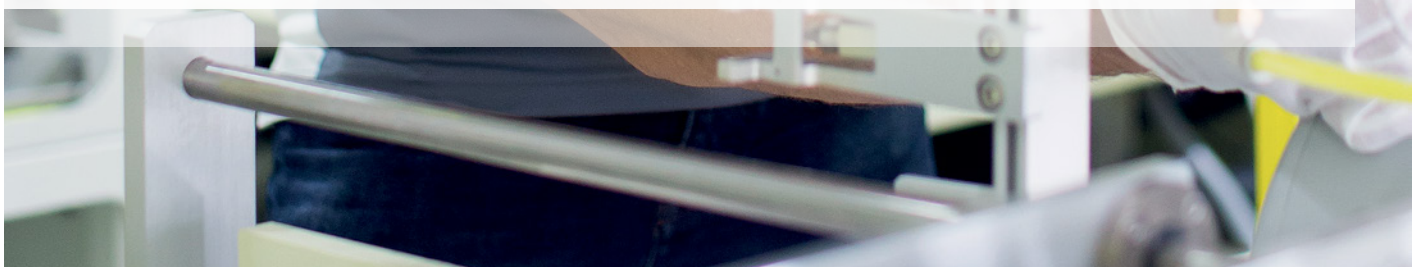


PCB PRODUCTION SOLUTIONS

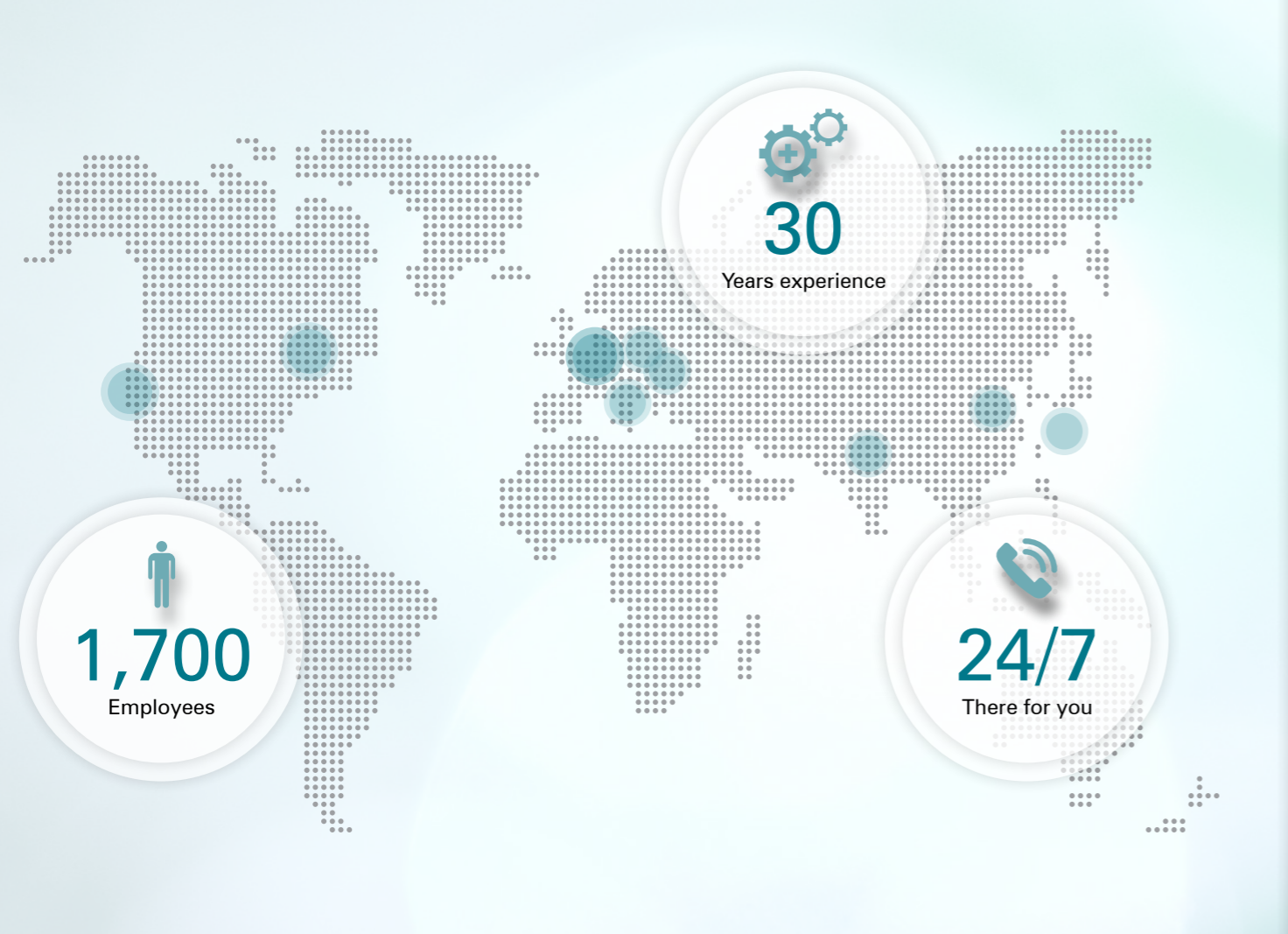


PCB Production Solutions

for IC, HDI, BGA, MSAP and FPC Processes



GERMAN ENGINEERING — INTERNATIONALLY STAGED — GLOBAL REFERENCES



Manz AG

Established 1987
 Headquarters in Reutlingen, Germany.
 Additional locations in Slovakia, Hungary, Italy, China, Taiwan, the United States, and India.

Employees

Approx. 1,700 employees worldwide, of which approx. 500 are engineers

Core technologies

Automation
 Metrology
 Laser processing
 Wet chemistry
 Roll-to-roll

Production solutions for printed circuit boards

FROM PCS TO CELLPHONES — FROM CARS TO PLANES. THERE IS BARELY AN APPLICATION IN OUR DAILY LIFE THAT DOESN'T INVOLVE A PRINTED CIRCUIT BOARD. WITH MORE THAN 30 YEARS OF EXPERIENCE IN DEVELOPING HIGH-TECH EQUIPMENT FOR PRODUCING HIGH-EFFICIENCY PCBs, WE HAVE EARNED AN OUTSTANDING REPUTATION AS A PROVIDER OF WET CHEMICAL PROCESS EQUIPMENT.

Founded in 1987, Manz AG is a global high-tech equipment manufacturing company. Its business activities focus on the Solar, Electronics, Energy Storage, Contract Manufacturing, and Service segments.

With many years of expertise in automation, laser processing, vision and metrology, wet chemistry, and roll-to-roll processes, the company offers manufacturers and their suppliers innovative production solutions in the areas of photovoltaics, electronics and lithium-ion battery technology.

