SLOVENSKI STANDARD
SIST EN 60834-1:2001

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Teleprotection eqiupment of power systems - Performance and testing - Part 1: Command systems (IEC 60834-1:1999)

Teleprotection equipment of power systems - Performance and testing -- Part 1: Command systems

Schutzsignal-Übertragungseinrichtungen für Energieversorgungsnetze - Leistungsmerkmale und Prüfungen -- Teil 1: Systeme mit Übertragung von Befehlen

Matériels de téléprotection des réseaux d'énergie électrique - Performances et essais -- Partie 1: Systèmes de commande

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EUROPEAN STANDARD

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English version

Teleprotection equipment of power systems
Performance and testing
Part 1: Command systems
(IEC 60834-1:1999)

Matériels de téléprotection des réseaux d'énergie électrique
Performances et essais
Partie 1: Systèmes de commande
(CEI 60834-1:1999)

Schutzsignal-Übertragungseinrichtungen für Energieversorgungsnetze
Leistungsmerkmale und Prüfungen
Teil 1: Systeme mit Übertragung von Befehlen
(IEC 60834-1:1999)

This European Standard was approved by CENELEC on 1999-12-01. 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.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

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Foreword

The text of document 57/406/FDIS, future edition 2 of IEC 60834-1, prepared by IEC TC 57, Power system control and associated communications, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60834-1 on 1999-12-01.

This European Standard supersedes HD 543.1 S1:1991.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2000-09-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2002-12-01

Annexes designated "normative" are part of the body of the standard.
Annexes designated "informative" are given for information only.
In this standard, annex ZA is normative and annexes A, B and C are informative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60834-1:1999 was approved by CENELEC as a European Standard without any modification.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE: When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60050-151	1978	International Electrotechnical Vocabulary (IEV) Chapter 151: Electrical and magnetic devices	-	-
IEC 60050-448	1995	Chapter 448: Power system protection	-	-
IEC 60060-1 + corr. March	1989 1990	High-voltage test techniques Part 1: General definitions and test requirements	HD 588.1 S1	1991
IEC 60870-2-1	1995	Telecontrol equipment and systems Part 2: Operating conditions Section 1: Power supply and electromagnetic compatibility	EN 60870-2-1	1996
IEC 60870-2-2	1996	Part 2: Operating conditions Section 2: Environmental conditions (climatic, mechanical and other non-electrical influences)	EN 60870-2-2	1996
IEC 61000-4-1	1992	Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques Section 1: Overview of immunity tests Basic EMC publication	EN 61000-4-1	1994
ITU-T G.823	1993	The control of jitter and wander within digital networks which are based on the 2048 kbit/s hierarchy	-	-
CISPR 22 (mod)	1997	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement	EN 55022 + corr. August	1998 1999

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Part 1: Command systems

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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TELEPROTECTION EQUIPMENT OF POWER SYSTEMS – PERFORMANCE AND TESTING –

Part 1: Command systems

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The 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 the 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 National Committees.

3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical reports or guides and they are accepted by the National Committees in that sense.

4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.

5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.

6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60834-1 has been prepared by IEC technical committee 57: Power system control and associated communications.

This second edition cancels and replaces the first edition published in 1988.

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

FDIS	Report on voting
57/406/FDIS	57/425/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 3.

Annexes A, B and C are for information only.

The committee has decided that this publication remains valid until 2004. At this date, in accordance with the committee's decision, the publication will be

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

TELEPROTECTION EQUIPMENT OF POWER SYSTEMS – PERFORMANCE AND TESTING –

Part 1: Command systems

1 General

1.1 Scope

This part of IEC 60834 applies to teleprotection command systems used to convey command information, generally in conjunction with protection equipment. It aims at establishing performance requirements and recommended testing methods for command type teleprotection equipment. The information conveyed by the teleprotection equipment can be in analogue or digital form.

The command type teleprotection equipment referred to in this standard can be power line carrier equipment or voice frequency equipment which is used in connection with various telecommunication systems, such as power line carrier (PLC), radio links, optical fibre, rented circuits, leased or privately owned cables. In addition the command type teleprotection can be digital equipment which is used with a digital telecommunication system or media such as optical fibres, radio links, leased or privately owned digital links.

The command type teleprotection equipment may be separate or provided as an integral part of the protection equipment.

In addition to teleprotection equipment performance tests, tests have to be carried out on the power supply of the teleprotection equipment. All the tests should be regarded as type tests.

NOTE – According to the International Electrotechnical Vocabulary (IEV), a type test is defined as a test of one or more devices made to a certain design to show that the design meets certain specifications.

1.2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60834. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 60834 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60050(151):1978, *International Electrotechnical Vocabulary – Chapter 151: Electrical and magnetic devices*

IEC 60050(448):1995, *International Electrotechnical Vocabulary – Chapter 448: Power system protection*

IEC 60060-1:1989, *High voltage test techniques – Part 1: General definitions and test requirements*

IEC 60870-2-1:1995, *Telecontrol equipment and systems – Part 2: Operating conditions – Section 1: Power supply and electromagnetic compatibility*

IEC 60870-2-2:1996, *Telecontrol equipment and systems – Part 2: Operating conditions – Section 2: Environmental conditions (climatic, mechanical and other non-electrical influences)*

IEC 61000-4-1:1992, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 1: Overview of immunity tests. Basic EMC publication*

ITU-T G.823:1993, *The control of jitter and wander within digital networks which are based on the 2048 kbit/s hierarchy*

CISPR 22:1997, *Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement*

1.3 Service conditions

With reference to IEC 60870-2-1 and IEC 60870-2-2, the following specifications shall apply.

