



1000 OHM 375 PLATINUM RTD LOW RANGEABLE TRANSMITTER MODEL T91L



DESCRIPTION

The **Model T91L** is a specialty unit for very low temperatures down to -300°F (-184°C).

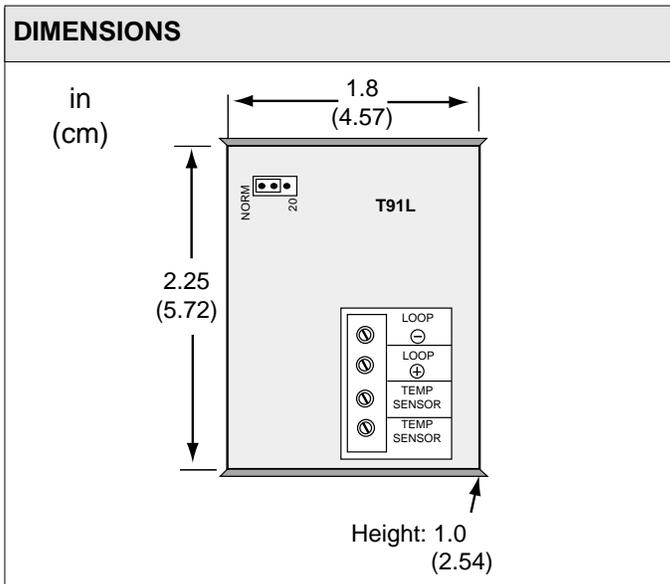
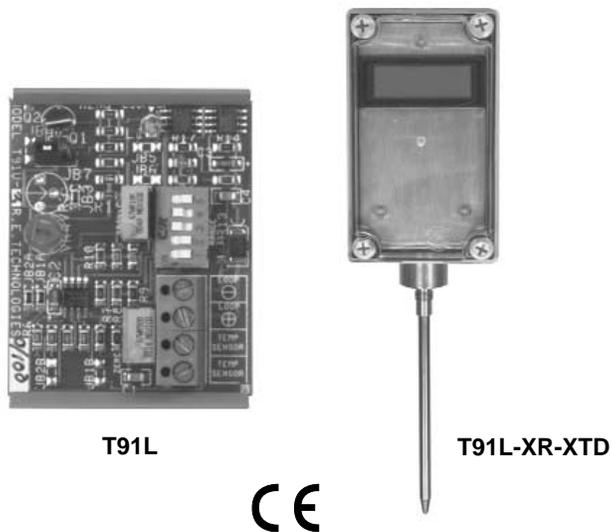
The **Model T91L** is a field rangeable, two-wire, 4-20 mA RTD transmitter designed for use with Type 91 1000Ω Platinum RTD Sensors. The transmitter is custom ranged to customers' requirements before shipping. It can be set for any range between -300° to 32°F (-184° to 0°C) with a minimum span of 100°F (38°C) and a maximum span of 332°F (160°C).

To adjust the **Model T91L**, set the DIP switches to match the desired range and use the zero and span pots to fine tune. (A high accuracy digital ohmmeter and decade box are required.)

The **Model T91L** has a special 20 mA loop calibration test signal to provide easy system verification. Simply move the bottle plug jumper from NORM to 20 and the transmitter will output a constant 20 mA. The loop up LED provides power indication for the 4-20 mA output.

