# SeaLine MK3 Monitors

## *USER'S MANUAL*

Type number: SL150-01.MON.03/ SL190-02.MON.03/ SL213-01.MON.03/ SL231-02.MON.03

**January 2014**



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## Table of Contents







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# 1. Foreword

Thanks for purchasing a North Invent Sea Line Monitor. Our series of rugged TFT LCD Display Monitors are conceived and built with the greatest care and state of the art electronic and software features. North Invent focuses its full expertise in offering dedicated display solutions, matching with your highest requirements and use.

Before starting operating the Monitor, we would like to suggest that you carefully read through the present document, as our aim with this User's Manuel is to give you the best experience in using our Monitors.

May you have any suggestions for improvements, or any feedbacks about this manual, the Monitor and/or its features, feel free to contact us. We will be pleased to oblige.

This User's Manual is for use only with our Sea Line MK3 Monitors. To assess which series of Monitor you are in possession of, please check the Serial Number plate at the back of the screen. The mention shall bear MON.03 (see below). May you have a different series of Monitor, please contact us, so to have the proper manual sent to your attention.

### Terms and abbreviations

| | |
|---|---|
| DVI | Digital Visual Interface |
| DVI-A | - Analog |
| DVI-I | -Integrated |
| HMI | Human- Machine Interface |
| LCD | Liquid Crystal Display |
| LED | Light-Emitting Diode |
| OSD | On-Screen Display |
| RGB | Red-Green-Blue |
| TFT | Thin Film Transistor |
| VGA | Video Graphics Array |

## 1.1 Monitor description

The Sea Line monitors are a series of rugged TFT LCD Display Monitors available in 15'', 19'', 21.3'' and 23.1'' display sizes. All of our Monitors can be flush mounted or equipped with stand, turntable and/or sunshade.

- *Each Sea Line MK3 Monitor is designated as below:*

| | | | | | |
|---|---|---|---|---|---|
| SL | 150 | 01 | MON | 03 | xxxx |
| SL | 190 | 02 | MON | 03 | xxxx |
| SL | 213 | 01 | MON | 03 | xxxx |
| SL | 231 | 02 | MON | 03 | xxxx |





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Where “SL” stands for Sea Line, “150/190/213/231” for the display’s Size, “01/02” for the hardware Revision, “MON“ for Monitor, “03” for Version MK3 and “xxxx” for identification of minor variants (bezel colors, flash logo, OEM labels etc.).

- *Each Monitor is constituted by the following set of components:*

- Front glass with the User Interface Panel
- Display Frame and all necessary electronic components
- Rear cover and Terminal plate
- 1 x Power AC Cable / 1 x DC plug / 1 x VGA Cable
- 4 x M6 x 25, Stainless Steel screws for front mounting / 4 x Cover for M6 screws

(optional)

- Stand
- Turntable
- Sunshade

- *Each Monitor presents the following materials and features:*

- The Front, Display Frame, Cover, Stand, Turntable and Sunshade are made of Marine Grade Aluminium allowing to reduce weight while eliminating corrosion problems.

- The electronic set of components includes a specifically designed Power Supply, a high quality Display Controller, a Backlight Inverter, with sealed transformers, and a custom-made Interface Board.

- All our Monitors use identical Power Supply and User Panel. The Power Supply can be supplied with 115/230 VAC and/or 24 VDC, and even be used as a part of an UPS.

- All our Monitors can be flush mounted (front or back tightened with stainless screws) or used as free standing units with use of a Stand and/or a Turntable.

- Furthermore, when flush mounted, all our Monitors can be water- and dust- tight sealed, with the use of optional Sealing Kits, to be mounted at the back of the display frame into the dedicated sealing groove. These specific (per size of Monitor) Sealing Kits being recommended to further protect all electronics, against harsh environment.

- All our Monitors come with VGA, DVI, S-Video and Composite video inputs, and a RS232 input for remote control purposes.

- Pixel pitch on all displays are 0,294 mm both in x and y direction. This pixel pitch equals 1 m viewing distance with a viewing angle of 1 minute of arc as required in IEC 62.388 section 6.13.2.b.
  Nominal viewing distance in a normal environment is 1,0 m.





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- *Each Monitor complies with the following international Standards and Requirements:*

- All our Monitors has been tested by the Danish testing body “DELTA” (Danish Electronics, Light & Acoustics, DK-2970 Hørsholm) and found to comply with the requirements of the International Association of Classification Societies (IACS) as well as the selected requirements of IEC 60945, IEC 60533, IEC 60529 and MIL-STD-810F.

- All our Monitors are approved in compliance with the international standard IEC 60945 : 2002 (Clause 4.4 Equipment category b, protected from the weather (formerly class B)), Maritime navigation and radiocommunication equipment and systems - General requirements - Methods of testing and required test results.

- The compass safe distance indication is placed on the rear label (see figure 1.) and is valid for the Monitor only. It excludes accessories like sunshade, turntable and stand.





