NANOMUSCLE

Preliminary

Advanced Miniature Motion

DS-CE Linear Actuators

System Includes

- Bi-directional Linear Actuator
- Silent Operation
- Internal Drive Electronics
- Integrated Over-Strain Protection
- Digital End Stop Indicators
- Digital Control Input

Benefits

- Miniature Size
- Operates On as Little as a Single AAA Battery
- Completely Silent Operation
- Simple Electrical Interface

The best way to evaluate NanoMuscle products is by purchasing our demonstration kit. Order yours today!

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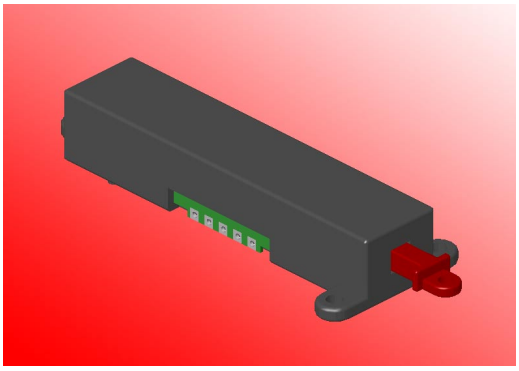
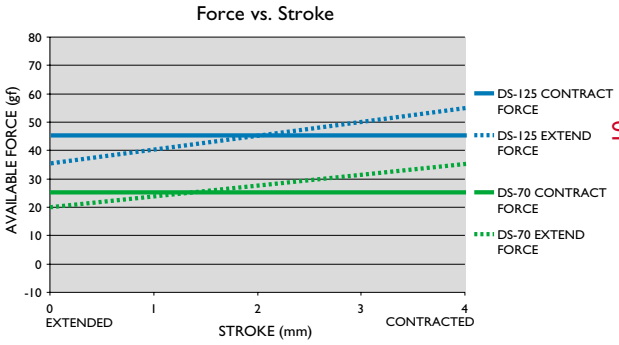
The NanoMuscle DS-CE Linear Actuators are a range of bi-directional high efficiency actuators which contract when activated and extend when deactivated, providing force in both directions. The actuators can interface with all CMOS digital controllers and include overstress protection, drive electronics, and endstop position sensors. Some models also provide position feedback.

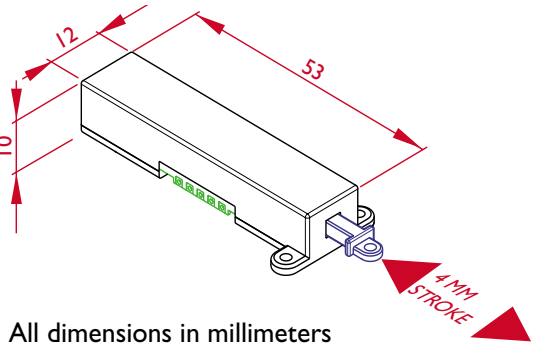


Force Specifications

Actuators can be selected that match the required force, which varies along the length of the stroke as shown below:



External Dimensions



All dimensions in millimeters

Specifications

Model	General Electrical				Contract		Return	
	V_{DC} Range	V_{DC} Nom	Resistance	$I_{AVERAGE}$	$I_{CONTRACT}$	$t_{CONTRACT}$	I_{RETURN}	t_{RETURN}
	V	V	Ω	mA	mA	ms	mA	ms
DS-70-CE 1010	0.8 ~ 3.25	0.8 (Min)	0.95	516	850	400	0	1000
		1.15 (Nom)			1210	280		
		3.25 (Max)			3400	n/a		
DS-70-CE 1030	2.4 ~ 12.0	2.4 (Min)	8.50	175	280	400	0	550
		3.3 (Nom)			400	280		
		12.0 (Max)			1410	n/a		
DS-125-CE 1010	0.8 ~ 1.85	0.8 (Min)	0.55	891	1500	400	0	1500
		1.15 (Nom)			2090	280		
		1.85 (Max)			3400	n/a		
DS-125-CE 1030	2.4 ~ 12.0	2.4 (Min)	4.80	315	500	400	0	750
		3.3 (Nom)			710	280		
		12.0 (Max)			1410	n/a		

