

INTERNATIONAL STANDARD



**Maritime navigation and radiocommunication equipment and systems –
Integrated navigation systems (INS) –
Part 2: Modular structure for INS – Operational and performance requirements,
methods of testing and required test results**



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CONTENTS

FOREWORD	8
1 Scope	10
2 Normative references	10
3 Terms, definitions and abbreviated terms	11
3.1 Terms and definitions.....	11
3.2 Abbreviated terms.....	20
4 MSC IMO resolutions.....	21
4.1 General.....	21
4.2 Purpose of integrated navigation systems	22
4.3 Application	23
5 Test requirements and results	25
5.1 General.....	25
5.2 Exceptions for tests previously performed	25
5.3 Test site.....	26
5.4 Methods of test	26
6 Module A – Requirements for integration of navigational information	26
6.1 Interfacing and data exchange	26
6.1.1 Combination, processing and evaluation of data	26
6.1.2 Availability, validity and integrity	26
6.1.3 Failure of data exchange	27
6.1.4 Interfaces in general	27
6.1.5 Interface to alert management	27
6.2 Accuracy.....	27
6.2.1 Requirement.....	27
6.2.2 Methods of test and required results	28
6.3 Validity, plausibility, latency	28
6.3.1 Validity	28
6.3.2 Plausibility	29
6.3.3 Latency.....	30
6.4 Consistent common reference system (CCRS).....	30
6.4.1 Consistency of data	30
6.4.2 Consistent common reference point (CCRP).....	31
6.4.3 Consistency of thresholds.....	32
6.5 Integrity monitoring	33
6.5.1 Requirement.....	33
6.5.2 Methods of test and required results	34
6.6 Marking of-data	35
6.6.1 Requirement.....	35
6.6.2 Methods of tests and required results	36
6.7 Selection of sensors and sources.....	36
6.7.1 Requirement.....	36
6.7.2 Methods of test and required results	37
7 Module B – Task related requirements for integrated navigation systems	37
7.1 Description	37
7.2 Task and functional requirements for an INS.....	37

7.2.1	General	37
7.2.2	Task "Route planning"	38
7.2.3	Task "Route monitoring"	40
7.2.4	Task "Collision avoidance"	44
7.2.5	Task "Navigation control data"	48
7.2.6	Task "Alert management"	50
7.2.7	Task "Status and data display"	50
7.3	Functional requirements for INS task stations	52
7.3.1	Number of task stations	52
7.3.2	Track control	53
7.3.3	Automatic control functions	54
7.4	Functional requirements for displays of INS	55
7.4.1	General	55
7.4.2	Default display configurations and operational modes	58
7.4.3	Mode and status awareness	59
7.4.4	Information display	60
7.5	Human machine interface	61
7.5.1	General	61
7.5.2	~~System~~ Equipmen design	62
7.5.3	Display	62
7.5.4	Input	62
7.6	INS back-up requirements and redundancies	63
7.6.1	General	63
7.6.2	Hardware redundancies (back-up)	65
7.7	System failures and fallback arrangement	65
7.7.1	General description	65
7.7.2	Restored operation	65
7.7.3	Failure or change of sensor for automatic control function	66
7.7.4	Failure of sensor	66
7.7.5	Storage of system related parameters	67
7.7.6	Safe response to malfunction	67
7.7.7	Alert management	68
7.7.8	Fallback for navigational information failure	69
7.8	Technical requirements	70
7.8.1	General	70
7.8.2	Hardware and/or processors	71
7.8.3	Power supply	71
7.8.4	Power interruptions and shutdown	72
7.8.5	Data communication interface and protocols	73
7.8.6	Installation	73
8	Module C – Alert management	74
8.1	~~Description~~	
8.1.1	~~Purpose of alert management~~	
8.1.2	~~Scope of alert management~~	
8.1.3	~~Application of alert management~~	
8.2	~~General requirements~~	
8.2.1	~~Provisions~~	
8.2.2	~~Number of alerts for one situation~~	

8.2.3	Alerts to be handled by the alert management	
8.2.4	Logical architecture of the alert management	
8.2.5	Alert management HMI	
8.2.6	Audible announcements	
8.2.7	Display at several locations	
8.3	Priorities and categories	
8.3.1	Priorities of alerts	
8.3.2	Criteria for classification of alerts	
8.3.3	Categories of alerts	
8.4	State of alerts	
8.4.1	General	
8.4.2	Alarms	
8.4.3	Warnings	
8.4.4	Cautions	
8.4.5	Alert escalation	
8.5	Consistent presentation of alerts within the INS	
8.5.1	Requirement	
8.5.2	Methods of test and required results	
8.6	Central alert management HMI	
8.6.1	General requirements	
8.6.2	Silencing of audible alerts	
8.6.3	Category A and B alert history list	
8.7	Acknowledgement location	
8.7.1	Requirement	
8.7.2	Methods of test and required results	
8.8	Self-monitoring of alert management	
8.8.1	Monitoring of system communication	
8.8.2	Testing of alerts	
8.8.3	Failures	
8.9	Interface requirements for alert related communication	
8.9.1	Communication concept	
8.9.2	Alert priorities, states, etc	
8.9.3	Alert source identity	
8.9.4	Acknowledge and silence	
8.9.5	Fault tolerance of alert communication	
8.10	Integration of systems in alert management	
8.10.1	Overall alert management	
8.10.2	Inclusion of other equipment	
8.10.3	Connection of other equipment	
8.1	Description	106
8.1.1	Purpose of alert management	106
8.1.2	Scope of alert management	106
8.2	General requirements	107
8.2.1	Provisions	107
8.2.2	Requirement	107
8.2.3	Methods of test and required results	107
8.3	Transfer to BNWAS	107
8.3.1	Requirement	107

8.3.2	Methods of test and required results	108
8.4	Testing of alerts	108
8.4.1	Requirement	108
8.4.2	Methods of test and required results	108
8.5	Failures	108
8.5.1	Requirement	108
8.5.2	Methods of test and required results	109
9	Module D – Documentation requirements	109
9.1	Manuals	109
9.1.1	Requirement	109
9.1.2	Methods of tests and required results	110
9.2	Information regarding the system configuration	110
9.2.1	Requirement	110
9.2.2	Methods of tests and required results	110
9.3	Failure analysis	110
9.3.1	Requirement	110
9.3.2	Methods of test and required results	110
9.4	Onboard familiarization material	111
9.4.1	Requirement	111
9.4.2	Methods of test and required results	111
Annex A (informative)	Modular structure for IMO performance standards	112
A.1	Modular structure for radar performance standards	112
A.2	Modular structure for track control performance standards	114
Annex B (informative)	Guidance to equipment manufacturers for the provision of on-board familiarization material	115
B.1	General	115
B.2	On-board familiarization training for INS	115
B.3	Familiarization training framework	116
B.3.1	General description	116
B.3.2	Detailed operation (normal conditions)	116
Annex C (normative)	Classification of alerts	118
Annex D (normative)	Default display configurations	121
Annex E (informative)	Data flow diagram/consistent common reference system (CCRS)	123
Annex F (normative)	~~IEC 61162~~ Interfaces	125
Annex G (informative)	Guidance for testing	133
G.1	Methods of test derived from ISO 9241-12	133
G.2	Observation	133
G.3	Inspection of documented evidence	133
G.4	Measurement	134
G.5	Analytical evaluation	134
Annex H (normative)	Verification of CCRP calculations	135
H.1	Scenario for verification of CCRP calculations	135
H.2	Stationary scenario	135
H.3	Dynamic scenario	136
Annex I (normative)	Sentence for integrity and plausibility	137
Annex J (normative)	INS alert related communication	139

J.1	Overview.....	139
J.2	Use of ALR for BNWAS.....	139
J.3	Use of ALR and ACK for legacy simple sensors	151
J.4	Use of HBT, ALF, ALC, ACN, AGL and ARC	151
J.5	INS standardized alert identifiers	151
J.6	Alert state transition diagram	151
Annex K	(~~normative~~ informative) Sentences for advanced alert related communication.....	152
Annex L	(normative) Alert communication with ALR and ACK	
Annex M	(normative) Icons for alert management	
Bibliography		162
Figure E.1	– Data flow diagram/consistent common reference system (CCRS)	124
Figure F.1	– INS logical interfaces	125
Figure J.1	~~– Legacy sensor communication showing priority reduction~~	
Figure J.2	~~– Legacy sensor communication in case priority reduction is not possible~~	
Figure J.3	~~– Alerts' communication showing priority reduction~~	
Figure J.4	~~– Alerts with communication in case priority reduction is not possible~~	
Figure J.5	~~– Alert state diagram~~	
Figure L.1	~~– State diagram~~	
Table 1	– Applicable modules of performance standards of stand alone equipment.....	24
Table 2	– Applicable modules of other standards for INS to substitute for individual equipment.....	24
Table 3	– Marking of data	36
Table 4	~~– Announcement states and related conditions~~	
Table 5	~~– Announcement state and presentation for Alarms~~	
Table 6	~~– Announcement state and presentation for Warnings~~	
Table 7	~~– Announcement state and presentation for Cautions~~	
Table A.1	– Modular structure for radar performance standards	112
Table A.2	– Modular structure for track control performance standards	114
Table C.1	– Classification of INS alerts as specified in these performance standards	118
Table C.2	– Classification for INS for alerts specified in the individual equipment performance standards	119
Table D.1	– Task "Route monitoring"	121
Table D.2	– Task "Collision avoidance"	122
Table F.1	– IEC 61162-1 sentences transmitted by the INS	126
Table F.2	– IEC 61162-1 sentences received by the INS.....	129
Table H.1	– Required results	135
Table H.2	– Required results	136
Table H.3	– Required results for dynamic scenario	136
Table H.4	– Required resolution for test.....	136
Table J.1	~~– Conversion from ALR to ALF~~	
Table J.2	~~– Conversion from ACN to ACK~~	

~~Table J.3 — Unique alert identifier at alert source~~

~~Table M.1 — Alert management icons — Basic~~

~~Table M.2 — Alert management icons — Additional qualifiers~~

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**MARITIME NAVIGATION AND
RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS –
INTEGRATED NAVIGATION SYSTEMS (INS) –****Part 2: Modular structure for INS –
Operational and performance requirements,
methods of testing and required test results**

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International Standard IEC 61924-2 has been prepared by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems.

This second edition cancels and replaces the first edition published in 2012, of which it constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) addition of a requirement for INS to provide capability for Maritime Safety Information to comply with requirements of the International Maritime Organization;
- b) modification of Clause 8 (Alert management) and associated annexes to align it with IEC 62923-1 concerning bridge management;
- c) modifications to Annex D to incorporate newer recommendations of the International Maritime Organization.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
80/977/FDIS	80/970/RVC

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 61924 series, published under the general title *Maritime navigation and radiocommunication equipment and systems – Integrated navigation systems (INS)*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

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MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – INTEGRATED NAVIGATION SYSTEMS (INS) –

Part 2: Modular structure for INS – Operational and performance requirements, methods of testing and required test results

1 Scope

This part of IEC 61924 specifies the minimum requirements for the design, manufacture, integration, methods of testing and required test results for an integrated navigation system (INS) to comply with the International Maritime Organization (IMO) requirements of Resolution MSC.252(83), *as amended by Resolution MSC.452(99)*. In addition, it takes account of IMO Resolution A.694(17) to which IEC 60945 is associated. When a requirement in this document is different from IEC 60945, the requirement of this document takes precedence.

