BRITISH STANDARD

BS ISO
19018:2004

Ships and marine technology — Terms, abbreviations, graphical symbols and concepts on navigation

ICS 01.040.47; 01.080.30; 47.020.01

BSI
British Standards

National foreword

This British Standard reproduces verbatim ISO 19018:2004 and implements it as the UK national standard.

The UK participation in its preparation was entrusted to Technical Committee SME/32, Ships and marine technology, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

Cross-references

The British Standards which implement international publications referred to in this document may be found in the *BSI Catalogue* under the section entitled "International Standards Correspondence Index", or by using the "Search" facility of the *BSI Electronic Catalogue* or of British Standards Online.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, the ISO title page, pages ii to iv, pages 1 to 24, an inside back cover and a back cover.

The BSI copyright notice displayed in this document indicates when the document was last issued.

Amendments issued since publication

Amd. No.	Date	Comments

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 2 September 2005

ISBN 0 580 46147 5

INTERNATIONAL STANDARD

ISO 19018

First edition
2004-07-01

Ships and marine technology — Terms, abbreviations, graphical symbols and concepts on navigation

Navires et technologie maritime — Termes, abréviations, symboles graphiques et concepts relatifs à la navigation

Reference number
ISO 19018:2004(E)

Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 19018 was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 9, *General requirements*.

Ships and marine technology — Terms, abbreviations, graphical symbols and concepts on navigation

1 Scope

This International Standard contains terms, abbreviations and graphical symbols, which are to be used in maritime navigation on board ships. The application of abbreviations is useful, but they should not be used in mathematical formulae. Symbols for use in mathematical formulae are mentioned, if necessary.

Navigation is the process of position finding as well as planning, recording and controlling the movement of a craft or vehicle from one place to another.

2 Normative references

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

ISO 31-1, *Quantities and units — Part 1: Space and time*

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

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

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

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

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

3 Special units in maritime navigation

Item No.	Name of unit	International symbol for unit	Definition, conversion factors and remarks
3.1 Unit of length			
3.1.1	nautical mile	NM in charts: M*	1 NM = 1 852 m. The nautical mile is not an SI-unit. This definition was adopted by the First International Hydrographic Conference in 1929 (see ISO 31-1).
3.1.2	cable, cable length	cbl	One-tenth of a nautical mile.
3.2 Unit of velocity and speed			
	knot, knots	kn	$1\text{kn} = 1\ \frac{\text{NM}}{\text{h}} = 0{,}514\quad 444\text{m/s}$ (see ISO 31-1 and Chart INT 1) Velocity is a vector quantity, whereas speed is a scalar having magnitude only.
3.3 Unit of angle			
3.3.1	degree	°	$1^\circ = \frac{\pi}{180}\ \text{rad}$
3.3.2	minute	'	$1' = \frac{1^\circ}{60}$ (see ISO 31-1) In maritime navigation, angles should be specified in degrees, minutes and decimals of minutes (example: write 17° 40,25' not 17° 40' 15").

* Symbol M is to be used in Charts according to the "Chart Specifications of the IHO" which came into force at the XIIth International Hydrographic Conference 1982 in Monaco.

4 Reference directions

4.1 North directions

North directions are horizontal reference directions.

Item No.	Name of the term	Abbreviation	Definition, remarks
4.1.1	true north	TN	Northerly direction of the meridian (see 9.1.12).
4.1.2	magnetic north	MN	Northerly direction of the horizontal component of the earth's magnetic field (see 14.2).
4.1.3	compass north	CN	Northerly direction of the needle or zero-index of a magnetic compass.
4.1.4	gyro north	GyN	Northerly direction indicated by the gyro-compass.

4.2 Dead ahead direction

Dead ahead direction is the direction ahead of the ship's fore-and-aft line.

5 Course, heading, track, speed

5.1 Course, heading

Course (CSE) and heading (HDG) are angles, measured in the horizontal plane from one of the reference directions specified in Clause 4, counted clockwise from 000° through < 360°, written as three-digit numbers. In radar navigation, the abbreviations CRS for course and HDG for heading are preferred.

Item No.	Name of the term	Abbre-viation	Definition, remarks
5.1.1	true course, course to steer	TC T CRS CTS	The direction, in which the ship is intended to be steered, defined by the angle between the meridian through its position and the fore-and-aft line of the ship, expressed in angular units from true north (000°).
5.1.2	true heading	TH T HDG	Actual direction in which the longitudinal axis of the ship is pointed, defined by the angle between the meridian through its position and the fore-and-aft line of the ship, expressed in angular units from true north (000°).
5.1.3	magnetic course	MC M CRS	The direction, in which the ship is intended to be steered, defined by the angle between the magnetic meridian (see 14.4) through its position and the fore-and-aft line of the ship, expressed in angular units from magnetic north (000°).
5.1.4	magnetic heading	MH M HDG	Actual direction in which the longitudinal axis of the ship is pointed, defined by the angle between the magnetic meridian through its position and the fore-and-aft line of the ship, expressed in angular units from magnetic north (000°).
5.1.5	compass course	CC C CRS	The direction, in which the ship is intended to be steered, defined by the angle between compass north (see 4.1.3) and the fore-and-aft line of the ship, expressed in angular units from compass north (000°).
5.1.6	compass heading	CH C HDG	Actual direction in which the longitudinal axis of the ship is pointed, defined by the angle between compass north and the fore-and-aft line of the ship, expressed in angular units from compass north (000°).
5.1.7	gyro course	GyC Gy CRS	The direction, in which the ship is intended to be steered, defined by the angle between gyro north (see 4.1.4) and the fore-and-aft line of the ship, expressed in angular units from gyro north (000°).
5.1.8	gyro heading	GyH GY HDG	Actual direction in which the longitudinal axis of the ship is pointed, defined by the angle between gyro north and the fore-and-aft line of the ship, expressed in angular units from gyro north (000°).
5.1.9	course through water	CTW	Direction of the ship's movement through the water, defined by the angle between the meridian through its position and the direction of the ship's movement through the water, expressed in angular units from true north.

