



BSI Standards Publication

Maritime navigation and radiocommunication equipment and systems — Shipborne voyage data recorder (VDR)

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

National foreword

This British Standard is the UK implementation of EN 61996-1:2013+A1:2021. It is identical to IEC 61996-1:2013, incorporating corrigendum February 2014 and amendment 1:2021. It supersedes BS EN 61996-1:2013, which will be withdrawn on 24 June 2024.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to IEC text carry the number of the IEC amendment. For example, text altered by IEC amendment 1 is indicated by A1 A1.

The UK participation in its preparation was entrusted to Technical Committee EPL/80, Maritime navigation and radiocommunication equipment and systems.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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Amendments/corrigenda issued since publication

Date	Text affected
31 March 2014	Implementation of IEC corrigendum February 2014: 8th row in Table A.1 of Annex A amended
31 August 2021	Implementation of IEC amendment 1:2021 with CENELEC endorsement A1:2021

**Maritime navigation and radiocommunication equipment and systems -
Shipborne voyage data recorder (VDR) -
Part 1: Performance requirements, methods of testing and required test
results
(IEC 61996-1:2013)**

Matériels et systèmes de navigation et de
radiocommunication maritimes -
Enregistreurs des données du voyage
(VDR) de bord -
Partie 1: Exigences de fonctionnement,
méthodes d'essai et résultats d'essai
exigés
(CEI 61996-1:2013)

Navigations- und
Funkkommunikationsgeräte und -systeme
für die Seeschifffahrt -
Fahrtdatenaufzeichnungsgeräte (VDR) auf
Seeschiffen -
Teil 1: Fahrtdatenaufzeichnungsgerät
(VDR) -
Leistungsanforderungen, Prüfverfahren
und geforderte Prüfergebnisse
(IEC 61996-1:2013)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

The text of document 80/690/FDIS, future edition 2 of IEC 61996-1, 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 61996-1:2013.

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) 2014-03-27
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2016-06-27

This document supersedes EN 61996-1:2008.

EN 61996-1:2013 includes the following significant technical changes with respect to EN 61996-1:2008:

- 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.

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 61996-1:2013 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 60268-5	NOTE Harmonised as EN 60268-5.
IEC 61162-1	NOTE Harmonised as EN 61162-1.
IEC 61924-2	NOTE Harmonised as EN 61924-2.
IEC 62065	NOTE Harmonised as EN 62065.
IEC 62288	NOTE Harmonised as EN 62288.
ISO 8728	NOTE Harmonised as EN ISO 8728.
ISO 11674	NOTE Harmonised as EN ISO 11674.

Foreword to amendment A1

The text of document 80/976/CDV, future IEC 61996-1/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 61996-1:2013/A1:2021.

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) 2022-03-24
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2024-06-24

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Endorsement notice

The text of the International Standard IEC 61996-1:2013/A1:2021 was approved by CENELEC as a European Standard without any modification.

Annex ZA

(normative)

Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

NOTE 1 Where 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.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60068-2-27	2008	Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock	EN 60068-2-27	2009
IEC 60268-16	-	Sound system equipment - Part 16: Objective rating of speech intelligibility by speech transmission index	EN 60268-16	-
IEC 60945	-	Maritime navigation and radiocommunication equipment and systems - General requirements - Methods of testing and required test results	EN 60945	-
IEC 61097-2	-	Global maritime distress and safety system (GMDSS) - Part 2: COSPAS-SARSAT EPIRB - Satellite emergency position indicating 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	Series	Maritime navigation and radiocommunication equipment and systems - Digital interfaces	EN 61162	Series
IEC 61162-450	2011	Maritime navigation and radiocommunication equipment and systems - Digital interfaces - Part 450: Multiple talkers and multiple listeners - Ethernet interconnection	EN 61162-450	2011
IEC 61174	-	Maritime navigation and radiocommunication equipment and systems - Electronic chart display and information system (ECDIS) - Operational and performance requirements, methods of testing and required test results	EN 61174	-
IEC 61260 + A1	1995 2001	Electroacoustics - Octave-band and fractional- octave-band filters	EN 61260 + A1	1995 2001
IEC 61672-1	2002	Electroacoustics - Sound level meters - Part 1: Specifications	EN 61672-1	2003
IEC 62388	2007	Maritime navigation and radio-communication equipment and systems - Shipborne radar - Performance requirements, methods of testing and required test results	EN 62388	2008



