

COLUMNS



Zirconium



Tantalum



Graphite

PTFE



MeRseN

MERSEN, AN EXPERT IN MATERIAL AND EQUIPMENT FOR DEMANDING ENVIRONMENTS

Mersen wishes to share its extensive expertise in high-performance equipment with its customers. Mersen designs innovative solutions to address its clients' specific needs to enable them to optimize their manufacturing process in sectors such as energy, transportation, electronics, chemical, pharmaceutical and process industries.

Mersen's experience and skills in thermal design, process engineering and anticorrosion materials ensure that all the manufactured equipment can cope with your process constraints. All the equipment and systems are compliant with international standard requirements and certifications such as ASME, AS ADM, JIS, CODAP, RCCM, HAF 601.

To serve its worldwide customers, Mersen manufactures its equipment through American, European, Indian and Chinese first-class production plants representing more than 220,000 m².

	Reactors Pressure vessels	Mixers	Heat exchangers		Columns	Piping Fittings
			Block / Plate	Shell & Tube		
Graphite						
SiC						
Tantalum						
Zirconium						
Titanium						
Carbon Steel Stainless Steel Nickel Alloys						
Fluoropolymer						
			Anticorrosion Systems			

Mersen designs and manufactures distillation and absorption columns in graphite, PTFE lined, reactive metals (tantalum, titanium, zirconium) and metals (nickel alloys, stainless steel, carbon steel).

The columns fully comply with your specifications.

Our columns are in accordance with international construction codes and certifications:

- PED 97/23/EC European Pressure, Equipment Directive, ASME Stamp U/U2 American certification, SELO Chinese certification, AD-Merkblatt 2000-WO, AD-Merkblatt 2000-HPO...
- ASME VIII Div 1, CODAP, AD-Merckblatt

MATRIX SELECTION : MATERIALS-PRESSURE-TEMPERATURE

Whatever the constraints of your process, we have the solution within our large range of materials.

	Graphite	PTFE Lined Steel	Metals	PFA, FEP, ECTFE, PVDF, PTFE sheet lined steel
Design Pressure	Max 3barG	8barG	30barG	10 barG
Vacuum resistance	OK	Optional	For clad or solid For loose lined	Partial
Design Temperature	Up to 430°C	230°C	250°C	Maxi 180°C
Sealing	Gasket between sections Max 2.5m	No gasket required Max 1.5m	Welding or gasket when required	Gasket
Maximum diameter	80" in Graphilor® ML	• 64" in seamless PTFE • Alternative material	No limit	No limit
Permeability	Impregnated graphite	PTFE natural permeability	None	Fluoropolymers natural permeability
Thermal shock resistance	Ceramic material	No influence	No influence	No influence
Main application	• HCl stripping • HCl absorption • Gas cleaning	• HCl stripping • HF and H ₂ SO ₄ processing	• Ta: All chemicals except HF • Zr: Acetic acid, formic acid, sulfuric, nitric • Ti: chlorine chemicals, sea water, nitric acid	Same as PTFE
Final product tests	• Visual • Dimensional • Tightness (Hydro test, pneumatic test)	• Visual • Dimensional • Tightness (Dielectric test, hydro test, pneumatic test)	• Visual • Dimensional • Dye penetrant test • X Rays, ultrasonic • Helium test • Hydro test • Hot gas cycle	Visual, dielectric test, heat cycle, dye penetrant, hydraulic test

All values are indicative

■ most suitable ■ less suitable

GRAPHITE COLUMNS

Mersen graphite columns offer reliable and corrosion-resistant solutions to the processes of organic and inorganic chemical industries.

The columns are manufactured with Graphilor®3, an exclusive graphite developed by Mersen.

To learn more about Graphilor®3

As a century-old experienced company in manufacturing fine and ultra-fine structured graphites, Mersen has developed its advanced ultra-fine graphite (grain size of 20 microns): Graphilor®3.

