PUBLICLY
AVAILABLE
SPECIFICATION

IEC PAS 62437

First edition
2005-09

INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE

Radio disturbance characteristics for the protection of receivers used on board vehicles, boats, and on devices – Limits and methods of measurement – Specifications for active antennas

Reference number
IEC/PAS 62437:2005(E)

Publication numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series. For example, IEC 34-1 is now referred to as IEC 60034-1.

Consolidated editions

The IEC is now publishing consolidated versions of its publications. For example, edition numbers 1.0, 1.1 and 1.2 refer, respectively, to the base publication, the base publication incorporating amendment 1 and the base publication incorporating amendments 1 and 2.

Further information on IEC publications

The technical content of IEC publications is kept under constant review by the IEC, thus ensuring that the content reflects current technology. Information relating to this publication, including its validity, is available in the IEC Catalogue of publications (see below) in addition to new editions, amendments and corrigenda. Information on the subjects under consideration and work in progress undertaken by the technical committee which has prepared this publication, as well as the list of publications issued, is also available from the following:

- **IEC Web Site (www.iec.ch)**

- **Catalogue of IEC publications**

  The on-line catalogue on the IEC web site (www.iec.ch/searchpub) enables you to search by a variety of criteria including text searches, technical committees and date of publication. On-line information is also available on recently issued publications, withdrawn and replaced publications, as well as corrigenda.

- **IEC Just Published**

  This summary of recently issued publications (www.iec.ch/online_news/ justpub) is also available by email. Please contact the Customer Service Centre (see below) for further information.

- **Customer Service Centre**

  If you have any questions regarding this publication or need further assistance, please contact the Customer Service Centre:

  Email: custserv@iec.ch
  Tel: +41 22 919 02 11
  Fax: +41 22 919 03 00

PUBLICLY AVAILABLE SPECIFICATION

IEC PAS 62437

First edition
2005-09

INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE

Radio disturbance characteristics for the protection of receivers used on board vehicles, boats, and on devices – Limits and methods of measurement – Specifications for active antennas

International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: inmail@iec.ch Web: www.iec.ch

Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE M

For price, see current catalogue

CONTENTS

FOREWORD....3
INTRODUCTION....5

1 Scope....6
2 Normative references....6
3 Terms and definitions....6
4 Set-up for noise-floor measurement....7

Annex A (informative) Examples for artificial antenna networks....10

Figure 1 – Example test set-up for noise-floor measurements (Category I antennas)....8
Figure 2 – Example test set-up for noise-floor measurements (Category II antennas)....8
Figure A.1 – Block circuit of an artificial antenna network for antennas intended for rear-screen installation....10
Figure A.2 – Block circuit of an artificial antenna network for antennas intended for side-screen installation....11

INTERNATIONAL ELECTROTECHNICAL COMMISSION
INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE

_____

RADIO DISTURBANCE CHARACTERISTICS FOR THE PROTECTION OF RECEIVERS USED ON BOARD VEHICLES, BOATS, AND ON DEVICES – LIMITS AND METHODS OF MEASUREMENT – SPECIFICATIONS FOR ACTIVE ANTENNAS

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

A PAS is a technical specification not fulfilling the requirements for a standard but made available to the public.

IEC-PAS 62437 has been processed by CISPR subcommittee D: Electromagnetic disturbances related to electric/electronic equipment on vehicles and internal combustion engine powered devices.

During the maintenance of CISPR 25, the need for additional information regarding the use of active antennas for on-board reception was raised. Since it is necessary to gather experience with the described methods, CISPR subcommittee D decided not to include it as an annex in CISPR 25 for the time being, but to publish it as separate document.

The text of this PAS is based on the following document:	This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document
Draft PAS	**Report on voting**
CISPR/D/308/NP	CISPR/D/315/RVN

Following publication of this PAS, the technical committee or subcommittee concerned will investigate the possibility of transforming the PAS into an International Standard.

This PAS shall remain valid for an initial maximum period of 3 years starting from 2005-09. The validity may be extended for a single 3-year period, following which it shall be revised to become another type of normative document, or shall be withdrawn.

