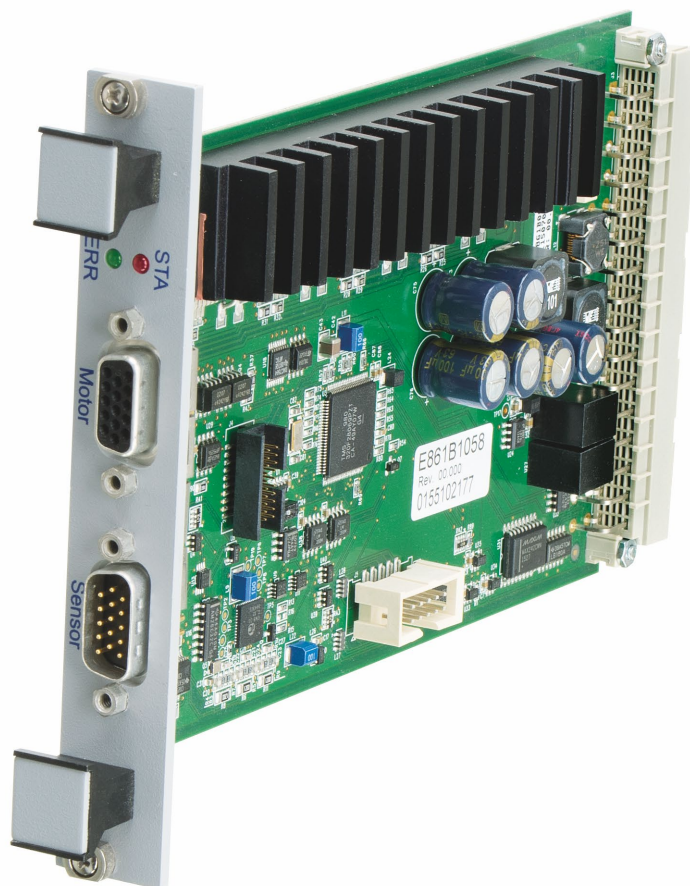


## E-861.11C885

### Motion Controller Module for NEXACT® Drives, for C-885 PIMotionMaster



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## About this Document

This document describes the the E-861.11C885 controller module for the C-885 PIMotionMaster (p. 7) from PI.

## Symbols and Typographic Conventions

The following symbols and typographic conventions are used in this document:

### CAUTION



#### Dangerous situation

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

- 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.

| Symbol/Label                                                                                                                                                            | Meaning                                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| 1.<br>2.                                                                                                                                                                | Action consisting of several steps whose sequential order must be observed        |
| ➤                                                                                                                                                                       | Action consisting of one or several steps whose sequential order is irrelevant    |
| ▪                                                                                                                                                                       | List item                                                                         |
| p. 5                                                                                                                                                                    | Cross-reference to page 5                                                         |
| Status                                                                                                                                                                  | Labeling of an operating element on the product (example: status LED)             |
|   | Warning signs on the product which refer to detailed information in this document |

## Other Applicable Documents

The devices which are mentioned in this document are described in their own manuals.

| Description                  | Document              |
|------------------------------|-----------------------|
| E-861.1A1 NEXACT® controller | PZ205 user manual     |
| C-885 PIMotionMaster         | C885T0002 user manual |
| PIMikroMove                  | SM148 software manual |

## Downloading Manuals

### INFORMATION

If a manual is missing or there are problems with downloading:

- Contact our customer service department (p. **Fehler! Textmarke nicht definiert.**).

### Downloading manuals

1. Open the website [www.pi.ws](http://www.pi.ws).
2. Search the website for the product number (e.g., C-885).
3. Click the corresponding product to open the product detail page.
4. Click the **Downloads** tab.

The manuals are shown under **Documentation**. Software manuals are shown under **General Software Documentation**.

5. Click the desired manual and fill out the inquiry form.

The download link will then be sent to the email address entered.

## Safety

### Intended Use

The E-861.11C885 is designed to be integrated in a device as defined by DIN EN 61010-1. It is intended to be used in interior spaces and in an environment which is free of dirt, oil and lubricants.

In accordance with its design, the E-861.11C885 is intended for driving capacitive loads, in the present case, piezoceramic actuators.

The E-861.11C885 is intended for closed-loop operation using incremental position sensors, but can as well be operated in open-loop mode by deactivating the sensor. Furthermore, the E-861.11C885 can read out and process the reference point and limit switch signals of the NEXACT® drive connected.

