ANNEX 1

GUIDELINE FOR THE STANDARDISATION OF FUNCTIONS AND DISPLAY OF NAVIGATION EQUIPMENT (S-MODE)

Introduction

1.   This guideline provides guidance on where and how standardization can provide for increased usability of electronic navigation systems. It applies to Integrated Navigation Systems (INS), Integrated Bridge Systems (IBS), Electronic Charting Display and Information Systems (ECDIS) and Radar. It may be applied to other components of electronic navigation equipment, where a designer considers it would improve usability and offer standardization. The aim of this guideline is to provide guidance on standardisation of user interfaces for navigation equipment and systems to help meet user needs. It aims to facilitate innovation for manufacturers, whilst providing familiarity for seafarers across navigation systems and equipment.

2.   Standardization of the user interface and information used by seafarers to monitor, manage and perform navigation tasks, will improve the safe and effective navigation of SOLAS ships. Application of this guideline to the design and testing of navigation equipment ultimately aims to reduce to near zero the type-specific training required to readily use the mandated functions of ships' navigation equipment.

Scope

3.   Greater standardization of the user interfaces through application of this guideline will reduce variation in navigation systems and equipment. This in turn will help to provide users with timely access to essential information and functions that support safe navigation. This guidance stems from a strong user need for standardisation to enhance usability across navigation equipment and systems. Irrespective of an equipment's manufacturer, vast variation between systems and equipment has led to inconsistency in the way essential information is presented and used to perform key functions related to safety of navigation.

4.   While the operation of navigation equipment requires specialist training, specific training or familiarisation across different branded equipment should ideally be minimised for mandatory functions. The application of standardization principles enables users to locate and interpret important information quickly and react decisively. This has proven crucial to safe navigation.

5.   General system design and portrayal of displays is defined through a number of IMO documents and international standards. The scope of this guideline builds on these standards and can be illustrated as follows:

Definitions

6.   This section provides definitions relevant to this guideline and its use by industry.

further definitions to be added later in the
process of developing this document, and
referencing to already existing definitions in
other relevant documents

a. **Standardisation Design Principles:** a set of general rules of thumb that consider human abilities, characteristics and limitations to the design of an interface.

b. **User interface**: all components of an interactive system (software or hardware) that provide information and controls for the user to accomplish specific tasks with the interactive system.

c. **Navigational phase:** Spatial characterization of typical navigation scenarios such as navigation at open sea, in coastal areas, restricted waters, port entries, …docking, etc.

d. **Navigational situation:** defined as Situation of the individual ship taking into account the navigational phase as well as environment (geometric, bathymetric, traffic conditions, etc. in

e. **Nautical task:** defined as Tasks covering nautical aspects e.g. "Route planning" or "Route monitoring" or "Collision avoidance" or "Navigation control data" or "Status and data display" or "Alert management" in

f. **Nautical application(s):** defined as Technical function(s) to assist or support the realization of a nautical task

g. **Standardisation Design Principles:** a set of general rules of thumb that consider human abilities, characteristics and limitations to the design of an interface.

h. **User interface**: all components of an interactive system (software or hardware) that provide information and controls for the user to accomplish specific tasks with the interactive system.

i. **Navigational phase:** Spatial characterization of typical navigation scenarios such as navigation at open sea, in coastal areas, restricted waters, port entries, …docking, etc.

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l. **Nautical application(s):** defined as Technical function(s) to assist or support the realization of a nautical task

User needs

7.   The IMO e-navigation Strategy Implementation Plan (SIP) has identified areas for enhancement in the usability of navigation systems. This guidance is driven by user needs and is focussed on standardization of the functions of navigation relevant to INS, IBS, ECDIS and ARPA.

8.   The steps involved in navigating a ship remain largely unchanged. Safe navigation using electronic navigation equipment is achieved through the effective application of navigation tasks. There is vast variation between systems and equipment as to the way in which functions contribute to achieving navigation tasks. Where significant variation exists between buttons, icons, actions, workflows, processes, units of measure, location of information there becomes a higher demand for in depth familiarization with different equipment. Users must be able to learn through experience and transfer skills between systems and equipment. To achieve this, essential information needs to be located in consistent locations, be of a similar size, recognisable colour and shape, and units of measurement.

9.   Feedback and analysis indicates that users benefit from standardization. Standardization provides for effectiveness, efficiency and satisfaction for the user, and supports overall system safety. It provides the user with the opportunity to transfer skills gained through experience between systems and equipment, allowing for minimum skill fade and less familiarization. Where standardization is present, less familiarization is necessary when transferring skills to a different equipment.

10.   User feedback and testing has been used to develop a set of standardisation design principles, adapted from commonly recognized interface design heuristics. These principles align with the users need for more standardisation. They should be applied in the design process for electronic navigation equipment, and to test conformance with the standardisation requirements of this guideline. The Standardisation Design Principles for electronic navigation equipment are summarized as follows:

      a. Consistency

          (1)   patterns, grouping

          (2)   Standard places,

          (3)   Standard Vocabulary

          (4)   Standard symbols and icons

      b. Recognition

      c. Frequency of use

      d. Visibility of system status

      e. Map to real world

      f. Prevent errors, emergency exit

      g. Tailor to experience levels

      h. Help, documentation

11.   The above Standardisation Design Principles have been applied in the development of the technical content provided in the appendices to this guideline. The appendices include:

      a. standard & user settings;

      b. standardized terminology, abbreviations and icons for commonly-used functions (Hot Keys) and groups of functions (Shortcuts);

      c. logical grouping of related information;

      d. access requirements for essential information and functions ("single or simple operator action");

Standardization Design Principles

12.   Vast amounts of information is available to the user of electronic navigation equipment. Vessel safety depends on the user's ability to identify, understand and interpret essential information, in order to perform navigation functions. Decision making depends on the effective and efficient use of essential information across different pieces of equipment and between different manufacturers. Standardisation design principles, that apply across key systems and equipment allows for this to happen. Head Down Time (HDT) should/could be minimized by standardization design principles, thus providing the navigator with more time evaluating and monitoring the surroundings of the ship/vessel.
.

