

## M3-LS-U2-10 Linear Smart Stage *All-In-One Motion Module*

- **Smart Stage:** Embedded controller, no separate electronics
  - Operate directly using I<sup>2</sup>C or SPI ASCII commands **-or-**
  - Evaluate with Pathway™ PC Software and USB adapter
- **Cost-effective, long-life:** For high-volume production
- **Small size:** 32 x 32 x 10 mm
- **High resolution:** 0.5 μm with absolute encoding
- **High speed:** 35 mm/s
- **Long stroke:** 10 mm
- **Power:** 5 V DC input, ~2.3 W when moving, zero to hold
- **High repeatability** with precision linear guidance

### Precision, stability and ease of use for high volume product applications

The M3-LS-U2 Linear Smart Stage is a direct-drive, high-precision micro stage built for fast, simple integration into miniature OEM systems. All drive and control functions are embedded into the compact stage assembly – **no external electronics** are needed!

The stage drive is a UTAF2 piezo motor combined with a 0.5 μm resolution sensor for precise, repeatable positioning of optics, probes, sensors and more. The piezo motor operates at 5 VDC. No high voltage boost is needed. **Absolute encoding** removes the need to home the stage on power-up, eliminating errors and disruptions in processes and experiments.

At 35 mm/sec it is **7x faster** than other M3 Smart Stages.

The anodized aluminum stage uses linear ball bearing slides **with uniform and very low friction**. The bearings directly support the motor preload which creates a stable, precise and zero clearance guide system. The base is the maximum space required for installation in your product because the carriage moves within the total length of the base.

**This smart stage is designed for long life and is ideal for embedding precision motion into high-volume products.**

### Digital Control and Pathway™ Software

The M3-LS-U2-10 Smart Stage can be driven directly via standard I<sup>2</sup>C or SPI serial protocols. The smart stage microprocessor accepts ASIC high-level motion instructions.

New Scale Pathway™ software and USB adapter enable PC control. Access all stage capabilities including settings, motion commands, performance diagnostics, and parameters stored in non-volatile memory. Use the intuitive script generator to create command sequences for automated operation.

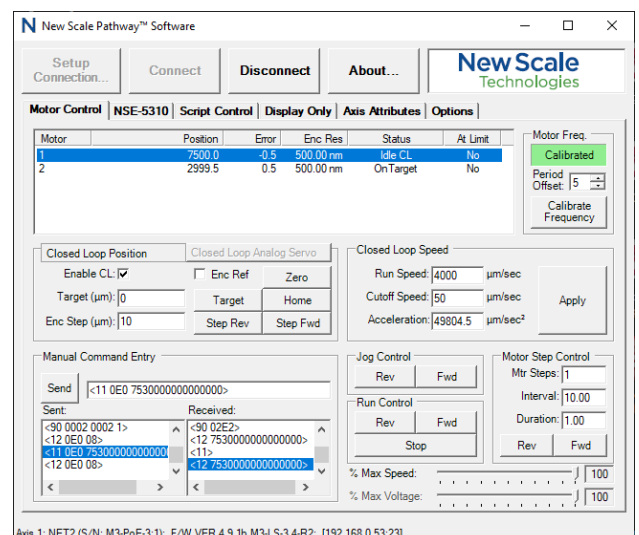
SMALL, PRECISE, SMART ... IN MOTION



The M3-LS-U2 Linear Smart Stage is an ultra-compact positioning stage with sub-micrometer resolution and absolute encoding. *All electronics are built into the stage* for simple system integration. This model features high speed and is cost-effective for high volume manufacturing.

### APPLICATIONS

- DNA sequencing instruments
- Wearable medical devices
- Point-of-care diagnostic systems
- Handheld video microscopes
- Portable spectroscopy instruments
- Handheld imaging systems
- Biomedical probing & sampling
- Laser beam steering
- Miniature camera systems



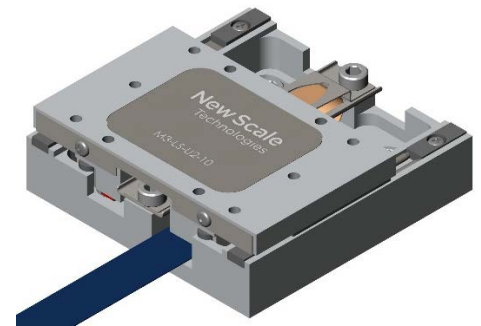
**New Scale Pathway™ Software** with easy-to-use graphical interface enables PC control for evaluation and system development. Control multiple smart stages from one PC screen, or develop your own code using the intuitive scripting tool.

