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: **Jotron**

Type: **TR-8000**

Applying test standards: IEC 62288 [Sections 4, 7]: 2008

Test Report No.: BSH/46121/4321890/12-3

Applicant:

Jotron
Østbyveien 1
3280 Tjodalyng
Norway

Hamburg, 19 April 2012
Federal Maritime and
Hydrographic Agency

by order

Heinrich Bartels

Test engineer

by order

Axel Werth

Deputy
head of section

**Federal Maritime and Hydrographic Agency**
**Bernhard-Nocht-Str. 78**
**D-20359 Hamburg**
**Germany**

nach EN ISO/IEC 17025:2005
akkreditiertes Prüflaboratorium

Deutscher Akkreditierungs Rat
DAR
DAT-P-086/98

DATech Deutsche Akkreditierungsstelle Technik in der TGA GmbH
Signatory of the Multilateral Agreement of EA and ILAC for the mutual recognition

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# Deutschen AkkreditierungsRat

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**Federal Maritime and Hydrographic Agency**
**Department Shipping**
**Laboratory for Type Approvals**
**Bernhard-Nocht-Straße 78**

**20359 Hamburg**

is competent under the terms of DIN EN ISO/IEC 17025:2005 to carry out testing in the fields of

**Marine Equipment (Navigation Equipment, Radio-Communication Equipment, Life-Saving Appliances)**

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Frankfurt/Main, 2008-12-23

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i.V. Dipl.-Ing.(FH) R. Egner
Head of the Accreditation Body

Member in EA, ILAC, IAF

Translation for information purposes only. The German Accreditation Certificate is authoritative

See notes overleaf

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# 1 General

## 1.1 Summary

Start of test: 2012-04-03

End of test: 2012-04-18

**Test standards[1]:** 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 | not applicable |
| 2.9 | (4.4.1) | DISCRIMINATION OF COLOURS | not applicable |
| 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 | not applicable |
| 2.23 | (4.10.1) | USER MANUALS, INSTRUCTIONS AND REFERENCE GUIDE | not appl./not tested |
| 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 1

| **Transponder** | | | | |
|---|---|---|---|---|
| Type | TR-8000 | | Part no. | --- |
| Delivery date | 2011-06-01 | | Serial no. | BSH Godjenning 1 |
| | | | | |
| HW Version: | Delivery date | 2011-06-01 | Version no. | |
| | Installation date | 2011-06-01 | | |
| SW Version: | Delivery date | 2012-02-07 | Version no. | 01.00.05-2141 |
| | Installation date | 2012-02-08 | | |
| SW Version: | Delivery date | | Version no. | |
| | Installation date | | | |

| **MKD** | | | | |
|---|---|---|---|---|
| Type | Jotron AIS display unit | | Part no. | --- |
| Delivery date | 2011-06-01 | | Serial no. | BSH Godjenning 1<br>0 Serie 1 |
| | | | | |
| HW Version: | Delivery date | 2011-06-01 | Version no. | |
| | Installation date | 2011-06-01 | | |
| SW Version: | Delivery date | 2012-02-07 | Version no. | 01.00.05<br>SVN 2140 |
| | Installation date | 2012-02-08 | | |
| SW Version: | Delivery date | | Version no | |
| | Installation date | | | |

### 1.2.2 EUT system no 2

| **Transponder** | | | | |
|---|---|---|---|---|
| Type | TR-8000 | | Part no. | --- |
| Delivery date | 2011-06-01 | | Serial no. | BSH Godjenning 1 |
| | | | | |
| HW Version: | Delivery date | 2011-06-01 | Version no. | |
| | Installation date | 2011-06-01 | | |
| SW Version: | Delivery date | 2012-02-07 | Version no. | 01.00.05-2141 |
| | Installation date | 2012-02-08 | | |
| SW Version: | Delivery date | | Version no. | |
| | Installation date | | | |

| **MKD** | | | | |
|---|---|---|---|---|
| Type | Jotron AIS display unit | | Part no. | --- |
| Delivery date | 2012-03-06 | | Serial no. | BSH Godjenning 1<br>0 Serie 1 |
| | | | | |
| HW Version: | Delivery date | 2012-03-06 | Version no. | |
| | Installation date | 2012-03-06 | | |
| SW Version: | Delivery date | 2012-03-06 | Version no. | 01.00.06<br>SVN 2167 |
| | Installation date | 2012-03-06 | | |
| SW Version: | Delivery date | | Version no | |
| | Installation date | | | |

