

# TT176, TT246 RTD Transmitters



TT176 RTD Transmitter,  
current output



TT246 RTD Transmitter,  
voltage output

## Overview

Specify these rugged, accurate transmitters for process control and other industrial applications.

Model TT176 provides a linearized 4 to 20 mA current signal for long-distance transmission. It has a built-in LED indicator to monitor operation.

TT246 outputs 1 to 5 VDC proportional to temperature.

It draws only 3 mA of quiescent current, making it ideal for solar or battery powered systems.

- TT176: 4 to 20 mA current signal  
TT246: 1 to 5 VDC voltage signal
- 2 or 3-wire RTD input
- TT176: Factory Mutual (FM) approved intrinsically safe, nonincendive for hazardous locations
- Ambient rated to 85°C (185°F)
- Fits DIN "B" style connection heads
- Optional high-accuracy calibration to Minco RTDs for improved accuracy; see next page and page 5-22 for more information.

## Specifications

**Output:** Linear with temperature over specified range.

TT176: 4 to 20 mA

TT246: 1 to 5 VDC

**Calibration Accuracy:** ±0.1% of span (0.2% of span for spans less than 10 Ω)

**Linearity:** 0.1% of span, referenced to actual sensor temperature

**Adjustments** Zero and span, ±5% of span, non-interacting. Factory set.

**Ambient temperature:**

Operating: -40 to 85°C (-40 to 185°F)

Storage: -55 to 100°C (-67 to 212°F)

## Ambient temperature effects:

±0.009% of span per °C

±0.014% of span per °C for spans less than 10 Ω

## Warmup drift:

±0.1% of span max., with  $V_{supply} = 24$  VDC and  $R_{loop} = 250$  Ω.

Stable within 15 minutes.

## Supply voltage:

TT176: 10 to 35 VDC

TT246: 7.5 to 35 VDC

Voltage effect ±0.001% of span per volt.

Reverse polarity protected.

**Supply current (TT246) :** 3mA max. with no load.

**Maximum load resistance:** The maximum allowable resistance of the signal carrying loop is:

$$R_{loop\ max} = \frac{V_{supply} - 10}{0.020\ \text{amps}}$$

Example: With supply voltage 24 VDC, maximum loop resistance is 700 Ω.

**Minimum span:** 10°C (18°F).

**Minimum output current:** 2.2 mA.

**Maximum output current:** 28 mA.

**Leadwire compensation:** (3-wire RTD) ±0.05% of span per Ω up to 25 Ω in each leg.

**Hazardous atmospheres:** Both models may be used with Minco explosionproof connection heads. Model TT176 is also Factory Mutual (FM) approved nonincendive for use in Class I, Division 2 areas and intrinsically safe for Class I, Division 1 areas (requires approved barrier). Transmitter entity parameters:  $V_{max} = 35$  volts;  $I_{max} = 150$  mA;  $C_i = 0$  μF and  $L_i = 0$  mH.

**Connections:** Terminal block for wires AWG 22 to AWG 14.

**Physical:** Polycarbonate case, epoxy potted for moisture resistance.

**Weight:** 2.0 oz. (57 g).

*Specifications subject to change*

## RTD input types

2 or 3-wire resistance thermometer:

Element		Code
Platinum (0.00392 TCR)	100 Ω at 0°C	PA
Platinum (0.00391 TCR)	100 Ω at 0°C	PB
Platinum (0.00385 TCR)	100 Ω at 0°C	PD, PE
Platinum (0.00385 TCR)	1000 Ω at 0°C	PF
Platinum (0.00375 TCR)	1000 Ω at 0°C	PW
Copper (0.00427 TCR)	10 Ω at 25°C	CA
Nickel-iron (0.00518 TCR)	604 Ω at 0°C	FA
Nickel-iron (0.00527 TCR)	1000 Ω at 70°F	FB
Nickel-iron (0.00527 TCR)	2000 Ω at 70°F	FC
Nickel (0.00672 TCR)	120 Ω at 0°C	NA

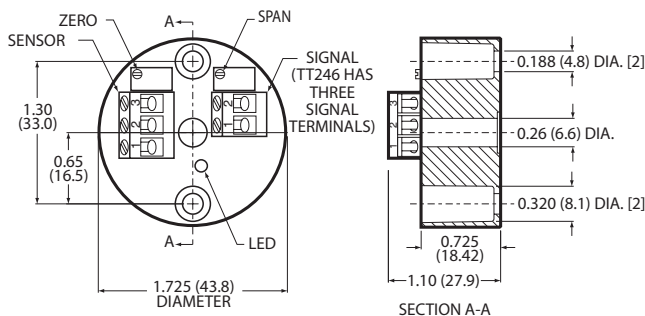
## Special high-accuracy calibration

For high system accuracy, specify transmitters with matched calibration. Temptrans match calibrated to a sensor are always ordered as assemblies. Common examples are shown in Section 2.