<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IMO A.658(16)	-	Use and fitting of retro-reflective materials on life-saving appliances	-	-
IMO A.662(16)	-	Performance standards for float-free release and activation arrangements for emergency radio equipment	-	-
IMO 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 Resolution MSC.471(101)	-	Performance standards for float-free satellite emergency position-indicating radio beacons (EPIRBs) operating on 406 MHz	-	-
IMO A.1021(26)	-	Code on alerts and indicators	-	-
IMO MSC.333(90)	2012	Performance standards for shipborne Voyage Data Recorders (VDRs)	-	-
EUROCAE ED-112	2003	Minimum operational performance specification (MOPS) for crash protected airborne recorder systems	-	-
VESA	2007	Video electronics standards association – VESA and industry standards and guidelines for computer display monitor timing (DMT)	-	-
SAE AS8045A	2011	Engineering Society for advancing mobility land sea air and space – Minimum performance standard for underwater locating devices – Acoustic, self-powered	-	-

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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.
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International Standard IEC 61996-1 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 2007 and 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.

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

FDIS	Report on voting
80/690/FDIS	80/699/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.

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 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.

The contents of the corrigendum of February 2014 have been included in this copy.

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*

IEC 61174, *Maritime navigation and radiocommunication equipment and systems – Electronic chart display and information system (ECDIS) – Operational and performance requirements, methods of testing and required test results*

IEC 61260:1995, *Electroacoustics – Octave-band and fractional-octave-band filters*
Amendment 1:2001

IEC 61672-1:2002, *Electroacoustics – Sound level meters – Part 1: Specifications*

IEC 62388:2007, *Maritime navigation and radiocommunication equipment and systems – Shipborne radar – Performance requirements, methods of testing and required test results*

IMO A.658(16), *Use and fitting of retro-reflective materials on life-saving appliances*

IMO A.662(16), *Performance standards for float-free release and activation arrangements for emergency radio equipment*

IMO 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 Resolution MSC.471(101), *Performance standards for float-free emergency position-indicating radio beacons (EPIRBs) operating on 406 MHz* 

IMO A.1021(26), *Code on alerts and indicators*

IMO MSC.333(90):2012, *Performance standards for shipborne Voyage Data Recorders (VDRs)*

EUROCAE ED-112:2003, *Minimum operational performance specification (MOPS) for crash protected airborne recorder systems*

VESA:2007, *Video electronics standards association – VESA and industry standards and guidelines for computer display monitor timing (DMT), Version 1.0, Revision 0.11*

SAE AS8045A:2011, *Engineering Society for advancing mobility land sea air and space – Minimum performance standard for underwater locating devices – Acoustic, self-powered*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document the following terms and definitions apply.

3.1.1

alert

announcement of abnormal situations and conditions requiring attention. Alerts are divided in four priorities: emergency alarms, alarms, warnings and cautions

Note 1 to entry: See (A.1021(26)/3).

3.1.2

alarm

high priority of an alert. A condition requiring immediate attention and action, to maintain the safe navigation and operation of the ship

Note 1 to entry: See (A.1021(26)/3).

3.1.3

bridge work station

position at which a person is expected to be when performing one of the normal bridge duties at, for example, the following work stations:

- centre line conning;
- bridge wing(s);
- main radar;
- chart table;
- helmsman;
- communication

3.1.4

caution

lowest priority of an alert. A condition which does not warrant an alarm or warning condition, but still requires attention and out of the ordinary consideration of the situation or of given information

Note 1 to entry: A caution is indicated by a steady visual indication with a message of sufficient detail to enable the bridge team to identify and address the caution condition. No acknowledgement is required and the caution should be automatically removed after the condition is rectified.

Note 2 to entry: See (A.1021(26)/3).

3.1.5

combined EPIRB/VDR capsule

single unit which meets all the requirements of a satellite EPIRB (as required by the carriage requirements of SOLAS IV) and all the requirements of a VDR (as required by the carriage requirements of SOLAS V)

Note 1 to entry: Combined EPIRB/VDR capsule was defined by IMO COMSAR 8.

3.1.6

configuration data

describes the vessel's equipment, its installation on the vessel and its relation to the VDR. The storage and playback software uses this data to store the data record and to convert the data record into information that assists casualty investigation during playback

Note 1 to entry: See (MSC.333(90)/4.10).

