

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Maritime navigation and radiocommunication equipment and systems –
Shipborne voyage data recorder (VDR) –
Part 1: Performance requirements, methods of testing and required test results**

**Matériels et systèmes de navigation et de radiocommunication maritimes –
Enregistreur de données de navigation embarqué (VDR) –
Partie 1: Exigences de fonctionnement, méthodes d'essai et résultats d'essai
exigés**



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2021 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.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
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 corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

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 It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC online collection - oc.iec.ch

Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 18 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC -

webstore.iec.ch/advsearchform

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études, ...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

IEC online collection - oc.iec.ch

Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 000 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.



IEC 61996-1

Edition 2.1 2021-05
CONSOLIDATED VERSION

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Maritime navigation and radiocommunication equipment and systems –
Shipborne voyage data recorder (VDR) –
Part 1: Performance requirements, methods of testing and required test results**

**Matériels et systèmes de navigation et de radiocommunication maritimes –
Enregistreur de données de navigation embarqué (VDR) –
Partie 1: Exigences de fonctionnement, méthodes d'essai et résultats d'essai
exigés**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 47.020.70

ISBN 978-2-8322-1032-3

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

REDLINE VERSION

VERSION REDLINE



**Maritime navigation and radiocommunication equipment and systems –
Shipborne voyage data recorder (VDR) –
Part 1: Performance requirements, methods of testing and required test results**

**Matériels et systèmes de navigation et de radiocommunication maritimes –
Enregistreur de données de navigation embarqué (VDR) –
Partie 1: Exigences de fonctionnement, méthodes d'essai et résultats d'essai
exigés**

CONTENTS

FOREWORD.....	6
1 Scope.....	8
2 Normative references	8
3 Terms, definitions and abbreviations	9
3.1 Terms and definitions.....	9
3.2 Abbreviations.....	12
4 Performance requirements.....	12
4.1 General.....	12
4.2 Purpose	12
4.3 Operational requirements.....	12
4.3.1 Design and construction	12
4.3.2 Maintenance of sequential records	13
4.3.3 Co-relation in date and time.....	13
4.3.4 Final recording medium	13
4.3.5 Interfaces	14
4.3.6 Performance test	15
4.4 Data selection and security	15
4.4.1 Selection of data items	15
4.4.2 Configuration data	15
4.4.3 Resistance to tampering	16
4.4.4 Recording integrity	16
4.5 Operation.....	17
4.5.1 Recording and saving of data	17
4.5.2 Power source	17
4.5.3 Dedicated reserve power source.....	17
4.5.4 Recording period and duration.....	17
4.6 Data items to be recorded.....	17
4.6.1 Date and time	17
4.6.2 Ship's position	18
4.6.3 Speed.....	18
4.6.4 Heading.....	18
4.6.5 Bridge audio	18
4.6.6 Communications audio	18
4.6.7 Radar data – post-display selection	18
4.6.8 ECDIS	19
4.6.9 Echo sounder	19
4.6.10 Main alarms.....	19
4.6.11 Rudder order and response	19
4.6.12 Engine and thruster order and response	19
4.6.13 Hull openings (doors) status	19
4.6.14 Watertight and fire door status.....	19
4.6.15 Accelerations and hull stresses	20
4.6.16 Wind speed and direction	20
4.6.17 AIS	20
4.6.18 Rolling motion.....	20
4.6.19 Configuration data	20

4.6.20	Electronic logbook	20
5	Technical characteristics	20
5.1	Co-relation in date and time	20
5.2	Particular design requirements for the final recording medium	21
5.2.1	Fixed protective capsule	21
5.2.2	Float-free capsule	21
5.2.3	Long-term recording medium	21
5.3	Location beacons	21
5.3.1	Fixed protective capsule	21
5.3.2	Float-free capsule	22
5.4	Survivability of recorded data	22
5.4.1	Long-term retention	22
5.4.2	Physical protection	22
5.5	Information to be included in the manufacturer's documentation	23
5.5.1	Installation guidelines	23
5.5.2	Operation and maintenance manual	23
5.5.3	Information for use by an investigation authority	24
5.6	Bridge audio specifications	24
5.6.1	Input interface	24
5.6.2	Reference signal	24
5.6.3	Audio frequency response	24
5.6.4	Quality index	24
5.6.5	Signal noise level – Signal to noise and distortion	25
5.6.6	Ability to handle complex signals	25
5.6.7	Suppression of low frequency out band noise	25
5.6.8	Microphones	25
5.7	Communications audio	26
5.7.1	Input interfaces	26
5.7.2	Reference signal	26
5.7.3	Audio frequency response	26
5.7.4	Quality index	26
5.7.5	Audio noise level – Signal to no signal	26
5.7.6	Signal noise level – Signal to noise and distortion (SINAD)	26
5.8	Screen image capture	27
5.8.1	Input interface	27
5.8.2	Image outputs	27
5.9	Radar data – Post-display selection	28
5.10	ECDIS data	28
5.11	Configuration data	28
5.11.1	Distribution of data in final recording media	28
5.11.2	Protection	28
5.11.3	Synchronisation of sensor and configuration data	28
5.12	Operational performance test	29
5.13	Bridge alert management system	29
6	Methods of testing and required test results	29
6.1	General	29
6.1.1	Test setup	29
6.1.2	Download and playback equipment	30
6.1.3	Sequence of tests	31

