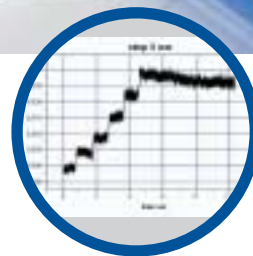


PiezoWalk® Drives

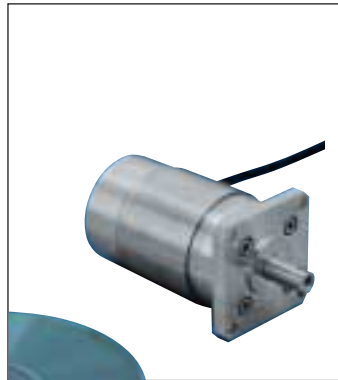
Nanopositioning with Millimeter-Travel



Nanometer-Precision Actuators

Piezoelectric / Motorized Actuator Solutions

PI is the leading manufacturer of ultra-high-precision actuators for nanopositioning and micropositioning applications in industries such as Semiconductors; Biotechnology and Medicine; Lasers, Optics, Microscopy; Aerospace Engineering; Precision Machining; Astronomy and Microsystems Technology.



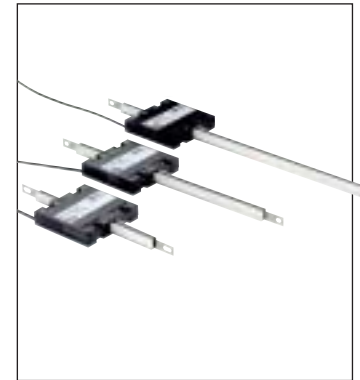
NEXLINE® Nanopositioning Actuators

- PiezoWalk® Drive
- High-Dynamics Operation Mode
- Forces to 600 N
- <0.1 nm Resolution
- Self-Locking at Rest
- Travel to 20 mm (Basically Unlimited)
- High Reliability and Long Lifetime
- Non-Magnetic



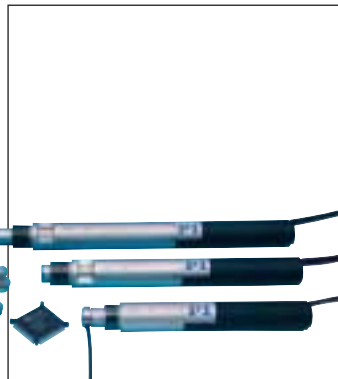
NEXACT® Nano Positioning Actuators

- PiezoWalk® Drive
- Compact Dimensions
- Forces to 10 N
- <0.1 nm Resolution
- Self-Locking at Rest
- Travel to 25 mm (Basically Unlimited)
- Velocity to 10 mm/s
- Non-Magnetic



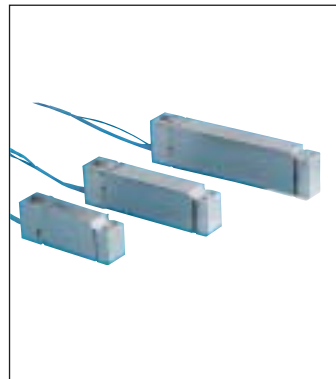
PILine® Linear Actuators / Motors

- Ultrasonic Piezomotors and Drives
- Velocity to 500 mm/s
- Compact Dimensions
- Travel to 150 mm (Basically Unlimited)
- Forces to 7 N
- Self-Locking at Rest
- Resolution to 50 nm
- Non-Magnetic



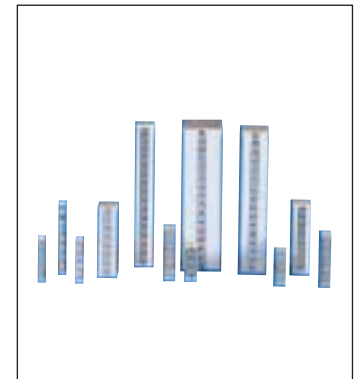
Motorized Actuators

- DC & Stepper Motors
- Forces to 400 N
- Travel to 50 mm
- Resolution to 50 nm



Flexure-Guided Piezo Actuators

- PICMA® Piezoceramic Multilayer Actuators
- Sub-Nanometer Resolution
- Fast Response (Millisecond-Range)
- Excellent Guiding Precision
- Travel to 2 mm



Piezo Stack Actuators

- PICMA® Multilayer and PICA™ Stack Actuators
- Forces to 100 kN
- Sub-Nanometer Resolution
- Fast Response (to Microsecond-Range)
- High Reliability and Long Lifetime
- Travel to 200 μm

PiezoWalk® Precision Drives – Millimeter Travel, Nanometer Resolution, High Forces

PiezoWalk® drives break away from the limitations of conventional Nanopositioning actuators. They offer a basically

unlimited travel range and still provide the characteristic features of a piezoelectric actuator: an open-loop resolution down to 30 picometers and a very high stiffness for dynamic operation and force generation. PI offers two product lines

based on different versions of the PiezoWalk® principle: NEXLINE® and NEXACT®. Both provide specific advantages depending on the application.

PiezoWalk® piezo stepping drives usually consist of several individual piezo actuators and generate motion through succession of coordinated clamp / unclamp and shear-motion cycles (steps). Each cycle provides only a few microns of movement, but running at hundreds of hertz, the drive achieves continuous motion in the mm/second range.

