EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 61162-450:2011+A1

May 2016

ICS 47.020.70

English version

Maritime navigation and radiocommunication equipment and systems - Digital interfaces - Part 450: Multiple talkers and multiple listeners - Ethernet interconnection

(IEC 61162-450:2011)

Matériels et systèmes de navigation et de radiocommunication maritimes - Interfaces numériques - Partie 450: Emetteurs multiples et récepteurs multiples - Interconnexion Ethernet (CEI 61162-450:2011)

Navigations- und Funkkommunikationsgeräte und -systeme für die Seeschifffahrt - Digitale Schnittstellen - Teil 450: Mehrere Datensenden und mehrere Datenempfänger - Leichte Schiffssystemzusammenschaltung (IEC 61162-450:2011)

This European Standard was approved by CENELEC on 2011-07-15. 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, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Management Centre: Avenue Marnix 17, B - 1000 Brussels

© 2011 CENELEC - All rights of exploitation in any form and by any means reserved worldwide for CENELEC members.

Ref. No. EN 61162-450:2011 E

Foreword

The text of document 80/615/FDIS, future edition 1 of IEC 61162-450, prepared by IEC TC 80, Maritime navigation and radiocommunication equipment and systems, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61162-450 on 2011-07-15.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

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)	2012-04-15
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2014-07-15

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61162-450:2011 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60603-7	NOTE	Harmonized as EN 60603-7.
IEC 60603-7-3	NOTE	Harmonized as EN 60603-7-3.
IEC 60603-7-7	NOTE	Harmonized as EN 60603-7-7.
IEC 61076-2-101	NOTE	Harmonized as EN 61076-2-101.
IEC 61162-2	NOTE	Harmonized as EN 61162-2.
IEC 61162-3	NOTE	Harmonized as EN 61162-3.
IEC 61754-20	NOTE	Harmonized as EN 61754-20.
IEC 61996-1	NOTE	Harmonized as EN 61996-1.
IEC 62388	NOTE	Harmonized as EN 62388.

Foreword to amendment A1

The text of document 80/795/FDIS, future IEC 61162-450:2011/A1, prepared by IEC/TC 80 "Maritime navigation and radiocommunication equipment and systems" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61162-450:2011/A1:2016.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2017-02-05
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2019-05-05

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 61162-450:2011/A1:2016 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

Addition:

IEC 61174	NOTE	Harmonized as EN 61174.

Delete

IEC 61996-1	NOTE	Harmonized as EN 61996-1

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 60825-2	-	Safety of laser products - Part 2: Safety of optical fibre communication systems (OFCS)	EN 60825-2	-
IEC 60945	-	Maritime navigation and radiocommunication equipment and systems - General requirements - Methods of testing and required test results	EN 60945	-
IEC 61162-1	-	Maritime navigation and radiocommunication equipment and systems - Digital interfaces - Part 1: Single talker and multiple listeners	EN 61162-1	-
IEC 61996-1	-	Maritime navigation and radiocommunication equipment and systems - Shipborne voyage data recorder (VDR) -- Part 1: Performance requirements, methods of testing and required test results	EN 61996-1	-
IEEE 802.3	-	IEEE Standard for Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications	-	-
ISOC RFC 768	-	User Datagram Protocol	-	-
ISOC RFC 791	-	Internet Protocol - DARPA Internet Program Protocol Specification	-	-
ISOC RFC 792	-	Internet Control Message Protocol	-	-
ISOC RFC 826	-	Ethernet Address Resolution Protocol	-	-
ISOC RFC 1918	-	Address Allocation for Private Internets	-	-
ISOC RFC 2474	-	Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers	-	-
ISOC RFC 5000	-	Internet Official Protocol Standards	-	-
ISOC RFC 5227	-	IPv4 Address Conflict Detection	-	-
ISOC RFC 5424	-	The Syslog Protocol	-	-
NMEA 0183	2008	Standard for interfacing marine electronic devices	-	-

CONTENTS

1 Scope 8
2 Normative references 8
3 Terms and definitions 9
4 General network and equipment requirements 12
4.1 Network topology example 12
4.2 Basic requirements 13
4.2.1 Requirements for equipment to be connected to the network 13
4.2.2 Additional requirements for network infrastructure equipment 13
4.3 Network function (NF) requirements 14
4.3.1 General requirements 14
4.3.2 Maximum data rate requirements 14
4.3.3 Error logging function 14
4.4 System function (SF) requirements 16
4.4.1 General requirements 16
4.4.2 Assignment of unique system function ID (SFI) 16
4.4.3 Implementing configurable transmission groups 16
4.5 Serial to network gateway function (SNGF) requirements 17
4.5.1 General requirements 17
4.5.2 Serial line output buffer management 17
4.5.3 Datagram output requirements 18
4.6 Other network function (ONF) requirements 18
5 Low level network requirements 18
5.1 Electrical and mechanical requirements 18
5.2 Network protocol requirements 20
5.3 IP Address assignment for equipment 20
5.4 Multicast address range 20
6 Transport layer specification 20
6.1 General 20
6.2 UDP messages 21
6.2.1 UDP multicast protocol 21
6.2.2 Use of multicast addresses and port numbers 21
6.2.3 UDP checksum 22
6.2.4 Datagram size 23
7 Application layer specification 23
7.1 Datagram header 23
7.1.1 Valid header 23
7.1.2 Error logging 23
7.2 General IEC 61162-1 sentence transmissions 23
7.2.1 Application of this protocol 23
7.2.2 Types of messages for which this protocol can be used 23
7.2.3 TAG block parameters for sentences transmitted in the datagram 23
7.2.4 Requirements for processing incoming datagrams 25
7.2.5 Error logging 25
7.3 Binary image transfer using UDP multicast 25
7.3.1 Application of this protocol 25