## Specifications (PRELIMINARY)

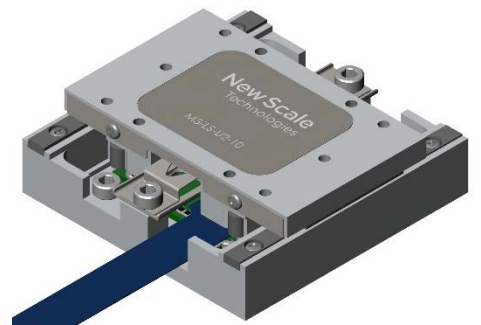
M3-LS-U2-10 Linear Smart Stage specifications	
<b>MODEL</b>	<b>M3-LS-U2-10</b>
<b>Stroke</b>	10 mm
<b>Dimensions</b>	32 x 32 x 10 mm <i>including controller</i>
<b>Mass of Smart Stage</b>	15 grams <i>including controller</i>
<b>Moving mass (vertical) (note 1)</b>	≤ 20 grams recommended
<b>Moving mass (horizontal) (note 1)</b>	≤ 40 grams (offset < 10 mm) recommended
<b>Force (operating)</b>	0.2 N
<b>Speed (at operating force)</b>	35 mm/sec
<b>Closed-loop performance</b>	
<b>Resolution</b>	0.5 μm with absolute encoding
<b>Bi-directional repeatability</b>	± 5 μm
<b>Accuracy</b>	± 20 μm
<b>Input Power</b>	~ 2.3 W peak at max speed and force
<b>Input Voltage</b>	5 V DC (4.75 V to 5.5 V)
<b>Mechanical stage</b>	
<b>Static parallelism</b>	< 30 μm
<b>Runout</b>	< 10 μm
<b>Pitch and yaw</b>	< 1 mrad
<b>Absolute maximum loads</b>	See Chart
<b>Environment</b>	
<b>Relative humidity</b>	< 70%
<b>Operating temperature (note 2)</b>	-30 °C to +70 °C
<b>Storage temperature</b>	-40 °C to +80 °C
<b>Lifetime</b>	50 km
<b>Compliance</b>	CE / RoHS
<b>Drive electronics</b>	Integrated into the smart stage
<b>Control interface</b>	Directly via I <sup>2</sup> C or SPI interface. Indirectly via USB adapter to PC.
<b>Standard Cable Length</b>	9 cm
<b>Maximum Cable Length</b>	60 cm, > 25 cm requires reduced clock rate

Note 1: Higher mass is possible but will affect performance and lifetime.

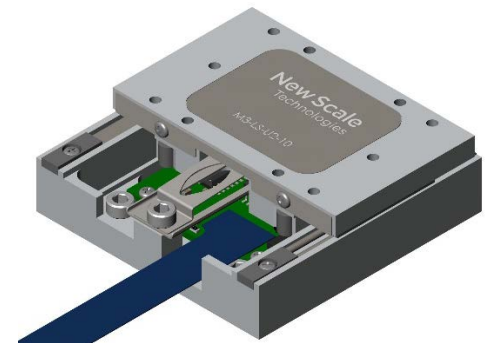
Note 2: Speed and force reduced at lower temperatures within the range.



