LAUREL
ELECTRONICS, INC.

Laureate™ Ohmmeter for Resistance in Ohms or Milliohms

Features

- **Five precalibrated resistance input ranges from 20.000 Ω to 200.00 kΩ**
- **Fixed 2.0000 ohm, 2.0000 MΩ and 20.000 MΩ range as factory specials**
- **1 mohm resolution on 20 ohm scale**
- **2, 3 or 4-wire connection with lead resistance compensation**
- **Highly accurate and repeatable**
- **Up to 60 conversions per second**
- **Peak or valley display**
- **Universal AC power, 85-264 Vac**
- **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

The Laureate Ohmmeter is ideal for high-speed, high-accuracy resistance measurements in a production environment, such as contact resistance measurements. It is factory calibrated for five jumper selectable resistance ranges from 20.000 Ω to 200.00 kΩ. Fixed factory-special ranges of 2.000 Ω, 2.0000 MΩ and 20.000 MΩ are also available. Accuracy is an exceptional ±0.01% of full scale ± 2 counts. Resolution is one part in 20,000. In the 20 Ω range, resolution is 1 mΩ, making the meter suitable for contact resistance and conductance measurements.

Meter connections can be via 2, 3 or 4 wires. With 4-wire hookup, 2 wires are used for excitation and two separate wires are used to sense the voltage across the resistance to be measured, thereby eliminating any lead resistance effects. With 3-wire hookup, the meter senses the combined voltage drop across the resistance to be measured plus two excitation leads. It also senses the voltage drop across one excitation lead, and then subtracts twice this voltage from the combined total. This technique effectively subtracts lead resistance if the excitation leads are the same.

All resistance ranges are digitally calibrated at the factory, with calibration factors stored in EEPROM on the signal conditioner board. This allows ranges and signal conditioner boards to be changed in the field without recalibrating the meter. If desired, the meter can easily be calibrated using external standards plus scale and offset in software.

Multiple relay operating modes are selectable in software. One of these is band deviation setpoint operation, where a deviation limit (such as 50 counts) is set up around both sides of the set-point. The relay closes (or opens) when the reading falls within the deviation band, and opens (or closes) when the reading falls outside of this band. This mode sets up a passband around the setpoint and is often used for component testing.

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. All power and signal connections are via UL / VDE / CSA rated screw clamp plugs.

Specifications

Range	Resolution	Accuracy	Excitation Current
0-2.0000 ohm **	0.1 mohm		5 mA
0-20.000 ohm *	1 mohm		5 mA
0-200.00 ohm *	10 mohm		500 µA
0-2000.0 ohm *	100 mohm	±0.01% of range	50 µA
0-20000 ohm*	1 ohm	± 2 counts	5 µA
0-200.00 kohm *	10 ohm		500 nA
0-2.0000 Mohm **	100 ohm		500 nA
0-20.000 Mohm **	1 kohm		75 nA

* Jumper-selectable, precalibrated range.
** Factory-set fixed range
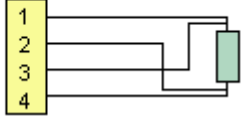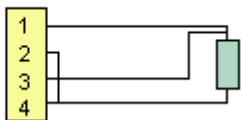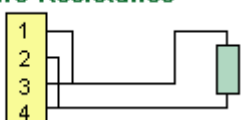
Display	
Readout	5 digits, 7-segment, 14.2 mm (.56")
Color	Red or green LED
Indicators	2 red LED lamps

Accuracy	
Accuracy at 25°C	±0.01% of range ± 2 counts
Span tempco	±0.003% of reading/°C

Electrical	
Connection	2, 3 or 4-wire
Max applied voltage	100 mV
Overvoltage protection	125 Vac
Open sensor indication	Flashes full-scale

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	56/s at 60 Hz, 47/s at 50 Hz
Display Update	3.5/s at 60 Hz, 3/s at 50 Hz

