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INTERNATIONAL STANDARD

Maritime navigation and radiocommunication equipment and systems – Bridge navigational watch alarm system (BNWAS)

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland
Email: inmail@iec.ch
Web: www.iec.ch

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MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – BRIDGE NAVIGATIONAL WATCH ALARM SYSTEM (BNWAS)

FOREWORD

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

FDIS	Report on voting
80/577/FDIS	80/588/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.

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 web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this document may be issued at a later date.

MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – BRIDGE NAVIGATIONAL WATCH ALARM SYSTEM (BNWAS)

1 Scope

This International Standard specifies the minimum performance requirements, technical characteristics and methods of testing, and required test results, for a bridge navigational watch alarm system (BNWAS) as required by Chapter V of the International Convention for the Safety of Life at Sea (SOLAS), as amended. It takes account of the general requirements given in IMO resolution A.694(17) and is associated with IEC 60945. When a requirement in this International Standard is different from IEC 60945, the requirement in this standard takes precedence.

This standard incorporates the parts of the performance standards included in IMO resolution MSC.128(75).

NOTE 1 All text of this standard, whose wording is identical to that of IMO resolution MSC.128(75), is printed in italics, and the resolution and associated performance standard paragraph numbers are indicated in brackets.

(128/A1) *The purpose of a bridge navigational watch alarm system (BNWAS) is to monitor bridge activity and detect operator disability which could lead to marine accidents. The system monitors the awareness of the Officer of the Watch (OOW) and automatically alerts the Master or another qualified OOW if for any reason the OOW becomes incapable of performing the OOW's duties. This purpose is achieved by a series of indications and alarms to alert first the OOW and, if he is not responding, then to alert the Master or another qualified OOW. Additionally, the BNWAS may provide the OOW with a means of calling for immediate assistance, if required. The BNWAS should be operational whenever* the ship is underway at sea (SOLAS V/19.2.2.3).

NOTE 2 BNWAS may not, in practice, be realised as a stand alone equipment. It may be integrated in other equipment such as radar, ECDIS, etc.

2 Normative references

The following referenced documents are indispensable for the application 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 (all parts), *Maritime navigation and radiocommunication equipment and systems – Digital interfaces*

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

IEC 62288, *Maritime navigation and radiocommunication equipment and systems – Presentation of navigation-related information on shipborne navigational displays – General requirements – Methods of testing and required results*

IMO Resolution A.694(17), *General requirements for shipborne radio equipment forming part of the Global maritime distress and safety system and for electronic navigational aids*

IMO Resolution A.813(19), *General requirements for electromagnetic compatibility (EMC) for all electrical and electronic ship's equipment*

IMO Resolution A.830(19), *Code on alarms and indicators*

IMO Resolution MSC.128(75), *Recommendation on performance standards for a bridge navigational watch alarm system (BNWAS)*

IMO MSC/Circ.982, *Guidelines on Ergonomic Criteria for Bridge equipment and Layout*

3 Performance requirements

3.1 Functionality

3.1.1 Operational modes

(See 7.4.1)

(128/A4.1.1.1) *The BNWAS* shall *incorporate the following operational modes:*

- *Automatic (Automatically brought into operation whenever the ship's heading or track control system is activated and inhibited when this system is not activated)*
- *Manual ON (In operation constantly)*
- *Manual OFF (Does not operate under any circumstances)*

NOTE The Automatic mode is not suitable for use on a ship conforming with regulation SOLAS V/19.2.2.3 which requires the BWNAS to be in operation whenever the ship is underway at sea.

3.1.2 Operational sequence of indications and alarms

3.1.2.1 Dormant period

(See 7.4.2)

(128/A4.1.2.1) *Once operational, the alarm system* shall *remain dormant for a period of between 3 and 12 min (Td).* See Figure 1.

