

# micro nano Mag

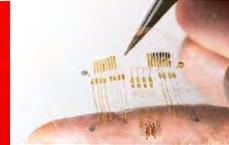


SENSORS & MEASURING DEVICES  
 AERONAUTICS & SPACE  
 MACHINES, INDUSTRIAL EQUIPMENT  
 & AUTOMATION  
 AUTOMOBILE  
 ELECTRONICS, MICRO-ELECTRONICS  
 MEDICAL  
 ENERGY  
 WATCHMAKING  
 TELECOMMUNICATIONS  
 MATERIALS  
 R & D + SERVICES  
 SUB-CONTRACTING  
 SECURITY



The Magazine of the micro-nanotech Cluster of Western Switzerland

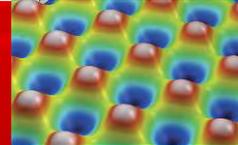
III - 2018



Thin-film multilayer encapsulation



Silicon nitride photonic integrated circuit



Stainless steel 3D sinusoidal surface

Time  
 Watchmaking  
 Sensors  
 Nanomaterials  
 Precision  
 Innovation  
 Reliability  
 MEMS

Micro-electronics

Western Switzerland

The future of microtech  
 Innovation  
 Reliability

Prosthetic hands with tactile sensing



Cleaner energy in aviation through electric propulsion systems



New single-piece oscillator in Zenith's «Defy Lab»



Watchmaking was historically the source of technical skills that Western Switzerland matured into high-end micro and nanotechnologies.

The area has still the most accomplished and prestigious watchmaking industry in the world. Some of its key actors tell us below, in tweet format, about their itinerary, vision, passions...



**Blancpain / Breguet / Jaquet Droz**

**Marc A. Hayek, President of Breguet, Blancpain and Jaquet Droz**  
Watchmaking is my passion. Three brands mean three times as much fun! I like to push back limits, both at work and in my life.



**Patek Philippe**

**Thierry Stern, President of Patek Philippe, member of its Management Board**  
Born in a family owned factory, my passion is to create watches for the pleasure of our customers and, above all, to bring about surprise.



**TAG Heuer**

**Jean-Claude Biver, CEO of TAG Heuer, President of the Watches Division of the LVMH Group**  
Veteran and visionary in the watchmaking industry. Agitator and brand developer. Current position: President of the Watch Division in LVMH.



**Parmigiani Fleurier**

**Michel Parmigiani, Founder and CEO of Parmigiani Fleurier**  
As a watchmaker I was originally a restorer by day and a creator by night. Creation has taken over without me losing sight of my roots.



**Chopard**

**Caroline Scheufele, Co-Chairwoman of the Chopard Group**  
Creation is my drive, jewellery my favorite field of expression. As an art director, my passions have become my profession, a privilege.



**Chopard**

**Karl-Friedrich Scheufele, Co-Chairman of the Chopard Group**  
I am a man of passion. For watchmaking of course, which occupies most of my time, for wine - Château Monestier La Tour... - and vintage cars.



**Longines**

**Walter von Känel, Chairman of Longines**  
An infantry commander, history lover, my heart has been beating for more than half a century for watchmaking, included 48 years at Longines.



**Officine Panerai**

**Angelo Bonati, CEO of Officine Panerai**  
CEO since 2000, I contributed to relaunch the brand internationally. Italian, intuitive, passionate. Love watchmaking, sailing, golf, music.



**Frédérique Constant**

**Peter Stas, CEO of Frédérique Constant**  
Passionate, eager to meet the next challenge, to push barriers in the watchmaking industry in respect of our philosophy of accessible luxury.



**Ralph Lauren**

**Guillaume Tetu, COO of Ralph Lauren Watch and Jewelry**  
A career in product design & development. Joined the company in 2016 to link creativity in New York and ground realities in Switzerland.



- 05 Editorial**  
CDEP-SO and Micronarc
- 07 SENSORS, MEASURING DEVICES & AERONAUTICS**
- 13 R&D + SERVICES**
- 14 SPOTLIGHT ON... CSEM**
- 27 MACHINES, INDUSTRIAL EQUIPMENT & AUTOMATION**
- 37 ELECTRONICS, MICRO-ELECTRONICS**
- 47 MEDICAL**
- 57 WATCHMAKING**
- 64 FACTS AND FIGURES IN WATCHMAKING**
- 71 MATERIALS**
- 85 Micronarc**  
A mission at the heart of micro and nanotechnologies
- 88 Micronarc**  
Events 2018

**IMPRESSUM**

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**Coordination:** Céline Bernasconi - CAorganiz, Chaumont/Neuchâtel  
**Design and editing:** Adequa Communication SA - Laurent Donner, Jean-Luc Renck, La Chaux-de-Fonds.

**Printing:** Imprimerie Messeiller SA, Neuchâtel

**Pictures and credits:** Pictures transmitted by the companies themselves: companies' copyright, Watches The Guide, Bern Tourism, CSEM, Vincent Bourrut, swiss-image.ch, Switzerland Tourism/Christof Sonderegger, Maison du Tourisme/Jura Evasion S.A./Christof Sonderegger, GenèveTourisme/Olivier Miche, Laurent Donner.

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[www.cdep-so.ch](http://www.cdep-so.ch)

**D**ear reader,  
Welcome to the third edition of your Micro&Nano Mag! It is proudly published by Micronarc, the micro-nanotech cluster of Western Switzerland, and its eminent partners.



Danick Bionda,  
Secretary General  
of Micronarc

Our goal is to present you with some of the most innovative products and technologies from our region.

Looking back at the three past decades, we must realize the tremendous impact that microtechnology had on our daily life:

- smartphones became our «best friends»: they combine powerful chips and micro-electronics, digital cameras (micro-optics), great functions based

- on gps and sensors (microphones, antenna, accelerometers,...), high resolution display, advanced technology batteries, etc.

- cars, trains and planes bring us every day, miles away, in a safer and cheaper way! These vehicles are «moving labs» incorporating the latest microtechnology discoveries in energy, connectivity, security and also autopilot (for many years for planes and now for trains and cars)!

- medical devices are enhancing our lifespan and health. Pacemakers, insulin pumps, knee and hip prostheses, dental implants, spine orthopedics, etc. are all successful microtechnology developments. As well as many surgery, imaging and diagnosis instruments, to name a few: endoscopes, scanners/x-ray/ultrasound machines, equipment to measure ECG/EEG/blood pressure/sugar level, etc.

Should we mention tablets, flat screens, virtual reality headsets, drones, robots, smartwatches or satellites?...

The acceleration of technological achievements has reached an unprecedented growth and Switzerland is a key contributor, thanks to the hard work and strong synergies, between several entities, sharing best practices on a daily basis: top universities, outstanding research institutes, highly qualified facilitators and of course, companies daring to innovate.

So, are you ready to explore Western Switzerland and would you like to join us on our booths to exhibit your activities locally and abroad? Please, check our program of events at the end of this Micro&Nano Mag!

We wish you a happy reading!



«There's a silly notion that failure's not an option at NASA. Failure is an option here [at SpaceX]. If things are not failing, you are not innovating enough.»

Elon Musk



Living creatures need to perceive what is pertinent, useful, vital to them. Human societies too. Today, small sensors and smart sensing systems assess everywhere our environment, energies, processes, health... with the finest details. This new stage of global evolution has Western Switzerland as a preeminent actor.

Pont Wilsdorf, Geneva



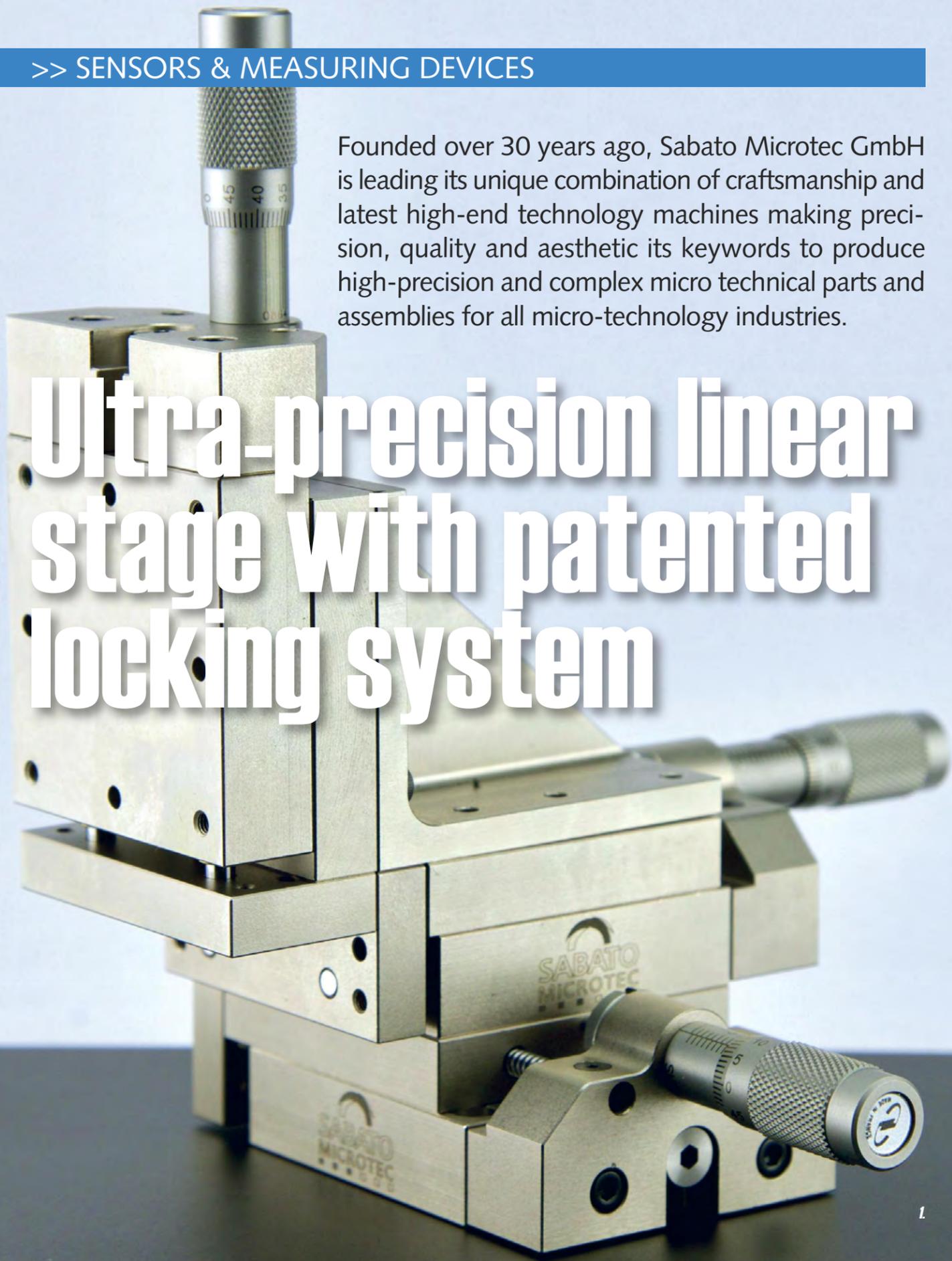
Surface finishing such as Ra0,025 (N1), mirror polish



Electric propulsion systems can make aviation energy efficient, cleaner, safer...

Founded over 30 years ago, Sabato Microtec GmbH is leading its unique combination of craftsmanship and latest high-end technology machines making precision, quality and aesthetic its keywords to produce high-precision and complex micro technical parts and assemblies for all micro-technology industries.

# Ultra-precision linear stage with patented locking system



1



2

III - 2018 Micronarc Magazine

The use of some of the most advanced milling and turning tools such as hard metals and monocrystalline diamond, together with last generation LHSC (Linear High Speed Cutting), allows for the manufacturing of hard metals and other troublesome materials.

EDM (Electrical Discharge Machining) technology is a great resource for Sabato Microtec, that surpasses the limits of the traditional cutting techniques and allows to produce geometries and to reach tolerances otherwise impossible.

The Sabato Microtec atelier is temperature-controlled and equipped with a floor in reinforced concrete that absorbs almost every vibration allowing tolerances as restrictive as 1 µm.

Mounting and finishing activities are the core of the company. When a job is completed, every single mechanical detail can be admired, without any aesthetic imperfection and with a great visual impact; all of this done with precision as main value.

Today, high precision often means functionality, reliability and durability. However, making high precision is not enough anymore and Sabato Microtec wants to combine it with aesthetics. All produced pieces are worthy of the word «chef-d'œuvre», masterpiece.

With an experience of more than 30 years, the know-how of Sabato Microtec in the micro-mechanic sector is recognized as a synonym of high quality manufacturing and prototyping in the fields of watch-making, jewelry, automation and MedTech.

The company has always found production solutions that satisfy even the most compelling requirements, like few other companies in the world could do. Its key strengths are the flexibility, skillset and problem solving capabilities of its entire staff.



«Quality doesn't happen by chance.»

Mike Sabato, CEO

### Craftsmanship and innovation

Starting from roughing until finishing, nothing is left to chance. The production process is monitored and recorded at every step. The management of times and methods guarantees both high efficiency and cost optimization.



3

Sabato Microtec differentiates itself from competitors by giving aesthetics a dominant role in its production; surface finishing such as Ra0,025 (N1), mirror polish, matte polish are delivered daily.

### Innovation driven

Sabato Microtec competences in mechanical problems enable them to face any challenge. An example is their new innovative device, born from a problem common to both automation and vision.

The newly invented linear stage provides the user with higher productivity, thanks to an innovative concept of guiding and locking system.

1. XYZ Modular linear stage with patented locking system.
2. Surface finishing such as Ra0,025 (N1), mirror polish, matte polish.
3. Inspection holder for high quality components.
4. Ultra-precision linear stage with patented locking system.

This linear stage offers:

- no torsion or displacement during locking phase
- position maintained after locking
- high load capacity
- modular conception
- combinations x-xy-xz-xyz
- precision & repeatability [+ - 1µm].

This device has been conceived in order to solve the stop-machine problems related to the loss of position due to machine vibrations and shock. A problem still open on the linear stages present on market.

A stop-machine costs a lot in terms of stop-production, employee working-hours and frustration in the employee who must re-adjust position everytime. This invention offers the solution to these problems.

[www.microtec.ch](http://www.microtec.ch)



4

# H55: electric propulsion technologies

H55 develops certified technology solutions to make air transport clean, safe, quiet, efficient, affordable and ultimately autonomous through the use of electric propulsion systems. In September 2016, the take-off of the first Swiss electric aerobatic plane demonstrated H55's capabilities.



1. The «Hamilton aEro» demonstrates that electric propulsion systems can make aviation energy efficient, cleaner, safer...
2. Sebastien Demont and Thomas Pfammatter, co-founders.
3. View of the energy management computer.

**N**amed the *Hamilton aEro*, at 310 kg, this innovative aerobatic plane is powered by an 80 kW electric motor and reaches a speed of 300 km/h. The lithium batteries allow some 35 minutes of flight time and have a recharge ratio of 1:1 (10 min. flight time = 10 min. charging time).

The «Hamilton aEro» is a proof of concept for H55's novel electric propulsion systems. Launched by Thomas Pfammatter and Dominique Steffen, the project received support from Hamilton Watch, The Ark Foundation and others. Quickly Sébastien Demont, former head of electrical engineering at Solar Impulse joined the team. Together they undertook the technical challenges related to battery management systems, power management control and electronic flight instrument systems. Of course, with all the securities and redundancies expected for aeronautics standards.



**«We change air transportation of tomorrow with today's electric technologies.»**

*Thomas Pfammatter, co-founder, finance & operations*

Compared to a classical combustion engine, the electric propulsion system makes air transport quiet and energy efficient, but also much more affordable due to dramatically reduced operating and maintenance costs. The use of elec-

tric motors in air transport is a game changer. «Electric motors react immediately. They deliver power right at the point where needed without mechanical transmission systems. Just some wires make completely new concepts of flying vehicles feasible. Electric solutions are developed for propulsion, but also for stabilising and will radically transform air transportation», concludes Thomas Pfammatter, co-founder of H55.

H55 is currently developing its second-generation technology solutions. These will be able to propel aircrafts with up to 1 MW of power. Which means aircrafts with up to 20 passengers.

As a first commercial solution, H55 will equip a two-seater light trainer aircraft with its systems. The goal is to have a trainer aircraft that is able to fly for 45 minutes electrically and up to three hours with a detachable range extender.

This solution will make the aircraft flyable for regular applications (training flights, travel flights and aerobatic training) on a daily basis with approximately half of the fuel consumption (on hybrid) compared to today's aircrafts and with much less noise pollution.

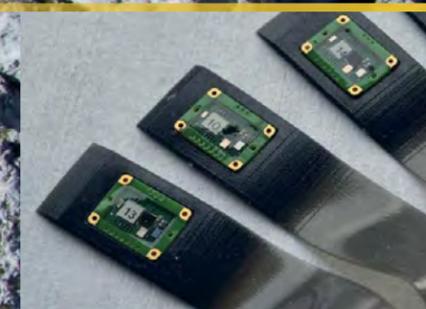
Recently the core team has been strengthened with the addition of André Borschberg and Gregory Blatt, two former key people from Solar Impulse. They joined to help bringing H55 to the next level and unleash its full potential.

«H55 aims to be an international leader for electric propulsion systems in air transport. Within 5 years you will see new flying vehicles above our heads and in daily life's operations», predicts Thomas Pfammatter.

[www.h55.ch](http://www.h55.ch)



# Switzerland: innovation & reliability.



*WiseSkin for tactile prosthetics*



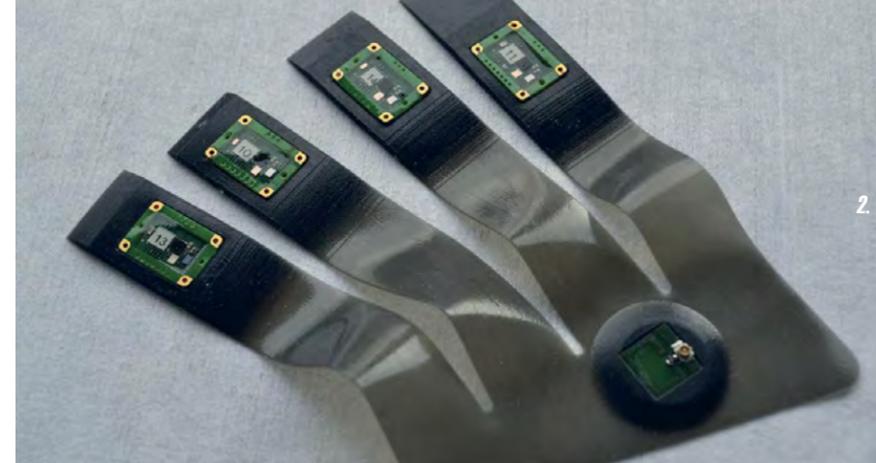
*Online kiosk by e-liberty operating in «Deux Alpes» (France) ski resort*

For life as well as for technologies, innovation is a question of environments, with their challenges and synergies. Western Switzerland fuels innovation with the richest network for fruitful relationships.

*Gastlosen, Fribourg*

Mastering the smart and miniaturized devices, the «things» of the IoT, interfacing the real, analog world and the virtual, data world of «big data» can be an enormous opportunity for the transition of industry towards the digital economy. The large variety and specialization of such devices requires an economy that is high added-value, diversified and networked. This background proper to the Swiss economy is difficult to rebuild, and therefore this should be a powerful tool in the hands of our industries.

# The transition to a digital world: an opportunity for micro-engineering



- 1. Ultra low power integrated systems.
- 2. WiseSkin for tactile prosthetics.
- 3. Pressure sensing everywhere.

In the summer of 2007, wild fires were burning across the southern Mediterranean. At the end of that summer, an e-mail arrived from a colleague at the University of Athens. He had received a request to cover a large swathe of forest – something like 5 km by 20 km – every 100 meters with wireless sensors for recording temperatures, as an experiment in forest protection.

The first thing to do was to calculate the number of sensors: it would need 10,000! Up to this point, we had been working with 5 to 10, or maybe 50 to 100 of them at a time. So 10,000 presented a different challenge entirely, and some obvious questions came to mind. How small would they need to be? How would we make them? How would we deploy them? Drop them out of a plane by parachute? How could we localize the individual sensors to detect where a fire was starting? And, in the end, a colleague sitting at the table made the bitter remark: 10,000 burning batteries would be great for the forest!

Needless to say, we abandoned the project. This eye-opening experience was, however, one of the very first examples of ours requiring a really very high number of «integrated» sensors. These nodes make up what we call today the Internet of Things – which, of course, if you want to make it a reality, need to be quasi-invisible. There are actually a lot of positives here: the skills required to make and integrate these sensors are precisely at the core of CSEM's culture, as a research institute based in Western Switzerland.

Now, and in the future, these nodes will require such devices, and with increased diversification due to the continual frag-

mentation of market needs. If the forest needs thousands of temperature sensors, and factories need chemical sensors, positioning sensors, or even vision sensors, and hotel rooms need air-quality, fire, and presence sensors, cars need all of the above – and planes even more. Diversification will require skills in the small-scale production of a very large variety of components and their integration into working systems: these are traditional and well-established skills in the culture of both Western Switzerland and CSEM.

Concerns will inevitably arise, and the first, most obvious one, is security. Tomorrow, billions of devices will be vulnerable to hacking, whether bio-implantable or car devices alike; each single device is an open door for a Trojan Horse.



**«Data is the oil of tomorrow; smart systems are the pumps to extract this oil.»**

*Georges Kotrotsios, VP, CSEM Marketing & Business Development*

The second concern is ethical. A good illustration is the «neural dust» concept developed at UC Berkeley: these are nanosensors that monitor our neurons. Is this what we want? Maybe yes, but our society needs to take these decisions in a conscious, deliberated manner or otherwise provide the means to protect us from abuse.

The third concern is around resources. Are we assuming that resource availability will be infinite, with petabytes being

created every day, in terms of storage capacity, bandwidth and energy (processing, cooling, and transmitting of information)? Even if not infinite, scarcity of resources will sooner or later create limits to the expansion of the Internet of Things.

These are some of the challenges in the world of the Internet of Things. Meeting these challenges will require an industrial base that is high-added-value, diversified and networked, and based upon multiple technologies. This situation is inherent in the Swiss economy and is difficult to reproduce. Therefore, it provides an opportunity for Western Switzerland, and CSEM is ready to support this effort in terms of R&D. Beyond acting as a lever for industry, these «things», through the implementation of data processing and aggregation, can convert raw data into smart data and therefore also play a role in the protection of privacy and security, as well as resource usage.

[www.csem.ch](http://www.csem.ch)



The Haute Ecole Arc Ingénierie is the University of Applied Sciences of the Arc jurassien, one of the areas in Switzerland and Europe which offers the highest job density in the industrial sector. We teach engineers for the new challenges of digitalization and industrial efficiency, and propose our skills to carry out applied research projects aimed at helping Switzerland to remain the most innovative country of the world.

# The HE-Arc Ingénierie, serving a unique industry in the world



The Haute Ecole Arc Ingénierie has its origins in the watchmaking schools in the cantons of Neuchâtel, Jura and Bern. These schools were created in the 1860s to support the industrial development in the Jura region.

One hundred and fifty years later, the watchmaking industry remains the flagship of this region and its historic microtechnical knowledge has been applied to other sectors like machine construction and health and medical technologies. Thanks to the acquired skills and to new technologies integration, the industry is more than ever able to meet the current challenges and spreading its unique knowledge worldwide.

To answer the needs, the Haute Ecole Arc Ingénierie has defined four fields of strategic activities which correspond to what the Jura region conceives, produces and values:

- **Smart & Micromanufacturing:** the solutions for a flexible, efficient and interconnected production tool
- **Smart sensing & Digitalization:** the solutions which include sensors, Internet of things and data valorization
- **Watchmaking & Industrial luxury:** from conception to industrialisation in a watchmaking manufacture
- **Health & Medical technologies:** from «serious game» to implantable microsystem, technologies serving wellness, health and medicine.

Our mission consists in educating engineers who do not have only technical and scientific skills but who are also aware of their responsibilities toward society. We also work closely with the industry in the field of applied research and development.



**«Our skills want to serve a unique industry in the world by developing directly applicable research, always in direct contact with the industrial economy of the region. And the results from this applied research must permanently serve our educational programs. We want our motto to be alive: Dare... Think... Do!»**

*Philippe Grize,  
Head of the Haute Ecole  
Arc Ingénierie*

This collaboration enables a bilateral knowledge transfer, confronts us daily with the realities of the industrial world, enables us to adapt our education programs and to offer the companies an ac-

cess to our skills, cutting-edge equipment as well as to our engineers for a real and efficiently valuable technological transfer.

These are the main collaboration modes that we propose to the industry:

- Bachelor and Master student projects
- Consulting and development services
- Direct assignments and projects with public co-funding (Innosuisse - Swiss Innovation Agency and European projects, amongst others)
- Ongoing training
- Framework contracts and engineer incubator.

[www.he-arc.ch/ingenierie](http://www.he-arc.ch/ingenierie)

*1. Health & Medical technologies: The micro-technical knowledge acquired in the Jura region through making watches has been applied to other sectors like medical technologies.*

*2. Smart & micromanufacturing: micro5, the 5-axis machine developed by the Haute Ecole Arc Ingénierie, is five times smaller – the size of a coffee machine – and consumes ten times less energy than usual 5-axis machines.*

The French-Swiss group «e-liberty», located both in Microcity in Neuchâtel and in Technolac - the tech hub of Savoie (France) - is the worldwide leader of online transactional systems for ski stations.

# e-liberty straight to online value creation



1



1. Functional description of the software engine.

2. Online kiosk by e-liberty operating in «Deux Alpes» (France) ski resort.

**W**ith its about 20 engineers, e-liberty was created in Verbier in 2005 and in Sophia Antipolis (France) in 2007. The innovative vision of the company lies in its capability to link usual access control systems (such as Skidata, Axess or Alfi) as well as their related ticketing platforms with the internet cloud, while precisely tracking all the transactions using a back office associated to a CRM solution.

At the core of this technological revolution, lies a software engine allowing to scan thousands of products references and to make (in the same way that a GDS does for other companies such as Amadeus) considering a date, a group composition, a skiing area or a loyalty program, the best possible price in association with a RFID card which is immediately identifiable by the access control installed on the slopes.

This opening of the access control via internet had 3 main benefits in the skiing area operators sector: it allows to do away with the access control holder (dependance) and drastically cuts the related costs. It reduces the waiting time at the cash desks and their operational costs, and it increases the internet visibility where 80% of touristic transactions are nowadays made.

