

# Series 2380

# Programmable DC Electronic Loads



Series 2380 programmable DC electronic loads can sink a wide range of voltages and currents. The 200W Model 2380-500-15 can accept up to 500V or 15A. The 250W Model 2380-120-60 can accept up to 120V or 60A. The 750W Model 2380-500-30 can accept up to 500V or 30A. These single-output, stand-alone electronic loads are cost-effective and self-contained.

### Multiple Operating Modes

These DC electronic loads can operate in constant current (CC), constant voltage (CV), constant resistance (CR), or constant power (CP) mode. They can also be configured to provide a dynamically changing load to the DC source with load switching times

- 200W, 250W, and 750W models
- Supports up to 500V or 60A
- Constant current (CC), constant voltage (CV), constant resistance (CR), and constant power (CP) operating modes
- LED simulated load test mode
- Readback voltage and current resolution down to 0.1mV/0.01mA
- Dynamic mode with cycle rate up to 25kHz
- Voltage rise and fall time measurement
- Current monitor function
- List mode
- Battery test mode
- Built-in GPIB, USB, and RS-232 interfaces

as fast as 25kHz. Versatile internal, external, and remote triggering options allow synchronizing the dynamic load behavior with other events.

### Comprehensive Protection

Protection functions built into Series 2380 DC electronic loads ensure the reliability and safety of all tests. These functions include over temperature protection (OTP), over voltage protection (OVP), over current protection (OCP), over power protection (OPP), and local/remote reverse voltage (LRV/RRV) protection. A power-on system self-test ensures the instrument is operating properly.

### Full Complement of Settings and Controls

To maximize testing efficiency, you can save test parameters into any one of 100 memory locations for quick recall. All load parameters, such as voltage, current, slew rate, and dynamic mode time intervals, can be set using the front panel controls or programmed remotely. A numeric keypad and rotary knob allow entering settings quickly and setting parameters to their full resolution easily. USB-TMC, GPIB and RS-232 interfaces are built in for remote control and communication. A current monitor interface simplifies monitoring input current waveforms by providing a connection for an oscilloscope.



Figure 1. Use either the rotary knob or the keypad to quickly enter settings and set parameter values using all the available resolution.

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## Ordering Information

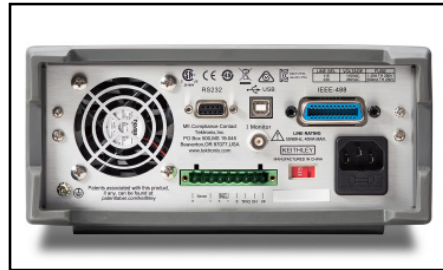
- 2380-500-15  
Programmable DC Electronic Load, 500V, 15A, 200W
- 2380-120-60  
Programmable DC Electronic Load, 120V, 60A, 250W
- 2380-500-30  
Programmable DC Electronic Load, 500V, 30A, 750W
- 2380J-500-15  
Programmable DC Electronic Load, 500V, 15A, 200W-Japan only
- 2380J-120-60  
Programmable DC Electronic Load, 120V, 60A, 250W-Japan only
- 2380J-500-30  
Programmable DC Electronic Load, 500V, 30A, 750W-Japan only

## Accessories Supplied

- Quick Start Guide
- Documentation CD
- Power cord

## APPLICATIONS

- Environmental test, stress test, and accelerated life testing for AC/DC power sources and DC/DC modules
- LED lighting drivers and high power component testing
- Automotive electronics testing
- Battery research and discharge testing
- Production test



Model 2380-500-15 rear panel



Model 2380-500-15 front view showing the safety covers on the input terminals.



Model 2380-500-30 rear panel

## ACCESSORIES AVAILABLE

- 2380-001 9-pin Rear Panel Mating Connector
- 2380-002 DUT Connection Protective Cover
- 7007-2 Double-Shielded Premium IEEE-488 Interface Cable, 2m (6.5 ft)
- KP-CL-488LPA IEEE-488.2 Interface Board for the PCI Bus
- USB-B-1 USB Cable, Type A Connector to Type B Connector, 1m (3.3 ft)

## RACK MOUNT KITS FOR THE 2380-500-15 AND THE 2380-120-60

- 4299-7 Universal Fixed Rack Mount Kit
- RMU2U Fixed Rack Mount Kit
- 386759800 RMU2U Rack Mount Cosmetic Filler Panel

## RACK MOUNT KIT FOR THE 2380-500-30

- 2380-RM Full-Rack-Width Instrument Fixed Rack Mount Kit

## SERVICES AVAILABLE

- Model Number\*-1-EW  
3-year factory warranty from date of shipment extended 1 additional year
- Model Number\*-5Y-EW  
3-year factory warranty from date of shipment extended to 5 years
- C/Model Number\*-3Y-STD  
KeithleyCare 3 YR STD Calibration Plan
- C/Model Number\*-3Y-DAT  
KeithleyCare 3 YR Calibration w/Data Plan
- C/Model Number\*-5Y-STD  
KeithleyCare 5 YR STD Calibration Plan
- C/Model Number\*-5Y-DAT  
KeithleyCare 5 YR Calibration w/Data Plan

\* Replace the specific power supply model number in place of Model Number to generate the appropriate model number for a service item. Example for a 2380-500-15, a 1-year extended warranty model number would be 2380-500-15-EW.

