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Maritime navigation and radiocommunication equipment and systems – Radar –

Part 5: Guidelines for the use and display of AIS information on radar

PUBLICLY AVAILABLE SPECIFICATION



INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**MARITIME NAVIGATION AND RADIOCOMMUNICATION
EQUIPMENT AND SYSTEMS – RADAR –****Part 5: Guidelines for the use and display of AIS information on radar**

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IEC-PAS 60936-5 has been processed by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems.

The text of this PAS is based on the following document:

This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document

Draft PAS	Report on voting
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Following publication of this PAS, the technical committee or subcommittee concerned will investigate the possibility of transforming the PAS into an International Standard.

This PAS shall remain valid for no longer than 3 years starting from 2003-09. The validity may be extended for a single 3-year period, following which it shall be revised to become another type of normative document or shall be withdrawn.

This PAS document relates to International Standards of the IEC 60936 series and IEC 61993-2. The document has been co-ordinated with IMO Safety of Navigation circular No.217.

MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – RADAR –

Part 5: Guidelines for the use and display of AIS information on radar

1 Scope

This document specifies the minimum operational and performance requirements, methods of testing and required test results and the effect on extant standards, that are recommended to be complied with for optional equipment conforming to Interim Operational Guidelines not inferior to those adopted by the IMO in SN/Circ.217 (11 July 2001) – Interim guidelines for the presentation and display of AIS target information. The scope is further restricted to requirements for superimposition of **selected parts of AIS information** on radar systems. All text of this standard, which is identical to that in IMO SN/Circ.217 is printed in *italics* and the Circular and paragraph numbers are indicated in brackets, for example – (C.217/3.3).

The interim guidelines deal with the graphical presentation, alphanumeric information and the display of AIS target data in standalone or integrated navigational aids or systems and are considered as an interim performance guideline. They should be replaced by the appropriate performance standards after experience has been gained. (C.217/2)

The fusion of AIS and radar plotting (RP) data and information is not detailed in this guideline as it is only permitted when the functionality meets the requirements of an 'Integrated Navigation System', as specified in the relevant IMO Performance Standards.

2 Application

2.1 Intended use of these guidelines

These guidelines are intended to apply to all SOLAS ship's radar and radar plotting displays complying to IMO MSC.64(67) Annex 4¹⁾, IMO A.820(19)¹⁾ and IMO A.823(19)¹⁾.

2.2 Intended application of these guidelines

The application of these Guidelines is intended to reduce OoW workload, provide common training and enhance situation awareness for safety.

2.3 Effects of these guidelines on existing radar

The effect of these guidelines on the extant radar and radar plotting standards is given in Annex A.

3 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 60872-1:1998, *Maritime navigation and radiocommunication equipment and systems – Radar plotting aids – Part 1: Automatic radar plotting aids (ARPA) – Methods of testing and required test results*

¹⁾ As implemented in the IEC 60936 and IEC 60872 series of standards.

IEC 60872-2:1999, *Maritime navigation and radiocommunication equipment and systems – Radar plotting aids – Part 2: Automatic tracking aids (ATA) – Methods of testing and required test results*

IEC 60872-3:2000, *Maritime navigation and radiocommunication equipment and systems – Radar plotting aids – Part 3: Electronic plotting aids (EPA) – Methods of testing and required test results*

IEC 60936-1:2002, *Maritime navigation and radiocommunication equipment and systems – Radar – Part 1: Shipborne radar – Performance requirements – Methods of testing and required test results*

IEC 60936-2:1998, *Maritime navigation and radiocommunication equipment and systems – Radar – Part 2: Shipborne radar for high-speed craft (HSC) – Methods of testing and required test results*

IEC 60936-3:2002, *Maritime navigation and radiocommunication equipment and systems – Radar – Part 3: Radar with chart facilities – Performance requirements – Methods of testing and required test results*

IEC 60945:2002, *Maritime navigation and radiocommunication equipment and systems – General requirements – Methods of testing and required test results*

IEC 61162: *Maritime navigation and radiocommunication equipment and systems – Digital interfaces*

IEC 61993-2:2001, *Maritime navigation and radiocommunication equipment and systems – Universal shipborne automatic identification system (AIS) installation using VHF TDMA techniques*

IEC 62287 AIS class B ²⁾

IMO MSC.982(73) *Guidelines on ergonomic criteria for bridge equipment and layout*

IMO SN/Circ.217 (11 July 2001) *Interim guidelines for the presentation and display of AIS target information*

4 Definitions and abbreviations

4.1 Definitions

4.1.1

AIS Symbol 1 – Sleeping target

target symbol indicating the presence and orientation of a vessel equipped with AIS in a certain location. No additional information is presented until AIS targets are activated, thus avoiding information overload. (C.217/1)

