

Electricity metering — Tariff and load control — Particular requirements for electronic ripple control receivers

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National foreword

This British Standard has been prepared by Technical Committee PEL/14 and is the English language version of EN 61037:1992, *Electronic ripple control receivers for tariff and load control*, including its amendments A1:1996 and A2:1998 and CENELEC corrigendum 1997, published by the European Committee for Electrotechnical Standardization. It was derived by CENELEC from IEC 1037:1990, including its amendment 1, published by the International Electrotechnical Commission (IEC). It was originally published as BS 7401:1990. The start and finish of each common modification is indicated in the text by

 . Sidelining has been used to indicate changes implemented by amendment.

Textual note: IEC amendment 2:1998 includes addition of a subclause 5.4.3. As subclauses 5.4.3 and 5.4.3.2 have already been introduced by CENELEC common modification of the original IEC text when adopting IEC 1037 and BS EN 61037, this additional subclause has been renumbered as 5.4.3.3.

The British Standards which implement international or European publications referred to in this document may be found in the BSI *Standards Catalogue* under the section entitled “International Standards Correspondence Index” or using the “Find” facility in the BSI *Standards Catalogue*.

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Summary of pages

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English version

Electronic metering — Tariff and load control — Particular requirements for electronic ripple control receivers

(includes amendments A1:1996 and A2:1998)
(IEC 1037:1990 + A1:1996, modified)

Comptage de l'électricité — Tarification et
contrôle de charge — Prescriptions
particulières pour récepteurs électroniques de
télécommande centralisée
(inclut les amendements A1:1996 + A2:1998)
(CEI 1037:1990 + A1:1996, modifiée + A2:1998)

Messung der elektrischen Energie —
Tarif- und Laststeuerung Besondere
Anforderungen für elektronische
Rundsteuerempfänger
(enthält die Änderungen A1:1996 + A2:1998)
(IEC 1037:1990 + A1:1996, modifiziert +
A2:1998)

This European Standard was approved by CENELEC on 1992-09-15; amendment A1 was approved by CENELEC on 1996-03-05 and amendment A2 was approved on 1998-08-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
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Foreword

Following the advice of CENELEC Technical Committee TC 13, Equipment for electrical energy measurement and load control, the CENELEC 69 Technical Board decided to submit the text of IEC 1037:1990, together with some common modifications prepared by TC 13, to the CENELEC formal vote.

The text of the draft was approved by CENELEC as EN 61037 on 15 September 1992.

The following dates were fixed:

- latest date of publication of an identical national standard (dop) 1993-06-01
- latest date of withdrawal of conflicting national standards (dow) 1993-06-01

Annexes designated “normative” are part of the body of the standard. Annexes designated “informative” are given only for information. In this standard, Annex A, Annex B, Annex C, Annex D, Annex E, Annex F and Annex ZA are normative and Annex G, Annex H, Annex J and Annex K are informative.

Statement

The International Standard IEC 1037:1990, together with the common modifications attached can be used in its present state. However the answers received from the members to the Primary Questionnaire showed that a number of complementary studies (which do not affect fundamentally the present text) were needed; these complementary studies have been proposed to IEC TC 13. They could lead to a draft amendment to IEC 1037, draft which should then be submitted to the parallel IEC/CENELEC voting procedure (this amendment could also include the common modifications).

In addition, it is to be noted that the harmonics levels specified in 4.6.2, as well as the EMC requirements might have to be reconsidered in the future in the light of the studies carried out in CENELEC TC 110 and CENELEC BTTF 68-6 (DISNORM 12).

Foreword to Amendment A1

The text of document 13/1091/FDIS, future amendment 1 to IEC 1037:1990, prepared by IEC TC 13, Equipment for electrical energy measurement and load control, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A1 to EN 61037:1992 on 1996-03-05.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1996-12-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 1996-12-01

Annexes designated “normative” are part of the body of the standard.

In this standard, Annex ZA is normative.

Annex ZA has been added by CENELEC.

Foreword to Amendment A2

The text of document 13/1152/FDIS, future amendment 2 to IEC 61037:1990, prepared by IEC TX 13, Equipment for electrical energy measurement and load control, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A2 to EN 61037:1992 on 1998-08-01.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1999-05-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2001-05-01

Annexes designated “normative” are part of the body of the standard. In this standard, annex ZA is normative.

Annex ZA has been added by CENELEC.

