

**MECHATRONICS AND MICRO-MECHATRONICS CONCEPTS FOR
INTELLIGENT SYSTEMS AND FOR ADVANCED ROBOTICS, WITH
APPLICATIONS FOR TECHNOLOGICAL AND MEASUREMENT
AND CONTROL PROCESSES**

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ABSTRACT

The paper presents new mechatronics concepts and solutions for intelligent equipments and for advanced robotics with applications of measurement and control in technological and metrological processes from various HIGH-TECH environments, for assuring quality levels of the industrial products, marks and technologies. Intelligent equipments and for advanced robotics, presented in the paper, identify mechatronics systems / micro-systems as parts of assemblies by experimental simulation and by behavioral determination that are based on signals measured and parameters of mathematical and physical models.

Structures and micro-structures of intelligent equipments and for advanced robotics are created based on the destination of the application that takes into account the type of the process or type of the mark/product, in terms of geometrical and precision characteristics, in terms of nature and properties of the materials used in terms of technological parameters and means of accessibility in process. Each intelligent equipments and for advanced robotics has determined conceptual and functional, the structure of the elements and mechatronics micro-systems, in terms of informatisation of the measurement and integrated control process and technological process, using new mechatronics structures with micro-movements functions, micro-positioning and automate micro-measurements, with syntheses, coordination, command, control and decision in expert system. In the paper are presented various types of intelligent equipments and of advanced robotics, for dynamic and static applications for measurement, checking and integrated control processes and for industrial and technological processes. In the paper are presented, the architecture of sensors/transducers in the value chain of mechatronics systems, electronic and informatics unit for information, control and diagnostic, micro-mechanics micro-systems, micro-systems of dynamic control for process supervising and software packages for measurement, integrated and decisional control.

Keywords: micro-mecatronic concepts; intelligent systems; advanced robotics; control and measurement process.

1. REGARDING INTEGRATION OF MECHATRONIC AND MICRO-MECHATRONIC CONCEPTS

Integration of mechatronic and micro-mechatronic concepts in intelligent equipments and advanced robotics develops their applications in measurement processes and metrological control and in performant technological processes for assuring and controlling quality level and especially precision level, at HIGH-TECH industrial products.

The general concept of intelligent equipments and advanced robotics, brings into the structure and functional chart, systems and sub-systems MEMS and MECHATRONIC/ MICROMECHATRONIC as main parts of ensembles, identified by experimental and behavioral structure simulation, functioning and maintenance and by results of measured signals and mathematical and physical models, but also through destination of applications which will take into account the process or product type from geometrical and precision characteristics, of nature and properties of the materials used, of technical and technological parameters and of process accessibility methods.

2. INTEGRATION OF INTELLIGENT EQUIPMENTS AND ADVANCED ROBOTICS

The intelligent equipments and advanced robotics, have been realized and implemented by the National Institute of Research and Development for Precision Mechanics, and also in some high-tech level companies (for example S.C. Automobile Renault-Dacia, Pitești).

An example of advanced robotics, is “**the concept of mecatronic micro-robot of measurement and dimensional integrated control with micro-detector with Laser fascicle**”, used in metrological measurement processes, in micro-technological processes from integrating industry of precision mechanics and mechatronics and showed in the following figure:

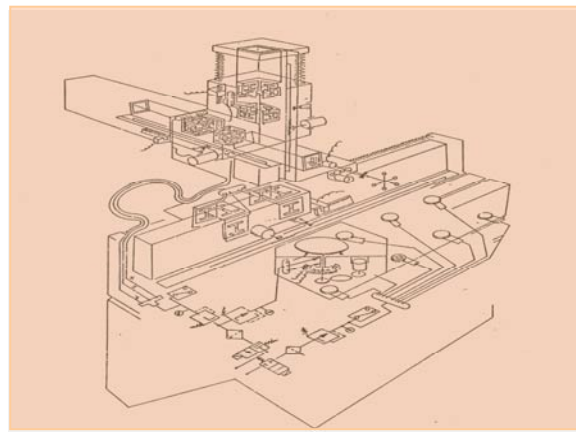


Figure 1. Equipment mechatronic micro-robot of measurement and dimensional control

The constructive mechatronic solutions of the equipment and means of sensors / transducers architecture integration are presented in the following figure:

