



Innovative Technology Leaders

Swiss companies operating globally



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International leaders – at home in Switzerland

With its innovative services and products, Switzerland has occupied a leading position in the international rankings for many years. Success like this does not come from nowhere. A country that is poor in commodities needs to be innovative if it is to be economically successful. This is particularly true of the Swiss electrical and mechanical engineering industries (MEM industries), which export around 80 percent of their products and must therefore operate in a globally competitive environment.

What are the key pillars of Switzerland's success in this area? An outstanding education system is clearly a vital element. Well-qualified workers at all levels of a company are a key prerequisite for a company's ability to innovate. Switzerland's tried-and-tested apprenticeship model allows young workers to acquire training in the real world. The permeability of the Swiss education system then allows them to develop professionally in a way that is tailored to individual needs, while at the same time responding flexibly to the requirements of the labour market. The courses at Switzerland's tertiary education institutions are likewise of the very highest calibre.

In addition, Swiss universities possess excellent research institutes, which represent an important source of innovation for large companies and SMEs, both with their research activities and through partnerships. Then there are the companies themselves, whose dedication to innovation is evident just from the significant financial resources they channel into research and development (R&D): More than two thirds of all R&D expenditure in Switzerland is financed by companies.

The Swiss MEM industries operate in an extremely diverse high-tech sector offering high-performance solutions in all key areas of business and people's lives, and are systematically geared to their customers' needs. They succeed by having their finger on the pulse of the market at all times and adopting developments at an early stage. In this magazine, we introduce some of the technology trends with future potential in which our companies and their products are heavily involved – and rank highly in the international league tables.

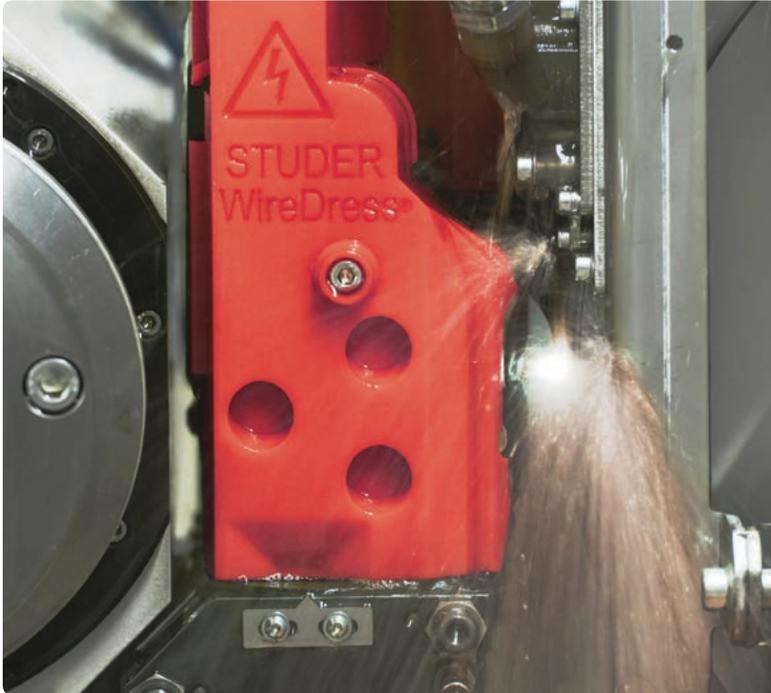
Precision manufacturing



In Switzerland, the tradition of manufacturing highly precise metal parts can trace its origins back to the beginnings of the watchmaking industry. This activity now centres around extremely skilled companies that make machine tools and state-of-the-art precision tools. Products that enjoy world renown include long-turn Swiss type lathe machines together with products for cylindrical grinding and electrical discharge machining. The product and services spectrum has also featured innovative ways of processing precision parts and micro-parts with lasers for a considerable while now. With the development of high-performance diodes and ultra-short pulse lasers, applications such as laser ablation and the processing of diamond tools can be industrialized.



