) Measured on the front from distance of 1 m

7) 1HU = 44.45 mm

22,400W ... 28,800W DC

Model (order number)	ZS25606	ZS25612	ZS22430	ZS22460	ZS22480
Voltage	60 V	120 V	300 V	600 V	800 V
Current ¹⁾	2,400 A	1,200 A	480 A	320 A	240 A
Continuous power	25,600 W	25,600 W	22,400 W	22,400 W	22,400 W
Short-time power ²⁾	57,600 W	57,600 W	38,400 W	-	-
Current setting	0 ... 800 A 0 ... 2,400 A	0 ... 400 A 0 ... 1,200 A	0 ... 160 A 0 ... 480 A	0 ... 107 A 0 ... 320 A	0 ... 80 A 0 ... 240 A
Resistance setting	2.5 mΩ ... 0.83 Ω (max. 800 A) 0.83 mΩ ... 0.28 Ω (max. 2,400 A)	5 mΩ ... 3.33 Ω (max. 400 A) 1.7 mΩ ... 1.11 Ω (max. 1,200 A)	0.013 Ω ... 20.8 Ω (max. 160 A) 4.2 mΩ ... 6.9 Ω (max. 480 A)	0.019 Ω ... 62.5 Ω (max. 107 A) 6.3 mΩ ... 20.8 Ω (max. 320 A)	0.025 Ω ... 111 Ω (max. 80 A) 8.3 mΩ ... 37 Ω (max. 240 A)
Power setting ³⁾	0 ... 19,200 W 0 ... 57,600 W	0 ... 19,200 W 0 ... 57,600 W	0 ... 12,800 W 0 ... 38,400 W	0 ... 7,467 W 0 ... 22,400 W	0 ... 7,467 W 0 ... 22,400 W
Rise/fall time ⁴⁾	100 μs	100 μs	100 μs	100 μs	100 μs
Load connections ⁵⁾	FK40	FK40 with cover	FK25 with cover	FK25 with cover	FK25 with cover
Power consumption	980 VA	980 VA	980 VA	980 VA	980 VA
Noise max. ⁶⁾	79 dB(A)	79 dB(A)	79 dB(A)	79 dB(A)	79 dB(A)
Weight	150 kg	150 kg	144 kg	144 kg	144 kg
Housing ⁷⁾	19" - 20 HU	19" - 20 HU	19" - 20 HU	19" - 20 HU	19" - 20 HU

Model (order number)	ZS27206	ZS27212	ZS23830	ZS23860	ZS23880
Voltage	60 V	120 V	300 V	600 V	800 V
Current ¹⁾	2,550 A	1,275 A	510 A	340 A	255 A
Continuous power	27,200 W	27,200 W	23,800 W	23,800 W	23,800 W
Short-time power ²⁾	61,200 W	61,200 W	40,800 W	-	-
Current setting	0 ... 850 A 0 ... 2,550 A	0 ... 425 A 0 ... 1,275 A	0 ... 170 A 0 ... 510 A	0 ... 113 A 0 ... 340 A	0 ... 85 A 0 ... 255 A
Resistance setting	2.4 mΩ ... 0.78 Ω (max. 850 A) 0.8 mΩ ... 0.26 Ω (max. 2,550 A)	4.7 mΩ ... 3.14 Ω (max. 425 A) 1.6 mΩ ... 1.05 Ω (max. 1,275 A)	0.012 Ω ... 19.6 Ω (max. 170 A) 3.9 mΩ ... 6.54 Ω (max. 510 A)	0.018 Ω ... 58.8 Ω (max. 113 A) 5.9 mΩ ... 19.6 Ω (max. 340 A)	0.023 Ω ... 104 Ω (max. 85 A) 7.8 mΩ ... 34.6 Ω (max. 255 A)
Power setting ³⁾	0 ... 20,400 W 0 ... 61,200 W	0 ... 20,400 W 0 ... 61,200 W	0 ... 13,600 W 0 ... 40,800 W	0 ... 7,933 W 0 ... 23,800 W	0 ... 7,933 W 0 ... 23,800 W
Rise/fall time ⁴⁾	120 μs	120 μs	100 μs	100 μs	100 μs
Load connections ⁵⁾	FK40	FK40 with cover	FK40 with cover	FK25 with cover	FK25 with cover
Power consumption	1,050 VA	1,050 VA	1,050 VA	1,050 VA	1,050 VA
Noise max. ⁶⁾	80 dB(A)	80 dB(A)	80 dB(A)	80 dB(A)	80 dB(A)
Weight	157 kg	157 kg	157 kg	151 kg	151 kg
Housing ⁷⁾	19" - 20 HU	19" - 20 HU	19" - 20 HU	19" - 20 HU	19" - 20 HU

