WEBSMART Motor sizing

General procedure

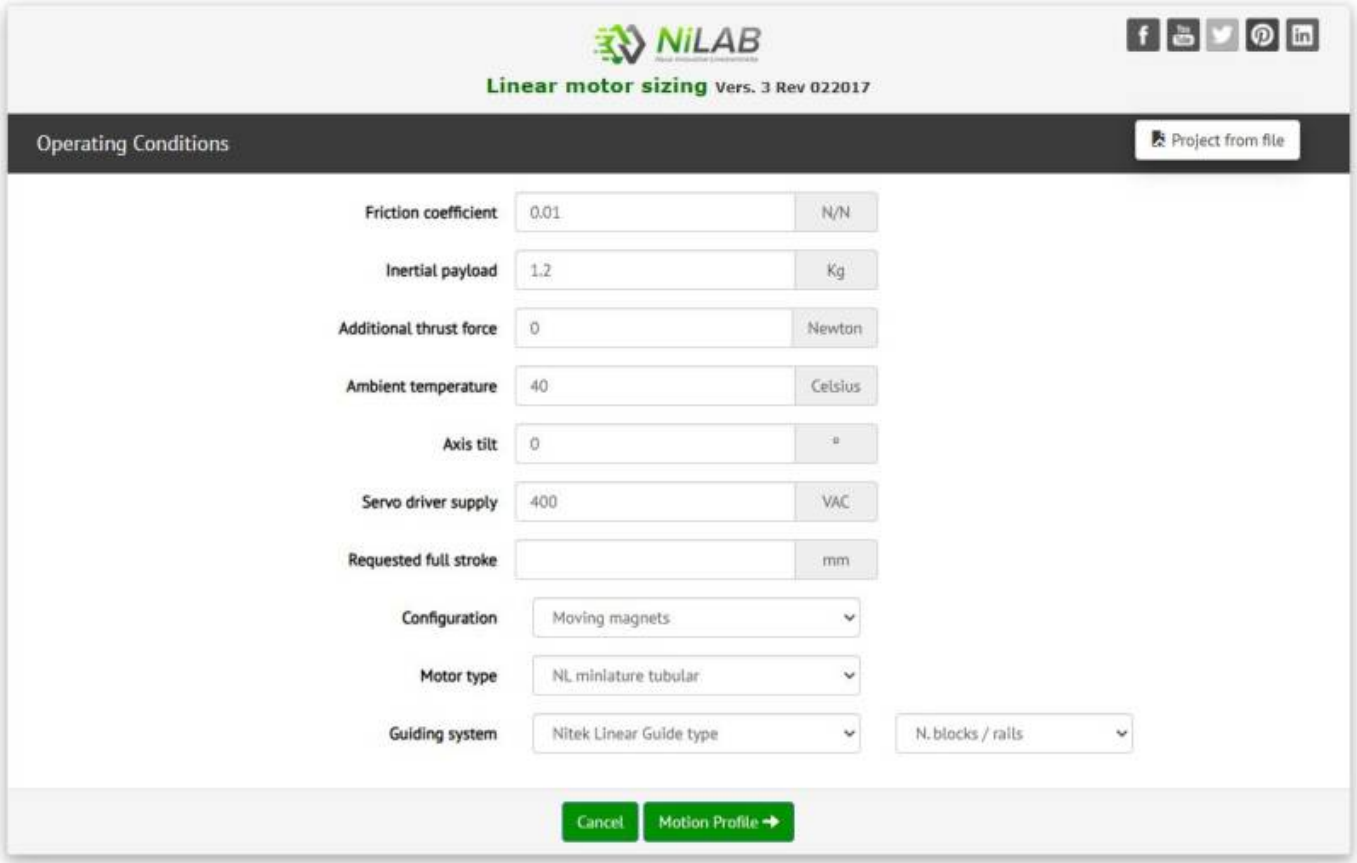
The sizing of linear motors is mainly determined by the application-related characteristics of velocity and feed force. First of all, the user should determine velocity and force profiles for the required application and set the proper parameters about payload, thrust force, ambient temperature and axis 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.



