

V22 Version



Piezo Nano Motion

- Fast Tool Positioning Stages -

Fast Tool Positioning Stages



Fast Tool Positioning Stage is designed for ultra-precision turning. It features high frequency, large stiffness, high precision. The stage can complete rapid micro-feed motion, and achieve precision machining of complex shapes or structures.



Fast Tool Positioning Stages

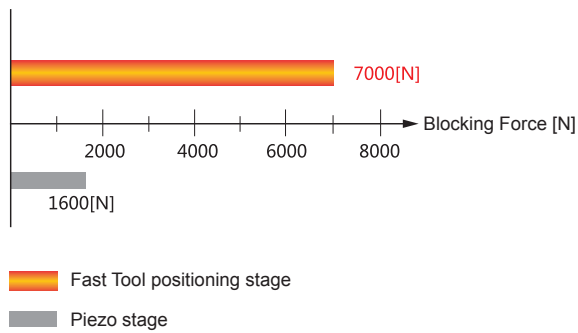
Fast Tool Positioning Stage is designed for ultra-precision turning. It has the characteristics of high frequency, large stiffness, high precision to drive the tool to quickly feed in the direction of motion, achieving precision machining of complex surface parts or structures.

► Characteristics

- Ultra high precision
- Large load capacity
- Fast response time
- Large stiffness

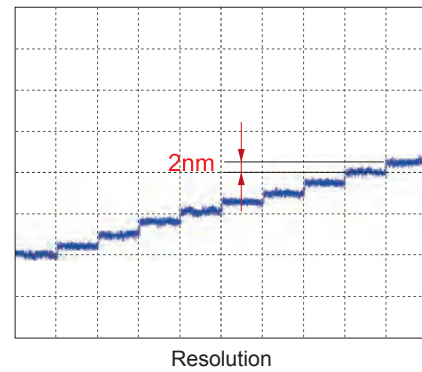
► Large Blocking Force

The blocking force of piezo actuator in fast tool positioning stage is several times that of other piezo actuator in piezo stage.



► Closed loop Resolution

Unlike vibration machining, the tool position could be feedbacked by sensor integrated, which can offer nanometer resolution.



► Sensors Type



► Applications

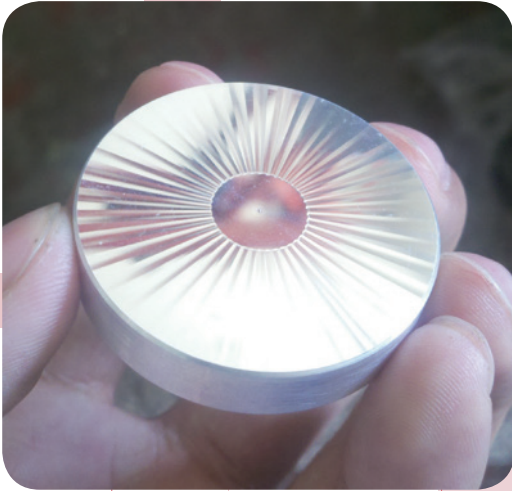
- Diamond micro-feeding
- Precision processing
- High-speed tool control
- Precision machining and grinding

► Product List

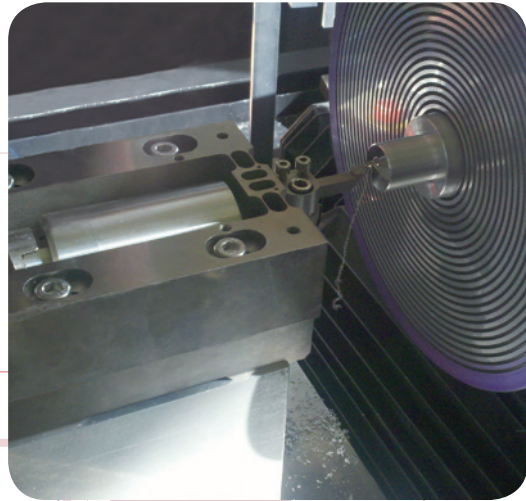
Axes	Mechanism	Type	Displacement [μm]	Resolution [nm]	Resonant frequency[kHz]	Load capacity[kg]	Page
X	Direct drive	P92.X20	18	-	4	0.3	3
		P92.X25	23	5	3	-	4
		P92.X30	30	0.7	1.8	0.3	5
		P92.X40	40	10	3.975	-	7
		P92.X70	75	2.5	1.6	5	5
	Amplified	P93.X70	81	3	0.15	20	9
		P93.X100	118	10	0.2	20	9

