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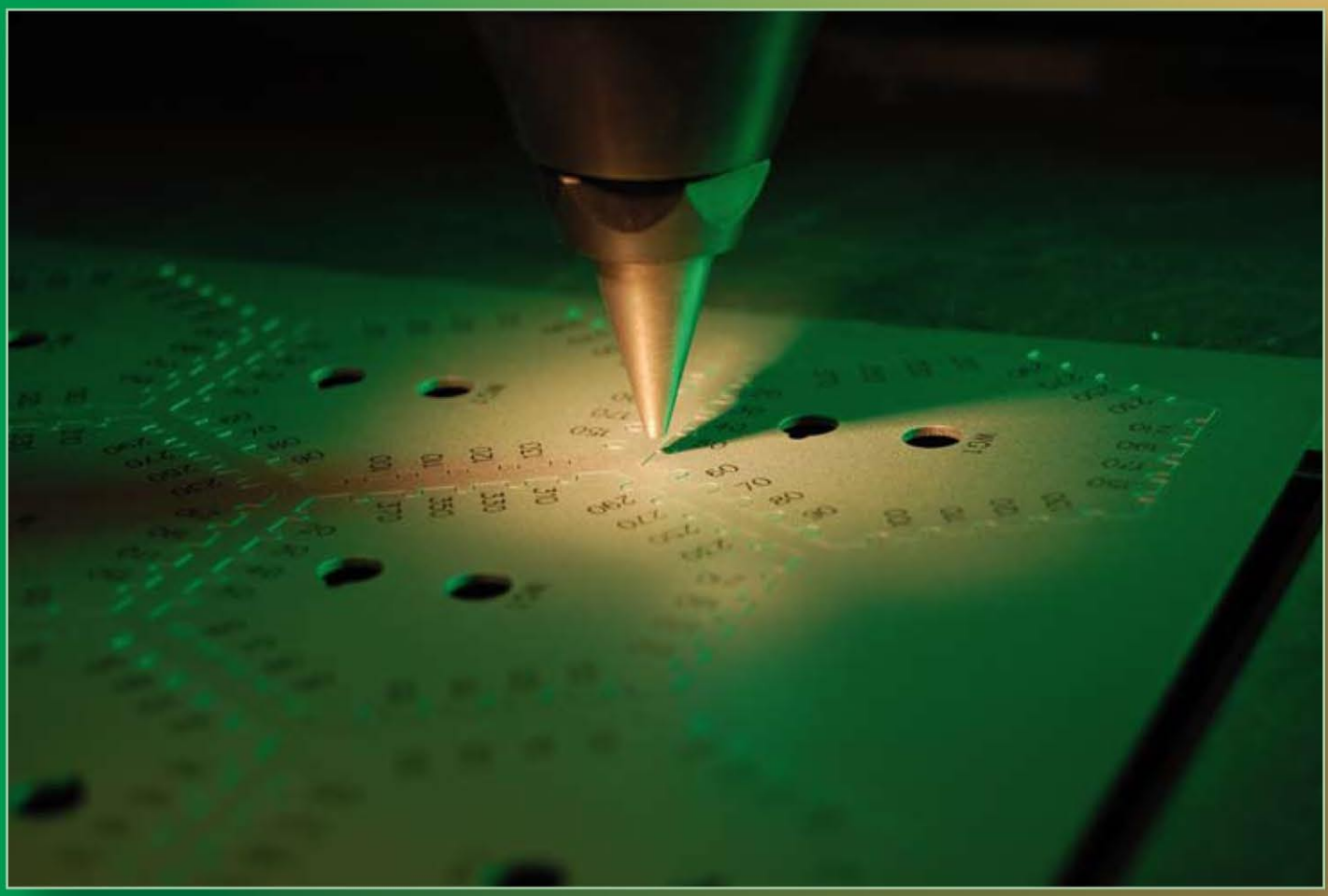

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High-resolution capacitive sensor with integrated automatic alignment mechanism
Statically-balanced compliant micromechanisms • High-speed milling
Ultra-precise digitisation of astrometric plates • Report of 18th Micronora Symposium on micro- and precision machining • Official fair catalogue

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The cover photo (the nozzle of ECN's LASAG cutting laser above a TQC wet-film thickness gauge) is courtesy ECN (Energy research Centre of the Netherlands).

editorial

(Precision) Fair trade

The Precision Fair illustrates the depth of high-tech industrial activities in the Netherlands. This is a fine sector in which margins can be good. And that is exactly what we need, because it can be difficult to survive in the high-volume consumer products industry. The Netherlands is well positioned in high-tech systems. This position includes an extensive supply chain centred around OEMs such as ASML, Philips, FEI and Océ.

To maintain this world-class high-tech position, we need to invest in technology and marketing. DSPE has taken the initiative to position the Netherlands as the place to be in the world of high-tech systems: Dutch Precision. For this position, we will explore a marketing plan that will focus on different areas.

The first focus is on technology:

- We must invest in new technologies for the future, not only at the OEMs but also at suppliers to the OEMs. The supply chain should serve both our local OEMs and OEMs in other parts of the world. This will enable us to become world-class in many areas of high-tech supply.
- We will invest in high-tech system architecture proposals to be applied in the markets of the future: computers, cameras, navigation, health, wellness, games, communication.
- We will be able to globally supply high-tech subsystems, such as sensors, mechatronics, optics, printing, and imaging.

The second focus is on increasing global awareness of our existence:

- We will communicate our competences by means of a magazine (Mikroniek) and the internet (www.dspe.nl).
- We will explore relationships with “precision valleys” around the world.
- We will show our results at fairs and exhibitions to increase global awareness of our activities.

The third focus is on the human capital paragraph:

- We need to ensure that universities and “hogescholen” (universities of applied sciences) maintain a clear focus on the relevant disciplines in precision engineering.
- We need to continuously develop employees to be able to meet future needs.

With so many exciting things ahead, there’s plenty of (Precision) Fair trade.

Hans Krikhaar
President of DSPE

High-resolution capacitive sensor with integrated automatic alignment mechanism

A new concept has been developed that overcomes alignment problems in high-resolution capacitive sensors. This concept, called 'thermal stepper', is based on thermal actuation of clamping elements and allows automation of alignment procedures. A prototype of a self-aligning capacitive sensor head was realised and it was demonstrated to have sub-micrometer positioning accuracy and sub-nanometer long-term clamping stability.

• *Jeroen van Schieveen* •

In many high-precision systems relative position accuracy of key components is reaching the level of nanometers or even better. Mechanical solutions used to be sufficient when requirements were less stringent. High-stiffness constructions or use of special low-expansion materials enabled reduction of vibrations or deformations due to temperature variations to a tolerable level.
In cases when pure mechanical methods are not sufficient anymore, active compensation of the remaining position errors is a solution. Systems that perform this task rely on sensors to detect these residual displacements. In order to compensate sub-nanometer errors, their resolution should be high, in the order of tens of picometers. Next to this, the

Author's note

Jeroen van Schieveen is working as a Ph.D. researcher at Delft University of Technology, the Netherlands, in the Mechatronic System Design group of Professor Rob Munnig Schmidt under the daily supervision of Dr Jo Spronck. Jeroen received his M.Sc. in Mechanical Engineering for his work on capacitive sensor systems for ultra-precision magnetic bearings. He is now focusing on the mechanical aspects of sensor heads for high-precision and high-stability capacitive sensors.

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stability should be at sub-nanometer level and especially when measuring vibrations, measurement speed must be high, in the order of several kHz.

Small-range, high-resolution measurements are typical applications for absolute sensors, such as capacitive sensors. However, for this type of sensors, resolution, speed and range are generally inversely related to each other. Although the measurement range for detection of vibrations or drift in geometry is in most cases small (<10 µm), the total range is much larger. Tolerances in fabrication and assembly of different parts in a machine can build up to several hundreds of micrometers. As the unknown initial position will have to be covered within the measurement range of the sensor, the total range has to be at least a few hundred micrometers.

This extension of the measurement range makes it difficult to achieve the combination of required very high resolution, range and speed with absolute sensors. Therefore, it is necessary to align the sensors after assembly of the complete machine. Manual alignment however is time consuming and for this the sensors need to be reachable. Alignment mechanisms make the system more complex and may decrease the mechanical stability of the system.
A capacitive sensor system that does not suffer from large fabrication and mounting tolerances could be used without time-consuming and costly alignment procedures. This would decrease installation time and overall machine costs.

Capacitive distance or proximity sensors

The capacitive distance sensor is based on a long known physical phenomenon; see Figure 1. Two conducting plates positioned parallel at a distance d from each other with overlap A form a capacitance C, which can be described by its geometric properties as follows:

$$C = \varepsilon_0 \cdot \varepsilon_r \cdot A/d$$

In this equation ε_0 is the constant permittivity of vacuum ($8.85 \cdot 10^{-12}$ F/m), and ε_r is the relative permittivity of the medium in between the two plates or electrodes (~1 for air). It may be clear that changing either A or d results in a changing capacitance.

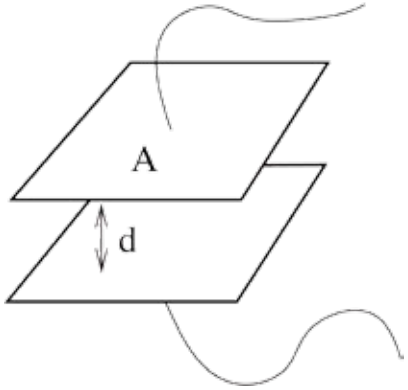


Figure 1. Basic principle of a capacitive distance sensor. Two parallel conducting surfaces with overlapping surface area A form a capacitor of which the value is dependent on the distance d and the medium with relative permittivity ε_r.

As capacitance can also be described in electrical properties charge (Q) and voltage (V) as $C = Q/V$, it is possible to convert the capacitance with an electronic system to e.g. an analog or digital electronic signal. When the overlap A is fixed and known, the output of such a system directly gives information about the electrode distance d.

Common capacitive read-out circuits provide an output signal that is related to the relative capacitance change, which means that the measured change is related to the absolute capacitance of the electrode structure. The signal-to-noise ratio or resolution of these read-out systems is limited. Depending on the speed, it varies between ~14 bits for fast measurements (up to tens of kHz) and 24 bits for slow measurements (~100 Hz).

What does this mean for the mechanical properties of the sensor head? The geometrical properties have to be chosen carefully to achieve the required resolution. To do this, we first take a look at the sensitivity of the parallel plate capacitor:

$$\delta C/\delta d = -\varepsilon_0 \cdot \varepsilon_r \cdot A/d^2$$

As the read-out circuit works with relative numbers, it is more logical to work with the relative sensitivity. This is obtained by dividing the equation above by the total capacitance:

$$\delta C/(C\,\delta d) = -1/d \text{ or } \delta C/C = -\delta d/d$$

It is clear that the sensitivity of the system is only determined by the absolute distance d.
Sub-nanometer resolution at reasonable speed (~10 kHz) is only possible on a very small distance. If we assume for example a resolution of 16-17 bits at the required speed,

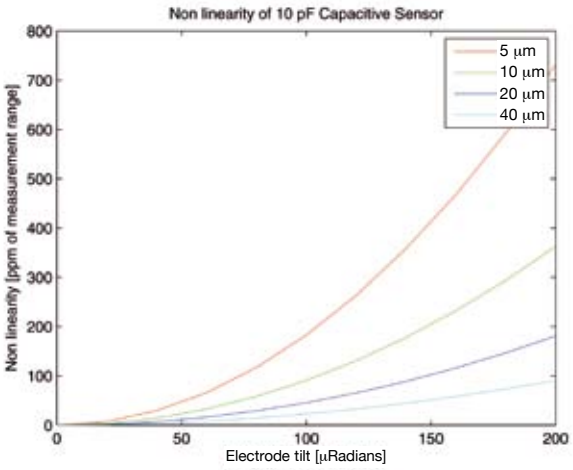


Figure 2. Non-linearity of a 10 pF capacitive sensor as a function of the tilt angle at different nominal distances.

the maximum distance for 100 picometer resolution can only be $100 \cdot 10^{-12} \cdot 2^{17} = \sim 10$ µm.

Alignment

Accurate placement of the sensor electrodes at the small initial distance cannot be achieved by only relying on fabrication tolerances and normal mounting procedures. Without precautions, the total error after mounting can easily be 50 µm or more. This may result in a too small distance, where the electrodes will touch and the sensor will not work properly, or in a too large distance, making the resolution of the measurement too small.
Mounting without alignment will result in non-parallel electrode surfaces and this deviation will affect the linearity of the sensor system and therefore introduces an error in the measurement. Figure 2 shows the resulting non-linearity error as a function of tilt angle for different nominal distances of the sensor electrodes for a sensor with a realistic nominal capacitance of 10 pF.

For a capacitive sensor with a nominal distance of 10 µm, it is easy to calculate that the maximum allowed tilt angle can only be 100 µrad when the error over a measurement range of 1 µm should remain sub-nanometer (100 pm). From the above it is clear that unstable mounting and alignment errors prevent a capacitive sensor system from operating properly. A new concept has been developed that overcomes alignment problems and enables the use of relatively cheap capacitive sensors in many applications in which they could not be applied until now.

Thermal stepper concept

The new concept for positioning has been named ‘thermal stepper’, after the typical stepping motion and thermal actuation. The system is based on a monolithic structure that uses a clamping force to hold the sensor electrode in place. Thermal actuation by heaters placed on this structure enables (re)positioning of the electrode.
In contrast to common thermal actuators, this system is able to produce a permanent displacement of the object after a thermal cycle, even if the heating power is switched off. This is achieved by applying heat during a cycle in such a way that the moving object slides relative to the clamping structure. Displacement in one direction is generated by first heating all elements at the same time and then cooling them one after the other. Figure 3 shows the working principle with a theoretical minimum of three clamping elements.

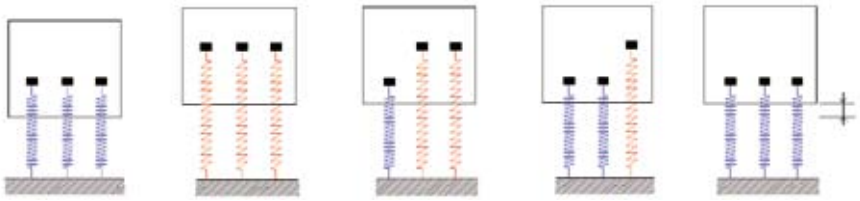
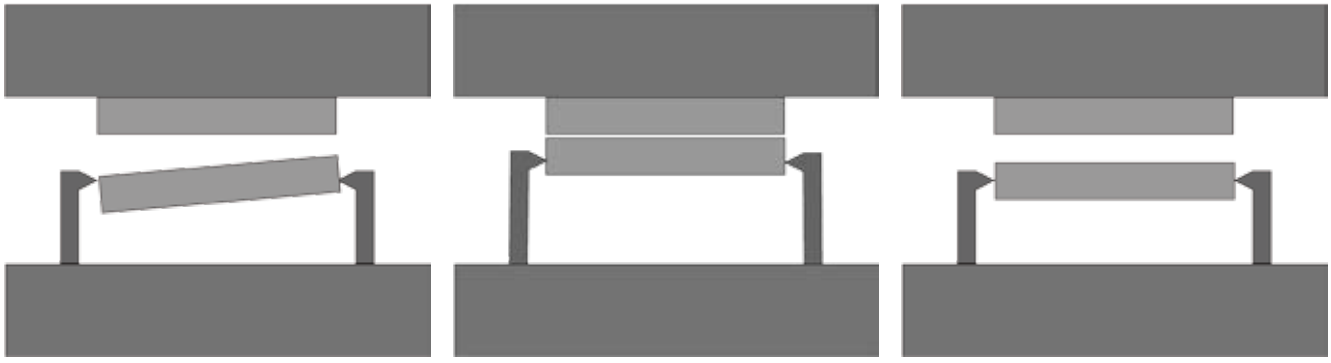


Figure 3. Operation principle of the thermal stepper system. A typical heating cycle consists of heating all three clamping elements at the same time and cooling them one after the other. Cooling down one of the elements means that this specific element will slip relative to the object and will shorten, while the object is held in place by the majority of the elements. The friction force of the cooling element will however cause a slight compression of the other elements. A typical step size for a 20 mm system takes about 30 seconds and is 1 µm/K.

Displacement in the opposite direction is possible by an inverse cycle, in which the elements are heated in serial order and cooled all together. A consecutive combination of these thermal cycles results in a stepping motion of the object, enabling a large stroke of the system in the order of millimeters, in principle only limited by the available amount of time and the size of the mechanism.
Figure 4 shows how the proposed system can be realised. The round layout makes it ideal to align typically round sensor electrodes. Fabrication of the clamping structure out of one piece of material makes it possible to realise a very stable system, which is also far more simple than mechanisms made out of many different parts.

Figure 4. Possible construction of the clamping structure with the moveable electrode.



Phase 1:
Stepping motion moves one electrode towards the other, until they come into contact.

Phase 2:
Expansion of all clamping elements pushes the electrodes into a parallel position.

Phase 3:
Cooling down of all clamping elements retracts one electrode over a predefined distance.

Figure 5. Alignment procedure with the thermally actuated positioning system.

Procedure

Alignment of the sensor electrodes always starts with decreasing the large initial distance of up to 100 µm by moving the electrodes towards each other. The exact alignment can be done in two different ways. A first possibility is to move the electrode further, as depicted in Figure 5. A final heating step in which all elements are heated to the same temperature, pushes the electrodes into contact and makes them become parallel. Cooling down of all elements afterwards ensures a retraction over a fixed distance while the electrodes stay parallel within acceptable limits because all clamping elements are designed to behave identical.

A second option is to divide the measurement electrode into different segments, which allows measuring not only distance, but also tilt. Controlling the heating in such a way that elements on opposite sides move in different directions makes it possible to rotate or tilt the electrode. Combined with the normal linear movement this will result in an active control of both distance and two tilt angles, which makes the system capable of three-degree-of-freedom positioning.

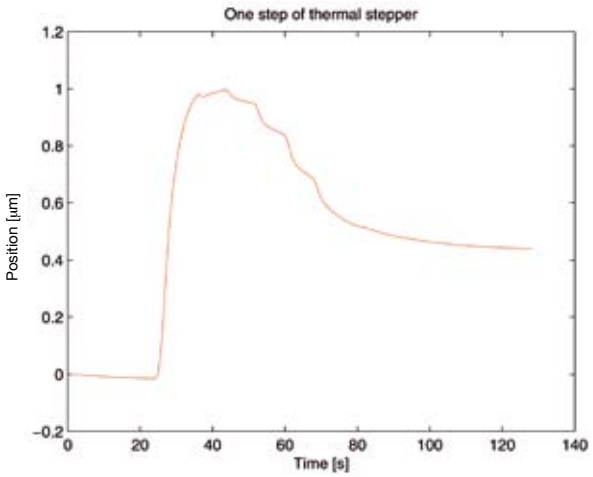
Heating and cooling of the elements is a first-order exponential process that will not reach its final temperature instantaneously. A heating cycle and therefore the movement of the system is not very fast. The alignment itself can be fully automatic, making it possible to align multiple sensors at the same time without human intervention. This reduces hands-on hours and the resulting costs.
Besides for alignment, the mechanism can also be used for on-site sensor calibration. By applying a defined temperature step to all elements simultaneously, it is possible to generate a defined movement of the electrode. This known step can be used for on-site calibration of the sensor and electronics.

Experimental results

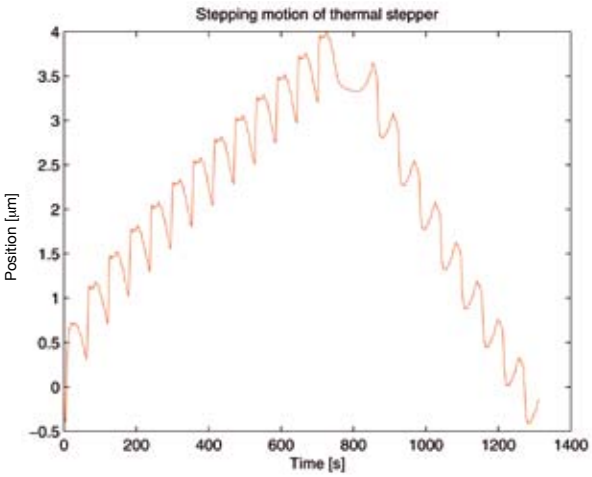
Several test setups have been built to test different aspects of the thermally actuated alignment concept. The performance of the sensor head with auto-alignment can be separated into two different parts by separating the two functions. First the system has to position the two electrodes at the specified distance with limited tilt angle. The second function is to hold them into that position and provide a stable measurement.
The experiments were performed on a system with twelve clamping elements, divided in six groups of two opposing elements. Figure 6a shows the typical movement profile. It can be divided in two parts. First part is the heating of all elements together, which results in the initial upward motion. After this initial heating, the six groups are cooled one after the other. This causes a slight retraction of the electrode. After all elements have cooled down, a permanent displacement has been created. We call this thermal cycle one step. Multiple steps can be made to generate larger movements, both up and down, as depicted in Figure 6b.

Varying step size between a few tens of nanometers and a few micrometers can be obtained by changing heating power. This enables positioning of the sensor electrodes with sub-micrometer accuracy, which is enough to guarantee proper operation of the capacitive sensor.

The second function of the alignment system, providing a stable mount for the electrode during measurement, was evaluated by performing long-term stability measurements. A second electrode was placed on top of the sensor head. The distance between the moving electrode and this fixed one was measured by connecting them to a capacitive read-



a



b

Figure 6: Typical displacement profiles of the thermal stepper for:
(a) one step;
(b) multiple steps.

out circuit, which was especially designed and built for high-stability measurements.
The effect of temperature variations on the setup was kept as small as possible by fabricating as much components as possible from the same material, which enables compensation for thermal expansion of different parts.

The graph in Figure 7 shows the position of the electrode during a 4 hours stability measurement. Position changes due to temperature variations in the lab were removed by compensation with the measured thermal sensitivity (~50 nm/K) of the measurement setup. The resulting signal is smooth and proves that the system is capable of reaching sub-nanometer stability in a controlled environment.

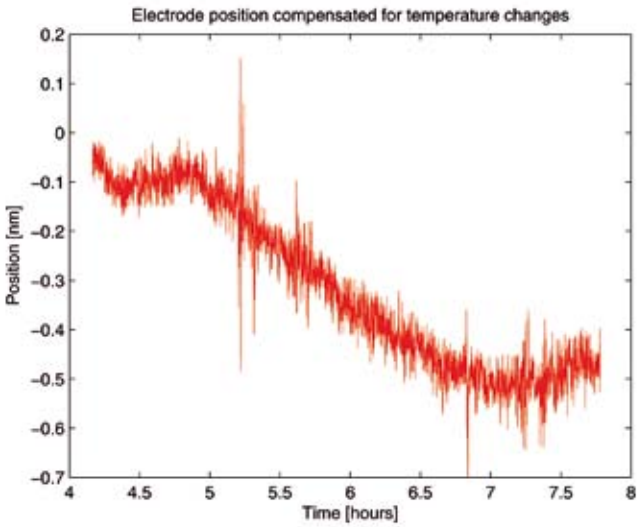


Figure 7. Measured electrode position during 4 hours. The position has been compensated for drift due to the temperature variations.

Realised system

Successful experimental results have resulted in the design and realisation of a functional prototype of the self-aligning sensor head. The prototype is shown in Figure 8**.** It consists of a thermal actuator structure with now sixteen clamping elements, mounted in a rectangular aluminum block. The clamping structure was fabricated by first making the cylindrical shape on the turning lathe. CNC milling was used to cut away the material in between the clamping elements.
As the electrode should be electrically isolated from the clamping structure, it was made as an aluminum conducting coating on a ceramic substrate (aluminum oxide). A small difference in diameter between the electrode and clamping structure of 0.1 mm generates a pretension of around half a Newton per element, which ensures a stable clamping.

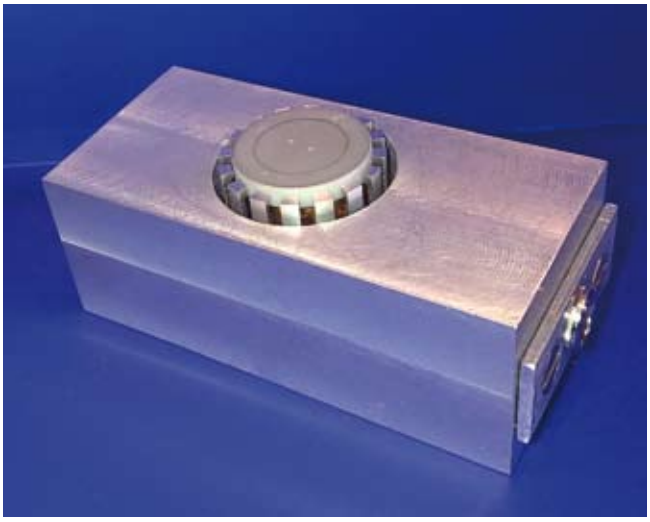


Figure 8. Realised functional prototype of the self-aligning capacitive sensor head. The electrode outer diameter is 22 mm.

Figure 9. The complete electronic control system on a flexible PCB can be mounted inside the clamping structure.

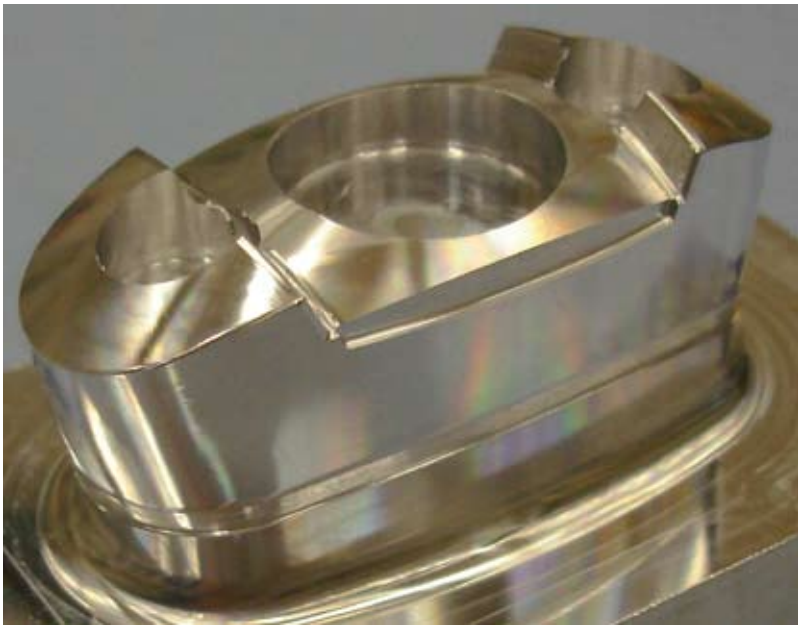
The specific heating sequence of all clamping elements is controlled by an electronic circuit which is integrated in the sensor head. This heating system consists of a flexible printed circuit board with a microcontroller that controls the current through sixteen resistors; see Figure 9. The flex PCB is glued inside the clamping structure, in such a way that the resistors are in contact with the clamping elements and can be used to heat the elements.

Step size and therefore speed of the system is dependent on heating power. The system shown here is able to make steps of ~1 µm at 5 V with a peak current of ~500 mA. A system like this can for example be powered via the USB port of the controlling laptop or PC. This makes the system also useful as stand-alone alignment device, not only for sensor electrodes but also for optical components.

Acknowledgements

This work is part of the "Picometer Resolution Capacitive Sensor for Industrial Applications" project funded by Dutch Technology Foundation STW. The project is carried out at Delft University of Technology, within the Mechatronic System Design group in the faculty of Mechanical, Maritime and Materials Engineering, and within the Electronic Instrumentation Laboratory in the faculty of Electrical Engineering, Mathematics and Computer Science. Two Ph.D. students, one from each faculty, are cooperating in this multidisciplinary project, with both mechanical and electrical aspects.

Small is beautiful, when accurate



Micromachining technologies were the theme of an interesting symposium organised by Mikrocentrum in collaboration with K.U.Leuven on 14 October in Leuven, Belgium. It once again showed that classic machining technologies like milling still are able to move their precision limits. The symposium also demonstrated that a nearly classic technology like chemical milling becomes more attractive by adding clever inventions. Materials like ceramics that were thought to be difficult to machine gain in application width by new insights in their forming and machining. And the symposium showed that combining existing technologies leads to new opportunities for realising high-tech precision products.

• *Frans Zuurveen* •

Chairman of the day Professor Bert Lauwers of the K.U.Leuven university illustrates in his introduction the evolution in microcomponents. To that end he compares the volumes and speeds of two power generators: an antique piston steam engine with 127 kW at 100 rpm and a modern automotive petrol engine with 126 kW at 7,000 rpm. The well-known diagram of Taniguchi gives a definition of the terms precision and ultra-precision machining. However, Lauwers states that precision is a rather relative conception, as an accuracy of 1 mm for a very large product may mean high precision. This illustrates that precision engineers not always have to think in terms of micro- or even nanometers. Their challenges are reproducibility and robustness of micromachining processes, especially of advanced materials like ceramics, and the application of advanced production technologies like ECM (Electro Chemical Machining), EDM (Electrical Discharge Machining) and hybrid machining processes.

Three cases

After this introduction, Lauwers changes places with his colleague Professor Dominiek Reynaerts, who gives a

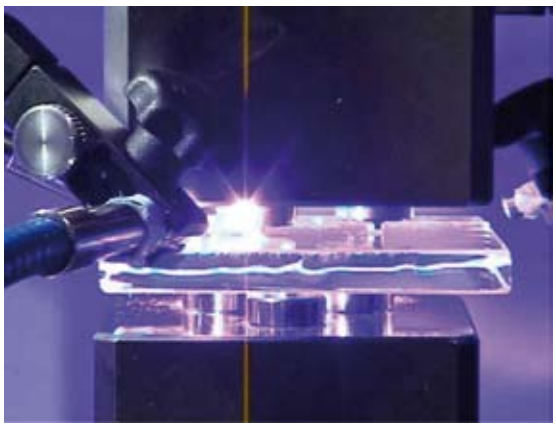


Figure 1. The application of UV hardening glues for solving aligning problems when machining optical surfaces.

Figure 2. Micro-EDM milling of a turbine impeller (Ø 20 mm) made from Si_3N_4-TiN. (Photo courtesy K.U.Leuven)

lecture entitled “Precision machining more than just a process”. To substantiate his title, Reynaerts presents three cases: grinding with ultra-high precision, measuring with ultra-high precision and repositioning a workpiece on a machine.

The ELID grinding technology (ELectrolytic In-process Dressing) is highly helpful to achieve stable grinding conditions with high accuracies as a result. Unfortunately, the arrangement of measuring devices in conventional machine slides does not correspond with the Abbe principle, which states that the distance to measure and the measuring scale should be in one line to avoid first-order deviations. Within the framework of an EU project named NanoGrind, K.U.Leuven succeeded in designing an ultra-precision grinding machine in which displacement measuring conforms with the Abbe principle by introducing separate measuring frames with high stiffness and low mass. Moreover, heat shields were used to avoid thermal deformations. Thanks to these actions the absolute accuracy during the machining process reduced to 1.6 µm reproducible error (which can be eliminated by calibration) and 0.16 µm non-reproducible error.

The case of ultra-high precision measuring is illustrated by the K.U.Leuven design of a calibration measuring machine with 1 nm accuracy. This machine can be considered as a metrological AFM (Atomic Force Microscope) and has been provided with a symmetrically formed invar measuring frame. The force and measuring loops are completely separated and interferometer measuring devices are incorporated.

When a workpiece has to be submitted to successive precision machining operations, repositioning the workpiece is an important problem, as dealt with in the third case. Reynaerts shows the design of a MacroNanoChuck for holding a workpiece with a repositioning accuracy of ± 0.5 µm. He also demonstrates that UV hardening glues can be very helpful to solve aligning problems, see Figure 1.

Micromachining ceramics

In the next lecture, Bert Lauwers first explains some characteristic advantages of ceramics: hardness, wear and heat resistance, chemical and electrical resistivity. Applications include precision nozzles, moulds and dies. Another interesting example is a gas turbine impeller from Si_3H_4-TiN for a power unit, with a rotational speed of 500,000 rpm and 1,200 K inlet temperature, see Figure 2.

Conventionally, ceramic products are produced by an elaborate process of “green body” forming, firing and sometimes final machining to achieve high accuracy (for reasons of volume shrinkage and deformation). This labour-intensive procedure together with a better knowledge of grinding machining processes – like ELID and vibration-assisted processes – has led to a tendency to machine directly from a ceramic block.

Moreover, it has been discovered that some ceramics are sufficiently electrically conductive to apply electro-discharge machining processes: wire EDM, die sinking EDM and micromilling EDM. A better knowledge of ceramics made it possible to add elements to enhance mechanical properties, machinability and conductivity. Also EDM processes could be improved thanks to new generators and strategies.

Other machining processes for ceramics are water-jet machining, laser milling and drilling, and hybrid processes that combine some of the processes mentioned before. Classical technologies like turning and milling are being investigated for their ability to machine ceramics.

Optimised process combinations

Tim Hösel from IMTEK (Institut für Mikrosystemtechnik) of the University of Freiburg, Germany, discusses the

combination of processes like lithography, micromilling, EDM and ECM for large-scale micro- and nano-integration. He first states that silicon-based processes are very well suited to micro- and nanostructuring and therefore can provide ideal combinations with non-silicon processes to realise innovative products that combine advantages of both.

Lithography is the general designation for silicon-based technologies. They can either be subtractive using masks or interference lithography for dry or wet etching of photo-resists, or additive with SU8 or dry resists for multiple layer structuring.

The applied non-silicon based shaping methods are UPM (Ultra-Precision Milling), EDM and ECM. Next to these shaping methods different replication techniques are used, like µIM (micro Injection Moulding), HE (Hot Embossing) or NIL (Nano-Imprint Lithography), see Figure 3.

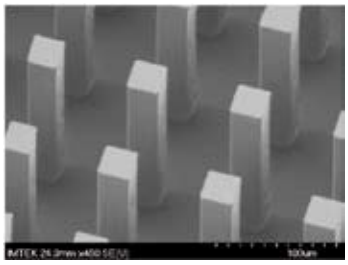


Figure 3. High aspect-ratio structures made by UV-assisted NIL (Nano-Imprint Lithography).

Interesting process combinations including micro- and nanostructures are a moth-eye-like anti-reflection structure on a structured Fresnel lens surface. Here UPM, HE and interference lithography were combined. Another example uses interference lithography and UV-assisted NIL for large-scale replication of nanostructures on foils. The combination of standard lithography and ECM leads to microstructures in mould inserts for replication in tool steels, see Figure 4.

Figure 4. A tool steel with the IMTEK logo structured by ECM, surface roughness R_a = 90 nm.

Electro Chemical machining

Hans-Henk Wolters of ECM Technologies defines ECM as "a metal machining technology based on electrolysis with processing without contact and thermal influence". Currently, the process has been improved by introducing pulsating power supplies and mechanical vibrations. The latter alternated by rinse cycles for better disposal of reaction products. Thus the minimum gap widths could be reduced to less than 5 ± 1 µm with extra accurate products and lower power consumption as results.

Some advantages of ECM are freedom of burrs, absence of thermal or physical strains, surface quality R_a < 0.05 µm attainable, high machining speeds at low costs, nearly or no electrode wear, relatively environment-friendly by re-using of the electrolyte. High tooling development costs might be considered as a disadvantage.

Wolters shows a turbine wheel with a process time of 12 minutes as an illustrative ECM-product, see Figure 5. ECM is also able to generate microstructures, like pillars of some tens of micrometers wide and centre-to-centre distances of 0.2 mm, see Figure 6. Thin-wall profiles with a minimum of 15 µm thickness are challenging but realisable. And heads of modern rotating shavers are currently being fabricated by ECM, instead of by conventional mechanical machining and polishing.

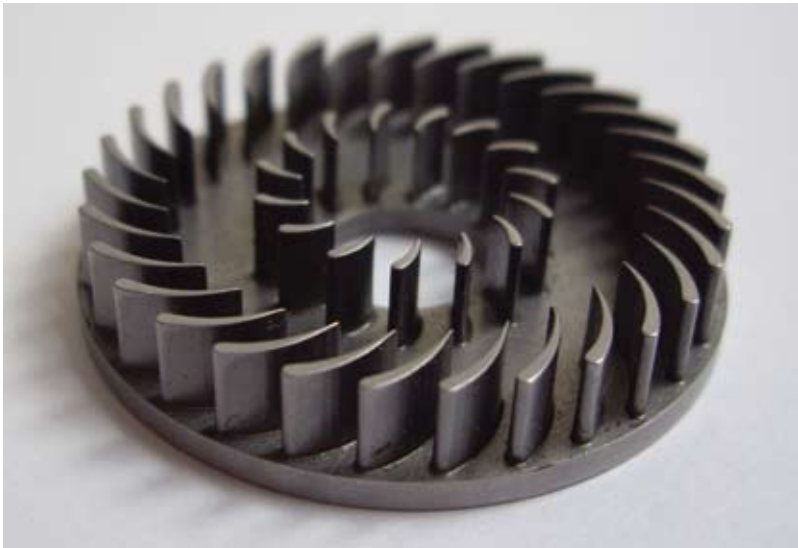


Figure 5. A turbine wheel produced by ECM with a process time of 12 minutes.

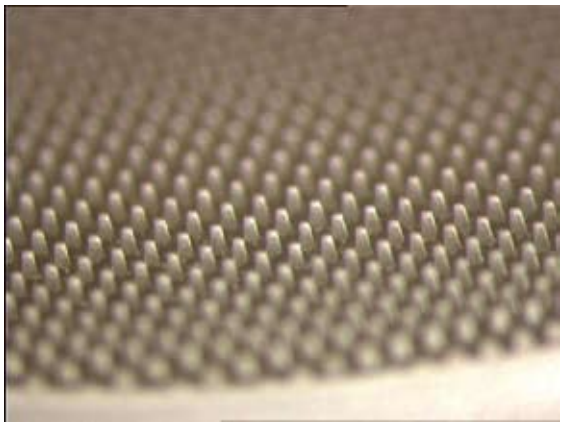


Figure 6. A microstructure realised by ECM with pillars of 60-70 µm diameter, 250 µm height and relative distances of 200 µm; process time 12 minutes.

Precision glass optics

Sebastian Nollau from Fraunhofer IPT in Aachen, Germany, covers the Production4µ project, an EU-funded production research programme in which European companies and institutes cooperate. The project specialises in precision glass moulding technology for the production of high-precision optical components, see Figure 7. The process cycle involves evacuating, flushing with inert gas, heating, moulding and at last cooling with nitrogen, see Figure 8. A coating step may be added.

Tungsten carbide material for moulding tools has been investigated: grain sizes should be lower than 20 nm and Co binder lower than 0.3%. At the Fraunhofer IPT institute a nanocoating facility was established and several new glass melts were evaluated. After this basic research the need for automation of the ultra-precision mastering and mould making procedures became clear. A major part of the automated process appeared to be the workpiece alignment procedure with a travel range of ± 20 µm and a resolution of 2 nm of the actuators, leading to a repeatable positioning accuracy of ± 0.25 µm. To support this, an active alignment chuck has been introduced.

Products that demonstrate the applicability of the Production4µ project include aspheric microlenses, cylinder lens arrays and diffractive aspheric lenses. They are producible with a form accuracy of 1/4 to 1/8 of the wavelength of the applied light, with short lead times, relatively low costs and low resource consumption.

Figure 7. The Precision4µ process for glass moulding.

Precision milling chain

Han Oosterling from TNO Science and Industry in Eindhoven, the Netherlands, explains that interface problems in the chain from design to precision milling production cause a number of inaccuracies. The chain consists of the following steps: CAD – CAM – postprocessing – machine control – milling machine.

Oosterling has estimated the tolerance losses during each step. Very often the CAD geometry has to be modified for CAM by designing additional geometry and planes. This causes tolerance losses in the range of 0.5 µm. The step from CAM to postprocessor in the form of a CL file causes tolerance losses of 3 to 10 µm, because of the translation of curved lines into straight line segments. This also causes a lower surface quality than theoretically expected. From milling machine control to the actual machining operations also inaccuracies occur, i.e. too many data points, which

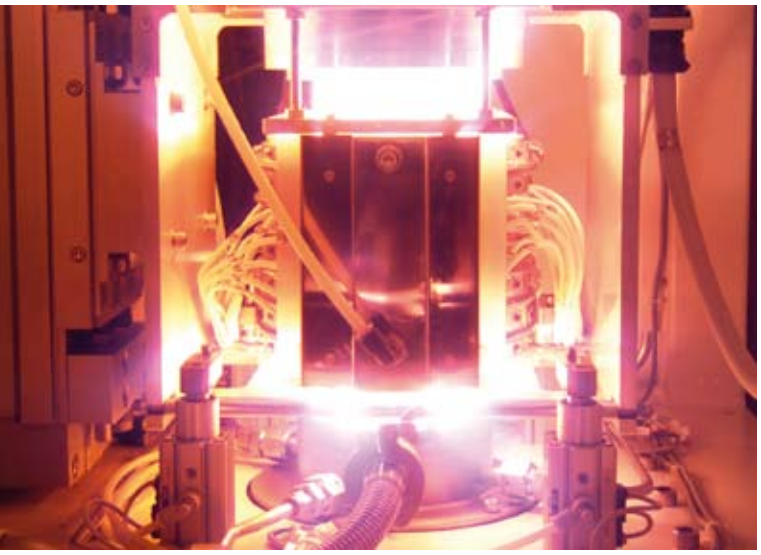


Figure 8. The moulding chamber within the glass moulding machine.

give a tool feed that is too low. Moreover the quality of the translation of control signals into real slide movements gives additional inaccuracy in this last step of the production chain.