## Specifications

## Model 2380-500-15/2380J-500-15

		Low Range	High Range
Rated Value (0°–40°C)	Input Voltage	0–500 V	0–500 V
	Input Current	0–3 A	0–15 A
	Input Power	200 W	200 W
	Min. Operating Voltage	0.6 V at 3 A (maximum 0.9 V)	4.5 V at 15 A
Constant Voltage Mode	Range	0.1–50 V	0.1–500 V
	Resolution	1 mV	10 mV
	Accuracy	±(0.05% + 0.025% FS)	±(0.05% + 0.025% FS)
Constant Current Mode	Range	0–3 A	0–15 A
	Resolution	0.1 mA	1 mA
	Accuracy	±(0.05% + 0.05% FS)	±(0.05% + 0.05% FS)
Constant Resistance Mode <sup>1</sup>	Range	0.3 Ω–10 Ω	10 Ω–7.5 kΩ
	Resolution	0.001 Ω	0.1 Ω
	Accuracy <sup>2</sup>	0.01% + 0.08 S	0.01% + 0.0008 S
Constant Power Mode <sup>3</sup>	Range	200 W	200 W
	Resolution	10 mW	10 mW
	Accuracy	0.1% + 0.1% FS	0.1% + 0.1% FS

## Dynamic Mode

CC Mode	T1 & T2	20 μs–3600 s; Res: 1 μs	20 μs–3600 s; Res: 1 μs
	Accuracy	5 μs ± 100 ppm	5 μs ± 100 ppm
	Ascending/Descending Slope <sup>4</sup>	0.0001–0.1 A/μs	0.001–1 A/μs
	Minimum Rise Time <sup>5</sup>	~10 μs	~10 μs

## Measuring Range

Readback Voltage	Range	0–50 V	0–500 V
	Resolution	1 mV	10 mV
	Accuracy	±(0.025% + 0.025% FS)	±(0.025% + 0.025% FS)
Readback Current	Range	0–3 A	0–15 A
	Resolution	0.01 mA	0.1 mA
	Accuracy	±(0.05% + 0.05% FS)	±(0.05% + 0.05% FS)
Readback Power	Range	200 W	200 W
	Resolution	10 mW	10 mW
	Accuracy	±(0.1% + 0.1% FS)	±(0.1% + 0.1% FS)

## Protection Range

Overpower Protection	~210 W	~210 W
Overcurrent Protection	~3.3 A	~16.5 A
Overvoltage Protection	~530 V	~530 V
Over Temperature Protection	~85°C	~85°C

## Specification

Short Circuit	Current (CC)	~3.3 / 3 A	~16.5 / 15 A
	Voltage (CV)	~0 V	~0 V
	Resistance (CR)	~300 mΩ	~300 mΩ
Input Terminal Impedance	~1 MΩ	~1 MΩ	
Dimensions	214.81 mm × 104.24 mm × 397.03 mm		

## Model 2380-120-60/2380J-120-60

		Low Range	High Range
Rated Value (0°–40°C)	Input Voltage	0–120 V	0–120 V
	Input Current	0–6 A	0–60 A
	Input Power	250 W	250 W
	Min. Operating Voltage	0.18 V at 6 A	1.8 V at 60 A
Constant Voltage Mode	Range	0–18 V	0–120 V
	Resolution	1 mV	10 mV
	Accuracy	±(0.05% + 0.025% FS)	±(0.05% + 0.025% FS)
Constant Current Mode	Range	0–6 A	0–60 A
	Resolution	0.1 mA	1 mA
	Accuracy	±(0.05% + 0.1% FS)	±(0.05% + 0.1% FS)
Constant Resistance Mode <sup>1</sup>	Range	0.05 Ω–10 Ω	10 Ω–7.5 kΩ
	Resolution	0.001 Ω	0.1 Ω
	Accuracy <sup>2</sup>	0.01% + 0.08 S	0.01% + 0.0008 S
Constant Power Mode <sup>3</sup>	Range	250 W	250 W
	Resolution	10 mW	10 mW
	Accuracy	0.2% + 0.2% FS	0.2% + 0.2% FS