The E-861.11C885 may only be used in compliance with the technical specifications and instructions in this document.

The E-861.11C885 has no case and is designed to be integrated in the C-885 PIMotionMaster (p. 3) from PI. The operator is responsible for electrical safety according to EN 61010-1:2010 and electromagnetic compatibility according to EN 61326-1:2013 when integrating the E-861.11C885 in the PIMotionMaster.

### Safety Precautions

#### CAUTION



##### **Risk of electric shock during operation without case!**

If the E-861.11C885 is operated without a case, live parts will be accessible. Touching the live parts can result in minor injuries due to electric shock.

- Only operate the E-861.11C885 when it is installed in a suitable case (p. 3) that is connected to the protective earth conductor.

#### NOTICE



##### **Electrostatic hazard!**

The E-861.11C885 contains electrostatically sensitive equipment (ESD) and can be damaged if handled improperly.

- Avoid touching assemblies, pins and PCB traces.
- Before you touch the E-861.11C885, discharge yourself of any electric charges. For example, wear an antistatic wrist strap.
- Only handle and store the E-861.11C885 in environments that dissipate existing static charges to earth in a controlled way and prevent electrostatic charges (ESD workplace or electrostatically protected area, in short EPA).

## Product Description

The E-861.11C885 is a controller module for the C-885 PIMotionMaster (p. 3) from PI. It is based on the standard E-861.1A1 controller.

In comparison to the E-861.1A1 controller, the E-861.11C885 controller module

- is not installed in a case;
- only features an HD Sub-D 15 (f) motor socket, an HD Sub-D 15 (m) sensor panel plug, an error LED (ERR) and a status LED (STA);
- provides a function for deactivating the sensor.

Note that pin 8 of the E-861.11C885 motor socket (p. 12) is not connected.

## Product View



Figure 1: E-861.11C885 controller module (front view)

## Scope of Delivery

| Item ID      | Description                                                                         |
|--------------|-------------------------------------------------------------------------------------|
| E-861.11C885 | Motion controller module for NEXACT® piezomotor systems, 1 axis, for PIMotionMaster |
| E861T0013    | User manual for E-861.11C885 (this document)                                        |

## Accessories

| Order Number | Description                                                                                                                                                                                                                               |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| C-885.iD     | Digital interface module, gives access to the four input lines (digital/analog) and four output lines (digital) of the E-861.11C885.<br>For pinout, see p. 12. Further details see the C885T0002 user manual of the C-885 PIMotionMaster. |

## Overview of C-885 PIMotionMaster

The E-861.11C885 is designed to be integrated in a C-885 PIMotionMaster from PI.

The C-885 PIMotionMaster is a customizable, modular multi-axis controller with card slots. In order to be functional, the C-885 PIMotionMaster requires a chassis (C-885.Rx ) with one digital processor and interface module (C-885.Mx) and at least one controller module. See the table below for the C-885 system components. For the supported controller modules see the documentation of the C-885 PIMotionMaster (p. 3).

| Product Number | Item                                                                                   | Remarks                                                                                                                                                                                                                                                            |
|----------------|----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| C-885.Mx       | Digital processor and interface module for PIMotionMaster with Ethernet interface, USB | One C-885.Mx module required per PIMotionMaster.<br>The C-885.Mx controls up to 20 controller modules with the largest chassis.                                                                                                                                    |
| C-885.Rx       | Chassis for PIMotionMaster                                                             | One C-885.Rx chassis required per PIMotionMaster.<br>There are chassis in two sizes: <ul style="list-style-type: none"><li>▪ 9.5": provides card slots for up to 4 controller modules</li><li>▪ 19": provides card slots for up to 20 controller modules</li></ul> |

## Installation

The E-861.11C885 must be installed in the C-885 PIMotionMaster (p. 7) from PI. See the documentation of the C-885 PIMotionMaster (p. 3) for more information.

## Power Source

The maximum power consumption of the E-861.11C885 is 48 W.

- Use a sufficiently dimensioned power supply for the C-885 PIMotionMaster in which the E-861.11C885 is to be installed.

## Start-Up and Operation

### Configuration of the E-861.11C885 and Normal Operation of the C-885 PIMotionMaster

At the first start-up of the C-885 PIMotionMaster, the E-861.11C885 controller module has to be configured for the connected stage. Configuration of the controller module requires direct communication with the controller module.

In normal operation, the C-885 PIMotionMaster behaves like a "conventional" multi-axis controller, and the parameter settings for the axes cannot be changed.

