
QUADSYSTEM®
SUPER-QUAD
The original with the red grid
The winning move for the milling
Electropermanent magnetic clamping systems
- powerful - safe
- practical - cost-effective
TECNOMAGNETE®
Safety through Power

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The original with the red grid

for clamping ferrous workpieces of every type and size

Beyond traditional limits

Even the most sophisticated machine tools are frequently unable to realise their full potential due to restraints represented by traditional clamping systems.

In fact, the workpieces are never completely free to execute all the machining anticipated when operating with vices and clamps and it is therefore necessary to proceed with successive positioning to carry out the cycle completely, with all the inevitable drawbacks in terms of productivity. Moreover, the use of traditional mechanical systems frequently induce structural stresses, creating deformations that generate problems when processing and consequently achieving the required tolerances.

Free workpiece and uniform clamping

The use of a magnetic system enables the workpiece to be positioned on a magnetic surface that acts both as a mechanical reference and as a clamping area.

The force is distributed uniformly over the entire contact surface without compressing or deforming the workpiece, which remains completely free for all the machining operations with a single set-up.

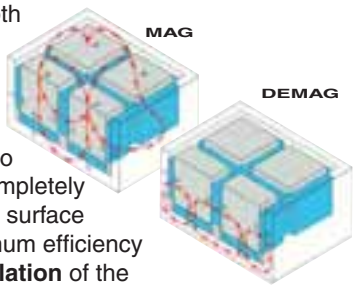
Because there are no obstacles or constraints, the machine's capacities can be best exploited.

The absence of vibration allows higher stock removal, longer-life for the tools, better finishing and superior accuracies.

QUADSYSTEM: the winning technology

The innovative and patented QUADSYSTEM electropermanent technology has enabled to build up electropermanent magnetic systems capable of ensuring **great strength, total security, long-term reliability**, improving all the typical limitations of the obsolete electro-magnetic systems.

The **invertible double magnetic** system comprises a series of independent square poles in a chess board arrangement and alternating N/S, capable of generating a high **concentrated force** through a mesh of multiple magnetic seams that permit the magnetic flux to circulate in a horizontal and flat field.
The clamping force generated enables the workpiece to be held irrespective of the direction of the cutting force, even in the case of limited thicknesses, thanks to the limited depth of field.
The "**neutral crown**" enables the magnetic flux to be directed completely over the active surface ensuring optimum efficiency and **total insulation** of the module.



Electric power is only used for a few seconds in the MAG (activation) and DEMAG (de-activation) phases: during processing the workpiece is held exclusively by the force of the **high-energy permanent magnets** that surround each of the square generator poles on 5 faces.

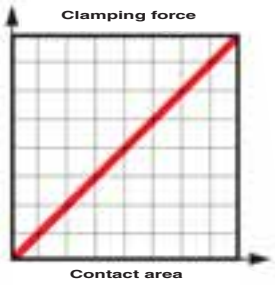
The system is insensitive to possible current failures and is therefore **"intrinsically" safe**.
The absence of consumption enables energy to be saved and the clamping surface to be maintained in a **"cold" condition** with no deformations or expansions.
The force of the magnets remains constant **indefinitely**.

TECNOMAGNETE®
Safety through Power

ECO-COMPATIBILITY
• No comsumption
• No pollution

The revolutionary answer for a field of virtually unlimited applications

The new series of Super-Quad systems, the result of the exclusive QUADSYSTEM technology, represents the best technological display of electropermanent magnetism applied to workholding in the metalworking industry.
The new series allows a large variety of ferrous parts to be clamped quickly and flexibly, on virtually any type of machine tool.
The Super-Quad are **powerful, lightweight, compact**, easy to install and to use; they ensure a rapid return on investment with **significant immediate advantages**.
Super-Quad guarantees real production cost efficiency with simplicity, avoiding complicated and expensive special fixturing equipment or using machines that are larger than necessary, freeing working space, limiting capital outlay and making production flows more flexible.



The high clamping strength and power of Super-Quad is developed uniformly, linearly and proportionally to the contact surface of the workpiece and remains constant over time, not tied to the processing phases.

Flexibility
- 5 sides clear access
- all useful strokes used
- workpieces larger than the table surface are machinable
- unique tooling
- simplified CNC or FMS programming

Cost-effectiveness
- limited capital outlay
- no maintenance
- no modification to the machine and to the line
- energy-saving
- reduced consumption of tools
- high-value over time

Safety
- constant and concentrated force
- no electric power supply during clamping
- ergonomic in operation
- no dispersion of magnetic flux
- no interference

Productivity
- easy and quick set-up
- drastic reduction in downtime
- higher stock-removal rates
- facilitated interaction with CAD/CAM systems
- improved finishings and greater accurancies

Tens of thousands of installations worldwide by highly qualified **mould-makers, sub-contractors, machine builders, mould and die makers, shipyards, construction and steel works** go to show a promise that has been kept.

