

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 with strict sequential order
2.	
➤	Action consisting of one or more steps without relevant sequential order
▪	Bullet point
p. 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).

Downloading manuals

1. Open the website **www.pi.ws**.
2. Search the website for the product number (e.g., N-310).
3. In the search results, select the product to open the product detail page.
4. Select **Downloads**.

The manuals are shown under **Documentation**.

5. For the desired manual, select **ADD TO LIST** and then **REQUEST**.
6. Fill out the request form and select **SEND REQUEST**.

The download link will be sent to the email address entered in the form.

Safety

Intended Use

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

The N-310 drive can be integrated in other equipment. The drive is 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. 9).
- 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.

- Do **not** exceed the maximum allowable load and torque values (p. 7).

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 drive 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 $<0.1 \text{ ohm}$ at 25 A at all connection points relevant for mounting the protective earth conductor.
2. Pay attention to 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.

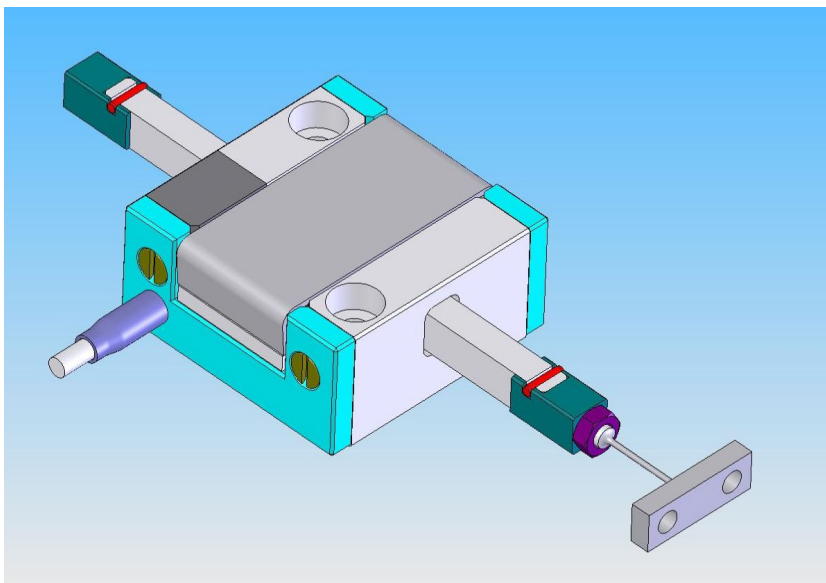


Figure 1: NEXACT® drive with an example for a coupling, here: example of N-310.10

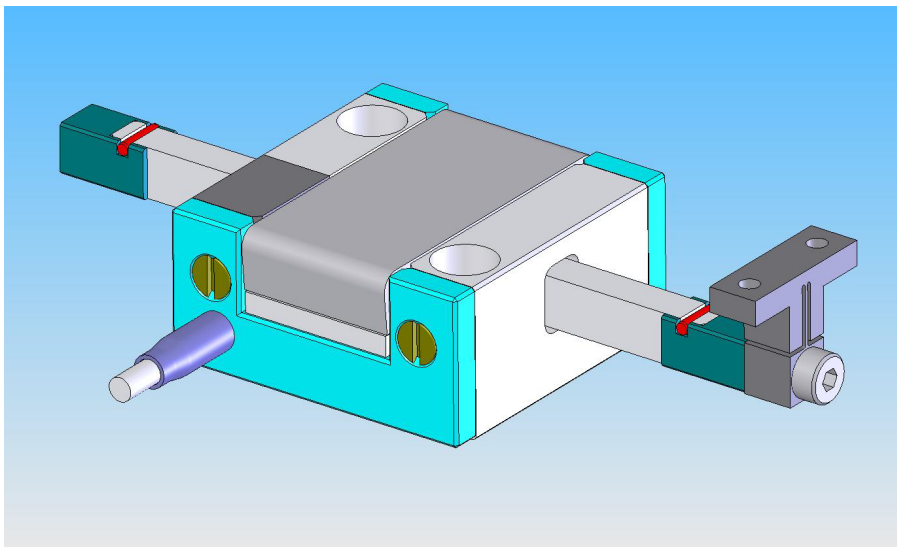


Figure 2: NEXACT® drive with another possible coupling, here: example of N-310.10

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.