Model (order number)	ZS28806	ZS28812	ZS25230	ZS25260	ZS25280
Voltage	60 V	120 V	300 V	600 V	800 V
Current ¹⁾	2,700 A	1,350 A	540 A	360 A	270 A
Continuous power	28,800 W	28,800 W	25,200 W	25,200 W	25,200 W
Short-time power ²⁾	64,800 W	64,800 W	43,200 W	-	-
Current setting	0 ... 900 A 0 ... 2,700 A	0 ... 450 A 0 ... 1,350 A	0 ... 180 A 0 ... 540 A	0 ... 120 A 0 ... 360 A	0 ... 90 A 0 ... 270 A
Resistance setting	2.2 mΩ ... 0.74 Ω (max. 900 A) 0.74 mΩ ... 0.25 Ω (max. 2,700 A)	4.4 mΩ ... 2.96 Ω (max. 450 A) 1.5 mΩ ... 0.99 Ω (max. 1,350 A)	0.011 Ω ... 18.5 Ω (max. 180 A) 3.7 mΩ ... 6.17 Ω (max. 540 A)	0.017 Ω ... 55.6 Ω (max. 120 A) 5.6 mΩ ... 18.5 Ω (max. 360 A)	0.022 Ω ... 98.7 Ω (max. 90 A) 7.4 mΩ ... 32.9 Ω (max. 270 A)
Power setting ³⁾	0 ... 21,600 W 0 ... 64,800 W	0 ... 21,600 W 0 ... 64,800 W	0 ... 14,400 W 0 ... 43,200 W	0 ... 8,400 W 0 ... 25,200 W	0 ... 8,400 W 0 ... 25,200 W
Rise/fall time ⁴⁾	120 μs	120 μs	100 μs	100 μs	100 μs
Load connections ⁵⁾	FK40	FK40 with cover	FK40 with cover	FK25 with cover	FK25 with cover
Power consumption	1,025 VA	1,025 VA	1,025 VA	1,025 VA	1,025 VA
Noise max. ⁶⁾	77 dB(A)	77 dB(A)	77 dB(A)	77 dB(A)	77 dB(A)
Weight	164 kg	164 kg	164 kg	158 kg	158 kg
Housing ⁷⁾	19" - 20 HU	19" - 20 HU	19" - 20 HU	19" - 20 HU	19" - 20 HU

- 1) Each range of the higher voltage classes of the same device power can also be selected as current range.
- 2) Level and duration of the peak power, see diagram on page 31

- 3) The setting range extends max. to the possible peak power.
- 4) Rise and fall times are defined of 10 % ... 90 % and 90 % ... 10 % of the maximum current. (current mode FAST, tolerance ±20 %)

- 5) SB4: 4 mm safety socket
BM8: M8 screw fitting
FK25: Flat copper rail 25x10 mm with 4 mm hole and M10 and M12 bolt
FK40: Flat copper rail 40x12 mm with 4 mm hole and M12 and M16 bolt

- 6) Measured on the front from distance of 1 m
- 7) 1HU = 44.45 mm



For our customers, precision is key

Electronic Loads, ZSLC Series

Water-cooled

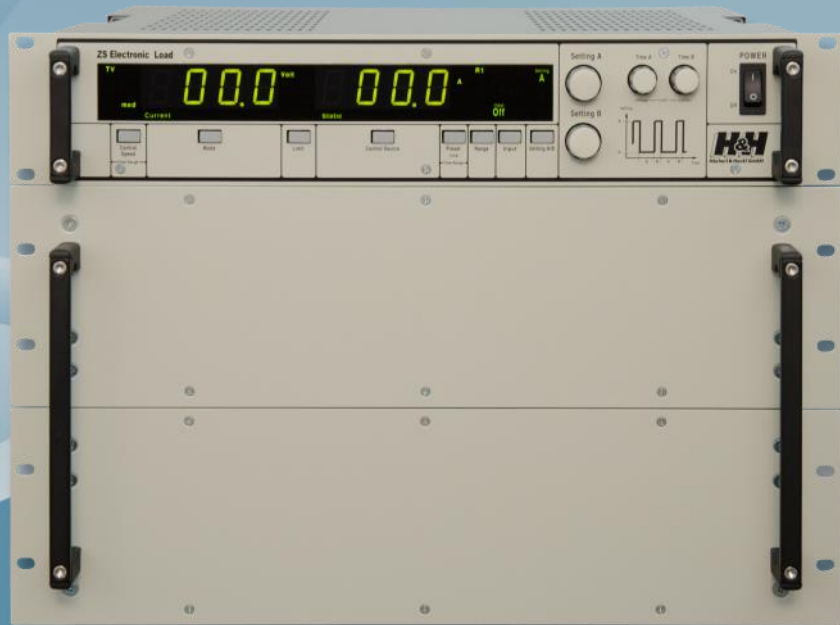
SCPI
96 Commands



Interface overview

RS-232	○
USB	○
GPIO	○
LAN	○
System bus	○
Analog	✗
Analog isolated	○

✗ Standard ○ Option / not available



ZSLC16006

- High power density by water-cooling
- Power 8,000 W ... 40,000 W
- Minimal operating noise
- Temperature-controlled coolant circuit
- Condensation protection
- For coolant with up to 30 % glycol

