



Special Plastic Module for
semiconductor industry

S.P.M. s.r.l.

Manual – Semiautomatic – Automatic Wet Benches



We have been producing semiconductor equipment for years and got a great experience. This allowed us to perfectionate our technology and tools.

The wet benches we propose can be:

- ▣ Manual (for use in laboratories and research centers)
- ▣ Semiautomatic
- ▣ Automatic (mainly utilized in production lines or in special research centers, where results must be highly performant)

Every system we realize is tailored according to customer's requirements. We are expert in identify at first meeting, client's necessities, so we can propose the correct solution for each problem.

This presentation will describe the main components of our wet benches, then the three categories of our production, with some realization examples of equipment already installed plus some prototypes.



Structure



Our wet benches structures can be realized using different materials, according to used chemicals and/or to special customer's requests. Usually we employ the following types of plastics:

- PPS
- PE
- PVDF
- FM 4910 approved plastics

In case of use of solvents, the wet bench structure will be made in electro-polished stainless steel:

- SS 304
- SS 316L

Other system parts will also comply with chemical used, to warrant:

- Minimum contamination
- System elevated life
- Safety



From CDS - BCDS



Bottle/canister refilling



According to customer's specifications and needs, a wet bench chemical refilling can be done in different ways:

- Directly from CDS – BCDS
- From bottle/canister refilling system, integrated into the wet bench
- From bottle/canister refilling system, housed in a separate module

Moreover, to warrant highly accurate dosings, the wet bench can be equipped with extremely precise dosimetric flowmeter, that draw exact chemical quantities to prepare process solutions.

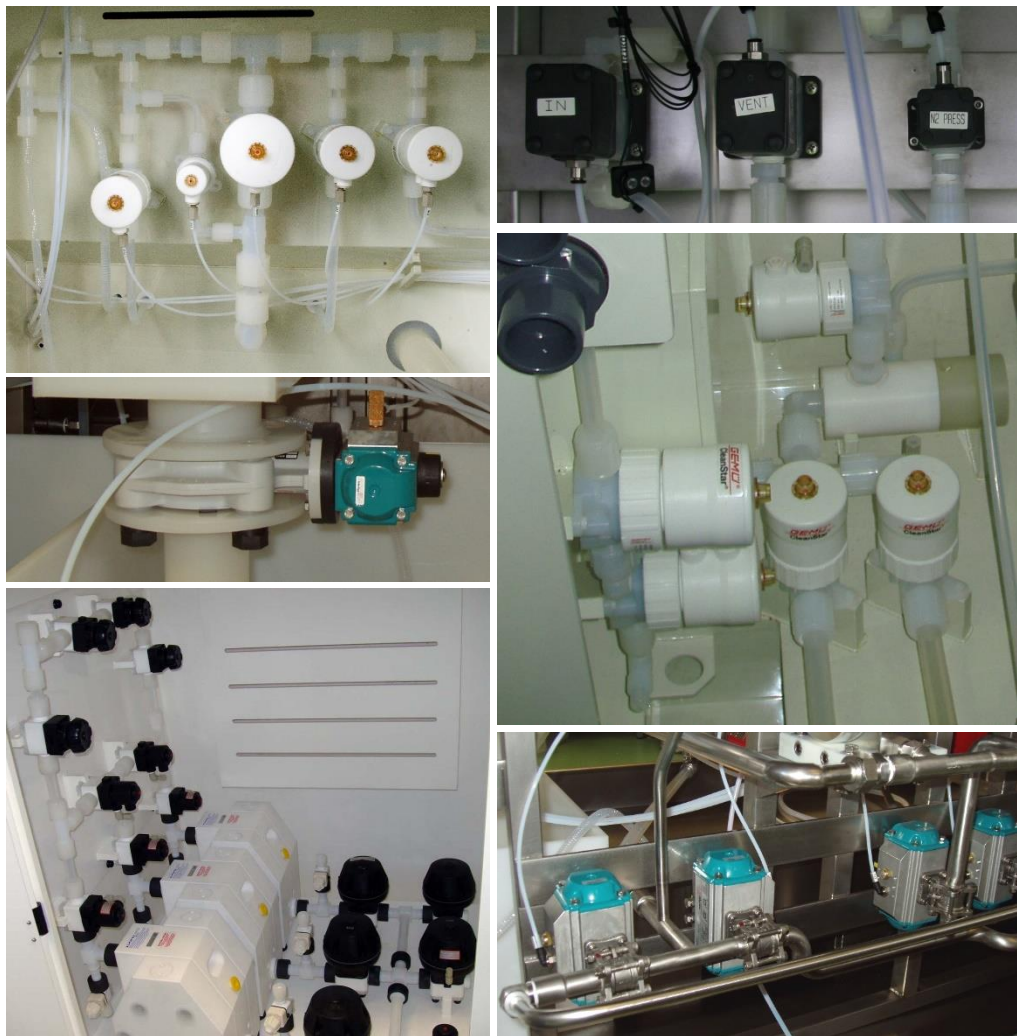
Of course, these dosing systems can be located either into the wet bench (integrated version), or into other modules (as for instance into a CDS).



Water group components are the fundamental parts that compose a wet bench, because they must:

- Transfer solution
- Filter
- Recycle
- Heat
- Chill
- Maintain the desired temperature
- Dosing chemicals

On the following page, we'll describe the wet bench main components.



Valves employed in our equipment have different characteristics and are usually chosen according to customer's requirements.

We usually install either pneumatic or manual valves composed by:

- SPM body + actuator and GEMÜ handwheel
- GEMÜ metal free valve, for extreme requirement processes, with PFA body

According to their use, these valves can be manual or pneumatic, for passage of fluids and gases.





Pumps are necessary for solution recycle. We usually employ standard or metal free pumps, realized in different materials:

- ▣ PP
- ▣ PVDF
- ▣ PTFE
- ▣ PFA

Thanks to the co-operation with Levitronix, we can also use magnetic levitation pumps.