The results have met the expectations as French ski stations (the first market in Europe) are making more than 30% of their revenue on the Internet, with a raw annual growth of 20%. As for e-liberty, more than 300 millions euros of transactions have been conducted last year.

### Revolution in three steps

The second step of this evolution consisted in integrating the software engine developed by e-liberty group into self-service terminals on the ground in 2016. This has allowed the skier to retrieve his package, purchased at low-cost on the internet or to instantaneously buy an RFID card on site, without having to go to the cash desks.

Although these online *kiosks* have not yet entered into common usage in Switzerland, skiing area owners largely use it in France where more than 200 of these terminals have already been installed on site.



**«The value on the cloud is in the customer data.»**

*Christian Mars, CEO and founder of e-liberty group*

Indeed, these terminals have a major advantage: besides their affordability and the low maintenance they require, they allow customer-centered sales in connection with the ski station CRM. This means that the transaction is tracked into an individual account for each skier-consumer who can then integrate it into his loyalty program. e-liberty thus provides a solution to the main weaknesses of cash desks: anonymous sales and transaction slowness.

The third development step of the applicative and transactional cloud lies in an optimum customer data recovery. This stage started in January, 2017 in

Microcity. The starting question was: «How to get rid of these heavy infrastructures (costly, expensive to maintain etc...) and to develop a customer control system *on the fly*?»

Answering this question brings a real technological break in access control as it makes it permanent and more fluid. e-liberty had to question the usual passive and binding support (the RFID cards) in order to find an active support which is low-energy consuming and more efficient as it communicates with the cloud and thus offer a myriad of services generating value (geo-tracking, micropayment...).

After a 9-month research period, the technical solution has been found and is now patented. A first on-site trial is scheduled this winter under the aegis of the Compagnie du Mont Blanc (Chamonix) and the Compagnie des Alpes (1st skiing area operator). Furthermore, e-liberty is gradually opening new tourism markets in Switzerland (Pays de la Gruyère, Pays du Saint-Bernard, Jura Seeland) and is planning to extend its solutions to other sectors such as urban transportations and infrastructures (bus, subways, swimming-pool, parking, sport arena etc.) where the implementation would bring great benefits to cities such as Neuchâtel.

[www.eliberty.ch](http://www.eliberty.ch)





«Connecting people and offering adequate infrastructures – including laboratories, workshops and offices – is essential for success and innovation.»

Mathieu Piller,  
co-managing director

Awesome. Do you know the common denominator between the characteristic Ferrari-red, contact lenses and resins for 3D printers? Marly. These jewels are actually invented and developed in Fribourg at the former Ciba Research and Development Campus, which became Ilford later on. Today, one of the most promising state-of-the-art technology parks in Switzerland, the Marly Innovation Center (MIC) has replaced the photo production factory. A boosting hot spot.

WE TALKED WITH MATHIEU PILLER, ONE OF THE TWO MANAGING DIRECTORS

# High-growth technology park connecting people



1. Marly Innovation Center: 370 000 m<sup>2</sup> dedicated to innovation and value chains.
2. First autonomously driving shuttle integrated into public network.
3. International Competence center for Digital Printing (iPrint).
4. 7000 m<sup>2</sup> of laboratories.
5. Flexible offices and business center.
6. Workshops. 7. Logistics.



Photos 2-7: © Gregory Collavini / Sept.ch SA

**T**he Marly Innovation Center (MIC) was launched in 2014 following the Ilford bankruptcy and hosts over 130 enterprises today. More than 400 jobs were created and growth continues steadily. What is your recipe for success?

Key elements are definitely our high-quality and diverse infrastructure – in particular laboratories, workshops and offices – and our attractive rents that are relatively low for Switzerland. We are flexible and have an open ear for our tenants. This enables us to offer customized services. Beyond that, we benefit from our well-established network to the Marly authorities and to the Fribourg canton as well as to the major players in regional economy, like the Fribourg Cantonal Bank, Public Transport Fribourg, Groupe E (energy company) and graduate schools, like the School of Engineering and Architecture of Fribourg, the Fribourg university and its Adolphe Merkle Institute, the CSEM in Neuchâtel. This ecosystem of private, public and university co-operation is part of our strength.

**We must underline that there is still space for development?**

Absolutely. The MIC comprises a surface of 370 000 m<sup>2</sup>, which makes us definitely one of the largest technology centers in Switzerland. Adding to the current facilities with a surface for rent of 72 000 m<sup>2</sup>, of which 7000 m<sup>2</sup> are fully equipped and secured laboratories, five buildings with an additional surface of approximately 11 500 m<sup>2</sup> are being constructed. In the future, a green eco dwelling will be built in the immediate surroundings. This will provide an entire ecosystem to the people who work on site. Quality of life is essential to success.

**What are the main fields of activity at the MIC?**

Our site is fully dedicated to cutting-edge research, manufacturing, craftsmanship and services. We have companies from various industries, from research and development in ink and polymers to beer production and fine

chemistry, medical analysis and numerous companies in the service business.

**Your philosophy is to generate a value-added chain by creating and growing innovative ideas. How does this work in concrete terms?**

Our aim is to create a strong community beyond providing the working space. Diversity is key. Those who want to can work together, foster exchange and share their knowledge to go a step further. Direct contacts are crucial. This is why we organize events and meeting opportunities for our tenants. For example at the moment we are building a new restaurant to foster encounters. Innovation requests exchanges.

**Innovation is anchored in the DNA of the site, whose construction started back in 1961. The chemical company Ciba from Basel established then a research and development campus, later owned by Ilford, the leader in photo-chemical technologies.**

Yes, innovation is central to the history and current projects on site. Did you know that Ferrari-red, disposable contact lenses or resin for 3D printing were all developed in Marly? Since December 2017, the first two autonomously driving shuttles have been in use here in our public transport network. And it is definitely no coincidence that iPrint, international competence center for digital printing (iPrint.heia-fr.ch), opened under our roof. At MIC, innovative ideas are surrounded with ideal conditions for future development.

**Is 3D printing your battle horse?**

Yes, it is an important field of development. Besides the companies already active in this sector on site, our facility is ideal for a value chain requiring laboratories, workshops and offices. Printing is a field of the future. A real pool of competence is emerging. And, of course, this innovative activity needs a lot of know-how and interactions, including micro-mechanics, microelectronics, software and robotics.

[www.marly-innovation-center.org](http://www.marly-innovation-center.org)

There are many organizations that support the ongoing growth of entrepreneurs and companies, but the right one can transform a good idea into a real business expansion. These three examples demonstrate how the Office for Promotion of Industries and Technologies (OPI) helped launch projects faster and generated business opportunities by activating its vast network in the Geneva industrial area.



**«We want to lead new projects and create real solutions for the companies. The emergence of the smart factory is a real opportunity for Geneva's industrial sector.»**

*Philip Maguire,  
Head of communication,  
events & competitive  
intelligence*

# OPI, helping innovative companies to take off



«You can have brilliant ideas, but if you can't get them across, your ideas won't get you anywhere,» business leader Lee Iacocca once said. Even a great technology can fail with a weak commercialization effort. In an increasingly complex, competitive and unpredictable environment, the OPI's support has been crucial for many companies. Since 1976, the Office for Promotion of Industries and Technologies (OPI) has led companies to new connections and partnerships, and to new clients and customers.

The case of Plair, a University of Geneva spin-off, is a good example of how the OPI's expertise is essential for business success. Thanks to the OPI, Plair not only enhanced its understanding of the market but also found its first investor.

Plair created the world's first instrument to accurately analyse single aerosol particles in real time. «In the beginning, Plair was only focused on pollen monitoring. We realized that, as their technology could also be used for air quality monitoring, their services could be of interest to the Federal Office for the Environment (FOEN),» says Jean-Marc Hilfiker, coach at Platinn, the inter-cantonal support programme hosted at the OPI. «We helped them to adapt their strategy.»

The OPI put Plair in contact with the FOEN and they signed a contract. «Beyond finding us our first big client, the OPI helped us understand how the different governmental structures work in Geneva and the approach we should have with each of them,» says Svetlana Kiseleva, founder of Plair. «They also introduced us to many potential partners.»

Plair's instrument detects and instantly identifies pollen species with an outstanding precision of up to 99% and a sensitivity of one particle per cubic



metre, 24 hours per day, all year round. This technology is a revolution in hay fever prevention and can radically improve people's quality of life.

«The OPI helps companies to save time and resources in business development activities and networking,» says Dr Kiseleva. «They have broad project management skills and help attract the right partners to corporate projects.» Plair's partnership with the OPI is not limited to these aspects and continues. «The OPI is now supporting us in exploring new applications for our innovation and expanding our targets in different industry sectors in order to find new clients,» says Ms Kiseleva.

By evaluating the commercial potential of innovation, identifying partners with complementary skills, planning projects and optimizing work structures, the OPI supports companies' development from A to Z.

OPI coaches connect companies with targeted parties in Geneva and can also help them to expand their boundaries by exploring international markets. This is the case for the recently launched, OPI-led aeronautical excellence cluster in Geneva. The companies Jean Gallay, Kugler Bimetal, Mercury Systems, Niklaus and Saint-Jean Aero joined forces to explore synergies that will improve their global positioning in the aerospace market. They seek to improve the competitiveness of each member through collective action, new approaches and by exchanging information and best practices. «Geneva has many industrial companies active in the field of aeronautics that are characterized by a high level of expertise. The goal is to give them more visibility and position Geneva on the world map of aeronautics,» says the member of OPI management Philip Maguire.

1. TOSA is an electric bus with ultra-fast and high-performance batteries.

2. A station for pollen monitoring designed by Plair company.

From the sky to the streets, another breakthrough technology project headed by the OPI is the brand new TOSA bus – which made testing debuts in Geneva in December 2017. TOSA is an electric bus with ultra-fast and high-performance batteries, both ecological and of a large autonomy. «The OPI is pleased and proud to have led the project management in line with the innovation, alongside with our partners TPG, SIG, ABB, the State of Geneva and the Swiss Federal Office of Energy. Our knowledge of the local and regional industrial sectors allows us to be ideally positioned to set business relations and successful partnerships such as TOSA,» explains Philip Maguire.

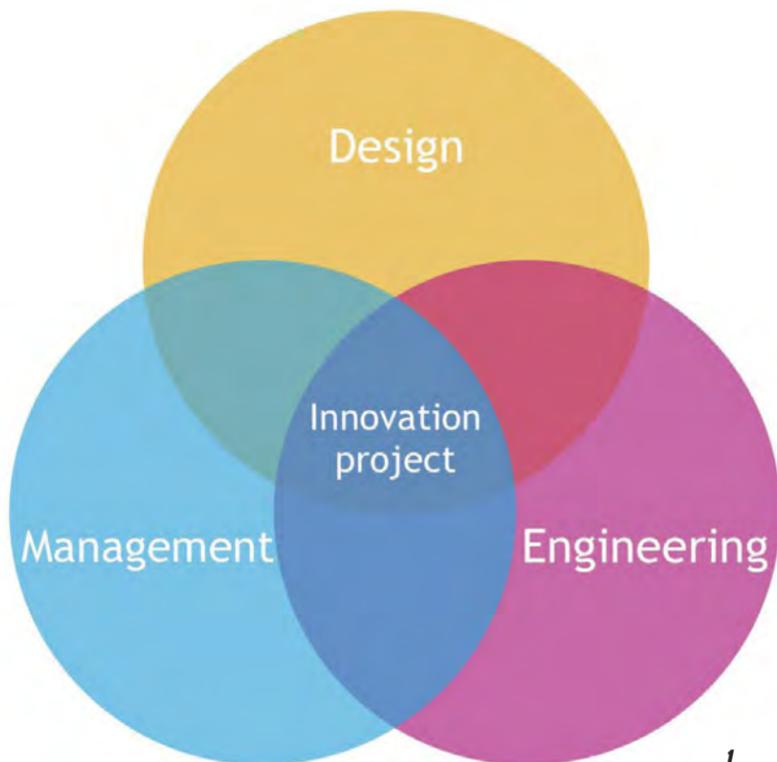
With an eye resolutely fixed on the future, the OPI also acts as a facilitator in important projects in the industry 4.0. It recently launched a think-tank dedicated to the digitalization of the sector. The group, which is co-piloted by the Department of Security and Economy (DSE), brings together industrial and academic entities to give practical support to industrial SMEs by allowing them to better understand the risks and opportunities of this forth industrial revolution. «We want to lead new projects and create real solutions for the companies. The emergence of the smart factory is a real opportunity for our companies. We just can't let it get away,» concludes Mr. Maguire.

www.opi.ch



The Innokick Master offers students the interdisciplinary skills they need to develop innovative products and services and successfully bring them to market. It also offers students the opportunity to develop the kind of business ideas that most customer-focused businesses want.

# What is the Innokick Master?



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«Innovation in Switzerland is recognised to be amongst the most dynamic in Europe. We, at FELCO

**Motion SA, believe that it is essential for development, economics and design to come together and develop a mutual understanding. A multidisciplinary approach is key to the success of all our day-to-day operations. When we employ a young graduate from this course, we can be sure of getting someone who has acquired an inquisitive mind and an understanding of other ways of thinking.»**

Stéphane Poggi,  
CEO, Felco Motion SA



Innokick Master aims to meet market demand for managers who are innovative, agile and active within their professional environments, people who are creative thinkers and can readily respond to the major societal and technological challenges of the world today.

This unique venture is an interdisciplinary course which brings together students from the HES-SO's three Faculties: Business, Management and Services; Engineering and Architecture; and Design and the Visual Arts. With over 19 400 students, HES-SO University of Applied Sciences and Arts is the largest UAS in Switzerland.

### In more details

The Innokick Master is a «Design Thinking» degree – it focuses on user experience (desirability); it harnesses technology (feasibility); and it promotes an understanding of economics (profitability).

This course adopts an innovative teaching approach centred on project-based learning. It closely combines academic teaching with practical training – stu-

dents carry out real assignments in collaboration with SMEs, scientific laboratories and start-ups.

It also draws on strategic partnerships which were built up with players who are active in supporting innovation, alongside a number of companies established here in Switzerland.

The Innokick Master offers to students:

- the opportunity to work on a practical, career-oriented project in close collaboration with locally embedded companies. These partners provide the bedrock for our courses and the framework for our theoretical and practical modules;
- a strongly interdisciplinary approach where lecturers, as a matter of course, work closely alongside their students;
- an emphasis on reflective, personalised learning to enable prospective graduates to plan their future careers on the basis of their professional and personal skills;
- an interdisciplinary Master's thesis carried out in groups of two or three students.



4

1. Innokick's concept.
2. The last batch of students 2016/2017.
3. An Innokick's student team won the second prize at HES-SO's innovation prize.
4. Innokick's curriculum.

### Innokick's curriculum

The practical applied project forms the cornerstone of the curriculum. Students work together in interdisciplinary groups for two semesters to develop innovative products and/or services using the tools they have acquired in the theoretical and practical classes. This project is supplemented by a reflective approach focusing on the students' personal skills.

During the last academic year, projects were conducted together with the following companies: Genève Aéroport, Elite, Atelier Nova, Vélocité et Sterilux.

### Who can participate to an innovation project?

Actually, any SMEs, scientific laboratories, start-ups and even larger companies can suggest an innovation project to our students.

The goal is to help companies to identify new application for existing and/or emerging technologies, to redesign an existing product which comes end-of-life or even, to provide answer to market-driver problematic, with the objective to combine both product-push and market-pull approaches.

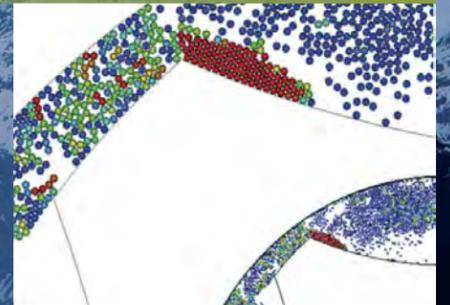
### What's in it for me as a company?

Companies can benefit from the competency of the students, especially in the field of marketing, design and engineering and of the professorial staff who will coach the students and ensure a co-development process in order to guarantee the overall objectives are met. They will take advantage from a fresh and critical view on their innovation activities.

www.hes-so.ch/innokick

The living world is a place of ingenious solutions at every stage of its complexity. Micro & nanotechnologies opened an entire universe of engineered solutions that Western Switzerland is continuously improving, shaping, manufacturing to the ultimate precision, from the smallest parts to full production chains.

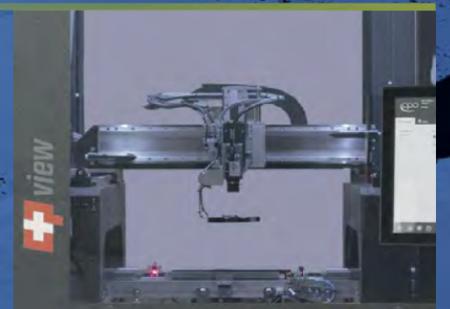
*The Monte Rosa SAC's hut at 2883 m with the Matterhorn in the background near Zermatt in Canton Valais. This construction in a high alpine surrounding is an example of efficiency regarding energy and resources.*



DEM numerical simulation of milling process (EPFL)



The Touchless revolution



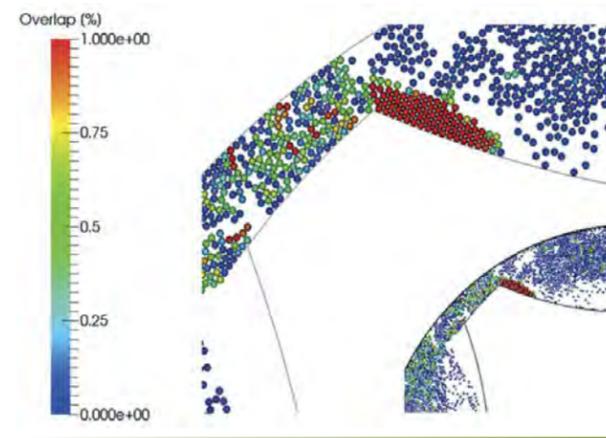
Automated inspection of a dial, based on artificial intelligence

Since 1946, Frewitt SA, located near Fribourg, Switzerland, has been at the forefront in the development of milling processes, as well as the manufacturing of premium quality mills for renowned, industry-leading clientele active in the pharmaceutical, fine chemical, and food sectors. Oriented towards the present and future needs of its customers, as well as anticipating future trends, Frewitt places its first priority on providing optimal process solutions and thereafter delivering cutting-edge milling, sieving, homogenizing, deagglomerating, conveying, dosing and filling systems for powders and granulates of every type.

# Preparing for a future with nanoparticles



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1. Wet milling equipment for pharmaceutical active products.
2. DEM numerical simulation of milling process (EPFL).
3. Evolution of particle size during NanoWitt milling.

**K**nown substances that are milled into nanoparticles take on new properties. Active ingredients increase their potency thus allowing better drug formulation and dosage for a more targeted fight to diseases.

Nanotechnology refers to the production, analysis, and application of structures that are at least one dimension smaller than 100 nanometers. The particles are 1,000 times thinner than the diameter of a human hair.



«From meter to nanometer, the new NanoWitt brings another dimension to Frewitt milling solutions.»

Christian Rhême,  
R&D Manager, Frewitt  
fabrique de machines SA

### Think big, go small

The use of nanotechnology is not only increasing for surface treatments but is also delivering impressive results in the medical industry. Recent headlines have included: «Drug-carrier nanoparticles very effective at killing liver cancer cells», «Breakthrough in cancer research», and «Nanovaccine in the battle against tumors».

Frewitt, known for its innovations in the area of fine milling, has tackled the

nano challenge with the development of a ground-breaking bead mill. This technical breakthrough is known as the NanoWitt. The device, developed for drug development & formulation, is detailed hereafter.

### Efficient down to the smallest detail

With the NanoWitt-Lab, materials can be wet milled down to a particle size of 50 nanometers (nm). The milling chamber's modular construction is designed for milling quantities ranging from milligrams up to 1.5 kg. The specified range depends on the solid's content.

The extremely compact lab device is easy to integrate and thanks to its intuitive control system, it can be set up and ready to work in a very short time. The innovative patented NanoWitt construction allows short milling time at low specific energy, this resulting in gentle product processing, no hot spot generation, lowest product contamination and tight particle size distribution. Its unique dynamic separator (DS) with no filter prevents clogging and hectic operation, which are steady problems with other technologies. In addition to providing stable processing conditions, the DS allows direct in-line sampling and integration of an in-line particle size measurement.

The NanoWitt cGMP design provides furthermore user-friendly operation and easy bead handling, this combined with high product recovery.

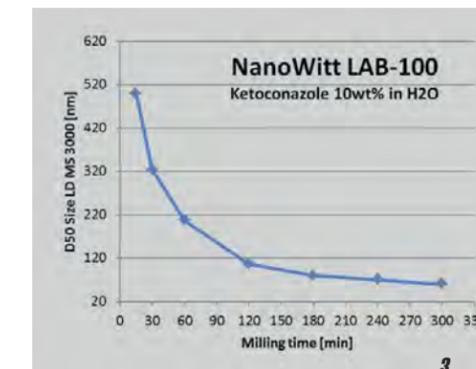
### Modifications with a flick of the wrist

Frewitt has kept its proven modular system for changing the milling head on the FreDrive-Lab platform. With just a single tri-clamp, the particularly lightweight nano milling head is readily interchangeable on the platform and easy to integrate into a rigid or flexible isolator. After removal, the milling head can be cleaned quickly and easily.

### Wide scope of application

The NanoWitt-Lab is designed to mill all types of powders, delivering a homogeneous product whose particle size can be measured with a real-time PAT solution if desired. Batch or semi-batch processing along with simplified filling/emptying round off the technical features of the new bead mill for producing nanoparticles. The NanoWitt has blazed a trail into a new future, and now all we have to do is follow it together.

www.frewitt.com



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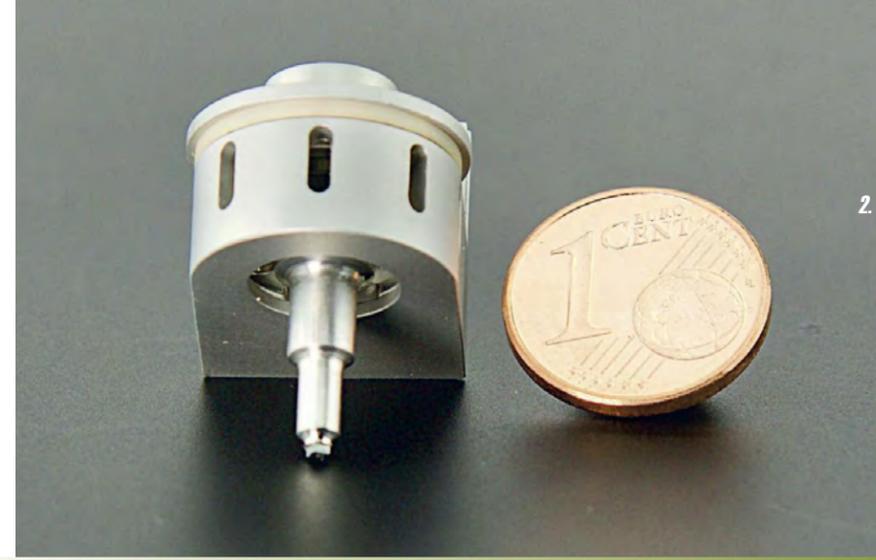
Touchless Automation is a high-tech and industrial oriented startup, located in the heart of the Swiss Watch Valley, born with the mission of bringing Swiss precision to the next level.

# The Touchless revolution

DEVICE TIP

COMPONENT

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Some problems seem to be aimlessly waiting for a solution for years. How to manipulate delicate parts without scratches. How to deal with pieces that should be contamination-free. How to pick and place object almost invisible to the naked eye. Eventually the solution comes and is ready to change how we approach to the world of micro-assembly. Touchless Automation developed an innovative tool that allows manipulating objects without contact. This means that it can move an object from A to B without touching it. The tool could be easily implemented on almost any assembly platform dealing with components in the range from 0.1 to 20 millimetres. Furthermore, there is no limitation on the handled material. Objects could be made of any possible material, from metal to epoxy, from glass to plastic.

#### Avoiding contact

Touching delicate and fragile components may not sound like the best thing to do, but in most cases, it is the only available option to assemble or use them. Touchless Automation solution consists in levitating micro-components of any kind of material, offering at same time a placing precision higher than the conventional methods used today in pick-and-place operations. This new technological paradigm completely solves the issues mentioned above, and it allows for the first time a non-destructive touchless handling of micrometer parts with nanometer surface structure.

#### The problem of being small

Today, the market is pushing companies towards solutions with even smaller features. In Internet of Things applications, some chips are smaller than half a millimetre. Touchless Automation innovative solution was effectively able to manipulate a chip with dimension smaller than a grain of sugar, correctly picking and placing it with an accuracy never reached before. As some of Touchless Automation customers said, this approach could mean a completely new world of opportunities to be unlocked.



«Our purpose is to bring the Swiss precision to the next level and unlocking its potential for all industries that could benefit from it.»

Fabio Depetris, CEO  
Touchless Automation

#### Precision is the key

Placing the components with the right precision is never an easy task. Many factors such as adhesion forces or capillarity come into play. The root of all these issues is the contact, all is needed is to avoid it. Handling without contact allows for greatly increasing the placing position, given that contact forces are nulled and the pieces can be released without stress.

1. Touchless Automation tool, levitating a 1mm x 1mm square component.

2. A complete tool, with standard assembly case.

Furthermore, physics comes to give us a hand. As soon as the tool is turned on, the component aligns itself automatically to the tip of the tool. Any misplacement in position or angle of the component is corrected, as the component is aligned with the tool in a stable and repetitive way. This effect turns out to be especially effective when handling tiny components. The lack of adhesion forces and this effect, combined together, allow for a very high placing position.

#### The solution to your problems

Touchless Automation has developed a special tool that is able to manipulate micro components without touching them. Together with its customers, the device was implemented in different environments and was able to handle very different components. In most of the cases, results that are impossible for conventional contact-based tools were reached. Touchless Automation continuously looks for new applications for its products and, for this reason, continues to invest on research, following the many requests coming from potential partners and customers.

www.touchless-automation.ch

Founded in 1999, CPAutomation SA provides turnkey systems based on standard programs and platforms. It can also create and provide solutions tailored to customers' needs.

Its customers benefit from a broad range of skills and expertise in the fields of micro-assembly/micro-handling, laser machining, and automatic visual inspection.

