



Centrotecnica Srl
Vibration testing solutions

*Smart fixture solutions
for your test bench*

Designed by people who perform everyday vibration tests





A key feature for quality testing is the choice of certified suppliers who can provide a reliable product control, using tools whose reliability is attested without doubts.

Centrotecnica is specialized in the design and production of fixtures since 1991 and for this activity is certified ISO 9001

CENTROTECNICA S.r.l.

UNITA' OPERATIVE
OPERATIVE UNITS

Via Confalonieri, 23 - 20060 Masate (MI)
Italia

E' CONFORME ALLA NORMA
IS IN COMPLIANCE WITH THE STANDARD

UNI EN ISO 9001:2015

PER LE SEGUENTI ATTIVITA'
FOR THE FOLLOWING ACTIVITIES

EA: 34 - 17

Esecuzione di test ambientali. Progettazione e produzione di attrezzature per l'esecuzione di prove vibrazionali. Progettazione di prove e consulenza per problemi di vibrazioni. Misure vibrazionali e dimensionali sul campo.

Provision of environmental tests. Design and production of fixtures for vibration tests. Test design and consulting for vibrational matters. Field vibration and dimensional measurements.

Centrotecnica's products are therefore designed and manufactured by following all the necessary processes and quality controls.

Fixtures compliance is attested by a laboratory validation test and certified by a document provided to the customer with the fixture.





INDEX

Company profile.....pag. 4

Facilities & Resources.....pag. 5

Slip tables.....pag. 6

Head Expanders.....pag. 20

Cubes & Prisms.....pag. 28

Plates & Head Extenders.....pag. 32

Thermal Barriers.....pag. 36

Fixtures.....pag. 40

Contacts.....pag.52

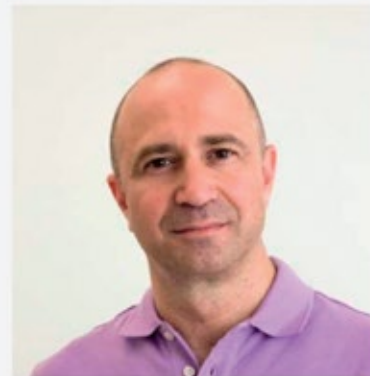




COMPANY PROFILE

Centrotecnica Srl boasts over 40 years of experience in engineering and environmental testing.

Centrotecnica was founded in 1979 by Ing. Danilo Cambiaghi, who turned his technical office, dealing with advanced mechanics since 1973, into an Engineering company. In 1982 Centrotecnica entered the aerospace sector by developing studies and designs of devices for satellites application.



Thanks to an in-house design department and a well equipped production unit, Centrotecnica has become a leader in the engineering and manufacturing of high quality and patented fixtures. Our products are designed for a variety of applications, from testing on big dimension and high mass DUTs to very small components.

Centrotecnica can boast one of the largest private Test House in Europe and it is accredited by ACCREDIA; thanks to its "state of the art" testing capabilities, including a whole range of shakers able to go from 0.3 to 74 kN force, shock machines, climatic chambers and other testing equipments, Centrotecnica is able to meet customers' specific requests in many different markets.

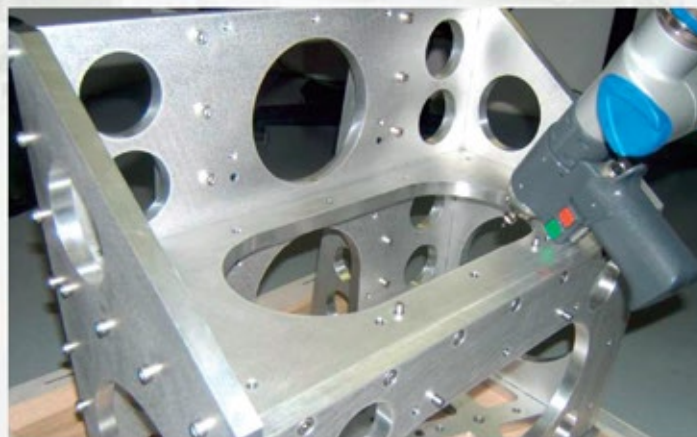
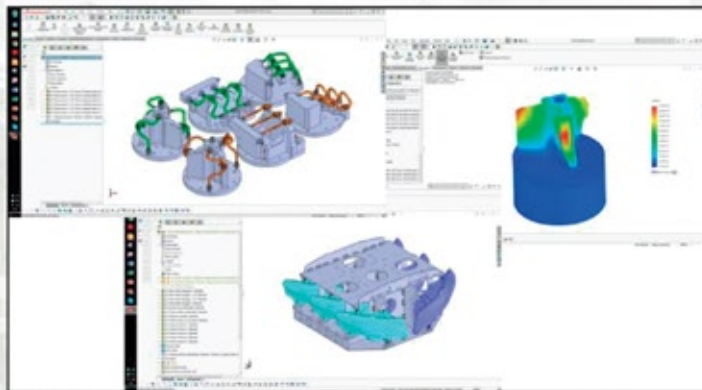
A team composed of highly skilled personnel with extensive background follows the customers in their environmental test campaigns at our laboratory and can support them to find the best fixture solution for their test-benches.





FACILITIES & RESOURCES

- ↘ *Design department, with 3D modeling and constantly updated FEM analysis software*
- ↘ *Production area of approx 300 m², with crane lift capability of 6.5 tons*
- ↘ *Innovative CNC machine with working area 3m x 2m*
- ↘ *Dimensional measurement station, with FARO CAM2 Platinum 7 axis portable measuring arm*
- ↘ *Gantt scheduling, fast lead time, Worldwide delivery and support*
- ↘ *Vibration laboratory experience, with over 20 test-benches*
- ↘ *360° service: design, production, testing, certification, installation and maintenance*





↘ SLIP TABLES

Purpose : to increase the shaker capabilities, by allowing the transmission of the vertical vibration along horizontal directions.

Key features:

- High damping ratio and light solution with minimum moving mass
- High over-turning moments
- Interchangeable tables to fit a variety of vibration generators
- Customized hole insert patterns and thread sizes available by request

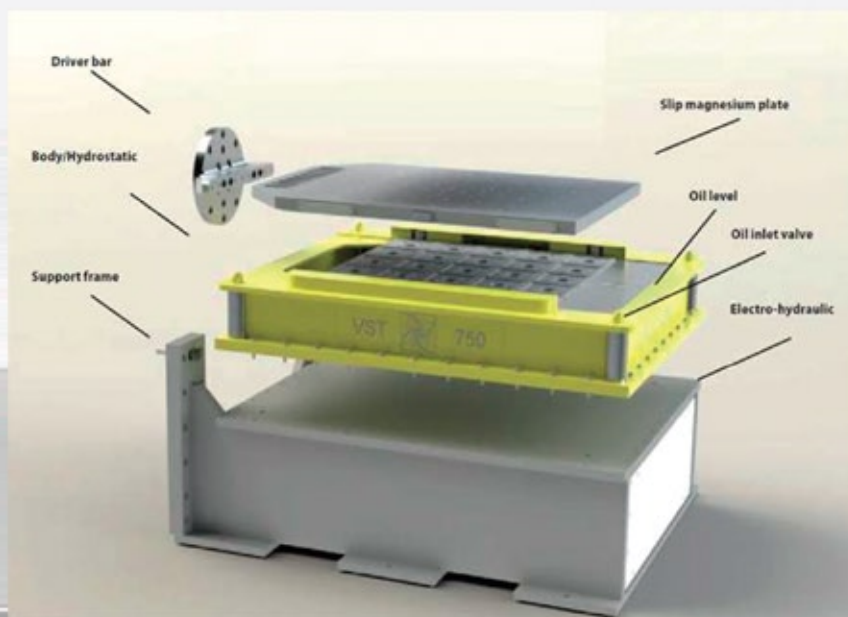




Centrotecnica can study and design the most suitable horizontal solutions for all main shakers, by providing:

- a **customized iron frame** to support the slip table and to achieve the proper working height, aligned to the vibration axis of the shaker.

- a **suitable driver bar** to connect the shaker's armature to the slip table. This component can be manufactured both in aluminium and in magnesium alloy, in order to be stiff and light enough to reduce the total moving mass.



Two slip table types (RT & VST) are available; they share the same height in order to be easily interchangeable to each other and can be realized with customized inserts patterns.

A dedicated user manual, inspection certificates and the declaration of incorporation (in compliance with the essential requirements of the Machine Directive 2006/42/CE, annex II, B.) are included in each supply

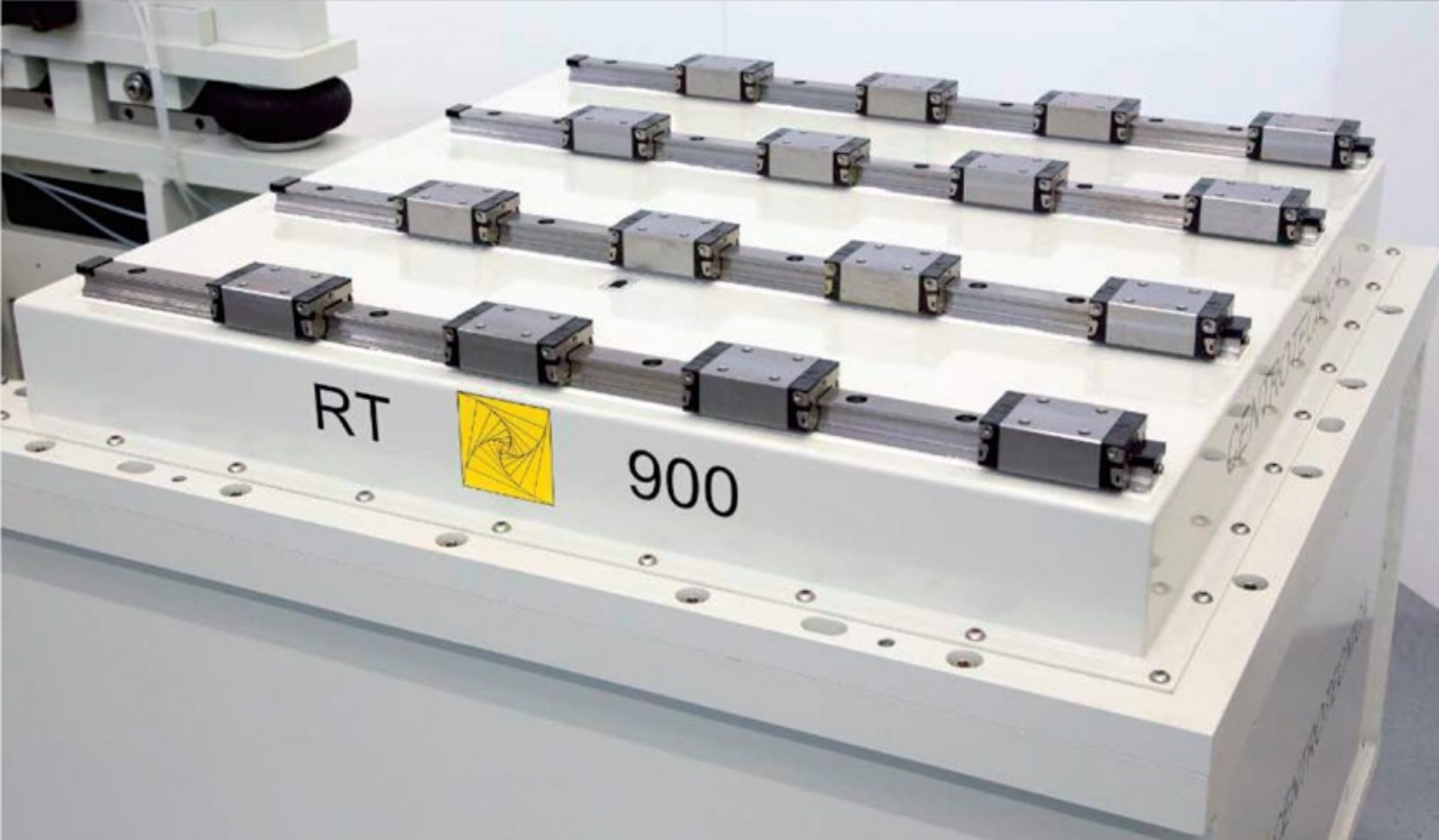
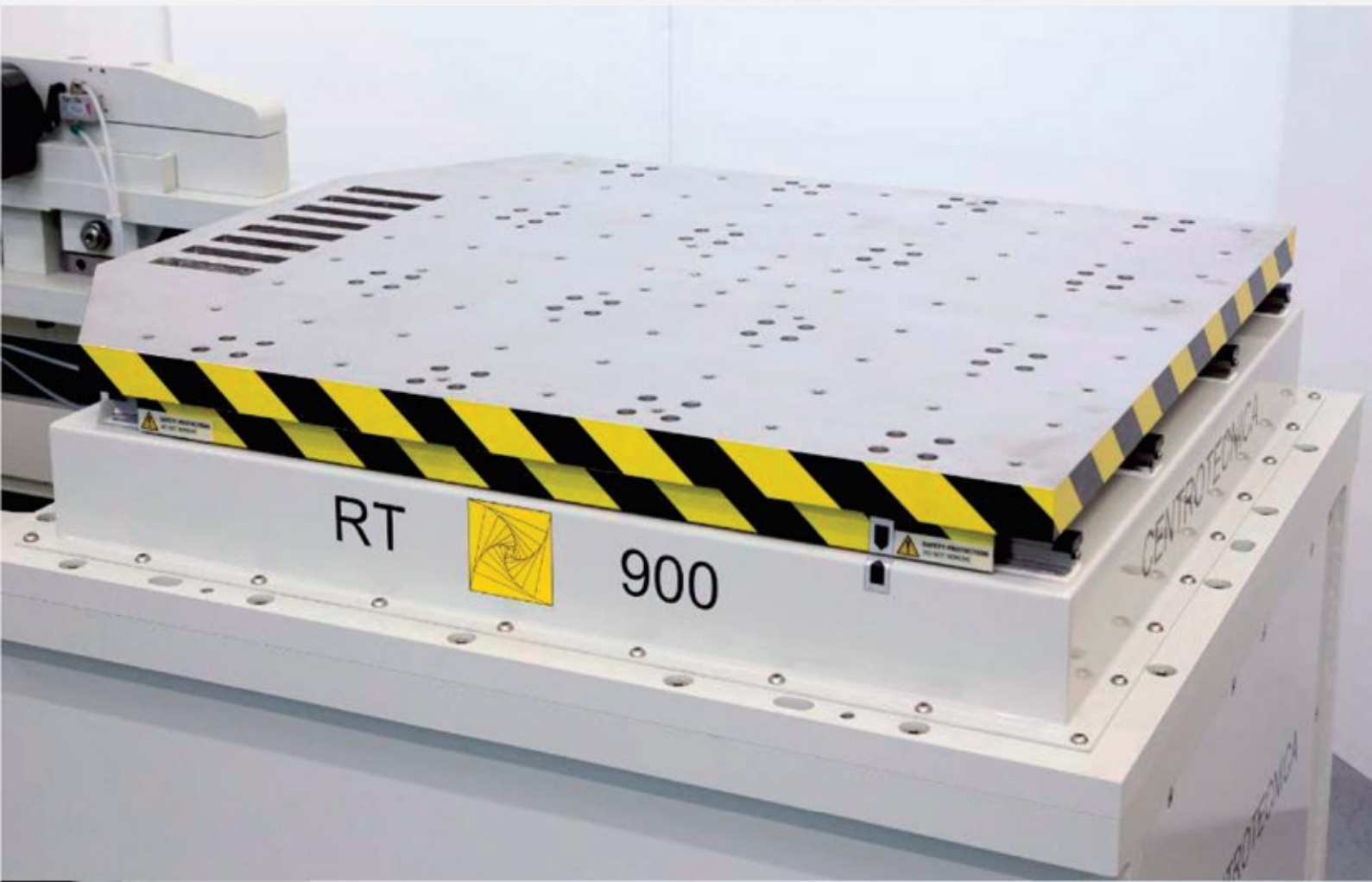
↘ **RT – slip tables**

Easy and innovative concept, purely mechanical

↘ **VST – vacuum slip tables**

Top-level product with very high performance







↘ RT - TABLES

Key Concept

A purely mechanical table guided by linear system, with bearings and guides

MAIN FEATURES

- No oil, no electric components, no compressed air
- Easy and fast maintenance, just bearings replacement

- High robustness and resistance to bending
- High damping ratio
- Low mass due to multilayer structure and empty spaces

- Quick table change to install a smaller size
- Easy alignment
- Possibility to remove the table and mount fixtures directly on bearings, reducing moving mass

- Perfect solution under climatic chamber
- Not-sensitive to moisture and water
- High temperature range
- Provided with a special system to allow the thermal expansion of the table (**expansion not bending**), so RT can withstand the bending effect better than all other tables.



