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DIN EN 62388:2008-09

Entwurf

**Navigations- und Funkkommunikationsgeräte und -systeme für die
Seeschifffahrt –
Radar für Schiffe –
Leistungsanforderungen, Prüfverfahren und geforderte Prüfergebnisse
(IEC 80/674/CDV:2012);
Englische Fassung FprEN 62388:2012**

Maritime navigation and radiocommunication equipment and systems –
Shipborne radar –
Performance requirements, methods of testing and required test results
(IEC 80/674/CDV:2012);
English version FprEN 62388:2012

Anwendungswarnvermerk

Dieser Norm-Entwurf mit Erscheinungsdatum 2013-05-27 wird der Öffentlichkeit zur Prüfung und Stellungnahme vorgelegt.

Weil die beabsichtigte Norm von der vorliegenden Fassung abweichen kann, ist die Anwendung dieses Entwurfes besonders zu vereinbaren.

Stellungnahmen werden erbeten

- vorzugsweise online im Norm-Entwurfs-Portal des DIN unter www.entwuerfe.din.de bzw. für Norm-Entwürfe der DKE auch im Norm-Entwurfs-Portal der DKE unter www.entwuerfe.normenbibliothek.de, sofern dort wiedergegeben;
- oder als Datei per E-Mail an dke@din.de möglichst in Form einer Tabelle. Die Vorlage dieser Tabelle kann im Internet unter www.din.de/stellungnahme oder für Stellungnahmen zu Norm-Entwürfen der DKE unter www.dke.de/stellungnahme abgerufen werden;
- oder in Papierform an die DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE (Hausanschrift: Stresemannallee 15, 60596 Frankfurt am Main).

Die Empfänger dieses Norm-Entwurfs werden gebeten, mit ihren Kommentaren jegliche relevanten Patentrechte, die sie kennen, mitzuteilen und unterstützende Dokumentationen zur Verfügung zu stellen.

Gesamtumfang 187 Seiten

DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE
Normenstelle Schiffs- und Meerestechnik (NSMT) im DIN

Nationales Vorwort

Die englische Originalfassung des internationalen Dokuments FprEN 62388:2012 „Navigations- und Funkkommunikationsgeräte und -systeme für die Seeschifffahrt – Radar für Schiffe – Leistungsanforderungen, Prüfverfahren und geforderte Prüfergebnisse“ (Entwurf in der Umfrage) ist unverändert in diesen Norm-Entwurf übernommen worden.

Die Internationale Elektrotechnische Kommission (IEC) und das Europäische Komitee für Elektrotechnische Normung (CENELEC) haben vereinbart, dass ein auf IEC-Ebene erarbeiteter Entwurf für eine Internationale Norm zeitgleich (parallel) bei IEC und CENELEC zur Umfrage (CDV-Stadium) und Abstimmung als FDIS (en: Final Draft International Standard) bzw. Schluss-Entwurf für eine Europäische Norm gestellt wird, um eine Beschleunigung und Straffung der Normungsarbeit zu erreichen. Dem entsprechend ist das internationale Dokument IEC 80/674/CDV:2012 „Maritime navigation and radiocommunication equipment and systems – Shipborne radar – Performance requirements, methods of testing and required test results“ unverändert in den Entwurf FprEN 62388:2012 übernommen worden.

Das internationale Dokument wurde vom TC 80 „Maritime navigation and radiocommunication equipment and systems“ der Internationalen Elektrotechnischen Kommission (IEC) erarbeitet.

Das Präsidium des DIN hat mit Präsidialbeschluss 1/2004 festgelegt, dass DIN-Normen, deren Inhalt sich auf internationale Arbeitsergebnisse der Informationsverarbeitung gründen, unter bestimmten Bedingungen allein in englischer Sprache veröffentlicht werden dürfen. Das K 738 hat mit RS_738_2012-0018 beschlossen, dass die Bedingungen des DIN-Präsidialbeschlusses 1/2004 für das vorliegende Normprojekt erfüllt sind.

Da sich die Benutzer der vorliegenden Norm der englischen Sprache als Fachsprache bedienen, wird die Englische Fassung der IEC 62388 veröffentlicht. Zu deren Abschnitt 3, der die Abkürzungen und Begriffe festlegt, wurde eine Übersetzung angefertigt und als informativer Nationaler Anhang NA der vorliegenden Norm hinzugefügt. Für viele der verwendeten Begriffe existieren keine gebräuchlichen deutschen Benennungen, da sich die deutschen Anwender in der Regel ebenfalls der englischen Benennungen bedienen. Diese Norm steht nicht in unmittelbarem Zusammenhang mit Rechtsvorschriften und ist nicht als Sicherheitsnorm anzusehen.

Bei der Abstimmung zu dem Europäischen Schluss-Entwurf bei CENELEC und dem Internationalen Schluss-Entwurf bei IEC [Final Draft International Standard (FDIS)] sind jeweils nur „JA/NEIN“-Entscheidungen möglich, wobei „NEIN“-Entscheidungen fundiert begründet werden müssen. Dokumente, die bei CENELEC als Europäische Norm angenommen und ratifiziert werden, sind unverändert als Deutsche Normen zu übernehmen.

Für diesen Norm-Entwurf ist das nationale Arbeitsgremium K 738 „Elektronische Navigationsinstrumente“ der DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE (www.dke.de) zuständig.

Es ist vorgesehen, auch bei der entsprechenden zukünftigen Deutschen Norm auf die deutsche Sprachfassung zu verzichten und diese in der englischsprachigen Fassung zu veröffentlichen

Für den Fall einer undatierten Verweisung im normativen Text (Verweisung auf eine Norm ohne Angabe des Ausgabedatums und ohne Hinweis auf eine Abschnittsnummer, eine Tabelle, ein Bild usw.) bezieht sich die Verweisung auf die jeweils neueste gültige Ausgabe der in Bezug genommenen Norm.

Für den Fall einer datierten Verweisung im normativen Text bezieht sich die Verweisung immer auf die in Bezug genommene Ausgabe der Norm.

Der Zusammenhang der zitierten Normen mit den entsprechenden Deutschen Normen ergibt sich, soweit ein Zusammenhang besteht, grundsätzlich über die Nummer der entsprechenden IEC-Publikation. Beispiel: IEC 60068 ist als EN 60068 als Europäische Norm durch CENELEC übernommen und als DIN EN 60068 ins Deutsche Normenwerk aufgenommen.

Änderungen

Gegenüber DIN EN 62388:2008-09 wurden folgende Änderungen vorgenommen:

- a) In 5.2 wird eine Referenz auf den überarbeiteten Annex B gemacht, wo die Maske verschärft und an die ITU Anforderungen angepasst wurde und ein neuer, informativer Annex J, die Interferenz von Emissionen in benachbarten Frequenzbändern betreffend, wurde ergänzt.
- b) Anstelle der Referenz zur EN 62288 wurde Abschnitt 6 durch entsprechende Abänderungen in der ganzen Norm vereinfacht (und die bisherigen Annexes J und K wurden entfernt).
- c) In 8.7.2 wurden die Anforderungen an parallele Indexlinien überarbeitet.
- d) In 9.9.4 wurde ein neuer Anzeigemodus „head-up stabilized“ ergänzt.
- e) In 10.5 wurden neue Anforderungen und Prüfungen für Arten von AIS-Zielen, AIS-Relaisstationen und zur Filterung von AIS-Zielen ergänzt.
- f) In Abschnitt 11 wurde ein neuer Unterabschnitt 11.3 zu ECDIS-Backup Anforderungen ergänzt.
- g) In Abschnitt 12 wurde ein neuer Unterabschnitt 12.1.4 ergänzt, der Anforderungen an Default-Steuerungseinstellungen vorgibt.
- h) 13.3 wurde zusammen mit dem zugehörigen Annex H überarbeitet, um insbesondere die Anforderungen im Hinblick auf die Alert-Behandlung und Schnittstellen zum VDR zu aktualisieren.
- i) Abschnitt 15 wurde überarbeitet, um die Anforderungen zu aktualisieren und an das Bridge Alert Management anzupassen und neue Anforderungen für eine Alert Management Schnittstelle mit zugehörigen Änderungen in der ganzen Norm ergänzt.
- j) In Abschnitt 17 wurde ein neuer Unterabschnitt 17.4 für Wartungsinformation und Geräte-Update ergänzt.

Nationaler Anhang NA (informativ)

NA.1 Begriffe

Für die Anwendung dieses Dokuments gelten die folgenden Begriffe.

Die deutschen Übersetzungen haben Empfehlungscharakter und können nur die ungefähre Begrifflichkeit in Deutsch wiedergeben. Unter Experten wird empfohlen, ausschließlich die englischen Fachbegriffe zu verwenden, um die Gefahr von Missverständnissen zu reduzieren.

NA.1.1 Begriffe

1.1.1

aktiviertes AIS-Ziel

Ziel, das die automatische oder manuelle Aktivierung eines schlafenden Ziels für die Anzeige zusätzlicher grafisch dargestellter Informationen wiedergibt. Das Ziel wird durch ein „aktiviertes Ziel“ Symbol einschließlich einem Vektor; dem Kurs und der Rotation oder der Drehrichtungsanzeige (wenn verfügbar) angezeigt, um begonnene Kursänderungen zu kennzeichnen.

1.1.2

Akquisition eines Radarziels

Prozess zur Erfassung eines Ziels und Beginn seiner Verfolgung

1.1.3

Aktivierung eines AIS-Ziels

Aktivierung eines schlafenden AIS-Ziels für die Anzeige zusätzlicher grafischer und alphanumerischer Informationen

1.1.4**akquiriertes Radarziel**

Automatische oder manuelle Akquirierung initiiert die Radarverfolgung. Vektoren und vorherige Positionen (wenn angegeben) werden angezeigt, wenn die Daten einen stabilen Zustand (nach 1 Min.) erreicht haben.

1.1.5**automatisches Identifizierungssystem****AIS**

Automatisches Identifizierungssystem, das den Anforderungen in Anhang 3 der IMO Resolution MSC.74(69) und IEC 61993-2 entspricht

1.1.6**AIS-Ziel**

von einer AIS-Meldung generiertes Ziel

1.1.7**zugehöriges Ziel**

Ziel, welches gleichzeitig ein akquiriertes Radarziel und ein gemeldetes AIS-Ziel mit ähnlichen Parametern darstellt (zum Beispiel Position, Kurs, Geschwindigkeit), die mit einem Zuordnungsverfahren als übereinstimmend erkannt wurden

1.1.8**Akquirierungs- und Aktivierungszone**

durch den Bediener festgelegte Zone, in der das System Radarziele automatisch erfasst und gemeldete AIS-Ziele beim Eintritt in die Zone aktiviert

1.1.9**Azimuthstabilisierung**

Referenzkursinformation, zum Beispiel die des eigenen Kreiselkompass, wird zur Ausrichtung der Vorauslinie auf der Radaranzeige benutzt, so dass sie auf der Peilskala vom CCRP zum Referenzkurs des eigenen Schiffes zeigt

1.1.10**kleinster Abstand zum Kreuzen des Bugs / Zeit bis zum Kreuzen des Bugs****BCR/BCT**

vom Bug des Schiffes aus gesehene Messungen, im Gegensatz zum CCRP

1.1.11**die vier Hauptrichtungen**

0 Grad, 090 Grad, 180 Grad, 270 Grad Richtungen auf dem Kompass

1.1.12**konsistenter, gemeinsamer Bezugspunkt****CCRP**

Ort auf dem eigenen Schiff, auf den alle horizontalen Messungen wie Zielentfernung und -peilung, relativer Kurs, relative Geschwindigkeit, kleinster Passierabstand (CPA), Zeit bis zum kleinsten Passierabstand (TCPA) bezogen sind, in der Regel der Steuerstand auf der Brücke

1.1.13**kleinster Passierabstand (CPA) / Zeit bis zum kleinsten Passierabstand****TCPA**

Entfernung zum kleinsten Passierabstand (CPA) und Zeit bis zum kleinsten Passierabstand (TCPA). Grenzwerte werden durch den Bediener gesetzt und sind auf das eigene Schiff bezogen.