INTRODUCTION

Use of active antennas is today the state of the art in vehicles. In principle, active antennas can be handled like any other component/module used in vehicles, but, since they become part of the test equipment when performing radiated emission tests according to Clause 5 of CISPR 25, it must be guaranteed that the emissions produced by the active antenna itself will allow these emission measurements.

RADIO DISTURBANCE CHARACTERISTICS FOR THE PROTECTION OF RECEIVERS USED ON BOARD VEHICLES, BOATS, AND ON DEVICES – LIMITS AND METHODS OF MEASUREMENT – SPECIFICATIONS FOR ACTIVE ANTENNAS

1 Scope

Active antennas used on board vehicles are electronic components in the sense of CISPR 25. Therefore, the requirements regarding emissions apply to it in its function as EUT. In addition to this, vehicle active antennas are used as part of the measurement chain for the evaluation of emissions produced by any other component in the vehicle. With a passive antenna no special considerations were necessary because it can neither generate emissions nor harmonics due to its linearity.

This Publicly Available Specification (PAS) gives additional information for the use of active antennas for radiated emission measurement according to CISPR 25. Test set-ups at component level are defined for the determination of noise floor.

The current vehicle antenna technology provides two categories of active antennas. The first category (I) consists of an active part (electronic part) and a passive part (antenna structure). These parts can be considered as two separate “black boxes”. During the emission tests (antenna as EUT), the passive antenna part is normally replaced by an “artificial antenna network”.

Antennas with their active and passive parts inseparably combined within one housing are defined as category (II) antennas.

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.

CISPR 25, *Radio disturbance characteristics for the protection of receivers used on board vehicles, boats, and on devices – Limits and methods of measurement*

3 Terms and definitions

For the purposes of this document, the following definitions apply.

3.1
antenna matching unit
unit for matching the impedance of an antenna output to that of the 50 Ω measuring instrument over the antenna measuring-frequency range

3.2
antenna noise floor
voltage measured at the output of an active antenna via an original coaxial cable in the absence of a reception field strength (category II) or when the passive part of the antenna is replaced by a terminated artificial antenna network (category I)

3.3
artificial antenna network (AAN)
electrical circuit consisting of lumped inductors, capacitors and resistors giving the same complex scattering parameter S_{22} as the passive part of the antenna installed in the vehicle, boat or device

3.4
artificial network (AN)
line impedance stabilization network (LISN[1)])
network inserted in the supply lead or signal/load lead of apparatus to be tested which provides, in a given frequency range, a specified load impedance for the measurement of *disturbance voltages* and which may isolate the apparatus from the supply or signal sources/loads in that frequency range

[IEV 161-04-05, modified]

3.5
r.f.-amplifier
electronic part of the antenna system

3.6
shielded enclosure
screened room
mesh or sheet metallic housing designed expressly for the purpose of separating electro-magnetically the internal and the external environment

[IEV 161-04-37]

3.7
vehicle active antenna
antenna consisting of the passive part, the active part (r.f.-electronic) and the whole vehicle body including the cable harnesses acting as counterpoise

4 Set-up for noise-floor measurement

Knowledge of the noise floor is strongly required for assessment of emissions when the active antenna is part of the measurement chain. It is not useful to define limits for the noise floor. However, it shall be measured according to the following method and shall be recorded to allow interpretation of measurement results. Noise-floor measurements are required only in the frequency bands for which the antenna is designed. It applies to both category I and II antennas. The measurements shall be performed with the active antenna mounted in a shielded enclosure (see Figures 1 and 2). In the case of a category I antenna, an artificial antenna network (see Annex A) shall be used. The intended coaxial cable shall be used for the connection between the antenna and the measurement receiver or the antenna matching unit (usually applicable for AM bands). Bandwidths and detectors shall be chosen in order to cover all emission measurement necessities described in CISPR 25 for which the antenna will be used.

1) In the USA.

