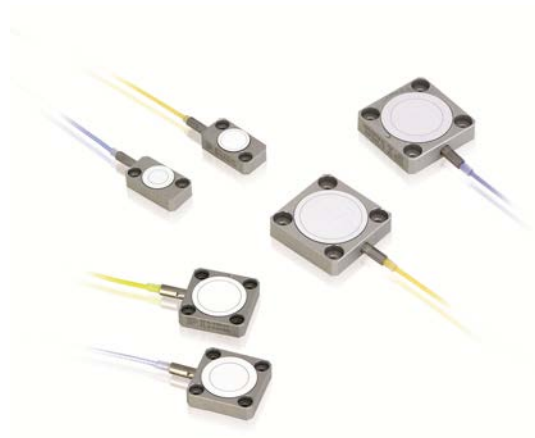


Capacitive Sensors

Subnanometer-Resolution Position Sensors



D-015 • D-050 • D-100

- For applications with the highest precision requirements
- Measuring range to 1000 μm
- Resolution to 0.01 nm
- Linearity error to 0.01 % with digital controller
- E-509.CxA control electronics, compatible with E-500 piezo controller system

Resolution

Capacitive sensors achieve resolutions into the picometer range over shorter distances. The theoretical measuring resolution is unlimited. In practice, scatter radiation, geometrical effects, and the measuring electronics noise influence the achievable accuracy. In conjunction with the E-509.C1A electronics, the effective noise factor of the D-100.00 sensors (100 μm) is 0.02 $\text{nm}/\sqrt{\text{Hz}}$. Corresponds for example, to a resolution of 0.2 nm with 100 Hz bandwidth. The jumper-adjustable bandwidth of the electronics is up to 3 kHz.

In addition to the standard sensors listed here, PI offers customized versions, e.g., in measuring, geometry, material, electronics etc.

Fields of application

High-precision positioning.

Specifications

Sensor	D-015.00	D-050.00	D-100.00
Sensor type	Capacitive	Capacitive	Capacitive
Nominal measuring range	15 µm	50 µm	100 µm
Extended measuring range	45 µm	150 µm	300 µm
Resolution*	0.001 % of the measuring range	0.001 % of the measuring range	0.001 % of the measuring range
Linearity error**	0.01 %	0.01 %	0.01 %
Sensor active area	16.60 mm ²	56.5 mm ²	113.10 mm ²
Thermal drift***	50 ppm/K	50 ppm/K	50 ppm/K

Miscellaneous	D-015.00	D-050.00	D-100.00
Operating temperature range	-20 to 80 °C	-20 to 80 °C	-20 to 80 °C
Material	Aluminum	Aluminum	Aluminum
Recommended evaluation electronics	E-509.CxA	E-509.CxA	E-509.CxA

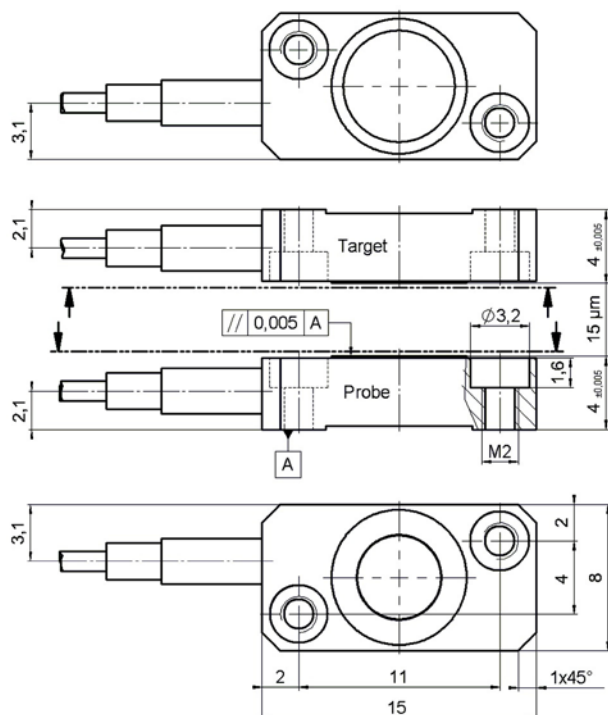
* At 3 kHz, with E-509.C3A

** With digital controller; to 0.05 % with E-509 analog controller

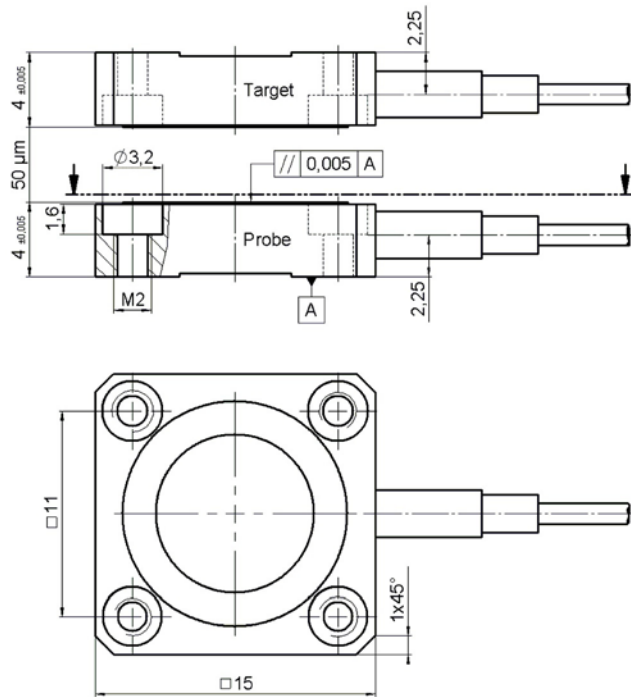
*** Change of active surface size in ppm (parts per million), refers to measuring range

Ask for custom materials.

