This document describes the following product:

- **P-763.22C**
  XY Nanopositioning System with Small Footprint and Large Aperture, 200 µm × 200 µm, Direct Metrology, Capacitive Sensors
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NanoCube®, NanoAutomation®, Picoactuator®, PInano®

The products described in this document are in part protected by the following patents:

German patent no. 10021919C2
German patent no. 10234787C1
German patent no. 10348836B3
German patent no. 102005015405B3
German patent no. 102007011652B4
US patent no. 7,449,077
Japanese patent no. 4667863
Chinese patent no. ZL03813218.4

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Subject to change without notice. This manual is superseded by any new release. The latest release is available for download (p. 3) on our website.
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1 About this Document

In this Chapter

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1.1 Goal and Target Audience of this User Manual

This manual contains the necessary information on the intended use of the P-763.

Basic knowledge of control technology, drive technologies and suitable safety measures is assumed.

The latest versions of the user manuals are available for download (p. 3) on our website.

1.2 Symbols and Typographic Conventions

The following symbols and typographic conventions are used in this user manual:

---

**CAUTION**

Dangerous situation
If not avoided, the dangerous situation will result in minor injury.

- Actions to take to avoid the situation.

---

**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.

<table>
<thead>
<tr>
<th>Symbol/Label</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Action consisting of several steps whose sequential order must be observed</td>
</tr>
<tr>
<td>2.</td>
<td>Action consisting of one or several steps whose sequential order is irrelevant</td>
</tr>
<tr>
<td>▪</td>
<td>List item</td>
</tr>
<tr>
<td>p. 5</td>
<td>Cross-reference to page 5</td>
</tr>
<tr>
<td>RS-232</td>
<td>Labeling of an operating element on the product (example: socket of the RS-232 interface)</td>
</tr>
<tr>
<td>✔</td>
<td>Warning signs affixed to the product that refer to detailed information in this manual.</td>
</tr>
</tbody>
</table>

1.3 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.

1.4 Other Applicable Documents

The devices and software tools which are mentioned in this documentation are described in their own manuals.

The latest versions of the user manuals are available for download (p. 3) on our website.
1.5 Downloading Manuals

**INFORMATION**
If a manual is missing or problems occur with downloading:
- Contact our customer service department (p. 33).

**INFORMATION**
For some products (e.g. Hexapod systems and electronics that are delivered with a CD), access to the manuals is password-protected. The password is stored on the CD. Availability of the manuals:
- Password-protected manuals: FTP download directory
- Freely available manuals: PI website
- Follow the corresponding instructions for downloading.

**Download freely accessible manuals**
2. Click *Downloads*.
3. Click the corresponding product category.
4. Go to the corresponding product code.
   - The available manuals are displayed.
5. Click the desired manual and save it on the hard disk of your PC or on a data storage medium.
Download password-protected manuals

1. Insert the product CD in 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.
5. Open the FTP download directory (`ftp://pi-ftp.ws`).
   - Windows operating systems: Open the FTP download directory in Windows Explorer.
6. Log in with the user name and the password from the Release News.
7. In the directory of the corresponding product, go to the Manuals sub-directory.
8. Copy the desired manual to the hard disk of your PC or to a data storage medium.
2 Safety

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2.1 Intended Use

The P-763 is a laboratory device as defined by DIN EN 61010-1. It is intended to be used in interior spaces and in an environment which is free of dirt, oil, and lubricants.

Based on its design and realization, the P-763 is intended for fine positioning as well as the fast and precise movement of small objects. The specifications of the P-763 apply to horizontal mounting. The motion takes place horizontally in two axes.

The intended use of the P-763 is only possible in combination with suitable drive and control electronics (p. 12) available from PI. The electronics is not included in the scope of delivery of the P-763.

The electronics must provide the required operating voltages. To ensure proper performance of the servo-control system, the electronics must also be able to read out and process the signals from the position sensors.

2.2 General Safety Instructions

The P-763 is built according to state-of-the-art technology and recognized safety standards. Improper use can result in personal injury and/or damage to the P-763.

- Only use the P-763 for its intended purpose, and only use it if it is in a good working order.
- Read the user manual.
- Immediately eliminate any faults and malfunctions that are likely to affect safety.