1 Scope

This International Standard specifies requirements for the type test of indoor electronic ripple control receivers for the reception and interpretation of pulses of a single audio frequency superimposed on the voltage of the electricity distribution network and for the execution of the corresponding switching operations. In this system the mains frequency is generally used to synchronize the transmitter and receivers. Neither the control frequency, nor the encoding are standardized in this standard.

This standard gives no requirements for constructional details internal to the receiver.

This standard does not cover the acceptance tests and the conformity tests. (Nevertheless, an example of what could be an acceptance test is given in Annex G (informative).)

The reliability aspect also is not covered in this standard as there are no short term procedures available which would fit into type test documents to satisfactorily check this requirement.

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.

IEC 50(301, 302, 303):1983, *International Electrotechnical Vocabulary (IEV), Chapter 301: General terms on measurements in electricity*.

IEC 60, *High-voltage test techniques*.

IEC 60068-2-1:1990, *Environmental testing — Part 2: Tests — Tests A: Cold*.

IEC 68-2-2:1974, *Environmental testing, Part 2: Tests. Tests B: Dry Heat*.

IEC 68-2-6:1982, *Environmental testing, Part 2: Tests. Test Fc and guidance: Vibration (sinusoidal)*.

IEC 68-2-27:1987, *Environmental testing, Part 2: Tests. Test Ea and guidance: Shock*.

IEC 68-2-30:1980, *Environmental testing, Part 2: Tests. Test Db and guidance: Damp heat, cyclic (12 + 12-hour cycle)*.

IEC 85:1984, *Thermal evaluation and classification of electrical insulation*.

IEC 269-3:1987, *Low voltage fuse, Part 3: Supplementary requirements for fuses for use by unskilled persons (fuses mainly for household and similar applications)*.

IEC 410:1973, *Sampling plans and procedures for inspection by attributes*.

IEC 60417-2:1998, *Graphical symbols for use on equipment — Part 2: Symbol originals*.

IEC 529:1989, *Classification of degrees of protection provided by enclosures (IP Code)*.

IEC 60695-2-1-1:1994, *Fire hazard testing — Part 2: Test methods — Glow-wire end-product test and guidance*.

IEC 60721-3-3:1994, *Classification of environmental conditions — Part 3: Classification of groups of environmental parameters and their severities — Section 3: Stationary use at weatherprotected locations*.

IEC 1000-4-2:1995¹⁾, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 2: Electrostatic discharge immunity test — Basic EMC publication*.

IEC 1000-4-3:1995, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 3: Radiated, radio-frequency, electromagnetic field immunity test*.

IEC 61000-4-4:1995, *Electromagnetic compatibility — Part 4: Testing and measurement techniques — Section 4: Electrical fast transient/burst immunity test — Basic EMC publication*.

IEC 817:1984, *Spring-operated impact-test apparatus and its calibration*.

IEC/CISPR22:1993, *Limits and methods of measurement of radio disturbance characteristics of information technology equipment*.

¹⁾ International Standard IEC 1000-4-2 replaces (and is technically equivalent to) IEC 801-2:1991, *Electromagnetic compatibility for industrial-process measurement and control equipment — Part 2: Electrostatic discharge requirement*.

3 Definitions

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

3.1 General definitions

3.1.1

electronic ripple control receiver

instrument with a solid state input and decoder circuit for the reception and interpretation of pulses of a single audio frequency superimposed on the voltage of an electricity distribution network and for the execution of the corresponding switching operations

3.1.2

standard receiver

receiver for mounting on an equipment board, a meter board or instrument rail (or which is a part of the meter)

3.1.3

special receiver

receiver intended for particular applications, for example street lighting receivers

3.1.4

rated supply voltage (U_n)

value of the supply voltage for which the receiver is designed

3.1.5

rated supply frequency (f_n)

value of the supply frequency for which the receiver is designed

3.2 Definitions related to the functional elements

3.2.1 input element

functional element that separates the control signals from the supply voltage and transmits them to the decoding element.

3.2.1.1

rated control voltage (U_s)

audio-frequency voltage superimposed on the supply system voltage. Throughout this document its steady r.m.s. value is used and is expressed as a percentage of the rated supply voltage U_n of the receiver

3.2.1.2

operate voltage (U_p)

minimum value of the control voltage that, under prescribed conditions, is sufficient to ensure correct operation of the receivers, the message being coded according to the system considered

3.2.1.3

non-operate voltage (U_{nf})

maximum value of the control voltage for which, under prescribed conditions, the receivers do not operate, the message being coded according to the system considered

3.2.1.4

maximum control voltage (U_{max})

maximum value of the control voltage that, under prescribed conditions, ensures correct operation of the receivers receiving a message coded according to the system considered

3.2.1.5

rated control frequency (f_s)

frequency of the control voltage for which the receiver is designed

3.2.2 Code and decoding element

3.2.2.1

code

sequence of a given number of pulse positions having a specified cycle duration

NOTE 1 Examples of time diagrams for ripple control codes are given in Annex H (informative).