13.   Users generally follow a common, but often unwritten, workflow for the functions associated with their role. Standardisation of information and the way it is presented makes this task easier. As an example, the standardisation of essential information for common navigational tasks means that the user can comprehend information easily across different navigation systems and equipment. Standardisation through design and testing reduces the workload and simplifies the process, which increases efficiency, effectiveness and usability.

14.   The following principles should be applied during the design and testing of equipment.

a. Consistency has been identified as the most significant standardisation design principle. The use of consistency throughout the design process increases usability as well as standardisation and is an enabling principle when optimising standardisation throughout the design process. The findings of user feedback and testing can be used to identify areas where further consistency can enhance standardisation.

   (1) Patterns, grouping - Human perception reacts positively to patterns and logical groups of items, and uses categories to search for individual bits of information. User testing can identify groupings and patterns of information that should be prioritised for consistency. Patterns incorporate the way in which someone uses information and the types of information that is grouped together.

   (2) Standard location - The search for information when monitoring can be greatly improved through the use of consistent location, where consistency in location coupled with consistent grouping greatly speeds up searches and contributes to recognition. User testing has been used to highlight high frequency use areas and can be used to identify places and locations that require standardisation. Places where essential information is located, and or information that is used most frequently should be located together, or a short distance apart. Most frequently used information should also be as close as possible to the bridge window, to reduce scan times.

   (3) Standard vocabulary - Consistency in naming, in conjunction with the two above, will aid search and identification. The naming protocol should be chosen by contextual seafarer logic as opposed to engineering terminology. Functions related to mandatory tasks must follow a standardised naming convention whereby the function name is transferred between systems (e.g. starboard and port, not left and right).

   (4) Standard symbols and icons - The standardisation of symbols is well defined in IEC standards, however the use function related icons across different navigation equipment and between manufacturers includes significant variation. Appendix X provides information on icons, symbols and abbreviations that require standardisation. Consistency enables recognition and detectability across the user interface of different navigation systems.

b. Recognition - Using the location and grouping for consistency provides for recognition. Human perception and search works faster with cues than complete recall – which is aided by consistency. The user must recognise where information is, or how to perform a process. In performing functions, the user should not need to recall a process where something is located or the process for doing something. This is the ability for the user to recognise an event, process, or information flow rather than recall the detail of how to get to that point. This is integral to usability.

c. Frequency of use - Sorting, grouping and locating according to frequency of use increases efficiency. This principle requires that the user can access those task which the frequently use. It includes the application of 'hot keys, and single operator actions.

d. Visibility of system status - Integration of humans and technology to support the ability to work as a team relies on being able to identify system status. Systems status provides confidence in the validity of information, and the performance of navigation equipment and sensors. Systems status includes visibility of 'processing' information and the performance of system sensors to illustrate degraded information.

e. Map to real world – There are two elements to mapping to the real world.

   (1) Whenever possible use images or wording that is contextually related to the task. This is applicable to the interaction with the interface, for example when increasing a number, twist a dial and show increase as "up"…,

   (2) Geolocation of information to provide a linkage, or correlation, between the user, electronic equipment, and the real world; relative to the ship promotes correlation

of information. When combined with recognition, the user intuitively links displayed information with physical reality.

f. Prevent errors, emergency exit - Continuous testing during development will identify possible error paths that can be removed. The user should also be aware of how to navigate back to the start of a process, and be aware of what stage they are at in a process.

g. Tailor to experience levels – The user interface should be tailored to suit the ability of the user. Mandated functions must be simple, standardised, with limited variation. Optional or enhanced functions, outside of mandated scope can build on the functions and essential information as mandated. A clear path or method should be standardised, and complemented by shortcuts as experience increases.

h. Help, documentation - Design help documentation to be user and task focused and not engineering focused.

15.   The use of standardisation design principles can be applied during the design process and testing. The application of standardisation design principles significantly enhance the usability, effectiveness, efficiency, satisfaction and overall safety.

Conclusion

……………………[to be added]

Appendices are included as follows:

Appendix 1 – Navigation-related terminology and icons of functions (Hot Keys & Shortcuts)

Appendix 2 – Logical grouping of information ("essential information blocks")

Appendix 3 – List of functions that must be accessible by single or simple operator action

Appendix 4 – Standard & User settings

APPENDIX 1
Navigation-related terminology and icons of functions (Hot Keys & Shortcuts)

Introduction

This Appendix identifies commonly-used functions on navigation equipment and for each function specifies the associated terminology, abbreviation and (where appropriate) icons. These terms, abbreviations and icons, if available, should be used for the display of navigation-related information, to promote consistency of presentation across navigational equipment.

The terminology and icons listed in Appendix 1 should replace symbols which are currently contained in existing performance standards. Where a standard term or icon is not available, another icon or term may be used, but these should not conflict with the icons listed in the appendix.

All terms and abbreviations in this Appendix are mandatory to implement. Use of icons is not mandatory; but if icons are implemented then they must meet the requirements specified.

The icons specified may indicate a status, may execute a specific function (Hot Key), or may provide access to a group of related functions (Shortcut).

Only the shape of the icon is specified; this Appendix does not specify a colour scheme for icons.
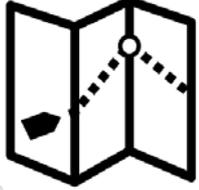
Note: For some functions, multiple icon options are suggested for consideration. The final S-Mode Guidelines should provide only one icon for each function.

