# THE INTEGRATION OF THE COMMUNICATION WITHIN MECHATRONIC SYSTEMS

**Alexandru CONSTANTINESCU [1,a, b] Gheorghe I. GHEORGHE [2, a, b,c]**

[a] National Institute of Research and Development in Mechatronics and Measurement Technique,
6-8 Pantelimon Road, 2nd district, Bucharest, Romania
[b] Doctoral School of Mechanical Engineering, Valahia University Targovişte,
Str. Lt. Stancu Ion, no.35, Targovişte, Romania
[c] Scientific PhD supervisor – Doctoral School of Mechanical Engineering, U.V.Târgovişte;
Associate Professor at U.T.M.Bucharest, U.P. Bucharest and U.V.Târgovişte;
Corresponding Member of the Academy of Technical Sciences of Romania
[1] ddnrmix@yahoo.com, [2]geocefin@yahoo.com, [2]geo@incdmtm.ro

***Abstract:*** *Communication between the various mechatronic systems is a way to transmit information from one device to another through standardized communication protocols. Standardized communication has enabled the development of mechatronic systems in various fields in the area of the quality control by interconnecting various equipment in the complex architectures dimensional control and measurement for different parts. Was made various mechatronic systems having architectures that combine various elements necessary for the control and measurement of the dimensions parts.*

***Keywords:*** *communication protocols, mechatronic, system*

## 1. INTRODUCTION

Information and communications technology is often used as an extended synonym for information technology, but is a more specific term that stresses the role of unified communications and the integration of telecommunications, computers as well as necessary enterprise software, middleware, storage, and audio-visual systems, which enable users to access, store, transmit, and manipulate information. [1]

In mechatronic systems there are various devices (sensors, actuators, and others) that are integrated and must ensure their interconnection, which is achieved trough a central processing element. Interconnection of various equipment within the mechatronic architecture can be achieved through communication protocols that are equipped devices to pass information from one device to another.

The information exchanged between devices—through a network, or other media—is governed by rules and conventions that can be set out in technical specifications called communication protocol standards. [2] In telecommunications, a communications protocol is a system of digital rules for data exchange within or between computers. [2] Communicating systems use well-defined formats for exchanging messages. a protocol must define the syntax, semantics, and synchronization of communication; the specified behavior is typically independent of how it is to be implemented. [2] Protocols specify the rules for governing the transmission.

For the data transmission must be taken into account the following characteristics of communication:

- data formats for data exchange;
- address formats for data exchange;
- address mapping;
- routing;
- detection of transmission errors;
- acknowledgements;
- loss of information - timeouts and retries;
- direction of information flow;
- sequence control;
- flow control.

The communication system consists of a set of individual devices connected together to form a whole.

The structure of a communication system is an assembly of interdependent relationships (master and slave) which connects the system elements.

## 2. THE COMMUNICATION WITHIN MECHATRONIC SYSTEMS

The system architecture represent the conceptual model that defines the structure, behavior and connects the embedded devices. [3]

In the mechatronic architecture are used different systems beetwen are established connections wich specify how these communicate and works together.

In the figure 1 is presented the general scheme of the architectures used in the control systems with the connections between the components. [4]

