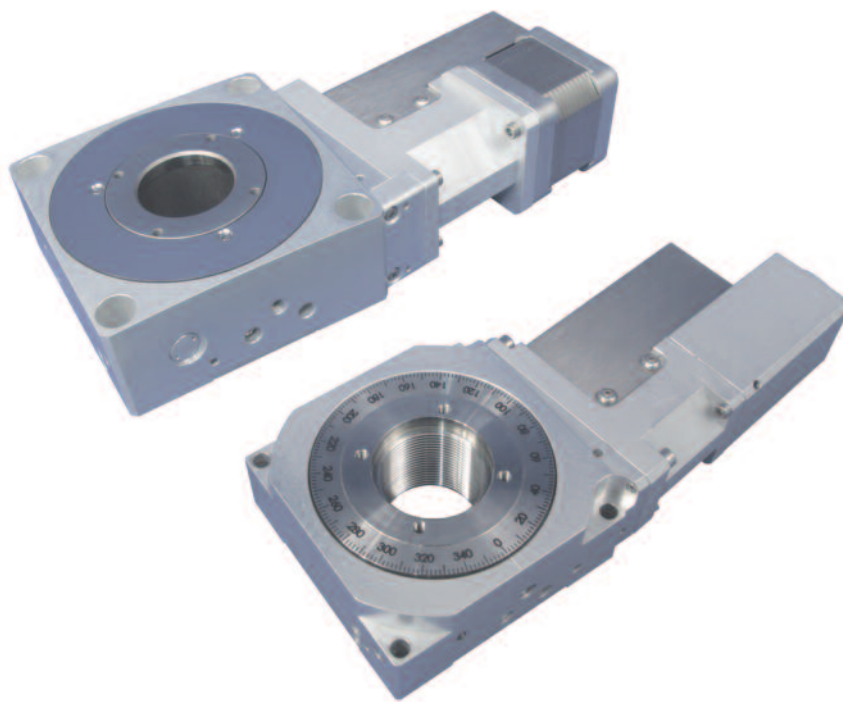




URS-BPPV6 Series

Vacuum Compatible Precision Rotation Stage



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.



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.

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.**

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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Table of Contents

Warranty	ii
EC Declaration of Conformity.....	v
Definitions and Symbols.....	vi
Warnings	vii
Caution	viii
1.0 — Introduction.....	1
2.0 — Description	2
2.1 Design Details	2
3.0 — Characteristics	3
3.1 Definitions	3
3.2 Mechanical Specifications	4
3.3 Load Specification Definitions.....	4
3.4 Load Characteristics and Stiffness	4
3.5 Stage Weights	5
4.0 — Drives and Motors	5
4.1 Stepper Drive Versions	5
4.2 Sensor Position.....	6
4.3 Feedback Signal Position for URS50BPPV6 Stage	6
4.5 MSCABLE-3 Cable.....	7
5.0 — Connection to Newport Controllers.....	8
5.1 Warnings on Controllers	8
5.2 Connection.....	9
5.3 Cables	9
5.4 MSCABLE-3 Cable.....	9
6.0 — Connection to Non-Newport Electronics	11
6.1 Connections	11
7.0 — Disabling of Limit Switches	12
8.0 — Dimensions	13
8.1 URS50BPPV6 Stage.....	13
8.2 URS75BPPV6 Stage.....	13

9.0	— Maintenance	14
9.1	Maintenance	14
9.2	Repair	14
9.3	Calibration	14

	Service Form	15
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EC Declaration of Conformity

URS-BPPV6 Series



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: " URS-BPPV6 "
- Function: Precision rotation stages
- Models: URS50BPPV6 / URS75BPPV6.

– 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 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 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 Beaune 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.



WARNING

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



CAUTION

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

NOTE

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

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



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.

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.

Caution

CAUTION

Do not place this stage in a hostile environment such as X-Rays, hard UV,... or in any vacuum environment less than 10^{-6} hPa.

