



# DL3000 Series

## Programmable DC Electronic Load

- DL3021/DL3021A: single channel, DC150 V/40 A, total power up to 200 W
- DL3031/DL3031A: single channel, DC150 V/60 A, total power up to 350 W
- Dynamic mode: up to 30 kHz
- Adjustable current rising speed: 0.001 A/μs to 5 A/μs
- Min. readback resolution: 0.1 mV, 0.1 mA
- 4.3-inch TFT LCD, capable of displaying multiple parameters and states simultaneously
- Overvoltage/overcurrent/overpower/overtemperature/reverse voltage protection
- 4 static modes: CC, CV, CR, CP
- 3 dynamic modes: continuous, pulsed, toggled
- List function supports editing as many as 512 steps
- Battery test function, OCP test, OPP test, factory test function, etc.
- Short-circuit test function
- Power-off memory function
- Built-in RS232/USB/LAN communication interface
- USB-GPIB module (optional)

DL3000 is a cost-effective programmable DC electronic load with high performance. With a user-friendly interface and superb performance specifications, DL3000 series provides various interfaces for remote communication to meet your diversified test requirements. It can be widely used in various industries, such as automotive electronics, aerospace, and fuel cells.

TECHNOLOGIES, INC.



ES France - Département Tests & Mesures  
127 rue de Buzenval BP 26 - 92380 Garches

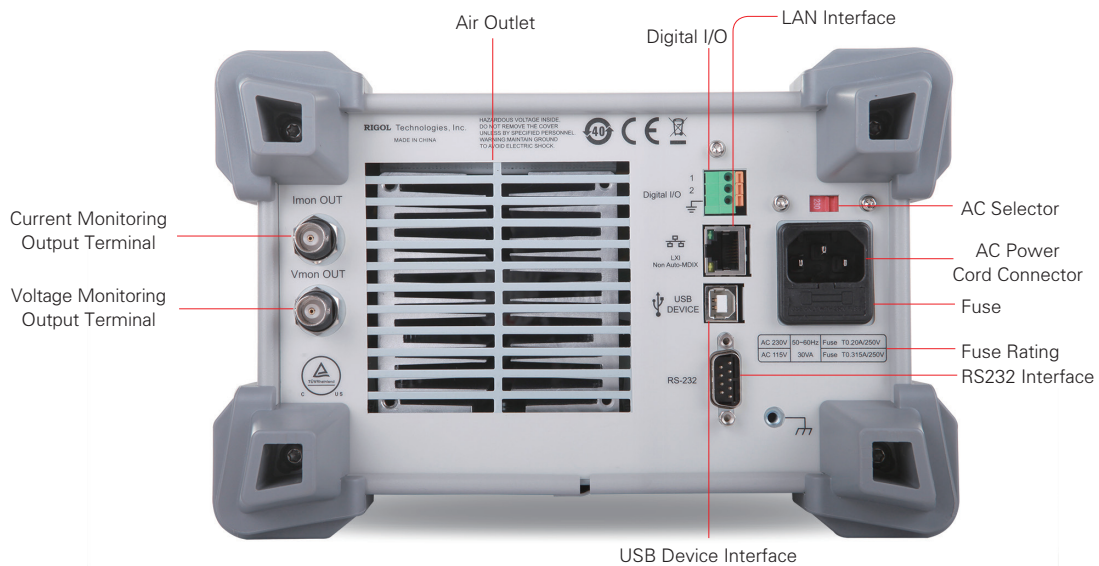
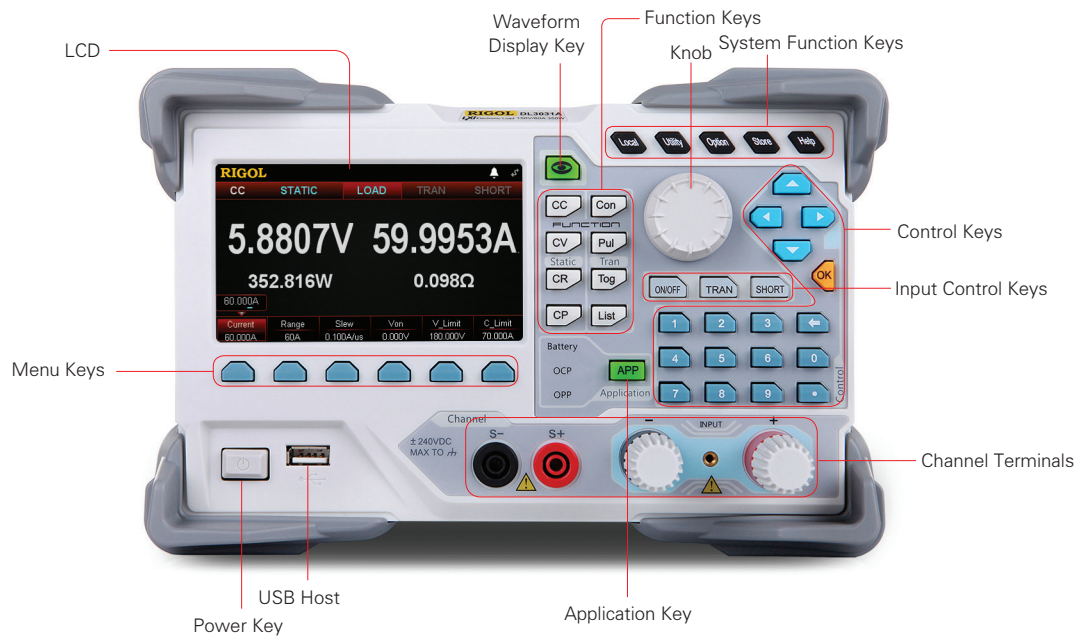


