Key Features of Meter Linearizing

- **Applicable to Laureate™ process, strain gauge, load cell meters, frequency / rate meters, and totalizers**
- **Easy programming using custom nonlinear curve fits**
- **Improves accuracy of low-cost transducers**
- **Extends transducer operating range on high and low ends**
- **Solves application problems involving non-linear relationships**
- **Included with Extended versions of Laureate digital panel meters, counters and timers**
- **Easy setup by entering data points into a computer spreadsheet, or typing in desired readings for actual signal inputs.**
- **Exceptional accuracy from 0.1% to 0.01% of full scale with few data points, made possible by curvilinear spline fits.**

Description

Custom curve linearization is a feature available with the Extended option version of all Laureate digital panel meters, counters and timers, excluding only the temperature meter, which already has built-in linearization curves.

Benefits: Custom curve linearization can provide exceptional accuracy from low cost transducers of these are repeatable. It can extend the working range of transducers on their high and low ends. It can also solve special application problems where there is a non-linear relationship between the input and the desired readout.

Implementation: Linearizing is implemented in the form of 20 nonlinear spline-fit segments, which provide much better accuracy than a larger number of straight line segments. The typical error will be from 0.1% to 0.01% of full scale, depending on the number of data points used for setup, the error in the data points, and the severity of non-linearities or discontinuities.

Easy Setup: Setup of a Laureate Linearizing Process Meter requires an external PC, which is connected to the meter via RS232 or USB cable, and utilizes linearizing software furnished by Laurel Electronics. To download, go to our Software Download web page. A serial communications board is required, but can be removed from the meter following setup. Three meter programming methods are offered:

- **Spreadsheet Method:** Data points consisting of the input signal in Volts or Amps and the desired reading are entered into an Excel spreadsheet or into a text file using a space, comma or tab as the delimiter. There can be up to 180 data points. Laurel's software then calculates 20 spline-fit segments and downloads their coefficients into the meter.

- **Actual Input Method:** The meter is hooked up to the actual signal source, and the user enters the desired readings for different signal levels. There can be up to 180 input / reading combinations. Laurel's software then calculates 20 spline-fit segments and downloads their coefficients into the meter. This method automatically compensates for any errors in the transducer.

- **Polynomial Method:** The mathematical formula relating the input to the output is entered into the computer, which then uses this data to calculate the spline-fit segments. This method is ideal if the mathematical relationship is knows, for example to calculate the contents of a tank based on the known geometry of the tank.

Application Examples

- **Thermistors** and other sensors whose output is a non-linear changing resistance.

- **Altimeters,** since the relationship between pressure and altitude is non-linear.

- **Rate of ascent** based on successive altimeter readings.

- **Volume of irregularly-shaped tanks,** such as horizontal cylinders, based on measured liquid level or liquid pressure at the base of the tank.

- **Fine-calibration of linear transducers,** since even nominally linear transducers will have nonlinear components.

- **Extending the working range of transducers,** since many transducers become nonlinear at their low and high ends.

Compensating for inaccuracy of low-cost transducers.
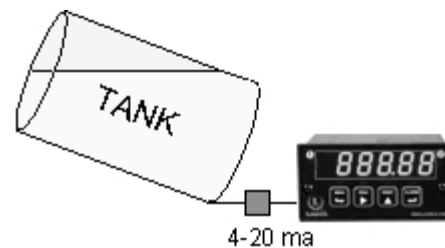
Measuring tank volume

The Extended Laureate process meter can display the volume of irregularly shaped tanks based on the static pressure at the base of the tank. An example is a cylindrical tank lying on its side. The tank can be tilted to facilitate drainage, as illustrated.

