User Manual

C663T0004, valid for C-663.12C885

Ast, BRo, 8/30/2018

C-663.12C885

Motion Controller Module for Stepper Motors, for C-885 PIMotionMaster

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About this Document

This document describes the C-663.12C885 controller module for the C-885 PIMotionMaster from PI. See "Product Description" (p. 5) for detailed information on C-663.12C885.

Symbols and Typographic Conventions

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

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. 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
S. 5	Cross-reference to page 5
SV0?	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
	Warning signs on the product which refer to detailed information in this manual.

Other Applicable Documents

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

Description	Document
C-663.12 Mercury Stepper Motor Controller	MS241E user manual
C-885 PIMotionMaster (details see p. 6)	C885T0002 user manual
PIMikroMove	SM148E software manual

Downloading Manuals

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

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

Safety

Intended Use

C-663.12C885 is designed to be integrated in a laboratory 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 C-663.12C885 is intended for the operation of PI stages equipped with stepper motors.

The C-663.12C885 is intended for open loop operation of 2-phase stepper motors as well as for their closed-loop operation using incremental position sensors. Furthermore, the C-663.12C885 can read out and process the reference point and limit switch signals from the stage connected.

The C-663.12C885 may only be used in compliance with the technical specifications and instructions in this manual.

The C-663.12C885 has no case and is designed to be integrated in the C-885 PIMotionMaster (p. 6) 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 C-663.12C885 in the PIMotionMaster.

Safety Precautions

NOTICE

Electrostatic hazard!

The C-663.12C885 contains electrostatically sensitive equipment (ESD) and can be damaged if handled improperly.

- Avoid touching assemblies, pins and PCB traces.
- Before you touch the C-663.12C885, discharge yourself of any electric charges. For example, wear an antistatic wrist strap.
- Only handle and store the C-663.12C885 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 C-663.12C885 is a controller module for the C-885 PIMotionMaster (p. 6) from PI. It is based on the standard C-663.12 controller. In comparison to the C-663.12 controller, the C-663.12C885 controller module does not support joystick control and is not installed in a case.

Product View

Figure 1: C-663.12C885 controller module (front view)

Scope of Delivery

Item ID	Description
C-663.12C885	Motion Controller Module for Stepper Motors, for C-885 PIMotionMaster
C-815.AA42	Adapter connector D-Sub 15 (f) to HD D-Sub 26 (m)
C663T0004	User manual for C-663.12C885 (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 C-663.12C885. For pinout, see p. 13. Further details see the C885T0002 user manual of the C-885 PIMotionMaster.

Overview of C-885 PIMotionMaster

The C-663.12C885 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. 4).

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. 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. There are chassis in two sizes: ▪ 9.5'': provides card slots for up to 4 controller modules ▪ 19'': provides card slots for up to 20 controller modules

Installation

The C-663.12C885 must be installed in the C-885 PIMotionMaster from PI. See the documentation of the C-885 PIMotionMaster (p. 4) for more information.

Power Source

The maximum power consumption of the C-663.12C885 is 48 W.

➢ Use a sufficiently dimensioned power supply for the C-885 PIMotionMaster in which the C-663.12C885 is to be installed.

The C-663.12C885 controller module can be operated with either 48 V DC or 24 V DC.

The difference in the operating voltage does not affect the velocity that can be reached by the motor of the connected stage, because the maximum output voltage of the C-663.12C885 is always 48 V, even if operated with 24 V DC.

Start-Up and Operation

Configuration of C-663.12C885 and Normal Operation of C-885 PIMotionMaster

At the first start-up of the C-885 PIMotionMaster, the C-663.12C885 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. 4) for details and instructions.

Command Set of C-663.12C885

The C-663.12C885 is fully GCS 2.0 compatible.

The commands of the C-663.12C885 are accessible via direct communication with the controller module. See the documentation of the C-885 PIMotionMaster (p. 4) for details.

The range of commands and parameters available on the C-663.12C885 controller modules may be different from that of the C-663.12 controller.

- To get a list of available GCS commands, send HLP? to the C-663.12C885.
- To get a list of available parameters, send HPA? to the C-663.12C885.

See the MS241E user manual of the C-663.12 controller (p. 4) for more information on GCS commands and parameters.

