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AVAILABLE
SPECIFICATION

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PAS 61162-102

Pre-Standard

First edition
2003-12

**Maritime navigation and
radiocommunication equipment
and systems –
Digital interfaces –**

**Part 102:
Single talker and multiple listeners –
Extra requirements to IEC 61162-1
for the Voyage Data Recorder**



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – DIGITAL INTERFACES –

Part 102: Single talker and multiple listeners – Extra requirements to IEC 61162-1 for the Voyage Data Recorder

FOREWORD

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A PAS is a technical specification not fulfilling the requirements for a standard, but made available to the public.

IEC-PAS 61162-102 has been processed by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems.

The text of this PAS is based on the following document:

This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document

Draft PAS	Report on voting
80/364/PAS	80/384/RVD

Following publication of this PAS, the technical committee or subcommittee concerned will investigate the possibility of transforming the PAS into an International Standard.

This PAS document relates to International Standards of the IEC 61162 series. The document has been co-ordinated with the NMEA Standards Committee.

This PAS shall 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a single 3-year period, following which it shall be revised to become another type of normative document, or shall be withdrawn.

INTRODUCTION

This document is issued as an IEC Publicly Available Specification according to the IEC/PAS approval process. This agreed process allows the new information needed to implement the Voyage Data Recorder (VDR) to be placed in the public domain in a shorter time-scale than revising the appropriate international standards.

This document provides information on sentences necessary to interface shipborne alarm systems with the VDR. The introduction of the VDR has highlighted the limitations of the existing alarm sentences in the IEC Standards 61162-1 and 2. The VDR is required to acquire data on engine, cargo and deck monitoring status in addition to the navigation and radiocommunications.

In particular, the data sources have to be identified, in a system possibly comprising several thousand sensors.

This PAS has been developed in conjunction with the NMEA.

This PAS will be replaced at a future date by, or be included within, a revision of the international standard IEC 61162-1.

MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – DIGITAL INTERFACES –

Part 102: Single talker and multiple listeners – Extra requirements to IEC 61162-1 for the Voyage Data Recorder

1 Scope

The IEC 61162-1 standard includes 4 sentence formatters for handling alarm and transducer status data. These were originally developed to handle the data required by navigation and radiocommunications equipment and multiple alarm systems were not envisaged.

The introduction of the Voyage Data Recorder (VDR) has necessitated the interfacing to engine, cargo and deck monitoring systems. In particular the interface to multi-point fire alarm systems presents problems due to the large number of sensors and the need to identify specific sources of incoming messages.

The IEC 61162-102 is the specified interface to the VDR and to permit identification of data a series of specific sentences has been developed.

Whilst the facilities included in the IEC 61162-4 series may be utilised to handle the most complex systems, these are not in general use, and probably unlikely on smaller vessels. The VDR has to be applied with immediate effect to a range of vessels and there does not appear to be any alternative standard available to meet the requirement.

NOTE This document defines sentences and parameters useful for the VDR and associated systems. The sentences and parameters extend in some cases beyond the minimum requirement for the VDR.

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.

The references contained in IEC 61162-1 apply to this PAS. In addition the following apply :

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

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

IMO SOLAS Convention, Chapter V, (2002)

IMO HSC Code, Chapter 13.

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

3 Definitions

3.1

alarm

denotes a condition that has to be recognised, or acted upon immediately, e.g. depth minimum limit exceeded, anchor deep

3.2

diagnostic

usually denotes a failure, or warning of deterioration in a system, e.g. engine sensor malfunction

3.3

event

is used to log a condition that has occurred and /or [track the operation of some condition]. Events are [normally] defined, e.g. transfer of control to the bridge

3.4

fault

is a technical problem in one of the system components that will reduce the availability, or future availability, of some or all functions

3.5

warning

is similar to ALARM but need not be acted upon immediately

4 Data requirements of the VDR (from IMO A.861)

Date and time

Ship's position

Speed

Heading

Bridge Audio

Communications audio

Radar data, post-display selection

Echo-sounder

Main alarms

Rudder order and response

Engine order and response

Hull openings status

Watertight and fire door status

Accelerations and hull stresses

Wind speed and direction

5 Existing sentence formatters in IEC 61162-1 for handling alarm data

ALR – Set alarm status –possibly relevant to the VDR but not for machinery, fire or related alarms.

AAM – Waypoint arrival alarm –possibly relevant to the VDR but not for machinery, fire or related alarms.

ACK – Acknowledge alarm – developed for single items of equipment and has limitations for the VDR. Lacks definition of source.

XDR – Transducer measurements – has limited use where multiple devices are in use e.g. cabin fire alarm status.

6 Limitations of existing sentences

The data source is not readily identified in a multi-sensor system.

No differentiation between two or more devices transmitting the same sentence.

The definition of the alarm is inadequate, i.e. no distinction between a malfunction and abnormal condition.

The VDR requires additional talker identifiers not presently covered by IEC 61162-1.

7 Additional talker identifiers

FD	Fire door controller / monitoring panel
FR	Fire detection system
HD	Hull door controller / monitoring panel
HS	Hull stress monitoring system
RC	Propulsion machinery including remote control system
SG	Steering gear / steering engine
WD	Watertight door controller / monitoring panel
WL	Water level detection system

NOTE Talker identifiers FE (Fire extinguisher system – halon, CO2 or similar), FS (Sprinkler, watermist or similar system) and BI (Bilge system) may be added in a later edition.

8 New sentence formatters

NOTE An additional dedicated sentence for rudder order and response will be considered in a later edition of 61162.

8.1 AKD – Acknowledge detail alarm condition

This sentence provides for acknowledgement of the detail alarm condition received from the alarm source. The sentence is designed to clarify the source of the response.

8.2 ALA – Set detail alarm condition

This sentence permits the alarm condition of a system to be set. The data source is identified and the alarm category is defined and avoids any conflict between alarms and devices.

8.3 EVE – Detailed event message to VDR

This is a voluntary sentence that is used to inform the VDR about details in system status that are not contained in the mandatory sentences.

8.4 DOR – Door status detection

This sentence indicates the status of watertight doors, fire doors and other hull openings / doors. Malfunction alarms of the watertight door, fire door and hull opening/door controller should be included in the “ALA” sentence.

