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I-01

NAVIGATIONAL WARNING RECEIVERS

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Foreword

CCS Product Inspection and Testing Guideline (hereinafter referred to as this Guideline) contains the technical requirements, inspection and testing criteria related to classification and statutory survey of marine products to be applied for CCS approval/inspection.

This Guideline frees the users to adopt other test methods and requirements which are equivalent to or are stricter than this Guideline.

This Guideline is published and updated by CCS, and is released at <http://www.ccs.org.cn>. Your comments or suggestions are welcomed and may be sent to our email addressed mp@ccs.org.cn.

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Main changes:

1. Add the relevant requirements of IMO resolution MSC.430 (98).
2. Update edition of IEC 61097-6 and update related content.
3. Update edition of IEC 60945.
4. Edit modifications and corrections.

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NAVIGATIONAL WARNING RECEIVERS

1 Scope of Application

This Guideline applies to the approval and inspection of navigational warning receivers used to receive navigational and meteorological warnings and urgent information.

2 Normative References

2.1 IMO MSC.148(77) Adoption of the Revised Performance Standards for Narrow-Band Direct-Printing Telegraph Equipment for the Reception of Navigational and Meteorological Warnings and Urgent Information to Ships (NAVTEX);

2.2 IMO MSC.430(98) Amendments to the Revised Performance Standards for Narrow-Band Direct-Printing Telegraph Equipment for the Reception of Navigational and Meteorological Warnings and Urgent Information to Ships (NAVTEX) (Resolution MSC.148(77));

2.3 IEC 61097-6:2005/AMD1:2011/AMD2:2019 Narrowband direct-printing telegraph equipment for the reception of navigational and meteorological warnings and urgent information to ships (NAVTEX);

2.4 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;

2.5 IEC 60945:2002/COR1:2008 Maritime navigation and radiocommunication equipment and systems - General requirements - Methods of testing and required test results.

3 Terms and Definitions

3.1 Navigational warning receiver is NAVTEX receiver, i.e. the radio equipment which is used to receive and at the same time automatically print and/or display maritime safety information regularly released by means of CEFC of Mode B in the specified NBDP format;

3.2 Navigational warning means the radio message including urgent information for safe navigation;

3.3 BAM means bridge alert management;

3.4 INS means integrated navigation system;

3.5 RTC means real time clock;

3.6 USB means universal serial bus;

3.7 UTC means universal time coordinated.

4 Drawings and Documents

4.1 The following drawings and documents shall be submitted to CCS for approval:

4.1.1 Technical specifications;

4.1.2 Drawing of overall size and structure (including arrangement of panel and backboard);

4.1.3 Schematic circuit diagram;

4.1.4 Type test outline.

4.2 The following drawings and documents shall be submitted to CCS for future reference:

4.2.1 Schematic block diagram;

4.2.2 Operation instructions for the products;

4.2.3 Drawing of external wiring.

5 Technical Requirements

5.1 A navigational warning receiver is to comprise radio receivers, a signal processor and either:

5.1.1 An integrated printer; or

5.1.2 A dedicated display device, printer output port and a non-volatile message memory; or

5.1.3 A connection to INS (complying with IEC 61162) and a non-volatile memory.

5.2 The degree of protective enclosure of navigational warning receivers is generally IP22 and where the degree IP22 is impractical due to the associated printer, at least IP20 is to be reached. The degree of protective enclosure of antennas is not to be lower than IP56.

5.3 Technical performance

5.3.1 The receiver is to be capable of automatically rejecting unwanted information using character B₁ of transmitters.

5.3.2 The receiver is to be capable of disabling printout, transmission to the INS port or display of selected types of messages using character B₂, with the exception of messages with B₂ characters A, B, D and L.

5.3.3 B₃B₄ is a two-character serial number for each B₂, starting from 01, except in special cases where the serial number 00 is used.

5.3.4 The printer or store is only to be activated if the preamble B₁B₂B₃B₄ is received without errors.

5.3.5 Facilities are to be provided to avoid printing, storage or display of the same message

several times on the same ship, when such a message has already been satisfactorily received.

5.3.6 A message is always to be printed, stored and displayed if $B_3B_4 = 00$ and if it is transmitted by a coast station that the equipment is programmed to select.

5.3.7 The characters ZCZC $B_1B_2B_3B_4$ need not be printed/displayed.

5.4 Reception of messages with character errors

5.4.1 Only satisfactorily received messages (for non-printing receivers) or message identifications (for printing receivers) are to be stored; a message is satisfactorily received if:

- (1) The character error rate is $\leq 4\%$; or
- (2) The received character error rate does not exceed 33% for more than 5 seconds.

