WEBSMART Motor sizing

General procedure

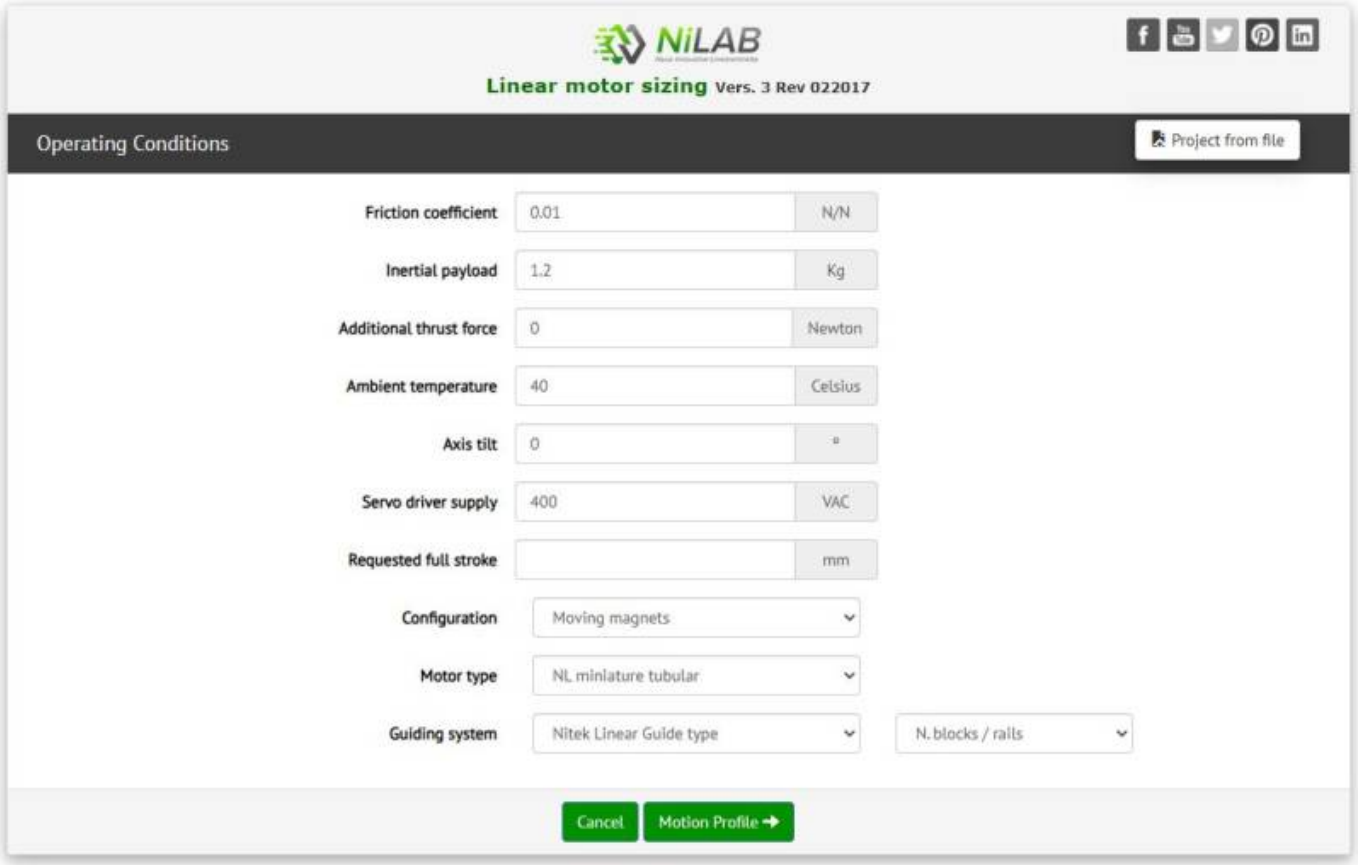
The sizing of linear motors is mainly determined by the application-related characteristics of velocity and feed force. First, the user should determine the velocity and force profiles for the required application and set the proper parameters for payload, thrust force, ambient temperature, and axis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

One online application for motor sizing is provided at: Websmart

Step by step with websmart

Step 1) Specify the operating conditions of the motor.

