LAUREL
ELECTRONICS, INC.

Ethernet & 4-20 mA Output RTD Transmitter for Pt100, Cu10 and Ni120 RTD Input

Standard Features

- **Ethernet Serial Data I/O, Modbus TCP or Laurel ASCII protocol**
- **4-20 mA or 0-10V transmitter output, 16 bits, jumper selectable, 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 for lead resistance compensation**
- **User selectable input span from entire RTD range down to 15.0°**
- **Analog output resolution 0.0015% of span (16 bits), accuracy ±0.02% of span**
- **Fast update rate to 50 or 60 per second**
- **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**
- **Power over Ethernet (PoE) jumper selectable with 10-48 Vdc supply**

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°), 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 4wires. 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 LT transmitters include:

- **Ethernet I/O, isolated.** Supported protocols are Modbus RTU and ASCII (tunneled via Modbus TCP) and Laurel ASCII. The latter is simpler than the Modbus protocol and is recommended when all devices are Laureates. Note that RS232 or RS485 data I/O in lieu of Ethernet is provided by our LT Series transmitters.

- **4-20 mA, 0-20 mA or 0-10V 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. The supply can drive 20 mA into a 500 ohm (or lower) load for 10V compliance, or 10V into a 5K ohm (or higher) load for 2 mA compliance.

- **Dual solid state relays, isolated.** Available for local alarm or control. Rated 120 mA at 130 Vac or 180 Vdc.

- **Universal 85-264 Vac power.** Low-voltage 10-48 Vdc or 12-32 Vac power is optional.

Discovery and configuration of Laureate Ethernet Nodes is easily achieved with Laurel's Node Manager Software, and the discovered transmitters can then be programmed using Laurel's Instrument Setup Software. Both softwares run on a PC under MS Windows and can be downloaded at no charge.
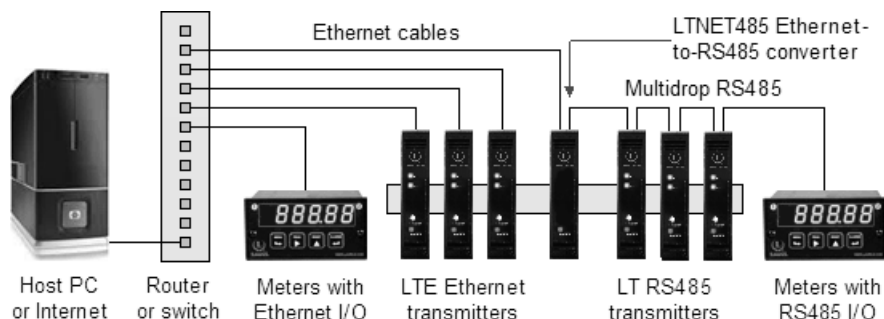
Specifications

RTD Metal	Alpha	R at 0°C	R at top of range	Excitation Current	Range	Conformity Error
Platinum	0.003850 (DIN)	100Ω	390.48Ω at 850°C	196 µA	-200°C to +850°C -328°F to +1562°F	±0.03°C ±0.05°F
Platinum	0.003902 (ANSI)	100Ω	394.36Ω at 850°C	196 µA	-200°C to +850°C -328°F to +1168°F	±0.04°C ±0.07°F
Nickel	0.00672	120Ω	380.31Ω at 260°C	196 µA	-80°C to +260°C -112°F to +500°F	±0.05°C ±0.09°F
Copper	0.00427	9.035Ω	19.116Ω at 260°C	5.0 mA	-97°C to +260°C -143°F to +500°F	±0.05°C ±0.09°F

RTD Input

Calibration, Pt 100 DIN	Per IEC 751 (ITS-90)
Calibration, Pt 100 ANSI	NIST Monograph 126
Calibration, Ni 120	DIN 43760
Max error 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
Connection	2, 3 or 4-wire
Overvoltage protection	125 Vac
Open sensor indication	0 mA or > 20mA output, user selectable
Sensor lead resistance	2-wire, 10 mdeg/Ω/deg up to 10Ω
Tempco per conductor	3 & 4-wire, 10 mdeg/Ω/deg up to 100Ω