The operator is responsible for the correct installation and operation of the P-763.
The P-763 is driven by piezo actuators. Temperature changes and compressive stresses can induce charges in piezo actuators. After being disconnected from the electronics, piezo actuators can stay charged for several hours. Touching or short-circuiting the contacts in the connectors of the P-763 can lead to minor injuries. The piezo actuators can be destroyed by an abrupt contraction.

- Do not open the P-763.
- Discharge the piezo actuators of the stage before installation: Connect the stage to the switched-off PI controller, which is equipped with an internal discharge resistor.
- Do not pull out the connectors from the electronics during operation.
- Do not touch the contacts in the connectors.
- Secure the connectors of the stage with screws against being pulled out of the controller.

Mechanical forces can damage or misalign the P-763.

- Avoid impacts that affect the P-763.
- Do not drop the P-763.
- Do not exceed the maximum permissible stress and load capacities according to the specifications (p. 35).
- Only hold the P-763 externally by the base body.

The P-763 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 manual.
- Do not open the P-763.
2.3 Organizational Measures

User manual

- Always keep this user manual available by the P-763. The latest versions of the user manuals are available for download (p. 3) on our website.
- Add all information given by the manufacturer to the user manual, for example supplements or Technical Notes.
- If you pass the P-763 on to other users, also turn over this user manual as well as other relevant information provided by the manufacturer.
- Only use the device on the basis of the complete user manual. Missing information due to an incomplete user manual can result in minor injury and property damage.
- Only install and operate the P-763 after having read and understood this user manual.

Personnel qualification

The P-763 may only be installed, started up, operated, maintained and cleaned by authorized and appropriately qualified personnel.
3 Product Description

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Product View ................................................................................................................. 9
Product Labeling ........................................................................................................... 10
Scope of Delivery ........................................................................................................... 11
Recommended Piezo Controllers ................................................................................ 12
Technical Features ........................................................................................................ 12

3.1 Product View

The figure serves as an example and can differ from your stage model.

Figure 1: Example of product view

1 Base body
2 Moving platform
3 Cable exit (X axis)
4 Protective earth connection
5 Cable exit (Y axis)
X Positive direction of motion of the X axis
Y Positive direction of motion of the Y axis
3.2 Product Labeling

![Diagram of P-763 Stage]

Figure 2: P-763: Position of the product labeling (example of a view from above)

<table>
<thead>
<tr>
<th>Position</th>
<th>Labeling</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>P-763.22C</td>
<td>Product name</td>
</tr>
<tr>
<td>A</td>
<td>114031266</td>
<td>Serial number (example), individual for each P-763. Meaning of the places (counting from left): 1 = internal information, 2 and 3 = manufacturing year, 4 to 9 = consecutive numbers</td>
</tr>
<tr>
<td>A</td>
<td>![Manufacturer's logo]</td>
<td>Manufacturer's logo</td>
</tr>
<tr>
<td>A</td>
<td>![Warning sign]</td>
<td>Warning sign &quot;Observe manual!&quot;</td>
</tr>
<tr>
<td>A</td>
<td>![Old equipment disposal symbol]</td>
<td>Old equipment disposal (p. 41)</td>
</tr>
<tr>
<td>A</td>
<td>Country of origin: Germany</td>
<td>Country of origin</td>
</tr>
<tr>
<td>A</td>
<td><a href="http://WWW.PI.WS">WWW.PI.WS</a></td>
<td>Manufacturer's address (website)</td>
</tr>
<tr>
<td>A</td>
<td>![CE conformity mark]</td>
<td>CE conformity mark</td>
</tr>
<tr>
<td>A</td>
<td>![Symbol for the protective earth conductor]</td>
<td>Symbol for the protective earth conductor, marks the protective earth connection of the P-763</td>
</tr>
<tr>
<td>A</td>
<td>X</td>
<td>Cable exit of the X axis</td>
</tr>
<tr>
<td>A</td>
<td>Y</td>
<td>Cable exit of the Y axis</td>
</tr>
</tbody>
</table>
Position | Labeling | Description
--- | --- | ---
B | Arrow and letter X | Positive direction of motion of the X axis
C | Arrow and letter Y | Positive direction of motion of the Y axis

![Warning Sign](image)

*Figure 3: P-763: "Residual voltage" warning sign on connector*

Warning sign "Residual voltage": Notice of risk of electric shock (p. 5)