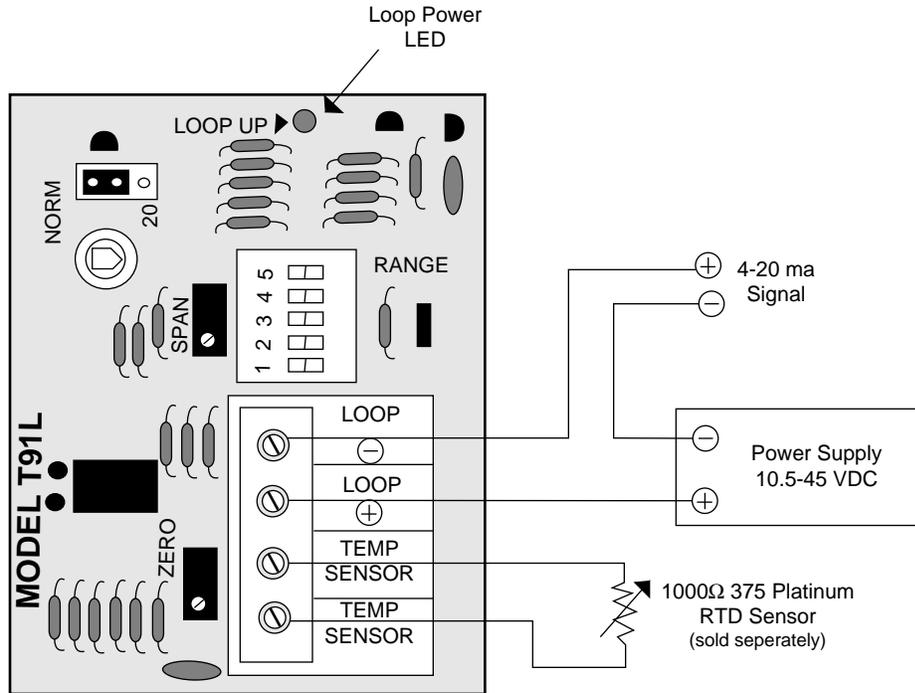
FEATURES

- *Dip switch rangeable*
- *Loop calibration test signal*
- *Low cost*
- *Snap-track mounting*
- *Loop-powered LED indication*
- *Fits into card slot of ST-U91 housing*
- *Very high-range and low-range models*
- *18-month warranty*



SPECIFICATIONS			
Sensor input	1000Ω platinum TCR 0.00375 Ω/Ω/°C	Max impedance	675Ω @ 24 VDC/375Ω with display
Configuration	Two-wire, loop-powered	Ambient temp	0° to 140°F (-18° to 60°C)
Rangeability limits	-300° to 32°F (-184° to 0°C)	Humidity	0% to 95% noncondensing
Min span	100° to 332°F (38°C to 160°C)	Accuracy	0.1°F or 0.2% of span
Output	4-20 mA	Dimensions	1.8"W x 2.25"L x 1"H (4.6 x 5.7 x 2.5 cm)
Output limit	25 mA (sensor leads open)	Display option (XTD)	3-1/2 digit LCD
Loop calibration output	20 mA ±0.2%		
Supply voltage	10.5-45 VDC (one power supply may power multiple units)		

WIRING



ORDERING INFORMATION

MODEL	DESCRIPTION
T91L	4-20 mA Rangeable RTD Transmitter Low Temperature Rangeability (XR Range only)
	RANGE
XR†	Special Range (See previous page for rangeability limits)
	SENSOR TYPE
—	Transmitter only
D	ST-D91-XW Duct sensor*
O	ST-O91 Outside air sensor*
W	ST-W91-XW Immersion sensor* with well
WE	ST-W91-E-XW Immersion sensor* without well
AV	ST-AV91H Averaging sensor*
XTD	Digital display option for (D) duct or (W) immersion sensors*
XWM	Single gang weather resistant box (Mounted without sensor)

T91L — XR — D

Example: T91L-XR-D Transmitter with range of -100° to 0°F (-73° to -18°C) mounted and wired in duct sensor enclosure

†Indicate at time of order (__ to __ ° [F/C])

*Includes sensor mounted and wired. Check temperature of RTD.

Related Products

HTP-U

Low temperature probe, limited to -320°F (-200°C)

RANGE CALIBRATION (All units are factory calibrated before shipping)

The **T91U** RTD transmitter can be field-calibrated by using the ZERO and SPAN potentiometers and DIP switches. Use the step-by-step instructions below to calibrate the **T91U** to the desired temperature range. For information about accuracy, see Special Notes on Field Calibration on the reverse side.

- Step 1** Assemble required equipment: temperature transmitter, 24 VDC power supply, decade box [Model **RSU-280 (Newark)** or equal], digital VOM [Fluke Model **87 (Newark)** or equal], trim screwdriver, RTD Resistance vs. Temperature Chart (see Temperature section of Kele catalog).
- Step 2** Using the RTD Resistance vs. Temperature Chart for 1000Ω Platinum 375 Curve, select and record the resistance values for the high and low temperatures in the desired range. Designate these values as LOW TEMP OHMS and HIGH TEMP OHMS.
- Step 3** Calculate the calibration factor using the ohms recorded in Step 2:

$$\text{CAL FACTOR} = \frac{\text{HIGH TEMP OHMS} - \text{LOW TEMP OHMS}}{16}$$

- Step 4** Using the resistance decade box, select a resistance value within one ohm of the low temperature ohms in Step 2. **Do not use a lower value.** Measure this resistance with the VOM and record the actual value accurate to hundredths of an ohm. This value will be referred to as MIN REF OHMS.

