MU-Thermocouple1 CAN

Temperature Measurement Unit with CAN Connection

User Manual

PEAK System

Products taken into account

Product Name	Model	Item Number
MU-Thermocouple1 CAN (MU-TC1 CAN)	Metal-cased measuring unit with 8 measuring channels	IPEH-002205

The cover page shows the product MU-TC1 CAN with thermocouple connectors for the type J (black). Versions with assemblies for other thermocouple types have an identical casing design.

Attention! Follow the safety instructions in section 3.1 on page 10 that also refer to the warning sign printed on the unit casing.

PEAK-System Technik GmbH
Otto-Roehm-Strasse 69
64293 Darmstadt
Germany

Phone: +49 (0)6151 8173-20
Fax: +49 (0)6151 8173-29

www.peak-system.com
info@peak-system.com

Issued 2009-02-16

Contents

1 Introduction

The measuring unit Thermocouple1 MU-CAN (short: MU-TC1 CAN) provides terminals for 8 thermocouples for various temperature ranges. The readings are preprocessed by a microcontroller and then transmitted via CAN bus. The corresponding configuring is done with a Windows program on a computer that is connected to the same CAN bus.

1.1 Properties at a Glance

- 8 sockets for thermocouple types J, K, and T (depending on assembly at delivery)
- 4 galvanically isolated measuring modules, each with 2 thermocouple sockets of the same type
- Measurement accuracy: 0.2 %
- Precision of the reference sensors: ±0.5 K at +25 °C
- Temperature resolution at CAN communication: 1/16 K
- Preprocessing of readings possible with integrated microcontroller, e.g. with hysteresis curve, characteristic curve, or mathematical functions (software available on application)
- High-speed CAN connection (ISO 11898-2) for data transfer and configuring
- Metal casing with attachment grooves and connectors on the front panel

1.2 Prerequisites for the Operation

The following prerequisites must be given, so that the measuring unit can be used properly:

- Power supply 12 V DC nominal (6 - 32 V possible), connected via supplied mating connector

For configuring of the measuring unit via CAN:

- Computer with Windows Vista, XP SP2, or 2000 SP4
- CAN interface of the PCAN series for the computer (e.g. PCAN-USB or PCAN-PCI)
- Installed device driver for the CAN interface
- CAN connection between the computer and the measuring unit

1.3 Scope of Supply

The scope of supply normally consists of the following parts:

- Measuring unit MU-TC1 CAN in an aluminum casing
- Mating connector for the power supply
- CD with software and documentation

2 Connectors

This chapter deals with all connectors on the measuring unit.

2.1 Thermocouple Sockets

The measuring unit MU-TC1 CAN supports the following types of thermocouples (according to the assembly of the measuring unit):

Type	Color (IEC 584)	Temperature range
J	black	-210 - +1121 °C
K	green	-200 - +1370 °C
T	brown	-200 - +400 °C

The connection is done with a 2-pin standard thermocouple connector according to DIN EN 50212. The color of the thermocouple socket shows the thermocouple type to be used according to the standard IEC 584 (see table above).

Note: Connecting the wrong type of thermocouple leads to measurement errors.

Due to the different sizes of pins on a thermocouple connector a reverse polarity protection is ensured.

Figure 1: Standard connector for a thermocouple

2.2 CAN (D-Sub Connector)

A High-speed CAN bus (ISO 11898-2) is connected to the 9-pin D-Sub connector. The pin assignment corresponds to the CiA recommendation 102 DS.

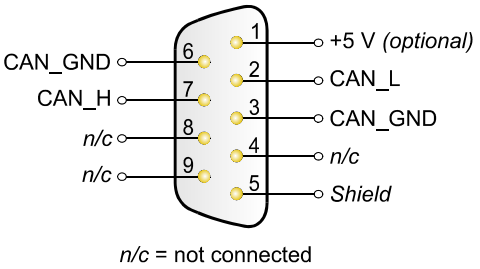

Figure 2: Pin assignment High-speed CAN bus
(view onto the male D-Sub connector of the measuring unit)

2.3 Supplying External Devices via the CAN Connector

A 5-Volt supply can be routed to pin 1 of the D-Sub CAN connector by setting a solder bridge on the controller board of the measuring unit. Thus external devices with low power consumption (e.g. bus converters) can be directly supplied via the CAN connector.