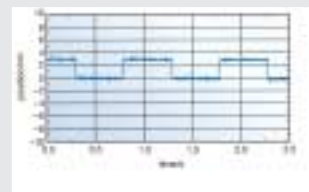
The PiezoWalk® working principle provides high force capabilities, resolution and repeatabil-

ity. These properties are typically better for piezo stepping actuators compared to inertia drives or ultrasonic motors.

The operation is possible in two different modes: a high-resolution, high dynamics analog mode within a single step, and a step mode with virtually unlimited travel range.



Custom PiezoWalk® linear actuator



50 picometer steps with a NEXLINE® drive, measured with external ultra-high-resolution capacitive sensor. This performance provides a big safety margin for next generation nanotechnology applications

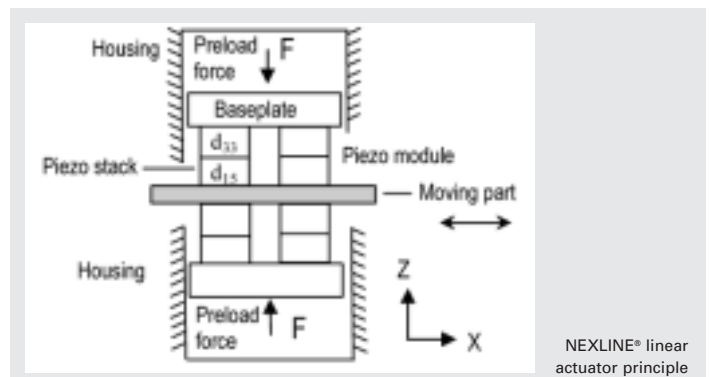
Features and Advantages of PiezoWalk® Drives

- Very high resolution, limited typically only by the sensor. In fine-adjustment, analog mode, resolution of 30 picometers has been demonstrated.
- High force generation and stiffness. NEXLINE® drives can hold and generate forces to 600 N, NEXACT® to 15 N.
- PiezoWalk® drives hold a stable position to nanometer level in power-off mode. Due to the actuator design, the maximum clamping force is applied at rest.
- Because a position can be held with zero operating voltage, leakage currents cannot affect the integrity of the piezo drive.

- PiezoWalk® drives are available for non-magnetic applications such as super-conductivity experiments. They do not create magnetic fields nor are they influenced by them.
- The active parts in PiezoWalk® drives are made of vacuum-compatible ceramics. The drives also work in UV-light environments.
- NEXLINE® drives can survive shock loads of several g during transportation.
- PiezoWalk® drives are available in three levels of integration to provide flexibility for OEMs: OEM drives, packaged actuators and integrated into complex positioning systems such as multi-axis translation stages or 6-DOF Hexapods.



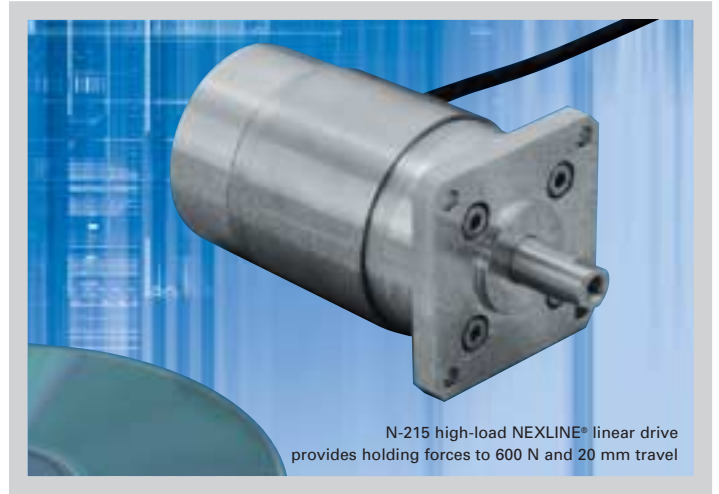
6-axis parallel-kinematic nanopositioning system (Hexapod) with N-215 based NEXLINE® high-load actuators for use in strong magnetic fields



NEXLINE® linear actuator principle

NEXLINE® High-Force Drives for Nanopositioning

NEXLINE® systems are based on very rugged, high-efficiency shear and clamping actuators and incorporate a preloading mechanism to provide pushing and holding forces up to 600 N with high lifetime. The rigid design with resonant frequencies of hundreds of hertz allows the construction of very stiff structures and helps to suppress vibration. The analog operating mode can be used for dithering and active vibration cancellation.






Compact NEXACT® Drives for Moderate Forces

NEXACT® drives use bending actuators which combine the feed forward and the clamping cycles. They provide push/pull forces to 15 N with maximum velocities of more than 10 mm/s at low operating voltages of 40 V. The compact and cost-effective NEXACT® drives are available with various drive electronics, ranging from cost-effective OEM drives for open-loop operation in stepping mode to the sophisticated E-861 servo-controller for high-resolution, closed-loop linear translation stages.