3.1.7

data

any item of information received by the VDR for recording, including numerical values, text and audio or radar signals and including all configuration data, except where specifically stated or where the context dictates otherwise

3.1.8

dedicated reserve power source

a battery, with suitable automatic charging arrangements, dedicated solely to the VDR, of sufficient capacity to operate it as required by 5.4.2

Note 1 to entry: See (MSC.333(90)/4.9).

3.1.9

final recording medium

the items of hardware on which the data is recorded such that access to any one of them would enable the data to be recovered and played back by use of suitable equipment. The combination of a fixed recording medium and float-free recording medium and long-term recording medium, together, is recognized as the final recording medium

Note 1 to entry: See (MSC.333(90)/4.3).

3.1.10

fixed recording medium

part of the Final Recording Medium which is protected against fire, shock, penetration and a prolonged period on the ocean floor. It is expected to be recovered from the deck of the vessel that has sunk. It has a means of indicating location

Note 1 to entry: See (MSC.333(90)/4.4).

3.1.11

float-free recording medium

part of the Final Recording Medium which should float-free after a sinking. It has a means of indicating location

Note 1 to entry: See (MSC.333(90)/4.5).

3.1.12

long-term recording medium

permanently installed part of the Final Recording Medium. It provides the longest record duration and has a readily accessible interface for downloading the stored data

Note 1 to entry: See (MSC.333(90)/4.6).

3.1.13

playback equipment

any data medium with the playback software, the operational instructions and any special parts required for connecting a commercial-off-the-shelf laptop computer to the VDR

Note 1 to entry: See (MSC.333(90)/4.7).

3.1.14

playback software

copy of the software program to provide the capability to download the stored data and play back the information. The software should be compatible with an operating system available with commercial-off-the-shelf laptop computers and where non-standard or proprietary formats are used for storing the data in the VDR, the software should convert the stored data into open industry standard formats

Note 1 to entry: See (MSC.333(90)/4.8).

3.1.15

playback system

system including the playback equipment that is capable of downloading and playing back the recorded data

3.1.16

recorder

VDR

complete system, including any items required to interface with the sources of input signals, their processing and encoding, the final recording medium, the playback equipment, the power supply and dedicated reserve power source

Note 1 to entry: See (MSC.333(90)/4.1).

**3.1.17
resolution**

smallest detectable increment between two values

**3.1.18
signal source**

any sensor or device external to the VDR, to which the VDR is connected and from which it obtains signals and data to be recorded

Note 1 to entry: See (MSC.333(90)/4.2).

3.2 Abbreviations

EPFS	Electronic position-fixing system
EUT	Equipment under test
FFT	Fast Fourier Transform
GMDSS	Global maritime distress and safety system
IMO	International Maritime Organization
INS	Integrated navigation system
ITU	International Telecommunication Union
LAN	Local area network
ROV	Remotely operated vehicle
SAR	Search and rescue
SINAD	Signal to noise and distortion
SPL	Sound pressure level
STI	Speech transmission index
STIPA	Speech transmission index for public address systems
UTC	Coordinated universal time
VHF	Very high frequency

4 Performance requirements

4.1 General

Performance requirements described in this clause are specified by reference to the numbered paragraphs of IMO Resolution MSC.333(90).

4.2 Purpose

(MSC.333(90)/1) *The purpose of a Voyage Data Recorder (VDR) is to maintain a store, in a secure and retrievable form, of information concerning the position, movement, physical status, command and control of a vessel over the period leading up to, and following, an incident having an impact thereon. Information contained in a VDR shall be made available to both the Administration and the shipowner. This information is for use during any subsequent safety investigation to identify the cause(s) of the incident.*

4.3 Operational requirements

4.3.1 Design and construction

(See 6.1.5)

(MSC.333(90)/5.1.4) *The design and construction, which shall be in accordance with the requirements of resolution A.694(17) and international standards acceptable to the*

International Maritime Organization (IMO), shall take special account of the requirements for data security and continuity of operation as detailed in 4.4 and 4.5.

