

walter

Lemmen

**Precision in detail**

**PCB TECHNOLOGY**



**SURFACE TECHNOLOGY**



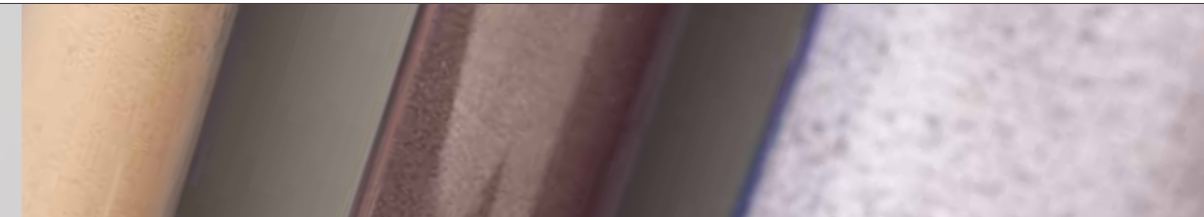
**SMALL EQUIPMENT FOR SURFACE TREATMENT**



**MEDICAL TECHNOLOGY**



**WASTEWATER- / EXHAUST- / FILTER-TECHNOLOGY**





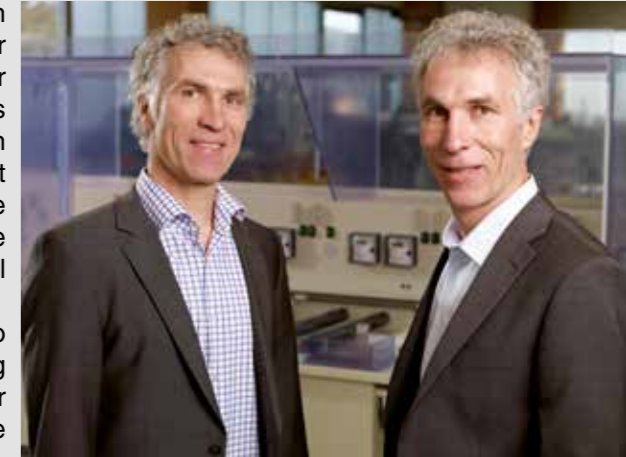
**PRECISION**

**Over 40 years of experience and passion**

For over 40 years the Walter Lemmen Ltd. has been producing an extensive selection of products, for the surface and printed circuit board technology for industry, research and teaching. The different facilities are constructed and manufactured in our factory in Kreuzwertheim and distributed worldwide. The product range includes machines and equipment for the production of single or double-sided PCBs, through hole plated PCBs and multilayers for prototypes and small serial production.

Barrel and rack treatments are individually adapted to customer requirements for electroplating and finishing of different materials. These applications are used for decorative and functional surfaces to complement the portfolio.

The outstanding results can be seen in exceptional quality materials and components thereby guaranteeing a low maintenance operation.



Walter Lemmen Ltd. offers as a system supplier, the development, design and construction of equipment and systems for printed circuit boards and electroplating.

Additionally, the company offers a complete product and service program, consisting of the delivery of customer-specific systems, components and chemistry, service and environmental concepts for various industrial branches.

Our main customers include the PCB industry, the automotive industry, the electronics industries, the aerospace, the telecommunications and management industry, the control systems, the medical technology and the photovoltaics industry.



The company has a close cooperation with different institutions in research and development. The basis for innovative implementations and enhancements of our plant diversity, is found in colleges, universities and in several industries and used to support new technologies in the printed circuit board technology and electroplating.



### PCB technologies:

- One and double sided PCBs
- Through hole plated PCBs
- Multilayer up to max. 6 layers
- RF circuit boards
- LTCC - Ceramic
- MID-Wafer Technology
- HDI Micro via Technology
- Flex and Flex-rigid Board Technology
- Thick Copper Board Technology
- Insulated Metal Substrate (IMS-Board Technology)
- Structuring of non-ferrous metals, stainless steel and aluminum front panels and labels

### PCB materials:

- Photo-coated base material FR4 / FR2 / CEM1 / PTFE
- Photo-plated SMD stencil sheets
- Base material for special applications
- Front panel material ALUCOREX
- Photo-coated anodized aluminum
- Flexible Substrates
- Rigid-Flex Substrates

### Equipment for the manufacture of printed circuit boards

The demand for finer and more complex structures, small components and flexible materials is growing rapidly. As a result, the company is expected to be fast and flexible in implementing the new technologies with available high-quality equipment.

