



COMPOSITE GRANITE

A SUCCESSFUL MATERIAL



CELITH Sarl - 2 La Graule F-23360 LA FORÊT DU TEMPLE

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THE COMPANY'S STORY

The two MICROPLAN Group fabrication units, MICROPLAN France (previously Ateliers Maître Europe) at LA FORET DU TEMPLE (23) and MICROPLAN Italy at VARALLO (Italy) are specialised in granite products for industry.

Amongst the uses of granites are :

- reference units for metrology,
- Ultra stable bases for optics,
- machine tool bases.

They are currently the best solution for micro-positioning machines taking into account **cost, accuracy and stability**.

In order to meet customer's new requirements for bases requiring less accuracy and reduced costs, but with high vibration damping characteristics, the MICROPLAN Group has decided to develop a new composite **granite-epoxy** material called « **CELITH** ».

The CELITH company was founded in March 1999 in a 600 m² building on the same site as MICROPLAN France, which enables CELITH to benefit from all their machining equipment and to obtain assistance with production and marketing.

The growth of activity has led CELITH to double its building surface in 2005 (to 1 200 m²) in order to increase its manufacturing and storage capacity.

At the same time, CELITH has invested in automated process equipment (a granulation station) in order to reach a production capacity of 20 tons/day.

The MICROPLAN Group's strategy of diversification has led CELITH into the field of technical ceramics in 2000. The principal activity is the manufacture of bases combining excellent rigidity, very high stability and low mass for mobile assemblies using air-bearing technology. This activity «CELITH - Assemblage Système» has a building of 350 m² including a clean room of 60 m².



COMPOSITE GRANITE THE PRODUCT

« CELITH » is a mixture of specific granite aggregates of various size graduations bonded with an epoxy resin and hardener.

These aggregates are from two sources :

- Diorite : particle size 0/4 (fine)
- Blue granite from Guéret : particle size 4/6, 6/10, 10/14 (coarse)

This composite granite is suitable for moulding which means significant cost reductions. This technique, and the incorporation of elements of other materials, simplifies the manufacturing process by eliminating certain stages of manufacture (cutting, milling and drilling).

It is also possible to add elements by bonding or remoulding. « CELITH » is produced and shaped at ambient temperature in a mould. It is possible to incorporate threaded inserts, hydraulic or pneumatic tubes, « Tee slots », metal reinforcing and granite components to rigidify the structure. Compacted by vibration it stabilises in a few days.

« CELITH » can also be used to fill thin wall metallic containers by inserting hollow tubes to obtain a good mass/stiffness compromise.

Moulds made of melamine faced agglomerate wood are used for prototypes or small series. For big series, steel moulds are used, made from laser cut and welded sheet metal.

This composite, with its superior mechanical performances, meets the requirements necessary for machine tool structures.

Its high damping properties produce in most applications (especially machine tools) increased performances rates whilst assuring the quality of machining (reduction of resonance phenomena, better cutting conditions and improved tool life and surface finish).

The low conductivity of the composite gives it thermally isolating characteristics. Thus machine tool structures in « CELITH » obviate the need to stabilise by running the machine empty, previously necessary for traditional machines after a prolonged halt. This also means that production cycle breaks during the day have no impact on the machining accuracy.

« CELITH » is unaffected by oil, humidity or most chemical products.

COMPOSITE GRANITE PROPERTIES

Comparison of technical data				
Properties	Unit	CELITH	Granite	Cast iron
Density	Kg/dm ³	2.3 to 2.5	2.7 to 3	7.2
Compressive strength	N/mm ²	120 to 150	350	500
Tensile strength	N/mm ²	10 to 15	10 to 15	150 to 250
Modulus of elasticity	KN/mm ²	30 to 40	35 to 45	90 to 120
Coefficient of linear thermal expansion	10 ⁻⁶ /°C	9 to 13	5 to 7	10 to 13
Thermal conductivity	W/m. °C	1 to 3	2	50

This comparison shows the advantage of CELITH over cast iron

CONTROL

Our **materials qualification laboratory** - 15 m² - allows us to control regularly the quality of our products at each production stage :

- Aggregates control
- Density control
- Compressive strength
- Tensile strength
- Shock strength
- Modulus of elasticity
- Coefficient of linear thermal expansion



*Machine for compressive
and flexion tests
4 columns
Max. load : 2 000 kN*

Controls are internal and are registered in a data base. Comparisons allow us to qualify our products.

