

P-752 High Precision Nanopositioning Stage



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User Manual

P752T0002, valid for P-752

KSch, 6/27/2018



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About this Document

This user manual contains the necessary information for the intended use of the P-752 (see p. 7 for the different models).

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. 5) on our website.

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.

The following symbols and markings are used in this user manual:

Symbol/Label	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
p. 5	Cross-reference to page 5
 	Warning sign affixed to the product that refers to detailed information in this manual.

Other Applicable Documents

The devices that are mentioned in this user manual are described in their own manuals.

Device	Document
E-505.00 piezo amplifier module	PZ62E user manual
E-610.00 piezo amplifier, OEM module	PZ70E user manual
E-610.C0 piezo amplifier / servo controller	PZ72E user manual
E-625.CR piezo amplifier/servo controller	PZ166E user manual
E-665.CR piezo servo controller	PZ127E user manual
E-754 digital piezo controller	E754T0001 user manual
PIMikroMove	SM148E software manual
P-5xx / P-6xx / P-7xx piezo positioning systems	PZ240EK short instructions

Downloading Manuals

INFORMATION

If a manual is missing or problems occur with downloading:

- Contact our customer service department (p. 22).

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: Get access data

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. Get the access data for downloading protected content in the "User login for software download" section of the Release News. Possible methods for getting:
 - Link to a page for registering and requesting the access data
 - Direct input of user name and password
5. If the access data needs to be requested via a registration page:
 - a) Follow the link in the Release News.
 - b) Enter the required information in the browser window.

- c) Click **Show login data** in the browser window.
- d) Note the user name and password shown in the browser window.

Downloading manuals

If you have requested access data for protected contents via a registration page (see above):

- Click the links in the browser window to change to the content for your product and log in using the access data that you received.

General procedure:

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 number up to the period (e.g., P-752) into the search field.
5. Click **Start search** or press the Enter 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 bottom of the list.
 - c) Click the corresponding product in the list.
7. Click the **Downloads** tab.

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

Intended Use

The P-752 nanopositioning stage 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-752 is intended for fine positioning as well as the fast and precise motion of small objects. The motion takes place linearly in one axis.

The P-752 can be mounted with a horizontally or vertically oriented motion axis. Vertical mounting is only possible under certain conditions (p. 12).

The intended use of the P-752 is only possible in combination with suitable electronics (p. 9) that is available from PI. The electronics is not included in the scope of delivery of the P-752.

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

For information about the electronics refer to its separate documentation.

Product Description

Model Overview

Model	Description
P-752.11C	High dynamics piezo nanopositioning system, 15 μm , direct position measuring, capacitive sensor, LEMO connectors
P-752.1CD	High dynamics piezo nanopositioning system, 15 μm , direct position measuring, capacitive sensor, Sub-D connector
P-752.21C	High dynamics piezo nanopositioning system, 30 μm , direct position measuring, capacitive sensor, LEMO connectors
P-752.2CD	High dynamics piezo nanopositioning system, 30 μm , direct position measuring, capacitive sensor, Sub-D connector

Product View

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

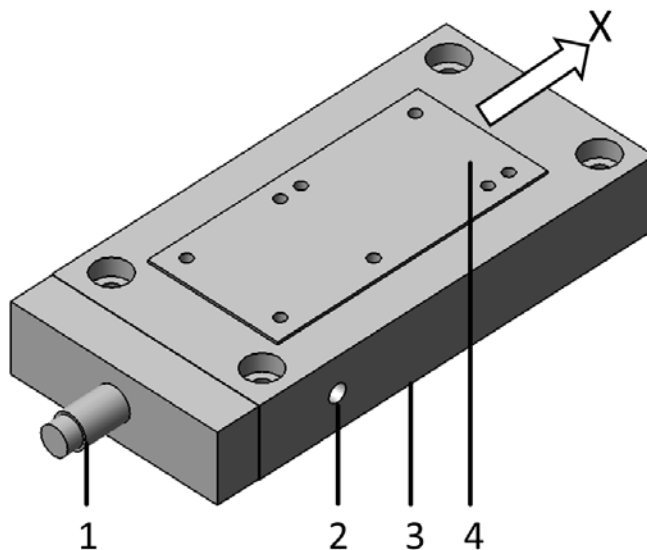


Figure 1: Example of product view (P-752.2xx)

- 1: Cable exit
- 2: Protective earth connection
- 3: Base body
- 4: Motion platform
- Arrow: Positive direction of motion

