READ THIS FIRST

Installation Guide

Model TSM and TSB Temperature Sensor

Revision 1.0 Document 10019

ANDERSON-NEGELE

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Section 1 - Theory of Operation

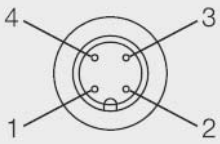
An RTD, or Resistance Temperature Detector, converts the sensed temperature into a resistance signal. A 100 ohm RTD will measure 100 ohms at 32°F (0°C), and its resistance will increase as the temperature increases. The amount of change in resistance per degree Celsius is related to the RTD's alpha coefficient. Anderson-Negele 100 ohm RTD's have an alpha coefficient of 0.00385 ohms/ohm/°C (also referred to as a 385 coefficient), which is a DIN standard. For a 100 ohm RTD, every degree Celsius increase in temperature will cause the resistance to increase 1.00385 times its current reading.

For applications where longer cable runs are required, or a 4-20 mA DC signal is desired, a TSM, TSB with MPU-4 or TSB with MPU-LCD temperature transmitter is available. A temperature transmitter utilizes a 100 ohm RTD, as well as an electronic circuit to convert the resistance signal into a 2-wire 4-20 mA DC signal.

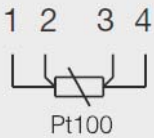
Section 2 - Wiring

Electrical connection without transmitter

With M12 plug

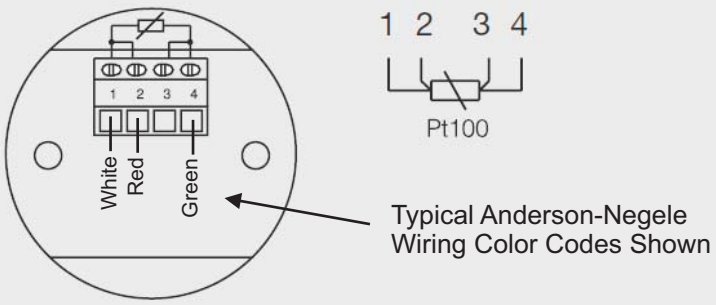


Configuration M12 plug



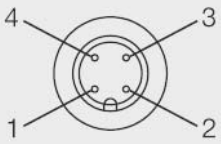
With cable gland

Configuration strip terminal



Electrical connection with transmitter

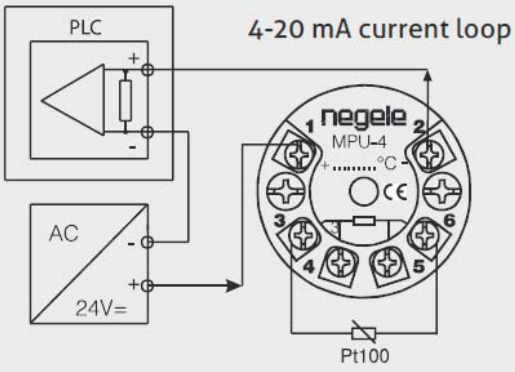
With M12 plug



Configuration M12 plug

1: +supply
2: - supply 4-20 mA
3: not connected
4: not connected

With cable gland



Section 3 - MPU-LCD Range Selection

Programming

By pushing the button above the display, the current measurement range will be shown (Fig. 2). Pushing the button again scrolls through available ranges.

To select new range, press button to scroll until desired range is shown - let go of button. After approximately three seconds, "Stor" will be shown on the display (Fig. 3).

Press and hold the button. When the display changes again the range has been stored (Fig. 1).

Fig. 1

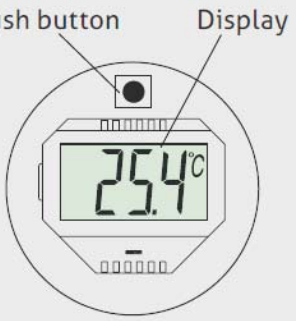


Fig. 2

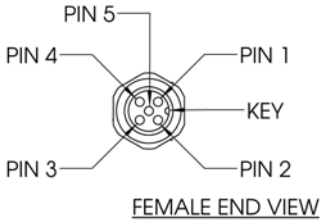
Fig. 3

Available Ranges

Fahrenheit: 0-100 °F, 0-150 °F, 0-200 °F, 30-230 °F, 0-300 °F

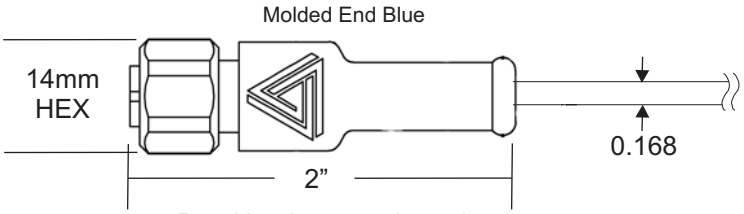
Celsius: -10-40 °C, 0-50 °C, 0-100 °C, 0-150 °C, 0-200 °C

