

Nanostage: 5 Nanometer Moving Coil Actuator

SMAC has developed a new moving coil actuator, so called nanostage (see figure 1) that initially is being used for an ultra precise Bio-Medical scanning customer.

Key Technical Feature

Direct drive by single phase coil

- No coil switching = smooth movement
- Servo linear motor
- Closed loop position tracking=virtually no position error
- Stainless steel moving mass
- Low inertia = fast settling
- Low wattage (1.5amp) coil
- Low heat generation = low thermo expansion
- Balanced cross roller guiding with rack and pinion
- Smooth movement with good stiffness in any mounting orientation
- 12 mm height
- meets low profile micro stage requirements.
- 10mm stroke (up to 100mm possible)
- No need for hybrid movement systems
- Low 4.8 nanometer encoder (1.2 possible by year end)
- Compact size allows integrated with many actuator configurations

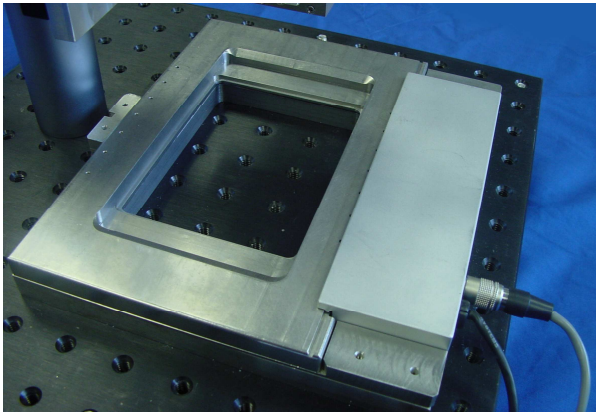
| | TimeDate | SetPoint1 | Iterations | StdDevErr | Time Difference |
|---|---------------|-----------|------------|-----------|-----------------|
|  | 3/27/06 18:58 | -200000 | 500 | 0.741620 | |
| | 3/27/06 21:24 | -183616 | 500 | 0.719316 | 2:25:55 |
| | 3/28/06 9:07 | 0 | 0 | 0.000000 | |
| | 3/28/06 11:33 | -200000 | 500 | 0.836660 | 2:25:51 |
| | 3/28/06 13:59 | -183616 | 500 | 0.835683 | 2:25:53 |
| | 3/28/06 16:25 | -167232 | 500 | 0.753894 | 2:25:54 |
| | 3/28/06 18:51 | -150848 | 500 | 0.726319 | 2:25:54 |
| | 3/28/06 21:17 | -134464 | 500 | 0.772828 | 2:25:54 |
| | 3/28/06 23:43 | -118080 | 500 | 0.740087 | 2:25:54 |
| | 3/29/06 2:08 | -101696 | 500 | 0.785749 | 2:25:54 |
| | 3/29/06 4:34 | -85312 | 500 | 0.766719 | 2:25:54 |
| | 3/29/06 7:00 | -68928 | 500 | 0.853034 | 2:25:54 |
| | 3/29/06 9:26 | -52544 | 500 | 0.727001 | 2:25:54 |
| | 3/29/06 11:52 | -36160 | 500 | 0.772833 | 2:25:53 |
| | 3/29/06 14:18 | -19776 | 500 | 0.779569 | 2:25:54 |
| | 3/29/06 16:44 | -3392 | 500 | 0.786000 | 2:25:55 |
| | 3/29/06 16:50 | 0 | 0 | 0.000000 | |
| | 3/29/06 19:16 | -3392 | 500 | 1.144552 | 2:25:54 |
| | 3/29/06 21:42 | 12992 | 500 | 1.233469 | 2:26:54 |
| | 3/30/06 0:08 | 29376 | 500 | 0.642133 | 2:25:54 |
| | 3/30/06 2:34 | 45760 | 500 | 0.898010 | 2:25:54 |
| | 3/30/06 5:00 | 62144 | 500 | 0.767450 | 2:25:53 |
| | 3/30/06 7:25 | 78528 | 500 | 0.817114 | 2:25:54 |
| | 3/30/06 9:51 | 94912 | 500 | 0.747109 | 2:25:54 |
| | 3/30/06 12:17 | 111296 | 500 | 0.798418 | 2:25:54 |
| | 3/30/06 14:43 | 127680 | 500 | 0.712730 | 2:25:53 |
| | 3/30/06 17:09 | 144064 | 500 | 0.646864 | 2:25:54 |
| | 3/30/06 17:15 | 0 | 0 | 0 | |
| | 3/30/06 17:19 | 0 | 0 | 0 | |

Figure 1 : 5 nano-meter stage

Figure 2 : Performances test

Performances & customised version

Tests show (see figure 2) that after 6,400,000 50nanomter steps, a position error of only 1 count, 5 nanometer, was observed. This is unprecedented !!

This actuator was developed to meet a specific customer's dimensional and performance requirement in 4 weeks.

SMAC can offer a variety of configurations to meet customer space and mounting requirement including very compact multi-axis designs.

Drawing