For example, enter an external payload of 1.2 kg and select the desired motor type (NL tubular linear motors). Then press the Motion Profile button.



Step 2) Select a motion profile.

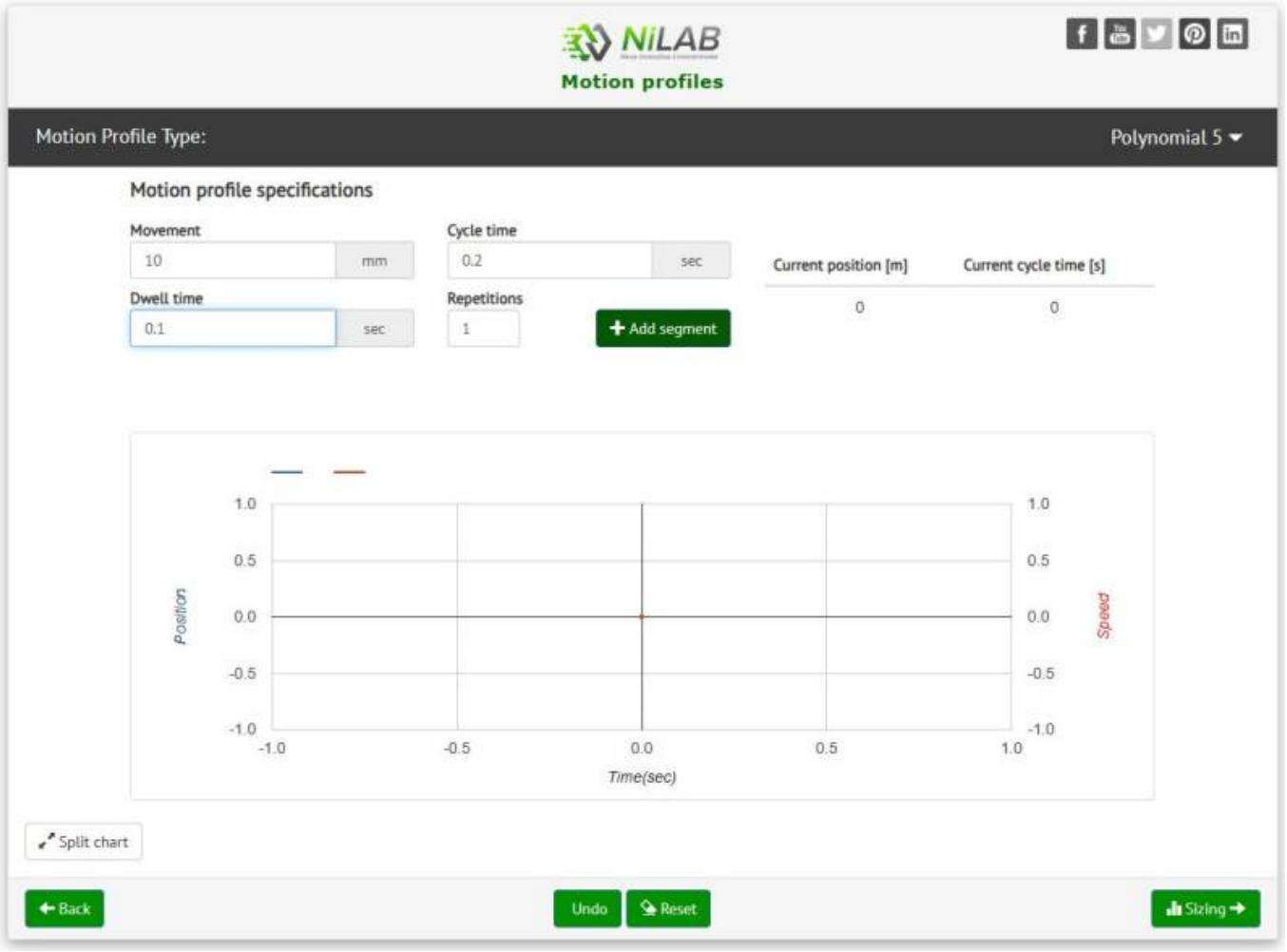
There are different options for the motion profile type. The simplest is polynomial 5.