~~NOTE 1—IEC 61924:2006 specifies the minimum requirements for the design, manufacture, integration, methods of testing and required test results for an integrated navigation system to comply with the earlier IMO requirements of Resolution MSC.86(70), Annex 3. Integrated navigation systems in accordance with IEC 61924:2006 are not suitable for installation after 1 January 2011.~~

For bridge alert management, IMO Resolution MSC.302(87) supersedes IMO Resolution MSC.252(83). Accordingly, this document incorporates references to IEC 62923-1 and IEC 62923-2 which are associated with Resolution MSC.302(87) for requirements and tests, where applicable. This document indicates which requirements and associated tests of MSC.252(83) have been superseded by MSC.302(87).

NOTE All text of this document whose wording is identical to that in IMO Resolution MSC.252(83), *as amended by MSC.452(99)*, ~~will be~~ is printed in *italics* and the Resolution and paragraph number indicated between brackets.

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.

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

~~IEC 61162 (all parts), Maritime navigation and radiocommunication equipment and systems – Digital interfaces~~

IEC 61162-1:2010/2016, *Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 1: Single talker and multiple listeners*

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

~~IEC 61162-3, Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 3: Serial data instrument network~~

IEC 61162-450, *Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 450: Multiple talkers and multiple listeners – Ethernet interconnection*

IEC 61174:~~2008~~2015, *Maritime navigation and radiocommunication equipment and systems – Electronic chart display and information system (ECDIS) – Operational and performance requirements, methods of testing and required test results*

IEC 62065:~~2002~~2014, *Maritime navigation and radiocommunication equipment and systems – Track control systems – Operational and performance requirements, methods of testing and required test results*

IEC 62288:~~2008~~, *Maritime navigation and radiocommunication equipment and systems – Presentation of navigation-related information on shipborne navigational displays – General requirements, methods of testing and required test results*

IEC 62388:~~2007~~2013, *Maritime navigation and radiocommunication equipment and systems – Shipborne radar – Performance requirements, methods of testing and required test results*

IEC 62616:~~2010~~, *Maritime navigation and radiocommunication equipment and systems – Bridge navigational watch alarm system (BNWAS)*

IEC 62923-1:2018, *Maritime navigation and radiocommunication equipment and systems – Bridge alert management – Part 1: Operational and performance requirements, methods of testing and required test results*

ISO 11674, *Ships and marine technology – Heading control systems*

IMO A.694(17), *General requirements for shipborne radio equipment forming part of the Global maritime distress and safety system (GMDSS) and for electronic navigational aids*

IMO/ICAO, *International Aeronautical and Maritime Search and Rescue Manual (IAMSAR Manual) Volume 3*

IMO MSC/Circ.982, *Guidelines on ergonomic criteria for bridge equipment and layout*

IMO MSC.191(79), *Performance standards for presentation of navigation-related information on shipborne navigational displays*

IMO MSC.232(82), *Revised performance standards for Electronic Chart Display and Information Systems (ECDIS)*

IMO MSC.252(83), *Performance Standards for Integrated Navigation Systems (INS)*

~~IMO MSC.302(87), performance standards for Bridge Alert Management (BAM)~~

~~ISO 11674:2006, Ships and marine technology – Heading control systems~~

IMO MSC.452(99), *Amendments to the revised performance standards for integrated navigation systems (INS) (Resolution MSC.252(83))*

3 Terms, definitions and abbreviated terms

3.1 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:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1.1

accuracy

degree of conformance between the estimated or measured parameter value at a given time and its true parameter value at that time

3.1.2

added value

functionality and information, which are provided by the INS, in addition to the requirements of the performance standard for the individual equipment

~~3.1.3~~

~~**aggregated alert**~~

~~alert indicating the existence of multiple individual alerts of the same kind~~

3.1.3

aid to navigation

AtoN

~~any~~ device or system external to a vessel intended to assist a navigator to determine position or safe course, or to warn of hazards to navigation

3.1.4

AIS ASM

AIS application specific messages that are included in IEC 62288

3.1.5

alarm

~~the highest priority of an alert as defined in MSC.252(83). Announcing a situation or condition requiring immediate attention, decision and if necessary action by the bridge team, to maintain the safe navigation of the ship~~

condition requiring immediate attention and action by the bridge team, to maintain the safe navigation of the ship

3.1.6

alert

~~announcing abnormal situations and conditions requiring attention, decision and/or action. Alerts are divided in three priorities: alarms, warnings and cautions~~

announcement of abnormal situations and conditions requiring attention

Note 1 to entry: Alerts are divided in four priorities: emergency alarms, alarms, warnings and cautions. An alert provides information about a defined state change in connection with information about how to announce this event in a defined way to the system and the operator.

3.1.7

alert announcement

visual and, where applicable, acoustical presentation of alerts

3.1.8

alert history list

accessible list of past alerts

3.1.9

alert management

concept for the harmonized regulation of the monitoring, handling, distribution and presentation of alerts on the bridge

3.1.10**announcement**

visual and/or audible signal issued to the user by the system

3.1.11**automatic control functions**

functions that include automatic heading, and/or track and/or speed control or other navigation related automatic control functions

3.1.12**backup**

use of data, function and/or hardware of similar type and quality

3.1.13**Category A alert**

alert where graphical, for example radar, ECDIS, information at the task station directly assigned to the function generating the alert is necessary, as decision support for the evaluation the alert related condition

3.1.14**Category B alert**

alerts where no additional information for decision support is necessary besides the information which can be presented at the central alert management HMI

3.1.15**caution****lowest-priority alert**

~~*lowest-priority of an alert. Raising bridge team's*~~ awareness of a condition which does not warrant an alarm or warning condition, but still requires attention out of the ordinary consideration of the situation or of given information

3.1.16**collision avoidance**

navigational task of detecting and plotting other ships and objects to avoid collisions

3.1.17**configuration in use**

sub-systems (e.g. sensors and sources, MFD workstations, automatic control function, etc.) selected for use and tasks (e.g. collision avoidance, route monitoring, etc.) selected operative in each MFD

Note 1 to entry: This is a subset of the available configuration which is a subset of the complete system configuration.

3.1.18**conning position**

place on the bridge with a commanding view and which is used by navigators when commanding, manoeuvring and controlling a ship

3.1.19**consistent common reference point****CCRP**

location on own ship, to which all horizontal measurements such as target range, bearing, relative course, relative speed, closest point of approach (CPA) or time to closest point of approach (TCPA) are referenced, typically the conning position of the bridge

3.1.20 consistent common reference system

CCRS

sub-system or function of an INS for acquisition, processing, storage, surveillance and distribution of data and information providing identical and obligatory reference to sub-systems and subsequent functions within an INS and to other connected equipment, if available

Note 1 to entry: Examples of reference are: coordinate system, time zone, chart datum and depth datum.

3.1.21 degraded condition

reduction in system functionality resulting from failure

3.1.22 detected hazard

hazard identified by a sensor (for example, radar or echo sounder) or reported by a communication device (for example AIS or NAVTEX) and which is available to the INS

3.1.23 entry field

location on a display for the input of data by the operator

Note 1 to entry: The requested information is usually alphanumeric.

3.1.24 essential functions

indispensable functions to be available as required for the relevant operational use

3.1.25 essential information

indispensable information to be available as required for the relevant functions

3.1.26 expected precision

deviation between the measured value and the true value that is normally not exceeded by a typical system

3.1.27 external safety related messages

data received from outside of the ship concerning the safety of navigation, through equipment listed in SOLAS chapter V and/or ~~NAVTEX~~ Maritime Safety Information (MSI) messages

Note 1 to entry: Sources of MSI are NAVTEX (IEC 61097-6), other IMO-recognized equipment accommodating other providers of GMDSS terrestrially-based services and recognized mobile satellite service enhanced group calling system (IEC 61097-4 and IEC 61097-16).

3.1.28 failure analysis

logical, systematic examination of an item, including its diagrams or formulas, to identify and analyse the probability, causes and consequences of potential and real failures

3.1.29 fallback

use of data, function or hardware of degraded quality in relation to the failed one, for example dead reckoning for position information, heading control in case of a failure of track control

3.1.30 functionality

ability to perform an intended function

Note 1 to entry: The activity of performing a function normally employs a system of displays, controls and instrumentation.

3.1.31

hazard

objects or conditions potentially dangerous to navigation, possibly leading to grounding or collision, that may be detected by a sensor, reported by a communication device, retrieved from a database or manually input to the INS

3.1.32

human factor

workload, capabilities and limits of a user trained according to the regulations of the IMO

3.1.33

human machine interface

HMI

part of a system an operator interacts with

Note 1 to entry: The interface is the aggregate of means by which the users interact with a machine, device, and system (the system). The interface provides means for input, allowing the users to control the system and output, allowing the system to inform the users.

3.1.34

indication

display of regular information and conditions, not part of alert management

3.1.35

integrated navigation system

INS

composite navigation system which performs at least the following tasks: collision avoidance, route monitoring thus providing "added value" for the operator to plan, monitor and safely navigate the progress of the ship

Note 1 to entry: The INS allows meeting the respective parts of SOLAS regulation V/19 and supports the proper application of SOLAS regulation V/15.

3.1.36

inspection

visual check of equipment or documentation

3.1.37

instance

~~unit/module on functional level which can generate, process and/or present alerts~~

3.1.37

integrity

ability of the INS to provide the user with information within the specified accuracy in a timely, complete and unambiguous manner, and alerts within a specified time when the system should be used with caution or not at all

3.1.38

integrity monitoring

ability of a system to provide the user with information within the specified accuracy in a timely, complete and unambiguous manner, and to present warnings and indications within a specified time when the system should be used with caution or not at all

3.1.39

known hazard

hazard retrieved from a database (including navigational charts and nautical publications) or manually input and which is available to the INS

3.1.40

latency

time interval between an event and its result, including time for reception, processing, transmission and display

3.1.41

leg

ship's intended ground track between two waypoints

3.1.42

man-over-board mode

MOB

display mode for operations and actions of a ship after a man-over-board accident happened (release of safety equipment, e.g., life buoy and life belt, performance of a return manoeuvre etc.)

3.1.43

Maritime Safety Information

MSI

navigational and meteorological warnings, meteorological forecasts and other urgent safety-related messages broadcast to ships

Note 1 to entry: MSI is promulgated using NAVTEX and EGC services (see IMO MSC.468(101)).

3.1.44

manufacturer

organisation responsible for the production of all or some of the parts of the INS, including the responsibility that these parts meet their appropriate international standards

Note 1 to entry: A manufacturer may also be the system integrator.