Tél. 01 47 95 99 45  
Fax. 01 47 01 16 22



e-mail : [tem@es-france.com](mailto:tem@es-france.com)  
Site Web : [www.es-france.com](http://www.es-france.com)

## ► Design Features



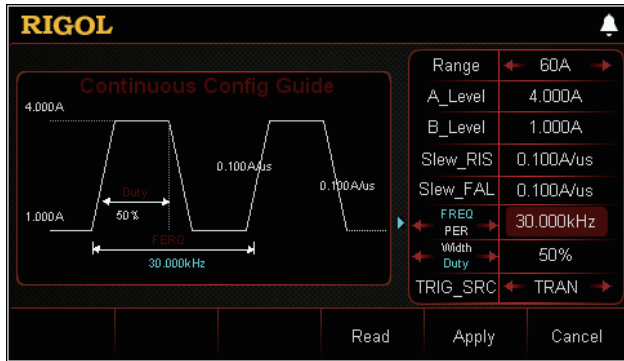
## ► Typical Applications

- General-purpose testing in the R&D lab
- DC power supply industry, such as regulated power supply, constant current power supply, switching mode power supply (SMPS), module power supply, power adapter, etc.
- Battery industry, such as various batteries and cell batteries
- Charger industry, such as battery charger and cell phone charger
- Power electronic device industry, such as MOSFET, IGBT, capacitor, and ballast resistor
- Teaching experiment



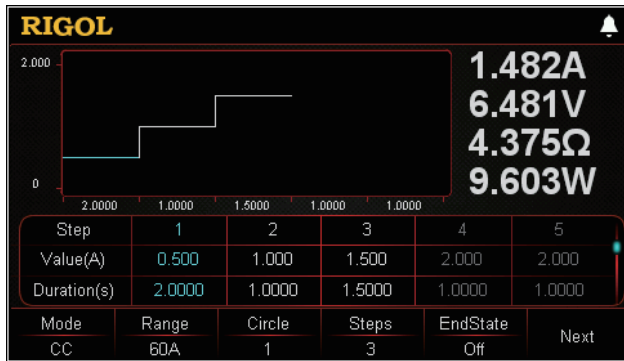
## ► Design Features

### 30 kHz dynamic mode



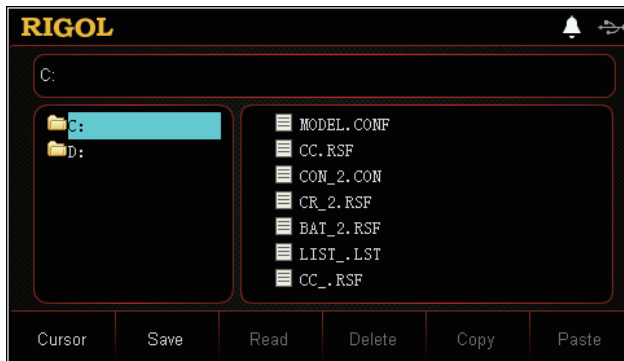
Transient test function enables the load to periodically switch between two set levels (Level A and Level B). It can be used to test the transient characteristics of the DUT. The highest frequency can be set to 30 kHz. Besides, in the guide interface, you can configure parameters in the parameter configuration list and view the configuration diagram at the left of the configuration list in the real-time manner.

