

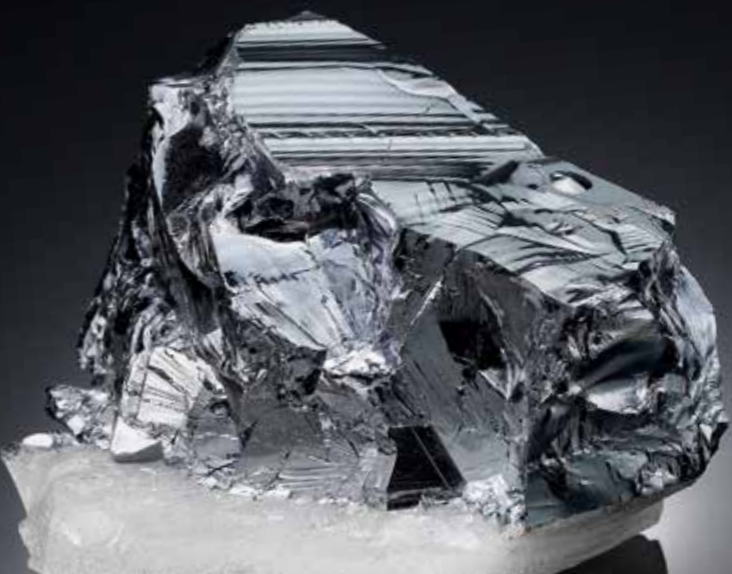
SILICON

A solution for the
manufacture of your
micro-components

Sigatec S.A.
microparts in silicon



The use of silicon as a micro-mechanical component began in the 70s with the development of MEMS (Micro-Electro-Mechanical Systems).



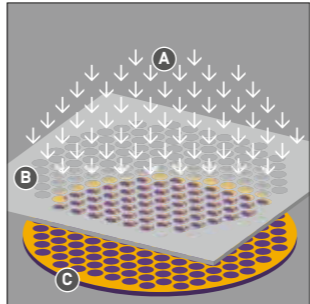
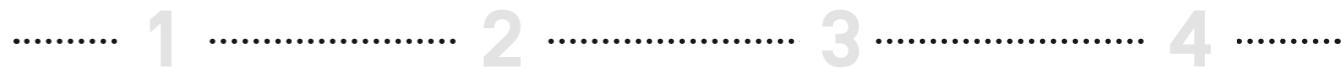
MANUFACTURING TECHNOLOGY

The most common manufacturing technology is deep reactive-ion etching (DRIE). This technology is made up of the following steps:

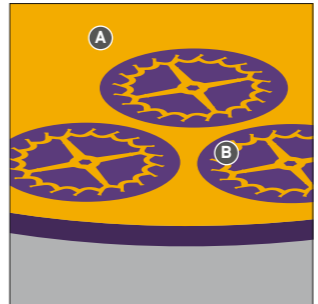
1. Wafer covered in photo-sensitive resin which is illuminated through a mask.
2. Resin is developed.
3. Deep etching of silicon (Bosch method).
4. Parts are removed.

Silicon is a material that:

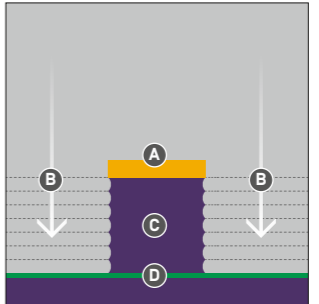
- > Is light : mass density of 2.33 kg/dm³
- > Is elastic : 130-170 GPa
- > Can be etched with precision at both micro-metric and submicro-metric levels.



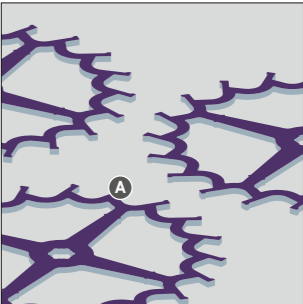
A Ultraviolet rays
B Photomask
C Silicon wafer



