IEC 62734

Edition 1.0 2014-10

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Industrial networks – Wireless communication network and communication profiles – ISA 100.11a

Réseaux industriels – Réseau de communication sans fil et profils de communication – ISA 100.11a

IEC 62734:2014-10(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

PRICE CODE
CODE PRIX XH

ICS 25.040; 33.040; 35.100

ISBN 978-2-8322-1874-7

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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INDUSTRIAL NETWORKS – WIRELESS COMMUNICATION NETWORK AND COMMUNICATION PROFILES – ISA 100.11A

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of 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, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). 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. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 62734 has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial-process measurement, control and automation.

This International Standard is based on ISA 100.11a:2011.

The reader's attention is drawn to the fact that Annex V lists all of the "in-some-country" clauses on differing practices of a less permanent nature relating to the subject of this standard.

This first edition cancels and replaces the IEC/PAS 62734 published in 2012. This edition constitutes a technical revision.

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

FDIS	Report on voting
65C/778/FDIS	65C/788/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 2.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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- withdrawn,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

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0 Introduction

0.1 General

This standard provides specifications in accordance with the OSI Basic Reference Model, ISO/IEC 7498–1, (e.g., PhL, DL, etc.), and also provides security and management (including network and device configuration) specifications for wireless devices serving Annex C's usage classes 1 through 5, and potentially class 0, for fixed, portable, and moving devices.

This standard is intended to provide reliable and secure wireless operation for non-critical monitoring, alerting, supervisory control, open loop control, and closed loop control applications. This standard defines a protocol suite, including system management, gateway considerations, and security specifications, for low-data-rate wireless connectivity with fixed, portable, and slowly-moving devices, often operating under severe energy and power constraints. The application focus is the performance needs of process automation monitoring and control where end-to-end communication latencies on the order of at least 100 ms can be tolerated.

To meet the needs of industrial wireless users and operators, the technology specified in this document provides robustness in the presence of interference found in harsh industrial environments or caused by wireless systems not covered by this international standard. As described in Clause 4, this standard addresses coexistence with other wireless devices anticipated in the industrial workspace, such as cell phones and devices based on IEC 62591 (based on WirelessHART™[1]), IEC 62601 (based on WIA-PA), IEEE 802.11 (WiFi), IEEE 802.15, IEEE 802.16 (WiMax), and other relevant standards. Furthermore, this standard supports interoperability of devices compliant with this international standard, as described in Clause 5, in those aspects of operation that are covered by this international standard.

This standard does not define or specify plant infrastructure or its security or performance characteristics. However, it is important that the security of the plant infrastructure be assured by the end user.

0.2 Document structure

This document is organized into clauses focused on unique network functions and protocol suite layers. The clauses describe system, system management, security management, physical layer, data-link layer, network layer, transport layer, application layer, and provisioning. Generic considerations that apply to protocol gateways are also included, though specifications of specific protocol gateways are not. Each clause describes a functionality or protocol layer and dictates the behavior required for proper operation. When a clause describes behaviors related to another function or layer, a reference to the appropriate other clause is supplied for further information.

The mandatory and optional communication protocols defined by this document are referred to as native protocols, while those protocols used by other networks such as legacy fieldbus communication protocols are referred to as foreign protocols.

0.3 Potentially relevant patents

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this document may involve the use of multiple patents:

a) concerning elliptic curve (asymmetric) cryptography, given in 7.4.6 and 7.2.2.3;

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[1] Property of the HART Communication Foundation. This information is given for the convenience of users of the standard and does not constitute an endorsement of the trademark holder or any related products. Compliance to this profile does not require use of the registered trademark. Use of the trademarks requires permission of the trade name holder.

b) concerning synchronizing clocks and assessing link quality, given in 9.1.9.3 and 9.1.15;

c) concerning unspecified subject areas;

d) concerning wireless provisioning, and selection and routing among multiple gateways.

IEC takes no position concerning the evidence, validity and scope of these patent rights.

The holders of these patent rights have assured the IEC that they are willing to negotiate licences either free of charge (free) or under reasonable and non-discriminatory terms and conditions (RAND) with applicants throughout the world. In this respect, the statements of the following holders of those patent rights are registered with IEC.