# A standardised platform for AI and industry 4.0



Today, production equipment must be more flexible, modular, and interconnected. There is no aspect of the industry untouched by the digital revolution. Companies have to adapt to new, breakthrough technologies, such as artificial intelligence (AI), 3D printing and the internet of things.

The unchecked approach to consumption – with ever shorter product life cycles, and new concepts launched with increasing frequency – is pushing companies to develop production equipment which are flexible, upgradeable, and available without delay. To meet these challenges, the teams of engineers at CPAutomation have spent 3 years developing the best automation platform possible. This CP Series platform is composed of basic cells which can house a large range of standard or specialised modules. This 4.0 modularity enables manufacturing processes – such as assembly, inspection, laser engraving or welding – to be combined.



**«We offer breakthrough technologies - previously only available to Apple, Google and Tesla.»**

*Marcel Dubey, Chief Sales & Marketing Officer*

The CP Series enables customers to equip themselves with flexible, modular production lines which integrate the

most innovative self-learning inspection, positioning, and laser technologies. Furthermore, the modularity and standardisation of the CP Series enable costs to be reduced by almost 40% compared to a custom-built machine offering the same functionalities, and can reduce the time to submit tenders from 6 weeks to 1 and decrease delivery lead times from 8 months to 5.

#### Self-learning inspection

CPAutomation has developed unique visual inspection solutions based on artificial intelligence, capable of replacing, and even surpassing, human inspection. It enables automatic visual inspections to be performed on micro-technical parts with highly varied dimensions and shapes for the watchmaking, medical, and electronics industries. Furthermore, the inspection can be quickly set up and configured by any operator.

#### Cutting-edge laser technology

CPAutomation has developed standardised picosecond and femtosecond engraving and micro-welding modules, compatible with the CP Series platform. The modules integrate cutting-edge laser technology. They enable exceptionally high quality interactions between the material and laser, such as welding a spiral spring to a collet, welding rotating parts, or even 3D engraving. The software and its intuitive operating interface are utterly unique. Offering faultless precision, it is so easy to use that welding and engraving of even the tiniest parts becomes child's play.

1. CP Series: the new Swiss flexible automation platform.

2. «CP Dials Inspector» cell.

3. Automated inspection of a dial, based on artificial intelligence.

#### Assembly and handling modules

Assembly, laser machining and inspection operations are only possible when the parts are supplied and positioned in the production equipment with high levels of precision and repeatability. To support the various manufacturing processes, the handling solutions developed by CPAutomation enable parts or trays to be supplied, conveyed, handled and moved within a cell or along a complete production line. It is possible to start a production run at the end of the day, and pick up the finished parts in the morning.

#### An ergonomic, interconnected 4.0 platform

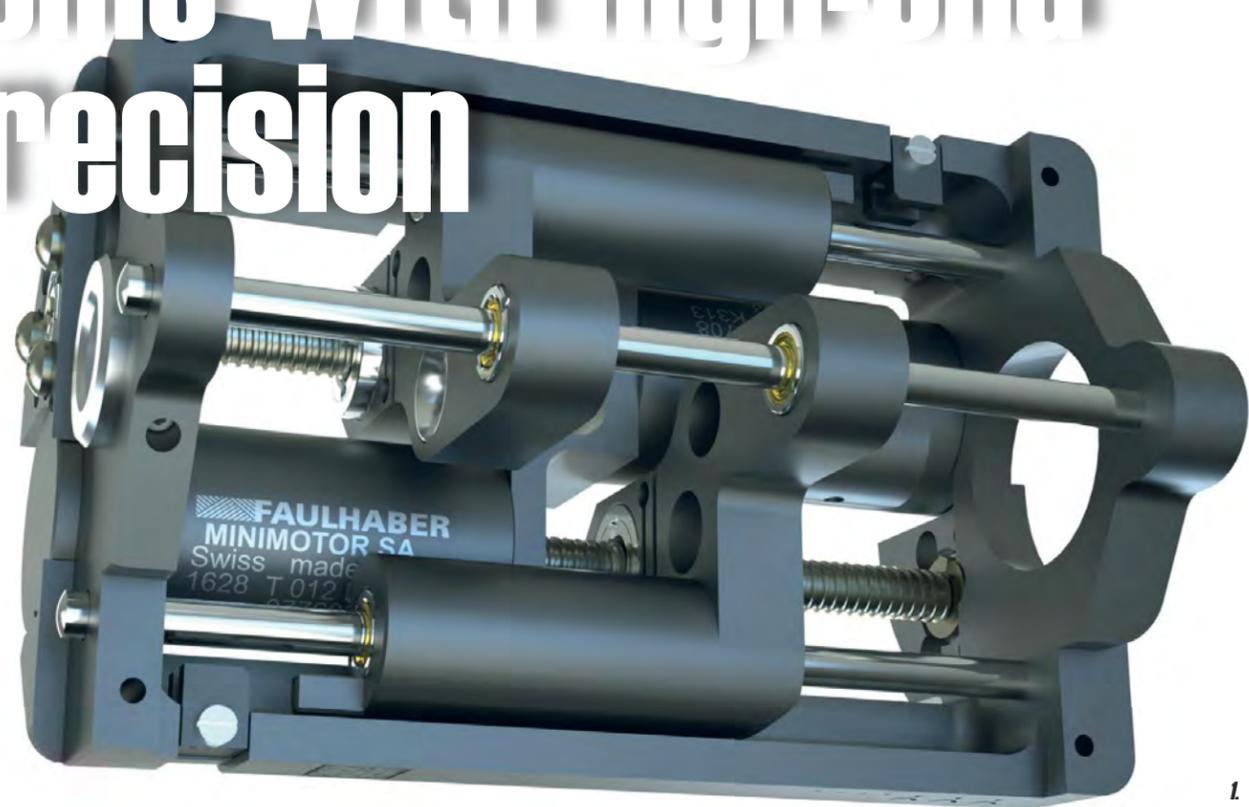
In collaboration with UX (User eXperience) and UI (User Interface) specialists, CPAutomation software engineers have designed the best user interface on the market, to meet both the growing demand for ergonomics, and future requirements for interconnectivity of machines, things and services.

[www.cpautomation.ch](http://www.cpautomation.ch)

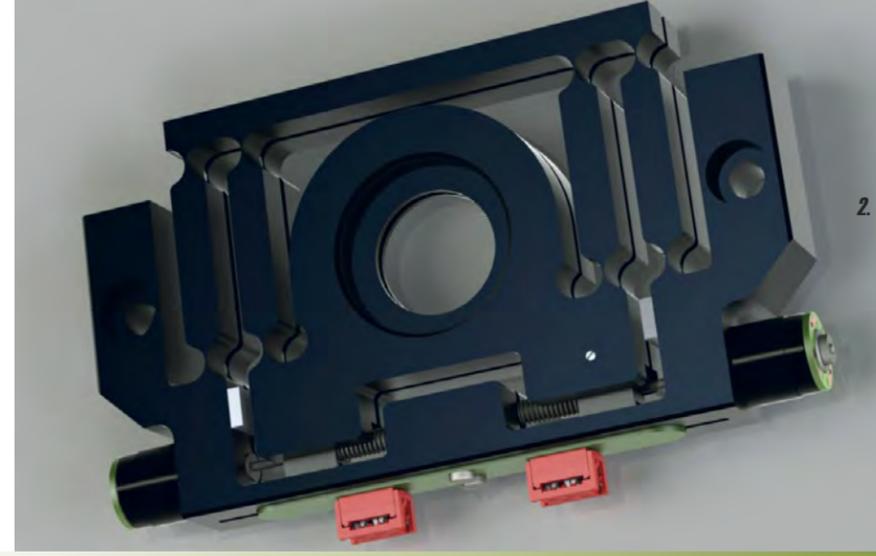


With headquarters located in Biel/Bienne Switzerland and as part of the Faulhaber Group, MPS Micro Precision Systems AG develops and manufactures highly complex and very precise mechanical and electro-mechanical microsystems used in the field of Optics & Photonics, Medtech, Automation, Science and Watchmaking. In a spacious and modern architecture, the 300 employees of MPS transform customer requirements and specifications into robust and reliable products and systems.

# Mechanical & electro-mechanical microsystems with high-end precision



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## MPS stands for highest precision, minimal friction and miniaturisation

MPS culture of precision and miniaturisation was born 80 years ago when the company started to manufacture miniature ball bearings for high-end applications. The same culture is driving today the development of innovative technologies and miniaturised solutions for very demanding industries. Thank to MPS capabilities, linear systems used in the field of micro-optics and photonics can be positioned with a precision of not more than 1µm.



«MPS innovation benefits strongly from cross pollination between markets and applications.»

Gregoire Bagnoud,  
Director Business  
Development

## Steadily increasing requirements of the optics & photonics market

The cutting performance (speed, plate thickness, cut quality) of a laser cutting equipment, the precision required for the correction of eye lens focus (refractive surgery) or the efficiency in working with a microscope are increasing year after year. For a high-tech system supplier like MPS, the trends in the optics & photonics industry goes towards 1) increased position accuracy 2) increased speed 3) miniaturisation 4) better guided systems 5) longer system lifetime and all of it at 6) lower costs (or at least with costs not increased).

## Towards the market trend with «ball based systems»

A system is called «ball based» when the linear movement is performed by a ball screw (driven by a motor) and guided with linear bearings. Such systems are very suitable to move lenses over long strokes (more than 5 mm) with a resolution of 1- 5µm - depending on the quality of the drive system- and a lateral deviation of just a few microns. The advantage of ball-based systems is the potential for miniaturisation and the stiffness of the system with minimal friction. The quality of the micro-assembly with a clearance between components of less than 1µm is key for the performance of such ball-based systems.

A typical application is laser guidance of unmanned flying objects. In this case, since laser focus has to be performed over a long distance, the lens displacement will also be over a long stroke (typically 40-60 mm). The system developed by MPS is composed of two parallel axles, each guiding a pair of lenses. Two linear systems made of brushless motors and ballscrews are driving the two pairs of lenses independently. The nearly frictionless movement is secured by miniature linear ball bearings. The complete system is built in a very accurate milled frame, which guarantees a perfect coaxiality.

## «Bending elements based systems» to meet market & specific needs

Bending elements (or flexure elements) based systems use material elastic deformation to generate a controlled linear movement. Through smart engineering

1. Ball based system.

2. Flexure element based system.

a flexible element (or combination of elements) can be made compliant in specific degrees of freedom. Frictionless, no backlash and no hysteresis are among the most important advantages of flexure elements. On the other hand, due to the physical limits set by the material properties, their use is limited to systems with small strokes (typically 0-5mm).

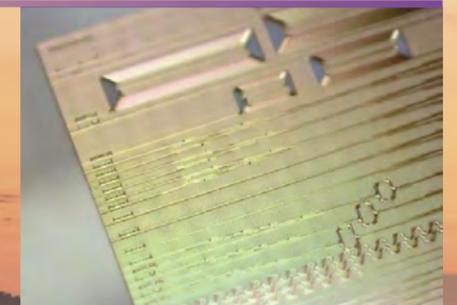
For one customer who needed a system capable of creating a lateral movement between two lenses with a positioning accuracy of less than 2µm, MPS developed a solution based on two superposed monolithic flexure elements. The system, suitable for a stroke of 2.5 mm, is driven in open loop by two stepper gear motors. One light barrier on each of the element sets the zero-position before each use of the system. MPS has designed the system with a challenging cost target, which would not have been achievable with the use of piezo motors.

## Generic technologies for other high-end optics & photonics applications

The applications shown in the section above are just examples of generic technologies developed by MPS, which can be customised for applications in other market segments such as laser material machining, science & space and ophthalmology.

www.mpsag.com

We just see a few of the myriads of interconnected tiny parts which make nature and our daily life efficient, informed, comfortable.  
Alike we have just glimpses of how deep thousands of researchers and developers in Western Switzerland contribute with micro & nano technologies to make both local and global worlds smarter: efficient, informed, comfortable.



*A silicon nitride photonic integrated circuit with different functionalities including delay lines, splitters and test structures*



*NiCorAl, a new plating that can resist up to 500 hours of salt spray corrosion*

Facing headwinds from fast-paced technology and new types of competitors, LEMO – a Vaud-based firm with 95% of its added value «made in Switzerland» – has turned to innovation to retain its competitive edge. And its novel approach has already slashed its time-to-market in half.

# The family-owned firm with a flair for innovation



Alexandre Patenaude

Serge Buechli

2

1. Anglissimo is an adaptive right angle plug in order to prevent cable snagging. Each connector can be oriented during its assembly.
2. LEMO wins the 2016 i-NOVO, R&D 100 and MAE awards for its Halo LED connector and NiCorAl special corrosion resistant plating.
3. The IAC - Intelligent Active Connector is a new range of connectors launched by LEMO which brings smart connectors to the market.

It's not often that a mid-sized family business beats the likes of PepsiCo and Philips Healthcare. Yet that's exactly what happened at CiMi.CON Award 2017, which recognizes companies with outstanding strategies and process innovation. LEMO won out against the two heavyweights in the final round thanks to its pioneering approach to innovation.

#### Push and pull

LEMO's flagship technology is the Push-Pull cable connector. This simple connection system latches in a snap and provides absolute security against vibration, shocks, and pulls on the cable it connects. Combining exceptional strength and reliability, the connectors are used in applications ranging from Formula 1 racing cars to medical equipment and satellites.



«A good idea isn't enough. We must also ensure it's viable and meets a genuine market need.»

Mathieu Menet, innovation manager

However, LEMO – currently a market leader – can't afford to rest on its laurels. Rapid advances in technology and new market entrants mean the company has to continually stay one step ahead. That means being proactive to anticipate customer needs even before they are expressed and setting up an agile

organization that can respond to those needs quickly. Realizing that innovation is the key to making those things happen, the company created an Innovation Lab in 2014 and appointed Mathieu Menet, Innovation Manager, as its coordinator.

#### An innovation ecosystem

The Lab is intended to foster and drive innovation across the company. But Menet has taken an entirely different approach. Moving beyond conventional innovation tools like brainstorming sessions and Post-It walls, he has set up a complete ecosystem combining best practices in innovation strategy, management, and acceleration. Underlying this approach is a three-step framework that involves scanning the market for new opportunities; developing solutions to capture those opportunities; and testing the solutions with customers to make sure they meet a genuine market need.

#### Reorienting the company culture

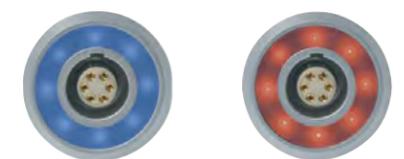
One of the biggest challenges Menet faced in implementing his approach was getting the firm's 1,550 employees to adopt a culture of innovation. While LEMO's founder was an innovator worthy of Silicon Valley – creating the company out of his kitchen 70 years ago – silos had since built up among the various divisions as the firm expanded. But seamless cross-functional communication is a core tenet of innovation. As is not being afraid to fail and share those failures with colleagues – vital to prevent the company from repeating the same mistakes.

Menet's solution was to break down the silos by setting up a collaborative online platform, or innovation hub, to facilitate communication and exchange. He also helped flatten the company's pyramidal structure so staff at all levels can propose ideas and receive the resources to test them out. He drew on methods from Design Thinking and Lean Startup to instill an iterative, rigorous process for identifying, ranking, and testing ideas to develop viable solutions with a fast time-to-market.

#### A tangible impact

Since the Lab was set up over two years ago, LEMO has launched seven innovations, won six innovation awards, and halved its time-to-market. As the firm forges ahead in innovation, it increasingly needs access to specific skills. One of its next goals is to build a network of experts: luckily, the Lausanne area, where LEMO is based, is home to numerous high-tech firms and universities. Through local initiatives such as Innovaud, the region's innovation agency, LEMO has been able to meet and share ideas with other companies. This kind of support will be essential now that the Innovation Lab is in place and the firm can focus on accelerating specific projects.

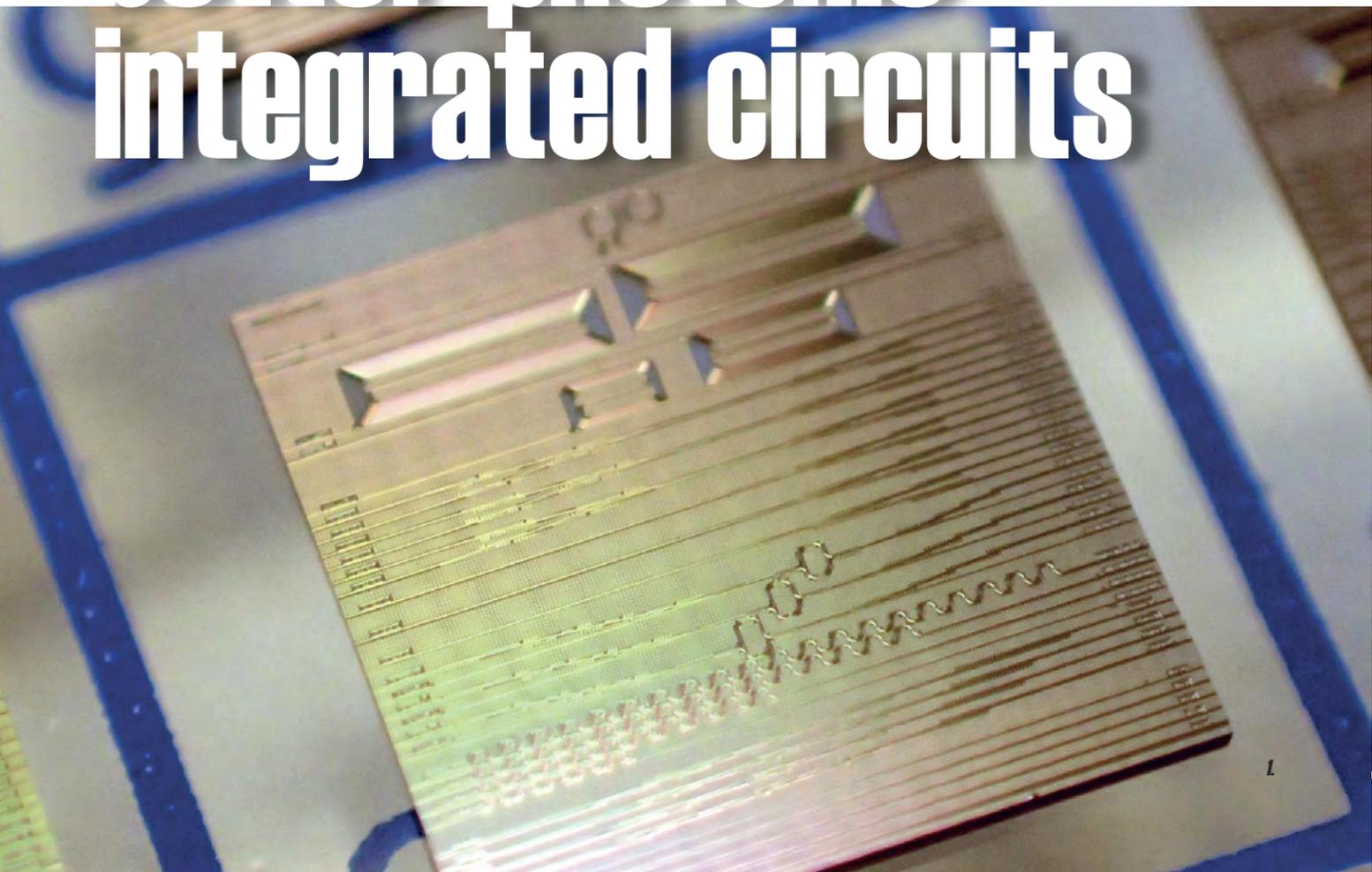
www.lemo.com



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Founded in 2016, LIGENEC SA is a spin-off from EPFL and is offering a micro-technology silicon nitride platform to miniaturize light circuits on a chip for applications in telecommunications, sensing and space.

# Thicker films for better photonic integrated circuits



**P**hotonic integrated circuits (PICs) are micro- and nano-circuits with dimensions of a few hundred nanometers in height and a few micrometers in width that can guide the light on a chip. Light can be manipulated on that PIC similar to an electronic integrated circuit where electrons are manipulated. It has been shown in the past that PICs can integrate many optical functions replacing bulk or fiber-based optics. This integration allows for smaller form factor, higher performance and complex system integration with unmovable light guides.



**«Photonic integrated circuits are the future of optical integration and will further enable new technologies.»**

*Michael Geiselmann,  
CTO & co-founder*

Several materials can be used to guide and manipulate light on a chip. These different PIC platforms have different functionalities ranging from passive optical elements through optical modula-

1. A silicon nitride photonic integrated circuit with different functionalities including delay lines, splitters and test structures.

2. Silicon nitride PIC functionalized with metal heaters and wire-bonded on a PCB.

tors and co-integration with electronics up to active materials providing integrated lasers and detectors. All platforms use wafer scale processing technologies in order to be able to scale up for volume fabrication.

Especially silicon nitride has become an interesting platform for photonic integration. Whereas for some platforms only three-inch wafers are available, silicon nitride PICs can be fabricated already in prototype runs up to eight-inch wafer technology.

Furthermore the large electronic band gap of silicon nitride allows for operation of a broad wavelength range covering the visible, near infrared and mid infrared, which is not always given for other PIC platforms. Therefore applications ranging from the bio- and medical sensing on a chip, high performance telecommunication, molecule sensing in the mid-infrared and space applications can benefit from the development of this technology.

Whereas thin film optical grade silicon nitride deposition below 200 nm is well mastered, thick film optical grade silicon nitride deposition exceeding 600 nm thickness was so far a challenge due to a very tensile material, when deposited through low-pressure chemical vapor

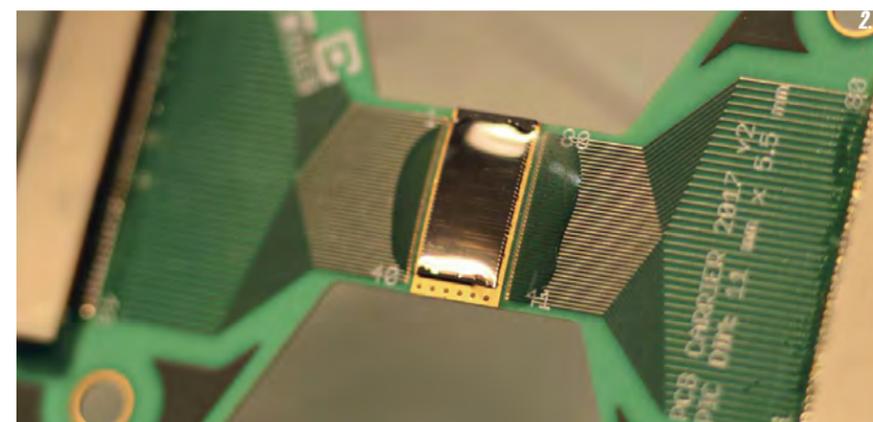
deposition (LPCVD) on a silicon wafer. Thick silicon nitride films often crack or delaminate from the wafer leading to a yield loss.

LIGENEC SA has further matured a technology originally developed at EPFL where these fabrication challenges can be overcome. With this innovative proprietary technology LIGENEC SA is able to deposit and structure silicon nitride films exceeding two microns in thickness.

Customers from telecommunication industry as well as the R&D sector see the advantage of the platform in the low loss propagation at small chip size resulting in cost effective solution. Our platform allows for strong light confinement and thus very small footprint of the circuit on the chip. Furthermore with the thick film waveguide technology nonlinear and quantum optics applications come into reach where emerging mass applications are on the horizon, reaching from massive telecommunication data rate transmission schemes to quantum key distribution for secure communication. Only recently it was demonstrated that with the use of a silicon nitride PIC an optical source for telecommunication could be realized providing more than 100 channels that could replace hundreds of lasers used nowadays for optical telecommunication.

LIGENEC is investing in further development and integration of more functions on the chips and offers prototyping solutions for silicon nitride PICs. The advantage of this wafer scale technology is scalability in cost and volume, once a prototype is developed successfully.

[www.ligentec.com](http://www.ligentec.com)

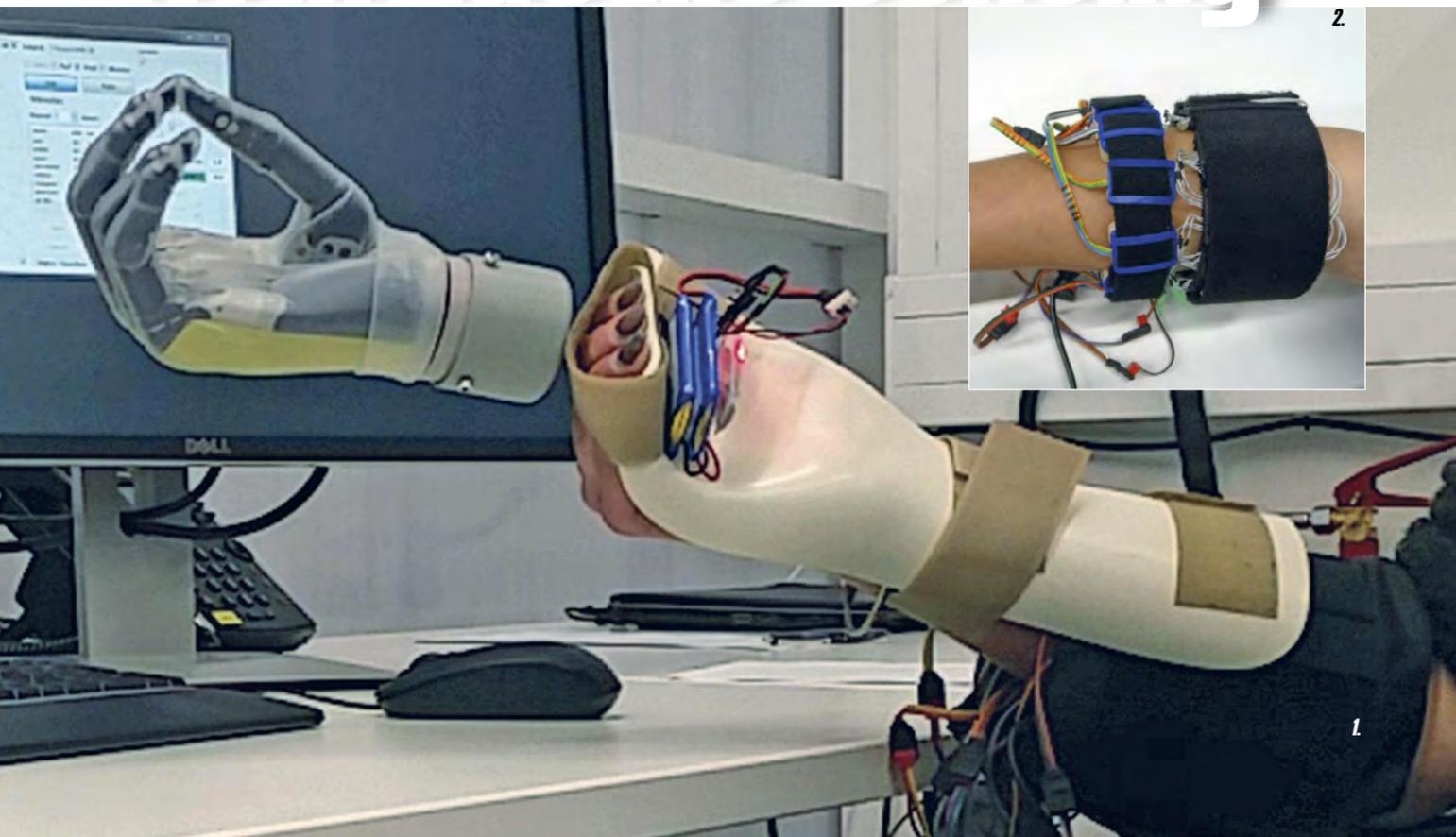


«The machine learning approach we develop takes into account the underlying structure and geometry of both sEMG and tactile array data.»

