



METALCONTROL

QUALITY IS MEASURABLE AT US

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INTRODUCTION

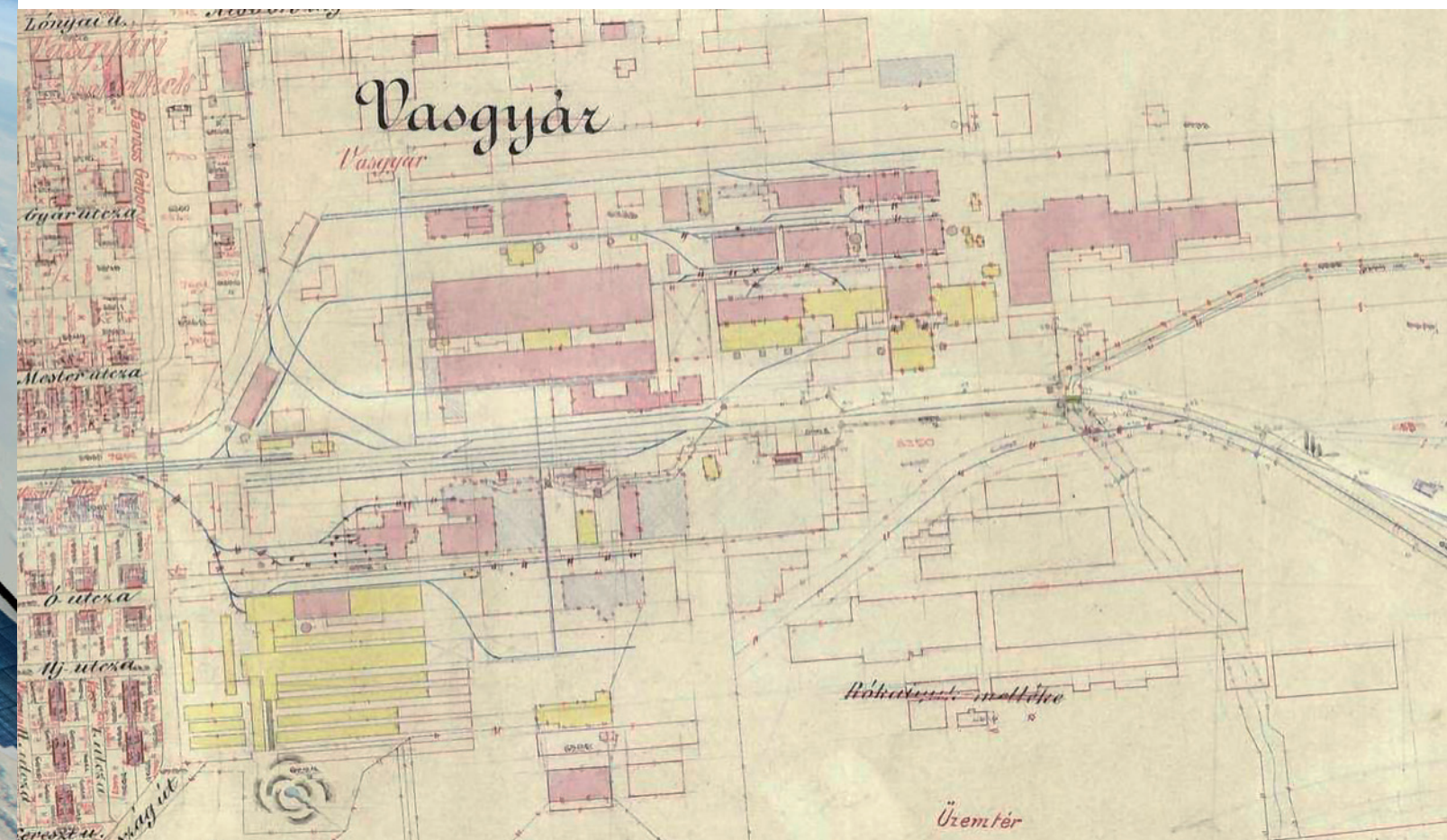
The material testing in Diósgyőr as an activity is the same as the 230-year-old metallurgy in Diósgyőr.

The first part of this period is – from 19th and the first half of the 20th century – during which materials science and materials technology developed, for which the basis was provided by the various measurements and studies. Meanwhile, the principles and methods of measurement and testing themselves have evolved.

Our company METALCONTROL Ltd. has grown out of this culture, which is now an independent institute in all respects, performing a wide range of materials and products, such as:

**metal, plastic, ceramic, wood, concrete,
water pollutants, soil**

conformity testing, defect detection testing, quality development, research in accordance with the European standards.



METALCONTROL Material Testing and Quality Control Center Ltd.
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Branch office: H-1138 Budapest, Népfürdő street 22., Duna Tower, „A” Bld. 5. floor

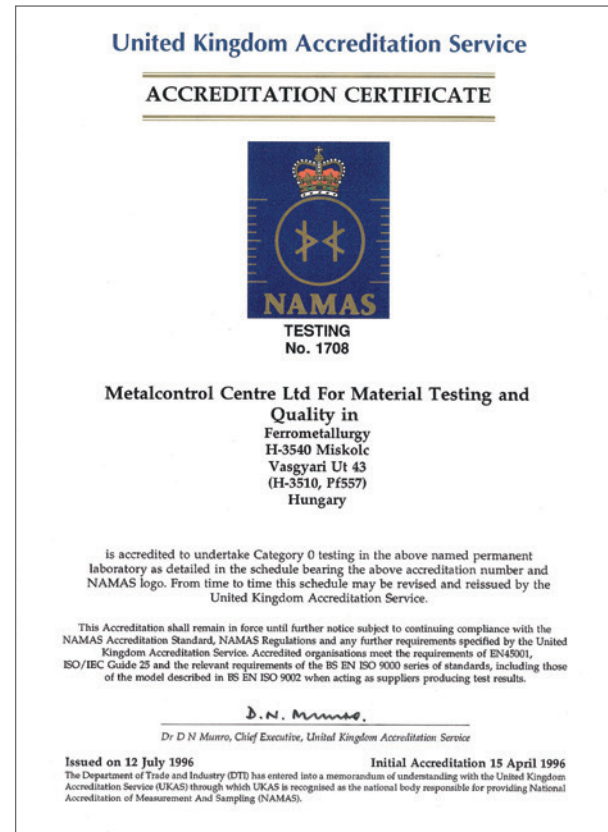
Fax: +36 46 531 250
www.metalcontrol.hu
www.metalcontrol.net



We have performed approximately 50.000 individual tests in our laboratories for nearly 500 customers over the years.

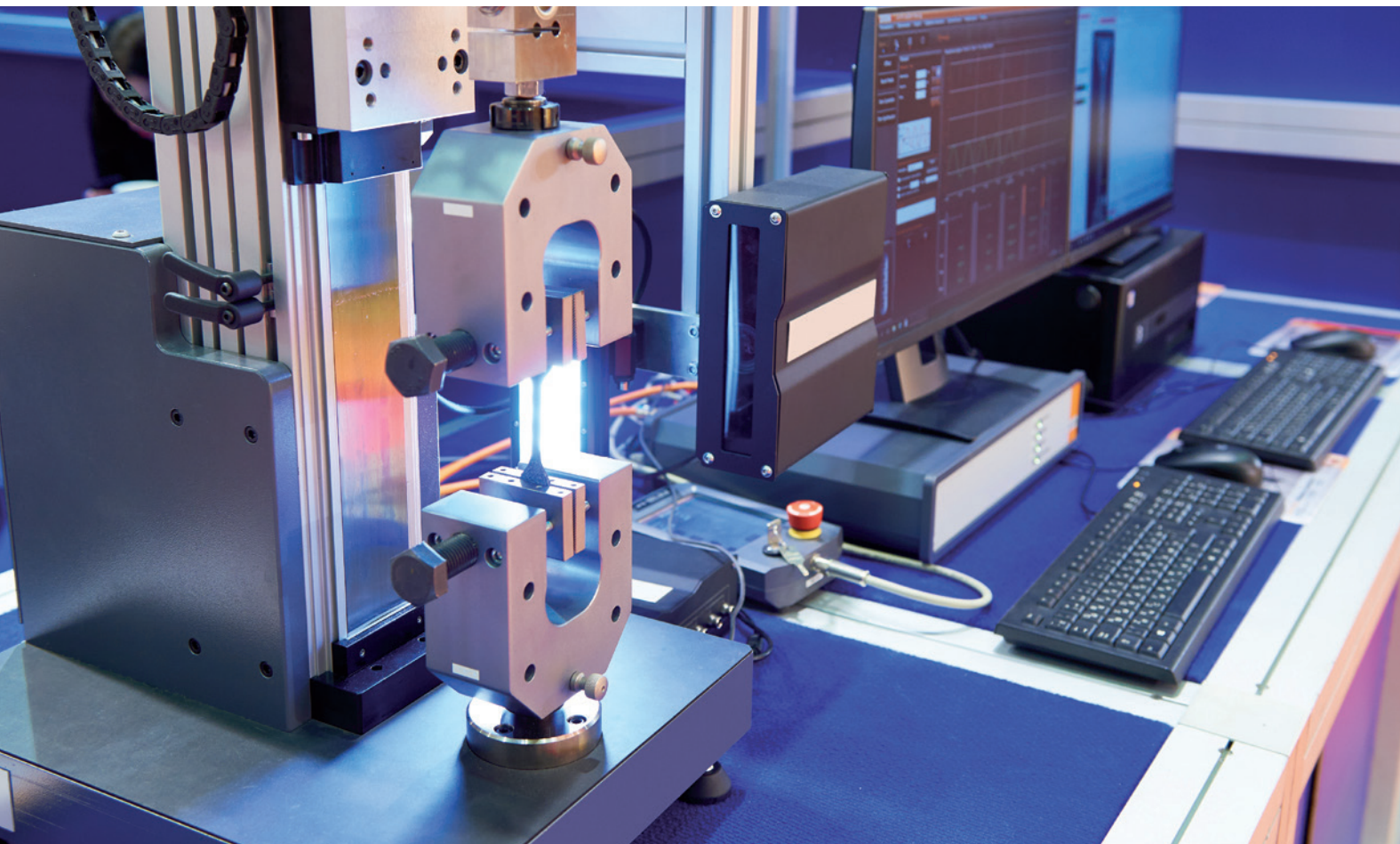
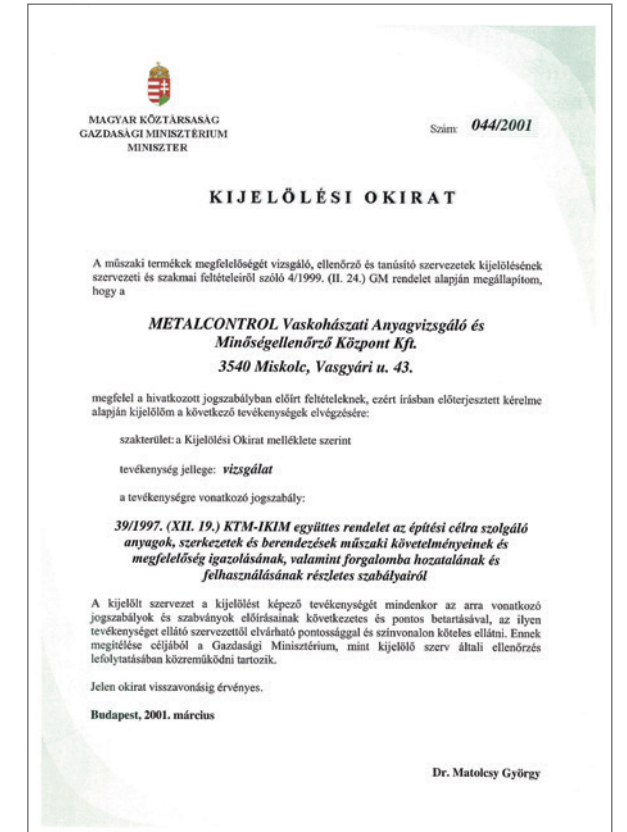
METALCONTROL Ltd. operated a quality management system according to the standard MSZ EN ISO/IEC 17025:2001. In the history of Metalcontrol, a wide range of chemical, mechanical, metallographic and non-destructive tests have been accredited by the English UKAS Accreditation Institute (No.1708) and the NAT Accreditation (501/ 0913).

