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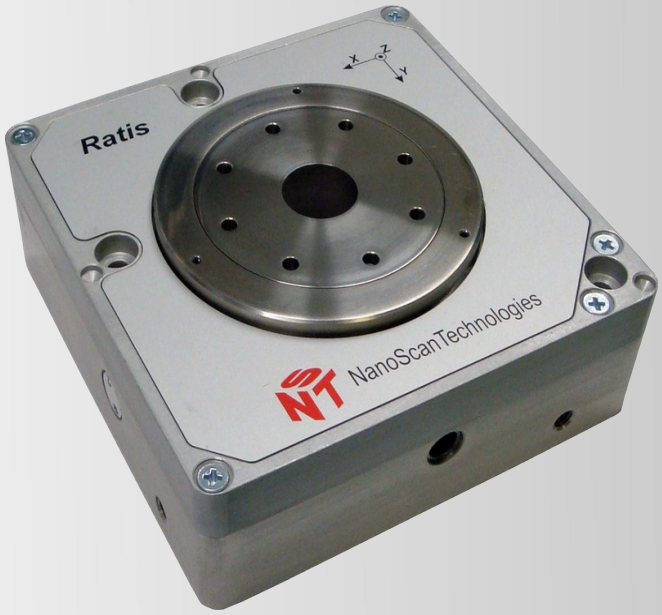
+7 495 642 40 68



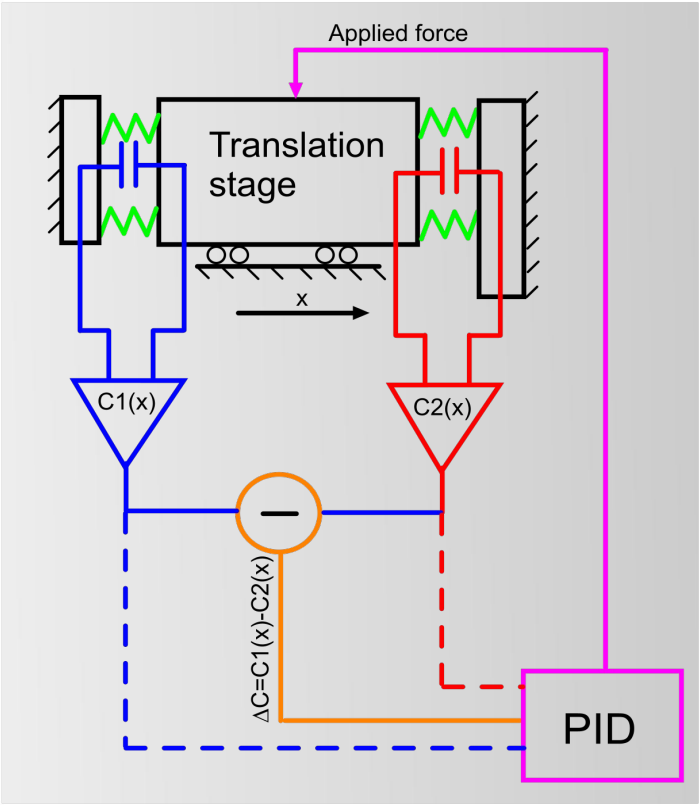
Ratis is a family of plane-parallel piezo stages for nanopositioning and scanning developed by NST. Piezo stages are made of solid metal bar processed with EDM wire-cutting and precise CNC machining. Movable central part hangs on flexible springs and is driven with piezo actuators. Ratis design provides excellent linearity and flatness of the movement, in contrast to the classical scanners based on piezoelectric tubes, where the scan surface is a sphere. In addition, plane-parallel scanners have higher mechanical strength, compared with fragile piezoelectric tubes. **Ratis** multi-axes scanners are equipped with capacitive displacement sensors for digital closed-loop control. It provides high accuracy and linearity of movement and eliminates the creep effect of piezoceramics. Capacitance measurements are made with TDC (time-to-digital conversion) technology where all measuring electronics is located as close as possible to the sensors. Such a design leads to the low noise and high speed displacement control.