5.4.2 Messages with character error rate of $> 4\%$ and $\leq 33\%$:

The receiver is to store the message (non-printing receivers) or message identification (printing receivers), but to allow the stored message/message identification to be replaced if it is subsequently received with lower error rate.

A receiver with an integral printer is to print the messages indicating a character error rate of $\leq 33\%$.

A receiver with an integral display is to display the messages indicating a character error rate of $\leq 33\%$.

5.4.3 Messages with character error rate of $> 33\%$:

The receiver is not to store or print such messages.

5.4.4 Calculation of character error rate:

The character error rate is to be calculated for each complete message. For example, a single error in a message of less than 100 characters is to result in a character error rate of 1%, and the character error rate is to be rounded up to the nearest integer.

5.5 Details of the coverage areas and message categories which have been excluded by the operator from reception and/or display are to be easily available.

It is to be possible to exclude at least four different message categories. It is not to be possible to exclude message categories A, B, D and L.

5.6 Programmable control memories

Information for location (B_1) and message (B_2) designators in programmable memories are to be permanently stored in non-volatile memory and are not to be erased by interruptions in the power supply of less than 6 h.

Default programmable settings:

All characters from A to Z (ABCDEF...UVWXYZ) for B₁;

Characters of ABCDEFHJKLVZ for B₂.

5.7 Alarms

5.7.1 The receipt of search and rescue information (B₂ = D) is to give an alarm at the position from which the ship is normally navigated. It is to be only possible to reset this alarm manually.

The receiver is to contain an integral alarm sounder or a pair of relay contacts for the provision of an external sounder.

If an additional alarm is provided at the equipment to indicate, for example, the reception of navigational and/or meteorological warnings, it is to be capable of being suppressed.

If an additional alarm is provided, it is to be distinguishable from a search and rescue alarm.

The audible volume of the alarm is to be 75 dBA to 85 dBA.

If a pair of relay contacts is provided to switch an external sounder on for an alarm condition, then the relay contacts are to be free of earth.

The alarm condition is to be reported via an ALR command on the INS serial port.

5.7.2 Using the ALR formatter

An ALR command is to be used to report the reception of a search and rescue alarm, navigational or meteorological warnings or to indicate a failure or malfunction that will reduce the integrity of the receiver.

Alarm messages are to be IEC 61162-1 compliant ALR sentences and are to contain the local alarm numbers and alarm text shown in Table 5.7.2.

Alarm Message Using ALR Sentence Formatter

Table 5.7.2

Alarm No.	Alarm message text
001	“NAVTEX: Navigational warning”
002	“NAVTEX: Meteorological warning”
003	“NAVTEX: Search and rescue information”
004	“NAVTEX: Receiver malfunction ” ^a
005	“NAVTEX: Built-in self-test failure ” ^b
006	“NAVTEX: General failure”
a The test may be extended to indicate which receiver has the malfunction. b The text may be extended to indicate the nature of the test failure.	

Note: Additional numbers may be used by the manufacturer for other purposes but are to be in the range 051-099.

5.7.3 Repetition of alarm conditions

Whilst any alarm conditions persist, the NAVTEX receiver is to repeat the appropriate ALR

sentences once every 30 s until acknowledged.

When all the alarm conditions are acknowledged (but still active), the NAVTEX receiver is to stop the output of any audible alarm indication (whether by integral sounder or by relay contacts) but is to continue to repeat the ALR sentences once every 30 s.

When the alarm condition has returned to “healthy”, an ALR sentence with the status set to “V” is to be sent out at one minute intervals.

When there are no active alarms, the NAVTEX receiver may send out a single ALR sentence with alarm number 006 and a status of “V” once every minute as an indication that all is well.

5.8 Testing facilities

The equipment is to be provided with a facility to test that the radio receiver, the display device/printer and non-volatile message memory are functioning correctly.

Equipment with a dedicated display is to include a visual or aural alert if a malfunction or general failure occurs.

5.9 Interfaces

5.9.1 The equipment is to include at least one interface for the transfer of received data to other navigation or communication equipment.

5.9.2 All interfaces provided for communication with other navigation or communication equipment are to comply with IEC 61162 series of standards.