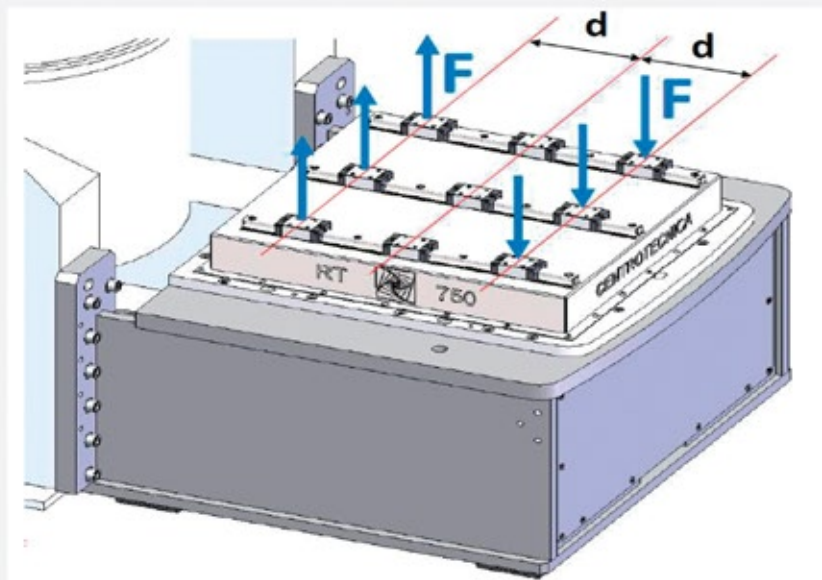


FOCUS POINTS

➤ **Pitch overturning moments**

RT bearings have a different behaviour than oil:

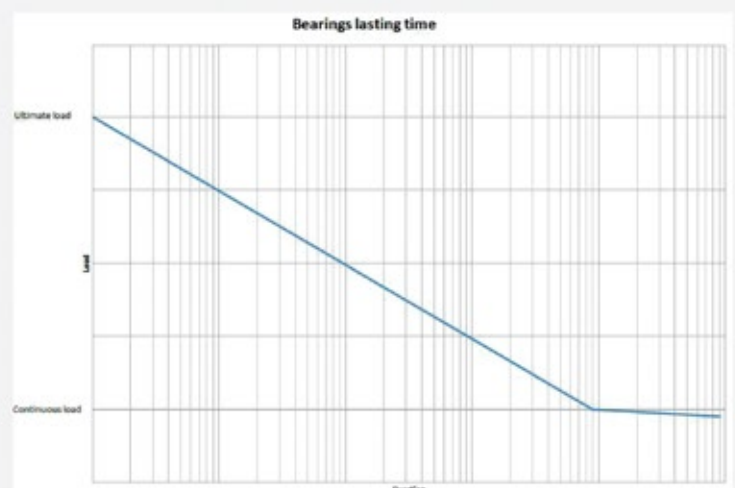
- The oil and the vacuum have a defined pitch limit: over the maximum pitch value, either the vacuum or the oil film get broken and the table cannot work any more.
- The RT bearing can support a huge load; nevertheless, the highest is the load, the shorter is the bearing life.



Please note following two overturning moments values to estimate the bearing duration for each size tables:

- **continuous**: the point the bearing is so comfortable that the table can work 24 hours a day for two years, without replacing the bearings

- **ultimate**: the point where the bearing gets immediately broken





Option KRT

Innovative Concept:

many sizes within only one system

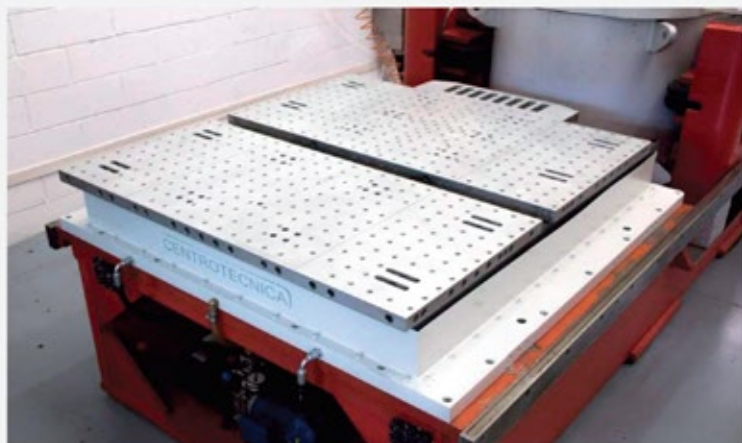
- KRT 1200/600
- KRT 1000/450
- Customized combinations

Minimum Moving Mass:

to reduce the energy required by the shaker or to achieve higher acceleration level than by using the whole big table.



Excellent Flexibility: fast change of configurations, just removing fixing bolts and moving aside the table parts. Easy and clean operations to meet each specific requirement.



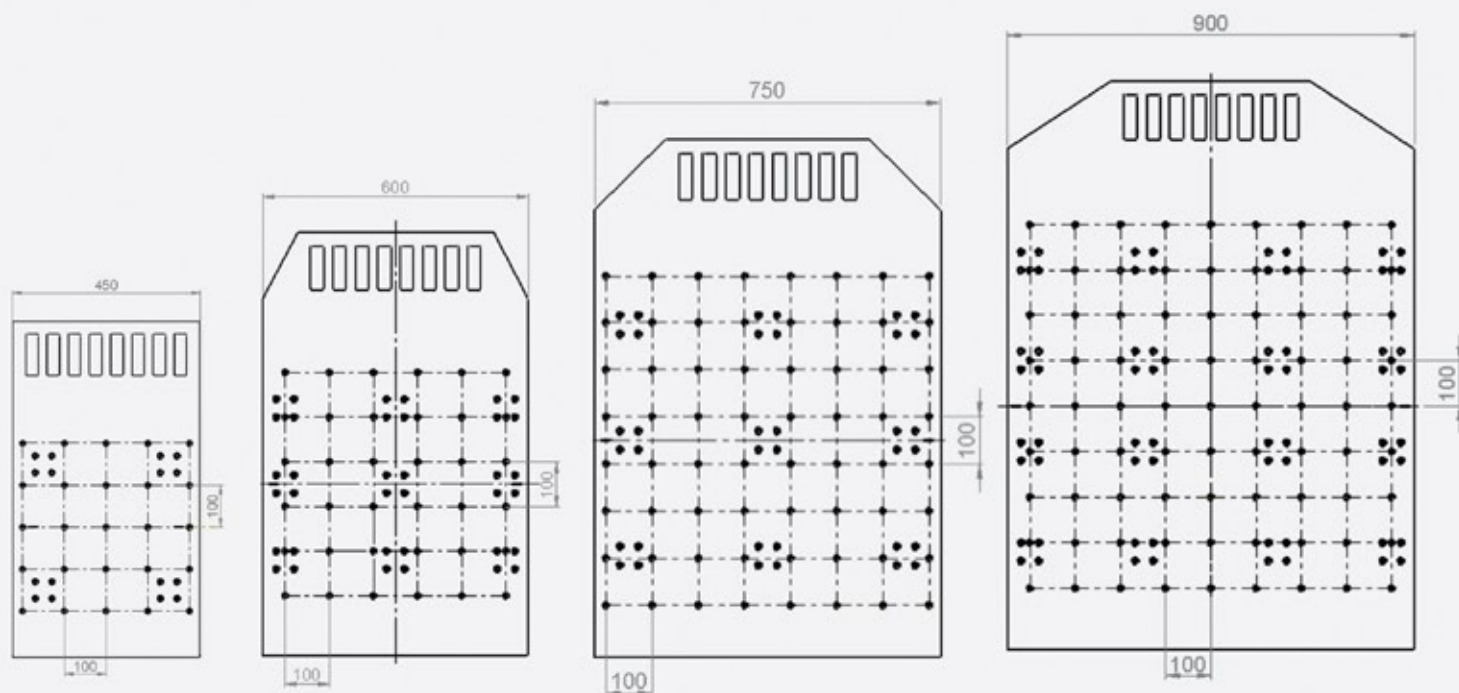


TECHNICAL SPECIFICATIONS - RT TABLES

TABLE SIZE		450x450	600x600	750x750	900x900	1050x1050	1200x1200
WEIGHT [kg]	Aluminium	30	50	68	96	125	160
	Magnesium	23	40	53	75	98	125
MAX DISPLACEMENT [mm]		160	160	160	160	160	160
MAX PAYLOADS [kg]		414	620	931	1241	1654	1654
USABLE FREQUENCY [Hz]		2000	2000	2000	2000	2000	2000
FIRST RESONANCE [Hz]		1400	1250	1050	950	830	700
DRIVER BAR [kg] *	Aluminium	15	15	15	15	15	15

* TBC according to the armature shaker

TABLE SIZE		450x450	600x600	750x750	900x900	1050x1050	1200x1200
CT STANDARD INSERT TYPE	100mm grid	M8	M8	M8	M8	M8	M8
STD. INSERT PATTERN	100mm grid	25	36	64	81	121	121

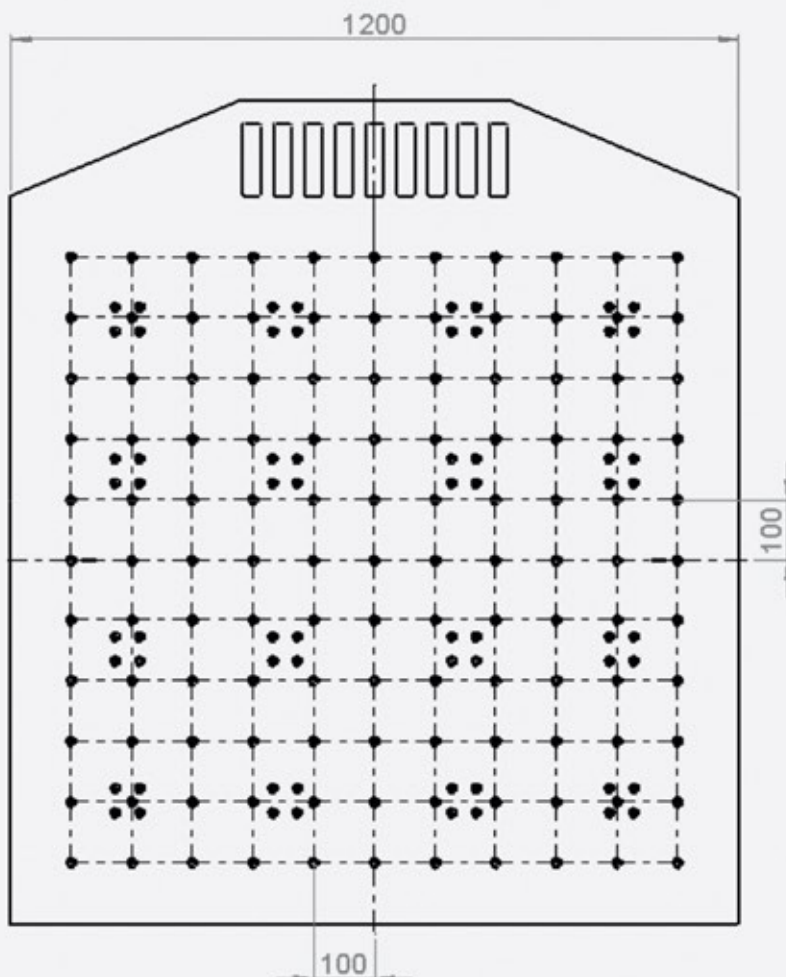
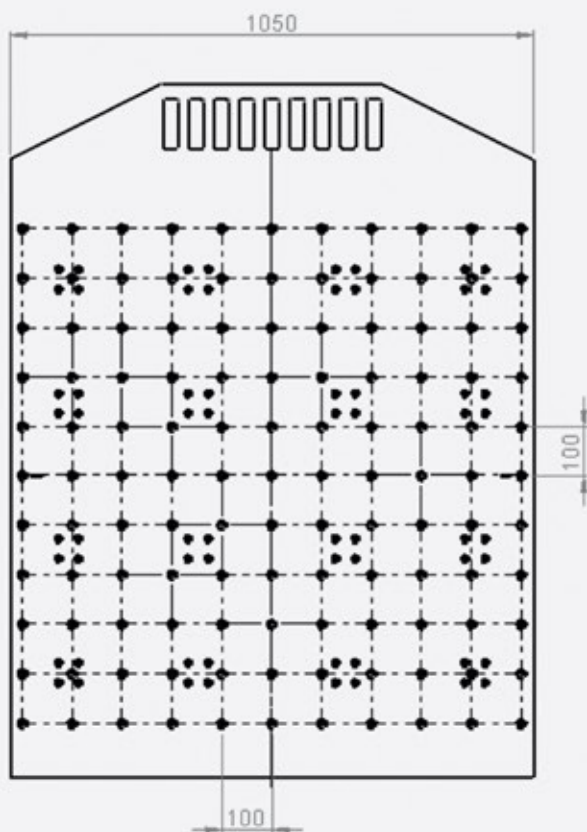




TECHNICAL SPECIFICATIONS – RT TABLES

TABLE SIZE		450x450	600x600	750x750	900x900	1050x1050	1200x1200
Overturning moments [kNm]	Pitch continuous	1.7	5.7	7.4	16.2	19.3	19
	Pitch ultimate	22.3	71.6	93	203.4	241.4	238.3
	Roll continuous	1.3	4.7	6.5	14.6	17.6	20.6
	Roll ultimate	17.1	59.9	81.3	182.5	220.6	258.6
	Yaw continuous	1.7	5.7	7.4	16.2	19.3	19
	Yaw ultimate	22.3	71.6	93	203.4	241.4	238.3

Standard patterns can be customized upon request







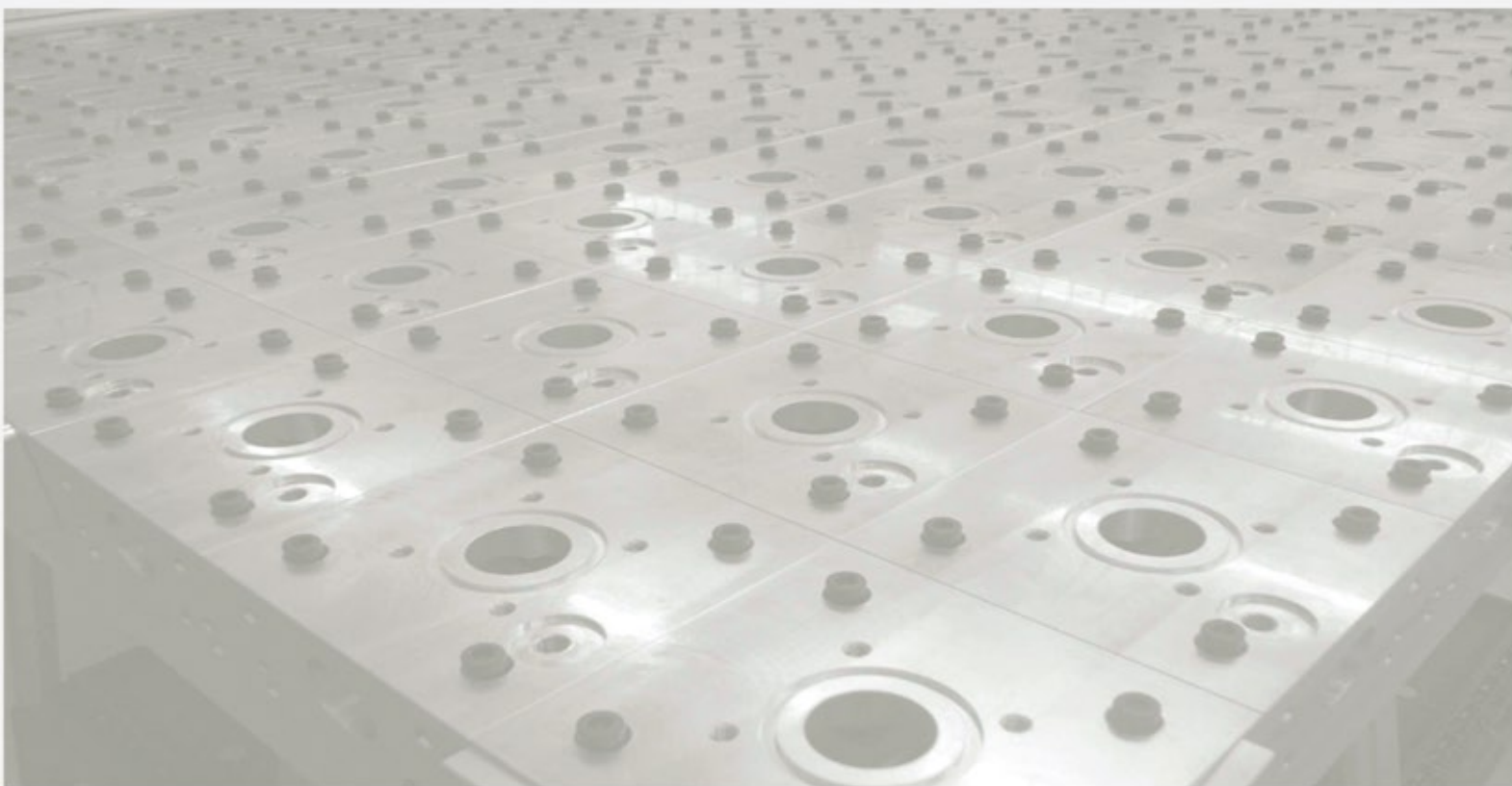
↘ VST – VACUUM SLIP TABLES

MAIN FEATURES

- Modular structure of the body
- High and proved robustness
- High damping ratio
- Table sustained over all surface
- High vacuum force leads to high moments
- Interlock on over pitch moment
- No bearing mass on the table
- Long stroke: 160mm
- The highest is the size, the highest is the performance
- High payload capability
- Minimum alignment
- ECO – plc controlled pressure and vacuum
- Log file of the parameters for maintenance