8.5 ETL – Engine telegraph operation status

This sentence indicates engine telegraph position including operating location and sub-telegraph indicator.

8.6 FIR – Fire detection

This sentence indicates fire detection status with data on the specific location. Malfunction alarm of the fire detection system should be included in the “ALA” sentence.

8.7 GEN – Generic status information

This sentence provides a means of transmitting multi-sensor information from any source, in a format that can be stored by the VDR.

8.8 HSS – Hull surveillance system

This sentence indicates the hull surveillance system (HSS) measurement data required to be logged by the VDR, if a HSS is fitted on the ship.

8.9 PRC – Propulsion remote control status

This sentence indicates the engine control status (engine order) on a M/E remote control system. This provides the detail data not available from the engine telegraph.

8.10 TRC/TRD – Thruster control data / Thruster response data

This sentence provides the control and response data for thruster devices.

8.11 WAT – Water level detection

This sentence provides detection status of water leakage and bilge water level, with monitoring location data. Malfunction alarm of the water level detector should be included in the “ALA” sentences

9 New sentence structure

The sentence format is presented in tabular form in this PAS to facilitate understanding and discussion.

9.1 AKD – Acknowledge detail alarm condition

This sentence provides for acknowledgement of the detail alarm condition received from the alarm source. The sentence is designed to clarify the source of the response. AKD is used to acknowledge an alarm reported through ALA.

\$--AKD, hhmmss.ss, aa, aa, xx, xxx, aa, aa, xx *hh<CR><LF>

0 1 2 3 4 5 6 7 8 9

Field No	Data form	Field name	Definition
0	\$--AKD	Header	
1	hhmmss.ss	Event time (optional)	Event time of alarm condition change or acknowledgement – if required or available.

Field No	Data form	Field name	Definition
			If not necessary, this shall be a null field.
2	aa	System indicator of original alarm source (destination for Acknowledgement)	Indicator characters as upper system of original alarm source. (Destination for Acknowledgement) This field is two fixed characters.
3	aa	Sub-system/equipment/ item indicator of original alarm source (Destination for Acknowledgement)	Indicator characters as lower system of original alarm source. (Destination for Acknowledgement) This field is two fixed characters. If no sub-system, this shall be a null field.
4	xx	Number of equipment / units / items	Numeric character indicating number of equipment, units or items. This field is two fixed numeric characters.
5	xxx	Number of original alarm	Numeric character indicating original alarm contents. This field is three fixed numeric characters.
6	aa	System indicator of source for Acknowledgement	Indicator characters as upper system of source for Acknowledgement This field is two fixed characters.
7	aa	Sub-system/equipment/ item indicator of source for Acknowledgement	Indicator characters as lower system of source for Acknowledgement This field is two fixed characters. If no sub-system, this shall be a null field.
8	xx	Number of equipment / units / items	Numeric character indicating number of equipment, units or items. This field is two fixed numeric characters.
9	*hh	Check-sum	

NOTE System indicator (field 2), Sub-system indicator (field 3) and number of original alarm (field 5) described in above tabulation are shown in Table 1, below the ALA tabulation.

NOTE The mechanism specified in AKD and ALA is for general alarm handling and exceeds the minimum requirement for the VDR.

9.2 ALA – Set detail alarm condition

This sentence permits the alarm condition of a system to be set. The data source is identified and the alarm category is defined and avoids any conflict between alarms and devices.

\$--ALA, hhmmss.ss, aa, aa, xx, xxx, a, a, c--c *hh<CR><LF>

0 1 2 3 4 5 6 7 8 9

Field No	Data form	Field name	Definition
0	\$--ALA	Header	
1	hhmmss.ss	Event time (Optional)	Event time of alarm condition change or acknowledgement – if required or available. If not necessary, this shall be a null field.
2	aa	System indicator of alarm source	Indicator characters as upper system of alarm source. This field is two fixed characters.

Field No	Data form	Field name	Definition
3	aa	Sub-system/equipment/ item indicator of alarm source	Indicator characters as lower system of alarm source. This field is two fixed characters. For group alarms or if no sub-system can be identified, this shall be a null field.
4	xx	Number of equipment / units / items	Numeric character indicating number of equipment, units or items. This field is two fixed numeric characters.
5	xxx	Number of alarm source	Numeric character indicating alarm identity. This field is three fixed numeric characters as defined in table 1. Codes 900-999 are user definable. If this sentence is used to indicate a group alarm, or if no alarm source can be identified, this shall be a null field.
6	a	Alarm condition	This field is a single character specified by the following : N = normal state H = alarm state (threshold exceeded) J = alarm state (extreme threshold exceeded) L = alarm state (Low threshold exceeded i.e. not reached) K = alarm state (extreme low threshold exceeded i.e. not reached) X = other
7	a	Alarm's acknowledge state	This field is a single character specified by the following: A = acknowledged V = not acknowledged B = Broadcast (acknowledgement not applicable) H = harbour mode O = Override
8	c--c	Alarm's description text	Additional and optional descriptive text/ alarm detail condition tag. Maximum number of characters will be limited by maximum sentence length and length of other fields.
9	*hh	Check-sum	

NOTE System indicator (field 2), sub-system indicator (field 3) and number of alarm source (field 5) described in the above tabulation are shown in table 1 below.

Table 1

NOTE The following table shows typical system alarm fields. The mandatory alarms required by a VDR are indicated in annex B to IEC 61996.

NOTE Alarms from more systems may be added in a later edition of 61162.

