Q-Motion® Miniature SpaceFAB Robot

Piezo-Motorized Inertia Drive, only 80 mm Side Length

Q-821

- Six-axis microrobotics system
- ±6 mm travel range in X and Y, and ±3 mm in Z
- ±6° rotation range in θ_X, θ_Y, and ±16.5° in θ_Z
- 1 nm sensor resolution

Fields of application

- Industry and research
- Measuring technology
- Microscopy
- Micromanipulation
- Biotechnology
- Automation

Piezoelectric inertia drive

Piezo inertia drives are space-saving and affordable piezo-based drives with relatively high holding forces and a virtually unlimited travel range. The inertia drive principle is based on a single piezoelectric actuator that is controlled with a modified sawtooth voltage provided by special driver electronics. The actuator expands slowly and moves the runner. Due to its inertia, the runner is unable to follow the subsequent fast contraction of the actuator and remains at its position. With an operating frequency of up to 20 kHz, the drives acting directly on the runner and achieve velocities of max. 5 mm/s.

Crossed roller guide

With crossed roller guides, the point contact of the balls in ball guides is replaced by line contact of the hardened rollers. Consequently, they are considerably stiffer and need less preload, which reduces friction and allows smoother running. Crossed roller guides are also distinguished by high guiding accuracy and load capacity. Force-guided rolling element cages prevent cage creep.

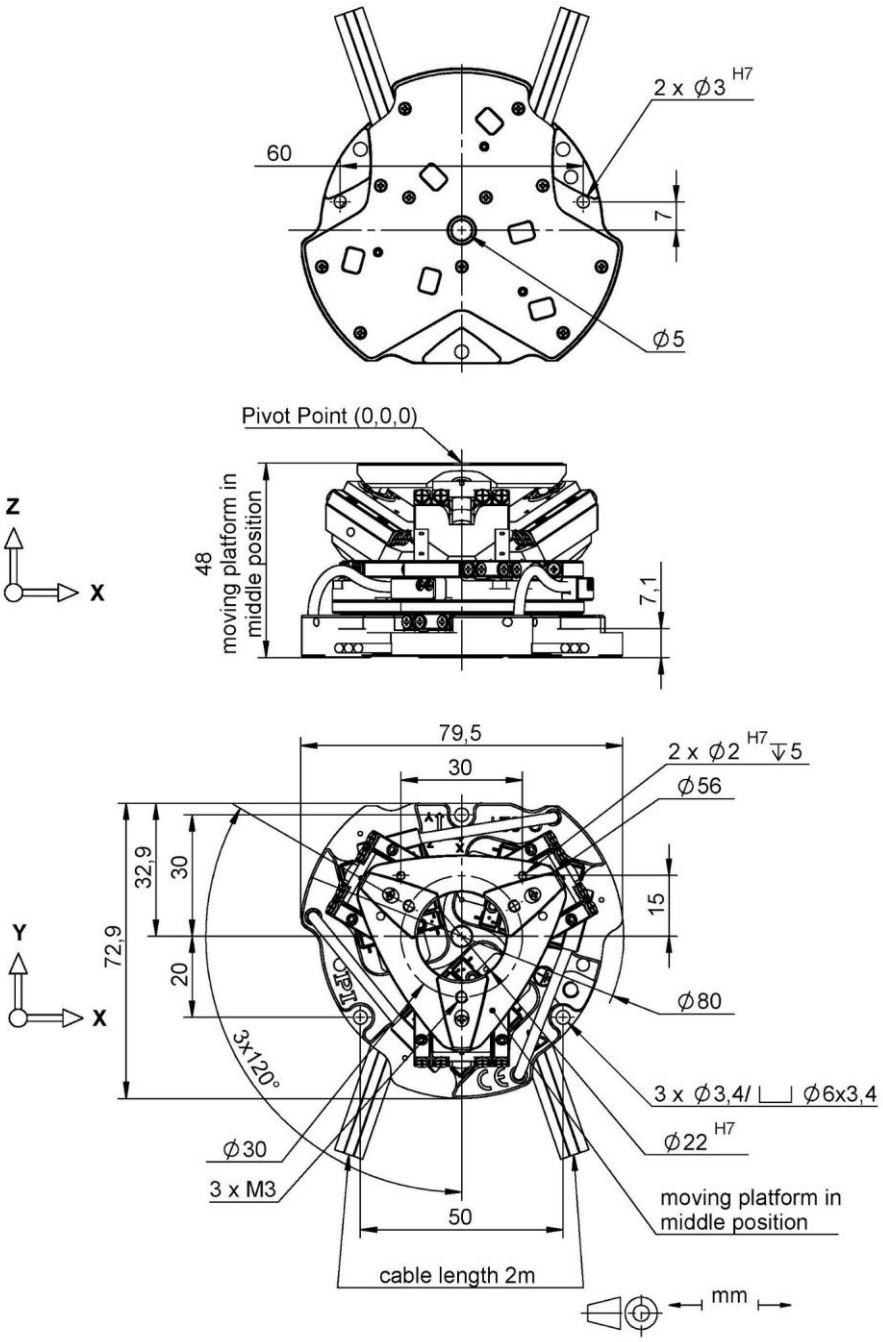
Specifications

Motion and positioning	Q-821.140	Unit	Tolerance
Active axes	X, Y, Z, θ_X, θ_Y, θ_Z		
Integrated sensor	Incremental, optical, direct measuring		
Travel range in X, Y	±6	mm	
Travel range in Z	±3	mm	
Rotation range in θ_X, θ_Y	±6	°	
Rotation range in θ_Z	±16.5	°	
Sensor signal	Analog sin/cos, differential, 1 Vpp		
Sensor resolution	1	nm	
Step size in full step mode	0.4	µm	
Operating frequency in full step mode	10	kHz	
Minimum incremental motion in X, Y	0.01	µm	typ.
Minimum incremental motion in Z	0.02	µm	typ.
Minimum incremental motion in θ_X, θ_Y, θ_Z	0.9	µrad	typ.
Unidirectional repeatability in X	±0.04	µm	typ.
Unidirectional repeatability in Y	±0.07	µm	typ.
Unidirectional repeatability in Z	±0.2	µm	typ.
Backlash in X, Y	0.04	µm	
Backlash in Z	0.08	µm	
Backlash in θ_X, θ_Y	45	µrad	
Backlash in θ_Z	25	µrad	
Max. speed in X, Y	5	mm/s	
Max. speed in Z	2	mm/s	

Mechanical properties	Q-821.140	Unit	Tolerance
Load capacity in X, Y	1	N	max.
Load capacity in Z (base plate horizontal)	2	N	max.
Holding force in X, Y, Z, passive	3	N	
Drive type	Piezoelectric inertia drive		
Guide type	Crossed roller bearings		

Miscellaneous	Q-821.140	Unit	Tolerance
Connection	6x Sub-D 15 (m)		
Material	Stainless steel, aluminum		
Mass without cable and connector	0.3	kg	±5 %
Cable length	2	m	±10 mm
Recommended electronics	C-886.31		

Drawings / Images



Q-821.140, dimensions in mm

Ordering Information

Q-821.140
Q-Motion® miniature SpaceFAB robot, piezo motor inertia drive, linear travel ranges 6 × 6 × 3 mm (X × Y × Z), rotation angle to 16.5°, dimensions 80 × 73 × 48 mm