

# TH16MICAN2

## General

The multiplexed thermocouple amplifier *TH16MICAN2* outputs CAN signals/messages which are proportional to the currently selected type-K-thermocouple's temperature. Up to 16 thermocouples of type K with miniature plug can be connected to the *TH16MICAN2*. These thermocouples are electrically isolated.

The *TH16MICAN2* amplifies the voltage difference which is caused by the thermocouple's temperature and the temperature of the amplifier *TH16MICAN2*. Since the absolute temperature of the thermocouple is subject of interest, the temperature of the *TH16MICAN2* is internally measured and the internal output signal is correspondingly compensated.

The selection of measurement range and channel number is done by the integrated controller unit. The controller unit transmits an 8-bit multiplex code to the integrated *TH16MI* and stops A/D conversion for a settling time of usually 20 ms.

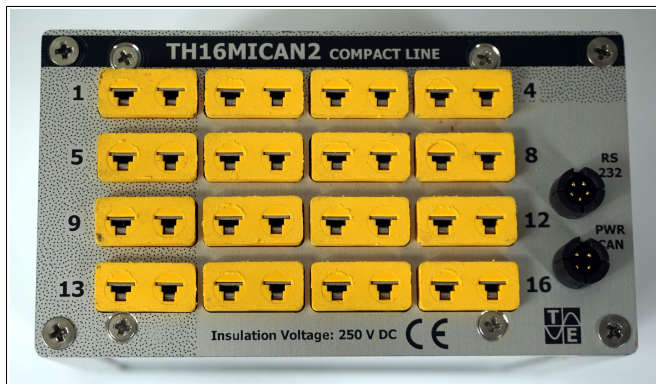


Figure 1: Thermocouple Amplifier *TH16MICAN2*.

## Temperatures

The *TH16MICAN2* compensates the linearity error of the type-K-thermocouples. It is calibrated for range  $R = 12$  at 0 °C and 300 °C. The typical maximal error is the maximum of the absolute error of 3 °C and relative error of 1 % (assuming the *TH16MICAN2* is configured in the optimal range for the actual temperature).

Range $R$	$T_{min}(R)$ in °C	$T_{max}(R)$ in °C
1	66.7	1372.0
2	50.3	1200.0
3	40.4	943.7
4	20.4	474.0
5	10.2	240.5
6	6.8	159.3
7	5.1	119.1
8	4.1	95.4

Range $R$	$T_{min}(R)$ in °C	$T_{max}(R)$ in °C
9	17.0	1372.0
10	0.0	1144.9
11	-10.4	892.6
12	-31.7	426.0
13	-42.8	189.0
14	-46.5	109.0
15	-48.4	70.0
16	-49.5	46.3

## Multiplex Code

The 8-bit multiplex code contains the measurement range  $R$  in its most significant nibble and the channel number  $C$  in its least significant nibble.

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
$R_3$	$R_2$	$R_1$	$R_0$	$C_3$	$C_2$	$C_1$	$C_0$

with range  $R = 1 + \sum_{i=0}^3 R_i \cdot 2^i$ , and

with channel number  $C = 1 + \sum_{i=0}^3 C_i \cdot 2^i$

## CAN

### CAN default settings

CAN library	TH16MI
CAN baud rate	500 kbps
CAN sample point	80 %
Message basis ID	100h (11-bit std ID)
Message IDs	100h ... 104h

### Bit numbering

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
7...0	15...8	23...16	31...24	39...32	47...40	55...48	63...56

A *TH16MICAN2* CAN signal allocates the bit range (within the CAN message) from its start bit to start bit + bit length - 1. The bit numbering corresponds to the weight of the bits of an unsigned 64-bit number (with Intel byte order).

**Message TH16MI1** (ID: base ID + 0 = 100h / Length: 3 bytes / Repetition rate: after each correctly obtained sample)

S'	D L	Description
0	u8	<b>TH16MI1_MultiplexCode:</b> Multiplex code which was used for the following temperature.
8	u16	<b>TH16MI1_MultiplexedTemperature:</b> Multiplexed temperature with a resolution of 0.1 °C per bit and a bit offset of -60 °C.

**Message TH16MI2** (ID: base ID + 1 = 101h / Length 8 bytes / Repetition rate: after each correctly obtained temperature for T1...T4.

