

## NR360S/M - March 12, 2019

Item # NR360S/M was discontinued on March 12, 2019. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

### 360 DEGREE CONTINUOUS ROTATION STAGE WITH STEPPER MOTOR ACTUATOR

- ▶ 1 arcsec Microsteps
- ▶ 50 kg Load Capacity
- ▶ Compatible with SM2 Lens Tubes and Optics



**NR360S**  
Shown Mounted  
on NR360SP2



**NR360SP8**

Range of Adapter Plates



**NR360SP4**



**NR360SP9**

**NR360S**  
SM2-Threaded Center Hole



[Hide Overview](#)

#### OVERVIEW

##### Features

- Resolution Better than 1 arcsec
- SM2 Threaded Central Aperture
- High Load Capacity, 50 kg Maximum Axial Load
- Preloaded Worm Gear Drive Mechanism with Minimal Backlash
- Origin Indicating Switch Every 360°
- Range of Mounting Options Available

The NR360S rotation stage provides arcsecond resolution when driven from a micro-stepping stepper motor controller, such as the BSC20x Series Benchtop Controllers. The low-profile design has a height of just 55 mm due to the use of two compact precision bearings. The rotating carriage of the stage allows continuous rotation and can support loads up to 50 kg. The aperture through the center of the rotation stage features an SM2 thread on the rotating and the non-rotating parts, making the stage compatible with our SM2 range of lens tubes and Ø2" optics, such as our polymer wave plates.

The frame of the stage is made from aluminum and has four 1/4" (M6) countersunk holes that allow the stage to be secured to a translation stage or optical table using one of the adapter plates presented below. In addition, four M6 tapped mounting holes are located on the sides of the stage to provide additional mounting options. A worm gear assembly transfers the rotary motion of the stepper motor into rotary motion of the carriage. The mechanical reduction in this gear assembly provides one revolution of the carriage for every 66 turns of the stepper motor.

We encourage you to review the tabs above for detailed specifications of the NR360S and the recommended Stepper Motor Controller, the BSC200 Series. Please note that Thorlabs offers bottom mounting adapter plates and brackets to secure the NR360S as well as several types of rotating adapter plates; these items are featured below with more detailed product descriptions.

[Hide NR360S Specs](#)

## NR360S SPECS

Item #	NR360S
Travel	360° Continuous Rotation
On Axis Load Capacity	110 lbs (50 kg)
Drive Mechanism	Worm Drive
Limit Switches	Reference Signal Every 360°
Motor Type	2 Phase Stepper
Gear Ratio	66:1
Accuracy	5 arcmin (If Used with BSC201)
Resolution	<1 arcsec
Bidirectional Repeatability	10 arcsec
Speed Range	50°/ sec (If Used with BSC201)
Recommended Controller	BSC201
Weight	3.08 lbs (1.4 kg)
Attached Cable Length	0.4 m
Included Extension Cable	PAA613, 3 m Cable

Motor Specs	
Step Angle	1.8°
Rated Phase Current	1 A
Phase Resistance	3.6 Ω
Phase Inductance	4.6 mH
Holding Torque	23.1 N-cm
Detent Torque	1.7 N-cm
Rotor Inertia	32 g-cm <sup>2</sup>

### Cables and Compatible Thorlabs Controllers

Controller	Cable
BSC20x and MST602 with 15-pin D-Type	PAA613, 3 m Cable
MST601 Units with 25-pin D-Type	PAA611, 3 m Cable

Although the Benchtop Controller (BSC20x) is recommended, if a rack system is preferred, please see MST602. Thorlabs offers a variety of driver cables in addition to the products listed above.

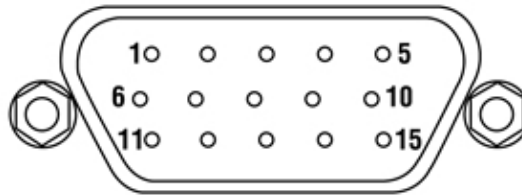
Note. The speeds quoted above are only achievable with lighter loads. When using heavy loads the speed should be reduced accordingly.