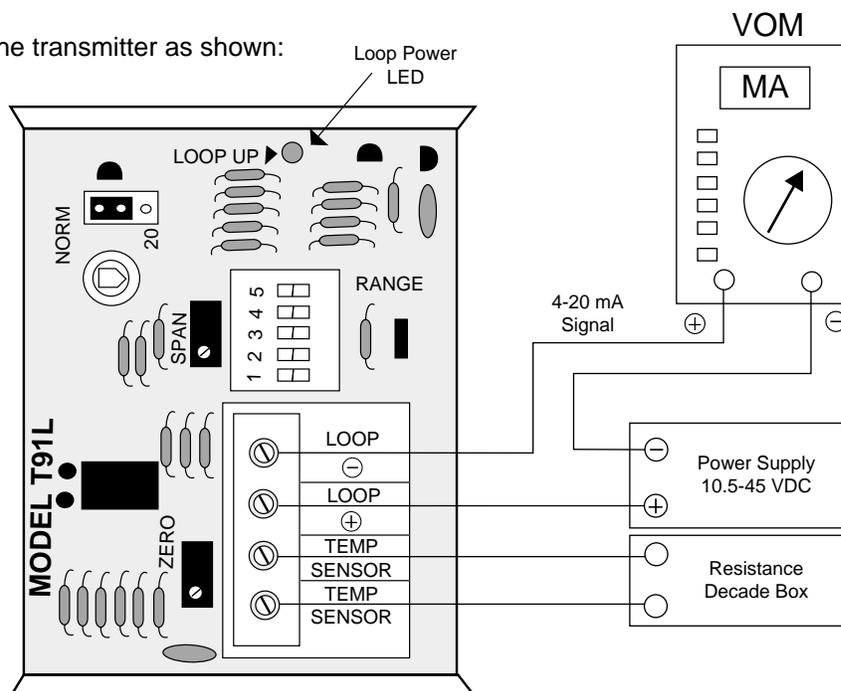
Select a resistance value within one ohm of the high temperature ohms in Step 3. **Do not use a higher value.** Measure this resistance with the VOM and record the actual value accurate to hundredths of an ohm. This value will be referred to as MAX REF OHMS.
Calculate the low mA reference:

$$\text{LOW MA REF} = \frac{\text{MIN REF OHMS} - \text{LOW TEMP OHMS}}{\text{CAL FACTOR}} + 4$$

Calculate the high mA reference:

$$\text{HIGH MA REF} = \frac{\text{MAX REF OHMS} - \text{LOW TEMP OHMS}}{\text{CAL FACTOR}} + 4$$

- Step 5** Connect the transmitter as shown:



RANGE CALIBRATION (CONTINUED)

Step 6 Set DIP switches 1-5 by following these two steps:

- ① Set DIP switches 1 and 2 according to desired ZERO setting (LEFT position is ON and RIGHT position is OFF.):

DESIRED ZERO	SWITCH 1	SWITCH 2
-300° to -230°F (-184° to -145°C)	OFF	OFF
-230° to -150°F (-145° to -101°C)	OFF	ON
-150° to -80°F (-101° to -62°C)	ON	OFF
-80° to -8°F (-62° to -22°C)	ON	ON



Example setting
is -200° to -50°F

Note: If the desired ZERO is very close to a range boundary and after step 7 you cannot adjust the ZERO to the desired setting, change the switch setting to the next range and readjust the potentiometer.

- ② Set DIP switches 3, 4, and 5 according to desired SPAN (HIGH TEMP - LOW TEMP) setting:

DESIRED SPAN (Hi-Lo) = Span	SWITCH 3	SWITCH 4	SWITCH 5
40° to 110°F (22° to 61°C)	ON	ON	ON
110° to 170°F (61° to 94°C)	ON	ON	OFF
170° to 200°F (94° to 111°C)	ON	OFF	ON
200° to 230°F (111° to 128°C)	ON	OFF	OFF
230° to 260°F (128° to 144°C)	OFF	ON	ON
260° to 270°F (144° to 156°C)	OFF	ON	OFF
270° to 300°F (156° to 167°C)	OFF	OFF	ON
300° to 332°F (167° to 184°C)	OFF	OFF	OFF

Note: If the desired SPAN is very close to a range boundary and you cannot adjust the SPAN to the desired setting, change the switch setting to the next range and readjust the potentiometer.

Examples: Desired Range: -150° to 0°F (-101° to -18°C) Set switches 01110

Step 7 Set the ZERO and SPAN potentiometers:

- Set the MIN REF OHMS on the decade box and adjust the ZERO potentiometer on the transmitter for the LOW MA REF calculated in Step 4.
- Set the MAX REF OHMS on the decade box and adjust the SPAN potentiometer on the transmitter for the HIGH MA REF calculated in Step 4.
- Repeat A and B and Step 6 as necessary.

Special Notes on Field Calibration

The accuracy of a field-calibrated RTD transmitter is highly dependent on the accuracy of the ohmmeter used to measure the sensor substitution resistances (MIN and MAX REF OHMS). **The percent accuracy of the calibrated RTD transmitter is not the same as the percent accuracy of the ohmmeter.**

OHMMETER ACCURACY (% of reading)	TRANSMITTER ACCURACY	
	LOW TEMP	HIGH TEMP
1%	±4°F	±7°F
0.5%	±2°F	±3.5°F
0.25%	±1°F	±1.8°F
0.1%	±0.4°F	±0.7°F
0.05%	±0.2°F	±0.36°F

A Fluke Model 87 should provide an accuracy of approximately ±1.4°F at low temperatures and ±1.9°F at high temperatures.

A Fluke Model 8060 should provide an accuracy of approximately ±0.4°F at low temperatures and ±0.6°F at high temperatures.