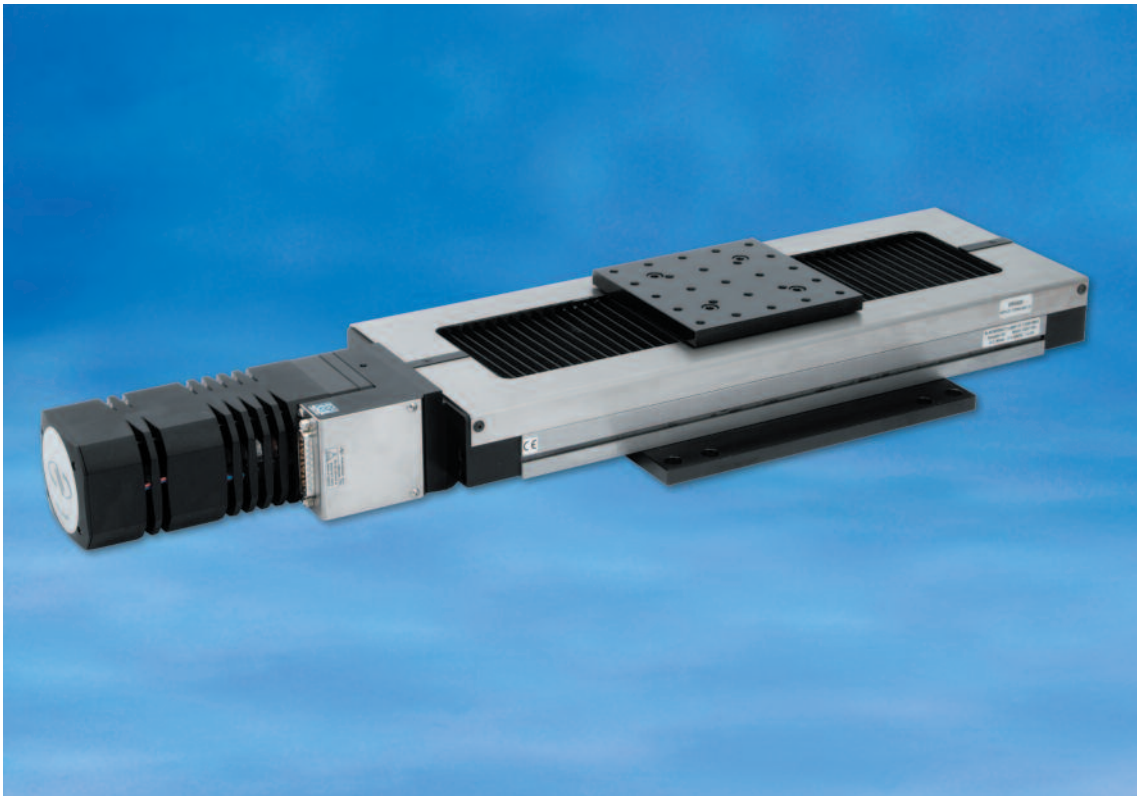


# MTM Series

## *Long-Travel Steel Linear Stages*



**Newport®**  
Experience | Solutions

## USER'S MANUAL

*For Motion, Think Newport™*

# Warranty

Newport Corporation warrants this product to be free from defects in material and workmanship for a period of 1 year from the date of shipment. If found to be defective during the warranty period, the product will either be repaired or replaced at Newport's discretion.

To exercise this warranty, write or call your local Newport representative, or contact Newport headquarters in Irvine, California. You will be given prompt assistance and return instructions. Send the instrument, transportation prepaid, to the indicated service facility. Repairs will be made and the instrument returned, transportation prepaid. Repaired products are warranted for the balance of the original warranty period, or at least 90 days.

## Limitation of Warranty

This warranty does not apply to defects resulting from modification or misuse of any product or part.

---

### CAUTION

**Warranty does not apply to damages resulting from:**

- **Incorrect usage:**
    - **Load on the stage greater than maximum specified load.**
    - **Carriage speed higher than specified speed.**
    - **Improper grounding.**
      - **Connectors must be properly secured.**
      - **When the load on the stage represents an electrical risk, it must be connected to ground.**
    - **Excessive or improper cantilever loads.**
  - **Modification of the stage or any part thereof.**
- 



#### CAUTION

**Please return equipment in the original (or equivalent) packing.**

**You will be responsible for damage incurred from inadequate packaging if the original packaging is not used.**

This warranty is in lieu of all other warranties, expressed or implied, including any implied warranty of merchantability or fitness for a particular use. Newport Corporation shall not be liable for any indirect, special, or consequential damages.

No part of this manual may be reproduced or copied without the prior written approval of Newport Corporation.

This manual has been provided for information only and product specifications are subject to change without notice. Any changes will be reflected in future printings.

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# EC Declaration of Conformity

## MTM Series

### EC Declaration of Conformity

following Annex II-1A  
of Directive 2006/42/EC on machinery



**The manufacturer:**

MICRO-CONTROLE Spectra-Physics,  
1 rue Jules Guesde ZI. Bois de l'Epine - BP189  
F-91006 Evry FRANCE

**Hereby declares that the machinery:**

- Description: " MTM"
- Function: Long-Travel Steel Linear Stage
- Models: M-/MTM/100/150/200/250/CC1/CC.1/PE1/PE1BV6/PE.1/PE.1BV6/PP.1/PP1.

– the technical file of which was compiled by:  
Mr Dominique DEVIDAL, Quality Director,  
MICRO-CONTROLE Spectra-Physics, Zone Industrielle - B.P.29  
F-45340 Beaune La Rolande France

– complies with all the relevant provisions of the Directive 2006/42/EC on machinery.  
– complies with all the relevant provisions of the Directive 2004/108/EC relating to electromagnetic compatibility.

– was designed and built in accordance with the following harmonised standards:  
• NF EN 61326-1:2006 « Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements »  
• NF EN 55011:2007 Class A

– was designed and built in accordance with the following other standards:  
• NF EN 61000-4-2  
• NF EN 61000-4-3  
• NF EN 61000-4-4  
• NF EN 61000-4-6

#### ORIGINAL DECLARATION

Done in Beaune La Rolande on 09 June 2011  
Dominique DEVIDAL  
Quality Director

DC1-EN rev:A

# Definitions and Symbols

The following terms and symbols are used in this documentation and also appear on the product where safety-related issues occur.

## General Warning or Caution



The exclamation symbol may appear in warning and caution tables in this document. This symbol designates an area where personal injury or damage to the equipment is possible.

## European Union CE Mark



The presence of the CE Mark on Newport Corporation equipment means that it has been designed, tested and certified as complying with all applicable European Union (CE) regulations and recommendations.



### ATTENTION

**This stage is a Class A device. In a residential environment, this device can cause radioelectric interferences. In this case, suitable measurements must be taken by the user of this device.**

## Warnings and Cautions

The following are definitions of the Warnings, Cautions and Notes that may be used in this manual to call attention to important information regarding personal safety, safety and preservation of the equipment, or important tips.



### WARNING

**Situation has the potential to cause bodily harm or death.**



### CAUTION

**Situation has the potential to cause damage to property or equipment.**

### NOTE

**Additional information the user or operator should consider.**

# Warnings




---

## WARNING

The motion of objects of all types carries potential risks for operators. Ensure the protection of operators by prohibiting access to the dangerous area and by informing the personnel of the potential risks involved.