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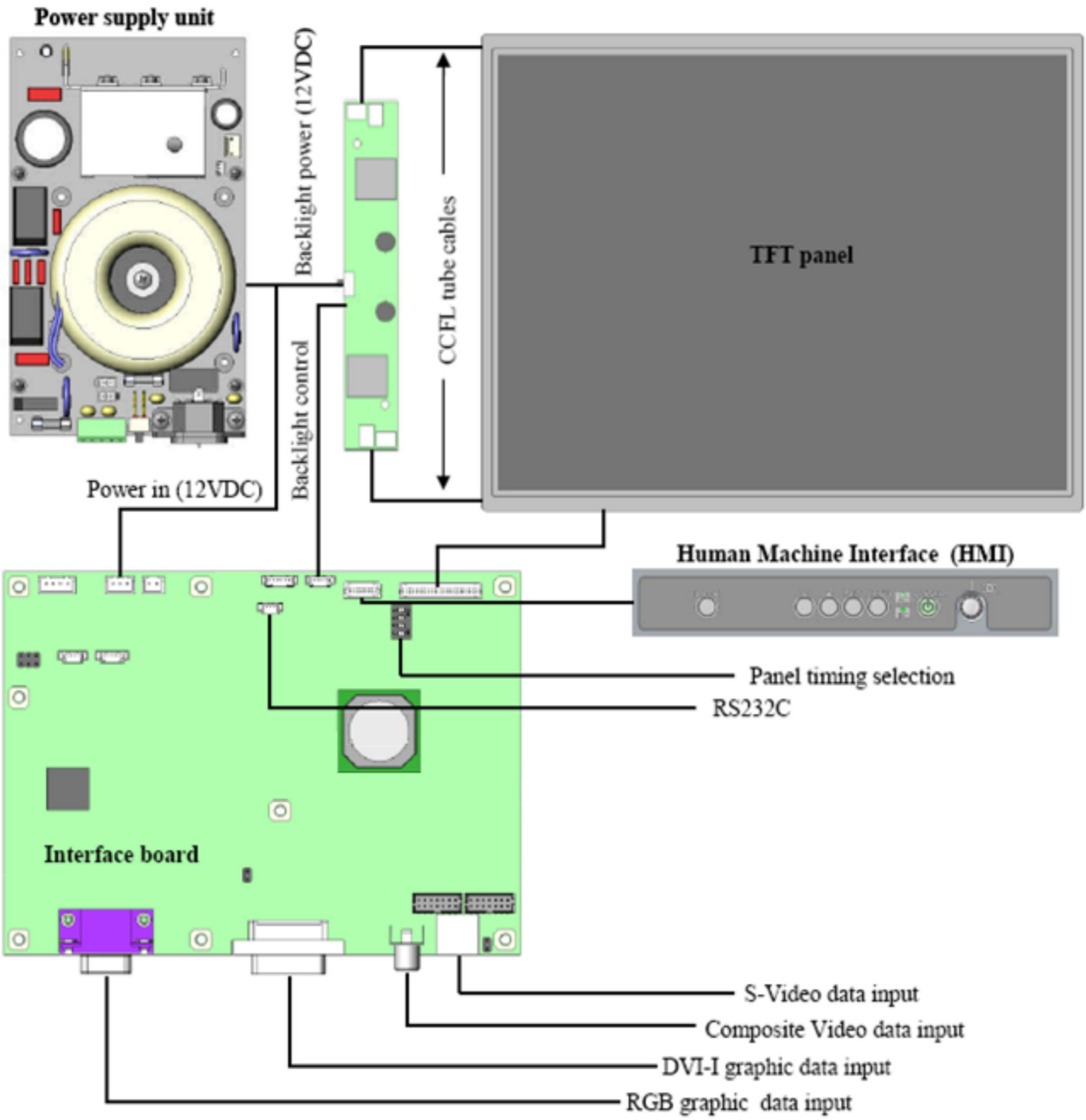
### 1.2 Main schematic overview




**Please note, that hardware revision 02 (19” and 23”) now have LED drivers and LED backlight instead of CCFL.**





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### 1.3 Packaging and delivery

Please check the delivered goods immediately on receipt with respect to damages caused by transportation and inform the delivering freight carrier immediately, on site, about any visible transport damages. Additionally, inform us immediately in writing, at the latest within 5 work days, about any visible transport damages. At reception, the delivery includes the following items:

- Sea Line MK3 Monitor
- Sea Line MK3 User's Manual
- VGA cable
- AC power cable
- DC power plug
- Front mounting screws and screw covers

- DVI cable (optional)
- Stand (optional)
- Stand mounting screws and screw covers (optional)
- Turntable (optional)
- Turntable mounting screws and screw covers (optional)
- Sunshade (optional)
- Sunshade mounting screws and screw covers (optional)
- Sealing Kit (optional)





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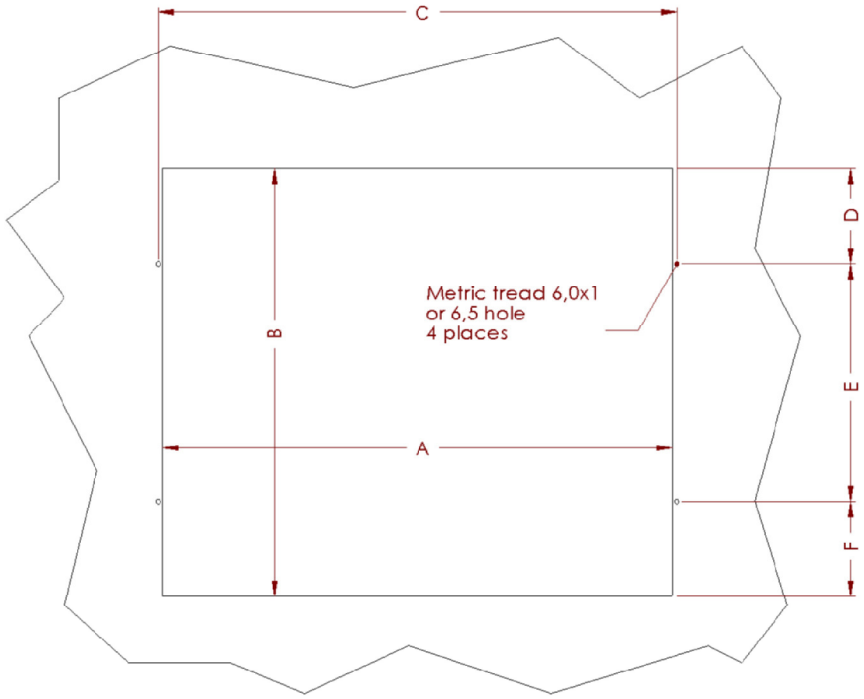
## 1.4 Mechanical Dimensions

***Panel cut out dimensions***




| Panel type | Measurements (mm) | | | | | |
|---|---|---|---|---|---|---|
| | A | B | C | D | E | F |
| SL150-01.MON.03 | 368 | 313 | 377.5 | 66.5 | 180 | 66.5 |
| SL190-02.MON.03 | 438 | 385 | 447.5 | 82.5 | 220 | 82.5 |
| SL213-01.MON.03 | 501.8 | 422 | 511.3 | 93.75 | 234.5 | 93.75 |
| SL231-02.MON.03 | 564 | 493.8 | 573.5 | 111.7 | 270.4 | 111.7 |