### 3.3 Scope of Delivery

<table>
<thead>
<tr>
<th>Item ID</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-763.22C</td>
<td>XY nanopositioning system with small footprint and large aperture, 200 μm × 200 μm, direct metrology, capacitive sensors</td>
</tr>
</tbody>
</table>
| 000036450 | M4 screw set for protective earth, consisting of:
  - 1 M4x8 flat-head screw with cross recess, ISO 7045
  - 2 safety washers
  - 2 flat washers |
| PZ240EK | Short instructions for piezo positioning systems |
3.4 Recommended Piezo Controllers

<table>
<thead>
<tr>
<th>Item ID</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-709.CRG*</td>
<td>Digital piezo controller, 1 channel, OEM module, -30 to 130 V, capacitive sensor, bench-top device</td>
</tr>
<tr>
<td>E-709.CHG*</td>
<td>Digital piezo controller, 1 channel, -30 to 130 V, capacitive sensor, bench-top device</td>
</tr>
<tr>
<td>E-725.3CD**</td>
<td>Digital multi-channel piezo controller, 3 channels, -30 to 135 V, Sub-D connector(s), capacitive sensors</td>
</tr>
<tr>
<td>E-725.3CDA**</td>
<td>Digital multi-channel piezo controller, 3 channels, -30 to 135 V, Sub-D connector(s), capacitive sensors, analog inputs</td>
</tr>
</tbody>
</table>

* One device per axis
** E-710.3D0 adapter cable required (must be ordered separately)

➢ To order, contact our customer service department (p. 33).

3.5 Technical Features

3.5.1 PICMA® Piezo Actuators

P-763 stages are driven by PICMA® piezo actuators. PICMA® actuators have all-ceramic insulation and are therefore far superior to conventional actuators in respect to performance and lifetime. The monolithic piezoceramic block is protected against humidity and failure due to increased leakage current by a ceramic insulation layer. In this way, an especially high reliability is achieved even under extreme ambient conditions. In contrast to motorized drives, there are no rotating parts or friction. The piezo actuators are therefore backlash-, maintenance- and wear-free.

3.5.2 Flexure Guides

P-763 stages have flexure guides (flexures) for frictionless motion and high guiding accuracies.

A flexure guide is an element which is free from static and sliding friction. It is based on the elastic deformation (bending) of a solid (e.g. steel) and does not have any rolling or sliding parts. Flexure elements have a high stiffness and load capacity. Flexure guides are maintenance- and wear-free. They are 100 % vacuum compatible, function in a wide temperature range and do not require any lubricants.
3.5.3 Capacitive Sensors

Capacitive sensors measure the position directly on the moving platform (direct metrology) and work without contact. Neither friction nor hysteresis interferes with the motion, which allows excellent linearity values to be achieved in combination with the high position resolution. In connection with suitable electronics, capacitive sensors achieve the best resolution, stability and bandwidth.

3.5.4 ID Chip

An ID chip is located in the Sub-D connector of the stage. When the stage is calibrated at the factory with digital electronics, the calibration data is saved together with specific product information on the ID chip. When switched on, digital electronics read the data from the ID chip of the connected stage. Stages whose ID chip contains the calibration data can therefore be connected to any suitable digital electronics without a new calibration.

For more information on the ID chip, see the manual of the controller used.
4 Unpacking

**NOTICE**

Mechanical overload from incorrect handling!
An impermissible mechanical overload of the moving platform of the P-763 can cause damage to the piezo actuators, sensors and flexure joints of the P-763 as well as losses of accuracy.

- Only hold the P-763 externally by the base body.

1. Unpack the P-763 with care.
2. Compare the contents against the items covered by the contract and against the packing list.
3. Inspect the contents for signs of damage. If parts are missing or you notice signs of damage, contact PI immediately.
4. Keep all packaging materials in case the product needs to be returned.
5 Installation

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5.1 General Notes on Installation

**CAUTION**

Dangerous voltage and residual charge on piezo actuators!
The P-763 is driven by piezo actuators. Temperature changes and compressive
stresses can induce charges in piezo actuators. After being disconnected from the
electronics, piezo actuators can stay charged for several hours. Touching or short-
circuiting the contacts in the connectors of the P-763 can lead to minor injuries. The
piezo actuators can be destroyed by an abrupt contraction.

➢ Do **not** open the P-763.
➢ Discharge the piezo actuators of the stage before installation:
  Connect the stage to the switched-off PI controller, which is equipped with an
  internal discharge resistor.
➢ Do **not** pull out the connectors from the electronics during operation.

Touching the contacts in the connectors can lead to an electric shock (max. 130 V
DC) and minor injuries.

