

TH1M, TH2M

General

The one channel amplifier TH1M outputs one voltage which is proportional to the connected type K thermocouple's temperature. The dual channel amplifier TH2M outputs two voltages which are proportional according to the connected two type K thermocouple's temperatures.

The amplifiers amplify the voltage difference which is caused by the difference between the thermocouple's temperature and the amplifier's temperature. The amplifier's temperature is internally measured and the output signal is correspondingly compensated.

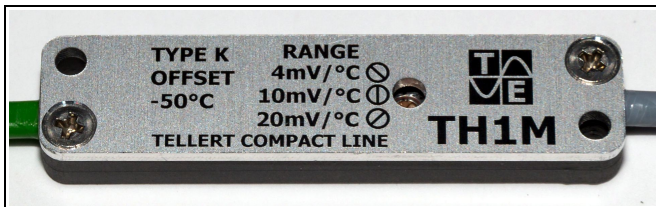


Figure 1: Thermocouple amplifier TH1M.

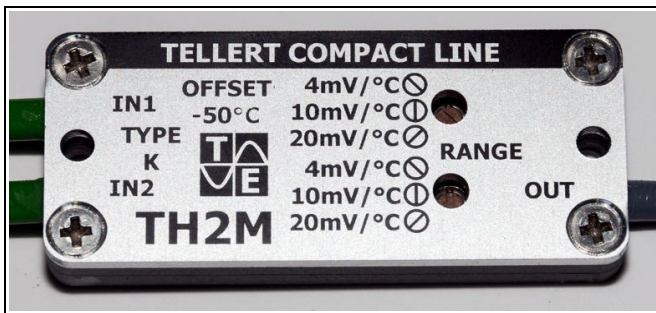


Figure 2: Thermocouple amplifier TH2M.

Output Signal

Each of the channels may work in one of three temperature ranges, where each temperature range has its own signal amplification a .

Range R	Ampl. $a(R)$	$T_{min}(R)$	$T_{max}(R)$
1	4 mV/°C	-25 °C	1150 °C
2	10 mV/°C	-40 °C	430 °C
3	20 mV/°C	-45 °C	190 °C

Depending on the temperature range R and the thermocouple's temperature T , the output voltage U_O is defined as $U_O(T) = a(R) \cdot (T + 50 \text{ °C})$.

The output voltage range is from 0.1 V to 4.8 V. Negative voltages may not appear in standard applications since they indicate either temperatures below -50 °C or a thermocouple defect.

TH1M and TH2M do not correct the linearity error of the type K thermocouples. TH1M and TH2M are calibrated for range $R=2$ at 0 °C and 300 °C . Within this range

the amplifier has a maximal absolute error (incl. thermocouples' linearity errors) of 3 °C . If not working within this range, the measurement error is received by taking both, the maximal absolute error of the internal temperature compensation ($= 2 \text{ °C}$) and the maximal relative error of the amplifier ($= 1 \%$) into account.

Setup of TH1M/TH2M

The range is selected by the corresponding switch position. The offset voltage can be fine-tuned with a potentiometer which is covered by the lid.

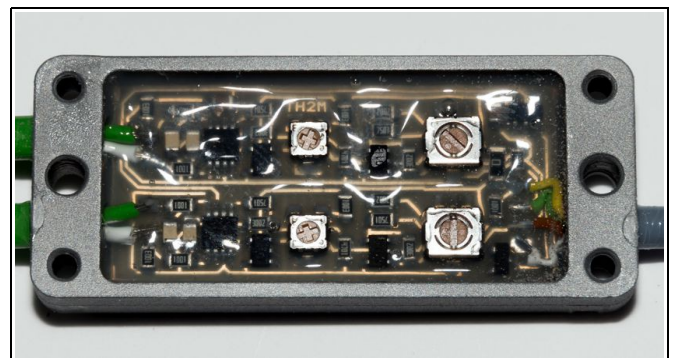


Figure 3: Open thermocouple amplifier TH2M.

TEMES Parameters (General)

The parameters which are used by TEMES to define a linear relationship between physical value p and input signal v are not (as commonly used) polynomial coefficients. Instead, TEMES uses two distinct points $P_0 = (v_0, p_0)$ and $P_1 = (v_1, p_1)$ of a two dimensional space, which is spanned by the input signal and the physical value. The relationship is then given by the line through these two points. The coordinates of the two points are given by the first physical value p_0 , the corresponding input signal v_0 , the second physical value p_1 and the corresponding input signal v_1 . Note that p_1 must not equal p_0 and v_1 must not equal v_0 .

Factor m and offset t are used to describe the linear relationship with polynomial coefficients. Thus, $p(v) = m \cdot v + t$.

Factor, Offset	Example for two points
$m = \frac{p_1 - p_0}{v_1 - v_0}$ $t = p_0 - m \cdot v_0$	$P_0: v_0 = 0, p_0 = t$ $P_1: v_1 = 1, p_1 = m + t$

TEMES Parameters (TH2M)

Range R	$p_0(R)$	$v_0(R)$	$p_1(R)$	$v_1(R)$
1 (= 1150 °C)	0 °C	0.2 V	300 °C	1.4 V
2 (= 430 °C)	0 °C	0.5 V	300 °C	3.5 V
3 (= 190 °C)	0 °C	1 V	150 °C	4 V

Pin Assignment

OUT: This plug is manufactured by Binder (Binder Series 719). It supplies the amplifier with voltage and outputs the temperature dependent voltages.

Pin	Assignment [Wire color]
1	Supplying voltage (7 V to 16 V DC) [white]
2	Ground (0 V) [brown]
3	Output channel 1 [green]
4	[TH2M only:] Output channel 2 [yellow]
5	(unused)

Mechanical Specification

Box Dimensions:	TH1M: 56 mm x 13 mm x 8 mm TH2M: 52 mm x 22 mm x 8 mm
Weight:	TH1M: 27 g TH2M: 41 g
Cable IN1/IN2:	Length: about 6 cm
Cable OUT:	Length: about 46 cm
Box Protection:	Splash-proof
Switches:	Slot width: 1.8 mm

The boxes are stackable with M3 screws.