Modular Programmable DC Electronic Load

DML Series

The DML Series is a versatile multi-channel modular DC electronic load system capable of sinking up to 800 W in a compact bench form factor. The mainframe features two slots for housing any combination of single or dual-channel load modules. With five swappable modules, this series provides the flexibility to test a variety of power sources, including multi-output DC power supplies, batteries, fuel cells, and photovoltaic arrays.

In addition to constant current (CC), constant voltage (CV), constant resistance (CR), and constant power (CW) operating modes, the DML Series features fast transient operation and sweep modes for dynamic load conditions. The intuitive front panel interface offers independent control of each module to quickly adjust key parameters—such as voltage, current, slew rate, and pulse width. Instrument settings and test configurations can be saved directly to internal memory for quick recall.

Comprehensive built-in protections and automatic power-on self-test ensure stable and reliable operation.

The DML Series is equipped with LAN, USB (USBTMC-compliant), RS232, and GPIB interfaces, all supporting the SCPI command protocol for remote communication and control.

Special Application

The DML Series provides advanced test modes specifically for evaluating DC power supplies:

- Sweep test
- Protection limit test
- Maximum power point test

Features and benefits

- Power range up to 800 W
- Current range up to 160 A with parallel operation
- CC/CV/CR/CW operating modes
- Swappable modules for easy system configurability
- Supports up to 4 channels using dual channel modules
- Overcurrent (OCP), overvoltage (OVP), overpower (OPP), overtemperature (OTP), undervoltage (UVP), and reverse polarity protections
- Operate up to 4 channels in parallel for increased current
- Rack-mount brackets with handles included
- Analog current control and monitoring
- Transient mode up to 25 kHz in CC mode
- Configurable battery discharge test
- List mode (sequence mode) - minimum 20 μs step width with 100 user programmable steps
- Adjustable slew rate in CC mode
- 16-bit voltage and current measurement system providing high resolution of 0.1 mV and 0.01 mA
- Remote sense to compensate for voltage drop
- 4U form factor
- LabVIEW™ drivers and operating software included
- Standard LAN, GPIB, USB, and RS232 interfaces with USBTMC/SCPI protocol support

Populate the mainframe with any combination of two modules.

Model	DML102	DML200	DML202	DML301	DML400
Power	100 W / 100 W	200 W	200 W / 200 W	300 W	400 W
Operating Voltage	80 V	80 V	80 V	80 V	80 V
Rated Current	20 A	40 A	20 A	60 A	80 A
No. of Channels	2	1	2	1	1

The tools you need

Modular design

With the removable module design, you can choose suitable load modules to customize the system according to your requirements. This design allows for multiple channels, and is ideal for testing several units, especially power supplies with multiple outputs. At the same time, all load modules can be configured to work independently.

Adjustable slew rate

In constant current mode, users can control the rate or slope of the change in current in a transient response test. Set the slew rate to as slow as 0.00004 A/μs or as fast as 8 A/μs depending on the module and selected current range.

Operating software

PC software is provided for generating and executing test sequences and data logging without the need to write source code.

- Log voltage, current, power measurement and export data in spreadsheet format for further analysis
- Configure and run transient operation, list mode programs, and more

CR-LED mode

Simulate the loading behavior of typical LEDs for testing LED drivers. Configure common LED characteristics including operating resistance, forward voltage and operating current.

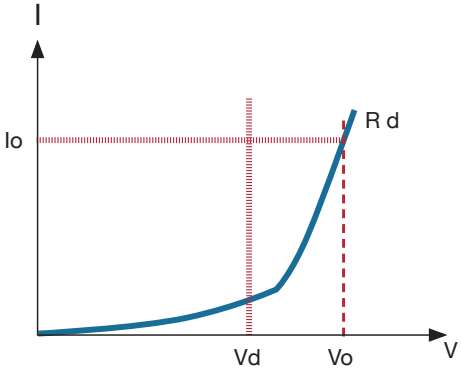
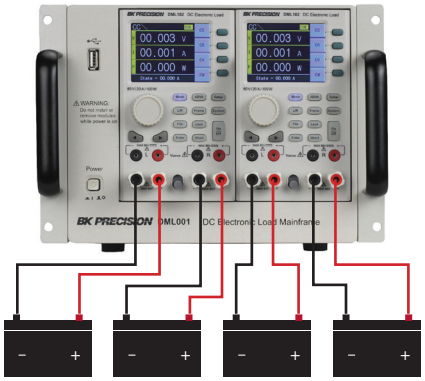


Figure - LED I-V Curve

- Vd = Forward voltage of the LED
- Rd Coeff = Ratio of the series equivalent resistance (RD) and total equivalent resistance of the LED (Vo/Io)
- Vo = Operating voltage across the LED
- Io = Operating current across the LED

Battery discharge test

Safely discharge batteries with configurable stop conditions including voltage and time. Once a battery discharge test has started, elapsed time is displayed with Amp-hour (Ah) and Watt-hour (Wh) measurements. Battery discharge test can operate in CC, CR, or CW mode.