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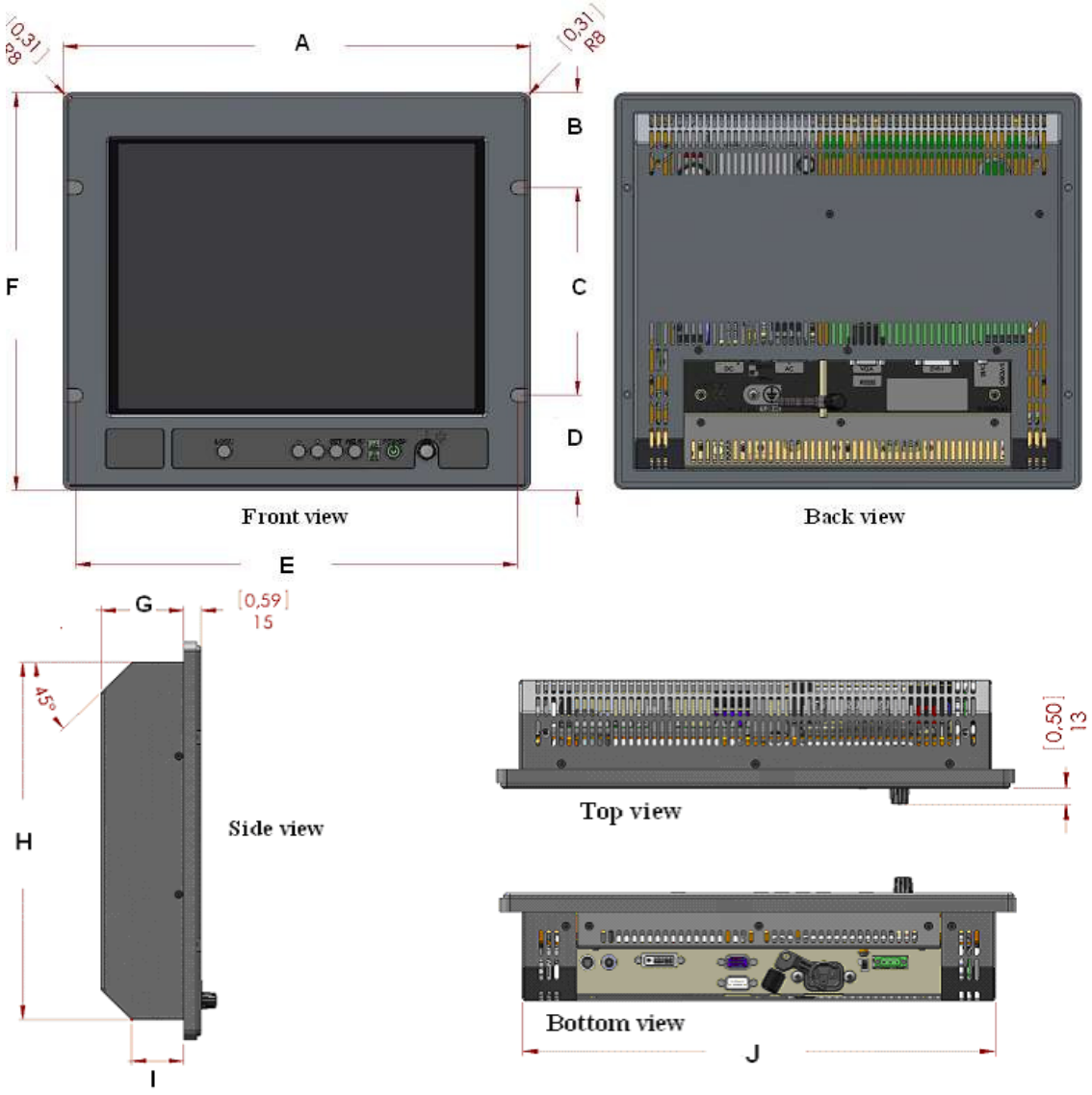
***Front mounting dimensions***




| Panel type | Measurements (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J |
| SL150-01.MON.03 | 400 | 83 | 180 | 83 | 377.5 | 345 | 70 | 310 | 44 | 365 |
| SL190-02.MON.03 | 470 | 98.5 | 220 | 98.5 | 447.5 | 417 | 70 | 382 | 44.1 | 435 |
| SL213-01.MON.03 | 533.8 | 109.75 | 234.5 | 109.75 | 511.3 | 454 | 75.4 | 419 | 49.48 | 498.8 |
| SL231-02.MON.03 | 596 | 127.7 | 270.4 | 127.7 | 573.5 | 525.8 | 77.4 | 490.8 | 51.48 | 561 |





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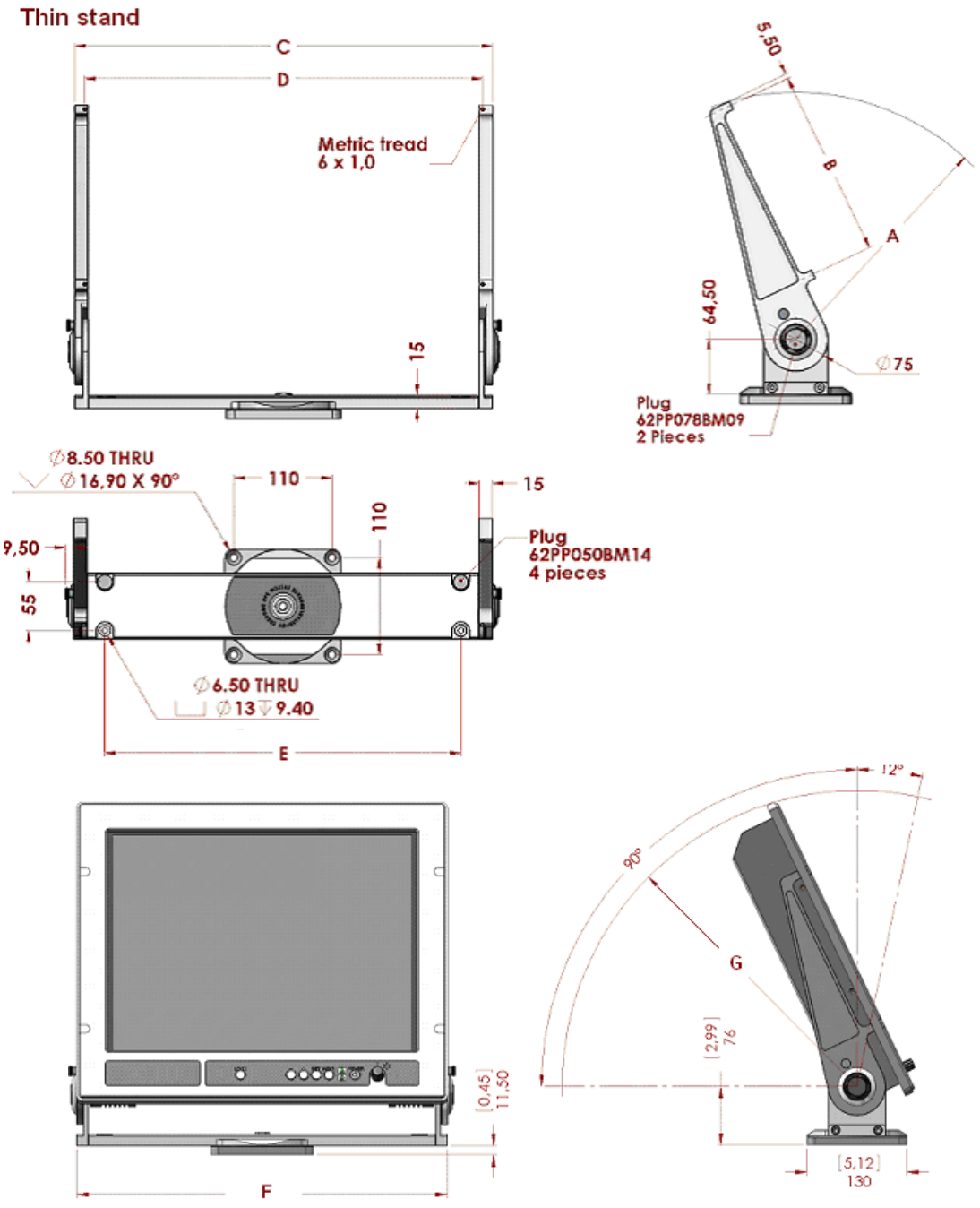
***Stand alone dimensions (with stand and turntable)***




