



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:

AMEC

Type:

Camino-701

Applying test standards:

IEC 62288 [Sections 4, 7]: 2008

Test Report No.:

BSH/46121/4322163/13-3

Applicant:

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Hamburg, 13 May 2013
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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

Siehe Hinweise auf der Rückseite



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



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1 General

1.1 Summary

Start of test: 2013-02-07

End of test: 2013-04-16

Test standards¹: IEC 62288 Ed. 1.0 2008-07

Test No.	Reference	Section	Result (passed / not passed / not applicable / not tested)
2.1	(4.1.1)	GENERAL REQUIREMENTS	not applicable
2.2	(4.2.1)	CONSISTENCY OF LAYOUT	passed
2.3	(4.2.2)	CONSISTENT PRESENTATION OF INFORMATION	passed
2.4	(4.2.3)	SEPARATION OF OPERATIONAL DISPLAY AREA	passed
2.5	(4.3.1)	READABILITY UNDER ALL AMBIENT LIGHT CONDITIONS	passed
2.6	(4.3.2)	LEGIBILITY OF ALPHANUMERIC DATA AND TEXT	passed
2.7	(4.3.3)	PRESENTATION OF TEXT	passed
2.8	(4.3.4)	ICONS	passed
2.9	(4.4.1)	DISCRIMINATION OF COLOURS	passed
2.10	(4.5.1)	OPERATIONAL INFORMATION	passed
2.11	(4.5.2)	ELECTRONIC CHART INFORMATION	not applicable
2.12	(4.6.1)	COLOUR CODING FOR DISCRIMINATION	not applicable
2.13	(4.6.2)	COLOUR CODING OF INFORMATION	not applicable
2.14	(4.6.3)	COLOUR CODING IN COMBINATION WITH OTHER ATTRIBUTES	not applicable
2.15	(4.6.4)	FLASHING OF INFORMATION	passed
2.16	(4.7.1)	INDICATION OF SOURCE, VALIDITY AND INTEGRITY STATUS	passed
2.17	(4.7.2)	COLOUR CODING OF VALIDITY AND INTEGRITY	not applicable
2.18	(4.7.3)	INDICATION OF PRESENTATION FAILURE	passed
2.19	(4.8.1)	OPERATIONAL STATUS	not applicable
2.20	(4.8.2)	LIST OF ALARMS	passed
2.21	(4.8.3)	ALARM RELATED INFORMATION FROM MULTIPLE SOURCES	not applicable
2.22	(4.9.1)	INDICATION OF PRESENTATION MODE IN USE	passed
2.23	(4.10.1)	USER MANUALS, INSTRUCTIONS AND REFERENCE GUIDE	passed
2.24	(7.2.1)	CONTRAST AND BRIGHTNESS	passed
2.25	(7.2.2)	MAGNETIC INTERFERENCE	not applicable
2.26	(7.2.3)	TEMPORAL STABILITY	passed
2.27	(7.2.4)	PHYSICAL CONTROLS AND STATUS INDICATORS	passed
2.28	(7.3)	SCREEN SIZE	not applicable
2.29	(7.4)	MULTICOLOURED DISPLAY EQUIPMENT	not applicable
2.30	(7.5)	SCREEN RESOLUTION	not applicable
2.31	(7.6)	SCREEN VIEWING ANGLE	passed

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.

1.2 Equipment history

1.2.1 EUT system no 3

<u>Transponder</u>				
Type	Camino-701		Part No.:	---
Delivery date	2013-02-01		Serial number	A2K700017
HW Version:				
	Delivery date	2013-02-01	Version no	
	Installation date	2013-02-01		
SW Version:				
	Delivery date	2013-02-04	Version no	1.0.6.8
	Installation date	2013-02-04		
SW Version:				
	Delivery date	2013-02-07	Version no	1.0.6.8 T2
	Installation date	2013-02-07		
SW Version:				
	Delivery date	2013-02-08	Version no	1.0.6.9
	Installation date	2013-02-08 UTC 15:00		
SW Version:				
	Delivery date		Version no	
	Installation date			

<u>MKD</u>			
Type	Integrated	Part No.:	
Delivery date		Serial number	

<u>GPS antenna</u>				
Type	AMEC		Part No.:	---
Delivery date	2012-01-12		Serial number	---
HW Version:				
	Delivery date	2012-01-12	Version no	---
	Installation date	2012-01-12		



