



LAUREL
ELECTRONICS, INC.

Laureate™ Digital Panel Meter for Load Cell & Microvolt Input



Features

- 20, 50, 100, 250 & 500 mV ranges
- Span adjust from 0 to $\pm 99,999$, zero adjust from -99,999 to +99,999
- Selectable fixed right-hand zero with rounding
- Isolated 10 Vdc supply to power up to four 350-ohm load cells in parallel
- 4- or 6-wire hookup to avoid lead resistance effects
- 1 Gohm input impedance
- Up to 60 conversions per second
- Peak or valley display
- Auto-tare with tare value stored in memory
- 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™ load cell & microvolt meter is a high-sensitivity monitor and controller for use with load cells, strain gauges and microvolt input signals where high accuracy and stability are required.

- **DC microvoltmeter operation** provides sensitivity down to ± 20 mV full scale with 1 μ V resolution. A display span of 99,999 counts with sensitivity of 0.2 μ V per count can be obtained by applying a digital multiplier of five. A moving average digital filter assures quiet readings in electrically noisy environments.
- **Load cell operation** allows six-wire hookup and scaling for direct readout in engineering units, such as pounds, kilograms or PSI. Scaling can be via front panel pushbuttons or a computer. Zero may be set from -99,999 to +99,999. Range may be scaled from 0 to $\pm 99,999$. Digital scaling and calibration eliminate drift caused by potentiometers in non-microcomputer based meters.

Meter accuracy is 0.01% of full scale ± 2 counts with an ideal load cell. Custom curve linearization, which is available with the optional Extended main board, can extend the working range of real-world load cells. Custom curve linearization also allows high accuracy to be achieved with lower cost, less linear load cells.

A built-in isolated 10 Vdc excitation supply can provide up to 120 mA of current at 10V to power four 350-ohm load cells in parallel. The meter operates in a ratiometric mode to eliminate errors due to supply variations. When excitation sense inputs are used in 6-wire connection, the meter compensates for variation in resistance of the transducer leads to allow long cable runs.

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 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.

Easy scale and offset are provided by Laureate DC, process and load cell meters by either of two selectable methods:

- **With the coordinate reading method**, the meter reads the high and low signal values, and the user enters the desired high and low reading values. The meter then calculates the span multiplier and offset. This method is ideal if an external calibration reference is available.
- **With the manual coordinate method**, the user enters the high and low input values in Volts plus the desired high and low reading values. This method is suitable if no external calibration reference is available.

Auto-tare is standard for weighing applications to subtract the weight of an empty container and may be controlled by an external pushbutton contact closure or a logic signal. Additional capabilities for weighing applications are provided by the Laureate weight & scale meter.

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 Microvolt Input

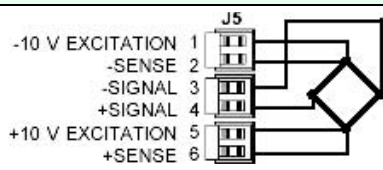
Input Range, mV	Resolution	Input Resistance	Error at 25°C
±20.000	1 µV	1 GΩ	0.01% FS ± 2 counts
±50.000	1 µV		
±100.00	10 µV		
±250.00	10 µV		
±500.00	10 µV		

Load Cell Input

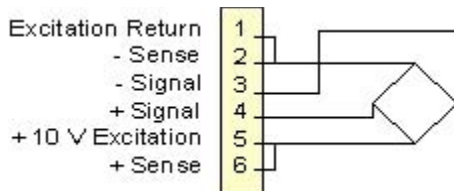
Full-Scale Input, mV	Zero Adjust	Span Adjust	Input Resistance	Error at 25°C
±20.000 ±50.000 ±100.00 ±250.00 ±500.00	-99,999 to +99,999	0 to ±99,999	1 GΩ	0.01% FS ± 2 counts