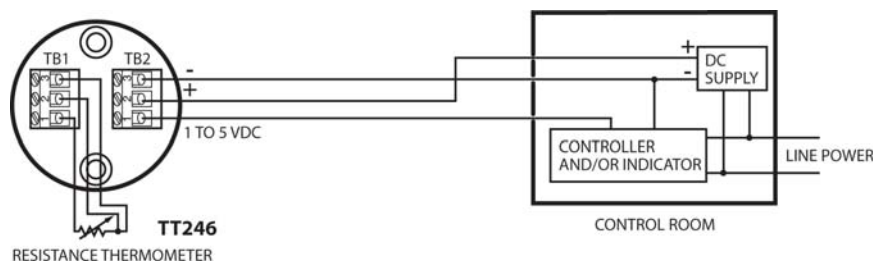
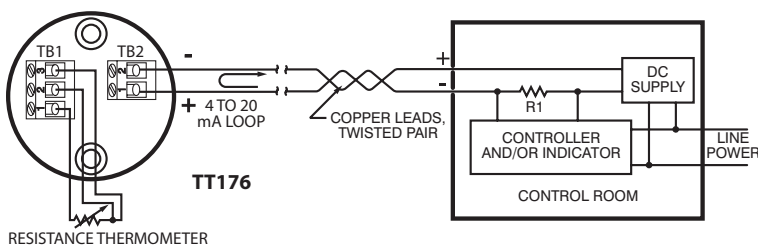
## Specification and order options:

TT176	Model Number: TT176: 4 to 20 mA TT246: 1 to 5 VDC
PB	RTD element code from table
1	
K	Temperature range code from tables below [Ex: K = 0 to 200°C (32 to 392°F)]
TT176PB1K = Sample part number	

## Dimensions in inches (mm)



## Wiring Diagrams



## Hazardous area requirements

Refer to Minco's Application Aid #19 entitled "Specifying Temperature Sensors for Hazardous Areas" for more information on how to classify a hazardous area, methods of protection, and the various standards and agencies (including FM, CSA, CENELEC and ATEX). Application Aid #19 is available at [www.mod-tronic.com](http://www.mod-tronic.com).

Specifications subject to change

# Temptran™ Temperature Ranges

Below is a list of commonly selected Temptran temperature ranges. The endpoints of the temperature range correspond to the Temptran's 4 and 20 mA signals. Choose the smallest possible span for best accuracy. Be sure to check the temperature limits of the sensor you specify.

If you do not find the temperature range required by your application, go to [www.mod-tronic.com](http://www.mod-tronic.com) for a complete list of temperature ranges. Custom ranges are also available for a small setup charge. Contact Mod-Tronic Sales and Customer Service for more information.

