

Laureate™ A/B Ratio & A/B-1 Draw Meters

With arithmetic functions applicable to rate or total



Extended Counter

- A/B and A/B-1 (draw) arithmetic functions.
- Applicable to rate or total.
- Frequencies from 0.005 Hz to 1 MHz.
- Independent scaling for each channel.
- Inputs from NPN or PNP proximity switches, contact closures, digital logic, magnetic pickups down to 12 mV, or AC inputs up to 250 Vac.
- Update rates to 25/s.
- Selectable "count by" of 10 or 100 with rounding.
- Isolated 5, 10 or 24 Vdc excitation supply to power sensors.
- Green or red 6-digit LED display.
- 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



The A/B ratio and A/B-1 draw meters are selectable operating modes of the Laureate with Extended counter main board and FR dual-channel signal conditioner board.

- **Ratio** can be used to compare flow rates in two channels, the RPM of rollers or gears, or the speed of moving machinery, such as conveyor belts. Ratio can also be applied to scaled totals to compare two batches to be mixed. In this application, one meter is used to monitor the ratio of flow rates, and a second meter to monitor the resulting batch totals.

- **Draw** is obtained by subtracting 1 from ratio. Draw is often used to measure the elongation or shrinkage of material as it passes between rollers, or to monitor variation in the speed of rollers for tensioning.

Ratio and draw are similar, except that 1 is subtracted from ratio to obtain draw. The frequency of channels A and B is first measured and is then converted to rate in engineering units by multiplying it by the appropriate scale factor for that channel. Either rate can be displayed. The A/B ratio is then taken mathematically by the meter, and 1 is subtracted for draw. The result can be multiplied by a multiple or 10 from 0.0001 to 100000, and the decimal point can be set to display the result with the desired precision up to six digits.

Fast, High Resolution Measurement

The Laureate counter determines frequency by timing an integral number of periods over a programmable gate time. The inverse period approach allows greater accuracy and faster update times than conventional meters which count signal pulses over a specified time interval.

Channel A accepts pulses from 0.005 Hz to 1 MHz, while Channel B accepts pulses from 0.005 Hz to 250 kHz. At the minimum gate time of 10 ms, update rates can be up to 25/second. Such fast response is ideal for peak capture and for alarm and control applications. Variations in the displayed reading can be reduced by selecting a longer gate time. An adaptive filter can further reduce variations due to noise while rapidly responding to actual changes in the signal.

Universal Signal Conditioner

The Laureate 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. 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

A built-in isolated 5, 10, or 24 Vdc excitation supply can power the transducer 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 ratio 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. The [1/8 DIN case](#) of Laureate meters and counters meets NEMA 4X (IP-65) standards from the front for high pressure wash-down when panel mounted.

Specifications

Display	
Readout	6 digits, 7-segment, 14.2 mm (.56")
Color	Red or green LED
Range	-999999 to +999999, XXXXEX scientific notation beyond 999999
Indicators	Four LED lamps
Inputs	
Types	AC, pulses from NPN, PNP transistors, contact closures, magnetic pickups Common ground for channels A & B
Signal Ground	0.005 Hz to 1 MHz
Channel A Frequency	0.005 Hz to 250 kHz

Channel B Frequency 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, -1.15V to +1.15V, +1.25V to +2.1V, -2.1 V to -1.25V
Rolloff Filter Debounce Time	Selectable: 1 MHz, 30 kHz, 250 Hz Selectable: 0, 3, 50 ms

Conversion

Frequency Technique Conversion Time Gate Time Max Wait Time for Signal Output & Display Updates	Inverse period Gate time + 30 ms+ 0-2 signal periods Selectable 10 ms to 199.99 s Selectable 10 ms to 199.99 s Same as conversion time
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Accuracy

Time Base Span Tempco Long-term Drift	Crystal calibrated to ± 2 ppm ± 1 ppm/ $^{\circ}$ C (typ) ± 5 ppm/year
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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
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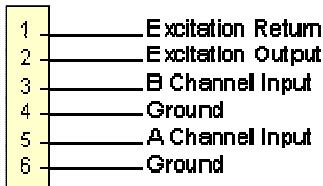
Excitation Output

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
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Environmental