ALMATEC®
A WILSON COMPANY

GemmeCotti
EUROPEAN PUMPS

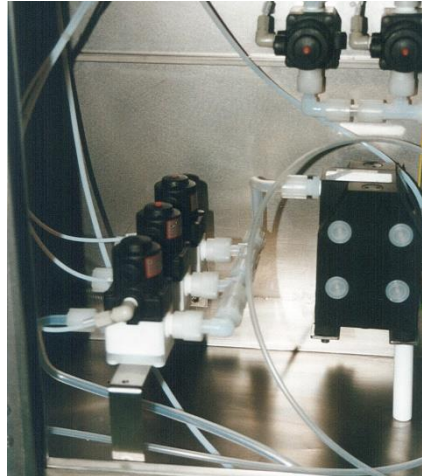
LEVITRONIX®

SMC

PILLAR

As alternative, we patented a special recycle and filtering system, that utilizes two plenum chambers. With this invention, you can have enormous advantages because:

- ▣ Recycle is pulse free
- ▣ Temperature remains constant



Pumps are necessary for solution recycle. In case of using with flammable solvents we have to install specific pumps.

With electric pumps we use only ATEX certified pumps.

ALMATEC
A WILDEN COMPANY

GemmeCotti
EUROPEAN PUMPS





Filters become necessary when you desire to utilize process solution many times, being sure it keeps in goods conditions.

These are various filter typologies that we actually install into our wet benches:

- Housing + cartridge; porosity to be defined according to process specifications
- Disposable with cartridge integrated into the filter. It is especially indicated for elevated solution temperature





Heat exchangers have the task of heating a solution.

Chillers serve to refrigerate process solutions.



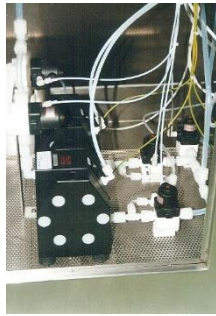
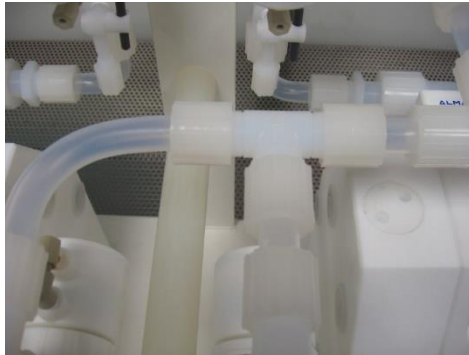
Using in sequence heat exchanger and chiller, you'll have an accurate chemical solution temperature control.

Heat exchanger we install are produced by SPM in different versions or by third parts, according to customers' needs and specifications



Heateflex Corporation
World Leader in Ultra-Pure Heating





To make connection, we use specific and high quality fittings and pipings to warrant:

- Life
- Reliability
- Low contamination
- Safety

For solvents we use Stainless Steels connectors and piping. We guaranteed connection with orbital welding made with ORBIMATIC technology.





Dosing Systems



If there is the necessity of dosing exact concentration of chemical SPM can provide different solutions in order to guaranteed the precision of mixing.

To do that we use four different approach:

- Volumetric calculation
- Magnetic, Coriolis, Ultrasound, Karman Vortex and paddle wheel flowmeters
- Syringe (only for spiking)
- Balance

Differences between that solutions are regarding flexibility, precision and chemical compatibility.

With flowmeters mixing parameters are edited directly from the touch screen.