1.1.14**Kurs**

in Grad gegenüber Nord ausgedrückte Richtung in die sich das Schiff bewegt oder bewegen soll, gewöhnlich von 0 Grad im Norden, dann im Uhrzeigersinn bis 360 Grad

1.1.15

**Kurs über Grund
COG**

an Bord des Schiffs gemessene, in Winkleinheiten zum geographischen Norden ausgedrückte Richtung der Schiffsbewegung relativ zum Boden

1.1.16

Kurs durch das Wasser (CTW)

durch den Winkel zwischen dem Längengrad durch die Schiffsposition und die Bewegungsrichtung des Schiffs durch das Wasser, in Winkleinheiten zum geographischen Norden ausgedrückte definierte Richtung der Schiffsbewegung durch das Wasser

1.1.17

Course-Up (C-up)

stabilisierte Sollkursanzeige, in welcher die Peilskala ausgerichtet werden kann, sodass der Kurs des eigenen Schiffs auf der Peilskala vertikal über dem CCRP liegt. Die Kurslinie zeigt weiterhin vom CCRP aus den anliegenden Kurs des eigenen Schiffs auf der Peilskala an.. Wenn der anliegende Kurs des eigenen Schiffs vom Kurs abweicht, dann zeigt die Kurslinie so lange nicht vertikal aufwärts vom CCRP, bis die Peilskala (manuell oder automatisch) zurückgesetzt wird, um die Kursänderung widerzuspiegeln .

1.1.18

gefährliches Ziel

Ziel, dessen vorhergesagte CPA und TCPA die durch den Bediener vorgegebenen Werte verletzen. Das entsprechende Ziel wird durch ein „Dangerous Target“-Symbol gekennzeichnet.

1.1.19

Vorgabe

vordefinierte, entweder durch den Anwender oder den Hersteller, eingestellte Bedingung

1.1.20

elektronisches Seekartendarstellungs- und Informationssystem

ECDIS

elektronisches Karten- und Informationssystem, welches den in der IMO-Resolution MSC.232(82) und in IEC 61174 niedergelegten Anforderungen entspricht

1.1.21

ECDIS Basisanzeige

Basisinformationen, die von einer ECDIS Anzeige nicht gelöscht werden können und die aus Informationen bestehen, die zu jedem Zeitpunkt in allen geographischen Regionen und unter allen Umständen erforderlich sind. Zur sicheren Navigation werden diese Informationen als nicht ausreichend angesehen.

1.1.22

ECDIS Standard Anzeige

Basisinformationen, die angezeigt werden, wenn eine Karte zum ersten Mal auf dem ECDIS dargestellt wird. Der Level der Informationen, die für die Routenplanung oder Routenüberwachung bereitgestellt werden, darf durch den Seefahrer entsprechend dessen Anforderungen geändert werden

1.1.23

elektronische Seekarte

ENC

hinsichtlich Inhalt, Struktur und Format entsprechend den einschlägigen IHO-Normen standardisierte Datenbasis, die durch oder im Auftrag einer Verwaltung veröffentlicht wurde

1.1.24

elektronisches Positionsbestimmungssystem

EPFS

Positionsbestimmungssystem unter Anwendung elektronischer Mittel

1.1.25**elektronische Abstands- und Peillinie****ERBL**

elektronische Peillinie mit einem Kennzeichen, das mit dem variablen Abstandskennzeichen kombiniert ist, um Abstand und Peilung vom eigenen Schiff oder zwischen zwei Zielen zu messen

1.1.26**Gerät im Test****EUT**

Gerät im Test

1.1.27**flüchtiger troposphärischer Ausbreitungskanal**

niedrig liegender Ausbreitungskanal (eine Änderung in der Luftdichte), der die Radarenergie so einfasst, dass sie sich nahe der Meeresoberfläche ausbreitet. Ein „duct“ kann Reichweiten der Radarzielerkennung ausweiten oder einschränken.

1.1.28**Sperrgebiet**

Gebiet, für das die automatische Erfassung zur Zielverfolgung ausgenommen sein kann und/oder die automatische Aktivierung schlafender AIS-Ziele unterdrückt sein kann

1.1.29**Grundstabilisierung**

Anzeigemodus, bei dem Geschwindigkeits- und Kursinformation auf den Grund bezogen sind, die grundbezogene Eingabedaten oder ein EPFS als Referenz nutzen

1.1.30**anliegender Kurs**

in horizontaler Richtung in Winkleinheiten ausgedrückter Winkel gegenüber einer Referenzrichtung, in die der Bug eines Schiffs in jedem Moment tatsächlich zeigt

1.1.31**Kurslinie**

graphische Linie von einem einheitlichen gemeinsamen Bezugspunkt ausgehend, hin zur Peilskala, um den anliegenden Kurs des Schiffs in einem Radarbild darzustellen

1.1.32**Rechtvorausmodus****H UP**

Darstellungsart, in der ein anliegender Kurs des eigenen Schiffs nach oben, in Richtung der Spitze der Peilskala, gerichtet ist. Im Rechtvorausmodus zeigt die Spitze der Peilskala einen relativen Kurs von 000 an. Radarechos werden entsprechend ihrer gemessenen Entfernungen angezeigt und bewegen sich mit relativen Zielspuren in einer Richtung relativ zum anliegenden Kurs des eigenen Schiffs.

1.1.33**stabilisierter Rechtvorausmodus****STAB H UP**

stabilisierter Rechtvorausmodus, wobei der Kurs des eigenen Schiffs nach oben in Richtung der sollkursstabilisierten Spitze der Peilskala gerichtet ist. Die Spitze der Peilskala zeigt den wahren anliegenden Kurswinkel des Schiffs gegenüber Norden. Radarechos und verfolgte Ziele werden in ihren gemessenen Entfernungen angezeigt und bewegen sich in einer Richtung relativ zum anliegenden Kurs des eigenen Schiffs.

1.1.34**Hochgeschwindigkeitsfahrzeug****HSC**

Wasserfahrzeuge, die der Definition für Hochgeschwindigkeitsfahrzeuge nach SOLAS entsprechen

1.1.35

Bildzeichen

Grafik, die eine Möglichkeit zur Steuerung einer Funktion bereitstellt oder kennzeichnet

1.1.36

Integriertes Navigationssystem

INS

Navigationssystem, welches den in der IMO-Resolution MSC.252(82) und IEC 61924-2 niedergelegten Anforderungen entspricht

1.1.37

Latenzzeit

Verzögerung zwischen den aktuell durch das Gerät empfangenen Daten und der Darstellung oder Anwendung dieser Daten

1.1.38

verlorenes AIS-Ziel

Zielsymbol, das die letzte gültige Position eines AIS-Ziels oder dessen letzte gekoppelte Position (DR) darstellt, bevor dessen Daten verloren gingen. Das Ziel wird durch ein „Lost AIS Target“-Symbol angezeigt.

1.1.39

verlorenes verfolgtes Ziel

verfolgtes Ziel, für das wegen schwacher, gestörter oder unklarer Signale keine Zielinformation mehr verfügbar ist. Das Ziel wird durch ein „Lost Tracked Radar Target“-Symbol an seiner zuletzt bekannten oder gekoppelten Position angezeigt.

1.1.40

Karten/Navigationsleitlinien

durch den Anwender definierte oder erzeugte Linien, um für die Navigation wichtige Verkehrstrennungsgebiete oder Grenzen eines Bereichs anzuzeigen

1.1.41

Menü

Bereich einer Anzeige, welcher für die interaktive Anzeige und den Betrieb eines strukturierten Menüs zur Auswahl oder zur Parameter- Daten- oder Befehlseingabe zugeordnet ist. Wenn ausgewählt, dann ersetzt das Anzeigemenü normalerweise Teile oder die ganze Datenanzeige.

1.1.42

Navigationssituation

breite und allgemeine Beschreibung der Navigationsart, die geplant ist oder gerade ausgeführt wird, zum Beispiel: Offenes Meer, Küste, äußere Anfahrt, eingeschränkte Fahrtgebiete, Sperrung, Anlegen/Manövrieren

1.1.43

nichtflüchtiger und übertragbarer Speicher

Speicher, der seine Daten behält, wenn er nicht mit Energie versorgt und von einem Gerät oder Modul getrennt und an ein anderes Gerät oder Modul angeschlossen wird

1.1.44

Norden oben (N-up)

Azimuth stabilisierte Darstellung, wobei der Norden auf der Kompassskala fest vertikal oberhalb des CCRP fixiert bleibt. Die Kurslinie zeigt vom CCRP zum auf das eigene Schiff bezogenen Kurs auf der Kursskala und die Peilung eines jeden Ziels wird von Norden gemessen. Solch eine Peilung wird gewöhnlich als eine wahre Peilung bezeichnet, wenn die Referenzkurseingabe von einem Kompass kommt, der auf den geographischen Norden abgeglichen ist.

1.1.45

betrieblicher Anzeigebereich

Anzeigebereich zur grafischen Präsentation elektronischer Karten- und Radarinformationen, ohne den Anwenderdialogbereich. Auf der Kartenanzeige ist das der Bereich der Kartendarstellung. Auf der Radaranzeige ist das der Bereich des Radarbildes

1.1.46**Betriebsart**

Primärfunktion der durch den Anwender ausgewählten Darstellung des Arbeitsauftrags oder der Navigationssituation, zum Beispiel Radar, Karte, Schiffsführung

1.1.47**Vergangenheits- Positionen**

Markierungen der letzten Positionen eines verfolgten oder angezeigten Ziels und des eigenen Schiffs mit gleichen zeitlichen Abständen. Die Spur der letzten Positionen kann relativ oder wahr sein und lässt sich auf verfolgte Radarziele oder AIS-Ziele anwenden.

1.1.48**Darstellungsart**

Ergebnis der Kombination der durch Anwender ausgewählten Parameter, welche die Anzeige von Informationen beeinflusst, zum Beispiel, Sollkurs Orientierung, Bewegung, Stabilisierung, Karten-Projektion

1.1.49**geschütztes Menü**

Menü, das nicht einfach durch den Anwender zugänglich ist und der Zugang kann zum Beispiel mit Password oder einem Schalter geschehen

1.1.50**Radar**

Abkürzung für radio detection and ranging. Es ist ein Funksystem, das die Bestimmung von Abstand und Richtung eines reflektierenden Gegenstands vom aussendenden Gerät erlaubt.

1.1.51**Radarbake**

Navigationshilfe, die auf die Radarübertragung durch die Erzeugung eines Radarsignals zur Identifikation ihrer Position und Identität antwortet

1.1.52**Radarquerschnitt****RCS**

bestimmt die Leistungsdichte, die von einem Ziel für ein bestimmtes Leistungsdichte Ereignis zum Radar zurück kommt

1.1.53**Radarerkenkung Fehlalarm**

Wahrscheinlichkeit eines Radar Fehlalarms, der die Wahrscheinlichkeit darstellt, dass Störungen den Erkennungs-Schwellwert übersteigen und als Ziel genannt werden, wenn nur Störungen vorhanden sind

1.1.54**Radaranzeige**

Modul eines Radarsystems, das aus der Hardware für die Darstellung besteht

1.1.55**Radarecho**

durch ein Ziel zu einer Radarantenne reflektiertes Signal, das im Radarvideo und im Radarbild erscheint

1.1.56**Radarbild**

Draufsicht des Radarvideos in Bereich und Richtung

1.1.57**Radardarstellung**

Anzeige eines Radarbildes, zusammen mit zugehöriger alpha-numerischer und graphischer Information

1.1.58

Radarsystem

gesamter Inhalt und Funktionalität eines Systems, welches zur Erfüllung der Anforderungen dieser Testnorm notwendig ist

1.1.59

Radarziel

fester oder beweglicher Gegenstand, der durch ein Radarsystem erkannt oder erkennbar ist und für den aufeinanderfolgende Radarmessungen von Entfernung und Richtung eine Bewegung festlegen. Ein Radarziel wird durch vom Radarsensor (Transceiver) bereitgestellte Videosignale abgeleitet und erscheint im Radarbild.

