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THORLABS

TSGNFL5/M - JUN 9, 2016

Item # TSGNFL5/M was discontinued on JUN 9, 2016. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

SINGLE-AXIS FLEXURE STAGES: 5 MM TRAVEL

- ► **Differential Adjusters**
- ► **20 µm Piezo and Closed-Loop Feedback Options**
- ► **Mounting Plate & Angle Bracket Accessories**

NFL5DP20S
Shown with NFL5P1

NFL5P2

NFL5P1

Typical XZ Configuration

OVERVIEW

Features

- Differential Micrometer Drive
- Open & Closed Loop Piezo Options
- 5 mm Travel
- Compact Size: 3.00" (75 mm) Square, 1.18" (30 mm) Thick
- XYZ-Configurable
- All Cables are Included
- Bundles Available with Stage and Controller

Single-Axis Flexure Translation Stages
1.5 mm Travel
5 mm Travel

When stability is of the utmost importance, the NanoFlex™ 5 mm travel single-axis compound flexure stages provide ultra smooth translation for applications that are intolerant to the errors inherent in linear bearings. The compound linear symmetrical flexure design ensures true linear motion with zero cross talk over the full range of translation. This is achieved without the use of parts that require controlled contact to maintain their function; all the motion results from the flexing of various structural components within the translator. These features provide uncompromised performance, even when used in harsh environments.

These stages can be stacked in a 2-axis or 3-axis configuration using the optional base plate NFL5P1(/M) and angle bracket NFL5P2(/M) described below. A 3 m long piezo drive cable (SMC to SMC) as well as a 3 m long feedback cable (Lemo to Lemo) are supplied where applicable. See the *Pin Diagrams* tab for connector details.

See the *Specs* tab above for more detailed information including compatible controllers. We offer stages bundled with controllers at a discounted price below. A power supply is not included; compatible power supplies are sold separately below.

SPECS

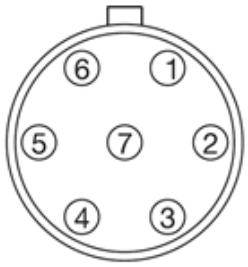
Item #	NFL5D	NFL5DP20	NFL5DP20S
Travel	0.20" (5 mm)	0.20" (5 mm)	0.20" (5 mm)
Max Load	Horizontal: 2.2 lbs. (1 kg) Vertical: 1.1 lbs (0.5 kg)	2.2 lbs. (1 kg) Vertical: 1.1 lbs (0.5 kg)	2.2 lbs. (1 kg) Vertical: 1.1 lbs (0.5 kg)
Drive Type	Differential Drive	Differential Drive & Piezo	Differential Drive & Piezo with Feedback
Coarse Adjustment Pitch	0.5 mm	0.5 mm	0.5 mm
Fine Adjustment Pitch	50 µm (300 µm Range)	50 µm (300 µm Range)	50 µm (300 µm Range)
Piezo (0 - 75 V)	N/A	Yes (20 µm Range)	Yes (20 µm Range)
Theoretical Resolution	N/A	20 nm (Piezo)	10 nm (Piezo w. Feedback)
Feedback	N/A	N/A	Strain Gauge
Recommended Controllers	N/A	MDT694B, MPZ601, or KPZ101	BPC301, MPZ601, or KPZ101 and TSG001

PIN DIAGRAMS

Displacement Sensor

7 Pin LEMO Male

NFL5DP20S Only



Pin	Designation
1	+15 V
2	Oscillator +
3	0 V
4	Signal Out -
5	Signal Out +
6	-15 V
7	Travel

Piezo Drive Input

SMC Male

NFL5DP20 and NFL5DP20S

Nominal maximum input voltage: 75 V
Absolute maximum input voltage: 100 V

KPZNFL5(/M)

KPZNFL5(/M) Bundle

The KPZNFL5(/M) bundle includes the NFL5DP20 stage, the KPZ101 K-Cube piezo controller, piezo drive cable, and NFL5P1(/M) mounting plate. The stage provides 0.20" (5 mm) of total translation via a micrometer. For finer adjustment, the piezo drive offers 20 µm of translation with 20 nm resolution.