### 1.2.3 EUT system no 3

| **Transponder** | | | | |
|---|---|---|---|---|
| Type | TR-8000 | | Part no. | --- |
| Delivery date | 2011-06-01 | | Serial no. | BSH Godjenning 2 |
| | | | | |
| HW Version: | Delivery date | 2011-06-01 | Version no. | |
| | Installation date | 2011-06-01 | | |
| SW Version: | Delivery date | 2012-02-07 | Version no. | 01.00.05-2141 |
| | Installation date | 2012-02-08 | | |
| SW Version: | Delivery date | | Version no. | |
| | Installation date | | | |

| **MKD** | | | | |
|---|---|---|---|---|
| Type | Jotron AIS display unit | | Part no. | --- |
| Delivery date | 2012-03-06 | | Serial no. | BSH Godjenning 1<br>0 Serie 1 |
| | | | | |
| HW Version: | Delivery date | 2012-03-06 | Version no. | |
| | Installation date | 2012-03-06 | | |
| SW Version: | Delivery date | 2012-03-06 | Version no. | 01.00.06<br>SVN 2167 |
| | Installation date | 2012-03-06 | | |
| SW Version: | Delivery date | 2012-04-13 | Version no. | 01.00.07<br>SVN 2192 |
| | Installation date | 2012-04-18 | | |
| 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 | H. Bartels / G. Skrabs |
| Location | 9°59,103 E 53°32,822 N |

| Equipment no | Start of test | End of test | Test engineer |
|---|---|---|---|
| 3 | 2012-04-02 | 2012-04-03 | Bartels |
| 3 | 2012-04-18 | 2012-04-18 | 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 | G. Skrabs |
| Location | 9°59,103 E 53°32,822 N |

| Equipment no | Start of test | End of test | Test engineer |
|---|---|---|---|
| 1 | 2012-02-23 | 2012-02-23 | Bartels |
| 2 | 2012-03-09 | 2012-03-09 | 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:

| | |
|---|---|
| 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.*

| **Date** 2012-04-02 | **Tester** Ba | **Test details** | | |
|---|---|---|---|---|
| Test item | | Check | Remark | Result |
| **4.1.1.2** | | See Annex D for guidance in the application of IEC 60945 for testing. | | 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.*

| **Date** 2012-04-02 | **Tester** Ba | **Test details** | | |
|---|---|---|---|---|
| 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 dis-played 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)

| **Date** 2012-04-02 | **Tester** Ba | **Test details** | | |
|---|---|---|---|---|
| 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. | | Passed |

## 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).*

| **Date** 2012-04-02 | **Tester** Ba | **Test details** | | |
|---|---|---|---|---|
| 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. | Because of the small size of the display there is only one operational or user dialogue area displayed at a time. | 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/m2 ± 50 % |
| **Dusk** | 10 cd/m2 ± 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- (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 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.

| **Date** 2012-04-02 | **Tester** Ba | **Test details** | | |
|---|---|---|---|---|
| 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/m² to a maximum level of at least 85 cd/m², and confirm that the values for brightness used for the setup are stable after the stabilisation period defined by the manufacturer. | The maximum value is 315 cd/m².<br>The minimum value is 0 cd/m² (completely off).<br>The next step – the lowest readable step – is 0.6 cd/m². | 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. | There is a night mode with light forground on dark background and individual settings, different to the day mode | 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 maximum variation accross the display is 16%.<br>It has been measured at maximum and reduced brightness | 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. | | 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. | | 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.

| **Date** 2012-04-02 | **Tester** Ba | **Test details** | | |
|---|---|---|---|---|
| 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 alpha-numeric data and text is presented using non-italic, 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 Character size is 3.5 mm, according to a viewing distance of 1 m | 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.

| **Date** 2012-04-02 | **Tester** Ba | **Test details** | | |
|---|---|---|---|---|
| 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. | • The following terms are used: RNG, BRG, MMSI, LAT, LON, HDG,ROT, SOG, COG, CPA, TCPA, ETA. | 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.

| **Date** 2012-04-02 | **Tester** Ba | **Test details** | | |
|---|---|---|---|---|
| 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, place-ment, and grouping; | | Passed |
| **b)** | | confirm by observation that icons used for data and control function are presented according to Annex E. | Only the North up Icon is used to indicat the north-up orientation of the screen. | 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.

