

# INTERNATIONAL STANDARD



Maritime navigation and radiocommunication equipment and systems –  
Digital interfaces –  
Part 3: Serial data instrument network

Document Preview

IEC 61162-3:2008

<https://standards.iteh.ai/catalog/standards/iec/cf088760-1009-4078-acfd-2e3ad5dbb0fa/iec-61162-3-2008>



## THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2010 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester.

If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland  
Email: [inmail@iec.ch](mailto:inmail@iec.ch)  
Web: [www.iec.ch](http://www.iec.ch)

### About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

### About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

- Catalogue of IEC publications: [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

The IEC on-line Catalogue enables you to search by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, withdrawn and replaced publications.

- IEC Just Published: [www.iec.ch/online\\_news/justpub](http://www.iec.ch/online_news/justpub)

Stay up to date on all new IEC publications. Just Published details twice a month all new publications released. Available on-line and also by email.

- Electropedia: [www.electropedia.org](http://www.electropedia.org)

The world's leading online dictionary of electronic and electrical terms containing more than 20 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary online.

- Customer Service Centre: [www.iec.ch/webstore/custserv](http://www.iec.ch/webstore/custserv)

If you wish to give us your feedback on this publication or need further assistance, please visit the Customer Service Centre FAQ or contact us:

Email: [csc@iec.ch](mailto:csc@iec.ch)

Tel.: +41 22 919 02 11

Fax: +41 22 919 03 00

IEC 61162-3:2008

<http://www.iec.ch/catalog/standards/iec/ci088760-1009-4078-acfd-2e3ad5dbb0a/iec-61162-3-2008>



IEC 61162-3

Edition 1.1 2010-11

# INTERNATIONAL STANDARD



---

**Maritime navigation and radiocommunication equipment and systems –  
Digital interfaces –  
Part 3: Serial data instrument network**

Document Preview

[IEC 61162-3:2008](#)

<https://standards.iteh.ai/catalog/standards/iec/cf088760-1009-4078-acfd-2e3ad5dbb0fa/iec-61162-3-2008>

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

---

ICS 47.020.70

ISBN 978-2-88912-190-8

## CONTENTS

FOREWORD.....	3
INTRODUCTION .....	5
1 Scope.....	6
2 Normative references.....	6
3 Terms, definitions and conventions.....	7
3.1 Terms and definitions .....	7
3.2 Conventions .....	10
4 Physical layer.....	10
4.1 CAN transceiver.....	10
4.2 Environmental.....	10
4.3 Radio frequency interference.....	10
4.3.1 Unwanted electromagnetic emissions.....	10
4.3.2 Immunity to electromagnetic environment .....	10
4.4 Cables .....	10
4.5 Interface power.....	11
4.6 Network power source .....	11
5 Data link layer.....	11
6 Network layer.....	11
7 Network management .....	11
7.1 Address configuration method .....	11
7.2 Address retention.....	11
8 Application layer.....	11
8.1 Parameter groups .....	11
8.1.1 Parameter group priority .....	11
8.1.2 Parameter group broadcast rate .....	12
9 Test criteria.....	12
10 Application notes.....	12
11 Manufacturer's documentation .....	12
Annex A (informative) System integration.....	13
Bibliography.....	17
Figure A.1 – Example of configuration .....	15
Figure A.2 – Example of configuration .....	15
Table A.1 – Test characteristics .....	14

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**MARITIME NAVIGATION AND RADIOCOMMUNICATION  
EQUIPMENT AND SYSTEMS –  
DIGITAL INTERFACES –****Part 3: Serial data instrument network**

## 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.
- 2) The formal decisions or agreements of 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 IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

**This consolidated version of IEC 61162-3 consists of the first edition (2008) [documents 80/496/CDV and 80/526/RVC] and its amendment 1 (2010) [documents 80/580/CDV and 80/594/RVC]. It bears the edition number 1.1.**

**The technical content is therefore identical to the base edition and its amendment and has been prepared for user convenience. A vertical line in the margin shows where the base publication has been modified by amendment 1. Additions and deletions are displayed in red, with deletions being struck through.**

International Standard IEC 61162-3 has been prepared by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of the IEC 61162 series, under the general title *Maritime navigation and radiocommunication equipment and systems – Digital interfaces*, can be found on the IEC website.

The committee has decided that the contents of the base publication and its amendments 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.

