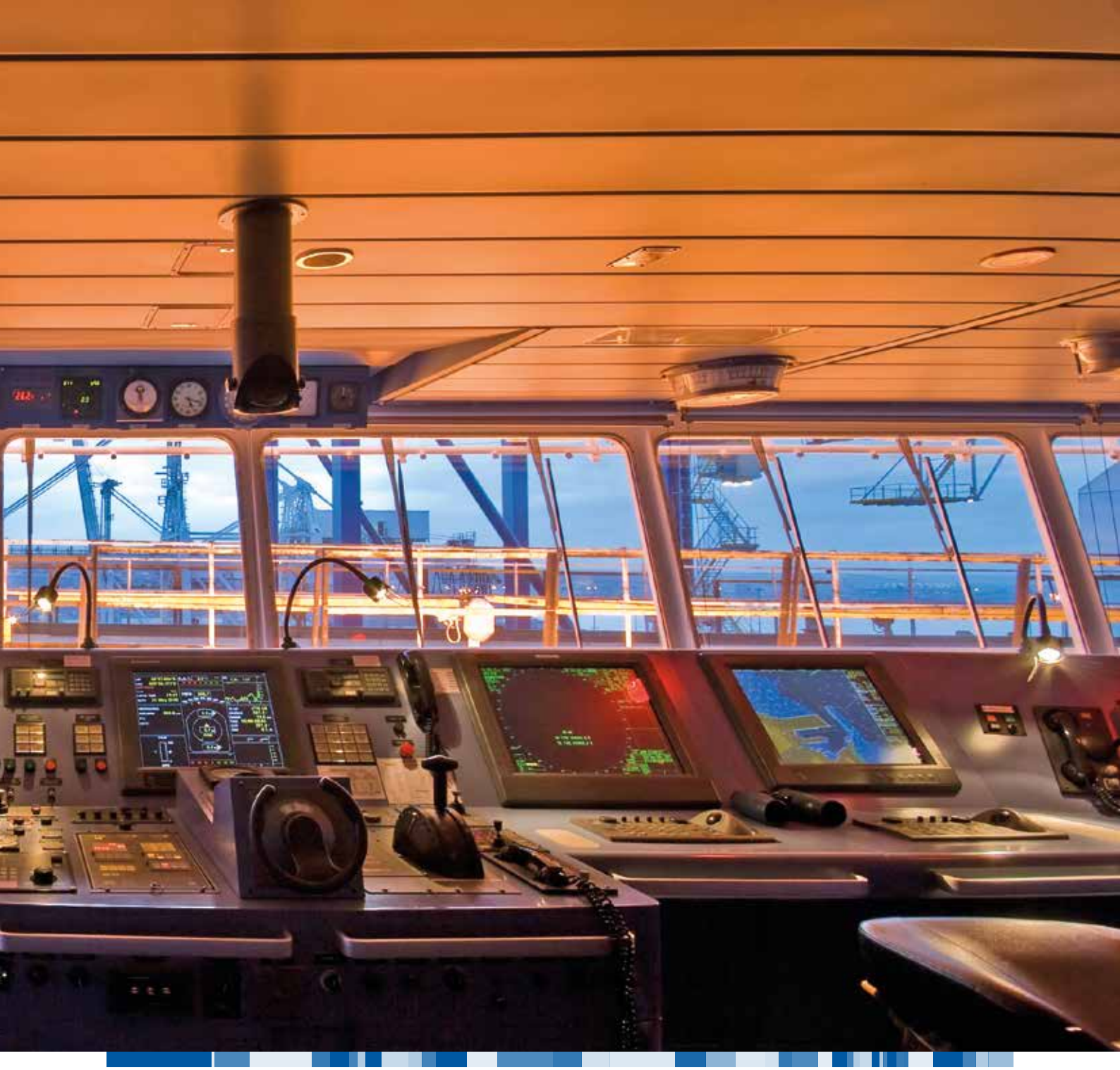

IEC Technical Committee 80

Maritime navigation and radiocommunication equipment and systems

Abbreviations

AIS	automatic identification system
ARPA	automatic radar plotting aid
BAM	bridge alert management
CCIR	International Radiocommunication Consultative Committee (now part of ITU-R)
CIRM	Comité International Radio-Maritime, the International Maritime Radio Committee
CISPR	International Special Committee on Radio Interference
ECDIS	electronic chart display and information system
ECS	electronic chart system
EMC	Electromagnetic Compatibility
EUROCAE	European Organisation for Civil Aviation Electronics
GMDSS	global maritime distress and safety system
GPS	global positioning system
HTS	high-throughput satellite
IACS	International Association of Classification Societies
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
IHO	International Hydrographic Organization
IMCO	Inter-Governmental Maritime Consultative Organization (now IMO)
IMO	International Maritime Organization (formerly IMCO)
ISO	International Organization for Standardization
ITU	International Telecommunication Union
ITU-R	ITU Radiocommunication Sector
LORAN	long range navigation system
NMEA	National Marine Electronics Association
SOLAS	International Convention for the Safety of Life at Sea
RTCM	Radio Technical Commission for Maritime Services
VDR	voyage data recorder
VSAT	very small aperture terminal

CIRM

The Comité International Radio-Maritime, or International Maritime Radio Committee, promotes use of electronic technology for shipping and the safety of life at sea, and fosters relations between all organizations concerned with electronic aids to marine navigation and marine radiocommunications.

CIRM was accorded consultative status by IMCO in 1961. It is also a Sector Member of ITU, and is a Liaison Member both of ISO and of IEC.

CIRM provides the Secretary of IEC Technical Committee 80 under an agreement with the British Standards Institute.

IMO

The International Maritime Organization, founded in 1948, is a specialized agency of the United Nations with headquarters in London and known until 1982 as the Inter-Governmental Maritime Consultative Organization (IMCO). It is a technical organization consisting of member states which has drafted some 40 conventions and 800 supporting resolutions.

ISO

At the International Organization for Standardization, TC 8 deals with ships and marine technology and its subcommittee 6: Navigation and ship operations, has a liaison with IEC TC 80.