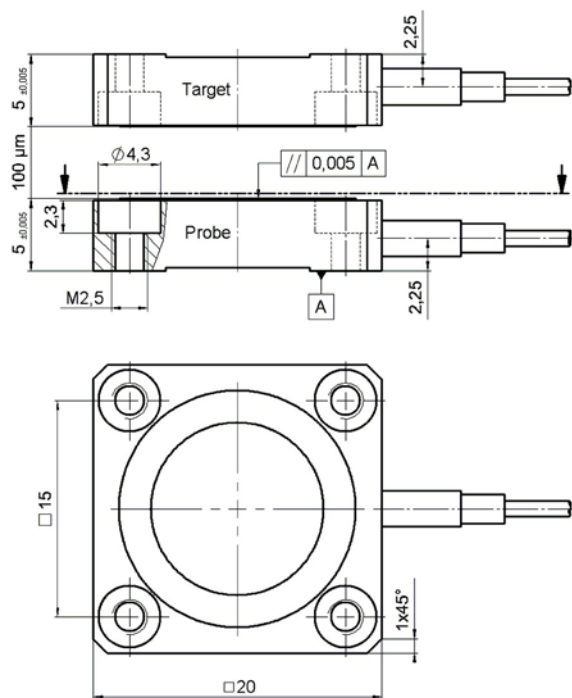
Drawings / Images



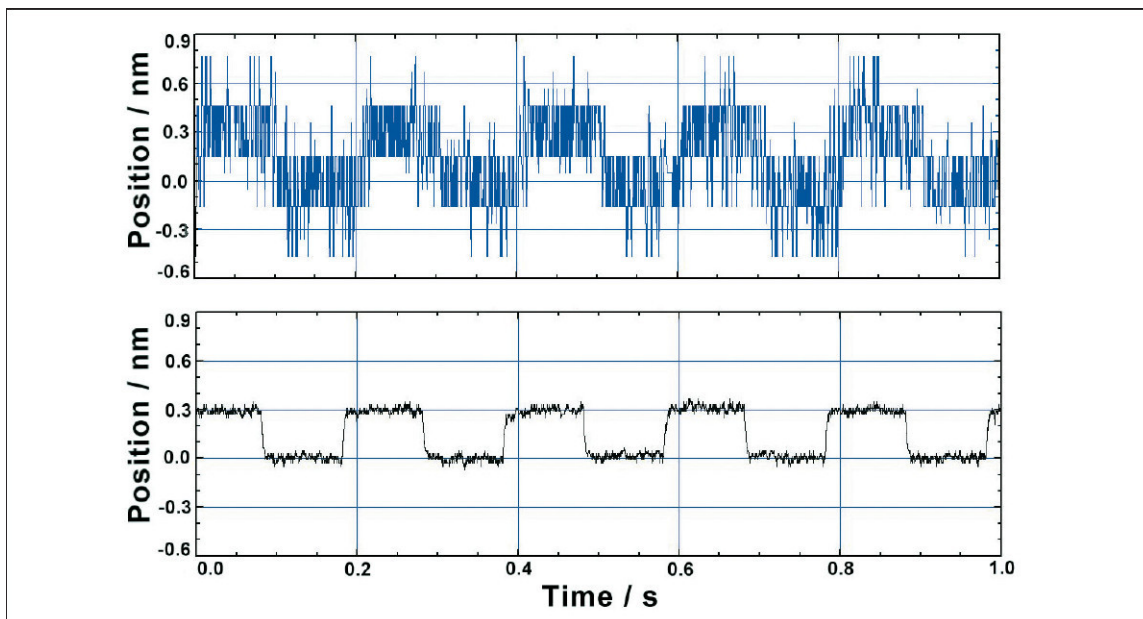
D-015.00, dimensions in mm



D-050.00, dimensions in mm



D-100.00, dimensions in mm



Motion of a piezo nanostaging system with 0.3 nm steps, measured with a capacitive sensor from PI (lower curve) and with a highly accurate laser interferometer (model Zygo ZMI 2000, upper curve). The capacitive sensor shows a significantly higher resolution than the interferometer.

Ordering Information

D-015.00

Capacitive two-plate position sensor, 15 µm nominal measuring range, aluminum

D-050.00

Capacitive two-plate position sensor, 50 µm nominal measuring range, aluminum

D-100.00

Capacitive two-plate position sensor, 100 µm nominal measuring range, aluminum