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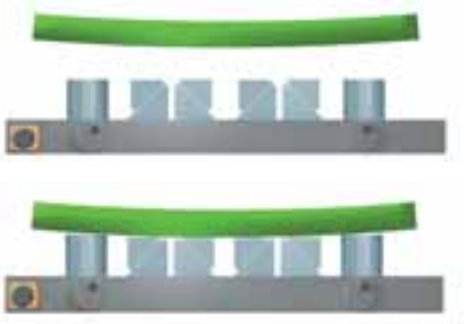
The automatic shimming becomes reality

The mobile pole extensions are an innovative and unique technical solution, originating from the need to clamp workpieces with irregular or warped surfaces.

Using the power of QUADSYSTEM Super-Quad circuit, which can generate a high force concentration even with pole extensions of considerable height, **a flexible magnetic bed** has been developed capable of adjusting itself to the workpiece to be clamped and to lock it firmly with no deformation.

The standard solution foresees the use of 3 fixed extensions plus a suitable number of moving ones, bolted to the generator poles, in order to achieve the best contact surface with the workpiece.
Once locked they provide full support to the workpiece and the high potential magnetic flux circulation stiffens the extensions/piece contact making it monolithic.



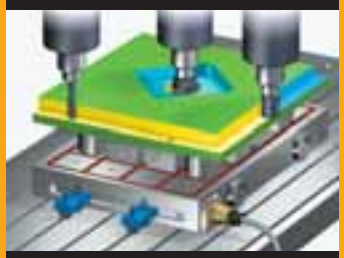
The self-adjusting pole extensions operate with the upper part moving on a slant surface and being them mounted opposite one another this will prevent any axial or radial movement during the clamping phase.

The impossible becomes easy

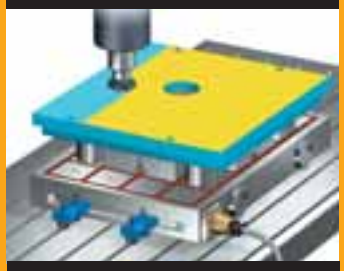
- **rapid, total and differentiated automatic shimming of the workpiece, clamped over the entire contact surface**
- **distortion-free clamping**
- **centesimal planarity over large surface areas with a single positioning operation**
- **rapid stress release**
- **contouring and through drilling**
- **extended working life of the magnetic surface**

Planarity and parallelism with total freedom on plates machining.

• rough-milling the 1st surface



• turning over , rough-milling, stress release and finishing the 2nd surface.



• turning over and finishing the 1st surface

Rapid stress release
All the internal stresses within the workpiece due to the machining operations are released without any movement from its set reference points, by simply deactivating the magnetic area and then reactivating the area immediately afterwards (DEMAG/MAG). This permits further cutting with no need for resetting the part.

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Electronic control units

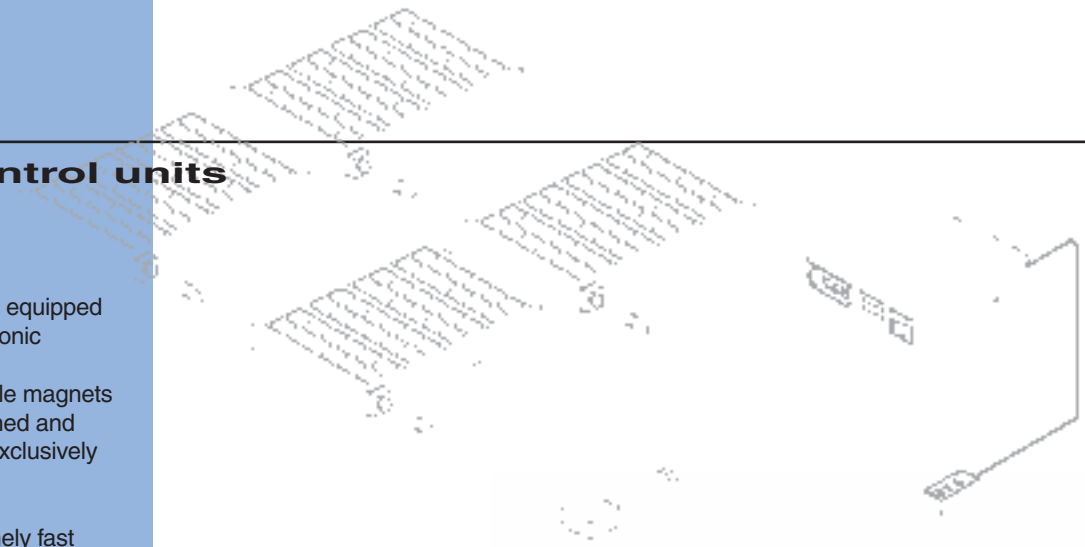
The Super-Quad systems are equipped with a series of modern electronic control units suited to single magnets or to banks of multiple magnets These units have been designed and produced by Tecnomagnete exclusively to equip their products.

