



Guideline No.: N-04(201510)

N-04 VOYAGE DATA RECORDER

Issued date: October 20,2015

© China Classification Society

Foreword:

This Guideline is a part of CCS Rules, which contains technical requirements, inspection and testing criteria related to classification and statutory survey of marine products.

This Guideline is published and updated by CCS and can be found through <http://www.ccs.org.cn> .
Comments or suggestions can be sent by email to ps@ccs.org.cn .

Historical versions and release date :

Main changes and effective date:

CONTENTS

1 Application.....	4
2 Normative references	4
3 Terms and definitions.....	5
4 Plans and documents	6
5 Design and technical requirements	7
6 Materials and components	9
7 Type approval.....	9
8 Product inspection (unit/batch inspection).....	24

VOYAGE DATA RECORDER

1 Application

1.1 This Guideline applies to the type approval and unit/batch inspection of voyage data recorders (VDR) fitted and used on ships and offshore installations.

1.2 Voyage data recorder (VDR) is to include:

1.2.1 Shipborne Voyage Data Recorder (VDR) as required by Reg. 18 and Reg. 20 of Chapter 5 of Amendments to 1974 SOLAS (2000);

1.2.2 Shipborne Simplified Voyage Data Recorders (S-VDRs) as required by Amendments to 1974 SOLAS (2004) (MSC 170(79)); and

1.2.3 The requirements for S-VDR may be implemented with reference to the cross-references between VDR and S-VDR as specified in 6.6.

2 Normative references

2.1 Technical requirements

2.1.1 IMO Resolution A.861(20) Performance Standards for Shipborne Voyage Data Recorders (VDRs);

2.1.2 IMO Resolution MSC.163(78) Performance Standards for Shipborne Simplified Voyage Data Recorders (S-VDRs);

2.1.3 IMO Resolution MSC.214(81) Adoption of Amendments to the Performance Standards for Shipborne Voyage Data Recorders (VDRs) (Resolution A.861(20)) and Performance Standards for Shipborne Simplified Voyage Data Recorders (S-VDRs) (Resolution MSC.163(78));

2.1.4 IEC61996-1 ed1.0 2007-11 (Maritime Navigation and Radio Communication Equipment and Systems-Ship Borne Voyage Data Recorder (VDR)-Part 1: Voyage Data Recorder (VDR)-Performance Requirements, Methods of Testing and Required Test Results);

2.1.5 IEC61996-2 ed2.0 2007-11 (Maritime Navigation and Radio Communication Equipment and Systems-Ship Borne Voyage Data Recorder (VDR)-Part 2: Simplified Voyage Data Recorder

(S-VDR)-Performance Requirements, Methods of Testing and Required Test Results);

2.1.6 IEC60945 ed4.0 2002-08 (Maritime Navigation and Radio Communication Equipment and Systems-General Requirements-Methods of Testing and Required Test Results);

2.1.7 IEC61162 Series (Maritime Navigation and Radio Communication Equipment and Systems-Digital Interfaces);

2.1.8 CCS: GUIDANCE NOTES GD01-2002 Guidelines for the Inspection of Shipborne Voyage Data Recorders.

3 Terms and definitions

The definitions in IEC61996-1 ed1.0 2007-11 apply to the Guidelines. For the convenience of developing and use, the Guidelines directly quotes or supplements the following definitions:

3.1 Main unit: server of VDR system mainly including the following parts: data processing unit, data transformation unit, hybrid speech unit, video switching unit, power unit, input storage unit and USB interface for downloading the data. The main unit consists of both hardware and software. The hardware includes: mainboard, power supply, hard disc drive, sound card, high resolution image acquisition card, processor, internal storage, adaptive network card, video card. The software includes: operating system, data acquisition programs and various board drivers.

3.2 Network exchanging unit: the network server used for the communications between all the internal units and external networks.

3.3 Power unit: UPS power box consisting of storage battery, power switching unit and control system, which may be used for the power supply of 110/220V AC and/or 24V DC. The standby battery is used as the backup power supply for the system for 2 hours in the case of failure of both AC power supply and DC emergency power supply.

3.4 Alarm and control unit: the equipment used for the processing and indicating of the alarm and for the operating of VDR system.

3.5 Indoor microphone: the equipment installed in the bridge for the acquisition of the audio of bridge working station.

3.6 Outdoor microphone: the equipment installed at the wings of the bridge for the acquisition of the audio of the bridge wings.

