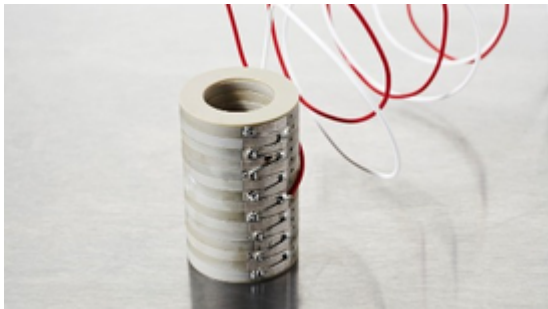


# NAC2123-Hxx



Noliac ring stack actuator NAC2123-Hxx (height in mm – Hxx) is based on the multilayer actuator NAC2123 and can be stacked to match you requirements. The standard range of NAC2123-Hxx is produced in a height between 4-120 mm. The ring stack provides a stroke in a range between 3.3 and 194.7  $\mu\text{m}$  and blocking force up to 3560 N depending on the height of the stack.

SPECIFICATIONS

Attributes	Value	Tolerance
Length / outer diameter	12 mm	+0.60/-0.40 mm
Width / inner diameter	6 mm	+0.20/-0.40 mm
Max width / outer diameter max	13.8 mm	
Height	4 — 120 mm	+/-0.2 mm or 1% (whichever is largest)
Operating voltage, max.	200 V	
Free stroke, max.	3.3 — 194.7 $\mu\text{m}$	+/- 15%
Blocking force, max.	3560 N	+/-20%
Capacitance	340-20200 nF	+/- 15%
Stiffness	1079-18 N/ $\mu\text{m}$	+/-20%
Maximum operating temperature	150 °C	
Material	NCE51F	
Unloaded resonance frequency	>248k - 9 k Hz	
Electrodes	Screen-printed Ag and soldered bus wire (option: glued connections)	
Remarks	-	