Quality control is on a long-term basis : the same controls are made at regular intervals guaranteeing repeatability.

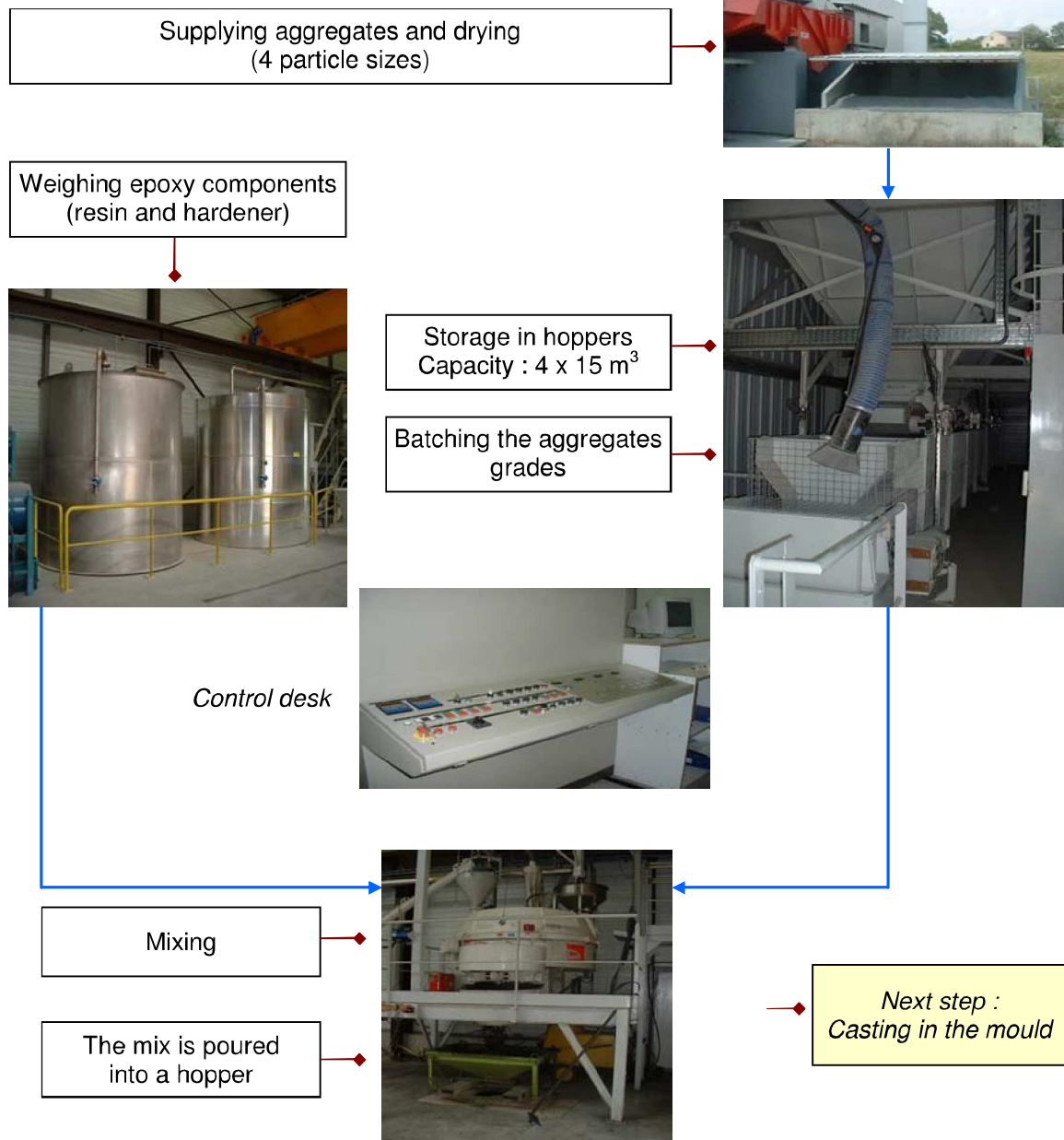
COMPOSITE GRANITE CAPACITIES

Large investments were made in 2004 and 2005 allowing us to progress from an artisan to industrial production.

In addition to the building expansion to 1 200 m², a **granulation station** has introduced automation to the production process since May 2005. Each step of the process is operated from a control desk (automatically or manually).

Daily production capacity : 20 to 40 tons

→ Steps :



COMPOSITE GRANITE EQUIPMENTS

- Granulation station 20 t. / day
- 2 vibrating tables 2 500 x 4 500 mm
- 1 vibrating table 1 250 x 2 500 mm
- Overhead 10 t. gantry cranes



- Fork lifts 1.5 to 5 t.
- Automatic soldering station
- 40 m³ steam room
- High-pressure cleaners

- Vertical wood panel saw and wood working equipment
- Lathe - Milling machine -
Drilling machine - Cutting machine
- Painting installation
- Materials qualification laboratory
- Various manual tools



COMPOSITE GRANITE FABRICATION PROCESS

- PREPARATION OF MOULD -