---



---

## WARNING

Do not use this stage when its motor is emitting smoke or is unusually hot to the touch or is emitting any unusual odor or noise or is in any other abnormal state.

Stop using the stage immediately, switch off the motor power and then disconnect the electronics power supply.

After checking that smoke is no longer being emitted contact your Newport service facility and request repairs. Never attempt to repair the stage yourself as this can be dangerous.

---

## WARNING

Make sure that this stage is not exposed to moisture and that liquid does not get into the stage.

Nevertheless, if any liquid has entered the stage, switch off the motor power and then disconnect the electronics from power supply.

Contact your Newport service facility and request repairs.

---




---

## WARNING

Do not insert or drop objects into this stage, this may cause an electric shock, or lock the drive.

Do not use this stage if any foreign objects have entered the stage. Switch off the motor power and then disconnect the electronics power supply.

Contact your Newport service facility for repairs.

---

## WARNING

Do not place this stage in unstable locations such as on a wobbly table or sloping surface, where it may fall or tip over and cause injury.

If this stage has been dropped or the case has been damaged, switch off the motor power and then disconnect the electronics power supply.

Contact your Newport service facility and request repairs.

---

## WARNING

Do not attempt to modify this stage; this may cause an electric shock or downgrade its performance.

---

## WARNING

Do not exceed the usable depth indicated on the mounting holes (see section “Dimensions”). Longer screws can damage the mechanics or cause a short-circuit.

---

# Cautions

---

**CAUTION**

Do not place this stage in a hostile environment such as X-Rays, hard UV,... or in any vacuum environment.

---

**CAUTION**

Do not place this stage in a location affected by dust, oil fumes, steam or high humidity. This may cause an electric shock.

---

**CAUTION**

Do not leave this stage in places subject to extremely high temperatures or low temperatures. This may cause an electric shock.

- Operating temperature: +10 to +35 °C.
  - Storage temperature: -10 to +40 °C (in its original packaging).
- 

**CAUTION**

Do not move this stage if its motor power is on.



Make sure that the cable to the electronics is disconnected before moving the stage. Failure to do so may damage the cable and cause an electrical shock.

---

**CAUTION**

Be careful that the stage is not bumped when it is being carried. This may cause it to malfunction.

---

**CAUTION**

When handling this stage, always unplug the equipment from the power source for safety.

---

**CAUTION**

When the carriage is in its end-of-run position, it is strongly recommended not to go beyond this point by using the manual knob as this may damage the stage mechanism.

---

**CAUTION**

Contact your Newport service facility to request cleaning and specification control every year.

---



# Long-Travel Steel Linear Stages

## MTM Series

### 1.0 Introduction

This manual provides operating instructions for the stage that you have purchased in the (M-)MTM Series:

- (M-)MTMPP1
- (M-)MTMPP.1
- (M-)MTMPE1
- (M-)MTMPE.1
- (M-)MTMPE1V6 <sup>(1)</sup>
- (M-)MTMPE.1V6 <sup>(1)</sup>
- (M-)MTMCC1
- (M-)MTMCC.1

#### <sup>1)</sup> REMARK

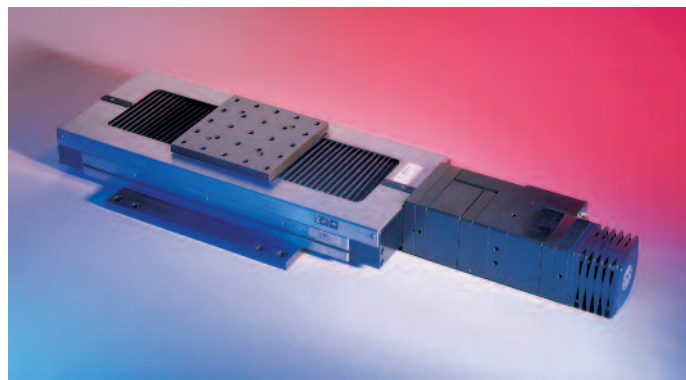
**Vacuum compatible stages to  $10^{-6}$  hPa. In this case, max. speed and load capacity have to be divided by two.**



*(M-)MTM Series linear stages.*

#### RECOMMENDATION

**We recommend you read carefully the chapter “Connection to electronics” before using the (M-)MTM stage.**

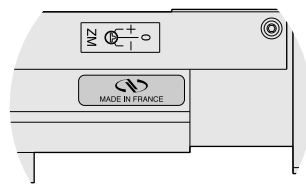


**2.0 Description**

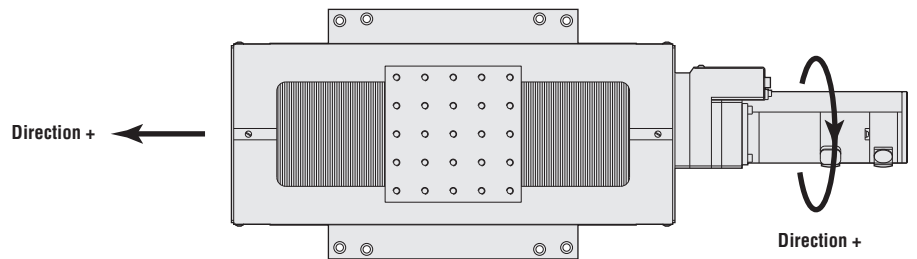
The (M-)MTM Series motorized, all-steel translation stages offer high precision positioning where longer travel of 100, 150, 200 or 250 mm is required. For durable, linear travel, opposing single-row bearing surfaces are precision-ground from tool steel. Smooth drive is provided by a diamond-corrected leadscrew and matched, precision-lapped nut.

The nut design includes anti-backlash preloading and a sophisticated uncoupling system that prevents leadscrew eccentricity errors from affecting stage movement.

All (M-)MTM stages include a center home position (Mechanical Zero) switch, supplemented by an index pulse signal from the encoder for precise origin location.

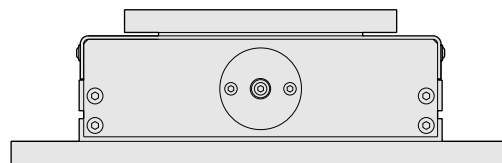


- +: Origin, side opposite motor.
- 0: Origin at stage center.
- : Origin on motor side.



Position measuring is performed with a 2,000 cts/rev. encoder (Stepper) or 4,000 cts/rev. encoder (DC), integral with the motor shaft.

On the drive leadscrew, side opposite motor, (M-)MTM stages are equipped with a hexagon socket. A 2.5 mm wrench permits a manual control of the carriage.



The modular design of (M-)MTM stages brings you the flexibility to choose the drive configuration that best matches your specific application requirements: high-resolution 0.1 μm version or higher torque 1 μm version, DC-motor or stepper motor driven versions, with mini-step or full-step drive options.

For optimal performance, we recommend the use of our motion controllers.

The (M-)MTM Series stages are supplied with a 3-meter cable for connection to our motion controllers.