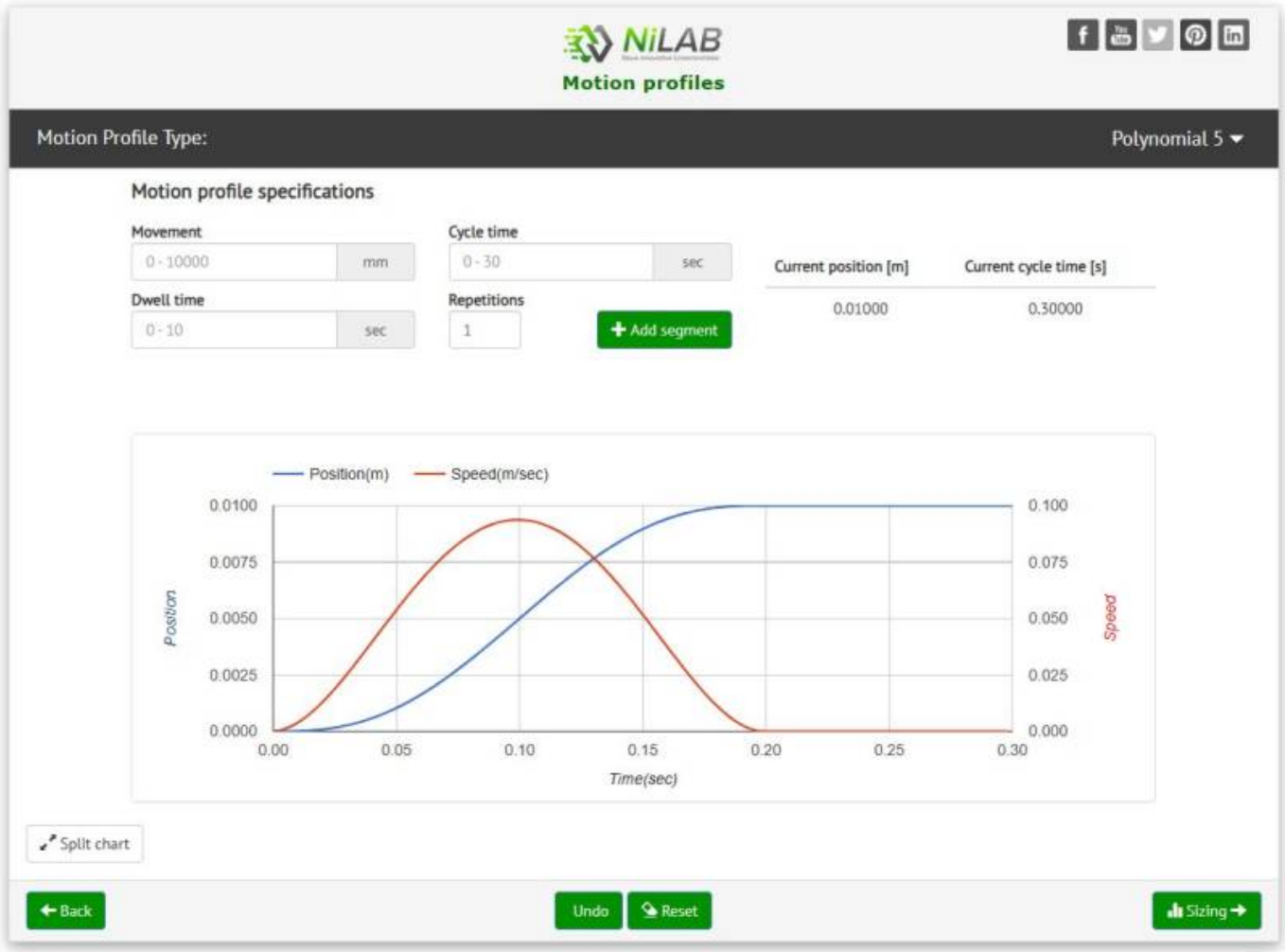
It is also possible to upload a cam profile file based on position points. Here is an example motion profile file: :cam_profile_example.zip

This example must contain, in the first row, the number of position points; in the second row, the time resolution; and then the position data points, with units in meters.