Product Labeling

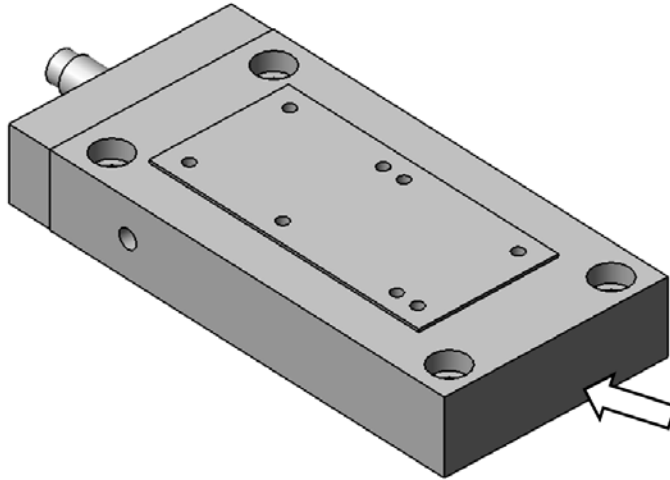







Figure 2: Position of the product labeling on the stage

Labeling	Description
P-752.1CD	Product name (example), the characters following the period refer to the model
118010244	Serial number (example), individual for each P-752 Meaning of the places (counting from left): 1 = internal information 2 and 3 = year of manufacture 4 to 9 = consecutive numbers
	Warning sign "Observe manual!"
	Old equipment disposal (p. 30)
Country of origin: Germany	Country of origin
WWW.PI.WS	Manufacturer's address (website)
	Manufacturer's logo
	CE conformity mark
	Symbol for the protective earth conductor, marks the protective earth connection of the P-752 (p. 26)

Scope of Delivery

Product number	Description
P-752	Nanopositioning stage according to order (p. 7)
000036450	M4 screw set for protective earth, consisting of: <ul style="list-style-type: none">▪ 1 M4x8 flat-head screw with cross recess, ISO 7045▪ 2 safety washers▪ 2 flat washers
PZ240EK	Short instructions for P-5xx, P-6xx and P-8xx piezo positioning systems

Suitable Electronics

Product number	Description
E-505.00	Piezo amplifier module, 2 A, -30 to 130 V, 1 channel
E-610.00	Piezo amplifier, -30 to 130 V, OEM module, 1 channel
E-625.CR	Piezo amplifier/servo controller, -30 to 130 V, 1 channel, for capacitive sensors, USB, RS-232, bench-top device
E-665.CR	Piezo amplifier / servo controller, -30 to 130 V, 1 channel, for capacitive sensors, USB, RS-232, bench-top device
E-754.1CD	Digital piezo controller, -30 to 135 V, 1 channel, for capacitive sensors, Ethernet, SPI, USB, RS-232

➤ To order, contact our customer service department (p. 22).

Accessories

Product number	Description
P-895.1LDC	Adapter cable LEMO to Sub-D 7W2 (m) for piezo actuator nanopositioning systems with capacitive sensors, 1 channel, 0.3 m
P-895.1DLC	Adapter cable Sub-D 7W2 (f) to LEMO for piezo actuator nanopositioning systems with capacitive sensors, 1 channel, 0.3 m

➤ To order, contact our customer service department (p. 22).

ID Chip (Only Models With Sub-D Connector)

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.

Installation

General Notes on Installation

CAUTION



Dangerous voltage and residual charge on piezo actuators!

The P-752 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 also stay charged for several hours. Touching or short-circuiting the contacts in the connector of the P-752 can lead to minor injuries. In addition, the piezo actuators can be destroyed by an abrupt contraction.

- Do **not** open the P-752.
- 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 connector from the electronics during operation.



For stages with Sub-D connector:

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

- Do **not** touch the contacts in the connector.
- Secure the connector of the stage with screws against being pulled out of the controller.

NOTICE



Mechanical overload from incorrect handling!

An impermissible mechanical overload of the motion platform of the P-752 can cause damage to the piezo actuators, sensors and flexure joints of the P-752 as well as losses of accuracy.

- Only hold the P-752 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-752 to the electronics.

NOTICE



Damage from incorrect mounting!

Incorrect mounting of the P-752 or incorrectly mounted parts can damage the P-752.

- Only mount the P-752 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. 28) given for the screws used during installation.

INFORMATION

Extended cables can reduce the positioning accuracy of the P-752 or affect the sensor processing by the electronics.

- If you need longer cables, contact our customer service department (p. 22)

Connecting the P-752 to a Protective Earth Conductor

INFORMATION

Observe the applicable standards for mounting the protective earth conductor.

The P-752 features a separate protective earth connection, see “Dimensions” on p. 26.

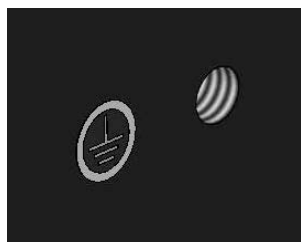


Figure 3: Example of a protective earth connection

Tools and accessories

- Suitable protective earth conductor: Cross-sectional area of the cable $\geq 0.75 \text{ mm}^2$
- Suitable screwdriver
- M4 screws for connecting the protective earth conductor

Connecting the protective earth conductor to the separate protective earth connection

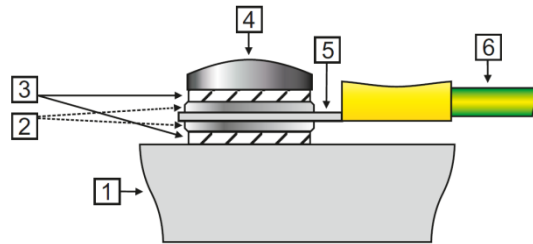


Figure 4: Recommended mounting of the protective earth conductor (profile view)

- 1 Base body of the P-752
- 2 Flat washer
- 3 Safety washer
- 4 Screw
- 5 Cable lug
- 6 Protective earth conductor

1. If necessary, attach a suitable cable lug to the protective earth conductor.
2. Use the M4 screw (together with the washers and self-locking washers) to affix the cable lug of the protective earth conductor to the protective earth connection of the P-752 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 connecting the protective earth conductor is $<0.1 \Omega$ at 25 A.