Properties of Graphilor®3

- Excellent refractory qualities and mechanical properties
- Very good thermal conductivity and temperature resistance
- Non-contaminating
- Exceptional corrosion resistance

Various impregnants to ensure the imperviousness, the resistance to corrosion - Temperature and the long-term stability

- Highly cross-linked resin (BS)
- Resin treated at high temperature (C)
- PTFE Resin (TH)

FOCUS APPLICATION: HCL ADIABATIC ABSORPTION

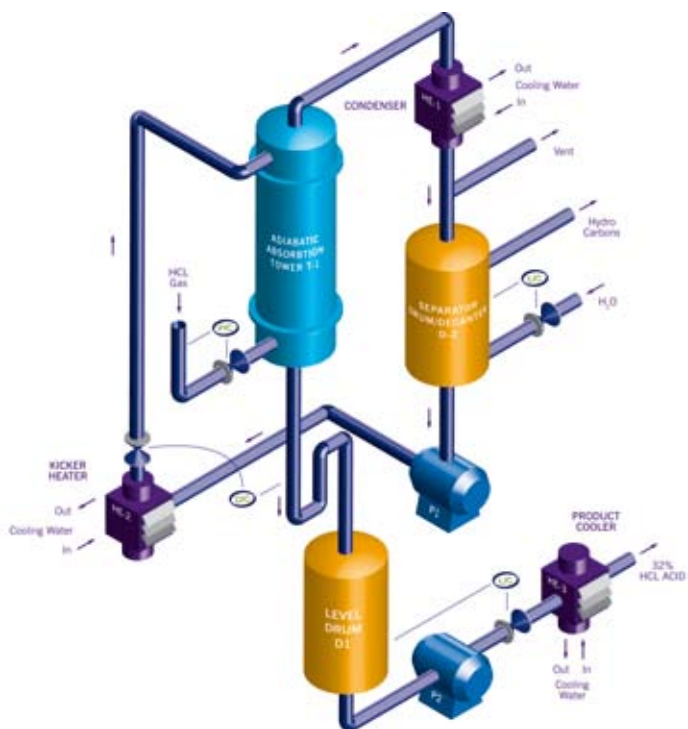
Gases such as HCl gas are dissolved in water in many chemical processes, particularly to store it, purify it or simply to use it in chemical reactions. This operation is called **absorption** which is an exothermic process.

Hydrogen fluoride and bromide are also concerned by the absorption process.

► *The absorption is completed in a Graphilor®3 column at atmosphere pressure. This column is widely used as a tail tower of HCl synthesis unit.*



Graphilor® 3 column



HCl Adiabatic Absorption

FLUOROPOLYMER LINED COLUMNS

PTFE Loose Lined Column

Armylor® Columns are manufactured in PTFE lined carbon steel. They are specially designed to comply with high temperature and to resist to corrosive environment. The PTFE liners are made by paste extrusion. PTFE lining is loose, thick and fully resistant to corrosion.

For diameter up to 64"

- Seamless liners
- Standard or heavy duty PTFE thickness (up to 10 mm)
- Fine powders of PTFE

For diameter more than 64"

- Welded PTFE liners
- Standard thickness 3 or 4 mm

Armylor® column is designed with an assembly of elements without gaskets in between.

To learn more about Armylor®

Armylor® is Mersen material made from PTFE or PFA. It is suitable for almost all corrosive fluids within the temperature range from -50°C to +230°C.

Since 1960's, Mersen has mastered all PTFE manufacturing processes such as paste extrusion process, isostatic molding, PFA transfer molding. This know-how allows us to propose the best fluoropolymer lining solution to your equipment.

Optionally, our column can be equipped with vacuum resistance system to withstand partial vacuum. As well, Mersen is able to offer double lining (ECTFE + PTFE) for more severe applications.

PFA, ECTFE, PVDF, FEP, PTFE sheet lined column

Fluoropolymer liners with fabric backing (in glass fiber or polyester fiber) are glued on carbon or stainless steel after surface preparation and then welded together.

There is no limitation in size and almost none in design of equipment.

Partial vacuum resistance is available.

Thickness from 1,5mm to 6mm.

Gasket are necessary for connecting flanges.

