

etchform

Wickeder Group

Photo Chemical etching: unknown but versatile non-conventional machining process

MSc Eric Kemperman – MTC 2024

“if you can sketch it we can etch it”

Version 16-04-2024

etchform
Wickeder Group

Contents

1. Who are we?
2. Photo Chemical Etching
3. Technology matrix
4. Summary

1. Who are we?



“if you can sketch it we can etch it”

Version 16-04-2024

Etchform is...

- Founded in 1980. Through the years R&D has become an important asset, leading to many innovative developments. These developments have led to **Etchform**'s ability to offer our clients options with difficult to etch materials including Molybdenum, Silver and Titanium as well as a wide portfolio of services.
- **Etchform** (Hilversum) has long established strong partnerships for specific mass production in mainland China (Dongguan) and Malasia and for electroforming in Germany (Dortmund).
- As of 2019 **Etchform** has become part of **Micrometal**, a division of the **Wickeder Group**.
- The **Wickeder Group** is a global group of companies with production sites in Europe, America and Asia. The portfolio includes the production of metallic semi-finished products, as well as classic metal processing with innovative technologies covering the entire process chain. From design and development over the production of semi-finished products as well as fully or partially automated metal processing to the assembly of entire assemblies.
- **Micrometal** in Germany and its subsidiaries in Sweden and The Netherlands offer a full range of etching services, inclusive prototyping, one off up to high volume sheet and reel to reel etching.

Etchform is...



COMPLETE SUPPLIER for etching solutions made of metal

Micrometal	Etchform	HP Etch
<p>Inline Technology</p> <ul style="list-style-type: none">• High volumes• Complex structures• Thin metals• 0,025 - 0,4 mm	<p>Batch Technology</p> <ul style="list-style-type: none">• Small, medium volumes• Electroforming• Partner network• 0,003 - 1,5 mm	<p>Batch Technology</p> <ul style="list-style-type: none">• Small, medium volumes• Bending Technology• Paratechcoating• 0,025 - 2,00 mm
<ul style="list-style-type: none">• Stainless steels and other alloys• Nickel and cobalt base materials• Copper and copper alloys		
<ul style="list-style-type: none">• Amorphous materials	<ul style="list-style-type: none">• Molybdenum, Titanium	<ul style="list-style-type: none">• Aluminum

Full Service

Etched and electroformed parts often need one or more additional treatments in order to be able to fulfil their final purpose. These specialist treatments are mostly outsourced, which means your organization has to organize this which mostly is not your core business. Etchform offers you the option of taking Full Service products from us. In this way, we take up the entire chain management and responsibility for the end result from you.

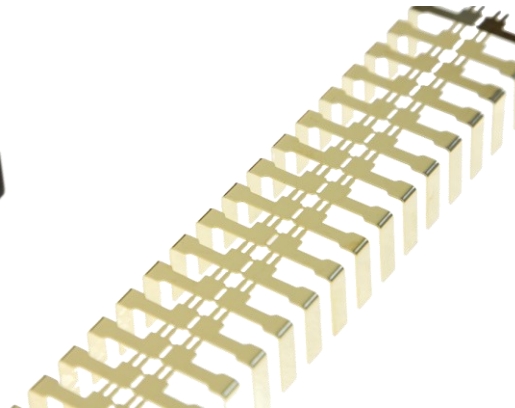
In short we can handle the complete supply chain for you.

Full Service

Etchform has anchored these complementary services within a strong network. Within this network, our partners work together to produce concrete added value in the field of technology, production and logistics. All of our partners are professionals who have been successfully working with us for a number of years.

Possible additional treatments include the following:

- assembly
- forming
- fine mechanical treatments
- heat treatments
- laser welding
- laser cutting
- surface treatments



2. Photo Chemical Etching

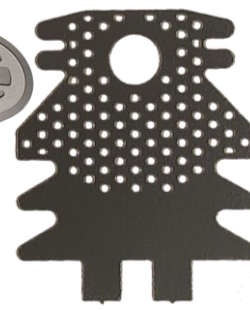
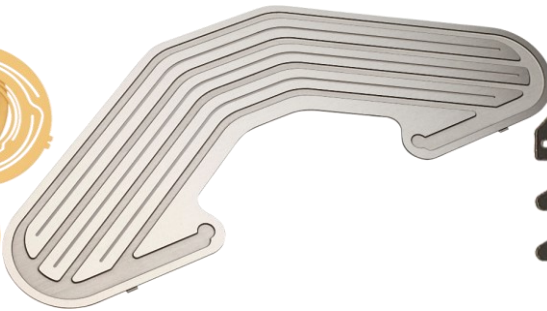
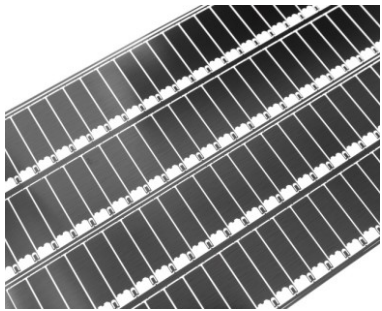


