LAUREL
ELECTRONICS, INC.

Laureate™ Digital Panel Meter for DC Voltage or Current

Features

- **Selectable ±0.2, ±2, ±20, ±200, ±300 & ±600 Vdc voltage ranges**
- **Selectable ±2, ±20, ±200 mA and ±5A dc current ranges**
- **All ranges factory calibrated**
- **99.99% full scale accuracy**
- **Scalable to ±99,999 for use with external current shunts**
- **Up to 60 conversions per second**
- **Peak or valley capture & display**
- **Selectable adaptive digital filter**
- **Universal AC power: 85-264 Vac**
- **Built-in isolated excitation supply: 5, 10 or 24 Vdc**
- **1/8 DIN case sealed to NEMA-4X from front panel**
- **Optional serial I/O: Ethernet, USB, RS232, RS485, Ethernet-to-RS485 converter**
- **Optional relay output: dual or quad relays, contact or solid state**
- **Optional isolated analog output: 4-20 mA, 0-20 mA, 0-10V, -10 to +10V**
- **Optional low voltage power: 10-48 Vdc or 12-32 Vac**

Description

Laureate™ DC voltage and current panel meters with a DC signal conditioner board combine high accuracy with high read rate and a wide range of isolated output options for computer interface and control. Accuracy is 99.99% of full scale ±2 counts.

- **DC voltmeter operation** (selected by jumpers) provides and six full-scale voltage ranges from ±200.00 mV with 10 mV resolution to ±600.0V with 100 mV resolution. The 200.00 mV and 2.0000V ranges provide a 1 Gohm high input impedance.
- **DC ammeter operation** (selected by jumpers) provides four full-scale current ranges from ±2.0000 mA with 0.1 mA resolution to ±5.000 A with 1 mA resolution. The 5.000A range measures the IR drop across a built-in 10 milliohm current shunt.

All voltage and current ranges are factory calibrated, with calibration factors for each range stored in an EEPROM on the signal conditioner board. This allows ranges and signal conditioner boards to be changed in the field without recalibrating the meter.

External current shunts are fully supported. Scaling from full-scale millivolts, such as 50 mV or 100 mV, to amperes is easily accomplished from the front panel of the meter. The scalable display is five full digits up to ±99,999 counts.

High read rates at up to 60 or 50 conversions per second while integrating the signal over a full power cycle are provided by Concurrent Slope (US Pat 5,262,780) analog-to-digital conversion. High read rates are ideal for peak or valley capture, real-time computer interface, and control. Peak and valley values are automatically captured. These may be displayed via a front panel pushbutton command or a control signal at the rear connector, or be transmitted as serial data.

Digital filtering is selectable for electrically noisy environments, including a batch averaging filter and an adaptive moving average filter which provides a choice of 8 time constants from 80 ms to 9.6 s. When a significant change in signal level occurs, that filter adapts by briefly switching to the shortest time constant to follow the change, then reverts back to the selected time constant. In a selectable Auto filter mode, the filter time constant is automatically selected based on detected signal noise.

Designed for system use. Optional plug-in boards include Ethernet and other serial communication boards, dual or quad relay boards, and an isolated analog output board. Laureates may be powered from 85-264 Vac or optionally from 12-32 Vac or 10-48 Vdc. The display is available with red or green LEDs. The 1/8 DIN case meets NEMA 4X (IP65) specifications from the front when panel mounted. Any setup functions and front panel keys can be locked out for simplified usage and security. A built-in isolated 5, 10, or 24 Vdc excitation supply can power transducers and eliminate the need for an external power supply. All power and signal connections are via UL / VDE / CSA rated screw clamp plugs.

Specifications

DC Voltage

DC Voltage Range	Resolution	Input Resistance	Error at 25°C
±200.00 mV	10 µV	1 GΩ	0.01% FS ± 2 cts
±2.000 V	100 µV	1 GΩ	0.01% FS ± 2 cts
±20.000 V	1 mV	10 MΩ	0.01% FS ± 2 cts
±200.00 V	10 mV	10 MΩ	0.01% FS ± 2 cts
±600.0 V *	100 mV	10 MΩ	± 0.4 V
±300.0 V	100 mV	10 MΩ	± 0.4 V

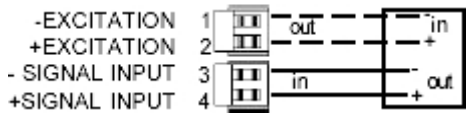
***** 600.0 V range is not ETL certified.

