



Linear Actuators

Plate Actuators

Features

- Displacement up to 3.3 μm
- Very low operating voltages (down to 60V)
- Very high force generation
- 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 plate actuators feature linear displacement at very low operating voltages. The plates are produced with a stroke up to 3.3 μm .

Standard Product, add-ons or Custom Solution

This document contains information about the CTS standard multilayer plate 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	NAC2001	NAC2011	NAC2002	NAC2012	NAC2024	Unit
Length (L)	2 +/- 0.10		3 +/- 0.10			mm
Width (W)	2 +/- 0.10		3 +/- 0.10			mm
Height (H)	2 +/- 0.05					mm
Operating Voltage, V_{max}	60	150	60	150	200	V
Free Stroke (+/- 15%)	3.0	3.3	3.0	3.3	1.9	μm
Blocking Force, 0 to V_{max} (+/- 20%)	168		378		290	N
Capacitance (+/15%)	150	25	400	65	25	nF
Large Signal Axial Stiffness (+/- 20%)	56	51	126	115	161	N/ μm
Maximum Operating Temperature	200*					$^{\circ}\text{C}$
PZT material	NCE51	NCE51F	NCE51	NCE51F	NCE41F or NCE46	-
External electrodes	Screen-printed silver					-

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

Product	NAC2003	NAC2013	NAC2025	NAC2014	NAC2021	Unit
Length (L)	5 +/- 0.10			7 +/- 0.10		mm
Width (W)	5 +/- 0.10			7 +/- 0.10		mm
Height (H)	2 +/- 0.05					mm
Operating Voltage, V_{max}	60	150	200	150	200	V
Free Stroke (+/- 15%)	3.0	3.3	1.9	3.3	3.3	μm
Blocking Force, 0 to V_{max} (+/- 20%)	1050		800	2060		N
Capacitance (+/15%)	1080	190	80	380	220	nF
Large Signal Axial Stiffness (+/- 20%)	350	318	400	624		N/ μm
Maximum Operating Temperature	200*					$^{\circ}\text{C}$
PZT material	NCE51	NCE51F	NCE41F or NCE46	NCE51F		-
External electrodes	Screen-printed silver					-

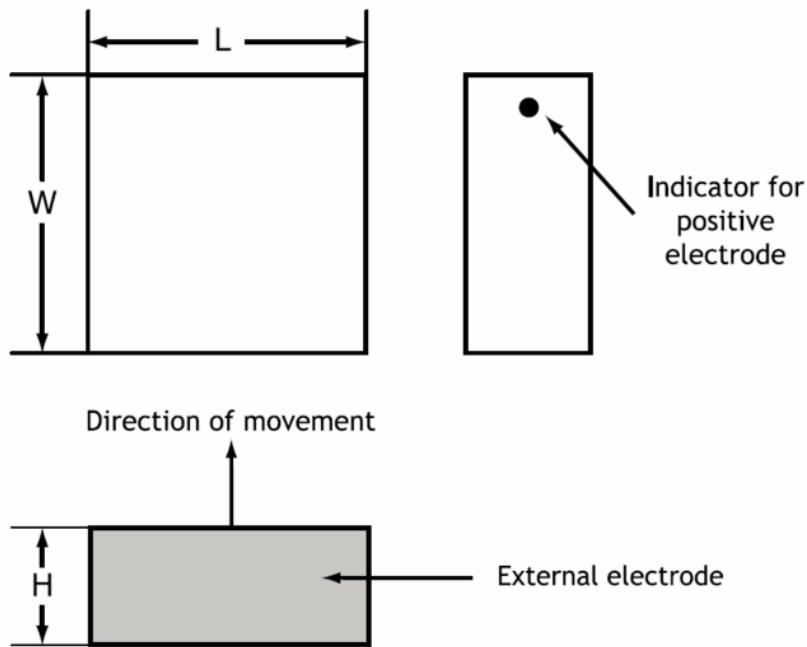
* Standard wire options A01 and A02 have a rating of 150 $^{\circ}\text{C}$



Product	NAC2015	NAC2022	NAC2023	Unit
Length (L)	10 +/- 0.10		15 +/- 0.10	mm
Width (W)	10 +/- 0.10		15 +/- 0.10	mm
Height (H)	2 +/- 0.05			mm
Operating Voltage, V _{max}	150	200	200	V
Free Stroke (+/- 15%)	3.3			μm
Blocking Force, 0 to V _{max} (+/- 20%)	4200		9450	N
Capacitance (+/- 15%)	760	440	970	nF
Large Signal Axial Stiffness (+/- 20%)	1273		2864	N/μm
Maximum Operating Temperature	200*			°C
PZT material	NCE51F			-
External electrodes	Screen-printed silver			-

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

Drawing



Mounting, Connecting and Driving

Please refer to our online tutorials for recommendations about mounting, connecting and driving plate 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

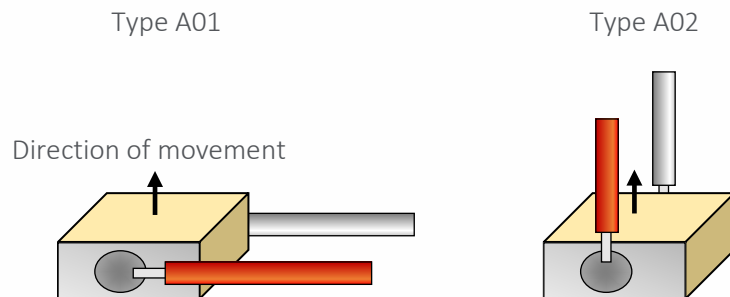
PTFE wires can stand temperatures above 200 °C, whereas PVC wires only resist temperatures up to 80 °C. We recommend PTFE for the thermal and chemical resistance of the insulation.

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

Standard wire options for plate actuators

Two standard wire options are available:

	Option A01	Option A02
Wire 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*	0.6	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 vapor 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.

Chamfers

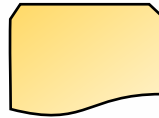
Plate actuators must not be mounted against a conductive surface, to avoid the risk of short-circuits between the surface electrodes. We recommend to always use a non-conductive interface or insert a layer of insulating tape between the actuator and a conductive counterpart.

As an alternative it is possible to order the plate actuator with chamfers in order to have a clearance between the external electrodes and a conductive surface. The robustness of this solution is however not ideal, as arcing can still occur in presence of high voltage or contamination for example.

Standard delivery
condition



Chamfers
0.1-0.2mm x 45°

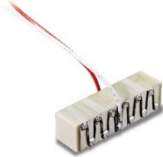


The chamfer add-on is applied on the electroded side and can be ordered at one or both ends of the plate actuator.

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.