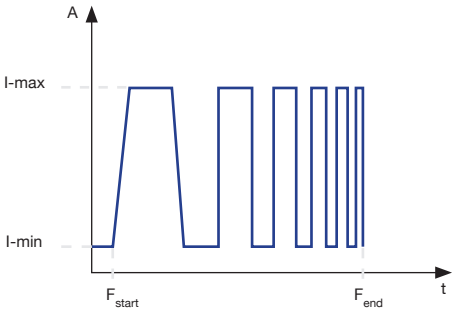
Discharge up to four batteries simultaneously.

Advanced power supply characterization

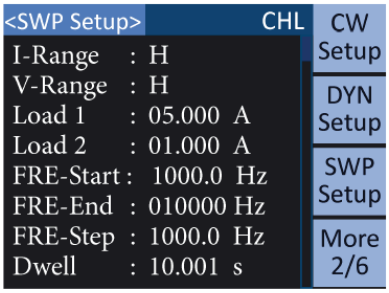
The DML Series features three test modes specifically for evaluating the performance of DC power supplies.

Sweep mode

Offers a simple way to capture overshoot and undershoot of a power supply by applying two configurable load levels at a swept frequency. The resulting maximum overshoot (Vp+) and maximum undershoot (Vp-) are displayed in real time at the frequencies of occurrence.



Sweep mode load profile



Sweep mode

Protection test

To evaluate the performance of common power supply protection features, the DML Series provides overcurrent, overvoltage, and overpower protection tests.

Maximum power point test

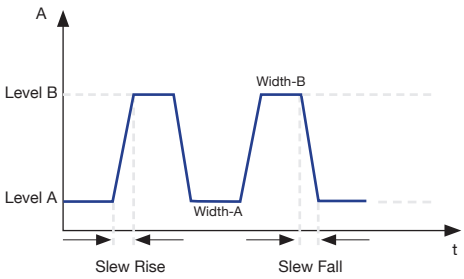
Determines the maximum power provided by the power supply and the voltage / current corresponding to the maximum power.

The tools you need

Transient operation

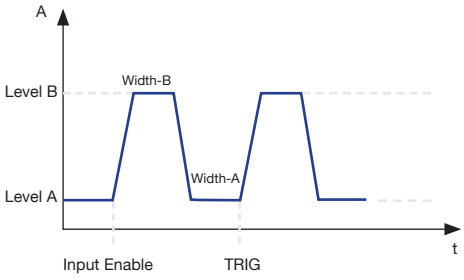
Transient operation enables the module to periodically switch between two load levels. A power supply's regulation and transient characteristic can be evaluated by monitoring the supply's output voltage under varying combinations of load levels, duty cycle, and slew rate. The DML Series can simulate these conditions at rates up to 25 kHz.

Transient – continuous



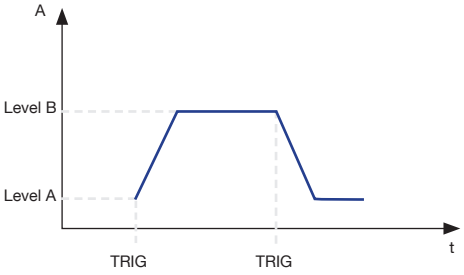
Switch continuously between A and B load current levels where rise/fall slew rates and level width can be adjusted.

Transient – pulse



Upon receipt of a trigger signal, the load executes one pulse cycle then returns to load current level A.

Transient – toggle

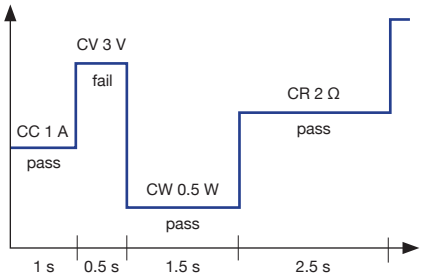


The DC load current will toggle between Level-A and Level-B following receipt of a trigger signal.