The success of today's companies is based on a long tradition of precision engineering in Switzerland, which has enabled valuable expertise to be built up.



Unique dressing technology **Fritz Studer AG**

Brand new possibilities for grinding with metal-bonded grinding wheels: this is what the integrated electro-discharge dressing technology WireDress® can do – which also drastically cuts auxiliary times. Compared to ceramic and resin bonds, grinding power can be increased by 30 percent and grinding wear reduced by 70 percent. Grinding wheels with particularly finely structured contours can also be polished.

With **STUDER-WireDress®** the company has brought a brand new dressing device to the market, which works on the principle of wire erosion and is completely integrated into the cylindrical grinding machine and its control system. No dismantling and resetting of the grinding wheel is necessary.

The wheel is extremely sleek thanks to the grit-free stand. This means that more grinding oil ends up in the grinding gap, facilitating a high feed rate as well as low tool deflection. The dressing intervals may also be longer. As so little work is involved in the dressing process, however, dressing can also be undertaken at shorter intervals for particularly complex contours. The **STUDER-WireDress®** dressing system repays the initial outlay in less than a year.

➔ www.studer.com

Lean management written large **DIXI Polytool S.A.**

DIXI Polytool S.A. specializes in the production of solid carbide and polycrystalline diamond (PCD) precision tools, as well as the manufacture of forming tools and precision reamers. The lean manufacturing principle has been applied in the production process since 2013. Together with ongoing investment in the machine park, this has resulted in continuous increases in productivity. Quality and environmental protection are written large at DIXI Polytool S.A. Lean manufacturing is now applied to the entire production process. In addition to a complete reorganization of manufacturing processes, the human factor plays a crucial role. Adding value for the customer lies at the heart of the project: shorter lead times for state-of-the-art products and rapid availability thanks to the stocking of standard products.

➔ www.dixipolytool.com

A legacy of innovation **Tornos AG**

Since 1914, when Tornos began manufacturing “Swiss-type” automatic lathes, the company has built up a legacy of innovation, becoming a globally acclaimed provider of future-shaping manufacturing solutions. Today, the company's complete portfolio of products includes both single- and multi-spindle solutions. Backed by its extensive industry-specific expertise, Industry 4.0-enabling software and a wide range of value-adding services, Tornos remains true to a singular promise: We keep you turning.

➔ www.tornos.com

Materials and coatings



Coating has an important role to play when it comes to the precision manufacturing of hard and difficult materials or if high durability needs to be ensured. For many decades now, Swiss companies have occupied a globally leading position in the area of coating solutions, surface structures and nanoscale products. No production tool can be used nowadays before it has acquired a coating, which makes this aspect an integral part of the production process. Here too, precision and experience are essential if coats are to be applied with micro-accuracy to a perfectly uniform degree, particularly when it comes to the radii of cutting edges. Innovative solutions in this area increase service life considerably, play an important role in the functionality of products and reduce costs dramatically.

Innovative coating technologies from Swiss companies increase service life, are key to the functionality of products and reduce costs dramatically.

A world first in the sphere of hard coatings

Platit AG

As a result of continuous development, PLATIT® has emerged as the leading high-tech company for compact PVD (physical vapour deposition) coating equipment and turnkey systems. The latest π411PLUS coating unit can be ideally tailored to the individual and technological requirements of the customer thanks to its modular construction. An absolute world first, it simultaneously combines two technologies – arc evaporation and sputtering in the coating process. This enables the performance of hard material coatings to be increased even further.

→ www.platit.com

State-of-the-art technology for hardening processes involving stainless steel

Härterei Gerster AG

Thanks to HARD-INOX-S, traditionally non-hardenable stainless steels can be made wear-resistant and protected against both cold welding and fretting damage. In addition, the corrosion resistance remains high. This innovative hardening process is suitable for numerous applications such as valves, shafts, bushes and fastening elements, and is deployed in numerous different sectors of the economy, including the food industry.