| Stand type | Measurements (mm) | | | | | | |
|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G |
| SL150-01.STA.01 | 235 | 180 | 400 | 377.5 | 328.9 | 399 | R313 |
| SL190-01.STA.01 | 290 | 220 | 470 | 447.5 | 399 | 469.55 | R384 |
| SL213-01.STA.01 | 315.5 | 234.5 | 533.8 | 511.3 | 462.6 | 533 | R420.21 |





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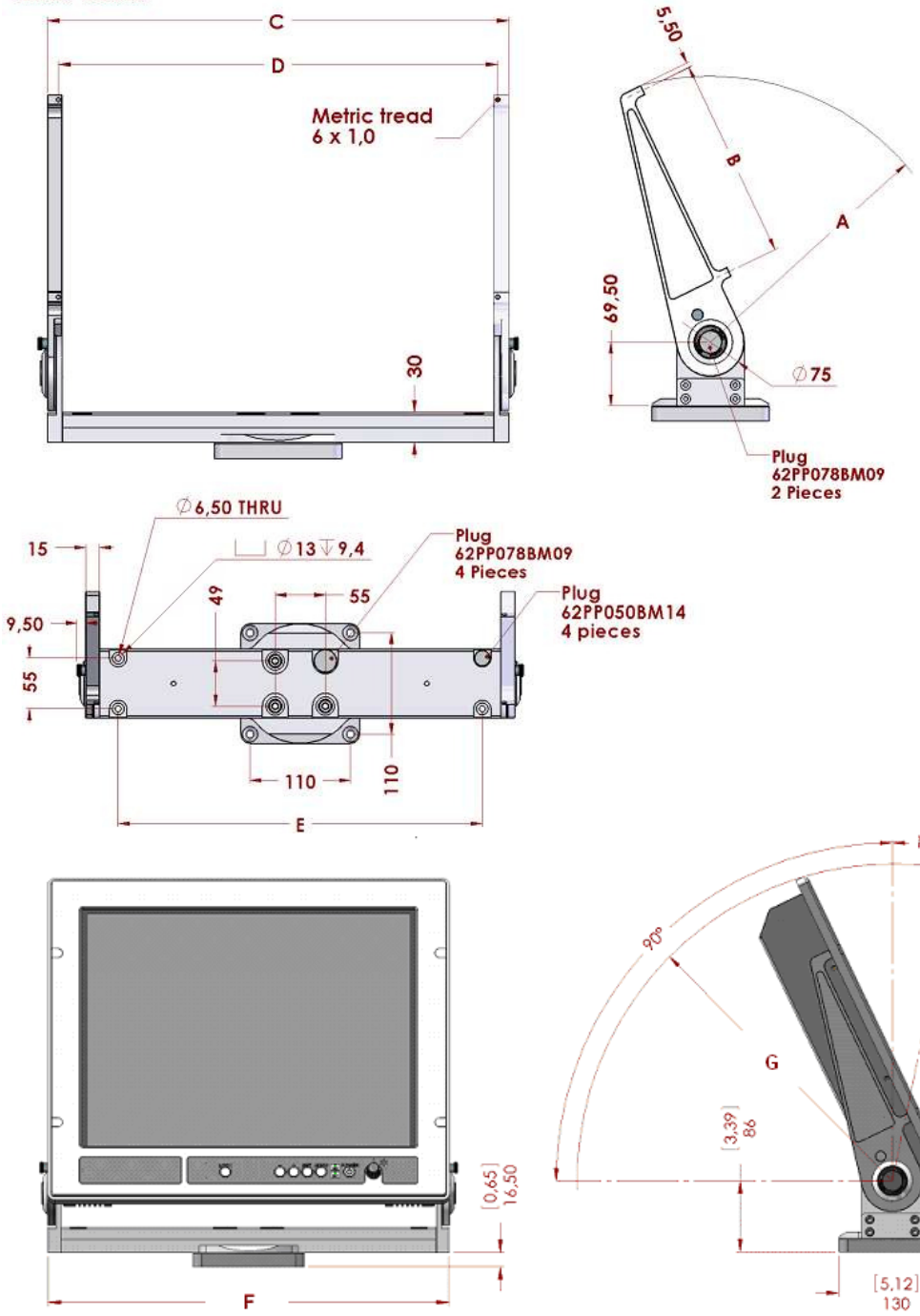
**Thick stand**




| Stand type | Measurements (mm) | | | | | | |
|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G |
| SL190-01.STA.02 | 290 | 220 | 470 | 447.5 | 399 | 469.55 | R384 |
| SL213-01.STA.02 | 315.5 | 234.5 | 533.5 | 511 | 462.6 | 533 | R420.21 |
| SL231-01.STA.01 | 361 | 270.4 | 596 | 573.5 | 526 | 596 | R483.44 |