### Powerful list operation function



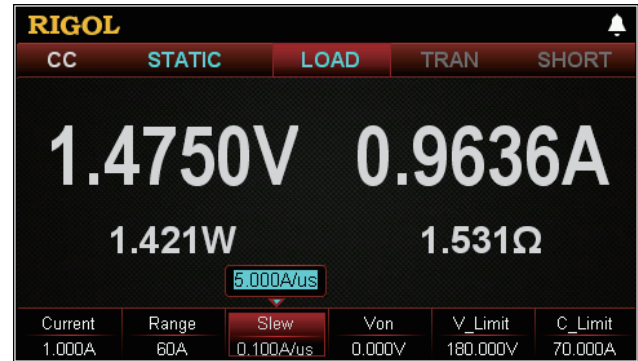
You can generate complex sequences by editing the setting value for each step, the dwell time, and slew rate (the slew rate can only be edited in CC mode) to meet the complex test demands.

### Easy-to-use function of file storage and recalling



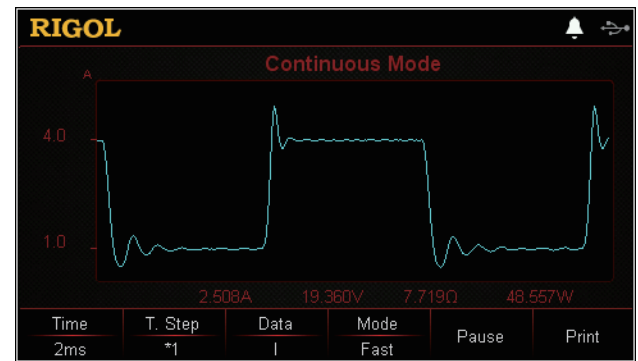
The load allows you to save different types of files to the internal and external memories. You can recall and read them when necessary.

### 5 A/μs current rising speed



Current rising speed is defined as the speed of transition from one setting to another. You can set the actual transition time from one setting to another by changing the current rising speed. Adjustable current rising speed: 0.001 A/μs to 5 A/μs.

### Powerful waveform display function



The electronic load provides the waveform display function and supports the following operations for the waveform, such as pausing the waveform, recording the waveform, and capturing the waveform. Therefore, you can dynamically observe the trend of parameters changes.

### Sound OVP/OCP/OPP/OTP/Reverse Voltage Protection

When OVP/OCP/OPP/OTP/reverse voltage protection occurs, the load will immediately turn off the input automatically and stop sinking. Then, a prompt message is displayed.



## ► Specifications

Unless otherwise noted, all specifications are guaranteed within the temperature range of 25°C±5°C with warm-up time of 30 minutes.

### DC Input (0°C ~40°C )

| Model   | Voltage | Current | Maximum Power | Minimum Operating Voltage (DC) |
|---------|---------|---------|---------------|--------------------------------|
| DL3021  | 0~150 V | 0~40 A  | 200 W         | 40 A@1 V                       |
| DL3021A |         |         |               |                                |
| DL3031  | 0~150 V | 0~60 A  | 350 W         | 60 A@1.3 V                     |
| DL3031A |         |         |               |                                |

### CC Mode

| Model   | Range  | Programmable Resolution | Programmable Accuracy <sup>[1]</sup> | Temperature Coefficient <sup>[2]</sup> |
|---------|--------|-------------------------|--------------------------------------|----------------------------------------|
| DL3021  | 0~4 A  | 1 mA                    | ±(0.1%+0.1%FS <sup>[3]</sup> )       | 100 ppm/°C                             |
| DL3021A | 0~40 A |                         | ±(0.05%+0.05%FS)                     |                                        |
| DL3031  | 0~6 A  | 1 mA                    | ±(0.1%+0.1%FS)                       | 100 ppm/°C                             |
| DL3031A | 0~60 A |                         | ±(0.05%+0.05%FS)                     |                                        |