| **Date** 2012-04-02 | **Tester** Ba | **Test details** | | |
|---|---|---|---|---|
| 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. | | 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 recommended colours in the IHO ECDIS Presentation Library, or an equivalent, as far as practical (see Clause D.6 for additional guidance). | | N/A |

## 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 ($v2 < 0,2$) shall be avoided for images subtending less than 35 mm/m (2° of arc) of viewing distance.

| **Date** 2012-04-02 | **Tester** Ba | **Test details** | | |
|---|---|---|---|---|
| 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; | See separate table below. Retest 2012-04-18 Ba: | 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. | | N/A |
| **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. | | N/A |

| **Test details** - Symbols | | |
|---|---|---|
| Symbol | Remark | Result |
| Own ship | The simplified symbol in combination with the minimised symbol is used.<br>The diameter of the outer circle is only 3 mm, but according to Annex E it should be 6 mm.<br>Therefore we recommend to use the minimised symbol only for the own ship<br>Retest 2012-04-18 Ba:<br>The minimised symbol is used for the own ship. | Passed |
| AIS target | • The shape and size is correct<br>• The symbol is oriented according to COG, even if heading is available. If heading is available it should be oriented according to the heading. If only SOG but no heading is available it can be oriented according to the SOG.<br>Retest 2012-04-18 Ba:<br>The symbol is oriented according to heading if available. If heading is not available it is oriented accroding to COG. | Passed<br>Passed |
| Selected target | The selected target is indicated by a dashed rectangle around the complete symbol including the heading line and oriented according to the symbol orientation.<br>The correct indication is a broken square, not oriented according to the symbol<br>Retest 2012-04-18 Ba:<br>The selected target is indicated by a broken square, not oriented according to the symbol | Passed |
| SART | The SART is displayed in red colour<br>This is not according to the display standard which says that the same basic colour as for an AtoN should be used.<br>Nevertheless I think the red colour is acceptable. | Passed |
| AtoN | A virtual AtoN is displayed in the same way as a real AtoN<br>I think this is acceptable for an MKD | Passed |
| Base station | A square is used with one side down. | Passed |
| | | |

## 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.

| **Date** 2012-04-02 | **Tester** Ba | **Test details** | | |
|---|---|---|---|---|
| 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; | | 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.).

| **Date** 2012-04-02 | **Tester** Ba | **Test details** | | |
|---|---|---|---|---|
| Test item | | Check | Remark | Result |
| **4.6.1.2** | | Confirm by observation that the colours within each colour table clearly differ from one another. | | 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*.

| **Date** 2012-04-02 | **Tester** Ba | **Test details** | | |
|---|---|---|---|---|
| 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. | | N/A |

## 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.

| **Date** 2012-04-02 | **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; | | 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. | | N/A |

## 2.15 (4.6.4) Flashing of information

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

| **Date** 2012-04-02 | **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. | Flashing is not used | 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*.

| **Date** 2012-04-02 | **Tester** Ba | **Test details** | | |
|---|---|---|---|---|
| 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; | Using the “Indicators” menue | 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.*

| **Date** 2012-04-02 | **Tester** Ba | **Test details** | | |
|---|---|---|---|---|
| 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; | | N/A |
| **b)** | | confirm by observation that the colour red is used to indicate invalid information. | | 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.).

| **Date** 2012-04-02 | **Tester** Ba | **Test details** | | |
|---|---|---|---|---|
| Test item | | Check | Remark | Result |
| **4.7.3.2** | | Confirm by observation that a conspicuous time-varying indication is provided in all presentation modes. | There is a UTC time indication in the top status line with the UTC second is changing 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*** |
|---|---|---|
| *Alarm, not acknowledged* | *Red, Flashing* | *Accompanied by an audible signal* |
| *Alarm, acknowledged* | *Red* | *Suppression of audible signal* |
| *Invalid Information* | *Red* | Silent |
| Information with *low integrity* | *Yellow* | *Silent* |
| *Important Indications (Warnings)* | *Yellow* | *Silent* (*unless otherwise specified*) |
| *Normal State* | *Optionally Green* | *Silent* |

| **Date** **2012-04-02** | **Tester** **Ba** | **Test details** | | |
|---|---|---|---|---|
| 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. | | 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.*

| **Date** 2012-04-03 | **Tester** Ba | **Test details** | | |
|---|---|---|---|---|
| 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; | Covered by IEC 61993-2 | Passed |
| **b)** | | where display equipment supports the presentation of alarms from multiple sources (for example, from multiple navigational systems and equipment): | | 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. | Covered by IEC 61993-2 | 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)*.

