



# VP-25AA

## High-Performance Precision Motorized Actuator

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 **Newport**<sup>®</sup>

**USER'S MANUAL**

# 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.

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### CAUTION

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

- **Incorrect usage:**
  - **Driven load greater than maximum specified load.**
  - **Actuator 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 actuator or any part thereof.**

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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.

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Original instructions.

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#### 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.**

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# EC Declaration of Conformity

## VP-25AA


**Newport®**

### EU Declaration of Conformity

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

**The manufacturer:**

MICRO-CONTROLE Spectra-Physics,  
9 rue du Bois Sauvage  
F-91055 Evry FRANCE

**Hereby declares that the machinery:**

- Description: "VP-25AA"
- Function: High-Performance Precision Motorized Actuator
- Models: (M-)VP-25AA

– the technical file of which was compiled by:

Mr Hervé LE COINTE , Quality Director,  
MICRO-CONTROLE Spectra-Physics, Zone Industrielle - B.P.29  
F-45340 Beauce 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 2014/30/EU relating to electro-magnetic compatibility.
- complies with all the relevant provisions of the Directive 2011/65/EU relating to RoHS2.

– was designed and built in accordance with the following harmonised standards:

- NF EN 61326-1:2013 « Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements »
- NF EN 55011:2010/A1:2011 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 61000-4-5
- NF EN 61000-4-6

#### ORIGINAL DECLARATION

Done in Beauce La Rolande on 16 May 2017  
Hervé LE COINTE  
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.

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.




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### WARNING

**Warning indicates a potentially dangerous situation which can result in bodily harm or death.**

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### CAUTION

**Caution indicates a potentially hazardous situation which can result in damage to product or equipment.**

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### NOTE

**Note indicates additional information that must be considered by the user or operator.**

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## 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.

## Warnings and Cautions




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### ATTENTION

**This stage is a Class A device. In a residential environment, this device can cause electromagnetic interference. In this case, suitable measures must be taken by the user.**

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# Warnings




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## 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.

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## WARNING

Do not use this actuator 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 actuator 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 actuator yourself as this can be dangerous.

---

## WARNING

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

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

Contact your Newport service facility and request repairs.

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## WARNING

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

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

Contact your Newport service facility for repairs.

---

## WARNING

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

If this actuator 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.

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## WARNING

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

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# Caution

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**CAUTION**

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

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**CAUTION**

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

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**CAUTION**

**Do not leave this actuator 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)**
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**CAUTION**

**Do not move this actuator if its motor power is on.**

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

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**CAUTION**

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

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**CAUTION**

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

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**CAUTION**

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

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# High-Performance Precision Motorized Actuator VP-25AA

## 1.0 Introduction

This manual provides operating instructions for the VP-25AA high-performance precision motorized actuator.



*VP-25AA motorized actuator.*

### RECOMMENDATION

We recommend you read carefully the chapter “Connection to electronics” before using the VP-25AA actuator.



## 2.0 Description

The VP-25AA actuator features an all aluminum body and recirculating preloaded ball bearing slides as guide ways to ensure accurate linear travel. The actuator rod doesn't rotate during its displacement.

A preloaded, backlash-free ballscrew with a 1 mm pitch provides smooth motion. The screw is accurately ground to reduce the heating factor to a minimum and extend the lifetime of the stage.

The position is read on a metal optical scale with pitch of 20  $\mu\text{m}$  and a 200x interpolation of signals to obtain a 0.1  $\mu\text{m}$  resolution.

The VP-25AA actuator features end-of-run limit switches at both ends to prevent bearing damage from over-travel. The origin (Mechanical Zero) is at the center of travel, with a reference on the optical scale.

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

The VP-25AA actuator is equipped with a cable of 1.5 m length and a SUB-D25 connector for connection to our motion controllers.

### 2.1 Design Details

Base Material	Aluminum
Bearings	Recirculating ball bearings
Drive Mechanism	Backlash-free ball screw
Drive Screw Pitch	1 mm
Feedback	Linear steel scale, 20 $\mu\text{m}$ signal period, 0.1 $\mu\text{m}$ resolution
Limit Switches	Optical
Origin	Optical, at center of travel, including mechanical zero signal
Motor	DC Servo
Cable Length	1.5 m

## 3.0 Characteristics

### 3.1 Definitions

Specifications of our products are established in reference to ISO 230 standard part II “Determination of accuracy and repeatability of positioning numerically controlled axes”.