4.1.2

AIS Symbol 2a, b, c – Activated target

symbol representing the automatic or manual activation of a sleeping target for the display of additional graphically presented information, including:

- a vector (speed and course over ground or water) (2a);
- the heading (2a); and

²⁾ To be published

- ROT or direction of turn indication (if available) to display the actually initiated course changes (2b) and/or path predictor (if available) (2c). (C.217/1)

4.1.3

AIS Symbol 3 – Selected target

symbol representing the manual or automatic selection of any AIS target for the display of detailed information in a separate data display area. In this area, received target data as well as the calculated CPA and TCPA values will be shown.(C.217/1)

4.1.4

AIS Symbol 4 – Dangerous target

symbol representing an AIS target (activated or not) which has data that contravenes pre-set CPA and TCPA limits. (C.217/1)

4.1.5

AIS Symbol 5 – Lost target

symbol representing the last valid predicted position of an AIS target before the reception of its data was lost. (C.217/1)

4.1.6

association

is a process by which data from AIS and radar plotting are assessed to represent the same physical target

4.2 Abbreviations

ACK	Acknowledge
AIS	Universal shipborne automatic identification system
ALR	Alarm
ARPA	Automatic Radar Plotting Aid
ATA	Automatic Tracking Aid
COG	Course over ground
CPA	Closest point of approach
CSE	Course
DR	Dead reckoning
EPA	Electronic Plotting Aid
EPFS	Electronic Position-Fixing System
EUT	Equipment Under Test
HSC	High Speed Craft
IEC	International Electrotechnical Committee
IMO	International Maritime Organization
MMSI	Maritime Mobile Service Identity
MSC	Maritime Safety Committee of the IMO
ROT	Rate Of Turn
RP	Radar Plotting
SENC	System electronic navigation chart
SOG	Speed over ground
SOLAS	Safety Of Life At Sea (IMO Convention for the Safety Of Life At Sea)
STW	Speed through water
TCPA	Time to closest point of approach
TDMA	Time division multiple access (system in the VHF maritime mobile band)

TTM	Serial output containing the TTM message (IEC 61162)
VDL	VHF data link
VDM	Serial output message containing VDL message (IEC 61162)
VDO	Serial output message containing VDO message (IEC 61162)

5 Functional requirements

5.1 General

5.1.1 Presentation and display of AIS information

In addition to the relevant performance standards, AIS information may be presented and displayed according to the following interim guidelines. (C.217/2)

5.1.2 Display and indication of AIS functions equivalency

As far as practical, the user interface for operating, displaying and indicating AIS functions shall be equivalent to the other relevant functions of the navigational aid. (C.217/2.3)

The AIS functionality, controls and display shall be similar to that provided for radar plotting as far as is practical.

5.1.3 Minimum required AIS information for collision avoidance

The equipment shall provide a facility to enable the user to select at least the minimum AIS information required for aiding collision avoidance and target identification.

The functionality shall aid collision avoidance by employing those selected parts of the AIS information necessary and sufficient for the task. (See Table 1)

5.1.4 Graphical display of AIS capability

The equipment shall have the capability to graphically display AIS targets as symbols.

5.1.5 Indication of AIS functionality

Clear and continuous indications shall be given of the status for AIS functionality and presentation.

5.2 Interfacing requirements

5.2.1 Minimum AIS information input

The minimum recommended selected parts of the AIS information – parts of messages 1, 2, (AIS class A) and optionally 18 and 19 (AIS class B) – that may be input to the own ship's radar for alpha-numeric or graphic display are given in table 1.

Table 1 – Relevant information content input from AIS

Relevant Information for 'Situation Awareness' (Collision Avoidance)			
Information provided by the AIS (data from IMO-AIS Spec.)	AIS-VDL message	AIS presentation interface IEC 61162 sentences	Minimum to be displayed if available by RADAR /RP
Static information			
MMSI	All	VDM	a
Dynamic information			
Target's position	1/2, 18/19	VDM	g
COG	1/2, 18/19	VDM	g, a
SOG	1/2, 18/19	VDM	g, a
Heading	1/2, 18/19	VDM	g
Turn Indicator or ROT	1/2	VDM	g
Where - g = graphic representation, and a = alphanumeric data.			
NOTE 1 Messages 18 and 19 are transmitted by Class B (SOLAS carriage exempt ships) transponders.			
NOTE 2 Incomplete AIS information shall be marked accordingly.			