4.3.2 Maintenance of sequential records

(See 6.1.11)

(MSC.333(90)/5.1.1) *The VDR shall continuously maintain sequential records of pre-selected data items relating to the status and output of the ship's equipment, and command and control of the ship, referred to in 4.6.*

4.3.3 Co-relation in date and time

(See 6.1.12)

(MSC.333(90)/5.1.2, 5.5.1) *To permit subsequent analysis of factors surrounding an incident, the method of recording shall ensure that the various data items can be co-related in date and time during playback on suitable equipment.*

The recording method shall be such that the timing of all recorded data items can be derived on playback with a resolution sufficient to reconstruct the history of an incident in detail (see 4.6.1).

4.3.4 Final recording medium

4.3.4.1 Items of final recording medium

4.3.4.1.1 General

(MSC.333(90)/5.2) *The final recording medium shall consist of the following items:*

- 1) Fixed recording medium;*
- 2) Float-free recording medium; and*
- 3) Long-term recording medium.*

4.3.4.1.2 Fixed recording medium

(See 6.1.13)

(MSC.333(90)/5.2.1) *The fixed recording medium shall be installed in a fixed protective capsule which shall meet all of the following requirements:*

- 1) be capable of being accessed following an incident but secure against a physical or electronically manipulated change or deletion of recorded data;*
- 2) maintain the recorded data for a period of at least 2 years following termination of recording;*
- 3) maximize the probability of survival against fire, shock, penetration and deep-sea-pressure and recovery of the final recorded data after any incident;*
- 4) be of a highly visible colour and marked with retro-reflective materials; and*
- 5) be fitted with an appropriate device to aid location under water.*

4.3.4.1.3 Float-free recording medium

(See 6.1.14)

(MSC.333(90)/5.2.2) *The float-free recording medium shall be installed in a float-free capsule which shall meet all of the following requirements:*

- 1) be fitted with means to facilitate grappling and recovery;*

- 2) *maintain the recorded data for a period of at least 6 months following termination of recording;*
- 3) *be so constructed as to comply with the requirements specified in resolution IMO ^{A1} MSC.471(101) ^{A1} and to minimize risk of damage during recovery operations;*
- 4) *be capable of transmitting an initial locating signal and further locating homing signal for at least 48 hours over a period of not less than 7 days/168 hours; and*
- 5) *be capable of being accessed following an incident but secure against a physical or electronically manipulated change or deletion of recorded data.*

4.3.4.1.4 Long-term recording medium

(See 6.1.4)

(MSC.333(90)/5.2.3) *The long-term recording medium shall:*

- 1) *be capable of being accessed from an internal, easily accessible area of the vessel; and*
- 2) *provide access to the data held on it but be secured against a physical or electronically manipulated change or deletion of recorded data.*

4.3.4.2 Assessment of fixed recording medium

(See 6.1.4)

Where the storage medium cannot be readily and reliably inspected after an incident, means shall be provided to enable an accident investigator to determine, prior to an attempted replay, whether the storage medium has been subjected to an excessive level of heat, where the survival of the stored data may be in doubt.

4.3.4.3 Access to data in capsule

(See 6.1.4)

A capsule is used to enclose the fixed and float-free final recording medium (4.3.4.1.2 and 4.3.4.1.3).

A means shall be provided to retrieve stored information from the capsule via an external device without opening the capsule.

4.3.4.4 Capsule visibility and marking

(See 6.1.4)

The capsule, together with any outermost shell, shall be of a highly visible fluorescent orange colour, marked with retro-reflective materials that comply with the relevant requirements of IMO A.658(16) and marked with the legend:

"VOYAGE DATA RECORDER – DO NOT OPEN –
REPORT TO AUTHORITIES"

4.3.4.5 Capsule location aid

The fixed recording medium capsule shall include an acoustic underwater beacon (see 5.3).

The float-free recording medium capsule shall include a suitable radio transmitter and a light (see 5.2 and 6.1.4).

4.3.5 Interfaces

(See 6.3)

4.3.5.1 Compliance with IEC 61162

(MSC.333(90)/8) *Interfacing to the various signal sources required shall be in accordance with the relevant international interface standard, IEC 61162 series, where possible. Any connection to any item of the ship's equipment shall be such that the operation of that equipment suffers no deterioration, even if the VDR system develops faults.*

As a minimum, the equipment shall support the sentences given in Annex A.

The interfaces for bridge audio, communications audio and screen image capture are defined in 5.6.1, 5.7.1 and 5.8.1 respectively.