Item No.	Name of the term	Abbre-viation	Definition, remarks
5.1.10	course of advance, course to make good	COA	Direction from the ship's last fix (see 9.2.5) to the next estimated position (see 9.2.3), expressed in angular units from true north.
5.1.11	course over ground	COG	Direction of the ship's movement relative to the earth, measured on board the ship, expressed in angular units from true north.
5.1.12	course made good	CMG	Rhumb-line direction (see 9.2.11) between two fixes (see 9.2.5).

5.2 Track

The term "track" is used

a) as the path of voyage over the ground (ground track) or through the water (water track) as plotted in the chart, expressed in angular units from true north (000°) clockwise through < 360°; must distinguish rhumb-line track (see 9.2.11) and great-circle track (see 9.2.9),

b) as the path of radar-targets on a plan position indicator (see 15.4).

Item No.	Name of the term	Abbre-viation	Definition, remarks
5.2.1	intended water track	WT	Intended path of the ship's movement through the water.
5.2.2	water track	WAT TRK	Actual path of the ship's movement through the water.
5.2.3	intended ground track	GT	Intended path of the ship's movement over the ground.
5.2.4	ground track	GND TRK	Actual path of the ship's movement relative to the earth.
5.2.5	track made good	TMG	Track between two fixes (see 9.2.5).

5.3 Speed

Item No.	Name of the term	Abbre-viation	Definition, remarks
5.3.1	speed	SPD	Own ship's speed in dead ahead direction (see 4.2) produced by machine or sail.
5.3.2	speed through the water	STW	Speed of the ship relative to the water surface.
5.3.3	speed of advance, speed to make good	SOA	Estimated speed of the ship relative to the earth.
5.3.4	speed over the ground	SOG	Speed of the ship relative to the earth, measured on board the ship.
5.3.5	speed made good	SMG	Speed of the ship between two fixes.

6 Bearings

Bearing (BRG) is an angle measured in the horizontal plane from one of the reference directions specified in Clause 4, measured clockwise from 000° through 360° written as three-digit numbers. In radar navigation, the abbreviation BRG for bearing is preferred.

Item No.	Name of the term	Abbre-viation	Definition, remarks
6.1	true bearing	TB T BRG	Angular distance from true north (000°) to the object, the direction of the electronic bearing line (see 15.2.4) on a plan postition indicator (PPI).
6.2	magnetic bearing	MB	Angular distance from magnetic north (000°) to the object.
6.3	compass bearing	CB	Angular distance from compass north (000°) to the object.
6.4	gyro bearing	GyB Gy BRG	Angular distance from gyro north (000°) to the object, the direction of the electronic bearing line (see 15.2.4) on a plan postition indicator (PPI).
6.5	relative bearing	RB R BRG	Angular distance from the ship's dead ahead direction (see 4.2) to the object, on a plan position indicator from the heading line (see 15.2.3) to the electronic bearing line (see 15.2.4). With the addition "right" (starboard) or "left" (port), semicircle counting from 000° through 180° is allowed.

7 Corrections

The numerical value of a correction is the best estimate which can be made of the difference between the true and the measured value of a parameter. The sign is such that a correction which is to be added to an observed reading is taken as positive.

Item No.	Name of the term	Abbre-viation	Definition, remarks
7.1	magnetic variation	MAG VAR	Angle between the geographic and the magnetic meridians (see 9.1.12 and 14.4) at any place of the earth, also called magnetic declination, from true north to magnetic north eastwards named E (sign plus), westwards named W (sign minus).
7.2	deviation	DEV	Angle between the magnetic meridian (see 14.4) and the axis of a compass card, expressed in degrees east or west to indicate the direction in which the northern end of the compass card is offset from magnetic north when it is disturbed by local attraction, from magnetic north to compass north eastwards named E (sign plus), westwards named W (sign minus).
7.3	total compass error correction	CE	Sum of variation and deviation. Angle between true north and compass north, from true north eastwards named E (sign plus), westwards named W (sign minus).

Item No.	Name of the term	Abbre-viation	Definition, remarks
7.4	speed error correction	δ_{Gy}*	Correction of the gyro heading error, which depends on position, speed and course of the ship; sign plus when the ship moves southwards, sign minus when the ship moves northwards.
7.5	gyro error correction	GyE	Correction of all errors (including speed error) of a gyro compass. Angle between true north and gyro north, from true north eastwards with sign plus, error low, westwards with sign minus, error high.
7.6	gyro-R		Correction of the measured error of a gyro compass indication without speed error (gyro residual aberration).
7.7	gyro-A		Correction of the constant part of gyro-R; mean value of measured gyro-R values.
7.8	leeway angle		Angular difference between the course through water and course to steer (CTW – TC).
7.9	drift angle		Angular difference between the course of advance or course over ground and course through water (COA – CTW or COG – CTW).
7.10	leeway and drift angle		Angular difference between the course of advance or course over ground and course to steer (COA – TC or COG – TC); sum of leeway angle and drift angle.
7.11	conversion angle	u *	Angular difference at a point between the rhumb line and a great circle (see 9.2.11 and 9.2.9) from that point to another point on the earth's surface.

* Formula symbol.

8 Influence of wind and current

8.1 Wind

Wind direction is the direction where the movement of the air comes from. The vector of this movement is in the opposite direction of the wind direction. For instance, the movement of the air is in the direction of 270° (direction of the vector in weather charts) in the case of an east wind.