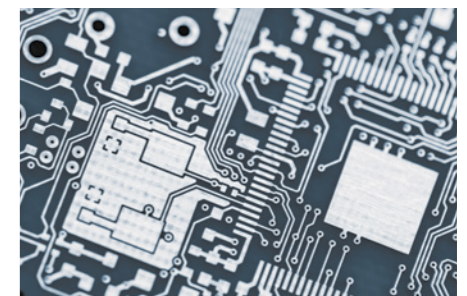
The company currently develops and manufactures in Germany, Slovakia, Hungary, Italy, China and Taiwan. It also has sales and service branches in the USA and India.

In 2008, Taiwanese Intech joined Manz corporation, contributing valuable experiences in the fields of production solutions for displays, touch screens, PCBs and wet chemical processes.

In 2015, through the acquisition of KLEO Halbleitertechnik GmbH, a subsidiary of the ZEISS Group, we have expanded our technology portfolio with laser direct imaging of printed circuit boards.

Today, Manz is the first company in the industry that provides "one stop solutions" for our customers' PCB production.

The use of innovative manufacturing equipment from Manz significantly increases efficiency of production and of the PCBs produced. This gives our customers a significant competitive edge and allows them to meet the market's increasing demand for even lighter, thinner, simply better electronic devices.



PBC Equipment Milestones

Taiwanese Intech joins the **2008** Manz Group. Manz becomes leading wet process supplier.

Manz successfully develops **2014** a low tension roll-to-roll system, enters market for ultra-thin PCBs.

Manz acquires ZEISS' KLEO **2015** Halbleitertechnik GmbH, enters the LDI market.

Manz becomes first manufacturer for CIM products, used for one stop system integration.

