

## N-310

NEXACT® OEM Miniature Linear Drive

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## About this Document

This document contains the information needed for the intended use of the N-310.

Basic knowledge of servo systems, drive technologies and suitable safety measures is assumed.

## Symbols and Typographic Conventions

### NOTICE



#### Dangerous situation

If not avoided, the dangerous situation will result in damage to the equipment.

- Actions to take to avoid the situation.

### INFORMATION

Information for easier handling, tricks, tips, etc.

The following symbols and markings are used in the user manuals of PI:

Symbol	Meaning
1.	Action consisting of several steps whose sequential order must be observed
2.	
➤	Action consisting of one or several steps whose sequential order is irrelevant
▪	List item
S. 5	Cross-reference to page 5

## Figures

For better understandability, the colors, proportions and degree of detail in illustrations can deviate from the actual circumstances. Photographic illustrations may also differ and must not be seen as guaranteed properties.

## Downloading Manuals

### INFORMATION

If a manual is missing or problems occur with downloading:

- Contact our customer service department (p. 9).

## INFORMATION

For products that are supplied with software (CD in the scope of delivery), access to the manuals is protected by a password. Protected manuals are only displayed on the website after entering the password.

The password is included on the CD of the product.

### For products with CD: Identify the password

1. Insert the product CD into the PC drive.
2. Switch to the Manuals directory on the CD.
3. In the Manuals directory, open the Release News (file including *releasenews* in the file name).
4. Find the user name and the password in the section "User login for software download" in the Release News.

### Downloading manuals

1. Open the website **www.pi.ws**.
2. If access to the manuals is protected by a password:
  - a) Click **Login**.
  - b) Log in with the user name and password.
3. Click **Search**.
4. Enter the product code up to the period (e.g., P-882) or the product family (e.g., PICMA® Bender) into the search field.
5. Click **Start search** or press the  key.
6. Open the corresponding product detail page in the list of search results:
  - a) If necessary: Scroll down the list.
  - b) If necessary: Click **Load more results** at the end of the list.
  - c) Click the corresponding product in the list.
7. Scroll down to the **Downloads** section on the product detail page.

The manuals are displayed under **Documentation**.
8. Click the desired manual and save it to the hard disk of your PC or to a data storage medium.

## Safety

### Intended Use

The N-310 NEXACT® linear drive provides motion in X axis.

Depending on the version the drives provide different travel ranges, see “Technical Data” on p. 10.

The N-310 drives can be integrated in other equipment. The drives are intended to be used in interior spaces and in an environment which is free of dirt, oil and lubricants.

The intended use of the N-310 is only possible in combination with suitable electronics that is available from PI.

For information about the electronics refer to its separate documentation.

### Safety Precautions

#### NOTICE



#### **Malfunction due to soiling!**

Any type of soiling, e.g. dust, oil, grease or condensation, will render the N-310 inoperable.

- Keep the N-310 free from dirt and condensation.
- Do **not** lubricate the N-310.
- Avoid touching the ceramic rod of the NEXACT® drive.

#### NOTICE



#### **Damage from changes in position due to external forces!**

Displacement of the rod from externally acting forces can damage the drive.

- Do **not** displace the rod of the NEXACT® drive manually!
- Especially when the drive is vertically mounted, make sure that the forces that act on the rod in the direction of motion do **not** exceed the active push/pull force of the drive (p. 10).
- Initiate all motions by sending motion commands to the controller (open-loop operation) or by using the driver electronics.

#### NOTICE



#### **Damage from exceeded load and torques!**

Exceeding the maximum allowable values for load and torque on the rod, as listed on p. 7, can damage the drive.

- Observe the given maximum allowable load and torque values.

## NOTICE



### Exceeded permanent operation frequency!

The N-310 can be damaged by permanent exceeded operation frequency.

- For permanent operation of the drives do not exceed operation frequencies of 1000 Hz.

## NOTICE



### Heating up of the N-310 during operation!

The heat produced during operation of the N-310 can affect your application.

- Install the N-310 so that the application is not impaired by the dissipated heat.
- Make sure that the complete bottom side of the N-310 is in contact with the surface on which the N-310 is mounted.

## NOTICE



### N-310 is maintenance-free!

The N-310 drive does not contain any user-serviceable parts.

- Never disassemble the N-310.