Item No.	Name of the term	Definition, remarks
8.1.1	true wind	Velocity of the air (speed and direction) relative to a fixed point on the earth.
8.1.2	speed wind	Velocity of the air only caused by the ship's motion relative to the earth; (direction against course over ground).
8.1.3	apparent wind, relative wind	Velocity of the air relative to the moving ship; the vector of apparent wind or relative wind (wind feeling on board) minus the vector of speed wind is equal to the vector of true wind.

8.2 Leeway and drift triangle

See Figure 1.

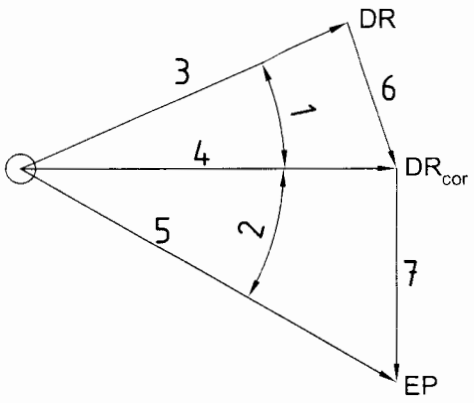

Figure 1

Key

⊕ last fix (see 9.2.5)

1 leeway angle (see 7.8)
2 drift angle (see 7.9)
3 own ship's velocity (see 8.2.1)
4 intended water track (see 5.2.1 and 8.2.3)
5 intended ground track (see 5.2.3 and 8.2.5)
6 leeway vector (see 8.2.2)
7 drift vector (see 8.2.4)
DR dead reckoning position (see 9.2.1)
DR_{cor} corrected dead reckoning position (sea position) (see 9.2.2)
EP estimated position (see 9.2.3)

Item No.	Name of term	Definition of the vector	Item No.	Magnitude of vector	Abbre-viation	Item No.	Direction of vector	Abbre-viation
8.2.1	own ship's velocity	own ship's velocity	8.2.1.1	speed (5.3.1)	SPD	8.2.1.2	course to steer (5.1.1)	CTS TC
8.2.2	leeway vector	ship's velocity due to influence of wind	8.2.2.1	leeway drift		8.2.2.2	leeway set	
8.2.3	intended water track	ship's velocity relative to the water	8.2.3.1	speed through water (5.3.2)	STW	8.2.3.2	course through water (5.1.9)	CTW
8.2.4	drift vector	horizontal velocity of the water surface	8.2.4.1	drift		8.2.4.2	set	
8.2.5	intended ground track	ship's velocity relative to the earth	8.2.5.1	speed of advance (5.3.3)	SOA	8.2.5.2	course of advance (5.1.10)	COA

9 Geographical coordinates, positions, lines, graphical symbols

9.1 Geographical coordinates

Item No.	Name of the term	Abbre-viation	Definition, remarks
9.1.1	geodetic datum		A set of parameters specifying the reference coordinate system used for geodetic control in the calculation of coordinates of points on the earth.
9.1.2	World Geodetic System	WGS	A global geodetic reference system developed by the USA for satellite position fixing and recommended by the IHO for hydrographic and cartographic use.
9.1.3	latitude, geographic latitude	φ LAT	Angular distance from the equator (00°) measured northwards or southwards through 90° and labelled N or S to indicate the direction of measurement.
9.1.4	longitude, geographic longitude	λ LON	Angle at the pole between the prime meridian (000°) (see 9.1.13) and the meridian of a point on the earth, measured eastwards or westwards from the prime meridian through 180° and labelled E or W to indicate the direction of measurement*.
9.1.5	geodetic latitude		Angular distance between the plane of the geodetic equator and the normal to a station on the earth ellipsoid, measured from the equator (00°) northwards or southwards through 90° and labelled N or S.
9.1.6	geodetic longitude		Angle between the plane of the geodetic prime meridian (000°) and the plane of the station's geodetic meridian, measured eastwards or westwards from the prime meridian through 180° and labelled E or W*.
9.1.7	geocentric latitude		Angle at the centre of the reference ellipsoid between the plane of the equator (9.2.8) and the radius vector to a point on the ellipsoid, measured from the equator (00°) northwards or southwards through 90° and labelled N or S.
9.1.8	geocentric longitude		Angle between the plane of the geocentric prime meridian (000°) and the plane of the station's geocentric meridian, measured eastwards or westwards from the prime meridian through 180° and labelled E or W*.
9.1.9	astronomical latitude		Angular distance between the plane of the celestial equator (00°) and the plumb line through the station, measured northwards or southwards through 90° and labelled N or S.
9.1.10	astronomical longitude		Angle between the plane of the prime meridian and the plane of the station's celestial meridian (see 12.2.8), measured eastwards or westwards, from the prime meridian through 180° and labelled E or W.

* The planes of geographic. geodetic and geocentric meridians are identical.

Item No.	Name of the term	Abbre-viation	Definition, remarks
9.1.11	parallel of latitude		A small circle on the earth's surface parallel to the equator.
9.1.12	meridian		Great circle between the geographical poles of the earth; north-south-reference line.
9.1.13	prime meridian, Greenwich meridian		The reference meridian 000°; origin for measurement of longitude.
9.1.14	difference of latitude	*d*.lat $\Delta\varphi$ *	The shorter arc of any meridian between the parallels of two places, expressed in angular measurement.
9.1.15	distance of latitude	b *	Distance on a meridian between two parallels of latitude, expressed in nautical miles.
9.1.16	difference of longitude	*d*.lon $\Delta\lambda$*	The shorter arc of a parallel between the meridians of two places, expressed in angular units.
9.1.17	distance of longitude on equator	l *	Distance on equator between two meridians, expressed in nautical miles.
9.1.18	mean latitude	L_m φ_m	Half of the sum of the latitudes of two places, expressed in angular units.
9.1.19	departure	Dep α *	Distance between two meridians at any given parallel of latitude, expressed in nautical miles, the distance to the east or west made good, or to make good, in proceeding from one point to another.
9.1.20	meridional parts	Φ *	The length of the arc of a meridian between the equator and a given parallel on a Mercator chart, expressed in units of 1' of longitude on the equator.
9.1.21	meridional difference	$\Delta\Phi$ *	The difference of the meridional parts of any two given parallels.