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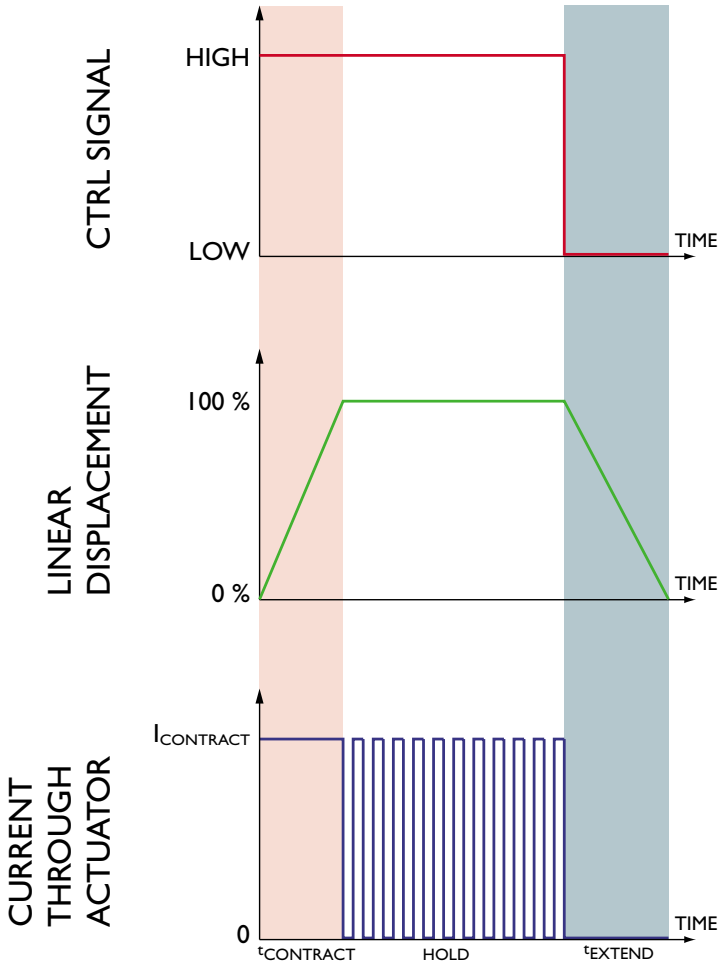
How Does it Work?

When the NanoMuscle control signal (CTRL) is set to high (see usage schematics, next page), the actuator shaft starts to contract and draws $I_{CONTRACT}$ amount of current from the V_{DC} pin. When the actuator has completed its motion (after $t_{CONTRACT}$), the internal electronics modulate the current drawn from the V_{DC} pin to match the required holding power. The amount of holding power depends on the applied load, ambient temperature and other parameters. The unit will continuously modulate the amount of power drawn while CTRL is held high, typically to about 40% of the minimum $I_{CONTRACT}$ current value.

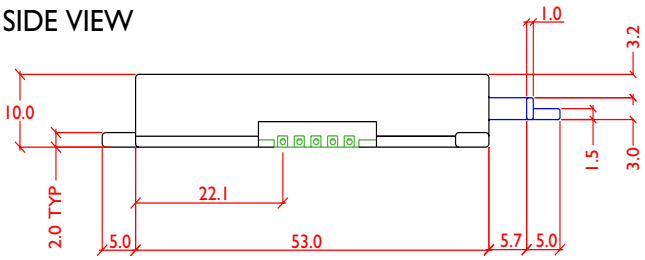
Once CTRL is set low by the controller, the NanoMuscle actuator stops drawing current and the actuator shaft returns to its starting point (after $t_{CONTRACT}$).

This means that the NanoMuscle actuator only draws power for the few hundred milliseconds that it is contracting, draws limited power while holding and no power while the shaft is returning to its starting position even though it provides force in both directions. Therefore, the average current drawn $I_{AVERAGE}$ is much lower than $I_{CONTRACT}$.

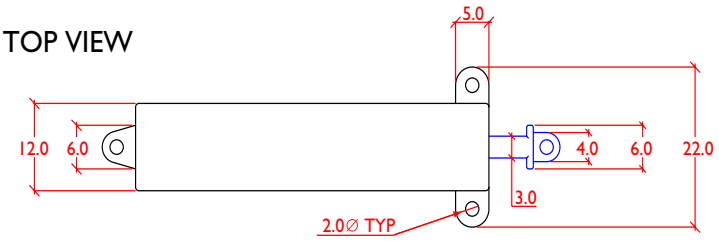


Detailed Dimensions (extended position)

SIDE VIEW



TOP VIEW



Available Options/Configurations

DS-CE Actuators are available with a number of shaft options as well as the Ring shown.

Position feedback is also available on some actuators to allow an external controller to implment position control.

