

## Laureate™ Quadrature Position & Rate Meters

For accurate position or rate from quadrature encoders



### Features

- Accepts low-level differential or single-ended 5 V logic level outputs from shaft encoders.
- Quadrature count x1, x2 or x4.
- Combined pulse rate to 250 kHz.
- Programmable display refresh rate up to 25/s.
- Zero channel input.
- 6-digit display scalable for direct readout in units of length.
- Isolated 5, 10 or 24 Vdc excitation output to power shaft encoder.
- AC or DC powered.
- Green or red LED display.
- Extended counter option to display rate or position.
- Choice of isolated plug-in options for control and computer interface:  
[dual relays](#), [4-20 mA & 0-10 V analog output](#), [RS-232/485 I/O](#), [parallel BCD output](#), [low voltage AC & DC power](#).
- [NEMA 4X, 1/8 DIN case](#).
- Certified to UL 3101-1, CAN/CSA-C22.2, EN 61010-1 (CE Mark).

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### Description



### Position, Length or Angle Measurement

The Laureate™ quadrature meter with the Standard counter main board accepts the A & B signals from shaft encoders to provide a highly accurate, scaled display of position, length, or angle in engineering units, such as ft, cm or degrees.

The A & B quadrature signals are 90° out of phase, and their phase relationship determines whether up counts (+) or down counts (-) are produced. The meter totalizes the counts and then scales the total in soft-ware for display and

control. A zero index signal may be added as a third input to the A & B signals.

## Scaled Rate Measurement

Use of the Extended counter main board can convert the quadrature meter from scaled position to scaled rate. For example, it can display the speed of a moving slab in ft/sec. Simultaneous display of position and rate will require two meters. The display and control output update rate for position or rate is normally set to a maximum of 25/s, as determined by a user-programmable gate time.

## Quadrature Meter Capabilities

- **One, two or four transitions** may be counted at a maximum combined rate of 250 kHz and be mathematically scaled for display in engineering units from -999,999 to +999,999. The quadrature board has input circuitry which may be jumpered for either single-ended input signals or for balanced line driver signals. Anti-jitter circuitry eliminates errors produced by vibration of the encoder.
- **A zero index pulse**, if available, is interpreted as by the meter as corresponding to an integral number of revolutions of the shaft encoder. It is used by the meter to correct for any cumulative pulse count errors. Special circuitry corrects for width of the zero index pulse.
- **In the event of a power failure**, the current total may be stored in non-volatile memory and can be used as the starting point for counting when power resumes. Power fail or zero index capabilities are alternate meter setup choices.



## Interface Capabilities

A built-in isolated 5, 10, or 24 Vdc excitation supply can power the encoder and eliminate the need for an external power supply. Plug-in [isolated analog output](#), [dual-setpoint controller](#), [RS-232/485 communications](#), and [parallel BCD output](#) boards can upgrade the Laureate quadrature meter from stand-alone monitor to system interface and control. In particular, the meter can provide an isolated 4-20 mA output signal scaled to the display.

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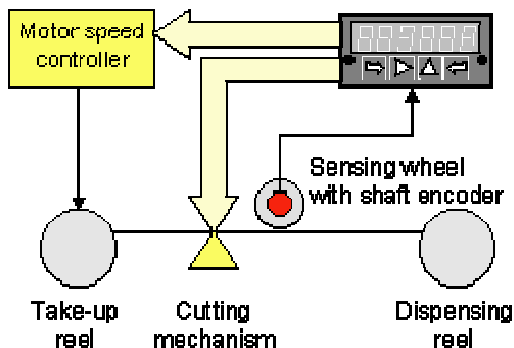
## Specifications

Display	
Readout	6 digits, 7-segment, 14.2 mm (.56")
Color	Red or green LED
Range	-999999 to +999999
Display Update Rate	Programmed gate time + 30 ms + 1-2 signal periods
Indicators	Four LED lamps
Inputs	
Type	Differential or single-ended quadrature
Transitions Monitored	x1, x2 or x4
Max Pulse Rate	250 kHz at x1, 125 kHz at x2, 62.5 kHz at x4
Position Error	No error contributed by meter
Rate Operation	
Conversion Technique	Inverse period
Conversion Time	+ 30 ms + 0-2 signal periods
Gate time	Selectable 10 ms to 199.99 s
Timeout	Selectable 10 ms to 199.99 s
Output & Display Update	Same as conversion time
Time Base Accuracy	Calibrated to $\pm 2$ ppm
Span Tempco	$\pm 1$ ppm/ $^{\circ}$ C (typ.)
Long-term Drift	$\pm 5$ ppm/year

Power	
Voltage, std.	85-264 Vac and 90-370 Vdc
Voltage, opt.	8-28 Vac and 9-37 Vdc
Frequency	DC or 49-440 Hz
Power isolation	Safety-rated to 250 Vac, meter ground to earth ground, DC to 60 Hz, 4.2 kVp per High Voltage Test
Excitation Output	
5 Vdc	5 Vdc $\pm$ 5%, 100 mA max
10 Vdc	10 Vdc $\pm$ 5%, 120 mA max
24 Vdc	24 Vdc $\pm$ 5%, 50 mA max
Output isolation	50 Vdc to meter ground
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