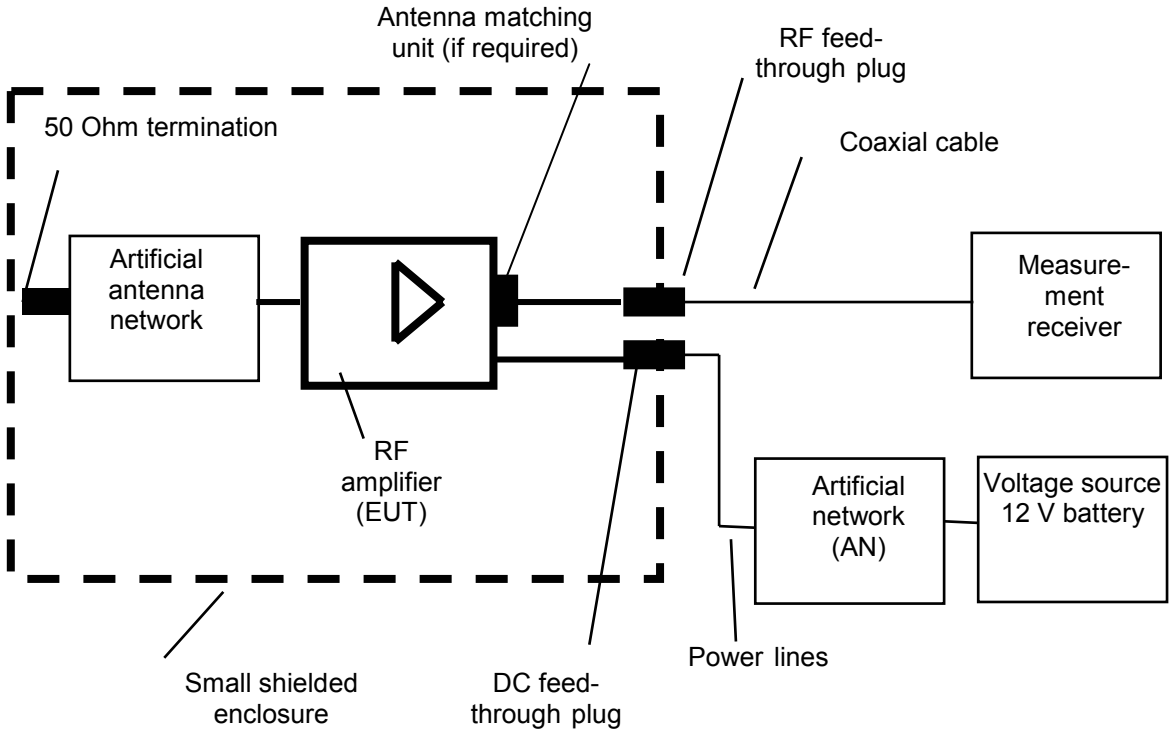


Figure 1 – Example test set-up for noise-floor measurements (Category I antennas)