(128/A4.1.2.2) *At the end of this dormant period, the alarm system shall initiate a visual indication on the bridge.*

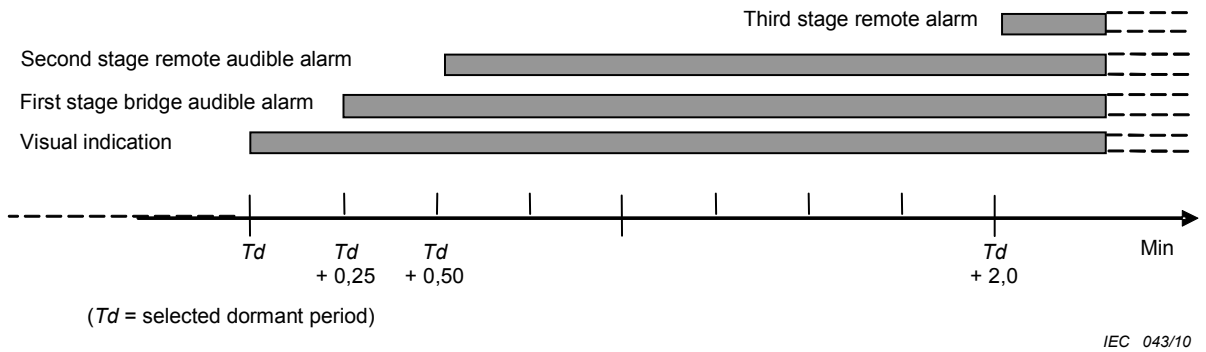

Figure 1 – Alarm sequence without acknowledgements

3.1.2.2 First stage bridge audible alarm

(See 7.4.3)

(128/A4.1.2.3) *If not reset, the BNWAS* shall *additionally sound a first stage audible alarm on the bridge 15 s after the visual indication is initiated.*

3.1.2.3 Second stage remote audible alarm

(See 7.4.3)

(128/A4.1.2.4) *If not reset, the BNWAS* shall *additionally sound a second stage remote audible alarm in the back-up officer's and/or Master's location 15 s after the first stage audible alarm is initiated.*

3.1.2.4 Third stage remote audible alarm

(See 7.4.3)

(128/A4.1.2.5) *If not reset, the BNWAS* shall *additionally sound a third stage remote audible alarm at the locations of further crew members capable of taking corrective actions 90 s after the second stage remote audible alarm is initiated.*

3.1.2.5 Alarm alternatives

(See 7.4.4)

(128/A4.1.2.6) *In vessels other than passenger vessels, the second or third stage remote audible alarms may sound in all the above locations at the same time. If the second stage audible alarm is sounded in this way, the third stage alarm may be omitted.*

(128/A4.1.2.7) *In larger vessels, the delay between the second and third stage alarms may be set to a longer value on installation, up to a maximum of 3 min, to allow sufficient time for the back-up officer and/or Master to reach the bridge.*

Installation set-up facilities shall be provided to inhibit the third stage alarm and to increase the delay between the second and third stage alarms to 3 min.

3.1.3 Reset function

3.1.3.1 Description of reset function

(See 7.4.5)

(128/A4.1.3.2) *The reset function* shall, *by a single operator action, cancel the visual indication and all audible alarms and initiate a further dormant period. If the reset function is activated before the end of the dormant period, the period* shall *be re-initiated to run for its full duration from the time of the reset.*

Single operator action is defined as activating a hard-key or soft-key including any necessary cursor movement.

3.1.3.2 Initiation of reset function

(See 7.4.6)

(128/A4.1.3.3) *To initiate the reset function, an input representing a single operator action by the OOW is required. This input may be generated by reset devices forming an integral part of the BNWAS or by external inputs from other equipment capable of registering physical activity and mental alertness of the OOW.*

For the purposes of this standard, mental alertness means consciously intended operations or movements for which there is no risk of automatic generation by vibration or by movement of the ship.

