TRANSPAK™ T287

Programmable Isolating Universal Input 2-Wire Transmitter

Provides an Isolated, Linearized Current Loop in Proportion to a Thermocouple, RTD, Millivolt, Potentiometer or Resistance Input

CE

Benefits

- Universal Input Reduces Inventory Levels

- Eliminates Ground Loops

- Supports Single or Dual Inputs

- User-Friendly Configuration

- Custom Linearization for Special T/C Types

- DIN Rail Mounting Adapter Included

Description

The T287 is a programmable two-wire transmitter that is configured to provide an isolated 4-20mA signal in proportion to the input signal. The T287 accepts thermocouple, 2-wire, 3-wire, or 4-wire RTD, potentiometer, resistance and millivolt inputs. The T287 supports either single or dual inputs. In the dual input mode, either input can be selected to control the output, or math functions can be applied in which both inputs have an effect on the output. The functions available are Sum, Difference, Average, Higher of the two or Lower of the two inputs. Typical applications include providing accurate, stable signals to distributed control systems (DCS), supervisory control and data acquisition systems (SCADA), environmental monitoring and control systems (EMCS), data acquisition and control systems (DACS) and custody transfer/pipeline systems.

Configuration is performed by connecting the transmitter to a standard (9-pin RS-232) PC serial port using an isolated interface adapter, and running a user-friendly Windows-based program. All of the configuration information can be defined and modified using only a PC, the interface adapter, and the transmitter. No loop supply, input simulation or meter on the output is required. The fully isolated adapter reduces the risk of damage to the PC which can be caused by spikes and surges on field wiring entering the computer via its unprotected serial port.

The T287 yields higher accuracy and long-term stability with lower power consumption than prior generation transmitters. The T287 automatically performs self-tests and auto-calibration while in service, resulting in a stability of better than ±0.1% of span over 12 months.

Operation

The T287 comes from the factory pre-configured as an RTD transmitter, programmed for a type Pt-100, 3-wire RTD with a temperature range of 0 to 100°C. The unit can be easily reconfigured using the C680-0001 Configuration Software. A single copy of the software is all that is required for an unlimited number of T287 transmitters.

Units already in service can have their configuration "up-loaded" to the PC. Their operating parameters can be reviewed, and if necessary, revised and downloaded again. All configuration parameters can be stored in a configuration file on the PC for future use. The Configuration & Calibration Software, Isolated RS-232/T287 Communications Adapter and User's Guide are all included in the model C680-0001.

ACTION INSTRUMENTS

Installation and Calibration Instructions

Quick Start

Before beginning this process, it is important to understand the difference between *calibration* and *configuration*. The transmitter's precision references are *calibrated* at the factory and may be adjusted later if necessary. *Configuration* is the process of defining the sensor type and range in engineering units. Connecting the transmitter to a PC and running the configuration software performs a *configuration*. Because the communications adapter provides power to the transmitter's microprocessor, it is not necessary to provide any external power to the transmitter in order to configure it.

1. Install the Configuration and Calibration software.
Run the file "TConf50.exe" on the CD-ROM. It will create a program group labeled XXXX. From the Programs menu of your Start tab, select XXXX and run the program YYYY.

2. Connect the communications adapter to the computer and transmitter.

3. Identify the serial port to which the adapter is connected.
Select "Options" from the menu bar, then click "Communications" and select the correct COMM port from the pull-down menu.

4. Configure the transmitter.
What you will need:

• PC
• Communications Adapter
• Transmitter

Configuration

Note that the communications adapter powers the transmitter from the PC's serial port. It is not necessary to provide external power in order to configure the transmitter.

1. If it did not happen automatically when you connected the transmitter, you will need to **Upload** ▲ the current configuration from the transmitter.

2. If the current "Sensor Type" does not match the application, click on the "Select Sensor" box and then select the appropriate tab at the top of the "Input Sensor Selection" screen.

3. Select Single Input or Dual Input. (Refer to the **Configuration Options** section for a more detailed explanation of the Dual Input option.) Select the Type of input. Most applications will work with the Mode/Transfer Function set to Standard or Linear depending upon which input type is used. If the application requires the Polynomial or User Defined table, refer to the Configuration Options section and the User's Guide (both located on the CD-ROM). Click the "OK" button to return to the Configuration Screen.

4. Select the Engineering Units (from the pull-down menu), enter the "Zero Scale" and "Full Scale" values and the "Burnout" mode (transmitter to go above full scale or below zero scale upon input failure). Also, ensure the proper "Line Frequency" is selected.

5. Click the "Set to Optimal" button to optimize the transmitter's filtering. (Refer to the Configuration Options section and the User's Guide for a more detailed explanation.)

