

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

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 61334-6:2002 sisaldab Euroopa standardi EN 61334-6:2000 ingliskeelset teksti.

Standard on kinnitatud Eesti Standardikeskuse 15.10.2002 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.

Standard on kättesaadav Eesti standardiorganisatsioonist.

This Estonian standard EVS-EN 61334-6:2002 consists of the English text of the European standard EN 61334-6:2000.

This standard is ratified with the order of Estonian Centre for Standardisation dated 15.10.2002 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.

The standard is available from Estonian standardisation organisation.

ICS 29.240.20, 33.200

Standardite reprodutseerimis- ja levitamiseõigus kuulub Eesti Standardikeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonilisse süsteemi või edastamine ükskõik millises vormis või millisel teel on keelatud ilma Eesti Standardikeskuse poolt antud kirjaliku loata.

Kui Teil on küsimusi standardite autorikaitse kohta, palun võtke ühendust Eesti Standardikeskusega:
Aru 10 Tallinn 10317 Eesti; www.evs.ee; Telefon: 605 5050; E-post: info@evs.ee

Right to reproduce and distribute Estonian Standards belongs to the Estonian Centre for Standardisation

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without permission in writing from Estonian Centre for Standardisation.

If you have any questions about standards copyright, please contact Estonian Centre for Standardisation:
Aru str 10 Tallinn 10317 Estonia; www.evs.ee; Phone: +372 605 5050; E-mail: info@evs.ee

Deutsche Fassung

**Verteilungsautomatisierung mit Hilfe von Trägersystemen
auf Verteilungsleitungen**

Teil 6: A-XDR-Kodierungsregel
(IEC 61334-6:2000)

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)

Diese Europäische Norm wurde von CENELEC am 2000-08-01 angenommen.

Die CENELEC-Mitglieder sind gehalten, die CEN/CENELEC-Geschäftsordnung zu erfüllen, in der die Bedingungen festgelegt sind, unter denen dieser Europäischen Norm ohne jede Änderung der Status einer nationalen Norm zu geben ist.

Auf dem letzten Stand befindliche Listen dieser nationalen Normen mit ihren bibliographischen Angaben sind beim Zentralsekretariat oder bei jedem CENELEC-Mitglied auf Anfrage erhältlich.

Diese Europäische Norm besteht in drei offiziellen Fassungen (Deutsch, Englisch, Französisch). Eine Fassung in einer anderen Sprache, die von einem CENELEC-Mitglied in eigener Verantwortung durch Übersetzung in seine Landessprache gemacht und dem Zentralsekretariat mitgeteilt worden ist, hat den gleichen Status wie die offiziellen Fassungen.

CENELEC-Mitglieder sind die nationalen elektrotechnischen Komitees von Belgien, Dänemark, Deutschland, Finnland, Frankreich, Griechenland, Irland, Island, Italien, Luxemburg, Niederlande, Norwegen, Österreich, Portugal, Schweden, Schweiz, Spanien, der Tschechischen Republik und dem Vereinigten Königreich.

CENELEC

EUROPÄISCHES KOMITEE FÜR ELEKTROTECHNISCHE NORMUNG
EUROPEAN COMMITTEE FOR ELECTROTECHNICAL STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION ELECTROTECHNIQUE

Zentralsekretariat: rue de Stassart, 35 B-1050 Brüssel

Vorwort

Der Text des Schriftstücks 57/451/FDIS, zukünftige 1. Ausgabe von IEC 61334-6, ausgearbeitet von dem IEC TC 57 „Power system control and associated communications“, wurde der IEC-CENELEC-Parallelen Abstimmung unterworfen und von CENELEC am 2000-08-01 als EN 61334-6 angenommen.

Nachstehende Daten wurden festgelegt:

- spätestes Datum, zu dem die EN auf nationaler Ebene durch Veröffentlichung einer identischen nationalen Norm oder durch Anerkennung übernommen werden muss (dop): 2001-05-01
- spätestes Datum, zu dem nationale Normen, die der EN entgegenstehen, zurückgezogen werden müssen (dow): 2003-08-01

Anhänge, die als „normativ“ bezeichnet sind, gehören zum Norm-Inhalt.

Anhänge, die als „informativ“ bezeichnet sind, enthalten nur Informationen.

In dieser Norm ist Anhang ZA normativ und sind die Anhänge A, B und C informativ.

Der Anhang ZA wurde von CENELEC hinzugefügt.

Anerkennungsnotiz

Der Text der Internationalen Norm IEC 61334-6:2000 wurde von CENELEC ohne irgendeine Abänderung als Europäische Norm angenommen.

This document is a preview generated by EVS

Anhang ZA (normativ)

Normative Verweisungen auf internationale Publikationen mit ihren entsprechenden europäischen Publikationen

Diese Europäische Norm enthält durch datierte oder undatierte Verweisungen Festlegungen aus anderen Publikationen. Diese normativen Verweisungen sind an den jeweiligen Stellen im Text zitiert, und die Publikationen sind nachstehend aufgeführt. Bei datierten Verweisungen gehören spätere Änderungen oder Überarbeitungen dieser Publikationen nur zu dieser Europäischen Norm, falls sie durch Änderung oder Überarbeitung eingearbeitet sind. Bei undatierten Verweisungen gilt die letzte Ausgabe der in Bezug genommenen Publikation (einschließlich Änderungen).

ANMERKUNG Wenn internationale Publikationen durch gemeinsame Abänderungen geändert wurden, durch (mod) angegeben, gelten die entsprechenden EN/HD.

Publikation	Jahr	Titel	EN/HD	Jahr
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 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)	–	–

CONTENTS

	Page
FOREWORD	5
INTRODUCTION	6
Clause	
1 Scope and object	7
2 Normative references	7
3 General characteristics of A-XDR	8
4 Structure of an encoding	8
5 Rules for encoding	11
5.1 The Identifier field	11
5.2 The Length field	12
5.3 The Contents field	12
6 Encoding procedures	13
6.1 Encoding of an INTEGER value	13
6.2 Encoding of a BOOLEAN value	16
6.3 Encoding of an ENUMERATED value	17
6.4 Encoding of a BIT STRING value	17
6.5 Encoding of an BYTE STRING value	18
6.6 Encoding of a CHOICE value	20
6.7 Tagged types (implicit, explicit and ASN.1 explicit tagging)	21
6.8 OPTIONAL and DEFAULT components	23
6.9 Encoding of a SEQUENCE value	24
6.10 Encoding of a SEQUENCE OF value	25
6.11 Encoding of the VisibleString type	27
6.12 Encoding of the GeneralizedTime type	28
6.13 Encoding of the ASN.1 NULL type/value	28
Annex A (informative) Extensibility	29
Annex B (informative) ASN.1 types and keywords used in DLMS	30
Annex C (informative) Examples of A-XDR encoding for DLMS PDUs	31
Figure 1 – The basic BER structure	8
Figure 2 – The structure of a constructed BER encoding	9
Figure 3 – The structure of a constructed A-XDR encoding	9
Figure 4 – Structure of the variable-length integer encoding	15

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 types¹⁾ 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 optimized²⁾. 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-XDR³⁾ 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 optimal⁴⁾ 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.