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Find the *Ametek / Elgar / Sorensen MML-80-20-102* at our website: *Click HERE*

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MML - Modular Medium Programmable DC Electronic Loads

The MML Series Programmable DC Electronic Loads are ideal for test environments requiring a variety of medium power loads. This series has single input loads from 100W to 600W. Two mainframe sizes, both 4U (7") high, accommodate either benchtop (10.8") wide or full rackmount environments.

This DC load series is ideal for engineering or manufacturing test applications. The loads have been designed to test AC to DC converters, DC to DC converters, power storage devices and electronic components. The system is easily configured by using front panel plug-in modules. The system can be operated by front panel keypad control, standard RS 232 or optional IEEE-488.2 control interface.

The MML Series, 80V modules are available in three power levels, 100 watts x 2 (dual input), 300 watts and 600 watts, all at 80 volts maximum. The 500V modules are available in two power levels, 300W and 600W at 500V maximum. This series can be operated in constant current, constant voltage and constant resistance modes. Each load is isolated and floating, programmable in two current ranges and capable of being synchronized with other load modules in the same mainframe. Each load can simulate a wide dynamic range of loading conditions, including short circuit simulations. Load test sequences can be programmed with different slew rates, load levels, durations and modes. In addition, 10 programs can be stored with up to 10 sequences per program and can be recalled for automated sequencing. Real time measurement of voltage and current with 15-bit resolution is built into each module. Protection includes overpower, overcurrent, overvoltage, overtemperature and reverse polarity to ensure safety and reliability.



KEY FEATURES

Module Variety:

- Load Module Increments: 100W x 2 (dual input, 80V only), 300W and 600W (80V or 500V)
- Flexible Modular Configuration
- Up to 8 (100W) channels in one 19-inch mainframe
- Two mainframe configurations, 4 bay (rackmount) and 2 bay (benchtop)
- Parallel operation to 1200 watts in one mainframe
- Individually optically isolated and floating load modules

Manual or Programmable Control:

- Standard front panel and RS 232 control or optional IEEE-488.2 interface
- Programmable control of constant current, constant voltage or constant resistance
- Push button or programmed short circuit test
- Continuous or pulsed loading (up to 20 kHz)
- Adjustable slew rates to 5A/µs
- High and low limit mode settings
- 10 program memories
- LabVIEW Drivers

Measurement and Protection:

- Accurate readback of voltage and current with 15-bit resolution
- Remote voltage sensing capability
- Self test at power-on
- OPP, OCP, OVP, OTP and reverse polarity protection
- Analog Go/No-Go status for each module input

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MODULAR RACKMOUNT AND BENCHTOP LOAD SIMULATION

Sorensen MML programmable electronic loads are easily configured. Plug-in modules only require front panel access for installation or removal from both the four bay and two bay mainframe. Only the mainframe requires the AC input power connection.

Rackmount Load Simulation



Up to eight load inputs can be configured in the 19-inch four bay mainframe (MML-4). This is accomplished by using four MML-80-20-102 modules (each module has dual 100W inputs). Any combination of load modules can be configured in the mainframe. Individual modules require the following mainframe space:

80V, 100W x 2 inputs	-	1 bay wide
80V, 300W input	-	1 bay wide
80V, 600W input	-	2 bays wide
500V, 300W input	-	1 bay wide
500V, 600W input	-	2 bays wide

