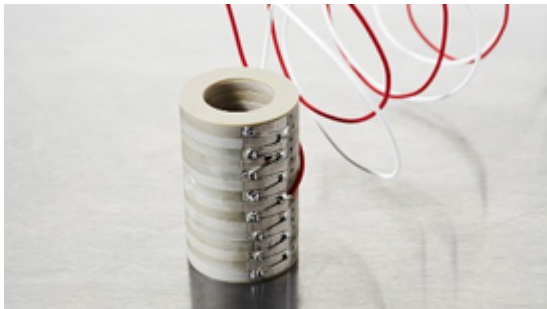


## NAC2125-Hxx



Noliac ring stack actuator NAC2125-Hxx (height in mm - Hxx) is based on the multilayer actuator NAC2125 and can be stacked to match your requirements. The standard range of NAC2125-Hxx is produced in a height between 4-200 mm. The ring stack provides a stroke in a range between 3.3 and 326.7  $\mu\text{m}$  and blocking force up to 8450 N depending on the height of the stack.

### SPECIFICATIONS

Attributes	Value	Tolerance
Length / outer diameter	20 mm	+0.80/-0.60 mm
Width / inner diameter	12 mm	+0.40/-0.60 mm
Max width / outer diameter max	21.8 mm	
Height	4 — 200 mm	+/-0.2 mm or 1% (whichever is largest)
Operating voltage, max.	200 V	
Free stroke, max.	3.3 — 326.7 $\mu\text{m}$	+/- 15%
Blocking force, max.	8450 N	+/-20%
Capacitance	800-79300 nF	+/- 15%
Stiffness	2561-26 N/ $\mu\text{m}$	+/-20%
Maximum operating temperature	150 °C	
Material	NCE51F	
Unloaded resonance frequency	>248k - 6 k Hz	
Electrodes	Screen-printed Ag and soldered bus wire (option: glued connections)	

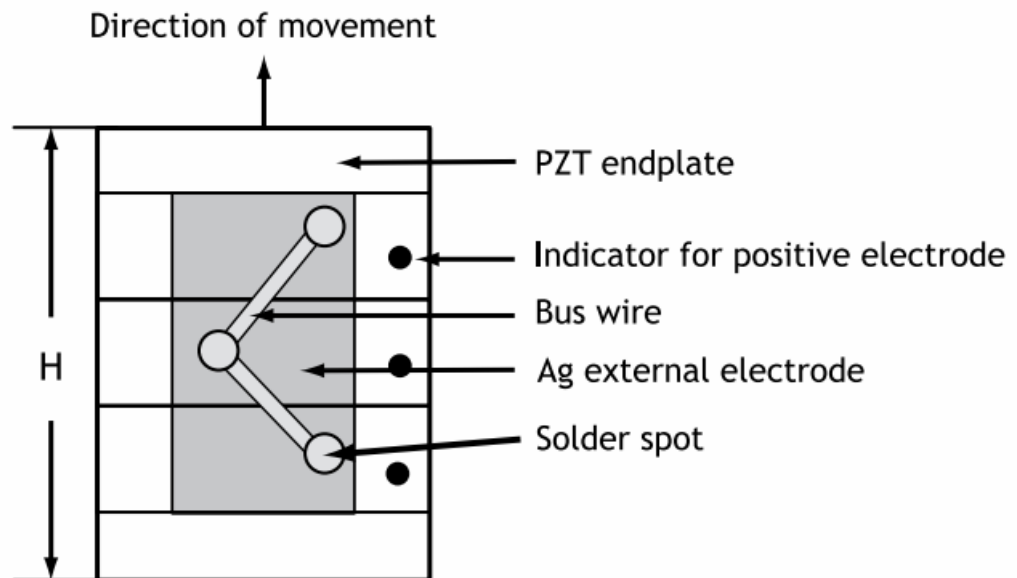
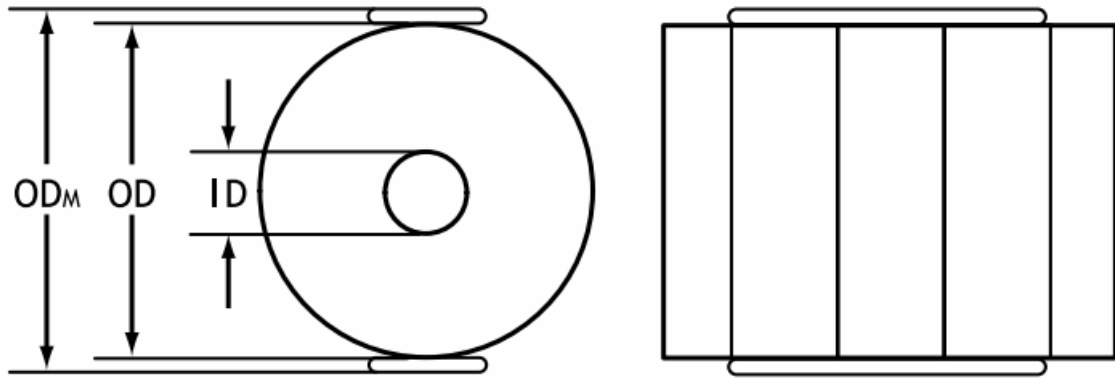
### Stack options

