SLOVENSKI STANDARD
SIST EN 60870-5-5:1997

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Telecontrol equipment and systems - Part 5: Transmission protocols - Section 5: Basic application functions (IEC 870-5-5:1995)

Telecontrol equipment and systems -- Part 5: Transmission protocols - Section 5: Basic application functions

Fernwirkeinrichtungen und -systeme -- Teil 5: Übertragungsprotokolle - Hauptabschnitt 5: Grundlegende Anwendungsfunktionen

Matériels et systèmes de téléconduite -- Partie 5: Protocoles de transmission - Section 5: Fonctions d'application de base

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ICS:

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SIST EN 60870-5-5:1997 **en**

EUROPEAN STANDARD

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English version

Telecontrol equipment and systems
Part 5: Transmission protocols
Section 5: Basic application functions
(IEC 870-5-5:1995)

Matériels et systèmes de téléconduite
Partie 5: Protocoles de transmission
Section 5: Fonctions d'application de base
(CEI 870-5-5:1995)

Fernwirkeinrichtungen und -systeme
Teil 5: Übertragungsprotokolle
Hauptabschnitt 5: Grundlegende Anwendungsfunktionen
(IEC 870-5-5:1995)

This European Standard was approved by CENELEC on 1995-07-04. 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 57/200/DIS, future edition 1 of IEC 870-5-5, 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 60870-5-5 on 1995-07-04.

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) 1996-04-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1996-04-01

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.

Endorsement notice

The text of the International Standard IEC 870-5-5:1995 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 870-5-1	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
ISO 7498	1984	Information processing systems Open systems interconnection Basic reference model	-	-

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Section 5: Fonctions d'application de base

Telecontrol equipment and systems –

Part 5:
Transmission protocols –
Section 5: Basic application functions

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CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

TELECONTROL EQUIPMENT AND SYSTEMS –

Part 5: Transmission protocols –

Section 5: Basic application functions

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 cooperation 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, prepared by technical committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.

3) They have the form of recommendations for international use 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.

International Standard IEC 870-5-5 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:

DIS	Report on voting
57/200/DIS	57/227/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.

INTRODUCTION

This section of IEC 870-5 specifies an assortment of basic application functions for use in telecontrol systems.

TELECONTROL EQUIPMENT AND SYSTEMS –

Part 5: Transmission protocols –

Section 5: Basic application functions

1 Scope and object

This section of IEC 870-5 applies to telecontrol equipment and systems with coded bit serial data transmission for monitoring and controlling geographically widespread processes. It defines basic application functions that perform standard procedures for telecontrol systems. Basic application functions are application procedures that reside beyond layer 7 (application layer) of the ISO reference model for open communication systems. The defined application procedures utilize standard services of the application layer. The specifications of this section serve as basic standards for different companion standards that will be elaborated in detail for specific telecontrol tasks. Each companion standard may use a specific selection of the defined functions. Basic application functions, which are not in this section but are found necessary for defining telecontrol companion standards, should be specified in these companion standards. Only the definition of companion standards will enable interoperability among compatible telecontrol equipment.

The general structure of application service data units (ASDUs) used by procedures specified in this section are defined in IEC 870-5-3.

Standards specified in this section are compatible with standards defined in sections 1 to 4 of IEC 870-5 (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 870-5-1: 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*

ISO 7498: 1984, *Information processing systems – Open Systems Interconnection – Basic Reference Model*

3 Definitions

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

3.1 basic application function (in telecontrol): Transmission procedure that performs a supervisory or control function that is generally used in telecontrol systems.

Examples: command transmission, event transmission, cyclic transmission, etc.

3.2 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.

3.3 enhanced performance architecture (EPA): A protocol reference model that provides, compared with the full seven-layer architecture according to the OSI basic reference model (ISO 7498), a three-layer architecture for obtaining faster response times for the critical information, but with service limitations.

3.4 compound data field (CP): A sequence of data fields with successive bit allocations that forms an information element.