7.3.2 Binary image structure 26
7.3.3 Header 26
7.3.4 Binary image descriptor structure 28
7.3.5 Binary image data fragment 29
7.3.6 Sender process for binary image transfer 29
7.3.7 Receiver process for binary image transfer 31
7.3.8 Other requirements 32
7.3.9 Error logging 33
8 Methods of test and required results 33
8.1 Test set-up and equipment 33
8.2 Basic requirements 34
8.2.1 Equipment to be connected to the network 34
8.2.2 Network infrastructure equipment 34
8.3 Network function (NF) 34
8.3.1 Maximum data rate 34
8.3.2 Error logging function 34
8.4 System function (SF) 34
8.4.1 General 34
8.4.2 Assignment of unique system function ID (SFI) 35
8.4.3 Implementing configurable transmission groups 35
8.5 Serial to network gateway function (SNGF) 35
8.5.1 General 35
8.5.2 Serial line output buffer management 35
8.5.3 Datagram output 35
8.6 Other network function (ONF) 36
8.7 Low level network 36
8.7.1 Electrical and mechanical requirements 36
8.7.2 Network protocol 36
8.7.3 IP address assignment for equipment 36
8.7.4 Multicast address range 36
8.8 Transport layer 37
8.9 Application layer 37
8.9.1 Application 37
8.9.2 Datagram header 37
8.9.3 Types of messages 37
8.9.4 TAG block parameters 37
8.10 Error logging 38
8.11 Binary image transfer using UDP multicast 39
8.11.1 Sender process test 39
8.11.2 Receiver process test 40
8.11.3 Image descriptor test 40
8.11.4 Image transfer error logging 40
Annex A (normative) Classification of IEC 61162-1 talker identifier mnemonics and sentences 41
Annex B (informative) TAG block example 47
Annex C (normative) Reliable transmission of command-response pair messages 49
Annex D (informative) Network and system design guidance 54
Bibliography 62

Figure 1 – Network topology example 13
Figure 2 – Ethernet frame example for a SBM from a rate of turn sensor 21
Figure C.1 – Command response communications 49
Figure C.2 – State diagram 51
Figure D.1 – General system design architecture 54
Figure D.2 – Example of ship-shore communication architecture 55
Figure D.3 – Security infrastructure 56
Figure D.4 – Decoupled system 58
Figure D.5 – Loosely coupled system 58
Figure D.6 – Strongly coupled system 59

Table 1 – Syslog message format 15
Table 2 – Syslog error message codes 15
Table 3 – Interfaces, connectors and cables 19
Table 4 – Destination multicast addresses and port numbers 22
Table 5 – Destination multicast addresses and port numbers for binary data transfer 22
Table 6 – Destination multicast addresses and port numbers for other services 22
Table 7 – Description of terms 26
Table 8 – Binary image structure 26
Table 9 – Header format 27
Table 10 – Binary image descriptor format 28
Table 11 – Examples of MIME content type for DataType codes 29
Table 12 – Binary image data fragment format 29
Table A.1 – Classification of IEC 61162-1 talker identifier mnemonics 41
Table A.2 – Classification of IEC 61162-1 sentences 43
Table B.1 – Defined parameter-codes 48
Table D.1 – Overview of possible security functions 57
Table D.2 – Network failure propagation possibilities 60

MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – DIGITAL INTERFACES –

Part 450: Multiple talkers and multiple listeners – Ethernet interconnection

1 Scope

This part of IEC 61162 specifies interface requirements and methods of test for high speed communication between shipboard navigation and radiocommunication equipment as well as between such systems and other ship systems that need to communicate with navigation and radio-communication equipment. This part of IEC 61162 is based on the application of an appropriate suite of existing international standards to provide a framework for implementing data transfer between devices on a shipboard Ethernet network.

This standard provides a higher speed and higher capacity alternative to the IEC 61162-1 and IEC 61162-2 standards while retaining these standards' basic data format. This standard provides a higher data capacity than IEC 61162-3.

This standard specifies an Ethernet based bus type network where any listener may receive messages from any sender with the following properties.

- This standard includes provisions for multicast distribution of information formatted according to IEC 61162-1, for example position fixes and other measurements, as well as provisions for transmission of general data blocks (binary image), for example between radar and VDR.
- This standard is limited to protocols for equipment (Network nodes) connected to a single Ethernet network consisting only of OSI level one or two devices and cables (Network infrastructure).
- This standard provides requirements only for equipment interfaces. By specifying protocols for transmission of IEC 61162-1 sentences and general binary image data these requirements will guarantee interoperability between equipment implementing this standard as well as a certain level of safe behaviour of the equipment itself.
- This standard permits equipment using other protocols than those specified in this standard to share a network infrastructure provided that it is supplied with interfaces which satisfy the requirements described for ONF (see 4.6).
- This standard does not contain any system requirements other than the ones that can be inferred from the sum of individual equipment requirements. Thus, to ascertain system properties that cannot be derived from equipment requirements alone, additional analysis or standards will be required. In particular, this applies to requirements to maintain system functionality in the face of a single point failure in equipment or networks. Informative Annex D contains guidance on how to address such issues.

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 60825-2, *Safety of laser products – Part 2: Safety of optical fibre communication systems (OFCS)*