See the documentation of the C-885 PIMotionMaster (p. 3) for details and instructions.

### Sensor Deactivation

In certain cases it may be necessary to deactivate the sensor, e.g. to perform measurements sensitive to electromagnetic emission.

Sensor deactivation is done by switching the sensor supply voltage off. For this the E-861.11C885 provides the following parameter:

| Parameter                          | Description and Possible Values                                                                                                                                                                                                                                                                                                                                                              |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Sensor Power Supply</b><br>0x56 | Supply voltage for sensor activated?<br>0 - supply voltage deactivated<br>1 - supply voltage activated (default value)<br>This parameter can only be set to 0 (sensor deactivated) in open-loop operation (servo OFF). As long as the sensor is deactivated the servo cannot be switched on.<br>When switching off the sensor supply voltage, the axis is no longer considered "referenced". |

To deactivate the sensor proceed as follows:

1. Switch off the servo using the **SVO** command.
2. Switch off the sensor supply voltage by sending this command: **SPA 1 0x56 0**

### Command Set of E-861.11C885

The E-861.11C885 is fully GCS 2.0 compatible.

The commands of the E-861.11C885 are accessible via direct communication with the controller module. See the documentation of the C-885 PIMotionMaster (p. 3) for details.

The range of commands and parameters available on the E-861.11C885 controller module is slightly different from that of the E-861.1A1 controller.

- To get a list of available GCS commands, send **HLP?** to the E-861.11C885.
- To get a list of available parameters, send **HPA?** to the E-861.11C885.

See the PZ205E user manual for the E-861.1A1 controller for more information on GCS commands and parameters.

## Updating the Firmware

If a firmware update is necessary for the E-861.11C885:

- For information on how to perform firmware updates, contact our customer service department.

## Customer Service

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

If you have questions concerning your system, have the following information ready:

- Product codes and serial numbers of all products in the system
- Firmware version of the controller (if present)
- Version of the driver or the software (if present)
- Operating system on the PC (if present)

The latest versions of the user manuals are available for download on our website ([www.pi.ws](http://www.pi.ws)).

## Technical Data

### Specifications

|                     | <b>E-861.11C885</b>                                                                                                                                           |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Function            | Controller module for NEXACT® drives, for C-885 PIMotionMaster modular multi-axis controller system                                                           |
| Drive type          | NEXACT® linear drive                                                                                                                                          |
| Axes                | 1                                                                                                                                                             |
| Supported functions | Start-up macro; data recorder for recording parameters such as motor voltage, velocity, position or position error; internal safety circuitry: Watchdog timer |

| <b>Motion and control</b> | <b>E-861.11C885</b>                                                                                                                                                                           |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Servo characteristics     | PID controller, parameter changing during operation                                                                                                                                           |
| Dynamics profile          | Trapezoidal velocity profile                                                                                                                                                                  |
| Encoder input             | Analog encoder input sine-cosine, interpolation factor to 16384x; interpolation electronics preset for differential transmission, 1 V <sub>pp</sub> amplitude and 2.5 V encoder offset signal |

| Motion and control     | E-861.11C885                                                        |
|------------------------|---------------------------------------------------------------------|
| Stall detection        | Automatic motor stop when a programmable position error is exceeded |
| Limit switches         | 2 × TTL                                                             |
| Reference point switch | 1 × TTL                                                             |

| Interfaces and operation | E-861.11C885                                                                                                                       |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| Communication interfaces | USB or Ethernet, via Digital processor and interface module C-885.M1 / C-885.M2                                                    |
| Motor connector          | HD Sub-D 15 (f)                                                                                                                    |
| Sensor connection        | HD Sub-D 15 (m)                                                                                                                    |
| I/O lines                | Optional with C-885.iD Digital Interface Module for PIMotionMaster: 4 analog/digital inputs (0 to 5V/TTL), 4 digital outputs (TTL) |
| Command set              | PI General Command Set (GCS)                                                                                                       |
| User software            | PIMikroMove                                                                                                                        |
| Software drivers         | LabVIEW driver, dynamic libraries for Windows and Linux                                                                            |

| Electrical properties and environment | E-861.11C885                                  |
|---------------------------------------|-----------------------------------------------|
| Max. output power                     | 40 W                                          |
| Output voltage                        | 0 V to 45 V                                   |
| Operating voltage                     | 24 V DC, supply via C-885 PIMotionMaster      |
| Max. current consumption              | 2 A                                           |
| Operating temperature range           | 10 to 40 °C                                   |
| Mass                                  | 220 g                                         |
| Dimensions                            | 186.42 mm × 128.4 mm (3 RU) × 19.98 mm (4 HP) |

