SLOVENSKI STANDARD

SIST EN 60870-5-102:1997

01-avgust-1997

Telecontrol equipment and systems - Part 5: Transmission protocols - Section 102: Companion standard for the transmission of integrated totals in electric power systems (IEC 870-5-102:1996)

Telecontrol equipment and systems -- Part 5: Transmission protocols -- Section 102: Companion standard for the transmission of integrated totals in electric power systems

Fernwirkeinrichtungen und -systeme -- Teil 5: Übertragungsprotokolle -- Hauptabschnitt 102: Anwendungsbezogene Norm für die Zählerstandsübertragung in der Elektritätsversorgung

Matériels et systèmes de téléconduite -- Partie 5: Protocoles de transmission -- Section 102: Norme d'accompagnement pour la transmission de totaux intégrés dans un système électrique de puissance

Ta slovenski standard je istoveten z: **EN 60870-5-102:1996**

ICS:

33.200	Daljinsko krmiljenje, daljinske meritve (telemetrija)	Telecontrol. Telemetering

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EN 60870-5-102

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Descriptors: Telecontrol, transmission protocols, companion standard, electricity consumption, electric power system, physical layer, data link layer, application layer, interoperability

English version

Telecontrol equipment and systems
Part 5: Transmission protocols
Section 102: Companion standard for the transmission of integrated totals in electric power systems
(IEC 870-5-102:1996)

Matériels et systèmes de téléconduite
Partie 5: Protocoles de transmission
Section 102: Norme d'accompagnement pour la transmission de totaux intégrés dans un système électrique de puissance
(CEI 870-5-102:1996)

Fernwirkeinrichtungen und -systeme
Teil 5: Übertragungsprotokolle
Hauptabschnitt 102: Anwendungsbezogene Norm für die Zählerstandsübertragung in der Elektrizität
(IEC 870-5-102:1996)

This European Standard was approved by CENELEC on 1996-07-02. 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
Europäisches Komitee für Elektrotechnische Normung

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

Foreword

The text of document 57/254/FDIS, future edition 1 of IEC 870-5-102, 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 60870-5-102 on 1996-07-02.

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) 1997-04-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1997-04-01

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 and B are informative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 870-5-102:1996 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 50(371)	1984	International electrotechnical vocabulary (IEV) - Chapter 371: Telecontrol	-	-
IEC 870-1-1	1988	Telecontrol equipment and systems Part 1: General considerations Section 1: General principles	-	-
IEC 870-1-3	1990	Section 3: Glossary	-	-
IEC 870-1-4	1994	Section 4: Basic aspects of telecontrol data transmission and organization of standards IEC 870-5 and IEC 870-6	-	-
IEC 870-5-1	1990	Part 5: Transmission protocols Section 1: Transmission frame formats	EN 60870-5-1	1993
IEC 870-5-2	1992	Section 2: Link transmission procedures	EN 60870-5-2	1993
IEC 870-5-3	1992	Section 3: General structure of application data	EN 60870-5-3	1992
IEC 870-5-4	1993	Section 4: Definition and coding of application information elements	EN 60870-5-4	1993
IEC 870-5-5	1995	Section 5: Basic application functions	EN 60870-5-5	1995
IEC 870-5-101	1995	Section 101: Companion standard for basic telecontrol tasks	EN 60870-5-101	1996
ISO/IEC 8482	1993	Information technology Telecommunications and information exchange between systems - Twisted pair multipoint interconnections	-	-
ITU-T V.24	1994	List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE)	-	-

Publication	Year	Title	EN/HD	Year
ITU-T V.28	1994	Electrical characteristics for unbalanced double-current interchange circuits	-	-

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Telecontrol equipment and systems –

Part 5:
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Section 102: Companion standard for the transmission of integrated totals in electric power systems

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

TELECONTROL EQUIPMENT AND SYSTEMS –

Part 5: Transmission protocols – Section 102: Companion standard for the transmission of integrated totals in electric power 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. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 870-5-102 has been prepared by IEC technical committee 57: Power system control and associated communications.

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

FDIS	Report on voting
57/254/FDIS	57/273/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.

Annexes A and B are for information only.

INTRODUCTION

This section of IEC 870-5 serves as a companion standard for the transmission of integrated totals in electric power systems based on the series of international standards IEC 870-5.