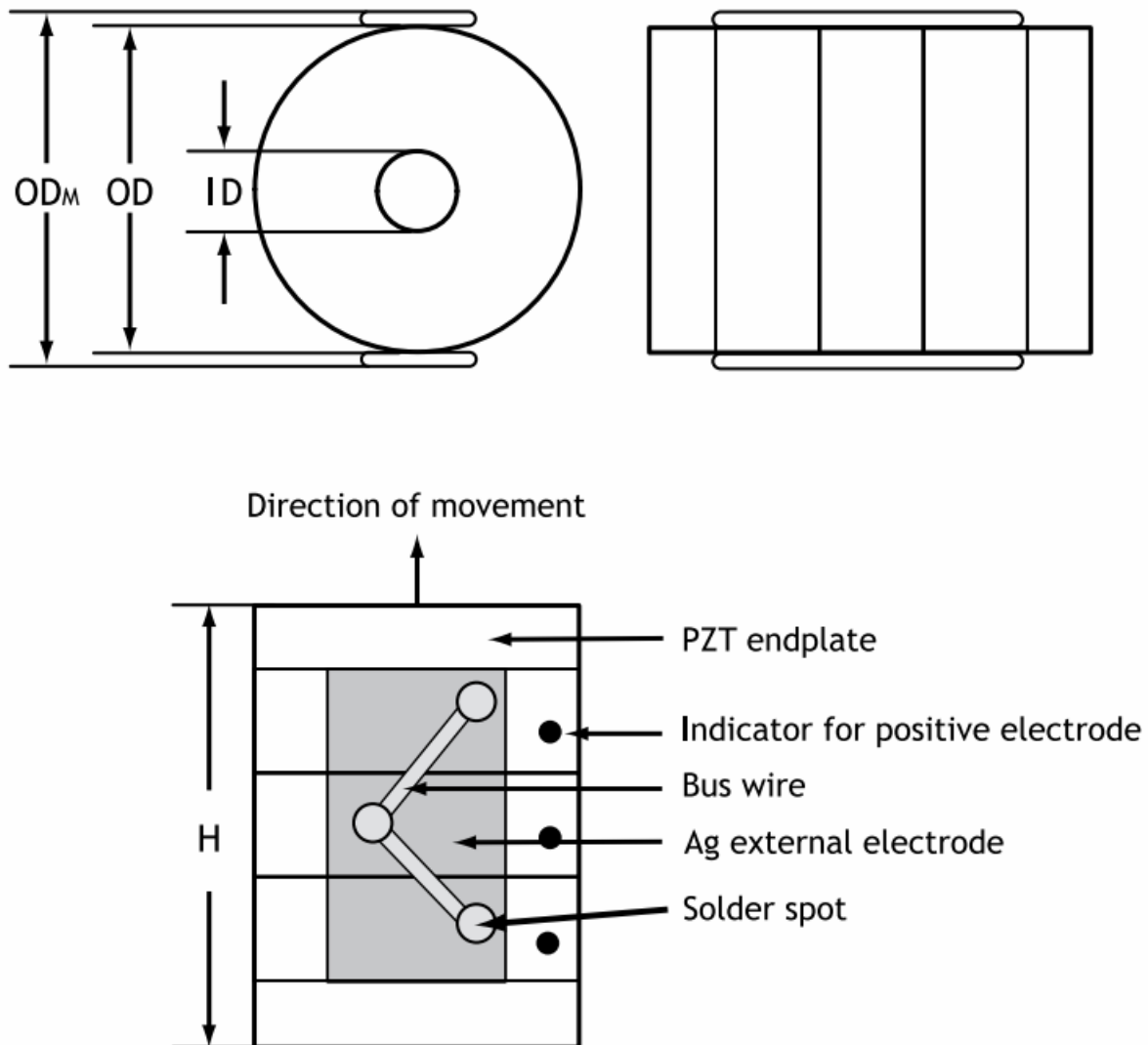
## Stack options

Height	Stroke	Capacitance
4 mm	3.3 $\mu\text{m}$	340 nF
6 mm	6.6 $\mu\text{m}$	680 nF
8 mm	9.9 $\mu\text{m}$	1030 nF

10 mm	13.2 $\mu\text{m}$	1370 nF
12 mm	16.5 $\mu\text{m}$	1710 nF
14 mm	19.8 $\mu\text{m}$	2050 nF
16 mm	23.1 $\mu\text{m}$	2390 nF
18 mm	26.4 $\mu\text{m}$	2740 nF
20 mm	29.7 $\mu\text{m}$	3080 nF
22 mm	33 $\mu\text{m}$	3420 nF
24 mm	36.3 $\mu\text{m}$	3760 nF
26 mm	39.6 $\mu\text{m}$	4100 nF
28 mm	42.9 $\mu\text{m}$	4450 nF
30 mm	46.2 $\mu\text{m}$	4790 nF
32 mm	49.5 $\mu\text{m}$	5130 nF
34 mm	52.8 $\mu\text{m}$	5470 nF
36 mm	56.1 $\mu\text{m}$	5810 nF
38 mm	59.4 $\mu\text{m}$	6160 nF
40 mm	62.7 $\mu\text{m}$	6500 nF
42 mm	66 $\mu\text{m}$	6840 nF
44 mm	69.3 $\mu\text{m}$	7180 nF
46 mm	72.6 $\mu\text{m}$	7520 nF
48 mm	75.9 $\mu\text{m}$	7870 nF
50 mm	79.2 $\mu\text{m}$	8210 nF
52 mm	82.5 $\mu\text{m}$	8550 nF
54 mm	85.8 $\mu\text{m}$	8890 nF
56 mm	89.1 $\mu\text{m}$	9230 nF
58 mm	92.4 $\mu\text{m}$	9580 nF
60 mm	95.7 $\mu\text{m}$	9920 nF
62 mm	99 $\mu\text{m}$	10260 nF
64 mm	102.3 $\mu\text{m}$	10600 nF
66 mm	105.6 $\mu\text{m}$	10940 nF
68 mm	108.9 $\mu\text{m}$	11290 nF
70 mm	112.2 $\mu\text{m}$	11630 nF
72 mm	115.5 $\mu\text{m}$	11970 nF
74 mm	118.8 $\mu\text{m}$	12310 nF
76 mm	122.1 $\mu\text{m}$	12650 nF
78 mm	125.4 $\mu\text{m}$	13000 nF
80 mm	128.7 $\mu\text{m}$	13340 nF
82 mm	132 $\mu\text{m}$	13680 nF
84 mm	135.3 $\mu\text{m}$	14020 nF
86 mm	138.6 $\mu\text{m}$	14360 nF
88 mm	141.9 $\mu\text{m}$	14710 nF
90 mm	145.2 $\mu\text{m}$	15050 nF
92 mm	148.5 $\mu\text{m}$	15390 nF
94 mm	151.8 $\mu\text{m}$	15730 nF
96 mm	155.1 $\mu\text{m}$	16070 nF
98 mm	158.4 $\mu\text{m}$	16420 nF
100 mm	161.7 $\mu\text{m}$	16760 nF
102 mm	165 $\mu\text{m}$	17100 nF
104 mm	168.3 $\mu\text{m}$	17440 nF