3.1.45

marking

visual or logical indication of the status of displayed or transferred information

3.1.46

mode

setting of a group of parameters determining the behaviour (operational modes) or the human machine interface (HMI) (display modes) or the control functions (control modes) of the equipment and/or its sensors

3.1.47

mode awareness

perception of the mariner regarding the currently active Modes of Control, Operation and Display of the INS including its subsystems, as supported by the presentations and indications at an INS display or workstation

3.1.48

multifunction display

MFD

single visual display unit that can present, either simultaneously or through a series of selectable pages, information from more than a single function of an INS

3.1.49

navigation

process of planning, executing, monitoring and recording the progress of a safe and expeditious voyage of a vessel

3.1.50**navigational aid**

ship-borne device that complies with its relevant International Standard(s), for example instrument, method or chart, intended to assist in the navigation of a ship

3.1.51**navigation control data**

task that provides information for the manual and automatic control of the ship's movement on a task station

3.1.52**one equipment concept**

equipment which is recognized as one type of equipment by integrating the function of mandatory equipment of SOLAS of a plural number

Note 1 to entry: This is the concept by which single equipment may be recognized as integrating the functions of a plurality of IMO performance standards for which mandatory SOLAS carriage requirements apply.

3.1.53**operational mode**

mode of operation depending on the sea area

3.1.54**operational/functional module**

module comprising the operational/functional requirements for navigational systems

3.1.55**part**

individual INS subsystem, equipment or functional module

3.1.56**partial integrations**

smaller integrations which are not covering the tasks "route monitoring" and "collision avoidance"

3.1.57**passage**

process of moving a ship from one place to another by navigating through a certain area within a certain period of time and in compliance with certain environmental and legal provisions

3.1.58**performance check**

functional check to show that the system or component is still operational without investigating all details of its functionality

3.1.59**plausibility of data**

quality representing if data values are within the normal range for the respective type of data

3.1.60**processing**

~~event that an instance in the system with additional knowledge is monitoring incoming alerts and is aggregating or reevaluating those alerts via a command action~~

~~Note 1 to entry: Processing describes a system-released activity not an operator activity. An operator triggered acknowledgement in this context is not "processing".~~

3.1.60

primary navigation data

data of own ship's position, speed through water, speed over ground, course over ground, heading, time and if available, depth, provided by selected sensors, to be used in the system for processing the navigational information

3.1.61

redundancy

use of data, function or hardware of equal type and quality

3.1.62

responsibility transferred

alert state which represents the result of a harmonized risk evaluation between an individual alert originator (e.g. sensor) and a function within the INS with system knowledge and alert reevaluation capabilities (e.g. CCRS)

Note 1 to entry: The harmonized risk evaluation does not change the priority of the original alert at the originator.

Note 2 to entry: Requirements for unambiguity of alert states and for consistent presentation are given within this document.

3.1.63

responsibility transfer

transition of the state of an alert to the state "responsibility transferred"

3.1.64

route

representation of a voyage or passage geographically defined by a point of departure, a point of arrival and usually by intermediate waypoints

Note 1 to entry: The route may include time of departure and/or ship's speed as well as parameters and limits for safe navigation such as off-track/cross-track limit, turn radius, time references, etc. as defined in IMO Resolution A.893(21).

3.1.65

route monitoring

navigational task of continuous surveillance of own ships position in relation to the pre-planned route and the waters

3.1.66

safety related automatic functions

automatic functions that directly impinge on hazards to ship or personnel, e.g., target tracking

3.1.67

search and rescue mode

display mode for operations of a ship involved in search and rescue actions

3.1.68

selected route or track

route or track which has been chosen for monitoring the performance of the navigation

Note 1 to entry: The term "track" is typically used for systems that have automatic track control capability.

3.1.69

sensor

navigational aid (measuring device), with or without its own display, processing and control as appropriate, automatically providing information to operational systems or INS

3.1.70**sensor/source module**

module comprising the sensor/source requirements

3.1.71**ship's primary movement**

longitudinal directional, lateral directional and heading-rotational movement of the ship

3.1.72**simple operator action**

procedure achieved by no more than two hard-key or soft-key actions, excluding any necessary cursor movements, or voice actuation using programmed codes or equivalent alternative means

3.1.73**single operator action**

procedure achieved by no more than one hard-key or soft-key action, excluding any necessary cursor movements, or voice actuation using programmed codes, or equivalent alternative means

3.1.74**situation awareness**

mariner's perception of the navigational and technical information provided, the comprehension of their meaning and the projection of their status in the near future, as required for timely reaction to the situation

Note 1 to entry: Situation awareness includes mode awareness.

3.1.75**source**

device, or location of generated data or information (e.g. chart database), which is part of the INS automatically providing information to INS

3.1.76**system alert**

alert related to equipment failure or loss (system failures)

3.1.77**system data**

data that is used by the system for the processing and display of essential information

Note 1 to entry: System data of the same type is from a similar type of source. System data, at least for primary navigation data, has been checked for integrity.

3.1.78**system function**

navigational tasks of an INS such as route planning, route monitoring, collision avoidance, navigation control data, status and data display, and alert management

3.1.79**system integrator**

organization responsible for ensuring that the INS complies with the requirements of this document

3.1.80**system position**

position calculated in the INS out of at least two positioning sensors

3.1.81

task station

multifunction display with dedicated controls providing the possibility to display and operate any navigational tasks

Note 1 to entry: A task station is part of a workstation.

3.1.82

track

path to be followed over ground

3.1.83

track control

control of the ship movement along a track in conformance with MSC 74(69), Annex 2

3.1.84

validity

property of information as conforming to specified criteria, and the marking of information such as being "valid" or "invalid" (i.e. "good" or "no good") for its intended use

3.1.85

vessel

water craft of any description, including non-displacement craft, wing in ground craft and seaplanes, used or capable of being used as a means of transportation on water

3.1.86

voyage

execution of all aspects of the operation of a craft in journeying from the point of departure to the final destination

Note 1 to entry: A voyage may consist of one or more passages.

3.1.87

warning

~~announcing a situation or condition requiring attention but no immediate attention or action by the bridge team. Warnings are presented for precautionary reasons to make the bridge team aware of changed conditions which are not immediately hazardous, but may become so, if no forward looking decision is made or action is taken~~

condition requiring immediate attention, but no immediate action by the bridge team

Note 1 to entry: Warnings are presented for precautionary reasons to make the bridge team aware of changed conditions which are not immediately hazardous, but may become so, if no action is taken.

3.1.88

waypoint

geographically defined position used as reference for navigation along a leg, track or route

3.1.89

workstation

combination of all job-related items, including the console with all devices, equipment and the furniture, to fulfil certain tasks

Note 1 to entry: Workstations for the Bridge are specified in MSC/Circ.982.

3.2 Abbreviated terms

AIS	Automatic Identification System
ASM	Application Specific Messages
BAM	Bridge Alert Management

CAM	Central Alert Management
COG	Course Over Ground
EBL	Electronic Bearing Line
EGC	Enhanced Group Call
EPFS	Electronic Position Fixing System
ETA	Estimated Time of Arrival
ETD	Estimated Time of Departure
EUT	Equipment Under Test
FMEA	Failure Mode and Effect Analysis
GMDSS	Global Maritime Distress and Safety System
IMO	International Maritime Organization
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
MSC	Maritime Safety Committee
MSI	Maritime Safety Information
OOW	Officer Of the Watch
PS	Performance Standards
SMCP	Standard Marine Communication Phrases
SOG	Speed Over Ground
SOLAS	Safety Of Life At Sea
STW	Speed Through Water
VRM	Variable Range Marker

4 MSC IMO resolutions

4.1 General

~~The following resolutions made it necessary to supply this standard.~~

(MSC.252(83)/2.1.1) *An INS comprises navigational tasks such as "Route planning", "Route monitoring", "Collision avoidance", "Navigation control data", "Navigation status and data display" and "Alert management", including the respective sources, data and displays which are integrated into one navigation system. These tasks are described in 7.2.*

(MSC.252(83)/2.1.2) *An INS is defined as such if work stations provide multifunctional displays integrating at least the following navigational tasks/functions:*

- "Route monitoring"
- "Collision avoidance"

and may provide manual and/or automatic navigation control functions.

(MSC.252(83)/2.1.3.1) *An alert management is a part of the INS. The scope and the requirements of the alert management are specified in module C (Clause 8).*

NOTE 1 MSC.252(83) refers to CAM HMI, which implies that INS should contain a CAM system according to IEC 62923-1, modules B and D.

NOTE 2 IMO in 2010 adopted new performance standards for Bridge Alert Management in Resolution MSC.302(87). This resolution states in 3.6 that it shall take precedence over the requirements of MSC.252(83). Where applicable the requirements of MSC.302(87) are considered ~~and marked with a note~~. Likewise, IEC 62923

and IEC 62923-2, implementing the requirements of MSC.302(87), are also considered in this document and references to these standards are incorporated where applicable.

(MSC.252(83)/2.1.3.2) *The presentation of navigation control data for manual control as specified in 7.2.5.2 is part of the INS.*

(MSC.252(83)/2.1.4) *Other navigational tasks/functions may also be integrated in the INS.*

(MSC.252(83)/2.2.1) *The tasks are allocated to, and operated by the operator on, a defined set of multi-functional "task stations".*

(MSC.252(83)/2.2.2) *The scope of an INS may differ dependent on the number and kind of tasks integrated.*

(MSC.252(83)/2.2.3) *Configuration, use, operation and display of the INS is situation-dependent on:*

- *ship underway, at anchor, and moored,*
- *manual and automatic navigation control in different waters,*
- *planned routine navigation and special manoeuvres.*

4.2 Purpose of integrated navigation systems

~~The following considerations, based on Resolution MSC.252(83), are dealt with in this standard.~~

(MSC.252(83)/1.1) *The purpose of integrated navigation systems (INS) is to enhance the safety of navigation by providing integrated and augmented functions to avoid geographic, traffic and environmental hazards.*

(MSC.252(83)/1.2) *By combining and integrating functions and information the INS provides "added value" for the operator to plan, monitor and/or control safety of navigation and progress of the ship.*

(MSC.252(83)/1.3) *Integrity monitoring is an intrinsic function of the INS. The INS supports safety of navigation by evaluating inputs from several sources, combining them to provide information giving timely alerts of dangerous situations and system failures and degradation of integrity of this information.*

(MSC.252(83)/1.4) *The INS presents correct, timely, and unambiguous information to the users and provides subsystems and subsequent functions within the INS and other connected equipment with this information.*

(MSC.252(83)/1.5) *The INS supports mode and situation awareness.*

(MSC.252(83)/1.6) *The INS aims to ensure that, by taking human factors into consideration; the workload is kept within the capacity of the operator in order to enhance safe and expeditious navigation and to complement the mariner's capabilities, while at the same time to compensate for their limitations.*

(MSC.252(83)/1.7) *The INS aims to be demonstrably suitable for the user and the given task in a particular context of use.*

(MSC.252(83)/3.1.1) *The purpose of these performance standards is to support the proper and safe integration of navigational functions and information.*

(MSC.252(83)/3.1.2) *The purpose is in particular:*

- *to allow the installation and use of an INS instead of stand-alone navigational equipment onboard ships; and*
- *to promote safe procedures for the integration process;*

both for

- *comprehensive integration; and*
- *partial integration,*

of navigational functions, data and equipment.

