INTERNATIONAL STANDARD

IEC 61162-2

First edition
1998-09

**Maritime navigation and radiocommunication equipment and systems –
Digital interfaces –**

**Part 2:
Single talker and multiple listeners,
high-speed transmission**

*Matériels et systèmes de navigation
et de radiocommunication maritimes –
Interfaces numériques –*

*Partie 2:
Emetteur unique et récepteurs multiples,
transfert rapide de données*

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For general terminology, readers are referred to IEC 60050: *International Electrotechnical Vocabulary* (IEV).

For graphical symbols, and letter symbols and signs approved by the IEC for general use, readers are referred to publications IEC 60027: *Letter symbols to be used in electrical technology*, IEC 60417: *Graphical symbols for use on equipment. Index, survey and compilation of the single sheets* and IEC 60617: *Graphical symbols for diagrams*.

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*   See web site address on title page.

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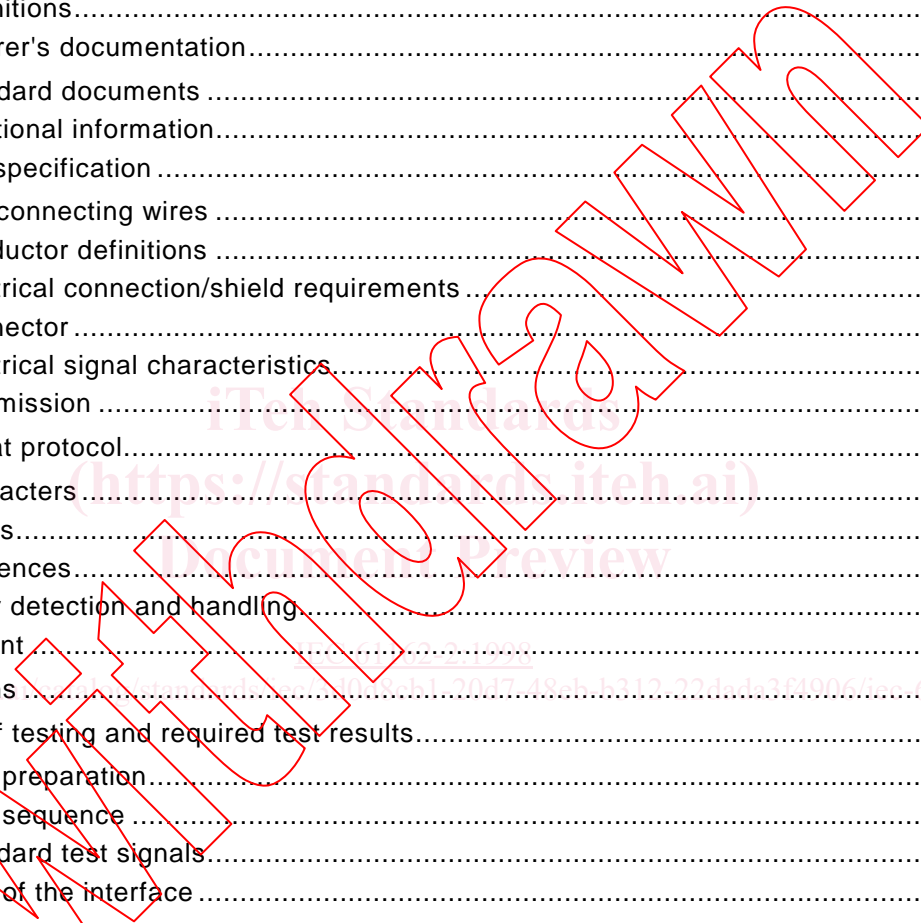Международная Электротехническая Комиссия

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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MARITIME NAVIGATION AND RADIOCOMMUNICATION
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high-speed transmission

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.

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International Standard IEC 61162-2 has been prepared by technical committee 80: Maritime navigation and radiocommunication equipment and systems.

This part of IEC 61162 is based upon NMEA 0183, version 2.30, and it is the intention of IEC and NMEA to maintain this commonality as far as possible.

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

FDIS	Report on voting
80/189/FDIS	80/206/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.

Annexes A and B are for information only.

A bilingual version of this standard may be issued at a later date.

MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – DIGITAL INTERFACES –

Part 2: Single talker and multiple listeners, high-speed transmission

1 General

1.1 Scope

This part of IEC 61162 contains the requirements for data communication between maritime electronic instruments, navigation and radiocommunication equipment when interconnected via an appropriate interface.

This standard is intended to support one-way serial data transmission from a single talker to one or more listeners. This data is in printable ASCII form and may include any information as specified by approved sentences or information coded according to the rules for proprietary sentences. Typical messages may be from 11 to a maximum of 79 characters in length and generally require repetition rates up to once per 20 ms.