NOTE The IMO subcommittee on the safety of navigation at its 55th session (NAV 55/21) described three methods for the reset function as follows:

1) by a single operator action from a device forming an integral part of the BNWAS, for example a manually operated button or a touch screen; or
2) by external inputs from other equipment registering physical activity, for example sensors preferably detecting the presence and movements of a human body or floor pressure pads detecting movement of a human; or
3) by external inputs from other equipment registering mental alertness of the OOW, for example speech recognition sensors or changes in the operation of the manual controls of bridge equipment.

3.1.3.3 Continuous activation

(See 7.4.7)

(128/A4.1.3.4) *A continuous activation of any reset device* shall *not prolong the dormant period or cause a suppression of the sequence of indications and alarms.*

3.1.4 Emergency call facility and transfer of alarms

(See 7.4.8)

(128/A4.1.4) *Means may be provided on the bridge to immediately activate the second, and subsequently third, stage remote audible alarms by means of an "Emergency Call" push button or similar.*

Installation set-up facilities shall be provided for an “Emergency Call” system.

Facilities shall also be provided to immediately actuate the “Emergency Call” system from other equipment capable of transferring an unacknowledged alarm by contact closure or equivalent circuit, or an IEC 61162 interface using the ALR sentence.

NOTE Examples of equipment which are capable of transferring alarms include Integrated Navigation Systems and Track Control Systems.

IMO Resolution MSC.252(83), paragraph 20.5.1 states: *After a time defined by the user unless otherwise specified by IMO, an unacknowledged alarm should be transferred to the bridge navigational watch alarm system (BNWAS), if available. The unacknowledged alarm should remain visible and audible.*

IMO Resolution MSC.74(69) annex 2, paragraph 5.3.4 states: *In the case of any failure or alarm status received from the position-fixing sensor, the heading sensor or the speed sensor in use: 1) an alarm should be generated at the track control system; 2) the system should automatically provide guidance to the user of a safe steering mode; and 3) a back-up navigator alarm should be given if a failure or alarm status is not acknowledged by the officer of the watch (user) within 30 s.*

3.2 Accuracy

(See 7.4.9)

(128/A4.2) *The alarm system* shall *be capable of achieving the timings stated in* 3.1.2 *with an accuracy of 5 % or 5 s, whichever is less, under all environmental conditions.*

3.3 Security

(See 7.4.10)

(128/A4.3) *The means of selecting the Operational Mode and the duration of the Dormant Period (Td)* shall *be security protected so that access to these controls should be restricted to the Master only.*

3.4 Malfunctions, alarms and indications

(See 7.4.11)

(128/A4.4.1) *If a malfunction of, or power supply failure to, the BNWAS is detected, this* shall *be indicated. Means shall be provided to allow the repeat of this indication on a central alarm panel if fitted.*

NOTE See also 5.3 where there is a requirement for this indication to be powered from a battery maintained supply.

4 Ergonomic criteria requirements

4.1 Operational controls

(See 7.4.12)

The following controls are required:

a) (128/A5.1.1) *A protected means of selecting the operational mode of the BNWAS.*

b) (128/A5.1.2) *A protected means of selecting the duration of the dormant period of the BNWAS.*

c) (128/A5.1.3) *A means of activating the "Emergency Call" function if this facility is incorporated within the BNWAS.*

4.2 Presentation of information

4.2.1 Operational mode

(See 7.4.13)

(128/A5.2.1) *The operational mode of the equipment* shall *be indicated to the OOW.*

4.2.2 Visual indications

(See 7.4.14)

(128/A5.2.2, see also Annex A) *The visual indication initiated at the end of the dormant period* shall *take the form of a flashing indication. The colour of the indication(s)* shall *be chosen so as not to impair night vision and dimming facilities (although not to extinction)* shall *be incorporated.*

4.2.3 First stage bridge audible alarm

(See 7.4.15)