3.7 Data acquisition unit: the unit used for processing all analog and digital signals received from the onboard sensors and communicates with the main unit. The unit supports the following data acquisition boards: DC digital signal input board, AC digital signal input board, current analog signal input board (4-20 mA), voltage analog signal input board (+/- 10V), synchronizing signal input board, dry contact signal input board. These modules are used to realize data switching and provide photoelectric isolation. Therefore, the failure of VDR system will not affect the normal operation of other equipment.

3.8 Data protection unit: the storage module and its protective capsule used for extracting VDR data by the maritime investigation organization after the ship incidents. Circulating storage of data of the last 12 hours may be achieved and the latest data is to replace the old data when the capacity is full. The data may be downloaded from the capsule to USB disk, external notebook or other onboard external computers connected with permanent network.

3.9 Radio acoustic beacon: the radio acoustic alarm bounded with the data protection unit for the purpose of searching the data protection unit. When the ship sank, the beacon is to start by connecting with the circuit through sea water so as to continuously send radio wave for at least 30 days for searching and locating.

3.10 Sunken data protection unit: the data protection unit may be used by both VDR and SVDR. The unit is resistant to fire, vibration, penetration and may be maintained under the sea for a long time. The medium may be salvaged from the deck of the sunken ship. The unit is capable of indicating the location.

3.11 Floating data protection unit: one of the data protection units used by SVDR. The unit can float freely after entering of water and the unit is capable of indicating the location.

4 Plans and documents

In addition to the review in accordance with CCS procedural documents and CCS Guidelines for the Inspection of Shipborne Voyage Data Recorders (GD01-2002), attention is also to be paid to Reg. 5.5 of IEC61996-1 2007 on the requirements for documentation supplied by manufacturer.

4.1 The following documents are to be submitted to CCS for approval:

4.1.1 Technical specifications (software version number of major firmware is to be included);

4.1.2 Schematic diagram of the system;

4.1.3 Schematic diagram of major units of the system: main unit, power unit, alarm and control

unit, data acquisition unit, data protection unit;

4.1.4 Configuration drawing and panel arrangement;

4.1.5 Type test program.

4.2 The following documents are to be submitted to CCS for information:

4.2.1 Installation manual, operation manual and service manual;

4.2.2 Block diagram of system configuration;

4.2.3 Wiring diagrams of components;

4.2.4 Routine test record (sample);

4.2.5 List of main components and parts;

4.2.6 Identification or nameplate, sample of products quality certificate;

4.2.7 Simulation software used for test;

4.2.8 Playback software used for recovery of data.

4.3 In addition to the review of the plans and technical documents of the hardware equipment for shipborne voyage data recorders, the information on the reliability and stability of the software are also to be reviewed.

4.4 If necessary, other plans and documents which required for review by CCS are to be submitted.

5 Design and technical requirements

5.1 The function and performance of the product are to comply with the ambient environment and test requirements in IEC61996-1 ed1.0 2007-11 (VDR) or IEC61996-2 ed2.0 2007-11 (SVDR).

5.2 Electrical safety, power supply conditions adaptability, environmental adaptability and electromagnetic compatibility of the product are to comply with the ambient environment and test requirements in IEC60945 ed4.0 2002-08.

5.3 Data format and interfaces are to comply with the ambient environment and test requirements

in IEC61162, including:

5.3.1 IEC 61162-1 Edition 4.0 2010-11 Maritime Navigation and Radio Communication Equipment and Systems – Digital Interfaces – Part 1: Single Talker and Multiple Listeners;

5.3.2 IEC61162-2 First edition 1998-09 Maritime Navigation and Radio Communication Equipment and Systems –Digital Interfaces –Part 2: Single Talker and Multiple Listeners, High-Speed Transmission;

5.3.3 IEC 61162-3 Edition 4.0 2010-11 Maritime Navigation and Radio Communication Equipment and Systems - Digital Interfaces - Part 3: Serial Data Instrument Network.

5.4 Technical points

5.4.1 Non-IEC61162/NEMA0183 signals may be collected. Multiple current/voltage analog signal, switch signal, AC/DC synchronizing signal and stepped signal may be collected.

5.4.2 Microphone signal and VHF signal may be collected simultaneously. The voice data is to be stored after compressed.

5.4.3 The acquisition ability of radar image: the minimum requirement is to collect one radar image.

5.4.4 The collected data may be stored into data protective capsule and other local folder through configuration program.

5.4.5 Data in the black box may be burned onto the disc through disc-carving machine or the stored data may be downloaded through USB interface or network cable connection for the analysis or back-up.