## Installation

### Grounding the N-310

The N-310 actuator has to be grounded. Since the N-310 does not feature a separate protective earth connection you have the following options:

- Connect the actuator to a protective earth conductor via an electrically conductive surface or
- Connect the actuator to a protective earth conductor via its mounting interfaces

Proceed as follows:

1. Make sure that the contact resistance is  $<0.1$  ohm at 25 A at all connection points relevant for mounting the protective earth conductor.
2. Observe the applicable standards for mounting the protective earth conductor.

## Requirements for Mounting the N-310

- ✓ Rod and movable platform of the stage, where the drive is to be integrated in, have to be parallel.
- ✓ Minimize forces vertical to the motion direction of the rod, i.e. forces parallel to Y axis. The maximum allowable force in this direction is 5 N.
- ✓ The coupling between rod and stage must be very stiff in the rod's motion direction, here along X axis, but flexible in Y axis. See Fig. 1 and Fig. 2 below for a drive with two examples for a coupling.
- ✓ Make sure that displacement of the rod in Z direction does not occur.

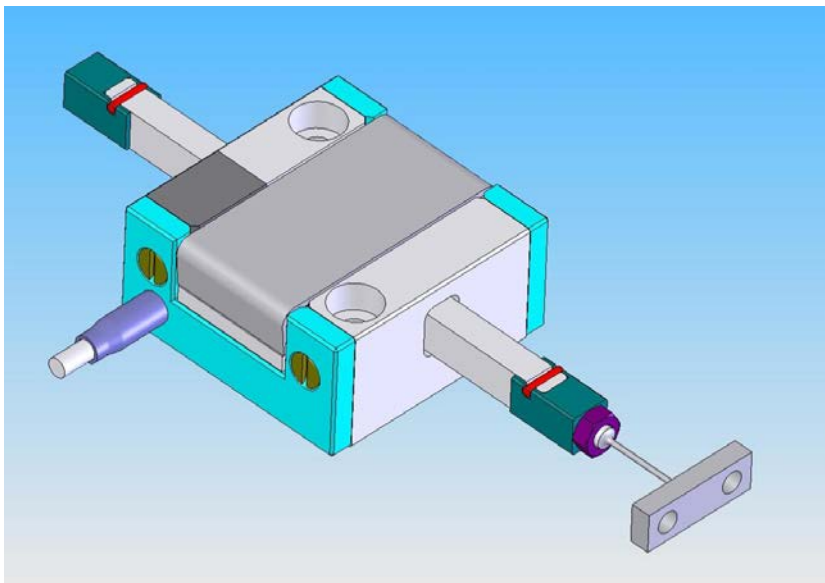


Figure 1: N-310.10 NEXACT<sup>®</sup> drive with an example for a coupling

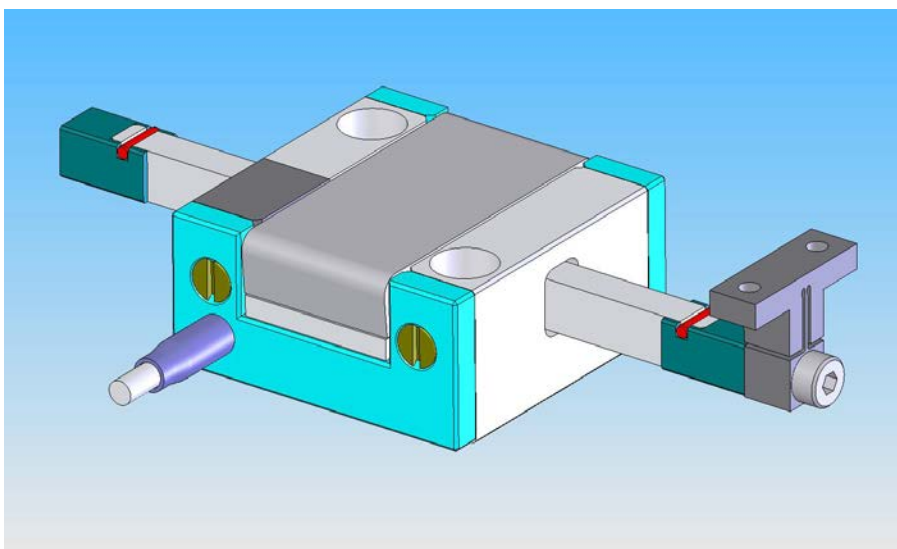


Figure 2: N-310.10 NEXACT<sup>®</sup> drive with another possible coupling

## Mounting the N-310

The M2 threaded holes on both ends of the runner are provided to couple the moving part of the system. Using the  $\varnothing 2.7$  mm holes in the drive housing, affix the drive to a mounting base.