ISO TC 8 standards which complement the work of IEC TC 80, or have been produced jointly, include the following:

- Magnetic compass (ISO 25862)
- Ship's bridge layout (ISO 8468)
- Gyro-compass (ISO 8728, ISO 16328)
- Radar reflector (ISO 8729)
- Echo sounder (ISO 9875)
- Heading controller (ISO 11674, ISO 16329)
- Night vision (ISO 16273)
- Searchlight (ISO 17884)
- Transmitting heading devices (ISO 22090)
- Rate of turn indicators (ISO 20672)
- Rudder indicators (ISO 20673)
- Propeller indicators (ISO 22554, ISO 22555)
- Signalling lamps (ISO 25861)
- Wind vane (ISO 10596)
- Sound reception systems (ISO 14859)
- Electronic inclinometers (ISO 19697)

Taking a step back in time

The origins of IEC Technical Committee 80 date from the 1970s when electromechanical instruments started to be replaced by electronic instruments. In 1978 the IEC set up a working group to propose a possible work programme on “advanced navigational instruments”. The preferred approach was what today would be called “multi-modal” covering land, sea and air applications and the concept envisaged for navigation included related aspects of radiocommunications. Experts from France, Germany, Japan and Norway formed the working group with contributions from:

- CCIR, now ITU-R
- CIRM
- IALA
- IMCO, now IMO
- EUROCAE
- ISO

The working group identified a need for standards for instruments used on ships and possibly aircraft, noted the complex interrelations between IMCO, EUROCAE and ISO and centres of expertise existing within IEC, particularly in IEC TC 18: Electrical installations of ships and of mobile and fixed offshore units, and the CISPR.

The newly formed Technical Committee 80 held its first meeting in June 1980 in Stockholm with delegates from China, France, Germany, Japan, the Netherlands, Sweden, UK, US, Yugoslavia and observers from TC 18 and CIRM. The top priority task identified was standards to support the carriage requirements of the then new SOLAS 1974, particularly ARPA. TC 80 subsequently specialized into the activity of maritime instruments and today supports some 45 standards.

New electronic and digital systems

One of the fundamental trends in the maritime industry over the past decades has been an increasing reliance on electrical and electronic technologies for navigating and communicating. The bridge of a merchant ship now comprises a console of electronic instruments to assist the watch officer in navigating the vessel. Many of these instruments are found on fishing vessels and even small vessels used for pleasure purposes.

