

Voyage Data Recorders



References

International Convention for the Safety of Life at Sea (SOLAS)

Resolution MSC.333(90)

Resolution MSC.214(81)



DEFINITION

Voyage data recorder, is a data recording system designed for all vessels required to comply with the IMO's International Convention SOLAS Requirements in order to collect data from various sensors on board the vessel. It then digitizes, compresses and stores this information in an externally mounted protective storage unit. The protective storage unit is a tamper-proof unit designed to withstand the extreme shock, impact, pressure and heat, which could be associated with a marine incident (fire, explosion, collision, sinking, etc.).

Voyage data recorder (VDR) means a 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.

Like the black boxes carried on aircraft, VDRs enable accident investigators to review procedures and instructions in the moments before an incident and help to identify the cause of any accident.

DEFINITION

Signal source means 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

Final recording medium means 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.

Fixed recording medium means a 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 ship that has sunk. It has a means of indicating location.

Float-free recording medium means a part of the final recording medium which should float-free after a sinking. It has a means of indicating location.

Long-term recording medium means a 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.

CARRIAGE REQUIREMENTS

SOLAS REQUIREMENTS

Regulation 20: carriage of Voyage Data Recorders (VDR or S-VDR) – Timetable for fitting

Type of vessel	Date by which VDR or S-VDR must be fitted
Passenger ships constructed on or after 1 July 2002	<u>VDR</u> - Date of build
Ro-ro passenger ships constructed before 1 July 2002	<u>VDR</u> - Date of first survey on or after 1 July 2002
Passenger ships other than ro-ro constructed before 1 July 2002	<u>VDR</u> - 1 January 2004
Ships other than passenger ships of 3000 gt. and upwards constructed on or after 1 July 2002	<u>VDR</u> - Date of build
Cargo ships of 20000 gt. and upwards constructed before 1 July 2002*	<u>VDR or S-VDR</u> - Date of first scheduled dry docking after 1 July 2006 but not later than 1 July 2008
Cargo ships of 3000 gt. up to 20000 gt. constructed before 1 July 2002 *	<u>VDR or S-VDR</u> - Date of first scheduled dry docking after 1 July 2007 but not later than 1 July 2010

* Cargo ships built before 1 July 2002 may be exempted from requirements to carry VDR /S-VDR when they are to be taken permanently out of service within 2 years of the relevant implementation date.

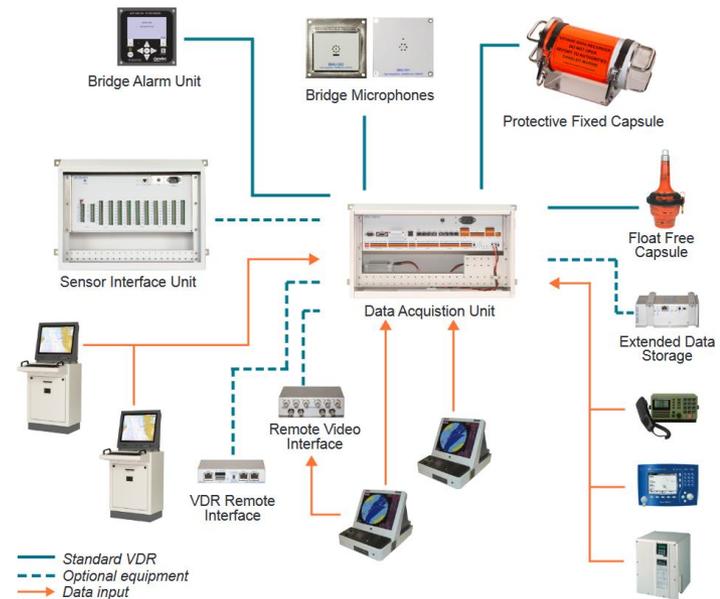
OPERATIONAL REQUIREMENTS

The VDR can be classified to contain following units,

- the Data Collection Unit (DCU) that is fitted on the bridge that pulls in data from all the integrated sources,
- a Data Recording Unit (DRU)

The final recording medium should consist of the following items:

- fixed recording medium;
- float-free recording medium; and
- long-term recording medium.



OPERATIONAL REQUIREMENTS

Fixed recording medium

The fixed recording medium should be installed in a fixed protective capsule which should meet all of the following requirements:

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

OPERATIONAL REQUIREMENTS

Float-free recording medium

The float-free recording medium should be installed in a float-free capsule which should meet all of the following requirements:

- be fitted with means to facilitate grappling and recovery;
- maintain the recorded data for a period of at least six months following termination of recording;
- be so constructed as to comply with the requirements specified in resolution A.810(19) and to minimize risk of damage during recovery operations;
- 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 seven days/168 hours; and
- be capable of being accessed following an incident but secure against a physical or electronically manipulated change or deletion of recorded data.

OPERATIONAL REQUIREMENTS

Long-term recording medium

The long-term recording medium should:

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

OPERATIONAL REQUIREMENTS

The equipment should 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 should be recorded.