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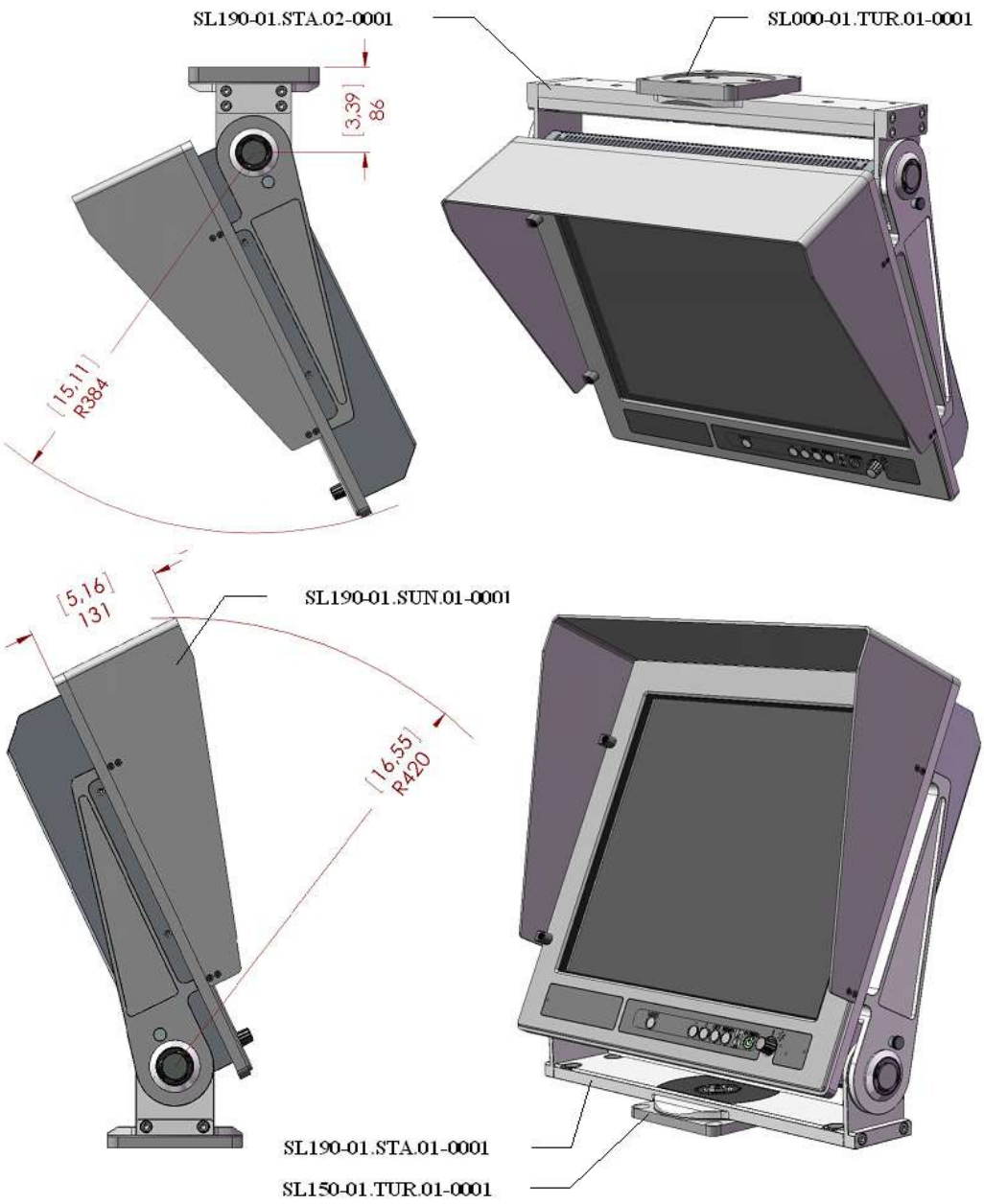
***Stand alone dimensions (with stand, turntable and sunshade)***





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### 1.5 Mechanical installation

All our Monitors are delivered with all necessary accessories as specified on the order confirmation.

- **Front mounting**

- When the Monitor is flush mounted, one must imperatively use the 4 x M6 screws and covers enclosed in the delivery. The tightening moment must be of 8-10 Nm.

- **Stand mounting**

- The Monitor is fixed to the Stand by using the 4 x M6 screws and covers enclosed in the delivery. The tightening moment must be of 8-10 Nm.

- The viewing angle of the Monitor can be adjusted from -12° to 90° (vertical) and maintained in position by using the manual screws on each side of the Stand. Pull out the screws and turn them anticlockwise until they are loose. Move the Monitor to the desired viewing angle and turn the manual screws clockwise this time, until they are tightened again.

- If the Monitor is exposed to severe vibration or shock, firmly maintain it in position by using 2 x M10 nuts on each side of the Stand.

- 2 versions of stand are available thin (single layer) or thick (double layer). The reinforced stand will be more stable for bigger Monitors size, such as the 19”, 21.3” and 23.1” ones.

- **Turntable mounting**

- When ordered together, the Turntable comes mounted on the Stand on delivery.

- Orientation of the Monitor can be made from 0-360° by simply turning the Monitor with a slight lateral pressure on the turntable. The forced needed to turn the Monitor can be adjusted using the M10 nuts on the top of the Turntable. Remove the plastic covers and loose or tighten the screws. Remember to reposition the plastic covers again.

- If the Monitor is exposed to severe vibration or shock the M10 screws can be tightened at 8-10 Nm. Remember to loose the screws before adjusting the Turntable again.

- The Monitor is fixed to the Stand by using the 4 x M6 screws and covers enclosed in the delivery. The tightening moment must be of 8-10 Nm.

- **Sunshade mounting**

- The Sunshade is fixed to the Monitor by using the 4 x M3 screws and covers enclosed in the delivery.

- Remove the 4 screw covers from the Monitor’s frame and position the Sunshade on the Monitor. The Sunshade screws will fit into the hole and shall be tightened at 2-3 Nm. Remember to position the covers again.





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- **Sealing Kit mounting**

- The kit consists of a gasket, 4 small O'rings and a pot of grease.

- Ensure that the surface to be in contact with the back of the frame, and thus the gasket, is plane and has been cleaned, prior to firmly flush mount the Monitor in place.

- The gasket must be positioned totally into the surrounding groove at the back of the Monitor's frame. Cover both the gasket and the front evenly with grease. Position carefully the monitor in the panel cut out, and adjust the edge of the gasket so that it levels the front.

- Position the 4 small O'rings into their respective screw holes, grease slightly every one of them before tightening the 4 front screws.

## 1.6 Electrical installation

- All electrical connections are to be found on the lower back side of the Monitor. All necessary electrical indications are to be found on the Terminal Plate at the bottom of the Monitor's backside.

- May the Monitor be exposed to severe vibration or shocks, all electrical cables can firmly be maintained in position, using the 2 black plastic cable retainers.

