

#### Products by Type

Digital Panel Meters  
Electronic Counters  
Programmable Timers  
Transmitters, 4-20 mA  
Transmitters, Modbus  
Large Digit Displays  
Bar Graph Displays  
Meter/Counter Options  
Meter Accessories  
Data Logging Systems  
Serial-to-Analog  
4-20 mA Loop Splitters

#### Meters by Application

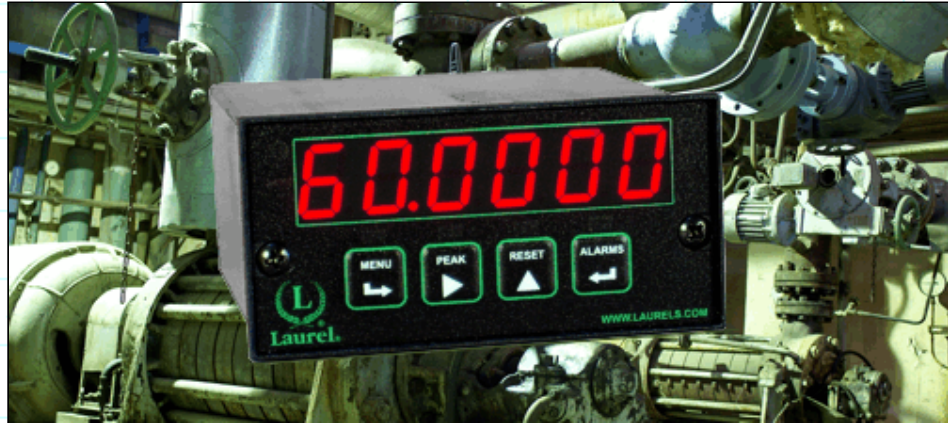
DC Volts & Amps  
AC Power Monitoring  
Process Meters  
Flow Rate Total Batch  
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# Laureate™ Frequency, Rate & Period Meter

**With dual, independently field-scalable channels**



## Standard Frequency / Rate Meter

- Two independently field-scalable channels selected by front panel pushbutton
- Frequencies from 0.005 Hz to 1 MHz
- Inputs from NPN or PNP proximity switches, contact closures, digital logic, magnetic pickups down to 12 mV, or AC inputs up to 250 Vac.
- 6-digit resolution at update rates up to 25/s
- Line frequency measurement to 60.0000 in a few line cycles
- Selectable "count by" of 10 or 100 with rounding
- Universal AC power, 85-264 Vac
- Isolated 5, 10 or 24 Vdc excitation supply to power sensors
- NEMA 4X, 1/8 DIN case
- Certified to UL 61010C-1 (UL mark), EN 61010-1 (CE mark) and RoHS

## Extended Frequency / Rate Meter. All capabilities of Standard Counter, plus:

- Rate and total simultaneously
- Custom curve linearization
- Arithmetic functions for inputs A & B: A+B, A-B, AxB, A/B, A/B-1 (draw)

## Options

- Low voltage power: 10-48 Vdc or 12-32 Vac
- 2 or 4 output relays, electromechanical or solid state
- 1 or 2 isolated analog outputs: 4-20 mA, 0-20 mA, 0-10V, -10 to +10V
- Serial communications: RS232, RS485, Modbus RS485, USB, USB-to-RS485 converter

## Description



**The Laureate dual-channel frequency, rate and period meter** is a basic operating mode of the Laureate counter with the FR signal conditioner board. It can display frequency from 0.005 Hz to 1 MHz, rate in engineering units, and period (inverse of frequency). The normal displayed value can range up to 999,999 counts. Above that level, the display will flash and go into four-digit XXXEX scientific notation. Each channel (A or B) may be independently scaled for frequency, rate or period. The displayed channel is selected via a front panel pushbutton. Examples of applications are the accurate display of AC line frequency, RPM, speed from proximity switch inputs, and flow from turbine flow meter inputs.