6. Download ▼ the new configuration to the transmitter.

Wiring Instructions

1. Physical dimensions for mounting are shown in Figure 2.

2. Connect the input signal wires according to the interconnection diagram shown in Figure 1.
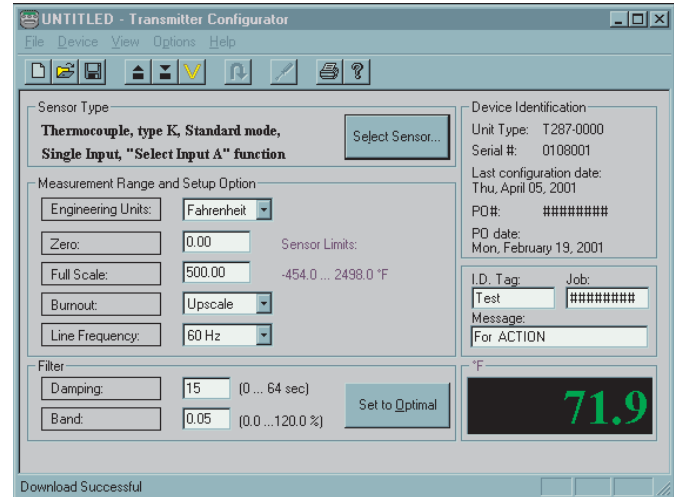
3. Connect the output signal wires to the controller or digital indicator with a power supply to create an output loop as shown in Figure 1. Observe proper polarity.

Configuration Options

The Model T287 is capable of performing many functions in addition to the simple example outlined in the Quick Start exercise.

SINGLE vs. DUAL INPUT MODE

The T287 supports either single or dual inputs. In the dual input mode, either input can be selected to control the output, or math functions can be applied in which both inputs have an effect on the output. The functions available are Sum, Difference, Average, Higher of the two or Lower of the two inputs.

Other Transfer Functions

The transfer function is the "formula" the transmitter uses to determine the appropriate output signal for a given input signal.

• A "Linear" function means the output is changes in a straight line as the input changes, within the configured input zero and full scale range. Zero percent of range input yields 4mA output and 25% of range input yields 8mA, etc.

• A "Standard" function means the transmitter will apply a standard linearization curve for temperature inputs.

• RTD sensor matching, square root, custom Polynomial and custom User Defined Tables are described below.

RTD Sensor Matching

The accuracy of RTD temperature sensing can be increased significantly when the temperature transmitter is "matched" to the individual sensor using a method called Callender-van Dusen linearization. Doing so requires entering the sensor's Alpha, Beta (measured for temperatures above zero and for temperatures below zero), Sigma, and Ro values into the transmitter's configuration. These values can be requested from the manufacturer when the sensor is purchased or may be measured by a testing lab.

Square Root

Select this function if the transmitter's output is to vary with the square root of the input.

Custom Polynomial

The transmitter can use up to a 10th order polynomial equation ($y = A_0 + A_1x + A_2x^2 + ... + A_{10}x^{10}$) as the transfer function by inputting the coefficients into the transmitter's configuration.

Custom User Defined Table

The transmitter can use a User Defined Table by specifying a ".tbl file." The data in the file should be two columns, separated by either a single space or a tab. Up to xx data pairs can be listed. The input values in column one must be equally spaced in value.

Dynamic Input Filtering

Filtering is provided to optimize the stability and response of the transmitter output signal. The filter is set by specifying a filter band and a damping time constant. To simplify the definition of the filter values, click on the "Set to Optimal" button on the configuration screen.

Damping Filter Band

The Damping Filter Band allows the transmitter to be configured to react quickly to significant changes in input while smoothing out small changes. This band defines the range above and below the current input reading within which the damping time constant will be applied. It is defined as a percent of the configured span of the transmitter. For example, a 0.5% Damping Filter Band on a transmitter configured for an input range of 200 to 700 degrees F would mean the damping time constant will be applied to input changes of less than 2.5 degrees, but changes of more than 2.5 degrees would be immediately reflected in the output. In general, the larger the full scale range, the smaller the Damping Filter Band should be. Conversely, a larger filter band is generally appropriate for smaller input ranges. Clicking the "Set to Optimal" button triggers the calculation of an appropriate setting based on the currently defined input range.

Damping Factor

Damping is defined as the length of time, in seconds, over which the input will be averaged to determine the output value when the input change is less than the Filter Band. Changes in the input that are greater than the Filter Band bypass the Damping Filter and are reflected in the output. The default value of 15 seconds, when used with the optimal Damping Filter Band yields a very stable output while maintaining a fast response to significant changes in the input.

