С 9 по 12 мая в Штутгарте (Германия) прошла выставка решений для контроля качества Control 2017. В форуме приняли участие более 900 экспонентов из 31 страны, представившие на площади 52 тыс. м² оборудование, технологии, материалы и программное обеспечение для измерений и анализа в различных областях техники. Форум посетило почти 30 тыс. специалистов из 106 стран мира.

Настоящий обзор дополняет интервью с руководителями и специалистами компаний EMCO-TEST, ERICHSEN, Fischer, INNOVATEST, Labortech, Sensofar и Struers, опубликованные в нашем журнале.

**ALICONA**
Компания Alicona выпускает системы для бесконтактного контроля формы поверхности изделий. Благодаря инновационной технологии динамического определения фокусного расстояния Focus Variation одновременно с измерением формы оценивается также шероховатость поверхности.

На выставке Control 2017 компания представила систему Tool Cobot для измерений непосредственно в технологическом оборудовании. Решение основано на использовании 6-осевого робота и надежного оптического 3D-измерительного датчика IF-SensorR25.
This review complements the interviews with the heads and specialists of EMCO-TEST, ERICHSEN, Fischer, INNOVATEST, Labortech, Sensofar and Struers, published in our magazine.

**ALICONA**

Alicona manufactures systems for contactless surface measurement. Thanks to the innovative Focus-Variation technology, the surface roughness is also assessed along with the form measurement.

At the Control 2017 exhibition, the company introduced the Tool Cobot system for measurements directly in process equipment. The solution is based on the use of a six-axis robot and a reliable optical 3D sensor IF-SensorR25. The system is easy to operate, provides high accuracy and repeatability and can be integrated into an existing production systems.

Another novelty is the mobile device IF-PortableRL, intended for optical 3D-control of micro structured surfaces of objects of both planar and curved shapes. The maximum size of the measurement field is 50×50×26 mm. The use of batteries provides the possibility of using the device away from a stationary electrical network, for example, for monitoring turbine blades, parts of massive structures, road surfaces, etc.

**FEI**

FEI, acquired in 2016 by Thermo Fisher Scientific, has presented the Avizo software for dimensional metrology and structure characterization of products and materials. Avizo can be used to process data obtained with computer tomography, electronic and optical microscopy, magnetic resonance imaging, radiography and other methods. It is also possible to import data from CAD. The system performs 3D-visualization of the
object and analyzes its dimensional and structural parameters. The features include evaluating the porosity of the material (morphology, pore distribution and structure), defect analysis (corrosion, cracks, voids, delamination, gluing errors, etc.), checking dimensional parameters in comparison with the reference sample, fiber analysis (length and orientation of fibers, detection of defects in fibers). The analysis can be performed in real time. Thus, the system provides a set of tools addressing the whole research-to-production cycle from materials research in labs to automated quality control in production.

**KB PRÜFTECHNIK**

KB Prüftechnik has been producing several ranges of instruments for measuring the hardness of materials by methods of Rockwell, Brinnel, Vickers and Knoop since 1997, as well as universal hardness testers. The premiere of the universal hardness tester KB 3000 MHSR, intended for measurements at a load from 5 to 3000 kgf, was held at the exhibition. The device is equipped with an eight-fold turret, a five-megapixel digital camera, a LED illumination, a motorized stage and can operate in fully automatic mode. The management software KB HardWin XL processes measurement results, builds graphs, performs statistical analysis and archives data.

**LEICA MICROSYSTEMS**

Leica Microsystems demonstrated a wide range of industrial analytical solutions based on optical microscopes. In particular, a new S9 series of Greenough stereomicroscopes was presented. Due to the large magnification range from 6.1x to 55x, the operator can quickly switch from an overview...
to an analysis of the smallest details. The Fusion Optics technology provides viewing of elements within 12 mm height range in focus with high resolution. At the same time, eliminating the need to adjust the focus saves up to 20% of the working time. A large working distance (122 mm) makes it convenient to work with samples of different sizes. S9 stereo microscope can be equipped with an integrated 10-megapixel digital camera.

Dr. Nicol Ecke presented during the exhibition the development of Leica Microsystems in the field of Laser Induced Breakdown Spectroscopy (LIBS). This method of atomic emission spectroscopic analysis is based on the use of highly energetic laser pulse (laser spark) and does not require special sample preparation. Analysis of samples of different nature in different aggregate states is carried out in contactless mode at once for all elements with high spatial resolution. Instruments that implement the LIBS method are compact and allow real-time measurement.