DC Current

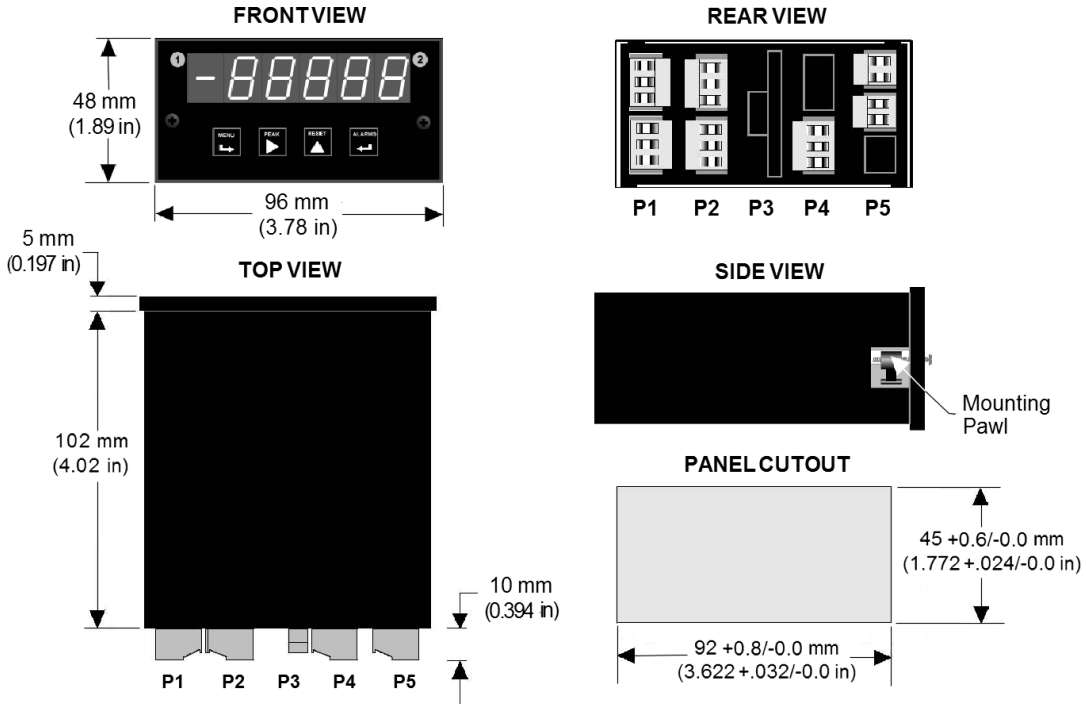
DC Current Range	Resolution	Input Resistance	Error at 25°C
±2.0000 mA	0.1 µA	100 Ω	0.01% FS ± 2 cts
±20.000 mA	1.0 µA	10 Ω	0.01% FS ± 2 cts
±200.00 mA	10 µA	1 Ω	0.01% FS ± 2 cts
±5.000 A	1.0 mA	0.01 Ω	± 10 mA