1.2.2 EUT system no 4

<u>Transponder</u>				
Type	Camino-701		Part No.:	---
Delivery date	2013-03-15		Serial number	A2K700018
HW Version:	Delivery date	2013-03-15	Version no	
	Installation date	2013-03-15		
SW Version:	Delivery date	2013-03-15	Version no	1.0.6.12
	Installation date	2013-03-15		
SW Version:	Delivery date	2013-03-20	Version no	1.0.6.13
	Installation date	2013-03-20		
SW Version:	Delivery date	2013-03-21	Version no	1.0.6.14
	Installation date	2013-03-21		
SW Version:	Delivery date	2013-03-21	Version no	1.0.6.15
	Installation date	2013-03-22		
SW Version:	Delivery date	2013-03-27	Version no	1.0.6.18
	Installation date	2013-03-27		
SW Version:	Delivery date		Version no	
	Installation date			

<u>MKD</u>			
Type	Integrated	Part No.:	
Delivery date		Serial number	

<u>GPS antenna</u>				
Type	AMEC		Part No.:	---
Delivery date	2012-01-12		Serial number	---
HW Version:	Delivery date	2012-01-12	Version no	---
	Installation date	2012-01-12		

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 (9 th floor)
Test engineer	H. Bartels
Location	9°59,103 E 53°32,822 N

Equipment no	Start of test	End of test	Test engineer
4	2013-03-25	2013-03-26	Bartels
4	2013-03-27	2013-03-27	Bartels
Manual	2013-04-16	2013-04-16	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 (7 th floor)
Test engineer	H. Bartels
Location	9°59,103 E 53°32,822 N

Equipment no	Start of test	End of test	Test engineer
3	2013-02-07	2013-02-07	Bartels
4	2013-03-25	2013-03-25	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

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

1.6 Test report editions

Date	Edition	Remark	Author
2013-04-16	1	First edition	Ba
2013-05-13	2	Editorial correction in 4.4.1 b)	Ba

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

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

2 Functional Tests

2.1 (4.1.1) 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.*

Datum	Tester	Test details		
2013-03-25	Ba			
Test item		Check	Remark	Result
4.1.1.2		See Annex D for guidance in the application of IEC 60945 for testing.	Covered by testing according to IEC 60945	N/A

2.2 (4.2.1) 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, 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.*

Datum	Tester	Test details		
2013-03-25	Ba			
Test item		Check	Remark	Result
4.2.1.2		The methods of test and the required results are as follows:		
a)		verify that the arrangement, operation and identification of controls, screen displays and indications are in accordance with Annex E and IEC 60945, 4.2.1.2 through 4.2.1.5;		Passed

b)	confirm by observation that the screen layout and arrangement of information is consistent from screen to screen and/or page to page, as appropriate, and as far as practical;		Passed
c)	confirm by observation that data and controls are logically grouped according to their function or the task-at-hand, as applicable;		Passed
d)	confirm by observation that priority information essential to the task-at-hand is identified and permanently or persistently displayed in a prominent manner, as appropriate, for each application.		Passed

2.3 (4.2.2) 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)

Datum	Tester	Test details		
2013-03-25	Ba			
Test item	Check	Remark	Result	
4.2.2.2	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 following units are incorrect: In the target list the unit for second is "Sec." but should be "s" and the unit for minute is "Min." but should be "min". The unit for Nautical Mile is "nm" in the whole system but should be "NM". "nm" is the unit for Nanometer.		



		<p>The term for draught is not used consistently. In "Ship details" the term "Draft" is used (American), in Voyage settings the term "Draught" is used (Britisch). I recommend to use on both places "Draught". <u>Retest 2013-03-27 Ba:</u></p> <ul style="list-style-type: none"> • Tx time units in the target list are corrected to "s" and "min" • The unit for Nautical mile has been changed to "NM". • In "Ship details" the term "Draft" is changed to "Draught" 	<p>Passed</p>
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2.4 (4.2.3) 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).*

Datum	Tester	Test details		
2013-03-25	Ba			
Test item		Check	Remark	Result
4.2.3.2		Confirm by observation that the presentation is clearly separated into one or more operational display areas and one or more user dialogue areas.		Passed

2.5 (4.3.1) 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 and viewing angles) 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 4.4.1, 7.2.1 and 7.6.1)*

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 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 Ed. 3.3, or the “Day Black Background” colour table provided in the IHO ECDIS Presentation Library Ed. 3.2, 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 or less and may be extinguishable below that point. 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 Variance is determined by the equation: $1 - (L_{min}/L_{max})$ where L_{min} is the minimum luminance and L_{max} is the maximum luminance measured across the operational display area, or the entire screen depending upon the application.

It shall be possible to select a presentation of alphanumeric data, text, symbols (see 4.5) 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 4.5.2), 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 The IHO ECDIS Presentation Library provides “black-adjust” symbols BKAJ1 and BKAJ2, for the colours black and grey, respectively.

