Silicon is a fascinating semiconductor material. It is the second most common material on earth after oxygen. It is the foundation of rapidly growing industries like electronics, multimedia and communication, and it is the root of the most sophisticated and advanced technologies.

Topsil produces the purest silicon of all, the Float Zone silicon (FZ). Our products are at the heart of most electronic appliances. A trusted position we aim to fulfil with dedication and commitment.

It is Topsil’s mission to meet the needs for Float Zone silicon of the electronic industry. By focusing on research, rapid product development, advanced production methods and high quality we offer a variety of silicon solutions for every purpose. Our flexibility and close customer relationships enable us to adapt to an ever-changing market.

Over the last 20 years, the demands from the semiconductor industry have grown with an average of 17 per cent per year. But the figures cover a wide spreading with no average years. Despite expert statements, it is incredibly difficult to predict the development of the semiconductor industry and thereby the silicon market.

At the same time, the silicon market is probably one of the most competitive in the world. Fast changing technology combined with an unpredictable balance between demand and supply makes it a real challenge to provide the right products to the right price at the right time. Clear goals are required to succeed in such a competitive environment.

Topsil aims to be the world’s leading supplier of FZ silicon. In order to reach this goal, we focus on growth, value and human resources. Our goal brings people and resources together and focuses the energy. And the process is catalysed by a high degree of communication and motivation. By releasing the creativity and energy of our employees we will fulfil our vision.
Topsil Semiconductor Materials A/S has more than 40 years’ experience in the silicon business. Topsil is the only silicon supplier in the world, who has specialised exclusively in the production of FZ silicon.
A crucial link

FZ silicon is a semiconductor material used for the production of power electronic and detectors. It forms a crucial link in our customers’ supply chain. A matter of vital importance left in trust to the most efficient and reliable supplier.

Topsil has more than 40 years’ experience in the silicon business. We are the only silicon supplier in the world, who has specialised exclusively in FZ silicon. And our expertise is reflected in the quality of our products.

Topsil’s research and development is in line with market demands. To optimise the products, we are constantly moving closer to our customers and suppliers. We believe in partnership and alliances. Through joint product development, market forecasting, EDI (Electronic Data Interchange) and long term agreements we are able to make a difference.

The difference manifests itself through improved competitiveness and a fast and flexible support service. As a small and agile supplier, Topsil is able to adjust production to the exact needs of each individual partner. And our orders are always delivered in the right quantity and quality at the right time.
The FZ single crystal is sliced into wafers supplied in CFZ, PFZ, NTD and HPS qualities.
From poly-crystalline silicon, the mono-crystalline FZ ingots are grown onto the seed crystal. The poly-silicon is melted using an induction coil.
The Inner Diameter sawing method is normally used for slicing small and medium wafer quantities. Operators are trained to master more than one job function. This provides a higher degree of job satisfaction and flexibility. Each production unit is run by an autonomous team, which gives the individual maximum influence on the actual work situation.

As raw material for semiconductors, silicon is used in all electronic components. Silicon has an extreme purity with excellent electrical properties, and it is abundantly available in ordinary sand.

Topsil silicon substrates are based on the FZ technique for crystal growth. That means, that poly-silicon is melted by a high frequency induction coil. From a 6 mm thick seed crystal beneath a melt droplet, a single crystal can be grown to a specified diameter. All it takes is an adjustment of the pulling speed and applied power.

The electrical properties of FZ silicon are controlled by adding a phosphorus or boron contented gas to the molten zone. Alternatively, a Neutron Transmutation Doping “NDT” technique is applied. Here the silicon single crystal is irradiated in a nuclear reactor, so that the silicon atoms are converted into phosphorus atoms. The effect is a precise control of the electrical conductivity. A key feature for very high voltage components.

Wire Cutting is ideal for slicing large quantities of thin wafers. With wire cutting it is possible to slice up to 1,800 wafers in one operation.
Slicing damages are removed by lapping the wafers and the subsequent etching process leaves a totally damage-free crystal surface. All parameters of chemical treatment are strictly controlled.

The edge of the sliced wafers is automatically rounded.

When the single crystal has been made, it is cut into wafers. Topsil uses ID-cutting as well as wirecutting technologies in the production.

The choice of technique depends on wafer thickness. With wirecutting, it is possible to cut large diameter ingots with high accuracy and similarity. Something, which saves money and material in large scale production.

The cutting process is fully automated and optimised. We have data acquisition of all essential parameters. In this way, it is possible to analyse product quality in relation to the specification and to make changes to match specific customer requirements.

Ordinary sand is refined into 99% pure silicon powder. Afterwards, a distillation process produces a gas of very high purity, which is finally deposited as poly-silicon. Poly-silicon is the raw material used for producing FZ single crystals.

The wafer mark machine generates lettering on the surface of the wafers. Thereby it is possible to identify batch number and wafer number.
FZ silicon is used for rectifiers, power transistors, diodes, thyristors, GTO’s and IGBT’s. Semiconductors are found in every traction system from drives to electric cars and trains.