## Maximum Ratings

The E-861.11C885 is designed for the following maximum ratings:

| Output on:                                        | Maximum Output Voltage                                                            | Maximum Output Current                                                             | Maximum Output Frequency                                                            |
|---------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                                   |  |  |  |
| HD Sub-D 15 (f) motor socket (pins 1, 2, 6 and 7) | 0 to 45 V                                                                         | 1 A                                                                                | 2 kHz                                                                               |

## Ambient Conditions and Classifications

See the documentation for the C-885 PIMotionMaster (p. 3) for details.

## Dimensions

Dimensions in mm. Note that the decimal places are separated by commas in the drawings.

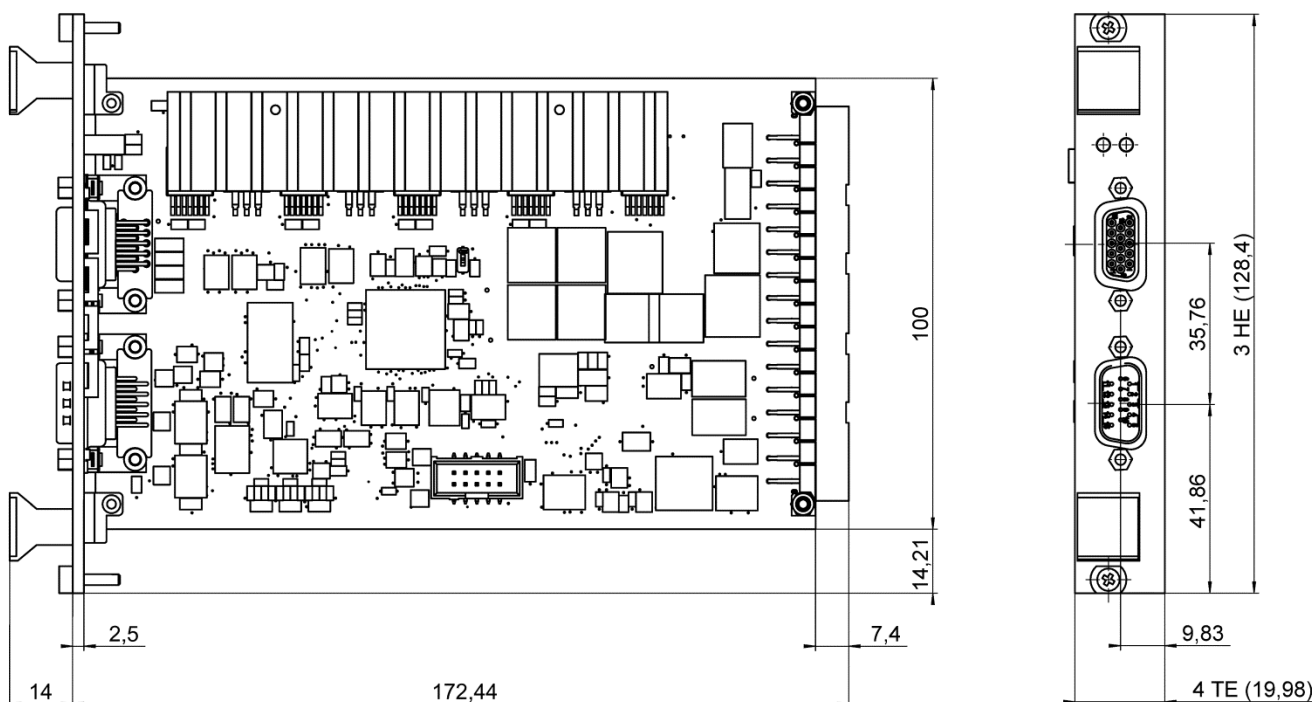


Figure 2: Dimensions of the E-861.11C885: HE = rack unit (RU), TE = horizontal pitch (HP)

