PUBLICLY AVAILABLE SPECIFICATION

ISO/PAS 21195

First edition
2018-01

Ships and marine technology — Systems for the detection of persons while going overboard from ships (Man overboard detection)

Navires et technologie maritime — Systèmes pour la détection des personnes passant par-dessus bord (détection d'un homme à la mer)

Reference number
ISO/PAS 21195:2018(E)

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

Page

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 1, *Maritime safety*.

Introduction

The lack of standardized man overboard (MOB) detection system requirements has made it difficult for end users to objectively evaluate the safety and effectiveness of such systems. This document addresses these issues by clearly defining the technical specifications for the equipment, thereby allowing manufacturers to develop systems against a common set of requirements and enabling end-users to evaluate the safety, effectiveness, performance, and reliability of MOB detection systems.

Comments to ISO TC 8 SC 1 on this document are encouraged. The experience gained by the wider audience of users, suppliers, and other stakeholders using this document will better inform the development of the final International Standard. To submit comments, see https://www.iso.org/committee/45800.html.

Ships and marine technology — Systems for the detection of persons while going overboard from ships (Man overboard detection)

1 Scope

This document specifies technical requirements for systems designed to detect a person who has gone overboard from a passenger ship. This document addresses how a system is expected to perform in various environmental conditions and a wide variety of incident profiles.

This document does not cover man overboard (MOB) detection systems that require the passengers or crew to wear or carry a device to trigger an MOB event.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO/TR 7250-2:2010, *Basic human body measurements for technological design — Part 2: Statistical summaries of body measurements from national populations*

IEC 60068-2-6:2007, *Environmental testing — Part 2-6: Tests — Test Fc: Vibration (sinusoidal)*

IEC 60092-376:2003, *Electrical installations in ships — Part 376: Cables for control and instrumentation circuits 150/250 V (300V)*

IEC 60945:2002(E), *Maritime navigation and radiocommunication equipment and systems — General requirements — Methods of testing and required test results*

IEC 61162-3:2014, *Maritime navigation and radiocommunication equipment and systems — Digital interfaces — Part 3: Serial data instrument network*

IMO Resolution A.1021(26), *Code on alerts and indicators*, 2009

IMO Resolution MSC.337(91), *Adoption Of The Code On Noise Levels On Board Ships*

SOLAS Chapter III, International Safety of Life at Sea, 1974

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
accessible open area
any area of the ship that is accessible to either passengers or crew and open to the outside

3.2
active state
state in which the system is on

3.3
alarm actions
actions available within the system when an MOB warning or alarm is triggered or changes status

3.4
A-weighted noise level
quantity measured by a sound meter in which the frequency response is weighted according to the A-weighting curve defined in IEC 61672:2013

3.5
control station
equipment that provides the facilities for human observation and control of the MOB detection system

3.6
data
information captured and/or generated by the MOB detection system

Note 1 to entry: Data may be in either a raw or a processed form and includes basic (e.g. text, numeric, Boolean), composite (e.g. array, class, and list), and multimedia (e.g. images, audio, and video) data types.

3.7
electronic chart display and information system
ECDIS
navigation information system that is defined in the International Maritime Organization (IMO) Performance Standard for ECDIS (IMO Resolution A.817 (19)), as amended)

3.8
environmental vibration
periodic motion of equipment installed aboard ships as a result of environmental forces

3.9
false alarm
system activation not caused by an actual MOB event

3.10
heading
angle between the direction in which the ship's bow is pointing and a reference direction expressed in degrees from a reference direction, e.g. true north, usually from 000° clockwise through 360°

3.11
independent laboratory
laboratory that has been recognized by a laboratory accrediting organization to test and evaluate products to a product safety standard, and is free from commercial, financial, and other pressures that may influence the results of the testing and evaluation process