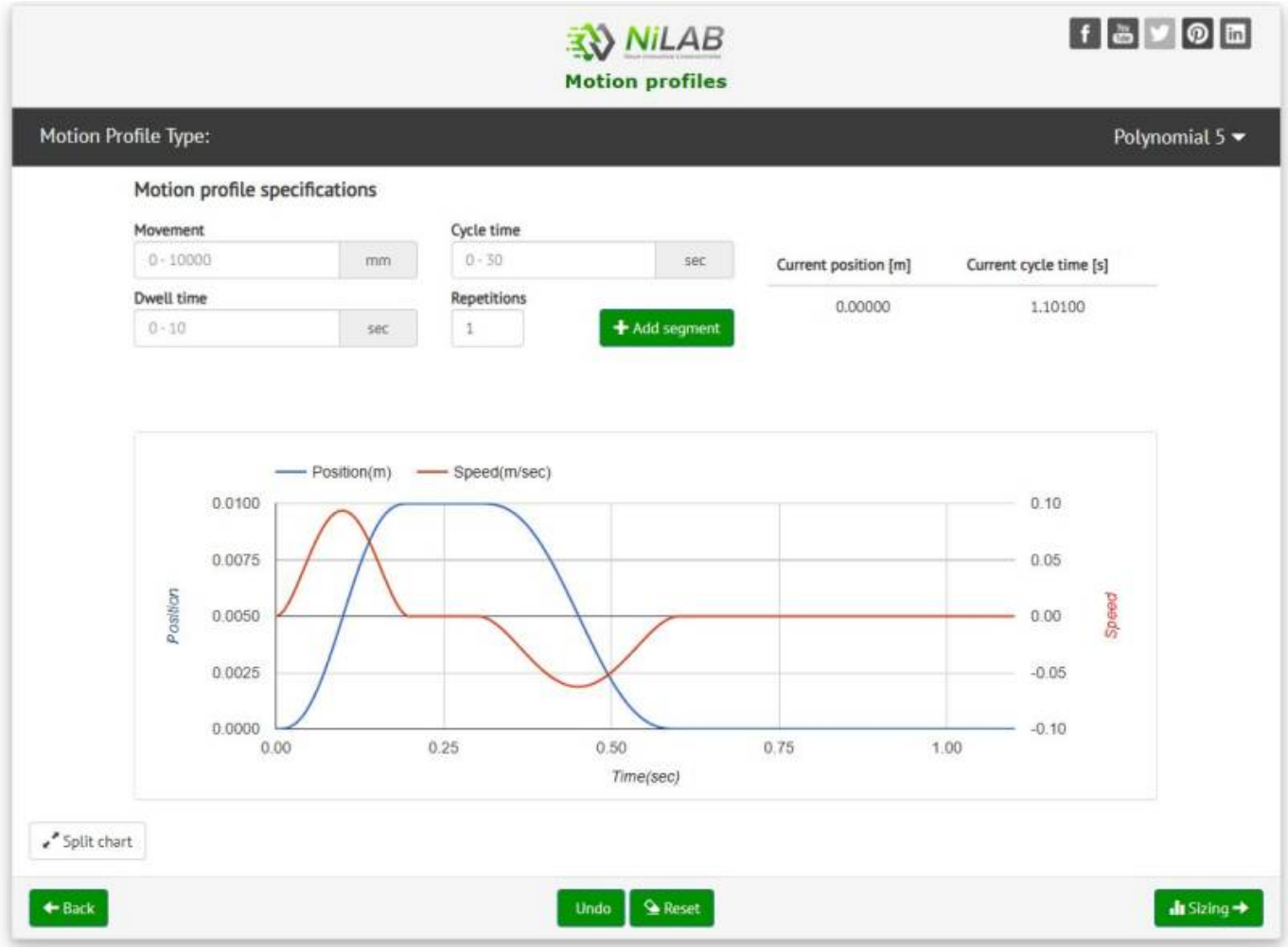
Step 3) Create a polynomial 5 motion profile

As an example, we selected the Polynomial 5 motion profile. The motor will move from 0 to 10 mm, with a cycle time of 0.2 s and a waiting time of 0.1 s. Press the 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
Time(sec)
Split chart
Back
Undo
Reset
Sizing