**Fast, high resolution measurements.** The Laureate counter determines frequency by timing an integral number of periods over a specified gate time, and then taking the inverse of period. Rate is obtained by multiplying the input by a scale factor. The inverse period approach allows greater accuracy and faster update times than conventional meters which count signal pulses over a time interval. AC line frequency may be accurately measured to 50.0000 or 60.0000 Hz in a few line cycles. 1000 Hz signals may be measured to 0.01 Hz resolution at up to 25 readings per second. Fast response is ideal for alarm and control applications.

**For noise reduction,** a count by 10 or 100 feature with rounding is selectable. Variations in the displayed reading can also be reduced by selecting a longer gate time. An adaptive digital filter is selectable to reduce variations due to noise while rapidly responding to actual changes in the signal.

**An Extended counter version provides all capabilities of the Standard counter plus:**

- **Rate and total simultaneously.** One channel can display total while the other displays rate. The selection for either channel is via a front panel pushbutton. This mode is ideal for flow applications when the same signal is applied to both channels.
- **Custom curve linearization.** Exceptionally accurate custom curve linearization allows linearization of the low end of turbine flowmeters. For setup, up to 180 data points can be input into a spreadsheet or text file by the user. The computer then calculates nonlinear segments, which are downloaded into the meter via RS-232. The Extended version allows linearized rates to be totalized.
- **Arithmetic functions.** The Extended counter makes arithmetic functions available, namely A+B, A-B, AxB, A/B and A/B-1 (draw). For example, A+B allows two input flows to be summed for total flow, while A-B allows outflow to be subtracted from inflow for net flow. If transducers with a frequency output are used, AxB allows horsepower to be displayed based measured torque and RPM, or based on force and velocity. A/B can be used for the proper mixing of ingredients, while A/B-1 (draw) is used to compare rates for stretching or tensioning.

**The FR dual-channel signal conditioner** accepts inputs from proximity switches with PNP or NPN output, TTL or CMOS logic, magnetic pickups, contact closures, low-level outputs from turbine flow meters down to 12 mV, and high-level AC line inputs up to 250 Vac. A built-in isolated 5, 10, or 24 Vdc excitation supply can power proximity switches and other sensors, thus eliminating the need for an external power supply.



**Designed for flexibility.** Optional plug-in boards for communications and control include single or dual isolated analog output boards, dual or quad relay boards, and serial communications boards. 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.

## Specifications

<b>Display</b>	
Readout	6 LRD digits, 7-segment, 14.2 mm (.56"), red or green.
Display Range	-999999 to +999999, XXXXEX notation beyond 999999
Zero Adjust	-999999 to +999999
Span Adjust	0 to 999999
Indicators	Four LED lamps
<b>Inputs</b>	
Types	AC, pulses from NPN, PNP transistors, contact closures, magnetic pickups.
Signal Ground	Common ground for channels A & B
Channel A Freq.	0.005 Hz to 1 MHz
Channel B Freq.	0.005 Hz to 250 kHz
Minimum Signal	Nine ranges from (-12 to +12 mV) to (+1.25 to +2.1V)
Maximum Signal	250 Vac
Noise Filter	1 MHz, 30 kHz, 250 Hz (selectable)
Contact Debounce	0, 3, 50 ms (selectable)
<b>Update Rate</b>	
Freq. Technique	Inverse period
Conversion Time	Gate time + 30 ms+ 0-2 signal periods
Gate Time	Selectable 10 ms to 199.99 s
Time Before Zero Out	Selectable 10 ms to 199.99 s
<b>Accuracy</b>	
Time Base	Crystal calibrated to $\pm 2$ ppm
Span Tempco	$\pm 1$ ppm/ $^{\circ}$ C (typ)
Long-term Drift	$\pm 5$ ppm/year
<b>Power</b>	
Voltage, standard	85-264 Vac or 90-300 Vdc (DC operation 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
<b>Excitation Output (standard)</b>	
5 Vdc	5 Vdc $\pm 5\%$ , 100 mA
10 Vdc	10 Vdc $\pm 5\%$ , 120 mA
24 Vdc	24 Vdc $\pm 5\%$ , 50 mA
Output Isolation	50 Vdc to meter ground
<b>Analog Output (optional)</b>	
Output Levels	4-20 mA, 0-20 mA, 0-10V, -10 to +10V (single-output option) 4-20 mA, 0-20 mA, 0-10V (dual-output option)
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 (dual analog outputs share the same ground)
<b>Relay Outputs (optional)</b>	
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