TC 80 produces operational and performance requirements together with test methods for maritime navigation and radiocommunication equipment and systems.

The committee provides industry with standards that are also accepted by governments as suitable for type approval where this is required by the IMO's SOLAS Convention. TC 80 does this by ensuring that it includes representatives from industry, users, governments and test certification bodies. There are currently 19 participating national members in the committee and liaisons with all the major international maritime bodies.

The committee work programme is associated with that of IMO by mirroring the performance standards adopted by IMO in its resolutions, with associated relevant ITU recommendations.

TC 80 standards support IMO resolutions and non-SOLAS and shore applications. Its scope is "to prepare standards for maritime navigation and radiocommunication equipment and systems, making use of electrotechnical, electronic, electroacoustic, electro-optical and data processing techniques for use on ships and where appropriate on shore".

By being represented in both IMO and ITU, TC 80 can contribute to the performance and technical content of the resolutions and recommendations. This is invaluable to industry, in that the performance and technical standards represent the practical state of current and emerging technology.

Key international standards

When IEC TC 80 was formed there were 20 classification societies, together with IACS, numerous statutory authorities, regional standards bodies and IMCO – all with different ideas on what the general requirements should be for equipment to be used on ships. It quickly became clear that general requirements interrelated environmental issues with other issues concerning the design of the equipment, its power supplies, EMC and safety.

In 1991 IMO, when discussing the changes which would arise with the introduction of the GMDSS, noted that in the future, radio equipment would be installed on the bridge alongside the navigation equipment instead of in a special radio room as hitherto and TC 80 standards subsequently took this into account.

Having attained consensus in IMO for the requirements for equipment used on the bridge of a ship, discussions began with classification societies, with IEC TC 18 and with ISO to align all their general requirements. This resulted in the third edition of IEC 60945 in 1996 which is the industry standard on this subject. This edition also introduced new requirements for software, reflecting the technological changes taking place in equipment design.

The fourth edition of IEC 60945 appeared in 2002 which extended the detail of operational tests, particularly for equipment which is operated through software menus, to reflect the importance given by IMO to human factors. The EMC tests were also extended to contain the increasing problems experienced by the use of ever more electronic equipment on a ship.

The work on general requirements was extended in 2008 by the publication of IEC 62288. This standard harmonizes the requirements for the presentation of navigation-related information on the bridge of a ship to ensure that all navigational displays adopt a consistent human-machine interface philosophy and implementation. The standard also provides standardized symbology and terminology.

Further work in IMO identified a compelling user need for yet greater standardization to enhance usability across navigation equipment and systems. Significant variation between systems and equipment produced by different manufacturers was leading to inconsistency in the way essential information was presented, understood and used to perform key navigation safety functions. IMO subsequently developed a standardized mode of operation, known as S-Mode. S-Mode provides users with more timely access to essential information and functions that support safe navigation and achieves a reduction in the time needed for seafarers to become familiar with a variety of electronic navigation equipment. IEC 62288 has been revised to incorporate this work.

Fact

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One of the fundamental trends is an increasing reliance on electrical and electronic technologies for navigating and communicating.

Interface standards and cyber security

Interest in standard interfaces to enable navigation equipment to communicate was developed in the 1970s. During this decade, CIRM took an interest in standards for gyro-compasses, NMEA focused on the use of LORAN for controlling an autopilot and, later, IMO became involved during the development of the GMDSS.

By the mid-1980s, the interface issue looked like it might polarize into two areas: exchange of navigational information and exchange of radiocommunication information. TC 80 helped to resolve this potential problem by developing standards suitable for all information exchange in the IEC 61162 series which today contains the accepted industry standards.

The interest now is in networking all the bridge instruments and TC 80 has produced a standard, IEC 61162-450, for Ethernet connection. The network of bridge instruments is able to share all the available information which assists in checking the validity of the information and assists in decision making. With an increasing awareness of the need to incorporate cyber security, a companion standard, IEC 61162-460, has been produced dealing with safety and security in networks.