NOTE 2 Each pulse position is designated by a number.

3.2.2.2

decoding element

element that identifies, from the signals received from the input element, those corresponding to the commands for which it is adjusted and that transmits the appropriate information to the output element

for this purpose the decoding element checks the presence and, possibly, the absence of information pulses at the positions for which it is adjusted

3.2.2.3

pulse position

position in the ripple control code where an information pulse may be present or absent

3.2.2.4

starting pulse

first pulse of the code, which is intended to start the decoding operation of the receiver

NOTE It is generally designed by the number 0.

3.2.2.5

information pulse

pulse present at one of the positions in the code after the starting pulse. It is designated by the number of its position

3.2.2.6**pulse interval**

interval of time between the beginning of the starting pulse or an information pulse, and the beginning of the following information pulse in the ripple control code

NOTE A pulse interval comprises a pulse of a length according to the coding system, plus, possibly, an associated pause.

3.2.2.7**message**

combination of the starting pulse and a certain number of information pulses representing one or more commands

3.2.2.8**command**

instruction to those receivers adjusted to that command to carry out a certain operation on the output element

NOTE It is generally characterized by the presence or absence of one or more information pulses.

3.2.2.9**cycle duration**

interval of time between the beginning of the start pulse and the normal return of the receiver to its quiescent state

3.2.3 output element

element comprising one or more switches controlled according to the information provided by the decoding element

3.2.3.1**rated breaking voltage (U_c)**

value of the voltage for which a switch is designed

3.2.3.2**rated breaking current (I_c)**

value of current for which a switch is designed and which it can close, carry continuously and break under specified conditions

3.2.3.3**maximum total current (I_{tot})**

value of total current that all the output switches of a receiver can carry continuously at the same time under specified conditions

3.2.3.4**operation**

pair of changes of state of an output element, closure followed by opening or vice versa

3.3 Definitions of mechanical elements**3.3.1****base**

back of the receiver by which it is generally fixed and to which are attached the electronic board(s), the output element(s), the terminals or the terminal block and the cover

3.3.2**cover**

enclosure on the front of the receiver, made either of transparent or opaque material

3.3.3**case**

comprises the base and the cover

3.3.4**accessible conductive part**

conductive part which can be touched by the standard test finger when the receiver is installed and ready for use

3.3.5**protective earth terminal**

terminal connected to accessible conductive parts of a receiver for safety purposes

3.3.6**terminal block**

support made of insulating material on which all or some of the terminals of the receiver are grouped together

3.3.7**terminal cover**

cover which covers the receiver terminals and, generally, the ends of the external wires or cables connected to the terminals

3.3.8**clearance**

shortest distance measured in air between two conductive parts

3.3.9**creepage distance**

shortest distance measured over the surface of insulation between two conductive parts

3.4 Definitions of insulations**3.4.1****basic insulation**

insulation applied to live parts to provide basic protection against electric shock

NOTE Basic insulation does not necessarily include insulation used exclusively for functional purposes.

3.4.2 supplementary insulation

independent insulation applied in addition to the basic insulation, in order to provide protection against electric shock in the event of a failure of the basic insulation

3.4.3 double insulation

insulation comprising both basic insulation and supplementary insulation

3.4.4 reinforced insulation

single insulation system applied to live parts, which provides a degree of protection against electric shock equivalent to double insulation

NOTE The term "insulation system" does not imply that the insulation should be one homogeneous piece. It may comprise several layers which cannot be tested singly as supplementary or basic insulation.

3.4.5 insulation encased receiver of protective class II

receiver with a case of insulating material in which protection against electric shock does not rely on basic insulation only, but in which additional safety precautions, such as double insulation or reinforced insulation, are provided, there being no provision for protective earthing or reliance upon installation conditions

3.5 Definitions of influence quantities

3.5.1 influence quantity

any quantity, generally external to the receiver, which may affect its working performances

3.5.2 reference conditions

an appropriate set of influence quantities and performance characteristics, with reference values, their tolerances and reference ranges, with respect to which the working performances are specified

3.5.3 electromagnetic disturbances

conducted or radiated electromagnetic interferences which may functionally affect the operation of the receiver