A Resin
B Aperture for the areas to be etched



A Resin
B DRIE etching
C Silicon
D Stoppage layer

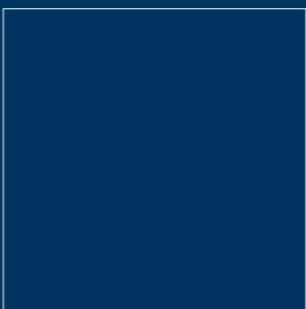
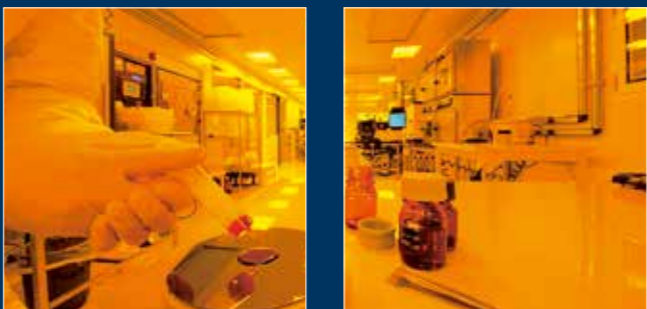


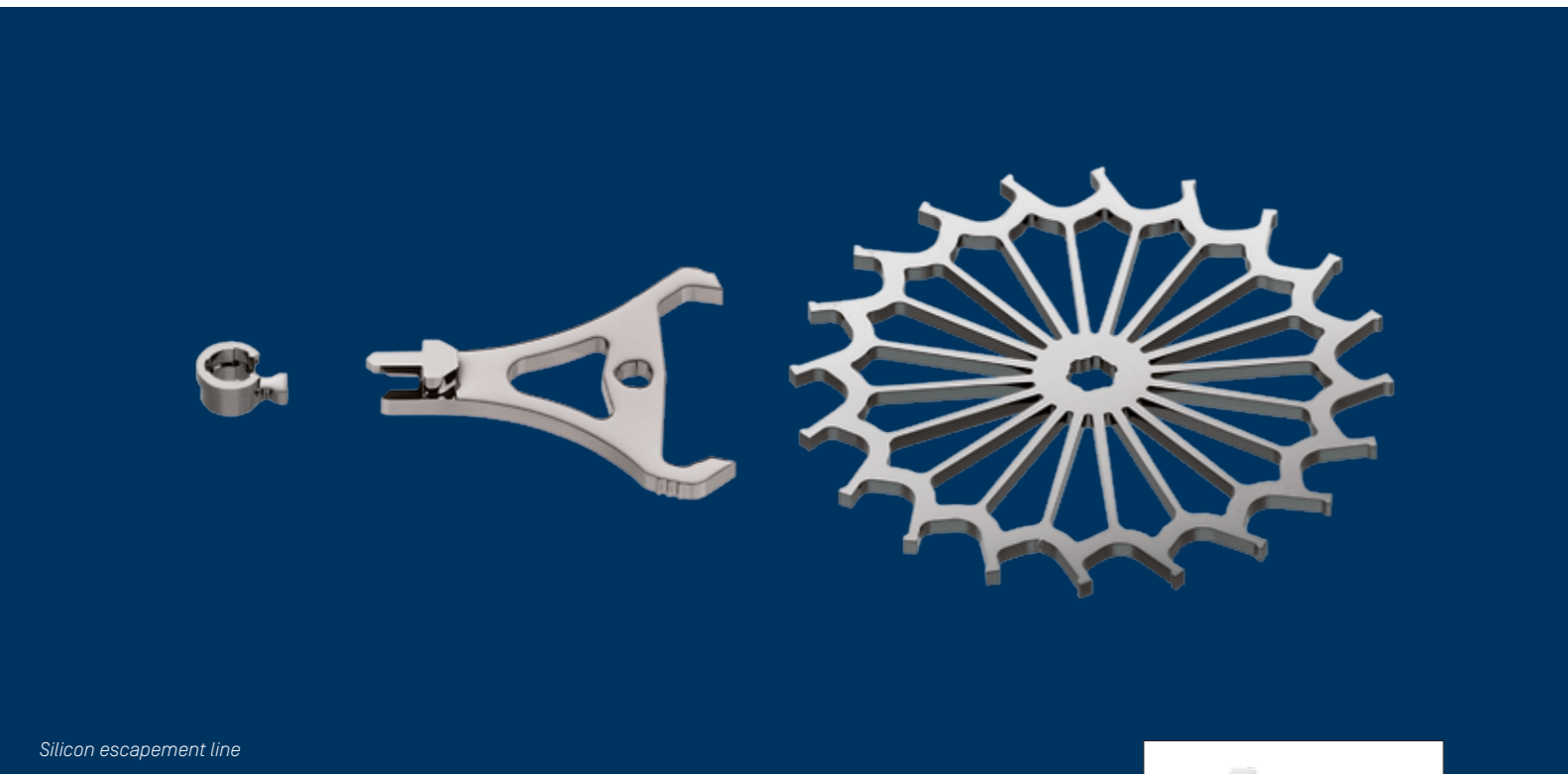
A Parts ready for assembly



Sigatec is specialised in the manufacture of silicon micro-mechanical components. Established in 2006, the company supplies these components mainly in the fields of watchmaking, aerospace and bio-medical needs.