IHO has recently developed a universal hydrographic data model, known as S-100, which provides a hydrographic geospatial data standard that can support a wide variety of hydrographic-related digital data sources, and is aligned with international geospatial standards, in particular the ISO 19100 series. This enables the development of new applications that go beyond the scope of traditional hydrography as used in ECDIS. TC 80 is commencing work on a new series of interface standards, IEC 63173, which will adopt the IHO Geospatial Information Registry. The first part will concern the exchange of route information, a route being

the core element of a ship's voyage plan. The exchange of routes between ship to ship and ship to shore will facilitate just-in-time operations by enabling stakeholders and service providers to be efficiently organized for handling vessel movements, port resources, and hinterland connections. The second part will concern secure exchange and communication of S-100-based products which will provide a protection scheme for the information exchange and enable standardized service exchange of information for maritime services such as route plans, chart updates and navigational warnings.

TC 80 has produced standards for all the equipment which is required by the SOLAS Convention to be carried on the bridge of a ship. This includes the AIS, the ECDIS, the VDR, the radio installation and the radar.

Where appropriate, such as in the case of the AIS, TC 80 has also produced standards for equipment intended to be used on small vessels which has to interwork with the SOLAS equipment and also for supporting shore-based equipment.

Bridge alert management

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A problem that has arisen with more electronic equipment on ships has been an ever-increasing number of alarms generated when there is a malfunction of equipment. Position information, for instance, is used by virtually all the bridge instruments so a failure of the GPS receiver providing position causes all the instruments to sound an alarm. TC 80 has produced a new series of standards, IEC 62923, which define a rationalized system of BAM. This will enable alerts to be grouped if they are of a related source and classified according to the risk they pose to the safety of the ship.

Cyber security

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Ships have traditionally had limited communication capability with shore networks but this is changing with the availability of HTSs with VSATs which is bringing broadband connectivity to ships. Many ship owners are finding that they have to provide broadband connection to retain crew members who wish to maintain social contact with their families. The broadband connections are then available for other purposes. Attractive uses are updating of electronic charts, exchange of ship route information and shore surveillance of the ship machinery for remote maintenance. This, however, brings the risk of computer viruses entering ship networks. TC 80 has developed IEC 61162-460 for the protection of ship networks and is now extending this work in a new standard, IEC 63154, to provide a basic level of protection against cyber incidents for all ship bridge equipment.

Current publications

IEC publication	IMO resolution	Title
IEC 60945:2002 Ed. 4.0	A.694(17)	Maritime navigation and radiocommunication equipment and systems – General requirements – Methods of testing and required test results
IEC 61023:2007 Ed. 3.0	MSC.96(72)	Maritime navigation and radiocommunication equipment and systems – Marine speed and distance measuring equipment (SDME) – Performance requirements, methods of testing and required test results
IEC 61097-1:2007 Ed. 2.0	A.802(19) amended by MSC.247(83)	Global maritime distress and safety system (GMDSS) – Part 1: Radar transponder – Marine search and rescue (SART) – Operational and performance requirements, methods of testing and required test results
IEC 61097-2:2008 Ed. 3.0	A.810(19) amended by MSC.56(66) and MSC.120(74)	Global maritime distress and safety system (GMDSS) – Part 2: COSPAS-SARSAT EPIRB – Satellite emergency position indicating radio beacon operating on 406 MHz – Operational and performance requirements, methods of testing and required test results
IEC 61097-3:2017 Ed. 2.0	A.803(19), A.804(19), A.806(19) amended by MSC.68(68)	Global maritime distress and safety system (GMDSS) – Part 3: Digital selective calling (DSC) equipment – Operational and performance requirements, methods of testing and required testing results
IEC 61097-4:2019 Ed. 3.2	A.807(19) amended MSC.68(68) Annex 4, MSC.263(84), MSC.306(87), MSC.431(98)	Global maritime distress and safety system (GMDSS) – Part 4: INMARSAT-C ship earth station and INMARSAT enhanced group call (EGC) equipment – Operational and performance requirements, methods of testing and required test results
IEC 61097-6:2019 Ed.2.2	MSC.148(77), MSC.430(98)	Global maritime distress and safety system (GMDSS) – Part 6: Narrowband direct-printing telegraph equipment for the reception of navigational and meteorological warnings and urgent information to ships (NAVTEX)
IEC 61097-7:2018 Ed. 1.1	A.803(19) amended MSC.68(68) Annex 1	Global maritime distress and safety system (GMDSS) – Part 7: Shipborne VHF radiotelephone transmitter and receiver – Operational and performance requirements, methods of testing and required test results
IEC 61097-8:1998 Ed. 1.0	A.803(19), A.804(19), A.806(19)	Global maritime distress and safety system (GMDSS) – Part 8: Shipborne watchkeeping receivers for the reception of digital selective calling (DSC) in the maritime MF, MF/HF and VHF bands – Operational and performance requirements, methods of testing and required test results
IEC 61097-9:1997 Ed. 1.0	A.806(19) amended MSC.68(68) Annex 3	Global maritime distress and safety system (GMDSS) – Part 9: Shipborne transmitters and receivers for use in the MF and HF bands suitable for telephony, digital selective calling (DSC) and narrow band direct printing (NBDP) – Operational and performance requirements, methods of testing and required test results
IEC 61097-12:2017 Ed. 1.1	A.809(19)	Global maritime distress and safety system (GMDSS) – Part 12: Survival craft portable two-way VHF radiotelephone apparatus – Operational and performance requirements, methods of testing and required test results