Oosterling concludes that micro- and precision milling of products with curved surfaces provide a best attainable product accuracy of about 20 µm for 3-axis milling and about 40 µm for simultaneous 5-axis milling, see Figure 9. For prismatically shaped products this accuracy amounts to about 10 µm for 3-axis milling.

To conclude

Various micro- and precision production technologies appeared before the symposium footlights, including the influence of many kinds of machining process parameters

Figure 9. A simultaneously 5-axis milled product with excellent surface quality.

on product accuracy. Again nanometers showed to come more and more in use when discussing modern fabrication technologies. The symposium and the subsequent visit of the workshops and measuring rooms of K.U.Leuven provided lots of discussion for all who are professionally involved in precision production problems.

Information

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Compiling celestial timetables

The DAMIAN ultra-precision scanning system at the Royal Observatory of Belgium fulfils a significant part of a global programme for the digitisation of astrometric plates and aerial photographic images that span over a century and have shaped our understanding of the world, the solar system and the universe. Aerotech contributed the complete motion sub-system for the plate scanner.

• *Nigel Johnson* •

With more than three million plate images estimated in the astronomical community alone, the global digitisation programme was borne out of a need to provide a much needed centralised archive for the digital age. The goal was to enhance the accuracy of predictive ephemerides ("timetables" of the coordinates of celestial bodies) and not least to preserve the heritage of this important work where media deterioration is an increasing problem, particularly for older photographic processes. As part of an international network of institutions involved in similar work, the Royal Observatory of Belgium (ROB, see Figure 1) has become a global centre of excellence, particularly where extreme levels of accuracy are required, such as is the case with astrometric plates.

Figure 1. The Royal Observatory of Belgium, based in Ukkel. (Photo: ROB)

Author's note

Nigel Johnson is International Sales Manager for Aerotech, a key supplier of high-precision, high-throughput motion systems used in manufacturing production, quality control and R&D. Aerotech is headquartered in Pittsburgh (PA, USA), operates sales and service facilities in the UK, Germany, and Japan, and has an office in China.

This article was based on a poster presented by Aerotech and the Royal Observatory of Belgium at the 2010 euspen Conference in Delft, the Netherlands.

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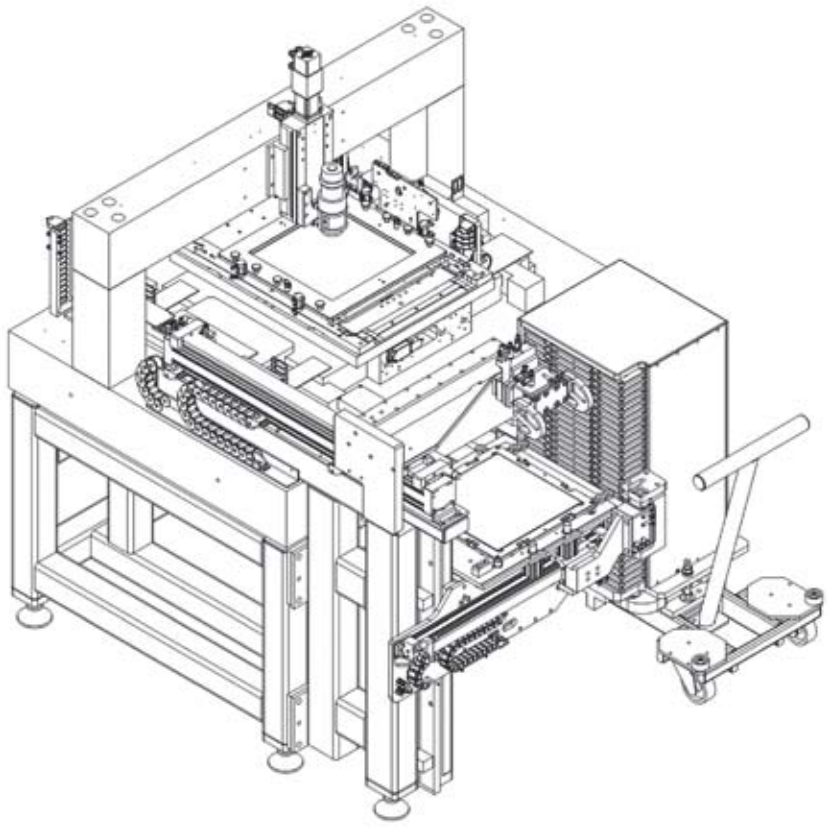

Figure 2. Design of the DAMIAN (Digital Access to Metric Images Archives Network) digitiser.

Moons

One particular exacting project example at the ROB involves digitising thousands of photographic plates for the US Naval Observatory. Taken over a period of 30 years several decades ago, using a 26-inch refractor telescope, the photographs record the moons of Mars, Jupiter and Saturn. By combining the process with highly sophisticated measurement and prediction software, DAMIAN can actually fill in many gaps that have hitherto been difficult to calculate. By improving this understanding of the interactive motions and internal structure models of these solar system bodies, the accuracy of calculation for their future positions over time is significantly improved. Other work carried out has similar significant implications for galactic kinematics, space surveillance and other areas of research in high-precision aerial mapping.

Specifications

The ROB began development of the DAMIAN (Digital Access to Metric Images Archives Network) digitiser with a study that produced design specifications for a 350 mm x 350 mm X-Y scanning motion system. To ensure the perfect reproducibility of the original analogue photographic images, the positional accuracy and repeatability targets needed to be an order above the inherent accuracy for the plates. This value was interpreted in the region of 0.5 µm over the whole scanning area with respect to a fixed telecentric objective of a sophisticated digital camera system. To ensure the fastest possible throughput, the motion system required a full-move displacement of 10 mm in less than half a second including acceleration, deceleration and settling time, and once in position, the stability (jitter) requirement was just 20 nm. Figure 2 shows the design of the system.

These factors would ensure that the plates could be fully scanned and archived in a matter of minutes rather than

Figure 3. Aerotech's ABL3600 series open-frame air-bearing table forms the basis of the DAMIAN motion sub-system.

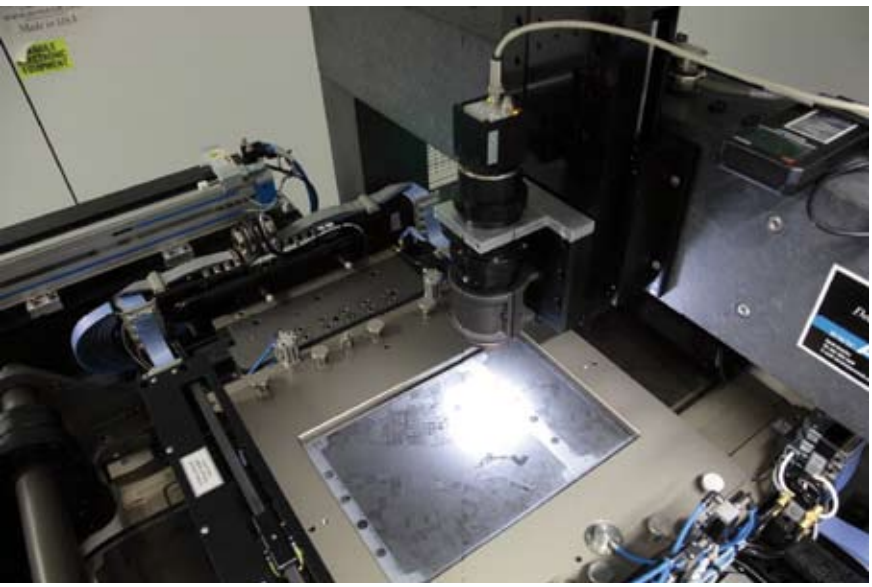

Figure 4. DAMIAN in operation.

older methods which were less accurate and required hours of processing. The machine specification also called for automatic loading of the glass photographic plates and film rolls, with a working duty cycle close to 24/7 continuous and unattended operation – so high reliability, low maintenance and long working life were also critical factors.

To realise such extreme precision and dynamic performance, the ROB chose Aerotech for a complete motion sub-system, based upon Aerotech's ABL3600 series open-frame air-bearing table in a custom-engineered system solution. The system included a lapped granite base plate, a granite bridge with a vertical focussing axis for the camera and optical assembly, plus a photographic plate holder, plate storage tower and fully-automatic transport system. Figure 3 shows the ABL3600 platform.

Smooth motion

Now delivered and fully commissioned, the DAMIAN digitiser is housed in a temperature- and humidity-controlled clean room, maintained to within 0.1 ºC and 1% RH (relative humidity); see Figure 4. Aerotech's ABL3600 series X-Y stage includes a preloaded, high-stiffness air-bearing system featuring powerful dual brushless and slotless linear motors on each axis with glass-scale linear encoder servo feedback. Two granite rails form a reference for the lower axis and both axes are referenced to a lapped granite surface plate with passive air isolation to maximise vibration stability.
In combination with this positioning system and fundamental to the machine's overall dynamic performance, Aerotech's linear technology servo amplifiers guarantee smooth motion, high bandwidth and outstanding in-position stability with zero backlash or hysteresis. The friction-free mechanics also provide the added benefit of very low maintenance and an essentially limitless working life. The large through aperture of the open frame design allows back illumination for the plates and images.

Calibration

For the ROB, Aerotech extended the ABL3600's normal working travel range from 250 mm to 350 mm in both axes. For such high-precision applications, Aerotech's HALAR calibration firstly ensures optimal levels of accuracy, bi-directional repeatability, straightness and flatness for each axis, then performs error mapping with laser-based measurement systems at Aerotech's state-of-the-art metrology lab – with the calibration file pre-configured on the motion controller. During tests at Aerotech and on-site at the ROB, object locations on a calibrated test plate were repeated to within 70 nm over a usable X-Y travel range of 335 mm – this far exceeded the original working specification. Other results included geometric test for accuracy and repeatability to better than +/– 0.1 µm, and the displacement speed and in-position stability performance were fully met.

Automation

The DAMIAN ultra-precision scanning system includes a full cable management system and was delivered complete with Aerotech's A3200 Automation Platform motion control system which controls the main X-Y axes as well as several other motion axes for film wind, plate stacking and tray height adjustment. The ROB took care of interfacing the A3200 to its own imaging software using a step and repeat procedure with alignment accuracy ensured using selected objects on the photographic media. Images are recorded at stand-still, thus the need for such high in-position stability.
The PC-based software-only motion and machine controller provides position, velocity and time information to Firewire®-interfaced linear technology servo drives.

Systems approach

This application is fairly typical for Aerotech's engineered systems approach, where customers provide their own very specialised expertise in combination with a fully tested and certified motion sub-system which fulfils a very intrinsic 'enabling technology' element for the entire system.

A breakthrough in

Compliant mechanisms play an important role in micromechanical structures for MEMS applications. However, the positive stiffness of these mechanisms remains a significant drawback. This stiffness can be compensated by including a static balancing mechanism (SBM), resulting in a statically-balanced compliant micromechanism (SB-CMM). This article presents design methods, concepts and simulation results of such mechanisms, which could be applied to MEMS (SB-MEMS). Two categories of SB-CMMs are presented, with the preloading force and travel path either (1) perpendicular to each other, or (2) parallel to each other. These concepts provide compliant mechanisms with approximately zero stiffness in a finite range of motion. Their application can ultimately result in a reliable, smaller, and energy-efficient microsystem, having a larger useful travel range.

• *Nima Tolou, Juan A. Gallego and Just L. Herder* •

Mechanisms and linkages based on rigid bodies in some cases can be replaced by compliant mechanisms to achieve the same function. Compliant mechanisms are those mechanisms that achieve their mobility through the deformation of one or more slender segments of their members; they do not rely exclusively on the relative motion between joints and rigid links.

Benefits

Compliant mechanisms introduce two performance benefits over conventional rigid-link mechanisms, namely no relative motion among pieces and no overlapping pieces. The absence of relative motion implies the absence of sliding friction, which eliminates wear, noise, vibration and the need for lubrication. Consequently, less maintenance is required. Furthermore, backlash is eliminated, which leads

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Just L. Herder is also part-time full professor in the Laboratory of Mechanical Automation and Mechatronics, within the Faculty of Engineering Technology, University of Twente.

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to reduced positioning error and therefore increased precision. The fact that there are no overlapping pieces allows fewer parts and single-piece production, which reduces the assembly and weight. Therefore, compactness and miniaturisation are enhanced while production costs are reduced. All these benefits help to create more innovative designs and actuation arrangements which increase the solution search space.

Challenges

Apart from the above advantages, the monolithic nature of compliant mechanisms also gives rise to some drawbacks. Due to the strain energy storage in the deformed compliant segments, the input-output relationship is affected. In particular, energy efficiency is challenged because part of the input energy is not transferred to the output but used for the deformation of the compliant segments of the mechanism. This deformation energy is often regarded as a 'necessary evil' of compliant mechanisms. However, the deformation energy is not dissipated, it is stored and thereby conserved.

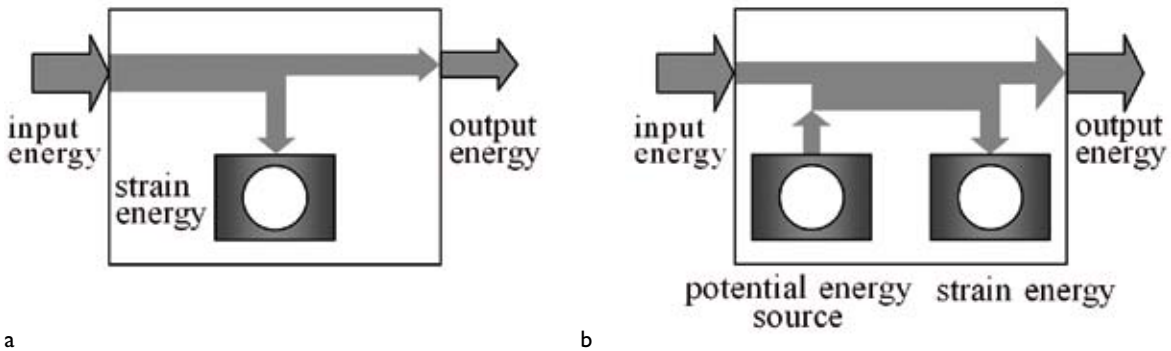
Static balancing

Consequently, a way to overcome this disadvantage is by reintroducing the strain energy into the energy stream between input and output from another source of potential energy; see Figure 1. Pre-stressing the compliant mechanism is a simple way to introduce the compensating energy [1, 2]. During motion the energy will flow from the pre-stressed to the deforming area. A compliant mechanism where the strain energy has been compensated to keep the elastic potential energy constant is said to be statically balanced. Statically-balanced compliant mechanisms (SBCMs) are useful in the design of applications requiring the monolithic characteristics from compliant mechanisms together with the energy-free and zero-stiffness behaviour from static balancing.

Now the question is, how to design statically-balanced compliant mechanisms? To find the answer, the question is split in two: how to design compliant mechanisms, and how to add static balance? And what defines a statically-balanced state?

Design methods

The design of compliant mechanisms tends to be a trial-and-error process highly dependent on the designer's experience due to the aforementioned disadvantages. Besides, if large deflections are involved, nonlinearities can not be avoided and hence kinematics and dynamics can not be considered independently during the synthesis and analysis. Dimensions of the members are not only determined by the kinematics requirement but also by the stress distribution. This design difficulty prevents the wide use of compliant mechanisms. Although compliant mechanisms have been used for more than a century, it is in the last twenty years that they have shown a growing



a b

Figure 1. Functional representation of (strain) energy storage in:
(a) a compliant mechanism (CM);
(b) a statically-balanced compliant mechanism (SBCM).

stream of publications with a proliferation of new methods for analysis and synthesis.

Three main different design synthesis approaches for compliant mechanisms are distinguished; the kinematics based approaches, the building blocks approaches and the structural optimisation based approaches [3, 4].
The kinematics based approaches make use of knowledge on rigid-body kinematics. Here two methods excel: the rigid-body-replacement method based on flexure joints and pseudo-rigid-body models [5, 6], and the freedom-and-constraints-topologies or FACT method [7, 8].
In the building blocks approach the idea is to concatenate multiple compliant mechanisms that perform simple functions to create compliant mechanisms that can perform more complex functions. Two methods are identified: the instant center approach and the flexible building blocks.
The structural optimisation approaches are based on the use of optimisation and search techniques to obtain the design topology, shape and size of a compliant mechanism that satisfies an objective function and its constraints for a set of design parameters.

Design synthesis approaches for compliant mechanisms can be summarised as:
- Using the well-known kinematics of rigid-body mechanisms. The conventional joints obtained in this way are replaced by compliant joints to obtain a compliant mechanism.
- Starting from the premise ”divide and conquer”, where the design problem is divided in smaller subproblems and where the final design is obtained by composing the solutions to the subproblems into a complete design. The subsolutions can be obtained either by some automated process or using the well-known kinematics from rigid-body mechanisms.
- Automating the search of a solution that fulfils a desired function and constraints. Find the proper way to describe the topology, shape and size (the parametrisation), and find what has to be fulfilled to get the proper design (the objective function).
- Any combination of the previous.

What defines a state of static balance for a range of motion is the observance of five conditions or criteria along this range of motion: the system has constant potential energy; it is in a state of continuous equilibrium; it shows zero stiffness or neutral stability; its virtual work is zero at any point in the range of motion; and finally, it exhibits zero natural frequency and moves with constant speed in the absence of external forces [9].
Now for the design of statically-balanced compliant mechanisms, it is proposed to use the three main design approaches for compliant mechanisms, in order to satisfy the static balancing criteria. Such combination leads in theory to fifteen design methods. In the kinematic approach only the use of the rigid-body-replacement method is feasible.

Application to micromechanisms

At microscale, performing micro-assembly tasks is technologically highly complicated due to the small part dimensions involved and the high-accuracy demands in positioning which could cost sometimes up to 80% of manufacturing cost [10]. Besides, manufacturing of pin joints which are rather small compared to the whole design, is costly and requires a tight position resolution as well [11]. On the other hand, compliant design has less clearance due to pin joints, resulting in higher precision [12, 13]. Therefore, the compliant mechanism seems to be promising in the design of micromechanical structures for MEMS (micro-electromechanical systems) applications [6, 13]. But, the positive stiffness of the mechanism remains a significant drawback [14]. This fact results in insufficient travel range, non-accessible actuation force, larger actuators and therefore larger size of the final design and lower energy conservation. Actually, a statically-balanced compliant micromechanism for application as MEMS (SB-MEMS) may be a breakthrough in precision engineering. In this mechanism, energy is transferred between the mechanism and the balancer.

The following sections will elaborate on the overall aim of this research. Two cases of SB-MEMS are presented for different applications: the balancing force and loading are either in same direction (case I) or perpendicular to each other (case II). These concepts provide a compliant mechanism with zero stiffness at the start and the end of its travel range, respectively.

Case I

It has been shown that the horizontal stiffness of the beam elements of a straight guided mechanism is reduced by an applied compression force, in the same way that in a

conventional slider-crank mechanism the stiffness along the travel path is decreased by the balancing compression force applied to the crank's spring [15]. Besides, the moment produced from the compression force generates a larger balancing force. The initially curved beams as balancing elements avoid ramping up of a high buckling load, which will result in a better distributed force compared to straight beams. Considering fabrication and performance constraints and the above-mentioned issues, the concept has been proposed [16] as shown in Figure 2 and the results are shown in Figure 3.

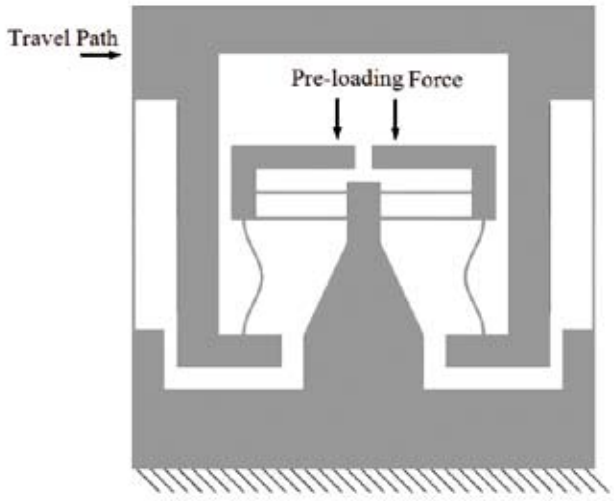


Figure 2. Concept of the statically-balanced compliant micromechanism of case I.

As illustrated in Figure 3, adding the negative stiffness of the SBM (dotted circular line) to the increasing positive stiffness of the CMM (solid star line) results in a SB-CMM (dashed diamond line) with an approximately zero force (F) versus displacement (X) curve and therefore a zero-stiffness mechanism. As shown in this figure, the SBM effectively compensates the CMM from the starting point of the travel range because of approximately opposite stiffnesses. Therefore, the system is in static equilibrium from the start of the travel range. However, the mechanism can be only statically balanced for a certain range of motion, as the difference in nonlinear stiffness characteristics of the SBM and CMM increases along the travel path. In this concept, it has been assumed that the balancing elements are already preloaded externally.

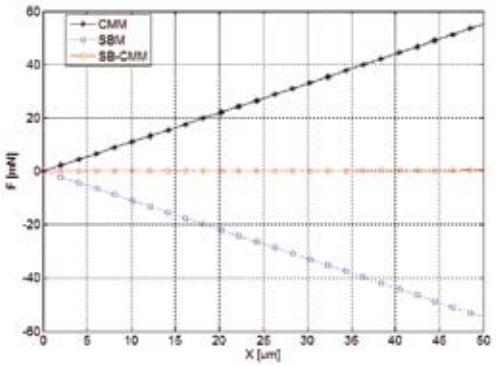


Figure 3. Actuation force versus displacement for case I – comparison of conventional micromechanism (CMM), statical balancing mechanism (SBM) and statically-balanced compliant micromechanism (SB-CMM).

Case II

In this case the directions of travel path and balancing load are assumed to be parallel and the mechanism is in static equilibrium at positions further along the overall mechanism travel range.

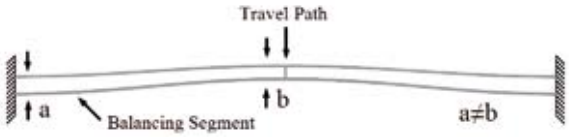


Figure 4. Concept of the statically-balanced compliant micromechanism of case II.

Figure 4 presents the initial concept [16] and the results are shown in Figure 5. Solid star and dotted circle lines present the CMM and SBM, respectively, and dashed diamonds show the total force from the SB-CMM. As shown in this figure, by combining a bi-stable mechanism (SBM) with another bi-stable mechanism (CMM), the positive stiffness of the combined structure (SB-CMM) may reduce if the second and first stable positions of the CMM and SBM are nearly in the same position (see Figure 5). In this case, when the positive stiffness of the CMM after its second bifurcation point is compensated by the negative stiffness of the SBM after its first bifurcation point, the system can be in approximate static equilibrium for a certain range of motion around the matching stable position.

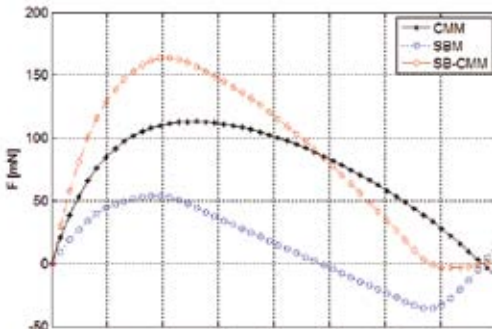


Figure 5. Actuation force versus displacement for case II – comparison of conventional micromechanism (CMM), statical balancing mechanism (SBM) and statically-balanced compliant micromechanism (SB-CMM).

In other words, the mechanism is approximately statically balanced internally for a certain range of motion instead of in one or two positions. This concept resembles those presented in [12]. But here a double buckling mechanism is proposed with a *difference in rise* of the beams (i.e. a ≠ b), which results in a significant change of buckling behaviour in which the system is statically balanced internally for a certain range of motion. The same principle has been used to design a nonlinear static balancing mechanism by combination of different balancing mechanisms [17].

Conclusion

Design methods, concepts and simulation results of statically-balanced compliant micromechanisms (SB-CMMs) have been presented. These concepts provide compliant micromechanisms with approximately zero stiffness in a finite range of motion. The simulation results confirm the validity and performance of the concepts, which have been optimised for further evaluation. Incorporation of these concepts can ultimately result in a reliable, smaller, and energy-efficient microsystem, having a larger useful travel range.

Acknowledgement

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Milling in steps

How to define high-speed milling (HSM)? That's not so easy, though one statement is that the cutting speed is so high that this causes the forces for cutting the workpiece material to decrease. However, there is no doubt that the Mikron series machines from the GF AgieCharmilles Group are real "HSMs". Really innovative is that they are provided with ITM, a system for exactly defining the vertical position of the high-speed cutting tool edge. Besides that, the designers took a lot of measures to realise stable machines with very accurate high-speed spindles.

• *Frans Zuurveen* •

GF AgieCharmilles forms part of the Swiss GF Group. Already in 1802, Georg Fischer started a steel mill in Schaffhausen and succeeded in producing steel that could compete with steel from England, then fully involved in its Industrial Revolution. Today, the GF Group consists of GF Piping Systems, GF Automotive and, as said, GF AgieCharmilles. The latter combines Mikron, a famous producer of milling machines, and AgieCharmilles, specialized in EDM (Electrical Discharge Machining). AgieCharmilles is a cooperation of Agie and Charmilles.

a

b

c

Figure 1. The GF AgieCharmilles Mikron HSM 400 LP Precision milling machine.
(a) Overview.
(b) Milling with rotating and tilting table.
(c) Precision milling a pump impeller.

# of a micrometer

Agie and Charmilles are well known for their die-sinking and wire-eroding machines. Recently, GF AgieCharmilles added laser machining to its skills, so that it now masters nearly all thinkable high-precision cutting and non-cutting machining technologies.

Mikron Machines

The Mikron HSM 400 LP Precision machine (LP: Linear Performance) has a work space of 500 mm x 450 mm x 360 mm; see Figure 1. The maximum spindle speed is 54,000 min^{-1} and the minimum endmill tool diameter is not less than 0.1 mm.

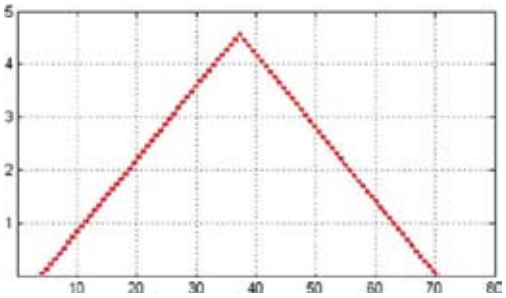


Figure 2. Diagram showing the stepwise movement of a slide, displacement [µm] versus time [s].

The adage "Precision" is not without meaning. Figure 2 shows that a linear slide of the milling machine is able to make extremely small steps of 0.1 µm. It goes without saying that such small steps can only be achieved by taking special design measures regarding mechanical and thermal stability, and regarding precision of slide positioning.

The machine base frame is formed as a force-closed gantry, made from material with good damping characteristics. That material obviously is not steel, nor cast iron, but polymer concrete casting material: Epument, fabricated by Epucret Mineralgusstechnik GmbH. It is a mixture of epoxy resin and mineral quartz with a specific gravity of 2.3 g/cm^3. Vibrations damp out more than two times faster than in cast iron. Young's modulus amounts to 35-40 kN/mm^2. This is about five times lower than Young's modulus of steel, which necessitates enlarging cross-sections to preserve the same frame stiffness.

Thermal stability is achieved by water cooling all spots where heat is being generated: motor drives, spindle, etc. Of course, the temperature of the cooling water is controlled within narrow limits. The water cools in particular the front nose of the tool spindle, which is very near to the workpiece, of course.

The spindle makes a separate story. Some years ago GF AgieCharmilles acquired StepTec, a Swiss firm specialised in the design and manufacture of turning and milling spindles, see Figure 3. StepTec applies hybrid roller bearings, which combine rolling elements from Si_3N_4 with steel races. The bearings are being lubricated by an oil-air mixture.
The slides are provided with precision rolling elements and driven by linear electric motors. Their position is being measured by Heidenhain optical scales, with interpolation between scale periods in the nanometer range.

Intelligent Tool Measurement

ITM is a hardware and software system for defining the vertical position of a high-speed cutting edge with an accuracy of ± 1 µm. The hardware makes use of a laser beam in which the tool "plunges" when moving downwards. The ITM software takes care of – digitally – removing errors from adhering particles or cutting oil; see Figure 4. This last feature is based on the detection of the

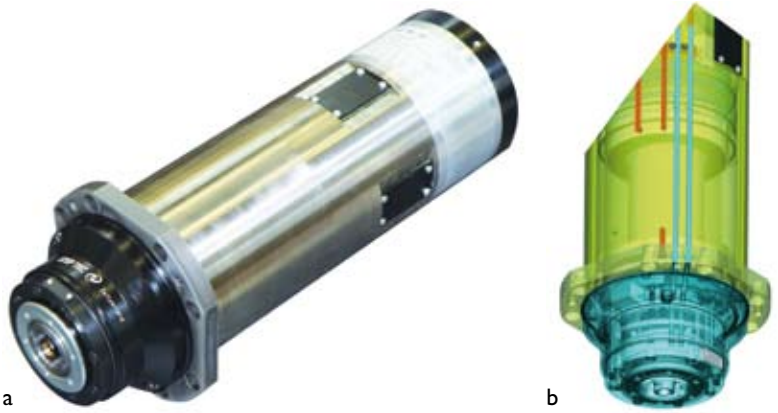


Figure 3. The StepTec tool spindle applied in Mikron HSM machines.
(a) Overview.
(b) Transparent view of the front nose showing the cooling channels.

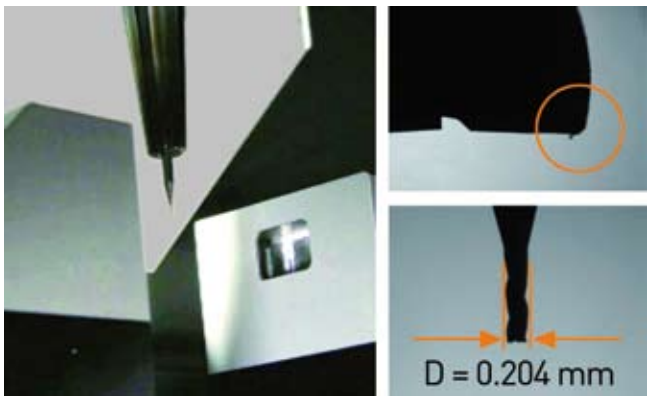


Figure 4. The ITM system. Errors from adhering particles (upper right) or cutting oil are digitally removed. Therefore, image sensors detect the complete tool tip (left).

complete tool tip with image sensors. Thus it provides an absolute *z*-reference with micrometer precision.
ITM takes action before starting the cutting operation, but with full tool rotation speed. As a result, ITM corrects the vertical tool position when necessary, thanks to a compensation mechanism inside the spindle.

Proving precision

Of course, the accuracy of the Mikron machines proves itself when producing precision parts in practice; see Figure 5. An ultimate test is shown in Figure 6. At first, different steps are machined with the same tool with successive *z*-position steps of only 2 µm. In some respects, this might be called “routine practice”. But the subsequent endmill machining of 1 µm deep slots with different tools and rotational speeds is quite a challenging masterpiece. Especially, because the slots are supposed to end exactly between the 0 µm and +2 µm step level.
These and other precision tests also show excellent surface finish conditions. Mean roughness values of R_a = 20 nm have been obtained.

To conclude

Mikron machines are frequently in use in the Swiss watch industry. Needless to say that precision engineers in other industrial branches can also take benefit from the skills of Swiss milling machine builders.

Reference

When fractions of micrometers count, Swiss Quality Production, Hanser Verlag, Munich, 2010.

Figure 5. HSM milling a precision part.

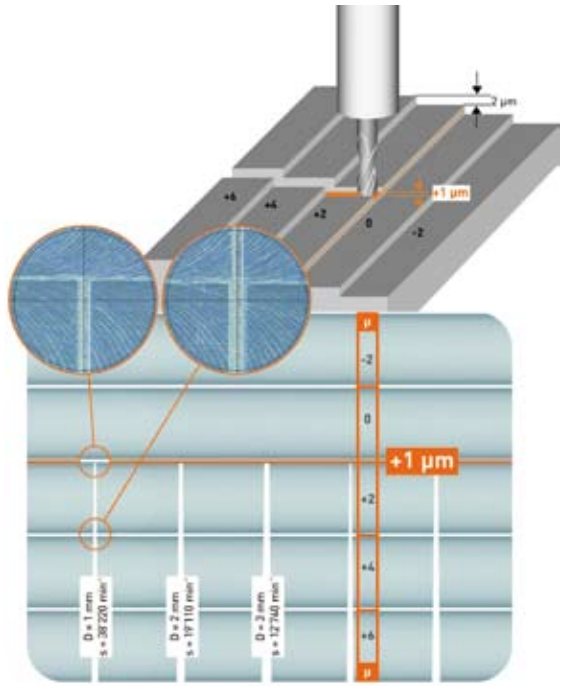


Figure 6. A testpiece machined in steps of 2 µm. Subsequently machined slots, with different tools, are 1 µm deeper.
D = tool diameter, *s* = rotational speed.

Author’s note

Frans Zuurveen is a freelance text writer who lives in Vlissingen, the Netherlands

Information

www.gfac.com

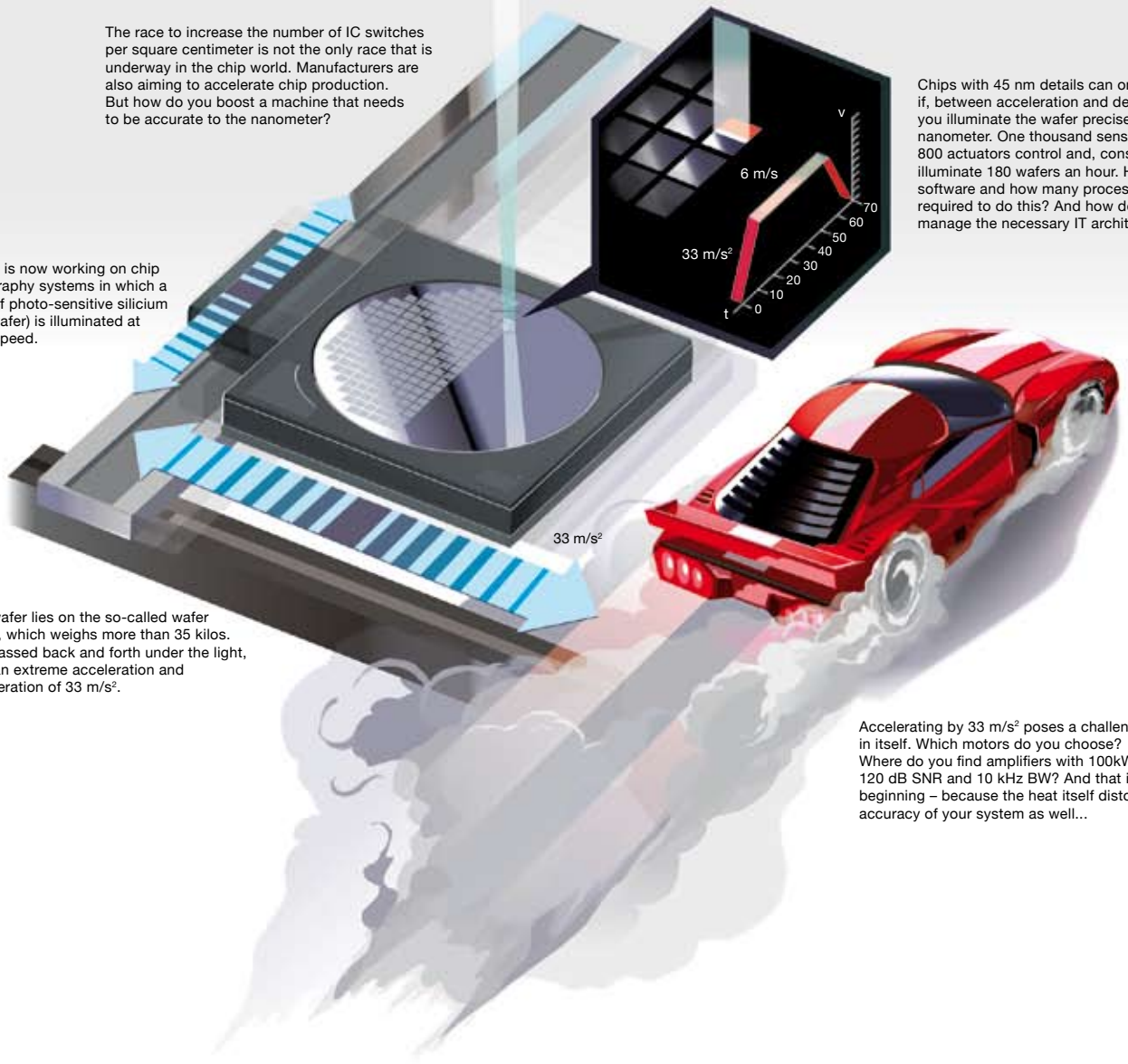
Tomorrow, we will be able to make chips faster. Today, you can tell us how.

Deep UV-light (193 nm)

The race to increase the number of IC switches per square centimeter is not the only race that is underway in the chip world. Manufacturers are also aiming to accelerate chip production. But how do you boost a machine that needs to be accurate to the nanometer?

Chips with 45 nm details can only be made if, between acceleration and deceleration, you illuminate the wafer precisely to the nanometer. One thousand sensors and 800 actuators control and, consequently, illuminate 180 wafers an hour. How much software and how many processes are required to do this? And how do you manage the necessary IT architecture?

ASML is now working on chip lithography systems in which a disk of photo-sensitive silicium (the wafer) is illuminated at high speed.



The wafer lies on the so-called wafer stage, which weighs more than 35 kilos. It is passed back and forth under the light, with an extreme acceleration and deceleration of 33 m/s².

Accelerating by 33 m/s² poses a challenge in itself. Which motors do you choose? Where do you find amplifiers with 100kW capacity, 120 dB SNR and 10 kHz BW? And that is just the beginning – because the heat itself distorts the accuracy of your system as well...

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40 Years of precision..

Besançon traditionally hosted this year's 18th edition of Micronora (28 September to 1 October). As the name suggests ("micron" for small and "ora" as in hour) this bi-yearly exhibition/trade show was started in the 1970s as a (time) measurement event, when Besançon – located roughly between Dyon, France, and Bern, Switzerland – was known as the French 'Capital of Watches'. As the Franche-Comté region itself, Micronora has experienced the transition from watches and metrology into today's exhibition dealing with advanced micro- and nanometrology, micromachining and surface characterisation. Five exhibition halls offered 25,000 m² of exhibition space for this year's 860 exhibitors, all dealing with the subjects 'small' and 'precise'. With more than 15,000 visitors – including a Dutch delegation – and one third of the exhibitors being foreign, Micronora has grown into a "salon" of European importance.

• *Richard Bijlard* •

Enterprise Europe Network

Hosted by innovation network Syntens, the exhibition and related Brokerage Event were visited by a small Dutch delegation, including entrepreneurs and DSPE president Hans Krikhaar. Rim Stroeks, advisor to Syntens and consultant to the Enterprise Europe Network (EEN), acted both as the delegation's driver and host for the four-day visit. The event was also an opportunity for all international members of the EEN Micro- and Nanotechnology Sector Group to get together, exchange experiences and have a sector meeting. As invitees to the EEN sector diner event, the Dutch got a good idea about the setup of this network, in which the various regional and national consultants actively try to match technology offers and demands to create pan-European co-operations.

