

New Scale Technologies

M3-LS-U2-8 Linear Smart Stage *All-In-One Motion Module*

- **Smart Stage:** Embedded controller, no separate electronics
 - Operate directly using I²C 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:** 8 mm
- **Power:** 5 V DC input, ~ 3.2 W peak when moving
- **High repeatability** (± 2 µm typical)

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 races **with very low uniform friction**. The bearings directly support the motor preload which creates a stable, precise and zero clearance guide system. The base is the maximum footprint required for installation in your product because the carriage moves within the total length of the base.

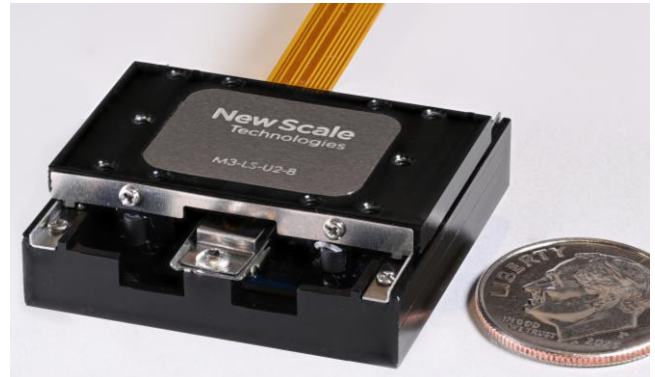
This smart stage is designed for long life and is ideal for embedding precision motion into high-volume products.

Digital Control and Pathway™ Software

The M3-LS-U2-8 Smart Stage can be driven directly via standard I²C or SPI serial protocols. The smart stage microprocessor accepts ASCII 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.

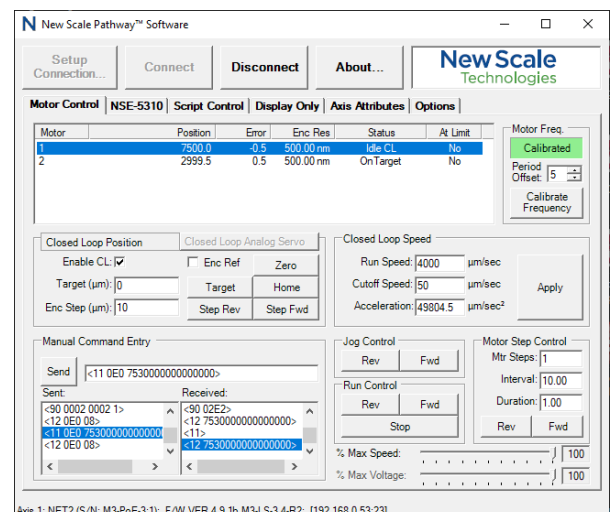
SMALL, PRECISE, SMART ... IN MOTION



The M3-LS-U2-8 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 power-off hold, high speed, and is cost-effective for high volume manufacturing.

APPLICATIONS

- DNA sequencing instruments
- Point-of-care diagnostic systems
- Portable spectroscopy instruments
- Biomedical probing & sampling
- Laser beam steering
- Miniature camera systems
- And much more



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

M3-LS-U2-8 Linear Smart Stage Specifications

MODEL	M3-LS-U2-8
Stroke	8 mm
Dimensions	32 x 32 x 10 mm <i>including controller</i>
Mass of Smart Stage (Note 1)	15 grams <i>including controller</i>
Payload mass (vertical) (Notes 2, 3)	≤ 5 grams recommended
Payload mass (Sideways and horizontal) (Notes 2, 3)	≤ 20 grams recommended
Holding Force	≥ 0.3 N
Force (bidirectional)	≥ 0.1 N
Speed	35 mm/sec
Duty cycle (Note 4)	50% max recommended
Closed-loop performance	
Resolution	0.5 μm with absolute encoding
Bi-directional repeatability	± 5 μm
Accuracy	± 10 μm
Input Quiescent Power	~ 0.35 W
Input Power (peak)	~ 3.2 W
Input Voltage	5 V DC (4.75 V to 5.5 V)
Mechanical stage	
Static parallelism	< 30 μm
Runout	< 10 μm
Pitch, yaw, and roll	< 1 mrad
Absolute maximum loads	See chart on page 3
Environment	
Relative humidity	< 70%
Operating temperature (Note 5)	-30 °C to +70 °C
Storage temperature	-40 °C to +80 °C
Lifetime (Note 6)	50 km
Compliance	RoHS; CE pending
Drive electronics	Integrated into the smart stage
Control interface	Directly via I ² C or SPI interface. Indirectly via USB adapter to PC.
Standard Cable Length	100 mm (90 mm to edge of stage)
Maximum Cable Length	600 mm, > 250 mm requires reduced clock rate