Selection Guide

PiezoWalk® Drives

Models	Description	Holding Force	Resolution	Travel
	N-310 NEXACT® Compact OEM PiezoWalk® Drives	15 N	0.03 nm (open-loop)	20 mm
	N-111 NEXLINE® Miniature High-Load Piezo Nanopositioning Drive	80 N	0.03 nm (open-loop), 5 nm (closed-loop version)	6 mm
	N-214/ N-215 NEXLINE® High-Load Piezo Nanopositioning Drive	300 N (N-214) 600 N (N-215)	0.03 nm (open-loop), 5 nm (closed-loop version)	20 mm

Positioning Systems with PiezoWalk® Drives

Models	Description	Resolution	Active Axes	Travel
	N-310K001 Compact NEXACT® Linear Nanopositioning Stage	25 nm (closed-loop)	X	20 mm
	N-510 NEXLINE® Z, Tip, Tilt Platform, 200 N	10 nm (closed-loop)	Z / Tip / Tilt (parallel kinematics)	1.3 mm (Z) 10 mrad
	N-511 NEXLINE® Z, Tip, Tilt Platform, 500 N	5 nm (closed-loop)	Z / Tip / Tilt (parallel kinematics)	1 mm (Z) 8 mrad
	N-512 NEXLINE® X, Y Platform, 100 N, Non-Magnetic	15 nm (closed-loop)	X, Y	6 x 6 mm

N-310

Compact NEXACT® OEM Piezo Stepping Drives with Long Travel Ranges



N-310 Actuator with E-861 Servo-Controller (integrated drive electronics)

- 20 mm Standard Travel Range, Flexible Choice of the Runner Length
- Compact and Cost-Effective Design
- 0.03 nm Resolution
- To 10 N Push/Pull Force
- Low Operating Voltage
- Self Locking, with no Head Dissipation, Nanometer Stability
- Non-Magnetic and Vacuum-Compatible Working Principle

N-310 NEXACT® PiezoWalk® linear drives feature travel ranges of 20 mm and push/pull force capacities to 10 N in a compact package of only 25 x 25 x 12 mm. With their high resolution, NEXACT® drives, are ideal for high-precision positioning over long travel ranges.

Application Examples

- Semiconductor technology
- Wafer inspection
- Nano lithography
- Surface Measurement Technique
- Profilometry
- Microscopy
- Motion in strong magnetic fields

The N-310 can be operated in open-loop and closed-loop mode (with the addition of an external position sensor). A variety of NEXACT® controllers facilitates the integration into micro- or nanopositioning applications.

Advantages of PiezoWalk® piezo stepping drives

NEXLINE® and NEXACT® drives offer several advantages over traditional drive technologies:

- Resolution in the picometer range
- Compact dimensions
- High drive forces from ten newtons (NEXACT®) up to several hundred newtons (NEXLINE®)
- High dynamic performance with sub-microsecond response

- Self-locking when powered down; no holding current
- Zero backlash, no wear or maintenance, no mechanical components like gears or leadscrews.
- Non-Magnetic and Vacuum Compatible Operating Principle

Working Principle for Application Flexibility

NEXACT® PiezoWalk® technology overcomes the limitations of conventional nanopositioning drives and combines virtually unlimited travel ranges with high stiffness in a very small package. Furthermore, NEXACT® actuators provide piezo-class resolution (far below one nanometer) and millisecond responsiveness. The special drive design reduces the operating voltage to 40 V and below.

In operation, piezoceramic bending elements act on the runner, which is connected to the moving part of the application. The length of the runner determines the travel range. Force capacity, resolution and velocity are determined by the piezo geometry and drive electronics and are scalable. To move the runner over longer distances the stepping mode is used, whereas for distances smaller than one step, the linear (analog) mode enables high-dynamics positioning with resolutions far below one nanometer.

Wear and Maintenance-Free

In contrast to ordinary DC or stepper motor drives, the PiezoWalk® drives effect linear motion directly, without the need to transform rotation with mechanical elements such as gears, leadscrews and nuts. Therefore, mechanical

Ordering Information

N-310.01
NEXACT® OEM linear drive,
20 mm, 10 N

Ask about custom designs

limitations such as backlash and wear are eliminated and the drive is maintenance-free.

Self-Locking PiezoWalk® Piezo Stepping Drive

NEXLINE® and NEXACT® exhibit high stiffness and are self-locking even when powered down due to the clamping action of the piezo actuators in the mechanics. This entails nanometer position stability at rest, with no heat dissipation or servo-dither.

Controller and Drive Electronics appropriated for the Application

NEXACT® actuators require special drive electronics to control the complex stepping sequences. The E-860 series NEXACT® controllers are available in different open and closed-loop versions. For example, the E-861 includes a complete NEXACT® servo-controller with low-noise, 24-bit drivers and a powerful DSP. It also comes with ample software for easy integration and highly effective computer control. For applications which do not require the highest resolution lower-priced drive electronics, ranging all the way to OEM boards, can be ordered.

