Bundesrepublik Deutschland
Federal Republic of Germany

Bundesamt für Seeschifffahrt und Hydrographie
Federal Maritime and Hydrographic Agency

BUNDESAMT FÜR SEESCHIFFFAHRT UND HYDROGRAPHIE

Conformance test report of an

AIS Display

Equipment under test: **Seatex**

Type: **AIS300**

Applying test standards: IEC 62288 Ed.2 [Sections 4, 7]: 2014

Test Report No.: BSH/4543/001/4322719/15-3

Applicant: Kongsberg Seatex AS
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Hamburg, 23 April 2015
For theFederal Maritime and Hydrographic Agency

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DAkkS Deutsche Akkreditierungsstelle D-PL-12084-01-01

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Akkreditierung

Die Deutsche Akkreditierungsstelle GmbH bestätigt hiermit, dass das Prüflaboratorium

Bundesamt für Seeschifffahrt und Hydrographie
Bundesoberbehörde im Geschäftsbereich
des BMVBS
Bernhard-Nocht-Straße 78
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die Kompetenz nach DIN EN ISO/IEC 17025:2005 besitzt, Prüfungen in folgenden Bereichen durchzuführen:

Schiffsausrüstung (Navigationsausrüstung, Funkausrüstung, Rettungsmittel)

Die Akkreditierungsurkunde gilt nur in Verbindung mit dem Bescheid vom 08.03.2013 mit der Akkreditierungsnummer D-PL-12084-01 und ist gültig bis 07.03.2018. Sie besteht aus diesem Deckblatt, der Rückseite des Deckblatts und der folgenden Anlage mit insgesamt 9 Seiten.

Registrierungsnummer der Urkunde: **D-PL-12084-01-01**

Frankfurt am Main, 08.03.2013

Im Auftrag Dipl.-Ing. (FH) Ralf Egner
Leiter Abteilung 2

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1 General

1.1 Summary

Start of test: 11 February 2015

End of test: 12 March 2015

Test standards[1]: IEC 62288 Ed. 2.0 2014-07

[1] Numbers listed in the titles of the test sections of this report refer to the respective sections of IEC 62288 if not stated otherwise.

Test No.	Reference	Section	Result (N/T / not N/T / not applicable / not tested)
2.2.1	(4.2.2)	GENERAL REQUIREMENTS	not applicable
	4	GENERAL REQUIREMENTS FOR ALL DISPLAYS ON THE BRIDGE OF A SHIP	
	4.3	ARRANGEMENT OF INFORMATION	
2.3.1	(4.3.1)	CONSISTENCY OF LAYOUT	Passed
2.3.2	(4.3.2)	CONSISTENT PRESENTATION OF INFORMATION	Passed
2.3.3	(4.3.3)	SEPARATION OF OPERATIONAL DISPLAY AREA	Passed
	4.4	READABILITY	
2.4.1	(4.4.1)	READABILITY UNDER ALL AMBIENT LIGHT CONDITIONS	Passed
2.4.2	(4.4.2)	LEGIBILITY OF ALPHANUMERIC DATA AND TEXT	Passed
2.4.3	(4.4.3)	PRESENTATION OF TEXT	Passed
2.4.4	(4.4.4)	ICONS	Passed
	4.5	COLOURS AND INTENSITY	
2.5	(4.5)	DISCRIMINATION OF COLOURS	not applicable
	4.6	SYMBOLS	
2.6.1	(4.6.1)	OPERATIONAL INFORMATION	Passed
2.6.2	(4.6.2)	ELECTRONIC CHART INFORMATION	not applicable
	4.7	COLOR CODING OF INFORMATION	
2.7.1	(4.7.1)	COLOUR CODING FOR DISCRIMINATION	not applicable
2.7.2	(4.7.2)	COLOUR CODING OF INFORMATION	not applicable
2.7.3	(4.7.3)	COLOUR CODING IN COMBINATION WITH OTHER ATTRIBUTES	not applicable
2.7.4	(4.7.4)	FLASHING OF INFORMATION	Passed
	4.8	INTEGRITY MARKING	
2.8.1	(4.8.1)	INDICATION OF SOURCE, VALIDITY AND INTEGRITY STATUS	Passed
2.8.2	(4.8.2)	COLOUR CODING OF VALIDITY AND INTEGRITY	not applicable
2.8.3	(4.8.3)	INDICATION OF PRESENTATION FAILURE	Passed
	4.9	ALERTS AND INDICATIONS	
2.9.1	(4.9.1)	OPERATIONAL STATUS	Passed
2.9.2	(4.9.2)	LIST OF ALERTS	Passed
2.9.3	(4.9.3)	ALERT RELATED INFORMATION FROM MULTIPLE SOURCES	not applicable
	4.9.4	SPEECH OUTPUT FOR ALARMS AND WARNINGS	not applicable
	4.10	PRESENTATION MODE	
2.10	(4.10)	PRESENTATION MODE	not applicable
	4.11	USER MANUALS, INSTRUCTIONS AND REFERENCE GUIDES	
2.11	(4.11)	USER MANUALS, INSTRUCTIONS AND REFERENCE GUIDES	Passed
	7	PHYSICAL REQUIREMENTS	
3.2.1	(7.2.1)	CONTRAST AND BRIGHTNESS	Passed
3.2.2	(7.2.2)	MAGNETIC INTERFERENCE	not applicable
3.2.3	(7.2.3)	TEMPORAL STABILITY	Passed
3.2.4	(7.2.4)	PHYSICAL CONTROLS AND STATUS INDICATORS	Passed
3.3	(7.3)	SCREEN SIZE	not applicable
3.4	(7.4)	MULTICOLOURED DISPLAY EQUIPMENT	not applicable
3.5	(7.5)	SCREEN RESOLUTION	not applicable
3.6	(7.6)	SCREEN VIEWING ANGLE	Passed

1.2 Equipment history

Transponder Unit No.2				
Type	AIS300	Part number	A300-01	
Delivery date	2014-04-29	Serial number	AIS300-141001	
HW Version:	Delivery date	2014-04-29	Version no.	
	Installation date	2014-04-29		
SW Version:	Delivery date	2015-02-11	Version no.	1.00.01.b36
	Installation date	2015-02-11		
SW Version:	Delivery date	2015-02-23	Version no.	1.00.01.b38
	Installation date	2015-02-23		
SW Version:	Delivery date	2015-02-27	Version no.	1.00.01.b39
	Installation date	2015-03-04		
SW Version:	Delivery date	2015-03-09	Version no.	1.00.01.b43
	Installation date	2015-03-09		
SW Version:	Delivery date		Version no.	
	Installation date			

MKD Unit No.2				
Type	Data response		Part no.	---
Delivery date	2014-10-09		Serial no.	PW1450018957
HW Version:	Delivery date	2014-10-09	Version no.	Rev 1.1
	Installation date	2014-10-09		
	Installation date	2014-01-19		
SW Version:	Delivery date	2015-01-19	Version no.	1.00.01b5
	Installation date	2015-01-19		
SW Version:	Delivery date	2015-01-23	Version no.	1.00.00b6
	Installation date	2015-01-23		
SW Version:	Delivery date	2015-03-02	Version no.	1.00.00b7
	Installation date	2015-03-04		
SW Version:	Delivery date	2015-03-05	Version no.	1.00.00b8
	Installation date	2015-03-09		
SW Version:	Delivery date		Version no.	
	Installation date			

1.3 Test environment

1.3.1 Test environment 1 – AIS lab

Here it is intended to record for which time which EUT system is under test.
This test environment is completely equipped as described in Annex A.

Room	BSH Room 916 (9th floor)
Test engineer	Heinrich Bartels
Location	9° 59,103 E 53° 32,822 N

Equipment no	Start of test	End of test	Test engineer
2	2015-02-12	2015-02-12	Heinrich Bartels, Lena Müller
2	2015-02-24	2015-02-26	Lena Müller
2, Manual	2015-03-10	2015-03-10	Heinrich Bartels

1.3.2 Test environment 2 – Light measurement lab

Here it is intended to record for which time which EUT system is under test.
This test environment is completely equipped as described in Annex A.

