

NX NanoSensor®



- **Precision measurement to picometres**
- **Stability of measurement**
- **Tuneable to meet application requirements**
- **Options for a wide range of applications**

NanoSensor® for the ultimate in position monitoring

The NanoSensor® is a non-contact position measuring system based on the principle of capacitance micrometry. Two sensor plates, a Target and a Probe, form a parallel plate capacitor.

The spacing of these two plates can be measured using the appropriate electronic controller, to better than 7pm, with a range up to 1.25mm, a frequency response up to 10KHz and linearity down to 0.02%. Because the NanoSensor® is a non-contact method, it is free from hysteresis. No power is dissipated at the point of measurement.

Key Features	Key Benefits
Sub nanometre position resolution	Very sensitive to atomic scale changes in position
Zero hysteresis	Repeatable measurement
Linearity error down to 0.02%	High Accuracy
Bandwidth from 50Hz up to 10kHz	Allows optimisation to give either positional accuracy or high responsiveness to dynamic motion.
High thermal stability construction (Super invar, zerdur and ceramic options available)	Choice of materials to minimise position drift
UHV, Radiation, Cryogenic, Nonmagnetic, etc. Variants	To suit a broad range of environmental challenges

NX NanoSensor[®]

Typical Applications Include:

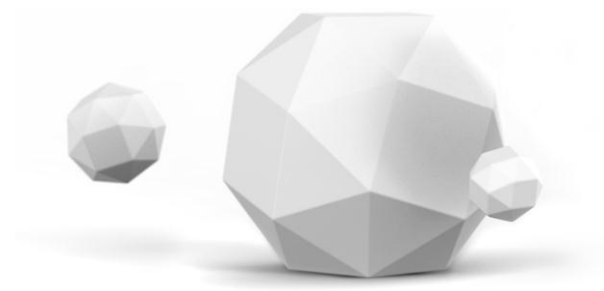
- Precision manufacturing
- Metrology
- Deformation measurements
- Stain measurement (used on space station robotic arm and hand)
- Stage control
- Materials testing
- Microscopy
- Active Optics
- Precision Beam Steering

Suggested Controller

The NS2000 is a single channel standalone electronic module for driving the NX NanoSensor[®] series. It operates by measuring the change in capacitance of a parallel plate capacitor and outputs an analogue voltage proportional to the NanoSensor[®] gap. The voltage output varies linearly between -5V and +5V as the sensor gap changes from 50% to 150% of the nominal NanoSensor[®] gap. Available with switchable 50Hz , 500Hz and 5000Hz bandwidth settings as well as switchable range settings.

The NS2000-SM is a synchronisable variant of the NS2000 controller allowing multiple units to be operated together without interference.

The NS-A-1100 works in the same manner as the NS2000, its main differences are a -10V to +10V output and it has a higher maximum bandwidths of 10kHz. Bandwidths and range settings are factory fixed for this controller.





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Parameter		Value						Units	Comments
Static physical									
Variant		NXB		NXC		NXD			
Active area		22.5		113		282		mm ²	
Material		AL	SI	AL	SI	AL	SI		Note 1
Dynamic physical (Typical values)									
Thermal drift		230	3	230	3	230	3	nm K ⁻¹	Note 2
Short range –S (10pF)	Range	20		100		250		μm	
	Nominal scale factor	2		10		25		μm/V	
	Noise	<0.001		<0.005		<0.013		nm _{rms} Hz ^{-1/2}	
	Linearity error	<0.08		<0.05		<0.06		%	Note 3
Long range –L (2pF)	Range	100		500		1,250		μm	
	Nominal scale factor	10		50		125		μm/V	
	Noise	<0.015		<0.075		<0.188		nm _{rms} Hz ^{-1/2}	
	Linearity error	<0.08		<0.03		<0.06		%	Note 3
Operating temperature	Controller	+10 to +50						°C	
	Sensor	-273 to +80						°C	
Storage temperature		0 to +70						°C	
Relative humidity		5 to 95 (non-condensing)						%	
Operating pressure	-UHV	10 ⁻⁹						τ	Note4

Notes

1. Aluminium (AL) and Super Invar (SI) material available on all variants. Alternative materials, e.g. Stainless Steel or Invar 36 can be used. Please consult Queensgate.
2. This is the thickness contribution only. It does not include the area effect.
3. Linearity error can be dominated by the parallelism of the sensor faces; particularly for short range sensors. Linearity for type 4 compact sensors will have an order of magnitude higher non-linearity.
4. Vacuum sensors should be baked out at 100 °C for two days prior to installation for best vacuum compatibility.