Datum	Tester	Test details		
2013-03-25	Ba			
Test item		Check	Remark	Result
4.3.1.2		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) standard.		
NOTE Before measurements are taken, power up the display equipment and allow it to stabilize for the period of time specified by the manufacturer.				
a)		Confirm by observation that alphanumeric data, text, symbols and other graphical information are readable from expected user positions and under the ambient light conditions described in Table 1.		Passed

b)	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/m ² to a maximum level of at least 85 cd/m ² , and confirm that the values for brightness used for the setup are stable after the stabilisation period defined by the manufacturer.	The brightness can be varied between 0.7 Cd/m ² to a maximum level of at 263 cd/m ² . The values are stable from beginning.	Passed
NOTE This test image should not be generated internally by the display equipment.			
c)	Confirm by observation that alphanumeric data, text, symbols and other graphical information can be presented using a lighter foreground against a dark background.		Passed
d)	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.	The variation is less than 13%	Passed
e)	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.	In night mode	Passed
f)	Where display equipment is intended to present symbols for charted information confirm by observation that the user can verify that the colour black is visually distinguishable against a background set to dark grey, and vice-versa.	The equipment is not a chart display	N/A

2.6 (4.3.2) 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.

Datum	Tester	Test details		
2013-03-25	Ba			
Test item		Check	Remark	Result
4.3.2.2		The methods of test and the required results are as follows:		
a)		confirm by observation that alphanumeric data and text is presented using non-italic, sans-serif font;	The test is resentend using non-italic, sans-serif font with some small serifes at some characters	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 character height is 2.5 mm, The reading distance is 2.5/3.5 (m) = 0,7m. This seems to be appropriate for the MKD	Passed

2.7 (4.3.3) 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.*

Datum	Tester	Test details		
2013-03-25	Ba			
Test item		Check	Remark	Result
4.3.3.2		The methods of test and the required results are as follows:		
a)		confirm by observation 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.	<ul style="list-style-type: none"> The following terms are used: RNG, BRG, MMSI, LAT, LON, HDG, ROT, SOG, COG, CPA, TCPA, DEST, ETA, Other special AIS terms are used which are not defined in Annex B. Incorrect items according to IEC62288 Table B.1 are: HDT → HDG EPFD → EPFS 	Passed
			<u>Retest 2013-03-27 Ba:</u> <ul style="list-style-type: none"> “HDT” has been change to “HDG”. “EPFD” has been change to “EPFS”. 	Passed

2.8 (4.3.4) 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.

Datum	Tester	Test details		
2013-03-25	Ba			
Test item		Check	Remark	Result
4.3.4.2		The methods of test and the required results are as follows:		
a)		confirm by observation that icons and their purpose can be intuitively recognized by appearance, placement, and grouping;		Passed
b)		confirm by observation that icons used for data and control function are presented according to Annex E.		Passed

2.9 (4.4.1) Discrimination of colours

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 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 Ed. 3.3, or the “Day Black Background” colour table provided in the IHO ECDIS Presentation Library Ed. 3.2, and adjusting brightness and contrast, if provided, for use under all light conditions.

Datum	Tester	Test details		
2013-03-25	Ba			
Test item		Check	Remark	Result
4.4.1.2		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-1/9 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.		Passed

2.10 (4.5.1) 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*.

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 ($v_2 < 0,2$) shall be avoided for images subtending less than 35 mm/m (2° of arc) of viewing distance.

Datum	Tester	Test details		
2013-03-25	Ba			
Test item		Check	Remark	Result
4.5.1.2		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;	Covered by test according to IEC 61993-2 Ed.2	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.	The targets dimension of the target symbol is 3 mm. We accept this for this kind of minimum display	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.	Colour identification is not required	N/A

2.11 (4.5.2) 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 4.3.2);
- 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 Presentation Library symbols.

Datum	Tester	Test details		
2013-03-25	Ba			
Test item	Check	Remark	Result	
4.5.2.2	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;	The EUT is not a chart display	N/A	
b)	where symbols deviate from the 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 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 Presentation Library symbols.		N/A	

2.12 (4.6.1) 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 4.4.1.).*

Datum	Tester	Test details		
2013-03-25	Ba			
Test item		Check	Remark	Result
4.6.1.2		Confirm by observation that the colours within each colour table clearly differ from one another.	Colour coding is not used	N/A

2.13 (4.6.2) 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 alarm related information.*

Datum	Tester	Test details		
2013-03-25	Ba			
Test item		Check	Remark	Result
4.6.2.2		Confirm by inspection of documented evidence that the colour red is used to indicate an alarm condition.		Passed

2.14 (4.6.3) 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.