Room	BSH, Room 720 (7th floor)
Test engineer	Heinrich Bartels
Location	9° 59,103 E 53° 32,822 N

Equipment no	Start of test	End of test	Test engineer
2	2015-02-11	2015-02-11	Heinrich Bartels, Lena Müller
2	2015-02-26	2015-02-26	Heinrich Bartels, Lena Müller
2	2015-03-12	2015-03-12	Heinrich Bartels

1.4 Legend

Result marking (in the "result" column)[2]:

Passed	Item is ok, test was successful
Not passed	Test of a required item was not successful, change required
N/T	Not tested
N/A	Not applicable

Specific remarks (in the "remark" column, marked "***bold italic***":)

REC	Recommendation (in terms of IEC17025 "opinion"): an improvement or change is recommended
Note	Note or comment (in terms of IEC17025 "interpretation"): rationale for specific results or interpretation of requirements as appropriate

Template for additional test notes (copy if required):

Date	Sign	Result	Status

1.5 General observations

General observations not specific to any test item of the test standard are listed here.

	General problems		
Date	Item	Remark	Result

[2] Test items maybe colour marked in draft versions of the report as follows:

Passed	no colour marking
Not passed	yellow
N/T	blue
N/A	no colour marking
REC	green

2 (4) General requirements for all displays on the bridge of a ship

2.1 (4.1) Relationship to IMO standards

2.2 (4.2) Application of IEC 60945

2.2.1 (4.2.1) Remark

2.2.2 (4.2.2) General requirements

Requirement*:* (MSC191/3) *In addition to the general requirements set forth in* IMO *Resolution A.694(17)* and further specified in IEC 60945, *display equipment* shall *meet the requirements* set forth in IMO Resolution MSC.191(79) and further specified in this standard*, as applicable.*

Date **2015-02-12**	**Tester** **Mu**	**Test details**		
Test item		Check	Remark	Result
4.2.2.2		See Annex D for guidance in the application of IEC 60945 for testing.	No specific test, covered by IEC 60945	N/A

2.3 (4.3) Arrangement of information

2.3.1 (4.3.1) Consistency of layout

Requirement: (MSC191/5.1.1) *The presentation of information* shall *be consistent* within the user interface *with respect to screen layout and arrangement of information*, for example, with respect to concepts, terminology, labelling and interaction paradigms used across the application and from screen to screen and/or from page to page, as appropriate, and as far as practical*. Data and control functions* shall *be logically grouped* according to their function or the task-at-hand*. Priority information* essential to the task-at-hand shall *be identified for each application* (for example, radar, ECDIS, etc.)*, permanently* or persistently *displayed*, as appropriate for the application, *and presented to the user in a prominent manner by, for example, use of position* (for example, screen location), *size and colour.*

Date 2015-02-12	**Tester** Mu	**Test details**		
Test item		Check	Remark	Result
4.3.1.2		The methods of test and the required results are as follows:		
a)		confirm by analytical evaluation that the arrangement, operation and identification of controls, screen displays and indications are in accordance with Annex E and IEC 60945:2002, 4.2.1.2 through 4.2.1.5;	The symbol for display brilliance is not completely identical with Annex E. The circle around it is missing. Retest 2015-02-24 Mu The symbol includes the circle	Passed
b)		confirm by analytical evaluation that the concepts, terminology, labelling and interaction paradigms, screen layout and arrangement of information is consistent from screen to screen and/or page to page;		Passed
c)		confirm by analytical evaluation that priority information essential to the task-at-hand is identified and permanently or persistently dis-played in a prominent manner, as appropriate, for each application.		Passed

2.3.2 (4.3.2) Consistent presentation of information

Requirement: (MSC191/5.1.2) *The presentation of information* shall *be consistent with respect to:*

- numerical *values* (for example, position, speed, distance, time, etc.)*;*
- *units;*
- *meaning* of information (for example, using the terms and abbreviations in Annex B)*;*
- *sources* of information (for example, using the terms and abbreviations in Annex B)*;*
- *validity* of information (see also 4.7.1 and 4.7.2)*; and*
- *integrity* of information, if available (see also 4.7.1 and 4.7.2).

(See also IEC 60945, 4.2.1.5)

Date 2015-02-12	**Tester** Mu	**Test details**		
Test item		Check	Remark	Result
4.3.2.2		Confirm by observation that numerical values and their units, the meaning and source(s) of information, and the validity and integrity of information are presented in a consistent manner.	The units for the input of Vessel dimension/ reference and draught are missing We recommend to add the units to the headline (e.g. “Dim A (m)” instead of “Dim A”). Retest 2015-02-24 Mu All units are enclosed.	Passed

2.3.3 (4.3.3) Separation of operational display area

Requirement: (MSC191/5.1.3) *The presentation of information* shall *be clearly separated into* one or more *operational display areas (for example radar, chart) and one or more user dialogue areas (for example*, *menus, data, control functions).*

Date 2015-02-12	**Tester** Mu	**Test details**		
Test item		Check	Remark	Result
4.3.3.2		Confirm by observation that the presentation is clearly separated into one or more operational display areas and one or more user dialogue areas.		Passed

2.4 (4.4) Readability

2.4.1 (4.4.1) Readability under all ambient light conditions

Requirement: (MSC191/5.2.1) The presentation of alphanumeric data, text, symbols and other graphical *information (*for example*,* chart information, radar echoes or a *radar* video *image*, etc.) shall *support readability from typical user positions* (i.e. with respect to reading distance) *under all ambient light conditions likely to be experienced on the bridge of a ship* (for example, day, dusk and night)*, and with due consideration to the night vision of the officer of the watch.* (See also 4.5.1, and 7.2.1)

Table 1 characterizes light levels for the ambient light conditions day, dusk and night:

Table 1 – Ambient light conditions

Ambient condition	Light level
Day	200 cd/m^2 ± 50 %
Dusk	10 cd/m^2 ± 50 %
Night	Darkness (i.e. where the display is the predominant light source)
NOTE Natural Daylight is preferred for the day and dusk conditions	

NOTE 1 The "Day" colour table provided in the IHO ECDIS Presentation Library Ed. 3.3 uses a white background that may not support readability under all light conditions and may be a risk to safety of navigation for some navigational systems and equipment, including radar. Readability may be achieved by using the black background in the "Dusk" or "Night" colour tables provided in the IHO ECDIS Presentation Library and adjusting brightness and contrast, if provided, for use under all light conditions.

Display equipment shall provide a luminance of at least 85 cd/m² measured at the centre of the display when set to the maximum brightness setting. The white luminance level of the display shall be adjustable down to 1 cd/m² ±20% and may be extinguishable below that point.

If provided, dimming below 0,8 cd/m² as white level shall continue to ensure readability of alerts (alarms, warnings and cautions) while readability of all other items is not required.

Note 2 General requirements for illumination are described in IEC 60945

Transflective and reflective displays shall provide adjustable self illumination suitable for all ambient light conditions likely to be experienced on the bridge of a ship (day, dusk and night) and with due consideration to the night vision of the officer of the watch. It shall be adjutable to produce display luminance at least from 1 cd/m² to 5 cd/m² under night conditions.

The luminance across the operational display area shall not have a variance of more than 30 % from the brightest point to the dimmest point.

NOTE 3 Variance is determined by the equation: 1- (Lmin/Lmax) where Lmin is the minimum luminance and Lmax is the maximum luminance measured across the operational display area, or the entire screen depending upon the application.

It shall be possible to display alphanumeric data, text, symbols (see 4.6) and other graphical information using a lighter foreground (for instance character, symbol, etc.) against a dark background of high contrast, emitting as little light as possible at night. The brightest elements of the presentation shall be restricted to points and thin lines.

If display equipment is intended to present symbols for charted information (see 4.65.2), it shall provide a means or method for the user to verify that the colour black is visually distinguishable against a background set to dark grey and vice-versa.