To facilitate the removal of components from moulds, a layer of wax is applied and a demoulding agent is sprayed over the entire mould.



Applying the wax



Spraying on demoulding agent

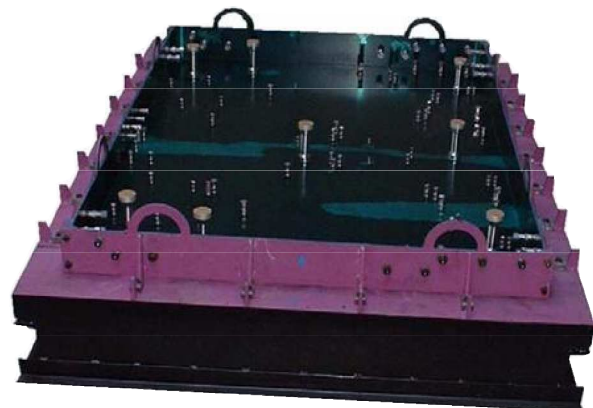


Mould being set up

- SETTING UP OF MOULD AND INSERTS -



Setting up of inserts



Mould ready for casting

- PREPARATION OF THE « CELITH » -

The proportioning of products (aggregates, resin and hardener) is automated

- CASTING OF « CELITH » -



Mould is fixed on a vibrating table



The hopper contents are poured into the mould

After each pouring « CELITH » is spread manually over the whole mould to obtain a better distribution of the product. Vibration tables ensure correct distribution of the resin around the aggregate, evacuation of air trapped during pouring and erosion of the contact points between stone chips.

- REMOVAL FROM MOULD -



The part is removed from the mould 48 hours after casting

- CLEANING, FINISHING TOUCHES -



The high-pressure cleaner removes the demoulding agent



Corners are smoothed off with a flexible grinder

COMPOSITE GRANITE MACHINING

Machining work (milling, grinding, drilling, lapping and final controls) are subcontracted to MICROPLAN France.



