

# User Manual

C887T0036, valid for C-887.MC2

BRo, 6/25/2019



## C-887.MC2 Manual Control Unit

USB device for use with C-887 hexapod controller or PC with PIMikroMove



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## About this Document

### Symbols and Typographic Conventions

The following symbols and typographic conventions are used in this user manual:

#### CAUTION



##### Dangerous situation

If not avoided, the dangerous situation will result in minor injury.

- Actions to take to avoid the situation.

#### NOTICE



##### Dangerous situation

If not avoided, the dangerous situation will result in damage to the equipment.

- Actions to take to avoid the situation.

#### INFORMATION

Information for easier handling, tricks, tips, etc.

The following symbols and markings are used in the user manuals of PI:

Symbol	Meaning
1.	Action consisting of several steps whose sequential order must be observed
2.	
➤	Action consisting of one or several steps whose sequential order is irrelevant
▪	List item
S. 5	Cross-reference to page 5
SVO?	Command line or command from PI's General Command Set (GCS) (example: command to get the servo mode)
RS-232	Operating element labeling on the product (example: socket of the RS-232 interface)
Device S/N	Parameter name (example: parameter where the serial number is stored)
Start > Settings	Menu path in the PC software (example: to open the menu, the Start and Settings buttons must be clicked in succession)
5	Value that must be entered or selected via the PC software

## Other Applicable Documents

The latest versions of the user manuals are available for download on our website.

Description	Document
C-887.5xx hexapod controller	MS244E user manual
PIMikroMove	SM148E software manual

## Downloading Manuals

### INFORMATION

If a manual is missing or problems occur with downloading:

- Contact our customer service department (p. 14).

### INFORMATION

For products that are supplied with software (CD in the scope of delivery), access to the manuals is protected by a password. Protected content is only displayed on the website after entering the access data.

You need the product CD to get the access data.

### For products with CD: Get access data

1. Insert the product CD into the PC drive.
2. Switch to the Manuals directory on the CD.
3. In the Manuals directory, open the Release News (file including **releasenews** in the file name).
4. Get the access data for downloading protected content in the "User login for software download" section of the Release News. Possible methods for getting the access data:
  - Link to a page for registering and requesting the access data
  - User name and password is specified
5. If the access data needs to be requested via a registration page:
  - a) Follow the link in the Release News.
  - b) Enter the required information in the browser window.
  - c) Click **Show login data** in the browser window.
  - d) Note the user name and password shown in the browser window.

## Downloading manuals

If you have requested access data for protected contents via a registration page (see above):

- Click the links in the browser window to change to the content for your product and log in using the access data that you received.

General procedure:

1. Open the website **www.pi.ws**.
2. If access to the manuals is protected by a password:
  - a) Click **Login**.
  - b) Log in with the user name and password.
3. Click **Search**.
4. Enter the product number up to the period (e.g., P-882) or the product family (e.g., PICMA® Bender) into the search field.
5. Click **Start search** or press the  key.
6. Open the corresponding product detail page in the list of search results:
  - a) If necessary: Scroll down the list.
  - b) If necessary: Click **Load more results** at the bottom of the list.
  - c) Click the corresponding product in the list.
7. Click the **Downloads** tab.

The manuals are shown under **Documentation**.
8. Click the desired manual and save it to the hard disk of your PC or to a data storage medium.

## Safety

### Intended Use

The C-887.MC2 is a laboratory device as defined by DIN EN 61010-1. It is intended for indoor use and use in an environment that is free of dirt, oil, and lubricants.

Using the C-887.MC2 manual control unit, axis motion can be started and stopped. The C-887.MC2 is designed for use with a C-887.5xx hexapod controller or a PC. Use of C-887.MC2 requires the following:

- USB interface on C-887.5xx hexapod controller or PC
- C-887.5xx hexapod controller: firmware version 2.7.1.1 or newer
- PC: Windows operating system, PIMikroMove

The C-887.MC2 must not be used for purposes other than those stated in this user manual.

The C-887.MC2 may only be used in compliance with the technical specifications and instructions in this user manual. The operator is responsible for process validation.

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## General Safety Instructions

The C-887.MC2 is built according to state-of-the-art technology and recognized safety standards. Improper use can result in personal injury and/or damage to the C-887.MC2.

- Only use the C-887.MC2 for its intended purpose, and only use it if it is in a good working order.
- Read the user manual.
- Immediately eliminate any faults and malfunctions that are likely to affect safety.