Any interface units which may be required to convert non-IEC 61162 signals, shall conform to the requirements of IEC 60945.

In all cases, any connection to any item of the ship's equipment shall be such that the operation of that equipment suffers no deterioration, even if the VDR system develops faults.

4.3.5.2 Data interface

The VDR shall provide an interface for downloading the stored data to an external computer (see Annex C).

4.3.6 Performance test

(See 6.1.4)

(MSC.333(90)/5.1.3) *The system shall include functions to perform a performance test at any time, e.g., annually or following repair or maintenance work to the VDR or any signal source providing data to the VDR. This test may be conducted using the playback equipment and should ensure that all the required data items are being correctly recorded.*

Any equipment used to perform these functions shall be permanent part of the VDR installation.

Where the playback equipment is used it shall be in addition to the equipment required in Annex C.

The VDR shall record date, time and test results of at least the last 10 tests on the final recording medium.

NOTE The correct reading of the required data items check is performed in the recording integrity test (see 4.4.4). The receipt of these required data items is tested in the operational performance test (see 5.12).

4.4 Data selection and security

4.4.1 Selection of data items

(See 6.1.4)

(MSC.333(90)/5.3.1) *The minimum amount of operational data items to be recorded by the VDR is specified in 4.6. Optionally, additional items may be recorded provided that the requirements for the recording and storage of the specified selections are not compromised.*

4.4.2 Configuration data

(See 6.1.2.2)

In addition to the operational data referred to in 4.4.1, a data block defining the configuration of the VDR and the sensors to which it is connected shall be written into the final recording medium during commissioning of the VDR. This configuration data shall be permanently

retained in the final recording medium and protected from modification other than by a duly authorised person following any change to the configuration. Any change to the configuration of this data block shall not adversely affect the recording of the mandatory items. (See 4.6.19)

The following system configuration information and data source identity shall be included in this data block:

- a) type approval authority and reference;
- b) IMO vessel identification number;
- c) software version(s) used and date and time of installation;
- d) automatic insertion of date and time of last configuration data amendment;
- e) microphone locations, recording channel allocation, and ID (two character identification for example M1, M2, etc.);
- f) VHF communications – Location of connected VHF installation(s) and recording port allocation, and ID (two character identification, for example V1, V2, etc.);
- g) for each sensor – the manufacturer, type and version number of the sensor and the interpretation of the sensor data;
- h) screen display output(s) location and ID (two character identification, for example R1, R2, etc. for Radar, E1, E2 for ECDIS, D1, D2 for non-dedicated displays). For dedicated displays the function of the display, for example radar X-Band, S Band, navigational ECDIS;
- i) date and time – from which source obtained;
- j) ship's position – from the INS if fitted and from which EPFS obtained and relative positions on the vessel according to the method defined for the IEC 61162 POS sentence;
- k) other data inputs, at the minimum for all data required by 4.6:
 - 1) identification of which equipment is supplying the data;
 - 2) identification of the sentence (IEC 61162) which is carrying the information (see Annex A);
 - 3) if received as proprietary sentences according to IEC 61162 (for example containing converted analogue or discrete signals), information to include the location of the information within the sentence and the specification of the relations between sensor values (RPM, rudder angles, state of alert or indicator, etc.) and received values.

4.4.3 Resistance to tampering

(See 6.1.4)

(MSC.333(90)/5.3.2) *The equipment shall be so designed that, as far as is practical, it is not possible to manipulate the amount of data being recorded by the VDR, the data itself nor the data which has already been recorded. Any attempt to interfere with the integrity of the data or the recording shall be recorded.*

4.4.4 Recording integrity

(See 6.1.10)

(MSC.333(90)/5.3.3) *The recording method shall be such that each item of the recorded data is checked for integrity, i.e. it is identical to the data being received, and an alert according to IMO A.1021(26) given if a non-correctable error is detected.*

The VDR shall automatically continuously monitor the following:

- power supply;
- record function;
- microphone functionality.

Malfunction of any of the above shall generate a caution (see 3.1.4). The caution shall remain until the equipment is serviceable. It shall also indicate its caution status by means of contacts of a relay (or equivalent) which is held energized in the no-alert condition.

The VDR shall also continuously monitor the period of data stored on each element of the final recording medium. If the period of any of the elements falls below the minimum compliant period defined in 4.5.4 a caution shall be generated and remain while the condition is true.

