

## White paper on the new VDR standard in 2014



*Danelec Marine's new generation of Voyage Data Recorders (VDRs) will be launched in Q1 2013, and is designed to meet both the existing and new VDR standards taking effect in 2014.*

*This white paper provides an overview of the revised performance standards and technical requirements for VDRs defined by IMO in MSC.333(90) which was adopted in May 2012 and will be enforced in July 2014.*

### What is a VDR?

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

The purpose of a Voyage Data Recorder is to store information in a secure and retrievable form, concerning the position, movement, physical status, command and control of a ship over the period and following an incident. Information contained in a VDR should be made available to both the authorities and the shipowner. This information is for use during any subsequent safety investigation to identify the cause(s) of the incident.

A VDR with capabilities and technical specifications according to those defined in IMO regulations is required to be fitted to ships, as follows:

- Passenger ships and ships other than passenger ships of 3000 gross tonnage and upwards constructed on or after 1 July 2002 must carry VDRs to assist in accident investigations,
- A simplified VDR (S-VDR) must be fitted on existing cargo ships of 3000 gross tonnage and upwards constructed before 1 July 2002.

In May 2012 the Maritime Safety Committee of IMO (International Maritime Organization) adopted a revised recommendation on performance standards for voyage data recorders (VDRs), to be enforced by 1 July 2014.



## Summary of new requirements

New requirements defined in MSC.333(90):

- Data shall be recorded in a fixed capsule, a **float-free capsule** and internally in the VDR (opposed to just a fixed capsule).
- Data shall be recorded for **minimum 48 hours** in both capsules (opposed to 12 hours in the fixed capsule) and **30 days internally in the VDR**.
- Bridge audio shall be recorded using at least two tracks for indoor microphones. Outdoor microphones (where applicable) shall be recorded on an additional separate track. The current standard is not very specific regarding this. The new standard also specifies that audible alarms and noise on the vessel shall not prevent the VDR from recording audio properly.
- Images, chart(s) used and settings from the ECDISs shall be recorded.
- Images from both radars on the vessel shall be recorded (opposed to just one).
- Data from the AIS shall be recorded.
- Data from an inclinometer shall be recorded if installed.

Additional requirement in IEC 61996-1 Ed.2:

- The VDR shall not generate audible alarms. In return, the crew or a service technician shall be able, on demand, to initiate a self-test of the VDR and be able to read the result without having to use any additional equipment.

Data items to be recorded	S-VDR	Current VDRs	New VDRs
Date and time	✓	✓	✓
Ship's position	✓	✓	✓
Speed	✓	✓	✓
Heading	✓	✓	✓
Bridge audio	✓	✓	✓
Communication audio	✓	✓	✓
Radar data	*	✓	✓
AIS	*	✗	✓
Echo sounder	**	✓	✓
Rudder order and response	**	✓	✓
Engine order and response	**	✓	✓
Hull opening (doors) status	**	✓	✓
Watertight and fire door status	**	✓	✓
Main Alarms	**	✓	✓
Acceleration and hull stresses	**	**	**
Wind speed and direction	**	**	**
Second radar	✗	✗	✓
ECDIS	✗	✗	✓
Data from inclinometer	✗	✗	✓

\* Radar must be recorded if possible using COTS equipment else AIS data must be recorded.

\*\* If suitable equipment is fitted i.e. equipment which transmits data using the IEC61162 format.

## Detailed description of new requirements

### Requirement for float-free capsule

Some flag states have argued that the cost of retrieving a fixed capsule from deep water is prohibitive in some cases and the investigators will end up having no data available. It is believed that having an additional float-free capsule could reduce the likelihood of this scenario. Additionally, the float-free capsule can replace or act as an EPIRB. However a float-free capsule cannot survive e.g. fire and consequently cannot replace the fixed capsule.

### Requirements for longer recording times and internal recording

The current concept of having someone to initiate a save of data in the capsule following an incident does not work satisfactorily. Moreover most vessels - even severely damaged after an incident - have been able to supply power to the VDR for more than 10 hours after the incident happened. Consequently the data in the capsule were overwritten. Increasing the recording time to 48 hours in the capsules and to 30 days internally in the VDR is believed to cover all likely scenarios following an incident.

### New requirements to recording of bridge audio

A number of problems have been identified related to the quality of audio recordings from VDRs:

- Too many microphones are mixed together on too few recording tracks.
- The maximum sound level by which the VDR functions properly is typically too low, although it meets the requirements of the current standard.
- Low frequency out-of-band noise often interferes with the recordings.
- The codec or algorithm used for the audio compression is typically inadequate for compression of voice with a high level background noise.

Requirements in the new VDR standard addresses the above issues and requirements for the microphones are now also included.

### Recording of data from ECDIS

ECDIS is probably the most important tool for navigation on new ships (and soon for existing vessels too), therefore it is essential that images and data from ECDIS are recorded.

### Recording of images from both radars shall be recorded

It is believed that having images from both the X-band and S-band radar is a significant improvement which will not significantly increase the cost of a VDR.

### Recording AIS

AIS data is essential. The additional cost of recording these data is insignificant and already being recorded on many vessels.

## Recording of data from inclinometer if fitted

There has been a long ongoing discussion about whether an inclinometer, which can measure rolling motion and roll period, shall become a carriage requirement. Information from an inclinometer may be essential for the investigators and shall be recorded if fitted.

## Requirements for improved user interface

Many VDRs are not fully operational. The current standard specifies that the VDR shall generate an audible alarm which the crew shall acknowledge. Further, an indicator shall become red while the problem exists and the crew is supposed to fix the problem or call for assistance. This concept is not working satisfactorily. The VDR will often generate numerous false alarms if e.g. equipment is switched off. It is not beneficial to the crew to get a number of alarms from the VDR if e.g. the GPS suddenly fails. Another requirement in the current VDR standard is that a service technician shall test the VDR after installation or repair of equipment on the vessel. Today this is very difficult.

According to the new standard there shall be no audible alarm only a red indicator showing if something is wrong. Further the user interface to the VDR shall facilitate that the crew or a service technician can start a self-test of the VDR and read the result without having to use any additional equipment. This new concept will not prevent vessels from sailing with a defective VDR, however on vessels where appropriate procedures are implemented there is a fair chance of having a functional VDR, and a service technician who installs or repairs equipment on a vessel can easily test that the VDR is still functioning.

## The new DM100 VDR

Danelec Marine's new generation of VDRs is designed to meet both the existing and new VDR standards taking effect in July 2014.