→ www.gerster.ch



BALIQ® TISINOS: the innovative coating for complex cutting applications

Oerlikon Balzers

New materials, and in particular ever more complex and tiny component geometries, make extremely challenging demands on cutting tools. The quality of the applied coating has the effect of improving tool performance.

An example of the technological expertise of the global supplier Oerlikon Balzers is the S3p® (scalable pulsed power plasma) coating technology, which combines the benefits of the arc evaporation and sputtering coating procedures: Longer, high-power impulses deliver a strong ionization of the coating, which is characterized by extraordinarily smooth, homogeneous surfaces, as well as exceptional density, hardness, adhesive strength and wear resistance.

In today's micro-cutting industry, tools with dimensions of less than 1 mm process complex micro-scale components in the 1 mm – 1 cm range, whose manufacturing tolerances lie in the µm area. In order to deliver precise, sharp cutting wheels, precision tools need coating thicknesses accurate to the nearest micro-metre. It is precisely in this area that the extremely powerful BALIQ TISINOS tool coating solution has made waves in the market.

Customers make significant cost and time savings thanks to longer tool life times and high process reliability.

→ www.oerlikon.com/balzers

Digitalization

Industrial production in Switzerland is highly automated, and value creation chains are globally organized. Both the spectrum of machinery and the infrastructure as a whole meet the highest demands. Digitalization is enabling Swiss companies to increase their efficiency even further as well as minimize the use of resources. In addition, it facilitates more flexible production, which in turn means faster delivery times and the commercial production of smaller batches. Furthermore, the customer benefits from new product options. But digitalization is also a driver of innovation. In addition to new, smart products, Industry 4.0 technology opens up opportunities for the marketing of new services and the introduction of radically new business models.



Swiss industrial companies are already far advanced in the implementation of Industry 4.0 concepts, and are successfully exploiting their potential.



Finishing 4.0 for sophisticated, digitally-printed print products **Müller Martini AG**

Declining print runs and growing product diversity combined with the boom in digital printing present major challenges for the graphic arts industry. Müller Martini's Finishing 4.0 development strategy encompasses an array of innovative, cleverly combined industrial print processing solutions for both the digital and offset printing markets. Thanks to very close networking, systems are capable of preparing for print runs wholly automatically, before then initiating and executing production with the minimum of manual intervention. This requires a seamless production workflow, a high degree of automation and precise mechanical engineering. The systems of Müller Martini coordinate these three elements and thereby facilitate a touchless workflow. This in turn allows for the highly efficient production of personalized, format-variable products in print runs of just one copy. The fact that these business models are increasingly being used by numerous printers and bookbinderies sends a clear signal that the company is headed in the right direction with Finishing 4.0.

→ www.mullermartini.com

Custom-built machinery **LCA Automation AG**

LCA Automation AG has been developing and building customized machinery for factory automation, process engineering and manual assembly since 1972. The company teams up with its customers to develop and build sophisticated equipment in its own factory. Commissioning happens worldwide and direct support is granted through wholly owned subsidiaries in the key markets China and Mexico. PLC development and high level language programming as well as data capture/analysis come as standard features for LCA custom built systems. Customers value the partnership with LCA to engineer, build and support complex mechanical systems to achieve world best production efficiency. Furthermore, service and support at LCA Automation AG is a strong commitment to customer satisfaction and available 24/7.

→ www.lca.ch

A new generation of digital fine-boring heads **BIG KAISER AG**

With the EWE 2-152, BIG KAISER offers a new generation of digital fine-boring heads with wireless connectivity. A single button ensures that handling is simplicity itself, virtually ruling out incorrect manipulations. The EWE connects wirelessly with a specially designed app in order to help the user determine the optimum cutting parameters. This makes it possible to adjust positional accuracy to $\emptyset 1\mu\text{m}$ while also saving the last 100 settings. In addition, the EWE comes with an automatic switch-off mechanism that automatically saves the most recent display value.