Icons and terminology for functions (Hot Keys)
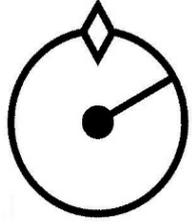
Table 1: General navigation functions

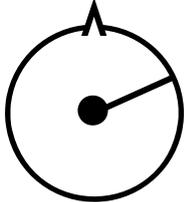| Explanation	Term	Abbreviation	Icon (Hot Key)
To set panel illumination	Panel illumination	PANEL	(Table E.3 of IEC 62288 Ed.2)
it is proposed by Japan to use the icon from Table E.3 of IEC 62288 Ed.2			

To set display brilliance	Display brilliance	BRILL	(Table E.3 of IEC 62288 Ed.2.)
	it is proposed by Japan to use the icon from Table E.3 of IEC 62288 Ed.2		
To select ECDIS mode (for example required by INS)	ECDIS	ECDIS	
To select Radar mode (for example as required by INS)	Radar	RADAR	
To select Conning display mode (for example as required by INS)	Conning	CONN	
To select CAM-HMI as defined in Bridge Alert Management (BAM) (for example as required by INS)	CAM-HMI	CAM	**OR**

[

To select North Up display	North Up	N UP	
To select Head Up display	Head Up	H UP	

To select Course Up display	Course Up	C UP	

Above - The center circle of this icon is bigger than the "North Up" icon. The center circle must be same as the "North Up" icon. And the arrow should not be overhead. Because user may mistake "Head Up

To select True Motion mode	True Motion	TM	**TM**
To select Relative Motion mode	Relative Motion	RM	**RM**
To select ship centred mode	Centred	CENT	
To select ship off centred mode	Off centred	OFF CENT	
To perform True Motion reset	TM reset	TM R	**TM R**
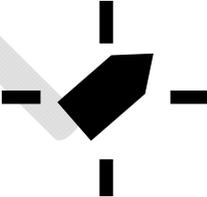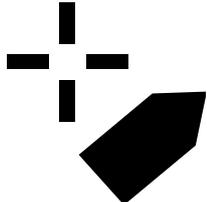
Above- Can this be misinterpreted with the True Motion Relative (vectors) function, or is it just me that misinterpret it

| To select range | Range | RANGE | |
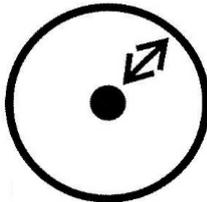
To perform Range up (for example, from 3nm to 6nm)	Up	UP +	
To perform Range down (for example, from 6nm to 3nm)	Down	DN -	
To identify the "heading line" off position	Heading Line Off	HL OFF	
To toggle Range Rings on and off	Range Rings	RR	(IEC)
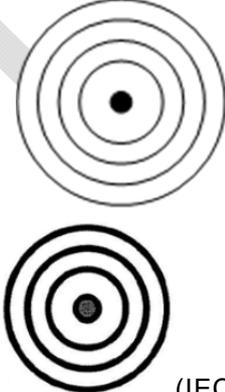
Above - This icon should be same as the Table E.4of IEC 62288 Ed.2. Because the user is already familiar with this icon

To set Variable Range Marker	Variable Range Marker	VRM	**VRM**
To set Electronic Bearing Line	Electronic Bearing Line	EBL	**EBL**
To control simultaneous measurement of range and bearing	Electronic Range and Bearing Line	ERBL	**ERBL**
To perform Target Acquire	Acquire	ACQ	**ACQ**

To perform selection (for example, target or chart object)	Select	SEL	
To call up the information associated with an object by cursor pick on its symbol	Pick report	PICK	
To perform target cancellation (or to put an AIS target to sleep)	Cancel	CNCL	
To perform cancellation of all targets (or to put all AIS targets to sleep)	Cancel all	CNCL ALL	
To acknowledge an alert	Acknowledge	ACK	ACK
To silence alerts	Silence	SIL	
To record an event	Record event	REC EVENT	
To select standard settings (standardized configuration is defined in Appendix 4)	Select standard	STND CONF	DEF OR STND
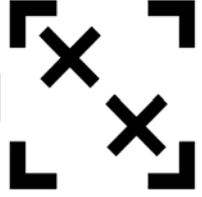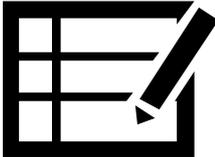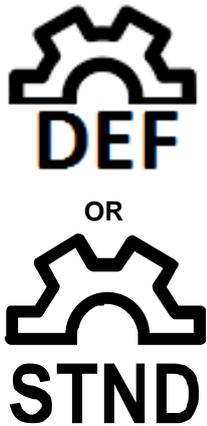
To select user settings	Select user	USR	
To save user settings	Save user	SAV USR	
To select standard display for chart	Standard Display	STND DISP	
To execute Trial Manoeuvre	Trial manoeuvre	TRIAL	
To toggle Day/Night/Dusk mode	Day / Night	DAY / NT	

Table 2: Control of Radar functions

Explanation	Term	Abbreviations	Icon (Hot Key)
To select "radar stand-by"	Standby	STBY	
To select short pulse position of the pulse length selection control	Short Pulse	SP	
To select medium pulse position of the pulse length selection control	Medium Pulse	MP	*[Insert Symbol]*
To select long pulse position of the pulse length selection control	Long Pulse	LP	
To set tuning control	Tune	TUNE	
To set gain control	Gain	GAIN	
To set anti-clutter rain control	Rain	RAIN	
To set anti-clutter sea control	Sea	SEA	
To select performance monitor	Performance Monitor	MON	(IEC)
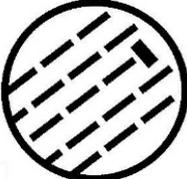
Comment Above - Arrows of this icon are too small. Should be corrected from "MON" to "PM"
This icon should be same as the Table E.5 of IEC 62288 Ed.2. Because the user is already familiar with this icon