Although the various company profiles are widely accessible and stored in a central Syntens database, a good personal contact and an active approach are key to really make things work. From an outsider point of view, the sector group looked like a very cooperative and involved

Author's note

With his company Technogation, Richard Bijlard is actively helping technology companies to develop international partnerships and sales channels. Key to this are his experience in technology marketing and sales and his large international technology network.
www.technogation.com

..but no more clocks!

group of people that shared a passion for matchmaking in technology, over the boundaries of country borders. Taking over from his Greek colleague, Rim Stroeks was voted chairman of the Sector Group for the coming time period.

Exhibition

The Micronora exhibition was organised in a business-led approach (tooling, machining, stamping, assembly, barturning, automation, metrology, etc.), whose common denominator is precision increasingly combined with miniaturisation. Spread over four exhibition halls, various manufacturers and representatives from France and parts of Europe, Asia and America showed their latest and greatest in 'small'. A specific section was used to demonstrate some of the latest high-tech developments, organised around five areas of technology: micromanufacturing and micromanipulation; micro-injection and micromoulding; microsystems; surface processing; and nanotechnologies and nanomaterials. This so-called ZOOM area showed various applications like low-power sensor technology, scanning probe microscopy, etc. Furthermore, a number of lectures (French-only) were held on industrial applications of micro- and nanotechnology.

A fifth exhibition hall was dedicated to nanotechnology, recognised by the industry as a fast emerging field. In this nanotechnology pavilion, various nanotechnology process and measurement equipment and materials were shown. Although this section apparently was bigger than last time, a quick survey amongst some of the various exhibitors showed me that they were only relatively happy with the amount of attention of the public and were eagerly anticipating further growth in this particular nanotechnology area of Micronora.

During the Brokerage Event, there was ample of room for matchmaking. (Photo: ARIST)

Overview of the social event in a very nice art-deco restaurant in the old town of Besançon. (Photo: ARIST)

Brokerage Event

The Brokerage Event was organised for the seventh time by ARIST Franche-Comté, the technological department of the Chamber of Commerce and Industry and a partner of the European Enterprise Network. A separate building on the exhibition terrain, not far from the Micronora exhibition floor, offered the approximately 100 participants the necessary peacefulness and silence and the opportunity to talk business. Before the event, the Brokerage organisation had hosted a website where all participants could display their profiles and wishes and where it was possible to express interest in other parties. Before the actual start of the one-and-a-half day Brokerage Event, everyone could pick up their individual meeting schedule with the day divided in half-hour time slots. Amongst the participants a large number of companies and institutes from the region (France, Switzerland) but also a significant number of delegates from Germany, Belgium, the Netherlands, Italy, Spain and Sweden. This event alone was worth the trip: very interesting conversations in a very good and stimulating setting, leading to some promising contacts. The event was followed by a delegates diner in a very nice art-deco restaurant in the old town of Besançon. Here all participants could meet informally again and taste the delicacies from the region, accompanied by the Micronora organising committee and a delegation of the Franche-Comté region.

French-Dutch collaboration

During the Micronora trade show, Syntens consultant Rim Stroeks and DSPE president Hans Krikhaar had a meeting with the Micronora board to explore the potential for collaboration between the French Micronora and the Dutch Precision Fair. As a result, the Micronora board will attend the tenth Precision Fair to be held on 1 and 2 December. It is Stroeks' ambition to have a collective Dutch stand at the next Micronora in 2012. "A 'Dutch Precision' pavilion might add something special to the Micronora. It has classical micromechanics at its heart, but there is increasing attention to system development and function integration."

Information

www.micronora.com
www.syntens.nl
www.enterpriseeuropenetwork.nl

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5 Years of Photonics in the Benelux

The 5th annual Photonics Event will take place at Nieuwegein's Business Center on Tuesday 29 and Wednesday 30 March 2011. The free, two-day event with an increasingly international allure comprises an inspiring conference and an extensive exhibition. The Photonics Event is the annual knowledge and networking event about new lighting technologies – in the 21st century, photonics will drive innovation within a number of social and other themes.

Since the first edition, the Photonics Event has contributed to this development by annually bringing together researchers, scientists, entrepreneurs, CEOs, policy makers and science students. In the Benelux, the Photonics Event forms the bridge between new technologies and innovative applications.

Under the auspices of Photonics Cluster Netherlands (PCN), a high-quality conference programme is being put together on social themes such as Health & Life Science, Information & Communication Technology, Photonics in Daily Life, Lighting, Industrial Photonics, and Solar. These will be complemented with new technology subjects such as LEDs, microscopy and lasers.

Tel. +31 (0)40 - 296 99 20 (Ellen van Ree, Mikrocentrum)
e.van.ree@fotonica-evenement.com
www.fotonica-evenement.nl

Impression of the 2010 Photonics Event.

New Lens Design course

Engenia, an organisation for training and education at an academic and post-tertiary education level, has announced a new six-day course in Lens Design, starting on Thursday 13 January 2011. This course is intended for novices in lens design and will be taught by Dr Chris Velzel (consultant, formerly at Philips Research, NanoFocus and Eindhoven University of Technology).
The course includes:

- introduction to geometrical optics and optical instruments;
- aberrations and optical calculations, optical workshop technologies;
- lens design processes, lens types and design strategies;
- workshop on optical instrument design;
- lens design software and design optimisation.

Other courses scheduled in the early part of 2011 are: Acquisition of high-tech projects, Finite Element Method, Production Management and Industrial Engineering, Reliability, and Supply Chain Management.

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www.engenia.nl

Seminar on difficult-to-machine materials

Difficult-to-machine materials, which include high-temperature nickel alloys, titanium, inox steel, ceramics and composites, are no longer exclusive to the aerospace industry. Nowadays, they are applied in other domains as well, such as medical, automotive and equipment manufacturing. Processing these materials requires special attention regarding machine, tools and technology. Alternatively, products can also be manufactured by Selective Laser Melting (SLM), which is used for producing medical implants, for example.
On 14 December, Mikrocentrum will be organising a highly informative seminar on this topic in collaboration with TNO Science and Industry.

www.mikrocentrum.nl

Design principles for precision mechanisms

The successful design of mechanisms for products, tools and equipment relies on excellent concepts and properly designed details. Both are covered in a new book, “Design principles for precision mechanisms”, by Herman Soemers. Many of the examples presented in this book have been realised in practice and properly evaluated, giving the reader/designer a high level of confidence, according to the author. Every example comes with the considerations underlying the application and the limitations of the particular idea.

Designing is a process that starts with an explicit desire, or to put it more formally, user specifications that describe what the object (product, tool, etc.) to be designed must be capable of. Based on these specifications, the designer (here a mechanical or mechatronic designer) conceives mental images of what it could be like. This is a highly creative activity. He or she translates these mental images into drawings or 3D models, and in doing so makes the ideas available in a more concrete form both to him- or herself and others. By exposing his or her ideas to an audience, the designer provokes criticism – for example: it is too large, too compliant, it does not fit or it is too expensive – which leads the designer to iterate the drawings or models so that they incorporate more requirements and more detail. Following this line of thought, the author concludes that designing involves an alternation between creativity and analysis.

The book on design principles for precision mechanisms contains six chapters:

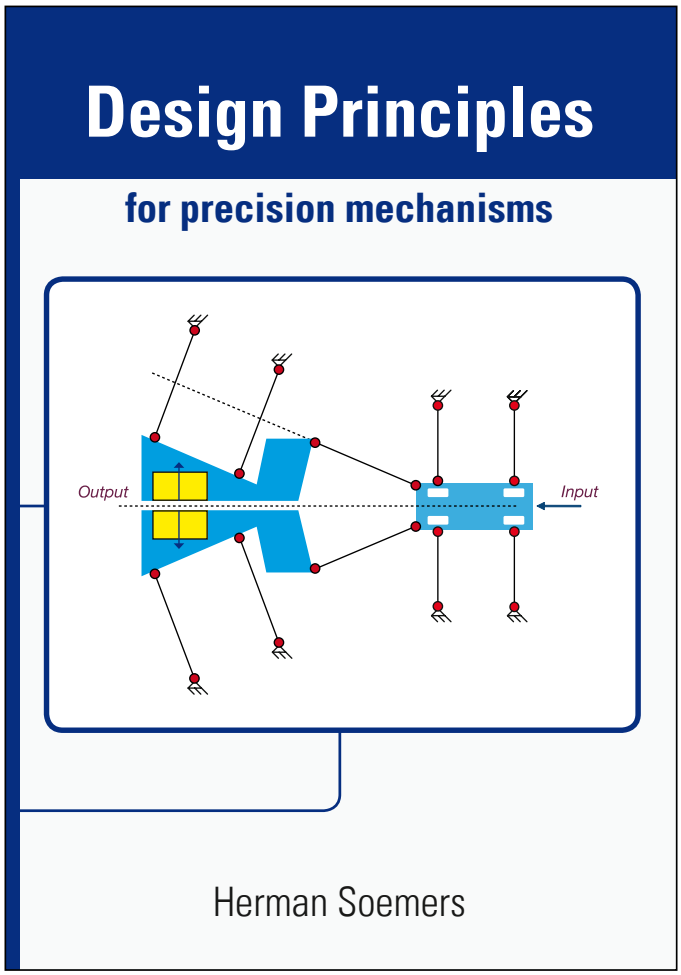
1. Design for Stiffness
2. Controlling Degrees of Freedom
3. Flexure Mechanisms
4. Hysteresis and Microslip
5. Bearings, Rollers and Webs
6. Dynamics and Energy Management

It is not a comprehensive collection of design examples and relevant products. The book rather focuses on providing insights and proposing design concepts in the focus areas reflected by these chapter titles. For students, it may well be their first acquaintance with design as a means to embody mechanical engineering concepts. But more than that, it aims to demonstrate ways to convert modelled realities (as can be found in so many learning books) into real constructions with predictable behaviour. The book is also intended to show the power of thinking in “Degrees of Freedom”, and to help stimulate creativity by providing a large number of examples, plus many unconventional solutions and underlying trains of thought. Together with the basic example calculations provided, these should be helpful to more experienced designers as well as to students.

The book is based on the work started in the 1960s by W. van der Hoek at Philips in Eindhoven, the Netherlands, and subsequently continued by M.P. Koster, culminating in the Dutch-language book “Constructieprincipes” [Design principles for accurate movement and positioning]. The core of their design approach has been preserved, while theory and examples were updated and the English language was adopted to reach a broad audience within the Netherlands as well as abroad.

Herman (H.M.J.R.) Soemers is part-time professor in Mechatronic Design at the University of Twente, Enschede, the Netherlands. His chair is sponsored by the Mechatronics Valley Twente Foundation. He also works as a technology manager mechatronics with Philips Applied Technologies in Eindhoven.

The book (ISBN 978-90-365-3103-0) was published bij T-Pointprint.
info@t-pointprint.nl
www.t-pointprint.nl



Brainport Industries launched

Earlier this autumn, in Eindhoven, the Netherlands, Brainport Industries was launched. Chairman Marc Hendrikse, CEO of NTS-Group, presented background, goals and organisation: "With Brainport Industries, the suppliers take charge and control of the high-tech supply chain. By collaborating, we can further professionalise and internationalise our eco-system." Frencken Europe director, Henk Tappel introduced CFT 2.0, an investigation into a joint institute for new manufacturing technologies as a full-blown successor to Philips's renowned Centre for Fabrication Technology. Joost Krebbekx (Berenschot) presented the long-term technology investment roadmap for the high-tech systems chains. KMWE CEO, Edward Voncken introduced a project aimed at sharing information in the supply chain to facilitate and speed up collaboration. Finally, Daan Kersten (Boer & Croon) presented an initiative to address supplier assessment through *value sourcing* and process improvement in a chain context.

www.brainportindustries.com

Initiators of Brainport Industries, from left to right: in the front row, Hans Duisters (Sioux), Lars van der Hoorn (Van der Hoorn Buigtechniek), Roland Sniekers (Euro-Techniek) and Henk Tappel (Frencken Europe); behind them, Edward Voncken (KMWE), Marc Hendrikse (NTS-Group), Ferry van de Pasch (HTR Rubber & Foam) and Theun Baller (Philips Research Open Labs); Ad van Berlo (Van Berlo Group) was not present. Photo: Marieke Duijsters

Inaugural lecture Mechatronics lector Jos Gunsing

On Friday, 3 December 2010, Jos Gunsing, lector Mechatronics at Avans Hogeschool university of applied sciences in Breda, the Netherlands, will deliver his inaugural lecture. In this lecture, entitled "Van Stoom en Stroom naar de ultieme Droom" (From Steam and Current/ Flow to the ultimate Dream), Gunsing will discuss the development from a mono- to a multidisciplinary habitat in technology. As a guest speaker, Egbert Stremmelaar, chairman of the FEDA drive & automation federation will talk about the changing world of mechatronics and address collaboration between industry and education. The next Mikroniek issue will feature a summary of Gunsing's lecture.

www.avans.nl

Sterilisable motors

For use in high-speed medical applications of up to 90,000 rpm, maxon motor extends their product range by two sterilisable 50 Watt drives. Stand-alone, or as motor/gear combination, the drives stand out by high power, extremely low-noise and low-vibration operation, marginal heat generation and minimal size – characteristics particularly useful for medical handheld power tools.
Both drives, differing in outer diameter and shaft dimensions, are characterised by a special compact design particularly adapted for medical use, a very high nominal speed, quiet running, minimised heat generation and sterilisability in the autoclave. The motors are available with Hall sensors or sensorless and with three different windings. The gearheads come in reductions of 5:1 to 125:1, with or without output end shaft seal.

New linear stages for harsh production environments

Aerotech has launched a new range of industrial-grade positioning stages that feature direct-drive linear servo motors and ultra-smooth cross-roller bearings in a hard-top/side-sealed protection design that offers outstanding levels of positional and geometric precision for harsh production environments. The new ALS2200 range is aimed at high-precision/high-throughput manufacturing applications such as multi-axis laser micromachining, which typically demands very tight velocity and in-position control combined with smooth motion and micron-level straightness and flatness.

Free from recirculating bearing elements and with a high-power cog-free linear servo motor, drive-induced stage vibration is reduced to almost imperceptible levels resulting in outstanding velocity stability. With a nominal stage width of under 204 mm, the range covers a choice of 100 mm or 150 mm travel with direct load-up to 30 kg, HALAR calibrated accuracy to +/- 0.75 µm, a bi-directional repeatability of +/- 0.2 µm, and speeds to 500 mm/sec. Positioning resolution is up to 3 nm with zero backlash.

www.aerotech.com

FEI-Nanonics collaboration

FEI Company, a leading instrumentation company providing electron microscope systems for applications across many industries, this autumn announced that it has entered into an agreement to collaborate with Nanonics Imaging, based in Israel. Nanonics Imaging is a market leader of combined near-field optical microscopes and atomic force microscopes (AFMs). The partners aim to explore the feasibility of adding an AFM to an FEI DualBeam™ focused ion beam (FIB)/ scanning electron microscope (SEM) system. The AFM is used for imaging, measuring and manipulating matter at the nanoscale. It uses a mechanical probe to measure the surface topography of a sample. The DualBeam is a FIB/SEM system that provides 3D imaging and analysis down to the nanoscale. The DualBeam uses an SEM to image FIB-milled cross sections, which reveal subsurface features.

www.nanonics.co.il
www.fei.com

High-precision optical metrology bench

In the ever demanding world of scientific research, metrology systems often need to go beyond the capabilities of off-the-shelf equipment. Direct collaboration between end-users and system designers is the way to maximise the compatibility of the process needs with a custom-designed motion platform. Q-Sys, headquartered in Helmond, the Netherlands, illustrates this philosophy with an optical metrology bench as an example of the bespoke motion solutions they provide. Designed for the laser metrology of optical surfaces, the system includes innovative techniques for maximising the stability and repeatability of measurements while reducing angular errors to a minimum (< 2 arcsec). The air-bearing carriages are driven by linear motors and the platform is also designed to input extremely low levels of heat into its environment. The finished system is exceeding expectations in both accuracy (< 4 µm) and measurement repeatability.

www.q-sys.eu

Portable surface roughness tester

Recently, Mitutoyo introduced the Surftest® SJ-210 portable surface roughness tester. The new tester combines high accuracy and measurement speed with numerous features creating a versatile, user-friendly instrument for use in production environments. For reliable roughness analysis, no less than 39 parameters can be measured according to the latest standards. The various types have either 0.75 or 4 mN measuring force, with a stylus tip radius of 2 or 5 µm, respectively. Range and resolution are between 400 µm / 0.02 µm and 25 µm / 0.002 µm.

www.mitutoyo.com

New laser beam deflection unit

RAYLASE, a leading manufacturer of components and subsystems for the deflection, modulation, and control of laser beams, has introduced the RAZORSCAN-AC (RS-AC) featuring the world's first auto-calibrating galvanometers. The galvanometers, the integrated digital auto-calibration devices and the auto-calibration software were all developed in-house by RAYLASE. The precision two-axis subsystem guarantees long-term stability, and the integrated auto-calibration feature ensures that gain drift and offset drift are corrected in seconds.

The combination of exact verification of coordinates, control of deflection with µrad precision, and auto-calibration makes the RAZORSCAN-AC product unique worldwide, so RAYLASE claims. The aluminum twin-shell construction ensures that generated heat is distributed across the entire deflector head, almost completely eliminating temperature gradients; ambient temperatures of up to 40 °C are allowed. Optimised temperature management ensures that the whole module maintains temperature equilibrium. The RAZORSCAN-AC, available with apertures of 10, 12, 14 and 20 mm, is suited for accurate material processing such as rapid tooling, deep engraving, edge isolation, and trimming.

www.laser2000.nl
www.raylase.com

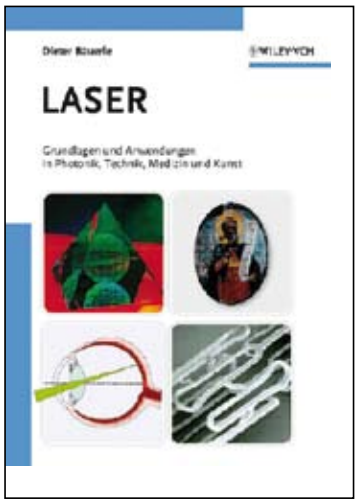
Motor feedback systems with inductive scanning

HEIDENHAIN is presenting new rotary encoders with inductive scanning as feedback systems. It has developed a new absolute rotary encoder, the ECI 119 in single-turn resolution, for applications in direct-drive technology and for mounting on hollow-shaft motors that up to now have been equipped, for example, with toothed-belt solutions for driving the feedback systems. The ECI 119 features significant functional reserves with regard to the influence of contamination, shock and vibration. The high internal 14-bit interpolation of the inductively produced scanning signals generates a 19-bit absolute value (equals 524,288 positions) in one revolution.

With its EBI 1135, HEIDENHAIN is presenting another new product with inductive scanning and EnDat interface. The absolute multi-turn encoder attains a total resolution of 35 bits (single-turn: 19 bits, multi-turn: 16 bits). The modular design without ball bearing and a battery-buffered revolution counter permit very compact dimensions. With an overall length of less than 13 mm and an outside diameter of only 35 mm, the rotary encoder is one of the world's smallest rotary encoders and is therefore, according to a press release, predestined for application on highly dynamic servo motors with small dimensions.

www.heidenhain.com

Laser: principles and applications



Fifty years ago, in the US the first laser started to shine. In the last twenty years, the optical all-rounder in its many configurations has become more reliable, stable and compact, and cheaper. Barely noticed, this unique fine-tunable and controllable light source has penetrated our daily life: medical care, entertainment devices, education, printing, ‘green’ solar cell fabrication, telecommunications and informatics, etc. In modern industry, especially manufacturing technology, high-power lasers due to their many fortes have managed to overturn traditional production.

This well-made, German-language book introduces the curious technical – but not necessarily expert – reader to fascinating developments in photonics and laser technology. For a better understanding, the unique characteristics of laser light are enlightened. Next, the author covers the numerous applications of lasers in modern times: entertainment, printing, informatics, industrial manufacturing, measurement and environmental technologies, bio- and medical technologies, and art. Due to a well-defined division, each item can be studied separately. The author, Dieter Bäuerle, is Emeritus Professor in the Institute of Applied Physics at the Johannes-Kepler-Universität in Linz, Austria.

Dieter Bäuerle, Laser: Grundlagen und Anwendungen in Photonik, Technik, Medizin und Kunst; ISBN 978-3-527-40803-0, Wiley-VCH, Weinheim (G), 2008.

Matchmaking in Israel

Following trips to Japan, Thuringia (see the September issue of Mikroniek) and the Micronora trade show (see this issue), Rim Stroeks, advisor to Syntens and consultant to the Enterprise Europe Network (EEN), is currently planning a trip to Israel next year. Israel is a highly innovative, world-class technology player, having, for example, more NASDAQ-listed companies than all European countries taken together. Israel is leading in the valorisation of academic knowledge, and is the number one country regarding technology start-ups.

The goal of the company mission is matchmaking and exploring the potential for collaboration; the focus will be on microtechnology. Suggestions for specific topics to be addressed during this trip or companies/institutions to be visited, as well as inquiries of potential participants are invited.

rim.stroeks@syntens.nl

Suitable for Use in Cleanrooms!

For operation in cleanroom conditions, each individual machine element must demonstrate its suitability separately. The same applies for every bearing support, including the lubricant contained within.

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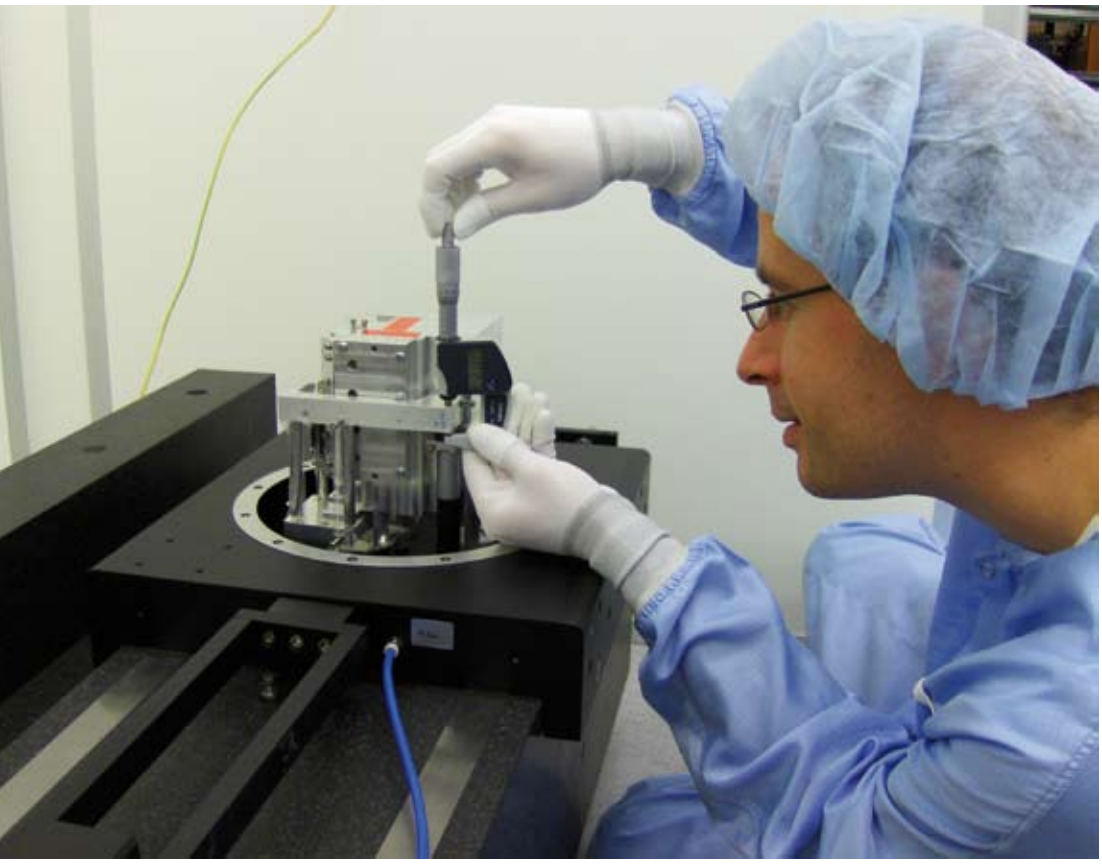
Precision-in-Business day: Vision Dynamics

During a PiB day in October, Eindhoven-based Vision Dynamics took the opportunity to demonstrate their skills. This event provided an excellent example of Precision in Business, with Vision Dynamics presenting their mission of teaching engineers to convert dreams into practical products. In many cases those products relate to precision, such as the measuring device with nanometer accuracy designed for lithography. Vision Dynamics always keeps future business in mind, according to director Hugo de Haan: "We find our ideas in the streets and use them to solve today's problems with products that come onto the market within three to five years."



A Mechaphysics engineer at work.

The Vision Dynamics Group consists of five small companies, with the flexibility to create more subsidiaries when necessary. In the VD promotional video, one of the VD people says that his firm aim is to create two Ltds a year. The following are just a selection of the subsidiaries: Mechaphysics for feedforward mechaphysical contract research with a simple mechanical design as the ultimate goal, VD Learning for education in open innovation and entrepreneurship, and Innophysics for conversion of brilliant Ph.D.-level ideas into marketable products.

Dreams

During an inspiring sailing trip, enthusiastic engineers brainstormed about their dreams of spending money earned. So far, the most successfully implemented

dream – that of Alquin Stevens and Paul Blom – is to use miniature plasma discharges in a printer to make material surfaces suitable for processes in thin-film technology, for instance OPV (Optical Photovoltaics) and electronics. This makes local layer deposition possible without using a mask. Another dream is to equip golf balls with a device that communicates where the ball is located after a wayward shot. This would prevent golfers from becoming irritated when looking for their ball. The last dream mentioned here is the design and manufacture of a revolutionary vibration-less table. While a functional model already exists, a young Ph.D. engineer hopes to redesign it into a commercial product.

The plasma printing process is already at the prototype stage, but the other dreams are still waiting for enough demand to justify development. It will be interesting to see just how many of them really provide a commercial product in the near future. According to Hugo de Haan, the key is not the commercial success, but the entrepreneurial learning experience. In his lecture, he said that, during the short life of Vision Dynamics, five out of twenty ideas have already succeeded technically. Of these five, two were a commercial success and one has achieved global recognition. More importantly, however, over fifty engineers have been able to test their entrepreneurial skills.

Learning

VD Learning meets the future challenges imposed by the high-tech value chains in the Eindhoven region. During a five-month learning programme, about ten well-known entrepreneurial experts will present lectures, practical exercises and case studies. The aim is to equip industrial high-potential students with entrepreneurship skills by transforming high-tech capacity into future market demand with regional series production. They learn to cooperate with specialists from various disciplines with the aim of developing disruptive strategies to reach commercial targets.
Illustrative for the VD Learning approach is the adoption of practical projects in which, within a five-day period, students create a new product together or improve an existing one. During the PiB day, this approach was explained by highlighting a case from IDEO, a Stanford-based design consultancy, in which a small team succeeded in improving the well-known supermarket trolley by making it more attractive, cheaper and easier to use.

Demonstrations

During the PiB day, two examples of Vision Dynamics activities were presented. Firstly, a modified PixDro inkjet printer from OTB was demonstrated, in which the DOD inkjet printing head had been replaced by a plasma printing head. The other example was the loading of liquid nitrogen-cooled specimen gauzes into the ultra-high vacuum of a transmission electron microscope from FEI, the Eindhoven-based specialist in electron and ion optics and successor to Philips Electron Optics.

(Text: Frans Zuurveen)

Information

www.visiondynamics.nl
www.innophysics.nl

Obituary: Herman Akkerman

On 23 October, Herman Akkerman died aged 89. Herman had been of great importance to DSPE for years, which is why he was appointed honorary member (when DSPE was still called the NVPT). His amiable nature enabled Herman to bring people together. He favoured the practical approach. As a board member of the NVPT, he was always asking himself what the NVPT could do for its members – and supported by the board, he would carry out whatever came up. He was the driving force behind the promotion of the precision engineering trade and precision engineering companies, for example by organising a collective stand of NVPT members at relevant trade fairs, such as the Techni-Show. To that end, he would personally visit corporate members in order to motivate them to participate. Herman organised the so-called Mikropool in collaboration with Wietse Bauer, Gert Schuller and Jan van IJzendoorn. In tables that are still included in the Precision Technology Yearbook, he visualised the members' expertise. Herman 'retired' from the NVPT in 2002.

DSPE wishes Mrs Akkerman and all those close to Herman the strength and courage to bear this loss.

Hans Krikhaar
President of DSPE

Herman Akkerman in 2002, at his 50th wedding anniversary.

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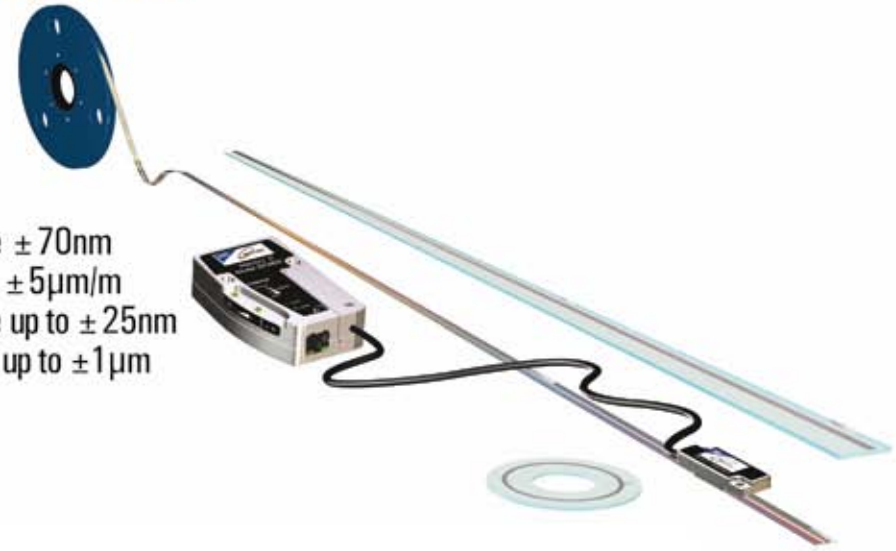

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Since its establishment back in 1977, ACE has developed into a leading engineering and consultancy firm. Services include conceptualisation, development, engineering and prototyping. Headquartered in Eindhoven, the Netherlands, ACE offers a customer-oriented comprehensive approach that is characterised by excellent problem-solving skills and a high level of decisiveness.

Companies are being confronted more frequently by an extensive integration of technology and specialised domain knowledge. Continuous access to knowledge and flexibility play an important role in responding to this appropriately. It is ACE's mission to professionally develop and engineer successful products, production equipment, production tooling and production processes for innovative companies, from small and medium-sized to large industrial enterprises.

Business units

ACE embeds its technological knowledge and competences in four dedicated business units:

- Industrial Automation
- High-tech Systems
- Product Development
- Construction Technology

ACE business units act as specialised engineering partners that combine specific knowledge with strong action. Keeping a close eye on the latest developments and responding accordingly, ACE is the perfect partner for conceptual solutions. The High-tech Systems business unit focuses on precision mechanics and mechatronics, a base technology for all motion control and positioning components in advanced equipment and products.

Approach

Thanks to its solid knowledge of development and engineering and a clear approach to collaboration and project execution, ACE has the capability to ensure fulfilling and long-term partnerships.
ACE believes in a result-driven approach that guarantees maximum flexibility and close cooperation through its professional services:

- Outsourcing to ACE with clear objectives, concrete deliverables and adequate project management.
- Highly qualified engineers to assist the client's project team on-site when necessary.

Collaboration

Collaboration in development requires an intensive exchange of knowledge and information. ACE seeks to forge long-term relationships with its clients, in which every project, regardless of size, has the potential to develop into a long-term business opportunity. "Collaboration is our ambition. Together we aim to find solutions that truly meet your needs and help enhance your competitiveness."

Information

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Trade fair & Conference

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NH Conference Centre Koningshof, Veldhoven, Netherlands



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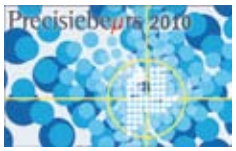

2010 Precision Fair

Organised by Mikrocentrum, the tenth edition of the Precision Fair (or *Precisiebeurs*, in Dutch) will be held in NH Conference Centre Koningshof in Veldhoven, the Netherlands, on 1 and 2 December 2010. The Precision Fair has grown into *the* event on precision technology and has already acquired an international reputation.

Lecture programme

This year, 'Business in precision technology' will be the recurring theme of the main lectures. It will be demonstrated how industrial partners can participate in open innovation systems. Also, the Dutch long-term technology investment roadmap will be presented to suppliers. As an example, the collaboration between an OEM and his suppliers on the development and manufacturing of complex modules will be highlighted. One of these suppliers will present his growth strategy aimed at becoming a system supplier of advanced precision modules.

Technology Hotspot

For the fourth consecutive year, Mikrocentrum is organising the 'Technology Hotspot' at the Precision Fair. Universities, universities of applied sciences and research institutions from the Netherlands, Belgium and Germany will be presenting their research in the field of precision technology and related areas. Scientists will also play a crucial role in the lecture programme. The Technology Hotspot will be supported by Agentschap NL.

TECHNOLOGY HOTSPOT

Brokerage Event for SMEs

For the second year, a Brokerage Event for SMEs from all over Europe will be organised.

Largest Benelux precision trade fair

During the trade fair, some 200 specialised companies and knowledge institutions from the Netherlands, Belgium, Germany and other countries will be exhibiting in a wide array of fields: optics, photonics, precision etching, high-precision mechanics (micron range), nanotechnology, micro-systems technology (MST), mechatronics, embedded software, micro-assembly, micro-laser processing, micro-connection, sensor technology, motion control, vision systems, materials (composites, ceramics), precision machining, measuring machines, and piezo technology.

Date

Wednesday 1 and Thursday 2 December 2010
from 9.30 a.m. to 5.00 p.m.

Location

NH Conference Centre Koningshof
Entrance Beneluxhal
Locht 117
5504 RM Veldhoven (near Eindhoven)
The Netherlands

Visitor registration

You can register for this event and the congress via www.precisiebeurs.nl.
After receiving your registration, a confirmation letter will be sent including your badge.

Free at the 2010 Precision Fair

Entrance to the fair – entrance to the lecture programme – valuable (digital) fair reference material – fair catalogue – coffee/tea – parking.

Organisation and Information

Mikrocentrum
P.O. Box 359, 5600 AJ Eindhoven, the Netherlands
Tel. +31 (0)40 - 296 99 22
seminars@mikrocentrum.nl
www.mikrocentrum.nl
www.hightechplatform.nl

Visitor information: Jolanda van de Vorst
Exhibitor information: Hans Houdijk

PRECISION FAIR 2010 – WHO SUPPLIES WHAT

BRANCH ORGANIZATION

62 DSPE
145 DUTCH PRECISION TECHNOLOGY
169 ELMUG eG
188 ENTERPRISE EUROPE NETWORK NETHERLANDS
46 FMI PRECISION BV
170 HOLLAND INNOVATIVE BV
178 LOKET MBO MECHATRONICA (KENTEQ, INDUTEQ)
184 POINT-ONE

CALIBRATION

121 CARL ZEISS BV
53 D&M VACUÜMSYSTEMEN BV
22 ETEL BV
51 FARO BENELUX BV
26 HEIDENHAIN NEDERLAND BV
136 IRMATO
171 KEMET EUROPE BV
37 KISTLER BV NETHERLANDS
133 LASER 2000 BENELUX
07 MITUTOYO NEDERLAND BV
104 MOLENAAR OPTICS VOF
119 MURAAD
119 MYTRI BV
139 PROMIS ELECTRO-OPTICS BV
103 Q-SYS BV
159 RENISHAW BENELUX BV
12 TESA BENELUX
138 VSL
121 W.J. ROELOFS MEETINSTRUMENTEN BV
102 WENZEL-BENELUX

HIGH-PRECISION MACHINERY

193 3TU
06 AALBERTS INDUSTRIES INDUSTRIAL SERVICES
89 AIRCONET BV
14 ALL MEPP BV
143 AXXICON MOULDS EINDHOVEN BV
151 BAKKER FIJNMETAAL
77 BENDERTECHNIEK BV
117 BKL ENGINEERING BV
116 BOERS & CO FIJNMETAALGROEP
103 BOTECH BV
25 BRANDT FIJNMECHANISCHE INDUSTRIE BV
100 CCM CENTRE FOR CONCEPTS IN MECHATRONICS BV
120 CERATEC TECHNICAL CERAMICS BV
58 CONTROLLED VONK TECHNOLOGIE
53 D&M VACUÜMSYSTEMEN BV
172 DHV BV
114 DOEKO BV
164 DUTCH MECHATRONICS BV
58 ECM TECHNOLOGIES BV
173 ERTEC BV
22 ETEL BV
51 FARO BENELUX BV
165 FETERIS COMPONENTS BV
46 FMI PRECISION BV
190 FONTYS HOGESCHOLEN
180 FRAUNHOFER IPT
99 FRENCKEN DEVELOPMENT & ENGINEERING
28 GELDERBLOM CNC MACHINES BV
06 GERMEFA BV
177 GIBAS NUMERIEK BV
49 GREENTECH ENGINEERING BV
101 HEMBRUG MACHINE TOOLS
06 HFI BV
58 HIPRECISION
39 HITTECH GROUP BV
73 HIWIN LINEAR TECHNOLOGIE GMBH
04 IAI INDUSTRIAL SYSTEMS BV
129 IBS PRECISION ENGINEERING
111 IGS GEBOJAGEMA
55 IMAGO GROUP BENELUX
136 IRMATO
27 KANTNER PRÄZISIONSOPTIK
171 KEMET EUROPE BV
47 KMWE PRECISION SYSTEMS & PRECISION COMPONENTS BV
10 KUGLER GMBH
54 KUSTERS METAALBEWERKING OSS BV
133 LASER 2000 BENELUX
58 LCS BELGIUM BVBA
156 LEUVEN AIR BEARINGS NV
134 MA3 SOLUTIONS BV
99 MACHINEFABRIEK GEBRS. FRENCKEN BV
38 MARTEK
167 MASÉVON TECHNOLOGY
106 MECAL APPLIED MECHANICS BV
24 MECHAPHYSICS BV
06 MFK BV
179 MI-PARTNERS
06 MOGEMA BV
162 MTSA TECHNOPOWER
30 NIJDRA GROEP
52 NTS-GROUP
103 Q-SYS BV
44 ROFIN-BAASEL BENELUX BV
155 ROMÉDES ENGINEERING BV
75 SCHAEFFLER NEDERLAND BV
40 SCHNEEBERGER GMBH
118 ST INSTRUMENTS BV
176 STT PRODUCTS BV / SYSTEM125®
113 TECHNISCHE HANDELSONDERNEMING DE RIDDER BV
06 TECHNOLOGY TWENTE BV
134 TEGEMA GROUP
97 TER HOEK VONKEROSIE RIJSSEN BV
56 THE HOUSE OF TECHNOLOGY
33 TNO INDUSTRIE EN TECHNIEK
155 TONASCO BV
107 TRIOS PRECISION ENGINEERING
108 TRUMPF NEDERLAND BV
108 V.A.C. MACHINES
45 VACUTECH BV

HIGH-PRECISION MECHANICS (MICRON RANGE)

193 3TU
94 AAE BV
06 AALBERTS INDUSTRIES INDUSTRIAL SERVICES
80 ACE STOßDÄMPFER GMBH
151 BAKKER FIJNMETAAL
117 BKL ENGINEERING BV
116 BOERS & CO FIJNMETAALGROEP
35 BORIT
110 BOSCH REXROTH BV
103 BOTECH BV
121 CARL ZEISS BV
100 CCM CENTRE FOR CONCEPTS IN MECHATRONICS BV
120 CERATEC TECHNICAL CERAMICS BV
23 CZL TILBURG BV
149 DE ROOY SLIJPCENTRUM BV
172 DHV BV
114 DOEKO BV
58 ECM TECHNOLOGIES BV
126 ENERGIEONDERZOEK CENTRUM NEDERLAND
173 ERTEC BV
29 EURO-TECHNIEK EINDHOVEN BV
06 F.I.V. BV
147 FIJNMECHANISCHE INDUSTRIE GOORSENBERG BV
46 FMI PRECISION BV
180 FRAUNHOFER IPT
99 FRENCKEN DEVELOPMENT & ENGINEERING
144 GEREEDSCHAPMAKERIJ G.M.I. BV
06 GERMEFA BV