106 mm	171.6 $\mu\text{m}$	17780 nF
108 mm	174.9 $\mu\text{m}$	18130 nF
110 mm	178.2 $\mu\text{m}$	18470 nF
112 mm	181.5 $\mu\text{m}$	18810 nF
114 mm	184.8 $\mu\text{m}$	19150 nF
116 mm	188.1 $\mu\text{m}$	19490 nF
118 mm	191.4 $\mu\text{m}$	19840 nF
120 mm	194.7 $\mu\text{m}$	20180 nF

## DRAWINGS



## MOUNT AND CONNECT

### Mounting

The actuators are usually grinded on top and bottom surfaces (perpendicular to the direction of expansion) in order to obtain flat and parallel surfaces for mounting. The actuators may be mounted either by mechanical clamping or gluing.

Avoiding short circuit can either be achieved by:

- Adding Kapton foil on the metallic surfaces.
- Having inactive ceramic plates between the actuator and the metal plate.

Stacked actuators are manufactured with top and bottom insulating ceramic end-plates.

If glued, it is important to ensure a very thin glue line between the actuator and the substrate. It is recommended that a pressure, e.g. 2-5 MPa, is applied during the curing process.

To avoid significant loss of performance, the mounting of the actuators should avoid mechanical clamping and/or gluing on the sides of the actuator.

During manufacturing or handling, minor chips on the end-plates can appear. Minor chips cannot be avoided, but such chips do not affect performance.

### Electrical connection

#### External electrodes

The external electrodes are screen printed silver as standard. Other materials, e.g. gold or silver/palladium are available on request. The positive electrode is indicated by a black spot.

Electrical connection to the external electrodes can be achieved by mechanical contacts, soldering, gluing with electrically conductive glues or wire bonding.

#### Mechanical connections

Mechanical connections can be arranged by e.g. copper springs contacted to the external electrodes. It is recommended to use external electrodes of gold in order to eliminate oxidation of the electrodes.

#### Soldering

Soldering electrical wires to the screen-printed silver electrode makes an excellent and time-stable connection. In order to avoid challenges with wetting the solder on the silver surface, always clean the external electrodes with a glass brush or steel wool.

## WIRES

When you order actuators from Noliac, 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 Teflon wires

Teflon wires can stand temperatures above 200 °C, whereas PVC wires only resist temperatures up to 80 °C. In tough operating conditions or in vacuum, it is recommended always to use Teflon isolated wire to guarantee the proper performance of PZT-elements.

### Wire thickness (AWG)

The wire thickness (AWG) is determined by the current that has to be transmitted to and from the PZT-element. The required current is determined by the capacitance of the PZT-element, the maximum driving frequency and the maximum voltage  $U_{p-p}$ .

	Option A01	Option A02	Option C
Type	28 AWG Teflon	28 AWG Teflon	Custom
Length	200 +/- 10mm	200 +/- 10mm	To be defined
Position	Middle of the actuator	Middle of the actuator	To be defined
Direction	Perpendicular to the height	Toward top	To be defined

## Type A01



## Type A02