Analog Output (standard)

Output Levels	4-20 mA, 0-20 mA, 0-10 Vdc, -10 to +10Vdc (user selectable)
Compliance, 4-20 mA	10V (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
Output Isolation	250V rms working, 2.3 kV rms per 1 minute test
Step Response Time	50 ms

Serial Communications (standard)

Type	10/100Base-T Ethernet per IEEE 802.3
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 TCP, Modbus RTU, Modbus ASCII, Laurel ASCII
Modbus Compliance	Modbus over Serial Line Specification V1.0 (2002)
Digital Addresses	247 for Modbus, 31 for Custom ASCII

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 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

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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

FRONT

BACK
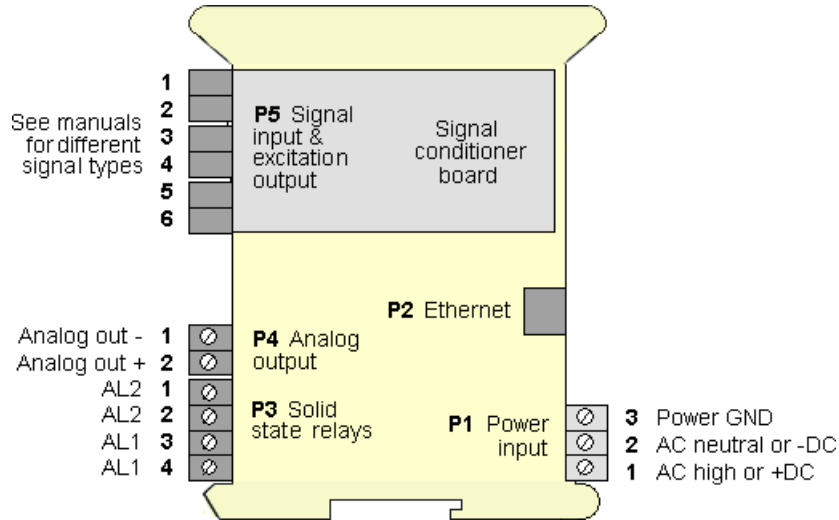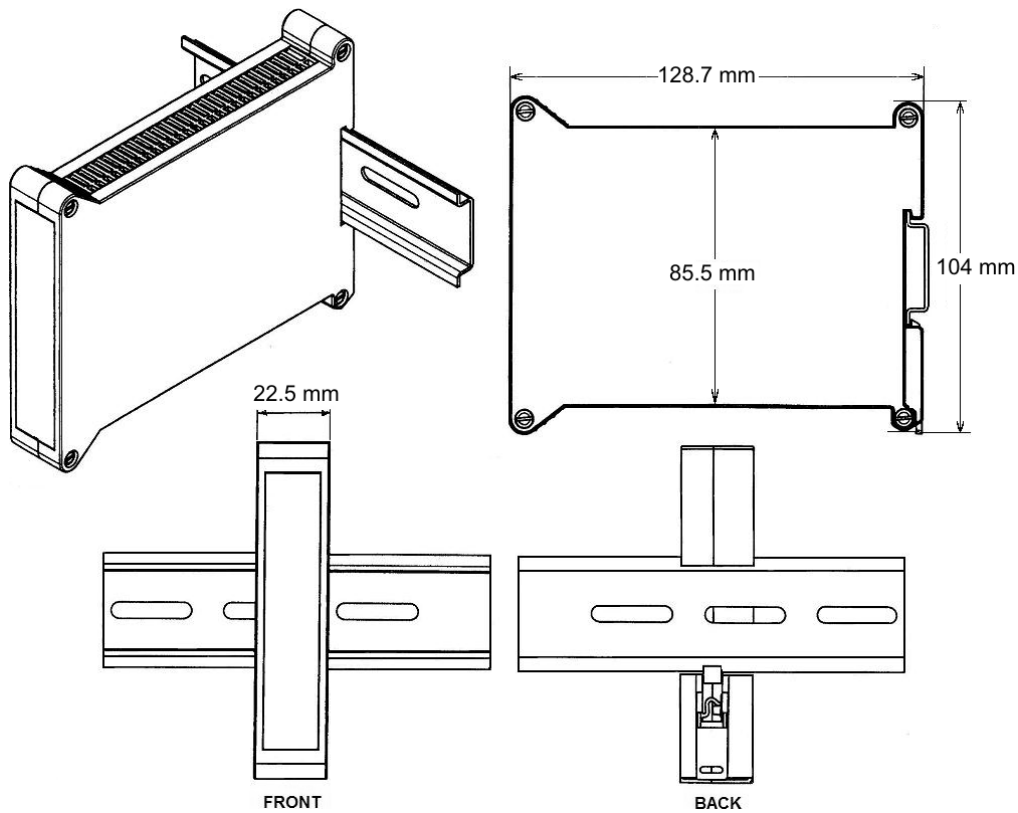
## Operation as a Fast ON/OFF Controller or Supervisory Monitor

