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Electricity metering (a.c.) – Tariff and load control –

Part 11: Particular requirements for electronic ripple control receivers

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRICITY METERING (AC) – TARIFF AND LOAD CONTROL –

Part 11: Particular requirements for electronic ripple control receivers

FOREWORD

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International Standard IEC 62054-11 has been prepared by IEC technical committee 13: Equipment for electrical energy measurement and load control. This standard, in conjunction with IEC 62052-21, cancels and replaces IEC 61037:1990, *Electricity metering – Tariff and load control – Particular requirements for electronic ripple control receivers.*

This standard is to be used in conjunction with IEC 62052-21 and the relevant parts of the IEC 62059 series.

The text of this standard is based on the following documents:

FDIS	Report on voting
13/1306/FDIS	13/1315/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until 2013. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

INTRODUCTION

This standard distinguishes between protective class I and protective class II equipment

The test levels are regarded as minimum values to guarantee the proper functioning of the equipment under normal working conditions. For special applications, other test levels might be necessary and should be agreed on between the user and the manufacturer.

Ripple control receivers are components of a system of remote control permitting the simultaneous operation of a large number of receivers from a central point. The signal generally used for this purpose is an audio-frequency voltage superimposed on the mains frequency and coded in the form of pulses, which can provide a multiplicity of control functions. Other types of signals, such as frequency modulation, deformation of the mains frequency, etc. may also be used. These signals are propagated through the electricity supply network, from the injection point to the receiver sites.

Some characteristics of such systems, for example, the value of the frequency or the method of coding, are not standardized here.

To facilitate the application of this standard the following principles should be applied.

1) The requirements of this standard are not limiting. If it is absolutely unavoidable, a user can add additional technical requirements in his specification.

   The technical requirements and tests relate to the general functioning of the receiver. The method of operation of the functional elements is not specified. These requirements and tests may, however, be the subject of additional technical agreements.

2) Ripple control systems are auxiliary equipment for network operation. Their design is determined by the network characteristics and other factors. At the present time rapid development of power electronic equipment is leading to a parallel increase in the amount of harmonic distortion in the supply voltage. The harmonic levels indicated in this standard take account of this development. They are not to be considered as values that could be regarded as permissible on the network but as recommended values for designing and testing receivers. These recommended levels could be adapted to particular characteristics of networks under consideration.

   Receivers designed for use with transmitters already in operation and having a control frequency equal, or very close, to a harmonic, need not conform to the whole of the requirements of this standard.

For information, the relevant parts of IEC 62052, IEC 62054 and IEC 62059 are listed below.

IEC 62052-21 Electricity metering equipment (a.c.) – General requirements, tests and test conditions – Part 21: Tariff and load control equipment

(*Replaces the general requirements of IEC 61037 and IEC 61038.)*

IEC 62054-11 Electricity metering – Tariff and load control – Part 11: Particular requirements for electronic ripple control receivers

(*Replaces the particular requirements of IEC 61037.)*

IEC 62054-21 Electricity metering – Tariff and load control – Part 21: Particular requirements for time switches

(*Replaces the particular requirements of IEC 61038.)*

IEC 62059-11 Electricity metering equipment – Dependability – Part 11: General concepts

IEC 62059-21 Electricity metering equipment – Dependability – Part 21: Collection of meter dependability data from the field

IEC 62059-41 Electricity metering equipment – Dependability – Part 41: Reliability prediction[1]

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[1] To be published.

ELECTRICITY METERING (AC) – TARIFF AND LOAD CONTROL –

Part 11: Particular requirements for electronic ripple control receivers

1 Scope

This part of IEC 62054 specifies particular requirements for the type test of newly manufactured 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.

In the case where ripple control functionality is integrated in multifunction electricity metering equipment, the relevant parts of this standard apply.

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 D.

The dependability aspect is covered by the documents of the IEC 62059 series.

When using this standard in conjunction with IEC 62052-21, the requirements of this standard take precedence over those of IEC 62052-21 with regard to any item already covered in it.

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.

IEC 62052-21, *Electricity metering equipment (a.c.) – General requirements, tests and test conditions – Part 21: Tariff and load control equipment* [2]

3 Terms and definitions

For the purposes of this document, the definitions of IEC 62052-21 apply.

4 Standard electrical values

The values given in IEC 62052-21 apply.

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[2] To be published

5 Mechanical requirements and tests

The requirements and tests specified in IEC 62052-21 and the following apply.

5.1 Operation status indicator

The receiver shall have an operation status indicator to indicate the quiescent state, the message reception or the command execution.