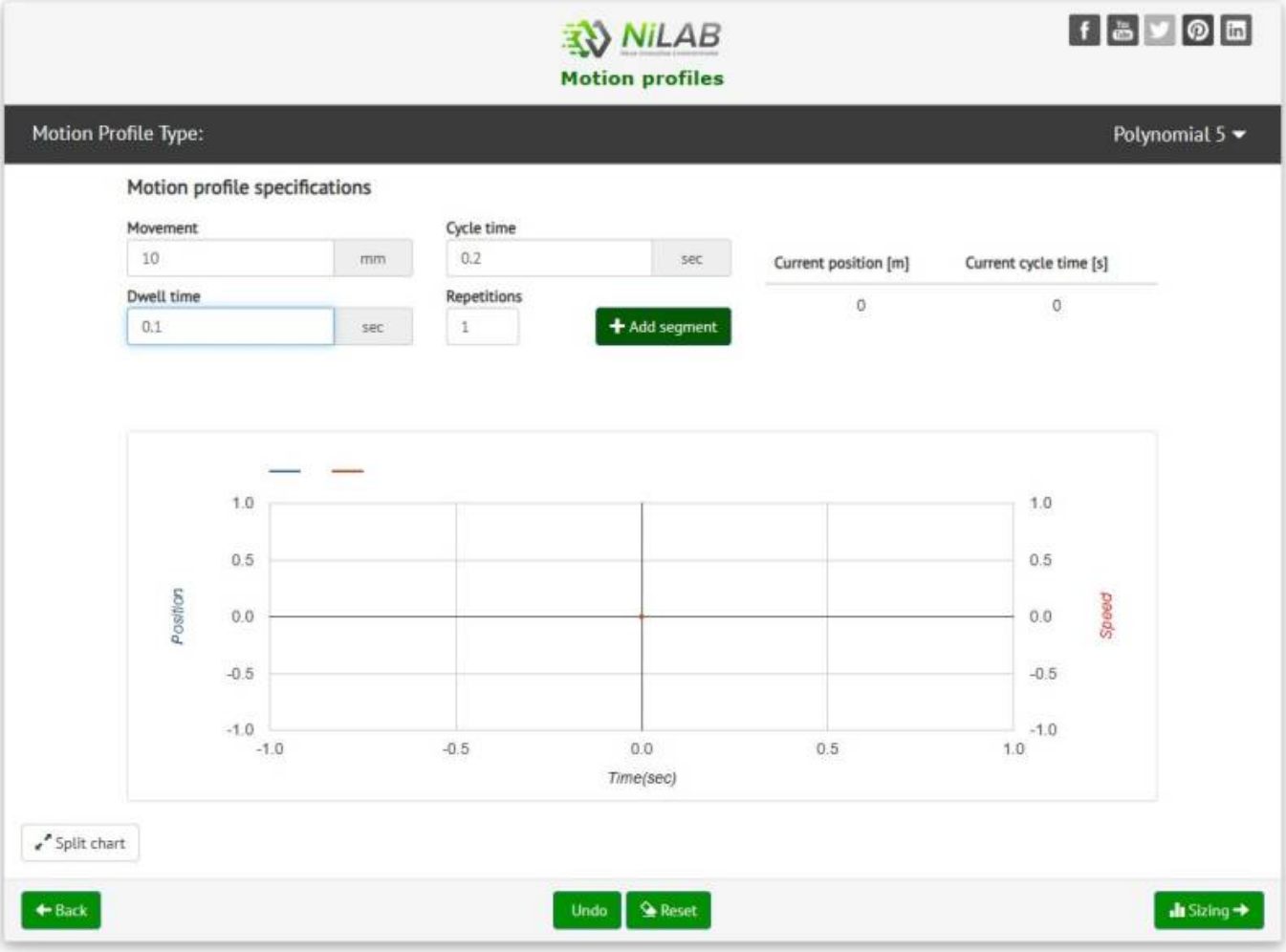
Step 2) Select a motion profile.