* Formula symbol.

9.2 Positions and lines

Item No.	Name of the term	Abbre-viation	Definition, remarks
9.2.1	dead reckoning position	DR	Calculated position of a vessel obtained by adding to the last fix (see 9.2.5) the ship's true course (see 5.1.1) and own speed (see 5.3.1).
9.2.2	corrected dead reckoning position, sea position	DR_{cor}	Calculated position of a vessel obtained by adding to the last fix the ship's course and speed through water (see 5.1.9 and 5.3.2).
9.2.3	estimated position	EP	Most probable position of a vessel obtained by adding to the last fix the ship's course and speed of advance, considering all estimated influences, including current (see 5.1.10 and 5.3.3).
9.2.4	assumed position	AP	A point on the surface of the earth at which a vessel is assumed to be located and for which the computed altitude is determined in the solution of a celestial observation.
9.2.5	fix	Fix	Ship's position determined without reference to any other former position.
9.2.6	North pole	P_N	North geographical pole.
9.2.7	South pole	P_S	South geographical pole.
9.2.8	equator		Primary great circle of the earth whose plane is at right angles to the earth's axis.
9.2.9	great circle	GC	The intersection of a sphere on the earth and a plane through its centre; also called orthodrome.
9.2.10	great-circle direction		Horizontal direction of a great circle, expressed as an angular distance from true north (000°) at the ship's position.
9.2.11	rhumb line	RL	Line on the surface of the earth forming the same angle with all meridians; strait line on a Mercator chart; also called loxodrome.
9.2.12	rhumb-line direction		Horizontal direction of a rhumb line, expressed as an angular distance from true north (000°) at the ship's position.
9.2.13	course line		Graphic representation of a ship's intended course to make good.
9.2.14	line of position	LOP	A plotted line on which a ship is located.
9.2.15	transferred line of position		Line of position transferred to the direction of the course line by the distance sailed.
9.2.16	line of equal bearings	LEB	Line of equal bearings of an object.
9.2.17	line of equal altitudes		Line of equal angular distances of the centre of a celestial body above the celestial horizon (12.2.1).

9.3 Graphical symbols

Graphical symbols, abbreviations and terms which are used on charts on board ships are published in Chart INT 1 (see footnote to 3.1.1). This subclause lists the symbols for the terms which are given in this standard.

Item No.	Graphical symbol	Definition, remarks
9.3.1	——————————>	Line of position (see 9.2.14); if the line of position points towards an object, with the arrowhead towards this object.
9.3.2	——————————>–>	Transferred line of position (see 9.2.15); arrowheads point towards the object.
9.3.3	+	Estimated or dead reckoning position, annotated with time in a four-digit notation in parentheses; e.g. (0715).
9.3.4	⊕	Fix (see 9.2.5); annotated with time in a four-digit notation in parentheses; e.g. (0715).

10 Waypoint navigation

Item No.	Name of the term	Abbre-viation	Definition, remarks
10.1 Points			
10.1.1	port (or point) of departure		The port (or point) where a voyage begins.
10.1.2	destination	DEST	The geographic point to which a craft is navigating. It may be the next waypoint along a route of waypoints or the final destination of a voyage.
10.1.3	waypoint	WPT	Point on a route (see 10.2.3).
a)	waypoint distance	WPD	Distance to a waypoint.
b)	waypoint bearing	WPB	Bearing of a waypoint.
10.1.4	vertex		The point on a great circle nearest to the north or south pole.
10.2 Distances			
10.2.1	great-circle distance, orthodromic distance	D_G	Distance between two points on a great circle.
10.2.2	rhumb-line distance, loxodromic distance	D_L	Distance between two points on a rhumb line.
10.2.3	route	RTE	Intended ground tracks (see 5.2.2) of a voyage.
10.2.4	leg		Intended ground track between two waypoints.
10.2.5	distance to go	DTG	Distance on the route to the next waypoint or to destination.
10.2.6	cross track distance	XTD	Position distance perpendicular to the intended ground track (see 5.2.3).
10.2.7	along track error	ATE	Position error in the direction of the intended ground track.

Item No.	Name of the term	Abbre-viation	Definition, remarks
10.2.8	fix adjustment		Vector from the estimated position (see 9.2.3) to the fix (see 9.2.5).
10.3 Time			
10.3.1	estimated time of arrival	ETA	The predicted time of reaching a destination or waypoint.
10.3.2	time to go	TTG	The predicted duration to reach a destination or waypoint from the present position.
10.3.3	estimated time of departure	ETD	The predicted time of leaving a port or waypoint.