1.1.60

Radarbild

durch einen Radarempfänger als Ergebnis reflektierter Radarechos generiertes Signal

1.1.61

Radarzielverstärker

elektronischer Radarreflektor, an dessen Ausgang, ohne eine Verarbeitung, außer Begrenzung, eine Verstärkung des empfangenen Radarimpulses entsteht

1.1.62

Bereichsverzögerungsindex

Verzögerung zu Beginn einer Radardarstellung, um den Inhalt des Nahbereichsradarsignals wirksam zu unterdrücken und die lineare Darstellung zu verzerren

1.1.63

Drehgeschwindigkeit

ROT

Kursänderung pro Zeiteinheit

1.1.64

Referenzziel

Symbol zur Kennzeichnung, dass das assoziierte unbewegliche verfolgte Ziel (zum Beispiel ein Navigationszeichen) als eine auf Grund stabilisierte Geschwindigkeitsreferenz benutzt wird

1.1.65

relative Peilung

Richtung einer Zielposition vom CCRP des eigenen Schiffs, ausgedrückt als Winkelabweichung zum Kurs des eigenen Schiffes.

1.1.66

relativer Kurs

Bewegungsrichtung eines Ziels relativ zum Kurs (Peilung) des eigenen Schiffes

1.1.67

relative Bewegung

RM

Anzeige auf der die Position des eigenen Schiffs fest bleibt und sich alle Ziele relativ zum eigenen Schiff bewegen. Es ist die Kombination von relativem Kurs und relativer Geschwindigkeit.

1.1.68

relative Geschwindigkeit

Geschwindigkeit eines Ziels, relativ zu den Geschwindigkeitsdaten des eigenen Schiffes

1.1.69

relativer Richtungsvektor

vorhergesagte Bewegung eines Ziels, relativ zur Bewegung des eigenen Schiffes

1.1.70**Such- und Rettungstransponder
SART**

Radarantwortsender für den Betrieb im 9-GHz-Band

1.1.71**Geschwindigkeits- und Distanzmessgerät
SDME**

Geschwindigkeits- und Distanzmessgerät, welches den in der IMO-Resolution MSC. 96(72) niedergelegten Anforderungen entspricht

1.1.72**Seegang**

Zustand des Meeres aufgrund des Umgebungswetters, ausgedrückt als Seegang Stärke 0 für flache Verhältnisse mit minimalem Wind bis Stärke 8 für sehr raue Meeresbedingungen

1.1.73**ausgewähltes Ziel**

manuell ausgewähltes Ziel zur Anzeige von detaillierter alphanumerischer Information in einem separaten Anzeigebereich. Das Ziel wird durch ein „selected Target“-Symbol identifiziert.

1.1.74**schlafendes AIS-Ziel**

Ziel, welches das Vorhandensein und die Orientierung eines mit AIS ausgerüsteten Schiffes an einem bestimmten Ort anzeigt. Das Ziel wird durch ein „sleeping target“-Symbol dargestellt. Es werden keine weiteren Informationen angezeigt, bis das Ziel aktiviert ist.

1.1.75**Meeresstabilisierung**

Anzeigebetriebsart, bei der Geschwindigkeits- und Kursinformation auf das Meer bezogen sind, unter Anwendung von Kompass oder Gleichwertigem und einer Wassergeschwindigkeitslogeingabe als Referenz

1.1.76**Schutz des menschlichen Lebens auf See****SOLAS**

Internationales Übereinkommen zum Schutz des menschlichen Lebens auf See, angenommen durch die Internationale Konferenz zur Sicherheit des Lebens auf See, die durch die International Maritime Organization (IMO) in 1974 ausgerichtet wurde

1.1.77**einfache Bedienhandlung**

Ablauf, der durch nicht mehr als zwei Tasten oder Soft-Key-Bedienungen unter Ausschluss notwendiger Cursor-Bewegungen oder durch Sprachsteuerung unter Anwendung programmierter Codes oder gleichwertiger alternativer Mittel erreicht werden kann

1.1.78**Fahrt (oder Geschwindigkeit) über Grund****SOG**

an Bord des Schiffs, gegenüber dem Erdboden, gemessene Relativgeschwindigkeit

1.1.79**Geschwindigkeit im Wasser****STW**

Geschwindigkeit des Schiffs relativ zur Wasseroberfläche

1.1.80**Standardanzeige**

Level an Information, der gezeigt werden soll, wenn eine Karte zum ersten Mal auf einem ECDIS oder ECS angezeigt wird. Der Level an Information, der für Routenplanung und -überwachung bereitgestellt wird, kann durch den Seemann entsprechend seinen Anforderungen abgeändert werden.

1.1.81

Dauerzustandsverfolgung

Zielverfolgung bei stetiger Bewegung:

- nach Beendigung des Erfassungsvorgangs oder
- ohne ein Manöver des Ziels oder des eigenen Schiffs oder
- ohne Ziel-Tausch oder Störung

1.1.82

Achterlinie

Graphische Linie vom einheitlichen gemeinsamen Bezugspunkt zur Peilskala mit einer zur Kurslinie entgegengesetzten Peilung

1.1.83

Ziel-Tausch

Situation, in welcher die eingehenden Radardaten eines verfolgten Ziels inkorrekt einem anderen verfolgten Ziel oder einem nicht verfolgten Radarecho zugeordnet werden

1.1.84

vorhergesagte Zielbewegung

Vorhersage von auf der gegenwärtigen Bewegung basierendem zukünftigen Zielkurs und zukünftiger Geschwindigkeit, bestimmt durch vergangene Messungen von Entfernung und Peilung auf dem Radar

1.1.85

Zielverfolgung

TT

Computer Ablauf zur Beobachtung der sequentiellen Positionsänderungen in der Position eines Radarziels, um seine Bewegung festzulegen. Ein solches Ziel ist ein verfolgtes Ziel.

1.1.86

Arbeitsauftrag

Besondere Aktivität, die durch den Anwender ausgeführt wird, zum Beispiel, Kollisionsvermeidung, Routenplanung, Routenüberwachung, Vermeidung von Grundberührung

1.1.87

Testziel

Für Testanforderungen benutztes Radarziel mit bekannten Charakteristika

1.1.88

Spuren

in Form eines Nachglühens angezeigte Spuren von Radarzielen. Spuren können wahr oder relativ sein. Relative Spuren werden wie in relativer Bewegung dargestellt. Wahre Spuren werden wie in wahrer Bewegung dargestellt.

1.1.89

Versuchsmanöver

Gelegenheit zur graphischen Simulation, um dem Anwender zu helfen, ein vorgeschlagenes Steuer- und Kollisionsvermeidungsmanöver durch Anzeige des vorhergesagten Zustands von zumindest allen akquirierten oder aktivierten Zielen als Resultat des simulierten Manövers des eigenen Schiffs auszuführen

1.1.90

wahre Peilung

vom CCRP des eigenen Schiffs oder von einer anderen Zielposition ausgehende, als Winkelabweichung vom geographischen Norden ausgedrückte Richtung eines Ziels

1.1.91

wahrer Kurs

als Winkelabweichung vom geographischen Norden ausgedrückte relative Bewegungsrichtung eines Ziels zum Grund oder zum Meer

1.1.92**wahre Bewegung
TM**

Anzeige durch welche sich das eigene Schiff mit seiner wahren Bewegung bewegt. Es ist die Kombination von wahrem Kurs und wahrer Geschwindigkeit.

1.1.93**wahre Geschwindigkeit**

Geschwindigkeit eines Ziels relativ zum Boden oder zum Meer

1.1.94**wahrer Richtungsvektor**

Richtungsvektor, der die vorhergesagte wahre Bewegung eines Ziels darstellt und den Kurs und die Geschwindigkeit mit Referenz zum Boden oder zum Meer anzeigt

1.1.95**Anwender konfigurierte Darstellung**

durch den Anwender auftragsgemäß konfigurierte Darstellung. Die Darstellung kann Radar- und/oder Karteninformation in Kombination mit anderen Navigations- oder Schiffsbezogenen Daten enthalten

1.1.96**Anwender definiert**

Ergebnis einer Funktion oder ausgewählter bzw. anwenderdefinierter Parameter innerhalb der Vorgaben für spezielle Geräte

1.1.97**Anwenderdialogbereich**

der interaktiven Darstellung zugeordneter Anzeigebereich, der aus Datenfeldern und/oder Menüs zur Auswahl betrieblicher Parameter, hauptsächlich zur Eingabe von Daten und Kommandos in alphanumerischer Form besteht

1.1.98**Fahrtdatenaufzeichnungsgerät
VDR**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**MARITIME NAVIGATION AND RADIOCOMMUNICATION
EQUIPMENT AND SYSTEMS –**

**Shipborne radar –
Performance requirements, methods of testing
and required test results**

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International Standard IEC 62388 has been prepared by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems.

This third edition cancels and replaces the second edition published in 2007. This edition constitutes a technical revision.

The main changes with respect to the previous edition are:

- In 5.2 (Transmission and interference) reference is now made to a revised Annex B (Unwanted emissions) where the mask has been tightened from 20 dB/decade to 30 dB/decade in line with ITU requirements and a new informative Annex J has been added concerning interference from emissions in adjacent frequency bands.

- 488 - Clause 6 (Display presentation) has been simplified (and the previous Annexes J and
489 K deleted) with reference made instead to IEC 62288 with associated changes
490 throughout the standard;
- 491 - In 8.7.2 (PI lines and positioning) the requirements for parallel index lines have been
492 revised;
- 493 - In 9.4.4 (Display orientation) a new mode of display orientation “head-up stabilised”
494 has been added;
- 495 - In 10.5 (Automatic Identification System) new requirements and tests have been
496 added for types of AIS targets, AIS relay stations and filtering of AIS targets;
- 497 - In Clause 11 (Chart radar) a new subclause 11.3 has been added for ECDIS backup
498 requirements;
- 499 - In Clause 12 (Ergonomic criteria) a new subclause 12.1.4 has been added giving
500 requirements for default control settings;
- 501 - 13.3 (Interfacing) has been revised together with the associated Annex H to update
502 the requirements particularly with regard to alert handling and interfaces to the VDR;
- 503 - Clause 15 (Alerts and indicators) has been revised to update the requirements to align
504 with Bridge Alert Management and new requirements added for an alert management
505 interface with associated changes throughout the standard;
- 506 - In Clause 17 (Equipment familiarisation and documentation) a new subclause 17.4 has
507 been added for maintenance information and equipment update.

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

FDIS	Report on voting

509
510 Full information on the voting for the approval of this standard can be found in the report
511 on voting indicated in the above table.

512 This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

513 The committee has decided that the contents of this publication will remain unchanged
514 until the maintenance result date¹⁾ indicated on the IEC web site under
515 "http://webstore.iec.ch" in the data related to the specific publication. At this date, the
516 publication will be

- 517 • reconfirmed,
- 518 • withdrawn,
- 519 • replaced by a revised edition, or
- 520 • amended.

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

522

523

1) The National Committees are requested to note that for this publication the maintenance result date is 2018.

MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS –

Shipborne radar – Performance requirements, methods of testing and required test results

1 Scope

This International Standard specifies the minimum operational and performance requirements, methods of testing and required test results conforming to performance standards not inferior to those adopted by the IMO in Resolution MSC.192(79).

(MSC.192/2) *The radar installation, in addition to meeting the general requirements as set out in resolution A.694(17) and the related standard IEC 60945, should comply with the performance standards of MSC.192(79).* When a requirement of this standard is different from IEC 60945 the requirement in this standard takes precedence.