“if you can sketch it we can etch it”

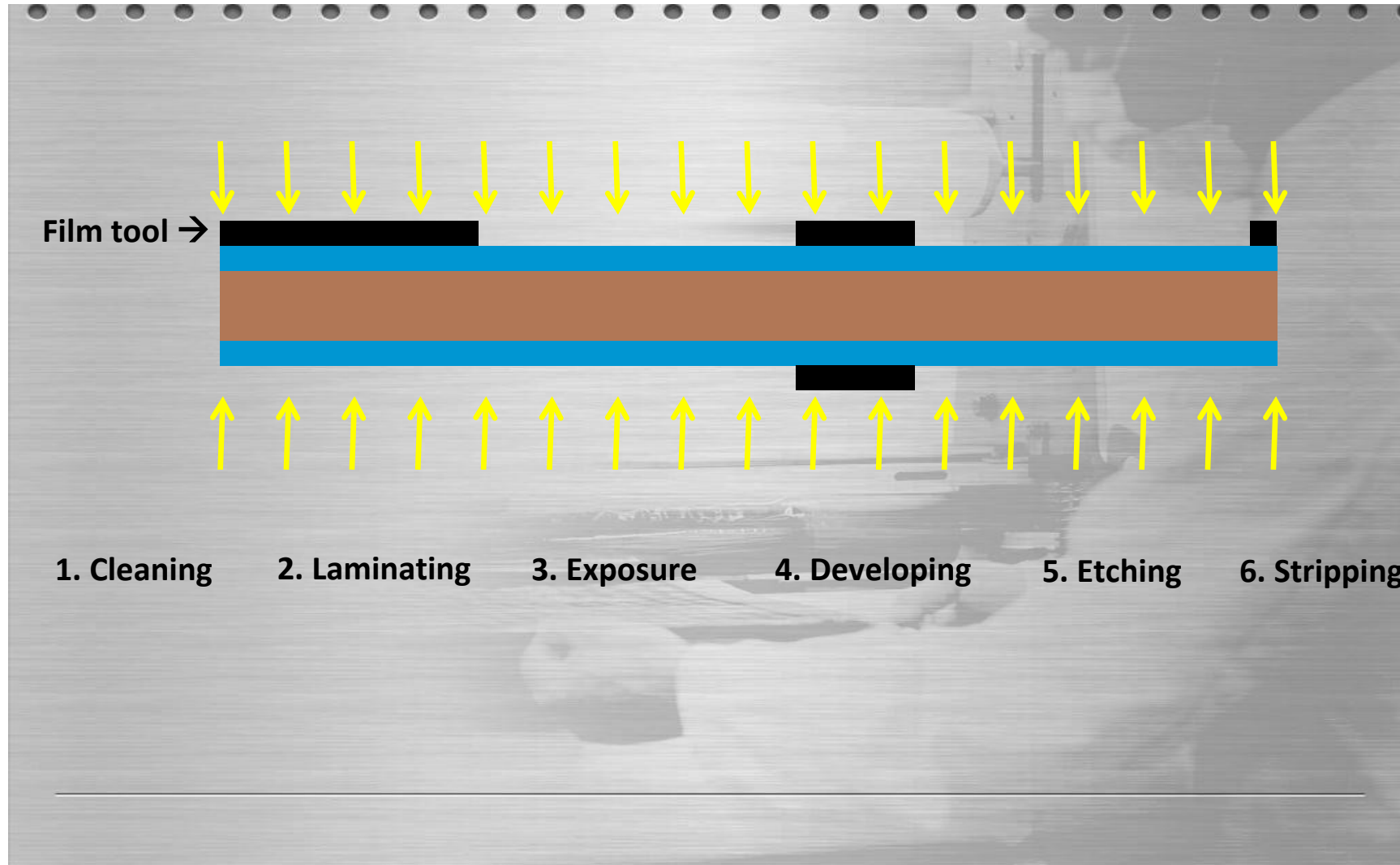
Version 16-04-2024

Etching is generally defined as...

