LAUREL ELECTRONICS, INC.

4-20 mA & Serial Data Output Transmitter for Thermocouple Types J, K, T, E, N, R, S

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 thermocouple types J, K, T, E, N, R, S in one range**
- **User selectable input span from entire thermocouple range down to 15.0°**
- **Output update rate to 60/sec**
- **Analog output resolution 0.0015% of span (16 bits), accuracy ±0.02% of span**
- **5V, 10V or 24V dc transducer excitation output, isolated**
- **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**

CE RoHS ETL LISTED 4006497 MADE IN CALIFORNIA

Description

The Laureate thermocouple transmitter provides a linearized, highly accurate, stable and repeatable transmitter output for thermocouple types J, K, T, E, N, R or S. The thermocouple 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 thermocouple 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 thermocouple ranges is performed at 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. Cold junction compensation automatically corrects for temperature variations at the thermocouple reference junction at the transmitter. Open sensor indication is standard and may be set up to indicate either upscale or downscale.

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.

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

TC Types	Range	Conformity Error
J	-210°C to +760°C (-347°F to +1400°F)	±0.09°C (±0.16°F)
K	-244°C to +1372°C (-408°F to +2501°F)	±0.1°C (±0.17°F)
T	0°C to +400°C (32°F to 752°F) -257°C to 0°C (-430°F to +32°F)	±0.03°C (±0.05°F) ±0.2°C (±0.36°F)
E	-240°C to +1000°C (-400°F to +1830°F)	±0.18°C (±0.32°F)
N	-245°C to +1300°C (-410°F to +2370°F)	±0.10°C (±0.17°F)
R	-45°C to +1768°C (-49°F to +3214°F)	±0.17°C (±0.31°F)
S	-46°C to +1768°C (-51°F to +3213°F)	±0.12°C (±0.22°F)

Analog Input	
Calibration	NIST Monograph 125 (IPTS-68)
Input resistance & current	1 GΩ, 100 pA
Max lead resistance	1 kΩ max for rated accuracy
Overall accuracy	±0.01 of full scale ±2 counts
Span tempco	±0.003% of reading/°C
Ref junction tempco	±0.02 deg/deg
Over-voltage protection	125 Vac
NMR at 50/60 Hz	80 dB plus selectable filter from 80 ms to 9.6 s time constant
CMR, DC-60 Hz	120 dB with 500Ω imbalance
CMV, DC-60 Hz	250 Vac from power and earth grounds
Open sensor indication	0 mA or > 20 mA output, selectable

Analog Output (standard)	
Output Levels	4-20 mA, 0-20 mA, 0-10 Vdc, -10 to +10Vdc (user selectable)
Compliance at 20 mA	10V (0-500Ω load)
Compliance at 10V	2 mA (5 kΩ load or higher)
Output Resolution	16 bits (65,536 steps)
Output Accuracy	0.02% of output span plus conversion accuracy
Output Isolation	250V rms working, 2.3 kV rms per 1 minute test
Step response time	50 ms

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

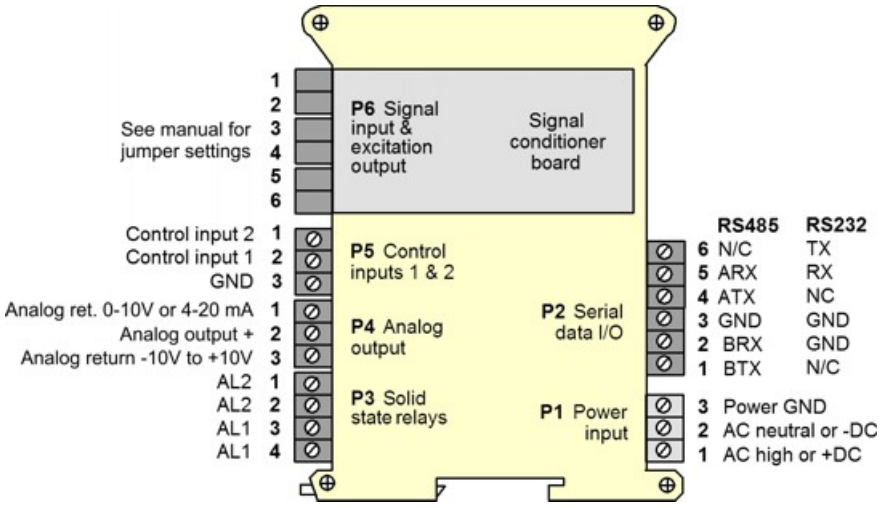
Serial Communications (standard)	
Signal Types	RS232 or RS485 (half or full duplex)
Data Rates	300, 600, 1200, 2400, 4800, 9600, 19200 baud
Output Isolation	250V rms working, 2.3 kV rms per 1 min test
Serial Protocols	Modbus RTU, Modbus ASCII, Laurel ASCII
Modbus Modes	RTU or ASCII
Modbus Compliance	Modbus over Serial Line Specification V1.0 (2002)
Digital Addressing	247 Modbus addresses. Up to 32 devices on an RS485 line without a repeater