Output common Isolation	130 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
<b>Serial Data I/O (optional)</b>	
Board Selections Protocols Data Rates Digital Addresses Isolation	RS232, RS485, Modbus RS485, USB, USB-to-RS485 converter Modbus RTU, Modbus ASCII, simpler Laurel ASCII 300 to 19200 bps 247 (Modbus), 31 (Laurel ASCII), 250V rms working, 2.3 kV rms per 1 min test
<b>Environmental</b>	
Operating Temp. Storage Temp. Relative Humidity Protection	0°C to 60°C -40°C to 85°C 95% at 40°C, non-condensing NEMA-4X (IP-65) when panel mounted
<b>Electrical Connections</b>	

## Typical Applications

### AC Line Frequency



The Laureate will accept line voltages up to 250 Vac and display line frequency to 6-digit accuracy (50.0000 or 60.0000) in a few line cycles. Fast low frequency response is achieved by timing the period and taking its inverse.

### RPM and Speed



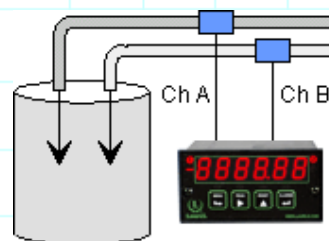
The Laureate can sense the low-level signals from magnetic pickups or the NPN or PNP transistor output of active sensors. These can be powered directly by the meter. Display in RPM or units of speed is achieved by mathematically scaling the meter.

### Flow Rate and Simultaneous Total



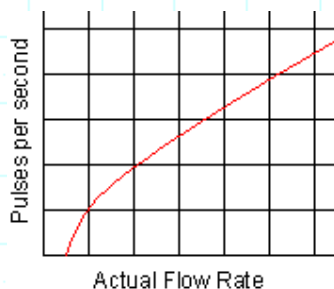
The Laureate is compatible with all flow meters which generate pulses at a frequency proportional to flow rate. The Extended version can display scaled rate or total for the same input at the push of a button, and alarm from both the rate and total. The Extended version can also linearize flow transducers so as to extend their dynamic range.

### Combining Two Rates



The Extended Laureate offers A+B, A-B and A/B arithmetic functions. A+B allows two input flows to be summed for total flow, while A-B allows outflow to be subtracted from inflow for net flow. Flow ratios aid in the proper mixing of ingredients

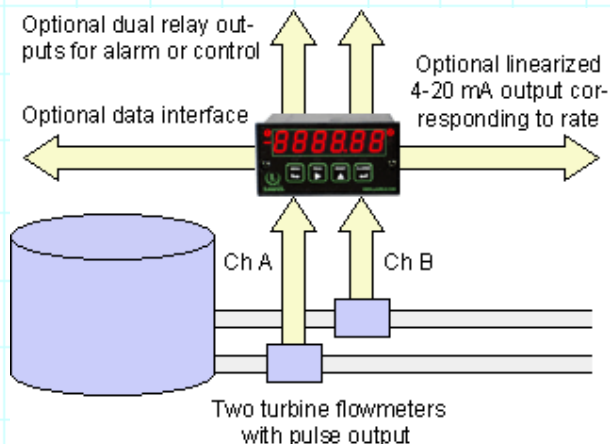
## Custom Curve Linearization



The Extended Laureate can linearize the output turbine flow meters, which tend to be nonlinear on the low end. Linearizing improves the dynamic range and accuracy of turbine flow meters.