- Current, voltage, resistance, power-mode
- Dynamic loads
- SCPI programming with measurement function
- Full electronic protection
- Analog measurement outputs for voltage and current
- Analog control input

Features

The liquid-cooled loads of the ZSLC series have all the features of the ZS series.

Water Cooling

Water cooling is a very efficient heat dispersion method which does not heat the environment. It is also very quiet. The use of water-cooled devices is therefore particularly suited for areas in which correspondingly high-performance air-cooled devices cannot be used because of their thermal load and noise. The devices are also considerably more compact.

Coolant

The coolant must have a pH-value of between 6 and 8. A glycol portion of 20% to 30% is permissible.

Coolant consumption is controlled according to power.

Coolant feed is switched off in standby mode.

The maximum coolant temperature for the rated power is 12 °C. Power derating should be considered at higher temperatures.

A correspondingly lower coolant quantity is needed at inlet temperatures of less than 12 °C.

To ensure that the device is

fed with sufficient coolant it requires an operating pressure of 3 bar at the inlet.

Drainage must be possible without creating back pressure.

The required flow rate can be found in the type overview.

Condensation Protection

The ZSLC devices are protected against condensation of liquid by cold coolant.



Coolant distributor

8,000 W ... 24,000 W DC Water-cooled

Model (order number)	ZSLC8006	ZSLC8012	ZSLC8030	ZSLC8060
Voltage	60 V	120 V	300 V	600 V
Current ¹⁾	500 A	350 A	200 A	100 A
Continuous power	8,000 W	8,000 W	8,000 W	8,000 W
Current setting	0 ... 166 A 0 ... 500 A	0 ... 116 A 0 ... 350 A	0 ... 67 A 0 ... 200 A	0 ... 33 A 0 ... 100 A
Resistance setting	12 mΩ ... 4 Ω (max. 166 A) 4 mΩ ... 1.33 Ω (max. 500 A)	17 mΩ ... 11.4 Ω (max. 116 A) 5.7 mΩ ... 3.8 Ω (max. 350 A)	30 mΩ ... 50 Ω (max. 67 A) 10 mΩ ... 16.7 Ω (max. 200 A)	60 mΩ ... 200 Ω (max. 33 A) 20 mΩ ... 66.7 Ω (max. 100 A)
Power setting	0 ... 2,667 W 0 ... 8,000 W	0 ... 2,667 W 0 ... 8,000 W	0 ... 2,667 W 0 ... 8,000 W	0 ... 2,667 W 0 ... 8,000 W
Rise/fall time ²⁾	500 μs	500 μs	400 μs	400 μs
Load connections ³⁾	FK40	FK40 with cover	FK40 with cover	FK40 with cover
Power consumption	70 VA	70 VA	70 VA	70 VA
Coolant consumption ⁴⁾	15 l/min	15 l/min	15 l/min	15 l/min
No. of coolant connections	1	1	1	1
Weight	54 kg	54 kg	54 kg	54 kg
Housing ⁵⁾	19" - 5 HU	19" - 5 HU	19" - 5 HU	19" - 5 HU

Model (order number)	ZSLC16006	ZSLC16012	ZSLC16030	ZSLC16060
Voltage	60 V	120 V	300 V	600 V
Current ¹⁾	1,000 A	700 A	400 A	200 A
Continuous power	16,000 W	16,000 W	16,000 W	16,000 W
Current setting	0 ... 333 A 0 ... 1,000 A	0 ... 233 A 0 ... 700 A	0 ... 133 A 0 ... 400 A	0 ... 66 A 0 ... 200 A
Resistance setting	6 mΩ ... 2 Ω (max. 333 A) 2 mΩ ... 0.66 Ω (max. 1,000 A)	8.5 mΩ ... 5.71 Ω (max. 233 A) 2.8 mΩ ... 1.9 Ω (max. 700 A)	15 mΩ ... 25 Ω (max. 133 A) 5 mΩ ... 8.33 Ω (max. 400 A)	30 mΩ ... 100 Ω (max. 66 A) 10 mΩ ... 33.3 Ω (max. 200 A)
Power setting	0 ... 5,333 W 0 ... 16,000 W	0 ... 5,333 W 0 ... 16,000 W	0 ... 5,333 W 0 ... 16,000 W	0 ... 5,333 W 0 ... 16,000 W
Rise/fall time ²⁾	500 μs	500 μs	400 μs	400 μs
Load connections ³⁾	FK40	FK40 with cover	FK40 with cover	FK40 with cover
Power consumption	105 VA	105 VA	105 VA	105 VA
Coolant consumption ⁴⁾	30 l/min	30 l/min	30 l/min	30 l/min
No. of coolant connections	2	2	2	2
Weight	92 kg	92 kg	92 kg	92 kg
Housing ⁵⁾	19" - 8 HU	19" - 8 HU	19" - 8 HU	19" - 8 HU