The control units allow extremely fast activation (MAG) and deactivation (DEMAG) cycles to be achieved, equal to 1-2 sec., based on the size of the magnetic area.
The commands are given using digital push-button integrated in the units or by using a digital remote control unit connected by wire (TC) that is available on request.

Each unit is equipped with a system to detect the saturation current (UCS), the multi-channel units are complete with a machine safety connector and –on request- the PLC interface.

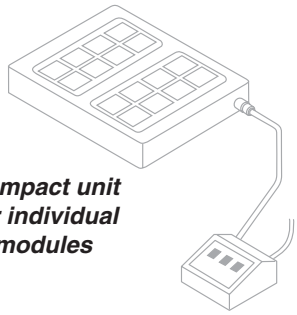
A "special" control
Special electronic control units "console type" and remotely controlled can be supplied on request to equip large magnetic tables and for handling special processing cycles.

In the DEMAG phase, the Tecnomagnete control unit, in addition to allowing complete deactivation of the magnetic area, it allows items made from mild steel to be totally demagnetized, together with all relevant machining chips that can be easily brushed off.



Multi-channel for tables of multiple modules.

Compact unit for individual modules



TC digital remote control

Easy positioning

All the units include a magnetic surface for easy positioning of any metal structure in a comfortable position for the operator.

Quick connection

The Super-Quad modules are standard equipped with a waterproof rapid connector for the discharge cable from the electronic control unit.

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The customised solution for every kind of processing

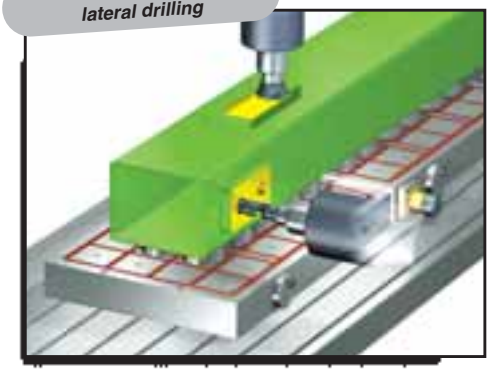
The Super-Quad systems enable **heavy-duty** or **high-speed machining** to be performed on a large variety of components, positioned both horizontally and vertically.

Their robust, mono-block structure not subjected to deformation allows an easy positioning of pins and reference stops on the “neutral” zones.
The absence of deformations is granted by their robust structure machined from solid block.
Fixing is achieved using through drilling or side brackets. The perfect planar matching between the magnetic modules and the machine table ensure excellent, **vibration-free** mechanical stability.

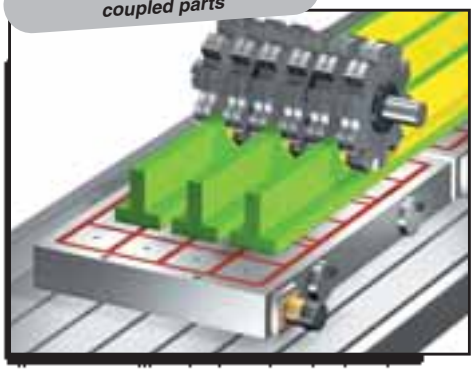
The Super-Quad systems are the ultimate workholding solution for application on bench type, **gantry or fixed table milling machines, on machining centres, on pallets and cube tooling on FMS systems**.
The lack of a permanently connected electrical cord frees up pallets to be rotated or moved to different workstations.

Their **modular design** enables multiple combinations to prepare table arrangements or for dedicated solutions.
Dedicated fixtures for non-magnetic parts can be clamped quickly and easily on the magnetic module, thus permitting fast changeover and greater machine uptime and flexibility.