TELECONTROL EQUIPMENT AND SYSTEMS –

Part 5: Transmission protocols – Section 102: Companion standard for the transmission of integrated totals in electric power systems

1 Scope and object

The purpose of this section of IEC 870-5 is to standardize the transmission of integrated totals representing the amount of electrical energy transferred between power utilities, or between a power utility and independent producers on a high voltage (HV) or medium voltage (MV) network as a part of EMS (energy management systems) functionality. This section is not concerned with the low voltage (LV) networks or the interfaces to the energy consumption meters themselves.

In general the values of integrated totals are transmitted at periodic intervals to update the energy interchanged between utilities or between heavy industry and utilities. The periodically received information is used for supervisory and control purposes of energy distribution in wide area networks. The defined data transmission protocol specifies particular means of security against corruption of the transmitted application data from source to destination. Upgraded provisions of data integrity are desirable because interchange accounting may be based on the correct transfer of this information.

Standards specified in this section of IEC 870-5 are compatible with standards defined in IEC 870-5-1 to IEC 870-5-5 (see clause 2).

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this section of IEC 870-5. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this section of IEC 870-5 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 50(371): 1984, *International Electrotechnical Vocabulary (IEV) – Chapter 371: Telecontrol*

IEC 870-1-1: 1988, *Telecontrol equipment and systems – Part 1: General considerations – Section one: General principles*

IEC 870-1-3: 1990, *Telecontrol equipment and systems – Part 1: General considerations – Section three: Glossary*

IEC 870-1-4: 1994, *Telecontrol equipment and systems – Part 1: General considerations – Section 4: Basic aspects of telecontrol data transmission and organization of standards of IEC 870-5 and IEC 870-6*

IEC 870-5-1: 1990, *Telecontrol equipment and systems – Part 5: Transmission protocols – Section one: Transmission frame formats*

IEC 870-5-2: 1992, *Telecontrol equipment and systems – Part 5: Transmission protocols – Section 2: Link transmission procedures*

IEC 870-5-3: 1992, *Telecontrol equipment and systems – Part 5: Transmission protocols – Section 3: General structure of application data*

IEC 870-5-4: 1993, *Telecontrol equipment and systems – Part 5: Transmission protocols – Section 4: Definition and coding of application information elements*

IEC 870-5-5: 1995, *Telecontrol equipment and systems – Part 5: Transmission protocols – Section 5: Basic application functions*

IEC 870-5-101: 1995, *Telecontrol equipment and systems – Part 5: Transmission protocols – Section 101: Companion standard for basic telecontrol tasks*

ISO/IEC 8482: 1993, *Information technology – Telecommunications and information exchange between systems – Twisted pair multipoint interconnections*

ITU-T V.24: 1994, *List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE)*

ITU-T V.28: 1994, *Electrical characteristics for unbalanced double-current interchange circuits*

3 Definitions

For the purpose of this section of IEC 870-5, the following definitions apply.

3.1 **companion standard:** A companion standard adds semantics to the definitions of the basic standard or a functional profile. This may be expressed by defining particular uses for information objects or by defining additional information objects, service procedures and parameters of the basic standard.

NOTE – Companion standards do not alter the standards to which they refer, but make explicit the relationship between those used together for a specific domain of activity.

3.2 **integrated total; counter reading:** The integral of a quantity over a time.

3.3 **integrated total data terminal equipment:** Equipment which updates integrated totals of energy interchange at transfer points of energy flow and presents this information for transmission to remote locations.

3.4 **record address of integration period:** Identification of particular integration periods.

3.5 **date of standard:** The date of the release of a companion standard.

3.6 **signature:** The arithmetic sum modulo 256 over all octets of an integrated total and its associated identification field.

3.7 **control direction:** The direction of transmission from the controlling station to a controlled station.

3.8 **monitor direction:** The direction of transmission from a controlled station to the controlling station.

4 Protocol structure

The IEC 870-5 protocol is based on the three-layer reference model "ENHANCED PERFORMANCE ARCHITECTURE" (EPA), as specified in clause 4 of IEC 870-5-3.

The physical layer uses ITU-T recommendations that provide binary symmetric and memoryless transmission on the required medium in order to preserve the high level of data integrity of the defined block encoding method in the link layer.