The operator is responsible for the correct installation and operation of the C-887.MC2.

## Organizational Measures

### User manual

- Always keep this user manual available with the C-887.MC2. The latest versions of the user manuals are available for download (p. 4) on our website.
- Add all information from the manufacturer to the user manual, for example supplements or technical notes.
- If you give the C-887.MC2 to other users, also include this user manual as well as other relevant information provided by the manufacturer.
- Only use the device on the basis of the complete user manual. Missing information due to an incomplete user manual can result in minor injury and damage to equipment.
- Only install and operate the C-887.MC2 after you have read and understood this user manual.

### Personnel qualification

The C-887.MC2 may only be installed, started up, operated, maintained, and cleaned by authorized and appropriately qualified personnel.

## Product Description

### Product View



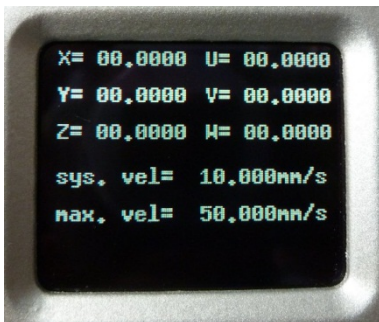
Figure 1: C-887.MC2 manual control unit

No.	Type	Function
1	Cable with connector USB type A	Connection to any of the USB sockets of a C-887.5xx hexapod controller or PC Recommended with C-887.5xx: Use USB type A socket for high insertion and pulling forces, see C-887.5xx user manual (MS244E).
2	<b>STOP</b> push button	If the C-887.MC2 is connected to a C-887.5xx hexapod controller, the button stops the following: <ul style="list-style-type: none"> <li>All motions</li> <li>Macros running on the C-887.5xx hexapod controller</li> </ul> If the C-887.MC2 is connected to a PC, you can assign a function to the button in the <b>Configure PC HID Control</b> window of PIMikroMove; for details, see p. 11.
3	Display (examples see Figure 2 on p. 8)	The following information is displayed if the C-887.MC2 is connected to a C-887.5xx hexapod controller: <ul style="list-style-type: none"> <li>Target positions for the axes of the motion platform, in mm or degrees (corresponds to the MOV? response of the controller)</li> <li>System velocity for the motion platform (corresponds to the VLS? response of the controller)</li> <li>Maximum system velocity for the motion platform</li> <li>Pivot point coordinates for the motion platform (corresponds to the SPI? response of the controller)</li> <li>Error code of the last occurred error</li> </ul> If the C-887.MC2 is connected to a PC and used in PIMikroMove, the display is not supported.

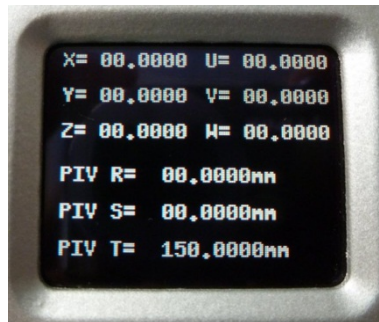
No.	Type	Function
4	REF push button	<p>If the C-887.MC2 is connected to a C-887.5xx hexapod controller, the button starts a reference move of the axes of the motion platform (X, Y, Z, U, V, W). Press for at least 1 s.</p> <p>If the C-887.MC2 is connected to a PC, you can assign a function to the button in the <b>Configure PC HID Control</b> window of PIMikroMove; for details, see p. 11.</p>
5	X, Y, Z, U, V, W rotary knobs	<p>Starts motion to a relative target position.</p> <p>The rotary knobs are turned in steps:</p> <ul style="list-style-type: none"> <li>▪ If connected to a C-887.5xx hexapod controller: A turn by a single step corresponds to a motion with the step size set with the SST command of the controller.</li> <li>▪ If connected to a PC: The axis is moved with each step of the knob by the distance specified in the <b>Step size</b> column on the <b>Axes</b> tab card of PIMikroMove; for details, see p. 11.</li> </ul>

## Display Details

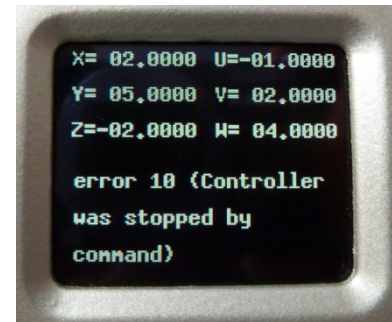
The display is only supported if the C-887.MC2 manual control unit is connected to a C-887.5xx hexapod controller.