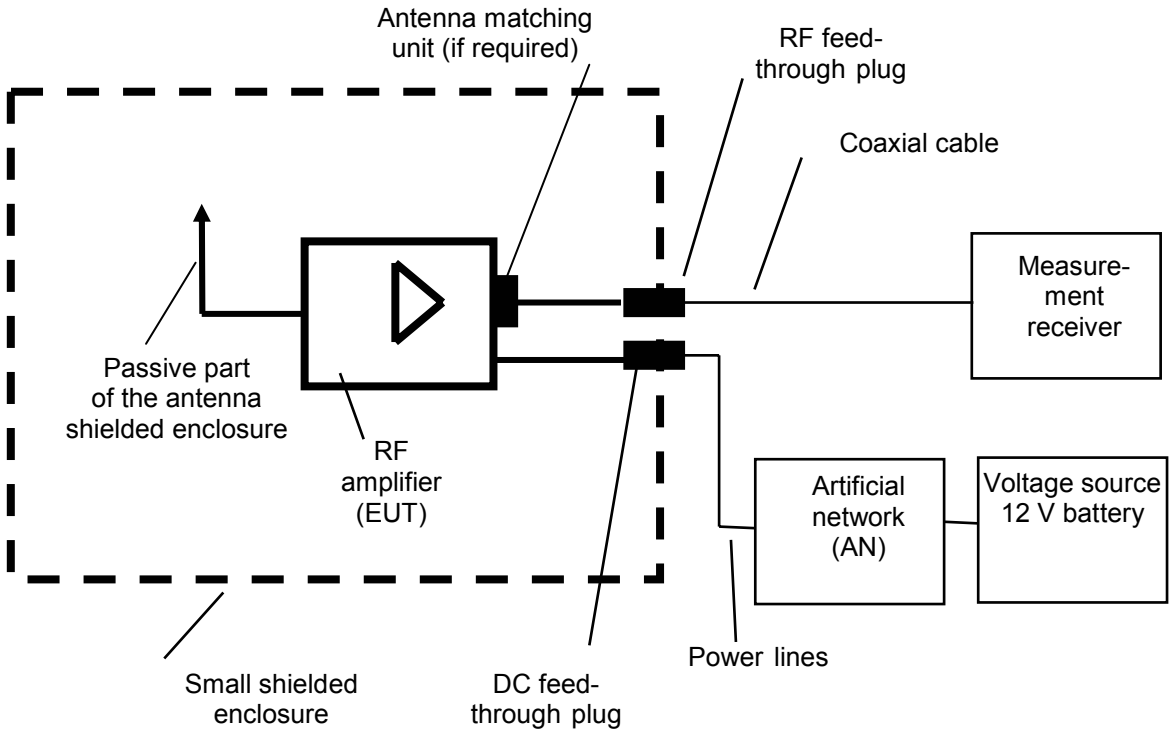


Figure 2 – Example test set-up for noise-floor measurements (Category II antennas)

The process steps described in Annex I of CISPR 25 for vehicle-mounted antennas are applied also at component level.

a) The active antenna is replaced by a termination at the antenna matching unit r.f. input (if applicable) or directly at the end of the coaxial cable (if no antenna matching unit is required). The noise floor of the test equipment (measurement receiver and antenna matching unit) is measured in the radio bands for which the antenna is designed ($U_{\text{Equipment noise}}$ in dB(µV)).

b) The active antenna is installed according to Figures 1 and 2 and the noise floor of the active vehicle antenna including the noise floor of the test equipment is measured ($U_{\text{Equipment noise plus antenna noise}}$ in dB(µV)).

c) From these two measurements, the active antenna noise floor $U_{\text{antenna noise}}$ is calculated with formula (1):

$$U_{\text{antenna noise}} = 10 \cdot \log\left(10^{\frac{U_{\text{Equipment noise plus antenna noise}}}{10}} - 10^{\frac{U_{\text{Equipment noise}}}{10}} \right) \text{ in dB(µV)} \quad (1)$$

Annex A
(informative)

Examples for artificial antenna networks

A.1 Example of an artificial antenna network for antennas intended for rear-screen installation

This type of artificial antenna network consists of three main parts as shown in Figure A.1. These parts simulate the impedance behaviour of the vehicle passive antenna in AM frequency ranges (number 3 in Figure A.1), FM/TV/GPS frequency ranges (number 2 in Figure A.1) and also the d.c. behaviour of the vehicle's screen heater (number 6 in Figure A.1).

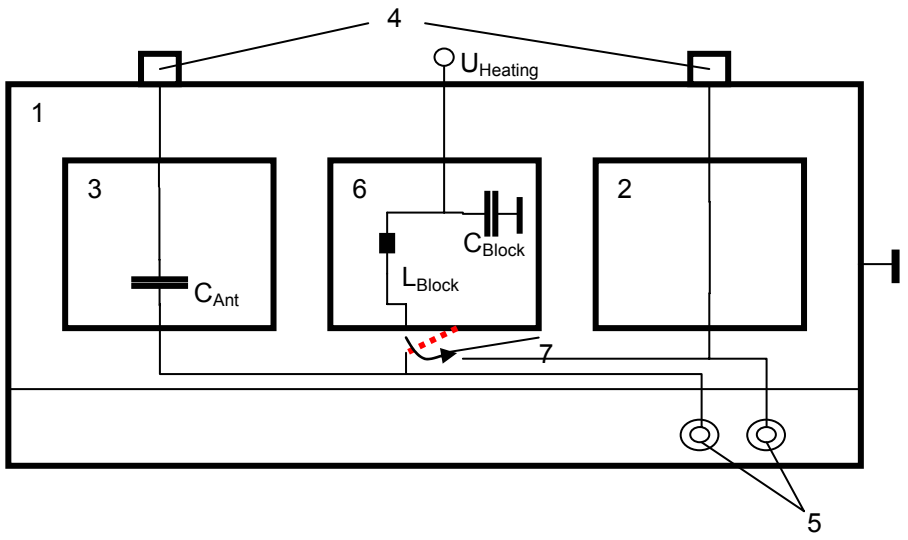
The elements of AM and high-frequency networks for use with a 50 Ω[1)] measuring system are defined as follows.

