
**Ships and marine technology —
Guidelines for the operation and
installation of voyage data recorders
(VDR) —**

*Navires et technologie maritime — Lignes directrices pour
le fonctionnement et l'installation des enregistreurs de données
de voyage (VDR) —*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

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Ships and marine technology — Guidelines for the operation and installation of voyage data recorders (VDR)

1 Scope

This International Standard provides guidance for the planning, installation and operational testing of VDR S-VDR installations according to the electric/electronic and acoustic specifications of IMO A.861 (20), IMO MSC.163 (78) and IEC 61996 (including IEC 61996-2, Simplified voyage data recorder). These standards mainly deal with interfaces between VDR/S-VDR and external sensors, which is the main subject for technical agreements between user, shipyard, VDR/S-VDR supplier and/or sensor manufacturers when installations are planned. In addition, matters of performance test and playback are also described. Furthermore, details for checking of items related to the interfaces and the installation are introduced. This International Standard is not intended for the standardization of performance factors and functional requirements related to VDR and/or S-VDR.

Hereafter, VDR means VDR and S-VDR unless specifically indicated otherwise.

NOTE All text of this International Standard which is identical to that of IMO A.861, IMO MSC.163, IEC 61996 and IEC 61996-2 is formatted in *italics*, and the Regulation and associated performance standard paragraph numbers are indicated in brackets, where necessary.

2 Normative references

The following referenced documents are indispensable for the application 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.

IEC 60945, *Maritime navigation and radiocommunication equipment and systems — General 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 61162-1:2000, *Maritime navigation and radiocommunication equipment and systems — Digital interfaces — Part 1: Single talker and multiple listeners*

IEC 61162-2:1998, *Maritime navigation and radiocommunication equipment and systems — Digital interfaces — Part 2: Single talker and multiple listeners, high-speed transmission*

IEC 61996:2000, *Maritime navigation and radiocommunication equipment and systems — Shipborne voyage data recorder (VDR) — Performance requirements — Methods of testing and required test results*

IEC 61996-2:2006, *Maritime navigation and radiocommunication equipment and systems — Shipborne voyage data recorder (VDR) — Part 2: Simplified voyage data recorder (S-VDR) — Performance requirements, methods of testing and required test results*

IMO A.830 (19):1995, *Code on Alarms and Indicators*

IMO A.861 (20):1997, *Performance standards for shipborne voyage data recorders (VDRs)*

IMO MSC.163 (78):2004, *Performance standards for shipborne simplified voyage data recorders (S-VDRs)*

IMO MSC/Circ.1024:2002, *Guidelines on voyage data recorder (VDR) ownership and recovery*

IMO SN/Circ.246:2005, *Recommended means for extracting stored data from voyage data recorders (VDRs) and simplified voyage data recorders (S-VDRs) for investigation authorities*

International convention on the Safety of Life at Sea (SOLAS), IMO, 1974, as amended

VESA:1996, *Video electronics standards association — Discrete monitor timings standard 1.0, Revision 0.7 (DMTS)*

3 Terms, definitions and abbreviated terms

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

3.1 Terms and definitions

3.1.1

recorder (VDR)

complete system, including any items required to interface with the sources of input data, for processing and encoding the data, the final recording medium in its capsule, the power supply and dedicated reserve power source

[IMO A.861 / 4.1]

3.1.2

sensor

any unit external to the VDR to which the VDR is connected and from which it obtains data to be recorded

[IMO A.861 / 4.2]

3.1.3

final recording medium

item of hardware on which the data is recorded such that access to it would enable the data to be recovered and played back by use of suitable equipment

[IMO A.861 / 4.3]

3.1.4

playback equipment

equipment, compatible with the recording medium and the format used during recording, employed for recovering the data. It includes also the display or presentation hardware and software that is appropriate to the original data source equipment. Playback equipment is not normally installed on a ship and is not regarded as part of a VDR for the purposes specified by performance standards

[IMO A.861 / 4.4]

3.1.5

dedicated reserve power source

secondary battery, with suitable automatic charging arrangements, dedicated solely to the VDR, of sufficient capacity to operate it as required by 4.5.3 of IEC 61996

[IMO A.861 / 4.5]