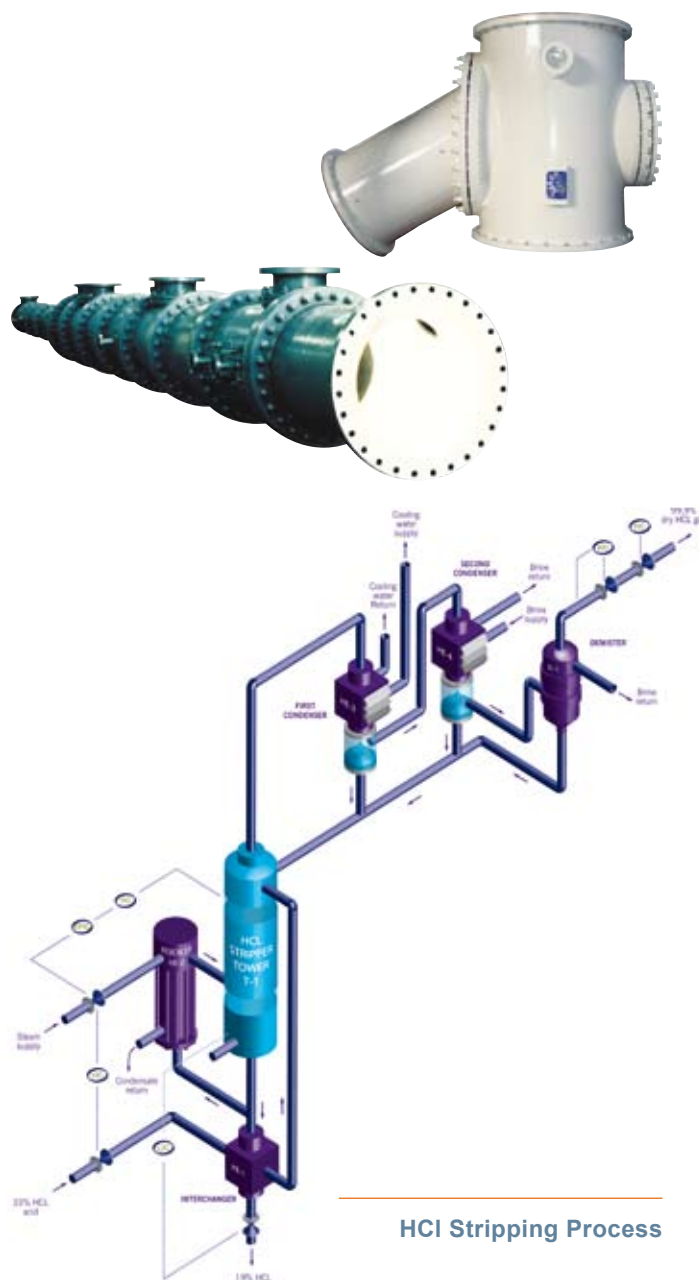
FOCUS APPLICATION: STRIPPING HCL

It is a system designed to produce HCl gas from a feed of hydrochloric acid solution, usually 33%.

► *The HCl solution is fed into the top of a column in Graphilor®3 Armylor®, PTFE or Tantalum CL-Clad®.*

The typical uses of pure HCl gas are:

- High purity silicon for solar cell or electronics applications
- Organic chemistry
- Various metallurgical processes



HCl Stripping Process

TANTALUM COLUMNS THE HIGH-END SOLUTION

We offer tantalum columns made by loose lining or CL-Clad® process. Tantalum CL-Clad® plates as well as zirconium and titanium, are exclusively produced in Mersen France and can be shipped to our American or Chinese plants for final manufacturing.

To learn more about CL-Clad® technology

CL-Clad® is a patented cladding process developed by Mersen (France). With this process, a thin layer of reactive metal (Tantalum, Titanium, Zirconium) can be cladded onto a carbon steel or stainless steel base plate. CL-Clad® technology is perfectly suitable for big thickness when design pressure is high.