3.12
International Association of Classification Societies (IACS)
organization that establishes, reviews, promotes, and develops minimum technical requirements in relation to the design, construction, maintenance, and survey of ships and other marine related facilities; and assists international regulatory bodies and standards organizations to develop, implement and interpret statutory regulations and industry standards in ship design, construction, and maintenance, with a view to improving safety at sea and the prevention of marine pollution

3.13
man overboard (MOB) event
incident in which a person(s) has accidently or intentionally gone over the side/front/back of a ship and into the water

3.14
man overboard (MOB) verification data
system data that may be used by user to acknowledge, deny, confirm, or terminate an MOB warning or alarm at the control station

3.15
nominal operating conditions
set of ship and environmental conditions that are typically encountered by a ship while travelling with passengers as shown in Table 1

Table 1 — Nominal operating conditions

Condition	Value
Wave height	0 m to 2,5 m
Precipitation	None
Ship speed	0 knots to 25 knots

3.16
recognized organization
competent organization that has been assessed by a National Authority and found to be capable of witnessing the required tests and certifying the test results

3.17
sensor unit
device or system of devices that detects and responds to one or more physical stimuli

3.18
shipboard cable
armored or unarmored cable constructed in accordance with ISO/IEC 11801:2002, ISO/IEC 11801:2002/Amd2:2010 or other recognized ship cable standards, and listed or classified by a nationally recognized testing laboratory

3.19
underway
not at anchor, or made fast to the shore, or aground

4 Abbreviated terms

ECDS Electronic chart display and information system

IACS International Association of Classification Societies

IBS Integrated bridge system

IEC International Electrotechnical Commission

IMO International Maritime Organization

MOB Man overboard

NMEA National Marine Electronics Association

RAID Redundant array of independent disks

RO Recognized Organization

RoHS Restriction of the Use of Certain Hazardous Substances

S-VDR Simplified voyage data recorder

SOLAS International Convention for the Safety of Life at Sea, 1974, as amended by IMO Res. MSC.47(66)

TBT Technical Barriers to Trade

UTC Coordinated universal time

VDR Voyage data recorder

WTO World Trade Organization

5 Requirements

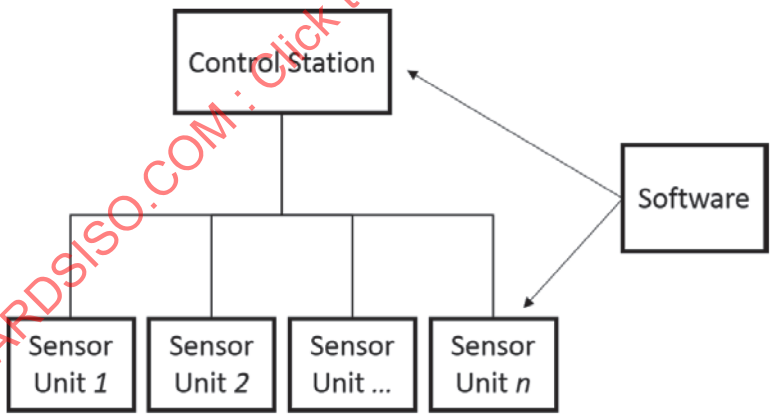
5.1 General

The testing outlined in this document shall be conducted by an independent laboratory or may be conducted by the manufacturer provided the tests conducted by the manufacturer are approved (or certified) by a Recognized Organization or Classification Society that complies with the applicable unified interpretations and requirements posted by the International Association of Classification Societies (IACS).

The intent of the following requirements is to verify that the system contains all the core system capabilities.

5.2 System description

A general MOB detection system described in this document consists of a control station, sensor units, cables, and associated software (Figure 1).



NOTE Depending on the system, the associated software can be installed on the control station and/or sensor units.

Figure 1 — Block diagram of a general MOB detection system with logical links

5.3 Control station

The system shall include a control station where alarms and data can be reviewed.

The system shall have the capability for an operator to manually select an imaging sensor and timeline for playback at the control station.

