Features

- **6-digit display of analog rate or totalized analog rate**
- **0-1 mA, 4-20 mA, 0-10V input, or special factory scaling**
- **Exceptional accuracy: ±0.005% of span ±1 count**
- **Selectable square root display for differential pressure flow transducers**
- **Field scalable for direct readout in engineering units**
- **Selectable "count by" of 10 or 100 with rounding**
- **Update rate selectable to 25/sec**
- **Peak or valley display**
- **Universal AC power, 85-264 Vac**
- **Isolated 5, 10 or 24 Vdc excitation supply to power sensors**
- **NEMA 4X, 1/8 DIN case**
- **Optional serial I/O: Ethernet, USB, RS232, RS485, Ethernet-to-RS485 converter**
- **Optional relay output: dual or quad relays, contact or solid state**
- **Optional isolated analog output: 4-20 mA, 0-20 mA, 0-10V, -10 to +10V**
- **Optional low voltage power: 10-48 Vdc or 12-32 Vac**
- **Optional Extended Counter: all capabilities of Standard counter, plus**
  - **Batch control based on rate and total**
  - **Display of process time based on rate**
  - **Custom curve linearization**

Description

Standard Counter Version:

- **Six-digit display of rate or total** at the push of a front panel key. A Laureate with the Standard counter main board and a VF voltage-to-frequency signal conditioner board can be scaled to display rate or totalized rate to six digits for 0-1 mA, 4-20 mA or 0-10V analog process signals. Special input ranges are available from the factory. For example, the display can be scaled to show flow rate in gallons/minute or liters/sec, or to show volume in gallons or liters from the 0-10V output of a flow transducer. Or the display can be scaled to display power consumption in kilowatts or total utilized energy in kilowatt-hours based on the 0-1 mA output of a watt transducer.

- **Square root extraction** is selectable) and can be applied to rate or total. This makes the VF Laureate ideal for use with differential pressure flow meters, which have a squared output. Totalized volume is based on linearized rate.

- **Accuracy** is one of the highest for any digital panel meter: ±0.005% of span ±1 count.

Extended Counter Version:

- **Batch control** based on linearized total. A Laureate VF meter with the Extended counter main board can totalize linearized flow from an analog rate signal, and also count up to a preset value, or count down to zero from a preset value for batch control. Operation as a batch controller requires the dual or quad relay board options. One of the relays is dedicated to ON/OFF batch control. Another relay is available to slow down rate near the setpoint or to provide another alarm or control function based on rate or total.

- **Custom curve linearization** can use up to 180 data points 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. The Extended VF meter can linearize and display analog inputs based on a custom curve, for instance to read out the volume of an irregularly shaped tank based on level or pressure, or to linearize a nonlinear transducer. Custom-linearized rates can also be totalized and be used for batch control.

- **Time based on rate** allows the Extended VF meter to 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 is decreased.
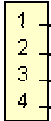
Principles of V-to-F Operation

A voltage-to-frequency signal conditioner board converts the full-scale 0-1 mA, 4-20 mA or 0-10 V analog signal to a frequency of 10 kHz to 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. 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.