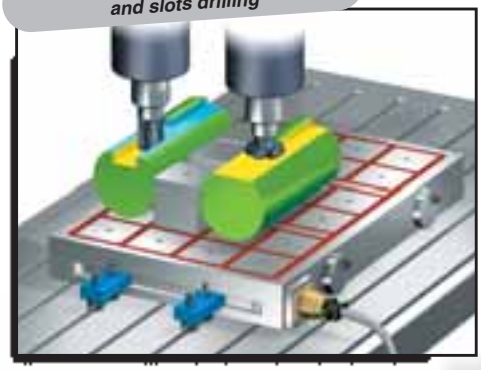
Face milling and lateral drilling



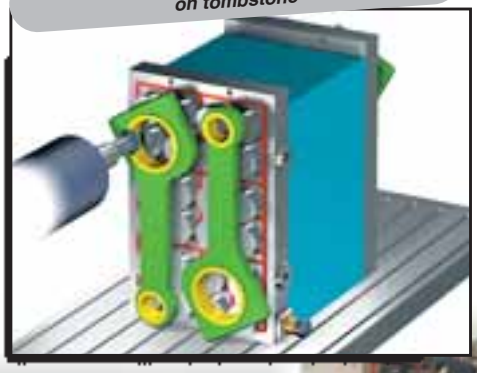
Milling multiple coupled parts

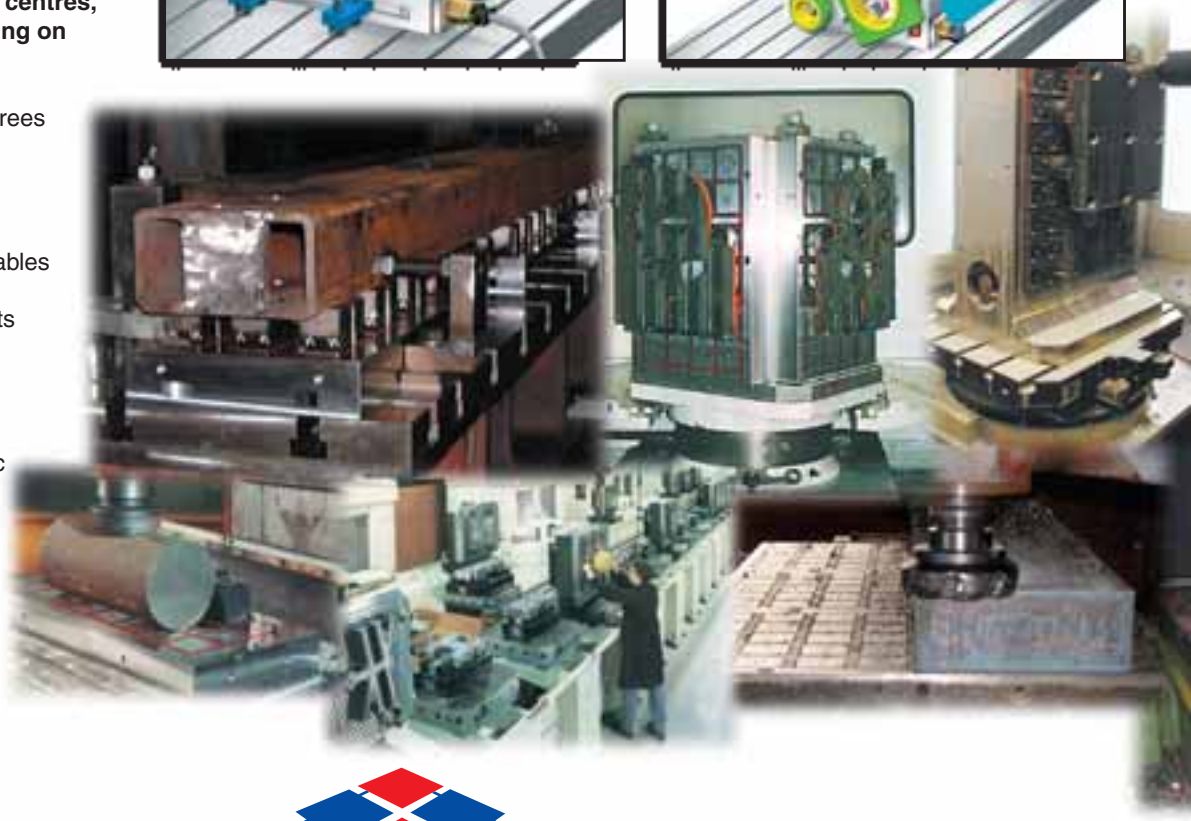


Round bar facing and slots drilling



Machining forged parts on tombstone





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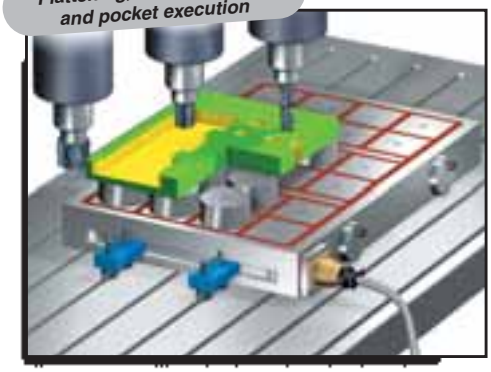
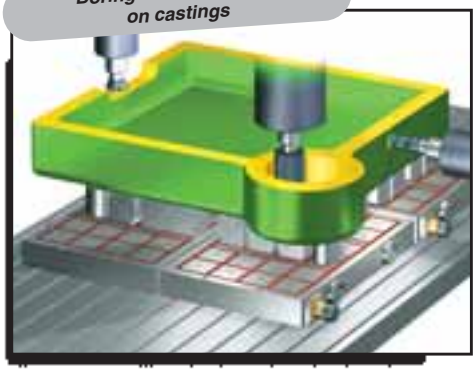
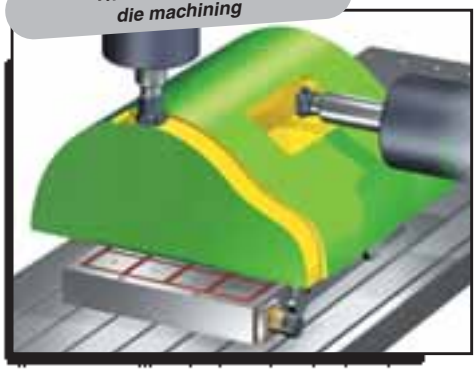
Flattening, through drilling and pocket execution



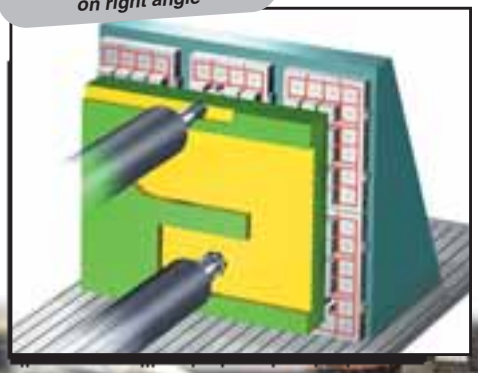
Boring and contouring on castings



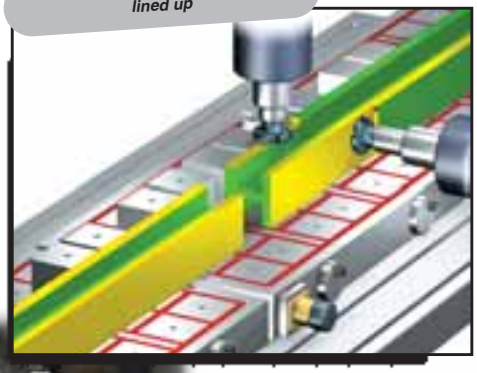
Three-dimensional die machining



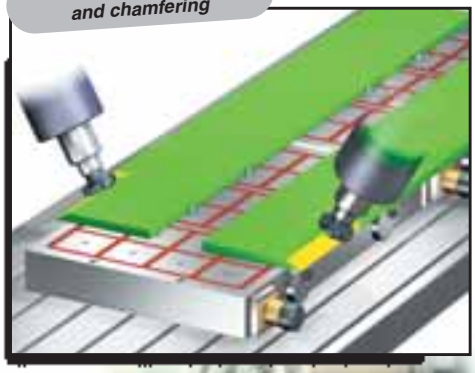
Plates machining on right angle



Machining multiple parts lined up



Edge milling and chamfering



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The result of an advanced technology

In the design phase

The Super-Quad modules are produced in a **mono-block structure**, hollowed out from solid steel, capable of ensuring **rigidity** and **solidity**, even when heavy-duty machining is required. The working surface comprising **nickel treated** steel poles to increase their resistance to wear and **high resistance epoxy resin**, combined with the absence of internal moving parts and any form of overheating, guarantee long-term **reliability** and **duration** over time without requiring maintenance.
Modern CAD/CAM systems ensure the design and the product are flexible enough to meet the different dimensional and application needs of the vast range of customers.

In the production process

The use of the latest FMS systems combined with the **modular technology** of all the components (poles, coils, magnets, etc.) enable Tecnomagnete to achieve linear and controlled production flows that have a significant impact on production efficiency.
The "**waterproof**" condition of the Super-Quad module is guaranteed by a resin "cast" in a controlled environment.

In research and development

Tecnomagnete has always been constantly committed to the research and development of cutting-edge technological solutions with its own team of specialised technicians and the support of sophisticated instrumentation.

The possession of global know-how from the most up-to-date expertise in magnetics, to the development of electronics to control the entire production process, places Tecnomagnete in the best position to meet the challenges presented by globalisation and to maintain the Company's **global leadership** in the electropermanent magnetic sector.
Each product is controlled individually using dedicated instruments to verify full compliance with corporate standards and EC and international regulations.