As a minimum the equipment is to be capable of communicating with the sentences ACK, ALR, NRM and NRX with the electrical signal characteristics given in IEC 61162-1. The equipment is also to be capable of responding to query sentences as defined in IEC 61162-1 for the NRM and NRX sentences.

5.9.3 If there is no integrated printer, the equipment is to include a standard printer interface (for example an RS232, Centronics, USB interface, or other serial protocols and support for other printer types).

5.9.4 The equipment should include an interface for alert management in accordance with resolution MSC.302(87) on Performance standards for bridge alert management.

In addition to the sentences previously mentioned, the equipment shall be capable of communicating alert related information with the sentences ACN, ALC, ALF, ARC and HBT as described in IEC 61162-1.

5.10 Receivers

5.10.1 Number and frequencies of receivers

The equipment is to contain one receiver operating on the frequency prescribed by the Radio Regulations for the international NAVTEX system (518 kHz). The equipment is to contain at least a second receiver capable of working at the same time as the first one on at least two other frequencies (490 kHz (If used only in the domestic ships, the frequency can be 486 kHz) and 4209.5 kHz) recognized for the transmission of NAVTEX information. The first receiver is to have priority in the display or printing of received information. Printing or displaying of messages from one receiver is not to prevent reception by the other receiver. Where the second receiver can be switched between operating frequencies, this is to be done both manually and via the INS port.

5.10.2 Receiver sensitivity

The receiver sensitivity is to be such that for a source with an e.m.f. of 2 μ V in series with a non-reactive impedance of 50 Ω , the character error rate is less than 4%.

5.11 Display

5.11.1 If a display is included as part of the receiver, the following requirements are to be met:

- (1) There is to be a display mode that clearly shows B_1 and B_2 currently selected by the user for each receiver;
- (2) There are to be controls for adjusting the display illumination and contrast settings;
- (3) There is to be an indication of which receiver(s) are currently receiving;
- (4) New search and rescue (SAR) messages are to be displayed immediately that they are received and stored, and are to cause an alarm to be set. SAR messages are to be displayed until they are acknowledged by the cancellation of the alarm;
- (5) The reception and storage of new messages other than SAR messages are to be clearly indicated to the user by a method declared by the manufacturer; and

(6) It is to be possible to select transmitter coverage area (B₁) and message types (B₂) independently for message storage to non-volatile memory, for message output to the INS port and for message output to the printer port.

5.11.2 The display device is to be able to display a minimum of 32 characters per line.

5.11.3 The display device is to be able to display at least 16 lines of message text.

5.11.4 If a dedicated display device is used, the following requirements are to be met:

(1) An indication of newly received selected messages is to be immediately displayed until acknowledged or until 24 h after receipt;

(2) Newly received selected messages are also to be capable of being displayed; and

(3) Stored messages are to be capable of being displayed and searchable by B₁ and B₂.

5.11.5 Visibility of display

The design and size of the display device are to be such that displayed information is easily read under all conditions by observers at normal working distances and viewing angles.

This requirement is to apply for all displayed information received from any of the receivers, whether in English or in any other national language or any other supported alphabet.

5.11.6 Automatic line feed

If automatic line feed entails division of a word, this is to be indicated in the displayed text.

5.11.7 End of message display

When displaying received messages on a display device, a clear indication of the end of a message is to be given by automatically adding line feeds after the message or including some other form of delineation.

5.11.8 The equipment is to display an asterisk (*) if the character is received corrupted.

5.11.9 Where the printer is not integrated, it is to be possible to select the following data to be output to the printer interface:

(1) All messages as they are received;

- (2) All messages stored in the message memory;
- (3) All messages received on specified frequencies, from specified locations or having specified message designators;
- (4) All messages currently displayed; and
- (5) Individual messages selected from those appearing on the display.

5.12 Integral printer

If a printer is included as part of the receiver, the following requirements are to be met:

- 5.12.1 The printer is to be able to print a minimum of 32 characters per line.
- 5.12.2 If automatic line feed entails division of a word, this is to be indicated in the printed text.
- 5.12.3 The printer or printer output is to automatically insert line feeds after completing print of the received message.
- 5.12.4 The equipment is to print an asterisk (*) if the character is received corrupted.
- 5.12.5 The integral printer:
 - (1) Is to print easily legible signs and produce a level of acoustic noise < 60 dBA;
 - (2) Is to print the message received on paper. Changing the paper or printing mechanism, if required, is to be a simple operation. The paper and printing capacity are to be sufficient to enable at least 200,000 characters to be printed;
 - (3) Is to be provided with an alarm to indicate that the paper has nearly run out or has run out;
 - (4) Is to provide temporary storage for partially printed messages. If any message is incompletely printed because the paper has run out or the printer is out of order, the message is to be stored in the memory and printed once new paper has been loaded. Memory storage of further new message identifications is to be inhibited if there is no paper available in the printing device.
- 5.12.6 It is to be possible to select the following data to be output to the integral printer:
 - (1) All messages as they are received;

- (2) All messages received on specified frequencies, from specified transmitter coverage areas or having specified message type designators.

