

MFA Series Miniature Linear Stages



- 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
- Economic stepper motor versions directly compatible with our new NSC200 motion electronics
- Vacuum-compatible versions to 10^{-6} hPa.

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.

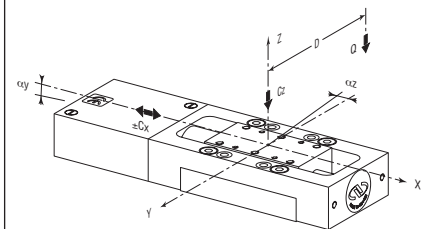
MFA linear stages are available in two variants: The MFA-CC features a miniature DC-motor with integrated gear-box and a motor mounted high resolution rotary encoder with 2,048 cts/rev. The high-resolution position feedback and low-friction mechanical design ensures ultra-smooth motion with 100 nm sensitivity. 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 stepper motor version MFA-PP is a more economic solution for less demanding applications. End-of-run limit switches prevent bearing damage from accidental over-travel.

MFA stages feature an all-steel construction that provides a higher stiffness-to-weight ratio with 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 elements of the stage. Compared to alternative solutions that use commercial bearings, MFA linear stages offer 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 a line contact with 2 mounting holes.

Load Characteristics

Cz	(N)	50
-Cx	(N)	10
+Cx	(N)	10
$k\alpha_x$	($\mu\text{rad}/\text{Nm}$)	60
$k\alpha_y$	($\mu\text{rad}/\text{Nm}$)	100



Q	Off-center load, $Q \leq Cz / (1 + D/20)$
D	Cantilever distance in mm
Cz	Normal center load capacity on bearings
+Cx	Direct load capacity on X axis
-Cx	Inverse load capacity on X axis

Assembly Pattern



MFA stages in an XYZ configuration

TECHNICAL REFERENCE

MANUAL LINEAR STAGES

MANUAL ROTATION STAGES

MANUAL ACTUATORS

MOTORIZED LINEAR STAGES

MOTORIZED ROTATION STAGES

MOTORIZED ACTUATORS

CONTROLLERS AND AMPLIFIERS

SYSTEMS

Design Details

Base Material	Stainless steel
Bearings	Double row linear ball bearings
Drive Mechanism	Backlash compensated leadscrew
Drive Screw Pitch (mm)	0.5
Reduction Gear	MFA-CC: 1:14 MFA-PP: 1:43
Feedback	MFA-CC: Motor mounted rotary encoder; 2,048 cts/rev MFA-PP: None
Limit Switches	Mechanical switches
Origin	Uses motor side limit for homing, typically <4 μm repeatability
Motor	MFA-CC: DC servo motor UE1724SR MFA-PP: 2-phase stepper motor UE16PP, 1 full step = 0.485 μm
Cable Length (m)	1.5
Vacuum Compatibility	Vacuum compatible versions are available up to 10 ⁻⁶ hPa using a DC motor (MFA-CCV6). Data about outgassing and temperature rise is available upon request.
MTBF	10000h at a 1kg load with a 20% duty cycle

Specifications

	MFA-PP	MFA-CC
Travel Range [in. (mm)]		1 (25)
Resolution (μm)**	0.00757	0.0175
Minimum Incremental Motion (μm)	0.1	0.1
Uni-directional Repeatability (μm) guaranteed	0.25 typical, 0.5 guaranteed	0.18 typical, 0.3 guaranteed
Bi-directional Repeatability (μm) guaranteed*	1 typical, 2.5 guaranteed	0.6 typical, 2 guaranteed
On Axis Accuracy (μm) guaranteed		3 typical, 8 guaranteed
Maximum Speed (mm/s)	1	2.5
Pitch (μrad) guaranteed		80 typical, 200 guaranteed
Yaw (μrad) guaranteed		60 typical, 100 guaranteed

* After backlash compensation

**Equals 1/64 of a full step

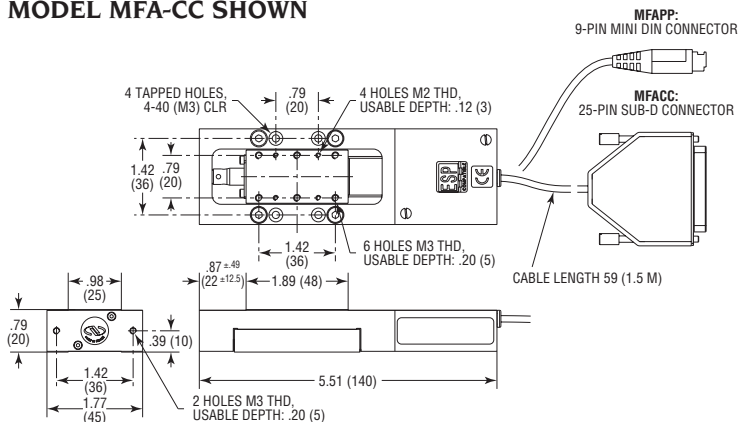
See the Metrology Tutorial section (see page 845) for more information on typical and guaranteed specifications

Ordering Information

Description	Model
Miniature linear stage, DC motor	MFA-CC
Miniature linear stage, stepper motor	MFA-PP
Miniature linear stage, DC motor, vacuum compatible to 10 ⁻⁶ hPa	MFA-CCV6
Universal top plate for XZ and XYZ mounting	MFA-BK
Top plate, English version	MFA-TP
Top plate, metric version	M-MFA-TP
Universal base plate	MFA-BP

Dimensions

MODEL MFA-CC SHOWN

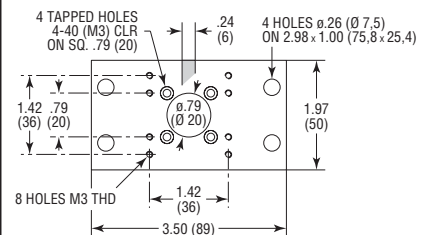


Motion Controller Options

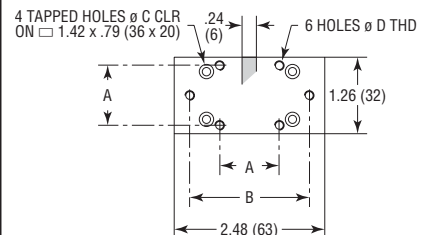
For optimum performance and seamless compatibility, we recommend using one of the following Motion Controllers/Drivers:

Model	
XPS (page 1009)	Except MFA-PP
ESP300 (page 1018)	Except MFA-PP
SMC100CC (page 1020)	Except MFA-PP
NSC200 (page 1003)	Except MFA-CC

MODEL MFA-BP



MODEL MFA-TP



	DIMENSIONS [in. (mm)]		THREAD	
	A	B	C	D
MFA-TP	1.00 (25.4)	2.00 (50.8)	4-40	8-32
M-MFA-TP	.98 (25.0)	1.97 (50.0)	M3	M4

MODEL MFA-BK