Key Concept

Slip table guided by balancing oil pressure and vacuum force

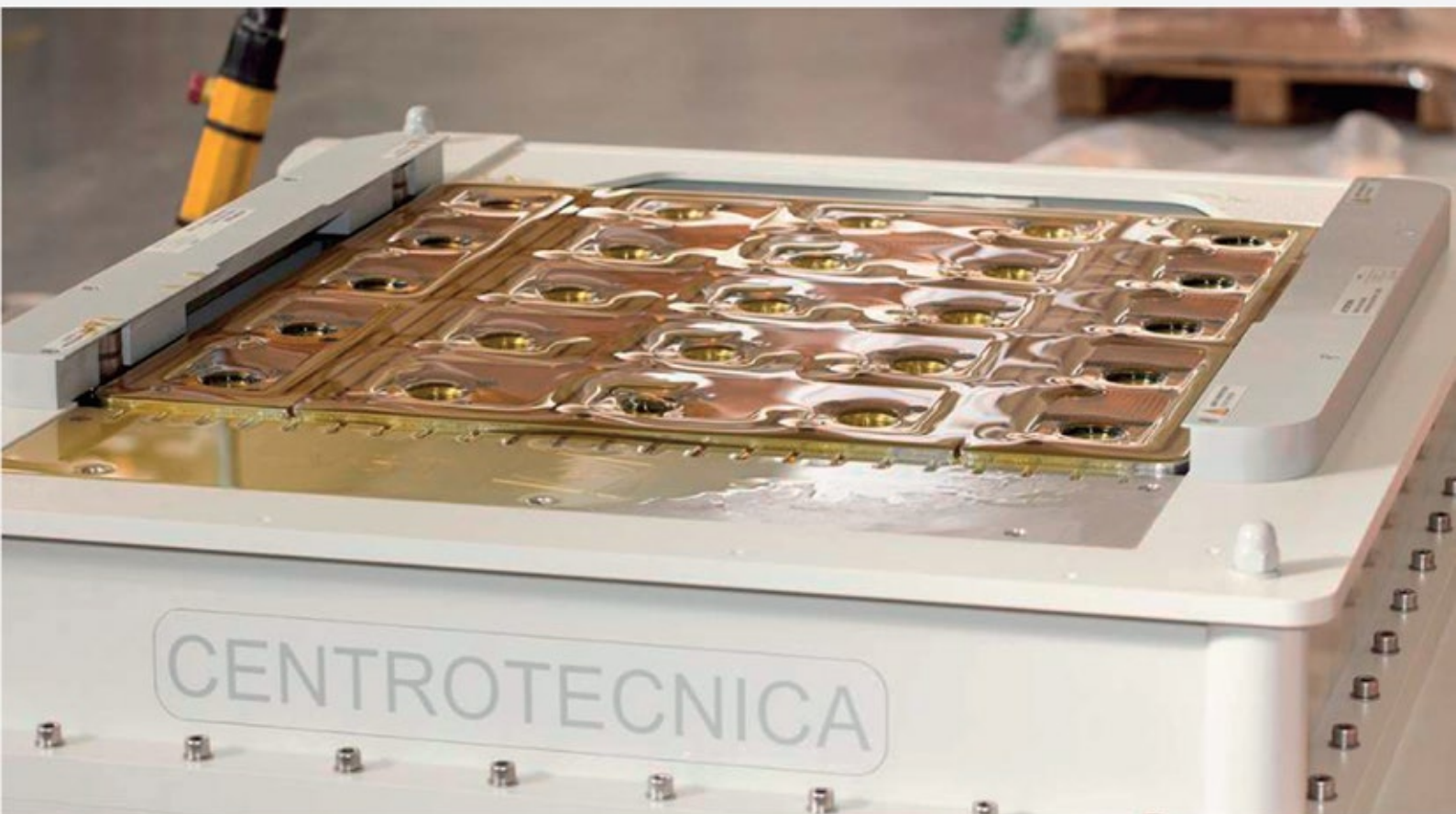
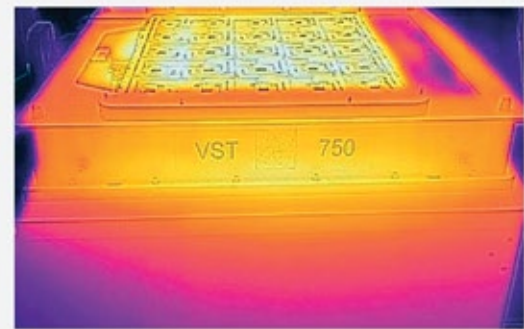
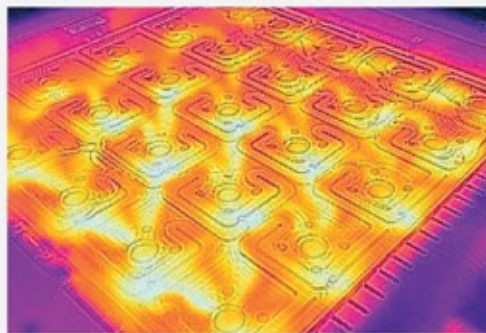




FOCUS POINTS

➤ **Vacuum pump patented by Centrotecnica**

The vacuum pump is the “heart” of VST and is designed and patented by Centrotecnica. This component is installed inside the VST body, under the table, and allows to compress air and oil together and to directly pump them into the tank = no oil vapour.





➤ **Optional front cover**

Upon request, VST can be provided with a special front cover in order to avoid any possible contact between DUTs and oil.

The front cover is manufactured by rubber material and follows the table movement.

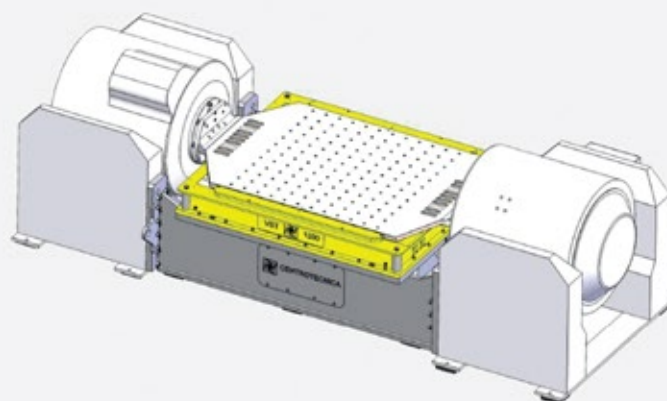
This optional item is mainly addressed to space applications, where the cleanliness issue is mandatory.



➤ **Special solutions**

Centrotecnica can adapt its standard vacuum slip tables to meet specific and special customer requirements in order to provide the best vibration solution.

Our design dpt studies all slip table possible configurations, together with the climatic chamber and shaker manufactures.



Vacuum slip table – VST1200
for push-pull system with two shakers



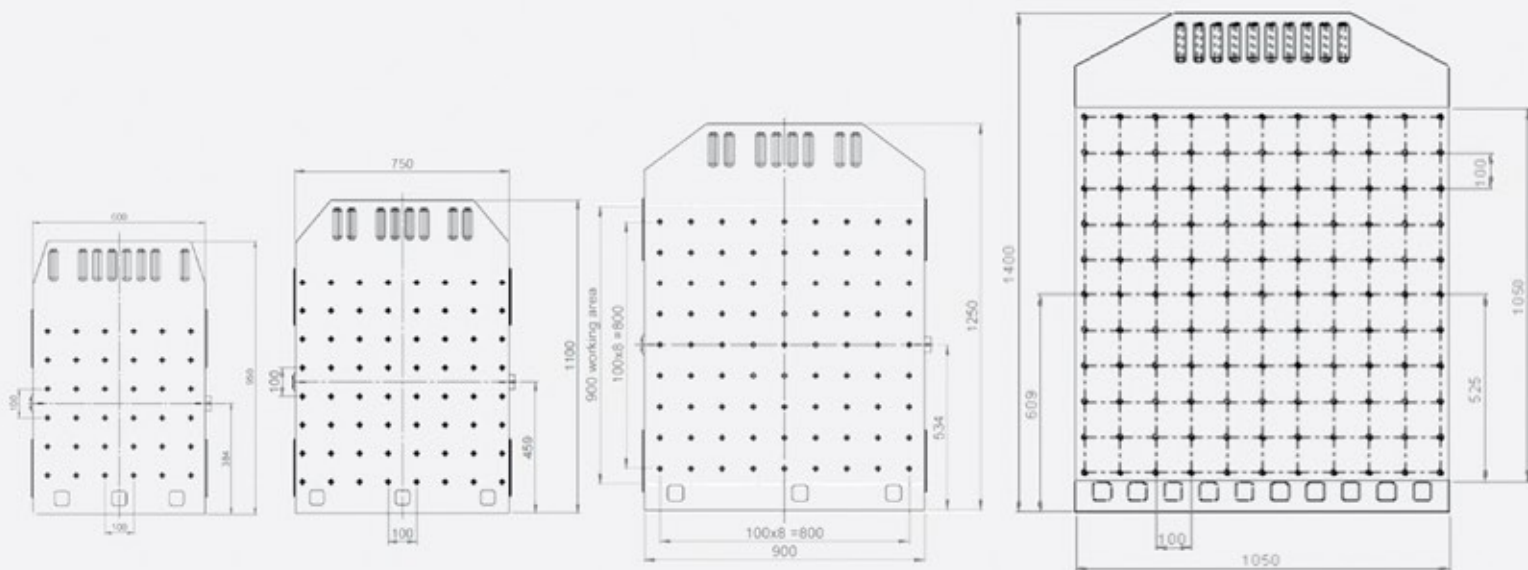


TECHNICAL SPECIFICATIONS - VST VACUUM SLIP TABLES

TABLE SIZE		600x600	750x750	900x900	1050x1050	1200x1200	1500x1500
WEIGHT [kg]	Magnesium	35	50	67	88	111	167
MAX DISPLACEMENT [mm]		160	160	160	160	160	160
MAX PAYLOADS [kg]		640	1000	1450	1950	2550	4000
USABLE FREQUENCY [Hz]		2000	2000	2000	2000	2000	2000
FIRST RESONANCE [Hz]		1250	1050	950	830	730	600
DRIVER BAR [kg] *	Aluminium	15	15	15	15	15	15

* TBC according to the armature shaker

TABLE SIZE		600x600	750x750	900x900	1050x1050	1200x1200	1500x1500
CT STANDARD INSERT TYPE	100mm grid	M8	M8	M8	M8	M8	M8
STD. INSERT PATTERN	100mm grid	36	64	81	121	144	225

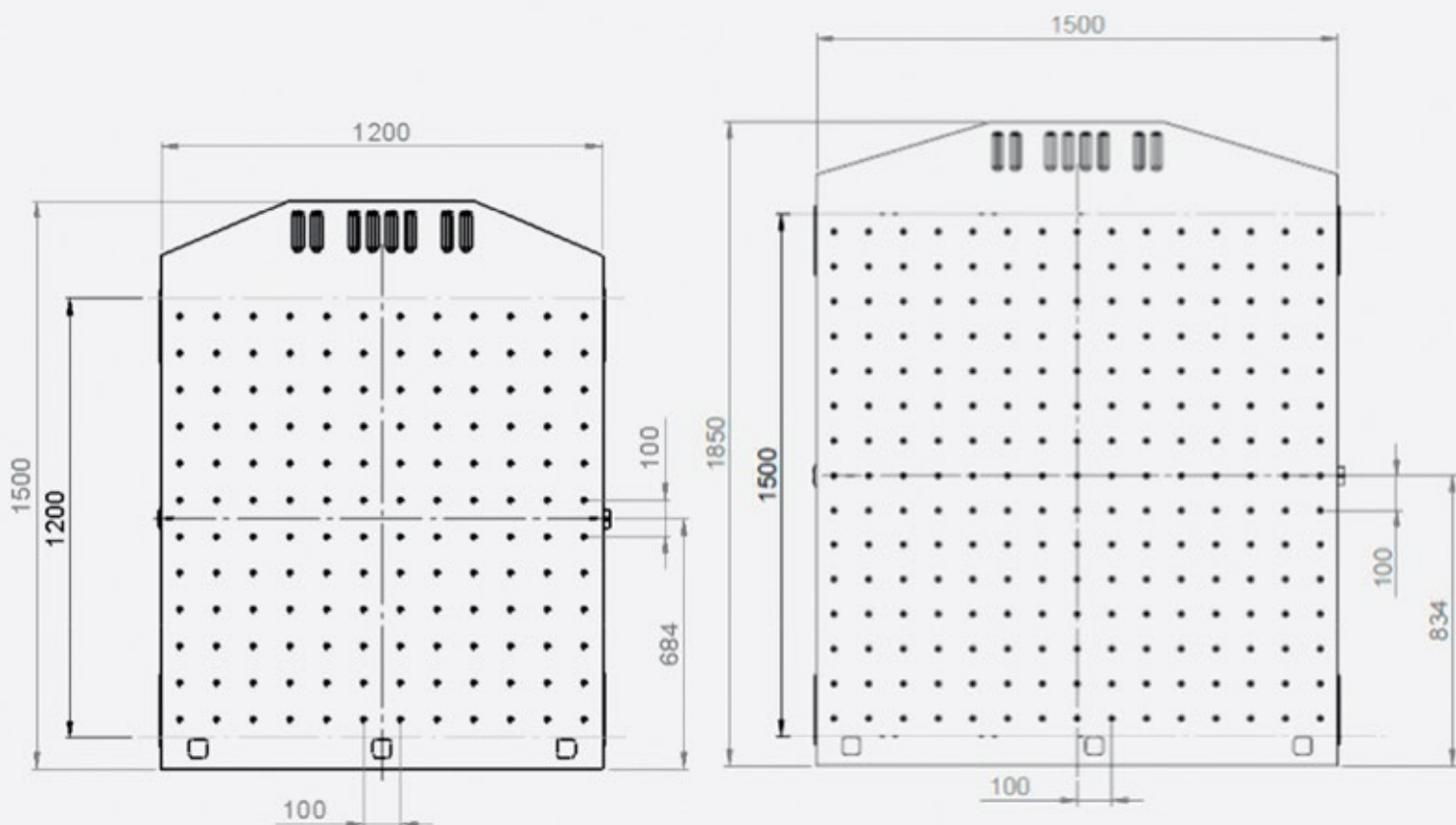




TECHNICAL SPECIFICATIONS - VST VACUUM SLIP TABLES

TABLE SIZE		600x600	750x750	900x900	1050x1050	1200x1200	1500x1500
Overturning moments [kNm]	Pitch	7.7	15.0	25.9	41.2	61.4	120
	Roll	7.7	15.0	25.9	41.2	61.4	120
	Yaw continuous	2.8	3.7	4.7	5.6	6.5	8.4
	Yaw ultimate	23.4	31.2	39	46.8	54.6	70.2

Standard patterns can be customized upon request





↘ HEAD EXPANDERS

Purpose : to enlarge the mounting area of the shaker armature, in order to test bigger payloads or many items in a single test run.

Key features:

- Innovative geometry to optimized the dynamic behaviour
- Machined, boxed and casted solutions, with a lightened design to save mass
- Material = aluminium or magnesium alloy or composite solution
- Customized hole insert patterns and thread sizes available upon request





CASTED HEAD EXPANDERS

The best solution to increase the armature surface is a pyramidal-conic shape. Casted head expanders are studied and optimized to be light but rigid.

High frequency performances are proved by FEM analysis and tested with the best control strategy.

Centrotecnica can supply either rounded and squared upper area expanders, depending on customer request.



MACHINED HEAD EXPANDERS

This type of head expander is machined out from an aluminium or magnesium plate, characterized by inner lightening design, with no mechanical bolted or welded parts.

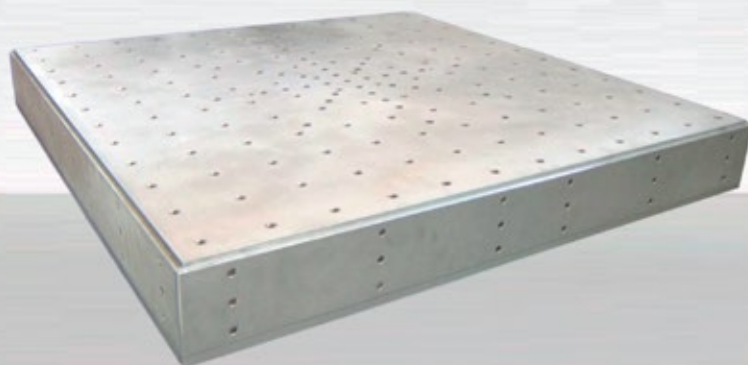
This concept is applied to small and medium size rounded and squared expanders, up to 900mm. Even though these expanders have a lower frequency range, they save mass since lighter and lower than casted ones.



BOXED HEAD EXPANDERS

Boxed head expanders are obtained by assembling aluminium or magnesium plates, with a innovative technique that stiffens the crucial areas.

The boxed type is designed to save as much weight as possible for low-medium frequency range testing. Moreover, this expander requires few space when used in combination to climatic chambers.





FOCUS POINTS

↳ **Inserts designed by Centrotecnica**

Stainless steel inserts are installed in the upper surface of the expanders, applying the appropriate loctite and a tightening torque.

Many sizes and types are available to meet each customer requirement. In case of replacement, an oversize version is supplied to protect the thread of the holes.

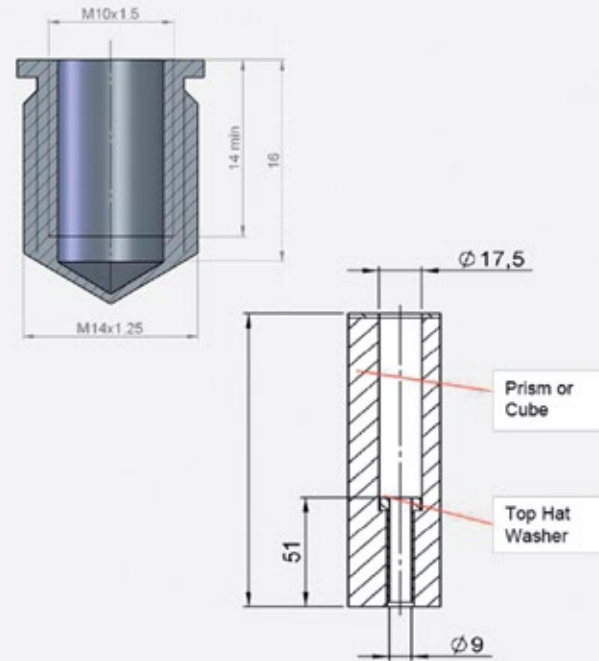
↳ **Top Hat Washers**

Stainless steel Top-Hat-Washers are installed into the counter-bored holes.

This feature prevents deformations of the material due to the fixing screws.

↳ **Finishing treatment**

Scratchproof paint is applied on each expander of Centrotecnica, usable up to 160°C.