[Hide Pin Diagrams](#)

## PIN DIAGRAMS

### NR360S Pin Connections

#### D-type Male



PIN	Description
1	Limit Switch Ground
3	Clockwise Limit Switch Output
4	Stepper Motor Phase B-
5	Stepper Motor Phase B+
6	Stepper Motor Phase A-
7	Stepper Motor Phase A+
15	Earth for Cable Braid
2, 8 - 14	Not Used

Adapter for Controllers Included

[Hide Controllers](#)



## Features

- High Resolution Microstepping Control for Very Fine Positioning Applications
- Stable and Predictable Low Speed Operation for Velocity Sensitive Applications
- Differential Encoder Feedback (QEP Inputs) for Closed Loop Positioning
- Auto-Configure Function for all Thorlabs Stages
- Motor Control I/O Port (Jogging, Interlocks)
- Full Software Control Suite Supplied
- Intuitive Software Graphical Control Panels
- Extensive ActiveX® Programming Interfaces
- Fully Software Integrated with Other apt™ Family Controllers

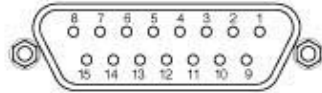
The BSC100 Series apt™ controller is a range of single, two and three channel 50 W stepper motor controllers designed to drive high power, 2-phase bi-polar stepper motors, with and without encoder feedback. It is the recommended driver for the NanoRotator 360 Degree Rotation Stage (NR360S). The unit is designed to drive not only nano-positioning actuators and stages, but also any generic two phases bi-polar motor of varying powers and varying cardinal step sizes (a breakout cable is available to support this latter option).

USB connectivity provides easy plug-and-play PC operation - multiple units can be connected to a single PC via standard USB hub technology for multi-axis motion control applications. Coupling this with the very user friendly apt™ software allows the user to very quickly get up and running with reasonably complex move sequences in a short period of time – for example, all relevant operating parameters are set automatically for Thorlabs stage/actuator products, such as the NR360S. For a full presentation of the BSC Series of Stepper Motor Controllers, please click [here](#).

Item #	BSC201	BSC202, BSC203
<b>Controller Specifications</b>		
<b>Input and Output</b>		
Motor Drive Connector (15-Pin D-Type Female)	2 Phase Bipolar Motor Drive Output Differential Quadrature Encoder (QEP) Input Forward, Reverse Limit Switch Inputs Encoder 5V (with Ground)	
Motor Control (15-Pin D-Type Female)	Jog Forward/Back Input (TTL) User Logic Input/Output (TTL) Single Ended Analog Input (0-10V) User 5V (with Ground) 100mA Max Trigger Input/Output (TTL)	
<b>Motor Resolution</b>		
Microsteps per Full Step	2048	
For 200 Step Motor	409,600 Microsteps/Rev	
For 24 Step Motor	49,152 Microsteps/Rev	
<b>Motor Drive Voltage</b>	<b>48 V</b>	
<b>Motor Drive Power</b>	<b>Up to 50 W (Peak)/25 W (Avg)</b>	
<b>Motor Speeds</b>	<b>Up to 3000 RPM (200 Full Step Motor)</b>	
<b>Encoder Feedback Bandwidth</b>	<b>500 KHz (500,000 Counts/sec)</b>	
<b>Input Power Requirements</b>		
Voltage	85-264 VAC	
Power	100 W (Peak)	200 W (Peak)
Fuse	3.15 A	
<b>General</b>		
Housing Dimensions (W x D x H)	152 x 244 x 104 mm (6" x 9.6" x 4.1")	240 x 360 133 mm (9.5" x 14.2" x 5.2")
Weight	3.18 kg (7 lbs)	6.7 kg (14.75 lbs)
<b>Compatible Motor Specifications</b>		
StepAngleRange	20° to 1.8°	
Coil Resistance (Nom)	4 to 15Ω	

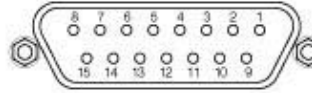
Coil Inductance (Nom)	4 to 15 mH
Rated Phase Currents (Nom)	0.1 to 1 A

### CONTROL IO



Pin	Description	Pin	Description
1	5V User	9	0V User
2	Jog Fwd	10	Jog Back
3	Not Used	11	Analog In
4	Trig In	12	Trig Out
5	EN Return	13	Enable
6	Not Used	14	Not Used
7	User In	15	User Out (o/c)
8	Keyed Pin		