5.4.6 Data protection unit is normally installed on the compass deck and connected with the main unit through network switch. It is to be composed of a hard driver with sufficient capacity (normally not less than 2G), data interface, base and underwater acoustic beacon provided with battery.

5.4.7 Safety of recording data

(1) The final recording medium is to be enclosed in the data protective capsule. The final recording medium is accessible through client work station for the investigation and analysis of the cause after incident.

(2) The data stored in the final protective capsule may be accessible with the authorization but not be deleted and changed. The access to the final recording medium is not to tamper the recording data.

5.4.8 The power unit of VDR is to have the following functions:

(1) Failure alarm: sending the alarm information to the main unit when the voltage is excessively low or the main source of power is lost;

(2) Automatic switch: change over to the power supply to VDR system by standby storage battery when the voltage is excessively low or AC power is lost. The continuity of the system is to be maintained during the change-over of the source of power;

(3) Automatic start: the system is to start automatically and operate normally while resupplied by the main source of power after the shutdown of the system or stop of the recording.

5.4.9 Requirements for microphone: outdoor microphone is to be water resistant. Acquisition server is to carry out an acoustic self-inspection to the microphone without manual intervention once every 12 hours. The protection level of the shell: for indoor microphone IP22, for outdoor microphone IP65.

5.4.10 Acquisition of radar image: the minimum recording period is to record a video image once every 15 seconds. If more than one radar's images are to be collected, the acquisition may be achieved by automatic switching among different sources of radar image through image switching card.

5.4.11 The alarm information includes the information relating to source of power, recording, voice and storage. Audible and visual alarms will be given by the system in the event of failure of any of the above mentioned parts. The alarm may be mute but the visual alarm is to be kept till the failure is eliminated.

6 Materials and components

Materials and components are to comply with relevant requirements of CCS Rules

7 Type approval

7.1 General principles

The voyage data recorder is to be type approved by CCS. The type approval certificate is to be

issued, maintained, modified, renewed or cancelled according to the requirements of Chapter 3 of PART ONE of Rules for Classification of Sea-going Steel Ships.

7.2 Selection of typical samples and arrangement of test

Types and specifications of test samples are to be technically representative and are to cover the products for which type approval is sought. All standard and optional configurations are to be selected to ensure that the system is provided with the most functions and interfaces before the test is carried out. The test samples are to be taken by CCS surveyor at the manufacturer on site.

Equipment under test (EUT) is to include: main unit, microphone (indoor and outdoor), data protection unit, UPS alarm and operation unit, UPS power supply, etc.

7.3 Test organization

The type approval test is to be carried out in a competent test organization acceptable to CCS. The test organization is to subject to the international/domestic laboratory certification. Some functional tests may be carried out at the manufacturer under supervision of CCS Surveyor on site if the manufacturer is qualified to carry out the test and examined and approved by CCS surveyor.

7.4 Type approval test items and requirements

7.4.1 General requirements

(1) Composition of EUT: the composition of the EUT of each test item is to be determined according to the configuration of the system, EUT is usually to include: main unit, microphone (indoor and outdoor), data protective capsule, UPS power supply and alarm unit.

(2) Determination of input signal: standard data is to be input based on the data, voice and image during the performance test and inspection. The data is to be backed up for the comparison after the test.

(3) Bridge audio: the maximum number of connectable microphones is to be connected to EUT.

(4) Communications audio: VHF is to connect the maximum number of connectable communications audio input ports to EUT.

(5) Radar image: the test signals are to be provided to EUT.

(6) IEC61162 Data input

Each IEC61162 data input interface is to entry the continuous data flow in compliance with the sentence format of IEC61162. The recording of the input data is to be stored chronologically for further comparison.

7.4.2 The inspection and test items required by IEC61996

(1) Visual examination

The following items are to be checked in addition to the inspection carried out according to Reg. 4.2 of Chapter 4 of CCS Guidelines for the Inspection of Shipborne Voyage Data Recorders (GD01-2002).

Description of the function of equipment and the markings are to be accurate, clear and durable. The function of beacon is to be examined with dedicated tool and the voltage of battery is to be within the specified range. To check if all parts of the system are complete and whether necessary documents are provided (including Reg. 3.6 of GD01-2002).

(2) Test for recording period

Where the external power is connected, PC is to send the analog signal of standard data format to VDR so that the VDR is to work continuously for more than 12 hours. Then the results are to be examined according to the requirements for performance inspection (PC).