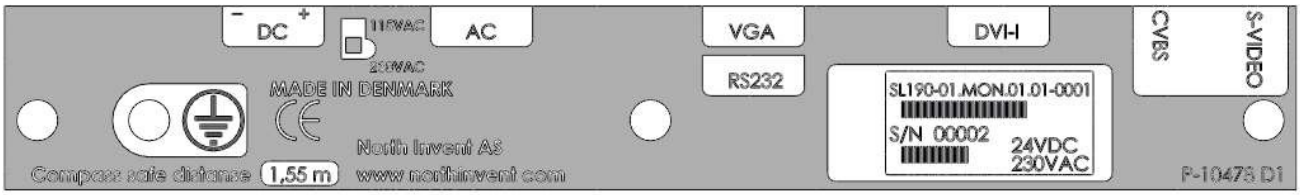


**Figure 1**. Terminal Plate for a 19" Sea Line Monitor.

- **Power supply**

- The Monitor can be supplied with 115/230 VAC and/or 24 VDC. The AC voltage can be selected on a slide switch placed between the AC and DC input connectors. The lower position (by default) selects 230 VAC while the upper position selects 115 VAC.

- The Monitor is connected to AC voltage by means of the standard AC power cable included in the delivery. The AC current to the Monitor must be limited by a 10A fuse or similar.

- The Monitor is connected to DC voltage by means of the DC power plug included in the delivery and wires suitable for up to 8 A. The Monitor will not be damaged by reversed polarity, may it occur.

- **Earth connection**

- On the Terminal Plate an icon, marked with an earth symbol, is presented for placing of the earth connection screw, allowing safe earth connection. Please use a cable of minimum 1.3 $mm^2$ (16 AWG) with crimp terminals.

- Remember to fasten the earth connection screw for adequate earth connection.





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- **VGA cable (Analog RGB)**

- The VGA cable is included in the delivery.

- Remember to fasten the VGA cable's fixing screws for adequate connection.

- **DVI cable (Digital RGB)**

- The DVI cable is not included in a standard delivery but is available as an option.

- The DVI cable is to be connected to the DVI-I terminal.

- Remember to fasten the DVI cable's fixing screws for adequate connection.

- **Video cables**

- Video signals can be obtained by connecting the Monitor to the S-VHS (S-Video) and CVBS (composite video) terminals. The video cables must be of high quality in order to avoid signal's interference.

- **RS232 cable**

- The Monitor is equipped with a standard 9-pin D-SUB female connector for RS232 remote control.

- Further information about this interface and the remote control is to be found in the Remote Control section.

- **Compass safe-distance**

- Every component of type approved equipment is tested in order to determine the minimum safe distances at which it should be installed from both the steering and the standard magnetic compasses, so not to significantly affect the accuracy of these compasses. The safe compass distances are mentioned on every Monitor or in the accompanying handbook. A safe distance takes into account both the constant effect on a magnetic compass, of the presence of magnetic material but also any variable effect due, for instance, to electrical circuits or the opening/closing of drawers or panels. Thus, provided that a Monitor is not placed in a position nearer to the centre of the bowl of a magnetic compass than the recommended safe distance, the Monitor may be installed or removed without any need for adjustment of that compass.

- SL150-01.MON.03 1.00m
- SL190-02.MON.03 1.55m
- SL213-01.MON.03 1.60m
- SL231-02.MON.03 2.10m

- The safe distance is also indicated on the terminal plate of every Monitor as shown on Figure 1.

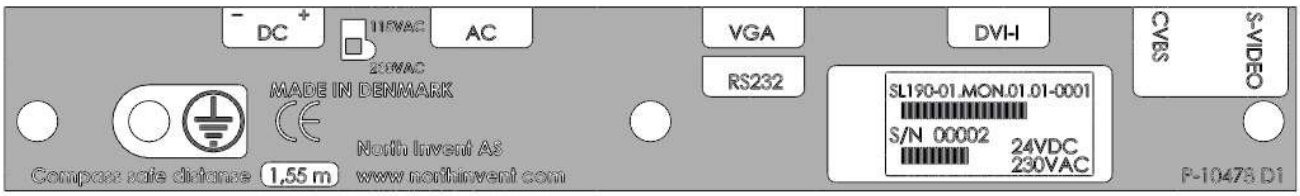


**Figure 1**. Terminal Plate for a 19" Sea Line Monitor.





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## 2. Operating Instructions

The following instructions assume that the Monitor has been correctly installed and that the commissioning work has been finalised.

### 2.1 Controls and indicators

- Controls and Indicators are placed on the User Panel in the lower right side of the Monitor.
- Normal functioning of the Control knobs and Indicators are explained in the following table:

| Control / Indicator | Function |
|---|---|
| POWER | Press once to switch the Monitor ON.<br>Press for 5 sec to switch the Monitor OFF. |
| AC | Indicates that the Monitor is supplied with 115 or 230 VAC. |
| DC | Indicates that the Monitor is supplied with 24 VDC |
| LOCK | Press once to activate the OSD in unlocked state.<br>Press LOCK and MENU for 5 sec to unlock and activate the OSD in locked state. |
| MENU | Press once to activate the OSD in unlocked state.<br>Press once to deactivate the OSD again.<br>Press once to change from sub to main menu. |
| SET | Press to indicate/change the video input source (OSD not active).<br>Press once to go to the selected sub menu (OSD active).<br>Press once to set or unset the selected sub menu (OSD active). |
| + | Press and hold to increase the indicator brightness (OSD not active).<br>Press once to select the next menu (OSD active).<br>Press or hold to increase values (OSD active). |
| – | Press or hold to decrease the indicator brightness (OSD not active).<br>Press once to select the previous menu (OSD is active).<br>Press or hold to decrease values (OSD active). |
| DIMMING KNOB | Turn clockwise to increase the screen's backlight (brightness).<br>Turn anticlockwise to decrease the screen's backlight (dimming). |

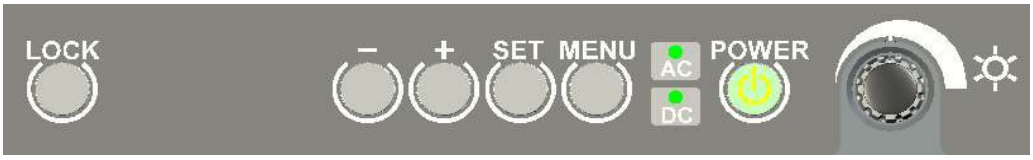


**Figure 2.** Front Panel with controls and indicators.

### 2.2 Start-up

- Ensure that power and a valid video signal are supplied to the Monitor. Standard video signals are listed in the Mode Table section below.





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- Press the Power control once – the Power, LOCK and relevant AC/DC indicators will light up. The control and indicator backlight can be adjusted using the +/− controls. When Locked (e.g. ECDIS mode) the indicator and the control panel backlight will follow dimming of the display backlight. In ECDIS mode the backlight, control and indicator are preset to Day, Dusk and Night (controlled via RS232).