The electrical definitions in this standard are intended to accommodate higher data rates than are specified in IEC 61162-1. Since there is no provision for guaranteed delivery of messages and only limited error-checking capability, this standard should be used with caution in all safety applications.

Annex A contains a list of relevant IMO resolutions and ITU recommendations to which this standard applies.

1.2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 61162. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 61162 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60945:1996, *Maritime navigation and radiocommunication equipment and systems – General requirements, methods of testing and required test results*

IEC 61162-1:1995, *Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 1: Single talker and multiple listeners*

ITU-T V.11:1996, *Electrical characteristics for balanced double-current interchange circuits operating at data signalling rates up to 10 Mbits/s*

NMEA 0183 – Version 2.30:1998, *National marine electronics association (USA) – Standard for interfacing marine electronic navigational devices*

EIA 485:1991, *Electrical characteristics of generators and receivers for use in balanced digital multipoint systems*

1.3 Definitions

Common terms are defined in the glossary of annex B. Where there is a conflict, terms shall be interpreted, wherever possible, in accordance with the references in 1.2.

For the purposes of this part of IEC 61162, the following definitions apply.

talker
any device which sends data to other devices. The type of talker is identified by a two-character mnemonic as listed in 6.2 (table 4) of IEC 61162-1.

listener
any device which receives data from another device

latency
time interval between an event and its resulting information, including time for processing, transmission and/or reception

2 Manufacturer's documentation

2.1 Standard documents

Operator manuals or other appropriate literature provided for equipment that is intended to meet the requirements of this standard shall contain as a minimum the following information:

a) identification of the A, B and common (C) signal lines;

b) the output drive capability as a talker;

c) a list of approved sentences, noting unused fields, proprietary sentences transmitted as a talker, data latency and transmission interval for each sentence;

d) the load requirements as a listener;

e) a list of sentences and associated data fields that are required by, or are acceptable to, a listener;

f) the current software and hardware revision if this is relevant to the interface;

g) an electrical description or schematic of the listener/talker input/output circuits citing actual components and devices used, including connector type and part number;

h) the version number and date of update of the standard for which compliance is sought.

2.2 Additional information

As latency, filtering, error handling and data transmission interval can have a serious influence on the performance of a system, the manufacturer shall give careful consideration to these aspects. Documentation should include such data where applicable.

3 Hardware specification

One talker and multiple listeners may be connected in parallel over interconnecting wires. Because of EMC requirements shielded cables are recommended. The number of listeners depends on the output capability, the input drive requirements of the connected devices, and on the use of termination resistors.

3.1 Interconnecting wires

Interconnection between devices may be by means of a shielded two-conductor twisted-pair wire (A, B) plus any means to secure common signal ground potential (C) for transmitting and receiving devices. For this purpose, a third wire additional to the twisted pair or the inner shield of double-shielded cable with insulated shields may be used.

3.2 Conductor definitions

The conductors referred to in this standard are the signal lines A, B, C (common) and shield.

3.3 Electrical connection/shield requirements

All signal and common line connections A, B and C are connected in parallel.

With single-shielded cables and a separate wire as common line C (signal ground), the shield shall be connected to the talker chassis and shall not be connected to any listener. However, the shield shall be continuous (unbroken) between all listeners (see figure 1 and figure 2a)).

With double-shielded cables and the inner shield used as common line C (signal ground), the outer shield shall be connected to the talker chassis and shall not be connected to any listener. However, the outer shield shall be continuous (unbroken) between all listeners (see figure 1 and figure 2b)).

With double-shielded cables and a separate wire as common line C (signal ground), the inner shield shall be connected to the talker chassis and shall not be connected to any listener. However, the inner shield shall be continuous (unbroken) between all listeners. The outer shield may be connected to the chassis on either side if required (see figure 1 and figure 2c)).

The cabling shall be designed in a way that stubs are avoided or kept as short as possible. If long cables are necessary, termination at the end of the line according to ITU-T V.11 shall be considered.

3.4 Connector

No standard connector is specified. Wherever possible readily available commercial connectors shall be used. Manufacturers shall provide means for user identification of the connections used.

3.5 Electrical signal characteristics

This subclause describes the electrical characteristics of transmitters and receivers.

3.5.1 Signal state definitions

The idle, marking, logical 1, OFF or stop bit state is defined by a negative voltage on line A with respect to line B, as in IEC 61162-1.

The active, spacing, logical 0, ON or start bit state is defined by a positive voltage on line A with respect to line B, as in IEC 61162-1.