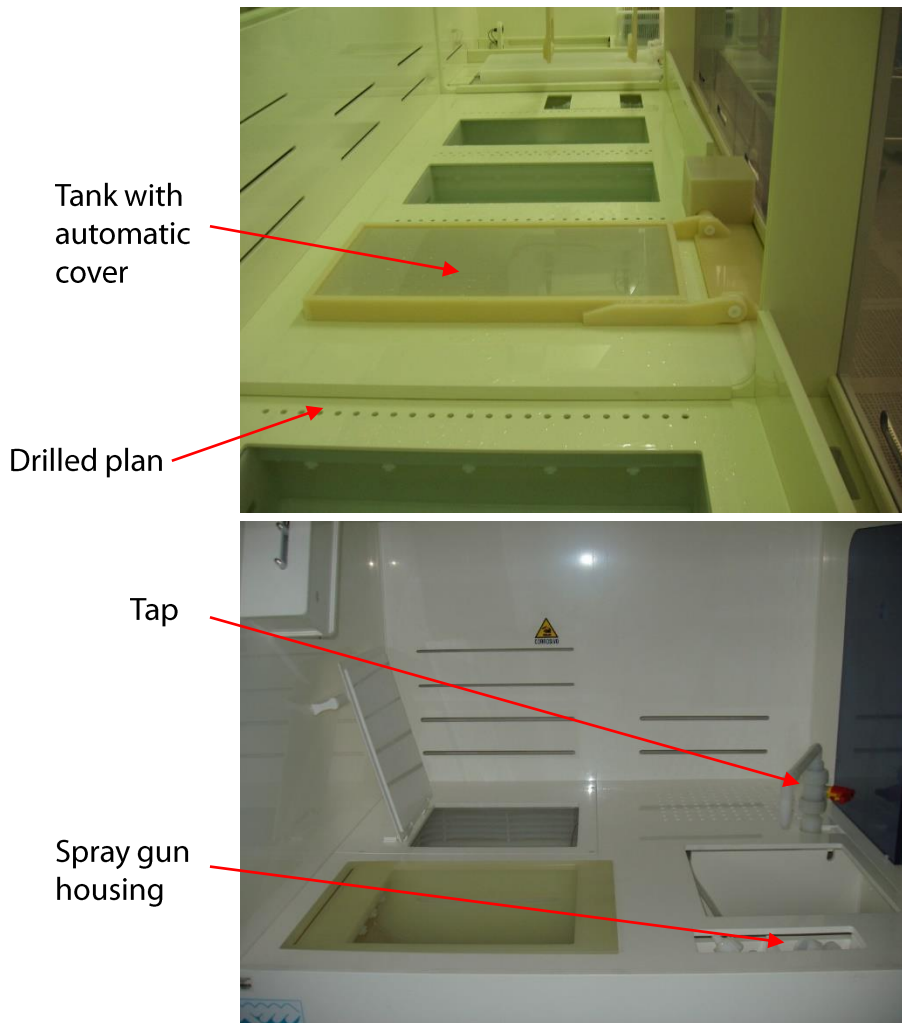
SURPASS

GEMÜ®

bürkert
FLUID CONTROL SYSTEMS

+GF+

Endress+Hauser 
People for Process Automation

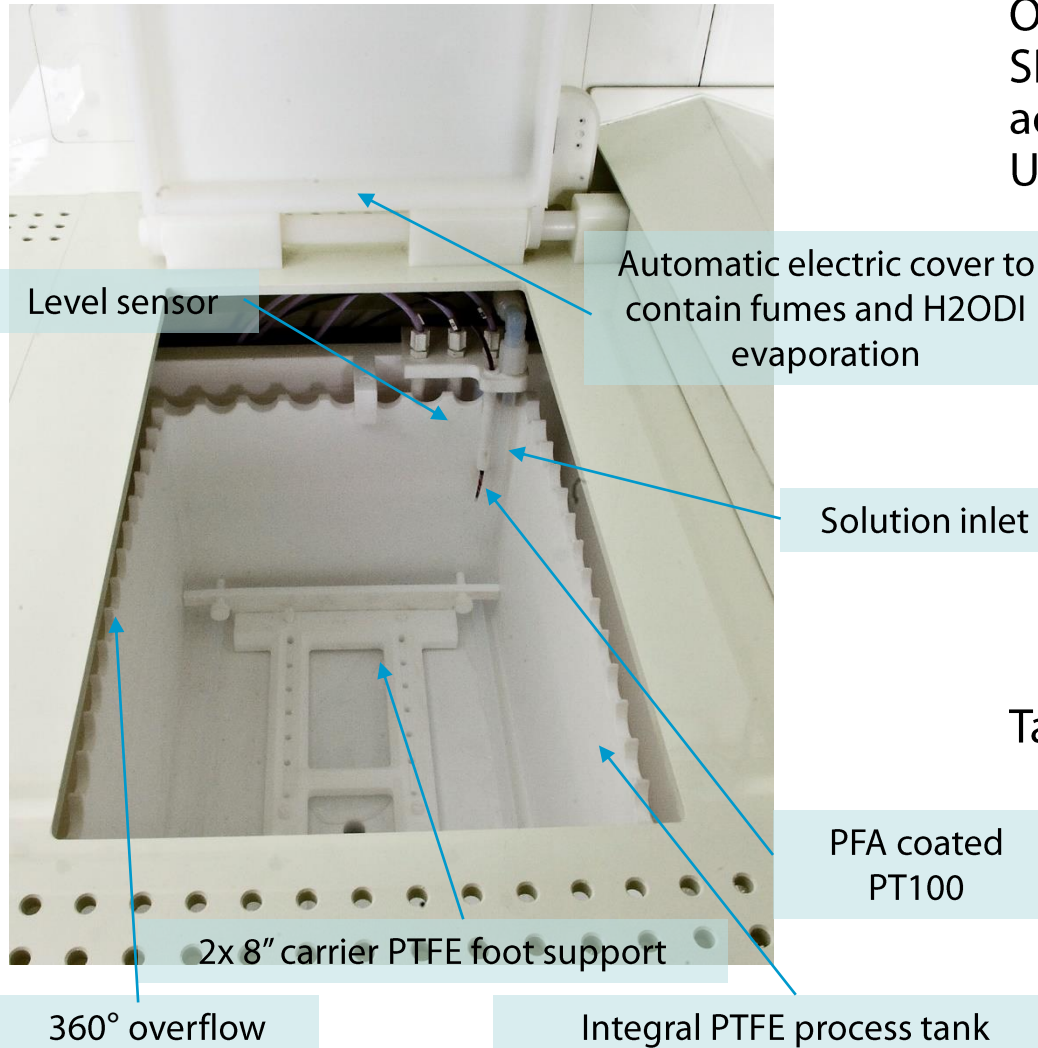


Every wet bench working plan can be personalized, equipping it with taps, spray guns, heating plates, ... Usually, a working plan includes:

- ▣ Process tank
- ▣ Rinse tank
- ▣ Drying unit
- ▣ Load / unload station

According to customer's needs, it can include various tanks, to complete system performance and to work contemporarily in many tanks.

Usually a working plan comprehends a drilled part for chemical drainage, in case of accidental spills, caused by operator. Fluid drain from the working plan is immediate.