► Applications

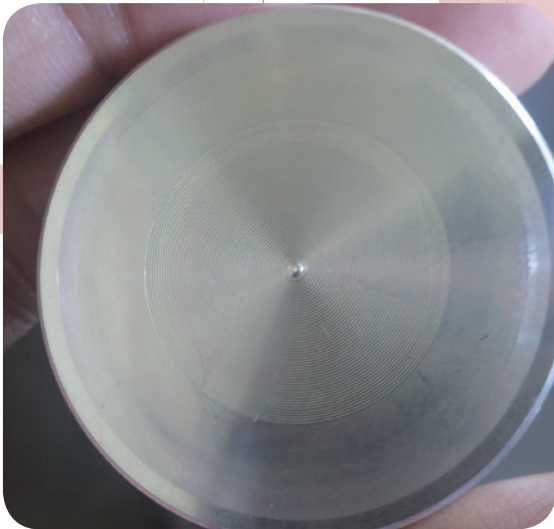
Fast Tool Positioning Stages



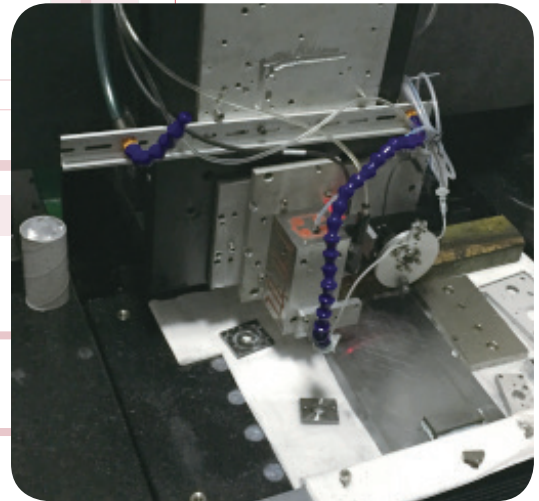
Processed optical component



Precision turning



Processed optical component



Light guide plate processing

P92.X20S/K Fast Tool Positioning Stages

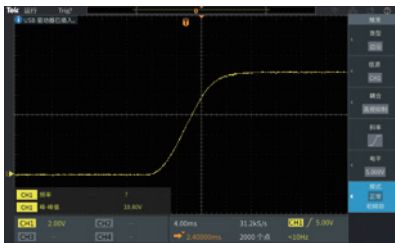


P92.X20S/K fast tool positioning stage is a fast tool micro-feed stage designed for ultra-precision turning. It adopts direct-driving structure, features large load capacity, high frequency, and optional capacitive sensor with nano-scale positioning accuracy.

► Characteristics

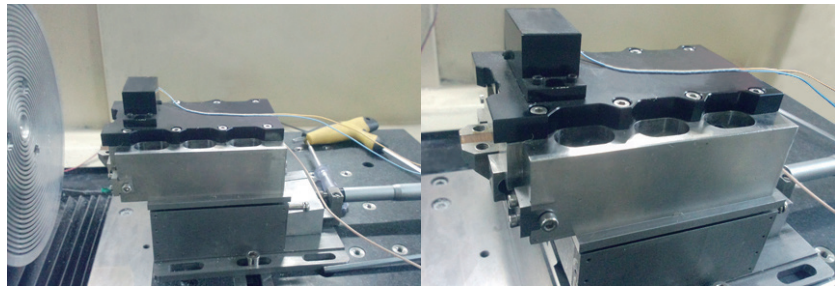
- Max stroke to 18μm
- Operating frequency to 95Hz
- Load capacity to 300g
- Optional sensor
- Direct drive

► Phase shift time



160μs at 18μm, 95Hz

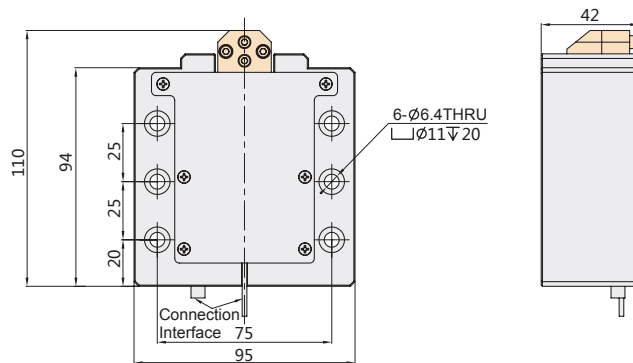
► Processing Show



► Applications

- Diamond micro-feeding
- Precision processing
- High-speed tool control
- Precision machining and grinding
- Workpiece positioning
- FTS fast tool servo turning system

► Drawing



► Technical Data

Type	P92.X20S	P92.X20K	Units
	18@95Hz (0~150V)	18@95Hz (0~150V)	
Travel range	9@190Hz	9@190Hz	μm ±10%
	1@600Hz	1@600Hz	
Sensor	SGS	-	
Linearity	0.1	-	%F.S.
Repeatability	15	-	nm
Load capacity	300	300	g
Stiffness	120	120	N/μm±20%
Unloaded resonant frequency	4000	4000	Hz±20%
Size	L110 × W95 × H42	L110 × W95 × H42	mm
Mass	2100	2100	g±5%
Operating temperature	-20~80	-20~80	°C
Cable length	1.5m or longer	1.5m or longer	m±10mm

Note: Max driving voltage could be -20V~150V, 0~120V is recommended for long-term and high-reliable operation.
Technical data are measured by CoreMorrow E00/E01 series piezo controller.

