

Datasheet

Conductive Diamond Coated Tips

Conductive Diamond Coating:

Polycrystalline diamond at the tipside of the cantilever conductive due to boron doping

Features:

- True polycrystalline diamond
- Conductivity of 0.003 - 0.005 Ωcm
- Thickness approx. 100 nm
- Macroscopic tip radius of 100 - 200 nm
- Nanoroughness in the 10 nm regime improving the resolution on flat surfaces

Order Codes:

- CDT-FMR
- CDT-NCHR
- CDT-NCLR

Applications:

SPM applications that require a hard, wear-resistant and conductive tip, e.g.:

- Tunneling AFM (Conducting AFM)
- Scanning Capacitance Microscopy (SCM)

Description:

For SPM applications that require hard contact between probe and sample on the one hand and a conductive, not passivated tip on the other hand we recommend our Conductive Diamond Coated Tip sensors CDT.

Some applications are Tunneling AFM (Conducting AFM) and Scanning Capacitance Microscopy (SCM). Much more operation modes and applications are possible. They benefit from the hardness of the hardest material in the world – diamond combined with a fairly high conductivity.

The CDT sensors are based on NANOSENSORS™ force modulation sensor (FM), the non-contact / tapping™ mode sensor (NCH) or the non-contact / tapping™ mode long cantilever sensor (NCL).

To improve the reflectivity the detector side of the cantilever beam is covered by our standard aluminum reflex coating.

Datasheet

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Coating Features:

- True polycrystalline diamond coating on the tipside of the cantilever with the unsurpassed hardness of diamond.
- The diamond coating is highly doped with boron leading to a fairly good conductivity. The macroscopic resistivity is 0.003 – 0.005 Ωcm .
- The thickness of the diamond layer is approximately 100 nm.
- The macroscopic tip radius is in the range of 100 - 200 nm, but the tip often exhibits a nanoroughness in the 10 nanometer regime which improves the resolution on flat surfaces.

Sensor types:

For the various possible applications of the probes with conductive diamond coating we offer several sensor types with different mechanical properties:

Force Modulation Sensors

The fairly soft cantilever of the CDT-FMR sensor is tailored for applications that require contact to the surface which should be sufficient but not destructive. The force constant of this sensor type which lies in between the values for contact and non-contact mode allows contact mode measurements with medium forces as well as non-contact or tapping™ mode operation. In addition, the high wear resistance allows friction measurements or the measurement of elastic properties of samples that need not necessarily to be soft.

Non Contact / Tapping™-Mode Sensors - Preferred Type -

For applications that require extremely high forces between tip and sample we recommend our conductive diamond tip CDT-NCHR based on the Pointprobe® non-contact / tapping™ mode sensor (NCH). The force constants of approximately 50 N/m allow the penetration even into hard materials as silicon or silicon oxide.

Non Contact / Tapping™-Mode Sensors - Long Cantilever -

For the same applications the conductive diamond tip CDT-NCLR could be used. This type is recommended if the feedback loop of the microscope does not accept high frequencies (400 kHz) or if the detection system needs a minimum cantilever length (> 125 μm).

In addition, the CDT-NCHR and CDT-NCLR types can be used for conventional non-contact / tapping™ mode applications.

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Detailed Specifications:

	CDT- FMR		CDT- NCHR		CDT- NCLR	
Technical Data	Typical Value	Specified Range	Typical Value	Specified Range	Typical Value	Specified Range
Thickness / μm	3	2.0 - 4.0	4	3.0 - 5.0	7	6.0 - 8.0
Mean Width / μm	28	20 - 35	30	22.5 - 37.5	38	20 - 35
Length / μm	225	215 - 235	125	115 - 135	225	215 - 235
Force Constant / (N/m)	2.8	0.5 - 9.5	42	10 - 130	48	21 - 98
Resonance Frequency /kHz	75	45 - 115	320	204 - 497	190	146 - 236

Order codes, shipping units and coatings:

Order Code	Quantity	Data Sheet	Coating
CDT-FMR-10	10	of all sensors	diamond and reflex
CDT-FMR-20	20	of all sensors	diamond and reflex
CDT-FMR-50	50	without	diamond and reflex
CDT-FMR-100	16	without	diamond and reflex
CDT-FMR-200	50	without	diamond and reflex
CDT-FMR-W	380	of up to 32 sensors	diamond and reflex
CDT-NCHR-10	10	of all sensors	diamond and reflex
CDT-NCHR-20	20	of all sensors	diamond and reflex
CDT-NCHR-50	50	without	diamond and reflex
CDT-NCHR-100	100	without	diamond and reflex
CDT-NCHR-200	200	without	diamond and reflex
CDT-NCHR-W	380	of up to 32 sensors	diamond and reflex
CDT-NCLR-10	10	of all sensors	diamond and reflex
CDT-NCLR-20	20	of all sensors	diamond and reflex
CDT-NCLR-50	50	without	diamond and reflex
CDT-NCLR-100	100	without	diamond and reflex
CDT-NCLR-200	200	without	diamond and reflex
CDT-NCLR-W	380	of up to 32 sensors	diamond and reflex