PRECISION FAIR 2010 – WHO SUPPLIES WHAT

06	HFI BV
58	HIPRECISION
39	HITTECH GROUP BV
73	HIWIN LINEAR TECHNOLOGIE GMBH
192	HOGESCHOOL UTRECHT
129	IBS PRECISION ENGINEERING
153	ICAMAT TECHNOLOGY
111	IGS GEBOJAGEMA
136	IRMATO
171	KEMET EUROPE BV
05	KML LINEAR MOTION TECHNOLOGY GMBH
47	KMWE PRECISION SYSTEMS & PRECISION COMPONENTS BV
10	KUGLER GMBH
148	KUSTERS & BOSCH FIJNMECHANISCHE INDUSTRIE BV
146	LARSEN PREMIUM PRECISION PARTS
133	LASER 2000 BENELUX
43	LEMO CONNECTORS BENELUX
156	LEUVEN AIR BEARINGS NV
90	LM SYSTEMS BV
134	MA3 SOLUTIONS BV
106	MECAL APPLIED MECHANICS BV
24	MECHAPHYSICS BV
122	MEVI BV FIJNMECHANISCHE INDUSTRIE BV
06	MFK BV
179	MI-PARTNERS
06	MIFA ALUMINIUM
06	MOGEMA BV
104	MOLENAAR OPTICS VOF
162	MTSA TECHNOPOWER
71	NEITRACO GROUP
128	NEWPORT SPECTRA-PHYSICS GMBH
30	NIJDRA GROEP
16	NORMA GROEP BV
52	NTS-GROUP
99	OPTIWA BV
103	Q-SYS BV
159	RENISHAW BENELUX BV
44	ROFIN-BAASEL BENELUX BV
155	ROMÉDES ENGINEERING BV
157	SARIX SA
75	SCHAEFFLER NEDERLAND BV
42	SCHUT PRECISIONPARTS BV
141	SKF NEDERLAND
118	ST INSTRUMENTS BV
36	STEEN METROLOGY SYSTEMS SA
82	TECHNOBIS GROUP
06	TECHNOLOGY TWENTE BV
95	TEESING SUBMICRON TECHNOLOGY
134	TEGEMA GROUP
97	TER HOEK VONKEROSIE RIJSSEN BV
33	TNO INDUSTRIE EN TECHNIEK
155	TONASCO BV
107	TRIOS PRECISION ENGINEERING
45	VACUTECH BV
175	W. VAN DER ZWAN BV
72	WIJDEVEN
18	WILTING COMPONENTS / WILTING MODULES
152	WOLTERS METAALTECHNIEK BV

INNOVATION SUPPPORT

191	AVANS HOGESCHOOL
151	BAKKER FIJNMETAAL
110	BOSCH REXROTH BV
32	CADFLEX (TOTAL SUPPORT GROUP)
100	CCM CENTRE FOR CONCEPTS IN MECHATRONICS BV
53	D&M VACUÜMSYSTEMEN BV
124	DEMCON ADVANCED MECHATRONICS BV
164	DUTCH MECHATRONICS BV
58	ECM TECHNOLOGIES BV
169	ELMUG eG
126	ENERGIEONDERZOEK CENTRUM NEDERLAND
173	ERTEC BV
165	FETERIS COMPONENTS BV
147	FIJNMECHANISCHE INDUSTRIE GOORSENBERG BV
46	FMI PRECISION BV
49	GREENTECH ENGINEERING BV
58	HIPRECISION
55	IMAGO GROUP BENELUX
58	INNOGRIND™
32	INNOTEQ (TOTAL SUPPORT GROUP)
136	IRMATO
47	KMWE PRECISION SYSTEMS & PRECISION COMPONENTS BV
58	LCS BELGIUM BVBA
90	LM SYSTEMS BV
134	MA3 SOLUTIONS BV
105	MATHWORKS
02	MAXON MOTOR BENELUX BV
106	MECAL APPLIED MECHANICS BV
24	MECHAPHYSICS BV
06	MFK BV
179	MI-PARTNERS
06	MOGEMA BV
104	MOLENAAR OPTICS VOF
162	MTSA TECHNOPOWER
71	NEITRACO GROUP
52	NTS-GROUP
75	SCHAEFFLER NEDERLAND BV
40	SCHNEEBERGER GMBH
166	SICK BV
168	STAMHUIS LINEAIRTECHNIEK BV
176	STT PRODUCTS BV / SYSTEM125®
134	TEGEMA GROUP
56	THE HOUSE OF TECHNOLOGY
33	TNO INDUSTRIE EN TECHNIEK
32	TOTAL SUPPORT (TOTAL SUPPORT GROUP)
107	TRIOS PRECISION ENGINEERING
138	VSL
18	WILTING COMPONENTS / WILTING MODULES

LINEAR TECHNOLOGY

110	BOSCH REXROTH BV
103	BOTECH BV
100	CCM CENTRE FOR CONCEPTS IN MECHATRONICS BV
120	CERATEC TECHNICAL CERAMICS BV
22	ETEL BV
73	HIWIN LINEAR TECHNOLOGIE GMBH
129	IBS PRECISION ENGINEERING
163	IEF WERNER GMBH
127	IKO NIPPON THOMPSON EUROPE BV
136	IRMATO
05	KML LINEAR MOTION TECHNOLOGY GMBH
156	LEUVEN AIR BEARINGS NV
90	LM SYSTEMS BV
38	MARTEK
02	MAXON MOTOR BENELUX BV
91	MIJNSBERGEN BV
179	MI-PARTNERS
07	MITUTOYO NEDERLAND BV
16	NORMA GROEP BV
52	NTS-GROUP
139	PROMIS ELECTRO-OPTICS BV
103	Q-SYS BV
159	RENISHAW BENELUX BV
74	ROMICON
75	SCHAEFFLER NEDERLAND BV
166	SICK BV
141	SKF NEDERLAND
168	STAMHUIS LINEAIRTECHNIEK BV
113	TECHNISCHE HANDELSONDERNEMING DE RIDDER BV
33	TNO INDUSTRIE EN TECHNIEK
115	VARIODRIVE AANDRIJF- EN BESTURINGSTECHNIEK BV
17	VHE INDUSTRIAL AUTOMATION BV

72 WIJDEVEN
18 WILTING COMPONENTS / WILTING MODULES

MATERIALS (COMPOSITES, CERAMICS, GLASS)
103 BOTECH BV
100 CCM CENTRE FOR CONCEPTS IN MECHATRONICS BV
120 CERATEC TECHNICAL CERAMICS BV
173 E.S. TOOLING
126 ENERGIEONDERZOEK CENTRUM NEDERLAND
190 FONTYS HOGESCHOLEN
158 FORMATEC TECHNICAL CERAMICS BV
140 FRIATEC TECHNISCH KERAMIEK / GLYNWED
58 LCS BELGIUM BVBA
130 LOUWERS GLASS AND CERAMIC TECHNOLOGIES
02 MAXON MOTOR BENELUX BV
40 SCHNEEBERGER GMBH
56 THE HOUSE OF TECHNOLOGY
33 TNO INDUSTRIE EN TECHNIEK

MEASURING MACHINES AND MEASURING EQUIPMENT
31 AIR-PARTS BV
14 ALL MEPP BV
41 ARGON MEASURING SOLUTIONS
103 BOTECH BV
76 BRUKER NEDERLAND BV
121 CARL ZEISS BV
100 CCM CENTRE FOR CONCEPTS IN MECHATRONICS BV
161 CNC-CONSULT & AUTOMATION BV
98 CVI MELLES GRIOT BV
172 DHV BV
173 E.S. TOOLING
169 ELMUG eG
173 ERTEC BV
22 ETEL BV
51 FARO BENELUX BV
165 FETERIS COMPONENTS BV
46 FMI PRECISION BV
174 GLOVEQB
49 GREENTECH ENGINEERING BV
26 HEIDENHAIN NEDERLAND BV
85 HELMUT FISCHER MEETTECHNIEK BV
13 HEXAGON METROLOGY BENELUX
129 IBS PRECISION ENGINEERING
111 IGS GEBOJAGEMA
55 IMAGO GROUP BENELUX
58 INNOGRIND™
08 IRIS VISION BV
136 IRMATO
171 KEMET EUROPE BV
78 KEYENCE - DIVISIE NEDERLAND
37 KISTLER BV NETHERLANDS
133 LASER 2000 BENELUX
43 LEMO CONNECTORS BENELUX
156 LEUVEN AIR BEARINGS NV
134 MA3 SOLUTIONS BV
38 MARTEK
106 MECAL APPLIED MECHANICS BV
179 MI-PARTNERS
07 MITUTOYO NEDERLAND BV
104 MOLENAAR OPTICS VOF
162 MTSA TECHNOPOWER
119 MURAAD
119 MYTRI BV
15 NATIONAL INSTRUMENTS
52 NTS-GROUP
150 OCEAN OPTICS BV
11 PHILIPS GTDM
139 PROMIS ELECTRO-OPTICS BV
103 Q-SYS BV
159 RENISHAW BENELUX BV
75 SCHAEFFLER NEDERLAND BV
01 SCHUT GEOMETRISCHE MEETTECHNIEK BV
141 SKF NEDERLAND
118 ST INSTRUMENTS BV
36 STEEN METROLOGY SYSTEMS SA
176 STT PRODUCTS BV / SYSTEM125®
134 TEGEMA GROUP
12 TESA BENELUX
56 THE HOUSE OF TECHNOLOGY
33 TNO INDUSTRIE EN TECHNIEK
84 VIBA NV
138 VSL
121 W.J. ROELOFS MEETINSTRUMENTEN BV
102 WENZEL-BENELUX
154 ZME VOF

MICRO-ASSEMBLY
193 3TU
06 AALBERTS INDUSTRIES INDUSTRIAL SERVICES
94 AAE BV
125 ANTERYON BV
123 BOA NEDERLAND BV
35 BORIT
124 DEMCON ADVANCED MECHATRONICS BV
173 E.S. TOOLING
180 FRAUNHOFER IPT
192 HOGESCHOOL UTRECHT
135 ILT INDUSTRIËLE LASER TOEPASSINGEN BV
88 IMS BV
32 INNOTEQ (TOTAL SUPPORT GROUP)
136 IRMATO
47 KMWE PRECISION SYSTEMS & PRECISION COMPONENTS BV
186 LAYERWISE
58 LCS BELGIUM BVBA
134 MA3 SOLUTIONS BV
167 MASÉVON TECHNOLOGY
24 MECHAPHYSICS BV
30 NIJDRA GROEP
16 NORMA GROEP BV
52 NTS-GROUP
44 ROFIN-BAASEL BENELUX BV
155 ROMÉDES ENGINEERING BV
42 SCHUT PRECISIONPARTS BV
118 ST INSTRUMENTS BV
06 TECHNOLOGY TWENTE BV
95 TEESING SUBMICRON TECHNOLOGY
56 THE HOUSE OF TECHNOLOGY
33 TNO INDUSTRIE EN TECHNIEK
155 TONASCO BV
107 TRIOS PRECISION ENGINEERING
45 VACUTECH BV
18 WILTING COMPONENTS / WILTING MODULES

MICRO-CONNECTION
193 3TU
123 BOA NEDERLAND BV
173 E.S. TOOLING
126 ENERGIEONDERZOEK CENTRUM NEDERLAND
135 ILT INDUSTRIËLE LASER TOEPASSINGEN BV
88 IMS BV
58 LCS BELGIUM BVBA
43 LEMO CONNECTORS BENELUX
134 MA3 SOLUTIONS BV
50 MAVOM b.v.
44 ROFIN-BAASEL BENELUX BV
118 ST INSTRUMENTS BV
95 TEESING SUBMICRON TECHNOLOGY
33 TNO INDUSTRIE EN TECHNIEK

MICRO-LASER PROCESSING
94 AAE BV
06 AALBERTS INDUSTRIES INDUSTRIAL SERVICES

PRECISION FAIR 2010 – WHO SUPPLIES WHAT

131 APPLIED LASER TECHNOLOGY BV
23 CZL TILBURG BV
173 E.S. TOOLING
169 ELMUG eG
126 ENERGIEONDERZOEK CENTRUM NEDERLAND
135 ILT INDUSTRIËLE LASER TOEPASSINGEN BV
55 IMAGO GROUP BENELUX
88 IMS BV
32 INNOTEQ (TOTAL SUPPORT GROUP)
136 IRMATO
10 KUGLER GMBH
133 LASER 2000 BENELUX
86 LASERTEC BV
186 LAYERWISE
112 LIGHTMOTIF BV
128 NEWPORT SPECTRA-PHYSICS GMBH
11 PHILIPS GTDM
109 REITH LASER BV
44 ROFIN-BAASEL BENELUX BV
118 ST INSTRUMENTS BV
33 TNO INDUSTRIE EN TECHNIEK
108 TRUMPF NEDERLAND BV
108 V.A.C. MACHINES

MICRO-SYSTEM TECHNOLOGY (MST/MEMS)

193 3TU
125 ANTERYON BV
173 E.S. TOOLING
169 ELMUG eG
192 HOGESCHOOL UTRECHT
88 IMS BV
19 IMT MASKEN UND TEILINGEN AG
10 KUGLER GMBH
133 LASER 2000 BENELUX
130 LOUWERS GLASS AND CERAMIC TECHNOLOGIES
134 MA3 SOLUTIONS BV
02 MAXON MOTOR BENELUX BV
118 ST INSTRUMENTS BV
33 TNO INDUSTRIE EN TECHNIEK

MOTION CONTROL

193 3TU
80 ACE STOßDÄMPFER GMBH
31 AIR-PARTS BV
87 AEROTECH
110 BOSCH REXROTH BV
100 CCM CENTRE FOR CONCEPTS IN MECHATRONICS BV
120 CERATEC TECHNICAL CERAMICS BV
03 CONTROLLAB PRODUCTS BV
98 CVI MELLES GRIOT BV
124 DEMCON ADVANCED MECHATRONICS BV
173 E.S. TOOLING
22 ETEL BV
165 FETERIS COMPONENTS BV
26 HEIDENHAIN NEDERLAND BV
39 HITTECH GROUP BV
73 HIWIN LINEAR TECHNOLOGIE GMBH
163 IEF WERNER GMBH
55 IMAGO GROUP BENELUX
136 IRMATO
133 LASER 2000 BENELUX
156 LEUVEN AIR BEARINGS NV
90 LM SYSTEMS BV
38 MARTEK
02 MAXON MOTOR BENELUX BV
106 MECAL APPLIED MECHANICS BV
91 MIJNSBERGEN BV
179 MI-PARTNERS
07 MITUTOYO NEDERLAND BV
104 MOLENAAR OPTICS VOF
119 MURAAD
15 NATIONAL INSTRUMENTS
128 NEWPORT SPECTRA-PHYSICS GMBH
16 NORMA GROEP BV
52 NTS-GROUP
103 Q-SYS BV
142 RELIANCE PRECISION MECHATRONICS LLP
74 ROMICON
75 SCHAEFFLER NEDERLAND BV
40 SCHNEEBERGER GMBH
166 SICK BV
141 SKF NEDERLAND
92 TE LINTELO SYSTEMS BV
82 TECHNOBIS GROUP
56 THE HOUSE OF TECHNOLOGY
33 TNO INDUSTRIE EN TECHNIEK
107 TRIOS PRECISION ENGINEERING
17 VHE INDUSTRIAL AUTOMATION BV
72 WIJDEVEN
18 WILTING COMPONENTS / WILTING MODULES

OPTICS

193 3TU
125 ANTERYON BV
131 APPLIED LASER TECHNOLOGY BV
20 BEFORT WETZLAR
121 CARL ZEISS BV
100 CCM CENTRE FOR CONCEPTS IN MECHATRONICS BV
98 CVI MELLES GRIOT BV
23 CZL TILBURG BV
124 DEMCON ADVANCED MECHATRONICS BV
173 E.S. TOOLING
173 ERTEC BV
29 EURO-TECHNIEK EINDHOVEN BV
46 FMI PRECISION BV
180 FRAUNHOFER IPT
55 IMAGO GROUP BENELUX
48 INSCOPE BV
08 IRIS VISION BV
136 IRMATO
27 KANTNER PRÄZISIONSOPTIK
171 KEMET EUROPE BV
10 KUGLER GMBH
133 LASER 2000 BENELUX
106 MECAL APPLIED MECHANICS BV
24 MECHAPHYSICS BV
07 MITUTOYO NEDERLAND BV
104 MOLENAAR OPTICS VOF
128 NEWPORT SPECTRA-PHYSICS GMBH
30 NIJDRA GROEP
16 NORMA GROEP BV
52 NTS-GROUP
150 OCEAN OPTICS BV
09 PRECISION MICRO LIMITED
139 PROMIS ELECTRO-OPTICS BV
44 ROFIN-BAASEL BENELUX BV
166 SICK BV
118 ST INSTRUMENTS BV
92 TE LINTELO SYSTEMS BV
82 TECHNOBIS GROUP
06 TECHNOLOGY TWENTE BV
56 THE HOUSE OF TECHNOLOGY
33 TNO INDUSTRIE EN TECHNIEK
18 WILTING COMPONENTS / WILTING MODULES

PHOTONICS

14 ALL MEPP BV
131 APPLIED LASER TECHNOLOGY BV
20 BEFORT WETZLAR
98 CVI MELLES GRIOT BV
124 DEMCON ADVANCED MECHATRONICS BV
55 IMAGO GROUP BENELUX
48 INSCOPE BV
27 KANTNER PRÄZISIONSOPTIK

133 LASER 2000 BENELUX
134 MA3 SOLUTIONS BV
104 MOLENAAR OPTICS VOF
128 NEWPORT SPECTRA-PHYSICS GMBH
150 OCEAN OPTICS BV
139 PROMIS ELECTRO-OPTICS BV
44 ROFIN-BAASEL BENELUX BV
118 ST INSTRUMENTS BV
92 TE LINTELO SYSTEMS BV
82 TECHNOBIS GROUP
56 THE HOUSE OF TECHNOLOGY
33 TNO INDUSTRIE EN TECHNIEK
108 TRUMPF NEDERLAND BV
108 V.A.C. MACHINES

PIEZO TECHNOLOGY
131 APPLIED LASER TECHNOLOGY BV
110 BOSCH REXROTH BV
120 CERATEC TECHNICAL CERAMICS BV
98 CVI MELLES GRIOT BV
124 DEMCON ADVANCED MECHATRONICS BV
171 KEMET EUROPE BV
37 KISTLER BV NETHERLANDS
133 LASER 2000 BENELUX
58 LCS BELGIUM BVBA
134 MA3 SOLUTIONS BV
91 MIJNSBERGEN BV
179 MI-PARTNERS
104 MOLENAAR OPTICS VOF
128 NEWPORT SPECTRA-PHYSICS GMBH
40 SCHNEEBERGER GMBH
134 TEGEMA GROUP

PRECISION ETCHING
34 ADVANCED CHEMICAL ETCHING LTD
125 ANTERYON BV
132 ETCHFORM BV
19 IMT MASKEN UND TEILINGEN AG
133 LASER 2000 BENELUX
104 MOLENAAR OPTICS VOF
09 PRECISION MICRO LIMITED

PRECISION PACKAGING
192 HOGESCHOOL UTRECHT
55 IMAGO GROUP BENELUX
83 PROKONPACK
118 ST INSTRUMENTS BV
33 TNO INDUSTRIE EN TECHNIEK

PRECISION PLASTICS PROCESSING
143 AXXICON MOULDS EINDHOVEN BV
160 VAN DEN BERG KUNSTSTOFBEWERKING BV
173 E.S. TOOLING
29 EURO-TECHNIEK EINDHOVEN BV
180 FRAUNHOFER IPT
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171 KEMET EUROPE BV
37 KISTLER BV NETHERLANDS
133 LASER 2000 BENELUX
186 LAYERWISE
58 LCS BELGIUM BVBA
112 LIGHTMOTIF BV

PRECISION TOOLS (DIAMOND)
14 ALL MEPP BV
96 B&S TECHNOLOGY BV
23 CZL TILBURG BV
173 E.S. TOOLING
169 ELMUG eG
177 GIBAS NUMERIEK BV
58 INNOGRIND™
171 KEMET EUROPE BV
112 LIGHTMOTIF BV
179 MI-PARTNERS
71 NEITRACO GROUP
139 PROMIS ELECTRO-OPTICS BV
118 ST INSTRUMENTS BV
113 TECHNISCHE HANDELSONDERNEMING DE RIDDER BV
56 THE HOUSE OF TECHNOLOGY
33 TNO INDUSTRIE EN TECHNIEK

PROFESSIONAL MAGAZINES
62 DSPE (MIKRONIEK)

SENSOR TECHNOLOGY
31 AIR-PARTS BV
100 CCM CENTRE FOR CONCEPTS IN MECHATRONICS BV
124 DEMCON ADVANCED MECHATRONICS BV
173 E.S. TOOLING
169 ELMUG eG
126 ENERGIEONDERZOEK CENTRUM NEDERLAND
165 FETERIS COMPONENTS BV
192 HOGESCHOOL UTRECHT
129 IBS PRECISION ENGINEERING
55 IMAGO GROUP BENELUX
58 INNOGRIND™
136 IRMATO
37 KISTLER BV NETHERLANDS
43 LEMO CONNECTORS BENELUX
134 MA3 SOLUTIONS BV
38 MARTEK
24 MECHAPHYSICS BV
07 MITUTOYO NEDERLAND BV
16 NORMA GROEP BV
150 OCEAN OPTICS BV
139 PROMIS ELECTRO-OPTICS BV
159 RENISHAW BENELUX BV
74 ROMICON
137 SENTECH SENSOR TECHNOLOGY BV
166 SICK BV
141 SKF NEDERLAND
118 ST INSTRUMENTS BV
82 TECHNOBIS GROUP
56 THE HOUSE OF TECHNOLOGY
33 TNO INDUSTRIE EN TECHNIEK
102 WENZEL-BENELUX

SOFTWARE, TECHNICAL/SCIENTIFIC
100 CCM CENTRE FOR CONCEPTS IN MECHATRONICS BV
161 CNC-CONSULT & AUTOMATION BV
124 DEMCON ADVANCED MECHATRONICS BV
173 E.S. TOOLING
169 ELMUG eG
126 ENERGIEONDERZOEK CENTRUM NEDERLAND
173 ERTEC BV
51 FARO BENELUX BV
55 IMAGO GROUP BENELUX
136 IRMATO
133 LASER 2000 BENELUX
105 MATHWORKS
15 NATIONAL INSTRUMENTS
118 ST INSTRUMENTS BV
56 THE HOUSE OF TECHNOLOGY
33 TNO INDUSTRIE EN TECHNIEK

SURFACE TREATMENT
06 AALBERTS INDUSTRIES INDUSTRIAL SERVICES
23 CZL TILBURG BV
126 ENERGIEONDERZOEK CENTRUM NEDERLAND
173 ERTEC BV
58 INNOGRIND™
81 JEVEKA BV
171 KEMET EUROPE BV
86 LASERTEC BV

58	LCS BELGIUM BVBA
112	LIGHTMOTIF BV
52	NTS-GROUP
44	ROFIN-BAASEL BENELUX BV
33	TNO INDUSTRIE EN TECHNIEK
108	TRUMPF NEDERLAND BV
108	V.A.C. MACHINES

TRAINING

191	AVANS HOGESCHOOL
110	BOSCH REXROTH BV
121	CARL ZEISS BV
53	D&M VACUÜMSYSTEMEN BV
173	E.S. TOOLING
59	ENGENIA
173	ERTEC BV
51	FARO BENELUX BV
190	FONTYS HOGESCHOLEN
58	HIPRECISION
170	HOLLAND INNOVATIVE BV
58	INNOGRIND™
136	IRMATO
171	KEMET EUROPE BV
58	LCS BELGIUM BVBA
178	LOKET MBO MECHATRONICA (KENTEQ, INDUTEQ)
105	MATHWORKS
59	MIKROCENTRUM
07	MITUTOYO NEDERLAND BV
15	NATIONAL INSTRUMENTS
71	NEITRACO GROUP
75	SCHAEFFLER NEDERLAND BV
01	SCHUT GEOMETRISCHE MEETTECHNIEK BV
141	SKF NEDERLAND
33	TNO INDUSTRIE EN TECHNIEK
138	VSL
102	WENZEL-BENELUX

VISION SYSTEMS

191	AVANS HOGESCHOOL
20	BEFORT WETZLAR
121	CARL ZEISS BV
100	CCM CENTRE FOR CONCEPTS IN MECHATRONICS BV
124	DEMCON ADVANCED MECHATRONICS BV
173	E.S. TOOLING
190	FONTYS HOGESCHOLEN
55	IMAGO GROUP BENELUX
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136	IRMATO
134	MA3 SOLUTIONS BV
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119	MURAAD
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3TU 193

The three leading universities of technology in the Netherlands – Delft University of Technology, Eindhoven University of Technology and the University of Twente – have joined forces in the 3TU.Federation. This federation maximizes innovation by combining and concentrating the strengths of all three universities in research, education and knowledge transfer. During the Precision Fair we would like to show examples of research that focuses on technologies that, with precision and sensitivity, can support or take over human action. In our interactive booth located at the Technology Hotspot, you will find a range of research varying from MEMS to Bicycle Dynamics and Telemanipulation to Automated Design Optimization.

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AAE BV 94

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Contact person: Mr. Henk Tils / Mr. Raph Alink
t +31 (0)492-541861
mail@aaebv.com
www.aaebv.com

AALBERTS INDUSTRIES INDUSTRIAL SERVICES 6

Aalberts Industries NV is a Stock exchange listed international industrial Group with two main activities, Industrial Services (Industrial products and Material Technology) and Flow Control. Aalberts Industries Industrial Services has contacts in several areas of the medical industry, is a longstanding partner of the semiconductor industry and the suspension market, is a qualified supplier in the aerospace industry and well-known in the automotive industry. The combination of engineering, surface and heat treatment and production technologies makes Aalberts Industries Industrial Services the right partner for many industries.

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ACE STOSSDÄMPFER GMBH 80

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New innovations include the HDB heavy duty hydraulic brake with independent adjustment in each direction, even during motion, also the IDS system with active damping control of production shock absorbers and the PMC range of shock absorbers capable of operating in severe environments.
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See these innovations at booth number 80.

ACE STOßDÄMPFER GMBH
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4715 EP RUCPHEN (NL)
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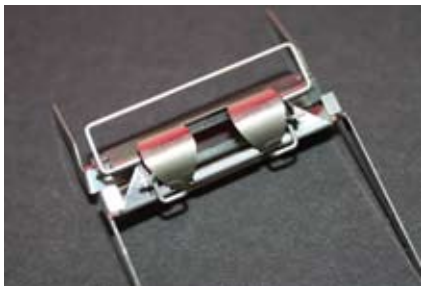

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AEROTECH 87

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AIRCONET BV 89

Airconet is a service providing company, certified with ISO 9001, VCA and STEK. Airconet is specialized in sales, rental, service and engineering of compressed air systems of amongst others Boge and Ekomak compressors and industrial process cooling of amongst others MTA waterchillers and liquid coolers. Airconet rents, designs and builds various compressed air and cooling systems and provides service and maintenance to all compressed air and cooling systems.

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AIR-PARTS BV 31

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ALL MEPP BV 14

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At the Precision Fair we will show some of our projects in position and measurement technology.

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ANTERYON BV 125

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APPLIED LASER TECHNOLOGY BV 131

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ARGON MEASURING SOLUTIONS 41

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AVANS HOGESCHOOL 191

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Avans Hogeschool, Fontys Hogescholen and Hogeschool Utrecht will be sharing a booth.

AVANS HOGESCHOOL
Lovensdijkstraat 61-63,
4818 AJ BREDA (NL)
Contact person: Mr. W.C. de Graaf
t +31 (0)76-5250500 /
+31 (0)6-17986920
wc.degraaf1@avans.nl
www.avans.nl

AXXICON MOULDS EINDHOVEN BV 143

Axxicon Moulds Eindhoven B.V. initially started in the moulding of micro- and nano-structures by manufacturing the very first moulds for producing optical storage media in the early 80s. Axxicon is able to produce precision components by turning, grinding, lapping and polishing in climate-controlled production facilities. Polished surfaces from Axxicon can reach roughness values of less than 5 nm. Such specific values are critical for optical quality. Axxicon uses its knowledge in the area of injection moulding of ultra-flat, high-precision parts. Our unique selling point is the replication of microstructures like microfluidic structures.

AXXICON MOULDS EINDHOVEN BV
Postbus 1717,
5602 BS EINDHOVEN (NL)
Contact person: Mrs. C. van de Kamp
t +31 (0)499-494450
c.vandekamp@axxicon.com
www.axxicon.com

BAKKER FIJNMETAAL 151

Bakker Fijnmetaal produces fine mechanical parts for a wide range of constructions, components and applications. These precision components are meticulously produced and widely tested before they leave our factory. Our completely automated machinery guarantees you a short lead time and cost-efficient production. The materials used include copper, brass, stainless steel, aluminium, titanium and various plastics. In the assembly hall and the cleanroom, Bakker Fijnmetaal's experienced professionals carry out the assembly work. All the means required to clean and assemble your products are there. To develop customer-specific products, Bakker Fijnmetaal uses CAD software to draw your design. Nothing is impossible!

BAKKER FIJNMETAAL
Ekkersrijt 1301, 5692 AH SON (NL)
Contact person: Mr. Rien Elling
t +31 (0)499-473416
info@bakkerfm.nl
www.bakkerfm.nl

BEFORT WETZLAR 20

- Optical and mechatronical design and construction.
- Manufacturing of fine optics and mechanics.
- Coatings for service.
- Assembly of opto-mechatronical systems.

BEFORT WETZLAR
Braunfelser Str. 26-30,
D 35578 WETZLAR (D)
Contact person: Mr. Henner Befort
t +49-6441-92410
hbr@befort-optic.com
www.befort-optic.com
www.optischesysteme.de

BENDERTECHNIEK BV 77

For this exhibition Bendertechniek BV will focus on milling and mill/turning for the high-end Japanese Matsuura machines. With sample pieces from several respected Dutch Matsuura users Bendertechniek BV will show the possibilities of the very high accuracy of the Matsuura machines. Besides a wide range of different spindles Matsuura also offers big toolchangers and palletsystems on almost all the horizontal, 5-axes and Cublex (mill/turn) models. Together with the superb reliability of all the Matsuura models this will guarantee a high productivity and return on investment and one of the best accuracies available in the world.

BENDERTECHNIEK BV
Plesmanstraat 32,
3905 KZ VEENENDAAL (NL)
Contact person: Mr. G.J. Bender
t +31 (0)318-550200
info@bendertechniek.nl
www.bendertechniek.nl

VAN DEN BERG KUNSTSTOFBEWERKING BV 160

v/d Berg Kunststofbewerking is specialized in processing plastics to customer specifications.
A combination of factors makes v/d Berg Kunststofbewerking stand out from its competitors. For example, we like to think with our customers right from the start. And in our level of service, we like to go further than other companies and provide support throughout the entire production process. Years of experience, know-how and a unique, highly advanced machine park make BKB a number one player in this field. Irrespective of whether you need prototyping, or a small to medium-sized product series, at v/d Berg Kunststofbewerking you've come to the right address. So, if you have any questions on processing plastics, please visit us at stand no. 160, or contact one of our employees.

VAN DEN BERG KUNSTSTOFBEWERKING BV
Postbus 1671,
5602 BR EINDHOVEN (NL)
Contact person:
Mr. E.M.B.T. Claassen
t +31 (0)40-2670101
info@vdberg-kunststof.nl
www.vdberg-kunststof.nl

BKL ENGINEERING BV 117

BKL Engineering develops and builds special machines and customer-specific service tools.

Service tools
Next to development and fabrication the company has the expertise in the field of inspection, official approval and testing. BKL is accredited for complete inspection of tools by the "Raad voor Accreditatie" (Dutch Accreditation Council), worldwide. Maintenance and certification is done at BKL in Nuenen, but also world-wide at the customer's location.

Special machines
The development of special machines means precision engineering of mechatronic solutions; this for well-known OEMs working in diverse industries and sectors. Production takes place in a workshop of our own, containing cleanroom environment.

BKL ENGINEERING BV
Duivendijk 7,
5672 AD NUENEN (NL)
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t +31 (0)40-2951444
albert.van.bakel@bkl.nl
www.bkl.nl

BOA NEDERLAND BV 123

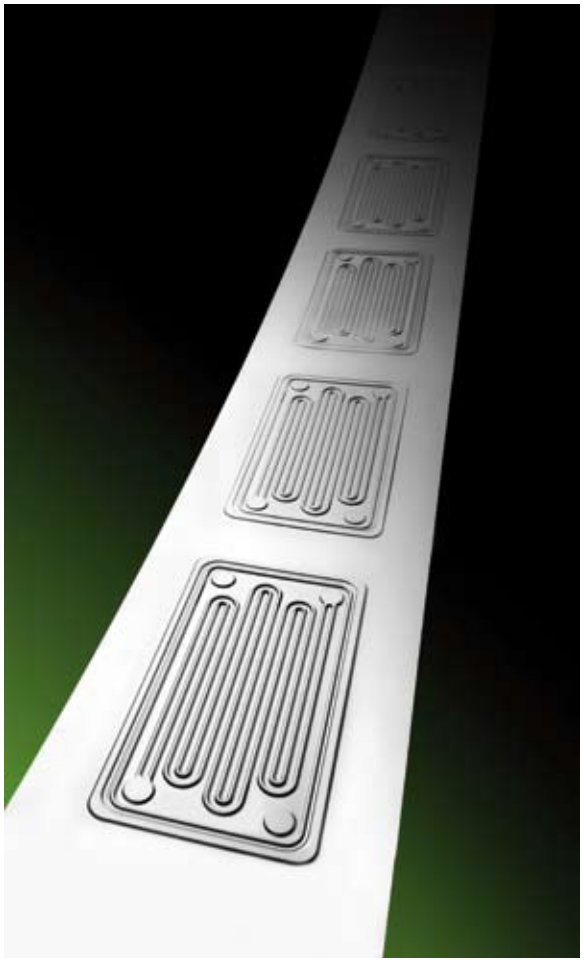
BOA shows high-precision flexible stainless steel piping and pipe work for OEM applications. BOA specialises in the design and manufacturing of hoses, bellows and complete assemblies. BOA also offers cleaning and cleanroom capacities for manufacturing, assembling and packing of its products. A novelty is the BOA hybrid, a high-purity hose for vacuum and pharmaceutical applications. More information on www.boanederland.nl

BOA NEDERLAND BV
Postbus 214,
5000 AE TILBURG (NL)
Contact person: Mr. C. van der Gaag
t +31 (0)13-5350625
chris@boanederland.nl
www.boanederland.nl

BORIT 35

Borit's technology Hydrogate of sheet metal products is based on hydro forming and offers high flexibility, excellent quality and high productivity. We support customers from the early design stage through material and coating knowledge, with state of the art testing and characterization equipment and with a profound knowledge of flow fields.

- Bipolar plates and interconnectors, Fuel Cells
- Plates for (Compact) Heat Exchangers
- Heat spreaders for the electronic industry
- Cold Plates for liquid or gas cooling
- Half shells for electronic equipment, phones, digital cameras, medical equipment and implants
- Cooling elements for high power LEDs



BORIT
Pres. J.F. Kennedylaan 3,
B 9060 ZELZATE (B)
Contact person: Mr. Dirk Claeys
t +32-93451363
dirk.claeys@borit.be
www.borit.be

BOERS & CO FIJNMETAALGROEP 116

For more than a 100 years, the Boers & Co FijnMetaal Group has been a preferred partner for its customers, providing them with knowledge, expertise and flexibility.

Its companies, Boers & Co FijnMechanische Industrie, Boers & Co MechaTronica Industrie and Boers & Co PlaatWerkIndustrie, prove to be excellent players in the field of fine mechanical parts, high-precision assembly and sheet metal products.

More and more we see the use of computer-controlled machines that can operate without the use of personnel. The high-tech machinery which Boers & Co uses, give them a leading edge over their competition and can guarantee a low-cost, high-end product for customers in the fields of medical appliances, flow-control, automotive and petrochemical industry, to name only a few.

"Passie voor precisie"

BOERS & CO FIJNMETAALGROEP
Postbus 132,
3100 AC SCHIEDAM (NL)
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t +31 (0)10-4373622
erik.van.gijn@boers.nl
www.boers.nl

BOSCH REXROTH BV 110

Bosch Rexroth is one of the leading specialists worldwide in drive and control technology. Using the brand name of Rexroth, tailor-made solutions for power, control and actuator systems are created for application in industrial automation, semi-conductor equipment as well as in renewable energy. The Drive & Control Company is the supplier of choice to more than 500,000 customers for high quality electrical, pneumatic and mechatronic components and systems. In more than 80 countries Rexroth is a reliable partner for its customers, supporting their production of safe and efficient machines and thereby contributing to the economical use of natural resources.

BOSCH REXROTH BV
Kruisbroeksestraat 1,
5281 RV BOXTEL (NL)
Contact person: Mr. Hans ten Hagen
t +31 (0)411-651290
hans.tenhagen@boschrexroth.nl
www.boschrexroth.nl

BOTECH BV 103

BoTech BV provides complete solutions in large and stable high-precision bases, supports and moving parts. We are a high-tech company that specializes in the design, manufacturing and assembly of precision machine components and assemblies. We have over 25 years of experience in products in granite, metal, carbonfibre-epoxy, ceramics and combinations of these.
Our products are used in numerous applications, often combined with airbearings.
Our extensive manufacturing facility contains numerous advanced CNC-machine centers for a large range of products, up to 2.5 x 7 meters in one piece. In our conditioned production and assembling areas the products are finished to micron-precision accuracies.

BOTECH BV
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5700 ET HELMOND (NL)
Contact person:
Mr. Ir. R.A.A. van Mil
t +31 (0)492-551875
info@botechbv.com
www.botechbv.com

BRANDT FIJNMECHANISCHE INDUSTRIE BV 25

Brandt Fijnmechanische Industrie BV in Almere, the Netherlands, is a supplier and partner for the fine mechanical industry.

The portfolio includes the manufacturing of mechanical products of various components in different forms, sizes and materials of complete prototype and serial parts. Additionally, Brandt FMI is specialized in assembly, support, modification, overhaul and repair of machined parts, assemblies and equipment to customers specifications for aviation, space, defense and industrial applications.

The strength of the organization is based on the guiding principle "VISION ON PRECISION". Highest quality and precision are the business philosophy. Our processes are AS 9100 Revision B - EN 9100:2003 certified.

BRANDT FIJNMECHANISCHE INDUSTRIE BV
De Strubbenweg 15,
1327 GB ALMERE (NL)
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t +31 (0)36-5231398
h.hoek@brandtfmi.nl
www.brandtfmi.nl

BRUKER NEDERLAND BV 76

From groundbreaking scientific research to high-speed production QC, Bruker provides the critical measurements necessary for success with the world's broadest range of atomic force microscopes (AFMs), stylus profilers, and non-contact optical solutions.

- VCM™ Optical Profiler System combines the latest in confocal technology and nanometer-scale height measurements with the ease-of-use of a conventional microscope.
- NPFLEX™ 3D Metrology System provides the most flexible, non-contact 3D areal surface characterization available on the market for large samples.
- NEW ContourGT™ Family is the most comprehensive and intuitive 3D surface metrology platform available today for production, research and quality control applications.

BRUKER NEDERLAND BV
Bruynvisweg 18,
1531 AZ WORMER (NL)
Contact person: Mr. Jim Flach
t +31 (0)75-6285251
jim.flach@bruker-nano.com
www.bruker-axs.com

B&S TECHNOLOGY BV 96

B&S Technology specialises in the design and manufacture of dies, moulds, high-precision components and assembled products in the high-quality segment of the market. In doing so, B&S offers a total solution and plays an influential role throughout, from the development of a product through to maintenance and after-care. Our customers are found mainly in the market segments of microelectronics, medical pharmaceuticals, automotive, and the glass and packaging industries.

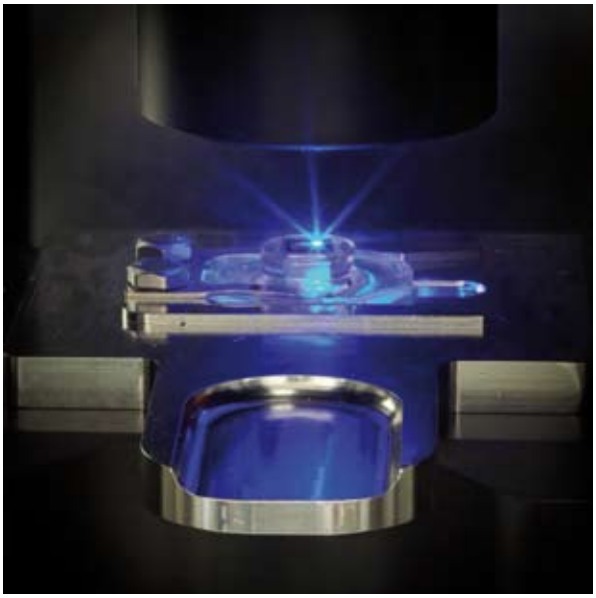
B&S TECHNOLOGY BV
Swaardvenstraat 2,
5048 AV TILBURG (NL)
Contact person: Mr. J. Schapendonk
t +31 (0)13-4625809
j.schapendonk@bstechnology.nl
www.bstechnology.nl

CADFLEX (TOTAL SUPPORT GROUP) 32

For over 12 years now, CADflex has been successfully active in the field of technical recruitment. Through a period of temporary staffing and through selection and recruitment we will find a new employee for you. We are specialised in the recruitment of staff with a secondary professional education, bachelor or master degree in Mecha(tro)nic Engineering.
What you can expect from CADflex is extensive technical experience in project/engineering, a professional attitude and the right capabilities. Our recruiters have an engineering background and know your line of business. We are sincere, have well-developed people knowledge and we have our own in-house training facilities. As part of the Total Support Group, we also have access to an extensive professional network.