(128/A5.2.3, see also Annex A) *The first stage audible alarm which sounds on the bridge at the end of the visual indication period* shall *have its own characteristic tone or modulation intended to alert, but not to startle, the OOW. This function may be engineered using one or more sounding devices. Tone/modulation characteristics and volume level* shall *be selectable during commissioning of the system.*

4.2.4 Second and third stage remote audible alarm

(See 7.4.16)

(128/A5.2.4) *The remote audible alarm which sounds in the locations of the Master, officers and further crew members capable of taking corrective action at the end of the bridge audible alarm period* shall *be easily identifiable by its sound and should indicate urgency. The volume of this alarm* shall *be sufficient for it to be heard throughout the locations above and to wake sleeping persons* as described in IMO resolution A.830(19).

5 Design and installation requirements

5.1 General

(See 7.4.17)

(128/A6.1) *The equipment* shall *comply with IMO resolutions A.694(17), A.813(19), their associated international standard* IEC 60945 *and MSC/Circ.982 regarding Guidelines for Ergonomic Criteria for Bridge Equipment and Layout.*

5.2 Specific requirements

5.2.1 System physical integrity

(See 7.4.18)

(128/A6.2.1) *All items of equipment forming part of the BNWAS* shall *be tamper-proof so that no member of the crew may interfere with the system's operation.*

5.2.2 Reset devices

(See 7.4.19)

(128/A6.2.2) *Reset devices* shall *be designed and installed so as to minimise the possibility of their operation by any means other than activation by the OOW.* Manual *reset devices* shall *all be of a uniform design and* shall *be illuminated for identification at night.*

(128/A6.2.3) *Alternative reset arrangements may be incorporated to initiate the reset function from other equipment on the bridge capable of registering operator actions in positions giving proper look out.*

5.3 Power supply

(See 7.4.20)

(128/A6.3) *The BNWAS* shall *be powered from the ship's main power supply. The malfunction indication, and all elements of the Emergency Call facility, if incorporated,* shall *be powered from a battery maintained supply.*

5.4 Installation documentation

(See 7.4.21)

The installation documentation shall include appropriate information so that the requirements of Annex A can be fulfilled by the installer of the equipment.

6 Interfacing requirements

(See 7.4.22)

6.1 Inputs

(128/A7.1) *Inputs* shall *be available for additional reset devices or for connection to bridge equipment capable of generating a reset signal by contacts, equivalent circuits or serial data* as described in IEC 61162.

Additionally, inputs shall be available for operating the emergency call system as described in 3.1.4.

6.2 Outputs

(128/A7.2) *Output(s)* shall *be available for connection of additional bridge visual indications and audible alarms and remote audible alarms.*

An output shall also be available for connection to central alarm panels to repeat the malfunction indication as required in 3.4 by contacts, equivalent circuits or an IEC 61162 compliant interface.

Additionally, the BNWAS shall provide an interface according to IEC 61162-1, ALR sentence, with the following message content:

- hhmmss.ss: this part may be left blank if the BNWAS does not include UTC time information
- xxx: Designation of source of alarm or source of reset command. The automatic mode is designated as "000".
- A: A = Dormant period exceeded
  V = Dormant period not exceeded
- A: A = Alarm acknowledged
  V = Alarm unacknowledged
- c - - c: BNWAS mode (see 3.1.1): c_1; c_2; c_3

  c_1 = AUT or MAN or OFF
  c_2 = Dormant period in min, (03 – 12)
  c_3 = Alarm stage: 1, 2 or 3.

Example

$BNALR,,000,A,V,C1=AUT;C2=03;C3=1*hh<CR><LF>

The alarm message shall be sent with any change of the BNWAS settings for mode or dormant period, and with any activated and reset alarm.

