

# WEBSMART Motor sizing

## General procedure

The sizing of linear motors is mainly determined by the application-related characteristics of velocity and feed force. First of all, the user should determine velocity and force profiles for the required application and set the proper parameters about payload, thrust force, ambient temperature and axis tilt. Then, the choice of the motor size is given either by simply calculating its physical limits, or by using a motor sizing application.

One online application for motor sizing is provided at the address: [Websmart](#)

## Step by step with websmart

### Step 1) Specify the operating condizions of the motor.

For example, an external payload of 1.2 kgs and a motor type wanted of NL tubular linear motors. Then press Motion Profile button.

The screenshot shows the 'Linear motor sizing' web application interface. At the top, there is a header with the 'NiLAB' logo and the text 'Linear motor sizing Vers. 3 Rev 022017'. Social media icons for Facebook, YouTube, Twitter, Pinterest, and LinkedIn are visible in the top right corner. Below the header is a dark bar with the text 'Operating Conditions' and a 'Project from file' button. The main area contains several input fields and dropdown menus for specifying operating conditions:

- Friction coefficient: 0.01 (unit: N/N)
- Inertial payload: 1.2 (unit: Kg)
- Additional thrust force: 0 (unit: Newton)
- Ambient temperature: 40 (unit: Celsius)
- Axis tilt: 0 (unit: °)
- Servo driver supply: 400 (unit: VAC)
- Requested full stroke: (unit: mm)
- Configuration: Moving magnets (dropdown)
- Motor type: NL minilature tubular (dropdown)
- Guiding system: Nitek Linear Guide type (dropdown)
- N. blocks / rails: (dropdown)

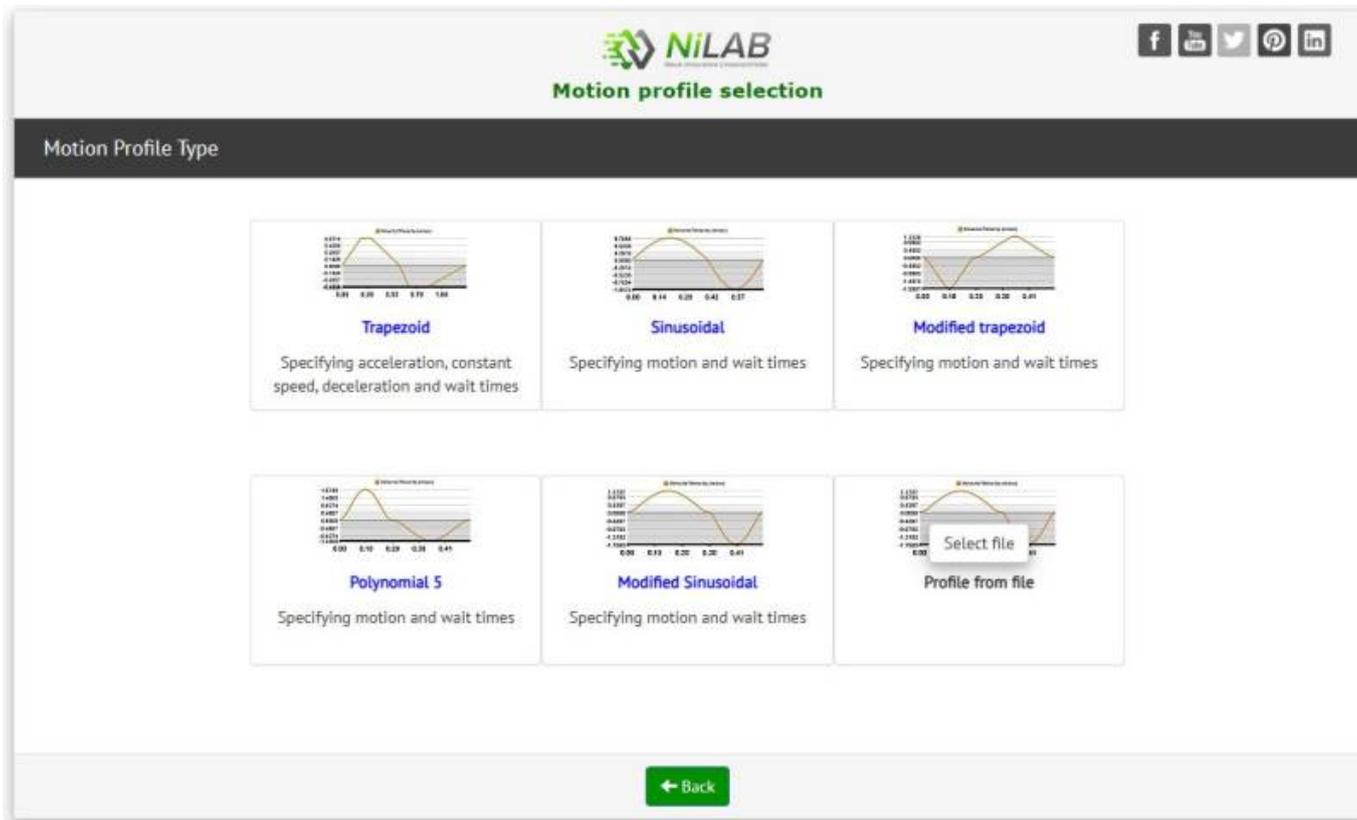
At the bottom of the form, there are two buttons: 'Cancel' and 'Motion Profile →'.