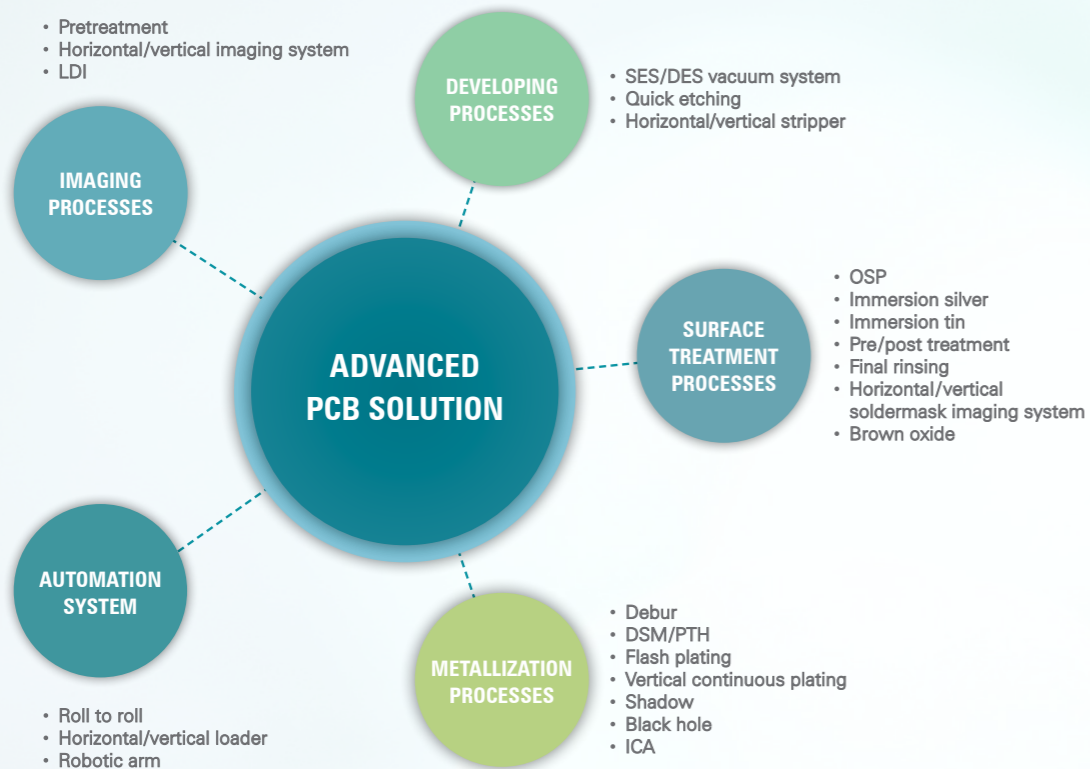
Manz introduces MASP total **2016** solution reaching L/S 15/15 μm.



Internet of things (IoT) global market is expected to reach **100 Billion USD** by 2020.



SOLUTIONS DESIGNED FOR ADVANCED PCBs



* Applicable for rigid and flex PCB

Manz dedicates itself to the research and manufacture of wet process PCB equipment. With over thirty years of experience, Manz offers systems for pretreatment, etching, developing, stripping, brown oxide, DSM/PTH, imaging, various surface treatment and automation. Manz's customer base includes many world class PCB companies.

As one of the most innovative PCB equipment providers, Manz has spent many efforts to improve the capability and yield rate of its equipments. As a "one stop solution" with integrated software and hardware through Manz CIM, we allow our customers to further improve production processes and quality control.

The strengths of our one stop solution are:

- Integrated data base management, allowing the customer to detect production errors and reduce workers at job site.
- PLI400 *SpeedLight* LDI system, combining wet process and dry process equipment for super fine line applications.
- Easy to control and monitor HMI
- Lower energy and water consumption reduce costs and are better for the environment.

Developing Etching Stripping Process

TO FORM THE CIRCUIT PATTERN BY PHOTO-RESIST DEVELOPING, ETCHING AND PHOTO-RESIST STRIPPING (ACID ETCHING).



TECHNICAL SPECIFICATIONS

Panel size

max. 610 x 610 mm
min. 250 x 250 mm

Panel thickness

0.05 mm (core) + Cu ~ 3.2 mm of traditional PCB
0.8 mm ~ 12 mm of back panel

Hole size

PTH hole: min 0.1 mm A/R 10:1
BVH hole: min 0.075 mm A/R 1:1

Etching capability

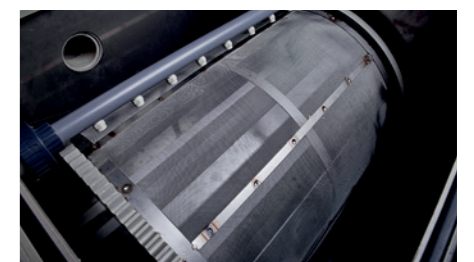
Copper thickness 18 μm :
L/S 35 μm /35 μm
Copper thickness 36 μm :
L/S 50 μm /50 μm

PRODUCT FEATURES

Etch factor ≥ 3.5 , great uniformity

High conveying stability with deviation at ± 10 mm, squeegee roller residue ≤ 10 cc/m².