## Dynamic Mode

CC Mode	T1 & T2	20 μs–3600 s; Res: 1 μs	20 μs–3600 s; Res: 1 μs
	Accuracy	5 μs ± 100 ppm	5 μs ± 100 ppm
	Ascending/Descending Slope <sup>4</sup>	0.0001–0.25 A/μs	0.001–2.5 A/μs
	Minimum Rise Time <sup>5</sup>	~20 μs	~20 μs

## Measuring Range

Readback Voltage	Range	0–18 V	0–120 V
	Resolution	0.1 mV	1 mV
	Accuracy	±(0.025% + 0.025% FS)	±(0.025% + 0.025% FS)
Readback Current	Range	0–6 A	0–60 A
	Resolution	0.1 mA	1 mA
	Accuracy	±(0.05% + 0.1% FS)	±(0.05% + 0.1% FS)
Readback Power	Range	250 W	250 W
	Resolution	10 mW	10 mW
	Accuracy	±(0.2% + 0.2% FS)	±(0.2% + 0.2% FS)

## Protection Range

Overpower Protection	~260 W	~260 W
Overcurrent Protection	~6.6 A	~66 A
Overvoltage Protection	~130 V	~130 V
Over Temperature Protection	~85°C	~85°C

## Specification

Short Circuit	Current (CC)	~6.6 / 6 A	~66 / 60 A
	Voltage (CV)	0 V	0 V
	Resistance (CR)	~30 mΩ	~30 mΩ
Input Terminal Impedance	~300 kΩ	~300 kΩ	
Dimensions	214.81 mm × 104.24 mm × 397.03 mm		

## NOTES\*

1. The voltage/current input is no less than 10% FS (FS indicates the full scale). Accuracy is defined as: % of reading + % of full scale.
2. The range of read-back resistance is between  $(1/(1/R + (1/R)*0.01% + 0.08)\Omega)$  and  $(1/(1/R - (1/R)*0.01% - 0.08)\Omega)$ .
3. The voltage/current input is no less than 10% FS.
4. Ascending/descending slope: 10%–90% current ascending slope from 0 to maximum current.
5. Minimum rise time: 10%–90% current rise time.

\*Specifications are subject to change without notice.

## Model 2380-500-30/2380J-500-30

	Low Range	High Range	
Rated Value (0°–40°C)	Input Voltage	0–500 V	0–500 V
	Input Current	0–3 A	0–30 A
	Input Power	750 W	750 W
	Min. Operating Voltage	0.36 V / 3 A	3.6 V / 30 A
Constant Voltage Mode	Range	0–50 V	0–500 V
	Resolution	1 mV	10 mV
	Accuracy	±(0.025% + 0.05% FS)	±(0.025% + 0.05% FS)
Constant Current Mode	Range	0–3 A	0–30 A
	Resolution	0.1 mA	1 mA
	Accuracy	±(0.05% + 0.05% FS)	±(0.05% + 0.05% FS)
Constant Resistance Mode <sup>1</sup>	Range	0.15 Ω–10 Ω	10 Ω–7.5 kΩ
	Resolution	0.001 Ω	0.1 Ω
	Accuracy <sup>2</sup>	0.01% + 0.08 S	0.01% + 0.0008 S
Constant Power Mode <sup>3</sup>	Range	750 W	750 W
	Resolution	10 mW	10 mW
	Accuracy	0.2% + 0.2% FS	0.2% + 0.2% FS
<b>Dynamic Mode</b>			
CC Mode	T1 & T2	20 μs–3600 s; Res: 1 μs	20 μs–3600 s; Res: 1 μs
	Accuracy	5 μs ± 100 ppm	5 μs ± 100 ppm
	Ascending/Descending Slope <sup>4</sup>	0.0001–0.1 A/μs	0.001–1 A/μs
	Minimum Rise Time <sup>5</sup>	~20 μs	~20 μs
<b>Measuring Range</b>			
Readback Voltage	Range	0–50 V	0–500 V
	Resolution	1 mV	10 mV
	Accuracy	±(0.025% + 0.025% FS)	±(0.025% + 0.025% FS)
Readback Current	Range	0–3 A	0–30 A
	Resolution	0.1 mA	1 mA
	Accuracy	±(0.05% + 0.05% FS)	±(0.05% + 0.05% FS)
Readback Power	Range	750 W	750 W
	Resolution	10 mW	10 mW
	Accuracy	±(0.2% + 0.2% FS)	±(0.2% + 0.2% FS)
<b>Protection Range</b>			
Overpower Protection	~760 W	~760 W	
Overcurrent Protection	~3.3 A	~33 A	
Overvoltage Protection	~530 V	~530 V	
Over Temperature Protection	~85°C	~85°C	
<b>Specification</b>			
Short Circuit	Current (CC)	~3.3 / 3 A	~3.3 / 30 A
	Voltage (CV)	0 V	0 V
	Resistance (CR)	~120 mΩ	~120 mΩ
Input Terminal Impedance	1 MΩ	1 MΩ	
Dimensions	482mm × 131.4mm × 580mm		