P92.X25 Fast Tool Positioning Stages

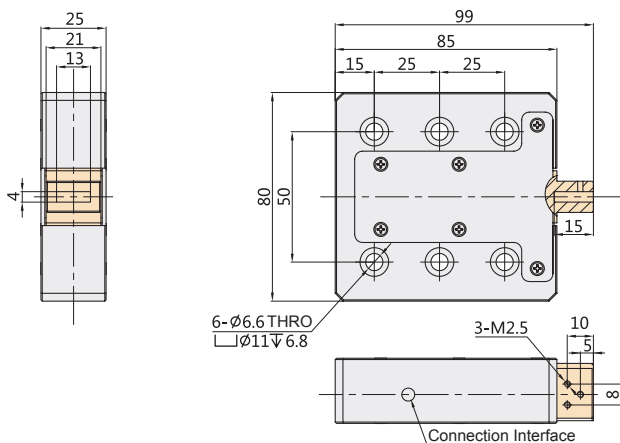


► Technical Data



Type	P92.X25S	P92.X25K	Units
Active axes	X	X	
Travel range(0~120V)	18	18	$\mu\text{m}\pm 10\%$
Travel range(0~150V)	23	23	$\mu\text{m}\pm 10\%$
Integrated sensor	SGS	-	
Resolution	5	5	nm
Unloaded resonant frequency	3000	3000	Hz $\pm 20\%$
Unloaded step time	0.3	0.3	ms
Stiffness	50	50	N/ $\mu\text{m}\pm 20\%$
Blocking force	1000	1000	N
El. capacitance	7.2	7.2	$\mu\text{F}\pm 10\%$
Material	Aluminium, steel	Aluminium, steel	
Mass	<1.5	<1.5	kg $\pm 5\%$
Operating temperature	-25~+80	-25~+80	°C

Note: The above parameters are measured using E00/E01 piezo controllers. The max driving voltage can be -20~150V; For high-reliability and long-term operation, the recommended driving voltage is 0~120V.

► Drawing



► Recommended Controllers

E00/E01	E52	E53
		
1 channel Analog, digital Open/closed loop Ave. current: 291mA	1 channel Analog, digital Open/closed loop Ave. current: 300mA	1 channel Analog, digital Open/closed loop Ave. current: 60mA
Note: For detailed parameters, see "Piezo Controllers".		

P92.X30/70 Fast Tool Positioning Stages

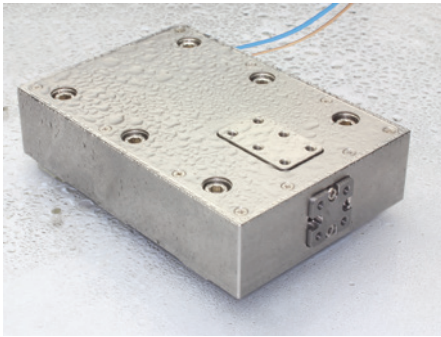


P92 offers two displacement ranges (30 μ m and 75 μ m) for choice, and the corresponding models are P92.X30 and P92.X70.

► Characteristics

- Ultra high precision
- Large load capacity
- Fast response time
- High stiffness

► Dust and Droplet Proof on Request

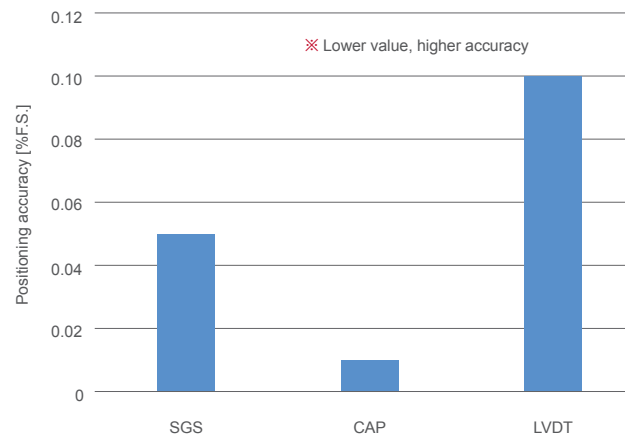


► High Stiffness

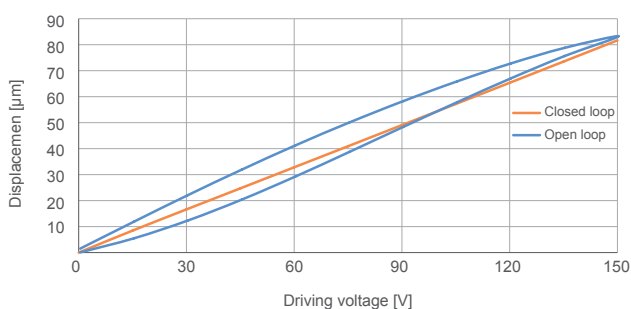
The stage body material is made of stainless steel to ensure the stability during processing, the structure is stable and reliable, and the machining accuracy is not affected by the vibration. The stiffness of the fast tool positioning stage is much greater than the conventional piezo nanopositioning stage.

