

MFA Series

MINIATURE LINEAR STAGES



Designed for space-limited applications and compact multi-axis assemblies, MFA Series linear stages supply very high resolution, single-axis translation in a low-cost, motorized package. Typical applications for this stage are fiber optic alignment, laser diode research, bio-medical applications and inspection systems.

MFA linear stages are available in two versions: The MFA-CC with a DC-motor, features an integrated gear-box and a motormounted high resolution 2,048 cts/rev rotary encoder. The highresolution position feedback and low-friction mechanical design ensures ultra-smooth motion with 100 nm sensitivity. The DC motor supplies an optimized output torque that permits the use of a lower ratio step-down gear allowing for faster motion with higher reliability and lower backlash. Hence, the MFA-CC is the recommended choice for applications that require small incremental motion with high dynamic speed range and good repeatability. The MFA-PP and MFA-PPD stepper motor versions are more economical solutions for less demanding applications.

Travel limit switches prevent bearing damage from accidental over-travel.

MFA stages feature an all-steel construction that provides a higher stiffness-to-weight ratio and lower thermal expansion compared to aluminum designs. The result is superior performance in a smaller footprint. The smooth motion of the MFA linear stages is further accentuated by Newport's proprietary double-row linear ball bearing design with bearing ways that are directly machined into the structural frame of the stage. Compared to other solutions that use commercial bearings, MFA linear stages have a higher load capacity and stiffness with low pitch and yaw errors.

Another benefit of Newport's integrated bearing ways is the availability of 4 widely spaced mounting holes for base mounting and XY-assemblies. This provides better stress distribution and allows for more rigid multi-axis combinations than other designs that provide only line contact with 2 mounting holes.

- 25 mm travel in a low-cost and compact design
- All-steel construction provides exceptional load capacity and stiffness
- Precision-ground, double-row linear ball bearings ensure ultra-smooth and accurate linear travel
- High-resolution, encoder feedback enables ultra-smooth motion with 100 nm sensitivity
- Vacuum-compatible versions to 10⁻⁶ hPa

Design Details

Base Material	Stainless steel
Bearings	Double row linear ball bearings
Drive Mechanism	Backlash compensated leadscrew
Feedback	MFA-CC: Motor mounted rotary encoder; 2,048 cts/rev MFA-PP: None
Limit Switches	Optical switches
Origin	Uses motor side limit for homing, typically <5 mm repeatability
Cable (m)	3 (included)
Vacuum Compatibility	Vacuum compatible versions are available up to 10 ⁻⁶ hPa using DC motor (MFA-CCV6). Maximum load, speed and acceleration are halved.

Specifications

	MFA-PP and MFA-PPD	MFA-CC
Travel Range [in. (mm)]	1 (25)	
Minimum Incremental Motion, Linear (μm)	0.1	0.1
Uni-directional Repeatability, guaranteed (μm)	0.5	0.3
Bi-directional Repeatability, guaranteed ⁽¹⁾⁽²⁾ (μm)	1.5 or ±0.75	1.5 or ±0.75
On-Axis Accuracy, guaranteed ⁽¹⁾ (μm)	6 or ±3	
Maximum Speed (mm/s)	0.3 (MFA-PP) 1.0 (MFA-PPD)	2.5
Pitch, guaranteed ⁽¹⁾ (μrad) ⁽³⁾	200 or ±100	
Yaw, guaranteed ⁽¹⁾ (μrad) ⁽³⁾	100 or ±50	
MTBF	10,000 h at a 1 kg load with a 20% duty cycle	

¹ Shown are peak to peak, guaranteed specifications or ± half the value as sometimes shown. The typical specifications are about 2X better than the guaranteed values.

² After backlash compensation.

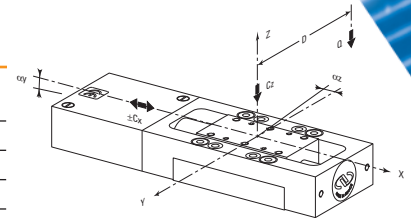
³ To obtain arcsec units, divide mrad value by 4.8.