(3) Reserve power source supply test

The duration of data storage required in the Guidelines is calculated based on the data which final recording medium is saved for 12 hours. Actually, the period for the general data coverage is to be more than 12 h.

Only bridge audio is to be recorded by reserve power source, not including communications audio. A suitable alarm is to be given when the normal external electrical power is removed. The alarm is to be capable of being mute manually or to be muted automatically after 2 min.

(4) Recharging test of reserve power source

The recharging of reserve power source is satisfactory if the reserve source is recharged for a period of 10 h to operate VDR system for a continuous period of 2 h.

(5) Test of electric power interruption

On completion of the interruption test, the record of the final recording medium is to be checked that at least 11 h 45 min of the original 12-hour record is to be saved, where the record containing only the bridge audio is to be less than 5 min.

(6) System integrity test

It is to verify that the bit error rate for digital signals does not exceeding 10^{-8} by the comparison between the data stored in the final recording medium and standard data.

Automatic test of microphone every 12 hours: in general, the system is to carry out the automatic test while starts to operate and an appropriate record will be retained in the system file and an appropriate record will be generated once every 12 hours later. Verification may be carried out through the check of the test record file. A suitable alarm is to be activated if there is no response to the acoustic test without intervention of all microphones.

Alarm is to be activated when the communication between the main box and alarm unit is interrupted.

(7) Test of recording sequence

VDR system generally uses UTC as time reference and it is an independent system, which carries out time synchronization with GPS every 1 hour. Each data recorded is provided with a time label. The timing error may be verified through the accuracy of the time label. The resolution ratio of ship's position, speed and heading may be verified through the accuracy of the recorded data.

(8) Test for recording related to date and time may be verified whether the resolution ratio of time is in compliance with the requirements by the date of data and the accuracy of time label.

(9) Test of positioning device

The beacon used in the sunken data protective capsule may accept the approval certificate issued by the competent organization such as FAA and the approved products are to comply with the requirements of SAEAS8045. However, relevant functional check of the beacon and the check of the battery voltage are to be carried out.

(10) Audio frequency response test for the bridge audio

- ① Defining the amplitude of the reference signal level firstly;

- ② Drawing the amplitude-frequency curve of the port under test;
- ③ Reproducing the above input test signal on PC and recording the frequency and amplitude;
- ④ Each port operates independently and other ports are short-circuited;
- ⑤ For the amplitude-frequency curve of each port, the variation of the level within the specified frequency band is not to exceed 6dB.

(11) Quality index test for bridge audio

Quality index for audio transmission, see IEC60268-16.

① Test for single port

(a) With all other area microphone port inputs short-circuited, connect the STI signal generator to the port under test. Adjusting the signal generator to a level equivalent to 75 dBA and recording the signal.

(b) Replaying the record and analyzing the STI;

(c) Repeating the above steps for all other area microphone ports;

(d) Required results: not to be less than that corresponding to the quality value for the speech transmission index of 0.85.

② Test for multiple ports

(a) With all other area microphone ports having an electrical input equivalent to 65 dBA of band limited white noise, connecting the STI signal generator to the port under test. Adjusting the signal generator to level equivalent to 75 dBA;

(b) Recording the signal of the ports under test;

(c) Replaying the speech data and records and analyzing the results;

(d) Required results: not to be less than that corresponding to the quality value for the speech transmission index of 0.60.

(12) Audio noise level – signal to no signal for bridge audio

- ① With all other area microphone port inputs short-circuited, connecting the audio signal generator to the port under test.
- ② Adjusting the output level of signal generator to the reference signal level and adjusting its frequency so as to operate the VDR system, then measuring the output of the reference signal level in way of frequency point of the 1/3 octave center through replaying the speech voice;
- ③ Operating VDR for 30 s for each of the five conditions, such as open-circuit, short-circuit and three different out-of band signals applied. For the out-of-band tests, connecting the signal generator to each port under test and setting the input signal to the reference signal level with the frequencies of 8 kHz, 10 kHz and 12.5 kHz alternately;
- ④ Operating VDR for 30 s under five conditions;
- ⑤ Replaying the speech data and records under five conditions;
- ⑥ According to Table 4.17.2(2) of the Guidelines, calculating the ratio of noise level at each central frequency point to the output for the reference signal input, expressed in dB.
- ⑦ Measuring the ratio of noise level to the output for the reference signal input of other ports separately with the same method;
- ⑧ Required results:

With no signal applied to any bridge area microphone port, the reproduced signal at any replay output is to be at least 48 dB below the output level. This requirement is to be met across the frequency band over the range of 150 Hz to 6000 Hz with the inputs both open and short-circuited.