System indicator (field 2)		Sub-system/equipment indicator (field 3)		Number of alarm source (field 5)	
ID	System category	ID	Sub system/Equipment	No	Alarm contents
SG	Steering gear	PU	Power unit	001	Stop
				002	Power fail
				003	Overload
				004	Phase fail
				005	Hydraulic fluid level low
				010	Run

System indicator (field 2)		Sub-system/equipment indicator (field 3)		Number of alarm source (field 5)	
ID	System category	ID	Sub system/Equipment	No	Alarm contents
		CL	Control system (actuator or drive unit for steering signal)	001	Power fail
PC	Propulsion control	PC	Propulsion control	001	Inhibition of starting of propulsion engine
				002	Automatic shutdown
				003	Automatic slowdown
				004	Safety system override
				005	Operating in barred speed range
				006	System power supply main and emergency feeders – failure
				007	CPP hydraulic oil pressure – low & high
				008	CPP hydraulic oil temperature – high & low
				009	Control, alarm or safety system, power supply failure
		RC	Remote control system	001	Power fail
				002	System abnormal
				003	Governor control abnormal
				004	Propeller pitch control abnormal
		MN	Monitoring system	001	Normal power source – fail
				002	Individual power supply to control, monitoring and Safety systems – fail
				003	Integrated computerized system: data highway abnormal
				004	Integrated computerized system: duplicated data link – failure
		AL	Group alarm system	001	Power fail
				002	Personnel alarm
				003	Dead man alarm
				004	Request backup OOW
		SP	System power source	001	Main feeder – fail
				002	Emergency feeder – fail
		OT	Others	900 999	Others (if necessary, it is possible to define by user.)
AM	Auxiliary Machinery	EP	Electric power generator plant	001	Voltage – low & high
				002	Current – high
				003	Frequency – high & low
				004	Failure of online generator
				005	Bearing lub. oil inlet pressure – low
				006	Generator cooling inlet pump or fan motor – fail

System indicator (field 2)		Sub-system/equipment indicator (field 3)		Number of alarm source (field 5)	
ID	System category	ID	Sub system/Equipment	No	Alarm contents
				007	Generator cooling medium temperature – high
		RM	High voltage rotating machine	001	Stationary windings temperature – high
		FO	Fuel oil system	001	Settling and service tank level – high & low
				002	Overflow tank and drain tank level – high
		ST	Stern tube lub. Oil	001	Tank level – low
		BL	Boiler	001	Automatic shutdown
		MS	Propulsion machinery space	001	Bilge level – high
				002	Air condition system – fail
				003	Fire detected
		OT	Others	900 999	Others (if necessary, it is possible to define by user.)
DE	Diesel plant	FO	Fuel oil	001	Fuel oil tank heating control and temp. display and alarm – high
				002	Fuel oil engine inlet pressure – low
				003	Fuel oil before injunction pump temp – high & low
				004	Leakage from high pressure pipe
		LO	Lubricating oil	001	Lub. oil to main bearing pressure – low
				002	Lub. oil to thrust bearing pressure – low
				003	Lub. oil to crosshead bearing pressure – low
				004	Lub. oil to camshaft pressure – low
				005	Lub oil to camshaft temp – high
				006	Lub oil inlet temp – high
				007	Thrust bearing pads temp temp – high
				008	Main, crank, crosshead bearing oil outlet temp – high
				009	Cylinder lubricator, flow rate – low
				010	Lub oil tanks, level – low
		TC	Turbo-charger	001	Lub oil inlet, pressure – low
				002	Lub oil outlet, temp – high
		PS	Piston cooling	001	Coolant inlet, pressure – low
				002	Coolant outlet, temp. – high
				003	Coolant outlet, flow – low
				004	Coolant expansion tank, level – low

System indicator (field 2)		Sub-system/equipment indicator (field 3)		Number of alarm source (field 5)	
ID	System category	ID	Sub system/Equipment	No	Alarm contents
		SC	Seawater cooling	001	Seawater cooling pressure – low
		FW	Cylinder fresh water cooling	001	Water inlet pressure – low
				002	Water outlet from cylinder, temp – high
				003	Oily contamination of engine cooling water system – fail
				004	Cooling water expansion tank, level – low
		CA	Compressed air	001	Starting air before main shut-off valve, pressure – low
				002	Control air, pressure – low
				003	Safety air, pressure – low
		SA	Scavenge air	001	Scavenge air box, temp – high
				002	Scavenge air receiver water, level – high
		EH	Exhaust gas	001	Exhaust gas, temp – high
				002	Exhaust gas deviation from average, temp – high
				003	Exhaust gas before tarbo-charger, temp – high
				004	Exhaust gas after tarbo-charger, temp – high
		FV	Fuel valve coolant	001	Coolant, pressure low
				002	Coolant, temp – high
				003	Coolant expansion tank, level – low
		EG	Engine	001	Rotation – wrong way
				002	Engine, overspeed
		OT	Others	001	Reduction gear lub oil inlet, pressure – low
				900 999	Others (if necessary, it is possible to define by user.)
ST	Steam turbines plant	LO	Lubrication oil	001	Pressure at bearing inlet - high & low
				002	Temp at bearing outlet – high
				003	Filter differential pressure – high
				004	Gravity tank level – low
		LC	Lubricating oil cooling system	001	Pressure – low
				002	Temp at outlet – high
				003	Expansion tank level – low
		SW	Seawater	001	Pressure – low
		SM	Steam	001	Pressure at throttle – low

System indicator (field 2)		Sub-system/equipment indicator (field 3)		Number of alarm source (field 5)	
ID	System category	ID	Sub system/Equipment	No	Alarm contents
				002	Gland seal exhaust fan – failure
				003	Astern guardian valve – fail to open
		CD	Condensate	001	Condenser level – high & low
				002	Condensate pump pressure – low
				003	Condenser vacuum – low
				004	Salinity – high
		RT	Rotor	001	Vibration level – high
				002	Axial displacement – large
				003	Overspeed
				004	Shaft stopped – excess of set period
		PW	Power	001	Throttle control system power failure
		OT	Others	900 999	Others (if necessary, it is possible to define by user.)
GT	Gas turbine plant	FO	Fuel oil	001	Pressure – low
				002	Temp - low & high
		LO	Lubricating oil	001	Inlet pressure – low
				002	Inlet temp – high
				003	Main bearing oil outlet temp – high
				004	Filter differential pressure – high
				005	Tank level – low
		CM	Cooling medium	001	Pressure – low
				002	Temp – high
		SA	Starting	001	Stored starting energy level – low
				002	Automatic starting failure
		CB	Combustion	001	Flame failure
		EH	Exhaust gas	001	Temp – high
		TB	Turbine	001	Vibration level – high
				002	Rotor axial displacement – large
				003	Overspeed
				004	Vacuum at compressor inlet – high
		OT	Others	900 999	Others (if necessary, it is possible to define by user.)
EP	Electric propulsion plant	PG	Propulsion generator	001	Bearing lub oil inlet pressure – low
				002	Voltage – off-limit
				003	Frequency – off-limit