➢ Do **not** touch the contacts in the connectors.
➢ Secure the connectors of the stage with screws against being pulled out of the
  controller.
NOTICE
Mechanical overload from incorrect handling!
An impermissible mechanical overload of the moving platform of the P-763 can cause damage to the piezo actuators, sensors and flexure joints of the P-763 as well as losses of accuracy.

➢ Only hold the P-763 externally by the base body.

NOTICE
Damage from unsuitable cables!
Unsuitable cables can damage the stage and the electronics.

➢ Only use cables provided by PI for connecting the P-763 to the electronics.

NOTICE
Damage from incorrect mounting!
Incorrect mounting of the P-763 or incorrectly mounted parts can damage the P-763.

➢ Only mount the P-763 and the loads on the mounting fixtures (holes) intended for this purpose.

NOTICE
Damage due to incorrectly tightened screws!
Incorrectly tightened screws can cause damage.

➢ Observe the torque range (p. 38) given for the screws used during installation.

INFORMATION
Extended cables can reduce the positioning accuracy of the P-763 or affect the sensor processing by the electronics.

➢ Do not use cable extensions. If you need longer cables, contact our customer service department (p. 33).
5.2 Connecting the P-763 to the Protective Earth Conductor

**INFORMATION**
In the case of P-763 stages with Sub-D connectors, ground loops can occur when the stage is grounded via its protective earth connector as well as by the shield of the connection cable for the electronics.

- If a ground loop occurs, contact our customer service department (p. 33).

**INFORMATION**
- Observe the applicable standards for mounting the protective earth conductor.

The P-763 is equipped with an M4 hole for fastening the protective earth conductor. This hole is located next to the cable exit and is marked with the protective earth conductor symbol ⭈ (see "Dimensions", p. 37).

**Prerequisite**
- ✔ You have read and understood the general notes on installation (p. 17).
- ✔ The stage is **not** connected to the electronics.

**Tools and accessories**
- Suitable protective earth conductor: Cross-sectional area of the cable \( \geq 0.75 \text{ mm}^2 \)
- Supplied M4 protective earth screw set (p. 11) for connecting the protective earth conductor
- Suitable screwdriver
Connecting the P-763 to the protective earth conductor

1. If necessary, fasten a suitable cable lug to the protective earth conductor.

2. Fasten the cable lug of the protective earth conductor using the M4 screw on the protective earth connection of the P-763 as shown in the profile view.

3. Tighten the M4 screw with a torque of 1.2 Nm to 1.5 Nm.

4. Make sure that the contact resistance at all connection points relevant for mounting the protective earth conductor is <0.1 Ω at 25 A.
5.3 Mounting the P-763

**NOTICE**

Warping of the P-763 due to mounting on uneven surfaces!
Mounting the P-763 on an uneven surface can warp the P-763. Warping reduces the accuracy.

- Mount the P-763 on an even surface. The recommended evenness of the surface is ≤20 µm.
- For applications with great temperature changes:
  Only mount the P-763 on surfaces that have the same or similar thermal expansion properties as the P-763.

**NOTICE**

Tensile stress on piezo actuator with vertical mounting!
When the stage is mounted vertically, tensile stress can result in particular alignments that reduces the preload of the piezo actuator and thus destroys it.

- If you want to mount the P-763 vertically, contact our customer service department (p. 33).

The figure below serves as an example and can differ from your stage model.

![Figure 5: P-763: Holes at the bottom side for mounting the stage on a surface](image-url)
5 Installation

Prerequisite

✓ You have read and understood the general notes on installation (p. 17).

Tools and accessories

 Four M3 screws of suitable length (p. 37)
 Suitable screwdriver

Mounting the stage on a surface

1. Position the stage on an even surface.
2. Mount the stage to the mounting holes (see figure) with suitable screws. Observe the specified torque range (p. 38) while doing so.

5.4 Affixing the Load

NOTICE

Mechanical overload due to high torques and high loads!
When affixing the load, high torques and high loads can overload the moving platform of the P-763. Mechanical overload can cause damage to the piezo actuators, sensors and flexure joints of the P-763 and lead to losses in accuracy.

➢ Observe the torque range (p. 38) given for the screws used during installation.
➢ Avoid torques >100 Ncm on the moving platform.
➢ Do not exceed the maximum permissible stress and load capacities according to the specifications (p. 35).