5.4 Shipboard cables

Shipboard cables shall be manufactured in compliance with the applicable sections of IEC 60092-376:2003 for low smoke and zero halogen.

Shipboard cables shall be designed and manufactured in compliance with the Restriction of the Use of Certain Hazardous Substances (RoHS) in Electrical and Electronic Equipment Directive (2011/65/EU) or equivalent.

5.5 Light emitting system components

The intensity of light emitting system components located or installed in the bridge area shall be fully dimmable and capable of being controlled at the control station.

5.6 Noise emitting system components

All components of the system that are installed in the navigating bridge and/or chartrooms shall have a maximum A-weighted noise level of less than 65 dB(A), in accordance with IMO Resolution MSC.337(91). The MOB audible alarm is exempt from this requirement.

System components installed in locations other than the navigating bridge or chartroom shall follow the maximum A-weighted noise levels set forth by IMO Resolution MSC.337(91) The MOB audible alarm is exempt from this requirement.

5.7 Power

The system shall be capable of being powered from a 100 Vac to 230 Vac power source, or from a 24 Vdc power source.

5.8 Electromagnetic compatibility

The system shall satisfy the requirements for electromagnetic emission and immunity to electromagnetic environments set forth in IEC 60945:2002(E).

5.9 Ingress protection

All components of the system that are required to be installed in an area of the ship that is open to the elements shall be certified to an ingress protection rating of IP66 or greater.

NOTE IEC 60529:1989+A1:1999+A2:2013 provides additional information on ingress protection ratings.

5.10 Environmental vibration

The system shall be capable of withstanding typical environmental vibrations that may be encountered on the ship. The system shall be tested in accordance with IEC 60068-2-6:2007 to determine this capability.

5.11 MOB detection

The system shall detect persons that pass through the MOB detection zone (see 5.12) while going overboard.

The method of detection shall not require the passengers or crew to wear or carry a device to trigger an MOB event.

The system shall be capable of detecting a human with a height of 1,467 m. This height is based on the minimum 5th percentile stature data published in ISO/TR 7250-2:2010(E).

5.12 MOB detection zone

The MOB detection zone shall be designed to:

a) cover the entire periphery of the ship;

b) be located at or below the lowest accessible open area; and

c) extend a minimum of 5 m from the periphery of the ship.

The periphery of the ship is defined as the widest part of the ship at any location and is extended to include lifeboats. Other enclosed objects that protrude over the edge of the ship (e.g. rides, slides, etc.) do not modify the ship periphery.

System coverage shall be determined by using a general arrangement drawing (e.g. blueprint, computer aided design model, etc.) of the ship, sensor installation locations, and the detection envelope of the sensor units.

5.13 MOB warning initiators

The system shall be capable of initiating an MOB warning based on data captured from the sensor units.

The system shall not require human interaction to trigger an MOB warning.

The system shall allow users to manually initiate an MOB warning at the control station for the purposes of initiating a drill or if manual review of video imagery indicates an MOB event that did not cause an alarm. Manually initiated MOB warnings shall occur immediately. MOB warnings manually initiated for the purpose of a drill shall be designated as a drill within the system.

5.14 Visual alarm

The system shall generate a visual alarm in response to an MOB warning. The visual alarm shall remain active until the MOB warning has been acknowledged at the control station. The visual presentation of the alarm shall satisfy the requirements set forth in IMO Resolution A.1021(26).

5.15 Audible alarm

Once an MOB warning has been initiated, the system shall generate an audible alarm. The audible alarm shall remain active until the alarm has been deactivated or silenced at the control station.

When active, audible alarms located on the navigation bridge shall have an A-weighted noise level between 75 dB(A) and 85 dB(A) at distance of one meter from the system. Alternatively, the noise level may be adjusted to at least 10 dB(A) above the ambient noise level. The upper noise level shall not exceed 85 dB(A).

Audible alarms installed in locations other than the navigating bridge shall follow the guidance set forth by IMO Resolution A.1021(26).

