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Maritime navigation and radiocommunication equipment and systems – Part 1: Shipborne automatic transponder system installation using VHF digital selective calling (DSC) techniques – Operational and performance requirements, methods of testing and required test results

Matériels et systèmes de navigation et de radiocommunication maritimes – Partie 1: Installation de systèmes de répondeur automatique de bord de navires utilisant des techniques d'appel sélectif numérique en ondes métriques – Exigences d'exploitation et de fonctionnement, méthodes d'essai et résultats d'essai exigés

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS –

Part 1: Shipborne automatic transponder system installation using VHF digital selective calling (DSC) techniques – Operational and performance requirements, methods of testing and required test results

FOREWORD

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International Standard IEC 61993-1 has been prepared by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems.

This bilingual version (2013-01) corresponds to the monolingual English version, published in 1999-04.

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

FDIS	Report on voting
80/212/FDIS	80/222/RVD

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

The French version of this standard has not been voted upon.

Annex B is an integral part of the standard.

Annexes A and C are for information only.

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INTRODUCTION

In 1995 the IMO instigated work on the development of performance standards for a shipborne automatic identification system (AIS) using VHF digital selective calling (DSC) techniques.

These performance standards were developed into a draft resolution which was expected to be adopted by the IMO Maritime Safety Committee. However, there were objections to this on the grounds that some requirements for AIS were not met by the draft resolution.

The outcome has been that IMO has now developed further performance standards for a "Universal AIS" as a resolution which was adopted by the IMO Maritime Safety Committee in May 1998 as MSC. 74(69) annex 3.

During this period, some countries have gone ahead and implemented operational systems based upon the original IMO draft performance standards for AIS. There is therefore a need for a technical testing standard for such equipment.

At their plenary meeting in September 1997, technical committee 80 came to the following decisions:

– a draft technical standard which had been prepared on the basis of the original IMO performance standards would go ahead with the reference 61993-1, but would not directly refer to any IMO resolution for AIS;

– work would commence at the earliest opportunity on preparing a technical standard for a "Universal AIS" based rigorously upon the IMO resolution MSC.74(69) and a new recommendation ITU-R M.1371. This standard would have the reference 61993-2.

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MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS –

Part 1: Shipborne automatic transponder system installation using VHF digital selective calling (DSC) techniques – Operational and performance requirements, methods of testing and required test results

1 Scope

This part of IEC 61993 specifies the performance requirements, technical characteristics, operational requirements, methods of testing and required test results for shipborne automatic transponder system installations using VHF digital selective calling (DSC) techniques and is associated with IEC 60945. When a requirement in this standard is different from IEC 60945, the requirement in this standard shall take precedence.

The shipborne transponder installation is intended to assist in the efficient operation of ship-reporting systems and vessel traffic services (VTS) by enabling operators to identify, poll and automatically locate and track ships when they are approaching, entering and sailing within the limits of a ship-reporting system.

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The system may also be used for the identification of ships by a ship and ships by aircraft. A description of the system is given in annex C.

This standard

- incorporates the technical characteristics included in ITU-R Recommendation M.825 for transponder systems using DSC and the technical characteristics included in ITU-R Recommendation M.489 for VHF radiotelephone equipment;
- incorporates the technical characteristics of DSC equipment and the operational procedures for its use contained in Recommendations ITU-R M.493 and ITU-R M.541;
- incorporates applicable parts of the performance standards of IMO Resolution A.803 for shipborne VHF radio installations;
- takes account of IMO Resolution A.694 for general requirements; and
- conforms with the International Telecommunication Union (ITU) Radio Regulations where applicable.

This standard for a transponder system is not intended to meet the requirements for a universal automatic identification system (AIS), as detailed in IMO Resolution MSC.74(69) annex 3.