“A process in which an acid dissolves a metal by means of a redox reaction. By protecting parts of a surface, etching can be used to make a pre-determined design”.



Process steps: Etching



Benefits

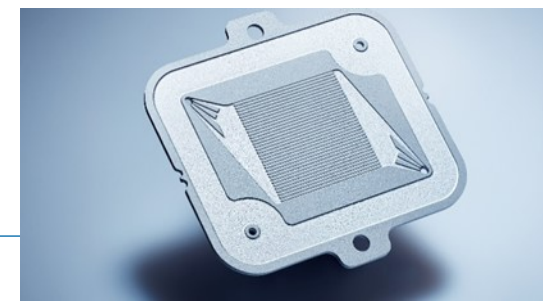
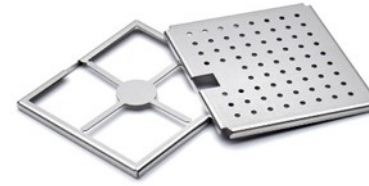
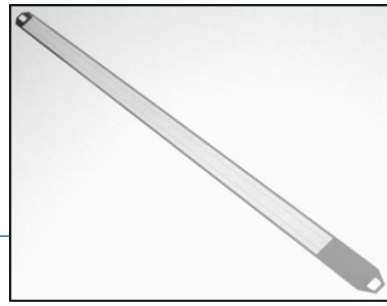
PHOTO CHEMICAL ETCHING

- Virtually any metal, also for metals on plastic carriers
- Material and its properties remain unchanged
- No additional internal material stress or warping, hardness and brittleness remain intact
- Burr-free, stress-free and flat products
- Product complexity has virtually no effect on the production costs
- Both the contour and the relief can be produced in the same process
- 2.5 D structures possible
- Quick start and flexible in the event of changes
- Limited tooling costs

IN GENERAL

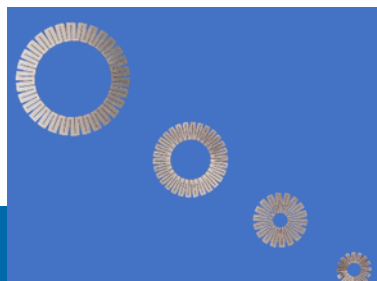
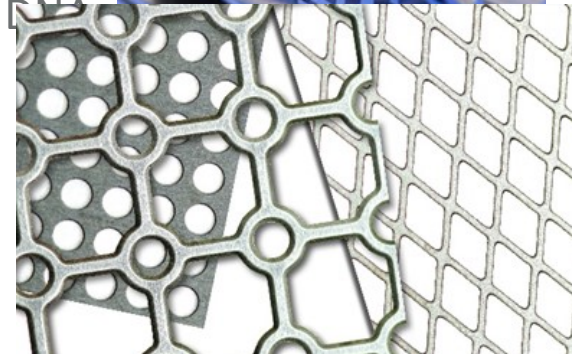
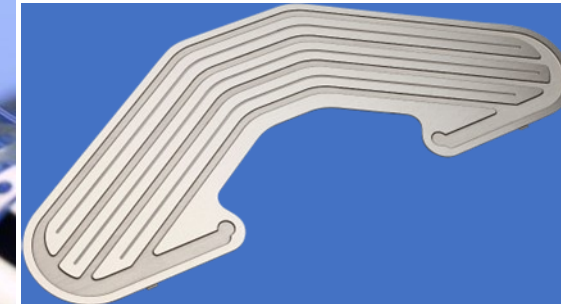
- Flexible in the event of changes
- High accuracies up to micro level are possible
- Suitable on-off up to mass production: sheet as well as roll to roll production

For all industries



Thin metal parts are made according to a drawing specification using various etching processes. Using our etching techniques, parts are produced in most (exotic) metals for virtually all industries, including:

- Automotive, for example filters and springs
- Digital printing, for example coronas and screens
- Electronics, for example connectors and shielding
- Energy, for example fuel- and distribution plates
- Aerospace, for example combustion plates and solar cell connectors
- Machine construction, for example gaskets and washers
- Medical, for example titanium implants and parts for (partial) dentures
- Optics, for example diaphragms and encoder discs
- Consumer, for example shaving foils and filters



Materials

- Aluminum
- Copper and its alloys Brass, Beryllium Copper, Phosphor Bronze
- Gold
- HyMu
- Molybdenum
- Nickel
- Stainless steels AISI 301, 302, 304, 310, 316, 321, 430
- Specialty alloys 7C27Mo2, Alloy 42, Elgiloy, Hastelloy, Inconel, Invar / Kovar
- Titanium
- Silver
- Composite materials Metal on PI, Copper/Invar/Copper, Copper/Molybdenum/Copper
- Etc.