Sylvain Calinon, heading the Robot Learning and Interaction group at Idiap

Despite recent advances in prostheses, intuitive and robust control of poly-articulated prosthetic hands remains an unsolved problem. The TACT-HAND project aims at providing hand amputees with improved dexterous capabilities by exploiting tactile sensing and innovative machine learning methods.

# Improving the control of prosthetic hands with tactile sensing



«The TACT-HAND project aims at providing hand amputees with improved dexterous capabilities by exploiting tactile sensing and innovative machine learning methods.»

Noémie Jaquier, PhD student working on TACT-HAND

The TACT-HAND project proposes to employ a new generation of tactile sensors coupled with efficient, innovative intent detection methods by exploiting recent advances in machine learning. The final goal is to provide amputees with a stable, reliable and user-friendly control of their prosthetic hands. The TACT-HAND project bases its development on the I-LIMB Ultra prosthetic hand by Touch Bionics. It involves researchers from Germany (German Aerospace Center and Bielefeld University) and Switzerland, with support from the Swiss National Science Foundation (SNSF) and the German Research Foundation (DFG). The machine learning aspects of the project are conducted at Idiap, a research institute specialized in artificial intelligence located at Martigny in Valais.

Most of the previous technologies were based on surface electromyography (sEMG) as the main modality to infer hand movement intent in a non-invasive way. Despite the light weight, low cost and ease of embedding these sensors, the drawbacks of sEMG make the exact activity intention not yet possible. Due to the high number of muscles packed side by side in the lower arm, the signal delivered by the electrodes takes the form of a noisy mixture of muscles activity patterns. sEMG can also often be unstable due to sweat and movement of the electrodes.

The breakthrough of TACT-HAND is to exploit tactile sensing as an additional information about the movement intent. When activated, the shapes of the muscles change, inducing a pressure on the surface of the forearm. A shape conformable tactile bracelet is developed in the project to capture muscles bulges. Depending on the circumference of the forearm, between seven and ten tactile sensor module of 32 electrodes (in a 4 by 8 arrangement) are assembled together. The tactile sensors are based on elastomer foam, so that they exploit the change in the interface resistivity between two electrodes of a cell according to the applied load. The bracelet allows the acquisition of tactile data at low cost, low power consumption and simple usability.

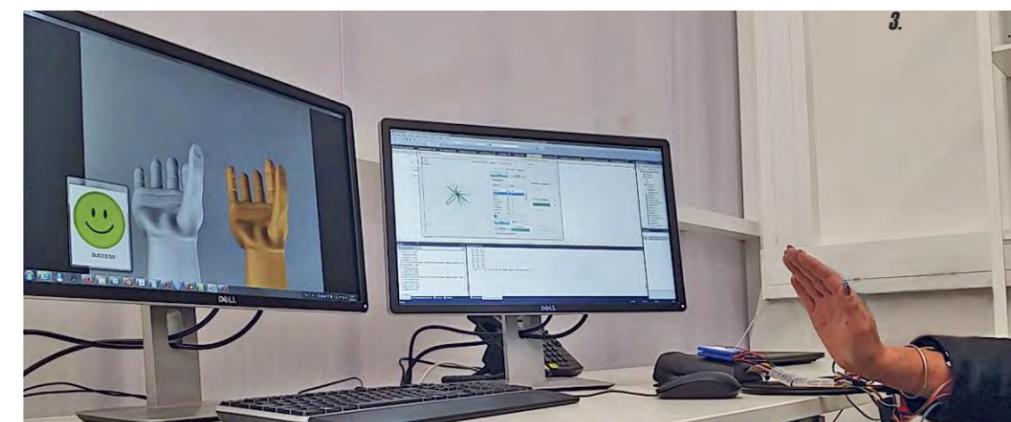
Tactile and sEMG data are then combined and processed by machine learning techniques developed at the Idiap Research Institute. The idea of machine learning is to allow a computer to learn without explicitly being programmed. In the case of controlling prosthetic hands, examples of tactile and sEMG input coupled with the associated hand or wrist movement are provided to the system. The developed model then learns the relationship between the input signals and the output movement, which is then used to make predictions when new input data are provided. The challenge of developing such a model is that the associated algorithm needs to adapt the control of the prosthesis when new situations are encountered. The novelty of TACT-HAND is that it considers the whole range of movement (including hand and wrist), as opposed to fixed poses. It means that the developed learning algorithm aims at recognizing how much a patient would like to open his/her hand instead of pro-

viding only closed and opened hand poses (regression vs. classification). In order to cope with such challenge, the approach developed at Idiap consists of taking into account the underlying structure and geometry of the data in the machine learning process.

Preliminary evaluations conducted on able-bodied participant, using only tactile array data, confirmed the feasibility and promises of the approach, and showed that the proposed method can successfully recognize movement intent. Future work includes the evaluation of the designed methods on amputees.

[www.idiap.ch/project/tact-hand](http://www.idiap.ch/project/tact-hand)

1. Experimental setup to test the i-LIMB prosthesis with able-bodied participants.
2. sEMG and tactile sensors wrapped around the forearm as a bracelet.
3. Experimental setup: the participant, wearing the developed tactile array bracelet, is asked to imitate the white hand pose observed on the screen, while controlling the skin-colored hand.



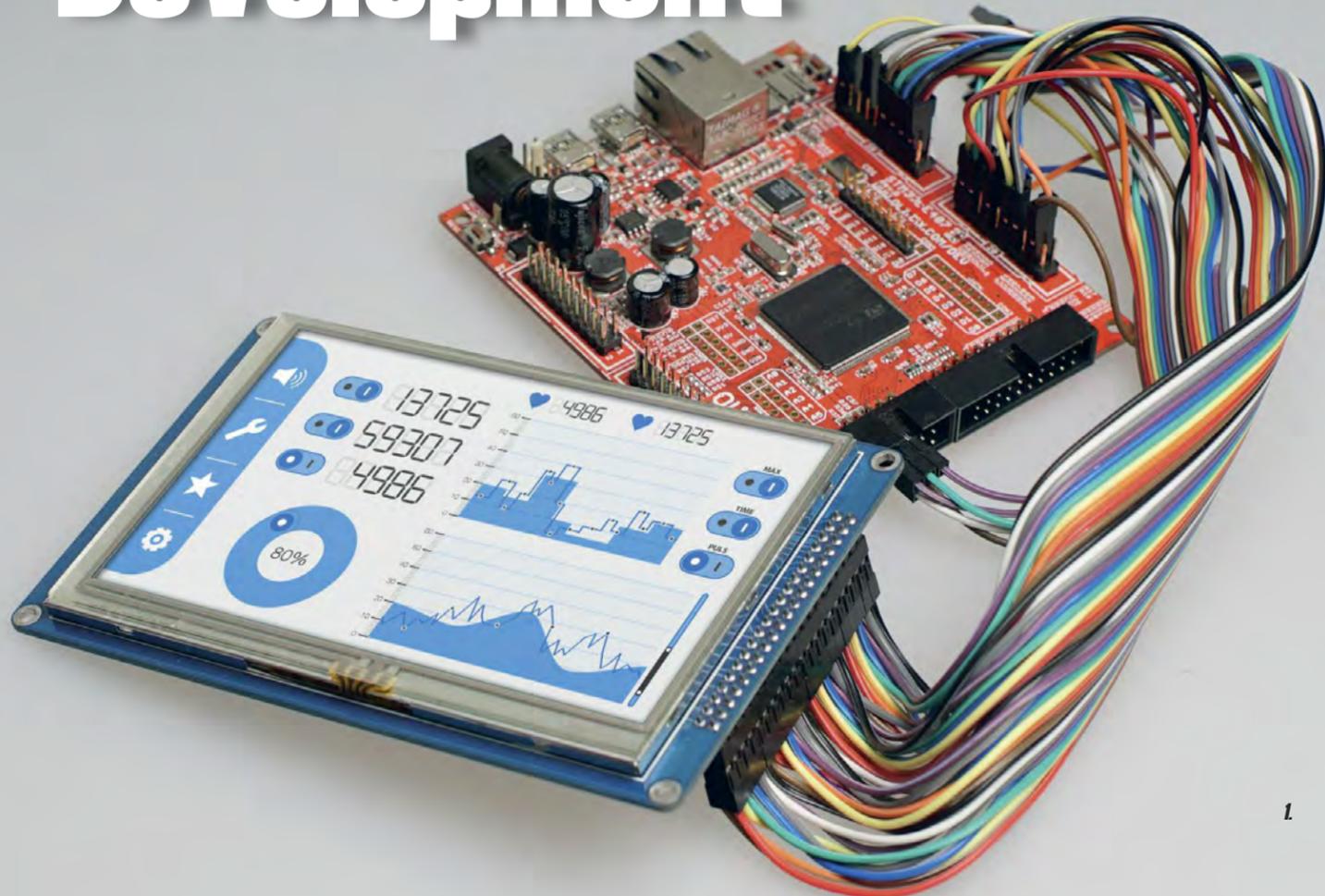


«Efficient collaboration between people of different backgrounds is a difficult task that must not be neglected.»

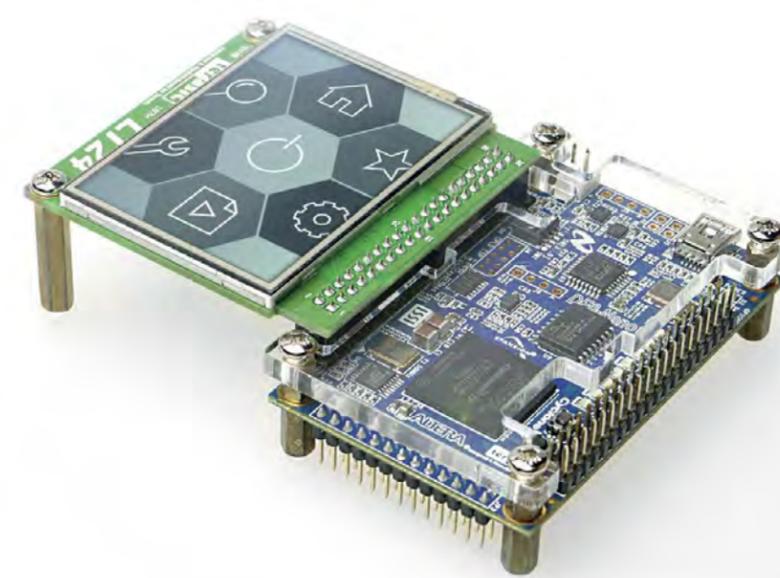
Joel Bodenmann, CEO

The expectations of graphical user interfaces (GUIs) on embedded devices are increasing constantly. End users are used to complex and glamorous GUIs from smart phones. Providing similar GUIs on embedded devices requires tools that allow graphical designers and software developers to collaborate.

# Embedded GUI Development



1



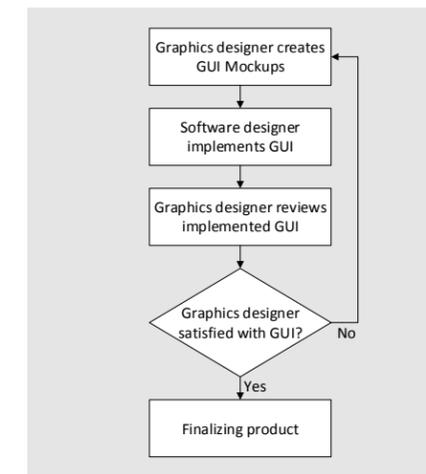
2

1. Embedded GUI prototyping.
2. Simple home automation GUI.

Nowadays, end users are used to complex and glamorous GUIs from devices such as smartphones. Whenever something is being touched or moved around on a touch-screen there are animations. Furthermore, every element has shadows, colour gradients and transparencies. Providing these features on small embedded devices is not only a technical challenge but it also requires tools that allow graphical designers, user interface designers and embedded software developers to collaborate. Developing a GUI for an embedded system is no longer a task just for skilled embedded software developers to save as much memory and processor resources as possible, but also requires equally skilled visual designers. However, experiences show that these are two distinct groups of people that do not usually work well together. That is not due to personal differences, but rather to the fact that these two groups come from two very different worlds with equally different experiences. Providing a tool which both groups can use to work on the same project vastly increases efficiency and reduces development time.

Tools that allow user interface designers to develop fully functional GUIs are nothing new. There are powerful code generators that allow any designer to create a GUI for a desktop computer or a smartphone without writing a single line of code. However, these GUI creator tools are targeting platforms with a lot of resources. Memory and CPU time are of no concern to the code generator, which

translates the GUI design into real code. This does not work when targeting embedded systems. CPU time and memory consumption are always delicate things to handle. As currently existing GUI creator tools cannot be used, the software developer has to implement the entire GUI him/herself. Experience shows that this workflow is rather inefficient due to the limitations of embedded systems; the final GUI never looks like the design, which requires the graphics designer to modify his/her GUI designs:

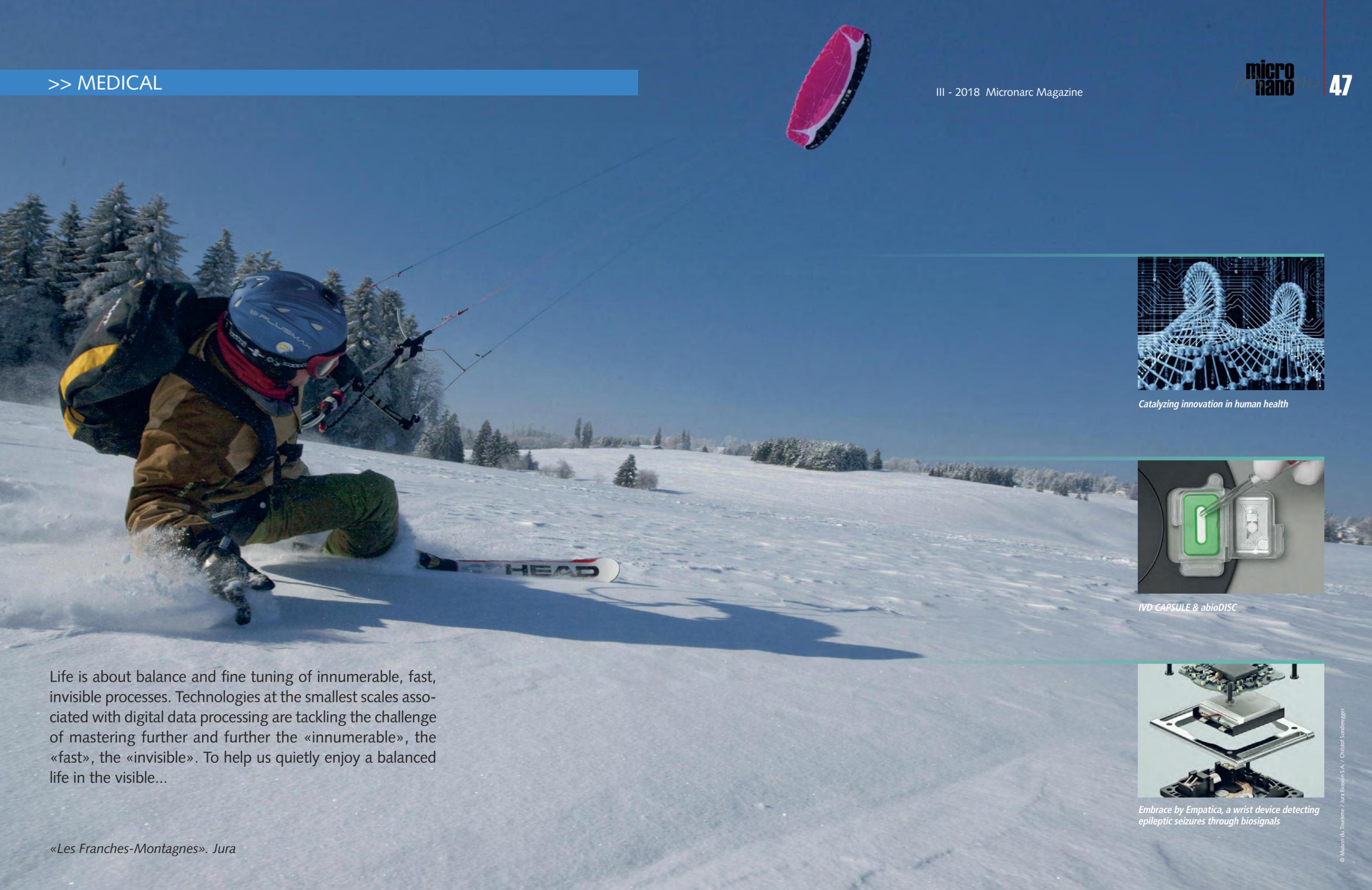


A tool which allows a designer to design the GUI directly inside an environment that matches the final hardware means that the overall GUI designing process no longer requires a software developer. Once the designer is finished with his/her work, he/she can simply pass the project files to the software developer who will use the exact same software to implement other aspects of the software.

The  $\mu$ GFX-Studio is a tool that is currently being developed that strives exactly for this goal: one tool for both designers and developers to vastly decrease development time of an embedded GUI, while still using as little resources as possible on the target hardware. Preliminary versions of the yet unreleased  $\mu$ GFX-Studio have been given to existing customers of the  $\mu$ GFX library. The gathered feedback shows that customers were able to implement entire GUIs three to four times more quickly. This reflects the importance of having tools that allow people of different backgrounds to work together on the same project using the same tool. Embedded software development is no longer only a technical challenge. Proper and efficient collaboration is a task that is often equally challenging and must not be neglected.

However, the  $\mu$ GFX-Studio is not only going to tackle the problem of collaboration. Compared to other existing solutions, the  $\mu$ GFX-Studio will focus on providing an editor that matches the display of the real end product. Unlike existing solutions, the  $\mu$ GFX-Studio does not use simulation or emulation. Instead, the  $\mu$ GFX library is used internally, directly rendering everything on the virtual display inside of the  $\mu$ GFX-Studio. This ensures that everything is accurate to the pixel. The content the  $\mu$ GFX-Studio shows on the desktop computer matches the final result on the real hardware pixel by pixel.

<https://ugfx.io>



Catalyzing innovation in human health



IVD CAPSULE & abioDISC



Embrace by Empatica, a wrist device detecting epileptic seizures through biosignals

Life is about balance and fine tuning of innumerable, fast, invisible processes. Technologies at the smallest scales associated with digital data processing are tackling the challenge of mastering further and further the «innumerable», the «fast», the «invisible». To help us quietly enjoy a balanced life in the visible...

«Les Franches-Montagnes». Jura

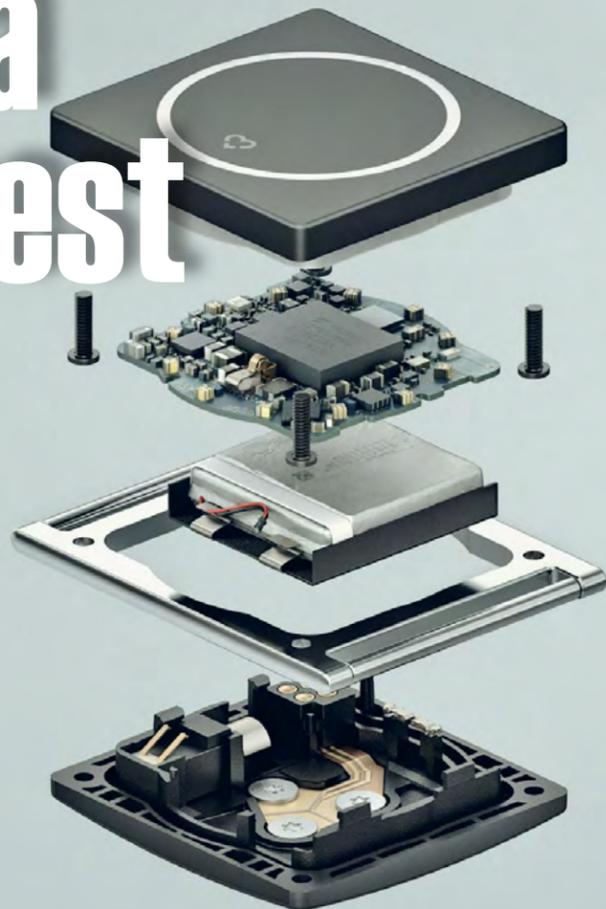
A unique European clinical research organisation to assess innovative health-oriented mobile and connected devices.



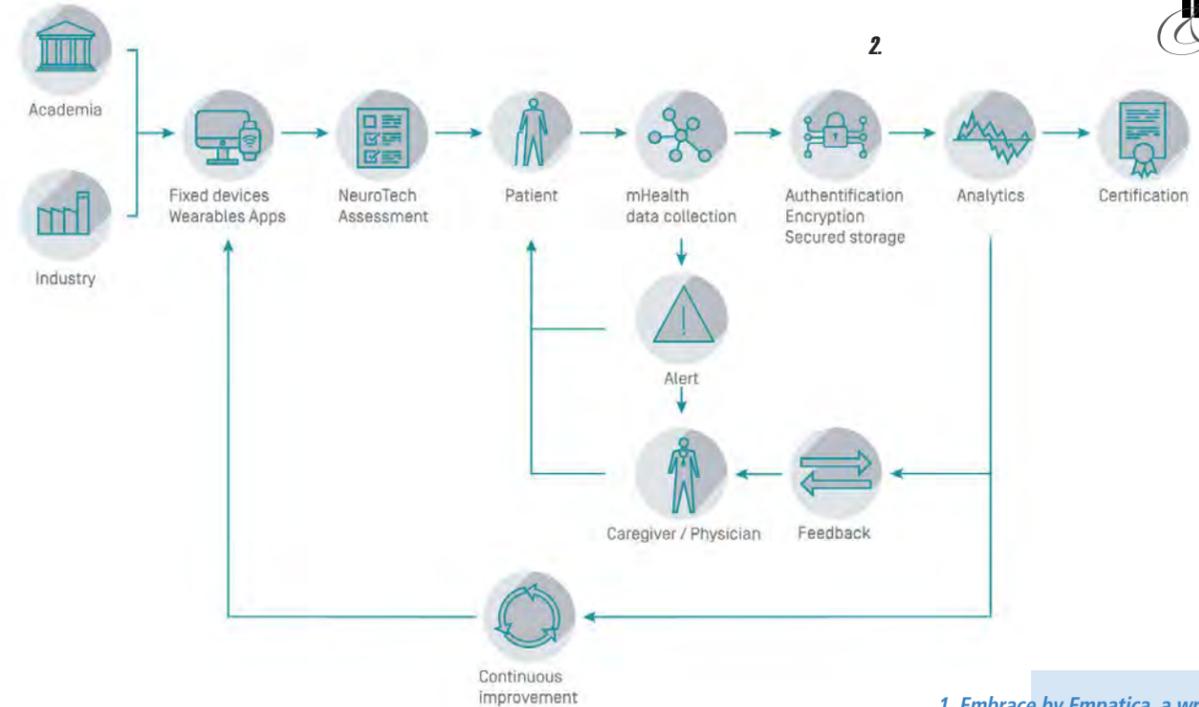
«mHealth offers a high potential to reduce the burden of brain diseases.»

Prof. Philippe Ryvlin,  
Head of Clinical Neuro-  
science at CHUV

# Bringing Big Data at its best



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1. Embrace by Empatica, a wrist device detecting epileptic seizures through biosignals.

2. NeuroTech activities & processing.

The academia and the industry have a unique opportunity to develop novel therapies suited to each patient by taking into account his genetic, biological and behavioural characteristics. With emerging technologies and big data, including digital patients' records, laboratory and imaging findings, -omics and data collected through wearable devices, a paradigm shift is taking place in the medical field, from a reactive to a proactive approach. NeuroTech has been launched in this context of an ever-changing environment with dozen of new mHealth devices, apps and sensors entering the market every day.

NeuroTech is a clinical research organisation dedicated to the assessment of the medical, medico-economic and societal impact of new technologies, in particular mobile and connected health solutions. Its activities include clinical trials, device's assessment, advisory services, as well as participation to certification and registration procedures with the methodology and standards of evidence-based medicine.

Within a large medical network, NeuroTech runs different types of clinical studies:

- The reliability of devices' sensing out-

put measures (e.g. cardiorespiratory activity, movements, electrodermal reactivity, etc) are compared to those simultaneously provided by medically-approved benchmark equipments. Tests are typically run over a few hours in each patient, within a dedicated living lab where a virtual reality environment can be implemented for contextualization.

- The usability, ergonomics and safety of tested devices are assessed over a time period of a few days in specifically-designed hyperconnected rooms at the CHUV patients' hotel. Rooms are equipped with a variety of sensors of reference, including closed circuit video recordings that precisely monitor patient- devices interactions.
- The medical, medico-economic and societal impacts of tested technologies are assessed in outpatients over a period of several months, typically using controlled randomised study design.

A comprehensive dedicated IT solution has been developed to optimally and securely handle all aspects of data management, from connection to the tested devices to encryption, transfer and storage at NeuroTech data warehouse, link

to other clinical data, analysis and monitoring by independent stakeholders, including regulatory bodies.