NOTE All text in this standard whose meaning complies with that in the normative references, namely IMO Resolution A.803(19) and ITU-R Recommendations M.825, M.489, M.493 and M.541 is followed by a reference to the source (number of IMO Resolution or ITU-R Recommendation and paragraph number) in brackets.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 61993. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However parties to agreements based on this part of IEC 61993 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative documents referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60945:1996, *Maritime navigation and radiocommunication equipment and systems – General requirements, methods of testing and required test results*

IEC 61097-3:1994, *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 61097-7:1996, *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 61162 (all parts), *Maritime navigation and radiocommunicaation equipment and systems – Digital interfaces*

IMO International Convention for Safety of Life at Sea (SOLAS) 1974, as amended

IMO Resolution A.694:1991, *General requirements for shipborne radio equipment forming part of the global maritime distress and safety system (GMDSS) and for electronic navigational aids*

IMO Resolution A.803:1995, *Performance standards for shipborne VHF radio installations capable of voice communication and digital selective calling*

IMO MSC.74(69):1998, *annex 3 – Performance standards for an Universal shipborne automatic identification system (AIS)*

ITU Radio Regulations:1997

ITU-R Recommendation M.489-2:1995, *Technical characteristics of VHF radiotelephone equipment operating in the maritime mobile service in channels spaced by 25 kHz*

ITU-R Recommendation M.493-9:1997, *Digital selective-calling system for use in the maritime mobile service*

ITU-R Recommendation M.541-8:1997, *Operational procedures for the use of digital selective calling (DSC) equipment in the maritime mobile service*

ITU-R Recommendation M.825-2:1997, *Characteristics of a transponder system using digital selective-calling techniques for use with vessel traffic services and ship-to-ship identification*

ITU-R Recommendation M.1371:1998, *Technical characteristics for a universal shipborne automatic identification system using time division multiple access in the VHF maritime mobile band*

ITU-T Recommendation V.11:1996, *Electrical characteristics for balanced double-current interchange circuits operating at data signalling rates up to 10 Mbit/s*

ITU-T Recommendation V.24:1996, *List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE)*

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ITU-T Recommendation V.28:1993, *Electrical characteristics for unbalanced double-current interchange circuits*

3 Definitions and abbreviations

3.1 Definitions

For the purpose of this standard, the following definitions apply.

3.1.1
status
navigational status of the ship as expressed by the second digit 1-7 of the two-digit symbols to indicate other ships (table 3 of Recommendation ITU-R M.825)

3.1.2
performance check
quick test under normal test conditions of the transmitter frequency error to 13.1, the transmitter output power to 13.2 (high power only) and the receiver calling sensitivity to 14.1, with standard test signal number 2 applied at a level of +12 dBμV. For results required, see 9.1.2

3.1.3
sensor
device which provides information to the system such as position, course and speed

3.2 Abbreviations

BER	Bit error rate
DCE	Data circuit-terminating equipment
DSC	Digital selective calling
DTE	Data terminal equipment
ECDIS	Electronic chart display and information system
EMC	Electromagnetic compatibility
e.m.f.	Electromotive force
EUT	Equipment under test
GMDSS	Global maritime distress and safety system
GPS	Global positioning system
IEC	International Electrotechnical Commission
IMO	International Maritime Organization
ITU	International Telecommunication Union
ITU-R	ITU Radiocommunication sector (formerly CCIR)
ITU-T	ITU Standardization sector (formerly CCITT)
MMSI	Maritime mobile service identity
p.t.t.	press-to-transmit
r.m.s.	root-mean-square
SOLAS	Safety of Life at Sea (International convention for the)
UTC	Universal time co-ordinated
VHF	Very high frequency
VTS	Vessel traffic services

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4 General requirements

4.1 General

4.1.1 Requirements contained in clause 4 cannot be verified by repeatable measurements. The manufacturer shall declare that compliance to these requirements is achieved and shall provide relevant documentation. The declaration(s), documentation and, when necessary, the equipment shall be checked.

4.1.2 The system shall have a high level of availability, shall enable operators to obtain information from the ship automatically, whenever practicable, and require a minimum of involvement of ship's personnel, thus reducing the burden of communication on board ships.

4.1.3 The system installation, in addition to meeting the requirements of the Radio Regulations, the relevant ITU-R recommendations [1)] and the general requirements set out in IMO A.694, as detailed in IEC 60945, shall comply with the following requirements and the requirements contained in clauses 5 and 6 of this standard.