Special requirements or detailed specifications for other environmental conditions (climatic, mechanical or other non-electrical influences), not covered in the following but considered relevant for the proper operation and life of the equipment, shall be agreed between user and manufacturer, preferably referring to specific classes mentioned in the IEC references above.

Class C2 is the preferred specification for severe environments (temperature range: –25 °C to +55 °C) except that high relative humidity shall be specified as 95 %.

1.3.1 Ambient conditions

The stated performance requirements shall be satisfied for the conditions corresponding to location class B3 (enclosed locations – air temperature controlled), the main characteristic being the following:

- temperature range +5 °C to +40 °C

1.3.2 Supply voltage with battery operation

The nominal d.c. voltage is typically 250 V, 220 V, 125 V, 110 V, 60 V, 48 V or 24 V.

The stated performance requirements shall be satisfied for the following voltage tolerance class:

- voltage tolerance DC3 –20 % to +15 %

1.3.3 Supply voltage with a.c. mains operation

The nominal a.c. voltage shall be chosen from the preferred values of 230 V r.m.s. or 110 V r.m.s single-phase 50 Hz or 60 Hz.

The stated performance requirements shall be satisfied for the following tolerance classes:

- voltage tolerance AC2 +10 % to –15 %
- frequency tolerance F3 ±5 %
- harmonic content H1 <5 %

1.3.4 Storage conditions

During storage or shipment, the equipment shall not suffer any damage when the ambient conditions correspond to location class C3 for storage and to class C2 for transportation, the main characteristic being:

- temperature range –40 °C to +70 °C

1.4 Telecommunication system used

The telecommunication system can be

a) cable links for voice frequency transmission;
b) carrier frequency links for cables and overhead lines;
c) carrier frequency links on aerial cables on power lines;
d) power line carrier (PLC) links;
e) point-to-point radio links (microwave);
f) leased circuits;
g) optical fibres.

The telecommunication systems should be chosen with care since they can be influenced by noise, change of parameters and other types of interference which may cause unwanted operation or the non-operation of the teleprotection equipment.

Figure 1 shows teleprotection equipment working in an audio-frequency configuration (e.g. using part of a 4 kHz band). The signals are conveyed from the transmitter to the receiver via a telecommunication system.

Figure 2 shows a configuration using a power line carrier link.

Figures 1 and 2 apply to teleprotection systems transmitting and receiving frequency shift keyed carrier or normally quiescent signals.

Figure 3 shows a configuration in which digital teleprotection is directly connected via an optical fibre.

Figure 4 is an alternative arrangement where the digital teleprotection is connected to a digital telecommunication system via multiplexing equipment.

Figures 3 and 4 apply to teleprotection systems transmitting and receiving digital data.

Figures 1 to 4 serve only as examples. Other configurations are possible but are not shown.

1.5 Definitions

For the purposes of this part of IEC 60834, the following definitions apply. Refer also to figure 5 which clarifies the relationship between terms in use.

1.5.1
protection
the provisions for detecting faults or other abnormal conditions in a power system, for enabling fault clearance, for terminating abnormal conditions, and for initiating signals or indications

NOTE 1 – The term "protection" is a generic term for protection equipments or protection systems.

NOTE 2 – The term "protection" may be used to describe the protection of a complete power system or the protection of individual plant items in a power system e.g. transformer protection, line protection, generator protection.

NOTE 3 – Protection does not include items of power system plant provided, for example, to limit overvoltages on the power system. However, it includes items provided to control the power system voltage or frequency deviations such as automatic reactor switching, load-shedding, etc.

[IEV 448-11-01]

1.5.2
protection equipment
an equipment incorporating one or more protection relays and, if necessary, logic elements intended to perform one or more specified protection functions

NOTE – A protection equipment is part of a protection system.

Example: Distance protection equipment, phase comparison protection equipment. (One-phase comparison equipment is part of one line-end of a phase comparison protection system.)

[IEV 448-11-03]

1.5.3
protection system
an arrangement of one or more protection equipments, and other devices intended to perform one or more specified protection functions

NOTE 1 – A protection system includes one or more protection equipments, instrument transformer(s), wiring, tripping circuit(s), auxiliary supply(s) and, where provided, communication system(s). Depending upon the principle(s) of the protection system, it may include one end or all ends of the protected section and, possibly, automatic reclosing equipment.

NOTE 2 – The circuit-breaker(s) are excluded.

[IEV 448-11-04]

1.5.4
selectivity of protection
the ability of a protection to identify the faulty section and/or phase(s) of a power system

[IEV 448-11-06]

1.5.5
unit protection
a protection whose operation and section selectivity are dependent on the comparison of electrical quantities at each end of the protected section

NOTE – In the USA, the term "unit protection" designates the protection provided for an electrical generator.

[IEV 448-11-09]

1.5.6
non-unit protection
a protection whose operation and section selectivity are dependent on the measurement of electrical quantities at one end of the protected section by the measuring relays and, in some cases, on the exchange of logic signals between the ends

NOTE – The section selectivity of non-unit protection may depend upon its setting, particularly with regard to time.

[IEV 448-11-10]

1.5.7
distance protection
a non-circuit protection whose operation and selectivity depend on local measurement of electrical quantities from which the equivalent distance to the fault is evaluated by comparing with zone settings

[IEV 448-14-01]

1.5.8
underreach
the condition of a protection, generally distance protection, when the shortest zone setting corresponds to a reach shorter than the protected section

[IEV 448-14-05]

1.5.9
overreach
the condition of a protection, generally distance protection, when the shortest zone setting corresponds to a reach longer than the protected section

[IEV 448-14-07]

1.5.10
teleprotection equipment
equipment specially designed to be used in conjunction with a protection system. The teleprotection equipment, which is connected to a telecommunication link between both ends of the protected circuit, transforms the information given by the protection equipment into a form suitable for transmission