### Step 2) Select a motion profile.

There are different options for the motion profile type. The simplest one is polynomial 5.

It is also possible to upload a cam profile file based on position points. Here an example of motion profile file: [cam\\_profile\\_example.zip](#)

This example must contain as in the first row the number of position point, second row the time resolution and then the position data point with unit in meters



### Step 3) create a polynomial 5 motion profile

As an example, we selected the Polynomial 5 motion profile. The motor will move from 0 to 10 mm, with cycle time = 0.2 sec and waiting time of 0.1 sec.

Press Add segment button to update the motion cycle.

  
**Motion profiles**

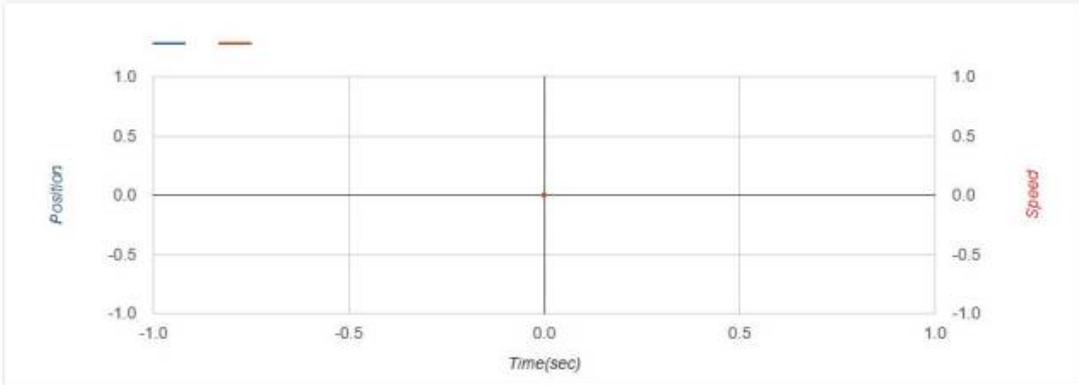


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Motion Profile Type:Polynomial 5 ▾

### Motion profile specifications

<b>Movement</b> <input type="text" value="10"/> <span>mm</span>	<b>Cycle time</b> <input type="text" value="0.2"/> <span>sec</span>	<b>Current position [m]</b> <input type="text" value="0"/>	<b>Current cycle time [s]</b> <input type="text" value="0"/>
<b>Dwell time</b> <input type="text" value="0.1"/> <span>sec</span>	<b>Repetitions</b> <input type="text" value="1"/> <span>+</span> <span>Add segment</span>		