The Walter Lemmen Ltd. has a perfectly matched equipment program. It covers the entire manufacturing process to produce high quality printed circuit boards with complex structures. Additionally it covers fine conductor plates, widths and distances on different base materials.

The product lines from the Walter Lemmen Ltd. ranges from systems for structuring, surface treatment and through hole plated systems. Surface facilities for the protection of one and double sided printed circuit boards, chemical milled parts and multilayer are also included. Our product range is complemented by environmentally friendly production technologies. This includes a high level of safety standards, reduction of environmental pollution, lower consumption of raw materials, chemicals, energy and water. Integrated rinsing and filtration technology, regeneration equipment, waste water treatment plants and electrolytic cells used for the complete recovery of precious metals from the rinse water process are reflected in our products.



## PCB TECHNOLOGY

### Film processing • Exposure • Lamination



Inexpensive and very effective devices are available for the technical film processing procedure especially for the production of prototypes. This ranges from photoplotters for the production of high-quality films for subsequent processes, to one and double-sided working UV exposure units. The professional design of the photoplotters allow the processing of standard CAD data, which guarantee an optimal film exposure result on the UV exposure systems. They are available in different sizes and designs. A special UV technology in combination with a drawer vacuum system and a wide range of device equipment, ensure an optimal exposure result and short exposure times.

The high quality UV-LDI direct image system (Laser-Technology) is the ideal solution for a fast, accurate and robust prototyping of printed circuit boards and etched parts. It exposes all standard UV sensitive materials, such as negative dry resist, positive resist or solder mask. The UV-LDI direct image system (Laser-Technology) exposes the layout in a short time and without any mask. There are already provided for in the basic-version resolution of 75µm line width and spacing.



Our powerful laminators can be used for the processing of all usual photostructurable laminates and photopolymer film (solder mask), printed circuit board production and chemical milled parts production. The laminators ensure an optimum lamination result.



### Brushing • Cutting • Drilling

A wide product range of manual and motorized sheet shears are available, for cutting of circuit boards, metal sheets and aluminum. The different device models provide the perfect cut and accurate edges. For professional drilling and routing of circuit boards, metal parts, plastic and front panels, we offer manually operated precision drilling machines. They are specifically designed for the prototype production, which guarantee a high level of drilling quality and usability. Our CNC controlled drilling and milling machines with manual or automatic tool changer works with high accuracy, resolution and step drilling frequency. The stable aluminum construction allows for processing multiple panels and can also be used for isolation routing of circuit boards and aluminum front panels.



Lemmen's compact brushing machines can be used universally for different materials and substrates include laminating or deburring, after drilling in the print production. Special devices of single or double-sided working table units or floor units are also available.



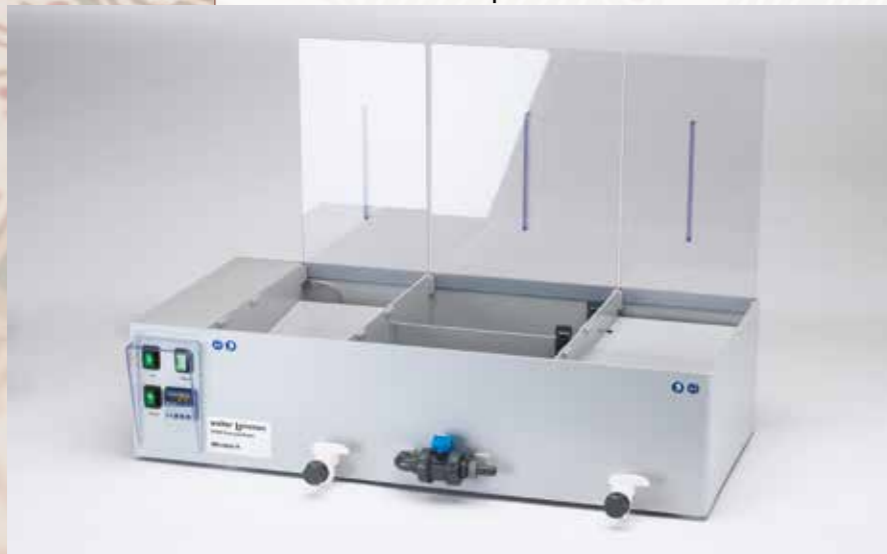
The machines through its easy handling and stable construction have a wide scope in the mechanical circuit board processing. Which combines the adjustable transport speed and the modulation oscillator devices.