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.
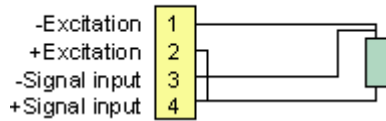
RTD Hookup

4-wire RTD

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-Excitation	1
+Excitation	2
-Signal input	3
+Signal input	4
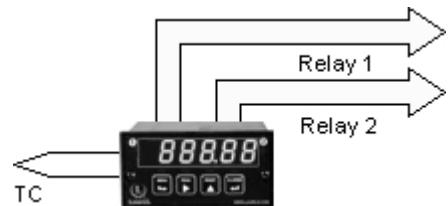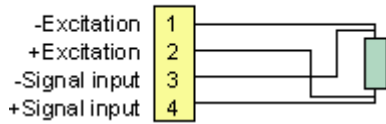
In 4-wire hookup, different pairs of leads are used to apply the excitation current and sense the voltage drop across the RTD, so that the IR drop across the excitation leads is not a factor.

3-wire RTD

-Excitation	1
+Excitation	2
-Signal input	3
+Signal input	4

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.

2-wire RTD

-Excitation	1
+Excitation	2
-Signal input	3
+Signal input	4
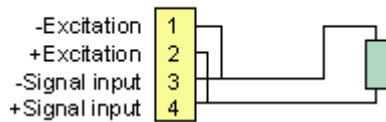
In 2-wire hookup, the transmitter senses the combined voltage drop across the RTD and both lead wires. The voltage drop across the lead wires can be measured by shorting out the RTD during transmitter setup, and this voltage is then automatically subtracted from the combined total. However, changing resistance of the lead wires due to ambient temperature changes will not be compensated.

Ordering Guide

Create a model a model number in this format: **LTE20P385C**

Transmitter Type	**LTE** Laureate 4-20 mA & Ethernet Transmitter
Main Board	**2** Standard Main Board
Power	**0** Isolated 85-264 Vac or 90-300 Vdc **1** Isolated 12-32 Vac or 10-48 Vdc
RTD Input	**P385C** Pt100 DIN RTD, -202°C to 850°C **P385F** Pt100 DIN RTD, -331°F to 1562°F **P392C** Pt100 ANSI RTD, -202°C to 631°C **P392F** Pt100 ANSI RTD, -331°F to 1168°F **N672C** Ni120 RTD, -100°C to +260°C **N672F** Ni120 RTD, -148°F to +500°F **C427C** Cu10 RTD, -100°C to +260°C **C427F** Cu10 RTD, -148°F to +500°F
	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.