NOTE 4 The IHO ECDIS Presentation Library provides "black-adjust" symbols BKAJ1 and BKAJ2, for the colours black and grey, respectively.

If display equipment is not intended to present symbols for chared information (see 4.6.2), it shall maintain that any colours used are visually distinguishable against the background.

Note 4 Visually distinguishable is at least luminance ratio 1:2 when using instrumental verification.

It is important to avoid affecting the night vision of the officer of the watch by excessive glow from displays on the bridge at night. The display shall be capable of providing a contrast of 100:1 between the 1 cd/m² white level and the black background.

Date **2015-02-12**	**Tester** **Mu**	**Test details**		
Test item		Check	Remark	Result
4.4.1.2		Set up the display equipment for measurements of luminance, contrast and colour according to the guidelines of IEC 61966-4 or the VESA Flat Panel Display Measurement (FPDM), see VESA-2001-6) standard. Before measurements are taken, power up the display equipment and allow it to stabilize for the period of time specified by the manufacturer, as follows		
a)		Confirm by observation at the manufacturer's recommended viewing distance that alphanumeric data, text, symbols and other graphical information including alerts are readable from expected user positions and under the ambient light conditions described in Table 1.		Passed
b)		For direct view displays (for example CRT (cathode ray tube), LCD (liquid crystal display) with backlight etc.) confirm by measurement using a test image with a white square at the centre of the operational display area (to be provided by the manufacturer) that the brightness can be varied from a minimum level of at most 1 cd/m² to a maximum level of at least 85 cd/m² measured under dark condition. Confirm by measurement that the values for brightness used for the setup are stable after the stabilisation period defined by the manufacturer Confirm by measurement in the night ambient condition that the contrast ratio between the 1 cd/m² white level and the black background is 100:1, minimum..	Minimum level: <1cd/m² Maximum level: 790cd/m² <u>Retest 2015-02-26 Mu</u> Minimum level: 4 cd/m² We think that the minimum level has been increased to fulfill test item 6.2.3d of IEC 60945 (reading intensity of alarms). Please ensure that the Minimum level can be adjusted down to 1 cd/m². See Note1) <u>Retest 2015-03-12 Ba:</u> The brightness can be adjusted down to < 1 cd/m² if no alarm is active	Passed Passed

c)	For transflective and reflective displays, confirm by measurement using a test image with a white square at the centre of the operational display area (to be provided by the manufacturer) that the brightness can be adjustable at least from 1 cd/m² to 5 cd/m² under conditions of night ambient illumination to a maximum level of at least 85 cd/m² under conditions of daylight ambient illumination. Confirm by measurement that the values for brightness used for the setup are stable after the stabilisation period defined by the manufacturer. Confirm by measurement in the night ambient condition that the contrast ratio between the 1 cd/m² white level and the black background is 100:1, minimum. The ambient illumination levels shall be as specified in Table 1.	Contrast ratio in the night ambient condition: 575	Passed
NOTE This test image should not be generated internally by the display equipment.			
d)	Confirm by observation that alphanumeric data, text, symbols and other graphical information can be presented using a lighter foreground against a dark background.		Passed
e)	Confirm by measurement that when the display equipment is set to maximum brightness, the luminance does not vary across the operational display area by more than 30 % from the brightest point to the dimmest point.	Variance: 17%	Passed
f)	Confirm by observation that the brightest elements of the presentation in the night ambient light condition described in Table 1 are points and thin lines.		Passed
g)	Where display equipment is intended to present symbols for charted information confirm by observation for each ambient light condition that the user can verify that the colour black is visually distinguishable against a background set to dark grey, and vice-versa.	No chart display	N/A
h)	Where display equipment is not intended to present symbols for charted information confirm by observation for each ambient light condition that any colours used are visually distinguishable against background.	No chart display	N/A

i)	If dimming below 0,8 cd/m² as white level is provided then confirm by observation after 10 min adaptation period to night ambient light condition by the observer that at least the alerts (alarms, warnings, cautions) are readable and different alert levels are distinguishable from each other.	Test 2015-03-12 Ba: The screen can be dimmed down to 4 cd/m² if there are active alerts. So the readability is ensured.	Passed

Note 1)
The manually settable minimum value of brightness has to be < 1cd/m². The minimum level should not be significantly below < 0,8 cd/m to ensure a minimum readability (see also item i).

In order to fulfill the requirements of test item 6.2.3d of IEC 60945 we recommend to increase the brightness when an alert is activated to a value which ensures readability of the alert indication (e.g. 4cd/m²).

2.4.2 (4.4.2) Legibility of alphanumeric data and text

Requirement: (MSC191/5.2.2) *Alphanumeric data and text* shall *be presented using a clearly legible nonitalic, sans-serif font*. *The font size* shall *be appropriate for the viewing distance from user positions* (i.e. with respect to reading distance and viewing angles) *likely to be experienced on the bridge of a ship.*

The character height in millimetres shall be not less than 3,5 times the nominal viewing distance in metres. The manufacturer's documentation shall identify the nominal viewing distance for the display equipment.

Date **2015-02-12**	**Tester** **Mu**	**Test details**		
Test item		Check	Remark	Result
4.4.2.2		The methods of test and the required results are as follows:		
a)		confirm by observation that alpha-numeric data and text is presented using non-italic, sans-serif font;	The MKD uses a serif font Retest 2015-02-24 Mu The MKD uses a sans serif font	Passed
b)		confirm by measurement that the character height (i.e. the distance between the top and bottom edges of the smallest capital letter used in the presentation) in millimetres is not less than 3,5 times the nominal viewing distance in metres.	The mostly used character height is 3 mm, according to a viewing distance of 0,86 m. The character height of the headline of the target list is 2.5 mm according to a viewing distance of 0.7 m	Passed

2.4.3 (4.4.3) Presentation of text

Requirement: (MSC191/5.2.3) *Text* shall *be presented using simple unambiguous language that is easy to understand* (for example, standard marine terminology or text that provides clear meaning by its context)*. Navigational terms and abbreviations* shall *be presented using the nomenclature* set forth *in* Annex B.

Date 2015-02-12	**Tester** Mu	**Test details**		
Test item		Check	Remark	Result
4.4.3.2		The methods of test and the required results are as follows:		
a)		confirm by analytical evaluation that text is presented using simple unambiguous language;		Passed
b)		confirm by observation that navigational terms and abbreviations are presented using the nomenclature in Annex B.	There are several terms, not using the nomenclature in Annex B. Correct terms would be: LON, LAT; MMSI, True HDG, IMO Retest 2015-02-24 Mu Most terms are changed correctly. On the IWW screen “Start Lon” and “End Lon” are used instead of “Start LON” and “End LON”. The same is valit for Lat. This is acceptable because it is in the IWW part and is used in a combined expression. We recommend to change this.(LON; LAT) Retest 2015-03-10 Ba: Has been changed to LAT and LON	Passed Passed
c)		Confirm by inspection of documented evidence that another terminology or abbreviation, if used, are explained in the operator’s manual.		Passed

2.4.4 (4.4.4) Icons

Requirement: (MSC191/5.2.4) *When icons are used, their purpose* shall *be intuitively recognized by appearance, placement*, *and grouping*. (See also ISO 80416-4).

Icons used for data and control functions shall be presented according to Annex E. Icons used for the presentation of alerts shall be presented according to Annex F.

Date **2015-02-12**	**Tester** **Mu**	**Test details**		
Test item		Check	Remark	Result
4.4.4.2		The methods of test and the required results are as follows:		
a)		confirm by analytical evaluation that icons and their purpose can be intuitively recognized by appearance, place-ment, and grouping;	The alert symbol is very small	Passed
b)		confirm by observation that icons used for data and control function are presented according to Annex E.		Passed
c)		Confirm by observation that icons used for the presentation of alerts are presented according to Annex F (see also 5.6.1.2).	The icon used to indicate alerts does not comply with the symbols defined in Annex F. The following Icons are applicable: ▪ Icon 1 for unacknowledged alarms ▪ Icon 3 for acknowledged alarms, see Annex F Retest 2015-02-24 Mu Icons are correct	Passed

2.5 (4.5) Colours and intensity

2.5.1 4.5.1 Discrimination of colors - Requirement

(MSC191/5.3.1) *The colours used for the presentation of alphanumeric data, text, symbols and other graphical information* shall *provide sufficient contrast* for discrimination and identification *against the background under all* ambient *light conditions likely to be experienced on the bridge of a ship* (for example, day, dusk and night) and with due consideration to the night vision of the officer of the watch.

