



Ministry of Education and Research



**NATIONAL INSTITUTE OF RESEARCH AND DEVELOPMENT
FOR MECHATRONICS AND MEASUREMENT TECHNIQUE**



Results of Research , Development & Innovation in INCDMTM Bucharest

VOL. XXVI

To the attention of the:
• Quality Manager
• Marketing Manager
• Technological Transfer and
Innovation Manager

BUCHAREST 2020 ROMANIA

RESULTS OF RESEARCH, DEVELOPMENT & INNOVATION IN INCDMTM BUCHAREST 2020 VOL. XXVI

Elaborated by INCDMTM – Bucharest, by:

- Strategy, Marketing Compartment – CSM;
- Relay Centre of Technological Transfer and Consultancy – CRTTC;
- Inter-Regional Centre of Innovation and Technology Transfer Chisinau – Iasi – Bucharest – CIITT;
- Industry Links Office – OLI;
- Evaluation and Training Centre for Mechatronics – CEF „MECATRON”;
- Business and Innovation School – SAI „MINATECH”;
- Bucharest - Ilfov Regional Mechatronics Cluster – ”MECHATREC”;
- Competitiveness Strategic Pole in Mechatronics, Integronics and Adaptronics "INDMECATRON".



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MINISTRY OF EDUCATION AND RESEARCH
NATIONAL INSTITUTE OF RESEARCH AND DEVELOPMENT IN
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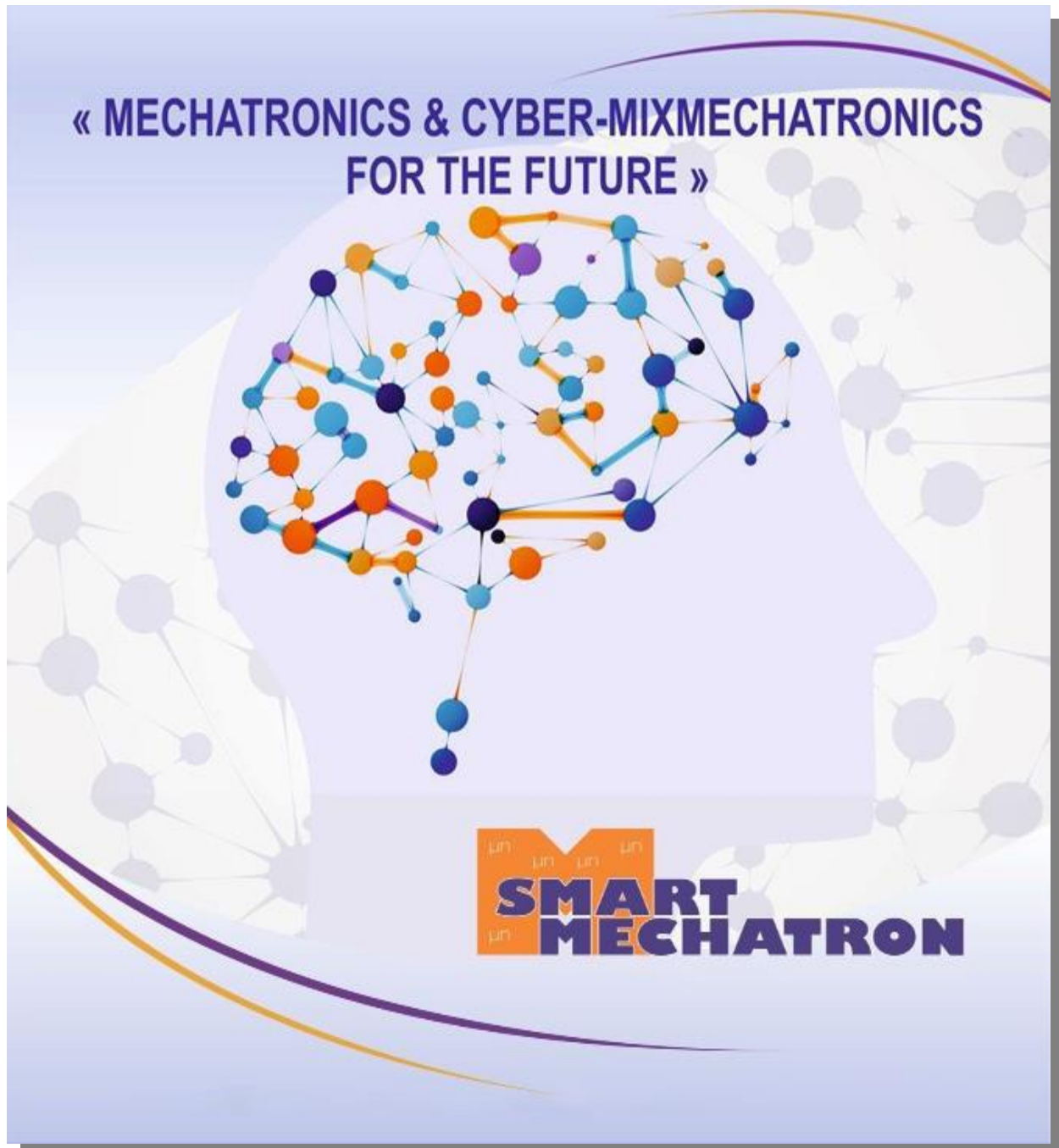
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- Our Key Visual



INSTITUTE OVERVIEW

The National Institute of Research and Development in Mechatronics and Measurement Technique – INCDMTM Bucharest has as main objectives:

- **basic research**
- **industrial research**
- **technological development**
- **elaboration of development strategies for national and European Precision Mechanics Integronics, Adaptronics, and Mechatronics industry;**
- ▶ **INCDMTM identifies with the following strengths:**
 - **intelligent measurement technique, active, automatic and computerized control;**
 - **equipments and integronic, adaptronic, mechatronic devices for multi-parameter integrated control;**
 - **non-electric physical quantities control (pressure, temperature, mass, strength, time);**
 - **innovative technologies;**
 - **tribotechnology of cutting and micro-nano-cutting processes;**
 - **intelligent mechatronic, integronic and adaptronic biomedical equipment;**
 - **robotic, microrobotic and nanorobotic systems;**
 - **methodologies, standards, testing and certification;**
 - **linkswith industry;**
 - **technology transfer;**
 - **development and sustainability strategies;**
- ▶ ***INCDMTM participates in National and European RESEARCH- DEVELOPMENT - INNOVATION programs.***



GENERAL MANAGER
Gh. Ion GHEORGHE
Univ. Professor PhD Eng.
Eurlng. D.h.c.

The National Institute for Research & Development in Mechatronics and Measurement Technique (INCDMTM), is a quasi - governmental organization, established by the national law for promoting R&D activities. We, at INCDMTM, are mainly responsible with fundamental and industrial researches, technological developments, technical and economic regulations, with national or limited applicability, all these regarding the field of Precision Mechanics and MECHATRONICS, INTEGRONICS AND INTEGRONICS. INCDMTM takes part in working out national strategies for development, giving priority to achieving the scientifically and technological objectives included in National Programs.

- ▶ **INCDMTM activities, according to NACE: 2571; 2573; 2652; 2813; 2824; 6201; 6311; 6312; 6399; 7021; 7112; 7120; 7211; 7320; 7410; 7490; 8230; 8299; 8541; 8559; 8560; 7811; 5812; 5814; 5819; 5829; 7219; 2651; 2660; 2670; 3250; 3320 include:**
 - ↪ basic research and development;
 - ↪ applied research activities;
 - ↪ information technology;
 - ↪ manufacturing activities to support specific R&D;

- ↳ studies, strategies and analyses;
- ↳ technological transfer, results capitalization and managerial consulting;
- ↳ general and special training seminars;
- ↳ publishing specialized publications and ordering information;
- ↳ activities in tertiary education;
- ↳ joining activities;
- ↳ activities abroad;
- ↳ activities additional to R&D work;

► **Sub-fields covered:**

- ↳ intelligent measurement technique;
- ↳ systems for measuring non-electrical dimensions and specific technologies for precision mechanics, mechatronics, integronics and adaptronics;
- ↳ MEMS and NEMS;
- ↳ instruments for laboratories and research, special biomedical and environment equipment;
- ↳ quality engineering, assurance and certifying;
- ↳ strategy development, marketing and technological transfer.

► **Our main achievements grouped according the aforementioned activity sub-fields:**

- *Methods, technologies, measuring and control instruments for assessing quality characteristics through different proceedings, according to measuring techniques:*

a) **dimensional control integrated with manufacturing process - in process control, automated and numerical control for:**

- automotive industry;
- bearings industry;
- injection pumps industry;

b) **out of process dimensional control for:**

- FMCG industries;
- motors industry;

c) **control technologies and measuring equipment using laser interferometers, inductive and photoelectric sensors and transducers;**

d) **MECHATRONIC, INTEGRONIC AND ADAPTRONIC equipment and installations for multidimensional control, using a high degree of automation and numerical data processing;**

- *Concepts and methods for improving competitiveness, reliability and capability in industrial processes; new materials, along with appropriate technologies for using them in mechatronics, integronics and adaptronics:*

- a) **control of non-electrical sizes - pressure, temperature, mass, force, time;**
- b) **technologies, carbide tools, diamond tools, posts for tools;**
- c) **equipment for specific testing and investigation methods and procedures;**
- d) **adapting and applying new technologies and micro-nano-technologies for rationalization and optimization in industrial processes, for cutting costs and consumption, and raising productivity;**

- e) building and developing seismic stations;
- f) surveillance active/passive mechatronic, integronic and adaptronic systems for normal wear and catastrophic tools;
- g) tribotechnological characterization of cutting and micro-cutting processes (grinding, turning, super-equalling) with tools with the active part made up of hard materials
- **Methods, procedures and instruments for evaluation of trends, prognoses and strategies for the industry of precision mechanics, mechatronics, integronics and adaptronics:**
 - a) strategies for restructuring and development the precision mechanics, integronic, adaptronic, and mechatronic industry;
 - b) strategies for approaching and integrating the precision mechanics, integronic, adaptronic, and mechatronic industry to EU market.
- **Technological transfer, result capitalization and consulting, offered to manufacturing companies and consumers in the industry:**
 - a) control technology for gears parameters;
 - b) control technology for the main parts of the motors with internal combustion;
 - c) manufacturing technologies for blanks from sintered metal carbides and diamonds;
 - d) equipment for gears profile and lead.

► **Other data:**

- Year of establishing: 1971
- Number of employees: 135 (21 PhD Engs, 8 PhD students)
- Collaborators: over 40 R&D Romanian institutions operating in different fields of knowledge and industry; polytechnic and specialized universities in Bucharest, Brasov, Cluj, Timisoara, etc.
- Endowment: suitable to accomplished activities
- INCDMTM is registered in the Registry of Commerce
 - ✓ Member of:
 - Romanian Chamber of Commerce and Industry, Bucharest
 - General Engineers' Association in Romania
 - Romanian Society of Mechatronics
 - Association of the Romanian Patronage in Precision Mechanics, Optics and Mechatronics Industry
 - Professional Association of Precision Mechanics and Optics from Romania
 - CONPIROM
 - ✓ Tutelary Forum:
 - Ministry of Education and Research;

In 2013, INCDMTM has been the subject of an international evaluation process (between September 12-13), and received the highest rank A+.

CODIFICATION OF PRODUCTS ACCORDING TO NACE ARRANGEMENT OF ACTIVITIES IN THE NATIONAL ECONOMY

- ✓ **Metallic construction and metal products industry:** NACE 257
- ✓ **Cutting tools and products:** NACE 2571
- ✓ **Hand Tools:** NACE 2573
- ✓ **Machinery and medical instruments, precision, optical and watch making:** NACE 265;266;266;
267;325;3320
- ✓ **Machinery and medical instruments:** NACE 2660; 3250
- ✓ **Machinery and tools of measurement, verification and control:** NACE 2651
- ✓ **Measurement, regulating and controlling equipments:** NACE 8320
- ✓ **Optical and photographic devices:** NACE 2670
- ✓ **Clocks and clock mechanisms industry:** NACE 2652



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**COMPARTMENT OF
RESEARCH AND
DEVELOPMENT
«SMART MECHATRONIC
MEASUREMENTS»**

THE DIVISION OF RESEARCH AND DEVELOPMENT FOR SMART MECHATRONIC MEASUREMENT offers Professional solutions and services of excellence

The INCDMTM proposal – through the DIVISION OF RESEARCH AND DEVELOPMENT FOR SMART MECHATRONIC MEASUREMENT-comprises a wide palette of computer-aided intelligent complex measuring and integrated control equipments.

The DIVISION OF RESEARCH AND DEVELOPMENT FOR SMART MECHATRONIC MEASUREMENT, oriented on producing and developing mechatronic measuring means and techniques is prepared to help clients efficiently with the view to obtaining a quality production and to transform production in a intelligent production processes.

The DIVISION OF RESEARCH AND DEVELOPMENT FOR SMART MECHATRONIC MEASUREMENT also offers service; this facility includes:

- **Putting into operation;**
- **Training;**
- **Warranty;**
- **Service;**
- **Maintenance and product remedy contracts.**

NACE 265; 267; 332

- ▶ Intelligent Measuring, Testing and Control Devices and Tools; ◀NACE 2651▶

- ▶ Mechatronic, Integronic and Adaptronic Measuring, Arrangement and Control Devices for industrial processes; ◀NACE 3320▶

- ▶ Optical and Photographical Devices; ◀NACE 2670▶

- ▶ Watches and timing mechanisms ◀NACE 2652▶

DEVELOPING AND TESTING / OPTIMIZATION OF A TECHNOLOGICALLY ADVANCED SYSTEM FOR MANUFACTURING AND INSPECTION OF THE MEDIUM SIZE INNER AND OUTER RINGS OF ROLLER BEARINGS, MANUFACTURED ON CNC MACHINE-TOOLS

Subsidiary contract of the project: Knowledge Transfer Partnerships to Enhance Business Competitiveness in the Field "Automotive Industry and Components" and Improve Road Traffic Safety – KTAutoComp
Project co-funded by the European Regional Development Fund through Competitiveness Operational Programme 2014 – 2020

Program: Competitiveness Operational Programme 2014-2020

Call identifier: **POC-A1-A1.1.4-E-2015**

MySMIS Code: 105552

Partner: SC COMIS SRL

Generalities

Bearings are critical components in almost all rotating machines. Most important characteristics which influence bearings quality are: dimensional and geometrical accuracy of the bearing rings and roller elements.

The bearing rings of medium sizes are manufactured generally by material removal (lathing) from pipe or barr. CNC high speed turning is more and more used for bearing components manufacturing. This process will lead to a high quality surface, appropriate to the grinding. During bearing rings races processing occur elastic deformations machined form errors due to workholding and cutting loads which contribute to. These form errors often require finishing operations that can be time consuming and environmentally unfriendly.

The improvement of inspection technologies and the use of statistical quality control contribute significantly to the increase of the quality and efficiency of the manufacturing processes. Statistical quality control aims at maintaining a stable, capable and predictable process. The main benefits of using statistical quality control are:

- It provides a means of detecting error at inspection;
- It leads to more uniform quality of production;
- It reduces the number of rejects and saves the cost of material;
- It provides a means of determining the capability of the manufacturing process;
- It helps to avoid unnecessary machine adjustments so long as the process is in a state of control.
- It improve the quality and productivity by process control.

The development of sensors and transducers with wireless transmission allows the interconnection of measuring devices and equipment, swiftly and accurately data collection in the inspection process and increases the company competitiveness based on detailed data analysis.

The advantages of using local wireless data transmission networks from measuring instruments to computers are:

- Easy installation
- Does not require modification of the production space
- Low investment
- Easy reconfiguration.

Integrated system for dimensional and geometric inspection of bearing rings

For bearing rings inspection we designed a set of two measurement devices based on diametral measurement method, for inner and outer surfaces. Diametral measurement system can be used to measure and evaluate the diametral variation of cylindrical objects. Each diametral measurement device include two digital indicator aligned opposite one another for measuring diametral variation as the part is rotated. The measurements obtained from the diametral measurement devices can be used to evaluate the magnitude and orientation of form deviations and the diameter deviation from nominal value. For measuring short cylindrical parts such as bearing rings, diameter measuring systems can be considered as a robust, fast and economical solution for measuring and analyzing diameters and form deviations.

In the figure 1 are presented the two devices for measuring the inner and outer surfaces of the bearing rings. The probe arms are adjustable both horizontally and vertically to allow a wide range of bearing rings to be measured.

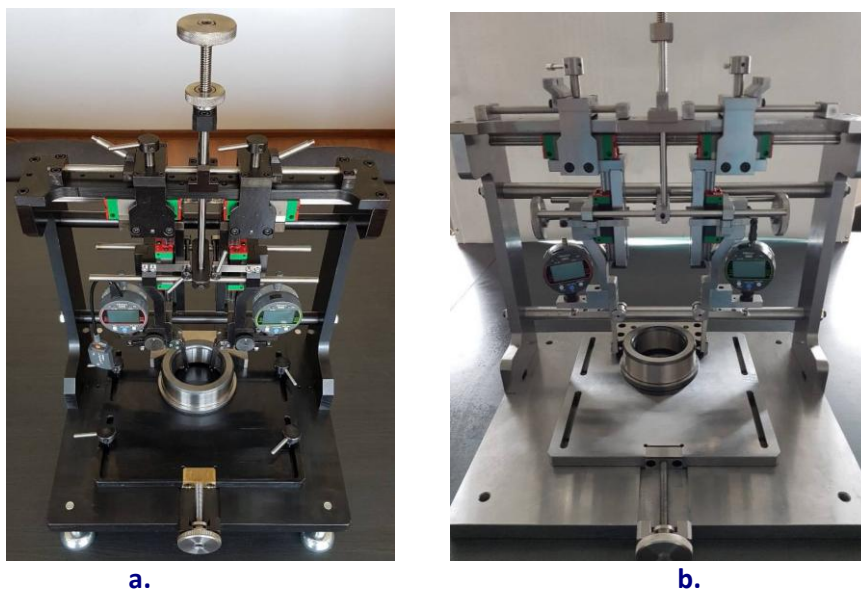


Figure 1. Devices for outer (a) and inner (b) surfaces measurement

The 2 measurement devices are interconnected in a informatic system through digital indicators, U-WAVE system enables easy wireless data communication and a PC (see figure 2).

The purpose of storing the information in the PC is to have control over the inspection operations and statistically data processing for control of the manufacturing process.

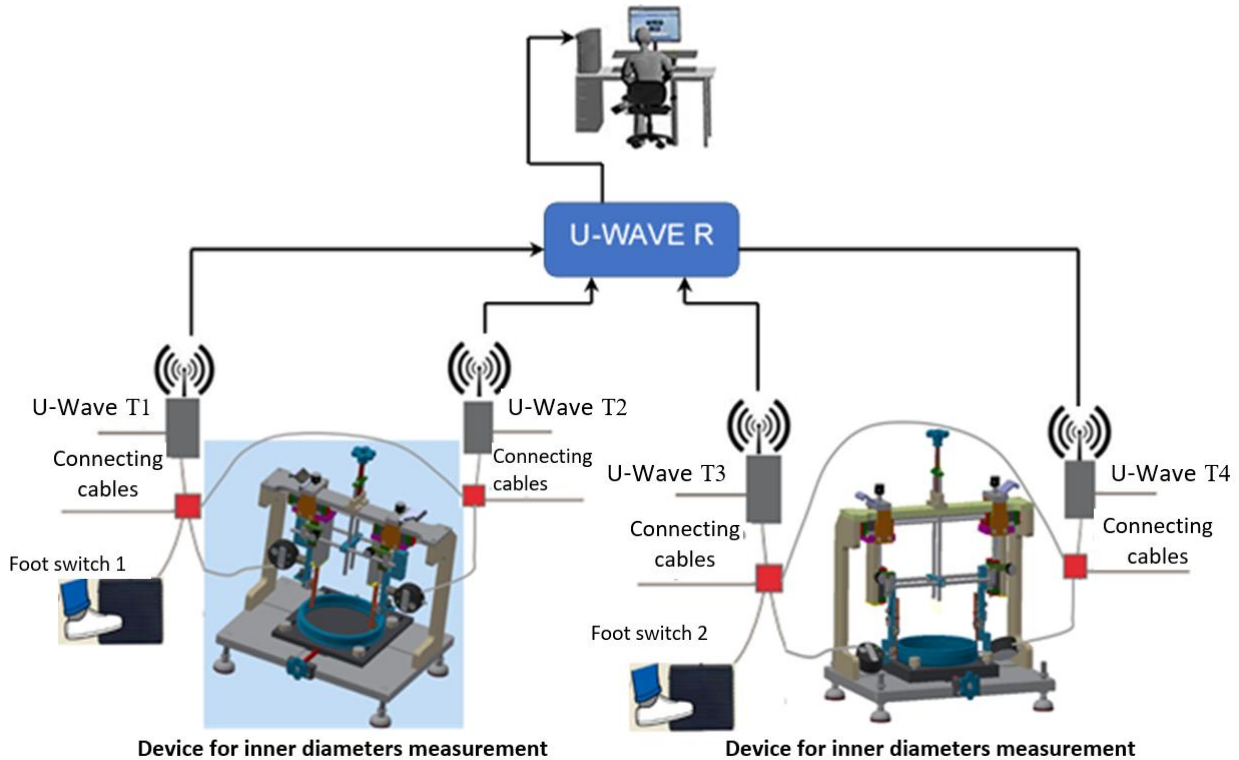


Figure 2. Integrated system for inner and outer diameter of beasing rings measurement

The data wireless collected from the transducers are processed from the specific software application and stored in the database. The operating logic diagram of the integrated system is presented in figure 3.

The database is implemented on a MySQL (My Structured Query Language) server. MySQL is a relational database management system (RDBMS) with the following main functions:

- Designing the structure of the tables (database schema) and defining the relationships between the tables.
- Add, edit and delete data
- Sorting and processing of data
- Database query according to selected filters

Technical features:

- Measured parts dimensions:
 - Inner diameters: 48÷190 mm; Outer diameters: 50÷200 mm; Heights: max. 50 mm;
 - Dimensional and geometric accuracy: 0.050,5 mm;
- Resolution: 0,01 mm or 0,001 mm (selectable)
- Measurement range: 12,7 mm
- Repeatability: 0,005 mm;

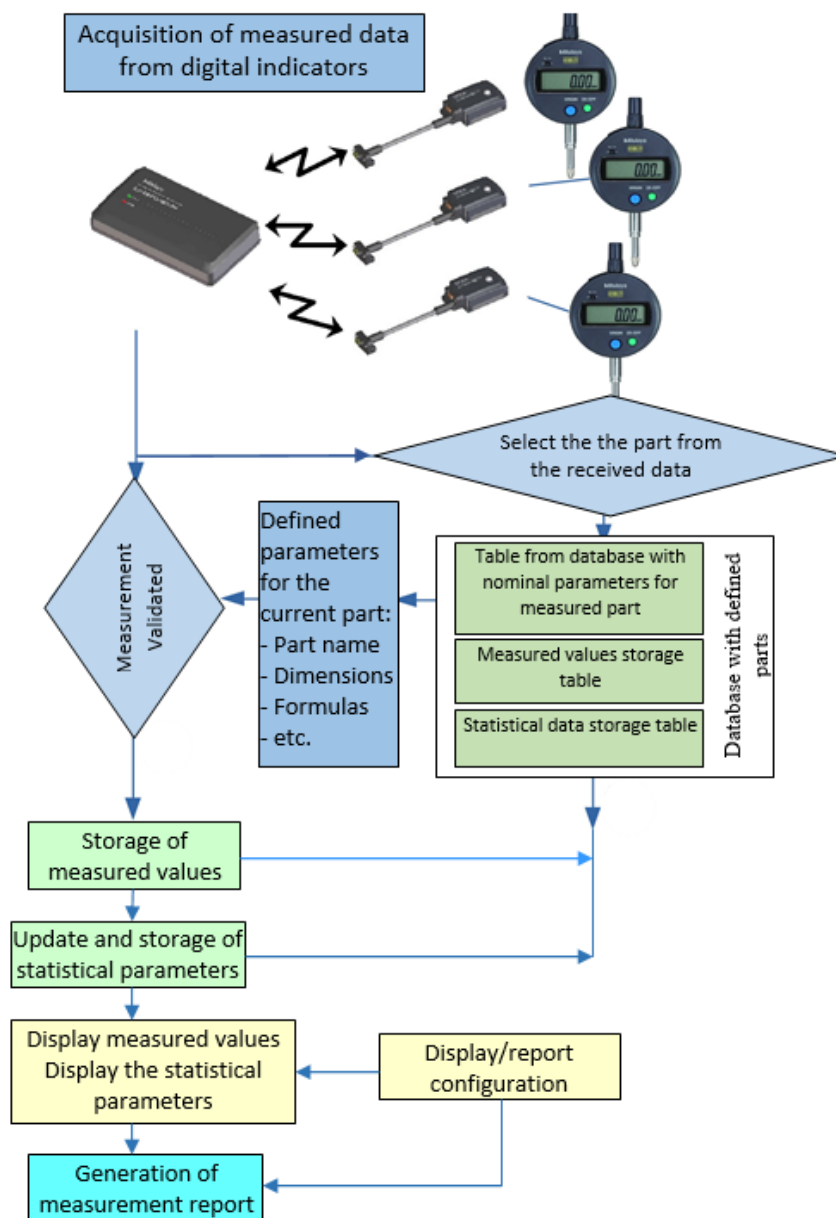


Figure 3. Operation logic diagram of the integrated system

APPLICABILITY: Bearing industry.

BENEFICIARY: SC COMIS SRL

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KNOWLEDGE TRANSFER FOR THE DEVELOPMENT OF AN ELECTRIC POWER STEERING MOTOR FOR ELECTRIC VEHICLES – MOSERVEL

Subsidiary contract 2794/2018 of the project: Knowledge Transfer Partnerships to Enhance Business Competitiveness in the Field "Automotive Industry and Components" and Improve Road Traffic Safety – KTAutoComp

Project co-financed by the European Regional Development Fund through Competitiveness Operational Programme 2014 – 2020

Program: Competitiveness Operational Programme 2014-2020

Call identifier: **POC-A1-A1.1.4-E-2015**

MySMIS Code: 105552

Partner: Icpe SA

Generalities

The steering system is one of the most important and complex system installed on a vehicle. Steering system provides the directional change in the movement of an automobile. This system converts the rotation of the steering wheel into angular movement of the front wheels to control the direction of the vehicle motion.

In recent developments, in automotive industry, the trend is that electrical power steering (EPS) replaces the hydraulic power steering (HPS) due their advantages:

- Improvement of the fuel economy (because the electric motor is driven only when the steering wheel is turned);
- elimination of hydraulic fluid;
- elimination of many components such as the pump, hoses, fluid, drive belt and pulley (for this reason, electric steering systems tend to be smaller and lighter than hydraulic systems);
- better response at different speeds compared to hydraulic steering system.

The main components of an EPS are:

- Torque sensor which measures the effort being applied by the driver to the steering wheel;
- Electric Control Unit (ECU) which calculates the necessary assist torque, considering the driving situation;
- Electric Motor which assists the steering force of the driver according to the speed and steering condition of the car;
- Rotational angle sensor
- Vehicle speed sensor
- Reduction gear which input the necessary power assist to the steering mechanism.

A block diagram showing all these components is shown in Figure 1.

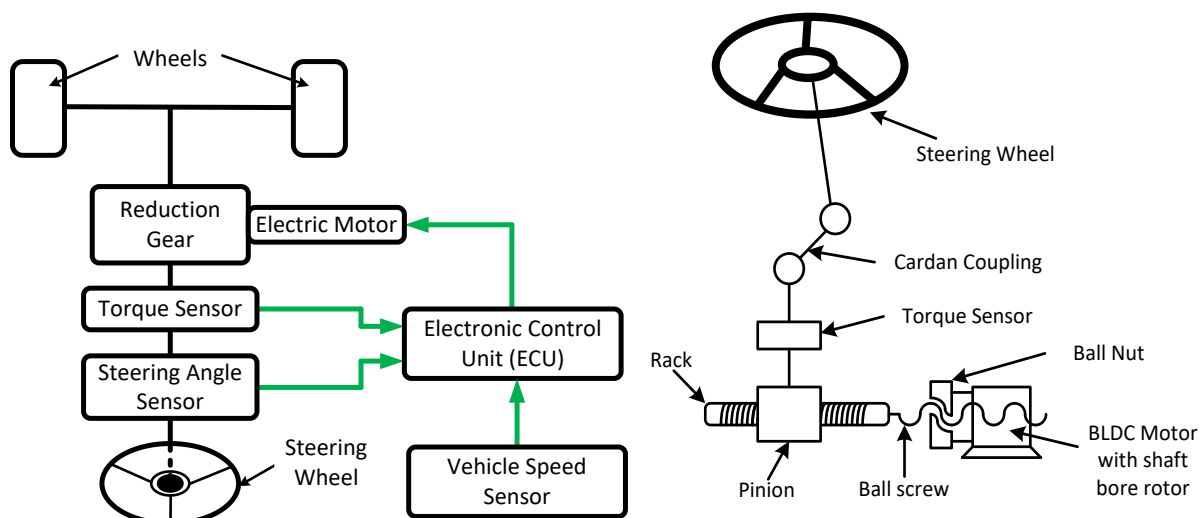


Figure 1. Electric power steering – block diagram **Figure 2.** Cinematic scheme of the designed EPS

One of the main parts of the EPS is the electric motor, typically a BLDC motor, which replace the hydraulic actuation mechanism to develop the required steering torque.

In this project, the experimental model of an electric motor with permanent magnets (BLDC) was designed and tested. This motor was dwsigned for an EPS with architecture presented in figure 2.

Preliminary determination of the motor parameters

The determination of the technical specification of the BLDC motor was performed by calculation (using the measurements made by Icpe SA on a 1967 VW Beetle) and by simulation in the MATLAB / Simulink environment.

The BLDC motor and its control system were developed based on the functional equations and the transfer functions.

The simulations were performed for a motor with the parameters presented in Table 1.

Table 1. Parameters of the BLDC motor

Symbol	Description	Value	Unit
f	Frequency of the triangular signal	15	kHz
R	Stator phase winding resistance	30	mΩ
L	Winding inductance	123	μH
K _e	Back EMF coefficient	3,59	Vpk/krpm
F _f	Friction torque	0,1	Nm
J	Motor inertia	0,00018	kg·m ²
n _p	Number of pole pairs	3	
U	Supply DC voltage	12	V
T	Simulation time	0,2 or 0,4	sec.
ΔT	Simulation sample time	1	μs

The experimental model of the BLDC motor is presented in figure 3.