Products list:

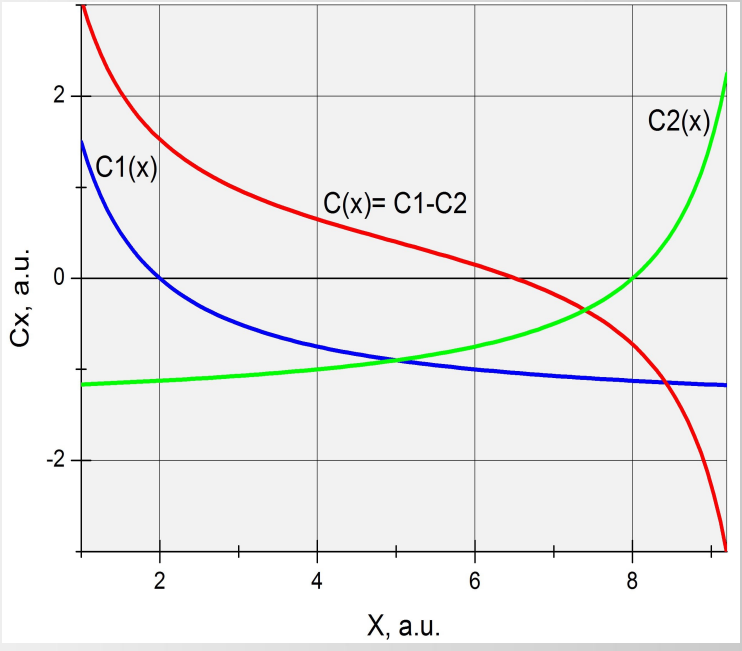
Parameters	Ratis XY(Z)	Ratis XY(Z)_H	**Ratis SPM XYZ**	Vectus Z stage
XY travel range, µm	200	200	40	----------
Z rang e, µm	20	20	5	60 (100)
Fres XY, kHz	1	1	5	1
Fres Z, kHz	30	3	50	1Min
Min. step, nm	0.1	0.1	0.1	0.1
Max. Dev. , degree	<0.01	<0.01	<0.01	<0.01
Max. Speed Hz	10	10	100	10
Max. Sam. Weight, gr	300	300	100	300
Tem. range	±40	±40	±40	±40

Ratis stage

Double Cap Technique



Capacitance sensors are mostly used as translation sensors, in various positioning systems. It is quite simple and cheap. Typical system is drawn in pic 1. One capacitance (C1, or C2) is normally used for displacement measurement, signal are being processed with PID controller, and calculated force are being applied to control object. Quite big disadvantage is nonlinear response from sensors(pic 2. C1(x) dependence, or C2(x)), it can be written as $C(x) \sim \frac{1}{x}$, this dependence causes different sensors response at the beginning and end of the translation range, up to 10 times which leads to problem with PID controller tuning, and different resolution (accuracy), it means quite big translater non-uniformity. **Nano Scan Technologies** uses advanced technology based on two sensors measurement, which arranged at opposite sides of the scanner. When first capacitance is increasing, another is decreasing. This can be written as following dependence: $\Delta C \sim \frac{1}{X} - \frac{1}{Xo - X}$; You can see this dependence at Pic. 2. Linearity of this curve is much better for system linearization, response difference is much smaller, just 2 times, scanner becomes more uniform in resolution and linearity terms. This technology is using in all our scanners, Ratis model.