(MSC191/5.3.2) *The colours and brightness* shall *take into account the* ambient *light conditions of day, dusk and night. The presentation* shall *support night viewing by showing lighter foreground information on a dark non-reflecting background.*

(MSC191/5.3.3) *The background colour and contrast* shall *be chosen to allow* displayed *information to be easily discriminated without degrading the colour coding aspects of the presentation.*

Display equipment may use a range of tones of basic colours, provided they are identifiable and visually distinguishable from each other. Colours used for the presentation of information in the user dialogue areas shall not detract from the presentation of information in the operational display area.

If display equipment is intended to present symbols for charted information, it shall use colours that comply with or are based upon the colours recommended for the IHO ECDIS Presentation Library in IHO S-52 and its Appendices, or an equivalent set of colour tables, as far as practical.

NOTE The “Day” colour table provided in the IHO ECDIS Presentation Library uses a white background that may not support readability under all light conditions and may be a risk to safety of navigation for some navigational systems and equipment, including radar. Readability may be achieved by using the black background in the “Dusk” or “Night” colour tables provided in the IHO ECDIS Presentation Library Ed. 3.3, or the “Day Black Background” colour table provided in the IHO ECDIS Presentation Library and adjusting brightness and contrast, if provided, for use under all light conditions.

Date **2015-02-12**	**Tester** **Mu**	**Test details**		
Test item		Check	Remark	Result
4.5.1.2		The person conducting this test shall have passed the minimum colour vision and acuity tests required for users by IMO STCW Code Part B Table B and have adapted to night viewing for 10 min before checking the night display.		
a)		Confirm by observation that the colours used for the presentation of alphanumeric data, text, symbols and other graphical information provide sufficient contrast for identification and discrimination against the background under the ambient light conditions described in Table 1.	No chart display	N/A

b)	Confirm by observation that the colours used for the presentation of alphanumeric data, text, symbols and other graphical information support night viewing by showing lighter foreground information on a dark non-reflecting background.		N/A
c)	Confirm by observation that the colours used for the presentation of alphanumeric data, text, symbols and other graphical information are identifiable and visually distinguishable from each other.		N/A
d)	Confirm by observation that the colours used in the user dialogue areas do not detract from the presentation of information in the operational display area.		N/A
e)	Where display equipment is intended to present symbols for charted information, confirm by analytical evaluation that the colours used conform to the IHO specified colours in the IHO ECDIS Presentation Library, or equivalent, as far as practical (see Clause G.1 for additional guidance).		N/A

2.6 (4.6) Symbols

2.6.1 (4.6.1) Operational information

Requirement: (MSC191/5.4.1) *Symbols used for the presentation of operational information* other than chart information shall comply with or be based upon the symbols set forth *in* Annex A.

(SN-Circ.243/1/3) *Where a standard symbol is not available, another symbol may be used, but this symbol shall not conflict with the symbols listed in* Annex A or in the ECDIS presentation library. (For additional guidance, see also ISO 80416-4.)

Colours used for the presentation of operational information shall be discriminated from the colours used for the presentation of the radar image, target trails, additional processed radar information and electronic chart information.

A symbol shall subtend at least 5 mm/m (17 min of arc) at the nominal viewing distance. Where accurate colour identification of a symbol is required, the symbol shall subtend at least 8,7 mm/m (30 min of arc) at the nominal viewing distance. The use of spectrally extreme blue ($v' < 0,2$) shall be avoided for images subtending less than 35 mm/m (2° of arc) of viewing distance.

Date **2015-02-12**	**Tester** **Mu**	**Test details**		
Test item		Check	Remark	Result
4.6.1.2		The methods of test and the required results are as follows:		
a)		confirm by inspection of documented evidence that the symbols used to present operational information are presented in accordance with Annex A;		Passed
b)		confirm by measurement that the largest dimension of the symbol is at least 5 mm/m (17 min of arc) at the nominal viewing distance, and includes at least 16 pixels.	Symbol size is 5mm, what is according to 1m view distance	Passed
c)		where accurate colour identification is required for a symbol, confirm by measurement that the largest dimension of the symbol is at least 8,7 mm/m (30 min of arc) at the nominal viewing distance, and includes at least 29 pixels.	Accurate colour identification is not required for AIS	N/A

2.6.2 (4.6.2) Electronic chart information

Requirement: (MSC191/5.4.2) *Symbols used for the* presentation *of* vector format electronic *chart information* shall *comply with* or be based upon the symbols recommended for the IHO ECDIS Presentation Library in IHO S-52 and its Appendices, or an equivalent symbol set, as far as practical.

NOTE Some symbols provided in the IHO ECDIS Presentation Library may not be suitable for the display of electronic chart information on radar or in a composite presentation based upon radar. IHO S-52 and its Appendices allow minor deviations to symbology. It provides a framework and guidelines for chart symbolization from which manufacturers can derive a customized symbol set.

If symbols that deviate from the IHO ECDIS Presentation Library are used for the presentation of any chart information, then they shall:

- be legible;
- be certain and unambiguous in their meaning;
- be of sufficient size to support the nominal viewing distance (see also 4.4.2);
- have the same general shape as Presentation Library symbols used for the same or similar purpose(s).

Symbols added to the ECDIS Presentation Library shall not be confused with IHO ECDIS Presentation Library symbols.

Date 2015-02-12	**Tester** Mu	**Test details**		
Test item		Check	Remark	Result
4.6.2.2		The methods of test and the required results are as follows:		
a)		confirm by inspection of documented evidence that the symbols used to present chart information are presented in accordance with IHO S-52 and its Appendices;	No chart display	N/A

b)	where symbols deviate from the IHO ECDIS Presentation Library, confirm by observation that they:		
	1) are legible;		N/A
	2) are certain and unambiguous in their meaning;		N/A
	3) are of sufficient size to support the nominal viewing distance;		N/A
	4) have the same general shape as IHO ECDIS Presentation Library symbols used for the same or similar purposes;		N/A
c)	confirm by observation that symbols added to the ECDIS Presentation Library cannot be confused with IHO ECDIS Presentation Library symbols.		N/A

2.7 (4.7) Colour coding of information

2.7.1 (4.7.1) Colour coding for discrimination

Requirement: (MSC191/5.5.1) If *colour coding is used for discrimination or conspicuousness of alphanumeric text, symbols and other graphical information all colours in* each colour table shall *clearly differ from one another* (see also 4.5.1).

Date **2015-02-12**	**Tester** **Mu**	**Test details**		
Test item		Check	Remark	Result
4.7.1.2		Confirm by observation that the colours within each colour table clearly differ from one another.	Colour coding is not used	N/A

2.7.2 (4.7.2) Colour coding of information

Requirement: (MSC191/5.5.2) If *colour coding is used,* then *the colour red* shall *be used for* the *coding of alert related information for alarm and emergency alarm conditions unless otherwise specified by the IMO (for example in tables 7.1.1 and 7.1.2 of the IMO A.1021(26) Code on Alerts and Indications).*

Date 2015-02-12	**Tester** Mu	**Test details**		
Test item		Check	Remark	Result
4.7.2.2		Confirm by inspection of documented evidence that the colour red is used to indicate an alarm or emergency alarm condition unless otherwise specified by the IMO..	Colour coding is not used	N/A

2.7.3 (4.7.3) Colour coding in combination with other attributes

Requirement: (MSC191/5.5.3). If *colour coding is used it* shall *be used in combination with other symbol attributes, such as size, shape and orientation.*

A specific implementation shall not rely solely on a single saturated colour. If the display equipment technology relies on the separate transmission of primary colours, the presentation of alarms shall be visible and identifiable even after the failure of any one primary colour input to the display.