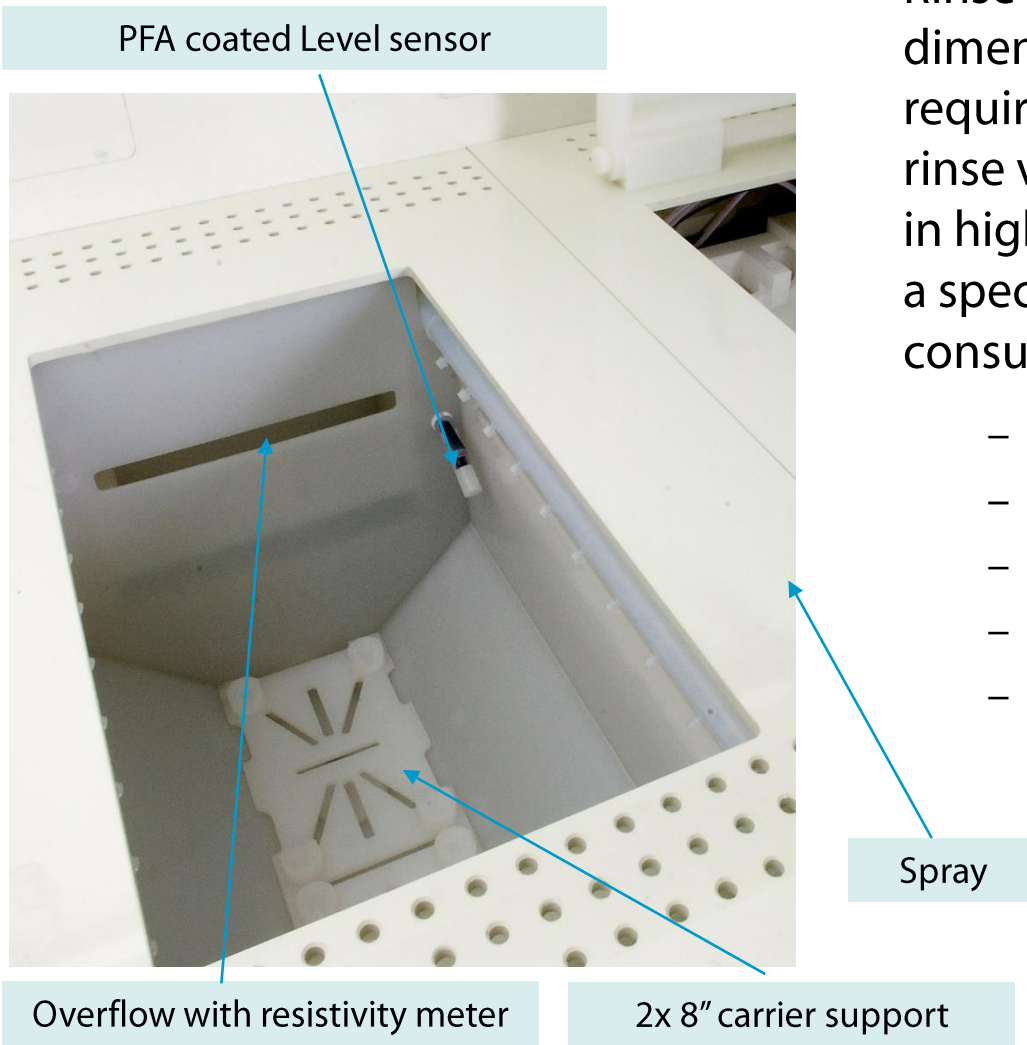


Our tanks are completely realized by SPM, so they can be expressly tailored according to customer's requirements. Utilized materials are:

- PTFE
- PFA
- PPS
- High density PE
- Halar
- PVDF
- Quartz
- SS316L – SS304

Tanks can be equipped with:

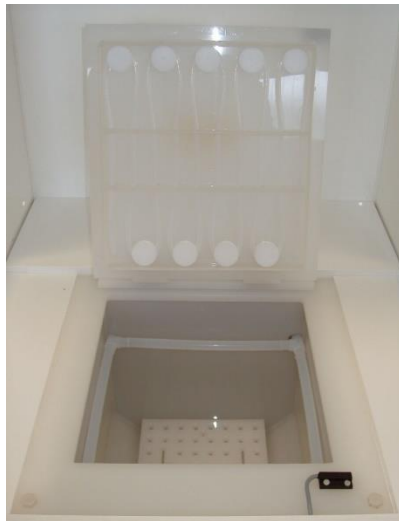
- Drain
- Overflow
- Recycle
- Ultrasound
- Megasonic
- Level and temperature sensors



Rinse tanks are opportunely dimensioned, according to customer's requirement. They are usually in dump rinse version and are completely realised in high density PE. SPM rinse tanks have a special configuration, to reduce H₂O DI consumption and are equipped with:

- No. 2 spray manifolds (upper section)
- dump for quick drain
- Sensor for cleaning cycles counting
- Overflow
- OPTIONAL: resistivity control





apet Co.,Ltd.

The drying unit we are introducing can be realized in different versions:

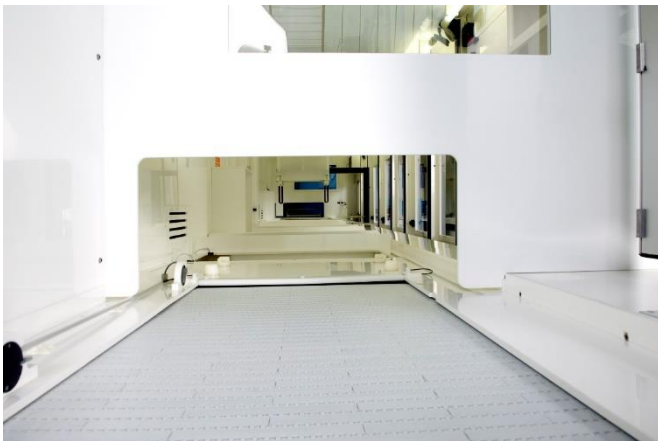
- ▣ drying with: H2ODI + IPA + hot N2
- ▣ drying with: H2ODI overflow + hot H2ODI + hot N2
- ▣ Drying with high flow hot hair
- ▣ APET dryer



The load/unload station is projected to house in specific seats carriers or baskets that contains disposables to be processed.

This station allow a completely safe operation, either for what concerns chemicals or robot movements. In fact it is equipped with position sensors.

Operator can enter exclusively to this position, to preserve process environment and to warrant safety.



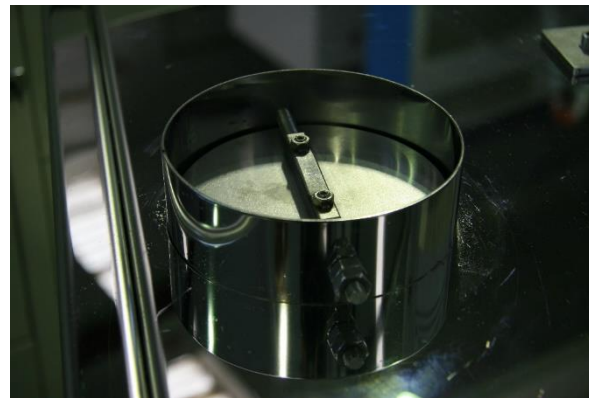


Exhaust is an air continuous flow that inhales fumes, due to chemicals that are present in every solution.

By means of special louvers (located behind each tank), gases are driven outside the wet bench; this warrants:

- Maximum operators' safety
- Prevention for wet bench deterioration
- Higher process control

SPM provide also a system to automatic control the exhaust rate in order of consumption reduction.





To reduce air consumption, on customer's request SPM supplies an automatic system that varies exhaust rate, either according to operation in function, or to wet bench parameters.

This system warrants operators' maximum safety and optimum solution quality, while highly reducing wet bench exhaust needs.





With flammable chemicals like solvents SPM can provide our tools with automatic fire extinguishing systems.