Slope-bottom and small-volume tank design for the rinsing process to increase the tank turnover rate by 50 %.



Top: Developing etching stripping equipment
Center: Super-fine line etching
Bottom: Dry film sludge separation system

Horizontal Oxide Replacement Process

TO FORM A HIGH ANTI-TEAR STRENGTH OXIDIZATION LAYER ON THE INNER LAYER TO ENHANCE THE BONDING OF THE INNER LAYER AND PREPREG DURING LAMINATION.



TECHNICAL SPECIFICATIONS

Panel size

max. 610 × 610 mm
min. 250 × 250 mm

Panel thickness

0.05 mm (core) + Cu ~ 3.2 mm
of traditional PCB
0.8 mm ~ 12 mm of back panel

PRODUCT FEATURES

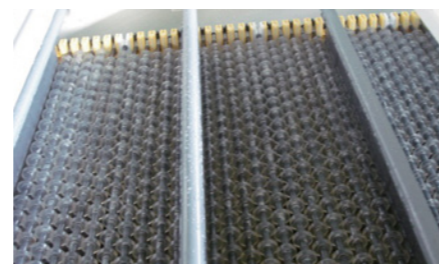
Minimum 5 times of thermal shock test.

Uniformed color and oxidization layer bonding ability $\geq 3.0 \text{ lb/in}^2$.

High conveying stability with deviation at $\pm 10 \text{ mm}$ and drag out $\leq 10 \text{ cc/m}^2$.

Slope-bottom and small-volume tank design for the rinsing process to increase the tank turnover rate by 50 %.

Maximum uptime $\geq 95 \%$



Top: Horizontal oxide replacement equipment
Center: Oxide replacement
Bottom: Cool air-knife

Horizontal DSM & PTH Process

TO REMOVE AND TEXTURE THE DRILLED HOLE WALL, DEPOSITING ELECTROLESS COOPER FOR COMING ELECTROPLATING PROCESS.



TECHNICAL SPECIFICATIONS

Panel size

max. 610 × 610 mm
min. 250 × 250 mm

Panel thickness

0.05 mm (core) + Cu ~ 2.4 mm
0.1 mm (core) ~ 3.2 mm

Hole diameter

PTH hole: min. 0.1 mm A/R 10:1
BVH hole: min. 0.075 mm A/R 1:1

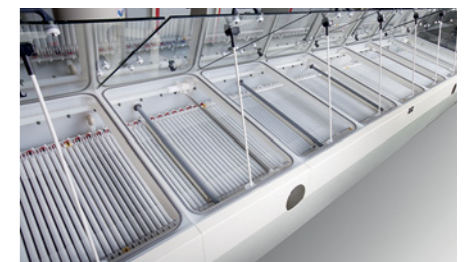
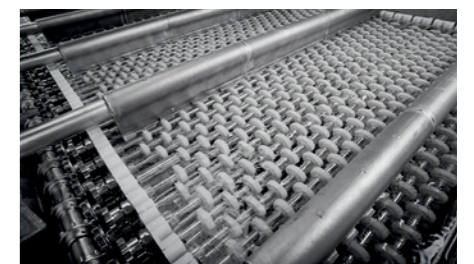
PRODUCT FEATURES

Excellent Mn6+ activation:
Mn6+ content < 25 g/l

Excellent chemical copper deposition speed and thickness with at least Grade 9 backlight.

High conveying stability with deviation at $\pm 10 \text{ mm}$ (with width control device).

