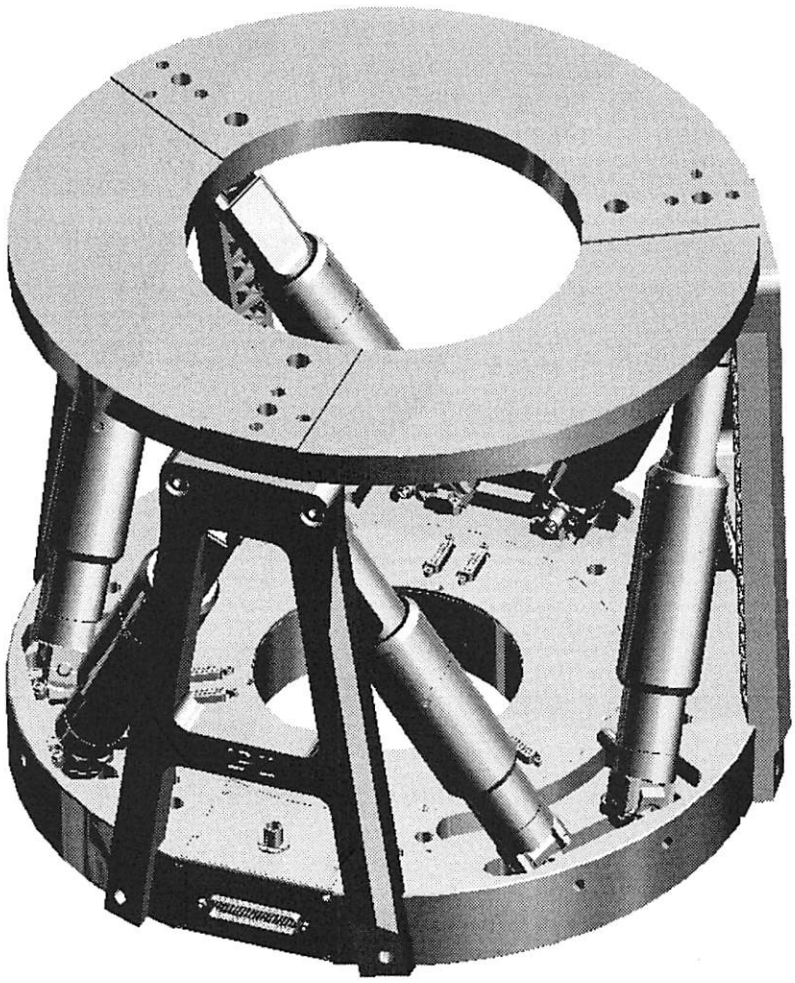
Technical Note

MMa, 2015-04-28
H850T0013, valid for H-850K043

H-850K043
6-Axis Hexapod Positioner with Provisional Platform and Special Fixation



INFORMATION

Besides the topics described below, the instructions and descriptions given in the following manuals apply:

- User Manual *MS202E* for the *H-850 Hexapod Microrobot*
- User Manual *MS204Equ* for the *C-887 Hexapod Controller* (paper version)
- User Manual *MS204E* for the *C-887 Hexapod Controller* and related Technical Notes (included in the CD-ROM)
- Technical Note *C887T0008* for the C-887.52 *Hexapod Controller*

Contents

Safety / Intended Use

Intended Use

The Hexapod is a laboratory device in accordance with DIN EN 61010-1. It is intended to be used in interior spaces and in an environment that is free of dirt, oil and lubricants.
Based on its design and realization, the Hexapod is intended for positioning, adjusting and shifting of loads in six axes at various velocities.
The Hexapod is part of a Hexapod system. The intended use of the Hexapod is only possible in connection with the Hexapod controller, which is part of the Hexapod system and coordinates all motions of the Hexapod.

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

The operator is responsible for the correct installation and operation of the Hexapod.

Organizational Measures

Documentation

- Always keep this document available by the Hexapod.
- Add all information given by the manufacturer to the document, for example supplements or further Technical Notes.
- If you pass the Hexapod on to other users, also turn over this document as well as other relevant information provided by the manufacturer.
- Only use the device on the basis of the complete document. Missing information due to an incomplete document can result in minor injury and property damage.
- Only install and operate the Hexapod after having read and understood this document.

Personnel Qualification

The Hexapod may only be started up, operated, maintained and cleaned by authorized and qualified staff.

Safety Measures during Transport

An impermissible mechanical load can damage the Hexapod.

- Only send the Hexapod in the original packaging.
- Due to the Hexapod's weight, let a second person assist when transporting/positioning the complete mechanics.

Safety Measures during Installation

Impermissible mechanical load and collisions between the Hexapod, the load to be moved and the environment can damage the Hexapod.

- Only hold the Hexapod by the base plate.
- Before installing the load, determine the limit value for the load of the Hexapod with a simulation program.
- Before installing the load, determine the work space of the Hexapod with a simulation program
- Make sure that the installed load observes the limit value determined with the simulation program.
- Avoid high forces and torques on the moving platform during installation of the Hexapod and the load.

- Ensure an uninterruptible power supply in order to prevent an unintentional deactivation of the Hexapod system and resulting unintentional position changes of the Hexapod.
- Make sure that no collisions between the Hexapod, the load to be moved and the environment are possible in the work space of the Hexapod.

Incorrect mounting can warp the base plate. Warping of the base plate reduces the accuracy.

- Mount the Hexapod on an even surface. The recommended evenness of the surface is 300 µm.

Safety Measures during Start-Up

There is a risk of minor injuries caused by crushing which can occur between the moving parts of the Hexapod and a stationary part or obstacle.

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

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

- Make sure that no collisions between the Hexapod, the load to be moved, and the surroundings are possible in the working space of the Hexapod.
- Do not place any objects in areas where they can get caught by moving parts.
- Immediately stop the motion if a malfunction occurs in the controller (see user manuals of the C-887).

Safety Measures during Maintenance

The Hexapod can become misaligned as a result of improper maintenance. The specifications can change as a result.

- Do not loosen any screws.

General System Information

Modifications Compared to the Standard Product

In contrast to the standard models *H-850.H1* and *C-887.11*, the delivered product includes:

- Provisional platform
- Fixation for easy dismounting and installation of platforms
- Modified electronics, incl. data connector and position sensors, at the Hexapod
- Modified controller hardware
- Specific controller firmware

Delivered System Components (Hardware)

Item No.	Description
H850B0081	6-axis Hexapod positioner
C-887.522	C-887.52-based Hexapod controller with E-Stop function, incl. specific firmware
C887B0038	Short-circuit adapter for the controller's E-Stop connector
C-887.5PS	Power supply for controller (output 24 V, DC) with IEC-60320 C14 (m) and M12 4-contact (f) connectors
K040B0266	Data cable 6 m, with connectors D-sub 78 m/f
K060B0147	Power cable 6 m, with connectors M12, 4-pin, m/f
000034605	Screw set, incl. - 6 hex cap screws M6x30 (ISO 4762) - Allen wrench AF 5 DIN 911

Handling and Cleaning of the System

NOTE

For any type of Hexapod handling:

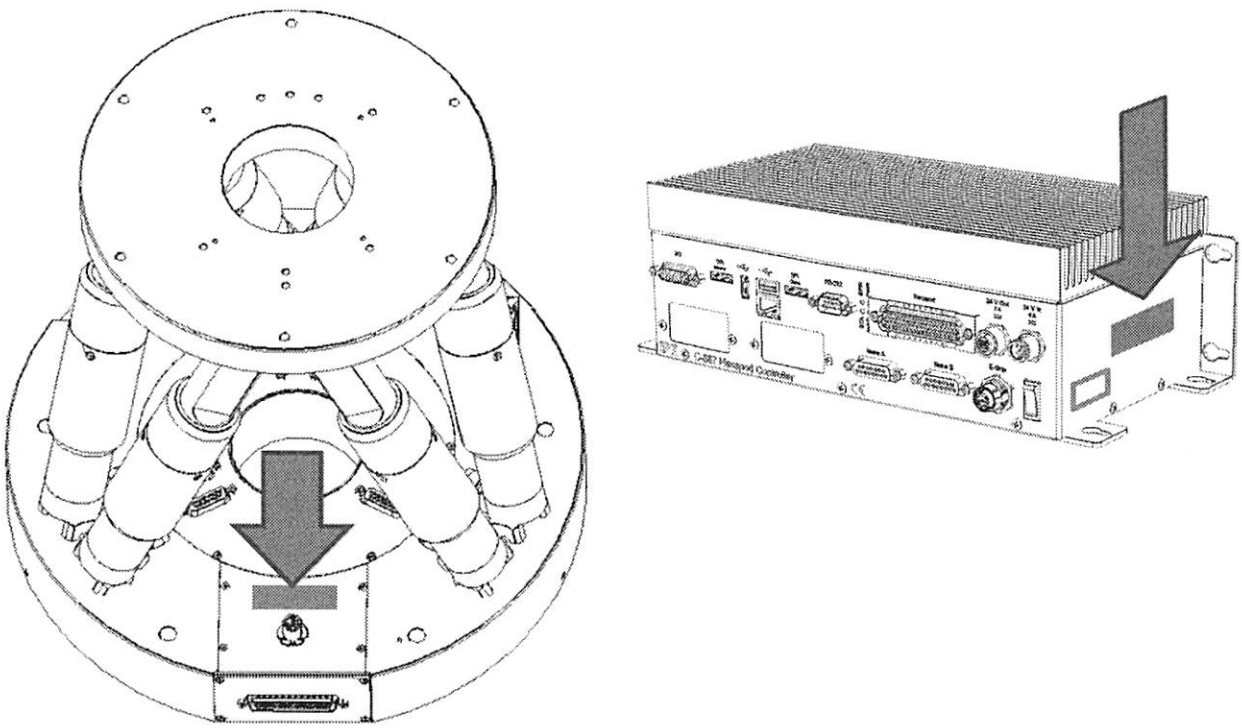
➢ Do **not** touch the Hexapod struts.

For cleaning the surfaces of the Hexapod and the controller, we recommend using a cloth and small amounts of mild disinfectants or solvents (also including non-aggressive organic solvents, e. g. isopropyl alcohol).

Identifying Your System Components

System components (Hexapod mechanics and controller) can be identified via the product labels. Its information includes:

- Product ID
- Serial number
- Manufacturer logo and website reference
- Conformity marks
- Warning signs, if applicable
- Country of origin



Location of the product labels for Hexapod mechanics (left) and controller (right)

Mechanical Setup of the Hexapod

The Hexapod is delivered with mounted transport lock (brackets) and a provisional platform which needs to be replaced by your final platform. For this purpose, each of the red mounting brackets includes a pair of fixing screws each for the struts and the platform.

NOTE

Risk of Damage

The mounting brackets provide safe fixation of the Hexapod's struts when mounting, dismounting or replacing platforms.

➢ Do **not** dismount the brackets before having replaced the provisional platform with your final platform.

NOTE

Risk of Damage

For any type of handling:

➢ Do **not** touch the Hexapod struts.

INFORMATION

Due to the weight of the Hexapod mechanics, the device should be held by **two persons** for unpacking, transport and installation at the application site.

Prerequisites

- The controller is disconnected from the Hexapod or powered off.

Tools and Accessories

- Screws M8 with a length that matches the corresponding threaded holes in the platform and the static and dynamic forces during operation. If matching, you can use the screws used for fixing the provisional platform (see below).
- For fixing the final platform: Corresponding wrench or screwdriver (for cylinder head screws ISO 4762: Allen wrench AF 7)
- For dismounting the provisional platform: Allen wrench AF 7

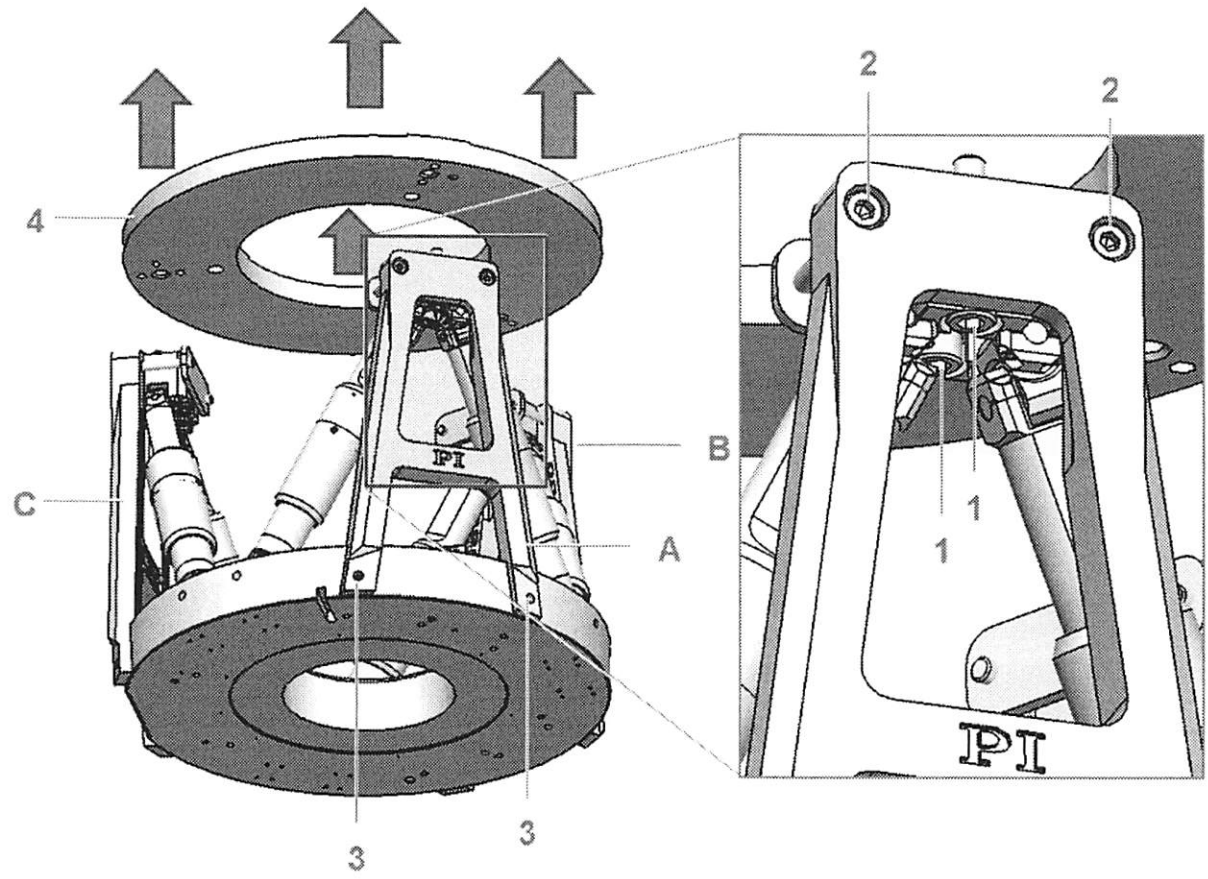


Figure 1: Removing the provisional platform

A-C	*Mounting bracket*
1	*Platform fixing screw M8x60*
2	*Strut fixing screw M8x60*
3	*Bracket fixing screw M8x20*
4	*Provisional platform*

Removing the Provisional Platform

1. Remove the platform fixing screws (see figure above, pos. 1) from each bracket.
2. If you want to re-use the screws, keep them at a safe place.
3. Carefully remove the provisional platform.