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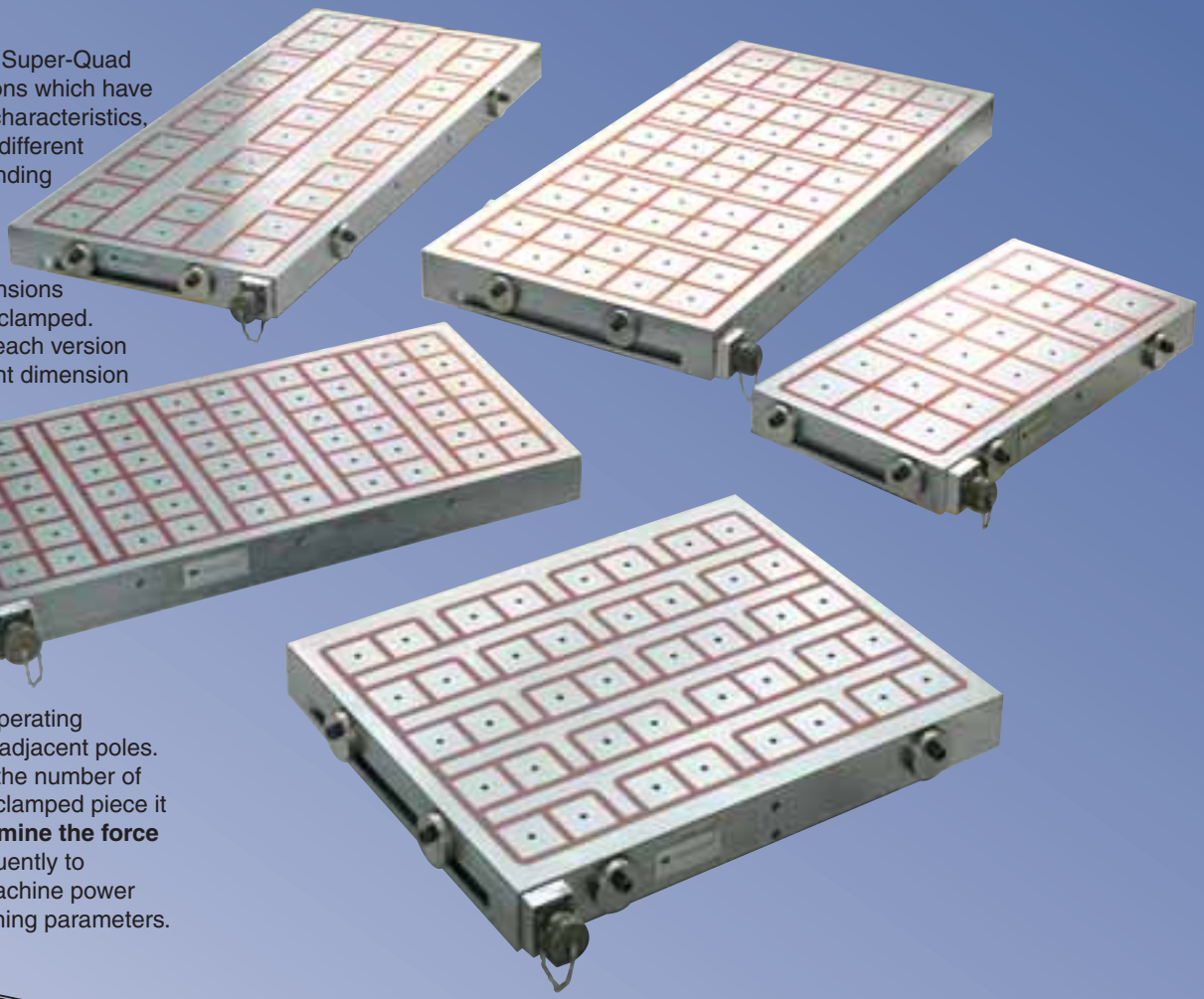
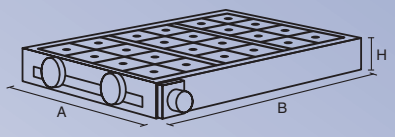
Selecting the right solution

The standard series of Super-Quad chucks include 5 versions which have different performance characteristics, capable of adapting to different operating needs, depending on the thicknesses, the surface conditions (or the operating air gaps) and the dimensions of the workpiece to be clamped. The clamping force of each version depends on the different dimension types of poles and on the configurations of the magnetic area.



Each pair of N/S poles generates an autonomous and defined force which is not influenced by the operating conditions of the other adjacent poles. Therefore by counting the number of poles occupied by the clamped piece it is possible to **predetermine the force** generated and consequently to establish the usable machine power with the relative machining parameters.