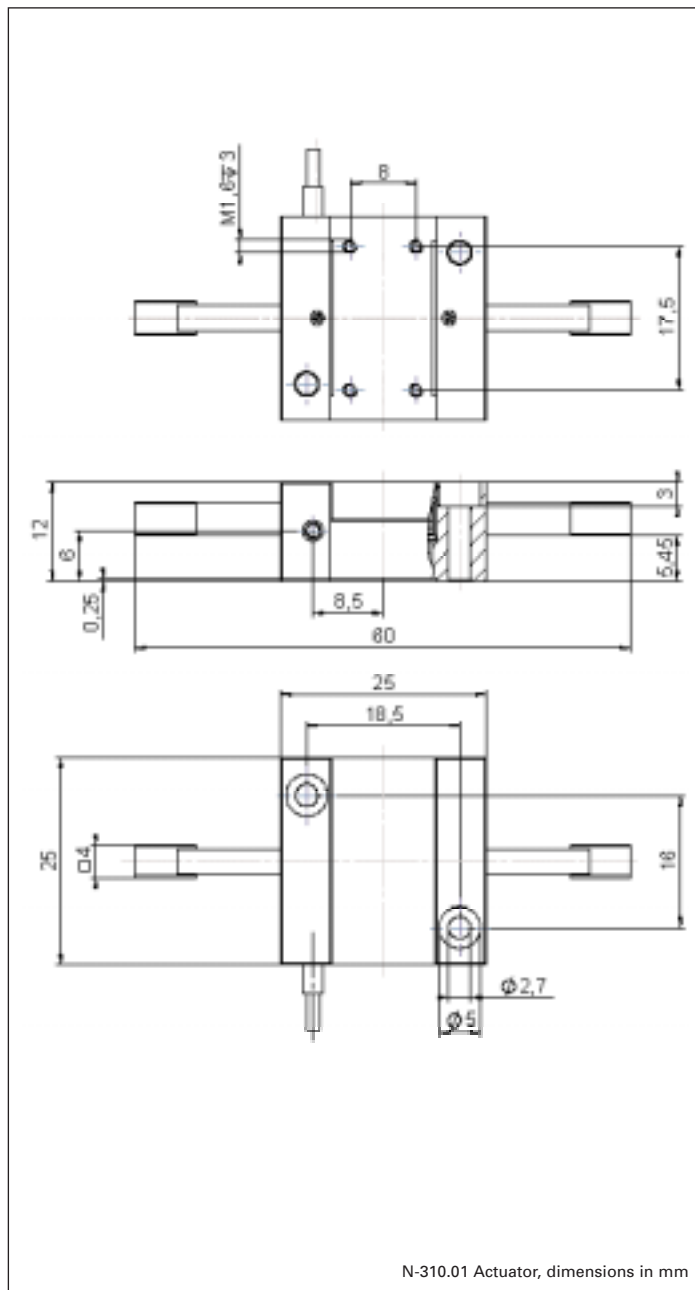
The products described in this document are in part protected by the following patents:
German Patent No. P4408618.0



Technical Data

Models	N-310.01	Tolerance
Active axes	X	
Motion and positioning		
Travel range	±20 mm	
Step size (in step mode)	5 nm to 5 µm	
Travel range in analog operation	7 µm	max.
Open-loop resolution	0.025 nm	typ.
Step frequency	1.5 kHz*	max.
Max. speed	10 mm/s*	max.
Mechanical properties		
Push/Pull force (active)	10 N	max.
Drive properties		
Drive type	NEXACT® linear drive	
Operating voltage	-10 V to +40 V	
Miscellaneous		
Operating temperature range	0 to 50 °C	
Body material	Stainless steel	
Mass	50 g	±5%
Cable length	1.5 m	±10 mm
Connector	NEXACT® linear drive (D-Sub 15, 3 row)	
Recommended controller/driver	E-860-series	

* Depending on the control electronics.



N-310.01 Actuator, dimensions in mm

N-111

NEXLINE® OEM Piezo Nanopositioning Stepping Drive



- 5 mm Travel
- To 50 N Pull / Push Force and 80 N Holding Force
- Self Locking at Rest, no Heat Generation
- Non-Magnetic and Vacuum-Compatible Working Principle

The innovative N-111 NEXLINE® OEM drives are compact actuators for nanopositioning with travel ranges to 5 mm, high resolution, and generated forces to 50 N.

Two versions are available, the N-111.3A closed-loop model and N-111.30 open-loop mo-

del. Both can be operated with the sophisticated E-755 NEXLINE® motion controller. The N-111.3A is equipped with a 5 nm resolution linear encoder for long-range position control. Due to its low-noise, 24 bit D/A converters, the E-755 controller can provide picometer level resolution in the highly-dynamic short-range / dithering mode.

Application Examples

- Semiconductor technology
- Semiconductor testing
- Wafer inspection
- Nano lithography
- Nano imprint
- Nanometrology
- Active vibration damping
- Motion in strong magnetic fields

NEXLINE® Working Principle for Application Flexibility

NEXLINE® PiezoWalk® drives can be used wherever high loads must be positioned very precisely over long distances and then perhaps subjected to small-amplitude dynamic adjustment, as for active vibration control. By varying the combination of longitudinal and shear piezo elements, the step size, dynamic operating range (analog travel), clamping force, speed and stiffness can

all be optimized for a particular application.

NEXLINE® PiezoWalk® Piezo-ceramic clamping and shear elements act directly on a moving runner that is coupled to the moved object. While the runner can be moved larger distances in step mode, analog operation over a distance of less than one step enables high-dynamics positioning with resolutions far below one nanometer. The patented PiezoWalk® overcomes the limitations of conventional nanopositioning actuators and combines long travel ranges with high resolution and stiffness.