Robots are used only in semiautomatic or in automatic wet bench versions
Robot allows precise carrier transfer from one tank to another warranting:

- ▣ safety
- ▣ low contamination
- ▣ Inferior number of operators needed
- ▣ Human error reduction to minimum

Rexroth
Bosch Group

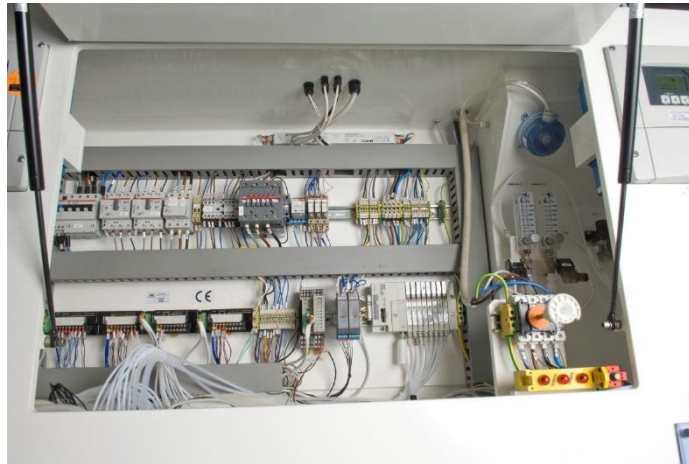
OMRON

YASKAWA
The Drive for Quality™

Robots we use have exposed parts duly shielded in specific material (according to employed chemical), to warrant maximum compatibility, minimum solution contamination and equipment long life.



With solvent: motors and controls are in ATEX version or placed in protected areas.



Our wet bench are all equipped with PLC. Normally we use OMRON PLC and as HMI interface we can provide two options:

- ▣ OMRON Touch screen
- ▣ Industrial PC touch screen with SCADA software Wonderware InTouch or Progea Movicon



Movicon
MONITORING VISION AND CONTROL

invensys®
Wonderware

OMRON

Schneider
Electric

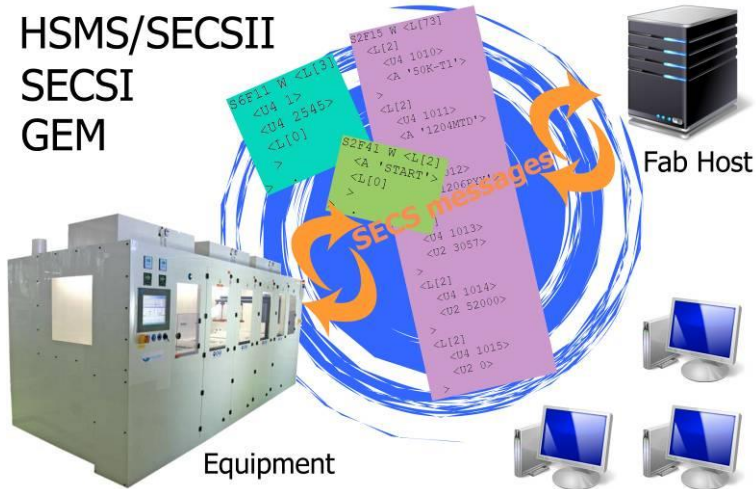
ABB

SMC



Remote Control

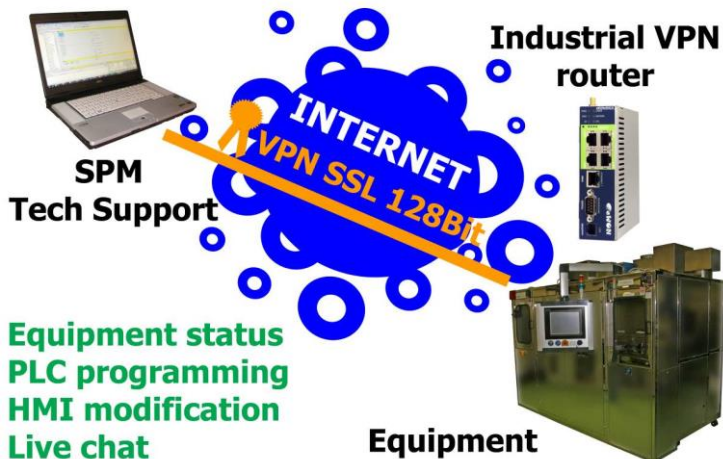
HSMS/SECSII
SECSI
GEM



SPM can provide different architecture in order to have a remote management of semiconductor and photovoltaic industries.

We can provide also SECS-GEM protocol compliance tools.

We offer service of remote assistance installing special industrial VPN router.



Equipment status
PLC programming
HMI modification
Live chat





Manual wet benches are usually employed in laboratories of simple processes, where repeatability is not so strict and where an automatic unit won't be exploitable in all its capabilities.

The manual version, according to working plan configuration, can be equipped with specific components, as per customer's specifications.

On the following slides you'll see some photos with descriptions of some manual wet benches, already realized in the past.



Example of manual wet bench personalization



Spray-Gun

Tap

Divisional wall to
avoid
contamination
among different
processes

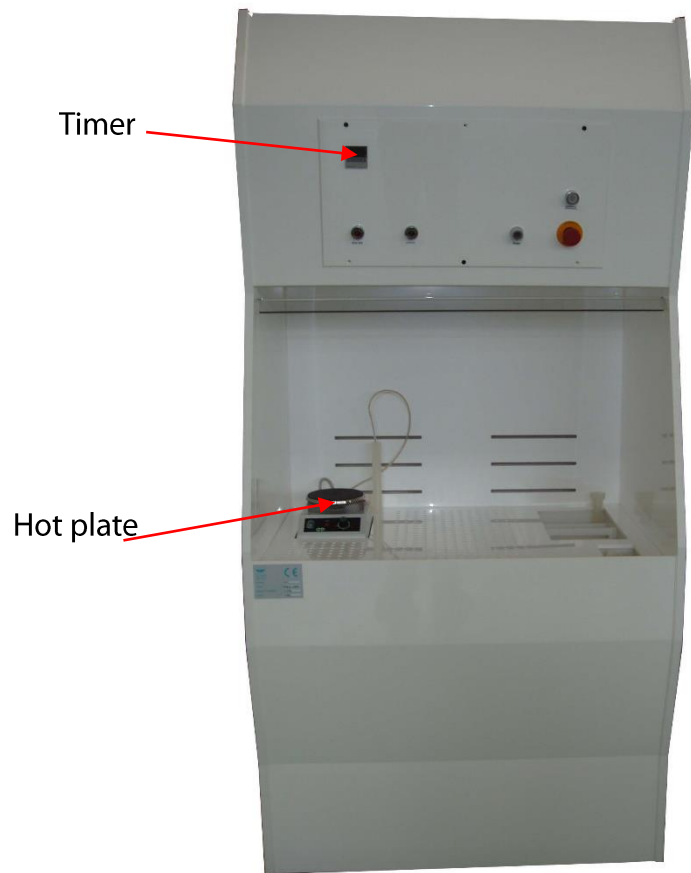
Tank with
manual cover

Example of manual wet bench; in this case operator manages various operations by means of push buttons and measuring instruments