System indicator (field 2)		Sub-system/equipment indicator (field 3)		Number of alarm source (field 5)	
ID	System category	ID	Sub system/Equipment	No	Alarm contents
				004	Stationary windings temperature – high
				005	Failure of online generator
				006	Transfer of standby generator
				007	Generator cooling medium temperature – high
				008	Generator cooling pump – failure
				009	Inter-pole windings temperature – high
		PA	Propulsion motor – AC	001	Bearing lub oil inlet pressure – low
				002	Armature voltage – off-limit
				003	Frequency – off-limit
				004	Stationary windings temperature – high
				005	Failure of online generator
				006	Transfer of standby generator
				007	Motor cooling medium temperature – high
				008	Motor cooling pump – failure
		PD	Propulsion motor – DC	001	Bearing lub oil inlet pressure – low
				002	Armature voltage – off-limit
				003	Motor overspeed
				004	Failure of online generator
				005	Transfer of standby generator
				006	Motor cooling medium temperature – high
				007	Motor cooling pump – failure
		PS	Propulsion SCR	001	Overload (high current)
				002	SCR cooling medium temperature – high
				003	SCR cooling pump – failure
		TF	Transformer	001	Transformer winding temp – high
		OT	Others	900 999	Others (if necessary, it is possible to define by user.)
PB	Propulsion boiler	FW	Feed water	001	Atmospheric drain tank level – high & low
				002	Dearator level – high & low
				003	Dearator pressure – high & low
				004	Feed water pump pressure – low
				005	Feed water temp – high
				006	Feed water outlet salinity – high

System indicator (field 2)		Sub-system/equipment indicator (field 3)		Number of alarm source (field 5)	
ID	System category	ID	Sub system/Equipment	No	Alarm contents
		BD	Boiler drum	001	Water level – high & low
				002	Water level – low-low
		SM	Steam	001	Pressure – high & low
				002	Superheater outlet temp – high
		AR	Air	001	Forced draft fan – failure
				002	Rotating air heater motor – failure
				003	Fire in boiler casing
		FO	Fuel oil	001	Pump pressure at outlet – low
				002	Fuel oil temp – high & low
		BN	Burner	001	Atomizing medium pressure – off-limit
				002	Flame of burner – fail
				003	Flame sensor – fail
				004	Untake gas temp – high
		PW	Power	001	Control system power failure
		OT	Others	900 999	Others (if necessary, it is possible to define by user.)
AB	Auxiliary boiler	FW	Feed water	001	Feed water outlet salinity – high
		BD	Boiler drum	001	Water level – high & low
		SM	Steam	001	Pressure – high & low
				002	Superheater outlet temp – high
		AR	Air	001	Supply air pressure – fail
				002	Fire in boiler casing
		FO	Fuel oil	001	Pump pressure at outlet – low
				002	Fuel oil temp – high & low
		BN	Burner	001	Flame of burner – fail
				002	Flame sensor – fail
				003	Untake gas temp – high
		PW	Power	001	Control system power failure
		OT	Others	900 999	Others (if necessary, it is possible to define by user.)
AD	Auxiliary diesel engine	FO	Fuel oil	001	Fuel oil leakage from injuction pipe
				002	Fuel oil temp – high & low
				003	Service tank level – low
		LO	Lubricating oil	001	Bearing oil inlet pressure – low
				002	Bearing oil inlet temp – high

System indicator (field 2)		Sub-system/equipment indicator (field 3)		Number of alarm source (field 5)	
ID	System category	ID	Sub system/Equipment	No	Alarm contents
				003	Crankcase oil mist concentration – high
		CM	Cooling medium	001	Pressure – low
				002	Temp. – high
				003	Expansion tank, level – low
		ST	Starting medium	001	Energy level – low
		EH	Exhaust gas	001	Exhaust gas, temp – high
		EG	Engine	001	Engine, overspeed
		OT	Others	900 999	Others (if necessary, it is possible to define by user.)
AT	Auxiliary turbine	LO	Lubrication oil	001	Pressure at bearing inlet – low
				002	Temp at bearing inlet – high
				003	Temp at bearing outlet – high
		LC	Lubricating oil cooling system	001	Pressure – low
				002	Temp at outlet – high
				003	Expansion tank level – low
		SW	Seawater	001	Pressure – low
		ST	Steam	001	Pressure at inlet – low
		CO	Condensate	001	Condensate pump pressure – low
				002	Condenser vacuum – low
		RT	Rotor	001	Axial displacement – large
				002	Overspeed
		OT	Others	900 999	Others (if necessary, it is possible to define by user.)
AG	Auxiliary gas turbine	FO	Fuel oil	001	Pressure – low
				002	Temp – high & low
		LO	Lubricating oil	001	Inlet pressure – low
				002	Inlet temp – high
				003	Bearing oil outlet temp – high
				004	Filter differential pressure – high
		CM	Cooling medium	001	Pressure – low
				002	Temp – high
		SA	Starting	001	Stored starting energy level – low
				002	Ignition failure
		CN	Combustion	001	Flame failure
		EH	Exhaust gas	001	Temp – high