Mounting the Final Platform

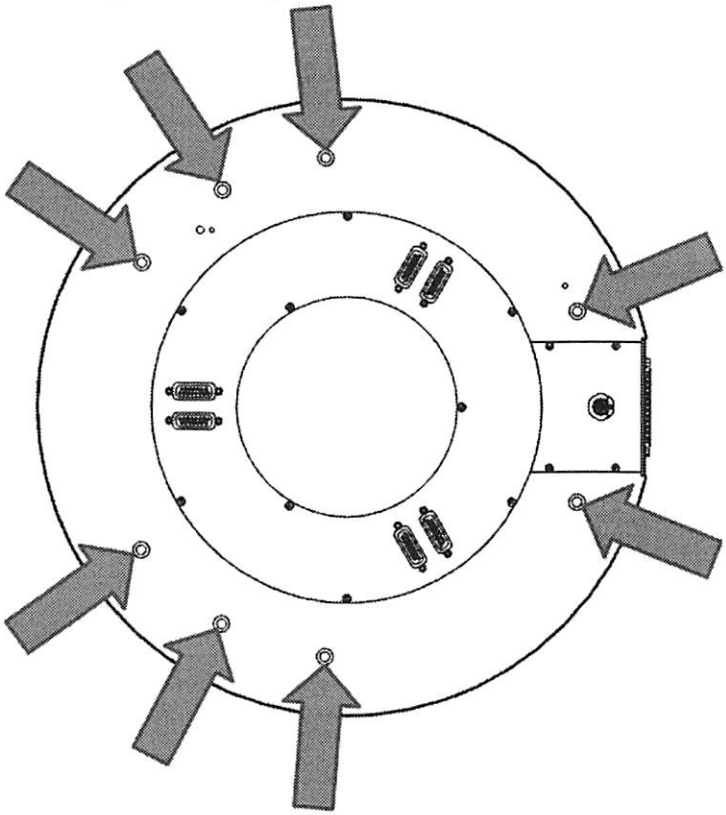
1. Position the final platform on the Hexapod assembly so that the corresponding mounting holes in the platform overlap with the holes for the platform fixing screws (see figure above, pos. 1).
2. Insert an M8 screw into each of the above-mentioned holes and tighten. If matching, you can re-use the fixing screws for the provisional platform.
3. Ensure that the platform is fixed without backlash.

Removing the Brackets

The following procedure applies for each of the three brackets:

1. Unscrew the strut fixing screws completely (see figure above, pos. 2), simultaneously holding the related plate behind. The corresponding struts are then released.
2. Unscrew the bracket fixing screws (see figure above, pos. 3) at the Hexapod's base plate. The corresponding bracket is then released.
3. For further use, keep the bracket in a safe place.

Mounting the Hexapod on a Surface



Mounting the Hexapod (shown with platform and cables suppressed; arrows indicating mounting positions)

Prerequisites

- You have provided a suitable surface (for the required positions of the holes for accommodating the screws, see "Dimensions" (p. 22)
- For applications with great temperature changes: The surface should have the same or similar thermal expansion properties as the Hexapod.
- You accounted for the space required for cable routing free of kinks and in accordance with regulations.

Tools and Accessories

- Screws M6 with a length that matches the corresponding threaded holes in the surface and the static and dynamic forces during operation. If matching, you can use the M6x60 screws included in the delivered screw set)
- Corresponding wrench or screwdriver (for cylinder head screws ISO 4762: Allen wrench AF 5; included in the delivered screw set)

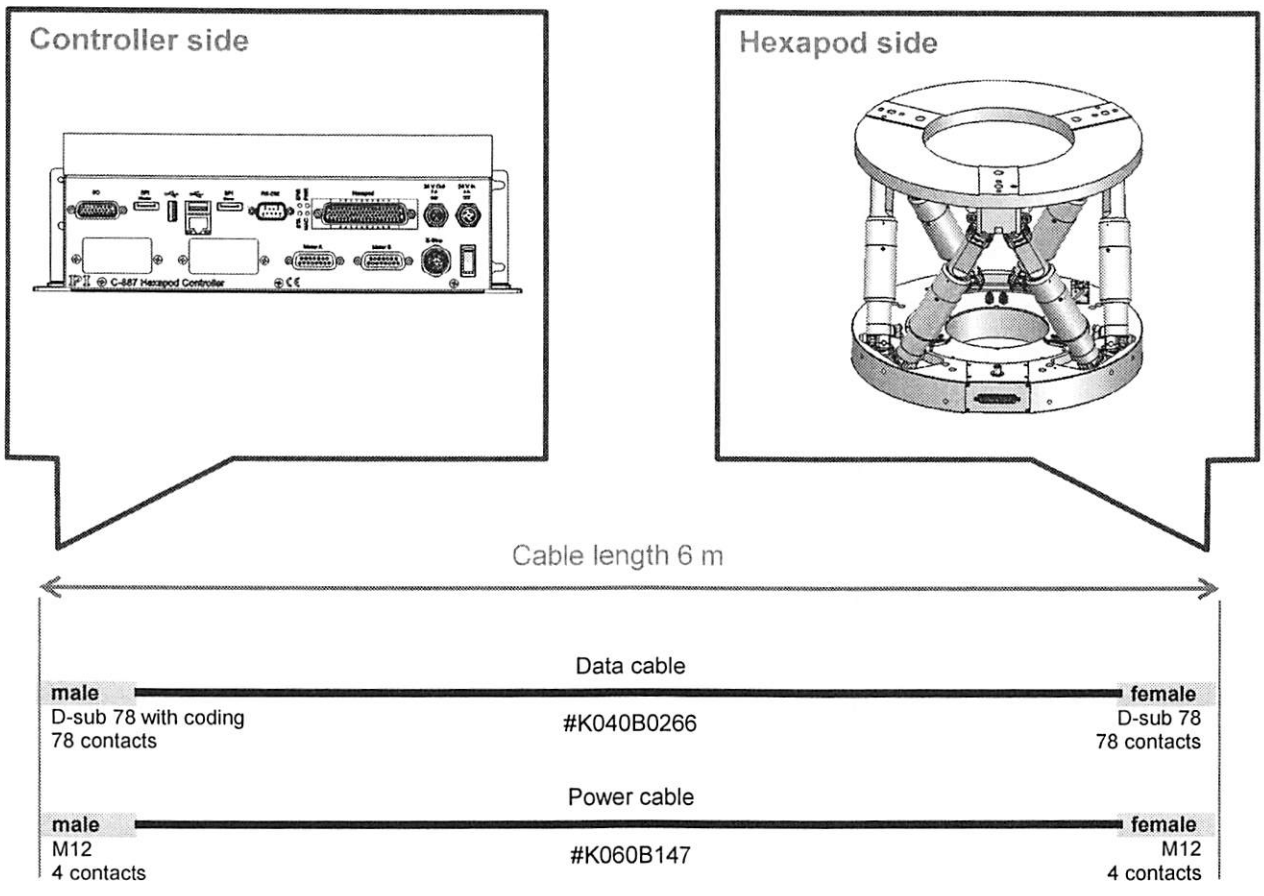
Mounting the Hexapod on a Surface

1. Align the Hexapod on the surface so that the corresponding mounting holes in the Hexapod and surface overlap.
2. Completely screw in the screws at least into three mounting holes (uniformly distributed at the circumference of the Hexapod's base plate, see figure above).
3. Check that the Hexapod fits on the surface without backlash.