Mounting the P-752

NOTICE



Warping of the P-752 due to mounting on uneven surfaces!

Mounting the P-752 on an uneven surface can warp the P-752. Warping reduces the accuracy.

- Mount the P-752 on an even surface. The recommended evenness of the surface is $\leq 10 \mu\text{m}$.

For applications with great temperature changes:

- Only mount the P-752 on surfaces that have the same or similar thermal expansion properties as the P-752.

NOTICE



Tensile stress on piezo actuator with vertical mounting!

If the stage is mounted vertically and the direction of motion of the X axis is downward, this will result in a tensile stress which reduces the internal preload of the piezo actuator. Operation with reduced preload can destroy the piezo actuator.

- Do not exceed the maximum permissible stress and load capacities according to the specifications (p. 23).

NOTICE



Protruding screw heads!

Protruding screw heads can damage the P-752.

- Ensure that the screw heads do not protrude from counter-sunk holes so that they do not interfere with the stage motion.

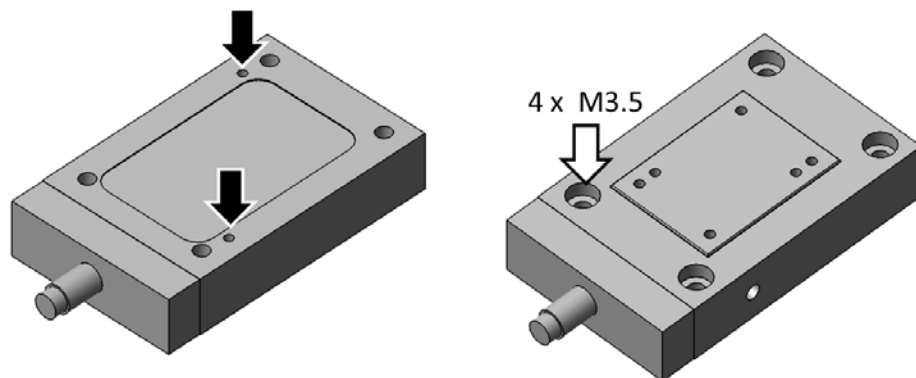


Figure 5: P-752.1x; Left: Two mounting holes for alignment on the bottom (black arrows), right: Four counter-sunk holes for mounting from above (white arrow)

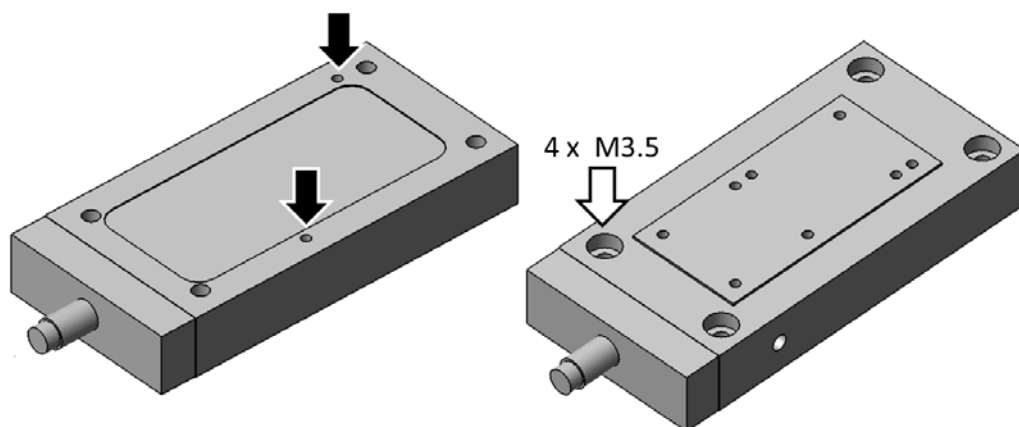


Figure 6: P-752.2xx; Left: Two mounting holes for alignment on the bottom (black arrows), right: Four counter-sunk holes for mounting from above (white arrow)

Requirements

- ✓ You have read and understood the precautions and the general notes on installation (p. 10).
- ✓ You have provided a suitable surface:
 - Four M3.5 holes are present. For the required position of the holes, see "Dimensions" (p. 26).
 - The evenness of the surface is $\leq 10 \mu\text{m}$.
 - For applications with great temperature changes: The surface should have the same thermal expansion properties as the P-752 (e.g. surface made of aluminum).
- ✓ You have accounted for the space required for a cable routing free of kinks and in accordance with regulations.

Tools and accessories

- 4 M3.5 screws of suitable length (p. 26)
- Optional: 2 alignment pins H7 with a \varnothing of 2 mm and of suitable length (p. 26)
- Suitable screwdriver

Mounting the P-752

1. Align the P-752 on the surface so that the corresponding holes in the P-752 and the surface overlap.

Optional: The 2 holes H7, \varnothing 2mm, with a depth of 5 mm, that are located on the bottom side of the P-752 are intended for aligning the P-752 onto a surface, see Figure 6 above.

2. Mount the P-752 onto the surface:
 - a) Introduce four screws into the counter-sunk holes in the base body of the P-752 from above.
 - b) Tighten the four screws. Pay attention to the specified torque range (p. 28) while doing so.