**2.1 Design Details**

Base Material	Stainless Steel
Bearings	Linear ball bearings
Drive Mechanism	Backlash-compensated leadscrew
Drive Screw Pitch (mm)	CC: 4 mm PP, PE: 2mm
Reduction Gear	10:1 on all versions with 0.1 μm resolution additional motor mounted gear 10:1 on all PE versions
Feedback	CC: 4,000 cts/rev. screw mounted rotary encoder with index pulse PP, PE: 2,000 cts/rev. rotary encoder with index pulse
Limit Switches	Mechanical
Origin	Centered, can be set to left or right travel limit via external switch
Protection	Bellows
Vacuum Compatibility	Vacuum compatible versions are available up to 10 <sup>-6</sup> Torr using full-step motor (PE1 and PE.1)
Cable (m)	3 (included)



**NOTE**

**This product complies with the RoHS directive  
(Restriction of Hazardous Substances)**

**3.0 Characteristics**

**3.1 Definitions**

Specifications of our products are established in reference to ISO 230 standard part II “Determination of the position, precision and repeatability of the machine tools with CNC”.

This standard gives the definition of position uncertainty which depends on the 3 following quantities:

**(Absolute) Accuracy**

Difference between ideal position and real position.

**On-Axis Accuracy**

Difference between ideal position and real position after the compensation of linear error sources.

Linear errors include: cosine errors, inaccuracy of screw or linear scale pitch, angular deviation at the measuring point (Abbe error) and thermal expansion effects. All Newport motion electronics can compensate for linear errors.

The relation between absolute accuracy and on-axis accuracy is as follow:

$$Absolute\ Accuracy = On-Axis\ Accuracy + Correction\ Factor \times Travel$$

**Repeatability**

Ability of a system to achieve a commanded position over many attempts. Can be specified as uni-directional or bi-directional.

**Reversal Value (Hysteresis)**

Difference between actual position values obtained for a given target position when approached from opposite directions.

**Minimum Incremental Motion (Sensitivity)**

The smallest increment of motion a device is capable of delivering consistently and reliably.

**Resolution**

The smallest increment that a motion device can be commanded to move and/or detect.

**Yaw, Pitch**

Rotation of carriage around the Z axis (Yaw) or Y axis (Pitch), when it moves.

The testing of on-axis accuracy, repeatability, and reversal error are made systematically with test equipment in an air-conditioned room (20 ±1 °C).

A linear cycle with 21 data points on the travel and 4 cycles in each direction gives a total of 164 points.

**Guaranteed Specifications**

Guaranteed maximum performance values are verified per Newport's A167 metrology test procedure. For more information, please consult the metrology tutorial section in the Newport catalog or at [www.newport.com](http://www.newport.com)

**3.2 Mechanical Specifications**

	PP1, PE1, CC1	PP.1, PE.1, CC.1
Travel Range (mm)	100, 150, 200 and 250	
Minimum Incremental Motion (µm)	1	0.3
Uni-directional Repeatability, guaranteed <sup>(1)</sup> (µm)	1.5	
Bi-directional Repeatability, guaranteed <sup>(1)</sup> (µm)	3.0 or ±1.5	3.5 or ±1.75
On-Axis Accuracy, guaranteed <sup>(1)</sup> (µm)	5 or ±2.5	5 or ±2.5
Maximum Speed (mm/s)	40 <sup>(3)</sup> (CC1), 20 (PP1), 2 <sup>(4)</sup> (PE1)	4 (CC.1), 2 (PP.1), 0.2 <sup>(4)</sup> (PE.1)
Pitch, guaranteed <sup>(1)(2)</sup> (µrad) <sup>(5)</sup>	40 or ±20	40 or ±20
Yaw, guaranteed <sup>(1)(2)</sup> (µrad) <sup>(5)</sup>	35 or ±17.5	35 or ±17.5



<sup>1)</sup> Shown are peak to peak, guaranteed specifications or ± half the value as sometimes shown. Typical specifications are about 2X better than the guaranteed values.

<sup>2)</sup> For 100 mm travel.

<sup>3)</sup> 20mm/s for vertical usage with maximum Cx.

<sup>4)</sup> With V6 versions the maximum speed is reduced by a factor of two.

<sup>5)</sup> To obtain arcsec units, divide mrad value by 4.8.

**CAUTION**



**To reach specifications stated, stages must be fixed on a plane surface with a flatness of 5 µm.**

**3.3 Load Specification Definitions**

**Normal Load Capacity (Cz)**

Maximum load a stage can move while maintaining specifications.

This value is given with speed and acceleration specified for each stage, and with a load perpendicular to bearings.

**Axial Load Capacity ( $\pm Cx$ )**

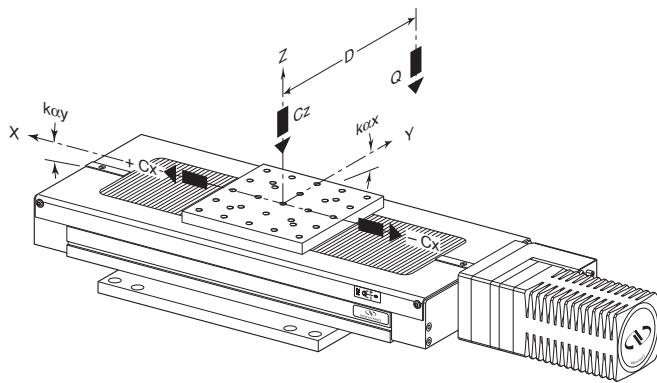
Maximum load along the direction of the drive train.

**Off-Centered Load (Q)**

Maximum cantilever-load a stage can move:  $Q \leq Cz / (1 + D/100)$

D: Cantilever distance.

**3.4 Load Characteristics and Stiffness**



Cz, Normal center load capacity on bearings	1000 N
+Cx, Direct load capacity on X axis	200 N (PE1, PE.1, PP.1) 150 N (PP1, CC.1) 100 N (CC1)
-Cx, Inverse load capacity on X axis	50 N
kox, Compliance in roll	5 mrad/Nm
koy, Compliance in pitch	10 mrad/Nm
Q, Off-center load	$Q \leq Cz / (1 + D/100)$
D, Cantilever distance in mm	

**3.5 Stage Weights**

Weights indicated into the below table are average values for stages with a typical drive unit installed.

	Weight [lb (kg)]
(M-)JMTM100	22 (10)
(M-)JMTM150	25.4 (11.5)
(M-)JMTM200	28.7 (13)
(M-)JMTM250	32 (14.5)

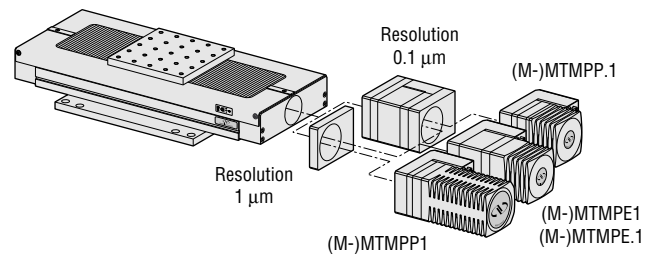
The weight variation between drive units is not very significant.

**4.0 Drive**

**4.1 Stepper Drive Versions**

Stepper-motor-driven stages are offered in four variants:

- Two mini-step drive versions with resolutions of 1  $\mu\text{m}$  (PP1) and 0.1  $\mu\text{m}$  (PP.1). These combine high speed positioning and smooth displacement from 1/10-stepper encoder count driving mode. For ultrasmooth low-speed positioning, microstepping up to 250x is possible using ESP Series Controllers.
- Two full-step versions with resolutions of 1  $\mu\text{m}$  (PE1) and 0.1  $\mu\text{m}$  (PE.1). These are primarily designed for applications requiring the position to be maintained within the stage’s resolution when power is switched off, such as operation in vacuum.



