



PNC FORCE SENSOR KIT

TECHNICAL DATASHEET

Version 1.3, April 2025

Manufacturer: NanoSen GmbH

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Typical characteristics of a Ø20 mm PNC force sensor:

Property	Value
Measurement device	NanoSen Readout Electronics
Measurement counts	100 to 19000
Sensor: PNC-FS-20	20 mm* diameter
Sensor version	V4.1.1
Stable measurement range	0.01 N to 150 N**
Maximum measurable force	200 N [§]
Non-actuated sensor counts	≈2500 [†] ± 4%
Sensor counts @ 150 N	≈15000 [†] ± 3%
Drift rate %	<6.4% in <20 seconds <1.7% between 20 seconds and 1 hour <0.02% between 24 hours and 100 hours
Settling time (2% threshold)	30 s
Single part repeatability	2.4%
Part to part repeatability	5.8%
Durability	200 N, 1.5 Hz over 4 million cycles
Hysteresis	<2% (0.1 N to 10 N at 5 µm/s) <9% (10 N to 100 N at 5 µm/s)
Operating temperature	+20° C to +50° C
Humidity influence	Sensor encapsulation required

* The values provided correspond to the 20 mm diameter PNC force sensor tested under the specified testing conditions. Deviations may occur if the sensor is tested differently or integrated into alternative systems.

** The maximum recommended extension cable length is 50 cm for measuring a maximum load of 150 N.

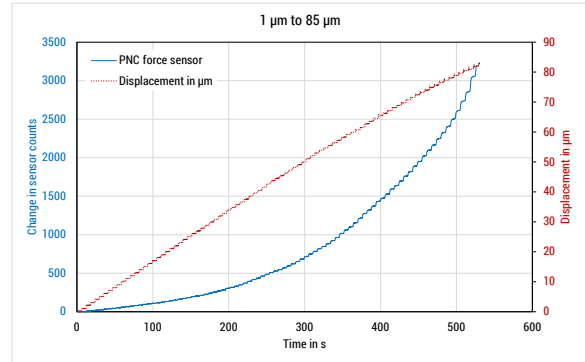
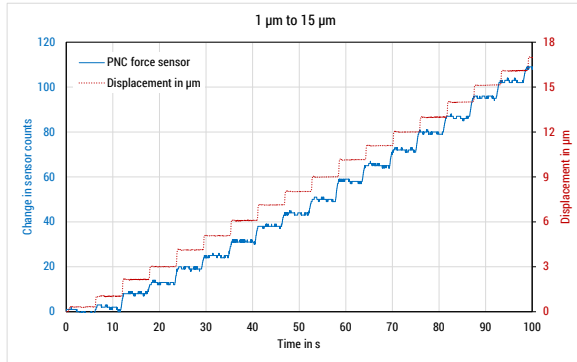
§ Measurements at 200 N can be performed without extension cables, but the offset introduced by extension cables causes sensor saturation at 200 N.

† Each 20 cm of extension cable introduces an offset of approximately 600 sensor counts.

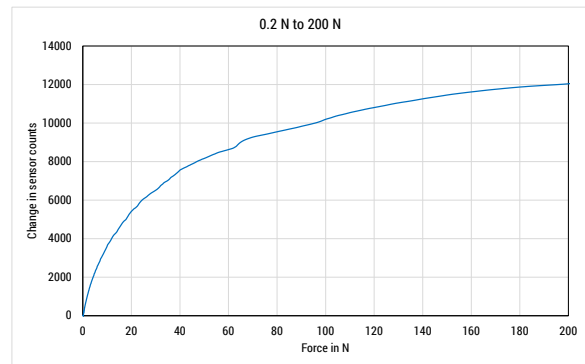
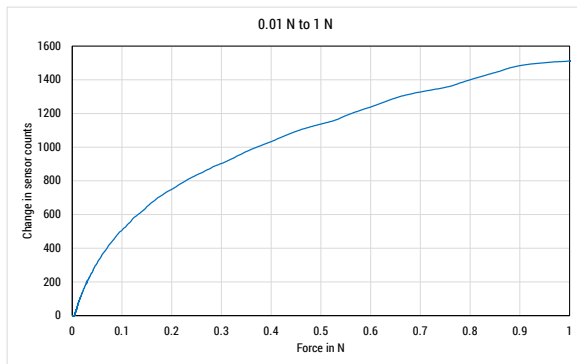
For more details on the PNC sensor kit please refer to the instruction manual!