Advantages of PiezoWalk® Piezo Stepping Drives

NEXLINE® and NEXACT® drives offer several advantages over traditional drive technologies:

- Resolution in the picometer range
- Compact dimensions
- High drive forces from ten newtons (NEXACT®) up to several hundred newtons (NEXLINE®)
- High dynamic performance with sub-microsecond response

Ordering Information

N-111.30
NEXLINE® OEM Nanopositioning Drive, 5 mm, 50 N

N-111.3A
NEXLINE® OEM Nanopositioning Drive, 5 mm, 50 N, Closed-Loop, 5 nm Resolution

Ask about custom designs

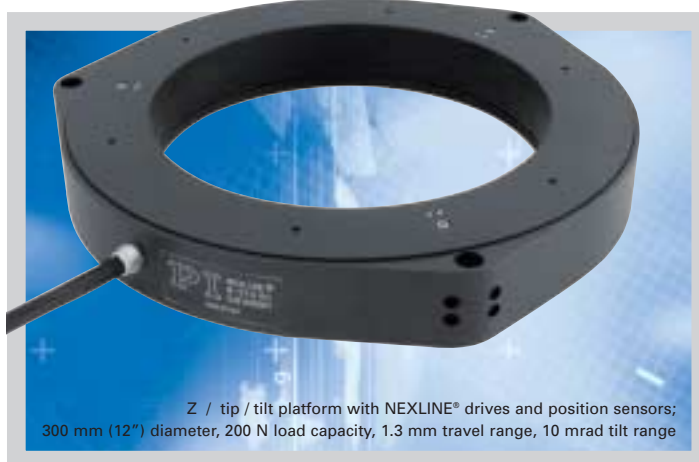
- Self-locking when powered down; no holding current
- Zero backlash, no wear or maintenance, no mechanical components like gears or leadscrews.
- Non-magnetic and vacuum compatible operating principle

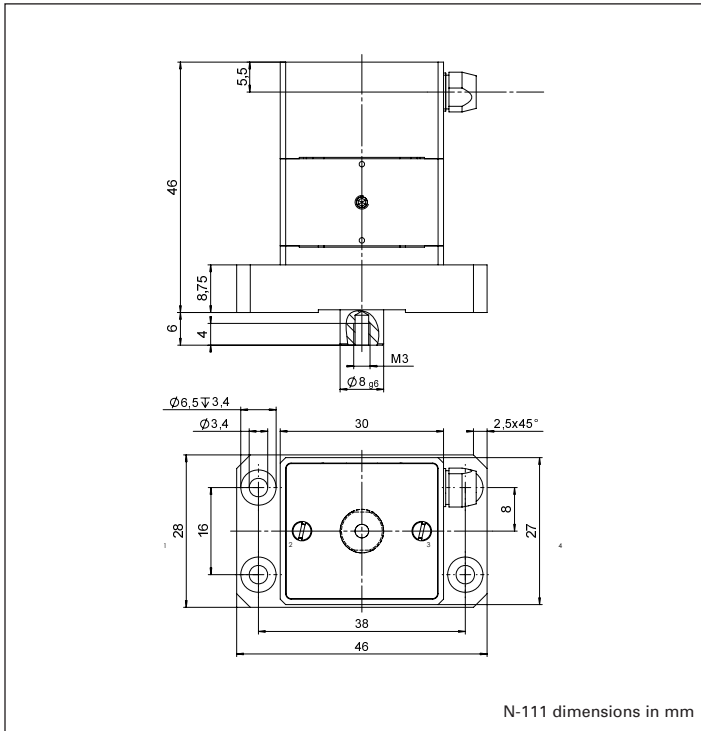
NEXLINE® Actuators are distinguished by a number of unique outstanding features:

- Cleanroom compatibility
- Vacuum compatibility
- Operation under conditions, which prohibit usage of magnetic drives

Notes

The products described in this document are in part protected by the following patents:
German Patent No. 10148267
US Patent No. 6,800,984





Technical Data

Models	N-111.30	N-111.3A	Tolerance
Active axes	X	X	
Motion and positioning			
Travel range	5 mm	5 mm	
Step size (in step mode)	10 nm to 4 μ m	10 nm to 4 μ m	
Integrated sensor	-	Linear encoder	
Sensor resolution	-	5 nm	
Analog mode travel range	2.5 μ m	2.5 μ m	Max.
Open-loop resolution	0.025 nm	0.025 nm	Typ.
Closed-loop resolution	-	5 nm	
Step frequency	100 Hz	100 Hz	Max.
Max. velocity	0.2 mm/s*	0.2 mm/s*	Max.
Mechanical properties			
Stiffness in motion direction	15 N/ μ m	15 N/ μ m	\pm 20 %
Push / Pull force (active)	50 N	50 N	Max.
Holding force (passive)	80 N	80 N	Min.
Drive properties			
Drive type	NEXLINE® linear drive	NEXLINE® linear drive	
Operating voltage	\pm 250 V	\pm 250 V	
Miscellaneous			
Operating temperature range	-40 to 80 °C	-40 to 80 °C	
Material	Al (anodized), steel	Al (anodized), steel	
Mass	115 g	135 g	\pm 5 %
Cable length	1.5 m	1.5 m	\pm 10 mm
Connector	Sub-D NEXLINE® connector, single-channel	Sub-D NEXLINE® connector, single-channel; sensor connector	
Recommended controller / driver	E-755.101:	E-755.1A1	

* The maximum speed in stepping mode is set so as to allow the greatest possible velocity constancy, so that no velocity fluctuations occur during step motion.