The CL-Clad® columns have many advantages

- Cost-effective solution
- Excellent resistance to thermal and mechanical shocks
- Very low maintenance
- Reliable sealing for high pressure or vacuum applications
- High corrosion resistance against most process fluids

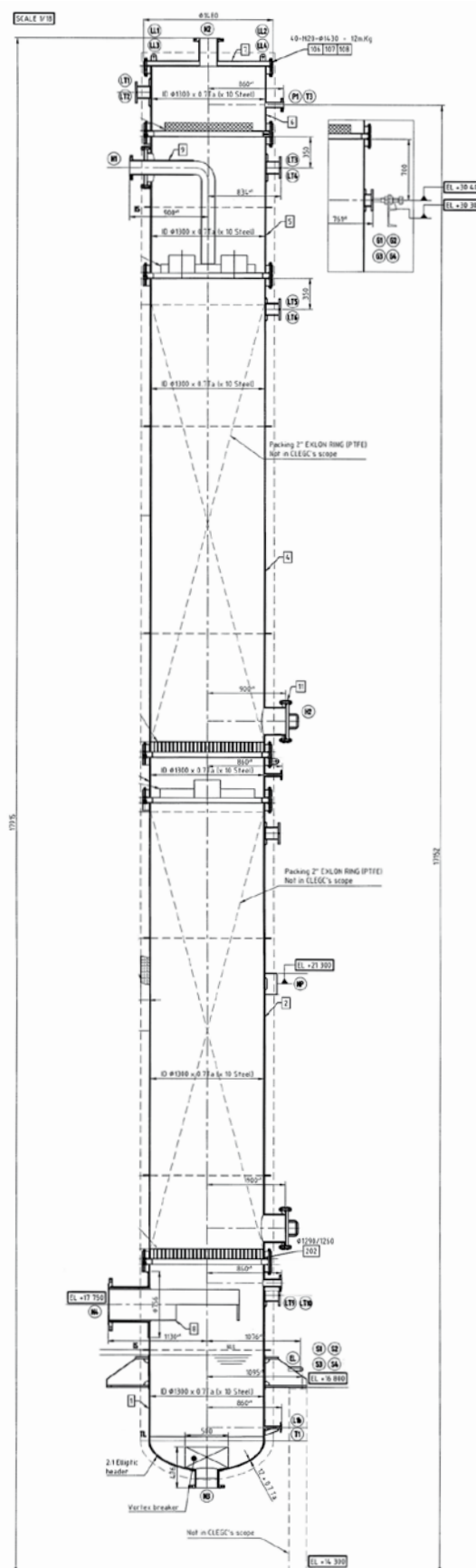
FOCUS APPLICATION: HCL STRIPPING HIGH PRESSURE

When a customer requires production of high pressure HCl up to 5 barG, the natural permeability of PTFE liner limits the use of Armylor® column. In such case, a design with reactive metal layer as Tantalum appears as the most reliable solution.

► We have several references of Tantalum CL-Clad® columns working satisfactorily under hard conditions.



Tantalum CL-Clad® columns



ZIRCONIUM COLUMNS

Zirconium columns are suitable in corrosive environments, notably for the production of acetic acid where Mersen is recognized as the number 1 in supplying zirconium columns and produces zirconium shell and tube heat exchangers and pressure vessels for the major producers of acetic acid.

A long expertise in the design and fabrication of reactive metal equipment combined with an international material sourcing policy allow Mersen to bring quality and cost-effective solutions.

Mersen has mastered solid or clad Zirconium fabrication processes for decades.

Mersen has developed a patented cladding technology, CL-Clad® already experienced on various Zirconium columns.

Mersen produces Zirconium columns in plants on 3 continents: 6000 m² in USA, 6000 m² in Europe and 13 000 m² in China.