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

#### **Absolute Accuracy**

Difference between ideal position and real position.

#### **Accuracy**

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

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 follows:

$$\text{Absolute Accuracy} = \text{Accuracy} + \text{Correction Factor} \times \text{Travel}$$

#### **Repeatability**

Ability of a system to achieve a commanded position over many attempts.

#### **Reversal Value (Hysteresis)**

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

#### **Minimum Incremental Motion (MIM or Sensitivity)**

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

#### **Resolution**

The smallest increment that a motion device can theoretically move and/or detect. Resolution is not achievable, whereas MIM, is the real output of a motion system.

The testing of accuracy, repeatability, and reversal error are made systematically with test equipment in controlled environment (20<sup>±1</sup> °C).

A linear cycle with 21 data points on the travel and 4 cycles in each direction gives a total of 168 points.

### **Guaranteed and Typical 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**



Travel Range	25 mm
Minimum Incremental Motion	0.1 $\mu$ m
Uni-directional Repeatability, Typical (Guaranteed) <sup>(2)</sup>	$\pm 0.04$ (0.10) $\mu$ m
Bi-directional Repeatability, Typical (Guaranteed) <sup>(1)(2)</sup>	$\pm 0.2$ ( $\pm 0.30$ ) $\mu$ m
Accuracy, Typical (Guaranteed) <sup>(1)(2)</sup>	$\pm 0.5$ ( $\pm 1.0$ ) $\mu$ m
Maximum Speed	25 mm/s
MTBF	20,000 h

<sup>1)</sup> For the definition of Typical and Guaranteed specifications see "Motion Basics Terminology & Standards" Tutorial at [www.newport.com](http://www.newport.com)

<sup>2)</sup> Measured on a linear stage attached to the actuator.

The MTBF value indicated above is given to use the actuator with the following parameters:

Axial load	20 N
Displacements	2 mm
Speed	10 mm/s
Operating rate on the cycle	20%
Cycle	21 hours/day, 330 days/year

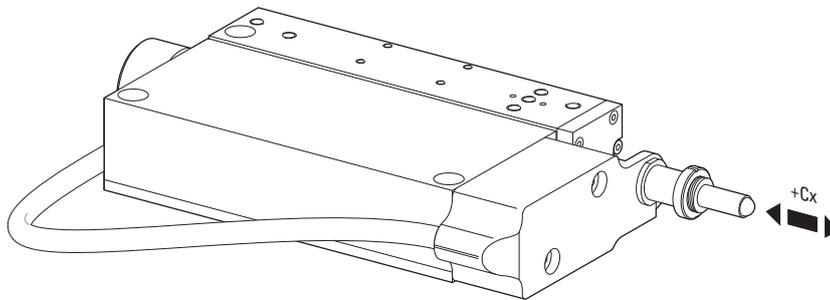
**3.3 Axial Load Capacity ( $\pm C_x$ )**

Maximum load an actuator can move while maintaining specifications. This value is given with speed and acceleration specified for the actuator.

This value is given for load along the direction of the drive train.

Max. Speed (mm/s)	25
Max. Acceleration (mm/s <sup>2</sup> )	100

**3.4 Load Characteristics**



-Cx, +Cx, Axial load capacity	40 N
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**3.5 Actuator Weight**

The actuator weight below includes the cable.

	Weight [lb (kg)]
VP-25AA	2.2 (1.0)

**4.0 Drive and Motor**

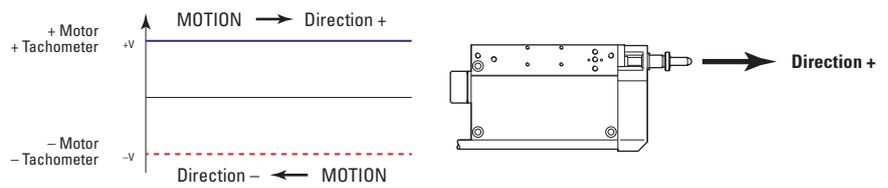
**4.1 DC-Servo Drive Version**

The VP-25AA actuator is equipped with DC-motor and a metal optical scale.

