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Maritime navigation and radiocommunication equipment and systems – Integrated communication system (ICS) – Operational and performance requirements, methods of testing and required test results

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Matériels et systèmes de navigation et de radiocommunication maritimes – Système de communication intégré (ICS) – Exigences de fonctionnement et de performance, méthodes d'essai et résultats d'essai exigés

IEC 62940:2016-10(en-fr)

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MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – INTEGRATED COMMUNICATION SYSTEM (ICS) – OPERATIONAL AND PERFORMANCE REQUIREMENTS, METHODS OF TESTING AND REQUIRED TEST RESULTS

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The text of this standard is based on the following documents:

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

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INTRODUCTION

IEC 62940 incorporates the applicable parts of the performance standards included in IMO Resolution A.811(19) for an integrated radiocommunication system. It also incorporates the applicable requirements for the presentation of information included in IMO Resolution MSC.191(79) which is associated with IEC 62288, applicable requirements for bridge alert management included in IMO Resolution MSC.302(87) based on, and in compliance with applicable requirements for Ethernet interconnection in IEC 61162-450.

The ICS is a system in which individual radiocommunication equipment and installations are used as subsystems, i.e. without the need for their own control units, providing outputs to and accepting inputs from a communications human machine interface (COM-HMI). Each subsystem is in compliance with the type approval requirements for that subsystem where applicable, and is in compliance with the interface requirements in this document. An ICS consists of at least two individual GMDSS subsystems.

The COM-HMI is designed so that it can be made available on a bridge workstation either dedicated to communications or as part of a multi-function display.

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MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – INTEGRATED COMMUNICATION SYSTEM (ICS) – OPERATIONAL AND PERFORMANCE REQUIREMENTS, METHODS OF TESTING AND REQUIRED TEST RESULTS

1 Scope

IEC 62940 specifies the minimum operational and performance requirements, technical characteristics and methods of testing, and required test results, for shipborne integrated communication systems (ICS) designed to perform ship external communication and distress and safety communications (GMDSS) and the functions of onboard routeing of this communication. It takes account of IMO Resolution A.694(17) and is associated with IEC 60945. When a requirement in this document is different from IEC 60945, the requirement in this document takes precedence.

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.

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

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

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

IEC 61162-460:2015, *Maritime navigation and radiocommunication equipment and systems – Digital interface – Part 460: Multiple talker and multiple listeners – Ethernet interconnection – Safety and security*

IEC 61924-2:2012, *Maritime navigation and radiocommunication equipment and systems – Integrated navigation systems – Part 2: Modular structure for INS – Operational and performance requirements, methods of testing and required test results*

IEC 62288:2014, *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*

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

IMO MSC.1/Circ.1389*, Guidance on procedures for updating shipborne navigation and communication equipment*

ITU-R M.493, *Digital selective-calling system for use in the maritime mobile service*

3 Terms, definitions and abbreviations

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
COM-HMI
communications human machine interface
human machine interface for presentation and handling of communication tasks on the bridge

3.1.2
CCRS
consistent common reference system
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

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3.1.3
ICS
integrated communication system

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composite communication system designed to perform ship external communication and distress and safety communications and the functions of onboard routeing of this communication

3.1.4
radio communication
wireless transmission of information

Note 1 to entry: Examples of radio communication are voice radio communication and the wireless exchange of data.

3.1.5
remote COM-HMI
remote communications human machine interface
human machine interface for presentation and handling of communication tasks, placed outside the ICS

3.1.6
subsystem
communication-related device within the ICS

3.2 Abbreviations

AIS	automatic identification system
BAM	bridge alert management
BNWAS	bridge navigational watch alarm system
CAM	central alert management
DSC	digital selective calling

EPFS	electronic position fixing system
EUT	equipment under test
FMEA	failure mode and effects analysis
FTP	file transfer protocol
GMDSS	global maritime distress and safety system
HMI	human machine interface
HTTP	hypertext transfer protocol
IMAP	internet message access protocol
INS	integrated navigation system
MFD	multi-function display
MSI	maritime safety information
SMTP	simple mail transfer protocol

4 General and operational requirements

4.1 General requirements

4.1.1 Requirements

The ICS shall meet the general requirements set out in IMO Resolution A.694(17) as further specified in IEC 60945 appropriate to their category, for example "protected". However, specific requirements may be made in individual equipment standards so consideration should be given to any exemptions or additional requirements in combination with standards for all included radiocommunications equipment in the ICS.