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

**IMPORTANT – The “colour inside” logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this publication using a colour printer.**

[IEC 61162-3:2008](https://standards.iteh.ai/catalog/standards/iec/cf088760-1009-4078-acfd-2e3ad5dbb06/iec-61162-3-2008)

<https://standards.iteh.ai/catalog/standards/iec/cf088760-1009-4078-acfd-2e3ad5dbb06/iec-61162-3-2008>

## INTRODUCTION

This part of IEC 61162 has been developed by the IEC technical committee 80 working group 6, to meet the requirement for a versatile and economic means of connecting a wide range of marine navigation and radiocommunications equipment aboard SOLAS vessels. The National Marine Electronics Association's Standard Committee has developed the NMEA 2000®<sup>1</sup> standard. The NMEA<sup>2</sup> 2000 Standard provides for capabilities across all classes of vessels. The development of NMEA 2000 began in 1994 and was completed in 1999. More than a dozen manufacturers worldwide conducted a two-year beta test. The finalised NMEA 2000 standard version 1.000 was published in 2001. IEC and NMEA have worked together since 1999 to ensure that the NMEA 2000 standard fully supports SOLAS applications. NMEA 2000 version 1.200 was published in 2004, with expanded support for redundant messaging and for equipments such as AIS.

The need for an improved standard, compared with IEC 61162-1 and IEC 61162-2, has arisen due to the increased complexity of the latest equipment and systems. This requires multiple links between equipment and greatly improved communication speed.

The parts 400 of the IEC 61162 series have already been issued and cater for the most complex systems to be found on board a ship.

This new part 3 of IEC 61162 adopts the controller area network (CAN) technology, already well established for many industrial systems. This permits a versatile system to be established with the minimum of effort and reasonable cost. The equipment types supported and the sentence data content developed for IEC 61162-1 has been retained.

IEC 61162-3 describes a low cost, moderate capacity, bi-directional multi-transmitter/multi-receiver instrument network to interconnect marine electronic equipment. The connectors and cables used are compatible with industrial bus systems for instance DeviceNet<sup>TM</sup><sup>3</sup> and Profibus<sup>TM</sup><sup>4</sup>.

IEC 61162-3 provides for the application of NMEA 2000 aboard SOLAS vessels. Exceptions, additions and specific requirements for implementation upon SOLAS vessels are contained in this document.

IEC 61162-3:2008

<https://standards.iteh.ai/catalog/standards/iec/61162-3-2008/78-acfd-2e3ad5dbb06/iec-61162-3-2008>

### INTRODUCTION (to Amendment 1)

The amendment updates the normative reference for NMEA 2000 Appendix B to a later version which includes five new sentences: PGN # 129807 - AIS Class B Group Assignment, PGN # 129809 - AIS Class B "CS" Static Report Part A, PGN # 129810 - AIS Class B, PGN # 129039 - AIS Class B Position Report, and PGN # 129040 - AIS Class B Extended Position Report.

<sup>1</sup> NMEA 2000® is the registered trademark of the National Marine Electronics Association, Inc. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by IEC of the trademark holder or any of its products. Compliance to this profile does not require use of the trade name. Use of the trade name requires permission of the trade holder.

<sup>2</sup> NMEA is the registered trademark of the National Marine Electronics Association, Inc. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by IEC of the trademark holder or any of its products. Compliance to this profile does not require use of the trade name. Use of the trade name requires permission of the trade holder.

<sup>3</sup> DeviceNet<sup>TM</sup> is the registered trademark of the Open DeviceNet Vendor Association, Inc. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by IEC of the trademark holder or any of its products. Compliance to this profile does not require use of the trade name. Use of the trade name requires permission of the trade holder.

<sup>4</sup> Profibus<sup>TM</sup> is the registered trademark of PROFIBUS International. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by IEC of the trademark holder or any of its products. Compliance to this profile does not require use of the trade name. Use of the trade name requires permission of the trade holder.

# MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – DIGITAL INTERFACES –

## Part 3: Serial data instrument network

### 1 Scope

This part of IEC 61162 is based upon the NMEA 2000 standard. The NMEA 2000 standard contains the requirements for the minimum implementation of a serial-data communications network to interconnect marine electronic equipment onboard vessels. Equipment designed to this standard will have the ability to share data, including commands and status, with other compatible equipment over a single signalling channel.

Data messages are transmitted as a series of data frames, each with robust error check confirmed frame delivery and guaranteed latency times. As the actual data content of a data frame is at best 50 % of the transmitted bits, this standard is primarily intended to support relatively brief data messages, which may be periodic, transmitted as needed, or on-demand by use of query commands. Typical data includes discrete parameters such as position latitude and longitude, GPS status values, steering commands to autopilots, finite parameter lists such as waypoints, and moderately sized blocks of data such as electronic chart database updates. This standard is not necessarily intended to support high-bandwidth applications such as radar, electronic chart or other video data, or other intensive database or file transfer applications.

This standard defines all of the pertinent layers of the International Standards Organisation Open Systems Interconnect (ISO/OSI) model, from the application layer to the physical layer, necessary to implement the required IEC 61162-3 network functionality.

