



NanoSat Lab Facilities

Electrodynamic Shaker

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Change Log

Revision	Release date	Section	Description
v0.1	04/06/2019	All document	First release.

1. General view

The NanoSatLab Facilities of the UPC Barcelona Tech, Campus Nord, is equipped with an electrodynamic shaker to perform vibration testing of small spacecraft systems and subsystems. The shaker system is located within an ISO Class 8 cleanroom and features a slip table, which allows horizontal testing. The shaker can thus be used for three axis testing (independently).



Figure 1. Electrodynamic Shaker

It is used to conduct qualification and acceptance vibration tests to ensure that the satellite can withstand the vibration induced by rocket during the launch. In addition, an exploration of resonance frequencies can also be conducted.

2. Main Characteristics

The table below summarises the main characteristics of the shaker system:

Table 1. Main characteristics

Maximum Sine Force	1650	Lbf
	7325	N
	745	Kgf
Maximum Random force	1120	Lbf
	5000	N
	505	Kgf
Maximum Acceleration (Sine)	120	g
	1175	M/s ²
Maximun Velocity	57	ips
	1.45	mps
Rated Travel Peak to Peak	1.0	in.
	25.4	mm
Armature Diameter	6.9	in.
	174.5	mm
Armature Mass	11.5	lbs.
	5.22	Kg
Armature Resonance $\pm 5\%$	2800	Hz
Frequency Range	DC	Minimum
	3000	Maximum
Shaker Body Mass	1410	lbs.
	640	Kg

2.1. Instrumentation

The table below summarises the main characteristics of the acceleration sensors:

Table 2. Sensors Type

Part Number	Manufacturer	Type	Measuring Range	Resonant Frequency	Temperature	# Units	Sensitivity	Transverse Sensitivity
8640A50	Kistler	Mono-Axial	± 50 g	25.0 KHz	[-40, +65 °C]	5	105.0 mV/g	3.0 %
							104.2 mV/g	
							98.4 mV/g	
							105.2 mV/g	
							98.1 mV/g	
8640A10	Kistler	Mono-Axial	± 10 g	17.0 KHz	[-40, +65 °C]	2	518 mV/g	3.0 %
							482 mV/g	
8702B500	Kistler	Mono-Axial	± 500 g	25.0 KHz	[-40, +65 °C]	1	10.25 mV/g	0.3 %

3. Interface Patterns

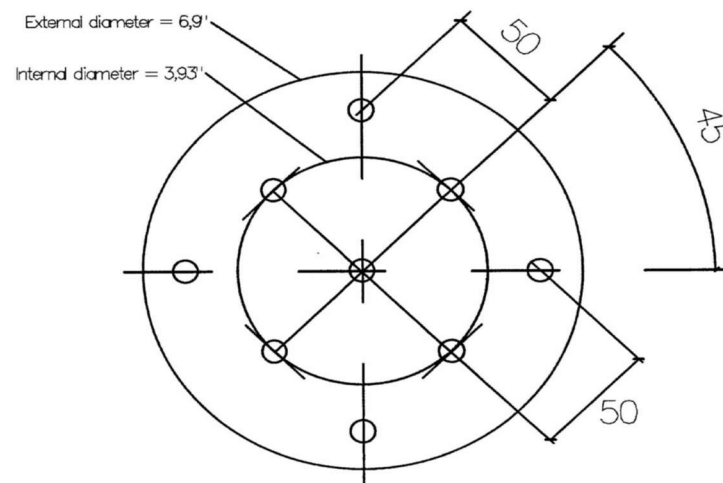
The table below summarises the main screws and tools that are available in the NanoSatLab to attach the adapter flanges:

Table 3. Screws Type

Metric	DIN	Material	Large (mm)	# Units Available
8	912	INOX A4	16	18
8	912	INOX A4	20	18
8	912	INOX A4	25	18
8	912	INOX A4	30	18
8	912	INOX A4	35	18
8	912	INOX A4	40	18

Plain Washer M8 DIN A125 in INOX4 is also available

The drawings below illustrate the interface patterns of the slip table and armature, which are required for the manufacturing of adapter flanges.