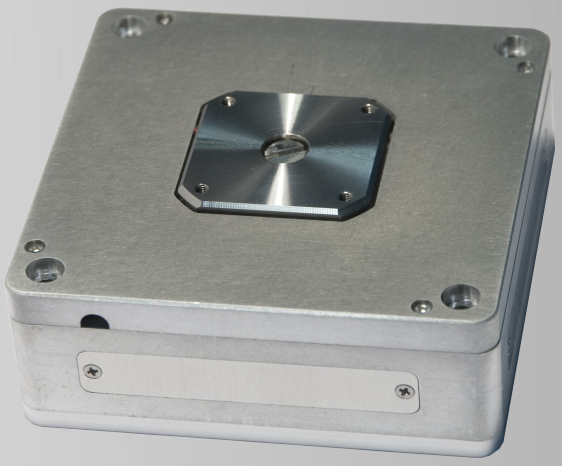


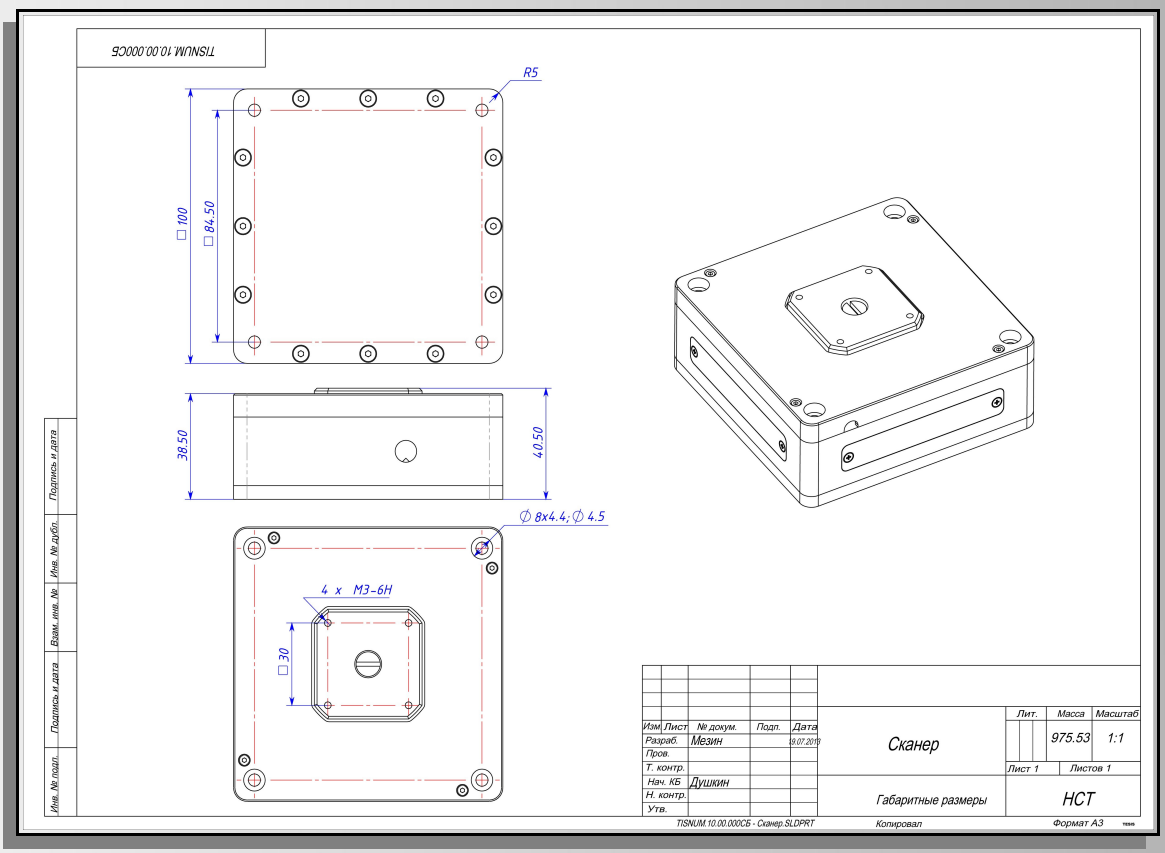
info@nanoscantech.ru
+7 495 642 40 68

Ratis stage

Ratis XY(Z) – is basic model of a piezo scanning stage. Ratis XY(Z) piezo stage are capable of moving the objects with sub-nanometer precision.