Benchtop Load Simulation

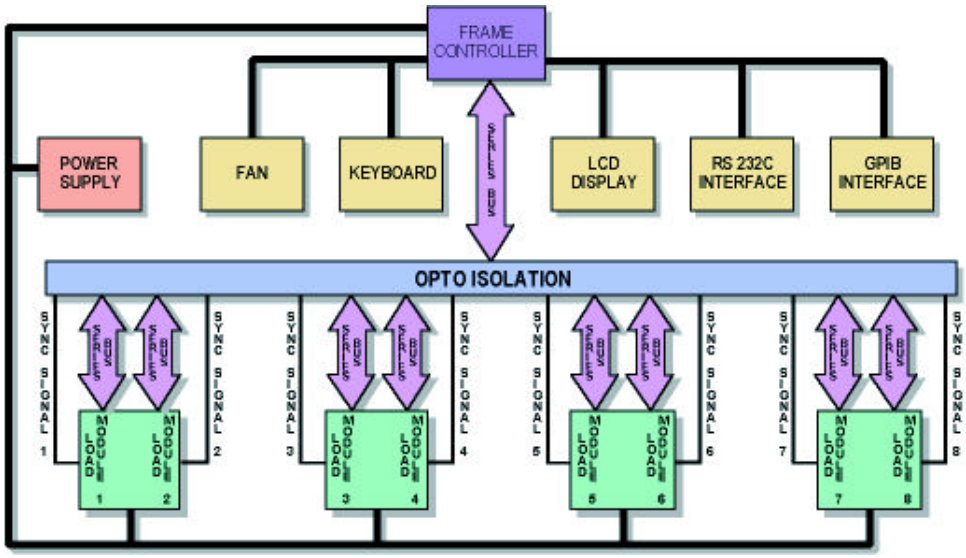


Benchtop load simulation is easily accomplished using the narrower double bay mainframe (MML-2). The mainframe controller (common to the 4 bay and 2 bay mainframe) has front panel digital keypad controls which include a numeric keypad and special function keys for selecting load module channel, mode of operation and go/no-go test limits. Programming keys allow setting, clearing, saving or recalling data. A configuration key allows display of mainframe firmware status, control of module synchronization and other system level parameters.

Individual modules have their own front panel control, in addition to the mainframe controller. Each module has push button controls for turning the module on, enabling a short circuit test, left or right channel selection (only applies to dual input load modules), selecting static or dynamic load conditions. An analog knob allows easy continuous manual adjustment of the load level setting.

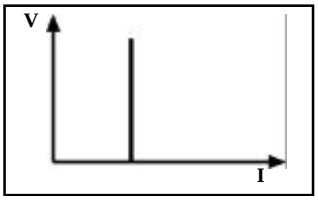
Both the four bay (MML-4) and the two bay (MML-2) mainframes come standard with RS 232 and can be ordered with an optional IEEE-488.2 interface.

Block Diagram of Four Bay Mainframes with 8 loads (from dual input load modules)



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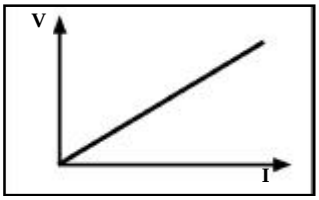
Load Simulation



Constant Current Mode

Applications include testing:

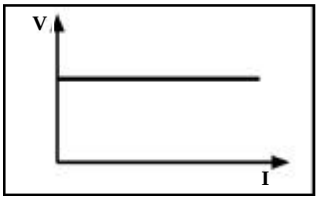
- Power supplies
- Batteries
- Capacitor discharge
- Characteristics



Constant Resistance Mode

Applications include testing:

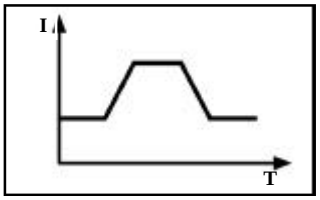
- Power supply crossover
- Power supply start-up
- Loads requiring resistor
- Simulation



Constant Voltage Mode

Applications include testing:

- Current sources
- Current set-points
- Current shunt regulators

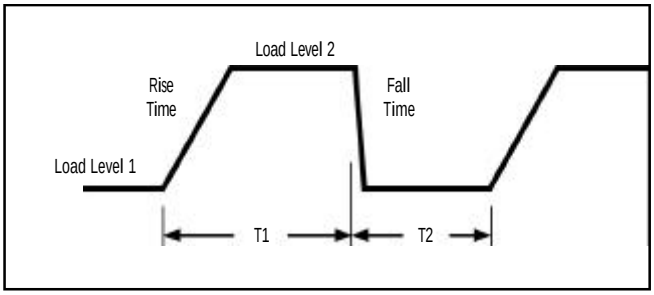


Pulsed Mode, Programmable Slew Rate and Duty Cycle

Applications include testing:

- Power supplies
- Transient response
- Characteristics
- Components

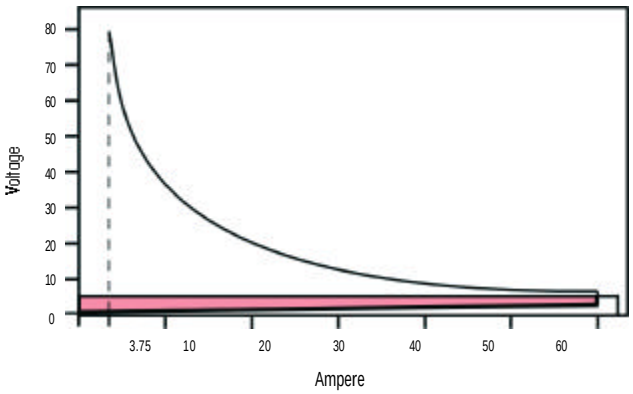
Dynamic Loading Control



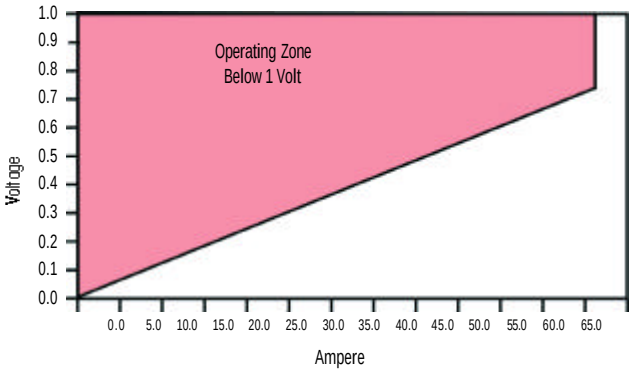
As electronic systems operate at increasingly higher speeds, power supplies and devices must perform with more dynamic load conditions. The MML Series electronic load has been designed to simulate these conditions. The figure above illustrates the programmable load parameters. Specifically, this is the duty cycle controlled by T1 and T2 , slew rates (rise and fall times) and load levels.

Module Input Characteristics

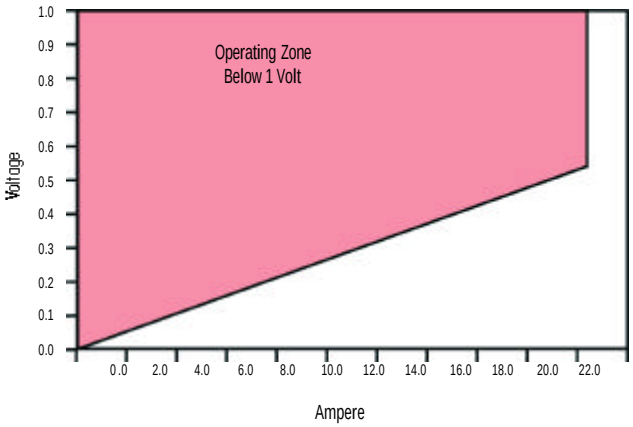
The modules incorporate MOSFET power devices to regulate the programmed load conditions. This FET technology achieves minimum input resistance while enabling high current sink capability at low voltages. For example, the 300W (MML-80-60-301) module is capable of sinking 60 amps down to 1V. Lower voltage operation is possible at reduced current levels. This low voltage range is suitable for testing the new low voltage (i.e. 3V) power supplies.