The above signal to no signal performance is to be met in the presence of out-of-band input signals and also at the reference signal level.

(13) Audio noise level – signal to noise and distortion (SINAD)

- ① Setting the reference signal level;
- ② With the other area microphone ports short-circuited, connecting the port under test via an attenuator to the signal source of the distortion meter;

③ Adjusting the source of signal so as to change the frequency of input signal of the port under test within the 1/3 octave with certain intervals. Level at each frequency is to be reduced to -20 dB by the range of 5 dB for every varying, i.e., 0 dB, -5 dB, -10 dB, -15 dB, -20 dB. Recording for each combined signal.

④ Replaying the above-mentioned records and replaying the recorded voice through a band-pass filter of 150 Hz to 6 000 Hz;

⑤ Measuring the total harmonic distortion and noise for each test condition, calculating the ratio of distortion and noise to the reference signal input, expressed in dB.

⑥ Repeating the test for the other area microphone port to obtain the minimum value of the record;

Required results:

The reproduced signal to noise and distortion (SINAD) ratio is to be more than 24 dB across the frequency band of 150 to 6000Hz.

(14) Audio frequency response for communications

The test method for audio frequency response test for communications with band width of 150 to 3500Hz is the same as that for the audio frequency response test for bridge. The requirements for the test results of these two tests are the same.

(15) Quality index test for communications audio

The quality index test for communications audio is only carried out for single channel and the test for single channel of the quality index test for bridge audio may be taken for reference.

(16) Audio noise level – signal to no signal for the communications audio

The input signal band width is 150 to 3500 Hz, the frequencies for out-of-band input signal are 5kHz, 6.3kHz and 8kHz. Other test conditions and results are the same as those of audio noise level for bridge audio.

(17) Audio noise level – ratio of signal to noise and distortion (SINAD) for communications audio

The input signal band width is 150 to 3500Hz. Other test conditions and results are the same as

those of audio noise level – signal to noise and distortion for bridge audio.

(18) Radar data test

The test is to be carried out according to Reg. 4.23 of CCS Guidelines for the Inspection of Shipborne Voyage Data Recorders (GD01-2002).

(19) Tests for echo sounder, main alarms, rudder order and response, engine order and response, hull opening status, watertight and fire door status, accelerations and hull stresses, wind speed and direction

The recorded data is to be displayed item by item and the format and resolution rate are to comply with the requirements of IEC61996 ed1.0. The data is to be refreshed with the frequency of more than once a second. The data may be recorded for a period of 30 min and replayed.

Required results:

All changed data are to be accurately generated at least once a second.

(20) Functional test for data downloading and replaying

The VDR is to provide an interface for data downloading and a software for data playback. The interface for data downloading and playback software are to comply with the requirements for data downloading interface and playback software in Annex C of IEC61996-1 (2007).

7.4.3 Verification of ship's fixed data

The VDR final recording medium is to restore the ship's fixed data information, the format and contents of which are to comply with the relevant requirements of IEC61996. The fixed data information is to be entered to its configuration file. When the VDR system works normally, the information of the configuration file is to be recorded into the recording medium in real time. The ship's fixed data information recorded by VDR is to be replayed for verification through playback software.

7.4.4 Environmental and electromagnetic compatibility type test items

The environmental and electromagnetic compatibility type tests are to be carried out according to IEC60945 item by item.

7.5 Other examination points on type approval site

Attentions are to be paid to the following items during the site examination of the type approval of such products:

7.5.1 Control of the purchased parts;

7.5.2 Commissioning, inspection and control of system boards;

7.5.3 Commissioning, inspection and control of assembly;

7.5.4 Confirmation of the compliance of the purchased parts with the requirements of documents approved by CCS;

7.5.5 Confirmation of the compliance of the certificate with the products for the parts with certification requirement;

7.5.6 To confirm that strict management systems for non-conformity products have been established by the applicant, including the disposal of non-conformity products of purchased parts, non-conformity products of system components and non-conformity products of the system;

7.5.7 To confirm that the applicant at least has the necessary inspection equipment for the routine test and complete calibration/check management provisions;

7.5.8 Personnel of key position such as inspection personnel are to have appropriate qualification certificates;

7.5.9 To confirm the identification and traceability of the product;

7.5.10 The applicant is to have the quality management department/unit independent of the manufacturer;

7.5.11 Quality control points are to involve the whole process from the inspection of purchased parts to the installation inspection of parts and assembly inspection.