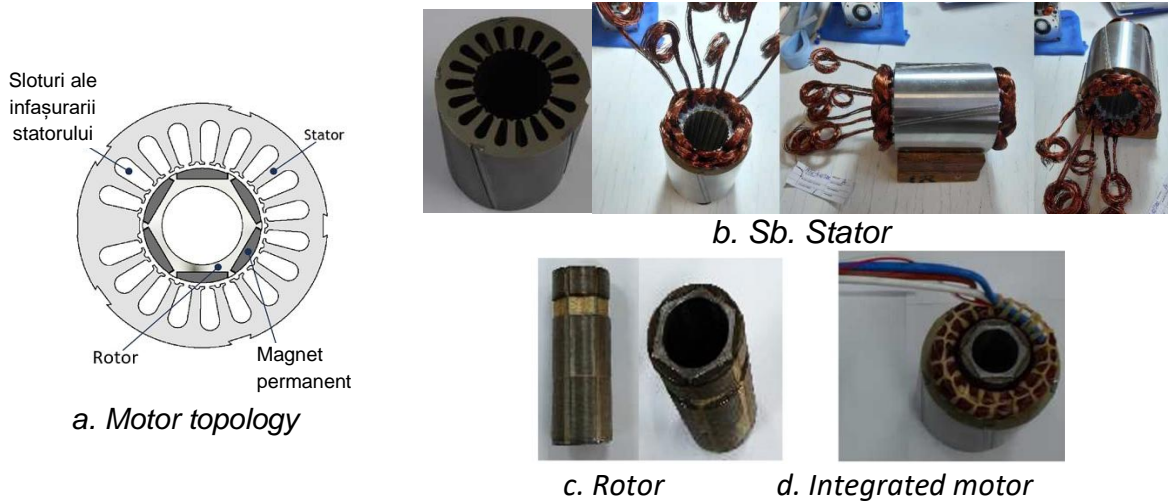


Figure 3 – Experimental model of BLDC motor

The BLDC motor is controlled using a three phases semiconductor bridge. The motor requires a rotor position sensor for providing proper commutation sequence. Based on the rotor position, the power devices are commutated sequentially ever 60° . The commutation sequences, back electromotive force and reference current generation are presented in figure 4.

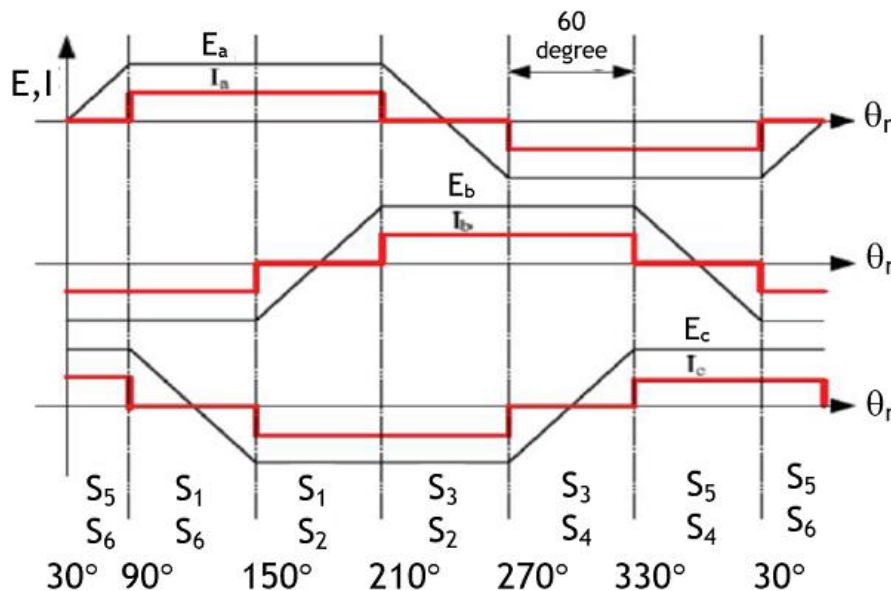


Figure 4. Trapezoidal back EMF of three phase BLDC motor and reference current generation

According to simulation model realized in Matlab, six groups of simulations were performed for various conditions.

After running the simulations, current and back EMF voltage waveforms, speed and torque diagrams and Hall signals were recorded and analysed.

The motor parameters were selected according the simulation results presented in figure 5.

The BLDC motor was tested on the experimental stand presented in figure 6.

Technical features:

- Motor type: BLDC;
- Control algorithm: six pulse control;
- Torque: 4 Nm;
- Rated speed: 500 rpm;
- The constructive solution of the power steering mechanism: direct assistance;
- Step of the ball screw: 10 mm;
- Ball screw displacement range: 150 mm.

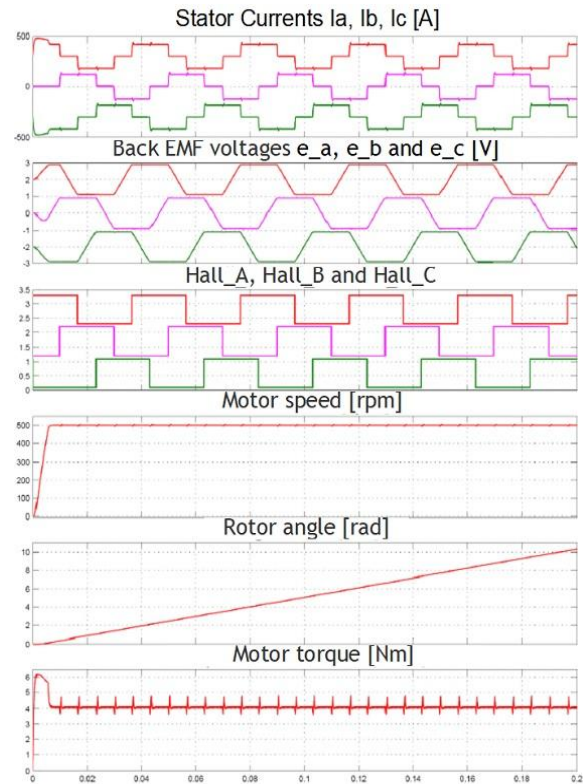


Figure 5. Diagram of simulation (MATLAB/SIMULINK)

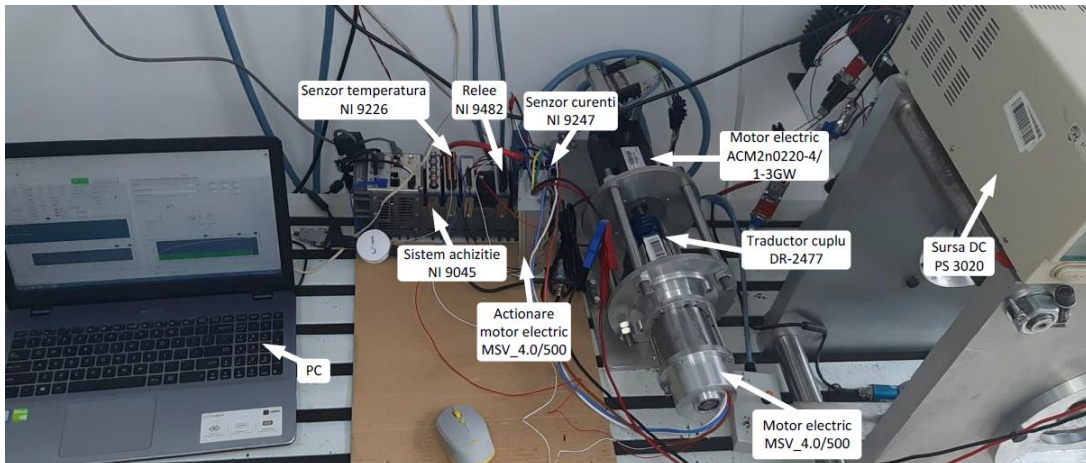


Figure 6. Experimental stand for BLDC motor testing

APPLICABILITY: Automotive industry.

BENEFICIARY: SC ICPE SA

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RESEARCH ON THE DEVELOPMENT, TESTING AND OPTIMIZATION OF AN AUTOMATION MEASUREMENT AND SORTING CELL FOR AUTOMOTIVE PARTS MANUFACTURED ON CNC MACHINE TOOLS - AutoCelMas

Subsidiary contract 2799/2018 of the project: Knowledge Transfer Partnerships to Enhance Business Competitiveness in the Field "Automotive Industry and Components" and Improve Road Traffic Safety – KTAutoComp

Project co-financed by the European Regional Development Fund through Competitiveness Operational Programme 2014 – 2020

Call identifier: **POC-A1-A1.1.4-E-2015**

SMIS Code: 105552

Partner: SC IP Automatic Design SRL

Generalities

In today's competitive environment, quality of manufactured parts becomes an important advantage. In the automotive industry, the quality of safety critical components directly reduces potential risks. Many of the automotive parts are small or medium in size and have complex geometry. Such parts are difficult to be handled and inspected. Cycle time, diversity and volume of production are important factors in the automotive industry. The ability to accomplish precise measurements for 100% inspection is very important for automotive industry, where the knowledge of dimensions and surface quality is essential to guarantee conformity of parts and to control the production processes.

Most manufacturers understand the value of automation in machined part manufacturing process. A flexible automatic inspection cell, being able to combine multiple processes into a single setup can significantly reduce cycle times and improve quality with less handling of the workpiece.

The directions for the development the factory of the future in context of the Industry 4.0 concept, includes the use of innovative solutions enabling the integration of manufacturing processes and quality inspection in modular structures of production lines.

One of the directions of the development of advanced inspection systems consists in the use of hybrid measuring stations using both, non-contact optical measurement methods and contact methods.

Currently, advanced optoelectronic devices for for dimensional and geometric measurements are available on the market. In this project we are developing a flexible inspection cell for small and medium parts manufactured with CNC machine tools, which includes an optical measurement system, a contact measurement system, a manipulator to perform all the movements of the machined parts inside the cell, feeding and out feed module and a central controller.

System overview

The architecture of designed inspection cell for automatic multi-parametric quality inspection of parts manufactured with CNC machine tools is shown in figure 1. This is a flexible inspection system, easy to set up for the production requirements. The compact design allows for in-process placement on the shop floor. The assembled flexible cell is built around a manipulator robot type UR10 (collaborative robot). It ensures the handling of the parts inside the cell, taking over the parts from the feeding system, positioning the parts in the measuring stations, positioning the measured parts on the out station for compliant or non-compliant parts.

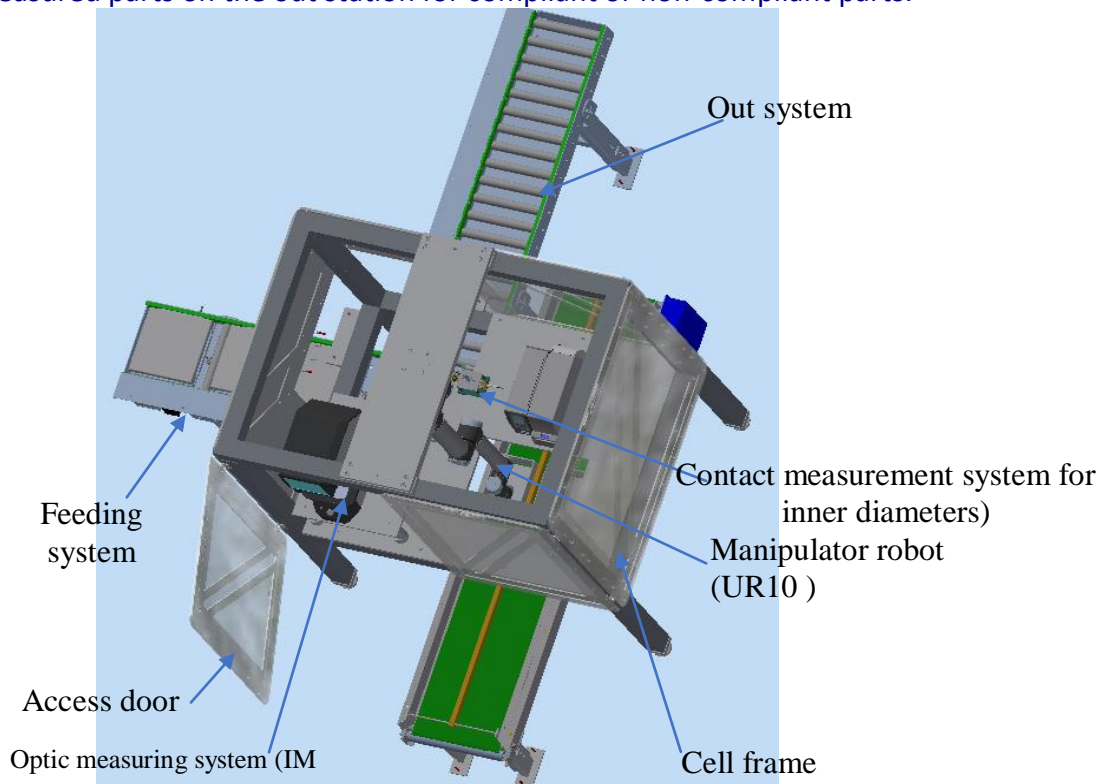


Figure 1. Inspection cell architecture

This inspection cell includes two types of measurement equipment:

- an optical measuring system based on image dimension measurement (figure 2)
- a contact measurement system for inner surfaces (figure 3)

Feeding and out systems consist in motorized conveyors, easily adaptable to the configuration of the production line.

The optical measurement system (IM – 7020 - Keyence) has following features:

- Automatic recognition of part position and orientation
- Fast measurement (multiple parts simultaneously in seconds)
- Versatile programming for in-process and final inspections
- Accurate and repeatable measurements
- Ability to record results and create inspection reports.

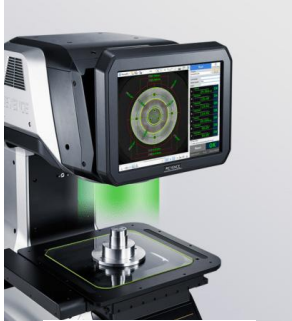


Figure 2. Optical measurement system (IM – 7020 - Keyence)



Figure 3. Inner diameter measurement system



Figure 4. UR10 manipulator robot with 2F-140 adaptive gripper

Technical features:

- Optoelectronic measurement system:
 - Max. measurement range: image-based measurement: x axes: 200 mm; Y axes: 200 mm; Z axes: 4x R50
 - Measurement system resolution: 0,2 μm
 - Repeatability (without/with measuring table displacement): $\pm 1 \mu\text{m}$ / $\pm 2 \mu\text{m}$
- Contact inner diameter measurement system feature:
 - Measurement range: 10 to 50 mm diameters
 - Repeatability: 0,005 mm
- UR10 cobot features:
 - Payload: 10 kg
 - Reach: 1300 mm
 - Joint ranges: +/- 360°
 - Repeatability: +/- 0.1 mm
- Gripper features:
 - Stroke: 140 mm
 - Grip Force: 10 to 125 N
 - Form-fit Grip Payload: 2,5 Kg
 - Friction Grip Payload: 2,5 Kg
 - Closing speed: 30 to 250 mm/s

APPLICABILITY: Manufacturing industry.

BENEFICIARY: SC iP Automatic Design SRL

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EQUIPMENT FOR MICROPROCESSING OF METALLIC, CERAMIC AND PLASTIC MATERIALS WITH FIBRE LASER

Project: Knowledge Transfer Partnerships to Enhance Business Competitiveness in the Field "Automotive Industry and Components" and Improve Road Traffic Safety – KTAutoComp Project co-funded by the European Regional Development Fund through Competitiveness Operational Programme 2014 – 2020

MySMIS Code: 105552

Subsidiary contract: Researches Regarding Achievement of a Equipment with Fiber Laser for Metallic, Ceramic and Plastic Materials Microprocessing, Integrated in the Automotive Emerging Processing Technologies - IMPLA

Partner: SC Apel Laser SRL

GENERALITIES

Ultrafast lasers have become essential tools for advanced micro-machining and materials processing. Today, modern industries are demanding a large list of requirements regarding lasers processing systems: easy to focus laser beam in a large area, great stability, ultrafast and high precision processing, compact form and adapted to work in rough manufacturing environments, etc.

The main challenges of this project consist in development of a flexible equipment able to: delivery laser pulses to the workpiece with a high degree of accuracy and repeatability; development the human machine interface software, integration of the system for scanning the processed surfaces; automation of working process; getting reference combinations of parameters for various applications.

At this moment 3 types of laser sources are mostly used for industrial production: the CO₂ laser, the Nd:YAG-laser and the fiber laser.

CO₂ laser are gas lasers that are based on a carbon dioxide gas mixture, which is stimulated electrically. With a wavelength of 10,6 μm, they are mainly suited for working on non-metallic materials, organic materials and on most plastics (because metals have high reflectivity at this wavelength).

Crystal lasers (Nd:YAG, Nd:YVO) are solid-state lasers. They have the same wavelength as fiber lasers (1.064 nm) and are suitable for marking metals and plastics. Unlike fiber lasers, these laser types include the relatively expensive pump diodes, which are wearing parts. The crystal itself also has a shorter service life than a fiber laser.

The fiber laser, the ideal successor of the Nd:YAG laser for most of his applications, produces an extremely small focal diameter. As a result their intensity is up to 100 times higher than that of CO₂ lasers with the same emitted average power. Fiber lasers are optimally suited for metal marking, metal engraving and high-contrast plastic markings.

Advantages of Fiber Laser Technology

The main advantages of fiber laser include:

- compact solid state design configuration;
- high absorption of the fiber wavelength and high power density created by the focused beam combine to achieve high processing speed<
- high power (ease of cooling);
- high stability;
- high reliability;
- lower maintenance costs;
- low noise;
- immune to environmental changes.

PRODUCT OVERVIEW:

In figure 1 is presented the block diagram and in figure 2 the 3D model of the of the equipment for microprocessing of metallic, ceramic and plastic materials with fibre laser

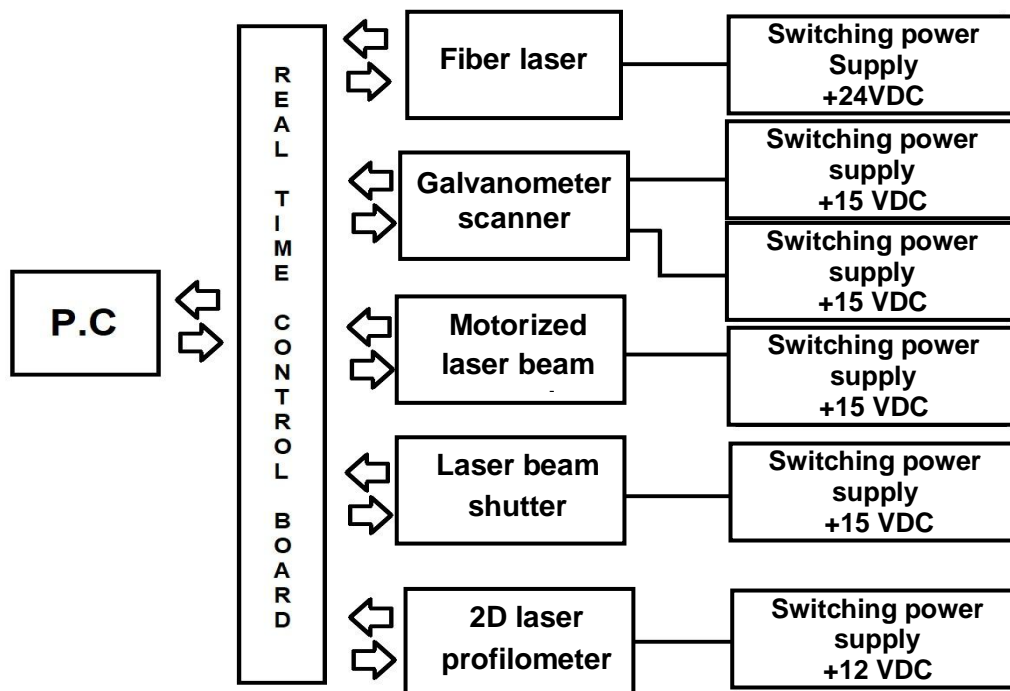


Figure 1. Block diagram

The microprocessing equipment consist of:

- 3D controlled moving system;
- Laser processing head;
- Complex surfaces blue laser scanning system;
- Controller
- Display

TECHNICAL FEATURES:

- Microprocessing of materials with different characteristics, in a selective manner, by using a controlled laser source for removing and modifying the material
- Laser type: fiber laser, wavelength 1064 nm
- Laser power: 100 W
- Laser power stability: $\leq \pm 3\%$
- Laser beam parameters controlling (power, propagation direction, spot diameter, etc.)
- Laser autofocus
- Working surface: 200x300 mm
- Capability to move the processing/scanning head on complex trajectories
- High processing speed.
- 2D laser profilometer with blue light 405 nm wavelength)
- Measurement range:
 - X axis: 62 mm
 - Z axis: 96 mm (± 48 mm)

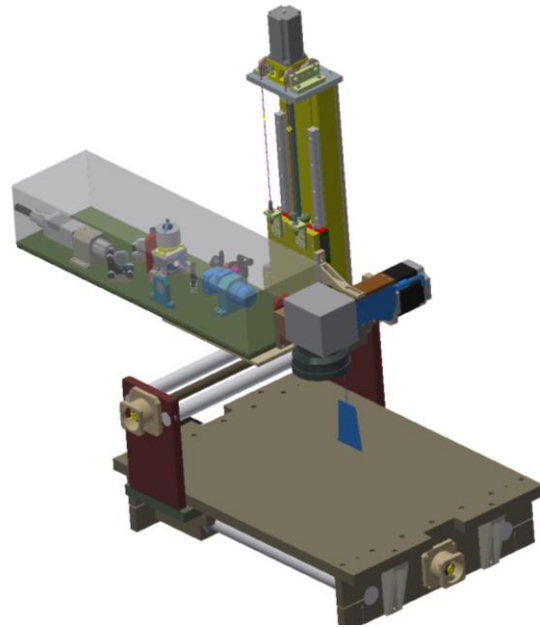


Figure 2. Laser microprocessing and scanning system 3D model

APPLICABILITY: marking, engraving, drilling, cleaning in automotive industry and other manufacturing industries.

BENEFICIARY: SC Apel Laser SRL

FURTHER INFORMATION:

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PhD. Student Mihai SELAGEA, SC APEL LASER SRL, e-mail: mihai.selagea@apellaser.ro

DEVELOPMENT OF INTEGRATED FLEXIBLE CELL, WITH A HIGH DEGREE OF ADAPTABILITY, BASED ON CYBER-MECHATRONIC PRINCIPLES, FOR TRANSPORT, HANDLING, INSPECTION AND CONTROL OF MACHINED PARTS WITH HIGH RISK POTENTIAL IN THE AUTOMOTIVE INDUSTRY, IN THE CONTEXT OF INDUSTRY 4.0

Contract 17N/2019, Project PN 19 24 01 03

Project financed by the NUCLEU 2019-2022 Program

Generalities

The demands regarding the quality of machined parts with a decisive role in the automotive safety are constantly increasing. Currently, quality control in an industrial context is predominantly realized as an end-of-line inspection system that checks certain specifications of the products. On the other hand, it is well known that checking the quality of products in the final stage of the manufacturing process is more expensive than the inspection integrated in the manufacturing flow. The integration of intelligent inspection systems in automatic mode on the manufacturing flow contributes to:

- Increasing product quality
- Reducing manufacturing costs by controlling manufacturing processes.

Automatic inspection performs several tasks of which the most important is to remove rejected parts out of the system. In many cases, it also provides signals to automatically compensate tools, make adjustments, initiate alert signals for self diagnosis.

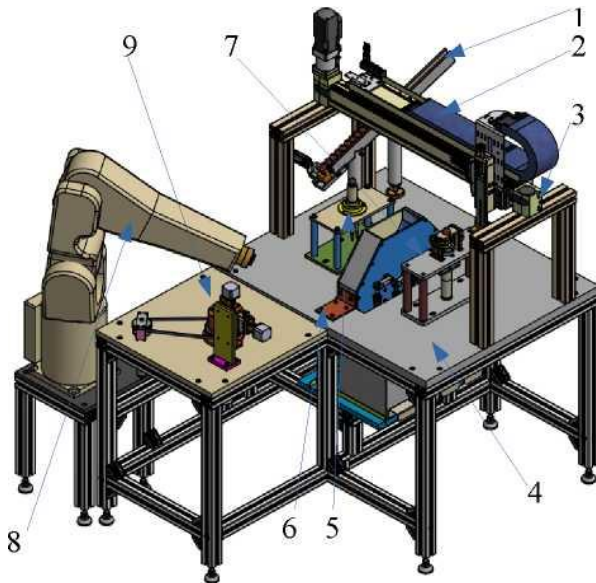
In the last decade, the new industrial revolution "Industry 4.0" has emerged as a new paradigm associated with the concept of sustainable manufacturing concept, which focuses on creating industrial value through automation, intelligent technologies and processes that include cyber-physical systems (CPS), the Internet of Things (IoT), the Industrial Internet of Things (IIOT), cloud computing, cognitive computing and artificial intelligence.

The new industrial era aims to increase the flexibility of manufacturing processes and develop individualized mass production, supported by a massive exchange of data between intelligent manufacturing stations and cells with mechatronic systems and sensors networks embedded.

This project aims to develop high-performance and flexible solutions in order to achieve a flexible cell for inspection automotive mechanical parts. The designed handling, feeding and transport systems can be adapted to be used to make flexible cells for the inspection of various parts with the axis of revolution. To test the proposed solutions, in the project is developed an flexible cell for steering joint pivot inspection on the manufacturing flow.

Product overview:

The architecture of the experimental model of the designed cell, established based on the analysis of the steering joint pivot manufacturing technology at SC Componente Auto Topoloveni SA is presented in figure 1.



1. Parts feeding and evacuating systems
2. XZ cartesian Gantry robot
3. Supporting structure of the linear handling system (Gantry)
4. Inspection cell frame
5. Pivot thread integrity control station
6. Non-compliant parts sorting station
7. Pivot length and torx depth measuring station
8. Six axes articulated robot
9. Defectoscopic control system

Figure 1. Flexible cell for multiparametric inspection of steering joint pivot

Technical features:

- Inspected parameters:
 - Pivot thread integrity;
 - Pivot length and torx depth (figure 2)
 - Pivot surface integrity
- Gantry robot range: X: 650 mm; Z: 100 mm
- Communication protocols: PROFINET, PROFIBUS;
- Central unit: SIEMENS CPU 315-2 PN

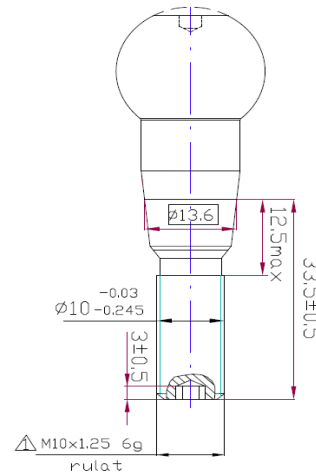


Figure 2. Measured parameters

APPLICABILITY: Automotive industry.

POTENTIAL BENEFICIARY: Manufacturers of automotive components

FURTHER INFORMATION:

PhD.eng. Daniela CIOBOATA, INCDMTM Bucharest, e-mail: ciboatadoina@yahoo.com

Phd.eng. Dănut STANCIU, e-mail: danutstanciu@yahoo.com

INTELLIGENT UNIT FOR TIGHTNESS CONTROL IN VACUUM FOR POWER TRANSFER UNIT - MDR HJD-DP8 ADAPTATION FOR AUTONOMOUS LOADING/DOWNLOADING ROBOT



Product overview:

The product is an adaptation for feeding the control stations with pieces by a robot.

The testing intelligent unit is a duo-block construction and verifies the air loss from the pieces who composed the Reverse module (Power transfer unit).

The loading-unloading of the installation with pieces in order to check for leaks is done with the help of an autonomous robot, based on a communication protocol.

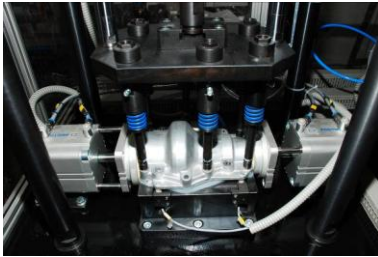
The "Reverse Module" (or PTU) is assembled by three pieces: "body", "coupling" and "cover".

In our case, the body and coupling are the same for two types of PTU but the covers are different.

The unit consists of:

1) Three control stations for HJD TL8/DP8, fitted on the same body for:

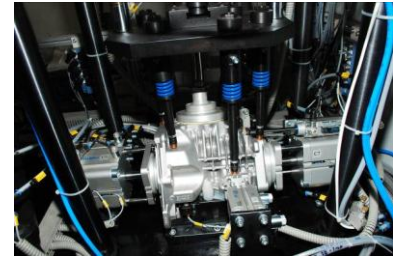
“cover” HJD TL8/DP8



“coupling” HJD TL8/DP8



“body” HJD TL8 only



2) One control station for HJD DP8, separated, only for “cover” reverse module HJD DP8



- The unit has an automatic working cycle;
- The intelligent measuring program is set for each type of pieces ;
- The measuring is made sequentially: “cover-coupling-body”
- The pieces are set inside the machine, on the corresponding tightening plate;
- The pressure subassemblies press the pieces on the tightening plates;
- The tapered and clamping subassemblies pressurize the bores of the pieces;
- The ATEQ-cell introduces air in the obtained cavity of the piece (-0,5 bar);the admissible air loss must be under 0,25 cm³/s;
- If the piece is good it's automatically marked;

The machine is protected with immaterial barriers against the intruders over the function, in the work space. The access is admitted for loading the machine with pieces, only through the front.

The all work-process of the machine is driven and monitored by a programmable automaton Siemens with a specialized controller; there is a continuous communication (man-machine) with final decision and feed-back.

The vacuum source and the pneumatic panel (with pneumatic elements for command) are part of the unit.

TECHNICAL FEATURES:

- electrical supply: 220 V.c.a./50 Hz;
- pressure supply: 6 bar;
- work pressure 5 bar;
- tightness test pressure (vacuum): -0,5 bar;
- admissible air loss: 0,25 cm³/s;
- accuracy: ± 0,02 cm³/s;
- work time/tour: ~ 85 sec/piece

APPLICABILITY:

The product is used for checking the tightness of the component parts for Power Transfer Unit HJD TL8-DP8.

BENEFICIARY:

S.C. RENAULT MECANIQUE ROUMANIE S.A.