Model (order number)	ZSLC24006	ZSLC24012	ZSLC24030	ZSLC24060
Voltage	60 V	120 V	300 V	600 V
Current ¹⁾	1,500 A	1,050 A	600 A	300 A
Continuous power	24,000 W	24,000 W	24,000 W	24,000 W
Current setting	0 ... 500 A 0 ... 1,500 A	0 ... 350 A 0 ... 1,050 A	0 ... 200 A 0 ... 600 A	0 ... 100 A 0 ... 300 A
Resistance setting	4 mΩ ... 1.33 Ω (max. 500 A) 1.3 mΩ ... 0.44 Ω (max. 1,500 A)	5.7 mΩ ... 3.8 Ω (max. 350 A) 1.9 mΩ ... 1.26 Ω (max. 1,050 A)	10 mΩ ... 16.6 Ω (max. 200 A) 3.3 mΩ ... 5.55 Ω (max. 600 A)	20 mΩ ... 66.6 Ω (max. 100 A) 6.7 mΩ ... 22.2 Ω (max. 300 A)
Power setting	0 ... 8,000 W 0 ... 24,000 W	0 ... 8,000 W 0 ... 24,000 W	0 ... 8,000 W 0 ... 24,000 W	0 ... 8,000 W 0 ... 24,000 W
Rise/fall time ²⁾	600 μs	500 μs	500 μs	600 μs
Load connections ³⁾	FK40	FK40 with cover	FK40 with cover	FK40 with cover
Power consumption	170 VA	170 VA	170 VA	170 VA
Coolant consumption ⁴⁾	45 l/min	45 l/min	45 l/min	45 l/min
No. of coolant connections	3	3	3	3
Weight	143 kg	143 kg	143 kg	143 kg
Housing ⁵⁾	19" - 11 HU	19" - 11 HU	19" - 11 HU	19" - 11 HU

1) Each range of the higher voltage classes of the same device power can also be selected as current range.

2) Rise and fall times are defined of 10 % ... 90 % and 90 % ... 10 % of the maximum current. (current mode FAST, tolerance ±20 %)

3) FK40: Flat copper rail 40x12 mm with 4 mm hole and M12 and M16 bolt

4) At a coolant temperature of 12 °C
5) 1 HU = 44.45 mm

32,000 W ... 40,000 W DC Water-cooled

Model (order number)	ZSLC32006	ZSLC32012	ZSLC32030	ZSLC32060
Voltage	60 V	120 V	300 V	600 V
Current ¹⁾	2,000 A	1,400 A	800 A	400 A
Continuous power	32,000 W	32,000 W	32,000 W	32,000 W
Current setting	0 ... 666 A 0 ... 2,000 A	0 ... 466 A 0 ... 1,400 A	0 ... 266 A 0 ... 800 A	0 ... 133 A 0 ... 400 A
Resistance setting	3 mΩ ... 1 Ω (max. 666 A) 1 mΩ ... 0.33 Ω (max. 2,000 A)	4.2 mΩ ... 2.85 Ω (max. 466 A) 1.4 mΩ ... 0.95 Ω (max. 1,400 A)	7.5 mΩ ... 12.5 Ω (max. 266 A) 2.5 mΩ ... 4.16 Ω (max. 800 A)	20 mΩ ... 66.6 Ω (max. 133 A) 6.6 mΩ ... 22.2 Ω (max. 400 A)
Power setting	0 ... 10,667 W 0 ... 32,000 W	0 ... 10,667 W 0 ... 32,000 W	0 ... 10,667 W 0 ... 32,000 W	0 ... 10,667 W 0 ... 32,000 W
Rise/fall time ²⁾	600 μs	500 μs	500 μs	400 μs
Load connections ³⁾	FK40	FK40 with cover	FK40 with cover	FK40 with cover
Power consumption	180 VA	180 VA	180 VA	180 VA
Coolant consumption ⁴⁾	60 l/min	60 l/min	60 l/min	60 l/min
No. of coolant connections	4	4	4	4
Weight	195 kg	195 kg	195 kg	195 kg
Housing ⁵⁾	19" - 14 HU	19" - 14 HU	19" - 14 HU	19" - 14 HU