In 2001, the Ministry of Economy (GM) designated METALCONTROL Ltd. in Document O44 / 2001 to certify the technical requirements and conformity of construction materials, structures and equipment, furthermore in accordance with Joint Decree 39/1997 (XII/19) KTM IKIM on the detailed rules for the placing on the market and use of construction materials and products.



The laboratory was part of the Outsourced Quality Department of the University of Miskolc for a long time. As a result, the University and the laboratory of METALCONTROL Ltd. still maintain a close relationship to this day.

The philosophy of the company is as follows: If you need a professional, fast and reliable measurement, conformity test or damage analysis test, you want to develop your products or improve the quality system, or improve the existing one, be our partner, use our services!

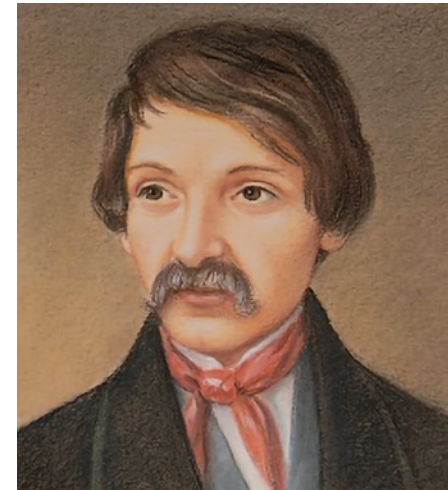
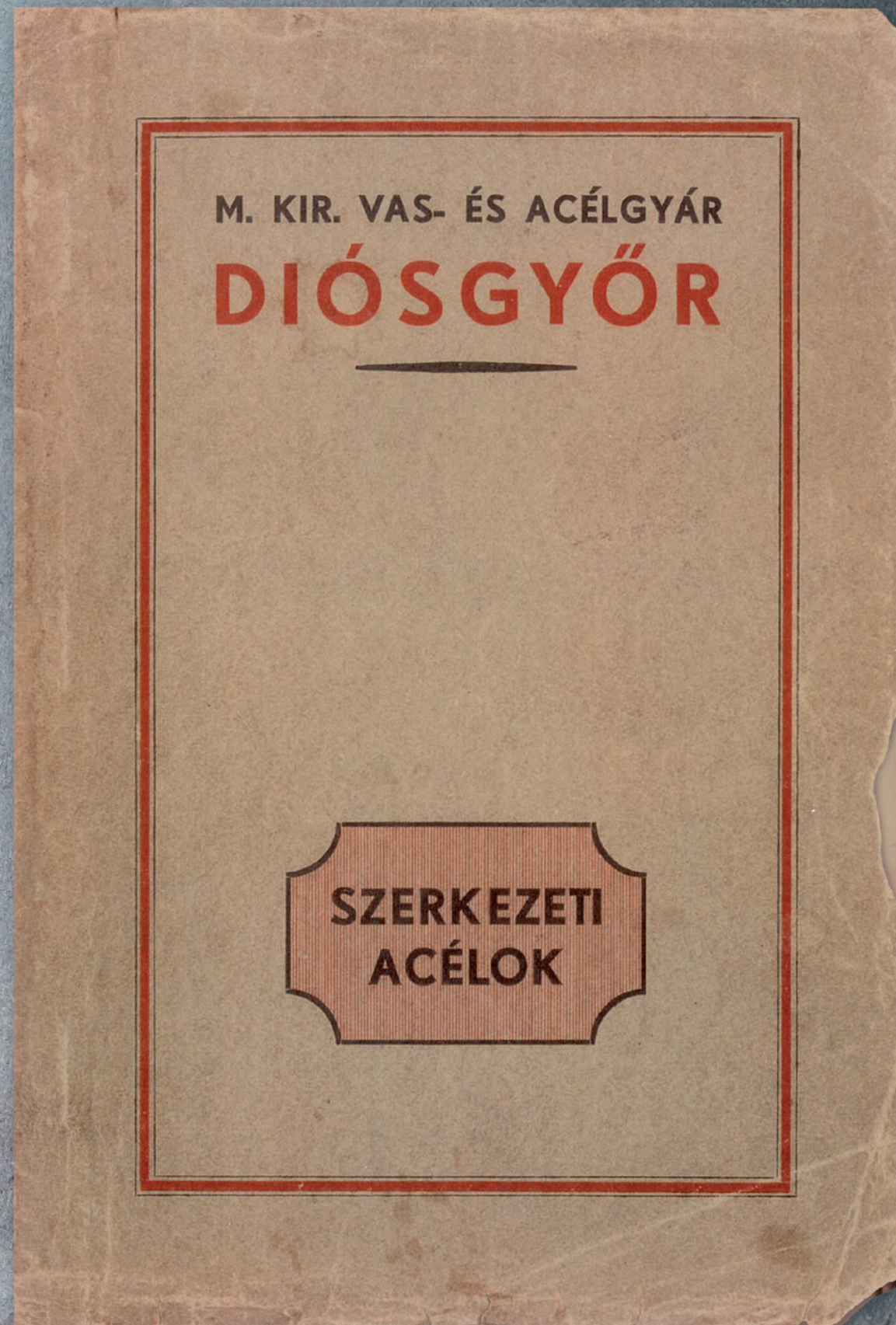


Ownership

Until 1990, the company was owned by DIMAG Plc., then by ÁPV Plc. ÁPV Plc resold the company. Our company Metalcontrol Ltd.

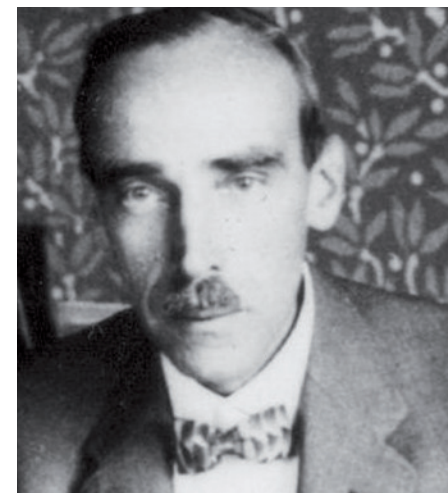
is currently 100% owned by a professional investor.

GREAT PREDECESSORS



HENRICH FAZOLA
1730 - 1779

On July 28, 1770, Maria Theresa signed the founding letter of the metallurgical works factory in Diósgyőr. At that time - together with the Vienna Mining Treasury, chief chamber officials and merchants from Miskolc - he began to build the iron smelter in Felsőhámor (now Miskolc - Ómassa), and it was put into operation in the spring of 1772. For the construction and start-up of the plant, he settled Styrian and upland specialists in iron production and processing, who became the ancient inhabitants of Ómas and Hámor. Giving up his residence in Eger, he himself moved to the territory of metallurgical works factory, and since then he worked as an ironworks. He remarried, his wife Karl Tekla, and he gave birth to son Frederick and daughter Borbála.



ZSIGMOND FÁBRY
1878 - 1958

He was born in Temesvár. He completed his secondary education in Budapest and his higher education at the Academy of Mining and Forestry in Selmecbánya. He had already completed the obligatory two-year internship in Diósgyőr, after which he received a degree in iron metallurgy in 1901. He studied metallography at the Berlin Mining Academy. The management of the metallographic laboratory of the Royal Hungarian Iron and Steel Factory in Diósgyőr was designed by the management of the factory in 1905, and for many years he headed the metallographic laboratory. It was the first such research base in the country. Through his work in the field of metallography, he made a significant contribution to making Diósgyőr steel and tool steel world-famous. In 1928 he became deputy factory manager, and in 1932, he was given a managerial position in the Iron-works Department of the Ministry of Commerce.



