



IEC 62065

Edition 2.0 2014-02

# INTERNATIONAL STANDARD



---

**Maritime navigation and radiocommunication equipment and systems – Track control systems – Operational and performance requirements, methods of testing and required test results**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

PRICE CODE **XD**

---

ICS 47.020.70

ISBN 978-2-8322-1381-0

**Warning! Make sure that you obtained this publication from an authorized distributor.**

## CONTENTS

FOREWORD.....	5
1 Scope.....	7
2 Normative references .....	7
3 Terms, definitions and abbreviations .....	8
3.1 Terms and definitions .....	8
3.2 Abbreviations .....	12
4 Application of this standard .....	12
5 Requirements .....	14
5.1 Operational requirements .....	14
5.1.1 Functionality.....	14
5.1.2 Accuracy and performance constraint documentation .....	17
5.1.3 Alerts.....	18
5.2 Ergonomic criteria .....	20
5.2.1 Operational controls .....	20
5.2.2 Presentation of information.....	21
5.3 Design and installation .....	21
5.4 Interfacing .....	22
5.4.1 Sensors.....	22
5.4.2 Status information .....	22
5.4.3 Standards.....	22
5.5 Fall-back arrangements .....	22
5.5.1 Failure of track control.....	22
5.5.2 Failure of position sensor .....	23
5.5.3 Failure of the heading measuring system.....	23
5.5.4 Failure of the speed sensor .....	24
6 Test requirements and results .....	25
6.1 General .....	25
6.2 General requirements.....	25
6.2.1 Environmental tests .....	25
6.2.2 Documentation .....	26
6.2.3 Declarations .....	27
6.3 Environment setup .....	27
6.3.1 General .....	27
6.3.2 Ship motion simulator .....	29
6.3.3 Test scenarios .....	30
6.3.4 Planning .....	30
6.4 Test execution.....	31
6.4.1 General .....	31
6.4.2 Check the track .....	31
6.4.3 Execution of the scenarios.....	33
6.4.4 Execution of additional tests .....	39
6.4.5 Monitoring and alerts .....	41
6.4.6 Fallback and manual change over .....	47
6.4.7 Display of information.....	50
6.4.8 Operational controls .....	50
Annex A (normative) Graphical description of sequences.....	51

Annex B (informative) Speed control .....	53
Annex C (informative) Track control systems with dual controllers .....	55
Annex D (informative) Management of static and dynamic data.....	56
Annex E (informative) Limits .....	58
Annex F (informative) Data flow diagram .....	59
Annex G (normative) Scenario definitions and plots .....	61
Annex H (informative) Sensor errors and noise models .....	67
Annex I (normative) Ship model specification.....	73
Annex J (informative) Explanation of adaptation tests (6.4.4.1).....	94
Annex K (normative) IEC 61162 interfaces.....	97
Bibliography.....	100
Figure 1 – Functional model of track control as part of an integrated navigation system.....	26
Figure 2 – Block diagram .....	28
Figure 3 – High level block diagram .....	29
Figure A.1 – Sequence of course change alerts (~A) .....	51
Figure A.2 – Handling of the Back-up Navigator Alarm (NA).....	52
Figure G.1 – Scenario 1 plot .....	62
Figure G.2 – Scenario 2 plot .....	63
Figure G.3 – Scenario 3 plot .....	64
Figure G.4 – Scenario 4 plot .....	66
Figure H.1 – Spectral distribution of modelled GPS errors .....	68
Figure H.2 – Wave sequence – sea state 5 .....	70
Figure H.3 – Wave spectrum – sea state 5.....	70
Figure H.4 – Supertanker – sea state 5.....	71
Figure H.5 – Container ship – sea state 5 .....	71
Figure H.6 – Fast ferry – sea state 5.....	71
Figure H.7 – Container ship – sea state 2 .....	72
Figure I.1 – High level model block diagram.....	74
Figure I.2 – Model block diagram .....	86
Figure I.3 – Application with simple follow-up.....	87
Figure I.4 – Control system using actuator outputs and feedback.....	87
Figure I.5 – System with actuator mechanism, bypassing the rudder response model .....	88
Figure I.6 – System with actuator mechanism using a fast rudder response time in the model .....	88
Figure I.7 – Turning circle manoeuvre – Ferry.....	91
Figure I.8 – Turning circle manoeuvre – Container ship .....	92
Figure I.9 – Turning circle manoeuvre – Tanker .....	93
Figure J.1 – Adaptation to speed change .....	94
Figure J.2 – Adaptation to changes along a leg.....	95
Figure J.3 – Adaptation to current changes during turn .....	95
Figure J.4 – Adaptation to sea state during turn .....	96
Figure J.5 – Adaptation to sea state change on a leg .....	96