Table 3: Control of Chart display functions

Explanation	Term	Abbreviation	Icon (Hot Key)
To show accuracy related symbols	Accuracy	Not applicable	Not applicable
Selector for viewing group layer	All isolated dangers	Not applicable	Not applicable
	Archipelagic sea lanes	Not applicable	Not applicable
	Boundaries and limits	Not applicable	Not applicable
	Buoys, beacons, aids to navigation	Not applicable	Not applicable
	Cautionary notes	Not applicable	Not applicable
Chart boundary shown	Chart boundary	Not applicable	Not applicable
Selector for viewing group layer	Chart scale boundaries	Not applicable	Not applicable
To show contour labels	Contour label	Not applicable	Not applicable
Date-dependant objects	Date dependent	Not applicable	Not applicable
Deep contour	Deep contour	Not applicable	Not applicable
Selector for viewing group layer	Display base	Not applicable	Not applicable
Selector for viewing group layer	Drying line	Not applicable	Not applicable
Use four shades	Four shades	Not applicable	Not applicable
Selector for full light sector lines	Full light lines	Not applicable	Not applicable
Show date dependent object	Highlight date dependent	Not applicable	Not applicable
Show symbol for INFORM and NINFOM	Highlight info	Not applicable	Not applicable
Show symbol for TXTDSC, NTXDS and PICREP	Highlight document	Not applicable	Not applicable
Selector for viewing group layer	Important text	Not applicable	Not applicable
	Magnetic variation	Not applicable	Not applicable
	Miscellaneous	Not applicable	Not applicable
Show national language NOBJNM, text group 2	National language	Not applicable	Not applicable
Selector for viewing group layer	Other text	Not applicable	Not applicable

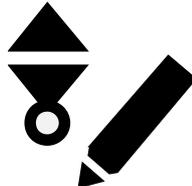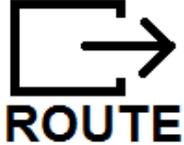| Selection for point object style	Paper chart / Simplified symbols	Not applicable	Not applicable
Selection for line style	Plain / Symbolized boundaries	Not applicable	Not applicable
Selector for viewing group layer	Prohibited and restricted areas	Not applicable	Not applicable
To select safety contour	Safety contour	Not applicable	Not applicable
Depths in safety area shown, soundings in safe area shown	Safe depths shown	Not applicable	Not applicable
To select safety depth	Safety depth	Not applicable	Not applicable
To turn SCAMIN off	Scale min	Not applicable	Not applicable
Selector for viewing group layer	Seabed	Not applicable	Not applicable
Shallow contour	Shallow contour	Not applicable	Not applicable
To show shallow pattern	Shallow pattern	Not applicable	Not applicable
To show isolated dangers in shallow waters	Shallow water dangers	Not applicable	Not applicable
Selector for viewing group layer	Ships' routing systems and ferry routes	Not applicable	Not applicable
	Spot soundings	Not applicable	Not applicable
	Submarine cables and pipelines	Not applicable	Not applicable
	Tidal	Not applicable	Not applicable
Use two shades	Two shades	Not applicable	Not applicable
Selector for displaying unknown objects	Unknown	Not applicable	Not applicable
To highlight objects which have undergone modification	Update review	Not applicable	Not applicable

Table 4: Control of chart functionality

Explanation	Term	Abbreviations	Icon (Hot Key)
To select a date or date range for displaying all chart objects active at that date and time	Display date	DISP DATE	
To toggle latitude/longitude grid	Grid	GRID	
To perform manual update	Manual update	MAN UPD	
To toggle radar overlay	Radar overlay	RADAR OVR	

Table 5: Database functions

Function	Term	Abbreviation	Icon (Hot Key)
To import ENC	Import Chart	IMPORT CHART	Not applicable
To review ENC updates	Update review	UPD RVW	Not applicable
To view ENC update summary report	Update summary	UPD SUM	Not applicable
To view graphical index of ENC charts	Graphical index	GRAPH INDX	Not applicable
To view ENC update log	Update log	UPD LOG	Not applicable
To view ENC Update Status Report	ENC Update Status Report	ENC UPD STATUS	Not applicable
To view ENC Management Report	ENC Management Report	ENC MGT REP	Not applicable

Table 6: Route plan and monitoring functions

Function	Term	Abbreviation	Icon (Hot Key)
To export route plan	Export Route	Export	
To import route plan	Import Route	Import	
To set own-ship look ahead	Own ship look-ahead	LOOK AHEAD	Not applicable
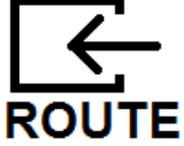
Icons and terminology for groups of functions (Shortcuts)

Table 7: Groups of functions

Group of functions	Term	Abbreviation	Icon (Shortcut)
To set collision avoidance limits and other target-related parameters (including CPA, TCPA, etc.)	Target control	TGT CTRL	TGT
To set radar controls (including tunings, anti-clutter, etc.)	Radar control	RADAR CTRL	RADAR
To set chart related limits and other chart-related parameters (including safety contour, safety depth, areas with special conditions, own ship check area, etc.)	Chart control	CHART CTRL	CHART
To set trial manoeuvre parameters	Set Trial	SET TRIAL	TRIAL
To add or remove information from the ECDIS display. (This icon will provide access to the functionality included in table 3).	Chart display	DISP	
To provide additional mariner's information	User chart	USR CHT	USER
			Comment - The map and route mark should be deleted. It is too complicated to display in the icon
To access route plan settings	Route plan	ROUTE PLAN	PLAN
To access route monitoring settings	Route monitoring	ROUTE MON	MONIT
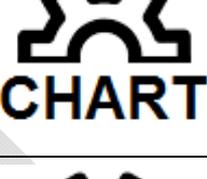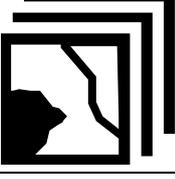
Cannot read 'MONIT" – Map and track mark should be removed

To access chart database management	Chart management	CHART MGMT	

Cannot read 'CHART"

APPENDIX 2
Logical grouping of information ("essential information blocks")

Introduction

This Appendix defines clusters of related navigational information that shall be displayed together on the user interface, to enable the user to quickly locate and react to essential navigation information.