Fortepan / Szepesfalvy Gábor



EMIL NÉMETH
1922 – 1981

He was born in Iván, Sopron County. He graduated from the Széchenyi Grammar School in Sopron, after which he obtained a degree in metallurgical engineering in 1948 at the József Nádor University of Technology and Economics.

He was a novice engineer in the Nagykovács workshop in Diósgyőr, where he successfully solved the heat treatment of railway tires in an electric bell kiln. Therefore, he was soon appointed plant unit manager.

In 1952 he joined the Materials Testing Department, where he mainly dealt with experimentation and research. In 1956 he submitted a candidate dissertation on the topic of exploring the laws of electrolytic heating. Before the revolution, the proceedings began, the judges were appointed. However, the dissertation was not defended, as its reviewer went abroad after the defeat of the revolution, and he was no longer able to initiate the defense.

From 1957, he became head of the Materials Testing Department until his death. In his last years, he has also been the vice of the main metallurgist. It was characteristic of his activity that he considered material testing as a tool for the sake of some kind of production and innovation goal. He was the first in Hungarian industrial practice to acquire and use a transmission electron microscope for material structure studies.

Starting in 1949, the University of Heavy Industry taught a number of industrial engineers during this time, along with mostly commuting heads of departments. Mr. Emil Németh himself taught material testing and heat treatment at the Faculty of Metallurgy relocated from Sopron for a long time.

In 1961 he wrote a note entitled “Heat Treatment of Steels and Cast Iron”. From 1964 to 1965, “Heat treatment equipment for steels I and II”.

The book entitled “Heat treatment of steels and nonferrous metals in production technology” was proofread before his death, but he passed before the publishing (Műszaki Könyvkiadó Bp. 1981).



ISTVÁN MESTER
1901 – 1970

He was born in Békés. After graduating from the local grammar school, he obtained a degree in mechanical engineering at the József Nádor University of Technology and Economics. He joined the MÁVAG factory in Budapest in 1932, and a year later he worked in the material testing laboratory of the Diósgyőr Iron and Steel Factory. He soon became a professional authority in his narrower field of work. In 1945 he was awarded the position of Deputy Director of the Diósgyőr factory. He also took part what is in rebuilding the country from war ruins. A memorial plaque on the Margaret Bridge preserves this. In 1948 he took over the management of the Metallurgy and Research Department of the Heavy Industry Center, and also in 1949 the management of the Materials Testing Department of the Iron Industry Research Institute. He worked here until his retirement in 1967.



MAIN FIELDS OF ACTIVITIES

METALCONTROL Iron Metallurgy Material Testing and Quality Control Center Ltd. was established on January 1, 1990 from the former Lenin Metallurgical Works Material Testing Laboratory. It has a history of 230 years and is one of the largest and best equipped independent institutes for material testing and quality control in the country. As a third party, the company carries out conformity testing,

defect detection, quality development and research of various materials and products, such as: metal, wood, plastic, concrete, ceramics, glass and other construction products, as well as water, soil and environmental pollutants. Its scope of activities is very wide, independent of material testing and quality control, which shows that material testing is completely complex.

About the company's professional standards:

- had both Hungarian and English accreditation,
- among the first in international round examinations.

It performs material testing for a very wide range of customers. On an annual basis, many companies place test orders. There are several of these companies that regularly inspect the materials used in their products with METALCONTROL Ltd. The company's market position is strengthened by the fact that several of its customers, which manufacture export products, have also accepted

METALCONTROL Ltd's investigation with the customer.

In addition to material and lifetime tests is also available in the selection of materials for its production technology, and also provides expert advice for the regular inspection of manufactured products.



What does METALCONTROL Ltd. offer?

Helps:

- in the selection of materials,
- in product development,
- in the development of technology,
- in discovering the cause of failure.

By this contributes to the customer:

- to have EU compliant product suitable for export,
- have a well-functioning quality system,
- have a business operates economically,
- getting stronger market position.



In the field of quality development and consulting:

- Development and implementation of quality assurance and quality control systems according to ISO 9001,
- qualification and audit of suppliers,
- preparing laboratories for accreditation according to EN 45001,
- establishment and commissioning of material testing laboratories, development of testing methods, validation of testing equipment and methods.



METALCONTROL Ltd. has an extensive contact system

- close cooperation with universities (eg University of Miskolc), colleges and institutes
- active participation in international projects such as COST, OTKA, OMFB PHARE, COPERNICUS
- the company and our key persons (founding) who are members of MMT, EOQ MNB, HUNGAROLAB, GTE, OMBKE organizations and professional association
- has a daily working relationship with certification companies such as MERTCONTROL, TÜV, SGS, LLOYD
- achieves outstanding positions in international laboratory proficiency tests:
 - BAM: Bundesanstalt für Materialforschung und prüfung
 - GAZ: Association for the Accreditation and Certification GmbH

Accreditations of METALCONTROL Ltd.

The Hungarian Standards Institution accredited the laboratories of Ltd in 1991 according to the standards MI 18931 – 1988, then in 1993 according to the MSZ EN 45001: 1991 standards, which was confirmed by the National Accreditation Body in 1998 with the document No. 501/0600. Accreditation took place every three years.

The preparation process for a new accreditation process are currently underway.

As a result of a test of the company's operating quality system and testing capabilities at the European level, it was also accredited by the UK's UKAS (United Kingdom Accreditation Service) in 1995. Testing Accreditation No. 1708 certifies that the company's laboratories have met the requirements of EN 45001, ISO / TEC Guide 25 series of standards. 2001-UI the company operates according to the ISO / IEC quality management standard, which is already accredited by UKAS.

Mechanical material testing

The material testing equipment at Metalcontrol Ltd allows a wide variety of mechanical tests to be performed – even at different temperatures and environmental conditions.

The tests are performed according to the standards currently in force, which are constantly updated. Non-standardized examinations are recorded in home examination instructions.

Inspections performed on raw materials

- Qualification and design basis for static test reporting
- Technological research
- Fracture mechanical tests
- Lifetime examination
- Dynamic studies
- Hardness measurements



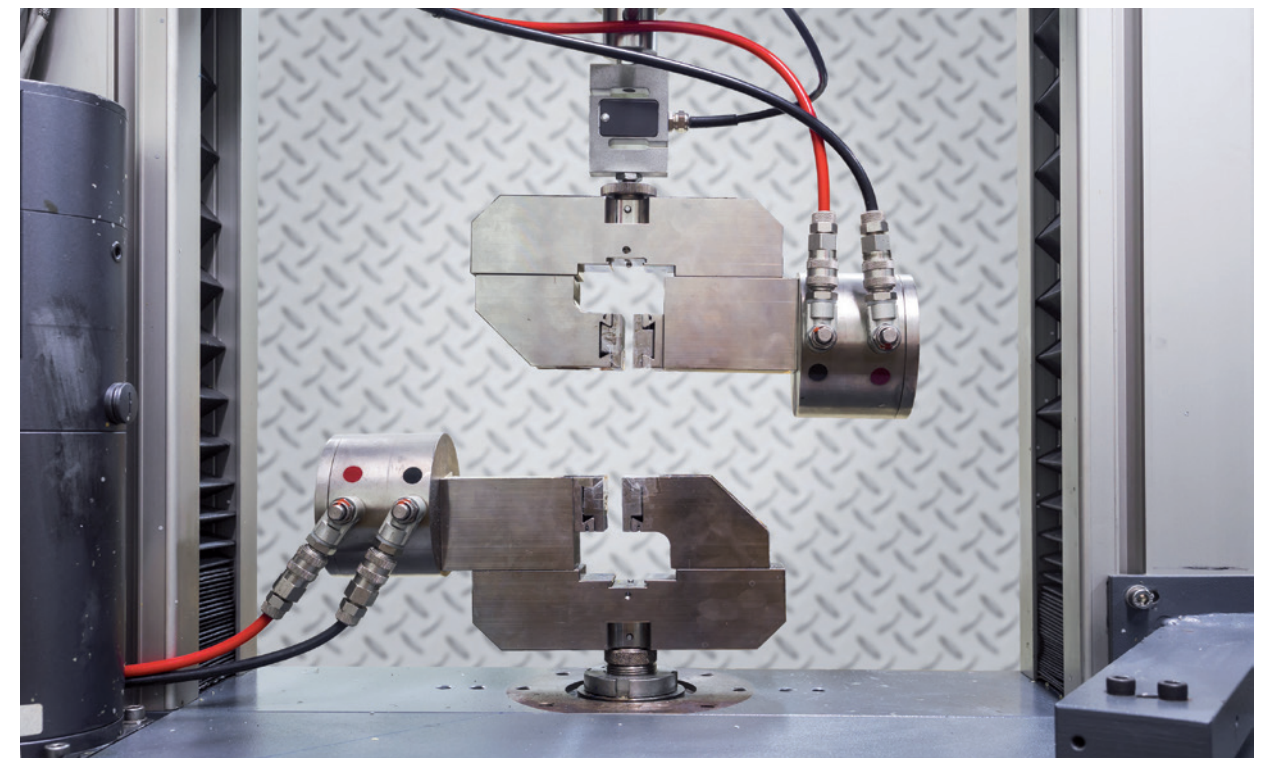
Tests on products and semi-finished products

- Inspection of steel pipes
- Examination of welding seams of KPE pipes
- Examination of welded joints of metals
 - Welder qualification tests
 - Welding technology tests
 - Welding technology testing of boilers and pressure vessels
- Testing of construction products
- Mechanical inspection of fasteners
- Examination of railway tracks
- Mechanical testing of ceramic raw materials
- Load testing of steel structures
- Examination of wires and twists