→ www.bigkaiser.com

Advanced manufacturing

Efficient and intelligent production coupled with efficient organization is a hallmark of Swiss companies. Digital technologies, simulations and additive procedures are increasingly being integrated into production processes. Together with traditional strengths such as flexibility, client proximity and proven strength in innovation and precision, expertise in the area of advanced manufacturing gives Swiss industry a cutting edge. These strengths are enhanced by networking with internationally leading tertiary education institutions, a dynamic start-up landscape with close links to industry, and outstanding research centres.



Switzerland's outstanding universities and research institutes are key in enabling companies to use pioneering technologies at an early stage.



Precision and high-speed solutions with state-of-the-art connectivity options

GF Machining Solutions

GF Machining Solutions is a globally leading manufacturer and supplier of machine tools and all-in solutions. The company's spectrum of products and services encompasses electro-erosion and high-speed milling machines, laser texturing and cutting machines, additive manufacturing, and software for automation, connectivity and industrial purposes. With dedicated centres of expertise and production in Switzerland and China, as well as distribution and service companies all around the world, **GF Machining Solutions** covers the high-precision and productivity needs of the die and mould industry, aviation and aerospace, automotive construction, medical technology and ICT, as well as providing its customers with comprehensive support across the entire product life-cycle.

The Digital Transformation business area makes available an industrial platform for the Internet of Things (IoT) in order to support customers' production processes with state-of-the-art connectivity solutions and software applications. **GFMS** machines are ideally suited to the IoT thanks to the rConnect infrastructure developed by symmedia: This central communication platform delivers business applications based on manufacturer-independent communication protocols such as OPC Unified Architecture (OPC UA) and MTConnect.

→ www.gfms.com

Centre of excellence for additive manufacturing **Irpd AG**

Irpd AG provides its customers with a wide range of services in the field of additive manufacturing (AM). Its services include consulting and support for AM-compatible engineering and re-designing, measuring technology for reverse engineering, and design qualification and manufacturing of jointly-developed product solutions on the **Irpd** additive production systems for numerous metal alloys and plastics. It also offers a series of ThinkAdditive™ workshops. Its customers operate in a range of sectors including the automotive, energy, aviation and aerospace industries, transport and heavy industry, the die and mould industry, precision mechanics and mechanical engineering.