Datum 2013-03-25	Tester Ba	Test details		
Test item		Check	Remark	Result
4.6.3.2		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;	Color 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.	Color coding is not used	N/A

2.15 (4.6.4) Flashing of information

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

Datum 2013-03-25	Tester Ba	Test details		
Test item		Check	Remark	Result
4.6.4.2		Confirm by observation that flashing of information is only used for unacknowledged alarms.	Unacknowledged alarms are indicated by a flashing yellow triangle with a red exclamation mark	Passed

2.16 (4.7.1) 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. 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.*

Datum	Tester	Test details		
2013-03-25	Ba			
Test item		Check	Remark	Result
4.7.1.2		The methods of test and the required results are as follows:		
a)		confirm by observation that the source of information can be indicated;		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

2.17 (4.7.2) 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 yellow, and invalid information shall be qualitatively marked by using the colour red.*

Datum	Tester	Test details		
2013-03-25	Ba			
Test item		Check	Remark	Result
4.7.2.2		If colour coding is used, the methods of test and the required results are as follows:		
a)		confirm by observation that the colour yellow is used to indicate information with low or doubtful integrity;	Color coding is not used	N/A
b)		confirm by observation that the colour red is used to indicate invalid information.	Color coding is not used	N/A

2.18 (4.7.3) 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.).

Datum	Tester	Test details		
2013-03-25	Ba			
Test item		Check	Remark	Result
4.7.3.2		Confirm by observation that a conspicuous time-varying indication is provided in all presentation modes.	On all screen on the upper right corner the UTC time is displayed with the second changeing every second	Passed

2.19 (4.8.1) Operational status

Requirement: (MSC191/5.7.1) *The operational status of information shall be indicated as follows:*

Table 2 – Operational status

Status	Visual Indication	Audible Signal
<i>Alarm, not acknowledged</i>	<i>Red, Flashing</i>	<i>Accompanied by an audible signal</i>
<i>Alarm, acknowledged</i>	<i>Red</i>	<i>Suppression of audible signal</i>
<i>Invalid Information</i>	<i>Red</i>	<i>Silent</i>
<i>Information with low integrity</i>	<i>Yellow</i>	<i>Silent</i>
<i>Important Indications (Warnings)</i>	<i>Yellow</i>	<i>Silent (unless otherwise specified)</i>
<i>Normal State</i>	<i>Optionally Green</i>	<i>Silent</i>

Datum	Tester	Test details		
2013-03-25	Ba			
Test item		Check	Remark	Result
4.8.1.2		Confirm by inspection of documented evidence that alarms and indications are presented in accordance with Table 2.	Alarm indication is covered by the equipment standard.	N/A

2.20 (4.8.2) List of alarms

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.*

Datum	Tester	Test details		
2013-03-25	Ba			
Test item		Check	Remark	Result
4.8.2.2		The methods of test and the required results are as follows:		
a)		confirm by observation that the display equipment provides a sequential list of alarms;		Passed
b)		where display equipment supports the presentation of alarms from multiple sources (for example, from multiple navigational systems and equipment):	The EUT does not support presentation of alarms from multiple sources	N/A

	1) confirm by observation that the user can set a priority for the alarms;		N/A
	2) confirm by observation that an indication of priority is included in the list of alarms;		N/A
c)	confirm by analytical evaluation that acknowledged alarms which are no longer relevant are deleted from the list of alarms.	Tested in the test according to IEC 61993-2 Ed.2	Passed

2.21 (4.8.3) Alarm related information from multiple sources

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

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

Datum	Tester	Test details	
2013-03-25	Ba		
Test item	Check	Remark	Result
4.8.3.2	Where display equipment supports the presentation of alarms and indications from multiple navigational systems and equipment, confirm by observation that the presentation of alarm related information is consistent with respect to the time of alarm occurrence, the cause of the alarm, the source of the alarm, and the status of the alarm.	The EUT does not support presentation of alarms from multiple sources	N/A

2.22 (4.9.1) Indication of presentation mode in use

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.

Datum	Tester	Test details		
2013-03-2	Ba			
Test item		Check	Remark	Result
4.9.1.2		Confirm by observation that the presentation modes in use are clearly indicated.	All menus and list are clearly identified by a head line The 3 graphical screen can easily be identified by their appearance.	Passed

2.23 (4.10.1) 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.)*

Datum	Tester	Test details		
2013-03-26	Ba			
Test item		Check	Remark	Result
4.10.1.2		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.	<ul style="list-style-type: none"> • There is an explanation of the icons used in the top and bottom bar. • There is no list and explanation of symbols used in the radar and map view. • There is no list of terms and abbreviations used by the system. <p>Retest 2013-04-16 Ba: Manual version 1.09</p> <ul style="list-style-type: none"> • There is a list and explanation of symbols used in the radar and map view. • There is a list of terms and abbreviations used by the system. 	Passed
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2.24 (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 4.3.1.)*

(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 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.