See p. 12 for dimensions of the drive.

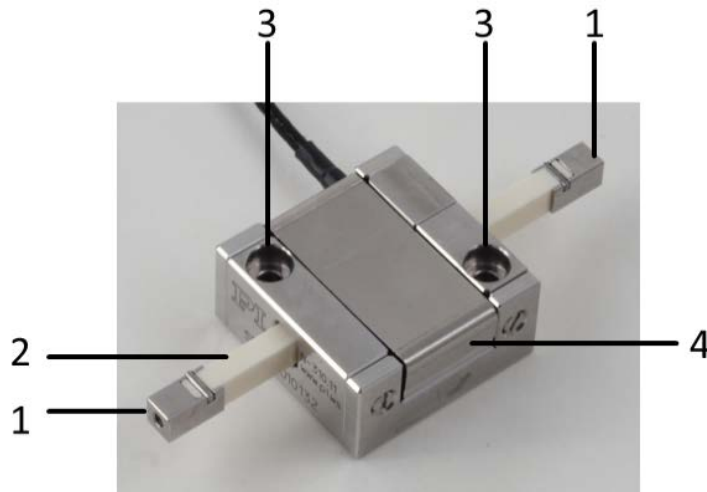


Figure 3: Mounting interfaces of NEXACT<sup>®</sup> drive, here: example of N-310.10

- 1 Mounting interface (M2) for the moving part of the system
- 2 Ceramic rod
- 3 Holes ( $\varnothing 2.7$  mm) for mounting on a base
- 4 Cover

## Maximum Allowable Load and Torque Values

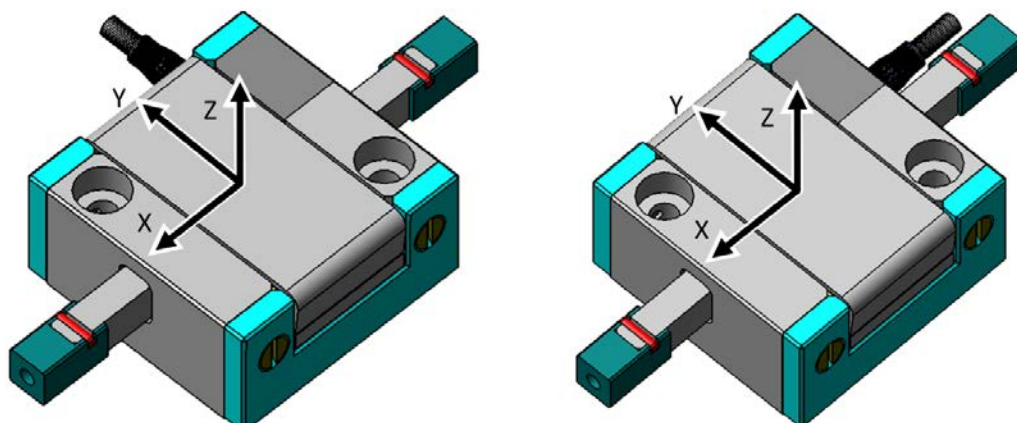


Figure 4: NEXACT<sup>®</sup> drive with coordinate system; Left: N-310.10, right: N-310.101

The following values refer to the N-310 NEXACT® drive with the coordinate system shown in the figure above

Max. lateral load / Y direction	5 N
Max. lateral load / Z direction	0 N*
Max. momentum around X axis	0.05 Nm
Max. momentum around Y axis	0 Nm
Max. momentum around Z axis	0.3 Nm

\* Even small loads over time will bring the rod into contact with the housing and thus diminish performance.

## Start-Up and Operation

### Start-Up and Operation

#### Requirements

- ✓ You have read and understood the safety precautions (p. 4).
- ✓ The N-310 may only be started up, operated, maintained and cleaned by authorized and qualified staff.

#### Starting up and operating the N-310

- Follow the instructions in the manual of the used controller for start-up and operation of the N-310.

