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
- Factory calibrated for 100Ω platinum, 10Ω copper and 120Ω nickel RTDs
- 2, 3 or 4-wire RTD connection with lead resistance compensation
- User selectable input span from entire RTD range down to 15.0°C
- Analog output resolution 0.0015% of span (16 bits), accuracy ±0.02% of span
- Universal 85-264 Vac / 90-300 Vdc or 10-48 Vdc / 12-32 Vac power
- DIN rail mount housing only 22.5 mm wide, detachable screw-clamp connectors

Description

The Laureate RTD temperature transmitter provides a linearized, highly accurate, stable and repeatable transmitter output for 100 ohm platinum, 10 ohm copper and 120 ohm nickel RTDs. Pt 100 platinum RTDs can have a DIN alpha of 0.00385 or ANSI alpha of 0.00392. The RTD type and temperature range, specified in °C or °F, are user-selectable. The temperature range can be as wide as the entire span of the RTD type or as narrow as 150 counts (such as 15.0°C), limited only by considerations of electrical noise and digital filtering time constants.

Digital calibration of all RTD ranges is performed the factory, with calibration data stored in EEPROM on the signal conditioner board. This allows signal conditioner boards and ranges to be changed in the field with no need for recalibration.

RTD connections can be via 2, 3 or 4 wires. With 3- and 4-wire connections, the transmitter automatically compensates for lead resistance of the sensor.

Fast read rate at up to 50 or 60 conversions per second while integrating the signal over a full power line cycle is provided by Concurrent Slope (Pat 5,262,780) analog-to-digital conversion. High read rate is ideal for peak or valley capture and for real-time computer interface and control.

Open sensor indication is standard and may be set up to indicate either upscale or downscale. RTD excitation is provided by the transmitter.

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

<table>
<thead>
<tr>
<th>RTD Metal</th>
<th>Alpha</th>
<th>R at 0°C</th>
<th>R at top of range</th>
<th>Excitation Current</th>
<th>Range</th>
<th>Conformity Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platinum (DIN)</td>
<td>0.003850</td>
<td>100Ω</td>
<td>390.48Ω at 850°C</td>
<td>196 µA</td>
<td>-200°C to +850°C, -328°F to +1562°F</td>
<td>±0.03°C, ±0.05°F</td>
</tr>
<tr>
<td>Platinum (ANSI)</td>
<td>0.003902</td>
<td>100Ω</td>
<td>394.36Ω at 850°C</td>
<td>196 µA</td>
<td>-200°C to +850°C, -328°F to +1562°F</td>
<td>±0.04°C, ±0.07°F</td>
</tr>
<tr>
<td>Nickel</td>
<td>0.00672</td>
<td>120Ω</td>
<td>380.31Ω at 260°C</td>
<td>196 µA</td>
<td>-80°C to +260°C, -112°F to +500°F</td>
<td>±0.05°C, ±0.09°F</td>
</tr>
<tr>
<td>Copper</td>
<td>0.00427</td>
<td>9.035Ω</td>
<td>19.116Ω at 260°C</td>
<td>5.0 mA</td>
<td>-97°C to +260°C, -143°F to +500°F</td>
<td>±0.05°C, ±0.09°F</td>
</tr>
</tbody>
</table>

### RTD Input
- **Calibration, Pt 100 DIN**: Per IEC 751 (ITS-90)
- **Calibration, Pt 100 ANSI**: NIST Monograph 126
- **Calibration, Ni 120**: DIN 43760
- **Max err at 25°C, Pt100**: ±0.04°C (±0.07°F) ± 0.01% of reading
- **Span tempco**: ± 0.003% of reading/°C
- **Zero tempco**: ± 0.03 deg/deg
- **Provision for calibration**: Multiplier of RTD resistance plus offset in degrees

### Analog Output (standard)
- **Output Levels**: 4-20 mA, 0-20 mA, 0-10 Vdc, -10 to +10Vdc (user selectable)
- **Compliance, 4-20 mA**: 10 V (0-500Ω m load)
- **Compliance, 0-10V**: 2 mA (5 kΩ load)
- **Output Resolution**: 16 bits (65,536 steps)
- **Output Accuracy**: ±0.02% of output span