Typical performance of a Ø20 mm PNC force sensor:

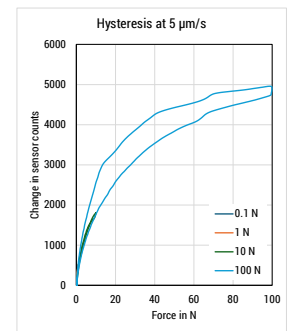
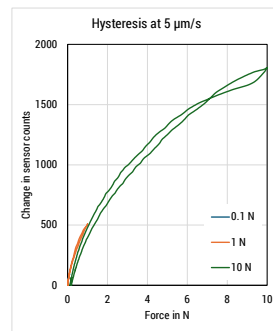
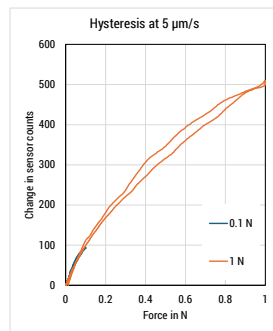
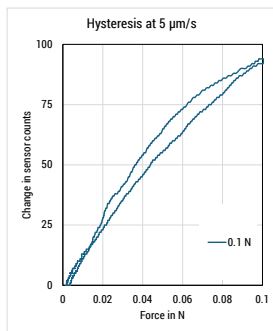
Response vs. Displacement (1 µm steps) over Time:



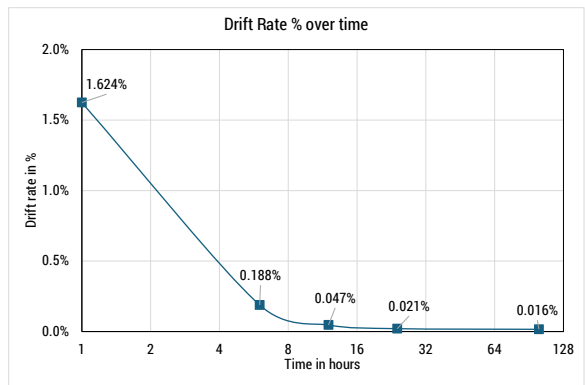
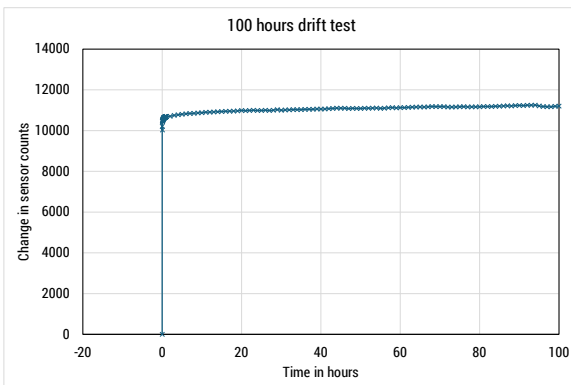
Measurement range from 0.01 N to 200 N:



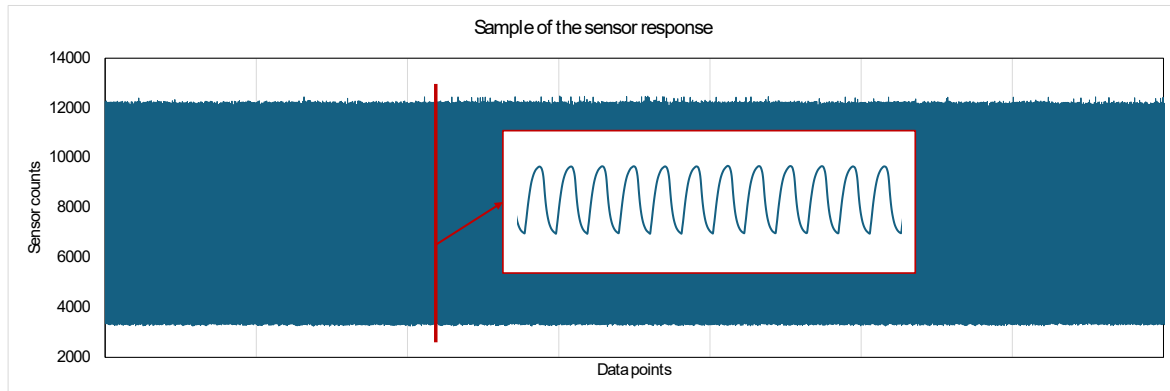
Hysteresis from 0.1 N to 100 N:



Drift with constant load of 180 N:

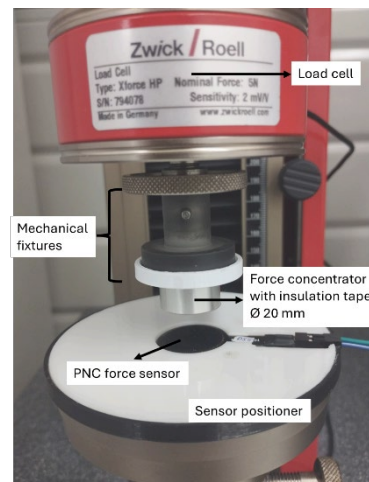
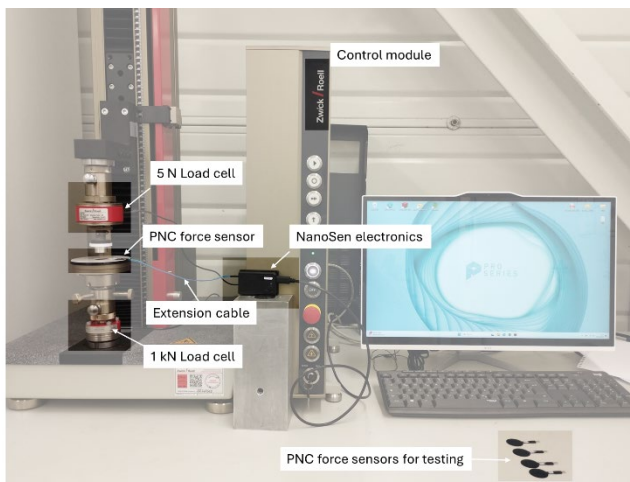


Durability test over 4 million cycles:



Testing setup:

The PNC force sensor was tested using a Universal Testing Machine (UTM), model "Zwicki Z2.5TN" from Zwick-Roell. The UTM is equipped with two load cells: one for measurements from 0.01 N to 5 N and the other for measurements from 2 N to 1000 N. Both load cells were utilized to characterize the full measurement range of the sensor.



Notes:

- The sensor was securely mounted in the UTM using a plastic disc to ensure proper placement during measurements.
- A 0.2 mm thick 20mm metal disc was adhered to the underside of the sensor's electrode to ensure flatness during testing.
- A 20 cm extension wire was used to connect the sensor to the electronics, resulting in an offset of approximately 600 sensor counts.

- A 20 mm diameter aluminium force concentrator cylinder was used to apply force evenly across the sensor's entire surface. The cylinder was electrically insulated from the sensor to prevent interference with the measurements.

Document history

Version	Date	Description of changes
V1.0	18.12.2024	Initial Release
V1.1	19.12.2024	Adjusted measurement range
V1.2	31.12.2024	Stable measurement range extended to 150 N
V1.3	10.04.2025	Updated drift and durability information