Cabling Schemes

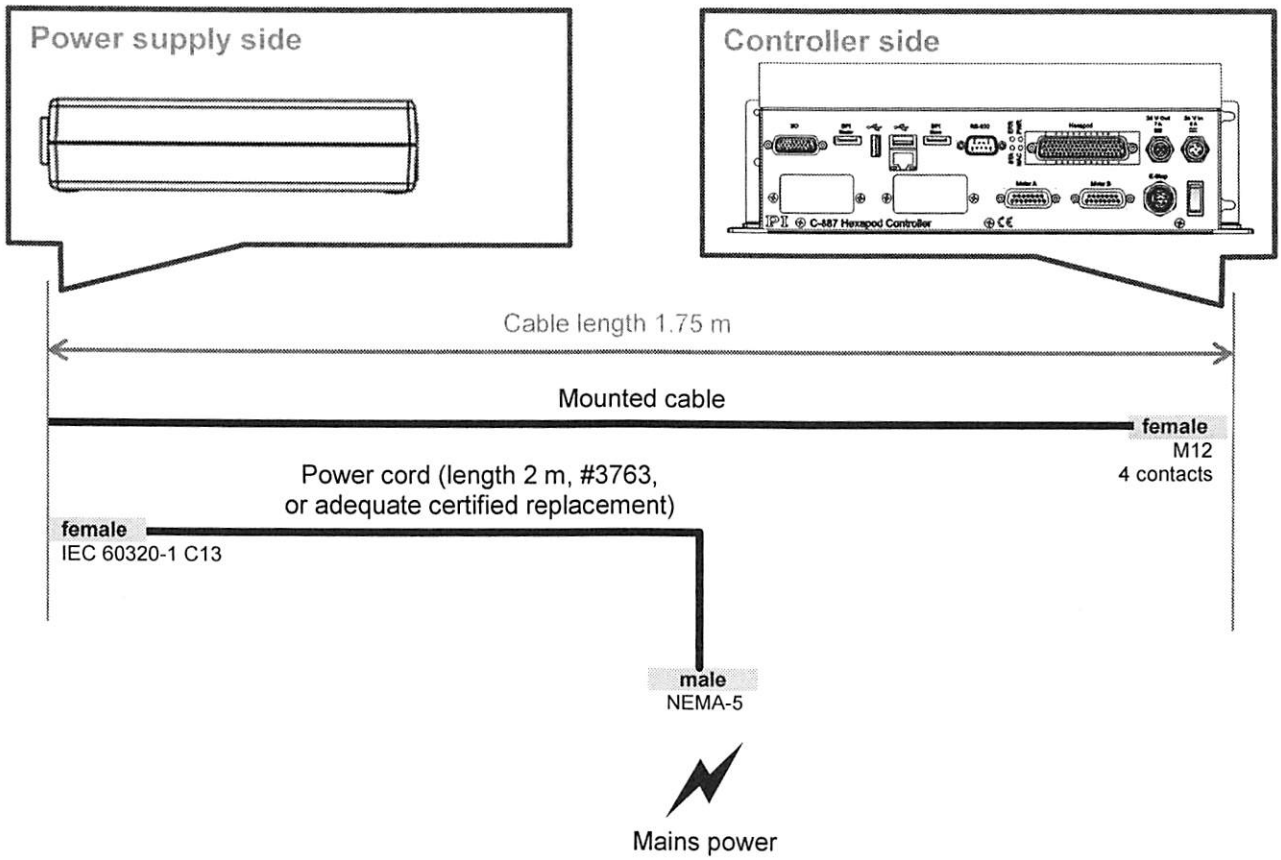
For pinout tables, see ***Pin Assignment - Connectors at the Controller,*** p. 28.

Controller – Hexapod



Power Supply - Controller

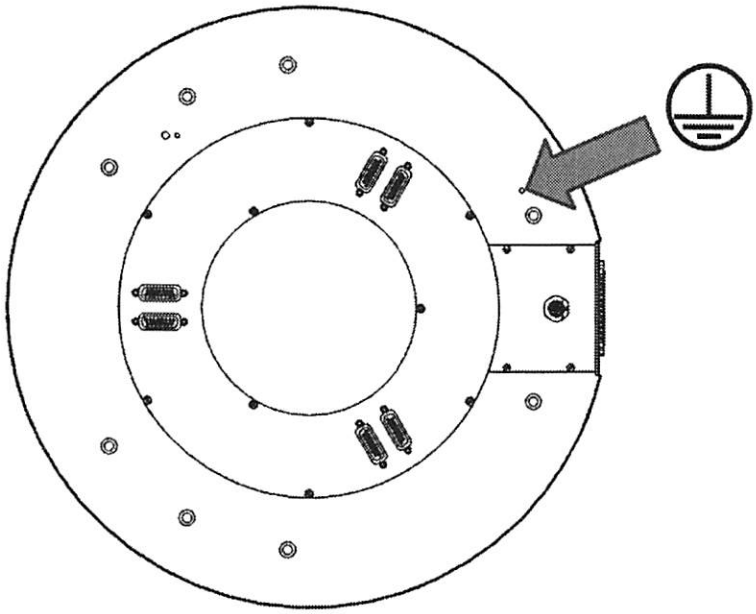
The allowed input voltage of the power supply ("Mains power", see figure below) ranges from 90 V to 264 V and 47 Hz to 63 Hz, covering all common mains power systems worldwide.
The power supply includes mounted cable 1.75 m with M12 4-pin connector and a mounted C14 connector (m) according to IEC 60320-1. The required power cord for North American mains power systems is included in the scope of delivery.



Grounding Connections (Protective Earth)

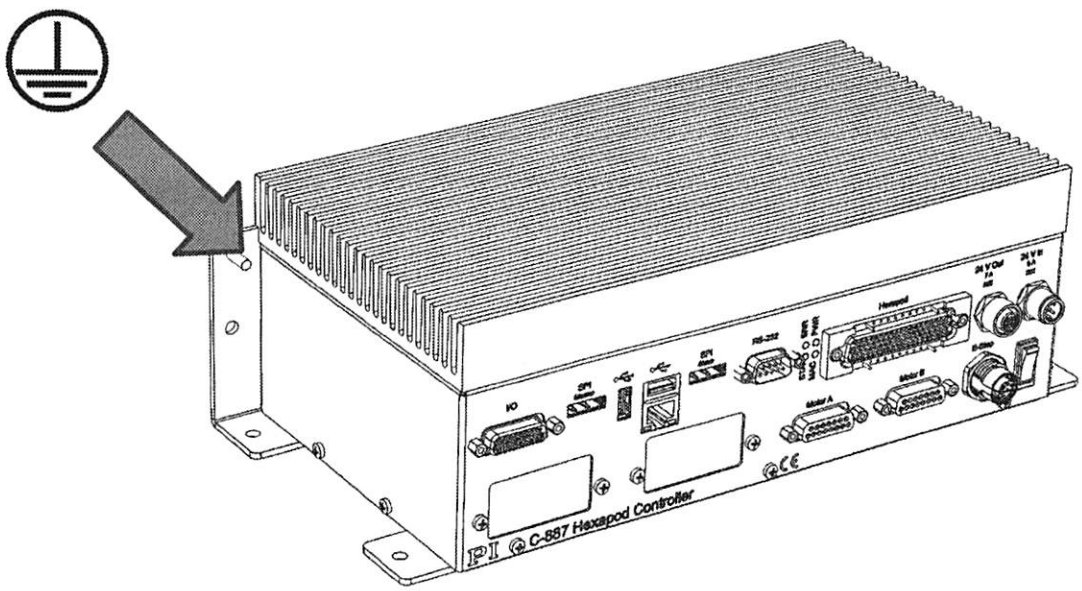
Hexapod Mechanics

For the position of the grounding connection (threaded hole M4 at the base plate), refer to the following figure (see arrow).



Hexapod Controller

For the position of the grounding connection (screw M4), refer to the following figure (see arrow).