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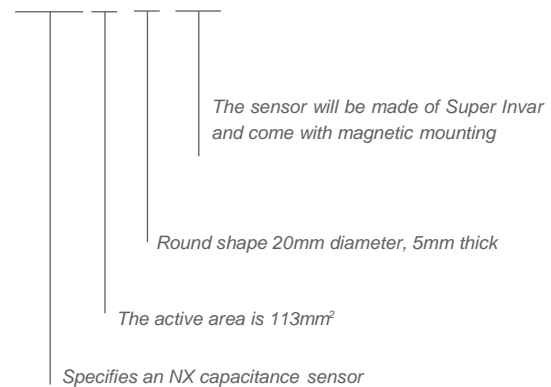
Ordering information

The NX NanoSensors[®] are available in three sizes, up to three different shapes and two materials. The size is indicated by letters, B (smallest) to D (largest). The larger the sensor the longer the range. The shape is indicated by numbers, 1 (round), 2 (square) and 3 (rectangular). The shape does not affect performance.

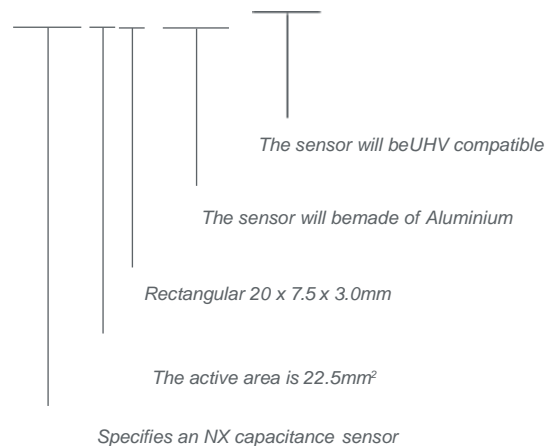
All NX series sensors are available in Aluminum and Super Invar (0.3ppm K⁻¹). The round Super Invar sensor has an optional magnetic base. Alternative materials are available please consult Queensgate.

Example order codes

NXC1-SI



NXB3-AL-UHV





queensgate

a brand of Elektron Technology

NX NanoSensor[®]

	NXB, ACTIVE AREA 22.6sqmm	NXC, ACTIVE AREA 113sqmm	NXD, ACTIVE AREA 282sqmm
1 ROUND	<p>FIXING HOLE M1.6 x 1.6 DEEP EQUI-SPACED @120° ON 9.3 P.C.D.</p> <p>4.7 12.3 5.0</p> <p>NXB1</p>	<p>FIXING HOLE M1.6 x 1.6 DEEP EQUI-SPACED @120° ON 17.0 P.C.D.</p> <p>4.7 20.0 5.0</p> <p>NXC1</p>	<p>FIXING HOLE M1.6 x 1.6 DEEP EQUI-SPACED @120° ON 24.0 P.C.D.</p> <p>4.7 27.0 5.0</p> <p>NXD1</p>
2 SQUARE	<p>FIXING HOLE ϕ1.80 THRU C'BORE ϕ3.2 x 1.8 DEEP 4 PLACES</p> <p>3.2 10.7 14.5 3.5</p> <p>NXB2</p>	<p>FIXING HOLE ϕ1.80 THRU C'BORE ϕ3.2 x 1.8 DEEP 4 PLACES</p> <p>3.2 16.0 20.0 3.5</p> <p>NXC2</p>	<p>FIXING HOLE ϕ1.80 THRU C'BORE ϕ3.2 x 1.8 DEEP 4 PLACES</p> <p>3.2 23.0 27.0 3.5</p> <p>NXD2</p>
3 RECTANGULAR	<p>FIXING HOLE M1.6 x 0.35 THRU 2 PLACES</p> <p>20.0 17.0 7.5 1.5 3.75 2.5 3.0</p> <p>NXB3</p>	<p>FIXING HOLE ϕ2.80 THRU C'BORE ϕ4.8 x 2.8 DEEP 2 PLACES</p> <p>40.0 34.5 12.7 8.35 2.75 5.0 4.5</p> <p>NXC3</p>	<p>NOT CURRENTLY AVAILABLE</p>
4 ROUND COMPACT	<p>NOT CURRENTLY AVAILABLE</p>	<p>3 x M1.6 - 6H ∇ 1.6 EQUI-SPACED @ 120° ON 9.3 PCD</p> <p>11.9 3.0 14.3 12.0</p>	<p>3 x M1.6 - 6H ∇ 3.2 EQUI-SPACED @ 120° ON 17 PCD</p> <p>11.9 3.0 21.3 12.0</p>