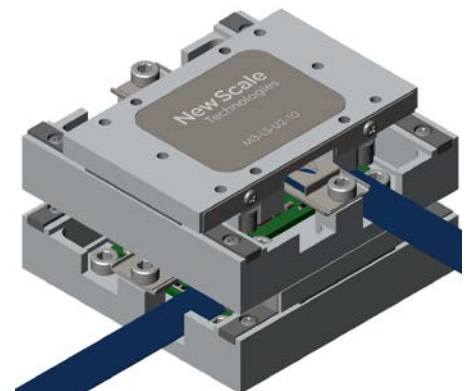
Forward Position



Center Position



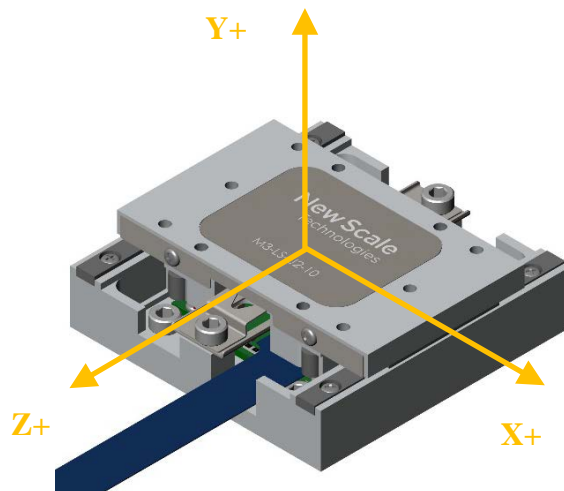
Reverse Position



X-Y Assembly (Centered)

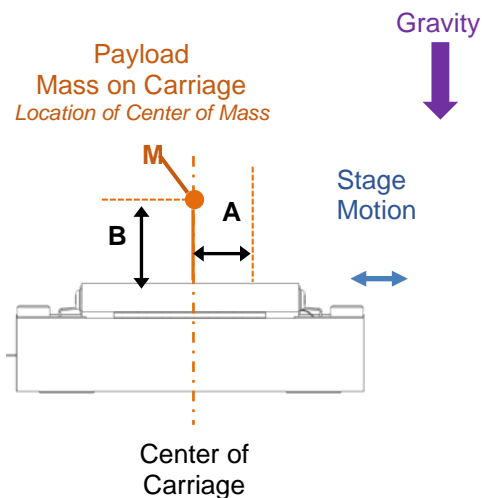
Single Stage– M3-LS-U2-10 Maximum Combined Stage Loading (1,2)		
Direction	Recommended Payload	Absolute Maximum Load
X+	0.5 N	2 N
X-	0.5 N	2 N
Y+	0.5 N	2 N
Y-	0.5 N	10 N
Z+	0.2 N	2 N
Z-	0.2 N	2 N
$\theta_x$ (+/-)	5 N-mm	10 N-mm
$\theta_y$ (+/-)	5 N-mm	10 N-mm
$\theta_z$ (+/-)	5 N-mm	10 N-mm

- Total Stage mass is 15 grams.
- Moving mass of stage without payload is 6 grams.