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 motion platform of the P-752. Mechanical overload can cause damage to the piezo actuators, sensors and flexure joints of the P-752 and lead to losses in accuracy.

- Pay attention to the torque range (p. 28) given for the screws used during installation.
- Avoid torques $> 0.3 \text{ Nm}$ on the motion platform.
- Do not exceed the maximum push/pull force and load capacities according to the specifications (p. 23).

NOTICE



Warping of the P-752 due to affixing of loads with uneven contact surface!

Affixing loads with an uneven contact surface can warp the P-752. Warping reduces the accuracy.

- Only affix loads on the P-752 whose contact surface with the motion platform of the stage has an evenness of at least 10 μm .

For applications with great temperature changes:

- Only affix loads on the P-752 that have the same or similar thermal expansion properties as the P-752.

NOTICE



Center of load at unsuitable position!

If the center of load is located far outside of the motion platform (e. g. high set-ups and long levers), the P-752 can be damaged from high strain on the flexure guides, high torques and oscillations, especially when operated dynamically.

- If the center of the load to be affixed is far above or to the side of the motion platform, adjust the controller settings before start-up or contact our customer service department (p. 22).

NOTICE



Screws that are too long!

The P-752 can be damaged by screws that are too long.

- Note the depth of the mounting holes in the motion platform (p. 26).
- Only use screws of the correct length for the respective mounting holes.

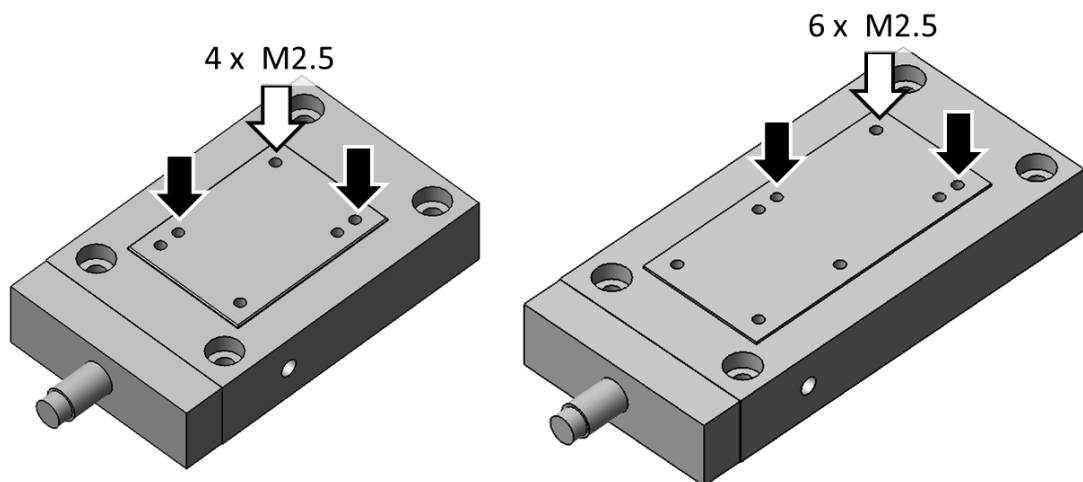


Figure 7: Top side of P-752.1xx (left) and P-752.2xx (right); Black arrows assign the mounting holes for alignment, the white arrow assigns the mounting holes for affixing the load

Center of load at the optimum position:

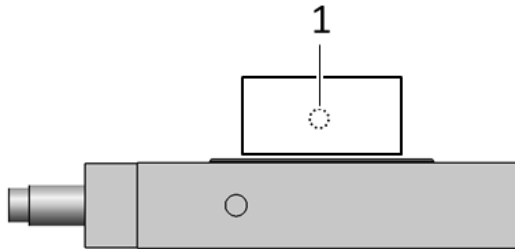


Figure 8: Example of an optimally placed load (1: center of load)

Center of load at an unsuitable position:

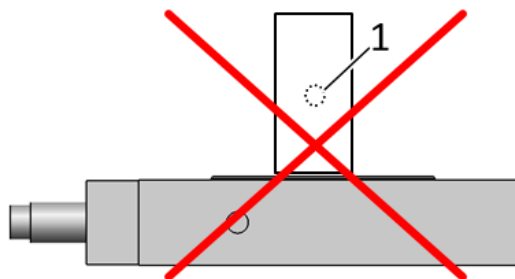


Figure 9: High set-up and center of load (1) far above the motion platform

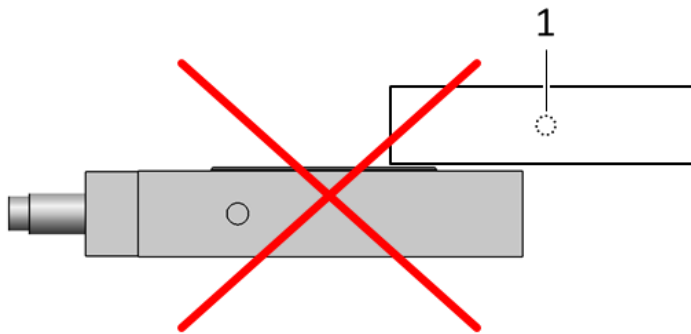


Figure 10: Long lever and center of load (1) on the side of the motion platform

Requirements

- ✓ You have read and understood the safety precautions and the general notes on installation (p. 10).