### CV Mode

| Model   | Range   | Programmable Resolution | Programmable Accuracy | Temperature Coefficient <sup>[2]</sup> |
|---------|---------|-------------------------|-----------------------|----------------------------------------|
| DL3021  | 0~15 V  | 1 mV                    | ±(0.05%+0.02%FS)      | 50 ppm/°C                              |
| DL3021A | 0~150 V | 5 mV                    | ±(0.05%+0.025%FS)     |                                        |
| DL3031  | 0~15 V  | 1 mV                    | ±(0.05%+0.02%FS)      | 50 ppm/°C                              |
| DL3031A | 0~150 V | 5 mV                    | ±(0.05%+0.025%FS)     |                                        |

### CR Mode<sup>[4]</sup>

| Model   | Range <sup>[5]</sup>              | Programmable Resolution | Programmable Accuracy <sup>[6]</sup> |
|---------|-----------------------------------|-------------------------|--------------------------------------|
| DL3021  | 0.08 Ω~15 Ω<br>(0.0667 S~12.5 S)  | 2 mA/Vsense             | Vin/Rset*(0.2%)+0.2%IFS              |
| DL3021A | 2 Ω~15 kΩ<br>(0.0000667 S~0.5 S ) |                         |                                      |
| DL3031  | 0.08 Ω~15 Ω<br>(0.0667 S~12.5 S)  | 2 mA/Vsense             | Vin/Rset*(0.2%)+0.2%IFS              |
| DL3031A | 2 Ω~15 kΩ<br>(0.0000667 S~0.5 S ) |                         |                                      |

### CP Mode<sup>[4]</sup>

| Model   | Range   | Resolution |
|---------|---------|------------|
| DL3021  | 0~200 W | 100 mW     |
| DL3021A |         |            |
| DL3031  | 0~350 W | 100 mW     |
| DL3031A |         |            |

### Con Mode

| Model   | Frequency Range | Frequency Resolution | Frequency Accuracy | Duty Cycle Range |
|---------|-----------------|----------------------|--------------------|------------------|
| DL3021  | 0.001 Hz~15 kHz | 0.8%                 | ±0.5%              | 5%~95%, 1%       |
| DL3021A | 0.001 Hz~30 kHz |                      |                    |                  |
| DL3031  | 0.001 Hz~15 kHz |                      |                    |                  |
| DL3031A | 0.001 Hz~30 kHz |                      |                    |                  |



| Current Slew Rate <sup>[7]</sup> |                                                                   |            |          |
|----------------------------------|-------------------------------------------------------------------|------------|----------|
| Model                            | Range                                                             | Resolution | Accuracy |
| DL3021                           | 0.001 A/μs~0.25 A/μs<br>0.001 A/μs~2.5 A/μs (>5 V) <sup>[8]</sup> | 0.001 A/μs | 5%+10 μs |
| DL3021A                          | 0.001 A/μs~0.3 A/μs<br>0.001 A/μs~3 A/μs (>5 V)                   |            |          |
| DL3031                           | 0.001 A/μs~0.25 A/μs<br>0.001 A/μs~2.5 A/μs (>5 V)                | 0.001 A/μs | 5%+10 μs |
| DL3031A                          | 0.001 A/μs~0.5 A/μs<br>0.001 A/μs~5 A/μs (>5 V)                   |            |          |

| Readback Current |          |            |                  |                                        |
|------------------|----------|------------|------------------|----------------------------------------|
| Model            | Range    | Resolution | Accuracy         | Temperature Coefficient <sup>[2]</sup> |
| DL3021           | 0 ~ 40 A | 1 mA       | ±(0.1%+0.1%FS)   | 50 ppm/°C                              |
| DL3021A          |          | 0.1 mA     | ±(0.05%+0.05%FS) |                                        |
| DL3031           | 0 ~ 60 A | 1 mA       | ±(0.1%+0.1%FS)   | 50 ppm/°C                              |
| DL3031A          |          | 0.1 mA     | ±(0.05%+0.05%FS) |                                        |