One current NeuroTech's study assesses Embrace by Empatica, a CE marked wrist band device which detects epileptic seizures by measuring several biosignals including electrodermal reactivity and accelerometry. Once a seizure is detected, the device automatically sends alarms to the affected patient's and caregiver's mobile phone. Such intervention might have a major impact on patients' management and quality of life. The post market evaluation performed by NeuroTech precisely aims to evaluate this impact.

Next to supporting and accelerating the development of patient-oriented new technologies, NeuroTech exerts a leverage effect on academic and technological research, local industrial innovation sector, and provides basis for decision-making in matter of public health investment related to novel technologies.



«Integration of competencies is key to maintain Switzerland's competitiveness.»

Dr Jean-Marc Brunner, CEO of the Swiss Integrative Center for Human Health

Born to help researchers from academia and industry to continue to innovate and maintain their competitive advantage, the Swiss Integrative Center for Human Health SA (SICHH) is focused on an unique approach. With the motto «Innovation by Integration», the center tackles R&D challenges holistically with interdisciplinary services.

# Catalyzing innovation in human health



1. Nanosurf Flex Ana with Atomic Force Microscope (AFM) - Image courtesy of Nanosurf.

2. Zeiss Smartproof 5 – Widefield Confocal Microscope – A first in Switzerland.

## Innovation by Integration

The Swiss Integrative Center for Human Health SA is dedicated to supporting fundamental and applied research related to human health. In other terms, SICHH tackles the creation of an innovative and interdisciplinary environment, which catalyzes innovation in R&D for public-private ideas and projects.

Established in the blueFACTORY, Fribourg Innovation quartier, SICHH's scientists operate in five high-tech facilities and labs hosted under the same roof:

- Health Facility: genome sequencing and proteomics
- Ergonomics Facility: human-machine interaction and effective visualization of complex results
- Materials Facility: microscopy and materials characterization
- Arithmetics Facility: analysis and interpretation of results; modeling and simulation data
- Tech Facility: laboratory support and cell culture services.

## Medtech meets Bio

The Medtech sector is entering a new era of developments using new technologies and integrating new components such as biomolecules, drugs, sensors and IT. While Switzerland had the chance to build up on the existing and experienced watchmaking and jeweler industry, medical technology is developing beyond dentistry and orthopedic areas.

Telemedicine makes use of telecommunication and information technologies in

order to provide monitoring and clinical health care at a distance. Implantology and personalized-medicine make use of new imaging technics, characterization and functionalization of surfaces as well as 3D prototyping and printing techniques. In parallel, some combinations products feature medical devices with new bio-components such as DNA, proteins, cells, antibodies or drugs.

The multidisciplinary team of highly skilled specialists provides microscopy services such as materials and surface characterization, modification but is also able to integrate technologies such as Next Generation Sequencing (NGS), genomic profiling, chemical synthesis, particle analysis or biological and microbiological analysis.

## Focus on Materials Facility: latest generation microscopes

At the crossroads of biology, physics, chemistry and bioinformatics, the Materials Facility provides solutions responding to those emerging needs. Imagery taken from latest generation microscopes can provide medtech customers with information such as hydrophilicity, hydrophobicity, roughness, texture, functionality or reactivity of materials. The facility is equipped with high-tech microscopes including:

- Zeiss Smartproof 5 Widefield Confocal Microscope
- Atomic Force Microscope – Nanosurf Flex Ana
- Confocal Microscope – Zeiss LSM 800 On Axio Observer Z1
- Morphologically-Directed Raman Spectroscopy – Malvern Morphologi 3G ID
- SEM with EDX system – Zeiss Gemini.



## Academic and industrial partnerships for innovative collaborations

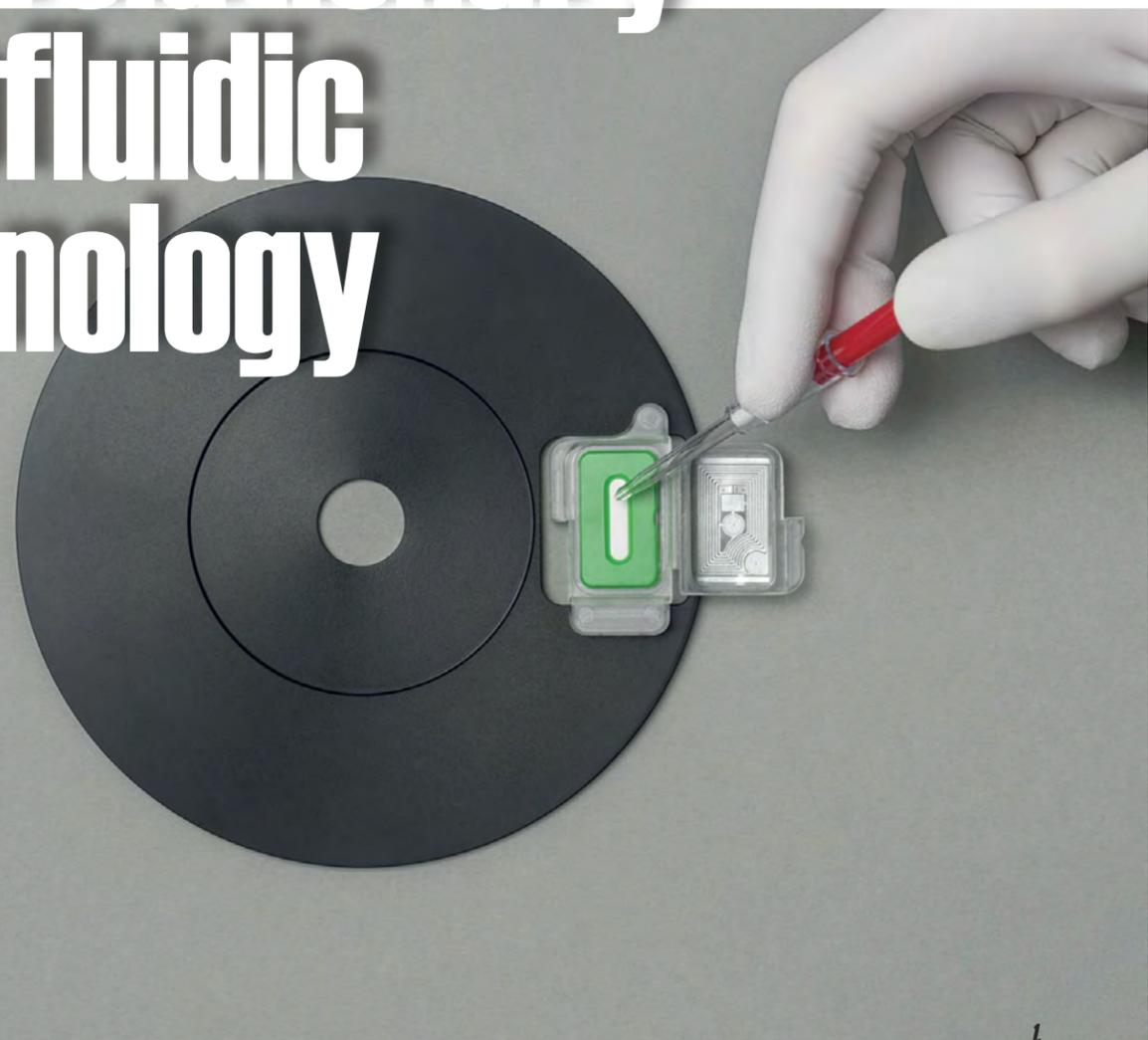
Company shares are held by academic partners across Switzerland. As a result, SICHH creates a network of academic competencies, facilitating access to professors and researchers for industrial customers. Academic partners also participate in projects involving multiple partners, such as H2020 for example.

SICHH also established partnerships with world-renowned industrial suppliers for equipping its facilities. The center's partners benefit of the latest generation technologies from its partners. In addition, machine suppliers bring their know-how and expertise to R&D projects development.

www.sichh.ch

Founded in 2010 at the renowned Swiss Federal Institute of technology in Lausanne (EPFL), Abionic SA is uniquely positioned at the crossroad of medical technology, biotechnology and nanotechnology. Abionic has developed a revolutionary nanofluidic technology that accelerates diagnostics.

# A revolutionary nanofluidic technology



1



2

1. IVD CAPSULE & abioDISC.
2. Abionic offers three different lines for pharmacies, hospitals & clinics and medical offices.
3. The blue abioSCOPE® for the medical practitioner.

**W**ith 28 highly qualified collaborators, and holding the record of prizes and awards ever won by a swiss startup, incl. 4 times best med-tech startup of the year, the company has managed to gain global interest and recognition from key opinion leaders and specialists in the medical field. With its 5-minute blood tests, Abionic brings molecular biology to medical offices, pharmacies, and hospitals for the greatest benefits of patients.

The company is a proud member of the Health Valley, which is considered as the fastest growing biotech cluster in the world. Actively selling products into the market, Abionic is now scaling up, profiting of the innovative fast-pace environment.

### abioSCOPE® – Medical diagnosis for immediate treatment

Based on a disruptive nanotechnology, Abionic is committed to stay at the forefront of innovation and to bring in vitro diagnostic world to a whole new level. With the abioSCOPE and its IVD CAPSULE, the company provides healthcare professionals with rapid and accurate clinical blood test results.

The technological principle relies on measuring the molecular interactions occurring in the nanofluidic biosensors contained in the IVD Capsule. *The whole process is simplified, intuitive and does not require any specific training for the users.* One drop of blood or serum (50µL) extracted from the patient's fingertip is sufficient to perform the test. After mixing the sample with

the provided reagent, the solution is placed into a capsule where it fills biosensors by capillary action. Using the diffusion phenomena, molecules interact together in biosensors and form molecular complexes in case of specificity. These immobilized complexes are optically detected by the laser integrated in the reading machine, the abioSCOPE. The intensity of the detected fluorescent signal quantifies the concentration of the tested biomarker and the first result appears on the device's touchscreen within 5 min. The data can be archived, printed and sent to the patient and/or doctor enabling physicians to deliver personalized advices and immediate treatment.



«Patients gain access to the right treatment faster thanks to our nanotechnology.»

Dr Nicolas Durand, Founder & CEO

### Innovation and R&D

The first abioSCOPE applications are in allergies. To this matter, a test measuring total IgE as well as the six main respiratory allergens (dogs, cats, birch pollen, olive tree pollen, house dust mites and grasses), is already commercially available in pharmacies across Switzerland. In addition, in 2017, the company announced the receipt of the CE mark for a unique novel test for sepsis risk assessment and management. Sepsis is the most common avoidable cause of death throughout the world.

This new application has the potential to significantly lower the mortality as the rapid test will enable fast and early detection and therewith allow much earlier treatment. As this high-tech solution is cost effective, it enables access to lab quality blood analysis even in places, where there is no or no sufficient laboratory infrastructure in place yet.

The Abionic team is committed to constantly develop new applications / rapid tests that are game changing in each of their respective markets. Thriving for innovation, this highly diverse and mindful extension of Abionic's portfolio is the perfect example to illustrate the devotion of the R&D department as well as the entire company's desire to revolutionize the in vitro diagnostic field in the patients' best interest.

[www.abionic.com](http://www.abionic.com)



3



«Our aim is to provide organs-on-chip that accurately predict the drug response in humans.»

Olivier Guenat, CEO

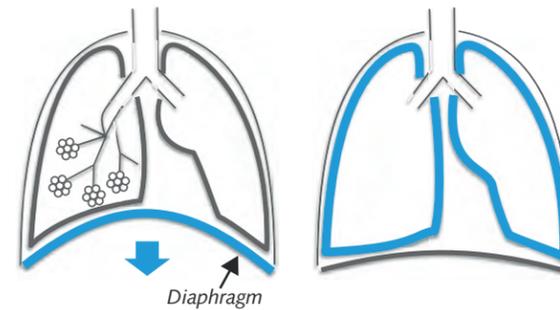
Founded in 2015, AlveoliX SA aims at bringing organs-on-chip on the market to select more efficiently drug candidates in the preclinical phase. In sharp contrast to standard in-vitro models based on Petri dish technology, organs-on-chip reproduce the in-vivo cellular environment in an unprecedented way.

# Organs-on-Chip, predictive tools for preclinical and precision medicine



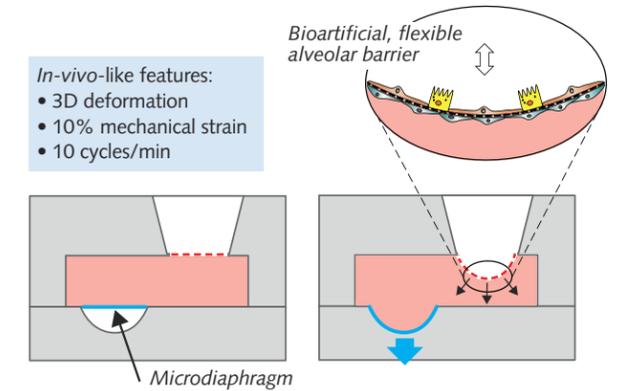
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IN-VIVO



Contraction of the diaphragm    Expansion of the thoracic cage

IN-VITRO



Microdiaphragm actuation    Alveolar membrane deflection

2

**T**oday, the drug discovery process is hampered by low success rates (only 10-15%) and high costs due to unacceptable toxicity and/or a lack of efficacy in compounds that are not identified by standard in-vitro and in-vivo models in the preclinical phase. This leads to late stage failure of promising drug candidates in the drug development process.

### Healthy and diseased human in-vitro models

AlveoliX, a spin-off from the ARTORG Center of the University of Bern in Switzerland, develops an organs-on-chip technology, starting with the lung. These in-vitro models are based on human organ tissue and on the reproduction of a near physiological environment that preserve the original functions of the tissue, either healthy or diseased. These models are easy-to-manipulate, cost-effective, and are an efficient way to study clinical and pharmacological effects in these tissues, and eventually in a combination of tissues (multi-organs-on-chip systems), allowing for faster and more humane testing.

### Potential of organs-on-chip technology

With this technology AlveoliX aims to transform the way preclinical and clinical tests are done and to help pharmaceutical and biotechnology companies improve on their historically long and costly process of developing efficient and safe drug compounds. The organs-on-chip technologies currently being developed are potentially critical for the emerging field of personalized healthcare. The World Economic Forum recognizes these technologies as a truly transformational innovation that will help to shorten drug discovery times, select the most promising drug candidates early and reduce the use of animal testing by enabling patient cells to be used during the drug discovery stage and in toxicological studies.

### Lung-on-chip: in-vivo-like and easy to use

AlveoliX's first product, a lung-on-chip, is a unique lung alveolar model that mimics key aspects of the lung parenchyma environment, including the thin alveolar barrier and the mechanical

1. The AlveoliX lung-on-chip system based on a multiwell format.

2. Left: breathing mechanism in-vivo. The thoracic cage expands upon contraction of the diaphragm. Right: schematic view of the bio-inspired actuation principle used in the lung-on-chip. The alveolar barrier deforms in three-dimension like in-vivo when the microdiaphragm is deflected by a negative pressure (from the breather).

stress induced by the breathing movements. AlveoliX's lung-on-chip system is a benchtop system, consisting of a multiwell plate with 12 lung-on-chips connected pneumatically to a docking station located in an incubator and an electro-pneumatic breather that recreates the cyclic breathing movements. The system is compatible with existing pipetting robots used in the pharmaceutical industry and has been designed to be easy to use.

www.alveolix.com

As the industrial revolution was spreading, Western Switzerland got inspired by timekeeping. The area has still the most accomplished and prestigious watchmaking industry in the world, while its brilliant technical skills have matured into micro, and now nanotechnologies, to meet even the highest demands.



Richard Mille  
RM 50-03 McLaren F1



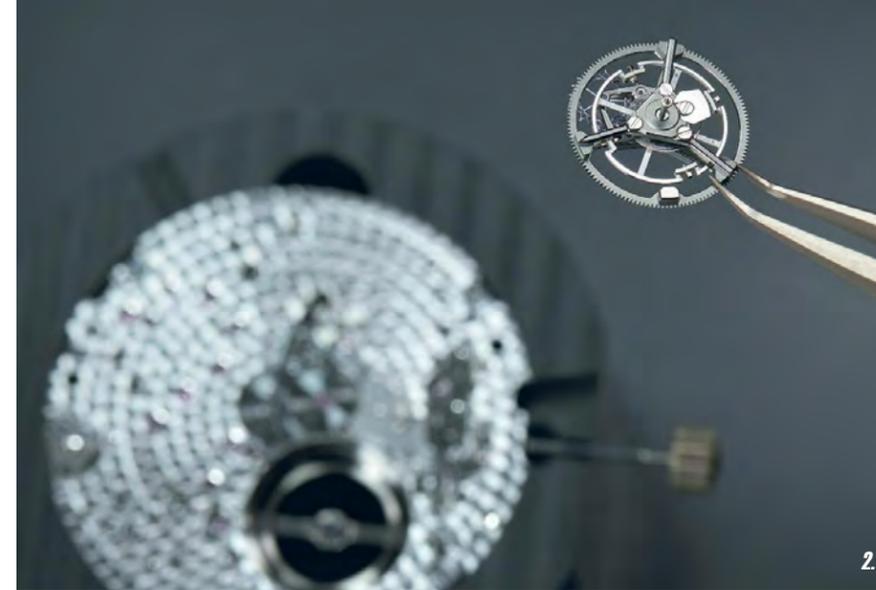
Breguet  
Marine Équation Marchante 5887

Temporary ice rink in front of the federal parliament building, Bern



In days gone by, the holy grail for sailors was to know where they were in terms of latitude, and especially longitude. Breguet pays homage to marine chronometer-making and Abraham-Louis Breguet – Watchmaker to the French Royal Navy.

▲▲ BY YANNICK NARDIN - WATCHES THE GUIDE



1. Marine chronometer No. 3196 sold on 14 January 1822 to the French Navy.

2. This grand complication integrates a running equation, perpetual calendar and tourbillon, with engraved bridges and a barrel decorated with a compass rose.

3. The Breguet Marine Équation Marchante 5887 in 18-carat rose gold with a silvered gold dial and anthracite movement.

# Breguet - by the light of the sun



The history of watchmaking has been punctuated by the inventions of Abraham-Louis Breguet (1747-1823). From the ingenious tourbillon, to the gong-spring, to the Breguet balance-spring, he also developed a «chronometer with double 'observation' seconds» in 1820, which anticipated the flyback chronograph. In the 19<sup>th</sup> century, many European rulers and sovereigns wore a «Breguet». In France however, Napoleon chose not to award the watchmaker any particular honours, unlike Louis XVIII. In 1814, the king appointed Abraham-Louis Breguet as a member of the Bureau des Longitudes, before making him Watchmaker to the French Royal Navy the following year – a supreme honour. Assigned to one single watchmaker for the duration of his lifetime, the position notably involved the development of marine chronometers for the royal fleets. These two roles reflected the crucial importance of astronomical and chronometric watchmaking for sailors at the time.

## Watchmaking sets sail

At this point in history, dominion over the oceans – and the riches of the colonies – depended on navigational skills. When Abraham-Louis Breguet became Watchmaker to the French Royal Navy, France had the second most powerful navy after Great Britain. Aboard the ships, the chronometer played a vital role; it was used to determine longitude, calculated by comparing the real position of the sun in the sky with Greenwich Mean Time as indicated by the

marine chronometer. This also worked for any other celestial body in the sailor's almanac. Marine chronometers required the greatest accuracy as a variance of a single second is equal to almost 500 metres! For instance, on Breguet's chronometer n° 3196, a suspension system and a detent escapement compensated for the discrepancies caused by impacts and variations in temperature. But not all ships had a marine chronometer. They were expensive and few sailors knew how to use them. For this reason, in 1817 Breguet completed a short work entitled «Instructions on the use of marine watches». As Watchmaker to the French Royal Navy, Abraham-Louis Breguet sold a total of 78 pieces classed marine watches or clocks, 22 of them to the French Royal Navy.

## The path of the sun

Today's sailors rely on other technologies – such as GPS radar systems. However Breguet continues its research into astronomical watchmaking to this day, in the same spirit as the inventive watchmaker. In 1990, the brand launched the Marine collection in honour of the role held by the watchmaker from 1815 until his death. In 2017, the Marine Équation Marchante 5887 interpreted the complication of the equation of time, a symbol of the historical quest for a civil time that corresponded to the real solar time. This rare and fascinating watch complication displays the difference between the mean time – the civil hours and minutes – and the real time – the solar hours and minutes. Normally the equation of time is shown as the number of minutes that must be added to or subtracted from the civil time to obtain the real time. On the dial of the Marine Équation Marchante, two distinct hands indicate the times simultaneously. The minutes of the solar time can be read directly from the running solar hand featuring a golden sun. But behind this seeming simplicity lies a highly complex mechanism that few watchmakers are capable of producing. Breguet has even added a perpetual calendar to these major complications. In terms of aesthetics, the model has a modern look with guilloché decoration forming a wave pattern on the dial. Last but not least, the tourbillon bar features an inscription that evokes Breguet's rich history: «Marine royale».



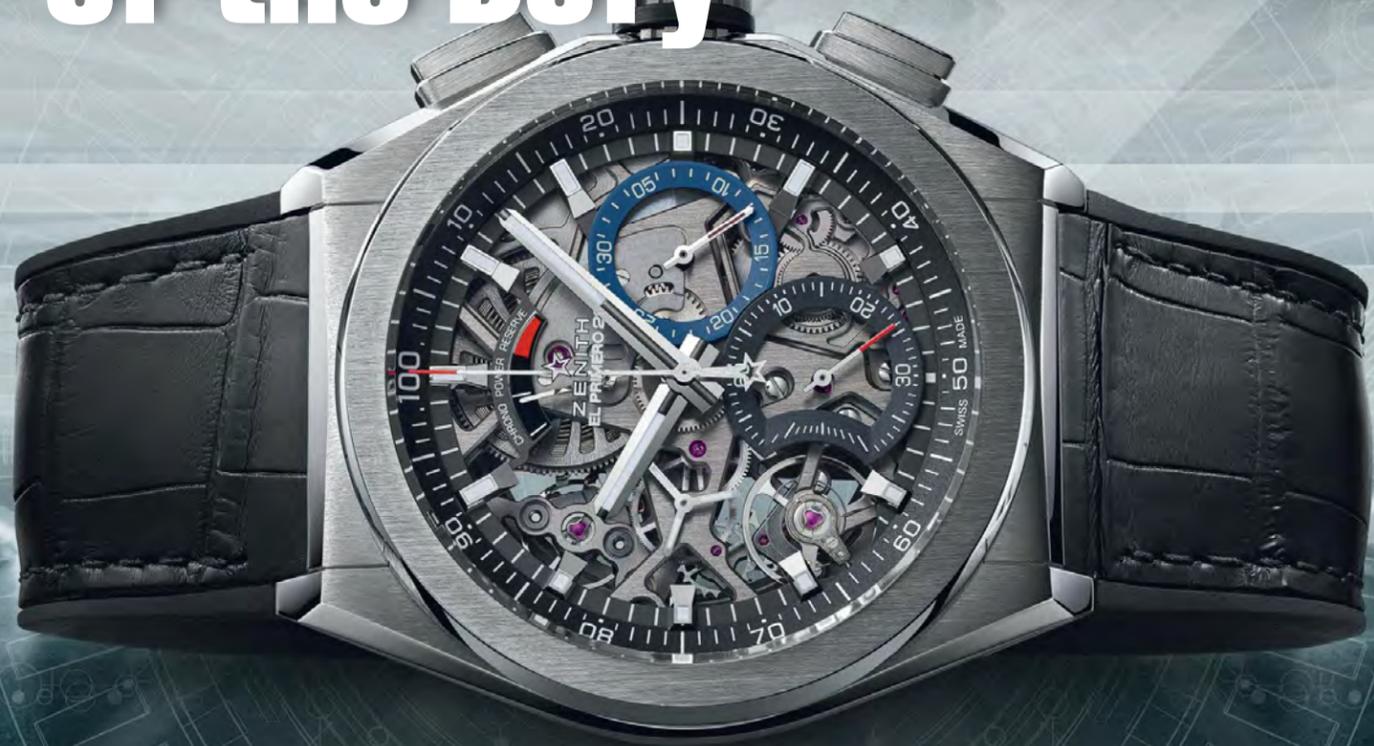


1

With the arrival of Julien Tornare at the helm of Zenith, the brand blazes into the 21<sup>st</sup> century with two decisive milestones: Defy El Primero 21 – a chronograph capable of measuring 1/100<sup>th</sup> of a second, and the Defy Lab, a mechanical watch of astonishing precision.

▲▲ BY MICHEL JEANNOT - WATCHES THE GUIDE

# Zenith: 2017, the year of the Defy



2



III - 2018 Micronarc Magazine

**W**hen I wanted to meet Julien Tornare, who was in Hong Kong at the time, he said to me: 'Ok, I'll come on Saturday and go home the same day.' That's when I understood he had the responsiveness I was looking for. Jean-Claude Biver, President of the Watch Division of the LVMH Group, saw in Julien Tornare the ideal candidate to reverse the fortunes of Zenith. A man after his own heart? In terms of his vision – that of building on the vast heritage of the manufacture and propelling it into the 21<sup>st</sup> century – he certainly is. In other words, innovation is at the heart of his strategy to regain the leading position the brand once enjoyed in terms of chronometry and innovative developments in watchmaking.

From that point of view, Zenith can draw on its solid chronometric heritage and strong manufacturing capacity. But it can also count on the power of LVMH's scientific R&D division. All they needed was a unifying project to harness those synergies and high-precision mechanics.

### A Defy worthy of the name

That project was to be Defy. More than a mere product, this is a concept: a new collection which is gradually becoming a cornerstone of Zenith's renaissance. At Baselworld we admired its first incarnation: the Defy El Primero 21, the first chronograph wristwatch able to measure 1/100<sup>th</sup> of a second as standard. And what is more, it is COSC-certified. The central chronograph hand makes a full rotation every second. It consumes 10 times more energy than the 1969 El Primero. In order not to affect the watch's precision or put any strain on its power reserve, Zenith has equipped its

Defy El Primero 21 with two complete kinematic chains, each with its own barrel (power reserve) and escapement. The time section offers autonomy of 50 hours while the chronograph can operate for 50 consecutive minutes.

### Revolutionary

The Defy Lab is Act II of this adventure. This is less of an evolution and more of a complete revolution – probably one of the most significant since the invention of the spiral balance spring in 1675 by Christiaan Huygens. The watch contains a new oscillator formed from a single monolithic piece of monocrystalline silicon, replacing over 30 components in a standard oscillator. No more friction, no more need for oil. The Defy Lab is also entirely unaffected by temperature, gravity and magnetic fields.

