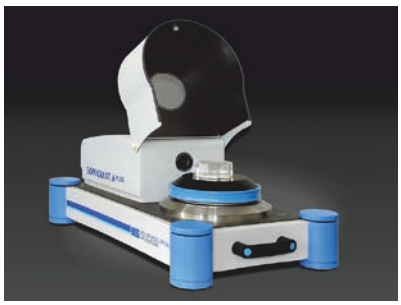
## Fully Automatic Goniometer

**Manufacturer:** Möller-Wedel Optical.
**Product:** Fully automatic goniometer "GONIOMAT A$^{PLUS}$" for testing angles of optical prisms, polygon mirrors and wedges with an accuracy of 0.4 arcseconds. Furthermore it can be used for testing angles of angle gauge blocks. The device is just as compact, portable and flexible as the "GONIOMAT M" and is ideally suited for use in testing laboratories and inspection of incoming and outgoing optical parts as well as for small, medium or large volume production.
**Features:** Thanks to its new precision bearing with backlash and maintenance free drive, no compressed air is needed. The combination of a motor driven measurement table with a software based evaluation of the angle encoder signals with reference to the autocollimation image allows a fully automatic measurement with a very low measurement uncertainty. By evaluation of the autocollimation image and the angle value of the encoder in 3D space ("virtual tilting table"), the time-consuming adjustment of the specimen using an adjustable tilting table is no longer necessary. Additionally, the algorithm is able to detect multiple reflections and to exclude the non-relevant reflections during the analysis. The goniometer is controlled via a single USB 3.0 connection, thus only a laptop is needed, giving the system a small and portable footprint. Additionally, the measurement cell and the laser finder for micro prisms are now directly integrated.



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## First AWG with Real-time Precompensation

**Manufacturer:** Zurich Instruments.
**Product:** Real-time precompensation technology for the "HDAWG" arbitrary waveform generator. By inverse filtering, precompensation minimizes effects of imperfections in the wiring and ensures that the signal applied to the tested device equals the signal designed on the HDAWG. Multiple filter types are available to correct for AC coupling, spurious inductances and capacitances, impedance mismatches, amplifier ringing, and others.
**Features:** With the HDAWG-PC real-time precompensation option, each channel of the HDAWG is equipped with a chain of digital filters between the waveform generation unit and the digital-to-analog converter. Each filter can be individually enabled and configured in situ while monitoring the effect on the signal at the device under test, e. g. as displayed on an oscilloscope. The "LabOne Precompensation Simulator" allows the user to match the measured signal with the simulated effect of the inverse filter and thus helps finding the right filter parameters quickly. Once this is done, the user can proceed to work in the "LabOne AWG Sequencer" and rely on the visualized waveform data. Real-time precompensation considers the full history of the signal over long time scales without consuming waveform memory and is compatible with dynamic sequencing where the pattern is only known at the time of the experiment.
**Applications:** The main application for the 4 and 8 channel HDAWG with the precompensation option are quantum computing with flux bias pulses for superconducting qubits or gate voltage pulses for spin qubits. Other applications are EPR (electron paramagnetic resonance) or NMR (nuclear magnetic resonance).

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## Ultrastable, Ultra-Narrow Lasers With Reduced Form Factor

**Manufacturer:** Menlo Systems.
**Product:** New "ORS-Cubic" Ultrastable Laser, a more compact solution delivering state-of-the-art performance.
**Features:** The laser is based on the rigidly mounted 5 cm cubic cavity developed in cooperation with the National Physical Laboratory which offers the lowest vibration sensitivity reported for an optical cavity. The rigid mounting of the cavity allows for transportation of the system without the need for realignment. Thus, the "ORS" Ultrastable Laser System series, available from 500 to1600 nm, helps saving valuable R&D time and staying highly focused on the experimental application. The robustness of the turn-key metrology systems allows for continuous operation.
**Applications:** The lasers are used in applications such as ultralow-noise microwave synthesis, ultrastable frequency dissemination via optical fiber, optical clocks and many other atomic and molecular physics experiments. Combined with the "FC1500-250-ULN Ultra Low Noise" Optical Frequency Comb, the purity of the ultrastable Laser is transferred to other parts of the optical spectrum. For optical clock applications (e. g. Strontium lattice clocks), complete solutions are available which include the various lasers required for cooling and preparation of the atoms.