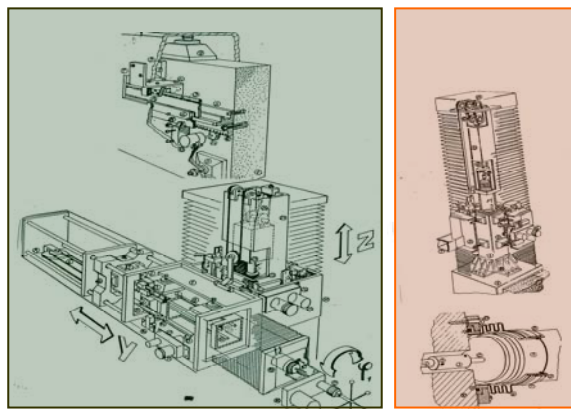


Figure 2. Constructive solutions and architecture integration for sensors / transducers and actuators – Mecatronic micro-robot equipment

Functional chart of mecatronic micro-robot of measurement and dimensional integrated control is showed in the following figure:

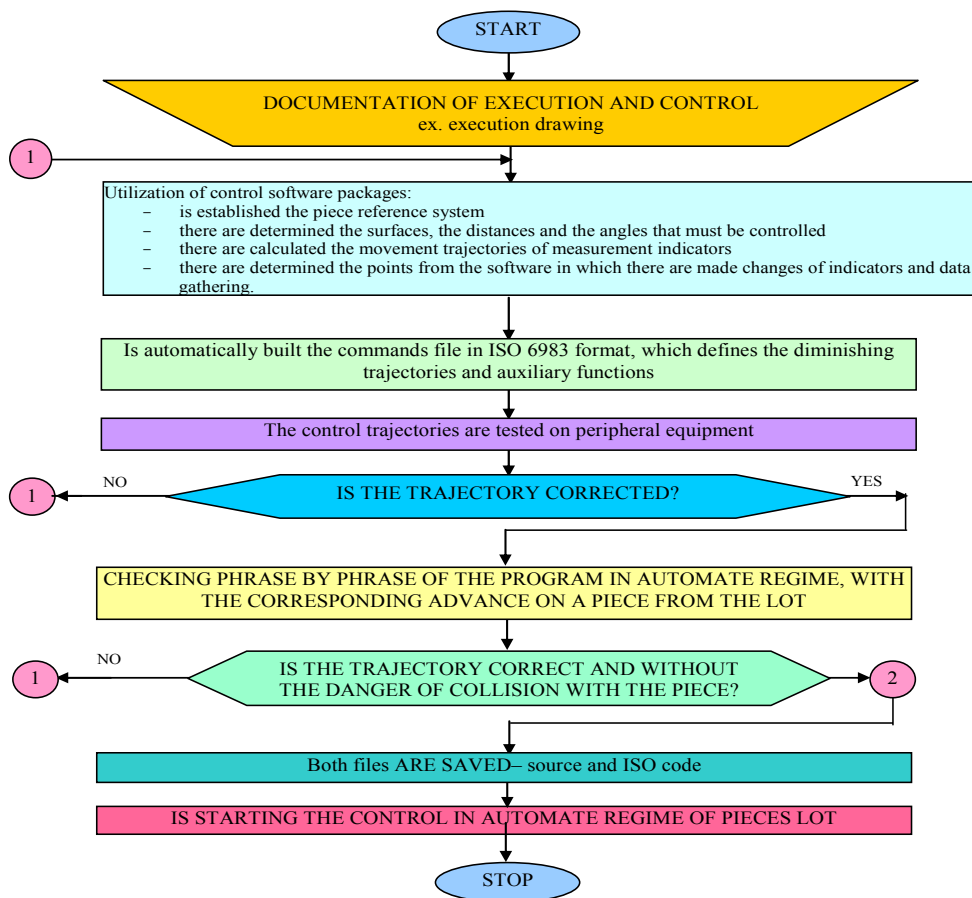


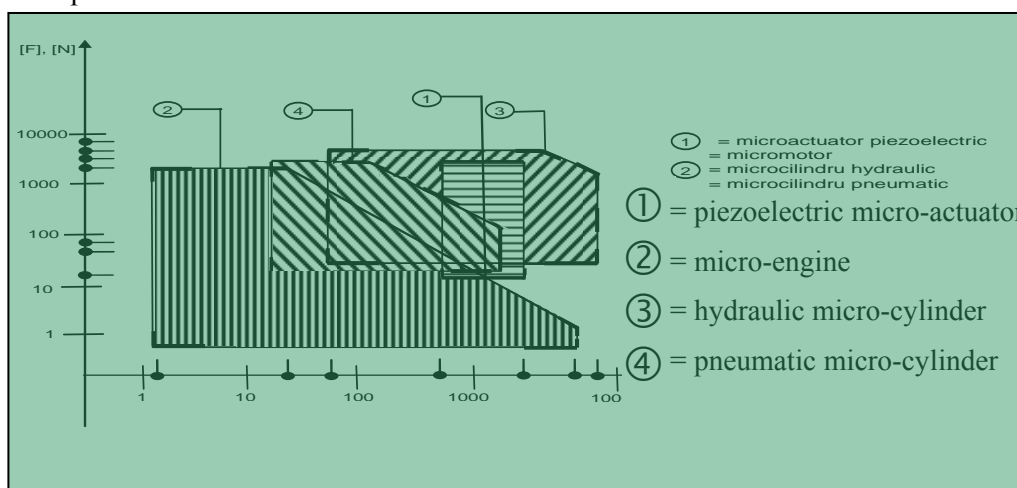
Figure 3. Functional chart of mecatronic micro-robot equipment