Windmills, power plants and power distribution lines depend on power electronics. Without FZ semiconductors, modern society would come to a stand still.

With electronic information systems and multimedia communication technology, the use of FZ silicon has reached new heights.

After cutting each wafer, it is lapped, etched and polished to a smooth, highly reflective, mirror-like surface. Each wafer must be absolutely free from particles and microscopic damages, so the final inspection takes place in a clean room, where particles and minor scratches as small as 0.1 µm can be detected. As extra quality assurance each wafer is laser marked and numbered to enhance traceability upon request.

These wafers are the basis for all functional electronic devices.
In the clean room, wafers pass a wafer scrubber machine to remove particles after polishing.

Resistivity can be very precisely controlled by irradiating silicon single crystal in a nuclear reactor. The Neutron Transmutation Doped silicon, NTD, has a high electrical performance.

Crystal growth of FZ is Topsil’s core competence and we are always investing in the development of new products and processes.

In power electronics, there is a constant demand for even higher voltages, currents and for less power consumption. This calls for tighter resistivity tolerances. In compliance with our customers, these demands are the driving force of our product development. Currently Topsil is working on alternative products. This development is based on trials of dedicated FZ-pullers, analyses and numerical simulations.
At the same time, customers call for cost reductions, which also have also been obtained by increasing the diameter of the crystal, together with yield improvement programmes in the production.

As an innovative and flexible producer, Topsil focuses on process control and cost reduction programmes. For example, we have designed and built our own FZ pullers. Cost effective wirecutting confirm our flexibility in relation to wafer thickness. Our latest acquirements include lasermarking and particle counting equipment after polishing in the clean room.

Topsil is at the front edge of FZ technology. An accomplishment, which has been recorded and recognised by the entire semiconductor industry.
Topsil’s premises were drawn by architects, who fit the buildings in a landscape of meadows and hillsides. Part of the inlet is a protected natural reserve. An extra incentive to ensure that all manufacturing activities have absolutely no adverse effects.

An attractive place of work

Topsil’s human resource policy focuses on the individual. It is the knowledge and skills of the individual combined with personal commitment and flexibility that forms the foundation of our activities and development.

The demands on Topsil’s products and productivity are constantly increasing. We stand up to the challenge with a flat, unbureaucratic organisation where knowledge and information flows freely. In this way there is no limit to the growth of personal and professional skills.

In the production, autonomous teams are responsible for the decision making. Each employee exerts a great influence on his working conditions. Operators are trained to master more than one job function, and this provides a higher degree of job satisfaction and flexibility. Considerable efforts are invested in training and education programmes, and there are personal development plans for every individual in the organisation.
Topsil seeks to create a strong company spirit based on the dynamics between the individual and the corporation. We offer a creative professional environment, where each individual thrives while working with others in pursuit of common goals.

Market trends and forecasts from our customers are analysed and used to plan the production.

Natural balances

Topsil is situated on the bank of Roskilde Fjord. A natural site for a company that originates from a human desire to explore the world and use the experience to enrich life.

The city of Roskilde was the base, from where the Bronze Age Vikings set out to explore the world. They brought home knowledge and treasures achieved through trade or raids in a world where everyone guarded his own findings.

Today the area is accommodated by high technology companies, universities, and Risø National Laboratory. The landscape is rich on woods, fields and inlets. A cherished recreational area for the community and employees.

Just like the Vikings we feel committed to guard this area and prevent pollution of the land, the air and Roskilde Fjord. For Topsil it is an ethic ambition to obtain environmental certification and to minimise the impact of our manufacturing activities on the environment.
Topsil is committed to quality in every aspect of operation. We have an obligation to manufacture products of a high uniform quality, and we have taken the required measures.

One measure is a high production efficiency and constant productivity improvements. Our quality is based on teamwork, and all department performances follow a joint score and conduct.

Second, Topsil's organisation development focuses on management skills and awareness. We have chosen to make our quality management visible and operative.

Third, all critical milestones are kept under close observation. All quality related inputs, spanning from claims over corrective and preventive actions to improvements and development projects, are part of this superior quality strategy. Through visible and obtainable goals we ensure a high product quality for all production teams. Data from the statistic process control, the so-called SPC-data, are reviewed every day at meetings in the QA department.
Topsil supplies products of a high and uniform quality on time - and matching the specifications and expectations of the customers. In order to send a clear signal to present and future customers, our quality policy is certified according to ISO 9001, accomplished and maintained by Lloyd's Register of Quality Assurance.

By focusing on quality we are able to control production process and enter a close partnership with our customers. The purpose of the partnership is to create added value. To the benefit of the products, the customers and the business.
Topsil is dedicated to production of float zone silicon products and is recognised as the flexible supplier to all applications and customers.

It is Topsil’s mission to meet the electronic industry’s need for FZ and CZ silicon. Our customers demand constant improvements in terms of quality, reliability and cooperation. Consequently, our top priorities are R&D, process improvements and education.