

Features



- 4-20 mA, 0-20 mA, 0-10V or -10V to +10V transmitter output, 16 bits, isolated
- RS232 or RS485 serial data output, Modbus or Laurel ASCII protocol, isolated
- Dual 120 mA solid state relays for alarm or control, isolated
- Two independently field-scalable pulse input channels from 0.005 Hz to 1 MHz
- Inputs from NPN or PNP proximity switches, contact closures, digital logic, magnetic pickups down to 12 mV, or AC inputs up to 250 Vac
- Analog output resolution 0.0015% of span (16 bits), accuracy $\pm 0.02\%$ of span
- DIN rail mount housing only 22.5 mm wide, detachable screw-clamp connectors
- 5V, 10V or 24V dc transducer excitation output, isolated
- Universal 85-264 Vac / 90-300 Vdc or 10-48 Vdc / 12-32 Vac power
- Extended main board for simultaneous rate and total, custom curve linearization, arithmetic functions A+B, A-B, AxB, A/B, A/B-1 (optional)



Description

The Laureate transmitter for frequency, rate or period accepts two independently scalable input channels from a wide range of pulse sources, such as NPN or PNP proximity switches, contact closures, digital logic, magnetic pickups down to 12 mV, or AC voltages to 250 Vac. Input frequencies can range from 0.005 Hz to 1 MHz. The transmitter output can be selected as 4-20 mA, 0-20 mA or 0-10V, and is isolated to avoid ground loops. Applications include AC line frequency, RPM or speed from proximity switch inputs, and flow from turbine flow meter inputs.

With a Standard Main Board, the transmitter output can be scaled to track frequency in Hz, rate in engineering units (such as gallons per minute), or period (inverse of frequency). Square root extraction is standard.

With an Extended Main Board, the transmitter output can track rate or totalized rate (such as gallons) whether the transducer output is linear, requires square root extraction, or requires custom curve linearization. The latter can be provided by a curvilinear spline fit with up to 180 data points. The transmitter can also count up to a preset total or down from a preset total to zero. Such applications typically make use of optional dual solid state relays. External reset of totals is via a special three-position screw terminal connector. The two input channels A & B can also be combined arithmetically to provide an analog transmitter output that tracks A+B (e.g., sum of two flows), A-B (e.g., difference of two flows), AxB (e.g., horsepower as product of force and RPM), A/B (ratio of two flow), and A/B-1 (draw or relative elongation of material between rollers).

Exceptional accuracy and stability in frequency measurement are achieved by taking the inverse of period measured with a calibrated quartz crystal time base. This results in extremely accurate and stable 6-digit internal readings ($\pm 999,999$ counts), which are then processed in software. The analog output is generated by an ultra-linear 16-bit (65,536 step) digital-to-analog converter (DAC).

Standard features of Laureate transmitters include:

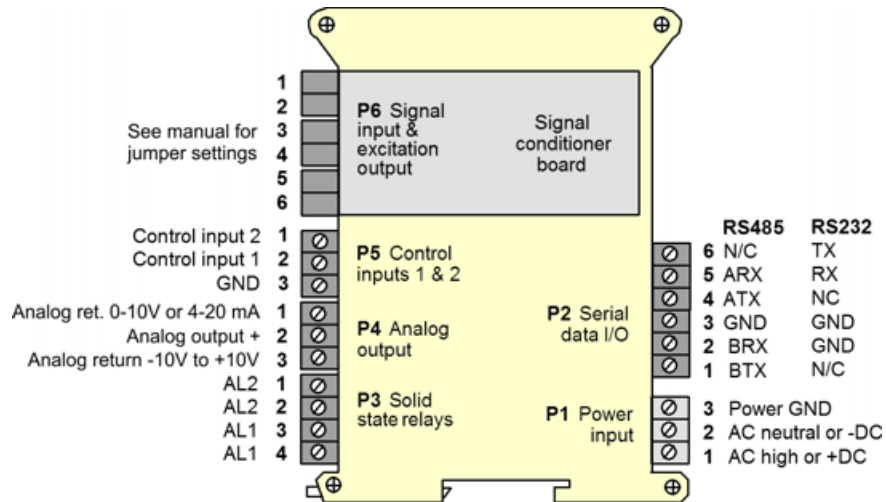
- **4-20 mA, 0-10V or -10V to +10V analog transmitter output**, isolated, jumper-selectable and user scalable. All selections provide 16-bit (0.0015%) resolution of output span and 0.02% output accuracy of a reading from -99,999 to +99,999 counts that is also transmitted digitally. Output isolation from signal and power grounds eliminates potential ground loop problems.
- **Serial communications output**, isolated. User selectable RS232 or RS485, half or full duplex. Three protocols are user selectable: Modbus RTU, Modbus ASCII, or Laurel ASCII. Modbus operation is fully compliant with Modbus Over Serial Line Specification V1.0 (2002). The Laurel ASCII protocol allows up to 31 Laureate devices to be addressed on the same RS485 data line. It is simpler than the Modbus protocol and is recommended when all devices are Laureates.
- **Dual solid state relays**, isolated. Available for local alarm or control. Rated 120 mA at 130 Vac or 170 Vdc.
- **Transducer excitation output**, isolated. User selectable 5V@100 mA, 10V@120 mA or 24V@50 mA.
- **Universal 85-264 Vac power**. Low-voltage 10-48 Vdc or 12-32 Vac power is optional.