Date 2015-02-12	**Tester** Mu	**Test details**		
Test item		Check	Remark	Result
4.7.3.2		The methods of test and the required results are as follows:		
a)		confirm by inspection of documented evidence that the colour coding is always combined with another symbol attribute;	Colour coding is not used	N/A
b)		where the display equipment technology relies on the separate transmission of primary colours, confirm by observation that alarms remain identifiable even after transmission of the red primary colour is disabled.	Colour coding is not used	N/A

2.7.4 (4.7.4) Flashing of information

Requirement: (MSC191/5.5.4) *Flashing of information* shall *be reserved for unacknowledged alarms.*

Date 2015-02-12	**Tester** Mu	**Test details**		
Test item		Check	Remark	Result
4.7.4.2		Confirm by observation that flashing of information is only used for unacknowledged alarms.	Flashing is not used	Passed

2.8 (4.8) Integrity marking

2.8.1 (4.8.1) Indication of source, validity and integrity status

Requirement: (MSC191/5.6.1) *The source, validity, and where possible, the integrity of information* shall *be indicated* (see important indication*). Invalid information or information with low integrity* shall *be clearly marked qualitatively and/or quantitatively*. *Invalid information or information with low integrity may be quantitatively indicated by displaying absolute or percentage values*.

Date 2015-02-12	**Tester** Mu	**Test details**		
Test item		Check	Remark	Result
4.8.1.2		The methods of test and the required results are as follows:		
a)		confirm by observation that the source of information can be indicated;	The source of information is indicated on the sensor status page	Passed
b)		confirm by observation that the validity of information is indicated;		Passed
c)		confirm by observation that the integrity of information is indicated, where available. Where integrity is indicated quantitatively, confirm by observation that either absolute values or percentage values are displayed.		Passed

2.8.2 (4.8.2) Colour coding of validity and integrity

Requirement: (MSC191/5.6.2) If *colour coding is used,* then *information with low* or doubtful *integrity* shall *be qualitatively marked by using* the colour *as defined in Table 2,, and invalid information* shall *be qualitatively marked by using* the colour *as defined in Table 2..*

Date 2015-02-12	**Tester** Mu	**Test details**		
Test item		Check	Remark	Result
4.8.2.2		If colour coding is used, the methods of test and the required results are as follows:		
a)		confirm by observation that the colour as defined in Table 2 is used to indicate information with low or doubtful integrity;	Colour coding is not used	N/A
b)		confirm by observation that the colour as defined in Table 2 is used to indicate invalid information.	Colour coding is not used	N/A

2.8.3 (4.8.3) Indication of presentation failure

Requirement: (MSC191/5.6.3) In many cases, information on the display does not change frequently enough to make presentation failure immediately obvious to the user. *In order to show that the screen is being refreshed,* a *means* or method shall *be provided to immediately make the user aware of a presentation failure on an operational display (*for example*, "picture freeze").*

A conspicuous periodically time varying element shall be provided as a prominent indication of normal screen refresh (for example, dynamic display of time, two alternating dots, etc.).

Date 2015-02-12	**Tester** Mu	**Test details**		
Test item		Check	Remark	Result
4.8.3.2		Confirm by observation that a conspicuous periodically time-varying indication is provided in all presentation modes.	Displaying the UTC including seconds provides a time-variation every second.	Passed

2.9 (4.9) Alerts and indications

2.9.1 (4.9.1) Operational status

Requirement: (MSC191/5.7.1) *The operational status of information* shall *be indicated as* in Table 2 unless otherwise specified by the IMO (for example in tables 7.1.1 and 7.1.2 of the Code on Alerts and Indications, 2009):

MSC 302/7.6.2) *An unacknowledged warning shall be:*

1) repeated as a warning after a limited time period not exceeding 5 min; or
2) changed to alarm priority after a limited time period not exceeding 5 min; or
3) changed to alarm priority after a user selectable time not more than 5 min, if provided; or
4) *changed to alarm priority, as required by specific requirements for the individual equipment and system.*

Table 2 – Operational status

Status	***Visual Indication***	***Audible Signal***
Emergency alarm	As specified in Table 7.1.1 of the Code on Alerts and Indications 2009 (IMO resolution A.1021(26))	As specified in Table 7.1.1 and 7.2 of the Code on Alerts and Indications 2009 (IMO resolution A.1021(26))
Alarm, not acknowledged	Red, Flashing	Accompanied by an audible signal, as 3 short audible signals repeated every 7s to 10 s
Alarm, silenced	Red, Flashing	Silent
Alarm, acknowledged	Red	Suppression of audible signal (= silent
Invalid Information	Yellowish orange	Silent
Information with low integrity	Yellow	Silent
Warnings, not acknowledged	Yellowish orange, Flashing	Accompanied by an autible signal, as 2 short autible signals, to be repeated at least once per 5 min or be replaced by an alarm
Warnings, silenced	Yellowish orange, Flashing	Silent
Warnings, acknowledged	Yellowish orange	Silent
Caution	Yellow	Silent
Important Indications	Yellow	Silent
Indication	No special requirement	Silent
Normal State	Optionally Green	Silent

Note Code on Alerts and Indications 2009 (IMO resolution A.1021(26)) specifies frequency range (in 5.11) and sound pressure level (in 5.13) for audible signal.

Date 2015-02-12	**Tester** Mu	**Test details**		
Test item		Check	Remark	Result
4.9.1.2		Confirm by inspection of documented evidence that alerts and indications are presented in accordance with Table 2.	The different allerts and indications according to Table 2 are currently not yet implemented in AIS	N/A

2.9.2 (4.9.2) List of alerts

Requirement: (MSC191/5.7.2) *A list of alarms* shall *be provided based on the sequence of occurrence. Additional indication of priority, as set by the user,* shall *be provided on displays* that present *alarms from multiple sources. Alarms that have been acknowledged and are no longer relevant* shall *be deleted from the list of alarms, but may be retained in an alarm history list.*

Date 2015-02-12	**Tester** Mu	**Test details**		
Test item		Check	Remark	Result
4.9.2.2		The methods of test and the required results are as follows:		
a)		confirm by observation that the display equipment provides a sequential list of alerts;	A list of active alerts is provided	Passed
b)		where display equipment supports the presentation of alerts from multiple sources (for example, from multiple navigational systems and equipment):		
		1) confirm by observation that there is the capability for the user user set a priority for the alarms;		N/A
		2) confirm by observation that an indication of priority is included in the list of alerts;		N/A
c)		confirm by observation that acknowledged alarms which are no longer relevant are deleted from the list of alerts.		Passed

2.9.3 (4.8.3) Alarm related information from multiple sources

Requirement: (MSC191/5.7.3) If *a single display is used to present* alert related *information from multiple navigational systems and equipment,* then *the presentation of alerts and indications* shall *be consistent for the display of:*

- *the time of alert occurrence,*
- *the cause of the alert,*
- *the source of the alert, and*
- *the status of the alert (*for example*, acknowledged, not acknowledged)*.

Date 2015-02-12	**Tester** Mu	**Test details**		
Test item		Check	Remark	Result
4.9.3.2		Where display equipment supports the presentation of a *alert* and indications from multiple navigational systems and equipment, confirm by observation that the presentation of *alert* related information is consistent with respect to the time of *alert* occurrence, the cause of the *alert*, the source of the *alert*, and the status of the *alert*.	No presentation of alarms from multiple sources	N/A

2.10 (4.10) Presentation mode

Requirement: (MSC191/5.8) *If displays are capable of presenting information in different modes,* then *there* shall *be a clear indication of the modes in use, for example*:

- *orientation* (north-up, course-up, head-up);
- *stabilisation* (ground-stabilised, sea-stabilised);
- *motion* (true, relative); *and*
- *chart projection* (Mercator, polyconic, etc.).

NOTE The indication of chart projection is only required when electronic chart information is presented. It may be provided to the user on request.