5.16 MOB verification data

The system shall make available MOB verification data, in the form of still or video images, to a human operator within five seconds of an MOB warning.

The system shall allow a human operator to control the playback of available MOB verification data.

MOB verification data shall include:

a) data obtained from the sensor unit(s) that initiated the MOB warning; and

b) data obtained 5 s before and 5 s after the MOB warning.

The resolution of the MOB verification data shall be sufficient to allow for a human operator to distinguish between a human and other objects at the maximum range of the detection envelope of the sensor.

5.17 Warning and alarm actions

The system shall allow authorized system users to acknowledge, deny, or confirm an MOB warning or alarm at the control station. Each action shall produce a different system response, the details of which can be found in Table 2.

Table 2 — Requisite alarm actions

Alarm action	Description	Required system response
Acknowledge	Allows a user to acknowledge the MOB warning	— Stop the audible alarm — Stop the visual alarm
Deny[a]	Allows a user to classify an acknowledged MOB warning as a false alarm	— Stop the MOB alarm log — Provide the user with the option to create a text-based MOB log entry
Confirm[b]	Allows a user to classify an acknowledged MOB warning as a human-verified MOB event	— Escalate the MOB warning to an MOB alarm — Provide the user with the option to create a text-based MOB log entry
[a] System users should only deny an MOB event in the system after reviewing the data. [b] The confirm alarm action shall be an optional step in the alarm review process.		

The system shall be capable of marking all data corresponding to an MOB alarm to prevent deletion or overwriting of the data prior to the 30 day minimum storage duration.

5.18 MOB event message

Once an MOB event has been confirmed by an authorized system user, the system shall generate a National Marine Electronics Association (NMEA) message.

5.19 MOB alarm log

The system shall generate an MOB alarm log when an MOB warning is initiated. The MOB alarm log shall contain the following items:

a) date and time of alleged MOB event;

b) the identity(s) of the sensor unit(s) that initiated the MOB alarm;

c) current ship location;

d) current ship heading;

e) current ship speed; and

f) username(s) and, if appropriate, alarm actions(s) of any individual logged into the system.

The MOB alarm log shall be maintained for a minimum of 30 days.

5.20 Operational status

The system shall monitor the operational status of the system.

The operational status of the system shall be displayed at the control station at power up, reset, or change of system status.

The operational status of the system shall include:

a) the activation state (e.g. active or inactive) of all system sensors; and

b) the functional state (e.g. normal or malfunction) of all system sensors.

5.21 Captured data

The data captured from each sensor unit shall be recorded in its final data format.

If an MOB system utilizes video as means of recording an MOB alarm, then video associated with an alarm must be equal to the native resolution and frame rate of the camera.

5.22 Date and time stamps

All required system data shall be embedded with a date and time stamp in a manner that is compliant with national and international evidential standards.

The system shall utilize the time code input from a valid coordinated universal time (UTC) feed to generate the date and time stamp.

5.23 Data storage

The system shall record all of the required system data while the system is in an active state. The required system data shall include the following items:

a) operational status of the system;

b) operational status of each sensor unit;

c) data captured from each sensor unit (see 5.21);

d) any active MOB alarm logs (see 5.19);

e) MOB log entries; and

f) security log (see 5.27).

The required system data shall be recorded at the sampling rates prescribed in Table 3.

Table 3 — Required system data sampling rates

Item	Required sampling frequency	Recommended sampling frequency
Operational status (as defined in 5.20) of the system	At power up, reset, and on change of status	At power up, reset, on change of status, and every 5 min
Operation status (as defined in 5.20) of each sensor unit	At power up, reset, and on change of status	At power up, reset, on change of status, and every 5 min
Data captured from each sensor unit	≥9 Hz	At the maximum rate of the sensor unit
Any active MOB alarm logs	On change of status	On change of status
MOB log entries	When saved by the user	When saved by the user
Security log	Upon each system event	Upon each system event

The system shall have the capacity to store the required system data for a minimum of 30 days.