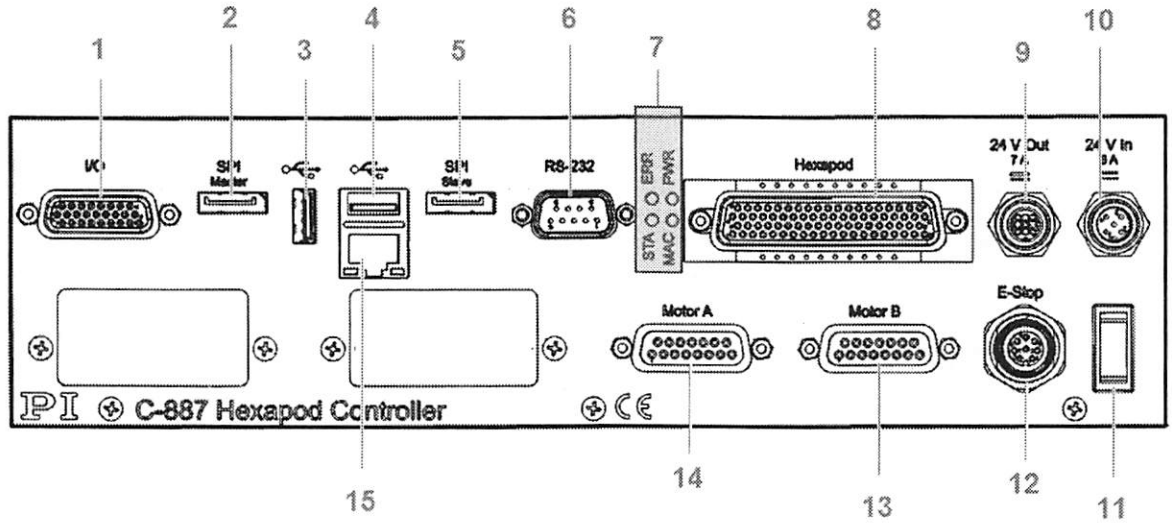


Electric Installation

INFORMATION

The controller can only be properly operated if its E-Stop connector is connected either to the delivered short-circuit connector or to a properly working E-Stop instrumentation.

Connectors and Control Elements of the Controller



Connectors and controls of the controller with all options included (front panel, description see table)

Position	Connector / Function	Format Type	Pin Assignment
1	I/O (input / output)	D-sub15 (f)	See p. 25
2	SPI master	Display port (f)	Standard
3	USB	USB 2.0 Type A (f)	Standard
4	USB	USB 2.0 Type A (f)	Standard
5	SPI slave	Display port (f)	Standard
6	RS-232	D-sub 9 (m)	Standard
7	Status indicators (ERR / PWR / STA / MAC)	LED	-
8	Hexapod data	D-sub 78 (f)	See p. 24
9	Hexapod power (DC, 24 V / 7 A max.)	M12 / 5-pin (f)	See p. 25
10	Controller power in (DC, 24 V / 8 A max.)	M12 / 4-pin (m)	See p. 25
11	Power on/off	Switch	-
12	Emergency stop (interruptor function)*	M12 / 8-pin (f)	See p. 26
13	Motor B (additional actuator)	D-sub 15 (f)	See p. 26
14	Motor A (additional actuator)	D-sub 15 (f)	See p. 26
15	LAN / Host computer	RJ-45 (f)	Standard

Prerequisites

- The power supply's power cable is **not** connected to the mains power.
- The power switch of the controller is in "OFF" / "O" position.

Installing the cables

1. If applicable, connect the controller's grounding connector to the grounding system of the rack using a cable and connection system according to the national standards for grounding. See also the user manual of your rack system.
2. Connect the Hexapod's grounding connector to your grounding system.
3. Connect the cables for the Hexapod side according to the *Cabling Scheme* chapter above:
   Connect the Hexapod data connector (m) with the corresponding connector (f) of the controller (see the figure above, position 8) using the appropriate cable.
   Connect the Hexapod's power connector (m) with the corresponding connector (f) of the controller (see the figure above, position 9) using the appropriate cable.
4. Connect the LAN connector to the corresponding LAN devices or a computer using at least CAT 5 (STP) LAN cable.
5. Connect the E-Stop Unit to the E-Stop connector of the controller (M12 8-pin). If you want to test the system without the final E-Stop instrumentation, mount the short-circuit-connector at the controller's E-Stop connector.
6. Connect the M12 (5-pin) connector of the power supply to the controller's Power-In connector (see the figure above, position 10). Secure the connection by screwing in the knurled nut at the M12 connector of the adapter cable.
7. Connect the power connector of the power supply to the power socket of your mains power system using the delivered power cable or an adequate replacement.

Software Installation

1. On the host computer, install the delivered software. Follow the descriptions given in the user manuals of the corresponding software and the C-887 controller (included in the CD-ROM).
2. If you use the LAN connector for communication, establish an according TCP/IP connection. Follow the descriptions given in the user manuals of the software and the C-887 controller.

Starting Up and Operating the Controller

INFORMATION

For regular controller operation, the E-Stop Unit

- **must** be connected to the controller
- **must** be initially switched **on** by pressing its green Release button

For testing or operation without E-Stop devices, the delivered short-circuit adapter can be connected to the controller's E-Stop connector. Note that otherwise, the controller will not start regularly.

Prerequisites

- You have read and observed the safety instructions given in this document and in the manuals of the H-850 Hexapod and the C-887 controller.
- You have observed the instructions for mounting and electric installation of the controller above.
- You have installed the Hexapod according the instructions given in the manual of the Hexapod.
- You have installed the controller according the instructions given above.
- You have connected the controller's E-Stop connector to the short-circuit adapter (for testing purposes) or to your E-Stop instrumentation.

Starting Up the Controller

1. Switch on the power switch of the controller.
2. Check whether the Power LED is on.
3. If the Power LED is off:
    a. Switch off the power switch of the controller.
    b. Check the cabling of the controller unit.
    c. Check the mains socket.
    d. If you detected errors, eliminate the errors. If you cannot detect any error: Contact the PI Customer Service (e-mail: info@pi.ws).
4. At the E-Stop unit (see below), ensure that the red button is unlatched and press the green push button. Alternatively, use the short-circuit adapter connected to the controller's E-Stop connector when testing the system.
5. At the host computer, start the software and perform some moves of the Hexapod for testing.

INFORMATION

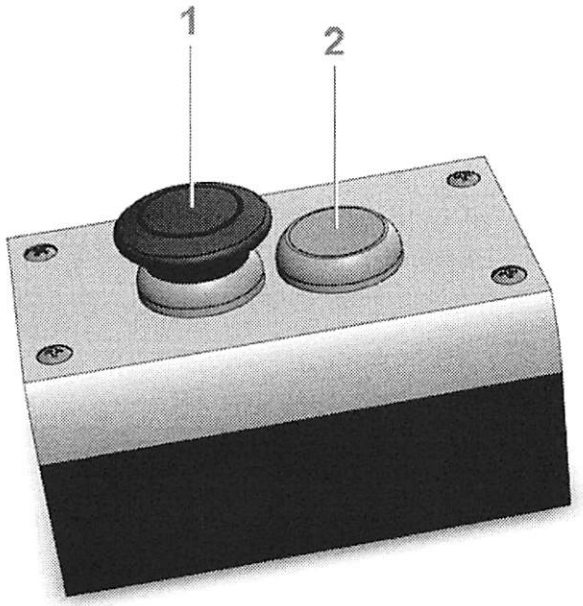
For modified or added controller commands (compared to those described in the C-887 user manua)l, see Technical Note *C887T0008.*

E-Stop

INFORMATION

The following sections describe the use of an E-Stop mechanism according to EN 60204. A ready-to-use switching device is available from PI.

➢ If you use other systems, proceed correspondingly.



Sample E-Stop Unit according to EN 60204-1 (shown without cable and connector) with

1. *E-Stop button (lock knob, red)*
2. *Release push button (green)*

INFORMATION

The red push-button at the E-Stop Unit is **not** able to power off **additional** actuators completely that have **separate** power supplies.

For the Hexapod, the sensor lines remain active also after activating the E-Stop function over the red push-button.

The **power off** feature applies for the drives of the Hexapod struts and for those additional axes (connected over "Motor A" and "Motor B") which are **exclusively** supplied by the controller connectors.

If additional actuators with separate power supplies have to be switched:

- Integrate the corresponding actuators separately in your e-stop concept; or
- Contact the customer service (info@pi.ws) for developing a solution.

In critical situations, Hexapod motions can be stopped over the red push-button of the E-Stop Unit. In this case, the power for the Hexapod strut drives and the motor control signal of the additional axes is cut at the corresponding connectors (labeled "Hexapod", "Motor A", "Motor B").

The stop can be reset via unlatching the red button and subsequently pressing the green push-button of the E-Stop Unit (Details see below).

Using the E-Stop Button

In case of dangerous situations:

- Press the **red** button at the E-Stop Unit (see figure above, pos. 1)

INFORMATION

When the red push-button at the E-Stop Unit has been pressed, it remains in a latched position.