Place of heating structure	L_{Block}	C_{Block}
On AM structure	≥ 160 μH	≤ 8 nF (optional)
FM, TV, GPS, GSM structure	≥ 2 μH	≥ 100 pF

These elements are preferably the same as those installed in a vehicle.

When the antenna structure is designed for installation at the rear screen, the network (number 2 in Figure A.1) for FM and/or TV bands is reduced to a 50 Ω[1)] system (real impedance, given by the 50 Ω[1)] termination or measurement receiver).

The network for AM bands (number 3 in Figure A.1) is built by a high-impedance system in accordance with Figure A.1. The corresponding capacitor is given as $C_{Ant} \approx 56pF$.



Key

1 Shielded enclosure
2 Matching network for FM, TV, GPS, ..., bands
3 DC isolation AM network ($C_{Ant} \approx 56$ pF)
4 AM/FM BNC input connector 50 Ω[1)]
5 AM/FM double push-button output to amplifier
6 Simulation of d.c. screen heater
7 Switch for screen heater (FM,TV, GPS,..., or AM)

Figure A.1 – Block circuit of an artificial antenna network for antennas intended for rear-screen installation

1) This value depends on the impedance of the measurement system used (for example, 50 Ω or 75 Ω).

A.2 Example of an artificial antenna network for antennas intended for side-screen installation

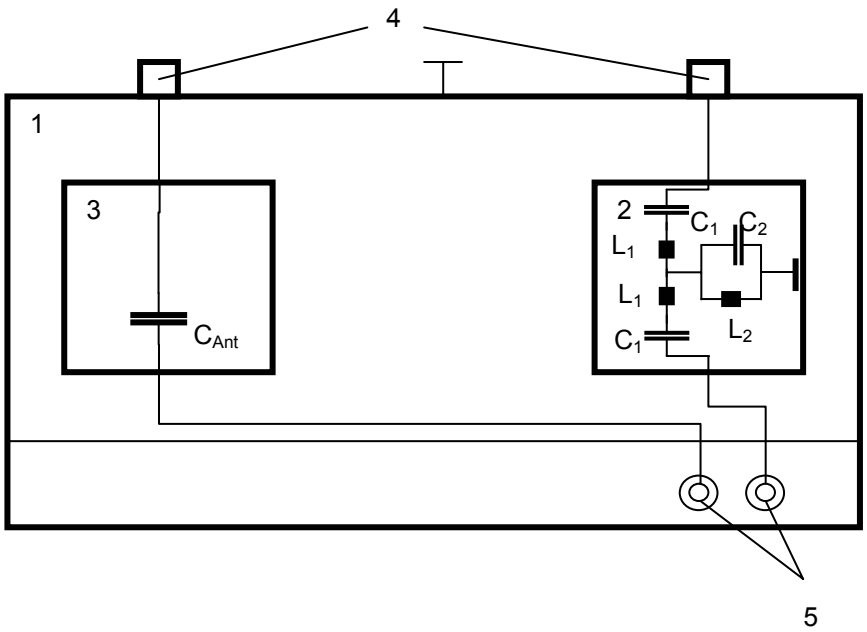
This type of artificial antenna network consists of two main parts as shown in Figure A.2. These parts simulate the impedance behaviour of the vehicle passive antenna in AM frequency ranges (number 3 in Figure A.2) and FM/TV/GPS,..., frequency ranges (number 2 in Figure A.2).