Updating the Firmware

If a firmware update is necessary for the C-663.12C885:

- For information on firmware updates, contact our customer service department (p. 8).

Customer Service

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

If you have any 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)

Technical Data

Data Table

	C-663.12C885
Function	Mercury Step stepper motor module, for C-885 PIMotionMaster modular multi-axis controller system
Drive types	2-phase stepper motor
Axes	1
Motion and control	
Servo characteristics	PID, parameter changing during operation
Dynamics profile	Trapezoidal velocity profile, point-to-point motion
Microstep resolution	1/2048 full step
Encoder input	A/B quadrature, TTL, RS-422; 60 MHz
Limit switches	2 × TTL, programmable
Reference point switch	1 × TTL, programmable
Index switch	1 x RS-422 for index pulse
Stall detection	Automatic motor stop when a programmable position error is exceeded (only in conjunction with sensor)
Electrical properties	
Operating voltage	24 V DC or 48 V DC, supply via C-885
Max. output voltage*	0 V to 48 V (with lower operating voltage by voltage converter), for direct control of stepper motors
Power consumption, full load	48 W (max.)
Power consumption, no load	3 W
Max. output power (< 2 ms)	100 W
Average output power	< 48 W
Current limitation per motor phase	2.5 A
Interfaces and operation	
Communication interfaces	USB or Ethernet, via Digital Processor and Interface Module C-885.Mx
Motor / sensor connection	HD Sub-D 26 (f)
I/O lines	Optional with C-885.iD Digital Interface Module for PIMotionMaster: 4 analog / digital inputs (0 to 5 V / TTL), 4 digital outputs (TTL)
Command set	PI General Command Set (GCS)

	C-663.12C885
User software	PIMikroMove, PITerminal
Software drivers	LabVIEW driver, dynamic libraries for Windows and Linux, MATLAB library
Supported functions	Start-up macro; data recorder for recording operating data such as velocity, position or position error; internal safety circuitry: Watchdog timer; ID chip detection (for future use)
Miscellaneous	
Operating temperature range	5 to 50 °C (temperature protection switches off at excessively high temperatures)
Mass	130 g
Dimensions	186.42 mm × 128.4 mm (3 RU) × 19.98 mm (4 HP)

Maximum Ratings

The C-663.12C885 is designed for the following maximum ratings:

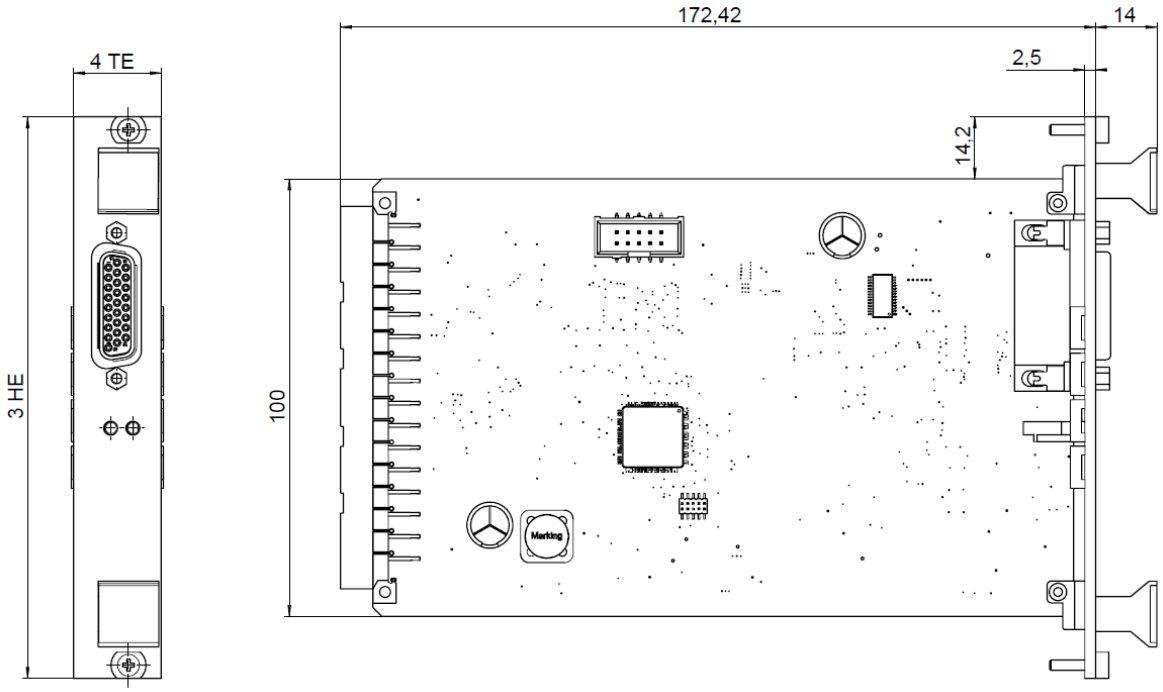
Output on:	Maximum Output Voltage	Maximum Output Current	Maximum Output Frequency
HD Sub-D 26 (f)	48 V	2.5 A	20 kHz (PWM)