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 as this may damage the stage mechanism.

CAUTION

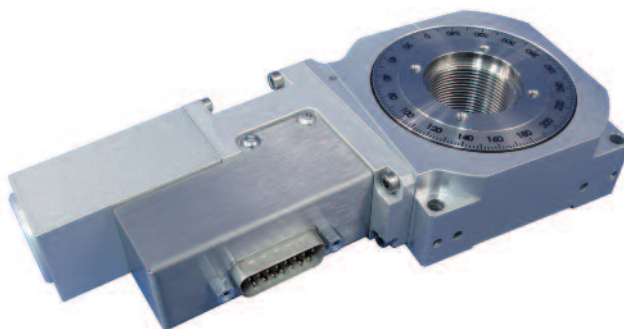
Contact your Newport service facility to request cleaning and specification control every year.

Vacuum Compatible Precision Rotation Stages

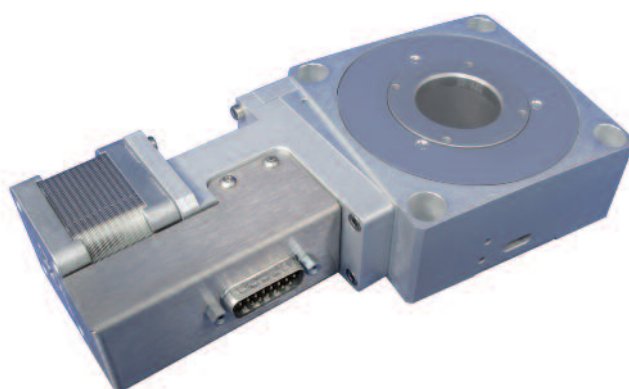
URS-BPPV6 Series

1.0 Introduction

This manual provides operating instructions for the URS-BPPV6 series rotation stages:



URS50BPPV6 rotation stage.



URS75BPPV6 rotation stage.

RECOMMENDATION

We recommend you read carefully the chapter “Connection to electronics” before using the URS-BPPV6 rotation stage.

2.0 Description

The URS-BPPV6 rotation stages features an enhanced, lower profile package providing easier top down mounting that is directly compatible with our vacuum compatible stages.

When using with our XPS or ESP301 motion controllers with high micro-step capability, low noise operation and very small incremental motions are guaranteed. The URS-BPPV6 rotation stage does not use encoder feedback, but calculates position by the number of commanded steps and micro-steps. For this purpose, the stepper motor is directly attached to the worm screw with a proprietary bellow coupling with high torsional stiffness and no gear or belt drive in between. Furthermore, the high output torque of the stepper motor minimizes the risk of lost steps and provides optimum motion sensitivity with good linearity between commanded micro-step and the actual motion of the stage.

The URS-BPPV6 rotation stages features a proprietary 4-contact point ball bearing. The unique, 2-piece design of the URS-BPPV6 provides a low-profile compact stage with exceptional stiffness, high reliability and outstanding wobble and eccentricity. The tilted worm screw arrangement allows for 4 symmetric mounting holes as compared to other designs that only feature 2 or 3 mounting holes. As a result, the URS-BPPV6 stages provides a higher stiffness for better support of higher or off-centered loads.

Additionally, the flexible preloading system for the worm gear has been improved to guarantee a backlash-free operation with an MTBF of 20,000 hours.

2.1 Design Details

Based Material	Hardened steel with aluminum body
Bearings	Large diameter ball bearings
Drive Mechanism	Grinded worm gear with self-compensating preload
Worm Gear Ratio	URS50BPPV6: 1:80 URS75BPPV6: 1:90
Feedback	URS50BPPV6: Motor Mounted Rotary Encoder, 48 pts/rev. URS75BPPV6: None
Limit Switches	URS50BPPV6: None URS75BPPV6: Two independently adjustable optical limit switches
Origin	Optical, fixed at position 0°. Typical 0.04° repeatability
Manual Adjustment	Via Allen wrench (included) at the end of the worm screw
Motor	Stepper Motor
Cable Length	SUB-D15F/SUB-D25M cable, length 3 m Not Vacuum compatible

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.