DC Microvolts & Load Cell

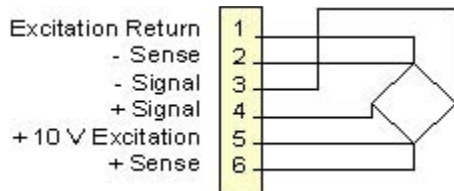
Accuracy	
Error at 25°C	0.01% FS ± 2 counts
Span tempco	0.0015% of reading/°C
Zero tempco	0.1 µV/°C
Load cell linearization	Provided by Extended meter version
Noise Rejection	
CMR, DC to 60 Hz	130 dB
NMR at 50/60 Hz	90 dB with min filtering
A-to-D Conversion	
Technique	Concurrent Slope™ (Pat 5,262,780)
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
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
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 isolation	250V rms working, 2.3 kV rms per 1 min test
Power consumption (typ. with four 350Ω load cells at 10V)	2.4W @ 120 Vac, 2.7W @ 240 Vac, 2.5W @ 10 Vdc, 2.6W @ 20 Vdc, 2.75W @ 30 Vdc, 3.0W @ 40 Vdc, 3.35W @ 48 Vdc
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 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 Isolation	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	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
Signal Connections	
	
Environmental	
Operating temperature	0°C to 55°C
Storage temperature	-40°C to 85°C
Relative humidity	95% at 40°C, non-condensing
Protection	NEMA-4X (IP-65) when panel mounted

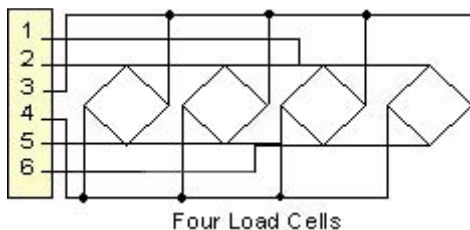
Load Cell Meter Connections



In 4-wire connection, the excitation and sense lines are tied together. The meter can make ratiometric corrections for supply voltage variations, but not compensate for variations in lead resistance. This connection is often used with short cable runs.



In 6-wire connection, the sense lines are separate from the excitation lines, thereby eliminating effects due to variations in lead resistance. This allows long cable runs in outdoor environments with temperature extremes.

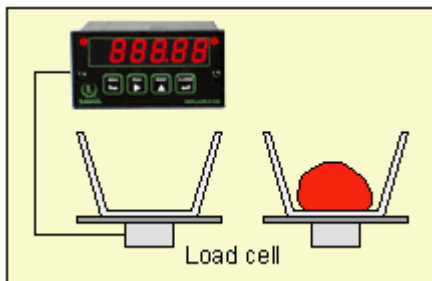


For large scales, up to four 350 ohm load cells can be powered by a single Laureate, whose excitation output is rated 120 mA at 10 V. The excitation and sense points of the four bridges are connected in parallel through a summing box.



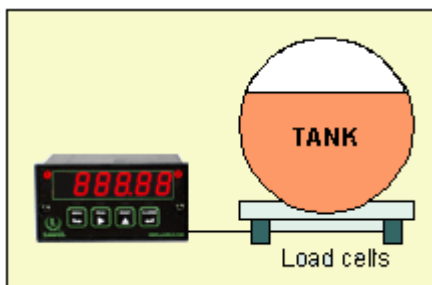
Seat belt tensile strength testing using Laureate digital panel meters.
The three meters display Force, Displacement and Speed.

Sample Applications



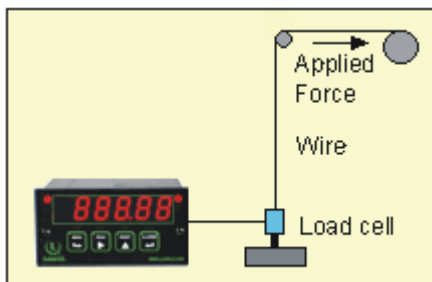
Auto-Tare

To read the net weight of an object, the empty container is first weighed, and an external button is pushed to zero out the display. The meter will then read net weight when an object is added to the empty container. The tare value is stored in memory for subsequent readings.



