

Laureate™ Duty Cycle Meter

For display of On or Off period in percent



Features

- Measures ON or OFF period as a percentage of total period.
- Resolution of 1%, 0.1% or 0.01%.
- Inputs from NPN or PNP proximity switches, contact closures, digital logic, magnetic pickups down to 12 mV, or AC inputs up to 250 Vac.
- Trigger on positive or negative pulse edges.
- Frequency from .005 Hz to 10 kHz.
- 6-digit red or green LED display.
- Isolated 5, 10 or 24 Vdc excitation output to power sensors.
- 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).

Description



Duty Cycle Mode

Duty cycle is a measure of ON or OFF period as a percentage of total period. Duty cycle is determined by averaging an integral number of periods over a gate time which is selectable from 10 ms to 199.99 s. The same signal is applied to Channels A and B. The meter divides the average pulse width by the period between pulses and expresses this ratio in percent. A resolution of 1%, 0.1% or 0.01% is selectable. By selecting leading or falling pulse edges, the ON or OFF duty cycle can be displayed.

Duty cycle measurement is used to monitor modulated proportional control systems and pulse-modulated systems, such as radar, lasers or packet radio. For long periods, duty cycle can be measured by using the A and B channels of the Laureate dual-channel counter to totalize AC line cycles and having the counter display the ratio of the two totals scaled to percent.

The Laureate duty cycle meter uses the FR dual-channel signal conditioner board and Extended counter main board.



Universal Signal Conditioner

The dual-channel signal conditioner accepts inputs from proximity switches with PNP or NPN output, TTL or CMOS logic, magnetic pickups, contact closures, and AC signals from 12 mV to 250 Vac. Jumper selections provide optimum operation for different sensor types and noise conditions.

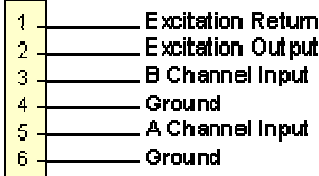
A built-in isolated 5, 10, or 24 Vdc excitation supply can power proximity switches and other sensors, and eliminate the need for an external power supply.

Other Features & Options

Laureates may be powered from [85-264 Vac and 90-370 Vdc](#), or optionally from [8-28 Vac and 9-37 Vdc](#). They are available with red or green LEDs. They are housed in a [1/8 DIN case](#) that meets NEMA 4X (IP65) specifications from the front when panel mounted. Any setup functions and front panel keys may be locked out for simplified usage and security.

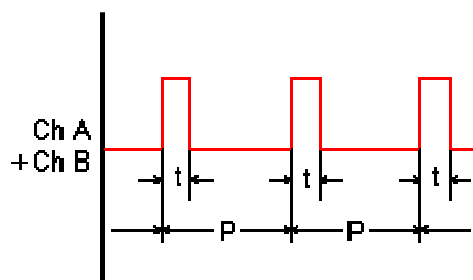
Specifications

Phase Angle Mode	
Item Displayed	Phase angle difference between two waves of same period
Display Units	1°, 0.1°, 0.01°
Frequency Range	.005 Hz to 10 kHz
Accuracy	.01°, .005 Hz to 100 Hz, .1° at 1 kHz, 1° at 10 kHz
Maximum Timing Interval	200 s
Duty Cycle Mode	
Item Displayed	ON or OFF duty cycle of periodic pulse waveshape
Display Units	1%, 0.1%, 0.01%
Frequency Range	0.005 Hz to 50 kHz
Accuracy	0.01%, 0.005 Hz to 500 Hz, 0.1% at 5 kHz, 1% at 50 kHz
Maximum Timing Interval	200 s
Display	
Readout	6 digits, 7-segment, 14.2 mm (.56")
Color	Red or green LED
Range	-999999 to +999999
Indicators	Four LED lamps
Inputs	
Types	AC, pulses from NPN, PNP transistors, contact closures, magnetic pickups
Signal ground	Common ground for channels A & B
Selectable Hysteresis	-12 mV to +12 mV, +30 mV to +60 mV, -30 mV to -20 mV, -150 mV to +150 mV, +350 mV to +600 mV, -600 mV to -350 mV, -1.15 V to +1.15 V, +1.25 V to +2.1 V, -2.1 V to -1.25 V
Rolloff Filter	Selectable: 1 MHz, 30 kHz, 250 Hz
Debounce Time	Selectable: 0, 3, 50 ms
Timing Interval	