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

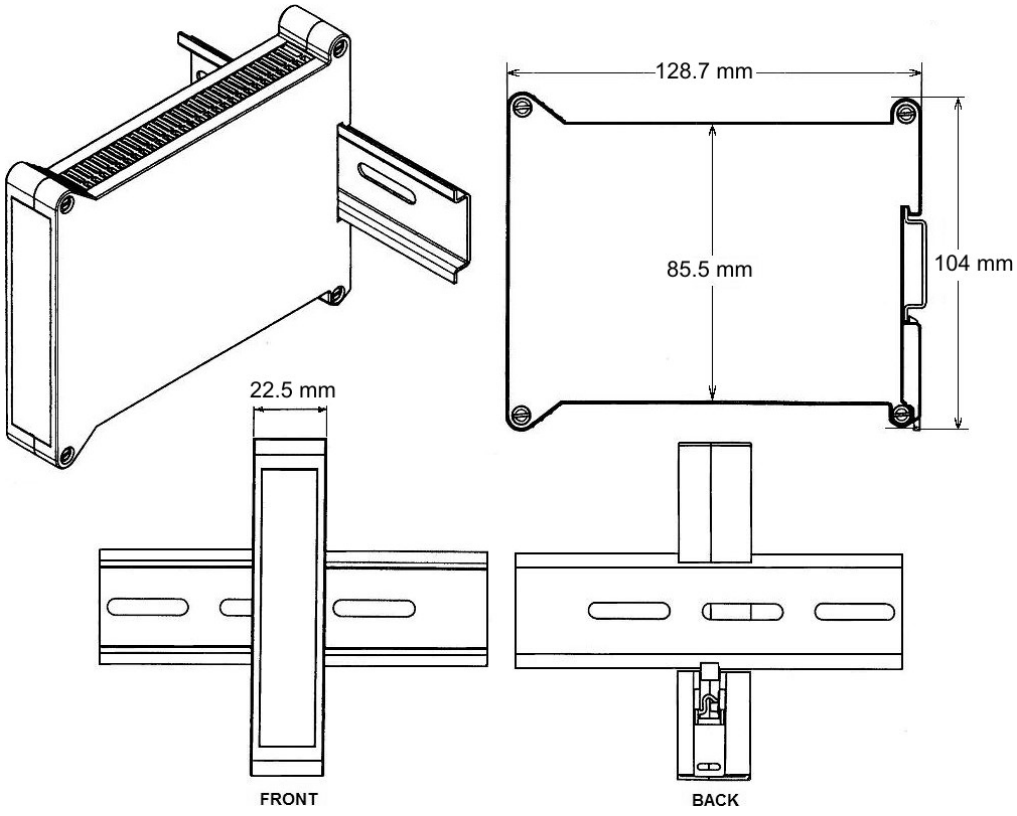
Mechanical	
Dimensions	129 x 104 x 22.5 mm case
Mounting	35 mm rail per DIN EN 50022
Electrical Connections	Plug-in screw-clamp connectors

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.

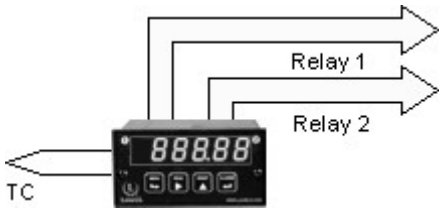
Pinout



Mechanical



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.

Ordering Guide

Create a model a model number in this format: **LT20JC**

Transmitter Type	**LT** Laureate 4-20 mA & RS485 Transmitter
Main Board	**2** Standard Main Board
Power	**0** Isolated 85-264 Vac or 90-300 Vdc **1** Isolated 10-48 Vdc or 12-32 Vac
Thermocouple Input	**JC** Thermocouple Type J, -210°C to 760°C **JF** Thermocouple Type J, -347°F to 1400°F **KC** Thermocouple Type K, -347°C to 1372°C **KF** Thermocouple Type K, -408°F to 2501°F **TC** Thermocouple Type T, -257°C to 400°C **TF** Thermocouple Type T, -430°F to 752°F **EC** Thermocouple Type E, -240°C to 1000°C **EF** Thermocouple Type E, -400°F to 1830°F **NC** Thermocouple Type N, -240°C to 1000°C **NF** Thermocouple Type N, -410°F to 2370°F **SC** Thermocouple Type S, -46°C to 1768°C **SF** Thermocouple Type S, -51°F to 3214°F **RC** Thermocouple Type R, -45°C to 1768°C **RF** Thermocouple Type R, -49°F to 3213°F
	Note: The same signal conditioner board can be user configured for all thermocouple types listed and °C or °F.
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.