| **Date** 2012-04-03 | **Tester** Ba | **Test details** | | |
|---|---|---|---|---|
| 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. | | 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.

| **Date** 2012-04-03 | **Tester** Ba | **Test details** | | |
|---|---|---|---|---|
| Test item | | Check | Remark | Result |
| **4.9.1.2** | | Confirm by observation that the presentation modes in use are clearly indicated. | Only 1 mode is possible for AIS MKDs (North-up ground-stabilised)<br>The North-up orientation is indicated by the appropriate symbol of Annex E.5 | 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.)

| **Date** 2012-04-03 | **Tester** Ba | **Test details** | | |
|---|---|---|---|---|
| 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. | Covered by IEC 61993-2 | Passed |

## 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.

| **Date** 2012-04-03 | **Tester** Ba | **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) 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). | A contrast control is not provided and not applicable for the type of LCD display | N/A |
| **b)** | | Confirm by observation that a manual brightness control is provided. | | Passed |
| **c)** | | Verify the adjustment of contrast and brightness in accordance with 4.3.1: (See 4.3.1.2.) | The brightness can be adjusted from 0 cd/m², 0.6 cd/m² up to 315 cd/m². | Passed |
| | | 1) confirm by observation that the contrast and brightness controls can be reset to their default values; | A short push on the on/off button (this is the only hardware button) a menu is displayed to get the default settings. This menu uses the default settings. So it is readable also if the display is not readable with the current setting. | 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.) | No disply of chart information | N/A |

| | | | |
|---|---|---|---|
| **d)** | Confirm by inspection of documented evidence that the default conditions for contrast and brightness controls are identified. | | Passed |

## 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.*

| **Date** 2012-04-03 | **Tester** Ba | **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 informa-tion. | | 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.

| **Date** 2012-04-03 | **Tester** Ba | **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 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. | Evaluated by measurement.<br>There were no temporal frequencies found below 30 kHz. | 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. | | 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.

| **Date** 2012-04-03 | **Tester** Ba | **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 are locatable by visual or tactile means; | There are no physical controls (Touch screen) | 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 4.3.2, 4.3.3 and 4.3.4; | | N/A |
| **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 presens of power is indicated by the light emitting screen | Passed |
| **g)** | confirm by observation that a visual indication of the presence of video signals to the display equipment is provided. | It is an internal display not using a video signal | 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.

| **Date**<br>**2012-04-03** | **Tester**<br>**Ba** | **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; | | 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).*

| **Date** 2012-04-03 | **Tester** Ba | **Test details** | | |
|---|---|---|---|---|
| Test item | | Check | Remark | Result |
| **7.4.2** | | Verify in accordance with 4.4.1. | 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).

| **Date** 2012-04-03 | **Tester** Ba | **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 the display equipment supports a screen resolution of at least 1280 | | N/A |

| | | | |
|---|---|---|---|
| | × 1024 or equivalent if the equipment uses a different aspect ratio;<br>Alternatively, confirm by inspection of documented evidence that the display equipment supports the minimum screen resolution permitted by the applicable Performance Standards.<br>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. | | |
| **b)** | confirm by inspection of documented evidence that the display equipment provides amaximum pixel pitch of not more than 1 min of arc;<br>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. | | 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 |

## 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.*

| **Date**<br>**2012-04-03** | **Tester**<br>**Ba** | **Test details** | | |
|---|---|---|---|---|
| Test item | | Check | Remark | Result |
| **7.6.2** | | Verify in accordance with 4.3.1. | The MKD uses a wide angle screen | Passed |