11 Terms of time

11.1 Universal terms of time

Item No.	Name of the term	Abbre-viation	Definition, remarks
11.1.1	International Atomic Time	TAI	The time reference coordinate established by the Bureau International de l'Heure (BIH) on the basis of atomic clocks.
11.1.2	Universal Time	UT	Time as defined by the rotational motion of the earth and determined from the apparent diurnal motions which reflect this rotation. Because of variations in the rate of rotation, Universal Time is not rigorously uniform.
11.1.3	Universal Time 0	UT0	The uncorrected time of the earth's rotation as measured by the transit of stars across the observer's meridian. This rotation is referred to a fiducial mark on the ecliptic which approximates the position of the mean sun.
11.1.4	Universal Time One	UT1	UT0 corrected for polar motion. Mean solar time of the prime meridian (see 9.1.13), measured from midnight through 24 h due to the observed motion of the geographic pole; used in astronomical navigation.
11.1.5	Universal Time Two	UT2	UT1 corrected for seasonal variations in the earth's rotation.
11.1.6	Coordinated Universal Time	UTC	The time scale that is available from most broadcast time signals. It differs from TAI (see 11.1.1) by an integral number of seconds. UTC is maintained within 1 s of UT1 by the introduction of 1 s-steps (leap seconds) when necessary, normally at the end of December.
11.1.7	DUT1	DUT1	Approximation to the difference: UT1 minus UTC, transmitted in codes on broadcast signals.
11.1.8	standard time	ST	The legally established time for a given zone.
11.1.9	Greenwich Mean Time	GMT	Former time scale; sometimes still used if difference between UTC and UT1 is not important. Local mean time (see 11.2.2) at the Greenwich meridian (see 9.1.13).

11.2 Terms concerning time for navigation use

Item No.	Name of the term	Abbre-viation	Definition, remarks
11.2.1	local apparent time	LAT	The arc of the celestial equator between the lower branch of the local celestial meridian (see 12.2.10) and the hour circle of the true sun, measured westwards from the lower branch of the local celestial meridian through 24 h.
11.2.2	local mean time	LMT	The arc of the celestial equator between the lower branch of the celestial meridian and the hour circle of the mean sun, measured westwards from the lower branch of the local celestial meridian through 24 h.
11.2.3	equation of time		The difference at any instant between local apparent and local mean time (LAT – LMT).
11.2.4	zone time	ZT	The local mean time of a reference or zone meridian whose time is kept throughout a designated zone. The zone meridian is usually the nearest meridian whose longitude is exactly divisible by 15°.
11.2.5	chronometer time		The time as indicated by a chronometer.
11.2.6	chronometer correction	CC	The amount that must be added algebraically to the chronometer time to obtain UT. Chronometer correction is numerically equal to the chronometer error, but of opposite sign.
11.2.7	difference of longitude in time		Difference of longitude (see 9.1.16) divided by the earth's angular velocity 15°/h.
11.2.8	zone description		Time difference between zone time and UTC.
11.2.9	meridian passage	MP	The passage time of a celestial body across the Greenwich hour circle.

12 Astronomical navigation

12.1 Celestial coordinates, points, lines and angles on the celestial sphere

Item No.	Name of the term	Abbre-viation	Definition, remarks
12.1.1	zenith	Z	The point of the celestial sphere vertically overhead.
12.1.2	nadir	Na	The point of the celestial sphere vertically below the observer.
12.1.3	celestial poles	P_N, P_S	Points of intersection of the celestial sphere and the extended axis of the earth, labelled N and S.
12.1.4	elevated pole		The celestial pole above the horizon.
12.1.5	depressed pole		The celestial pole below the horizon.
12.1.6	cardinal points		Any of the four principal directions, north, east, south and west.

Item No.	Name of the term	Abbre-viation	Definition, remarks
12.1.7	north	N	The primary reference direction relative to the earth, indicated by true north (000°) (see 4.1.1).
12.1.8	east	E	The direction 090° to the right of north.
12.1.9	south	S	The direction 180° from north.
12.1.10	west	W	The direction 270° to the right of north or 090° to the left of north.
12.1.11	Aries, vernal equinox	♈	The point of intersection of the ecliptic and the celestial equator, occupied by the sun as it changes from south to north declination; also called "First point of Aries".
12.1.12	autumnal equinox	♎	The point of intersection of the ecliptic and the celestial equator, occupied by the sun as it changes from north to south declination; also called "First point of Libra".

12.2 Great and small circles

Item No.	Name of the term	Abbre-viation	Definition, remarks
12.2.1	celestial horizon		The circle of the celestial sphere formed by the intersection of the celestial sphere and a plane through the centre of the earth and perpendicular to the zenith-nadir line.
12.2.2	parallel of altitude		A circle of the celestial sphere parallel to the celestial horizon, connecting all points of equal altitudes; also called circle of equal altitudes.
12.2.3	vertical circle		A great circle of the celestial sphere through the zenith and nadir.
a)	principal vertical		The vertical circle passing through the north and south celestial poles.
b)	prime vertical		The vertical circle perpendicular to the principal vertical. The intersection of the prime vertical with the horizon defines the east and west points of the celestial horizon.
12.2.4	celestial equator		The primary great circle of the celestial sphere, everywhere 90° from the celestial poles.
12.2.5	parallel of declination		A circle of the celestial sphere parallel to the celestial equator.
12.2.6	hour circle		A great circle through the celestial poles.
12.2.7	Greenwich hour circle		Hour circle on the celestial sphere projected from the prime meridian (see 9.1.13).
12.2.8	celestial meridian		A great circle of the celestial sphere through the celestial poles, zenith and nadir.
12.2.9	upper branch		The half of a celestial meridian from pole to pole through the zenith.
12.2.10	lower branch		The half of a celestial meridian from pole to pole through the nadir.
12.2.11	north meridian		Vertical circle through the north-point.
12.2.12	south meridian		Vertical circle through the south-point.

