

DDSA03/M - January 11, 2018

Item # DDSA03/M was discontinued on January 11, 2018. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

220 MM LINEAR TRANSLATION STAGE, DIRECT-DRIVE SERVO MOTOR

- ▶ 220 mm Travel at Speeds up to 300 mm/s
- ▶ Brushless DC Servo Motors
- ▶ Direct Drive - No Leadscrew

Application Example
 Our ODL220 Optical Delay Line Kit
 Incorporates Our DDS220 Stage



OVERVIEW

Features

- High Speeds: Up To 300 mm/s
- High Repeatability: 0.25 μ m
- Positional Accuracy: <3.0 μ m
- Low Profile: 44 mm (1.73")
- Integrated, Brushless DC Linear Servo Motor Actuators
- Linear Optical Encoders
- High-Quality, Precision-Engineered Linear Bearings
- 5-40, 8-32, and 1/4"-20 or M3, M4, and M6 Tapped Holes for Mounting Optomechanics

Thorlabs' DDS220 low-profile, direct-drive translation stage provides 220 mm of travel with 50 nm resolution and a maximum speed of 300 mm/s. This 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 moves. Twin,

Key Specifications ^a	
Travel Range	220 mm (8.6")
Velocity (Max)	300 mm/s
Min Achievable Incremental Movement	0.1 μ m
Bidirectional Repeatability^b	\pm 0.25 μ m
Horizontal Load Capacity (Max)	3.0 kg (6.6 lbs)
Actuator Type	Brushless DC Servo Motor
Cable Length	2.7 m (8.9 ft)
Recommended Controller	apt™ Servo Motor Controllers

- Please see the *Specs* tab for a complete specifications list.
- The average of the repeatability when a set position is approached from both directions.

Motorized Linear Long-Travel Stages	
100 mm	Stepper
	DC Servo

precision-grooved linear bearings provide 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 $\pm 0.25 \mu\text{m}$. The DDS220 stage is at the core of our ODL220 Optical Delay Line kit.



BBD201



DDS220

MJC001

Dual-Axis Configuration

For dual-axis applications, two stages can be directly bolted together in an XY configuration without the need for an adapter or spacer plate, thereby keeping the vertical profile to a minimum. Furthermore, end users can choose to bolt the upper stage on centrally (as shown at the top of the page) or off center (as shown to the left).

Please note that these stages are not suitable for operation in a vertical (Z-axis) orientation.

Controller Options

The recommended controller for the DDS220 direct-drive, linear translation stage is the BBD201 single-axis or BBD202 dual-axis Brushless DC Motor Controller. These controllers provide 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.

Joystick Option

An optional 2-axis joystick console (MJC001) is also available for remote positioning applications. See the presentation below for more details.

Accessory Mounting Plates

A range of mounting plates is also available. The DDSA01 and DDSA02 adapter plates allow accessories to be fixed to the moving platform, or either end of the stage. The DDSA03 riser plate raises the deck height of the stage to the standard 62.5 mm for compatibility with our NanoMax, MicroBlock and RollerBlock stages. Finally, the DDS220P1 allows a NanoMax or MicroBlock stage to be bolted to the moving platform of the DDS220 stage. See the presentations below for more details.

150 mm	Stepper
	Stepper with Integrated Controller
220 mm	DC Servo
300 mm	Stepper with Integrated Controller
	DC Servo with Benchtop Controller
600 mm	DC Servo with Benchtop Controller
Optical Delay Line Kits	
Other Translation Stages	

S P E C S

DDS220 Stage	
Travel Range	220 mm (8.6")
Speed (Max)	300 mm/s
Acceleration (Max)	5000 mm/s ²
Bidirectional Repeatability ^a	$\pm 0.25 \mu\text{m}$
Backlash ^b	N/A
Load Capacity ^c	3.0 kg (6.6 lb)
Incremental Movement (Min) ^d	0.1 μm
Absolute On-Axis Accuracy	$\pm 2.0 \mu\text{m}$
Home Location Accuracy (Unidirectional)	$\pm 0.25 \mu\text{m}$
Straightness/Flatness	$\pm 5.0 \mu\text{m}$
Pitch ^e	$\pm 175 \mu\text{rad}$
Yaw ^e	$\pm 175 \mu\text{rad}$
Continuous Motor Force	7.0 N
Peak Motor Force (2 sec)	15 N
Weight (Including Cables)	2.4 kg (5.3 lbs)
Limit Switches	Yes
Operating Temperature Range	5 to 40 °C (41 to 104 °F)