DC Voltage & Current

Display	
Readout	5 LED digits, 7-segment, 14.2 mm (.56"), red or green.
Range	-99999 to 99999 or -99990 to 99990 (count by 10)
Indicators	Minus sign, 2 red LED lamps
A-to-D Conversion	
Technique	Concurrent Slope™ (Pat 5,262,780)
A-to-D rate	60/s at 60 Hz, 50/s at 50 Hz
Output update rate	56/s at 60 Hz, 47/s at 50 Hz,
Display update rate	3.5/s at 60 Hz, 3/s at 50 Hz
Accuracy	
Error at 25°C	0.01% FS ± 2 counts (except 5A range)
Span tempco	0.003% of reading/°C
Zero tempco	0.1 count/°C
Noise Rejection	
CMR, DC to 60 Hz	130 dB
NMR at 50/60 Hz	90 dB with min filtering
Maximum Signal	
Max applied voltage	600 Vac for 20, 200 and 300 V ranges, 125 Vac for other ranges
Current protection	25x for 2 mA, 8x for 20 mA, 2.5x for 200 mA, 1x for 5 A
Power	
Voltage, standard	85-264 Vac or 90-300 Vdc (DC operation is not UL approved)
Voltage, optional	12-32 Vac or 10-48 Vdc
Frequency	DC or 47-63 Hz
Power Isolation	250V rms working, 2.3 kV rms per 1 min test
Excitation Output (standard)	
Selectable levels	5 Vdc ± 5%, 100 mA; 10 Vdc ± 5%, 120 mA; 24 Vdc ± 5%, 50 mA
Output isolation	50 Vdc to meter ground
Analog Output (optional)	
Output levels	4-20 mA, 0-20 mA, 0-10V, -10 to +10V (jumper selectable)
Current compliance	2 mA at 10V (> 5 kΩ load)
Voltage compliance	12V at 20 mA (< 60Ω load)

Scaling Resolution Isolation	Zero and full scale adjustable from -99999 to +99999 16 bits (0.0015% of full scale) 250V rms working, 2.3 kV rms per 1 min test
Relay Outputs (optional)	
Relay types Current ratings Output common Isolation	2 Form C contact relays or 4 Form A contact relays (NO) 2 or 4 Form A, AC/DC solid state relays (NO) 8A at 250 Vac or 24 Vdc for contact relays 120 mA at 140 Vac or 180 Vdc for solid state relays Isolated commons for dual relays or each pair of quad relays 250V rms working, 2.3 kV rms per 1 min test
Serial Data I/O (optional)	
Board selections Protocols Data rates Digital addresses Isolation	Ethernet, Ethernet-to-RS485 server, USB, USB-to-RS485 server, RS485 (dual RJ11), RS485 Modbus (dual RJ45), RS232. Modbus RTU, Modbus ASCII, Laurel ASCII protocol 300 to 19200 baud 247 (Modbus), 31 (Laurel ASCII), 250V rms working, 2.3 kV rms per 1 min test
Signal Connections	
	
Environmental	
Operating temperature Storage temperature Relative humidity Protection	0°C to 55°C -40°C to 85°C 95% at 40°C, non-condensing NEMA-4X (IP-65) when panel mounted

Mechanical



Ordering Guide

Create a model a model number in this format: **L10000DCV1, IPC**

DPM Type	**L** Laureate Digital Panel Meter
Main Board	**1** Standard Main Board, Green LEDs **2** Standard Main Board, Red LEDs
Power (isolated)	**0** 85-264 Vac **1** 12-32 Vac or 10-48 Vdc
Relay Output (isolated)	**0** None **1** Two 8A Contact Relays **2** Two 120 mA Solid State Relays **3** Four 8A Contact Relays **4** Four120 mA Solid State Relays
Analog Output (isolated)	**0** None **1** Isolated 4-20 mA, 0-20 mA, 0-10 V, -10 to +10V
Digital Interface (isolated)	**0** None **1** RS232 **2** RS485 (dual RJ11 connectors) **4** RS485 Modbus (dual RJ45 connectors) **5** USB **6** USB-to-RS485 device server **7** Ethernet **8** Ethernet-to-RS485 device server
Signal Input (isolated)	**DC Volts** **DCV1** ±200.00 mV **DCV2** ±2.0000 V **DCV3** ±20.000 V **DCV4** ±200.00 V **DCV5** ±600.0 V (range does not qualify for U/L certification) **DCV6** ±300.0 V
	DC Amps **DCA1** ±2.0000 mA **DCA2** ±20.000 mA **DCA3** ±200.00 mA **DCA4** ±5.000 A
Add-on Options	**BL** Blank Lens without Button Pads **CBL01** RJ11-to-DB9 Cable **CBL02** USB-to-DB9 Adapter **CBL05** USB Cable, A to B **IPC** Splash-proof Cover **BOX1** NEMA-4 Enclosure **BOX2** NEMA-4 Enclosure plus IPC