Easy Transmitter programming is via Laurel's Instrument Setup Software, which runs on a PC under MS Windows. This software can be downloaded from our website at no charge. The required transmitter-to-PC interface cable is available from Laurel (P/N CBL04).

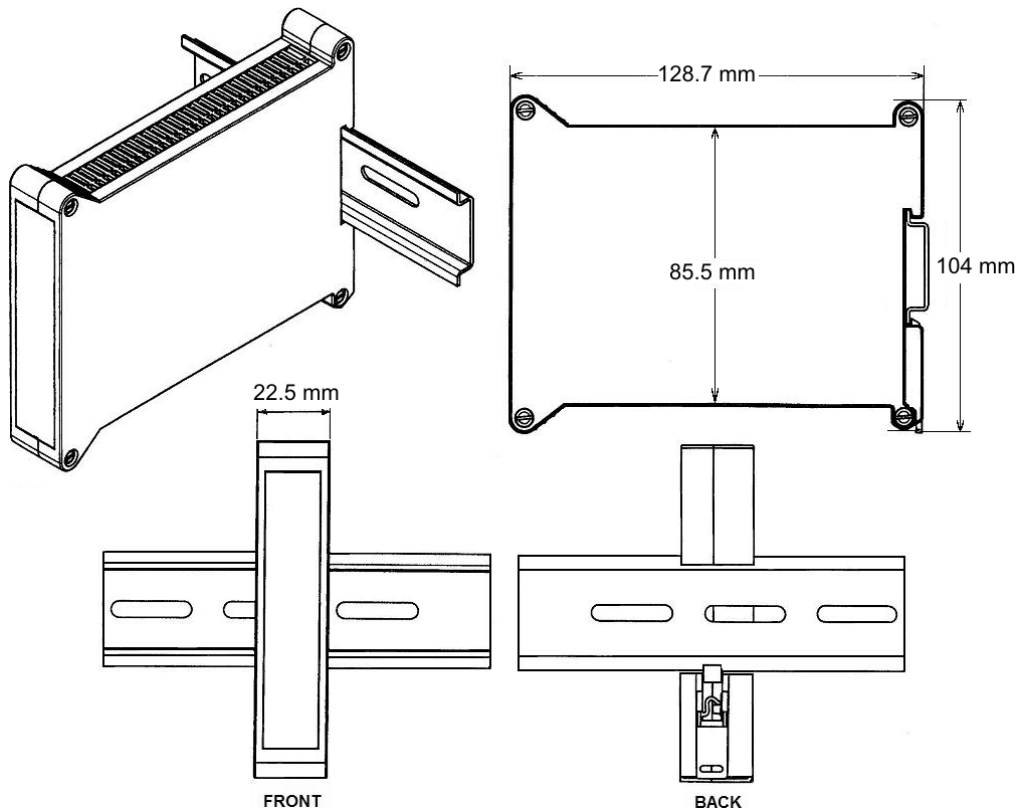
Specifications

Pulse Input	
Signal Types	AC, pulses from NPN, PNP transistors, contact closures, magnetic pickups.
Grounding	Common ground for channels A & B
Channel A Frequency	0.005 Hz to 1 MHz
Channel B Frequency	0.005 Hz to 250 kHz
Minimum Signal	Nine ranges from (-12 to +12 mV) to (+1.25 to +2.1V)
Maximum Signal	250 Vac
Noise Filter	1 MHz, 30 kHz, 250 Hz (selectable)
Contact Debounce	0, 3, 50 ms (selectable)
Time Base Accuracy	Quartz crystal calibrated to ± 2 ppm
Analog Output (standard)	
Output Levels	4-20 mA, 0-20 mA, 0-10 Vdc, -10 to +10Vdc (user selectable)
Compliance at 20 mA	10V (0-500 Ω load)
Compliance at 10V	2 mA (5 k Ω load or higher)
Output Resolution	16 bits (65,536 steps)
Output Accuracy	0.02% of output span
Output Update Rate	Programmed gate time + 30 ms + 0-2 signal periods
Output Isolation	250V rms working, 2.3 kV rms per 1 minute test
Serial Communications (standard)	
Signal Types	RS232 or RS485 (half or full duplex)
Data Rates	300, 600, 1200, 2400, 4800, 9600, 19200 baud
Output Isolation	250V rms working, 2.3 kV rms per 1 min test
Serial Protocols	Modbus RTU, Modbus ASCII, Laurel ASCII
Modbus Modes	RTU or ASCII
Modbus Compliance	Modbus over Serial Line Specification V1.0 (2002)
Digital Addressing	247 Modbus addresses. Up to 32 devices on an RS485 line with no repeater
Dual Relay Output (standard)	
Relay Type	Two solid state relays, SPST, normally open, Form A
Load Rating	120 mA at 140 Vac or 180 Vdc
Sensor Excitation Output (standard)	
Output Levels	5V@100 mA, 10V@120 mA, 24V@50 mA (jumper selectable)
Output Isolation	50V from signal ground
Power Input	
Standard Power	85-264 Vac or 90-300 Vdc
Low Power Option	10-48 Vdc or 12-32 Vac
Power Frequency	DC or 47-63 Hz
Power Isolation	250V rms working, 2.3 kV rms per 1 min test
Power Consumption	2W typical, 3W with max excitation output
Mechanical	
Dimensions	129 x 104 x 22.5 mm case
Mounting	35 mm rail per DIN EN 50022
Electrical Connections	Plug-in screw-clamp connectors
Environmental	
Operating Temperature	0°C to 55°C
Storage Temperature	-40°C to 85°C
Relative Humidity	95% at 40°C, non-condensing
Cooling Required	Mount transmitters with ventilation holes at top and bottom. Leave 6 mm (1/4") between transmitters, or force air with a fan.