Date 2015-02-12	**Tester** Mu	**Test details**		
Test item		Check	Remark	Result
4.10.1.2		Confirm by observation that the presentation modes in use are clearly indicated.	No different modes available	N/A

2.11 (4.11) User manuals, instructions and reference guides

Requirement: (MSC191/5.9) *The user manual and instructions* and reference guides shall *be available in the English language at least*. *The user manual or reference guide* shall *include a list of all terms, abbreviations, symbols*, icons *and their explanations presented by the system or equipment*. (See also Annexes A, B and E.)

Date 2015-02-12	**Tester** Mu	**Test details**		
Test item		Check	Remark	Result
4.11.1.2		The methods of test and the required results are as follows:		
a)		confirm by observation that user manual, instructions and reference guide are available in the English language;		Passed
b)		confirm by inspection of documented evidence that the user manual and/or reference guide includes a list of all terms, abbreviations, symbols, icons and their explanations used by the system.	There is no list of icons/symbols included in the user manual Retests 2015-03-10 Ba: There is a list of icons in the manual.	Passed

3 (7) Physical requirements

3.1 (7.1) General

3.2 (7.2) Display adjustment

3.2.1 (7.2.1) Contrast and brightness

Requirement: (MSC191/8.1.1) *It* shall *be possible to adjust the contrast and brightness of the display, as applicable to the display technology. It* shall *be possible to dim the display. The range of control* shall *permit the display to be legible under all ambient light conditions* likely to be experienced on the bridge of a ship (for example, day, dusk and night). The range of adjustment shall be sufficient to maintain the user's dark adaptation at night. (See also 4.4.1.)

(MSC191/8.1.2) *It* shall *be possible for the* user *to reset the values of contrast and/or brightness to a preset or default condition*. The manufacturer's documentation shall identify the default conditions.

If the brightness adjustment is set for night, then means shall be provided to return to such a brightness level that it is possible to continue control under daylight.

If display equipment is intended to present electronic chart information (see 4.5.2), then it shall:

- provide the user with the capability to reset the values of brightness and/or contrast to a calibrated colour performance reference setting for each of the ambient light conditions defined in Table 1; and
- prevent inadvertent adjustments by the user by restricting access to controls that may cause degradation of colour performance, such as gamma and colour temperature adjustments.

Date 2015-02-12	**Tester** Mu	**Test details**		
Test item		Check	Remark	Result
7.2.1.2		The setup for measurements of contrast, luminance and colour shall be conducted in accordance with the guidelines of IEC 61966-4 or the VESA Flat Panel Display Measurement (FPDM) (see VESA-2001-6) standard. Before measurements are taken, display equipment shall be powered up and allowed to stabilize for a period identified by the manufacturer. (See also Annex G.)		
a)		Confirm by observation that a manual contrast control is provided, if applicable (for example, for CRT technology).		N/A
b)		Confirm by observation that a manual brightness control is provided.		Passed

c)	Confirm by observation that, after dimming, the equipment for use at night, when daylight ambient conditions are applied, there are means to readjust for operation under daylight.	There is no switching between day/night operation	N/A
d)	Verify the adjustment of contrast and brightness in accordance with 4.4.1: (See 4.4.1.2.)	An adjustment of brightness is provided An adjustment of contrast is not provided, but it is not appropriate for the TFT type of display.	Passed
	1) confirm by observation that the contrast and brightness controls can be reset to their default values;	There is no possibility to reset brightness to their default values. (e.g. push on/off button for 3 seconds) Retest 2015-02-24 Mu No way found to set the brightness to their default values. Retest 2015-03-10 Ba: With the “Def Brightness” button the MKD can be set to the default brightness.	Passed
	2) where display equipment is intended to display chart information, confirm by measurement of luminance that a means or method is provided to return the contrast and brightness controls to their calibrated setting for each ambient light condition in accordance with Table 1. (See 4.4.1.)		N/A
e)	Confirm by inspection of documented evidence that the default conditions for contrast and brightness controls are identified.	This is a manual item. Not found in the current manual. Retest 2015-02-24 Mu Default condition for brightness is documented in the manual. As there is no possibility to change the contrast, there is no need to include this in the manual.	Passed

3.2.2 (7.2.2) Magnetic interference

Requirement: (MSC191/8.1.3) If *magnetic fields degrade the presentation of navigation-*related *information,* then *a means* or method *to neutralise the effects of magnetic fields* shall *be provided.*

Date 2015-02-12	**Tester** Mu	**Test details**		
Test item		Check	Remark	Result
7.2.2.2		Confirm by inspection of documented evidence that a means or method to neutralise the effects of magnetic fields is provided if magnetic fields degrade the presentation of navigation-related information.	Not applicable for LCD displays	N/A

3.2.3 (7.2.3) Temporal stability

Requirement: Display equipment shall be perceptually "flicker" free in direct and peripheral vision at the nominal viewing distance identified in the manufacturer's documentation in accordance with the perception thresholds as defined in Clause G.2.

NOTE The perception threshold of "flicker" is known to vary for observers, depending on such factors as age, fatigue, ambient lighting conditions, frequencies, the displayed image size, image brightness and image content.

Date **2015-02-12**	**Tester** **Mu**	**Test details**		
Test item		Check	Remark	Result
7.2.3.2		Establish by inspection of documented evidence whether the luminance persistence (response time) of the display equipment is less than or more than 1 ms.		
a)		For display equipment with a luminance persistence of 1 ms or more (for example, CRT, LCD's, etc.), confirm by analytical evaluation or measurement that the display equipment emits less energy in the temporal frequencies than an ob-server will detect as "flicker" (i.e. the predicted "flicker" threshold) according to G.2.3.1 under each ambient light condition specified in Table 1.	Evaluated by measurement, see Annex B of test report The backlight is controlled by PWM of 200 Hz. Therefore there is no relevant flicker in the critical range of 0...120 Hz.	Passed
b)		For display equipment based on technologies which have a luminance persistence much less than 1 ms (for example, EL (electro luminescent), plasma, light emitting diodes (LED), etc.), confirm by analytical evaluation or measurement that the display equipment emits less energy in the temporal frequencies than an observer will detect as "flicker" according to G.2.3.2 under each ambient light test condition specified in Table 1.		N/A

3.2.4 (7.2.4) Physical controls and status indicators

Requirement: Physical controls for display equipment shall be locatable by visual or tactile means. If the display equipment has more than three adjacent controls (for example, knobs or switches), then labels with adjustable illumination shall be provided for identification of these controls. Labels shall comply with the legibility/readability requirements contained in 4.4.2, 4.4.3 and 4.4.4.

Any illuminated status indicators separate from the main display (for example, built-in to the front panel of the monitor) shall be locatable by visual means. Adjustable illumination provided for labels and status indicators shall be suitable for all ambient light conditions likely to be experienced on the bridge of a ship (day, dusk and night) and with due consideration to the night vision of the officer of the watch.

Illumination shall be dimmable to produce a maximum brightness of not more than 1 cd/m^2 and may be extinguishable below that point.

Date 2015-02-12	**Tester** Mu	**Test details**		
Test item		Check	Remark	Result
7.2.4.2		The methods of test and the required results are as follows:		
a)		confirm by observation that physical controls for display equipment , if available, are locatable by visual or tactile means;		N/A
b)		where more than three adjacent control knobs or switches exist, confirm by observation that they have labels with adjustable illumination and that the illumina-ted labels comply with the legibility/ readability requirements contained in 4.4.2, 4.4.3 and 4.4.4;		N/A
c)		where illuminated status indicators exist separate from the main display, confirm by observation that they are locatable by visual means;		N/A
d)		where adjustable illumination is provided, confirm by observation that illumination is dimmable to not more than 1 cd/m² and may be extinguishable below that point;	It is possible to dim <1cd/m²	Passed
e)		confirm by observation that a visual indication of the presence of power to the display equipment is provided;	The presence of power is indicated by content on the display	Passed
f)		confirm by observation that a visual indication of the presence of video signals to the display equipment is provided.		N/A

3.3 (7.3) Screen size

Requirement: (MSC191/8.2.1) *Display equipment* shall *be of sufficient size to support the requirements of the relevant* IMO *Performance Standards.*

(MSC191/8.2.2) (MSC232/10.2) For ECDIS, *the operational display area of the chart presentation for route monitoring* shall *be at least 270 mm × 270 mm.*

(MSC232-6/4.2.2) For ECDIS back-up arrangements, the effective size of the chart presentation shall be not less than 250 mm × 250 mm or 250 mm diameter.