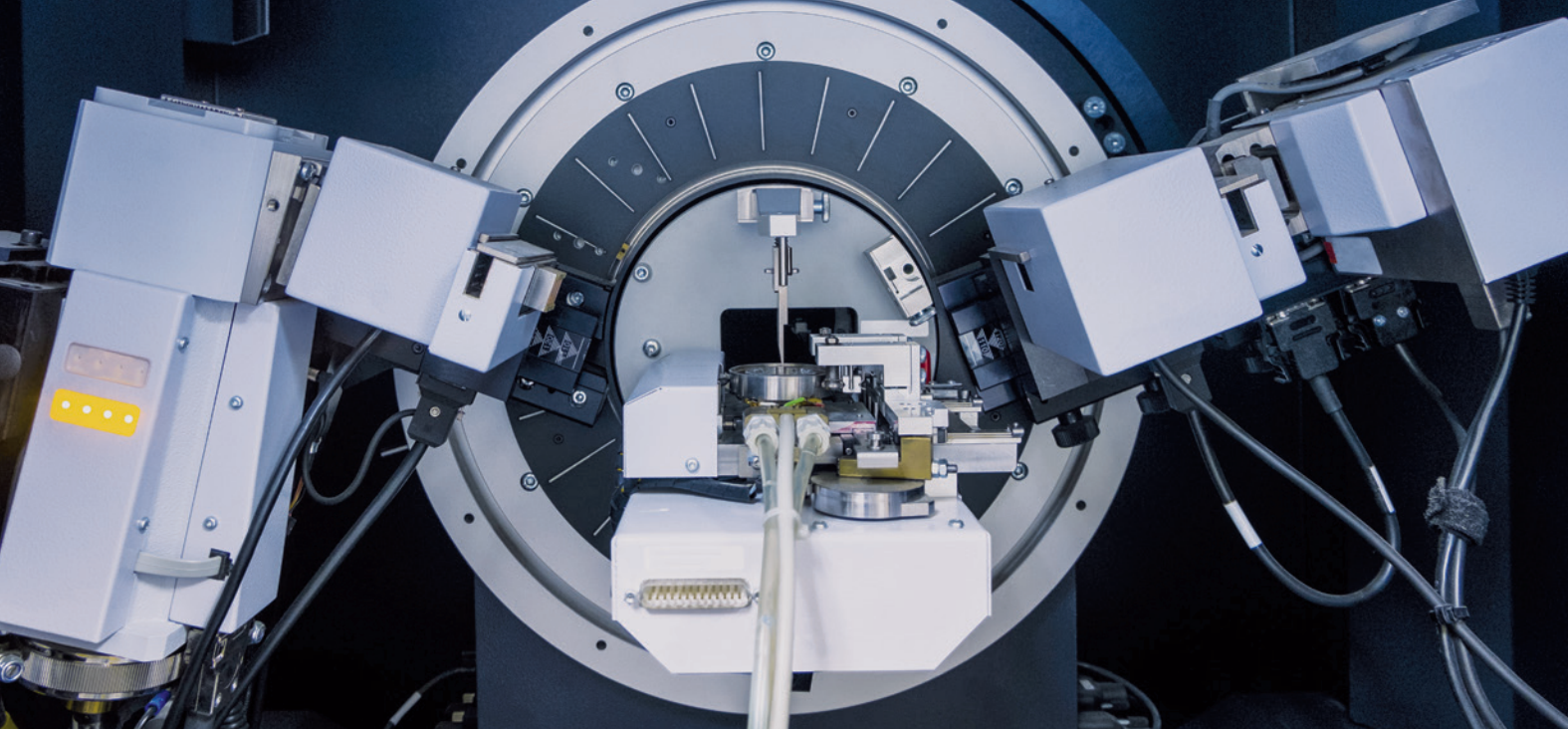
Static tests that provide basic qualification and design data

- Tensile test
 - Tensile testing of films and thin tapes
 - Hot break tensile test
 - Tensile test at low temperatures
- Shearing inspection
- Pressure inspection
- Determination of metals specific tensile work
- Determination of spring force, spring characteristics
- Determination of hardening exponent (n)
- Determination of anisotropy
- Determination of poison factor
- Relaxation examination



Fracture mechanical tests

- Determination of fracture toughness
- Determination of KIC toughness measure
- Fatigue crack propagation (da / dN) test
- Determination of R-curve
- Determination of critical crack opening



Lifetime tests

- Fatigue test on machined specimen (HCF)
- Fatigue test on original sample
- Low Cycle Fatigue Test (LCF)
- Determination of fatigue limit (Rd)
- Wöhler curve definition
- Smith diagram definition
- Determination of fatigue properties of bearing materials
- Creep test at elevated temperatures

Technological tests

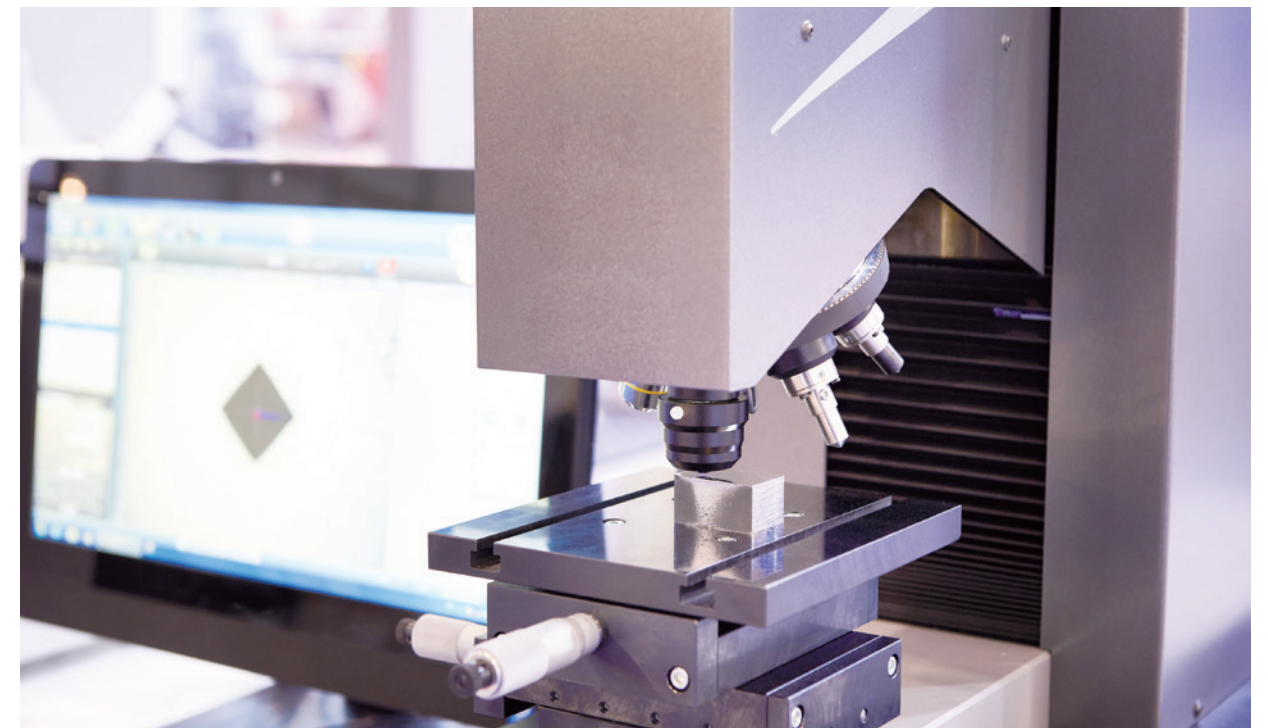
- Bending test
- Upsetting test
- Load testing of steel structures

Dynamic investigations

- Testing of deformation aging with an impactor
- Charpy impact testing
- Determination of transient temperature by impact test
- Instrumented impact test
- Drop test

Hardness tests and measurements

- Brinell hardness measurement (HB)
- Vickers hardness test (HV)
- Rockwell hardness test (HRC)
- On-site hardness measurements (HV, HB, HRC)
- Testing the permeability of steels by end hardening (Jominy test)



Tests on products and semi-finished products

- Inspection of steel pipes
- Examination of welding seams of KPE pipes
- Examination of welded joints of metals
- Welding qualification tests
- Welding technology tests
- Welding technology testing of boilers and pressure vessels
- Mechanical testing of fasteners (screws, nuts, pins, rivets, etc.)
- Examination of railway rails
- Mechanical testing of ceramics up to 1500°C
- Examination of wires and wires
- Examination of thin tapes and plates
- Inspection of springs
- Mechanical tests of rebar

Chemical tests

With the appropriate instrumentation, analytical knowledge and testing experience, our chemical laboratory is able to perform elemental analytical analysis of various solid and liquid substances in sub-ppm values characteristic of