Periodic Timing Interval Gate Time Timeout Output & Display Update	Gate time + 30 ms + 0-2 signal periods Selectable 10 ms to 199.99 s Selectable 10 ms to 199.99 s Same as period timing interval
Power	
Voltage, std. Voltage, opt. Frequency Power isolation	85-264 Vac and 90-370 Vdc 8-28 Vac and 9-37 Vdc DC or 49-440 Hz 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 10 Vdc 24 Vdc Output isolation	5 Vdc \pm 5%, 100 mA max 10 Vdc \pm 5%, 120 mA max 24 Vdc \pm 5%, 50 mA max 50 Vdc to meter ground
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
Electrical Connections	
	

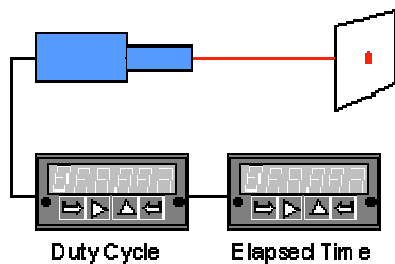
Applications

Duty Cycle Mode



Duty cycle indicates the ON or OFF time in percent from 0% to 100% of period for repetitive pulse train. In the illustration, duty cycle is $100 \times t / P$. The same signal is applied to the A and B channels.

Duty Cycle and Elapsed Time of a Laser



Duty cycle can be used to indicate the ON time of a pulsed laser in relation to total time. Laureate counters can also measure elapsed time, the number of pulses, average width in μ s, the number of pulses, and total energy applied.

Ordering Guide

Laureate™ Phase Angle & Duty Cycle Meter

Create a model number in this format: **L60101FR**. 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 dual-channel frequency signal conditioner. Includes plug-in screw terminals.

Main Board	<input type="checkbox"/> L7	Extended Main Board, Green LEDs.	\$260	
	<input type="checkbox"/> L8	Extended Main Board, Red LEDs.	\$260	
Note: Use of the Extended Main Board makes this counter also suitable for A-B time interval, stopwatch, frequency, rate, period, square root of rate, up or down total, arithmetic functions, simultaneous rate and total, phase angle, batching, and custom curve linearization.				
Power	<input type="checkbox"/> 0	Isolated 85-264 Vac & 90-370 Vdc	NC	
	<input type="checkbox"/> 1	Isolated 8-28 Vac & 9-37 Vdc.	\$30	
Setpoint Output	<input type="checkbox"/> 0	None.	NC	
	<input type="checkbox"/> 1	Dual 10A Contact Relays.	\$80	
	<input type="checkbox"/> 2	Isolated Dual Solid State Relays.	\$55	
Second Output	<input type="checkbox"/> 0	None.	NC	
	<input type="checkbox"/> 1	Isolated 0-20 mA & 0-10 V.	\$90	
	<input type="checkbox"/> 2	Batch Relay. Only used with pulse-input batching operation.	\$50	
Digital Interface	<input type="checkbox"/> 0	None.	NC	
	<input type="checkbox"/> 1	Isolated RS-232.	\$60	
	<input type="checkbox"/> 2	Isolated RS-485.	\$80	
	<input type="checkbox"/> 3	Isolated Parallel BCD Output.	\$105	
Input Type	<input type="checkbox"/> FR	Dual-Channel Pulse Input Signal Conditioner	NC	
Add-on Options	<input type="checkbox"/> EB	Extra Bright Red LED Display.	<input type="checkbox"/> Unselected.	\$30
	<input type="checkbox"/> BL	Blank Lens without Button Pads.	<input type="checkbox"/> Unselected.	NC