SLOVENSKI STANDARD
SIST EN 61334-6:2002

01-april-2002

[Not translated]

Distribution automation using distribution line carrier systems -- Part 6: A-XDR encoding rule

Verteilungsautomatisierung mit Hilfe von Trägersystemen auf Verteilungsleitungen -- Teil 6: A-XDR-Codierungsregel

Automatisation de la distribution à l'aide de systèmes de communication à courants porteurs -- Partie 6: Règles d'encodage A-XDR

Ta slovenski standard je istoveten z: EN 61334-6:2000

ICS:

29.240.20	Daljnovodi	Power transmission and distribution lines
33.200	Daljinsko krmiljenje, daljinske meritve (telemetrija)	Telecontrol. Telemetering

SIST EN 61334-6:2002 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 61334-6

November 2000

ICS 29.240.20;33.200

English version

Distribution automation using distribution line carrier systems
Part 6: A-XDR encoding rule
(IEC 61334-6:2000)

Automatisation de la distribution
à l'aide de systèmes de communication
à courants porteurs
Partie 6: Règles d'encodage A-XDR
(CEI 61334-6:2000)

Verteilungsautomatisierung
mit Hilfe von Trägersystemen auf
Verteilungsleitungen
Teil 6: A-XDR-Codierungsregel
(IEC 61334-6:2000)

This European Standard was approved by CENELEC on 2000-08-01. 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.

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

Ref. No. EN 61334-6:2000 E

Foreword

The text of document 57/451/FDIS, future edition 1 of IEC 61334-6, 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 61334-6 on 2000-08-01.

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) 2001-05-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2003-08-01

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 61334-6:2000 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 61334-4-41	1996	Distribution automation using distribution line carrier systems Part 4: Data communication protocols -- Section 41: Application protocols - Distribution line message specification	EN 61334-4-41	1996
IEC 61334-4-42	1996	Part 4: Data communication protocols -- Section 42: Application protocols - Application layer	EN 61334-4-42	1996
ISO/IEC 8825-2	1997	Information technology - ASN.1 Encoding rules: Specification of packed encoding rules (PER)	-	-
ITU-T Recommendation X.208	1988	Specification of Abstract Syntax Notation One (ASN.1)	-	-
ITU-T Recommendation X.209	1988	Specification of basic encoding rules for Abstract Syntax Notation One (ASN.1)	-	-

NORME INTERNATIONALE

INTERNATIONAL STANDARD

CEI
IEC
61334-6

Première édition
First edition
2000-06

Automatisation de la distribution à l'aide de systèmes de communication à courants porteurs –

Partie 6: Règles d'encodage A-XDR

Distribution automation using distribution line carrier systems –

Part 6: A-XDR encoding rule

International Electrotechnical Commission 3, rue de Varembé Geneva, Switzerland
Telefax: +41 22 919 0300 e-mail: inmail@iec.ch IEC web site http://www.iec.ch

Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

CODE PRIX
PRICE CODE W

Pour prix, voir catalogue en vigueur
For price, see current catalogue

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

DISTRIBUTION AUTOMATION USING DISTRIBUTION LINE CARRIER SYSTEMS –

Part 6: A-XDR encoding rule

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 specifications, 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 61334-6 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
57/451/FDIS	57/474/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 the contents of this publication will remain unchanged until 2003. At this date, the publication will be

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

INTRODUCTION

ITU-T Recommendation X.208 specifies a formal language (ASN.1 = Abstract Syntax Notation One) which enables application layer specifications to define the types[1)] of information they need to exchange. A representation of this information can be derived by applying a set of encoding rules to values of types defined using the ASN.1 notation. Application of these encoding rules produces a transfer syntax for such values.