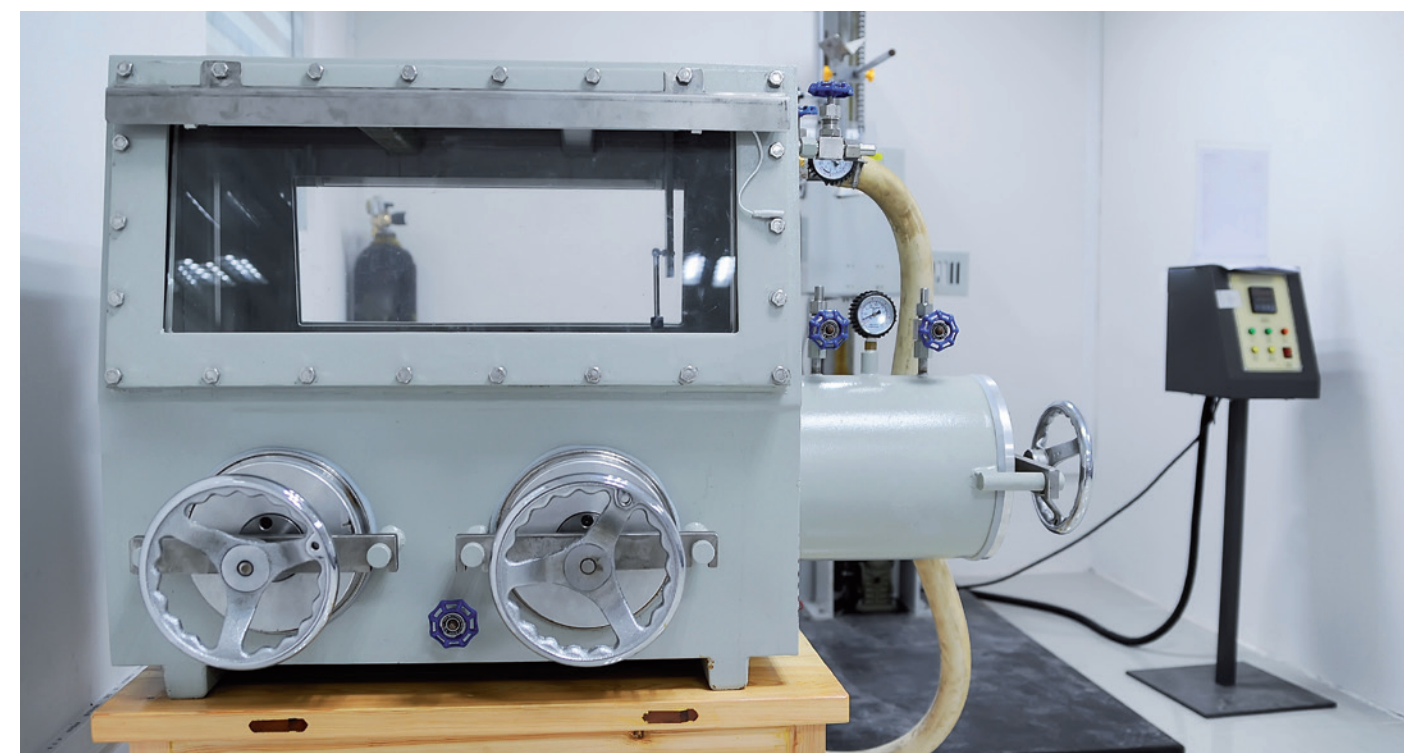
trace contaminants and microalloys up to 90% of the main components.

Analytical tests

- Determination of the chemical composition of iron and steel materials with an optical emission spectrometer
- Determination of carbon and sulfur content of metallic and non-metallic materials
- Determination of calorific value, carbon, hydrogen and nitrogen content of coal, coke, oil and organic matter
- Determination of oxygen, nitrogen and hydrogen content of iron and steel products
- Determination of oxygen and nitrogen (oxide, nitride) content of industrial ceramics
- ICP and AAS solution analytical tests of microalloys, heavy metals, contaminants in various materials

Our major analytical test equipment

- Spark-excited optical emission spectrometers (ARL)
- Sequence ICP spectrometer (ARL)
- Atomic absorption spectrometer (VARIAN SPECTRA)
- Gas content analysis equipment (LECO)
- Wet chemical devices
- Coal and sulfur analyzers (LECO)
- Instruments for energy testing (LECO)
- LECO CHN-600 carbon (carbon), hydrogen and nitrogen elemental device
- Portable spectrometer (METALSCAN)
- Salt spray chamber (WEISS TECHNIK)
- Gas chromatograph (DANI)

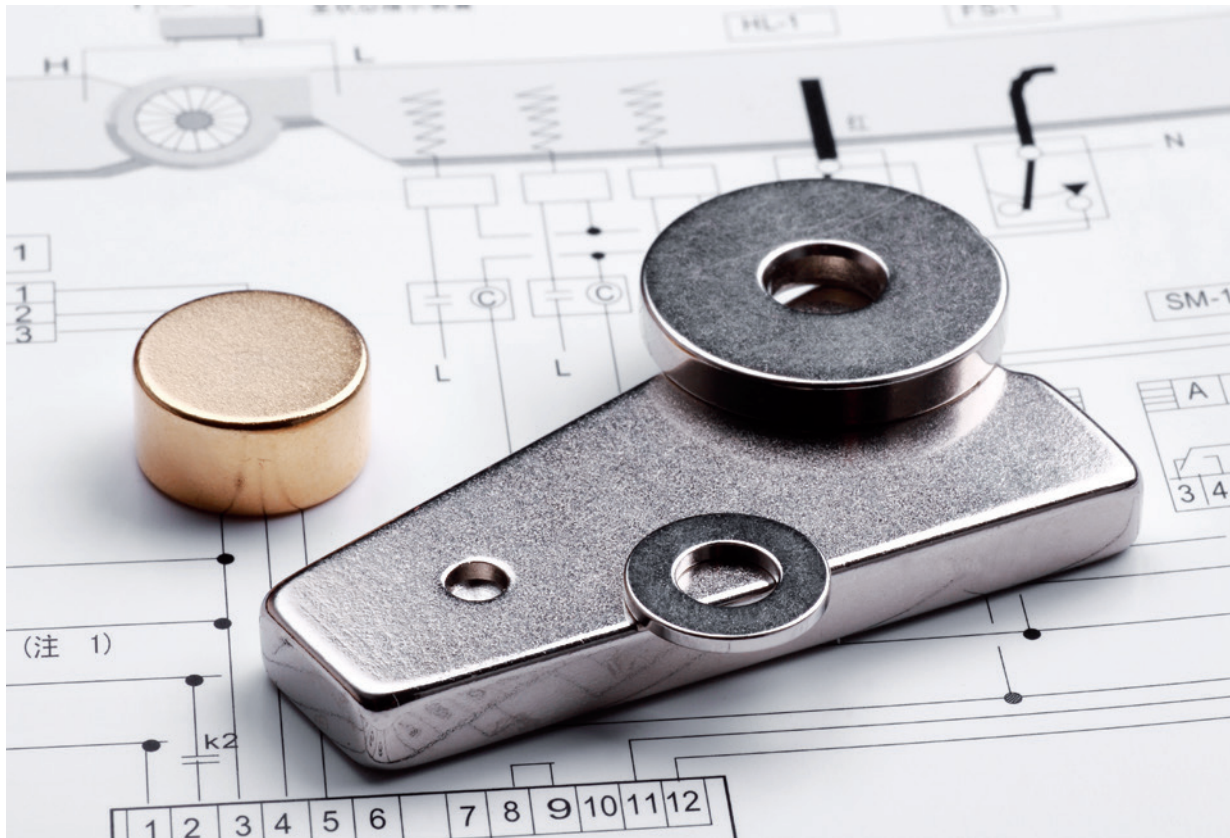


Analysis of metals and alloys

Cast iron, steel, copper alloys (various types of bronze, brass and red alloys), light metals (aluminum alloy, magnesium alloy, titanium), nickel and cobalt based materials, bearing metal alloys, soft and brazing, letter metals, precious metals and their precious metals determination of the main components, alloying, impurity, microalloying and trace elements of special metal alloys (zirconium-based alloys).

Testing of high purity materials

99,99 ... 99,999 ... 99,9999%-os purity of substances, determination of chemical contaminants, examination of degrees of purity.



Environmental investigations

Different types of materials (wastes, abrasive sludges, soot, lake sediments, soil samples, sewage sludges, electrical and electronic equipment and plastic parts for cars, paints, packaging and adhesives) analytical examination of the element, determination of its heavy metal (Cd, Pb, Hg, Cr6) content.

Testing of energy carriers

Determination and identification of the basic physicochemical parameters of the calorific value of coal, coke, oil and other organic substances, coal, motor fuels (oil, petrol), various industrial oils.

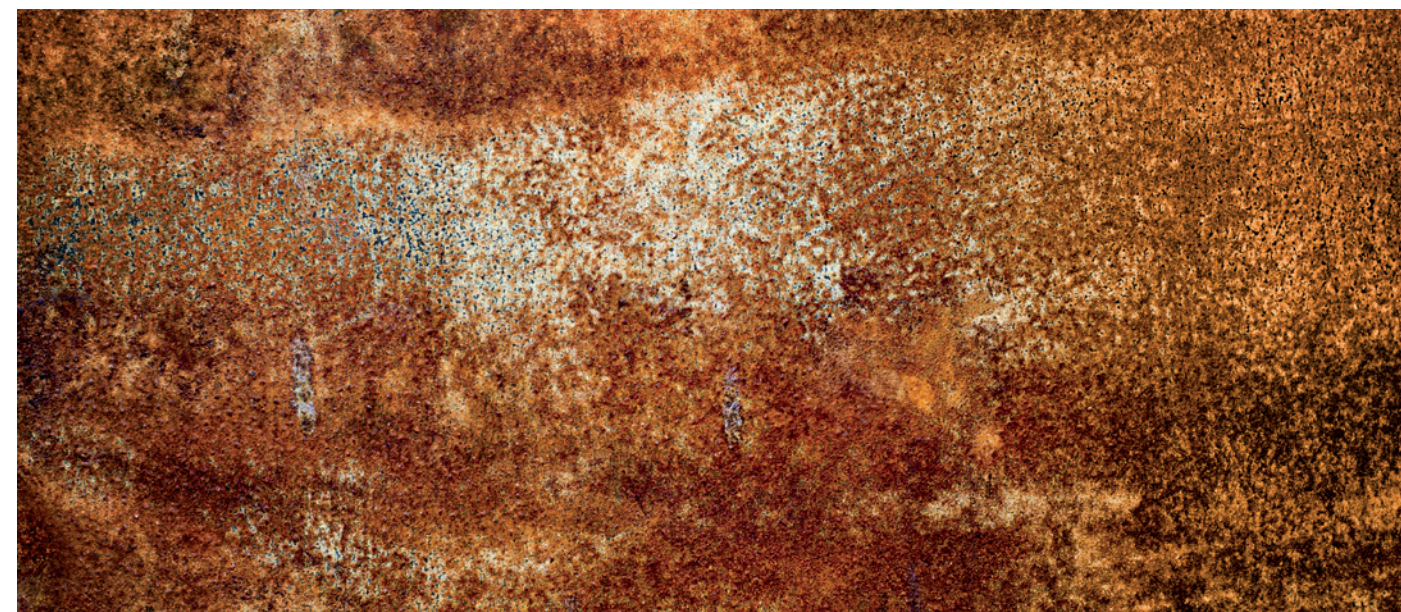


Corrosion resistance test

Investigation of the corrosion and climate resistance of various galvanic coatings, paints, paint coating systems in a salt spray chamber using various test media (water, saline, acetic acid, etc.).

