

STANDARD

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**Road vehicles — Diagnostic systems —  
Requirements for interchange of digital  
information**

*Véhicules routiers — Systèmes de diagnostic — Caractéristiques de l'échange de  
données numériques*



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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 9141 was prepared by Technical Committee ISO/TC 22, *Road vehicles*.

## Introduction

This International Standard has been established with a view to specifying the following desirable features for the diagnosis of electronically controlled on-board systems:

- 1) determination of the electrical requirements of a diagnostic system so that diagnostic equipment having at least minimum functional capability as specified herein will be compatible with any on-board diagnostic system designed in accordance with these specifications;
- 2) limitation of the number of contacts on electronically controlled systems for unidirectional and bidirectional diagnostic communication;
- 3) transmission of identifying information, as well as operational status information including actual values of parameter and required values.

The diagnostic communication is expected to fulfil one or more of the following aims:

- a) to determine if a system is functioning correctly;
- b) to carry out an inspection;
- c) to locate deviations from specification and achieve economic repair;
- d) to confirm a system has been restored to correct operation;
- e) to reset or adjust system operating values in an Electronic Control Unit (ECU) in strict accordance with the vehicle manufacturer's instructions;
- f) to give recorded information related to service activities.

This may be accomplished by way of one or more of the following:

- a) identification of the components in a system;
- b) output of diagnostic information from an ECU;
- c) examination of a wide range of sensor and operating parameter values;
- d) carrying out specific actions;
- e) changes in data held in the ECU in strict accordance with the vehicle manufacturer's instructions.

# Road vehicles — Diagnostic systems — Requirements for interchange of digital information

## 1 Scope

This International Standard specifies the requirements for setting up the interchange of digital information between on-board Electronic Control Units (ECUs) of road vehicles and suitable diagnostic testers. This communication is established in order to facilitate inspection, test diagnosis and adjustment of vehicles, systems and ECUs.

This International Standard does not apply when system-specific diagnostic test equipment is used.

This International Standard does not apply to the use of flashing code techniques.

## 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 4092 : 1988, *Road vehicles — Diagnostic systems for motor vehicles — Vocabulary*.

ISO/TR 7637-0 : 1984, *Road vehicles — Electrical interference by conduction and coupling — Part 0: General and definitions*.

## 3 Definitions

For the purposes of this International Standard, the following definitions apply.

**3.1 inspection:** See ISO 4092.

**3.2 test:** See ISO 4092.

**3.3 diagnosis:** See ISO 4092.

**3.4 diagnostic tester:** See ISO 4092.

This non-built-in equipment may be used in the vehicle.

**3.5 system:** Assemblage of components performing a specific function, for example an assemblage of an ECU with its associated sensors, actuators and interconnections.

**3.6 ECU:** Abbreviation of Electronic Control Unit.

**3.7 bus:** One or more conductors connecting two or more ECUs together with the purpose of communicating with the test equipment.

**3.8 NRZ:** Abbreviation of Non-Return-to Zero — a method of representing binary signals in which there is no change of signal levels between two successive bits of the same logic level.

**3.9 baud rate:** Number of binary elements of information transmitted per second on one line.

**3.10 LSB:** Abbreviation of Least Significant Bit.

**3.11 MSB:** Abbreviation of Most Significant Bit.

**3.12 initialization:** Process to activate an ECU for starting communication.

**3.13 key words:** Identifier of a set of specifications for the subsequent serial communication.

This set of specifications defines:

- the specific function of each communication line;
- the format of the digital information such as the protocol, number and meaning of each of the words exchanged; and
- if a redefinition is desired, the format of data such as baud rate, data coding, word length.

**3.14 header:** First group of serial data transmitted to the diagnostic tester after initialization (if required) before further data exchange commences.

The header consists of

- baud rate synchronization pattern;
- key words.

**3.15 bit time:** Duration of one unit of information.