► Sensor Type

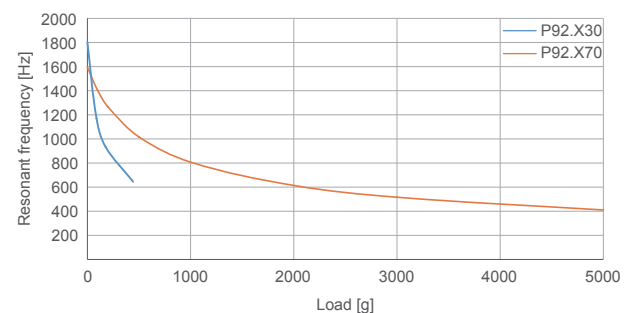
P92 could be optionally equipped with SGS sensor, LVDT sensor or CAP sensor to eliminate the hysteresis and creep of piezo actuator, and input control voltage is linear with output displacement.



► Closed/Open Loop Curve

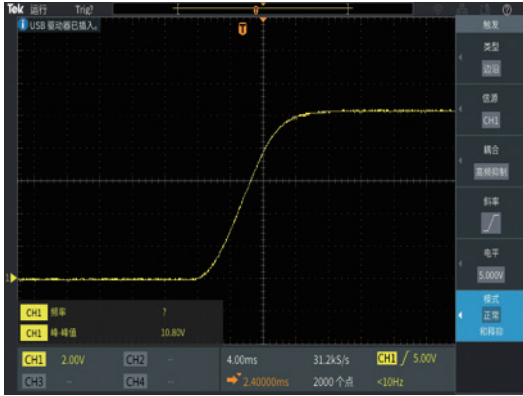


► Frequency vs Load Curve



► Step Time

The step time with load of P92.X70C is about 12ms.
Custom step time is available.



► Recommended Controllers

E00/E01	E52	E53
		
1~3 channel Analog, digital Open/closed loop Ave. current: 291mA	1 channel Analog, digital Open/closed loop Ave. current: 300mA	1 channel Analog, digital Open/closed loop Ave. current: 60mA
Note: For technical data, please refer to "Piezo Controllers"		

► Technical Data

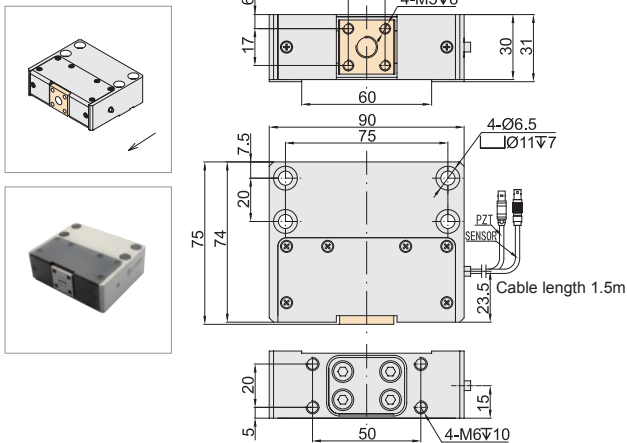
Type	S/C/L-Closed loop K-Open loop	P92.X30S P92.X30K	P92.X70C P92.X70L P92.X70K	Units
Travel range(0~120V)		24	60	$\mu\text{m}\pm 10\%$
Travel range(0~150V)		30	75	$\mu\text{m}\pm 10\%$
Integrated sensor		SGS/-	CAP/LVDT/-	
Closed/open-loop resolution		2/0.7	5/10/2.5	nm
Closed-loop linearity		0.1/-	0.1/0.2/-	%F.S.
Repeatability		0.05/-	0.01/0.1/-	%F.S.
Pitch/yaw/roll		<10	<15	μrad
Push/pull force		300/100	550/240	N
Stiffness		10	8	$\text{N}/\mu\text{m}\pm 20\%$
Unloaded resonant frequency		1.8	1.6	$\text{kHz}\pm 20\%$
Unloaded step time		5/3	10/5	$\text{ms}\pm 20\%$
Unloaded operating frequency	10% travel	1000	550	$\text{Hz}\pm 20\%$
	100% travel	40	20	
Load capacity		0.3	5	kg
El. capacitance		7.2	18	$\mu\text{F}\pm 20\%$
Material		Steel, Aluminum	Steel	
Mass		1450	3500	$\text{g}\pm 5\%$
Operating temperature		CAP 10~50, LVDT 10~40, other -20~80		$^{\circ}\text{C}$
Cable length		1.5		$\text{m}\pm 10\text{mm}$

Note: Max driving voltage could be -20V~150V, 0~120V is recommended for long-term and high-reliable operation.

