Technical Note

BRo, MMa, 2015-10-29
H811T0019, valid for H-811.D2 and H-811.S2

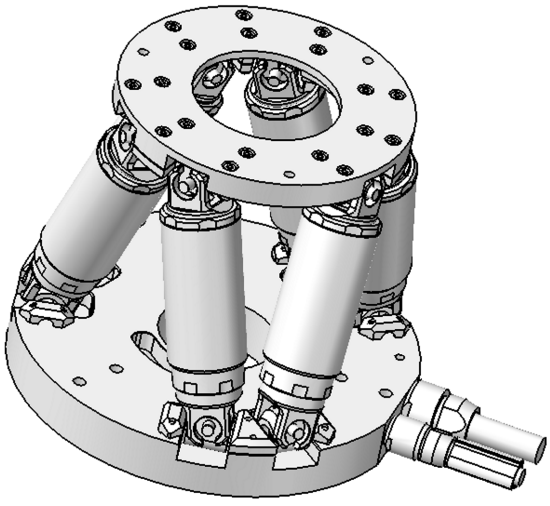
H-811.D2 and H-811.S2 Hexapod Microrobots

Contents

Introduction

Precision-Class 6-Axis Positioning System

Parallel-kinematic design for six degrees of freedom making it significantly more compact and stiff than serial-kinematic systems, higher dynamic range, no moved cables: Higher reliability, reduced friction



Model Overview

H-811.D2 Miniature Hexapod Microrobot, Direct Drive, 10 mm/s, 5 kg Load, 2 m Cable, HD Sub-D Connector

H-811.S2 Miniature Hexapod Microrobot, Direct Drive, 20 mm/s, 5 kg Load, 2 m Cable, HD Sub-D Connector

Recommended Controller (to be ordered separately)

C-887.5xx 6D Hexapod Controller, TCP/IP, RS-232, Bench-Top Device, Control of Two Additional Servo-Motor Axes Included; various models available

Other Applicable Documents

Description	Document
H-811 Hexapod Microrobot	MS199E user manual for H-811.D1 Hexapod models. This manual is also valid for H-811.D2 and H-811.S2 Hexapod models, except for the information superseded by the H811T0019 Technical Note (this document). ➢ Refer to the MS199E user manual for the following information: – Safety instructions and product description – Instructions for unpacking, installation, start-up, and maintenance of the Hexapod – Overview for troubleshooting
C-887.5xx Hexapod Controller	MS204E user manual Technical Notes for the individual controller models Documentation for the PC software that comes with the Hexapod controller
C-887 Wave Generator Functions	C887T0013 Technical Note, included in the controller CD C-887.CD (relevant for corresponding operation of H-811.S2; e.g. shaker applications)

Scope of Delivery

Order Number	Items
H-811	Hexapod according to your order, cable permanently installed
000015165	Steward snap-on ferrite suppressor
Packaging, consisting of:	
	▪ Outer box ▪ Inner box ▪ Two pads for sliding onto the inner box ▪ Internal cushion, bottom ▪ Internal cushion, cover ▪ Pallet
Documentation, consisting of:	
H811T0019	Technical Note for H-811.D2 and H-811.S2 Hexapod models (this document)
H811T0001	Technical Note on unpacking the Hexapod
MS199E	User manual for the Hexapod
Screw sets:	
000020110	Mounting accessories: ▪ 6 M4x25 hex-head cap screws ISO 4762 ▪ 1 Allen wrench 3.0 DIN 911