Designed for system use. Optional plug-in boards include Ethernet and other serial communication boards, dual or quad relay boards, and an isolated analog output board. 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. A built-in isolated 5, 10, or 24 Vdc excitation supply can power transducers and eliminate the need for an external power supply. All power and signal connections are via UL / VDE / CSA rated screw clamp plugs.
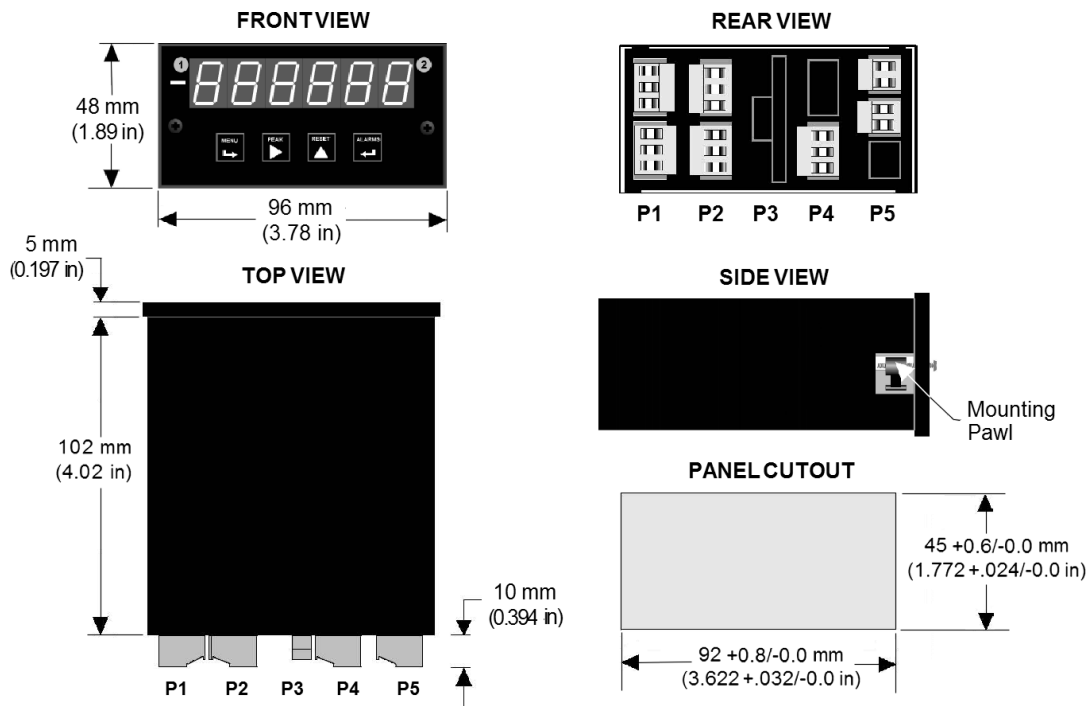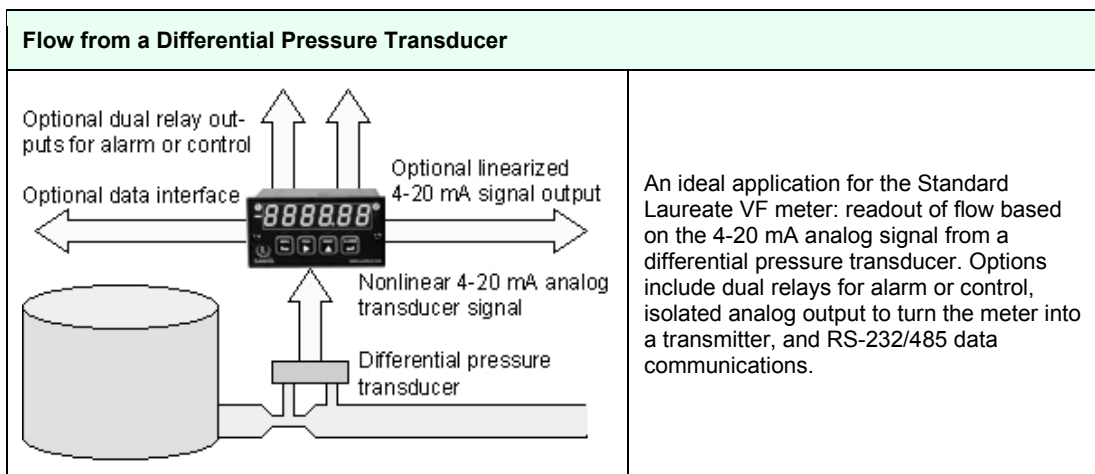
Specifications

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, 0-10V
Input resistance	1.00 kΩ at 0-1 mA, 50 Ω at 4-20 mA, 1.01 MΩ at 0-10V
Other signal levels	Consult factory

Conversion	
Frequency Technique	Inverse period
Update Rate	Gate time + 30 ms (max)
Gate Time	Selectable 10 ms to 199.99 s

Accuracy	
Span Tempco	±0.0025% FS/°C
Zero Tempco	±0.0005% FS/°C
Accuracy at 25°C	±0.005% FS ± 1 count

Power	
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

Excitation Output (standard)	
5 Vdc	5 Vdc ± 5%, 100 mA
10 Vdc	10 Vdc ± 5%, 120 mA
24 Vdc	24 Vdc ± 5%, 50 mA
Output Isolation	50 Vdc to meter ground

Analog Output (optional)	
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 kΩ load)
Voltage compliance	12V at 20 mA (< 600 Ω 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)

Relay Outputs (optional)	
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
	120 mA at 140 Vac or 180 Vdc for solid state relays
Output common	Isolated commons for dual relays or each pair of quad relays
Isolation	250V rms working, 2.3 kV rms per 1 min test

Serial Data I/O (optional)	
Board Selections	Ethernet, Ethernet-to-RS485 server, USB, USB-to-RS485 server, RS485 (dual RJ11), RS485 Modbus (dual RJ45), RS232.
Protocols	Modbus RTU, Modbus ASCII, Laurel ASCII protocol
Data Rates	300 to 19200 baud
Digital Addresses	247 (Modbus), 31 (Laurel ASCII),
Isolation	250V rms working, 2.3 kV rms per 1 min test

Environmental	
Operating Temp.	0°C to 55°C
Storage Temp.	-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

Mechanical

FRONT VIEW

48 mm
(1.89 in)

96 mm
(3.78 in)

REAR VIEW

P1   P2   P3   P4   P5

5 mm
(0.197 in)

TOP VIEW

102 mm
(4.02 in)

10 mm
(0.394 in)

P1   P2   P3   P4   P5

SIDE VIEW

Mounting
Pawl

PANEL CUTOUT

45 +0.6/-0.0 mm
(1.772 +.024/-0.0 in)