FURTHER INFORMATION:

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INTELLIGENT UNIT FOR TIGHTNESS CONTROL FOR BASE PLATE - ASSEMBLY CYLINDER BLOCK (SEMELLE) – TYPES: H4 & HR10



Product overview:

The unit testing the tightness for two types of Baseplates Assambly Cylinder Block (Semelle), H4 and HR10.

The unit is equipped with a turntable which allows checking a piесе while uploading/downloading another piесе.

The loading / unloading of the piесes from the measuring station is done with a Robot that supplies the turntable; thus it is possible to verify a piесе at the same time as the loading-unloading of another piесе.

The work cycle is automatic.

All moving parts are driven by pneumatic cylinders assisted by proximity sensors.

The piесе is sealed on all sides with clamps and plugs.

The installation is equipped with two rows of protective barriers.

TECHNICAL FEATURES:

- Supply/ work pressure: min. 6 bar/5 bar min
- Control pressure: 1 bar for both circuits (air and oil);
- Type of measurement: the pressure difference;
- The measuring mode: \hat{n} cm³/min and Pa;
- Cycle time: 45s/piece;
- Electricity: 220 V c.a.; 50 Hz.
 - Accepted air loss:
 - 25 cm³ /min for low pressure circuit;
 - 3,6 cm³/min for high pressure circuit
 - PLC: Siemens
 - Operating panel: OP77
 - Operating system: Win CC for OP77
 - Type control: 100% (piece by piece)
 - Marking: "E" for good piece

APPLICABILITY: The product is used for checking the tightness of the base plate of the assembly cylinder block on the manufacturing lines for the types HR10 and H4Bt8 - for Dacia-Renault engines.

BENEFICIARY: S.C Automobile Dacia Groupe Renault S.A.

FURTHER INFORMATION: E-mail: laborator_tm1@yahoo.com



APPLICATIONS OF CRYOGENICS AND ULTRASONS IN RECOVERY ANALYSIS OF COOLING METHODS AND SYSTEMS

Subsidiary contract of the project: 17N/2019/ PN 19 24 05 01

Program: NUCLEU

OVERVIEW

Technical features:

Design and implementation of the cryogenic system

Within the project, the execution documentation of the experimental model - cooling system - was elaborated and the product was made.

Characteristics

Cryotherapy: adjustable down to -10°C

Display: digital display

Hose L = 1700 mm

The refrigeration unit, composed of compressor, evaporator and condenser, cools the fluid inside and inside the hose in the range -20°C to $+10^{\circ}\text{C}$. The hose head, which comes into contact with the patient's skin, will have this temperature range. The temperature is taken over by the temperature sensor that it regulates, as needed. The adjustment is done in 2 ways:

- directly on the display screen
- via Wireless Display

The following MAN TGA / TGX indelB Travel Box refrigerator kit (condenser + evaporator) was chosen and a Danfoss Compressor

BD35F / 50F Multivoltage R134a, -30°C , $+10^{\circ}\text{C}$ evap. temp. 85-240 V AC 50/60 Hz, 12-24 V DC, automatic selection of alternating current when available, 15-152 / 20-191 W cooling capacity.

The NTC probe was chosen to regulate the temperature. It is a resistive type temperature probe, whose resistivity decreases with increasing temperature.



NTC probe specifications:

1. PVC cable length: 1.5 meters
2. the cable covers 2 wires with a diameter of 0.35 mm²
3. metal bulb, stainless
4. metal bulb diameter: 6 mm
5. metal bulb length: 35 mm
6. Temperature range: -50 - + 105 ° Celsius
7. resistivity: 10 kΩ at + 23 ° Celsius
8. accuracy: ± 1% at 25 ° Celsius

Temperature control via WiFi-App

Enclosure and hose

The enclosure is a parallelepiped box, made of metal, thermally insulated. It is equipped with a cover on which the monitor is mounted.

The fluid generated by the cooling system passes through the enclosure, towards the hose, up to the metal head.

The hose has a length of 1700 mm, is flexible and has thermal insulation.

The hose has a metal head that will come in contact with the patient's skin.

The monitor will display the cooled fluid temperature and the set temperature

APPLICABILITY:

The system will allow the treatment of the different pathologies of the locomotor system, e.g.

- Severe inflammatory pathologies
- Intensification of pain at the chronic degenerative level
- Severe phases in traumatology (pain-spasm-immobilization treatment, improvement in the recovery process and faster recovery).

The system supports the healing process, causes a faster recovery due to the interruption of the pain cycle, because, there is a strong analgesic and anti-inflammatory effect on the treated tissues.

BENEFICIARY:

Hospitals and medical recovery centers

FURTHER INFORMATION:

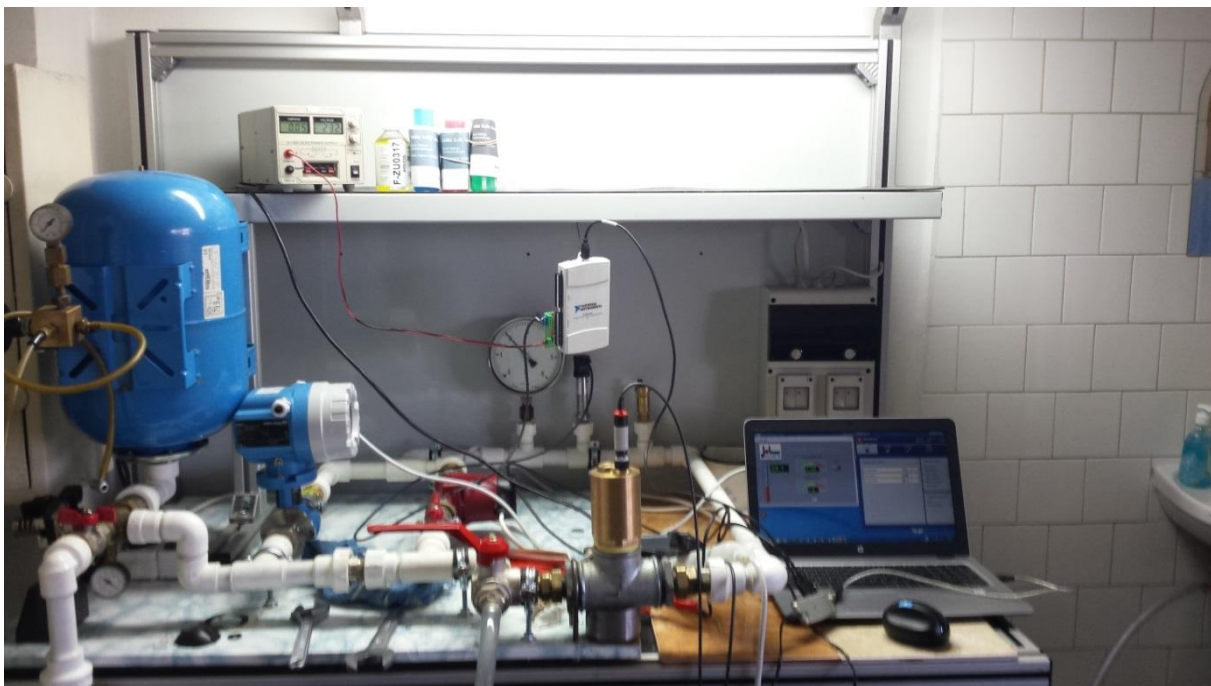
E-mail: dianammura@gmail.com

SPECIALIZED EQUIPMENT FOR CALIBRATION IN-LINE APPLIANCES FOR TESTING PHYSICAL PARAMETERS OF WATER QUALITY

OVERVIEW:

In recent years the development of IT and communications technologies have a more significant contribution in the water processing management and the technologies for water quality control are undergoing continuous improvements. These technologies not only must comply with strict rules, safety measures, and quality standards, social and environmental challenges but also face serious problems of obsolete infrastructure, network leaks and the quality of drinking water. On the other hand, supplying clean drinking water and protecting the health of the population of the adverse effects of any contaminated water intended for human consumption are fundamental requirements of the European Directive 98/83/EC, transposed into Romanian legislation law No. 458/2002 (amended and completed by law No. 311/2004 and the Governmental Ordinance No. 11/2011).

As a result, there is a market demand for drinking water management solutions considering that current technologies are far from satisfying the legal requirements in terms of monitoring, remote transmission and data processing for water quality. To know the water quality monitoring solution currently used is manual removal of samples, in certain specific points (especially the plug), transport to laboratory, measurements and issuing a report.



TECHNICAL FEATURES:

The main technical characteristics of the specialized equipment for in-line calibration of the apparatuses for determining the physical parameters of the water quality are the following:

- Work environment: fluid (water);
- Pressure: minimum 0,7 bar and maximum 6 bar
- Working pressure: max. 3 bar
- Flow rate: $F_{\min} = 0.1887 \text{ mc /s}$; $F_{\max} = 0.55 \text{ mc /s}$; $F_{\text{work}} = 0.25 \text{ mc /s}$
- Temperature: $25 \pm 5 \text{ }^{\circ}\text{C}$
- Power supply: 50Hz; 1x230 V; 0 ... 24 VDC
- Pump: 0.016 mc /s - 0.09 mc /s
- WaterTank: 80 l

APPLICABILITY: Computerization for the day-to-day management of the infrastructure is extensively used in the field of water. As a market requirement for the field of water, given its dimension, the introduction of the automation and computerization, we can state this seems to be a must. Thus, the use of sensors, systems of registration, and transmission of data remotely, energetic autonomy are topics for companies manufacturing and distribution of water.

TECHNOLOGY TRANSFER:

The main contribution to the promotion of the technological progress in this project is focused on the innovative solutions suggested to the current concerns of computerization of the water quality measurement process.

BENEFICIARY: Privat companies, R & D institutes, technical universities.

FURTHER INFORMATION: Dumitru VLAD, e-mail: didivlad2006@yahoo.com



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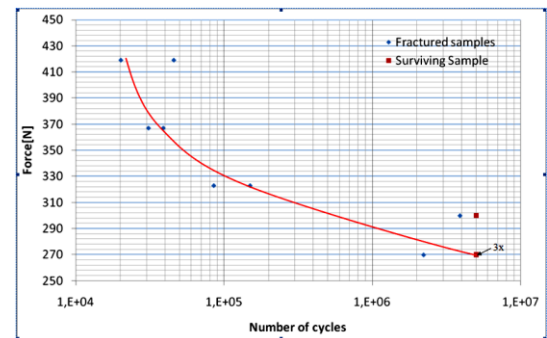
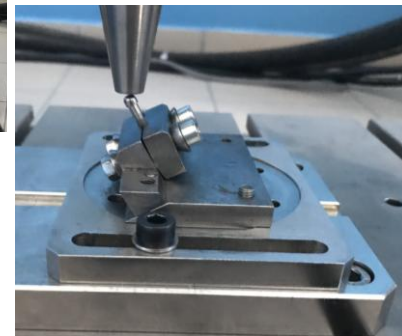
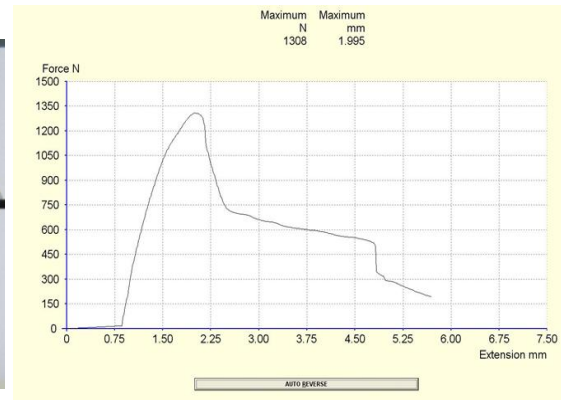
NACE 266;325;332

- ✓ **Medical devices and tools** ◀NACE 2660 ▶

- ✓ **Measuring, Checking and Control Devices and Tools** ◀NACE 3320 ▶

- ✓ **Measuring, Checking and Control Devices for medical processes** ◀NACE 3250 ▶

DYNAMIC FATIGUE LOAD TESTING SERVICES FOR ENDOSSEOUS DENTAL IMPLANTS ACCORDING TO SR ISO 14801: 2016



PRESENTATION OF THE TEST PROCEDURE:

- According to SR EN ISO 14801: 2016 Dentistry. Implants. Fatigue dental implant testing.
- Fatigue loading is performed with a cyclic load at a loading rate of $R = 0.1$;
- Working frequency: 15 Hz;
- The loading force is applied at an angle of 30° to the axis of the implant;
- The samples (implant-mount-screw-fixing assembly) are fixed at a 30° angle to the vertical loading axis using a fastening device having the modulus of elasticity of the 200 GPa component parts.
- The implant is fixed to the end of the clamping device (apical to the nominal level of the bone), according to the standard SR EN ISO: 2016;
- The samples (implant-mounting-fixing screw assembly) are tested using a hemispherical loading element, provided by the manufacturer;
- The test is performed in air at a temperature in the range $20^\circ\text{C} \pm 5^\circ\text{C}$ during the test period.



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TECHNICAL FEATURES:

- Testing equipment: Instron 8870 Peak Servo Hydraulic Stand series no. 8872K2654,
- Actuator model A1740-3002 series no.3113/07 with force cell series no. 58892,
- Loading capacity 10,000N in the 0.5% tolerance class with accuracy of $\pm 0.25\%$.

APPLICABILITY:

In vitro testing of implants to compare different implant designs and geometries.

BENEFICIARY:

- Institutions / centers of research, development, innovation in the medical fields;
- Producers of dental implants in the country and abroad.

FURTHER INFORMATION:

E-mail: laborator_biomecatronica@yahoo.com

Infrastructure direct public link: <https://erris.gov.ro/biolab>

ADDITIVE MANUFACTURING SERVICES BY SELECTIVE LASER SINTERING WITH METAL POWDER



THE AM TECHNOLOGY:

Additive manufacturing is the common name for the "layer by layer" processing technology, using virtual 3D models.

The basic principle of the laser sintering process consists of melting of layers of the raw powders using a laser beam, adding each layer on top of the melted previous layers. During this process, the powder is briefly heated above the melting point by exposure with the laser beam. A solid, 3D part is produced layer by layer from a virtual 3D model.

Selective laser sintering uses a wide range of materials: aluminum alloys, corrosion-resistant steel, titanium and cobalt alloys, plastic polymers, in order to obtain products with high geometric complexity and high physical-mechanical properties for fields such as: medical, aerospace, automotive.

TECHNICAL FEATURES:

- Effective building volume (including building platform): 250 mm(X) x 250 mm(Y) x (215 mm Z);
- Building speed (material-dependent): from 2 to 20 mm³/s;
- Layer thickness (material-dependent): from 20 to 100 µm;
- Laser power: 200 W;
- Scanning speed: up to 7 m/s;
- Variable focus diameter: from 100 to 1a 500 µm.



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- Power supply: 32 A;
- Power consumption: maximum 5,5 kW;
- Nitrogen generator: standard;
- Compressed air supply: 20 m³/h;

APPLICABILITY:

Processing of complex, personalized and overloaded components for applications in the fields: medical, aerospace and automotive, but also in other fields.

BENEFICIARY:

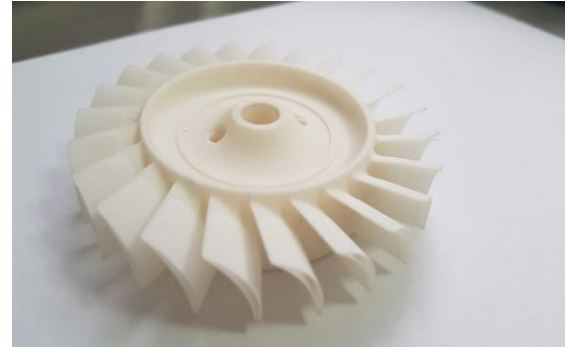
- Centers and institutions of research, development and innovation in the medical, aerospace and automotive fields,
- Orthopedics and traumatology clinics for hard tissue (bone) surgery,
- Aerospace and automotive production.

FURTHER INFORMATION:

E-mail: laborator_biomecatronica@yahoo.com

Infrastructure direct public link: <https://erris.gov.ro/biolab>

ADDITIVE MANUFACTURING SERVICES BY SELECTIVE LASER SINTERING WITH PLASTIC POWDER



THE AM TECHNOLOGY:

Additive manufacturing is the common name for the "layer by layer" processing technology, using virtual 3D models.

The basic principle of the laser sintering process consists of melting of layers of the raw powders using a CO₂ laser, adding each layer on top of the melted previous layers. During this process, the powder is briefly heated above the melting point by exposure with the laser beam. A solid, 3D part is produced layer by layer by this heating and then subsequent cooling process.

Selective laser sintering uses a wide range of materials: aluminum alloys, corrosion-resistant steel, titanium and cobalt alloys, plastic polymers, in order to obtain products with high geometric complexity and high physical-mechanical properties for fields such as: medical and automotive.

TECHNICAL FEATURES:

- Building volume: 200 mm(X) x 250 mm(Y) x 330 mm(Z);
- Layer thickness (depending in material): from 0,06 mm to 0,12 mm;
- Laser type: CO₂
- Laser power: 30 W;
- Scan speed during building process: up to 5 m/s;
- Building rate: up to 1,2 l/h;
- Power supply: 16 A;
- Power consumption: typical 3 kW, maximum 5 kW;

APPLICABILITY:

- Processing of complex and personalized components for applications in the fields: medical and automotive, but also in other fields;
- Processing experimental models for complex surgical procedures that require geometrical precision and pre-surgical equipment;



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- Testing the functionality and the design of mobile assemblies before manufacturing them from other more expensive and demanding materials;
- Processing prototypes of verifying new, innovative solutions.

BENEFICIARY:

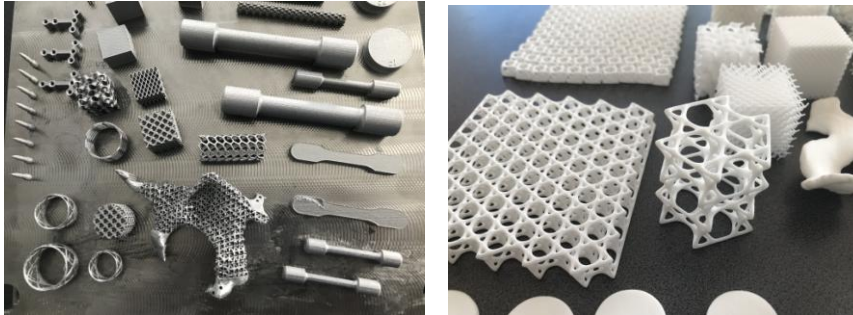
- Institutions/centers for research, development, innovation in the medical and automotive fields;
- Medical pre-surgical equipment in clinics and hospitals that perform traumatology interventions;
- Production of prototypes in the automotive and medical fields.

FURTHER INFORMATION:

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IMPLEMENTING ADDITIVE TECHNOLOGIES IN ORDER TO MANUFACTURE COMPLEX AND OVERLOADED COMPONENTS - DIGITECH



PRODUCT OVERVIEW

Additive manufacturing is an emerging technology that promises to revolutionize global production and will have a major impact in many areas. In Romania, this technology is just at its beginning and has great growth potential. However, considering additive technology's uncommon qualities, there has been encountered significant challenges in determining the optimal methods of characterization and evaluation of the final components, as well as in validating and accepting these technologies in certain fields that are generating additional technical conditions: medical, automotive, aerospace, etc.

OBJECTIVES

The objectives are to manage experimental researches regarding the evaluation and validation of additive technology of laser sintering / melting and the adaptability of processing parameters to the specific requirements of manufacturing and testing the complex and overburdened components:

In medicine, for easy manufacturing of complex, anatomic-adaptive, lighter and more resistant implantable structures designed for 3D prostheses of harsh human tissues, with the possibility of improving the technology and therefore extending the application in the field of human organs bio-prototyping;

In the automotive industry, for manufacturing finished products designed to customize each car and its spare parts, with the possibility of extending the application to almost entirely manufacture cars from lightweight and durable materials. Also, a methodology will be developed with the purpose of optimizing the design process of complex products for the automotive industry by using artificial intelligence and modelling;

In the aerospace industry, for manufacturing complex components, mechanical and thermal overloaded: compressor and/or turbine blades, injectors, structural elements, etc.

FURTHER INFORMATION: PhD.eng. Stanca COMSA,
e-mail: laborator_biomecatronica@yahoo.com

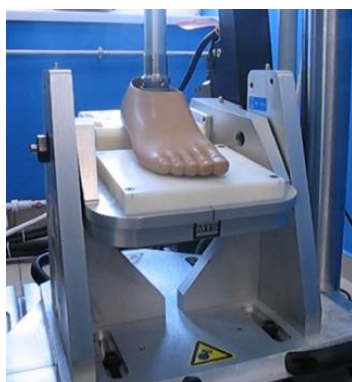
MECHATRONICS EQUIPMENTS FROM BIOMECATRONICA LABORATORIES



Tensile test



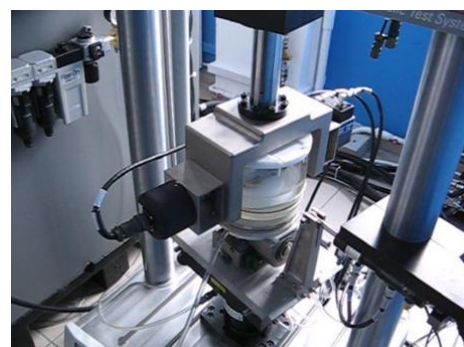
Compression test



"External ankle-foot prosthesis for lower limb" subassembly testing



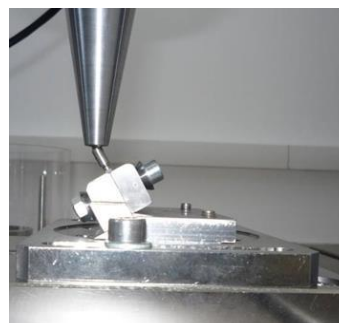
Hip prosthesis wear simulation



Knee endoprosthesis wear simulation



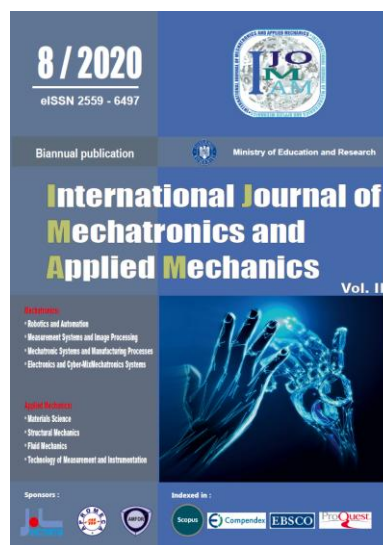
Osteosintesis element for maxilo facial surgery



FURTHER INFORMATION: PhD. Eng. Stanca Comşa, [e-mail: stanca_comsa@yahoo.com](mailto:stanca_comsa@yahoo.com)



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MINISTRY OF EDUCATION AND RESEARCH
**NATIONAL INSTITUTE OF RESEARCH AND DEVELOPMENT IN
MECHATRONICS AND MEASUREMENT TECHNIQUE**

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COMPARTMENT OF
RESEARCH AND
DEVELOPMENT
«MECHATRONIC MICRO
AND
NANOTECHNOLOGIES»

The DIVISION OF RESEARCH AND DEVELOPMENT FOR MECHATRONIC MICRO AND NANOTECHNOLOGIES offers professional solutions and services:

- √ **Researches in the field of processes specific to chipping** (dynamics, kinematics, tribology):
 - Special chipping tools and high productivity tools;
 - Tools with the active part made up of tough materials (CMS, cermets, ceramic);
 - Tools with the active part made up of extra-tough materials (NCB diamond, diamond poly-crystals):
- √ **Mechatronics** technologies;
- √ Design and execution for:
 - Special chipping tools and high productivity tools;
 - Tools and subassemblies of tools;
 - Tools and subassemblies of tools and tool support assemblies for the extractive industry and the wood industry, the industry of civil engineering;
- √ Tool support assemblies and dedicated accessories for motor vehicles – theme tools;
- √ Matrices;
- √ Complex laboratory devices;
- √ Dedicated theme installations and tools used in precision mechanics and mechatronics;
- √ Special micro technologies and nanotechnologies.

NACE 267

NACE 289

NACE 711

✓ Subassemblies for laser devices

◀NACE 267▶

NACE 2670

✓ Special machines and equipments

◀NACE 289▶

NACE 2899

✓ Industrial robots

✓ Technical engineering and consultancy

◀NACE 711▶

NACE 7111

✓ Technical testing and analysis

NACE 7120

MICRO/ NANOMETRIC COATINGS FOR IMPROVING THE FUNCTIONAL CHARACTERISTICS OF MECHATRONIC COMPONENTS STRUCTURES" IN NUCLEU PROGRAM "ENGINEERING OF INTELLIGENT MECHATRONICS AND CYBER-MECHATRONIC SYSTEMS / IMISC-M

PRODUCT OVERVIEW

Study: Technical study

The project "Micro/ nanometric coatings for improving the functional characteristics of mechatronic components structures" has as main objective the achievement of researches regarding intelligent materials tribology.

General objective of the project is to investigate and to use materials for coatings of metallic parts of friction couplings used in mechatronic applications (high-precision gears in miniaturized constructions, high precision bearings, components of mechatronic equipment for measuring, positioning and adjustment: raceways, guides, grippers, etc., components for biomedical devices, MEMS & NEMS) in order to increase their lifetime. Of the many materials from which mechatronic components are done, in the framework of this project, micro/ nanostructured thin films were deposited on steel substrates, which can improve their quality.

In order to develop this objective it was necessary to achieve a technical study, which was the basis for future experimental studies. It is a field that is consistent with objective 4 of NUCLEU program "Engineering of intelligent mechatronics and cyber-mechatronic systems/ IMISC-M". Thus, the main area of interest in the project is materials science, which deals mainly with the acquisition of knowledge regarding the internal structure of materials, physical properties, and materials processing to obtain required performances in different fields of application. For example, researches on materials used in mechatronics are directed to the study of their surface properties, and the stresses to which they are subjected to.

The types of structures used at the deposition methods and characterization techniques of thin films have been analysed. Criteria by which are chosen materials for coating, and used deposition techniques: physical and chemical methods are also described.

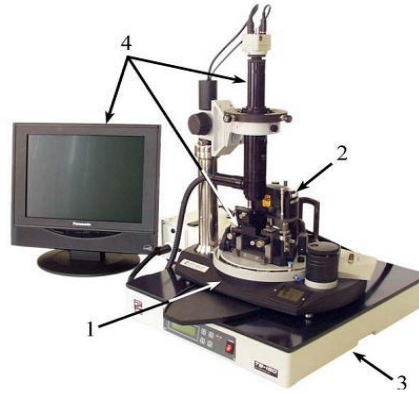
Academic researches, of companies and performed in specialized institutes have broadened and the area of used materials/ alloys: metals (e.g. Ti, Ta and Au), ferrous alloys containing Cr, alloys based on Co - Mo - Ni - Mn - Zr - Sn - W and alloys based on Ti - Al - V - Nb - Ta - Zr, etc.

Nationally, experiments regarding deposition of titanium thin films were developed at the ICEM and INCDMFS in the years 1980-1987 and completed with technologies assimilated in manufacturing at IMF Bucharest and FS Rasnov.

Concerns regarding development of procedures and conducting experimental researches for characterization of micro- and nanostructured films, used for biomedical applications were developed also at INCDMTM.

To characterize structurally and physico-mechanically thin films obtained and applied for improvement of mechatronic components different technologies, which are presented in the same study, are used.

End of this study presents the main technical variants possible for implementation of the work; timetable of the project and describes the content and phasing of planned activities.



Atomic Force Microscope, NT-MDT NanoLaboratory NTEGRA Probe.

1 - basic unit; 2 - measuring probe; 3 - vibration isolation system; 4 - viewing optical system.

STUDY: Laboratory studies and researches I: structural characterization

The result of the second stage of the present project consisted of an experimental study, achieved as a result of some structural characterizations of samples studied in the project.

It is about the Ti, Cr, Al thin layers and Ti/ Al multilayer obtained by the electron beam evaporation deposition process on four types of steel: OLC45, Ru11, C120 and OSC. The deposited layers had thickness of 50 nm (Cr and Al), 100 nm (Ti), and Ti / Al multilayer had 100 nm (the thickness of each layer is 50 nm).

These samples were then characterized using atomic force microscopy and laser measurement of surfaces microgeometry.

It was observed that all the deposited layers have uniformity resulting from the deposition process, but, at the microscopic level, all seem to have not a very flat surface. Also, in the images obtained from the microscopic analysis of samples, was possible to observe the complete bonding between coating and substrate.

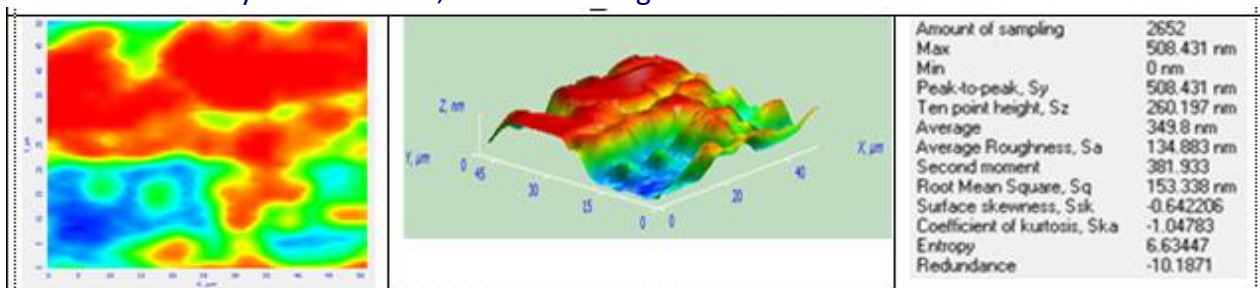
Following microscopic observations, to better characterize the layers, scans were performed using atomic force microscopy, which allows the characterization of surfaces up to the nanometer level. After scanning area of $50 \times 50 \mu\text{m}$ from the different films deposited on various substrates, were analysed different topographic parameters (e.g. roughness, surface skewness, coefficient of kurtosis), which provides information on distribution of deposited layer. In this way it could be done the detailed characterization of the structure of films with different thickness deposited on various substrates. The roughness was used as an indicator of deterioration of deposited layer to obtain information on the variation in height from one point to another. Surface skewness assesses the asymmetry degree of a distribution and characterizes, together with coefficient of kurtosis, the distribution form. From measurements taken it was observed that there are some average values, minimum and maximum, of parameters obtained for thin films deposited depending on the substrate.