12.3 Altitudes and angular distances on the celestial sphere

Item No.	Name of the term	Abbre-viation	Definition, remarks
12.3.1	true altitude	h	Angular distance of the centre of a celestial body above the celestial horizon.
12.3.2	azimuth	Zn	The horizontal direction of a celestial point, expressed as the angular distance from true north (000°) clockwise through < 360°.
12.3.3	declination	d, dec	The arc of an hour circle between the celestial equator and a point on the celestial sphere, measured northwards or southwards from the celestial equator (00°) through 90° and labelled N (sign +) or S (sign −) to indicate the direction of measurement.
12.3.4	local hour angle	LHA	The angle at the celestial pole between the upper branch of the local celestial meridian and the hour circle of a point on the celestial sphere, measured westwards from the local celestial meridian (000°) through < 360°.
12.3.4.1	meridian angle (East)	t_E	Angle at the celestial pole between the upper branch of the local celestial meridian and the hour circle of a celestial body, measured eastwards; from the local celestial meridian through 180°.
12.3.4.2	meridian angle (West)	t_W	Angle at the celestial pole between the upper branch of the local celestial meridian and the hour circle of a celestial body, measured westwards from the local celestial meridian through 180°.
12.3.4.3	local hour angle of Aries	LHA ♈	The angle at the celestial pole between the upper branch of the local celestial meridian and the hour circle of Aries, measured westwards from the local celestial meridian (000°) through < 360°.
12.3.5 a)	Greenwich hour angle	GHA	Local hour angle at longitude 000°.
b)	Greenwich hour angle of Aries	GHA ♈	Angle at the celestial pole between the Greenwich hour circle and the hour circle of Aries, measured westwards from the Greenwich hour circle (000°) through < 360°.
12.3.6	siderial hour angle	SHA	The angle at the celestial pole between the hour circle of Aries and the hour circle of a point on the celestial sphere, measured westwards from the hour circle of Aries (000°) through < 360°.
12.3.7	right ascension	RA	360° — SHA
12.3.8	navigational triangle		Celestial triangle formed on the celestial sphere by the great circles connecting the elevated pole, zenith of the observer's (assumed) position and a celestial body.
12.3.9	parallactic angle		The angle between a body's hour circle and its vertical circle on the celestial sphere.

Item No.	Name of the term	Abbre-viation	Definition, remarks
12.3.10	zenith distance	z	The arc of a vertical circle between the zenith and a point of the celestial sphere, measured from the zenith through 90° for bodies above the horizon.
12.3.11	meridian altitude		Altitude of a celestial body on the celestial meridian.
12.3.12	polar distance	p	The arc of an hour circle between a celestial elevated pole and a point on the celestial sphere.

12.4 Sight reduction

Sight reduction is the process of deriving from a sight the information needed for establishing a line of position.

Item No.	Name of the term	Abbre-viation	Definition, remarks
12.4.1	visible horizon		The line where sky and earth appear to meet, and the projection of this line upon the celestial sphere.
12.4.2	sextant altitude	h_s	Altitude as indicated by a sextant before corrections are applied.
12.4.3	index correction	IC	The correction due to the error in the reading of a sextant equal to the difference between the zero of the scale and the zero of the index.
12.4.4	sextant altitude above the visible horizon		Altitude of a celestial body after index correction has been applied.
12.4.5 a)	sensible horizon		The circle of the celestial sphere formed by the intersection of the celestial sphere and a plane through the observer's eye which is perpendicular to the zenith-nadir line.
b)	geoidal horizon		The circle of the celestial sphere formed by the intersection of the celestial sphere and a plane through a point on the sea level surface of the earth which is perpendicular to the zenith-nadir line.
12.4.6	parallax in altitude	PinA	Geocentric parallax of a celestial body; the difference in the direction of the body due to the displacement of the observer from the centre of the earth. The expression is used to distinguish the given altitude from HP.
12.4.7	parallax in horizon	HP	Parallax in altitude when the body is in the sensible horizon (see 12.4.5).
12.4.8	refraction correction	R	Correction to a sextant altitude due to the atmospheric refraction.
12.4.9	dip of the horizon	D	The vertical angle at the observer's eye between the sensible horizon and the line of sight to the visible horizon.
12.4.10	height of eye	HE	Height of the observer's eyes above the water surface.
12.4.11	apparent altitude		Corrected sextant altitude (see 12.4.2) including all corrections. IC, PinA, R and D.

Item No.	Name of the term	Abbre-viation	Definition, remarks
12.4.12	semidiameter	SD	Half the angle at the observer subtended by the visible disk of a celestial body.
12.4.13	assumed position	AP	See 9.2.4.
12.4.14	observed altitude, true altitude	H_o	Corrected sextant altitude; angular distance of the centre of a celestial body above the celestial horizon of an observer measured along a vertical circle through 90°.
12.4.15	computed altitude	H_c	Altitude of the centre of a celestial body determined by tables or computation as an arc on a vertical circle of the celestial sphere from the celestial horizon.
12.4.16	altitude intercept	H_o–H_c	The difference in minutes between the observed and the computed altitude, labelled + (towards) and – (away), as the observed altitude is greater or smaller than the computed altitude.

12.5 Symbols of celestial bodies and sextant altitudes

Item No.	Symbol	Celestial body
12.5.1	☉	sun
12.5.2	☾	moon
12.5.3	*	star
12.5.4	♀	Venus
12.5.5	♁	Earth
12.5.6	♂	Mars
12.5.7	♃	Jupiter
12.5.8	♄	Saturn
12.5.9	$\overline{\odot}$	upper limb * (sun)
12.5.10	$\underline{\mathbb{C}}$	lower limb * (moon)
12.5.11	— * —	centre of a celestial body (star or planet)

* A limb is the upper or lower edge of an observed celestial body.