4.5 Operation

4.5.1 Recording and saving of data

(See 6.1.2.1)

(MSC.333(90)/6) *The unit shall be entirely automatic in normal operation.*

4.5.2 Power source

(See 6.1.4/6.1.9/6.1.16)

(MSC.333(90)/5.4.1) *The VDR shall be capable of operating from the ship's main and emergency source of electrical power.*

4.5.3 Dedicated reserve power source

(See 6.1.7/6.1.8)

(MSC.333(90)/5.4.2) *If the ship's source of electrical power supply to the VDR fails, the VDR shall continue to record Bridge Audio (see 4.6.5) from the dedicated reserve power source for a period of 2 hours. At the end of this 2 hour period all recording shall cease automatically.*

It shall be possible to recharge the dedicated reserve power source within a period of 10 h.

4.5.4 Recording period and duration

(See 6.1.6)

(MSC.333(90)/5.4.3) *Recording shall be continuous unless terminated in accordance with 4.5.3. The time for which all stored data items are retained shall be at least 30 days/720 hours on the long-term recording medium and at least 48 hours on the fixed and float-free recording media. Data items which are older than this may be overwritten with new data.*

Recording may also be terminated, by means of a key or other secure method.

NOTE This may occur under the following circumstances:

- a) during essential maintenance whilst the vessel is in port;
- b) when the vessel is laid-up;
- c) upon request by an investigation authority, for example after the vessel had been involved in a marine incident.

4.6 Data items to be recorded

4.6.1 Date and time

(See 6.2.1)

(MSC.333(90)/5.5.1) *Date and time, referenced to UTC, shall be obtained from a source external to the ship and an internal clock shall be synchronized with valid date and time data. During times of a loss of the external source, the internal clock shall be used. The recording shall indicate which source is in use. The recording method shall be such that the timing of all other recorded data items can be derived on playback with a resolution and continuity sufficient to reconstruct the history of the incident in detail.*

4.6.2 Ship's position

(See 6.2.1)

(MSC.333(90)/5.5.2) *Latitude and longitude, and the datum used, shall be derived from a designated EPFS or INS if available. The recording shall ensure that the identity and status of the source can always be determined on playback.* The ship's position shall be recorded, as available on the ship, up to a resolution of 0,000 1 min of arc.

4.6.3 Speed

(See 6.2.1)

(MSC.333(90)/5.5.3) *Speed through the water, and speed over the ground (transverse and longitudinal), including an indication of which it is, derived from the ship's designated speed and distance measuring equipment, shall be recorded, as available on the ship, up to a resolution of 0,1 kn.*

4.6.4 Heading

(See 6.2.1)

(MSC.333(90)/5.5.4) *As indicated by a designated ship's heading source.* The ship's heading shall be recorded, as available on the ship, up to a resolution of 0,1°.

4.6.5 Bridge audio

(See 6.2.2)

(MSC.333(90)/5.5.5) *Microphones shall be positioned on the bridge covering all work stations as described in MSC/Circ.982 so that conversation is recorded. The recording shall be such that, on playback, a normal speaking voice should provide adequate intelligibility while the ship is performing its normal operations. This performance shall be maintained at all work stations while there is a single audio alarm anywhere on the bridge or any noise, including noise from faulty equipment or mounting, or wind. This shall be achieved through the use of at least two channels of audio recording. Microphones positioned outside on bridge wings, shall be recorded on at least one additional separate channel.*

The equipment shall be capable of recording workstations with no more than 2 microphones per channel.

4.6.6 Communications audio

(See 6.2.3)

(MSC.333(90)/5.5.6) *VHF communications relating to ship operations shall be recorded on an additional separate channel to those referred to in 4.6.5, independently of the bridge audio. The recording shall include both transmitted and received audio signals and shall be continuous from a directly connected fixed VHF set to be designated at installation (see 5.7 for technical characteristics).*

4.6.7 Radar data – post-display selection

(See 6.2.4)

(MSC.333(90)/5.5.7) *The electronic signals of the main displays of both ship's radar installations as required by SOLAS regulations. The recording method shall be such that, on playback, it is possible to present a faithful replica of the entire radar display that was on view at the time of recording, albeit within the limitations of any bandwidth compression techniques that are essential to the working of the VDR.*

NOTE In the case of a ship fitted with an INS, 'radar display' signifies 'collision avoidance task and functions display'.