**For more temperature ranges (over 400 options) call Mod-Tronic at 1-800-794-5883**

Range code	Temperature Range				RTD Temptrons			Thermocouple Temptrons	
	Zero °F	Span °F	Zero °C	Span °C	TT111, TT115, TT211, TT829	TT176, TT246, TT220	TT190, TT221	TT205	
					Platinum elements*	Other elements	Elements	T/C types	T/C types
MH	-328	-148	-200.0	-100.0	PA PB PD PE				
HG	-325	100	-198.3	37.8	PA PB PD PE PF PW			JT	
QS	-300	150	-184.4	65.6			PA PB PD PE		
EZ	-148	32	-100.0	0.0	PA PB PD PE PF PW		PA PB PD PE		
LN	-148	212	-100.0	100.0	PA PB PD PE				
SA	-140	100	-95.6	37.8			PA PB PD PE		
UL	-103	752	-75.0	400.0				K	
M	-58	122	-50.0	50.0	PA PB PD PE PF PW		PA PB PD PE		
EO	-58	212	-50.0	100.0	PA PB PD PE	NA	PA PB PD PE	T	ET
JD	-58	302	-50.0	150.0	PA PB PD PE		PA PB PD PE	J	
MR	-58	500	-50.0	260.0			PA PB PD PE CA NA		
SD	-50	100	-45.6	37.8	PA PB PD PE				
MI	-50	150	-45.6	65.6	PA PB PD PE		PA PB PD PE	T	
AI	-50	275	-45.6	135.0	PA PB PD PE PF PW	FB FC FL NA	PA PB PD PE		
MS	-50	650	-45.6	343.3	PA PB PD PE		PA PB PD PE		
AD	-40	120	-40.0	48.9	PA PB PD PE	FB FC	PA PB PD PE		
AK	-40	140	-40.0	60.0	PA PB PD PE PU		PA PB PD PE		
BE	-40	160	-40.0	71.1	PA PB PD PE	FB	PA PB PD PE		
GH	-40	212	-40.0	100.0	PA PB PD PE		PA PB PD PE		
UE	-40	302	-40.0	150.0	PA PB PD PE		PA PB PD PE		
L	-30	120	-34.4	48.9	PA PB PD PE PF PW	FB FC			
AS	-30	130	-34.4	54.4	PA PB PD PE PF PW	FB	PA PB PD PE		
R	-30	150	-34.4	65.6	PA PB PD PE	FB FC	PA PB PD PE		
DN	-22	122	-30.0	50.0	PA PB PD PE		PA PB PD PE		
EE	-22	302	-30.0	150.0	PA PB PD PE		PA PB PD PE		
DO	-20	120	-28.9	48.9	PA PB PD PE PF PW	ND	PA PB PD PE		
EN	-20	140	-28.9	60.0	PA PB PD PE PF PW	FB	PA PB PD PE		
B	-20	180	-28.9	82.2	PA PB PD PE	FB FC NA	PA PB PD PE CA		
BP	-4	104	-20.0	40.0	PA PB PD PE	FC	PA PB PD PE		
SH	-4	122	-20.0	50.0	PA PB PD PE				
DB	-4	212	-20.0	100.0	PA PB PD PE		PA PB PD PE		
JZ	0	65	-17.8	18.3	PA PB PD PE		PA PB PD PE		
S	0	100	-17.8	37.8	PA PB PD PE PF PG PW	FB	PA PB PD PE PW		
JH	0	120	-17.8	48.9	PA PB PD PE PF PW	FC	PA PB PD PE		
HD	0	130	-17.8	54.4	PA PB PD PE PF PW		PA PB PD PE		
DV	0	150	-17.8	65.6	PA PB PD PE	FB	PA PB PD PE		
EI	0	160	-17.8	71.1	PA PB PD PE				
AC	0	200	-17.8	93.3	PA PB PD PE PF PW	FB NA	PA PB PD PE CA	EJKT	T
EY	0	250	-17.8	121.1	PA PB PD PE PF PW	NA	PA PB PD PE	JK	JKT
AN	0	300	-17.8	148.9	PA PB PD PE PF PW	FB FC NA	PA PB PD PE CA NA	EJKT	K
JA	0	350	-17.8	176.7	PA PB PD PE		PA PB PD PE	KJ	
DS	0	400	-17.8	204.4	PA PB PD PE	NA	PA PB PD PE CA NA	JK	
AG	0	500	-17.8	260.0	PA PB PD PE PF PW	NA	PA PB PD PE CA	EJT	JKT
QN	0	550	-17.8	287.8	PA PB PD PE		PA PB PD PE		
AB	0	600	-17.8	315.6	PA PB PD PE PF PW	NA	PA PB PD PE	EJK	J
AA	0	800	-17.8	426.7	PA PB PD PE PF PW		PA PB PD PE	J	JK
BZ	0	1000	-17.8	537.8	PA PB PD PE		PA PB PD PE	JK	EJ

\* Element codes (PA, PB, PD, PE, etc.) are defined in the Resistance/Temperature Tables on page 1-13