**Mini-Step Drive**

Is used for stepper motors, when 1 pulse emitted by electronic corresponds to theoretical physical motion of a fraction of a full step of the motor.

For these stages a mini-step equals 1/10 of a full step.

**Full-Step Drive**

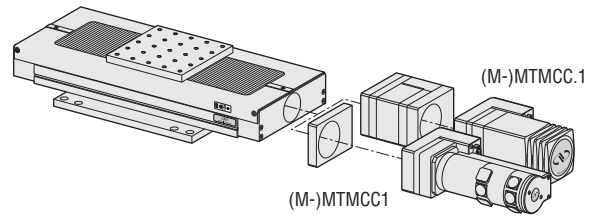
Is used for stepper motors, when 1 pulse emitted by electronic corresponds to theoretical physical motion of 1 full step of the motor.

**Stepper Motor Performance Specifications**

	Resolution ( $\mu\text{m}$ )	Speed (mm/s)	Motor
(M-)MTMPP1	1	20	UE63PP
(M-)MTMPP.1	0.1	2	
(M-)MTMPE1	1	2	UE41PP
(M-)MTMPE.1	0.1	0.2	
(M-)MTMPE1BV6	1	1	UE41PPV6
(M-)MTMPE.1BV6	0.1	0.1	

**4.2 DC-Servo Drive Versions**

Two DC-motor-driven configurations are available with resolutions of 1 μm (CC1) and 0.1 μm (CC.1). These feature a built-in tachometer to provide superior speed stability.



**DC-Motor Performance Specifications**

	Resolution (μm)	Speed (mm/s)	Motor
(M-)MTMCC1	1	40 <sup>(1)</sup>	UE511CC
(M-)MTMCC.1	0.1	4	UE404CC

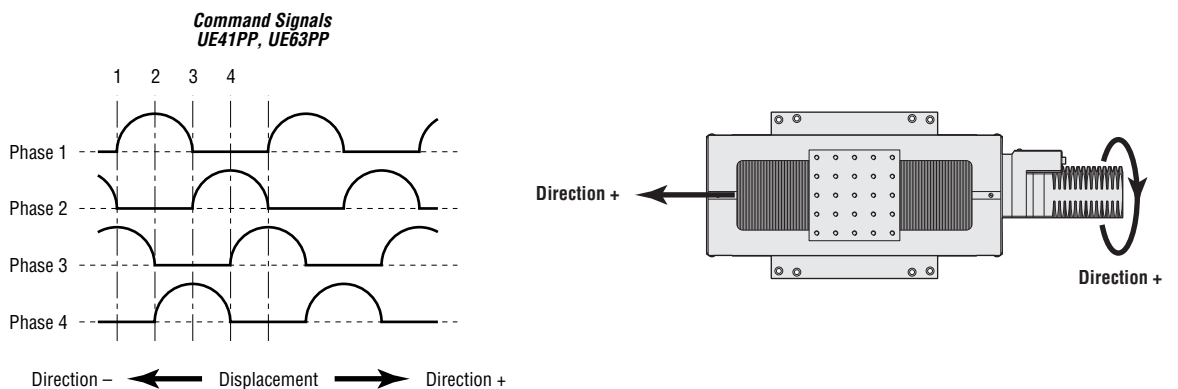
<sup>1)</sup> 20 mm/s for vertical usage with maximum Cx.

**5.0 Motor**

**5.1 Stepper Motor Characteristics**

Motor	Angle by Step (°)	RMS Current per Phase (A)	Resistance (Ω)	Inductance (mH)	Newport Utilization
UE41PP	1.8	0.43	2.9	3.4	Mini-Step
UE41PPV6	1.8	0.23	5.7	11.3	Full-Step
UE63PP	1.8	1.56	1.16	2.9	Mini-Step

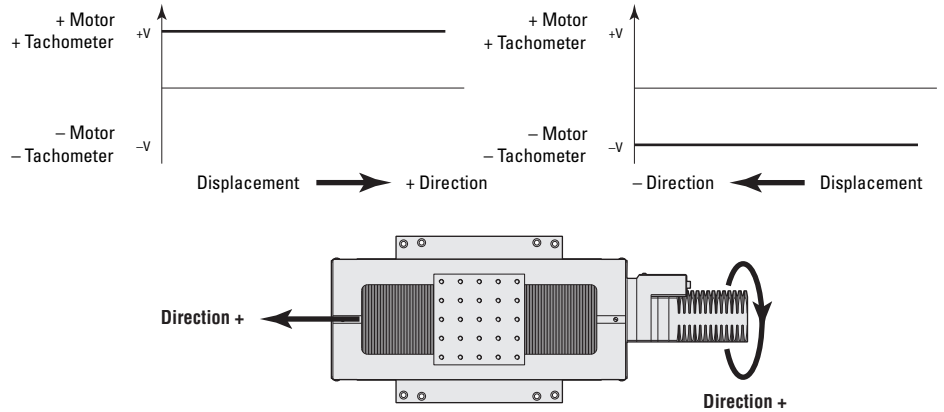
**5.2 Command Signals for Stepper Motors**



**5.3 DC-Motor Characteristics**

Motor	Nominal Voltage (V)	Max. RMS Current (A)	Max. Peak Current (A)	Resistance ( $\Omega$ )	Inductance (mH)	Tachometer Const. (V/krpm)
UE404CC	30	0.7	1	18.6	6.6	3 ( $\pm 10\%$ )
UE511CC	48	1.5	2.3	5.1	3.2	7 ( $\pm 10\%$ )

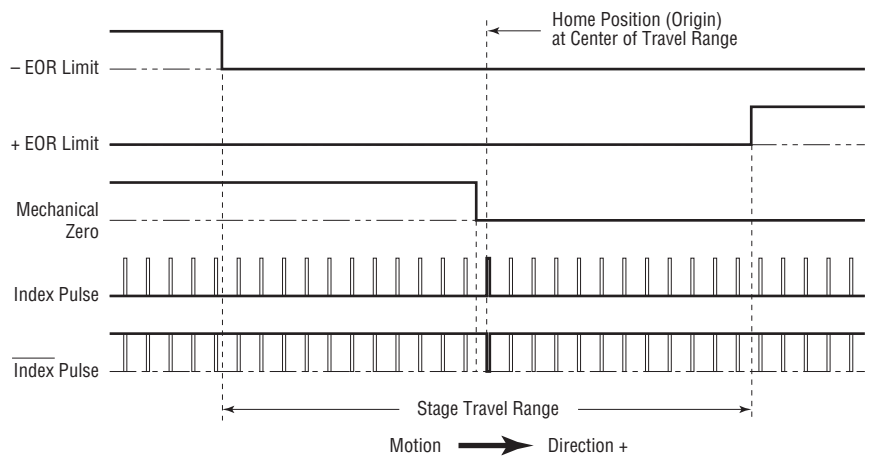
**5.4 Command Signals for DC-Motors**



In the above drawings, + Motor signal is referred to - Motor signal, + Tacho Generator signal is referred to - Tacho Generator signal.