Pinout



Mechanical



Application Examples of Frequency / Rate Meters & Transmitters

AC Line Frequency



Laureate frequency meters and transmitters accept line voltages up to 250 Vac and output line frequency to 6-digit accuracy (50.0000 or 60.0000) in a few line cycles. Fast low frequency response is achieved by timing the period and taking its inverse.

RPM and Speed



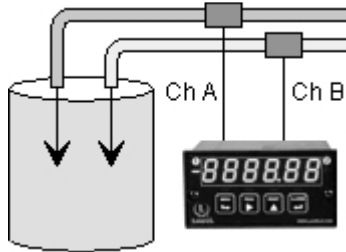
Laureate frequency meters and transmitters can sense low-level signals from magnetic pickups or the NPN or PNP transistor output of active sensors. These can be powered directly by the meter or transmitter. Output in RPM or units of speed is achieved by mathematical scaling.

Flow Rate and Simultaneous Total



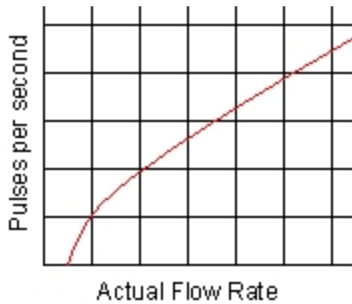
Laureate frequency meters and transmitters are compatible with all flow meters which generate pulses at a frequency proportional to flow rate. The Extended version can display scaled rate or total for the same input at the push of a button, and alarm from both the rate and total.

Combining Two Rates



Extended Laureate frequency meters and transmitters offer A+B, A-B and A/B arithmetic functions. A+B allows two input flows to be summed for total flow, while A-B allows outflow to be subtracted from inflow for net flow. Flow ratios aid in the proper mixing of ingredients.

Custom Curve Linearization



Extended Laureate frequency meters and transmitters can linearize the output turbine flow meters, which tend to be nonlinear on the low end. Linearizing improves their dynamic range and accuracy.

Ordering Guide

Create a model a model number in this format: **LT60FR, CBL04**

Transmitter Type	LT Laureate 4-20 mA & RS232/RS485 output Transmitter
Main Board	6 Standard Main Board 8 Extended Main Board <i>With Standard Main Board:</i> Scalable to ±999,999 for frequency, rate, square root of rate, up or down total, period, A-to-B time interval. <i>With Extended Main Board:</i> Above, plus rate and total simultaneously, ratio (A/B), draw (A/B-1), other arithmetic functions (AxB, A+B, A-B), phase angle, stopwatch, up/down counting, batching operation, linearization of nonlinear inputs.
Power	0 Isolated 85-264 Vac or 90-300 Vdc 1 Isolated 12-32 Vac or 10-48 Vdc
Input Type	FR Dual-Channel Frequency
Accessories	CBL04 RS232 cable, 7ft. Connects RS232 screw terminals of LT transmitter to DB9 port of PC. CBL02 USB to RS232 adapter cable. Combination of CBL02 and CBL04 connects transmitter RS232 terminals to PC USB port.