5.2.2 Output of AIS information

The output from the AIS is specified by IEC 61162 messages (VDM/VDO). If AIS targets are transmitted from the radar using the TTM message, then the type of acquisition field shall be identified with the letter R.

5.3 Processing of information

5.3.1 Zones and limits

If zones or limits for automatic target acquisition are set, these shall be the same for automatically activating and presenting any targets regardless of their source. (C.217/2.2.1) Details shall be included in the manufacture's documentation.

5.3.2 Vector consistency

The vector time set shall be adjustable and valid for presentation of any target regardless of its source. (C.217/2.2.2) Vectors from radar plotting and AIS shall be of the same "time" length and shall all be consistent in presentation.

5.3.3 Equivalency of radar plotting and AIS plotting functions

If radar-plotting aids are used for the display of AIS information, these shall be capable of calculating and displaying collision parameters for AIS equivalent to the available radar plotting functions. (C.217/2.2.3)

5.3.4 (CPA/TCPA) Alarm

In all cases when the AIS functionality is enabled and *if the calculated CPA and TCPA values of an AIS target are less than the set limits,*

- an alarm shall be given; and
- a dangerous target symbol shall be displayed when the system is set to the appropriate range scale.

The pre-set CPA/TCPA limits applied to target data derived from different sensors shall be identical. (C.217/2.2.4)

It may be possible to enable/disable the AIS functionality. When disabled, the AIS CPA and TCPA activity shall also be disabled.

When calculating the CPA/TCPA value of an AIS target the system shall use the last COG/SOG and/or position values as received from AIS. There shall be no filtering or prediction based on the rate of turn.

If a failure of own ship or AIS target COG/SOG or other parameters causes the calculated CPA/TCPA value to be uncertain, a clear indication shall be given (for example AIS symbol triangle outline to be dashed.) Details of the clear indication method shall be provided in the manual.

The use of manual speed, set and drift and echo references shall be disabled when AIS functionality is enabled.

5.3.5 Processing or display overload

An indication shall be provided, when the maximum number of AIS targets that can be displayed has been reached.

The system shall continue to function normally when the maximum anticipated number (for example 500) AIS targets possible to be processed has been reached.

5.3.6 Lost target

If the signal of a dangerous AIS target is not received for a set time dependent on the reporting rates of the AIS target (see Table 2), then:

- a lost target symbol shall appear at the latest predicted position and an alarm be given;
- the lost target symbol shall disappear after the alarm has been acknowledged or after a pre-set time; and

Means to recover the data for a number of last acknowledged lost targets may be provided.

Preferably this function may also be applied to any AIS target within a certain range/distance. (C.217/2.2.5)

Table 2 – AIS Reporting Rates

Category of ship	Nominal reporting interval Class A	Lost target maximum interval Class A	Nominal reporting interval Class B	Lost target maximum interval Class B
Ship at anchor or moored and not moving faster than 3 knots (class B not moving faster than 2 knots)	3 min	18 min	3 min	18 min
Ship at anchor or moored and moving at more than 3 knots	10 s	60 s	N/A	N/A
Ship 0 – 14 knots (class B 2 – 14 knots)	10 s	60 s	30 s	180 s
Ship 0 – 14 knots and changing course	3 1/3 s	60 s		
Ship 14 – 23 knots	6 s	36 s	15 s	90 s
Ship 14 – 23 knots and changing course	2 s	36 s		
Ship > 23 knots	2 s	12 s	5 s	30 s
Ship > 23 knots and changing course	2 s	12 s		

5.3.7 Ownship position – lost

If ownship EPFS position is lost, AIS functionality shall be disabled unless a DR position is used. If used for CPA/TCPA calculations a clear indication shall be given. A DR position may only be used for up to 10 minutes after which AIS functionality shall be disabled.

5.3.8 Automatic display function

An automatic display selection function (target association) may be provided to avoid the presentation of two target symbols for the same physical target. If target data from AIS and from radar plotting functions are available and if the automatic display selection criteria is fulfilled then the activated AIS target symbol shall be presented. Otherwise the respective radar plotting and AIS symbols shall be displayed separately. The operator shall have the option to make reasonable changes to the default parameters of automatic display selection (association) criteria. (C.217/2.2.6).

5.4 Presentation of information

5.4.1 Minimum AIS information to be displayed

If AIS information is made available for a graphical display, at least the following information shall be displayed when the equipment is ground stabilised: (see Resolution MSC.74(69) Annex 3 (AIS) Paragraph 6):

- 1) *position*
- 2) *course over ground*
- 3) *speed over ground*
- 4) *heading*
- 5) *rate of turn, or direction of turn, as available (C.217/2.1.1).*

Equivalent information shall be displayed if the presentation is sea stabilised:

- 1) *position*
- 2) *course through the water*
- 3) *speed through the water*
- 4) *heading*
- 5) *rate of turn or direction of turn, as available*

5.4.2 Heading lost

If heading is lost from an AIS target, then the orientation of the triangle shall be displayed oriented in the COG or CSE direction as appropriate.