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The manufacturer shall declare any preconditioning required before environmental checks. For the purposes of this document, the following definitions for "performance check" and "performance test", required by IEC 60945, shall apply:

Performance check	Reconfigure the EUT and check by non-quantitative visual checks that the system is still operative.
Performance test	Identical to the "performance check".

The manufacturer shall declare the equipment to be tested and the tasks and functions that it performs. The 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,
- the location of tasks and functions,
- the general data flow between physical and/or logical parts, and
- the 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.

The acoustic alarm level may be capable of being adjustable below the level defined in IEC 60945.

The ICS shall meet the requirements for the presentation of information on shipborne displays set out in IMO Resolution MSC.191(79) as further specified in IEC 62288:2014, Clause 4 and Clause 7.

The ICS shall meet the requirements for alert management as an alert source (see Clause 6 and Clause 7).

4.1.2 Methods of testing and required test results

Verify conformance with IMO Resolution A.694(17) by testing in accordance with IEC 60945.

Verify conformance with IMO Resolution MSC.191(79) by testing in accordance with IEC 62288:2014, Clause 4 and Clause 7.

4.2 Test site

Unless otherwise stated, all tests in this document are to be executed in a laboratory environment with a simulator arrangement or via live "on-air" tests on the actual equipment.

For a simulator arrangement, the following characteristics are required:

- capable of simulating the "air-interface" for transmission of radio signals for the equipment included in the ICS;
- capable of simulating AIS targets and other AIS messages.

The simulated signals shall be in accordance with the applicable international standards. The output signals shall comply with IEC 61162-1 and with the types of interfaces supported by the EUT according to the manufacturer´s declaration.

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4.3 Functional requirements

4.3.1 GMDSS equipment

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4.3.1.1 Requirements

The manufacturer shall declare which selected functions of the GMDSS are integrated in the ICS. All functional requirements of the GMDSS equipment integrated into the ICS shall conform to the performance standards for that equipment. For functionality of DSC, the latest version of ITU-R M.493 is applicable.

NOTE The functions of the GMDSS are given in SOLAS regulation IV/4 and the performance standards are given in IMO Resolutions which are referenced in SOLAS regulation IV/14. The relevant Resolutions are given in the Bibliography.

The implementation of a specific item of GMDSS equipment or its installation shall not impair the availability, operation or functionality of another equipment integrated into the ICS.

For radio transmission, at least two simultaneous operations are required. All receiver functions shall be available simultaneously.

4.3.1.2 Methods of testing and required test results

Confirm by inspection of the documented evidence that the documents provided by the manufacturer declare the configuration of the ICS.

Confirm by observation or analytic evaluation that the implementation of a specific item of GMDSS equipment or its installation does not impair availability, operation or functionality of another equipment integrated into the ICS.

Confirm by observation that for radio transmission at least two simultaneous operations are possible, and that all receiver functions are available simultaneously.

4.3.2 Non-GMDSS equipment/function

4.3.2.1 Requirements

The ICS may integrate non-GMDSS communication and other equipment/functions. The manufacturer shall declare which non-GMDSS communication and other equipment/functions are integrated in the ICS. Such equipment/functions shall comply with IEC 60945, and the ICS shall be compliant with the relevant interface requirements of IEC 61162-1.

The implementation of a specific item of non-GMDSS equipment or its installation shall not impair the availability, operation or functionality of another equipment integrated into the ICS.

4.3.2.2 Methods of testing and required test results

Confirm by inspection of documented evidence whether non-GMDSS communication equipment/functions are integrated in the ICS.