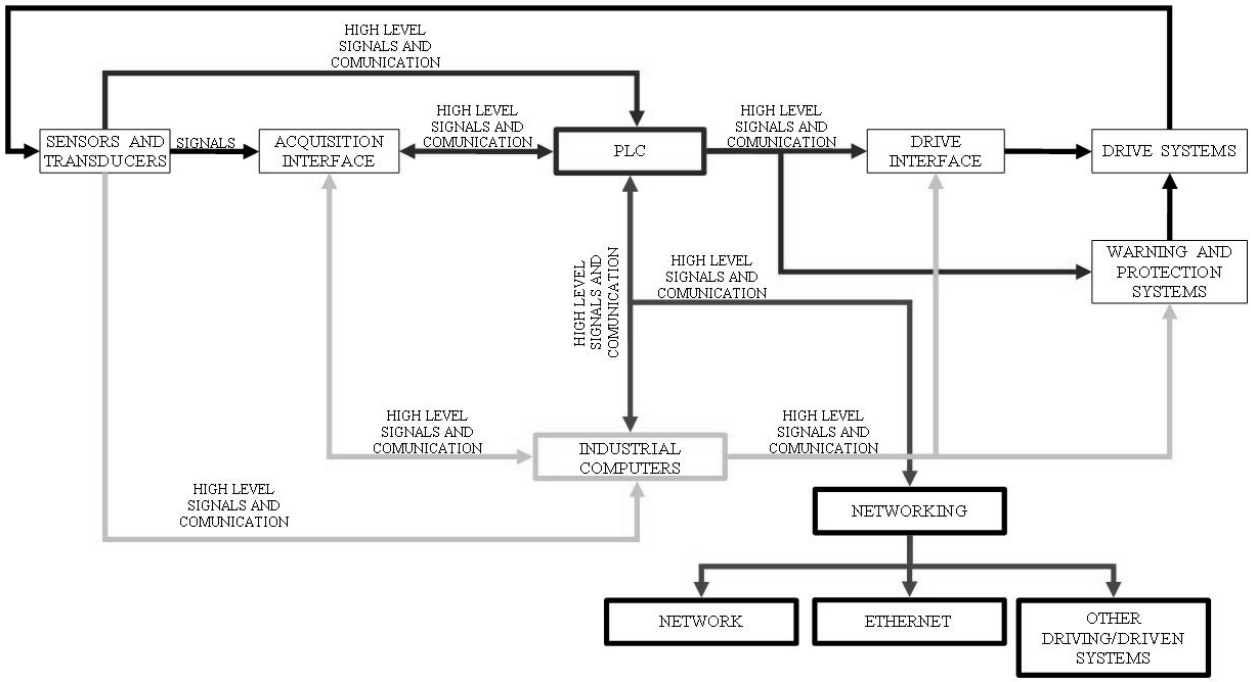


**Figure 1. The general scheme of the architecture used in the control systems**

In the structure of an architectures used in the control systems enter sensors and transducers, data acquisition interface, PLC, industrial computer, the drive interface.

The connections between the different devices of an architecture different according to the mode of connection between them. [5]

Devices which are part of an architecture can be equipped with different types of communication: serial, parallel, CAN, PROFIBUS, SSI, Interbus, Ethernet, DeviceNet and other specialized communication.

In the following figures i presented the architectures of two dimensional control systems implemented in a production flow that has the role to check the parts before entering the assembly line.

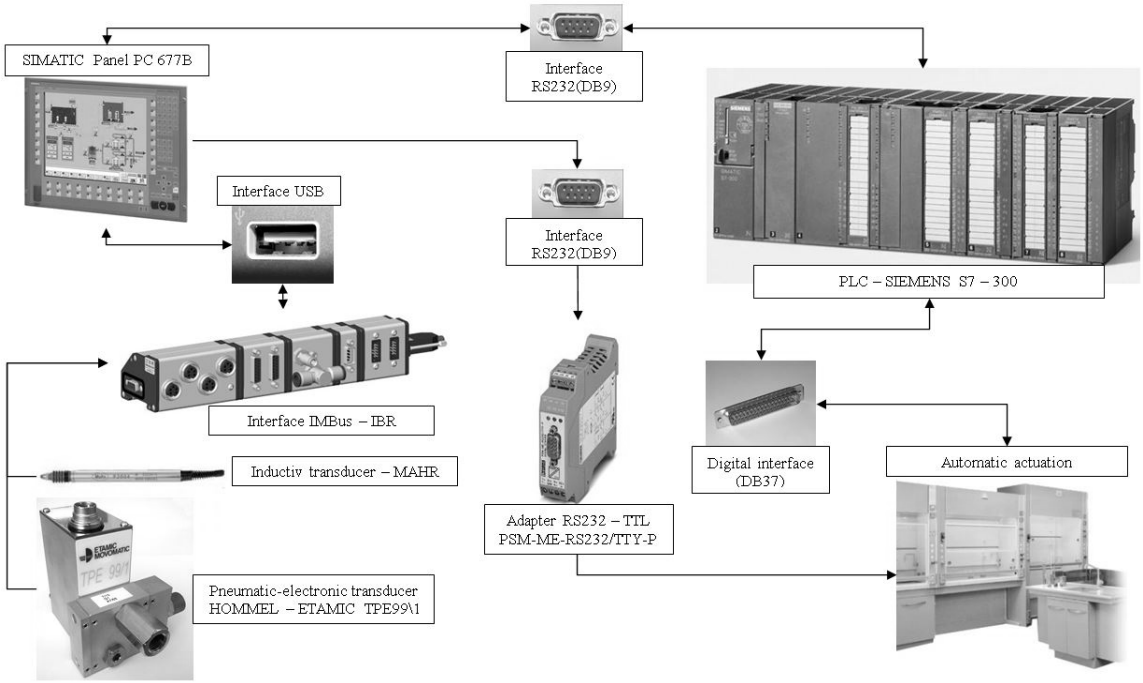


**Figure 2. The scheme of the architecture for the control systems with corrections for the lathe**

In these systems was used an industrial computer, PLC, an signal adapter, an acquisition interface for the electrical signals, a marking system equipped with camcorder, pneumatic and inductive transducers, optical barriers, pneumatic cylinders and inductive sensors.

In the figure 2 the actuation and machining system communicates with the PLC using a digital interface for transmitting the moment of the measurement and for determining the state of the control system.

When the PLC receives a command to measure, this sends to the industrial computer the command wich through the acquisition interface makes the measurements, it processes then display the dates from the transducers and sends through the communication adapter to the actuation and machining system for making the corrections for the next parts.

Because was wanted to replace just one section of the equipment, the communication between the control system and the actuation and machining system was encountered communication problems between that which were resolved by using a PLC which has inputs and outputs digital and a communication adapter from the standard RS232 to signals TTY-P.

The use of the PLC communication was imposed by the actuation and machining existing system through the wich was achieved the connection between this and the industrial computer.