## Discharging

The piezo actuators of the drive must be discharged before demounting. Demounting is necessary e.g. before cleaning or transporting the drives as well as for modifications.

#### Discharging the drive that is connected to the controller

- Set the piezo voltage to 0 V on the controller.

#### Discharging the drive that is not connected to the controller

- Connect the drive to the switched-off controller for 10 seconds.



## Maintenance

### NOTICE



#### Misalignment from loosening screws!

The N-310 is maintenance-free and achieves its positioning accuracy as a result of the optimum alignment of mechanical components and piezo actuators. Loosened screws cause a loss in positioning accuracy.

- Only loosen screws according to the instructions in this document.
- Do not open the N-310.

## Cleaning the N-310

### Requirements

- ✓ You have discharged the piezo actuators of the N-310 (p. 8).
- ✓ You have disconnected the N-310 from the controller.

### Cleaning the N-310

- Clean the surfaces of the N-310 with a cloth that is slightly dampened with a mild cleanser or disinfectant (e.g. ethanol or isopropanol).
- Do not do any ultrasonic cleaning.

## Customer Service

For inquiries and orders, contact your PI sales engineer or send us an e-mail ([info@pi.ws](mailto:info@pi.ws)).

If you have questions concerning your system, have the following information ready:

- Product codes and serial numbers of all products in the system
- Firmware version of the controller (if present)
- Version of the driver or the software (if present)
- Operating system on the PC (if present)

## Technical Data

### Data Table

	N-310	Unit	Tolerance
Active axes	X		
<b>Motion and positioning</b>			
Travel range, step mode	N-310.10, N-310.101: 10 mm N-310.11, N-310.111: 20 mm N-310.12, N-310.121: 30 mm N-310.13, N-310.131: 50 mm N-310.14, N-310.141: 75 mm N-310.15, N-310.151: 100 mm N-310.16, N-310.161: 125 mm		
Step size, step mode	5 nm to 10 µm		
Travel range, analog mode	±5	µm	max.
Resolution, open-loop <sup>1</sup>	0.03	nm	
Velocity <sup>2</sup>	10	mm/s	max.
<b>Mechanical properties</b>			
Push/pull force (active)	10	N	max.
Holding force (passive)	12	N	max.
<b>Drive properties</b>			
Drive type	NEXACT® linear drive		
Operating voltage	-10 to 45	V	
<b>Miscellaneous</b>			
Operating temperature range	0 to 50	°C	
Housing material	Stainless steel, nonmagnetic		
Mass (without cables and connectors)	50 (20 mm travel range)	g	
Cable length	1.5	m	

# User Manual

N310T0012, valid for N-310

KSch, 5/9/2019

	N-310	Unit	Tolerance
Cable exit	N-310.x0: Cable exit in Y N-310.x01: Cable exit in -X		
Connector	HD sub-D 15 (m)		
Recommended controller <sup>3</sup> / driver	E-712, E-861, E-861.11C885, E-862		




<sup>1</sup> Depending on the drive electronics; 1 nm with E-861

<sup>2</sup> Depending on the control electronics

<sup>3</sup> When the N-310 NEXACT® drive is combined with a sensor

## Maximum Ratings

The N-310 NEXACT® drives are designed for the following operating data:

Maximum operating voltage	Maximum operating frequency	Maximum power consumption
 45 V	 1500 Hz	 20 W