The majority of our work is achieved in clean room, completely equipped for the design of silicon components. Our methods are optimal, whether for the manufacture of unique components or for series production up to 100,000 parts.





Silicon escapement line



MANUFACTURING PROCESS
ONE-LEVEL ETCHING
Part types
Anchors, escapement wheels



MANUFACTURING PROCESS
TWO-LEVEL ETCHING : CROSSED LEVELS
Part types
Disks, anchors



MANUFACTURING PROCESS
TWO-LEVEL ETCHING : SUPER-IMPOSED LEVELS
Part types
Escapement wheels, anchors



MANUFACTURING PROCESS
DRIE ANGLING



1. SURFACE OXIDISATION

Silicon component oxidisation improves mechanical resistance and tribology properties. Different thicknesses are offered, which can have an influence on the final colour. Standard thicknesses are from 0.5 µm [violet] or 1.55 µm [grey].

2. DIAMOND DEPOSIT DCS, Diamond Coated Silicon

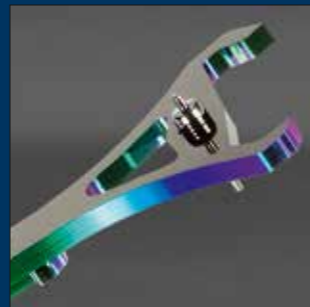
The technology which comprises of coating the components with a diamond nano-cristalline allows for the mechanical strengthening of the parts.

3. LATERAL SURFACE STRUCTURING

With the mastery of etching technology, Sigatec can structure flanks and optimize their usage. Moreover, decorative angles and surface friction optimization are possibilities [for example, wheel-anchor].

4. DECORATIVE AND HOLOGRAPHIC ETCHING

Through micro-etching one can cover silicon surfaces with motifs. These motifs are unique, customized and highly identifiable.