The link layer consists of a number of link transmission procedures using explicit LINK PROTOCOL CONTROL INFORMATION (LPCI) that are capable of carrying APPLICATION SERVICE DATA UNITS (ASDUs) as link-user data. The link layer uses a selection of frame formats to provide the required integrity/efficiency and convenience of transmission.

The application layer contains a number of application functions that involve the transmission of ASDUs between source and destination.

The application layer of this companion standard does not use explicit APPLICATION PROTOCOL CONTROL INFORMATION (APCI). This is implicit in the contents of the ASDU DATA UNIT IDENTIFIER field and in the type of link service used.

Figure 1 shows the EPA model and the selected standard definitions of the companion standard.

Selected application functions of IEC 870-5-5	User process
Selected application information elements of IEC 870-5-4	Application (layer 7)
Selected application service data units of IEC 870-5-3	
Selected link transmission procedures of IEC 870-5-2	Link (layer 2)
Selected transmission frame formats of IEC 870-5-1	
Selected ITU-T recommendations	Physical (layer 1)

Figure 1 – Selected standards of this companion standard for transmission of integrated totals

5 Physical layer

5.1 *Selections from ISO and ITU-T recommendations*

The following fixed network configurations are supported:

- point-to-point;
- multiple point-to-point;
- multipoint-star;
- multipoint-partyline;
- dialled point-to-point.

The subset of ITU-T recommendations V.24/V.28, defined in 5.1.1, is valid.

In case of digital transmission methods using digital signal multiplexers the X.24/X.27 interface may be used for channels up to 64 kbit/s by special agreement (see 5.1.2).

In this companion standard the data circuit is treated separately from the integrated total data terminal equipment (DTE) because it is often implemented by separate hardware. Consequently the companion standard includes a full specification of the DTE/DCE (data circuit terminating equipment) interface but only a requirement specification for suitable DCEs is given.

5.1.1 *Unbalanced interchange circuit V.24/V.28*

This companion standard specifies a subset of the ITU-T recommendation V.24, using the signal levels specified by recommendation V.28.

Table 1 – Selections from V.24/V.28

Interchange circuit number	Interchange circuit name	From DCE	To DCE
102	Signal ground or common return	–	–
103	Transmitted data		X
104	Received data	X	
105 [1]	Request to send		X
106 [2]	Ready for sending	X	
107 [2]	Data set ready	X	
108 [1]	Data terminal ready		X
109 [2]	Data channel received line signal detector	X	

[1] May have constant potential.

[2] Not mandatory. It can be used to supervise the transmission circuit.

The standard transmission speeds may be specified for the directions of transmission and reception separately. The following choice of standard transmission speeds of the V.24/V.28 FSK-interface are supported:

100 bit/s	200 bit/s
300 bit/s	600 bit/s
1,2 kbit/s	

The standard transmission speeds of the V.24/V.28 MODEM-interface are:

300 bit/s	600 bit/s
1,2 kbit/s	2,4 kbit/s
4,8 kbit/s	9,6 kbit/s

Data transmission methods that are used to increase the exploitation of the bandwidth of a given transmission channel should be avoided unless it can be proven that the used method (that usually violates the required memoryless channel encoding principle) does not reduce the data integrity of the data block encoding method of the frame format FT 1.2.

5.1.2 *Balanced interchange circuit X.24/X.27*

Table 2 shows the balanced interchange circuit X.24/X.27 (used synchronously) to digital signal multiplexers. The interface that is operated with symmetric difference signals is suited for 64 kbit/s.

Table 2 – Selection from X.24/X.27 for interfaces to synchronous digital signal multiplexers

Interchange circuit number	Interchange circuit name	From DCE	To DCE
G	Signal ground or common return	–	–
T	Transmit		X
R	Receive	X	
C [1)]	Control		X
I [1)]	Indication	X	
S	Signal element timing	X	

1) Control and indication signals are dispensable if DTEs are connected to the digital signal multiplexer. The signals may, however, be used for supervisory purposes.

The standard transmission speeds may be specified for the directions of transmission and reception separately.

The standard transmission speeds are:

2,4 kbit/s	4,8 kbit/s
9,6 kbit/s	19,2 kbit/s
38,4 kbit/s	56 kbit/s
64 kbit/s	

5.1.3 *Other compatible interfaces*

Other interfaces such as ISO 8482 or interfaces to fibre optics, etc, are permitted by agreement between vendor and user.