Bearing Type	Precision Linear Bearing
Motor Type	Brushless DC Linear Motor
Dimensions	370.0 mm x 90.0 mm x 44.0 mm (14.57" x 3.54" x 1.73")
Weight	2.4 kg (5.3 lbs)
Recommended Controller	BBD201 (1-Channel) BBD202 (2-Channel)

- a. The average of the repeatability when a set position is approached from both directions.
- b. The stage does not suffer from backlash because there is no leadscrew.
- c. The stage can carry higher loads at a lower acceleration. The acceleration is limited by the motor force.
- d. The measured minimum incremental motion that the stage can achieve, also referred to as the minimum step size.
- e. Pitch and yaw are measured by moving the stage over its full travel range and taking an angular robust laser interferometry (RLI) measurement at 20 equidistant points along the travel. This is repeated 10 times and the maximum discrepancy between minimum and maximum value in the pitch and yaw directions is taken.

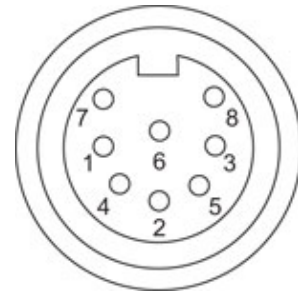
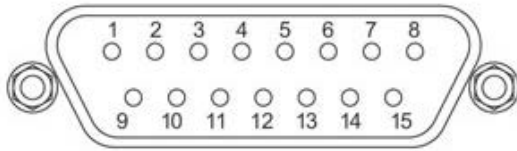
BBD201 Controller	
Drive Connector	8-Pin DIN, Round, Female
Feedback Connector	15-Pin D-Type
Continuous Drive Output	5 A
PWM Frequency	40 kHz
Operating Modes	Position and Velocity
Control Algorithm	16-Bit Digital PID Servo Loop with Velocity and Acceleration Feedforward
Velocity Profile	Trapezoidal/S-Curve
Position Count	32 Bit
Position Feedback	Incremental Encoder
Encoder Bandwidth	2.5 MHz 10 M Counts/s
Encoder Supply	5 V
AUX Control Connector	15-Pin D-Type
Power Supply Input	Power: 250 VA Voltage: 85 to 264 VAC Frequency: 46 to 63 Hz Fuse: 3.15 A
Dimensions	240 mm x 337.9 mm x 124.8 mm (9.5" x 13.3" x 4.9")
Weight	3.46 kg (7.6 lbs)

PIN DIAGRAMS

The flying leads are terminated in a male 15-pin D-Type and male 8-pin round DIN connector. Pin details are given below.

Feedback Connector

Motor Drive Connector



Pin	Description	Pin	Description
1	Not Used	9	Ground
2	Ground	10	Limit Switch +
3	Not Used	11	Limit Switch -
4	Enc Index -	12	Enc Index +
5	QB -	13	QB +
6	QA -	14	QA +
7*	5 V	15	Not Used
8*	5 V		

*Pins 7 and 8 are shorted together internally

Pin	Description
1	Motor Phase V
2	Ground
3	Thermistor (Not Used)
4	Motor Phase U
5	Stage ID
6	Ground
7	Motor Phase W
8	Enable

220 mm Linear Translation Stage, Servo Motor

Characterized by high-speed translation and high-positional accuracy, the DDS220 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 BBD series controller with associated MJC001 joystick option (described below).

Part Number	Description	Price	Availability
DDS220/M	Direct Drive Stage, 220 mm Travel - Metric	\$3,943.32	Today
DDS220	Direct Drive Stage, 8.6" Travel - Imperial	\$3,943.32	Today

Benchtop Brushless DC Motor Controllers

Depending on your application need, we recommend using our BBD series 1- or 2-Axis Brushless DC Servo Motor Controller. With a user-configurable, S-curve acceleration/deceleration profile that enables fast, smooth positioning without vibration or shock, these controllers are ideal for any motion control applications demanding operation at high speeds (hundreds of mm/s) and high encoder resolution. Incorporating the latest digital and analog techniques as well as high-bandwidth, high-power servo control circuitry, the BBD series controller is designed to drive any brushless DC servo motor products with continuous output currents of up to 5 A.

These DC servo controllers incorporate Thorlabs' standard APT control and programming interface, enabling easy integration into automated motion control applications. For greater flexibility, both a USB and RS232 computer interface is provided, and automated PC control of the stage is supported with the supplied software development kit (SDK). The fully documented SDK supports all major development languages running on Windows and comes in the form of ActiveX

libraries or a conventional dynamic link library (DLL).

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. Combining this feature with the user-friendly APT software allows the user to program and carry out complex move sequences in a short space of time. For more information, please see the full Brushless DC Servo Motor Controller presentation.