Leica Microsystems has presented also a cleanliness analysis workflow, developed in cooperation with PALL. This solution is intended, first of all, for mechanical engineering. It includes systems for extraction and filtration of contaminant particles, as well as for analysis using microscopy and special software. The joint development of Leica Microsystems and PALL makes it possible to detect the presence of dangerous particles on the parts and components and take countermeasures in a timely manner.

MTS

MTS presented equipment for mechanical testing of materials, in particular, electromechanical and hydraulic universal testing.
machines, as well as pendulum coppers. Since 1966, MTS has been developing and supplying solutions for the automotive, aerospace and other industries, where the strength of materials is a critical parameter. Although the testing of materials is a rather conservative area, the company owns several dozen patents protecting its technological and design developments.

NANOFOCUS
The Nanofocus’ booth hosted the debut of the ultra-fast µscan select+ 3D profilometry system. The high speed of measuring surfaces with different reflective properties is combined with the resolution at the level of micrometer. The device can be used in the automotive industry, energy, printing industry, medical technology, semiconductor industry, material research.
Also, the µsurf explorer device for 3D measurement and analysis of surfaces based on the confocal microscope was demonstrated. The measuring system of the device of the new generation is equipped with HDR function and automatic lens detection. The implementation of HDR allows to capture the information with a depth of 16 bits. Optionally, the device can be equipped with a color digital camera.

Nikon Metrology
Nikon Metrology has focused on solutions for automating quality control in the industry.
The new MV331/351 robotic automatic laser radar system is designed to control the geometry of car bodies. Laser radar allows you to measure almost any surface, including reflective body elements. At the same time, the MV331/351 is a flexible solution and is effective for a large range of parts.
The automated CT (X-ray Computed Tomography) inspection system is designed for operation in a production environment. Contrary to the prevailing stereotypes about the low measurement speed by this method, the new system can be used for 100% control of the parts both in batch inspection and inline automated inspection.

Another development of Nikon Metrology is the HN-C3030 device for non-contact inspection of gears. It allows you to control complex hypoid, bevel and helical gears, detecting wear and defects.

The new ECLIPSE MA100N inverted microscope is designed for use in machine building and other high-tech industries. It requires 11% less space than the previous model, and is characterized by reduced power consumption due to the use of LED illumination.

The company from Rochester (USA), which has been operating in the industry for more than 70 years, has introduced the SmartScope CNC 635 system of contactless control of geometric dimensions. The measuring head is mobile in all three axes, while the part during measurement is stationary. The use of carbon fiber composite X-axis beam provides minimization of noise and an increase in the speed of measurement. The size of the measurement area is $635 \times 635 \times 200$ mm. SmartScope CNC 635 is used in engineering, aerospace, semiconductor industry and other fields.

Oxford Instruments was represented by the Industrial Analysis Division. It should be noted that shortly before the exhibition, it was announced that this business unit would be sold to the Hitachi High-Technologies Group (the deal was completed on July 3).
The accent in the exposition was made on one of the latest developments of the company – the portable laser device Vulcan, which is one of the fastest metals analyser on the market. The use of LIBS (Laser Induced Breakdown Spectroscopy) provides a faster measurement than XRF (X-ray fluorescence) and eliminates the need for a license for X-ray equipment. A device weighing only about 1.5 kg in a waterproof and dustproof housing allows identifying the steel, as well as the alloys of nickel, cobalt, copper, lead, tin, titanium, zinc, aluminum and magnesium. The measurement time is only about 1 s. Vulcan can be used to identify alloys in various industries, including in scrap metal processing, and makes it possible to minimize the time spent on inspection and sorting of primary and secondary raw materials and finished products. A simple user interface allows even non-specialists to use the device.

Another interesting development of Oxford Instruments is the FOUNDRY-MASTER Optimum desktop metals analyzer. This instrument implements the method of optical emission spectroscopy, used to identify and analyze alloys of iron, aluminum, copper, nickel, titanium, zinc, lead, tin, magnesium and cobalt. FOUNDRY-MASTER Optimum is an industrial system designed for quality control in metallurgy, metalworking and related industries. The device is compact and easy to operate. The self-diagnostic function is integrated into the control software.

POLYTEC
Polytec company presented solutions in the field of surface metrology, as well as optical sensors for vibration and velocity measurement and other tasks.
TMS-500-R TopMap Pro.Surf+
white light interferometer was
developed for the non-contact mea-
surement of the form of the sur-
faces. Thanks to the built-in con-
focal chromatic sensor, this device
also allows you to control the sur-
face roughness. The application of
the Michelson method provides
resolution at the level of units of
nanometers, in particular along
the Z axis it is less than 1.5 nm
with a scanning range of 70 mm.
The telecentric optical system pro-
vides high-precision measure-
ment of objects of different shapes.
In the area from 44 × 33 mm to
230 × 220 mm, about 2 million
points are inspected. Integrated
image processing tools simplify
and accelerate quality control by
simultaneously measuring mul-
tiple samples without mechanical
fixture. TopMap Pro.Surf + can be
used to control the form, dimen-
sions and surface quality of preci-
sion parts in both laboratory and
production environments.