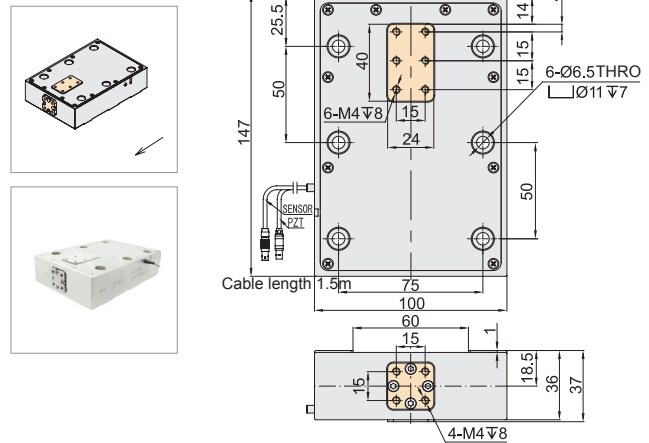
Technical data are measured by CoreMorrow E00/E01 series piezo controller.

► Drawings

P92.X30



P92.X70



P92.X40 Fast Tool Positioning Stages(High Voltage Drive)

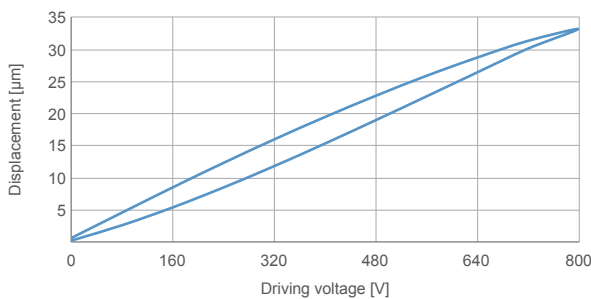


P92.X40 fast tool positioning stage is driven by high-voltage piezoelectric actuator, the driving voltage is 0~1000V, and the blocking force can reach 3000N.

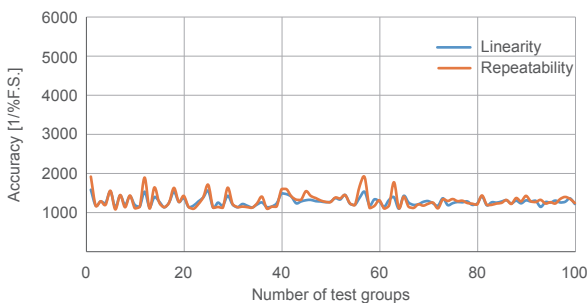
► Characteristics

- 0~1000V
- Stroke to 40μm
- Heat emission hole
- Blocking force to 3000N
- With sensor