### MOTOR DRIVE



Pin	Description	Pin	Description
1	Encoder A +ve	9	CW Limit Switch
2	Encoder A -ve	10	CCW Limit Switch
3	Encoder B +ve	11	0V User
4	Encoder B -ve	12	Not Used
5	5V User	13	Not Used
6	Not Used	14	Phase B +
7	Phase B -	15	Phase A +
8	Phase A -		

[Hide Rotation Mounts and Stages](#)

## ROTATION MOUNTS AND STAGES & NBSP ;

### Rotation Mount and Stage Selection Guide

Thorlabs offers a wide variety of manual and motorized rotation mounts and stages. Rotation mounts are designed with an inner bore to mount a  $\varnothing 1/2"$ ,  $\varnothing 1"$ , or  $\varnothing 2"$  optic, while rotation stages are designed with mounting taps to attach a variety of components or systems. Motorized options are powered by a DC Servo motor, 2 phase stepper motor, or an Elliptec™ resonant piezo motor. Each offers 360° of continuous rotation.

#### Manual Rotation Mounts

Rotation Mounts for $\varnothing 1/2"$ Optics						
Item #	RSP05(/M)	CRM05	PRM05(/M) <sup>a</sup>	SRM05	KS05RS	CT104
Click Photo to Enlarge						
Features	Standard	External SM1 (1.035"-40) Threads	Micrometer	16 mm Cage-Compatible	$\pm 4^\circ$ Kinematic Tip/Tilt Adjustment Plus Rotation	Compatible with CT1 Cage Translator Stage and 1/4" Translation Stages <sup>b</sup>
<b>Additional Details</b>						

- <sup>a</sup> This mount is available in the PRM05GL5 bundle, which includes the PRM05 rotation mount with the SM05PM5 polarizing prism mount.
- <sup>a</sup> The CT104 is compatible with the 1/4" translation stages using our MS103(/M) adapter plate.
- <sup>b</sup> The CT104 is compatible with the CT1 cage translation stage, which is designed for use with 30 mm cage systems.

Rotation Mounts for $\varnothing 1"$ Optics								
Item #	RSP1(/M)	LRM1	RSP1D(/M)	DLM1(/M)	CLR1(/M)	RSP1X15(/M)	RSP1X225(/M)	PRM1(/M) <sup>a</sup>
Click Photo to Enlarge								
Features	Standard	External SM1 (1.035"-40) Threads	Adjustable Zero	Two Independently Rotating Carriages	Rotates Optic Within Fixed Lens Tube System	Continuous 360° Rotation or 15° Increments	Continuous 360° Rotation or 22.5° Increments	Micrometer
<b>Additional Details</b>								

⚠ This mount is available in the PRM1GL10 bundle, which includes the PRM1 rotation mount with the SM1PM10 polarizing prism mount.

Rotation Mounts for Ø1" Optics						
Item #	LM1-A & LM1-B(/M)	CRM1(/M)	CRM1L(/M)	CRM1P	KS1RS	K6XS
Click Photo to Enlarge						
Features	Optic Carriage Rotates Within Mounting Ring	30 mm Cage-Compatible <sup>a</sup>	30 mm Cage-Compatible for Thick Optics <sup>a</sup>	30 mm Cage-Compatible with Micrometer <sup>a</sup>	±4° Kinematic Tip/Tilt Adjustment Plus Rotation	Six-Axis Kinematic Mount <sup>a</sup>
<b>Additional Details</b>						

⚠ This mount also features four 4-40 (M3) holes on the rotation dial for use with the K6A1(/M) prism platform.