Model (order number)	ZSLC40006	ZSLC40012	ZSLC40030	ZSLC40060
Voltage	60 V	120 V	300 V	600 V
Current ¹⁾	2,500 A	1,750 A	1,000 A	500 A
Continuous power	40,000 W	40,000 W	40,000 W	40,000 W
Current setting	0 ... 833 A 0 ... 2,500 A	0 ... 583 A 0 ... 1,750 A	0 ... 333 A 0 ... 1,000 A	0 ... 167 A 0 ... 500 A
Resistance setting	2.4 mΩ ... 0.8 Ω (max. 833 A) 0.8 mΩ ... 0.267 Ω (max. 2,500 A)	3.4 mΩ ... 2.28 Ω (max. 583 A) 1.1 mΩ ... 0.76 Ω (max. 1,750 A)	6 mΩ ... 10 Ω (max. 333 A) 2 mΩ ... 3.33 Ω (max. 1,000 A)	12 mΩ ... 40 Ω (max. 167 A) 4 mΩ ... 13.3 Ω (max. 500 A)
Power setting	0 ... 13,333 W 0 ... 40,000 W	0 ... 13,333 W 0 ... 40,000 W	0 ... 13,333 W 0 ... 40,000 W	0 ... 13,333 W 0 ... 40,000 W
Rise/fall time ²⁾	600 μs	500 μs	500 μs	400 μs
Load connections ³⁾	FK40	FK40 with cover	FK40 with cover	FK40 with cover
Power consumption	240 VA	240 VA	240 VA	240 VA
Coolant consumption ⁴⁾	75 l/min	75 l/min	75 l/min	75 l/min
No. of coolant connections	5	5	5	5
Weight	247 kg	247 kg	247 kg	247 kg
Housing ⁵⁾	19" - 17 HU	19" - 17 HU	19" - 17 HU	19" - 17 HU



ZSLC16006

1) Each range of the higher voltage classes of the same device power can also be selected as current range.

2) Rise and fall times are defined of 10 % ... 90 % and 90 % ... 10 % of the maximum current. (current mode FAST, tolerance ±20 %)

3) FK40: Flat copper rail 40x12 mm with 4 mm hole and M12 and M16 bolt

4) At a coolant temperature of 12 °C
5) 1 HU = 44.45 mm

Electronic Loads, ZSLV series

Low Voltage

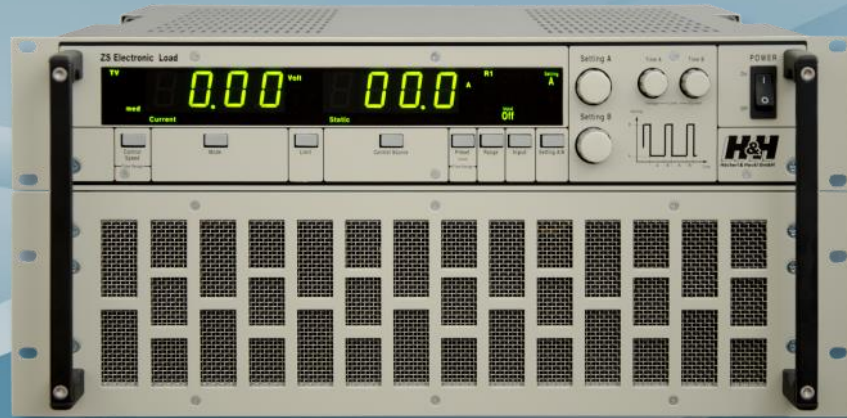
SCPI
96 Commands



Interface overview

RS-232	○
USB	○
GPIO	○
LAN	○
System bus	○
Analog	✗
Analog isolated	○

✗ Standard ○ Option / not available



ZSLV1502

- Specially designed for testing fuel cells
- Currents up to 2,250 A
- Power 1,000 W ... 6,000 W
- Full current at 150 mV input voltage
- Current, voltage, resistance, power mode
- Dynamic loads
- SCPI programming with measurement function

- Full electronic protection
- Analog measurement outputs for voltage and current
- Analog control input