3. EXPERIMENTAL DATA AND RESULTS REGARDING INTELLIGENT EQUIPMENTS AND ADVANCED ROBOTICS

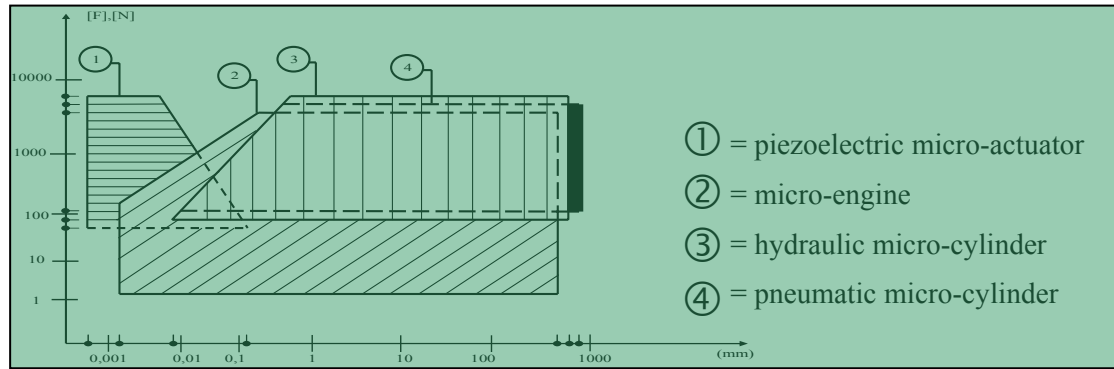
- Regarding applications and comparison areas of actuators / micro-actuators that can be used at intelligent equipments and advanced robotics

From the laboratory experimentations can be synthesize diagrams that realize comparisons between different actuators as: electrical micro-engines and step by step micro-engines, microelectromagnets, piezoelectric micro-actuators, pneumatic and hydraulic micro-cylinders etc.

So, in the following figure, there is synthesized the maximum speed of the micro-actuators and comparison speed-force:



So, in the following figure is synthesized positioning time for controlled response operating.



- **Regarding measurement of deviation from the roundness and/or from the surface micro-geometry**

In the following figure, there are presented the results of roundness measurement and from surface micro-geometry, by an intelligent equipment for converting circular displacement with Laser detector:

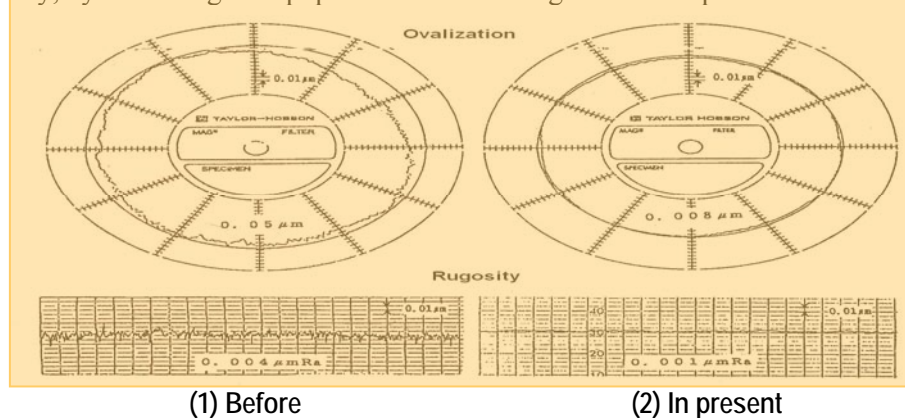


Figure 4. Measurement of roundness deviation and surface micro-geometry

4. CONCLUSIONS

In perspective, intelligent equipments technique and advanced robotics, develops **the methods and methodologies of safety and controlling high quality level** of industrial products and of technological manufacturing processes, contributing in this way to increasing competitiveness on national, European and international level.

5. REFERENCES

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