Milling / grinding



Drilling

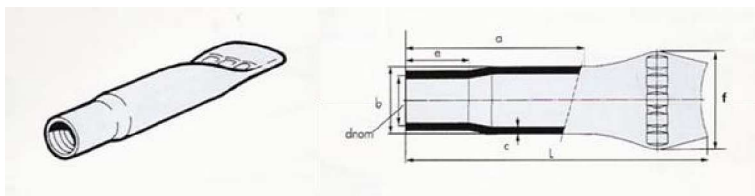


Lapping / control

COMPOSITE GRANITE INSERTS TYPES

« HALFEN » TYPE

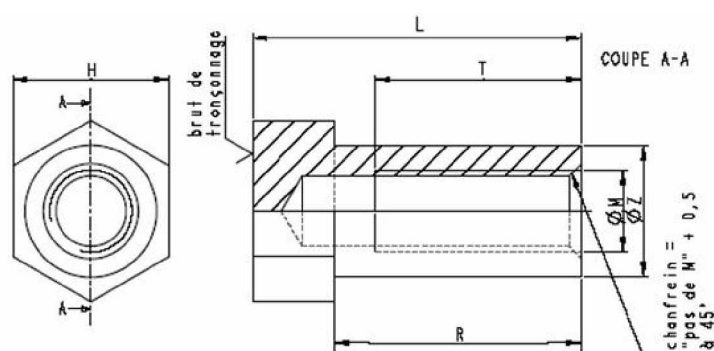
Only to fix cables, covers, etc.



CRUSHED INSERT

Ø M	L (mm)	a (mm)	b (mm)	c (mm)	e (mm)	f (mm)	g (mm)	h (mm)	C (N.m)	T (N)
M6	40	20	8.5	1.0	6	12.5	6.2	7	4	5800
M8	50	25	10.5	1.0	8	16.0	8.1	8	10	7400
M10	60	30	13.5	1.5	10	20	34	1	20	11200
M12	70	40	17	2	12	25	40	1	10	17000
M16	100	32	21.3	2.6	16	31	44	1.5	80	27000

« CELITH » TYPE



Ø M	"STANDARD"							"RIGIDIFIED"						
	H	L	T	R	Ø Z	C (N.m)	T (N)	H	L	T	R	Ø Z	C (N.m)	T (N)
M4 x 0,7	8	18	10	13	7	3	6000							
M5 x 0,8	10	20	12,5	14	9	6	9000							
M6 x 1	13	25	15	18	11	10	13000	24	40	15	25	15	15	19500
M8 x 1,25	17	33	20	23	14	25	18500	30	50	15	25	18	35	36000
M10 x 1,5	19	40	25	28	16	50	28000	32	60	20	30	20	75	42000
M12 x 1,75	22	45	30	31	18	85	36500	36	70	30	30	22	120	54000
M14 x 2	24	55	35	38	20	135	48000	36	80	30	30	24	200	72000
M16 x 2	27	60	40	42	22	200	68000	41	90	35	30	26	300	102000
M20 x 2,5	32	65	45	48	28	380	115000							
M24 x 3	41	75	50	52	33	450	150000							

COMPOSITE GRANITE STEEL MOULDS

Steel moulds are used for large series.