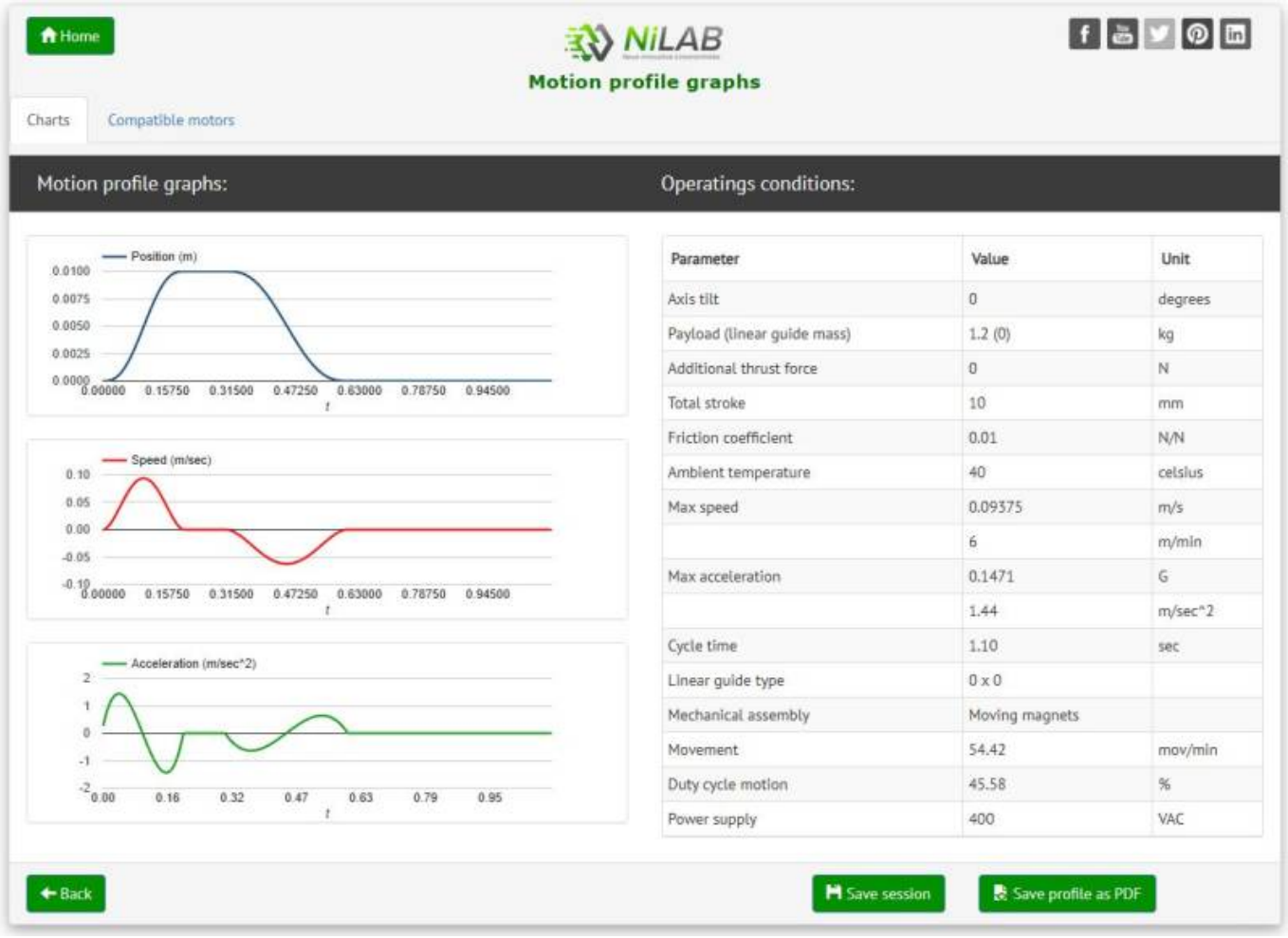


Then we move back 10 mm with different timing.