The 5-Volt supply is connected to the power supply of the measuring unit and is not fused separately. For galvanic isolation the measuring unit contains an interconnected DC/DC converter. Therefore the current output is limited to 100 mA.

Attention! Risk of short circuit! The measuring unit's electronics or connected electronics may be damaged.

If the option described in this section is activated, you may only connect or disconnect CAN cables or peripheral devices (e.g. bus converters) to or from the measuring unit while it is disconnected from the power supply (de-energized).

Do the following to activate the 5-Volt supply at the CAN connector:

1. Take off any connected cable from the measuring unit.
2. Remove the four screws on the front panel in order to detach it.
3. Pull out the right board (has the D-Sub connector) of the casing.
4. On the bottom side of the board set a solder bridge on the position as marked in the following figure. During this procedure take especially care not to produce unwanted short circuits on the board.

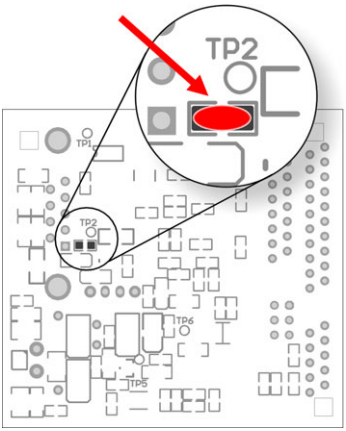

Figure 3: Position of the solder bridge on the bottom side of the controller board

2.4 Power Supply Socket

The measuring unit is operated with 12 V DC, 6 to 34 V are possible. The connection is done with the supplied mating connector for fastening cable strands. The polarity is as follows:

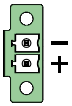

Figure 4: Connection for the power supply
at the lower right part of the front panel

3 Use

3.1 Safety Instructions

Attention! Danger due to electric shock! Risk of destroying the measuring unit!

You may only measure temperatures on energized parts, when these are not directly connected with the mains voltage (measuring category CAT I). The measuring unit must not be used in the measuring categories CAT II, CAT III, or CAT IV.

Never apply a voltage higher than 30 V between thermocouples or between a thermocouple and earth.

Attention! Risk of burns!

At ambient temperatures of +70 °C (+158 °F) and above a protection against contact must be ensured for the measuring unit, i.e. the surface may no longer be tangible.

3.2 Operation with Default Configuration

At delivery the measuring unit is provided with a default configuration which allows you to start measuring and acquire the measuring data via CAN instantly without further adaptations.

Tip: If you have advanced demands, you can reconfigure the measuring unit (see chapter 4 on page 12).

3.2.1 CAN Data

With the default configuration the measuring values of the eight measuring channels are transmitted via CAN as follows:

Property	Value
CAN IDs	100h, 101h
Data bytes	2 per measuring channel (8 per CAN message)
Contents per measuring channel	16-bit value: 16th °C
Data mode	Intel (Little Endian) signed
CAN transfer rate	500 kBit/s
Transmission period	300 ms

Data byte in ID 100h	Measuring channel
1 - 2	1A
3 - 4	1B
5 - 6	2A
7 - 8	2B

Data byte in ID 101h	Measuring channel
1 - 2	3A
3 - 4	3B
5 - 6	4A
7 - 8	4B

3.2.2 Status LEDs

LED position	The LED …	Meaning
Thermocouple socket	shines red	An intact thermocouple is connected. If despite an connected thermocouple the corresponding LED should not shine, the cable or the thermocouple may not be all right.
Power supply connector	blinks green (1 Hz)	Normal operation of the microcontroller unit
	blinks green quickly (2 Hz)	Missing configuration. Send a configuration to the measuring unit via CAN (see chapter 4 Configuring the Measuring Unit on page 12).