Technical characteristics

Mod.	Force pole (daN)	Dimensions A (mm) from	to	B (mm) from	to	H (mm)
ST50/T	350	400	590	330	1070	54
HD50/T	350	230	600	330	1070	54
ST70/T	760	300	600	605	1000	54
HD70/T	760	220	580	225	990	54
HP80/T	1000	380	620	450	990	68

Modules with H= 68mm are available on request

ST50 /T

Version with a standard polar density comprising Size 50 poles with a force of 350 daN for each pole.
Extremely useful for clamping workpieces of all sizes, also with limited thicknesses and normal operating air gaps.

HD50 /T

High polar density version comprising Size 50 poles with a force of 350 daN for each pole.
Particularly suited to operating with fixed and mobile polar extensions, ideal for small and large pieces with normal operating air gaps, also with limited thicknesses.

ST70 /T

Standard polar density version comprising Size 70 poles with a force of 760 daN for each pole.
Ideal for general pieces of various dimensions with normal operating air gaps and medium thicknesses and for use in table configurations.

HD70 /T

High-density polar version comprising Size 70 poles with a force of 760 daN for each pole.
Particularly suited for use with fixed and mobile polar extensions and ideal for pieces of every size with normal operating air gaps and medium thicknesses.

HP80 /T

High-density polar version comprising Size 80 poles in the "High Power" version with a force of 1000 daN for each pole.
Ideal for medium and large size pieces with high operating air gaps and significant thicknesses and for use with fixed and mobile polar extensions, also those exceeding the standard height.

Magnetic tombstones

HD70

HD50

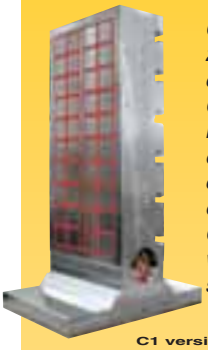
Cubotec with QUADSYSTEM SUPER-QUAD circuit integrated is the final solution for flexible work-holding on horizontal machining centers and FMS systems
CUBOTEC is easy to mount on any type of pallet: the production flows will be more stream-lined with a strong impact on the productivity level.

Firm and Rigid
The mono-block construction is made by machining a solid steel block with modern FMS systems in a single set-up.
This achieves great structural rigidity and better machining tolerances.

Flexible
The subsequent integration of the magnetic circuit Super-Quad into the bee-hiving structure makes it possible to leave neutral zones for an easy positioning of reference pins and stops.

Compact and light
More compact and light in comparison with a traditional tombstone equipped with magnetic chucks, Cubotec allows an higher working daylight; he absence of any encumbrance on 5 sides of the workpiece makes the path of the tool more efficient.
The lightweight of CUBOTEC permits to speed-up the pallet translation with less burden for the mechanism of the machine.

Mono-bifacial versions



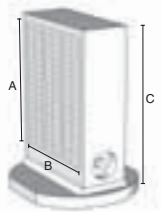
C1 version

Cubotec is available in 2 different configurations:
C1: 1 face with a magnetic surface, the other with T-slots for conventional clamping of a-magnetic material.
C2: with both faces with magnetic a surface.

Polar extensions

Cubotec can be supplied with mobile pole extensions, to clamp unleveled pieces; fixed pole extensions, for contouring and through-hole machining operations.

Cubotec can clamp work pieces of different shapes and sizes, even larger than the clamping area, with a single and powerful fixturing unit. The full machine capacity is really exploited.

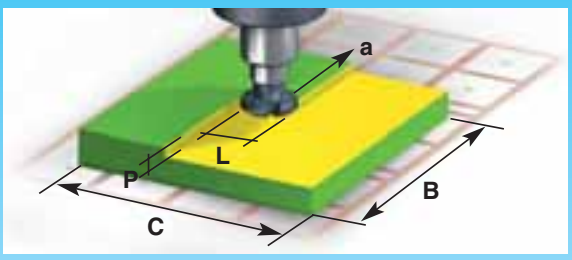


Standard dimensions

Model	A (mm)		B (mm)		C (mm)	
	from	to	from	to	from	to
C1 HD50	425	855	325	1075	180	220
C2 HD50	425	855	325	1075	180	220
C1 HD70	425	1005	475	830	180	230
C2 HD70	425	1005	475	830	180	230

Unbeatable performances

Table 1 - Machining parameters calculation



a = feed rate	mm/min
B = workpiece length	mm
C = workpiece witdh	mm
L = cut width	mm
P = cut depth	mm
S = workpiece surface	mm^2 (B x C)
α = coefficient	(refer to Table 2)

Q max = maximum stock removal mm3/min

$$Q\ max = S \times \alpha$$

Derived formulae

$$L = \frac{Q\ max}{P \times a} \qquad a = \frac{Q\ max}{P \times L} \qquad P = \frac{Q\ max}{L \times a} \qquad Q\ max = L \times P \times a$$