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Range code	Temperature Range				RTD Temptrans				Thermocouple Temptrans	
	Zero °F	Span °F	Zero °C	Span °C	TT111, TT115, TT211, TT829		TT176, TT246, TT220		TT190, TT221	TT205
					Platinum elements*	Other elements	Elements		T/C types	T/C types
HU	0	1300	-17.8	704.4					K	
BY	14	104	-10.0	40.0	PA PB PD PE		PA PB PD PE			
AJ	14	122	-10.0	50.0	PA PB PD PE		PA PB PD PE			
AP	20	70	-6.7	21.1	PA PB PD PE PF PW		PA PB PD PE			
GV	20	100	-6.7	37.8	PA PB PD PE PF PW		PA PB PD PE			
A	20	120	-6.7	48.9	PA PB PD PE PF PW	FA FB FC NA	PA PB PD PE PF			
HE	20	240	-6.7	115.6	PA PB PD PE					
AF	20	320	-6.7	160.0	PA PB PD PE	FA FB				
QE	22	122	-5.6	50.0	PA PB PD PE					
GW	23	131	-5.0	55.0	PA PB PD PE					
U	30	80	-1.1	26.7	PA PB PD PE PF PW	FB FC	PA PB PD PE			
DA	30	90	-1.1	32.2	PA PB PD PE PF PW	FC	PA PB PD PE			
DP	30	100	-1.1	37.8	PA PB PD PE PF PW					
BI	30	130	-1.1	54.4	PA PB PD PE PF PW		PA PB PD PE PF PW			
DQ	30	150	-1.1	65.6	PA PB PD PE	FB	PA PB PD PE			
KK	30	180	-1.1	82.2	PA PB PD PE					
EV	30	230	-1.1	110.0	PA PB PD PE		PA PB PD PE			
BN	30	240	-1.1	115.6	PA PB PD PE PF PW	FB	PA PB PD PE			
BJ	30	250	-1.1	121.1	PA PB PD PE PF PW	NA	PA PB PD PE FA			
GQ	32	100	0.0	37.8	PA PB PD PE PF PW		PA PB PD PE			
EG	32	104	0.0	40.0	PA PB PD PE PF PW		PA PB PD PE			
N	32	122	0.0	50.0	PA PB PD PE PF PW	FB FC	PA PB PD PE			
HL	32	167	0.0	75.0	PA PB PD PE		PA PB PD PE			
C	32	212	0.0	100.0	PA PB PD PE PF PW	FB FC NA	PA PB PD PE CA NA	JT		
QR	32	257	0.0	125.0	PA PB PD PE					
DL	32	280	0.0	137.8	PA PB PD PE		PA PB PD PE			
J	32	302	0.0	150.0	PA PB PD PE PF PU PW	FC NA	PA PB PD PE CA	J		J
K	32	392	0.0	200.0	PA PB PD PE PU	NA	PA PB PD PE CA	JK		J
LX	32	400	0.0	204.4	PA PB PD PE					
BW	32	482	0.0	250.0	PA PB PD PE	NA	PA PB PD PE	EJKT		J
LF	32	572	0.0	300.0	PA PB PD PE		PA PB PD PE	JT		
JW	32	932	0.0	500.0	PA PB PD PE		PA PB PD PE	JK		K
HA	32	1112	0.0	600.0	PA PB PD PE PF PW			K		
GF	32	1472	0.0	800.0	PA PB PD PE		PA PB PD PE	K		K
SG	33.8	123.8	1.0	51.0	PA PB PD PE					
H	40	90	4.4	32.2	PA PB PD PE PF PW	FB	PA PB PD PE			
BU	40	100	4.4	37.8	PA PB PD PE PF PW					
QL	40	120	4.4	48.9	PF PW	FC				
BK	40	140	4.4	60.0	PA PB PD PE PF PW	FB	PA PB PD PE			
KH	40	240	4.4	115.6	PA PB PD PE PF PW		PA PB PD PE			
KP	42	92	5.6	33.3	PA PB PD PE					
DU	45	95	7.2	35.0	PA PB PD PE		PA PB PD PE			
DX	50	100	10.0	37.8	PA PB PD PE PF PW		PA PB PD PE			
AH	50	110	10.0	43.3	PA PB PD PE	FB	PA PB PD PE			
ED	50	120	10.0	48.9	PA PB PD PE PF PW	FB				
V	50	150	10.0	65.6	PA PB PD PE PF PW	FA FB NA	PA PB PD PE			
AV	50	230	10.0	110.0	PA PB PD PE PF PW		PA PB PD PE	J		
BF	50	250	10.0	121.1	PA PB PD PE PF PW		PA PB PD PE PF PW	ET		
AO	50	300	10.0	148.9	PA PB PD PE		PA PB PD PE CA FA			
KF	50	400	10.0	204.4	PA PB PD PE		PA PB PD PE			
D	70	220	21.1	104.4	PA PB PD PE PF PW	FB FC	PA PB PD PE			
E	100	500	37.8	260.0	PA PB PD PE PF PW		PA PB PD PE			
BH	122	302	50.0	150.0	PA PB PD PE		PA PB PD PE	T		
BL	200	500	93.3	260.0	PA PB PD PE PF PW			K		

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