Split chart

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**Motion profiles**

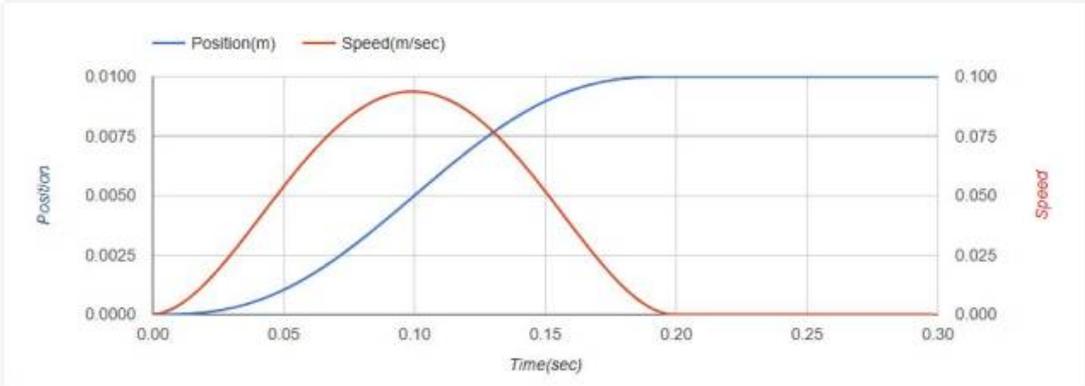


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Motion Profile Type: Polynomial 5 ▾

**Motion profile specifications**

<b>Movement</b> <input type="text" value="0 - 10000"/> <span style="border: 1px solid #ccc; padding: 2px;">mm</span>	<b>Cycle time</b> <input type="text" value="0 - 30"/> <span style="border: 1px solid #ccc; padding: 2px;">sec</span>	<b>Current position [m]</b> 0.01000	<b>Current cycle time [s]</b> 0.30000
<b>Dwell time</b> <input type="text" value="0 - 10"/> <span style="border: 1px solid #ccc; padding: 2px;">sec</span>	<b>Repetitions</b> <input type="text" value="1"/>	<span style="background-color: #28a745; color: white; padding: 5px 10px; border-radius: 3px;">+ Add segment</span>	



Position(m)    Speed(m/sec)

Time(sec)

Split chart

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Then, we move back of 10 mm with different timing.

  
**Motion profiles**

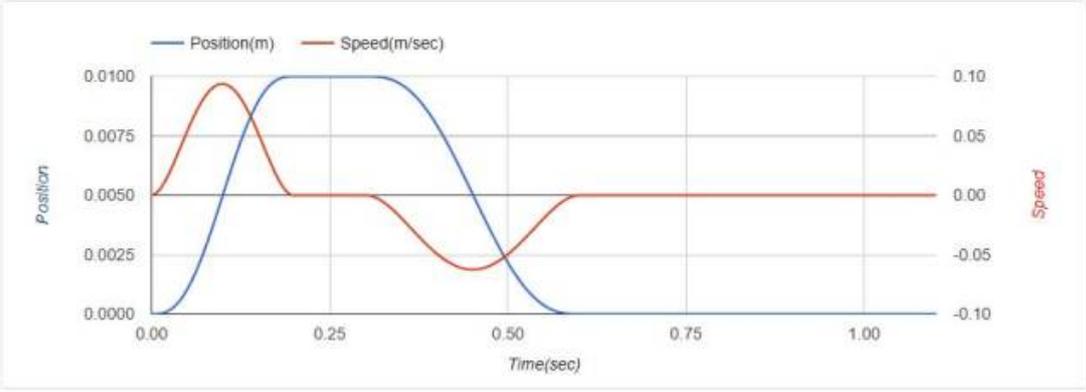


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Motion Profile Type: Polynomial 5 ▾

**Motion profile specifications**

<b>Movement</b> 0 - 10000 mm	<b>Cycle time</b> 0 - 30 sec	<b>Current position [m]</b> 0.00000	<b>Current cycle time [s]</b> 1.10100
<b>Dwell time</b> 0 - 10 sec	<b>Repetitions</b> 1	<input type="button" value="+ Add segment"/>	



**Step 4) When the motion cycle is complete press Sizing button to go ahead.**

A summary window with all the application data will be shown.