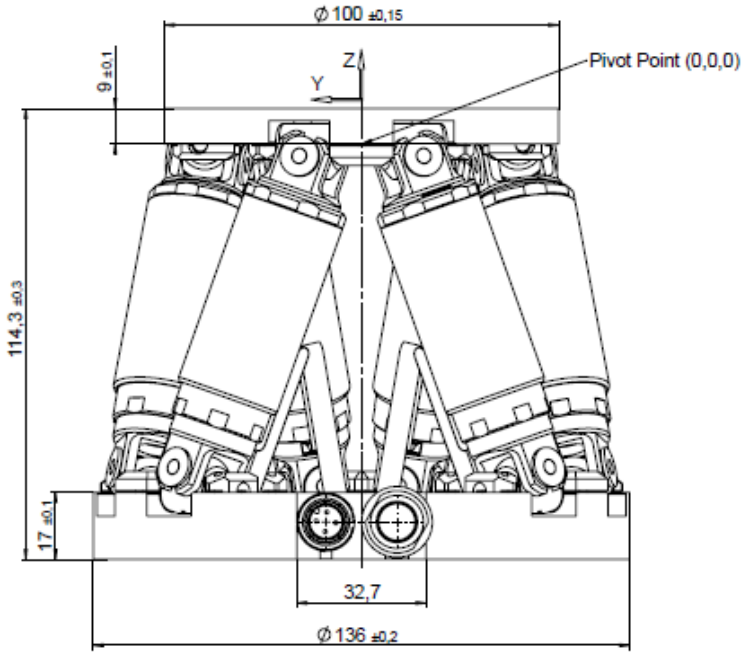
Order Number	Items
000036450	Accessories for connection to the grounding system: ▪ 1 flat-head screw with cross recess M4x8 ISO 7045 ▪ 2 washers, form A-4.3 DIN 7090 ▪ 2 safety washers, Schnorr Ø 4 mm N0110

Connecting the Hexapod to the C-887.5xx Controller

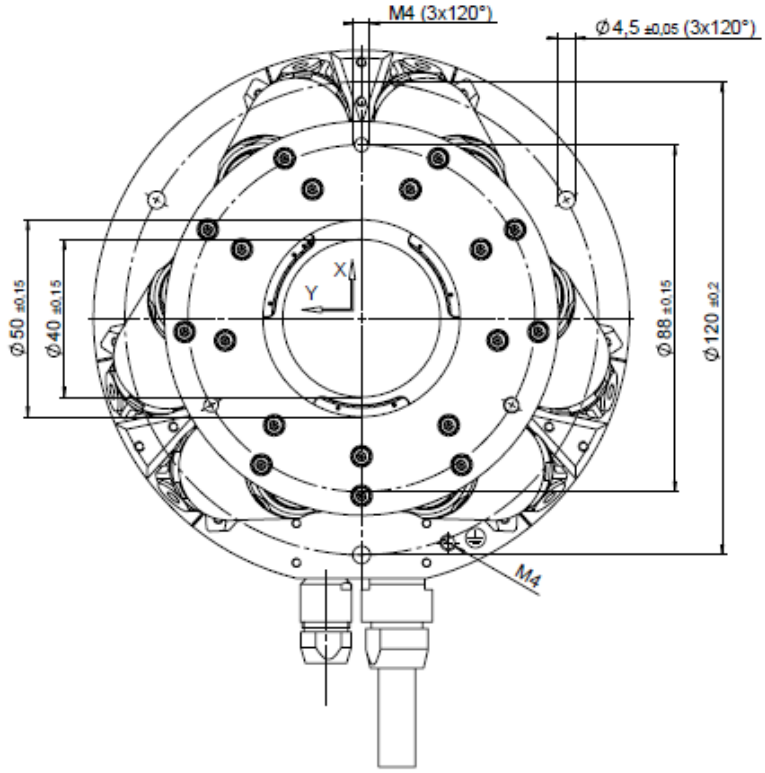
1. Read and observe the following installation instructions:
   - Instructions in the user manual of the Hexapod, especially sections „General Notes on Installation“, „Determining the Permissible Load and Working Space“, „Attaching the Snap-On Ferrite Suppressor“, „Grounding the Hexapod“, „Mounting the Hexapod on a Surface“ and „Affixing the Load to the Hexapod“.
   - Instructions in the user manual of the Hexapod controller, especially sections „General Notes on Installation“ and „Determining the Working Space and Permissible Load of the Hexapod“.
2. Make sure that the Hexapod controller is switched off (see user manual of the Hexapod controller).
3. Connect the H-811 Hexapod to the Hexapod controller:
   a) Connect the HD Sub-D 78 (m) connector of the data transmission cable to the **Hexapod** socket of the controller.
   b) Connect the M12 connector of the power supply cable to the **24 V Out 7 A** socket of the controller.