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

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

4 Application services

Each application process can have a "primary application function" and a "secondary application function". A "primary application function" is part of an application process that initiates application requests to a remote application process by means of a "secondary application function" belonging to the latter. Requested tasks are executed via communication services that involve the transmission of protocol data units (PDUs). Sequential procedures of communication services are described by means of sequences of service primitives.

4.1 *Application service primitives*

A primary application initiates a function by a service request primitive "request". Confirmed application services require responses from the secondary application. The secondary application returns associated responses by service response primitives that are delivered to the primary application by service confirm primitives (see figure 1).

Service.request (.req) The primary application initiates a request by this service primitive to a remote secondary application function via the communication services.

Service.indication (.ind) The communication services use this service primitive to deliver the service indication request to the secondary application function.

Service.response (.res) The secondary application function uses this service primitive to respond to a request from the communication services.

Service.confirm (.con) The communication services use this service primitive to deliver the response of the secondary to the primary application function.

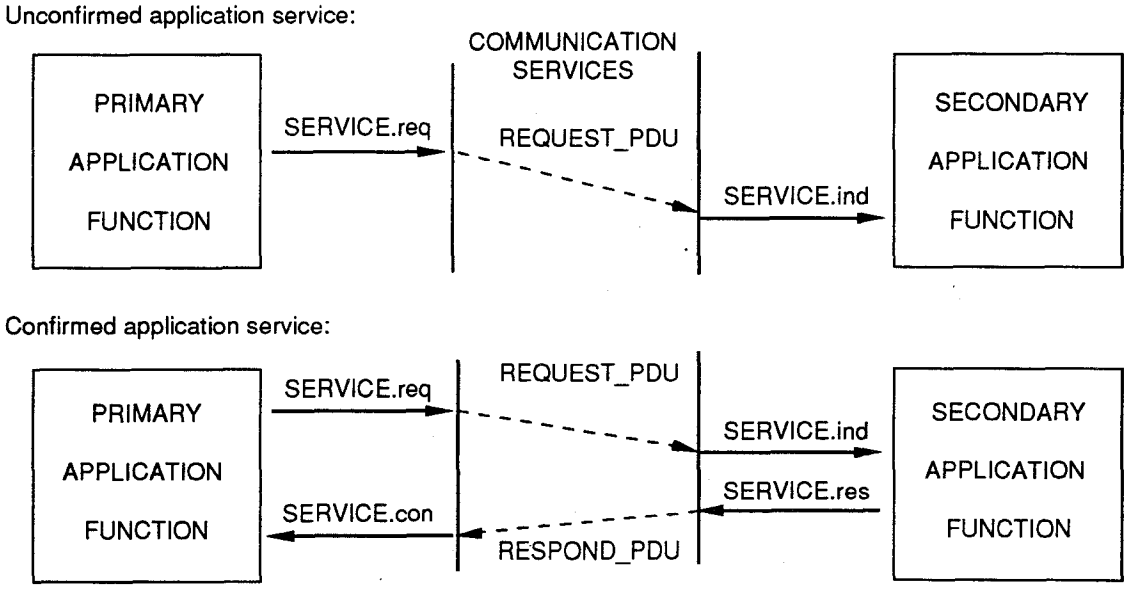

Figure 1 – Basic application services

5 General concept of application functions

Application processes that involve peer-to-peer communication to perform coordinated procedures between remote locations use means that are offered in the layers 7, 2 and 1 of the EPA model (see figure 2).

More than one procedure (in different stations) may be in progress at the same time. However the following application function procedures are described individually. The procedures are defined in single hierarchical presentation. Additional definitions for the use of multi-hierarchical telecontrol networks (e.g. network with concentrator station) should be specified in the companion standards.

The individual application functions use service primitives and elements of transmission procedures of the layers 7, 2 and 1 that are specified in the sections 1 to 5 of IEC 870-5.