1. Surface oxidisation



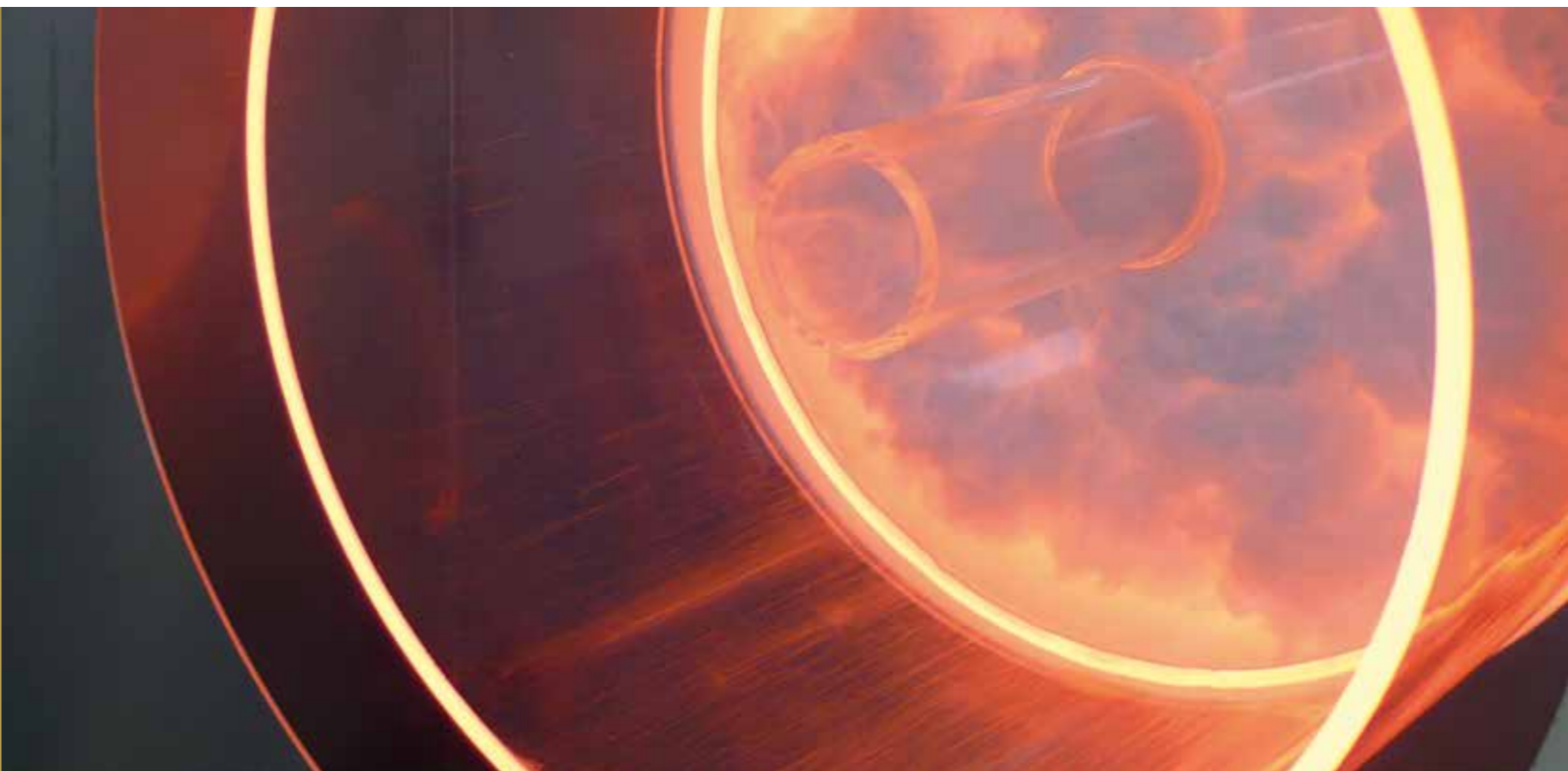
2. Diamond deposit



3. Lateral surface structuring



4. Decorative or holographic etching



1. BIOMEDICAL

The extreme precision of machining technology with silicon, combined with its metallic replication possibilities, opens the door to numerous technological breakthroughs in the following fields:

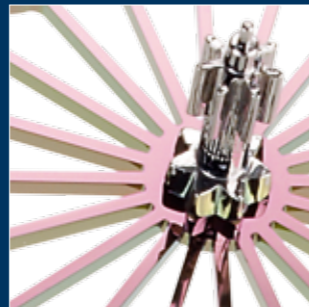
- > **Microfluid** microchannels
- > **Cell traps** and a selection of cells via wells and dead end channels

2. FILTERS AND MICRO-CAVITY DIFFUSERS

Cavities of various shapes and micro-metric sizes are achievable in silicon or via metallic replication. Utilization in the fields of diffusion and product filtration.

3. CONNECTING PLATES

Silicon structuring precision is also used in the field of connectivity.



COMPONENT ASSEMBLY

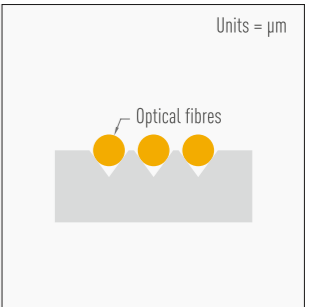
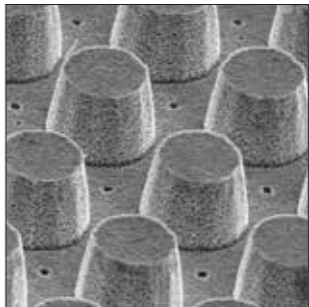
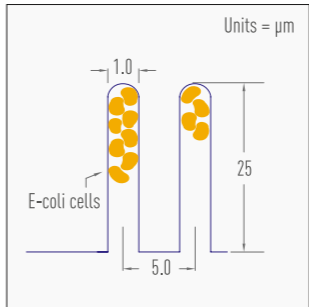
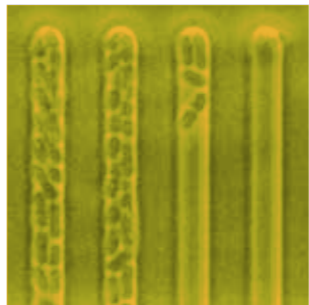
Sigatec offers the possibility of final silicon component assembly to its clientele, thereby allowing our customers to receive the parts ready for use.

We have developed our know-how in the following fields:

- > Gluing procedures
- > Geometric testing of assembled parts
- > Torque and strength tests



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