(MSC191/8.2.3) For radar display equipment, *the operational display area of the radar presentation* shall *be at least a circle of diameter of:*

- *180 mm for ships smaller than 500 gross tonnage;*
- *250 mm for ships larger than 500 gross tonnage and HSC less than 10000 gross tonnage;*
- *320 mm for ships larger than 10000 gross tonnage.*

The manufacturer's documentation shall identify the intended size of the operational display area.

Date 2015-02-12	**Tester** Mu	**Test details**		
Test item		Check	Remark	Result
7.3.2		The methods of test and the required results are as follows:		
a)		for ECDIS, confirm by measurement that the dimensions of the operational display area are at least 270 mm × 270 mm;	Not applicable for small displays	N/A
b)		for ECDIS back-up arrangements, confirm by measurement that the dimensions of the operational display area are at least 250 mm × 250 mm, or 250 mm in diameter;		N/A
c)		for radar display equipment, confirm by measurement that the diameter of the operational display area is at least a circle of diameter of the intended size specified in the manufacturer's documentation.		N/A

3.4 (7.4) Multicoloured display equipment

Requirement: (MSC191/8.3.1) *Multicoloured display equipment* shall *be used except where monochrome displays are permitted within individual* IMO *Performance Standards.*

(MSC191/8.3.2) *Multicoloured operational displays including multifunction displays (*for example*, conning displays)* shall *provide a minimum of 64 colours except where permitted or not required by the* IMO*, or when used for a single specific purpose (*for example*, speed log, echo-sounder).*

Monochrome displays may be provided when used for a single specific purpose (for example, speed log, echo-sounder) except where multicoloured displays are required by IMO performance standards or Code on Alerts and Indicators.

Date 2015-02-12	**Tester** Mu	**Test details**		
Test item		Check	Remark	Result
7.4.2		For multicoloured display verify the result in accordance with Clause 4. For monochrome display verify the result in accordance with Clause 4 except the colour-related requirements specified in 4.5.1, 4.7.1, 4.7.2, 4.7.3 and 4.8.2. For monochrome display confirm by inspection of documented evidence that he manufacturer has noted the limitation of usage of the display to a single specific purpose or noted relevant IMO Performance Standard permitting use of monochrome display.	Not applicable because used for a single specific purpose	N/A

3.5 (7.5) Screen resolution

Requirement: (MSC191/8.4) *Operational display equipment including multifunction displays (*for example*, conning displays)* shall *provide a minimum screen resolution of 1280 × 1024* pixels*, or equivalent for a different aspect ratio, except where permitted or not required by the* IMO*, or when used for a single specific purpose (*for example*, speed log, echo-sounder)* or 180 mm radar*.* For 180 mm radar, a minimum screen resolution of 1024 pixels × 768 pixels, or equivalent for a different aspect ratio, shall be provided.

Display equipment intended to support the presentation of electronic chart information shall provide a maximum pixel pitch of 0,29 mm/m of nominal viewing distance (1 min of arc), for example, 0,36 mm at 1237 mm viewing distance.

The manufacturer's documentation shall describe the screen resolution, pixel format and viewing distance (i.e. for measurement of pixel pitch).

Date 2015-02-12	**Tester** Mu	**Test details**		
Test item		Check	Remark	Result
7.5.2		The methods of test and the required results are as follows:		
a)		confirm by inspection of documented evidence that for radar displays larger than 180 mm diameter the display equipment supports a screen resolution of at least 1280 × 1024 or equivalent resolution if the equipment uses a different aspect ratio. For radar displays of 180 mm or smaller diameter the requirement is at least 1 024 x 768 or equivalent resolution if the equipment uses a different aspect ratio; alternatively, confirm by inspection of documented evidence that the display equipment supports the minimum screen resolution permitted by the applicable Performance Standards; alternatively, if the display equipment is used for a single specific purpose (for example, speed log, echo-sounder, etc.), confirm by inspection of documented evidence that it is not required to support a minimum screen resolution.	Not applicable for small displays	N/A
b)		confirm by inspection of documented evidence that the display equipment provides a maximum pixel pitch of not more than 1 min of arc; alternatively, if the display equipment is used for a single specific purpose (for example, speed log, echo-sounder, etc.), confirm by inspection of documented evidence that it is not required to support a maximum pixel pitch.	Not applicable for small displays	N/A
c)		confirm by inspection of documented evidence that the screen resolution, pixel format and the viewing distance used for the measurement of pixel pitch are identified.		N/A

3.6 (7.6) Screen viewing angle

Requirement: (MSC191/8.5) *The display* equipment shall *support the reading of information under all ambient light conditions, simultaneously, by at least two users, from standing and sitting* user *positions likely to be found on the bridge of a ship.*

Date **2015-02-12**	**Tester** **Mu**	**Test details**		
Test item		Check	Remark	Result
7.6.2		Verify in accordance with 4.4.1.2 a) that readability requirements are satisfied from a position at the side of the operator.		Passed

Annex A Test equipment summary

#	Description	Type	Identification (S/N / Bund-Nr.)
1	Luminance Meter	LMT L 1009	0388231 / 2165
2	System Flash Meter	LMT SF 100	1195151 / -
3	Digital Multimeter	Tektronix DMM 916	138531 / 97/248/643
4	Oscilloscope	LeCroy Wavesurfer 422	LCRY0301J15673 / 106106/2005
5	Oscilloscope	Picoscope 4262	BSH 2012/ 7200002551
6	Lowpassfilter	Lowpassfilter 150 Hz	Tiefpassfilter Nr. 1

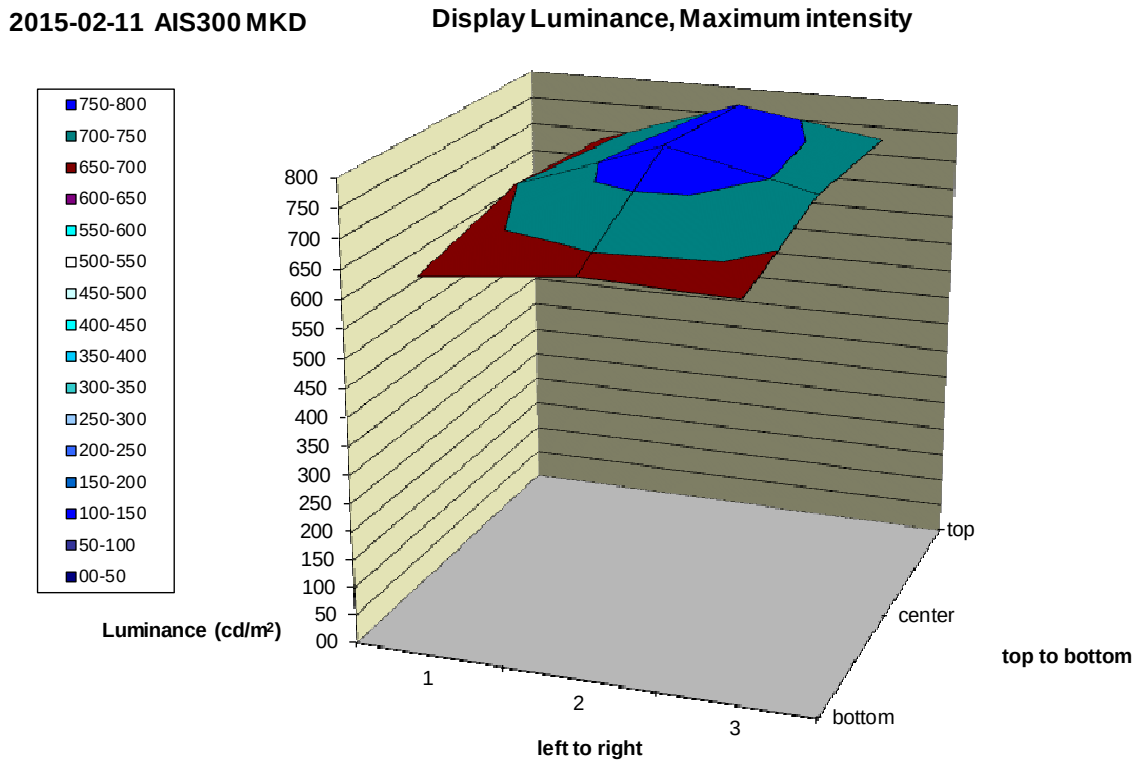
Brightness measurements were carried out with
#1: Luminance Meter LMT L1009.