For side-screen antennas, the high-frequency network is built as shown in number 2 in Figure A.2. The corresponding "T" or "π-terms" are needed to achieve the matching between the DUT and the passive antenna (characteristic impedance of the side screen). The elements L_1, C_1 and L_2, C_2 shall be determined according to the vehicle considered. Usually, the values of these elements for a 50 Ω[1)] measurement system are as follows.

L1 [nH]	L2 [nH]	C_1 [pF]	C_2 [pF]
≈ 10... 390	≈ 10 to 390	≈ 5 to 220	≈ 5 to 220

When the antenna structure is designed for installation at the side screen, the network (number 2 in Figure A.2) for FM and/or TV bands is reduced to a 50 Ω[1)] system (real impedance, given by the connected 50 Ω[1)] termination or connected measurement receiver).

For the AM bands, the network (number 3 in Figure A.2) is built in accordance with Figure A.2. The corresponding capacitor is given as $C_{Ant} \approx 56$ pF.



Key

1 Shielded enclosure
2 Matching network for FM, TV, GPS, ..., bands
3 DC isolation AM matching network ($C_{Ant} \approx 56$ pF)
4 AM/FM BNC input connector 50 Ω[1)]
5 AM/FM double push-button output to amplifier

Figure A.2 – Block circuit of an artificial antenna network for antennas intended for side-screen installation

1) This value depends on the impedance of the measurement system used (for example, 50 Ω or 75 Ω).

Bibliography

IEC 60050-161, *International Electrotechnical Vocabulary (IEV) – Chapter 161: Electromagnetic compatibility*

_____

Standards Survey

The IEC would like to offer you the best quality standards possible. To make sure that we continue to meet your needs, your feedback is essential. Would you please take a minute to answer the questions overleaf and fax them to us at +41 22 919 03 00 or mail them to the address below. Thank you!

Customer Service Centre (CSC)

International Electrotechnical Commission
3, rue de Varembé
1211 Genève 20
Switzerland

or

Fax to: **IEC**/CSC at +41 22 919 03 00

Thank you for your contribution to the standards-making process.

Nicht frankieren
Ne pas affranchir

Non affrancare
No stamp required

A Prioritaire

RÉPONSE PAYÉE

SUISSE

Customer Service Centre (CSC)
International Electrotechnical Commission
3, rue de Varembé
1211 GENEVA 20
Switzerland

Q1 Please report on **ONE STANDARD** and **ONE STANDARD ONLY**. Enter the exact number of the standard: *(e.g. 60601-1-1)*

.....

Q2 Please tell us in what capacity(ies) you bought the standard *(tick all that apply).* I am the/a:

purchasing agent ❑
librarian ❑
researcher ❑
design engineer ❑
safety engineer ❑
testing engineer ❑
marketing specialist ❑
other.....

Q3 I work for/in/as a: *(tick all that apply)*

manufacturing ❑
consultant ❑
government ❑
test/certification facility ❑
public utility ❑
education ❑
military ❑
other.....

Q4 This standard will be used for: *(tick all that apply)*

general reference ❑
product research ❑
product design/development ❑
specifications ❑
tenders ❑
quality assessment ❑
certification ❑
technical documentation ❑
thesis ❑
manufacturing ❑
other.....

Q5 This standard meets my needs: *(tick one)*

not at all ❑
nearly ❑
fairly well ❑
exactly ❑

Q6 If you ticked NOT AT ALL in Question 5 the reason is: *(tick all that apply)*

standard is out of date ❑
standard is incomplete ❑
standard is too academic ❑
standard is too superficial ❑
title is misleading ❑
I made the wrong choice ❑
other .....

Q7 Please assess the standard in the following categories, using the numbers:
(1) unacceptable,
(2) below average,
(3) average,
(4) above average,
(5) exceptional,
(6) not applicable

timeliness.....
quality of writing.....
technical contents.....
logic of arrangement of contents .....
tables, charts, graphs, figures.....
other .....

Q8 I read/use the: *(tick one)*

French text only ❑
English text only ❑
both English and French texts ❑

Q9 Please share any comment on any aspect of the IEC that you would like us to know:

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

ISBN 2-8318-8200-1

ICS 33.100.10; 33.100.20

Typeset and printed by the IEC Central Office
GENEVA, SWITZERLAND