Datum	Tester	Test details		
2013-03-26	Ba			
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) 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 D.)			
a)	Confirm by observation that a manual contrast control is provided, if applicable (for example, for CRT technology).	There is no manual contrast provided. It is no necessary for the used type of LCD display	N/A	
b)	Confirm by observation that a manual brightness control is provided.	Activated using the "DIM" key	Passed	
c)	Verify the adjustment of contrast and brightness in accordance with 4.3.1: (See 4.3.1.2.)		Passed	
	1) confirm by observation that the contrast and brightness controls can be reset to their default values;	No way found to reset the dimming to a default value. It should be possible to do this without beeing able to read the display (e.g. by pressing "DIM" twice, first to go to the "Customize / Dimmer level" screen, second to set the dimmer to the default values. The reason is that it is possible to set the display in a not readable mode. Then it should be possible to get it back into a readable mode. <u>Retest 2013-03-27 Ba:</u> By pressing "DIM" twice the display is set to the default settings (100% brilliance).	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 4.3.1.2.)	The EUT is not a chart display	N/A
d)	Confirm by inspection of documented evidence that the default conditions for contrast and brightness controls are identified.	Not found. The default value should be mentioned in the manual <u>Retest 2013-04-16 Ba:</u> The default setting is defined in 4.2.7 Dimmer setting	Ok

2.25 (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.*

Datum	Tester	Test details		
2013-03-26	Ba			
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.	There are no magnetic fields	N/A

2.26 (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 of ISO 13406-2, B.2.5 and B.2.6.

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.

Datum	Tester	Test details		
2010-06-11	Skr			
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 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 ISO 13406-2, B.2.5 under each ambient light condition specified in Table 1.	There is no significant flicker. The flicker measurement in a very low flicker signal, see Annex B of the test report	Passed
b)	For display equipment based on technologies which have a luminance persistence much less than 1 ms (for example, EL, plasma, 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 ISO 13406-2, B.2.6 under each ambient light test condition specified in Table 1.	The luminance persistence is higher than 1 ms (case a))	N/A

2.27 (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 4.3.2, 4.3.3 and 4.3.4.

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.

As a minimum, a switch to power display equipment and visual indications of the presence of input power and video signals shall be provided.



Datum	Tester	Test details		
2013-03-2	Ba			
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 are locatable by visual or tactile means;		Passed
b)		where more than three adjacent control knobs or switches exist, confirm by observation that they have labels with adjustable illumination and that the illuminated labels comply with the legibility/readability requirements contained in 4.3.2, 4.3.3 and 4.3.4;	The keys have an illumination which is dimmed together with the display.	Passed
c)		confirm by observation that the display equipment can be powered on/off by a physical switch;		Passed
d)		where illuminated status indicators exist separate from the main display, confirm by observation that they are locatable by visual means;	There are no separate status indicators.	N/A
e)		where adjustable illumination is provided, confirm by observation that it is suitable under each of the ambient light conditions specified in Table 1;		Passed
f)		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 the display. There is no separate indication for the presence of power	Passed
g)		confirm by observation that a visual indication of the presence of video signals to the display equipment is provided.	No video signal is used	N/A

2.28 (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.

Datum	Tester	Test details		
2013-03-26	Ba			
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;	The EUT is not an ECDIS	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	

2.29 (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).*

Datum	Tester	Test details		
2013-03-26	Ba			
Test item		Check	Remark	Result
7.4.2		Verify in accordance with 4.4.1.	Not required by IMO and used for a single specific purpose	N/A

2.30 (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).

Datum	Tester	Test details		
2013-03-2	Ba			
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 the display equipment supports a screen resolution of at least 1280 × 1024 or equivalent if the equipment uses a different aspect	Not required by IMO and used for a single specific purpose	N/A



	<p>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.</p>		
b)	<p>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.</p>		N/A
c)	<p>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.</p>		N/A

2.31 (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.*

Datum	Tester	Test details		
2013-03-26	Ba			
Test item		Check	Remark	Result
7.6.2		Verify in accordance with 4.3.1.	The display has a very wide viewing angle	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	PicoScope 4262	BSH 2012/ 7200002551