4 Configuring the Measuring Unit

If the default configuration for measuring data transmission as described in section 3.2 doesn't fit your needs, you can configure the measuring unit MU-TC1 CAN with Windows software via a CAN connection.

Two kinds of configuring are possible:

- Simple configuring with the program Thermocouple Configuration
- Advanced configuring (software available on request)

The possible settings are described in the corresponding sections.

4.1 Prerequisites for Configuring via CAN

The following prerequisites must be given, so that you can use a configuration program:

- Computer with Windows Vista, XP SP2, or 2000 SP4
- CAN interface of the PCAN series for the computer (e.g. PCAN-USB or PCAN-PCI)
- Installed device driver for the CAN interface
- CAN connection between the computer and the measuring unit

4.2 Simple Configuring

With the help of the supplied Windows program Thermocouple Configuration you can easily change the following settings regarding the measuring data:

- Block-wise assignment of CAN IDs to the measuring channels 1A to 2B and 3A to 4B
- Transmission periods for both CAN IDs
- Data type and format for each measuring channel (signed/unsigned, Intel/Motorola)
- Scaling of measuring values for each measuring channel (scale, offset)
- Similar options for the four measuring values of the reference sensors in the measuring unit

4.2.1 Starting Thermocouple Configuration

The program doesn't require an extra installation and can directly be started from the supplied CD.

Do the following to start Thermocouple Configuration:

1. Insert the supplied CD into the appropriate drive of the computer.
2. The navigation program starts automatically after a short moment. If not, start the program `Intro.exe` from the root directory of the CD manually.
3. Under **English** > **Tools** > **Thermocouple Configuration** select the command **Start**.

Alternatively, you can copy the contents of the CD directory `\Tools\Thermocouple` to an arbitrary place of a local hard disk and execute the program `TConfig.exe` there.

4.2.2 Doing Simple Configuring

The program Thermocouple Configuration guides you through the configuring procedure step by step. The created configuration may not only be sent to the measuring unit but also saved on a data carrier (CANdb format). Further more you can use a saved configuration as basis for a new one, or send it without any changes to the measuring unit.

4.3 Advanced Configuring

Some functions of the measuring unit may also be configured more detailed. For example, you can apply hysteresis functions, characteristic curves, and other simple as well as more complex conversion and composition functions to the measuring values of the thermocouple inputs and the reference sensors. Further more there are options for individually activating the LEDs and for adapting the transmission parameters of the CAN bus to special applications.

The required software is not part of the delivery scope but available on request (contact data: see on page 2).

5 Technical Specifications

Measuring modules	
Supported thermocouple types (IEC 584)	J (-210 - +1121 °C) K (-200 - +1370 °C) T (-200 - +400 °C) (according to equipment)
Connectors	Thermocouple socket with standard size (DIN EN 50212)
Reference sensors	4 (1 per measuring module having 2 sockets)
Measuring category	CAT I (only electric circuits that are not connected to the mains)
Measurement accuracy	±0,2 %
Accuracy of the reference sensors	±0,5 K at +25 °C ±1 K at 0 - +70 °C ±2 K at -20 - +85 °C ±3 K at -40 - +125 °C

Controller module	
Microcontroller	Philips/NXP LPC2364
Temperature resolution at CAN transmission	1/16 K

CAN	
Specification	ISO 11898-2 High-speed CAN (up to 1 MBit/s) 2.0A (standard format) and 2.0B (extended format)
Transceiver	NXP (Philips) TJA1040T
Connection	D-Sub (m), 9 pins, pin assignment according to CiA recommendation 102 DS Optional 5-Volt supply at pin 1 for external devices (e.g. bus converters), max. 100 mA Galvanic isolation up to 500 V

Continued on the next page

Supply	
Supply voltage	Nominal 12 V DC (6 - 34 V possible)
Current consumption	ca. 100 mA at 12 V

Measures	
Size (incl. mounting plate and connectors)	130 x 60 x 73 mm (5 1/8 x 2 3/8 x 2 7/8 inches) (W x H x D) See also dimension drawings, Appendix B on page 18
Weight	420 g (14.8 oz.)

