

Recommendation 85

Recommendations on Voyage Data Recorder

Jan 2005

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These Recommendations are applicable to Voyage Data Recorders (VDR) required by SOLAS Chapter V, Reg. 20.

These Recommendations may be used by IACS Member Societies in conjunction with their requirements and procedures when approving VDR installation for ships.

The recommendations are based on the understanding that the applicable regulations and guidelines issued by the International Maritime Organization are complied with and, in particular IMO Res. A.861(20), IMO Res. A.694(17), MSC Res. MSC.163(78).

Any data items listed in paragraphs 7.8 – 7.16 of this recommendation should be recorded within the final recording medium of Simplified Voyage Data Recorders only when the data is available in accordance with the international digital interface standards using approved sentence formatters¹.

1. Type Approval

The VDR should be type approved (ref. SOLAS reg.V/18.1) and installed according to IMO Res. A.861(20). The VDR should be type tested according to IEC 61996.

2. Approval of documents

The following documents should be submitted for plan approval prior for the VDR installation onboard ship:

- General description of the installation
- Cable plan/block diagram identifying all sensors and cable types
- List of data items to be recorded by VDR
- All sensor's interface specification
- Location of all VDR components (e.g. main unit, final recording medium in its protective capsule, dedicated reserve power source, microphones)
- Information about power supply to the VDR
- Type Approval Certificate for the VDR issued by or on behalf of the Administration.

3. Survey

3.1 Testing of a new installation.

The final installation should be tested according to the manufacturer's instructions. Testing of the installation normally requires attendance from the manufacturer representative and use of special playback equipment.

Before the surveyor attends the test, the VDR should record for a period greater than the maximum retaining time (with a minimum period of at least 12 hours, ref. IMO

¹ Refer to IEC 61162

Res. A.861(20), 5.3.3) with all sensor inputs active (in operation) before the recorded data is presented for the surveyor item by item according to paragraph 7 in this document. The Final Recording medium shall contain at least 12 hours of recorded data of all required data items.

The survey is to verify that the installation complies with paragraphs 4, 5 and 7 of this document. In addition to verifying that the required sensor data of paragraph 7 are recorded as applicable, it should be verified that the configuration file includes proper identification of the data received on the various input channels.

The procedures required for data retrieval should be included in the ship's safety management system² and to be verified by or on behalf of the Administration.

3.2 Annual testing of VDR.

The voyage data recorder system, including all sensors, should be subjected to an annual performance test. The test should be conducted by an approved service supplier to verify the accuracy, duration and recoverability of the recorded data. In addition, tests and inspections should be conducted to determine the serviceability of all protective enclosures and devices fitted to aid location (Ref. SOLAS Ch. V Reg. 18.8 and HSC Reg.13.16.2).

The service supplier should be approved by the Society or approvals done by the Flag Administration itself or duly authorised organisations acting on behalf of the Flag Administration. Service supplier approvals granted on behalf of the Flag Administration are to be conducted in accordance with the procedures detailed in IACS UR Z17, with reference to Annex 1, paragraph 10 therein.

The Surveyor shall check that the vessel has a copy of a valid Certificate of Compliance (COC) which should contain following information:

- name and IMO number of the ship
- date and place of successfully passed testing
- manufacturer, type and serial number of the VDR
- name and address of service supplier
- name and signature of the technician carrying out the annual performance test
- Society service supplier approval certificate number and the date of expire of the service supplier certificate.

If the ship is not able to present a Certificate Of Compliance to document the annual test, only a conditional short term Passenger Ship Safety Certificate/Cargo Ship Safety Equipment Certificate/Cargo Ship Safety Certificate should be issued.

4. Location of the VDR components

All VDR components should be installed according the VDR manufacturer's installation guidelines and any special requirements stated in the Type Approval Certificate.

² see section 10 of the ISM Code

4.1 Protective capsule

The protective capsule should be located in open deck area close to the bridge and as near to the centerline of the ship as practically possible. Considerations should be made to ensure both the accessibility for routine maintenance and the accessibility for both ROVs and divers in case of underwater removal after an accident. In case of a float-free capsule the location should minimize the risk of obstruction after release.

4.2 Microphones

Microphones should be so positioned on the bridge that conversation at or near the conning position, radar display(s), chart tables and other workstations³ are adequately recorded. As far as practicable, the positioning of microphones should also capture intercom, public address systems and audible alarms on the bridge.