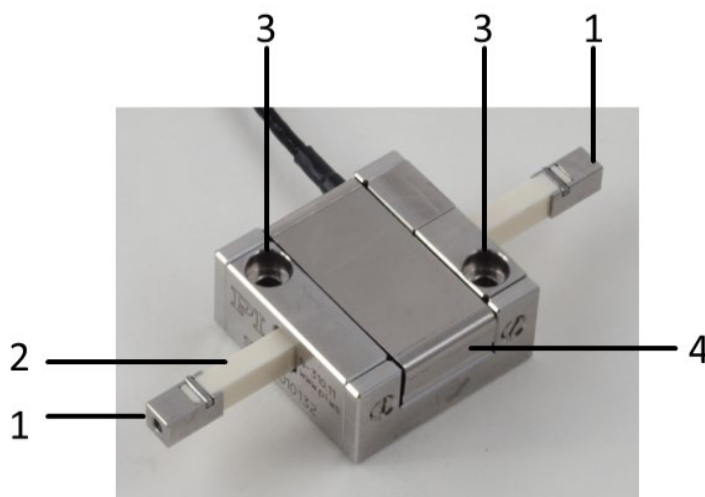


Figure 3: Mounting interfaces of NEXACT® drive, here: example of N-310.10

- 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

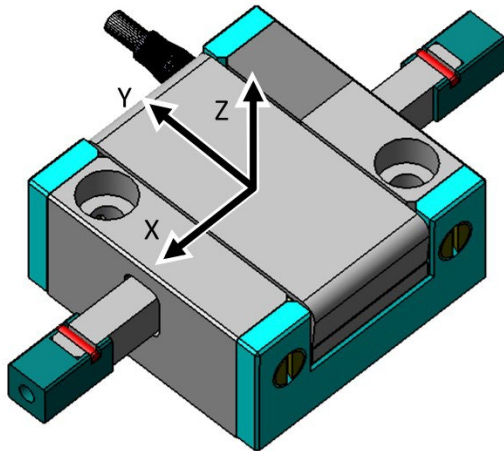


Figure 4: NEXACT® drive with coordinate system, here: example of N-310.10

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. 3).
- ✓ 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 email (service@pi.de).

- If you have any questions concerning your system, provide the following information:
 - Product and serial numbers of all products in the system
 - Firmware version of the controller (if applicable)
 - Version of the driver or the software (if applicable)
 - Operating system on the PC (if applicable)
- If possible: Take photographs or make videos of your system that can be sent to our customer service department if requested.

Technical Data

Subject to change. You can find the latest product specifications on the product web page at www.pi.ws.

Data Table

Motion	Unit	Tolerance	N-310.11
Active axes			X
Travel range in X	mm		20
Travel range in X (analog mode)	μm	Max.	10
Maximum velocity in X, unloaded	mm/s		10

Positioning	Unit	Tolerance	N-310.11
Step size in full step mode	μm		10
Resolution in X, open loop	nm	Typ.	0.03

Drive Properties	Unit	Tolerance	N-310.11
Drive type			NEXACT® piezo walking drive
Operating voltage	V		-10 to +45
Drive force in positive	N	Max.	10

Drive Properties	Unit	Tolerance	N-310.11
direction of motion in X			
Drive force in negative direction of motion in X	N	Max.	10

Mechanical Properties	Unit	Tolerance	N-331.11
Holding force in X, passive	N	Max.	12
Overall mass	g	±5 %	50
Material			Stainless steel, ceramic; cable: PFA, PTFE

Miscellaneous	Unit	Tolerance	N-331.11
Operating temperature range	°C		0 to 50
Connector			HD D-sub 15 (m)
Cable length	m	±50 mm	1.5
Recommended controllers / drivers			E-712, E-861.11C885




Maximum velocity in X, unloaded: Depending on the drive electronics.

Resolution in X, open loop: Depending on the drive electronics

At PI, technical data is specified at 22 ±3 °C. Unless otherwise stated, the values are for unloaded conditions. Some properties are interdependent. The designation "typ." indicates a statistical average for a property; it does not indicate a guaranteed value for every product supplied. During the final inspection of a product, only selected properties are analyzed, not all. Please note that some product characteristics may deteriorate with increasing operating time.

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

Pay attention to the following ambient conditions and classifications 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.