Tools and accessories

- M2.5 screws of suitable length (p. 26)
- Suitable screw driver

Affixing the load

1. Align the load on the P-752 so that the corresponding holes in the load and the P-752 overlap.

Optional: The 2 holes H7, \varnothing 2mm, with a depth of 5 mm, that are located on the top side of the P-752 are intended for aligning the load onto the P-752, see Figure 7 on p. 15.

2. Only affix loads to the threaded holes (p. 26) intended for this purpose and with suitable screws.
While doing so, pay attention to the torque range (p. 28) specified for the screws, and avoid torques >0.3 Nm on the motion platform.
3. Affix the load so that it is centered and that the center of load is on the motion platform.

Startup and Operation

General Notes on Startup 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 and there is a risk of electric shock. In the case of malfunction or failure of the system, touching the P-752 can result in minor injuries.

- Connect the P-752 to a protective earth conductor before start-up.
- Do **not** remove the protective earth conductor during operation.
- Use electrically conductive materials (e.g. screws and flat washers) for mounting the protective earth conductor.
- Make sure that the contact resistance is < 0.1 ohm at 25 A at all connection points relevant for mounting the protective earth conductor.

If the protective earth conductor has to be temporarily removed (e.g. for modifications), reconnect the P-752 to the protective earth conductor before starting it up again.

NOTICE



Destruction of the piezo actuator by electric flashovers!

The use of the P-752 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-752 in environments that can increase the electric conductivity.
- Only operate the P-752 within the permissible ambient conditions and classifications (p. 25).

NOTICE



Destruction of the piezo actuator by continuously high voltage!

The constant application of high voltage to piezo actuators can lead to leakage currents and flashovers that destroy the ceramic.

If the P-752 is not used, but the controller is to remain switched on to ensure temperature stability:

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

NOTICE



Operating voltage too high or incorrectly connected!

Operating voltages that are too high or incorrectly connected can cause damage to the P-752.

- Only operate the P-752 with controllers/drivers and original accessories from PI.
- Do not exceed the operating voltage range (p. 24) for which the P-752 is specified.
- Only operate the P-752 when the operating voltage is properly connected; see "Pin Assignment" (p. 28).

NOTICE



Uncontrolled oscillation!

Oscillations can cause irreparable damage to the P-752. Oscillations are indicated by a humming and can result from the following causes:

- The load and/or dynamics of operation differ too much from the calibration settings.
- The P-752 is operated near its resonant frequency.
- If you notice oscillations, stop the P-752 immediately.

INFORMATION

The positive direction of motion of the axis is given in the product view (p. 7).

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.

Starting Up and Operating the P-752

Requirements

- ✓ You have read and understood the general notes on start-up and operation (p. 17).
- ✓ The P-752 may only be started up, operated, maintained and cleaned by authorized and qualified staff.

Starting up and operating the P-752

- Follow the instructions in the manual of the used piezo controller for start-up and operation of the P-752.

Discharging the P-752

The P-752 must be discharged in the following cases:

- Before installation
- If the P-752 is not used but the controller remains switched on to ensure temperature stability
- Before demounting (e.g. before cleaning and transporting the P-752 and for modifications)

The P-752 is discharged through the internal discharge resistor of the controller from PI.

Discharging an P-752 that is connected to the controller

In closed-loop operation:

- Switch off the servo mode on the controller
- 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 an P-752 that is not connected to the controller

- Connect the P-752 to the switched-off PI controller for 10 seconds.

Maintenance

General Notes on Maintenance

NOTICE



Misalignment from loosening screws!

The P-752 is maintenance-free and precisely aligned.

- Do not loosen any screws on the P-752.

Cleaning the P-752

Requirements

- ✓ You have discharged the piezo actuators of the P-752 (p. 19).
- ✓ You have disconnected the P-752 from the controller.

Cleaning the P-752

- Clean the surfaces of the P-752 with a cloth that is slightly dampened with a mild cleanser or disinfectant (e.g. ethanol or isopropanol).
- Do **not** do any ultrasonic cleaning.

Troubleshooting

Problem	Possible Causes	Solution
No or limited motion	The cable is not connected correctly	➤ Check the cable connections.
	Excessive load	➤ Do not exceed the maximum permissible stress and load capacities according to the specifications (p. 23).
	Zero shift of the sensor for the following reasons: <ul style="list-style-type: none">▪ Load applied in direction of motion▪ Ambient/operating temperature of the stage far above or below calibration temperature (21°C to 24°C)	➤ Perform a zero-point adjustment of the sensor (see controller manual).