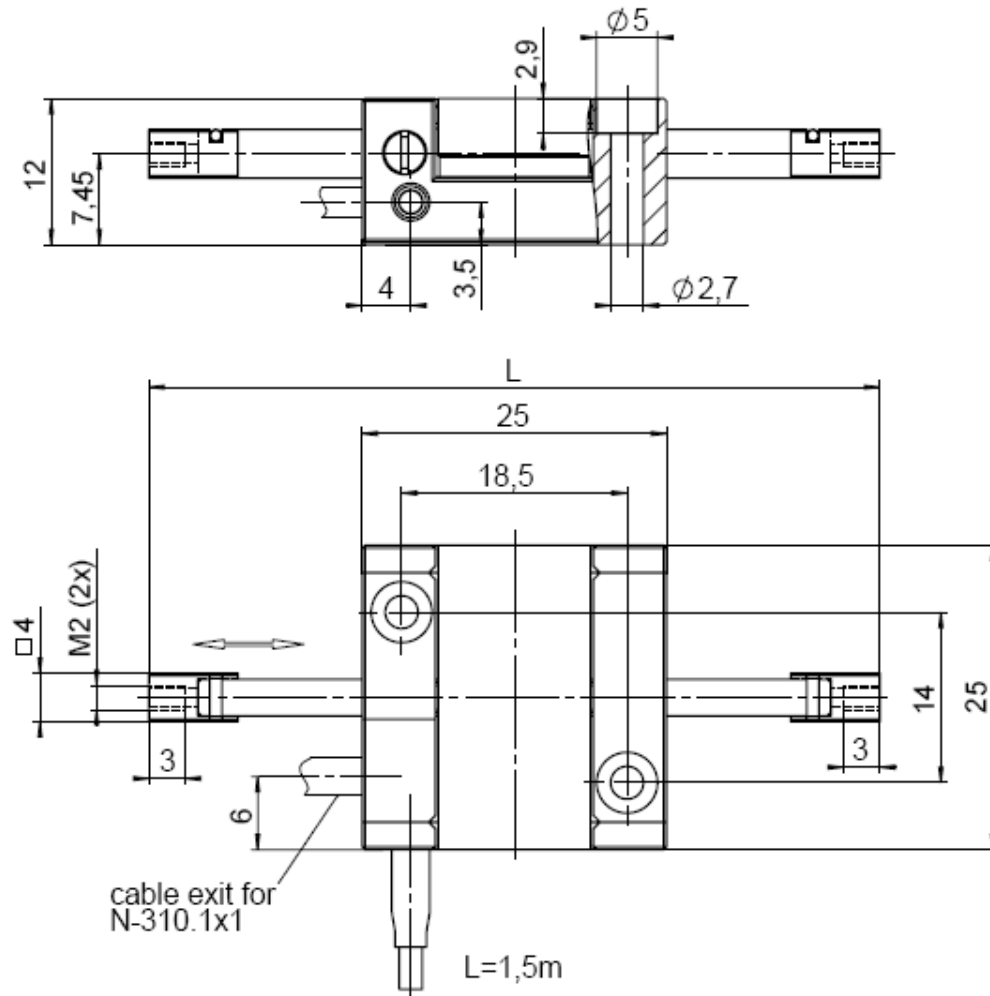
## Ambient Conditions and Classifications

The following ambient conditions and classifications must be observed for the N-310 drives:

Area of application	For indoor use only
Maximum altitude	2000 m
Air pressure	1100 hPa to 0.1 hPa
Relative humidity	Highest relative humidity 80 % for temperatures up to 31 °C, non-condensing Decreasing linearly to 50 % relative humidity at 40 °C, non-condensing
Storage temperature	-20 °C to 70 °C
Transport temperature	-20 °C to 70 °C
Overvoltage category	II
Protection class	I
Degree of pollution	1
Degree of protection according to IEC 60529	IP20

## Dimensions

Dimensions in mm. Note that the decimal places are separated by a comma in the drawings.



	L
N-310.11 / .111	60
N-310.12 / .121	70
N-310.13 / .131	90
N-310.14 / .141	115
N-310.15 / .151	140
N-310.16 / .161	165

Figure 5: N-310 drive

## Pin Assignment

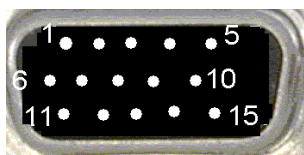


Figure 6: HD sub-D 15-pin (m) connector

Pin	Function*
1	Piezo 1
2	Piezo 2
3	-
4	-
5	-
6	Piezo 0
7	Piezo 3
8	-
9	-
10	-
11	GND
12	GND
13	-
14	-
15	-

\* The "-" sign indicates that the corresponding pin has not been assigned.

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## Old Equipment Disposal

In accordance with the applicable EU law, electrical and electronic equipment may not be disposed of with unsorted municipal wastes in the member states of the EU.

When disposing of your old equipment, observe the international, national and local rules and regulations.

To meet the manufacturer's product responsibility with regard to this product, Physik Instrumente (PI) GmbH & Co. KG ensures environmentally correct disposal of old PI equipment that was first put into circulation after 13 August 2005, free of charge.

If you have old PI equipment, you can send it postage-free to the following address:

Physik Instrumente (PI) GmbH & Co. KG

Auf der Roemerstr. 1

D-76228 Karlsruhe, Germany