## NOTES\*

- The voltage/current input is no less than 10% FS (FS indicates the full scale). Accuracy is defined as: % of reading + % of full scale.
- The range of read-back resistance is between  $1/(1/R + (1/R)*0.01% + 0.08) \Omega$  and  $1/(1/R - (1/R)*0.01% - 0.08) \Omega$ .
- The voltage/current input is no less than 10% FS.
- Ascending/descending slope: 10%–90% current ascending slope from 0 to maximum current.
- Minimum rise time: 10%–90% current rise time.

\*Specifications are subject to change without notice.

## General

**Memory Capacity:** 100 sets of measurements and selectable parameters.

**Signal Connections:**

**Front Panel:** Input: Stud and threaded knob terminals for lug connectors (200W and 250W versions).

**Rear Panel:**

**Input:** Terminal Bars (750W version).

**Current Monitor Output:** BNC.

**Remote Sense, Analog Input, External Trigger, Voltage Fault:** 9-pin terminal block.

**Communications:**

**USB:** USB2.0 device, type B, USB-TMC compliant.

**RS-232:** DB-9 connector.

**GPIO:** IEEE-488.2 compliant.

**Cooling Method:** Fan.**Fan Speed vs. Internal temperature:**

Temperature	40°C	50°C	70°C	85°C
Fan status	First gear	Second gear	Third gear	Temperature protection (OH) and load is shut off.

**Power Source:**

**AC Input:** Switchable between 120VAC nominal and 240VAC nominal.

**“J” versions:** 100VAC, nominal.

**Frequency:** 50/60Hz.**Power Consumption:**

**2380-500-15:** 40VA.

**2380-120-60:** 40VA.

**2380-500-30:** 150VA.

**EMC:** Conforms to European Union EMC Directive.

**Safety:**

**Canadian Certification:** CSA listed to UL Std. No. 61010-1(3rd Edition) and Can/CSA-C22.2 No. 61010-1-12.

**European Union Compliance:** Conforms to European Union Low Voltage Directive.

**Environment:**

**Altitude:** Operating: 2000m, (6562 ft) above sea level.

**Temperature and Relative Humidity:**

**Operating:** 0° to 40°C full accuracy with 80% relative humidity at up to 35°C, non-condensing.

**Storage:** –20° to 70°C, 10% to 85% relative humidity up to 40°C, 5% to 60% relative humidity above 40°C.

**Net Weight:**

**200W/250W Model:** 4.65kg.

**750W Model:** 24.95kg.

**Shipping Weight:**

**200W/250W Model:** 7kg.

**750W Model:** 31.75kg.

**Recommended calibration frequency:** 1 time/year.

**Warranty:** 3 years.

## Contact Information:

**ASEAN / Australia** (65) 6356 3900  
**Austria** 00800 2255 4835  
**Balkans, Israel, South Africa and other ISE Countries** +41 52 675 3777  
**Belgium** 00800 2255 4835  
**Brazil** +55 (11) 3759 7627  
**Canada** 1 800 833 9200  
**Central East Europe and the Baltics** +41 52 675 3777  
**Central Europe & Greece** +41 52 675 3777  
**Denmark** +45 80 88 1401  
**Finland** +41 52 675 3777  
**France** 00800 2255 4835  
**Germany** 00800 2255 4835  
**Hong Kong** 400 820 5835  
**India** 000 800 650 1835  
**Italy** 00800 2255 4835  
**Japan** 81 (3) 6714 3010  
**Luxembourg** +41 52 675 3777  
**Mexico, Central/South America & Caribbean** 52 (55) 56 04 50 90  
**Middle East, Asia, and North Africa** +41 52 675 3777  
**The Netherlands** 00800 2255 4835  
**Norway** 800 16098  
**People's Republic of China** 400 820 5835  
**Poland** +41 52 675 3777  
**Portugal** 80 08 12370  
**Republic of Korea** 001 800 8255 2835  
**Russia & CIS +7 (495) 6647564**  
**South Africa** +41 52 675 3777  
**Spain** 00800 2255 4835  
**Sweden** 00800 2255 4835  
**Switzerland** 00800 2255 4835  
**Taiwan** 886 (2) 2656 6688  
**United Kingdom & Ireland** 00800 2255 4835  
**USA 1 800 833 9200**

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### Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: [info@moschip.ru](mailto:info@moschip.ru)

Skype отдела продаж:

moschip.ru

moschip.ru\_4

moschip.ru\_6

moschip.ru\_9