**DC-Motor Performance Specifications and Characteristics**

	Resolution ( $\mu\text{m}$ )	Speed (mm/s)	Nominal Voltage (V)	Max RMS Current (A)	Max. Peak Current (A)	Resistance ( $\Omega$ )	Inductance (mH)	Tachometer Const. (V/krpm)
<b>VP-25AA</b>	0.1	25	48	0.5	1	8	0.83	0.52

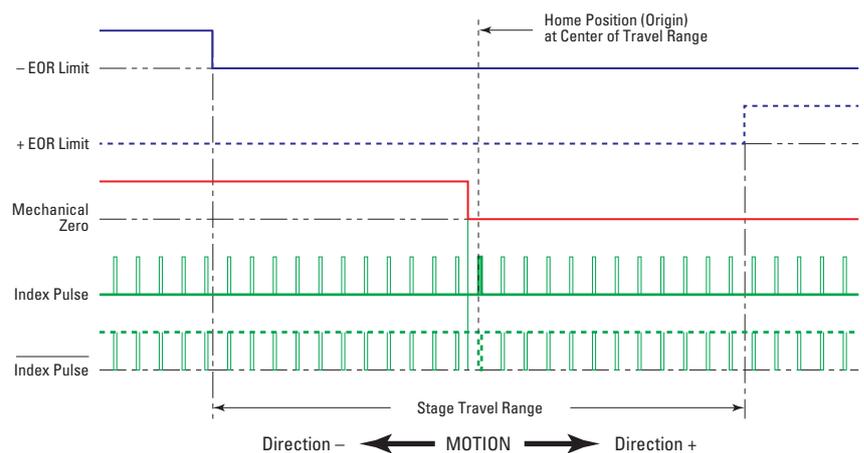
**Command Signals for the DC-Motor**



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

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

**4.2 Sensor Position**



End-of-Run and Mechanical Zero are 5 V open collector type.

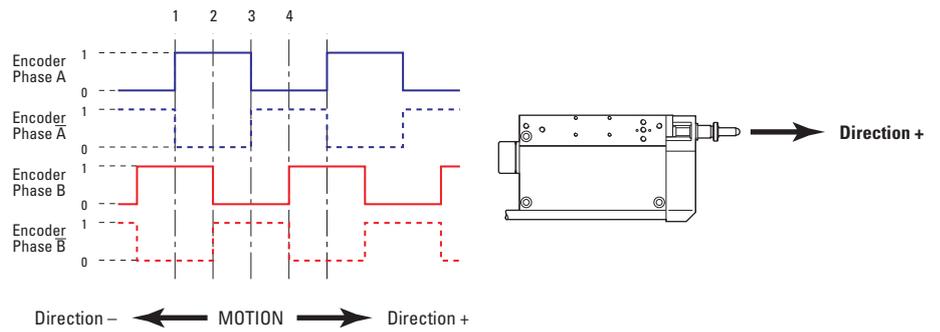
The Index Pulse provides a repeatable Home Position at  $\pm 1$  step.



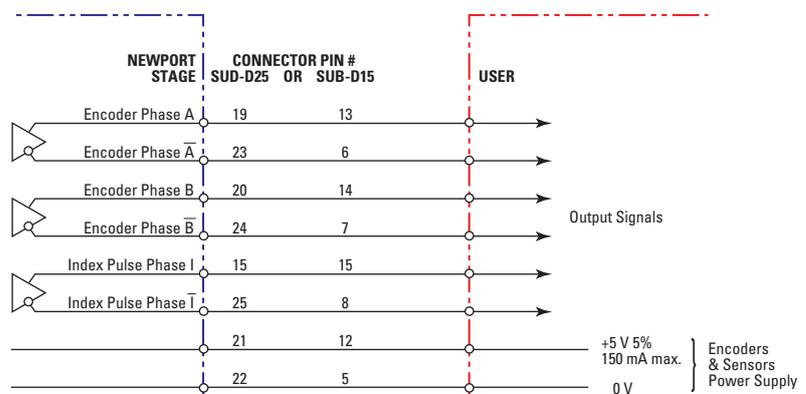
**CAUTION**

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

### 4.3 Feedback Signal Position



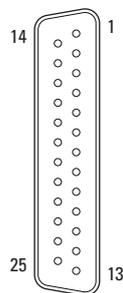
The incremental sensor consists of an optical scale and an encoder head. When the carriage moves, the encoder head generates square signals in quadrature and sends to pins #19, #20, #23 and #24 of the SUB-D25 connector.