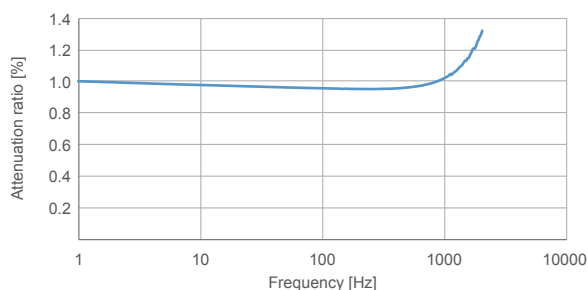
► Open-Loop Curve



► Closed-Loop Accuracy Curve



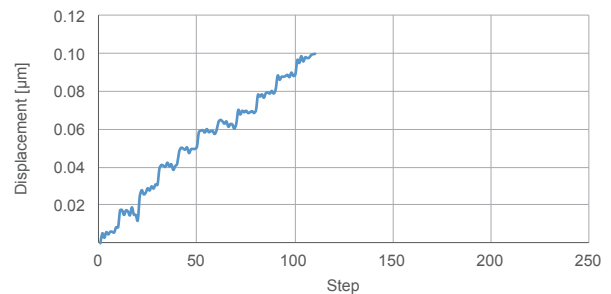
► Gain



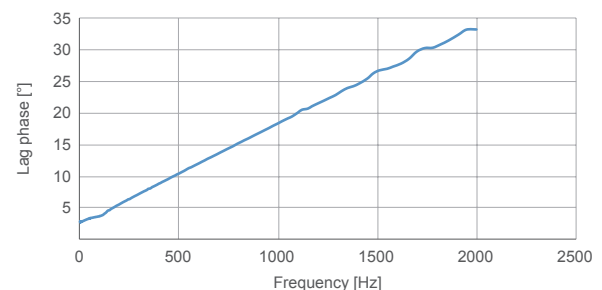
► Technical Data

Type	P92.X40S	Units
Travel range(0~800V)	32	μm±10%
Travel range(0~1000V)	40	μm±10%
Integrated sensor	SGS	
Lag phase(1μm/1Khz)	<20	°±20%
Lag phase(5μm/500hz)	<10	°±20%
Push force	3000	N
Stiffness	100	N/μm±20%
Unloaded resonant frequency	3975	Hz±20%
Closed-loop linearity	<0.1	%F.S.
Repeatability	<0.1	%F.S.
Closed-loop resolution	10	nm±20%
El. capacitance	540	nF±20%
Material	Steel	
Operating temperature	10~50	°C
Cable length	1.5, customizable	m±10mm

► Closed-Loop Resolution



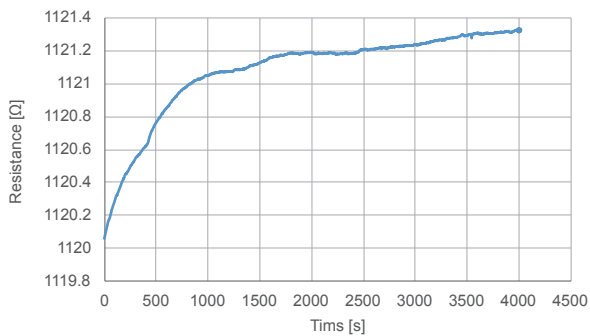
► Phase



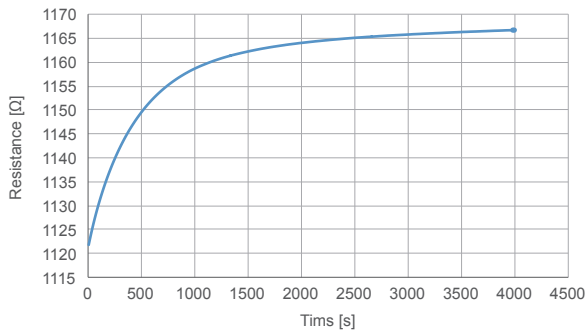
► Temperature Rise Curve

Operating conditions	Temperature rise
1kHz, 1μm	0.32°C
500Hz, 5μm	11.56°C
20W(P=U ² /2FC)	45.85°C

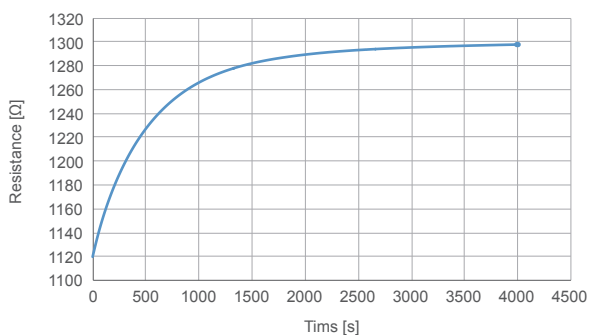
1) Temperature rise@1kHz, 1μm



2) Temperature rise@500Hz, 5μm



3) Temperature rise@200Hz, 400V

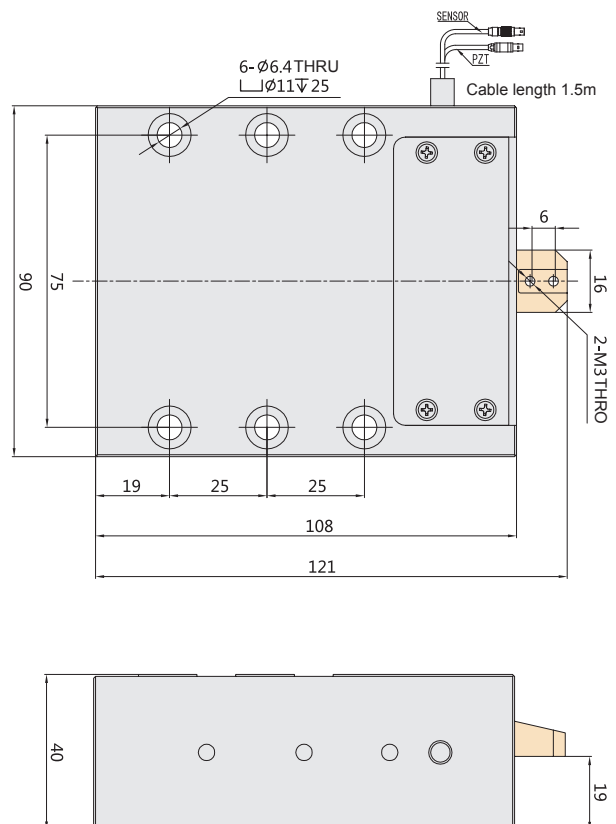
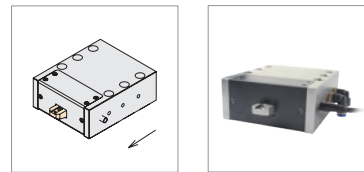


► Recommended Controllers

E00/E01	E52	E53
1~3 channel Analog, digital Open/closed loop Ave. current: 291mA	1 channel Analog, digital Open/closed loop Ave. current: 300mA	1 channel Analog, digital Open/closed loop Ave. current: 60mA
Note: For technical data, please refer to "Piezo Controllers".		