It operates at 15Hz or 108'000 vph, compared to a maximum of 28'000 for almost all mechanical watches! This new oscillator gives Defy Lab an exceptional precision of 0.3 seconds per day for 95%

1. 1/100<sup>th</sup> of a second chronograph movement.
2. Defy El Primero 21 in brushed titanium with a skeletonised dial.
3. New single-piece oscillator from the Defy Lab.
4. The Defy Lab, in Aeronith, the world's lightest aluminium composite.

of its power reserve (over 60 hours). By comparison, one of the criteria for obtaining «chronometer» certification from the COSC is an average daytime operation on the first 10 days of control of -4 seconds to +6 seconds, i.e. a tolerance of 10 seconds. The Defy Lab's case is made of Aeronith, the world's lightest aluminium composite. Like all major innovations, those that grace the Defy Lab – only 10 of which are in existence, reserved for passionate collectors – will unleash their full power when they are used to equip their series watches in 2018. Zenith is still working on it, but the renaissance of the brand is most certainly well underway.

[www.zenith-watches.com](http://www.zenith-watches.com)



4



Parmigiani Fleurier has cultivated its difference for over 20 years, earning a special place in the hearts of connoisseurs. The Tonda Chronor Anniversaire recently introduced them to a new dimension in watchmaking.

▲▲ BY OLIVIER MÜLLER - WATCHES THE GUIDE

# Parmigiani Fleurier, art and know-how



2

1. The Tonda Chronor Anniversaire with its integrated flyback chronograph movement made from gold.

2. The Kalparisma, with a gemset 18-carat rose gold tonneau-shaped case and a mother-of-pearl dial.

3. The Bugatti Type 390: an engine/passenger compartment/bodywork construction inspired by the car, with the cylindrical calibre PF390 with flying tourbillon.

Does it defy definition? The Parmigiani Fleurier manufacture eludes many fine watchmaking standards. Most brands are centuries old, whereas Parmigiani Fleurier has just celebrated its 20<sup>th</sup> anniversary. At that point in their lifetime, many other brands are working on the design of models powered by third-party movements. However Parmigiani Fleurier is already a completely integrated manufacture capable of producing a timepiece from the initial sketch to the hands, including the rare feat of creating the regulating organ – designing, producing, assembling, and hand-finishing every single component of its calibres.

Parmigiani Fleurier develops contemporary timepieces that are deeply anchored in tradition. The Maison's creations harmoniously blend proportions, nature, culture and architecture. Another distinguishing factor is that Parmigiani Fleurier is completely independent. It is owned by the Sandoz Family Foundation, while Michel Parmigiani himself – master watch restorer and founder of the manufacture – embodies the company's creative soul to this day.

### A peerless chronograph

This uniqueness gives rise to equally unique timepieces, as one of Parmigiani Fleurier's latest creations – the Tonda Chronor Anniversaire – brilliantly demonstrates, winning over the most enlightened collectors. It is manufactured in a limited edition of two batches of 25 pieces in white gold or pink gold. It is the first chronograph calibre to be produced by the manufacture – which makes it a piece that will go down in history. What is more, it's not just a chronograph, it is a

flyback chronograph, one of the most technical variations and one only usually attempted by the long-established brands. The Tonda Chronor Anniversaire also displays a large date, i.e. one with a double disc.

Most purists would stop there – but not Parmigiani Fleurier. The manufacture also decided to work on a completely integrated design, thereby doing away with the certainly easier but less noble modular construction. The movement is not made from brass or nickel silver, but 18K solid gold. To reflect this noble material, Parmigiani Fleurier gave its Tonda Chronor Anniversaire a Grand Feu enamel dial – a tribute to some of the finest pieces in history. Finally, the Tonda Chronor operates at 36'000 vibrations per hour, making it one of the very few 100% manufacture flyback calibres to oscillate with such precision. It is easy to imagine such a frantic rhythm being embraced by the legendary musicians who perform at the Montreux Jazz Festival, of which Parmigiani Fleurier has now been a partner for over 10 years.

### Kalpa, a strong identity

Long before the Tonda Chronor Anniversaire, the Kalpa had already left its mark on contemporary watchmaking for at least three reasons. The first: its shape. The piece quickly made an impression thanks to its tonneau-shaped case with integrated lugs, highlighting the success of a daring design that has become iconic of the brand. The second is the variety of versions. All of them are powered by manufacture calibres, offering three-hand, date, chronograph, power reserve, and skeleton variations, and many more. The third and final reason is its versatility.

The Kalpa models appeal to both men and women.

The women's versions also showcase Parmigiani Fleurier's artistic expression. Today, there are over 30 variations, alternating gold, steel, diamonds, guilloché mother-of-pearl, quartz or automatic movements, gold bracelets or Hermès leather straps, calendars and small seconds. Meanwhile the Kalparisma models offer a marginally larger automatic watch designed for women looking for a more assertive, contemporary piece.

[www.parmigiani.com](http://www.parmigiani.com)



3

Swiss watchmaking is undergoing a period of profound change. In addition to geo-political upheavals, customer behaviour has changed in terms of information and purchasing. After a sharp decline in 2016 (-9.9%), Swiss watchmakers hope to end 2017 on a stable note. The tourists are returning, especially to Switzerland, and they are starting to buy watches again. At the same time, it appears that Millennials continue to have an appetite for luxury watches. Still a clear leader in the watchmaking market, Switzerland sells 26 times fewer watches than China, but at prices 177 times higher! Watches The Guide takes you on a journey to the land of watchmaking via a few facts and figures.

▲▲ BY MICHEL JEANNOT - WATCHES THE GUIDE

### Hong Kong leads the way... despite the downturn

Despite a decline of more than 25% in 2016, Hong Kong remained the premier outlet for Swiss watchmakers. It must be said that practically all of the principal markets experienced a downward trend in this sluggish year for Swiss watchmaking, since, in addition to the situation in Hong Kong, exports to the United States fell by nearly 10% and exports to China and Japan by over 3%. Only the UK imported more Swiss watches by value last year, mainly due to the sudden attractiveness of their price (based on international comparison) resulting from the sharp fall of the pound sterling against the Swiss franc.



The main markets for Swiss watches in 2016



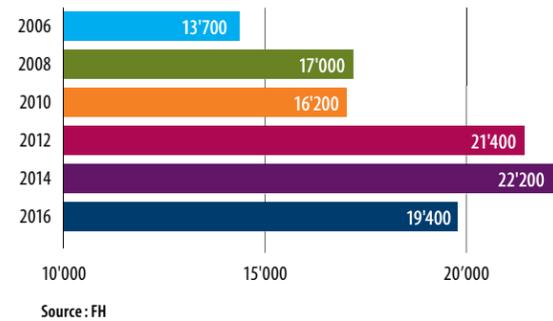
Source: FH

Sources: The Federation of the Swiss Watch Industry (FH), Vontobel Bank (Vontobel Luxury Goods Shop 2017), Deloitte 2017 Study on the Swiss Watch Industry.

**2016, a second year of decline**

Swiss watch exports amounted to CHF 19.4 billion in 2016, a decrease of 9.9%. This is the second consecutive decline after an initial fall of 3.3% in the previous year. The record year of 2014 – with 22.4 billion francs of exports – now seems a long way off. But 2017 promises a return to stability and some indicators have turned to green. Exports continued to decline in the first quarter (-3%), but picked up again in the second quarter with an increase of 3.2% to CHF 5 billion. It should be noted that China, where falling demand was a significant cause of the 2016 slowdown, experienced a spectacular recovery in the second quarter: Swiss watch exports to the Middle Kingdom jumped by over 27%!

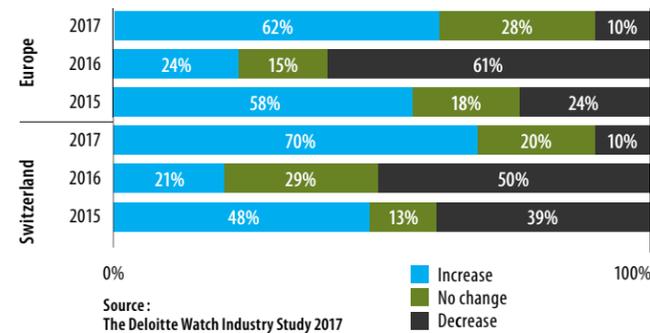
**Growth in exports**  
(in millions of CHF)



**The tourists are back: optimism is in the air**

Senior watchmaking executives are optimistic about sales prospects in Europe and Switzerland among tourists from Asia, South America, Russia and the Middle East over the next few months. 62% of these industry professionals expect an increase in sales to tourists in Europe, compared to 24% in 2016. The situation for Switzerland (which accounts for about 5% of total sales for Swiss watchmakers) is even better: 70% of executives surveyed believe that sales will increase in the coming months, compared to only 21% in 2016.

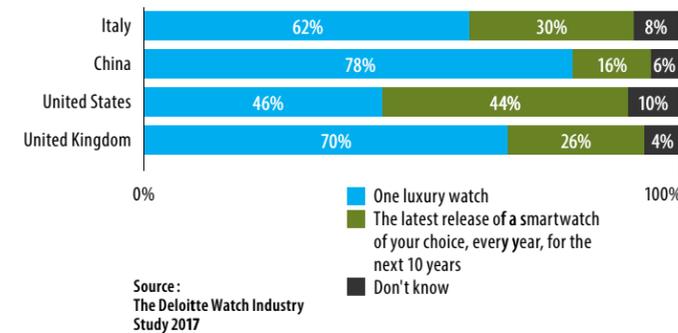
**Sales prospects**



**The high-end segment still appeals to Millennials**

Deloitte's research indicates that members of Generation Y, or Millennials, are less interested in purchasing a smart watch than you might at first imagine. When asked how they would spend a gift of CHF 5,000, if they were to choose to buy a watch, young Millennials in China, Italy, the United Kingdom and the United States say they would choose a luxury mechanical watch rather than purchasing the latest version of a smartwatch every year for the next ten years. With the exception of the United States, where the proportion of young people surveyed who prefer smartwatches is almost equal to those who opt for mechanical watches, more than 60% of respondents would prefer to buy a mechanical watch.

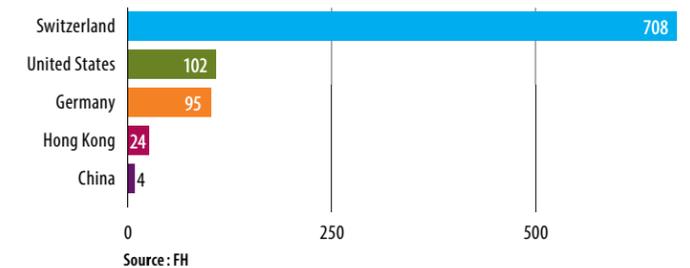
**Smartwatch vs mechanical watch**



**The price gap**

The 25 million watches exported by Swiss watchmakers represent only 2.1% of the world market, estimated at 1.2 billion watches. The reason these 25 million watches have propelled Switzerland to the top of the world rankings in terms of value is because the average price of the Swiss watch far exceeds those of all its competitors. The average export price of a Swiss watch was US\$708 in 2016, down slightly from US\$748 in 2015. The United States records an average price of US\$102 for a production of 10 million units, while Germany has an average price of US\$95 for 17 million watches exported. It's another story altogether for the two Asian producers Hong Kong and China, with average export prices of US\$24 and US\$4 respectively, for exports amounting to 241 and 652 million watches respectively!

**Average price of exported watches**  
(export price in US\$)

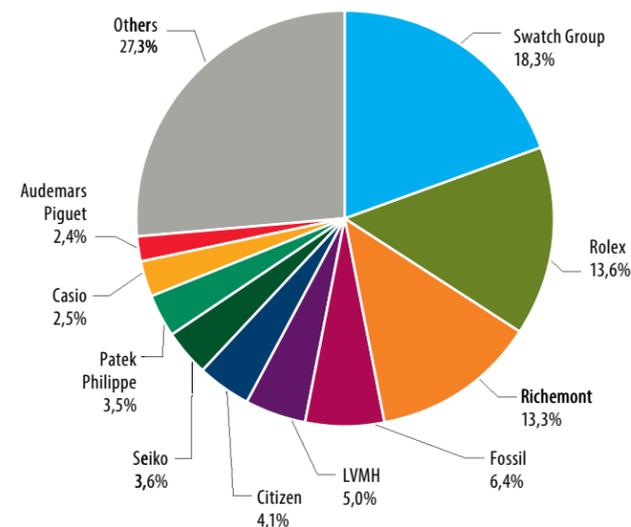


**The biggest players in watchmaking in 2016**  
(in market share value)

**Swatch Group still leads the way**

Despite a market share that has fallen to 18.3% (19.6% in 2015), Swatch Group remains the world's leading watchmaking group. It outperformed Rolex in growth terms, reaching 13.6% (12.9%), which outstripped a flagging Richemont group at 13.3% (14.8%). In short, three Swiss groups have secured the top three positions in the world watchmaking rankings. Next in the rankings comes the American company Fossil, with 6.4% (6.3%) of market share, followed by LVMH with 5% (4.3%). Japanese watchmakers Citizen (4.1%), Seiko (3.6%) and Casio (2.5%) together account for 10.2% of the world market, while Patek Philippe can claim 3.5% and Audemars Piguet 2.4%.

Source: Vontobel Luxury Goods Shop 2017

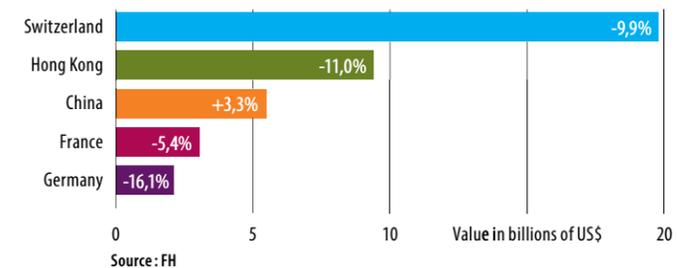


Source: Watches The Guide

**Switzerland way out in front**

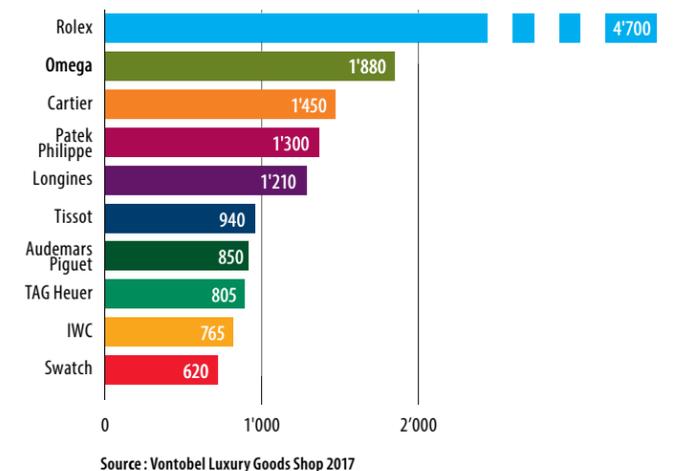
Switzerland retained its place as clear leader among the world's watchmaking producers in 2016 by value. Despite a 9.9% decrease last year, Swiss watchmakers exported the equivalent of US\$19.1 billion, a long way ahead of Hong Kong with US\$8.8 billion. China ranks third with US\$5.6 billion of watches exported, ahead of France (2.7 billion) and Germany (2 billion). Among the five main exporting countries, only China posted growth (+ 3.3%) in 2016, while the other four countries recorded a decline in their activities.

**The main exporting countries in 2016**  
(direct exports)



**Top 10**

**Top 10 brands for watch sales in 2016**  
(in millions of CHF)



Source: Watches The Guide



**RICHARD MILLE**  
**RM 50-03 McLaren F1 / CHF 1'058'500**  
 Tonneau-shaped case in Graph TPT®, dimensions 44.5 x 49.65 x 16.1 mm, sapphire crystal case back. Manually wound mechanical movement, manufacture calibre RM50-03 in grade 5 titanium and TPT® Carbon, variable inertia balance, fast rotating barrel, barrel pawl with progressive recoil. Power reserve of about 70 hours. Functions: hours, minutes, flyback chronograph, tourbillon, 30-minute totaliser, power reserve, torque and function indicators. Grade 5 titanium dial, TPT® Carbon flange. Rubber and graphene strap. Water-resistant to 50 metres. Limited edition of 75 timepieces.



**HARRY WINSTON**  
**Histoire de Tourbillon 8 / CHF 577'000**  
 Case in 18-carat white gold, 51 mm diameter, sapphire crystal case back. Manually wound mechanical movement, calibre HW4503, two biaxial tourbillons linked by a spherical differential, two rapidly rotating coaxial barrels, 534 components, 21'600 vibrations/hour. Power reserve of about 55 hours. Functions: hours and minutes on cones, power reserve indicator on a scroll. Structured black dial, aluminium indicator cones. Black alligator-leather strap, pin buckle in 18-carat white gold. Water-resistant to 30 metres. Limited edition of 10 timepieces.



**LOUIS VUITTON**  
**Tambour Moon Flying Tourbillon Volant «Poinçon de Genève»**  
**CHF 249'000**  
 Platinum case, 42.5 mm diameter, sapphire crystal case back. Manually wound mechanical movement, manufacture calibre LV97, skeletonised flying tourbillon, 160 components, 21'600 vibrations/hour. Power reserve of 80 hours. Functions: hours, minutes, tourbillon. Skeletonised dial, aligned geartrains. Black alligator-leather strap, platinum pin buckle. Water-resistant to 50 metres. Poinçon de Genève certified watch.



**BREGUET**  
**Marine Équation Marchante 5887 / CHF 225'000**  
 Platinum fluted case, 43.9 mm diameter, sapphire crystal case back. Automatic mechanical movement, numbered, with Breguet signature, calibre 581DPE, silicon escapement wheel and balance-spring, 4 Hz frequency, six-position adjustment. Power reserve of 80 hours. Functions: hours, minutes, small seconds, running equation of time, perpetual calendar, tourbillon, power reserve indicator. Blue gold dial with hand-applied guilloché decoration, gold Breguet «apple» hands, solar minute hand with faceted golden sun. Alligator-leather strap, gold folding clasp. Water-resistant to 100 metres.



**PATEK PHILIPPE**  
**Perpetual Calendar reference 5320G / CHF 73'000**  
 18-carat white gold case, 40 mm diameter, interchangeable sapphire crystal or solid case back. Automatic mechanical movement, manufacture calibre 324 S Q, 367 components, Gyromax® balance, Spiromax® balance-spring, 28'800 vibrations/hour. Power reserve of about 35 hours. Functions: hours, minutes, seconds, perpetual calendar, day, month, Moon phases, leap years, day/night, date. Cream-coloured lacquered dial, Arabic numerals, luminescent blackened gold baton hands. Glossy chocolate brown alligator-leather strap, 18-carat white gold folding clasp. Water-resistant to 30 metres.

Source: Watches The Guide

**BREGUET**  
**Tradition Dame 7038 / CHF 37'200**  
 Fluted 18-carat rose gold case, 37 mm diameter, bezel set with 68 brilliant-cut diamonds (~0.89 carat), sapphire crystal case back. Automatic mechanical movement, numbered, with Breguet signature, calibre 505SR, silicon balance-spring, 3 Hz frequency, six-position adjustment. 50-hour power reserve. Functions: hours, minutes, retrograde seconds. Off-centred dial in natural white mother-of-pearl, hand-applied guilloché decoration, gold Breguet «hollow apple» hands. Alligator-leather strap, gold pin buckle set with 19 brilliant-cut diamonds (~ 0.13 carat). Water-resistant to 30 metres.



**ROLEX**  
**Oyster Perpetual Cosmograph Daytona / CHF 26'200**  
 18-carat yellow gold Oyster case, 40 mm diameter, monobloc case middle, screwed case back, crown and push-pieces, black ceramic Cerachrom bezel with engraved tachymeter scale, Triplock triple water-resistance system. Automatic mechanical movement, manufacture calibre 4130, COSC-certified Superlative Chronometer, paramagnetic blue Parachrom balance-spring, variable inertia balance, 28'800 vibrations/hour. Power reserve of about 72 hours. Functions: hours, minutes, seconds, small seconds, chronograph, stop seconds. Champagne and black dial. Oysterflex strap. Water-resistant to 100 metres.



**GIRARD-PERREGAUX**  
**Neo Bridges / CHF 24'300**  
 Titanium case, 45 mm diameter, sapphire crystal case back. Automatic mechanical movement, calibre GP08400-0001, 21'600 vibrations/hour. Power reserve of about 48 hours. Functions: hours and minutes. No dial, ring with suspended hour-markers, luminescent skeleton hands. Dark grey alligator-leather strap, titanium folding clasp. Water-resistant to 30 metres.



**HUBLLOT**  
**Big Bang Unico GMT / CHF 18'900**  
 Titanium case, 45 mm diameter, engraved bezel and six H-shaped titanium screws, side inserts in blue composite resin, sapphire crystal case back. Automatic mechanical movement, manufacture calibre Unico HUB 1251, 339 components, 28'800 vibrations/hour. Power reserve of 72 hours. Functions: hours, minutes, seconds, second time zone, day/night indicator. Blue and anthracite grey skeletonised dial. Black and blue lined rubber strap, titanium folding clasp. Water-resistant to 100 metres.



**TAG HEUER**  
**Autavia / CHF 4'950**  
 Polished steel case, 42 mm diameter, black aluminium notched bidirectional rotating bezel, fluted crown, sapphire crystal case back. Automatic mechanical movement, manufacture calibre Heuer 02. Power reserve of 80 hours. Functions: hours, minutes, small seconds, chronograph, date. Black opaline dial, white snailed counters, applied hour-markers and hands with beige Super-LumiNova®, vintage «Heuer» logo and «AUTAVIA». Steel «rice grain» bracelet. Water-resistant to 100 metres.

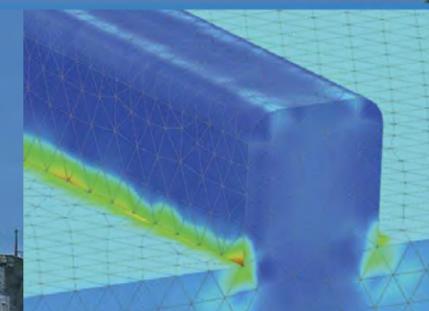


Source: Watches The Guide



Nature has finely designed so many materials to serve the huge diversity of forms and ways of Life. Still, engineers in Western Switzerland go ahead with passion to invent innovative materials at the micro & nanoscales for applications that reach into every part of society.

Chillon Castle near Montreux on Lake Léman. Vaud



FE analysis of an injected plastic part showing stress accumulation at the edges.



A new thin-layer black galvanic coating.



PIMENT project: Steel (DIN 1.2343) mold cavity detail and its perfect replication in ABS-PC by injection molding (confocal measurement (IPC, France), hemispheres  $\varnothing=50 \mu\text{m}$ ) Micropat SA



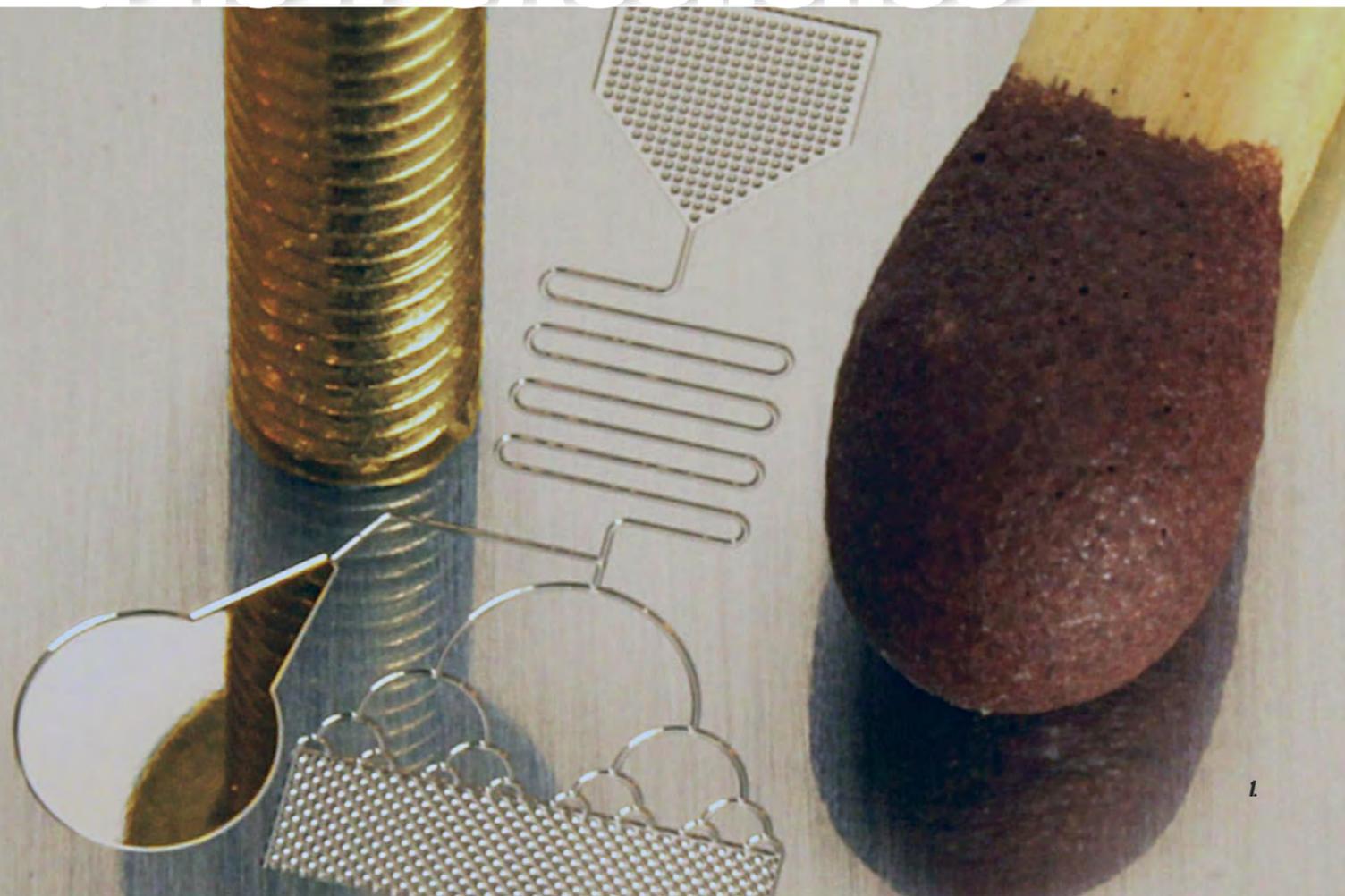
«Only dead fish go with the flow.»