“Encoder” and “Index Pulse” are “differential pair” (type RS-422) 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.

### 4.4 Pinouts

The pinout diagram for the VP-25AA actuator SUB-D25M connector is shown below.



1	+ Tachometer	14	Ground
2	N.C.	15	Index Pulse I
3	- Tachometer	16	0 V
4	N.C.	17	+ End-of-Run
5	+ Motor	18	- End-of-Run
6	+ Motor	19	Encoder Phase A
7	- Motor	20	Encoder Phase B
8	- Motor	21	+5 V
9	N.C.	22	0 V
10	N.C.	23	Encoder Phase /A
11	N.C.	24	Encoder Phase /B
12	N.C.	25	Index Pulse /I
13	Mechanical Zero		

## 5.0 Connection to Newport Controllers

### 5.1 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.

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## 5.2 Connection

There is a label on every stage indicating its part and serial numbers.



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### WARNING

Always turn the controller's power OFF before connecting to an actuator.

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### NOTE



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

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## 5.3 Cables

The VP-25AA actuator is delivered equipped with a 1.5-meter cable with a SUB-D25M connector for direct connection to Newport Controllers.

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### WARNING

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

---



### WARNING

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

---

**6.0** Connection to Non-Newport Electronics

6.1 Connections

**WARNING**

Newport is not responsible for malfunction or damage of VP-25AA actuators when used with non-Newport controllers.

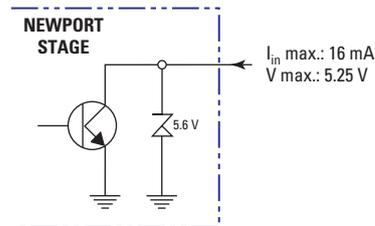
**WARNING**

Newport guarantees “CE” compliance of VP-25AA actuators only if used with Newport cables and controllers.

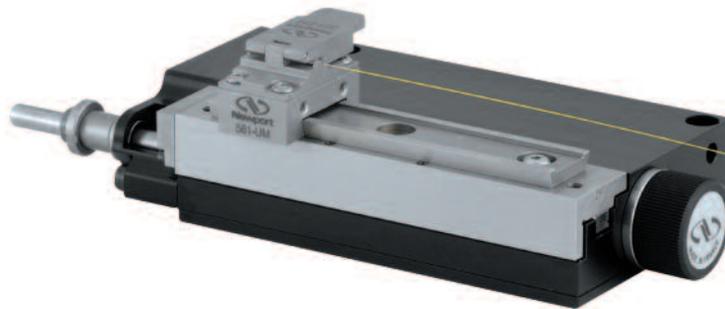
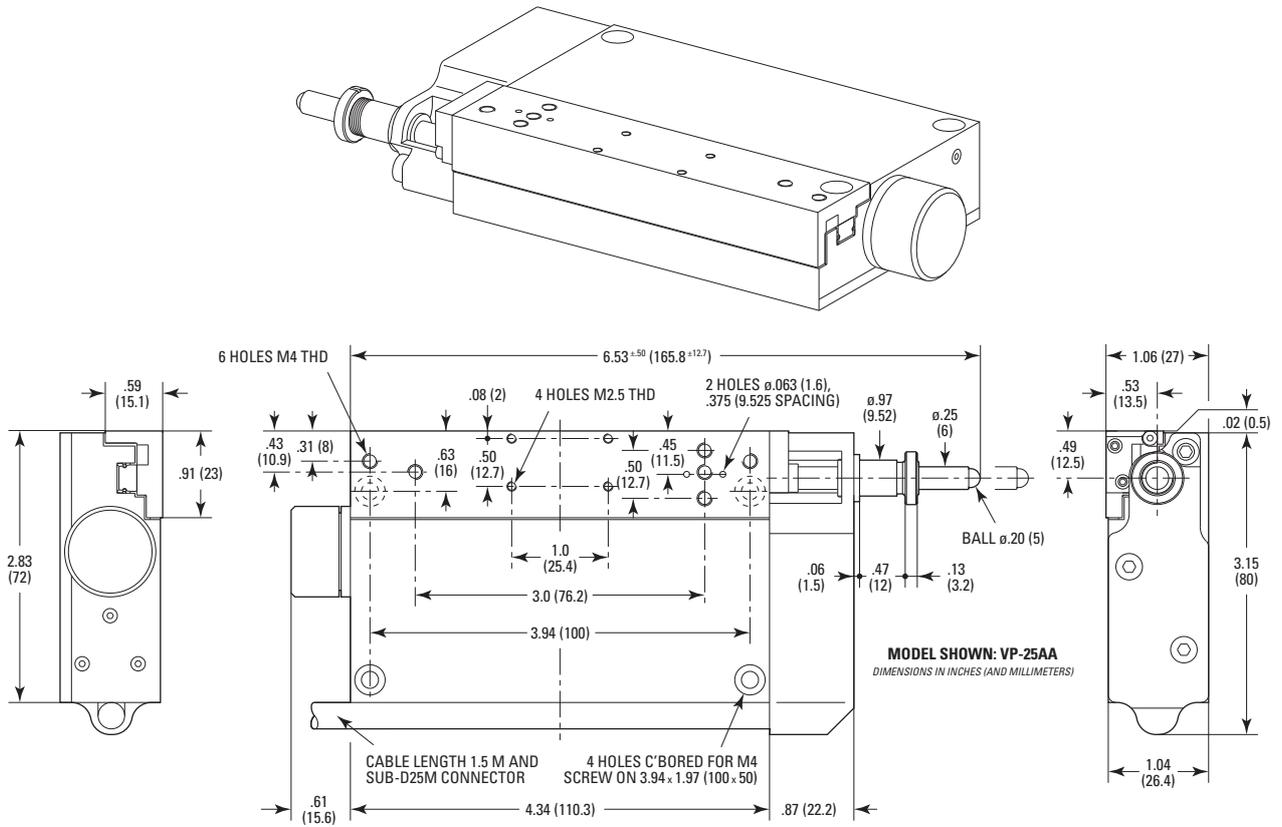