## PCB TECHNOLOGY

### Developing • Etching • Rinsing • Stripping

The modular designed etching and developing devices of Lemmen Ltd., allow for fast processing of printed circuit boards in the spray-etching and development process, foam-etching process or continuous spray-etching process. This provides the perfect premise for a high-quality printed circuit board image.

Special holders allow the customer to edit different PCB materials in the manual or vertical method of process running. The floor-mounted or table units in a compact construction include all process steps from developing, etching and rinsing (optional stripping) in one unit and enable the production of high-quality PCB structures of 50-100 microns. The units are designed for prototypes and small series of up to a suitable plate size of 500 x 600 mm.



The laboratory bench systems of series MINISTAR and the floor-mounted units of the series ETCHING CENTER V are used for developing, etching and rinsing in foam-etching process and continuous development process. They are ideal for the processing of small printed circuit boards and etched plates in laboratories, schools and institutions to create professional sample sheets and prototypes.



The spray development and spray etching units, ETCHING CENTER S and CONVERT from Lemmen Ltd., are suitable for the production of fineline single or double-sided printed circuit boards or chemical milled parts. The systems are available either manually or vertically, which are operating systems with integrated rinsing moduls. Our new rotation spray systems give uniformity and intensive treatment to the entire surface. The units are equipped with multiple rinses which is characterized by their clean and compact way of working. The modular design allows expansion of the units by a stripper and dryer module.



## PCB TECHNOLOGY

### Through hole plated technology

The creation of high-quality printed circuit boards and multilayers require high precision and systems engineering for the metallization of the holes, soldering of the contacts and finishing, which protects against oxidation and corrosion.

To create the through-hole plated printed circuit boards, the PCBs must be pretreated by a wet chemical process, by metallizing the substrate inside the hole and thereby establishing connection between the individual layers.

For the through-hole plating galvanic process we offer our range COMPACTA, as

a general-purpose electroplating plant, for the chemical or electrochemical treatment of metals in vertical technology. In consultation with the customer's requirements the desired through-hole plating system is constructed.

The general production of high quality through-hole printed circuit boards, is based on an environmentally friendly direct metallizing with graphite as catalyzer, in tenting or subtractive process.



The modular design of the systems provides the ability to integrate additional processes into the system concept: desmearing, blackening, tin stripping, resist stripping, immersion tin and organic protective coating (OSP), immersion nickel / gold, immersion silver, electroplated nickel / gold. The treatment and rinsing tanks are optimally fitted with high-quality facilities and system components which guarantee an optimal result for printed circuit board.



### Multilayer

Multilayer production is used to achieve a high level of information on a printed circuit board.

The multilayer presses of the MLP-L series are devices for the production of multilayer printed circuit boards (Multilayers) for prototyping and small-scale production.

The device has two separate controlled, electrically heated press plates. The hydraulic system can be controlled by an integrated SPS touch panel. The extensive functionality of the multilayer press of MLP-L series allows the use for various manufacturing processes.

In combination with the exposure, development, etching and through-hole plated units, high-quality multilayers can be manufactured in a short period of time.



## PCB TECHNOLOGY

### Final Finishes • protective layers

Organic, chemical or galvanic protective coatings are used for oxidation and corrosion protection of PCB surface finishes.