Environmental Specifications

Model	Battery Life		Operating Temperature		Miscellaneous	
	Cycles from alkaline AAA	Cycles from alkaline AA	Min	Max	Cycle Life	mass
	cycles	cycles	°F	°F	cycles	g
DS-70-CE 1010	7,000 from 1 cell	16,000 from 1 cell	-95	165	200,000	5.1
DS-70-CE 1030	25,000 from 3 cells	56,000 from 3 cells				
DS-125-CE 1010	1,200 from 1 cell	3,000 from 1 cell				
DS-125-CE 1030	4,200 from 3 cells	10,500 from 3 cells				

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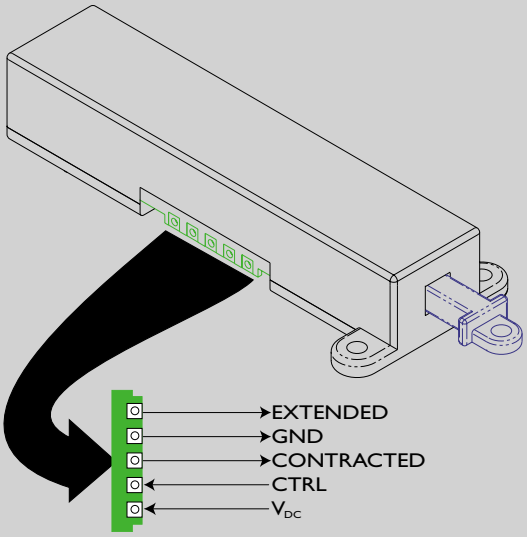
DS-CE Linear Actuator Module
Electrical Usage



Circuit Pinout

Terminal	Description	I/O
EXTENDED	Signal indicating status of full extension	O
CONTRACTED	Signal indicating status of full contraction	O
CTRL	Logic signal	I
V_{DC}	Applied Voltage	I
GND	Ground	

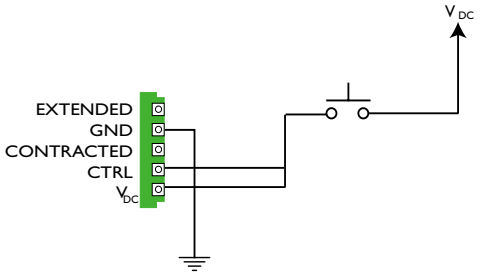
Electrical Characteristics

Motor Position	EXTENDED	CONTRACTED
Fully Extended	V_{DC}	O
Intermediate	O	O
Fully Contracted	O	V_{DC}

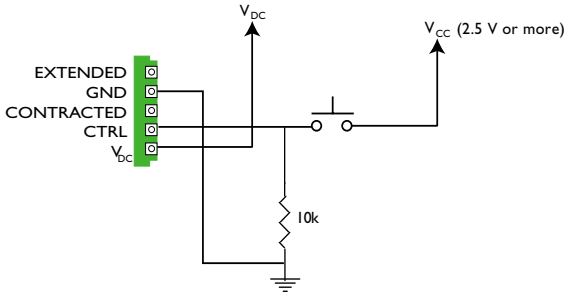
CTRL	Actuator
CTRL < 1V (LOW)	OFF
CTRL > 2.5V (HIGH)	ON

Typical Configurations

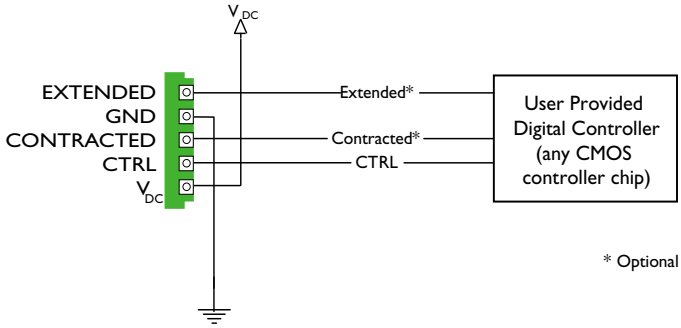
SIMPLE ON/OFF SWITCH 1
When the switch in the schematic (below) is closed, the drive electronics activate the actuator, causing it to contract. When the switch is opened, the actuator extends (assuming V_{DC} is above 2.5v).



SIMPLE ON/OFF SWITCH 2
When the switch in the schematic (below) is closed, the drive electronics activate the actuator, causing it to contract. When the switch is opened, the actuator extends.



DIGITAL CONTROL WITH LOGIC LEVEL V_{DC}
When CTRL is set HIGH, the actuator contracts. Otherwise, the actuator extends.



DIGITAL CONTROL WITH NON LOGIC LEVEL VOLTAGE
When V_{DC} is outside the acceptable range of the controller's voltage, V_{CC}, comparators must be used to buffer the output signals from the actuator. The outputs of the voltage comparators/translators are pulled up to the logic voltage level of the external control electronics. This translates the EXTENDED and CONTRACTED output signal levels to that of the external control electronics, V_{CC}. The comparators are open collector devices.