3.5.4 reference temperature

ambient temperature specified for reference conditions

3.5.5 rated operating conditions

set of specified ranges for performance characteristics and specified operating ranges for influence quantities, within which the variations or working performances of a receiver are specified and determined

3.5.6 specified operating range

range of values of a single influence quantity which forms a part of the rated operating conditions

3.5.7 limit range of operation

extreme conditions which an operating receiver can withstand without damage and without degradation of its characteristics when it is subsequently operated under its rated operating conditions

3.5.8 storage and transport conditions

extreme conditions which a non-operating receiver can withstand without damage and without degradation of its characteristics when it is subsequently operated under its rated operating conditions

3.5.9 normal working position

position of the receiver defined by the manufacturer for normal service

3.6 Definition of tests

3.6.1 type test

procedure according to which the series of tests is carried out on one receiver or on a small number of receivers of the same type having identical characteristics, selected by the manufacturer, to verify that the respective type of receiver complies with all the requirements of this standard for the relevant class of receivers

4 Requirements

4.1 Standard electrical values

4.1.1 Rated supply voltage (U_n)

Standard values for U_n are 120 V and 230 V.

4.1.2 Rated supply frequency (f_n)

Standard values for f_n are 50 Hz and 60 Hz.

4.2 Mechanical requirements

4.2.1 General mechanical requirements

Receivers shall be designed and constructed in such a way as to avoid introducing any danger in normal use and under normal conditions, so as to ensure especially:

- personal safety against electric shock;
- personal safety against effects of excessive temperature;
- protection against spread of fire;
- protection against penetration of solid objects, dust and water.

All parts which are subject to corrosion under normal working conditions shall be effectively protected. Any protective coating shall not be liable to damage by ordinary handling, or damage due to exposure to air, under normal working conditions.

The receiver shall have adequate mechanical strength and shall withstand the elevated temperature which is likely to occur in normal working conditions.

The components shall be reliably fastened and secured against loosening.

The construction of the receiver shall be such as to minimize the risks of short-circuiting of the insulation between live parts and accessible conducting parts due to accidental loosening or unscrewing of the wiring, screws, etc.

4.2.2 Case

The receiver shall have a case which can be sealed in such a way that the internal parts of the receiver are accessible only after breaking the seal.

The case shall be designed according to protective class I or II.

The cover shall not be removable without the aid of a tool.

The case shall be so constructed and arranged that any non-permanent deformation cannot prevent the satisfactory operation of the receiver.

Unless otherwise specified, receivers intended to be connected to a supply mains where the voltage under reference conditions exceeds 250 V to earth, and whose case is wholly or partially made of metal, shall be provided with a protective earth terminal.

4.2.3 Terminals, terminal block(s), protective earth terminal

Terminals may be grouped in a) terminal block(s) having adequate insulating properties and mechanical strength. In order to satisfy such requirements when choosing insulating materials for the terminal block(s), adequate testing of materials should be taken into account.

The terminal block shall be so constructed that the ripple control receiver during any deformation caused by rated operating conditions shall comply with the insulation requirements and the clearance and creepage distances within this standard.

The holes in the insulating material which form an extension of the terminal holes shall be of sufficient size to accommodate also the insulation of the conductors.

The manner of fixing the conductors to the terminals shall ensure adequate and durable contact such that there is no risk of loosening or undue heating. Screw connections transmitting contact force and screw fixings which may be loosened and tightened several times during the life of the receiver shall screw into a metal nut.

For receivers with rated breaking currents up to 25 A, when screw type terminals are used, it shall be possible to connect in each terminal either one conductor of at least 1,5 mm² or 2 conductors of 1,5 mm².

If a system other than screw type terminals is used for connection of the conductors, this system shall retain its full efficiency after 20 connections and disconnections.

All parts of each terminal shall be such that the risk of corrosion resulting from contact with any other metal part is minimized.

Electrical connections shall be so designed that contact pressure is not transmitted through insulating material.

Terminals with different potentials which are grouped close together shall be protected against accidental short-circuiting. Protection may be obtained by insulating barriers. Terminals of one output circuit are considered to be at the same potential.

The terminals, the conductor fixing screws, or the external or internal conductors shall not be liable to come into contact with metal terminal covers.

The protective earth terminal, if any:

- a) shall be electrically bonded to the accessible metal parts;
- b) should if possible, form part of the receiver base;
- c) should preferably be located adjacent to its terminal block;
- d) shall accommodate a conductor having a cross-section at least equivalent to one of the output circuit of the highest rating.
- e) shall be clearly identified by the earthing symbol (see 60417-2-IEC-5019).