K-Cube Piezo Controller

The KPZ101 can be controlled by its top panel for standalone operation or through its PC interface. The KPZ101 connects to a PC via a mini USB port and utilizes Thorlabs' Kinesis® software or former generation APT™ software. The Kinesis software features an intuitive graphical user interface (GUI) that allows the unit to be controlled completely via a PC. For more demanding applications, customers can utilize ActiveX® or .NET programming to create their own software for Thorlabs' line of K-Cubes. See the *Motion Control Software* tab for more information.

Power Supplies

The KPZ101 does not include a power supply as our customers have varying needs. Please see the recommended power supply below.

Item #	KPZNFL5(/M)
NFL5DP20	
Travel	0.20" (5 mm)
Max Load	2.2 lbs. (1 kg)
Drive Type	Differential Drive & Piezo
Coarse Adjustment Pitch	0.5 mm
Fine Adjustment Pitch	50 µm (300 µm Range)
Piezo (0 - 75 V)	Yes (20 µm Range)
Theoretical Resolution	20 nm (Piezo)
Feedback	N/A
KPZ101 (K-Cube Piezo Controller)	
Drive Voltage	0 - 150 V
Drive Current, Max, Continuous	7.5 mA
Stability	100 ppm Over 24 hrs (After 30 min Warm-Up)
Noise	<2 mV_{RMS}
Typical Piezo Capacitance	1 - 10 µF
Bandwidth	1 kHz (1 µF Load, 1 V_{p-p})
External Input (SMA Male)	0 - 10 V
Output Monitor (SMA Male)	0 - 10 V
USB Port	USB 2.0 Micro B[a]

- The USB 3.0 port is compatible with a USB 2.0 Micro B connector if the Micro B connector is plugged into the shaded region in the photo above. A USB 3.0 type A to type Micro B cable is included with the KPZ101. Click here for a diagram.

TSGNFL5(/M)

TSGNFL5(/M) Bundle

The TSGNFL5(/M) bundle includes the NFL5DP20S stage, the former generation TPZ001 T-Cube piezo controller, TSG001 T-Cube strain gauge reader, NFL5P1(/M) base plate, and piezo drive and feedback cables. The stage provides 0.20" (5 mm) of full translation via a micrometer, but a piezo provides finer adjustments over a shorter travel range. The piezo drive offers 20 µm of travel and, when operated in closed loop, provides 10 nm resolution. The same translation stage when used in open-loop is only able to achieve 20 nm resolution, so closed-loop operation is a necessity for more sensitive applications.

T-Cube Piezo Controller

The TPZ001 can be controlled by its top panel for standalone operation or through its PC interface. The TPZ001 connects to a PC via a mini USB port and utilizes Thorlabs' APT™ software. The APT™ software features an intuitive graphical user interface (GUI) that allows the unit to be controlled completely by a PC. For more demanding applications, customers can utilize ActiveX® programming to create their own software for Thorlabs' line of T-Cubes.

T-Cube Strain Gauge Reader

The TSG001 T-Cube strain gauge reader provides feedback to the TPZ001 piezo driver. This allows for closed-loop operation of the stage for increased resolution. Like the TPZ001, the unit can be used with or without a PC. The top of the unit features a digital readout of the strain on the piezo. When connected via USB to a PC, the APT™ software can be used to control the unit.

Power Supplies

The TPZ001 and TSG001 come without power supplies as our customers have varying needs. Please see the recommended power supply below.

Item #	TSGNFL5(/M)
NFL5DP20S	
Travel	0.20" (5 mm)
Max Load	2.2 lbs. (1 kg)
Drive Type	Differential Drive & Piezo with Feedback
Coarse Adjustment Pitch	0.5 mm
Fine Adjustment Pitch	50 µm (300 µm Range)
Piezo (0 - 75 V)	Yes (20 µm Range)
Theoretical Resolution	20 nm (Piezo with Feedback)
Feedback	Yes
TPZ001 (T-Cube Piezo Controller)	
Drive Voltage	0 - 150 V
Drive Current, Max, Continuous	7.5 mA
Stability	100 ppm Over 24 hrs (After 30 min Warm-Up)
Noise	<2 mV_{RMS}
Typical Piezo Capacitance	1 - 10 µF
Bandwidth	1 kHz (1 µF Load, 1 V_{p-p})
External Input (SMA Male)	0 - 10 V
Output Monitor (SMA Male)	0 - 10 V
USB Port	Version 1.1 mini
TSG001 (T-Cube Straing Gauge Reader)	
Strain Gauge Input	9-Way D-Type
Bridge Type	AC
Excitation Frequency	18 kHz
Reading Resolution	Position Mode: 1 nm Force Mode: 1 mN Voltage Mode: 1 mV
Sampling Bandwidth	500 Hz
Position Output Monitor	0 - 10 V (SMA)
USB Port	Version 1.1 mini