NOTICE

Warping of the P-763 due to affixing of loads with uneven contact surface!
Affixing loads with an uneven contact surface can warp the P-763. Warping reduces the accuracy.

➢ Only affix loads on the P-763 whose contact surface with the moving platform of the stage has an evenness of at least 20 μm.
➢ For applications with great temperature changes: Only affix loads on the P-763 that have the same or similar thermal expansion properties as the P-763.
NOTICE

Center of load at unsuitable position!
If the center of load is located far outside of the moving platform (e.g., high set-ups and long levers), the P-763 can be damaged from high strain on the flexure guides, high torques and oscillations. 

- If the center of the load to be affixed is far above or to the side of the moving platform, adjust the controller settings before start-up or contact our customer service department (p. 33).

NOTICE

Screws that are too long!
The P-763 can be damaged by screws that are too long.

- Note the depth of the mounting holes in the moving platform (p. 37).
- Only use screws of the correct length for the respective mounting holes.

INFORMATION

The positive direction of motion of the axes is given in the product view (p. 9).

Center of load at the optimum position:

Figure 6: Example of an optimally placed load
Prerequisite

✓ You have read and understood the general notes on installation (p. 17).

Tools and accessories

- Screws of appropriate size and length (p. 37)
- Suitable tools

Affixing the load

- Only affix loads to the threaded holes (p. 37) intended for this purpose and with suitable screws. Observe the specified torque range (p. 38) while doing so, and avoid torques >100 Ncm on the moving platform.
- Affix the load so that it is centered and that the center of load is on the moving platform.
6 Start-Up and Operation

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6.1 General Notes on Start-Up and Operation

CAUTION

Risk of electric shock if the protective earth conductor is not connected!
If a protective earth conductor is not or not properly connected, dangerous touch voltages can occur on the P-763 in the case of malfunction or failure of the system. If touch voltages exist, touching the P-763 can result in minor injuries from electric shock.

- Connect the P-763 to a protective earth conductor (p. 19) before start-up.
- Do not remove the protective earth conductor during operation.
- If the protective earth conductor has to be removed temporarily (e.g. in the case of modifications), reconnect the P-763 to the protective earth conductor before starting it up again.

NOTICE

Destruction of the piezo actuator by electric flashovers!
The use of the P-763 in environments that increase the electrical conductivity can lead to the destruction of the piezo actuator by electric flashovers. Electric flashovers can be caused by moisture, high humidity, liquids and conductive materials such as metal dust. In addition, electric flashovers can also occur in certain air pressure ranges due to the increased conductivity of the air.

- Avoid operating the P-763 in environments that can increase the electric conductivity.
- Only operate the P-763 within the permissible ambient conditions and classifications (p. 36).
NOTICE

Reduced lifetime of the piezo actuator due to permanently high voltage!
The permanent application of a high static voltage to piezo actuators leads to a
considerable reduction in the lifetime of the piezo ceramic of the actuator.

- When the P-763 is not used but the controller remains switched on to ensure
temperature stability, discharge the P-763 (p. 27).

NOTICE

Operating voltage too high or incorrectly connected!
Operating voltages that are too high or incorrectly connected can cause damage to
the P-763.

- Only operate the P-763 with controllers/drivers and original accessories from PI.
- Do not exceed the operating voltage range (p. 36) for which the P-763 is
  specified.
- Only operate the P-763 when the operating voltage is properly connected; see
  "Pin Assignment" (p. 38).

NOTICE

Uncontrolled oscillation!
Oscillations can cause irreparable damage to the stage. Oscillations are indicated by
a humming and can result from the following causes:

- A change in the load and/or dynamics requires the servo-control parameters to
  be adjusted.
- The stage is operated near its resonant frequency.

If you notice oscillations:

- In closed-loop operation, immediately switch off the servo mode.
- In open-loop operation, immediately stop the stage.

INFORMATION

The positive direction of motion of the axes is given in the product view (p. 9).
6 Start-Up and Operation

6.2 Operating the P-763

 Follow the instructions in the manual of the controller used for start-up and operation of the P-763.

6.3 Discharging the P-763

The P-763 must be discharged in the following cases:

 Before installation
 If the P-763 is not used but the controller remains switched on to ensure temperature stability
 Before demounting (e.g. before cleaning and transporting the P-763 and for modifications)

The P-763 is discharged through the internal discharge resistor of the controller from PI.