13 Depth of water and tides

Item No.	Name of the term	Abbre-viation	Definition, remarks
13.1 Depth data			
13.1.1	depth of water		Distance between water surface and bottom.
13.1.2	depth below keel, or under-keel clearance		Distance between keel and bottom.
13.1.3	depth below transducer		Distance of transducer from bottom.
13.1.4	chart datum	CD	The vertical datum to which depths and drying heights on a chart are referred.
13.1.5	charted depth		The vertical distance from the chart datum to the bottom.
13.2 Heights and times of tide			
13.2.1	tide		The periodic rise and fall of the surface of oceans, bays, etc. due principally to the gravitational interactions between the moon, sun and earth.
13.2.2	tidal wave		The wave motion of tides.
13.2.3	flood, rising tide		The rise of tide beginning at low water and ending at the following high water.
13.2.4	ebb, falling tide		The fall of tide beginning at high water and ending at the following low water.
13.2.5	tidal stream		The horizontal movement of the water, caused by gravitational interactions between the moon, sun and earth. NOTE Current is the non-tidal horizontal movement of the water surface due mainly to meteorological, oceanographical or topographical causes.
a)	flood stream		Tidal stream during flood, generally towards land.
b)	ebb stream		Tidal stream during ebb, generally towards sea, away from land.
13.2.6	springs, spring tides		Tides of increased range occurring semimonthly as the result of the moon being new or full.
13.2.7	neaps, neap tides		Tides of decreased range occurring semimonthly as the result of the moon being in first or last quadrature.
13.2.8	age of phase inequality, age of tide		The time interval between new or full moon and the maximum effect of these phases upon the rise of tide.
13.2.9	high water	HW	The highest level reached at a place by the water surface in one oscillation, also called high tide.
a)	high water height	HWH	Height of high water above chart datum.
b)	mean high water springs	MHWS	The average height of the high waters of spring tides, also called spring high water.

Item No.	Name of the term	Abbre-viation	Definition, remarks
c)	mean high water neaps	MHWN	The average height of the high waters of neap tides, also called neap high water.
d)	high water time	HWT	Time of high water.
13.2.10	low water	LW	The lowest level reached at a place by the water surface in one oscillation, also called low tide.
a)	low water height	LWH	Height of low water above chart datum.
b)	mean low water springs	MLWS	The average height of the low waters of spring tides, also called spring low water.
c)	mean low water neaps	MLWN	The average height of the low water of neap tides, also called neap low water.
d)	low water time	LWT	Time of low water.
13.2.11	duration of rise		Time interval from low water to high water.
13.2.12	duration of fall		Time interval from high water to low water.
13.2.13	rise of tide		Difference between low water height and next high water height.
13.2.14	fall of tide		Difference between high water height and next low water height.
13.2.15	range of tide		Mean value of rise of tide and fall of tide.
13.2.16	height of tide	H	Vertical distance from the chart datum to the water surface at any stage of the tide.
13.3 Special stations in Admiralty Tide Tables (A.T.T.)			
13.3.1	reference station	Ref Sta	Selected station with daily predictions of times and heights of high and low water.
13.3.2	subordinate station	Sub Sta	Station with mean time and height differences of high and low water referring to a reference station.

14 Terrestrial magnetism

Item No.	Name of the term	Abbre-viation	Definition, remarks
14.1	flux density of terrestrial magnetism	F	Total intensity of the magnetic field of the earth (in teslas) at compass' position.
14.2	horizontal intensity	H	Horizontal component of F.
14.3	vertical intensity	Z	Vertical component of F; positive in nadir-direction.
14.4	magnetic meridian		A line of undisturbed magnetic force of the earth in the direction to magnetic north (see 4.1.2).
14.5	magnetic equator		Line of all points, where $Z = 0$.
14.6	magnetic dip, inclination	I, Φ	Vertical angle between F and H, expressed in angular units from − 90° through + 90°.
14.7	magnetic pole		Either of two places on the earth, where the inclination is − 90° or + 90°.
a)	arctic pole		Magnetic pole near the geodetic north pole; $I = + 90°$.
b)	antarctic pole		Magnetic pole near the geodetic south pole; $I = - 90°$.
14.8	magnetic variation	MAG VAR	See 7.1.
14.9	deviation	DEV	See 7.2.
14.10	deviation coefficients	A, B, C, D. E	Mathematical expression for the deviation at any heading: $Dev = A + B \times \sin \alpha + C \times \cos \alpha + D \times \sin 2\alpha + E \times \cos 2\alpha$ where α is the Compass Heading (CH)

15 Radar navigation

For additional definitions, see IEC 60872, Parts 1, 2 and 3, and IEC 60936, Parts 1 and 2 (see Clause 2).

Item No.	Name of the term	Abbre-viation	Definition, remarks
15.1 Displays and radar targets on the plan position indicator (PPI)			
15.1.1	true motion	TM	A radar display in which own ship and targets in motion move on the PPI in accordance with their true courses and speeds.
15.1.2	relative motion	RM	A radar display in which targets move relative to own ship.
a)	head up	H Up	A non-stabilized radar display in which target directions are relative to the heading of own ship which is maintained up in relation to the display.
b)	course up	C Up	An azimuth-stabilized radar display in which target directions are relative to a preset base course of own ship which is maintained up in relation to the display.
c)	north up	N Up	An azimuth-stabilized radar display in which target directions are relative to true north which is maintained up in relation to the display.
15.1.3	centre	CENT	Own ship's position always stays in the centre of the PPI.
15.1.4	off-centring	OFFCENT	Own ship's position can be selected anywhere on the PPI.
15.2 Markers and lines on the plan position indicator (PPI)			
15.2.1	range rings		Rings of equal distances from own ship.
15.2.2	variable range marker	VRM	Variable line of distance from own ship. May also appear as a variable distance mark on a single azimuth. May also be offset to an origin other than own ship.
15.2.3	heading line, heading marker	HL HM	Line which points in the direction of own true heading (see 5.1.2).
15.2.4	electronic bearing line	EBL	A bright, rotatable radial line on the display of a radar used for bearing determination. May be centred on own ship or offset to another origin.
15.2.5	target vector		Line with vector of velocity on a target.
15.3 Control elements			
15.3.1	automatic frequency control	AFC	The technique of automatically maintaining the frequency of a receiver.
15.3.2	sensitivity time control	STC	Electronic circuit which controls a varying amount of suppression to be applied when sea clutter is present; also called "Anti-Clutter Sea" or "Sea".
15.3.3	fast time constant	FTC	Used in radar receivers to permit discrimination against received pulses of longer duration; whereby only the leading edge of a target having a long time duration is displayed on the PPI, e.g. in case of rain-targets; also called "Anti-Clutter Rain" or "Rain".