(MSC.252(83)/3.1.3) *These standards supplement for INS functional requirements of the individual Performance Standards adopted by the IMO.*

4.3 Application

~~The following considerations concerning the application have been included in this standard.~~

(MSC.252(83)/3.2.1) *These performance standards are applicable to systems where functions/equipment of at least the navigational tasks mentioned in (MSC.252(83)/2.1.2) are combined.*

(MSC.252(83)/3.2.2) *If further tasks are integrated, the requirements of these standards should apply to all additional functions implemented in the INS.*

(MSC.252(83)/3.3.1) *These performance standards are based on a modular concept which should provide for individual configurations and for extensions, if required.*

(MSC.252(83)/3.3.2) *These standards contain four modules:*

- *Module A (Clause 6) for the requirements for the integration of navigational information,*
- *Module B (Clause 7) for the operational/functional requirements for INS based on a task-related structure,*
- *Module C (Clause 8) for the requirements of the Alert management, and*
- *Module D (Clause 9) for the Documentation requirements.*

(MSC.252(83)/3.4.1) *Modules A (Clause 6), C (Clause 8), D (Clause 9) and 7.1, 7.3, 7.8, of Module B (Clause 7) are applicable for any INS.*

(MSC.252(83)/3.4.2) *Additionally, for each task integrated into the INS, the INS should fulfil both:*

- *the requirements of the respective tasks as specified in module B and*
- *the relevant modules of performance standards for stand-alone equipment as specified in Table 1.*

Table 1 – Applicable modules of performance standards of stand alone equipment

INS tasks and functions (subclauses of this document)	Additionally applicable modules of specific equipment standards for task integrated into the INS. ~~The modules are specified in the appendices of these performance standards, if not specified in the equipment standards.~~
Collision avoidance (7.2.4)	Radar PS (Res. MSC.192(79)) (modules specified in Annex A) Module A: "Sensor and Detection" Module B: "Operational requirements" Module C: "Interfacing"
Route planning (7.2.2) Route monitoring (7.2.3)	ECDIS PS (Res. MSC.232(82)) Module A: "Database" Module B: "Operational and functional requirements"
Track control (7.2.5.3 and 7.3.2, 7.3.3)	Track Control PS Res. MSC.74(69), Annex 2 (see Clause A.2). Module B: "Operational and functional requirements"

(MSC.252(83)/3.5.1 as amended by MSC.452(99)) These standards may allow for accepting INS to substitute for some carriage requirements of navigational equipment as equivalent to other means under SOLAS regulation V/19. In this case, the INS should comply with:

- these performance standards; and
- for the relevant tasks of these performance standards, with the applicable modules of the equipment performance standards as specified in Table 2.

**Table 2 – Applicable modules of other standards for INS
to substitute for individual equipment**

Allow for accepting the INS as	INS in compliance with	
	Tasks and functions (subclauses of this document)	Applicable modules of specific equipment standards as specified in the Appendices of ~~the document~~ IMO resolution MSC.252(83)
Radar system	Collision avoidance (7.2.4)	Radar PS (Res. MSC.192(79)) (Modules specified in Annex A) Module A: "Sensor and Detection" Module B: "Operational requirements" Module C: "Design and Technical requirements"
ECDIS	Route planning (7.2.2) Route monitoring (7.2.3)	ECDIS PS (Res. MSC.232(82)) Module A: "Database" Module B: "Operational and functional requirements"
Heading control system (HCS)	Navigation control data (7.2.5) or Navigation status and data display 7.2.7.	Res. A.342, as amended – MSC.64(67), Annex 3
Track control system, (TCS)	Navigation control data and track control (7.2.5.3 and 7.3.2, 7.3.3)	Track Control Res. MSC.74(69), Annex 2 (Modules specified in Annex A) Module B: "Operational and functional requirements"
Presentation of AIS data	Collision avoidance (7.2.4) Navigation control data (7.2.5)	MSC.74 (69), Annex 3
Echo sounding system	Route monitoring (7.2.3)	MSC.74(69), Annex 4

Allow for accepting the INS as	INS in compliance with	
	Tasks and functions (subclauses of this document)	Applicable modules of specific equipment standards as specified in the Appendices of ~~the document~~ IMO resolution MSC.252(83)
EPFS	Navigation control data (6-2-5 7.2.5) or Navigation status and data display (7.2.7)	GPS Res. A.819(19), as amended, MSC.112(73) or GALILEO, Res. MSC.233(82) or GLONASS, Res. MSC.53(66), as amended MSC.113(73) or BDS, Res. MSC.379(93)
SDME	Navigation control data (7.2.5) or Navigation status and data display (7.2.7)	Res. MSC.96(72)
NAVTEX or other IMO-recognized equipment accommodating other providers of GMDSS terrestrially-based services	Meteorological warnings (7.2.3.2) Navigation and SAR warnings (7.2.3.2) Ice warnings (7.2.3.2)	MSC.148(77)
Recognized mobile satellite service enhanced group calling system	Meteorological warnings (7.2.3.2) Navigation and SAR warnings (7.2.3.2) Ice warnings (7.2.3.2)	A.807(19), as amended by MSC.68(68), Annex 4, and MSC.306(87)
NOTE Additional equipment not listed above can be included into the INS.		

NOTE (MSC.252(83)/3.7.1) The workstation design, layout and arrangement is not addressed in these performance standards, but in MSC/Circ.982. Guidance on familiarisation documentation is given in Annex B.

5 Test requirements and results

5.1 General

The manufacturer shall declare the equipment to be tested and the tasks and functions that it performs. The equipment under test (EUT) shall be installed in compliance with the manufacturer's installation manual. Where equipment is divided, the entire configuration shall be tested together.

The manufacturer shall declare the

- physical parts involved,
- location of tasks and functions,
- general data flow between physical and/or logical parts,
- dependencies between tasks and functions.

NOTE Typical examples are hardware overviews down to the lowest replaceable unit, block diagrams or high functional level software descriptions.

5.2 Exceptions for tests previously performed

Where parts of an INS have been tested and documented as meeting individual International Standards (for example through individual type approvals), there is no requirement to repeat such testing. In such cases, corresponding documentation (for example certificates, test reports) shall be provided.

5.3 Test site

Unless otherwise stated, all tests in this document ~~are to~~ shall be executed in a laboratory environment with a simulator arrangement.

A simulator arrangement with the following characteristics is required:

- capable of providing position, speed, heading, time and depth simultaneously from multiple sources including different sensor locations;
- capable of simulating own ship manoeuvres;
- capable of simulating failures in sensors and sources (see Annex C);
- capable of simulating corrupt and implausible data;
- capable of simulating disturbances and jumps within and between sensors;
- capable of simulating set and drift;
- capable of simulating AIS targets as described in IEC 62388 and other AIS messages;
- capable of simulating radar collision avoidance scenarios as target scenario simulator defined in IEC 62388;
- capable to perform the testing according the individual equipment testing requirements if testing of equipment is required for this document (see Annex A).

The resolution and accuracy of the simulated signals shall be in accordance with the applicable International Standards. The output signals shall comply with IEC 61162-1, IEC 61162-2 and/or IEC 61162-450 consistent with the types of interfaces supported by the EUT according to the manufacturer's declarations.

5.4 Methods of test

This document is organized so that each group of requirements is immediately followed by a clause identifying the method(s) of test. The test terminology is derived from ISO 9241-12 on test of visual displays. Guidance on testing is provided in Annex G.

6 Module A – Requirements for integration of navigational information

6.1 Interfacing and data exchange

6.1.1 Combination, processing and evaluation of data

6.1.1.1 Requirement

As a minimum, 6.1.1 is applicable for primary navigational data.

(MSC.252(83)/5.1.1) *An INS shall combine, process and evaluate data from connected sensors and sources.*

6.1.1.2 Methods of test and required results

Covered by tests in 6.1.2 to 6.7.

6.1.2 Availability, validity and integrity

6.1.2.1 Requirement

As a minimum, 6.1.2 is applicable for primary navigational data.

(MSC.252(83)/5.1.2) *The availability, validity and integrity of data exchange within the INS and from connected sensors and sources shall be monitored.*

Unavailable data shall be detected and indicated within a time period which is related to the process requirements and described in the manufacturer's documentation.

6.1.2.2 Methods of test and required results

Refer to manufacturer's documentation about data exchange within the INS and from connected sensor/sources. Select randomly 5 examples and confirm by observation that unavailable data is detected and indicated.

Tests for validity and integrity are covered by 6.3.1 and 6.5.

6.1.3 Failure of data exchange

6.1.3.1 Requirement

(MSC.252(83)/5.1.3) *A failure of data exchange shall not affect any independent functionality.*

6.1.3.2 Methods of test and required results

Test for failure of data exchange is covered by 7.6.1.2.

6.1.4 Interfaces in general

6.1.4.1 Requirement

(MSC.252(83)/5.1.4) *Interfacing to, from, and within the INS shall comply with international standards for data exchange and interfacing as appropriate.*

NOTE Information flowing within the EUT ~~may~~ can use proprietary interfaces and contain proprietary data.

The INS shall support the IEC 61162-1, IEC 61162-2 and/or IEC 61162-450 interfaces as given in Annex F as a minimum. In addition, suitable alternative input or output interfaces may be used.

6.1.4.2 Methods of test and required results

Confirm by inspection of manufacturer's documentation that all standard input and output interfaces as given in Annex F are present. Confirm by observation that at least every required sentence in Annex F is checked once to conform to IEC 61162-1 and that every physical interface conforms to IEC 61162-1, IEC 61162-2 and/or IEC 61162-450.

6.1.5 Interface to alert management

6.1.5.1 Requirement

(MSC.252(83)/5.1.5) *The interface(s) shall comply with the interface requirements of the alert management as described in Module C (Clause 8) of these performance standards.*

6.1.5.2 Methods of test and required results

~~See 8.9 and 8.10.~~

Tests and required results are described in IEC 62923-1; see 8.2.3.

6.2 Accuracy

6.2.1 Requirement

(MSC.252(83)/5.2.1) *INS data shall comply with the accuracy and resolution required by applicable performance standards of the IMO (see Table 2).*

The accuracy and resolution of data derived within INS, i.e. within the CCRS, distributed within INS and provided by INS shall not be degraded below applicable performance standards of the IMO.

6.2.2 Methods of test and required results

Confirm by observation that data in the following list is correct to the specified resolution when displayed on the EUT and when available in output interfaces of the EUT:

- latitude and longitude with at least 3 decimals resolution for minutes;
- speed through water and speed over ground with at least 1 decimal resolution for knots;
- heading with at least 1 decimal resolution for degrees;
- **course over ground with at least 1 decimal resolution for degrees;**
- time with at least 1 s resolution;
- depth with at least 1 decimal resolution for metres.

6.3 Validity, plausibility, latency

6.3.1 Validity

6.3.1.1 Requirement

(MSC.252(83)/5.3.1.1) *Data failing validity checks shall not be used by the INS for functions dependent on these data, unless for cases where the relevant performance standards specifically allow use of invalid data. There shall be no side effects for functions not depending on this data.*

(MSC.252(83)/5.3.1.2) *When CCRS output data used by the INS for a function becomes invalid, or unavailable, at least a warning shall be given. Higher priority alerts shall be given where required; see 8.3.2.1 and Table C.2 (classification of the alerts).*

When CCRS output data not actually in use by the INS becomes invalid, or unavailable, this shall be indicated at least as a caution. Loss of data which requires attention and which does not result in a hazardous situation shall lead into a caution, i.e. data is redundantly available or only used for display reasons, see 8.3.2.1.