P.-F. Chauvy,  
CEO micropat SA

Micropat SA vision is to promote the use of metallic micropatterned surfaces.

Our extremely precise, 3D-compatible, engraving technique fulfills the specific needs of a variety of domains such as plastic injection molding, decoration, biomedical applications, microfluidics and scientific research.

# Metal engraving to a new excellence



1



2

## Electrochemical micromachining

Micropat SA excellence consists in a very high precision metal engraving electrochemical technique (ECMM). We focus on R&D and technology transfers, while offering a job shop service to manufacture prototypes and high-end small series.

We routinely work with most stainless steels, various tool steels and titanium (grade1-4), as well as other «exotic alloys» such as NiTi.

Hemispherical cavities or cylindrical channels ( $\varnothing$  30 to 300  $\mu\text{m}$ ) are etched with a positioning and dimensional accuracy in the  $\mu\text{m}$  range.

ECMM technology is well adapted for processing both flat substrates and more complex 3D-shape objects. Directly performed on bulk metallic parts, it offers the unique advantage to be easily combined with mechanical machining. Large scale geometries are created by milling and micropat SA provides a finishing step with the engraving of micro features. Plastic injection molds microstructuring is a perfect illustration of our capabilities.

### Scientific applications

ECMM is particularly interesting for the fabrication of microfluidic circuits (cf. image 1). This direct machining methodology is well-suited to titanium high-pressure microfluidics used in chromatography. Moreover, ECMM provides an ideal solution for the realization of microfluidic circuits on steel master plates, which are subsequently mirrored by nickel electroforming to obtain submasters used for large-scale production of polymeric replicates.

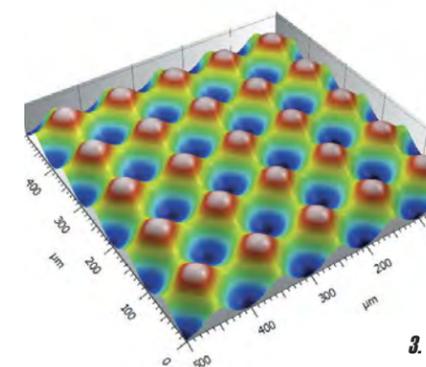
From a metallurgical point of view, the technique leaves the material properties unaltered: no oxidation, no darkening, neither loss of corrosion resistance is induced. The metallic surface is left in a passive state without residual stresses. We take advantages of these features for manufacturing very thin stress-free metallic membranes for scientific applications.

Considerable replication ease and exceptional topographical control enable micropat surfaces to perform as high-quality standards in fundamental sciences, such as tribology, fluid dynamics and cell biology (cf. image 3).

### Unique decorative features

A further advantage of ECMM in comparison to laser machining, chemical etching, electric discharge machining or micro milling is the incomparable smoothness (measured residual roughness  $R_a$  well below 25 nm) allowing for a very high reflectivity of the engraved structures.

Over the years, we have developed extensive know-how and special programming tools to take advantage of the decorative capabilities of such engraving



3

1. Microfluidic circuit (60  $\mu\text{m}$  wide channels) engraved on a steel plate.

2. Decorative «Double image» engraved in stainless steel.

3. SINUSURF project: stainless steel 3D sinusoidal surface (interferometric measurement (LAMIH, University of Valenciennes, France), 100  $\mu\text{m}$  period & 10  $\mu\text{m}$  amplitude).

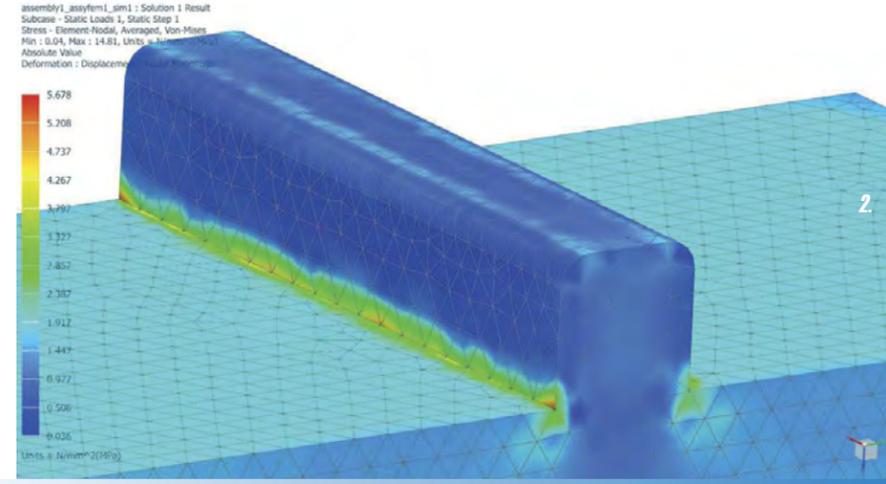
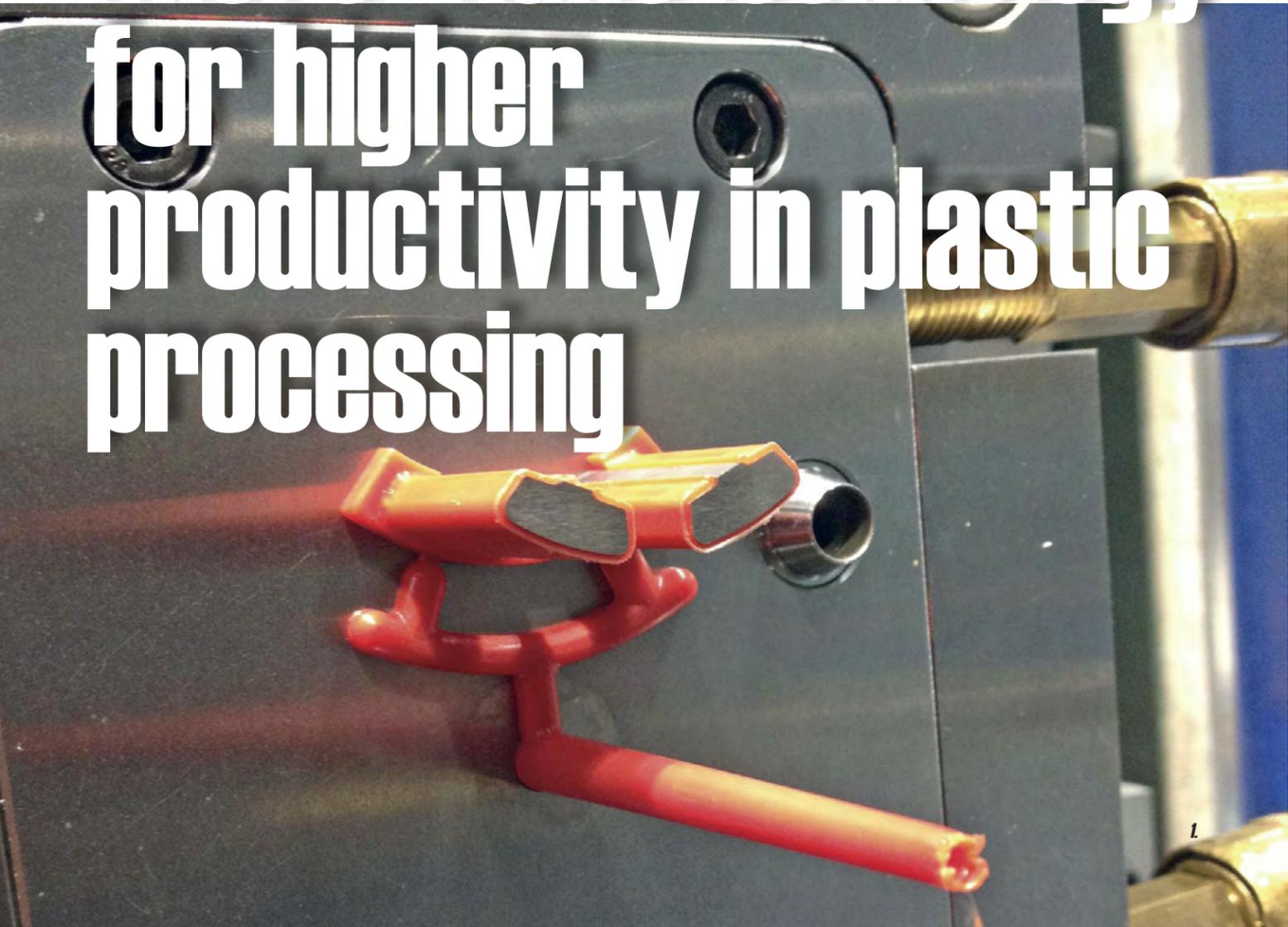
process. Well-tailored graphic patterns create aesthetic optically variable images, with appearance changing with the viewing direction (cf. image 2). In conjunction with polymer injection or elastomer compression molding, this technique offers a unique solution for demanding decoration needs of the watch industry.

### Network-enhanced innovation

We are proud to be well integrated in an international and transdisciplinary network of partners enabling us to constantly develop our processes and address new domains of applications. The PIMENT project is a good illustration of such collaboration. This Interreg consortium is composed by the CSEM (Neuchatel) and micropat SA on the Swiss side and by the IPC (French technical center for Plastic and Composites, Bellignat) and VUILLERMOZ Philippe SAS (high precision machining, Saint-Claude) as French partners. In the framework of this project we realized molded micro/nano-structured demonstrators targeting the watch industry and the budiagnostic field (cf. page 73). The PIMENT results went beyond expectations and we are pleased to announce the kick-off of a follow-up Interreg project (code name HARISSA) with an extended consortium. Definitely collaboration plays a key role in the success of micropat SA.

The recently started EUREKA project Super-Moulds represents a perfect example where a full value chain of stakeholders in the Plasturgy sector are reunited and highlights the competencies of the institute for Applied Plastics Research (iRAP) in terms of micro-nano technology

# Micro-Nanotechnology for higher productivity in plastic processing



The EUREKA Super-Moulds project is jointly financed by the Innovation Fund Denmark and the Swiss CTI. The project started in January 2017 with a total duration of four years. This collaboration of seven Danish and three Swiss partners focuses on the optimization of the plastic injection process by optimizing the mould surface treatments. Demoulding of complex plastic parts is complicated by sticking and high friction between the polymer and the mould surface resulting in long cooling times to avoid deformation, process interruptions due to cleaning and reduced mould service life. The aim of this project is to tailor mould surface coatings and textures to achieve optimum anti-stick properties for a set of commercial plastic types.

This outstanding consortium is based on a complete value chain approach within plastic processing; beginning with the supplier of polymer material (Dupont de Nemours-CH), the stakeholders in surface texturing technology (Georg Fischer Machining Solutions-CH) and coating (Tribology Center, Danish Technological Institute-DK) to the supplier of moulding tools (Winther Mould Technology-DK). The Danish National Metrology institute (DFM) contributes with their expertise in surface roughness analysis and the academic partner (iRAP-CH) centralizes the injection tests. The end users (Novo Nordisk, SP Moulding and Giboplast) contribute to the definition of the appropriate plastic part geometries to study and validate the final results under production conditions. The Danish Plastics Federation and the Swiss Plastics Cluster will foster the market penetration by publishing the results.

The Institute for Applied Plastics Research (iRAP) plays a key role in this project since this partner centralizes the injection tests. Several test moulds have been realized and are ready for systematic injection tests (Fig.1) to identify the influence of polymer material, plastic part geometry, mould surface texture and coating on the demoulding properties. Tribological tests of the polymer-metal interface are performed to study the influence of surface micro-nano treatment on the friction behavior. EDX and contact angle analysis are done to study surface composition and energy. Nanoindentation is applied, a local probe method allowing for identifying the mechanical properties such as hardness that will be related to the wear resistance of the different surface treatments. The effect of EDM and Laser surface texturing (supplied by GFMS, Fig.3) will be evaluated by applying textures with different (sub)micron roughness levels on the mould surface. The effect of PVD coatings with additional ion implantation (supplied by DTI) will be analysed alone and in combination with surface texturing. The demoulding properties of the plastic part are quantified by measuring the force and the energy necessary for ejection. The plastic injection process is modelled with mold-flow and finite element analysis allowing for identifying the effect of the plastic part geometry on the shrinkage of the polymer and the associated contact pressures what directly influences the ejection process (Fig.2). Together with this Super-Moulds consortium iRAP wishes to reach an internationally renowned level in the domain of micro-nanotechnol-

1. Opened test mould for quantitative analysis of demoulding properties.
2. FE analysis of an injected plastic part showing stress accumulation at the edges.
3. Example of a laser surface texturing ( $Ra=0.4 \mu\text{m}$ , VDI12) performed by GFMS.

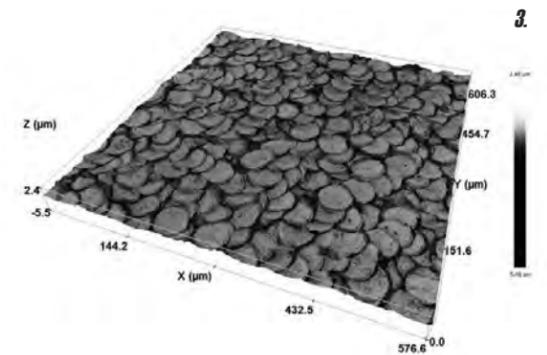


«Micro and Nanotechnology are powerful tools to improve plastic processing»

Dr Stefan Hengsberger, professor of physics and nanotechnology, member of the institute iRAP

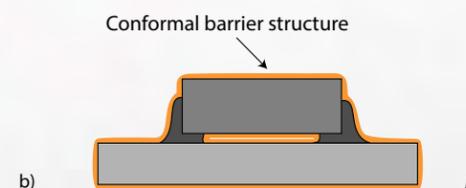
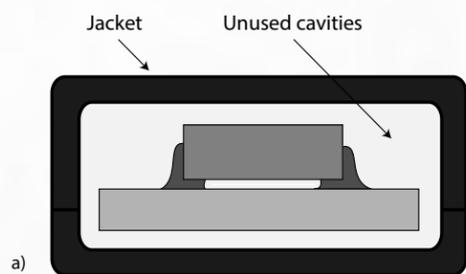
ogy in Plasturgy. The developed solution targets a potential productivity increase of up to 50 % and a doubling of the mould service life without compromising the product quality. This project is therefore of key importance for the worldwide market of plastic industry, in particular for production sites in high salary countries.

<http://irap.heia-fr.ch>

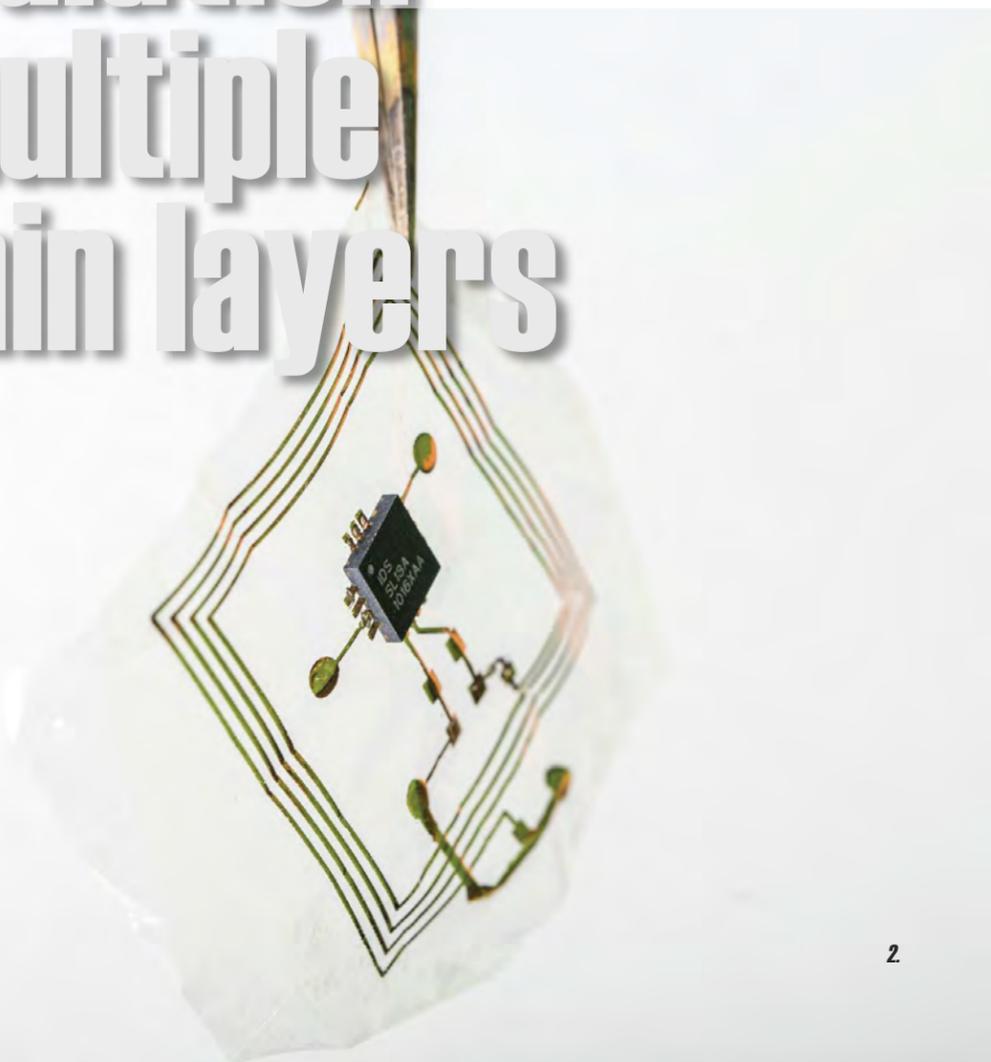


Coat-X, a Swiss company based in La Chaux-de-Fonds, is a leading solution provider for critical impermeability issues and expert in thin-film encapsulation. He provides an innovative encapsulation technology using ultrathin layers (< 10 µm) to protect all sorts of electronics, sensors, watch components or medical devices against corrosion and humidity caused by harsh environmental conditions.

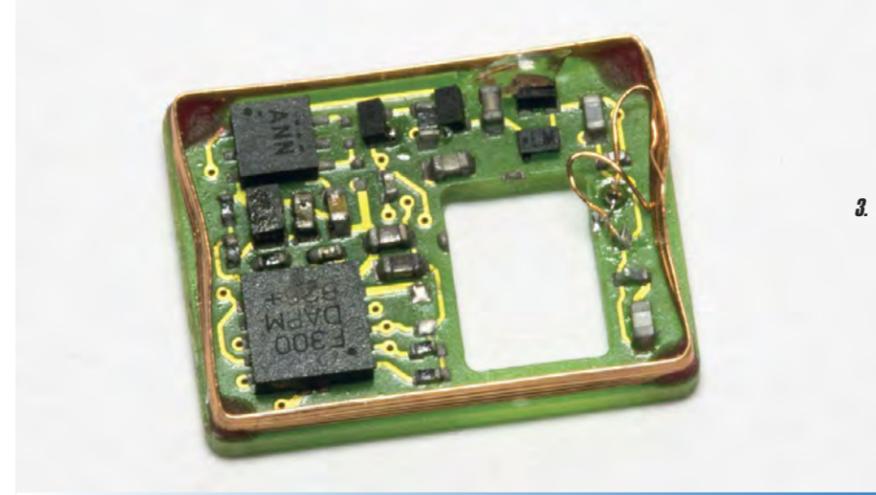
# Encapsulation with multiple ultrathin layers



1



2



3

1. Illustration of a conventional metal or glass package (a) and the novel thin-film layer encapsulation method of Coat-X (b).
2. Ultra-flexible multilayer PCB with integrated conductors and antenna.
3. Multilayer coated PCB for humidity protection.

Coat-X was created in 2016 by Andreas Hogg, Yanik Tardy and Eric Nagels, through multiple projects between the university of applied sciences (HE-Arc Ingénierie) and Johnson & Johnson in Le Locle, in the valley of micro-technologies. The goal was to avoid the conventional metal or glass encapsulation by a thin film composed of Parylene and ceramics of a few micrometers in order to further miniaturize medical implants and thereby provide less invasive surgical interventions. This development of a novel combined chemical vapor deposition (CVD) process constitutes the core know-how of the company and its unique thin-film encapsulation competence. Already in the early stage of Coat-X, its encapsulation product could be proven by clinical studies on implantable medical devices for the company Rheon Medical.



«Coat-X is the leading solution provider for critical permeability issues.»

Dr. Andreas Hogg, CEO

### Acknowledged technology

The innovation of the product and its potential for the industry was acknowledged by multiple awards to Coat-X like the Neode price in 2015 and the Innovation BCN price in 2016.

In 2017, the company was invited by EPHJ to expose the technology during the event as a finalist of the «Grand prix of the Exhibitors 2017» with 6 other companies among 823 exhibitors.

Each year, startup experts from Startup.ch select the top 100 Swiss startups from over 100 000 companies, representing the most innovative and promising Swiss startups. In 2017, Coat-X had the privilege to be selected.

The expansion went ahead the same year with a new lead investor, Stefan Schwab of the Linoa Holding, who boosted the growth of the company. The next steps for Coat-X will be the progressive increase of production capacity, installation of cleanroom facilities (ISO 4) and the finalization of the ISO 13485 certification for medical devices.

### An improvement by a factor of 2000

The aim of the company is to provide a high-quality solution in form of a thin, biocompatible and multilayered coating to protect small critical components or products, measuring a few millimeters or centimeters, against harsh environment.

Based on silicon oxide and Parylene-C, the multilayer provides a tightness 2000 times better compared to a traditional Parylene-C coating within a range from 1 to 10 µm layer thickness and it can be applied seamlessly to 3D complexes components.

Benefits resulting of the multilayer can be:

- better biocompatibility, hermeticity and corrosion resistance;
- reduction of the size of an existing or a new product;
- cost reduction.

The solution can protect electronics, wearable devices, implants and all de-

vices that have to resist to for example water or aggressive solvents. This includes medical devices like implants or ophthalmological devices, electronic devices like sensors, PCB's or semiconductors, neodymium magnets, watchmaking components, like barrels, etc. There is also a huge economic potential to apply the multilayer to novel flexible devices like displays or solar cells.

### Flexible PCB

The second product provided by Coat-X are the ultra-flexible substrates where electronics can be directly embedded into the multilayer thin film (picture 2). This novel multilayer PCB's can be bent at 180° while maintaining the high tightness, hermeticity and biocompatibility.

### Technology application

Rheon Medical is a Swiss medtech company based in Lausanne which has developed the implantable eyeWatch system, the first adjustable glaucoma drainage device. Thanks to this device, which is implanted into the eye of the patient, the intraocular pressure can be non-invasively adjusted, which is reducing strongly the rate of complications after a surgery. The core of the system is made with a rotatable magnetic disk, which can compress selectively a deformable tube and thus adjust the fluidic resistance of the aqueous humor. This magnet needs to be protected against corrosion and only the Coat-X technology provides such a long term protection. Rheon Medical is successfully testing the eyeWatch system since 2015 through clinical trials in Lausanne and Zurich with more than 30 patients enrolled.

www.coat-x.com

Acrotec is an independent group created by watchmaking and micromechanics professionals. STS (Saulcy Traitement de Surface), an Acrotec Group company headquartered in Develier/canton of Jura, has developed a new revolutionary surface treatment: the black NAC.



# A new thin-layer galvanic coating

1

Following the development of the deep anthracite colour named NAC, which has been a great success for eight years, STS is now introducing a new black coating that complements its dark coating range.

Five years ago, STS faced a problem with the REACH regulation which banned one of the molecules composing a black ruthenium galvanic plating, putting an end to this treatment. As a solution to this problem and to design a new treatment, STS built a partnership with the University of Franche-Comté and its Research & Development Laboratory in Le Sentier. Under the name of black NAC, this new treatment is the result of a partnership that has completely reinvented the basis of black surface treatment.



**«The new black NAC is sustainable long term as it does not use REACH listed molecules. STS has spent three years developing this new treatment.»**

*Frédéric Saulcy, CEO*

«We initially tried to compensate by changing the molecule in the black ruthenium but we had significant issues with corrosion», said Mr. Frédéric Saulcy, CEO of STS. «The new black NAC is sustainable long term as it does not use REACH listed molecules. STS has spent three years developing this new treatment», added Mr. Saulcy. «Our specifications were extremely complex, and we worked on this for three years. A full-time engineer specialising in surface treatment, supported by university researchers, worked on developing this coating, and we have finally obtained an almost perfect deposition.»

Now the black NAC lasts seven days in a tropical climate and we have overcome all watchmakers' tests relating to electroplating. The black NAC is a thin, ductile, adherent decorative coating and is applicable to other industries such as jewellery, leatherwork, etc.

From an aesthetic point of view, the black NAC is measured photometrically as L= 40, making it a deep black. On clock movements, it highlights the decoration with very beautiful light reflections. The black NAC is an innovative treatment, respectful of the initial surface and industrially applicable. «Thanks to STS research, it is now possible to apply a black coating as if it were rhodium or gold plating», concluded Mr. Saulcy.

The two anthracite NAC and black NAC coatings are from the same family, an alloy of PGMs. Ductile, adherent and resistant to tropical climate, they conform to watchmaking movement requirements.

STS has other innovational assets, such as the TRIBO-Ni and the tribological 3N and 4N gold plating, three innovative coatings for treating the mechanisms after trimming.

The black NAC is currently in the industrialisation phase and STS is likely to patent it soon. There is also a watch brand using this process as a pilot project. In summary, the layer thickness is 1 micron and the black colour is perfectly reproducible. The black NAC complies with REACH and ecological regulations as it does not contain chromium and what's more, it is economical. This treatment sublimates the decorations whilst having perfect adhesion and very high ductility.

STS will continue to develop a Beta version of this deposition for use on high-wear applications such as watch decoration and other applications. STS's site in Develier focuses its activity on deposition technology for the electronics, automotive, aerospace or medical industries.

[www.acrotec.ch](http://www.acrotec.ch)

1. Black NAC coating.
2. STS site in Develier/JU.



2

Based in the Canton of Jura, INNOmaterials SA is a young company that provides a wide technical know-how in the development of new materials and the whole industrial project management process. Its innovation: the ability to offer a value chain to market tailor-made innovative materials.

# Innovative materials for specific requests

1. Colouring rubber.
2. Ingredients for tailor-made innovation.
3. The «BrandTracer» concept.
4. Searching, finding the right answers to customers' needs.