Mould for turning support



Mould for lathe support



Mould for balance system support



*Mould for automated optical inspection
of printed circuit boards*

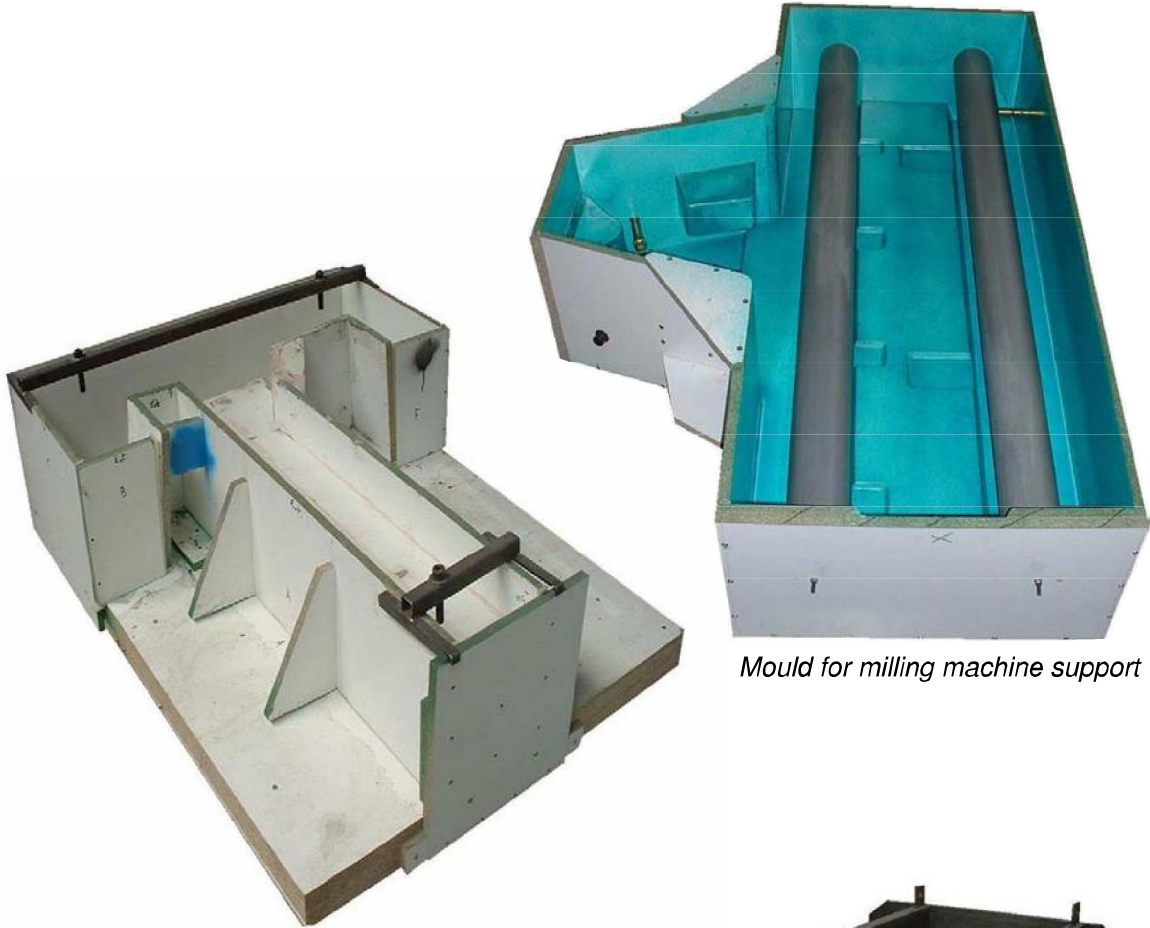


Mould for machine tool support

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COMPOSITE GRANITE WOODEN MOULDS

Wooden moulds are used for small series.