CADFLEX (TOTAL SUPPORT GROUP)
Furkapas 8,
5624 MD EINDHOVEN (NL)
Contact person: Mr. Bart Builtjes
t +31 (0)40-2548222
info@cadflex.nl
www.cadflex.nl

CCM CENTRE FOR CONCEPTS IN MECHATRONICS BV 100



CCM has a long experience in inventing original concepts and is able to realize the entire development process up to a finished product or production equipment. Development is done by CCM in a professional way, which enables to control costs for realizing functionality, performance and time to market. In all project stages, from concept development up to realization and sustaining, CCM can be involved and can provide a competent and professional contribution.
Projects that have been realized cover almost the entire field of mechatronical design and engineering (incl. optics and information technology).
You are most welcome to visit our stand.

CCM CENTRE FOR CONCEPTS IN MECHATRONICS BV
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info@ccm.nl
www.ccm.nl

CARL ZEISS BV 121

Carl Zeiss will show the scanning 3D-measuring machine DuraMax at stand number 121.
The DuraMax is the perfect measuring machine for accurate 3D measuring, suitable in every production environment and shopfloor between 18 and 30 degrees.
Furthermore, we would like to inform you about a new development: the MetroTom, a computer tomograph which enables to inspect the internal structures of materials of a synthetic, composite or ceramic nature. The MetroTom can also determine geometrical dimensions. The MetroTom 800 has an accuracy of 4.5 micrometer + *L*/100.
Carl Zeiss BV provides a range of services to visualize your production process.

CARL ZEISS BV
Postbus 310,
3360 AH SLIEDRECHT (NL)
Contact person: Mr. K. Gerritsen
t +31 (0)184-433551
k.gerritsen@zeiss.nl
www.zeiss.nl

CERATEC TECHNICAL CERAMICS BV 120

Ceramic materials offer unprecedented possibilities for many industries, especially when products and components with extreme material properties are required. Ceratec Technical Ceramics BV has specialised in industrial technical ceramic components since 1983. Ceratec's strength lies in the complete formula of problem analysis, development, prototyping and production. Ceratec Technical Ceramics BV has played a key role in applying technical ceramics in many ways.
Our goal is to put the often extreme properties of technical ceramics to its best use. During the fair Ceratec will show her latest ceramic developments (Mechatronics, Semi-Conductor, Piëzo, Solar, LED & Ceramic Composites).

CERATEC TECHNICAL CERAMICS BV
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4191 NZ GELDERMALSEN (NL)
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t +31 (0)345-580101
r.bruggeman@ceratec.nl
www.ceratec.nl

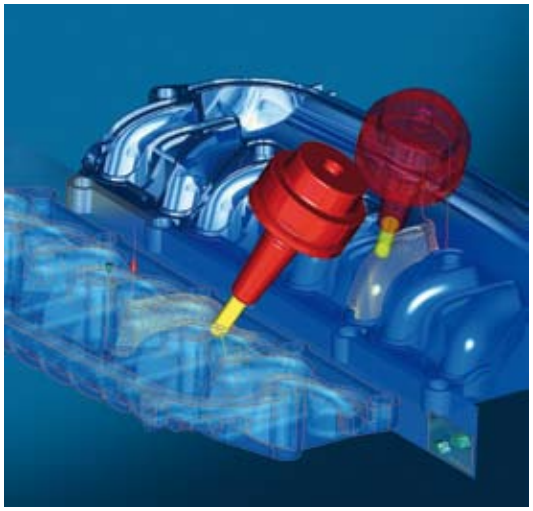
CNC-CONSULT & AUTOMATION BV 161

On the Precision Fair CNC-Consult will present itself with the newest CAD/CAM-solutions, scansystems and Rapid Prototyping systems.

hyperCAD® / hyperMILL®
The powerfull CAD/CAM-solution for milling, turning an wire-erosion. The software targets both the entry level market with 2D CAM-strategies as complex 5-axis technology.

Scansystems
In scanning and Reverse Engineering CNC-Consult offers the newest models of the scanarms of Microscribe®, Baces3D® and Nikon® (METRIS®).

Rapid Prototyping
The Envisiontec® 3D printers build 3D objects out of fluid polymers with DLP light projection. The voxel-layers have a minimum thickness of 15 µm up till 150 µm. The building envelope varies between the systems from 44 x 33 mm up till 457 x 304 mm. Accuracies up to 16 µm.



CNC-CONSULT & AUTOMATION BV
Titaniumlaan 86, 5221 CK
'S-HERTOGENBOSCH (NL)
Contact person:
Mr. Maarten J.G. van Teeffelen
t +31 (0)73-6480166
info@cncconsult.nl
www.cncconsult.nl

CONTROLLAB PRODUCTS BV 3

Rapid Protoyping for Control Engineers!
Designing a controller and testing it on hardware is a hard job. The existing tools are complex and expensive. The 20-sim tool chain solves this problem. A single person can now design and implement a controller in hardware in less than one hour! Use our open source Real Time Linux-based solutions (single board PCs, PC104, PC) or choose for proven technology (Bachmann). We will show with various setups how to run code, log experiments and much more.

CONTROLLAB PRODUCTS BV
Hengelosestraat 705,
7521 PA ENSCHEDE (NL)
Contact person:
Mrs. Jolanda Boelema
t +31 (0)53-4836434
jolanda.boelema@controllab.nl
www.controllab.nl

CONTROLLED VONK TECHNOLOGIE 58

Controlled Vonk Technologie (C.V.T.), boasting over 30 years of experience, is a true EDM-specialist. We know all the tricks of this special machining method and provide our customers with the most efficient solutions in high-accuracy production. Our machines run almost autonomous allowing 24/7 production schedules. Because of this, we have more machines than employees allowing us to work at a surprisingly competitive price level.
EDM-machining represents a world of production possibilities which are continuously expanded. We are more than happy to share our knowledge with you and together with our customers often find innovative solutions to challenging problems. Interested in what C.V.T. can do for you? Just call +31 497 541 040.

CONTROLLED VONK TECHNOLOGIE
Groenstraat 5a,
5528 NS HOOGELOON (NL)
Contact person:
Mr. Albert van Heugten
t +31 (0)497-541040
info@cvtbv.nl
www.cvtbv.nl

CVI MELLES GRIOT BV 98

CVI Melles Griot is a world-wide Leader in the Manufacture and Distribution of Optical Components and Assemblies for Electro-Optical and Laser Systems.
We manufacture (a)spherical lens elements, windows, mirrors, beamsplitters, waveplates and other flat optics, optical assemblies & electro-optical systems, electro-mechanical (shutters), and opto-mechanical assemblies optimized for use in the deep ultra-violet through infrared spectral region. Our reliable products and business solutions, rapid delivery, willingness to customize, value, and customer service will differentiate us in the global marketplace. Via the CVI Melles Griot catalog we offer also the widest range of off-the-shelf photonic components and laser systems.

CVI MELLES GRIOT BV
Postbus 272,
6900 AG ZEVENAAR (NL)
Contact person: Mr. Klaas Hop
t +31 (0)316-333041
khop@cvimellesgriot.com
www.cvimellesgriot.com

CZL TILBURG BV 23

In 2009, CZL Tilburg introduced SuNiCoat® Optics – a diamond-turnable nickel coating for optical moulds, cleanroom packaging and low-phosphorous electroless nickel plating as their new services.
For over 30 years, CZL Tilburg provides surface treatments and repairs high-value technical components. Our services includes e.g. HP-HVOF thermal spraying (carbide and metals), SuNiCoat® Optics, Diarc® Diamond Coating, Dicronite® Dry Lube, MCP® (Micro Chrome Plating), hardchrome plating, electroless nickel plating, black oxidizing, cleanroom packaging, micro-laser welding, cylindrical grinding, flat grinding and superfinishing. All our processes and treatments are executed in accordance with EN/AS-9100 and customer specifications. More information www.czltilburg.nl.

CZL TILBURG BV
Postbus 10048,
5000 JA TILBURG (NL)
Contact person:
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t +31 (0)13-5703370
info@czltilburg.nl
www.czltilburg.nl

DEMCON ADVANCED MECHATRONICS BV 124

DEMCON realizes high-tech mechatronic systems and products through research, development and production. With its mechatronic approach to design, DEMCON generates high-end solutions for complex issues in various markets, ranging from semicon and medical to life sciences and defence.
DEMCON supplies advanced systems to leading OEMs and is an excellent partner for small and medium-sized enterprises in the introduction of their innovative products to existing and new markets.

DEMCON ADVANCED MECHATRONICS BV
Zutphenstraat 25,
7575 EJ OLDENZAAL (NL)
Contact person:
Mrs. Ir. A.J.R. Kuipers
t +31 (0)541-570720
anke.kuipers@demcon.nl
www.demcon.nl

DHV BV 172

Mechatronics is an approach within DHV that generates solutions for the activities concerning products and production resources. Clients who encounter mechanical or electrical engineering problems with their machinery or products can call on Mechatronics. Our experts are responsible for the design and construction of complete machines or parts thereof, tooling such as lifting and clamping tools, and the positioning of units.
The Mechatronics experts of DHV possess knowledge of and experience in various disciplines, such as industrial automation, mechanical engineering structures, production mechanization, CE marking and information management.

DHV BV
Larixplein 1,
5616 VB EINDHOVEN (NL)
Contact person: Mr. F.C.A.M. Gevers
t +31 (0)40-2593744
frans.gevers@dhv.com
www.dhv.nl/mechatronica

D&M VACUÜMSYSTEMEN BV 53

D&M Vacuümsystemen B.V. is specialized in offering turn-key solutions for (high-quality and complex) vacuüm systems. D&M Vacuümsystemen's competitive advantage is that we are able to offer all vacuüm-related knowledge and services from internal sources (e.g. Engineering, CNC Manufacturing, Assembling and service), creating the best and most cost-effective solutions for our wide range of clients. D&M is a reliable and independent partner that has a specialized knowledge of high-end applications and related processes.

To create this knowledge, D&M has its own engineering department, service workshop and CNC production facility (for prototypes and smaller series) with an experienced team of vacuüm specialists. With these competences, D&M has received confidence and credits from various prestigious companies and institutes.

D&M VACUÜMSYSTEMEN BV
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t +31 (0)495-491967
m.driessen@dm-vacuumsystemen.nl
www.dm-vacuumsystemen.nl

DOEKO BV 114

DOEKO BV
Postbus 125,
6640 AC BEUNINGEN GLD (NL)
Contact person:
Mr. G.J. van Doesburg
t +31 (0)24-6790750
g.doesburg@doeko.nl
www.doeko.nl

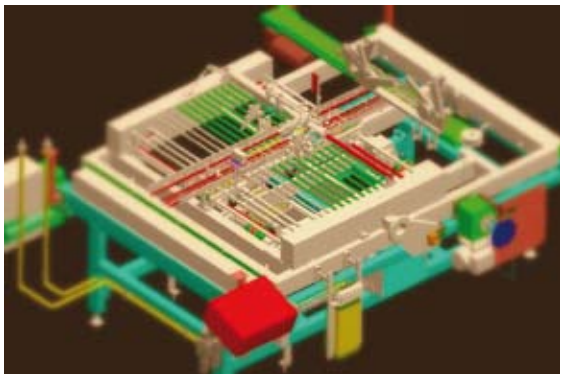
DSPE 62

The Dutch Society for Precision Engineering (DSPE) is a community of precision engineers in industry, university and institutes. The mission of DSPE is to stimulate precision technology knowledge innovation, knowledge transfer and networking between professionals.
Members of DSPE are companies, institutes and universities that are active in precision technology. The major players in the Netherlands are member of DSPE.
Main interactions of DSPE are:

- Mikroniek, international magazine on precision engineering.
- www.dspe.nl, precision engineering portal with a lot of technical information for precision engineers.
- Certification of precision engineering postdoc education.
- Young Precision Network, where young engineers meet each other.
- Precision in Business days, where companies show their capabilities in a company visit.
- Yearbook on Precision Engineering.
- Summer school.
- Seminars and events.

DSPE
Postbus 359,
5600 AJ EINDHOVEN (NL)
Contact person: Mrs. M. Vervoort
t +31 (0)40-2969915
info@dspe.nl
www.dspe.nl

DUTCH MECHATRONICS BV 164



Dutch Mechatronics BV is, as a system supplier for the high-tech system and medical industry, a joint venture of 5 prominent industrial companies, with in sum 135 FTE and the focus on innovation, quality and reliability.
Dutch Mechatronics BV as a system supplier mainly aims at the high-tech system industry and the medical industry. Dutch mechatronics BV provides from A to Z innovative, qualitative and reliable mechatronics solutions against the lowest possible integrated costs due to specialism, far-reaching automation, flexible production and supply chain management.

DUTCH MECHATRONICS BV
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info@dutchmechatronics.com
www.dutchmechatronics.com

DUTCH PRECISION TECHNOLOGY 45

Dutch Precision Technology (DPT) is the main association in the Netherlands in the field of precision machining. The affiliated companies offer: guaranteed excellence, quality, flexibility and effective cooperation at a competitive price.
The affiliated companies have top specialists available for all types of precision machining such as turning and milling and even the composition of complete systems or products.

DPT is an association within the Koninklijke Metaalunie. The Koninklijke Metaalunie is with over 13,000 members the largest association for SMEs in the metal industry. The members have a combined turnover of 20 billion Euros and offer employment to more than 150,000 people.

DUTCH PRECISION TECHNOLOGY
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Mr. Frans van der Brugh
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brugh@metaalunie.nl
www.dptech.nl

E.S. TOOLING 173

E.S. Tooling is a production company for mechanical parts in the following areas: Automotive, Mould & Die, Medical, Aerospace and Optical. The company wants to achieve perfection under 5 micron accuracy, reliable deliveries and an open communication to costumers and shareholders. We are working on a modern base and with the yearly investments in high-technological machines, E.S. Tooling is in Europa a state-of-the-art company in its area. After the start in 1996 E.S. Tooling won several prices, for example in 2004 it became KMO-laureate of Flanders.
Searching for new areas, in 2007 E.S. Healthcare was grounded for implant suprastructures (www.isus.be).

E.S. TOOLING
Research Campus 10,
B 3500 HASSELT (B)
Contact person:
Mr. Erik Schildermans
t +32-11379916
info@estooling.be
www.estooling.be

ECM TECHNOLOGIES BV 58

ECM Technologies is specialiazed in Electrochemical Machining. Electrochemical machining is a metal machining technology based on electrolysis by which the product is processed without contact or any thermal influence. The metal work piece is dissolved (Machining) locally through electricity (Electro) and chemistry (Chemical) until it reaches the required complex 3D end shape. At the exhibition ECM Technologies will present the possibilities of electrochemical machining. A number of parts that have been developed by ECM Technologies will show the strength and quality of this process.

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8903 JM LEEUWARDEN (NL)
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wolters@electrochemicalmachining.com
www.electrochemicalmachining.com

ELMUG EG + 4 COMPANIES 169

- ELMUG - Network for electronic measurement and equipment technology companies in Thuringia.
- IMMS GmbH is a service provider in the field of application-oriented preparatory research for the development of products of microelectronics and system engineering.
- As an electronic full service and outsourcing partner for the industry, Voigt electronic GmbH assist their clients from initial consultation through the development and production to comprehensive after sales service.
- With TETRA's solutions it is now possible to solve tasks of industrial precision automation and quality control.
- COLANDIS GmbH is a manufacturer of custom-engineered cleanroom solutions for all sectors of industry that are required to adhere to defined manufacturing conditions.

ELMUG eG + 4 companies
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D 98693 ILMENAU (D)
Contact person: Mrs. Ines Richter
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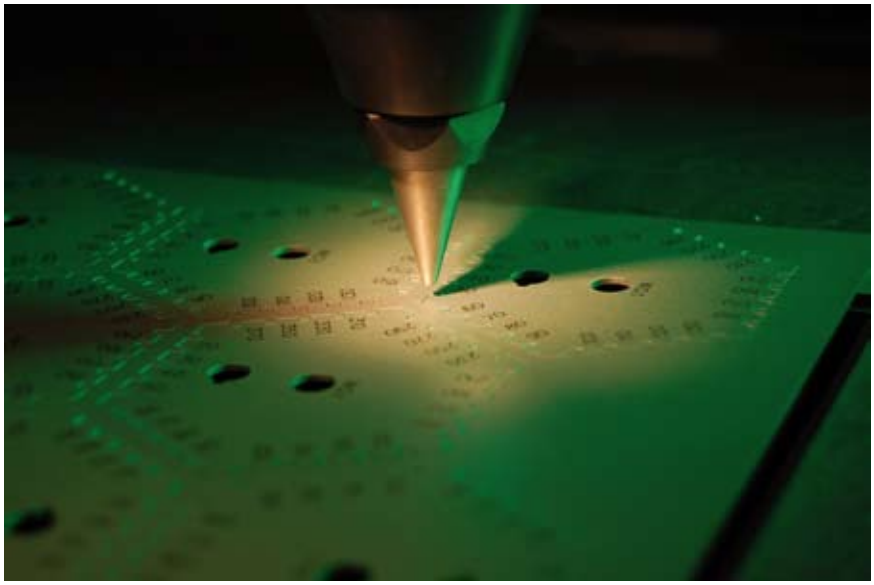
www.elmug.de

ENERGIEONDERZOEK CENTRUM NEDERLAND 126

Engineering & Services is the technical support and development group of ECN. This group of about 100 employees supports you in designing, engineering and realizing of experimental installations, prototypes and high-tech components. E&S conducts materials research, takes care of data acquisition, data processing and visualization and realizes scientific and technical software. Besides ECN, this group supports innovative institutes and companies. Recently ECN started the Metal Injection Moulding activities. With the MIM process it is possible to produce complex shaped metal parts in small and bigger series. The ECN laser fabrication activities are broadly divided over the different wavelengths and we can support you in optimizing your production. E&S is the problem solver for technological challenges.



ENERGIEONDERZOEK CENTRUM NEDERLAND
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wardenaar@ecn.nl
www.ecn.nl

ENGENIA 59

Engenia is a new organization for training and education at an academic and post-tertiary education level. Its target group includes companies in the technology and process industry. Courses are offered all over the Benelux and cover many different kinds of areas. The courses are open to individual registration as well as in a corporate setting. Engenia teachers are themselves professionals in their line of expertise, highly skilled and educated as well as enthusiast. Engenia is also on LinkedIn and Twitter.

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www.engenia.nl

ENTERPRISE EUROPE NETWORK NETHERLANDS 188

The Enterprise Europe Network is a key instrument in the EU's strategy to boost growth and jobs. Bringing together more than 580 business support organisations from 47 countries, we help SMEs seize the unparalleled business opportunities in the EU Single Market. We can help you find international business partners, source new technologies and receive EU funding or finance. We can advise you on issues so diverse as intellectual property, going international, or EU law. Our member organizations include chambers of commerce and industry, technology centres and research institutes. As members of the Enterprise Europe Network they are linked up through powerful databases, sharing their knowledge and sourcing technologies and business partners across all Network countries.

ENTERPRISE EUROPE NETWORK NETHERLANDS
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eileen.ridders@syntens.nl
www.enterprise-europe-network.ec.europa.eu

ERTEC BV 173

ERTEC specializes in optimizing your production process.
Besides our expertise on automation of small series with reference systems, robots and software of System 3R together with JobDISPO "real time" ERP/planning software we plan your workshop, which means that you will have always the actual situation on your screen. Spreitzer specializes in clamping devices of your work pieces for your production machines and measuring machine.
Our Simpline products allow you to order tooling thru our web shop for an attractive price. Benefits:

- Good and clear information
- Modern web shop for direct orders
- Downloading of information
- Good market prices

ERTEC BV
Biesveld 2, 5673 BN NUENEN (NL)
Contact person: Mr. Rob Rebel
t +31 (0)40-2982036
office@ertec.eu
www.ertec.eu

ETCHFORM BV 132

Etchform provides customised solutions for metal precision parts.

- Production of thin metal precision parts by means of precision etching & electroforming.
- One-off and mass production.
- Additional surface and heat treatments as well as precision mechanical, isolation, assembly and logistic services can be offered.

ETCHFORM BV
Arendstraat 51,
1223 RE HILVERSUM (NL)
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Mr. Johan van der Kraan
t +31 (0)35-6855194
info@@etchform.com
www.etchform.com

ETEL BV 22

ETEL is the world's leading supplier for direct-drive and motion systems. It supplies high-tech industries with a comprehensive range of products such as linear motors, torque motors, motion systems, motion control solutions enabling customers to get the most out of ETEL's direct-drive solutions in a very short time.
The complete ETEL solutions enable machine builders to simplify integration into their machine thanks to a very homogeneous design. It also gives them the opportunity to focus on their core competence and technology while ETEL takes care of the motion system part of the development.

ETEL BV
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etel@etelbv.nl
www.etelbv.nl

EURO-TECHNIEK EINDHOVEN BV 29

Euro-Techniek is a specialist in metal forming and plastic molding. In these areas we take care of product and process engineering, design and build tooling, and manufacturing of components by molding and forming. Unique is the combination of these activities under a single roof. We are a technically driven company, take pride in our craftsmanship, knowledge and equipment. We work efficient and effective, resulting in high delivery accuracy, and a low level of complaints. We keep our overhead low with a short chain of command.
We are ISO 9001 and ISO 13485 certified, and additionally are familiar with ISO-TS16949 (automotive), and HACCP (food).

EURO-TECHNIEK EINDHOVEN BV
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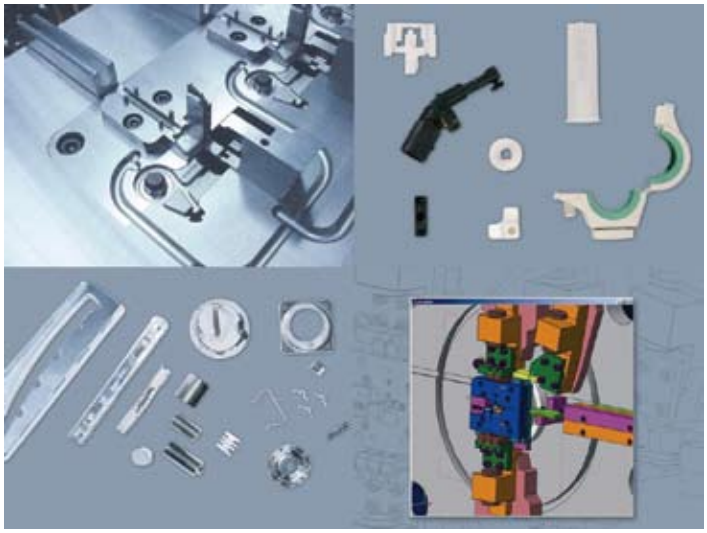

FARO BENELUX BV 51

FARO (NASDAQ: FARO) develops and markets computer-aided measurement systems and software worldwide. The portable coordinate measuring devices from FARO, together with their industry-specific software solutions, allow high-precision 3D measurements and 3D comparisons of parts and complex systems directly within assembly and production processes. FARO measurement systems are used anywhere where the most accurate measurements are necessary. Today, approximately 9,500 customers worldwide with more than 20,000 installations have put their trust in FARO measurement systems. They can be found in the production and quality assurance processes of leading companies such as Airbus, Audi, BMW, Goodyear Dunlop, Miele, Porsche, Siemens and Volkswagen.

FARO BENELUX BV
Flight Forum 3502, 5657 DW
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marjolein.bele@faroeurope.com
www.faro.com

F.I.V. BV 6

FIV BV in Cuijk, the Netherlands, specialises in the manufacture of small-series turned and milled components from all of the most commonly used materials, with the focus on stainless steel. Thanks to the flexibility of its organization, its top-of-the-range machinery and the technical expertise of its workforce, FIV is able to offer its customers high product quality and short delivery times.
FIV's customer base boasts a number of high-profile companies operating in the food and luxury goods industry, apparatus engineering, die-making, the aircraft industry and mechanical engineering in general.

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www.fivbv.nl

FETERIS COMPONENTS BV 165

Feteris Components B.V. is a specialized industrial components supplier to the machine, equipment, shipbuilding, and vehicle industry and also the process and medical industry. The comprehensive range consists of Industrial Sensors and Man-Machine Interface (M.M.I.) products at high technical standards, produced by worldwide well-known manufacturers.
Our sales activities are based on a clear market-oriented approach, where personal technical expertise and support are obvious.

FETERIS COMPONENTS BV
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www.feteriscomponents.com

FIJNMECHANISCHE INDUSTRIE GOORSENBERG BV 14

Fijmechanische Industrie Goorsenberg was founded in 1966. We produce components and assemblies according to customer specifications in small and medium-sized series for sectors as the medical industry, textile industry, petro-chemical, aerospace, electrical equipment, high-tech industry, machine construction and engineering. Our skilled professionals make quality products. We are equipped with modern machines for milling, turning and grinding. Our specialties are 4-axle and 5-axle milling, swiss machining, deep hole drilling, prototyping and engineering. In our acclimatised measuring room we have two 3D-measuring machines. By optimal process control and final inspection we guarantee a constant high quality level.

FIJNMECHANISCHE INDUSTRIE GOORSENBERG BV
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www.goorsenberg.nl

FMI PRECISION BV 46

FMI was originally a manufacturer of stamps, dies and moulds. Gradually the company developed into what it is today: a specialized manufacturer of one-off to medium-sized batches of fine precision components. FMI Precision works with extremely complex materials such as Hastalloy, Inconel, Duplex and other exotic materials. We manufacture the most accurate and/or complex components in the FMI group and make the impossible possible. FMI Precision delivers products for the semiconductor, oil and gas, petrochemicals, aviation and space branches.
Certificates; ISO 9001:2000, ISO 13485 (medical), AS/EN 9100 (aerospace), FDA Registered.

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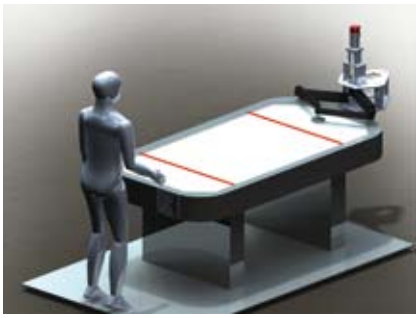
www.fmi.nl

FONTYS HOGESCHOLEN 190

The department of Mechatronics is a knowledge center within the Fontys University of Applied Sciences. At the department there is knowhow about mechanical engineering, physics, computer technology and electrical engineering. The department of Mechatronics collaborates with companies in the region of whom the interest fields are applied sciences. Typical research projects are "Composites in Mechatronics" and "Remote Robotics". An overview of these projects will be shown at the fair.
Fontys Hogescholen, Avans Hogeschool and Hogeschool Utrecht will be sharing a booth.



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m.stappers@fontys.nl
www.fontys.nl

FORMATEC TECHNICAL CERAMICS BV 158

Formatec Technical Ceramics BV produces technical ceramics for a wide selection of industries. We can manufacture complex components very efficiently by injection moulding (CIM). By this production method costs will decrease substantially through the limitation or absence of machining. Ceramics has many advantages, such as: it is bio inert, wear resistant and offers high-precision applications.

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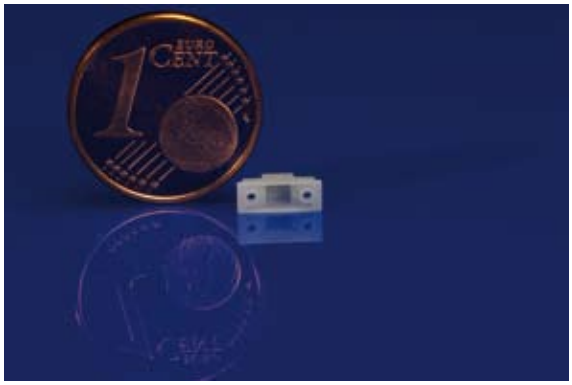
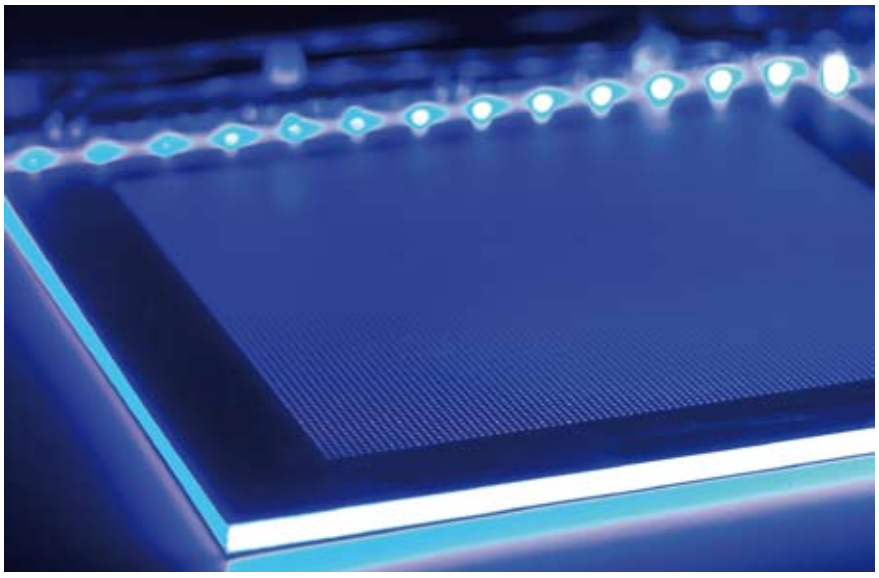
oswald.hermans@formatec.nl
www.formatec.nl



FRAUNHOFER IPT 180



Fraunhofer IPT is home to a wealth of expertise and experience in all aspects of production technology. At this year's Precision Fair, Fraunhofer IPT will exhibit a selection of samples for micro and precision components that can be manufactured by using high/ultra-precision diamond machining processes such as Fast-Tool-Servo turning, (micro) milling, fly cutting and planning. This includes components with microstructures on freeform surfaces, mold inserts with nickel-phosphorous coatings, and large-area components with microstructured surfaces. Fraunhofer IPT will also demonstrate its capabilities concerning the process chain for the production of polymer optics and glass optics.

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philipp.kolb@ipt.fraunhofer.de
www.ipt.fraunhofer.de

MACHINEFABRIEK GEBRS. FRENCKEN BV 99

Machinefabriek Gebrs. Frencken B.V. is a trusted supplier to demanding customers in the analytical, medical, semiconductor, optical industries and aerospace. They chose us because we have repeatedly invested in the most sophisticated engineering equipment available today and in highly-motivated people, who have the skills and experience to produce complex components of the finest tolerances for many critical applications. We work closely with customers' technical teams to engineer a cost-effective solution, balancing the right level of performance and precision with economical whole-life costs. Our factory has the flexibility and capacity to handle one-off prototypes or full batch production using the latest CNC multi-axis equipment, for machining as well as for sheet metal. We keep investing in the latest CNC equipment to achieve the standard of precision our customers demand.

MACHINEFABRIEK GEBRS. FRENCKEN BV
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5652 AJ EINDHOVEN (NL)
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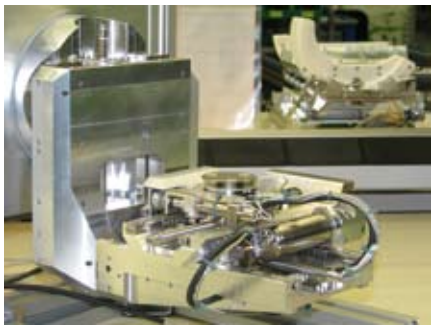
t +31 (0)40-2507507
machinefabriek@frencken.nl
www.frencken.nl

FRENCKEN DEVELOPMENT & ENGINEERING 99



Frencken Development & Engineering (FDE) develops advanced Mechatronic products. Our Product Creation Process assures a well-structured development effort based on the customer's specification and resulting in a fully qualified product. Continuously, the product cost price is monitored and managed to assure that we meet the targets agreed upon. FDE is part of Frencken Europe and has access to manufacturing facilities in both Europe and Asia. We specialize in accurate positioning of objects. Our customers are active in the analytical, medical, industrial automation and semiconductor markets. Typical products are: Reticle mask for Lithography equipment, Stages for electron beam microscopes, and Patient tables for Cardiovascular X-ray machines.

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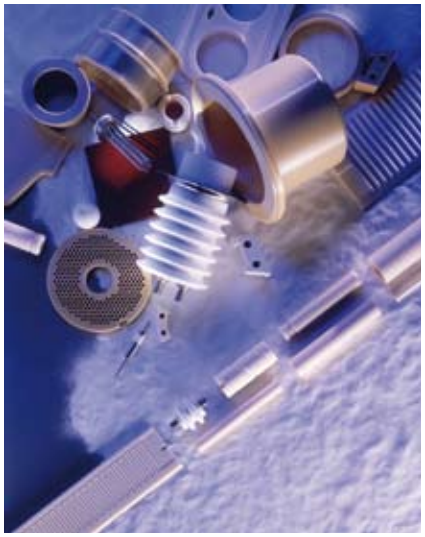
FRIATEC TECHNISCH KERAMIEK / GLYNWED 140

FRIATEC AG is one of the most specialized manufacturers of ceramic components out of pure oxides; their registered trade mark is FRIALIT®DEGUSSIT®.
Technical ceramics can be applied in various industries, laboratories, measurement and control techniques, machine building (O.E.M.), electrical engineering and electronics. Besides a large scale of standard products, custom-made products can be manufactured in aluminia oxides, zirconia oxides, silicium nitride and silicium carbides.



As associated firm of FRIATEC AG, Glynwed B.V. is responsible for consulting and sales of FRIALIT®DEGUSSIT® ceramics. A variety of ceramic components of FRIATEC AG is presented in booth number 140.

FRIATEC TECHNISCH KERAMIEK / GLYNWED
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ella.huisert@glynwed.nl
www.glynwed.nl

GELDERBLOM CNC MACHINES BV 28

Gelderblom CNC Machines B.V. is exclusive and specialized dealer for OKUMA CNC Lathes and Machining Centers from Japan in Belgium, the Netherlands and Luxembourg. OKUMA Machines are famous for their reliability and quality and therefore a perfect partner for automation.
Gelderblom not only delivers standard machines but specializes in delivery of turnkey production cells that contain an Okuma CNC Lathe and/or Machining Center. It is our aim to add value for our customers in order to realize highly efficient and profitable production capacity.

GELDERBLOM CNC MACHINES BV
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3991 CR HOUTEN (NL)
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h.volker@gelderblom.nl
k.vankooten@gelderblom.nl
www.gelderblom.nl

GERMEFA BV 6

The right move when quality is key… Germefa is a precision-engineering supplier with over 65 years of experience. Computer-controlled turning, milling and drilling operations are combined with every conceivable type of grinding technology, wire erosion, precision machining and assembly. We have a very comprehensive range of machinery for all your machining needs. From relatively simple to very accurate and complex work and from small to large series. Germefa can handle almost all material qualities. Almost all kinds of steel, non-ferrous metals, plastics and castings can be machined for you. What this versatility means for you is that you can outsource the complete process to us. Germefa takes care of the whole machining process in house.

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GIBAS NUMERIEK BV 177

GIBAS NUMERIEK BV
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Contact person: Mr. J.K. Boot
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www.gibas.nl

GLOVEQB 174

Nowadays, correct implementation of experimental or industrial preparations often requires a controlled and gas-tight atmosphere. With the development of the GloveQb system, there is an excellent alternative to create workspaces with the required gas conditions. A world of possibilities is now at your fingertips with this new technology, rooted in practical experience. The GloveQb system is characterized by endless possibilities for expansion and a high degree of adaptability. The basis for these properties is the 3D modular construction system. A patented technique that allows you to design the space that is required for your experiments. Quick, modular and easy!

GLOVEQB
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t +31 (0)10-4427949
info@GloveQb.com
www.GloveQb.com

GEREEDSCHAPMAKERIJ G.M.I. BV 144

"Quality is produced by working together."

Since 1980, this business philosophy has provided GMI with an undisputed reputation. The development and production of both high-grade moulds and precision mechanical components involve accuracy and reliability. This requires two parties that can implicitly trust each other's expertise, innovative thinking, operational speed and flexibility.
At GMI, quality is an obvious combination of product and delivery reliability. It is achieved by continuously probing the limits in our own business and collaborating with our customers to find the best solution. It is not for nothing that we maintain long-term relationships with many of our clients.

GEREEDSCHAPMAKERIJ G.M.I. BV
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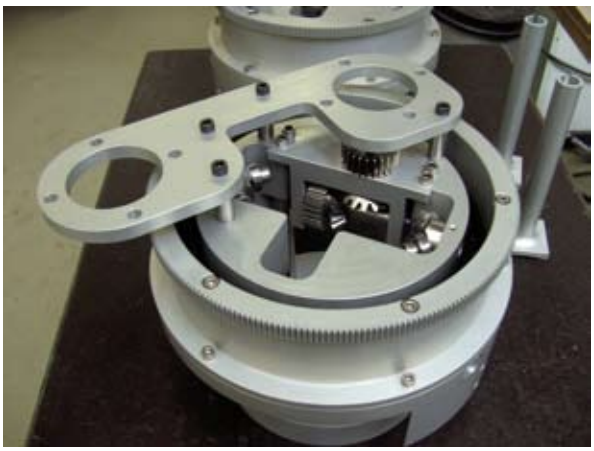
5021 LJ TILBURG (NL)
Contact person: Mr. A.J. Vlug
t +31(0)13-5425246
andre.vlug@gmi-bv.nl
www.gmi-bv.nl



GREENTECH ENGINEERING BV 49

GreenTech Engineering (GTE) is a company based on Integral Engineering, driving innovation into operation. GTE approaches the operation challenges in high-tech industry through combined application, process, production and equipment engineering.
Key is the focus on manufacturing technology and the production process. By these competences and directed through profound project management, GTE is able to balance and accelerate the circle of innovation and operation sustainably and at high speed.

GREENTECH ENGINEERING BV
High Tech Campus 09, Technology Center, 5656 AE EINDHOVEN (NL)
Contact person: Mr. Marcel Grooten
t +31 (0)40-8514610
info@gt-engineering.nl
www.gt-engineering.nl

HEIDENHAIN NEDERLAND BV 26

Measurement and Control Technology for Demanding Positioning Tasks
DR. JOHANNES HEIDENHAIN GmbH develops and manufactures linear and angle encoders, rotary encoders, digital readouts, and numerical controls for demanding positioning tasks. HEIDENHAIN products are used primarily in high-precision machine tools as well as in plants for the production and processing of electronic components. With our extensive experience and know-how in the development and manufacture of measuring devices and numerical controls, we create the groundwork for the automation of tomorrow's plants and production machines.
In our booth at the Precision Fair 2010 we proudly present you our newest developments with the focus on absolute position measuring technology used in industrial automation, motion control and automated metrology.

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verkoop@heidenhain.nl
www.heidenhain.nl

HELMUT FISCHER MEETTECHNIEK BV 85

HELMUT FISCHER is recognized as a leader in the field of coating thickness measurement and material testing instruments. We are able to recommend the best solution for any application. FISCHER is active around the world with own FISCHER companies and a large number of business partners in different countries. At the 2010 edition of the Precision Fair, FISCHER will introduce a range of brand new instruments like the new FISCHERSCOPE XDV-SDD for material analysis and coating thickness measurement within the nano range, as well as a new micro hardness tester for measuring elastic and plastic deformation of material under load.

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netherlands@helmutfischer.com
www.helmutfisher.nl

HEMBRUG MACHINE TOOLS 101

Hembrug is the specialist with more than 40 years experience in the design, manufacturing and world wide sale of ultra precision fully hydrostatic turning machines. The Hembrug Mikroturn® machine range is at the leading edge of what is possible with hard turning today. Hembrug offers finish hard turning solutions for workpieces up to a diameter of 1500 mm having hardness 58-68 HRC. Shape accuracies 0.1-2 micron, dimensional accuracies < 2 micron and surface finish accuracies of 0.1-0.4 micron have been obtained. The Hembrug Mikroturn® machines are supplied to various industries such the bearing industry, the automotive industry and the die and mold industry.