3.1.6

resolution

smallest detectable increment between two values

[IEC 61996 / 3.1.6]

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3.1.7**data**

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

[IEC 61996 / 3.1.7]

3.1.8**activation of a suitable alarm**

mutable audible alarm and persistent visual indication, given according to the requirements of IMO A.830, but with an audible level in the range of 55 dBA to 65 dBA

[IEC 61996 / 3.1.8]

3.1.9**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 table
- chart table
- helmsman
- communication

[IEC 61996 / 3.1.9]

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3.2 Abbreviated terms

EPFS	Electronic Position Fixing System	ISO 22472:2006
IMO	International Maritime Organization	http://www.imo.org/standards/sist/d639a15e-ec2d-45c3-ad28-7e733051db7f/iso-22472-2006
INS	Integrated Navigation System	
ITU	International Telecommunication Union	
AIS	Automatic Identification System	

4 VDR interface

According to IMO A.861 (20), IMO MSC.163 (78) and IEC 61996 (including IEC 61996-2) *interfacing between the various sensors and VDR shall be in accordance with the relevant international interface standard IEC 61162 series, where possible.*

In case there is no free interface port available for the connection to the VDR, a "data splitter"-interface should be added for providing the additionally required output port of a sensor.

It is also specified that *any connection to any item of the ship's equipment shall be such that operation of that equipment suffers no deterioration, even if the VDR system develops faults.* (A.861/7).

Regarding S-VDR installation, it is stated in IMO MSC.163 (78), 5.4.9 that *any additional data items listed by IMO with the requirements set out in resolution A.861 (20) should be recorded when the data is available in accordance with the international digital interface standards¹⁾ using approved sentence formatters.* In addition to this, it is stated in IMO MSC.163 (78), 5.4.8 as well that, *If it is impossible to obtain radar data²⁾ then AIS target data should be recorded as a source of information regarding other ships.*

1) IEC 61162.

2) Where commercial off the shelf (COTS) interfaces are not available.

Consequently, S-VDR may have the same interfaces as VDR. In addition, an S-VDR shall also include a port for interfacing an AIS in case radar data cannot be obtained. Though minimum interface requirements of an S-VDR are less than those of a VDR, as “any additional data items” stated in IMO MSC.163 (78), 5.4.9 may be taken into consideration, it is recommended to carefully review for each individual ship, in accordance with this standard, which item of “any additional data items” can be interfaced in digital format according to IEC 61161 or through signal converter(s). Any additional data items are Echo sounder (Depth), Main Alarms, Rudder order / response, Engine order / response (main engine, thruster), Hull openings, Watertight doors, Fire doors, Accelerations / hull stress and Wind speed and Direction. These signals are principally not different from those for VDR.

It may be noted that the use of signals defined under common standards results in fewer problems for the installation of any VDR, even if the interfaces of several mandatory shipborne equipment are (still) not internationally standardised, such as sound captured by microphone, VHF communication signals, radar image, watertight door / fire door / hull opening (door) status signals and alarm signals. It is therefore desired that equipment output signals should at least be in accordance with IEC 61996 Annex A, Table A.1-References and IEC 61162-102.

Equipment which will interface with VDR include but may not be limited to those listed below. The specific requirements for each interface are detailed at paragraphs 5.3.1 to 5.3.16.

4.1 Input signals required for VDR interfaces

To promote common understanding between equipment manufacturers, ship builders and operators, the signals used for the interfaces between sensors and the VDR are described in paragraphs 4.1.1 to 4.1.5, 4.2 and 4.3. Paragraph 5.1 to 5.16 then provide forms for filling in and confirming and the details for each individual input to the VDR.