Figure K.1 – Track control system logical interfaces .....	97
Table 1 – Simulator input rate .....	29
Table 2 – Simulator output rate .....	30
Table E.1 – Limits .....	58
Table G.1 – Scenario 1 .....	61
Table G.2 – Scenario 2 .....	62
Table G.3 – Scenario 3 .....	63
Table G.4 – Scenario 4 .....	65
Table H.1 – Heights and periods for half-waves .....	69
Table I.1 – Relationship between thrust lever and rudder models .....	76
Table I.2 – Constant parameters of the model .....	83
Table I.3 – Run-time inputs .....	85
Table I.4 – Model outputs .....	85
Table I.5 – Parameter sets for three ships .....	89
Table I.6 – Results from turning circle manoeuvres .....	90
Table K.1 – IEC 61162-1 sentences transmitted by the track control system .....	97
Table K.2 – IEC 61162-1 sentences received by the track control system .....	98

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

---

**MARITIME NAVIGATION AND  
RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS –  
TRACK CONTROL SYSTEMS –****Operational and performance requirements,  
methods of testing and required test results**

## 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.

International Standard IEC 62065 has been prepared by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems.

This second edition cancels and replaces the first edition published in 2002 and constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- alarms and warnings have been brought into line with the requirements for Bridge Alert Management;
- requirements for the category B system have been revised;

- the parameters of the ship models of Annex I have been adjusted to resemble more Newtonian-like behaviour and the tidal current has been modelled;
- a new Annex K has been added with interface requirements.

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

FDIS	Report on voting
80/716/FDIS	80/729/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.

All text of this standard that is identical to that in IMO resolution MSC.74(69), Annex 2, is printed in *italics* and the resolution (abbreviated to – A2) and paragraph numbers are indicated in brackets i.e. (A2/3.3).

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.

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 document using a colour printer.**

# MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – TRACK CONTROL SYSTEMS –

## Operational and performance requirements, methods of testing and required test results

### 1 Scope

This International Standard specifies the minimum operational and performance requirements, methods of testing and required test results conforming to performance standards adopted by the IMO in resolution MSC.74(69) Annex 2 Recommendation on Performance Standards for Track Control Systems. In addition, it takes into account IMO resolution A.694(17) to which IEC 60945 is associated.

When a requirement of this standard is different from IEC 60945, the requirement in this standard takes precedence. Also it takes into account IMO resolution MSC.302(87) on bridge alert management (BAM).

### 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.

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

IEC 61162 (all parts), *Maritime navigation and radiocommunication equipment and systems – Digital interfaces*

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

IEC 61162-2, *Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 2: Single talker and multiple listeners, high-speed transmission*

IEC 61924-2, *Maritime navigation and radiocommunication equipment and systems – Integrated navigation systems – Part 2: Modular structure for INS – Operational and performance requirements, methods of testing and required test results*

IEC 62288, *Maritime navigation and radiocommunication equipment and systems – Presentation of navigation-related information on shipborne navigational displays – General requirements, methods of testing and required test results*

IEC 62616, *Maritime navigation and radiocommunication equipment and systems – Bridge navigational watch alarm system (BNWAS)*

IMO MSC.74(69) Annex 2, *Recommendation on Performance Standards for Track Control Systems*

IMO resolution A.694(17), *General requirements for shipborne radio equipment forming part of the Global Maritime Distress and Safety System (GMDSS) and for electronic navigational aids*

IMO MSC.302(87), *Performance standards for bridge alert management (BAM)*