HEMBRUG MACHINE TOOLS
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2031 BJ HAARLEM (NL)
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sales@hembrug.com
www.hembrug.com

HFI BV 6

Hartman Fijnmechanische Industrie (HFI BV) specializes in the production of fine mechanical parts for the industry. The turned parts are used in measuring and control equipment and in the heating, electronics and automotive industry. HFI produces precision-turned parts in series ranging from several pieces to over a million. Diameter range from Ø1 to Ø100 mm. HFI uses modern CNC machines for the production of the turned parts. HFI is able to supply part assemblies to customer specification. These assemblies are often delivered "plug and play" in Kan-Ban fashion to customers world wide. Sinds 2000 we are part of Aalberts Industries.

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www.aiis-group.nl

HEXAGON METROLOGY BENELUX 13

The Leica Absolute Tracker AT401 is a highly accurate portable CMM for 3D measurements over ultra-long ranges. It is the first laser tracker to be battery-operated and designed for cable-less operation. It is IP54 certified and includes enhanced features such as PowerLock and Automatic Target Recognition (ATR). The ROMER Absolute Arm is the first measuring arm with absolute encoders. This technology avoids the earlier need with all measuring arms to initialise the encoders – the user can simply switch the machine on and start measuring. The ROMER Absolute Arm is notable for its low weight and systematic, ergonomic design.

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contact.nl@hexagonmetrology.com
www.hexagonmetrology.com

HIPRECISION 58

HiPrecision provides all competences needed for fast and efficient development of equipment and machinery. HiPrecision clarifies specifications, provides creative input into the concept design, and applies systematic design methods.
Systematic and function-oriented design leads to an efficient use of staff and resources, and a design that is functioning reliably and predictably. In the prototyping stage HiPrecision develops test plans, and takes care for the tests and for analysis of the results. HiPrecision makes it work!

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HIWIN LINEAR TECHNOLOGIE GMBH 73

HIWIN GmbH, a subsidiary of the Taiwanese HIWIN Technologies Corporation, develops, manufactures and markets since 1993 Linear Technology. The product portfolio embraces HIWIN Linear Guideways, Ballscrews, Actuators and Ball Bushes; also complete positioning systems include Linear Motors, Linear Stages, Planet Motors, Round Tables, Torque motors and Linear Encoders. Besides standard solutions HIWIN produces specially customized solutions, including complete Gantry-systems with Linear Motor drives.
The European HIWIN Head Office offers along with local sales office also technical consultancy and product training and a maintenance and repair service.
The clients of HIWIN include both end users as well as OEM customers from various industry branches, manufacturers of machinery, processing, packaging, handling and special equipment such as medical devices, production equipment for the electronics and semiconductor market.

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HITTECH GROUP BV 39

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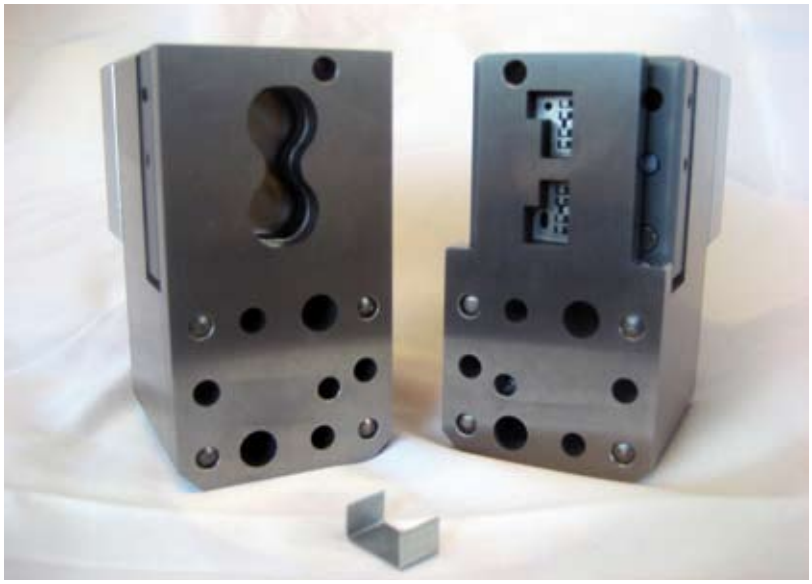
harm.tewinkel@bihca.nl
www.hittech.nl

TER HOEK VONKEROSIE RIJSSEN BV 97

Flexible, conscientious and trustworthy – Machining without restrictions
No direct contact between tool and workpiece. That is the essence of spark erosion. Sparking from the electrode to the workpiece melts a tiny part of it. The tool does not have to be harder than the editing part. All electrically conductive materials can be edited very accurately. Due to the lack of mechanical techniques there will be no stress on the material and due to its dimensional stability results with an accuracy of 0.001 mm are possible. We also do large pieces under 3000 kg and contours of 500 mm thick, as well as Contours Sparking.



TER HOEK VONKEROSIE RIJSSEN BV
Propaanstraat 1,
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Contact person: Mr. G. ter Hoek
t +31 (0)548-540807
info@terhoekvonkerosie.nl
www.terhoekvonkerosie.nl

HOGESCHOOL UTRECHT 192

The Research Group MicroSystemTechnology(MST) of the University of Applied Sciences Utrecht (HU) focuses on product improvement and industrialization of microsystems.
Within the format of Submissive Product Design ten projects have been realized in which during the product development process the intented production methods were stringently taken into account.

A temperature sensor network, ~10 nodes, with data collection via GPRS working with a low-energy protocol, will be shown.
HUniversal Production is proposed as the production philosophy for the future. It is developed within the framework of Agile Manufacturing. As an example will be shown the HUniplacer Delta, the third variant realized within this production platform.
Hogeschool Utrecht, Avans Hogeschool and Fontys Hogescholen will be sharing a booth.

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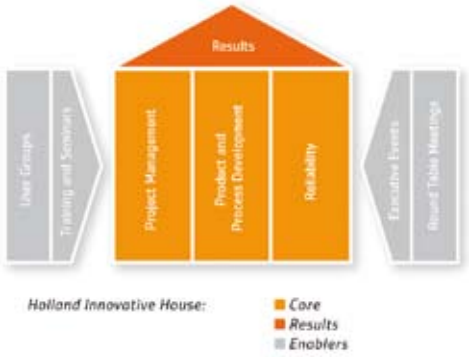
www.hu.nl

HOLLAND INNOVATIVE BV 170



Holland Innovative is market leader in supporting organizations in product, process and project management. In Solar we actively participate in and reinforce project teams in process development as well as running-in of solar production facilities on a global scale. A multidisciplinary team of experienced professionals develops and implements adequate and sustainable solutions. According to the "voice of the customer" and the "voice of the business", with clear targets and results.

Always a solution
If you are looking for yield improvement, development of production processes, reliability design or any other complex process…., Holland Innovative will offer in a short time a sustainable, reliable solution! Challenge us!

The Holland Innovative Team

HOLLAND INNOVATIVE BV
High Tech Campus 9,
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www.holland-innovative.nl

IAI INDUSTRIAL SYSTEMS BV 4

IAI industrial systems in Veldhoven designs, builds and delivers high-tech systems for a variety of industrial users. Our core market is document security, where we supply systems for the personalisation of passports and identity cards. We also operate in the solar market, where we design, construct and deliver production systems for wafers and solar panels. Our core competences are optics, laser applications, system design, automation, product handling, machine vision, control software and inkjet printing. We have experienced a strong growth and are looking to expand our workforce even further in the coming years. Please visit our booth to discover the possibilities.

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5504 DE VELDHOVEN (NL)
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t +31 (0)40-2542445
info@iai.nl
www.iai.nl

IBS PRECISION ENGINEERING 129

Based in Eindhoven, the Netherlands, and with offices in France and Germany, IBS Precision Engineering is a leading innovator in the field of high-precision engineering. We specialize in the development of custom-engineered measurement and positioning solutions, machine tool calibration, non-contact precision sensors, laser interferometer measurement systems and air bearings. We have established close relations with many leading knowledge centers and are actively involved with standards development. We develop unique solutions for anything that is difficult to measure. ISARA, the most accurate 3D CMM on the market with a volumetric accuracy of 30 nm, is a perfect example of our capabilities.

IBS PRECISION ENGINEERING
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smits@ibspe.com
www.ibspe.com

ICAMAT TECHNOLOGY 153

Icamat Technology offers the capacity to manufacture components following customer's specifications. The company has some 20 modern CNC machines for the turning and milling of relatively small batches (up to 1,000 pieces) of parts for various industries. Flexibility, complex geometries, tough materials (high-nickel) are some of the highlights of the company.

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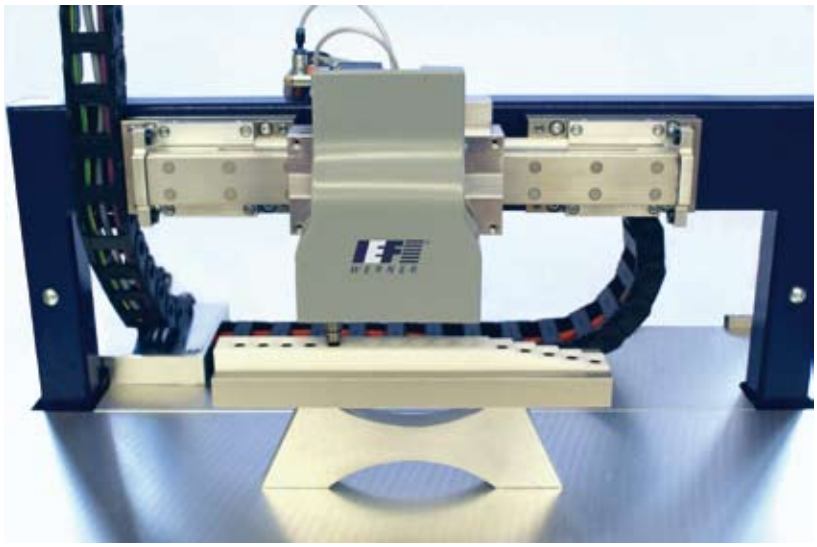
mail@icamat.nl
www.icamat.nl

IEF WERNER GMBH 163

IEF-Werner is established as a leading specialist of transport and positioning systems, Controls and Pallet Systems, worldwide. The wide range of components for all automation and handling applications is now further enforced with a positioning system for mini and micro parts.
IEF presents the availability of most innovative types of machines like Palletizer and high-speed handling units according to latest quality standards. Excellent technology which is protected by a large number of patents combined with smallest footprints will be featured on this show.



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dirk.reise@ief-werner.de
www.ief-werner.de

IGS GEBOJAGEMA 111

Your solution in precision and high precision parts and components.

IGS GeboJagema has become one of the world's leading players in the field and has left a definite mark in various sectors in recent decades. IGS GeboJagema combines know-how and experience to form an outstanding metal business.

These are the qualities that underline our broad coverage:
- Precision parts & components for machinery and equipment.
- Replacement parts and measuring devices for production processes.
- Components and subassemblies for manufacturers of tools and precision parts.

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De Vest 13,
5555 XL VALKENSWAARD (NL)
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www.igsgebojagema.nl

IKO NIPPON THOMPSON EUROPE BV 127

Founded in 1950, the company has accumulated numerous proprietary technologies and a wealth of experience that it uses to develop innovative products. Nippon Thompson has become an established leader in three specialties: Needle Roller Bearings, Linear Motion and Mechatronic Products. Marketed under the IKO brand, these products have established a worldwide reputation for high quality and originality.
The European affiliate, Nippon Thompson Europe, has its head office in the Netherlands with its own warehouse and facilities to modify linear motion products according to customer specification.
At the Precision Fair, we will show our latest development of maintenance-free linear ways and mechatronic products.

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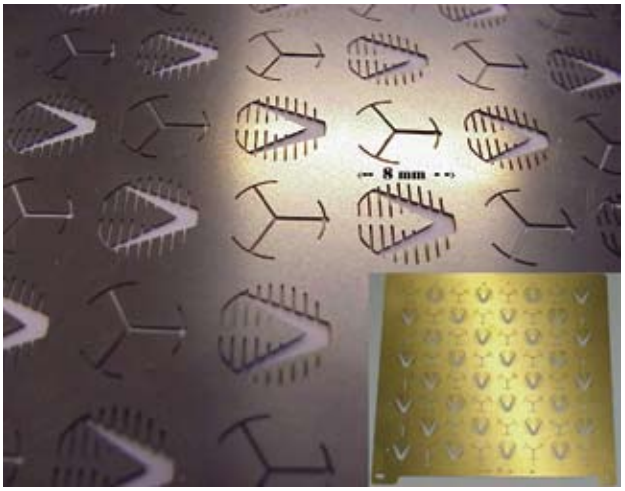
nte@ikonet.co.jp
www.ikont.eu

ILT INDUSTRIËLE LASER TOEPASSINGEN BV 135

Fine mechanical laser processing
ILT specializes in producing highly accurate laser-made products for customers in the fields of fine mechanics, microelectronics, medical systems, etc. Our main fields of expertise are:
- Laser (micro) cutting
- Laser (micro) welding
- Laser (micro) drilling
- Laser engraving



Production batches range from 1 (prototyping) to 5,000 pieces.

Laser (micro) cutting
- Small and accurate parts, projection masks etc.
- Cutting widths down to 20 microns.

Laser (micro) welding
- Materials: stainless steel, Titanium, Gold, etc.

Laser (micro) drilling
- Orifices from 10 microns to 0.5 mm.
- Laser engraving.
- Moulds for compact discs, chip cards.
- Reproduction of identity codes of transponders, etc.

ILT INDUSTRIËLE LASER TOEPASSINGEN BV
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7547 TG ENSCHEDE (NL)
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info@ilt.nl
www.ilt.nl

IMAGO GROUP BENELUX 55

Imago Group Division Machine Vision and Measurement (VIM) Benelux (formerly Aims Optronics) specializes in the exclusive distribution of Machine Vision and Measurement components such as industrial cameras, lighting, lenses, frame grabbers, software, fiber optic sensors, etc.
Our team (technical support but also our sales department) consists of engineers and technicians with experience in machine vision, image processing and analysis and automation. Provider of instrument rental services (high-speed cameras). The company has offices in Brussels and in Waalre-Eindhoven (new address).

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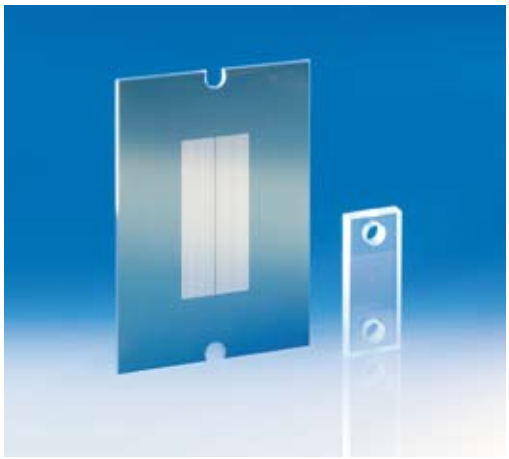
www.imagogroup-benelux.com/vim

IMT MASKEN UND TEILINGEN AG 19

Microstructures on Glass – Optical Components
IMT has been a supplier of complex microstructures on glass for more than 50 years.
Products: delineated optics, custom-made microstructures, thin-film coatings, lab-on-chip components, 200mm wafers with patterned optical coatings, electro-optic modulators.
All manufacturing processes for complex microlithography are in-house.

Core competences:
- Microlithography, micro-structuring of glass
- Micro-channels
- Thin-film technology, optical coatings
- Electrically conductive thin-films, electrodes
- Sub-µm structures
- Glass machining
- Manufacture of large-area photomasks (largest format; 812 mm x 609 mm)



IMT employs 70 experts in the fields of optics, physics and micro-technology. The production facility includes 1200 m^2 clean rooms.

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t +41-439431966
atzannis@imtag.ch
www.imtag.ch

IMS BV 88

IMS offers worldwide turn-key manufacturing solutions to customers in the high-precision, electronics and medical industry.
At the Precision Fair, the IMS stand will feature a live exhibit of the new ProMicro platform for the medical industry: the ProMicro Medical.
ProMicro is the semi-automatic work cell for microsystems and is commonly used in micro-assembly projects for low to medium production volumes. Key aspects are its modular build-up and the focus on automating the customers' value-added processes, resulting in a cost-effective solution for micro-assembly challenges.

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www.ims-nl.com

INNOGRIND™ 58

Innogrind offers grinding on location to alleviate extreme peaks and staff problems on short term. In addition to that, consultancy, grinding training, and process analysis are among the possibilities, with the goal to optimize your grinding processes and raise the output of your grinding machines. Innogrind also offers the right advise and resources to avoid grinding burn.
As specialized Stresstech agent for the Benelux we offer only the best and renowned technologies like Barkhausen Noise Analysis (BNA) XRD and Prism (Hole drilling) to measure stress and retained austenite.

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5706 HK HELMOND (NL)
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Mr. Jos van Langh
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+31 (0)6-57336372
info@innogrind.nl
www.innogrind.nl

INNOTEQ (TOTAL SUPPORT GROUP) 32

InnoteQ Technical Projects translate your idea into a producible product that meets your requirements with regard to functionality, aesthetics, quality and quantities. We combine project management with relevant technical knowledge to convert ideas into concrete products including product design, simulation, functional prototypes and supply chain solutions. As part of the Total Support Group, we also have access to an extensive professional network. Together with your and our own extensive regional and international network, we take care of the realization and in-time supply of your projects.
Disciplines and capabilities: project management, product design, metal, plastic, decoration, assembly technologies, professional protoshop, laser welding, titanium bending, deep drawing, process development, parts, modules and final products, pilot production.

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Contact person:
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www.innoteq.nl

INSCOPE BV 48

Eyepiece-less Microscopes, Measuring systems, HD-Video microscopes.

INSCOPE BV
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RAAMSDONKSVEER (NL)
Contact person: Mr. R.J.J. Pels
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www.inscopebenelux.com

IRIS VISION BV 08

Iris Vision offers a complete range of machine vision and image processing products from major manufacturers. Our expertise is the integration of all necessary vision components for a wide variety of image processing and machine vision applications.
Ranging from the beginning of the data chain with lighting and optics, through the versatility of the acquisitions and processing to the result of the application. We offer you a range of solutions, simple frame grabbers, extensive pipeline processors, host-based processing and hardware processing.
Your vision problem is our problem. We help you in solving your image processing task for process control and quality control. Our price / performance in all the vision components and systems is unbeatable and our specialists are at your disposal to make your vision application easy.

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7213 AE GORSSEL (NL)
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www.iris-vision.nl

JEVEKA BV 81

Since 1937, Jeveka has been a leading specialist in the field of fasteners and tools in the Netherlands. We deliver a high-quality program, well attuned to our customers needs and wishes.
We support you as a customer with our large knowledge base and a customer-oriented, but above all reliable and independent organisation with over 55 people.

Quality products with excellent documentation
Our program consists of over 60,000 products from more than 50 renowned brands with a constant high quality. We are specialised in fasteners for vacuum and EUV applications. You can find our product range through our E-Commerce website.

JEVEKA BV
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1100 DL AMSTERDAM ZUIDOOST (NL)
Contact person:
Mrs. C.M. Collewijn
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tinycollewijn@jeveka.com
www.jeveka.com

IRMATO 136

Irmato – Developing your future
Irmato, with over 200 employees, is a multidisciplinary engineering and consultancy company for machinery and professional equipment. Irmato offers the one-stop-shopping principle. In this concept, Irmato supports its customers in the total product life cycle, from research to engineering, robotics & vision, project management and realisation. Also, Irmato offers high-tech measurement solutions and the P-ECM technology, and supports in service process optimisation and the implementation of ICT solutions in the field of CAD, CAM and PDM.
The strength of Irmato is the synergy between the available competences. The right combination of competences will lead to an optimal result. This way Irmato serves a wide market and offers complete solutions to its customers. For more information, please visit www.irmato.com.

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sroelinga@irmato.com
www.irmato.com

JTEKT EUROPE BEARINGS BV KOYO BENELUX OFFICE 93

Koyo is the brand name of the wide range of roller bearings produced by the Japanese JTEKT Group for automotive and industrial applications.

At the Precision Fair 2010, we will exhibit the Koyo Exsev series of high-precision roller bearings for applications in extreme environments. This includes full ceramic bearings, hybrid bearings and various types of steel bearings for special applications such as in high and low temperatures, high vacuum, low-non lubrication, non-particle emission, X-ray, chemicals, etc.

JTEKT EUROPE BEARINGS BV KOYO BENELUX OFFICE
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info@jtekt.nl
www.jtekt.nl

KANTNER PRÄZISIONSOPTIK 27

Kantner Präzisionsoptik is the European representative for American OEM optics suppliers. Kantner Präzisionsoptik is responsible for Rochester Precision Optics (PRO), Molded Plastic Optics (MPO), Sydor and Precision Optics.

- RPO is a manufacturer of high-precision molded aspherical lenses, polished lenses and optical systems.
- MPO is a manufacturer of high-precision compression-molded plastic components like lenses, lens-arrays, prisms and systems.
- Sydor is a manufacturer of high-quality double-side polished products like wafers windows or flats.
- Precision Optical is a manufacturer of high-end plano optical parts and assemblies like corner cubs, prisms, beam splitters and mirrors.

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KEYENCE - DIVISIE NEDERLAND 78

KEYENCE - DIVISIE NEDERLAND
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t.vanmelick@keyence.nl
www.keyence.nl

KEMET EUROPE BV 171

Specialized commerce, service and training of equipment and techniques for surface treatment such as technical polishing, lapping and cleaning. With a.o. tools for toolmakers, polishing systems and tools, industrial diamond products, ultrasonic cleaning systems, flat lapping and metallurgical machines, micro-lubrification.

KEMET EUROPE BV
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4614 RS BERGEN OP ZOOM (NL)
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Mrs. L. van den Broek
t +31 (0)164-271700
info@kemet-europe.com
www.kemet-europe.com

KISTLER BV NETHERLANDS 37

Kistler is a leading manufacturer of dynamic measurement technology. Sensors, signal conditioning and data acquisition solutions for force, pressure, torque, speed and acceleration are key areas of expertise.

Application-specific solutions have been developed for key markets:
- Engine Development
- Vehicle Technology
- Crash Technology
- Manufacturing Process Control
- Joining Systems
- Plastic Processing
- Biomechanics
- Road & Rail (Weigh in Motion)

The company is driven by innovation and engineering excellence and has production and R&D facilities in Switzerland, Germany and the United States. World-wide, the company employs 1,000 staff in over 25 countries.

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www.kistler.com

KML LINEAR MOTION TECHNOLOGY GMBH 05

KML is a leading innovation specialist for complex linear motor systems. We conceive and implement, for you and in cooperation with you, complete standard and customized solutions with linear and rotary direct drives, as well as with a comprehensive range of conventional drive technologies. All standard linear motor systems and torque motors can also be combined to form multiple-axis solutions with plug-in energy chains, cables and controls. We will present you an assortment of our standardized linear motor systems such as the pick&place handling series LMS M and our efficient and cost-saving LMS E^2 series.

KML LINEAR MOTION TECHNOLOGY GMBH
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KMWE PRECISION SYSTEMS & PRECISION COMPONENTS BV 47

KMWE offers a unique combination of over 50 years of experience with a state-of-the-art technology within the high-mix, low-volume and high-complexity industry by:
- A proven concept of robotized and process-controlled machining of complex light-weight parts in low volume mainly used as the basis of a critical function.
- Assembly (if required in clean room conditions) of mechatronic modules and systems with a high mechanical content based on repeatable quality and functional testing. Typical functions are product/fluid handling and positioning systems/stages.
- Value engineering focused on reducing complexity and improving repeatability by integration.
- A global network with plants in the Netherlands, Malaysia and Turkey.

KMWE PRECISION SYSTEMS & PRECISION COMPONENTS BV
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i.verheggen@kmwe.com
www.kmwe.com

KUGLER GMBH 10

KUGLER develops and produces highly complex and sophisticated micro machine tools, ultra-precision optical and mechanical components and – in jobshop production – optical surfaces. All products are manufactured in direct machining processes without polishing and are mainly made of non-ferrous materials. KUGLER's uniqueness is based on profound knowledge in technology transfer and on the development and manufacture of ultra-precision components manufactured on self-developed ultra-precision machine tools.
For the Precision Fair 2010, KUGLER focuses on micro parts, micro moulds and optical components, all produced in direct machining and, in the case of micro parts and moulds, on KUGLER machines.

KUGLER GMBH
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KUSTERS & BOSCH FIJNMECHANISCHE INDUSTRIE BV 148

KUSTERS & BOSCH FIJNMECHANISCHE INDUSTRIE BV
Postbus 22, 5730 AA MIERLO (NL)
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tkusters@kusters-bosch.nl
www.kusters-bosch.nl

KUSTERS METAALBEWERKING OSS BV 54

The activities mainly consist of the production of (fine) mechanical parts for widely divergent trades. Almost all metal machining processes, with regard to the most widely divergent types of metal and synthetic materials, can be performed by us to perfection. Because of the flexibility, the quality consciousness of the organisation and the versatile modern machinery, hightech products and a short production cycle can be realized.

KUSTERS METAALBEWERKING OSS BV
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info@kustersmetaal.nl
www.kustersmetaal.nl

LARSEN PREMIUM PRECISION PARTS 146

Fine mechanical parts of undeniably high quality are essential to the workings of a machine and are decisive for a company's reputation. This is our field of activity. Larsen is the specialist in premium milling and turning work. We are fully equipped with the knowledge and technology required to produce special parts made of stainless steel, aluminium, synthetic or exotic materials. We work for demanding clients who cannot and will not accept anything less than premium precision parts.

LARSEN PREMIUM PRECISION PARTS
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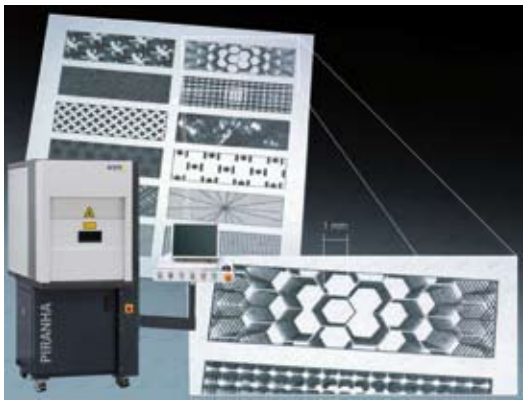
t +31 (0)36-5220931
info@precisionparts.nl
www.precisionparts.nl

LASER 2000 BENELUX 133



Laser 2000 Benelux is a design-in distributor, specialized in lasers, light and positioning, in the widest meaning of the words. Laser 2000 serves industrial, OEM and scientific customers in the Benelux countries.
Laser 2000 will show its latest developments in the area of lasers, industrial laser systems, nano- and micropositioning systems and linear motors. To name a few: fiberlasers with advanced laser parameter handling, integrated piezo-controller positioning configurations, stand-alone interfacing electronics for galvo & laser control. Laser 2000 also started with import, installation and service of Chinese laser material processing workstations.
Laser 2000, extended knowledge in the area of laser material processing, fine mechanics and nano-positioning.

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info@laser2000.nl
www.laser2000.nl

LASERTEC BV 86

Our expertise comes from experience. For more than 15 years now, Lasertec has been a strong and reliable partner in the world of laser technology. Thanks to its high levels of knowledge and practical experience, Lasertec can build bridges between the conceptual stages and technical execution. During the past years, this has resulted in a number of remarkable cases in which the level of knowledge of Lasertec and its strategic partners fires the imagination.

Keywords:
- 3D ultraviolet treatment in picoseconds
- Custom-made applications
- Innovative power
- Non-impact measurement solutions

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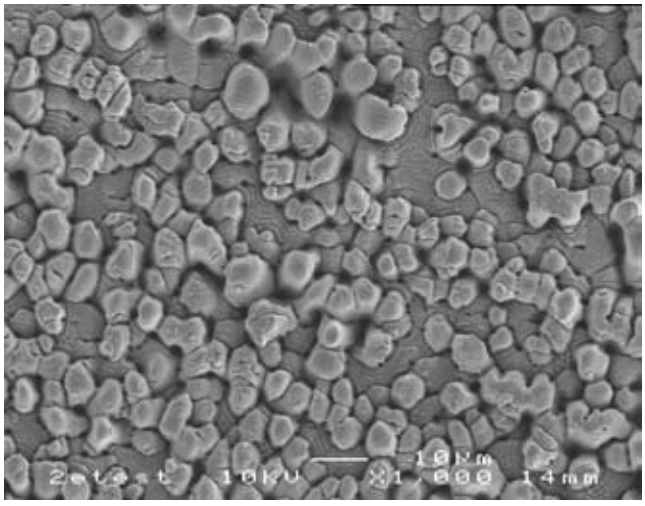
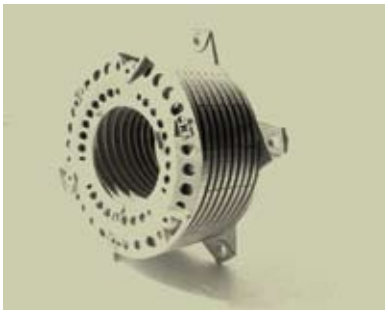
lasertec@lasertec.nlwww.lasertec.nl



LAYERWISE 186



Leuven-based LayerWise focuses on selective laser melting (SLM), a powerful technology that shapes any desired metal part geometry by melting metal powder layer by layer. Using this digital approach, the optimum shape of complex circulation parts can be produced in a single manufacturing step. Such a part not only delivers better performance, it is also more reliable than the complicated assembly it replaces. Furthermore, SLM technology is the right choice for small metal products, of which thousands can be produced simultaneously. In addition to countless industrial applications, the company manufactures revolutionary orthopedic, maxillofacial and dental implants.

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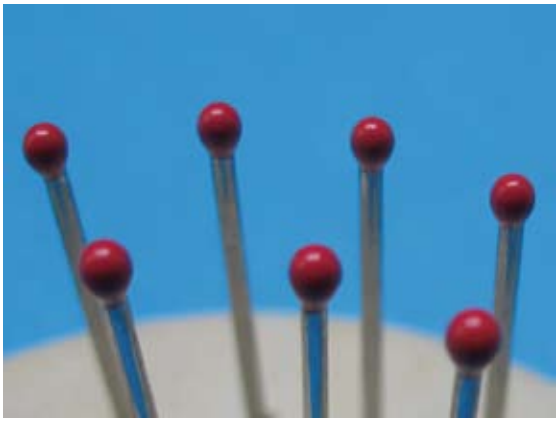
www.layerwise.com

LCS BELGIUM BVBA 58

LCS Belgium bvba provides independent consultancy services and expert advice to all users of adhesives, encapsulants, sealants, coatings and fluids in order to cost-effectively improve clients' development, implementation, manufacturing and quality control processes & procedures.

Your key benefits:
- Extensive and specialised experience with adhesive bonding technology in many industries.
- Immediately available and when needed.
- Multilingual.
- Cost benefits: no additional headcount on your payroll.
- Independent and sound recommendations on adhesives and related equipment suppliers.



LCS BELGIUM BVBA
Bergenstraat 84,
B 3053 HAASRODE (B)
Contact person: Mr. J. Lambrechts
t +32-16389045
jld@lcs-adhesivebonding.com
www.lcs-adhesivebonding.com

LEUVEN AIR BEARINGS NV 156

Leuven Air Bearings develops and produces standard and advanced air bearing solutions. LAB is an innovative partner for companies in industrial automation, process control, compressor and power generation industries. LAB is specialized in high-speed applications and high-accuracy applications.

For high-accuracy applications, air bearings are typically used in coordinate measurement machines, test equipment, wafer steppers, CT scanners, etc. The high-speed applications range from compressors, generators, turbomachinery to high-speed spindles for drilling operations.

LEUVEN AIR BEARINGS NV
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B 3001 LEUVEN (B)
Contact person: Mrs. I. Clijsters
t +32-16401244
ilse.clijsters@leuvenairbearings.com
www.leuvenairbearings.com

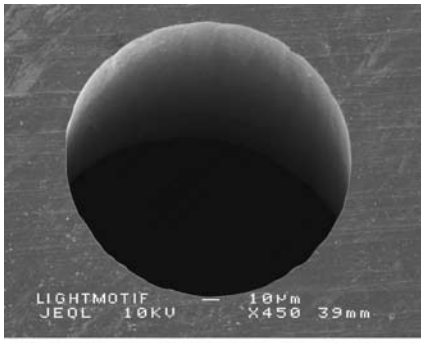
LEMO CONNECTORS BENELUX 43

The Original Push-Pull Connector
LEMO is the acknowledged leader in the design and manufacture of precision custom connection solutions. LEMO's high-quality push-pull connectors are found in a variety of challenging application environments including medical, industrial control, test and measurement, audio-video, and telecommunications.
LEMO has been designing precision connectors for six decades. Offering more than 50,000 product combinations that continue to grow through custom-specific designs, LEMO, and its affiliated sister companies REDEL and COELVER, currently serve more than 100,000 customers in over 80 countries around the world.

LEMO CONNECTORS BENELUX
De Trompet 2108,
1967 DC HEEMSKERK (NL)
Contact person: Mr. R. Lengers
t +31 (0)251-257820
info@lemo.com
www.lemo.com

LIGHTMOTIF BV 112

Lightmotif provides semi custom solutions for micro- and nanomachining based on ultrashort pulsed lasers. This new laser technology enables milling, drilling, cutting and surface structuring with unmet precision on all possible materials. Micromachining benefits from a largely increased range of processable materials, more freedom to process complicated curved products and much less damage to substrates.



laser drilled hole in 0,3 mm stainless steel

Surface structuring or texturing is used to fabricate surfaces with new functionalities like reduced friction or super water-repelling properties. Lightmotif develops processes and applications, performs small-scale production and develops machinery for customers in various markets like semicon, medical, high-tech machines, automotive and consumer products.

LIGHTMOTIF BV
Pantheon 12,
7521 PR ENSCHEDE (NL)
Contact person:
Mr. Max Groenendijk
t +31 (0)53-4500840
max.groenendijk@lightmotif.nl
www.lightmotif.nl

LM SYSTEMS BV 90

LM Systems BV is located in Veenendaal and is the exclusive Dutch Service Supplier for THK. THK's creative ideas and unique technology have made the company worldwide pioneers in the development of Linear Motion (LM) products and have made THK a leading manufacturer in the industry. Today, THK's linear motion products are indispensable in mechanical and electronic equipment in a wide variety of systems used in all industries. At the Precision Fair, we exhibit our wide program with unique mechanical products and focus on THK's miniature program of ball rails, ball splines and balls screws.
THK "the Mark of Linear Motion".

LM SYSTEMS BV
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3905 TG VEENENDAAL (NL)
Contact person: Mrs. K. Naninck
t +31 (0)318-554615
info@thk.nl
www.thk.nl

LOKET MBO MECHATRONICA (KENTEQ EN INDUTEQ) 178

Portal site "MBO Mechatronica" organizes theme event "Talent for the Future".
The portal site Vocational Training Mechatronics is a unique site for anyone who is looking for information on vocational training in mechatronics. You will find information on: qualifications, training institutes, examinations, job market, knowledge circles, topical subjects and agenda items. All relevant information is available within 2 or 3 mouseclicks. The portal site is an initiative of Kenteq, centre of expertise and advice on technical craftmanship.
Come and see us at stand number 178 (Hotspot). At our theme event "Talent voor de Toekomst – slim aan de slag" that will be held on 1st December we inform our network relations on competency-based education and social innovations in technical organizations.

LOKET MBO MECHATRONICA (KENTEQ EN INDUTEQ)
Postbus 81,
1200 AB HILVERSUM (NL)
Contact person: Mrs. L. Pop
t +31 (0)35-7504205
leonore.pop@kenteq.nl
www.kenteq.nl
www.loketmbomechatronica.nl

LOKET MBO MECHATRONICA

LOUWERS GLASS AND CERAMIC TECHNOLOGIES 130

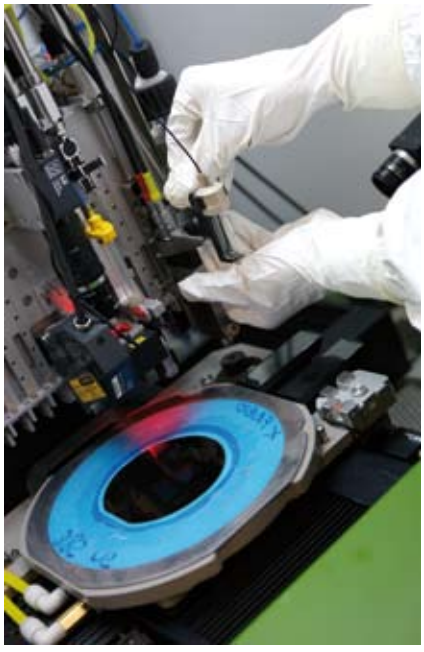
Louwers vormt in vele gevallen de ontbrekende schakel bij de ontwikkeling en productie van glazen en keramische precisiecomponenten voor tal van high-tech industrieën. Louwers kenmerkt zich met name als kennisondersteunende partner bij de ontwikkeling en de toepassing van velerlei precisiecomponenten. Niet alleen conceptontwikkeling, verificatie en prototyping, maar ook de vervaardiging van de nulseries en de productieseries kan in zijn geheel door Louwers worden verzorgd. Tevens heeft Louwers een zeer ruime ervaring met verregaande mechanisatie, smart engineering en volledig SPC-gestuurde processen, waardoor ook serieproductie voor uiterst concurrerende prijzen, met behoud van de welbekende hoge Louwers-kwaliteit, kan worden gerealiseerd.

LOUWERS GLASS AND CERAMIC TECHNOLOGIES

Energieweg 3a,
5527 AH HAPERT (NL)
Contact person:
Mr. S. van den Cruijsem
t +31 (0)497-339696
info@louwers.nl
www.louwers.nl

MA3 SOLUTIONS BV 134

MA3 Solutions is the leading manufacturer of tailor-made automation equipment for the micro-dispense and micro-systems assembly market.



Active in the areas of Life Sciences, Medical, Automotive, Inkjet, Semiconductors, ICT/Telecom and MEMS/MST, MA3 supports its customers with shorter delivery lead-times and faster ramp-up to volume. MA3 works with customers active in production and integration and operating between manual and proprietary automated solutions. The company's system philosophy is based on utilization and high standardization of the base equipment and processes, which ensures a proven and stable platform. This allows MA3's customers to focus on their business opportunities.

MA3 SOLUTIONS BV

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5692 EA SON (NL)
Contact person:
Mr. Martin van Acht
t +31 (0)40-2969330
m.vanacht@ma3solutions.com
www.ma3solutions.com

MAGNETIC INNOVATIONS BV 79

Magnetic Innovations, electro mechanic design & products
Magnetic Innovations is an advanced knowledge centre for electromagnetic and thermal designs. We focus on rotary and linear motors, rotary generators, magnetic bearings, sensors and shielding.

Contract research
We operate by means of contract research. Many of our designs have been successfully completed and market introduced. Our innovative designs resulted in several patents.

Products
We can offer moving magnet actuators, high-torque motors, hub motors and wind turbine generators.

Electromagnetic alternative for pneumatic cylinders
We can deliver a new generation of electric cylinders, which are faster and make less noise than pneumatic cylinders.

MAGNETIC INNOVATIONS BV

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Mr. Bart van den Broek
t +31 (0)40-2051718
bart.van.den.broek@magneticinnovations.com
www.magneticinnovations.com

MARTEK 38

MARTEK is the BeNeLux specialist importer company for precision sensors, linear and angular encoders, inspection instrumentation, digital readouts and probing systems for machine tools.

MARTEK
Avenue René Comhaire 82,
B 1082 BRUSSEL (B)
Contact person:
Mr. Francis Geerinckx
t +32-24670040
info@martek.be
www.martek.be

MASÉVON TECHNOLOGY 167

Masévon Technology is a high-tech system supplier, operating in the photovoltaic, display and semiconductor market, as well as in aviation, aerospace, chemical industry, and industrial yarn manufacturing.
In engineering, manufacturing and assembly, Masévon has its own capacities and availabilities. Our specialties cover mechanics, mechatronics, electronics and software. Our software engineers are familiar with several control systems.
Masévon Technology is part of the Triumph Group, a unique combination of companies, amongst them Machinefabriek Tuin and Vernooy Vacuüm Engineering.
By skilled and smart connections of the available capabilities, Triumph has created a highly flexible and high-quality supplier.

MASÉVON TECHNOLOGY
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7772 NM HARDENBERG (NL)
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www.masevon.com

MATHWORKS 105

MathWorks is the world's leading developer of mathematical computing software. This includes MATLAB® and Simulink® for data analysis, algorithm development, numeric simulation and design of multi-domain embedded systems. Together with a wide range of optional add-on products, these establish the most powerful environment for Model-Based Design currently available 'off-the-shelf.' It enables engineers in the high-tech mechatronic industry to go from 'innovative idea' to 'actual product' in the shortest possible time and in accordance with the highest possible quality and/or certification standards. Founded in 1984, MathWorks employs more than 2,200 people in 15 countries. For additional information, visit www.mathworks.nl.