SENTECH
Sentech Instruments develops and
manufactures devices for mea-
suring the parameters of thin-
tfilm structures by non-destruc-
tive ellipsometry and reflectom-
etry. Modular, flexible in use
measuring equipment of the
German company finds applica-
tion both in scientific researches,
and in manufacture, in particular,
in the semiconductor industry and
photovoltaics.

A spectroscopic ellipsometer
SENpro, operating in the spec-
tral range 370–1050 nm, was dem-
onstrated at the booth. This bud-
get-class device allows measure-
ments at different angles on dif-
ferent types of surfaces with high-
precision assessment of thickness
and optical characteristics (refrac-
tive and absorption coefficients) of
both single-layer films and multi-
layer structures.
The RM 1000 series is used to measure transparent, poorly absorbent films from 5 nm to 50 μm on reflective, transparent and absorbing samples by spectroscopic method.

Also, SENTECH Instruments introduced the RT Inline measurement and control module for the in-line inspection of thin-film coatings (TCO, CdS, a-Si, μ-Si, CIGS, CdTe).

UHL
The German company Walter Uhl technische Mikroskopie has been working in the field of microscopy solutions for more than 70 years, presenting a complete line of instruments and components for scientific and industrial applications. In the 2000s, several business areas in the field of optical microscopes and hardness testers production were transferred from Leica to Uhl.

At the Control 2017 exhibition, Uhl introduced a VMHT microhardness tester designed to use Vickers or Knoop methods with a load from 1 g to 2 kg in semi- or fully automatic modes. Qualitative Leica optics and high-precision load mechanism ensure good repeatability of measurement results. Even the basic model includes a motorized turret, an focus helper and motorized load selection.

With the use of a modular MS4 microscope, quality control of printed circuit boards was demonstrated. The MS4 is equipped with a digital video camera and has a telecentric optical system that minimizes optical distortion. The size of the measured area is 150 × 150 mm or 250 × 150 mm. Motorized stage with three-axis joystick provides fast and convenient positioning of the sample. MS4 can be equipped with exchangeable objectives or a turret.
Модульное, гибкое в использовании измерительное оборудование немецкой компании находит применение как в научных исследованиях, так и в производстве, в частности, в полупроводниковой промышленности и фотовольтаике.

На стенде демонстрировался спектроскопический эллипсометр SENpro, работающий в спектральном диапазоне 370–1050 нм. Этот прибор бюджетного класса позволяет проводить измерения под различными углами на разных типах поверхностей с высокоточным определением толщины и оптических характеристик (коэффициентов преломления и поглощения) как однослоиных пленок, так и многослойных структур.

Рефлектометр серии RM 1000 применяется для измерения прозрачных, плохо абсорбирующих пленок толщиной от 5 нм до 50 мкм на отражающих, прозрачных и абсорбирующих образцах спектроскопическим методом.

Также SENTECH Instruments представила контрольно-измерительный модуль RT Inline, предназначенный для производственного контроля тонкопленочных покрытий (TCO, CdS, a-Si, µ-Si, CIGS, CdTe) солнечных элементов в режиме "в линию".

UHL

Немецкая фирма Walter Uhl technische Mikroskopie уже более 70 лет работает в области решений для микроскопии, представляя в настоящее время полную линейку приборов и компонентов для научных и промышленных задач. В 2000-х годах к Uhl перешло несколько бизнес-направлений в области оптической микроскопии и производства твердомеров от компании Leica.

На выставке Control 2017 Uhl представила прибор для контроля микротвердости VMHT, предназначенный для проведения испытаний по методам Виккерса или Кнупа с нагрузкой от 1 г до 2 кг в полу- или полностью автоматическом режимах. Качественная оптика Leica и высокоточный механизм регулирования нагрузки обеспечивают хорошую повторяемость результатов измерений. В базовую комплектацию входят моторизованная турель, оптическая система помощи фокусировки и моторизованная регулировка нагрузки.

С применением модульного микроскопа MS4 демонстрировался контроль качества печатных плат. MS 4 оснащен цифровой видеокамерой и имеет телецентрическую оптическую систему, которая минимизирует оптические искажения. Размер измеряемой области – 150×150 мм или 250×150 мм. Моторизованный столик с трехосевым джойстиком обеспечивает быстрое и удобное позиционирование образца. MS 4 может комплектоваться сменными объективами или турелью.