Eccentricity

Displacement of the geometric center of a rotation stage from the rotation axis in the plane defined by bearings.

Wobble

Tilt of rotation axis during rotation of a stage, measured on a reference surface.

The testing of accuracy, repeatability, and reversal error are made systematically with test equipment in controlled environment (20⁺¹ °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

3.2 Mechanical Specifications



	URS50BPPV6	URS75BPPV6
Travel Range (°)	360 continuous	360 continuous ⁽¹⁾
Minimum Incremental Motion (°)	0.0002 (0.0005 in open loop mode)	0.0002
Uni-directional Repeatability ⁽²⁾ , (°)	±0.00075	±0.00035
Typical (Guaranteed) (°)	(±0.002)	(±0.001)
Bi-directional Repeatability ⁽²⁾ , (°)	±0.0012	±0.0044
Typical (Guaranteed) (°)	(±0.003)	(±0.006)
Accuracy ⁽²⁾ , (°)	±0.012	±0.008
Typical (Guaranteed) (°)	(±0.020)	(±0.015)
Max. Speed (°/s)	4	20
Wobble ⁽²⁾ , Typical (Guaranteed) (μrad)	±12 (±25)	
Eccentricity ⁽²⁾ , Typical (μm)	±3.0	±0.3
MTBF	20000 h at 25% load and with a 10% duty cycle	

⁽¹⁾ With disabled limit switches.

⁽²⁾ For the definition of Typical and Guaranteed specifications see "Motion Basics Terminology & Standards" Tutorial at www.newport.com



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 rotation stage can move while maintaining specifications.

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

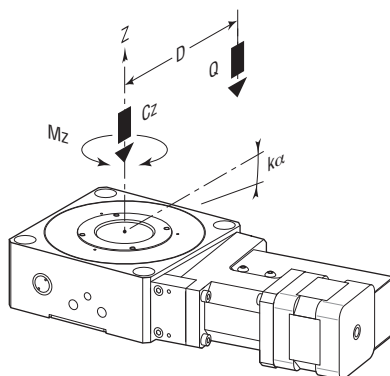
Off-Centered Load (Q)

Maximum cantilever-load a rotation stage can move: $Q \leq C_z \div (1 + D/a)$

D: Cantilever distance.

a: Construction parameter.

3.4 Load Characteristics and Stiffness



	URS50BPPV6	URS75BPPV6
Cz, Normal centered load capacity (N)	50	100
a, Construction parameter (mm)	20	25
Kα, Transversal compliance (μrad/Nm)	100	30
Mz, Nominal torque (Nm)	0.125	0.5
Q, Off-center load (N)	$Q \leq C_z \div (1 + D/a)$	
Where D = Cantilever distance (mm)		

3.5 Stage Weights

Weights indicated into the below table are average values without any cable.

	Weight [lb (kg)]
URS50BPPV6	1.5 (0.7)
URS75BPPV6	3.7 (1.7)
3-meter MSCABLE-3 Cable	0.66 (0.3)

4.0 Drives and Motors

4.1 Stepper Drive Versions

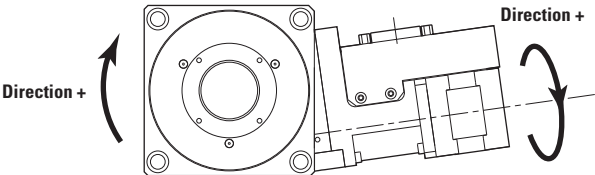
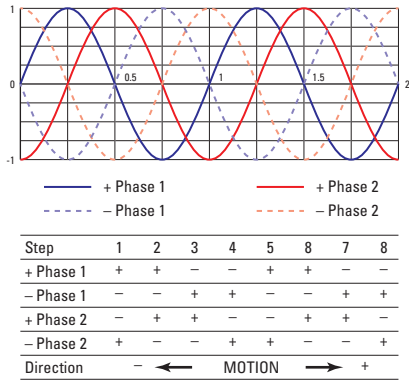
The URS-BPPV6 stages are driven by a 2-phase stepper motor.