System velocity was changed.



Pivot point coordinates are shown.



An error has occurred.

Figure 2: Examples for display content

The display is not configurable.

The display shows the last valid target positions, and, whenever changed in the controller, the current valid values for velocity, step size, and pivot point. In addition, it shows the current macro command and error code.

When an error has occurred on the C-887.5xx hexapod controller, the error code is displayed on the C-887.MC2 control unit. Even if the error was reset with the ERR? command in the meantime, the error code is displayed until one of the knobs or buttons of the C-887.MC2 control unit is used.



## Scope of Delivery

Description	Document
C-887.MC2	Manual control unit with USB connector and 3 m cable
C887T0036	User manual for the C-887.MC2 manual control unit (this document)

## Installation and Operation

### General Notes on Operation

#### CAUTION



##### Risk of crushing by moving parts!

There can be a risk of minor injuries from crushing between the moving parts of the positioner and a stationary part or obstacle.

- Keep your fingers away from areas where they can get caught by moving parts.

#### NOTICE



##### Damage due to collisions!

Collisions can damage the positioner, the load to be moved, and the surroundings.

- Make sure that no collisions are possible between the positioner, the load to be moved, and the surroundings in the workspace of the positioner.
- Do not place any objects in areas where they can be caught by moving parts.
- Stop the motion immediately if a controller malfunction occurs.

## Using the Manual Control Unit with a C-887.5xx Hexapod Controller

### INFORMATION

For hexapod axes with incremental sensors, motion can only be commanded after a successful reference move (also referred to as "initialization"). A reference move is started with the **REF** push button of the C-887.MC2 control unit.

The behavior of the hexapod axes after the reference move is determined by the **Behaviour After Reference Move** (ID 0x07030401) and **Target For Motion After Reference Move** parameters (ID 0x07030402) of the C-887.5xx hexapod controller. Depending on the parameter values, the hexapod axes can be moved automatically e.g., to a specified position after the reference move.

- Value of the parameter 0x07030401 = 0: The axis remains in the reference position after the reference move.
- Value of the parameter 0x07030401 = 1: After the reference move, the axis moves to the absolute target position, which is given by parameter 0x07030402.

No reference move is required for axes with absolute-measuring sensors. The use of the **REF** push button is still recommended for these axes, however. The **REF** button does **not** start a reference move for axes with absolute-measuring sensors but sets the target positions to the current position values. The above-described parameter values also go into effect, so that the axes can be moved to a defined "initial position", for example.

### Requirements

- ✓ The C-887.5xx hexapod controller has firmware version 2.7.1.1 or newer.
  - Read the device identification string of the controller with the `*IDN?` command.
  - Read the versions of the firmware components with the `VER?` command.
  - If necessary, follow the instructions in der C-887.5xx user manual (MS244E) to update the firmware of the controller.

### Using the manual control unit with the C-887.5xx hexapod controller

1. Recommended: Switch off the C-887.5xx hexapod controller.

Notes:

- The controller may not recognize the C-887.MC2 manual control unit if it is connected with the controller switched on.
  - If it is not possible to switch the controller off, reboot it after connecting the manual control unit with the `RBT` command.
2. Connect the control unit to the controller's USB socket for high insertion and pulling forces, see C-887.5xx user manual (MS244E).
  3. Switch on the controller.

After approximately 30 seconds a message appears on the display of the control unit asking to start a reference move.
  4. Press the **REF** push button for one second to start a reference move of the hexapod axes.

When you turn a rotary knob while the hexapod performs a reference move, the reference move continues and an error code is set and displayed.

5. When the reference move is finished, turn a rotary knob to start a motion for the corresponding hexapod axis (**X, Y, Z, U, V, W**).

The direction of motion depends on the direction in which the knob is turned.

The target results from the number of steps the knob is turned and from the current valid step size value. By default, the size of one step is 0.01 mm or degree. The step size value can be changed in the range of 0.0001 to 0.5 using the `SST` command of the hexapod controller.