Section 4 - Molded Cordset (5 Conductor)



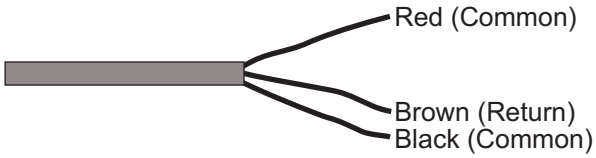
FEMALE END VIEW

PIN OUT	WIRE COLOR
PIN 1	RED
PIN 2	BLACK
PIN 3	GREEN
PIN 4	BROWN
PIN 5	WHITE
NUT	SHIELD



Part Number	Length
42117H0025	25 ft
42117H0050	50 ft
42117H0100	100 ft

Color Codes - 3 Wire RTD



Color Codes - 4-20 mA

SPECIFICATIONS

Connector:	5 Pin Eurofast Style Female
Contact Carrier Material/Color:	Pur/Black
Molded Head Material/Color:	Pur/Blue
Contact Material/Plating:	Brass/Gold
Coupling Nut:	14mm HEX
Shielding:	100% Shield coverage
Rated Current:	4.0 A
Rated Voltage:	250V
Outer Cable Jacket Material/Color:	PVC/Black
Conductor Insulation Material:	PVC
Number of Conductors:	5 x 24 AWG
Drain Shield:	24 AWG Drain wire / Foil Shield
Temp Range:	-40C to +80C
Protection Class:	Meets NEMA 1, 3, 4X, 6P and IEC IP68, 69k

NOTE:
Drain shield connected to coupling.

Additional grounding not required or recommended.

Section 5 - MPU-4 Transmitter Puck Range Change

- MPU-4 transmitter pucks have the capability to be programmed via computer interface.
- The MPU-P9701 Programmer Kit attaches via USB to a PC allowing “ZERO” and “SPAN” range changes.
- Note that all pucks are supplied pre-programmed for specified range. Range is laser etched on housing - use caution if altering.

This device is available separately.

Section 6 - RTD Configurations

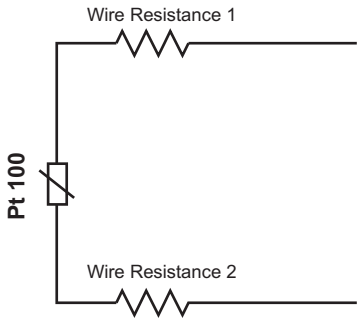
There are 3 major RTD wiring schemes, two wire, three wire, and 4 wire.

Two Wire RTD

The Figure to the left shows a two wire RTD configuration. A current source is applied to one of the wires and the circuit ground is connected to the other. The voltage generated is a function of the total resistance and the current (I) going through it.

V = I x (RTD + Wire Resistance 1 + Wire Resistance 2)
Temperature = f(V)

It can be seen in the calculation that the length of the wires connecting to the RTD affects the overall resistance, which will add an offset error to the temperature measurement.



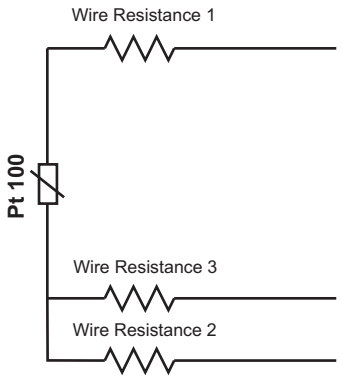
Three Wire RTD

The Figure to the left shows a 3 wire RTD. It is used to negate the errors created by wire resistances. This design requires two current sources (I1, I2), one applied to wire 1 and one applied to wire 3. The sum of the two current sources flow through wire 2.

