



Linear Actuators

Ring Actuators

Features

- Displacement up to 3.3 μm
- Very high force in the kN range
- High stiffness for short response times (<1ms)

Applications

- Micro- and nanopositioning
- Industrial equipment
- Active vibration control
- Valves
- Laser tuning
- Shaker

Description

CTS tape cast multilayer piezoelectric linear actuators are ideal for a wide range of electronic designs requiring precise and fast movement. CTS multilayer piezo ring actuators are produced with a stroke up to 3.3 μm . The piezo ring actuators are used in a wide range of applications due to the easy integration of a ring.

Standard Product, add-on or Custom Solution

This document contains information about the CTS standard multilayer ring actuators and available add-ons. All the CTS multilayer products can be custom designed to match specific requirements – find more information on www.ctscorp.com or contact your local sales representative.



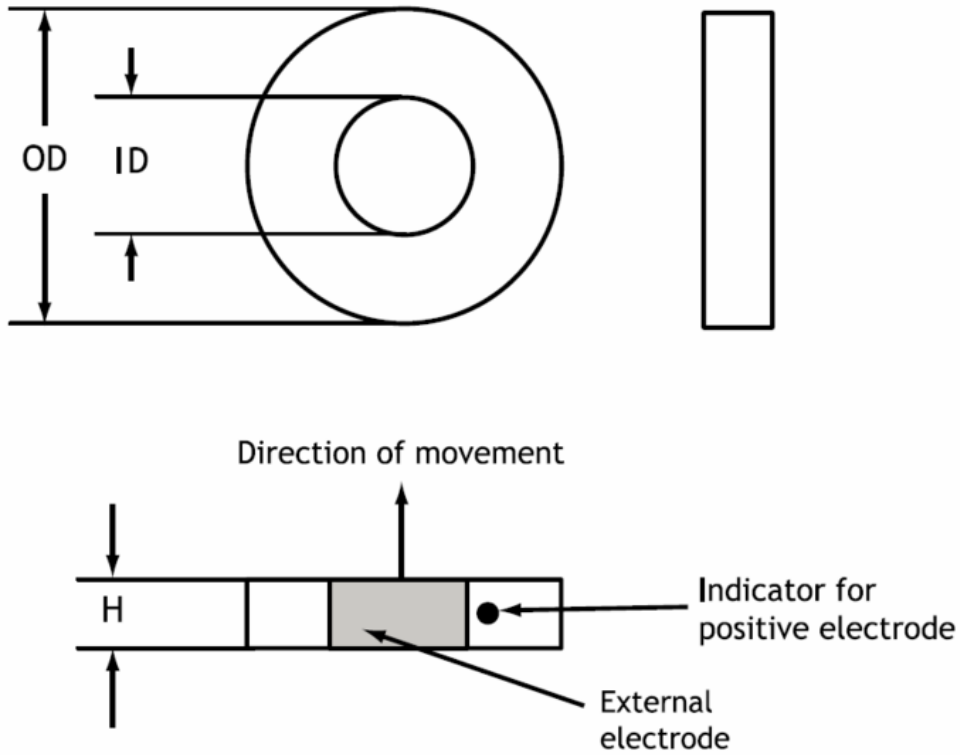


Specifications

Product	NAC2121	NAC2122	NAC2123	NAC2124	NAC2125	Unit
Outer Diameter (OD)	6 +/- 0.20	8 +/- 0.25	12 +/- 0.40	15 +/- 0.45	20 +/- 0.60	mm
Inner Diameter (ID)	2 +/- 0.10	3 +/- 0.10	6 +/- 0.20	9 +/- 0.30	12 +/- 0.40	mm
Height (H)	2 +/- 0.05	2 +/- 0.05	2 +/- 0.05	2 +/- 0.05	2 +/- 0.05	mm
Operating Voltage, V_{max}	200					V
Free Stroke (+/- 15%)	3.3					μm
Blocking Force, 0 to V_{max} (+/- 20%)	1060	1810	3560	4750	8450	N
Capacitance (+/- 15%)	105	200	380	510	890	nF
Large Signal Axial Stiffness (+/- 20%)	321	548	1079	1439	2561	N/ μm
Maximum Operating Temperature	200*					$^{\circ}\text{C}$
Material	NCE51F					-
Electrodes	Silver					-

* Standard wire options A01 and A02 have a rating of 150 $^{\circ}\text{C}$

Drawing



Mounting, Connecting and Driving

Please refer to our online tutorials for recommendations about mounting, connecting and driving ring actuators.