1,000 W ... 6,000 W DC Low Voltage

Model (order number)	ZSLV1002	ZSLV1502	ZSLV2002	ZSLV4002	ZSLV6002
Voltage	20 V	20 V	20 V	20 V	20 V
Current	220 A	500 A	750 A	1,500 A	2,250 A
Vmin @ Imax	150 mV	150 mV	175 mV	200 mV	200 mV
Continuous power	1,000 W	1,500 W	2,000 W	4,000 W	6,000 W
Current setting	0 ... 73 A 0 ... 220 A	0 ... 166 A 0 ... 500 A	0 ... 250 A 0 ... 750 A	0 ... 500 A 0 ... 1,500 A	0 ... 750 A 0 ... 2,250 A
Resistance setting	2 mΩ ... 3 Ω (max. 73 A) 0.7 mΩ ... 1 Ω (max. 220 A)	0.9 mΩ ... 1.33 Ω (max. 166 A) 0.3 mΩ ... 0.44 Ω (max. 500 A)	0.7 mΩ ... 0.9 Ω (max. 250 A) 0.23 mΩ ... 0.3 Ω (max. 750 A)	0.4 mΩ ... 0.45 Ω (max. 500 A) 0.13 mΩ ... 0.15 Ω (max. 1,500 A)	0.27 mΩ ... 0.26 Ω (max. 750 A) 0.09 mΩ ... 0.087 Ω (max. 2,250 A)
Power setting	0 ... 333 W 0 ... 1,000 W	0 ... 500 W 0 ... 1,500 W	0 ... 666 W 0 ... 2,000 W	0 ... 1,333 W 0 ... 4,000 W	0 ... 2,000 W 0 ... 6,000 W
Rise/fall time ¹⁾	500 μs	500 μs	600 μs	600 μs	750 μs
Load connections ²⁾	FK50	FK50	FK50	FK50	FK50
Power consumption	90 VA	110 VA	120 VA	150 VA	260 VA
Noise max. ³⁾	58 dB(A)	58 dB(A)	62 dB(A)	64 dB(A)	65 dB(A)
Weight	34 kg	39 kg	48 kg	73 kg	98 kg
Housing ⁴⁾	19" - 5 HU	19" - 5 HU	19" - 5 HU	19" - 8 HU	19" - 11 HU

1) Rise and fall times are defined as 10% ... 90% and 90% ... 10% of the maximum current.
(current mode FAST, tolerance ±20%)

2) FK50: flat copper rail 50x10 mm with M12 bolt
3) Measured on the front from distance of 1 m
4) 1 HU = 44.45 mm

H&H

PL

ZS

ZSLC
Water-cooledZSLV
Low VoltagePMLI
Multi-channelZSAC
ACNL
Source-SinkAccesso-
ries

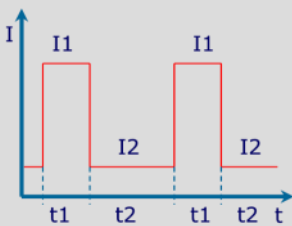
Application Notes

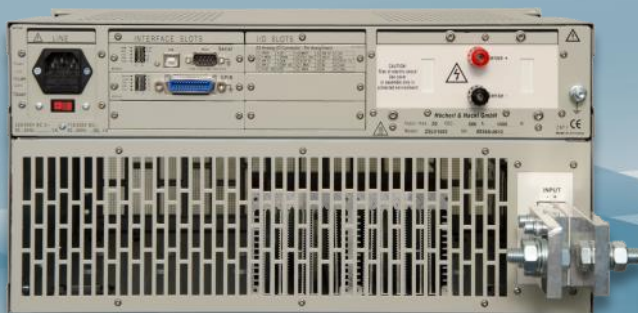
Software

GTC

Technical data ZS, ZSLC, ZSLV series

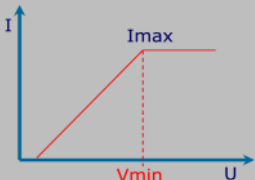
Accuracy of manual setting, no preset function		
	of the setting value	of the corresponding range
Voltage	±0.2 %	±0.05 %
Current ZS,ZSLC ZSLV	±0.2 % ±0.3 %	±0.05 % ±0.1 %
Accuracy of manual setting via preset function		
	of the setting value	of the corresponding range
Voltage	±0.6 %	±0.05 %
Current ZS,ZSLC ZSLV	±0.6 % ±0.7 %	±0.05 % ±0.1 %
Resistance ZS,ZSLC ZSLV	±1.4 %	±0.3 % of current range ±0.5 % of current range
Power ZS,ZSLC ZSLV	±1.4 %	±0.5 % ±1 %
Current protection	±1.4 %	±0.3 %
Trigger voltage	±1.4 %	±0.3 %
Accuracy of display		
	of the measured value (actual value)	of the corresponding range
Voltage	±0.2 %	±0.05 % ±1 digit
Current	±0.2 %	±0.05 % ±1 digit
Accuracy of analog control 0 ... 5 V / 0 ... 10 V for current, voltage, power		
	of the setting value	of the corresponding range
Voltage	±0.2 %	±0.1 %
Current ZS,ZSLC ZSLV	±0.2 % ±0.3 %	±0.1 % ±0.2 %
Power ZS,ZSLC ZSLV	±2 % ±2.5 %	±0.5 % ±1 %
Current protection *	±1 %	±0.4 %
Trigger voltage *	±1 %	±0.4 %
* only if option ZS08 is installed Input resistance of analog inputs >10 kΩ GND max. ±2 V with respect to negative load input ¹⁾		
Accuracy of analog measurement outputs 0 ... 10 V for current, voltage, power ²⁾		
	of analog signal of real value	Offset voltage
Voltage	±0.2 %	±15 mV
Current ZS,ZSLC ZSLV	±0.2 % ±0.3 %	±15 mV ±30 mV
Power ZS,ZSLC ZSLV	±2 % ±2.5 %	±30 mV ±60 mV
GND max. ±2 V with respect to negative load input ¹⁾ Minimal load 2 kΩ		