Ordering Guide

Create a model number in this format: **L30000P, IPC**

Main Board	Compatible Signal Conditioner
L3 or L4	DC, P, SG, WM
L7 or L8	FR, VF

Main Board	**L3** Extended DPM Main Board, Green LEDs. **L4** Extended DPM Main Board, Red LEDs. **L7** Extended Counter Main Board, Green LEDs. **L8** Extended Counter Main Board, Red LEDs. **Note:** Extended capability is required for custom curve linearization or for display of time rate of change, such as flow rate from changing tank level or acceleration from changing speed. Not applicable to temperature meters.
Power (isolated)	**0** Isolated 85-264 Vac **1** Isolated 12-32 Vac or 10-48 Vdc
Relay Output (isolated)	**0** None **1** Two 8A Contact Relays **2** Two 120 mA Solid State Relays **3** Four 8A Contact Relays **4** Four 120 mA Solid State Relays
Analog Output (isolated)	**0** None **1** Isolated 0-20 mA & 0-10 V **2** Dual isolated output, 4-20 mA, 0-20 mA, 0-10V
Digital Interface (isolated)	**0** None **1** RS232 **2** RS485 (dual RJ11 connectors) **4** RS485 Modbus (dual RJ45 connectors) **5** USB **6** USB-to-RS485 converter **7** Ethernet **8** Ethernet-to-RS485 converter
Signal Input (isolated)	**DC Volts** **DCV1** ±200.00 mV **DCV2** ±2.0000 V **DCV3** ±20.000 V **DCV4** ±200.00 V **DCV5** ±600.0 V (range not ETL certified) **DCV6** ±300.0 V (range ETL certified) **DC Amps** **DCA1** ±2.0000 mA **DCA2** ±20.000 mA **DCA3** ±200.00 mA **DCA4** ±5.000 A **Process Signals** (e.g., 4-20 mA, 0-5 V) **P** Field scalable. Default scaling is 4-20 mA = 0-100.00 **Strain Gage, Potentiometer** (4-wire ratio) **SG** Field scalable. Default scaling is 0-200 mV = 0-100.00 **Note:** The same DC signal conditioner board can be user-configured for DC Volts, DC Amps, process, or strain. Precalibrated in EEPROM for all DC Volt and DC Amp ranges listed.

	Load Cells (6-wire ratio)
	WM Field scalable. Default scaling is 0-20 mV = 0-100.00
	Resistance (4-wire ratio)
	R0 0-2.0000 ohms (factory special fixed range)
	R1 0-20.000 ohms
	R2 0-200.00 ohms
	R3 0-2.0000 kohms
	R4 0-20.000 kohms
	R5 0-200 kohms
	R6 0-2.0000 Mohms (factory special fixed range)
	Pulse Rate or Totalizing
	FR Dual-Channel Frequency. Scalable to ±999,999 for frequency or rate.
	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.
	Specify min input, min reading; max input, max reading. Component changes by the factory may be required.
Add-on Options	**CBL01** RJ11-to-DB9 cable. RJ11 to DB9. Connects RS232 ports of meter and PC.
	CBL02 USB-to-DB9 adapter cable. Combination of CBL02 and CBL01 connects meter RS232 port to PC USB port.
	CBL03-1 6-wire data cable, RJ11 to RJ11, 1 ft. Used to daisy chain meters via RS485.
	CBL03-7 6-wire data cable, RJ11 to RJ11, 7 ft. Used to daisy chain meters via RS485.
	CBL05 USB cable, A-B. Connects USB ports of meter and PC.
	CBL06 USB to RS485 adapter cable, half duplex, RJ11 to USB. Connects meter RS485 port to PC USB port.
	CASE1 Benchtop laboratory case for one 1/8 DIN meter
	CASE2 Benchtop laboratory case for two 1/8 DIN meters
	IPC Splash-proof cover
	BOX1 NEMA-4 Enclosure
	BOX2 NEMA-4 enclosure plus IPC
	BL Blank Lens without button pads
	NL Meter lens without button pads or Laurel logo

Mechanical

FRONT VIEW

48 mm
(1.89 in)

96 mm
(3.78 in)

5 mm
(0.197 in)

TOP VIEW

102 mm
(4.02 in)

10 mm
(0.394 in)

P1　P2　P3　P4　P5

REAR VIEW

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)