

Laureate™ Analog Input Flow Rate Meter & Analog Flow Totalizer

Rate, analog square root, batch control, time based on rate from 0-1 mA, 4-20 mA or 0-10 V signals.



Standard Counter

- Square root readout from analog output of differential pressure flow transducers.
- 0-1 mA, 4-20 mA, 0-10 V inputs, or special factory scaling.
- 6-digit resolution.
- Field scalable for direct readout in engineering units.
- Isolated 5, 10, or 24 Vdc excitation output to power sensors.
- Selectable "count by" of 10 or 100 with rounding.
- 25/s update rate.
- Peak value display.
- Green or red 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).

Extended Counter

All capabilities of the Standard Counter, plus:

- Custom curve linearization.
 - Total based on rate and time.
 - Batch control based on rate and total.
 - Display of process time based on rate input.
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Description



Standard Counter Version

Rate with Square Root Extraction

A Laureate™ meter with the Standard counter main board and a voltage-to-frequency (V-to-F) signal conditioner board (shown to right) is able to accurately extract the square root of analog signals. The display is a full six digits. The three standard input ranges are 0-1 mA, 4-20 mA and 0-10 V. Special input ranges are available from the factory.

One application of the Standard V-to-F meter is to accurately display flow rate in engineering units, such as gallons per minute, from the 4-20 mA signal of a flow transducer with a linear or squared output.

Extended Counter Version

- **Batch Control with Linearized Total**

The Laureate V-to-F meter with the Extended counter main board can also totalize the linearized flow rate derived from the analog rate signal, count up to a preset value, or down to zero from a preset value for batch control. The analog input may or may not require linearization. In addition to rate and total, the grand total of the batches or the number of batches can also be displayed by pressing a front panel key.

Use of the Extended V-to-F meter as an up or down-counting batch controller requires the dual-relay output board option. One of the relays is dedicated to ON/OFF batch control. The other relay is available to slow down rate near the setpoint or to provide another alarm or control function based on rate or total.

One application of display of rate plus total is to read out kilowatts and kilowatt-hours based on 0-1 mA from a watt transducer.

- **Custom Curve Linearization**

The relationship between the analog input and the value to be displayed can have a linear, square root, or custom curve relationship. For custom curve linearization, up to 240 data points can be input into a spreadsheet or text file by the user. The computer then calculates spline-fit segments, which are downloaded into the meter via RS-232. Custom-linearized rates can be totalized and be used for batch control.

Like the Extended analog DC panel meter, the Extended V-to-F meter can linearize and display analog inputs based on a custom curve unrelated to flow, for instance to read out the volume of an irregularly shaped tank based on level or pressure, or to linearize a nonlinear transducer.

- **Time Based on Rate**

The Extended V-to-F meter can display a time inversely proportional to measured rate, such as the time that it will take a conveyor to traverse an oven. As the rate of the conveyor is increased, the displayed baking time will be decreased.

Principles of V-to-F Operation

The V-to-F signal conditioner board converts the full-scale 0-1 mA, 4-20 mA or 0-10 V analog signal to a frequency of 10-110 kHz. This frequency is determined by measuring period over a selected gate time (from 10 ms to 200 s) and taking the inverse of period. Selecting a short gate time provides a much higher update rate than conventional counting-type frequency meters. At the lowest frequency of 10 kHz and the minimum gate time of 10 ms, the meter is capable of 25 updates per second.



Scaling to rate in engineering units and totalizing are done mathematically. Totals are stored in nonvolatile memory in case of power loss.

High Resolution Display

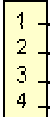
The display of rate or total may be scaled to $\pm 999,999$. The two least-significant digits may be set to display zero with rounding or be active digits. In addition to a selectable gate time for rate measurement, an adaptive filter can reduce variations due to noise while rapidly responding to actual changes in signal level.

Hardware Features

Optional plug-in [isolated analog output](#), [dual setpoint controller](#), [RS232/485 serial data I/O](#), or [parallel BCD output](#) boards can upgrade the Laureate Analog Input Flow Rate Meter & Analog Flow Totalizer from a stand-alone monitor to system interface and control. In particular, the analog 4-20 mA or 0-10 V analog output will be linearized to the reading, which may be rate or total. 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.

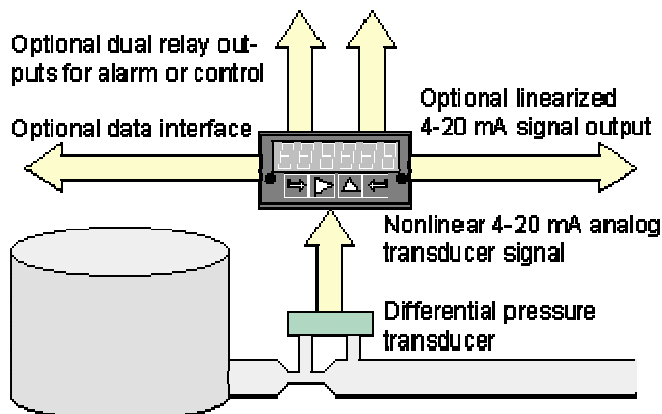
Specifications

Display	
Readout	6 digits, 7-segment, 14.2 mm (.56")
Color	Red or green LED
Range	-999999 to +999999
Indicators	Four LED lamps
Inputs	
Standard signal levels	0-1 mA, 4-20 mA, 0-10 V
Other signal levels	Consult factory
Conversion	
Frequency Technique	Inverse period
Rate	Gate time + 30 ms (max)
Gate Time	Selectable 10 ms to 199.99 s
Output & Display Updates	Same as conversion time
Accuracy	
Span Tempco	0.003% R/°C
Zero Tempco	0.001 FS/°C
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
CMR	130 dB, DC to 60 Hz