► Drawing

P92.X40



P93 Fast Tool Positioning Stages



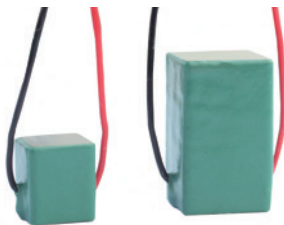
P93 could realize max stroke to 118 μ m. It could be equipped with LVDT sensor or CAP sensor. The sensor outputs 0~10V voltage signal corresponding to zero to full stroke of the stage.

► Characteristics

- Ultra high precision
- Max stroke to 118 μ m
- Load capacity to 20kg
- Response time to 7ms

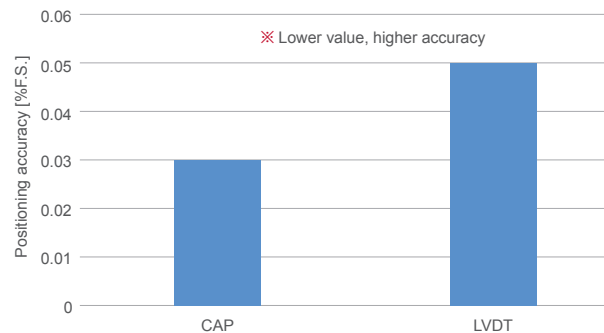
► Principle

P93 is driven by piezo actuators. Using inverse piezo effect, voltage is applied to PZT, and PZT generates micro-deformation. They have the characteristics of high resolution, high response time, large blocking force, and have been widely used in applications of micro-feeding.



► Sensor Type

P93 could be optionally equipped with LVDT sensor or CAP sensor to eliminate the hysteresis and creep of piezo actuator.



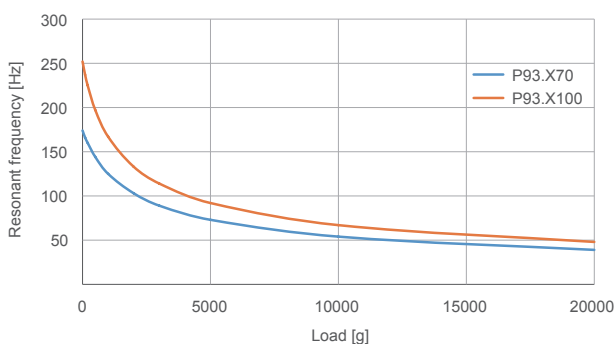
► Customized Temperature Sensor

Customized temperature sensor is available for over-temperature protection and safety protection.

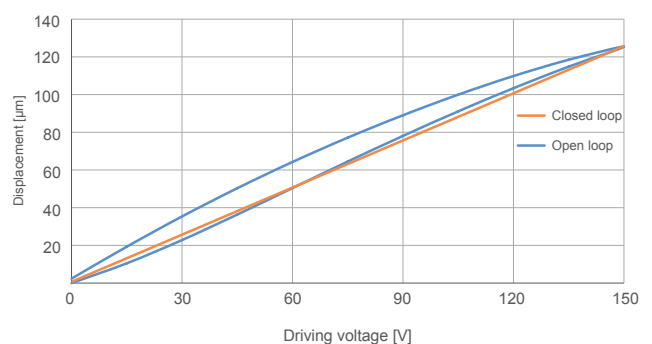
► Applications

- Diamond micro-feeding
- Precision processing
- High speed tool control
- Precision machining and grinding

► Frequency vs Load Curve

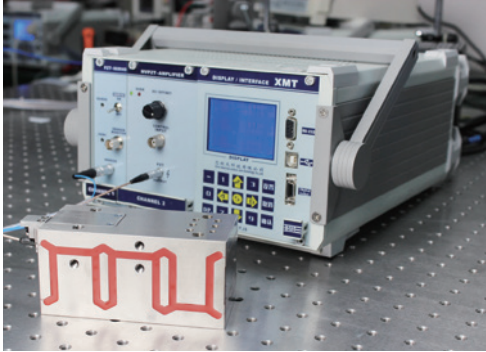


► Open/Closed-Loop Curve



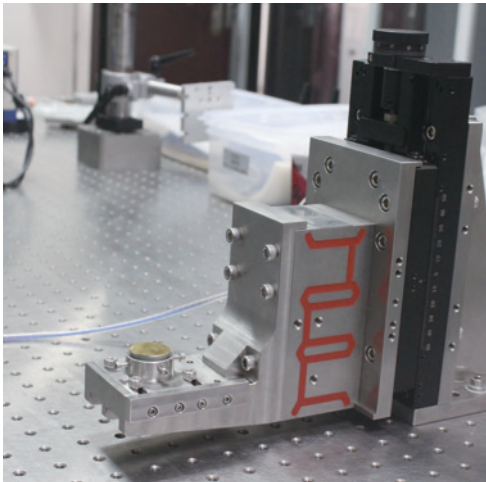
► Piezo Controller

E01.D1 piezo controller (please refer to piezo controller) have the characteristics of high power, high current to be suitable for driving fast tool positioner.