The system shall store data in a resilient and redundant device such as a redundant array of independent disks (RAID) 6 array.

It shall be possible for an advanced user to set a data retention policy for the system. Once data exceeds the data retention policy duration then it shall be automatically destroyed. The data retention policy shall not conflict with the 30 day minimum storage requirement.

5.24 User account types

There shall be at least two different types of user accounts on the system: standard and advanced user.

A user with a standard account shall not be capable of:

a) creating or deleting user accounts on the system; or

b) changing his or her account information or account type.

5.25 Access controls

Access to the control station shall be restricted to users with the appropriate credentials.

5.26 Anti-tamper protection

Individuals accessing the system shall not have the ability to alter or delete any recorded data. The system shall log user actions.

5.27 Security log

The system shall record system events in a security log. System events shall include the following event types:

a) logons;

b) logoffs;

c) data export;

d) software upgrades; and

e) system setting changes.

For each system event, the user that initiated the event, the type of the event, and the date and time associated with the event shall be recorded.

In the case of a data export event, a description sufficient to describe the data that was exported from the system shall also be recorded.

In the case of a software upgrade event, the new software version shall also be recorded.

In the case of a system setting change event, both the old and new settings shall be recorded. If the system automatically adjusts the detection settings at a frequency greater than once an hour, a lookup table or report that describes how the settings are applied may be supplied in lieu of the detection setting change event log entries.

5.28 MOB testing manikin

The system shall be evaluated in a controlled environment using a manikin with a mass of 40 kg and a height of 1,467 m. The manikin shall have a basic human shape that contains two arms, two legs, a torso, and a head. The manikin may be modified in order to represent the signature of a human for a particular sensing modality. Any modifications to the manikin shall be approved by an independent

laboratory or a Recognized Organization or Classification Society that complies with the applicable uniform interpretations and requirements posted by IACS.

6 Controlled environment performance requirements

The intent of the following requirements is to verify that the system in question satisfies the minimum performance criteria prior to installation and subsequent testing on a ship (Clause 7).

6.1 Basic probability of detection

The probability of detection of an MOB manikin shall be greater than or equal to 95 % in a controlled environment setting. A controlled environment setting means the environmental conditions during the tests are within the range of environmental conditions set out in the test plan. Environmental conditions include temperature, wind, light intensity (general and measured at the sensor), visibility, cloudiness, rain, fog. Tests may be conducted indoors or outdoors.

This probability of detection shall be calculated by conducting at least 100 drops throughout the detection envelope of the sensor. To ensure adequate testing coverage, the detection envelope shall be divided into 20 test regions of approximately equal area. Five drop tests shall be conducted at each testing region. Of these five drop tests, two shall be conducted 1 m to 3 m above the sensor plane, one shall be conducted 4 m to 6 m above the sensor plane, and two shall be conducted 7 m to 10 m above the sensor plane. In addition to the test parameters outlined above, the following information shall be collected and recorded in the test logs:

a) test date;

b) test time;

c) test organization;

d) name of tester;

e) test location (indoors or outdoors);

f) light intensity (general and maximum intensity measured at surface of sensor);

g) system manufacturer;

h) system details (e.g. sensor type, number of sensors used during tests, model and serial number of sensor(s) used during test);

i) map of sensor detection envelope and associated test regions;

j) environmental conditions;

k) model of manikin used during drop tests;

l) serial number of manikin used during drop tests; and

m) list of any modifications made to manikin for testing (e.g. clothing type, heated sections, etc.).

7 Shipboard-based performance requirements

The intent of the following requirements is to verify that the system is capable of functioning with an acceptable level of performance in the intended, nominal operational environment.

Shipboard testing shall be performed on a vessel that is authorized to carry at least 250 passengers, has onboard sleeping facilities for each passenger, and is not engaged on a coastwise voyage.