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## Multi-Wavelength Laser Engine

**Manufacturer:** Coherent.
**Product:** New family of flexible laser light engines, the "OBIS CellX" series, that delivers up to four separate laser wavelengths from a single module, thereby lowering the complexity and overall cost of laser integration in multi-wavelength life sciences instruments such as flow cytometers. The system is targeted at instrument manufacturers that need to incorporate multiple lasers together with their associated infrastructure and beam delivery.
**Features:** The laser engine is a compact one-box source in which the lasers, electronic control and beam conditioning optics are all completely integrated in a single package. It features a single controller board, common power and RS-232/USB connections, and a single I/O connector. Flexibility and utility are further enhanced by providing independent customer adjustment of the pointing and focus of each wavelength, allowing the $TEM_{00}$ outputs to be aligned and positioned as needed for each specific instrument.
"CellX" is based on the proven "OBIS" plug and play smart platform. It is available in two standard formats – a three-channel version with outputs at 405, 488 and 640 nm, and a four-channel engine that also includes 561 nm. Beam parameters are particularly well-suited to flow cytometry. The system offers a choice of either 50 mW or 100mW output power per wavelength, suiting cell analysis as well as the higher powers needed for cell sorting. In addition, patent-pending optical accessories are available that convert output into the focused, elliptical spots typically needed for flow cytometry. Customers can also easily generate flexible stripe patterns aligned to their flow cell using CellX laser-safe adjustments.

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## Universal Mounting Plates

**Manufacturer:** OWIS.
**Product:** Universal mounting plates ("UMP") for optical and fine mechanical setups. They allow the mounting of components with arbitrary grid and adjust these flexibly. The smallest grid possible is 20 × 20 mm and the plates are available in two sizes (UMP 84N and UMP 124N).
**Features:** The setup is fixed by sliding blocks. Thanks to its star-shaped arrangement these can be positioned flexibly. Furthermore, it is possible to insert and remove these at any point of the groove. The sliding blocks will be held securely in place by springs, but can also be loosened and readjusted easily. Standard are sliding blocks with threaded holes for M4 and M6, optionally they are also available for M5 or M8 thread upon request. The universal mounting plates are screwed directly together with another component or setup, such as an optical table or positioner, through four counterbores. The use of further adapter plates is unnecessary. For the linear stage "LIMES 124N" these replace the mounting plate completely and therefore avoid an additional construction height.
The UMP are included in the standard program. All mounting plates consist of deformation-resistant aluminum, are black anodized by default and optionally available in other colors. Besides that, a vacuum-prepared version (up to $10^{-6}$ mbar) is available upon request.

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## Diaphragm Pumps for Clean Fore-Vacuum

**Manufacturer:** Vacuubrand.
**Product:** Diaphragm pumps as backing pumps for modern turbo pumps, which is particularly advantageous for high-purity processes in analytics or for applications with corrosive gases. Diaphragm pumps run completely oil-free. Compared to rotary vane pumps, this avoids the risk of contamination of the high-vacuum system with hydrocarbons. In addition, oil changes and the disposal of waste oil are no longer necessary.
**Features:** In diaphragm pumps, there are no frictional components inside the pumping chamber and thus no abrasion occurs. Consequently, contamination of the high vacuum area or the environment at the pump outlet due to particles is excluded. Chemistry diaphragm pumps in which all wetted parts are made of fluoropolymers are particularly suitable for applications with corrosive gases. They provide an almost universal chemical resistance. The diaphragm pumps are characterized by an unmatched degree of reliability in continuous operation: With lifetimes of more than 40,000 h in continuous operation, the ultimate vacuum remains stable over the entire test period. The diaphragm pumps of the "VARIO" series adapt the motor speed to the gas load. This results in an increase in the lifetime of the diaphragms and extends the service intervals even further. Additionally, noise, energy consumption, and vibration are reduced significantly.

