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THORLABS

DDSM50 - January 15, 2021

Item # DDSM50 was discontinued on January 15, 2021. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

50 MM LINEAR TRANSLATION STAGE, DIRECT-DRIVE SERVO MOTOR

- **High Speed Translation of up to 500 mm/s**
- **Backlash-Free DC Servo Motor**
- **Stackable in XY Configuration**
- **Compatible with Compact K-Cube Controller**

DDSM50

XY Configurable

KBD1
Controller for t
DDSM50(/M)
(Shown with Included
Mounting Plate)

OVERVIEW

Features

- Travel Range: 50 mm
- High Speed: Up to 500 mm/s
- High Repeatability: 1.5 µm
- On-Axis Accuracy: <10.0 µm
- Low Profile: 35 mm (1.38")
- Integrated Brushless DC Linear Servo Motor Actuators
- Linear Optical Encoders
- High-Quality, Precision-Engineered Linear Bearings

Thorlabs' DDSM50 low-profile, direct-drive stage provides 50 mm of travel with 0.5 µm resolution and a maximum speed of 500 mm/s. The stage is ideal for applications that require high speeds and high positioning accuracy, including automated alignment, surface inspection, mapping, and probing.

An innovative, low-profile design with integrated, brushless linear motors eliminates the external housings that create mechanical clash points and impede access to the moving platform. The direct-drive technology removes the need for a lead screw, eliminating backlash, and internal flexible ducting ensures cables cannot become trapped as the mechanism

Item #	DDSM50
Travel Range	50 mm (1.97")
Velocity (Max)	500 mm/s
Velocity (Min)	70 nm/s
Acceleration (Max)	5000 mm/s^2
Acceleration (Min)	0.74 mm/s^2
Acceleration at 1.0 kg Load	500 mm/s^2
Resolution (Min)	500 nm
Bidirectional Repeatability[a]	±1.5 µm
Flatness over Full Travel Range	±5.0 µm
Straightness over Full Travel Range	±5.0 µm
Horizontal Load Capacity (Max)	0.9 kg (1.98 lbs)
Min Achievable Incremental Movement[b]	500 nm
Home Location Accuracy	1.5 µm
Absolute On-Axis Accuracy	±5 µm
Dimensions (L x W x H)	145 mm x 57 mm x 35 mm

moves. A precision-grooved linear bearing provides superior rigidity and linearity with excellent on-axis accuracy. This backlash-free operation coupled with high-resolution, closed-loop optical feedback ensures a minimal bidirectional repeatability of 1.5 µm.

	(7.71" x 2.25" x 1.38")

- a. The average of the repeatability when a set position is approached from both directions.
- b. The measured minimum incremental motion that the stage can achieve, also referred to as the minimum step size.

Controller Options

The controller for the DDSM50 direct-drive, linear translation stage is the KBD101 K-Cube Brushless DC Motor Controller. This controller provides a user-configurable, S-curve acceleration/deceleration profile that enables fast, smooth positioning without vibration or shock. See below for a brief overview, or click here to view the full presentation for these Brushless DC Motor Controllers.

Motorized Linear Translation Stages	
12 mm	Standard
25 mm	Compact
	Standard
	TravelMax
50 mm	Compact
	Direct-Drive Servo
	TravelMax
Long Travel: 100 mm to 300 mm	

Click for Enlarge
Two DDSM50 Stages can be Connected in an XY Configuration Using the DDSMP1 XY Adapter Plate

Dual-Axis Configuration

For dual-axis applications, two stages can be bolted together in an XY configuration by using the DDSMP1 XY adapter plate as shown to the left. Note that these stages are not suitable for operation in a vertical (Z-axis) orientation. Please contact Tech Support for more details.

Adapter brackets are also available that allow optomechanical components to be mounted close to the linear travel of the stage in applications such as a delay line.
Please see below for more details.

Please Note: Magnetic components should not be mounted to the stage platform. Magnets prevent proper homing and can affect the accuracy of the stage's encoder even after the magnetic component has been removed. When no power is applied, the platform of the stage has very little inertia and is virtually free running. This may make the stage unsuitable for applications where the stage's platform needs to remain in a set position when power is off.

