Draft translation of the French standard NF E 01-010

Mechatronics - Vocabulary

1 Scope

This document establishes an initial set of terms and definitions related to the field of mechatronics. It aims at contributing to mutual understanding between the different partners in a mechatronic project: technical experts, system prime contractors, integrators and component suppliers. Informative Annex A provides an illustration of these concepts.

2 Terms and definitions

2.1 mechatronics

approach aiming at the synergistic integration of mechanics, electronics, control theory, and computer science within product design and manufacturing, in order to improve and/or optimize its functionality.

Note 1: In this definition, computer science is used in a broad sense, taking into account information processing and communication technology.

Note 2: In this definition, functionality has to be understood in a broad sense, and takes into account the notion of "added value", the aim of mechatronics being to obtain an added value higher than the sum of added values of each function taken separately.

Note 3: In French, the word "mécatronique" is used as a name and as an adjective. In English, the word "mechatronics" is the name of the integrated engineering approach and "mechatronic" is the adjective which pertains to products of that approach

2.2 mechatronic product

product with the ability to: perceive its environment, process information, communicate and act on its environment with a full level of mechatronic integration from functional and physical points of view.

Note: "mechatronic product" is a generic term, which, depending on the sector of activities, includes notions such as system, autonomous sub-system, production equipment, etc

2.3 mechatronic component

component part for a mechatronic product or products with partial mechatronic integration, from a functional or physical point of view, combining mechanics and electronics and enabling information processing.

Note: In this document, a mechanical sub-system with partial integration is referred to as a "mechatronic component" whereas a mechanical component with full integration is referred to as a "mechatronic product".

2.4 physical integration

interpenetration of mechanical and electronic supports (with embedded control and software functions)

Note: considering distributed mechanical and electronic supports connected with wires, a first integration step consists of embedding electronic devices in the mechanical assembly, with the objective of achieving full integration, defined as the "fusion" of mechanical and electronic support in a single physical unit.

2.5 functional integration

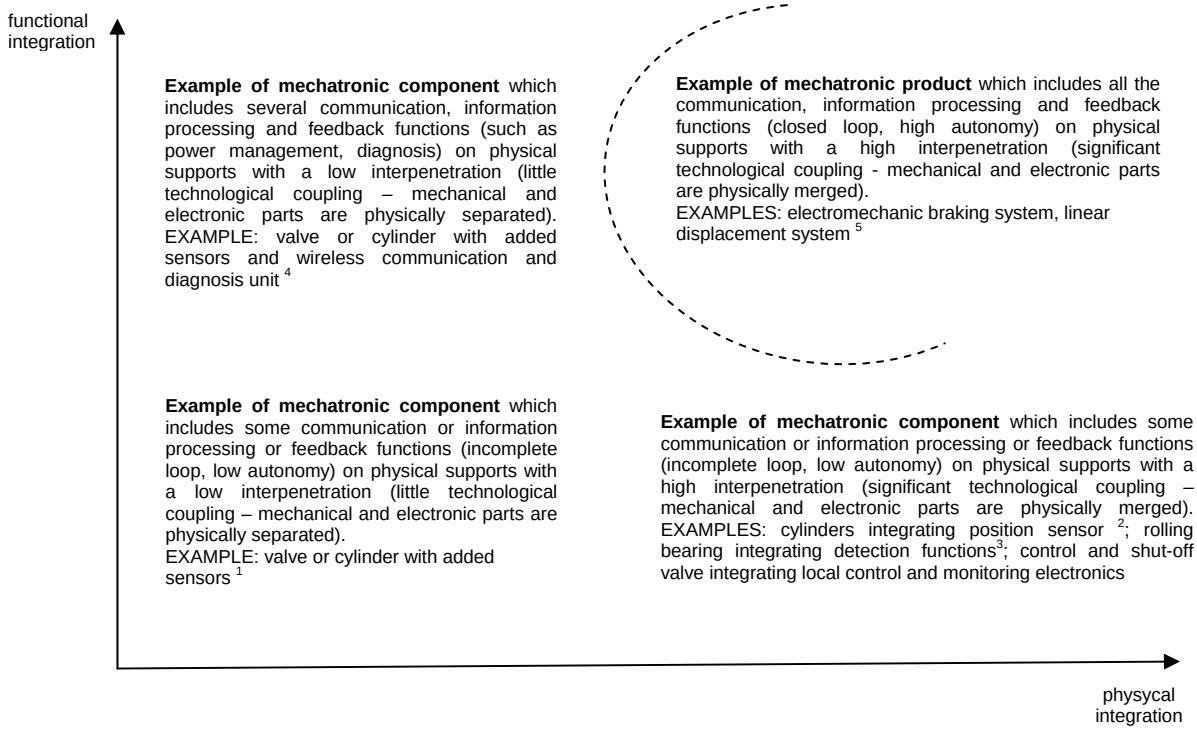
enhancement of basic mechanical functions with detection, communication, information processing and feedback functions.

Note 1: feedback has to be understood as the ability of a product to react to an external stimulus; this reaction can be achieved by different means, for instance regulation (automatic control), closed-loop control, sequential or combinatory logic.

Note 2: several functional integration levels can be defined depending on the degree of autonomy which is reached.

Annex A (informative)
Examples

Generally speaking, turning a component into a product requires the adjunction of functionalities giving increased autonomy to the component (regulation, power management, diagnosis…). In addition, as far as mechatronics is concerned, an interpenetration of the physical supports is needed (high level coupling – mechanical and electronic supports are merged). The diagram in Figure A.1 gives an illustration of theses concepts; it provides technical examples; other aspects, such as economic or environmental aspects, can be added.



[1] Sensors are fixed on the mechanical structure ; electronics and mechanics are linked ; distances have been reduced.

[2] Cylinder rod design integrates detection function through engraving or machining of track.

[3] Rigid ball bearing is equipped with a seal integrating a multipolar magnetic ring, a magnetised pulsed ring, a sensor and a connecting wire. The sensor provides a digital signal delivered by inductive loop and representing the rotational speed of the wheel.

[4] Embedded sensors and electronics (communication and diagnosis functions) are fixed on the mechanical structure.

[5] Cylinder including the hydraulic directional valve, the position sensor, and an electronic unit for processing and monitoring the information about the cylinder position. Electronics and mechanics are strongly merged to form a consistent functional unit. Mechanics and electronics are integrated.

Figure A.1