NOTE The lack of the heading indicator on the symbol will alert the user of the lack of heading from the AIS target message.

5.4.3 Symbol presentation

If information provided by AIS is graphically presented, the symbols described in annex B shall be applied. Symbols may be positioned on the screen using prediction between AIS reports. In the case of a radar display, where practical, radar signals shall not be masked, obscured or degraded. (C.217/2.1.2)

5.4.4 Equivalency of AIS and radar plotting target presentation

Whenever the graphical display of AIS targets is enabled or available, the graphical properties of other (for example radar plotting) target vectors shall be equivalent to those of the AIS target symbols. The type of vector presentation mode (for example ground / sea, true /

relative), *may be selectable by the operator and the active display mode shall be indicated.* (C.217/2.1.3)

5.4.5 Prioritisation of display symbology

The presentation of AIS target symbols, except for sleeping or lost targets, shall have priority over other target presentations within the display area, including targets from EPA, ATA or ARPA. If such a target is marked/selected for data display, the existence of the other source of target data may be indicated, and the related data may be available for display upon operator command. (C.217/2.1.4)

AIS target symbology may be deactivated allowing radar plotting target symbology to take precedence.

5.5 Alpha-numeric display of selected target data

A target may be selected for the display of its AIS data and collision parameters in alphanumeric form on request. The target shall be indicated with the target symbol for selected target.

The mariner shall be able to select additional parts of the information from AIS targets including the ship's identification, at least the MMSI, which, when selected, shall be presented in the data area of the display (i.e. outside the radar effective area). If the received AIS information is not complete, this shall be indicated, (for example by a blank data field). (C.217/2.1.5). Additionally, when the target is selected, its CPA/TCPA information shall be co-located with the identity and presented in the data area of the display.

Other associated information may also be presented in the same data area of the display.

5.5.1 Display of current data

The data shall be displayed and continually updated, until another AIS or radar-plotted target is selected for data display or until the window is closed.

5.5.2 Selected alphanumeric data

When an AIS target is 'selected', alphanumeric data detailed in clause 5.5 shall be displayed in the data area. Temporary overwriting of this information is permitted.

5.5.3 Common reference point

A common reference point shall be used for the superimposition of AIS symbols with other information on the same display, and for the calculation of target properties (for example TCPA, CPA.). (C.217/2.1.6)

The values displayed for target properties shall be the same regardless of the source of the data.

5.5.4 Target data identification

Target data derived from radar/radar plotting and AIS shall be clearly distinguishable as such. (C.217/2.1.8) The method of differentiation shall be noted in the manufacturer's documentation. For example the letters 'AIS' may be used for this purpose on the alphanumeric display.

5.6 Graphical display of targets

5.6.1 Display activation

It shall be possible to switch on and off the graphical display of AIS information. If the display of AIS information is off, the collision risk (CPA and TCPA) alarm function shall still be active.

5.6.2 Independent display of AIS data with respect to radar

AIS targets shall be displayed whether or not radar targets are present.

5.6.3 Display of AIS targets

Within the capacity of the equipment, the operator may choose to display all or any AIS targets for graphical presentation. The mode of presentation shall be indicated. (C.217/2.1.9)

All AIS targets shall be displayed when they are within the limitations and capacity of the equipment, as defined in the manufacturer's documentation and when the user-selected display criteria are met. (E.g. range, CPA/TCPA and area of risk).

The AIS targets shall be displayed at least as sleeping targets, unless the display of AIS is switched off.

A clear indication for the mode of presentation, status and source (e.g. RP or AIS etc.) of information presented on the AIS display, shall be provided.

It shall not be possible for the user to remove individual AIS targets from the display.

5.6.4 Enabled AIS symbol removal

If the display of AIS symbols is enabled, removing a dangerous target shall only be possible temporarily as long as the operator activates the corresponding control. (C.217/2.1.10)

5.6.5 Activation of targets

One or several individual targets may be activated or deactivated.

- The activation may be manual.
- The manual activation and deactivation of AIS targets shall have similar functionality as for the acquisition and cancellation of radar-plotted targets.