SPECS

Item #	DDSM50
Travel Range	50 mm (1.97")
Velocity (Max)	500 mm/s
Velocity (Min)	70 nm/s
Acceleration (Max)	5000 mm/s^2
Acceleration (Min)	0.74 mm/s^2
Acceleration at 1.0 kg Load	500 mm/s^2
Resolution (Min)	500 nm
Bidirectional Repeatability[a]	±1.5 µm
Flatness over Full Travel Range	±5.0 µm
Straightness over Full Travel Range	±5.0 µm
Pitch Runout	±175 µrad
Yaw Runout	±175 µrad
Horizontal Load Capacity (Max)	0.9 kg (1.98 lbs)
Min Achievable Incremental Movement[b]	500 nm
Home Location Accuracy	1.5 µm
Absolute On-Axis Accuracy	±5.0 µm
Continuous Motor Force	0.8 N
Peak Motor Force (5 s)	2.0 N
Bearing Type	High-Rigidity Recirculating Precision Linear Bearing
Limit Switches	Magnetic Sensor at Each End of Stage

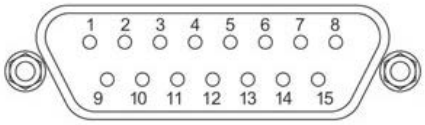
Operating Temperature Range	5 to 40 °C (41 to 104 °F)
Motor Type	Brushless DC Linear Motor
Cable Length	1 m (3.3')
Dimensions (L x W x H)	145 mm x 57 mm x 35 mm (5.71" x 2.25" x 1.38")
Weight (with Cables)	600 g (1.3 lbs)
Motor Electrical Specifications	
Magnetic Pitch	30 mm
Maximum Continuous Current	1.2 A
Maximum Current (5 s)	2 A
Motor Resistance	1.3 Ω (Phase to Phase)
Inductance	45 µH (Phase to Phase)
Force Constant	1 N/A

- a. The average of the repeatability when a set position is approached from both directions.
- b. The measured minimum incremental motion that the stage can achieve, also referred to as the minimum step size.

PIN DIAGRAM

Motor Control Connector

D-Type Male



Pin	Description	Pin	Description
1	Quadrature A-	9	Ground
2	Quadrature A+	10	Motor Phase C
3	Quadrature B+	11	Motor Phase A
4	Quadrature B-	12	Motor Phase B
5	Encoder Index I-	13	+5 V
6	Encoder Index I+	14	Ground
7	Negative Limit	15	Stage ID
8	Positive Limit		

MOTORIZED LINEAR STAGES

Motorized Linear Translation Stages

Thorlabs' motorized linear translation stages are offered in a range of maximum travel distances, from a stage with 20 µm of piezo translation to our 600 mm direct drive stage. Many of these stages can be assembled in multi-axis configurations, providing XY or XYZ translation. For fiber coupling applications, please see our multi-axis stages, which offer finer adjustment than our standard motorized translation stages. In addition to motorized linear translation stages, we offer motorized rotation stages, pitch and yaw platforms, and goniometers. We also offer manual translation stages.

Piezo Stages

These stages incorporate piezoelectric elements in a variety of drive mechanisms. Our Nanoflex™ translation stages use standard piezo chips along with manual actuators. Our LPS710E z-axis stage features a mechanically amplified piezo design and includes a matched controller. The PD1 stage incorporates a piezo inertia drive that uses "stick-slip" friction properties to obtain an extended travel range. The Elliptec™ stages use resonant piezo motors to push and pull the moving platform through resonant elliptical motion.

Piezoelectric Stages						
Product Family	**Nanoflex™ 20 µm Stage with 5 mm Actuator**	**Nanoflex™ 25 µm Stage with 1.5 mm Actuator**	**LPS710E 1.1 mm Z-Axis Stage**	**PD1 20 mm Stage**	**Elliptec™ 28 mm Stage**	**Elliptec™ 60 mm Stage**
Click Photo to Enlarge						
Travel	20 µm + 5 mm Manual	25 µm + 1.5 mm Manual	1.1 mm	20 mm	28 mm	60.0 mm
Maximum Velocity	-		-	3 mm/s	180 mm/s	90 mm/s
Drive Type	Piezo with Manual Actuator		Amplified Piezo	Piezoelectric Inertia Drive	Resonant Piezoelectric Motor	
Possible Axis Configurations	X, XY, XYZ		-	X, XY, XYZ	X	
Additional Details						More [+]

Stepper Motor Stages

These translation stages feature removable or integrated stepper motors and long travel ranges up to 300 mm. The MLJ150 stage also offers high load capacity vertical translation. The other stages can be assembled into multi-axis configurations.