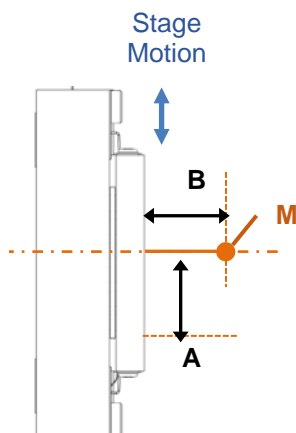


## Single Stage Orientations and Load Limits

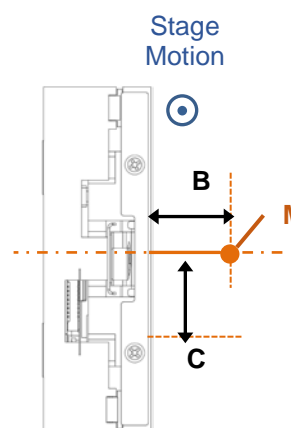
### Horizontal



### Vertical

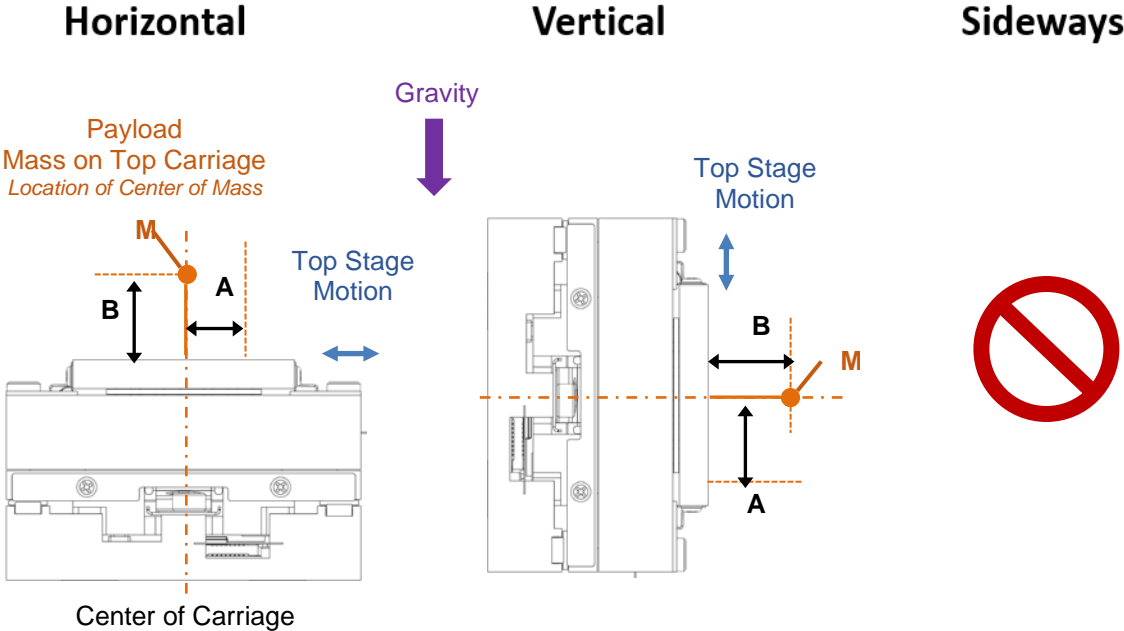


### Sideways



Orientation	Max M	A	B	C
Horizontal	50 gram	< 10 mm @ Max M	< 50 mm Recommended	< 10 mm @ Max M
Vertical	16 grams	< 50 mm Recommended	< 30 mm @ Max M	< 30 mm @ Max M
Sideways	50 grams	< 10 mm @ Max M	< 10 mm @ Max M	< 50 mm Recommended

# X-Y Stage Orientations and Load Limits



Note: The total masses and offsets must not exceed the **single stage load limits**

Orientation	Max M	A	B	C
Horizontal	34 gram	< 10 mm @ Max M	< 30 mm Recommended	< 10 mm @ Max M
Vertical (Top Stage)	16 grams	< 50 mm Recommended	< 10 mm @ Max M	< 30 mm @ Max M
Sideways (Top Stage)	<b>Not Feasible</b>			