Rotation Mounts for Ø2" Optics						
Item #	RSP2(/M)	RSP2D(/M)	PRM2(/M)	LM2-A & LM2-B(/M)	LCRM2(/M)	KS2RS
Click Photo to Enlarge						
Features	Standard	Adjustable Zero	Micrometer	Optic Carriage Rotates Within Mounting Ring	60 mm Cage-Compatible	±4° Kinematic Tip/Tilt Adjustment Plus Rotation
<b>Additional Details</b>						

### Manual Rotation Stages

Manual Rotation Stages								
Item #	RP005(/M)	MSRP01(/M)	RP01(/M)	RP03(/M)	QRP02(/M)	PR01(/M)	CR1(/M)	XYR1(/M) <sup>a</sup>
Click Photo to Enlarge								
Features	Standard				Two Hard Stops	SM1-Threaded Central Aperture	Fine Pitch Worm Gear	Rotation Plus 1/2" Linear XY Translation
<b>Additional Details</b>								

⚠ This stage is available in the OCT-XYR1(/M), which includes the XYR1(/M) stage with the XYR1A solid plate platform adapter.

### Motorized Rotation Mounts and Stages

Motorized Rotation Mounts and Stages					
Item #	DDR25(/M)	K10CR1(/M)	PRM1Z8(/M) <sup>a</sup>	PRMTZ8(/M) <sup>b</sup>	NR360S(/M)

Click Photo to Enlarge					
Features	Compatible with SM05 Lens Tubes, 16 mm Cage System, & 30 mm Cage System	Compatible with SM1 Lens Tubes and 30 mm Cage System	Tapped Mounting Platform for Mounting Prisms or Other Optics	SM2-Threaded Central Aperture	
<b>Additional Details</b>					

⚠ This stage is available in the KPRMTE(/M), which includes the PRMTZ8(/M) Motorized Rotation Stage with the KDC101 K-Cube DC Servo Motor Controller.

⚠ This stage is available in the KPRM1E(/M), which includes the PRMT1Z8(/M) Motorized Rotation Stage with the KDC101 K-Cube DC Servo Motor Controller.

[Hide NanoRotator with SM2-Threaded Central Aperture](#)

### NanoRotator with SM2-Threaded Central Aperture

- ▶ SM2-Threaded Central Aperture on Rotating and Non-rotating Parts
- ▶ Preloaded Worm Gear Drive Mechanism with Minimal Backlash
- ▶ Origin Indicating Switch Every 360°
- ▶ Mounting Holes
  - Four 1/4" (M6) Countersunk Holes
  - Four 1/4" (M6) Tapped Mounting Holes (Two Each Side Face)

Item #	NR360S
<b>Resolution</b>	<1 arcsec
<b>Travel</b>	360° Continuous Rotation
<b>On Axis Load Capacity</b>	110 lbs (50 kg)
<b>Motor Type</b>	2 Phase Stepper
<b>Accuracy<sup>a</sup></b>	5 arcmin
<b>Bidirectional Repeatability</b>	10 arcsec
<b>Speed Range<sup>a</sup></b>	50°/ sec
<b>Recommended Controller</b>	BSC201
<b>Included Extension Cable</b>	PAA613, 3 m Cable

⚠ Measured Using a BSC201 Controller

Part Number	Description	Price	Availability
NR360S/M	NanoRotator Stage with SM2-Threaded Center Hole, Metric	\$2,760.98	Lead Time
NR360S	NanoRotator Stage with SM2-Threaded Center Hole	\$2,760.98	Today

[Hide apt™ Stepper Motor Controllers](#)

### apt™ Stepper Motor Controllers

- ▶ High Resolution Microstepping Control for Very Fine Positioning Applications
- ▶ Stable and Predictable Low Speed Operation for Velocity Sensitive Applications
- ▶ Differential Encoder Feedback (QEP Inputs) for Closed Loop Positioning
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- ▶ Motor Control I/O Port (Jogging, Interlocks)
- ▶ Full Software Control Suite Supplied
- ▶ Intuitive Software Graphical Control Panels
- ▶ Extensive ActiveX® Programming Interfaces
- ▶ Fully Software Integrated with Other apt™ Family Controllers
- ▶ More Information Available Here

Item #	BSC Series
<b>Motor Resolution</b>	
• Microsteps per Full Step	2048
• For 200 1.8° Step Motor	409,600 Microsteps/Rev
<b>Motor Drive Voltage</b>	48 V
<b>Motor Drive Power</b>	Up to 50 W (Peak)/25 W (Avg)
<b>Motor Speeds</b>	Up to 3000 RPM (200 Full Step Motor)
<b>Encoder Feedback Bandwidth</b>	500 KHz (500,000 Counts/sec)