# Annex A Test equipment summary

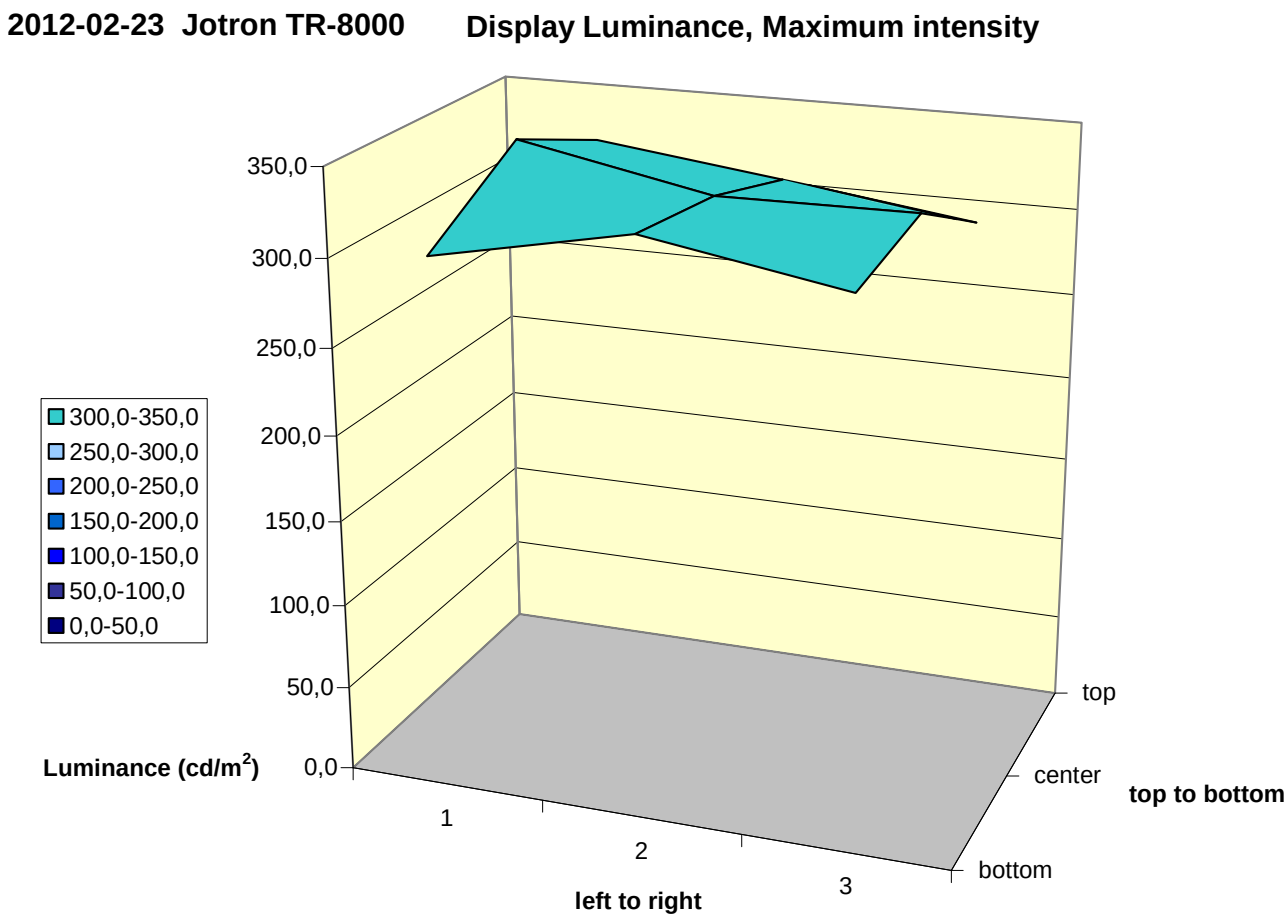
| # | Description | Type | Identification (S/N / Bund-Nr.) |
|---|---|---|---|
| 1 | Luminance Meter | LMT L 1009 | 0388231 / 2165 |
| 2 | System Flash Meter | LMT SF 100 | 1195151 / - |
| 3 | Digital Multimeter | Tektronix DMM 916 | 138531 / 97/248/643 |
| 4 | Oscilloscope | LeCroy Wavesurfer 422 | LCRY0301J15673 / 106106/2005 |

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.