Confirm by inspection of documented evidence that such equipment complies with the relevant interfaces requirements in IEC 61162-1.

Confirm by inspection of documented evidence that such equipment complies with the relevant requirements in IEC 60945.

Confirm by observation or analytic evaluation that the implementation of a specific item of non-GMDSS equipment or its installation does not impair the availability, operation or functionality of another equipment integrated into the ICS.

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4.4 Operational requirements of ICS

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4.4.1 Requirements

The ICS shall

a) comprise at least two COM-HMI capable of performing GMDSS functions for the included GMDSS equipment,

b) ensure that initiating a distress alert has priority over all other functions of the ICS,

c) be capable of performing all distress functions, for the included GMDSS equipment,

d) include a printing capability if required by individual IMO performance standards and not provided by the individual equipment,

e) make MSI available based on a common storage media if provided (see 4.6),

f) have facilities for automatic reception of position and time data from the ship's CCRS, in addition to provision for manual input of this data (if required),

g) have a power supply arrangement which ensures that it is not possible to inadvertently switch off any part of the ICS,

h) have a failure analysis, at ICS functional level, performed and documented for the ICS. The failure analysis shall verify that the ICS is designed on "fail-to-safe" principle and that failure of one part of the integrated system should not affect the functionality of other parts, except for those functions directly dependent on the defective part.

NOTE IEC 60812 (FMEA) describes how failure analysis can be performed.

4.4.2 Methods of testing and required test results

Perform the following:

a) confirm by inspection of documented evidence that the EUT comprises at least two COM-HMIs capable of performing GMDSS functions for the GMDSS equipment included into the EUT;

b) confirm by analytic evaluation that initiating a distress alert has priority over all other functions of the EUT;

c) confirm by observation that the EUT is capable of performing all distress functions for the GMDSS equipment included into the EUT;

d) confirm by observation that the EUT provides printing capability, if required by the individual performance standards related to the GMDSS equipment included into the EUT;

e) see test for 4.6;

f) confirm by observation that the EUT has facilities both for automatic reception of position and time data and for manual input from the ship's CCRS for position and time data;

g) confirm by analytic evaluation that the power supply arrangements for the EUT are such that it is not possible to inadvertently switch off any part of the EUT;

h) use the manufacturer's documentation for failure analysis to select randomly 3 cases from the failure analysis and confirm by observation that what is documented in the failure analysis happens in the EUT.

4.5 Operational requirements of the COM-HMI

4.5.1 General

4.5.1.1 Requirements

Each of the COM-HMI shall

- have consistent and identical lay out of the user interfaces,
- have consistent and identical access to each function for different subsystems (use of different screen sizes is allowed), and
- be capable of being operated independently of each other.

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Only one COM-HMI, at one indicated workstation or MFD task station shall be in control of configuration per "non-shareable function" at any time, and only one COM-HMI or MFD task station shall be assigned to accept control commands per "non-shareable function" at any time.

NOTE An example of a non-shareable functions is VHF voice; an example of a sharable function is making a text message for Inmarsat-C.

It shall be visually indicated to the bridge team, if not otherwise obvious, which COM-HMI is in control of which functions. Means shall be available on the COM-HMI to take over control of individual functions to that COM-HMI.

4.5.1.2 Methods of testing and required test results

Confirm by observation that each COM-HMI has consistent and identical layout of the user interface for each of the functions provided.

Confirm by observation that there is consistent and similar access to each function of the different subsystems provided on the COM-HMIs.

Access different functions on different COM-HMIs and confirm by observation that it is possible to operate the COM-HMIs independently of each other.

Access a "non-shareable function" on one COM-HMI and do not complete the operation. Confirm by observation that it is indicated on the COM-HMI used that there indeed is access to the "non-shareable function". Then attempt to access the same function on another COM-HMI. Confirm by observation that access to the "non-shareable function" is not accepted. Confirm by observation that a function to take over control is present. Subsequently exercise that function and confirm by observation that control and access is transferred.