5.6.6 Scaled ship symbol

The AIS symbol (AIS 2) of an activated target may be replaced by a scaled ship symbol on a large scale/small range display. (C.217/2.1.11)

5.6.7 Reported ship antenna reference point

If the COG / SOG (or CSE / STW) vector is shown, its reference point shall be the reported position (either the actual or the virtual position) of the antenna. (C.217/2.1.12)

5.6.8 Target selection

Means shall be provided to select a target or own ship for the display of its AIS data on request. If more than one target is selected, the relevant symbols and the corresponding data shall be clearly identified. The source of the data (for example, AIS or radar) shall be clearly indicated. (C.217/2.1.13)

If more than one target is selected, the relevant symbols and the corresponding data windows shall be clearly identified (for example, with a unique number adjacent to the symbol and the associated data area).

5.6.9 Stabilisation of graphically displayed data

If AIS information is graphically displayed on radar, the equipment shall be capable of appropriately stabilising the radar image and the AIS information. (C.217/2.1.7) Both sea and ground stabilisation may be available. Mixing of different stabilisation modes shall not be permitted on the same screen. When the presentation is sea stabilised both graphical and alphanumeric information (including the AIS) shall be consistently displayed.

AIS vectors shall be 'sea' stabilised (using CSE and STW) in the 'sea stabilised' mode and the radar plotting vectors shall be 'ground' stabilised (using COG and SOG) in the 'ground stabilised' mode. If a trail manoeuvre is provided, it shall be consistent for radar plotting and relevant AIS targets. (See annex C)

5.7 Equipment alarms and indications

Means shall be provided to display and acknowledge alarm messages from own AIS. IEC 61162-1 ALR and ACK sentences are available from the AIS and may be used for this purpose. An indication shall be given if own AIS is out of service, for example non-operational or switched off. (C.217/2.2.7)

5.8 Equipment manuals

The manufacturer's documentation shall include information on installation and operation in accordance with IEC 60945. The manufacturer's documentation shall also identify any 'operational limitations' as a consequence of including the enhancement provided for by these guidelines. (See Annex C)

6 Methods of testing and required test results

6.1 General

Using a simulator set up scenarios to fully exercise the EUT according to the manufacturer's documentation. Equivalent methods to meet these criteria are acceptable.

6.1.1 Presentation and display of AIS information

6.1.1.1 Method of test

Manufacturer's demonstration that the EUT meets the relevant performance standards and that, AIS information can be presented. Additional hardware to facilitate AIS presentation is to be declared. (5.1.1)

6.1.1.2 Required result

Confirm that the manufacturer's demonstration meets the requirement.

6.1.2 Display and indication of AIS functions equivalency

6.1.2.1 Method of test

Check and ensure equivalency between radar plotting and AIS plotting functionality and operation. (5.1.2)

6.1.2.2 Required result

Confirm that the results comply with the requirement.

6.1.3 Minimum required AIS information for collision avoidance

6.1.3.1 Method of test

Check and ensure that a facility to enable the user to select at least the minimum AIS information required for aiding collision avoidance and target identification is available as noted in Table 1. (5.1.3)

6.1.3.2 Required result

Confirm that the results comply with the requirement.

6.1.4 Graphical display of AIS capability

6.1.4.1 Method of test

Check and ensure that the equipment has the capability to graphically display AIS targets as symbols as noted in Annex B. (5.1.4)

6.1.4.2 Required result

Confirm that the results comply with the requirements.

6.1.5 Indication of AIS functionality

6.1.5.1 Method of test

Check by inspection that a clear and continuous indication is given of the status for the AIS functionality. (5.1.5)

6.1.5.2 Required result

Confirm that the results comply with the requirement.

6.2 Interfacing requirements

6.2.1 Minimum AIS information input

6.2.1.1 Method of test

Set up the AIS inputs in accordance with the requirement for messages 1 and 2, and, 18 and 19. (5.2.1)

Run the standard test scenario and ensure the minimum requirements for graphical and alphanumeric display is met in accordance with Table 1. (5.2.1)

6.2.1.2 Required result

Confirm that the results comply with the requirement.

6.2.2 Output of AIS information

6.2.2.1 Method of test

If AIS targets are transmitted from the radar ensure the TTM message is available and type of acquisition field is set to 'R'. (5.2.2)

6.2.2.2 Required result

Confirm that the results comply with the requirement.

6.3 Processing of information**6.3.1 Zones and limits****6.3.1.1 Method of test**

Set zones or limits for automatic target acquisition if provided, ensure that these are the same regardless of their source, according to the manufacturer's documentation. (5.3.1)

6.3.1.2 Required result

Confirm that the results comply with the requirement.

6.3.2 Vector consistency**6.3.2.1 Method of test**

Check and verify that the vector time is adjustable and valid for presentation of any target regardless of its source. Ensure that vectors from radar plotting and AIS are of the same 'time' length and consistent in presentation. (5.3.2.)