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4.1.1 Signals defined in IEC 61162 series

a) IEC 61162

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Four (4) standard signals are described in the IEC 61162 series. Of these only two (2) are used for VDR and they are listed at IEC 61996, Annex A, Table A.1. The characteristics of ‘talkers’ and ‘listeners’ referred to in IEC 61162 are compared in Annex B to this standard. With regard to VDR interfacing the VDR is considered the ‘listener’ and the sensors are considered the ‘talkers’. Thus, when planning VDR installation, care must be taken to ensure that sensors and VDR are compatible in terms of interface signal types.

b) IEC 61162-1 and IEC 61162-2

IEC 61162-1 and IEC 61162-2 are of the single talker and multi-listener type communication. The difference between types is the communication speed, i.e. 4 800 bps by IEC 61162-1 and 38.4 kbps by IEC 61162-2. At present, IEC 61162-1 is normally used for communications between marine equipment, except that IEC 61162-2 is typically used for Gyro compass interfaces.

c) IEC PAS 61162-102

Signal sentences used for interfaces between VDR and sensors are shown in IEC 61996 Annex A, Table A.1 as informative. However, some more sentences following the international standard of IEC 61162 would be appropriate for interfacing the required sensor information to a VDR. In December 2003, additional sentences were approved as IEC/PAS 61162-102. For reference, these sentences are briefly described in paragraph A.3, annex A. This PAS will remain valid for an initial maximum period of 3 years starting from 2003-09. The validity may be extended for a single 3-year period, following which the standard should have been revised to become a normative document, or will be withdrawn. A summary of the new sentences is shown in Annex-B of this standard.

Signals and sentences available for being used for VDR are listed in table 1 below. Data items in table 1, no. 1, 2, 3, and 4, are required for S-VDR installations in any case, while the remaining items in table 1 are specified in IMO MSC.163 (78), 5.4.9 as “Other items”. (Any additional data items listed by IMO with the requirements

set out in resolution A.861 (20) should be recorded when the data is available in accordance with the international digital interface standards³⁾ using approved sentence formatters.)

Therefore, if "Other items" are available in the international digital format of IEC 61162, such signals have to be interfaced to S-VDR. If any signal of item No.1, 2, 3 and 4 is not available in the international digital format, it may have to be converted accordingly.

Table 1 — Sentences used for interface of VDR (referred to IEC 61996, Annex A)

No.	Parameter to be recorded	IEC 61996 clause(s)	Sentence format	Notes
1	Date and time	4.6.1	ZDA, GNS ^a , GGA ^a	
2	Ship's position and datum used	4.6.2	GNS, DTM, GGA ^a , GLL ^a , RMC ^a	
3	Speed (water and/or ground)	4.6.3	VBW, VHW ^a , VTG ^a	
4	Heading (true)	4.6.4	HDT	
5	Heading (magnetic)	4.6.4	HDG	
6	Depth (echo sounder)	4.6.8	DPT	
7	Alarms	4.6.9	ALR, ALA ^{*2}	
8	Rudder order / response manual	4.6.10	RSA	Note 1
9	Rudder order / response automatic	4.6.10	HTC, HTD	
10	Engine order / response	4.6.11	RPM, XDR, ETL ^b , PRC ^b , TRC ^b , TRD ^b	Note 1 and 2
11	Hull openings, watertight doors Fire doors	4.6.12, 4.6.13	XDR, DOR ^b	Note 2
12	Accelerations and hull stress	4.6.14	XDR, ALR, HSS ^b	Note 2
13	Wind speed and direction	4.6.15	MWV	
14	VDR alarm output		\$VRALR	Note 3
15	AIS		VDO, VDM ^c	

^a Sentences marked with ^a are defined in IEC 61162-1 are not shown in Table A.1 Annex A (informative) of IEC 61996, but these contain the same information as the required parameter in this Table 1 above.

^b Sentences marked with ^b are new sentences specified in IEC PAS 61162-102), which are not shown in Annex A Table A.1 (informative) of IEC 61996.

^c Sentences marked with ^c are new sentences specified in the IEC 61993-2 and have been prepared solely for AIS output signals. Those sentences are not shown in Table A.1 Annex A (informative) of IEC 61996.

(Referred to IEC 61996 Annex A.)

Note 1	The current specifications for RSA and RPM do not have fields for 'order', only 'response'
Note 2	The table of transponder types in the current specification for XDR does not specifically include these uses.
Note 3	There is no requirement for the VDR to send alarm messages. If, as an option, such messages are sent, then the appropriate sentence format is ALR.

3) Refer to publication IEC 61162.

4.1.2 Signals in other than IEC 61162 format

Any interface units which may be required to convert non-IEC 61162 signals, shall conform to the requirements of IEC 60945 (IEC 61996 / 4.3.6).