Expander Kit includes:

- inserts installed on the upper surface
- full mounting kit with screws and tools
- lifting eyebolt
- technical user manual
- certification document
- wooden box

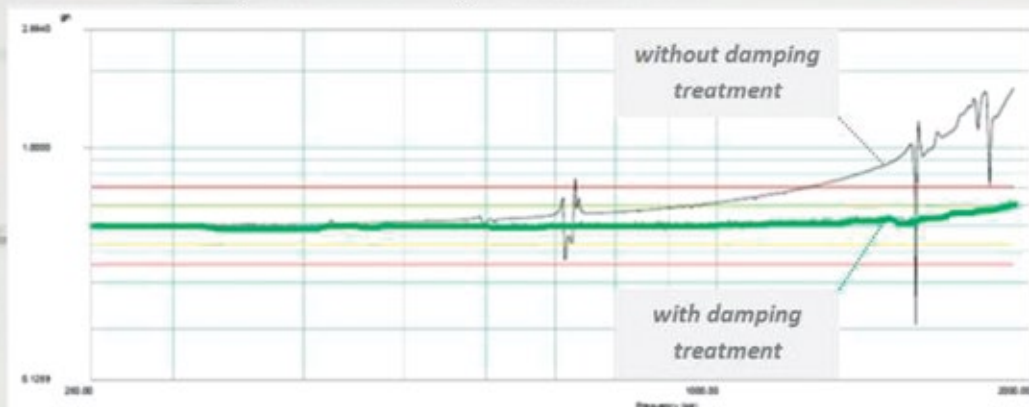




➤ **The importance of a damping treatment**

Expanders can be provided with the innovative “ultra damp” treatment that gives the expander a very high damping factor to kill unwanted resonances. A thin aluminium layer is designed and applied on the upper face. It exploits the principle of constrained layer damping.

The damping treatment reduces the energy of the excited resonances, improving the dynamical behaviour of the expander and leading to a better control.

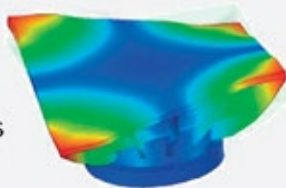


➤ **Dynamic Behaviour**

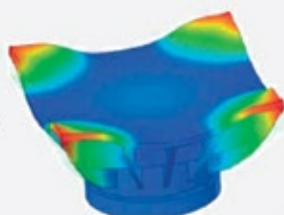
Centrotecnica expanders are studied with FEM analysis to achieve the best compromise between weight and first resonance.

Before delivering the expander, a sine vibration test is performed on the shaker or with an instrumented hammer, in order to identify the main vibration shapes and to find out the best control strategy.

SADDLE MODE
excited only with
unbalanced payloads



UMBRELLA MODE
excited by the shaker
(main resonance)





ADVANCED CONFIGURATIONS

Our design department can study the best technical solution for special customers applications by upgrading the already existing test-benches of all shaker types, thanks to the drawings available in our database.

A guidance system, load support and night locking system can be provided with the big sizes expanders.

↳ **Guidance system**

The guidance system is composed by a steel frame and roller elements to increase the capability of the expander to withstand the overturning moments.

The mass of the frame improves shaker seismic mass and global moments of inertia.

Centrotecnica's guidance system exploits the kinetic schema consisting in the expander rigidly guided by the direct connection between its guidance frame and the shaker body.

There is a perfect alignment between shaker armature motion and expander motion.

The guidance is mounted and aligned on the machined frame, assuring precision and locking lateral and rotational expander modes. The guidance is completely mechanical, without oil or additional equipment, very low maintenance is therefore needed.



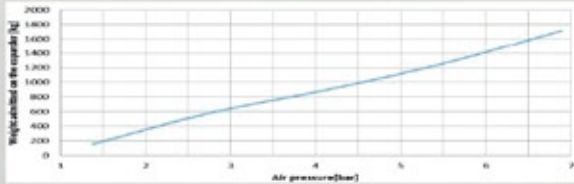
ø1800 guided expander example:
- installed on shaker armature ø640mm
- aluminium material





➤ **Load support & night locking system**

Air-springs are placed under the expander in order to increase the load support capability of the system. During the night, without air, a locking system turns on to keep up the load and a safety switch is provided to prevent any shaker start-ups.



➤ **Special design**

Upon request, reinforced walls can be applied to the sides of the casted expanders to improve the dynamic behaviour, increasing the frequency of the first resonance.

ø1500 guided expander example:

- designed for shaker armature ø560mm
- magnesium material



**TECHNICAL SPECIFICATIONS - ALUMINIUM EXPANDERS**

Armature	Upper size	Height	Weight \pm 5% Aluminium version	Manufacturing	First resonance	Usable range
Ø 110 mm	300 x 300 mm	110 mm	10 kg	C	4500 Hz	3287 Hz
Ø 156 mm	Ø 254 mm	55 mm	3.5 kg	M	> 2000 Hz	2000 Hz
Ø 180 mm	Ø 305 mm	55 mm	5 kg	M	> 2000 Hz	2000 Hz
Ø 180 mm	250 x 250 mm	68 mm	6 kg	M	4265 Hz	3000 Hz
Ø 180 mm	330 x 330 mm	132 mm	12.5 kg	C	2290 Hz	3000 Hz
Ø 180 mm	350 x 350 mm	132 mm	13.5 kg	C	2260 Hz	3000 Hz
Ø 180 mm	700 x 300 mm	100 mm	23 kg	M	853 Hz	1000 Hz
Ø 240 mm	400 x 400 mm	137 mm	20.5 kg	C	1840 Hz	2000 Hz
Ø 240 mm	500 x 500 mm	165 mm	32.5 kg	C	1625 Hz	2000 Hz
Ø 240 mm	750 x 750 mm	322 mm	102 kg	C	1600 Hz	2000 Hz
Ø 335 mm	Ø 610 mm	177 mm	46 kg	C	2480 Hz	2000 Hz
Ø 335 mm	Ø 700 mm	187 mm	60 kg	C	2060 Hz	2500 Hz
Ø 335 mm	500 x 500 mm	162 mm	38 kg	C	2400 Hz	2000 Hz
Ø 335 mm	500 x 500 mm	87 mm	24 kg	M	1460 Hz	2000 Hz
Ø 335 mm	600 x 600 mm	252 mm	74 kg	C	2330 Hz	2000 Hz
Ø 335 mm	600 x 600 mm	100 mm	41 kg	M	1000 Hz	1000 Hz
Ø 335 mm	800 x 800 mm	122 mm	90 kg	M	610 Hz	500 Hz
Ø 370 mm	Ø 700 mm	187 mm	59 kg	C	2060 Hz	2000 Hz
Ø 440 mm	Ø 610 mm	112 mm	42 kg	C	2900 Hz	2000 Hz
Ø 440 mm	Ø 812 mm	252 mm	101 kg	C	2260 Hz	2000 Hz
Ø 440 mm	Ø 812 mm	252 mm	101 kg	C	2260 Hz	2000 Hz
Ø 440 mm	Ø 900 mm	247 mm	110 kg	C	1890 Hz	2000 Hz
Ø 440 mm	Ø 1000 mm	307 mm	168 kg	C	1370 Hz	2000 Hz
Ø 440 mm	500 x 500 mm	127 mm	38 kg	C	2764 Hz	2000 Hz
Ø 440 mm	600 x 600 mm	200 mm	73 kg	C	1838 Hz	2000 Hz
Ø 440 mm	600 x 600 mm	100 mm	43 kg	M	1185 Hz	1000 Hz
Ø 440 mm	750 x 750 mm	255 mm	98 kg	C	1420 Hz	2000 Hz
Ø 440 mm	812 x 812 mm	280 mm	120 kg	C	1257 Hz	2000 Hz
Ø 440 mm	905 x 300 mm	152 mm	36 kg	B	957 Hz	1000 Hz
Ø 440 mm	925 x 600 mm	230 mm	91 kg	C	1097 Hz	2000 Hz
Ø 440 mm	1000 x 1000 mm	320 mm	187 kg	C	1060 Hz	1000 Hz
Ø 440 mm	1000 x 1000 mm	205 mm	160 kg	B	730 Hz	500 Hz
Ø 440 mm	1000 x 1200 mm	387 mm	285 kg	C	927 Hz	2000 Hz
Ø 440 mm	1200 x 1200 mm	392 mm	282 kg	C	770 Hz	900 Hz
Ø 440 mm	1600 x 900 mm	346 mm	199 kg	C	> 200 Hz	200 Hz
Ø 440 mm	1800 x 440 mm	206 mm	130 kg	B	292 Hz	200 Hz
Ø 640 mm	Ø 812 mm	194 mm	103 kg	C	1600 Hz	2000 Hz
Ø 640 mm	Ø 910 mm	195 mm	118 kg	C	1490 Hz	2000 Hz
Ø 640 mm	750 x 750 mm	157 mm	74 kg	C	1550 Hz	2000 Hz
Ø 640 mm	812 x 812 mm	157 mm	98 kg	C	1130 Hz	2000 Hz
Ø 640 mm	1000 x 1000 mm	322 mm	248 kg	C	1100 Hz	1000 Hz
Ø 640 mm	1000 x 1000 mm	322 mm	248 kg	C	1100 Hz	1000 Hz
Ø 640 mm	1200 x 1200 mm	362 mm	290 kg	C	800 Hz	1000 Hz
Ø 640 mm	1500 x 1500 mm	360 mm	318 kg	C	560 Hz	500 Hz
Ø 640 mm	1600 x 900 mm	302 mm	296 kg	C	659 Hz	700 Hz



**TECHNICAL SPECIFICATIONS - MAGNESIUM EXPANDERS**

Armature	Upper size	Height	Weight \pm 5% Magnesium version	Manufacturing	First resonance	Usable range
Ø 110 mm	300 x 300 mm	110 mm	5.5 kg	C	4500 Hz	3287 Hz
Ø 156 mm	Ø 254 mm	55 mm	2.4 kg	M	> 2000 Hz	2000 Hz
Ø 180 mm	Ø 305 mm	55 mm	3.3 kg	M	> 2000 Hz	2000 Hz
Ø 180 mm	250 x 250 mm	68 mm	4 kg	M	4265 Hz	3000 Hz
Ø 180 mm	330 x 330 mm	132 mm	8.3 kg	C	2290 Hz	3000 Hz
Ø 180 mm	350 x 350 mm	132 mm	8.3 kg	C	2260 Hz	3000 Hz
Ø 240 mm	400 x 400 mm	137 mm	13.5 kg	C	1840 Hz	2000 Hz
Ø 240 mm	500 x 500 mm	157 mm	19 kg	C	1625 Hz	2000 Hz
Ø 240 mm	750 x 750 mm	322 mm	68 kg	C	1600 Hz	2000 Hz
Ø 335 mm	Ø 610 mm	185 mm	30 kg	C	2480 Hz	2000 Hz
Ø 335 mm	Ø 700 mm	187 mm	40 kg	C	2060 Hz	2500 Hz
Ø 335 mm	500 x 500 mm	162 mm	25 kg	C	2400 Hz	2000 Hz
Ø 335 mm	600 x 600 mm	252 mm	52 kg	C	2330 Hz	2000 Hz
Ø 370 mm	Ø 700 mm	187 mm	39 kg	C	2060 Hz	2000 Hz
Ø 440 mm	Ø 610 mm	112 mm	28 kg	C	2900 Hz	2000 Hz
Ø 440 mm	Ø 812 mm	252 mm	73 kg	C	2260 Hz	2000 Hz
Ø 440 mm	Ø 812 mm	260 mm	73 kg	C	2260 Hz	2000 Hz
Ø 440 mm	Ø 900 mm	247 mm	74 kg	C	1890 Hz	2000 Hz
Ø 440 mm	Ø 1000 mm	307 mm	115 kg	C	1370 Hz	2000 Hz
Ø 440 mm	500 x 500 mm	170 mm	25 kg	C	2764 Hz	2000 Hz
Ø 440 mm	600 x 600 mm	192 mm	47 kg	C	1838 Hz	2000 Hz
Ø 440 mm	750 x 750 mm	255 mm	67 kg	C	1420 Hz	2000 Hz
Ø 440 mm	812 x 812 mm	282 mm	82 kg	C	1257 Hz	2000 Hz
Ø 440 mm	925 x 600 mm	230 mm	60 kg	C	1097 Hz	2000 Hz
Ø 440 mm	1000 x 1000 mm	320 mm	120 kg	C	1060 Hz	1000 Hz
Ø 440 mm	1000 x 1000 mm	205 mm	105 kg	B	730 Hz	500 Hz
Ø 440 mm	1000 x 1200 mm	387 mm	190 kg	C	927 Hz	2000 Hz
Ø 440 mm	1200 x 1200 mm	392 mm	190 kg	C	770 Hz	900 Hz
Ø 440 mm	1800 x 440 mm	206 mm	90 kg	B	292 Hz	200 Hz
Ø 640 mm	Ø 812 mm	194 mm	68 kg	C	1600 Hz	2000 Hz
Ø 640 mm	Ø 910 mm	195 mm	83 kg	C	1490 Hz	2000 Hz
Ø 640 mm	750 x 750 mm	157 mm	53 kg	C	1550 Hz	2000 Hz
Ø 640 mm	812 x 812 mm	157 mm	59 kg	C	1130 Hz	2000 Hz
Ø 640 mm	1000 x 1000 mm	322 mm	161 kg	C	1100 Hz	1000 Hz
Ø 640 mm	1000 x 1000 mm	322 mm	161 kg	C	1100 Hz	1000 Hz
Ø 640 mm	1200 x 1200 mm	354 mm	197 kg	C	800 Hz	1000 Hz

An approval design is shared with the customer before the production starting.

Please always ask for technical feasibility:

compatibility between armature and our casting model has to be checked.





↘ CUBES & PRISMS

Purpose : to perform the vibration test along three orthogonal directions by rotating the items on the cube or prism's faces.

Key features:

- High resonance frequencies than L- or T-fixture
- Machined and casted solutions with a lightened design to save the mass
- Material = aluminium or magnesium alloy
- Customized hole insert patterns and thread sizes available upon request

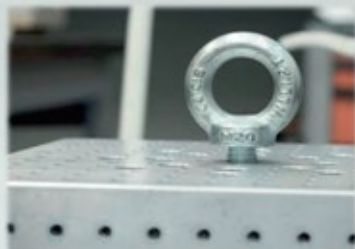




STANDARD CUBES

Centrotecnica cubes are the most solid solution for the vibration testing. They are provided with inserts pattern on the 5 faces to mount the DUTs. The small sizes are machined from solid material, while the big sizes are manufactured from the casting model with a special inner lightening.

Cubes are typically installed on shaker armatures, interface plates or slip tables for tests on many DUTs at a time, in different orientations, and therefore save time.



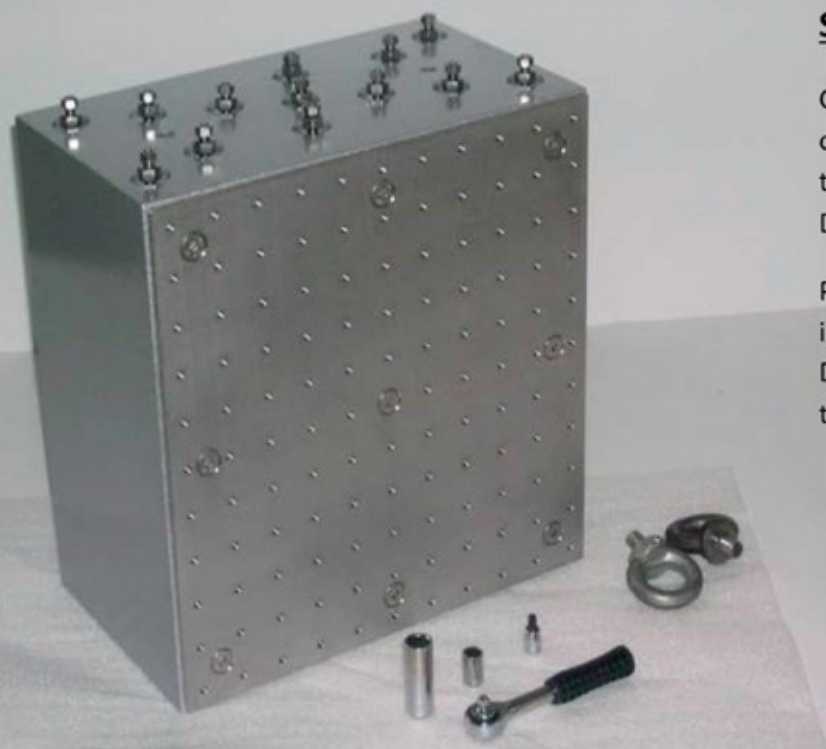
STANDARD PRISMS

Centrotecnica prisms are designed with two opposite faces with the same inserts pattern so that both can be used as mounting surface for the DUTs.

Prisms are typically installed on shaker armatures, interface plates or slip tables for tests on many DUTs at a time, in different orientations, and therefore save time.