The variable-speed vacuum pumps in combination with the new "VACUU·SELECT" controller offer a perfect combination of modern control electronics and software with powerful mechanics. The innovative controller offers the option of configuring customer specific vacuum processes and provides a unique "Turbo Backing Pump" application: The patented optimization of the motor speed improves the attainable final vacuum and thus provides the best conditions for using the diaphragm pump as backing pump for turbo molecular pumps.

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## Optical Cryostat Wins Prestigious "R&D 100" Award

"OptiCool", *Quantum Design's* optical cryostat with closed helium cooling cycle and 7 Tesla superconductive magnet, has just been awarded the *R&D100 Award* as one of the top 100 technologically most exceptional products in the field Analytic/Test
The optical cryostat "OptiCool" is a low-temperature and high-magnetic-field platform. The cryogen-free cryostat is mounted on an optical table and can easily be integrated in a variety of optical experiments. Optical access to the sample is available through seven side windows and one top window. The large sample area measures 89 mm in diameter and 84 mm in height. The sample is in the center of the magnetic field and all possible optical ray tracks.

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## ASOPS Femtosecond Spectroscopy System

**Manufacturer:** Laser Quantum.
**Product:** Next generation femtosecond spectroscopy system based on ASynchronous OPtical Sampling (ASOPS) technology. The ASOPS engine innovatively combines high scan rates (up to several 10 kHz), long measurement windows (up to 12 ns) and minimal dead time (each photon is used for the measurement) and allows two-color pump-probe experiments with no additional effort.
**Features:** ASOPS is a technique for ultrafast spectroscopy that does not require a mechanical delay unit and therefore enables scanning rates in the kHz range. *Laser Quantums'* ASOPS engine consists of two fs-lasers with approximately the same repetition rate and the patented "TL-1000" ASOPS stabilization unit. New is the fact that the ASOPS engine is now available not only for the "taccor" laser series with a repetition rate of 1 GHz, but also for the "venteon/gecko" and "helix" series with repetition rates of 84 MHz and 250 MHz, respectively. The two fs-lasers are arranged in a master-slave configuration, i.e. the repetition rate of the slave laser is adjusted by piezo actuators and a phase-locked loop (PLL) to the repetition rate of the free-running master laser with a well-defined difference frequency. Depending on the repetition rate, the difference frequency between the two lasers is in the range of less than 100 Hz (for 84 MHz systems) to 10 kHz (for 1 GHz systems), with the "TL-1000" ASOPS stabilization unit capable of difference frequencies from 4 µHz to 100 kHz. The difference frequency is set via touch screen; repetition rate locking is enabled by simply pressing a button.
**Application:** The ASOPS principle reduces the parameter space in pump-probe experiments by eliminating the problem of finding the time zero point. With an impulsive THz-source, the ASOPS engine can be flexibly extended to a high-resolution terahertz spectrometer (HASSP-THz with GHz resolution at more than 6 THz bandwidth) with a signal-to-noise ratio of more than 100 dB.


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## Faster Detection, Classification And Identification Of Microparticles

**Manufacturer:** WITec.
**Product:** Revolutionary particle analysis tool "ParticleScout" for the "alpha300" Raman microscope series. It enables researchers to find, classify, quantify and identify particles quickly and easily and to find correlations between the physical and chemical attributes of particles.
**Features:** The device delivers a greatly accelerated workflow to the researcher investigating particulate samples while making full use of confocal Raman imaging's abilities in fast, label-free and nondestructive chemical characterization. It begins by surveying samples with bright and dark field illumination to view the particles they contain. "Image Stitching" combines many measured areas for a detailed overview of large areas and "Focus Stacking" allows larger particles to be sharply rendered for accurate outline recognition. The optical images lead to the creation of a mask which is used to physically

categorize particles of interest and arrange them in a ranked list. A Raman spectrum is then automatically acquired from each particle. The Raman spectra are evaluated and the particles they correspond to can be identified manually or by using the seamlessly-integrated "TrueMatch" Raman database software. This integration of a particle analysis tool with a Raman database is unique in the industry and offers a streamlined experimental environment to boost productivity. Finally, the device generates a comprehensive report that features user-selectable combinations of filters and advanced algorithms to show the quantities of selected particles and their prevalence relative to other groups.
**Applications:** Particle analysis from large-area imaging to high-resolution spectroscopy, in areas like microplastics research, environmental science, pharmaceutical research, geology, food science and many other fields.