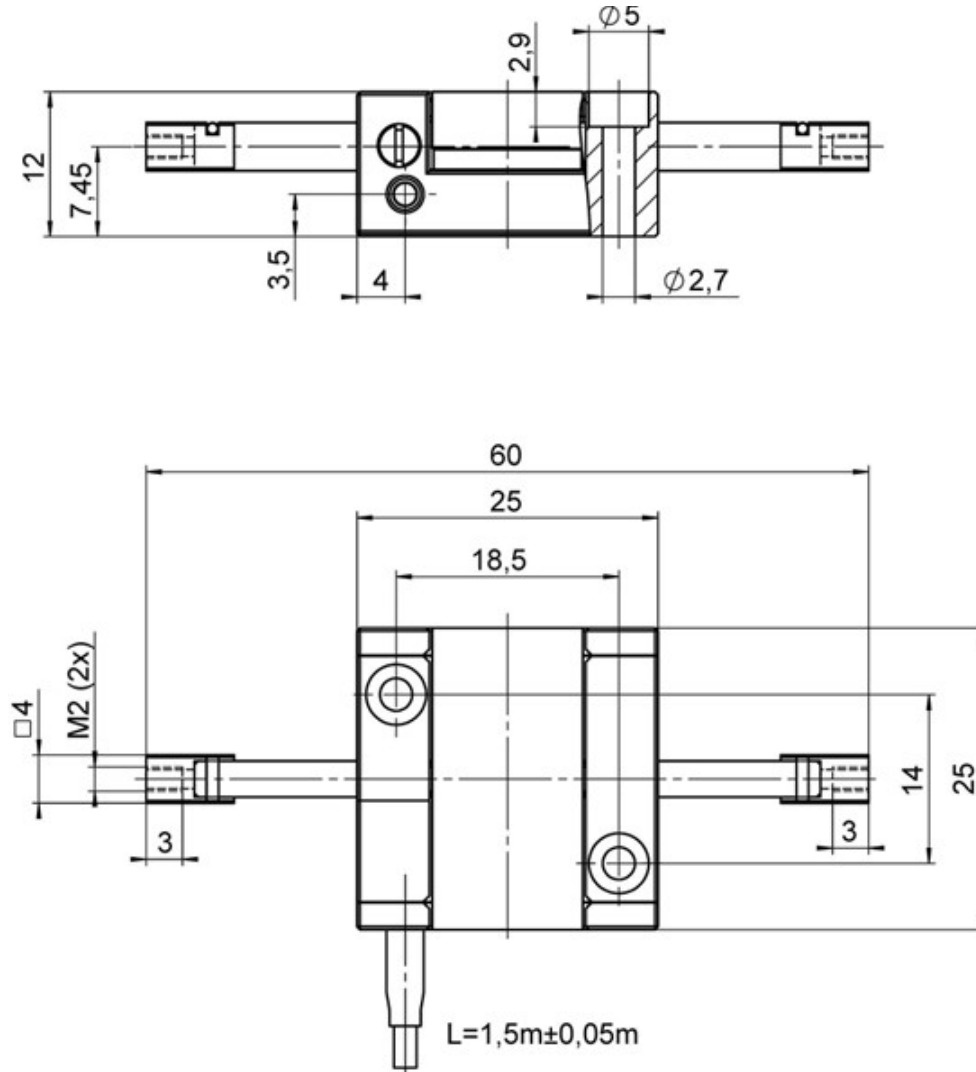


Figure 5: N-310.11 drive

Pin Assignment

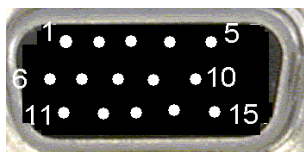


Figure 6: HD sub-D 15-pin (m) connector

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.

Old Equipment Disposal

In accordance with EU law, electrical and electronic equipment may not be disposed of in EU member states via the municipal residual waste.

Dispose of your old equipment according to international, national, and local rules and regulations.

In order to fulfill its responsibility as the product manufacturer, Physik Instrumente (PI) SE & Co. KG undertakes environmentally correct disposal of all old PI equipment made available on the market after 13 August 2005 without charge.

Any old PI equipment can be sent free of charge to the following address:

Physik Instrumente (PI) SE & Co. KG
Auf der Römerstr. 1
D-76228 Karlsruhe, Germany