6.3.2.2 Required result

Confirm that the results comply with the requirement

6.3.3 Equivalency of radar plotting and AIS plotting functions**6.3.3.1 Method of test**

Run the test scenario for 10 corresponding AIS and 10 radar plotting targets. Check that the calculated CPA and TCPA values for the corresponding AIS and radar plotting targets are equivalent.

Where radar plotting aids are used for the display of AIS information, ensure that these are capable of calculating and displaying AIS collision parameters equivalent to the available radar plotting functions. (5.3.3)

6.3.3.2 Required result

Confirm that the results comply with the requirement

6.3.4 (CPA/TCPA) Alarm**6.3.4.1 Method of test**

Set up the following scenario according to Table 3 and Table 4 and record the results. (5.3.4)

Table 3 – Scenario – Initial situation (T + 0)

	Range	Bearing	Speed SOG	Bearing COG
Own ship			12 kt	0,0°
AIS 1	8,0 nm	330°	14 kt	135°
AIS 2	4,4 nm	0,0°	0 kt	N/A
RP 1	8,0 nm	30°	14 kt	225°

Initial Settings: CPA 2 nm; TCPA 10 min; vector length 10 min

- a) Run the scenario comprising 3 targets with the above initial settings. Acquire or activate the targets. Observe the reactions when the targets approach and violate the limits. Record the time (T) of the alarm(s) from the start of the scenario and acknowledge the alarm(s). Targets AIS 1 / radar plotting 1 are expected to trigger an alarm at T + 9,5 min. and Target AIS 2 at T + 12 min.

Table 4 – Scenario – Situation at T + 10 min

	Range	Bearing	Speed SOG	Bearing COG	CPA	TCPA
Own Ship			12 kt	0,0°		
AIS 1	4,1 nm	325°	14 kt	135°	0,9	9,5
AIS 2	2,4 nm	0,0°	0 kt	N/A	0,0	12,0
RP 1	4,1 nm	35°	14 kt	225°	0,9	9,5

Reduce the TCPA limit so that the TCPA limit is no longer violated.

Disable the AIS functionality and increase the TCPA limit until the TCPA limit is again violated, observe the alarm.

- b) If AIS functionality can be de-activated, then operate this function and check that no AIS CPA/TCPA alarm is generated when an AIS target violates the set limits.
- c) Check that the system uses the last available COG/SOG and or position received from AIS.
- d) Check that no filtering or prediction is used based on rate of turn information.
- e) Check that if a failure of own ship or AIS target COG/SOG or other parameters causes an uncertainty in CPA/TCPA values that a clear indication is given. Check that this clear indication is described in the manual.
- f) When AIS is enabled check that the manual speed, set and drift and echo reference functions are disabled.

6.3.4.2 Required result

- a) For the above scenario. Confirm that the vector presentation for the moving targets (AIS1 and radar plotting1) after T + 3 min is approximately equivalent and complementary about ownship heading line.

Confirm that alarms sound, symbols change and that they can be acknowledged.

Check that the TCPA calculation accuracy is within ± 1 minute and that the CPA calculation accuracy is within $\pm 0,5$ nm.

With the AIS functionality disabled confirm that only the radar plotting1 target raises an alarm.

- b), c), d), e) and f) confirm that the requirements are met.

6.3.5 Processing or display overload

6.3.5.1 Method of test

When the maximum number of AIS targets that can be processed has been reached, an indication is provided.

When the maximum anticipated number (for example 500) of AIS targets possible to be processed has been reached the system continues to operate. (5.3.5)

6.3.5.2 Required result

Confirm that the requirements are met.

6.3.6 Lost target alarm

6.3.6.1 Method of test

Construct a scenario containing 12 targets complying with the parameters as shown in Table 2.

Disable one AIS target, repeat for AIS targets of different reporting rates and ensure that the results as shown in Table 2 are met.

If the facility is provided, check that acknowledged lost target data can be recovered. (5.3.6)

As an equivalent, this test can be carried out with one target when all the reporting rates are checked accordingly.

6.3.6.2 Required result

Confirm that the requirements are met.

6.3.7 Ownship position – lost

6.3.7.1 Method of test

Disconnect ownship EPFS position and ensure that AIS functionality is disabled unless DR position is used for CPA/TCPA then ensure that a clear indication is given and that AIS functionality is disabled after a maximum of 10 min. (5.3.7)

6.3.7.2 Results required

Confirm that the requirement is met.