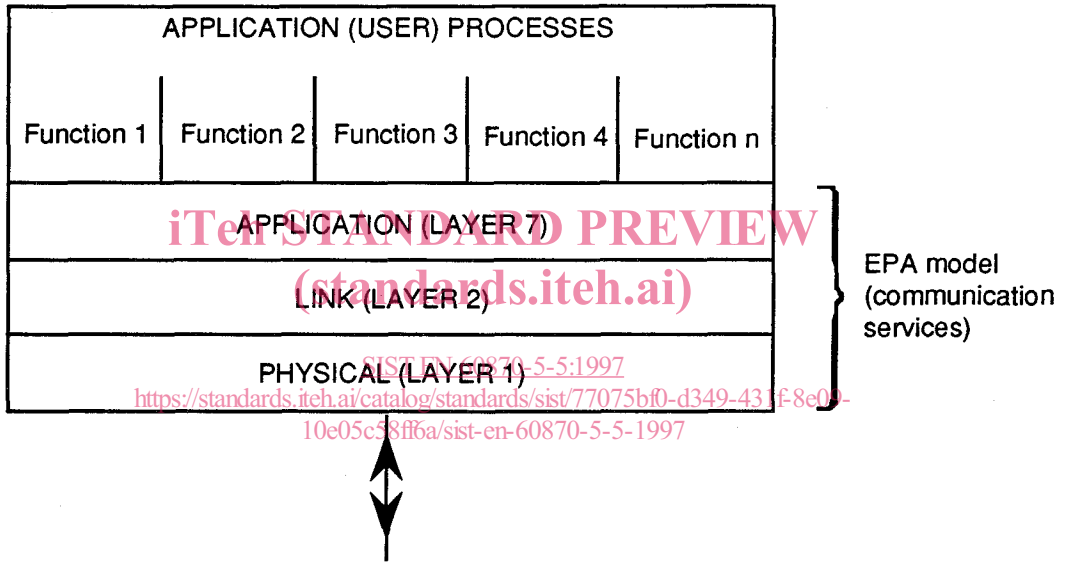

Figure 2 – Location of communication services and application functions in the EPA (enhanced performance architecture) model

Application functions are the part of application processes which perform the remote communication procedures between application processes.

The following clauses of this section of IEC 870-5 define an assortment of basic application functions. Each function is composed of transfer procedures of specific ASDUs between remotely communicating application processes. Information contents, frame formats of the various PDUs and parameter lists of service primitives are specified by the chosen companion standards.

6 Basic application functions

This clause defines an assortment of basic application functions that utilize standard communication services. The functions are described by presenting diagrams that indicate the sequence of data units that are exchanged between controlling and controlled stations and by describing the tasks of these data units to accomplish the functions. The first two described basic application functions, namely station initialization and data acquisition by polling represent a base for the execution of further basic application functions. These two functions are performed by coordination of particular application and link services that are described in detail. Other basic application functions that may involve the utilization of polling procedures are then described without repeating details about this procedure.

Sequential transmission procedures are described by arrows. Each arrow represents a protocol data unit PDU. A hierarchic structure of letters will be used for naming APDUs or ASDUs which may be completed by the different companion standards. In IEC 870-5 protocol definitions ASDUs are the same as APDUs because there is no explicit APCI.

The ASDU-labels specified in the following table follow a hierarchical order, which offers the possibility of using global labels in this standard and specific ones in the different companion standards. The highest level distinguishes between:

Kind of information Level 1	*Label*
Monitored information	M
Control information	C
Parameter	P
File transfer	F

The second level defines:

Kind of information Level 2	*Label*
Monitored information	M
Single-point information	M_SP
Double-point information	M_DP
Measurements	M_ME
Events of protection	M_EP
Integrated totals	M_IT
Step position information	M_ST
Bit and octet strings	M_BO
End of initialization	M_EI
Application layer available	M_AA
Control information	C
Single command	C_SC
Double command	C_DC
Set-point command	C_SE
Regulating step command	C_RC
Interrogation command	C_IC
Clock synchronization command	C_CS
Delay acquisition	C_CD
Counter interrogation command	C_CI
Test command	C_TS
Reset process command	C_RP
Read command	C_RD
End of initialization	C_EI