Problem	Possible Causes	Solution
Reduced accuracy	Warping of the base body or the moving platform	<ul style="list-style-type: none"> ➤ Only mount the P-753 on surfaces with the following characteristics: <ul style="list-style-type: none"> – Evenness of at least 10 µm – The thermal expansion properties are similar to those of the P-753 (e. g. surfaces made of aluminum). ➤ Only affix loads with the following characteristics on the P-753: <ul style="list-style-type: none"> – The contact surface of the load has an evenness of at least 10 µm. – The thermal expansion properties are similar to those of the P-753 (e. g. loads made of aluminum).
	P-753 or controller has been replaced	<p>When stages, whose ID chip (p. 9) does not contain any calibration data, or LEMO connectors are used, the axis displacement has to be recalibrated after the P-753 or the controller has been replaced.</p> <ul style="list-style-type: none"> ➤ Perform a recalibration of the axis displacement (see controller manual) or contact our customer service department (p. 22).
	Axes were mixed up during connection (only with LEMO connectors)	<ul style="list-style-type: none"> ➤ Observe the assignment of the axes when connecting the stage to the controller. This assignment is indicated by labels on the devices.
	The stage is not connected to the corresponding controller (only with several systems)	<ul style="list-style-type: none"> ➤ Observe the assignment of the devices when several systems are connected. The assignment is indicated on the calibration label of the controller (see rear panel or bottom side), which contains the serial number of the stage to be connected.
The stage starts oscillating or positions inaccurately	Servo-control parameters incorrectly set because e. g. the load was changed	<ol style="list-style-type: none"> 1. Immediately switch off the servo mode of the corresponding stage axes. 2. Check the settings of the servo-control parameters on the controller. 3. Adjust the servo-control parameters on the controller according to the load change.
	Open-loop operation near the resonant frequency	<ul style="list-style-type: none"> ➤ In open-loop operation, only operate the stage with a frequency that is below the resonant frequency.

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. 22).

Customer Service

For inquiries and orders, contact your PI sales engineer or send us an e-mail (service@pi.de).

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

Technical Data

Data Table

	P-752.11C	P-752.1CD	P-752.21C	P-752.2CD	Units	Tolerance
Active axes	X	X	X	X		
Motion and positioning						
Integrated sensor	Capacitive	Capacitive	Capacitive	Capacitive		
Travel range at -20 to +120 V, open loop	20	20	35	35	µm	+20 % / -0 %
Travel range, closed loop	15	15	30	30	µm	
Resolution, open loop / closed loop	0.1	0.1	0.2	0.2	nm	typ.
Linearity error, closed loop	0.03	0.03	0.03	0.03	%	typ.
Repeatability	±1	±1	±2	±2	nm	typical, full travel
Pitch / yaw	±1	±1	±1	±1	µrad	typ.
Mechanical properties						
Stiffness in motion direction	30	30	20	20	N/µm	±20 %
Resonant frequency, no load	3200	3200	2100	2100	Hz	±20 %
Resonant frequency, under load, 300 g	980	980	600	600	Hz	±20 %
Push/pull force capacity in motion direction	100 / 10	100 / 10	100 / 10	100 / 10	N	max.
Load capacity	30	30	30	30	N	max.
Drive properties						
Ceramic type	PICMA® P-885	PICMA® P-885	PICMA® P-885	PICMA® P-885		
Electrical capacitance	2.1	2.1	3.7	3.7	µF	±20 %
Miscellaneous						
Operating temperature range	-20 to 80	-20 to 80	-20 to 80	-20 to 80	°C	
Material	Steel	Steel	Steel	Steel		
Dimensions	66 mm × 40 mm × 13.5 mm	66 mm × 40 mm × 13.5 mm	84 mm × 40 mm × 13.5 mm	84 mm × 40 mm × 13.5 mm		
Mass	0.25	0.25	0.35	0.35	kg	±5 %
Cable length	1.5	1.5	1.5	1.5	m	±10 mm
Sensor/voltage connection	LEMO	Sub-D 7W2 (m)	LEMO	Sub-D 7W2 (m)		




	P-752.11C	P-752.1CD	P-752.21C	P-752.2CD	Units	Tolerance
Recommended electronics	E-505, E-610, E-625, E-665, E-754					

The resolution of the system is limited only by the noise of the amplifier and the measuring technology because PI piezo nanopositioning systems are free of friction.

All specifications based on room temperature (22 °C ±3 °C).

Maximum Ratings

The P-752 is designed for the following maximum ratings:

Model	Maximum operating voltage 	Maximum operating frequency (without load) ¹ 	Maximum power consumption ² 
P-752.11C	-20 to 120 V	1067 Hz	6.45 W
P-752.1CD	-20 to 120 V	1067 Hz	6.45 W
P-752.21C	-20 to 120 V	700 Hz	10.75 W
P-752.2CD	-20 to 120 V	700 Hz	10.75 W

¹ To ensure stable operation, the maximum operating frequency is defined as approximately 1/3 of the mechanical resonant frequency.

² The heat generated by the piezo actuator during dynamic operation limits the value for maximum power consumption.

Details can be found online:

<http://piceramic.com/piezo-technology/properties-piezo-actuators/electrical-operation.html>

Ambient Conditions and Classifications

The following ambient conditions and classifications must be observed for the P-752:

Area of application	For indoor use only
Maximum altitude	2000 m
Air pressure	1100 hPa to 0.1 hPa
Relative humidity	Max. 80% for temperatures up to 31 °C Decreasing linearly to 50 % at 40 °C
Storage temperature	-20 °C to 80 °C
Transport temperature	-25 °C to 85 °C
Overvoltage category	II
Protection class	I
Degree of pollution	1
Degree of protection according to IEC 60529	IP20

Dimensions

Decimal places are separated in commas.