IEC 61097-13:2003 Ed 1.0	MSC.130(75)	Global maritime distress and safety system (GMDSS) – Part 13: Inmarsat F77 ship earth station equipment – Operational and performance requirements, methods of testing and required test results
IEC 61097-14:2010 Ed 1.0	MSC.246(83)	Global maritime distress and safety system (GMDSS) – Part 14: AIS search and rescue transmitter (AIS-SART) – Operational and performance requirements, methods of testing and required test results
IEC 61097-15:2012 Ed 1.0	MSC.130(75)	Global maritime distress and safety system (GMDSS) – Part 15: Inmarsat FB500 ship earth station – Operational and performance requirements, methods of testing and required test results
IEC 61097-16:2019 Ed 1.0	MSC.434(98)	Global maritime distress and safety system (GMDSS) – Part 16: Ship earth stations operating in mobile-satellite systems recognized for use in the GMDSS – Operational and performance requirements, methods of testing and required test results
IEC 61108-1:2003 Ed. 2.0	MSC.112(73)	Maritime navigation and radiocommunication equipment and systems – Global navigation satellite systems (GNSS) – Part 1: Global positioning system (GPS) – Receiver equipment – Performance standards, methods of testing and required test results
IEC 61108-2:1998 Ed. 1.0	MSC.113(73)	Maritime navigation and radiocommunication equipment and systems – Global navigation satellite systems (GNSS) – Part 2: Global navigation satellite system (GLONASS) – Receiver equipment – Performance standards, methods of testing and required test results
IEC 61108-3:2010 Ed. 1.0	MSC.233(82)	Maritime navigation and radiocommunication equipment and systems – Globalnavigation satellite systems (GNSS) – Part 3: Galileo receiver equipment – Performance requirements, methods of testing and required test results
IEC 61108-4:2004 Ed. 1.0	MSC.114(73)	Maritime navigation and radiocommunication equipment and systems – Global navigation satellite systems (GNSS) – Part 4: Shipborne DGPS and DGLONASS maritime radio beacon receiver equipment – Performance requirements, methods of testing and required test results
IEC 61162-1:2016 Ed. 5.0		Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 1: Single talker and multiple listeners
IEC 61162-2:1998 Ed. 1.0		Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 2: Single talker and multiple listeners, high-speed transmission
IEC 61162-3:2014 Ed.1.2		Maritime navigation and radiocommunication equipment and systems – Digital interfaces - Part 3: Serial data instrument network
IEC 61162-450:2018 Ed. 2.0		Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 450: Multiple talkers and multiple listeners – Ethernet interconnection
IEC 61162-460:2018 Ed. 2.0		Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 460: Multiple talkers and multiple listeners – Ethernet interconnection – Safety and security
IEC 61174:2015 Ed. 4.0	MSC.232(82)	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 61924-2:2012 Ed. 1.0	MSC.252(88)	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 publication	IMO resolution	Title
IEC 61993-2:2018 Ed. 3.0	MSC.74(69) Annex 3	Maritime navigation and radiocommunication equipment and systems – Automatic identification systems (AIS) – Part 2: Class A shipborne equipment of the universal automatic identification system (AIS) – Operational and performance requirements, methods of test and required test results
IEC 61996-1:2013 Ed. 2.0	MSC.333(90)	Maritime navigation and radiocommunication equipment and systems – Shipborne voyage data recorder (VDR) – Part 1: Voyage data recorder (VDR) – Performance requirements, methods of testing and required test results
IEC 61996-2:2007 Ed. 2.0	MSC.163(78) amended by MSC.214(81)	Maritime navigation and radiocommunication equipment and systems – Shipborne voyage data recorder (VDR) – Part 2: Simplified voyage data recorder (S-VDR) – Performance requirements, methods of testing and required test results
IEC 62065:2014 Ed. 2.0	MSC.74(69) Annex 2	Maritime navigation and radiocommunication equipment and systems – Track control systems – Operational and performance requirements, methods of testing and required test results
IEC 62238:2003 Ed. 1.0		Maritime navigation and radiocommunication equipment and systems – VHF radiotelephone equipment incorporating Class "D" Digital Selective Calling (DSC) – Methods of testing and required test results
IEC 62287-1:2017 Ed. 3.0		Maritime navigation and radiocommunication equipment and systems – Class B shipborne equipment of the automatic identification system (AIS) – Part 1: Carrier-sense time division multiple access (CSTDMA) techniques
IEC 62287-2:2017 Ed. 2.0		Maritime navigation and radiocommunication equipment and systems – Class B shipborne equipment of the automatic identification system (AIS) – Part 2: Self-organizing time division multiple access (SOTDMA) techniques
IEC 62288:2014 Ed. 2.0	MSC.191(79)	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 62320-1:2015 Ed. 2.0		Maritime navigation and radiocommunication equipment and systems – Automatic identification system (AIS) – Part 1: AIS Base Stations – Minimum operational and performance requirements, methods of testing and required test results
IEC 62320-2:2016 Ed. 2.0		Maritime navigation and radiocommunication equipment and systems – Automatic identification system (AIS) – Part 2: AIS AtoN Stations – Operational and performance requirements, methods of testing and required test results
IEC 62320-3:2015 Ed. 1.0		Maritime navigation and radiocommunication equipment and systems – Automatic identification system (AIS) – Part 3: Repeater stations – Operational and performance requirements, methods of testing and required test results
IEC 62388:2013 Ed. 2.0	MSC.192(79)	Maritime navigation and radiocommunication equipment and systems – Shipborne radar – Performance requirements, methods of testing and required test results
IEC 62616:2010 Ed. 1.0	MSC.128(75)	Maritime navigation and radiocommunication equipment and systems – Bridge navigational watch alarm system (BNWAS)