Stepper Motor Performance Specifications and Characteristics

	Resolution ⁽¹⁾ (°)	Speed (°/s)	Angle by Step (°)	RMS Current per Phase (A)	Resistance (Ω)	Inductance (mH)
URS50BPPV6	0.0028	4	15	0.18	12.5	5.5
URS75BPPV6	0.02	20	1.8	0.22	5.7	11.3

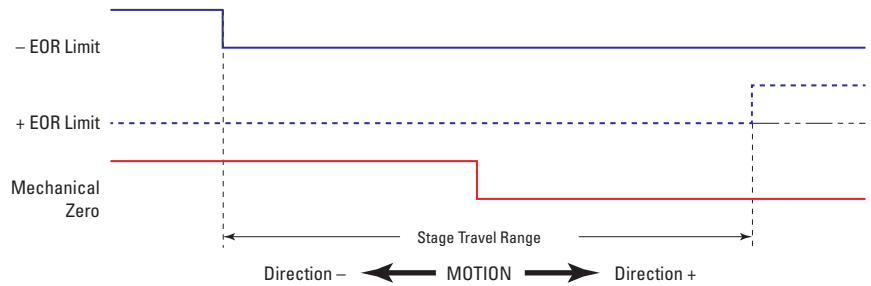
¹⁾ When used with Newport motion controllers, these motors are driven in a dynamic micro-stepping mode (software commutation).

Command Signals for the Stepper Motors



4.2 Sensor Position

URS50BPPV6 Sensor



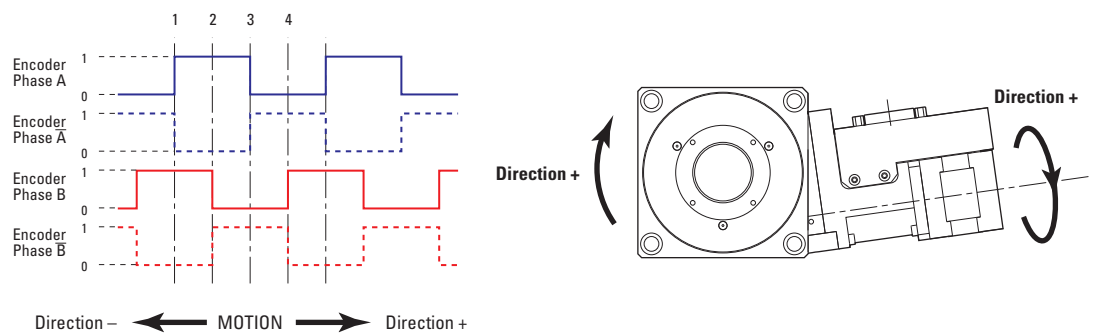
End-of-Run and Mechanical Zero are 5 V open collector type.



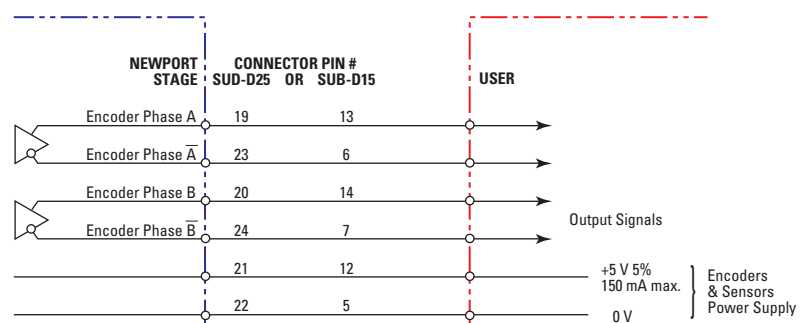
CAUTION

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

4.3 Feedback Signal Position for URS50BPPV6 Stage



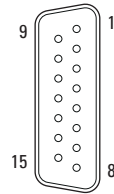
The incremental sensor consists of an optical scale and an encoder head. When the carriage moves, the encoder head generates square signals in quadrature and sends to pins #6, #7, #13 and #14 of the SUB-D15 connector.