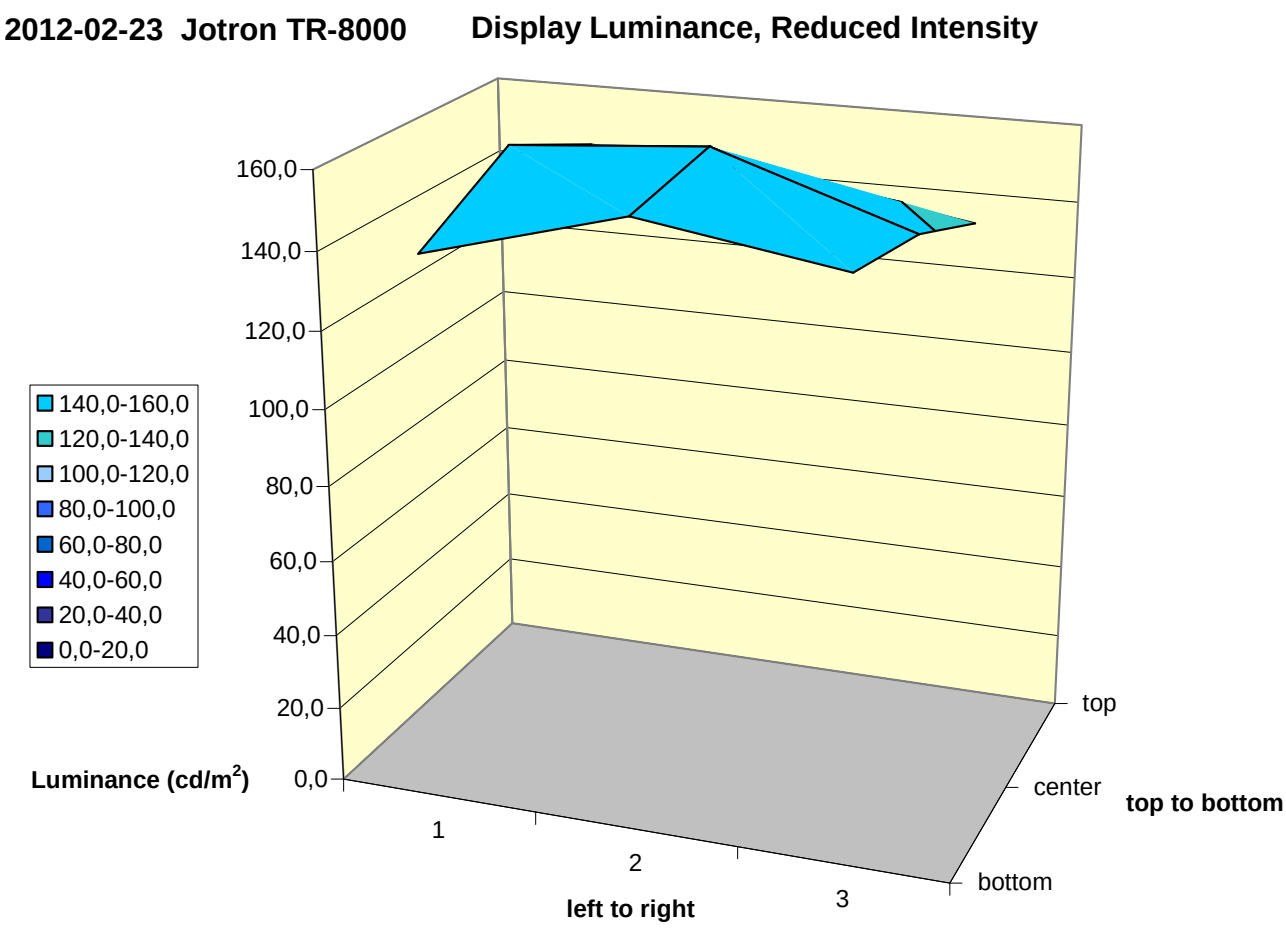
# Annex B Test diagrams

## B.1 Brightness measurement

### B.1.1 Maximum display luminance



## B.1.2 Reduced display luminance



# B.2 Variation calculation

## IEC 62288 Display Measurement

### *4.3.1 Readability under all ambient light conditions*

AZ: BSH/4612/4321890/12
EUT: Jotron TR-8000
S/N: 0 Serie 1 Titel 2012-02-23 Jotron TR-8000
Date: 23.02.2012

Measureing equipment: LMT L1009

**Maximum intensity**

| | | | |
|---|---|---|---|
| 316,0 | 302,0 | 287,0 | cd/m² |
| 343,0 | 321,0 | 322,0 | cd/m² |
| 307,0 | 330,0 | 311,0 | cd/m² |

| | | |
|---|---|---|
| Average | 315,4 | cd/m² |
| Minimum | 287,0 | cd/m² |
| Maximum | 343,0 | cd/m² |
| Variance (%) | **16%** | |

**Reduced intensity**

| | | | |
|---|---|---|---|
| 144,0 | 140,0 | 132,0 | cd/m² |
| 156,0 | 161,0 | 143,0 | cd/m² |
| 142,0 | 156,0 | 148,0 | cd/m² |

| | | |
|---|---|---|
| Average | 146,9 | cd/m² |
| Minimum | 132,0 | cd/m² |
| Maximum | 161,0 | cd/m² |
| Variance (%) | **18%** | |

# Annex C Photos of equipment under test

## C.1 TR-8000 Display unit



3


3

# C.2 Brightness measurement

# C.3 Flicker measurement