300W, 80V module input characteristics 0-80 volts



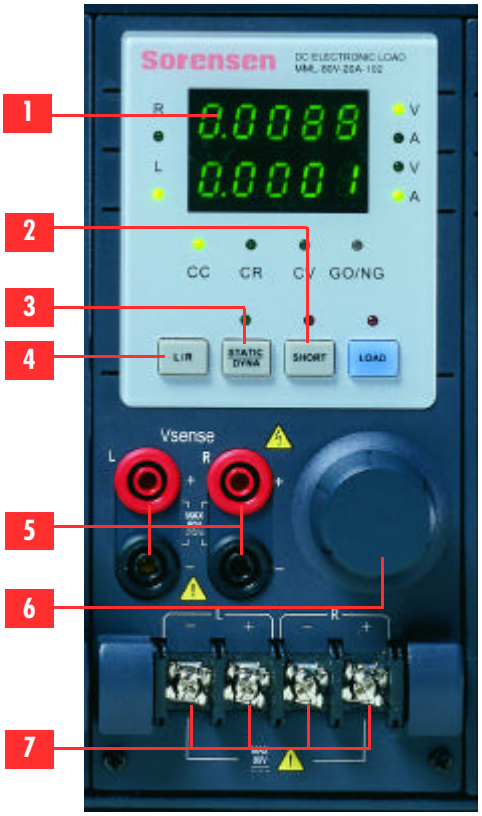
300W, 80V module input characteristics below 1 volt



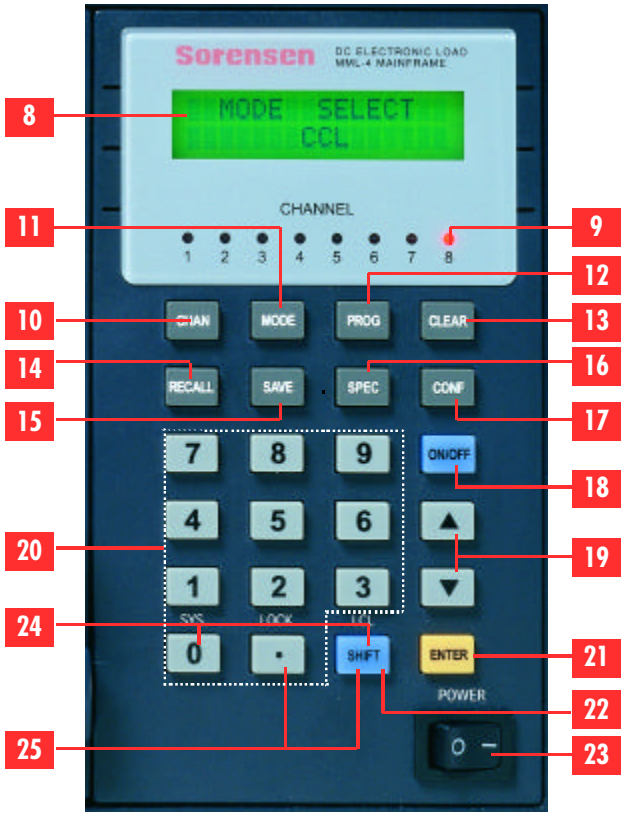
100W, 80V module input characteristics below 1 volt

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Load Module (100W x 2)



Mainframe Controller



1. LED Indicator
2. SHORT key: To apply a short circuit across the input
3. STATIC/DYNA key: To select static or dynamic test mode
4. L/R key: To select left or right channel of input load (only applies to dual channel loads)
5. V terminal: To measure the UUT's output voltage using remote sense
6. Rotary knob: To adjust load level continuously
7. Load terminals
8. Liquid Crystal Display
9. LED indicator: To display the active load channel
10. CHAN key: To select input load channel
11. MODE key: To select the operation mode of CC, CR, or CV
12. PROG key: For setting program data
13. CLEAR key: Clear the current data displayed
14. RECALL key: To recall the setting status from memory
15. SAVE key: To save the front panel settings into memory
16. SPEC key: To set up High/Low limits for Go/No-Go test
17. CONF key: To set the mainframe configuration
18. ON/OFF key: To enable or disable the load input
19. Up/Down key: To select the next or previous menu display to edit
20. Numeric keypad: For data setting
21. ENTER key: To confirm editing data on the instrument
22. SHIFT key: As LOCAL key when in remote mode
23. Power Switch
24. SHIFT + 0 key: System function
25. SHIFT + . key: Lock function