Cube/Prism Kit includes:

- inserts installed on the faces
- full mounting kit with screws and tools
- lifting eyebolt
- technical user manual
- certification document





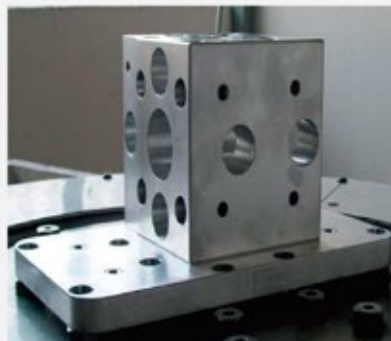
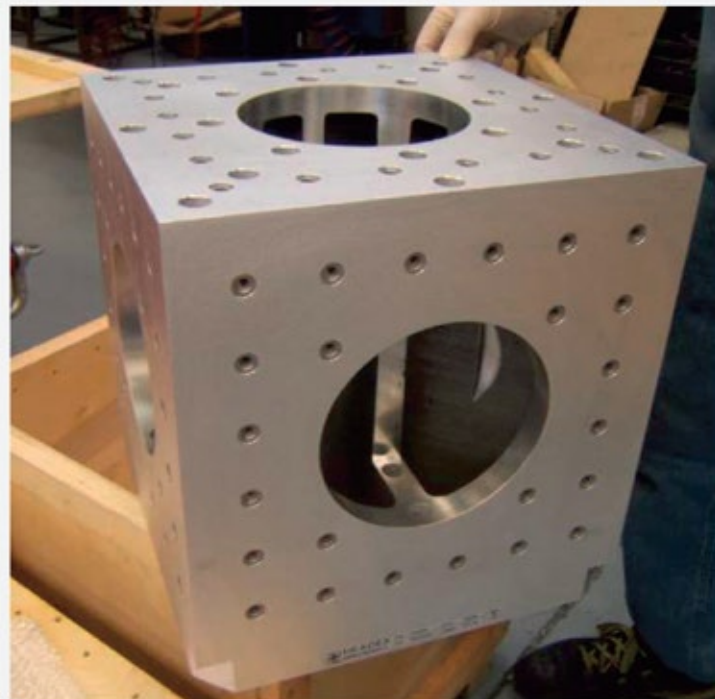
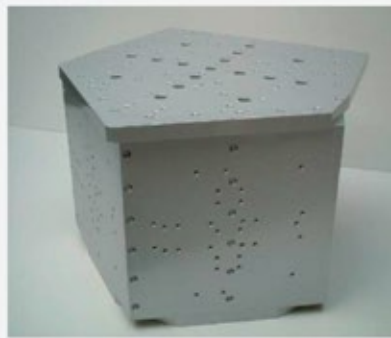
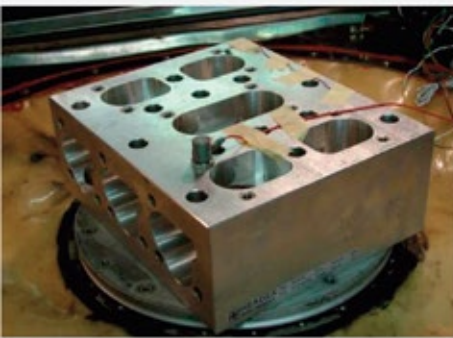
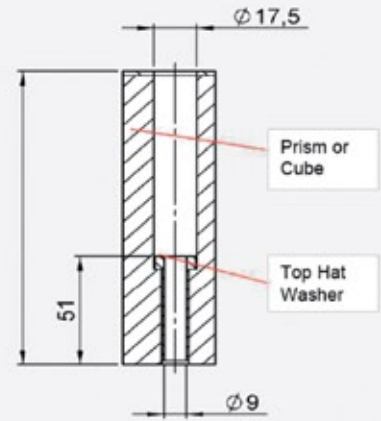
FOCUS POINTS

Top Hat Washers

Stainless steel Top-Hat-Washers are installed into the counter-bored holes. This feature prevents deformation of the material due to the fixing screws.

Special Design

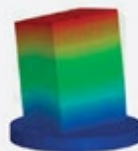
Upon request, Centrotecnica can design and machine the special solutions.



Dynamic Behaviour

Each cube/prism is analyzed by a FEM model to predict the dynamic response and to study the best control strategy. Before the delivery, a vibration test is performed on the shaker or with an instrumented hammer in order to identify the three main vibration shapes:

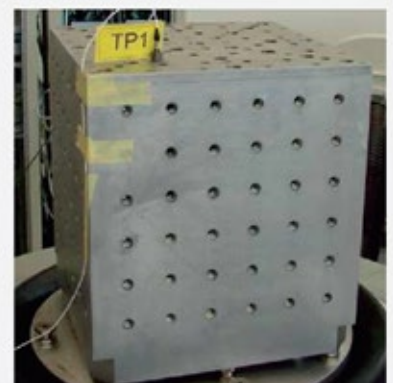
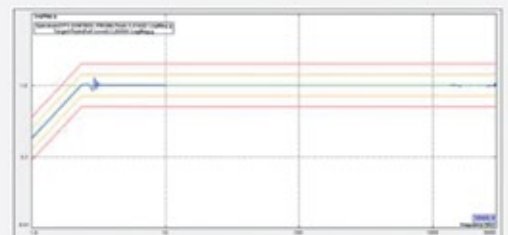
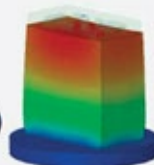
- TRANSVERSAL MODE
excited only with unbalanced payloads



- TORSIONAL MODE
negligibly excited by the shaker



- AXIAL MODE
excited by the shaker (main resonance)



**TECHNICAL SPECIFICATIONS - STANDARD CUBES & PRISMS**

Length	Width	Height	Weight \pm 5%	
			Aluminium version	Magnesium version
78 mm	78 mm	78 mm	0.8 kg	0.6 kg
110 mm	110 mm	130 mm	2.6 kg	2 kg
110 mm	110 mm	110 mm	2.2 kg	1.5 kg
156 mm	156 mm	176 mm	7 kg	5 kg
127 mm	127 mm	127 mm	3 kg	2 kg
198 mm	198 mm	223 mm	12 kg	8 kg
180 mm	180 mm	180 mm	7 kg	5 kg
240 mm	240 mm	275 mm	22.6 kg	15 kg
240 mm	240 mm	240 mm	15 kg	10 kg
180 mm	180 mm	215 mm	11 kg	7.5 kg
335 mm	335 mm	370 mm	63 kg	43 kg
350 mm	350 mm	380 mm	53 kg	35 kg

Length	Width	Height	Weight \pm 5%	
			Aluminium version	Magnesium version
180 mm	180 mm	100 mm	7 kg	5 kg
280 mm	280 mm	190 mm	31 kg	21 kg
280 mm	280 mm	190 mm	31 kg	21 kg
330 mm	330 mm	190 mm	42 kg	28 kg
440 mm	440 mm	245 mm	68 kg	46 kg
440 mm	440 mm	245 mm	68 kg	46 kg
445 mm	525 mm	245 mm	95 kg	64 kg
445 mm	525 mm	245 mm	95 kg	64 kg

An approval design is shared with the customer before the production starting.

Please always ask for technical feasibility:

compatibility between armature and our casting model has to be checked.



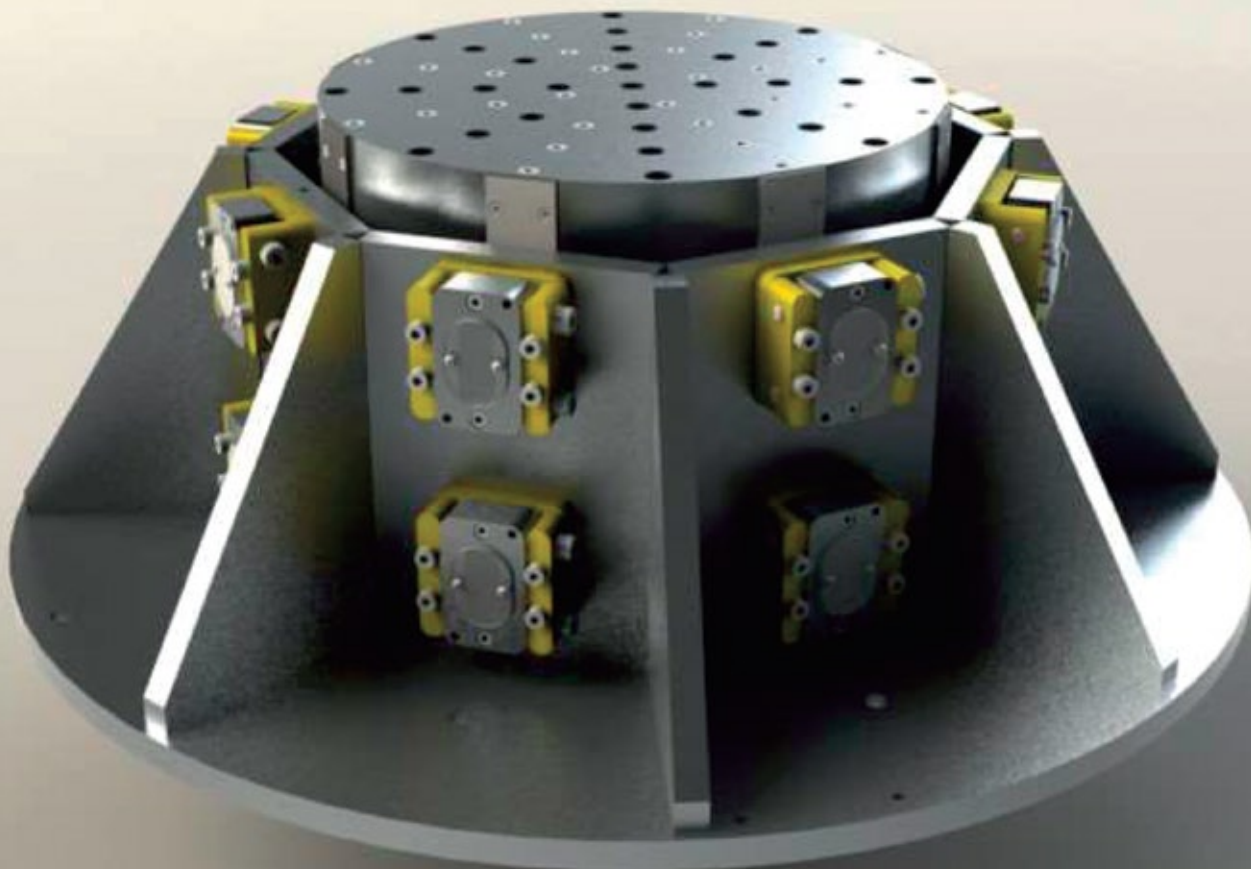


↘ PLATES & HEAD EXTENDERS

Purpose : to improve the test-bench with different inserts pattern or with an extension to cover the negative strokes or to pass through the chamber floor.

Key features:

- Customized thickness and height, by using modular solutions
- Casted and machined extenders, with a lightened design to save mass
- Material = aluminium or magnesium alloy
- Customized hole insert patterns and thread sizes available upon request





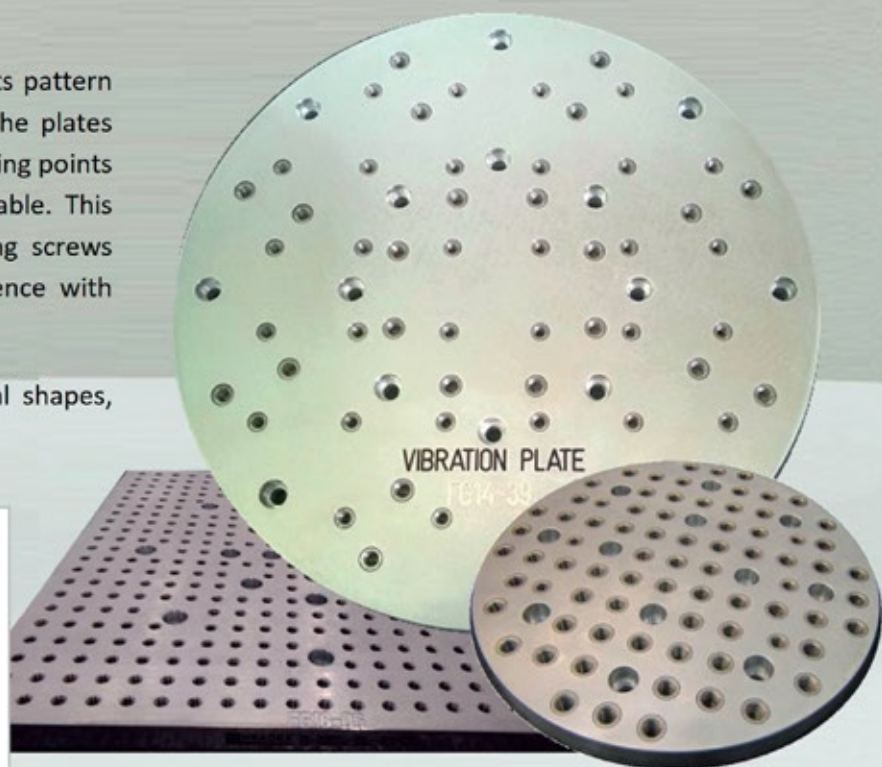
STANDARD PLATES

Centrotecnica plates are provided with inserts pattern as per the specific customer requirement. The plates are drilled with counter-bored holes at the fixing points on the armature shaker / expander / slip table. This design allows to hide the head of the fixing screws under the working plane, avoiding interference with the DUTs.

Centrotecnica can supply plates with several shapes, with carved serial number.

Plate/Extender Kit includes:

- inserts installed on the upper surface
- full mounting kit with screws and tools
- lifting eyebolt for the big extenders
- technical user manual
- certification document



STANDARD HEAD EXTENDERS

Centrotecnica produces cylindrical components for each shaker's armature. The extenders are designed with counter-bored holes for the fixing and provided with the inserts on the upper surface to replicate the armature pattern.

Head Extenders are typically installed on shaker armatures for test in combination with climatic chamber, to increase the height of the working plane beyond the floor.



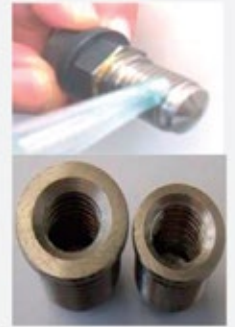
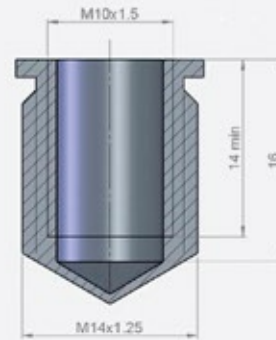


FOCUS POINTS

➤ **Inserts designed by Centrotecnica**

Stainless steel inserts are installed in the plates and in the extenders, applying the appropriate loctite and a tightening torque.

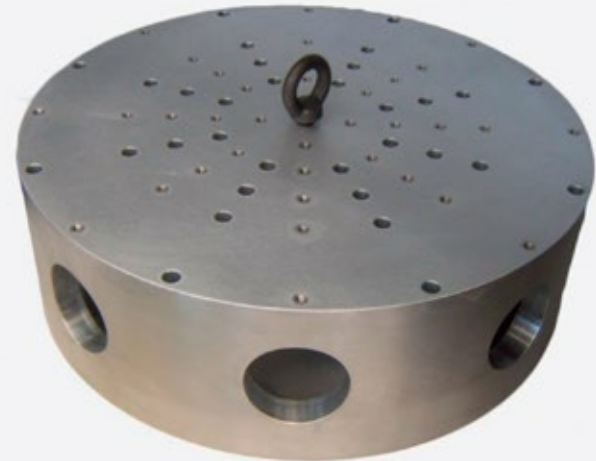
Many sizes and types are available to meet each customer requirement. In case of replacement, an oversize version is supplied to protect the thread of the holes.



➤ **Special Design**

Centrotecnica supplies the extenders with lightening design and a modular concepts to achieve every possible height.

Special shapes are studied to get the minimum moving mass, in particular, in case of extenders used in combination with thermal barriers and expanders.



➤ **Options: "guidance system" & "load support"**

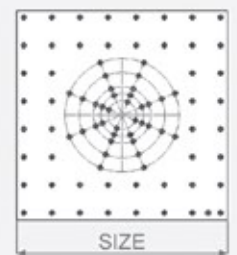
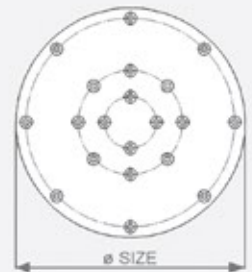
Upon request, Centrotecnica can produce technical solutions to increase the load support capability of the test-bench and to preserve the integrity of the shaker from damages due to the overturning moments of unbalanced payloads.



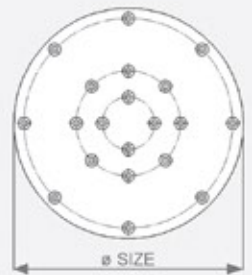


TECHNICAL SPECIFICATIONS - STANDARD PLATES & HEAD EXTENDERS

Shape	Size	Thickness	Aluminium version Weight \pm 5%	Magnesium version Weight \pm 5%
Round	\varnothing 160 mm	20 mm	1.2 kg	0.8 kg
Round	\varnothing 180 mm	20 mm	1.4 kg	0.9 kg
Round	\varnothing 240 mm	20 mm	2.4 kg	1.7 kg
Round	\varnothing 280 mm	20 mm	3 kg	2.1 kg
Round	\varnothing 335 mm	20 mm	4.7 kg	3.3 kg
Round	\varnothing 400 mm	20 mm	7 kg	4.6 kg
Round	\varnothing 440 mm	20 mm	8.6 kg	5.8 kg
Round	\varnothing 560 mm	20 mm	14 kg	9.7 kg
Round	\varnothing 610 mm	20 mm	16 kg	11 kg
Round	\varnothing 640 mm	20 mm	17.5 kg	12 kg
Round	\varnothing 760 mm	20 mm	25 kg	17 kg
Square	185 x 185 mm	20 mm	1.7 kg	1.2 kg
Square	280 x 280 mm	20 mm	3.8 kg	2.5 kg
Square	330 x 330 mm	20 mm	5.5 kg	3.6 kg
Square	440 x 440 mm	20 mm	10 kg	6.5 kg
Square	500 x 500 mm	20 mm	14 kg	9 kg
Square	600 x 600 mm	20 mm	19 kg	13 kg
Square	750 x 750 mm	20 mm	29 kg	19 kg



Shape	Size	Height	Aluminium version Weight \pm 5%	Magnesium version Weight \pm 5%
Cylindrical	\varnothing 180 mm	60 mm	3 kg	2 kg
Cylindrical	\varnothing 180 mm	100 mm	4.5 kg	3 kg
Cylindrical	\varnothing 280 mm	100 mm	11.5 kg	8 kg
Cylindrical	\varnothing 280 mm	150 mm	18 kg	12 kg
Cylindrical	\varnothing 335 mm	100 mm	14.8 kg	10 kg
Cylindrical	\varnothing 335 mm	150 mm	21 kg	14 kg
Cylindrical	\varnothing 440 mm	100 mm	23.5 kg	15 kg
Cylindrical	\varnothing 440 mm	150 mm	35 kg	26 kg
Cylindrical	\varnothing 440 mm	200 mm	45 kg	30 kg
Cylindrical	\varnothing 560 mm	100 mm	36 kg	24 kg
Cylindrical	\varnothing 640 mm	100 mm	41 kg	27.5 kg
Cylindrical	\varnothing 640 mm	150 mm	58 kg	38 kg



By request, Centrotecnica can provide plates and extenders with other dimensions, shapes and heights than the above standard ones .