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
Electrical Connections	
	1 ——— Excitation Return 2 ——— Excitation Output 3 ——— Signal Low 4 ——— Signal High

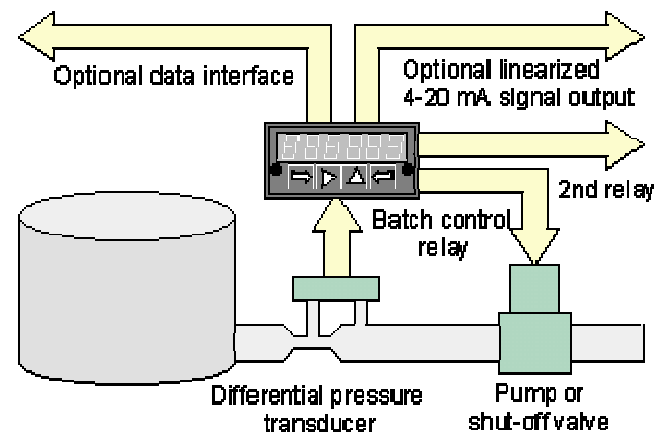
Application Examples

Flow from a Differential Pressure Transducer



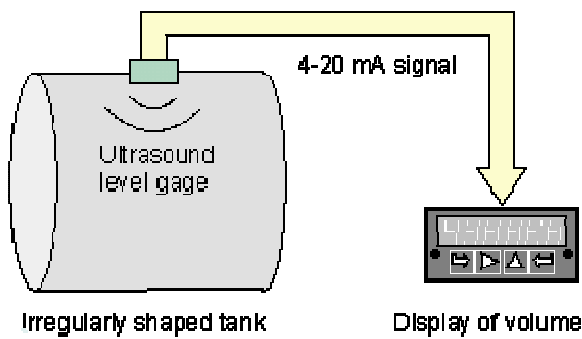
An ideal application for the Standard Laureate V-to-F meter: readout of flow based on the 4-20 mA analog signal from a differential pressure transducer. Options include dual relays for alarm or control, isolated analog output to turn the meter into a transmitter, and RS-232/485 or BCD data communications.

Up- or Down-Counting Batch Controller



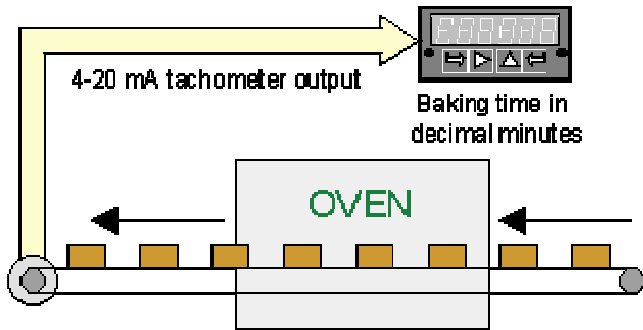
An ideal application for the Extended Laureate V-to-F meter: up- or down-counting batch controller. The dual-relay card is required. One relay is dedicated to batch control, the other relay is available to alarm the rate or total. The signal input can be linear or nonlinear. The display can be toggled between rate and total.

Volume of an Irregularly-Shaped Tank



The Extended Laureate V-to-F meter can linearize analog signals for display and alarm using custom curve linearization with multiple nonlinear segments. As illustrated, tank level is measured by an ultrasound detector, which transmits a 4-20 mA signal. This signal is then converted to a highly accurate volume reading. The linearized rate readings can also be totaled.

Process Time from an Analog Rate Signal



A unique application of the Extended Laureate V-to-F meter: displaying process time based on the 4-20 mA or 0-10 V signal from a rate meter. In the above example, a tachometer transmits the speed of a conveyor belt through an oven. The meter displays baking time in the oven using the mathematical relationship $time = distance / speed$.

Ordering Guide

Laureate™ V-to-F Process Receiver & Analog Totalizer

Create a model number in this format: **L80101VF1**. 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 voltage-to-voltage signal conditioner set for 4-20 mA.

Main Board	<input type="checkbox"/>	L5 Standard Main Board, Green LEDs.	
	<input type="checkbox"/>	L6 Standard Main Board, Red LEDs.	\$220
	<input type="checkbox"/>	L7 Extended Main Board, Green LEDs.	\$260
	<input type="checkbox"/>	L8 Extended Main Board, Red LEDs.	\$260
Note: With Standard Main Board: rate or square root of rate from differential pressure or target type flow transducers with a DC output. With Extended Main Board: above plus rate and total simultaneously, custom curve linearization, batch operation, 1/rate (time).			
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 checked="" type="checkbox"/>	0 None.		
	<input type="checkbox"/>	1 Isolated RS-232.		NC
	<input type="checkbox"/>	2 Isolated RS-485.		\$60
	<input type="checkbox"/>	3 Isolated Parallel BCD Output.		\$80
				\$105
Input Type	Voltage-to-Frequency Converter			
	<input type="checkbox"/>	VF1 V-to-F Converter, 4-20 mA.		NC
	<input type="checkbox"/>	VF2 V-to-F Converter, 0-1 mA.		NC
	<input type="checkbox"/>	VF3 V-to-F Converter, 0-10 V.		NC
	<input type="checkbox"/>	VF4 V-to-F Converter, Special Range. In the write-in field of your invoice, specify min input, min reading; max input, max reading. Component changes by the factory may be required.		\$35
Add-on Options	<input type="checkbox"/>	EB Extra Bright Red LED Display.	<input type="checkbox"/>	Unselected.
	<input type="checkbox"/>	BL Blank Lens without Button Pads.	<input type="checkbox"/>	Unselected.
				\$30
				NC