After analysing the average values of roughness of the deposited layers, it was observed that on the OSC type steel substrate are deposited layers with the most uniform surface. Titanium has the most uniform surface and from the thin films with thickness of 50 nm aluminium is evenly deposited on this type of substrate steel. From the measurements made it was noticed that from all steel types used as substrate, the titanium has the lowest roughness value, followed by aluminium and then chrome. The final conclusion was that were obtained layers increasingly uniform starting from chrome, aluminium and titanium. The multilayer Ti/ Al had the slightest roughness when deposited on steel substrate type C120 and the highest value of roughness when it was deposited on the steel substrate type OSC.

The average values of the surface skewness in all three types of layers deposited on the four substrates have values very close to zero, most of below 0.1 resulting that they have a symmetrical distribution. The only exception is the multilayer Ti/ Al, which has a positive surface skewness index, over 1, so it is a deposit with asymmetrical distribution to the right.

The analysis of kurtosis coefficient of the studied samples showed a platycurtic distribution (curve is flatter) of all thin films deposited on all four substrates. The exception is the Ti film with thickness of 100 nm, which has a leptocurtic distribution (height curve is higher than the normal one).

Similar results to those from AFM analysis were obtained realizing the structural characterization using the laser measuring system for microgeometry surfaces. The same surfaces with low uniformity at micro level, but with a roughness level of nm were observed.



100 nm thick titanium layer deposited on steel substrate type C120.

TARGETED BENEFICIARIES:

- Users:
 - mechanical components manufacturers;
 - specialized departments in higher education;
 - specialized testing laboratories;
 - INFLPR, IMT, ICPE-CA, etc.
- Producers: ITMAMIRO, TEHNOROM, TEHNOMED.

FURTHER INFORMATION: PhD. Physicist Laura Liliana Badita; e-mail: badita_l@yahoo.com

NANOTECHNOLOGICAL MEASURING SYSTEM



PRODUCT OVERVIEW

Nanotechnological measurement system is designed to calibrate devices and nanotechnology. Adaptive system is designed to be used both in the production of organized nanosystems as nanosensors and accurate transducers.

The system is equipped with two robots, displacement systems and precision laser measurement systems, opto-electronics and atomic force microscope.

TECHNICAL FEATURES:

- AFM resolution: 0.2 nm
- Laser measurement resolution: 1 nm
- Optoelectronic measurement resolution: 10 nm

APPLICABILITY:

The system can be used to calibrate the equipment and systems for nanotechnology production.

TECHNOLOGY TRANSFER:

Center of Excellence in Nanotechnology

BENEFICIARY:

Innovative SMEs in the field of micro and nanotechnology

FURTHER INFORMATION:

PhD. Eng. Popan Gheorghe; e-mail: popangeorge@yahoo.com

DISTANCE LASER MEASUREMENT SYSTEM FOR NANOSATELLITES



PRODUCT OVERVIEW:

It is a laser distance measuring system up to 1000 m. Measurement system will be used as a component of the nanosatellites measurements system required to maintain flight formation. The laser measuring system is based on time of flight method of a laser beam reflected on a target.

TECHNICAL FEATURES:

- Measuring domain: 0.066 m – 1000m
- Accuracy: ± 3 mm
- Resolution: 1mm
- Measuring rate: 200 meas./sec.

APPLICABILITY:

Highly precise measurements of distance

TECHNOLOGY TRANSFER:

The product is usable in companies producing high-tech products, R&D institutes, technical universities, including aerospace domain.

BENEFICIARY:

Institute of Space Science

FURTHER INFORMATION:

PhD. Eng. Popan Gheorghe, e-mail: popangeorge@yahoo.com

CERMISO CENTER - RESEARCH CENTER FOR INTELLIGENT MECHATRONIC SYSTEMS USED FOR SECURING OBJECTIVES AND INTERVENTION

CERMISO is a center research facility for the optimization of Autonomous Intelligent Airborne Minisystem with direct applications in safety and security objectives and intervention in case of disasters in areas difficult to reach. The Cermiso Center is a work in progress in INCDMTM Bucharest, that will optimally concentrate and use, the high-level scientific and technical potential of the institute. The center is equipped with state-of-the-art equipment for manufacturing and machining airborne prototypes.

Basically center activity will be conducted on the following CD guidelines:

- Autonomous intelligent mechatronic systems integration in the security space and the environment.
- Airborne autonomous intelligent mechatronic systems Optimization
- Secure data transmission technology
- Developing micro multisensory systems controlled by artificial intelligence.
- The development of artificial intelligence for automatic data processing in order to prevent disasters and accidents.
- Developing solutions and anti-hacking security algorithms for autonomous airborne systems.
- Hardware and software solutions to optimize energy consumption and increase endurance and autonomy of airborne mechatronic systems.

Proposed objectives:

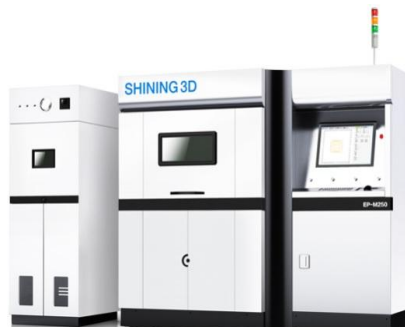
- The implication of the INCDMTM research centre in European projects especially H2020;
- The attainment of the capacity to develop partnerships with economic agents interested in thematic research and construction of functional models or prototypes in the project field;
- The attainment of the capacity to develop partnerships with universities, engaging students in educational activities and attracting young researchers from among the latter by providing the research centre with demonstration, testing or research equipment;
- INCDMTM affiliation by means of the research centre to the new European platforms.

Results will be made available to companies having manufacture and production possibilities for Autonomous Intelligent Airborne Minisystem equipment type, considering that there are all the necessary conditions to obtain ultra-high performance equipment in our country. In this moment in Romania there is no such equipment, in study or in the research stage. The range of use of Autonomous Intelligent Airborne Minisystem type is extremely broad, covering all the major existing fields just by a reconfigurable modular concept per task/intended use as it is addressed in the CERMISO concept.

MECHATRONICS EQUIPMENTS FROM CERMISO LABORATORIES



HORIZONTAL 5-AXIS MACHINING CENTER



LASER METAL 3 D SINTERING



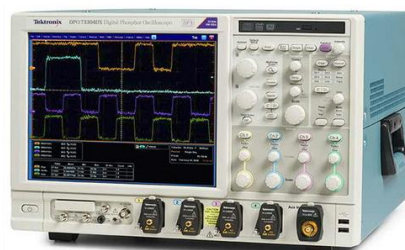
ELECTRODE EROSION MACHINE



WIRE EDM PROTOTYPING



HIGH DIGITAL TIG WELDING MACHINE



OSCILLOSCOPE EQUIPMENT MAKINO

LASER METAL SINTERING PROTOTYPING EQUIPMENT - SHINING 3D EP M250 3D PRINTER



Product overview:

The equipment is using the Metal Powder Bed Fusion technology, which is also known as Selective Laser Melting.

Using the fiber laser can directly melt alloy metal powder layer by layer to produce high performance metal parts directly. A large variety of metal material can be used, including Titanium Alloy, Aluminium Alloy, Nickel Alloy, Maraging Steel, Stainless Steel, Cobalt Chrome, Copper Alloy.

TECHNICAL FEATURES:

- Print volume: 250 x 250 x 300 mm
- Thickness of the print layer: 0.02 - 0.1 mm
- Minimum print detail size: X, Y, Z = 100 microns
- Accuracy: 60 microns
- Repeatability positioning X, Y: 50 microns
- Repeatability Z position: +/- 0.005 mm
- Material: Titanium Alloy, Aluminium Alloy, Nickel Alloy, Maraging Steel, Stainless Steel, Cobalt Chrome, Copper Alloy
- Laser source power: 500 W
- Scanning speed: 8m / s
- Preheating: 200⁰ C

APPLICABILITY:

The EP-M250 prototyping equipment is suitable for a wide range of applications in the aerospace, biomedical, automotive, research and development projects, etc.

BENEFICIARY: INCDMTM - Bucharest.

FURTHER INFORMATION: E-mail: popangeorge@yahoo.com

HORIZONTAL 5-AXIS MACHINING CENTER MAKINO D200Z



Product overview:

Makino 5-axis horizontal machining centers provide unprecedented levels of productivity and accuracy in the most complex, full 5-axis machining applications.

The ultra-high-accuracy rotary axes and superior motion-control systems eliminate compound errors and maximize accuracy while improving speed and productivity reducing part cycle times.

TECHNICAL FEATURES:

- X-axis stroke: 350 mm
- Y-axis stroke: 300 mm
- Z axis stroke: 250 mm
- Distance from the table surface to the front of the main shaft: 160 - 410 mm
- B axis (mass inclination): 180°
- C-axis (mass rotation): 360°
- Table diameter: 300 mm
- Payload: 75 kg
- Maximum piece dimensions (Diameter x height): 300 x 200 mm (with limitations)
- Speed range: 100 - 30,000 rpm

- Fast feed (X, Y, Z): 60,000 mm / min
- Working advance (X, Y, Z): 60,000 mm / min
- Rapid Advance (B / C): 36,000 / 54.000⁰ / min
- Working advance (B / C): 27,000 / 54.000⁰ / min
- Positioning accuracy:
- XYZ axes: ± 0.0015 mm
- Axis B: ± 2.0 sec
- C axis: ± 2.0 sec
- repeatability:
- XYZ axis: ± 0.0010 mm
- Axis B: ± 2.0 sec
- C axis: ± 1.0 sec

APPLICABILITY:

Any type of machining applications despite it's geometric complexity. The quipment is suitable for a wide range of applications in the aerospace, biomedical, automotive, research and development projects, etc.

BENEFICIARY: INCDMTM - Bucharest.

FURTHER INFORMATION: E-mail: popangeorge@yahoo.com

MAKINO EDAF2 - SINKER EDM

Product overview:

The EDAF2 sinker EDM machine offers an ideal mix of high-speed machining, high accuracy and surface finish capability to efficiently tackle any job.

The EDAF2 has a flexible machine design that utilizes a stationary worktable with a programmable rise-and-fall work tank. The solid electrode erosion machine Makino benefit from the revolutionary Hyper-I Control system that represents a radical change in operational efficiency and offers operators an identical, powerful and easy-to-use interface.



TECHNICAL FEATURES:

- Working range on XYZ axes: 350 x 250 x 250 mm
- The dimensions of the table: 550 x 350 mm
- X / Y / Z axis positioning accuracy: ± 0.002 mm
- Surface roughness quality: ≤ 1.0 μ m
- Automatic tool changer (electrode): 4 tools
- High precision linear rulers: 0.5 μ m

APPLICABILITY:

The EDAF2 sinker EDM machine offers an ideal mix of high-speed machining, high accuracy and surface finish capability to efficiently tackle any job in regard to solid electrode erosion machining technology. The equipment is suitable for a wide range of applications in the aerospace, biomedical, automotive, research and development projects, etc.

BENEFICIARY: INCDMTM - Bucharest.

FURTHER INFORMATION: E-mail: popangeorge@yahoo.com

MAKINO U6 H.E.A.T - WIRE EDM

Product overview:

The U6 H.E.A.T. Wire EDM machine provides an ideal mix of speed, accuracy, and surface finish capability with larger travels to tackle the most demanding applications with new levels of user-friendliness and efficiency. Makino's Hyper i control delivers intuitive and familiar touch Pinch/Swipe/Drag operations similar to smartphones and tablets to the U6 H.E.A.T. machine. The Hyper i control utilizes a straightforward 3-Step operation process of Program/Setup/Run, and this efficient and user-friendly interface is used for all Makino Wire and RAM EDM machines. U6 H.E.A.T reduce the single largest expenses in operating a wire EDM machine.



TECHNICAL FEATURES:

- Working range on XYZ axes: 280x250x280 mm
- The dimensions of the table: 600 x 400 mm
- Thread: copper wire and brass wire
- XYZ axis positioning accuracy: 0.0015 mm
- Repeatability: ± 0.001 mm
- CNC axis programming: simultaneous control of the 4 axes
- Surface quality processed (roughness): 0.005 mm

APPLICABILITY:

The U6 H.E.A.T. contains a robust machining conditions library that has been developed to provide an optimal mix of Speed, Accuracy, Surface Finish, and Low Wire Consumption for both sealed and poor flush applications. It can be used for any type machining process where wire EDM technology is necessary. The equipment is suitable for a wide range of applications in the aerospace, biomedical, automotive, research and development projects, etc.

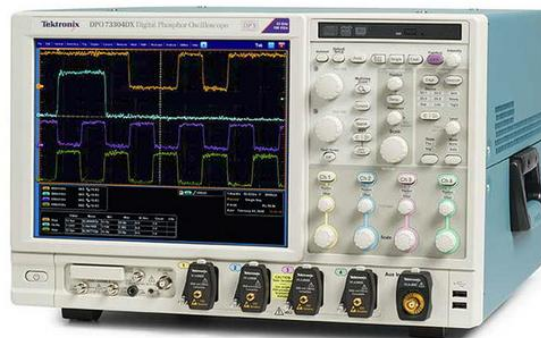
BENEFICIARY: INCDMTM - Bucharest.

FURTHER INFORMATION: E-mail: popangeorge@yahoo.com

TEKTRONICS DPO70404C - OSCILLOSCOPE

Product overview:

The DPO70404C is a 4 GHz, 4 Channel digital oscilloscope from Tektronix. Measure voltage or current signals over time in an electronic circuit or component to display amplitude, frequency and rise times, etc. Applications include troubleshooting, production test, and design.



TECHNICAL FEATURES:

- 25 GS/s Real-time Sample Rate
- Up to 125 Megasamples Record Length with MultiView Zoom™ Feature for Quick Navigation (31 MS standard)
- Fastest Waveform Capture Rate with >300,000 wfms/s Maximum per Channel
- Digital Serial Analyzer Models with Dedicated Configuration for High Speed Serial Design and Compliance Testing
- Enhanced Bandwidth to the Probe Tip Extended to Support Multiple Bandwidth Steps for Advanced Signal Integrity.
- Pinpoint® Triggering, with over 1400 Combinations to Address Virtually Any Triggering Situation
- Unique Serial Pattern Triggering up to 3.125 Gb/s and 8b/10b Standard Protocol Triggering for Isolation of Pattern-dependent Effects
- Serial Data Analysis and Compliance for PCI Express, Serial ATA, FB-DIMM, SAS, Fibre Channel, IEEE1394b, RapidIO, XAUI, HDMI, DVI, Ethernet, USB 2.0
- Most Popular Jitter and Timing Measurement and Analysis Package
- 12.1" Largest XGA Touch Screen Display in the Industry
- MyScope® Custom Windows Enhance Productivity
- Right-Mouse-Click Menus for Exceptional Efficiency
- Microsoft Windows 10 Enterprise IoT Edition



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MINISTRY OF EDUCATION AND RESEARCH
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APPLICABILITY:

- Design verification including signal integrity, jitter, and timing analysis
- Design characterization for high-speed, sophisticated designs
- Certification testing of serial data streams for industry standards
- Memory bus analysis and debug
- Prototype turn-on and power supply verification
- Research and investigation of transient phenomena
- Production testing of complex systems
- Spectral analysis of transient or wide-bandwidth RF signals

The equipment is suitable for a wide range of hardware applications in the aerospace, biomedical, automotive, research and development projects, etc.

BENEFICIARY: INCDMTM - Bucharest.

FURTHER INFORMATION: E-mail: popangeorge@yahoo.com

REHM TIGER 230 DC - HIGH DIGITAL TIG WELDING MACHINE

Product overview:

The REHM - TIGER welding equipment delivers first-class quality, a perfect seam look and the rework is significantly reduced. All these benefits you get in conjunction with a mobility that is second to none. With a maximum weight of 7.9 kg is the lightest TIG unit in the REHM welding equipment class.

Welding in the assembly and maintenance area is much more demanding, especially when the mobility and handling of the device that is one of the most important requirements in practice. Thanks to a new, intuitive operating concept, the TIGER offers maximum safety in the selection of welding parameters and thus a high degree of user-friendliness. The digital display also makes it easy for a less experienced welder to make the right setting safely and quickly.



TECHNICAL FEATURES:

- Setting range TIG [A] 4-230
- Duty cycle (ED) at I_{max}. (10 min.) At 40 ° C TIG [%] 40
- Power connection [V] 1 x 230
- Mains frequency [Hz] 50/60
- Hedging (sluggish) [A] 16
- Burner cooling gas / water *
- Degree of protection IP 23 S
- Power factor [cos phi] 0.98
- Power consumption at I_{max}. [kVA] 6.1
- Insulation class F
- Weight [kg] 7.5
- Dimension (LxWxH) [mm] 480 x 160 x 320

APPLICABILITY:

The mobile solution for all welding tasks that occur daily in the craft industry. It does not matter if you want to process stainless steel, aluminum, steel, copper or titanium in different material thicknesses.

The equipment is suitable for a wide range of welding applications in the aerospace, biomedical, automotive, research and development projects, etc.

BENEFICIARY: INCDMTM - Bucharest.

FURTHER INFORMATION: E-mail: popangeorge@yahoo.com

ADVANCED BLUETOOTH SYSTEM FOR MEASURING AND PRESETTING TOOLS - TOOL PRESET EZSET

PRODUCT OVERVIEW

Preparing your tools correctly pays off. Precisely measured tools and optimized machine and tool lives mean at least a 15% increase in productivity in your manufacturing processes. EZset tool presetting devices amortize quickly. They are easy to operate, small on costs, and big on performance.

Time-wasting fine adjustments are a thing of the past. The dynamic cross-hairs move to the tool cutting edges, and automatically measures the entire camera image. Results are precise no matter the user, as well as repeatable and reliable. Three in one! Quickly measure, preset, and inspect tools – directly beside your CNC machines.

TECHNICAL FEATURES:



- Operating system: Windows 7 64-bit multilingual
- Permitted for ambient temperatures up to 50 °C
- Manufactured according to CE regulations (Europe) and FCC class B (USA)
- Fast and shock-resistant solid state disk (SSD)
- One-button" data backup for each backup on a USB storage device
- Dimensions: approx. 33 x 27 cm (17" visible screen diagonal)
- Screen type: Widescreen flat-panel display (4:3)
- Maximum viewing angle: 178° vertical / 175° horizontal
- Screen type and surface: Hard coating (3H), anti-glare
- Optimal resolution: 1,280 x 1,024 pixels at 60 Hz

- Contrast ratio: 1000:1 (standard)
- Brightness: 350 cd/m² (standard)
- Response time: 5 ms
- Color support: 16.7 million colors
- Background lighting: LED
- Temperature during operation 0 to 50 °C (32 to 122 °F)
- Temperature when not operating, during storage and shipping: -20 to 60 °C (-4 to 140 °F)
- Humidity during operation: 10 to 80 % (non-condensing)
- Humidity when not operating, during storage and shipping: 5 to 90 % (non-condensing)

APPLICABILITY:

The EZset Tool Preset equipment is suitable for a wide range of cutting tools used in factories and production plants through metal processing, research and development centers equipped with microproduction sections, production and microproduction sections, etc.

BENEFICIARY: INCDMTM - BUCHAREST

FURTHER INFORMATION: E-mail: popangeorge@yahoo.com

EQUIPMENT STANDARD AND POLYGON STANDARD - TAYLOR HOBSON TRIANGLE ULTRASPEC 300

PRODUCT OVERVIEW

Taylor Hobson Autocollimators – developments of the renowned Hilger and Watts products – are sensitive optical instruments designed for the accurate measurement of small angular displacements. Taylor Hobson Autocollimators are used in conjunction with reflecting mirrors or surfaces for the accurate measurement of small angular deviations from a datum angle.



The main advantages of Taylor Hobson autocollimators are:

- High accuracy & wide range angle measurement
- Easy to set up and operate
- Calibration traceable to international standards
- Choice of Visual or Electronic systems
- Wide range of accessories and levels

TEHNICAL FEATURES:

- Wide measurement range (1800 seconds)
- High accuracy (0.2 seconds)
- Simultaneous dual axis operation and display
- Laser sighting aid for easy set-up
- Simple touch-screen operation
- Clear software with full electro optics applications package

Applications include:

- Simultaneous 2 axis straightness measurement
- Alignment of optical systems
- Flatness measurement
- Lens centration
- Angles of optical components and prisms
- Checking, setting & measurement of angular indexing heads and tables

APPLICABILITY:

Used extensively in workshop, tool rooms, inspection departments and quality control laboratories throughout the world.

BENEFICIARY: INCDMTM - BUCHAREST

FURTHER INFORMATION: E-mail: popangeorge@yahoo.com

MECHATRONICS EQUIPMENTS FROM CERTIM LABORATORIES



3D Automatic Laser Calibration System –
ETALON Laser Tracer



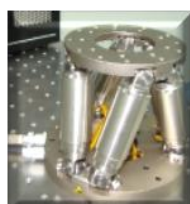
Atomic force microscope - A.P.E.Research
A100



NANOMETROLOGY FEATURES



ULTRARAPID LASER MEASUREMENT



COMPLEX MEASUREMENT AND POSITIONIN

FURTHER INFORMATION: PhD. Eng. Popan Gheorghe, e-mail: popangeorge@yahoo.com

FLEXIBLE POSITIONING MICROMECHATRONIC SYSTEM, INTEGRATED INTO TECHNOLOGICAL PLATFORMS



OVERVIEW:

The flexible positioning micromechatronic system is a modular construction and contains the following main parts:

- a worktable
- two electric linear axis model M403- 8PD of the Physik Instrumente company
- electric gripper LEHZ 32K2-22 and connections with controller
- industrial computer National Instruments PXI 8106
- electric panel
- temperature sensor
- inductive sensor
- optical barriers
- the positioning micromechatronic is electronically performed using linear gauges.

TECHNICAL FEATURES:

- worktable 1250x780x750 (mm)
- travel ranges from 0 to 200 mm on x and z axis
- carry up to 200 N and push/pull up to 50 N
- accuracy of the positioning: $\pm 0,00025$ mm;
- electrical supply: 220 V.c.a./50 Hz; (15V- CC motors, 24V- gripper and controllers)
- automatic loading and downloading of the work piece;

APPLICABILITY:

- Highly precise position for measuring.
- Mecatronic innovative system characterization of surfaces in complex vector space size, temperature
- Intelligent mechatronic system for determining the measurement of global constants in optical systems with complex software algorithms.
- System calibration inductive displacement sensors and pneumo-electric sensors.

TECHNOLOGY TRANSFER: The product is for companies producing high-tech products, R & D institutes, technical universities.

BENEFICIARY: Privat companies, R & D institutes, technical universities.

FURTHER INFORMATION: Zapciu Aurel, e-mail: zapciua@yahoo.com

METALLOGRAPHIC SAMPLE PREPARATION LABORATORY

Program: Institutional Development -“Institutional development of INCDMTM to increase capacity and performance to support excellence in research and development - short- and medium-term innovation”, contract no. 5 PFE/16.10.2018

The laboratory aims to prepare metallographic samples in order to perform structural metallographic analyzes. Cutting the samples is done so as not to produce changes in the structure of the material by abundant cooling of the cutting disc.

The embedding of the metallographic samples is made in reusable silicone glasses, the embedding material being a resin and hardener composition.

Sanding is performed on abrasive paper of various granulations and polishing on felt with alumina or diamond solution.

OVERVIEW

The following equipment was purchased:

Metallographic sample cutting equipment MECATOME T202

The equipment is a compact and robust precision manual micro-cutting machine. With a large working area, it can cut with the highest precision a wide range of materials, from the hardest to the softest. Its powerful engine allows it to work at high and constant torque over the entire speed range 100 to 4000 RPM.



Technical features:

Power 960 W

Type of cut-off wheels: Resinoid and diamond

Cut-off wheel size range: From \varnothing 75 to \varnothing 200 mm

Rotation speed :From 100 to 4000 RPM

Arbor size: 12,7 mm

Cutting mode: Manual or by gravity (weight / counter-weight)

X axis range :100mm X-axis movement of the sample carrier arm

Holder Sample:carrier arm accepts a wide variety of holders

Pressure embedding equipment for metallographic samples



Technical features:

Volume 4.5 liters
Working pressure 2 bar
Enclosure dimensions: Height 70 mm, Diameter 220mm
Ensures good filling of gaps for porous materials
Reduces resin shrinkage

Polishing equipment for metallographic samples MECATECH 250 SPI



Technical features:

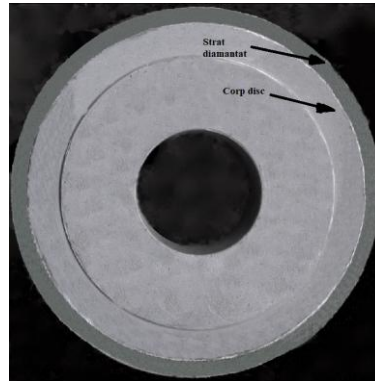
- Aluminum tray with diameter: 250mm
- Rotation speed: 20–700 rpm
- Motor with automatic torque compensation: 750 W
- Automatic grinding head with individual pressure - speed 20 - 150rpm
- rotation in both directions
- motor power: 180 W
- two 200 cc tanks for polishing substances
- pressing force on the piece: 0.1 - 5 daN

APPLICABILITY: The equipments has applicability to the characterization of metallic materials from a structural point of view.

BENEFICIARY: Metallography laboratories, research and development projects

FURTHER INFORMATION: Dr.ing.Zapciu Aurel, e-mail: zapciu.aurel@yahoo.com

DIAMOND WHEEL WITH POLYAMINE RESIN BONDS



OVERVIEW:

The project addresses the machining of sintered metal carbides with superabrasives and polyamide binders.

The product, diamond disk, code 1A1 150x20x6,5 was designed, made and subjected to tests to determine the rectification yield, rectifying flow rate and durability.

The roughness and hardness of the K20 test specimens were determined.

TECHNICAL FEATURES:

- diamond layer composition: diamond powder of the D126, D151, D181, polyamide resin, silicon green carbide, hardener
- dimensions $\varnothing 150 \times 20 \times 6,5$ mm
- Al alloy body

APPLICABILITY:

- are used in high productivity grinding when temperature in the working areas higher than 150°C
- grinding tungsten carbide
- deep feed grinding and special processing

TECHNOLOGY TRANSFER:

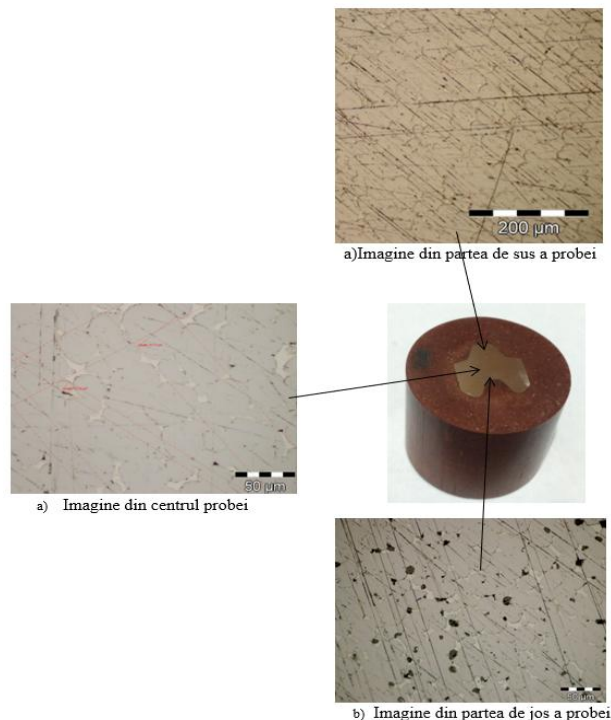
- SC Carmesin SA

BENEFICIARY: UEFISCDI

SC Carmesin SA

FURTHER INFORMATION: Zapciu Aurel, e-mail: zapciua@yahoo.com

CHARACTERIZATION OF ADVANCED MATERIALS MADE OF SINTERIZED METALLIC POWDER FOR SPECIAL USES



OVERVIEW:

The project addresses the field of manufacturing of powdered metal products based on powder metallurgy specific processes. The product, pill, code PMS-01, has dimensional tested, mass tested and, HRC hardness tested and structural analysis to highlight W in the Ni and Fe matrix, porosity and inclusions state.

TECHNICAL FEATURES:

- composition W95%, Ni3,5%, Fe1,5%
- dimensions $\varnothing 11^{0}_{-0,1}$ mm, $h = 11^{0}_{-0,05}$ mm
- mass = $12 \pm 0,1$ g
- hardness HRC 23 \pm 2

APPLICABILITY:

- powder metallurgy products that remove Co as a binder, a product that affects the environment;
- products with applications in the special industry;
- protective screens in the medical imaging industry;

TECHNOLOGY TRANSFER: SC Carmesin SA

BENEFICIARY: UEFISCDI

SC Carmesin SA

FURTHER INFORMATION: Zapciu Aurel, e-mail: zapciua@yahoo.com



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**COMPARTMENT OF
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- ✓ **Software products realization;** ◀ **NACE 5829** ▶
- ✓ **Informatic data processing;**
- ✓ **Database; Databank services;** ◀ **NACE 6311** ▶
- ✓ **Research and development in engineering sciences;** ◀ **NACE 7219** ▶
- ✓ **Market research;**
- ✓ **Strategic and operational marketing;** ◀ **NACE 7320** ▶
- ✓ **Consultancy in management and in business;** ◀ **NACE 7022** ▶
- ✓ **Technological Transfer;**
- ✓ **Direct marketing and Advertising;** ◀ **NACE 7021** ▶
- ✓ **Editing activities;** ◀ **NACE 5811;**
5812;
5814;5819 ▶

THE COMPARTMENT OF RESEARCH AND DEVELOPMENT

«STRATEGY, MARKETING»

develops

- **STRATEGIES & DEVELOPMENT**
- **MODERN MANAGEMENT CONCEPTS**
- **MARKETING STRATEGIES**
- **CAPITALIZATION**
- **COST REDUCTIONS PROGRAMMES**
- **COMMERCIAL MANAGEMENT CONSULTANCY**
- **PROJECT MANAGEMENT CONSULTANCY**
- **SPECIALISED CONSULTANCY**
- **INDUSTRY LINKS**
- **PUBLICATION**
- **SUPPORT ACTIVITIES IN SUPERIOR LEARNING SYSTEM**

**The Strategy, Marketing
Compartment
in
THE NATIONAL INSTITUTE OF RESEARCH AND DEVELOPMENT
FOR MECHATRONICS AND MEASUREMENT TECHNIQUE
offers
the following researches in domain:**

1. Researches regarding **development strategy of domain and production** for precision mechanics and mechatronics, integronics and adaptronics, and Romanian industry impact in EU.
2. **Marketing researches regarding promotion of products and services** I.C.C.N Chisinau and INCDMTM Bucharest on the markets from Romania, Moldavia Republic and other countries in precision mechanics, integronics and adaptronics and mechatronics domains.
3. Researches for **restructuring strategy substantiation in precision mechanics industry, integronics, adaptronics and mechatronics domain.**
4. Researches regarding the **impact of integration in European Union** of precision mechanics, integronics, adaptronics and mechatronics industry.
5. Researches regarding **international collaboration possibilities** in investments domain for privates and state economical agents specialized in precision mechanics, integronics, adaptronics and mechatronics manufacturing in Romania, in order to align qualitatively and competitive to the same European industry.
6. Researches regarding the **tendency of European community industry** to develop Romanian markets on medium and long time in precision mechanics, integronics, adaptronics and mechatronics domain.
7. Researches regarding **connection and integration of databases** in national and European information network.
8. Researches regarding **developing of strategic marketing and modern management activities** to evaluate and innovate the European tendencies in precision mechanics (measurement technique and quality engineering, instrumentation engineering), integronics, adaptronics and mechatronics industrial domain.
9. Researches regarding growth and organization of infrastructure entities type „relay centre for transfer and consultancy”, „interregional centre for innovation and transfer”, etc.