Note 1: Moving mass of the stage carriage without payload is ~ 6 grams.

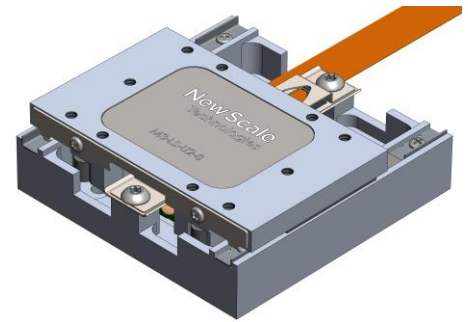
Note 2: Higher mass is possible but will affect performance and lifetime.

Note 3: Torque due to gravity of the payload calculated from center point (see the coordinates in the next page) on the carriage is recommended to be within 1.5 Nmm. Also recommend center of gravity of the payload above the carriage surface to be ≤ 15 mm.

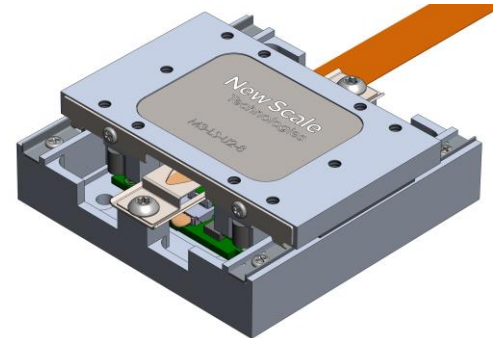
Note 4: A <50% duty cycle is recommended for operating at room temperature (25 °C or below) and mounting the stage on a surface with a good thermal conduction path to dissipate heat. Please consult NST for when operating at higher ambient temperatures.

Note 5: Speed and force reduced at lower temperatures within the range.

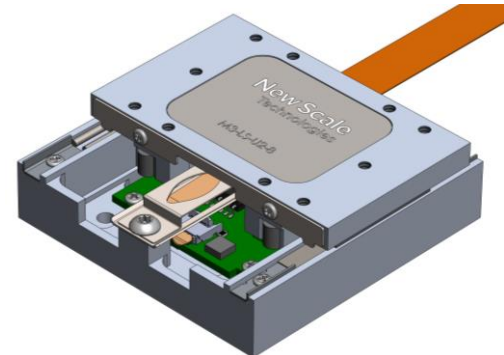
Note 6: Tested horizontally with random moves, with 20 grams load offset 8.75 mm at reverse position.