## Application Examples

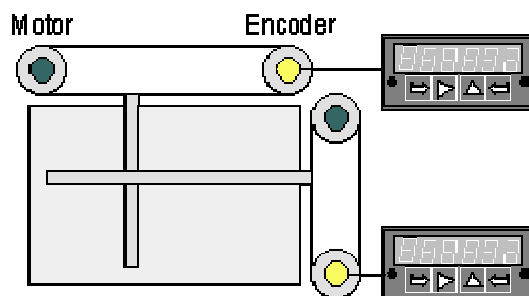
### Using Quadrature for Cutting to Length



Controlling the repetitive cutting of material to length is an excellent application of the Laureate quadrature meter.

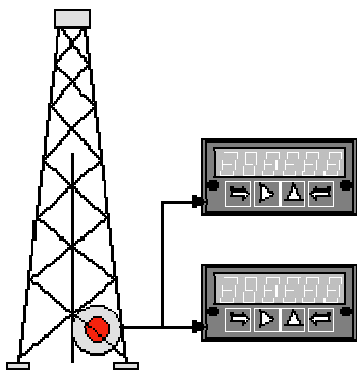
The quadrature encoder shares the shaft of a sensing wheel, whose rotation corresponds to lineal displacement of material. The meter compares the displacement reading against setpoint information, and then uses its dual relays to first slow down and then cut the material.

### Using Quadrature for X-Y Positioning



Accurate X-Y position or rate can be obtained from two shaft encoders, which convert linear position to quadrature signals as a shaft turns. In addition to serving as a display, each Laureate can use its optional dual relay setpoint capability for closed loop control. It can also transmit data via RS-232, RS-485, or a 4-20 mA analog signal.

### Using Quadrature to Monitor a Drilling Operation



Quadrature can be used to track position and vertical drilling speed of the bit in an oil drilling operation. A shaft encoder is rotated by a cable that moves with the drilling shaft.

In this application, the same encoder signal is applied to a Laureate quadrature meter for position, and to a second quadrature meter for rate. Both meters can be scaled to read out in appropriate engineering units, such as feet and inches per minute, and can be alarmed. A Laureate 6-digit remote display could be added to read out peak rate.

## Ordering Guide

### Laureate™ Quadrature Position & Rate Meters

Create a model number in this format: **L80101QD**. This example calls out a Laureate counter with an extended main board with red LEDs, 85-264 Vac & 90-370 Vdc power, dual 10 A contact relays, no second output, RS-232 serial output, and a quadrature signal conditioner. Usable for position or rate. Includes plug-in screw terminals.

<b>Main Board</b>	<input type="checkbox"/>	<b>L5</b> Standard Main Board, Green LEDs (for position).	
	<input type="checkbox"/>	<b>L6</b> Standard Main Board, Red LEDs (for position).	\$220
	<input type="checkbox"/>	<b>L7</b> Extended Main Board, Green LEDs (for position or rate).	\$260
	<input type="checkbox"/>	<b>L8</b> Extended Main Board, Red LEDs (for position or rate).	\$260
<b>Power</b>	<input type="checkbox"/>	<b>0</b> Isolated 85-264 Vac & 90-370 Vdc	NC
	<input type="checkbox"/>	<b>1</b> Isolated 8-28 Vac & 9-37 Vdc.	\$30
<b>Setpoint Output</b>	<input type="checkbox"/>	<b>0</b> None.	NC
	<input type="checkbox"/>	<b>1</b> Dual 10A Contact Relays.	\$80
	<input type="checkbox"/>	<b>2</b> Isolated Dual Solid State Relays.	\$55
<b>Second Output</b>	<input type="checkbox"/>	<b>0</b> None.	NC
	<input type="checkbox"/>	<b>1</b> Isolated 0-20 mA & 0-10 V.	\$90
	<input type="checkbox"/>	<b>2</b> Batch Relay. Only used with pulse-input batching operation.	\$50
<b>Digital Interface</b>	<input type="checkbox"/>	<b>0</b> None.	NC
	<input type="checkbox"/>	<b>1</b> Isolated RS-232.	\$60
	<input type="checkbox"/>	<b>2</b> Isolated RS-485.	\$80
	<input type="checkbox"/>	<b>3</b> Isolated Parallel BCD Output.	\$105
<b>Input Type</b>	<input type="checkbox"/>	<b>QD</b> Quadrature.	\$30
	<input type="checkbox"/>	<b>EB</b> Extra Bright Red LED Display.	\$30
<b>Add-on Options</b>	<input type="checkbox"/>	<b>BL</b> Blank Lens without Button Pads.	NC
	<input type="checkbox"/>		Unselected.
	<input type="checkbox"/>		Unselected.