XY travel range, µm	200
Z rang e, µm	20
Fres XY, kHz	1
Fres Z, kHz	30
Min. step, nm	0.1
Max. Dev. , degree	<0.01
Max. Speed Hz	10
Max. Sam. Weight, gr	300
Tem. range	±40
Controller	EG1000





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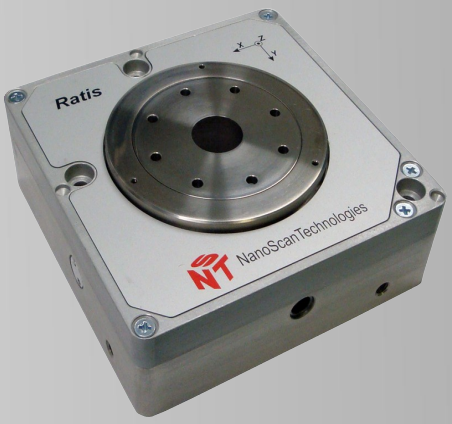
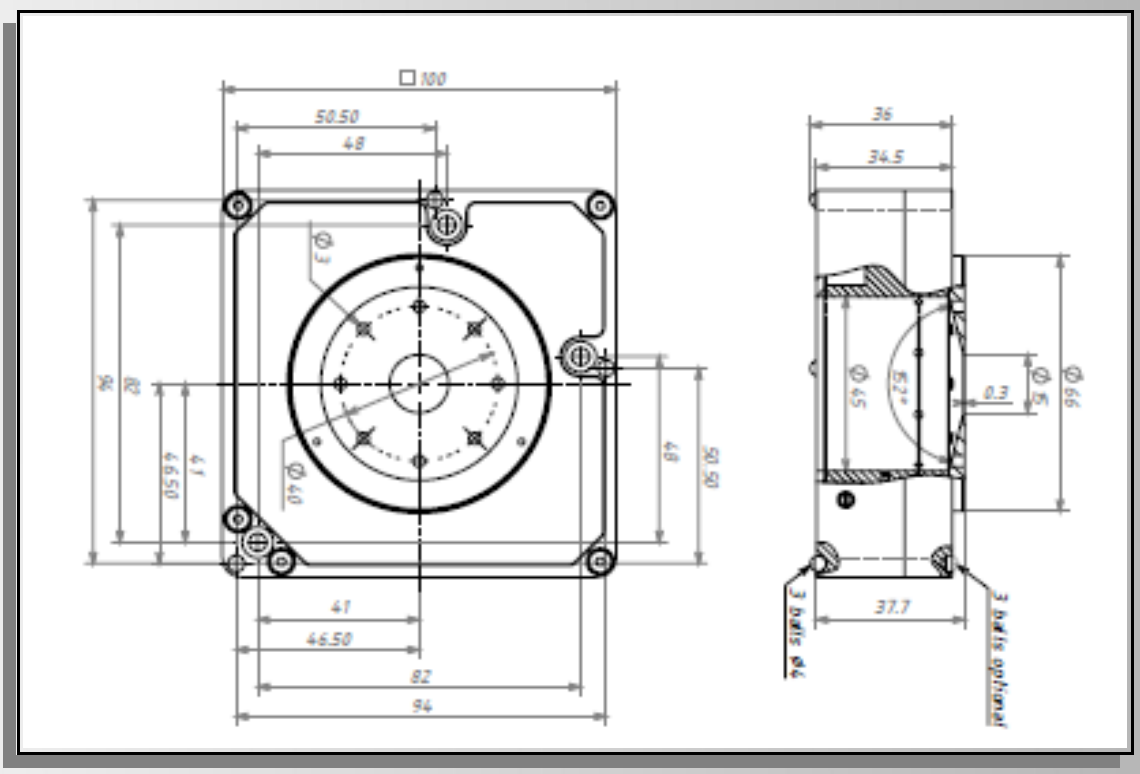
+7 495 642 40 68

Ratis stage

Ratis XYZ_H – scanning XYZ stage, with central hole for optic applications.

XY travel range, µm	200
Z rang e, µm	20
Fres XY, kHz	1
Fres Z, kHz	3
Min. step, nm	0.1
Max. Dev. , degree	<0.01
Max. Speed Hz	10
Max. Sam. Weight, gr	300
Tem. range	±40
Hole diameter	45мм
Controller	EG1000