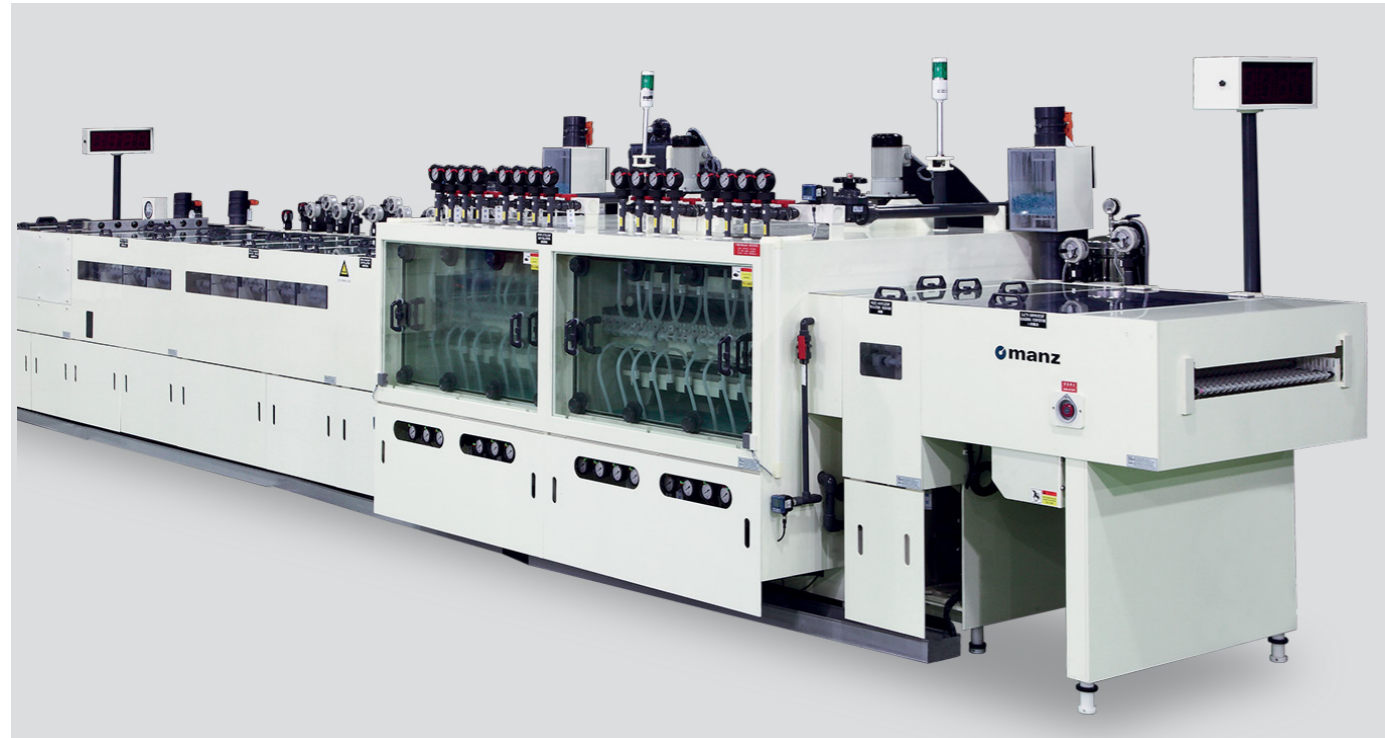
Slope-bottom and small-volume tank design for the rinsing process to increase the tank turnover rate by 50 % and drag out $\leq 10 \text{ cc/m}^2$.



Top: DSM & PTH equipment
Center: SWL & DSM
Bottom: Electroless copper deposit

Developing Process

FOR REMOVAL OF THE UNEXPOSED PHOTORESIST OR SOLDERMASK.



TECHNICAL SPECIFICATIONS

Panel size

max. 610 × 610 mm
min. 250 × 250 mm

Panel thickness

0.05 mm (core) + Cu ~ 3.2mm of traditional PCB
0.8 mm ~ 12mm of back panel

Hole diameter

PTH hole diameter:
min. 0.1 mm A/R 10:1
BVH hole diameter:
min. 0.075 mm A/R 1:1

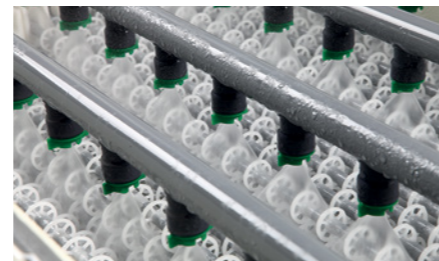
Development resolution

25 μm/25 μm

PRODUCT FEATURES

Excellent cleaning ability, no roller mark, water mark and SCUM residual.

High conveying stability with deviation at ±10 mm and drag out ≤ 10 cc/m².



Top: Developing equipment
Center: Direct spray, no shadow effect
Bottom: Develop spray manifold

Laser Direct Imaging (LDI)

TO EXPOSE THE CONDUCTIVE PATTERN ON A PHOTO-RESIST-COATED PANEL, MAKING THE PRODUCTION AND USE OF A TRADITIONAL PHOTO TOOL UNNECESSARY.



TECHNICAL SPECIFICATIONS

Panel format

max. 660 mm (W) × 650 mm (L)
(extendable to 850 mm)

Panel thickness

0.05 mm to 8 mm

Exposure field width

max. 650 mm

Throughput

max. double-sided exposed
180 two-sided panels/hour
(360 sides/hour)

PRODUCT FEATURES

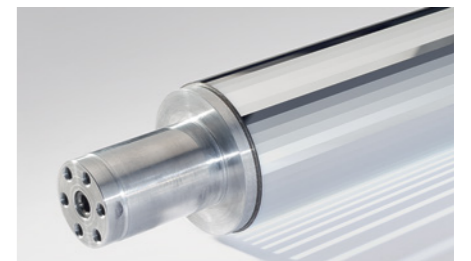
Parallel data processing and data transmission for two panels.