Although many such sets of encoding rules could be imagined, for a long time only one single set – the BER = Basic Encoding Rules – has been standardized (see ITU-T Recommendation X.209). This is mainly because BER is quite adequate for a wide range of applications. On the other hand, in some particular cases, BER can obviously be redundant. Avoiding this redundancy by providing alternative encoding rules for those particular cases is the scope of some recently developed new transfer syntax standards (DER, CER, PER). Clearly, the aim is not to provide general-purpose, but rather specialized, alternatives to the BER, which are more suitable than the BER in some respects.

Contrary to these general-purpose encoding rules, this standard specifies a new, special-purpose set of encoding rules – A-XDR – which fits in best with the DLMS context (see IEC 61334-4-41). The principal objective is to encode DLMS PDUs in such a way that the PDUs byte count and encoding/decoding complexity – the length of the required code, its processing performance and time – are optimized[2)]. This objective is fulfilled by two basic principles.

a) A-XDR specifies encoding rules only for a subset of ASN.1 types: for the subset which is used for the DLMS specification. (That is why A-XDR is special-purpose.)

b) A-XDR specifies byte-oriented encoding rules.

---

1) ASN.1 also specifies a notation for the specification of the value of a defined type.

2) With respect to the PDU size only, PER over-performs A-XDR. However, this better compacting performance – the principal objective of PER – is achieved by a much more extensive use of bit fields instead of byte fields to encode different values. To reduce encoding sizes further, the more complex PER variant (the Unaligned PER) also benefits from the limitation of values of constrained types. Gain on compactness is thus obtained at the expense of computational overhead. Furthermore, PER comes with two, incompatible variants (Aligned and Unaligned), and it is recommended that implementations should support both of them. This complexity means that PER is not optimal for the DLMS context. The 'lighter-weight' A-XDR encoding rules are more suitable to that simple environment, which is in some cases very poor in resources.

DISTRIBUTION AUTOMATION USING DISTRIBUTION LINE CARRIER SYSTEMS –

Part 6: A-XDR encoding rule

1 Scope and object

This part of IEC 61334 defines a set of encoding rules – the A-XDR[3)] encoding rules – that may be used to derive the specification of a transfer syntax for values of types defined in the DLMS core standard using the ASN.1 notation (see IEC 61334-4-41). These A-XDR encoding rules are also to be applied for decoding such a transfer syntax in order to identify the data values being transferred.

The A-XDR encoding rules

- are used at the time of communication;
- provide optimal[4)] encoding for DLMS PDUs.

NOTE Provided that A-XDR ensures optimal encoding for DLMS PDUs, it is intended to be the default encoding rule for DLMS-based communication protocols. Nevertheless, the default – and also the possibly usable optional – encoding rules will be specified in the Application Layer document of the given protocol (for example, IEC 61334-4-42), as part of the Application context.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 61334. 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 61334 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 ISO and IEC maintain registers of currently valid International Standards.

IEC 61334-4-41:1996, *Distribution automation using distribution line carrier systems – Part 4: Data communication protocols – Section 41: Application protocols – Distribution line message specification*

IEC 61334-4-42:1996, *Distribution automation using distribution line carrier systems – Part 4: Data communication protocols – Section 42: Application protocols – Application layer*

ISO/IEC 8825-2:1997, *Information technology – ASN.1 Encoding rules: Specification of packed encoding rules (PER)*

ITU-T Recommendation X.208:1988, *Specification of Abstract Syntax Notation One (ASN.1)*

ITU-T Recommendation X.209:1988, *Specification of basic encoding rules for Abstract Syntax Notation One (ASN.1)*

---

3) A-XDR stands for Adapted XDR. In fact, these encoding rules are derived from a proven and *de facto* standard of the Unix world, called XDR (eXternal Data Representation, rfc1014).

4) See footnote 2 of the introduction.

3 General characteristics of A-XDR

A-XDR specifies encoding rules which can be used to encode and decode the values of an abstract syntax defined as the values of a single ASN.1 type (the outermost type). This single ASN.1 type is either a simple type or a composite type. A component of a composite type may be a simple type or a composite type itself.