**D**evoted to innovative materials, INNOmaterials was created in 2014 by Dr Filomeno Corvasce, its CEO, with laboratories and offices housed in the medtech.lab building of the canton of Jura, in Courroux. With 30 years of experience, Dr Corvasce is well-known for his work on innovative elastomers and shows great expertise in Research & Development of new materials. The company has 5 employees plus one entity based in Luxembourg and benefits from an international network of laboratories and partners from multinational companies, such as Solvay and Novamont. The market is expanding very well in Switzerland and in the rest of Europe, and interest has also been shown in China.



**«If a material doesn't exist, we invent, develop and produce it for you.»**

*Dr Filomeno Corvasce, CEO*

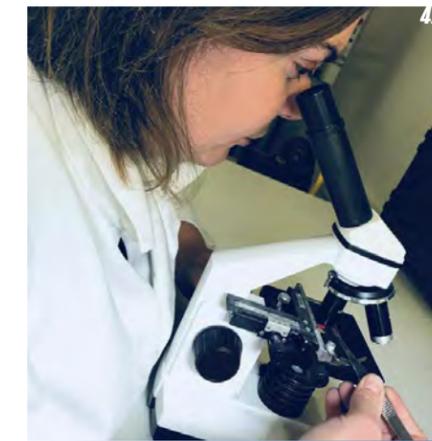
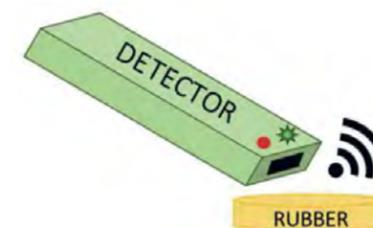
From the prototyping to the industrialization, INNOmaterials is a platform of competences for developing technologies for new materials while taking care of the whole value chain. Although their portfolio shows various fields of applications, for instance in the watchmaking or the medical industry, the company brings high value for the industrial sector. While many Swiss companies have the expertise for metal machining or plastic and rubber processing, INNOmaterials is able to take care of every step of the process.

The team gathers the competencies to analyze the client's needs in order to formulate an adequate product's composition,

and also to consider eventual collaborations within the partners' network. The on-site facilities contain a clean lab for colored compounds development, hydraulic presses and fully operational mixing equipment. The industrial mixing capacity is about one hundred tons a year of high added value compounds. The ability to proceed small quantities and tailor-made orders is a specificity of this equipment and one of the biggest strengths of the company. The analysis steps at the beginning and at the end of the process allow a relevant technological response to the client's needs.

INNOmaterials can provide a wide variety of compounds answering specific requests and specific properties such as low permeability, high strength, low friction, low permanent set, antibacterial, perfumed and many other characteristics.

Let's take a case study. INNOmaterials produced a fluoroelastomer formulation for watch brands to fight against counterfeiting, called BrandTracer. While assuring the preservation of the original rubber properties and working for all colors, this patented formula contains specific additives: multiple combinations of chemical tracers which are impossible to reproduce by counterfeiters. These additives can then be identified and traced which ensures the usage of Swiss made compounds and the certification of the watch's authenticity, using the



highest security level. The testing is assured by an optical and acoustic reader with a specific cocktail, but also by controlled confidentiality measures at all levels of the supply chain.

These fluoroelastomer formulations and the tracers are very robust over time and all chemicals used in the solution are REACH and RoHS compliant. It has no impact on properties and has been validated by certified laboratories. Additional tests are ongoing for traction, staining and aging.

Another case study is the development of interfacial adhesion between glass and an elastomer. INNOmaterials found the way to functionalize the glass surface through additives in the elastomers which react with the chemical surface functions. The results showed that the interface interactions were so good that even under severe solicitation, the elastomers were tearing but not the interface.

INNOmaterials must be considered as the partner for the development of thermoplastic, elastomeric, liquid and composite formulations answering to unique properties.

[www.innomaterials.net](http://www.innomaterials.net)



3D Precision SA owes its success to its multi-disciplinary skills in additive metal manufacturing for a broad array of applications. And also to a full support of its customers during the design phase of their products, guaranteeing a result fully in line with their expectations.

Don't mill  
your creativity!



2

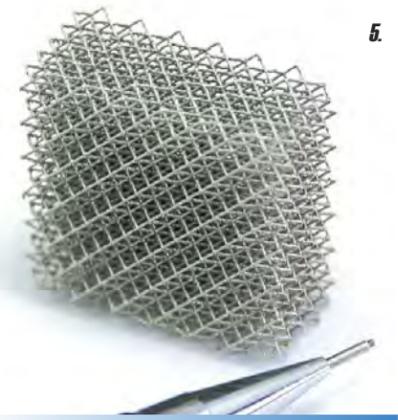


3



4

1. Orthodontics: titanium implant and custom-made cobalt-chrome skeleton.
2. Stainless steel washing basket.
3. Lightweight titanium structure (Ti6Al4V).
4. Stainless steel plate mechanism.
5. Steel lattice structure.
6. Fused structure in aluminium AlSi10.



5

Specialized in additive metal manufacturing (a form of 3D Printing), 3D Precision SA was founded in 2014 by Dominique Beuchat in Delémont, in the canton of Jura. 3D Precision relies on high-performance equipments to offer a complete manufacturing service including design and laser scanning, additive manufacturing and finishing operations.



«For the evolution of additive manufacturing we expect a lot from developers and designers and their ability to demonstrate limitless creativity!»

*Dominique Beuchat, CEO*

The company's activities are focused on demanding technical parts and production in small or large series. «Additive metal manufacturing is more than specific applications, prototyping or production of existing metal parts, says CEO Dominique Beuchat. Technical and commercial added value is highly dependent on the conception and design creativity of the components to be manufactured».

**Dealing finely with materials**

The additive manufacturing process proposed by 3D Precision generates a dense material with mechanical properties identical to the raw materials used in conventional subtractive processes. The structure of the material generated by selective melting through laser is typical

of the process, although this structure may vary depending on the adopted melting strategy (see fig. 6).

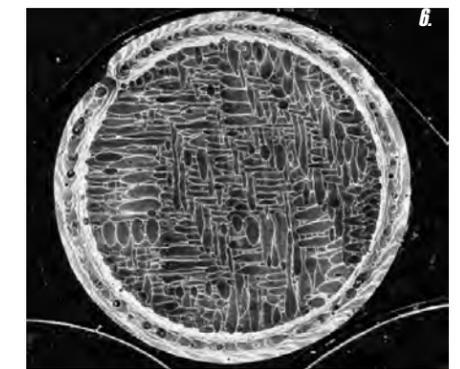
The raw material comes as powders. The array of alloys is not yet as wide as for other processes, but nevertheless already interesting: for example stainless steel 1.4404 (316L) and 1.4542 (17-4PH), maraging steel 1.2709, titanium Ti6Al4V (Grade 23), aluminum AlSi10, cobalt-chromium...). And should a desired alloy be unavailable, why not develop it? «This is one of our drives at 3D Precision. We have developed the melting of pure copper powder through collaboration of national research centers. This development enables us to manufacture heat exchangers, inductors and specific geometries for electrical applications».

**Applications? Very broad!**

Certified ISO 9001 and ISO 13485 (medical) since 2016, 3D Precision is organized as to guarantee the highest quality, rigour and traceability required by the many renowned customers who placed their trust in this skilled company. «Our customers are from very diverse domains, with a common denominator being their high requests that we meet with our materials and also the dimensions that our equipments allow us to ensure» explains Dominique Beuchat. 3D Precision is serving the sectors of machines, robotics, tooling (e.g. specific tools for manufacturing tasks, integrated mechanisms, injection moulds with integrated control channels, clamping, tools for drilling and material removal with integrated channels...), watch industry and jewellery (casing, parts for the machines and the produc-

tion), medical (surgical instruments, implants, screws...) and dental fields (tools, bridges, skeletons for orthodontics) as well as food industry (e.g. shaping nozzles for biscuits), aerospace domain, sports (cycling, mountaineering, horse riding) or architecture (structures for lamps, LED coolers, faucets...). And even... art, through concretization of complete or partial works!  
«In short, there are no limits to the applications we can tackle, so do not hesitate to submit us your needs!»

[www.3dprecision.ch](http://www.3dprecision.ch)



6

## The Micronarc network: an example of 7 innovative companies, in the 7 cantons of Western Switzerland

III - 2018 Micronarc Magazine

**Bity SA, Neuchâtel**

Interested in the currencies of the future? Buy and sell your Bitcoins and Ethers online or from ATM Bity Kiosks in Geneva, Lausanne, Montreux or Zurich: fast and simple!  
[www.bity.com](http://www.bity.com)

**HUMARD Automation SA, Delémont**

Excellence and innovation in robotics and automation, associated with the know-how of ABB Switzerland SA: a collaboration that stands as a high for the industry 4.0, just think of the YuMi «You and Me» robot.  
[www.humard.com](http://www.humard.com)

**Creaholic SA, Bienne**

By the professional inventor Elmar Mock, father of the Swatch: radical innovation as a passion & vocation for more than 30 years, 800 projects, 180 patent families, 50 ideas incubating, 8 spin off...  
[www.creaholic.com](http://www.creaholic.com)

**MindMaze SA, Lausanne**

By the first unicorn in Switzerland, an innovative solution to help people with a stroke: neurological rehabilitation through augmented reality and a software providing visual and digital simulations/stimulations.  
[www.mindmaze.com](http://www.mindmaze.com)

**MICRONARC**  
[www.micronarc.ch](http://www.micronarc.ch)

Western Switzerland Micro-nanotech Cluster

**regenHU SA, Villaz-St-Pierre**

Regenerating the human body thanks to 3D printing of tissues or organs: dream, utopia? These technologies are coming to life! With a name at regenHU: BioFactory®, 3DDiscovery®, BioInk™, BioCAD™, BioCAM™, BioCUT™...  
[www.regenhu.com](http://www.regenhu.com)

**Eversys SA, Ardon**

Unique professional coffee machines, with a reverse-flow vertical extraction system and intelligent connected electronics... A quintessence of coffee from a land with a passion for summits: pure «Made in Valais»!  
[www.eversys.com](http://www.eversys.com)

**OrbiWise SA, Geneva**

Optimized full solutions for the Internet of Things: wireless communication with long reach and low consumption, thanks notably to the LoRa® technology.  
[www.orbiwise.com](http://www.orbiwise.com)

**Micronarc**  
c/o FSRM – Swiss Foundation  
For research in Microtechnology  
Ruelle DuPeyrou 4  
CH-2001 Neuchâtel - Switzerland  
Tel. +41 32 720 09 09

Micronarc is an initiative of the Cantons of Bern, Fribourg, Vaud, Valais, Neuchâtel, Geneva and Jura. Supported by the Swiss State Secretariat for Economic Affairs (SECO) under the New Regional Policy (NRP).

Schweizerische Eidgenossenschaft  
Confédération suisse  
Confederazione Svizzera  
Confederaziun svizra  
Swiss Confederation  
Federal Department of Economic Affairs FDEA  
State Secretariat for Economic Affairs SECO



# A mission at the heart of micro and nanotechnologies

### A unique hub of competence

Micronarc covers a region with a highly developed industrial culture that has evolved into a centre of excellence in micro and nanotechnologies. Solidly anchored in a centuries-old tradition, the passion for innovation and extreme precision is reflected in a dense network of educational, research and business institutions. This translates into optimum performance in terms of symbiosis in research and applications, transfers of technology, and innovation cycles.

### A communication platform

Micronarc is a communication platform created by the governments of the seven cantons that constitute Western Switzerland (Berne, Fribourg, Vaud, Valais, Neuchâtel, Geneva and Jura). Its mission is to contribute towards:

- developing and promoting a regional scientific, technical and economic base in the micro and nanotechnology sectors, as well as related educational structures, R&D facilities, technology transfers, inward investment and business structures;
- encouraging seamless interaction between all participants;
- attracting other creative and innovative forces, generating jobs and ensuring

future generations of a qualified workforce;

- acting as a source of reliable and accessible information, serving as an instrument for the dissemination and exchange of knowledge, both in the professional and public arenas.

To achieve these objectives, Micronarc:

- manages and operates the internet portal [www.micronarc.ch](http://www.micronarc.ch);
- establishes a strong presence at the international level, notably through the organisation of grouped stands at industry trade shows;
- organizes professional and public events;
- provides information, networking structures, and business introductions.

### Executive Office

FSRM – Swiss Foundation  
For research in Microtechnology  
Ruelle DuPeyrou 4, CP 2353  
CH-2001 Neuchâtel - Switzerland  
Tel. +41 32 720 09 00  
[www.micronarc.ch](http://www.micronarc.ch)



# The Micronarc team

The Micronarc Expert Committee was set up in 2008. Its mission is to establish strategy guidelines for the Micronarc platform, to direct the platform, initiate new activities, and serve as liaison between the various participants.

The constituent members are:

Vincent Rivier, **President**  
Director of the Registre du Commerce

Serge Amoos  
Administrative Coordinator, The Ark Foundation

Dr Stefan Hengsberger  
Professor, EIA Fribourg

Antonio Rubino  
Secretary-General GIM-CH

Alain Codourey  
Managing Director Asyrl SA

Frédéric Chautems  
Plant Manager MPS Watch

Philippe Fischer  
Director FSRM

Jacques Jacot  
Professeur honoraire EPFL

Reynold Jaquet  
Member of the Berne Precision Cluster Committee

Georges Kotrotsios  
Vice President CSEM SA

Fabienne Marquis Weible  
Director of the Association Suisse pour la Recherche Horlogère

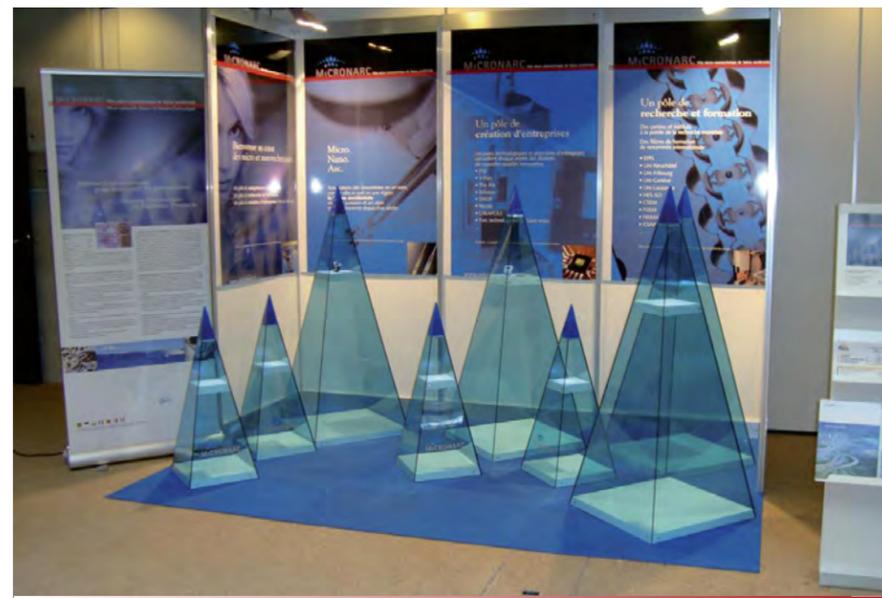
Max Monti  
Research Director, Haute Ecole ARC

Martial Racine  
ad personam

Micronarc is managed by its Executive Secretariat, the Swiss Foundation for Research in Microtechnology (FSRM) in collaboration with the GIM-CH / Swiss-mechanic.

## Contacts

Danick Bionda  
Secretary General



Micronarc is an initiative of the Cantons of Bern, Fribourg, Vaud, Valais, Neuchâtel, Geneva and Jura. Supported by the Swiss State Secretariat for Economic Affairs (SECO) under the New Regional Policy (NRP).

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Swiss Confederation  
Federal Department of Economic Affairs FDEA  
State Secretariat for Economic Affairs SECO

# Micronarc Alpine Meeting

9<sup>th</sup> edition

mAm 2018

## The Microproducts Annual Meeting

4 – 6 February 2018  
Villars-sur-Ollon, Switzerland

Microsystems have entered the age of high volume production for consumer applications, especially **mobile phones, ICT, watchmaking and medical disposable devices**. The issues associated with the production of these are of continued interest to manufacturers. These include tooling in high volume fabrication of precision parts, making highly efficient and reliable automated assembly lines and test systems for microproducts. There is a fast growing market for such components and products.

Following in the success of the first 9 editions, **The Micronarc Alpine Meeting 2018 will continue its focus on equipment and innovative processes and technologies for manufacturing microproducts**. This 2-day conference intends to stimulate networking and discussions in the casual atmosphere of Villars, a charming village and ski resort located at 1250 meters of altitude. The event is a high-level, niche workshop which provides participants with an excellent overview of state-of-the-art manufacturing technologies. **More information at: [www.mam2018.ch](http://www.mam2018.ch)**

**EARLY PROGRAM** See web site for the most up-to-date information, including confirmed speakers to date.

### Sunday 4 February 2018

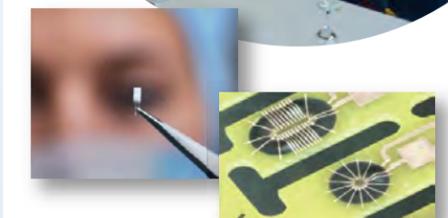
18:00 **Registration open**  
Welcome drink at the hotel (dinner afterwards on your own)

### Monday 5 February 2018

09:00-09:30 **Welcome Session**  
Danick Bionda, Secretary General, Micronarc  
Prof. Dr Volker Saile, Karlsruhe Institute of Technology, President, Mancef  
David Kappeler, Office for Economic Affairs, Canton of Vaud  
09:30-10:15 **Invited Keynote on the Future of Micro-manufacturing I**  
Prof. Philippe Renaud, Microsystems Laboratory 4, EPFL (Switzerland)  
10:15-10:45 **Coffee break + exhibition visit**  
10:45-12:00 **Micro-manufacturing Applications I – Watchmaking**  
Keynote: Thomas Mercier, R&D Scientist / Project Manager, Tag Heuer (Switzerland)  
+ 2 speakers + Exhibitor elevator pitch (3 min)  
12:00-13:45 **Lunch in the hotel**  
13:45-15:30 **Micro-manufacturing Applications II – Medtech**  
Keynote: Prof. Dr. Ute Schepers, Karlsruhe Institute of Technology (KIT) (Germany)  
+ 3 speakers + Exhibitor elevator pitch (3 min)  
15:30-16:00 **Coffee break + exhibition visit**  
16:00-17:30 **SENSORS**  
Keynote: Benedetto Vigna, President, Analog, MEMS & Sensors Group, ST Microelectronics (Italy/Switzerland)  
+ 3 speakers + Exhibitor elevator pitch (3 min)  
17:30 **Adjourn for the day**  
19:00 **Conference Dinner – Meet in hotel lobby at 19:00**

### Tuesday 6 February 2018

09:00-09:45 **Invited Keynote on the Future of Micro-manufacturing II**  
Prof. Dr. Harald Giessen, University of Stuttgart, 4<sup>th</sup> Physics Institute (Germany).  
09:45-10:15 **Coffee break + exhibition visit**  
10:15-11:45 **Energy Systems for Microproducts**  
Dr. Benjamin Strahm, R&D Manager, Meyer Burger Research AG (Switzerland)  
+ 2 speakers + Exhibitor elevator pitch (3 min)  
11:45-13:30 **Lunch in the hotel**  
13:30-15:15 **Novel Manufacturing – Printing**  
Keynote: Bastian E. Rapp, NeptunLab, KIT (Germany)  
+ 2 speakers + Exhibitor elevator pitch (3 min)  
15:15-15:45 **Coffee break + exhibition visit**  
15:45-16:15 **Invited Keynote on the Future of Micro-manufacturing III**  
Dr. André Kretschmann, Robert Bosch GmbH (Germany)  
16:15-16:30 **Final Remarks**  
16:30 **Conference adjourns – Farewell reception in hotel lobby**



Micronarc - The communication platform of a unique hub of competence



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A Micronarc event organised with  
**MANCEF** Micro and Nanotechnology Commercialisation Education Foundation  
as a COMET conference

With the support of  
**VAUD+**  
innovaud

You are cordially invited to exhibit with Micronarc at our 2018 events, or simply to drop by and visit our stand.  
Contact us at +41 32 720 09 00 or by e-mail at [events@micronarc.ch](mailto:events@micronarc.ch)

**21 to 25 January 2018** Event abroad  
IEEE MEMS 2018. 31<sup>st</sup> International Conference on Micro Electro Mechanical Systems. Belfast, Northern Ireland.  
[www.mems2018.org](http://www.mems2018.org)

**4 to 6 February 2018** Regional event  
MAM 2018 - Micronarc Alpine Meeting 2018. The Microproducts Annual Meeting . 9<sup>th</sup> edition.  
Villars-sur-Ollon, Switzerland. [www.mam2018.ch](http://www.mam2018.ch)

**14 to 16 February 2018** Event abroad  
Nano tech Japan - International Nanotechnology Exhibition and Conference. Tokyo, Japan. [www.nanotechexpo.jp](http://www.nanotechexpo.jp)

**22 to 24 March 2018** Event abroad  
MECSPE 2018. The reference fair for the manufacturing industry. Parma, Italy. [www.mecspe.com](http://www.mecspe.com)

**17 to 19 April 2018** Event abroad  
MEDTEC Europe - The leading Medical Technology show in Europe. Stuttgart, Germany. [www.medteceurope.com](http://www.medteceurope.com)

**17 to 20 April 2018** Regional event  
SIAMS 2018 - The trade fair for microtechnology production. Moutier, Switzerland. [www.siams.ch](http://www.siams.ch)

**May 2018** Regional event  
Event with Micronarc. Neuchâtel, Switzerland. [www.micronarc.ch](http://www.micronarc.ch)

**1<sup>st</sup> June 2018** Regional event  
RobotYx - Y-PARC - Swiss Technopole. Yverdon-les-Bains, Switzerland. [www.y-parc.ch/events/robotyx-2018](http://www.y-parc.ch/events/robotyx-2018)

**12 to 15 June 2018** Regional event  
EPMT-EPHJ-SMT - Professional Microtechnology Exhibition. • Medtech Microtechnology Day with HEPIA at EPMT.  
Geneva, Switzerland. [www.epmt.ch](http://www.epmt.ch)

**June 2018** Regional event  
Journée E-health. TechnoArk - Sierre, Switzerland. [www.theark.ch/e-health](http://www.theark.ch/e-health)

**26 to 28 June 2018** Event abroad  
Sensor+Test 2018 - The Measurement Fair. Nürnberg, Germany. [www.sensor-test.de](http://www.sensor-test.de)

**30 August to 1<sup>st</sup> September 2018** Regional event  
Micro18. Neuchâtel, Switzerland. [www.micro18.ch](http://www.micro18.ch)

**6 September 2018** Regional event  
Smart City Day with CleantechAlps & AlpICT. Fribourg, Switzerland. [www.smartcityday.ch](http://www.smartcityday.ch)

**24 to 26 September 2018** Event abroad  
COMS 2018. 22<sup>nd</sup> Conference on Commercialization of Emerging Technologies. Montreux, Switzerland.  
[www.coms2018.ch](http://www.coms2018.ch)

**September 2018** Regional event  
BIMO, Forum with AlpICT & BioAlps. Porrentruy, Switzerland. [www.bimo.ch](http://www.bimo.ch)

**24 to 27 September 2018** Event abroad  
MNE 2018. 44<sup>th</sup> Micro and Nano Engineering conference. Copenhagen, Denmark. [www.mne2018.org](http://www.mne2018.org)

**25 to 28 September 2018** Event abroad  
MICRONORA. International Microtechnology Trade Fair. Besançon, France. [www.micronora.com](http://www.micronora.com)

**November 2018** Regional event  
Event with Micronarc. Canton of Bern, Switzerland. [www.micronarc.ch](http://www.micronarc.ch)

**November 2018** Regional event  
SICHH - Swiss Integrative Center for Human Health. Fribourg, Switzerland. [www.sichh.ch](http://www.sichh.ch)

**12 to 15 November 2018** Event abroad  
COMPAMED. Düsseldorf, Germany. [www.compamed-tradefair.com](http://www.compamed-tradefair.com)

**November 2018** Regional event  
Colloque with partners. Neuchâtel, Switzerland. [www.micronarc.ch](http://www.micronarc.ch)



IcoFlex has enjoyed the unwavering support of Micronarc and its network for more than a decade. This platform is a great promotional tool serving companies. It enabled our company to expand its sales network through multiple participations to international shows «aboard» the Micronarc group stand, and to technological meetings such as the Micronarc Alpine Meeting.

**Dominique Solignac**  
Directeur, Icoflex, Ecublens

Except for EPHJ-EPMT in Geneva, Mimotec calls on Micronarc for exhibitions out of Switzerland. Taking on all the organization, administrative management, transport and setting up of the stand, Micronarc provides a real saving of time and money. Beside organizational and financial considerations, first of all, Micronarc gathers a very friendly team with whom I shared excellent moments!

**Adrian Häubi**, Chief Commercial Officer, Mimotec, Sion

Exhibiting with the Micronarc platform made our company more visible at trade shows. The volume of a grouped booth is beneficial for a small company, the synergy with Micronarc and exhibitors makes the networking easier. In addition, the communication and management provided by Micronarc highly ease the time the exhibiting company would have to invest otherwise. Also benefiting of the support from Micronarc has brought us beautiful encounters!

**Delphine Nussbaumer**, Directrice administrative, Manuplast, Ballaigues

Being in a trade show as a host of the Micronarc's collective stand is a real comfort. All organizational charges are taken on to the last detail before, during and after the show. No need to worry about some oversight since Micronarc thinks of everything, checks everything... Short absences from the stand do not put at risk of missing a business opportunity, as the organizers ensure a presence and contacts with visitors. During the exhibition, participants are usefully coached and share a friendly atmosphere which will extend beyond the meeting in the form of collaborations and potential synergies.

**Dr Jean-Claude Puipe**, CTO, Steiger Galvanotechnique SA, Châtel-Saint-Denis

A collective stand ensures we are not forgetting anything and wasting time filling out forms to order the floor mat or the right electrical outlet! We can arrive shortly before the exhibition's opening, arrange our products and here we go! The fine location and good visibility within the exhibition attract visitors. Also we have opportunities to get to know other companies, products and techniques, plus of course opportunities to interact with the stand's colleagues to exchange informations and contacts.

**Dominique Pillonel**  
La Manufacture – Ressorts CML  
Leysin



# technologies that make the difference



Advanced manufacturing



The future of energy



Smartwatches



Personalized health



The internet of things