Electronic
instrument

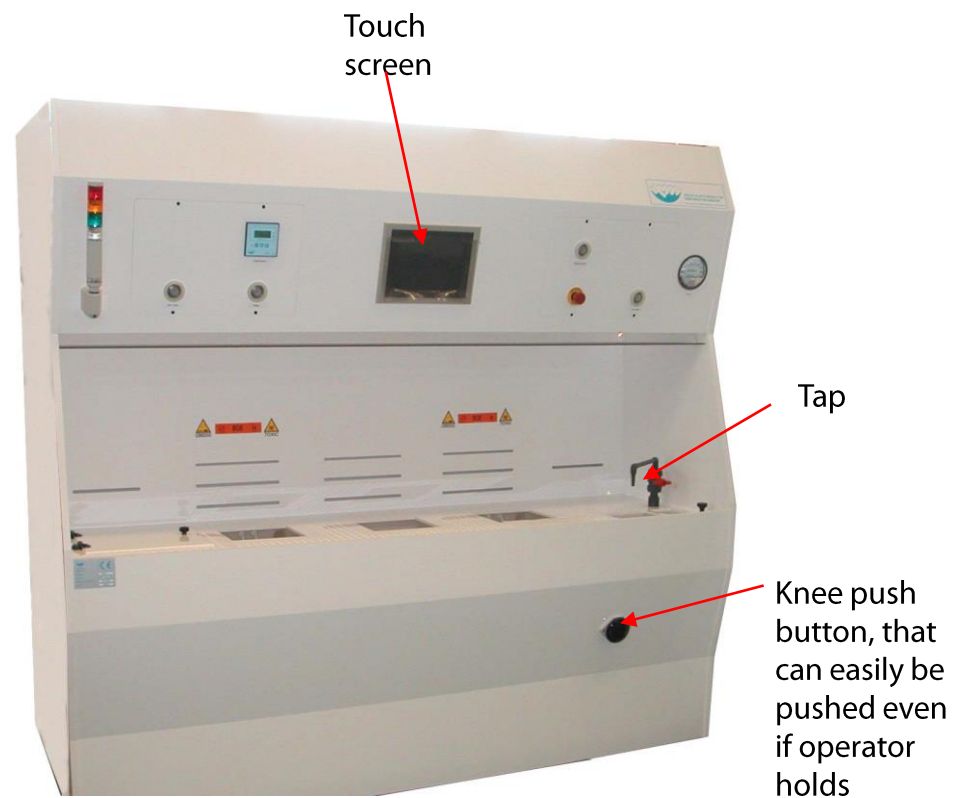
Semaphore for wet
bench functioning
control in real state



Timer

Hot plate

Simple manual wet bench, controlled by timer and push buttons. Hot plate for beaker and a process tank



Touch screen

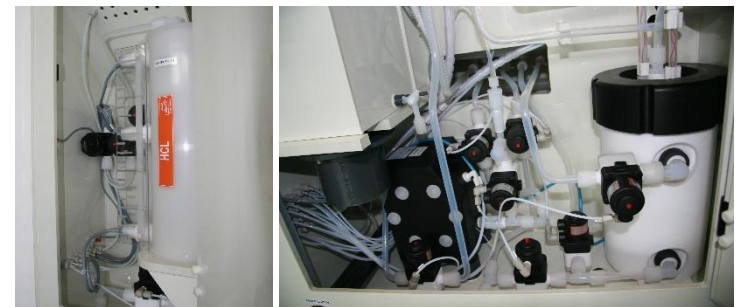
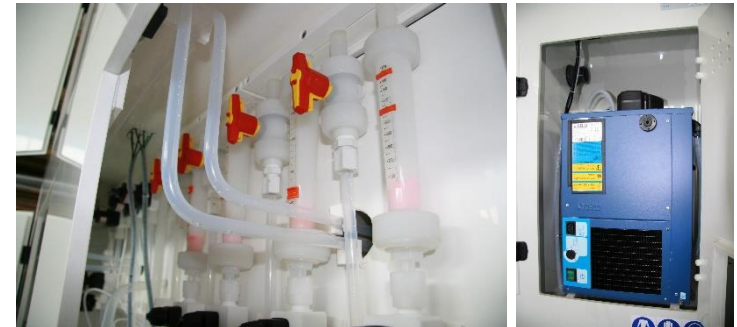
Tap

Knee push button, that can easily be pushed even if operator holds something in his hands

Manual wet bench with Touch screen, to allow a more accurate and easier process management



Wet bench LAB ON CHIP installed at STMicroelectronics Catania - ITALY





Automatic Solar Cells recovery system installed at IRYSOLAR - FRANCE





Wet bench PAC Preclean installed at VISHAY - ITALY



Manual Wet Benches



Wet bench for parts clean up installed at PRAMAC - SWISS





Semi-automatic wet benches reduce operator's interaction, even if his presence is necessary.

Usually, a small robot effectuates some transfers from one tank to another.

Semi-automatic wet benches are partly automatized, consequently processes are repeatable and controllable.

On the following pages you can look at some pictures with descriptions of some semi-automatic wet benches, that we realized.