4.3 Alarm unit

The VDR alarm unit (audible alarm device and visual indicator) should be located in the navigation bridge.

4.4 Other components

All other VDR components can be located as found appropriate allowing for easy maintenance.

5. Power supply

The VDR should be connected to the ships emergency source of power and backed-up by the dedicated reserve source of electrical power.

Special consideration is to be given to preventing the overwriting of the information held in the final recording medium when the voyage data recorder is not powered directly from the emergency source of power.

6. Sensor interfacing

Loss of one sensor shall not cause loss of other data items that do not depend upon the particular sensor (e.g. failure of the radar shall not cause loss of other data items than the radar picture).

The signal information may be derived from discrete sensors wired directly to the VDR or may also be derived from a suitable data network connection. Where the information is derived from a data network the interfacing should be implemented in such a manner that the network will continue to operate as intended in the event of any VDR system or interface component fault. The data transfer should be conducted in accordance with a relevant international interface standard.

7. Sensor input

³ It includes workstations where the ship is normally navigated. Such workstations might be: workstation for navigating and manoeuvring, workstation for monitoring, workstation for manual steering (Helmsman's workstation), workstation for radio communication and workstation for docking (bridge wing) as defined in UI SC181.

7.1 Date and time

From a source external to the ship (can be an Electronic position fixing system - EPFS) or from internal clock of the VDR. Date and time should be referenced to UTC. The recording should indicate which source is in use.

7.2 Ship's position

From a global navigation satellite system receiver or alternatively, a terrestrial radionavigation system. The ships position should be recorded, as available on the ship, up to a resolution of 0.0001 min of arc.

7.3 Speed

Speed through water or speed over ground, including an indication which it is, derived from the speed and distance measuring equipment (speed log) should be recorded, as available on the ship, up to a resolution of 0.1 knots. The interval between recordings is not exceed 1 second.

Speed input from EPFS will require that EPFS is approved as speed log.

7.4 Heading

Heading from the main heading source in use should be recorded, as available on the ship, up to a resolution of 0.1. The interval between recordings is not exceed 1 second.

7.5 Bridge audio

The bridge audio signals should be recorded in accordance with paragraph 4.6.5 of IEC 61996.

7.6 Communication audio

From the VHF installed nearest to the conning position (see SOLAS Ch. V Reg. 22) or alternatively, nearest to the main radar display.

7.7 Radar data⁴

The radar picture from the main radar (normally X-band at main conning position). Updating period less than every 15 second.

For ships where the statutory instrument requires two radar installations to be fitted and where inter switching facilities are provided between each installation the information from the radar installation that is in use by the navigator at the time of recording is the information that should be held in the voyage data recorder final recording medium.

7.8 Echo sounder

⁴ *When Simplified Voyage Data Recorder is installed and it is impossible to obtain radar data, i.e. where commercial off the shelf interface for radar data is not available, the AIS target data should be recorded instead of radar data as a source of information regarding other ships.*

Depth below the keel up to a resolution of 0.1m as available on the ship. The depth scale currently being displayed and other status information should be recovered where available. Updating frequency better than 1 Hz.

7.9 Main alarms

In respect of paragraph 5.4.9 of Annex to res. A.861(20) a mandatory alarm is one that is mentioned in the relevant statutory instrument applicable to the ship and is indicated in the instrument as being required to be provided on the navigating bridge.

The IMO Code on alarms and indicators (IMO res. A.830(19)) recommends the provision on the navigating bridge of alarms additional to those mentioned in the relevant statutory instrument applicable to the ship. Where such alarms are installed, the status of each additional alarm also should be identified within the final recording medium.

Where the alarm functions described in the statutory instrument include more than one alarm, the items should be recorded such that the status of each individual alarm can be identified within the final recording medium.

Where the statutory instruments permits the installation of override arrangements of shutdown or alarm functions, the activation of the override should be identified in the final recording medium.

Following lists are intended as guidance for which alarms should be recorded by the VDR.

7.9.1 Navigation equipment alarms

All required alarms from installed navigational equipment such as failure of integrated bridge systems sub-system alarm (ref. SOLAS Reg. V/19.6) should be recorded as available from the equipment.