## System-level Capabilities

The Laureate dual channel rate meter can independently scale, display and alarm two pulse input channels. All signal or alarm data can further be transmitted via RS-232 or RS-485, including peak readings and arithmetic combinations of the two rates. The displayed rates can also be transmitted as an isolated 4-20 mA or 0-10V analog output.



## Ordering Guide

### Laureate™ Frequency, Rate & Period Meters

Select the buttons to build a model number in this format: **L5000FR, IPC.**

Quantity		1
<b>Main Board</b>	<input type="radio"/> <b>L5</b> Standard Main Board, Green LEDs <input type="radio"/> <b>L6</b> Standard Main Board, Red LEDs <input type="radio"/> <b>L7</b> Extended Main Board, Green LEDs <input type="radio"/> <b>L8</b> Extended Main Board, Red LEDs	\$230 \$230 \$270 \$270
	<i>With Standard Main Board:</i> Scalable to ±999,999 for frequency, rate, square root of rate, up or down total, period, A-to-B time interval. <i>With Extended Main Board:</i> Above, plus rate and total simultaneously, ratio (A/B), draw (A/B-1), other arithmetic functions (AxB, A+B, A-B), phase angle, stopwatch, up/down counting, batching operation, custom curve linearization.	
<b>Power</b>	<input type="radio"/> <b>0</b> Isolated 85-264 Vac <input type="radio"/> <b>1</b> Isolated 12-32 Vac or 10-48 Vdc	NC \$30
<b>Relay Output</b>	<input type="radio"/> <b>0</b> None <input type="radio"/> <b>1</b> Two 8A Contact Relays <input type="radio"/> <b>2</b> Two Solid State Relays <input type="radio"/> <b>3</b> Four 8A Contact Relays <input type="radio"/> <b>4</b> Four Solid State Relays	NC \$80 \$55 \$100 \$75
<b>Analog Output</b>	<input type="radio"/> <b>0</b> None <input type="radio"/> <b>1</b> Single isolated 4-20 mA, 0-20 mA, 0-10V, -10 to +10V	NC \$90

	<input type="radio"/> <b>2</b> Dual isolated 4-20 mA, 0-20 mA, 0-10V	\$135
<b>Digital Interface</b>	<input type="radio"/> <b>0</b> None	NC
	<input type="radio"/> <b>1</b> Isolated RS-232	\$60
	<input type="radio"/> <b>2</b> Isolated RS-485	\$80
	<input type="radio"/> <b>4</b> Isolated Modbus RS-485	\$90
	<input type="radio"/> <b>5</b> USB	\$60
	<input type="radio"/> <b>6</b> USB-to-RS485 converter	\$100
<b>Input Type</b>	<input type="radio"/> <b>FR</b> Dual-Channel Pulse Input Signal Conditioner	NC
<b>Add-on Options</b>	<input type="checkbox"/> <b>BL</b> Blank lens without button pads	NC
	<input type="checkbox"/> <b>CBL01</b> RJ11-to-DB9 cable	\$19
	<input type="checkbox"/> <b>CBL02</b> USB-to-DB9 adapter	\$39
	<input type="checkbox"/> <b>CBL05</b> USB Cable, A to B	\$15
	<input type="checkbox"/> <b>IPC</b> Clear front panel cover sealed to NEMA 4X / IP65	\$40
	<input type="checkbox"/> <b>BOX1</b> NEMA-4X wall-mount enclosure	\$140
	<input type="checkbox"/> <b>BOX2</b> BOX1 plus IPC	\$180



**Laurel Electronics, Inc.**  
**Industrial Instrumentation & Displays**

3183-G Airway Avenue  
 Costa Mesa, CA 92626, USA



**Tel:** (714) 434-6131  
**Fax:** (714) 434-3766



Email [sales@laurels.com](mailto:sales@laurels.com)

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