- The Monitor will search for a video signal on the last selected input source. If the Monitor states “No Input Signal – Going to Sleep”, the correct source can be selected using the OSD (see below). The default source is the standard VGA input.

- The screen brightness can now be adjusted using the dimming Knob on the Front Panel and the picture positioning and size can be adjusted using the OSD (see below).

### 2.3 Source Input Messages

- After start-up of the Monitor a short message will appear in the same space provided for the OSD (see below). The different messages are explained in the following table.

| Message | Explanation |
|---|---|
| Analog RGB searching | The Monitor is searching for a valid video signal connected to the VGA input |
| Digital RGB searching | The Monitor is searching for a valid video signal connected to the DVI input |
| S-Video searching | The Monitor is searching for a valid video signal connected to the S-VHS input |
| Composite Video searching | The Monitor is searching for a valid video signal connected to the CVBS input |
| No Input Signal - Going to Sleep | The Monitor did not find any video signal on the selected input source |
| Out of range | The video signal on the selected input source is out of range |
| BW Limit exceeded | Input signal exceeds bandwidth (when PIP/SBS) or instead of “Out of range” |

- When the Monitor detects a valid video signal it will shortly indicate the source input, resolution and frequency of the input signal, as well as the video mode number.

- The input source can be selected using the OSD (see below).

- If the video signal is out of range either the resolution or frequency is too high for the Monitor. The message is also given if the current video mode is not included in the Mode Table (see below).

- Additional video modes can be added upon request.

### 2.4 On Screen Display (OSD)

- Most functions of the Monitor can be controlled using the OSD.

- The OSD is activated by pressing the LOCK or MENU control. The monitor is equipped with a lock function which prevents accidental use of the OSD. The lock function does not affect the indicator brightness and backlight controls. The status of the lock function is controlled by the OSD and remote control. The monitor is always locked when a valid RS232 signal is available. If the Monitor is in locked state the OSD can only be activated by pressing the LOCK and MENU buttons at the same time for 5 sec.





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- The screen backlight (brightness) can be adjusted using the KNOB on the front panel but it can also be adjusted using the OSD and remote control. There is a little mark above the KNOB control which indicates its calibrated setting. This setting must be used when the backlight is being controlled by the OSD or remote control. If the KNOB control is not positioned correct the OSD or remote control will not be able to adjust the brightness correct. If the backlight is only to be controlled by the KNOB the OSD backlight setting must be fixed at 50%.

- The next and previous menu can be selected using + / − controls.

- The sub menus are selected using the SET control and values can be increased/decreased using + / − controls. The SET control is also used to set the value and leave the sub menu.

- Press the MENU control once to return to the main menu and once again to leave the OSD.

- The OSD will be deactivated the selected period after the last control has been pressed (OSD timeout).

### 2.4.1 OSD division into folders, menus, sub-menus

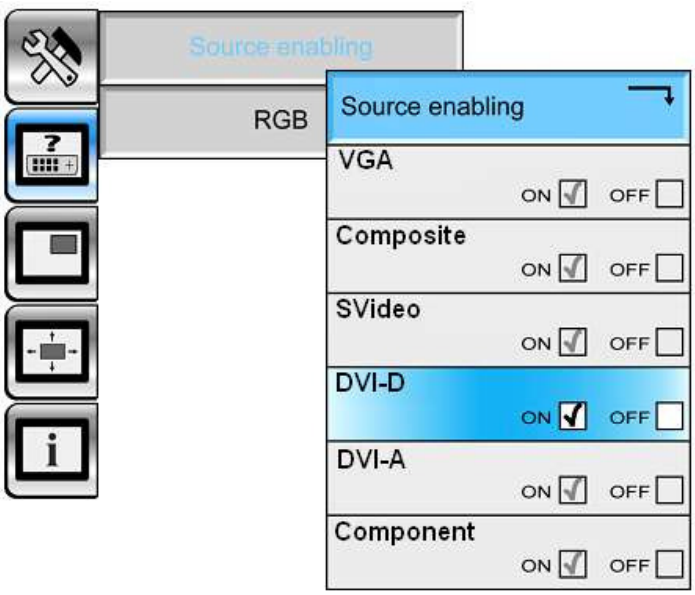


**Figure 3.** On Screen Display





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### 2.4.2 OSD items

- Depending on the menu chosen, different types of items can appear:


**Push button** - activates a sub-menu or a function


**List** - a value can be chosen from a list

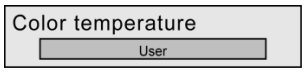

**Slide bar** – slide the bar to choose the desired level from 0-100%


**ON/OFF** - turns the settings On or Off

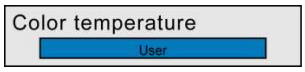

**Information** - contains pure text or value information

### 2.4.3 OSD items stages

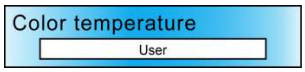
- Folder items, menu items, and sub-menu items exist in three different stages:




**Inactive** - when the OSD is opened all folders, menus, and sub-menus are by default inactive, and the only item that is selected is the 'Tools' folder.




**Selected** - when the user navigates through the OSD, part of the selected item is blue. It can not be adjusted before activated (Press ENTER).




**Activated** - the item is activated and can be adjusted. To activate an item, push the ENTER button on the HMI (Human Machine Interface).

### 2.4.4 Entering and adjusting the OSD

- The OSD menu can always be opened and closed by pressing the MENU button on the HMI (except when locked, see 2.4 on page 16). Once the menu has been opened it can be navigated up/down and right/left using '+' and '-' buttons. To be able to adjust the settings, an item has to be active, which is effectuated by pressing the ENTER button.

- To make adjustments in the OSD, follow these steps:

1. Press the MENU button on the HMI to activate the OSD.
2. Navigate up and down in the different folders with '+' and '-' buttons.
3. When the desired folder is partly highlighted, press the SET button to activate the menu.
4. Navigate with the + and - buttons until the desired control has been reached (and partly highlighted). To gain adjustment control, press SET. The control will be highlighted and can now be adjusted.
5. Press + to increase the value or - to decrease the value.
6. When the right level has been reached, press SET once again to activate the adjustment and automatically jump one level back.
7. To exit the OSD, press MENU.