- 1 When the stage moves in + Direction, the + Motor voltage is higher than - Motor voltage, and + Tacho Generator voltage is higher than - Tacho Generator voltage.
- 2 When the stage moves in - Direction, the + Motor voltage is lower than - Motor voltage, and + Tacho Generator voltage is lower than - Tacho Generator voltage.

**5.5 Sensor Position**



End-of-Run and Mechanical Zero are TTL type: 5 V  $\pm 5\%$ , 16 mA max.

Use of the Index Pulse provides a repeatable Home Position at  $\pm 1$  step.

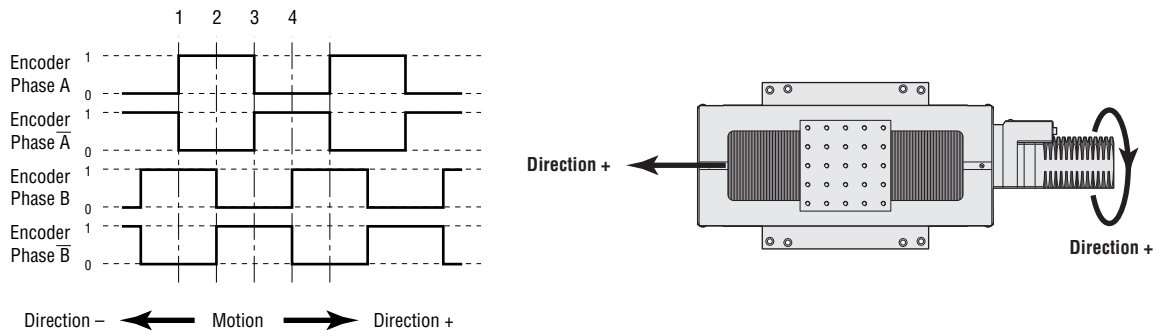


**CAUTION**

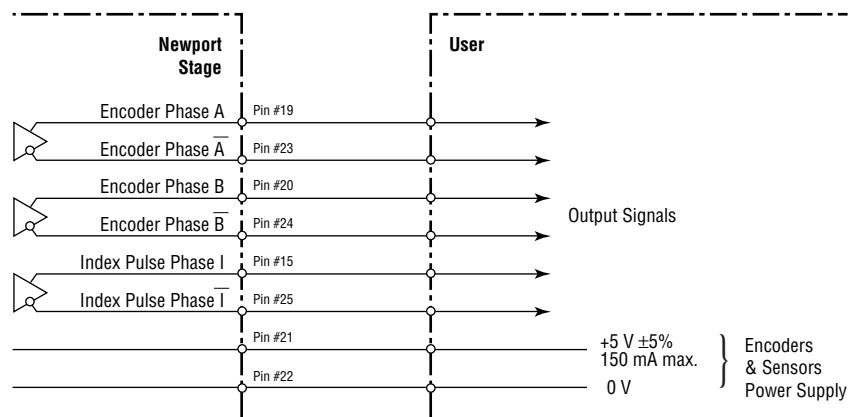
**“End-of-Run” and “Mechanical Zero” are active signals and should not be connected to any other source. Use appropriate TTL type receivers.**



5.6 Feedback Signal Position



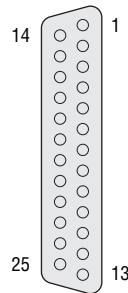
The incremental sensor operates following the photoelectric measurement principle, with a disk including slides. When the sensor shaft turns, the sensor generates square signals in quadrature, sent to pins #19, #20, #23 and #24 of the 25-pin Sub-D connector.



**5.7 Pinouts**

The 25-pin Sub-D connection for the (M-)MTM stages is given in the following table:

UE41PP, UE41PPV6 & UE63PP		UE404CC & UE511C	
<b>1</b>	Phase 1	<b>1</b>	+ Tachometer
<b>2</b>	Phase 1	<b>2</b>	+ Tachometer
<b>3</b>	Phase 2	<b>3</b>	- Tachometer
<b>4</b>	Phase 2	<b>4</b>	- Tachometer
<b>5</b>	Phase 3	<b>5</b>	+ Motor
<b>6</b>	Phase 3	<b>6</b>	+ Motor
<b>7</b>	Phase 4	<b>7</b>	- Motor
<b>8</b>	Phase 4	<b>8</b>	- Motor
<b>9</b>	N.C.	<b>9</b>	N.C.
<b>10</b>	N.C.	<b>10</b>	N.C.
<b>11</b>	N.C.	<b>11</b>	N.C.
<b>12</b>	N.C.	<b>12</b>	N.C.
<b>13</b>	Mechanical Zero	<b>13</b>	Mechanical Zero
<b>14</b>	Shield Ground	<b>14</b>	Shield Ground
<b>15</b>	Index Pulse I	<b>15</b>	Index Pulse I
<b>16</b>	0 V logic	<b>16</b>	0 V logic
<b>17</b>	+ End-of-Run	<b>17</b>	+ End-of-Run
<b>18</b>	- End-of-Run	<b>18</b>	- End-of-Run
<b>19</b>	Encoder Phase A	<b>19</b>	Encoder Phase A
<b>20</b>	Encoder Phase B	<b>20</b>	Encoder Phase B
<b>21</b>	Encoder Power: +5 V	<b>21</b>	Encoder Power: +5 V
<b>22</b>	0 V Encoder	<b>22</b>	0 V Encoder
<b>23</b>	Encoder Phase /A	<b>23</b>	Encoder Phase /A
<b>24</b>	Encoder Phase /B	<b>24</b>	Encoder Phase /B
<b>25</b>	Index Pulse /I	<b>25</b>	Index Pulse /I



## 6.0 Connection to Newport Controllers

### 6.1 Warnings on controllers

Controllers are intended for use by qualified personnel who recognize shock hazards and are familiar with safety precautions required to avoid possible injury. Read the controller user's manual carefully before operating the instrument and pay attention to all written warnings and cautions.

---

#### WARNING

Disconnect the power plug under the following circumstances:

- If the power cord or any attached cables are frayed or damaged in any way.
  - If the power plug is damaged in any way.
  - If the unit is exposed to rain, excessive moisture, or liquids are spilled on the unit.
  - If the unit has been dropped or the case is damaged.
  - If you suspect service or repair is required.
  - Whenever you clean the electronics unit.
- 

#### CAUTION

To protect the unit from damage, be sure to:

- Keep all air vents free of dirt and dust.
  - Keep all liquids away from the unit.
  - Do not expose the unit to excessive moisture (>85% humidity).
  - Read this manual before using the unit for the first time.
- 




---

#### WARNING

All attachment plug receptacles in the vicinity of this unit are to be of the grounding type and properly polarized.

Contact your electrician to check your receptacles.

---

#### WARNING

This product is equipped with a 3-wire grounding type plug.

Any interruption of the grounding connection can create an electric shock hazard.

If you are unable to insert the plug into your wall plug receptacle, contact your electrician to perform the necessary alterations to ensure that the green (green-yellow) wire is attached to earth ground.

---

#### WARNING

This product operates with voltages that can be lethal.

Pushing objects of any kind into cabinet slots or holes, or spilling any liquid on the product, may touch hazardous voltage points or short out parts.

---

**6.2 Connection**

On each stage is represented a label which indicates its name and its serial number.



**WARNING**

**Always turn the controller's power OFF before connecting to a stage.**

Stages may be connected to the rear panel motor connectors any time prior to power-up with the supplied cable assemblies.