Information on these patent rights and their licensing may be obtained from:

a)	Certicom Corporation 4701 Tahoe Blvd, Bldg A L4W 0B5 Mississauga, ON CANADA Attn: Patent licensing Licensing terms: presumably RAND Relevant patents: unknown; not stated by patent holder	b)	NIVIS LLC 1000 Circle 75 Pkwy, Suite 300 Atlanta, GA 30339-6051 USA Attn: Patent licensing Licensing terms: RAND Relevant patents: – US 20100027437 – US 20100098204
c)	General Electric 1 Research Cir Schenectady, NY 12309-1027 USA Attn: Patent licensing Licensing terms: presumably RAND, reciprocity Relevant patents: unknown; not stated by patent holder	d)	Yokogawa Electric Corporation 2-9-32 Nakachou, Musashina-shi Tokyo JAPAN Attn: Patent licensing Licensing terms: RAND, reciprocity Relevant patents: – JP 4129749 – US 8005514 – US 8031727 – US 8305927 – US 2009080394
The above patent holders, patents, and licensing terms are those declared to the IEC as relevant to IEC 62734, as of the date of preparation of this text.			

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights other than those identified above. IEC shall not be held responsible for identifying any or all such patent rights.

ISO (http://www.iso.org/patents) and IEC (http://patents.iec.ch) maintain on-line databases of patents relevant to their standards. Users are encouraged to consult these databases for the most up-to-date information concerning patents.

INDUSTRIAL NETWORKS – WIRELESS COMMUNICATION NETWORK AND COMMUNICATION PROFILES – ISA 100.11A

1 Scope

This International Standard specifies a method of reliable and secure wireless operation for non-critical monitoring, alerting, supervisory control, open loop control, and closed loop control applications. This standard defines a protocol suite, including system management, gateway considerations, and security specifications, for low-data-rate wireless connectivity with fixed, portable, and slowly-moving devices, often operating under severe energy and power constraints. The application focus of this standard is the performance needs of process automation monitoring and control, where end-to-end communication delays on the order of 100 ms can be tolerated.

This standard specifies the following:

- physical layer service definition and protocol specification;
- data-link layer service definition and protocol specification;
- network layer service definition and protocol specification;
- transport layer service definition and protocol specification;
- application layer service definition and protocol specification, including support for protocol tunneling and gateways;
- security and security management;
- provisioning and configuration;
- network management; and
- additive communication role profiles (i.e., one or more can be selected concurrently).

Functionality above the application layer of the OSI Basic Reference Model, such as the so-called User Layer and different profiles for functionality at that layer, is not addressed. However, it is discussed briefly in Annex A.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE See the Bibliography for non-normative references.

ISO/IEC 646, *Information technology – ISO 7-bit coded character set for information interchange*

ISO/IEC 10731, *Information technology – Open Systems Interconnection – Basic Reference Model – Conventions for the definition of OSI services*

ISO/IEC 18033-3, *Information technology – Security techniques – Encryption algorithms – Part 3: Block ciphers*

ISO/IEC 19772, *Information technology – Security techniques – Authenticated encryption*

ANSI X9.63:2011, *Public Key Cryptography for the Financial Services Industry – Key Agreement and Key Transport Using Elliptic Curve Cryptography*

IETF RFC 2460:1998, *Internet Protocol, Version 6 (IPv6) Specification*

IETF RFC 2464, *Transmission of IPv6 Packets over Ethernet Networks*

IETF RFC 2529, *Transmission of IPv6 over IPv4 Domains without Explicit Tunnels*

IETF RFC 3168, *The Addition of Explicit Congestion Notification (ECN) to IP*

IETF RFC 4213, *Basic Transition Mechanisms for IPv6 Hosts and Routers*

IETF RFC 4291:2006, *IP Version 6 Addressing Architecture*

IETF RFC 4944, *Transmission of IPv6 Packets over IEEE 802.15.4 Networks*

IETF RFC 6282:2011, *Compression Format for IPv6 Datagrams over IEEE 802.15.4-Based Networks*

IETF RFC 6298, *Computing TCP's Retransmission Timer*

IEEE 802.15.4™:2011[2], *IEEE Standard for Information technology — Telecommunications and information exchange between systems — Local and metropolitan area networks — Specific requirements – Part 15.4: Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for Low-Rate Wireless Personal Area Networks (LR-WPANs)*

SEC 1:2009, *Elliptic Curve Cryptography, version 2*, available at http://www.secg.org

SEC 4, *Elliptic Curve Qu-Vanstone Implicit Certificate Scheme (ECQV), version 0.97*, available at http://www.secg.org

3 Terms, definitions, abbreviated terms, acronyms, and conventions

For the purposes of this document, the following terms, definitions, abbreviations, acronyms and conventions apply.

3.1 Terms and definitions

3.1.1 (N)-layer and other terms and definitions from the open systems interconnection Basic Reference Model

3.1.1.1
abstract syntax
specification of (N)-PDUs by using notation rules which are independent of the encoding technique used to represent them

[SOURCE: ISO/IEC 7498-1:1994 as corrected and reprinted in 1996, 7.1.1.2, modified – generalized to any layer]

2 Property of IEEE, http://www.ieee.org.