According to the requirement that any connection to any item of the ship's equipment shall be such that operation of that equipment suffers no deterioration, even if the VDR system develops faults (A.861/7), interface signals shall be provided by the sensors in such a way, that failures of the VDR or of cables connecting the VDR cannot hamper the functionality of the source equipment: i.e. contacts or signals of equipment for primary ship manoeuvring functions shall be provided as "dry contacts" or via isolation amplifiers.

Signal formats not specified in IEC 61996 such as 'contact' signal and analog signals (e.g. voltage, current, synchro and pulse, etc.) except Bridge and Communications audio signals, have to be converted to a 'serial signal' before they can be interfaced to VDR or S-VDR.

In some VDR units a signal converter will be included. In other instances it will be possible to insert a converter between the sensor and the VDR. Thus in most instances of non-standard signals it should still be possible to achieve an interface. However, there are still many sensors which output analog signals and it is recommended that operators, shipbuilders and owners satisfy themselves that interface between specific equipments is possible. Refer to the list below.

Analog to IEC 61162 format converters
Discrete voltage or contact to IEC 61162 format converters
Gyro compass synchro or stepper signal to IEC 61162 converters
Rate-of-turn synchro or stepper signal to IEC 61162 converters
Synchro to IEC 61162 format converters for other interfaces, such as controls or indicators
Echo sounder Start-Stop signal to IEC 61162 converters
Speed-log Pulse signal to IEC 61162 converters
Interface channel splitters for providing additional interface channels from one sensor interface
Data protocol converters for generating IEC 61162 data formats from non-IEC 61162 data.
VHF radio tabs for existing VHF radios
video interfaces for existing radars, accommodating a variety of different video standards, pixel resolutions and refresh frequencies
video buffers for existing radars
hydraulic and pneumatic pressure transducers with analogue voltage output
angular pick-ups for angles of mechanical controls such as propulsion levers and rudder gears
pulse counters for picking-up rotations such as propeller shaft rotations

4.1.3 Bridge audible sound captured by microphones

In accordance with IEC 61996, 4.6.5 Bridge audio (A.861 / 5.4.5), requirement of microphone is as follows. *One or more microphones positioned on the bridge shall be placed, such that conversation at or near the conning stations, radar displays, chart tables, etc. (i.e. at work stations as defined in 3.1.9) may be adequately recorded. As far as is practicable, the positioning of microphones shall also capture the input and output of intercom, public address systems and the audible alarms on the bridge (bridge mounted equipment) (see 5.6 for technical characteristics). The audio signals at all workstations shall be recorded continuously. Optionally, means may be provided so that the originating workstation can be identified with the audio signal being analyzed during playback of the recorded information.*

In addition, it is stated in IEC 61996, 5.6.1 that *the microphones forming the bridge audio data source are to be considered to be parts of the VDR*. The manufacturer's VDR documentation should therefore include information about the coverage range of indoor and outdoor microphones, so that the planning of their installation can be based on certified values.

4.1.3.1 Location of microphones

Microphones should be installed to cover certain areas around main workstations on the bridge, and also at each wing or other manoeuvring workstation outside the wheelhouse, whereby suitable locations shall be selected considering ambient noise and work area's circumstances. Even on an enclosed bridge, attention shall be paid not only to main workstations but also to wing sides as well.

4.1.4 VHF radio connection

According to IMO A.861/5.4.6 and 4.6.6, *VHF communications relating to ship operations shall be recorded*, 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. Although more than one VHF communication equipment may normally be installed on the bridge, the IMO requirements do not define which VHF shall be interfaced to the VDR. Unless a bridge design makes it obvious that VHF communication related to ship operations of navigation and manoeuvring is routinely performed via more than one VHF unit, it should be sufficient if the VHF unit is connected, which is installed at the workstation for navigation and manoeuvring. In such case the other VHF unit(s) shall be covered by microphone(s).

4.1.5 Radar display connection

The VDR shall include electronic signal information from within one of the ship's radar installations which records all the information which was actually being presented on the master display of that radar at the time of recording (IMO A.861/5.4.7). However, on ships over 3,000 GT two radars or more may be installed each with a "master display", but the IMO requirements do not define which radar display(s) shall be interfaced to the VDR. Unless a bridge design makes it obvious that decisions regarding collision avoidance are routinely based on more than one radar display, it should be sufficient if the signals of the radar display is connected, which is mainly used for navigation.