When input data from sensor or source used by CCRS becomes invalid, or unavailable, this shall be indicated as a caution.

Validity checks shall include the evaluation of relevant empty data fields, status or mode fields (e.g. states, modes and qualities such as "valid", "invalid", "simulation", "manual input", "estimated (dead reckoning)", "no fix", "standby").

6.3.1.2 Methods of test and required results

Refer to manufacturer's documentation to identify 8 cases in which the EUT evaluates input data as invalid based on relevant empty data fields or content of status, mode or quality fields. Confirm by observation that the EUT provides at least a caution to indicate invalid data.

Refer to the manufacturer's FMEA documentation (see 9.3.1) to identify whether the EUT has any capability to use data failing validity checks. If such invalid data are used, check that the relevant performance standards specifically allow use of that data and confirm by analytical evaluation that such functionality does not cause side effects for functions not depending of this data.

Confirm by observation that when input data from sensor or source used by CCRS becomes invalid, or unavailable, then EUT provide a caution within a time period which is related to the process requirements and described in the manufacturer's documentation.

Refer to the manufacturer's FMEA documentation to identify 2 cases in different functions in which invalid, or unavailable, CCRS output data selected for use by the EUT causes changed conditions which require immediate attention but which are not immediately hazardous. Confirm by observation that the EUT provides a warning within a time period which is related to the process requirements and described in the manufacturer's documentation.

Refer to the manufacturer's FMEA documentation to identify 2 cases in different functions in which invalid, or unavailable, CCRS output data selected for use by the EUT will not result in any hazardous situation. Confirm by observation that the EUT provides a caution within a time period which is related to the process requirements and described in the manufacturer's documentation.

Refer to the manufacturer's FMEA documentation to identify 2 cases in different functions in which invalid, or unavailable, CCRS output data is not selected for use by the EUT. Confirm by observation that the EUT provides a caution within a time period which is related to the process requirements and described in the manufacturer's documentation.

If the EUT includes automatic control functions, refer to the manufacturer's FMEA documentation to identify 2 cases in each automatic control function in which invalid, or unavailable, CCRS output data selected for use by the EUT may cause a situation requiring immediate attention, decision and if necessary action to avoid any kind of hazardous situation (e.g. loss of essential information used by an automatic control function). Confirm by observation that the EUT provides an alarm within a time period which is related to the process requirements and described in the manufacturer's documentation.

6.3.2 Plausibility

6.3.2.1 Requirement

(MSC.252(83)/5.3.2.1) *Received or derived data that is used or distributed by the INS shall be checked for plausible magnitudes of values.*

Two kinds of checks for plausible magnitudes shall be carried out:

- checks that a value is within plausible range;
- checks that operative modes or states are matching when they are reported by more than one sentence from a single sensor/source or function (e.g. GGA and VTG sentences reporting equal operative states of a single EPFS).

(MSC.252(83)/5.3.2.2) *Data which has failed the plausibility checks shall not be used by the INS and shall not affect functions not dependent on these data.*

If data are not passing the plausibility check, they are considered as "invalid" and will be treated as described in 6.3.1.

6.3.2.2 Methods of test and required results

Confirm by inspection of manufacturer's documentation that input data which are used by the INS and its tasks and functions have defined plausible ranges and defined matching criteria for operative modes and states.

~~Confirm by observation that data not passing the plausibility check is not used by the INS.~~

Generate 5 representative examples of data not passing the plausibility check and confirm by observation that these data are not used by the INS.

6.3.3 Latency

6.3.3.1 Requirement

(MSC.252(83)/5.3.3.1) *Data latency (timeliness and repetition rate of data) within the INS shall not degrade the functionality specified in the relevant performance standards.*

6.3.3.2 Methods of tests and required results

Refer to manufacturer's documentation to identify the allowed latency for each task and function within the EUT. Confirm by analytical evaluation of manufacturer's documentation that the manufacturer has identified all cases for which the latency may be an issue when fulfilling the relevant performance standards.

Refer to manufacturer's documentation to identify 3 cases within the INS for which latency is important. Confirm by observation that data latency does not degrade the functionality specified within the relevant performance standards.

6.4 Consistent common reference system (CCRS)

6.4.1 Consistency of data

6.4.1.1 Requirement

As a minimum, 6.4.1 is applicable for primary navigational data.

(MSC.252(83)/5.4.1.1) *The INS shall ensure that the different types of information are distributed to the relevant parts of the system, applying a consistent common reference system for all types of information.*

(MSC.252(83)/5.4.1.2) *Details of the source and the method of processing of such data shall be provided for further use within INS.*

(MSC.252(83)/5.4.1.3) *The CCRS shall ensure that all parts of the INS are provided with the same type of data from the same source and all parts of the INS apply the provided data.*

NOTE Same type from same source means equal value and equal origin. For performance reasons, the EUT ~~may~~ *can* have parallel data distribution paths for different uses with different update rates (see Annex E). The CCRS principle is what is described in the definition of the CCRS (3.1.20).

Connected data such as latitude+longitude, COG+SOG and set+drift shall originate from the same source.

6.4.1.2 Methods of test and required results

Confirm by inspection of manufacturer's documentation that:

- the EUT uses the CCRS principle to distribute navigation data to all relevant parts of the ~~system~~ EUT;
- all relevant parts of the ~~system~~ EUT apply the distributed data based on the CCRS principle;
- details of the source and the method of processing of such data are provided for further use within INS.

Confirm also by observation that the above is true at least for primary navigational data.

Refer to manufacturer's documentation to identify whether parallel data distribution paths have been implemented. If implemented, confirm by observation that parallel distribution paths have methods to ensure that all part of the INS receive the same data from the same source.

Confirm by observation that all connected data such as latitude+longitude, COG+SOG and set+drift originate from the same source.

6.4.2 Consistent common reference point (CCRP)

6.4.2.1 Requirement

(MSC.252(83)/5.4.2.1) *The INS shall use a single consistent common reference point for all spatially related information. For consistency of measured ranges and bearings, the recommended reference location shall be the conning position. Alternative reference locations may be used where clearly indicated or distinctively obvious. The selection of an alternative reference point shall not affect the integrity monitoring process.*

The integrity monitoring process within the INS is related to a single consistent common reference point to get correct results.

Alternative reference locations may be used for local display, calculation and measurements. Affected information shall be clearly indicated or distinctively obvious. This information shall not be distributed outside the ~~system~~ equipment.

If provided, performance of any automatic control function shall not be adversely affected by selection of alternative reference locations.

Location of the CCRP shall be provided to equipment outside of the INS (see POS sentence in Annex F).

NOTE 1 An example of a temporarily specified alternative reference location ~~may~~ can be the reference for radar presentation (CCRP versus radar antenna position).

NOTE 2 An example of a permanently assigned alternative reference location ~~may~~ can be the location used by track control (ship specific installation parameter).

6.4.2.2 Methods of test and required results

Confirm by inspection of manufacturer's documentation that:

- installation process supports the CCRP concept, for example the installation manual includes description of offset adjustments for connected sensors providing spatially related data;
- recommendation is available in the installation manual that the conning position is used for the CCRP.

Confirm by observation of the results according to Annex H that:

- calculation of information from the relevant sensors to the consistent common reference point is made correctly for CCRS outputs (see Annex F), EBL, VRM, AIS targets, course and speed;
- if an alternative reference location is provided, ~~observe that,~~ then when used, the affected information is clearly indicated or distinctively obvious;
- if any automatic control function is provided and if an alternative reference location is provided, ~~confirm by observation for each automatic control function that~~ upon changing reference location, the performance of ~~the~~ each automatic control function is not adversely affected.

Select the CCRP as the reference location on all workstations. Confirm by observation that the following items within the EUT are presented using the same reference point:

- own ship's position;
- EBL, VRM, cursor and range rings;

- target range and bearing;
- closest point of approach (CPA);
- time to closest point of approach (TCPA);
- parallel index lines;
- course over ground (COG);
- speed (speed over ground (SOG) and speed through water (STW)).

In above condition, confirm by observation that all other items within the EUT are presented using either:

- the same reference point as above; or
- a permanently assigned alternative reference location that is clearly indicated or distinctively obvious.

If provided, select a temporarily specified alternative reference point as the reference location on a single task station. Confirm by observation that the following items within the task station are presented using the same reference point:

- own ship's position;
- EBL, VRM, cursor and range rings;
- target range and bearing;
- closest point of approach (CPA);
- time to closest point of approach (TCPA);
- parallel index lines;
- course over ground (COG);
- speed (speed over ground (SOG) and speed through water (STW)).

In above condition, confirm by observation that all other items within the task station are presented using either:

- the temporarily specified alternative reference location as above clearly indicated; or
- a permanently assigned alternative reference location that is clearly indicated or distinctively obvious.

Confirm by observation that the output data in interfaces of the EUT include the POS sentence (see Annex F) and are referenced either to the CCRP or a permanently assigned alternative reference location and not affected by selection of an alternative reference point.

6.4.3 Consistency of thresholds

6.4.3.1 Requirement

(MSC.252(83)/5.4.3.1) *The INS shall support the consistency of thresholds for monitoring and alert functions.*

(MSC.252(83)/5.4.3.2) *The INS shall ensure by automatic means that consistent thresholds are used by different parts of an INS, where practicable.*

Cross track limit threshold for monitoring route shall be common for track control (IEC 62065) and route monitoring (IEC 61174).

(MSC.252(83)/5.4.3.3) *A caution may be given when thresholds entered by the bridge team differ from thresholds set in other parts of the INS.*

6.4.3.2 Methods of test and required results

Confirm by observation that the following thresholds are consistent:

- depth below keel ~~(IEC 61174)~~;
- safety depth (IEC 61174);
- safety contour (IEC 61174);
- look ahead time or distance (IEC 61174);
- look ahead passing distance (IEC 61174);
- cross track limit for monitoring route ~~is common~~ for track control (IEC 62065) and route monitoring (IEC 61174);
- limits used for verification of monitored route against safety contour and areas or objects of interest (IEC 61174);
- CPA/TCPA (IEC 62388);
- if provided, BCR/BCT (IEC 62388);
- approach time to critical point (IEC 61174);
- if provided, track control limits such as low speed, course difference, early course change indication, end of track (IEC 62065);
- if provided and activated, heading control limits such as off-heading, heading monitor (ISO 11674).

If users are allowed to select inconsistent thresholds, then confirm by observation that a caution is given when a different threshold is entered into a part of EUT and that this is clearly indicated as long as a different threshold is in use.

6.5 Integrity monitoring

6.5.1 Requirement

As minimum, 6.5 is applicable for primary navigational data.