Item No.	Name of the term	Abbre-viation	Definition, remarks
15.4 Plotting			
15.4.1	Automatic Radar Plotting Aids	ARPA	A computer-assisted radar data-processing system which generates predicted ship vectors (see 15.2.5) based on the plotted position; it must satisfy requirements with respect to detection, acquisition, tracking, display, warnings, data display and trial manoeuvres.
15.4.2	acquisition, acquire	ACQ	The process of selecting a target and initiating its tracking (see 15.4.3).
15.4.3	tracking		The process of observing the sequential changes in the position of radar targets to establish their motion.
15.4.4	true track	T TRK	The apparent path of the target obtained by the vectorial combination of the target's relative motion through the water (when the sea is stabilized) or over the ground (when the ground is stabilized) and own ship's motion, expressed in angular distance from true north and knots.
a)	ground track	GND TRK	True track in the case of ground stabilisation.
b)	water track	WAT TRK	True track in the case of sea stabilisation.
15.4.5	relative track	R TRK	The apparent path of the target on a relative-motion display, expressed in angular direction from the top of the display and knots.
a)	relative speed		Speed of relative track of target.
b)	relative course		Course of relative track of target.
15.4.6	past position	PAST POSN	Past positions of a target on the PPI, also called history.
15.4.7	guard zone	GZ	Zone on the PPI limited by two guard rings and limit lines, zone on the PPI for automatic acquisitions.
15.4.8	target overflow		Maximum number of targets which can be tracked. When exceeded, selected criteria may be used to drop targets to make room for new targets.
15.4.9	target loss, lost target		A target which has been tracked disappears from the PPI.
15.4.10	target swap, target swop		Exchange of data between two adjacent targe[illegible]
15.5 Approach			
15.5.1	closest point of approach (closest plotted approach)	CPA	Range to the target's closest point of approach.
15.5.2	time to closest point of approach	TCPA	Duration to reach the expected point of closest point of approach.

16 LORAN-C

Item No.	Name of the term	Abbre-viation	Definition, remarks
16.1	time difference	TD	Time difference between the reception of equal pulse groups from a master and a secondary station of a LORAN-C chain.
16.2	group repetition interval	GRI *	Time interval between the same pulse groups of the master and secondaries of a LORAN-C chain, expressed in microseconds.
16.3	GRI-designator	GRI *	Designator for the LORAN-C chains. Group repetition interval, in microseconds, divided by 10 µs.
16.4	baseline length, baseline time travel	BLL BTT	Time required for the master signal to travel to the secondary, expressed in microseconds.
16.5	emission delay	ED	Total elapsed time from the master transmission until the secondary emission of pulse groups.
16.6	coding delay	CD	Emission delay minus baseline length; ED — BLL.
16.7	additional secondary factor	ASF	Correction in addition to the transmission time of a LORAN-C signal over a composite land-water path when the signal transit time is based on the velocity over sea, expressed in microseconds.
* It is important to distinguish between GRI in five-digit numbers with the unit microsecond and GRI in four-digit numbers without a unit.			

17 Global Positioning System (GPS)

17.1 Dilution of precision

Dilution of precision (DOP) is a parameter relating the precision of the position provided by a positioning system to that of the "observed quantities" directly measured by the system. DOP is a measure of the influence of loci on the precision of position fixing. DOP is frequently used with a qualifying term, such as geometric, horizontal, vertical, etc., to indicate that DOP is related to all or some unknown quantities.

Item No.	Name of the term	Abbre-viation	Definition, remarks
17.1.1	geometric dilution of precision	GDOP	Geometric factor that degrades the accuracy of position fixes from those satellites which form a volume.
17.1.2	positional dilution of precision	PDOP	Reciprocal value of a tetrahedon volume formed by own fix and the four satellites which are used for three-dimensional fixing.
17.1.3	horizontal dilution of precision	HDOP	Horizontal part of PDOP; reciprocal planimeter formed by the four satellites which are used for horizontal fixing.

Bibliography

[1] BOWDITCH, NATHANIEL, *The American Practical Navigator*, 2002 Bicentennial Edition, National Imagery and Mapping Agency, Bethesda, Maryland, USA

[2] *Admiralty Manual of Navigation*, **1**, 2nd imp. 1992; Ministry of Defence, HMSO, London

[3] *Hydrographic Dictionary* Part I, International Hydrographic Office (IHO), 5th Ed. 1994, Monaco

[4] DIN 13312, *Navigation — Concepts, abbreviations, letter symbols, graphical symbols*; Deutsches Institut für Normung, 2003, Berlin

[5] HILL, C. H. F. *Navigational terms. Nautical Briefing, Seaways*, Feb. 1981, pp. 13 to 15; The Nautical Institute London

blank