Height	Stroke	Capacitance
4 mm	3.3 $\mu\text{m}$	800 nF
6 mm	6.6 $\mu\text{m}$	1600 nF
8 mm	9.9 $\mu\text{m}$	2400 nF
10 mm	13.2 $\mu\text{m}$	3200 nF

12 mm	16.5 $\mu\text{m}$	4010 nF
14 mm	19.8 $\mu\text{m}$	4810 nF
16 mm	23.1 $\mu\text{m}$	5610 nF
18 mm	26.4 $\mu\text{m}$	6410 nF
20 mm	29.7 $\mu\text{m}$	7210 nF
22 mm	33 $\mu\text{m}$	8010 nF
24 mm	36.3 $\mu\text{m}$	8810 nF
26 mm	39.6 $\mu\text{m}$	9610 nF
28 mm	42.9 $\mu\text{m}$	10410 nF
30 mm	46.2 $\mu\text{m}$	11210 nF
32 mm	49.5 $\mu\text{m}$	12020 nF
34 mm	52.8 $\mu\text{m}$	12820 nF
36 mm	56.1 $\mu\text{m}$	13620 nF
38 mm	59.4 $\mu\text{m}$	14420 nF
40 mm	62.7 $\mu\text{m}$	15220 nF
42 mm	66 $\mu\text{m}$	16020 nF
44 mm	69.3 $\mu\text{m}$	16820 nF
46 mm	72.6 $\mu\text{m}$	17620 nF
48 mm	75.9 $\mu\text{m}$	18420 nF
50 mm	79.2 $\mu\text{m}$	19220 nF
52 mm	82.5 $\mu\text{m}$	20030 nF
54 mm	85.8 $\mu\text{m}$	20830 nF
56 mm	89.1 $\mu\text{m}$	21630 nF
58 mm	92.4 $\mu\text{m}$	22430 nF
60 mm	95.7 $\mu\text{m}$	23230 nF
62 mm	99 $\mu\text{m}$	24030 nF
64 mm	102.3 $\mu\text{m}$	24830 nF
66 mm	105.6 $\mu\text{m}$	25630 nF
68 mm	108.9 $\mu\text{m}$	26430 nF
70 mm	112.2 $\mu\text{m}$	27230 nF
72 mm	115.5 $\mu\text{m}$	28040 nF
74 mm	118.8 $\mu\text{m}$	28840 nF
76 mm	122.1 $\mu\text{m}$	29640 nF
78 mm	125.4 $\mu\text{m}$	30440 nF
80 mm	128.7 $\mu\text{m}$	31240 nF
82 mm	132 $\mu\text{m}$	32040 nF
84 mm	135.3 $\mu\text{m}$	32840 nF
86 mm	138.6 $\mu\text{m}$	33640 nF
88 mm	141.9 $\mu\text{m}$	34440 nF
90 mm	145.2 $\mu\text{m}$	35240 nF
92 mm	148.5 $\mu\text{m}$	36050 nF
94 mm	151.8 $\mu\text{m}$	36850 nF
96 mm	155.1 $\mu\text{m}$	37650 nF
98 mm	158.4 $\mu\text{m}$	38450 nF
100 mm	161.7 $\mu\text{m}$	39250 nF
102 mm	165 $\mu\text{m}$	40050 nF
104 mm	168.3 $\mu\text{m}$	40850 nF
106 mm	171.6 $\mu\text{m}$	41650 nF