Zirconium CL-Clad® columns

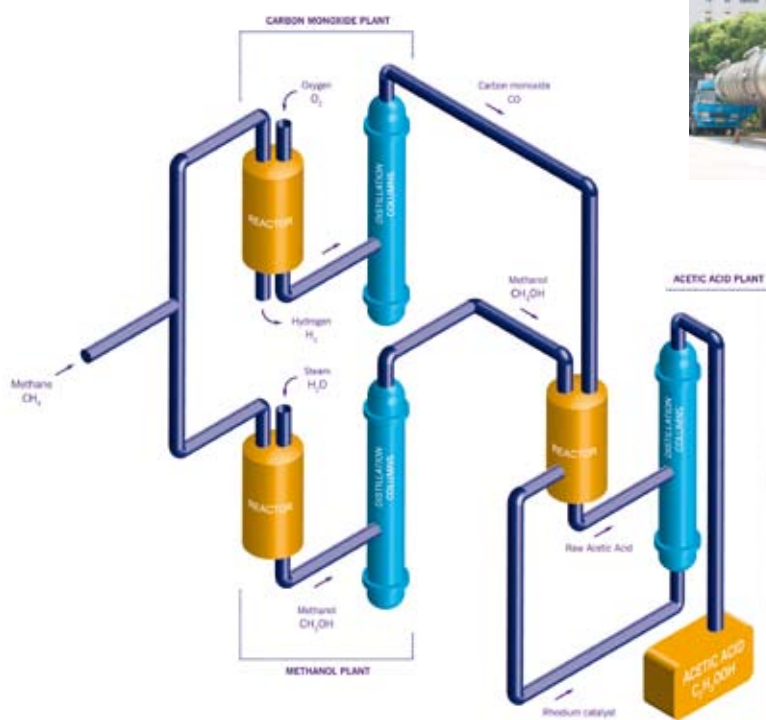
FOCUS APPLICATION: ACETIC ACID

Acetic acid is a chemical compound used in the manufacture of numerous consumer products, such as paints, cosmetics, plastic bottles and certain drugs.

► *Mersen is recognized as the N°1 in supplying zirconium equipment to the major producers of acetic acid: shell and tubes heat exchangers, reactors, columns.*

Type of columns in the acetic acid process

- Drying column
- Light-end column



Acetic Acid Process

TITANIUM COLUMNS

Mersen manufactures titanium columns (solid or clad) in its Chinese, French and American manufacturing sites. Mersen has a long experience in producing titanium columns, notably with a capability up to 7 m diameter.

To learn more about titanium

Titanium's resistance to the corrosive effect of salt water is among the best available. It is particularly resistant to metallic salts, chlorides, hydroxides, nitric and chromic acids. Different grades of titanium are available (pure and alloys). They can be selected based on corrosion requirements.

FOCUS APPLICATION: PTA

PTA (purified terephthalic acid) is an intermediate in various plastics production as Polyester or PET. Mersen, has a very large experience in supplying Titanium equipment to the major producers of PTA.

► *Mersen provides reactors, crystallisers, columns, heat exchangers and piping in titanium grade 2 for this application.*



As well, titanium columns are widely used for ammonia water stripping in the coke plant process



METALLIC COLUMNS NICKEL ALLOYS - STAINLESS STEEL - CARBON STEEL

Our metallic columns are mainly produced in China. Our 150,000m² plant allows the production of metallic columns up to 7m diameter and 60m long. All equipment such as heavy rolling, heavy cranes, heat treatment facility, sand blasting or painting, are fully integrated in our plant.



Carbon steel columns



Stainless steel column



Carbon steel columns



Carbon steel columns



Nickel Alloys columns



Mersen Xianda-Shanghai

INTERNALS AND ACCESSORIES

Mersen supplies various internals made of Graphilor® Fluoropolymer (PTFE, PVDF), metals (tantalum, titanium, nickel alloys, zirconium) or other materials on request.

- Demisters
- Spargers
- Distributors, re-distributors



- Support grids



- Packing rings: Rachig rings, saddles, structure packing
- Special pipes



GRAPHITE RASCHIG RINGS

Nominal Size (")	Dimensions OD/IDxL (mm)	Bulk density (kg/m ³)	Bulk number (pc/m ³)	Specific Surface (m ² /m ³)	Void volume (%)	Packing factor F (m ⁻¹)
¾"	18/11x18	700	130 800	259	0.62	1070
1"	25/16x25	660	48 800	187	0.65	700
1" ¼	32/22x32	590	23 200	146	0.68	460
1" ½	37/25x37	600	15 000	126	0.67	410
2"	51/38x51	500	5 750	92	0.73	230
3"	86/60x86	570	1 200	54	0.69	160