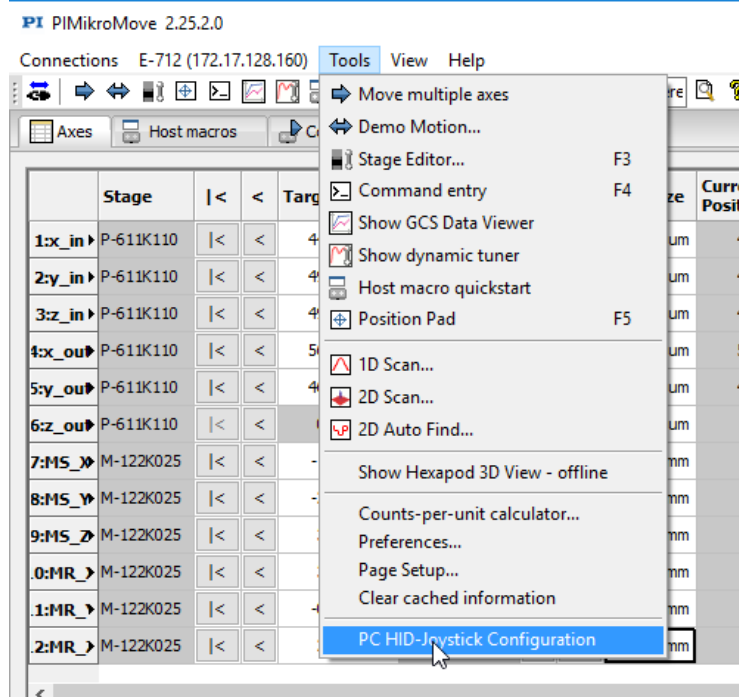
When a new target position is set while the hexapod is still moving to the last commanded target, the hexapod immediately starts to move to the new target position.

In the hexapod controller, macro content, move commands received via the communication interfaces and actions triggered by the control unit may overwrite each other.

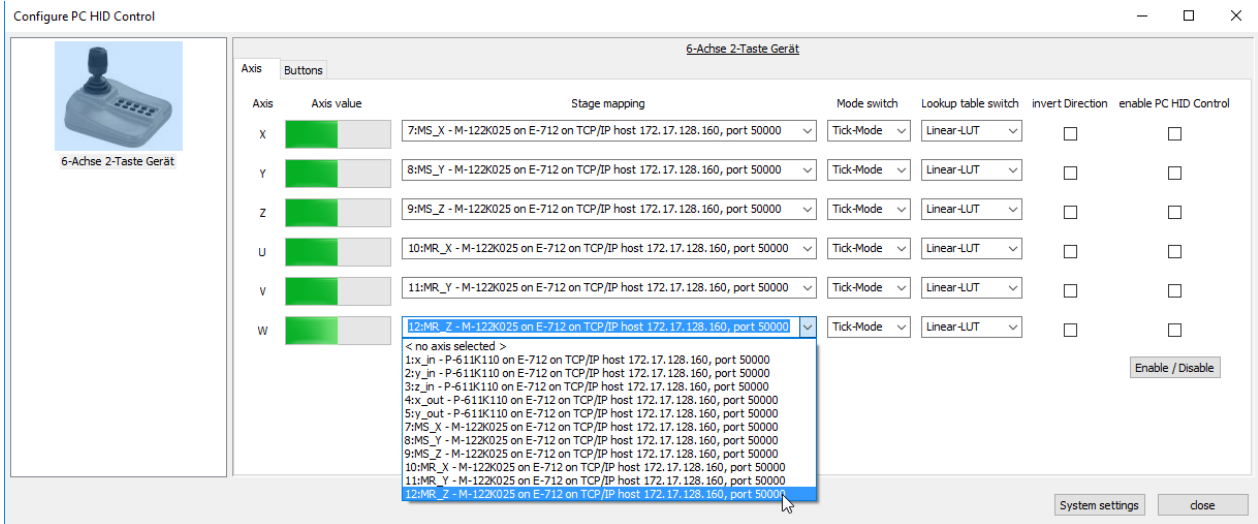
6. To stop a motion press the **STOP** push button.