Fire extinguishing system installed on a Solvent semiautomatic Wet

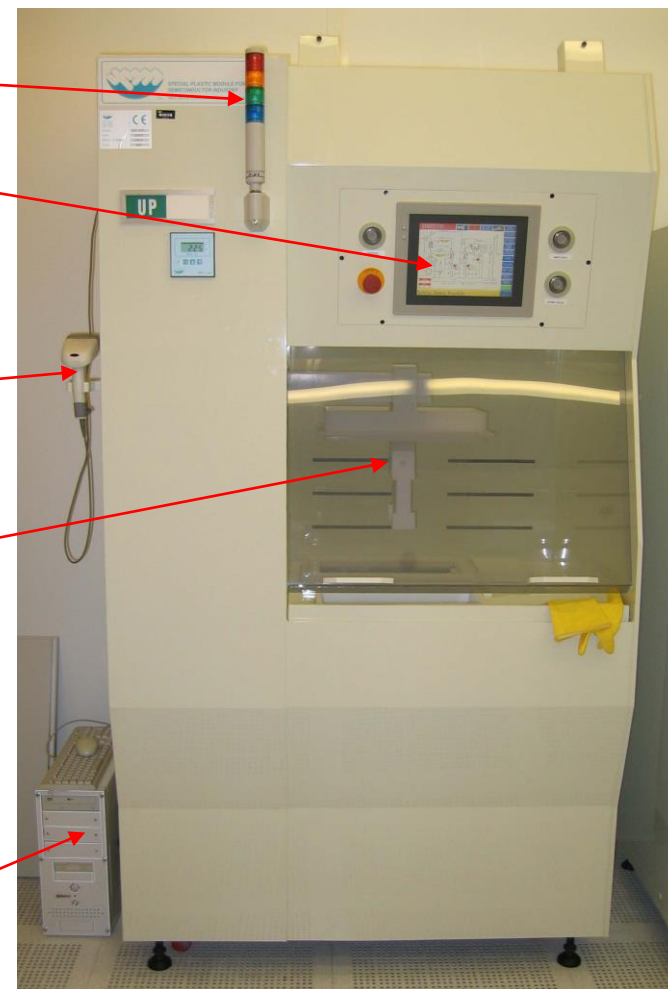
Semaphore

Touch screen

Bar code reader

Robot for carrier transfer from one tank to the other

Pc interfaced with wet bench PLC, to monitor the system status, via net



Example of semi-automatic wet bench

Semiautomatic Wet Benches



Wet bench for OXIDE etch installed at VISHAY - ITALY



Automatic wet benches offer great advantages, because they accomplish all processes in automatic mode (from carrier loading to carrier unloading); this means that operator's presence is not needed.

These automatic wet benches are useful in case of elevated productivity, or when you require a very strict control of a special process, because the absence of human contact drastically reduces contamination.

Of course, an automatic wet benches is more expensive, because it is equipped with robot, drying system, specific software for process global control.

SPM realizes automatic wet benches in different versions, as for instance with robot located in the wet back section, or in the front wet section.

On the following pages you can look at some photos and descriptions of some SPM automatic wet benches.



Removable panel
for easier
maintenance



Measuring
instruments



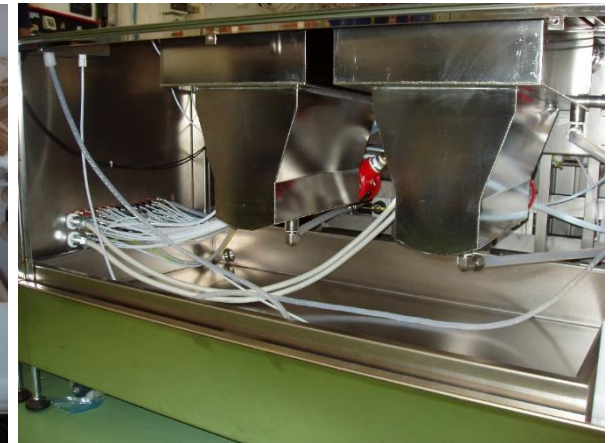
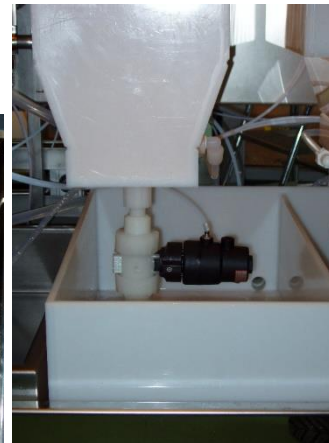
Transparent
protections with
sensors for
opening detection



Semaphore for wet
bench immediate
control

Touch screen to set process
values and to control all
system operations

Automatic Wet Benches



Wet bench BOLD etch installed at
STMicroelectronics - Singapore

Automatic Wet Benches



"Jakarta Model" - Wet bench for Alkaline-Acidic Solar cells texturing installed at IRYSOLAR - FRANCE

<http://www.youtube.com/watch?v=RPhzesc62LQ>

Automatic Wet Benches



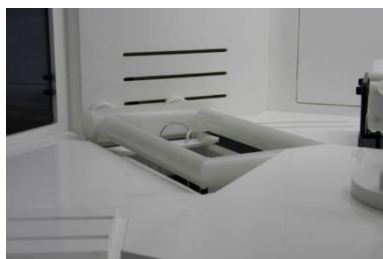
*Polyamide removal
with microstrip 5002
and Photoresist
removal with microstrip
3001*



"Korea Model" - Wet bench for MEMS installed at STMicroelectronics Agrate - ITALY

<http://www.youtube.com/watch?v=Uj2CT4beDF0>

Automatic Wet Benches



*Automatic wet bench– Carousel version “PALANGA Model” installed at VILNIAUS VENTOS
PUSLAIDININKIAI – Vilnius LITHUANIA*

Automatic Wet Benches



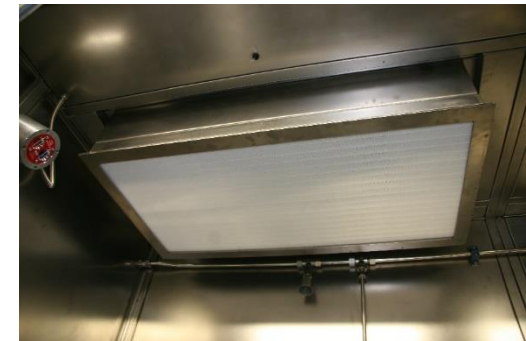
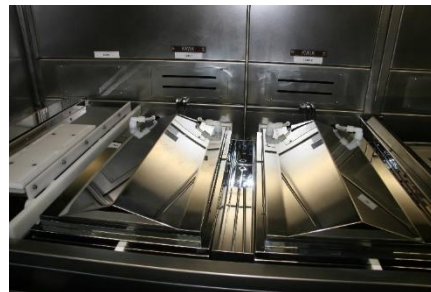
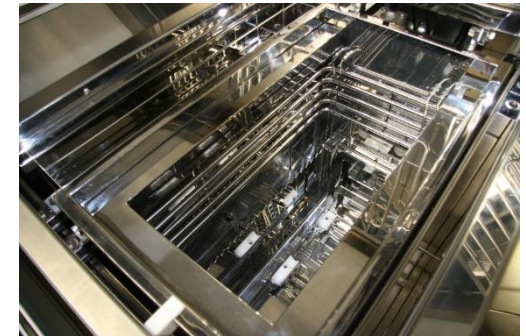
RER600 process