NOTE IMO Resolution A.861(20), paragraph 5.4.9 states: *This should include the status of all mandatory alarms on the bridge.*

7 Methods of testing and required test results

7.1 General

For the purpose of testing, a BNWAS is required comprising a visual indication (4.2.2), examples of first (4.2.3), second and third stage alarm equipment (4.2.4), examples of reset devices (5.2.2), an Emergency Call function (4.1 c)) and Installation documentation (5.4). It will be necessary for testing to have access to the means of selecting the operation mode (4.1 a)) and the means of selecting the duration of the dormant period (4.1 b)).

The BWNAS shall be installed in the test facility using interconnection and input cabling and methods representative of a normal installation.

7.2 General requirements

The BNWAS shall be tested against the general requirements contained in IEC 60945 for the equipment category “protected” or “exposed”, as applicable. For the purposes of IEC 60945 the following definitions apply:

Performance test: Operation of the BNWAS without acknowledgement including measurement of the timings shown in Figure 1. The required result is that the BNWAS operates correctly producing the first, second and third stage alarms and that the timings are achieved with an accuracy of 5 % or 5 s whichever is less.

Performance check: Operation of the BNWAS with acknowledgement after the first stage bridge audible alarm. The required result is that the BNWAS correctly produces the first stage bridge audible alarm and then resets.

7.3 Display of information

The BNWAS shall be tested as applicable against the general requirements for all displays contained in IEC 62288.

7.4 Operational tests

The requirements given in Clauses 3, 4, 5 and 6 shall be verified as follows.

7.4.1 Operational modes

(See 3.1.1)

Confirm by observation.

7.4.2 Dormant period

(See 3.1.2.1)

Set the BWNAS to Manual ON. Set the dormant period (*Td*) to 3 min and check that a visual indication is produced at the end of this period. Repeat the procedure for a dormant period (*Td*) of 6 min and 12 min.

Check that the *Td* can not be set to less than 3 min and more than 12 min.

7.4.3 Alarms

(See 3.1.2.2 to 3.1.2.4)

These requirements are confirmed by the IEC 60945 tests in 7.2.

7.4.4 Alarm alternatives

(See 3.1.2.5)

Confirm by inspection of documented evidence.

7.4.5 Description of reset function

(See 3.1.3.1)

Set the BNWAS to Manual ON. Set the dormant period (*Td*) to 3 min and initiate the equipment and allow the equipment to produce the third stage alarm. Check that with a single operator action it is possible to cancel the visual indication and all audible alarms. Check that the equipment has reset and produces a visual indication after a further period of 3 min. Reset the equipment to cancel this indication. After a period of 2 min reset the equipment. Check that the equipment produces a visual indication after a further period of 3 min.

7.4.6 Initiation of reset function

(See 3.1.3.2)

Confirm by inspection of documented evidence that a single operator action will initiate a reset of the BWNAS.

Confirm by inspection of documented evidence that input ports are available for connection of external reset devices from other equipment capable of registering physical activity and mental alertness of the OOW for example motion detectors.

If these input ports are digital interfaces conforming to IEC 61162 confirm by inspection of documented evidence that the reset operates only if the information has been derived from a physical activity.

NOTE The sentence EVE (General event message) is designed to transmit actions by the crew on the bridge. The tag code field should be set as “BNWAS” and the event description field should be set as “Operator activity”.

Example $RAEVE,,BNWAS,Operator activity*hh<CR><LF>

7.4.7 Continuous activation

(See 3.1.3.3)

Set the BNWAS to manual ON. Set the dormant period (*Td*) to 3 min and initiate the equipment and allow the equipment to produce a visual indication. Reset the equipment to cancel this indication and continually activate all the examples provided of the reset devices. Check that a visual indication is produced after a period of 3 min.

7.4.8 Emergency call facility and transfer of alarms

(See 3.1.4)

Confirm by inspection of documented evidence.

7.4.9 Accuracy

(See 3.2)

This requirement is confirmed by the IEC 60945 tests in 7.2.

7.4.10 Security

(See 3.3)

Confirm by observation that selection of the operational mode and dormant period is protected by unauthorised access such as by a password or a key-lock.