92 +0.8/-0.0 mm
(3.622 +.032/-0.0 in)

Application Examples

Flow from a Differential Pressure Transducer

Optional dual relay out-puts for alarm or control

Optional data interface

Optional linearized
4-20 mA signal output

Nonlinear 4-20 mA analog
transducer signal

Differential pressure
transducer

An ideal application for the Standard Laureate VF 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 data communications.
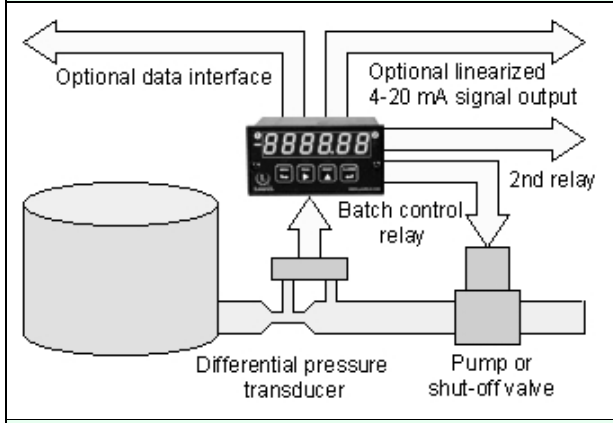
Up- or Down-Counting Batch Controller

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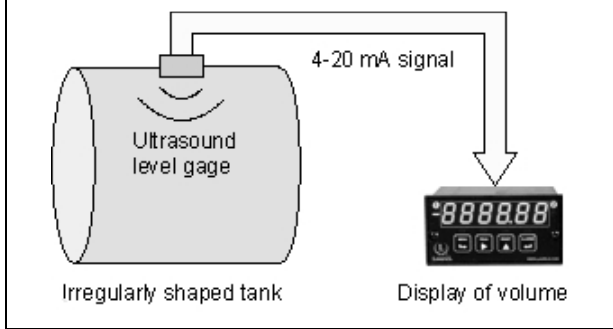
The Extended Laureate VF meter can linearize analog signals for display and alarm using custom curve linearization with multiple nonlinear segments. As illustrated, tank level is measured by an ultrasound detector, which transmits a 4-20 mA signal. This signal is then converted to a highly accurate volume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

Process Time from an Analog Rate Signal
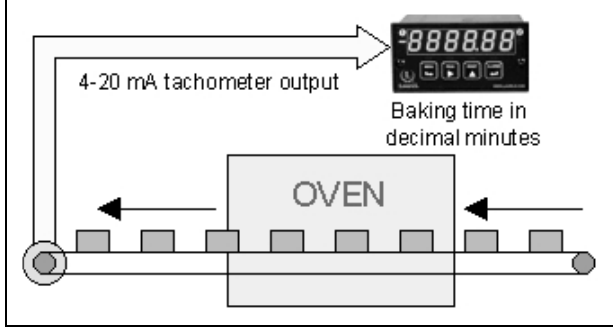
A unique application of the Extended Laureate VF meter: displaying process time based on the 4-20 mA or 0-10 V signal from a rate meter. In the above example, a tacho-meter transmits the speed of a conveyer belt through an oven. The meter displays baking time in the oven using the relationship time = distance / speed.

Ordering Guide

Create a model a model number in this format: **L50000VF1, IPC**

Main Board	**L5** Standard Main Board, Green LEDs **L6** Standard Main Board, Red LEDs **L7** Extended Main Board, Green LEDs **L8** Extended Main Board, Red LEDs **Note:** With Standard Main Board: rate, square root of rate, or totalized rate from transducers with a DC output. With Extended Main Board: above plus custom curve linearization, batch control operation, 1/rate (time).
Power (isolated)	**0** 85-264 Vac **1** 12-32 Vac or 10-48 Vdc
Relay Output (isolated)	**0** None **1** Two 8A Contact Relays **2** Two Solid State Relays **3** Four 8A Contact Relays **4** Four Solid State Relays
Analog Output (isolated)	**0** None **1** Single isolated 4-20 mA, 0-20 mA, 0-10V, -10 to +10V **2** Dual isolated 4-20 mA, 0-20 mA, 0-10V
Digital Interface (isolated)	**0** None **1** Isolated RS-232 **2** Isolated RS-485 **4** Isolated Modbus RS-485 **5** USB **6** USB-to-RS485 converter
Signal Input (isolated)	**Voltage-to-Frequency Converter** **VF1** V-to-F Converter, 4-20 mA **VF2** V-to-F Converter, 0-1 mA **VF3** V-to-F Converter, 0-10 V **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.
Add-on Options	**BL** Blank Lens without Button Pads **CBL01** RJ11-to-DB9 Cable **CBL02** USB-to-DB9 Adapter **CBL05** USB Cable, A to B **IPC** Splash-proof Cover **BOX1** NEMA-4 Enclosure **BOX2** NEMA-4 Enclosure plus IPC