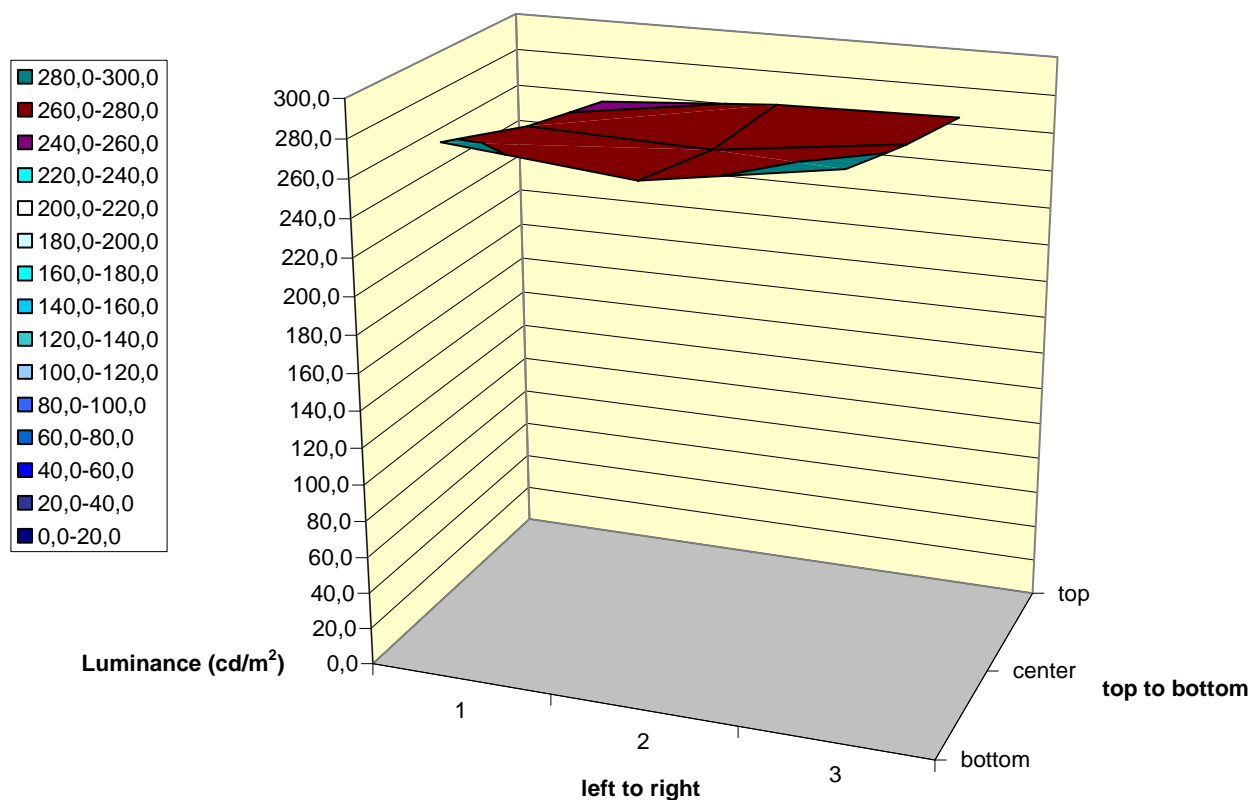
Brightness measurements were carried out with #1: Luminance Meter LMT L1009, flicker measurements with a combination of #2: System Flash Meter LMT SF 100, #3: Digital Multimeter Tektronix DMM 916 and #4: Oscilloscope LeCroy Wavesurfer 422.