Stepper Motor Stages							
Product Family	**LNR Series 25 mm Stage**	**LNR Series 50 mm Stage**	**MLJ150 50 mm Vertical Stage**	**NRT Series 100 mm Stage**	**NRT Series 150 mm Stage**	**LTS Series 150 mm Stage**	**LTS Series 300 mm Stage**
Click Photo to Enlarge							
Travel	25 mm	50 mm	50 mm	100 mm	150 mm	150 mm	300 mm
Maximum Velocity	2.0 mm/s	50 mm/s	3.0 mm/s	30 mm/s		50 mm/s	
Possible Axis Configurations	X, XY, XYZ	X, XY, XYZ	-	X, XY, XYZ		X, XY, XYZ	
Additional Details							More [+]

DC Servo Motor Stages

Thorlabs offers linear translation stages with removable or integrated DC servo motors. These stages feature low profiles and can be assembled in multi-axis configurations.

DC Servo Motor Stages					
Product Family	**MT Series 12 mm Stages**	**PT Series 25 mm Stages**	**MTS Series 25 mm Stage**	**MTS Series 50 mm Stage**	**KVS30 30 mm Vertical Stage**

Click Photo to Enlarge					
Travel	12 mm	25 mm	25 mm	50 mm	30 mm
Maximum Velocity	2.6 mm/s		2.4 mm/s		8.0 mm/s
Possible Axis Configurations	X, XY, XYZ		X, XY, XYZ		-
Additional Details					More [+]

Direct Drive Stages

These low-profile stages feature integrated brushless DC servo motors for high speed translation with zero backlash. When no power is applied, the platforms of these stages have very little inertia and are virtually free running. Hence these stages may not be suitable for applications where the stage's platform needs to remain in a set position when the power is off. We do not recommend mounting these stages vertically.

Direct Drive Stages					
Product Family	**DDSM Series 50 mm Stage**	**DDSM Series 100 mm Stage**	**DDS Series 220 mm Stage**	**DDS Series 300 mm Stage**	**DDS Series 600 mm Stage**
Click Photo to Enlarge					
Travel	50 mm	100 mm	220 mm	300 mm	600 mm
Maximum Velocity	500 mm/s		300 mm/s	400 mm/s	400 mm/s
Possible Axis Configurations	X, XY		X, XY	X	X
Additional Details					More [+]

50 mm Linear Translation Stage, DC Direct-Drive Servo Motor

Characterized by high-speed translation and high-positional accuracy, the DDSM50 stage is well-suited for surface mapping and characterization applications where there is a need to move a camera or probe at constant velocity while simultaneously capturing data. Very precise, fine positioning and control is easily achieved through a combination of the stable closed-loop control system and a KBD101 controller.

Please Note: Magnetic components should not be mounted to the stage platform. Magnets prevent proper homing and can affect the accuracy of the stage's encoder even after the magnetic component has been removed. These stages are not suitable for operation in a vertical (Z-axis) orientation. When no power is applied, the platform of the stage has very little inertia and is virtually free running. This may make the stage unsuitable for applications where the stage's platform needs to remain in a set position when power is off.

Part Number	Description	Price	Availability
DDSM50/M	**Customer Inspired! Compact 50 mm Travel Direct Drive Stage, Metric**	**$2,128.53**	**Lead Time**
DDSM50	**Customer Inspired! Compact 50 mm Travel Direct Drive Stage, Imperial**	**$2,128.53**	**Lead Time**

DDSM50 Adapter Plates

For 2-axis applications, two DDSM50 stages can be bolted together in an XY configuration using the DDSMP1

adapter plate as shown above in the *Overview* tab.

The DDSMA1 and DDSMA2 adapter plates attach to the end of the DDSM50 stage using the two supplied M3 x 20 screws (see image to the right) and allow optomechanical components to be mounted close to the linear travel of the stage in applications such as a delay line. The plates are drilled and tapped with six 1/4"-20 (M6) and five 8-32 (M4) holes.