In the case of S-VDR installation, refer to the paragraph 4.3 AIS in this standard.

4.2 Alarms

The recording of alarms shall include the status of all IMO mandatory alarms on the bridge (IMO Res. A.861(20), 5.4.9). *The status of all IMO mandatory alarms shall be recorded by the bridge audio and as a data parameter where practicable.*

IMO Resolution A.861(20) and SOLAS II-1 and II-2 mandate alarms to be available on the Bridge. These alarms are generally defined in Resolutions A.686(17) and A.830(19). The interfacing of alarms to VDR is outlined in IEC 61996. Signals listed specifically in Annex B, Tables B1, B2 and B3 will ensure the source of an alarm is recorded.

4.3 AIS

For S-VDR installations it is stated in MSC.163(78), 5.4.8 that, *if it is impossible to obtain radar data⁴⁾, then AIS target data should be recorded as a source of information regarding other ships. If radar data is recorded, AIS information may be recorded additionally as a beneficial secondary source of information on both other and own ship.*

AIS is a secondary source of information, which is not as complete as the information radar can provide, and is only a substitute for RADAR data.

4) Where commercial off the shelf (COTS) interfaces are not available.

Therefore, when a new RADAR, which can easily provide its information (e.g. Buffer amplifier is fitted) to a S-VDR, is installed on existing ship on which S-VDR connected with AIS has been already installed, the RADAR data is to be captured by the S-VDR instead of AIS the interface of which may be disconnected.

When VDR (Not S-VDR) is installed on an existing cargo vessel, and existing RADAR has not been provided with interface to VDR, the existing RADAR may be replaced by new RADAR with capable interface to VDR by the ship owner's option.

An AIS is designed to have two output data channels for external equipment or systems, such as own ship's data and other ships' data, in the digital format as defined by IEC 61162-2. Thereby the S-VDR digital interface for AIS data is specified by the IEC 61162 series which includes IEC 61162-2. Consequently, AIS and S-VDR can be generally interfaced readily.

5 Details of interfaces between sensors and VDR

By using the appropriate check sheet provided in the following sections for each system, the factors related to the interfaces between VDR and sensors can be confirmed between the parties involved.

Generally all interfaces may be the same for VDR and S-VDR, except for the AIS interface which may only be required for S-VDR, and except for interfaces from 5.8 to 5.15 if these do not comply with IEC 61162.

In addition, in the case of an S-VDR installation, additional data items, such as from Echo sounder (Depth), Main Alarms, Rudder order / response, Engine order / response (main engine, thruster(s)), Hull openings, Watertight doors, Fire doors, Accelerations / Hull stress and Wind speed and Direction, shall be recorded if signals are available in the international digital format. For an existing ship the actual states of installed equipment shall be confirmed at first, and then it can be established how a S-VDR might be interfaced with the existing sensors.

5.1 Date and Time (A.861 / 5.4.1)

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- a) Standard: Date and time referred to UTC, shall be obtained from a source external to the ship (for example, an EPFS or radio time signal) if available, or from an internal clock at least once per hour. 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 sufficient to reconstruct the history of the incident in detail, not worse than 1 s.

Data to be recorded	Relevant Standard		IEC 61162	Remarks (type of signal)
	IMO A.861(20)	IEC 61996		
Date and UTC	5.4.1	4.6.1	ZDA	
Sentence	\$--ZDA, hhmss.ss, xx, xx, xxxx, xx, xx *hh <CR><LF>			

- b) Alternative signals may be used, if the signal required by the standard above is not available.

Data to be recorded	Standard	Signal Specification	Confirmed type of signal
Date and UTC	IEC 61162	GNS, GGA	
Ship's Internal Clock			
EPFS			

- c) Agreed specification of the signal to be interfaced (including a) standard signal, and b) alternative signal, may be described down here).