IEC 62729:2012 Ed. 1.0	MSC.263(84), SOLAS V/19-1	Maritime navigation and radiocommunication equipment and systems – Shipborne equipment for long-range identification and tracking (LRIT) – Performance requirements
IEC 62923-1:2018 Ed. 1.0	MSC.302(87)	Maritime navigation and radiocommunication equipment and systems – Bridge alert management – Part 1: Operational and performance requirements, methods of testing and required test results
IEC 62923-2:2018 Ed. 1.0	MSC.302(87)	Maritime navigation and radiocommunication equipment and systems – Bridge alert management – Part 2: Alert and cluster identifiers and other additional features
IEC 62940:2016 Ed. 1.0		Maritime navigation and radiocommunication equipment and systems – Integrated communication system (ICS) – Operational and performance requirements, methods of testing and required test results
IEC PAS 63062:2016 Ed. 1.0		Maritime navigation and radiocommunication equipment and systems – Removable external data source (REDS) – General requirements, methods of testing and required test results
IEC 63135:2018 Ed. 1.0		Maritime navigation and radiocommunication equipment and systems – Automatic identification systems (AIS) – SAR airborne equipment – Operational and performance requirements, methods of test and required test results

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The IEC provides a worldwide, neutral and independent platform where 20 000 experts from the private and public sectors cooperate to develop state-of-the-art, globally relevant IEC International Standards. These form the basis for testing and certification, and support economic development, protecting people and the environment.