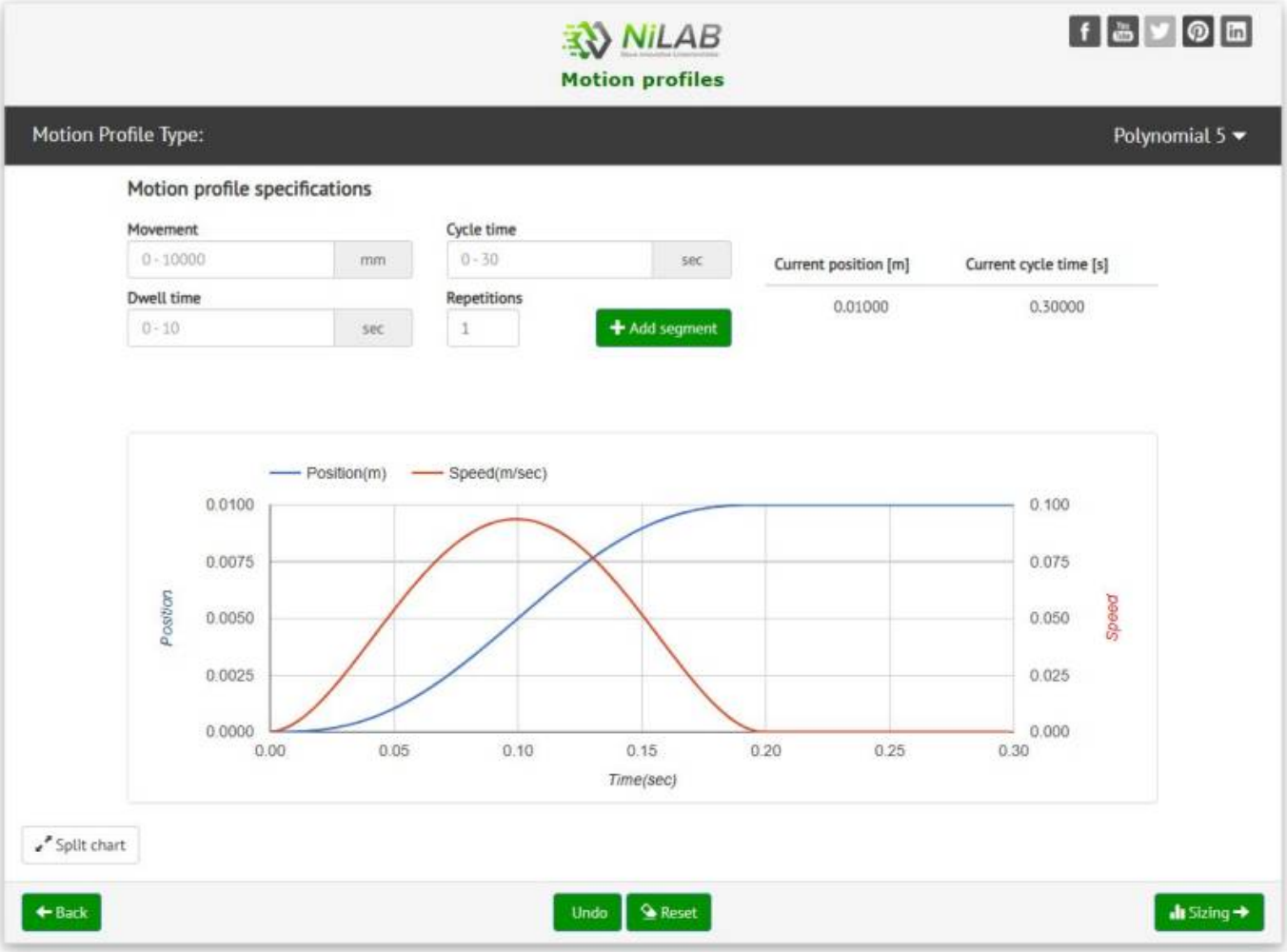
There are diffent option for the motion profile type. The simplest one is polynomial 5.