7.9.2 SOLAS II-1

Reference	Alarm	Applicability	Comments
15.7.3.1	Watertight door low hydraulic fluid level or gas pressure or loss of stored energy in hydraulic accumulator for centralized hydraulic system	Passenger ships constructed on or after 1 February 1992	
15.7.3.2	Watertight door low gas pressure (group alarm), loss of stored energy for each independent hydraulic system	Passenger ships constructed on or after 1 February 1992	
15.7.8	Watertight door electrical power supply loss	Passenger ships constructed on or after 1 February 1992	
20-2.1/2	Watertight integrity from the ro-ro	Ro-Ro passenger ships	

	deck to spaces below		
21.1.6.2	High water level alarm	Ships constructed on or after 1 February 1992	If located on the bridge
23-2.1	Shell door position indicator	Ro-ro passenger ships	Door open or locking device not secured.
23-2.2	Water leakage detection indication	Ro-ro passenger ships	
29.5.2	Main and auxiliary steering gear unit power failure	Passenger and cargo ships constructed on or after 1 July 1986	
29.8.4	Main and auxiliary steering control system electrical power supply failure	Passenger and cargo ships constructed on or after 1 July 1986	
29.12.2	Low steering gear hydraulic fluid level	Passenger and cargo ships constructed on or after 1 July 1986	
30.3	Electric/electrohydraulic steering gear supply circuit or motor overload	Passenger and cargo ships constructed on or after 1 July 1986	
30.3	Failure of any one of the electric /electrohydraulic steering gear supply phase	Passenger and cargo ships constructed on or after 1 July 1986	For 3-phase supply only
31.2.7 49.5	Propulsion machinery remote control failure	Passenger and cargo ships constructed on or after 1 July 1986	For ships with bridge control of propulsion machinery
31.2.9 49.7	Low propulsion starting air pressure	Passenger and cargo ships constructed on or after 1 July 1986	For ships with bridge control of propulsion machinery
31.2.10	Threshold warning of slowdown or shutdown and override of these safety functions when activated.	Passenger and cargo ships constructed on or after 1 July 2004	
48.1	High bilge level in the machinery spaces	Cargo ships with periodically unattended machinery spaces constructed on or after 1 July 1986	
48.2	Influx of liquid greater than the pump capacity or frequent operating of bilge pump	Cargo ships with periodically unattended machinery spaces constructed on or after 1 July 1986	

49.7	Low starting air pressure (or starting emergency level) for propulsion machinery	Cargo ships with periodically unattended machinery spaces constructed on or after 1 July 1986	
51.1.3	Fault requiring action by, or attention of, the officer on watch (machinery alarms, including SOLAS II-1 Regs. 53.4.2 and 53.4.3)	Cargo ships with periodically unattended machinery spaces constructed on or after 1 July 1986	
51.2.2	Alarm system normal power supply failure	Cargo ships with periodically unattended machinery spaces constructed on or after 1 July 1986	
52	Automatic shutdown of propulsion machinery	Cargo ships with periodically unattended machinery spaces constructed on or after 1 July 1986	
52	Override of safety system has been activated	Cargo ships with periodically unattended machinery spaces constructed on or after 1 July 1986	

7.9.3 SOLAS II-2 (Consolidated Edition 2001)

This section is only applicable for ships built before 1st of July 2002.

Reference	Alarm	Applicability	Comments
5.3.3.2	Halon system electric circuit fault or power loss		If located on the bridge
5.3.3.3	Halon system hydraulic or pneumatic pressure loss		If located on the bridge
5.3.3.8	Loss of Halon container pressure		Halon 1301 stored in protected machinery space
5.3.4.3	Local automatic Halon release		If located on the bridge
12.1.2	Automatic sprinkler in operation or in case of failure of the system		
13.1.2	Fixed fire detection & fire alarm system fault conditions		If located on the bridge

13.1.2	Fixed fire detection & fire alarm system power loss		If located on the bridge
13.1.4	Fire detection and fire alarm activation		*
13-1.1.3	Sample extraction smoke detection system loss of power	Ships constructed on or after 1 February 1992	
13-1.1.6	Detection of smoke or other products of combustion	Ships constructed on or after 1 February 1992	
14.2	Fire alarm in machinery space	Ships with periodically unattended machinery spaces only	*
62.19.6	Inert gas system	Tankers	If located on the bridge

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1. *Where the fire detection system is of the addressable type that includes means of remotely identifying each detector individually, the activation of the individual detector should be identified within the final recording medium.*
2. *Where the fire detection system identifies the detection of fire within a specified zone, the detection of fire within the individual zone should be identified within the final recording medium.*

7.9.4 SOLAS II-2

This section is only applicable for ships constructed on or after 1 July 2002.