S	D L	Description
0	u16	<b>TH16MI2_T1:</b> Temperature T1 with a resolution of 0.1 °C per bit and a bit offset of -60 °C.
16	u16	<b>TH16MI2_T2:</b> Temperature T2 with a resolution of 0.1 °C per bit and a bit offset of -60 °C.
32	u16	<b>TH16MI2_T3:</b> Temperature T3 with a resolution of 0.1 °C per bit and a bit offset of -60 °C.
48	u16	<b>TH16MI2_T4:</b> Temperature T4 with a resolution of 0.1 °C per bit and a bit offset of -60 °C.

**Message TH16MI3** (ID: base ID + 2 = 102h / Length 8 bytes / Repetition rate: after each correctly obtained temperature for T5...T8.

S	D L	Description
0	u16	<b>TH16MI3_T5:</b> Temperature T5 with a resolution of 0.1 °C per bit and a bit offset of -60 °C.
16	u16	<b>TH16MI3_T6:</b> Temperature T6 with a resolution of 0.1 °C per bit and a bit offset of -60 °C.
32	u16	<b>TH16MI3_T7:</b> Temperature T7 with a resolution of 0.1 °C per bit and a bit offset of -60 °C.
48	u16	<b>TH16MI3_T8:</b> Temperature T8 with a resolution of 0.1 °C per bit and a bit offset of -60 °C.

**Message TH16MI4** (ID: base ID + 3 = 103h / Length 8 bytes / Repetition rate: after each correctly obtained temperature for T9...T12.

S	D L	Description
0	u16	<b>TH16MI4_T9:</b> Temperature T9 with a resolution of 0.1 °C per bit and a bit offset of -60 °C.
16	u16	<b>TH16MI4_T10:</b> Temperature T10 with a resolution of 0.1 °C per bit and a bit offset of -60 °C.
32	u16	<b>TH16MI4_T11:</b> Temperature T11 with a resolution of 0.1 °C per bit and a bit offset of -60 °C.
48	u16	<b>TH16MI4_T12:</b> Temperature T12 with a resolution of 0.1 °C per bit and a bit offset of -60 °C.

**Message TH16MI5** (ID: base ID + 4 = 104h / Length 8 bytes / Repetition rate: after each correctly obtained temperature for T13...T16.

S	D L	Description
0	u16	<b>TH16MI5_T13:</b> Temperature T13 with a resolution of 0.1 °C per bit and a bit offset of -60 °C.
16	u16	<b>TH16MI5_T14:</b> Temperature T14 with a resolution of 0.1 °C per bit and a bit offset of -60 °C.
32	u16	<b>TH16MI5_T15:</b> Temperature T15 with a resolution of 0.1 °C per bit and a bit offset of -60 °C.
48	u16	<b>TH16MI5_T16:</b> Temperature T16 with a resolution of 0.1 °C per bit and a bit offset of -60 °C.

## Pin Assignment

The plugs of the *TH16MICAN2* are manufactured by *Binder* and part of *Binder Series 719*. The plug pins (in front view) are numbered anti-clockwise starting with the first pin after 12 o'clock position. The first pin is respectively labeled at the solder side (back view).

**PWR/CAN:** This plug supplies the *TH16MICAN2* with voltage and connects the *TH16MICAN2* to a CAN.

Pin	Assignment	Old Wire Color	Wire Color
1	Supplying voltage $U_B$ (10 V to 16 V DC)	Red	Brown
2	Ground	Brown	White
3	CAN_L (CAN)	Black	Blue
4	CAN_H (CAN)	Orange	Black

- 1 S: start bit  
 D: data type (u – unsigned Intel / s – signed Intel)  
 L: bit length

**RS232:** This plug provides a serial port.

Pin	Assignment	9-pin SUB-D plug of host PC
1	TX1	Pin 2
2	Ground	Pin 5
3	RX1	Pin 3
4	Not connected	
5	Not connected	

## Technical Data

Power supply:	10 V to 16 V DC
Current consumption:	typical 90 mA at 12 V DC
Insulation voltage:	250 V DC
Settling time:	20 ms
Box size without plugs:	100 mm x 56 mm x 70 mm
Weight:	typical 360 g