Starting with 2018, the annual International Conference MECAHITECH goes on
with a changed name.

So, please join us as we host 4th Edition of

International Conference of Mechatronics and Cyber-MixMechatronics – ICOMECYME

September 10th - 11th, 2020



INNOVATION

COOPERATION

KNOWLEDGE TRANSFER

This year, ICOMECYME was organized via Zoom, because of the pandemic. However, this was no reason for it not to reach the usual quality standards and to meet the expectations of the global audiences interested in this conference.

ICOMECYME has received a rich feedback thanks to the fact that it gives participants the chance to interact with specialists from all around the world in the exciting field of mechatronics, and to get in touch with a weath of innovations and new scientific discoveries.

► The Conference Proceedings of ICOMECYME are published by **SPRINGER Publishing House**

Due to the prestigious inclusion in the *Nature Series* books edited by Springer, our conference benefits from a wide interest among experts in the academia and in research facilities all over the world.

For more information please contact us at incdmtm@incdmtm.ro or access conference Website: <http://incdmtm.ro/icomecyme2020?lang=en>

Scope

ICOMECYME aims to promote scientific research results, technological development and innovation in Europe, but also to familiarize participants in other countries with the Romanian state of the art in **mechatronics, applied mechanics, cyber-mixmechatronics and other specialized smart fields**, by facilitating the interaction and exchange of experience and good practice between specialists in universities, research institutes and private companies.

CONFERENCE ORGANIZERS:



National Institute of Research and Development in Mechatronics and Measurement Technique, Bucharest – Romania



Relay Center of Technological Transfer and Consultancy



MECHATREC - Regional Cluster in Mechatronics Bucharest-Ilfov

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UNDER THE AEGIS OF THE:



Ministry of Research and Innovation
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Disemination and Publications

The Strategy, Marketing Department contributes to the disseminating of the institute results by designing and producing posters, ads, flyers, brochures, DVDs for all the scientific events organized by the institute.

The Strategy, Marketing Department also deals with editing the scientific publications, namely scientific books, catalogues, reports and **the scientific journal**. Since 2017, the former *Romanian Review Precision Mechanics, Optics and Mechatronics* will become the International Journal of Mechatronics and Applied Mechanics

International Journal of Mechatronics and Applied Mechanics is a publication dedicated to the global advancements of mechatronics and applied mechanics research, development and innovation, providing researchers and practitioners with the occasion to publish papers of excellent theoretical value on applied research. It provides rapid publishing deadlines and it constitutes a place for academics and scholars where they can exchange meaningful information and productive ideas associated with these domains.

The *journal* provides its readers with critically peer-reviewed, carefully selected articles about advances in the fields of mechatronics and applied mechanics.

Promotional materials:



Scientific publications



Papers published in *IJOMAM* bring an intellectual approach to knowledge, experience and learning. Moreover, these works establish an obvious connection between professors, researchers and highly qualified experts in the approached fields as papers appeal to a wide range of audiences interested in Mechatronics and Applied Mechanics all around the world.

Topics cover two main areas: Mechatronics and Applied Mechanics. Each main topic is structured in 4 sub-areas (8 fields of research for the journal), each with an Associate Editor assigned:

- *Under the Mechatronics topic:*

- Robotics and Automation
- Measurement Systems and Image Processing
- Mechatronic Systems and Manufacturing Processes
- Electronics and Cyber-Physical Systems

- *Under the Applied Mechanics topic:*

- Materials Science,
- Structural Mechanics,
- Fluid Mechanics,
- Technology of Measurement and Instrumentation.

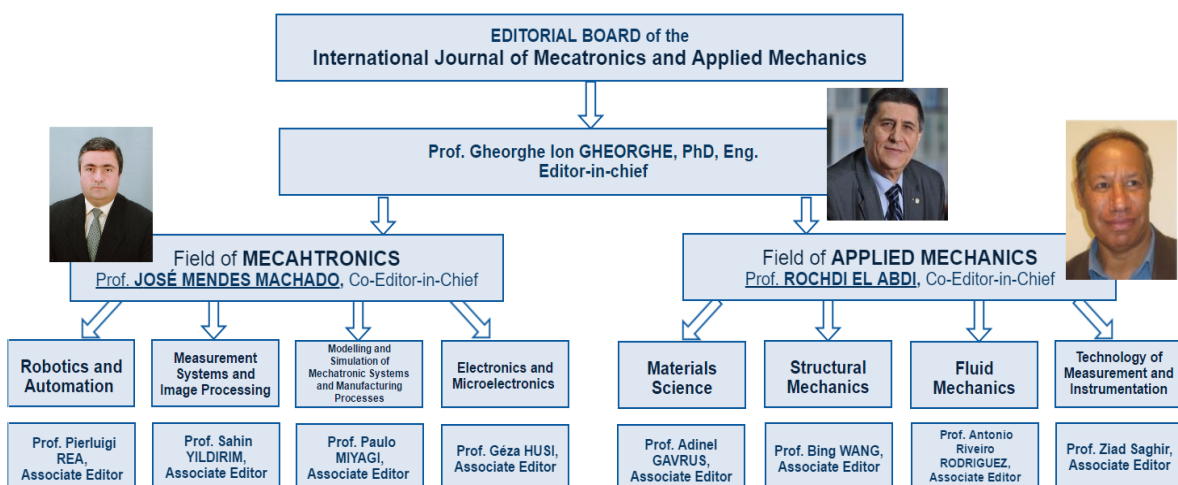
International Journal of Mechatronics and Applied Mechanics is a peer-reviewed, open-access journal, published twice a year, in July and November, and is included in **EBSCO**, **SCOPUS**, **ProQuest** and **Ei Compendex** international databases (IDB).

International Journal of Mechatronics and Applied Mechanics



If you have any questions on the submission and reviewing process, please contact the Editorial Team at incdmtm@incdmtm.ro

For more information please access journal Website: <http://ijomam.com>



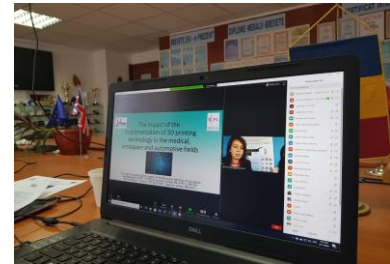
Event management

Event management is also an important tool for the institute's marketing and communication activity. The marketing team effort helps researchers to benefit from promotional events as a way to communicate with current and potential partners.



Our **STRENGTHS** are:

- We have a young, dynamic team with experience in organizing national and international events
- We have a strong relationships with our partners
- We are reliable
- We have an well developed system for registration, abstracts and papers collection, communication with participants
- We are friendly and open to suggestions



What we **DO BEST** (from our previous experience):

- International and National Conferences
- Symposia
- Thematic workshops
- Ad hoc groups for international exchanges
- Meetings
- Projects meetings and events
- Laboratory visits
- Detachments for European collaborations
- Management of individual participants for conferences.



Please, visit our website: www.ijomam.com

8 / 2020

eISSN 2559 - 6497



Biannual publication



Ministry of Education and Research

International Journal of Mechatronics and Applied Mechanics

Vol. II

Mechatronics:

- Robotics and Automation
- Measurement Systems and Image Processing
- Mechatronic Systems and Manufacturing Processes
- Electronics and Cyber-MixMechatronics Systems

Applied Mechanics:

- Materials Science
- Structural Mechanics
- Fluid Mechanics
- Technology of Measurement and Instrumentation



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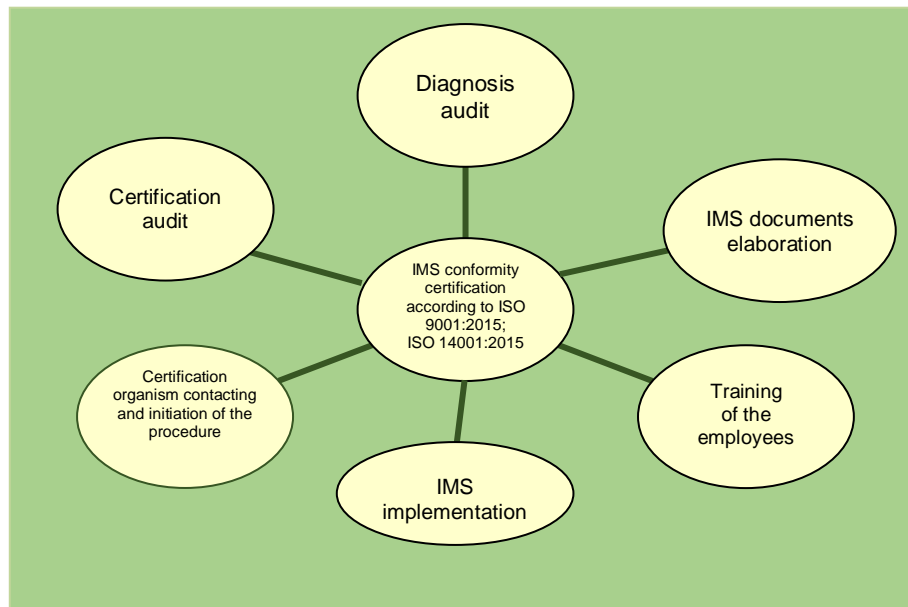
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COMPARTMENT OF
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INTEGRATED MANAGEMENT SYSTEM (IMS) CERTIFICATION IN FIVE STEPS



TECHNICAL AND FUNCTIONAL FEATURES:

- ◇ Duration until obtaining the certification – 5 months
- ◇ Assistance during the certification audit
- ◇ Internal audit services and assistance during availability of the certificates
- ◇ National and international recognition of certificates

APPLICABILITY:

- ◇ **Competitive advantage:** certified firms confirm the development of new businesses.
- ◇ **Increase in the demand by clients:** certified firms report an increase in the demand from clients, and, automatically an increase in business.
- ◇ **Business protection:** firms that are not certified have declared that they have lost clients who have preferred certified organizations. They have found out when losing contracts is already too late.
- ◇ **Cost reduction:** through efficiency, continuous improvement, loss diminishing, key control of processes.
- ◇ **The competition is certifying:** in many fields, concurrent are certified or are being certified. The more you wait before doing it, the bigger will the competition advantage be.
- ◇ **New prospects:** certified firms want to have certified business partners.
- ◇ **You will be qualified for the participation in public acquisitions.**
- ◇ **Increase in credibility:** Your businesses can increase dramatically, taking into account that many firms only work with certified firms.

CAPITALIZATION AND TECHNOLOGY TRANSFER: Seng. Carmen Finat; carmen.finat@incdmtm.ro

THE RESEARCH IN INTEGRATED MANAGEMENT DEPARTMENT HAS AS PRIMARY FIELDS OF EXPERTISE

- 👍 Execution of research – development projects focused on quality management and environment issues;
 - 👍 Methodological coordination of the certified laboratories of INCDMTM;
 - 👍 Development and implementing of quality management or integrated systems for: organizations, trial labs, management systems certifying entities, product certifying entities, inspection entities;
 - 👍 Internal and external audits of the quality management system;
- Standardization**, standard development, attending in Technical Standardization Committees;

Research objectives of the CMI personnel:

- attending participation in competitions through project C – D proposals;
- execution of C – D projects
- elaboration and editing of technical and scientific materials designed for presentation and informing purposes.
- Participation in development of scientific standards for the departments tied of expertise.

The CMI personnel abilities for:

- ↪ The completion of all activities assigned to CMI, with the regard for the specific conditions and terms subsequent from the procedure which documents the quality manage system;
- ↪ Identifying and registering any and all problems concerning processes, products and for the integrated quality management system;
- ↪ Annual management analysis;
- ↪ Initialization and conduction on Internal Audit Programs;
- ↪ Identifying of professional training needs inside the CMI ;
- ↪ Follow up of the training activities and training evaluation participation in INCDMTM;
- ↪ Participation in the analysis of bids, orders and contracts;
- ↪ Involvement in the assessment and selection activity of subcontractors;
- ↪ Timely elaboration at a scientific level of all the works assigned to CMI;
- ↪ Projects elaboration concerning the main activity field of CCMI and the department's personnel.

The concerning domains of CMI are part of the interest domain set of INCDMTM and are based on the following fundamental management principles:

- ❖ Clients explicit and implicit needs satisfaction;
- ❖ Quality level assessment opposed to the degree of correspondence with the client's needs;
- ❖ Prevention, as an economic solution for the improvement of the integrated quality

management system;

- ❖ Planning of the activities / processes of INCDMTM;
- ❖ Perfecting internal communication in INCDMTM;
- ❖ Promoting a quality based value system.

The main objectives of CMI are:

- ↳ **Continuous improvement of the integrated quality management system implemented in INCDMTM and keeping conformity with the referred standard SR EN ISO 9001: 2015 and SR EN ISO 14001: 2015 ;**
- ↳ **Project proposals participation** at the National and International Research – Development Innovation Programs;
- ↳ **Maintaining the certifications of the laboratories placed under the legal authority oh INCDMTM according to the conditions of the referral SR EN ISO / CEI 17025**

CMI is enabled and competent to deal with the development of the following third party works:

Ensuring a high level of competitiveness for the organizations / trial labs by giving assistance with the integrated quality management system for:

- technical and administrative assessment, identification of processes / sub processes of the organization, development of the establishment based on the processes existing in the lab / organization, by taking into consideration of all the conditions and norms concerning quality and quality management;
- ensuring the good functioning of the organization's processes according to the requested standard conditions of document elaboration;
- ensuring the success of developing integrated quality management system through an appropriate documentation of the processes from the organizations/labs, through the development of quality management system / integrated management system;
- development of an adequate management system documentation of the processes/ sub processes and activities that take place in the organization, in accordance with the organizational culture, with its objectives the services / products it provides, with the referral standards and / or other legal / normative requirements.
- ensuring the success of quality management system, implementation, maintenance and continuous, improvement inside organizations / trial labs by providing consulting and / or technical assistance.

Main areas of interest of the CMI in the standardization domain

In full accordance with the national policy of standardization, CMI participates at the assimilation of European standard process by assigning a representative of CMI in the Technical Standardization Committee.

Also from the standardization point of view, CMI has responsibilities in ensuring a human interface with the consequent department of ASRO and in maintaining a standardization data base in INCDMTM.



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ACTIVITY CONTROL IN INDUSTRY LINKS OFFICE

- ↪ **constituting a database with potential internal and external product/ technology/ service purveyors – OFFER and with participants at technological transfer – DEMAND from precision mechanics, mechatronics and connected domains;**
- ↪ **facilitation of information transfer to the partners;**
- ↪ **participation at negotiation of technology transfer;**
- ↪ **promotion, by various ways, of current and perspective necessities of economical agents;**
- ↪ **rational maintenance with some other technological transfer centers from different domains;**
- ↪ **consultancy and assistance regarding the participation in RD projects launched by the European Union.**



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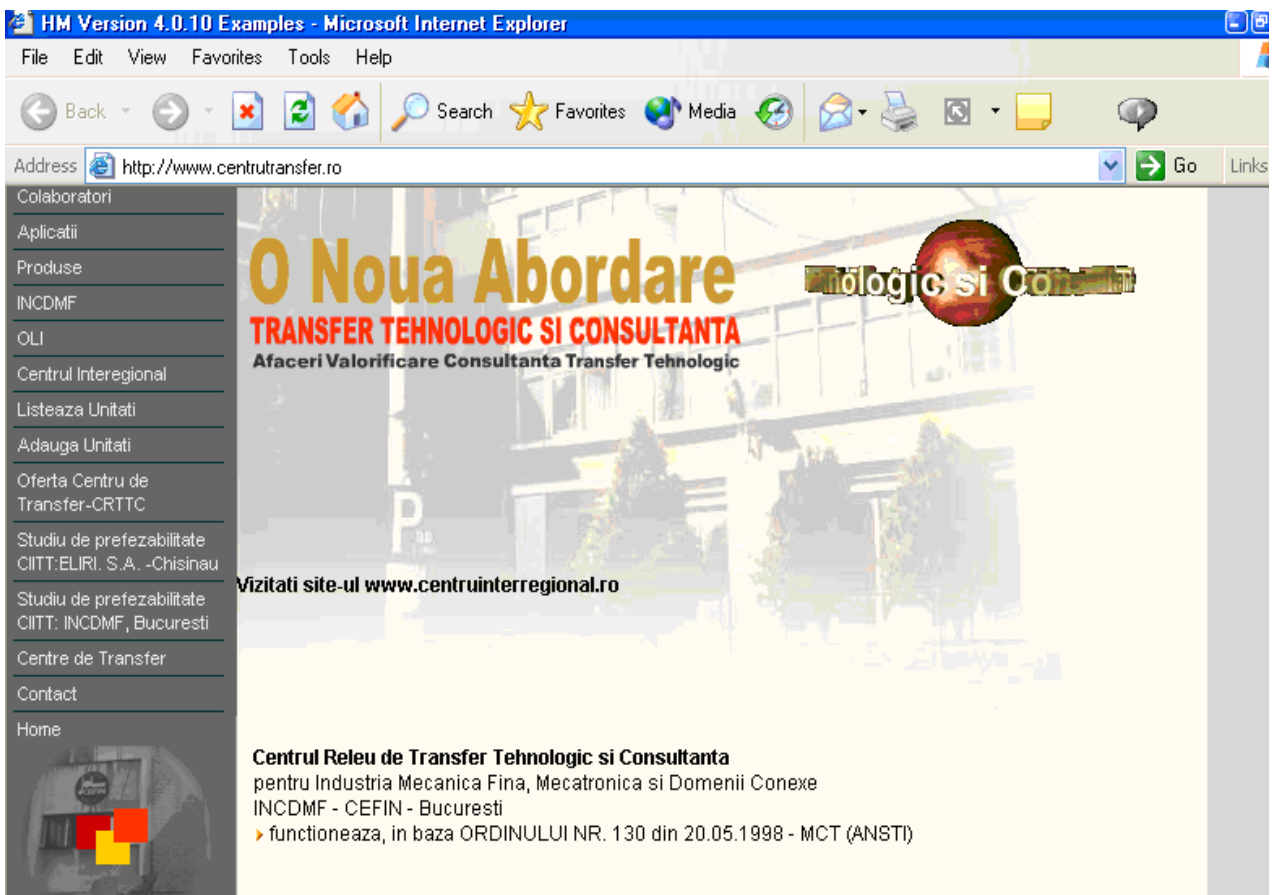
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- **Accredited ISO 9001/ 2001**



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▶ functioneaza, in baza ORDINULUI NR. 130 din 20.05.1998 - MCT (ANST)

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RELAY CENTER OF TECHNOLOGICAL TRANSFER AND CONSULTANCY

•CRTTC•

THE FUNDAMENTAL OBJECTIVE AND THE OPTIONS OF STRATEGY

RELEVANT THROUGH Relay Center of Technological Transfer and Consultancy – CRTTC –

[A] The fundamental objective in the medium term:

(1) creation by TECHNOLOGICAL TRANSFER of some sub-sectors of fine mechanics, optics and mechatronics for a functioning market, compatible with the EU principles, rules, mechanisms, institutions and policies;

(2) shaping the convergence of technological transfer activities, based both on evaluation of resources and opportunities, and on national and international context;

(3) support the imperative to conclude the transition of TECHNOLOGICAL TRANSFER to market economy in the field of industrial fine mechanics, optics and mechatronics as well as preparation of the accession of industries Fine mechanics, optics and mechatronics in industrial fields related EU;

[B] Options of the corresponding strategy of basic objective options aim to create conditions for:

(1) providing specific industry sectors increased proportion of fine mechanics, optics and mechatronics based on technology transfer and increase investment rate, both through a significant participation of national capital and by attracting external resources;

(2) further measures to stabilize the specific sub-industry of fine mechanics, optics and mechatronics through support for technology transfer for the domain and policies to ensure the budget deficits incurred and the dynamic quasi-fiscal deficit reduction in the specific industry;

(3) the promotion and integration of technology transfer and coherent policies are compatible with EU mechanisms, aimed at "adjusting" fine structural mechanic, optics and mechatronics, development and modernization of specific sub-area, revitalization and upgrading of sub-sectors and that some businesses related sub, supporting implementation of information technology in the automation industry and specifically by his computerization of other industrial sectors of developing the national strategy;

(4) providing an optimal environment TRANSFER OF TECHNOLOGY AND BUSINESS, specific market area based on the development of market competition, by reducing costs and easing the tax burden and promoting specific measures to stimulate small and medium enterprises;

(5) modernization and development of technology transfer and industrial services and other specific fields to best meet the needs and requirements of the internal market (and external), and approaching the standards the EU countries;

(6) increasing technology transfer and the remodelling of the structure of industrial production capacity and the related field of fine mechanics, optics and mechatronics, including the development and fostering cooperation with EU partners, including entities related to technology transfer infrastructure, amid consolidation operation market economy, it real infrastructure of a competitive environment and the renewal of SMEs with potential competitiveness;

(7) sequence selection process for resizing and operators in the field of fine mechanics, optics and mechatronics, engaged in restructuring and economic recovery by absorption of the most effective technology transfer of R & D results;

(8) developing the technology transfer consultancy and training, entrepreneurial training and business in centre field-specific relay transfer of fine mechanics, optics and mechatronics, which facilitates the provision of useful services for SMEs;

(9) improving project management research and development-innovation and technology transfer and capacity development to generate scientific and technological knowledge in the field of fine mechanics, optics and mechatronics, in order to reduce disparities in technology, information infrastructure development, application of standard procedures for assessing of operations and personnel, developing the capacity to disseminate scientific knowledge and technology infrastructure transfer extension and marketing services, industry liaison offices, business centres and centres of excellence;

(10) developing capacity of the innovation in the economic environment, by developing the field of fine mechanics, optics and mechatronics, and that the technological transfer of results in this priority area.

MISSION:

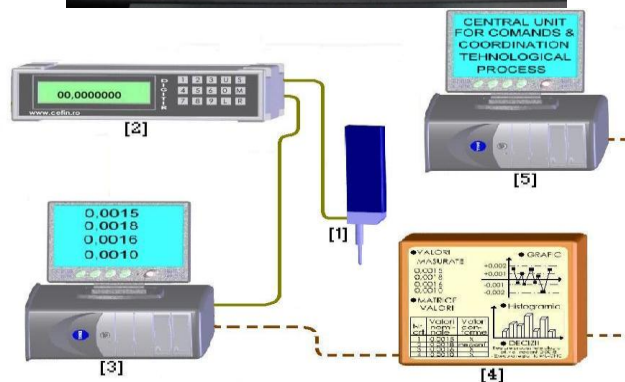
1. **Awareness of companies in the industry, the necessity and importance of technology transfer;**
2. **Constant involvement Relay Technology Transfer Center and Consultants share the results of RDI technology transfer.**

FURTHER INFORMATION:

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Phone: +4021.252.30.68/361
e-mail: iuliancefin@yahoo.com

INTELLIGENT MECHATRONIC SYSTEM FOR HIGH PRECISION MEASUREMENT OF LINEAR MICRO-MOUVEMENTS IN INDUSTRIAL AND LABORATORY ENVIRONMENTS - DIGITIL

Technology transfer



PRODUCT OVERVIEW:

The intelligent micro-system – DIGITIL includes the following innovative components / modulus:

- Incremental photoelectric transducer (1) for measurement of micro-displacements -and incremental divider scale with detail of original incremental network ;
- Electronic subsystem digital unit for measurement and display (2) ;
- Informatics unit PC (3) – and the functional block diagram;
- LCD monitor (4);
- Central informatics unit PC (3);

DIGITIL has an original configuration of intelligent mechatronic micro-system for measurement in continue flux (Original solution for the construction of the intelligent transducer; Original solution for the linear incremental photoelectrical network divisor kind / vernier kind and the incremental network of zero; Original solution for the construction of the electronic unit for measurement, display and transfer; Original

software for the process of measurement, comparison, representation and transfer; Original system for the electronic pitch of impulses; Lower energetic consumption for the entire micro – system; Lower ambience noise, network noise and other electromagnetic noises; Compensation of the amplifiers offset), quick measurement in real time, micron precision of measurement per measurement interval, Efficient control of data measured (that are acquisitioned and storage).

The intelligent system – DIGITIL includes the following innovative components / module:

- [1] Photoelectric incremental transducer for measurement of linear micro-movements
- [2] Electronic unit for digital measurement/display
- [3] Informatic unit PC
- [4] Electronic unit for registration and representation
- [5] Central unit for commands and coordination

TECHNICAL FEATURES:

- Dimensions (L x l x h – in mm): 600 x 550 x 880.
- **Measurement interval:** 10mm; (and 30; 50; 80;100mm for product development);
- **Resolution (R) :** 0,001mm ;(and 0,0001mm; 0,00001mm for product development)
- **Accuracy :** $\pm 0,001$ mm $\pm 0,0001$ mm for product development);
- **Display capacity:** 8 decade +1 decade for sign;
- **Supply IRED:** $+(5\pm 0,25)V$;
- **Supply for electronic unit:** 220V; 50 Hz $\pm 2\%$;
- **Electronic sub-partitions:** logical(2,4,6) and analogical(5,10,20);
- **Counting error:** \pm bit; **Accuracy error:** max. $\pm R/8$;
- **Electrical impulses frequency:** 0÷100 Hz;
- **Impulses filling factor:** $a/p = 0,5 \pm 0,1$;
- **Shift of impulses:** A and B : $b/p = 0,25 \div 0,05$;
- **Signals output:** TTL and with free collector.

APPLICABILITY

The product is used in very accurate linear measurements in static and dynamic, very precise linear positioning in static and dynamic, equipped as CN and CNC system on machine tools and other equipment; equipped as CN and CNC system on industrial and control robots / micro robots; equipped as intelligent mechatronic systems for measurement and control, or complex instruments / devices and equipments for control and measuring in 1D, 2D and 3D.

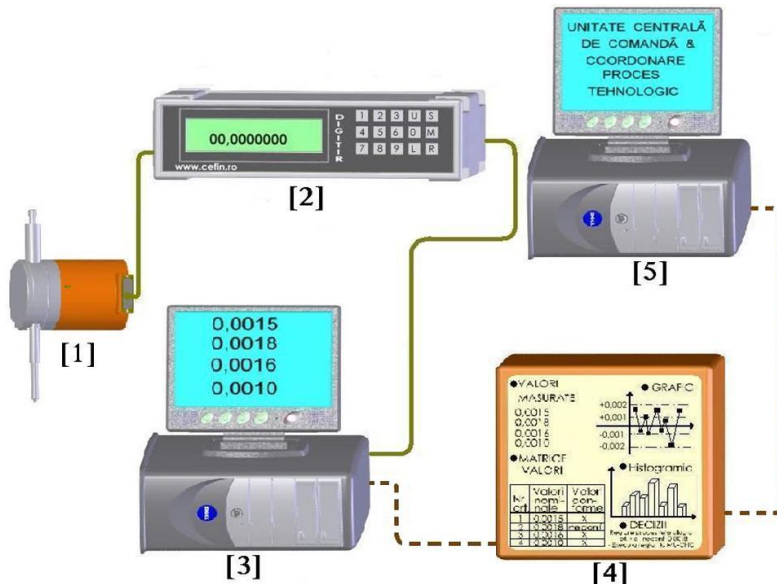
TECHNOLOGY TRANSFER: This technology / product were transferred to S.C. QUATRO PRODCOM S.R.L.

BENEFICIARY: S.C. QUATRO PRODCOM S.R.L., Dr. Eng. Ghiorghe Stoica

FURTHER INFORMATION: Professor PhD.EurEng Gh. Ion GHEORGHE / Tel. 021.252.30.68/69, Fax. 021.252.34.37, e-mail: geocefin@yahoo.com

INTELLIGENT MECATRONIC MICRO-SYSTEM FOR DIMENSIONAL MEASUREMENT FOR HIGH PRECISION MEANT TO DEVELOPMENT OF INSTRUMENTATION ENGINEERING IN INDUSTRIAL AND LABORATORY ENVIRONMENTS - DIGITRIL

Technology transfer



PRODUCT OVERVIEW:

The intelligent micro-system – DIGITRIL includes the following innovative components / modulus:

- [1] Photoelectric incremental transducer for measurement of linear micro-movements
- [2] Electronic unit for digital measurement/display
- [3] Infromatic unit PC
- [4] Electronic unit for registration and representation
- [5] Central unit for commands and coordination

DIGITRIL is designed for positioning / micro positioning and, equipment of technical and technological

installation MECHATRONICS equipment as a - CN and / or CNC system mechatronic.

The claimed novelties are: original solution for the construction of the intelligent transducer; original solution for the linear incremental photoelectrical network divisor kind / vernier kind and the incremental network of zero, original solution for the construction of the electronic unit for measurement, display and transfer; original software for the process of measurement, comparison, representation and transfer; original system for the electronic pitch of impulses; lower energetic consumption for the entire micro system; lower ambient noise, network noise and other electromagnetic noises; compensation of the amplifiers offset; quick measurement, in real time; micron precision of measurement per measurement interval; efficient control of data measured (that are acquisitioned and storage); original dedicated software which signalize promptly with audio and video messages(included a hold on of the measurement process) when a measured product is no conform (it is not in the tolerated field established at the start of the process).