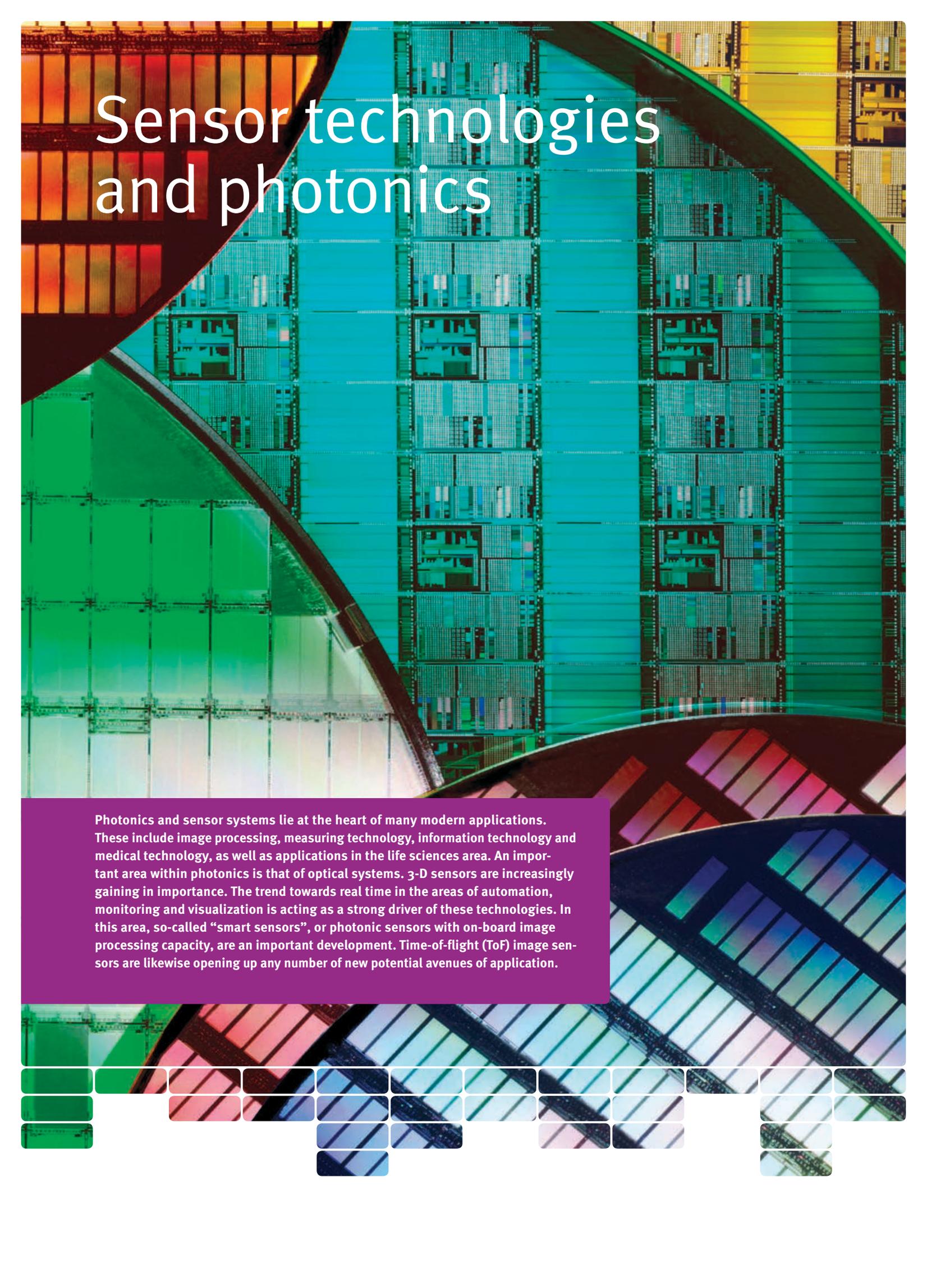
→ www.irpd.ch

Centre of excellence for modern manufacturing technologies **Inspire AG**

Inspire is the leading Swiss centre of excellence for modern manufacturing technologies, including additive manufacturing, laser surface modification, and CNC and EDM processing. It cooperates at both national and international levels with the mechanical engineering industry as well as R&D partners, and makes its expertise available for the development and improvement of processes, products and services.

The Innovation Centre for Additive Manufacturing Switzerland (icams) operated by **Inspire** is dedicated above all to the research and development of quality management systems for AM (additive manufacturing) processes, and therefore engages with the entire AM process chain.

→ www.inspire.ethz.ch



Sensor technologies and photonics

Photonics and sensor systems lie at the heart of many modern applications. These include image processing, measuring technology, information technology and medical technology, as well as applications in the life sciences area. An important area within photonics is that of optical systems. 3-D sensors are increasingly gaining in importance. The trend towards real time in the areas of automation, monitoring and visualization is acting as a strong driver of these technologies. In this area, so-called “smart sensors”, or photonic sensors with on-board image processing capacity, are an important development. Time-of-flight (ToF) image sensors are likewise opening up any number of new potential avenues of application.

Light-based technologies will play a key role in the decades to come. Thanks to its strong technological basis, Switzerland is home to numerous major companies.

Testing connected cars more efficiently

Kistler Instrumente AG

The Internet of Things will leave its mark on the automotive industry: Trends such as self-driving vehicles and connected cars require ever more complex test set-ups. Suppliers are facing the challenge of conducting these tests efficiently and accurately. With its own DTI (Digital Transducer Interface) Competence Center and many years of experience, Kistler is a strong partner capable of simplifying the processes of its clients. Kistler was the first – and remains the only – manufacturer to offer advanced DTI technology for the testing of driving dynamics and durability. The test setup with the “one wire for everything” concept guarantees the ultimate in process reliability and time saving. Benefits such as WLAN data transfer and automatic sensor recognition make the technology even more user-friendly.