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MODEL	MML-80-20-102		MML-80-60-301		MML-80-120-601	
Power	20W	100W	30W	300W	60W	600W
Current	0-2A	0-20A	0-6A	0-60A	0-12A	0-120A
Voltage	1-80V		1-80V		1-80V	
Min. Operation VDC	1.0V at 2A	1.0V at 20A	1.0V at 6A	1.0V at 60A	1.0V at 12A	1.0V at 120A
Constant Current Mode						
Range	0~2A	0~20A	0~6A	0~60A	0~12A	0~120A
Resolution	0.5 mA	5 mA	1.5 mA	15 mA	3 mA	30 mA
Accuracy	0.1% +0.1% F.S.	0.1% + 0.2% F.S.	0.1% + 0.1% F.S.	0.1% + 0.2% F.S.	0.1% + 0.1% F.S.	0.1% + 0.2% F.S.
Constant Resistance Mode						
Range	0.075Ω~300Ω (100W/16V) 3.75Ω~15 kΩ (100W/80V)		0.025Ω~100Ω (300W/16V) 1.25Ω~5 kΩ (300W/80V)		0.125Ω-50Ω (600W/16V) 0.625Ω-2.5 kΩ (600W/80V)	
Resolution	12 bits		12 bits		12 bits	
Accuracy	CRL 0.1 mho + 0.2% (0.075Ω-300Ω) CRH 0.01 mho + 0.1% (3.75Ω-15 kΩ)		CRL 0.1 mho + 0.2% (0.025Ω~100Ω) CRH 0.01 mho + 0.1% (10Ω~5 kΩ)		CRL 0.4 mho + 0.5% (0.0125Ω~50Ω) CRH 0.04 mho + 0.2% (0.625Ω~2.5 kΩ)	
Constant Voltage Mode						
Range	1~80V		1~80V		1~80V	
Resolution	20 mV		20 mV		20 mV	
Accuracy	±(0.05% + 0.1% F.S.)		±(0.05% + 0.1% F.S.)		±(0.05% + 0.1% F.S.)	
DYNAMIC MODE						
Dynamic Mode	C.C. Mode		C.C. Mode		C.C. Mode	
T1 & T2	0.025 ms~10 ms/Res:1 µs 1 ms~30s/Res:1 ms		0.25 ms~10 ms/Res:1 µs 1 ms~30s/Res:1 ms		0.025 ms~10 ms/Res:1 µs 1 ms~30s/Res:1 ms	
Accuracy	1 µs/1 ms+100 ppm		1 µs/1 ms+100 ppm		1 µs/1 ms+100 ppm	
Slew Rate	0.32~80 mA/µs	3.2~800 mA/µs	0.001~0.25A/µs	0.01~2.5A/µs	0.002~0.5A/µs	0.02~5A/µs
Resolution	0.32 mA/µs	3.2 mA/µs	0.001A/µs	0.01A/µs	0.002A/µs	0.02A/µs
Current	0~2A	0~20A	0~6A	0~60A	0~12A	0~120A
Resolution	0.5 mA	5 mA	1.5 mA	15 mA	3 mA	30 mA
Current Accuracy	±0.4% F.S.		±0.4% F.S.		±0.4% F.S.	
MEASUREMENT SECTION						
Voltage Readback						
Range	0~16V	0~80V	0~16V	0~80V	0~16V	0~80V
Resolution	0.5 mV	2.5 mV	0.5 mV	2.5 mV	0.5 mV	2.5 mV
Accuracy	±(0.05% + 0.05% F.S.)		±(0.05% + 0.05% F.S.)		±(0.05% + 0.05% F.S.)	
Current Readback						
Range	0~2A	0~20A	0~6A	0~60A	0~12A	0~120A
Resolution	0.0625 mA	0.625 mA	0.1875 mA	1.875 mA	0.375 mA	3.75 mA
Accuracy	±(0.1% + 0.1% F.S.)		±(0.1% + 0.1% F.S.)		±(0.1% + 0.1% F.S.)	
PROTECTIVE SECTION						
Overpower	~20.8W	~104W	~31.2W	~312W	~62.4W	~624W
Overcurrent	~2.04A	~20.4A	~6.12A	~61.2A	~12.24A	~122.4A
Overtemperature	~85°C		~85°C		~85°C	
Overvoltage	~16.3V	~81.6V	~16.3V	~81.6V	~16.3V	~81.6V
GENERAL						
Short Circuit						
Current (CC)	~2.4/2A	~24/20A	~7.2/7A	~72/60A	~14.4/12A	~144/120A
Voltage (CV)	~0V	~0V	~0V	~0V	~0V	~0V
Resistance (CR)	~3.75Ω	~0.075Ω	~1.25Ω	~0.025Ω	~0.625Ω	~0.0125Ω
Input Resistance (Load Off)	100 kΩ (typical)		100 kΩ (typical)		100 kΩ (typical)	
Temperature Coefficient	100 ppm/°C (typical)		100 ppm/°C (typical)		100 ppm/°C (typical)	
Power	Supply from mainframe (115/230 VAC)		Supply from mainframe (115/230 VAC)		Supply from Mainframe (115/230 VAC)	
Dimensions	3.19" (81 mm)W x 6.75" (172 mm)H x 19.5" (495mm)D		3.19" (81 mm)W x 6.75" (172 mm)H x 19.5" (495mm)D		6.37" (162 mm)W x 6.75" (172 mm)H x 19.5" (495mm)D	
Weight	8.9 lbs. (4 kg)		8.9 lbs. (4 kg)		16 lbs. (7.3 kg)	
Shipping Weight	9.3 lbs. (4.2 kg)		9.3 lbs. (4.2 kg)		18.5 lbs. (8.4 kg)	
Operating Range	0-40°C		0-40°C		0-40°C	
EMC & Safety	CE		CE		CE	