Environment	
Operating temperature	-40 – +85 °C (-40 – +185 °F)
Temperature for storage and transport	-40 – +100 °C (-40 – +212 °F)
Relative humidity	15 – 90 %, not condensing
EMC	DIN EN 61326-1 EC directive 2004/108/EG
Safety	EN 61010-1 + Amendments 1 and 2

Appendix A CE Certificate

MU-Thermocouple1 CAN IPEH-002205 – EC Declaration of Conformity
PEAK-System Technik GmbH

Notes on the CE Symbol CE

The following applies to the MU-Thermocouple1 CAN product IPEH-002205

EC Directive

This product fulfills the requirements of EC directive 2004/108/EG on "Electromagnetic Compatibility" and is designed for the following fields of application as per the CE marking:

Electromagnetic Immunity/Emission
DIN EN 61326-1; publication date: 2006-10
Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements (IEC 61326-1:2005);

German version EN 61326-1:2006

Declarations of Conformity

In accordance with the above mentioned EU directives, the EC declarations of conformity and the associated documentation are held at the disposal of the competent authorities at the address below:

PEAK-System Technik GmbH
Mr. Wilhelm
Otto-Roehm-Strasse 69
64293 Darmstadt
Germany

Phone: +49 (0)6151 8173-20
Fax: +49 (0)6151 8173-29
info@peak-system.com

Signed this 15th day of January 2009

Appendix B Dimension Drawings

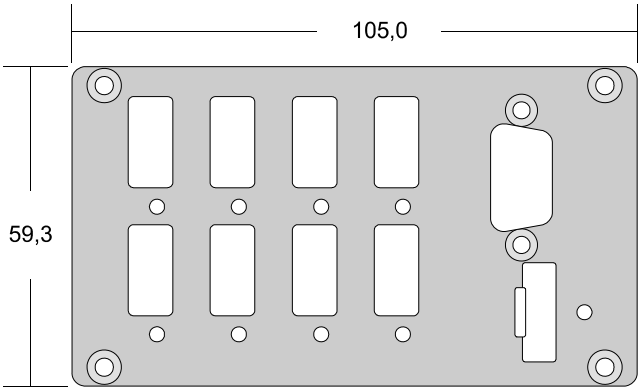

Figure 5: Front panel size

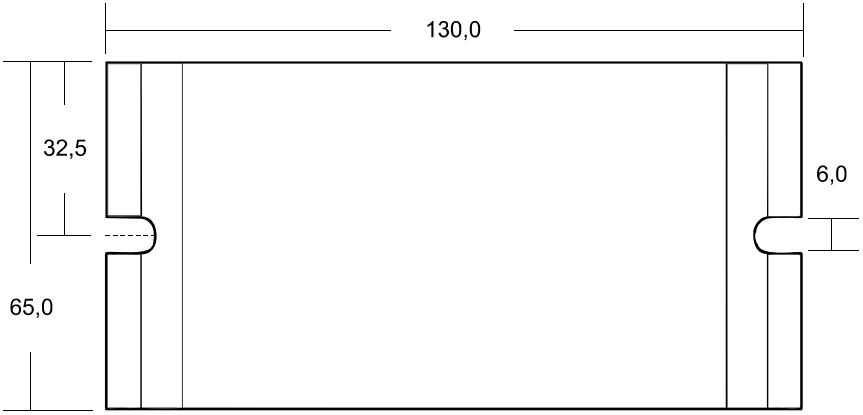

Figure 6: Mounting plate size

All data in millimeters (mm). The figures don't show the original size.