Power	
Voltage, standard	85-264 Vac or 90-300 Vdc
Voltage, optional	12-32 Vac or 10-48 Vdc
Power frequency	DC or 47-63 Hz
Power consumption (typical, base meter)	1.2W @ 120 Vac, 1.5W @ 240 Vac, 1.3W @ 10 Vdc, 1.4W @ 20 Vdc, 1.55W @ 30 Vdc, 1.8W @ 40 Vdc, 2.15W @ 48 Vdc
Power isolation	250V rms working, 2.3 kV rms per 1 min test

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 kOhm load)
Voltage compliance	12V at 20 mA (< 600 Ohm load)
Scaling	Zero and full scale adjustable from -99999 to +99999
Resolution	16 bits (0.0015% of full scale)
Isolation	250V rms working, 2.3 kV rms per 1 min test

Relay Outputs (optional)	
Relay Types	2 Form C contact relays or 4 Form A contact relays (NO) 2 or 4 Form A, AC/DC solid state relays (NO)
Current Ratings	8A at 250 Vac or 24 Vdc for contact relays
	120 mA at 140 Vac or 180 Vdc for solid state relays
Output common	Isolated commons for dual relays or each pair of quad relays
Isolation	250V rms working, 2.3 kV rms per 1 min test

Serial Data I/O (optional)	
Board Selections	Ethernet, Ethernet-to-RS485 server, USB, USB-to-RS485 server, RS485 (dual RJ11), RS485 Modbus (dual RJ45), RS232.
Protocols	Modbus RTU, Modbus ASCII, Laurel ASCII protocol
Data Rates	300 to 19200 baud
Digital Addresses	247 (Modbus), 31 (Laurel ASCII),
Isolation	250V rms working, 2.3 kV rms per 1 min test

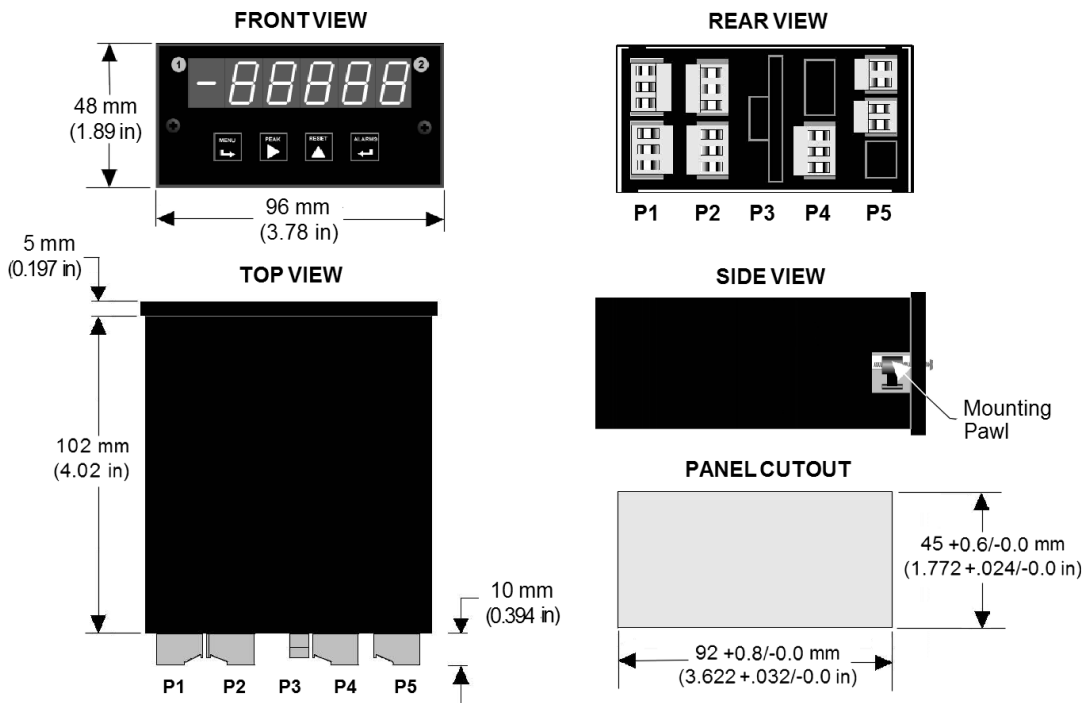| Environmental	
Operating Temp.	0°C to 55°C
Storage Temp.	-40°C to 85°C
Relative Humidity	95% at 40°C, non-condensing
Protection	NEMA-4X (IP-65) when panel mounted

Resistance Measurement with Excitation & Lead Compensation

In 4-wire hookup, different pairs of leads are used to apply the excitation current and sense the voltage drop across the unknown resistance, so that the IR drop across the excitation leads is not a factor.