Optical system with multi beam laser diodes and 9 scanning polygons with speed of 50,000 rpm to ensure high-speed exposure.

High throughput (panel/day) and low consumption costs, for small jobs.

Twinstage system doubles the area of operation compared to competitive systems; up to 8,000 exposures per day.

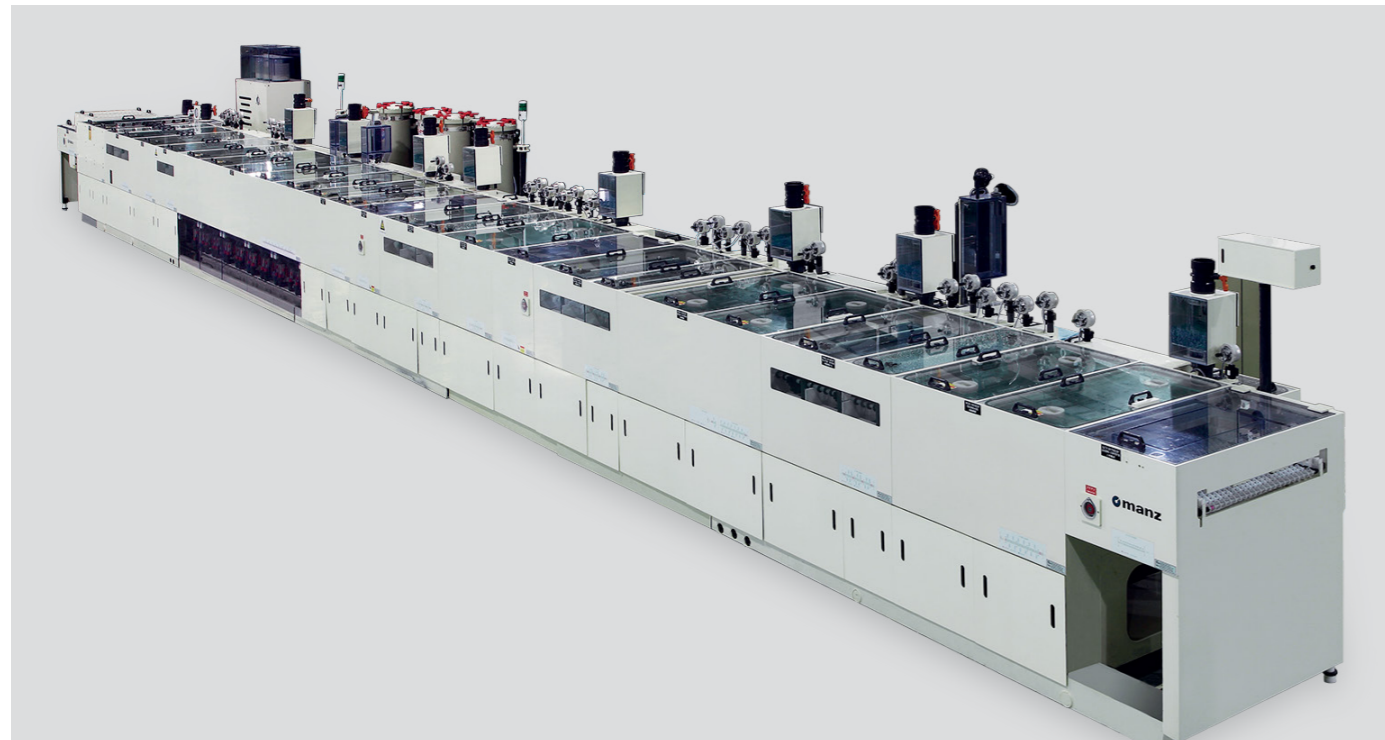
Throughput and performance not limited by typical bottlenecks of other digital imaging devices (e.g. solid-state laser, micromirror).



Top: LDI equipment PLI400 SpeedLight
Center: Polygon mirror with 48 facets
Bottom: Polygon module during exposure

Organic Solderability Preservative Process

FOR CREATING AN ORGANIC SOLDERABILITY PRESERVATIVE LAYER ON THE AREA WHERE THE COMPONENTS ARE BONDED.