MOTION CONTROL SOFTWARE

Thorlabs offers two platforms to drive our wide range of motion controllers: our legacy APT™ (Advanced Positioning Technology) software package or the new Kinesis software package. Either package can be used to control devices in the APT or Kinesis family, which covers a wide range of motion controllers ranging from small, low-powered, single-channel drivers (such as the K-Cubes and T-Cubes) to high-power, multi-channel, modular 19" rack nanopositioning systems (the APT Rack System).

Our legacy APT System Software platform is available by clicking on the link below. It features ActiveX-based controls which can be used by 3rd party developers working on C#, Visual Basic, LabVIEW or any Active-X compatible languages to create custom applications, and includes a simulator mode to assist in developing custom applications without requiring hardware.

The Kinesis Software features new .NET controls which can be used by 3rd party developers working in the latest C#, Visual Basic, LabVIEW or any .NET compatible languages to create custom applications. Low level DLL libraries are included for applications not expected to use the .NET framework. A Central Sequence Manager supports integration and synchronization of all Thorlabs motion control hardware.

APT GUI Screen

By providing these common software platforms, Thorlabs has ensured that users can easily mix and match any of the APT and Kinesis controllers in a single application, while only having to learn a single set of software tools. In this way, it is perfectly feasible to combine any of the controllers from the low-powered, single-axis to the high-powered, multi-axis systems and control all from a single, PC-based unified software interface.

The software packages allow two methods of usage: graphical user interface (GUI) utilities for direct interaction with and control of the controllers 'out of the box', and a set of programming interfaces that allow custom-integrated positioning and alignment solutions to be easily programmed in the development language of choice.

A range of video tutorials are available to help explain our APT system software. These tutorials provide an overview of the software and the APT Config utility. Additionally, a tutorial video is available to explain how to select simulator mode within the software, which allows the user to experiment with the software without a controller connected. Please select the *APT Tutorials* tab above to view these videos, which are also available on the software CD included with the controllers.

Software

APT Version 3.14.0

The APT Software Package, which includes a GUI for control of Thorlabs' APT™ system controllers.

Also Available:

- Software otocol

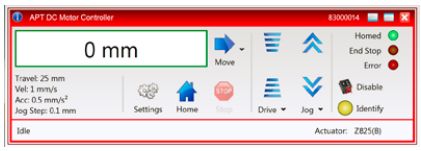
Software

Kinesis Version 1.5.0

The Kinesis Software Package, which includes a GUI for control of Thorlabs' Kinesis and APT™ system controllers.

Also Available:

- Software rotocol



Kinesis GUI Screen

Single-Axis Flexure Stages: 5 mm Travel

The stages are supplied with a differential micrometer drive, which provides coarse and fine adjustment. An optional piezo drive is available, with or without strain gauge feedback for closed- and open-loop operation, respectively. The NFL5 series stage is ideal for a variety of applications, including interferometry, microscopy, and other precision nanopositioning applications.

See the *Specs* tab above for more detailed information including compatible controllers. We offer stages bundled with controllers at a discounted price below. Compatible power supplies are sold separately below.

Part Number	Description	Price	Availability
NFL5D/M	NanoFlex™ 5 mm Translation Stage with Differential Drive, Metric Taps	$776.00	Today
NFL5DP20/M	NanoFlex™ 5 mm Translation Stage with Diff. Drive and Piezo, Metric Taps	$945.00	Lead Time
NFL5DP20S/M	NanoFlex™ 5 mm Translation Stage with Diff. Drive and Feedback Piezo, Metric Taps	$1,270.00	Lead Time
NFL5D	NanoFlex™ 5 mm Translation Stage with Differential Drive	$776.00	Today
NFL5DP20	NanoFlex™ 5 mm Translation Stage with Diff. Drive and Piezo	$945.00	Today
NFL5DP20S	NanoFlex™ 5 mm Translation Stage with Diff. Drive and Feedback Piezo	$1,270.00	Today

5 mm Single-Axis Stage & Controller Bundles

The KPZNFL5(/M) bundle includes the KPZ101 K-Cube Piezo Driver, the ideal driver for the NFL5DP20(/M) stage, as well as all necessary cables for a complete open-loop piezo positioning system. The KPZNFL5(/M) includes a NF5P1(/M) base plate. Compatible power supplies for the KPZ101 are sold separately below.