Add-ons

Wire Options

When you order actuators from CTS, you can have wires fitted to save time and money. However, you should consider these parameters, when you select a wire for connection:

- Operation voltage
- Intensity of current
- Operating temperature
- Environment for example vacuum

We recommend wires with PTFE insulation

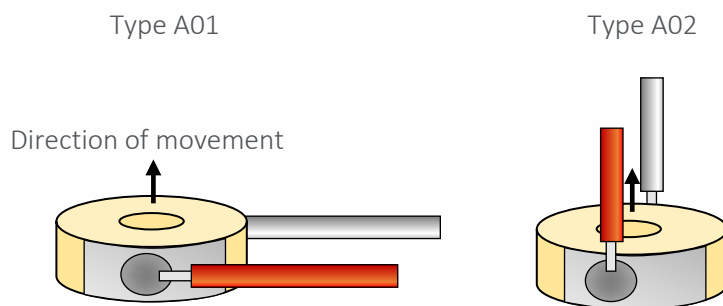
PTFE wires can stand temperatures above 200 °C, whereas PVC wires only resist temperatures up to 80 °C. We recommend PTFE for the thermal and chemical resistance of the insulation.

For vacuum and cryogenic applications, we recommend Kapton wires, which offer superior outgassing and flexibility.

Standard wire options for Ring Actuators

Two standard wire options are available:

	Option A01	Option A02
Type	MIL-W-16878/4, 28 AWG, 7 strands	
Length	200mm +/-10mm	
Position	Middle of the actuator	
Direction	Perpendicular to the height	Toward the top



Standard wire options A01 and A02 have a temperature rating of 150°C.

Wire gauge (AWG)

The wire gauge (AWG) and insulation type should be determined according to the voltage, current and operating environment. Should the standard –A01 or –A02 configuration not suit your application, we offer several alternative wire types:

Wire type	Voltage rating [V]	Approx. outer diameter [mm]	Rec. max. current [A]	Min. operating temperature [°C]
32AWG, MIL-W-16878/6, 7 strands	250	0.6	0.53	-60
30AWG, MIL-W-16878/4, 7 strands	600	0.8	0.86	-60
28AWG, MIL-W-16878/4, 7 strands	600	0.9	1.4	-60
28AWG, Allectra 301-KAPM-035 (Kapton insulation, UHV)	7500*	0.58	1.0	-269
22AWG, BS3G210 Type A, 19 strands	300	1.1	8	-75

* In vacuum conditions

As part of our custom program, we can also stock specific wire.

UHV preparation

Ultra high vacuum (UHV) is the vacuum regime characterized by pressures lower than about 10^{-7} pascal or 100 nanopascals ($\sim 10^{-9}$ torr). Extreme cleanliness and low outgassing are essential parameters in sustaining the vacuum level in such systems. Elevated temperature compatibility is often needed since water vapour and other trace gasses are removed from the system during a "bake-out".

CTS piezoceramic components are designed to support system development and integration of piezo technology in UHV applications. Among many technical capabilities, CTS is competent in producing piezoelectric actuators meeting the demands on temperature compatibility and out gassing levels set by UHV operation.

For low outgassing, Kapton-insulated wires are recommended. In addition, with the UHV preparation the products will undergo a specific cleaning process and be packaged in sealed pouches.

Strain-gauge

A strain gauge is a simple way of obtaining feedback on the deformation of a piezoelectric actuator, typically to achieve closed-loop control. Strain gauges are recommended for experimental setups and small series. CTS offer a standard version for piezo ring actuators (single and stacked) which is designed as a half bridge with two grids at 90°. The strain gauge is a very compact solution and can therefore be fitted to actuator series NAC2123 and above.

The characteristics of the strain gauge are:

Strain gauge parameters	
Nominal resistance	350 Ω
Nominal sensitivity	1 mV/V
Maximal range of deformation	2%
Deformation range of the actuator	0.1- 0.2 % Depending on the actuator type
Temperature range	-40 – +150 °C
Recommended supply voltage	5 V AC or DC Depending on temperature range and heating of the gauge

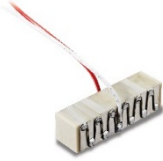
The bandwidth of the measurement system will depend on the signal conditioner that is used. A conditioner with a carrier frequency will typically have a cutoff frequency below 200Hz. “DC” type conditioners have a wider bandwidth but are more sensitive to noise.

The strain gauge has a range of 2% strain while the stack typically generates 0.18% strain (at room temperature). Therefore the output range will be about 9% of the full range. The nominal gauge factor specified by the manufacturer is 1.99+/-2%. However if quantitative measurements are required, it is recommended to perform an initial characterization of the strain-gauge directly in the application using an external sensor.

Linear Actuators Product Families



Plate and Ring Actuators



Stacked Actuators:

- Plate Stacks
- Plate stacks, compact
- Ring Stacks
- High Temperature Stacks
- Damage Tolerant Stacks



Preloaded Actuators

Learn more about the different linear actuators product families on www.ctscorp.com.