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MODEL	MML-500-10-301		MML-500-10-301	
Power	30W	300W	60W	600W
Current	0-1A	0-10A	0-2A	0-20A
Voltage	2.5-500V		2.5 - 500V	
Min. Operating VDC	2.5V at 1A	2.5V at 10A	2.5V at 2A	2.5V at 20A
Constant Current Mode				
Range	0~1A	0~10A	0~2A	0~20A
Resolution	0.25 mA	2.5 mA	0.5 mA	5 mA
Accuracy	±(0.1% + 0.1% F.S.)	±(0.1% + 0.2% F.S.)	±(0.1% + 0.1% F.S.)	±(0.1% + 0.2% F.S.)
Constant Resistance Mode				
Range	1.25Ω~5 kΩ (300W/125V) 50Ω~200 kΩ (300W/500V)		0.625Ω~2.5 kΩ (600W/125V) 25Ω~100 kΩ (600W/500V)	
Resolution	12 bits		12 bits	
Accuracy	5 kΩ: 2 mmho+0.2% 200 kΩ: 5 mmho+0.1%		2.5 kΩ: 2 mmho+0.2% 100 kΩ: 5 mmho+0.1%	
Constant Voltage Mode				
Range	2.5~500V		2.5~500V	
Resolution	125 mV		125 mV	
Accuracy	±(0.05% ± 0.1% F.S.)		±(0.05% ± 0.1% F.S.)	
DYNAMIC MODE				
Dynamic Mode	C.C. Mode		C.C. Mode	
T1 & T2	0.025 ms~10 ms/Res: 1 µs 1 ms~30s/Res: 1 ms		0.025 ms~10 ms/Res: 1 µs 1 ms~30s/Res: 1 ms	
Accuracy	1µs /1 ms +100 ppm		1µs /1 ms +100 ppm	
Slew Rate	0.16~40 mA/µs	1.6~400 mA/µs	0.32~80 mA/µs	3.2~800 mA/µs
Resolution	0.16 mA/µs	1.6 mA/µs	0.32 mA/µs	3.2 mA/µs
Current	0~1A	0~10A	0~2A	0~20A
Resolution	0.25 mA	2.5 mA	0.5 mA	5 mA
Current Accuracy	±0.4% F.S.		±0.4% F.S.	
MEASUREMENT SECTION				
Voltage Readback				
Range	0~125V	0~500V	0~125V	0~500V
Resolution	4 mV	16 mV	4 mV	16 mV
Accuracy	±(0.05% + 0.05% F.S.)		±(0.05% + 0.05% F.S.)	
Current Readback				
Range	0~1A	0~10A	0~2A	0~20A
Resolution	0.032 mA	0.32 mA	0.0625 mA	0.625 mA
Accuracy	±(0.1% + 0.1% F.S.)		±(0.1% + 0.1% F.S.)	
PROTECTIVE SECTION				
Overpower	~31.2W	~312W	~62.4W	~624W
Overcurrent	~1.02A	~10.2A	~2.04A	~20.4A
Overtemperature	~85°C		~85°C	
Overvoltage	127.5V	~505V	127.5V	~505V
GENERAL				
Short Circuit				
Current (CC)	~1.1/1A	~11/10A	~2.2/2A	~22/20A
Voltage (CV)	~0V	~0V	~0V	~0V
Resistance (CR)	~50Ω	~1.25Ω	~25Ω	~0.625Ω
Input Resistance (Load Off)	100kΩ (typical)		100kΩ (typical)	
Temperature Coefficient	100 PPM/°C (typical)		100 PPM/°C (typical)	
Power	Supply from mainframe (115/230 VAC)		Supply from mainframe (115/230 VAC)	
Dimensions	3.19" (81 mm)W x 6.75" (172 mm)H x 19.5" (495 mm)D		6.37" (162 mm)W x 6.75" (172 mm)H x 19.5" (495 mm)D	
Weight	8.9 lbs. (4 kg)		16 lbs. (7.3 kg)	
Shipping Weight	9.3 lbs (4.2 kg)		18.5 lbs (8.4 kg)	
Operating Range	0~40°C		0~40°C	
EMC & Safety	CE		CE	