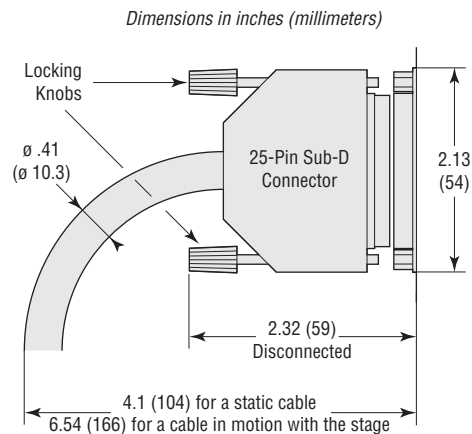
**NOTE**



MTM are ESP compatible stages. Enhanced System Performance is Newport's exclusive technology that enables Newport ESP motion controllers to recognize the connected Newport ESP stage and upload the stage parameters. This ensures that the user can operate the motion system quickly and safely.

**6.3 Cables**

All our (M-)MTM stages are delivered equipped with a 3-meter cable with 25-pin Sub-D connectors so they can be directly connected to our controllers/drivers.



**WARNING**

**This cable is shielded correctly. For a correct operation, make sure to lock connectors (ground continuity provided by the cable).**

For applications where the standard 3-meter cable (**MMCABLE-3**) included with your stage is not adequate, Newport offers longer length cables designed to ensure the integrity of your positioning application.



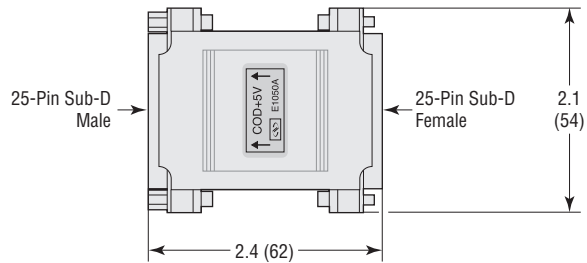
These cables are specially shielded and terminated with Newport's standard 25-pin sub-D connectors. They are available in 5-m (**MMCABLE-5**), 7-m (**MMCABLE-7**) or 10-m (**MMCABLE-10**) lengths.



**WARNING**

**Keep the motor cables at a safe distance from other electrical cables in your environment to avoid potential cross talk.**

For cable lengths in excess of 3 meters, we recommend the **MMCABLE-REG** to ensure a high quality, regulated 5 V supply to the stages.



This regulator is available as an option. Please note that for best efficiency, this regulator should be attached to the stage to re-adjust the 5 volts coming from the controller through the long cable.

7.0 Connection to Non-Newport Controllers

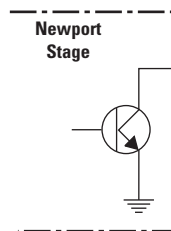
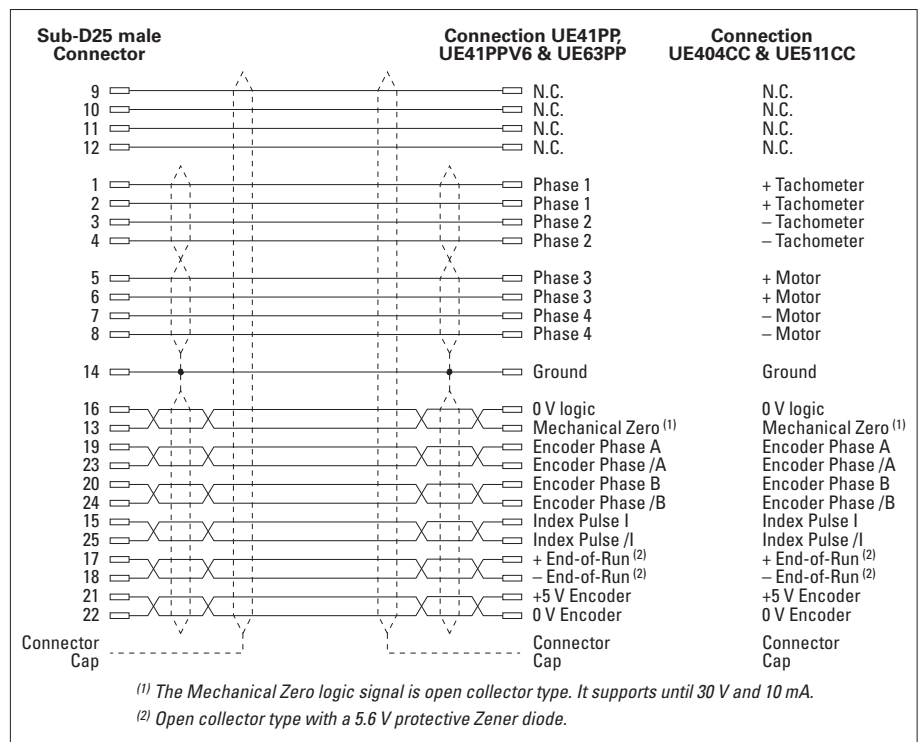
WARNING

Newport takes no responsibility for improper functioning or damage of a stage when it is used with any non- Newport controllers.

WARNING

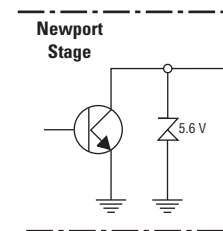
Newport guarantees the “CE” compliance of the (M-)MTM translation stages only if they are used with Newport cables and controllers.

Nevertheless, the figure below indicates the recommended wiring when a (M-)MTM stage is used with non-Newport controllers.



Mechanical Zero:  
 $I_{in}$  max.: 10 mA  
 V max.: 30 V

If the “Mechanical Zero” output is not used, a 1 kΩ/0.25 W resistor must be connected between pins #13 and #21.



End-of-Run:  
 $I_{in}$  max.: 16 mA  
 V max.: 5.6 V

“Encoder” and “Index Pulse” are “differential pair” type output signals. Using these signals permits a high immunity to noise. Emission circuits generally used by Newport are 26LS31 or MC3487. Reception circuits to use are 26LS32 or MC3486.

**8.0** Mounting

**8.1** Stage Mountings



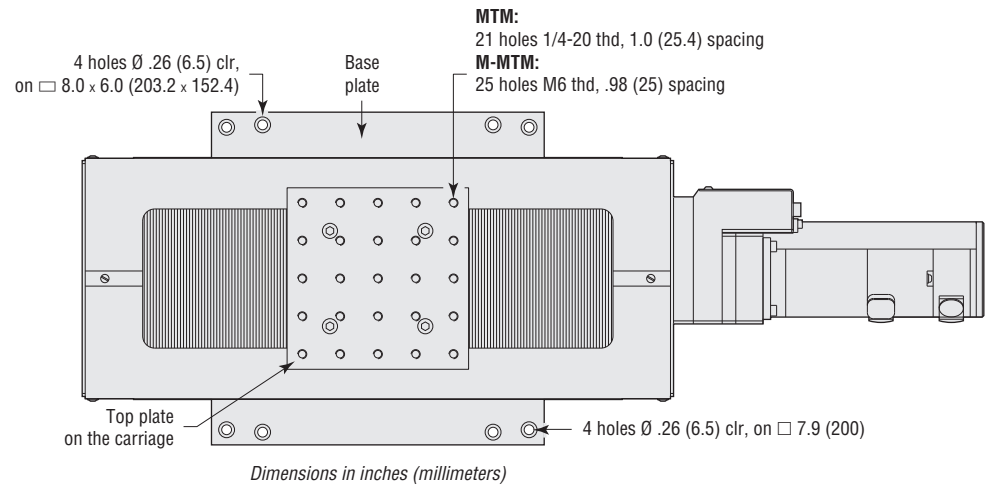
**WARNING**

Before to use a (M)-MTM stage, it is imperative to fix it:

- directly on a rectified working surface, from holes located on the mounting plate,
- on another stage, directly or with a mounting interface, but in no case, the stage has to remain without fastening.