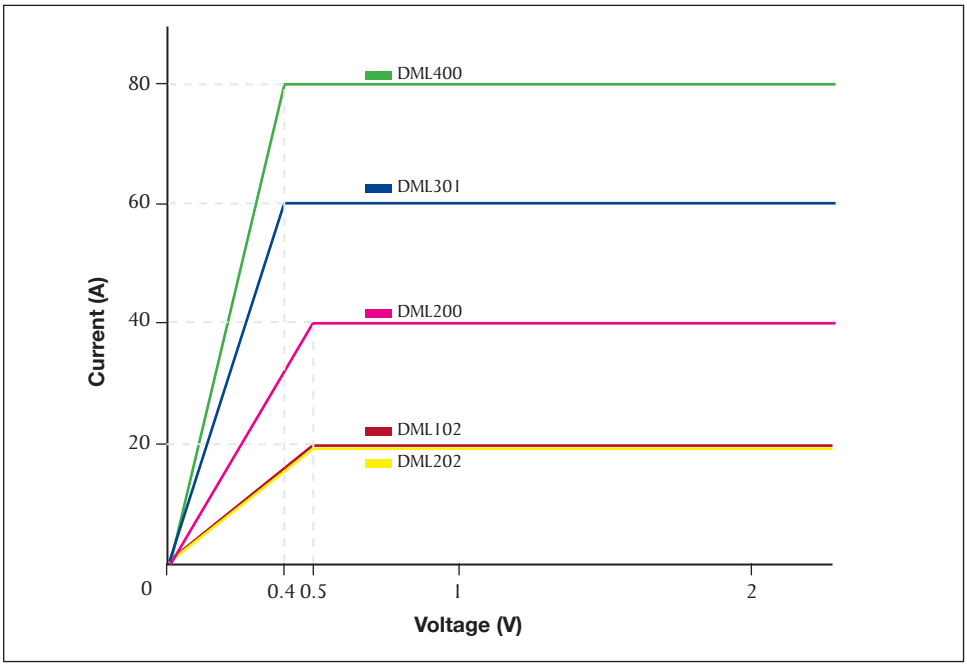
List mode

The DML Series list mode is highly configurable for generating precise load sequences with up to 100 user programmable steps. Step parameters include current limit, duration, and slew rate. The list mode programs can be set to repeat up to 65,535 times or indefinitely.

Automatic test mode



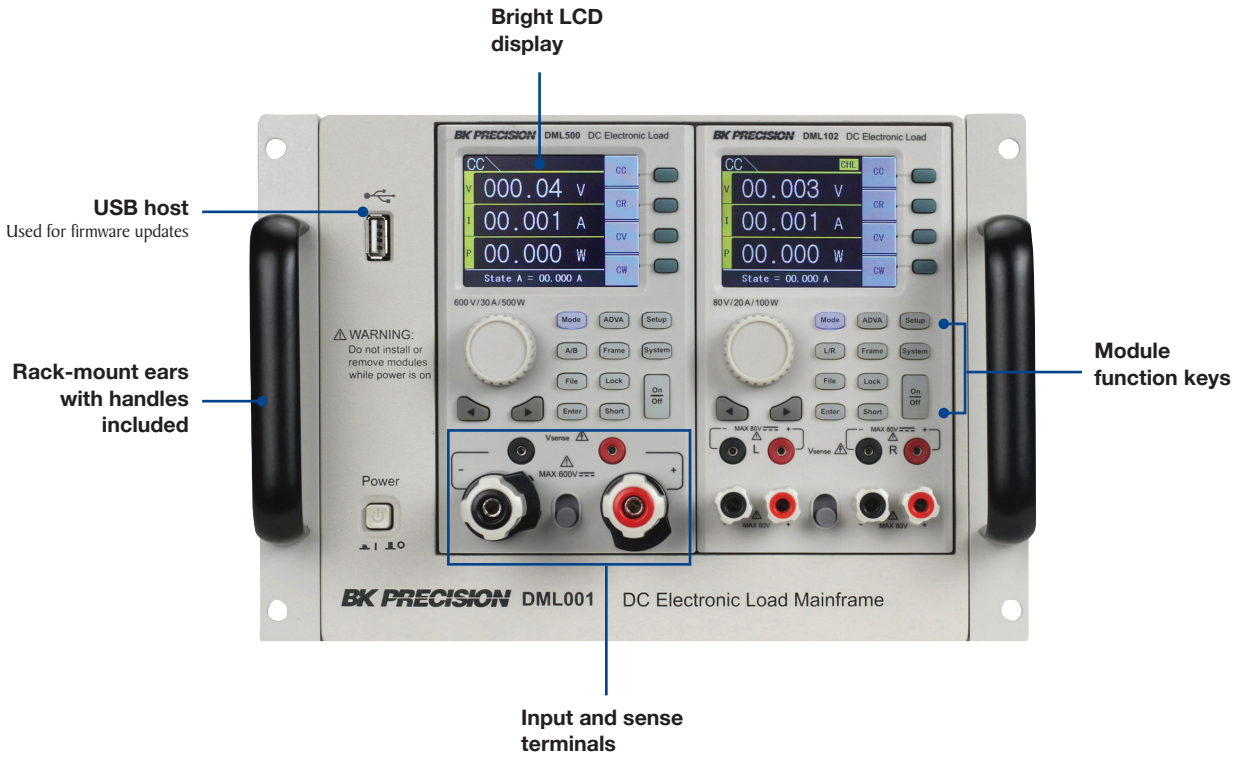
Automatic test mode enables these DC loads to execute multiple test sequences. Up to 100 different sequences can be linked to run steps of various operating modes and loading conditions. Each step can be programmed with upper and lower pass/fail limits.