(MSC.252(83)/5.5.1) *The integrity of data shall be monitored and verified automatically before being used, or displayed.*

(MSC.252(83)/5.5.2) *The integrity of information shall be verified by comparison of the data derived independently from at least two sensors and/or sources, if available.*

(MSC.252(83)/5.5.3) *The INS shall provide manual or automatic means to select the most accurate method of integrity monitoring from the available sensors and/or sources.*

(MSC.252(83)/5.5.4) *A clear indication of the sensors and sources of data selected for integrity monitoring shall be provided.*

(MSC.252(83)/5.5.5) *The INS shall provide a warning, if integrity verification is not possible or failed.*

The results of integrity monitoring shall be:

- Passed = integrity verification passed;
- Failed = integrity verification not passed;
- Doubtful = integrity verification not possible.

The ~~system~~ equipment shall provide at least the following methods for integrity monitoring:

- position: comparison between two EPFS;
- position: comparison between EPFS and dead reckoning using ship's heading and SDME;
- heading: comparison between two heading sensors.

The ~~system~~ equipment shall provide at least one of the following methods for integrity monitoring:

- speed through water: comparison between two STW sensors;
- speed through water: comparison with a SOG from SDME;
- speed through water: comparison with a SOG from EPFS.

The ~~system~~ equipment shall provide at least one of the following methods for integrity monitoring:

- speed and course over ground: comparison between two longitudinal/transversal ground speeds from SDME together with a heading;
- speed and course over ground: comparison with a STW sensor together with a heading sensor;
- speed and course over ground: comparison with a SOG and COG from EPFS.

The ~~system~~ equipment shall provide at least one of the following methods for integrity monitoring:

- depth: comparison with a second depth sensor;
- depth: comparison with data from largest available ENC chart.

The ~~system~~ equipment shall provide at least one of the following methods for integrity monitoring:

- time: comparison with a second EPFS sensor;
- time: comparison with internal clock.

The ~~system~~ equipment may provide the following method for integrity monitoring: heading: comparison between heading sensor and COG sensor when SOG is high enough for reliable comparison.

Other equivalent methods may be provided for integrity monitoring.

(MSC.252(83)/5.5.6) *Data which fails the integrity monitoring function or data where integrity monitoring is not possible shall not be used for automatic control systems/functions.*

In the above cases for track control, the fall-back arrangements specified in IEC 62065 for unavailable sensor data ~~are to~~ shall be followed.

If integrity monitoring of heading data or speed data is not possible, the requirements of paragraph MSC.252(83)/12.7 for fallback arrangements and maintaining minimum basic operation should be followed for heading control (see 7.7.8.4). In case the integrity monitoring fails and the ~~system~~ equipment is not able to determine the faulty source, the operator should select the source manually.

6.5.2 Methods of test and required results

Confirm by inspection of manufacturer's documentation that each mandatory method is provided and which additional methods are available.

Confirm by observation that the EUT provides either manual or automatic means to select the most accurate method for integrity monitoring.

Confirm by observation that the EUT provides clear indication of sensors and sources of data selected for integrity monitoring.

Confirm by observation of each available method that:

- with simulated errors (disturbances, jumps) exceeding the thresholds in use, the integrity monitoring works as documented by manufacturer;
- the EUT provides a warning when the result of integrity monitoring of data from sensors/sources in use is failed;
- the EUT provides a warning when integrity monitoring of data from sensors/sources in use is not possible.

If automatic control systems/functions are provided, then confirm by observation that when data fails the integrity monitoring or when integrity monitoring of data is not possible, this results in appropriate (i.e. as specified in related equipment standard) fall-back arrangements for unavailable sensor data.

6.6 Marking of-data

6.6.1 Requirement

As a minimum, 6.6 is applicable for primary navigational data.

(MSC.252(83)/5.6.1) *The data shall be marked with the source and the results of validity, plausibility checks and integrity monitoring to enable subsequent functions to decide whether their input data complies with their requirements or not.*

Table 3 defines the marking of data that has been checked for validity, plausibility and integrity within the INS.

Table 3 – Marking of data

Validity check	Plausibility check	Integrity monitoring	INS data marking			Remark
			Validity flag or status flag or mode indicator (e.g. GLL)	Plausibility status (e.g. NSR)	Integrity status (e.g. NSR)	
Fail	Fail	Not possible	Invalid	No	Failed	Data cannot be used within INS
Fail	Pass	Not possible	Invalid	Yes	Failed	Data cannot be used within INS unless relevant performance standards specifically allow use of invalid data
Pass	Fail	Not possible	Invalid	No	Failed	Data cannot be used within INS
Pass	Pass	Not possible due to lack of second sensor, source or method	Valid	Yes	Doubtful	Data cannot be used for automatic control function(s)
Pass	Pass	Fail	Valid	Yes	Failed	Data cannot be used for automatic control function(s)
Pass	Pass	Pass	Valid	Yes	Passed	Data is suitable for any use
NOTE For "data cannot be used for automatic control function(s)", see 6.5.1.						

6.6.2 Methods of tests and required results

Confirm by observation of displays that all parts of the INS use the data as marked with source, validity, plausibility and integrity.

Confirm by observation that the **NSR** sentences described in Annex I ~~are~~ is provided.

6.7 Selection of sensors and sources

6.7.1 Requirement

As a minimum, 6.7 is applicable for primary navigational data.

(MSC.252(83)/5.7.1) *INS shall provide two user selectable sensor/source selection modes when multiple sensors/sources are available; manual sensor/source selection mode and automatic sensor/source selection mode.*

(MSC.252(83)/5.7.2) *In manual sensor/source selection mode it shall be possible to select individual sensors/sources for use in the INS. In case a more suitable sensor/source is available this shall be indicated.*

(MSC.252(83)/5.7.3) *In automatic sensor/source selection mode, the most suitable sensors/sources available shall be automatically selected for use in the INS. It shall further be possible to manually exclude individual sensors/sources from being automatically selected. The manufacturer shall declare the criteria and procedures for selecting and deselecting the most suitable sensors/sources (see 9.1).*

6.7.2 Methods of test and required results

Confirm by observation and inspection of the content of the operating manuals (see 9.1) that:

- the EUT provides two alternative methods for selection of sensors/sources to be used: manual and automatic mode;
- in manual mode, an indication is provided when a more suitable sensor/source is available;
- in automatic mode, the EUT automatically selects between sensors/sources according to the manufacturer's description;
- it is possible to manually exclude individual sensors/sources from being automatically selected and used.

7 Module B – Task related requirements for integrated navigation systems

7.1 Description

(MSC 252/6.1) *The design of the INS should ease the workload of the bridge team and pilot in safely and effectively carrying out the navigation functions incorporated therein, compared to an equivalent set of standalone non-integrated equipment.*

(MSC 252/6.2) *The integration should provide all functions, depending of the task for which the INS is used and configured, to facilitate the tasks to be performed by the bridge team and pilot in safely navigating the ship.*

(MSC 252/6.3) *Each part of the INS should comply with all applicable requirements adopted by the IMO, including the requirements of this document.*

NOTE 1 For guidance, see 4.3, Table 1 and Table 2.

(MSC 252/6.4) *When functions of equipment connected to the INS provide facilities in addition to this document, the operation and, as far as is reasonably practicable, the malfunction of such additional facilities should not degrade the performance of the INS below the requirements of this document.*

(MSC 252/6.5) *The integration of functions of individual equipment into the INS should not degrade the performance below the requirements specified for the individual equipment by the IMO*

(MSC 252/6.6) *Alerts should be generated and presented according to Module C (Clause 8).*

~~NOTE 2 The IMO alert requirements above may be different from the requirements available in the individual performance standards. This standard describes what to do within the EUT of the INS. If there are differences regarding alerts between individual equipment performance standards and the INS performance standard, the INS performance standard overrides the individual performance standards for the EUT of the INS.~~

7.2 Task and functional requirements for an INS

7.2.1 General

7.2.1.1 Requirement

(MSC 252/7.1.1) *The configuration of the INS shall be modular and task-oriented. The navigational tasks of an INS are classified as "Route planning", "Route monitoring", "Collision avoidance", "Navigation control data", "Status and data display" and "Alert management". Each of these tasks comprises the respective functions and data.*

(MSC 252/7.1.2) *All tasks of an INS shall use the same electronic chart data and other navigational databases such as routes, maps, tide information.*

(MSC 252/7.1.3) *If Electronic Navigational Charts (ENCs) are available, they shall be used as common data source for INS.*

(MSC 252/7.1.4) *7.2.2 to 7.2.5 and 7.2.7 apply, if the respective task is integrated into the INS.*

NOTE The CCRS principle also applies to ENC charts and updates, routes for monitoring and user created navigation material (such as radar maps (~~IEC 62388:2007, 8.10~~ IEC 62388:2013, 9.12), symbols, lines, areas and text notes (~~IEC 61174:2008, 5.5.1~~ IEC 61174:2015, 5.4.1), etc.).

7.2.1.2 Methods of test and required results

Confirm by analytical evaluation that the ~~system~~ EUT meets each requirement.

7.2.2 Task "Route planning"

7.2.2.1 ECDIS performance standards related mandatory functions and data

7.2.2.1.1 Requirement

(MSC 252/7.2.1) *The INS shall provide the Route planning functions and data as specified in Module A and B of the revised ECDIS performance standards (Resolution MSC.232(82)). (See IEC 61174.)*

7.2.2.1.2 Methods of test and required results

Confirm by observation that the ~~system~~ EUT provides the Route planning functions and data as specified in Module A and B of the valid ECDIS performance standards and related IEC standards.

7.2.2.2 Procedures for voyage planning

7.2.2.2.1 Requirement

(MSC 252/7.2.2) *The INS shall be capable of supporting procedures for relevant parts of voyage planning, as adopted by the IMO Resolution A.893(21) Guidelines for voyage planning:*

(A.893(21)/3.2) *The detailed voyage or passage plan shall include the following factors:*

- 1 *the plotting of the intended route or track of the voyage or passage on appropriate scale charts: the true direction of the planned route or track shall be indicated, as well as all areas of danger, existing ships' routeing and reporting systems, vessel traffic services, and any areas where marine environmental protection considerations apply;*
- 2 *the main elements to ensure safety of life at sea, safety and efficiency of navigation, and protection of the marine environment during the intended voyage or passage; such elements shall include, but not be limited to:*
 - 2.1 *safe speed, having regard to the proximity of navigational hazards along the intended route or track, the manoeuvring characteristics of the vessel and its draught in relation to the available water depth;*
 - 2.2 *necessary speed alterations en route, e.g., where there may be limitations because of night passage, tidal restrictions, or allowance for the increase of draught due to squat and heel effect when turning;*
 - 2.3 *minimum clearance required under the keel in critical areas with restricted water depth;*
 - 2.4 *positions where a change in machinery status is required;*

- 2.5 *course alteration points, taking into account the vessel's turning circle at the planned speed and any expected effect of tidal streams and currents;*
- 2.6 *the method and frequency of position fixing, including primary and secondary options, and the indication of areas where accuracy of position fixing is critical and where maximum reliability must be obtained;*

7.2.2.2.2 Methods of test and required results

Confirm by analytical evaluation that the ~~system~~ EUT is capable of supporting the relevant procedures as described above.