7.6 Cross-references between voyage data recorder (VDR) and simplified voyage data recorder (S-VDR):

There are two main differences between S-VDR and VDR:

Requirements for the data collection are reduced (If no data in compliance with the format of

IEC61162 is provided by the equipment, S-VDR may not collect the data); requirements for the data protective capsule (VDR may only use sunken data protective capsule, S-VDR may use floating or sunken data protective capsule).

7.6.1 Cross-references between Recommendation on Performance Standards for Shipborne Simplified Voyage Data Recorders (S-VDRs) (MSC.163(78)) and Recommendation on Performance Standards for Shipborne Voyage Data Recorders (VDRs) (A.861(20)):

Cross-references between MSC.163(78) and A.861(20)

Table 7.6.1

Regulation	A.861(20) (VDR)	MSC.163(78) (S-VDR)
1. Purpose	The purpose of a voyage data recorder (VDR) is to...	(Identical)
2. Application	(Applies to all ships)	(Only applies to the existing cargo ships of 3000 gross tonnage and over constructed before 1 July 2002)
3. References	A.622(16) A.694(17), A.824(19), A.830(19), Annex 3 of MSC.64(67) Annex 4 of MSC.64(67)	In addition to the existing documents, the following are added: A.802(19) "Performance Standards for Survival Craft Radar Transponders for Use in Search and Rescue Operations"; A.810(19) "Performance Standards for Float-free Satellite Emergency Position – Indicating Radio Beacons (EPIRBs) Operating on 406 MHz"; A.812(19) "Performance Standards for Float-free Satellite Emergency Position – Indicating Radio
4. Definitions		
4.1 Voyage data recorder	Including "the final recording medium in its capsule"	Including "the final recording medium" (the words 'in its capsule' are deleted)
4.2	Sensor	(Identical)
4.3	Final recording medium	(Identical)
4.4	Playback equipment	(Identical)
4.5	Dedicated reserve power source	(Identical)
5. Operational requirements		
5.1 General		
5.1.1	The VDR should continuously maintain...referred to in 5.4	The S-VDR should continuously maintain...(identical in the latter part)
5.1.2	To permit subsequent analysis of factors surrounding an incident,...	(Identical)

Continued table 7.6.1

5.1.3	<p>The final recording medium should be installed in a protective capsule which should meet all of the following requirements:</p> <p>.1 be capable of being accessed following an incident but secure against tampering;</p> <p>.2 maximize the probability of survival and recovery of the final recorded data after any incident;</p> <p>.3 be of a highly visible color and marked with retro - reflective materials; and</p> <p>.4 be fitted with an appropriate device to aid location.</p>	<p>5.1.3 Final recording medium</p> <p>5.1.3.1 The final recording medium should be installed in a protective capsule of either a fixed or float-free type, which should meet all of the following requirements:</p> <p>.1 be capable of being accessed following an incident but secure against tampering;</p> <p>.2 maintain the recorded data for a period of at least 2 years following termination of recording;</p> <p>.3 be of a highly visible color and marked with retro-reflective materials; and</p> <p>.4 be fitted with an appropriate device to aid location.</p> <p>5.1.3.2 The fixed type protective capsule should comply with the requirements set out in resolution A.861(20) with the exception of the resulting requirements for withstanding penetration.</p>
5.1.4	<p>The design and construction, which should be in accordance with the requirements of resolution A.694(17) and international standards acceptable to the Organization</p>	(Identical)
5.2	Data selection and security	(Identical)
5.3	Continuity of operation	(Identical)
5.4 Data items to be recorded		
5.4.1	Date and time	(Identical)
5.4.2	Ship' s position	(Identical)
5.4.3	Speed	(Identical)
5.4.4	Heading	(Identical)
5.4.5	Bridge audio	(Identical)
5.4.6	Communications audio	(Identical)
5.4.7	Radar data, post - display selection	(Identical)
5.4.8	Echo sounder	<p>(Echo sounder cancelled)</p> <p>AIS Data</p> <p>If it is impossible to obtain radar data1 then AIS target data should be recorded as a source of information regarding other ships. If radar data is</p>

Continued table 7.6.1

5.4.9	Main alarms	(Main alarms cancelled) Other items Any additional data items listed by IMO with the requirements set out in resolution A.861(20) should (cancelled)
5.4.10	Rudder order and response	(cancelled)
5.4.11	Engine order and response	(cancelled)
5.4.12	Hull openings status	(cancelled)
5.4.13	Watertight and fire door status	(cancelled)
5.4.14	Accelerations and hull stresses	(cancelled)
5.4.15	Wind speed and direction	(cancelled)
6	Operation	(Identical)
7	Interfacing	(Identical)

7.6.2 If the VDR device has been approved, to obtain the approve certificate of S-VDR, may request the following table refer confirmation.