Design Rules

Material thickness:

General: 3 μm - 2.0 mm
Titanium standard up to and including 0.5 mm
Other thicknesses are available on consultation

Dimension:

Standard up to gross 550 x 550 mm
In consultation up to gross 610 x 1.800 mm
Large series in thickness up to 0.4 mm endless

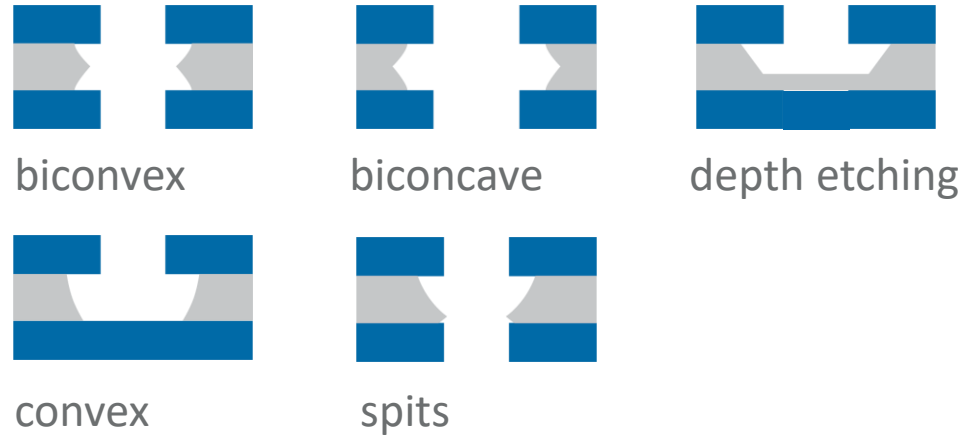
Tolerances:

Standard +/- 10% of the material thickness with a minimum of +/- 0.01 mm
This can however vary depending on the material and configuration

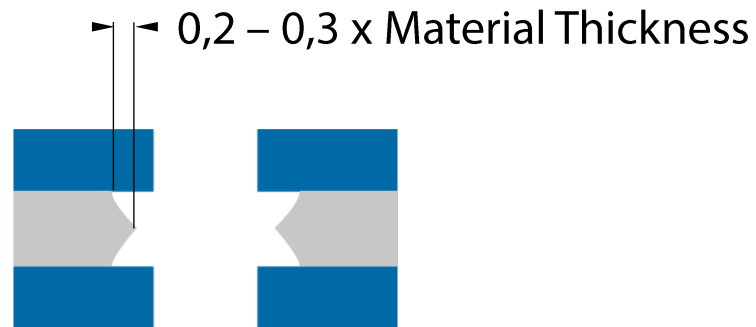
Special hole tolerances, for example H7, are standard etched undersized so that they can be reamed to size
We always use nominal dimensions as a starting point

Design Rules

Etching profiles:



Biconvex etching profile:



Design Rules

Dam and Sloth width:

- < 0,1 mm
- 0,1 - 0,2 mm
- > 0,2 mm

D=dam

1,2 T

0,1 mm

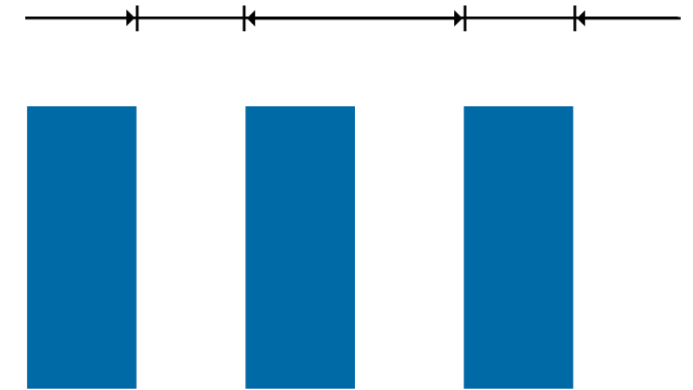
0,15 mm

G=slot/hole

1,2 T

1,1 T

1 T



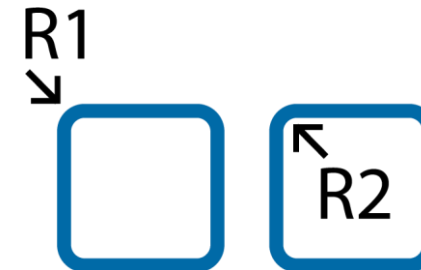
Internal and external corner radius:

R1

$\geq 0,75 T$

R2

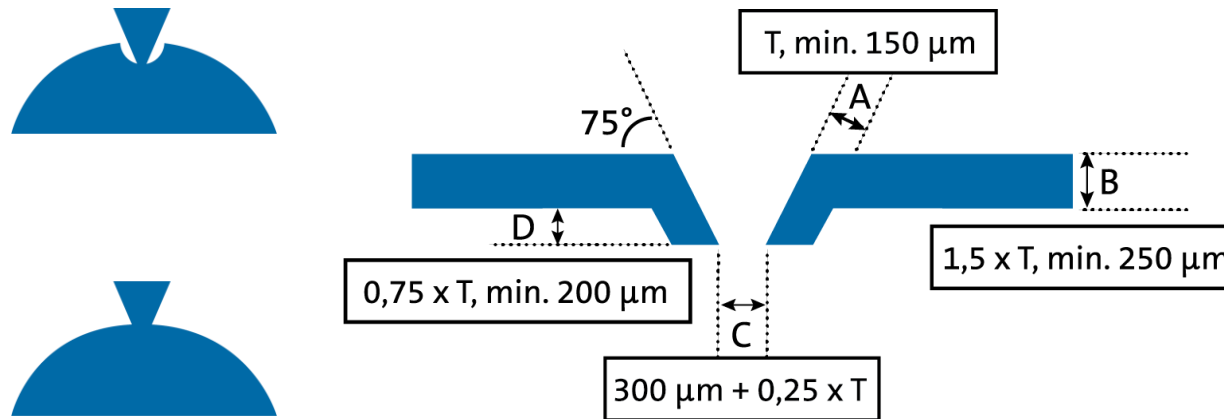
$\geq 1 T$



Design Rules

Connection tabs:

- Etching takes place in sheets in which products can be configured both separately and with connection tabs.
- It is preferable to etch with connection tabs: this is more efficient and gives a higher dimensional accuracy.
- Details connecting and recessed connection tabs:



T	A	B	C	D
(mm)	(mm)	(mm)	(mm)	(mm)
1	1	1,5	0,55	0,75
0,5	0,5	0,75	0,425	0,375
0,2	0,2	0,3	0,35	0,2
0,1	0,15	0,25	0,325	0,2





- In addition, etching can take place separately if connection tabs are not an option. This is more laborious and gives a somewhat larger tolerance field.

3. Technology Matrix



“if you can sketch it we can etch it”

Version 16-04-2024

	Etching	Laser cutting	Micro stamping	EDM	Water Jet cutting	Electroforming
Sample costs						
Mass production costs						
Metals	Nearly all metals	Nearly all metals	Nearly all metals	Carbon steel and most metal alloys	Except for very thin metals, nearly all metals	Predominantly nickel. Other metals: copper, silver and gold
Hardness	No restriction	No restriction	Problems with very soft, hard or brittle materials	Hardness is a consideration	Hardness is a consideration	Generally 200 - 670 HV
Stress	No stress	Thermal stress on the cutting edge	Stress at the cutting edge and close to it	Deformation, tempering and structural changes may occur in the material	Limited stress on the cutting edge	Low stress
Burrs	No burring	Micro burring	Partial burring	Micro burring	Micro burring	No burring
Design changes	Quick, easy, cost-effective	Quick, easy, cost-effective	Very costly and time consuming	Quick, easy, cost-effective	Quick, easy, cost-effective	Quick, easy, cost-effective
Tolerance as a % of the metal thickness	+/- 10%	+/- 5%	+/- 10%	+/- 10%	+/- 15%	+/- 5%

4. Resume



“if you can sketch it we can etch it”

Version 16-04-2024

Summary

- Photo Chemical Etching is a suitable technique for sampling and (small) series of complex, high accurate parts.
- Using reel to reel Photo Chemical Etching is also a suitable technique for producing parts in high volume.
- Photo Chemical Etching: the eminent technique for producing precision parts of almost all metals, innovative alloys and composite metals

etchform

Wickeder Group

**Photo Chemical etching: ~~unknown but~~
versatile non-conventional machining
process**

MSc Eric Kemperman – Precision fair 2022

“if you can sketch it we can etch it”

Version 16-04-2024

etchform
Wickeder Group

Thanks for your attention...

... Questions?

etchform

Wickeder Group

Etchform BV

Arendstraat 51

NL 1223 RE Hilversum

The Netherlands

www.etchform.com

erickemperman@etchform.com