→ www.kistler.com

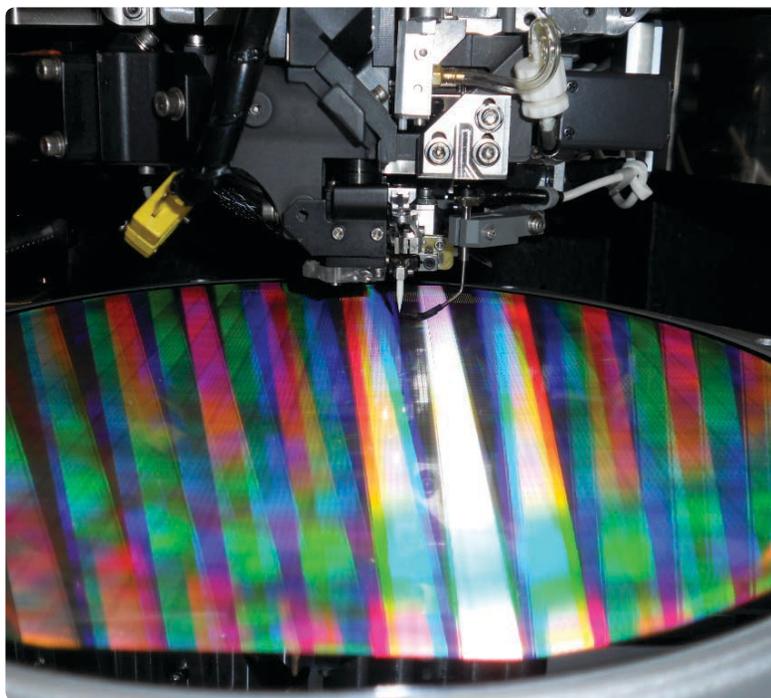
Custom made glass components for photonics and optics

IMT AG

IMT is development partner and large volume production foundry for custom made glass components for photonics and optics as well as consumables for Life Sciences and Diagnostics, Next Genome Sequencing, nano- and microfluidics applications and a wide range of optical applications in the medical field.

The product range comprises custom made patterned Flow Cells for Life Science and Genome Sequencing – including surface functionalization – in high volume, nano- and microstructures on and in glass, such as micro-channels, nano-dots, slits, polarizers, diffractive gratings and optical wave guides. The patterned materials include chrome, gold and titanium. IMT works with all types of glass in thicknesses up to 10 mm.

→ www.imt.ch



3D-sensor technology for smart sensors

ESPROS Photonics AG

Intelligent sensors are needed if future demand for autonomous vehicles, mobile robots and the like is to be met. What's more, they will need the ability to capture their environment in high-resolution 3-D – including at night, during the day, driving in snow, rain or fog. The applications of augmented or virtual reality (AR/VR) and face recognition also require intelligent sensors based on 3-D cameras. These need to be compact and cost-effective, as well as having very good depth resolution – because face recognition sensors will soon be found not just in our mobile phones but also on our front doors, on the doors of hotel rooms, and in cars.

ESPROS Photonics AG supplies the camera chip that makes all these applications possible, whether for high-resolution LiDAR in the case of driver assistance systems or for facial recognition. The chip in question is based on the globally unique CMOS semiconductor technology (CMOS: complementary metal-oxide semiconductor), which is also used in many other applications, such as micro-spectrometers for the identification of substances. It won't be long before micro-spectrometers of this kind are incorporated into smartphones in order to measure our blood sugars. Or they can determine whether there is gluten in a dish, and whether the fish or meat in our fridges has gone off.