It is also possbile to upload a cam profile file based on position points. Here an example of motion profile file::cam_profile_example.zip
This example must contains as in the first rows the numerf of position point, second rows the time resolution and then the position data point
with unit in meters

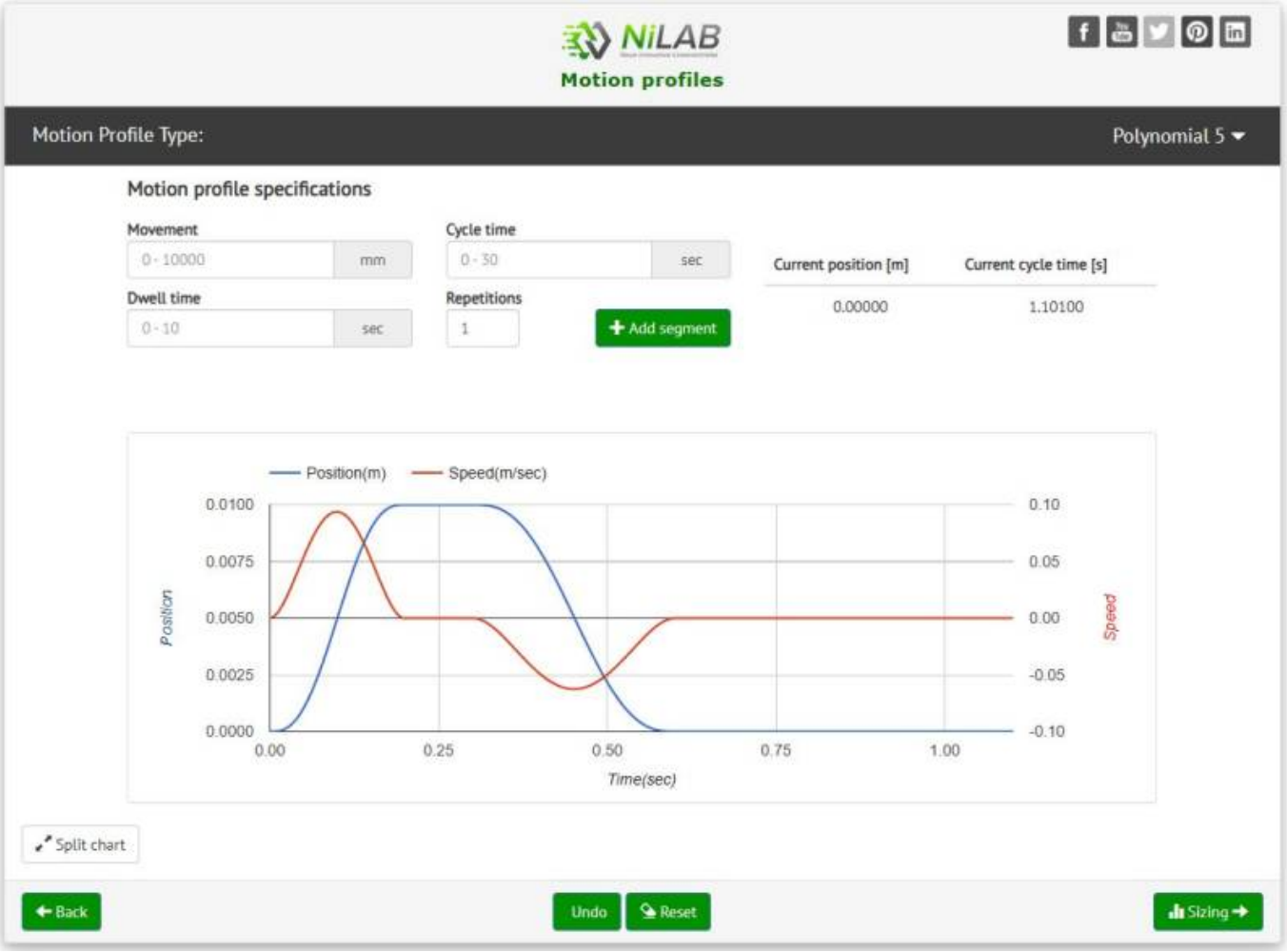
Step 3) create a polynomial 5 motion profile

As 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 0.1sec.
Press Add segment button to update the motion cycle.