Cross-references between VDR and S-VDR

Table 7.6.2

Project	Requirements Terms		Testing Terms	
	IEC 61996-1 For F-VDR	IEC 61996-2 for S-VDR	IEC 61996-1 for F-VDR	IEC 61996-2 for S-VDR
Scope		1		
Normative References	2	2		
Abbreviations	3.2	3.2		
General		4.1		
Design and construction	4.3.1/4.4/4.5		6.1.5	6.1.5.1

Continued table 7.6.2

Sequential records	4.3.2/4.6		6.1.11	
Date/time correlation	4.3.3/4.6.1		6.1.12	
Protective capsule	4.3.4.2/ 4.3.4.3.2	4.3.4.1/ 4.3.4.3.1/3		6.1.13
Construction	5.4.1	4.3.4.1/5.2/ 5.4.2	6.1.13.2/.4/ .6/.10	6.1.13.1/.3/.5/ .6/.7/.8/.9/.11/ .12
Visibility and marking	4.3.4.3.2		6.1.4	
Location device		4.3.4.3.3/5.3	6.1.13.10	
Assessment of final recording medium	4.3.4.2		6.1.13.6	6.1.13.6
Interfaces	4.3.5/5.5.1.5/ 5.6.1/5.7.1/ 5.8.1		6.2.6	
Selection of data items	4.4.1		6.2.1	
Configuration data block	4.4.2 (paragraph 2)		None. 6.1.4 by default	
Resistance to tampering	4.4.3		6.1.4	
Operation	4.5.1		6.1.4	

Continued table 7.6.2

Saving / copying data store	4.5.1.a/b/c/d		None. 6.1.4 by default	
Power source	4.5.2		6.1.15	
Reserve power source	4.5.3/4.6.5		6.1.7	
Recording period	4.5.4/4.5.4.a/b/4.5.1/4.5.3		6.1.6	
Data items to be recorded	4.6		6.2	
Date and time	4.6.1		6.2.1/6.2.6	
Ship's position	4.6.2		6.2.1/6.2.6	
Speed	4.6.3		6.2.1/6.2.6	
Heading	4.6.4		6.2.1/6.2.6	
Bridge audio	4.6.5/5.6		6.2.2/6.2.6	
Communications audio	4.6.6/5.7		6.2.3/6.2.6	
Radar	4.6.7/5.8		6.2.4/6.2.6	
Echo sounder	4.6.8	4.6.10	6.2.5/6.2.6	
Main alarms	4.6.9	4.6.11	6.2.5.2/6.2.6	6.2.5/6.2.5.1
Rudder orders etc.	4.6.10	4.6.12	6.2.5.2/6.2.6	6.2.5/6.2.5.1
Engine orders	4.6.11	4.6.13	6.2.5.2/6.2.6	6.2.5/6.2.5.1
Hull openings	4.6.12	4.6.14	6.2.5.2/6.2.6	6.2.5/6.2.5.1

Continued table 7.6.2

Watertight doors	4.6.13	4.6.15	6.2.5.2/6.2.6	6.2.5/6.2.5.1
Accelerations & hull stress	4.6.14	4.6.16	6.2.5.2/6.2.6	6.2.5/6.2.5.1
Wind	4.6.15	4.6.17	6.2.5.2/6.2.6	6.2.5/6.2.5.1
AIS	n/a	4.6.8	6.2.5.2/6.2.6	6.2.5/.1/ 6.2.7
Other items	n/a	4.6.9	6.2.5.2/6.2.6	6.2.5/6.2.5.1
Correlation in date and time	5.1		6.1.12	
Particulars for capsule		5.2	6.1.4	6.1.13
Shallow sea- water immersion		5.4.2.2		6.1.13.7
Location beacons		5.3	6.1.13.10	
Survivability of recorded data	5.4			6.1.13.9
Long term retention	5.4.1		6.1.4	
Survival following an incident		5.4.2	6.1.13.2/.4/ .6/.10	6.1.13.1/.3/.5/ .6/.7/.8/.9/.11/ .12
Documentation	5.5		6.1.4	
Bridge audio	5.6		6.2.2	

Continued table 7.6.2

Communications audio	5.7		6.2.3	
Radar	5.8		6.2.4	

8 Product inspection (unit/batch inspection)

Such products are to be type approved as required by the Convention. Products without approval may not be accepted for inspection unless otherwise specified by the Headquarters.