4.2 Composition

4.2.1 The installation shall comprise of at least

– a transmitter/receiver including antenna;
– a digital selective calling facility;
– a dedicated DSC watchkeeping facility to maintain watch on the designated calling frequency except during periods when the installation is required to operate on working channels in accordance with instructions from shore-based stations;
– an electronic position-fixing system capable of providing horizontal accuracy of 100 m (95 %);
– means to input and receive information;
– means for the automatic change to a working channel on request of the shore-based interrogating station.

4.2.2 The manufacturer shall declare the composition of the equipment and also the relevant category to IEC 60945 for each unit.

4.3 Design and construction

4.3.1 The installation shall operate continuously while underway or at anchor. The equipment shall be designed for continuous operation.

4.3.2 The system functions may be performed by separate units appropriately interconnected or be integrated with a radio transmitter and/or receiver.

NOTE "Integrated" means that the system function is physically integrated into a radio transmitter and/or receiver so that the system functions can only be tested by RF measurements.

4.4 Controls and indicators

4.4.1 The installation shall be provided with visual indication to show

– the equipment is switched on;
– the transponder function is disabled;
– the equipment is being interrogated; and
– the equipment is transmitting;
– loss of external data.

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1) Recommendations ITU-R M.825, M.493, M.541

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4.5 Interfacing

4.5.1 To enable a user display of information for example at a radar or ECDIS, the system shall be provided with a serial interface conforming to IEC 61162.

4.5.2 Interfaces for external sensors providing data for the system shall conform to IEC 61162.

4.5.3 As a minimum, the system shall be capable of operating with the sentences GGA, GLL, VBW, VTG, DSI, and DSR of IEC 61162.

4.5.4 When the installation comprises an external watch receiver, input terminals for AF, or alternatively DSC signals at logic level, the interfaces shall be as follows.

4.5.4.1 AF terminals for DSC signals shall have input and output impedance of 600 Ω, symmetrical and free of earth, with a closed-circuit level adjustable to 0,775 V (r.m.s.) ± 10 dB for connection to AF terminals of external radio equipment.

4.5.4.2 Alternatively, terminals for DSC signals at logic levels shall have the electrical characteristics compatible with Recommendation ITU-T V.11. The B-state shall be the logic "0", and the Y-state shall be the logic "1".

4.5.4.3 Additionally, terminals for DSC signals may be provided with characteristics as defined in ITU-T Recommendations V.24 and V.28.

4.6 Permissible warming-up period

The installation shall be operational within 1 min of switching on.

NOTE Sensors used with the system shall meet the requirements of their individual product standards (for example, IEC 61108-1 for GPS which permits 30 min to operation when there is no valid almanac data available).

5 Performance requirements

5.1 General

5.1.1 The system shall provide for calls of the category safety using DSC. (825/6.1)

5.1.2 Means shall be provided to automatically record all periods when the installation is non-functioning. It shall not be possible for the user to alter any information recorded by this device.

5.1.3 The last 10 times when the equipment is non-functioning for more than 15 min shall be recorded in UTC time and duration in a non-volatile memory. Means shall be provided to recover this data.

5.1.4 The installation shall be capable of receiving and processing all calls transmitted by an interrogating station.

5.1.5 The installation may not be required to process DSC type calls which are not AIS calls; however, such calls shall not affect correct system operation.

5.1.6 The installation shall be capable of operating on single-frequency channels or on single- or two-frequency channels.

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5.1.7 The installation shall be capable of automatically transmitting a response. An automatic response shall be transmitted to any interrogation containing one or more of the symbols 101, 102, 103, 108, 109, 111, 112 and 116.

5.1.8 When an automatic response is required but the requested information is not available, the relevant symbol shall be followed by the symbol 126. Symbol 126 shall also be transmitted for null-fields in the DSI sentence of IEC 61162.

5.2 Compatibility

5.2.1 Where the installation is combined with other VHF installations, in accordance with ITU Radio Regulations Article 61, interrogating transmissions shall have priority over all communications other than those of a higher priority as prescribed in that article. Facilities shall be provided to disable the installation for communications of higher priority.