All text in this standard with wording identical to that in IMO resolutions is printed in italics. Reference to MSC.192(79) is by the relevant requirement clause as indicated in brackets, for example (MSC.192/4.2.3). Some clauses from Resolution MSC.192(79) may be split and the requirements in this case are addressed separately.

(MSC.192/5) *The design and performance of the radar should be based on user requirements and up-to-date navigational technology. It should provide effective target detection within the safety-relevant environment surrounding own ship and should permit fast and easy situation evaluation.*

(MSC.192/1) *The radar equipment should assist in safe navigation and in avoiding collision by providing an indication, in relation to own ship, of the position of other surface craft, obstructions and hazards, navigation objects and shorelines. For this purpose, radar should provide the integration and display of radar video, target tracking information, positional data derived from own ship's position (EPFS) and geo referenced data.*

The integration and display of AIS information should be provided to complement radar. The capability of displaying selected parts of Electronic Navigation Charts (ENC) and other vector chart information may also be provided to aid navigation and for position monitoring. Radar is a technology that should be applied together with other sensor information applicable for the task in hand.

NOTE Radar is a system and its performance is a factor of all of its component parts. The type test should include the radar sensor, ancillary units and display, complete with its processing and presentation display. All of these component parts contribute to the requirements and approval to these radar standards. Other navigational systems and equipment that provide radar and/or target tracking functions, should comply with the relevant clauses of this standard according to the guidelines in Annex A. A navigation display or INS may be approved as part of a radar system when tested with the specific radar sensor and relevant ancillary units. Where the intended application for a navigation system is for collision avoidance, as a minimum requirement, the radar image should always be presented, together with the relevant functionality and performance as described in Annex A.

1.1 Purpose

(MSC.192/1) *The radar combined with other sensor, or reported information (for example AIS), should improve the safety of navigation by assisting in the efficient navigation of ships and protection of the environment by satisfying the following functional requirements:*

- 572 – in coastal navigation and harbour approaches, by giving a clear indication of land and
573 other fixed hazards;
- 574 – as a means to provide an enhanced traffic image and improved situation awareness;
- 575 – in a ship-to-ship mode for aiding collision avoidance of both detected and reported
576 hazards;
- 577 – in the detection of small floating and fixed hazards, for collision avoidance and the
578 safety of own ship; and
- 579 – in the detection of floating and fixed aids to navigation.

580 1.2 Application of these standards

581 (MSC.192/2) The Performance Standards defined by MSC.192(79) shall apply to all
582 shipborne radar installations used in any configuration mandated by SOLAS independent
583 of the type of ship, frequency band in use and the type of display, providing that no
584 special requirements are specified in Table 1 and that additional requirements for specific
585 classes of ship (in accordance with SOLAS Chapters V and X) are met.

586 (MSC.192/2) Close interaction between different navigation equipment and systems
587 makes it essential to consider this standard in association with other relevant IMO and
588 IEC standards.

589 This standard applies to radar systems, navigation systems and navigation equipment
590 which have the task of target detection and collision avoidance. Any equipment which
591 combines these tasks and meets all of the requirements in this standard is regarded as a
592 radar system. In support of the Collision Regulations, all available means shall be used to
593 enhance the role of radar for safe navigation and collision avoidance. The usage of other
594 sensors should, where practical, observe the requirements of the standards associated
595 with those sensors. This standard also provides guidelines and requirements for radar
596 functionality on all navigational displays supporting the tasks of target detection, collision
597 avoidance, general navigation and position referencing on the bridge of a ship.

598 The successful integration of radar with AIS, charts, databases and other sensors
599 demands that the radar equipment is correctly set up with special attention to the critical
600 alignment of heading(s), system index delay(s), CCRP offsets and gyro. Failure to align
601 these parameters may cause unacceptable registration with other information and may
602 detract from the purpose of integration. This standard has mandated requirements to
603 provide for these alignments.

604 NOTE While X-band radar systems remain compatible with radar beacons, SARTs and radar enhancers, S-
605 band systems are permitted to harness new radar technology which may not be compatible with those devices.
606 All tests (or their equivalent) in this standard apply to both non-coherent (for example conventional-based
607 radar) and coherent radar systems (for example pulse compression radar).

608 1.3 Equipment categories

609 This standard covers the testing of all SOLAS shipborne radar equipment. Individual
610 equipment may be tested for a specific category of vessel. Table 1 provides a summary of
611 the categories and basic differential capabilities for each category further specified in
612 10.5.2 and Table 26. The category should be indicated on the type label of the main radar
613 electronics unit and on the related Certification of Test. Equipment approved for high
614 speed applications should include a suffix H (for example CAT 1H) and equipment
615 approved with a chart option should include a suffix C (for example CAT 1HC).

616 (MSC.192/5.3.1.1) Recognising the high relative speeds possible between own ship and
617 target, the equipment should be specified and approved as being suitable for classes of
618 ship having normal (≤ 30 kn) or high (> 30 kn) own ship speeds (100 kn and 140 kn relative
619 speeds respectively).

620 The additional characteristics for equipment qualified to be approved for HSC and/or for
621 chart radar are identified in this standard. For example, HSC equipment should be
622 compatible with own ship speeds of up to 70 kn, should be capable of tracking targets with
623 a 140 kn relative speed and should operate between latitudes of 70 °N and 70 °S.

624 A chart radar should conform to all the requirements of Clause 11 in this standard.
625 References are made to IEC 61174 (ECDIS) for specific and standalone chart
626 functionality.

627 **Table 1 – Performance requirements for categories of ship/craft for SOLAS V**

	Category of ship/craft		
	CAT 3	CAT 2	CAT 1
Size of ship/craft	<500 gt	500 gt to <10 000 gt and HSC<10 000 gt	All ships/craft ≥10 000 gt
Minimum operational display area diameter	180 mm	250 mm	320 mm
Auto acquisition of targets	-	-	Yes
Minimum <u>acquired</u> radar target capacity	20	30	40
Minimum <u>activated</u> AIS target capacity	20	30	40
Minimum <u>sleeping</u> AIS target capacity	100	150	200
Minimum total AIS target and reports capacity	120	180	240
Trial manoeuvre	-	-	Yes
NOTE 1 The minimum processing capacity of AIS information should be in accordance with 10.5.2 and Table 26.			
NOTE 2 The minimum display area requirement in the first edition of this standard has been removed as it is not a requirement of the display standards given in Resolution MSC.191(79).			

628 2 Normative references

629 The following referenced documents are indispensable for the application of this
630 document. For dated references, only the edition cited applies. For undated references,
631 the latest edition of the referenced document (including any amendments) applies.

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

634 IEC 61162 (all parts), *Maritime navigation and radiocommunication equipment and*
635 *systems – Digital interfaces*

636 IEC 61174, *Maritime navigation and radiocommunication equipment and systems –*
637 *Electronic chart display and information systems (ECDIS) – Operational and performance*
638 *requirements, methods of testing and required test results*

639 IEC 61924-2, *Maritime navigation and radiocommunication equipment and systems – Part*
640 *2 Modular Structure for INS - Operational and performance requirements, methods of*
641 *testing and required test results*

642 IEC 61996 (all parts), *Maritime navigation and radiocommunication equipment and*
643 *systems – Shipborne voyage data recorder (VDR) – Performance requirements – Methods*
644 *of testing and required test results*

645 IEC 62288: *Presentation of navigation-related information on shipborne navigational*
646 *displays – general requirements, methods of testing and required results.*

- 647 ISO 9000, *Quality management systems – Fundamentals and vocabulary*
- 648 ISO 9241-8, *Ergonomic requirements for office work with visual display terminals (VDTs) –*
649 *Part 8: Requirements for displayed colours*
- 650 ISO 9241-12, *Ergonomic requirements for office work with visual display terminals (VDTs)*
651 *–Part 12: Presentation of information*
- 652 ITU-R Recommendation M.628-4, *Technical characteristics for search and rescue radar*
653 *transponders*
- 654 ITU-R Recommendation M.824-3, *Technical parameters of radar beacons (racons)*
- 655 ITU-R Recommendation M.1176, *Technical parameters of radar target enhancers*
- 656 IHO S-52, *Specifications for chart content and display aspects of ECDIS*
- 657 IHO S-52 Annex A, *IHO ECDIS Presentation Library*,
- 658 IMO Resolution A.424(XI), *Performance standards for Gyro-compasses*
- 659 IMO Resolution A.694(17), *General requirements for shipborne radio equipment forming*
660 *part of the global maritime distress and safety system (GMDSS) and for electronic*
661 *navigational aids*
- 662 IMO Resolution A.821(19), *Performance standards for Gyro-compasses for High-Speed*
663 *Craft*
- 664 IMO Resolution MSC.96(72), *Amendments to IMO Resolution A.824(19), Performance*
665 *standards for devices to indicate speed and distance*
- 666 IMO Resolution MSC.116(73), *Performance standards for marine transmitting heading*
667 *devices (THDs)*
- 668 IMO Resolution MSC.191(79):2004, *Performance standards for the presentation of*
669 *navigation-related information on shipborne navigational displays*
- 670 IMO Resolution MSC.192(79):2004, *Revised performance standards for radar equipment*
- 671 IMO Resolution MSC.232(82): *Revised performance standards for electronic chart display*
672 *and information systems (ECDIS)*
- 673 IMO Resolution MSC.302(87):2010, *Performance standards for bridge alert management*
- 674 IMO MSC.1/Circ.1389:2010, *Guidance on procedures for updating shipborne navigation*
675 *and communication equipment*
- 676 VESA-2007-5:2007, *Industry standards and guidelines for computer display monitor timing*
677 *(DMT)*
- 678 DDWG DVI:1999, *Digital Visual Interface (DVI) Revision 1.0, Digital Display Working*
679 *Group (DDWG)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

activated AIS target

target representing the automatic or manual activation of a sleeping target for the display of additional graphically presented information. The target is displayed by an “activated target” symbol including a vector; the heading; and the ROT or direction of turn indication (if available) to indicate initiated course changes

3.2

acquisition of a radar target

process of acquiring a target and initiating its tracking

3.3

activation of an AIS target

activation of a sleeping AIS target for the display of additional graphical and alphanumerical information

3.4

acquired radar target

automatic or manual acquisition initiates radar tracking. Vectors and past positions (if provided) are displayed when data has achieved a steady state condition (after 1 min)

3.5

automatic identification system

AIS

Automatic Identification System which complies with the requirements of IMO resolution MSC.74(69) Annex 3 and IEC 61993-2

3.6

AIS target

target generated from an AIS message

3.7

associated target

target simultaneously representing a tracked target and a reported AIS target having similar parameters (for example position, course, speed) which comply with an association algorithm

3.8

acquisition/activation zone

zone set up by the operator in which the system should automatically acquire radar targets and activate reported AIS targets when entering the zone

3.9

azimuth-stabilised

heading reference input, for example own ship’s gyro, is used to orientate the heading line on the radar display so that it points from the CCRP to own ship’s referenced heading on the bearing scale