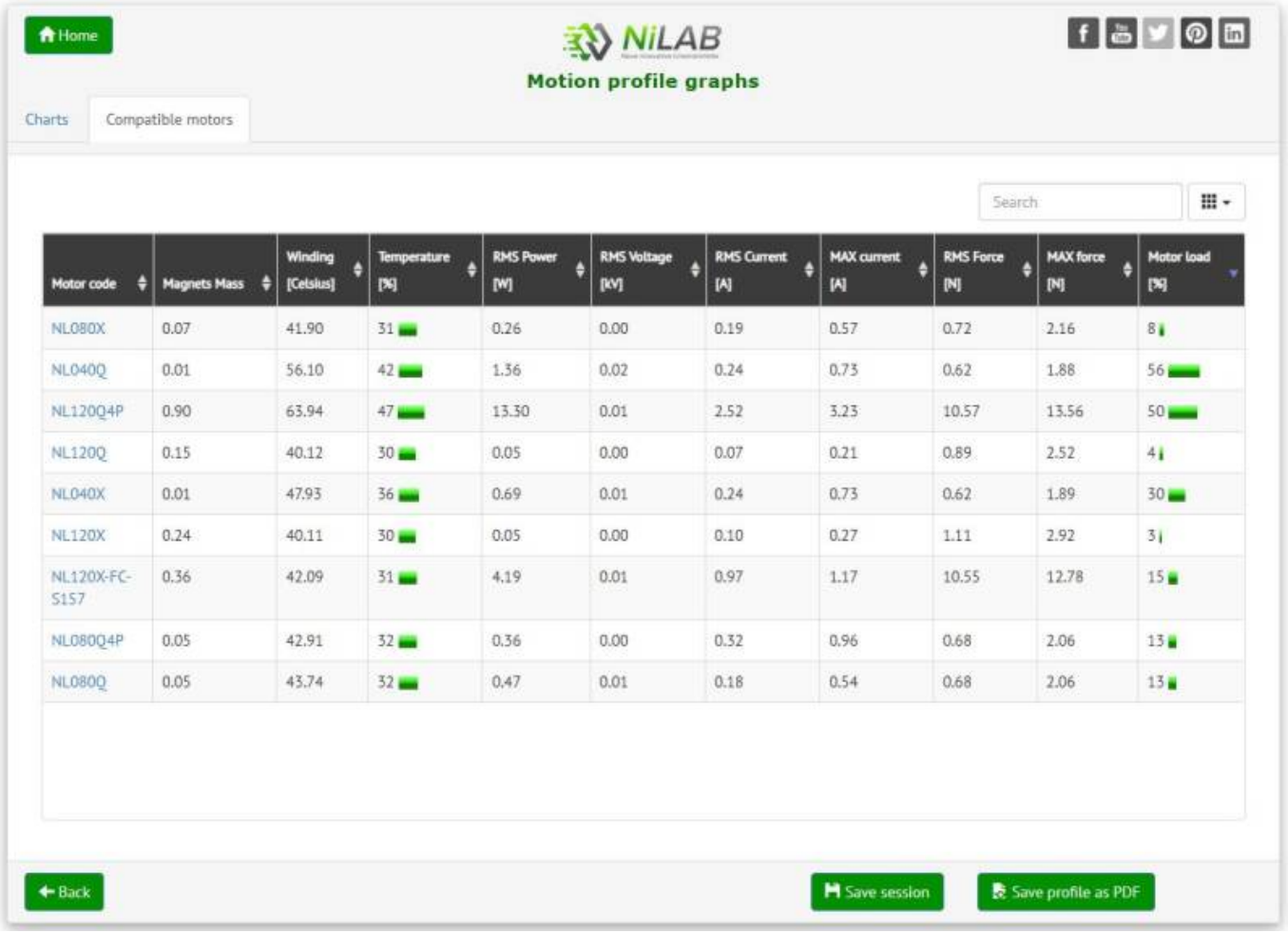
Step 4) When the motion cycle is complete, press the Sizing button to go ahead.

A summary window with all the application data is shown.



Step 5) Compatible motors

Click on the Compatible motor folder: a list of compatible motors is shown.