INFORMATION

Pressing the E-Stop button triggers a corresponding controller firmware signal and causes "servo off" state.

The firmware signal, however, may have a delay of up to 10 seconds

INFORMATION

If the Hexapod is in motion when pressing the E-Stop button, minor overtravel may occur since no brakes are present.

The new position, however, is detected by the controller.

Releasing the E-Stop

CAUTION

Potentially persisting hazard!

The E-Stop button is regularly used in case of dangers.

Before resetting the latched E-Stop button and pressing the Release button after an emergency stop:

- Make sure that the cause of the danger has been eliminated.
- Make sure that the system can re-start from the last position without problems.

INFORMATION

Potential overtravel of the strut motors may cause a deviation of the Hexapod platform's course after an emergency stop.

- Check all axes for deviations compared to the planned position. (E. g. by comparing the position values displayed in the PI MikroMove software).

INFORMATION

The release button function is available approx. 10 seconds after E-Stop activation.

- After E-Stop button activation, wait at least **10 seconds** before activating the green release button.

If the cause of the danger has been eliminated and the system can re-start without problems or when re-starting the system after powering off the controller:

1. If the red button is latched, press the latched red button at the E-Stop Unit again in order to unlatch it (see figure above, pos. 1).
2. Press the **green** button at the E-Stop Unit (Release button, see figure above, pos. 2).
3. In the motion control software or by external means, check whether the end position of the intended move has been reached or a position deviation occurred.
4. Re-initialize or set "servo on" state (see the C-887 Controller manual).
5. If necessary, command the Hexapod to the intended position.

Specifications

Technical Data (Hexapod Mechanics)

	H-850K043	Unit	Tolerance
Active axes	X, Y, Z, θ_X, θ_Y, θ_Z		
Motion and positioning			
Travel range* X, Y	±50	mm	
Travel range* Z	±25	mm	
Travel range* θ_x, θ_y	±15	°	
Travel range* θ_z	±30	°	
Single-actuator design resolution	0.005	µm	
Min. incremental motion X, Y	1	µm	typ.
Min. incremental motion Z	0.5	µm	typ.
Min. incremental motion θ_x, θ_y, θ_z	5	µrad	typ.
Backlash X, Y	4	µm	typ.
Backlash Z	1	µm	typ.
Backlash θ_x, θ_y	15	µrad	typ.
Backlash θ_z	30	µrad	typ.
Repeatability X, Y	±1	µm	typ.
Repeatability Z	±0.3	µm	typ.
Repeatability θ_x, θ_y	±5	µrad	typ.
Repeatability θ_z	±9	µrad	typ.
Max. velocity X, Y, Z	0.5	mm/s	
Max. velocity θ_x, θ_y, θ_z	6	mrad/s	
Typ. velocity X, Y, Z	0.3	mm/s	
Typ. velocity θ_x, θ_y, θ_z	3	mrad/s	
Mechanical properties			
Stiffness X, Y	7	N/µm	
Stiffness Z	100	N/µm	
Load (base plate horizontal / any orientation)	250 / 50	kg	max.
Holding force, de-energized (base plate horizontal / any orientation)	2000 / 500	N	max.
Motor type	DC motor, gearhead		
Miscellaneous			
Operating temperature range	-10 to 50	°C	
Material	Aluminum		
Mass (total / mechanics)	31.5 / 26.7	kg	±5 %

Technical data specified at 20±3 °C.

* The travel ranges of the individual coordinates (X, Y, Z, θX, θY, θZ) are **inter**dependent. The data for each axis in this table shows its maximum travel, where all other axes are at their zero positions. If the other linear or rotational coordinates are not zero, the available travel may be less. The rotation center (Pivot Point) for the rotational travel ranges is (0/0/0) which is the upper strut joint plane below the top plate of the Hexapod.

Center of gravity (CoG; from the top and center of hexapod interface as given in the Dimensions drawing
X = 0 mm
Y = 0 mm
Z = 186 mm

thus corresponding to PI definition (0 / 0 / 227.4)

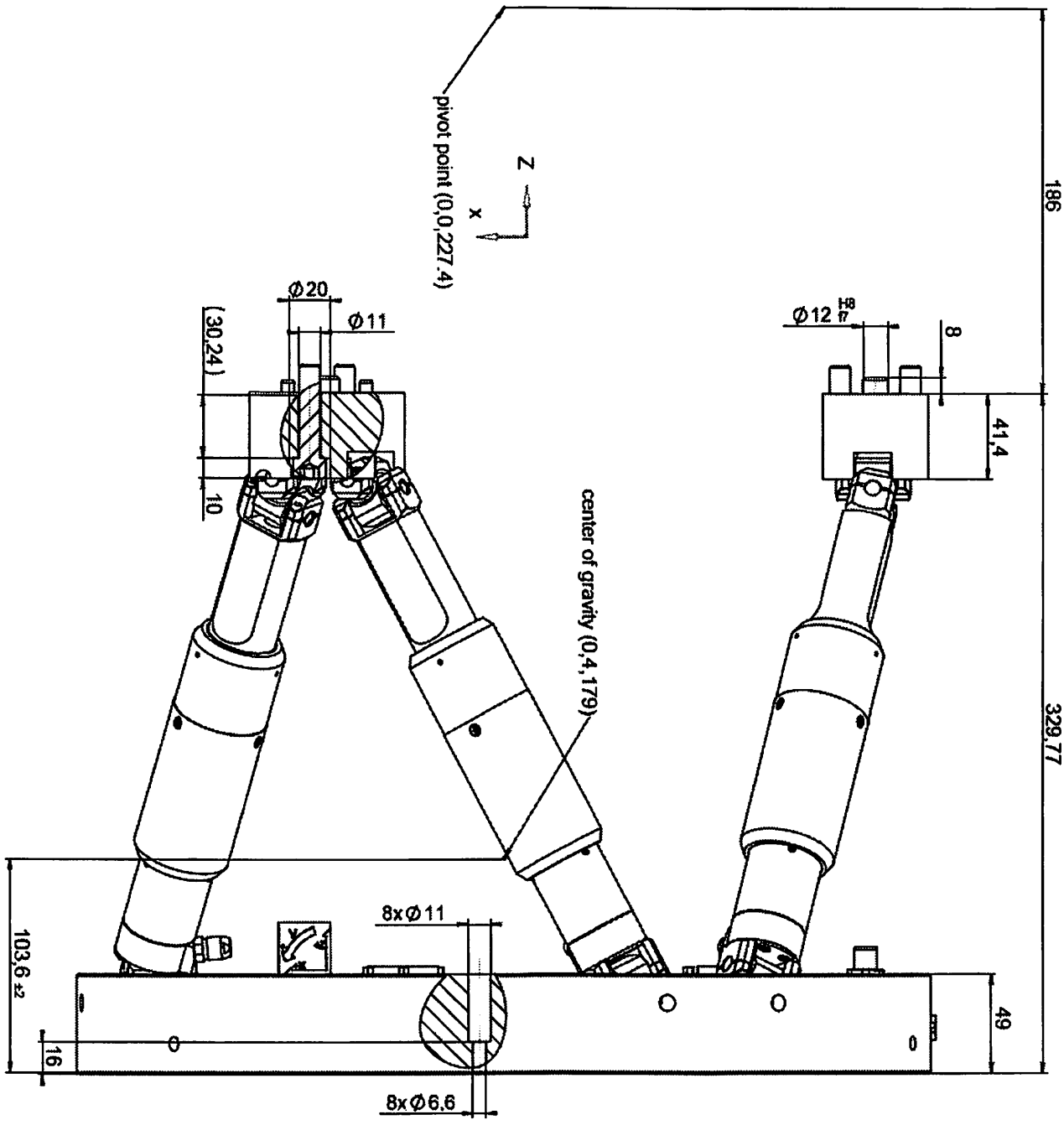
The payload mass of 120 kg is confirmed for all positions and mounting angles with the given CoG. The Hexapod is self-locking for the 120 kg load and holds position when powered off. When powered on, the Hexapod can move loads up to 150 kg with reasonable safety factor. When powered off, the worst case scenario allows only holding up to 130kg. For certain orientations and positions close to 0 the self-locking capability, is higher. See examples in the Appendix.

