4-20 mA & Serial Data Transmitter / Totalizer
for 0-1 mA, 4-20 mA or 0-10V Process Signals

Features
- 0-1 mA, 4-20 mA or 0-10V process signal input, isolated
- Converts signal input to a scaled rated or totalized rate
- Selectable square root for differential flow
- Output accuracy maintained for narrow or wide spans
- 4-20 mA or 0-10V transmitter output, jumper selectable, isolated
- Analog output resolution 0.0015% of span (16 bits), accuracy ±0.02% of span
- RS232 or RS485 serial data output, half or full duplex, isolated
- Modbus RTU, Modbus ASCII or Laurel ASCII protocol
- Dual solid state relays for alarm or control, isolated
- Universal AC power, 85-264 Vac, or low voltage power, 10-48 Vdc or 12-32 Vac
- DIN rail mount case with detachable screw clamp connectors

Description

The Laureate process signal input transmitter and totalizer accepts 0-1 mA, 4-20 mA or 0-10V signals from flow meters and other transducers, such as watt meters, to track rate or totalized rate.

- With a Standard Main Board, the transmitter output can track rate (such as gallons per minute or watts) or totalized rate (such as gallons or kilowatt hours) whether the transducer output is linear or requires square root extraction (differential pressure flow transducers).
- With an Extended Main Board, the transmitter can also perform custom curve linearization (provided by a curvilinear spline fit with up to 180 data points), display 1/rate (such as the time it takes a conveyor to pass through an oven), and perform batch control for repetitive fill operations. Such applications typically make use of optional dual solid state relays, which are available as options. External reset of totals is provided by a special connector.

The signal conditioner board of the transmitter 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. At the lowest frequency of 10 kHz and the minimum gate time of 10 ms, the transmitter is capable of 25 updates per second. Scaling is done mathematically. Totals are stored in nonvolatile memory in case of power loss.

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 loops.
- 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.
- 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

### Analog Input

<table>
<thead>
<tr>
<th></th>
<th>0-1 mA</th>
<th>4-20 mA</th>
<th>0-10 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input resistance</td>
<td>1.00 kΩ</td>
<td>50 Ω</td>
<td>1.01 MΩ</td>
</tr>
<tr>
<td>Max current or voltage</td>
<td>35 mA</td>
<td>70 mA</td>
<td>600 V</td>
</tr>
</tbody>
</table>

### Input Resolution

- Span Tempco: ±0.0025% R/°C
- Zero Tempco: ±0.0005 FS/°C
- Accuracy at 25 ±1/2°C: ±0.005% FS ± 1 count
- Read Rate: 25/sec (typical)

### Analog Output

- Output Levels: 4-20 mA, 0-20 mA, 0-10 Vdc, -10 to +10 Vdc (user selectable)
- Compliance, 4-20 mA: 10V (0-500Ω load)
- Compliance, 0-10V: 2 mA (5 kΩ load)
- Output Resolution: 16 bits (65,536 steps)
- Output Accuracy: ±0.02% of output span
- Output Update Rate: 25/sec
- Output Isolation: 250V rms working, 2.3 kV rms per 1 minute test

### Serial Communications

- 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
- Digital Addressing: Modbus over Serial Line Specification V1.0 (2002)
  - RTU or ASCII
  - 247 Modbus addresses. Up to 32 devices on an RS485 line with no repeater

### Transducer Excitation Output

- Jumper Selection 1: 10V @ 60 mA, isolated to 50V from signal ground
- Jumper Selection 2: 5V @ 50 mA, isolated to 50V from signal ground
- Jumper Selection 3: 15V @ 60 mA, non-isolated

### Dual Relay Output

- Relay Type: Two solid state relays, SPST, normally open, Form A
- Load Rating: 120 mA at 140 Vac or 180 Vdc

### 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

- Control input 1, 2
- Analog input 0-10V or 4-20 mA
- Analog output +
- Analog return -10V to +10V
- AL1, AL2

- P6 Signal input & excitation output
- P5 Control inputs 1 & 2
- P4 Analog output
- P3 Solid state relays
- P2 Serial data I/O
- P1 Power input

See manual for jumper settings

Mechanical

Dimensions:
- Width: 128.7 mm
- Height: 85.5 mm
- Depth: 22.5 mm

FRONT

BACK

RS485
- 6 NC
- 4 ATX NC
- 2 BRX GND
- 1 BTX NC

RS232
- 6 N/C TX
- 5 ARX RX
- 4 ATX NC
- 3 GND GND
- 2 BRX GND
- 1 BTX NC
## Ordering Guide

Create a model number in this format: **LT60VF1, CBL04**

<table>
<thead>
<tr>
<th>Transmitter Type</th>
<th>LT</th>
<th>Laureate 4-20 mA &amp; RS485 Transmitter</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main Board</strong></td>
<td>6</td>
<td>Standard Main Board</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Extended Main Board</td>
</tr>
</tbody>
</table>
| **With Standard Main Board:** | Rate, square root of rate, or totalized rate from differential pressure flow transducers with a DC output.  
**With Extended Main Board:** Above plus linearization of nonlinear inputs, batch operation, 1/rate (time). |
| **Power**        | 0   | Isolated 85-264 Vac or 90-300 Vdc   |
|                  | 1   | Isolated 12-32 Vac or 10-48 Vdc    |
| **Input Type**   | VF1 | V-to-F Converter, 4-20 mA           |
|                  | VF2 | V-to-F Converter, 0-1 mA           |
|                  | VF3 | V-to-F Converter, 0-10V            |
|                  |     | Specify min input, min reading; max input, max reading. |
| **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. |