## Using the Manual Control Unit on a PC

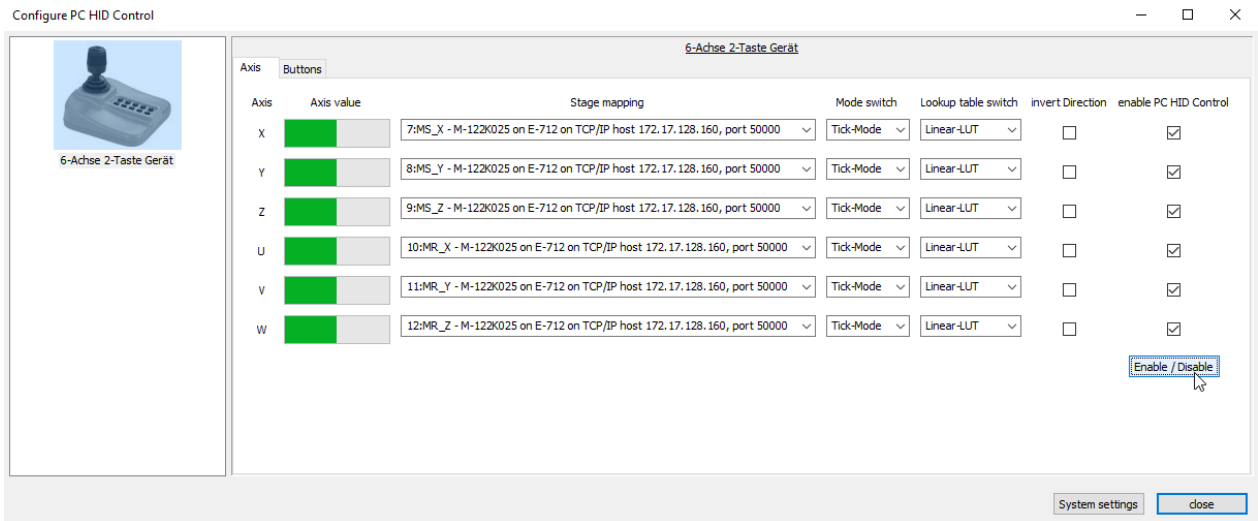
1. Make sure that PIMikroMove are installed on the PC.
2. Connect the manual control unit to the PC via USB.
3. Start up your system with PIMikroMove as described in the user manuals of the controller and positioner.
4. In the main window of PIMikroMove, open the configuration window for the manual control unit using the **Tools > PC HID-Joystick Configuration** menu item.



5. In the **Configure PC HID Control** window, assign the axes of your positioner(s) to the rotary knobs of the manual control unit via the corresponding drop-down lists. Note that the knobs in the window are referred to as axes with the designations X to W.



6. Optional: Configure the function of the **STOP** and **REF** push buttons on the **Buttons** tab of the **Configure PC HID Control** window. For the available options, see the PIMikroMove manual (SM148E).
7. To enable control by the manual control unit for all assigned axes, click the **Enable/Disable** button on the **Axis** tab of the **Configure PC HID Control** window.



8. Click **close** to close the **Configure PC HID Control** window.
9. Move the positioner's axes using the manual control unit.

The **Axes** tab card in the main window of PIMikroMove now shows that the axes are controlled by the manual control unit.

When you turn a rotary knob, the axis is moved with each step of the knob by the distance specified in the **Step size** column. In the example below the distance is 10  $\mu\text{m}$  per step.

PI PIMikroMove 2.25.2.0

Connections E-712 (172.17.128.160) Tools View Help

enter help search here

AXES Host macros Controller macros

age	<<	Target Value	Open-Loop Target Value	>>	Step size	Current Value/ Position	Control Value	Current Motor Out	HALT	State
1:x_in	<<	44,856 um	-59,616	>>	0,100 um	44,833 um			HALT	on target
2:y_in	<<	49,785 um	58,593	>>	0,100 um	49,805 um			HALT	on target
3:z_in	<<	49,875 um	-44,384	>>	0,100 um	49,858 um			HALT	on target
4:x_ou	<<	56,246 um	56,153	>>	0,100 um	56,596 um			HALT	on target
5:y_ou	<<	46,890 um	-48,558	>>	0,100 um	47,567 um			HALT	on target
6:z_ou	<<	0,000 um	-50,000	>>	0,100 um	7,684 um			HALT	servo off
7:MS_>	<<	-1,914 mm	-7,046	>>	0,010 mm	-1,914 mm			HALT	PC HID controlled
8:MS_>	<<	-2,134 mm	3,798	>>	0,010 mm	-2,134 mm			HALT	PC HID controlled
9:MS_>	<<	3,217 mm	-12,895	>>	0,010 mm	3,217 mm			HALT	PC HID controlled
0:MR_>	<<	3,548 mm	-10,093	>>	0,010 mm	3,548 mm			HALT	PC HID controlled
1:MR_>	<<	-0,037 mm	-7,267	>>	0,010 mm	-0,037 mm			HALT	PC HID controlled
2:MR_>	<<	2,691 mm	0,703	>>	0,010 mm	2,691 mm			HALT	PC HID controlled

- If the adjustment of the axes is finished, open the **Configure PC HID Control** window again and click the **Enable/Disable** button to disable control by the manual control unit.