MATHWORKS
Dr. Holtroplaan 5b,
5652 XR EINDHOVEN (NL)
Contact person: Mrs. Cindy Bouwels
t +31 (0)40-2156700
info@mathworks.nl
www.mathworks.nl

MAVOM B.V. 50

Since 1938 MAVOM has been a specialist in the production, marketing and sales of chemical specialty products for industrial applications. During the Precision Fair, we will be present with our complete line of:
- Adhesives & Sealants
- Specialty Lubricants
- Electronics (Conformal Coatings, potting compounds, etc.)

MAVOM b.v.
Handelsweg 6,
2404 CD ALPHEN A/D RIJN (NL)
Contact person: Mr. Rick Kamberg
t +31 (0)172-436361
info@mavom.nl
www.mavom.nl

MAXON MOTOR BENELUX BV 02

The solution is always a matter of the right combination.
maxon motor develops and produces brushless and brush DC motors with an unique ironless maxon winding, up to 500 watts. Our modular program is complemented by flat motors with an iron core. The modular system with planetary, spur and special gearheads, sensors and control electronics, completes the range.
High-tech CIM and MIM components are produced in a special competence center.
maxon motor stands for top quality, innovation, competitiveness and a worldwide distribution network. We combine motor, gearhead and electronics according to customers' specific requirements to create an integrated total solution. We are driven by your specific requirements.

Sterilizable motors EC 13 and EC Size 5, 50 watt drives for medical technology.

MAXON MOTOR BENELUX BV
De Giem 22,
7547 SV ENSCHEDE (NL)
Contact person: Mr. Matthijs Roorda
t +31 (0)53-4864777
info@maxonmotor.com
www.maxonmotor.nl

MECAL APPLIED MECHANICS BV 106

MECAL is a global engineering company headquartered in the Netherlands. Since its inception in 1989, MECAL has built an outstanding track record in the development of mechatronic systems and in supporting high-tech companies with simulation services.
Today MECAL is involved in analysis and simulation, concept design and engineering of customer-specific mechatronic systems for OEM companies in the High Tech Systems industry. Our product range includes vibration control platforms, customer specific mechatronic systems, turn-key test equipment and opto-mechatronics.
Our long standing experience, unique project approach and highly skilled people establish MECAL as the ideal development partner to the high-tech industry world-wide.

MECAL APPLIED MECHANICS BV
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5652 AG EINDHOVEN (NL)
Contact person: Mr. M. van Hout
t +31 (0)40-2302700
mechatronics@mecal.eu
www.mecal.eu

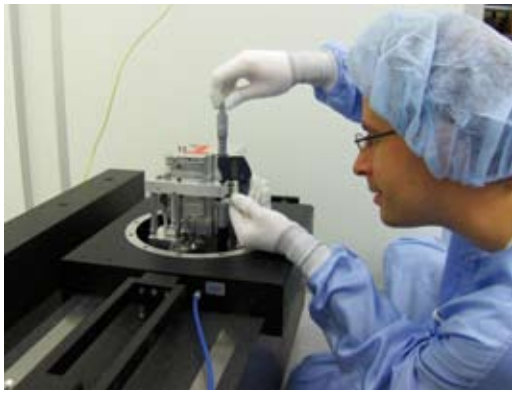
MECHAPHYSICS BV 24

Passion for technology
Mechaphysics is the precision engineering division of the Vision Dynamics Group. Concept research and design is our passion. We design according to physical principles with the accent on mechanical principles.
To fulfil the requirements for our customers, the base – the concept – must be right.
We also implement integration of precision mechanics for vacuum and clean room environment.

Supporting our customers by:
- Fundamental Research
- Concept Research
- Technical Design
- Prototyping
- Turn-key Solutions

Mechanical solution:
- Precision Mechanics
- Mechatronics
- Cryogenic Technology
- Sensor Technology
- E-beam Technology
- Vacuum
- Optics

MECHAPHYSICS BV
Fransebaan 592a,
5627 JM EINDHOVEN (NL)
Contact person: Mr. E. Bos
t +31 (0)40-2566745
info@visiondynamics.nl
www.mechaphysics.nl



MEVI BV FIJNMECHANISCHE INDUSTRIE BV 122

The Mevi Group, with its principal in Helmond, the Netherlands, and operating companies in Belgium and The Czech Republic, is a main supplier and valuable partner in the field of development, engineering and realisation of complete (prototype) machines and modules, to customer specification. Together with specialist companies for electronics and machine control, complete projects are realised for customers active in the fields of semiconductors, copying attachments, the CD and DVD industry, automotive and the electronics industry. The Mevi Group is furthermore specialised in the production of high-precision mechanics (micron range) and parts, in any type of material required and in quantities ranging from single items to several hundreds.

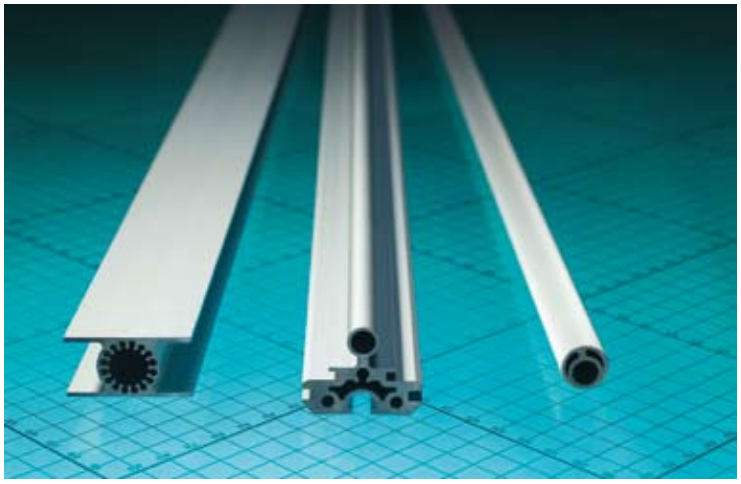
MEVI BV FIJNMECHANISCHE INDUSTRIE BV
Postbus 238,
5700 AE HELMOND (NL)
Contact person: Mrs. F. Colen
t +31 (0)492-538615
fcolen@mevi.com
www.mevi.com

MFK BV 6

Machinefabriek Van Knegsel (MFK) is a mechatronical system supplier, with over 50 years of experience. With around 25 employees, an advanced machine shop, specific know-how on high-tech machine operations and assembly, MFK is your partner for development and production of high-tech components, baseframes, complex assemblies and vacuum technology.
MFK is part of Aalberts Industries. Apart from our own competences, within Aalberts Industries MFK has a wide network of specialists active in special production techniques and surface treatments. Herewith MFK always has the right partners to produce your complex modules.

MFK BV
Hoefseweg 2,
5512 CH VESSEM (NL)
Contact person:
Mr. Freek Kronenberg /
Mr. Elgar van der Bij
t +31 (0)497-592200
info@vanknegsel.nl
www.vanknegsel.nl

MIFA ALUMINIUM 6



Mifa Aluminium specialises in tight-tolerance aluminium extrusions. The extrusion process offers the greatest design freedom possible to designers. Mifa is used to extrude tolerances up to ± 0.02 mm. With our innovative profile design engineering and technology, we can offer profiles with demanding shapes and sizes, a good surface finish, and press extreme thin wall thicknesses from 0.3 mm. Mifa is also capable to extrude in magnesium alloys!
There is no minimum order quantity, and Mifa is able to supply a fully finished component as well, through in-house CNC machining, surface treatment and assembly capabilities.

Some of our primary markets are machine construction, aerospace and defence, medical equipment, automotive and measuring and control equipment.
Mifa complies with many quality norms including ISO 9002.

MIFA ALUMINIUM
Deltakade 4-6,
5928 PX VENLO (NL)
Contact person:
Mr. Ivo van Galen
t +31 (0)77-3898888
sales@mifa.nl
www.mifa.nl

MIJNSBERGEN BV 91

Mijnsbergen is specialized in dynamic precision positioning systems. Besides selection of components, Mijnsbergen realizes projects from engineering up to installation. At the Precisiebeurs Mijnsbergen shows an extended range of components such as AKRIBIS direct-drive linear and rotary motors, circular and rectangular voice coil modules, piezo modules and ELMO servo drives. The motors and actuators are available as separate components or as complete modules, including linear guides, encoders and cabling. Experienced engineers offer support with the selection of components and offer the most efficient solution for your application needs.

MIJNSBERGEN BV
Postbus 166,
3640 AD MIJDRECHT (NL)
Contact person: Mr. H. le Noble
t +31 (0)297-285821
info@mijnsbergen.nl
www.mijnsbergen.nl

MIKROCENTRUM 59

MIKROCENTRUM offers a comprehensive array of short, to-the-point practical courses and workshops on all educational levels ranging from hands-on technical up to academic. The courses are held at various locations in the Netherlands and Belgium. MIKROCENTRUM offers these courses open to individual registration as well as in a corporate setting. MIKROCENTRUM teachers are themselves professionals in their line of expertise, highly skilled and educated as well as enthusiastic. Currently it is possible to choose from more than 195 different course topics starting at various points in time.
For additional information, please contact Mr. Frank Bruls, department manager Courses, f.bruls@mikrocentrum.nl

MIKROCENTRUM
Kruisstraat 74,
5612 CJ EINDHOVEN (NL)
Contact person: Mr. Frank Bruls
t +31 (0)40-2969933
opleidingen@mikrocentrum.nl
www.mikrocentrum.nl

MI-PARTNERS 179

MI-Partners is a centre of expertise in the field of mechatronics and is actively involved in the development of high-tech mechatronic systems. An enthusiastic team of experienced project leaders, system architects and highly educated engineers work together to develop innovative solutions. New concepts are defined based on extensive experience, creative thinking and combining knowledge from different markets. Predictive modeling in an early stage indicates final performance of the concept.
We proudly present an example of this way of working at our booth. Together with NXP ITEC Nijmegen we have developed a high-speed XYZ manipulator, capable of gluing more than 36.000 dies/hours, with an accuracy of ±5 µm and an acceleration of 50 m/s^2.

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5652 AM EINDHOVEN (NL)
Contact person: Mr. Leo Sanders
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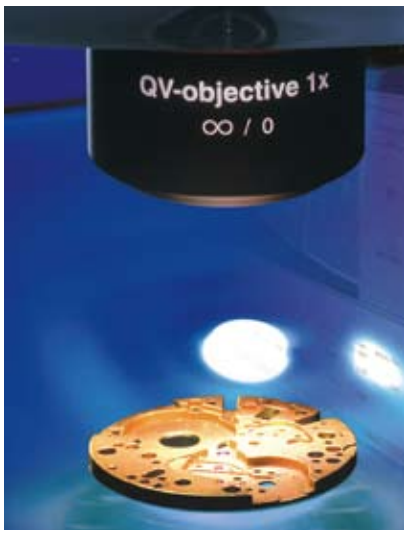
MITUTOYO NEDERLAND BV 07



Mitutoyo Nederland BV is a full daughter of the Japanese Mitutoyo Manufacturing Corporation Ltd, the world's biggest manufacturer of precision measuring instruments. In the Netherlands, Mitutoyo offers, besides the full product range of over 5,000 different precision instruments, also full service support, product and general metrology training and a RVA-accredited calibration service. Most instruments are operational in the over 400 m^2 showroom in Veenendaal. On the Precision Fair, Mitutoyo will display the latest generation of form measuring instruments, vision and tactile 3D measuring machines and a selection of products out of the comprehensive product range.

MITUTOYO NEDERLAND BV
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t +31 (0)318-534911
r.meijer@mitutoyo.nl
www.mitutoyo.nl

MOGEMA BV 6

Mogema is a mechatronical system supplier, with over 50 years of experience. With around 135 employees, an advanced machine shop, specific know-how on high-tech machine operations and assembly, Mogema is your partner for development and production of high-tech components, baseframes, complex assemblies and vacuum technology.

Mogema is part of Aalberts Industries. Apart from our own competences, within Aalberts Industries Mogema has a wide network of specialists active in special production techniques and surface treatments. Herewith Mogema always has the right partners to produce your complex modules.

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Industrieweg 9,
8084 GS 'T HARDE (NL)
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Mr. Hans Herman Doude /
Mr. Elgar van der Bij
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info@mogema.nl
www.mogema.nl

MODUS HIGH-TECH ELECTRONICS GMBH 21

MODUS HIGH-TECH ELECTRONICS GMBH
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D 47877 WILLICH (D)
Contact person: Mr. G. Landt
t +49-2154895900
info@modus-hightech.de
www.modus-hightech.de

MOLENAAR OPTICS VOF 104

Molenaar Optics offers innovation support for applications using optical- and opto-mechanical components. Designs may contain both standard as well as custom-made parts. Optical components comprise simple lenses, mirrors, prisms and complex multi-element laser objectives for materials processing or telecentric camera lenses for vision systems. Opto-mechanical part series contain holders for optics as well as manual and motorized positioning systems. Molenaar Optics also advises and offers optical measuring instruments, from basic microscopes and modular microscope components to digitally controlled profile projectors.

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3707 SH ZEIST (NL)
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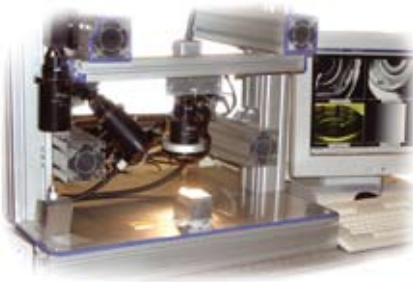
t +31 (0)30-6951038
info@molenaar-optics.nl
www.molenaar-optics.com



MTSA TECHNOPOWER 162

MTSA Technopower is a system supplier. We design, manufacture and maintain customer-specific equipment, installations, special machines and (sub) systems. MTSA Technopower offers innovative Total Solutions, from feasibility studies up to manufacturing, commissioning and service. From a well-balanced mix of engineering disciplines, procurement and own manufacturing capacity, we add value to processes and activities of our customers. Flexibility and the ability to translate customer requirements and specifications efficiently into technical solutions in compliance with the relevant QHSE norms and regulations are our main drivers.

Please visit our website, www.mtsa.nl, and our stand (162) during the Precision Fair 2010.

MTSA TECHNOPOWER
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6827 AT ARNHEM (NL)
Contact person:
Mr. Rob van der Sluis
t +31 (0)26-3636310
mail@mtsa.nl
www.mtsa.nl

MURAAD 119

Stereo mikroscope with LED from Askania /Schott.
Video microscope from Dr Schneider.
Contour-Roughness from T&S.

MURAAD
Kerkweg 73, 8091 EV WEZEP (NL)
Contact person: Mr. A. de Raad
t +31 (0)38-3765858
info@muraad.nl
www.muraad.nl

MYTRI BV 119

Mytri, your partner in precision granite
Within our company, applications and products in granite according to the highest possible accuracies are being manufactured. Mytri provides a standard delivery program with precision granite surface plates, squares, measuring beams, straight edges and so on. Beside this, Mytri can be your partner in your developing and innovation stage of your products and machines in which you would like to integrate granite with extreme accuracies. Mytri has the possibilities for many applications and processing according to your design drawings. For prototypes as well as serial work. Mytri also has a program for cast iron surface tables and components.

MYTRI BV
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7336 AZ APELDOORN (NL)
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t +31 (0)55-5429174
info@mytri.nl
www.mytri.nl

NATIONAL INSTRUMENTS 15

National Instruments offers an embedded design and prototyping platform that combines the LabVIEW graphical development environment with off-the-shelf, microprocessor and FPGA-based measurement and control hardware for design, simulation, rapid prototyping, implementation, validation and verification of embedded systems. Using the intuitive LabVIEW graphical dataflow programming environment, engineers and scientists can rapidly develop and iterate on designs, reducing the time from concept to prototype. After prototyping and validating the design, domain experts can then deploy these custom designs to an extensive range of off-the-shelf NI hardware or deploy to custom hardware.
Come to our booth 15 for more information.

NATIONAL INSTRUMENTS
Pompmolenlaan 10,
3447 GK WOERDEN (NL)
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t +31 (0)348-433466
info.netherlands@ni.com
www.ni.com/netherlands

NEITRACO GROUP 71

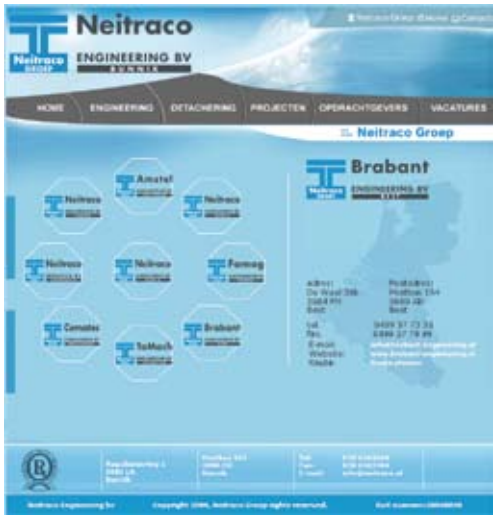
The Neitraco Group is a collaboration of engineering companies in the Benelux. Our core competences are Projects, Detachment and Realization in the fields of mechatronics, (precision) engineering and tooling in the areas of aviation, civil, geodesy, transport, heavy and light rail, nanotechnology, food and healthcare.

A selection of our customers: ASML, Fokker, Philips, Nedtrain. SBMGustoSMC, Vanderlande, VDL Group.

Our mission is technical support to collaborate with our customers to achieve mutual success. We achieve this with approximately 300 highly motivated and educated employees.

Our slogan is “Engineering in 4D”.

NEITRACO GROUP
Postbus 164, 5680 AD BEST (NL)
Contact person:
Mr. J.M.Ph. van de Laak
t +31 (0)499-377333
sjef.van.de.laak@brabeng.nl
www.neitracogroep.nl



NEWPORT SPECTRA-PHYSICS GMBH 128

Newport Corporation is a globally recognized leader in advanced technology products and solutions for fields such as Research, Life & Health Science, Aerospace & Defense, Industrial Manufacturing, Semiconductors, and Microelectronics. With decades of experience in motion control, Newport has both the capability and the capacity to provide the optimum solution for your individual needs, whether it be a standard product, an OEM solution or a fully customized engineered system. At the Precision Fair, Newport main displays will include nanopositioning linear stages, controllers, hexapod, the new Conex™ family of compact and simple photonic control devices and the New Focus™ family of picomotor actuators and components.

NEWPORT SPECTRA-PHYSICS GMBH
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D 64291 DARMSTADT (D)
Contact person: Mrs. Bettina Heil
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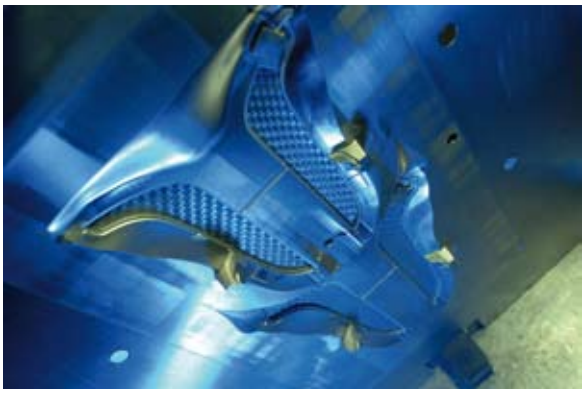
germany@newport.com
www.newport.com

NORMA GROEP BV 16

Norma: Your System Integrator
Norma employs more then 400 motivated people divided over three locations in Europe and one location in Asia. Norma has secured a strong position as a "low-volume, high-mix" system supplier over the entire life cycle of complex modules. We offer our OEM clients a service throughout the complete value chain. From development, production and assembly to testing and service.

Capabilities:
- Development, construction – Build to specification
- Configuration Management
- Ultra-precision machining – sizes: 0.5 m^3
- Precision machining – sizes: 5 m^3
- Dipbrazing, vacuum brazing
- Machining of alloys, titanium, inconel, high-grade aluminium.
- Module assembly, also in clean room conditions (10.000 class)
- UHV and UCV production
- Design, manufacture of composite products and assemblies
- RF expertise (wave guide manufacturing, testing)
- Complex cabling & electrification

Field of experience:
- Semiconductor
- Automotive
- Defense
- Aerospace
- Consumer Lifestyle



NORMA GROEP BV
Granaatstraat 54,
7554 TR HENGELO (NL)
Contact person:
Mr. R. Roozeboom
t +31 (0)74-2916579
info@norma-holding.nl
www.norma-holding.nl

NIJDRA GROEP 30

The Nijdra Group is a Dutch full-service and family-owned organization (based near Amsterdam). We are specialized in precision metal working, assembling and engineering of high-precision components and mechatronic (sub)assemblies. Cusomters include Philips Healthcare, PANalytical, Stratec, ASML, Grass Valley (Thomson) and KLM. The Nijdra Group is ISO 9001 and ISO 14001 certified.
Due to our high skill in operating automated and robotized machines we can produce 24/7 unmanned. Cost-efficient production on, for instance, our robotized 5-axis milling machine and our Flexible Manufacturing System (FMS) is especially for low volumes, high mixtures and short delivery times. With our experience over the years in several high-tech branches we can create a surplus value for our customers by supporting them in the design of new projects, but also with value engineering of products already introduced.

NIJDRA GROEP
Postbus 85, 1462 ZH
MIDDENBEEMSTER (NL)
Contact person: Mr. D.J. van Dijk
t +31 (0)299-689900
dijk.d@nijdra.nl
www.nijdra.com

NTS-GROUP 52

The NTS-Group takes responsibility for developing, producing and optimising opto-mechatronic systems and mechanical modules and components for leading OEMs, enabling its customers to focus fully on the marketing, sales and service of their products.
The NTS-Group has incorporated the key machine manufacture links of the chain within its own organisation, thereby maintaining an optimal hold on manufacturability, costs and logistical performance. Competence, knowledge and know-how complement each other within the group. Furthermore, its companies in the Netherlands, the

Czech Republic, Israel and China allow the NTS-Group to respond flexibly to market demand. The unique and international cluster of strengths within the NTS-Group ensures that customers are able to deliver competitively priced, high-quality machines within a short timeframe to their market.

NTS-GROUP
Postbus 7093,
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t +31 (0)40-2597200
info@nts-group.nl
www.nts-group.nl

OCEAN OPTICS BV 150

As leading manufacturer of miniature fibre optic spectrometers and accessories, we have enabled diverse applications in medical and biological research, environmental monitoring, life science, science education, and process and quality control. Known as the industry innovators we have many new products to show that complement our range of spectrometers, optical sensors, metrology instrumentation, light sources, sampling accessories, fibres and probes. Come see our NIRQuest and SIR infrared spectrometers or the latest Raman spectroscopy systems. We will also show you the latest Jaz developments, new light sources and more.

OCEAN OPTICS BV
Geograaf 24,
6921 EW DUIVEN (NL)
Contact person: Mr. Henri Tellegen
t +31 (0)26-3190500
info@oceanoptics.eu
www.oceanoptics.eu

OPTIWA BV 99

More possibilities in complex precision parts
Optiwa is a supplier of complex accurately machined parts and mechanical assemblies. Optiwa is able to offer you efficient production for parts with tolerances down to 0.5 µm accuracy. (Dimensional, form and location tolerances within the sub-micron range.)
In addition to turning and milling processes, Optiwa offers: grinding, hard turning, polishing, lapping and all possible surface and heat treatments. Various parts of the production area are climate controlled. Several CNC machines are automated by robot installations.
Parts are used in electron microscopes, air bearings ,optical modules and specific medical and analytical equipment.

OPTIWA BV
Postbus 4794,
5953 ZK REUVER (NL)
Contact person: Mr. Ing. A. Wullms
t +31 (0)77-4769900
twullms@optiwa.nl
www.optiwa.nl

PHILIPS GTDM 11

Philips GTDM, your bridge between product development and massproduction
Philips GTDM consists of a group of technological specialists with expertise and experience in product development and mass production. We realize and improve production processes or equipment for mass production. We supply the whole range from single operator posts up to complex automated mass-production lines. Main activities are machine design, process development, project execution, system integration and service, which are built around our core competences laser processing, micro welding, small parts handling, machine vision and light measurement.

PHILIPS GTDM
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B 2300 TURNHOUT (B)
Contact person: Mr. Huub Camp
t +32-14401281
info.gtdm@philips.com
www.philips.com/mechanization

PRECISION MICRO LIMITED 9

Precision Micro is one of the largest specialist components manufacturing operations in Europe, innovating, developing and utilizing a unique combination of manufacturing processes to meet the needs of customers worldwide.
The company has pioneered developments is precision etching, electroforming and mechanical forming, achieving standards admired by the industry and appreciated by customers in automotive, communications, aerospace, electronics, medical, military and other high-tech engineering industries.

PRECISION MICRO LIMITED
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info@precisionmicro.com
www.precisionmicro.com

POINT-ONE 60

Point-One is an open association of high-tech industry and knowledge institutes with research and development in the Netherlands on nanoelectronics, embedded systems, and mechatronics. Together, these technology domains are the cornerstone of a global value chain with applications in healthcare, leisure, energy, transport, security and ICT.
The mission of Point-One is to realize the Phase2 innovation program "From Good to Great in Dutch Technologies". This program is a joint initiative of the Point-One members and the Ministry of Economic Affairs, aiming at strong economic growth in the Netherlands.

POINT-ONE
High Tech Campus 69-3C,
5656 AG EINDHOVEN (NL)
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t +31 (0)88-5554333
arjan.gelderblom@point-one.nl
www.point-one.nl

PROKONPACK 83

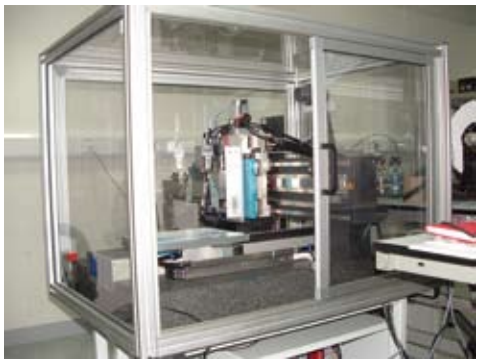
Prokonpack is always looking for new items to complete our assortment. From now on we can also offer you a wide range of plastic containers! Containers square or round. With or without compartments. With or without hinges. Transparent or colored. In all forms, shapes or sizes. The total range consists of several hundred different containers.
Ideal for storing, transporting or presenting your product. Optionally, we can offer you a print or a custom-made interior for optimal protection. Your product, our packaging… The ideal match!

PROKONPACK
Postbus 8732,
5605 LS EINDHOVEN (NL)
Contact person: Mrs. A. de Lepper
t +31 (0)40-2919393
angela@prokonpack.nl
www.prokonpack.nl

PROMIS ELECTRO-OPTICS BV 139

PROMIS ELECTRO-OPTICS BV
Postbus 194,
6600 AD WIJCHEN (NL)
Contact person: Mr. Ing. E. de Kler
t +31 (0)24-6488688
e.dekler@gotopeo.com
www.gotopeo.com

Q-SYS BV 103



Q-Sys offers a complete service, from initial application assessment, through feasibility and costing studies, system design, manufacture, calibration and commissioning. Bespoke system design is a speciality and we also offer a complete turnkey capability for multi-supplier configurations.

Additionally, we provide comprehensive technical support to maintain system availability at a maximum. Q-Sys offers cost-effective solutions for all motion control and positioning requirements. Some examples are: large-format digital printing, laser welding and cutting, flat panel display mastering, X-ray and optical inspection and holographic master creation.

Q-SYS BV
Korte Dijk 2,
5705 CV HELMOND (NL)
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t +31 (0)492-714434
h.over@q-sys.eu
www.q-sys.eu

REITH LASER BV 109

For more than 20 years, Reith Laser b.v. is the leading supplier of laser-processed products in Europe.

By using completely automatic production processes, we are capable to produce just one piece, but also larger series.
You can find our products all over the world and even beyond….
With our highly expanded and modern laser equipment (18 laser installations), we can offer you a great diversity of laser material processing activities:
- Laser (micro-) cutting
- Laser drilling
- Laser welding
- Laser micromachining

Reith Laser is active in precision industry, medical industry, aerospace, semiconductor and automotive industry.

REITH LASER BV
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6604 LK WIJCHEN (NL)
Contact person: Mr. ir. J. Reith
t +31 (0)24-3787564
info@reithlaser.nl
www.reithlaser.nl

RELIANCE PRECISION MECHATRONICS LLP 142

Reliance Precision Mechatronics LLP specialises in standard and special precision motion control components and small electro-mechanical assemblies available from stock or on short delivery. The standard range allows engineers to order small quantities via internet at stock prices for prototype development or large quantities for full production. We can cost-effectively modify the products or make complete to drawing.
Our standard range includes precision gears to AGMA Q14, precision ground rack, flexible shaft couplings, leadscrew assemblies, rack actuators, integrated motors and specialist stainless steel fasteners. Industries served include scientific instrument, medical, laboratory automation, printing, photonics, and process automation.

RELIANCE PRECISION MECHATRONICS LLP
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4879 AH ETTEN-LEUR (NL)
Contact person: Mr. John Bazuin
t +31 (0)76-5040790
sales@rpmechatronics.co.uk
www.rpmechatronics.co.uk

RENISHAW BENELUX BV 159

Renishaw is a global company with core skills in measurement, motion control, spectroscopy and precision machining. At the Precision Fair 2010, we will show recent innovations like RESOLUTE, a true absolute encoder system with excellent dirt immunity and extensive redundancy in scale code. This is world's first absolute encoder with 27-bit resolution at 36.000 rpm. A resolution of 1 nm can be achieved at up to 100 m/s for both linear and angular; and PH20, a 5-axis touchtrigger system for CMMs. Recently awarded with the MM award for 'most innovative measuring system' at the AMB 2010 exhibition in Germany.

RENISHAW BENELUX BV
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t +31 (0)76-5431100
philippe.reindersfolmer@renishaw.com
www.renishaw.nl

TECHNISCHE HANDELS-ONDERNEMING DE RIDDER BV 113

Submicron-machining demands experienced partners on the highest level. De Ridder THO is your "sparring partner" when you have to make things smaller and even more precise.
Famous and reliable names like Sodick, Kugler and Schleifring stand for defining your process in the very best sub-micron machining configuration.
De Ridder helps you realize the (almost) impossible.

TECHNISCHE HANDELSONDERNEMING DE RIDDER BV
IBC-weg 10, 5683 PK BEST (NL)
Contact person: Mr. J. Wegman
t +31 (0)499-392050
wegman@ridder.net
www.ridder.net

W.J. ROELOFS MEETINSTRUMENTEN BV 121

In 50 years, Roelofs Meetinstrumenten has built a reputation as importer of measuring instruments from manufacturers in England, Germany, the Netherlands and Switzerland, such as Marcel Aubert S.A., ARA, Diatest, Feinmess Suhl, Isatool, Kordt, L&W, Mytri, Opus, Sylvac, Tesa, Trimos, Wyler, YPG, and Zeiss TSK. With the support of our suppliers, we are capable to offer a wide range of solutions for measuring problems, in order to advise the right measuring instrument. On a regular basis we have presentations in our show room and seminar room, in order to inform our customers about the latest new product developments.

W.J. ROELOFS MEETINSTRUMENTEN BV
Kernreactorstraat 42-44,
3903 LG VEENENDAAL (NL)
Contact person: Mrs. I. Roelofs
t +31 (0)318-521580
info@roelofsmeetinstrumenten.nl
www.roelofsmeetinstrumenten.nl

ROFIN-BAASEL BENELUX BV 44

Rofin is een vooraanstaande leverancier van industriële lasers en lasersystemen voor materiaalbewerking. Op onze stand zal een nieuw type laserlassysteem worden getoond. Met dit systeem kan zowel handmatig als ook m.b.v. CNC worden gelast. Ook zal er een nieuw lasermarkeersysteem worden voorgesteld (de zgn. CombiLine Cube met 30 Watt fiberlaser). Naast bovenstaande zaken kunt u op onze stand o.a. terecht met vragen over lasermicrolassen, -fijnsnijden, -perforeren, -structureren, -ableren, -herstellassen van matrijzen en kunststoflassen.

ROFIN-BAASEL BENELUX BV
Edisonweg 52,
2952 AD ALBLASSERDAM (NL)
Contact person: Mr. Hans Matser
t +31 (0)78-6931037
h.matser@rofin-baasel.nl
www.rofin.com

ROMÉDES ENGINEERING BV 155

Romédes Engineering is an energetic company, which characterises itself by enthusiasm, drive and precision. The group of engineers is an energetic team of highly qualified and well-attuned specialists.
Based on the question c.q problem definition, with a clearly defined process, Romédes will generate a resourceful solution.
The realised projects consist of fast moving machines for precision engineering industries, assembly machines for electronics components, handling equipment for the medical and related industries. We show several fast moving machines which function with approx. 600 strokes per minute with a positioning accuracy within 10 µm.

Real engineers should not let the opportunity pass by to get acquainted.

ROMÉDES ENGINEERING BV
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Contact person: Mr. E.M. Berendsen / Mr. R.J.M. Wessels
t +31 (0)544-356180
info@romedes.nl
www.romedes.nl

ROMICON 74

Romicon is supplier of components for pneumatic and electric motion control, chemical liquid control, process gas control and high-vacuum control components. As partner of CKD, Romicon provides custumers with total solutions for all aspects of semiconductor devices. including gas and fluid system supply and exhaust. Romicon will show a 3-way miniature valve from MATRIX with a width of 8 mm and flow of 30 Nl/min. This valve responds within 1 millisecond (time to energize)

ROMICON
Vlijtweg 1D-F,
8191 JR WAPENVELD (NL)
Contact person: Mr. G. Wezenberg
t +31 (0)38-4479181
g.wezenberg@romicon.nl
www.romicon.nl

DE ROOY SLIJPCENTRUM BV 149

De Rooy Slijpcentrum (Grinding Centre), founded in 1939, has been a reliable supplier to a number of well-known industrial companies for many years. The company has developed in the last decade into a centre of allround grinding and milling excellence.

Capabilities:
- Flat and profile grinding
  7,000 x 1,750 x 1,500 mm
- Surface grinding
  6,000 x 1,400 x 500 mm
- Cylindrical grinding
  Ø 1,000 x 4,000 mm
- Internal grinding
  Ø 2,000 x 1,300 mm
- Milling 8,000 x 2,500 x 1,000 mm

Moreover, De Rooy is specialized in delivery of complete precision components.
De Rooy's extensive, modern machine park offers a high level of both flexibility and precision. De Rooy Slijpcentrum's quality control system conforms with – and is qualified by – TÜV-Nederland for ISO 9001:2000.

DE ROOY SLIJPCENTRUM BV
Postbus 781,
5600 AT EINDHOVEN (NL)
Contact person:
Mr. M.H.M. de Rooy
t +31 (0)40-2813459
m.derooy@rooy.nl
www.rooy.nl

SARIX SA 157

Always at the leading edge of the highest micro-machining performance, SARIX offers a new machining concept, the 3D Micro EDM Milling. Complexes cavities can be achieved down to real micro scale of 10 micron with accurate tolerance down to 1 micron within high surface finishing of R_a < 0.1.
SARIX designs, manufactures and markets highly efficient Micro-EDM equipment typically used in many industries, such as medical, die-making, microelectronics, automotive, aerospace as well as universities.
With its reliable machine concept, simultaneously using the Micro-Drilling and -Sinking and the EDM Milling, SARIX contributes to the development of new high-tech products from R&D to Mass Production reliability.

SARIX SA
Via Ai Molini 22,
CH 6616 LOSONE (CH)
Contact person: Mr. Reto Gallera
t +41-917858171
info@sarix.com
www.sarix.com

SCHAEFFLER NEDERLAND BV 75

High precision and equal course: detail of a manipulator for an X-ray measuring machine.

Schaeffler Nederland B.V. is part of the world-wide operating Schaeffler Group. With her brands LuK, INA and FAG, the Schaeffler Group belongs in the world of drives to the leading suppliers of rolling bearings, linear systems, maintenance products and services for all existing fields of application in the sectors Automotive, Industry and Aerospace.

On our booth, number 75, we will show you our latest developments of:
- IDAM (INA Drives & Mechatronics) – direct drives and mechatronics.
- INA Linear – compact linear unit driven by rolled ballscrew and an overview of linear products.
- Barden (part of FAG) – precision bearings.
- Blis – ballscrews.

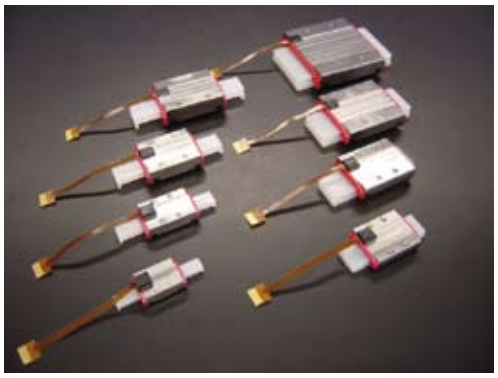
SCHAEFFLER NEDERLAND BV
Postbus 50,
3770 AB BARNEVELD (NL)
Contact person:
Mr. F. Kroes
t +31 (0)342-403028
f.kroes@schaeffler.com
www.schaeffler.com

SCHNEEBERGER GMBH 40

Schneeberger devellops and produces for already more than 80 years linear guides, guiding systems and complete turn-key positioning systems for the high-tech market. For regular environments as well as for clean-room and vacuum applications where µm or nm accuracy is needed. More and more we cast base frames for our systems out of mineral cast with high benefits regarding damping.

Schneeberger is globally oriented and has worldwide companies and representatives.

SCHNEEBERGER GMBH
p/a Beekerweg 65,
6235 CB ULESTRATEN (NL)
Contact person: Mr. Maurice Bastings
t +31 (0)43-3654532
maurice.bastings@schneeberger.com
www.schneeberger.com



SCHUT GEOMETRISCHE MEETTECHNIEK BV 1

Schut Geometrical Metrology is an international organization, specialized in the development, production and sales of measuring instruments and systems. Products by Schut are the 3D CNC coordinate measuring machines "DeMeet" (video, touch probe and multi-sensor models) and DeMeet-A7 in touch probe version, "DF-System" measurement fixtures, and "Approve" SPC software. Besides products such as Magnescale (electronic scales, gauges, etc.), TESA and Mitutoyo (measuring instruments), Fisso (stands), Käfer (dial indicators), Witte ("Alufix" fixture systems), Peak (magnifiers), LMW (gauges), Schwenk and Kroeplin (internal / external measuring tools) and Renishaw (probe systems), Schut offers an extensive range of measuring equipment in various price ranges.

SCHUT GEOMETRISCHE MEETTECHNIEK BV
Postbus 5225,
9700 GE GRONINGEN (NL)
Contact person:
Mr. Rob von Hebel
t +31 (0)50-5877877
schutnl@schut.com
www.schut.com

SCHUT PRECISIONPARTS BV 42

Schut PrecisionParts is a state-of-the-art subcontractor for mechanical parts and assemblies. We are specialised in precision machining, assembly and grinding. Our company offers a fully conditioned production facility, high-tech machinery, a certified quality system, 3D measurement facilities. A combination of these high standards and services enables us to function as a reliable partner.

SCHUT PRECISIONPARTS BV
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2950 AB ALBLASSERDAM (NL)
Contact person: Mr. J.M. Schut
t +31 (0)78-6915666
info@schutprecisionparts.nl
www.schutprecisionparts.nl

SENTECH SENSOR TECHNOLOGY BV 137

Sentech Sensor Technology BV thinks and acts with a view to meeting the customer's needs. Our specialised trading company supplies integrated sensor solutions tailored to fit the specific purpose for which the customer will use them. Sentech regularly delivers assembled sensors ready for immediate service, pre-fitted with casing, plug, cable or connector. The total sensor product will often embody ingenious solutions to specific problems that came to light during the customer's everyday operations. At Sentech, we do not merely supply products, we advise, integrate and assemble.

SENTECH SENSOR TECHNOLOGY BV
Postbus 21,
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Contact person:
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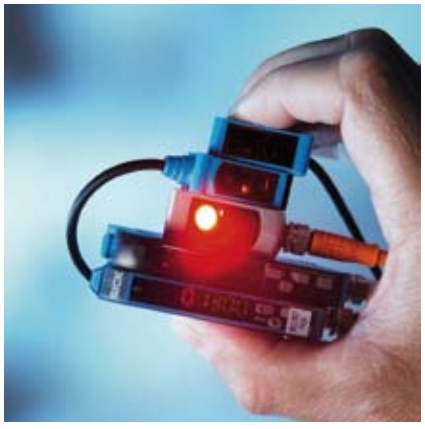
t +31 (0)73-5183121
marco.leeggangers@sentech.nl
www.sentech.nl

SICK BV 166

SICK B.V. is a subsidiary of SICK AG, which has a worldwide presence with numerous subsidiaries and affiliated companies, agencies and sales offices, and is one of the leading producers of sensors and sensor solutions. SICK supplies optical sensors, inductive sensors, positioning encoders, distance measurement systems, vision sensors and cameras, barcode-reading scanners, safety systems and level-measurement equipment for process automation.