Defining the Transmitter's User Fields

Each unit can be assigned an I.D. Tag name of up to 8 characters, a Job Number of up to 8 characters, and a "Message" of up to 16 characters, all of which will be stored in the transmitter's memory. Click on the desired field, enter the text, and click the download icon.

Saving the Configuration Information to a File

The transmitter's configuration can be saved to a file by clicking the diskette icon on the toolbar and specifying a file name and location.

Printing the Configuration Information

Click the printer icon on the toolbar to print a preconfigured summary of the transmitter's configuration and calibration. The report includes the current time and date, the date of the last calibration, and the date of the last configuration. Printing this report before and after calibrating a unit provides "as found" and "as left" documentation.

Calibration and Adjustment

The T287 is supplied factory-calibrated, with calibration reference parameters stored in the unit's non-volatile memory. Calibration requires high precision input sources for parameters such as mV, mA, resistance and temperature. Regardless of when and how changes of calibration settings were performed, the original factory-calibration parameters can be restored at any time during the life of the unit.

Instructions

Instrumentation requirements:

1. High-Precision 100mV source, 1μV resolution.
2. Precision 20.000mA current monitor.
3. Precision 300.000 ohm resistor.
4. Precision ambient temperature thermometer.
5. Precision thermocouple simulator/calibrator.

Connect the device to the power source and current output monitor according to the wiring diagram. Connect the device to the programming adapter and start the configuration software. Allow for a minimum warmup time of 15 minutes.

From the "Device" drop down menu, select "Calibration." A prompt for the password will be displayed. After entering the password (the default password is the device serial number) the "Device Calibration" screen will appear.

Output Calibration

From the "calibration references" list, select: Output 4 mA. Use the output scroll bar to adjust the reading of the current monitor to 4.00mA. Press the "send to device" button. The new reference will be downloaded to the unit.

From the "calibration references" list, select: Output 20 mA. Use the output scroll bar to adjust the reading of the current monitor to 20.00mA. Press the "send to device" button. The new reference will be downloaded to the unit.

mV Calibration

From the "calibration references" list, select: Input mV. Connect the precision 100.000 mV source to the device mV input terminals. Wait for the mV display to settle to within the required accuracy. Once the display turns green, press the "send to device" button. The new reference will be downloaded to the unit.

OHMS Calibration

From the "calibration references" list, select: Input Ohms. Connect the precision 300.000 ohm resistor to the device Ohms input terminals in the 4-wire configuration. Wait for the Ohms display to settle to within the required accuracy. Once the display turns green, press the "send to device" button. The new reference will be downloaded to the unit.

CJC Calibration

From the "calibration references" list, select: CJ temperature. Cold junction temperature can be calibrated in one of two ways:

1. Direct setting mode: Select "Direct setting" from the CJ temperature drop down menu. Use the precision ambient temperature thermometer to measure the temperature of the thermocouple input terminals. Enter the value of that measurement in the input terminal temperature window. Wait for the display to settle and then press the "send to device" button.

2. Simulation mode (recommended): From the CJ temperature drop down menu select one of the available thermocouple type simulation possibilities (whichever is more convenient). Using the precision thermocouple calibrator and the same type thermocouple wires, simulate an ambient temperature of 20°C to the thermocouple input terminals and enter this number into the input terminal temperature window. Wait for the display to settle and then press the "send to device" button.

Return to factory calibration settings

Restore a single parameter – when a specific parameter is selected inside the calibration menu, it is possible to return to the original factory settings by pressing the "default" button.

Restore all parameters – to restore all of the calibration parameters to the original factory calibration settings, the calibration menu must be started anew and NONE of the parameters should be selected. Pressing the "default" button will restore the factory settings for all of the calibration references.

Specifications

Input Types

Thermocouples:
   Most standard types & all special types using customer defined tables & polynomials.

RTD:
   2-, 3- & 4-wire, Pt-100, Ni-110, Ni-120 & other RTDs. Includes Callandar-Van-Dusen adaptation and custom sensors linearization with user defined tables and polynomials.

DC mV: ±135mV

Potentiometers: 0 to 20k Ohms

Resistance: 0 to 400 Ohms

General Specifications

Minimum Range: 2mV

Output: 4-20mA

Supply Voltage: 9-40VDC @ no load, reverse polarity protected

Maximum Load:
   $R_{max} = (V_{supply} - 9V) / 20mA$

Zero/Span Trimmer

The trimmer acts like a screwdriver on a trimpot. Just connect the trimmer to the T287 programming port and press the up or down button to adjust the zero or span. No computer required. No power connection required. Only output loop power required - just plug and trim.