The voltage at wire 1 will be:
VW1 = (I1 x WR1) + (I1 x RTD) + ((I1 + I2) x WR3)

The voltage at wire 3 will be:
VW3 = (I2 x WR3) + ((I1 + I2) x WR3)

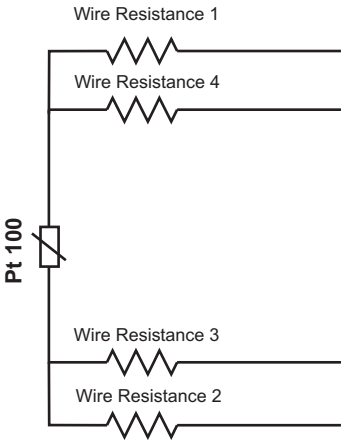
This method requires that the resistance of wire 1 and its connections is the same as wire 3 and its connections; VRTD is equal to VW3 - VW1. The effect of wire and connection resistance has been canceled.
Therefore this is a good choice for sensors with longer but equal lead lengths and good circuit connections.



Four Wire RTD

The 4 wire RTD uses only 1 current source. A current is injected through WR1, the RTD and WR2. WR4 and WR3 is connected to a very high impedance differential amplifier. Because there is no current flowing through WR3 and WR 4, there is no voltage drop across them and the amplifier inputs sees only the voltage directly across the RTD.

This method is not affected by the difference in wire and connection resistances. Therefore this is a good choice for sensors with non-equal lead lengths or with connections resistances that could change over time.



Section 6 - 100 Ohm RTD Curve (.00385 ohms / ohm / °C)

Degrees F	Degrees C	Ohms
0	-17.78	93.04
5	-15.00	94.12
10	-12.22	95.21
15	-9.44	96.31
20	-6.67	97.39
25	-3.89	98.48
30	-1.11	99.57
32	0.00	100
35	1.67	100.65
40	4.44	101.73
45	7.22	102.82
50	10.00	103.9
55	12.78	104.98
60	15.56	106.07
65	18.33	107.15
70	21.11	108.22

Degrees F	Degrees C	Ohms
75	23.89	109.31
80	26.67	110.38
85	29.44	111.45
90	32.22	112.53
95	35.00	113.61
100	37.78	114.68
105	40.56	115.76
110	43.33	116.83
115	46.11	117.9
120	48.89	118.97
125	51.67	120.04
130	54.44	121.11
135	57.22	122.17
140	60.00	123.24
145	62.78	124.31
150	65.56	125.37

Degrees F	Degrees C	Ohms
155	68.33	126.44
160	71.11	127.5
165	73.89	128.56
170	76.67	129.62
175	79.44	130.68
180	82.22	131.74
185	85.00	132.8
190	87.78	133.86
195	90.56	134.91
200	93.33	135.97
212	100.00	138.5
225	107.22	141.24
250	121.11	146.48
275	135.00	151.7
300	148.89	156.9

Section 7 - Warranty and Return Statement

These products are sold by the Anderson Instrument Company (Anderson-Negele) under the warranties set forth in the following paragraphs. Such warranties are extended only with respect to a purchase of these products, as new merchandise, directly from Anderson or from an Anderson distributor, representative or re-seller, and are extended only to the first buyer thereof who purchases them other than for the purpose of resale.

These products are warranted to be free from functional defects in materials and workmanship at the time the products leave the Anderson factory and to conform at that time to the specifications set forth in the relevant Anderson instruction manual or manuals, sheet or sheets, for such products for a period of one year.

THERE ARE NO EXPRESSED OR IMPLIED WARRANTIES WHICH EXTEND BEYOND THE WARRANTIES HEREIN AND ABOVE SET FORTH. ANDERSON MAKES NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE PRODUCTS.

Anderson shall not be liable for any incidental damages, consequential damages, special damages, or any other damages, costs or expenses with the exception of the cost or expense of repair or replacement as described above.

Products must be installed and maintained in accordance with Anderson instructions. Users are responsible for the suitability of the products to their application. There is no warranty against damage resulting from corrosion, misapplication, improper specifications or other operating conditions beyond our control. Claims against carriers for damage in transit must be filed by the buyer.

This warranty is void if the purchaser uses non-factory approved replacement parts and supplies, or if the purchaser attempts to repair the product themselves, or through a third party, without Anderson authorization.

Anderson's sole and exclusive obligation and buyer's sole and exclusive remedy under the above warranty is limited to repairing or replacing (at Anderson's option), free of charge, the products which are reported in writing to Anderson at its main office indicated below.

Anderson is to be advised of return requests during normal business hours, and such returns are to include a statement of the observed deficiency. The buyer shall prepay shipping charges for products returned, and Anderson, or its representative, shall pay for the return of the products to the buyer.

An RMA (Return Materials Authorization) MUST be obtained prior to the return of merchandise

Approved returns should be sent to:

ANDERSON - NEGELE
156 AURIESVILLE ROAD
FULTONVILLE, NY 12072 USA

ATTN: REPAIR DEPARTMENT - RMA Number Clearly Noted On Carton