System indicator (field 2)		Sub-system/equipment indicator (field 3)		Number of alarm source (field 5)	
ID	System category	ID	Sub system/Equipment	No	Alarm contents
		RT	Rotor	001	Vibration level – high
				002	Rotor axial displacement – large
				003	Overspeed
				004	Vacuum at compressor inlet – high
		OT	Others	900 999	Others (if necessary, it is possible to define by user.)
CG	Cargo control plant	CH	Chemical cargo system	001	High & low temp of cargo
				002	High temp in tank
				003	Oxygen concentration in void space
				004	Malfunctioning of temp controls of cooling system
				005	Failure of mechanical ventilation of cargo tank
				006	Low temp in inerted cargo tanks
				900 999	Others (if necessary, it is possible to define by user.)
		LG	LPG / LNG cargo system	001	High & low temp in cargo tank
				002	Gas detection
				003	Hull or insulation temp – high
				004	Cargo high pressure
				005	Chlorine concentration
				006	High pressure in chlorine cargo tank
				007	Liquid cargo in ventilation system – failure
				008	Vacuum protection of cargo tank – failure
				009	Inert gas pressure – high
				010	Gas detection equipment – failure
				011	Gas detection after bursting disk for chlorine – failure
				900 999	Others (if necessary, it is possible to define by user.)
		OL	Inert gas system	001	Low water pressure
				002	High water level in scrubber
				003	Gas temp – high
				004	IG blower – failure
				005	Oxygen content volume – high
				006	Power supply of automatic control

System indicator (field 2)		Sub-system/equipment indicator (field 3)		Number of alarm source (field 5)	
ID	System category	ID	Sub system/Equipment	No	Alarm contents
					system – failure
				007	Low water level in water seal
				008	High & Low pressure of gas
				009	Insufficient fuel oil supply
				010	Power supply – failure
				900 999	Others (if necessary, it is possible to define by user.)
WD	Watertight door controller	----	----	001	Hydraulic fluid reservoir level low
				002	Gas pressure low
				003	Electrical power loss
				900 999	Others (if necessary, it is possible to define by user.)
HD	Hull (shell) door controller	----	----	001	Door open or locking device not secured (representative)
				002	Power fail
				900 999	Others (if necessary, it is possible to define by user.)
FD	Fire door controller	----	----	001	System abnormal
				002	Power fail
				900 999	Others (if necessary, it is possible to define by user.)
FR	Fire detection system	HT	Heat detection type	001	System fail
				002	Power fail
		SM	Smoke detection type	001	System fail
				002	Power fail
		OT	Others	900 999	Others (if necessary, it is possible to define by user.)
OT	Other's system	----	----	900 999	Others (if necessary, it is possible to define by user.)

9.3 DOR – Door status detection

This sentence indicates the status of watertight doors, fire doors and other hull openings / doors. Malfunction alarms of the watertight door, fire door and hull opening/door controller should be included in the “ALA” sentence.

\$--DOR, a, hhmmss.ss, aa, aa, xxx, xxx, a, a, c—c *hh<CR><LF>

0 1 2 3 4 5 6 7 8 9 10

Field No	Data form	Field name	Definition
0	\$--DOR	Header	
1	a	Message type	<p>S: Status for section: the number of faulty and/or open doors reported in the division specified in field 4. The section may be a whole section (one or both of the division indicators are empty) or a sub-section. (If S is used then it shall be transmitted at regular intervals.)</p> <p>E: Status for single door. (E may be used to indicate an event).</p> <p>F: Fault in system: If limited to one section, indicated by division indicator fields, if not, division indicators empty. (F may be used to indicate an event.)</p>
2	hhmmss.ss	Time stamp (Optional)	<p>Time when this status/message was valid. (Optional)</p> <p>If not necessary, this shall be a null field</p>
3	aa	System indicator of door status	<p>Indicator characters as door system.</p> <p>The field is two fixed characters.</p>
4	aa	Division indicator of door allocation (1)	<p>Indicator showing division where door is located.</p> <p>This field is two characters. It may be physical fire zone or entity identifier for control and monitoring system, e.g., central number.</p>
5	xxx	Division indicator of door allocation (2)	<p>Indicator showing in which division the door is located.</p> <p>This field is three numeric characters. It may be physical deck number or identifier for control and monitoring system sub-system, e.g., loop number.</p>
6	xxx	Door number or door open count	<p>Number showing door number or number of doors that are open/faulty.</p> <p>This field is three fixed numeric characters.</p>
7	a	Door status	<p>This field includes a single character specified by the following: when S status indicated in 2nd field, this field is ignored</p> <p>O = Open</p> <p>C = Closed</p> <p>S = Secured</p> <p>F = Free status (for watertight door)</p> <p>X = Fault (door status unknown)</p>
8	a	Mode switch setting	<p>This field includes a single character specified by the following:</p> <p>O = Harbour mode (allowed open)</p> <p>C = Sea mode (ordered closed)</p>

Field No	Data form	Field name	Definition
			If not applicable, this shall be a null field.
9	c--c	Message's description text	Additional and optional descriptive text/door tag. Also if a door allocation identifier is string type, it is possible to use this field instead of above door allocation fields. Maximum number of characters will be limited by maximum sentence length and length of other fields.
10	*hh	Check-sum	

NOTE: System indicator (field 3) and division (fields 4 and 5) described in above tabulation are defined by the Table 2 below.

Table 2

Door system indicator		Indicator of division (1)	Indicator of division (2)
ID	System category		
WT	Watertight door	Number of watertight bulkhead / Frame number	Deck number
WS	Semi-watertight door (splash-tight)		
FD	Fire door	Number / letter of zone. This can also be identifier for control and monitoring main system.	Deck number or control system loop number or other control system division indicator as is appropriate for system
HD	Hull (Shell) door	Door indication number / Frame number	Deck number
OT	Other	As above	As above

NOTE: Not all systems may differentiate between WT and WS doors. In this case, WT shall normally be used.

9.4 ETL – Engine telegraph operation status

This sentence indicates engine telegraph position including operating location and sub-telegraph indicator.