108 mm	174.9 $\mu\text{m}$	42450 nF
110 mm	178.2 $\mu\text{m}$	43250 nF
112 mm	181.5 $\mu\text{m}$	44060 nF
114 mm	184.8 $\mu\text{m}$	44860 nF
116 mm	188.1 $\mu\text{m}$	45660 nF
118 mm	191.4 $\mu\text{m}$	46460 nF
120 mm	194.7 $\mu\text{m}$	47260 nF
122 mm	198 $\mu\text{m}$	48060 nF
124 mm	201.3 $\mu\text{m}$	48860 nF
126 mm	204.6 $\mu\text{m}$	49660 nF
128 mm	207.9 $\mu\text{m}$	50460 nF
130 mm	211.2 $\mu\text{m}$	51260 nF
132 mm	214.5 $\mu\text{m}$	52070 nF
134 mm	217.8 $\mu\text{m}$	52870 nF
136 mm	221.1 $\mu\text{m}$	53670 nF
138 mm	224.4 $\mu\text{m}$	54470 nF
140 mm	227.7 $\mu\text{m}$	55270 nF
142 mm	231 $\mu\text{m}$	56070 nF
144 mm	234.3 $\mu\text{m}$	56870 nF
146 mm	237.6 $\mu\text{m}$	57670 nF
148 mm	240.9 $\mu\text{m}$	58470 nF
150 mm	244.2 $\mu\text{m}$	59270 nF
152 mm	247.5 $\mu\text{m}$	60080 nF
154 mm	250.8 $\mu\text{m}$	60880 nF
156 mm	254.1 $\mu\text{m}$	61680 nF
158 mm	257.4 $\mu\text{m}$	62480 nF
160 mm	260.7 $\mu\text{m}$	63280 nF
162 mm	264 $\mu\text{m}$	64080 nF
164 mm	267.3 $\mu\text{m}$	64880 nF
166 mm	270.6 $\mu\text{m}$	65680 nF
168 mm	273.9 $\mu\text{m}$	66480 nF
170 mm	277.2 $\mu\text{m}$	67280 nF
172 mm	280.5 $\mu\text{m}$	68090 nF
174 mm	283.8 $\mu\text{m}$	68890 nF
176 mm	287.1 $\mu\text{m}$	69690 nF
178 mm	290.4 $\mu\text{m}$	70490 nF
180 mm	293.7 $\mu\text{m}$	71290 nF
182 mm	297 $\mu\text{m}$	72090 nF
184 mm	300.3 $\mu\text{m}$	72890 nF
186 mm	303.6 $\mu\text{m}$	73690 nF
188 mm	306.9 $\mu\text{m}$	74490 nF
190 mm	310.2 $\mu\text{m}$	75290 nF
192 mm	313.5 $\mu\text{m}$	76100 nF
194 mm	316.8 $\mu\text{m}$	76900 nF
196 mm	320.1 $\mu\text{m}$	77700 nF
198 mm	323.4 $\mu\text{m}$	78500 nF
200 mm	326.7 $\mu\text{m}$	79300 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.