For safe operation, we recommend:

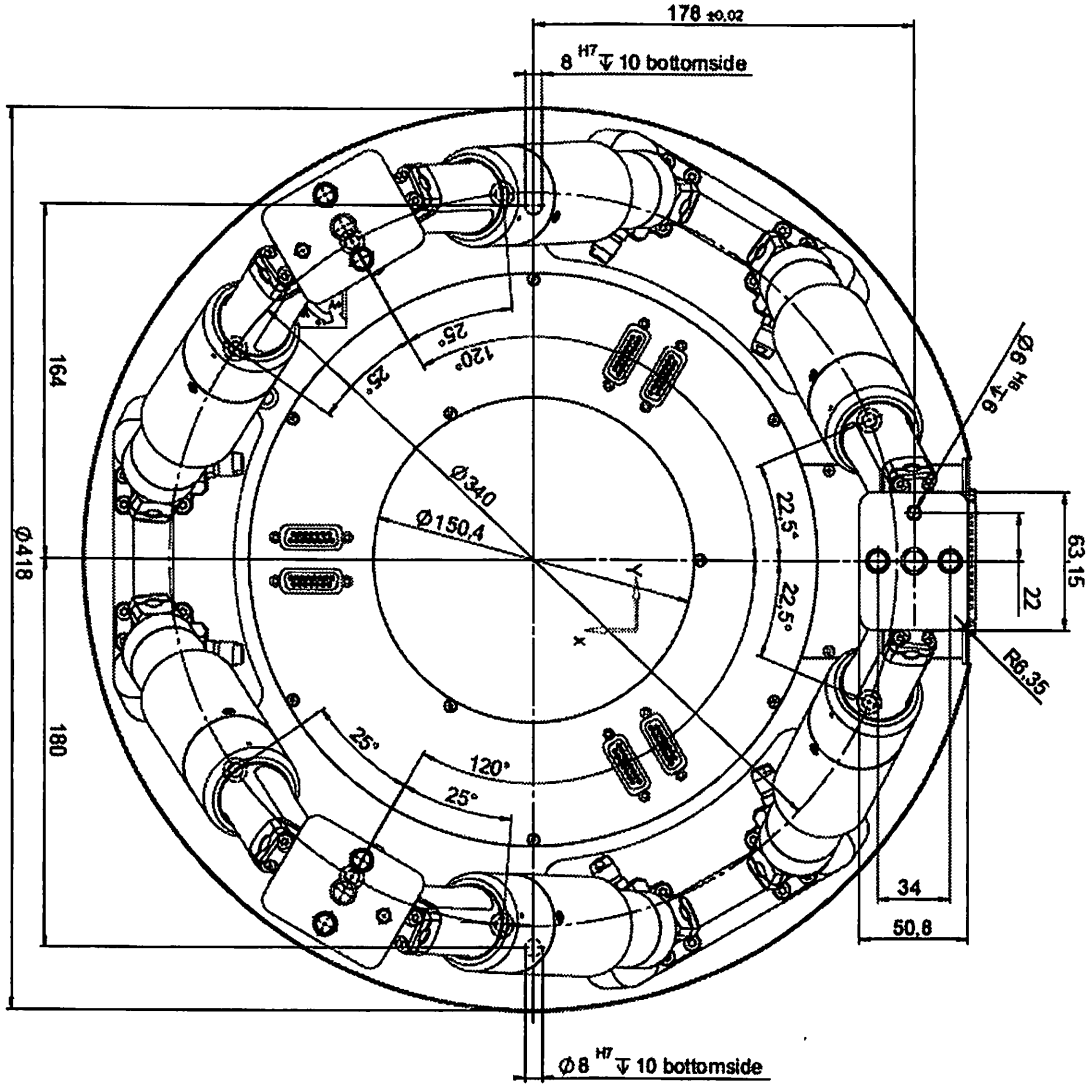
- to leave the hexapod powered on all the time and move it to zero position before powering down.
- to mount the hexapod with vertical x axis for more equally distributed leg forces.

Dimensions

Values in mm, decimal places separated by commas.



2015-04-28
H850T0013, valid for H-850K043

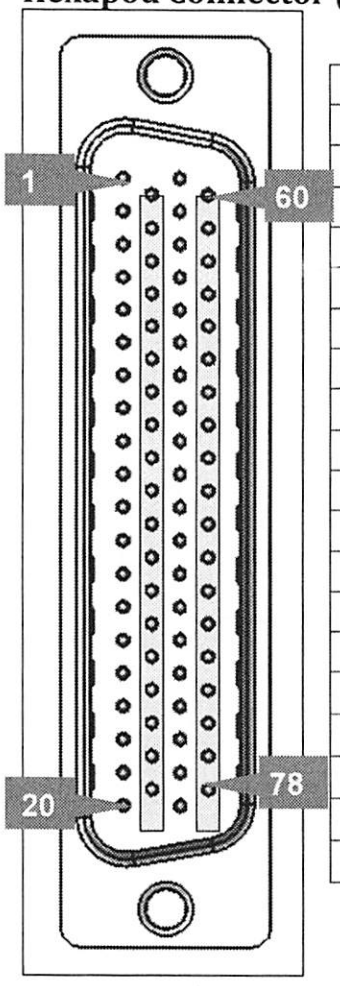


Pin Assignment - Connectors at the Controller

INFORMATION

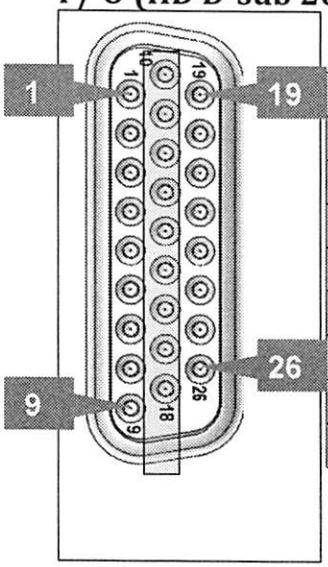
For additional information on controller-related items, see also the C-887 Controller documentation included in the CD-ROM.

Hexapod Connector (Data, D-sub 78, f)



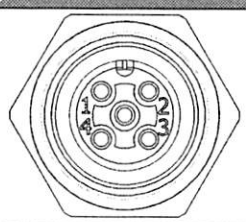
1	CH1 Sign	21	CH1 Ref	40	CH1 Magn	60	CH1 Limit Pos
2	CH1 +5V	22	CH1 A+	41	CH1 Limit Neg	61	CH1 B+
3	CH1 A-	23	CH1 GND	42	CH1 B-	62	CH1 GND
4	CH2 Sign	24	CH2 Ref	43	CH2 Magn	63	CH2 Limit Pos
5	CH2 +5V	25	CH2 A+	44	CH2 Limit Neg	64	CH2 B+
6	CH2 A-	26	CH2 GND	45	CH2 B-	65	CH2 GND
7	CH3 Sign	27	CH3 Ref	46	CH3 Magn	66	CH3 Limit Pos
8	CH3 +5V	28	CH3 A+	47	CH3 Limit Neg	67	CH3 B+
9	CH3 A-	29	CH3 GND	48	CH3 B-	68	CH3 GND
10	CH4 Sign	30	CH4 Ref	49	CH4 Magn	69	CH4 Limit Pos
11	CH4 +5V	31	CH4 A+	50	CH4 Limit Neg	70	CH4 B+
12	CH4 A-	32	CH4GND	51	CH4 B-	71	CH4 GND
13	CH5 Sign	33	CH5 Ref	52	CH5 Magn	72	CH5 Limit Pos
14	CH5 +5V	34	CH5 A+	53	CH5 Limit Neg	73	CH5 B+
15	CH5 A-	35	CH5GND	54	CH5 B-	74	CH5 GND
16	CH6 Sign	36	CH6 Ref	55	CH6 Magn	75	CH6 Limit Pos
17	CH6 +5V	37	CH6 A+	56	CH6 Limit Neg	76	CH6 B+
18	CH6 A-	38	CH6 GND	57	CH6 B-	77	CH6 GND
19	ID Chip	39	GND	58	Brake	78	GND
20	24V Out			59	Power Good		