“Encoder” 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 diagrams for the URS-BPPV6 stages SUB-D15M connectors are shown below.

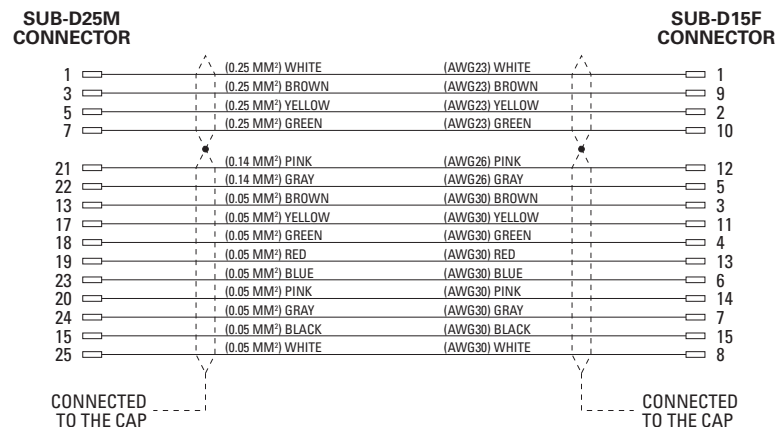


URS50BPPV6		URS75BPPV6	
1	+ Phase 1	1	+ Phase 1
2	+ Phase 2	2	+ Phase 2
3	Mechanical Zero	3	Mechanical Zero
4	Reserved *	4	– End-of-Run
5	0 V	5	0 V
6	Encoder Phase /A	6	Reserved *
7	Encoder Phase /B	7	Reserved *
8	Reserved *	8	Reserved *
9	– Phase 1	9	– Phase 1
10	– Phase 2	10	– Phase 2
11	Reserved *	11	+ End-of-Run
12	+5 V	12	+5 V
13	Encoder Phase A	13	Reserved *
14	Encoder Phase B	14	Reserved *
15	Reserved *	15	Reserved *

* : must be connected for continuity of service (see MSCABLE-3 cable)

4.5 MSCABLE-3 Cable

A 3-meter MSCABLE-3 cable is supplied with each URS-BPPV6 stage (see section 5.3: "Cables").



WARNING

The MSCABLE-3 cable supplied with the URS-BPPV6 stages is not vacuum compatible or intended for use in vacuum.

It is the customer's responsibility to make a cable for connecting the URS-BPPV6 stage to the controller via a vacuum feed trough.



WARNING

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

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.

5.2 Connection

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



WARNING

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

NOTE



These stages are ESP compatible. 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.

5.3 Cables

All URS-BPPV6 stages are delivered with **MSCABLE-3** 3-meter cables with a SUB-D25M connector for direct connection to Newport Controllers.

NOTE

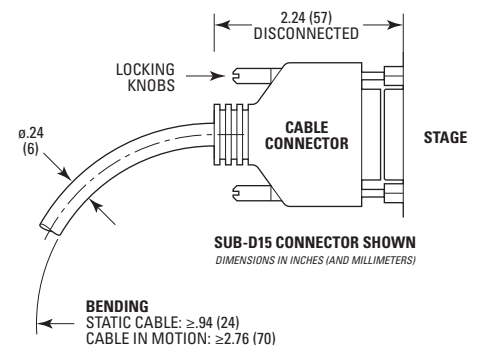
This cable supplied with the stage is not vacuum compatible.