By using the communication adapter is sent to the actuation and machining system the results from the controlled piece.

In the figure 3 the measurement system takes data from the transducers through the acquisition interface, and are processed and stored by the industrial computer.

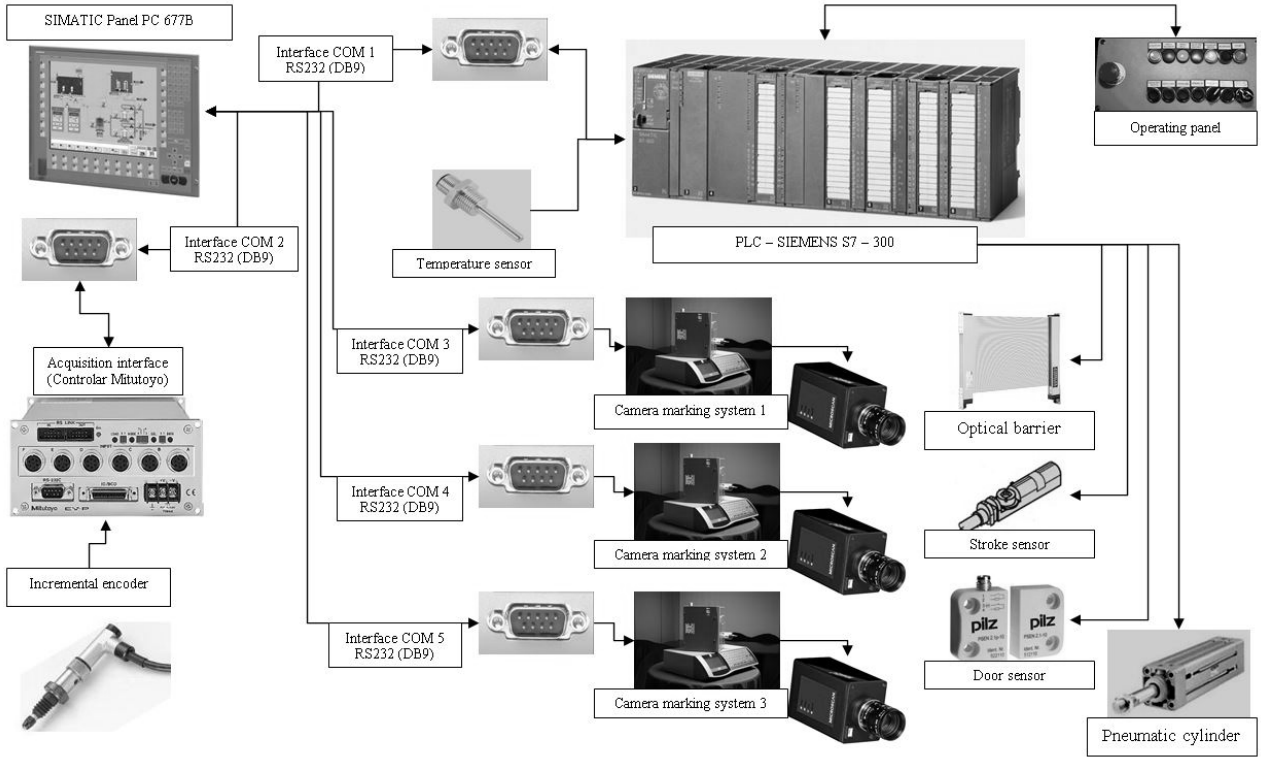


**Figure 3.** The scheme of the architecture for the control systems with inspection an marking system

The dimensional control system is equipped with a PLC, with an temperature sensor, optical barriers, stroke sensors, pneumatic cylinders, door sensors and a operating panel.

The whole system is controlled by integrated software in programmable machine and industrial computer, communication between the different elements that make up the architecture of the system is achieved through communication standard RS232 and digital signals.

## 3. CONCLUSIONS

Communication between different integrated systems within any mechatronic architecture is an important component through wich the system fulfills its intended purpose.

The standards of communication allows a simplification of the communication for the various devices integrated in a mechatronic architecture.

The simplicity through wich is realized the communications represent the ability to transmit large amounts of information in a short time using a single connection between two devices.

## REFERENCES

References sourced via the world wide web:

[1] Information and communications tehnology. [Online]

http://en.wikipedia.org/wiki/Information_and_communications_technology

[2] Communication protocol. [Online]

http://en.wikipedia.org/wiki/Communications_protocol

[3] Principles of System Architecture. [Online]
http://sysarch.pbworks.com/w/page/7241231/FrontPage.

Books:

[4] Conf. Univ. Dr. Ing. Gheorghe I. Gheorghe, Dr. Ing. Ulm Nicolae Spineanu, Prof. Univ. Dr. Ing. Doru Dumitru Palade, Prof. Univ. Dr. Ing. Valentin Pau. INGINERIA SISTEMELOR SI INFORMATIEI. Bucuresti : Editura CEFIN, 2005.

[5] GHEORGHE, GHEORGHE ION. *INGINERIA INTEGRATOARE.* Bucuresti : Editura CEFIN, 2007