Table 2 - α Coefficient

Material	ST50	HD50	ST70	HD70	HP80
Mild steel	2,6	3,8	2,4	4	5
Alloyed steel	1,6	2,4	1,4	2,4	3
Cast iron	1,1	1,6	1	1,6	2

Table 3 - Minimum thicknesses for total magnetic short-circuiting

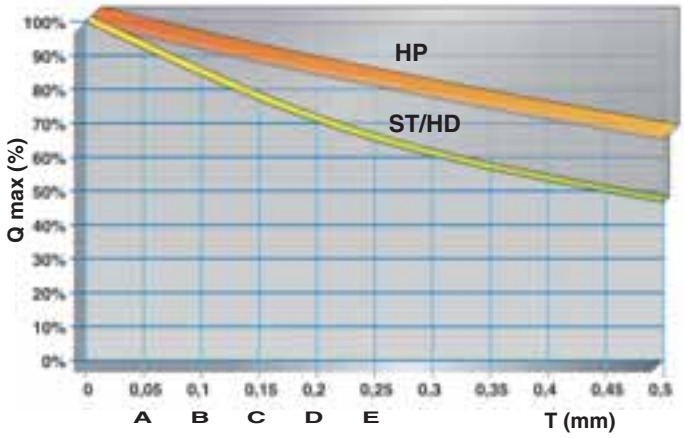
With workpiece positioned on at least 4 adjacent poles

Material	ST/HD50	ST/HD70	HP80
Mild steel	10	15	19
Alloyed steel	12	17	22
Cast iron	17	19	27

Notes (removed material data page)

- The data contained in Table 1 are only indicative. The values have been extrapolated based on tests performed with a free workpiece with a B/C ratio <=2, minimum thickness as indicated in Table 3 and clamped directly on the SQ module surface.
- Refer to Table 4 to relate the stock removal value **Q max** to the surface condition of the workpiece.
- The **Q max** value obtained can be improved up to 5 times with the workpiece against stop references.
- Shape errors are recovered by using the moving pole extensions. Refer to Table 5 to relate the values of the stock removal value **Q max** to the extensions' height.

Table 4 - Curves for stock removal / surface conditions



A = milled
B = rough-sized
C = stamped / rolled
D = shell casting
E = sand casting

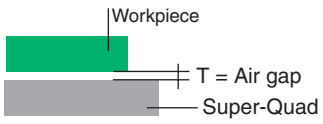
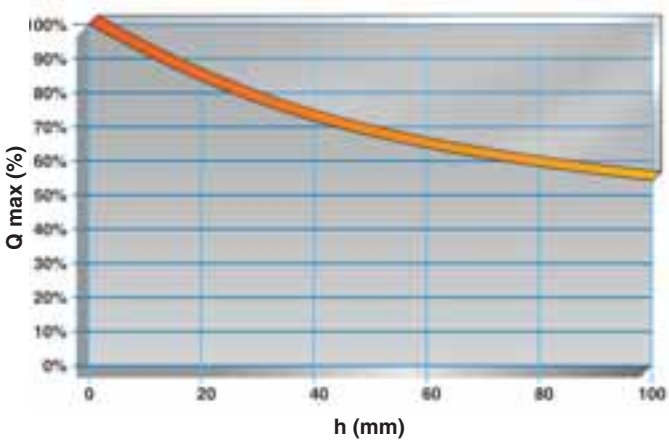
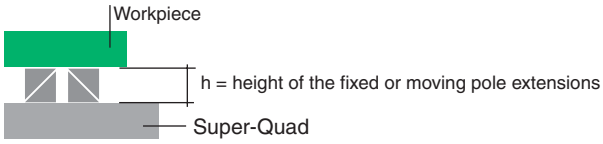


Table 5 - Curves for stock removal / extensions height





TECNOMAGNETE®
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Tecnomagnete: the World of the permanent-electro Magnetism

From its beginning in the seventies Tecnomagnete has developed numerous patents and has been able to achieve a world-wide leadership in technology and volumes produced.
Quadsystem™, the patented permanent-electro double reversible magnet circuit, made it possible for Tecnomagnete to offer highly effective applications for workholding on machine tools, quick mould clamping on presses and for handling a wide variety of ferrous load.
Tens of thousands of systems installed all over the world are the result of continuing research and development in advanced engineering applications.
A world-wide sales organization with directly owned subsidiaries and qualified agents and distributors can provide service that implements a truly "customer satisfaction" policy.

We reserve the right to make changes connected with engineering progress.

www.tecnomagnete.com

Headquarters:
TECNOMAGNETE spa
Via Nerviano 31 - 20020 Lainate (MI) Italy
Tel. +39-02.937.591, Fax +39-02.935.708.57
e-mail: info@tecnomagnete.it

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