7.4.11 Malfunction

(See 3.4)

Remove the power supply to the equipment and check that there is an indication that the equipment is not operational.

Confirm by inspection of documented evidence that facilities are provided for the repeat of this information through relay contacts or an IEC 61162 interface.

Check documented evidence for any facilities provided to check malfunction of the equipment such as time clock errors, serial interface errors, lack of continuity through remote alarms, reset devices, battery failure etc. and confirm by inspection or measurement that an indication is provided to show that the equipment is not operational.

7.4.12 Operational controls

(See 4.1)

Confirm by observation. (See also 7.4.10.)

7.4.13 Operational mode

(See 4.2.1)

Confirm by observation.

7.4.14 Visual indications

(See 4.2.2)

Confirm by observation.

7.4.15 First stage bridge audible alarm

(See 4.2.3)

Confirm by observation and measurement of the sound pressure level. The sound pressure level 1 m from the source shall be at least 75 dB(A) but not greater than 85 dB(A).

NOTE This test derives from IEC 60945 and has been carried out in 7.2.

Confirm by inspection of documented evidence that the tone/modulation characteristics and volume level are capable of being selectable.

7.4.16 Second and third stage remote audible alarm

(See 4.2.4)

Confirm by observation and measurement of the sound pressure level. The sound pressure level 1 m from the source shall be at least 75 dB(A) but not greater than 120 dB(A).

NOTE These sound pressure levels are defined in IMO Resolution A.830(19).

7.4.17 Design and installation general

(See 5.1)

These requirements have been confirmed by tests to IEC 60945 and IEC 62288. (See 7.2 and 7.3.)

7.4.18 System physical integrity

(See 5.2.1)

Confirm by inspection of documented evidence. (See also 7.4.10.)

7.4.19 Reset devices

(See 5.2.2)

Confirm by inspection of documented evidence. (See also 7.4.6.)

7.4.20 Power supply

(See 5.3)

Confirm by inspection of documented evidence and measurement that when the supply of power is removed from the equipment the malfunction indication and Emergency Call facility operates for a period of 6 h.

7.4.21 Installation documentation

(See 5.4)

Confirm by inspection that appropriate installation requirements are included.

7.4.22 Interfacing

(See Clause 6)

Confirm by inspection of documented evidence.

Annex A
(normative)

Installation considerations

A.1 General

The following requirements are included in IMO resolution MSC.128(75) concerning the installation of the BNWAS.

A.2 Location of reset function

(128/A4.1.3.1) *It* shall *not be possible to initiate the reset function or cancel any audible alarm from any device, equipment or system not physically located in areas of the bridge providing proper look out.*

A.3 Reset facilities

(128/A5.1.4) *Means of activating the reset function* shall *only be available in positions on the bridge giving proper look out and preferably adjacent to visual indications. Means of activating the reset function* shall *be easily accessible from the conning position, the workstation for navigating and manoeuvring, the workstation for monitoring and the bridge wings.*

A.4 Visual indications

(128/A5.2.2 part) *Flashing indications* shall *be visible from all operational positions on the bridge where the OOW may reasonably be expected to be stationed.*

A.5 First stage bridge audible alarm

(128/A5.2.3 part) *This alarm* shall *be audible from all operational positions on the bridge where the OOW may reasonably be expected to be stationed.*

NOTE Bridge includes wheelhouse and bridge wings.

Bibliography

IMO Resolution MSC.74(69), *Performance standards for track control systems*

IMO Resolution MSC.252(83), *Performance standards for Integrated Navigation Systems (INS)*

IMO Resolution A.861(20), *Performance standards for shipborne voyage data recorders (VDRs)*

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

3, rue de Varembé
PO Box 131
CH-1211 Geneva 20
Switzerland

Tel: + 41 22 919 02 11
Fax: + 41 22 919 03 00
info@iec.ch
www.iec.ch