On-site identification inspections

Determining the chemical composition of iron, aluminum and copper-based materials, checking the purchased and finished products, determining the type of material during maintenance and repair work, identifying waste with the help of a portable, multi-base optical emission spectrometer.



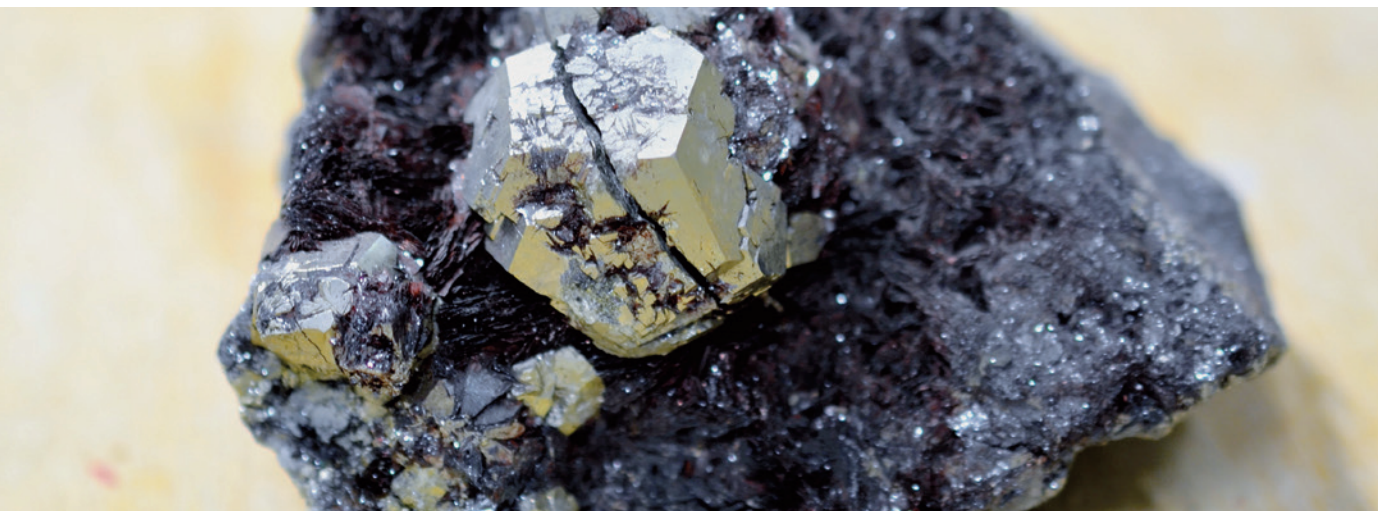
Examination of water samples

Determination of water chemical parameters (pH, conductivity, chemical, biochemical oxygen demand, aggressive carbonic acid, etc.), composition (main components, trace elements), volatile organic matter content of water samples of various origins.



Testing of non-metallic materials

Determination of the composition of basic and auxiliary materials, minerals and geological samples in the glass, glass and cement industry.



Metallographic examinations

Macrostructural examination

- Macrostructural examination, detection of internal and surface macro defects by deep etching
- Determination of sulfur distribution by Baumann method
- Examination of macrostructure, detection of internal defects by fracture testing
- Determination of non-metallic inclusions by blue fracture test

Microstructural examination

- Determination of grain size and non-metallic inclusions in steels
- Testing of fabric structure (steels, cast irons, welded joints, non-ferrous metals and alloys)
- Determination of decarbonized layer thickness and bark alloy depth, crack and defect depth
- Electron microscopic examination of inclusions, inhomogeneities, enrichments, fractures, microprobe analysis
- Electronmicroscopical examination



Other metallographic examinations

- Investigation of the intergranular corrosion tendency of stainless steels
- Take technical photos (using traditional photography or computer printing)
- Determination of crust thickness of insert-hardened steels, surface-hardened steels, bark alloy products, microhardness measurement of fabric elements



Our main metallographic testing equipment

- LEITZ METALLOVERT metal microscopes and LEITZ WILD stereomicroscope
- AMRAY1830 scanning electron microscope and energy-dispersive microsonde



Tests on products and semi-finished products

- Weld examination of KPE plastic pipes
- Weld examination of metal joints
- Welder quality tests
- Welding technology tests
- Welding technology examination of boilers and pressure vessels
- Investigation of the susceptibility of corrosion-resistant, welded steel pipes to crystalline corrosion (MSZ 2670/1)
- Examination of the weave structure and carbidity of bearing rings (SEP 1520)
- Macro- and micro-examinations of round bar and ingot raw materials, semi-finished products according to the relevant standard
- Quality of iron cast iron (MSZ 5716)
- Micro-examination of railway tires and railway rails based on Baumann imprint (MÁV-MI UIC 860: 2008, MSZ 2638-3: 1988)
- Macro- and microscopic examination of bicycle axles of railway vehicles (MSZ 2751)
- Primary fiber direction testing of gears, shafts, forged parts (MSZ 2638-4: 1988)
- Testing of construction products



Non-destructive testing

Radiological examinations

- Examination of welding seams, castings with X-ray machine or isotope depending on wall thickness



Ultrasound test

- Internal troubleshooting of welding seams, castings, rolled and forged products
- Ultrasonic wall thickness gauge with digital wall thickness gauge

Magnetic crack tests

- Examination of welds, castings, forged, rolled materials, used and new machine parts for near-surface and surface cracks. Field tests are performed using a walking magnet, laboratory tests are performed on a test bench using a black and white or fluorescent process.



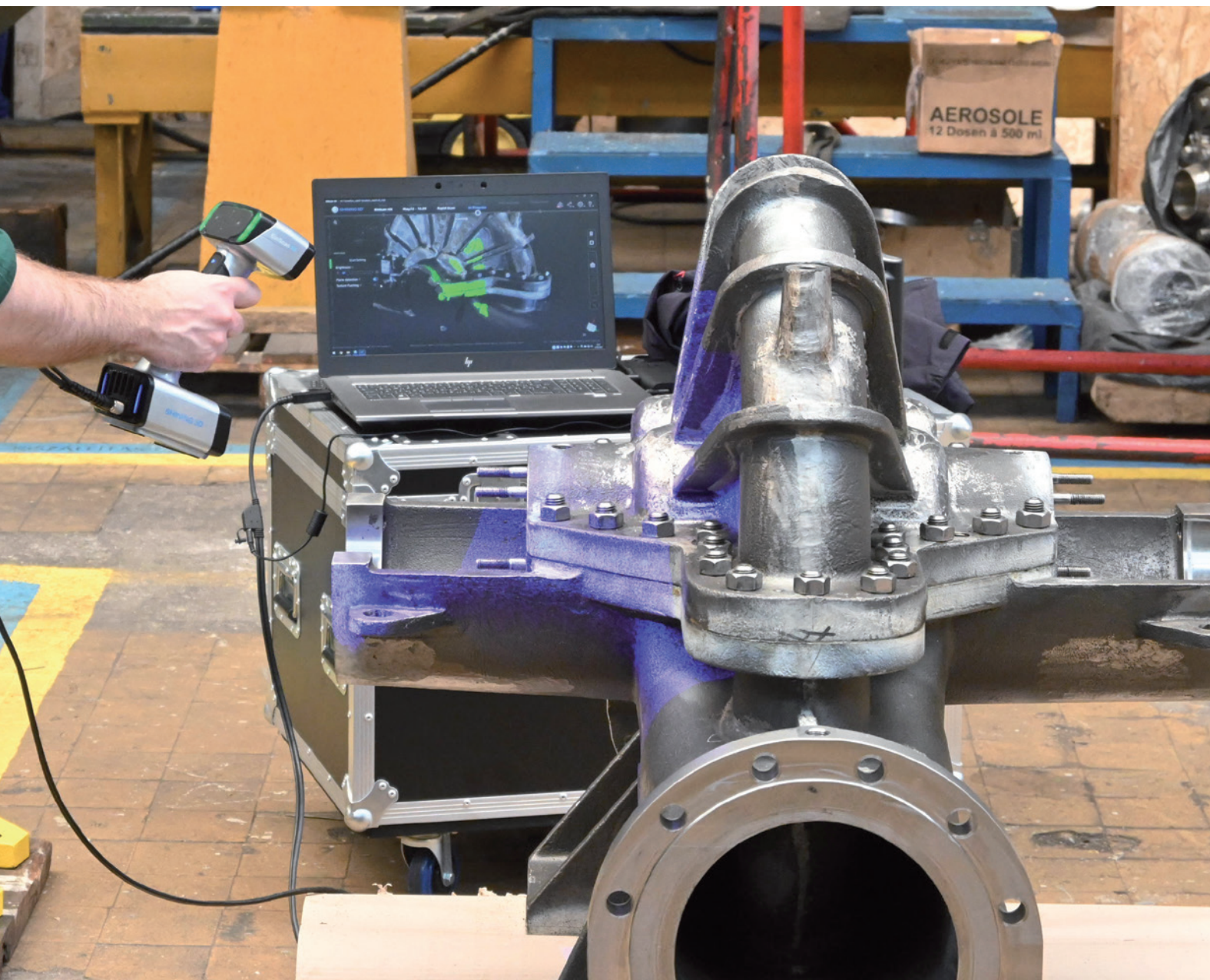
Penetration test

- Welding seams, castings, forged and rolled parts, used parts surface crack examination by liquid penetration method



3D laser survey

- Manual laser scanning with a portable device for color digitization of smaller objects. High resolution and accuracy meet the requirements of most industrial engineering applications. Minimum point distance 0.05 mm, accuracy up to 0.04 mm, color 3D point cloud.
- Long range 3D ground laser scanning. Digitizing the color dot cloud of buildings, plants, steel structures with the Leica P50 scanner is the fastest and safest long-range 3D laser scanner with a range of up to 1 km.