Click to Enlarge
Optomechanical Components can be Mounted Next to the Travel Range of the DDSM50 Stage Using DDSMA1 and DDSMA2 Adapter Plates

Part Number	Description	Price	Availability
DDSMP1/M	**XY Adapter Plate for DDSM100 Stage, Metric**	**$86.57**	**Lead Time**
DDSMA1/M	**Left Mounting Plate for DDSM100 Stage, Metric**	**$68.45**	**Today**
DDSMA2/M	**Right Mounting Plate for DDSM100 Stage, Metric**	**$68.45**	**Today**
DDSMP1	**XY Adapter Plate for DDSM100 Stage, Imperial**	**$86.57**	**Lead Time**
DDSMA1	**Left Mounting Plate for DDSM100 Stage, Imperial**	**$68.45**	**Lead Time**
DDSMA2	**Right Mounting Plate for DDSM100 Stage, Imperial**	**$68.45**	**Today**

K-Cube™ Brushless DC Servo Driver

- Front Panel Velocity Wheel and Digital Display for Controlling Motorized Stages or Actuators
- Two Bidirectional SMC Trigger Ports to Read or Control External Equipment
- Interfaces with Computer Using Included USB Cable
- Fully Compatible with Kinesis® or APT™ Software Packages
- Compact Footprint: 60.0 mm x 60.0 mm x 49.2 mm (2.42" x 2.42" x 1.94")
- Power Supply Not Included (See Below)

Click to Enlarge
KCH601 USB Controller Hub (Sold Separately) with Installed K-Cube and T-Cube™ Modules (T-Cubes shown on the KAP101 Adapter)

Thorlabs' KBD101 K-Cube™ Brushless DC Motor Controller provides local and computerized control of a single motor axis. It features a top-mounted control panel with a velocity wheel that supports four-speed bidirectional control with forward and reverse jogging as well as position presets. A backlit digital display is also included that can have the backlit dimmed or turned off using the the top-panel menu options. The front of the unit contains two bidirectional SMC trigger ports that can be used to read a 5 V external logic signal or output a 5 V logic signal to control external equipment. Each port can be independently configured.

The unit is fully compatible with our new Kinesis software package and our legacy APT control software.

Please note that this controller does not ship with a power supply. Compatible power supplies are listed below. Additional information can be found on the main KBD101 Brushless DC Servo Motor Controller page.

Part Number	Description	Price	Availability
KBD101	**K-Cube Brushless DC Servo Driver (Power Supply Not Included)**	**$791.03**	**5-8 Day**

Compatible Power Supplies

- Individual Power Supply
  - KPS101: For K-Cubes™ or T-Cubes™ with 3.5 mm Jacks
- USB Controller Hubs Provide Power and Communications
  - KCH301: For up to Three K-Cubes or T-Cubes
  - KCH601: For up to Six K-Cubes or T-Cubes

Click to Enlarge
The KPS101 Power Supply Unit

Click for Details
A location-specific adapter is shipped with the power supply unit based on your location. The adapters for the KPS101 are shown

The KPS101 power supply outputs +15 VDC at up to 2.4 A and can power a single K-Cube or T-Cube with a 3.5 mm jack. It plugs into a standard wall outlet.

The KCH301 and KCH601 USB Controller Hubs each consist of two parts: the hub, which can support up to three (KCH301) or six (KCH601) K-Cubes or T-Cubes, and a power supply that plugs into a standard wall outlet. The hub draws a maximum current of 10 A;

here.

please verify that the cubes being used do not require a total current of more than 10 A. In addition, the hub provides USB connectivity to any docked K-Cube or T-Cube through a single USB connection.

For more information on the USB Controller Hubs, see the full web presentation.

Part Number	Description	Price	Availability
KPS101	15 V, 2.4 A Power Supply Unit with 3.5 mm Jack Connector for One K- or T-Cube	$35.36	5-8 Days
KCH301	USB Controller Hub and Power Supply for Three K-Cubes or T-Cubes	$524.83	5-8 Days
KCH601	USB Controller Hub and Power Supply for Six K-Cubes or T-Cubes	$635.20	Lead Time