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Key figures

173
members and affiliates

>200
technical committees

20 000
experts from industry, test and research labs, government, academia and consumer groups

>10 000
international standards published

4
global conformity assessment systems

>1 million
conformity assessment certificates issued

>100
years of expertise

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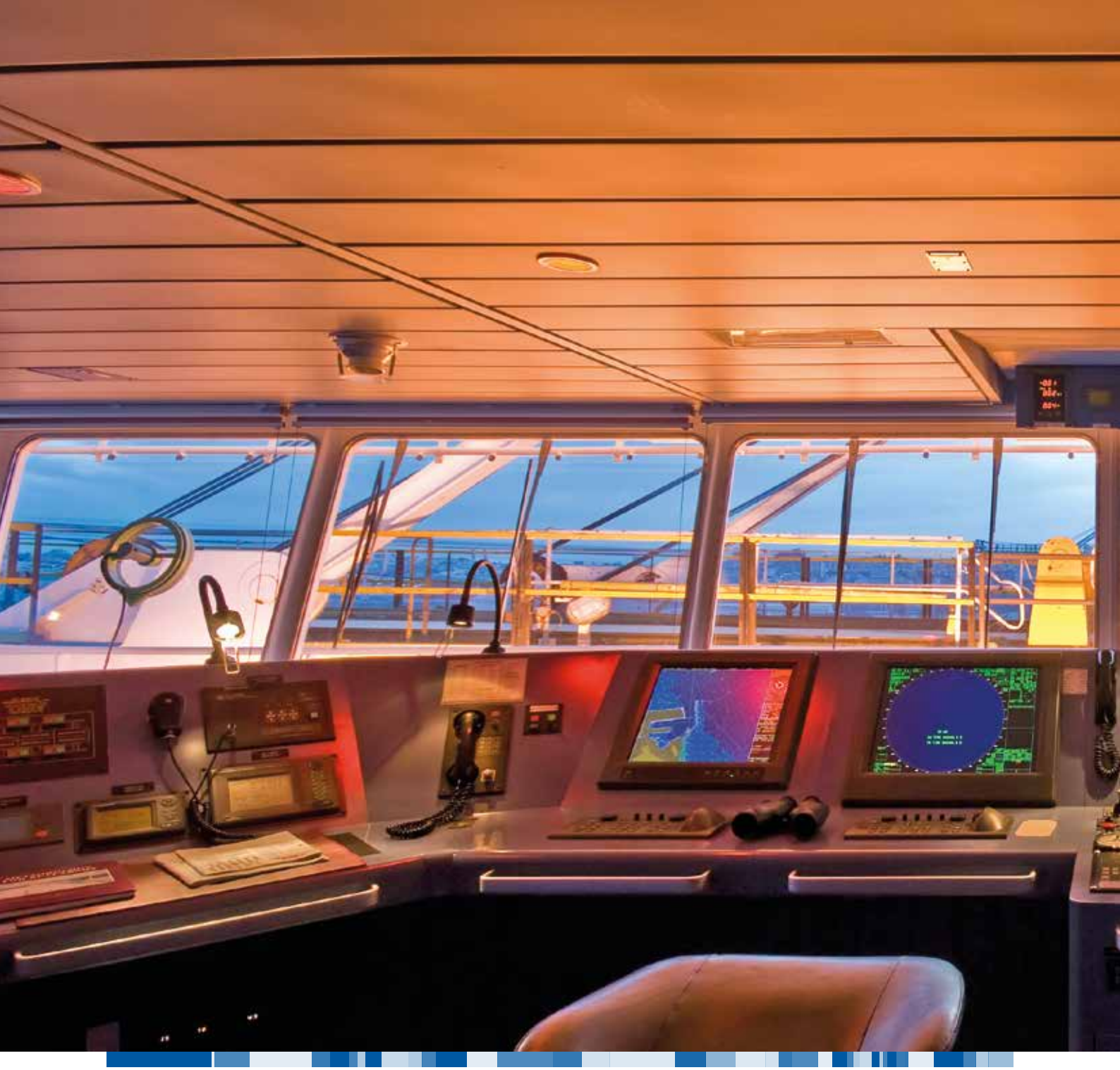

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