Dimensions

All figures show the Hexapod in the reference position. Dimensions in mm. Note that the decimal places are separated by a comma in the drawings.



The (0,0,0) coordinates refer to the origin of the XYZ coordinate system. When the default settings of the Hexapod controller are used and the Hexapod is in the reference position, the pivot point is located at the origin of the XYZ coordinate system.



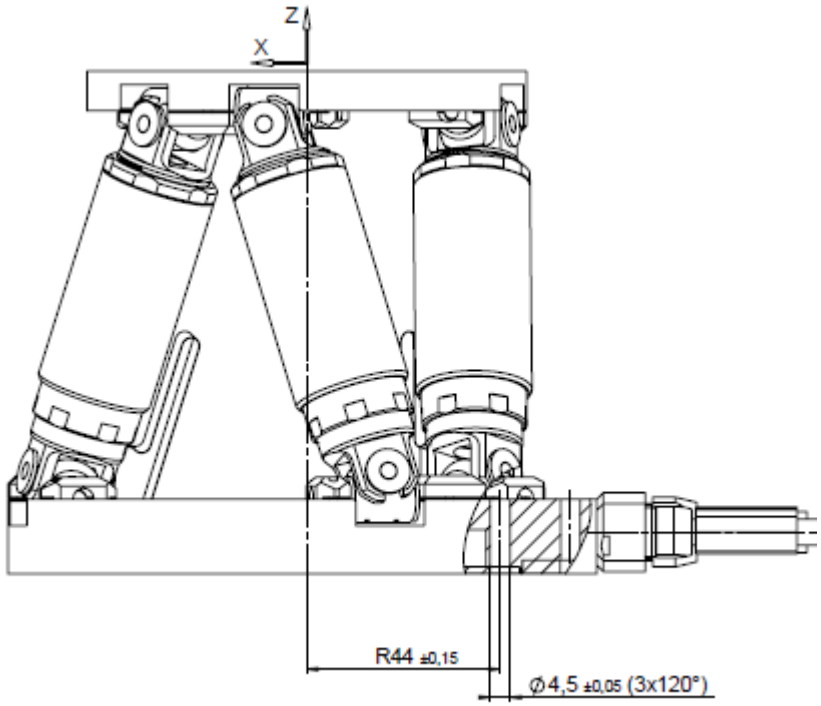


Figure 1: H-811.x2 Hexapod dimensions

Technical Data

Data Table

	H-811.D2	H-811.S2	Unit	Tolerance
Active axes	X, Y, Z, θ_X, θ_Y, θ_Z	X, Y, Z, θ_X, θ_Y, θ_Z		
Motion and positioning				
Travel range* X, Y, Z	±17, ±16, ±6.5	±17, ±16, ±6.5	mm	
Travel range* θ_X, θ_Y, θ_Z	±10, ±10, ±21	±10, ±10, ±21	°	
Single-actuator design resolution	40	80	nm	
Min. incremental motion X, Y	0.5	1	µm	typ.
Min. incremental motion Z	0.2	0.5	µm	typ.
Min. incremental motion θ_X, θ_Y, θ_Z	3.5	7	µrad	typ.
Backlash X, Y	1	2	µm	typ.
Backlash Z	0.2	0.5	µm	typ.
Backlash θ_X, θ_Y	10	20	µrad	typ.
Backlash θ_Z	15	30	µrad	typ.
Repeatability X, Y	±0.3	±0.3	µm	typ.
Repeatability Z	±0.1	±0.1	µm	typ.
Repeatability θ_X, θ_Y	±4	±4	µrad	typ.
Repeatability θ_Z	±8	±8	µrad	typ.
Max. velocity X, Y, Z	10	20	mm/s	
Max. velocity θ_X, θ_Y, θ_Z	250	500	mrad/s	
Typ. velocity X, Y, Z	5	10	mm/s	
Typ. velocity θ_X, θ_Y, θ_Z	120	250	mrad/s	
Mechanical properties				
Stiffness X, Y	0.2	0.2	N/µm	
Stiffness Z	3.6	3.6	N/µm	
Load (base plate horizontal / any orientation)	5 / 2.5	5 / 2.5	kg	max.
Holding force, de-energized (base plate horizontal / any orientation)	15 / 2.5	15 / 2.5	N	max.
Motor type	Brushless DC motor	Brushless DC motor		
Miscellaneous				
Operating temperature range	0 to 50	0 to 50	°C	
Material	Stainless steel, aluminum	Stainless steel, aluminum		
Mass	2.2	2.2	kg	±5 %
Cable length	2	2	m	±10 mm

Technical data specified at 20±3°C.