Discharging a P-763 that is connected to the controller

In closed-loop operation:

1. Switch off the servo mode on the controller.
2. Set the piezo voltage to 0 V on the controller.

In open-loop operation:

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

Discharging a P-763 that is not connected to the controller

 Connect the stage to the switched-off controller from PI.

INFORMATION

Sound and vibration (e.g. footfall, impacts) can be transmitted to the stage and can affect its performance with regard to position stability.

 Avoid transmitting sound and vibration while the stage is being operated.
7 Maintenance

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7.1 General Notes on Maintenance

NOTICE

Misalignment from loosening screws!
The P-763 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 manual.
- Do not open the P-763.

7.2 Cleaning the P-763

Prerequisites

- You have discharged the piezo actuators of the P-763 (p. 27).
- You have disconnected the P-763 from the controller.

Cleaning the P-763

- Clean the surfaces of the P-763 with a cloth that is slightly dampened with a mild cleanser or disinfectant (e.g. ethanol or isopropanol).
- Do not do any ultrasonic cleaning.
## 8 Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Causes</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>No or limited motion</td>
<td>The cable is not connected correctly</td>
<td>➢ Check the cable connections.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>➢ Do not exceed the maximum permissible stress and load capacities according to the specifications (p. 35).</td>
</tr>
<tr>
<td>Excessive load</td>
<td></td>
<td>➢ Perform a zero-point adjustment of the sensor (see controller manual).</td>
</tr>
<tr>
<td>Zero shift of the sensor</td>
<td>Load applied in direction of motion</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ambient/operating temperature of the stage far above or below calibration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>temperature (21°C to 24°C)</td>
<td></td>
</tr>
<tr>
<td>Reduced accuracy</td>
<td>Warping of the base body or the moving platform</td>
<td>➢ Only mount the P-763 on surfaces with the following characteristics:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>➢ Evenness of at least 20 μm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>➢ The thermal expansion properties are similar to those of the P-763 (e. g. surfaces made of aluminum).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>➢ Only affix loads with the following characteristics on the P-763:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>➢ The contact surface of the load has an evenness of at least 20 μm.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>➢ The thermal expansion properties are similar to those of the P-763 (e. g. loads made of aluminum).</td>
</tr>
</tbody>
</table>
### Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Causes</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>The stage starts oscillating or positions inaccurately</td>
<td>Servo-control parameters incorrectly set because e.g. the load was changed</td>
<td>1. Immediately switch off the servo mode of the corresponding stage axes.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Check the settings of the servo-control parameters on the controller.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Adjust the servo-control parameters on the controller according to the load change.</td>
</tr>
<tr>
<td>Open-loop operation near the resonant frequency</td>
<td></td>
<td>➢ In open-loop operation, only operate the stage with a frequency that is below the resonant frequency.</td>
</tr>
</tbody>
</table>

If the problem that occurred with your system is not listed in the table above or cannot be solved as described, contact our customer service department (p. 33).
9 Customer Service

For inquiries and orders, contact your PI sales engineer or send us an e-mail (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)

The latest versions of the user manuals are available for download (p. 3) on our website.
10 Technical Data

In this Chapter

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Ambient Conditions and Classifications ...................................... 36
Dimensions ........................................................................... 37
Torque for Stainless Steel Screws (A2-70) ........................................... 38
Pin Assignment................................................................. 38

10.1 Specifications

10.1.1 Data Table

<table>
<thead>
<tr>
<th>Active axes</th>
<th>P-763.22C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>X, Y</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Motion and positioning

Integrated sensor: Capacitive sensors

- Closed-loop travel in X, Y: 200 µm
- Open-loop resolution in X, Y: 1 nm
- Closed-loop resolution in X, Y: 2 nm
- Linearity error in X, Y: 0.02%
- Repeatability X, Y: ±5 nm

Mechanical properties

- Loaded resonant frequency in X: 180 Hz (260 g)
- Load capacity: 10 N

Drive properties

- Piezoceramics: PICMA® P-887
- Electrical capacitance in X, Y: 12.8 µF

Miscellaneous

- Operating temperature range: -20 to 80 °C
- Material: Aluminum, steel
- Dimensions: 70 mm × 70 mm × 25 mm
- Clear aperture: 30 mm × 30 mm
- Cable length: 1.5 m
- Connection: 1× Sub-D Mix, 1 channel, for X and Y respectively
- Recommended controller: 2× E-709.CRG or 2× E-709.CHG (for high dynamics); E-725 (plug adapter required)
### 10.1.2 Maximum Ratings

P-763 stages are designed for the following operating data in continuous operation:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Maximum Operating Voltage</th>
<th>Maximum Operating Frequency (without Load)*</th>
<th>Maximum Power Consumption**</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-763.22C</td>
<td>–20 to +120 V</td>
<td>100 Hz (in X) 83 Hz (in Y)</td>
<td>37.6 W (18.8 W per axis)</td>
</tr>
</tbody>
</table>

* To prevent damage, it is recommended to operate the stage with maximally one third of the resonant frequency. If the stage is operated with a load, the values are lower.