NiLAB
Motion profiles
Motion Profile Type:
Polynomial 5
Motion profile specifications
Movement
10
mm
Cycle time
0.2
sec
Current position [m]
Current cycle time [s]
0
0
Dwell time
0.1
sec
Repetitions
1
Add segment
1.0
0.5
0.0
-0.5
-1.0
Position
Speed
-1.0
-0.5
0.0
0.5
1.0
Time(sec)
Split chart
Back
Undo
Reset
Sizing

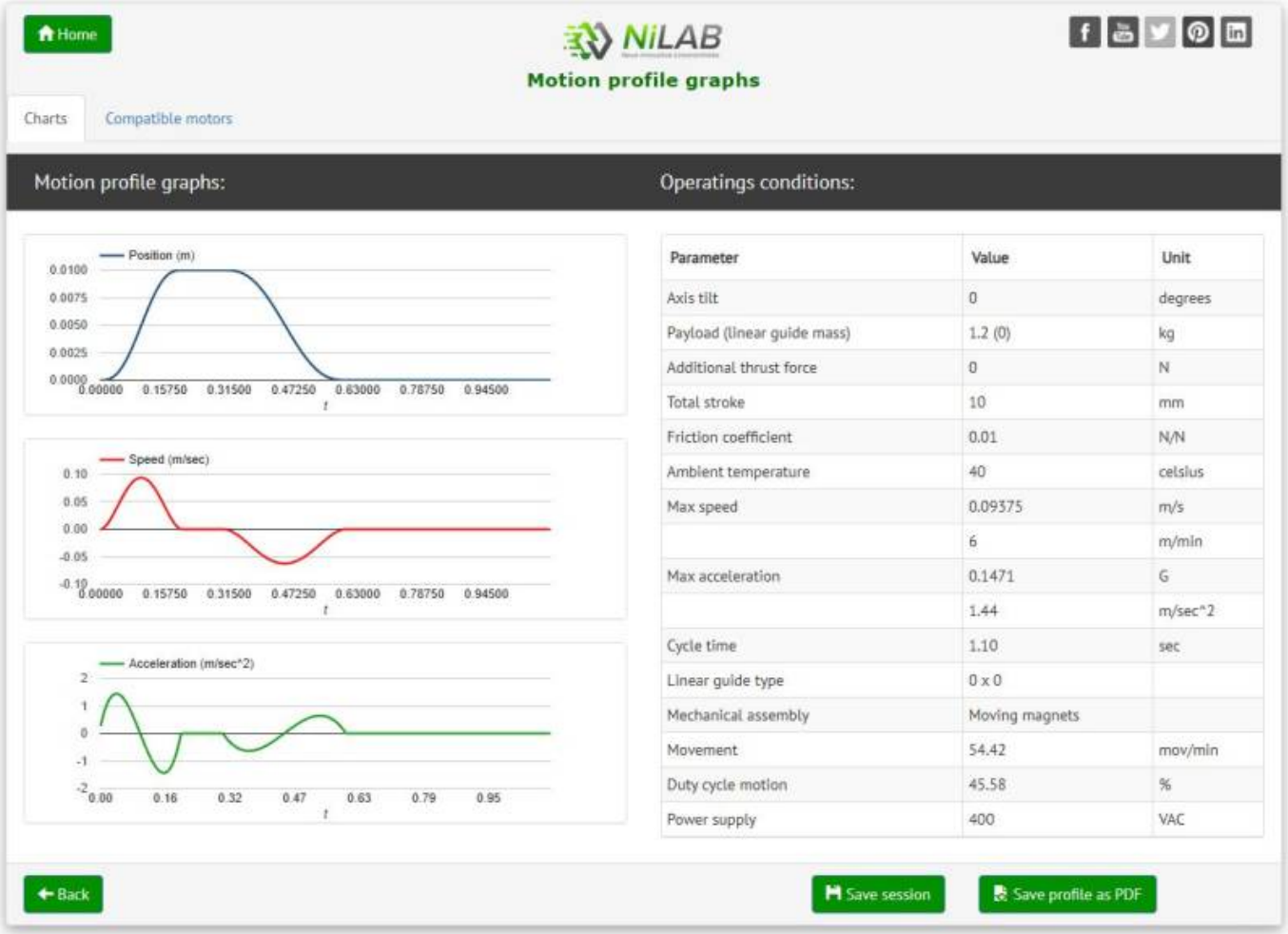


Then, we move back of 10 mm with different timing.