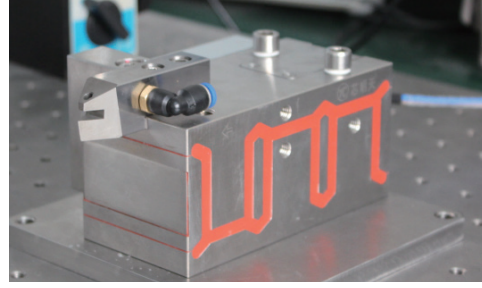


► Customized Macro Micro Stage

Combination with manual platform.



► Tool Holder Installment



► Technical Data

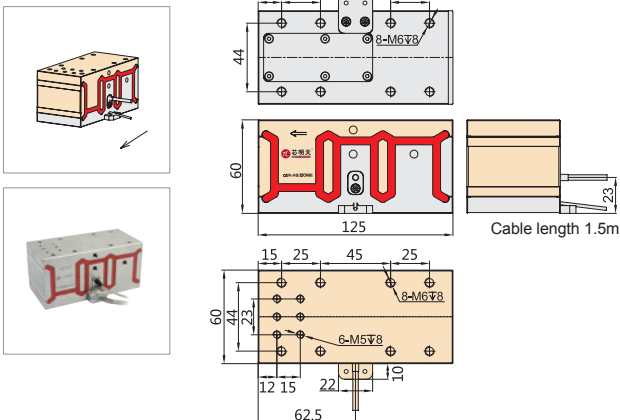
Type	C/L-Closed loop K-Open loop	P93.X70C P93.X70L P93.X70K	P93.X100C P93.X100L P93.X100K	Units
Travel range(0~120V)		65	95	$\mu\text{m}\pm 10\%$
Travel range(0~150V)		81	118	$\mu\text{m}\pm 10\%$
Integrated sensor		CAP/LVDT/-	CAP/LVDT/-	
Resolution		7/10/3	15/20/10	nm
Closed-loop linearity		0.05/0.1/-	0.1/0.15/-	%F.S.
Repeatability		0.03/0.05/-	0.03/0.05/-	%F.S.
Pitch/yaw/roll		<15	<20	μrad
Push/pull force		400/50	300/25	N
Stiffness		5	3	$\text{N}/\mu\text{m}\pm 20\%$
Unloaded resonant frequency		0.15	0.2	$\text{kHz}\pm 20\%$
Unloaded step time		10/7	30/7	$\text{ms}\pm 20\%$
Unloaded operating frequency	10% travel	50	50	$\text{Hz}\pm 20\%$
	100% travel	10	10	
Load capacity		20	20	kg
El. capacitance		15	15	$\mu\text{F}\pm 20\%$
Material		Steel	Steel	
Mass		4000	3500	$\text{g}\pm 5\%$
Operating temperature		CAP 10~50, LVDT 10~40, other -20~80		$^{\circ}\text{C}$
Cable length		1.5		$\text{m}\pm 10\text{mm}$

Note: Max driving voltage could be -20V~150V, 0~120V is recommended for long-term and high-reliable operation.

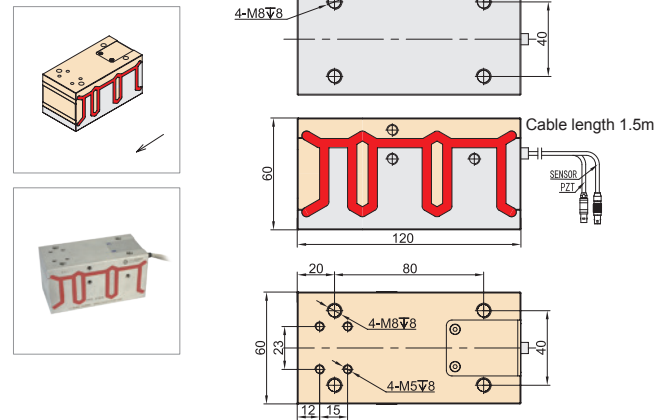
Technical data are measured by CoreMorrow E00/E01 series piezo controller.

► Drawings

P93.X70



P93.X100



Challenge the Limits of Nano Motion and Control Technology...

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