An approval design is shared with the customer before the production starting.



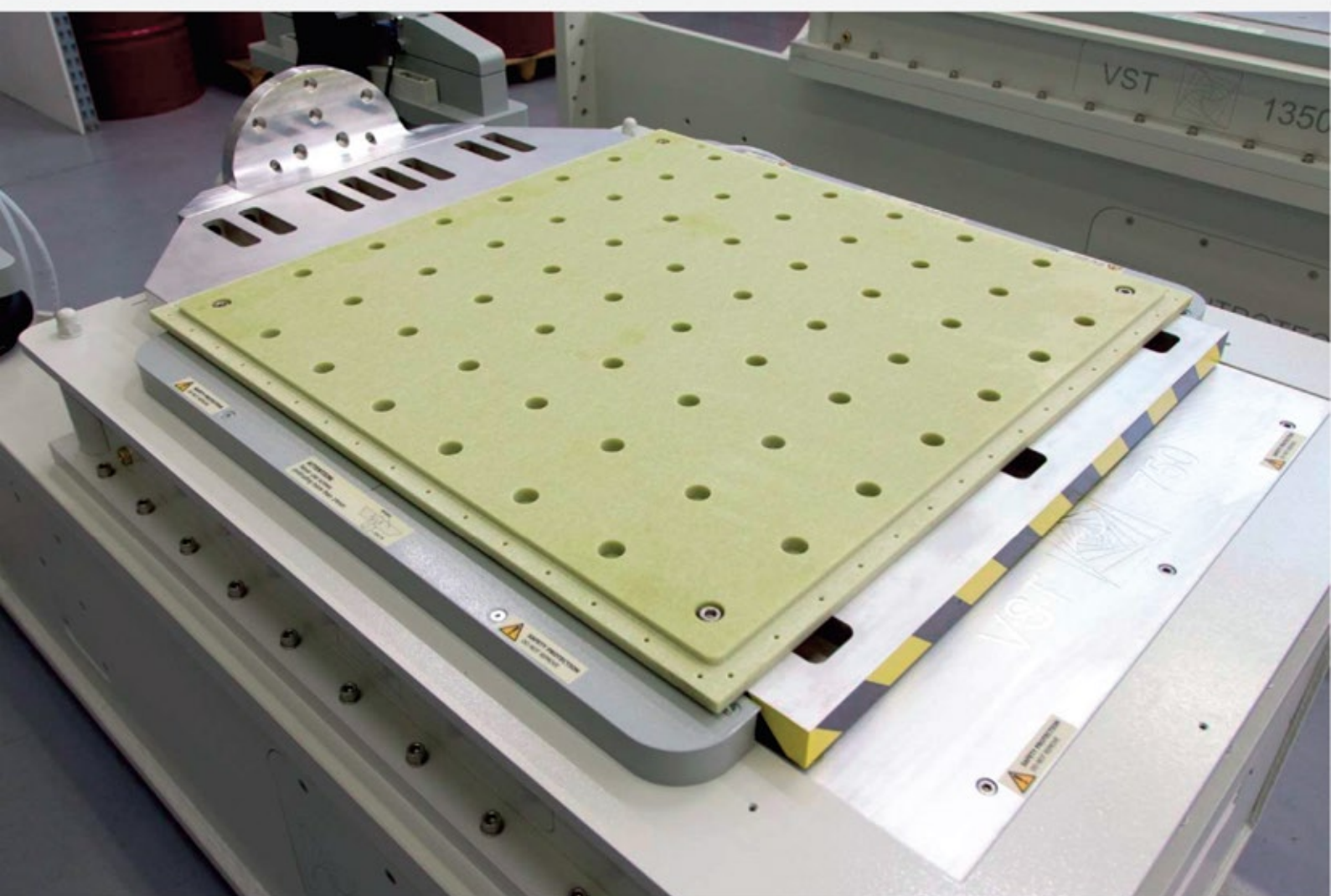


↘ THERMAL BARRIERS

Purpose : to limit the thermal transmission to the vibration system.
Thermal barriers are designed for shaker armatures, slip tables, expanders, etc.

Key features:

- Material = fiberglass (HT220)
- Thermal range = up to + 220 °C
- Thermal conductivity = 0.22 W / mK
- Customized hole insert patterns and thread sizes available upon request



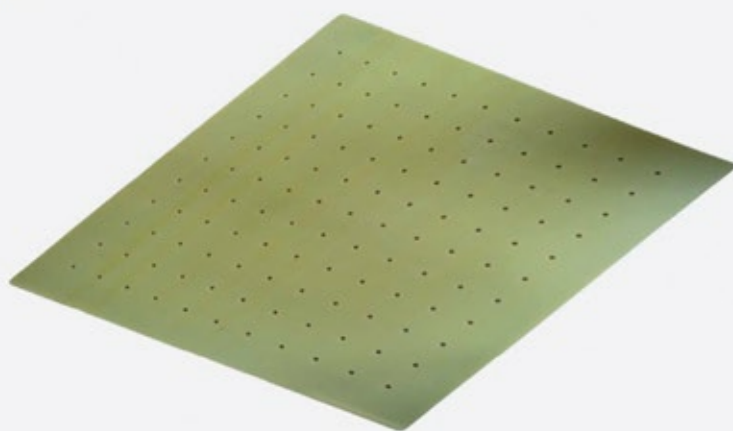


STANDARD THERMAL BARRIERS

The standard Thermal Barrier is the basic element for the insulation, drilled with passing-through holes at the armature/expander/slip table insert's pattern; there is no sealing groove for fixing the textile sheet or drainage system.

Thermal barriers are typically installed on shaker armatures, interface plates, extenders or expanders to cover the working surface.

Centrotecnica can supply both round and square thermal barriers, with carved serial number.



Thermal barrier Kit includes:

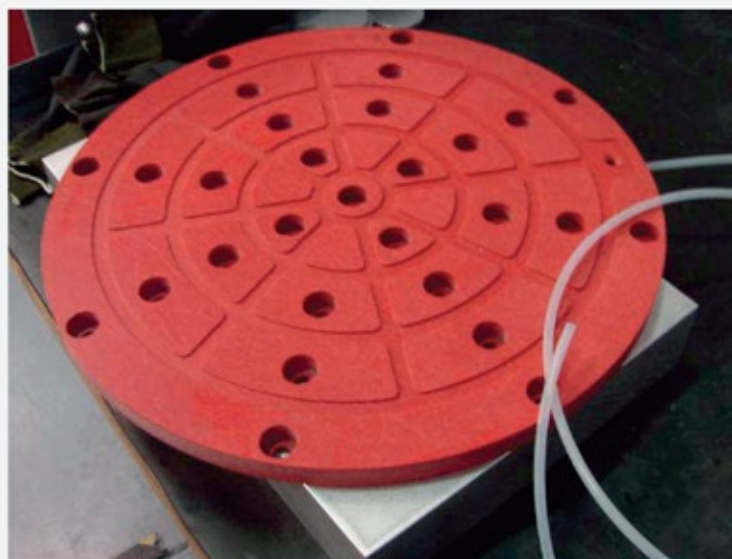
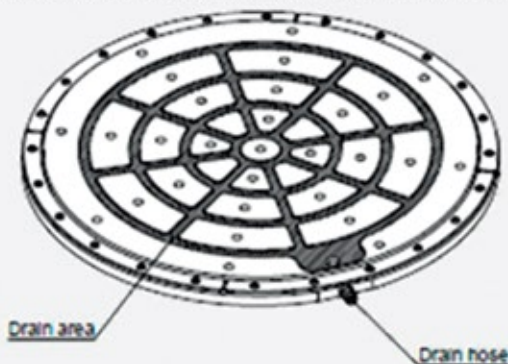
- full mounting kit with screws and tools
- technical user manual
- certification document
- aluminium bars (optional)
- drain pipe (optional)
- textile cover sheet (optional)

SPECIAL THERMAL BARRIERS

Upon request, following options are available on each thermal barrier:

➤ **option "drain system"**

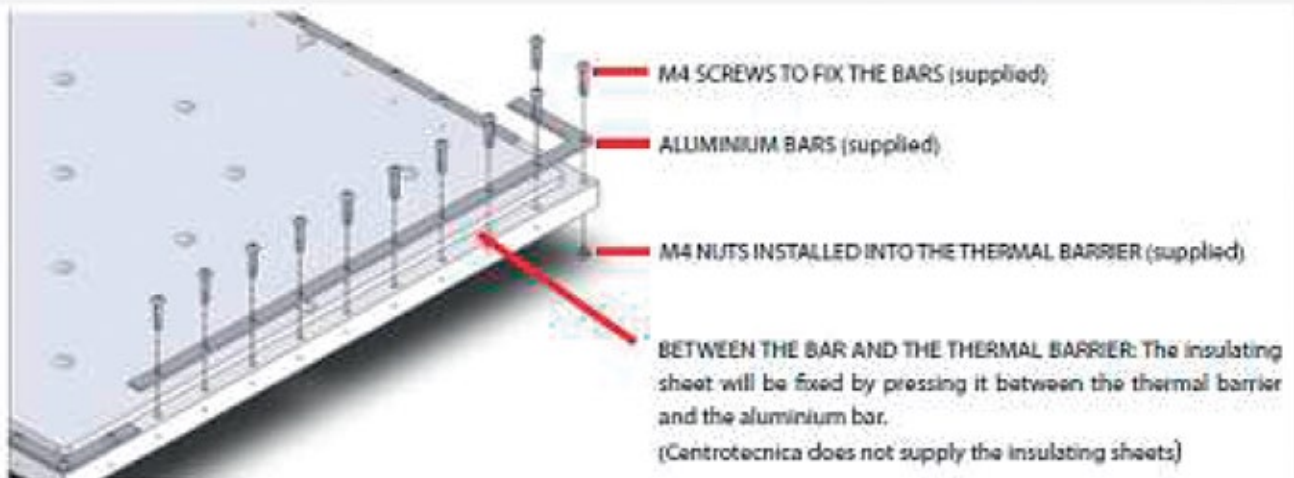
a special grooving for water drainage and a drain hose. This system is conceived to allow the water of the condensation to be canalized and poured out; to avoid the water to stay underneath the expander or drop onto the shaker and prevent corrosion.





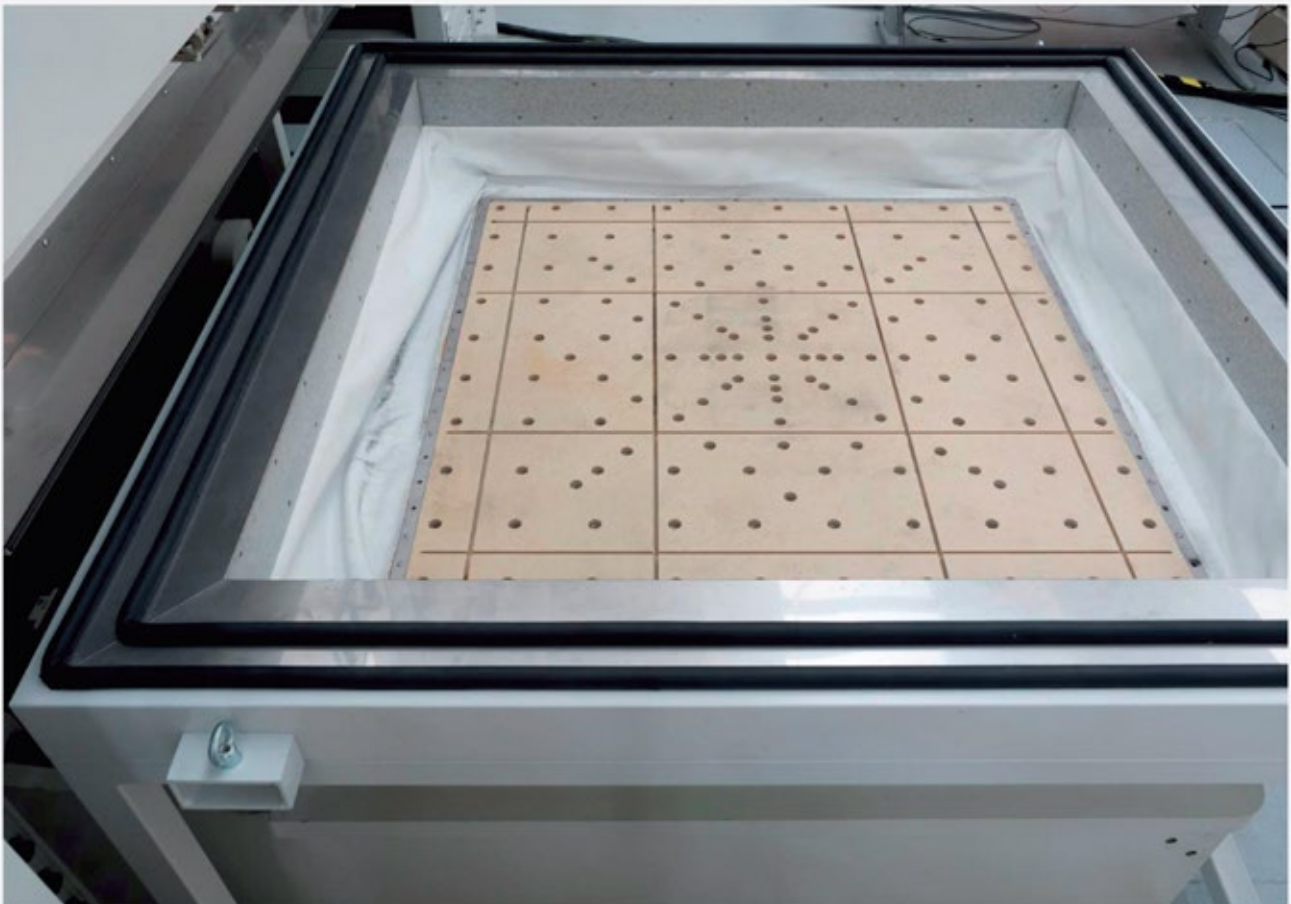
➤ **option "easy fixing"**

a seat along the perimeter to allow the textile sheet to be fixed by using M4 tapped holes and suitable aluminium bars.



➤ **option "orthogonal grooves"**

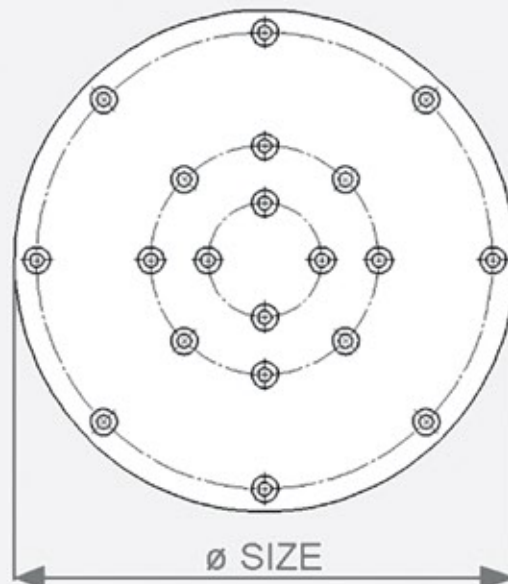
A special machining of the thermal barrier for the slip table, in order to reduce the table bending due to thermal expansion of the test fixture



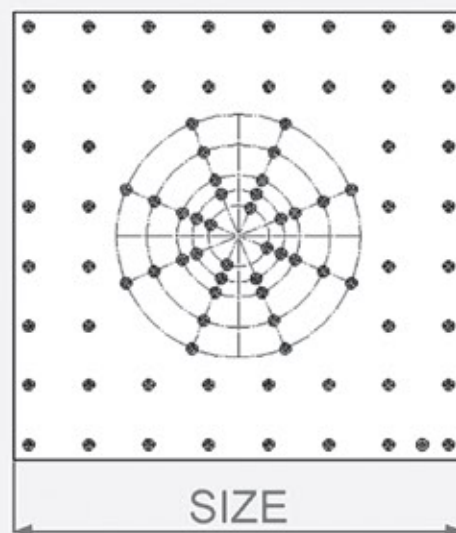


TECHNICAL SPECIFICATIONS - STANDARD THERMAL BARRIERS

Shape	Size	Thickness	Weight $\pm 5\%$
Round	\varnothing 65 mm	20 mm	0.1 kg
Round	\varnothing 114 mm	20 mm	0.4 kg
Round	\varnothing 128 mm	20 mm	0.5 kg
Round	\varnothing 150 mm	20 mm	0.7 kg
Round	\varnothing 174 mm	20 mm	0.9 kg
Round	\varnothing 180 mm	20 mm	1 kg
Round	\varnothing 190 mm	20 mm	1.1 kg
Round	\varnothing 200 mm	20 mm	1.2 kg
Round	\varnothing 240 mm	20 mm	1.7 kg
Round	\varnothing 290 mm	20 mm	2.5 kg
Round	\varnothing 320 mm	20 mm	3.1 kg
Round	\varnothing 335 mm	20 mm	3.3 kg
Round	\varnothing 400 mm	20 mm	4.8 kg
Round	\varnothing 440 mm	20 mm	5.8 kg
Round	\varnothing 560 mm	20 mm	9.4 kg
Round	\varnothing 610 mm	20 mm	11.1 kg
Round	\varnothing 640 mm	20 mm	12.2 kg
Round	\varnothing 700 mm	20 mm	14.6 kg
Round	\varnothing 750 mm	20 mm	16.8 kg
Round	\varnothing 812 mm	20 mm	19.7 kg



Shape	Size	Thickness	Weight $\pm 5\%$
Square	300 x 300 mm	20 mm	3.4 kg
Square	400 x 400 mm	20 mm	6.1 kg
Square	500 x 500 mm	20 mm	9.5 kg
Square	600 x 600 mm	20 mm	13.7 kg
Square	640 x 640 mm	20 mm	15.6 kg
Square	750 x 750 mm	20 mm	21.4 kg
Square	800 x 800 mm	20 mm	24.3 kg
Square	900 x 900 mm	20 mm	30.8 kg
Square	1000 x 1000 mm	20 mm	38 kg
Square	1200 x 1200 mm	20 mm	54.7 kg
Square	1350 x 1350 mm	20 mm	69.3 kg
Square	1400 x 1400 mm	20 mm	74.5 kg
Square	1500 x 1500 mm	20 mm	85.5 kg
Square	2000 x 2000 mm	20 mm	152 kg



The weight may increase by 10 % in case of special thermal barriers
 An approval design is shared with the customer before the production starting.