7.2.2.3 Additional mandatory functions

7.2.2.3.1 Requirement

(MSC 252/7.2.3) *The INS shall provide means for*

- *administering the route plan (store and load, import, export, documentation, protection),*
- *having the route check against hazards based on the planned minimum under keel clearance specified by the mariner,*
- *checking of the route plan against manoeuvring limitation, if available in the INS, based on parameters turning radius, rate of turn (ROT), wheel-over and course changing points, speed, time, ETAs,*
- *drafting and refining the route plan against meteorological information if available in the INS.*

NOTE "If available in the INS" means if this option is supported by EUT, the manufacturer ~~shall declare~~ declares which functions are available.

7.2.2.3.2 Methods of test and required results

Execute successively the following steps:

- create a new route plan "Test 1" and store it in the EUT;
- create another new route plan "Test 2" including at least a segment with a water depth less than 10 m, store it in the EUT and then export it to a removable media (e.g. memory stick, floppy disk, etc.) as supported by the EUT;
- load the already stored route plan "Test 1" for use in the EUT and confirm by observation that the content of it is as before storing of it;
- import route plan "Test 2" from removable media for use in the EUT and;
- either view, print or create a printable file from the route plan "Test 2";
- protect the route plan "Test 2" against changes. After protection, try to add a new waypoint;
- confirm by observation that user is informed that changing of protected route plan is not allowed;
- unprotect the route plan "Test 2";
- confirm by observation that now adding a waypoint is possible;
- set safety contour as 10 m and perform check of route plan "Test 2";
- confirm by observation that the ~~system~~ EUT is able to detect and display this violation of the safety contour.

If check against manoeuvring limitations is available in the EUT, execute successively the following steps:

- confirm by observation that the EUT is able to detect a turning radius which is less than possible for the ship;
- confirm by observation that the EUT is able to detect a planned speed higher than the maximum available for the ship or lower than the minimum acceptable speed for the available steering system;
- set planned speed as 80 % of maximum available for the ship;
- confirm by observation that the EUT is able to detect a turning radius which will require a higher rate of turn than is possible for the ship when sailing at 80 % of the maximum speed;
- confirm by observation that the EUT is able to detect if two waypoints both with 90° and 1,0 NM radius turns are so close to each other that the wheel-over or course change point for the second waypoint is before the end of turn of the first waypoint;
- set planned speed as 80 % of maximum available for the ship;
- confirm by observation that the EUT is able to inform the user that it is impossible to meet the selected ETA for the given ETD.

If check against meteorological information is available in the EUT, execute successively the following steps:

- confirm by observation that the EUT is able to draft a suitable route between two user given waypoints which is able to benefit from favourable items (e.g. wind, current, etc.) and able to avoid unfavourable items (e.g. wind, current, waves, etc.) as specified in the **operator operating** manual provided by the manufacturer;
- confirm by observation that the EUT allows the user to refine the drafted route plan by changing criteria to judge favourable and unfavourable conditions and by accepting user input of non-changeable waypoint locations.

7.2.3 Task "Route monitoring"

7.2.3.1 Mandatory functions

7.2.3.1.1 Requirements

(MSC 252/7.3.1) *The INS shall provide the route monitoring functions and data as specified in Module A and B in the ECDIS performance standards.*

7.2.3.1.2 Methods of tests and required results

Confirm by observation that the **system** EUT provides the route monitoring functions as specified in Module A and B of the valid ECDIS performance standards and related IEC standards.

7.2.3.2 Additional mandatory functions

7.2.3.2.1 Requirements

(MSC 252/7.3.2 **as amended by MSC.452(99)**) *The INS shall provide capability for*

- *optionally overlaying radar video data on the chart to indicate navigational objects, restraints and hazards to own ship in order to allow position monitoring evaluation and object identification,*

NOTE 1 "Optionally" means "possible user selection".

- *determination of deviations between set values and actual values for measured under-keel clearance and initiating an under-keel clearance alarm, if fitted,*

NOTE 2 "If fitted" means "it has to be supported by the EUT".

- *the alphanumeric display the present values of Latitude, Longitude, heading, COG, SOG, STW, under-keel clearance, ROT (measured or derived from change of heading),*
- *AIS reports of AtoNs,*
- *Coastal and NAVAREA navigational warnings,*
- *search and rescue (SAR) warnings,*
- *Coastal and METAREA meteorological warnings,*
- *ice warnings,*
- *Maritime Safety Information (MSI) overlay functions,*

NOTE 3 Sources of MSI are NAVTEX (IEC 61097-6), other IMO-recognized equipment accommodating other providers of GMDSS terrestrially-based services and recognized mobile satellite service enhanced group calling system (IEC 61097-4 and IEC 61097-16).

and if track control is integrated into the INS,

- *it shall be possible to include the planned track and to provide, monitor and display the track related and manoeuvring data.*

The INS shall provide the capability to display MSI received from NAVTEX and EGC services from IMO recognized providers in accordance with the requirements of IEC 62288 for display of information. The requirements from IEC 61174:2015, 4.12.6, (if applicable, as updated in future versions of IEC 61174) shall be applied to all such services.

NOTE 4 EGC is promulgated using services from recognized satellite providers such as, at the time of writing, SafetyNET (commercial name by Inmarsat) and SafetyCast (commercial name by Iridium). At the time of drafting IEC 61174:2015, only the former service was known.

For displaying MSI, the equipment shall be able to:

- process and display, at least upon request, MSI textual messages;
- offer proposals for geographical positions encoded in the messages, where possible, to be selected for use for graphical presentation;

NOTE 5 See IHO Publication S-53.

- offer the user the possibility to select, where necessary correct (i.e. edit) or add, the geographical positions in these messages, for example by numerical or graphical means, to be used for graphical display, including at least:
 - point positions of objects,
 - corner positions of areas;
- offer the possibility to call up the entire message when the user selects the graphical representation of MSI messages,
- offer the user the means to manage the deletion of messages.

NOTE 6 For calculation of distances, see IEC 61174:2015, Annex J.

The equipment shall provide the user with the current NAVTEX receiver mask as described in IEC 61174.

7.2.3.2.2 Methods of tests and required results

Confirm by observation that the ~~system~~ EUT provides the capability to select optionally the overlay of radar video data on the chart.

Confirm by observation or by inspection of manufacturer's documentation that the ~~system~~ EUT provides the capability to determine the deviations between set values and actual values for measured under-keel clearance and the possibility to initiate and present an under-keel clearance alarm.

Confirm by observation that the ~~system~~ EUT provides the capability to display alphanumerically the present values of latitude, longitude, heading, COG, SOG, STW, under-keel clearance, ROT (measured or derived from change of heading).

Confirm by observation that the ~~system~~ EUT provides the capability to display AIS reports of AtoNs.

Confirm by observation that the EUT provides the functionality to display Maritime Safety Information (MSI), including navigational, meteorological, ice and SAR warnings as specified in IEC 61174 from NAVTEX and from the IMO recognized satellite service providers for promulgating EGC in accordance with the requirements of IEC 62288.

Confirm by observation that the EUT provides the functionality to process and display, at least upon request, MSI textual messages and that it offers:

- proposals for selection of geographical positions in the messages, where possible, to be selected for use for graphical presentation;
- the user the possibility to select and correct (i.e. edit) or add to the geographical positions in these messages, for example by numerical or graphical means, to be used for graphical display, including at least:
 - point positions of objects,
 - corner positions of areas;
- the possibility to call up the entire message when the user selects the graphical representation of MSI messages,
- the means to manage the deletion of messages.

If track control is integrated into the INS, confirm by observation that it is possible:

- to select the planned track for route monitoring;
- to provide, monitor and display the track related and manoeuvring data.

Confirm by documented evidence that the EUT provides the user with the current NAVTEX receiver mask as described in IEC 61174.

7.2.3.3 Optional functions

7.2.3.3.1 Requirements

(MSC 252/7.3.3 as amended by MSC.452(99)) *For navigational purposes, the display of other route-related information on the chart display is permitted, e.g.*

- *tracked radar targets and AIS targets,*
- *AIS binary and safety-related messages,*
- *initiation and monitoring of man-over-board and SAR manoeuvres (search and rescue and man-over-board modes),*
- ~~NAVTEX~~
- *tidal and current data,*
- *weather data,*
- *ice data, and*

- MSI messages, where the operator may appropriately filter the display of Maritime Safety Information (MSI) messages (for example by source, by reason of warning, etc.).

The manufacturer shall declare which functions, data or AIS messages are available.

7.2.3.3.2 Methods of test and required results

Confirm by observation that the ~~system~~ EUT provides the optional functions, data or AIS messages together with facilities for the operator to filter the display of Maritime Safety Information (MSI) as specified by the manufacturer.

7.2.3.4 Search and rescue mode

7.2.3.4.1 Requirement

(MSC 252/7.3.4.1) *If available, it shall be possible to select on the route monitoring display a predefined display mode for a "search and rescue" situation that can be accessed upon simple operator command.*

The manufacturer shall declare which functions are available.

(MSC 252/7.3.4.2) *In the search and rescue mode, a superimposed graphical presentation of the datum (geographic point, line, or area used as a reference in search planning), initial most probable area for search, commence search point and search pattern chosen by the operator (expanding square search pattern, sector search pattern or parallel track search pattern) with track spacing defined by him shall be presented.*

The IMO IAMSAR Manual Volume 3 shall be used as reference for the search pattern.

7.2.3.4.2 Methods of test and required results

If a search and rescue mode is provided by the manufacturer, confirm by observation that the ~~system~~ EUT meets the requirements in the following manner:

- select the display of an IAMSAR search pattern by a simple operator command;
- define the geographic point, area or line to be used as reference in search planning;
- adjust the search pattern and area of search by the operator;
- confirm by observation that the search pattern is correctly presented in the route monitoring display.

Confirm by inspection of manufacturer documentation that the equipment manual describes the basis for calculations of the search and rescue mode, if that search and rescue mode is provided.

7.2.3.5 Man-over-board (MOB) mode

7.2.3.5.1 Requirement

(MSC 252/7.3.5.1) *If available it shall be possible to select on the route monitoring display a predefined display mode for a "man-over-board" situation, that can be accessed upon simple operator command.*

The manufacturer shall declare which functions are available.

(MSC 252/7.3.5.2) *In the man-over-board mode a superimposed graphical presentation of a operator selectable man-over-board manoeuvre shall be presented.*

(MSC 252/7.3.5.3) *The man-over-board position shall be memorised by a simple operator action.*

(MSC 252/7.3.5.4) *An urgency manoeuvring procedure shall be available at the display taking set and drift into consideration.*

As a minimum, the updated range and bearing display of the estimated MOB position information based on set and drift and initial MOB position shall be presented.

As a minimum, the updated display of estimated MOB position information based on set and drift and initial MOB position shall be presented.

7.2.3.5.2 Methods of test and required results

If available, confirm by observation that the predefined MOB display mode meets the requirements in the following manner.

- Select the MOB display mode by a simple operator command.
- Save the initial MOB position by a simple operator command.
- Show initial and estimated MOB position in conformance with IEC 62288.
- Show distance and bearing to the estimated MOB position.