Determining Volume Using Load Cells

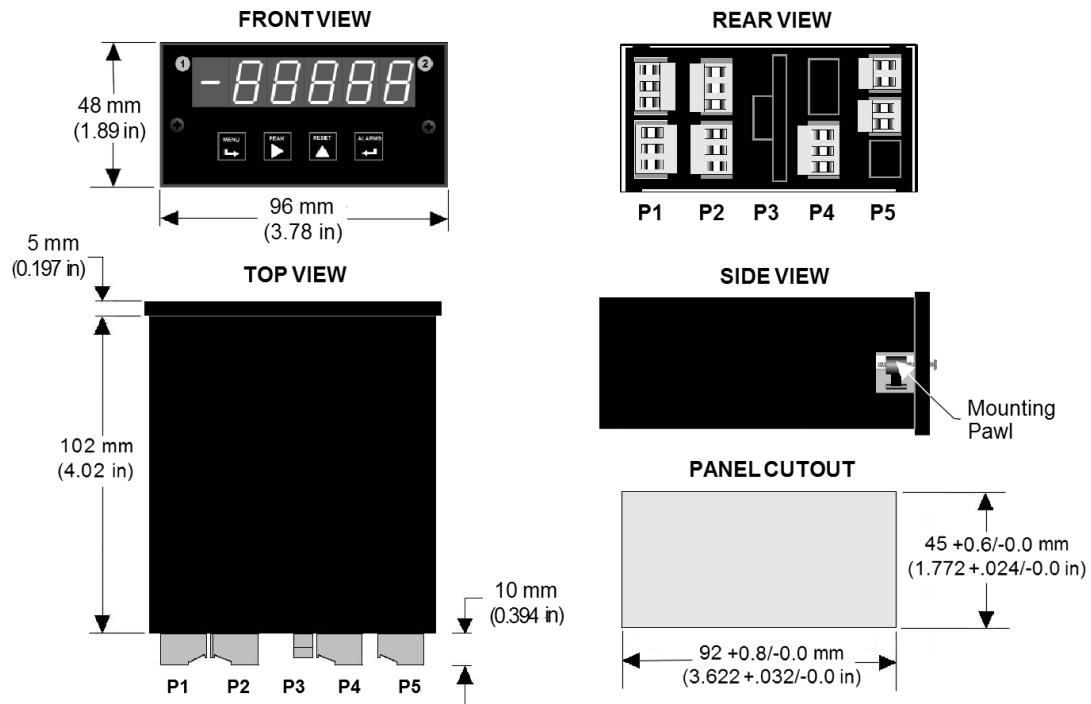
An easy way to determine volume of an irregularly shaped tank with no need for linearizing is to weigh the tank using load cells. The meter will automatically tare out the weight of the empty tank and then scale the load cell signals to units of volume, such as liters or gallons.



Peak Capture for Tensile Strength of Wire

Peak readings are automatically captured at rates up to 60 per second, while the display updates at a legible 3.5 per second. The peak reading can be recalled at the push of a button or be always displayed. It can also be transmitted to a computer via RS232, RS485, USB, or Ethernet.

Mechanical



Ordering Guide

Create a model number in this format: **L10000WM, IPC**

DPM Type	L Laureate Digital Panel Meter
Main Board	1 Standard Main Board, Green LEDs 2 Standard Main Board, Red LEDs 3 Extended Main Board, Green LEDs 4 Extended Main Board, Red LEDs Note: Extended capability is only required for custom curve linearization or for display of time rate of change, such as flow rate from changing tank weight.
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 Four 120 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)	Load Cell (6-wire ratio) WM Field Scalable. Default scaling is 0-20 mV = 0-100.00 WM1 Custom Scaling. In the write-in field of your order, specify min input, min reading; max input, max reading. Full-scale input is 20-500 mV. Excitation is 10 V for up to four 350-ohm load cells.
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