A high quality surface finish on PCBs is guaranteed through the use of special equipment in combination with chemical processes. The final surface treatment of different PCB types can be integrated as an additional process, eg. in the COMPACTA

device or as a single unit in the series PROTEC. The system configuration depends on different chemical treatments for the surface protection of the respective processes:



#### Systems for lead-free surface

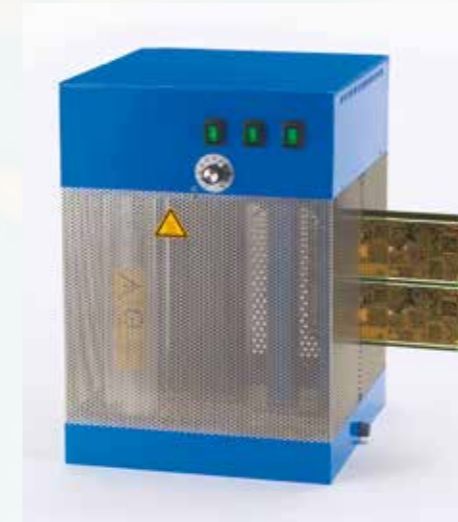
- Electroless Nickel / Gold
- Immersion Tin
- Immersion Silver
- Organic surface protection (OSP)

#### Equipment for special applications

- Galvanic Nickel / Gold
- Galvanic Silver



### Drying • Tempern



The printed circuit board process dryer is designed in a vertical position. This provides a rapid residue-free drying of PCBs, chemical milled parts, non-ferrous metals or other etched substrates by the wet chemical process. The circuit board is automatically transported through the drying zone and is the subsequent processing step of laminating and quick surface treatment. The program is expanded

by the universal use of ovens for drying, tempering and heating circuit boards and substrates. The quality of the stainless steel ovens offer a variety of facilities and program function. The application-specific options are easy to use and ensure a wide range of applications.





### Product range:

#### Tank volume:

5 liters - 100 liters  
(other volumes on request)

#### Design:

Manual rack and barrel treatments  
Automatic handling systems on request

#### Units for pre-treatment:

Pre-cleaning  
Degreasing  
Ultrasonic

#### Systems for decorative surface treatment:

Gold  
Silver  
Rhodium  
Chrome

#### Systems for functional surface treatment:

Copper  
Tin  
Zinc  
Electropolishing

#### Systems for anodization and coloring treatments

Anodization  
Titanium coloring

### Decorative and functional surface treatment for rack and barrel treatment

With our extensive knowledge and wide product range, we offer high productive systems in the field of surface technology and finishing. Our system covers an entire range for processing of the most diverse materials for decorative and functional surface coating. This includes cleaning, coating and finishing of barrel and rack treatment of plastics, steel, aluminum and titanium or other metals.

Customer-oriented concepts matched with the respective chemical processes and reliable services complement the portfolio. As a competent partner for the PCB and electronics industry as well as the automotive, sanitary, jewelry and consumer goods industry, we pursue a high quality standard and reliability in corrosive resistant surface.



## SURFACE TECHNOLOGY

### Pre-Treatment

Through the pre-treatment of the coated materials a high quality surface is guaranteed. These pre-treated units for barrel or rack treatments are fitted with a pre treatment tank for degreasing and rinsing cascades. Optional items like exhaust tubes and suction heads provide a clean work environment.



### Decorative and functional surfaces

In the field of decorative and functional surfaces, we offer a wide range of plants and plant technology for all surfaces, including chemicals and services. Together with the customer and the use of up to date electroplating technology, we develop multifunctional units for coating of metal substrates or plastic materials. Our product range includes all plant varieties for decorative and functional surfaces. This includes the pre-treatment and surface preparation, corrosion protection of components up to decorative surface finishing for jewelry, sanitary products or consumer goods.



### Anodization and coloring treatment

Small galvanic units or single tanks for anodizing of light metals are used for surface treatment of parts made of pure titanium or titanium alloys and aluminum. The facility includes all pre-treatment and post-treatment processes for optimum anodic oxidation to generate adherent surface layers in decorative colors.



### Automatic placement

Specific plants can be equipped with pneumatic handling system and Siemens S7 controller.

### Pickling, chemical deburring and electropolishing

Equipment for electrochemical and chemical polishing, deburring and cleaning of metal surfaces, e.g. stainless steel, steel, titanium, copper and copper alloys, brass, aluminum and other metals.