Reference	Alarm	Applicability	Comments
4.5.10.1.3	Protection of cargo pump-rooms Hydrocarbon gas alarm	Tankers	
4.5.10.1.4	Protection of cargo pump rooms High bilge level	Tankers	If located on the bridge
7.4.2	Fire detection in automated or remotely controlled machinery space.		*
10.5.6.4	Activation of any local application fire-extinguishing systems	Passenger ships of 500 gross tonnage and above and cargo ships of 2000 gross tonnage and above. Passenger ships of 2000 gross tonnage and above constructed before 1	If located on the bridge

		July 2002 shall also comply with reg.10.5.6.4 not later than 1 October 2005.	
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1. Where the fire detection system is of the addressable type that includes means of remotely identifying each detector individually, the activation of the individual detector should be identified within the final recording medium.
2. Where the fire detection system identifies the detection of fire within a specified zone, the detection of fire within the individual zone should be identified within the final recording medium.

7.9.5 RESOLUTION MSC.98(73)

Adoption of the international code for fire safety systems. The FSS Code take effect on 1 July 2002 upon the entry into force of the revised chapter II-2 of the convention.

Reference	Alarm	Applicability	Comments
MSC.98(73) 8.2.5.2.1	Automatic sprinkler in operation		If located on the bridge
MSC.98(73) 8.2.5.2.1	Automatic sprinkler system fault condition.		If located on the bridge
MSC.98(73) 9.2.5.1.1	Fire detection and fire alarm operation		If located on the bridge
MSC.98(73) 9.2.5.1.5	Fire detection and alarm system power loss.		If located on the bridge
MSC.98(73) 9.2.5.1.5	Fire detection and alarm system fault conditions.		If located on the bridge
MSC.98(73) 10.2.4.1.3	Detection of smoke		If located on the bridge
MSC.98(73) 10.2.4.1.4	Sample extractions smoke detection system loss of power supply		If located on the bridge
MCS.98(73) 15.2.4.3	Inert gas system alarms	Tankers	If located on the bridge

7.9.6 IMO Resolutions

Reference	Alarm	Applicability
A.481(12) 7.3 A.830 (19) 7.1.1	Personnel alarm (dead man alarm)	If provided Ships except warships, naval auxiliaries, fishing vessels, pleasure yachts, wooden

		ships of primitive build constructed on or after 28 April 1984
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7.9.7 Gas or Chemical Codes as follows:

Following alarms according to Gas or Chemical Codes should be recorded if the alarms are located on the bridge:

Reference	Alarm conditions	Comments
IBC 15.2.4 BCH 4.19.4	High and low temperature of cargo and high temperature of heat exchanging medium	(Ammonium nitrate solution 93% or less)
IBC 15.5.6 BCH 4.20.6	High temperature in tanks	(Hydrogen peroxide solution over 60% but not over 70%)
IBC 15.5.7 BCH 4.20.7	Oxygen concentration in void spaces	(Hydrogen peroxide solution over 60% but not over 70%)
IGC 13.4.1 GC 13.4.1	High and low pressure in cargo tank	
IGC 13.6.4, 17.9 GC 13.6.4, 17.11	Gas detection equipment	
IGC 13.5.2, GC 13.5.2	Hull or insulation temperature	
IGC 17.18.4.4 GC 17.12.2(d)(iv)	Cargo high pressure, or high temperature at discharge of compressors	(Methyl acetylene-propadiene mixtures)
IGC 17.14.4.3 GC 17.12.5(d)(iii)	Gas detecting system monitoring chlorine concentration	
IGC 17.14.4.4 GC 17.12.5(d)(iv)	High pressure in chlorine cargo tank	
IBC 15.5.18, BCH 4.20.19	High temperature in tanks	Hydrogen Peroxide solutions over 8% but not over 60% by weight
IBC 15.5.19, BCH 4.20.20	Oxygen concentration in void spaces	Hydrogen Peroxide solutions over 8% but not over 60% by weight

IBC 15.10.2, BCH 4.3.1(b)	Failure of mechanical ventilation of cargo tanks	Sulphur (molten)
IBC 19.8.4	Low pressure in inerted cargo tanks	
IGC 5.2.1.7, GC 5.2.5(b)	Liquid cargo in the ventilation system	
IGC 8.4.2.1, GC 8.4.2(a)	Vacuum protection of cargo tanks	
IGC 9.5.2, GC 9.5.2	Inert gas pressure monitoring	
IGC 13.6.11, GC 13.6.11	Gas detection equipment	
IGC 17.14.1.4, GC 17.12.5(a) (iv)	Gas detection after bursting disk for chlorine	