4.6.8 ECDIS

(See 6.2.4)

(MSC.333(90)/5.5.8) *Where a vessel is fitted with an ECDIS installation, the VDR shall record the electronic signals of the ECDIS display in use at the time as the primary means of navigation. The recording method shall be such that, on playback, it is possible to present a faithful replica of the entire ECDIS display that was on view at the time of recording, albeit within the limitations of any bandwidth compression techniques that are essential to the working of the VDR and in addition the source of the chart data and the version used.*

NOTE In the case of a ship fitted with an INS, 'ECDIS display' signifies 'route monitoring task and functions display'.

4.6.9 Echo sounder

(See 6.2.4)

(MSC.333(90)/5.5.9) *This shall include depth under keel, up to a resolution of 0,1 m as available on the ship. The depth scale currently being displayed and other status information shall be recorded where available.*

4.6.10 Main alarms

(See 6.2.4)

(MSC.333(90)/5.5.10) *This shall include the status of all IMO mandatory alarms on the bridge as given in Resolution A.1021(26) Table 10.1.1 (see Annex B) or as received from the Bridge Alert Management System, if installed, recorded as individually identified alarms.*

4.6.11 Rudder order and response

(See 6.2.4)

(MSC.333(90)/5.5.11) *This shall include status and settings of heading or track controller, if fitted and indicate the control station, mode, and power unit(s) in use.*

Both rudder order and response angles shall be recorded up to a resolution of 1° as available and permitted on the ship.

4.6.12 Engine and thruster order and response

(See 6.2.4)

(MSC.333(90)/5.5.12) *This shall include the positions of any engine telegraphs or direct engine/propeller controls, including shaft(s) rpm (or equivalent), and feedback indications on the bridge, if fitted, including ahead/astern indicators and indicate the control station in use. This shall also include status of bow and stern thrusters if fitted and indicate the control station in use. RPM shall be recorded up to a resolution of 1 rpm and pitch shall be recorded up to a resolution of 1°.*

4.6.13 Hull openings (doors) status

(See 6.2.4)

(MSC.333(90)/5.5.13) *This shall include all IMO mandatory status information required to be displayed on the bridge.*

4.6.14 Watertight and fire door status

(See 6.2.4)

(MSC.333(90)/5.5.14) *This shall include all IMO mandatory status information required to be displayed on the bridge.*

4.6.15 Accelerations and hull stresses

(See 6.2.4)

(MSC.333(90)/5.5.15) *Where a ship is fitted with IMO mandated hull stress and response monitoring equipment, all the data items that have been pre-selected within that equipment and are available shall be recorded.*

4.6.16 Wind speed and direction

(See 6.2.4)

(MSC.333(90)/5.5.16) *Where a ship is fitted with a suitable sensor, wind speed and direction shall be recorded, including its true or relative status.*

The wind speed shall have a resolution of 1 unit (kn, m/s, etc.) and the wind direction shall have a resolution of 1°.

4.6.17 AIS

(See 6.2.4)

(MSC.333(90)/5.5.17) *All AIS data shall be recorded.*

4.6.18 Rolling motion

(See 6.2.4)

(MSC.333(90)/5.5.18) *The VDR shall be connected to an electronic inclinometer if installed. The recording method shall be such that the rolling motion can be reconstructed during playback.*

4.6.19 Configuration data

(See 6.1.2.2)

(MSC.333(90)/5.5.19) *In addition to the data items specified in 4.6.1 to 4.6.18, a data block defining the configuration of the VDR and the sensors to which it is connected shall be written into the final recording medium during commissioning of the VDR. The data block shall be maintained up to date with respect to the vessel installation. It shall include details on the manufacturer, type and version number of a sensor, the identification and location of the sensor and the interpretation of the sensor data. This configuration data shall be permanently retained in the final recording media and protected from modification other than by a duly authorized person following any change to the configuration. (See 4.4.2).*

4.6.20 Electronic logbook

(See 6.2.6)

(MSC.333(90)/5.5.20) *Where a ship is fitted with an electronic logbook in accordance with the standards of the IMO the information from this shall be recorded.*

NOTE At the time of writing the IMO has not published any standards for this purpose.

5 Technical characteristics

5.1 Co-relation in date and time

(See 6.1.12)