- Pickling
- Electrochemical polishing and deburring (electropolishing)
- Passivation
- Chemical polishing and deburring



## SMALL EQUIPMENT FOR SURFACE TREATMENT

### Product range:

- Electroplating systems for the standard sizes of 1,5 – 3,0 liter tank volume
- Electroplating table units for the standard sizes from 5 - 50 liter tank volume
- Small electroplating plants as barrel or rack systems for the standard sizes from 5 - 100 liters of tank volume
- Metal recovery modules for precious metals
- Waste water treatments for precious metals
- Pickling
- Stripper systems for precious metals
- Developing and etching equipment for structuring stainless steel and nonferrous metals
- Accessories for electroplating

### Small electroplating systems for decorative and functional surfaces

In addition to our small electroplating plants, we offer a universal program for small appliances for functional and decorative surfaces with small bath volumes. These multifunctional devices and systems from 1,5 liter tank volume are suitable for the jewelry-industry, medical and industrial manufacturing of small parts. Through a variety of different bath components, such as heaters, rectifiers, barrels, racks, filters and ion exchange equipments, the units offer the optimum surface condition for a professional result.



## SMALL EQUIPMENT FOR SURFACE TREATMENT

### Small electroplating machines

The modular electroplating system is a high performance system for jewelers, watchmakers, research and development engineers and for laboratories in craft and industry. A multi-functional rectifier combined with different tank holders which have 1,5 liter and 3,0 liter tank capacity, and electrolytes, provide the basis for professional results in electroplating surface technology. The complete

system with integrated heating and agitation can be used for the electrolytic degreasing and all precious metal plating electrolytes.



### Compact small electroplating plants for decorative surfaces and machines for degreasing

The small compact electroplating facility in standard sizes of 5, 10 and 20 liter tank volume, are small electroplating machines for decorative surfaces such as gold, silver and rhodium. Additional modules for pre-treatment complement the series of devices. The plant design includes all necessary installation components such as rectifiers with Ah-counter, agitation, air injection and cooling which results in a high-quality decorative surface.



### TG- Electroplating Equipment – Table units

The TG-Electroplating systems have a standard tank volume of 5 l / 10 l / 20 l and 50 l, allows the individual assembly of treatment tanks. The TG-Electroplating system can be converted into an electroplating tank, by using conversion kit E or in a cleaning tank with air agitation by using conversion kit S. Additional options, such as agitation for movement, rectifiers, floor heaters with temperature controllers and barrels equipment allows reliable surface treatment for various applications.



## SMALL EQUIPMENT FOR SURFACE TREATMENT

### Titanium coloring units

The titanium-color system was developed specifically for surface treatment of parts made of pure titanium or titanium alloys. Anodic oxidation can produce different colors, uniformity and adherent surface layers. The parts to be coated are oxidized in the ready-used titanium-color electrolyte, and thereafter in a special anodic pre-treatment for titanium pickling. By varying the bath voltage through the adjustment of the artificially produced oxide layer, a variety of decorative colors can be generated. The multifunctional properties of titanium and titanium alloys, is the preferred choice in the medical, aerospace and chemical industries.



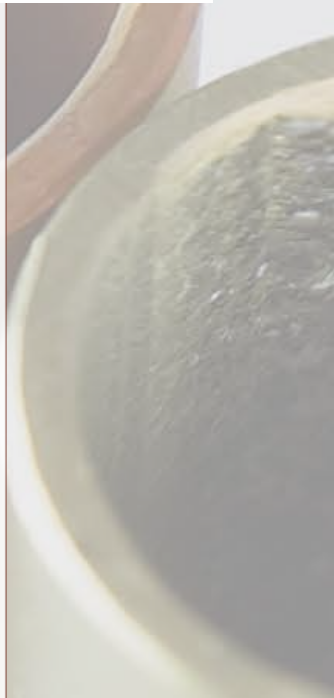
### Pickling and Stripping units

#### Pickling unit:

The pickling unit is suitable for stripping of precious metal parts and castings. The treatment unit is equipped with a heated pickling bath which is then followed by the rinsing procedure. Additionally, the acid-resistant exhaust fume with fan and security tank, which is optional, guarantee the safety aspect of a clean environment.

#### Stripping unit with metal recovery systems:

This system enables optimum stripping of precious metals on coated components. The recovery of precious metals takes place in a special electrolytic cell, which is built in several stages. The system concept guarantees a high deposition rate of gold, silver, rhodium or palladium from rinse water and concentrates.