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Ordering Information

The MML Modular DC Programmable Electronic Load Series can be ordered as a complete pre-assembled system or by individual part number.

To order individually use the model numbers and descriptions as listed here:

Mainframe

MML-2	Two bay mainframe with manual controller and RS 232
MML-4	Four bay mainframe with manual controller and RS 232

Mainframe Option

M9F	IEEE-488.2 interface

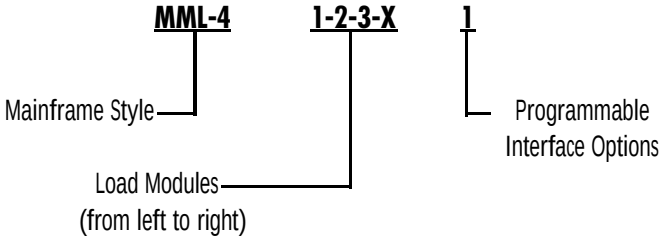
Load Modules

MML-80-20-102	80V, 20A, 100W, two channel, single bay
MML-80-60-301	80V, 60A, 300W, single channel, single bay
MML-80-120-601	80V, 120A, 600W, single channel, double bay
MML-500-10-301	500V, 10A, 300W, single channel, single bay
MML-500-20-601	500V, 20A, 600W, single channel, double bay
MML-B	Blank filler panel

Product specifications are subject to change without notice.

To order a complete system, use the following system configuration number scheme. Your system will be configured and tested before shipment.

MML MODEL NUMBER DESCRIPTION



Mainframe Style	
MML-2	Two bay mainframe with controller
MML-4	Four bay mainframe with controller
Load Modules	
1	80V, 20A, 100W, two channel, single bay
2	80V, 60A, 300W, single channel, single bay
3-X*	80V, 120A, 600W, single channel, double bay
4	500V, 10A, 300W, single channel, single bay
5-X*	500V, 20A, 600W, single channel, double bay
B	Blank filler panel
Programmable Interface Options	
0	RS 232 interface standard
1	IEEE-488.2 interface

** Takes two bays*

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