This Appendix does not specify where the clusters of information should appear on the screen, or the order in which the individual information elements should be grouped.

Essential information blocks

Navigation (Own ship information)
COG: <value / sensor status> <unit> | <sensor source>
SOG: <value / sensor status> <unit> | <sensor source>
HDG: <value / sensor status> <unit> | <sensor source>
STW: <value / sensor status> <unit> | <sensor source>
<LAT value> | <LON value> | <sensor source> | < sensor accuracy>

Date and Time
<Date> | <Time> | <Time Zone>

Route
To WPT: <WPT name>
BRG to WPT/BRG to WOL/Leg Course: <bearing>
DIST to WPT/DIST to WOL: <distance>
TTG: <time>
XTD: <value>
Radius: <value>
Next leg course: <value>

TTG first, in order to have a high SA concerning the time left on the current leg. – Norway
Further groupings and order of information to be added through testing, research and development of this appendix

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APPENDIX 3

List of functions that must be accessible by single or simple operator action

Introduction

Where the equipment provides the functions listed in the table below, access shall be as defined as in the table. A requirement for information to be presented on single operator action may alternatively be met by a permanent indication.

Single operator action is defined as "A procedure achieved by no more than one hard-key or soft-key action, excluding any necessary cursor movements, or voice actuation using programmed codes.

Simple operator action is defined as "A procedure achieved by no more than two hard-key or soft-key actions, excluding any necessary cursor movements, or voice actuation using programmed codes."

(Both definitions taken from IMO Resolution MSC.252(82)).

[The definitions of "Single operator action" and "Simple operator action" should be limited to be available only in this S-Mode guideline. Otherwise, it might conflict the other standards such as IEC61174 or IEC62388. For example, "single operator action" and "permanent indication" means clearly different in IEC61174.]

Requirements

Table 1: Existing requirements
(IEC 62388:2012, IEC 62288:2015, IEC 61174:2015)

[Please add reference in each function For example, elect ECDIS Standard Display, IEC 61174:2015 clause 4.3.3 andIEC 62288:2014 clause 6.3.3.1]

Function	Equipment	Access
Select ECDIS Standard Display	ECDIS	Single operator action

Function	Equipment	Access
Remove radar (image and tracked target), AIS and other navigational information overlaid over the ENC chart.	ECDIS	Single operator action
Select route monitoring display covering own ship's position	ECDIS	Single operator action
Select default ECDIS settings	ECDIS	Single operator action
Present AIS filter criteria	ECDIS	Single operator action
Present excluded MSI coverage areas and message categories	ECDIS	Single operator action
Present date (or date range) of date dependent ENC objects	ECDIS	Single operator action
Select AIS target information	ECDIS	Simple operator action
Remove chart data	Radar	Single operator action
Reset VRM origin	Radar/ECDIS	Simple operator action
Reset EBL origin	Radar/ECDIS	Simple operator action
Reset ERBL origin	Radar	Simple operator action
Reset Parallel Index line to own ship's heading	Radar	Simple operator action
Remove user defined maps	Radar	Simple operator action
Select default radar settings	Radar	Single operator action
Select presentation mode (radar, chart and other navigation information)	Radar/ECDIS	Simple operator action
Remove AIS Area Notice	Radar/ECDIS	Single operator action

Message 12 or 6 from AIS?
What is an area notice?
For discussion and testing

Function	Equipment	Access
Remove additional information (including information for route planning, route monitoring, information overlays and supplementary navigation tasks)	ECDIS	Simple operator action

Table 2 New requirements

Function	Equipment	Access

Set panel illumination	Radar/ECDIS	Simple operator action
Set display brilliance / Toggle Day/Night mode	Radar/ECDIS	Simple operator action
Select ECDIS mode	INS	Simple operator action
Select Radar mode	INS	Simple operator action
Select Conning display mode	INS	Simple operator action
Select CAM-HMI as defined in Bridge Alert Management (BAM) (for example as required by INS)	INS	Simple operator action
Select North Up display	Radar/ECDIS	Simple operator action
Select ship's Head Up display	Radar/ECDIS	Simple operator action

Head Up is not mandatory function of ECDIS.
Please delete

Select ship's Course Up display	Radar/ECDIS	Simple operator action
Select True Motion mode	Radar/ECDIS	Single operator action
Select Relative Motion mode	Radar/ECDIS	Single operator action
Select Ship centred mode	Radar/ECDIS	Single operator action

Should be reconsidered Single/Simple operator action requirement for ECDIS functions from "Select True Motion mode to "Perform True Motion reset".

Select Ship off centred mode	Radar/ECDIS	Simple operator action
Perform True Motion reset	Radar/ECDIS	Single operator action
Select range	Radar/ECDIS	Simple operator action
Perform Range up	Radar/ECDIS	Single operator action
Perform Range down	Radar/ECDIS	Single operator action

Temporarily suppress the "heading line"	Radar	Simple action	operator
Toggle Range Rings on and off	Radar/ECDIS	Simple action	operator
Start Variable Range Marker adjustment	Radar/ECDIS	Simple action	operator
Start Electronic Bearing Line adjustment	Radar/ECDIS	Simple action	operator
Start Electronic Range and Bearing Line adjustment	Radar/ECDIS	Simple action	operator
Perform Target Acquire	Radar	Simple action	operator
Select tracked target	Radar/ECDIS	Simple action	operator
Call up the information associated with an object by cursor pick on its symbol	ECDIS	Simple action	operator
Perform target cancellation (or to put an AIS target to sleep)	Radar/ECDIS	Simple action	operator
Perform cancellation of all targets (or to put all AIS targets to sleep)	Radar/ECDIS	Simple action	operator
Acknowledge an Alert	Radar/ECDIS	Single action	operator
Silence alerts	Radar/ECDIS	Single action	operator
Record an event	ECDIS	Simple action	operator
Set Trial Manoeuvre on	Radar	Simple action	operator

APPENDIX 4

Standard & User settings

User settings

A facility shall be provided to store and recall user-specific settings to suit the conditions at hand. At least two such configurations shall be available to be stored for recall. Selection for recalling a stored configuration shall be followed by an action to confirm the selection.