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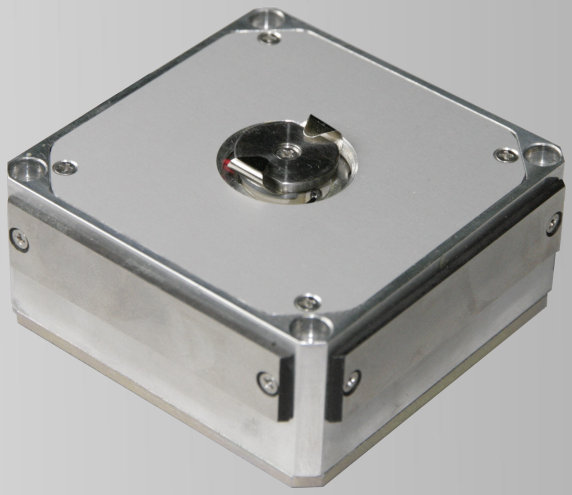
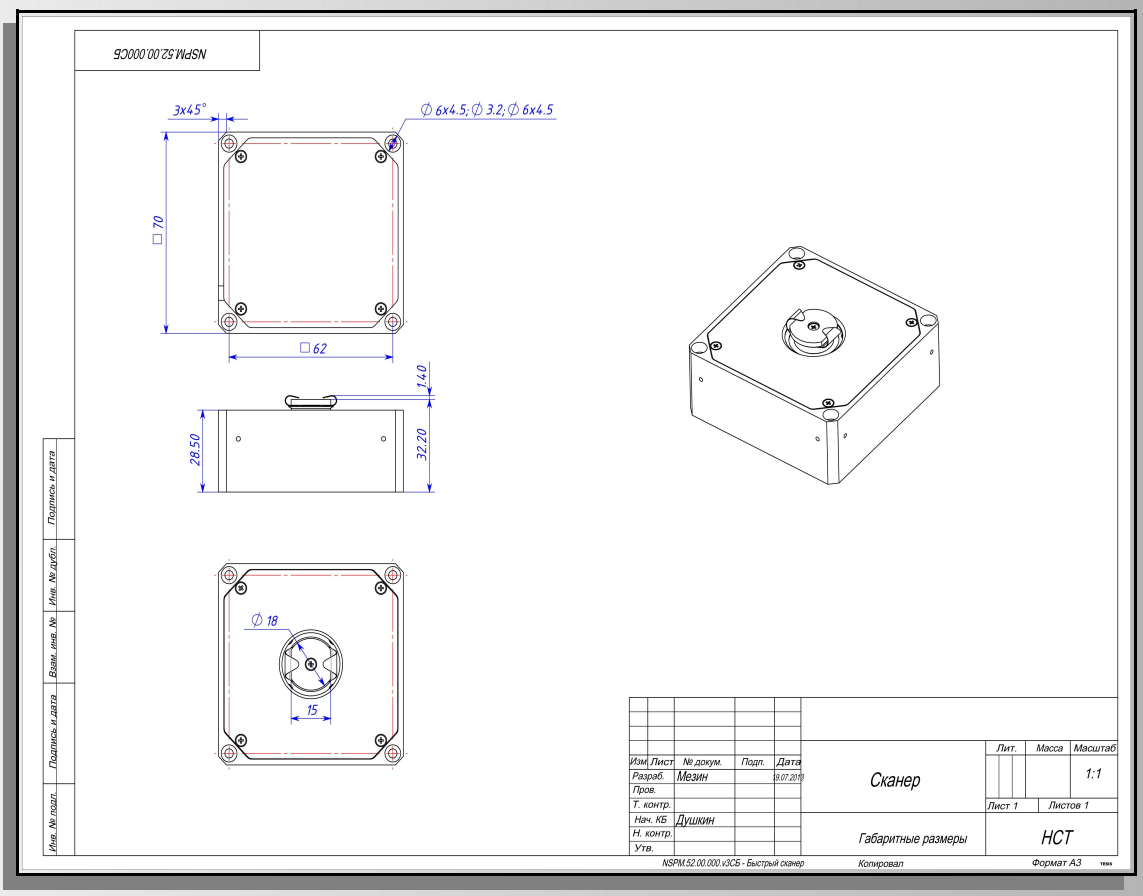
+7 495 642 40 68

Ratis stage

RatisSPM XYZ piezo stage basic model of a nano piezo scanning stage. It has high stiffness in all directions, it allows to scan with high speed and resolution, stage is specially designed for SPM applications.