\$--ETL, hhmmss.ss, a, xx, xx, a, x *hh<CR><LF>

0 1 2 3 4 5 6 7

Field No	Data form	Field name	Definition
0	\$--ETL	Header	
1	hhmmss.ss	Event time (Optional)	Event time of condition change. (Optional) If not necessary, this shall be a null field.
2	a	Indicator of command	Indicator character to identify command status; O = Order A = Answer-back
3	xx	Position indicator of engine telegraph	Numeric characters showing telegraph position. This field is two characters : 00 = STOP ENGINE 01 = [AH] DEAD SLOW

Field No	Data form	Field name	Definition
			02 = [AH] SLOW 03 = [AH] HALF 04 = [AH] FULL 05 = [AH] NAV. FULL 11 = [AS] DEAD SLOW 12 = [AS] SLOW 13 = [AS] HALF 14 = [AS] FULL 15 = [AS] CRASH ASTERN
4	xx	Position indication of sub-telegraph	Numeric characters showing sub-telegraph position. This field is two numeric characters: 20 = S/B (Stand-by engine) 30 = F/A (Full away – Navigation full) 40 = F/E (Finish with engine)
5	a	Operating location indicator	Indication to identify location. This field is single character. B = Bridge P = Port wing S = Starboard wing C = Engine control room E = Engine side / local W = Wing (port or starboard not specified) If not known, this shall be a null field.
6	x	Number of engine or propeller shaft	Numeric character to identify engine or propeller shaft controlled by the system. This is numbered from centre-line. This field is single character: 0 = single or on centre-line Odd = starboard Even = port
7	*hh	Check-sum	

9.5 EVE – General event message

This sentence is used to output detailed information about what happens in a safety related system in a format that can be stored, but not necessarily understood by the VDR. If the VDR has storage capacity, the contents of this sentence should be stored so that they can be replayed after an accident. The sentence can provide details that are not contained in other sentences or list events (e.g., actions by the crew) that cannot otherwise be reported.

\$--EVE, hhmmss.ss, c--c, c--c *hh<CR><LF>

0 1 2 3 4

Field No	Data form	Field name	Definition
0	\$--EVE	Header	
1	hhmmss.ss	Event time (Optional)	If not necessary, this shall be a null field.
2	c—c	Tag code or empty	Tag code used for identification of source of event if applicable. May not carry any meaning for VDR.
3	c—c	Event text	This is a talker specific event description. May not carry meaning for VDR.
4	*hh	Check-sum	

9.6 FIR – Fire detection

This sentence indicates fire detection status with data on the specific location. Malfunction alarm of the fire detection system should be included in the “ALA” sentence.

\$--FIR, a, hhmmss.ss, aa, aa, xxx, xxx, a, a, c--c *hh<CR><LF>

0 1 2 3 4 5 6 7 8 9 10

Field No	Data form	Field name	Definition
0	\$--FIR	Header	
1	a	Message type	S: Status for section: Number of faulty and activated condition reported as number in field 6. The section may be a whole section (one or both of the division indicators are empty) or a sub-section. (If S is used then it shall be transmitted at regular intervals)
			E: Status for each fire detector.(E may be used to indicate an event.)
			F: Fault in system: If limited to one section, indicated by division indicator fields, if not, division indicators empty. (F may be used to indicate an event.)
			D: Disabled/Disconnect. Detector is manually or automatically disabled from giving fire alarms.
2	hhmmss.ss	Event time (Optional)	Event times of condition changing or acknowledges changing. (Optional) If not necessary, this shall be a null field.
3	aa	System indicator of fire detection	Identification characters indicated as fire detection system. (e.g. smoke type, heat type) The field is two fixed characters.
4	aa	Division indicator of fire sensor allocation (1)	Indicator characters showing division where detector is located. This field is two characters. It may be physical fire zone or central the detector is connected to.
5	xxx	Division indicator of fire sensor allocation (2)	Indicator characters showing division where detector is located. This field is three numeric characters. It may be physical deck number or loop the detector is connected to.
6	xxx	Fire detector number or activation detection number count	Number showing detector number, or number of fire detector activated.

Field No	Data form	Field name	Definition
			This field is three fixed numeric characters.
7	a	Condition	This field includes a single character specified by the following : When S status indicated in 2 nd field, this field shall be a null field. A = Activation V = Non-activation X = Fault (state unknown)
8	a	Alarm's acknowledge state	This field includes a single character specified by the following: A = acknowledged V = not acknowledged If not necessary, this shall be a null field.
9	c--c	Alarm's description text	Additional and optional descriptive text/sensor location tag. Also if a sensor location identifier is string type, it is possible to use this field instead of above sensor allocation fields. Maximum number of characters will be limited by maximum sentence length and length of other fields.
10	*hh	Check-sum	

NOTE: System indicator (field 3) and division (fields 4 and 5) described in the above tabulation are defined by the Table 3 below.

Table 3

Detection system indicator		Indicator of division (1)	Indicator of division (2)
ID	System category		
FD	Generic fire detector, can be any of the below.	Number / letter of zone. This can also be control and monitoring system main unit identifier, e.g., fire central number/letter.	Loop number. This can also be another control and monitoring sub-system identifier, e.g., sub-central number.
FH	Heat type detector		
FS	Smoke type detector		
FD	Smoke and heat detector		
FM	Manual call point		
GD	Any gas detector	As above	As above
GO	Oxygen gas detector		
GS	Hydrogen Sulphide gas detector		
GH	Hydro-carbon gas detector		
SF	Sprinkler flow switch	As above	As above
SV	Sprinkler manual valve release		
CO	CO ₂ manual release	As above	As above
OT	Other	As above	As above

NOTE: For units controlled from the fire alarm system (typically all HT, SM, DM and MC), the normal division indicators should be fire zone and loop number.

NOTE: Further system categories may be added in later editions of this standard.

9.7 GEN – Generic status information

This sentence provides a means of transmitting multi-sensor generic status information from any source, in a format that can be stored by the VDR. The sentence is designed for efficient use of the bandwidth and must be accompanied with a description of how to interpret the information. Each sentence holds a base address for all status groups. Each group is assigned a 16-bit address. Up to eight contiguous groups with increasing address may be transmitted in a single sentence. Data is blocked in 16-bit groups. Unused bits shall be assigned a fixed value to simplify data compression.

A separate configuration with interpretation of bit equal to "1" and "0" for all sentence groups and bit positions that are used, must be provided as this information is not included in the sentence. It is the responsibility of the talker to provide this information.