→ www.espros.com

Automotive

A close-up photograph of the front of a red car. The image shows the upper part of the front grille, which has a black honeycomb pattern. To the right, there's a headlight with a chrome trim. The car's body is a vibrant red color, and the lighting creates strong highlights and shadows, emphasizing the car's curves and textures.

Automotive suppliers are facing a number of major challenges. E-mobility and autonomous driving are opening up new opportunities for vehicle manufacturers and suppliers, but they also require significant adjustment. Areas such as batteries, sensors and electric drive modules are set to grow hugely. Production figures for combustion engines, exhaust systems and gearboxes will decline. The transformation in the mobility behaviour of people – particularly in urban centres – is another factor set to change the way cars are used. Private vehicle ownership may well decline and be partly replaced by car-sharing systems. This in turn will mean more intensive use of vehicles.

The automotive industry is undergoing a period of change, and Swiss suppliers and manufacturers of production resources are adapting their concepts and technologies.



Broad offering of RADOX cables for secure connections for electrical systems
HUBER+SUHNER AG

HUBER+SUHNER supplies the automotive industry with a wide spectrum of RADOX® cables and connection solutions that guarantee long-lasting and secure connections for electrical systems. RADOX is an electron-beam-cross-linked insulation material that is characterized by particular resistance to thermal, chemical, electrical and mechanical wear. It is ideally suited to use in hot engine environments or in high-voltage and high-power electrical systems. A wealth of experience in the design and construction of complete cabled connection solutions makes HUBER+SUHNER the ideal professional partner for the development and manufacture of sophisticated wiring systems for electric and hybrid vehicles. The company offers turnkey connection solutions – starting in the planning phase and extending to the subsequent development of customer-specific wiring system solutions, as well as to global small-batch, pilot and high-volume production. HUBER+SUHNER is a leading international manufacturer and supplier of components and systems for electronic and optical connection technology.

➔ www.hubersuhner.com

Helping the Automotive industry to meet increasingly tighter environmental regulations
Datwyler

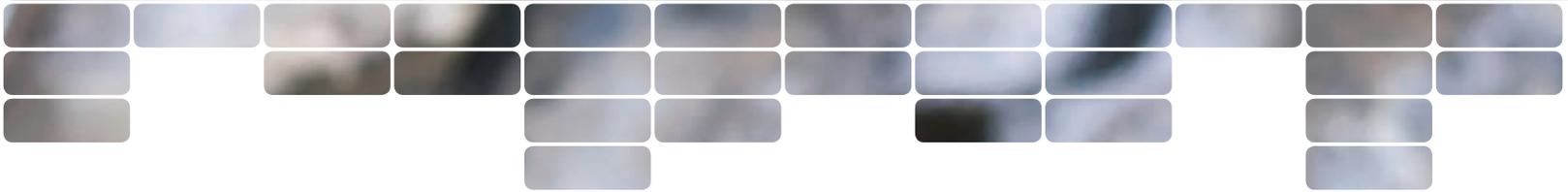
One of the biggest challenges for the Automotive industry will be to meet the increasingly stricter legal requirements for the reduction of exhaust gas emissions. A key technology to address these requirements is SCR (selective catalytic reduction). This innovative technology uses a water-based urea solution (AdBlue) as an ammonia source to neutralize nitrogen oxides in exhaust emissions of diesel engines. In the SCR system, the ammonia reacts selectively with the nitrogen oxides. This chemical reaction naturally results in nitrogen and water, two harmless substances. Datwyler produces elastomeric components that are used in SCR systems and provides sophisticated sealing solutions for brake systems, fuel and powertrain, e-mobility as well as other applications.

➔ www.datwyler.com

Oetiker WingGuard® Strap Clamps – a unique band-locking mechanism
Oetiker AG

Oetiker AG produces clamps and rings for the securing of hoses, tubes and other objects, as well as the associated assembly tools. One of its innovative products is WingGuard® Strap Clamp, whose unique winged band-locking mechanism provides high holding force and fully encloses all sharp edges. It lends itself ideally to the securing of airbag gas generators. The burr-free strip pitches reduce the risk of components being damaged before and after assembly, while a single clamp size works for a range of application diameters, providing ample clearance for easy assembly. All this can be achieved in a single working step, economically and reliably, with the electromechanical Oetiker FAST 3000 tool.