3.10

bow crossing range/bow crossing time

BCR/BCT

measurements presented as from the bow of the ship as opposed to the CCRP

725	3.11
726	cardinal points (compass)
727	0, 090, 180, 270 compass points
728	3.12
729	consistent common reference point
730	CCRP
731	<i>location on own ship, to which all horizontal measurements such as target range, bearing,</i>
732	<i>relative course, relative speed, closest point of approach (CPA) or time to closest point of</i>
733	<i>approach (TCPA) are referenced, typically the conning position of the bridge</i>
734	3.13
735	closest point of approach/time to the closest point of approach
736	CPA/TCPA
737	<i>distance to the closest point of approach (CPA) and time to the closest point of approach</i>
738	<i>(TCPA). Limits are set by the operator and are related to own ship</i>
739	3.14
740	course
741	<i>direction in which the ship is moving or intended to move, expressed in degrees from</i>
742	<i>North, usually from 000° at north, then in a clockwise direction through 360°</i>
743	3.15
744	course over ground
745	COG
746	<i>direction of the ship's movement relative to the earth, measured on board the ship,</i>
747	<i>expressed in angular units from true north</i>
748	3.16
749	course through water
750	CTW
751	<i>direction of the ship's movement through the water, defined by the angle between the</i>
752	<i>meridian through its position and the direction of the ship's movement through the water,</i>
753	<i>expressed in angular units from true north</i>
754	3.17
755	course-up
756	C-up
757	<i>azimuth-stabilised display in which the bearing scale can be orientated so that own ship's</i>
758	<i>course on the bearing scale is vertically above the CCRP. The heading line will continue</i>
759	<i>to point from the CCRP to own ship's referenced heading on the bearing scale. If own</i>
760	<i>ship's heading differs from the course, then the heading line will not point vertically</i>
761	<i>upwards from the CCRP until the bearing scale is reset (manually or automatically) to</i>
762	<i>reflect the course alteration</i>
763	3.18
764	dangerous target
765	<i>target whose predicted CPA and TCPA are violating the values as preset by the operator.</i>
766	<i>The respective target is marked by a "dangerous target" symbol</i>
767	3.19
768	default
769	<i>predefined condition set either by the user or the equipment manufacturer</i>
770	3.20
771	ECDIS
772	<i>Electronic Chart Display and Information System, which complies with IMO resolution</i>
773	<i>MSC.232(82) and IEC 61174</i>

- 774 **3.21**
 775 **ECDIS display base**
 776 *level of information which cannot be removed from the ECDIS display, consisting of*
 777 *information which is required at all times in all geographic areas and all circumstances. It*
 778 *is not intended to be sufficient for safe navigation*
- 779 **3.22**
 780 **ECDIS standard display**
 781 *level of information that should be shown when a chart is first displayed on ECDIS. The*
 782 *level of the information it provides for route planning or route monitoring may be modified*
 783 *by the mariner according to the mariner's needs*
- 784 **3.23**
 785 **electronic navigational chart**
 786 **ENC**
 787 *database standardised as to content, structure and format according to relevant IHO*
 788 *standards and issued by, or on the authority of, a Government*
- 789 **3.24**
 790 **electronic position fixing system**
 791 **EPFS**
 792 *position fixing system using electronic means*
- 793 **3.25**
 794 **electronic range and bearing line**
 795 **ERBL**
 796 *electronic bearing line carrying a marker, which is combined with the variable range*
 797 *marker, used to measure range and bearing from own ship or between two objects*
- 798 **3.26**
 799 **EUT**
 800 *equipment under test*
- 801 **3.27**
 802 **evaporation duct**
 803 *low lying duct (a change in air density) that traps the radar energy so that it propagates*
 804 *close to the sea surface. Ducting may enhance or reduce radar target detection ranges*
- 805 **3.28**
 806 **exclusion zone**
 807 *area which may exclude the automatic acquisition for target tracking and/or may suppress*
 808 *the automatic activation of sleeping AIS targets*
- 809 **3.29**
 810 **ground stabilisation**
 811 *display mode in which speed and course information are referred to the ground, using*
 812 *ground track input data, or EPFS as reference*
- 813 **3.30**
 814 **heading**
 815 *horizontal direction that the bow of a ship is pointing at any instant, expressed in angular*
 816 *units from a reference direction*
- 817 **3.31**
 818 **heading line**
 819 *graphic line on a radar presentation drawn from the consistent common reference point to*
 820 *the bearing scale to indicate the heading of the ship*

- 821 **3.32**
822 **head-up**
823 **H UP**
824 presentation mode in which own ship's heading is oriented "up" toward the top of the
825 bearing scale. In head-up, the top of the bearing scale shows ships relative heading, 000
826 degrees. Radar echoes are shown at their measured distances and moving in a direction
827 relative to own ship's heading with relative Target trails.
- 828 **3.33**
829 **head-up stabilised**
830 **STAB H UP**
831 an azimuth stabilised head-up presentation mode in which own ship's heading is azimuth
832 stabilised "up" toward the top of the bearing scale. The top of the bearing scale shows the
833 ship's true heading degrees from North. Radar echoes and tracked targets are shown at
834 their measured distances and moving in a direction relative to own ship's heading.
- 835 **3.34**
836 **high speed craft**
837 **HSC**
838 vessels which comply with the definition in SOLAS for high speed craft
- 839 **3.35**
840 **icon**
841 graphic that provides or signifies a control function capability
- 842 **3.36**
843 **integrated navigation system**
844 **INS**
845 navigation system which complies with the requirements of IMO resolution MSC.252(82)
846 and IEC 61924-2
- 847 **3.37**
848 **latency**
849 *delay between actual data received by the equipment and the presentation or use of that*
850 *data*
- 851 **3.38**
852 **lost AIS target**
853 *target symbol representing the last valid position of an AIS target before the reception of*
854 *its data was lost, or its last dead-reckoned (DR) position. The target is displayed by a "lost*
855 *AIS target" symbol*
- 856 **3.39**
857 **lost tracked target**
858 *one for which target information is no longer available due to poor, lost or obscured*
859 *signals. The target is displayed by a "lost tracked radar target" symbol at its last known or*
860 *dead-reckoned position*
- 861 **3.40**
862 **maps/navigation lines**
863 *operator defined or created lines to indicate channels, traffic separation schemes or*
864 *borders of any area important for navigation*
- 865 **3.41**
866 **menu**
867 area of display that is allocated to the interactive display and operation of a structured
868 menu for the selection and entry of operational parameters, data and commands. The
869 menu display, when selected, is typically replacing parts of, or the whole, data display

- 870 **3.42**
871 **navigation situation**
872 broad and general description of the type of navigation that is planned or being
873 conducted, for example open ocean, coastal, approach, confined waters, restricted,
874 docking/manoeuvring
- 875 **3.43**
876 **non-volatile and transferable memory**
877 memory which retains its data when it is not provided with power and removed from one
878 equipment or module, and fitted to another equipment or module
- 879 **3.44**
880 **north-up**
881 **N-up**
882 azimuth-stabilised presentation in which north on the bearing scale remains fixed
883 vertically above the CCRP. The heading line points from the CCRP to own ship's
884 referenced heading on the bearing scale, and the bearing of any target on the display is
885 measured from north. Such a bearing is commonly referred to as a true bearing when the
886 heading reference input comes from a gyro aligned with true north
- 887 **3.45**
888 **operational display area**
889 *area of the display used to graphically present chart and radar information, excluding the*
890 *user dialogue area. On the chart display this is the area of the chart presentation. On the*
891 *radar display this is the area encompassing the radar image*
- 892 **3.46**
893 **operational mode**
894 primary function of the presentation selected by the user, for the task at hand or
895 navigation situation, for example radar, chart, conning
- 896 **3.47**
897 **past positions**
898 *equally time-spaced past position marks of a tracked or reported target and own ship. The*
899 *past positions' track may be either relative or true, and may apply to tracked radar targets*
900 *or AIS targets*
- 901 **3.48**
902 **presentation mode**
903 result of the combination of user selected parameters that affect the display of
904 information, for example azimuth orientation, motion, stabilisation, chart projection
- 905 **3.49**
906 **protected menu**
907 one which is not easily accessed by the user and access may be, for example by a
908 password or a switch
- 909 **3.50**
910 **radar**
911 abbreviation for **radio direction and ranging**. It is a radio frequency system that allows the
912 *determination of distance and direction of reflecting objects and of transmitting devices*
- 913 **3.51**
914 **radar beacon**
915 *navigation aid which responds to the radar transmission by generating a radar signal to*
916 *identify its position and identity*

917	3.52
918	radar cross-section
919	RCS
920	determines the power density returned to the radar for a particular power density incident
921	on a target
922	3.53
923	radar detection false alarm
924	<i>probability of a radar false alarm represents the probability that noise will cross the</i>
925	<i>detection threshold and be called a target when only noise is present</i>
926	3.54
927	radar display
928	module of a radar system, consisting of the presentation hardware
929	3.55
930	radar echo
931	signal reflected by a target to a radar antenna that appears in the radar video signal and
932	radar image
933	3.56
934	radar image
935	plan view of the radar video in range and bearing
936	3.57
937	radar presentation
938	display of a radar image together with related alpha-numeric and graphical information
939	3.58
940	radar system
941	entire content and functionality of a system necessary to meet the requirements of this
942	test standard
943	3.59
944	radar target
945	<i>object, fixed or moving, which is detected or detectable by a radar system and has a</i>
946	<i>motion determined by successive radar measurements of range and bearing. A radar</i>
947	<i>target is derived from video signals provided by the radar sensor (transceiver) and which</i>
948	<i>appears in the radar image</i>
949	3.60
950	radar video
951	signal produced by a radar receiver as a result of radar echoes returned
952	3.61
953	radar target enhancer
954	<i>electronic radar reflector, the output of which is an amplified version of the received radar</i>
955	<i>pulse without any form of processing except limiting</i>
956	3.62
957	range index delay
958	delay provided at the start of a radar presentation causing the near range radar signal
959	contents to effectively be suppressed and distorting the linear plan presentation
960	3.63
961	rate of turn
962	ROT
963	<i>change of heading per time unit</i>

964	3.64
965	reference target
966	<i>symbol indicating that the associated tracked stationary target (for example a navigational</i>
967	<i>mark) is used as a speed reference for the ground stabilisation</i>
968	3.65
969	relative bearing
970	<i>direction of a target's position from own ship's CCRP expressed as an angular</i>
971	<i>displacement from own ship's heading</i>
972	3.66
973	relative course
974	<i>direction of motion of a target relative to own ship's direction (bearing)</i>
975	3.67
976	relative motion
977	RM
978	<i>display on which the position of own ship remains fixed, and all targets move relative to</i>
979	<i>own ship. It is the combination of relative course and relative speed</i>
980	3.68
981	relative speed
982	<i>speed of a target relative to own ship's speed data</i>
983	3.69
984	relative vector
985	<i>predicted movement of a target relative to own ship's motion</i>
986	3.70
987	search and rescue transponder
988	SART
989	<i>radar transponder capable of operating in the 9 GHz band</i>
990	3.71
991	speed and distance measuring equipment
992	SDME
993	<i>Speed and Distance Measuring Equipment which complies with IMO Resolution</i>
994	<i>MSC.96(72)</i>
995	3.72
996	sea state
997	<i>status of the sea condition due to the weather environment, expressed as a sea state 0 for</i>
998	<i>flat conditions with minimal wind, to sea state 8 for very rough sea conditions</i>
999	3.73
1000	selected target
1001	<i>manually selected target for the display of detailed alphanumeric information in a separate</i>
1002	<i>data display area. The target is identified by a "selected target" symbol</i>
1003	3.74
1004	sleeping AIS target
1005	<i>target indicating the presence and orientation of a vessel equipped with AIS in a certain</i>
1006	<i>location. The target is displayed by a "sleeping target" symbol. No additional information is</i>
1007	<i>presented until the target is activated</i>