3.5.2 Talker drive circuits

No provision is made for more than a single talker to be connected to the bus. The drive circuit shall meet, as a minimum, the requirements of ITU-T V.11.

Improved and compatible driver circuits (e.g. EIA-485) used in a compliant way are allowed.

3.5.3 Listener receive circuits

Multiple listeners may be connected to a single talker. The listener's receive circuit shall comply with ITU-T V.11. Optional termination resistors for the line shall be provided. The input terminals A, B and C shall be electrically isolated from the remaining electronics of the listening device. Reference is made to 3.5.4 and a sample circuit shown in figure 1 of this standard.

3.5.4 Electrical isolation

Within a listener there shall be no direct electrical connection between the signal lines A and B, the signal ground C or the shield to ship's mains ground or power line. This isolation shall be in accordance with IEC 60945.

3.5.5 Maximum voltage on the bus

The maximum applied voltage between signal lines A and B and between either line and ground C shall be in accordance with ITU-T V.11.

For protection against miswiring and for unintended connection to earlier TALKER designs, all receive circuit devices shall be capable of withstanding 15 V between either lines and signal ground for an indefinite period.

4   Data transmission

Data is transmitted in serial asynchronous form in accordance with 1.2. The first bit is a start bit and is followed by data bits, least-significant-bit first as in figure 3.

The following parameters are used:

– baud rate 38 400 (bits/s);

– data bits 8 (D7 = 0), parity none;

– stop bits 1.

5   Data format protocol

5.1   Characters

All transmitted data shall be interpreted as ASCII characters. The most significant bit of the eight-bit character shall always be transmitted as zero (D7 = 0).

5.1.1   Reserved characters

The reserved character set consists of those ASCII characters shown in 6.1 (table 1) of IEC 61162-1. These characters are used for specific formatting purposes, such as sentence and field delimiting, and shall not be used in data fields.

5.1.2   Valid characters

The valid character set consists of all printable ASCII characters (HEX 20 to HEX 7E) except those defined as reserved characters. The list of the valid character set is given in 6.1 (table 2) of IEC 61162-1.

5.1.3   Undefined characters

ASCII values not specified as either reserved characters or valid characters are excluded and shall not be transmitted at any time.

5.1.4   Character symbols

When individual characters are used in this standard to define units of measurement, to indicate the type of data field, type of sentence, etc., they shall be interpreted according to the character symbol in 6.1 (table 3) of IEC 61162-1.

5.2   Fields

A field consists of a string of valid characters, or no characters (null field), located between two appropriate delimiter characters.

5.2.1   Address field

An address field is the first field in a sentence and follows the "$" delimiter; it serves to define the sentence. Characters within the address field are limited to digits and upper-case letters. The address field shall not be a null field. Only sentences with the following three types of address fields shall be transmitted.

5.2.1.1   Approved address field

Approved address fields consist of five characters defined by this standard. The first two characters are the talker identifier, listed in 6.2 (table 4) of IEC 61162-1. The next three characters form the sentence formatter used to define the format and the type of data. A list of approved sentence formatters is given in 6.2 (table 5) of IEC 61162-1.

5.2.1.2   Query address field

The query address field consists of five characters and is used for the purpose of requesting transmission of a specific sentence on a separate bus from an identified talker.

5.2.1.3   Proprietary address field

The proprietary address field consists of the proprietary character P followed by a three-character manufacturer's mnemonic code used to identify the talker issuing a proprietary sentence, and any additional characters as required. A list of valid manufacturer's mnemonic codes may be obtained from NMEA.

5.2.2   Data fields

Data fields in approved sentences follow a "," delimiter and contain valid characters in accordance with the formats illustrated in 6.2 (table 6) of IEC 61162-1. Data fields in proprietary sentences contain only valid characters but are not defined by this standard.

Because of the presence of variable data fields and null fields, specific data fields shall only be located within a sentence by observing the field delimiters ",". Therefore, it is essential for the listener to locate fields by counting delimiters rather than counting the total number of characters received from the start of the sentence.

5.2.2.1   Variable length fields

Although some data fields are defined to have fixed length, many are of variable length in order to allow devices to convey information and to provide data with more or less precision, according to the capability or requirements of a particular device.

Variable length fields may be alpha-numeric or numeric fields. Variable numeric fields may contain a decimal point and may contain leading or trailing zeros.

5.2.2.2   Data field types

Data fields may be alpha, numeric, alphanumeric, variable length, fixed length, fixed/variable (with a portion fixed in length while the remainder varies). Some fields are constant, with their value dictated by a specific sentence definition. The allowable field types are summarized in 6.2 (table 6) of IEC 61162-1.