# PENTOR – 5-axis system

The PENTOR was developed to perform a linear movement in three axes while being able to provide tip and tilt motion. This piezo electric stage grants in total 5 degrees of freedom and thus provides a high spatial positioning flexibility to fulfill complex tasks.

A linear stroke of 100 µm is accessible in all three axes X, Y and Z. The tilt motion of ±2 mrad can be performed around the X and Y axis, respectively. In addition, the PENTOR is equipped with a 17mm diameter open aperture that makes it ideal for optical setups. Due to high resonant frequencies of all axes, it is also well suited for dynamic applications.

The 5-axes piezo stage is available in open and closed loop versions. The latter one is equipped with strain gage sensors to overcome drift and hysteresis. Vacuum and low temperature versions are available upon request as well.

We recommend to use the digital controller d-Drive (E-751-000) in combination with 5 EVD50(CL) modules for driving the PENTOR in order to take full benefit of the precise mechanics and the low noise electronics to get the best performance.

PENTOR 100 SG

*Product highlights:*

- combination of a three axis translation system and a two axis tilting system
- free center hole with 17 mm diameter
- integrated preload
- translation each axis: 100 µm
- tilt each direction: ±2 mrad
- solid state flexure hinges in parallelogram design without mechanical play
- optional measurement system
- vacuum and low temperature versions available

*Application examples:*

- scanning system
- micro and nano positioning
- dynamical applications
- laser tuning

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## Technical Data

| PENTOR series<br>part number | | unit | PENTOR<br>T-450-00 | PENTOR SG<br>T-450-01 | PENTOR SG<br>T-450-01D |
|---|---|---|---|---|---|
| **axes** | | - | x, y, z, $\Theta_x$, $\Theta_y$ | | |
| **voltage range** | | V | -20 … +130 | | |
| **central aperture** | | mm | 17 | | |
| **max. load** | | N | 50 | | |
| **temperature range** | | °C | -20 … +80 (-4°F … 176°F) | | |
| **dimensions (length, width, height)** | | mm | 69 x 68 x 40 (2.7“ x 2.7“ x 1.6“) | | |
| **weight** | | g | 450 (0.99 lbs) | 480 (1.06 lbs) | |
| PENTOR translation stage | | | | | |
| **motion (± 10%) x,y,z open loop** | | µm | 100 | | |
| **motion (± 0.2%) x,y,z closed loop** | | µm | - | 80 | |
| **resolution** | **open loop** | nm | 0,2 | | |
| | **closed loop** | nm | - | 2 | |
| **capacitance (per axis) ±20%** | | µF | 1,7 | | |
| **resonant frequency (unloaded)** | **x-axis** | Hz | 680 | | |
| | **y-axis** | Hz | 750 | | |
| | **z-axis** | Hz | 580 | | |
| **stiffness (per axis)** | | N/µm | 0,5 | | |
| **typ. non-linearity** | | % | - | x: 0.05, y: 0.06, z: 0.02 | |
| **typ. repeatability** | | nm | - | x: 5, y: 4, z: 5 | |
| PENTOR tilting stage | | | | | |
| **tilt (± 10%) $\Theta_x$, $\Theta_y$** | **open loop** | mrad | ±2 | | |
| **tilt (± 0.2%) $\Theta_x$, $\Theta_y$** | **closed loop** | mrad | - | ±1,6 | |
| **resolution** | **open loop** | µrad | 0.008 | 0.008 | 0.008 |
| | **closed loop** | µrad | - | 0.08 | 0.08 |
| **voltage range** | | V | -20 … +130 | | |
| **number of axes** | | - | 2 | | |
| **capacitance (per axis) ±20%** | | µF | 2 x 0,85 | | |
| **typ. non-linearity** | | % | - | $\Theta_x$: 0.18, $\Theta_y$: 0.13 | |
| **typ. repeatability** | | µrad | - | $\Theta_x$: 0.44, $\Theta_y$: 0.48 | |