- 1008 **3.75**
1009 **sea stabilisation**
1010 *display mode in which speed and course information are referred to the sea, using gyro or*
1011 *equivalent and water speed log input as reference*
- 1012 **3.76**
1013 **safety of life at sea**
1014 **SOLAS**
1015 *International Convention for the Safety of Life at Sea adopted by the International*
1016 *Conference on Safety of Life at Sea convened by the International Maritime Organization*
1017 *(IMO) in 1974*
- 1018 **3.77**
1019 **simple operator action**
1020 *a procedure achieved by no more than two hard-key or soft-key actions, excluding any*
1021 *necessary cursor movements, or by voice actuation using programmed codes or*
1022 *equivalent alternative means*
- 1023 **3.78**
1024 **speed over ground**
1025 **SOG**
1026 *speed of the ship relative to the earth, measured on board of the ship*
- 1027 **3.79**
1028 **speed through water**
1029 **STW**
1030 *speed of the ship relative to the water surface*
- 1031 **3.80**
1032 **standard display**
1033 *level of information that should be shown when a chart is first displayed on ECDIS or*
1034 *ECS. The level of the information it provides for route planning or route monitoring may be*
1035 *modified by the mariner according to the mariner's needs*
- 1036 **3.81**
1037 **steady state tracking**
1038 *tracking a target, proceeding at steady motion:*
- 1039 — *after completion of the acquisition process, or*
1040 — *without a manoeuvre of target or own ship, or*
1041 — *without target swap or any disturbance*
- 1042 **3.82**
1043 **stern line**
1044 *graphic line drawn from the consistent common reference point to the bearing scale, on a*
1045 *reciprocal bearing to the heading line*
- 1046 **3.83**
1047 **target swap**
1048 *situation in which the incoming radar data for a tracked target becomes incorrectly*
1049 *associated with another tracked target or a non-tracked radar echo*
- 1050 **3.84**
1051 **target's predicted motion**
1052 *prediction of a target's future course and speed based on its present motion as*
1053 *determined by past measurements of its range and bearing on the radar*

1054	3.85
1055	target tracking
1056	TT
1057	<i>computer process of observing the sequential changes in the position of a radar target in</i>
1058	<i>order to establish its motion. Such a target is a Tracked Target</i>
1059	3.86
1060	task at hand
1061	<i>specific activity being performed by the user, for example collision avoidance, route</i>
1062	<i>planning, route monitoring, grounding avoidance</i>
1063	3.87
1064	test target
1065	<i>radar target of known characteristics used for test requirement</i>
1066	3.88
1067	trails
1068	<i>tracks displayed by the radar echoes of targets in the form of an afterglow. Trails may be</i>
1069	<i>true or relative. Relative trails are as they would be presented in relative motion. True</i>
1070	<i>trails are as they would be presented in true motion</i>
1071	3.89
1072	trial manoeuvre
1073	<i>graphical simulation facility used to assist the operator to perform a proposed manoeuvre</i>
1074	<i>for navigation and collision avoidance purposes, by displaying the predicted future status</i>
1075	<i>of at least all acquired or activated targets as a result of own ship's simulated manoeuvres</i>
1076	3.90
1077	true bearing
1078	<i>direction of a target from own ship's CCRP or from another target's position, expressed as</i>
1079	<i>an angular displacement from true north</i>
1080	3.91
1081	true course
1082	<i>direction of motion relative to ground or to sea, of a target expressed as an angular</i>
1083	<i>displacement from north</i>
1084	3.92
1085	true motion
1086	TM
1087	<i>display across which own ship moves with its own true motion. It is the combination of true</i>
1088	<i>course and true speed</i>
1089	3.93
1090	true speed
1091	<i>speed of a target relative to ground, or to sea</i>
1092	3.94
1093	true vector
1094	<i>vector representing the predicted true motion of a target, showing course and speed with</i>
1095	<i>reference to the ground or sea</i>
1096	3.95
1097	user configured presentation
1098	<i>display presentation configured by the user for a specific task at hand. The presentation</i>
1099	<i>may include radar and/or chart information, in combination with other navigation or ship</i>
1100	<i>related data</i>

1101 **3.96**
 1102 **user-defined**
 1103 result of a function or parameter selected or defined by the user within the confines of
 1104 specific equipment

1105 **3.97**
 1106 **user dialogue area**
 1107 *area of the display consisting of data fields and/or menus that is allocated to the*
 1108 *interactive presentation and entry or selection of operational parameters, data and*
 1109 *commands mainly in alphanumeric form*

1110 **3.98**
 1111 **VDR**
 1112 voyage data recorder

1113

1114 **4 General**

1115 **4.1 Establishing equipment type and status**

1116 The manufacturer shall state the intended system content and the category of equipment
 1117 under test (EUT). Specific requirements, which shall include intended equipment category,
 1118 are listed below:

- 1119 • high speed or normal speed. (MSC.192/5.3.1.1) *Recognising the high relative*
 1120 *speeds possible between own ship and target, the equipment shall be specified*
 1121 *and approved as being suitable for classes of ship having normal (≤ 30 kn) or*
 1122 *high (> 30 kn) own ship speeds (100 kn and 140 kn relative speeds respectively);*
- 1123 • frequency band (X-band and/or S-band) and operational frequency limits;
- 1124 • declaration of any novel processing, new technology or additional functionality
 1125 which requires alternative testing or claims equivalency to the requirements;
- 1126 • list all variants (up-mast/down-mast, split processor/displays, chart option, etc);
- 1127 • identification of all antennas available with the radar. The smallest antenna (or its
 1128 properties) shall be used for all relevant performance testing. Environmental
 1129 testing (vibration and shock) shall use the largest antenna available;
- 1130 • all ancillary units (inter-switching, buffer amplifiers, etc);
- 1131 • units intended for protected (from the weather) or exposed (to the weather)
 1132 application;
- 1133 • the intended separation (cable, network or transmission line/feeder) between units.
 1134 When equipment with separate transmitter and antenna is tested in accordance
 1135 with this standard, the transmitter/receiver shall be connected to the antenna by a
 1136 20 m (minimum) of feeder. The display shall be connected to other units by 65 m
 1137 of cable. Where equipment is type tested, in which the transmitter and receiver are
 1138 always installed within the antenna/pedestal combination, the 20 m of antenna
 1139 feeder shall be omitted. Where necessary, the manufacturer shall supply the
 1140 appropriate cable and antenna feeder. The manufacturer, or its representative,
 1141 may propose to the test authority for consideration, a greater distance by which
 1142 units of the equipment may be separated and still comply with the requirements of
 1143 this standard. The actual distance requested and tested shall be recorded;
- 1144 • power supply requirements and declared nominal voltage/frequency of operation.
 1145 The supply voltage applied to the equipment during the tests shall be the nominal
 1146 voltage, and alternating current (a.c.) supplies shall be at nominal frequency
 1147 unless specified otherwise;
- 1148 • intended equipment configuration(s), either as standalone or as part of a system;

- 1149 • the manufacturer's code numbers for each piece of equipment and its ancillaries;
- 1150 • familiarisation documentation or media;
- 1151 • evidence of sea trials as required by 5.9.3.

1152 **4.2 Conditions of measurement and related definitions**

1153 All the general requirements of IEC 60945 shall be carried out on the same type of
1154 equipment under test (EUT) to verify whether the EUT meets these technical
1155 requirements. The equipment shall comply with those requirements of IEC 60945
1156 appropriate to its category, i.e. 'protected' (from the weather) or 'exposed' (to the
1157 weather). Accordingly, the manufacturer shall declare which equipment or units are
1158 intended to be 'protected' or 'exposed'. The manufacturer shall declare any
1159 'preconditioning' required before environmental checks.

1160 **4.3 Test sites and simulation**

1161 **4.3.1 Environmental and RF testing**

1162 Testing for general, environmental and radio frequency measurements shall be conducted
1163 in a test house, or location, accepted by the test authority and by competent persons
1164 familiar with the radar application.

1165 **4.3.2 Over-sea radar performance tests**

1166 Many of the tests may be conducted on land at a test site accepted by the test authority.
1167 Specific testing shall be required over sea and these may be shore based or at sea on a
1168 test ship.

1169 Radar performance tests will normally be carried out at test sites selected by the type test
1170 authority. These test sites shall provide an over water test range with test targets and the
1171 features required for specified tests. The operational performance testing in this standard
1172 shall be conducted with a nominal antenna height of 15 m.

1173 The manufacturer shall, unless otherwise agreed, set up the equipment and ensure that it
1174 is operating normally before type testing commences.

1175 The value of radar as a secondary position source is based on independence from GNSS.
1176 Tests of detection, resolution, and tracking shall exclude connection of any GNSS position
1177 and timing interfaces to the radar system during those tests. If a GNSS receiver is
1178 integrated into the radar system, it shall be deactivated during these tests.

1179 **4.3.3 Test targets and target simulation for performance tests**

1180 Standard targets used for the radar performance measurement and assessment are
1181 described in the relevant tests.

1182 The target scenario simulator provides test scenarios to assess the tracking performance
1183 of the EUT, in accordance with Annex F.

1184 The reported target simulator provides the test scenario for testing the AIS target
1185 functions and for target association, in accordance with Annex F.

1186 Simulators used for testing shall be suitably calibrated or verified before use for
1187 measurement.

1188 4.4 Quality requirements

1189 The equipment and documentation shall be developed, produced and written in
1190 accordance with a recognised quality procedure, for example ISO 9000 or an equivalent
1191 recognised quality standard.

1192 4.5 Test terminology and format

1193 4.5.1 General

1194 For each test subject, there is a requirement subclause (for example referenced to
1195 (MSC.192/clause) and a corresponding compliance subclause, which includes a test
1196 method and the required result.

1197 4.5.2 Test requirement terminology

1198 For the purposes of this standard, the following test terminology shall apply:

1199 *performance check* – reconfiguration of the EUT and checking by non-quantitative visual
1200 checks that the system is still operative for the purposes of IEC 60945. This shall include
1201 the operation of basic functionality to confirm normal operation;

1202 *performance test* – for the radar EUT, shall be of an identical standard to that used in the
1203 performance check for the purposes of IEC 60945, with the addition of a specified test as
1204 described in Clause 16;

1205 *clear indication or visibility of test targets* – visible for at least 8 out of 10 of the antenna
1206 scans, or an indication of 5 out of 10 with past positions, synthetic afterglow and trails
1207 facility switched off;

1208 *single operator action* – the use of a single hardware key or, the use of the cursor to
1209 select a single display icon or window followed by the operation of a key;

1210 *dedicated control function* – the use of a dedicated single hardware key or, the use of the
1211 cursor to select a single dedicated display icon or window followed by the operation of a
1212 key;

1213 *momentary control function* – the use of a dedicated single hardware key or, the use of
1214 the cursor to select a single dedicated display icon or window followed by the operation of
1215 a key. The control function shall only operate while the key is pushed;

1216 *readily available* – applies to information or to a function for the selected application,
1217 which is available in a top level menu and accessed directly from a screen function or
1218 icon, or by a dedicated control;

1219 *permanent indication* – applies to a status indication permanently or persistently available
1220 (as appropriate) and visible at any time that the equipment is operational;

1221 *protected menu* – is one which is not easily accessed by the user and protected for
1222 example, by a password, internal switch or hardware link;

1223 *means* – “a means to” do something is equivalent to “a method of” something, for example
1224 “a means to measure between two points” is the same as “a method of measuring”.

1225 4.5.3 Testing method terminology

1226 Testing method terminology is derived from ISO 9241-12 and for application to this radar
1227 standard, terms are defined as:

1228 *measurement* – refers to measurement or calculation of a variable concerning the
1229 presentation of information, accuracy, or the equipment performance;

1230 *observation* – means to examine or inspect the equipment to confirm that a particular
1231 observable condition has been met. Observations can be made by anyone who has the
1232 necessary skill to systematically check the presentation of information and make the
1233 determination;

1234 *document inspection* – means to confirm by inspection that any relevant documented
1235 information, facility or function is compliant with the requirement;

1236 *analytical evaluation* – requires the informed judgement of equipment performance from a
1237 study of observations or measurements by an expert, a suitably qualified person who has
1238 the necessary skill and experience to judge the relevant property in the relevant subject.
1239 The method is typically used for the evaluation of properties which can be judged only in
1240 the context of other information or knowledge.

1241 **5 Radar performance**

1242 **5.1 General**

1243 The performance test shall include measurement of the transmission frequency spectrum,
1244 familiarisation of the controls and signal processing functions, followed by minimum range,
1245 discrimination and accuracy measurements. The performance assessment in an over-sea
1246 environment shall exercise the signal processing and associated control functions. During
1247 this assessment, the test authority shall familiarise themselves with the gain and anti-
1248 clutter functions. Detection performance testing is provided in 5.9.