Shipboard testing shall be performed on a fully installed MOB detection system over a period of 90 days. MOB detection system parameters shall not be modified during testing unless the modifications are

outlined in the MOB detection system operation manual. If system modification instructions are outlined in the MOB detection system operation manual, changes to the system must be conducted by an independent third party or authorized end-user. Manufacturers shall be provided the opportunity to observe shipboard testing to ensure that system operation protocols have been followed throughout the test.

7.1 Probability of detection

During nominal operating conditions, the probability of detecting a human or an MOB manikin passing through the MOB detection zone shall be greater than or equal to 95 %. The probability of detection shall be calculated by conducting at least 100 drop tests with an MOB manikin at the locations described in Table 4. The tester shall make every effort to perform the tests at different locations within each defined area, including the bow and stern.

Table 4 — Detection probability drop test parameters

Number of tests	Time of day	Vessel side	Areas	Distance from side of vessel (m)	Vertical speed at sensor plane (m/s)
3	Day	Port	Forward	0 to 2	4 to 12
4	Day	Port	Mid	0 to 2	4 to 12
4	Day	Port	Aft	0 to 2	4 to 12
3	Day	Port	Forward	3 to 5	4 to 12
4	Day	Port	Mid	3 to 5	4 to 12
4	Day	Port	Aft	3 to 5	4 to 12
3	Day	Starboard	Forward	0 to 2	4 to 12
4	Day	Starboard	Mid	0 to 2	4 to 12
4	Day	Starboard	Aft	0 to 2	4 to 12
3	Day	Starboard	Forward	3 to 5	4 to 12
4	Day	Starboard	Mid	3 to 5	4 to 12
4	Day	Starboard	Aft	3 to 5	4 to 12
3	Night	Port	Forward	0 to 2	4 to 12
4	Night	Port	Mid	0 to 2	4 to 12
4	Night	Port	Aft	0 to 2	4 to 12
3	Night	Port	Forward	3 to 5	4 to 12
4	Night	Port	Mid	3 to 5	4 to 12
4	Night	Port	Aft	3 to 5	4 to 12
3	Night	Starboard	Forward	0 to 2	4 to 12
4	Night	Starboard	Mid	0 to 2	4 to 12
4	Night	Starboard	Aft	0 to 2	4 to 12
3	Night	Starboard	Forward	3 to 5	4 to 12
4	Night	Starboard	Mid	3 to 5	4 to 12
4	Night	Starboard	Aft	3 to 5	4 to 12
3	Day	Starboard and/or Port	Forward, Mid, and/or Aft	0 to 2	12+
3	Night	Starboard and/or Port	Forward, Mid, and/or Aft	0 to 2	12+
3	Day	Starboard and/or Port	Forward, Mid, and/or Aft	3 to 5	12+
3	Night	Starboard and/or Port	Forward, Mid, and/or Aft	3 to 5	12+

In addition to the test parameters outlined above, the following information, to capture conditions at the time of testing, shall be collected and recorded in the test logs:

a) test date;

b) test time;

c) test organization;

d) name of tester;

e) system manufacturer;

f) system details (e.g. sensor type, number of sensors used during tests, model and serial number of sensor(s) used during test);

g) model of manikin used during tests;

h) serial number of manikin used during drop tests;

i) height of manikin used during the tests;

j) weight of manikin used during the tests;

k) list any modifications made to manikin for testing (e.g. clothing type, heated sections, etc.);

l) ship name;

m) ship location;

n) ship heading;

o) ship speed;

p) ship roll;

q) ship heave;

r) wave height;

s) air temperature;

t) water temperature;

u) wind speed;

v) weather conditions;

w) precipitation;

x) test location;

y) drop height (with respect to sensor plane); and

z) deck activities (washing, painting, life boat operations, etc.).

During non-nominal operating conditions, the probability of detection shall be recorded when safe and practical. This data is for informational purposes only and is intended to help guide future versions of this document.

7.2 False alarm rate

False alarms are measured over an extended period (90 days) and averaged over that period.