Annex B Test diagrams

B.1 Brightness measurement

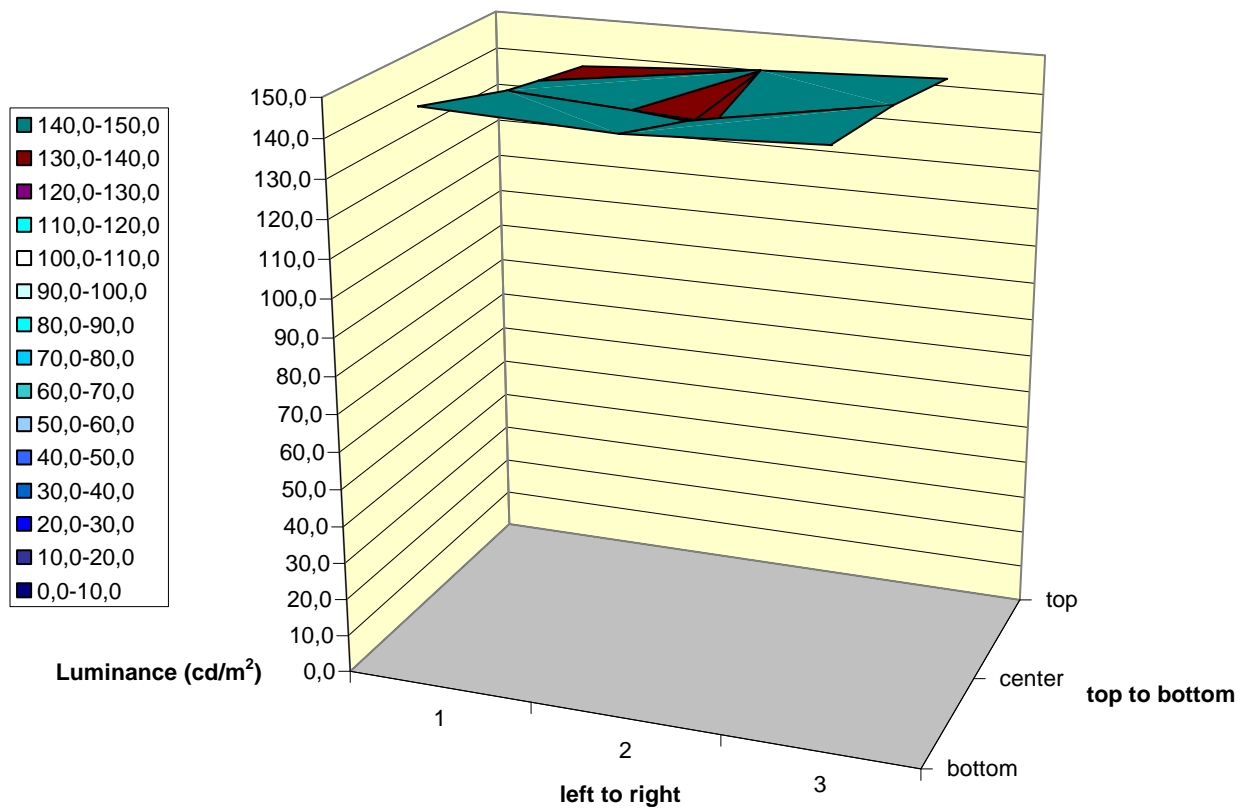
B.1.1 Maximum display luminance

2013-02-07 AMEC Camino-701 Display Luminance, Maximum intensity



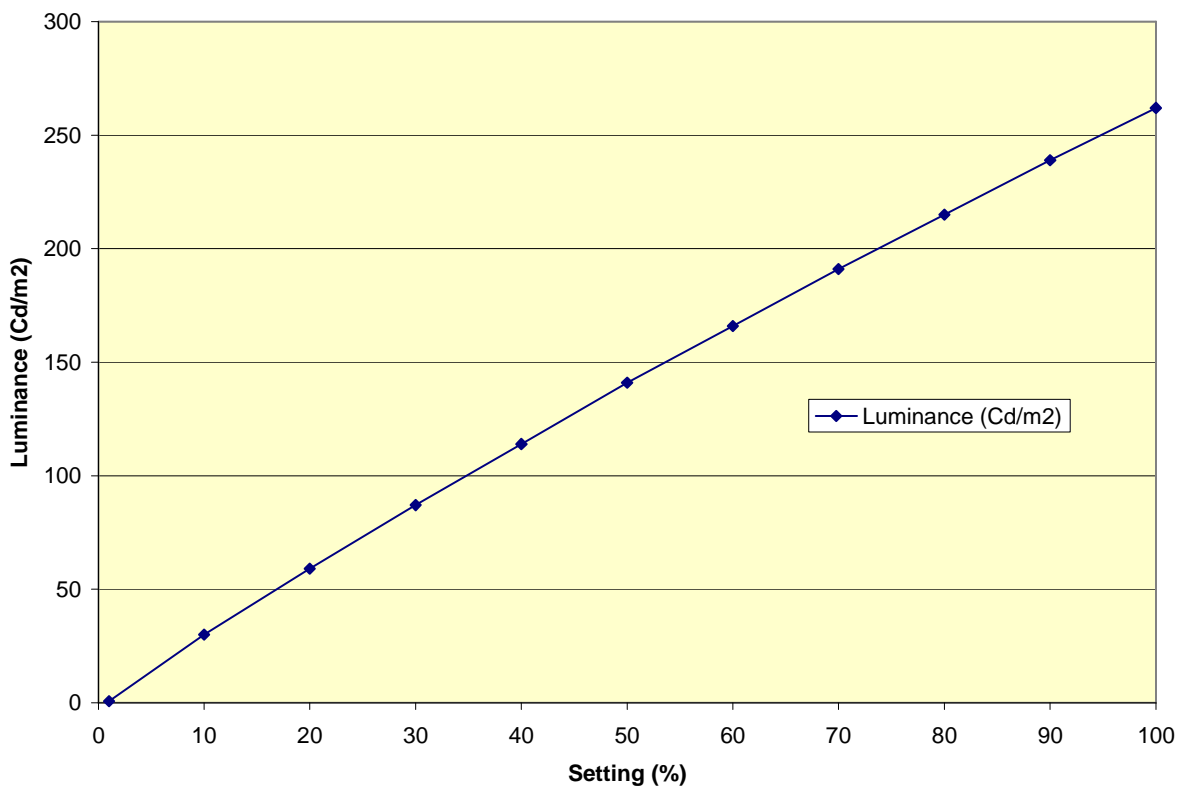
B.1.2 Reduced display luminance

2013-02-07 AMEC Camino-701 Display Luminance, Reduced Intensity



B.2 Luminance setting

2013-02-07 AMEC Camino-701 Luminance (Cd/m²) depending on setting



B.3 Flicker calculation

IEC 62288 Display Measurement

7.2.3 Temporal Stability (Flicker)

AZ: BSH/4612/4323163/13
EUT: AMEC Camino-701
S/N: A2K700017
Date: 07.02.2013

Measuring instrument:
LMT SF100

Setting

Day	full scale	
Luminance	263	cd/m ²
	Frequency (Hz)	Amplitude (mV)
DC	0	2821
Frequency 1	42	1
Frequency 2		
Frequency 3		
Sum flicker		1

100%

Dusk	half scale	
Luminance	139	cd/m ²
	Frequency (Hz)	Amplitude (mV)
DC	0	1513
Frequency 1	68	0,7
Frequency 2	195	3
Frequency 3		
Sum flicker		3,7

50%

Night		
Luminance	30	cd/m ²
	Frequency (Hz)	Amplitude (mV)

10%

DC	0	350
Frequency 1		
Frequency 2		
Frequency 3		
Sum flicker		0

IEC 62288 Display Measurement									
<u>7.2.3 Temporal Stability (Flicker)</u>									
AZ:	BSH/4612/4323163/13								
EUT:	AMEC Camino-701								
S/N:	A2K700017								
Date:	07.02.2013								
1 measurement		luminance		average		FFT coeff.		C1 frequency	
		Lm		C0		C1		f1	
1.1	bright	263,00	cd/m ²	2821,00	mV	1,00	mV	42,00	Hz
1.2	standard	139,00	cd/m ²	1513,00	mV	0,70	mV	68,00	Hz