1249 NOTE Radar provides the primary means to detect surface hazards for safe navigation and therefore the
1250 detection of surface hazards is a primary element in the task of collision avoidance. The performance
1251 requirements should address the fundamental radar transmission, detection and signal processing capability of
1252 the radar system.

1253 **5.2 Transmission and interference**

1254 **5.2.1 Transmission frequency**

1255 **5.2.1.1 Requirement**

1256 (MSC.192/5.1.1) *The radar shall transmit within the confines of the ITU allocated bands*
1257 *for maritime radar and meet the requirements of the radio regulations and applicable ITU-*
1258 *R recommendations.*

1259 (MSC.192/5.1.2) *Radar systems of both X-band and S-band are covered in these*
1260 *performance standards:*

- 1261 – *X-band (9,2-9,5 GHz) for high discrimination, good sensitivity and tracking*
1262 *performance; and*
- 1263 – *S-band (2,9-3,1 GHz) to ensure that target detection and tracking capabilities are*
1264 *maintained in varying and adverse conditions of fog, rain and sea clutter.*

1265 *The frequency band selected shall be indicated.*

1266 **5.2.1.2 Methods of test and required results**

1267 The methods of test and required results are as follows:

1268 confirm by measurement and analytical evaluation that the EUT meets the results
1269 required by the method described in Annex B of this standard. The test authority shall
1270 record the transmitted frequency or frequencies;

1271 confirm by observation that there is an indication of the selected frequency band in
1272 use.

1273 5.2.2 Interference

1274 5.2.2.1 Requirement

1275 (MSC.192/5.1.3) *The radar shall be capable of operating satisfactorily in typical*
1276 *interference conditions as encountered in a normal marine radar environment.*

1277 5.2.2.2 Methods of test and required results

1278 The methods of test and the required results are as follows:

- 1279 a) confirm by analytical evaluation that the radar system has a method to substantially
1280 reduce interference from other approved marine radar transmitting in the frequency
1281 bands allocated to marine radar;
- 1282 b) confirm by analytical evaluation that the radar system can transmit in the vicinity of
1283 other approved marine radar systems without causing significant interference or
1284 significant degradation in performance.

1285 NOTE Radar detection performance specified in this standard may be degraded by third party interference,
1286 possibly by equipment other than marine radar, see Annex J.

1287 5.3 Performance optimisation and monitoring

1288 5.3.1 General

1289 The radar system shall provide the means to optimise detection performance and to
1290 identify a significant drop in performance, as tested in 5.3.2.

1291 5.3.2 Optimum performance

1292 5.3.2.1 Requirement

1293 (MSC.192/5.7.1) *Means shall be available to ensure that the radar system is operating at*
1294 *the best performance. Where applicable to the radar technology, manual tuning shall be*
1295 *provided and additionally, automatic tuning may be provided.*

1296 (MSC.192/5.7.2) *An indication shall be provided, in the absence of targets, to ensure that*
1297 *the system is operating at the optimum performance.*

1298 (MSC.192/5.7.3) *Means shall be available (automatically or by manual operation) and*
1299 *while the equipment is operational, to determine a significant drop in system performance*
1300 *relative to a calibrated standard established at the time of installation.*

1301 5.3.2.2 Methods of test and required results

1302 The methods of test and the required results are as follows:

- 1303 a) confirm by observation that the operation of the tuning function (or equivalent as
1304 applicable to the technology) is effective. The user manual shall describe how optimum
1305 performance is maintained;
- 1306 b) confirm by observation there is a manual or automatic means to indicate that the radar
1307 system is operating at the optimum performance, even in the absence of targets, for
1308 example with the provision of a tuning indicator;
- 1309 c) if automatic tuning is provided, confirm by analytical evaluation that it is not inferior to
1310 the performance achieved with manual tuning;
- 1311 d) confirm by observation, that caution alert is provided to the operator when the overall
1312 performance reduction is reduced by 10dB using an attenuator or equivalent means.

1313 An up-mast system may be accepted by analogy with a down-mast system, given an
1314 equivalent implementation and equipment design.

1315 **5.4 Gain and anti-clutter functions**

1316 **5.4.1 General**

1317 This standard specifies control functions associated with processing or controlling the
1318 radar signals. If alternative means to achieve equivalent functionality is provided, the
1319 manufacturer shall identify the means and shall demonstrate equivalence, supported by
1320 the relevant user documentation and to the satisfaction of the test authority.

1321 *(MSC.192/5.3.2.1) Means shall be provided, as far as is possible for the adequate*
1322 *reduction of unwanted echoes, including sea clutter, rain and other forms of precipitation,*
1323 *clouds, sandstorms and interference from other radars.*

1324 Conformance with these requirements is addressed in 5.4.2 to 5.5.8 and the operation of
1325 functions is assessed in 5.9.

1326 **5.4.2 Gain function**

1327 **5.4.2.1 Requirement**

1328 *(MSC.192/5.3.2.2) A gain control function shall be provided to set the system gain or*
1329 *signal threshold level. A permanent indication of the gain level or setting of the signal*
1330 *threshold shall be given.*

1331 **5.4.2.2 Methods of test and required results**

1332 The methods of test and the required results are as follows:

- 1333 a) confirm by observation that there is a permanent indication of the gain level;
- 1334 b) confirm by observation that the control function is directly accessible;
- 1335 c) confirm by observation on a 24 NM range scale that the gain control varies from a
1336 minimum level where only the highest signal levels are presented to a maximum level
1337 providing visible receiver noise;
- 1338 d) confirm by observation that, if a preset gain adjustment is provided for installation or
1339 maintenance use, it is located in a set-up menu protected from user access as
1340 described in the equipment manual.

1341 **5.4.3 Manual and automatic sea anti-clutter**

1342 **5.4.3.1 Requirement**

1343 *(MSC.192/5.3.2.3) Effective manual and automatic anti-clutter sea functions shall be*
1344 *provided.*

1345 *(MSC.192/5.3.2.4) A combination of automatic and manual anti-clutter sea functions is*
1346 *permitted.*

1347 *(MSC.192/5.3.2.5) There shall be a clear and permanent indication of the status for gain*
1348 *and all anti-clutter sea control functions.*

1349 **5.4.3.2 Methods of test and required results**

1350 The methods of test and the required results are as follows:

- 1351 a) confirm by observation that both “manual sea” and “automatic sea” functions are
1352 provided;

1353 b) confirm by document inspection that the user manual describes any installation and
1354 operational adjustments associated with these functions and any performance
1355 limitations associated with their use;

1356 c) confirm by document inspection that the user manual describes the operation of the
1357 manual and automatic anti-clutter sea control functions, including any advantages and
1358 limitations;

1359 d) confirm by observation that the status and level of the functions are permanently
1360 indicated.

1361 5.4.4 Rain anti-clutter

1362 5.4.4.1 Requirement

1363 An effective manual means of suppressing rain clutter shall be provided. Automatic
1364 rejection of rain clutter may also be provided. There shall be a clear and permanent
1365 indication of the status of the anti-clutter rain function.

1366 5.4.4.2 Methods of test and required results

1367 The methods of test and the required results are as follows:

1368 a) confirm by observation the availability and operation of the rain anti-clutter control
1369 functions;

1370 b) confirm by observation that the status and level of the rain anti-clutter function is
1371 permanently indicated;

1372 c) confirm by document inspection that the user manual describes the use of the manual
1373 rain anti-clutter control (and automatic where provided), together with any performance
1374 limitations associated with its use.

1375 5.5 Signal processing

1376 5.5.1 General

1377 Signal processing functions serve to improve target visibility and detection performance.

1378 5.5.2 Target enhancement

1379 5.5.2.1 Requirement

1380 (MSC.192/5.3.1.3.2) *The radar system shall provide the means to enhance the visibility of*
1381 *targets in adverse clutter conditions at close range.*

1382 (MSC.192/5.3.3.1) *Means shall be available to enhance target visibility on the display.* If
1383 selectable, the target enhance status shall be indicated and the user manual shall
1384 describe the operation and principles of the target enhance functions.

1385 NOTE The function to enhance the visibility of targets at close ranges may use other processing techniques
1386 than those for standard navigation purposes.

1387 5.5.2.2 Methods of test and required results

1388 The methods of test and the required results are as follows:

1389 a) confirm by observation that there are means to enhance target visibility in the clutter
1390 environment. The target enhancement functions may be selectable or permanent. If
1391 any associated functions are provided, for example to reduce a high false alarm rate,
1392 they may be enabled to reduce degradation of target visibility;

1393 b) confirm by document inspection that the user manual describes the enhancement
1394 function(s) and principles, including any associated functions and their use;

1395 c) confirm by observation that the target-enhance status is indicated.

5.5.3 Radar signal correlation

5.5.3.1 Requirement

Correlation of consecutive transmissions shall be provided to reduce unwanted interference from other radar systems. Scan to scan correlation may be used to reduce echoes from clutter.

5.5.3.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by document inspection and observation that a means is provided for the effective reduction of interference generated by other marine conventional (magnetron) radar;
- b) confirm by document inspection that where correlation techniques are provided, for example to reduce clutter, any advantages and limitations are described in the user manual.

5.5.4 Signal processing and radar image latency

5.5.4.1 Requirement

(MSC.192/5.3.3.2) *The effective signal processing and radar image update period shall be adequate, with minimum latency to ensure that the target detection and associated processing requirements are met.*

5.5.4.2 Methods of test and required results

The methods of test and the required results are as follows:

- a) confirm by observation and measurement that the update of any target information has a latency of not more than the equivalent of one antenna scan. Alternative correlation techniques are permitted to have a latency of multiple scans;
- b) confirm by observation that the status of any correlation function is indicated;
- c) confirm by document inspection that the user manual describes the advantages and limitations of any alternative correlation applied.

5.5.5 Second-time-around echoes

5.5.5.1 Description

These echoes are a reflection of radar energy from a target due to a previous radar transmission which is prevalent in some atmospheric conditions. Second-time-around echoes appear as stable but false targets at any time (range) within the period between consecutive transmissions.

5.5.5.2 Requirement

A means of suppressing these second-time-around echoes may be provided and if provided, shall be tested.

5.5.5.3 Methods of test and required results

If a method for suppressing second time echoes is provided, then

- a) confirm by observation, where conditions permit, during the testing of the radar equipment, that an effective means of suppressing second time echoes is provided;
- b) confirm by document inspection that the means provided to suppress second time echoes is described in the user manual.

1437 5.5.6 Transmission format**1438 5.5.6.1 Requirement**

1439 To optimise detection performance for the weather conditions, the equipment may provide
1440 a means to change the transmission format, for example by providing the ability to
1441 increase or to decrease the pulse length.

1442 5.5.6.2 Methods of test and required results

1443 If a means to change the transmission format is provided, then

- 1444 a) confirm by document inspection, observation and analytical evaluation that appropriate
1445 default transmission formats are provided for each range scale;
- 1446 b) confirm by observation that inappropriate transmission formats are inhibited or are
1447 indicated to the user, for example the long pulse length should be prohibited on
1448 shorter range scales;
- 1449 c) confirm by document inspection that the function of changing the transmission format,
1450 if provided, is described in the user manual and the basic concept, features, benefits
1451 and limitations are stated.

1452 5.5.7 Picture update**1453 5.5.7.1 Requirement**

1454 (MSC.192/5.3.3.3) *The picture shall be updated in a smooth and continuous manner.*

1455 5.5.7.2 Methods of test and required results

1456 Confirm by observation that the radar image is updated smoothly and the method of
1457 update is not distracting to the user.

1458 5.5.8 Additional processing**1459 5.5.8.1 Requirement**

1460 Additional signal processing provided by the equipment shall be evaluated.

1461 5.5.8.2 Methods of test and required results

1462 The methods of test and the required results are as follows:

- 1463 a) confirm by document inspection what additional signal processing functions are
1464 provided;
- 1465 b) record top level details of additional signal processing features and any observed
1466 impact they have on the radar detection performance.

