

INTERNATIONAL STANDARD

NORME INTERNATIONALE



Industrial communication networks – Wireless communication network and communication profiles – WirelessHART™

Réseaux de communications industriels – Réseau de communications sans fil et profils de communication – WirelessHART™



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**INDUSTRIAL COMMUNICATION NETWORKS –
WIRELESS COMMUNICATION NETWORK
AND COMMUNICATION PROFILES –
WirelessHART™**

FOREWORD

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International Standard IEC 62591 has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial process measurement, control and automation.

This standard cancels and replaces IEC/PAS 62591 published in 2009. This first edition constitutes a technical revision.

This bilingual version, published in 2011-07, corresponds to the English version.

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

FDIS	Report on voting
65C/587/FDIS	65C/595/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

The French version of this standard has not been voted upon.

This publication has been drafted in accordance with 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- withdrawn,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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INTRODUCTION

This International standard provides the specification, definitions, and profile for a Wireless communication network. It supplements IEC 61158-5-20, IEC 61158-6-20 where some commands are specified and it supplements IEC 61784-1 where a Communication Profile CP 9/1, universal command, is specified.

This document follows the structure and conventions of IEC 61158 series (for example separation of DL-service definitions and DL-protocol specification) and conventions of IEC 61784-1. IEC 61158 series specify different communication networks. These are structured in different Types. The Type 20 is assigned to technologies of Hart™¹ Communication Foundation (HCF). For other assignments of Type numbers see IEC/TR 61158-1.

NOTE IEC 61158 series do not contain a DLL specification for Type 20. However, this standard includes a DLL specification.

IEC 61784-1, and IEC 61784-2 provide Communication Profile Families (CPF), and, within a family, one to n Communication Profiles. The assigned CPF number for technologies of the HCF is CPF 9. For other assignments of CPF numbers see IEC/TR 61158-1.

A new project number IEC 62591 was assigned to the Type 20 enhancements and the associated CP 9/2, so that this document contains the equivalent subparts of the IEC 61158 series and of IEC 61784-1 organized here in different clauses.

The Type 20 protocol supports two way digital communications for process measurement and control devices. Applications include remote process variable interrogation, cyclical access to process data, parameter setting and diagnostics. This document defines the specification that comprises the Type 20 field communications protocol for wireless devices. Specification of the Type 20 protocol is based largely on the OSI 7-layer Communication Model.

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this document may involve the use of patents concerning the claims of the patents listed below given in the normative Clauses.

US08/04750 & PCT 12/100986 [HCF] Combined Wired and Wireless Communications with Field Devices
US08/04777 & PCT 12/100927 [HCF] Increasing Reliability and Reducing Latency in a Wireless Network
US08/04677 & PCT 12/100995 [HCF] Adaptive Scheduling in a Wireless Network
US08/04716 & PCT 12/101000 [HCF] Wireless Protocol Adaptor
US08/04775 & PCT 12/101005 [HCF] Synchronizing Timeslots in a Wireless Communication Protocol
US08/04751 & PCT 12/101011 [HCF] Suspending Transmissions in a Wireless Communication Network
US08/04678 & PCT 12/101021 [HCF] Enhancing Security in a Wireless Network
US08/04746 & PCT 12/101037 [HCF] Wireless Gateway in a Process Control Environment
US08/04676 & PCT 12/101043 [HCF] Efficient Addressing in Wireless HART Protocol
US08/04745 & PCT 12/101049 [HCF] Support for Network Management and Device Communications in a Wireless Network
US08/04749 & PCT 12/101054 [HCF] Priority Based Scheduling and Routing in a Wireless Network
US08/04740 & PCT 12/101071 [HCF] Routing Packets on a Network Using Directed Graphs
US08/04761 & PCT 12/101074 [HCF] Scheduling Communication Frames in a Wireless Network

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

¹ HART™ and WirelessHART™ are the trade names of HART™ Communication Foundation (HCF). HCF is a non-profit trade organization to support the HART™ Communication. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by IEC of the trade name holder or any of its products. Compliance to this document does not require use of the trade name. Use of the trade name HART™ and WirelessHART™ requires permission of the trade name holder.