N-214 · N-215

NEXLINE® High-Load Piezo Nanopositioning Stepping Drive



N-215 NEXLINE® high-load actuator

- 20 mm Travel Range
- 0.03 nm Resolution Open-Loop and 5 nm Closed-Loop
- To 400 N Push / Pull Force and 600 N Holding Force
- Self Locking when Power down, No Heat Generation
- Non-Magnetic and Vacuum-Compatible Working Principle

The innovative N-214 / N-215 NEXLINE® OEM linear drives are ultra-precision nanopositioning actuators with travel ranges to 20 mm and push / pull forces to 400 N. The novel, patented NEXLINE® PiezoWalk® drive design combines long travel ranges with high mechanical stiffness and piezo-class resolution of better than 0.1 nm.

Application example

- Semiconductor technology
- Semiconductor testing
- Wafer inspection
- Nano lithography
- Nano imprint
- Nanometrology
- Active vibration damping
- Motion in strong magnetic fields

PiezoWalk® supports two different motion modes: a high-resolution, high-dynamics short range (analog) mode and a stepping mode with virtually unlimited travel range.

Two versions are available, the N-214 closed-loop model and N-215 open-loop model. Both can be operated with the sophisticated E-755 NEXLINE® motion controller. The N-214 is equipped with a 5 nm resolution linear encoder for long-range position control. Due to its low-noise, 24 bit D/A converters, the E-755 controller can provide picometer level resolution in the highly-dynamic short-range / dithering mode.

NEXLINE® Working Principle for Application Flexibility

NEXLINE® PiezoWalk® drives can be used wherever high loads must be positioned very precisely over long distances and then perhaps subjected to small-amplitude dynamic ad-

justment, as for active vibration control. By varying the combination of longitudinal and shear piezo elements, the step size, dynamic operating range (analog travel), clamping force, speed and stiffness can all be optimized for a particular application.

NEXLINE® PiezoWalk® Piezo-ceramic clamping and shear elements act directly on a moving runner that is coupled to the moved object. While the runner can be moved larger distances in step mode, analog operation over a distance of less than one step enables high-dynamics positioning with resolutions far below one nanometer. The patented PiezoWalk® overcomes the limitations of conventional nanopositioning actuators and combines long travel ranges with high resolution and stiffness.

High-Resolution Dynamic Operation

In analog mode the motion is effectuated exclusively by the very stiff shear elements, providing a resonant frequency in the direction of motion of several kilohertz. The motion resolution here is limited only by the stability of the drive electronics, or, in closed-loop operation, by the sensor.

Basically Unlimited Travel Range

Step mode involves a sequence of coordinated shear and

Ordering Information

N-214.00
NEXLINE® High-Load Actuator,
20 mm, 200 N, linear encoder,
5 nm resolution

N-215.00
NEXLINE® High-Load Actuator,
20 mm, 400 N, open-loop

clamping moves. That is why piezo stepping drives have no intrinsic travel limitation and can be used flexibly. The max. step frequency of 100 Hz and is determined by the controller. It allows velocities up to 1 mm/s, depending on the step size and / or analog range.

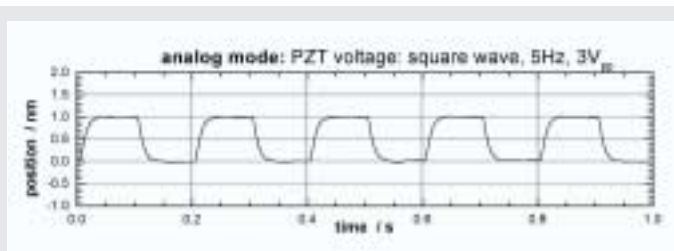
Unlimited Lifetime

The application area of NEXLINE® drives often lies in the difficult-to-access internals of machines, where nanometer-
real adjustment and vibration cancellation are required.

Long lifetime is therefore a basic requirement for NEXLINE® actuators. To promote long lifetime, the controller can reduce the operating voltage on all the piezo elements to zero at any position and still maintain the full holding force.

Note

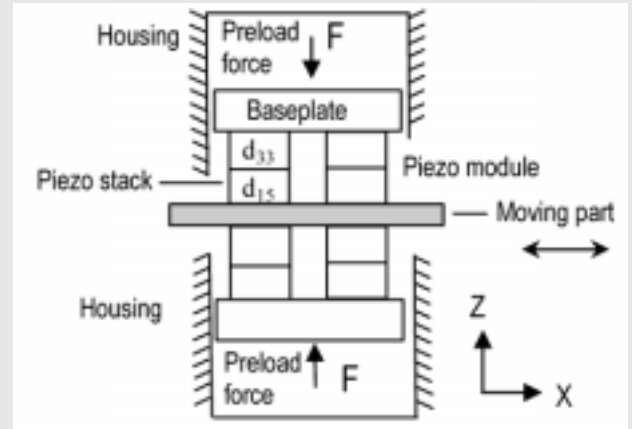
The products described in this document are in part protected by the following patents:
German Patent No. 10148267
US Patent No. 6,800,984



Train of 1 nm steps in open-loop analog mode with an N-215 NEXLINE® actuator



Six-axis parallel-kinematics Hexapod with N-215-based NEXLINE® high-load actuators for use in strong magnetic fields.