It is equally necessary to fasten the device to move on the carriage:

- directly,
- removing the plate on the top of the stage.

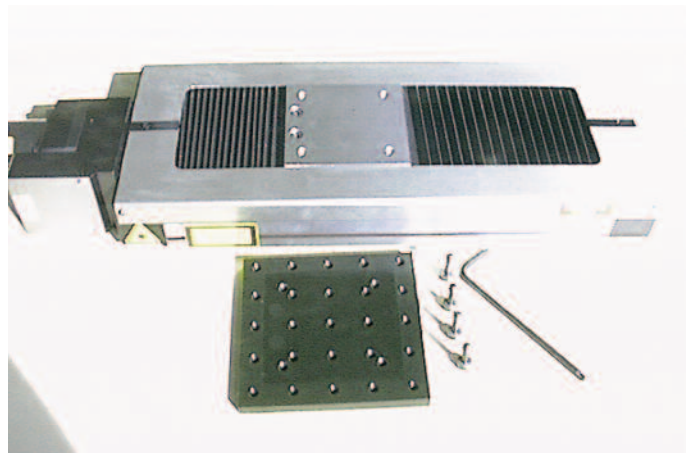


**WARNING**

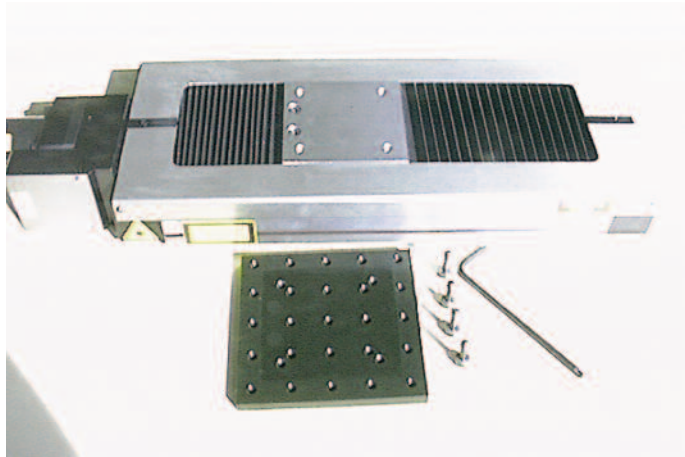
The working surface flatness directly influences stage accuracy and performance.

**8.2** Interfaces Disassembling

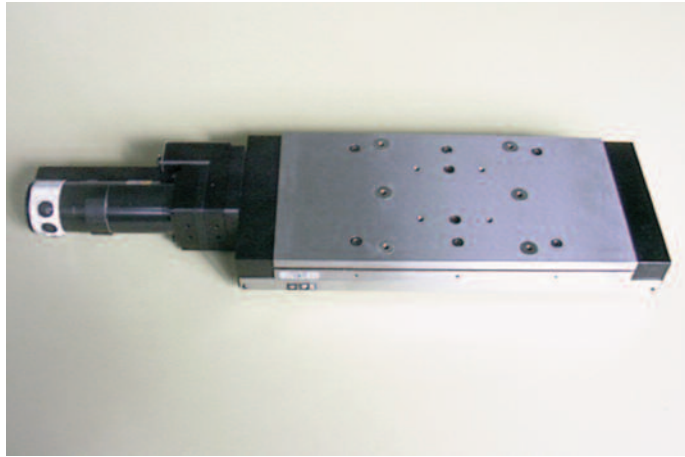
- Disassemble the top plate fixed on the carriage of the stage with 4 CHc M6 x .39 in. (10 mm) screws / □ 2.48 in. (63 mm).



- 2 Turn the stage upside down.



- 3 Disassemble the base plate fixed on the body of the stage with 4 CHc M6 x .39 in. (10 mm) screws / □ 5.04 in. (128 mm).



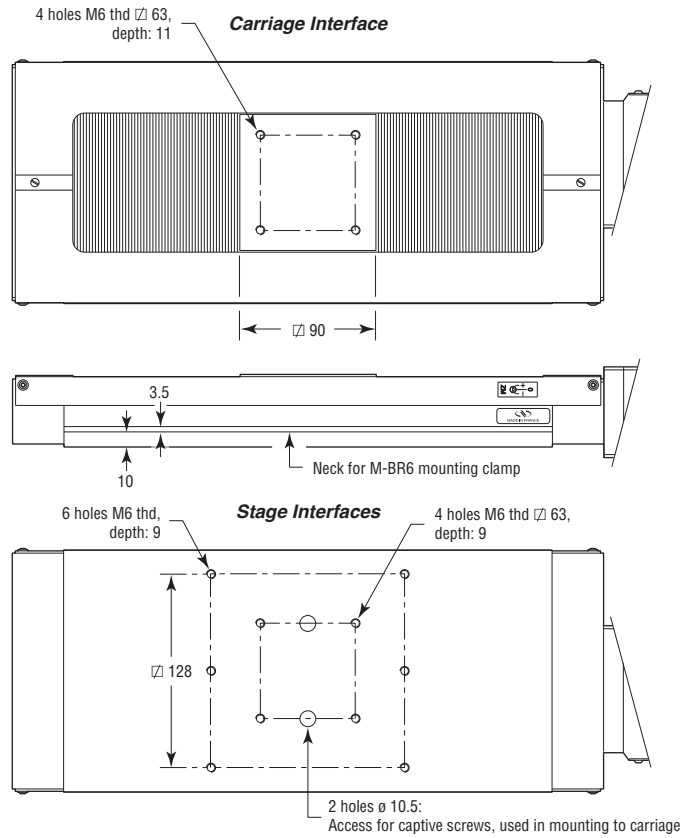
### 8.3 Interface Plates Mounting

Make steps of “Interfaces Disassembling” chapter in the opposite order.