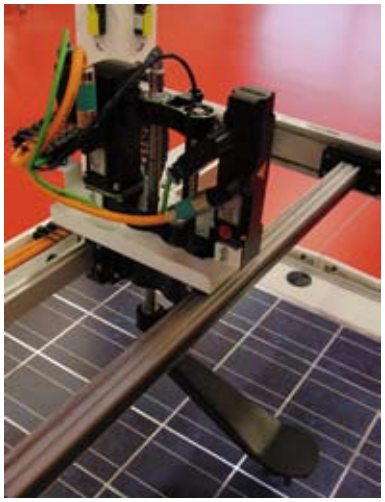
SICK BV
Leijenseweg 111,
3721 BC BILTHOVEN (NL)
Contact person: Mr. T. Bernardus
t +31 (0)30-2292544
info@sick.nl
www.sick.nl

SKF NEDERLAND 141

SKF Group is the leading global supplier of products, solutions and services within rolling bearings, seals, mechatronics, services and lubrication systems. Services include technical support, maintenance services, condition monitoring and training. SKF groups its technologies in five platforms: Bearings and Units, Seals, Mechatronics, Services, and Lubrication Systems. By utilizing capabilities from all or some of the platforms, SKF develops tailor-made offers for each customer segment, helping customers improve performance, reduce energy use and lower total costs, while bringing increased added value to SKF.

SKF NEDERLAND
Kelvinbaan 16,
3439 MT NIEUWEGEIN (NL)
Contact person:
Mr. Ringo van Voorst
t +31 (0)30-6307372
ringo.van.voorst@skf.com
www.nederland.skf.com

STAMHUIS LINEAIRTECHNIEK BV 168



The market in Linear Motion is moving rapidly. Machine builders are being challenged to achieve higher levels in precision, accuracy and speeds.

STAMHUIS Lineairtechniek is always searching for the latest Technical Solutions in Linear Techniques. New products you will find with us. We claim that we offer the best innovative solutions at a good price ratio making your machines economical and environmentally friendly.

Please visit our booth, number 168, and see our latest products:
- The latest Schneeberger Linear Positioning Table for high-vacuum applications
- The latest SBC Linear Guide Systems.
- Bahr Modultechnik: New Handling System for the solar industry
- The latest Active Balancing System in collaboration with University of Twente, Mr. Volkert van der Wijk M.Sc.

STAMHUIS LINEAIRTECHNIEK BV
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t +31 (0)571-272010
info@stamhuislineair.nl
www.stamhuislineair.nl

STEEN METROLOGY SYSTEMS SA 36

From the outset in 1982, SMS has offered a full range of high-quality geometrical measuring equipment with consultancy, support, training and service back-up.
To achieve this, SMS (located on the motorway E25 at 35 minutes from Maastricht, direction Luxembourg) uses in its own laboratory a variety of high-precision measuring equipment from its general sales range.

STEEN METROLOGY SYSTEMS SA
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B 4052 CHAUDFONTAINE (B)
Contact person: Mr. R. Steenacker
t +32-43687080
roger.steenacker@smsbenelux.be
www.smsbenelux.be

ST INSTRUMENTS BV 118

ST Instruments is a company specialized in micro- and nanotechnology for surface analysis. Our product portfolio consists of a broad range of instruments in the fields of profilometry, film thickness measurements, hardness, scratch and tribology testers, Atomic Force Microscopy, surface analysis, 3D software for SEM, etc.
ST Instruments will present several optical profilometry technologies. The new Plu Neox combines confocal, interferometry and spectroscopy in a single instrument and the InfiniteFocus can measure samples 360°, for form, dimensions and surface parameters.

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3360 AA SLIEDRECHT (NL)
Contact person:
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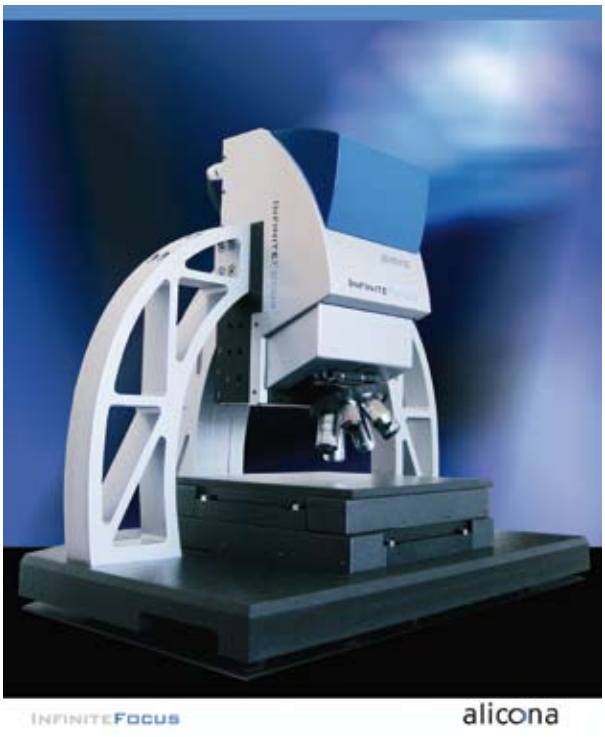
info@stinstruments.com
www.stinstruments.com



STT PRODUCTS BV / SYSTEM125® 176

STT Products is supporting the manufacturing and production (medical) industry, laboratories and research institutes. "Solving a problem of our customer by developing the best fitting solution", is our slogan. Therefore, we are following the all in-house concept, by having engineering, machining and assembly skills in-house. The company is well equiped with CNC multi-axis milling machines, lathes and anodize equipment. The all in-house concept guarantees short leadtimes. Next to the engineering activities, STT supplies a modular system: System125®. The system gives technicians the possibility to build quickly and flexible prototypes, constructions for test and measurement purposes, etc.

STT PRODUCTS BV / SYSTEM125®
Leuringslaan 48,
9356 VM TOLBERT (NL)
Contact person:
Mr. Ing. M.A. Kooistra
t +31 (0)594-514445
info@sttproducts.nl
www.sttproducts.nl

TECHNOBIS GROUP 82

Technobis Group is a developer and supplier of high-tech instruments and modules for the most dedicated national and international OEM companies.

Technobis Mechatronics (TBM)
Technobis Mechatronics specializes in carrying out complete product development projects, from an initial idea to a successful turnkey product, prototype or series product. Building on over 14 years of experience, we have emerged as a trusted supplier of mechatronic systems in a wide range of markets.

Technobis Fibre Technologies (TFT-FOS)
Technobis Fibre Technologies specializes in the development and supply of total solutions in high-speed, multi-sensor fibre interrogators and sensors.

TECHNOBIS GROUP
Geesterweg 4b,
1911 NB UITGEEST (NL)
Contact person: Mrs. E. Schipper
t +31 (0)251-248432
info@technobis.nl
www.technobis.nl

TE LINTELO SYSTEMS BV 92

Te Lintelo Systems BV is specialized in sales and services in the field of optical, opto-electronical and laser components and systems. In this field, we represent prominent suppliers for the Benelux. In cooperation with well-educated engineers with a long experience in optics, opto-electronics and mechanics, Te Lintelo Systems designs and produces customer-made systems as well.
We will demonstrate SIOS Laserinterferometric vibrometers ideal for accurate, contactless determination of position changes of objects or surfaces.

TE LINTELO SYSTEMS BV
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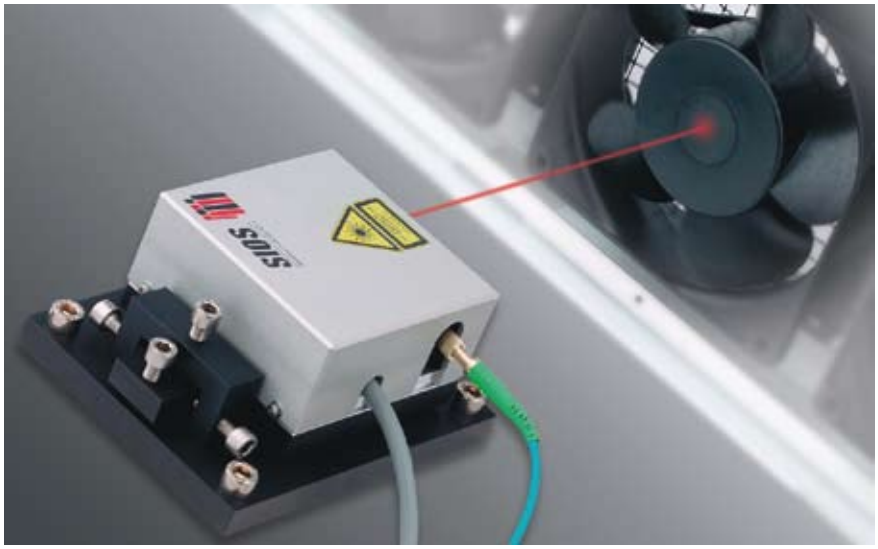
6900 AA ZEVENAAR (NL)
Contact person: Mr. Ben te Lintelo
t +31 (0)316-340804
sales@tlsbv.nl
www.tlsbv.nl



TECHNOLOGY TWENTE BV 6

Technology Twente BV is a working unit of Aalberts Industries Industrial Products NV. Our major competences are complex components for use in high-tech industries.
Technology Twente supplies its products to diversified markets such as the Medical, Optical, Aerospace, Defense, Energy production, Automotive, On/Offshore, and Semiconductor industries.

TECHNOLOGY TWENTE BV
Granaatstraat 54,
7554 TN HENGELO (NL)
Contact person: Mr. Alex Cloo
t +31 (0)74-2438866
acloo@technologytwente.nl
www.technologytwente.nl

TEESING SUBMICRON TECHNOLOGY 95

Teesing supplies components for applications in a wide variety of products, assemblies and systems associated with gases and liquids used for semiconductor processing. Ranging from cooling systems, bulk storage gas cabinets, gas monitoring applications, bulk filtration and purification to point-of-use gas supply. For the HP and UHP applications, Teesing offers high-quality components and sub-assemblies, such as piping, valves, regulators, tubing, manifolds, assemblies, and systems are supplied to semiconductor toolmakers and meet the stringent demands of the semiconductor industry. Double packed and produced under cleanroom conditions.

TEESING SUBMICRON TECHNOLOGY
Postbus 16, 2280 AA RIJSWIJK (NL)
Contact person: Mr. H.H. Heymans
t +31 (0)70-4130750
h.heymans@teesing.nl
www.teesing.com

TEGEMA GROUP 134

The Tegema Group develops, innovates and realizes products, processes, systems, modules, and apparatus from the idea or specification phase up to a functional model, prototype or pre-production series. In doing so, we take care of the means of production and assembly, tooling and test equipment, from the problem definition up to and including realization and commissioning.
We realize total solutions using a project-oriented approach. For specific knowledge and skill, we work closely with specialist companies and institutes. We also strive to work as much as possible and jointly develop together with our customers.

TEGEMA GROUP
Science Park 5080,
5692 EA SON (NL)
Contact person:
Mr. Martin van Acht
t +31 (0)40-2677677
mvacht@tegema.nl
www.tegema.nl

TESA BENELUX 12

Tesa is a Swiss company that produces precision measuring equipment since 1941. Tesa will show following new products at the 2010 edition of the Precision Fair that have been developed to make complex applications simple without losing performance :

- Multi Gage: portable measuring arm.
- Tesa Scan 52: new generation of optical measuring centres with artificial intelligence.
- Tesa Visio 300 DCC: motorised optical measuring machine.

TESA BENELUX
Van Elderenlaan 1,
5581 WJ WAALRE (NL)
Contact person:
Mr. Paul Siebens
t +31 (0)40-2220608
pascal.siebens@
hexagonmetrology.com
www.tesabs.ch

THE HOUSE OF TECHNOLOGY 56

THE HOUSE OF TECHNOLOGY
Postbus 7505,
5601 JM EINDHOVEN (NL)
Contact person: Mr. M. van de Ven
t +31 (0)6-19864495
marty.van.de.ven@
thehouseoftechnology.nl
www.thehouseoftechnology.nl

TNO INDUSTRIE EN TECHNIEK 33

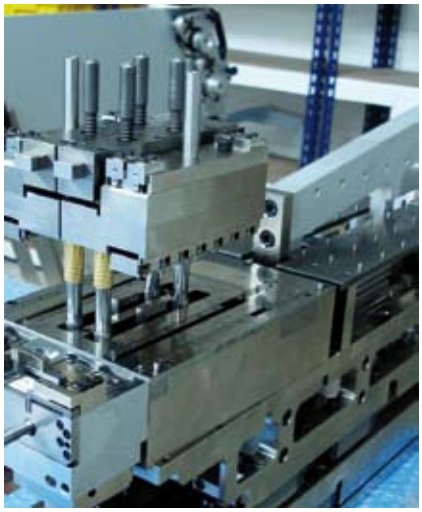
TNO INDUSTRIE EN TECHNIEK
Postbus 6235,
5600 HE EINDHOVEN (NL)
Contact person: Mrs. E. Janssen
t +31 (0)40-2650102
elma.janssen@tno.nl
www.tno.nl

TOTAL SUPPORT (TOTAL SUPPORT GROUP) 32

The core competence of the Total Support Group is technical knowhow with a focus on product design and mechanical engineering. The group consists of independently operating companies and employs approximately 120 people. The company executes turn-key technical projects, but also offers support on customer site.
As a full-service partner, the Total Support Group discusses new innovative product or mechanization ideas with her customers, proposes a design, industrialises the design proposal, manufactures prototypes and is able to bring the product into production. The group has a long and international experience in various market segments, such as the medical, the automotive and the professional market, and the food sector.

TOTAL SUPPORT (TOTAL SUPPORT GROUP)
Furkapas 8,
5624 MD EINDHOVEN (NL)
Contact person:
Mr. Frank van Stiphout
t +31 (0)40-2548222
info@totalsupport.com
www.totalsupport.com

TONASCO BV 155



Tonasco is a contract manufacturer focusing on automation projects and low-volume series production of single mechanical parts and assembled modules.

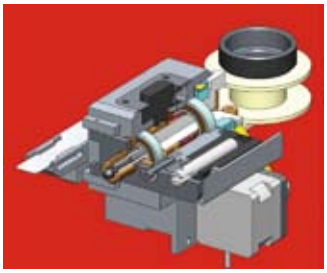
With our headquarters in Malaysia and sales office in the Netherlands, we can provide the best price and maintain a high quality level.

We are active in the following industries:

- Production Automation
- Medical & Analytical industry
- Automotive industry
- Food Processing and Packaging industry
- Tooling

TONASCO BV
Brugstraat 44,
1775 BG MIDDENMEER (NL)
Contact person: Mr. Toon Moors
t +31 (0)227-502835
sales@tonasco.com
www.tonasco.com

TRIOS PRECISION ENGINEERING 107



TRIOS Precision Engineering is a mechanical engineering firm offering high-grade, durable solutions in product development, product innovation and machine building. TRIOS specializes in developing precision-engineered solutions that perform under extreme conditions such as high vacuum and cryogenic temperatures. Constructing these solutions with high-performance metals and fabrics has become one of TRIOS' core competences, as well as transport and handling under cleanroom conditions and with extreme specifications. Over many years, TRIOS has acquired experience in various industrial sectors, with applications for equipment in the semiconductor industry, medical equipment, the food industry and space travel. TRIOS maintains a well-equipped production facility.

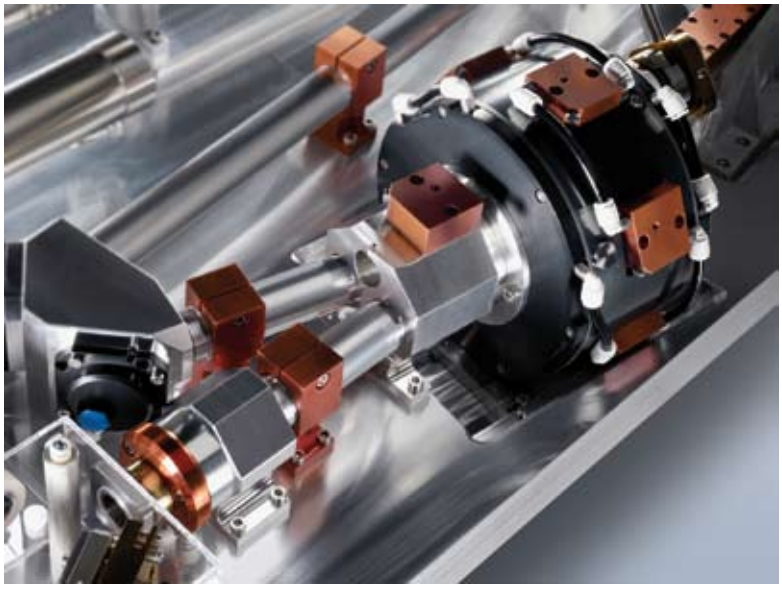
TRIOS PRECISION ENGINEERING
Nijverheidsweg 19,
7161 AA NEEDE (NL)
Contact person: Mr. H. Dijkstra
t +31 (0)545-280130
info@trios.nl
www.trios.nl

TRUMPF NEDERLAND BV 108

TRUMPF is distinguished for technical innovations in all of its fields of operation and for its tradition as well. The history of TRUMPF shows that, since its foundation in 1923, new ideas, continuity and consistent internationalization have been the hallmarks of the company's development.

The development of the laser at TRUMPF
TRUMPF plays a decisive role in the broad industrial application of the laser – in almost any field directly or indirectly. From the first use for the welding of watch springs to the latest trends in micro and macro processing – the success of the laser is partially due to the success of you as customers with TRUMPF as partner.

TRUMPF NEDERLAND BV
Postbus 837,
7550 AV HENGELO OV (NL)
Contact person: Mr. G. van der Endt
t +31 (0)74-2498498
info@nl.trumpf.com
www.nl.trumpf.com

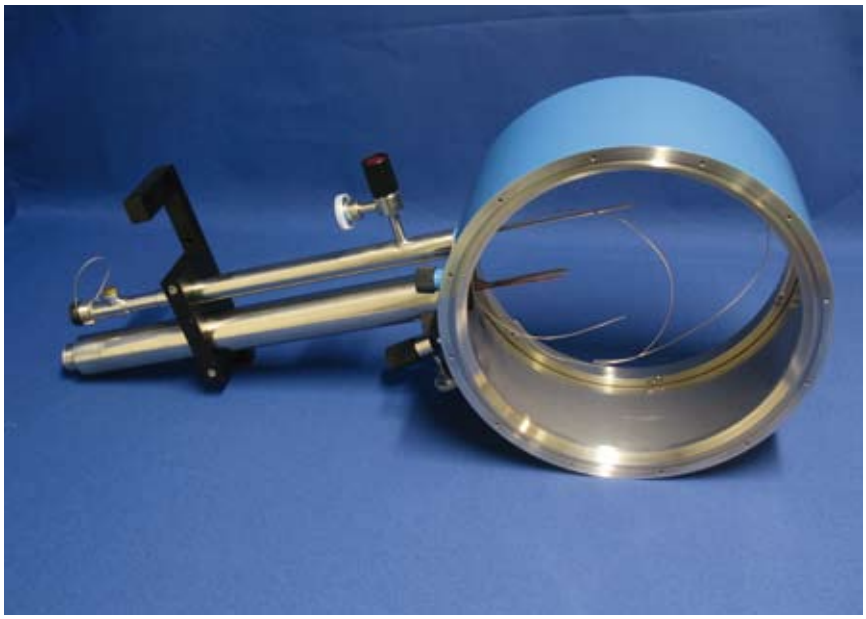


V.A.C. MACHINES 108

V.A.C. Machines is a distributor for industrial lasers and laser system technology (for region BeLux – Marking systems for BeNeLux) from TRUMPF. TRUMPF laser technology encompasses CO_2 lasers, solid-state lasers, marking lasers, and laser systems. It is difficult to find a manufacturing application that is not suitable for laser technology. Whether cutting, welding, marking, or forming – our wide spectrum of lasers and laser systems offers you a punctual/precisely accurate solution. The customers of our laser technology business field mainly come from the automotive industry and its suppliers, electronics and precision engineering, mechanical engineering, tool and mold making as well as medical technology.

V.A.C. MACHINES
Kleine Pathoekeweg 13-15,
B 8000 BRUGGE (B)
Contact person: Mr. K. Debbaut
t +32-50315083
info@vac-machines.be
www.vac-machines.be

VACUTECH BV 45



Vacutech has been creating high-quality technical solutions for a wide range of industries since 1982. We are a trusted and critical partner for the manufacture of precision mechanical and vacuum products for industrial applications. Vacutech employees are highly skilled and have flexible, state-of-the-art equipment at their disposal. In addition to our production department we have a specially equipped assembly department.
We produce, assemble, and test products, always in close consultation with our customers. We focus on professional and intensive collaboration, a process that is central in our philosophy. It makes us a partner you can talk to at your own level. Together we'll make it work!

VACUTECH BV
Polakweg 4a,
2288 GE RIJSWIJK ZH (NL)
Contact person: Mr. J. van Westing
t +31 (0)70-3990390
jeroen.van.westing@vacutech.nl
www.vacutech.nl

VARIODRIVE AANDRIJF- EN BESTURINGS-TECHNIEK BV 115

Variodrive is specialist op het gebied van high-end Motion Control, waarbij zij toeleverancier zijn voor de machinebouwers met besturingssystemen, servoregelaars, servomotoren zowel lineair als roterend, tot complete actuators in het submicrometerbereik. Alle berekeningen voor uiteindelijke bepaling van de juist in te zetten componenten behoren tot onze standaard werkzaamheden.

VARIODRIVE AANDRIJF- EN BESTURINGSTECHNIEK BV
Postbus 1525,
3260 BA OUD-BEIJERLAND (NL)
Contact person:
Mr. Ing. E.L.P. Hogervorst
t +31 (0)186-636280
sales@variodrive.nl
www.variodrive.nl

VERNOOY VACUÜM ENGINEERING BV 167

VERNOOY VACUÜM ENGINEERING BV
Archimedesbaan 8,
3439 ME NIEUWEGEIN (NL)
t +31 (0)30-6031293
info@vernooybv.nl
www.vernooybv.nl

VIBA NV 84

VIBA NV
Postbus 441,
2700 AK ZOETERMEER (NL)
Contact person:
Mr. A.L. van den Akker
t +31 (0)79-3306761
akker@viba.nl
www.viba.nl

VHE INDUSTRIAL AUTOMATION BV 17

VHE Industrial automation is an acknowledged specialist in the field of machine controls. We design and build complete systems and modules and represent also a number of renowned producers of components for driving and controlling machines. Our employee's technical knowledge and expertise guarantee inventive, innovative and cost-efficient solutions. Our key drive is boosting the success of our customers, because that is the best imaginable safeguard for continuity.

VHE INDUSTRIAL AUTOMATION BV
Postbus 1309,
5602 BH EINDHOVEN (NL)
Contact person:
Mr. A.P. van der Krieken
t +31 (0)40-2508500
paul.vanderkrieken@vhe.nl
www.vhe.nl

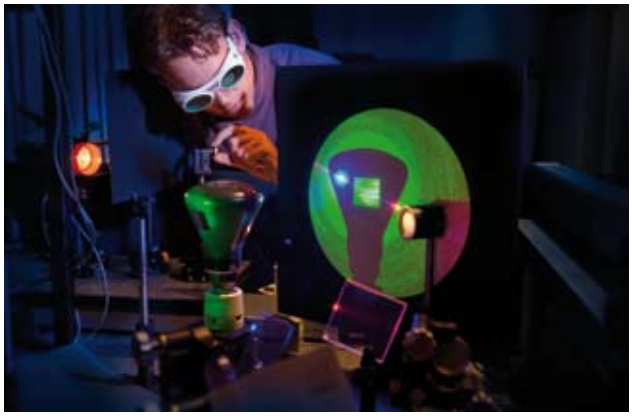
VSL 138

VSL is the national metrology institute of the Netherlands. VSL is part of Holland Metrology Group (known until March 2009 as the NMi Group).

VSL makes measurement results of companies, laboratories and organizations directly traceable to international standards. VSL makes an important contribution towards the reliability, quality and innovation of products and processes, both in business and society at large.

VSL is active in the field of:
- Calibration and Reference materials
- Contract research and consultancy
- Interlaboratory comparisons
- Courses and training

As the Dutch Metrology Institute, VSL presents the 7 SI-units at the VSL-stand.



VSL
Thijsseweg 11, 2629 JA DELFT (NL)
Contact person: Mrs. Marja Koster
t +31 (0)15-2691531
info@vsl.nl
www.vsl.nl

WENZEL-BENELUX 102

Wenzel-Benelux is a company selling 3D Measuring Machines, Vision Systems, Profile Projectors, height gauges, roughness and contour equipment and handtools. We also have our own calibration laboratory to NEN EN ISO 17025. Further, we have our own service department and we also provide clients with training and education. With more than 600 machines in the Benelux we are very strong in the market. In product measurement and training we are specialized. During the Precision Fair 2010, we will show several pieces of equipment from our newest agent Mahr. Also the latest software version Quartis from Wenzel will be shown and the Mobile Scan from ScanTec.

WENZEL-BENELUX
Sourethweg 5c,
6422 PC HEERLEN (NL)
Contact person: Mr. J. Kisters
t +31 (0)45-5660066
info@wenzel-benelux.com
www.wenzel-benelux.com

WIJDEVEN 72

Wijdeven is a modern, dynamic and technology-driven company with an experience of more then 70 years. Wijdeven is competent in areas of engineering, production and sales of transformers, coils, magnet assies and electro-mechanics.
Wijdeven has more than 100 well-motivated employees divided over two ISO-9001 certificated facilities in Oirschot and Ter Apel. Besides own facilities in the Netherlands, Wijdeven has co-activities in Eastern Europe and the Far East. We are known for: short time-to-market, innovative and cost-efficient. Focus markets are medical, machine equipment, semicon and energy.
Wijdeven will present items of the business units Power and Motion, e.g. transformers, coils, linear motors, voice coil actuators, direct drive motors, magnet assies and gravity compensators.

WIJDEVEN
De Scheper 303,
5688 HP OIRSCHOT (NL)
Contact person:
Mr. René van den Heuvel
t +31 (0)499-320130
info@wijdeven.nl
www.wijdeven.nl

WILTING COMPONENTS / WILTING MODULES 18

As partners of the high-tech industry, Wilting Components and Wilting Modules manufacture mechanical components and mechatronic modules in small and medium-sized series.
Wilting Components distinguishes itself by its ultra-modern business operations and highly intelligent 24/7 production methods. Wilting Modules focuses on the assembly of mechatronic modules including all related logistic and purchasing activities. Wilting Modules is equipped with a modern clean room facility.
We look forward to meet you at the Precision Fair 2010 to discuss the latest developments in your business and to explore how Wilting

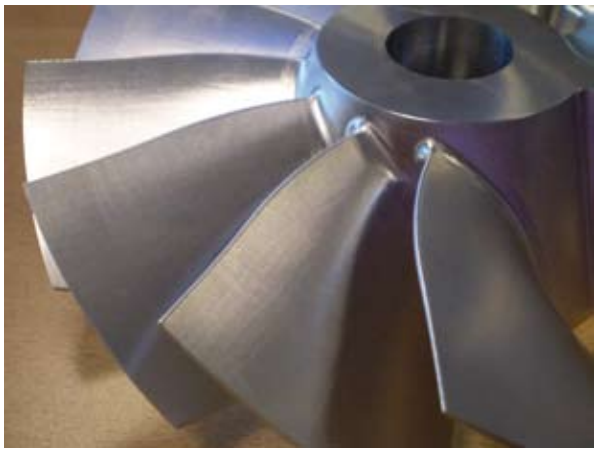
Components and Wilting Modules can support your business.

WILTING COMPONENTS / WILTING MODULES
Postbus 2004,
5513 ZG WINTELRE (NL)
Contact person: Mr. Geert Ketelaars
t +31 (0)40-2052727
ketelaars@wiltingcomponents.com
www.wiltingcomponents.com
www.wiltingmodules.com

WOLTERS METAALTECHNIEK BV 152

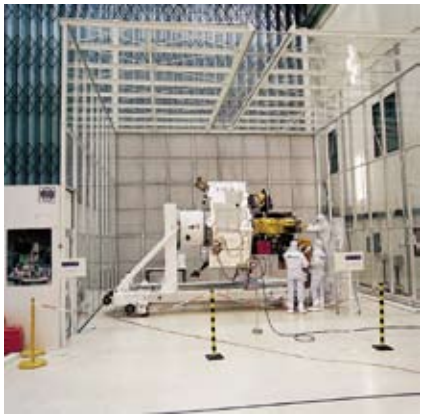
Wolters Metaaltechniek B.V. is specialized in the production of high-quality precision components, including assembly of complete modules, special tools and moulds. A team of competent, trained and motivated employees, in combination with a modern advanced machine park, is the key to translate specific customer requirements in quality products at the right price-quality ratio. Wolters Metaaltechniek is equipped for the production of single pieces, prototypes, as well as medium-sized series. Wolters Metaaltechniek can also participate in the R&D stage of products, or bring up innovative improvements in existing products.

WOLTERS METAAL-TECHNIEK BV
Edyweg 18,
6956 BB SPANKEREN (NL)
Contact person: Mr. Fred Wolters
t +31 (0)313-422537
info@wolters-metaal.nl
www.wolters-metaal.nl



WTS BENELUX BV 79

Specialized in Cleanrooms
Weiss Technology Systems has a long, proven experience for the realization of your cleanroom with the following disciplines:
- Construction and building of cleanroom partitioning.
- HVAC systems with air handling units, specialized for cleanroom use.
- Electric installation
- Process and Control technology



WTS Benelux install cleanrooms for a wide range of industries, including:
- Healthcare
- Pharmaceutical industry
- Fine mechanical Industry
- ICT
- Aerospace
- Food

Our creative approach, the solutions and know-how are an added value for the realization of your cleanroom process!

WTS BENELUX BV
Industriestraat 6a, 3371 XD
HARDINXVELD-GIESSENDAM (NL)
Contact person: Mr. P.A. Tenge
t +31 (0)184-615003
info@wtsbenelux.nl
www.wtsbenelux.nl

ZME VOF 154

ZME offers precision machining using modern machinery like turning lathes with driven tools and machining centers of the brands Benzinger, Spinner and Chiron. Maximum accepted diameter is 40 mm for the lathes. ZME has, despite the small size, a quality assurance system operational and is used to just-in-time deliveries and stockholding of parts. ZME is specifically good at producing parts in series but realizes that the market demands smaller series in shorter lead times and is working to follow this trend, ZME is probably the only precision machining company proudly operated by female personnel only.

ZME VOF
Rijksstraatweg 28,
3545 NA UTRECHT (NL)
Contact person:
Mrs. Nikki van der Zouw
t +31 (0)30-6665443
zme@zme.nl
www.zme.nl

W. VAN DER ZWAN BV 175

W. van der Zwan BV is a specialist in sliding headstock machining (Swiss-type lathes), and can make parts (maximum 25 mm diameter) complete in one chucking, with up to 7 controlled axes.
This type of machining is *not* only suitable for long and slender products, as you can see from the examples in our booth. Our mottos – "take the gambling out of subcontracting" and "state-of-the-art series production" – are visualized by our products. Because the products can be rather small, we do have enlarged photographs on display, framed as the pieces of art they actually are.

W. VAN DER ZWAN BV
Zuideinde 49,
2421 AB NIEUWKOOP (NL)
Contact person:
Mr. W. van der Zwan
t +31 (0)172-574200
info@vanderzwan.nl
www.vanderzwan.nl

Aerotech, Dedicated to the Science of Motion

Booth: 87

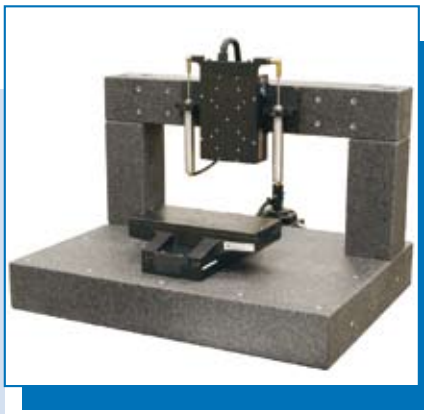
Aerotech delivers the essential micro and nano positioning performance for demanding precision engineering applications across all areas of manufacture and research.

Component-To-System Solutions
The comprehensive range includes technically superior linear and rotary air- and/or mechanical-bearing positioning stages with advanced motion and machine controls that are individually supplied or interconnected to form high performance positioning sub assemblies or completely custom engineered motion systems.

Our Commitment
Aerotech's commitment to advancing its product and value-added service capabilities is summed up in our motto, **Dedicated to the Science of Motion.**

From concept to final certification, Aerotech applies its engineering expertise and skills, along with unrivalled motion control and positioning technologies to provide:
- The lowest cost of ownership
- Highest throughput
- Highest accuracy
- Best return on investment

With over 100,000 positioning axes installed world-wide, Aerotech provides innovative solutions for challenging motion control applications in semiconductor, flat panel, medical device, life sciences, laser processing, electronics manufacture & test, photonics, solar panel, automotive, military/aerospace, and many other markets requiring high precision, high performance motion control solutions.



Aerotech Limited
Jupiter House, Calleva Park, Aldermaston
UK RG7 8NN
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E sales@aerotech.co.uk
I www.aerotech.co.uk

AEROTECH®
Dedicated to the Science of Motion

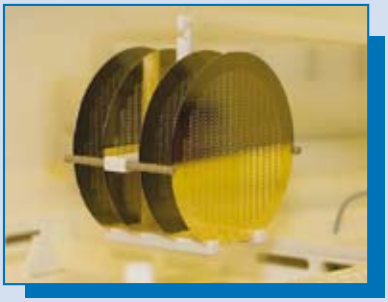
Precision in Performance

Booth: 132

Etchform is a manufacturing and service organization for etched and electroformed metal precision parts

Etchform provides customised solutions for metal precision parts.
- Production of thin metal precision parts by means of precision etching & electro-forming.
- Standard copper and stainless steel alloys, but also specialties such as beryllium copper, Elgiloy/Phynox, gold, Invar/Kovar, molybdenum, silver and titanium.
- One-off and mass production.
- Additional surface and heat treatments as well as precision mechanical, assembly and logistic services can be offered

We also supply MicroNano metal parts and tools such as:
- MicroNano Moulding Tools, Stamps, Shims.
- Micro Stencils.
- MicroNano Parts: micro precision parts, filter sieves, vaporizer nozzles, ink-jet nozzles, apertures, probes, gears.



Etchform B.V.
Arendstraat 51, 1223 RE Hilversum
Postbus 4025, NL-1200 LA Hilversum
T +31 (0)35 685 51 94
E info@etchform.com
I www.etchform.com

ETCHFORM

Laser 2000
Direct driven motor stages: Ruchservomotor

Booth: 133

Ruchservomotor has built up a significant expertise in the area of development and production of direct-drive systems. Ruchservomotor is manufacturing synchronous linear and rotary motors, torque tables, linear stepping motors, planar servomotors, and a wide spectrum of multi-coordinate systems based on this principle.

Ruchservomotor also designs and manufactures the control systems of different configurations according to the customer's requests. This type of linear motion is directly reproduced by the electromagnetic transducer without mechanical transmission. Exactly this determines the reliability and durability of the machines of Ruchservomotor. This also guarantees stable and high accuracy as well as stable and high dynamic characteristics during intensive usage for a long period of time. The modular construction and absence of a mechanical transmission allows for creating precision multicoordinate systems, that guarantee moving of objects on a trajectory of any complexity with high dynamics as well as high accuracy at the same time.

Amongst the realized systems are one- and multi-coordinate systems, and special precise systems according to customer's requirements. Ruchservomotor's team of highly skilled developers is continuously working on optimization to its motor-designs and offers solutions for its clients conform the highest world standards.

Applications:
High-precision (and often as well high-dynamic) motion applications are found in industrial OEM, industrial R&D and in (scientific) research areas.

Laser 2000 Benelux C.V.
Voorbancken 13A, 3645 GV Vinkeveen
Postbus 20, NL-3645 ZJ Vinkeveen
T +31 (0)297 266 191, F +31 (0)297 266 134
E info@laser2000.nl
I www.laser2000.nl
I www.ruchservomotor.com

LEMO The Original Push-Pull Connector

Booth: 43

LEMO is the acknowledged leader in the design and manufacture of precision custom connection solutions.

LEMO's high quality push-pull connectors are found in a variety of challenging application environments including medical, industrial control, test and measurement, audio-video, and telecommunications.

LEMO has been designing precision connectors for six decades. Offering more than 50,000 combinations of product that continues to grow through custom specific designs LEMO, and it's affiliated sister companies REDEL and COELVER, currently serve more than 100,000 customers in over 80 countries around the world.

LEMO is the standard connector supplier in several markets. This is due to the many benefits that LEMO Connectors can offer you.
To name a few advantages:

- UL Recognized
- Mating cycles >20.000
- Up to IP 68 protection
- Resistant to -55 °C to 250 °C
- Many contact configurations

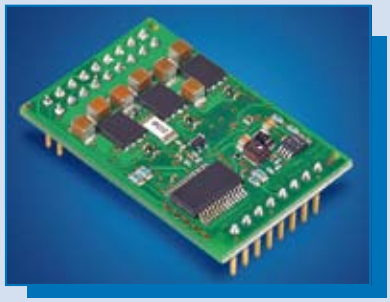
LEMO Connectors Benelux
De Trompet 2108, NL-1967 DC Heemskerk
T +31 (0)251 257 820
F +31 (0)251 257 821
E info@lemo.nl
I www.lemo.nl

maxon motor benelux at Precisiebeurs 2010

Booth: 02

We are pleased to inform you about our newest high-precision drive systems.

Innovative speed controller–
DEC Module 50/5
Constant miniaturization has produced an all-in-one amplifier with an extremely high power density of 250 watt continuous output power at 12 cm2 (3 x 4 cm). With its extensive protective functions, simple integration in all kinds of applications and an attractive price, the DEC module 50/5 is the ideal solution for any drive challenge.



Tiny drive with a big impact –
EC 8 Ø8 mm, brushless, 2 watts
Besides its exceptional performance data (continuous torque up to 0.95 mNm, nominal speed up to 80'000 rpm, 70% efficiency), the motor stands out due to its high quality. Being produced according to the most rigid Medical Standard ISO 13485, it is unquestioned in respect to quality and dependability.

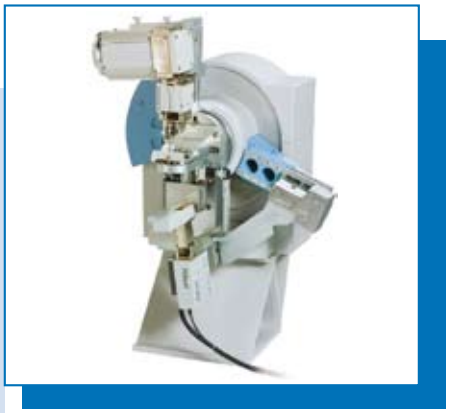
Driven by precision
maxon motor develops and produces brushless and brush DC motors with an unique ironless maxon winding, up to 500 watts. Our modular program is complemented by flat motors with an iron core. The modular system with planetary, spur and special gearheads, sensors and control electronics, completes the range. High-tech CIM and MIM components are produced in a special competence center. We combine motor, gearhead and electronics according tot customers' specific requirements to create an integrate total solution. We are driven by your specific requirements.

maxon motor benelux bv
De Giem 22, 7547 SV Enschede
P.O. Box 716, NL-7500 AS Enschede
T + 31 (0)53 486 47 77, F +31 (0)53 486 47 88
E info@maxonmotor.nl
I www.maxonmotor.nl

maxon motor
driven by precision

Nijdra Groep - Precision is our Profession

Booth: 30



The Nijdra Groep is a full-service, family-owned organisation and is specialised in high precision components and mechatronic modules.

The Nijdra Groep consists of the following business units:

1. Fine Mechanical Industry (turning & milling);
2. High-tech Mechanical Industry (grinding);
3. Nijdra Special Products (engineering & assembling);
4. Medical Product Technology (orthopaedic & orthodontic implants).

The Business Unit Nijdra Special Products (NSP) engineers, assembles and delivers strategic modules like the Goniometer (module for the X-ray diffraction machine) with an assembled tolerance of 3 micron!

The Nijdra Groep is ISO 9001 and ISO 14001 certified. The final implementation and certification of the ISO 13485 at this Business Unit will take place at the end of 2010.

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NIJDRA

Mikroniek guide

Bearing- and linear technology

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