* The travel ranges of the individual coordinates (X, Y, Z, θ_X, θ_Y, θ_Z) 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.

Maximum Ratings

The Hexapod is designed for the following operating data:

Maximum operating voltage	**Maximum operating frequency (unloaded)**	**Maximum current consumption**
24 V DC	⎓	5 A

Ambient Conditions and Classifications

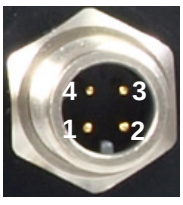
Degree of pollution:	2
Transport temperature:	–25°C to +85°C
Storage temperature:	0 °C to 70 °C
Humidity:	Maximum relative humidity of 80% at temperatures of up to 31°C, linearly decreasing until relative humidity of 50% at 40°C
Degree of protection according to IEC 60529:	IP20
Area of application:	For indoor use only
Maximum altitude:	2000 m

Pin Assignment

Power Supply

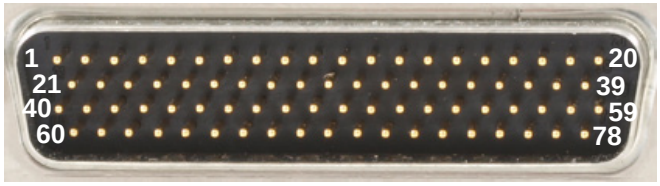
4-pin M12 connector

Pin	Function
1	GND
2	GND
3	24 V DC
4	24 V DC



Data Transmission

HD Sub-D 78 (m) connector



Pin*	Pin*	Signal*
1		CH1 Sign
	21	CH1 Ref
2		CH1 VDD
	22	CH1 A+
3		CH1 A-
	23	GND
4		CH2 Sign
	24	CH2 Ref
5		CH2 VDD
	25	CH2 A+
6		CH2 A-
	26	GND
7		CH3 Sign
	27	CH3 Ref
8		CH3 VDD
	28	CH3 A+
9		CH3 A-
	29	GND
10		CH4 Sign
	30	CH4 Ref
11		CH4 VDD
	31	CH4 A+
12		CH4 A-
	32	GND
13		CH5 Sign
	33	CH5 Ref
14		CH5 VDD
	34	CH5 A+
15		CH5 A-
	35	GND
16		CH6 Sign
	36	CH6 Ref
17		CH6 VDD

Pin*	Pin*	Signal*
40		CH1 MAGN
	60	CH1 LimP
41		CH1 LimN
	61	CH1 B+
42		CH1 B-
	62	GND
43		CH2 MAGN
	63	CH2 LimP
44		CH2 LimN
	64	CH2 B+
45		CH2 B-
	65	GND
46		CH3 MAGN
	66	CH3 LimP
47		CH3 LimN
	67	CH3 B+
48		CH3 B-
	68	GND
49		CH4 MAGN
	69	CH4 LimP
50		CH4 LimN
	70	CH4 B+
51		CH4 B-
	71	GND
52		CH5 MAGN
	72	CH5 LimP
53		CH5 LimN
	73	CH5 B+
54		CH5 B-
	74	GND
55		CH6 MAGN
	75	CH6 LimP
56		CH6 LimN

Pin*	Pin*	Signal*
	37	CH6 A+
18		CH6 A-
	38	GND
19		Reserved
	39	GND
20		24 V output

Pin*	Pin*	Signal*
	76	CH6 B+
57		CH6 B-
	77	GND
58		Brake/Enable drive
	78	GND
59		Power good 24 V input

* Pin assignment of the C-887.5xx Hexapod controller. Since not all signals are required for all Hexapod models, some pins may be not assigned with your Hexapod model.