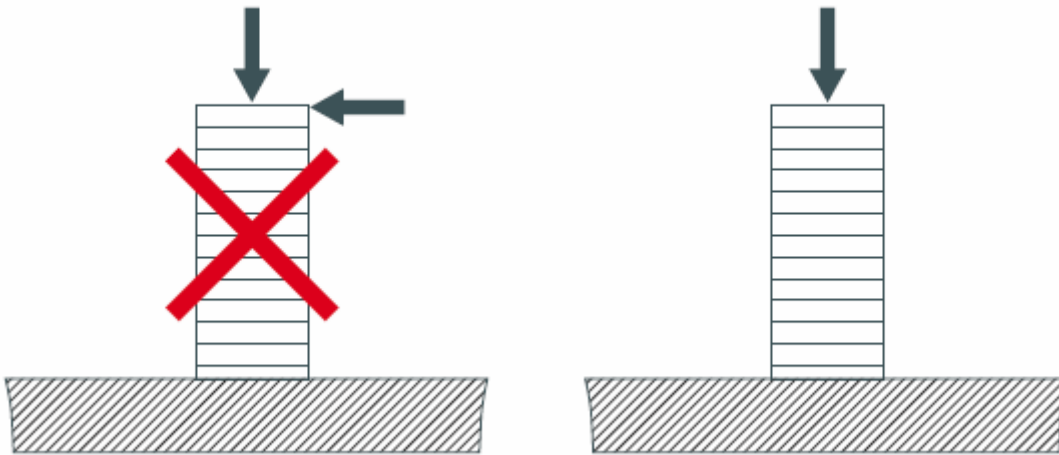
Mechanical connections

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.

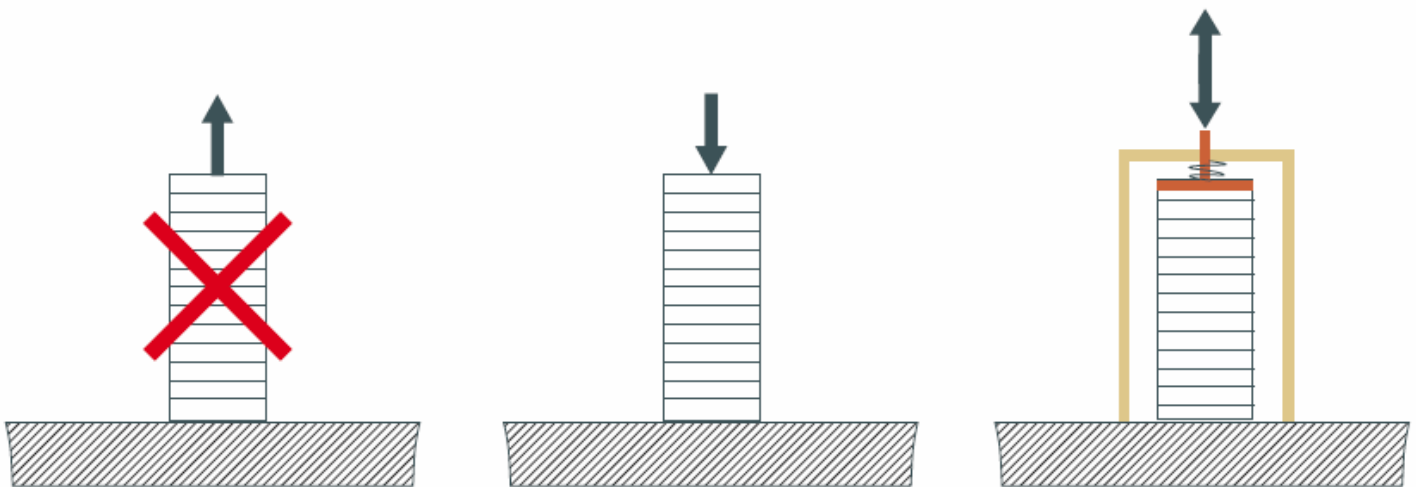
## Soldering

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.

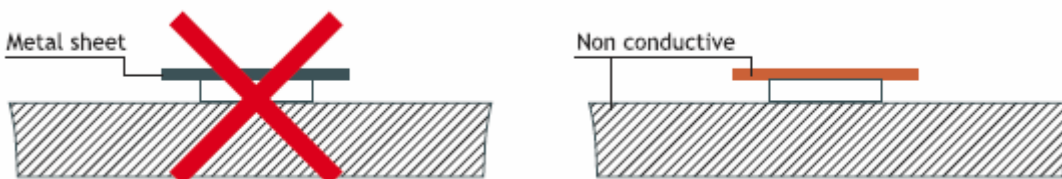
The actuators may only be stressed axially. Tilting and shearing forces must be avoided.