Part Number	Description	Price	Availability
BBD201	1-Channel Benchtop 3-Phase Brushless DC Servo Controller	\$2,044.08	Today
BBD202	2-Channel Benchtop 3-Phase Brushless DC Servo Controller	\$3,086.52	Today

2-Axis Joystick Console

- ▶ High-Reliability Hall Effect Joystick
- ▶ Speed Adjustment for Fast or High Precision Moves
- ▶ Speed Dial for Sensitivity Adjustment
- ▶ Ergonomic and Elegant Design
- ▶ High-Quality Machined Anodized Aluminum Casing

The MJC001 joystick console has been designed to provide intuitive, tactile, manual positioning of a stage. The console features a two-axis joystick for XY control. In most applications, the default parameter settings saved within the controller allow the joystick to be used out-of-the-box, with no need for further setup, thereby eliminating the need to be connected to a host PC and allowing true remote operation. This joystick is compatible with our Benchtop Brushless Controllers, Rack-Mounted Brushless Controller, and Stepper Motor Controllers.

Part Number	Description	Price	Availability
MJC001	2-Axis Microscopy Joystick Console	\$1,035.30	Today

MAX300/MBT Mounting Plate

- ▶ Single Plate to Mount MicroBlock or NanoMax Directly to the DDS220 Stage
- ▶ Resulting Overall Deck Height: 112.5 mm
- ▶ Resulting Overall Optical Height: 125.0 mm
- ▶ Bolts Supplied for Mounting to DDS220 Stage



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This mounting plate enables our MAX300 and MBT61x series of 3-axis stages to be mounted on the DDS220 stage. The 3-axis stage can be positioned quickly by the DDS220, before the MBT/MAX micrometer drives are used for fine manipulation of the device.

Part Number	Description	Price	Availability
DDS220P1/M	Customer Inspired!Mounting Plate (Metric) for MAX300 and MBT Series Stages	\$80.58	Today
DDS220P1	Customer Inspired!Mounting Plate (Imperial) for MAX300 and MBT Series Stages	\$80.58	Today

Accessory Plates

- ▶ End Mounting Plates with Nine 1/4"-20 (M6) Mounting Holes to Fix Accessories at Either End of Travel
- ▶ Grooved Mounting Plate with Sixteen 1/4"-20 (M6) Mounting Holes
- ▶ Riser Plate to Match 62.5 mm Deck Height, with Sixteen 1/4"-20 (M6) Mounting Holes

Three accessory plates are offered for use with the DDS220 Direct Drive Stage featured above. The DDSA01 Mounting Plate bolts to either end of the stage using two user-supplied 1/4"-20 (M6) bolts and allows accessories to be fixed at either end of travel.

A second accessory plate, the DDSA02 Grooved Mounting Plate, can be attached to the moving platform of the direct drive stage using the four included 1/4"-20 (M6) bolts. This plate features an array of sixteen 1/4"-20 (M6) mounting holes and a standard 3 mm groove for compatibility with our range of optical accessories. When used in conjunction with a DDSA01 End Mounting Plate, the DDSA02 grooved mounting plate can also be used at either end of the stage travel and is ideal for optical delay line applications.

Finally, the DDSA03 Riser Plate is designed to raise the deck height of the DDS220 stage to 62.5 mm, which is the same as our NanoMax 300, MicroBlock, and RollerBlock stages. This accessory is fixed to the moving platform of the stage using four included 1/4"-20 (M6) bolts.



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DDS220 stage with DDSA01 end mounting plates fitted



[Click to Enlarge](#)

DDS220 stage with DDSA01 end mounting plates and DDSA02 grooved mounting plates fitted



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DDS220 stage with DDSA03 riser plate fitted, shown aligning to a MAX300 3-axis stage.

Part Number	Description	Price	Availability
DDSA01/M	End Mounting Plate for DDS220 Direct Drive Stage, Metric	\$75.23	Today
DDSA02/M	Grooved Mounting Plate for DDS220 Direct Drive Stage, Metric	\$75.23	Today
DDSA03/M	Riser Plate for DDS220 Stage, 62.5 mm Optical Height, Metric	\$134.64	3-5 Days
DDSA01	End Mounting Plate for DDS220 Direct Drive Stage, Imperial	\$75.23	Today
DDSA02	Grooved Mounting Plate for DDS220 Direct Drive Stage, Imperial	\$75.23	Today
DDSA03	Riser Plate for DDS220 Stage, 62.5 mm Optical Height, Imperial	\$134.64	Lead Time