Standard settings

A facility shall be provided to apply a set of standard settings to return the equipment to a known state.

ECDIS standard settings

The table below lists the standard settings for ECDIS.

Table 1 – ECDIS control settings configured in response to 'Default' selection

Function	Setting
Display category	ECDIS Standard display
Chart related selector: Accuracy	Off
Chart related selector: Date dependent objects	current date
Chart related selector: Highlight date dependent	Off
Chart related selector: Full light lines	Off
Chart related selector: Highlight info	Off
Chart related selector: Highlight document	Off
Chart related selector: Unknown	On
Discussion and/or testing to confirm why this is set to 'on' is necessary	
Chart related selector: Scale min	Off
Chart related selector: Shallow pattern	Off
Chart related selector: Shallow water dangers	On
Chart related selector: Contour labels, if provided	Off
Chart related selector: Four shades, if provided	Off
Chart related selector: National language, if provided	Remain unchanged
Chart related selector: Paper chart / Simplified symbols	Simplified

Function	Setting
It is argued by the IHO (S-52) that simplified symbology is better than the traditional "paper chart" symbols. This is also supported by most end-users. I would argue that the use of simplified symbols should be the standard setting (fresh mariners of today might not even have seen a paper chart..) This requires testing and further discussion	
Chart related selector: Plain / Symbolized boundaries	Plain
Chart related selector: Text group layer	Important text
Selected sea area	Around own ship with appropriate off-set
Range	3 NM
Orientation	True motion, north-up
True motion reset	10 % from display edge
Geodetic datum, if selectable	WGS84
Manual updates (see **Error! Reference source not found.**)	If applied i.e. displayed if available
Mariner's notes (see **Error! Reference source not found.**)	If applied i.e. displayed if available
Japan has requested delete of the above two settings: Norway suggests I think mariners notes is used in a variety of ways. In Norway, one of the ways of using it is as an "notebook" tool to write in important geographical information, or even to highlight especial geographical areas or light characteristics/aids to navigation etc. This is the reason why I think It is important that the navigator makes a deliberate choice of displaying the notes. On the other side, you could argue that if this being a default value, the navigators has to "clean up" in the notes shown at any given time…	

Function	Setting
Selected route	Last selected route, including route parameters
Past track	On
Past track length, if selectable	12 h
Past track time-labels	On, 30 min
Look-ahead time	6 min
Any edit window (for example route plan)	Exit
Position data source	remain unchanged
Safety contour	remain unchanged
This value should be made easily available for the navigator.	
Safety depth	remain unchanged
Cross track limit	remain unchanged
Graphical indication of crossing safety contour during route planning, if selection provided	On
Graphical indication of prohibited areas, areas with special conditions and navigational hazards during route planning, if selection provided	On
Distance to prohibited areas, areas with special conditions and navigational hazards	remain unchanged
Graphical indication of crossing safety contour during route monitoring, if selection provided	On
Graphical indication of prohibited areas and areas with special conditions during route monitoring, if selection provided	On
Graphical indication of navigational hazards during route monitoring, if selection provided	On
Object highlight, selected object, track display from log	Cleared from display
Cursor pick	Closed
Any additional window (dual view, 3d, tides, etc.)	Closed
Any additional information layer, proprietary layer (weather, tides, AML, etc.)	Cleared from display
Chart update, Chart information exchange	Aborted
Colour differentiation test diagrams	Closed
Update review	Off

Function	Setting
Chart 1	Closed
Units	m, NM, kn
Crossing a navigational hazard in route monitoring mode	Caution
Vector time (length)	6 min
Vector mode	True
Vector stabilization	Ground
Symbol for target association, if provided	AIS
Collision warnings, if provided	ON (limits, CPA = 2 NM; TCPA = 12 min)
Radar and AIS target association, if provided	ON
Which data is primary? Would argue that Radar should be primary since this is a terrestrial navigation aid, which the ownship is in control of.	
AIS target filtering, if provided	target range = 6 NM target CPA = 4 NM target TCPA = 24 min target display = Off sleeping target display = Off AtoN display = On SART display = On repeated target display= Off
AIS true target outline	Off
Display of Radar image overlay, if provided	Off/ ON
For discussion and testing to determine desired setting	
Display of Radar tracked targets, if provided	On
For discussion and testing to determine desired setting	
Display of AIS reported targets, if provided	Off

Function	Setting
Target past positions, if provided	Off
Target trails, if provided	Off
Lost target warning, if provided	Off
Lost target warning range, if provided	12 NM
AIS interrogation, if provided	Off
Own ship true outline	On
For discussion and testing to determine desired setting To improve SA: On. This is applicable only on certain scales (dynamic)(?), so it will not clutter the picture.	
LOP source indication	Off
User selected time for warning escalation	60 s
Suppression of indication of user selected MSI messages based on first character of NAVTEX code field, if provided	Remain unchanged
Supression of indication of user selected messages based on time and distance from own ship, monitored route or planned route	No
Brightness and contrast controls, if software controlled	Calibrated setting

Radar standard settings

The table below lists the standard settings for Radar.