Please see the *KPZNFL5(/M)* tab for more information on this bundle.

The TSGNFL5(/M) bundle has been designed for customers who require precise, closed-loop control. The NFL5DP20S(/M) stage, together with the former generation TPZ001 T-Cube Piezo Controller and TSG001 Strain Gauge Reader, provides an out of the box, high-precision, closed-loop positioning solution. The TSGNFL5(/M) includes a NFL5P1(/M) base plate. Compatible power supplies for the TPZ001 and TSG001 are sold separately below.

Please see the *TSGNFL5(/M)* tab for more information on this bundle.

Part Number	Description	Price	Availability
KPZNFL5/M	NEW! NFL5DP20/M 5 mm Travel Stage with KPZ101 Piezo Driver	$1,390.00	Today
TSGNFL5/M	NFL5DP20S/M 5 mm Travel Stage with TPZ001 Piezo Driver and TSG001 Strain Gauge Reader	$2,160.00	Lead Time
KPZNFL5	NEW! NFL5DP20 5 mm Travel Stage with KPZ101 Piezo Driver	$1,390.00	Today
TSGNFL5	NFL5DP20S 5 mm Travel Stage with TPZ001 Piezo Driver and TSG001 Strain Gauge Reader	$2,160.00	Today

NFL5 Series Mounting Adapters

The NFL5P1 and NFL5P2 are adapter plates designed for the NFL5 Series of translation stages. The NFL5P1 is a universal base plate with slots on the side that enable obstruction-free mounting onto an optical breadboard. This base is ideal for XY or XYZ multi-axis configurations where the standard counterbores in the middle of the stages are obstructed.

The NFL5P2 is an angle bracket that allows a NFL5 Series stage to be mounted vertically. This is necessary in some XY and all XYZ configurations.

Part Number	Description	Price	Availability
NFL5P1/M	NanoFlex™ NFL5D Series Base Plate, Metric Taps	$46.00	Today
NFL5P2/M	NanoFlex™ NFL5D Series Angle Bracket, Metric Taps	$94.90	Lead Time
NFL5P1	NanoFlex™ NFL5D Series Base Plate	$46.00	Today
NFL5P2	NanoFlex™ NFL5D Series Angle Bracket	$94.90	Today

Compatible Power Supplies

- ±15 V/5 V Power Supply
  - TPS002: For up to Two K-Cubes or T-Cubes
- 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
  - KAP101: Adapter Plate for Connecting 60 mm Wide T-Cubes to KCH Series Hubs
  - KAP102: Adapter Plate for Connecting 120 mm Wide T-Cubes to KCH Series Hubs

Click to Enlarge

The TPS002 supplies power for up to two K-Cubes or T-Cubes. The cubes still need to be connected to a computer individually via a USB cable.

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; 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.

A KAP101 or KAP102 Adapter Plate (sold separately) is required for each T-Cube to operate on the KCH301 or KCH601 controller hub. The KAP101 is designed to adapt 60 mm wide T-Cubes to the hubs, while the KAP102 is designed to adapt 120 mm wide T-Cubes to the hubs.

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

Please note that our KPS101 Power Supply is not compatible with the controller on this page since it does not offer reversible polarity.

Part Number	Description	Price	Availability
TPS002	**±15 V/5 V Power Supply Unit for up to Two K-Cube or T-Cubes**	**$105.00**	**Lead Time**
KCH301	**USB Controller Hub and Power Supply for Three K-Cubes or T-Cubes**	**$475.00**	**Lead Time**
KCH601	**USB Controller Hub and Power Supply for Six K-Cubes or T-Cubes**	**$575.00**	**Today**
KAP101	**Adapter Plate for KCH Series Hubs and 60 mm Wide T-Cubes**	**$55.00**	**Today**
KAP102	**NEW! Adapter Plate for KCH Series Hubs and 120 mm Wide T-Cubes**	**$60.00**	**Today**

Visit the *Single-Axis Flexure Stages: 5 mm Travel* page for pricing and availability information:
http://www.thorlabs.com/newgrouppage9.cfm?objectgroup_id=720