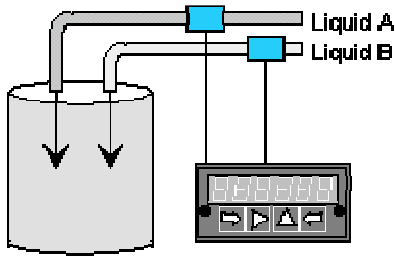
Operating Temperature Storage Temperature Relative Humidity Protection	0 $^{\circ}$ C to 55 $^{\circ}$ C -40 $^{\circ}$ C to 85 $^{\circ}$ C 95% at 40 $^{\circ}$ C, non-condensing NEMA-4X (IP-65) when panel mounted
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Electrical Connections



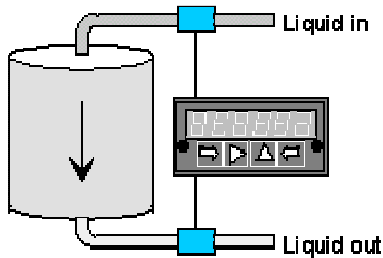
Typical Applications

Controlling the Mixing Ratio of Two Fluids



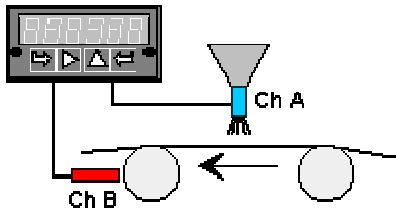
Displaying and alarming the input flow rate ratio of two fluids (gas or liquid) allows these to be mixed in a predetermined ratio in continuous processes. The sensing element is normally a turbine flowmeter, which outputs pulses at a frequency proportional to flow rate. The A/B ratio can also be displayed for totalized rate (or delivered volume).

Comparing Fluid Inflow & Outflow



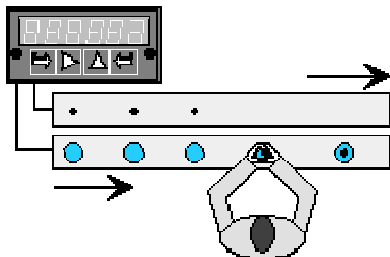
The ratio of the inflow and outflow rates of a tank is a measure of the relative filling or emptying rate. The same meter can also be programmed to display the net inflow or outflow rate in flow units, or to display totalized inflow or outflow in volume units. Any of these parameters can be alarmed using the dual relay board and be transmitted via 4-20 mA, RS-232 or RS-485.

Controlling Coating Thickness on a Film



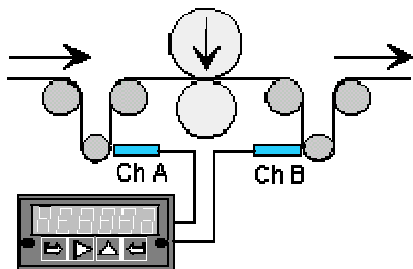
In this application, Channel A measures the rate at which a coating material is applied, as measured by a flow meter, while Channel B measures the speed of the film based on pulses from a proximity switch. Displaying and alarming the A/B ratio assures that an even thickness of coating material is applied as the speed of the film varies.

Synchronizing Two Conveyor Lines



The dual-channel Laureate counter can measure the speed of conveyor lines by using the output of proximity switches which sense gear teeth or spokes of rotating drive wheels. Displaying the speed ratio of two lines allows line speeds to be adjusted so that material arrives at work stations when needed.

Measuring Draw for Elongation



Draw ($\text{Ch A} / \text{Ch B} - 1$) can be used to display the elongation of films compressed between rollers, the shrinkage films, and the RPM difference of rollers whose speed is varied to maintain tension. The six-digit resolution of the Laureate dual channel counter / rate meter is ideal for comparison of rates that are close to each other.

Ordering Guide

Laureate™ A/B Ratio & A/B-1 Draw Meters

Create a model number in this format: **L80101FR**. 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: Extended capability is required for arithmetic functions, simultaneous rate and total in the same counter, phase, stopwatch, batching, and custom curve linearization.			
Power	<input checked="" 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 checked="" 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 checked="" 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 checked="" 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 checked="" type="checkbox"/> FR Dual-Channel Frequency.		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