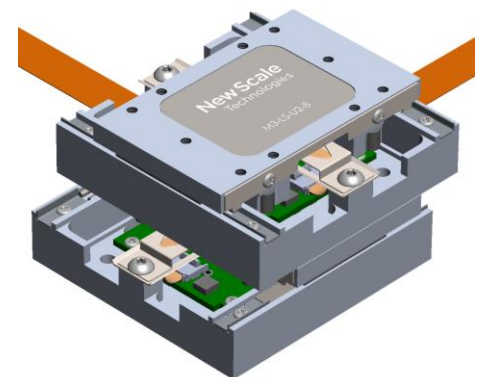
Forward Position



Center Position



Reverse Position

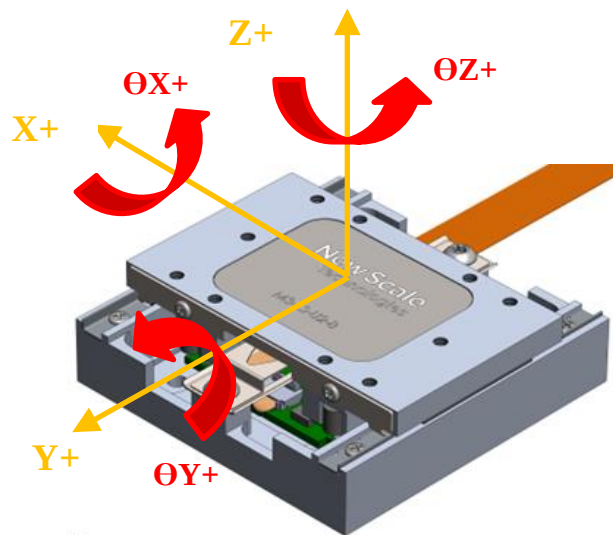


X-Y Assembly (Centered)

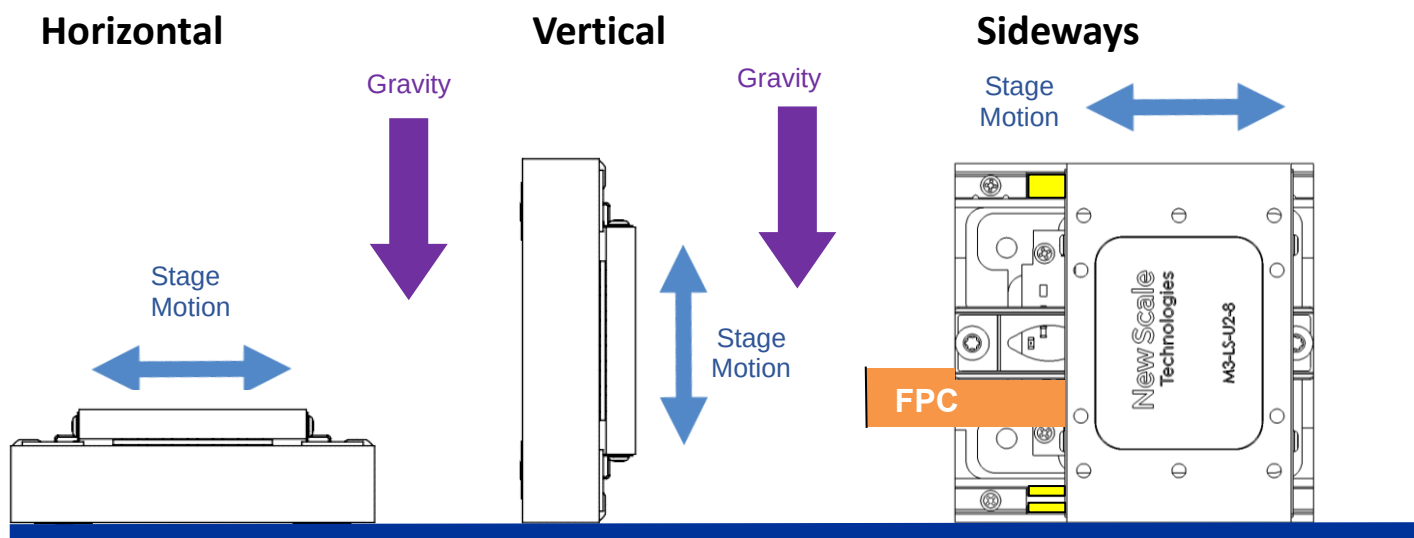
Single Stage Load Capacity M3-LS-U2-8

Direction	Absolute Maximum Load ⁽¹⁾
X+	2 N
X-	2 N
Y+	2 N
Y-	2 N
Z+	2 N
Z-	10 N
θ_x (+/-)	10 N-mm
θ_y (+/-)	10 N-mm
θ_z (+/-)	10 N-mm