TECHNICAL SPECIFICATIONS

Panel size

max. 610 × 610 mm
min. 250 × 250 mm

Panel thickness

0.05 mm (core) + Cu ~ 3.2 mm

Hole diameter

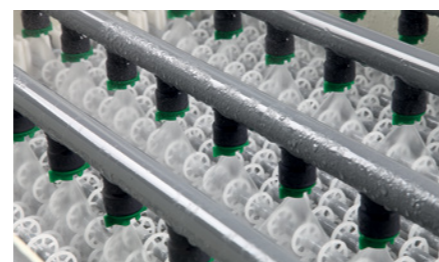
PTH hole diameter:
min 0.1 mm A/R 10:1
BVH hole diameter:
min. 0.075 mm A/R 1:1

PRODUCT FEATURES

Evenly distributed oxidized protective layer with no discoloration. The layer's thickness ranges from 0.15 μm to 0.3 μm.

High conveying stability with deviation at ±10 mm and drag out ≤ 10 cc/m².

Slope-bottom and small-volume tank design for the rinsing process to increase the tank turnover rate by 50 %.



Top: OSP equipment
Center: OSP chambers
Bottom: Direct spray, no shadow

Roll-to-Roll Process

ROLL IN: THE WINDING ROLL IS CONTROLLED BY THE BRAKE TORQUE THAT CORRESPONDS WITH THE OUTPUT OF THE TENSION SENSOR. ROLL OUT: THE UNWINDING ROLL IS DRIVEN BY A MOTOR, EQUIPPED WITH EPC TO ENSURE THAT THE UNWINDING ROLL WORKS EVEN AND STRAIGHT.



TECHNICAL SPECIFICATIONS

Panel width

Panel wideness: 250 ~ 600 mm
Panel thickness:
12.5 μm ~ 25 μm or thicker
Application: any roll-to-roll process
(RTR + Wet Chemistry;
RTR + Slit Coater; RTS + Cutter)

Performance

Uptime: ≥ 95 %
MTTR: 4 hr
Edge alignment: ± 0.5 mm
Low tension applied to 5 N ~ 30 N

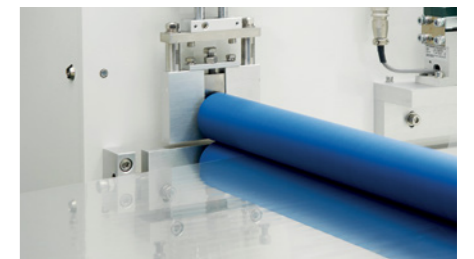
PRODUCT FEATURES

Adapts with the customer's FPC wet process equipment, such as scrubbing, DES, oxide replacement, and surface treatment.

Low tension control design with the min. tensile force as 5N.

Modularized design. Tension or dancing roller can be selected according to the process requirements to ensure no deforming.

Single track/double tracks can be selected according to productivity and pre-cess requirements.



Top: Roll-to-roll equipment
Center: Press roller
Bottom: Eps, edge positioning system

Vertical Automation Process

FOR PCB PROCESSES SUCH AS DEVELOPING, ETCHING, AND STRIPPING, FOR MSAP PROCESS, SUPER FINE LINE SPECIFICATIONS AND OTHER HIGH-END PCB PRODUCTIONS.



TECHNICAL SPECIFICATIONS

Automation solution

Loader, unloader, buffering system, turning station, and flip station

Vertical solution

Robotic loaders and unloader

Intelligent Automation System

Computer-integrated manufacturing system (CIM), logistic control automation system, and factory automation system (FA)

PRODUCT FEATURES

Uptime up to 99.8 %

Exclusive contact-free tooling conveyor system, achieving high productivity yield.

Various auto loader and unloader designs with various signal connection ports, allowing swift integration in existing equipment and achieving one-stop production.