| Readback Voltage |         |            |                  |                                        |
|------------------|---------|------------|------------------|----------------------------------------|
| Model            | Range   | Resolution | Accuracy         | Temperature Coefficient <sup>[2]</sup> |
| DL3021           | 0~150 V | 0.1 mV     | ±(0.05%+0.02%FS) | 20 ppm/°C                              |
| DL3021A          |         |            |                  |                                        |
| DL3031           | 0~150 V | 0.1 mV     | ±(0.05%+0.02%FS) | 20 ppm/°C                              |
| DL3031A          |         |            |                  |                                        |

| Readback Resistance |                                  |             |
|---------------------|----------------------------------|-------------|
| Model               | Range                            | Resolution  |
| DL3021              | 0.08 Ω~15 kΩ<br>(0.0667 S~0.5 S) | 2 mA/Vsense |
| DL3021A             |                                  |             |
| DL3031              | 0.08 Ω~15 kΩ<br>(0.0667 S~0.5 S) | 2 mA/Vsense |
| DL3031A             |                                  |             |

| Readback Power |         |            |
|----------------|---------|------------|
| Model          | Range   | Resolution |
| DL3021         | 0~200 W | 100 mW     |
| DL3021A        |         |            |
| DL3031         | 0~350 W | 100 mW     |
| DL3031A        |         |            |

| Protection Function                                                                                                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Overcurrent protection (OCP), overvoltage protection (OVP), overpower protection (OPP), overtemperature protection (OTP), as well as local/remote reverse voltage (LRV/RRV) protection. |

| Stability <sup>[9]</sup> |                |                |
|--------------------------|----------------|----------------|
| Model                    | Current        | Voltage        |
| DL3021                   | ±(0.01%+10 mA) | ±(0.01%+10 mV) |
| DL3021A                  |                |                |
| DL3031                   | ±(0.01%+10 mA) | ±(0.01%+10 mV) |
| DL3031A                  |                |                |

| Input Resistance |
|------------------|
| 350 kΩ           |





| Mechanical                |                                                                                                                                                                                                                                                                                                                  |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Dimensions                | 239 mm(W) x 157 mm(H) x 442 mm(D)                                                                                                                                                                                                                                                                                |
| Weight                    | Net weight: 7.58 kg                                                                                                                                                                                                                                                                                              |
| Power                     |                                                                                                                                                                                                                                                                                                                  |
| AC Input (50 Hz~60 Hz)    | 115 Vac±10%, 230 Vac±10% (max: 250 Vac)                                                                                                                                                                                                                                                                          |
| Maximum Input Power       | <30 VA                                                                                                                                                                                                                                                                                                           |
| Interface                 |                                                                                                                                                                                                                                                                                                                  |
| USB Device Interface      | 1                                                                                                                                                                                                                                                                                                                |
| USB Host Interface        | 1                                                                                                                                                                                                                                                                                                                |
| LAN Interface             | 1(optional)                                                                                                                                                                                                                                                                                                      |
| RS232                     | 1                                                                                                                                                                                                                                                                                                                |
| Digital I/O               | 1(optional)                                                                                                                                                                                                                                                                                                      |
| GPIB                      | 1 ((optional, GPIB extended from the USB-GPIB interface module)                                                                                                                                                                                                                                                  |
| Environment               |                                                                                                                                                                                                                                                                                                                  |
| Cooling Method            | Fan Cooled                                                                                                                                                                                                                                                                                                       |
| Operating Temperature     | 0°C ~40°C                                                                                                                                                                                                                                                                                                        |
| Storage Temperature       | -40°C ~70°C                                                                                                                                                                                                                                                                                                      |
| Humidity                  | 5%~80% RH (without condensation)                                                                                                                                                                                                                                                                                 |
| Altitude                  | Below 2,000 m                                                                                                                                                                                                                                                                                                    |
| Certification Information |                                                                                                                                                                                                                                                                                                                  |
| EMC                       | <p>Complies with the requirements of the following directive and standards.</p> <p>EMC Directive 2014/30/EU</p> <p>EN 61326-1</p> <p>EN 61000-3-2</p> <p>EN 61000-3-3</p> <p>Under following condition.</p> <p>The maximum length of all connecting cables and wires to the DL3000 series are less than 3 m.</p> |
| Safety                    | <p>Complies with the requirements of the following directive and standard.</p> <p>Low Voltage Directive 2014/35/EU</p> <p>EN 61010-1:2010</p> <p>IP Degree: IP20</p> <p>Pollution Degree: PD 2</p> <p>Over Voltage Category: OVC II</p> <p>Operation Location: Indoor use only; not for wet condition</p>        |

Note<sup>[1]</sup>: Data measured after 30-second current sinking at the programming value (applicable to the programming accuracy in CC mode and CV mode).