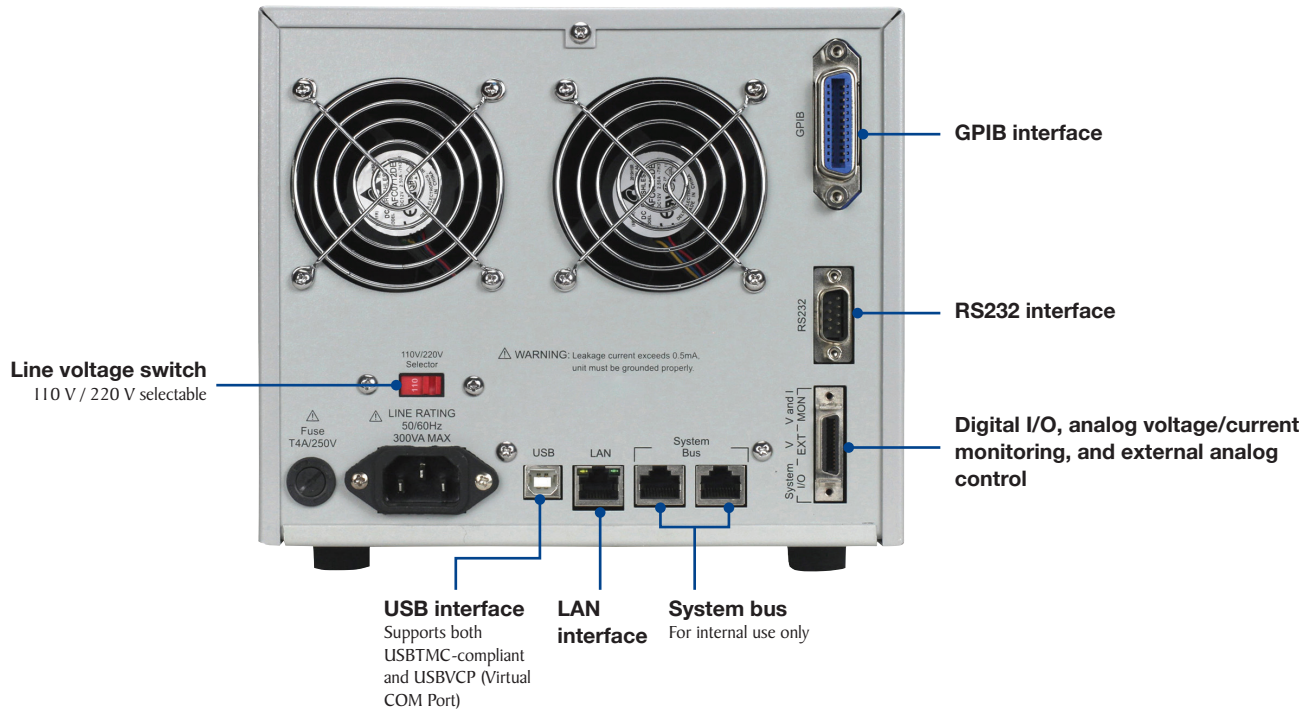
Typical minimum operating voltage at full scale current:

DML102	DML200	DML202	DML301	DML400
0.5 V	0.5 V	0.5 V	0.4 V	0.4 V

Front panel



Rear panel



Specifications

Note: All specifications apply to the unit after a temperature stabilization time of 30 minutes over an ambient temperature range of 23 °C ± 5 °C. Specifications are valid for single unit operation only. Under 80% humidity.