P-752.1xx

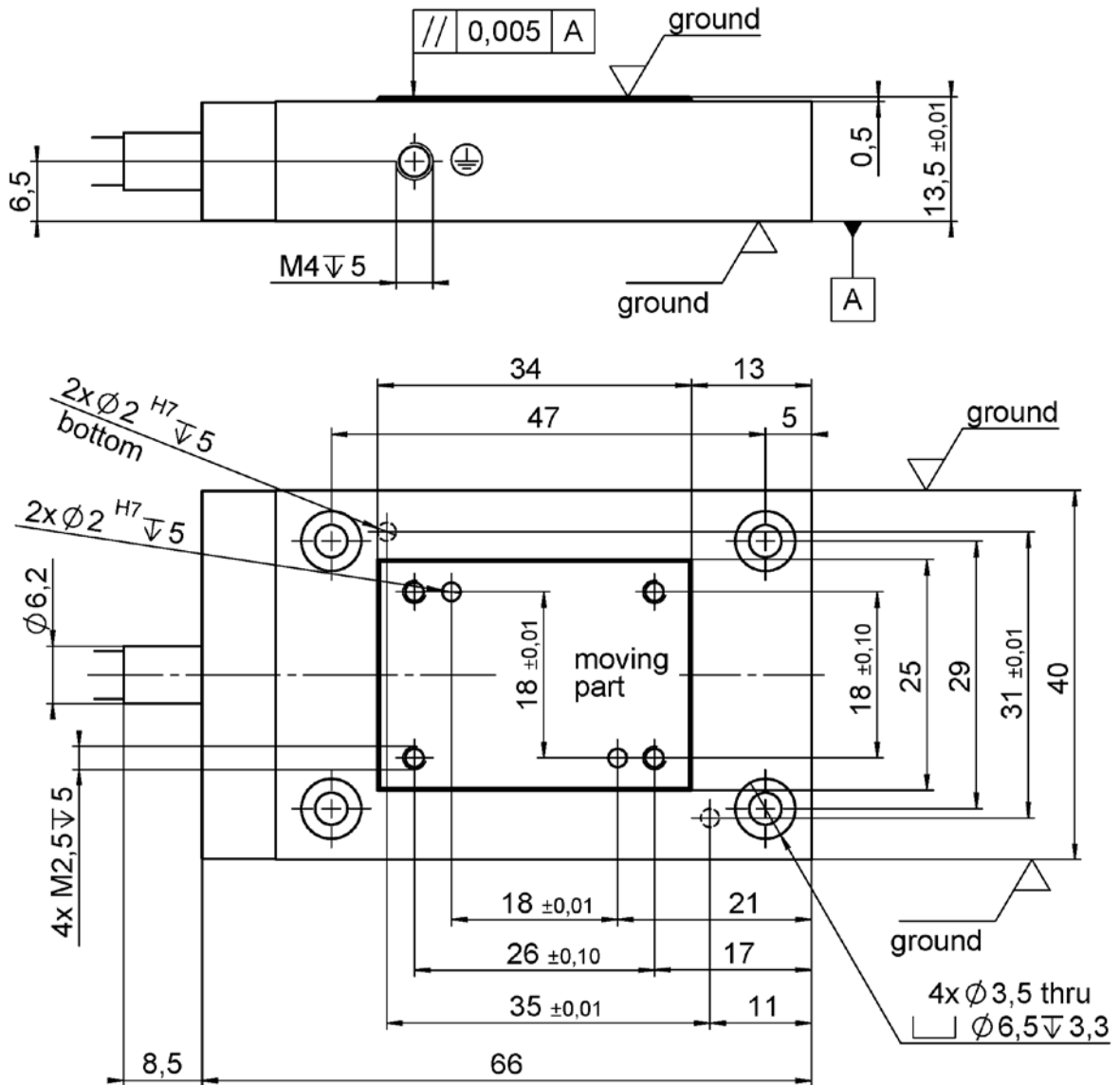


Figure 11: P-752.1xx

P-752.2xx

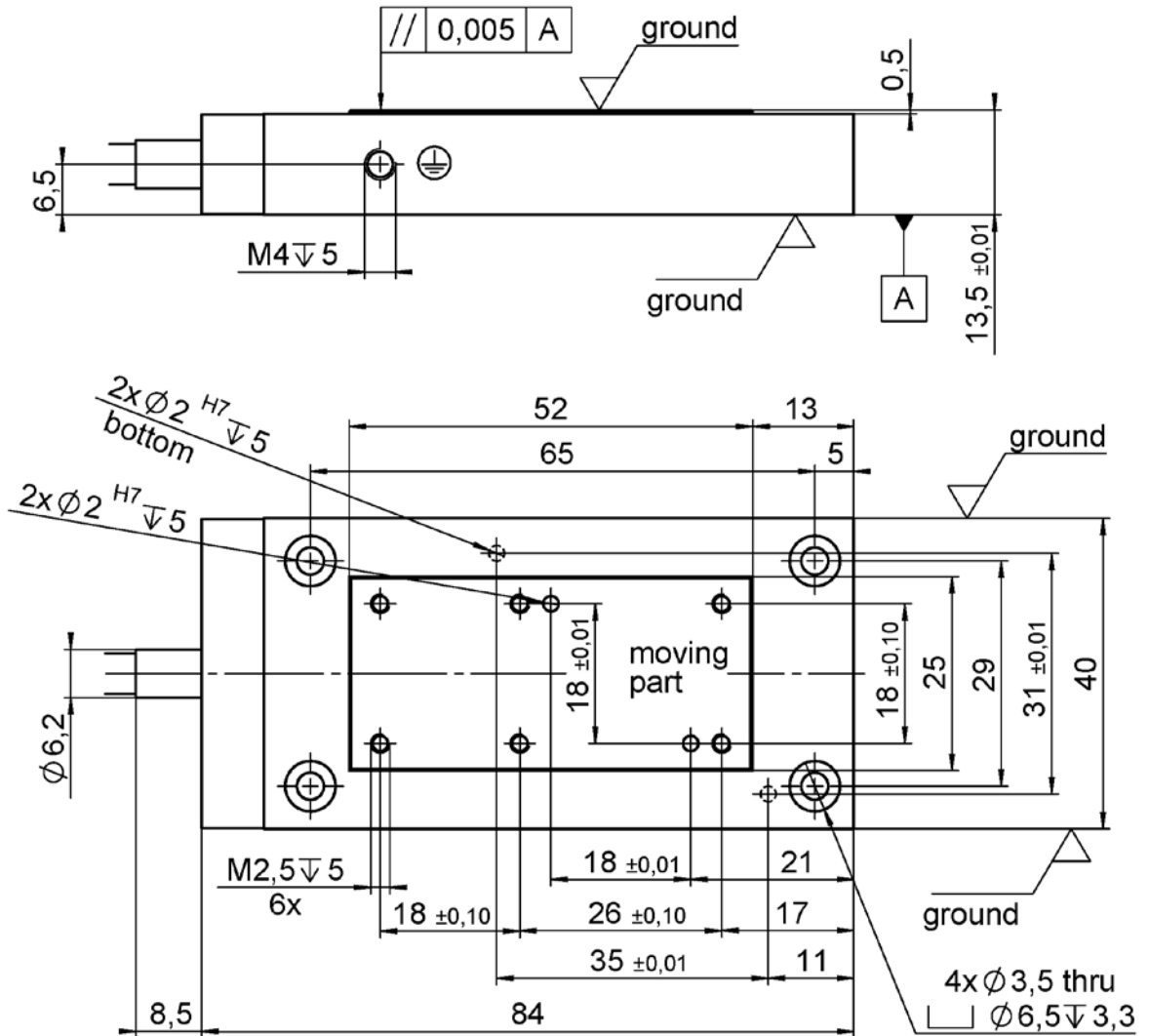


Figure 12: P-752.2xx

Torque for Stainless Steel Screws (A2-70)

Screw Size	Minimum Torque	Maximum Torque
M6	4 Nm	6 Nm
M5	2.5 Nm	3.5 Nm
M4	1.5 Nm	2.5 Nm
M3	0.8 Nm	1.1 Nm
M2.5	0.3 Nm	0.4 Nm
M2	0.15 Nm	0.2 Nm
M1.6	0.06 Nm	0.12 Nm

Pin Assignment

P-752.1CD, P-752.2CD

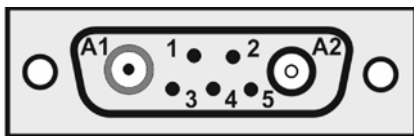


Figure 13: Sub-D 7W2 connector (m), contact side

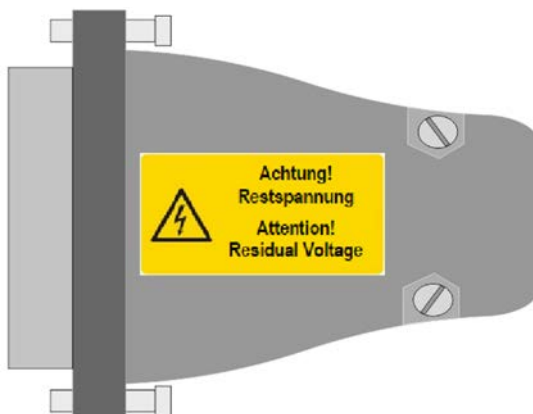


Figure 14: Sub-D 7W2 connector, exemplary top view

Pin	Signal	Function
A1	PZT	Piezo voltage
A2	Probe	Probe sensor signal (moving part of the capacitive sensor)
1	Data ID chip	Data cable for ID chip
2	GND target and ID chip	Ground of target and ID chip
3	GND PZT	Ground of piezo voltage
4	Free	-
5	Target	Target sensor signal (non-moving part of the capacitive sensor)
Case	-	Shield

P-752.11C, P-752.21C

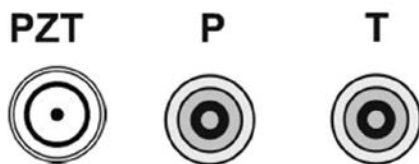


Figure 15: LEMO connectors: PZT, P and T

Connector	Signal	Function	Connector shell
P	Probe	Probe sensor signal (moving part of the capacitive sensor)	Cable shield
T	Target	Target sensor signal (non-moving part of the capacitive sensor)	Cable shield
PZT (not labeled)	PZT	Piezo voltage	Ground of piezo voltage on cable shield

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