**Product range:**

**Equipment for surface treatment of titanium and titanium alloys:**

Pretreatment: degreasing / ultrasonic  
Pickling  
Color anodizing  
Gray anodizing  
Etching  
Electropolishing  
Rinsing  
Drying

**Equipment for surface treatment of stainless steel:**

Pretreatment: degreasing / ultrasonic  
Pickling  
Electropolishing  
Passivation  
Rinsing  
Drying

**Units for manual and semi-automatic applications:**

Manual rack, basket or drum systems  
Semi-automatic with handling system and SPS control system

**Tank volume:**

Manual units:  
5 liters - 250 liters volume  
(Larger tank volumes on request)

Semi-automatic units:  
5 liters - 100 liters volume  
Load weight Handling system: max. 10 kg  
(Larger tank volumes on request)

**Surface treatment of materials of medical technology**

Titanium and Titanium Alloys  
Niobium, Nitinol, Tantalum  
Chromium-Cobalt Alloys  
Stainless-steel

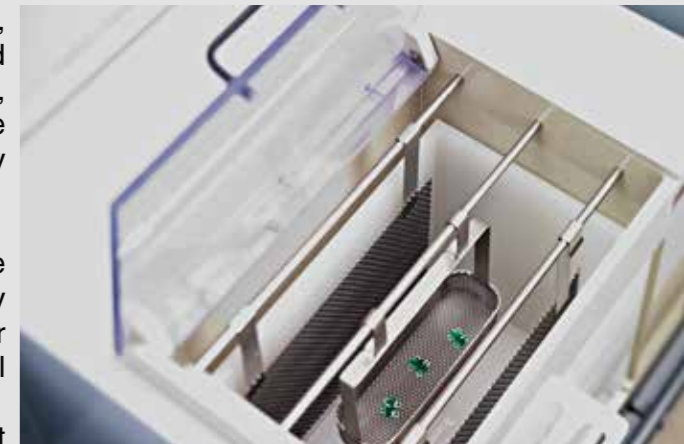
The requirements for medical instruments, components and materials are varied and complex. Safety and reliability materials, manufacturing processes and machine technologies are used in medical technology have high priority.

In addition, the validity of the complete process and sequences are increasingly important. Especially metallic heart or dental implants are subject to strict material properties:

High mechanical strength, highest biocompatibility and corrosion resistance. Raw-Materials such as titanium, niobium or stainless steel provide these material properties for highly stressed medical instruments and components.

For the surface treatment of medical instruments and components we offer special designed tank systems and compact electroplating units, manually operated or semi-automatic with handling system and SPS control.

The modular design of the electroplating units includes all the necessary process steps and tank applications for a high-quality surface. We offer as a system supplier, the development, design and construction of equipment and systems for the treatment of medical components. Additionally the complete product and service program, consisting of the delivery of customer-specific systems, components and chemistry, service and environmental concepts for the medical industry.



## MEDICAL TECHNOLOGY

### Stainless steel surface treatment of medical instruments and components

Precleaning / Pickling / Electropolishing / Passivation / Rinsing / Drying

Electrochemical polishing (electropolishing) and deburring of stainless steel improves the property of the metallic surface decisively. It has a positive effect on the durability of the medical components.

Electropolishing is an electrochemical process for surface removal at the edge zones of the components or instruments. The electroplating process is carried out with special chemistry solutions and creates a smooth and shiny surface.



### TITANIUM AND TITANIUM-ALLOYS / NIOB surface treatment of medical instruments and components

Precleaning / Pickling / Color or Grey Anodizing / Etching / Electropolishing / Rinsing / Drying

The treatment of medical instruments and components made by titanium and titanium alloys requires different surface structures and conditions:

The pickling process cleans and activates the surfaces for further process steps, such as color or grey anodizing.

Anodizing of surfaces is an electrochemical process for surface finishing of medical components, instruments and orthopedic implants. It primarily serves the color coding of the components and optics.

The chemical etching creates a porous structure on the surface and guarantees a good connection between metal and body tissue.

The electropolishing of titanium, on the other hand, provides very smooth surfaces. The surface guarantee an aesthetic look for the dental ceramics.