Model		DML102	DML200	DML202	DML301	DML400
Input Rating						
Input Voltage		0 to 80 V	0 to 80 V	0 to 80 V	0 to 80 V	0 to 80 V
Input Current		0 to 20 A	0 to 40 A	0 to 20 A	0 to 60 A	0 to 80 A
Input Power		100 W / 100 W	200 W	200 W / 200 W	300 W	400 W
Channels		2	1	2	1	1
Minimum Operating Voltage	Low	0.5 V at 0.2 A	0.5 V at 0.4 A	0.5 V at 0.2 A	0.5 V at 0.6 A	0.4 V at 0.8 A
	Med	0.5 V at 2 A	0.5 V at 4 A	0.5 V at 2 A	0.4 V at 8 A	0.4 V at 8 A
	High	0.5 V at 20 A	0.5 V at 40 A	0.5 V at 20 A	0.4 V at 80 A	0.4 V at 80 A
CV Mode						
Range	Low	0 to 6 V		0 to 6 V		
	Med	0 to 16 V		0 to 16 V		
	High	0 to 80 V		0 to 80 V		
Resolution	Low	0.1 mV				
	Med	1 mV				
	High	1 mV				
Accuracy		± (0.05% + 0.1% F.S.)				
CC Mode						
Range	Low	0 to 0.2 A	0 to 0.4 A	0 to 0.2 A	0 to 0.6 A	0 to 0.8 A
	Med	0 to 2 A	0 to 4 A	0 to 2 A	0 to 6 A	0 to 8 A
	High	0 to 20 A	0 to 40 A	0 to 20 A	0 to 60 A	0 to 80 A
Resolution	Low	0.01 mA				
	Med	0.1 mA				
	High	1 mA				
Accuracy		± (0.1% + 0.1% F.S.)				
CR Mode						
Range	Low	0.04 Ω to 80 Ω (100 W / 6 V)	0.03 Ω to 60 Ω (200 W / 6 V)	0.04 Ω to 80 Ω (100 W / 6 V)	0.015 Ω to 30 Ω (300 W / 6 V)	0.01 Ω to 20 Ω (400 W / 6 V)
	Med	1.4 Ω to 2.9 kΩ (100 W / 16 V)	1.0 Ω to 2.16 kΩ (200 W / 16 V)	1.4 Ω to 2.9 kΩ (100 W / 16 V)	0.3 Ω to 600 Ω (300 W / 16 V)	0.36 Ω to 720 Ω (400 W / 16 V)
	High	6 Ω to 12 kΩ (100 W / 80 V)	4.3 Ω to 9 kΩ (200 W / 80 V)	6 Ω to 12 kΩ (100 W / 80 V)	1.5 Ω to 3 kΩ (300 W / 80 V)	1.5 Ω to 2.9 kΩ (400 W / 80 V)
Resolution		0.1 Ω				
Accuracy (I > 5% of Range)		± 1% of setting				
CW Mode						
Range	Low	2 W	4W		6 W	8 W
	Med	10 W	20 W		30 W	40 W
	High	100 W	200 W		300 W	400 W
Resolution	Low	1 mW	2 mW		3 mW	4 mW
	Med	10 mW	20 mW		30 mW	40 mW
	High	100 mW	200 mW		300 mW	400 mW
Accuracy		± 1% of setting				