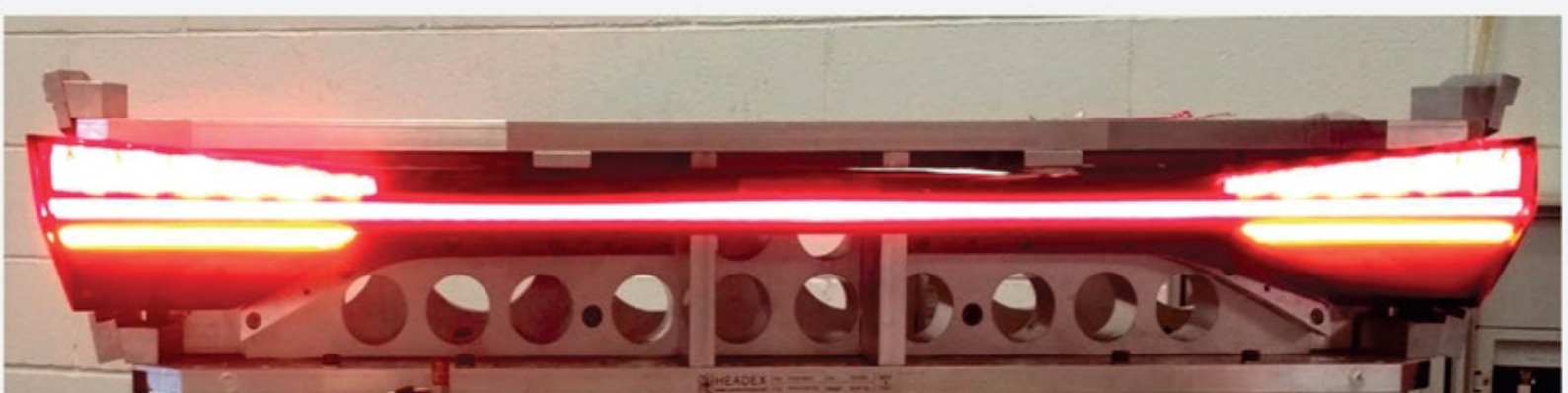


↘ FIXTURES

Purpose : to allow to interface the DUTs to the mounting surface of the test bench, simulating the real installation and configuration of the DUTs.

• **Key features:**

- Customized design according to specific test requirements, through FEA
- Stiff and light solutions for high performances
- Use of aluminium, magnesium and innovative materials
- Results of dynamic tests included in the Technical manual

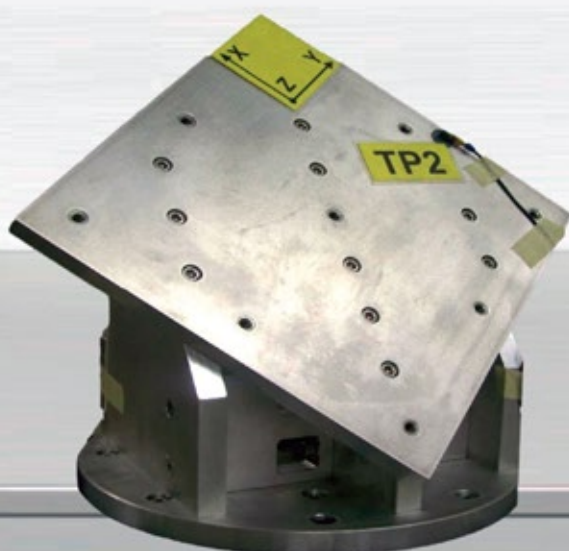
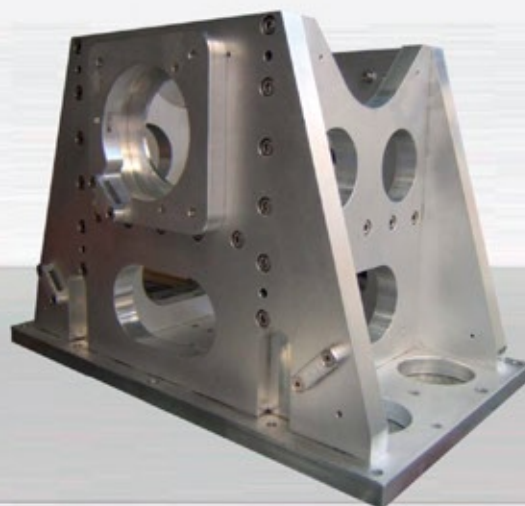




CUSTOM FIXTURES

Custom fixtures are designed to interface one or more DUTs to the test-bench and to allow the transmission of the same vibration to all DUT's fixing points.

Custom fixtures can be used for test along the three mutual axes by rotating it or by using a slip-table. Fixtures are optimized by FEM analysis to achieve the best compromise between minimum weight and maximum frequency range.



TRIAxIAL FIXTURES

Triaxial fixtures aim at rotating the DUT in a specific direction in order to fractionate the vibration along its three orthogonal axes.

This allows the test to be performed simultaneously along the three axes with a higher vibration level, along the resultant vector.

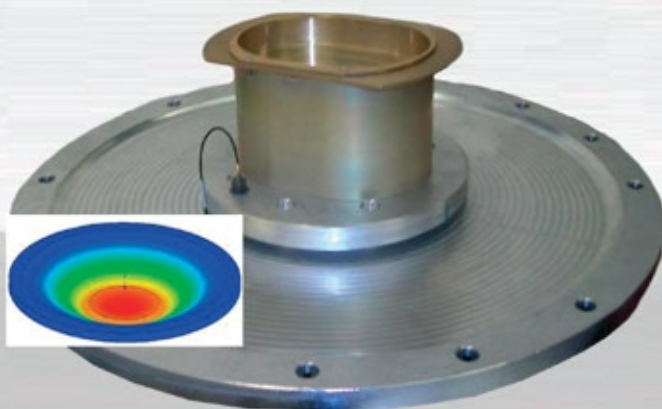
The use of a triaxial fixture speeds up the test by reducing the total test time to 1/3.

RESONANCE FIXTURES

Resonance fixtures are designed with a done on purpose resonance between shaker and DUT in order to achieve a very high vibration level

The item is mounted in a resonant part of the fixture. The amplification factor allows to reach vibration level of hundreds of g, in a restricted frequency range.

The use of a resonant fixture can save a lot of energy and prevents shaker damages.



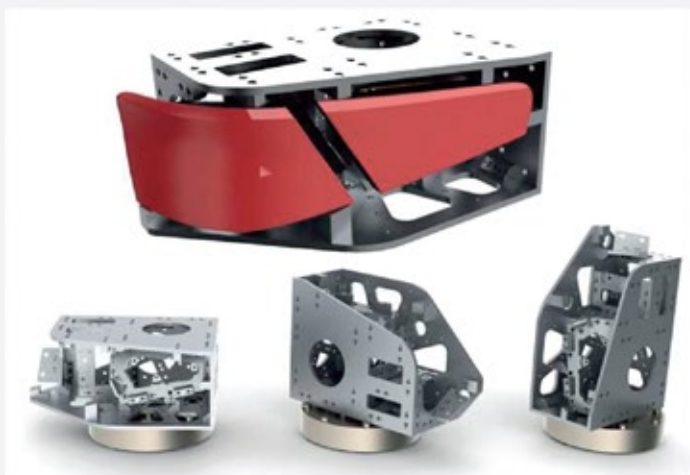


➤ AUTOMOTIVE FIXTURE

Centrotecnica supplies fixtures for automotive testing:

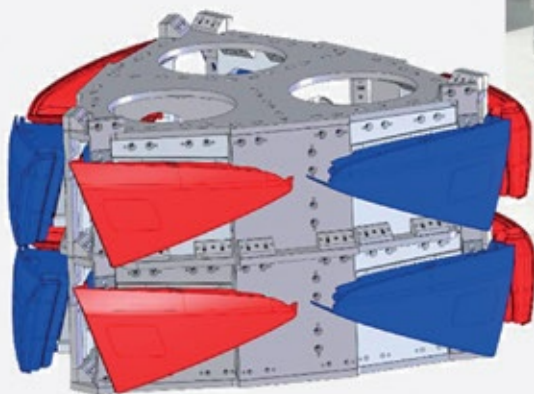
➤ **Qualification fixtures**

mountable along three axes, for high vibration level on one or two DUTs



➤ **Reliability fixtures**

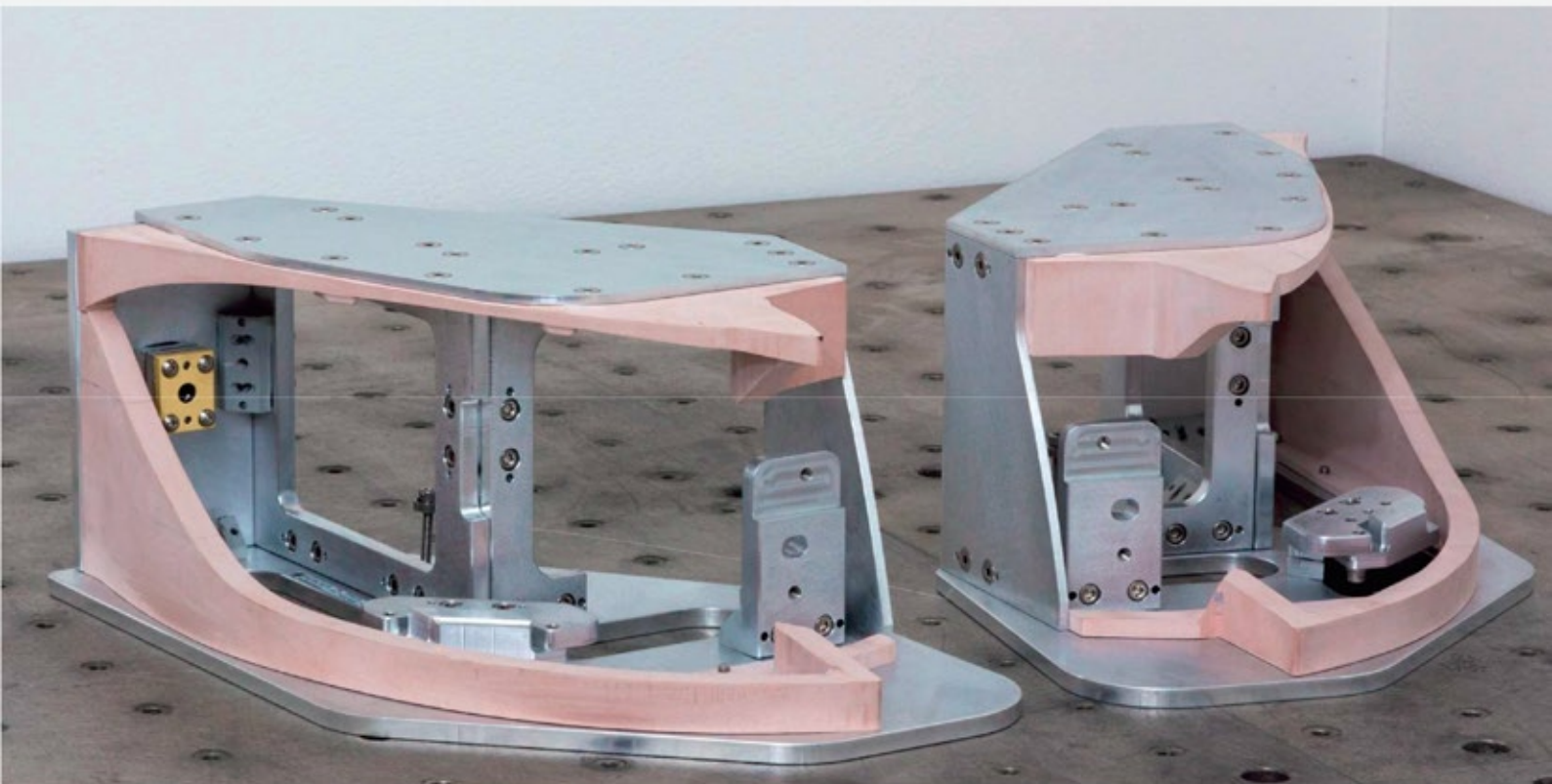
Usually required after qualification testing campaign, for medium vibration level on many DUTs at the same time, in order to shorten testing duration and to save shaker energy and money.





➤ **Photometric, Rain and Shock fixture**

light equipment with special accessories, innovative material and advanced manufacturing technology

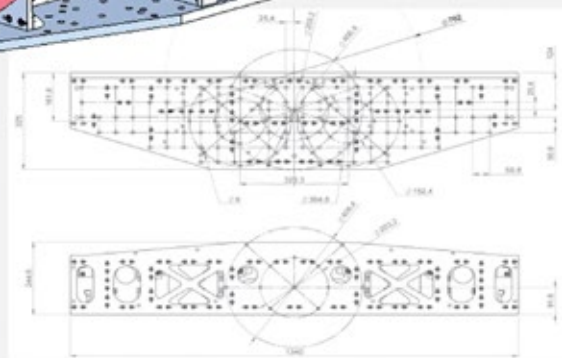
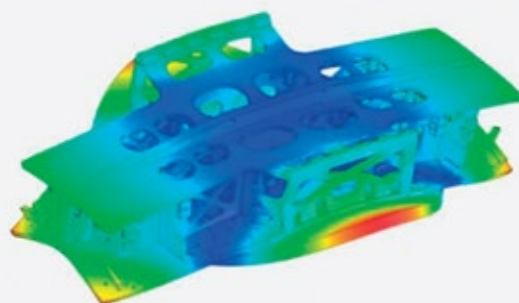
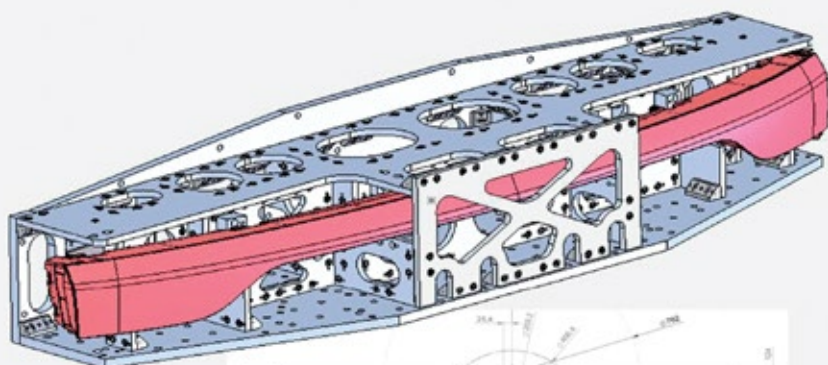




MAIN FEATURES:

↘ *Accurate design and FEA optimization:*

- perfect reproduction of fixing points, RPS, car body surface and more..
- best compromise between stiffness and weight for sine, random and shock tests



↘ *Manufacturing and Assembly:*

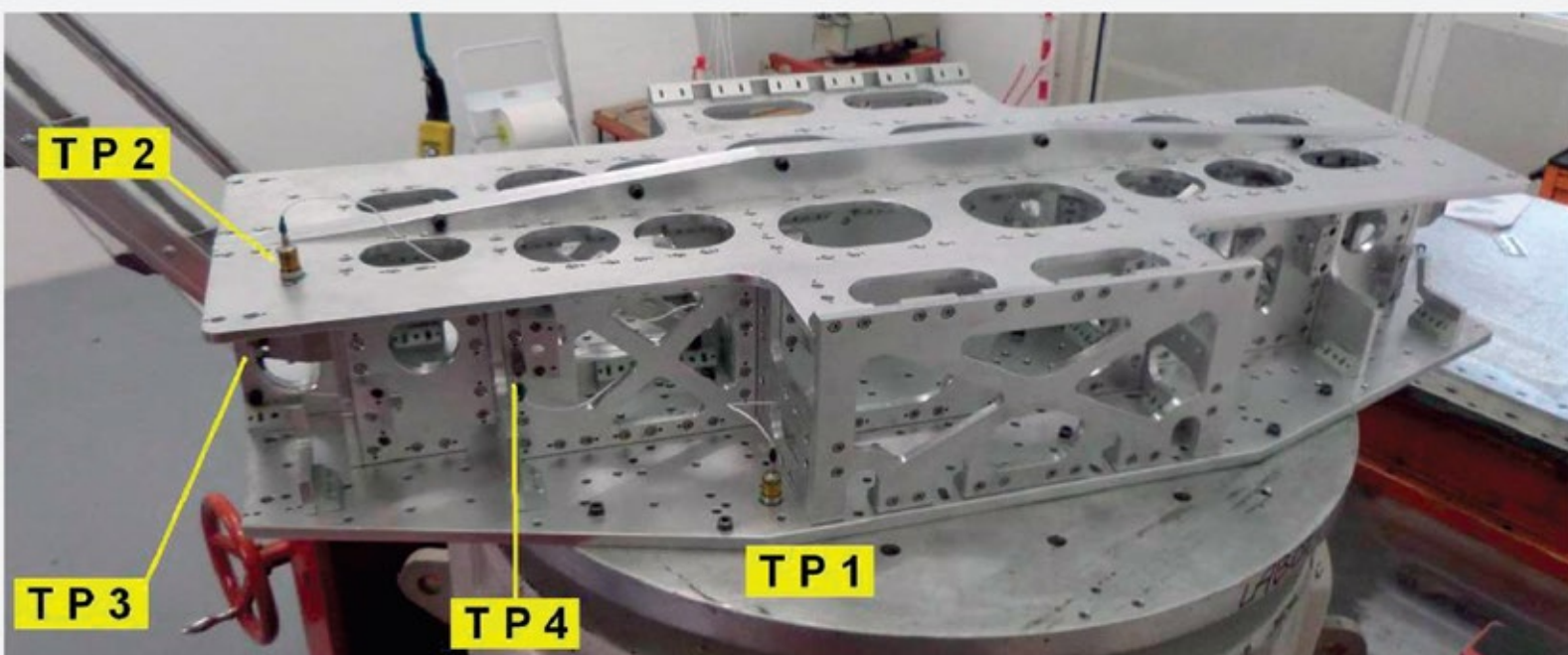
- innovative construction techniques
- CAM programs for CNC machine
- finishing treatments
- flexible and multifunction production