6.1.4	Requirements to be checked by inspection only	31
6.1.5	Environmental test conditions for normal operation	31
6.1.6	Recording duration	31
6.1.7	Reserve power source	32
6.1.8	Recharging of reserve source of power	32
6.1.9	Brief interruption of electrical power	33
6.1.10	Recording integrity	33
6.1.11	Maintenance of sequential records	33
6.1.12	Co-relation in date and time	33
6.1.13	Design and construction of the fixed protective capsule	34
6.1.14	Design and construction of the float-free capsule	36
6.1.15	Operational performance test	37
6.1.16	Power source	38
6.2	Data items to be recorded	38
6.2.1	Date/time – Ship’s position – Speed – Heading	38
6.2.2	Bridge audio	38
6.2.3	Communications audio	43
6.2.4	Radar data, post-display selection and ECDIS	46
6.2.5	Other items	54
6.2.6	Electronic logbook	55
6.3	Interfaces	55
Annex A (normative)	IEC 61162 sentence formats	56
Annex B (informative)	Mandatory alarms	57
Annex C (normative)	Download and playback equipment for investigating authorities	60
Annex D (informative)	Requirement/test – Cross-references	64
Annex E (normative)	LAN image protocol	66
Annex F (informative)	Network for image transmission	70
Annex G (normative)	ECDIS display source information	73
Bibliography	78
Figure 1	– Insertion of Morse letter “V” in homing transmission	22
Figure 2	– Test set-up block diagram	48
Figure 3	– Comparison of images	52
Figure F.1	– Network with a switch	70
Figure F.2	– Network with direct connections	71
Figure F.3	– Network for a ship with an extensive bridge	72
Table 1	– Bridge audio, signal to no signal measurements	40
Table 2	– Bridge audio, signal to noise and distortion (SINAD) measurements	41
Table 3	– Complex signals	42
Table 4	– Communications audio, signal to no-signal measurements	45
Table 5	– Communications audio, signal to noise and distortion (SINAD) measurements	46
Table 6	– Intersection colours of test images 1 and 2	50
Table A.1	– References in this standard	56
Table B.1	– Mandatory alarms on the bridge	57

Table D.1 – Subject list and subclauses (1 of 2).....	64
Table E.1 – Default values for transmitting equipment	69
Table E.2 – Default values for receiving equipment.....	69
Table G.1 – Required chart information.....	74
Table G.2 – Additional chart information	74

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**MARITIME NAVIGATION AND RADIOCOMMUNICATION
EQUIPMENT AND SYSTEMS –
SHIPBORNE VOYAGE DATA RECORDER (VDR) –****Part 1: 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.

This consolidated version of the official IEC Standard and its amendment has been prepared for user convenience.

IEC 61996-1 edition 2.1 contains the second edition (2013-05) [documents 80/690/FDIS and 80/699/RVD], its corrigendum 1 (2014-02) and its amendment 1 (2021-05) [documents 80/976/CDV and 80/993/RVC].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

International Standard IEC 61996-1 has been prepared by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems.

This second edition constitutes a technical revision.

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

- a) The description of the protective capsule in 4.3.4 has been changed in line with the requirements of the new IMO performance standards given in Resolution MSC.333(90) which now require a final recording medium comprising three parts; fixed, float-free and long-term.
- b) A new requirement for a performance test has been added in 4.3.6.
- c) Further data items to be recorded have been added to 4.6 for ECDIS, AIS, rolling motion and electronic logbooks.
- d) Clause 5 contains new technical requirements for configuration data, operational performance test and bridge alert management system. In addition, further technical requirements have been added to 5.6 for bridge audio and to 5.8 for radar and ECDIS images.
- e) References to “alarm” requirements in the previous edition have been substituted by references to “cautions” in line with current IMO recommendations. The test methods in Clause 6 have been updated to reflect the new requirements.
- f) New Annexes E, F and G concerning protocols for interfacing images using a Local Area Network have been added.

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

A list of all parts of the IEC 61996 series, under the general title *Maritime navigation and radiocommunication equipment and systems – Shipborne voyage data recorder (VDR)*, can be found on the IEC website.

NOTE All text of this standard, whose wording is identical to that of IMO Resolution MSC.333(90), is printed in *italics*, and the Resolution and associated performance standard paragraph numbers are indicated in brackets.

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

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 – SHIPBORNE VOYAGE DATA RECORDER (VDR) –

Part 1: Performance requirements, methods of testing and required test results

1 Scope

This part of IEC 61996 specifies the minimum performance requirements, technical characteristics, methods of testing and required test results, for shipborne voyage data recorder (VDR) installations as required by Chapter V of the International Convention for Safety of Life at Sea (SOLAS), as amended. It takes account of IMO resolution A.694(17) and is associated with IEC 60945. When a requirement in this standard is different from IEC 60945, the requirement in this standard takes precedence.

This standard incorporates the applicable parts of the performance standards included in IMO Resolution MSC.333(90).

NOTE All text of this standard, whose wording is identical to that of IMO Resolution MSC.333(90), is printed in *italics*, and the Resolution and associated performance standard paragraph numbers are indicated in brackets.

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 60068-2-27:2008, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

IEC 60268-16, *Sound system equipment – Part 16: Objective rating of speech intelligibility by speech transmission index*

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

IEC 61097-2, *Global maritime distress and safety system (GMDSS) – Part 2: COSPAS-SARSAT EPIRB – Satellite emergency position indicating radio beacon operating on 406 MHz – Operational and performance requirements, methods of testing and required test results*

IEC 61097-7:1996, *Global maritime distress and safety system (GMDSS) – Part 7: Shipborne VHF radiotelephone transmitter and receiver – Operational and performance requirements, methods of testing and required test results*

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

IEC 61162-450:2011, *Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 450: Multiple talkers and multiple listeners – Ethernet interconnection*