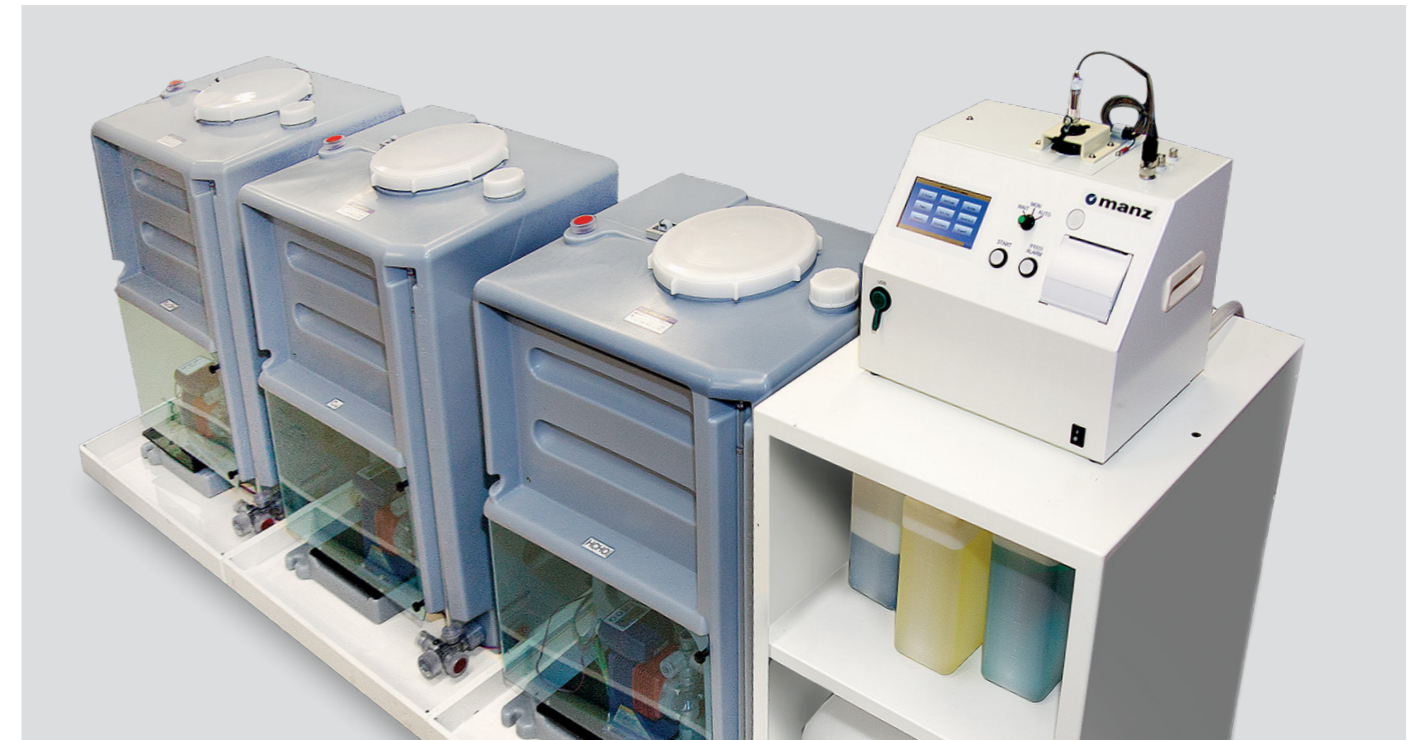


Top: Vertical developer
Center: Automation systems of vertical line
Bottom: Robotic arm

* Besides the standard application, tailor made systems can be delivered upon request.

In-Line Precise Analysis And Dosing Systems

FOR VARIOUS WET PROCESS EQUIPMENTS, USING TITRATION METHOD FOR INSTANT DATA MONITORING AND ANALYSIS.



TECHNICAL SPECIFICATIONS

Analysis precision: > 97 %

Analysis frequency: 15 min. (max.)

Required measurement time: 15 min.

Sampling precision: 0.02 ml

Sampling variability: ± 3 %

Maximum simultaneous measurement: 5 types per machine

Analysis method: Titration, PH scale, absorption spectroscopy

Automatic dosing interval: 5 min. (max.)

PRODUCT FEATURES

Compact design, simple to repair; spare parts can easily be replaced through express delivery, saving time and cost of hiring onsite mechanic.

Automatic sampling increases analysis frequency, allowing the customer to monitor the concentration more accurately and maintaining the stability of the concentration above 97 %.

Inline automatic dosing system allows faster and more accurate dosing compared to manual adjustments.

Effectively reduces the required laboratory personnel and analysis equipments, lowering the production cost for the customer in the long run.



Top: Analysis machine ICA 001
Center: Single molded dosing tank
Bottom: Standard industry drivers

Our Locations



Manz AG
Steigaeckerstrasse 5
72768 Reutlingen
Germany
Tel.: +49 7121 9000 0
Fax: +49 7121 9000 99
www.manz.com
info@manz.com

Manz China Suzhou Ltd.
No. 405, JiaLingjiang Road,
Suzhou New District,
Suzhou City, JiangSu Province,
China 215153
Phone +86 512 65136050
Fax +86 512 65136061
contact@manz.com.cn
www.manz.com.cn

Manz Taiwan Ltd.
No. 3, Tsu Chiang 3rd Road,
Chungli City, Taoyuan County,
32063 Taiwan
Phone +886 3452 9811
Fax +886 3452 9810
info@manz.com.tw
www.manz.com.tw