6 Climatic conditions, requirements and tests

The conditions, requirements and tests specified in IEC 62052-21 apply.

7 Electrical requirements and tests

The requirements and tests specified in IEC 62052-21 and the following apply.

7.1 Supply voltage

7.1.1 Supply voltage range

The values specified in IEC 62052-21 apply.

7.1.2 Supply frequency range

IEC 62052-21 applies.

7.1.3 Power consumption

IEC 62052-21 applies.

7.1.4 Voltage dips and short interruptions

See 7.6.8.

7.1.5 Long interruptions of supply voltage

7.1.5.1 Requirements

If the position of the output elements is controlled only by the information received from the decoding element – the ripple control messages – the output elements shall not change their position at an interruption of the supply voltage, the length of which is to be agreed on between user and supplier, or shall take up the pre-determined position within 5 s after the restoration of the nominal supply voltage.

If the position of the output elements is also affected by the timers of the ripple control receiver, then the output elements shall take up their position according to the timer programme.

7.1.5.2 Test of effect of a long interruption of the supply voltage

The test consists of verifying that, after interrupting the supply voltage for an agreed length of time and when the supply is restored to the receiver, the output elements retain or return to the position that they had before the interruption or that they take up the predetermined position agreed between the user and the supplier.

This test shall be carried out for all possible positions of the output switches.

The restoration of voltage shall be made with switching devices free from bounce.

7.1.6 Operation reserve

7.1.6.1 Requirements

If the ripple control receiver is equipped with a back-up power supply, IEC 62052-21 applies.

7.1.6.2 Tests

The test consists of verifying that, after interrupting the supply for a time period of 36 h, the internal timers of the ripple control receiver maintain their value and when the supply is restored to the receiver, the output elements take up the position according to the timer programme.

7.1.7 Life of back-up power supply

If the ripple control receiver is equipped with a back-up power supply, IEC 62052-21 applies.

7.1.8 Back up power supply replacement

If the ripple control receiver is equipped with a back-up power supply, IEC 62052-21 applies.

7.2 Heating

IEC 62052-21 applies.

7.3 Insulation

IEC 62052-21 applies.

7.4 Output elements

IEC 62052-21 applies.

7.5 Functional requirements and tests – Control performance

7.5.1 General test conditions

Place the ripple control receiver under test in its normal operating position and, if necessary, in a climatic chamber and supply it from an apparatus free of short interruptions and voltage dips. Unless otherwise indicated, the reference conditions shown in Annex B of IEC 62052-21 shall be maintained.

The sources providing the neighbouring harmonics shall conform to the requirements of 7.6.12.2.1.

7.5.2 Operate voltage

7.5.2.1 Requirements

The operate voltage shall be agreed upon case by case taking into account the characteristics of the ripple control system, the supply network, the manufacturing tolerances and the variations of the influence quantities:

– supply voltage;
– supply frequency;

– temperature;
– harmonics/interharmonics;
– control frequency.

7.5.2.2 Test of operation

The correct operation of the receiver shall be tested successively for all the combinations of parameters, which are shown in Table C.1 in accordance with the requirements of 7.6.11, the control frequency varying within limits agreed between the user and the supplier.

For all these combinations, the receiver tested shall operate faultlessly and carry out the commands corresponding to messages transmitted according to their codes, both at the operate voltage U_f and at the maximum control voltage U_{max}.

NOTE It is assumed that if the ripple control receiver passes the test both at U_f and U_{max}, it will work correctly between these limits.

7.5.3 Non-operate voltage

7.5.3.1 Requirements

The non-operate voltage shall be agreed upon case by case taking into account the characteristics of the ripple control system, the supply network, the manufacturing tolerances and the variations of the influence quantities:

– supply voltage;
– supply frequency;
– temperature;
– harmonics/interharmonics;
– control frequency.

7.5.3.2 Test of non-operation

For this test, apply all the combinations of parameters given in Annex C in accordance with the requirements of 7.6.11, the control frequency varying within the limits agreed between the user and the supplier.

For all these combinations, the receiver tested shall not switch in response to a correctly coded message at the non-operate voltage U_{nf}.

7.5.4 Maximum control voltage

For control frequencies below 250 Hz, the maximum voltage shall be at least 8 times and, for frequencies above 750 Hz, at least 15 times greater than the operate voltage. For intermediate frequencies, a linear interpolation shall be made according to the following formula:

$$U_{max} = U_f \left(8 + \frac{(f_s - 250) \times 7}{500} \right)$$

where f_s is expressed in hertz.