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## X-ray systems for Composition and Valence State Analysis on Trace Level

**Manufacturer:** Sigray.
**Distribution:** LOT-QuantumDesign.
**Product:** Several laboratory systems, based on the patented tunable multi-energy and ultra-bright x-ray sources and highly efficient x-ray optics, that are nearly as powerful as comparable synchrotron setups. This includes systems for X-ray fluorescence analysis (µXRF), X-ray absorption spectroscopy (XAS), X-ray absorption near edge structure (XANES), and X-ray absorption fine structure (EXAFS).
**Features:** XAS, XANES and EXAFS can provide answers to important questions regarding the chemical state of the sample, like oxidation, bonding symmetry, bonding lengths and coordinative setup. The XAS system "Quantum Leap" provides a high sample throughput and sub-eV resolution, similar to that of a synchrotron. As such, the system might be able to provide answers regarding the functional characterization of critical materials like catalysts, battery and fuel materials, and electronic components. As a non-destructive method, it allows analyses both in vacuum and under ambient conditions. It also enables in-situ experiments like the examination of the valence state of a battery material during charge and discharge cycles.

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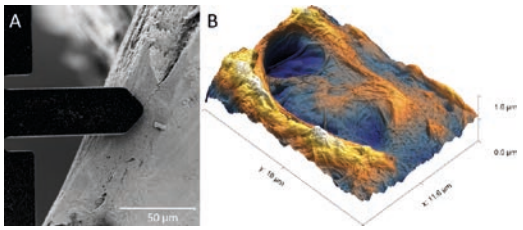
## Self-Sensing Cantilevers

**Manufacturer:** SCL-Sensor.
**Tech.+Distribution:** LOT-QuantumDesign.
**Product:** Self-Sensing Cantilevers for atomic force microscopy (AFM), Torque magnetometry, force measurements and gas sensing.
**Features:** The cantilevers are equipped with a full piezo-resistive bridge that directly measures the cantilever signal electrically. This eliminates the space-consuming requirement for an optical readout. The free space above the cantilever now enables a variety of new applications in air and vacuum conditions. The cantilever is bonded onto a 5.9 mm × 4.8 mm small PCB incl. connector to facilitate handling and exchange. They are available in various geometries, spring constants and resonant frequencies. When larger quantities are ordered, they can also be customized. Also available are various tips for a wide range of applications: Silicon, ultra-hard diamond (SCD) or tipless.
**Applications:** Application fields beside atomic force microscopy (AFM) are gas sensing – cantilevers can be used to distinguish and analyze various gas mixes – or torque magnetometry to characterize magnetic samples at ultra-low temperatures.

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## Aluminum Components for Extreme High Vacuum

**Manufacturer:** VACOM.
**Product:** Innovative "AluVaC" technology that combines aluminum materials with the proven full-metal sealing system for Ultra-High-Vacuum. Vacuum components according to VACOM Vacuum Class XHV 2 can be produced with guaranteed outgassing rates of $Q < 2{\cdot}10^{-14}$ mbar·l/(s·cm$^2$) to reach extreme high vacuum pressure ranges down to $p < 10^{-12}$ mbar.
**Background:** Formerly used materials limited the working pressure range of vacuum components. From the beginning of using vacuum as a medium in industry and science, mild steel was the preferred construction material for vacuum components. The mild steels' outgassing—mainly carbon monoxide is desorbed to the vacuum environment—limits the working pressure to the range of high vacuum ($10^{-7}$ mbar).
Since the early 1980's lower working pressures than high vacuum has been needed on a bigger scale. Stainless steel captured the vacuum technology market as the new number one construction material, allowing pressure ranges down to the UHV ($10^{-9}$ mbar). However, only with costly special treatment like low hydrogen annealing the working range can be extended down to the upper limit of extreme high vacuum ($10^{-11}$ mbar). Below that limit the achievable working pressure is restricted by the hydrogen outgassing, the minimum outgassing rate of vacuum components from stainless steel is $Q > 10^{-13}$ mbar·l/(s·cm$^2$). With the "AluVaC" technology extreme high vacuum pressure ranges certainly are achievable.

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