## Maintenance

### General Notes on Maintenance

The C-887.MC2 control unit is maintenance-free.

### Cleaning the Manual Control Unit

#### NOTICE



#### Short circuits or flashovers!

The C-887.MC2 contains electrostatic-sensitive devices that can be damaged by short circuits or flashovers when cleaning fluids penetrate the housing.

- Before cleaning, disconnect the C-887.MC2 from the C-887.5xx hexapod controller or the PC.
- Prevent cleaning fluid from penetrating the housing

- When necessary, clean the C-887.MC2 housing surface with a cloth lightly dampened with a mild cleanser or disinfectant.

## Customer Service

For inquiries and orders, contact your PI sales engineer or send us an email (<mailto:service@pi.de>).

- If you have any questions concerning your system, provide the following information:
  - Product and serial numbers of all products in the system
  - Firmware version of the controller (if applicable)
  - Version of the driver or the software (if applicable)
  - Operating system on the PC (if applicable)
- If possible: Take photographs or make videos of your system that can be sent to our customer service department if requested.

The latest versions of the user manuals are available for download (p. 4) on our website.

## Technical Data

### Data Table

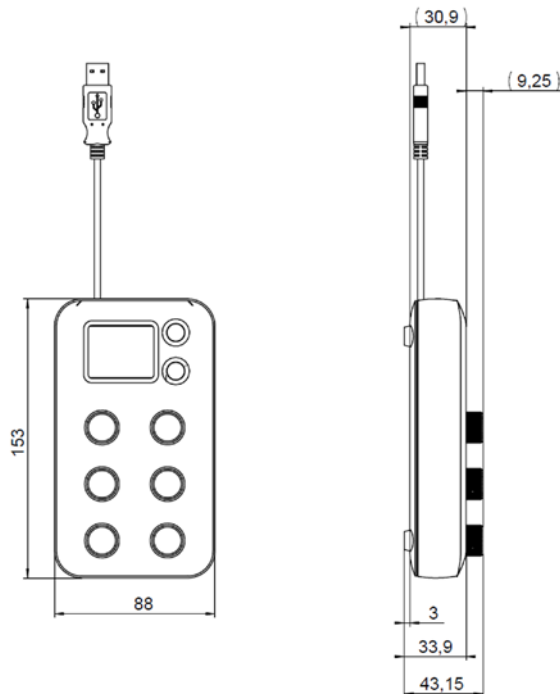
	<b>C-887.MC2</b>
Function	Manual control unit
Interface	USB (1.0/1.1 or higher)
Graphic display	160 x 128 pixel
Rotary knobs	32 steps per revolution, configurable step size
Operating temperature range	5 to 40°C
Operating voltage	USB powered (low-power device)
Cable length	3 m
Mass	350 g
Dimensions	153 mm x 88 mm x 43.15 mm (incl. rubber feet and rotary knobs, without cable)

## Ambient Conditions and Classifications

The following ambient conditions and classifications must be observed for the C-887.MC2:

Area of application	For indoor use only
Maximum altitude	2000 m
Air pressure	1100 hPa to 0.1 hPa (corresponds to roughly 825 torr to 0.075 torr)
Relative humidity	Highest relative humidity 80% for temperatures up to 31°C Decreasing linearly to 50% relative air humidity at 40°C
Operating temperature	5°C to 40°C
Storage temperature	0°C to 70°C
Transport temperature	-25°C to 85°C
Degree of protection according to IEC 60529	IP20

## Dimensions



## Old Equipment Disposal

In accordance with EU law, electrical and electronic equipment may not be disposed of in EU member states via the municipal residual waste.

Dispose of your old equipment according to international, national, and local rules and regulations.

In order to fulfil its responsibility as the product manufacturer, Physik Instrumente (PI) GmbH & Co. KG undertakes environmentally correct disposal of all old PI equipment made available on the market after 13 August 2005 without charge.

Any old PI equipment can be sent free of charge to the following address:

Physik Instrumente (PI) GmbH & Co. KG

Auf der Roemerstr. 1

D-76228 Karlsruhe, Germany



## EU Declaration of Conformity

For the C-887.MC2, an EU Declaration of Conformity has been issued in accordance with the following European directives:

EMC Directive

RoHS Directive

The applied standards certifying the conformity are listed below.

EMC: EN 61326-1

Safety: EN 61010-1

RoHS: EN 50581