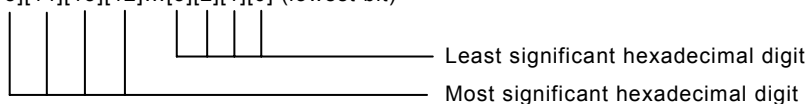
\$--GEN, hhhh, hhmmss.ss, hhhh, [,hhhh] *hh<CR><LF>

0 1 2 3 4 5

Field No	Data form	Field name	Definition
0	\$--GEN	Header	
1	hhhh	Address of first group in sentence	Address of first group in GEN sentence. Address is represented in hexadecimal format in HEX range 0000 through FFFF. The 16-bit address is formatted as fixed 4-character HEX field.
2	hhmmss.ss	Time stamp (Optional)	Time when this status was valid. If not available, this shall be a null field.
3	hhhh	Packed generic status group	The packed generic status group is represented as a 16-bit value. The 16-bit value is formatted as fixed 4-character HEX field.
4	hhhh	optional repeat of field 3	Optional repeated packed generic status field. Each repeat increases the status address by one. Up to seven repetitions yielding a total of 128 status bits per sentence is possible.
5	*hh	Check-sum	

NOTE 1 The 4-character HEX field values used in this sentence are interpreted as follows :-

hhhh = (highest bit) [15][14][13][12]...[3][2][1][0] (lowest bit)



NOTE 2 The example below shows 10 groups of status information. The 4-character HEX field value of 0123 for the first packed generic status group at HEX address 0000 is interpreted as a 16-bit value with bits 0, 1, 5 and 8 being set. The status from the source is sent in two sentences:

\$VRGEN,0000,011200.00,0123,4567,89AB,CDEF,0123,4567,89AB,CDEF*64

\$VRGEN,0008,011200.00,0123,4567*6C

9.8 HSS – Hull stress surveillance systems

This sentence indicates the hull surveillance system (HSS) measurement data required to be logged by the VDR, if a HSS is fitted on the ship.

\$--HSS, c--c, x.x, A *hh<CR><LF>

0 1 2 3 4

Field No	Data form	Field name	Definition
0	\$--HSS	Header	
1	c--c	Measurement point ID	
2	x.x	Measurement value	
3	A	Data status	A = data valid V = data invalid
4	*hh	Check-sum	

9.9 PRC – Propulsion remote control status

This sentence indicates the engine control status (engine order) on a M/E remote control system. This provides the detail data not available from the engine telegraph.

\$--PRC, x.x, A, x.x, a, x.x, a, a, x *hh<CR><LF>

0 1 2 3 4 5 6 7 8 9

Field No	Data form	Field name	Definition
0	\$--PRC	Header	
1	x.x	Lever demand position	Lever position of engine telegraph demand. -100 – 0 – 100% from “full astern” (crash astern) to “full ahead” (navigation full) “ stop engine”
2	A	Data status	A = data valid V = data invalid
3	x.x	RPM demand	RPM demand value
4	a	Data status	P = Per cent (%):0 – 100% from zero to maximum rpm R = Revolutions per minute (rpm) : “-“ Astern V = data invalid
5	x.x	Pitch demand	Pitch demand value
6	a	Data status	P = Per Cent (%) : -100 – 0 – 100% from “full astern” (crash astern) to “full ahead” (navigation full) through “stop engine” D = degrees: “-“ : Astern V = data invalid
7	a	Operating location indicator	Indication to identify location. This field is single character. B = Bridge P = Port wing S = Starboard wing C = Engine control room E = Engine side / local W = Wing (port or starboard not specified) If not known, this shall be a null field.
8	x	Number of engine or propeller shaft	Numeric character to identify engine or propeller shaft controlled by the system. This is numbered from centre-line. This field is a single character. 0 = single or on centre-line Odd = starboard Even = port
9	*hh	Check-sum	

9.10 TRC – Thruster control data

This sentence provides the control data for thruster devices.

\$--TRC, x, x.x, a, x.x, a, x.x, a *hh<CR><LF>

0 1 2 3 4 5 6 7 8

Field No	Data form	Field name	Definition
0	\$--TRC	Header	
1	x	Number of thruster, bow or stern	Numeric character to identify a thruster in the system. This is numbered from centre-line. This field is single digit: Odd = Bow thruster Even = Stern thruster
2	x.x	RPM demand	RPM demand value
3	a	Data status	P = Per cent (%) : 0 – 100% from zero to maximum rpm R = Revolutions per minute (RPM) V = data invalid
4	x.x	Pitch demand	Pitch demand value “-“ port
5	a	Data status	P = Per cent (%) D = Degrees V = data invalid
6	x.x	Azimuth demand	Direction of thrust in degrees (0 ⁰ – 360 ⁰). If not applicable, this shall be a null field.
7	a	Operating location indicator	Indication to identify location. This field is single character. B = Bridge P = Port wing S = Starboard wing C = Engine control room E = Engine side / local W = Wing (port or starboard not specified) If not known, this shall be a null field.
8	*hh	Check-sum	

9.11 TRD – Thruster response data

This sentence provides the response data for thruster devices.

\$--TRD, x, x.x, a, x.x, a, x.x *hh<CR><LF>

0 1 2 3 4 5 6 7

Field No	Data form	Field name	Definition
0	\$--TRD	Header	
1	x	Number of thruster, bow or stern	Numeric character to identify a thruster in the system. This is numbered from centre-line. This field is single digit: Odd = Bow thruster Even = Stern thruster
2	x.x	RPM response	RPM response value
3	a	Data status	P = Per cent (%): 0 – 100% from zero to maximum rpm R = Revolutions per minute (RPM) V = data invalid
4	x.x	Pitch response	Pitch response value “-“ port
5	a	Data status	P = Per cent (%): D = Degrees V = data invalid
6	x.x	Azimuth response	Direction of thrust in degrees (0° – 360°) If not applicable, this shall be a null field.
7	*hh	Check-sum	

9.12 WAT – Water level detection

This sentence provides detection status of water leakage and bilge water level, with monitoring location data. Malfunction alarm of the water level detector should be included in the “ALA” sentence.

\$--WAT, a, hhmmss.ss, aa, xx, xx, xxx, a, a, c—c *hh<CR><LF>

0 1 2 3 4 5 6 7 8 9 10

Field No	Data form	Field name	Definition
0	\$--WAT	Header	
1	a	Message type	S: Status for section: Number of faulty and activated condition reported as number in field 4. The section may be a whole section (one or both of the location indicators are empty) or a sub-section. (If S is used then it shall be transmitted at regular intervals.)