Part Number	Description	Price	Availability
BSC201	Customer Inspired!&nbsp;One-Channel APT™ Benchtop Stepper Motor Controller	\$1,428.82	Today
BSC202	Customer Inspired!&nbsp;Two-Channel APT™ Benchtop Stepper Motor Controller	\$2,331.28	Today
BSC203	Customer Inspired!&nbsp;Three-Channel APT™ Benchtop Stepper Motor Controller	\$2,965.84	Today

[Hide Table Mounting Plate](#)

### Table Mounting Plate

#### NR360SP1

##### Table Mounting Plate

The NR360SP1 adapter plate is necessary for the NR360S to be mounted horizontally on a large, flat surface, such as an optical table because the stepper motor extends below the bottom surface of the rotation stage frame (see image to the right). The 10 mm thick adapter plate provides 2 mm clearance between the stepper motor and the mounting surface.



[Click to Enlarge](#)



[Click to Enlarge](#)

Part Number	Description	Price	Availability
NR360SP1/M	Table Mounting Plate for NR360S Stage, Metric	\$81.69	Today
NR360SP1	Table Mounting Plate For NR360S Stage	\$81.69	Today

[Hide Vertical Mounting Bracket](#)

### Vertical Mounting Bracket

#### NR360SP2

##### Vertical Mounting Bracket

Allows the NR360S rotation stage to be mounted in a vertical orientation. The bracket can be secured to an optical table or optical breadboard using the seven 1/4" (M6) counterbored holes.



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Part Number	Description	Price	Availability
NR360SP2/M	Vertical Mounting Bracket for NR360S Stage, Metric	\$250.04	Today
NR360SP2	Vertical Mounting Bracket For NR360S Stage	\$250.04	Today

[Hide NR360S Adapter Plates](#)

### NR360S Adapter Plates

#### NR360SP9 Threaded Adapter Plate



NR360SP9

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- Provides numerous options for attaching devices to the NR360S
- 17 1/4"-20 or M6 Mounting holes, four #8 or M4 fixing holes

#### NR360SP4 Grooved Adapter Plate



NR360SP4

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- Integrates various accessories from our fiber launch systems product line
- Mounting holes: Fourteen 6-32, four 8-32 (M4)

**NR360SP8 SM1 Adapter Plate**



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- SM1-threaded through hole allows Ø1" optics and our SM1 product line to be mounted to the NR360S
- 4-40 Taps to integrate 30 mm Cage Assemblies

**NR360SP9 Threaded Adapter Plate Application**



Click to Enlarge

NR360SP9 Threaded Adapter Plate Attached to the NR360S Rotation Stage

**NR360SP4 Grooved Adapter Plate Application**



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NR360SP4 Grooved Adapter Plate Attached to the NR360S Rotation Stage

**NR360SP8 SM1 Adapter Plate Application**



Click to Enlarge

NR360SP8 SM1 Adapter Plate Attached to the NR360S Rotation Stage

Part Number	Description	Price	Availability
NR360SP4/M	Grooved Adapter Plate for NR360S and DDR100 Stages, Metric	\$123.97	Today
NR360SP9/M	M6 Threaded and M4 Counterbored Adapter Plate for NR360S and DDR100 Stages, Metric	\$97.18	Today
NR360SP8	SM1-Threaded Adapter for NR360S Stage	\$53.06	Today
NR360SP4	Grooved Adapter Plate for NR360S and DDR100 Stages	\$123.97	Today
NR360SP9	1/4"-20 Threaded and #8 Counterbored Adapter Plate for NR360S and DDR100 Stages	\$97.18	Today

[Hide NRT/LNR Stage Adapter Plate](#)

**NRT/LNR Stage Adapter Plate**

NR360SP5



### NRT/LNR Stage Mounting Plate

This bottom mounting plate allows the NR360S stage to be attached to an LNR Series stage, or an NRT Stage, as shown to the right.



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Part Number	Description	Price	Availability
NR360SP5/M	Adapter Plate for Mounting NR360S to LNR or NRT Stages, Metric	\$98.50	Today
NR360SP5	Adapter Plate for Mounting NR360S to LNR or NRT Stages	\$98.50	Today