[Agreement:][[Document or Drw. No.:][[Date: / /]

Item		Content of confirmation	Remarks
Sensor	Type of signal		
	Location		
Manufacturer (Who supplies information)			
Type of equipment			
Interface Standard to be applied			
Modification No			
Header			
Information of Sentence			
Signal interval			
Cable length between sensor signal terminal and VDR			
Type of cable / Number of conductors			
Related to signal interface			

- d) When the type of input signal to the VDR, including the alternative signal, is already specified, such signals shall be preferably used. If by the above steps of a) and b) the appropriate signal, including the alternative signal(s) cannot be verified to be available, the specification of another alternative signal should be discussed and agreed by persons concerned and the results may be filled in the table c) above.
- e) In the case of S-VDR installation, connection to S-VDR shall follow paragraph a) to d).

5.2 Ship's position (A.861 / 5.4.2)

- a) Standard: Latitude and longitude, and the datum used, shall be derived from a designated EPFS or INS if available. The recording shall ensure that 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 0,0001min of arc.

Data to be recorded	Relevant Standard		IEC 61162	Remarks (Confirmed type of signal)
	IMO A.861(20)	IEC 61996		
Ship's position	5.4.2	4.6.2	GNS/DTM	
Sentence position	\$--GNS,hhmmss.ss,III.II,a,yyyyy.yy,a,c-c,xx,x.x,x.x,x.x,x.x,x.x*hh<CR><LF>			
geographical datum	\$--DTM,ccc,a,x.x,a,x.x,a,x.x,ccc*hh<CR><LF>			

ISO 22472:2006(E)

b) Alternative signals may be used, if the signal required by the standard above is not available.

Data to be recorded	Standard	Signal Specification	Confirmed type of signal
Ship's position	IEC 61162	GGA, GLL, RMC etc.	
Manufacturer's sentence	NMEA	Propriety sentence: Signal voltage ___V	

c) Agreed specification of the signal to be interfaced (including a) standard signal, and b) alternative signal, may be described down here).

[Confirmation:][Document or Dw No.:][Date: / /]

Item		Content of confirmation	Remarks
Sensor	Type of signal		
	Location		
Manufacturer (Who supplies information)			
Type of equipment			
Interface Standard to be applied			
Modification No.			
Header			
Information of Sentence			
Signal interval		ISO 22472:2006	
Cable length between sensor signal terminal and VDR		https://standards.itech.ai/catalog/standards/sist/d639a15e-cc2d-45c3-ad28-0e733051db7f/iso-22472-2006	
Type of cable / Number of conductors			
Related to signal interface			

d) When the type of input signal to the VDR, including the alternative signal, is already specified, such signals shall be preferably used. If by the above steps of a) and b) the appropriate signal, including the alternative signal(s) can not be verified to be available, the specification of another alternative signal should be discussed and agreed by persons concerned and the results may be filled in the table c) above.

e) In the case of S-VDR installation, connection to S-VDR shall follow the paragraph a) to d).

5.3 Speed (A.861 / 5.4.3)

- a) Standard: Speed through the water, or speed over the ground (traverse as well as longitudinal in either case, as available on the ship), including an indication from 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 knot.

Data to be recorded	Relevant Standard		IEC 61162	Remarks (Confirmed type of signal)
	IMO A.861(20)	IEC 61996		
Speed	5.4.3	4.6.3	VBW	
Sentence	\$--VBW,x.x,x.x,A,x.x,x.x,A,x.x,x.x*hh<CR><LF>			

- b) Alternative signals may be used, if the signal required by the standard above is not available.

Data to be recorded	Standard	Signal Specification	Confirmed type of signal
Speed	IEC 61162	VHW (to the water), VTG(over ground)	
Manufacturer's sentence	NMEA	Propriety sentence Signal voltage ___V	
Pulse signal		200 p/nm, 400 p/nm etc	

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- c) Agreed specification of the signal to be interfaced (including a) standard signal, and b) alternative signal, may be described down here).

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[Confirmation: <https://standards.itech.ai/catalog/standards/sist/d639a15e-c7d1-45c3-7d28-0e733051db7f/iso-22472-2006>] [Document or Dw No.:] [Date: / /]

Item		Content of confirmation	Remarks
Sensor	Type of signal		
	Location		
Manufacturer (Who supplies information)			
Type of equipment			
Interface Standard to be applied			
Modification No.			
Header			
Information of Sentence			
Signal interval			
Cable length between sensor signal terminal and VDR			
Type of cable / Number of conductors			
Related to signal interface			