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**Motion profile graphs:**

**Operatings conditions:**

Parameter	Value	Unit
Axis tilt	0	degrees
Payload (linear guide mass)	1.2 (0)	kg
Additional thrust force	0	N
Total stroke	10	mm
Friction coefficient	0.01	N/N
Ambient temperature	40	celsius
Max speed	0.09375	m/s
	6	m/min
Max acceleration	0.1471	G
	1.44	m/sec^2
Cycle time	1.10	sec
Linear guide type	0 x 0	
Mechanical assembly	Moving magnets	
Movement	54.42	mov/min
Duty cycle motion	45.58	%
Power supply	400	VAC

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### Step 5) Compatible motors

Click on the Compatibl motor folder a list of compatible motor will be shown.

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Motor code	Magnets Mass	Winding [Celsius]	Temperature [%]	RMS Power [W]	RMS Voltage [kV]	RMS Current [A]	MAX current [A]	RMS Force [N]	MAX force [N]	Motor load [%]
NL080X	0.07	41.90	31	0.26	0.00	0.19	0.57	0.72	2.16	8
NL040Q	0.01	56.10	42	1.36	0.02	0.24	0.73	0.62	1.88	56
NL120Q4P	0.90	63.94	47	13.30	0.01	2.52	3.23	10.57	13.56	50
NL120Q	0.15	40.12	30	0.05	0.00	0.07	0.21	0.89	2.52	4
NL040X	0.01	47.93	36	0.69	0.01	0.24	0.73	0.62	1.89	30
NL120X	0.24	40.11	30	0.05	0.00	0.10	0.27	1.11	2.92	3
NL120X-FC-S157	0.36	42.09	31	4.19	0.01	0.97	1.17	10.55	12.78	15
NL080Q4P	0.05	42.91	32	0.36	0.00	0.32	0.96	0.68	2.06	13
NL080Q	0.05	43.74	32	0.47	0.01	0.18	0.54	0.68	2.06	13

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### Step 6) Performance and limits check

Click on the motor code the diagram about the motor limits and the requirements are shown.



### Step 7) Check safety margin

Click on the Parameter tables the safety margin about the motor performance are shown.



**Motor code: NL080X-10**

Charts
Parameter tables

MOTOR DATA	
Parameter	Value
Phase Resistance	4.86 ohm
Phase Inductance	0.6 mH
Force constant	3.79 N/A
Rated current	2.44 Arms
Back EMF	2.19 V/m/s
Rated Power	27 W
Electrical constant	0.12 msec
Motor constant	0.34 N/radq(W)
Motor shaft length Ls	198 mm
Motor length F	176 mm
Motor dimension H	50 mm

ENERGY SAVING DATA(BETA Version)	
Parameter	Value
Pneumatic cylinder	120603
Air pressure	3 bar
Cylinder outer diameter	12 mm
Cylinder rod diameter	6 mm
Cylinder force	229 N
Air consumption	0.008 nL/cycle
Compressor cost	0.012 Euro/m <sup>3</sup>
Air consumption cost	2.86 Euro/year
Motor consumption cost	28.38 Euro/year
Energy saving	-892.3 %
CO2 Saving	-119 Tons/year

PARAMETERS AND MARGINS OVERVIEW				
Motor Parameter	Value	Request by application	Value	Safety margin
Peak force	41.33 N	Requested Peak Force	2.16 N	94.77 %
RMS force	9.25 N	Requested RMS Force	0.72 N	92.22 %
Servo DCBUS	565.60 VDC	Requested DCBUS voltage	4.49 VDC	99.21 %

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