This standard defines data formats, network protocol, and the minimum physical layer necessary for devices to interface. SOLAS applications shall employ redundant designs (for instance dual networks, redundant network interface circuits) to reduce the impact of single point failures. The NMEA 2000 standard provides the fundamental tools and methods to support redundant equipment, buses and messaging. Specific shipboard installation designs are beyond the scope of this standard, however some guidance is given in Annex A.

### 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 60945, *Maritime navigation and radiocommunication equipment and systems – General requirements – Methods of testing and required test results*

ISO 11783 (all parts), *Tractors and machinery for agriculture and forestry – Serial control and communications data network*

ISO 11783-3, *Tractors and machinery for agriculture and forestry – Serial control and communications data network – Part 3: Data link layer*



ISO 11783-5:2001, *Tractors and machinery for agriculture and forestry – Serial control and communications data network – Part 5 Network management (including its corrigendum 1 (2002))*

NMEA 2000 Main document, Version 1.200: October 2004, *Serial-Data Networking Of Marine Electronic Devices*<sup>5</sup>

NMEA 2000, Appendix A, Version 1.200: October 2004, *Serial-Data Networking Of Marine Electronic Devices – Application Layer (Parameter Group Definitions)*

NMEA 2000, Appendix B, Version ~~1.210: September 2006~~ 1.300: May 2009, *Serial-Data Networking Of Marine Electronic Devices – Data Base*

NMEA 2000, Appendix C, Version 1.200: October 2004, *Serial-Data Networking Of Marine Electronic Devices – Certification Criteria and Test Methods*

NMEA 2000, Appendix D, Version 1.200: October 2004, *Serial-Data Networking Of Marine Electronic Devices – Application Notes*

IMO 1974, *International Convention for the Safety of Life at Sea (SOLAS), as amended – Chapter V – Safety of navigation*

### 3 Terms, definitions and conventions

#### 3.1 Terms and definitions

For the purposes of this document, the following definitions apply.

##### 3.1.1

###### **bit**

the smallest element of information on the communication channel

<https://standards.iteh.ai/catalog/standards/iec/ci088760-1009-4078-acfd-2e3ad5dbb06/iec-61162-3-2008>

NOTE Bits are grouped into bit fields of one or more bits. A bit is of constant time duration set by the signalling rate specified in this standard and has one of two logical values, dominant or recessive. When dominant and recessive levels are impressed on the communications channel at the same time the resulting level is dominant.

##### 3.1.2

###### **bridge**

device that joins two network segments using the same network protocol and address space

NOTE Data rate and physical media may differ on the two sides of a bridge. A bridge may perform message filtering.

##### 3.1.3

###### **byte**

eight bits

##### 3.1.4

###### **Controller area network (CAN) frame**

series of bits transmitted on the communications channel

NOTE CAN frames convey the following types of information:

- data frame. Carries data from a transmitter to the receivers.
- error frame. Transmitted by a unit detecting a bus error.
- overload frame. Transmitted to provide a delay between preceding and succeeding data frames.

<sup>5</sup> Available from National Marine Electronics Association (USA), [www.nmea.org](http://www.nmea.org).

The CAN data frame has defined start of frame and end of frame bit fields and is separated from preceding fields by an interframe space. CAN error and overload frames, when used, are appended directly to the preceding frame without an interframe space.

### 3.1.5

#### **class 1 devices**

refers to devices that have a single level A or level B network interface connection

### 3.1.6

#### **class 2 devices**

describes devices that have two level A or two level B network interface connections

NOTE Class 2 devices are intended for use on dual redundant bus systems. In addition to providing either level A or level B capabilities, class 2 devices provide a means to identify messages that are received from redundant buses as being the same or different.

### 3.1.7

#### **default operation**

operation or settings that exist when standard equipment is first shipped from the manufacturer

### 3.1.8

#### **device**

a product or equipment which, through a node, is connected to an IEC 61162-3 network

### 3.1.9

#### **gateway**

device that joins a network to another network or system

### 3.1.10

#### **interframe space**

bit field that separates data frames from preceding frames

### 3.1.11

#### **level A devices**

support the ISO transport layer and the complete set of network management parameter groups

### 3.1.12

#### **level B devices**

support address claim, ISO request PGN, and the product information parameter group

### 3.1.13

#### **listen only device**

device on the network that receives messages but does not participate in bus activity

NOTE This device cannot send any frames on the network (data, error, or acknowledge).

### 3.1.14

#### **load equivalency number**

a node's power rating reported in units of network load

### 3.1.15

#### **message**

consists of one or more data frames, as specified in this standard, that contain the parameter group information to be communicated from a network address

NOTE A message contains the message priority code, parameter group number, destination network address, source network address, and data fields. The destination network address may be a specific address or global.