Table 2 – Radar control settings configured in response to 'Default' selection

Function	Setting
Band	X-band, if selectable
Gain and anti-clutter functions (Sea, Rain)	Automatically optimized, where provided or leave manual controls set 'as is'

There are several radar manufacturers which have not got a good auto function when it comes to tuning the radar. It should thus not be put in auto, as this must be a conscious choice by the navigator so that he/she is aware of it.

This requires testing, analysis, and feedback from experts- tbc

Tuning	Automatically optimized where provided
Range	6 NM
Fixed range rings	Off
VRMs	One VRM on, 0.25NM
EBLs	One EBL on
Parallel index lines	Off or last setting, if applied
Display mode of the radar picture	True motion, north-up
Stabilization Sea/Ground	Ground (SOG, COG)
Off-centring	Appropriate look-ahead
Target trails	On, 6 minute (same as vector)
Past positions	Off
Radar target tracking	Continued
Vector mode	Relative
Vector time	6 min
Automatic radar target acquisition	Off
Graphical AIS reported target display	On
Radar and AIS Target fusion	On

Change to "association on"
This setting must be same as the Table 35 of IEC 62388 Ed.2

Operational alerts (except collision warnings)	Off

<table>
<tr><td colspan="2" align="center">Change to Operational Alarms (except Collision warnings).
This function is from Table 35 of IEC 62388 Ed.2.</td></tr>
<tr><td>Collision warnings</td><td>On (limits CPA 2 nm; TCPA 12 min)</td></tr>
<tr><td>Display of maps, navigation lines and routes</td><td>Last setting</td></tr>
<tr><td colspan="2" align="center">Table 35 of IEC 62388 Ed.2.</td></tr>
<tr><td>Display of charts</td><td>Off</td></tr>
</table>

<u>Additional notes on what else may need to be considered for the Appendices</u>

Navigation related terminology, Icons, and functions

The majority of symbols and terminology is previously defined, however there are specific functions and commonly used workflows in electronic navigation equipment that can be further defined and developed. This appendix will build on the standardisation delivered through IEC 62288 and MSC 191(79). It may offer new symbols and of terminology and/or abbreviations….

Anything included in this appendix should be specific to the equipment covered by S-Mode. Standardisation of frequently used icons, symbology, and workflows is aligned to the standardisation design principles. The following terminology and icons should be used as a standardised library for use in electronic navigation equipment.

[This Appendix is aimed at including …………]

- *Standardised terminology and symbology for and look ahead, anti grounding, guard zone, grounding alarm*
- *verify route, check route, scan route, validation*
- *XTE, XTD*
- *Over zoom, over scale*
- *SCAMIN, scale filter, conditionally displayed features*
- *Tools section of menu*
- *Fixing and line of position icons*
- *Tuning functions*
- *Brilliance and gain*
- *Mode change, or switch between systems*
- *Display orientation*
- *Range symbols, where the vary*
- *Cancel target tracking*
- *Predicted position and curved heading*
- *Different icons and symbols for the modes of INS equipment and or ECDIS, and changing between the different mandated functions of INS and ECDIS.*
- *When overlaying radar, or other additional layer to the chart.*
- *Import and export of data*
- *Icons to indicate systems status*
- *Different elements of the set up menu*

Through user feedback and testing, the following functions of electronic navigation equipment require further standardisation.:

- *Cross Track Distance (XTD)/ Cross Track Error (XTE) information (naming needs to be standardised, as does icon/ symbol)*
  - o *[Should be presented visually so that the mariner can recognise the limit of the cross track corridor, and its position relevant to the vessel. Distance should be measured from track to the vessel location and indicate where it is increasing or decreasing. XTD/ XTE should be measured in standard units.*

This is an area where vast variation exists between the way in which XTD information is displayed and interpreted. It is an area that requires further amendment and editing.

- o *Colour, shading, texture should be used to visually differentiate between safe/ pre-scanned water and un-scanned areas.*
- o *It should be easy to differentiate by alarm and warning for when the vessel is approaching limits of XTD]*

- *Function - Look ahead Function (may also be known as anti-grounding, guard zone, safety frame….)*
  - o *Name of this function needs to be standardised, as does the shape, icon, symbol for this function.*
  - o *This function should always be visually represented ahead and around the vessel shape to visually illustrate the area that it is scanning.*
  - o *It should be set from the same location/ menu and appear the same, including shape, colour, etc.*
  - o *The shape should indicate clearly if it is based on time, or distance*
  - o *The function should clearly indicate when it is not scanning ahead for dangers, such as when in RCDS mode*
  - o *Dangers should be highlighted within the scan cone/ shape and alarm to the user.*
  - o *Dangers should visually alert the user by enlargement, pulsing, colour, or a clear symbol.*
    (at present the look ahead does not have a defined shape, nor is it required to cover the stern of the vessel. It is a function of INS and ECDIS that varies significantly. Some systems do cover the whole vessel and its predicted position, but not all. There is no universal or standard convention)
- *Standard settings and information such as*
  - o *North and head up*
  - o *Rel and True Vectors*
  - o *Mode indicators*
  - o *Depth*
  - o *Heading, vs COG, vs CMG, and the order they appear in,*
  - o *Speed through water vs over ground*

Consistency through grouping of essential information

<mark>Some of the information contained in this annex could include:</mark>

This section includes the grouping, ordering and sequence of logical information between systems, equipment, and different manufacturers.

User feedback and testing can be used to build a section whereby grouping, order, scaling and display of essential information can deliver improved usability. This is closely aligned to is recognition, not recall.

Areas where logical and consistent grouping of information can be standardised across systems and equipment are listed below. These clusters of information promote recognition of information, and an instantaneous understanding of such information through recognition.

Some examples may include:

The way in which the route monitoring functions of ECDIS and INS displays track related information.

The order and means of which anti-collision information is presented, and the prioritisation of such information.

Waypoint monitoring information and display conventions. Order, location, display conventions, units are important in this area.

The way in which cross track distance, look ahead, anti-collision data is presented.