Wet bench for MEMS installed at STMicroelectronics Agrate - ITALY

Automatic Wet Benches



Wafer Bond removal process

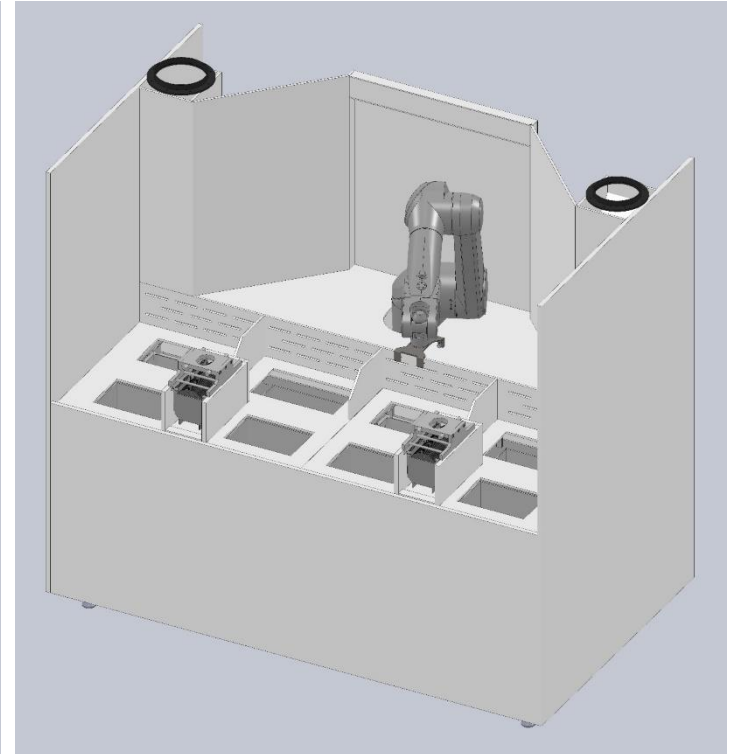
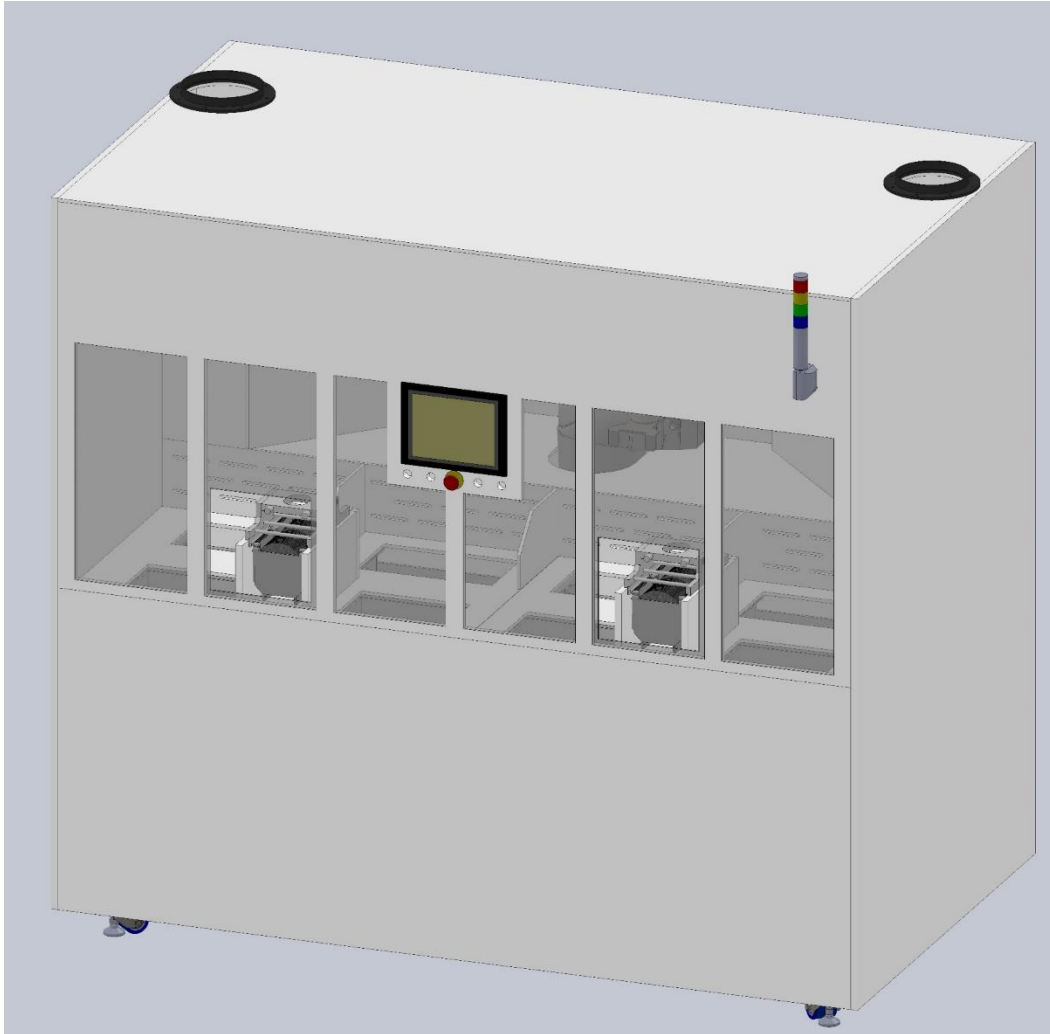


Wet bench for MEMS installed at STMicroelectronics Agrate - ITALY



*Polimer removal
process*

Wet bench for MEMS installed at STMicroelectronics Agrate - ITALY



STÄUBLI
6 axys Robot



S.P.M. s.r.l.

Ambrogio Sala

President



Special Plastic Module for
semiconductor industry

- E-mail: ambsala@spm-semiconductor.it
- Web: www.spm-semiconductor.it
- Youtube channel:
<https://www.youtube.com/user/SPMSemiconductor>
- Phone: +39 0396010152
- Fax: +39 0396011434
- Address: via G.Galilei 8, 20876 Ornago (MB) ITALY