TANTALUM CL-CLAD® DISTRIBUTOR

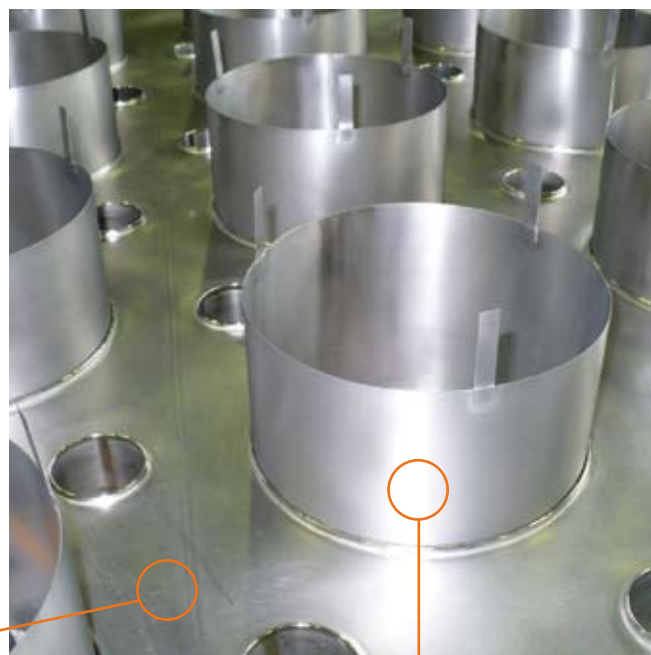
The Tantalum CL-Clad® Distributor is a combination of Tantalum CL-Clad® and solid parts.

Applications: Acid concentration

Key features of CL-Clad®

- Cost-effective solution
- Delivery time
- Mechanical strength

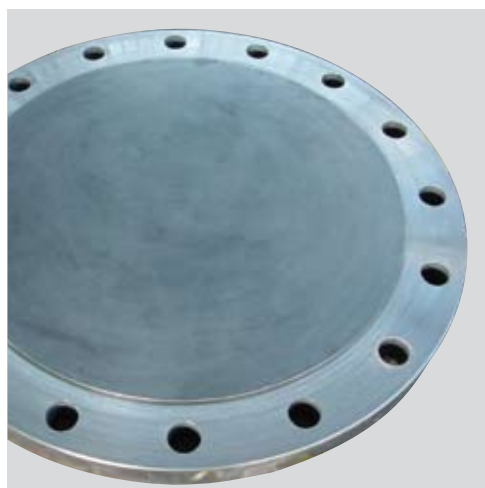
Tantalum CL-Clad®
a Tantalum layer brazed
with carbon steel base plate



Solid Tantalum

Tantalum CL-Clad® Distributor - Diameter 1 400 mm

Tantalum CL-Clad® Blind flange



Instrumentation





MERSEN
 Expertise, our source of energy

**A worldwide specialist
 in anticorrosion
 and process equipment**

Worldwide presence
 with several manufacturing
 sites and workshops close
 to our customers

Mersen France Pagny-sur-Moselle

- > 36,000 m²
- > Heat exchangers, pressure vessels, columns, piping, bellows and compensators, mixers, systems, bursting discs

Mersen USA Salem

- > 6,690 m²
- > Graphite heat exchangers, systems, welded plate heat exchangers, piping, bellows and compensators, bursting discs

Mersen France Brignais

- > 8,000 m²
- > Welded and gasketed plate heat exchangers, metallic shell and tubes heat exchangers, mixers

Mersen France Grévy

- > 8,000 m²
- > Specialist in equipment for the nuclear industry
- > Pressure vessels, columns, mixers, heat exchangers

Nippon Carbon Mersen

- > Distribution and repair shop

Mersen UK Teesside

- > 5,600 m²
- > Graphite heat exchangers, bursting discs

**Mersen Deutschland
 Linsengericht**

- > 3,000 m²
- > Tantalum equipment : heat exchangers, bayonets, heating coils, columns, accessories

Mersen USA Oxnard

- > 6,600 m²
- > Pressure vessels, columns, heat exchangers (zirconium, titanium)

Mersen India Chennai

- > 2,600 m²
- > Graphite heat exchangers, systems

Mersen Maroc El Jadida

- > 2,500 m²
- > Graphite and metallic heat exchangers
- > After-sales service, assembling

Mersen Xianda Shanghai-Fengxian

- > 150,000 m²
- > Heat exchangers, pressure vessels, columns, piping, mixers, systems

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