5.2.2 Such facilities shall be adequately protected from inadvertent operation and the times of disabling recorded in conformity with 5.1.2. Continuous watch on the designated calling frequency (Channel 70) shall be maintained irrespective of the frequency being used for communications by the installation.

5.2.3 In a combined installation, the system is permitted to operate the transmitter for the duration of a DSC call for system purposes provided that after the transmission the VHF installation returns automatically to its previous settings. Interrogations containing symbol number 101 to table 4 of Recommendation ITU-R M.825 shall cause the system to respond on the VHF channel indicated for any following symbols in the interrogating message. The system shall then return to channel 70 operation. If symbol number 101 is followed by symbol number 102, all subsequent position reports shall be made on the indicated VHF channel. These position reports will not normally be acknowledged by the originator of the request.

5.3 Identification

For the purpose of ship identification, the appropriate MMSI shall be used.

6 Operational requirements

6.1 Ship-shore identification

6.1.1 To enable shore-based authorities to identify the ship, the following information, which it shall not be possible for the user to change, shall be programmed in a secure manner into the installation:

– ship's MMSI;

– ship's name (symbol number 115 to table 4 of ITU-R M.825);

– ship's length (symbol number 124 to table 4 of ITU-R M.825); and

– type of ship (symbols numbers 50-55, 58, 59, 69, 79, 89 and 99 to table 3 of ITU-R M.825).

6.1.2 The following information shall be programmed into the installation automatically, either from integral equipment or from suitable sensor sources:

– ship's position (symbol number 100 to table 4 of ITU-R M.825);

– course of ship over ground (symbol number 119 to table 4 of ITU-R M.825); and

– speed of ship over ground (symbol number 120 to table 4 of Recommendation ITU-R M.825).

NOTE Where external sensors are used, these shall be protected against de-activation by the user.

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6.1.3 Facilities shall be provided to enable the user to readily programme additional information into the installation in accordance with the relevant ITU-R Recommendation [2)].

6.1.4 The additional information shall include at least

– draught (symbol number 123 to table 4 of ITU-R M.825);
– next port of call (symbol number 121 to table 4 of ITU-R M.825);
– destination (symbol number 114 to table 4 of ITU-R M.825);
– entering or leaving VTS (symbols numbers 105 and 107 to table 4 of ITU-R M.825); and
– status (applicable second digit 1-7 of symbols to indicate other ships to table 3 of ITU-R M.825).

6.1.5 Where facilities to programme additional information are not integral to the system they shall be provided to the installation via a serial interface complying to IEC 61162.

6.2 Ship-ship identification

6.2.1 For ship-to-ship identification purposes, the installation shall not allow the user to transmit interrogation messages addressed to a group of ships other than to a numerical geographic address no larger than 0,5 square nautical miles in area.

6.2.2 To enhance identification, the installation shall provide facilities to use other forms of address so as to add either course or ship type to the geographic address, in accordance with ITU-R M.825, in any interrogation message.

6.2.3 The installation shall permit the user to obtain, in addition to the ship's MMSI, the following information from addressed ships for identification purposes:

– position (symbol number 100 to table 4 of ITU-R M.825);
– course over ground (symbol number 119 to table 4 of ITU-R M.825);
– speed (symbol number 120 to table 4 of ITU-R M.825); and
– ship's name and call sign (symbol number 115 to table 4 of ITU-R M.825). (8.3)

6.2.4 It shall not be possible for the user to obtain additional information from other ships by use of the installation.

6.2.5 Means shall be provided to prevent more than three call attempts from the system in any period of 15 min.

6.2.6 Ship-to-ship interrogation shall be at low transmitting power, in the range of between 0,1 W and 1 W.

7 Technical requirements

7.1 Channel sensing

7.1.1 Provision shall be made for sensing the VHF channel 70 used for digital selective calling purposes to determine the presence of a signal, for automatically preventing the transmission of a transponder call until the channel is free.

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2) Recommendation ITU-R M.825

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