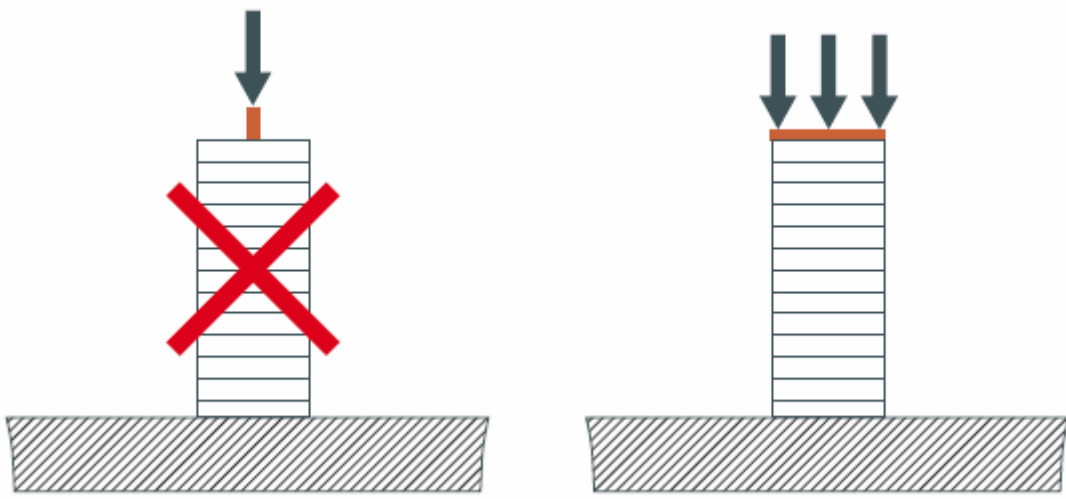
The actuators without preload are sensitive to pulling forces. It is recommended to apply a pre-load in order to optimize the performances of the actuators.



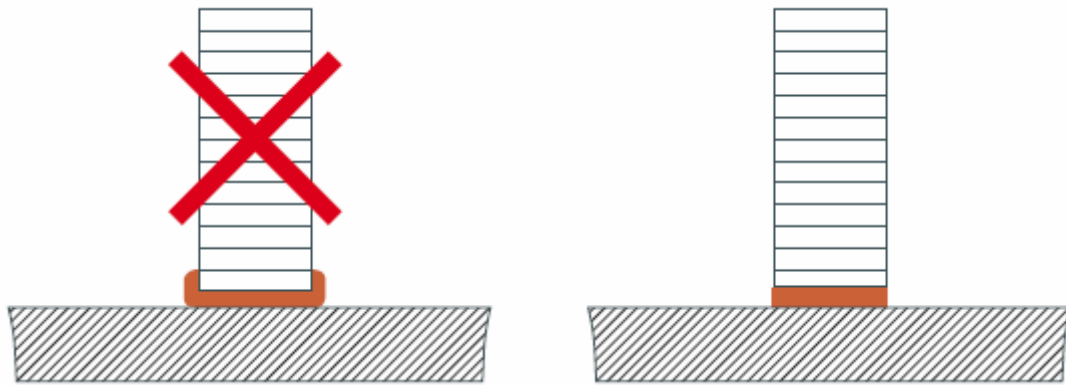
For linear actuators it is recommended not to use a metal plate on top and bottom in order to avoid short circuit.



The force must be applied on the full surface of the actuator in order to assure a good load distribution.



Epoxy glues are well suited for gluing piezoceramics.



## 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.

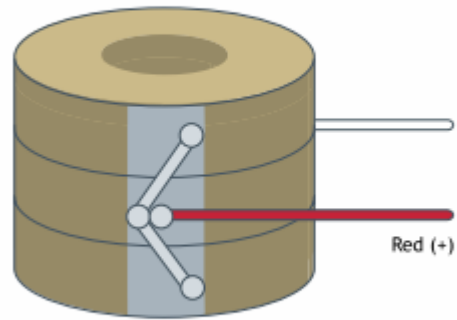
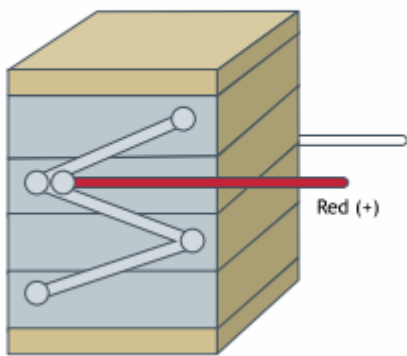
### Wire thickness (AWG)

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