7.9.8 Bulk carriers

Reference	Alarm conditions	Comments
MSC.134(76) (SOLAS XII/12.2)	Water ingress pre-alarm	
MSC.134(76) (SOLAS XII/12.2)	Water ingress main alarm	
MSC.145(77) 3.3.6, 3.3.7, 3.3.8	Deactivation of water level detectors	If located on the bridge
MSC.145(77) 3.3.6, 3.3.7, 3.3.8	Failure of water level detector system	If located on the bridge
MSC.145(77) 3.3.6, 3.3.7, 3.3.8	Failure of electrical power supply to water level detector system	If located on the bridge

7.10 Rudder order and response

The status of all steering gear power units installed in the ship and the status and settings of the control mode should be identified within the final recording medium.

Where arrangements are made for the remote control of the steering gear from more than one location, such as bridge wings or from automatic control systems such as autopilots and track controllers the individual order and response for the steering gear from the control location in operation and settings of the control mode in operation should be identified within the final recording medium.

Rudder order and response angles should be recorded up to a resolution of 1 degree as available and permitted on the ship. The interval between recordings is not exceed 1 second.

7.11 Engine order and response

This shall include the positions of engine telegraph or direct engine/propeller pitch controls in operation, including shaft(s) r.p.m (or equivalent), and feedback indications, if fitted, including ahead/astern indicators. This shall also include status of all propulsion thrusters (i.e. r.p.m., pitch and thrust direction).

RPM should be recorded up to resolution of 1 r.p.m. Where the controllable pitch propeller is used, the pitch should be recorded up to a resolution of 1 degree. The interval between recordings is not exceed 1 second.

7.12 Hull openings status

This shall include all mandatory status information required to be displayed on the bridge.

Reference	Alarm	Applicability	Comments
SOLAS II-1			
25-10.2	Position of watertight external openings, except for cargo hatch covers	Cargo ships constructed on or after 1 February 1992	*

* *The status of each individual opening should be identified within the final recording medium.*

7.13 Watertight and fire door status

This shall include all mandatory status information required to be displayed on the bridge.

Reference	Alarm	Applicability	Comments
SOLAS II-1			
15.6.4/15.8.2/16.2	Power-operated watertight doors indication	Passenger ships constructed on or after 1 February 1992 or passenger ships carrying goods vehicles and accompanying personnel regardless of the date of construction (ref. SOLAS II-1/16.1/2)	*
23-1.2	Watertight door position	Dry cargo ships constructed on or after 1 February 1992	*
25-9.2	Position of internal watertight doors used while at sea	Cargo ships constructed on or after 1 February 1992	*
25-9.3	Position of internal watertight door and access hatch covers normally closed at sea	Cargo ships constructed on or after 1 February 1992	*
SOLAS II-2 (Consolidated edition 2001)			
This section is only applicable for ships built before 1 st of July 2002.			

30.4.6	Fire door indication	Passenger ships	* If located on the bridge
37.1.2.3	Special category space fire door indication	Passenger ships	*
SOLAS II-2 This section is only applicable for ships constructed on or after 1 st of July 2002.			
7.9.3	Fire door indication	Passenger ships carrying more than 36 passengers	* If located on the bridge
9.4.1.1.4.6	Fire door indication	Passenger ships	* If located on the bridge
9.6.4	Special category space fire door indication	Passenger ships	*

* *The status of each individual door should be identified within the final recording medium.*

7.14 Accelerations and hull stresses

Where a ship is fitted with IMO mandated hull stress and response-monitoring equipment, all the data items that have been pre-selected within the equipment should be identified within the final recording medium. The interval between the recordings is not to exceed 1 second.

7.15 Wind speed and direction

This should be applicable where a ship is fitted with a sensor having a suitable output in accordance with IEC 61162. Either relative or true wind speed and direction should be identified within the final recording medium together with the information which of relative or true wind speed is recorded. The interval between the recordings is not to exceed 15 seconds.

7.16 Additional information

All other information recorded by the VDR shall not degrade the performance of the VDR (e.g. reduce the capacity of the Protective Memory Capsule below 12 hours of data).