Note<sup>[2]</sup>: Gain and zero temperature coefficient within the ranges of 0°C~20°C and 30°C~40°C. For example, at 40°C, the programming accuracy is  $\pm[(0.1\%+10^{\circ}\text{C}\cdot 100\text{ ppm}/^{\circ}\text{C})\cdot 1\text{A}+(0.1\%+10^{\circ}\text{C}\cdot 100\text{ ppm}/^{\circ}\text{C})\cdot 4\text{ A}]$  under the following conditions: CC mode, 0-4A range, sink current 1 A.

Note<sup>[3]</sup>: FS indicates the full scale.

Note<sup>[4]</sup>: The input voltage/current value should not be smaller than 10% of the full scale.

Note<sup>[5]</sup>: The input voltage for the low range in CR mode should be smaller than 8 V.

Note<sup>[6]</sup>: The programming accuracy in CR mode is also determined by the input voltage accuracy.

Note<sup>[7]</sup>: Current slew rate: rising slew rate for 10%~90% of the current (0-maximum current).

Note<sup>[8]</sup>: When the input voltage is greater than 5 V, the maximum current slew rate is 5 A/μs; when the input voltage is greater than 4 V, the maximum current slew rate is 2.5 A/μs; when the input voltage is greater than 2 V, the maximum current slew rate is 0.1 A/μs.

Note<sup>[9]</sup>: Following a steady 30-minute current sinking, change in current/voltage sinking over 8 hours under constant load, line, and ambient temperature.



## ► Order Information

|                                       | Description                                                                                                                                         | Order No.     |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>Model</b>                          | Programmable DC Electronic Load (single channel, DC 150 V/40 A 200 W 15 kHz 2.5 A/μs)                                                               | DL3021        |
|                                       | Programmable DC Electronic Load (single channel, DC 150 V/40 A 200 W 30 kHz 3.0 A/μs)                                                               | DL3021A       |
|                                       | Programmable DC Electronic Load (single channel, DC 150 V/60 A 350 W 15 kHz 2.5 A/μs)                                                               | DL3031        |
|                                       | Programmable DC Electronic Load (single channel, DC 150 V/60 A 350 W 30 kHz 5.0 A/μs)                                                               | DL3031A       |
| <b>Standard Accessories</b>           | Power Cord                                                                                                                                          | -             |
|                                       | Either one of the following fuses:<br>• Fuse 50T-0200H 250 V 0.20 A (AC selector: 230 Vac)<br>• Fuse 50T-0315H 250 V 0.315 A (AC selector: 115 Vac) | -             |
|                                       | Quick Guide (hard copy)                                                                                                                             | -             |
|                                       | Shield                                                                                                                                              | -             |
| <b>Software Options<sup>[1]</sup></b> | LAN Interface                                                                                                                                       | LAN-DL3       |
|                                       | Digital I/O Option                                                                                                                                  | DIGITALIO-DL3 |
|                                       | Readback Resolution                                                                                                                                 | HIRES -DL3    |
|                                       | High Frequency Option                                                                                                                               | FREQ-DL3      |
|                                       | High Slew Rate Option                                                                                                                               | SLEWRATE-DL3  |
| <b>Accessories</b>                    | 9-Pin RS232 Cable (female-to-female, cross-over)                                                                                                    | CB-RS232-A    |
|                                       | Shield#DL3000#F                                                                                                                                     | SC-DL3        |
|                                       | USB-GPIB Module                                                                                                                                     | USB-GPIB-L    |
|                                       | Sense Cable                                                                                                                                         | CB-SENSE      |
|                                       | 20 A Test Lead                                                                                                                                      | CB-20A-780MM  |
|                                       | 40 A Test Lead                                                                                                                                      | CB-40A-780MM  |
|                                       | 60 A Test Lead                                                                                                                                      | CB-60A-780MM  |
|                                       | DL3000 Series Rack Mount Kit<br>(for a single instrument)                                                                                           | RM-1-DP800    |
|                                       | DL3000 Series Rack Mount Kit<br>(for two instruments)                                                                                               | RM-2-DP800    |

Note<sup>[1]</sup>: The A-plus instrument models (DL3021A/DL3031A) have been installed with software options before leaving the factory.