NEXLINE® linear actuator principle

Models	N-214.00	N-215.00
Active Axes	Z	Z
Motion and positioning		
Travel range	20 mm	20 mm
Step size in stepping mode	10 nm to 6 μm	10 nm to 6 μm
Integrated sensor	Linear encoder	-
Sensor resolution	5 nm	-
Travel range in analog mode	3 μm	3 μm
Open-loop resolution	0.03 nm	0.03 nm
Closed-loop resolution	5 nm	-
Step frequency	100 Hz*	100 Hz*
Max. velocity	0.5 mm/s**	0.5 mm/s**
Mechanical properties		
Stiffness in motion direction	75 N/ μm	150 N/ μm
Drive force (active)	200 N	400 N
Holding force (passive)	300 N	600 N
Drive properties		
Drive type	NEXLINE® linear drive	NEXLINE® linear drive
Operating voltage	± 250 V	± 250 V
Miscellaneous		
Operating temperature range	-40 to 80 °C	-40 to 80 °C
Material	Al (anodized), steel	Al (anodized), steel
Mass	1050 g	1150 g
Cable length	4.0 m	2.0 m
Connector	D-sub single-channel NEXLINE® connector, plus separate sensor connector	D-sub single-channel NEXLINE® connector
Recommended controller / driver	E-755.1A1	E-755.101

* Depends on control electronics

** Depends on control electronics. The maximum speed in step mode is set so as to ensure the highest possible velocity constancy, with no speed fluctuations while steps are being performed.

E-755

Digital Controller for NEXLINE® Nanopositioning Linear Drives



E-755 digital NEXLINE® controller with N-214 nanopositioner, 20 mm travel range.

- **Special Control Algorithms for NEXLINE® Nanopositioning Linear Drives**
- **32-Bit Digital Filters**
- **24-Bit DAC Resolution**
- **Fully Programmable Low-Pass and Notch Filters**
- **Non-Volatile User Settings and Last-Position Data**
- **PI General Command Set Compatible**

E-755 digital nanopositioning controllers are designed to drive the novel, patented, NEXLINE® nanopositioning linear drives. Combining advanced control technology and sensor signal processing with special drive algorithms, the E-755 can provide precision motion control over hundreds of millimeters with picometer-range resolution.

Application Examples

- Semiconductor manufacturing
- Quality control in the semiconductor industry
- Astronomical telescopes
- Truss structures
- Active vibration control
- Alignment in high magnetic fields, as in particle physics, atomic fusion and superconductivity research

Coordinated action of shearing and clamping piezo elements is what allows NEXLINE® to break through the barriers of conventional nanopositioning actuators.

The E-755 offers two different control modes: a high-resolution, high dynamics direct piezo mode, with basically unlimited resolution, and a long-range mode with virtually unlimited travel range.

High-Resolution Closed-Loop Control

E-755 controllers are based on powerful 32-bit DSPs and come in open- and closed-loop versions. Both versions feature four high-resolution (24-bit) linear amplifiers with an output range of ± 250 V required to control a single-axis NEXLINE® drive. For the closed-loop models, high-resolution incremental position sensors to sub-nanometer resolution are supported by spe-

cial excitation and read-out electronics. A power-down routine in the E-755 firmware saves the current position, allowing a closed-loop system to be ready for use without referencing next time it is powered up.

Zero-Voltage Control Mode Promotes Extreme Actuator Lifetime

NEXLINE® nanopositioning actuators can often be found in inaccessible locations deep inside complex equipment, where nanometer-precise alignment and vibration cancellation are required. This makes the long lifetime of NEXLINE® drives especially advantageous. The E-755 firmware incorporates a special procedure to bring the NEXLINE® actuator to a full-holding-force zero-drive-voltage condition, no matter where it is along its travel range. This eliminates long-term offset voltages, which can limit the lifetime of conventional piezo drives.

Ordering Information

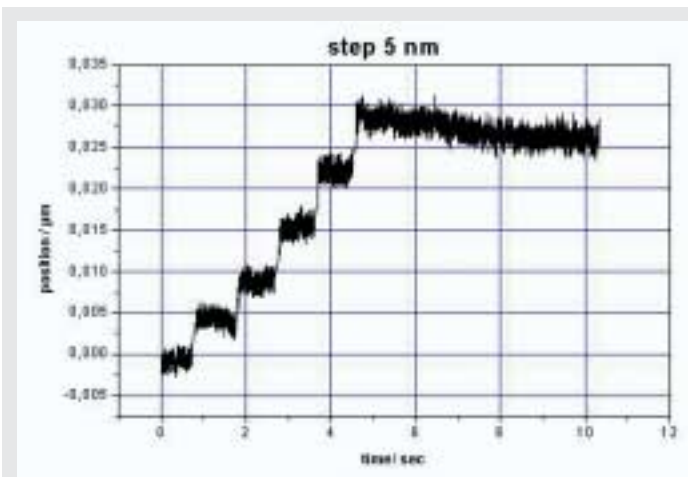
E-755.1A1
Digital Controller for Closed-Loop NEXLINE® Nanopositioning Linear Drives with Incremental Encoder

E-755.101
Digital Controller for Open-Loop NEXLINE® Nanopositioning Linear Drives

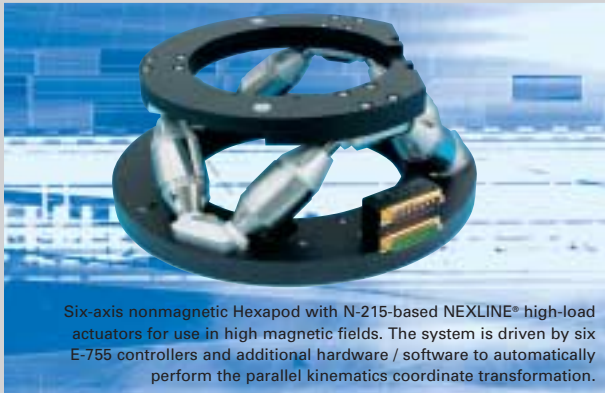
Linearization

E-755-controlled nanopositioning systems provide outstanding linearity, achieved by digital polynomial linearization. The linearization can improve linearity to 0.001% over the full travel range.