In 3-wire hookup, the meter senses the combined voltage drop across the unknown resistance plus two excitation leads. It also senses the voltage drop across one excitation lead, and then subtracts twice this voltage from the combined total. This technique effectively subtracts all lead resistance and compensates for ambient temperature changes if the two excitation leads are identical.

In 2-wire hookup, the meter senses the combined voltage drop across the unknown resistance and both lead wires. The voltage drop across the lead wires can be measured by shorting out the resistance during meter setup, and this voltage is then automatically subtracted from the combined total. However, changing resistance of the lead wires due to ambient temperature changes will not be compensated.

Ohmmeter hookup can be via 2, 3 or 4 wires to the J5 connector. The meter applies a fixed excitation current for each resistance range.

Mechanical

FRONT VIEW

48 mm
(1.89 in)

96 mm
(3.78 in)

5 mm
(0.197 in)

TOP VIEW

102 mm
(4.02 in)

10 mm
(0.394 in)

P1 P2 P3 P4 P5

REAR VIEW

P1 P2 P3 P4 P5

SIDE VIEW

Mounting Pawl

PANEL CUTOUT

45 +0.6/-0.0 mm
(1.772 +.024/-0.0 in)

92 +0.8/-0.0 mm
(3.622 +.032/-0.0 in)

Ordering Guide

Create a model number in this format: **L1110P385C, 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
Resistance Input (isolated)	**R0** 0-2.0000 ohm (factory special fixed range**)** **R1** 0-20.000 ohm **R2** 0-200.00 ohm **R3** 0-2.0000 kohm **R4** 0-20.000 kohm **R5** 0-200.00 kohm **R6** 0-2.0000 Mohm (factory special fixed range **R7** 0-20.000 Mohm (factory special fixed range
Add-on Options	**CBL01** RJ11-to-DB9 cable. RJ11 to DB9. Connects RS232 ports of meter and PC. **CBL02** USB-to-DB9 adapter cable. Combination of CBL02 and CBL01 connects meter RS232 port to PC USB port. **CBL03-1** 6-wire data cable, RJ11 to RJ11, 1 ft. Used to daisy chain meters via RS485. **CBL03-7** 6-wire data cable, RJ11 to RJ11, 7 ft. Used to daisy chain meters via RS485. **CBL05** USB cable, A-B. Connects USB ports of meter and PC. **CBL06** USB to RS485 adapter cable, half duplex, RJ11 to USB. Connects meter RS485 port to PC USB port. **CASE1** Benchtop laboratory case for one 1/8 DIN meter **CASE2** Benchtop laboratory case for two 1/8 DIN meters **IPC** Splash-proof cover **BOX1** NEMA-4 Enclosure **BOX2** NEMA-4 enclosure plus IPC **BL** Blank Lens without button pads **NL** Meter lens without button pads or Laurel logo

Application Example: Deviation Limit for Pass/Fail Testing
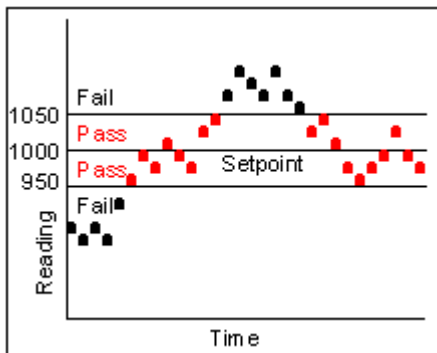
A **deviation limit** (50 mohm in this example) is set up around both sides of a setpoint. The relay closes (or opens) when the reading falls within the deviation band, and opens (or closes) when the reading falls outside of this band. This mode sets up a passband around the setpoint and can be used for contact resistance testing.