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

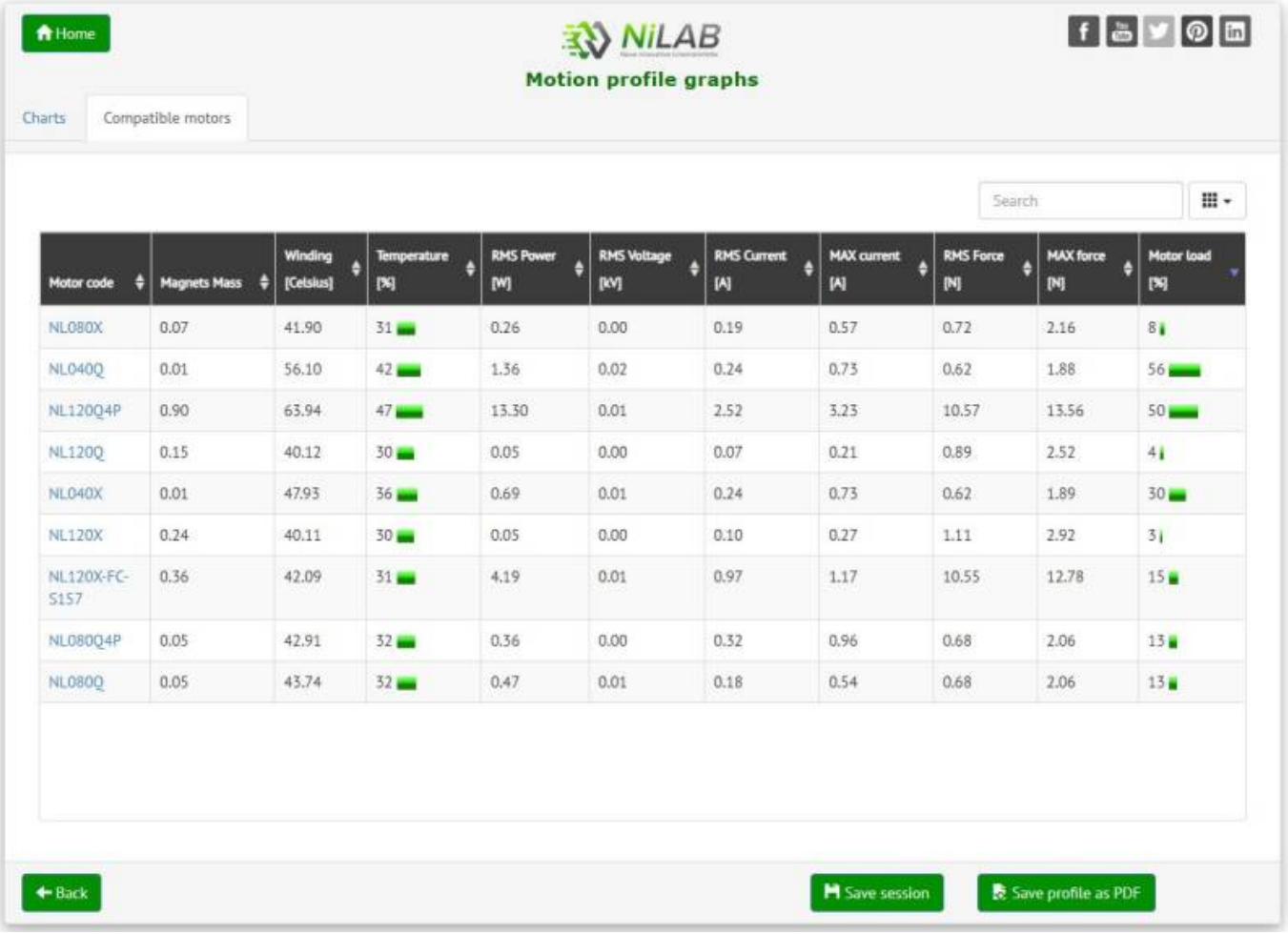
A summary window with all the application data will be shown.



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

Step 5) Compatible motors

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



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

Step 6) Perfomance 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.

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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	178 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^3
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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