

INTERNATIONAL STANDARD



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

IEC 62940:2016

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CONTENTS

FOREWORD	5
INTRODUCTION	7
1 Scope	8
2 Normative references	8
3 Terms, definitions and abbreviations	9
3.1 Terms and definitions	9
3.2 Abbreviations	9
4 General and operational requirements	10
4.1 General requirements	10
4.1.1 Requirements	10
4.1.2 Methods of testing and required test results	11
4.2 Test site	11
4.3 Functional requirements	11
4.3.1 GMDSS equipment	11
4.3.2 Non-GMDSS equipment/function	12
4.4 Operational requirements of ICS	12
4.4.1 Requirements	12
4.4.2 Methods of testing and required test results	12
4.5 Operational requirements of the COM-HMI	13
4.5.1 General	13
4.5.2 Interconnection with automatic identification systems (AIS)	14
4.5.3 GMDSS COM-HMI	14
4.5.4 Maritime Safety Information	17
4.5.5 Remote COM-HMI	17
4.6 Optional common storage media for electronic printing	19
4.6.1 Requirements	19
4.6.2 Methods of testing and required test results	20
4.7 Software and firmware maintenance	20
4.7.1 Requirements	20
4.7.2 Methods of testing and required test results	20
5 Technical requirements	21
5.1 Network integrating the ICS	21
5.1.1 Requirements	21
5.1.2 Methods of testing and required test results	22
5.2 Malfunctions and restoration	22
5.2.1 Requirements	22
5.2.2 Methods of testing and required test results	23
5.3 Accuracy and performance	24
5.3.1 Requirements	24
5.3.2 Methods of testing and required test results	24
5.4 Integrity monitoring	25
5.4.1 Requirements	25
5.4.2 Methods of testing and required test results	25
6 ICS alert management	26
6.1 Classification of alerts	26
6.1.1 Requirements	26

6.1.2	Methods of testing and required test results.....	26
6.2	Alert management.....	27
6.2.1	General	27
6.2.2	Unacknowledged warnings	28
6.2.3	Remote acknowledgement and silencing of alerts	28
7	Interfacing	28
7.1	IEC 61162 interfaces	28
7.1.1	Requirements	28
7.1.2	Methods of testing and required test results.....	32
7.2	BNWAS interface	32
7.2.1	Requirements	32
7.2.2	Methods of testing and required test results.....	33
7.3	INS/EPFS interface.....	33
7.3.1	Requirements	33
7.3.2	Methods of testing and required test results.....	33
7.4	Optional communication access interface	33
7.4.1	Requirements	33
7.4.2	Methods of testing and required test results.....	34
Annex A (normative)	Distress alerting	35
Annex B (informative)	Extracts from IMO performance standards for alarms and indications	37
B.1	Alarms	37
B.1.1	VHF radio installations.....	37
B.1.2	MF/HF radio installations	37
B.1.3	Inmarsat-C ship earth stations	37
B.1.4	Inmarsat ship earth stations	37
B.1.5	NAVTEX	37
B.1.6	EGC equipment	38
B.1.7	Automatic battery chargers	38
B.2	Indications	38
B.2.1	VHF radio installations.....	38
B.2.2	MF/HF radio installations	38
B.2.3	NAVTEX	38
B.2.4	EGC equipment	39
Annex C (normative)	Communication access interface implementation details	40
C.1	HTTP communication	40
C.2	Paths, directories and URIs	41
C.3	Meta information for the file transport.....	42
C.4	Vessel-id and shore entity identifier	43
C.5	Access to files by multiple on-board systems	43
C.6	Authentication and authorization	44
C.7	Implementation examples for data transfer scenarios	44
C.7.1	Ship system sends data to shore-system "TrackingSys" at "Acme"	44
C.7.2	On-shore system "controlpanel-update" at GadgetCorp sends data to ship system "controlpanel"	44
C.7.3	Ship client (ECDIS) requests the latest chart from shore.....	44
Annex D (informative)	Ship/shore and shore/ship communication implementation in support of e-navigation	46
D.1	General.....	46

D.2	One alternative for data transfer	46
D.2.1	General	46
D.2.2	Vessel to shore data transfer	47
D.2.3	Shore to vessel data transfer	47
D.2.4	Vessel to vessel data transfer	48
D.3	Another alternative for data transfer	48
Annex E (informative)	Digital interface sentence to parameter group number equivalence	49
Bibliography	51
Figure 1	– Example of ICS supporting distress communications	16
Figure 2	– Remote COM-HMI	18
Figure 3	– ICS interfaces	21
Figure 4	– Example of alert management in an ICS	27
Figure 5	– Interfaces of an ICS	29
Figure 6	– Role of communication access interface	34
Figure A.1	– Distress alert procedure	35
Figure A.2	– Follow up voice procedure	36
Figure C.1	– Example of a shore to ship transfer	45
Figure D.1	– Example of communication for e-navigation	46
Figure D.2	– Shore to vessel data transfer	47
Table 1	– Minimum integrity/status information to be presented by COM-HMI	25
Table 2	– Classification of GMDSS equipment alerts for alert management purposes	26
Table 3	– Mandatory IEC 61162-1 sentences received by the ICS equipment	30
Table 4	– Mandatory IEC 61162-1 sentences transmitted by the ICS equipment	30
Table 5	– IEC 61162-1 sentences received by the ICS equipment from remote COM-HMI and from external devices using MSI	30
Table 6	– IEC 61162-1 sentences transmitted by ICS equipment to remote COM-HMI and to external devices using MSI	31
Table 7	– IEC 61162-1 sentences received by ICS equipment from an external navigation equipment	31
Table 8	– IEC 61162-1 sentences transmitted by the ICS equipment to an external navigation equipment	31
Table 9	– Optional IEC 61162-1 sentences received by the ICS equipment from external equipment	32
Table 10	– Optional IEC 61162-1 sentences transmitted by ICS equipment to external equipment	32
Table C.1	– Information elements HTTP communication	41
Table C.2	– Communication access interface directories	42
Table C.3	– Information elements file transport	43
Table C.4	– Communications access interface operations	44
Table E.1	– Digital sentence to PGN equivalence	49

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

FOREWORD

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

FDIS	Report on voting
80/816/FDIS	80/821/RVD

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

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

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

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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 routing 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.

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

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

3.1.3

ICS

integrated communication system

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

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.

4.3 Functional requirements

4.3.1 GMDSS equipment

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.

4.4 Operational requirements of ICS

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 layout 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.

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.