5.4 MSCABLE-3 Cable



WARNING

The MSCABLE-3 cable supplied with the URS-BPPV6 stages is not vacuum compatible or intended for use in vacuum.





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 (**MSCABLE-3**) included with your stage is not adequate, Newport offers a 10-m longer length cable (**MSCABLE-10**) designed to ensure the integrity of your positioning application.

REMARK

The cross section of the MSCAB-10 cable is different from the one of the MSCABLE-3 cable to allow a longer length. The MSCAB-10 cable has the same mechanical properties as the MCAB-10 cable.

These cables are specially shielded and terminated with Newport's standard SUB-D15 and SUB-D25 connectors.

**WARNING**

Keep the motor cables 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 URS-BPPV6 stages when used with non-Newport controllers.

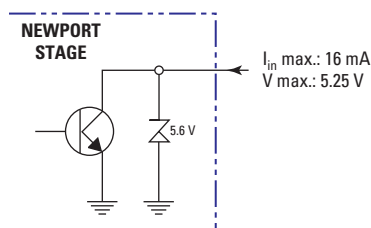
WARNING

Newport guarantees “CE” compliance of URS-BPPV6 stages 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.

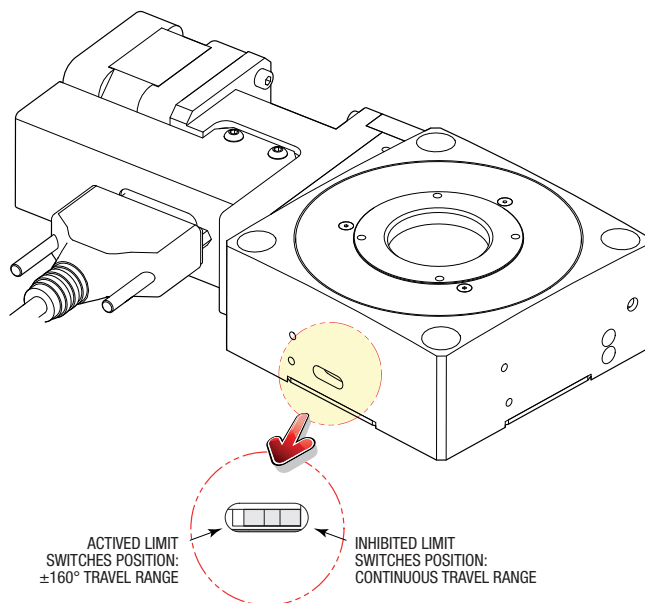


7.0 Disabling of Limit Switches

NOTE

The URS50BPPV6 stage is not equipped with limit switches.

The URS75BPPV6 stage is equipped with $\pm 160^\circ$ optical limit switches. This limit switch can be disabled for continuous 360° rotation.