### Product range:

#### Waste-water-treatment

Circulation ion exchange units with resin volume 1.5 - 30 liters  
Ion exchange cartridges (cation, anion, mixed bed)  
Ion exchange resins (cation, anion, mixed bed)  
Active carbon filters  
Regeneration service  
Change of resin mixed bed  
Fully de-sterilized / mixed bed cartridges  
Reverse osmosis systems

#### Metal recovery (closed and open systems)

Metal-Recovery Systems for the recovery of precious metals  
Metal-Recovery Systems for the recovery of non-precious metals  
Stripping equipment in combination with recovery cells

#### Filter technology

Solid filter with filter cartridges activated carbon  
Solid filter with filter cartridges PP  
Complete filter units with pump in different versions  
Bag filters  
Filter housing

#### Exhaust air technology

Exhaust Air washer  
Demister Laboratory ventilators

### Environmental technology

As a system supplier, the development, design and construction of equipment and systems for printed circuit boards and electroplating. Additionally, the company offers a complete product and service program, consisting of the delivery of customer-specific systems, components and chemistry, service and environmental concepts for various industrial branches.

Our production portfolio guarantees a high flexibility and quality in the implementation of customer requirements. We offer the high quality tanks and electroplating systems for almost any surface treatment.

After customer requirements, we supply complete solutions from engineering to the exhaust air technology, filtration and regeneration. We are supported by qualified specialist companies and guarantee the best solution and implementation of customer requirements.

Through environmentally friendly production technologies and use of high quality components we ensure process reliability, reduction of environmental pollution, lower consumption of raw materials, chemicals, energy and water. These includes integrated rinsing and filtration technology, regeneration equipment, waste water treatment plants and metal recovery cells for recovery of precious metals from the rinse water process.





## WASTEWATER- / EXHAUST- / FILTER-TECHNOLOGY

### WASTE WATER TREATMENT



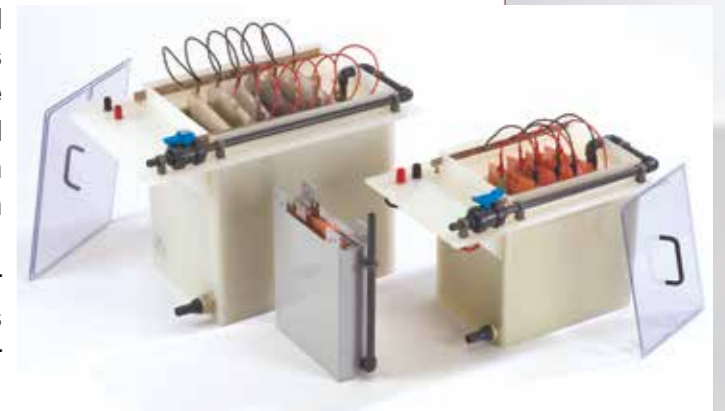
Special filters and water treatment technology ensure a clean water process. Besides a large selection of filters, we offer solid ion-exchange systems in the series IONEX that allows for continuous cleaning and reuse of rinse water from rinsing baths and sinks savings. This contributes to an increase in the circulation of water quality and substantial water savings. The waste water treatment is designed as a circulation or flow-through system. The circulation system cleaned and filtered the waste-water and return it to the electroplating units for reuse.

Through the use of special ion-exchange resins pre-cious metals (gold, silver, rhodium, palladium) can be recovered from the rinse water. The recovery of ion exchange resins is offered as a service and is therefore an economic solution in the waste water treatment process.



### TG- Electroplating Equipment – Table units

The TG-Electroplating systems have a standard tank volume of 5 l / 10 l / 20 l and 50 l, allows the individual assembly of treatment tanks. The TG-Electroplating system can be converted into an electroplating tank, by using conversion kit E or in a cleaning tank with air agitation by using conversion kit S. Additional options, such as agitation for movement, rectifiers, floor heaters with temperature controllers and barrels equipment allows reliable surface treatment for various applications.



### Filter technology



Complete solid filter units for particles and fine filtration of electroplating and chemical production processes. Different applications in combination with sealless magnet coupled centrifugal pumps in PP / PVDF / ECTFE suitable for fine filtration of organic and inorganic pollutions of aggressive and neutral liquids.

### Exhaust air technology

Custom-designed and converted laboratory air absorption systems, as additional application next to the exhaust ventilators for a clean laboritory enviromental.

The systems is controlled fully automatic and equipped with a level control system for filling and refilling the wash water, conductivity and pH control and monitoring system.







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