The order of ships dynamic information is presented.

Trackpilot countdown information when included in an INS.

How text and information appears on the screen.
- *Standard method for recognising what Mode the system is in. i.e. SAR, MOB, DR, EP, GNSS, manoeuvring?, coastal, pilotage?.*
- *The order and comparative size that essential information will appear on the screen,*
- *The size of information noting its importance and ease of recognition*
- *Position and sensor information*
- *The colour of information such as Red for port of track XTD to improved recognition*
- *What information is displayed?*
- *How integrity of sensor information is displayed (traffic light, accuracy scale, colour, and graphical information)*
- *How many decimal places are used for different measurements?*
- *The prioritisation of information such as*
  - *Distance to go (DTG),*
  - *Distance to Destination (DTD),*
  - *Distance to Waypoint or wheel over point,*
  - *Time information (for example zone and UT)*
- *How monitoring information on XTD warnings and alarms if fitted is displayed, where it is displayed and in what format.*
- *Critical vs informative warning and alarm information – this will require further exploration and developmental work through user testing.*
- *Method of setting essential safety related information such as*
  - *look ahead or anti grounding cone*
  - *UKC alarm*
  - *Draught, safety depth, UKC*
  - *Vectors (true and relative)*
- *The order in which anti- collision information appears and its location on the screen*
- *The ability and method of accessing anti- collision information easily and quickly*
  - *Determining the difference between AIS, Radar information and fusion of info.*

For Navigation control information that supports the safe control of the vessel, the information presented needs to be clear, concise, recognisable, useable, and enable safe decision making and movement of the ship:
- *How to discriminate between the information that is essential for the safe movement of the vessel such as:*
  - *Current and next leg information including info from the passage plan and that set by the user*
  - *The direction of turn indication*
  - *Colour co-ordination of information that supports safe navigation*
  - *Standard method for the display of information as in MSC 252(83) 7.5.2.1*
- *Standardised colour scheming for the improvement of recognition*
- *Standard display for integrity information*
- *Standardised means of identifying difference between Alarm, Warning and Caution.*
- *Standardised methods or display techniques for drawing attention*
- *Methods of acknowledgment in a standardised way*
- *Possible exploration of standardising and improving consequence analysis?*
- *Focus on essential information related to alert management*
- *Expand on consistency as described in the Para 21 of the INS Performance Standard (MSC 252(83))*

Standardisation of data and status information as prescribed in MSC 252(83) and will focus on the following areas:

- *The way in which mode and status data information is displayed and used such as text size, colour co-ordination, order of presentation etc.*
- *The standardisation of ships data including static and dynamic data*
- *Standardised display of measured motion data and set values*
- *Safety related information*
- *Standardisation of "Master Display" etc*

- *Cross Track Distance information should be presented visually so that the mariner can recognise the limit of the cross track corridor. It should use the same unit of measure and visually resembles a safe area through colour, texture,*

- *Look ahead should visually present the area that is being scanned by the system and illustrate the safety area. It should be set from the same location and appear the same, including shape, colour, etc*

- *Dangers should appear in the "look ahead' in the same manner. It should be easily recognised when it is set to distance ahead and time ahead.*

- *Look ahead should indicate when Scan is not possible for example 'flash' when in RCDS mode to indicate that it is not providing a scan ahead function.*

Standard and Default Settings

[a set of standardised setting, refined from user feedback and testing, that provide a default or expected standard setup and functionality for the user. This may include:

Some chart enabled features as a standard base settings
Orientation
Units for distance, speed, heading
Settings for look ahead functions, default track length etc
Default System Status
Safety settings- may be based on vessel max draft???
Colours and shading for dangers to navigation
Vector length, direction true or relative
Correlated information between RADAR, ECDIS, AIS, Chart?
CPA alarms- standard]

This list is an indication of relevant references used/ consulted/ reviewed in drafting this guideline. It is not exhaustive or defined. Please note further additional references and amendments as appropriate:

IMO references:

16.   MSC.1/Circ.1512 on SQA and HCD

17.   MSC. 232(82) Perf. Standard ECDIS as at 2006

18.   MSC 252(83) Perf. Standard INS

19.   MSC. 302(87) Perf. Standard Bridge Alert Management,

20.   MSC. 191(79) Perf. Standard Nav Related Information

21.   MSC.1-Circ.982 - Guidelines on ergonomic criteria for bridge equipment and layout

22.   MSC.1-Circ.1394-Rev.1 - Generic guidelines for developing IMO Goal-Based Standards (Secretariat)

23.   NCSR 3-28-1 - Development of guidance on the Standardized (or S) Mode of operation of navigation equipme... (Australia, et al (2))

24.   SN.1-Circ.265 - Guidelines On The Application of SOLAS Regulation V15 to INS, IBS and Bridge Design (Secretariat)

25.   SN.1/Circ.243 -   Presentation of navigational-related symbols, terms and abbreviations

ISO/ IEC Standards

26.   ISO 9241:110 – Dialogue Principles

27.   ISO 8468 – Bridge Layout and Equipment

28.   ISO 9241-210-2010 Ergonomics of HSI HCD for interactive systems

29.   ISO 20282 Part 1 Ease of operation of everyday

30.   ISO 20282 Part 3 Ease of Use of everyday products - Test Methods

31.   IEC 61174(ECDIS)

32.   IEC 61924(INS)

33.   IEC 62388(Radar)

34.   IEC 62288 (Maritime Nav and Rad equip)

35.   IEC 61174 Testing standard for type approval of ECDIS

36.   *IEC60945*

37.   *ISO/IEC 25010 System and software quality models (QIU model is included)*

38.   *ISO/IEC 25060 General framework for usability-related information*

39.   *ISO/IEC 25062 Common industry format (CIF) for usability test reports*

40.   *ISO/IEC 25063 User needs report*

41.   *ISO/IEC 25064 Context of use description*