1467 5.5.9 Signal processing description**1468 5.5.9.1 Requirement**

1469 (MSC.192/5.3.3.4) *The equipment manual shall explain the basic concept, features,*
1470 *benefits and limitations of any signal processing functions.*

1471 5.5.9.2 Methods of test and required results

1472 The methods of test and the required results are as follows:

- 1473 a) confirm by observation that the status of all selectable active signal processing
1474 functions is indicated;

1475 b) confirm by document inspection that the functions are described in the user manual
1476 and that basic concepts, features, benefits and limitations are stated.

1477 **5.6 Operation with SARTs, target enhancers (RTEs) and beacons**

1478 **5.6.1 General**

1479 X-band radar systems shall be compatible with radar beacons, SARTs and radar
1480 enhancers, while S-band radar systems may adopt new technology which may not be
1481 compatible with these navigation aids.

1482 **5.6.2 Radar beacons, SARTs and enhancers**

1483 **5.6.2.1 Requirement**

1484 (MSC.192/5.3.4.1) *The X-band radar system shall be capable of detecting radar beacons*
1485 *in the relevant frequency band.*

1486 (MSC.192/5.3.4.2) *The X-band radar system shall be capable of detecting SARTs and*
1487 *radar target enhancers.*

1488 (MSC.192/5.3.4.3) *It shall be possible to switch off those signal processing functions,*
1489 *including alternative polarisation modes, which might prevent an X-band radar beacon or*
1490 *SARTs from being detected and displayed. The status of signal processing and*
1491 *polarisation (if selectable) shall be indicated.*

1492 The operation of the equipment with beacons, SARTS and target enhancers shall be
1493 described in the user manual.

1494 **5.6.2.2 Methods of test and required results**

1495 The methods of test and the required results are as follows:

- 1496 a) confirm by observation that the X-band equipment operates with a typical radar
1497 beacon. The equipment shall be set working overlooking the sea and in the vicinity of
1498 known radar beacons, to demonstrate that the EUT is compatible with ITU-R M.824-3
1499 (beacons);
- 1500 b) confirm by observation that when the X-band equipment is set working overlooking a
1501 sea environment and in the vicinity of known SARTs and radar enhancers, the system
1502 detects SARTs and radar enhancers, as required by ITU-R M.628-4 (SARTs) and ITU-
1503 R M.1176 (radar target enhancers);
- 1504 c) confirm by observation that the status of signal processing and polarisation (if
1505 selectable) is indicated;
- 1506 d) confirm by document inspection that the operation of the equipment with beacons,
1507 SARTs and target enhancers is described in the user manual.

1508 **5.7 Minimum range and range compensation**

1509 **5.7.1 General**

1510 The minimum detection range for the radar system shall be measured after the range
1511 index error has been compensated for the selected antenna position.

1512 **5.7.2 Range compensation**

1513 **5.7.2.1 Requirement**

1514 (MSC.192/5.4.2) *Compensation for any range index error shall be automatically applied*
1515 *and where multiple antennas are installed, shall be automatically applied for each*
1516 *selected antenna.*

1517 5.7.2.2 Methods of test and required results

1518 The methods of test and the required results are as follows:

- 1519 a) confirm by document inspection that the equipment provides the means to compensate
1520 for the range index for the position of each antenna and that the settings are protected
1521 in a non-volatile memory. Adjust the range compensation for each sensor (as
1522 applicable) so that the range of a known target is correct;
- 1523 b) confirm by document inspection and observation that the compensation setting for
1524 each sensor is retained in a non-volatile memory and that it is automatically applied
1525 when each sensor is selected.

1526 5.7.3 Minimum range**1527 5.7.3.1 Requirement**

1528 (MSC.192/5.3.1.2) *The short-range detection of the targets under the conditions specified*
1529 *in Table 2 shall be compatible with the requirement.*

1530 (MSC.192/5.4.1) *With own ship at zero speed (or at a fixed land-based site), an antenna*
1531 *height of 15 m above the sea level and in calm (minimal clutter) conditions, the*
1532 *navigational buoy (with corner reflector) in Table 2 shall be detected at a minimum*
1533 *horizontal range of 40 m from the antenna position and up to a range of 1 NM, without*
1534 *changing the setting of control functions other than the range scale selector.*

1535 Ensure that the range index compensation is set correctly (as described in 5.7.2) before
1536 measurements are made.

1537 A test target, (equivalent to the navigational buoy with corner reflector) having a known
1538 RCS of 10 m² at X-band (having a known RCS of 1 m² at S-band) and mounted at a
1539 height of 3,5 m, shall be used.

1540 5.7.3.2 Methods of test and required results

1541 The methods of test and the required results are as follows:

- 1542 a) confirm by observation and document inspection that if a down-mast transceiver is an
1543 option for the radar under test, the test is conducted using a down-mast transceiver, or
1544 otherwise the test shall be conducted with an up-mast unit. If the implementation of
1545 up-mast and down-mast systems is different, both types of systems shall be tested;
- 1546 b) confirm by observation that a reference test target is available having the same
1547 properties as the mobile test target. The reference test target shall be stationary and
1548 positioned at 1 NM range. Adjust the radar system so that the reference test target at
1549 approximately 1 NM is clearly visible;
- 1550 c) confirm by measurement that with the radar antenna mounted at the specified height,
1551 the separation of a mobile test target (representative of a navigational buoy) and the
1552 antenna position can be decreased to the closest point at which the target can be
1553 identified within 40 m of the antenna position. Record the result. After adjustment, the
1554 mobile test target at the minimum range and the reference target at 1 NM shall be
1555 visible with the same setting of the gain and clutter controls;
- 1556 d) alternatively a mobile target with an RCS of 10 m² at X-band may be used and moved
1557 from the closest point at which the target is visible up to 1 NM with the same settings
1558 of the gain and clutter controls.

1559 The minimum range is the shortest distance at which, using a mandatory range scale of
1560 not more than 1,5 NM, a stationary target is presented separately from the position and
1561 image representing the antenna position. The separation distance is measured
1562 horizontally from the sea/ground level at the antenna position.

1563 For this measurement, only the range scale selector may be changed. The sea and gain
1564 controls may be adjusted before commencing this test. After adjustment, the test target
1565 shall be visible at the minimum range and at 1 NM with the same setting of the sea and
1566 gain control. An off-centred presentation is permitted for this measurement.

1567 **5.8 Range and bearing discrimination**

1568 **5.8.1 General**

1569 Point test targets used for the range and bearing discrimination measurements shall be
1570 equivalent to the navigational buoy with corner reflector defined in Table 2 and 5.7.3,
1571 having a known RCS of 10 m² at X-band or having a known RCS of 1 m² at S-band and
1572 mounted at a height of 3,5 m.

1573 **5.8.2 Measurement conditions**

1574 (MSC.192/5.5) *Range and bearing discrimination shall be measured in calm (minimal*
1575 *clutter) conditions, on a range scale of 1,5 NM or less and at between 50 % and 100 % of*
1576 *the range scale selected.* An off-centred presentation is permitted for this test.

1577 **5.8.3 Range discrimination**

1578 **5.8.3.1 Requirement**

1579 (MSC.192/5.5.1) *The radar system shall be capable of displaying two point targets on the*
1580 *same bearing, separated by 40 m in range, as two distinct objects.*

1581 **5.8.3.2 Methods of test and required results**

1582 The methods of test and the required results are as follows:

- 1583 a) confirm the range discrimination by measurement. The radar shall be set to a
1584 range scale of 0,75 NM. Two test targets as defined in 5.7.3 shall be placed on the
1585 same bearing with respect to the radar antenna, at a distance of between 0,375
1586 NM and 0,75 NM, and separated from each other by a distance of not more than
1587 40 m. The rain control and the effective pulse length of the radar shall be set to
1588 their minimum values. The sea and gain controls shall be adjusted to show
1589 separation of the two targets on the display;
- 1590 b) when the two targets are visibly separated for at least 8 scans out of 10, the linear
1591 distance between the two targets shall be measured. Confirm that the distance is
1592 not greater than 40 m.

1593 **5.8.4 Bearing discrimination**

1594 **5.8.4.1 Requirement**

1595 (MSC.192/5.5.2) *The radar system shall be capable of displaying two point targets at the*
1596 *same range, separated by 2,5° in bearing, as two distinct objects.*

1597 **5.8.4.2 Methods of test and required results**

1598 The methods of test and the required results are as follows:

- 1599 a) confirm the bearing discrimination by measurement. The radar shall be set to the
1600 range scale of 1,5 NM or less and the test targets positioned at between 60 % and
1601 100 % of the range scale selected. Two test targets of equal radar cross-section and
1602 as defined in 5.7.3, shall be placed at the same distance and shall be separated in
1603 bearing with respect to the radar antenna. The measurement may be made at any
1604 convenient bearing from the antenna location. The angular separation between the two

1605 targets shall be decreased until they cease to be displayed separately. When the two
1606 targets are visibly separated for at least 8 scans out of 10 the linear distance between
1607 the two targets shall be measured;

1608 b) confirm by calculation that the angle calculated with respect to the known range of the
1609 test targets does not exceed 2,5° and record the calculated angular separation.

1610 **5.8.5 Fundamental radar accuracy**

1611 **5.8.5.1 Requirement**

1612 (MSC.192/5.2) *The radar system range and bearing accuracy shall be:*

1613 *Range: within 30 m or 1 % of the range scale in use, whichever is greater;*

1614 *Bearing: within 1°*

1615 in typical operational and environmental conditions.

1616 **5.8.5.2 Methods of test and required results**

1617 The methods of test and the required results are as follows:

- 1618 a) bearing: confirm by measurement that when operating on a stationary platform, the overall
1619 accuracy of taking bearings by the radar system meets the bearing accuracy required.
1620 Measurement shall be by comparing the actual bearings of identifiable point targets with
1621 bearings obtained using the radar equipment. The comparison shall be made at sample
1622 bearings distributed over 360° and the distance of each target from the radar antenna
1623 shall be between 80 % and 100 % of the range scale in use. The bearing measurement
1624 can be made either by using a single point target positioned at a series of known bearings
1625 relative to the radar antenna pedestal, or by taking the radar bearing of a series of point
1626 targets at known surveyed bearings around the radar antenna pedestal;
- 1627 b) range: confirm by measurement from a stable platform using actual ranges of identifiable
1628 point targets, that when operating on a stationary platform, the overall accuracy of making
1629 range measurements by the radar system meets the range accuracy required.
1630 Measurement shall use at least two known targets, the first at nominally 1 NM, the second
1631 at nominally 10 NM. The range accuracy shall be within 30 m or 1 % of the range scale in
1632 use, whichever is the greater, and record the result. The radar transceiver shall operate
1633 with the appropriate transmission format for this test.

1634 **5.9 Target detection performance assessment**

1635 **5.9.1 General**

1636 This standard specifies the minimum range of first detection performance in clear
1637 conditions and in addition, defines clutter conditions in which compliance with the
1638 detection performance requirements are tested, measured or assessed, including:

- 1639 a) measurement of the range of first detection in minimal clutter conditions. Observations
1640 shall be made to confirm the visibility of a test target and in addition, shall be generally
1641 consistent with the IMO requirements as in Table 2;
- 1642 b) measurement/predictions of the range of first detection in the presence of clutter (between
1643 the antenna and the target) and the assessment of the target visibility in clutter conditions
1644 by observing test targets within the clutter field and/or rain extent, using sea states and
1645 rainfall rates of opportunity.

1646 For all radar performance tests, the radar antenna shall be installed on a platform either at
1647 sea or shore-based. The antenna shall be mounted at a height as close as practical at
1648 15 m above mean sea level, recognising that even small deviations in antenna and/or
1649 target height can influence target detection performance and will reposition multi-path
1650 nulls. To achieve consistency, the tests shall ensure that observations and measurements
1651 are made with the test targets positioned for detection at multi-path peaks. The radar