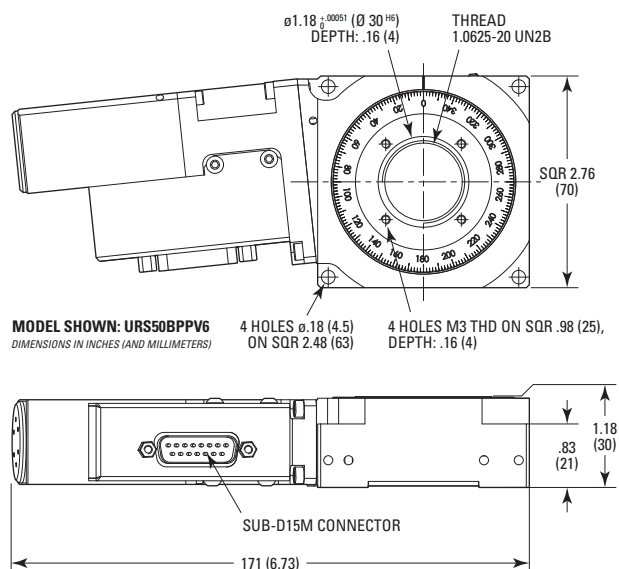


NOTE

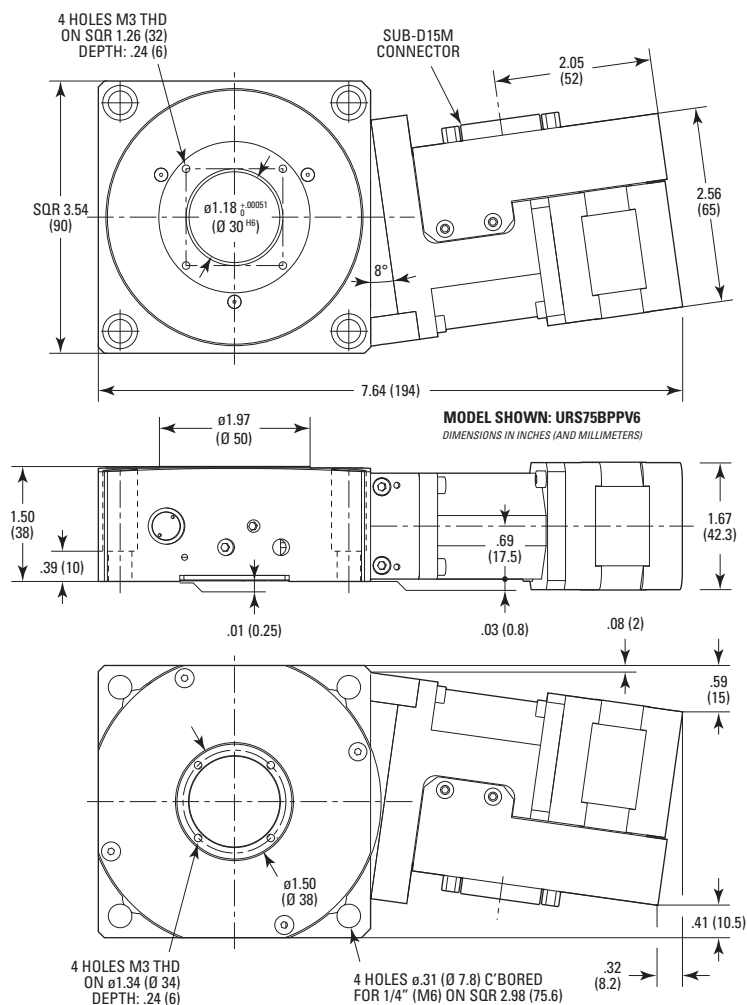
On request, URS75BPPV6 limit switches can be set in factory at the desired position. Please contact our sales engineers.

8.0 Dimensions

8.1 URS50BPPV6 Stage



8.2 URS75BPPV6 Stage



9.0 Maintenance

RECOMMENDATION

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

9.1 Maintenance

The URS-BPPV6 stage requires no particular maintenance. Nevertheless, this is a precision mechanical device that must be kept and operated with caution.

PRECAUTIONS

The URS-BPPV6 stage must be used or stocked in a clean environment, without dust, humidity, solvents or other substances.

RECOMMENDATION

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

If the stage URS-BPPV6 is mounted on a workstation and cannot be easily removed, please contact Newport's After Sales Service for further instructions.

9.2 Repair

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.

9.3 Calibration



CAUTION

It is recommended to return your URS-BPPV6 stage to Newport once a year for recalibration to its original specifications.

Your Local Representative

Tel.: _____

Fax: _____

Name: _____

Return authorization #: _____

(Please obtain prior to return of item)

Company: _____

Address: _____

Date: _____

Country: _____

Phone Number: _____

P.O. Number:

Fax Number:

Item(s) Being Returned:

Model #: _____

Serial #: _____

Description: _____

Reasons of return of goods (please list any specific problems):



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