6.3.8 Automatic display function

6.3.8.1 Method of test

If an automatic display function (target association) is provided, activate the automatic selection criteria, start the scenario and then check the following: (5.3.8)

- a) Where at least one of the association parameters is outside the set limits, an AIS target and a radar plotting target do not associate and are presented as separate targets.
- b) Where the association parameters are met, An AIS target and radar plotting target is displayed as a single target.
- c) Deactivate the association process and confirm that the AIS and radar plotting targets are presented as separate targets.

6.3.8.2 Required result

Confirm that:

- a) The AIS and radar plotting targets do not associate and are presented as separate targets
- b) The AIS and radar plotting targets associate and are presented as a single target
- c) The AIS and radar plotting targets are presented as separate targets

6.4 Presentation of information

Using the Standard test scenario. (5.4)

6.4.1 Minimum AIS information to be displayed

6.4.1.1 Method of test

Start the test scenario and activate a target with the equipment ground stabilised, check by inspection that the following information is graphically displayed: (5.4.1)

- 1) Position
- 2) Course over the ground
- 3) Speed over the ground
- 4) Heading
- 5) Rate of turn or direction of turn, as available.

Change the mode of presentation to sea stabilised and check that the following information is graphically displayed:

- 1) Position
- 2) Course through the water
- 3) Speed through the water
- 4) Heading
- 5) Rate of turn or direction of turn, as available.

6.4.1.2 Required result

Confirm that the results comply with the requirement.

6.4.2 Heading test

6.4.2.1 Method of test

Deactivate the heading for a selected AIS target and check by inspection that the orientation of the triangle is displayed in the COG or CSE direction, based on the appropriate mode of presentation. (Check both modes) (5.4.2)

6.4.2.2 Required result

Confirm that the information complies with the requirement.

6.4.3 Symbol presentation

6.4.3.1 Method of test

Run the scenario and check that: (5.4.3)

- a) The symbols described in Annex B are presented.
- b) If the system uses prediction the symbols on the screen are positioned correctly.
- c) Radar signals are not be masked, obscured or degraded

6.4.3.2 Required result

Confirm that the results comply with the requirements for a), b) and c).

6.4.4 Equivalency of AIS and radar plotting target presentation

6.4.4.1 Method of test

- a) Check that when the graphical display of AIS targets is enabled or available, the graphical properties of other (for example radar plotting) target vectors is equivalent to those of the AIS target symbols.
- b) Select each presentation and stabilisation mode as provided and verify that the vector properties change accordingly and the active display mode is indicated. (5.4.4)

6.4.4.2 Required result

Confirm that the results comply with the requirements for a) and b).

6.4.5 Prioritisation of display symbology

6.4.5.1 Method of test

Where target association is provided run the test scenario and check the following. (5.4.4)

- a) Check that the presentation of AIS target symbols, except for sleeping or lost targets, has priority over other targets within the display area including radar plotting targets.
- b) Where the facility is provided, select a target where AIS and radar plotting data are available for display and check that there is access to each source of target data. Check that the source of data is indicated.
- c) Where the facility is provided, check that the radar plotting symbol takes priority over sleeping or lost AIS targets.

6.4.5.2 Required result

Confirm that the results comply with the requirement for a), b) and c).

6.5 Alpha numeric display of selected target data

With a minimum of two moving AIS targets providing the required AIS test data and one moving or stationary radar target. (5.5)

6.5.1 Display of current data

6.5.1.1 Method of test

Select a moving target and check by inspection that the alphanumeric data is displayed and continually updated, until another AIS or radar plotting target is selected for data display, or until the window is closed. (5.5.1)

6.5.1.2 Required result

Confirm that the results comply with the requirement.

6.5.2 Selected alphanumeric data

6.5.2.1 Method of test

- a) Select a target for display of AIS data.
- b) Delete data attributes associated with the selected target on the AIS-target simulator and observe the contents of the display field. (5.5.2)

6.5.2.2 Required result

- a) Check and confirm that the system can display ship's MMSI, CPA and TCPA and associated data and. that data such as range and bearing, course and speed can be displayed.
- b) Check that missing information is clearly indicated in the related data field.

6.5.3 Common reference point

6.5.3.1 Method of test

By inspection of the relevant parts of the manufacturer's documentation and the capabilities of the radar display, confirm that a common reference point is used for the superimposition of AIS symbols with other information on the same display and for the calculation of target properties (for example CPA/TCPA). (5.5.3)

6.5.3.2 Required result

Confirm that the results comply with the requirement.

6.5.4 Target data identification

6.5.4.1 Method of test

Select a radar plotting target and AIS target, check that the data derived from these targets is clearly distinguishable and complies with the documentation of the manufacturer. (5.5.4)

6.5.4.2 Required result

Confirm that the results comply with the requirement.