Inter-production inspection of industrial equipment

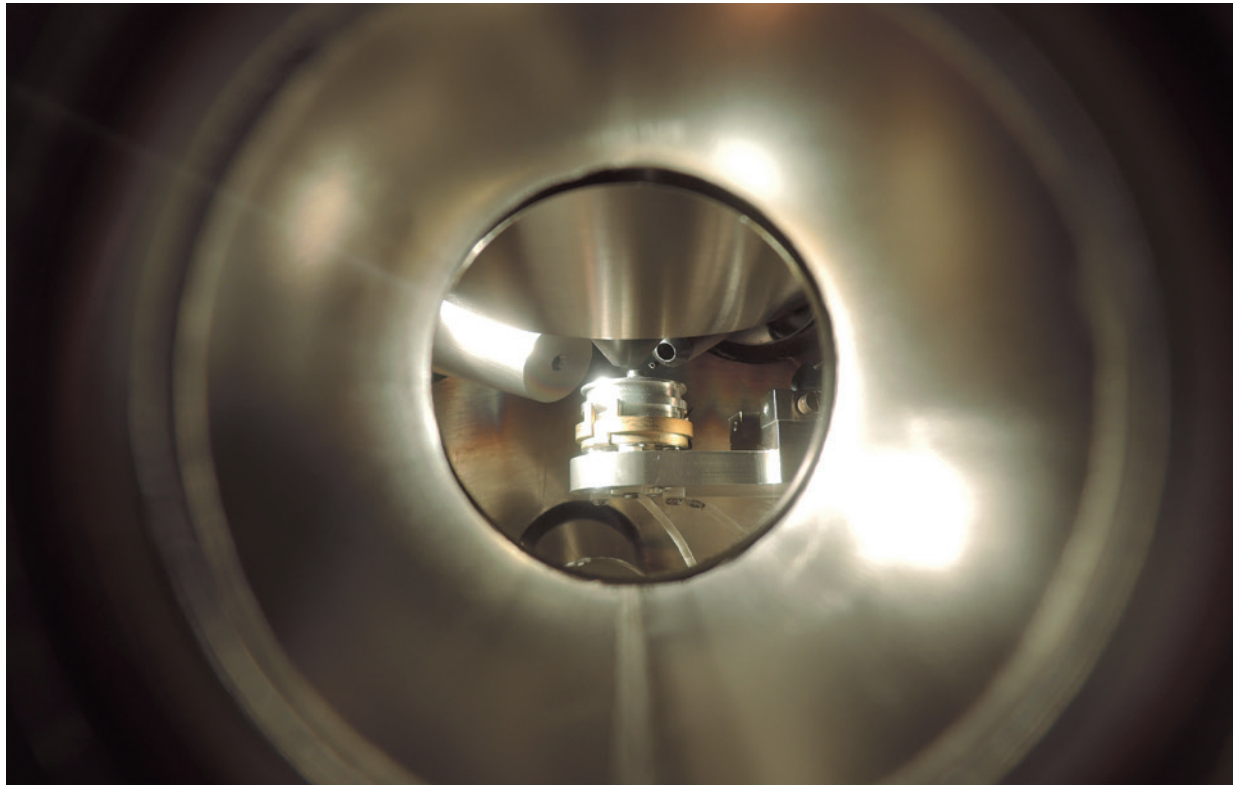
Carrying out inspections at suppliers (typically abroad).

- Review plans
- Carrying out inspections as the Investor's agent
- Control of production processes
- Supervision of final inspection of products



Eddy current tests

- A method for sorting materials of different composition or hardness up to a maximum diameter of 150 mm



Main testing instruments and equipment

- Radioactive isotope examinations
 - Co-60: testable wall thickness: 50 mm to 100 mm
 - Ir-192: testable wall thickness: 5 mm to 60 mm
- MMXR 200 X-ray examiner: up to a maximum plate thickness of 20 mm with computer data acquisition
- Ultrasound examiner
 - Measuring range: maximum 3 m
- DME-DL ultrasonic wall thickness gauge
 - Measurable wall thickness: 0.75 mm – 300 mm
 - Test temperature: -5°C to +50°C
- Penetration testing devices
- Magnetic crack tests
 - Portable and desktop models ripening range: up to 3 m

Expert activities

According to statistics, 80% of the damage in the world is caused by a fracture, one of the causes of which is the unsuitable raw material to be installed or its manufacturing defect. The research group of the Ltd. undertakes the examination and analysis of such and similar damages related to the properties and defects of the material.

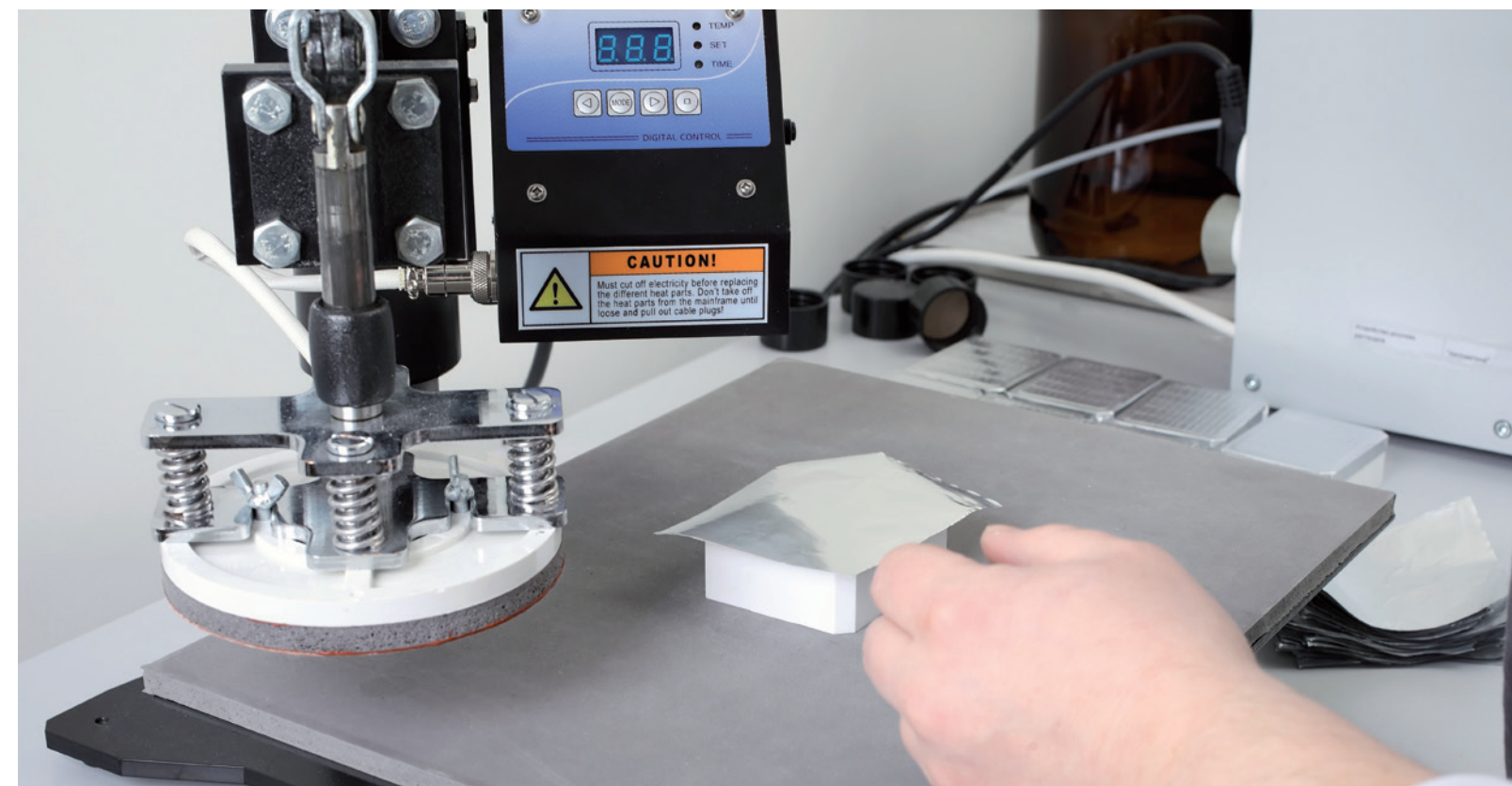
These conditions allow our Company to participate in domestic and international

research projects, to contribute to the development of production technologies and new testing methods.

METALCONTROL Ltd is one of the companies that has all the testing equipment that can be used to perform a comprehensive defect test for a given substance or product.

Main expert activities

- Error detection, error cause analysis exams
- Analysis of fractures and pathologies
- Preparation of expert opinions
- Carrying out research and related examinations
- Development of production technologies
- Development and implementation of new examination methods
- Complaints inquiries



Our references in the field of error detection

- Diósgyőri Szerszámgépgyár
- Csavar és Alkatrészgyártó Kft.
- CH Rt.
- Hámor Rt.
- Acélgyűrű Kft.
- BMT Ipari-, Kereskedelmi- és Szolgáltató Kft., Gödöllő
- Plesh Rt., Borsodnád
- ALTERRA Építőipari Kft.
- RÖTTGER STAHLHANDER AG Magyarországi Képviselete
- Miskolci Egyetem
- AUTOVILL Rt., Mezőkövesd
- ACEX Acéltermékgyártó Kft., Balmazújváros
- AUTOFER Rt., Szeged
- Diósgyőri Szivattyúgyár Kft., Szerencs
- Encsi Rendőrkapitányság
- Sajószentpéteri Üveggyár Rt.
- INTERSPAN Faipari Kft., Vásárosnamény
- AXION Hajtástechnika Kft.
- Rába Rt., Győr
- Csőszer Rt., Nyíregyháza
- Ózdi Acélművek Kft.
- ISOLYTH Ásványgyapot Gyártó Rt., Tapolca
- MÁV THERMIT Hegesztő Kft., Érd
- Debreceni Közlekedési Vállalat
- Magyar Kábelművek, Balassagyarmat
- Almási Ipari és Kereskedelmi Kft.
- Bay Zoltán Alkalmazott Kutatási Közhasznú Nonprofit Kft.
- CORWELD PLUS Kft.
- CSABA METÁL Öntödei Zrt.
- EFI Services Kft.
- Emerson Automation FCP Kft.
- Faurecia Emissions Control Technologies Hungary Kft.
- G.I.S Europe SE Magyarországi Fióktelepe
- Innopress Kft.
- Lanaxis Kft.
- Mertcontrol Metric Kft.
- Multi-Terra Kft.
- Óbúkk Kft.
- PREC-CAST Öntödei Kft.
- Pro Faber Kutatási és Fejlesztési Kft.
- Sanatmetal Kft.
- Spiko-Rex Kft.
- SW Umwelttechnik Magyarország Kft.
- UNIFY Kft.