The A-XDR encoding rules exploit the fact that the sender and the receiver of a DLMS PDU are operating exactly the same specification of the abstract syntax. While with BER the encoding of every value of any type of abstract syntax is constructed in type-length-value (TLV) style, A-XDR encodes the type and the length of the value only when this information is necessary. This implies that without knowledge of the type of value encoded it is not possible to determine the structure of the encoding.

NOTE This encoding method gives the result that A-XDR encoding rules are not extensible (see annex A).

In order to keep A-XDR as simple as possible, some restrictions apply with respect to the abstract syntax to be encoded as follows:

- no encoding support is provided for ASN.1 types which are not used in DLMS[5];
- the CHOICE ASN.1 type should contain only explicitly[6] tagged components.

A-XDR specifies byte-oriented encoding rules. This means that each part of the encoding – and therefore also the encoding of the whole – is an integral number of bytes.

4 Structure of an encoding

The basis of BER encoding (see ITU-T Recommendation X.209) is a structure, made up of three parts: type, length and value, as shown in figure 1. In BER, these three parts are termed identifier (I), length (L) and contents (C). The identifier part identifies the type, the length part allows the end of the contents[7] to be found, and the contents part conveys one of the possible values of that type.

Identifier	Length	Contents

IEC 730/2000

Figure 1 – The basic BER structure

The contents field can be simply a series of bytes[8] (primitive encoding) or a series of nested encoding (constructed encoding), as shown in figure 2.

---

[5] Annex B enumerates the ASN.1 types and keywords which are used in the DLMS specification.

[6] The terms "explicit tagging" and "implicit tagging" have a slightly different meaning in A-XDR than that specified for ASN.1 and BER. Subclause 6.7 deals with these notions and also introduces the new "ASN.1 explicit tagging" term.

[7] In fact, for BER, the length field does not always literally represent the length of the contents. BER specifies two forms (definite and indefinite) of the length field. Although, when the definite form is used, the length field effectively represents the number of bytes in the contents field, for the indefinite form the length field indicates that the contents are terminated by end-of-contents bytes.

[8] Zero or more.

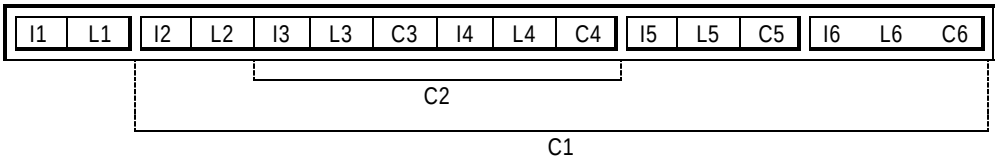

Figure 2 – The structure of a constructed BER encoding

The nesting can be as deep as needed and stops either with a primitive encoding or with a constructed encoding with empty contents.

A-XDR is based upon the same encoding structure, but in order to benefit from the fact that the sender and the receiver of a DLMS PDU are operating exactly the same specification of the abstract syntax, A-XDR does not encode the Identifier (I) and/or the Length (L) fields when those fields convey redundant information (when not to encode one or both of these fields does not result in uninterpretable, ambiguous encoding). A constructed A-XDR encoding therefore results in a structure as shown in figure 3.

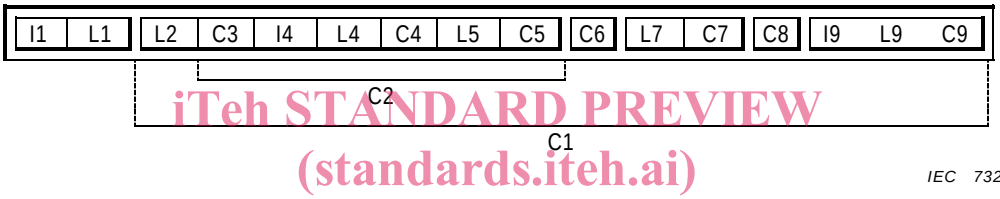

Figure 3 – The structure of a constructed A-XDR encoding