XY travel range, µm	40
Z rang e, µm	5
Fres XY, kHz	5
Fres Z, kHz	50
Min. step, nm	0.1
Max. Dev. , degree	<0.01
Max. Speed Hz	100
Max. Sam. Weight, gr	100
Tem. range	±40
Controller	EG1000



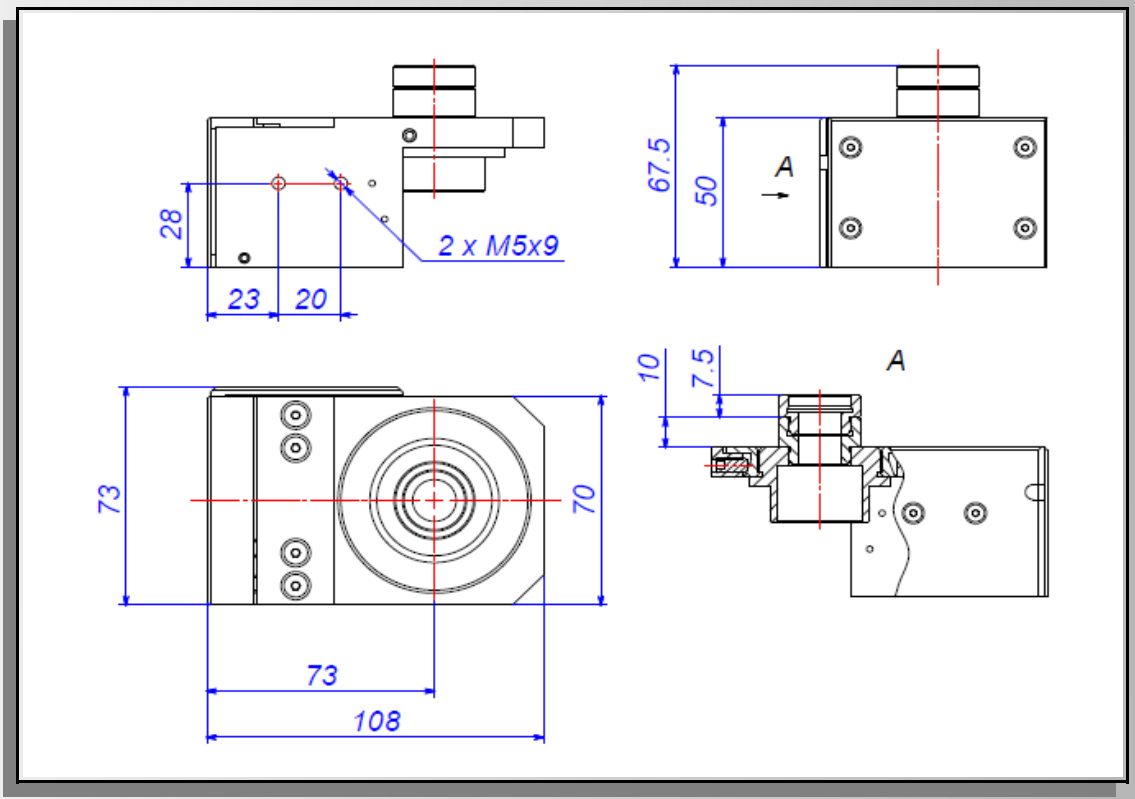


info@nanoscantech.ru
+7 495 642 40 68

Ratis stage

Vectus Z stage – nanofocusing stage is designed for moving and positioning along a single axis. In particular, to move the lens along the optical axis for focus position change with respect to the sample surfaces or objects at the sample.

XY travel range, µm	----------
Z rang e, µm	60 (100)
Fres XY, kHz	1
Fres Z, kHz	1Min
Min. step, nm	0.1
Max. Dev. , degree	<0.01
Max. Speed Hz	10
Max. Sam. Weight, gr	300
Tem. range	±40
Controller	EG1000



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Ratis stage

Electronic Controlers

EG3061 – Fully Functional SPM controller

EG1061 – piezo stage controller with ability of sync external signals recording

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Ratis stage