** Corresponds to the power provided by the amplifier, which results in heating of the piezo actuator to approximately 80 °C.

### 10.2 Ambient Conditions and Classifications

The following ambient conditions and classifications must be observed for the P-763:

<table>
<thead>
<tr>
<th>Area of application</th>
<th>For indoor use only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum altitude</td>
<td>2000 m</td>
</tr>
<tr>
<td>Air pressure</td>
<td>1100 hPa to 0.1 hPa (corresponds to roughly 825 Torr to 0.075 Torr)</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>Highest relative humidity 80 % for temperatures up to 31 °C Decreasing linearly to 50 % relative humidity at 40 °C</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>–20 °C to 80 °C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>–20 °C to 80 °C</td>
</tr>
<tr>
<td>Transport temperature</td>
<td>–25 °C to 85 °C</td>
</tr>
<tr>
<td>Overvoltage category</td>
<td>II</td>
</tr>
<tr>
<td>Protection class</td>
<td>I</td>
</tr>
<tr>
<td>Degree of pollution</td>
<td>1</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP20</td>
</tr>
</tbody>
</table>

IEC 60529
10.3 Dimensions

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

Figure 9: P-763.22C
10.4 Torque for Stainless Steel Screws (A2-70)

<table>
<thead>
<tr>
<th>Screw Size</th>
<th>Minimum Torque</th>
<th>Maximum Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>M6</td>
<td>4 Nm</td>
<td>6 Nm</td>
</tr>
<tr>
<td>M5</td>
<td>2.5 Nm</td>
<td>3.5 Nm</td>
</tr>
<tr>
<td>M4</td>
<td>1.5 Nm</td>
<td>2.5 Nm</td>
</tr>
<tr>
<td>M3</td>
<td>0.8 Nm</td>
<td>1.1 Nm</td>
</tr>
<tr>
<td>M2.5</td>
<td>0.3 Nm</td>
<td>0.4 Nm</td>
</tr>
<tr>
<td>M2</td>
<td>0.15 Nm</td>
<td>0.2 Nm</td>
</tr>
<tr>
<td>M1.6</td>
<td>0.06 Nm</td>
<td>0.12 Nm</td>
</tr>
</tbody>
</table>

10.5 Pin Assignment

7W2 Sub-D mix connector

Figure 10: Sub-D Mix connector 7W2: Front side with connections

Figure 11: Sub-D mix connector: Exemplary top view
<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>PZT</td>
<td>Piezo voltage</td>
</tr>
<tr>
<td>A2</td>
<td>Probe</td>
<td>Probe sensor signal (moving part of the capacitive sensor)</td>
</tr>
<tr>
<td>1</td>
<td>Data ID chip</td>
<td>Data cable for ID chip</td>
</tr>
<tr>
<td>2</td>
<td>GND target and ID chip</td>
<td>Ground of target and ID chip</td>
</tr>
<tr>
<td>3</td>
<td>GND PZT</td>
<td>Ground of piezo voltage</td>
</tr>
<tr>
<td>4</td>
<td>Free</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>Target</td>
<td>Target sensor signal (non-moving part of the capacitive sensor)</td>
</tr>
<tr>
<td>Case</td>
<td>-</td>
<td>Shield</td>
</tr>
</tbody>
</table>
11 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 Römerstr. 1
D-76228 Karlsruhe, Germany
12 EC Declaration of Conformity

For the P-763, an EC Declaration of Conformity has been issued in accordance with the following European directives:

2006/95/EC, Low Voltage Directive
2004/108/EC, EMC Directive
2011/65/EU, RoHS Directive

The applied standards certifying the conformity are listed below.

Safety (Low Voltage Directive): EN 61010-1:2010
EMC: EN 61326-1:2013
RoHS: EN 50581:2012