➔ www.oetiker.com



Committed to Swiss industry

Swissmem is the leading association for Switzerland's mechanical and electrical engineering industries (MEM industries) and related technology-oriented sectors. Swissmem enhances the competitiveness of its 1,100 member companies both at home and abroad by representing their political interests effectively and providing needs-based services, targeted networking, and market-oriented basic and advanced training for MEM industry employees.



Supporting innovation

An impressive level of innovation is an outstanding feature of the Swiss MEM industries. Here Switzerland's universities of applied sciences, other tertiary education institutions and research institutes play a crucial role. But their knowledge is not conveyed to companies automatically. Swissmem assumes the role of intermediary to ensure that businesses can fully exploit the potential of knowledge and technology transfer. Among the key beneficiaries are SMEs, which are particularly challenged by the increasing complexity of modern technologies.

Supporting specialist employees

The companies of the Swiss MEM industries are frequently international market leaders with their solutions. Access to specialist labour is a crucial prerequisite for that position. Swissmem has set itself the task of attracting talented young people to the industry, retaining them and supporting their further training. In Swissmem Vocational Training the association has its own centre of expertise and services for basic vocational training in the MEM industries. We strengthen Switzerland's competitiveness as a place for work and research by promoting vocational training that is up-to-date and attractive to young people. The key vocational areas of focus include mechanical engineering, design engineering, automation, electrical engineering and information technology.

Providing networks

With its specialist and industry groups, Swissmem provides member companies with a platform on which they can cultivate shared marketing activities and exchange information. This is where subject-specific information is prepared, trade fairs organized, and statistics and industry figures drawn up. At a European level, close contact between the groups and the European sector committees ensures current awareness of markets, the business environment and policy matters.

Swissmem specialist groups

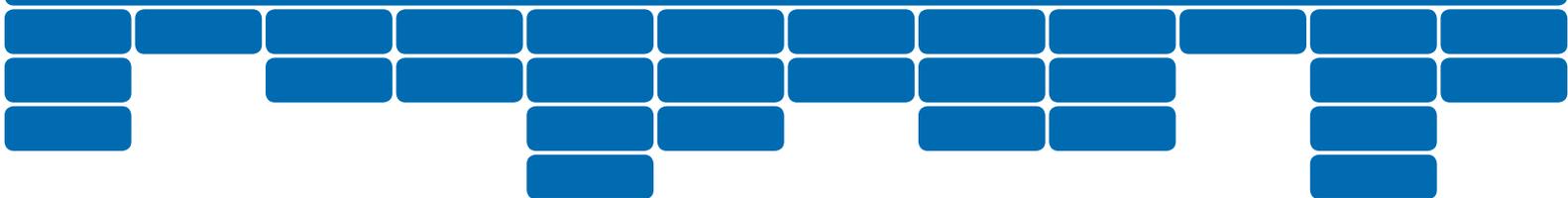
Assembly and Factory Automation
Automotive
Compressors, Pneumatic and Vacuum Technology
Die and Mould Industry
Dimensional Measurement
Environmental Technology
Hand Tools
Handling and Storage Equipment
Internal Combustion Engines
Packaging Machinery
Photonics
Plastics Machinery
Power Engineering Transmission
Precision Tools
Printing Machinery
Process Engineering Equipment
Pump Technology
Space Technology
Swiss Additive Manufacturing Group
Swiss Airport Suppliers
SWISS ASD (Aviation, Security & Defense)
Swiss Fluid Power Industries Group
Swiss Machine Tool Manufacturers
Swiss MEM Industries Sub-Contractors
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Cover image: sia Abrasives Industries AG



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