Specifications

Model		DML102	DML200	DML202	DML301	DML400
Transient Mode (CC mode)						
Min. Operating Voltage		1.5 V		1.5 V	1.5 V	
T1 & T2 [1]		20 µs to 10 ms				
Accuracy		1 µs / 1ms + 100 ppm				
Slew Rate [2]	Low	0.00004 to 0.02 A/µs	0.00008 to 0.04 A/µs	0.00004 to 0.02 A/µs	0.00012 to 0.06 A/µs	0.00016 to 0.08 A/µs
	Med	0.0004 to 0.2 A/µs	0.0004 to 0.4 A/µs	0.0004 to 0.2 A/µs	0.0012 to 0.6 A/µs	0.0016 to 0.8 A/µs
	High	0.004 to 2 A/µs	0.008 to 4 A/µs	0.004 to 2 A/µs	0.012 to 6 A/µs	0.016 to 8 A/µs
Resolution		1 mA / µs				
Accuracy		10% ± 20 µs				
Min. Rise Time		10 µs				
Readback Voltage						
Range	Low	0 to 6 V		0 to 6 V	0 to 6 V	
	Med	0 to 16 V		0 to 16 V	0 to 16 V	
	High	0 to 80 V		0 to 80 V	0 to 80 V	
Resolution	Low	2 mV				
	Med	3 mV				
	High	4 mV				
Accuracy	Low	± (0.025% + 0.01% F.S.)				
	Med	± (0.025% + 0.01% F.S.)				
	High	± (0.01% + 0.025% F.S.)				
Readback Current						
Range	Low	0 to 0.2 A	0 to 0.4 A	0 to 0.2 A	0 to 0.6 A	0 to 0.8 A
	Med	0 to 2 A	0 to 4 A	0 to 2 A	0 to 6 A	0 to 8 A
	High	0 to 20 A	0 to 40 A	0 to 20 A	0 to 60 A	0 to 80 A
Resolution	Low	0.004 mA	0.008 mA	0.004 mA	0.012 mA	0.016 mA
	Med	0.04 mA	0.08 mA	0.04 mA	0.12 mA	0.16 mA
	High	0.4 mA	0.8 mA	0.4 mA	1.2 mA	1.6 mA
Accuracy		± (0.05% + 0.05% F.S.)				
Readback Power						
Range	Low	16 W	30 W	30 W	30 W	60 W
	Med	30 W	60 W	60 W	60 W	60 W
	High	100 W	200 W	200 W	300 W	400 W
Accuracy		± (0.1% + 0.1% F.S.)				
Short Circuit						
Current (CC)		20 A	40 A	20 A	60 A	80 A
Voltage (CV)		0 V				
Resistance (CR)		60 kΩ (6 V), 150 kΩ (16 V), 700 kΩ (80 V)				

(1) Fast pulse trains with large transitions may not be achievable.
(2) The slew rate specifications are not warranted, but are descriptions of typical performance. The actual transition time is defined as the time for the input to change from 10% to 90%, or vice versa, of the programmed current values. In case of very large load changes, e.g. from no load to full load, the actual transition time will be larger than the expected time. The load will automatically adjust the slew rate to fit within the range (high or low) that is closest to the programmed value.

Specifications

General		
Mainframe	AC Input	90 VAC to 130 VAC / 175 VAC to 253 VAC, 47 Hz to 63 Hz
	Max. Power Consumption	300 VA
	I/O interfaces	USB (USBTMC-compliant and virtual COM), GPIB, LAN, RS232
Temperature	Operation	32 °F to 122 °F (0 °C to 50 °C)
	Storage	-4 °F to 158 °F (-20 °C to 70 °C)
Safety		EN61010-1:2010 + A1:2019, EU Low Voltage Directive (LVD) 2014/35/EU
Electromagnetic Compatibility		Meets EMC Directive 2014/30/EU, EN61326-1:20133
Warranty		3 Years

Model	DML001	DML102	DML200	DML202	DML301	DML400
Mechanical Specifications						
Type	Mainframe	Module				
Dimensions (W x H x D)	10.3" x 7" x 23.3" (260 x 177 x 590 mm)	3.4" x 5.6" x 21.7" (85 x 142 x 550 mm)				
Weight	24.3 lbs (11 kg)	9.3 lbs (4.2 kg)				
Standard Accessories	Power cord	Certificate of calibration & test report				

Ordering Information

① Start with the DML001 mainframe required to house and control up to two DC load modules.

DML001 Mainframe

② Populate the mainframe with any combination of two modules.

Model	Description			
DML102	Dual-channel DC load module	80 V /	20 A /	200 W total
DML200	Single-channel DC load module	80 V /	40 A /	200 W
DML202	Dual-channel DC load module	80 V /	20 A /	400 W total
DML301	Single-channel DC load module	80 V /	60 A /	300 W
DML400	Single-channel DC load module	80 V /	80 A /	400 W

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For more than 75 years, B&K Precision has provided reliable and value-priced test and measurement instruments worldwide.

Our headquarters in Yorba Linda, California houses our administrative and executive functions as well as sales and marketing, design, service, and repair. Our European customers are most familiar with B&K through our French subsidiary, Sefram. Engineers in Asia know us through our B+K Precision Taiwan operation. The independent service centers in Singapore and Brasil service customers in Singapore, Malaysia, Vietnam, Indonesia and South America, respectively.

B&K Precision group member Independent service center Service center location

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ISO9001:2015

Certification body NSF-ISR
Certificate number 6Z241-IS8

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