It is the customer’s responsibility to modify the cable and take care of sensor signal connections, when using the stage with non-Newport controllers.

End-of-Runs and Mechanical Zero are open collector type with a 5.6 V protective Zener diode.



7.0 Dimensions



The VP-25AA actuator as a single-rail linear stage to position small and light weight parts with the optional 561-RAIL rails.

## 8.0 Maintenance

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### RECOMMENDATION

Please contact Technical Sales Support team for recommendations on application specific maintenance.

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#### 8.1 Maintenance

The VP-25AA actuator requires no particular maintenance. Nevertheless, this is a precision mechanical device that must be kept and operated with caution.

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### PRECAUTIONS

The VP-25AA actuator must be used or stocked in a clean environment, without dust, humidity, solvents or other substances.

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### RECOMMENDATION

It is recommended to return the stage to Newport for re-lubrication after 2000 hours of use.

If the VP-25AA actuator is mounted on a workstation and cannot be easily removed, please contact Newport's After Sales Service for further instructions.

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#### 8.2 Repair

### CAUTION



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

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

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

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### CAUTION

Any attempt to disassemble or repair an actuator without prior authorization will void your warranty.

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#### 8.3 Calibration



### CAUTION

It is recommended to return your VP-25AA actuator to Newport once a year for recalibration to its original specifications.

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Visit Newport Online at:  
[www.newport.com](http://www.newport.com)

**North America & Asia**

Newport Corporation  
1791 Deere Ave.  
Irvine, CA 92606, USA

**Sales**

Tel.: (800) 222-6440  
e-mail: [sales@newport.com](mailto:sales@newport.com)

**Technical Support**

Tel.: (800) 222-6440  
e-mail: [tech@newport.com](mailto:tech@newport.com)

**Service, RMAs & Returns**

Tel.: (800) 222-6440  
e-mail: [service@newport.com](mailto:service@newport.com)

**Europe**

MICRO-CONTROLE Spectra-Physics S.A.S  
9, rue du Bois Sauvage  
91055 Évry CEDEX  
France

**Sales & Technical Support**

Tel.: +33 (0)1.60.91.68.68  
e-mail: [france@newport.com](mailto:france@newport.com)

**Service & Returns**

Tel.: +33 (0)2.38.40.51.55