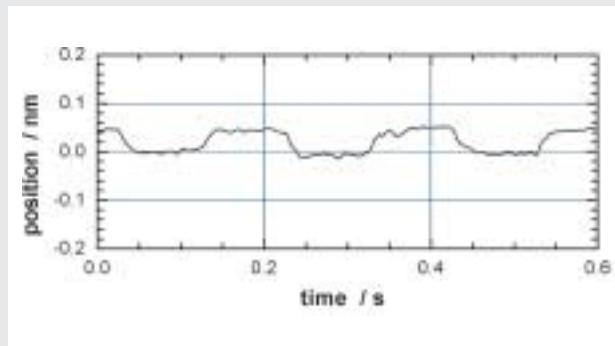
The products described in this datasheet are in part protected by the following patents: US-patent No. 6,800,984 German patent No. 10148267



5 nm steps performed by a system consisting of the N-214 NEXLINE® nanopositioner and the E-755.1A1 controller, measured by a Zygo ZMI 2000 interferometer. Note the excellent system response to consecutive 5 nm step commands. In this case the closed-loop resolution is limited by the linear encoder in the N-214 (5 nm / increment); the E-755 can work with linear encoders with sub-nanometer resolution.



Six-axis nonmagnetic Hexapod with N-215-based NEXLINE® high-load actuators for use in high magnetic fields. The system is driven by six E-755 controllers and additional hardware / software to automatically perform the parallel kinematics coordinate transformation.



50 picometer steps with a NEXLINE® drive in open-loop mode. Measured with external, ultra-high-resolution, capacitive sensor.

Technical Data

Models	E-755.1A1	E-755.101
Function	Digital controller for NEXLINE® linear drives, incremental encoder	Digital controller for NEXLINE® linear drives, open-loop
Sensor channels	1 incremental sensor	-
Logical axes	1	1
Piezo linear amplifier channels	4	4
Processor	DSP 32-bit floating point, 50 MHz	DSP 32-bit floating point, 50 MHz
Sensor sampling time	0.1 ms	-
Servo update time	0.2 ms	-
Dynamic cycle time	0.2 ms	0.1 ms
Effective DAC Resolution	24-bit	24-bit
Maximum output power	15 W / channel	15 W / channel
Average output power	3 W / channel, limited by temperature sensor	3 W / channel, limited by temperature sensor
Peak output current (20 ms)	60 mA / channel	60 mA / channel
Average output current	25 mA / channel, limited by temperature sensor	25 mA / channel, limited by temperature sensor
Current limitation	Short-circuit proof	Short-circuit proof
Temperature sensor	max. 70 °C, high voltage output is automatically deactivated if temperature out of range	max. 70 °C, high voltage output is automatically deactivated if temperature out of range
Output voltage	-250 to +250 V	-250 to +250 V
PZT voltage output socket	Sub-D special	Sub-D special
Sensor socket	Sub-D 15 (m)	-
Interfaces	RS-232	RS-232
Dimensions	264 x 260 x 47 mm	264 x 260 x 47 mm
Weight	2.3 kg	2.3 kg
Operating voltage	24 V (E-750.PS power supply) 20 to 30 V DC, 1.25 A, 5 A / 0.1 ms)	24 V (E-750.PS power supply) 20 to 30 V DC, 1.25 A, 5 A / 0.1 ms)

N-310K001

Compact NEXACT® Linear Nanopositioning Stage



- Travel Range 20 mm
- Linear Encoder for Direct Metrology, 25 nm Resolution
- Drive Force 10 N
- Compact Design
- Velocity 10 mm/s

N-510

High-Force NEXLINE® Z, Tip, Tilt Platform



- Parallel-Kinematic-Design
- 1.3 mm Vertical Travel, 10 mrad Tip / Tilt Angle
- 300 mm Diameter
- 200 N Load Capacity
- For Semiconductor Industry, Wafer Alignment

N-511

High-Force NEXLINE® XYZ Platform



- 500 N Load Capacity
- 1 mm Vertical Travel / 8 mrad Tip / Tilt Angle
- Linear Encoder for Direct Metrology, 5 nm Resolution
- With Special 3-Channel NEXLINE® Electronics

N-512

Non-Magnetic, High-Force NEXLINE® Open-Frame Stage



- 100 N Load Capacity
- 6 x 6 mm Travel Range
- Linearencoder for Direct Metrology, 5 nm Resolution
- For Superconductivity Experiments

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PI headquarters

Positioning Technology - 30 Years Ahead of its Time

PI has been a world market leader in nanopositioning technology and ultra-high-precision motion-control systems for many years. The first nanopositioning systems served research centers working in interferometry and laser technology. Today, entire branches of industry – such as the semiconductor industry, biotechnology and, increasingly, the machine-tool industry – are dependent on progress in nanopositioning.

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- Lasers, Optics, Microscopy
- Aerospace Engineering
- Precision Machining
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- Hexapods
- Micropositioners
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