7.2.4 Task "Collision avoidance"

7.2.4.1 Radar performance standards related mandatory functions and data

7.2.4.1.1 Requirement

(MSC 252/7.4.1) *The INS shall provide the collision avoidance functions and data as specified in Module A and B of the Radar performance standards. Refer to Annex A for definition of these modules.*

7.2.4.1.2 Methods of test and required results

Confirm by inspection of documented evidence that the EUT conforms to the relevant subclauses of IEC 62388:20072013. Refer to Annex A, for a list of the relevant subclauses.

7.2.4.2 Additional mandatory functions

7.2.4.2.1 Requirement

(MSC 252/7.4.2.1) *It shall be possible to present less information of ENC database objects than specified in MSC.232(82) for display base.*

It shall be possible to remove some or all of following categories or layers of ENC data, but not individual objects within each category/layer:

- coastline (high water);
- own ship's safety contour;
- isolated underwater dangers of depth less than the safety contour which lie within the safe water defined by the safety contour;
- isolated above water dangers which lie within the safe water defined by the safety contour such as fixed structures, overhead wires, etc.

7.2.4.2.2 Methods of test and required results

Confirm by observation that the EUT allows the presentation of less ENC data than that specified for the display base in MSC.232(82), by selecting layers listed in 7.2.4.2.1. Confirm by observation that it is not possible to remove individual objects.

7.2.4.3 Target association and target data integration

7.2.4.3.1 Requirement

(MSC 252/7.4.2.2) *If target information from multiple sensors/sources (radar and AIS; 2 radar sensors) are provided on one task station:*

- *the possibility of target association shall be provided for mutual monitoring and to avoid the presentation of more than one symbol for the same target,*
- *the association of AIS and radar targets shall follow the requirements of Resolutions MSC.192(79) and MSC.191(79),*
- *common criteria shall be used for raising target related alerts, e.g., CPA/TCPA.*

The target association shall be performed on all provided sensors/sources. Means such as hysteresis shall be applied to the association criteria in order to prevent unwanted association or disassociation. For practical applications, it shall be permitted to vary the association and disassociation criteria from the default values. The ~~user~~ operating manual shall describe the association parameters and options.

The selection of priority for association of single sources shall be valid for the whole EUT. The selection can be modified by operator action for the whole EUT at any nominated task station which displays associated targets.

The threshold of association shall be consistent within the INS.

NOTE Target association, including threshold of association and priority of association (i.e. which symbol is used for associated target), is a system wide function. A task station ~~may~~ can display associated targets or targets from a single source. If associated targets are displayed, then they are identical at every task station which displays the associated targets.

7.2.4.3.2 Methods of test and required results

~~IEC 62388:2007, 10.8.2~~ IEC 62388:2013, 11.8.2 (Association and priority), defines four scenarios for associating tracked targets and AIS targets. 7.2.4.3.2 reuses these scenarios to simulate a target from two different radar sensors.

Two independent Target Scenario Simulators (TSS) are required and they shall conform to the requirements of IEC 62388:2007/2013, Annex F, with the exceptions that support for target fading is not required and that only one tracked target is required from each simulator. Sensor errors are not simulated in this test. One TSS is set to provide radar data as defined in the TT column of the scenarios in ~~IEC 62388:2007, 10.8.2~~ IEC 62388:2013, 11.8.2, and the other TSS is set to provide data following the same position and velocity as the target defined in the AIS column of the scenarios.

The methods of test and required results are as follows.

- Confirm by observation that target association is provided and that, when targets are associated, a single symbol is presented for each target in all task stations which are selected to display associated targets.
- Ensure target association is enabled on the EUT. Ensure that the default association criteria are selected. Use the TSSs to generate the required radar sensor data for association scenario 1. Tracked targets should be acquired (manually or automatically) as soon as practical after the start of the test. On all task stations within the EUT that provide target information from multiple radar sensors, confirm by observation that the

requirements of test scenario 1 are met. Note that it is acceptable for the targets to be associated when the elapsed time is 0 min.

- c) Repeat test b) for association scenario 2. Note that it is acceptable for the targets to be associated when the elapsed time is 0 min.
- d) Repeat test b) for association scenario 3.
- e) Repeat test b) for association scenario 4. Note that it is acceptable for the targets to be associated when the elapsed time is 0 min.
- f) Confirm by observation that, if an association disable function is provided while target information from more than one radar source is provided on one task station, the association function can be enabled and disabled for the radar targets.
- g) If target information from more than one radar source is provided on one task station, confirm by observation while performing target association test scenarios 1 to 4 that the target disassociation algorithm meets the requirements of target disassociation and in addition, demonstrates that means has been provided in order to limit the function from hunting (indecisions) in the association/disassociation process.
- g) If target information from more than one radar source is provided on one task station, confirm by observation that no alarm is raised when the radar targets are disassociated.
- h) If target information from more than one radar source is provided on one task station, confirm by observation that ~~no alarm is raised~~, when the radar targets are disassociated, the disassociated targets have unique identifiers.
- ~~i) if target information from more than one radar source is provided on one task station, confirm by observation that when the radar targets are disassociated the disassociated targets have unique identifiers;~~
- i) Confirm by inspection of manufacturer's documentation that the ~~user~~ operating manual describes the parameters and options for associating radar targets.
- j) Confirm by inspection of documented evidence that the association of AIS and radar targets is in accordance with ~~IEC 62388:2007, 10.8.2~~ IEC 62388:2013, 11.8.2.
- k) Confirm by observation that common criteria are used for raising target related alerts at the task station.
- l) Confirm by observation that association threshold parameters are consistent in every task station of the EUT.

7.2.4.4 Target identifier

7.2.4.4.1 Requirement

(MSC 252/7.4.2.3) *For identical targets unique and identical target identifiers shall be used for presentation on all INS displays. Where a target from more than one source can be presented on one display the identifier shall be amended as required. Amended target identifiers shall be used for all INS display presentations.*

NOTE Example of "amended as required". Two radars track different targets, which are displayed in common display. Technical tracking identifiers in first radar are 2, 5 and 10. Technical tracking identifiers in second radar are 1, 5 and 6. As identifier 5 is available in both radars, the target identifier 5 given from second radar is amended to identifier 11 for common display.

Local target identifiers may be provided in addition to the unique identifier used for presentation on all INS displays. Where provided, local target identifiers shall be distinct from the unique identifier. Local identifiers shall only be presented on the individual task station to which they apply. The operator shall be able to switch off the presentation of the local identifiers.

7.2.4.4.2 Methods of test and required results

If the EUT does not provide the capability to display target information from multiple sensors/sources on a single task station, then the tests c), d), e), f), g) and h) are not applicable.

- a) Using the simulators defined in 7.2.4.3.2, simulate several physical targets by providing AIS data to the EUT for each of these targets. Confirm by observation that:
- a unique (i.e. different) identifier is used for each simulated AIS target;
 - the unique identifier is identical on all workstations that present the target.
- b) Switch off the AIS target simulation. Simulate several physical targets by providing radar sensor data to the EUT. Confirm by observation that:
- a unique identifier is used for each simulated radar target;
 - the unique identifier is identical on all workstations that present the target.
- c) Simulate several physical targets by providing both AIS and radar data to the EUT for each physical target. Ensure that the simulated AIS and radar data are sufficiently matched so as to meet the EUT's criteria for target association. Switch on target association, allowing sufficient time for the association to take place. (Refer to manufacturer's documentation as required.) Confirm by observation that:
- a unique identifier is used for each physical target, the identifier being amended as required to ensure that it is unique;
 - the unique identifier is identical on all workstations that present the target;
 - the unique identifier is not affected by change of presentation priority between radar and AIS data.
- d) If the EUT provides an option to switch target association off, switch it off and repeat the above test. Confirm by observation that:
- on workstations with association switched off, each physical target is presented by both an AIS target and a radar target;
 - each target presented has a unique identifier, amended as required to ensure that it is unique;
 - the unique identifier is identical on all workstations that present the target.
- e) Repeat test c) with the simulated AIS and radar data including at least 2 unmatched radar data so that they do not meet the EUT's criteria for target association. Confirm by observation that:
- a single unique identifier is used for each physical target which is matched as well as unique identifier for each physical unmatched targets, the identifier being amended as required to ensure that it is unique;
 - the AIS and tracked targets corresponding to each physical target are assigned different identifiers allowing them to be differentiated;
 - the identifiers used to present each target are identical on all workstations that present the target.
- f) Simulate several physical targets by the provision of radar data to the EUT from two different radar sensors for each physical target. Ensure that the simulated radar data is sufficiently matched to meet the EUT's criteria for target association; in order to achieve this, it may be sufficient to supply the same data to two inputs. Switch on target association and allow sufficient time for the association to take place. (Refer to manufacturer's documentation as required.) Confirm by observation that:
- a unique identifier is used for each physical target, the identifier being amended as required to ensure that it is unique;
 - the unique identifier is identical on all workstations that present the target.
- g) If the EUT provides an option to switch target association off, switch it off and repeat test f). Confirm by observation that:
- on workstations with association switched off and which have the capability to display radar targets from more than one radar sensor, each physical target is presented by two radar targets;
 - each target presented has a unique identifier, amended as required to ensure that it is unique;

- the unique identifier is identical on all workstations that present the target.
- h) Repeat test f) with the data from the two different radar sensors including at least 2 unmatched radar targets so that they do not meet the EUT's criteria for target association. Confirm by observation that:
 - a single unique identifier is used for each physical target which is matched as well as a unique identifier for each physical unmatched targets, the identifier being amended as required to ensure that it is unique;
 - the tracked targets corresponding to each physical target are assigned different identifiers allowing them to be differentiated;
 - the identifiers used to present each target are identical on all workstations that present the target.
- i) If the EUT provides local identifiers, confirm by observation that:
 - the local target identifiers are distinguishable from the unique identifier;
 - local identifiers are only presented on the individual task station to which they apply;
 - it is possible to deselect the display of local identifiers.

7.2.4.5 Combined radar signals

7.2.4.5.1 Requirement

(MSC 252/7.4.2.4) *A display may present combined radar signals from more than one radar source. The malfunctions of this additional facility shall not degrade the presentation of the radar source selected as primary, unless the primary source is the one that fails. Selection between the primary and the other source(s) shall be indicated as such.*

7.2.4.5.2 Methods of test and required results

Confirm by observation or by inspection of documented evidence that the ~~system~~ EUT meets the requirements according ~~IEC 62388:2007, 14.4.3~~ IEC 62388:2013, 15.6.3 (Combining radar).

7.2.4.6 Optional functions

7.2.4.6.1 Requirement

(MSC 252/7.4.3) *Optionally, the following information may be displayed:*

- *true scaled ship symbols and CPA/TCPA and bow crossing range (BCR) / bow crossing time (BCT) related to the real dimensions;*
- *chart data from the common database of INS: traffic-related object layers.*

7.2.4.6.2 Methods of test and required results

If optional functions are provided, confirm by observation that the ~~system~~ EUT meets each requirement.

7.2.5 Task "Navigation control data"

7.2.5.1 General

(MSC 252/7.5.1) *To support the manual and automatic control of the ship's primary movement, the INS navigation control task shall provide the following functionality:*

- *display of data for the manual control of the ship's primary movement;*
- *display of data for the automatic control of the ship's primary movement;*