TECHNICAL FEATURES

- Dimensions (L x l x h – in mm): 600 x 550 x 880.
- **Measurement interval:** 10mm; (and 30; 50; 80;100mm for product development);
- **Resolution (R) :** 0,001mm ;(and 0,0001mm; 0,00001mm for product development)
- **Accuracy :** $\pm 0,001$ mm $\pm 0,0001$ mm for product development);
- **Display capacity:** 8 decade +1 decade for sign;
- **Supply IRED:** $+(5\pm 0,25)V$;
- **Supply for electronic unit:** 220V; 50 Hz $\pm 2\%$;
- **Electronic sub-partitions:** logical(2,4,6) and analogical(5,10,20);
- **Counting error:** \pm bit; **Accuracy error:** max. $\pm R/8$;
- **Electrical impulses frequency:** 0÷100 Hz;
- **Impulses filling factor:** $a/p = 0,5 \pm 0,1$;
- **Shift of impulses:** A and B : $b/p = 0,25 \div 0,05$;
- **Signals output:** TTL and with free collector.

APPLICABILITY:

The product is used in very accurate linear measurements in static and dynamic, very precise linear positioning in static and dynamic, equipped as CN and CNC system on machine tools and other equipment; equipped as CN and CNC system on industrial and control robots / micro robots; equipped as intelligent mechatronic systems for measurement and control, or complex instruments / devices and equipments for control and measuring in 1D, 2D and 3D.

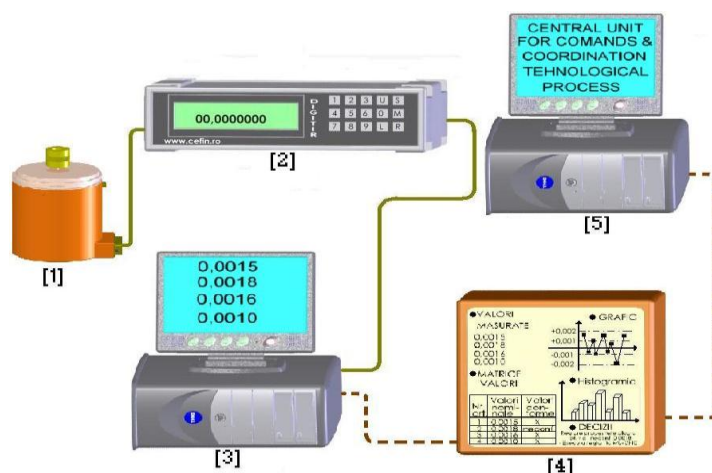
TECHNOLOGY TRANSFER: This technology / product were transferred to S.C. QUATRO PRODCOM S.R.L.

BENEFICIARY: S.C. QUATRO PRODCOM S.R.L., Dr. Eng. Ghiorghe Stoica

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INTELLIGENT SYSTEM WITH PHOTOELECTRIC TRANSDUCER WITH INCREMENTAL DISCS FOR MEASUREMENT OF ANGULAR MOTIONS - DIGITIR

Technology transfer



PRODUCT OVERVIEW

The intelligent system with incremental disks photoelectric transducer for dimensional and angular displacements measurement in industrial environment is intended for positioning / micro-positioning, direct measurements, angular displacements / micro-displacements and equipping as NC and/or CNC system, technical and technological installations and equipments.

The intelligent system, converts an analogical quantity (angular displacement) in a digital quantity (number of impulses).

The intelligent system, by photoelectric transducer subsystem supplies at exit four rectangular signals in quadrature and zero signals.

An adequate processing of those signals in electronic subsystem for measurement and digital display, allows electronic sub-partitions with 2, 4, 8 (in case of analogical exits can be made sub-partitions with 2, 4, 5, 10, 20) and detection of angular displacement orientation.

The intelligent system – DIGITIR includes the following innovative components / modulus:

- [1] Photoelectric incremental transducer for rotation
- [2] Electronic unit for digital measurement / display
- [3] Informatic unit PC
- [4] Electronic unit for registration and representation
- [5] Central unit for commands and coordination

Based on binding heights, the beneficiary can built different assembling systems of photoelectric transducer subsystem, adequate to various applications, with condition of respecting subsystem characteristics. Axis of rotation is made of non-corrosive steel hardened / tempering. Mechanical coupling is made through precision elastic systems.

TECHNICAL FEATURES:

- **Dimensions (L x l x h – in mm): 600 x 550 x 880.**
- **Measurement domain:** infinite; **rotation angle** is ∞ ; **measurement interval** $0^{\circ} \div n \cdot 360^{\circ}$;
- **Resolution** : $R = \frac{360^{\circ}}{N}$, [° , ' , "] ; where :N = number of impulses / rotation;
- **Accuracy** (correctness error): max. $\pm R/4$;
- **Hysteresis value:** max. $\pm R/7$;
- **Accuracy error:** max. $\pm R/8$;
- **Null impulse width:** max. R;
- **Electrical impulses frequency:** 0÷100 Hz;
- **Null impulse** (reference): one at 360° ;
- **Impulses filling factor:** $a/p = 0,5 \pm 0,1$;
- **Shift of impulses:** A and B : $b/p = 0,25 \div 0,05$;
- **Signals output** : TTL and with free collector
- **Photoelectric transducer subsystem weight:** max. 0,5 kg
- **Overall size** (photoelectric transducer subsystem: max. $\varnothing 58 \times 95$ mm;
- **MTBF** : 1500 hours;
- **R (550 h):** 0,9 ;
- **R (950 h):** 0,76 ;
- **Z (550 h):** $2,8 \cdot 10^4 \text{ h}^{-1}$;
- **Z (950 h):** $4,4 \cdot 10^4 \text{ h}^{-1}$;

APPLICABILITY: The product is used in very accurate linear measurements in static and dynamic, very precise linear positioning in static and dynamic, equipped as CN and CNC system on machine tools and other equipment; equipped as CN and CNC system on industrial and control robots / micro robots;

TECHNOLOGY TRANSFER: S.C. QUATRO PRODCOM S.R.L.

BENEFICIARY: S.C. QUATRO PRODCOM S.R.L., Dr. Eng. Ghiorghe Stoica

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**INTER-REGIONAL CENTER OF
INNOVATION AND
TECHNOLOGY TRANSFER
CHISINAU – IASI –
BUCHAREST**



INTER-REGIONAL CENTER OF INNOVATION AND TECHNOLOGY TRANSFER CHISINAU –IASI –BUCHAREST

WHO ARE WE?

- ✓ **CIITT is** “an inter-regional centre of innovation and technology transfer” associated with applied research institutions, universities and academic environment in Moldova and Romania;
- ✓ **CIITT** is an official collaborator of the Ministry of Education, Research, Education and Youth and the Ministry of Economy, Commerce and Business Environment, for disseminating information and promoting technology transfer and research results;
- ✓ **CIITT** is a partner in economic institutions and units from different industries in Romania and Moldova, for support and the process of technology transfer and consultancy;

FIELDS OF COMPETENCE:

- Information sharing
- **Consulting**
- Industrial Services, Commercial
- Technology Transfer for Products / Technologies / Services
- **Management and marketing**
- **Database**
- Information Products

MANAGEMENT & MARKETING:

- Human Resource Management
- Project Management
- Management of SME
- Information Management
- Management of Research
- Industrial Marketing
- Market research (product / technology / services)

STRATEGY & DEVELOPMENT:

Development strategy for the following industries:

- Precision Mechanics & Mechatronics & Integronics and Adaptronics;
- Electronics and Electrical engineering;
- Construction machinery
- Strategy & Development of SMEs in industrial and economic environments mentioned;
- Medium and long term strategy of the areas mentioned in light of EU accession.



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**THE NATIONAL SCIENTIFIC
CLUSTER «MICRO-NANO-
MECATRONICS»**

NATIONAL SCIENTIFIC CLUSTER “MICRO-NANO-MECHATRONICS”

OVERVIEW:

Beginning with the INITIATION PROTOCOL/1058 & 167/30.08.2007 for NATIONAL SCIENTIFIC CLUSTER MICRO-/NANO TECHNOLOGIES for MECHATRONICS, SENSORS AND ROBOTS performed between INCDMTM-Bucharest and the UNIVERSITY “POLITEHNICA” - RESEARCH AND DEVELOPMENT CENTER FOR MECHATRONICS, that put the basis of excellence scientific researches in the HIGH-TECH field of micro-nano-technologies for mechatronics, sensors and robots for an advanced and sustainable consideration of this domain for reaching EU levels of performances and compatibility - European area of research and also regarding The LISBON strategy.

- is responsible and coordinates at national level, advanced scientific researches for micro-nano-technologies for mechatronics, sensors and robots: development of new products micro-/nano-/mechatronics:micro-/nano-/sensors,micro-/nano-/actuators,mini-/micro-/nano-/robots; development of new micro-/nano-/intelligent systems: for new HIGH-TECH domains of microelectronics and electrotechnics, aerospace, micro-/nano-/mechatronics, for new domains MID-HIGH-TECH and LOW-HIGH-TECH;
- development of new advanced systems for integrated manufacturing processes: (a) off-process: ultra-precise systems for integrated control and monitoring for different industrial environments; (b) on-process: high accurate intelligent systems for interface control and quality evaluation for industrial issues;
- development of new principles, methods and high performances techniques: optical-electronic, laser, ultrasonic, piezoelectric etc.;
- development of micro-/nano-/technologies: (a) litho-photography; (b) chemical corrosion; (c) micro lasers; (d) thin layers; (e) LIGA; (f) physical/ chemical; (g) micro-machinery;
- development of frictional technological system researches: (a) frictional systems specific to cuttings and micro-cuttings; (b) frictional systems specific to friction torques; (c) characterization of micro-/nano-/ covering structures; (d) dynamic testing with or without lubrication;
- development of new intelligent materials: (a) hard and extra-tough materials; (b) composite materials; (c) ceramics materials; (d) direction properties materials; (e) processing and characterization materials;
- development of equipments and techniques for analysis and environmental control;
- development of intelligent medical techniques: (a) virtual with guiding through neuro-images for microsurgery and neurosurgery; (b) therapy with implant-prosthesis for controlled bone regeneration; (c) connections for securing techniques of data given by clinical and laboratories devices; (d) new joint generating techniques;
- is responsible and coordinates at national level of research-development infrastructure achievement using WHITE-CHAMBERS for micro-/nanotechnologies for mechatronics, sensors and robots;
- is responsible and coordinates of research-development infrastructure achievement i.e. “Pole of excellence for Mechatronics” within the project belonging to – IMPACT-STRUCTURAL FUNDS: (a) building-located nearby Mechatronic and Precision Mechanics Department in Polytechnic University Bucharest; (b) technical and technological environment specific to WHITE CHAMBERS;
- participates and elaboration Inventing Developing Research projects within National and European Programs, at their open competitions, as a coordinator and/or partner;
- participates and initializing and organizing National Technology Platforms on certain domains, similar to European ones, developing research activities, projects elaboration, information disseminating, marketing, training etc.;
- participate at the organizing of technical-scientific events and manifestations, elaborates scientific works for symposium, conferences/ scientific national and international congress;
- develops contact/contracts with institutions/ associations for research similar in EU.;
- it functions based on its own Regulations, commonly established with CLUSTER entities.

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**THE REGIONAL INNOVATIVE
CLUSTER BUCHAREST-ILFOV IN
THE FIELD OF MECHATRONICS,
INTEGRONICS & ADAPTRONICS
«MECHATREC»**

«MECHATREC» REGIONAL INNOVATIVE CLUSTER

• Purpose of MECHATREC Regional Cluster

Regional Cluster MECHATREC goal is the implementation and development, during preliminary time of its own strategy, by:

- Presenting, promoting, supporting and defending the economic, technical, scientific, social and legal aspects of cluster members;
- Increasing economic competitiveness domestically and internationally through:
 - Supporting a policy of cooperation within the cluster and with other external organizations;
 - Promoting and supporting innovation in structural entities;
 - Developing a common framework for the transfer, valorisation and implementation of advanced know-how;
 - Cooperation between cluster members in research, product development and new technologies;
 - Coordination in defining common strategic objectives: the design and implementation of measures and actions needed to achieve them;
 - Participation in various forms of association and cooperation with other national and international organizations aiming at establishing projects of common interest;
 - Development of activities covered by the nomenclature.

Activities in the European Community (NACE) implemented internally in the National Classification of Economic Activities (NACE - Rev.2):

- a) Implementing activities for the following divisions / groups: ..25/255, 256, 257; ..26/262, 265, 266, 267; ..28/281, 284, 289; ..32/325; ..33/331, 332.
- b) Research - development: NACE division 72/group 721;
- c) Technical testing and analysis activities: NACE division 71/group 712;
- d) Other professional, scientific and technical activities: NACE division 74/groups: 741, 749;
- e) Activities advertising and market research activities: NACE division 73;
- f) Membership organization activities: NACE division 94/group 941;
- g) Publishing activities: NACE Division 58;
- h) Extraterritorial organizations and bodies activities: NACE division 99;
- i) Commerce activities: NACE division 46/groups: 461, 464, 465, 466 and division 47/groups: 471, 474, 477.

The goal of establishing the Regional Cluster MECHATREC is to develop the following strategic technical and technological directions:

- the field of intelligent advanced mechatronic, integronic and adaptronic equipments, multi-structural, technological, and informational features for decision-making, measurement, control, integrative adaptive control;
- the field of high-tech mechatronic systems for industrial and commercial applications;
- the field of intelligent special medical and biomedical devices;
- the field of intelligent and hyper-intelligent mechatronic integronic adaptronic micro-nano-technologies;
- the field of intelligent new materials with micro-nanometric structures and special features

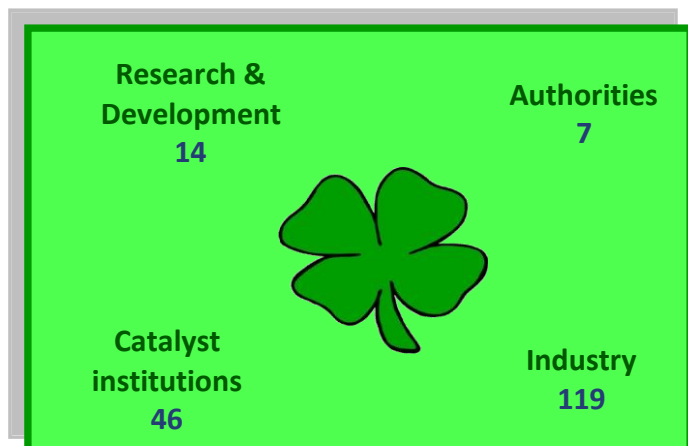
- new processing technologies and usage;
- the field of innovative and customized modular systems in industry and economy;
 - the field of advanced electromechanical mechatronic micro-nano-systems and systems;
 - the field of intelligent micro-robotics and nano-robotics;
 - the field of intelligent measurement technique, calibration, testing, calibration and functional tests and measurements;
 - the field of micro-nano techniques and micro-nano-tribology;
 - the field of logistics and support services;
 - the field of human resource development and specialization in the field;
 - The Regional MECHATREC Cluster structure is based upon economic units and sub-units required to achieve the set objectives and purpose, including:
 - economic production, trade and services – type SME, with or without RDI activities;
 - businesses having as main activity object – Research, Development and Innovation: national institutes, specialized institutes and centres;
 - secondary schools and universities;
 - testing laboratories and specialized testing laboratories;
 - chambers of commerce and industry, operating at central / regional / local level;
 - scientific organizations and professional associations and employers;
 - federations and confederations;
 - regional development agencies;

The Vision of Mechatrec cluster is that by 2020 it becomes one of the most credible service providers of innovative high-tech services and products in Europe and worldwide. The moto of the cluster - "Mechatronics for the future!" – shows the importance of the high-tech field, the training of the human capital in the area of research of excellence and of innovative research, as well as in the very activity of research and development, which is a generator of knowledge, of innovations and of advanced products and technologies that are connected to smart economic growth, but especially the importance of a cluster-like focus, featuring national and international vocation for the development of this innovative field.

MECHATREC is built on the principles and concepts of European structures type "four clover model", which bring together bodies in research, industry and local government.

- The need for forming MECHATREC Cluster is based upon national and European programming documents:

National Reform Plan - Business Environment and Industrial Policy Chapter;



- Mechatronics - Integronics - Adaptronics Development Strategy, as mix integrative scientific field with economically proven potential, but poorly supported at regional level;

- cluster development program coordinated by MEEMA - Romania;
- Europe 2020 and 2030 Strategies;
- Document Cluster Association in Romania, CLUSTERO;
- Documents of the European Cluster Alliance;
- Examples of good practices and successful actions of MECHATREC Cluster:
 - Partnerships with other clusters and competitiveness poles (eg EL - including INDAGRO, ALL ELECTRIC).
 - Collaboration between structural entities (eg INCDMTM - UPB - CCDM - HESPER - CCIB, UMF - Orthopaedics Clinic - Floreasca Emergency Hospital - INCDMTM, INFOSIT - INCDMTM - High School of Mechatronics, etc.)
 - Collaboration with personalities from the field (lectures in the field, supported by: prof. Stiharu Ion, PhD - Concordia University, Montreal - Canada, Professor. Alexandru Ivan - University Besancon - France Prof Rajshree Mootanah, PhD - University of Oxford England, etc.).
 - Cluster development database (members, designs, manufacturing, etc.).
 - Developing business opportunities between cluster members and joint projects;
 - Amplification and intensification of cooperation between and inter-clusters in high-tech strategic areas;
 - Achievements of mechatronic, integronic and high-tech adaptronic products:
 - **Cluster development perspective**
 - ✓ Attracting new members;
 - ✓ Member ship in the CLUSTERO National Association and the International Alliance of European clusters;
 - ✓ Enhancing partnerships, collaborations and relation ships to optimize value chains, products and intelligent manufacturing.

REGIONAL CLUSTER BUCHAREST – ILFOV FOR MECHATRONICS «MECHATREC»



**COOPERATION
FOR INNOVATION**

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**THE STRATEGIC COMPETITIVENESS POLE
IN THE FIELD OF MECHATRONICS,
INTEGRONICS & ADAPTRONICS
«INDMECATRON»**

«INDMECATRON» COMPETITIVENESS POLE

Scope of the INDMECATRON Pole:

The scope of the INDMECATRON Pole is to value, develop and implement its own strategies, according to time schedules designed and monitored to achieve the overall and specific objectives:

- Representing, supporting and harmonizing the interests of all economic entities;
- Objective and joint activities projecting, in strategic development areas, developed on the basis of their market research, marketing, valuation, feasibility, technology transfer, and so on,
- Creation, development and commercialization of innovative and intelligent mechatronic and adaptronic products, technologies and services;
- Working on a partnership between the states and the pole and its external entities to promote national and international research - development - innovation projects in common fields based on reciprocity, especially project management and formation of consortia for project development in the value chain matrix of high-tech intelligent mechatronic products;
- Working to address funding for European projects and international tenders and proposals promoting projects of common interest by promoting mutual international consortia formation, able to achieve mutual proposed projects and ensuring their management and coordination;
- Intelligent economical competitiveness through tangible and intangible investments financed from its own resources of national, community, international funds raised, etc.

The Pole specific objectives are listed, as follows:

- Economic competitiveness and national and international visibility techniques and tools:
 - Policies supporting collaboration within the Pole and other entities outside it;
 - Promoting and supporting innovation in all entities in the pole structure;
 - Development of a common framework for the transfer, capitalisation and implementation of advanced know-how;
 - Cooperation among members, research - development - innovation of products, technologies and services for participation in joint projects at national and international R & D programmes;
 - Coordination in defining common strategic objectives: the design and implementation of measures and actions needed to achieve them;
 - Development of new facilities and infrastructure in the new entity or entities within the innovative Pole;
 - International communication networking with other European or international competitiveness poles;
 - Development with public authorities at local, regional, national, and international level, aimed at achieving sustainable development.
 - **Good practices:**
 - Forming partnerships based on mutual interest and specialized subfields;
 - Collaboration with other poles of competitiveness;
 - Generation of product / technology and / or high-tech services, developing innovative SMEs in
- FURTHER INFORMATION:** Professor PhD.EurEng Gh. Ion GHEORGHE / Phone: 021.252.30.68/69, e-mail: geocefin@yahoo.com



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BENCHMARKING NETWORK



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BENCHMARKING STUDY CONCERNING TO CAPITALIZATION OF RESEARCH RESULTS FROM INCDMTM ECONOMIC AGENTS OF MECHATRONICS

Program Nucleu nr.pr 16210601

The project aims as its final stage, through a benchmarking study to develop a mechanism and tools to ensure a better exploitation of research results developed by INCDMTM. SWOT analysis to INCDMTM emphasizes the fact that the Institute has the potential scientific and organizational capacity to develop effective work of capitalizing on technologies/products/services/ knowledge and has a series of specific points of transfer activities: Benchmarking, industrial property, marketing, creating spin-off and start-up.

Overview:

Valorisation results of public research in Firms, represent a problem of major state policies, the rapidity with which to make a transfer of product/technology/process/service and technical performance and economic that such transfer provides them depending and competitiveness of firms that take.

Development companies by the Transfer of results and Innovation, is a concept that we find in all policies developed by the EU. In the last FP5-FP7 programs the problem of transfer results occupying an important place, more accentuated in the current Horizon 2020 Program.

The interest of States for capitalizing result of public research to industry is justified by the fact that from year to year research funding grow (already the EU average exceeded 2% of GDP) and return these funds to the budget must be reflected in the economic effects that bring assimilation of these products / technologies and services in the benefit of society. That is why, Technology Transfer (TT) be the subject of careful analysis in the EU states, in order to find the most appropriate policies, mechanisms and tools to motivate the transfer of knowledge and results, stimulating both the beneficiary of a patent or object transfer as well as also the one to take it over; TT and the last beneficiary, should not be left alone, but need financial support, legislation in this effort. The capitalization of patent and industrial property right there have different ways of treatment in European countries and US, the US practice instituted once the Bayh Doyle law application and validated by favourable economic results being acquired by the Europeans. Granting institution holding patent rights to itself commercialize patent, creating these institutions specialized bodies with TT and having one means that the inventor cannot have boosted activity. Appeared Centre for Technology Transfer in Universities and Institutions, Industry Liaison Offices, Agencies. INCDMTM has a great experience, succeeding previous years transferring research results its economic agents important and has the potential to develop this activity, make this institute a leadership in the promotion of results in research, increasing technical advantages in Institut or the product to which transfer. Technology, service, his experience - concentrated into a guide - can have a high degree of multiplier.

In establishing this guide will be addressed TT mechanisms, instruments should be created to support this activity -atât the patent licensor licensee knowledge and on - barriers that delayed reporting of research valorisation, possible indicators for evaluating the effectiveness, establishing some solid relations, long-term relationships between the research environment and industry / economic.

Equally, the experience gained in this project and the results may represent a useful contribution to solving a problem of global concern, in the European programs the problem of technology transfer - see ROP program that has a whole division in that finding the problematic - calls finding the most appropriate models for Technology transfer, transfer mechanisms and tools.

Development of innovative high-tech enterprises, result of the innovation process and transfer of research results

Industrial development of the company in the last few decades, more strongly highlighted the importance of innovation and the application of research results. European policies have endeavored to favor innovation by creating a favorable environment conducive to the increasing of labor productivity, economic growth, create jobs and wealth.

Innovation and strong support they formed the basis of creating a huge volume of knowledge, great efforts being made to transfer these results to the industry, lifting its technical level. Increasing sums being spent were allocated from year to year research statistics showing that countries that invest the most in research, benefits the strong industrial development that are based on outcome scientific transfer.

Statistics show explosive growth of innovative SMEs - those companies who use high-tech technology transfers, representing the EU Member economy around 50%, with significant contributions to GDP. There is a high tendency of increasing the percentage of innovative SMEs, those enterprises characterized by sustained policies of assimilation of high-tech products.

Mechatronics through the synthesis of high technology made in various fields, leading to the development of high-tech products intended for leading industries: automotive industry, aerospace, robotics, medical devices industry. This stands out by the high number of companies that address EU27, variety of supply and added value of the products.

In EUROSTAT 2015 appears eloquently the preoccupation of countries to innovation appeal for increasing the number of innovative enterprises. In Table 2 shows proportion of innovative enterprises to EU countries. The European average innovative enterprises of all existing enterprises is 48.9%. Above this average are situated Germany, Ireland, Italy, Sweden, Spain, France, Finland, the Netherlands, Greece; below 25%, there are only three countries: Bulgaria, Poland, Romania.

The proportion of innovative enterprises of all those existing in a country EU-28 is given in Figure 1.

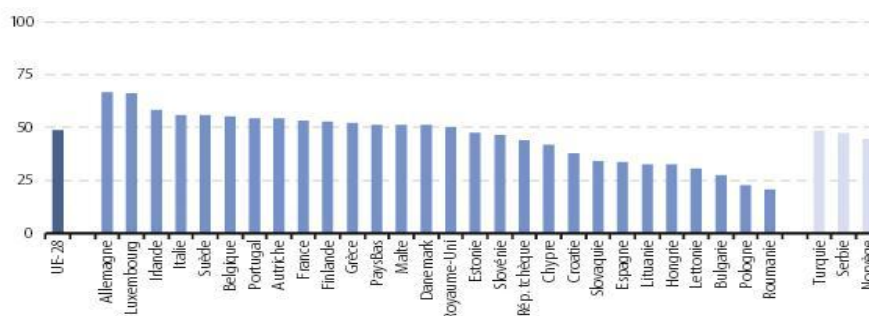


Figure 1. Proportion of innovative enterprises of all those existing in the EU 28

The activity of innovation in a company is not only the assimilation of new products or implementation of new technologies and processes but also to organize activities aimed at enterprise, new ways to do marketing.

Some important findings resulting from this table:

- The allocation of adequate funds for research explains the economic development of these countries (the first part of the table) compared with countries in the second group of table;
- The industry participate significantly to establishing the fund research compared to the second group, consisting of countries that passed after 1990 to a market economy are not yet consolidated economic to support research, the State is required to take this effort with reduced resources, though granted more as the industry, but funds are insufficient;
- Insufficient financing for research are a cause of transfer less research results together and that the industrial structure of Romania has changed substantially since 1990, with the disappearance of some industrial units strong, new ones - in training and without financial resources - an industry where the largest share of industrial output is achieved in multinational companies who use little to local research results even though they may be competitive as a solution;
- Romania have been identified a number of companies working in Mechatronics, selecting from amongst those who may become potential partners in the development of technological transfers. This selection was made after considering that turnover exceeding 10 million may suggest that the company has some potential financial or human resources to be interested in a possible technology transfer. Since the economic crisis of recent years has collected data and developments that turnover of selected companies made during the years 2006-2014. It noted that data was drawn from official documents sent by companies to the Chambers of Commerce or Chamber of Commerce Bucharest, in their synthesis done by collectively Project;
- From CAEN code analysis, has revealed that Mechatronics is covered mainly by Divisions 26 computers industry, electronic and optical products and optical equipment industry Divisions 27. The paper presents the subdivisions of these Divisions families of products being produced. Benchmarking study done on these divisions provide important data regarding the turnover of the 27 EU countries, value added, salary costs, the type of companies and their contributions to the formation of indicators, labor productivity, employment, the trend of specialization. Comparing the data submitted by Romania to EUROSTAT with the data communicated by with other European countries, made benchmarking analysis suggests the directions of Romania Mechatronics industry through technological transfers can find "niches" that would ensure a competitive participation in international markets.

For the first time in the country will develop a benchmarking study that addresses economic agents and mechatronic profile that will result mainly raising their competitiveness

Also will introduce a new concept in the activities of of economic agents with profile mechatronic namely: commercialization the research results from institute.