The recording method should be such that each item of the recorded data is checked for integrity and an alarm given if a non-correctable error is detected.

The VDR should be capable of operating from the ship's main and emergency source of electrical power. If the ship's source of electrical power supply fails, the VDR should continue to record Bridge Audio from the dedicated reserve power source for a period of 2 hours. At the end of this 2 hour period all recording should cease automatically.

Recording should be continuous unless terminated in accordance requirements. The time for which all stored data items are retained should 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.

OPERATIONAL REQUIREMENTS

Date and time

Date and time, referenced to UTC, should be obtained from a source external to the ship and an internal clock should be synchronized with valid date and time data. During times of a loss of the external source, the internal clock should be used. The recording should indicate which source is in use. The recording method should 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.

Ship's position

Latitude and longitude, and the datum used, should be derived from an electronic position-fixing system (EPFS). The recording should ensure that the identity and status of the EPFS can always be determined on playback.

OPERATIONAL REQUIREMENTS

Speed

Speed through the water and speed over the ground, including an indication of which it is, derived from the ship's speed and distance measuring equipment, as required by SOLAS regulations.

Heading

Heading as indicated by the ship's heading source.

Bridge audio

Microphones should be positioned on the bridge covering all work stations as described in MSC/Circ.982 so that conversation is recorded. The recording should be such that, on playback, a normal speaking voice should provide adequate intelligibility while the ship is performing its normal operations. This performance should 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 should be achieved through the use of at least two channels of audio recording. Microphones positioned outside on bridge wings, should be recorded on at least one additional separate channel.

OPERATIONAL REQUIREMENTS

Communications audio

VHF communications relating to ship operations should be recorded on an additional separate channel

Radar

The electronic signals of the main displays of both ship's radar installations as required by SOLAS regulations. The recording method should 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.

ECDIS

Where a vessel is fitted with an ECDIS installation, the VDR should record the electronic signals of the ECDIS display in use at the time as the primary means of navigation. The recording method should 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.

OPERATIONAL REQUIREMENTS

Echo sounder

The depth information. This should include, where available, depth under keel, the depth scale currently being displayed and other status information.

Main alarms

This should include the status of all mandatory alarms on the bridge or as received from the Bridge Alert Management System, if installed, recorded as individually identified alarms.

Rudder order and response

This should include status and settings of heading or track controller, if fitted and indicate the control station, mode, and power unit(s) in use.

Engine and thruster order and response

This should include the positions of any engine telegraphs or direct engine/propeller controls and feedback indications on the bridge, if fitted, including ahead/astern indicators and indicate the control station in use. This should also include any thrusters if fitted and indicate the control station in use.

OPERATIONAL REQUIREMENTS

Hull openings status

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

Watertight and fire door status

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

Accelerations and hull stresses

Where a ship is fitted with hull stress and response monitoring equipment, all the data items that have been pre-selected within that equipment should be recorded.

Wind speed and direction

Where a ship is fitted with a suitable sensor, wind speed and direction should be recorded, including its true or relative status.

AIS

All AIS data should be recorded.

OPERATIONAL REQUIREMENTS

Rolling motion

The VDR should be connected to an electronic inclinometer if installed. The recording method should be such that the rolling motion can be reconstructed during playback.

Configuration data

In addition to the data items, a data block defining the configuration of the VDR and the sensors to which it is connected should be written into the final recording medium during commissioning of the VDR. The data block should be maintained up to date with respect to the vessel installation. It should 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 should 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.

Electronic logbook

Where a ship is fitted with an electronic logbook in accordance with the standards of the Organization the information from this should be recorded.

INTERFACING

Interfacing to the various signal sources required should be in accordance with the relevant international interface standard, where possible. Any connection to any item of the ship's equipment should be such that the operation of that equipment suffers no deterioration, even if the VDR system develops faults.

DOWNLOAD AND PLAYBACK EQUIPMENT FOR INVESTIGATION AUTHORITIES

Data output interface

The VDR should provide an interface for downloading the stored data and play back the information to an external computer. The interface should be compatible with an internationally recognized format, such as Ethernet, USB, FireWire, or equivalent. It should be possible to perform a download of the recorded data for a user-defined period of time.

Software for data downloading and play back

A copy of the software program providing the capability to download the stored data and play back the information onto a connected external laptop computer and for the playback of the data should be provided for each VDR installation.

The software should be compatible with an operating system available with commercial-off-the-shelf laptop computers and provided on a portable storage device such as a CD-ROM, DVD, USB-memory stick, etc.

DOWNLOAD AND PLAYBACK EQUIPMENT FOR INVESTIGATION AUTHORITIES

Instructions for executing the software and for connecting the external laptop computer to the VDR should be provided.

The portable storage device containing the software, the instructions and any special (not commercial off-the-shelf) parts necessary for the physical connection of the external laptop computer, should be stored within the main unit of the VDR.

Where non-standard or proprietary formats are used for storing the data in the VDR, the software for converting the stored data into open industry standard formats should be provided on the portable storage device or resident in the VDR.