Ambient Conditions and Classifications

See the documentation for the C-885 PIMotionMaster (p. 4) for details.

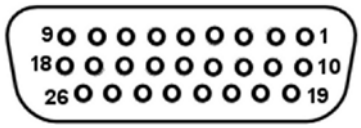
Dimensions

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



Pin Assignment Motor

HD Sub-D 26 (f)



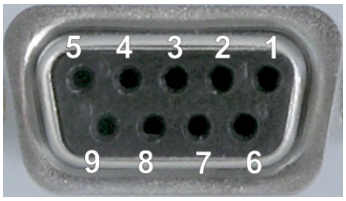
Pin	Signal	Direction	Function
1	OUT0a	Output	Phase I, pos. (48 V, max. 2 A, 20 kHz PWM)
2	OUT0b	Output	Phase I, pos. (48 V, max. 2 A, 20 kHz PWM)
3	OUT1a	Output	Phase I, neg. (48 V, max. 2 A, 20 kHz PWM)
4	OUT1b	Output	Phase I, neg. (48 V, max. 2 A, 20 kHz PWM)
5	OUT2a	Output	Phase II, pos. (48 V, max. 2 A, 20 kHz PWM)
6	OUT2b	Output	Phase II, pos. (48 V, max. 2 A, 20 kHz PWM)
7	OUT3a	Output	Phase II, neg. (48 V, max. 2 A, 20 kHz PWM)
8	OUT3b	Output	Phase II, neg. (48 V, max. 2 A, 20 kHz PWM)
9	-	-	reserved
10	REF	Input	Reference switch (5 V TTL input, single-ended)
11	NLIM	Input	Negative limit switch (5 V TTL input)
12	PLIM	Input	Positive limit switch (5 V TTL input)
13	-	-	reserved
14	-	-	reserved
15	-	-	reserved
16	-	-	reserved
17	ID Chip	Bidirectional	ID chip (reserved for future use)
18	VCC_ENC	Output	Supply of position sensor (5 V, 200 mA)
19	ENCA+	Input	Input encoder: A+ (RS-422)
20	ENCA-	Input	Input encoder: A- (RS-422)
21	ENCB+	Input	Input encoder: B+ (RS-422)
22	ENCB-	Input	Input encoder: B- (RS-422)
23	INDEX+	Input	Reference switch, differential
24	INDEX-	Input	Reference switch, differential
25	GND		GND
26	VCC_ENC	Output	Supply of position sensor (5 V, 200 mA)

Do not connect reserved pins!

Pin Assignment C-885.iD Digital Interface Module

The C-885.iD digital interface module is connected to the C-663.12C885 controller module via a ribbon cable and a 10-pin connector strip of the C-663.12C885. See the C885T0002 user manual of the C-885 PIMotionMaster (p. 4) for installation details.

Connector: Sub-D 9 (f)



Connector strip	Sub-D 9 socket		Function
1	1		Input 0 (analog: 0 to 5V / digital: TTL)
2		9	Input 1 (analog: 0 to 5V / digital: TTL)
3	2		Input 2 (analog: 0 to 5V / digital: TTL)
4		8	Input 3 (analog: 0 to 5V / digital: TTL)
5	3		Digital output 0 (TTL)
6		7	Digital output 1 (TTL)
7	4		Digital output 2 (TTL)
8		6	Digital output 3 (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