The holder of these patent rights has assured IEC that she/he is willing to negotiate licenses either free of charge or under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of these patent rights is registered with IEC. Information may be obtained from:

[HCF] Hart Communication Foundation
9390 Research Boulevard
Suite I-350
Austin TX 78759, USA

Attention is drawn to the possibility that some of the elements of this standard 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 (www.iso.org/patents) and IEC (http://www.iec.ch/tctools/patent_decl.htm) maintain on-line data bases of patents relevant to their standards. Users are encouraged to consult the data bases for the most up to date information concerning patents.

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INDUSTRIAL COMMUNICATION NETWORKS – WIRELESS COMMUNICATION NETWORK AND COMMUNICATION PROFILES – WirelessHART™

1 Scope

This International Standard specifies an additional Type 20 communication network to IEC 61158-5-20, IEC 61158-6-20 and a Communication Profile CP 9/2 in addition to IEC 61784-1 CPF 9.

This standard specifies the following:

- Physical layer service definition and protocol specification,
- Data-link layer service and protocol,
- Application layer service and protocol,
- Network management,
- Security,
- Communication profile,
- Wireless procedures and
- Gateway.

2 Normative references

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

IEC 60559, *Binary floating-point arithmetic for microprocessor systems*

IEC/TR 61158-1:2010, *Industrial communication networks – Fieldbus specifications – Part 1: Overview and guidance for the IEC 61158 and IEC 61784 series*

IEC 61158-5-20:2010, *Industrial communication networks – Fieldbus specifications – Part 5-20: Application layer service definition – Type 20 elements*

IEC 61158-6-20:2010, *Industrial communication networks – Fieldbus specifications – Part 6-20: Application layer protocol specification – Type 20 elements*

IEC 61784-1:2010, *Industrial Communication Networks – Profiles – Part 1: Fieldbus profiles*

IEC 61784-2:2010, *Industrial Communication Networks – Profiles – Part 2: Part 2: Additional fieldbus profiles for real-time networks based on ISO/IEC 8802-3*

ISO/IEC 7498-1, *Information technology – Open Systems Interconnection — Basic Reference Model: The Basic Model*

ISO/IEC 8824, *Information Technology – Open Systems Interconnection – Specification of Abstract Syntax Notation One (ASN.1)*

ISO/IEC 8859-1, *Information technology – 8-bit single-byte coded graphic character sets – Part 1: Latin alphabet No. 1*

ISO/IEC 9545, *Information technology – Open Systems Interconnection – Application Layer structure*

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

IEEE 802-2001, *IEEE Standard for Local and Metropolitan Area Networks: Overview and Architecture*

IEEE 802.15.4-2006, *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 (WPANs)*

3 Terms, definitions, symbols, abbreviations and conventions

For the purposes of this document, the following terms as defined in these publications apply.

3.1 Reference model terms and definitions

This standard is based in part on the concepts developed in ISO/IEC 7498-1 and ISO/IEC 7498-3, and makes use of the following terms defined therein.

DL-entity (N=2)	[7498-1]
DL protocol-data-unit	[7498-1]
DL service-data-unit	[7498-1]
DLS user-data	[7498-1]
NL-entity (N=3)	[7498-1]
NL protocol-data-unit	[7498-1]
NL service-data-unit	[7498-1]
NLS user-data	[7498-1]
TL-entity (N=4)	[7498-1]
TL protocol-data-unit	[7498-1]
TL service-data-unit	[7498-1]
TLS user-data	[7498-1]

3.2 Terms and definitions from ISO/IEC 7498-1 terms

- a) abstract syntax
- b) application entity