6.6 Graphical display of targets

6.6.1 Display activation

6.6.1.1 Method of test

Check that it is possible to switch the graphical display of AIS information on and off. Check that when off, the collision risk (CPA/TCPA) alarm function remains active by using the scenario defined in Tables 3 and 4. (5.6.1)

6.6.1.2 Required result

Confirm that the results comply with the requirement.

6.6.2 Independent display of AIS data with respect to radar

6.6.2.1 Method of test

Generate an AIS target with no radar returns present and check that an AIS symbol is displayed. (5.6.2)

6.6.2.2 Required result

Confirm that the results comply with the requirement.

6.6.3 Display of AIS targets

6.6.3.1 Method of test

- a) Check that the capacity and limitations of the system are noted within the operation manual.
- b) Check that within the capacity of the equipment and when the AIS targets meet the display criteria, that the operator can choose to display all or any AIS targets for graphical presentation.
- c) Check that it is not possible to remove individual AIS targets permanently from the display.
- d) Check that the mode of presentation and source (for example radar plotting or AIS) of information is indicated.
- e) Check AIS targets (within user selected display criteria and the equipment limitations) can be displayed at least as sleeping targets, when the display of AIS targets is switched on.
- f) Check that there is a clear indication of the AIS display presentation status.
- g) Check that all AIS targets are displayed when the display criterion is met. (5.6.3)

6.6.3.2 Required result

Confirm that the results comply with the requirement for a), b), c), d), e), f) and g).

6.6.4 Enabled AIS symbol removal

6.6.4.1 Method of test

Enable the display of AIS symbols and check that it is only possible to remove a dangerous target temporarily for as long as the operator activates the corresponding control. (5.6.4)

6.6.4.2 Required result

Confirm that the results comply with the requirement.

6.6.5 Activation of targets

6.6.5.1 Method of test

Start the scenario defined in Tables 3 and 4 and enable the display of AIS symbols and check when the CPA/TCPA alarm is released that: (5.6.5)

- a) It is possible to activate/deactivate one or several targets.
- b) That the functionality of the activation and deactivation of AIS targets is similar to the acquisition and cancellation of radar plotting targets.

6.6.5.2 Required result

Confirm that the results comply with the requirement for a) and b).

6.6.6 Scaled ship symbol

6.6.6.1 Method of test

If provided, check by inspection that the AIS symbol (AIS symbol 2) of an activated target can be replaced by a scaled ship symbol on a large scale/small range display. (5.6.5)

6.6.6.2 Required result

Confirm that the results comply with the requirement.

6.6.7 Antenna reference point

6.6.7.1 Method of test

Check by inspection that when a COG/SOG (or CSE/STW) vector is shown its reference point is the reported position (either actual or virtual position) of the antenna. (5.6.7)

6.6.7.2 Required result

Confirm that the results comply with the requirement.

6.6.8 Target selection

6.6.8.1 Method of test

Check by inspection the following aspects: (5.6.8)

- a) that it is possible to select at least one or optionally, more than one target;
- b) that the relevant symbols are used;
- c) that the corresponding data windows can be clearly identified (for example with a unique number adjacent to the symbol and in the associated data area) and that the source of data is clearly identified.

6.6.8.2 Required result

Confirm that the results comply with the requirement for a), b) and c).

6.6.9 Stabilisation of graphically displayed data

6.6.9.1 Method of test

- a) Check by inspection that when AIS information is graphically displayed on radar that the equipment is capable of appropriately stabilising the radar image and the AIS information.
- b) Check that different stabilisation modes are not displayed on the same screen at any time and verify by inspection that the presentation (graphic and alphanumeric) of sea stabilised information is consistently displayed.
- c) Check by inspection that AIS vectors are sea stabilised (using CSE and STW) in the sea-stabilised mode and the radar plotting vectors are ground stabilised (using COG and SOG) in the ground-stabilised mode.
- d) Check that when a trial manoeuvre feature is available, it is carried out in a consistent manner for radar plotting and AIS activated targets. (5.6.9)

6.6.9.2 Required result

Confirm that the results comply with the requirement for a), b), c) and d).

6.7 Equipment alarms and indications

6.7.1 Method of test

- a) Generate an alarm at the own AIS equipment and check that it is possible to display and acknowledge alarm messages at the radar display.
- b) If IEC 61162-1 ALR and ACK sentences are used for this purpose check the compliance in accordance with the note in the relevant standard.
- c) Stop the transmission from the simulator and check an indication is given. (5.7)

6.7.2 Required result

Confirm that the results comply with the requirement for a), b) and c).