↘ *3D dimensional certification*

through 3D 7 axes measurement FARO instrumentation

↘ *Dynamic validation*

- performed at our laboratory, before delivery
- technical report including the mounting procedure and test results with the best control strategy

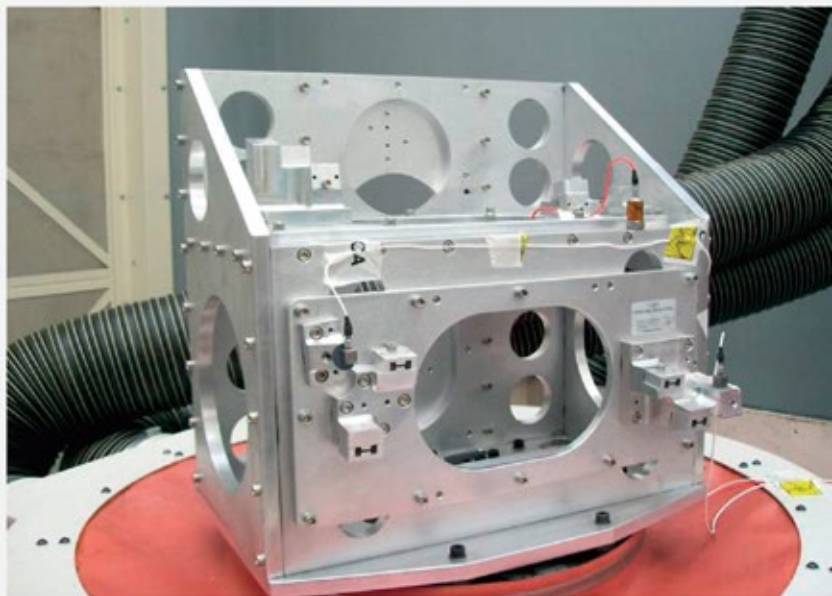
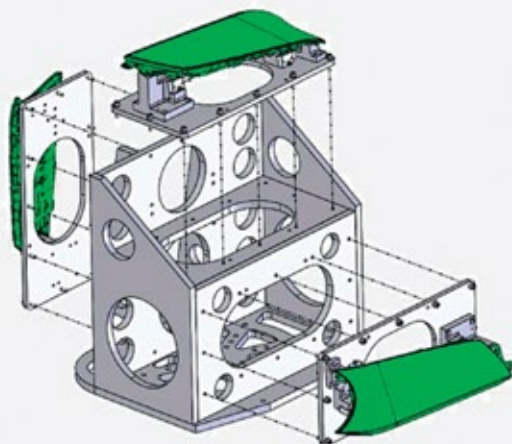




AUTOMOTIVE FIXTURES FOR MANY APPLICATIONS:

↘ *Special configurations*

A common base fixture for interchangeable elements to test different items, at three orientations at the same time.



↘ *Fixture for mufflers*

Fixtures connected to a furnace to test mufflers with air flow at 800°C, with rectangular machined expander for mounting on the shaker armature.



↘ *Custom design for engines*

Fixture for automotive engine electronic ignition with gas inside at the pressure of 16 bar, with a base aluminium plate for mounting on the shaker armature.





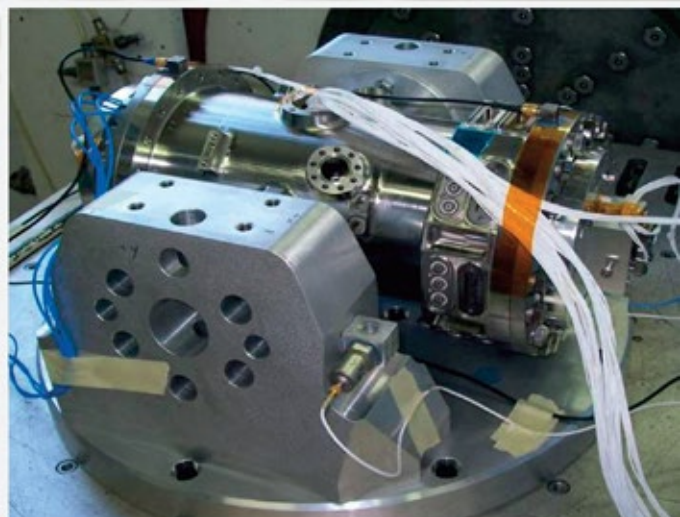
SPACE SECTOR

Key features:

- Rigid and precision fixtures
- Innovative and quality materials
- Compliance to norms, i.e. ECSS

Main references:

- EADS Astrium, Thales Alenia Space, AVIO, Ferrari Space, OHB, etc.



AERONAUTICAL SECTOR

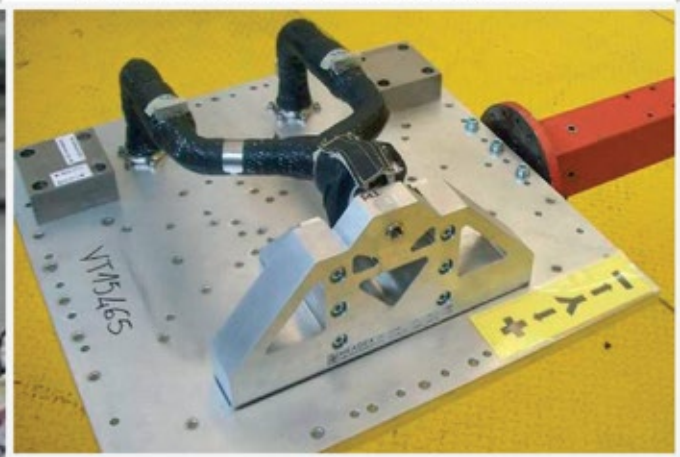


Key features:

- Accuracy and flexibility of the fixtures
- Special machining
- Compliance to norms, i.e. MIL-STD, RTCA-DO

Main references:

- AGUSTA Westland, Airbus, Leonardo, Aermacchi, DIEHL, Zodiac aerospace, etc.





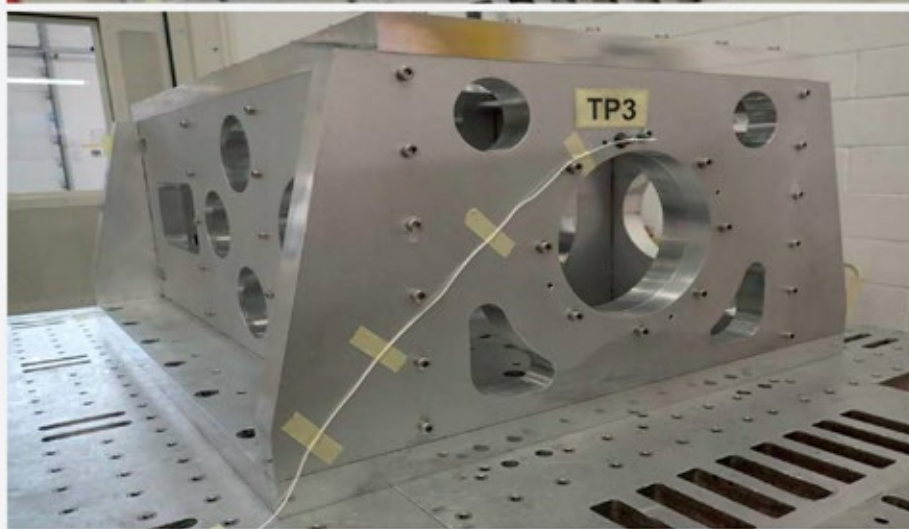
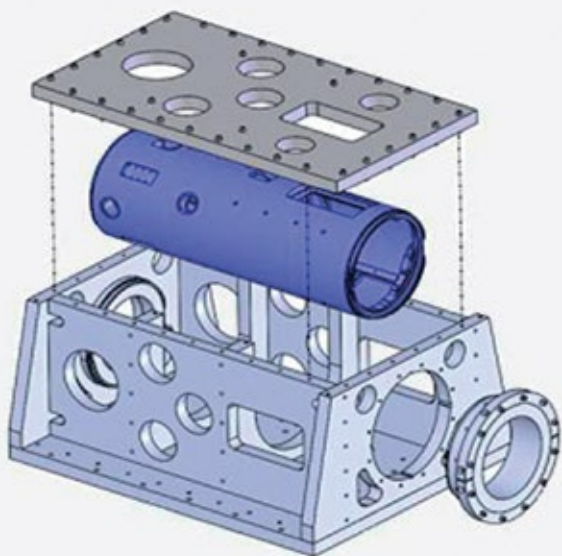
▷ DEFENCE SECTOR

Key features:

- High performance and technology
- Maximum reliability
- Compliance to norms, i.e. MIL-STD, DEF STAN, AECTP, RTCA-DO, STANAG

Main references:

- BAE Systems, Airbus Defence and Space, MBDA, Selex, Leonardo, etc.





▷ RAILWAY SECTOR

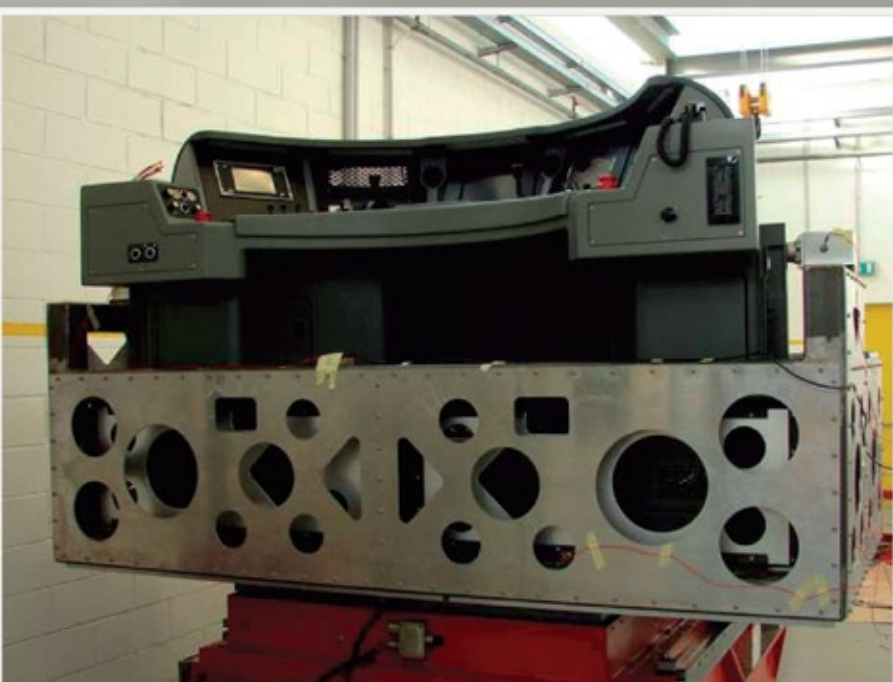


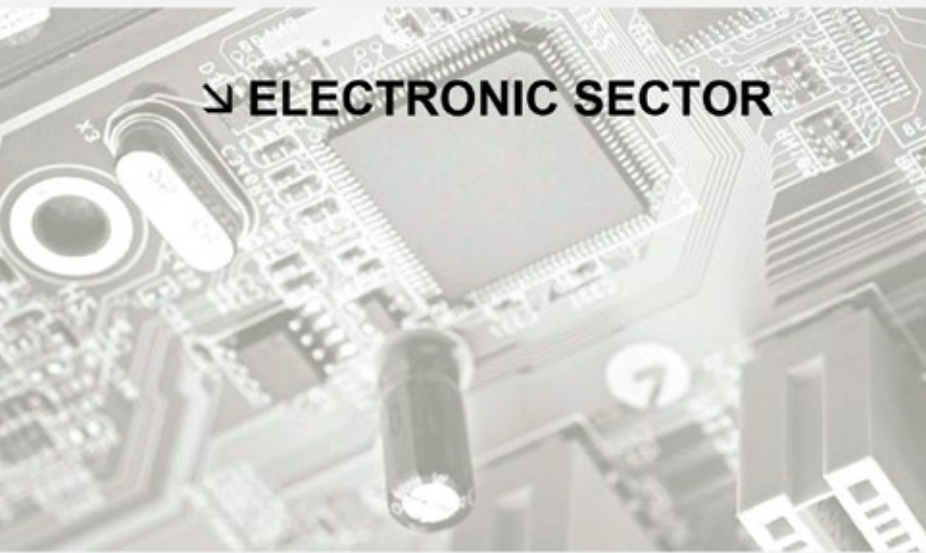
Key features:

- Fixtures for each DUTs size
- Steel and aluminium solutions
- Compliance to norms, i.e. CEI EN 61373, IS 00 402A

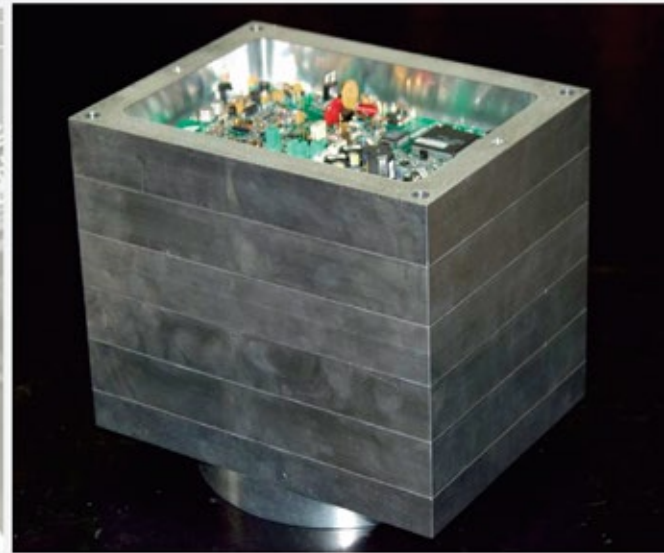
Main references:

- RFI rete ferroviaria italiana, Alstom, ABB, Leonardo, Ansaldo, Webasto,, etc..

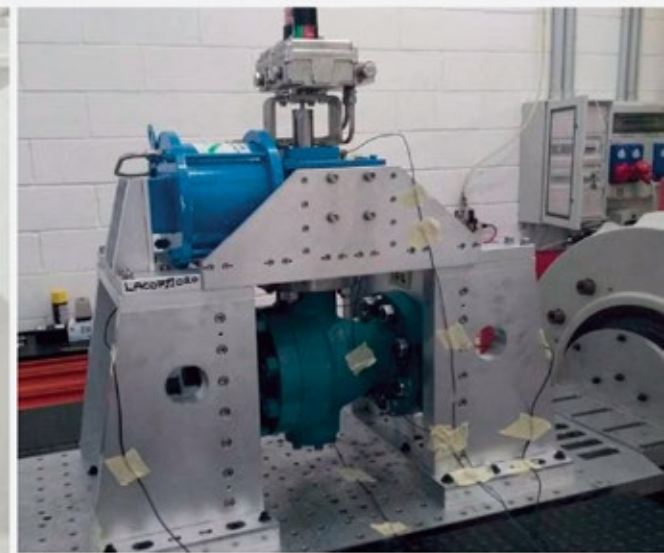




↘ **ELECTRONIC SECTOR**



↘ **HYDRAULIC SECTOR**



↘ **TRANSPORT SECTOR**

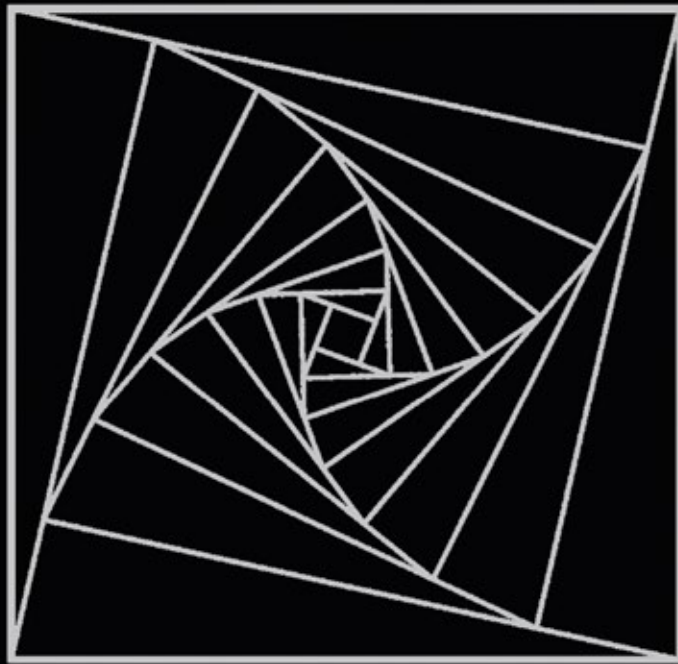




Notes:

A series of horizontal dotted lines provided for taking notes.





Centrotecnica Srl



Via F. Confalonieri 23
20060 Masate (MI) - Italy



info@ctecnica.it



+ 39 02 5530 5888