5ft cable
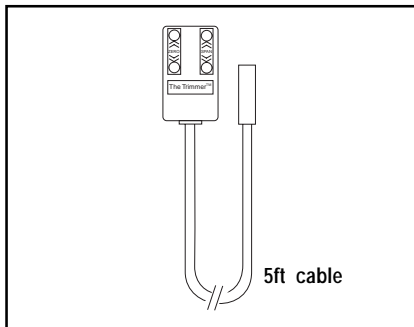
Operating Temperature: -40 to 85°C

Storage Temperature: -55 to +125°C

Humidity: 0 to 95% RHNC

Response Time:
   0.3 seconds, to 90% of input (>3 updates/sec)

Damping Factors:
   Programmable 0 to 64 seconds, to 0 to 120% of input range, using configuration software

Stability:
   Better than ±0.1% of span for 12 months

Isolation: 2000VDC, input to output

RFI Protection:
   <1% effect of span at 20-1000MHz and at field strength of 20V/m

Performance Specifications

Output Resolution: 0.015% of span (2.5uA)

Output Linearity (D/A):
   Better then 0.02% of output span

Sensor Linearization:
   Better than 0.1°C for RTDs
   Better than 0.2°C for Thermocouple

Cold Junction Compensation:
   Automatic to within ±0.7°C for all thermocouples

Temperature Stability:
   0.015%/°C combined zero and span.

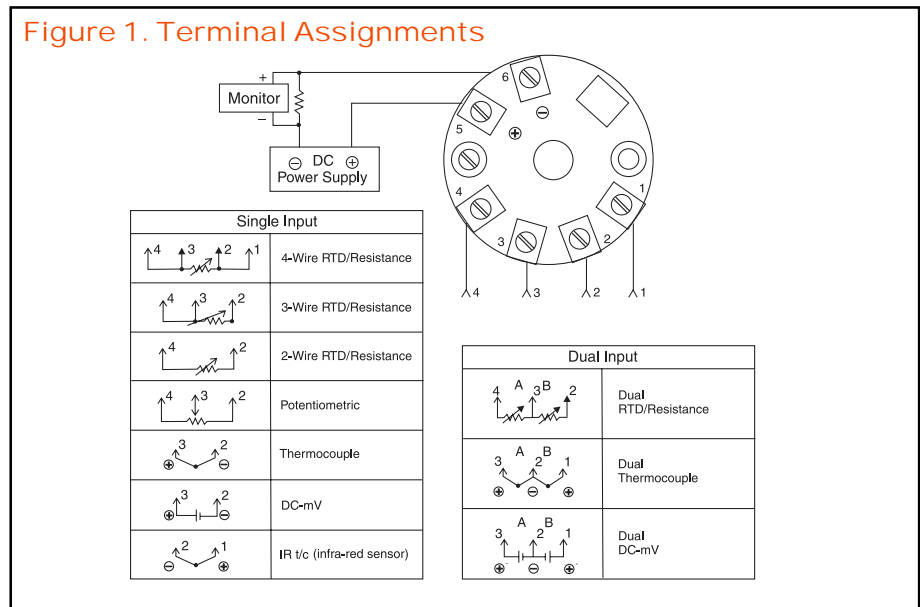Supply Voltage Effect:
   < ±0.003% per volt.

Calibration:
   Automatic, unit includes all calibration parameters. The unit performs periodic zero and span self-test, and auto calibration.

Input Linearity:
   Better than 0.01% of span (mV input)

Figure 1. Terminal Assignments

Models & Accessories

Ordering Information

Specify:
1. Model: **T287-0000**
2. Model: **C680-0001** Isolated Communications Adapter, Configuration and Calibration Software, and User's Guide.
3. Model: **C680-0002** Trimmer.

Accessories

9046	Action Pak 24/40VDC, 65mA Loop Power Supply
T609	24V, 600mA Loop Power Supply
V560/565	3½ digit remote loop powered indicator with wide ranging display.
T25H-0000	Head Mount Enclosure - ½ NPT for Thermowell and Conduit.

Figure 2. Dimensions
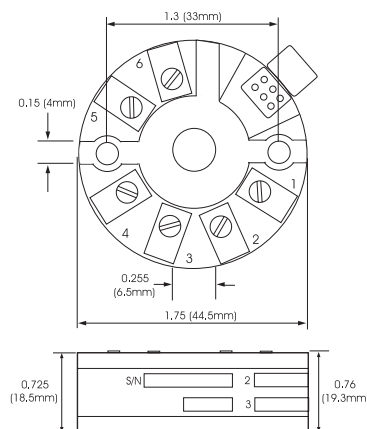
Head Mount Enclosure

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Factory Assistance

For additional information on calibration, operation and installation contact our Technical Services Group:

703-669-1318
actionsupport@eurotherm.com

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