5.13 NAVTEX message memory

5.13.1 Navigational warning receivers without integral printers

The following requirements are to apply to equipment that does not contain an integral printer such as devices incorporating an integral display:

- (1) Number of messages

For each receiver fitted, it is to be possible to record at least 200 messages of average length 500 characters (printable and non-printable) in non-volatile message memory. It is not to be possible for the user to erase messages from memory. When the memory is full, the oldest messages are to be overwritten by new messages.

It is to be possible to record individual messages up to 8,000 characters in length.

- (2) Message tagging

The user is to be able to tag individual messages for permanent retention. These messages may occupy up to 25 % of the available memory and are not to be overwritten by new messages. When no longer required, the user is to be able to remove the tag on these messages which may then be overwritten in normal course.

The message tagging function does not need to be supported on a NAVTEX receiver which does not have a dedicated display device.

- (3) Automatic erasure

After between 60 h and 72 h, a message and message identification are to be automatically erased from the store (unless tagged for permanent retention). If the number of received messages exceeds the capacity of the store, the oldest message and message identification are to be erased.

5.13.2 The following requirements are to apply only to equipment that contains an integral printer:

- (1) Number of messages

The equipment is to be capable of internally storing at least 200 message identifications for each receiver provided.

(2) Automatic erasure

After between 60 h and 72 h, a message is to be automatically erased from the store. If the number of received messages exceeds the capacity of the store, the oldest message is to be erased.

5.14 Power supply

Navigational warning receivers are supplied by ship main power.

5.15 Source of UTC

The equipment may optionally use an externally provided source of UTC or an internal RTC to provide timing data for handling message ageing.

6 Materials and Components

At least, the displays and/or printer and integrated circuits shall be included in the list of qualified suppliers, and its manufacturer shall not be changed without the Society's approval.

7 Type Test

7.1 Principles of sampling: in principle, one set of type test samples shall be chosen at random for all type test items in Article 7.2 herein.

7.2 Type test items and methods:

Table 7.2

S/N	Type test items	Type test methods	Remarks
1	Power supply		
1.1	Extreme power supply variation	Article 7.1 and 5.2.2 in IEC 60945:2002/COR1:2008	
1.2	Excessive conditions	Article 7.2 and 5.2.3 in IEC 60945:2002/COR1:2008	
1.3	Immunity to power supply short-term variation (if applicable)	Article 7.3 and 10.7 in IEC 60945:2002/COR1:2008	
1.4	Immunity to power supply failure	Article 7.4 and 10.8 in IEC 60945:2002/COR1:2008	

Continued Table 7.2

2	Environmental conditions		
2.1	Dry heat	Article 8.2 in IEC 60945:2002/ COR1:2008	
2.2	Damp heat	Article 8.3 in IEC 60945:2002/ COR1:2008	
2.3	Low temperature	Article 8.4 in IEC 60945:2002/ COR1:2008	
2.4	Vibration	Article 8.7 in IEC 60945:2002/ COR1:2008	
2.5	Rain and spray (only applicable to antenna)	Article 8.8 in IEC 60945:2002/ COR1:2008	
2.6	Salt mist (corrosion)	Article 8.12 in IEC 60945:2002/ COR1:2008	
3	Electromagnetic compatibility		
3.1	Conducted emissions	Article 9.2 in IEC 60945:2002/ COR1:2008	
3.2	Radiated emissions from enclosure port	Article 9.3 in IEC 60945:2002/ COR1:2008	
3.3	Immunity to conducted radio frequency disturbance	Article 10.3 in IEC 60945:2002/ COR1:2008	
3.4	Immunity to radiated radiofrequencies	Article 10.4 in IEC 60945:2002/ COR1:2008	
3.5	Immunity to fast transients	Article 10.5 in IEC 60945:2002/ COR1:2008	
3.6	Immunity to Surges (if applicable)	Article 10.6 in IEC 60945:2002/ COR1:2008	
3.7	Immunity to electrostatic discharge	Article 10.9 in IEC 60945:2002/ COR1:2008	
4	Special purpose		
4.1	Acoustic noise and signals	Article 11.1 in IEC 60945:2002/ COR1:2008	
4.2	Compass safe distance	Article 11.2 in IEC 60945:2002/ COR1:2008	
5	Safety precautions		
5.1	Protection against accidental access to dangerous voltages	Article 12.1 in IEC 60945:2002/ COR1:2008	
5.2	Electromagnetic radio frequency radiation	Article 12.2 in IEC 60945:2002/ COR1:2008	
5.3	Emission from visual display unit(VDU)	Article 12.3 in IEC 60945:2002/ COR1:2008	
5.4	X-radiation	Article 12.4 in IEC 60945:2002/ COR1:2008	
6	Appearance inspection	Article 8~9 in IMO A.694(17)	
7	Operation inspection	Article 6.1~6.4 in IEC 60945:2002/ COR1:2008	
8	Performance test		