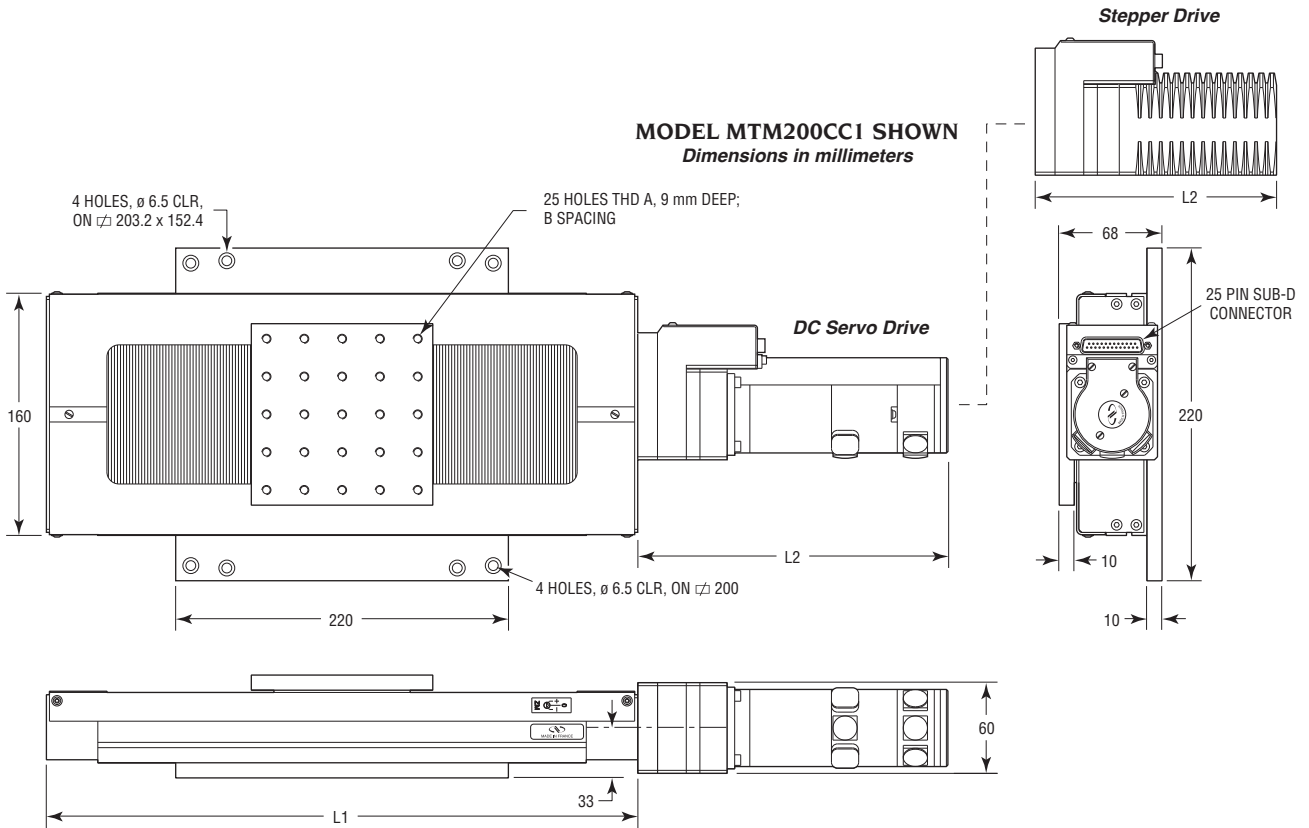
8.4 Assembly Pattern

Stacking (M-)MTM Series stages either together or with other Newport stage is easily accomplished. Below are example schematics of the assembly patterns used. These interfaces are accessed by unscrewing and removing the upper and/or lower plates of the stages (see dimension drawing).



(Dimensions in millimeters).

9.0 Dimensions



Dimensions [in. (mm)]

Model	Travel Range	L <sub>1</sub>	A	B
(M-)MTM100	3.9 (100)	11.4 (290)		
(M-)MTM150	168 (150)	13.4 (340)	1/4-20	1.0
(M-)MTM200	193 (200)	15.4 (391)	(M6)	(25)
(M-)MTM250	219 (250)	17.4 (442)		

Dimensions [in. (mm)]

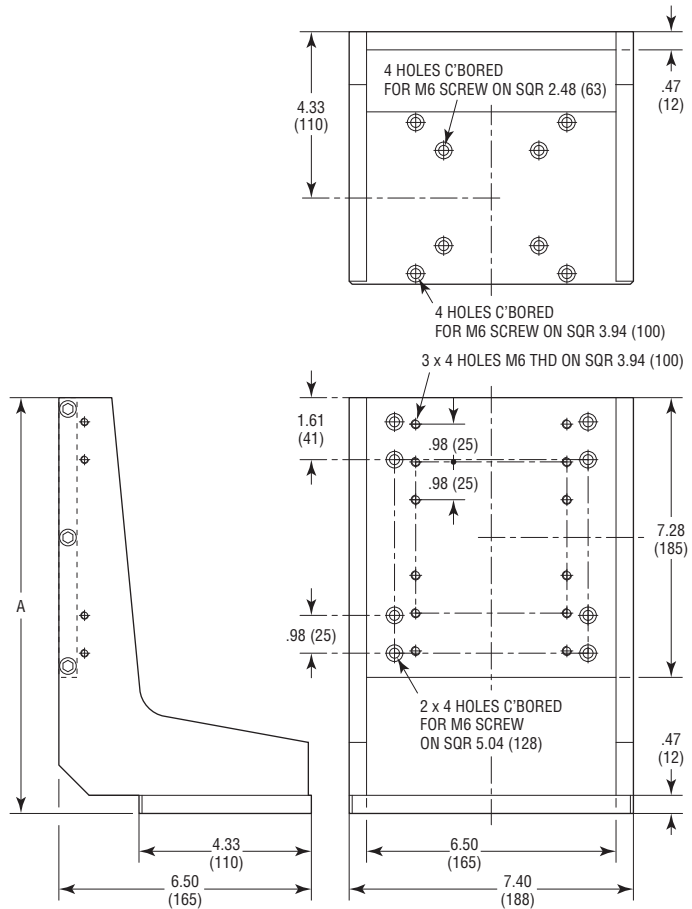
Version	L <sub>2</sub>
PP1	6.3 (159.6)
PP.1	7.1 (181.6)
PE1	5.6 (142.5)
PE.1	8.7 (220.6)
CC1	8.1 (205)
CC.1	9.5 (241.1)

**10.0** Accessories: EQ160 Brackets

EQ160 Series right-angle brackets (to order separately) can be used for vertical mounting configurations of an (M-)MTM stage.



Model	Description
EQ160-S	Right-Angle Bracket for (M-)MTM100/150
EQ160-L	Right-Angle Bracket for (M-)MTM200/250



Dimensions [in. (mm)]

Model	A
EQ160-S	10.8 (275)
EQ160-L	12.8 (325)

**11.0 Maintenance**

**RECOMMENDATION**

Contact Newport's After Sales Service to define the appropriate maintenance for your application.

**11.1 Maintenance**

The (M-)MTM stage requires no particular maintenance. Nevertheless, this is a precision mechanical device that must be kept and manipulated with precaution.

**PRECAUTIONS**

The (M-)MTM stage must operate, and be stocked in a clean environment, without dust, humidity, solvents or other substances.

**RECOMMENDATION**

It is recommended to return your stage to Newport's After Sales Service after every 2000 hours of use for lubrication and maintenance.

If your (M-)MTM stage is mounted on a workstation and cannot be easily dismantled, please contact Newport's After Sales Service for further instructions.

**11.2 Repairing**

**CAUTION**



Never attempt to disassemble a component of the stage that has not been covered in this manual.

To disassemble a non specified component can cause a malfunction of the stage.

If you observe a malfunction in your stage, please contact us immediately to arrange for a repair.

**CAUTION**



Any attempt to disassemble or repair a stage without prior authorization will void your warranty.

**11.3 Calibration**

**CAUTION**



It is recommended to return your stage to Newport once a year for recalibration to its original specifications.





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