# X-Y-Z Stage Orientations and Load Limits

**Horizontal**

**Vertical**

**Sideways**



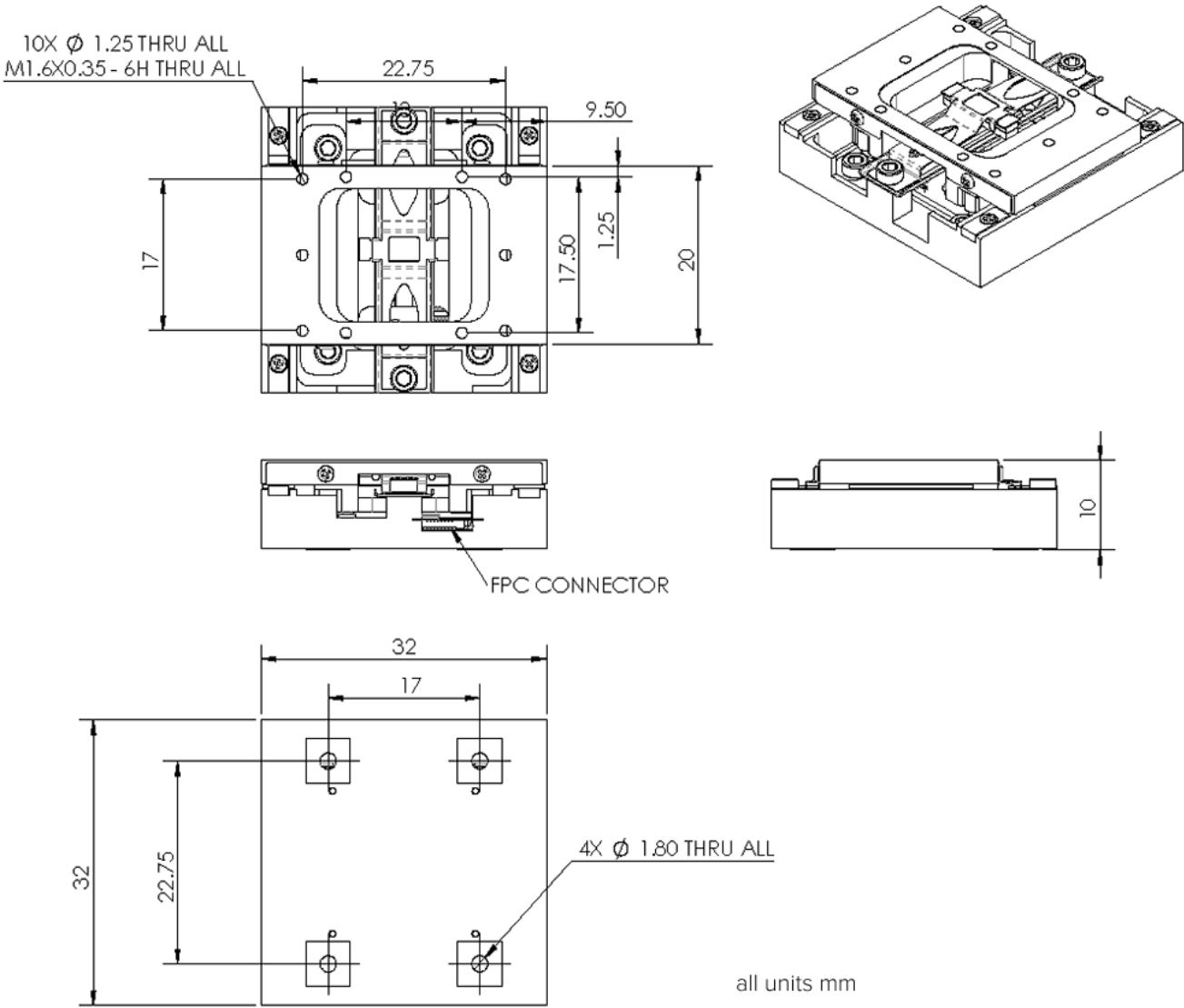
NOTE:  
Z-Bracket and  
Z-Stage in  
*approximate*  
locations to  
meet the  
**single stage**  
load limits



Orientation	Max M	A	B	C
Horizontal (Top Stage)	<b>Not Feasible</b>			
Vertical (Top Stage)	16 gram	< 20 mm Recommended	< 10 mm @ Max M	< 10 mm @ Max M
Sideways (Top Stage)	<b>Not Feasible</b>			

# Single Stage Dimension

See also Drawing 07463-8-0000



## Developer's Kits

M3-LS developer's kits provide easy evaluation and prototyping of one-axis M3-LS Linear Smart Stage systems. Developer's kits are available from New Scale and select reps and distributors.

Contact New Scale regarding additional stages, brackets and flex cables for use with the developer's kit to create 2-axis and 3-axis systems, or to inquire about volume pricing.

## Ordering information

Developer's Kit	Description
<b>DK- M3-LS-U2-10</b>	<b>M3-LS-U2 Developer's Kit</b> <ul style="list-style-type: none"> <li>• One M3-LS-U2-10 Linear Smart Stage</li> <li>• USB-I2C/SPI adaptor PCB</li> <li>• Straight Flex Cable, 250 mm</li> <li>• USB Extension Cable (Micro B)</li> <li>• 5V Supply and Power barrel plug</li> <li>• New Scale Pathway Software</li> <li>• Quick Start Guide</li> </ul>