Flicker measurements are carried out with a combination of
#2: System Flash Meter LMT SF 100,
#3: Digital Multimeter Tektronix DMM 916,
#6: Lowpassfilter and
#4: Oscilloscope LeCroy Wavesurfer 422 or #5: Oscilloscope Picosope 4262

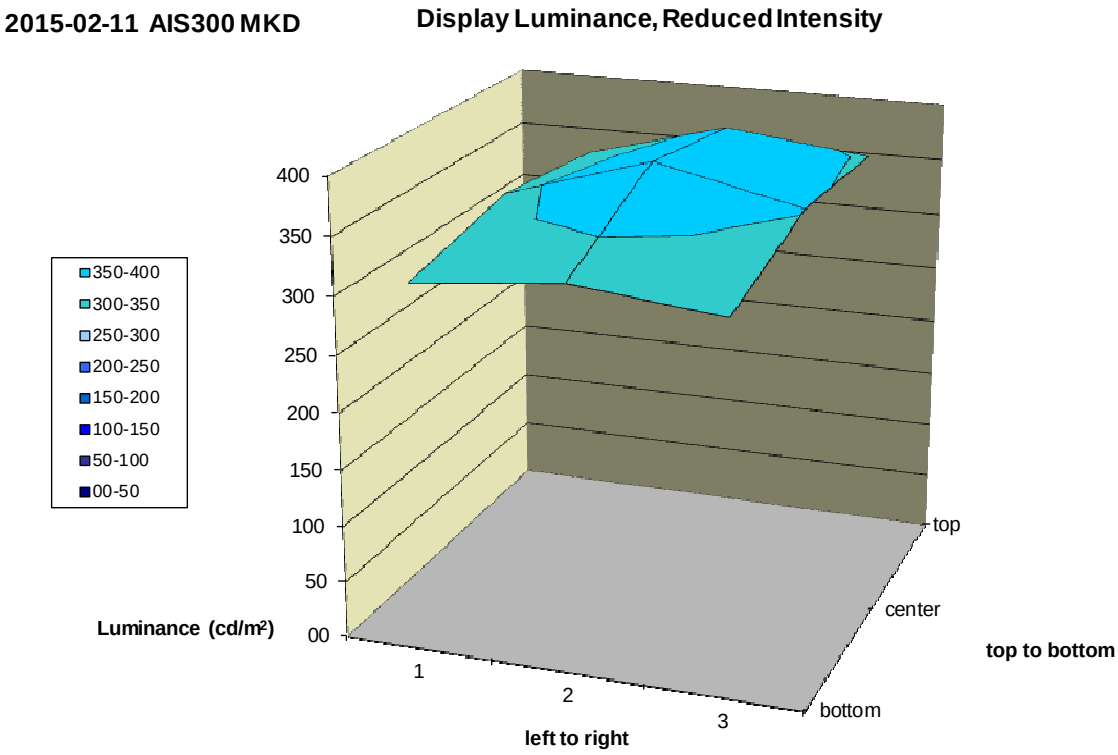
Annex B Test diagrams

B.1 Brightness measurement

B.1.1 Maximum display luminance



B.1.2 Reduced display luminance



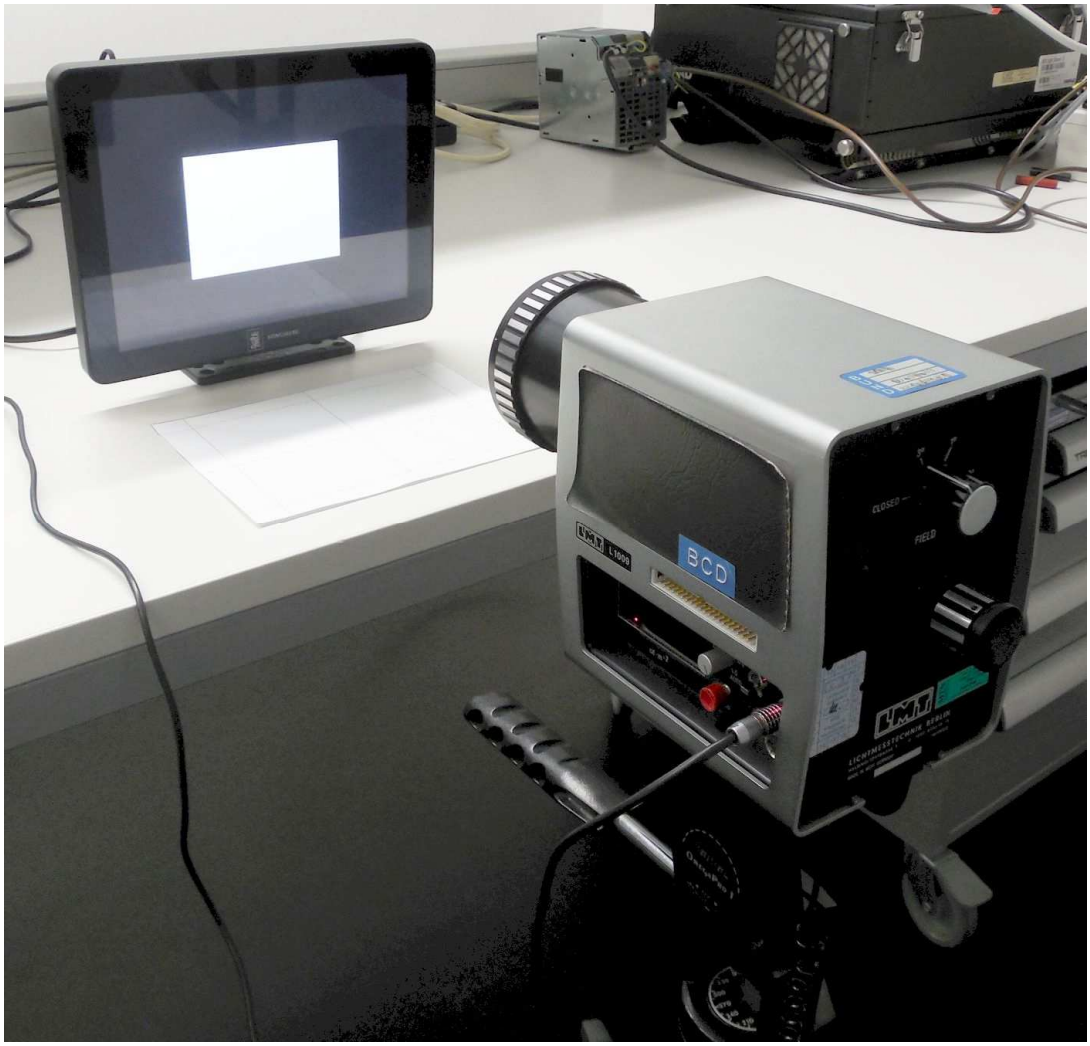
Annex C Photos of equipment under test

C.1 Display unit


RAM
dataresponsrev. 1.1
SN PW1450018957
Rating: 24VDC. Max 1
www.datarespons.com
DNV 2.4
IEC 60945


dataresponsrev. 1.1
SN PW1450018957
Rating: 24VDC. Max 1
www.datarespons.com
DNV 2.4
IEC 60945

C.2 Brightness measurement



C.3 Flicker measurement