1.3	dark	30,00	cd/m ²	350,00	mV	0,00	mV	100,00	Hz
2 ambient conditions		room Luminance			adapt.luminance		pupil area		
		Lr			Lt=Lr+Lm		A		
2.1	Day	200	cd/m ²		1.1	463,00	cd/m ²	4,65	mm ²
					1.2	339,00	cd/m ²	4,89	mm ²
					1.3	230,00	cd/m ²	5,21	mm ²
2.2	dusk	10	cd/m ²		1.1	273,00	cd/m ²	5,07	mm ²
					1.2	149,00	cd/m ²	5,58	mm ²
					1.3	40,00	cd/m ²	6,89	mm ²
2.3	dark	0,1	cd/m ²		1.1	263,10	cd/m ²	5,10	mm ²
					1.2	139,10	cd/m ²	5,64	mm ²
					1.3	30,10	cd/m ²	7,21	mm ²

2.4	screen size	screen diagonal			viewing distance	viewing angle (arc)			
		8,8	mm		0,60	m	0,84 °		
3 calculation		Lm/C0 factor			Luminance				
		k=Lrn/C0			L1=k*C1				
3.1	bright	0,09	cd/m ² *mV		0,09	cd/m ²			
3.2	standard	0,09	cd/m ² *mV		0,06	cd/m ²			
3.3	dark	0,09	cd/m ² *mV		0,00	cd/m ²			
						a	b		
		predicted energy coefficients:			1	arc<20	0,128	0,1919	
					2	20<arc<40	0,192	0,1201	
		row used	1		3	40<arc<65	0,508	0,1004	
					4	arc>65	0,53	0,0992	
		C1 energy observed				energy predicted			
		Eobs day		Eobs dusk		Eobs dark		Epred	
3.1	bright	0,87	trol	0,94	trol	0,95	trol	403,81	trol
3.2	standard	0,63	trol	0,72	trol	0,73	trol	59298,84	trol
3.3	dark	0,00	trol	0,00	trol	0,00	trol	27539863,42	trol
		pass criteria: Eobs<Epred							
		(IEC 62288 7.2.3; ISO 13406-2:2001 annex B)							

Annex C Photos of equipment under test

C.1 Display unit



C.2 Brightness measurement



C.3 Flicker measurement