8.1	Serial interface tests		
8.1.1	INS input electrical tests	Article 7.1 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
8.1.2	INS input performance tests	Article 7.2 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
8.1.3	INS output electrical tests	Article 7.3 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
8.1.4	INS output performance tests	Article 7.4 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
8.1.5	Printer output electrical tests	Article 7.5 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
8.1.6	Printer output performance tests	Article 7.6 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
8.1.7	BAM interface performance tests	Article 7.7 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
8.2	General and signal processing tests		
8.2.1	Exclusion of stations	Article 8.1 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
8.2.2	Exclusion of message categories	Article 8.2 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
8.2.3	Receiver test facility	Article 8.3 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
8.2.4	Search and rescue (SAR) alarm provision and reset	Article 8.4 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
8.2.5	Additional alarms (if applicable)	Article 8.5 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
8.3	Receiver tests		
8.3.1	Call sensitivity	Article 9.1 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
8.3.2	Interference rejection and blocking immunity	Article 9.2 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
8.3.3	Co-channel rejection	Article 9.3 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
8.3.4	Intermodulation	Article 9.4 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
8.3.5	Off-frequency transmitter	Article 9.5 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
8.3.6	Simultaneous operation on several receive frequencies	Article 9.6 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
8.3.7	Protection of input circuits	Article 9.7 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
8.4	Printer tests		
8.4.1	Basic requirements	Article 10.1 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
8.4.2	Paper roll end alarm and storage inhibition	Article 10.2 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	

Continued Table 7.2

8.4.3	Automatic line feed indication and paper feed	Article 10.3 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
8.4.4	Mutilated character indication	Article 10.4 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
8.4.5	Tests of technical characteristics	Article 10.5 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
8.5	Memory tests		
8.5.1	Internal storage, message tagging and erasure of oldest message identifications	Article 11.1 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
8.5.2	Erasure of message identifications/storage time	Article 11.2 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
8.5.3	Storage of message identifications	Article 11.3 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
8.5.4	Reception of messages with character errors	Article 11.4 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
8.5.5	Unsatisfactory reception	Article 11.5 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
8.5.6	Power-off check	Article 11.6 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
8.5.7	Brown-out test	Article 11.7 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
8.5.8	UTC handling check	Article 11.8 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
8.6	Miscellaneous tests		
8.6.1	Spurious emissions	Article 12.1 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
8.6.2	Equipment manuals – checks of the manufacturer's documentation	Article 12.2 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
8.6.3	Marking and identification	Article 12.3 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	

8 Unit/Batch Inspection

8.1 Product inspection from CCS shall not be applied until the type approval is gained.

8.2 The manufacturer can apply for product inspection from CCS after delivery inspection is completed for all products and all products are qualified.

8.3 Sampling inspection ratio of CCS: 10%, no less than 2 sets (unless there is only one set of products inspected).

8.4 Test items and methods of delivery test and CCS sampling inspection:

Table 8.4

S/N	Items of delivery test and CCS sampling inspection	Methods of delivery test and CCS sampling inspection	Remarks
1	Appearance inspection	Article 8~9 in IMO A.694(17)	
2	Exclusion of stations	Article 8.1 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
3	Exclusion of message categories	Article 8.2 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
4	Receiver test facility	Article 8.3 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
5	Search and rescue (SAR) alarm provision and reset	Article 8.4 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	
6	Additional alarms (if applicable)	Article 8.5 in IEC 61097-6:2005/ AMD1:2011/AMD2:2019	