Recommended Motion Controllers/Drivers

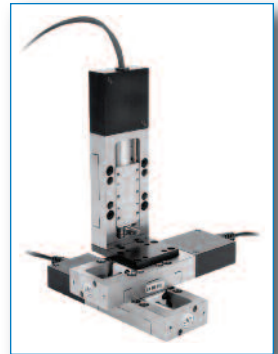
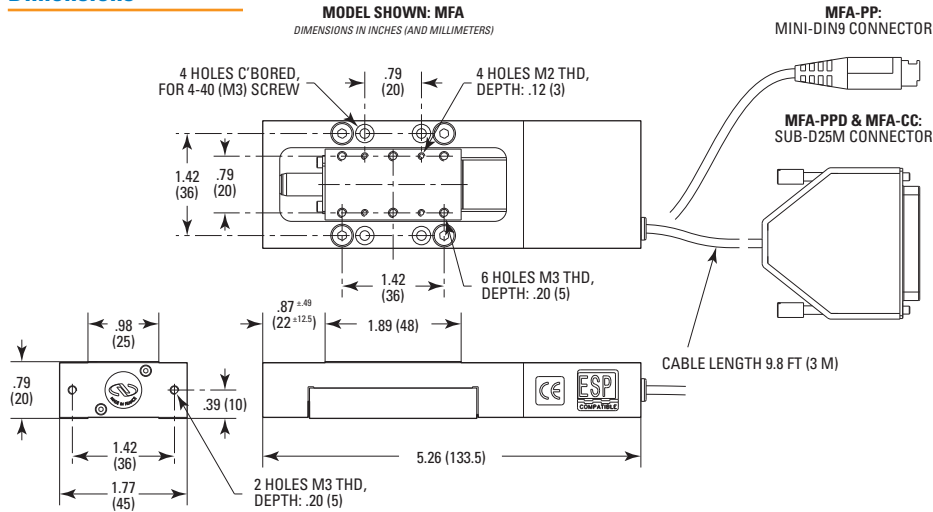
XPS	Except MFA-PP
ESP301	Except MFA-PP
SMC100CC	Except MFA-PP and MFA-PPD
SMC100PP	MFA-PPD only
NSC200	MFA-PP only
CONEX-CC	Included in CONEX-MFACC

Load Characteristics and Stiffness

C_z , Normal centered load capacity	50 N
$-C_x, +C_x$, Axial load capacity	10 N
$k_{\alpha x}$, Compliance in roll	60 $\mu\text{rad}/\text{Nm}$
$k_{\alpha y}$, Compliance in pitch	10 $\mu\text{rad}/\text{Nm}$
Q , Off-center load	$Q \leq C_z / (1 + D/20)$
D , Cantilever distance in mm	

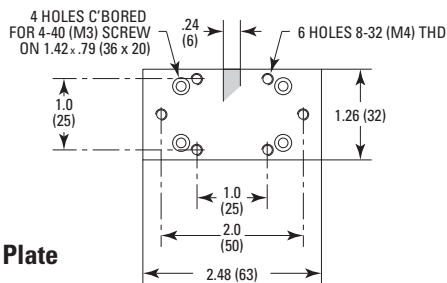


Dimensions

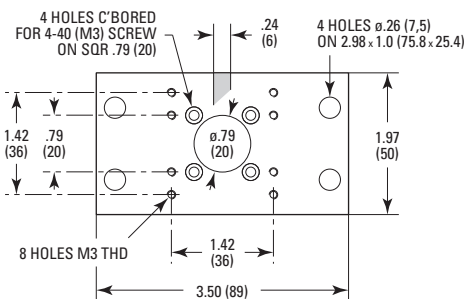


MFA stages in an XYZ configuration.

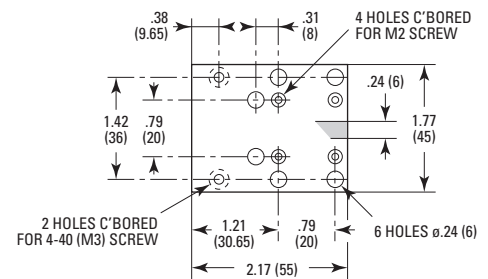
(M-)MFA-TP Top Plates



MFA-BP Base Plate



MFA-BK Plate



Ordering Information

Model	Description
MFA-CC	Miniature linear stage, DC motor
MFA-PP	Miniature linear stage, stepper motor, 9-pin mini-DIN connector Compatible with NSC200 only
MFA-PPD	Miniature linear stage, stepper motor, 25-pin D-Sub connector Compatible with SMC100PP, ESP301, and XPS
MFA-CCV6	Miniature linear stage, DC motor, vacuum compatible to 10^{-6} hPa
MFA-BK	Universal top plate for XZ and XYZ mounting
MFA-TP	Top Plate, MFA Series Miniature Linear Stage, English Thread
M-MFA-TP	Top Plate, MFA Series Miniature Linear Stage, Metric Thread
MFA-BP	Universal base plate

Remark

For MFA-CCV6 vacuum compatible stages to 10^{-6} hPa, max speed and load capacity are half of the standard values.



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