9 INSERTS @ M8

Figure 2. Armature Insert Distribution

Note that the armature pattern is repeated on the slip table. It consists of **9 x M8 threaded holes** placed in a 50mm grid.

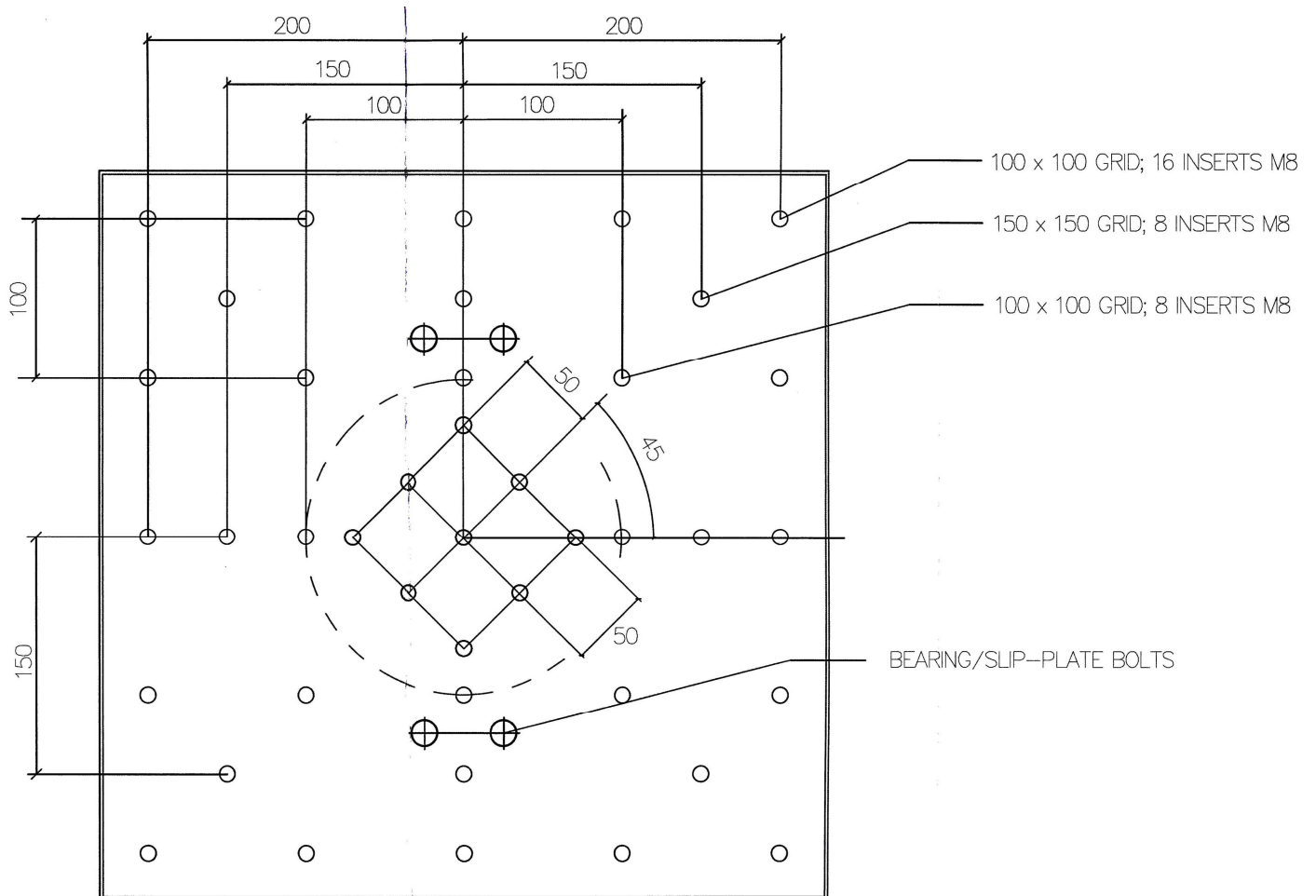


Figure 4. Slip table Insert distribution