Project manager: Dr.ing. Diana Mura Badea

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- “CE–MECATRON” - CENTRE FOR PROFESSIONAL COMPETENCES IN MECHATRONICS EVALUATION
- “CF–MECATRON” CENTRE FOR PROFESSIONAL TRAINING IN MECHATRONICS

“CE–MECATRON”- CENTRE FOR PROFESSIONAL COMPETENCES IN MECHATRONICS EVALUATION

[With National Authorization from CNFPA]

- ➔ Organizes evaluation for:
MECHATRONICS:
 - technician
 - engineer
- ➔ Ensures for the candidates the proper PROFESSIONAL COMPETENCES EVALUATION and the access to their Specific Resources.
- ➔ Issues CERTIFICATES/ DIPLOMAS recognised nationally
 - TARGET GROUP: any person of minimum 18 years of age, with experience in the field
 - REQUIREMENTS FOR THE TARGET GROUP REPRESENTATIVES: graduates from high school with / without high school diploma and / or vocational school graduation diploma

“CF–MECATRON” - CENTRE FOR PROFESSIONAL TRAINING IN MECHATRONICS

[With National Authorization from CNFPA with the following series: BNR-0004768]

- ➔ Organizes training for:
MECHATRONICS:
 - technician
 - engineer
 - ➔ Ensures for the candidates the proper PROFESSIONAL TRAINING and the access to their Specific Resources
 - ➔ The PROFESSIONAL TRAINING courses ensure:
 - ✓ Labour redistribution
 - ✓ Acquiring new skills for:
 - people seeking employment
 - persons employed in the entities and organizations
 - People interested in the labour market
 - ✓ Review of training programs in accordance with the law
 - ➔ The TRAINER course ensures:
 - ✓ Becoming TRAINER, for:
 - persons who have acquired skills of informal trainer (by self-study, at work,, from introductory or short courses) and want official certification
 - persons interested in obtaining the status of qualified Trainer
- Target group requirements: people with higher education or equivalent

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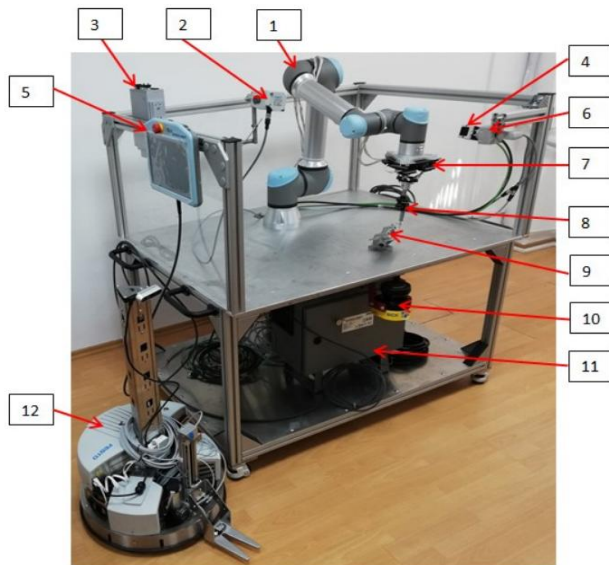
MINISTRY OF EDUCATION AND RESEARCH
NATIONAL INSTITUTE OF RESEARCH AND DEVELOPMENT IN
MECHATRONICS AND MEASUREMENT TECHNIQUE

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CYBER-MECHATRONICS
RESEARCH LABORATORY

“COBOTIC” TYPE SMART MULTI-APPLICATION ROBOTIC PLATFORM WITH REMOTE CONTROL AND ULTRA-ACCURATE MEASUREMENT CAPABILITY FOR DIGITAL INDUSTRY 4.0



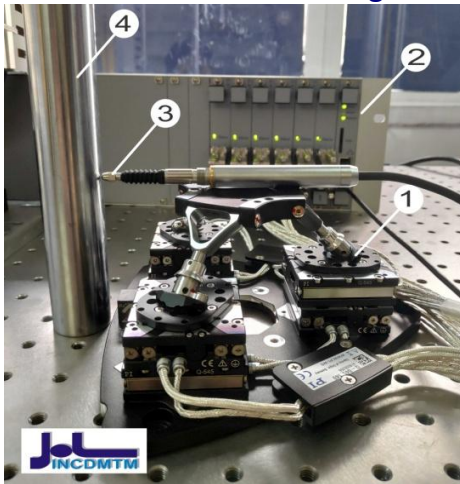
- (1) UR5e collaborative robot
- (2) Smart color sensor
- (3) Smart component identification video system
- (4) Smart camera
- (5) Touch-screen panel
- (6) Axis of rotation
- (7) High accuracy hexapodal robot
- (8) Ultra-precise probe
- (9) Measuring part
- (10) Security sensor
- (11) Electronic control controller
- (12) ROBOTINO mobile collaborative robotic system

OVERVIEW:

- The collaborative robotic platform integrates two robotic systems (1) and (7) ensures 11 degrees of mobility along with managing the positioning - with nanometric precision - of the final effector, respectively an ultra-precise probe transducer (8). The orientation of the probe throughout the general workspace is achieved with the positioning accuracy of the universal robot combined with the very high-resolution positioning (of the order of ± 7 mm) achieved by the hexapodal robotic subsystem (7).
- The smart multi-application platform type "Cobot" allows remote control of cyber mix-mechatronic platforms type "Cobot multi-application" by bidirectional data transmission and implementation of remote control, telemonitoring and teleservice functions through cyberspace - in the Remote Control and Teleservice Center - using specialized programming and visualization software.
- An autonomous mobile robot "Robotino" (12) - to which a smart forklift system is attached - performs various functions based on the reconfigurable software that manages the supply of parts (of the measuring stand or used in the smart control process).
- The smart measuring / control stand is a rigid table on which several functional subassemblies are positioned on two levels by means of clamping. The lower level is the robot controller (11) and the electrical and electronic circuit box. At the upper level is the Universal Robot (1) and also here is fixed the measuring part (9) or the part subjected to a smart control process. The upper level also restricts the effective working area of the robot.
- The smart component identification video system (3) allows the automatic identification of parts or bores as well as their indexing / counting.

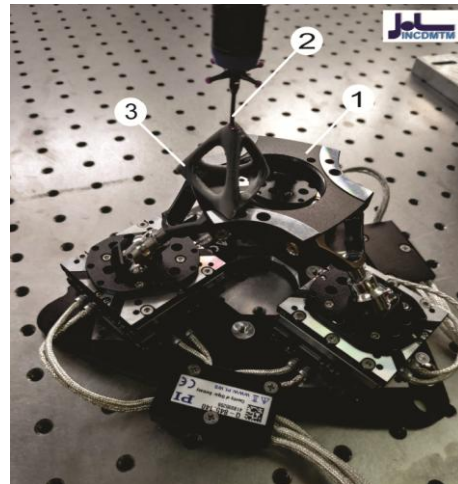
- The IP camera (4) allows remote viewing of the workspace with HD image quality, and it allows the automatic realization of smart video inspection and image capture functions.
- A (removable) display (5) is provided with a touch-screen with which it is possible to program and store the system variables of the collaborative robot (1). During automatic or remote-control work, various pieces of information on the status of the entire system, measurement results, etc. can be displayed on the screen.
- The measuring / controlled part is fixed on the rigid table stand (9). The “supply” of the system with parts / work objects is done, depending on the application, either automatically - with the robotic system endowed with Forklift “Robotino” - (12) or manually, by the human operator.
- The connection of the cobotic system with the higher level of command and communication (cyberspace) is made through the controller (11).

High accuracy hexapodal robot



Legend:

- 1-Movement platform with six degrees of freedom
- 2- Kinematic controller
- 3- Linear Transducer
- 4- Measured piece



Legend:

- 1-Movement platform with six degrees of freedom
- 2- Ultra-precise stylus 3D
- 3-Plastic prototype powder coating subjected to the ultra-precise measurement process

TECHNICAL FEATURES

The mixed-mechatronic cobotic system with serial-parallel structure for ultra-precise measurement and dimensional control used in the laboratory and the digitized industry 4.0 allows obtaining the following performances:

- fine, ultra-precise repeatability of the final effector: X, Y **7nm**, Z **20nm**;
- repeatability of the global positioning: 0.1mm;
- resolution of the axis of rotation of the final effector: $\theta_X, \theta_Y, \theta_Z$ **0.9 μ rad**;
- fine repeatability, ultra-precise at the rotation of the final effector: $\theta_X \pm 20 \mu$ rad;
- fine repeatability, ultra-precise at the rotation of the final effector: $\theta_Y \pm 10 \mu$ rad;

- fine repeatability, ultra-precise at the rotation of the final effector: $\Theta Z \pm 6 \mu\text{rad}$;
- effective global workspace radius: 500mm;
- working space for ultra-precise fine displacement: X, Y $\pm 7\text{mm}$;
- working space for ultra-precise fine movement: Z $\pm 5\text{mm}$;
- temperature of the working environment: $0 \div 50^\circ\text{C}$;
- power consumption: **150W**;
- Collaborative functions: **15 advanced safety functions** approved by TÜV NORD and tested according to standard **EN ISO 13849: 2008 PL d**;

APPLICABILITY:

The cobotic platform can be used by public and private smart production companies in the field of high-tech Research Laboratories in Institutes and Universities.

TECHNOLOGY TRANSFER: Center of Excellence in Cyber Mix-Mechatronics

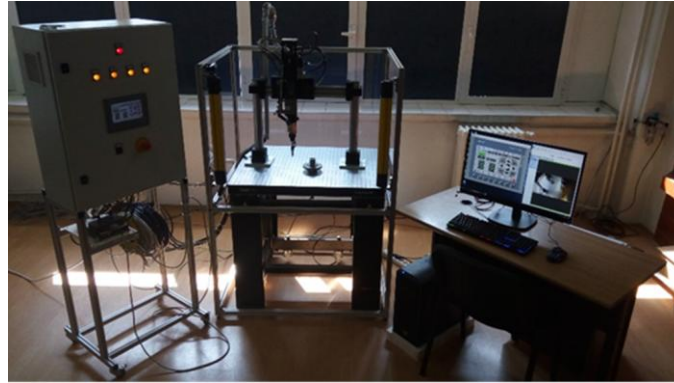
BENEFICIARY:

- Innovative SMEs in the field of micro and nanotechnology
- Institutions / centers of research, development, innovation in the Cyber Mix-Mechatronic fields;

FURTHER INFORMATION: Professor PhD.EurEng Gh. Ion GHEORGHE

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EXPERIMENTAL MODEL OF MECHATRONIC AND ADAPTRONIC AND CYBER-MECHATRONIC AND CYBER-ADAPTRONIC SYSTEM



OVERVIEW:

Within the framework of the Project PN 16210201 "Research on the Design and Making of Virtual and Physical Mechatronic and Adaptronic and Cyber-Mechatronic and Cyber-Adaptronic Models for Laboratory and Industry Work" we have developed an Experimental Model with the following technical features:

- horizontal X axis: made in a structure defined by the nominal stroke (measuring range) of 200 mm and the gauge of the axis of 510 mm, the nominal force of 205 N (and the maximum permissible force of 500 N), 1 linear motor, 1 absolute encoded with high precision and repeatability, 1 controller;
- horizontal Y axis: made in a structure defined by the nominal stroke (measuring range) of 100 mm and the gauge of the axis of 310 mm, the nominal force of 120 N (and the maximum permissible force of 250 N), 1 linear motor, 1 absolute encoded with high precision and repeatability, 1 controller;
- horizontal Z axis: made in a structure defined by the nominal stroke (measuring range) of 100 mm and the gauge of the axis of 100 mm, by the (maximum) nominal force of 115N, 1 linear motor, 1 break, 1 absolute encoded with high precision and repeatability, 1 controller;
- rotating electric axis ϕ with 1 controller, made in a structure defined by: torque: 0.4 / 1.2 (Nm); maximum rotation speed: 600 (1/min.); moment of inertia: 500 (Kgmm²); repeatability accuracy: 0,01 (°); operating pressure: 6 (bar); mass: 1.2 (Kg); temperature: 10/40 (° C); circuit voltage: 530 (V); Current: 1 (A); electronic control: external; encoder system: absolute encoder.
 - "micro gripper" subassembly,
 - "smart (ultraprecise) 3D probe" subassembly.

APPLICABILITY: automotive industry, electronic and mechatronic industry, aerospace industry and so on.

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**ACCREDITED TESTING
LABORATORIES**

LENGTH TESTING LABORATORY – LIL

OVERVIEW:

The **Length Testing Laboratory** is a laboratory accredited by RENAR according to SR EN ISO/CEI 17025:2005 (accreditation certificate no. LI 783) for the following tests:

- Dimensional and shape errors determination of the limitative plain cylindrical gauges;
- Callipers indication errors determination;
- Micrometers indication errors determination;
- Analogical and digital dial gauges indication errors determination;
- Pneumatic comparators indication errors determination;
- Linear and angular, shape and position dimensional errors determination;
- Vickers hardness test

For these tests, the Length Testing Laboratory uses performing measurement equipments:

TECHNICAL FEATURES:



Machine to measure in 3 coordinates MH-3D TESA – Switzerland MICRO-HITE 350

Technical features:

- Accuracy: $(0,002+3L/1000)$ mm
- measurement range: 350 mm
- rezolution: 0,001 mm.

Applications:

Determination of linear and angular dimension deviations, deviations of shape and position

Calibrated comparators and transducers OPTIMAR 100 MAHR Germany

- Accuracy: $(0,2+L/100)$ μm ,
L = measuring length (mm)
- measurement range: 100 mm
- rezolution: 0,02 μm

Applications:

Dial gauges and inductive probes calibration





3D measuring machine with CNC, type LEITZ-REFERENCE 600

Technical features:

- Accuracy: $0,9 + L/350 \mu\text{m}$,
L = measuring length (mm)
- Measurement range X/Y/Z: 1000/700/560 mm
- Resolution: $0.05 \mu\text{m}$

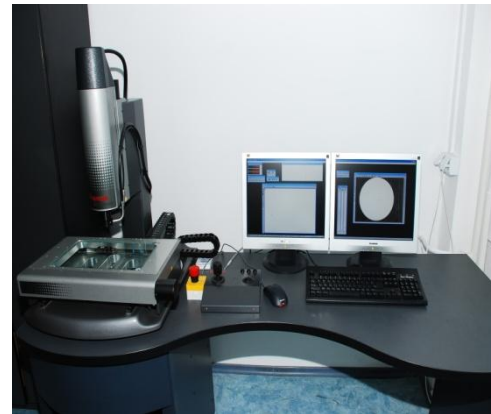
Applications: linear and angular measurements, geometrical tolerances control

Universal measuring microscope with digital display, type STARRETT GALILEO QC-5000

Technical features:

- Accuracy: X,Y : $(1.9 + 5L/1000) \mu\text{m}$;
Z: $(2.5 + 5L/1000) \mu\text{m}$; L = measuring length (mm)
- Measurement range: X/Y/Z: 300 / 150 / 140 mm
- Resolution: $0.1 \mu\text{m}$
- CNC system and VISIO unit

Applications: linear and angular measurements, surfaces positional tolerances control



CNC surface and contour tester RONCORDER EC 2500-KOSAKA

Technical features:

- Rotational accuracy:
 $0,02 \mu\text{m} + 0.0003 \mu\text{m}/\text{mm}$
- Rotary table with automatic centring and tilting
- Resolution: $0.001 \mu\text{m}$

Applications: control of surfaces form





CNC surface roughness tester IND 120-Taylor Hobson

Technical features:

- Resolution (Z):16nm/1mm;
3 nm/0.2 mm;
- Accuracy X, Z: 0.5 μ m

Applications: measurements of surface roughness and contour

Universal Length Measuring Machine DMS –680

Technical features:

Resolution: 0.1 μ m
Accuracy: 0.5 μ m
Measurement range: absolute 100mm;
differential: 680 mm

Applications: dimensional and shape errors determination of the limitative plain cylindrical gauges, micrometers and dial gauges indication errors determination.



MEASUREMENT AND CALIBRATION LASER INTERFEROMETER SYSTEM RENISHAW XL- 80



Technical features:

Linear measurement:

- Resolution: 0.001 μm
- Accuracy : 0.5 ppm
- Linear measurement range: 0-80 m

Flatness:

- Resolution: 0.01 μm
- Accuracy: 0.6% of calculated flatness
- Flatness measurement range: 1.5 mm

Angular measurement:

- Resolution: 0.1 $\mu\text{m}/\text{m}$ (0.01 arc sec.)
- Accuracy: 0.2% of calculated angle
- Angular measurement range: 10

Straightness:

- Resolution: Short range: 0.01 μm ;
Long range: 0.1 μm
- Accuracy:
Short range: 0.5% of displayed value
Long range: 2.5% of displayed value
- Straightness measurement range: 2.5 mm

Squareness:

- Resolution: 0,01 $\mu\text{m}/\text{m}$
- Accuracy: 0.5% of displayed value
- Measurement range: 3/M mm/m, M= measurement distance in meters of the longest axis

Applications: 3D measuring machines and length measuring machines calibration, high level direct measurements

OPTIMAR 100 Test Instrument

Technical features:

- Resolution: 0.02 μm
- Accuracy: 0.2 + L/100 μm ; L = measuring length (mm)
- Measurement range: 100 mm

Applications: dial gauges and inductive probes calibration





Height Gauge MICRO-HITE 350

Technical features:

- Resolution: 1 μm
- Accuracy: 2 +3 L/1000 μm
- Measurement range: 350 mm

Applications:dimensional errors determination for terminal sizes, height and length calibers and standards



Hardness Tester 251VRS-AFFRI

Technical features:

- Resolution: 0.1 HV-HB-HR
- Digital display
- Automatic conversion different scales: Rockwell, Brinell, Vickers

Applications:Rockwell, Brinell, Vickers hardness measurement

CAPITALIZATION AND TECHNOLOGICAL TRANSFER:

- Measurements within some research projects or on contract basis with beneficiaries from the automotive industry, aeronautics, etc.

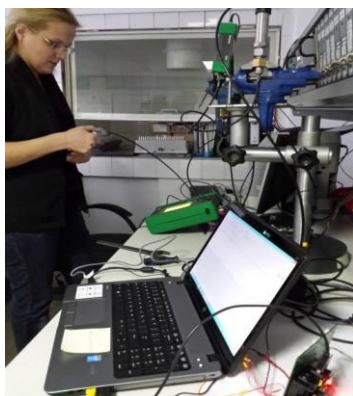
BENEFICIARIES:

- SC Autochassis International
- SC Automobile Dacia
- SC Renault Mecanique Roumanie
- Research institutes and universities laboratories
- SC Gruppo Italiano Imballage SRL
- SC Plastic Legno Romania SRL

FURTHER INFORMATION:

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PRESSURES TEMPERATURES CALIBRATION LABORATORY LE-PRESSURES



OVERVIEW:

Calibration laboratory - LE 009 operates under the legal responsibility of INCDMTM- Bucharest, organized as a National Research & Development Institute, internationally accredited with «A+». As part of INCDMTM - Bucharest, LE was founded in 1990 as a "Testing Laboratory, in the field of testing and metrological metering of pressure, temperature, becoming in 2012 the «Pressures, Temperatures» Calibration Laboratory. The field of activity of the Calibration Laboratory – LE is relative pressure measurement of fluids and gases.

TECHNICAL AND FUNCTIONAL CHARACTERISTICS:

Objectives:

- Calibration Laboratory - LE is responsible for maintaining traceability standards of equipment by regular calibrations relative to standards of other national and international institutes on metrology: INM- Bucharest and / or FINAS. Accredited by ilac-MRA;
- Management, maintenance, development, preservation, conservation and maintenance of standards and of the measuring endowment of the laboratory;
- Participation in interlaboratory comparison schemes with the purpose of maintaining the measurement capability of the laboratory;
- Maintaining and continuous improvement of the Quality Management System in laboratory.

Principles of Calibration Laboratory - LE:

- Independence – the staff of the laboratory is not subject to any internal or external pressure in terms of taking decisions on calibrations results;
- Trust – technical competence, growth of the competitiveness of the personnel, integrity of the laboratory is only few targets for winning and maintaining trust;
- Privacy – application of policies and procedures in accordance with the Quality Management System implemented within the laboratory, which ensures protection of information and property rights of clients;
- Responsibility – awareness of the personnel on the importance calibration activity and insurance of a qualities the best of these services;

- Quality - development, implementation, maintenance and improving of the effectiveness of the quality system.

APPLICABILITY AREAS :

Calibration Laboratory - LE in the field of pressure measurements is Accredited by RENAR with the Accreditation Certificate No: LE-009 of 05.02.2013, in accordance with EN ISO / IEC 17025: 2005 and is competent to perform calibration activities in accordance with the Annexes to the certificate, updated on 02/02/2017 by RENAR through the Accreditation certificate no. 009 / LE. Measurement capabilities: Calibration Laboratory - LE can perform calibrations permanently, at the premises, according to the Accreditation certificate No: 009 / LE from 02/02/2017

CAPITALIZATION AND TECHNOLOGY TRANSFER:

Calibration Laboratory - LE provides services in the following measurement intervals accredited for the measured size - relative pressure:

1. Transducers and Pressure transmission with voltage or current output;
2. Manometers, vacuum gage and vacuum metre with indication analogue or Digital.

The staff in the calibration laboratory - LE deals with the execution of calibrations and will not, under any circumstances, perform specific serve activities to the devices handed over for performing calibration.

The equipment in the laboratory are operated by the management personnel and by the technical personnel with high expertise. The instructions for use and maintenance of equipment (including user manuals of the manufacturer) are available in the laboratory for use by the staff of the laboratory.

The calibration certificates issued by calibration Laboratory – LE are according to EN ISO / IEC 17025: 2005 and meet all applicable standards and requirements of the Accreditation Association RENAR.

In the calibration process are used updated documents such as:

- RENAR policies;
- EA Documents - European Co-operation for Accreditation;
- EURAMET Documents - European Association of National Metrology Institute;
- ISO Documents - International Organization for Standardization;
- Documents according to the Quality Management System implemented by the Laboratory.

BENEFICIARIES: Calibration Laboratory – LE are oriented to all the beneficiaries in Romania and abroad who have the means to measure the pressure

FURTHER INFORMATIONS: Eng. Valentina Bajenaru, PhD , E-mail: incdmtm@incdmtm.ro / valibajenaru@yahoo.com



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**RESEARCH-INNOVATION
LABORATORIES**

OPERATING UNDER INTELIGENT MEASUREMENT MECHATRONICS COMPARTMENT

LABORATORY OF INTEGRATED CONTROL MECHATRONIC SYSTEMS

ACTIVITY FIELD

Founded together with the Institute, this compartment has carried out thousands of research and development works for our major beneficiaries consisting in a wide range of products, from the simplest of them (gauges, mechanical devices, pneumatic buffers and rings and so on) to the most complex of them (tightness checking machines, tappet selecting machine, machine for pressing spindle to the tappet lever etc.).

The laboratory benefits from the modern calculus technique and specialized design software tools. The specialists of the laboratory have participated and participate continuously to the rising of the level of training by attending training courses.

We are a leading supplier of plants, machinery, equipment and unique devices for controlling the auto parts for Dacia Groupe Renault cars.

By capitalizing the results of research together with the other laboratories of the Institute (Laboratories MMI4, MMI3 and MMI2) and in collaboration with renowned companies (Festo, ATEQ, Siemens, Bosch, Parker, Mitutoyo, Mahr, Tesa, Tox-Pressotechknic etc.) we managed the development of both domestically and internationally competitive works.

Some of our achievements were exhibited in national and international Exhibitions and awarded various prizes and recognitions.

Sphere of activity:

- 1) Research projects under national and international programs
- 2) On demand design:
 - √ Mechanical and electronic dimensional control devices
 - √ Machines, equipment and computing devices for dimensional control
 - √ Installations, equipment, pneumatic parts for dimensional control
 - √ Machines and equipment for checking tightness
 - √ Machines, installations and mounting devices
 - √ T-NT gages
- 3) Technical Studies
- 4) Control Technologies

PRECISION MEASUREMENTS AND SMART CONTROL LABORATORY

ACTIVITY FIELD

In accordance with the provisions contained in the Science and Technology thematic areas (according to FP7) in the Draft of the Decision of the European Commission on FP7 - EC COM (2005) 119 final:

1. Activities of applied research and precompetitive development, dissemination, technology transfer and capitalization of research findings
 - 3.1.3 Embedded systems, computing and control
 - 3.1.4 Software, network security and interdependence
 - 3.2.4 Smart infrastructures following the development of infrastructures that are more efficient, more robust in everyday use and resistant to failure
 - Mobility 3.3.1: intelligent transportation systems and vehicles; safe, comfortable and efficient transportation of people and goods
 - 3.3.3 Fabrication: rapid and adaptive design; production and delivery of goods with high adaptation to customer requirements; digital and virtual production; modelling, simulation, presentation, miniaturized and integrated products
 - 4.3 New productions
 - 4.4 Integration of technologies for industrial applications integrating new knowledge and technologies, nanomaterials and production processes and cross-sectoral applications
 - 6.1 Environment and health
 - 7.2 safety and security in transport

PRODUCTS:

- Control equipment for deviations of form and position
- Equipment for controlling gears
- Equipment for active control
- Roughness control devices
- Profile projectors
- Instruments for measuring profiles
- Machine for tool presetting
- Instruments and equipment for inspection of auto-mechanical, electronized / informatized parts:
 - √ complex installations for torque control, pressure and crankshaft clearance
 - √ computing systems with axle gearbox control
 - √ installation for collector verification
 - √ control equipment for pinion blows to the gearbox
 - √ noise control equipment
 - √ control for fork devices
 - √ disc brake control devices
 - √ hub control device
- Machinery and devices for threads control
- Devices for automatic measurement and sorting.

COMPLEX SYSTEMS AND AUTOMATION CONTROL LABORATORY

ACTIVITY FIELD

1. Basic and applied research activities on:

► Measurement and dimensional control systems:

- Equipment for measuring non-contact probes using optical, laser and ultrasound tools
- 3D measuring techniques and systems
- Automatic movement and spatial positioning for measuring complex profiles
- Miniaturized probing systems
- Equipment for laser flow control

► Automatic control and command systems:

- Specific control systems for image acquisition in precision mechanics, electronics, medicine, biology and biotechnology
- Metallographic determination system for materials' microstructure
- Computerized analysis systems of the *in vitro* development vegetal hybrids
- "Embedded" systems for on demand themes
- Error prevention techniques and systems for complex fabrication processes

2. Activities of design, commissioning, technical assistance, consulting for the automotive industry:

- Dynamic cabinets for assisting operators on assembly lines
- Automation systems for assembly and control posts

PRODUCTS:

- Portable devices for determining electrical charges of surfaces
- Portable devices for barcode acquisitions
- Dynamic cabinet systems for rapid identification of marks
- On demand Automation Systems with proprietary PLC, or PLC developed by: Siemens, Moeller, Schneider
- Control systems for stepper motors
- Electronic systems equipped with Atmel microcontrollers
- Small portal Coordinate Measuring Machines
- Laser equipment and computer system for the certification of final measures
- Equipment for computer analysis using video-electronical feeling
- Discrete feelers with switches, optical feelers
- Electronic rotary tables, dividing heads with digital display and interface for PC
- Dividing heads with transducer, digital display and interface for PC.

ENVIRONMENTAL ENGINEERING SYSTEMS AND RENEWABLE ENERGY LABORATORY

In this laboratory, we have developed several innovative systems:

System of diagnostics passenger wagons: The diagnosis system is a computerized system, redundant, aiming to detect a defect, the place where it occurs, the way it can be eliminated and how to memorize the event.

Organic airtight vacuum toilets for passenger cars – Ecotoaleta: The vacuum toilet system is a compact, automated, low water consumption and based on an electro-pneumatic system, which meets the requirements in passenger trains using European standards on hygiene and environmental protection.

System of specific investigations on tough composite materials: The system on investigation of hard metal powders is made for physical measurements of particulates, which directly influences the quality of finished products obtained by sintering.

Alcohol meter: The alcohol meter is a device for determining alcohol production and is part of the flow meter drum category that makes direct measurement of fluid flow and discontinuity.

Flow meter with digital display for stands for testing hydraulic pumps: The meter uses a variable time base and a turbine flow transducer, which allows the use of six variants depending on the measuring range.

Thermal mass flow meter: Thermal mass flow meter measures the flow of industrial gases based on the principle of hot wire anemometry.

V-Cone Flow Meter for industrial liquids: The device is part of flowmeters with constant section measuring, no moving parts, which measure the indirect flow of industrial liquids.

Transmission system unit based on GPS signal - MASTER CLOCK: The master clock displays the universal time information (hour, minute, second) or date (day, month, year) and allows local time to be compared to the Universal Time (Greenwich).

Litermeter: The Litermeter is a system of measuring the fuel consumption of trucks and buses equipped with diesel engines.

Command and control system of heat treatment furnaces: The product is a system of command and control program with temperatures in small capacity electric furnaces for heat treatment laboratories.

Portable tachometer: The tachometer is an opto-electronic device with non-contact measurement whose operating principle is generating a light spot projected on the direction of a reflector (brand) mounted on the rotating part.

Transmitter for measurement and control: The transmitter is a unified signal device based on galvanic separation, dedicated for measurement and control appliances from domestic production in order to increase automation of measurement processes.

Simple door intercom for passenger wagons: Simple doors and intercommunication doors are electro-pneumatic systems that drive the doors of the cars of passenger wagons.

SMART TERMOTECHNICAL MEASUREMENTS LABORATORY

Field of activity:

- research on systems, equipment, methods and technologies in the field of measurement pressures, temperatures and level;
- advanced research and applied research permanently connected to requirements of the Internal Market and European and international trends in the field;
- development and integrated approach for making use of sustainable directions of new research and related activities in the field of water resources;
- analysis and synthesis of the factors having effect on the competitiveness, effectiveness and performance, and superiority of SMEs on their competition market;
- developing strategies aimed at improving output performance, increasing efficiency, providing a high quality of service based on benchmarking;
- studies, analyses and forecasts;
- performing research and developing applied innovation technologies, that has both a technical / economic viable point of view as well as an environmentally friendly one;
- organizing, supervising and performing demonstrative projects and pilot projects to promote the above technologies;
- implementing research results into commercial projects in the private sector and those of local authorities, professional associations, etc.;
- offering services and technical consulting in the form of specialized know-how and information for third parties;
- experiments, testing equipment and systems in the field;
- offering advice in the areas of pressure, temperature, level and in the national policy, strategy and planning of these fields;
- disseminating the results of research in the field of expertise and offering viable information meant for supporting the interested investors interested and organizations;
- organizing and / or participating in technical and scientific seminars, educational programmes, specialized training, meetings and so on;
- attracting and preparing of workforce using the newest technologies of simulations to educate technicians quickly, which would allow for practice in secure environments and would ensure reduction of errors;
- participating in scientific and technological clusters, competitiveness poles and excellence virtual knowledge platforms, eco-innovation platforms;
- participating and elaborating in research-development projects and in national or European programmes as a coordinator and / or a partner.

Research infrastructure

- **Autonomous modular system for monitoring atmospheric conditions** (Intell. IRS31 Road sensor; VS20-UMB Visibility sensor; UMB ISOCON converter; Schnehohensensor SHM30; Luftdrucksensor air press. P; UMB Analog transmitter; Netzteil / net adapter 24V / 4A Surge arrester; Überspannungsschutz VENTUS; Visibility calibration kit);

• Noise measurement system and accessories

(Source; Amp; Sonometer; Plate Tone Soft Dirac, Cable Sound triaxial lemo 3.5 mm jack connector 3m cable from your sound card type in 2239; cable connecting plate-amplifier Tripod for. Source; Tripod for. Sonometer; box for. transport and storage);

- TOSHIBA TLP-X-200 Projector;
- 3 / PD1 BEIRFELD Gauges;
- MMV Gauge type 250; (MMV compensated)
- BUDENBERG gauge; (70bar);
- M2200 Gauge with piston and heights, model: BL2H 1200, measuring range (1 ... 1200) bar;
- Pressure calibrator kit type PC6-0700-CH; + Sical Soft (SI pressure);
- Temperature calibrator with dry bulk (-50 + 150) °C with Kit Quartz accessories (GIUSANI);
- PTX 620 Pomp of vacuum / pressure; 1,6bar abs .;
- Tektronix oscilloscope;
- Pressure transmitter (0 ... 20) bar abs. D10 type, with EasyCom and EasyCut Light software and RS323 cable and serial-USB converter (with digital output);
- DPI TIP-800 Pressure calibrator (GE Druck);
- Set of 6 digital pressure gauges;
- Set of 7 pressure transducers;
- FLUKE 8846A Digital multimeter;
- 603 TLP source of DC (0-30 V; 0-5 A; 60-60 V; 0-3A);
- Power source 115, 230Vac, output: 2x24x10,3A, 1x12V10 A PS3010;
- Set of transducers for pressure and temperature, with display
- RML6 LAUDA liquid thermostat;
- Vacuum pump (KNF type ANDC 24V N 828);
- Thermohygrographic;
- Stopwatch;
- Data acquisition NI USB-6210, code 779675-01;
- Desktop PC, Laptop, Windows 7.10; Office; Professional SolidWorks 2015, SolidWorks; Simulation Professional 2015; AutoCAD LT 2006 Commercial, Labview PDS, En, Windows; printers; scanner.