Mould for laser engraver support

Mould for milling machine support



Mould for machining center base

COMPOSITE GRANITE PRODUCTS

*Machining center base
2 600 x 1 050 x 600*

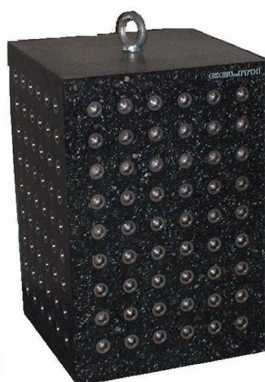


*Turning center base
1 300 x 1 000 x 800*



*Lathe base
1 600 x 450 x 350*

COMPOSITE GRANITE PRODUCTS



*Cube support for
various fixings
500 x 500 x 800*



*Support for balance system
2 500 x 1 200 x 250*



*Support for printed circuit
drilling machine
1 500 x 1 200 x 1600*



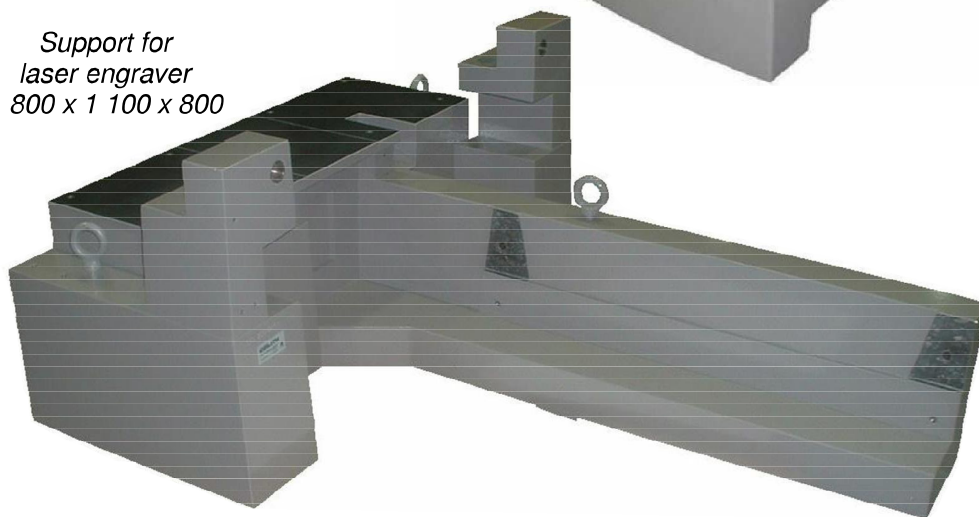
*Support for laser cutting machine
5 300 x 1 700 x 900*

COMPOSITE GRANITE PRODUCTS

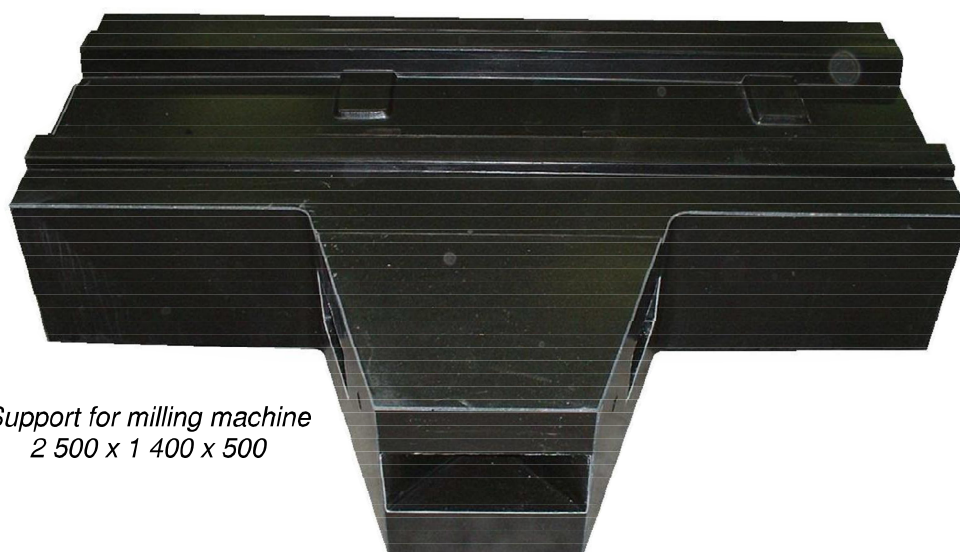
*Support for automated optical
inspection of printed circuit boards
1 200 x 1 100 x 850*



*Support for
laser engraver
1 800 x 1 100 x 800*



*Support for milling machine
2 500 x 1 400 x 500*



COMPOSITE GRANITE OUR CUSTOMERS

BALANCE SYSTEM	IT
CINETIC GIUSTINA GRINDING	FR
ESRF	FR
ETAMIC	FR
ETEL	CH
FAVRETTO	IT
KODAK POLYCHROME	CH
LCM3B	FR
MFLS FOREZIENNE	FR
MICRO-CONTROLE	FR
MICROPLAN FRANCE	FR
MICROPLAN ITALIA	IT
MORETTI	IT
SAGEM	FR
SEA ROBOTIQUE	FR
SNECMA	FR
SOMAB	FR
SYNCHROTRON SOLEIL	FR
VI TECHNOLOGY	FR

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