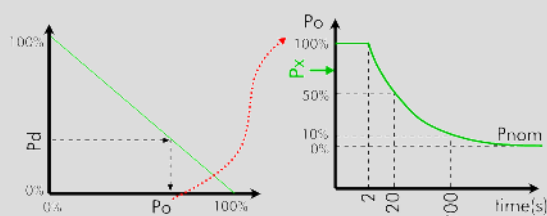
External control functions		
Via Analog I/O Interface	Load on - off Trigger input and output Range switching Operating mode switching Remote shut down	
Accuracy of setting Programming via data interface		
	of setting	of the corresponding range
Voltage	±0.2 %	±0.05 %
Current ZS,ZSLC ZSLV	±0.2 % ±0.3 %	±0.05 % ±0.05 %
Resistance ZS,ZSLC ZSLV	±1 %	±0.3 % of current range ±0.5 % of current range
Power ZS,ZSLC ZSLV	±1 %	±0.5 % ±1 %
Current protection	±1 %	±0.3 %
Trigger voltage	±1 %	±0.3 %
Resolution of setting	16 Bit	
Accuracy off measurement, read out via data interface		
	of the measured value (actual value)	of the corresponding range
Voltage	±0.1 %	±0.05 %
Current	±0.2 %	±0.05 %
Resolution of meas.	18 Bit	
Sampling rate	330 ms, not triggerable	
Accuracy off measurement, read out via data interface Option ZS13		
	of the measured value (actual value)	of the corresponding range
Voltage	±0.15 %	±0.07 %
Current	±0.3 %	±0.07 %
Resolution of meas.	13 Bit	
Sampling rate	minimal 200 μs (into memory) triggerable	
Dynamics		
2 currents and 2 times can be set independently		
Time ranges	100 ms	1000 ms
Accuracy of time setting	of setting ±1.4 %	of the corresponding range ±0.5 %



ZSLV1502

- 1) 500 V with option ZS06 (apart from Zero-Volt option)
- 2) In the case of units with 3 and 4 setting ranges the power-proportional measurement signal is related to the selected setting range.

Input	
Input resistance	>50 kΩ when load input is off
Input capacity	approx. 2 μF / 1,000 W
Parallel operation	up to 3 devices in Master-Slave mode (hardware-controlled)
Minimum voltage	 ZS-devices up to 120V ZS-devices from 300V ZSLC ZSLV Vmin: 1 V 2 V 2 V see type overview
Permissible operating voltage	negative - housing
Standard with ZS06 option	125 V DC 500 V DC ³⁾
Protective devices	Over-current and over-power protection Over-voltage protection up to 110% of rated voltage ¹⁾ Reverse polarity protection with diode up to rated current ²⁾ Over-temperature cut-off Transient protection
Rated power	up to $T_A = 21\text{ °C}$
Derating	-1.2 % / °C for $T_A > 21\text{ °C}$
Overload capacity	see type overview / diagram



The max. possible overload P_o depends on the temperature of the device and therefore on the previously consumed continuous power P_d .

The possible overload duration depends on the value of the overload P_x .

Operating conditions	
Operating temperature	5 °C ... 40 °C
Cooling	Variable controlled fans Liquid cooling depending on model
Noise	See type overview
Supply voltage	115/230 V ~ ±10 %, 50 ... 60 Hz
Dimensions, weight	See type overview and table page 32
Color: Front panel Side panels, top	RAL7032 (pebble grey) RAL7037 (stone grey)
Electrical safety	DIN EN 61010-1
EMC, CE marking	DIN EN 61326-1 DIN EN 61000-3-2 DIN EN 61000-3-3
Warranty	2 years

Supplementary technical data for ZSLC (water-cooled)	
Coolant	Water or water-glycol mix
Materials in the cooling circuit	Copper, Brass, plastic
Max. coolant temperature	12 °C for rated power
Min. coolant temperature	5 °C
Derating at higher coolant temperature	-5 %/°C
Coolant pressure for rated power	min. 3 bar
Permissible operating pressure	max. 5 bar
Coolant connection	½ inch per 8,000 W

