

# Road vehicles — Component test methods for electrical disturbances from narrowband radiated electromagnetic energy —

## Part 4: Bulk current injection (BCI)

ICS 33.100.20; 43.040.10

# National foreword

This British Standard is the UK implementation of ISO 11452-4:2005, incorporating corrigendum August 2009.

The UK participation in its preparation was entrusted to Technical Committee AUE/16, Electrical and electronic equipment.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

**Compliance with a British Standard cannot confer immunity from legal obligations.**

## Amendments/corrigenda issued since publication

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| 30 November 2009 | Incorporating ISO corrigendum August 2009 Figures <b>D.1</b> and <b>D.2</b> replaced. |
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**Road vehicles — Component test  
methods for electrical disturbances from  
narrowband radiated electromagnetic  
energy —**

**Part 4:  
Bulk current injection (BCI)**

*Véhicules routiers — Méthodes d'essai d'un équipement soumis à des  
perturbations électriques par rayonnement d'énergie électromagnétique  
en bande étroite —*

*Partie 4: Méthodes d'injection de courant (BCI)*





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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 11452-4 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 3, *Electrical and electronic equipment*.

This third edition cancels and replaces the second edition (ISO 11452-4:2001), which has been technically revised.

ISO 11452 consists of the following parts, under the general title *Road vehicles — Component test methods for electrical disturbances from narrowband radiated electromagnetic energy*:

- *Part 1: General principles and terminology*
- *Part 2: Absorber-lined shielded enclosure*
- *Part 3: Transverse electromagnetic mode (TEM) cell*
- *Part 4: Bulk current injection (BCI)*
- *Part 5: Stripline*
- *Part 7: Direct radio frequency (RF) power injection*

The radiating loop method is to form the subject of a future part 8.

## Introduction

Immunity measurements of complete road vehicles are generally able to be carried out only by the vehicle manufacturer, owing to, for example, high costs of absorber-lined shielded enclosures, the desire to preserve the secrecy of prototypes or a large number of different vehicle models.

For research, development and quality control, a laboratory measuring method can be used by both vehicle manufacturers and equipment suppliers to test electronic components.



# Road vehicles — Component test methods for electrical disturbances from narrowband radiated electromagnetic energy —

## Part 4: Bulk current injection (BCI)

### 1 Scope

This part of ISO 11452 specifies bulk current injection (BCI) test methods for determining the immunity of electronic components of passenger cars and commercial vehicles regardless of the propulsion system (e.g. spark-ignition engine, diesel engine, electric motor). The electromagnetic disturbances considered in this part of ISO 11452 are limited to continuous narrowband electromagnetic fields. See ISO 11452-1 for general test conditions.

### 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 11452-1, *Road vehicles — Component test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 1: General principles and terminology*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 11452-1 apply.

### 4 Test conditions

The frequency range of the BCI test method is a direct function of the current probe characteristic. More than one type of current probe may be required.

For testing automotive electronic systems, the applicable frequency range of the BCI test method is 1 MHz to 400 MHz.

The user shall specify the test severity level(s) over the frequency range. Suggested test levels are included in Annex E.

Standard test conditions shall be according to ISO 11452-1 for the following:

- test temperature;
- supply voltage;

- modulation;
- dwell time;
- frequency step sizes;
- definition of test severity levels;
- test signal quality.

## 5 Test location

The tests shall be performed in a shielded enclosure.

## 6 Test apparatus and instrumentation

### 6.1 General

Bulk current injection (BCI) is a method of carrying out immunity tests by inducing disturbance signals directly into the wiring harness by means of a current injection probe. The injection probe is a current transformer through which the wiring harnesses of the device under test (DUT) are passed. Immunity tests are carried out by varying the test severity level and frequency of the induced disturbance.

### 6.2 Measuring equipment

**6.2.1 Current injection probe or set of probes**, capable of operating over the entire test frequency range, required to couple the test equipment to the DUT. The probe(s) shall be capable of withstanding a continuous input power over the test frequency range regardless of the system loading.

**6.2.2 Current measurement probe or set of probes**, capable of operating over the entire test frequency range.

**6.2.3 Artificial network(s) (AN)**: see 7.2 and Annex C.

**6.2.4 RF generator**, with internal (or external) modulation capabilities.

**6.2.5 Power amplifier**

**6.2.6 Powermeter** (or equivalent measuring instrument), for measuring forward power and reflected power.

**6.2.7 Current measuring equipment**

### 6.3 Stimulation and monitoring of DUT

The DUT shall be operated as required in the test plan by actuators that have a minimum effect on the electromagnetic characteristics, e.g. plastic blocks on the push-buttons, pneumatic actuators with plastic tubes.

Connections to equipment monitoring electromagnetic interference reactions of the DUT may be accomplished by using fibre-optics, or high-resistance leads. Other types of lead may be used but require extreme care to minimize interactions. The orientation, length and location of such leads shall be carefully documented to ensure repeatability of test results.

Any electrical connection of monitoring equipment to the DUT may cause malfunctions of the DUT. Extreme care shall be taken to avoid such an effect.