Sampling rate: the manufacturer is to develop the sample inspection plan according to the widely used sample inspection standards (such as GB/T 2828 and ISO2859 standards) on the basis of process characteristics and quality control level and submit the plan to CCS for information. The surveyor is to examine the implementation record of the sample inspection plan during the unit/batch inspection. The performance of the product is to be inspected where deemed necessary by the surveyor.

8.1 Inspection items after approval:

8.1.1 Inspection of the series number of the product component and the version number of the software used;

8.1.2 Visual inspection

8.1.3 Inspection of visibility and marking

8.1.4 Inspection of insulation resistance and withstand voltage test

8.1.5 Inspection of the continuous operation of the system

8.1.6 Inspection of the reserve power source supply

8.1.7 Inspection of the recharging of reserve power source

8.1.8 Inspection of the system integrity

8.1.9 Inspection of basic data recording and error

8.1.10 Function inspection of serial port data recording

8.1.11 Function inspection of image acquisition recording

8.1.12 Function inspection of speech acquisition recording

8.1.13 Function inspection of data backup

8.1.14 Verification of the certified data protective capsule and beacon

8.1.15 Inspection of functions of beacons and voltage of battery

The surveyor is to witness the inspections and tests of all the above mentioned items. The applicant is to provide the inspection record/report.

8.2 Issue of the certificate

After satisfactory inspection of products, a certificate of marine products is to be issued. Except the data collected as specified by the Convention, the acquisition of other data differs due to the different conditions of the ship or requirements of the ship-owners. Thus the time for continuous recording will be effected. The certificate is to identify the name of the ship intended to be equipped or the ship engineering number.

8.3 Filling of the report

8.3.1 Visual inspection, inspection of visibility and marking

To check whether the markings are correct, the color of data protective capsule and whether the texts are in compliance with the requirements.

8.3.2 Insulation and pressure-tight tests: only for the power source.

8.3.3 System continuous operation test:

To record the start time of the operation of system, the duration of the continuous operation of system and to check whether the data recording, speech recording and image recording are complete and continuous; To check failure alarm information and the accuracy of the recorded data.

8.3.4 Reserve power source supply test:

To record the start time for power supply of reserve power source, the time when the system stops recording and the duration of power supply by the standby battery. To check whether the data recording is continuous and complete during the change-over from AC to reserve power source. The restoration time for the recording after the AC power restores.

8.3.5 System integrity test

(1) Function inspection of alarm unit

Indication function, gray scale adjusting button, key function, buzzer;

(2) Indication of normal operation of the system

Self-checking of microphone, indication of normal operation

(3) Alarm of abnormal operation of the system

Alarm for the failure of power source, recording of the failure alarm, alarm for the failure of communications between alarm unit and main unit, alarm for the failure of microphones;

8.3.6 Test for the correlation between recording and date and time:

To record the start time of the test and the completion time of the test, the consistency of the recorded time and original time in relation to time, whether the refresh rate of recorded data is in compliance with the requirements of IEC61996.

8.3.7 Function inspection of data backup

The system is in normal operation with all signals connected, no error occurred during download, the consistency of the recorded time and original time in relation to time; The downloaded data may be replayed with playback software and compared with the data in the data protective capsule.

8.3.8 Analog signal error test and recording test

Requirements for error:

To meet the requirements for the accuracy of the collected data.

To input the signal with step-down approach and filter process to the instrumentation amplifier to get isolated and amplified. The processed data is to be sent to AD acquisition circuit via filter

process for AD conversion, the converted data is to be transmitted to microprocessor for processing. The processed data is to be converted into output digital signal.

8.3.9 Data acquisition recording test in compliance with the format of IEC61162

Whether the IEC61162 sentence system sent by the corresponding port is correct; whether the collected data is refreshed at the rate of once a second.

8.3.10 Function inspection of image acquisition recording

To input the video signal, whether the recording is complete and continuous, redisplaying the image, whether there are obvious color errors during the subjective test, obvious position error;

8.3.11 Function inspection of speech acquisition recording

Whether harmonic distortion occurs during the input of audio signal, whether the output waveform is normal during the replay of speech, whether the speech recording is complete, continuous and clear.

8.3.12 Other test items with special requirements

8.4 Inspection marks

CCS stamp is to be marked on the nameplates of the products.