Field No	Data form	Field name	Definition
			E: Status for each water level detector. (E may be used to indicate an event.)
			F: Fault in system: location indicator fields define the affected locations.
2	hhmmss.ss	Time stamp (Optional)	Time when this status/message was valid. (Optional) If not necessary, this shall be a null field.
3	aa	System indicator of alarm source	Indicator characters showing system detecting water level. The field is two fixed characters. WL = Water level detection system BI = High water level by bilge system HD = Water leakage at hull (shell) door OT = others
4	xx	Location (1)	Indicator characters showing detection location. This field is two characters.*
5	xx	Location (2)	Indicator character showing detection location. This field is two characters.*
6	xxx	Number of detection point or detection point number [count]	Number showing high-water-level detecting point or the number of the water leakage detection point. This field is three fixed numeric characters.
7	a	Alarm condition	This field is a single character specified by the following : N = normal state H = alarm state (threshold exceeded) J = alarm state (extreme threshold exceeded) L = alarm state (Low threshold exceeded i.e. not reached) K = alarm state (extreme low threshold exceeded i.e. not reached) X = Fault (state unknown) When S status indicated in 2 nd field, this field is ignored
8	a	override setting	This field includes a single character specified by the following: O = Override mode (water allowed in space) N = Normal mode (water not allowed in space) If not applicable, this shall be a null field.
9	c—c	Descriptive text	Additional and optional descriptive text/level detector tag. Also if a level detector identifier is string type, it is possible to use this field instead of above level detector location fields. Maximum number of characters will be limited by maximum sentence length and length of other fields
10	*hh	Check-sum	

* NOTE: The format of the location information is not defined by this standard, but the two fields shall uniquely define the source for the alarm.

10 Data output sequence

10.1 Set detail alarm condition

This sentence shall be transmitted when an alarm condition occurs and/or an alarm acknowledge state changes. The change event sequence is as follows;

Case-1: regarding an alarm condition, from normal to alarm,

Case-2: regarding an alarm condition, from alarm to normal (opposite case of case-1), and

Case-3: regarding an acknowledged state, from un-acknowledge to acknowledge in alarming (that is, condition is in “alarm”).

NOTE: As IEC 61162-1 does not guarantee reliable transport, the designer should be very careful about how this sentence is used. Problems can occur either when the initial alarm message was lost or when the acknowledgement message was lost. One possible solution (in some cases) is to retransmit the alarm message until acknowledgement has been received. When acknowledgement has been received, an alarm acknowledged shall be sent. This acknowledgement must be sent on all subsequent acknowledgements. Acknowledgements must be sent on each received alarm message after acknowledgement and further on until the alarm acknowledgement message has been received.

10.2 Acknowledgement of detail alarm condition

This sentence shall be transmitted when an alarm has been acknowledged.

NOTE: As IEC 61162-1 does not guarantee reliable transport, the designer should be very careful about how this sentence is used. Problems can occur either when the initial alarm message was lost or when the acknowledgement message was lost. A possible solution is to retransmit the alarm message until acknowledgement has been received. When acknowledgement has been received, an alarm acknowledged shall be sent. This acknowledgement must be sent on all subsequent acknowledgements. Acknowledgements must be sent on each received alarm message after acknowledgement and further on until the alarm acknowledgement message has been received.

10.3 For door, fire detection, water level detection and telegraph status

Each talker sending data to a VDR shall continuously transmit sentences with the interval between transmissions not exceeding five minutes. This is intended as an “alive “ signal to the VDR and the VDR may assume that there is a fault in the talker, or in the communication link, if no transmissions have been received in the last ten minutes.

An appropriate sentence shall be transmitted, without unnecessary delay, when there is a (condition) change of status.

Complete system status shall be transmitted to the VDR with a period of not less than two hours. This shall ensure that rarely changes of state are correctly recorded, even if the VDR limits its storage to a finite time period.

NOTE: This can be achieved by sending all individual status messages every two hours or by sending summary status for each, e.g., fire zone and then only individual status for those units that are not normal (e.g., doors that are not closed or fire detectors that are not normal). The method employed will depend upon the number of units and the baud-rate available.

10.4 For propulsion remote control and thruster control status

Each sentence shall be transmitted at constant intervals.



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Q1 Please report on **ONE STANDARD** and **ONE STANDARD ONLY**. Enter the exact number of the standard: (e.g. 60601-1-1)

.....

Q2 Please tell us in what capacity(ies) you bought the standard (tick all that apply). I am the/a:

- purchasing agent ☐
 librarian ☐
 researcher ☐
 design engineer ☐
 safety engineer ☐
 testing engineer ☐
 marketing specialist ☐
 other.....

Q3 I work for/in/as a:
(tick all that apply)

- manufacturing ☐
 consultant ☐
 government ☐
 test/certification facility ☐
 public utility ☐
 education ☐
 military ☐
 other.....

Q4 This standard will be used for:
(tick all that apply)

- general reference ☐
 product research ☐
 product design/development ☐
 specifications ☐
 tenders ☐
 quality assessment ☐
 certification ☐
 technical documentation ☐
 thesis ☐
 manufacturing ☐
 other.....

Q5 This standard meets my needs:
(tick one)

- not at all ☐
 nearly ☐
 fairly well ☐
 exactly ☐

Q6 If you ticked NOT AT ALL in Question 5 the reason is: (tick all that apply)

- standard is out of date ☐
 standard is incomplete ☐
 standard is too academic ☐
 standard is too superficial ☐
 title is misleading ☐
 I made the wrong choice ☐
 other

Q7 Please assess the standard in the following categories, using the numbers:

- (1) unacceptable,
 (2) below average,
 (3) average,
 (4) above average,
 (5) exceptional,
 (6) not applicable

- timeliness.....
 quality of writing.....
 technical contents.....
 logic of arrangement of contents
 tables, charts, graphs, figures.....
 other

Q8 I read/use the: (tick one)

- French text only ☐
 English text only ☐
 both English and French texts ☐

Q9 Please share any comment on any aspect of the IEC that you would like us to know:

.....



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