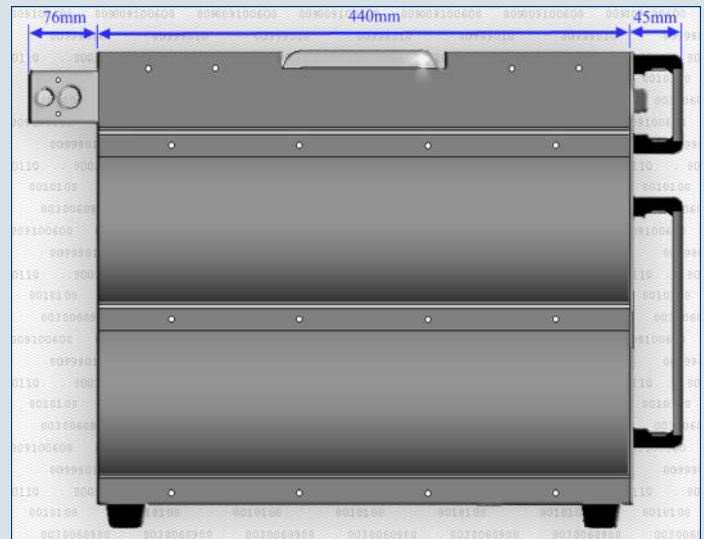
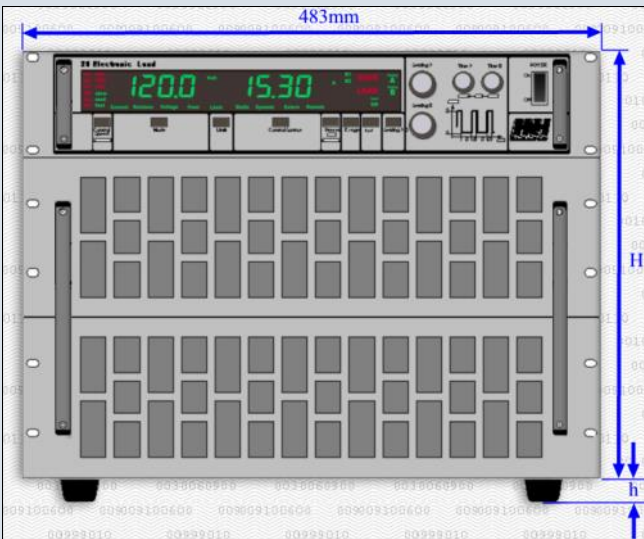


ZS512-4

- 1) 101 % with 800 V devices
- 2) No reverse polarity protection with Zero-Volt option
- 3) Apart from Zero-Volt option

Subject to technical modifications

Dimensions ZS, ZSLC, ZSLV Series

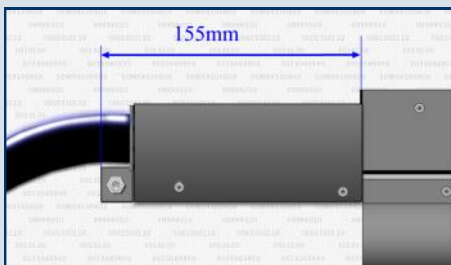


ZS units, air-cooled

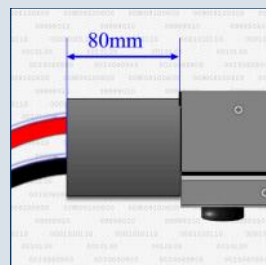
h: Standard:	15 mm
With option ZS09 (castors):	45 mm

Size (H)	2 HU	3 HU	5 HU	8 HU	11 HU	14 HU	17 HU	20 HU	23 HU	26 HU	29 HU	32 HU	35 HU
H (mm)	89	133	222	355	488	622	755	889	1,022	1,155	1,289	1,422	1,556

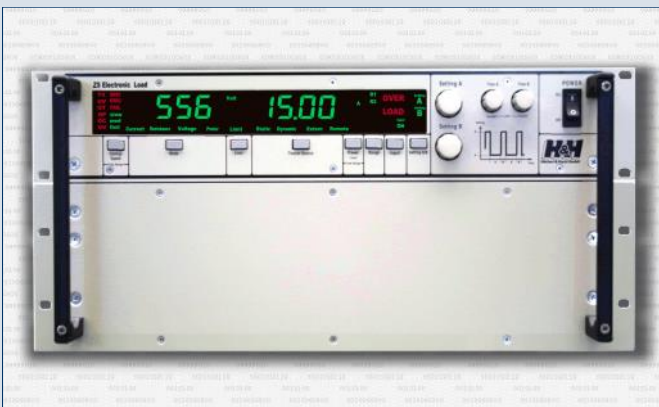
Dimension of terminals when using protective cover



from 5HU



2HU



ZSLC units, liquid cooled



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

Subject to technical modifications



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