## Pin Assignment

### Pin Assignment Motor

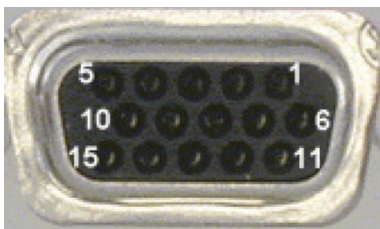


Figure 3: HD Sub-D 15 (f) motor socket, 3-row

| Pin | Signal Direction | Function           |
|-----|------------------|--------------------|
| 1   | OUT              | Piezo 1: 0 to 45 V |
| 2   | OUT              | Piezo 3: 0 to 45 V |
| 3   | Int. use         | Internal use       |
| 4   | NC               | Not connected      |
| 5   | NC               | Not connected      |
| 6   | OUT              | Piezo 0: 0 to 45 V |
| 7   | OUT              | Piezo 2: 0 to 45 V |
| 8   | NC               | Not connected*     |
| 9   | NC               | Not connected      |
| 10  | NC               | Not connected      |
| 11  | AGND             | Piezo GND          |
| 12  | AGND             | Piezo GND          |
| 13  | AGND             | Piezo GND          |
| 14  | GND              | Digital GND        |
| 15  | GND              | Digital GND        |

\* In contrast to the E-861.1A1 controller, Pin 8 is **not** connected on the E-861.11C885.

## Pin Assignment Sensor

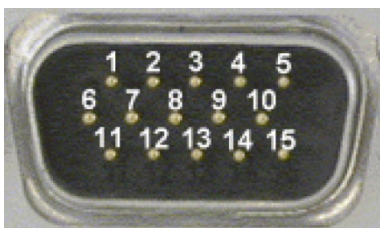


Figure 4: HD Sub-D 15 (m) sensor panel plug, 3-row

| Pin | Signal Direction | Function                                     |
|-----|------------------|----------------------------------------------|
| 1   | IN               | REF (reference switch)                       |
| 2   | OUT              | VDD (supply voltage encoder)                 |
| 3   | IN               | REFP (positive reference trace from ruler)*  |
| 4   | IN               | COSP (positive cosine encoder signal)        |
| 5   | IN               | SINP (positive sine encoder signal)          |
| 6   | IN               | PLIMIT (positive limit switch)               |
| 7   | IN               | NLIMIT (negative limit switch)               |
| 8   | IN               | REFN (negative reference trace from ruler)*  |
| 9   | IN               | COSN (negative cosine encoder signal)        |
| 10  | IN               | SINN (negative sine encoder signal)          |
| 11  | Int. use         | Internal use                                 |
| 12  | OUT              | VDD (supply voltage limit board)             |
| 13  | GND              | Digital GND for reference and limit switches |
| 14  | AGND             | Encoder signal GND                           |
| 15  | AGND             | Encoder signal GND                           |

\* For operation of the controller in closed-loop mode these signals are not obligatory.

## Pin Assignment C-885.iD Digital Interface Module

The C-885.iD digital interface module is connected to the E-861.11C885 controller module via a ribbon cable and a 10-pin connector strip of the E-861.11C885. See the C885T0002 user manual of the C-885 PIMotionMaster for installation details.

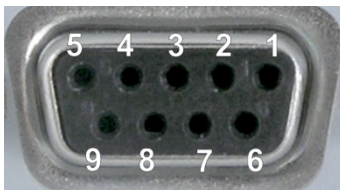


Figure 5: C-885.iD digital interface module: D-sub 9 (female)

| Connector strip | D-sub 9 socket |   | Function                                 |
|-----------------|----------------|---|------------------------------------------|
| 1               | 1              |   | Input 1 (analog: 0 to 5V / digital: TTL) |
| 2               |                | 6 | Input 2 (analog: 0 to 5V / digital: TTL) |
| 3               | 2              |   | Input 3 (analog: 0 to 5V / digital: TTL) |
| 4               |                | 7 | Input 4 (analog: 0 to 5V / digital: TTL) |
| 5               | 3              |   | Digital output 1 (TTL)                   |
| 6               |                | 8 | Digital output 2 (TTL)                   |
| 7               | 4              |   | Digital output 3 (TTL)                   |
| 8               |                | 9 | Digital output 4 (TTL)                   |
| 9               | 5              |   | GND                                      |
| 10              |                |   | n.a.                                     |

## Old Equipment Disposal

In accordance with the applicable EU law, electrical and electronic equipment may not be disposed of with unsorted municipal wastes in the member states of the EU.

When disposing of your old equipment, observe the international, national and local rules and regulations.

To meet the manufacturer's product responsibility with regard to this product, Physik Instrumente (PI) GmbH & Co. KG ensures environmentally correct disposal of old PI equipment that was first put into circulation after 13 August 2005, free of charge.

If you have old PI equipment, you can send it postage-free to the following address:

Physik Instrumente (PI) GmbH & Co. KG

Auf der Roemerstr. 1

D-76228 Karlsruhe, Germany