Results

Analyses, studies, new products, methods, technologies, experimentation, systems, equipment and robots in the areas of laboratory, strategies, methods of applied benchmarking, IT applications, projects in the field of technology transfer, articles, papers presented at scientific events, organizing and participating in workshops, scientific events.

Projects

1. Advanced pneumatic systems for robotic actuating and other industrial applications based on the development of new types of proportional mechatronic servodistributors
2. Creating a benchmarking network aiming at using strategic benchmarking, performance and process benchmarking aiming to complement the economic reform, and to enhance commerce for small and medium enterprises / BENCHMARK
3. Development of IT platforms for characterizing the potential of the field of precision mechanics, mechatronics, automation, and optimization in order to increase competitiveness of specific activities - developing a collaborative environment / IPCPMMA
4. The use of smart grids for on-line monitoring of the quality of electrical networks
5. Compared analysis of law and financial institutions and instruments for the evaluation of transfer and exploitation of results
6. GRID-BENCHMARKING resource centre for analysis, evaluation, processing data, in order to increase competitiveness of organizations to achieve high performance / GRID - BENCHMARK
7. Smart autonomous mechatronic equipment for the disposal of deposits of snow on secondary driveways in the urban environment / UACUZ
8. Prospective study on the implementation of Benchmarking in Romania / ST BR
9. Development capacity to keep the transfer and commercialization of research results in institutes and research centres applied to the ROMANIA - implement a pilot model for specialized departments
10. Wide network of sensors for water use - WIDSENS. Technology transfer to SMEs - FP7 Program
11. NUCLEU Programme: Benchmarking study on the exploitation of research results of INCDMTM in the businesses of mechatronics
12. Technology transfer and assistance for the implementation of research findings in the area of replacement of CFC coolants with cooling ecological use of laser cutting machines
13. NUCLEU Programme: Study on intelligent systems for measuring thermo-technical parameters in residential buildings
14. NUCLEU Programme: Support-study for defining the national strategy in the production of mechatronics equipment for measurement, control, pressure and temperature control
15. NUCLEU Programme: System m of hall sensors measuring the fluid level
16. NUCLEU Programme: Methods and systems for high precision measurement and control of the level of technical fluids
17. Technological methods and procedures for the realization of sound absorbing and soundproof areas for protection of populated areas against the noise produced by trucks on highways
18. Autonomous modular system for monitoring of atmospheric conditions on inland road transport (temperature, barometric pressure, fog, ice, snow, wind, precipitations)

Services offered in the fields of activity

- fundamental research;
- research for gaining new knowledge and competences for developing new products, processes or services or for a significant improvement in existing products, process or services, development of laboratory prototypes;
- development of new or improved products, processes and services, defining, planning and conceptual documentation of new products, processes and services;
- prototyping, demonstration, creating pilot projects for testing and validation of new or improved products, processes or services in environments representative for real functioning conditions;
- transmission of information, experience and best practices, as well as cooperation for promoting innovation;
- implementation of a new or substantially improved in practice of the product, service or process;
- placing a new or substantially improved product or service in the economic cycle;
- dissemination of information, providing consultancy, transmission of knowledge acquisition of specific devices and equipment in order to introduce to the economic cycle the results of research, converted into commercial products and services;
- exploitation of research results.

Perspectives

- excellence research in order to obtain advanced scientific and technological results;
- integration in national and European / international networks;
- national and international research proposals financed from private and / or public funding;
- approach and development of other directions and advanced themes;
- realization of transfer technological of the results of research in the economic environment;
- development of the advanced field of increase of energy efficiency by smart management of the building;
- development of the advanced field of water resources;
- development of the high-tech field of interactive IT products for the protection of the environment and of non-conventional energies;
- development of the smart field of promoting renewable energy resources;
- strategy for the Danube region;
- Parametrized diagnosis, environmental parameters monitoring: water, air and soil;

FURTHER INFORMATIONS:

Eng. Dumitru VLAD, PhD, Phone +40212523068; e-mail: didivlad2006@yahoo.com

OPERATING UNDER BIOMEDICAL MECAHTRONICS AND ROBOTICS COMPARTMENT

BIOLAB LABORATORY

Overall objective

The overall objective of BIOLAB is the contribution to growth of economic competitiveness on the medium and long term by increasing the quality and efficiency of the activities of research - development of national institutes, which will ensure efficient services for units of public health by equipping with modern tools, rehabilitation software and the creation of new modern research laboratories.

BIOLAB will support the integration of research - development – innovation in INCDMTM Bucharest, in the field of biomechatronics, in an economic innovative, knowledge-based activity which is emerging in the Development Region of Bucharest-Ilfov and in the European research area (ERA).

Specific objectives

BIOLAB has the following specific objectives:

- ▶ increasing the capacity of research - development – innovation of INCDMTM Bucharest by developing the infrastructures and attracting young and highly qualified specialists;
- ▶ strengthening of knowledge supply and service of medical research done by the beneficiary - a research institute;
- ▶ stimulate technology transfer based on the cooperation between the institute and R&D companies;
- ▶ stimulation of innovation demand of enterprises;
- ▶ supporting training and development of high-tech companies.

BIOLAB Presentation

BIOLAB is located in the building of the National Institute of Research Development in Mechatronics and Measurement Technique (INCDMTM), at the 4th floor.

BIOLAB includes:

1. Software and hardware for 3D reconstruction of medical images and CT design.
2. Mechatronic equipment for advanced technologies of selective laser sintering.
3. High-tech equipment for testing and controlling of complex biomechatronic systems under stress in conditions similar to those “in vivo”.
4. Gait Analysis and Simulation System.

LABORATORY OF SMART SYSTEMS. DATA ACQUISITION AND ROBOTICS

Activity Field

The laboratory is focused on the research and development of aims to research and development of robotic systems with non-industrial applications: inspection robots, investigation robots, intervention robots, sampling robots, robotic systems with serial parallel or mixed kinematics, with virtual applications in medicine.

Another activity of MBR 2 is the building of LabVIEW applications in data acquisition from various sensors (temperature, humidity, acceleration, etc.), processing and interpretation.

Features

1. Specialized data acquisition equipment, including computer system, National Instruments 6035 data acquisition plate, LabVIEW 6i Base Package Software, with the following characteristics:

- 16 analogue inputs
- Sampling rate: 200 000 samples / sec.
- ADC resolution: 16 bits

2. Motion control equipment, which includes computer system, NI PCI-7356 motion control board, UMI-7774 and UMI-7772 motor control interfaces, LabVIEW Full Development System 8.2 software, with the following characteristics:

- 6-axis motion
- Each axis can be configured for step-by-step or servo command
- Windows XP
- Compatible software: Visual Basic, C, C ++
- Recommended software: LabVIEW
- Driver software (included): NI-Motion
- Interface for 4 axes

3. Calculation system + software for computer aided design - SolidWorks PREMIUM OFFICE 2008

4. Data Acquisition Plate "High - Performance Multifunction DAQ for USB M Series 16-Bit, 16 Analog Inputs - NI 6229", 2 pieces:

- Analog Inputs: 16
- Resolution: 16 bits
- Sampling rate: 250 000 samples / sec.
- Analog outputs: 4
- Analog outputs Resolution: 16 bits
- Sampling rate analogue outputs: 833 000 samples / sec.
- Category: ± 10 V
- Digital I / O: 48
- Operating system: Windows Vista, XP, 2000
- Recommended Software: LabVIEW

5. Control equipment for robotic system, including:

- Customer Platform with NI PXI power supply-1031
- Industrial Computer NI PXI - 8106
- Motion Controller NI PXI -7356 6-Axes, with the following characteristics:
 - 6-axis motion
 - Step-by-step or servo command configurable for each axis
 - Compatible software: LabVIEW, Visual Basic, C, C ++
 - PID cycle period: 62.5 to 500 ms / cycle
 - Servo control of output voltage: ± 10 V, 16-bit (0.000305 V / LSB)
 - Analogue outputs: resolution 8, 16-bit, ± 10 V DC
- Control interface UMI-7764, with the following characteristics:
 - Interface for 4 axes
 - Isolation of signals
 - 24 VI / O
- Professional Development System LabVIEW 8.6 software

MECHATRONIC EQUIPMENT FOR ADVANCED LASER SELECTIVE SINTERING TECHNOLOGIES



LABORATORY INVESTIGATION MICROSYSTEMS, BIOSENSORS AND BIOMATERIALS

Field of activity

The laboratory addresses a wide range of new medical devices designed to highlight the new clinical methods used by medical research facilities in the country.

The areas of competence of the laboratory are:

- Equipment for dental offices and technical dental laboratories;
- Equipment and instruments for implantology and dental reconstruction;
- Prosthetic elements for orthopaedics and traumatology;
- Tool kits for orthopaedic surgery;
- Devices for intensive therapy (infusiomates and injectiomates);
- Braces and spacers for general surgery;
- Tool kits for ophthalmologic surgery;
- Equipment and instruments for surgery laparoscopic;
- Laboratory devices;
- Devices for automatic distribution of drug solutions;
- Developing automatic equipment and imagistic devices doe radiographs embedded in low radiation radiological devices;
- Modernization of the radiology equipment existing in hospitals with the view to reducing the level of the radiation dose to that allowed by international regulations;
- Tensile tests for medical devices;
- Rehabilitation and service for medical devices (operation note no. 145/14.11.2003 issued by the ministry of health and family on the importation, storage, manufacturing, repair, verification and commissioning).

Some of the medical devices made commonly include:

- Cautery devices;
- Surgical instruments;
- Cable monitors, cautery monitors, etc.;
- Instruments for laparoscopic surgery;
- Control and auctioning elements for medical devices;
- Blood pressure measuring devices;
- Patient plates;
- Refurbishment of scissors, drills and tweezers;
- Needle support;
- Controlled infusion devices;
- Instruments for orthopaedics;
- Secretion vacuums;
- Driving pedals;
- EKG monitors.

RAPID PROTOTYPING LABORATORY



EOSINT 270 M Dual Mode Equipment

Presentation

The Rapid Prototyping Laboratory is unique in Romania. It is based on the technique "high-tech laser sintering for metal powder" that works on the principle of obtaining parts from sintered metal powders (local molten solidified materials) using a laser beam.

Complex geometries can be addressed by creating parts directly in 3D software of the installation -CAD systems, allowing their implementation by adding successive layers of powder (with a thickness of about 18 microns), which are then sintered.

This is a modeling process used in producing parts with high accuracy and high resolution and with good surface quality and mechanical properties similar to those obtained by applying conventional casting processes.

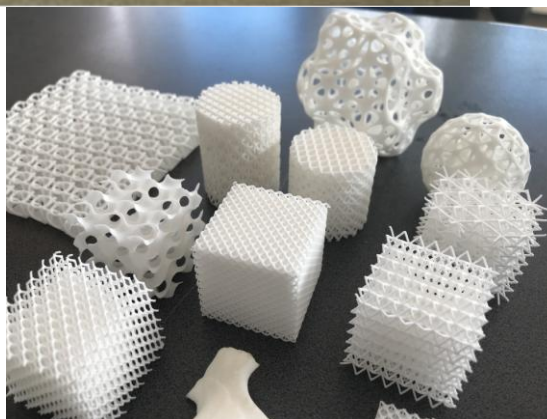
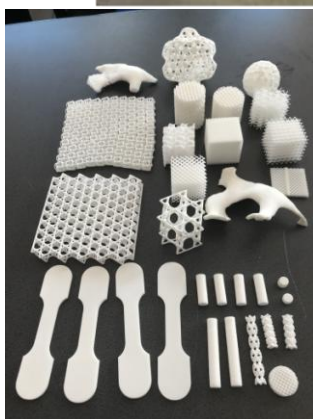
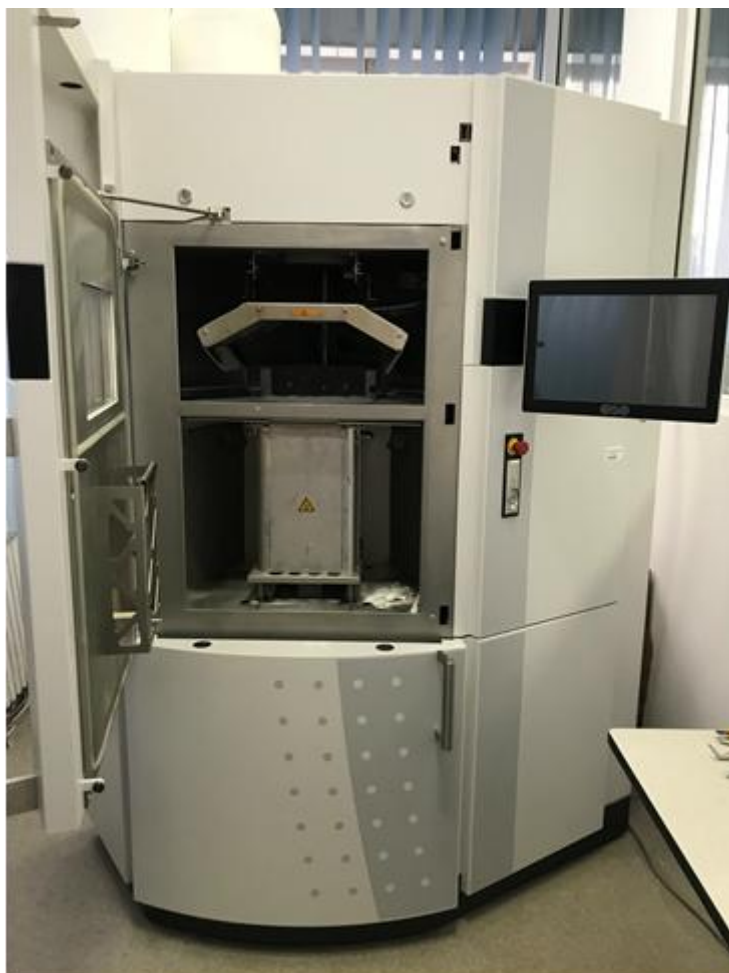
Services

- manufacturing of models and prototypes for implantable biomedical products;
- manufacturing of functional prototypes for the automotive and aerospace applications;
- making molds of high quality and durability.

LRP strategy

- Design, manufacture and testing of static and dynamic options of implants and other mechanical parts for the automotive and aeronautics applications;
- Execution of functional prototypes for the industry, along with molds, individual components, customized parts, biomedical and biocompatible implantable devices;
- Involvement in international strategies, under the EU and national scientific research areas, technological and innovation development through participation in partnership-based projects aimed at attracting structural funds.

EOS FORMIGA P110 Equipment for Processing Through Sintering of Plastics



OPERATING UNDER MECHATRONIC MICRO – AND NANO - TECHNOLOGIES COMPARTMENT

PROCESS MICRO AND NANOTECHNOLOGIES LABORATORY



Field of activity

- Engineering of systems and micro-systems of conventional and non-conventional processing: Analysis and diagnosis of process; Dedicated technological logistics developed in computerized systems / micro-systems for computerized processing, monitoring, management and transfer; Equipment/systems for checking and testing the process and the end of the technological process; Approaches to the processing, industrial applications, laser
- New materials: Research applications of composite materials with nano structures / micrometre; Research for processing technologies and use of new materials with special characteristics; Methods and equipment for investigation, characterization and processing new materials investigated;
- Nanotechnologies: Studies and analyses of evaluating the potential uptake of new research areas such as micro- and nano-dimensions and micro- and nano-structure; Forecasting immediate and future directions on the development of micro and nano-mechatronic systems, and especially micro- / nano-sensors and micro- / nano-actuators; Development of specific methods and procedures for characterization and evaluation.
- Forecast studies, strategies: Market studies; Sectoral development strategies; Forecasts on sector development.
- Studies / analyses of frictional systems: Analysis of specific tribo-systems for chipping and micro-chipping of metallic and non-metallic materials using hard and super hard composite structures; Study of the effects induced to the tribo-system by varying technological parameters according to categories of processes; Developing methods and testing procedures complementary to those practiced in the EU; Structural and operational characterization of wear-resistant coatings.



www.incdmtm.ro
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J40/1074/1997
C.I.F. RO 930

MINISTRY OF EDUCATION AND RESEARCH
NATIONAL INSTITUTE OF RESEARCH AND DEVELOPMENT IN
MECHATRONICS AND MEASUREMENT TECHNIQUE

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In the compartment, there is the Centre of Excellence called "Logistics and transfer for hard and super hard materials ", which operates as a network of scientific connections bringing together specialists from INCDMTM, institutions of higher learning, research institutes and private companies in the field of research.

The main strategic directions deriving from preliminary strategic directions include: The formation of a multidisciplinary extended core, with a higher potential of elaboration, promoting and developing sustainable projects that are also compatible with current requirements of internal and external market research; Development of a material base for research aligned to the scientific European and international requirements; Further development of associative activities, partnership with internal and external research entities, respectively, SMEs with innovative vocation and appetite for research and development.

CERTIM LABORATORY

Overall objective

CERTIM's overall objective is to contribute to increasing levels of economic competitiveness by increasing the quality and efficiency of activities of research – development in research institutes and SMEs will ensure efficient services for businesses by equipping with modern equipment, tools, software and the creation of new and modern research laboratories. CERTIM will support the integration of research, development and innovation of INCDMTM Bucharest for the smart laser-based measurement as an innovative economic activity, based on knowledge and intelligent techniques in the Region of Development Bucharest - Ilfov and in the European research area (ERA).

CERTIM has the following specific objectives:

- ▶ increasing the capacity of research - development – innovation of INCDMTM Bucharest by developing the infrastructures and attracting young and highly qualified specialists;
- ▶ strengthening of knowledge supply and service of medical research done by the beneficiary – a research institute;
- ▶ stimulate technology transfer based on the cooperation between the institute and R&D companies;
- ▶ stimulation of innovation demand of enterprises;
- ▶ supporting training and development of high-tech companies.

Scope of services:

- ▶ In metrological and industrial laboratories;
- ▶ In technical and technological manufacturing;
- ▶ In other specialized and related fields.

2015 Bucharest, Romania

CERTIM Overview

CERTIM is located in the building of the National Institute of Research Development in Mechatronics and Measurement Technique (INCDMTM) as a clean room space. CERTIM contains four operational laboratories:

- LABORATORY OF NANOMETROLOGY;
- LABORATORY OF COMPLEX MEASUREMENT AND POSITIONING;
- LABORATORY OF ULTRA-FAST LASER MEASUREMENT;
- LABORATORY FOR ADDITIVE PROCESSING AND PROMOTION.

Technical characteristics of the cleanroom:

Standard: ISO 14644 (USA- FS-209 D)

Class 10000 - ISO7

Useable Space: 59 m².

Environment conditions:

- humidity (%): 45 ± 10;
- relative pressure, Pa: 25 ± 5, between the clean room and outdoor;
- temperature ° C: 20 ± 1 OC
- speed air circulation; in accordance with the parameters of standard class clean room, but no

less than 0.25 m / s.

- noise level - 42dB ± 3dB.
- lighting: light boxes, in accordance with the parameters of standard class clean room (500 W)
- emergency lighting for escape autonomous systems (one hour of autonomy).





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PROFESSIONAL ASSOCIATION OF THE ROMANIAN PATRONATE OF PRECISION MECHANICS, OPTICS AND MECHATRONICS – APROMECA

OVERVIEW:

APROMECA is a professional association, a non-governmental, a-political and non-profit organization made up of registered juridical and authorized physical persons activating in the field of Precision Mechanics, Optics and Mechatronics. The association reunites over **30 affiliated members**: RDI national institutes/RDI institutes, SROMECA Association – The Romanian Mechatronics Society as well as economical agents/producers (SMEs).

- INCDMTM - Bucharest
- The National Institute for Research and Development in Electrical Engineering ICPE – CA
- THE RESEARCH INSTITUTE FOR HIDRAULICS AND PNEUMATICS INOE 2000 – IHP Bucharest
- THE ROMANIAN ECONOMICAL AND SOCIAL STUDIES – IRECSON – Bucharest
- UPB – RESEARCH AND DEVELOPMENT CENTER FOR MECHATRONICS – CCDM
- SC. PRO OPTICA SA Bucharest
- SC. OPTOELECTRONICA 2001 SA Bucharest
- SC. ITM – AMIRO SA Bucharest
- SC. ROMFLUID SA Bucharest
- SC. CARMESIN SA Bucharest
- SC. CONTOR GROUP SA Arad
- SC. BADOTHERM AMC SA Vaslui
- The Romanian Mechatronics Society – SROMECA
- SC. TEHNOROM Bucharest 1990 SRL
- C.I.T. Automations
- SC. QUATRO PROD COM SRL Bucharest
- SC. GENERAL FLUID SA Bucharest
- SC. HESPER SA Bucharest
- Etc .

APROMECA unfolds the following activities:

- industrial marketing;
 - information exchange and access on the evolution of the activity field at an international scale;
 - promotional activities;
 - Intercessions on the training of specialized experts ;
 - specialized Exhibitions and exhibitions both in Romania and outside the country;
 - European qualification actions, inclusively the harmonization of the Romanian legislation to the normative dispositions of the European Union;
 - representing the members in the social dialogue without affecting their independence; negotiating and enclosing the collective work contract in the branch, participating in other agreements with the public authorities and the syndicates, as well as participating in management and social dialogue;
 - forwarding to the proper Public Authorities in charge of proposals for laws;
- Accessing financing as subventions, donations, subscriptions, contributions, sponsorships.

APPLICABILITY:

Promoting research, development, innovation, marketing and knowledge dissemination activities in the field of mechatronics, advanced micro- and nano-processing micro-technologies in the field of mechatronics, micro-technologies.

TECHNOLOGICAL TRANSFER:

Capitalizing the applicative researches in the fields of precision mechanics, optics, mechatronics are found in the profile SMEs productions, as: technological and production systems, remote-control systems, bio-medical systems, slate and tools made of c.m.s, instrumental tools used in implanthology, cold, hot and branch-type meters, opto-electronic equipments for industrial applications, medical and military applications as well as micro-optical and nano-optical technologies.



Advanced micro-technology and equipment for micro- and nano-processings with laser beam by sintering - INCDMTM



Robotic module 3 DOF
UPB-CCDM Bucharest
robotic cu 3 DO



Cold and hot meters, of
branch-type Contour
Group Arad



Pressure differential transducers
INOE 2000 - IHP Bucharest



BENEFICIARY:

SMEs in the field of precision mechanics, optics, mechatronics, micro-optical and nano-optical measuring and control measuring technologies.



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**SCIENTIFIC
PRODUCTION
2020**

RESEARCH PROJECTS 2020

• NATIONAL/ INTERNATIONAL PROJECTS 2020			
Contract No.	Project name	Manager	Beneficiary
„NUCLEU”			
PN 16 21 01 01	The collaborative heterogeneous system of inspection and intervention in the disaster affected area	MARGARITescu Mihai	MCI
PN 16 21 01 02	Innovative solution for monitoring and testing soil and arable land using cyber-intelligent equipment to create the agricultural agricultural direction	ILIE Iulian	MCI
PN 16 21 01 03	Research regarding the development of integrated cells, flexible, with a high degree of adaptability, based on cyber-mechatronic principles, for transport, handling, inspection and control in the manufacture of components with high risk potential in the automotive industry, in the context of Industry 4.0	CIOBOATA Daniela	MCI
PN 16 21 01 04	Researches regarding the identification and implementation of modern and efficient solutions for ensuring the functional autonomy of the mechatronic equipment of measurement and control and their integration in the industrial and non-industrial cyber-space	SOREA Sorin	MCI
PN 16 21 02 01	Interdisciplinary research on the conception and realization of a multi-application intelligent robotic platform of type "COBOT" of ultra-precise telemetering and telecontrol for the Digitalized Industry (4.0)	GHEORGHE Gheorghe	MCI
PN 16 21 03 01	Researches regarding the realization of a non-contact calibration system of the special processes of production and control designed by eco-design	POPAN Gheorghe	MCI
PN 16 21 04 01	Complex researches for the realization, characterization and evaluation of the applicative capacity of the deposition of micro-nanostructured layers destined to the biocompatible components	BADITA Liliana	MCI
PN 16 21 05 01	Applications of cryogenics and ultrasound in medical recovery	BADEA Diana	MCI
SECTORAL PLAN PROGRAMME			
1PS	Technologies for carrying out agricultural works using ecological equipment	ZAPCIU AUREL	UPB
PROGRAMME: "PARTNERSHIP IN PRIORITY AREAS"			
5PFE	Institutional development of INCDMTM to increase capacity and performance to support excellence in	Gheorghe Gh.	MCI

	R & D and innovation in the short and medium term		
22 PCCDI	Autonomous Robotic Systems for Waste Management in the Smart City Context – SIRAMAND	Margaritescu Mihai	UEFISCDI
77 PCCDI	Implementing additive technologies in order to manufacture complex and overloaded components	Comsa Stanca	UEFISCDI
159 POC	Research Center for Intelligent Mechatronic Systems Used for Securing Objectives and Intervention -CERMISO	Popan George	MCI
85 POC	Knowledge Transfer Partnerships to Increase Competitiveness of the Automotive and Parts Industry and Enhance Traffic Safety – KTAutoComp	Cioboată Daniela	MCI
INTERREG PARTNERSHIPS			
307 POCA	Strengthening the institutional capacity of the Ministry of Research and Innovation through optimizing the decision-making processes in the field of R&D and innovation - SIPOCA 393	Gheorghe Gh.	MCI
323/340002 POC	Centru Suport pentru proiecte CDI internaționale în domeniul Mecatronică și Cyber-MixMecatronică”, cod SMIS 2014+ :108119	Gheorghe Gh.	MCI

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Conceptual model and proof of concept for a complex mechatronic system used In neuromuscular control treading, Cristian **Radu Badea**, **Paul-Nicolae Ancuța**, **Sergiu Dumitru**, **Anghel Constantin**, **Nicușor Nicolae**, Proceedings of the International Conference of Mechatronics and Cyber-MixMechatronics - 2020/ ICOMECYME 2020, Volume 143, p. 90-99, ISSN 2367-3370, ISBN 978-3-030-53972-6, Indexed **BDI Springer**

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Contributions concerning the influence of the running-in on the roughness of the Surfaces with plane contact of the friction couple, Virgil Florescu, Florin Liviu Isvoranu, C-tin Tiganesteanu, **Liliana-Laura Badita**, International Journal of Mechatronics and Applied Mechanics, no. 7, pp. 158-166 (2020), Indexed **BDI: Scopus, EBSCO, EiCompendex si Proquest**

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- Optimization (IJMO), vol. 10, No. 6, pp. 178-184, 2020, DOI: 10.7763/IJMO.2020.V10.767 Indexed **BDI**: ProQuest, Crossref, Google Scholar, EI (INSPEC, IET), EBSCO
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- Small power electric tractor performance during ploughing works, Mihai Gabriel Matache, Mario Cristea, Iuliana Gageanu, Aurel Zapciu, Emil Tudor, Eftalea Carpus, Lorena-Diana Popa, INMATEH - Agricultural Engineering, ISSN 2068 – 4215, pag.123-128, vol. 60 / no.1 / 2020, indexed **BDI**: Scopus.
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- Flat and flat valgus foot: A complex deformity especially affecting the protarsus and the medial mesotarsus, Gheorghe Burnei, Simona Lacrimioara Gavrilescu, **Cosmin Gabriel Lală**, Ionut Daniel Raducan, Cristian Burnei, Medical Research Archives vol 8 issue 6, June 2020, Indexed **BDI**: Crossref and Google Scholar.
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- Smart mechatronic systems for the development of Industry 4.0 in Romania, **Gheorghe Gheorghe**, International Journal of Mechatronics and Applied Mechanics, 2020, Issue 8, Vol. II, pp. 177-189, indexed **BDI**: Scopus, Ebsco, EiCompendex, Proquest

Challenges and conceptual framework to develop heavy-load manipulators for smart factories, Chi Hieu Le, Dang Thang Le, Daniel Arey, **Popan Gheorghe**, A.M Chu, X.B Duong, T.T. Nguyen, T.T Truong, Chander Prakash, Shi-Tian Zhao, Jamaluddin Mahmud, James Gao and M.S Packianather, Journal of Mechatronics and Applied Mechanics, 2020, Issue 8, Vol. II, pp. 209-216, indexed **BDI**: Scopus, Ebsco, EiCompendex, Proquest

Concepts and achievements of experimental models (cyber-mixmechatronics systems) for smart cobotic platforms in the smart industry (4.0), **Gheorghe Gheorghe**, Journal of Mechatronics and Applied Mechanics, 2020, Issue 8, Vol. II, pp. 233-242, indexed **BDI**: Scopus, Ebsco, EiCompendex, Proquest

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International Journal of Mechatronics and Applied Mechanics, 2020, Issue 8, CEFIN Publishing House, ISSN: 2559-4397, indexed **BDI**: Scopus, EBSCO, Proquest and EiCompendex.

GRANTED PATENTS - 2020

No.	INVENTION	INVENTOR
in the process of being real by Decision 6/116 from 30.09.2020	4D Mechatronic-Mixmecatronic control system in the laboratory and in industry	Gheorghe Gheorghe, Ilie Iulian, Anghel Constantin
in the process of being released by Decision 4/196 from 28.08.2020	Mechanical hygrostat with lamellar electrical contact	Codrut Darie, Florin Ontanu

Patent Applications filed in 2020

No.	OSIM No.	Patent Applications Title	INVENTOR
1.	A/00023/ 21.01.2020	Plant for measuring revolution surface with rotating probes	Stanciu Danut Iulian, Cioboata Doina Daniela, Abalaru Aurel, Logofatu Cristian, Soare Vasile Adrian
2.	A/00610// 28.09.2020	Cyber-mix-mechatronic Cobotic system with a parallel-serial structure for ultraprecise measuring and smart control used in laboratories and in the digital Industry 4.0	Gheorghe Gheorghe Anghel Constantin Ilie Iulian Alex. Constantinescu
3.	A /00725/ 11.11.2020	Femural component based on grid-like cellular structure made by selective laser syntering of biocompatible powders	Popa Nicoleta, Milodin Nichita, Tutoveanu Mihai, Artimon Flavia

European Patent Applications filed in 2020:

No.	OSIM No.	Patent Applications Title	INVENTOR
1.	EP20465535.1/ 12.06.2020	Device for real-time monitoring and active posture self-correction	Badea Cristian Radu



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**INTERNATIONAL
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PROTOCOLS**

Continuation in

• 2020 •

**1. Scientific Protocol signed with
“The International Centre of Mechatronics in
Linz – AUSTRIA” & INCDMTM Bucharest,
Romania**

**2. Scientific Protocol signed with
“Texas Institute of Science (TxIS) – USA” &
INCDMTM Bucharest, Romania**

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