Collaborative analysis

A number of methods for testing and evaluating the suitability of laboratories have been developed to date. One such evaluation method is interlaboratory testing.

Nowadays, cooperation between testing laboratories is commonplace. The first level of joint work is the so-called collaborative laboratory, which tests the same properties (e.g. composition) but it is not predetermined which method they can use. The next stage of development is the concept of a laboratory involved in age testing.

Why is a comparison between laboratories necessary?

The age test performed proves that the laboratory can really perform the measurements and tests as it claims.

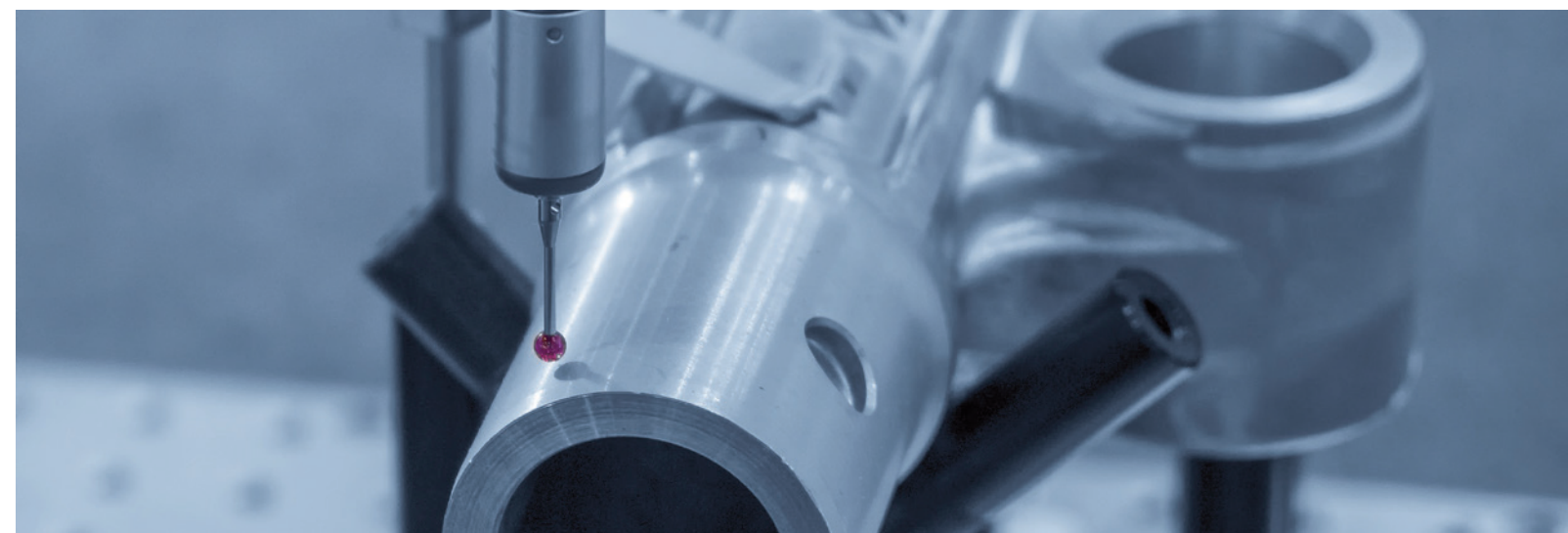
The different levels of inter-laboratory comparison are:

- Worldwide survey
- European competition (organized by EUROMET)
- National survey
- Industrial competition (based on demand and choice)

METALCONTROL Ltd has been involved in international body examinations in the fields of mechanical, chemical and metallographic examinations for many years. We participated in several rounds with outstanding results.

Examination of chemical composition

- Steel spectrometer and LECO (GAZ, Germany - 1994)
- Steel spectrometer and LECO (BAM, Germany - 1997)
- Aluminum ICP spectrometer (GAZ, Germany - 1993-94)
- Examination of an authentic material sample of cast iron spectrometer (Ferroetalon, Hungary - 1995)
- Flue gas Cr (VI) content ICP spectrometer (DANAK / AMI, The Netherlands - 2002)



Tensile testing

- R_m , R_{eh} , Agt, A, Z (CTLA/CAI, Czechoslovakia – 1998-99)
- R_m , $R_{p0.2}$, A, Z (ICEM-SA, Romania – 1999)

Hardness measurement

- HV10, HV30 (BAM, Germany – 1999)



Metallographic examinations

- Particle size and inclusion content (FH-Gelsenkirchen ABT, Germany – 2001)

Space research examination

The company is currently expanding its activities to include space exploration and the space industry. In this context, the activity will be extended mainly to the following areas:

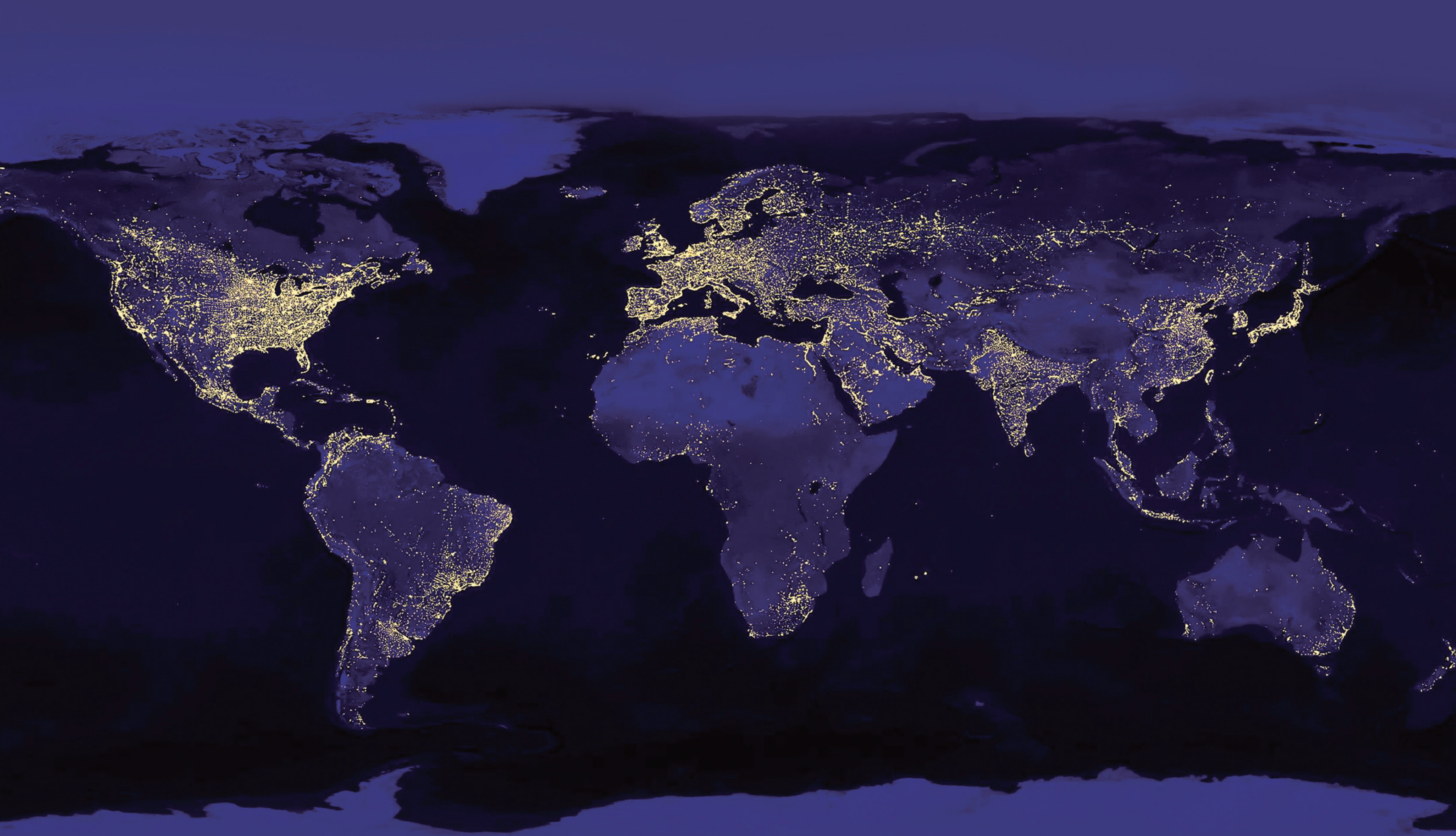
- cosmic radiation testing, surface cleanliness testing of spacecraft for various materials,
- sizing of tools used in space research,
- engineering activities related to terrestrial objects related to space exploration,
- ECSS-Q-HB-60-02A,
- ECSS-Q-ST-70-05C,



- metals, plastics and other tests under extreme temperature and radiation conditions.
- complex examination of the components of certain spacecraft (material examination, analysis of deformations under different loads, fracture analysis)
- ECSS-Q-HB-30-01A,
- ECSS-Q-HB-30-08A,
- ECSS-E-10-02-A,
- ECSS-Q-ST-70-39C



- the properties of promising materials are predictively determined using the equipment and software currently available to the company,
- ECSS-Q-ST-70-71C,
- ECSS-Q-ST-70C,



- participation in the development of terrestrial communication facilities,
- ECSS-Q-ST-70-41C.



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ZF

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