### 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 minute test
- **Output Isolation**: 247 with Modbus. Up to 31 devices on an RS485 line w/o a 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

### 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 minute 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

See manual for jumper settings

Control input 2
Control input 1
GND

Analog rel. 0-10V or 4-20 mA
Analog output +
Analog return -10V to +10V
AL2
AL2
AL1
AL1

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

Signal conditioner board

RS485
RS232

6 N/C
5 ARX
4 ATX
3 GND
2 BRX
1 BTX
NC
GND
GND
GND

1 AC high or +DC
2 AC neutral or -DC
3 Power GND

Mechanical

FRONT

BACK

Dimensions:
128.7 mm
85.5 mm
104 mm
22.5 mm
Operation as a Fast ON/OFF Controller or Supervisory Monitor

With the optional dual solid state relay output option, which has a typical response time of only 17 ms, Laureate temperature meters and transmitters can serve as extremely fast and accurate ON/OFF controllers for closed-loop temperature control. They can also serve as supervisory process monitors and provide alarms or shutoffs when processes exceed normal limits.

Multiple setpoint operating modes are individually selectable for each relay. Relay duty cycles and chatter can be minimized with programmable hysteresis and time delays. A band deviation operating mode can be selected for each relay, where an alarm is generated whenever the reading is a selected number of counts above or below the setpoint. The relay modes are non-latching.

RTD Hookup

4-wire RTD

-Excitation
+Excitation
-Signal input
+Signal input

3-wire RTD

-Excitation
+Excitation
-Signal input
+Signal input

2-wire RTD

-Excitation
+Excitation
-Signal input
+Signal input

In 4-wire hookup, different pairs of leads are used to apply the excitation current and sense the voltage drop across the RTD, so that the IR drop across the excitation leads is not a factor.

In 3-wire hookup, the transmitter senses the combined voltage drop across the RTD plus two excitation leads. It also senses the voltage drop across one excitation lead, and then subtracts twice this voltage from the combined total. This technique effectively subtracts all lead resistance and compensates for ambient temperature changes if the two excitation leads are identical.

In 2-wire hookup, the transmitter senses the combined voltage drop across the RTD and both lead wires. The voltage drop across the lead wires can be measured by shorting out the RTD during transmitter setup, and this voltage is then automatically subtracted from the combined total. However, changing resistance of the lead wires due to ambient temperature changes will not be compensated.

Ordering Guide

Create a model number in this format: LT20P385C

<table>
<thead>
<tr>
<th>Transmitter Type</th>
<th>LT Laureate 4-20 mA &amp; RS232/RS485 Transmitter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Board</td>
<td>2 Standard Main Board</td>
</tr>
<tr>
<td>Power</td>
<td>0 Isolated 85-264 Vac or 90-300 Vdc</td>
</tr>
<tr>
<td></td>
<td>1 Isolated 10-48 Vdc or 12-32 Vdc</td>
</tr>
<tr>
<td>RTD Input</td>
<td>P385C Pt100 DIN RTD, -202°C to 850°C</td>
</tr>
<tr>
<td></td>
<td>P385F Pt100 DIN RTD, -331°F to 1562°F</td>
</tr>
<tr>
<td></td>
<td>P392C Pt100 ANSI RTD, -202°C to 631°C</td>
</tr>
<tr>
<td></td>
<td>P392F Pt100 ANSI RTD, -331°F to 1168°F</td>
</tr>
<tr>
<td></td>
<td>N672C Ni120 RTD, -100°C to +260°C</td>
</tr>
<tr>
<td></td>
<td>N672F Ni120 RTD, -148°F to +500°F</td>
</tr>
<tr>
<td></td>
<td>C427C Cu10 RTD, -100°C to +260°C</td>
</tr>
<tr>
<td></td>
<td>C427F Cu10 RTD, -148°F to +500°F</td>
</tr>
</tbody>
</table>

Note: The same signal conditioner board can be user configured for all RTD types listed and °C or °F, as well as for resistance measurement.

| 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. |