Note:

- When the DUT outputs large currents, please use the specified test leads provided in the optional accessories.
- The color schemes for the interfaces of A-plus instrument models (DL3021A/DL3031A) and those models without A (DL3021/DL3031) are different.
- For all the accessories and options, please contact the local office of **RIGOL**.



## ► Accessories Description

### 20 A/40 A/60 A Test Lead

| Model           | 20 A Test Lead                                                                    | 40 A Test Lead                                                                     | 60 A Test Lead                                                                      |
|-----------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Maximum Current | 20 A                                                                              | 40 A                                                                               | 60 A                                                                                |
| Maximum Voltage | 150 V                                                                             | 150 V                                                                              | 150 V                                                                               |
| Terminal        | M8/M8                                                                             | M8/M8                                                                              | M8/M8                                                                               |
| Wire Gauge      | AWG14                                                                             | AWG14×2                                                                            | AWG14×3                                                                             |
| Length          | 780 mm                                                                            | 780 mm                                                                             | 780 mm                                                                              |
| Exterior Design |  |  |  |

### Sense Cables

Enable the sense function. Then, use the sense cables to connect the sense terminals and the output terminals of the DUT to compensate for the voltage drop caused by the load leads.

Cable length: 780 mm



### USB-GPIB Interface Converter

Use the USB-GPIB interface converter to extend the GPIB interface, and then use the GPIB cable to connect the load to the PC to build communication with the PC for remote control.



### Shield

For safety considerations, a shield shall be installed.



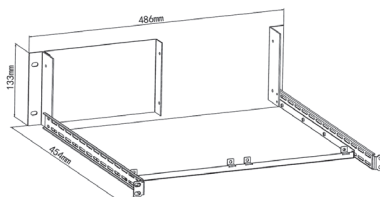
### 9-Pin RS232 Cable

To realize remote control, use the 9-pin RS232 cable to build communication between the load and the PC via the RS232 interface on the rear panel of the load.



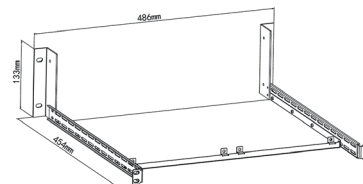
### Rack Mount Kit for a single instrument

It is used for installing a single instrument.



### Rack Mount Kit for two instruments

It is used for installing two instruments.



## Warranty Period

Three years for the mainframe.



ES France - Département Tests & Mesures  
127 rue de Buzenval BP 26 - 92380 Garches



Tél. 01 47 95 99 45  
Fax. 01 47 01 16 22



e-mail : [tem@es-france.com](mailto:tem@es-france.com)  
Site Web : [www.es-france.com](http://www.es-france.com)



#### HEADQUARTER

**RIGOL** TECHNOLOGIES, INC.  
No.8 Keling Road, New District, Suzhou,  
JiangSu, P.R. China  
Tel: +86-400620002  
Email: info@rigol.com

#### EUROPE

**RIGOL** TECHNOLOGIES EU GmbH  
Lindbergh str. 4  
82178 Puchheim  
Germany  
Tel: 0049-89/89418950  
Email: info-europe@rigol.com

#### NORTH AMERICA

**RIGOL** TECHNOLOGIES, USA INC.  
8140 SW Nimbus Ave.  
Beaverton, OR 97008  
Tel: 877-4-**RIGOL**-1  
Fax: 877-4-**RIGOL**-1  
Email: info@rigol.com

#### JAPAN

**RIGOL** TECHNOLOGIES JAPAN, LLC  
MJ Bldg. 3F, 1-7-4 Minato, Chuou-ku,  
Tokyo, Japan 104-0043  
Tel: +81-3-6262-8932  
Fax: +81-3-6262-8933  
Email: info-japan@rigol.com

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**ES France - Département Tests & Mesures**  
127 rue de Buzenval BP 26 - 92380 Garches



**Tél. 01 47 95 99 45**  
**Fax. 01 47 01 16 22**



**e-mail : [tem@es-france.com](mailto:tem@es-france.com)**  
**Site Web : [www.es-france.com](http://www.es-france.com)**