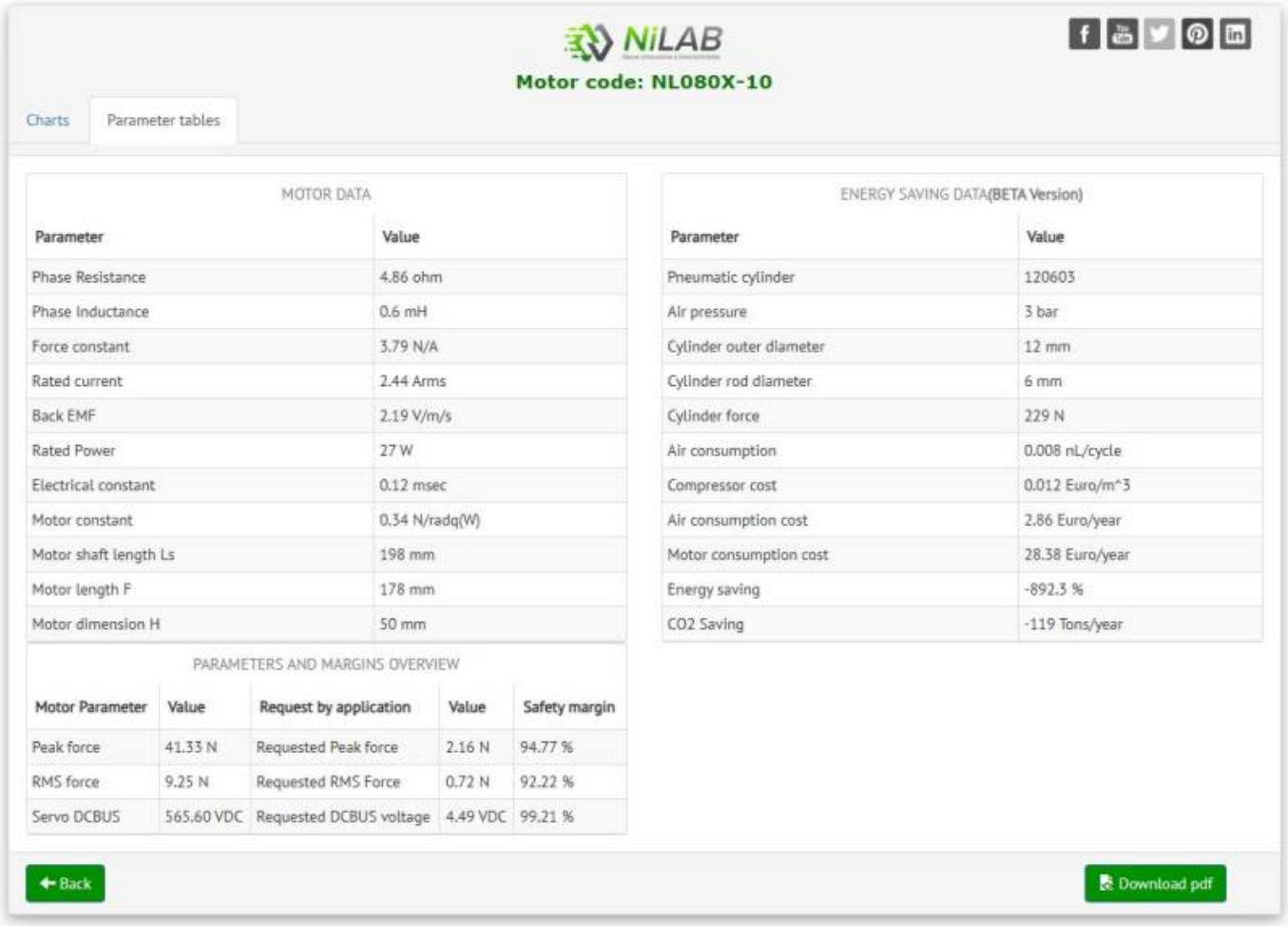
Motor code	Magnets Mass	Winding [Celsius]	Temperature [%]	RMS Power [W]	RMS Voltage [kV]	RMS Current [A]	MAX current [A]	RMS Force [N]	MAX force [N]	Motor load [%]
NL080X	0.07	41.90	31	0.26	0.00	0.19	0.57	0.72	2.16	8
NL040Q	0.01	56.10	42	1.36	0.02	0.24	0.73	0.62	1.88	56
NL120Q4P	0.90	63.94	47	13.30	0.01	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) Performance and limits check

Click on the motor code: the diagram showing the motor limits and the requirements is displayed.

Step 7) Check safety margin

Click on the Parameter tables: the safety margin for the motor performance is displayed.



NiLAB

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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