1. Non-operation (without damage)

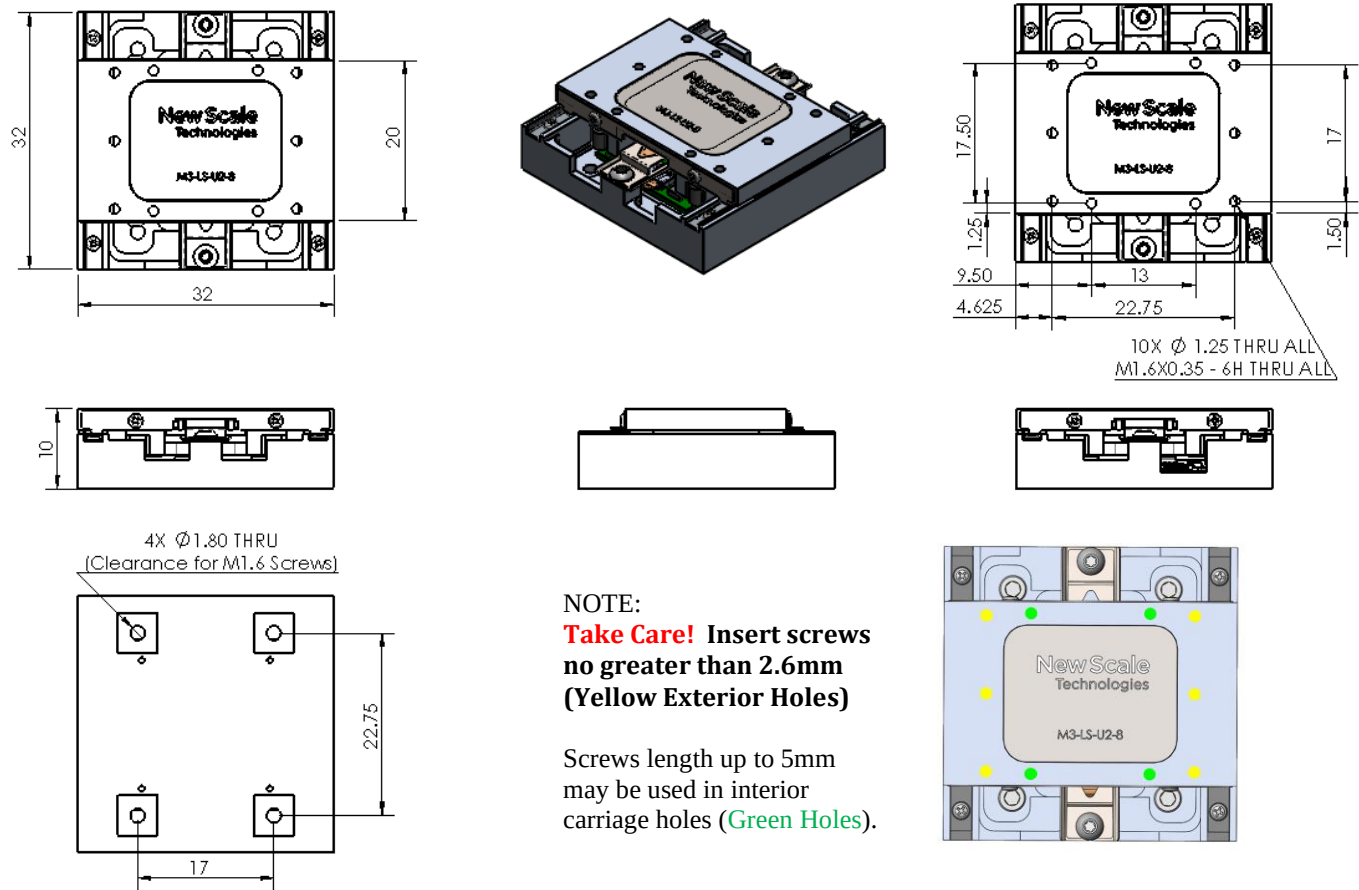


Single Stage Orientation Definitions



Note: Sideways Orientation Requires Flat Bearing Race Located at Top of Stage (As Pictured Above)

Single Stage Dimensions



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 and flex cables for use with the developer's kit to create more complicated systems, or to inquire about volume pricing.

Developer's Kit	Description
DK-M3-LS-U2-8	M3-LS-U2 Developer's Kit - One M3-LS-U2-8 Linear Smart Stage - USB-I2C/SPI adaptor PCB - Two Straight Flex Cables (100mm & 250 mm) - USB Extension Cable (Micro B) - External 5V power supply and adaptor (not pictured) - Mounting Screws and wrench - New Scale Pathway Software - Quick Start Guide