I / O (HD D-sub 26, f)



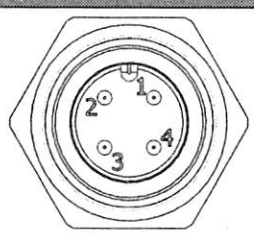
1	Analog in 2 (-10 V... 10 V)	10	Analog in 1 (-10 V... 10 V)	19	Analog in 3 (-10 V... 10 V)
2	GND (analog)	11	Analog in 4 (-10 V ... 10 V)	20	GND
3	Reserved	12	Reserved	21	Reserved
4	Reserved	13	Reserved	22	GND
5	Reserved	14	Reserved	23	Reserved
6	Vcc (+5 V)	15	Reserved	24	GND
7	Digital in 3 (TTL)	16	Digital in 4 (TTL)	25	Digital in 2 (TTL)
8	Digital out 4 (TTL)	17	Digital in 1 (TTL)	26	Digital out 3 (TTL)
9	Digital out 1 (TTL)	18	Digital out 2 (TTL)		

Power Out (at Controller and Power Supply: M12, 4-contact/5-pin*, f, coded "A")

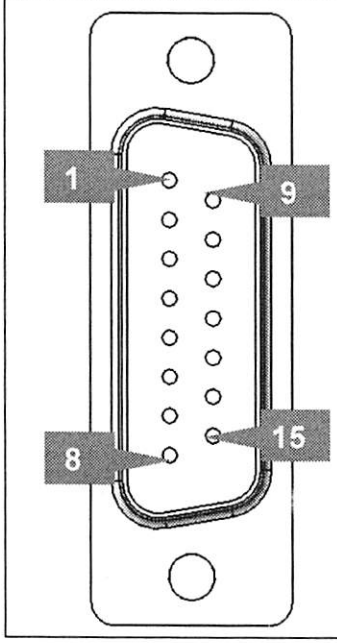
M12, 5-pin (f)	Pin	Signal
	1	GND
	2	GND
	3	24 V DC
	4	24 V DC

* The middle pin is generally **not** connected

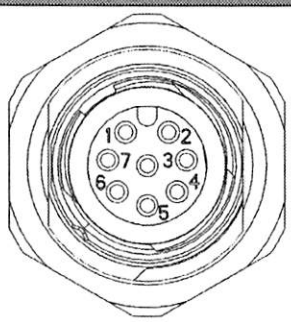
Power In (M12, 4-pin, m, coded "A")

M12, 5-pin (m)	Pin	Signal
	1	GND
	2	GND
	3	24 V DC
	4	24 V DC

Motor A / Motor B (D-sub 15, f)

D-sub15 (f)	Pin		Signal
	1		-
		9	Motor-
	2		Motor+
		10	GND
	3		-
		11	-
	4		+5V
		12	Limit negative
	5		Limit positive
		13	Reference
	6		GND
		14	Encoder A+
	7		Encoder A-
		15	Encoder B+
	8		Encoder B-

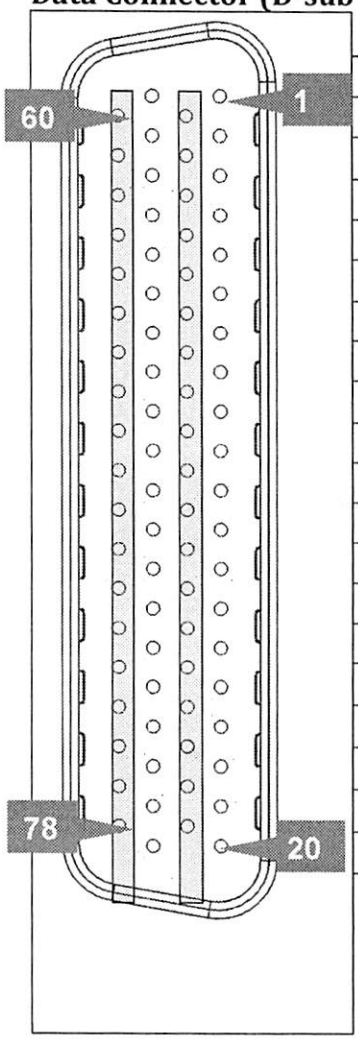
E-Stop (M12 / 8-pin, f, coded "A")

M12, 8-pin (f)	Pin	Signal
	1	Break contact 1 (Power off)
	2	Break contact 2 (Power off)
	3	Reserved
	4	Reserved
	5	Make contact 1 (Power on)
	6	Make contact 2 (Power on)
	7	Reserved
	8	Reserved

2015-04-28
H850T0013, valid for H-850K043

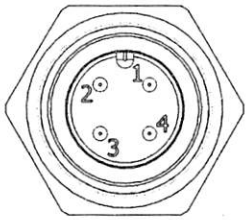
Pin Assignment - Connectors at the Hexapod

Data Connector (D-sub 78, m)



1	CH1 Sign	21	CH1 Ref	40	CH1 Magn	60	CH1 Limit Pos
2	CH1 +5V	22	CH1 A+	41	CH1 Limit Neg	61	CH1 B+
3	CH1 A-	23	CH1 GND	42	CH1 B-	62	CH1 GND
4	CH2 Sign	24	CH2 Ref	43	CH2 Magn	63	CH2 Limit Pos
5	CH2 +5V	25	CH2 A+	44	CH2 Limit Neg	64	CH2 B+
6	CH2 A-	26	CH2 GND	45	CH2 B-	65	CH2 GND
7	CH3 Sign	27	CH3 Ref	46	CH3 Magn	66	CH3 Limit Pos
8	CH3 +5V	28	CH3 A+	47	CH3 Limit Neg	67	CH3 B+
9	CH3 A-	29	CH3 GND	48	CH3 B-	68	CH3 GND
10	CH4 Sign	30	CH4 Ref	49	CH4 Magn	69	CH4 Limit Pos
11	CH4 +5V	31	CH4 A+	50	CH4 Limit Neg	70	CH4 B+
12	CH4 A-	32	CH4GND	51	CH4 B-	71	CH4 GND
13	CH5 Sign	33	CH5 Ref	52	CH5 Magn	72	CH5 Limit Pos
14	CH5 +5V	34	CH5 A+	53	CH5 Limit Neg	73	CH5 B+
15	CH5 A-	35	CH5GND	54	CH5 B-	74	CH5 GND
16	CH6 Sign	36	CH6 Ref	55	CH6 Magn	75	CH6 Limit Pos
17	CH6 +5V	37	CH6 A+	56	CH6 Limit Neg	76	CH6 B+
18	CH6 A-	38	CH6 GND	57	CH6 B-	77	CH6 GND
19	ID Chip	39	GND	58	Brake	78	GND
20	24V Out			59	Power Good		

Power In (M12, 4-pin, m, coded "A")

M12, 4-pin (m)	Pin	Signal
	1	GND
	2	GND
	3	24 V DC
	4	24 V DC

2015-04-28
H850T0013, valid for H-850K043

EC Declaration of Conformity

Hexapod Mechanics

For the H-850K043 (Mechanics: H850B0081), an EC Declaration of Conformity has been issued in accordance with the following European directives:

- 2006/42/EC, Machinery Directive
- 2004/108/EC, EMC Directive
- 2011/65/EU, RoHS Directive

The applied standards certifying the conformity are listed below.

- Safety of Machinery: EN 12100:2010
- Electrical Safety: EN 61010-1:2010
- EMC: EN 61326-1:2013
- RoHS: EN 50581:2012

Customer Service

For inquiries and orders, contact your PI sales engineer or send us an e-mail (mailto:info@pi.ws).

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 for standard products are available for download on our website www.pi.ws.