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- The following exemplifies how to adjust the settings for Saturation:
  1. Press MENU to activate the OSD
  2. Use + or - to navigate up or down until you have selected the Functions folder (the icon will be coloured).
  3. Press SET to activate the folder (the folder will turn blue, and automatically the first menu item in the sub-menu will be selected - in this case the 'Source enabling' button)
  4. Use '+' to navigate to DVI-A (or other Source input) and press 'SET' to activate
  5. Navigate down with the + button until you have selected the menu item 'Saturation'
  6. Press SET to activate the menu item.
  7. Use + or - to set the desired value for the saturation
  8. Press SET to validate the change - the OSD automatically jumps one level back

### 2.4.5 OSD content

- The OSD is designed with 5 different folders: Tools, Functions, Picture, RGB mode wizard, and Info, each of which has their own menu. Several of the menu items furthermore have sub-menus to be navigated through. In the following pages, the different settings will be described:





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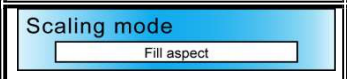
## Tools

| Control | Function |
|---|---|
|  | Backlights are used to illuminate displays. In small displays they are often used to increase readability in low light conditions. The OSD allows for the backlight to be dimmed from 100 – 0%. At 0%, the backlight is turned off.<br><br>Value: 0-100% |
|  | LED brightness |
|  | When showing a graphic signal or video signal, the following scaling modes exists:<br><br>*Normal*: Scaling mode depends on panel and source signal aspect ratio. This mode preserve the correct aspect ratio of the input signal, so if a 4:3 signal is to be displayed on a 16:9 display this adds black bars on both sides.<br><br>*One to one*: 1:1 representation of the input signal. If a 640x480 signal is to be displayed on a 1024x768 panel, you will see the picture centered using 640x480 pixels shown with a black frame around it.<br><br>*Fill all:* Regardless of input and output resolutions the input picture is scaled to fit the screen.<br><br>*Auto:* This means that for Composite or S-Video signals, provided Wide Screen Signalling (WSS) is available, input signal is automatically scaled depending on the ancillary data transmitted. This is usually sent by TV broadcasters or by DVD players according to the aspect ratio of the video.<br><br>*Anamorphic*: For 16:9 signals generated by DVD players (the signal is 16:9 but is stretched to fill the screen with no black bars, so the picture, if displayed on a 4:3 screen, would result in tall people). This will de-stretch the picture so that the given correct aspect ratio is restored.<br><br>Auto and Anamorphic will only appear if video input has been chosen.<br><br>Value: Normal, One to one, Fill all, Zoom, Auto and Anamorphic |
|  | If a still picture is needed, the present frame can be frozen by selecting ON in this property.<br><br>Value: ON/OFF |





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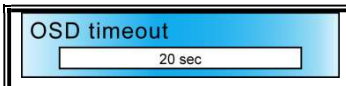
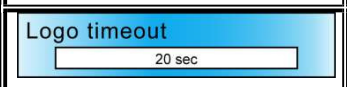
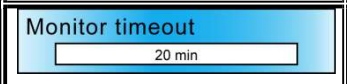
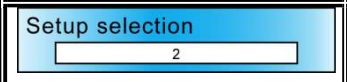
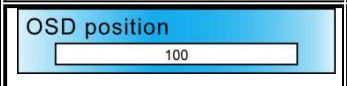
| | |
|---|---|
|  | Sets the duration for the time-out of the OSD menu, that is, how many seconds should pass with menu inactivity before the menu closes.<br>Value: 5-20 sec, No timeout |
|  | How many seconds the logo will be shown on the display at start-up is adjusted here.<br>Value: 1-20 sec, No logo |
|  | Sets the time that should pass before the display changes state to power save after input signal is removed.<br>Value: 1-20 min, No timeout. |
|  | Locks the keypad. To unlock the keypad again, press the LOCK and the MENU buttons for 5 seconds.<br>Value: ON/OFF<br>WARNING: Do not lock keypad if only IR remote is used. The access is only granted through keypad or RS232, NOT through the IR remote |
|  | Reinstalls the settings provided by the factory.<br>Note: The OSD menu will automatically close after choosing 'Factory Default' |
|  | A setup is a combination of settings adjusted by the user. It is possible to save up to 3 different setup combinations (0, 1, and 2). The procedure is:<br>1) Adjust the desired settings<br>2) Enter the 'Setup selection' and choose 0, 1, or 2<br>3) Choose the 'Save Monitor setup'<br>Value: 0, 1, or 2 |
|  | Saves the present settings entered by the user (See explanation above). |
|  | Recalls the settings depending on which 'Setup Selection' is chosen:<br>1) Choose the desired setup under 'Setup selection'<br>2) Activate the 'Recall Monitor setup' button |
|  | Horizontal position of the OSD menu on the display.<br>Value: 0-100 |





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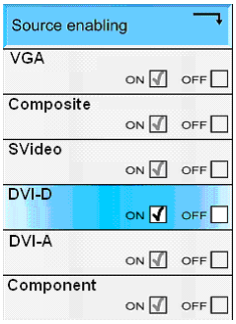
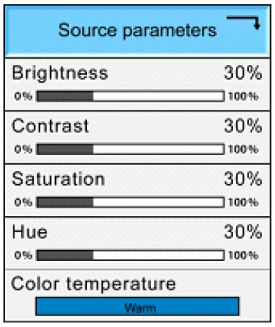
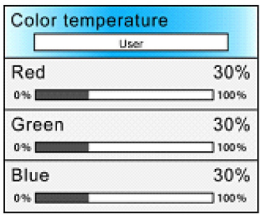
## Functions

| Control | Function |
|---|---|
| Source enabling | The 'Source enabling' control decides which input sources should be enabled and which should not. By activating the 'Source enabling' button, a sub-menu appears where input sources can be activated or deactivated by choosing the ON or OFF setting. A source has to be set to ON to be able to be adjusted. The list below is for Marlin Basic scalar boards. If a Marlin Single scalar board with extension module is used the list will reflect the inputs present on the Marlin Single plus the extension board.<br>  |
| DVI-D | Which source will be shown here depends on which component is set for the 'Source A' value under the menu 'Picture' (And eventually Source B in case of PIP and Side By Side). A sub-menu will appear with the following parameters:<br>  <br>By setting the 'Color temperature' to User, a new sub-menu appears:<br>  |





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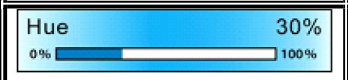
| | |
|---|---|
|  | Brightness specifies the darkness or lightness of a color. It is measured in percent from black (0) to white (100). At 0% brightness, both hue and saturation are meaningless.<br>Value: 0-100% |
|  | Contrast is the difference in light intensity between the brightest white and the darkest black.<br>Value: 0-100% |
|  | Saturation sets the brilliance and purity of a color, that is how much grey is in the color. A highly saturated hue (pure color) has a vivid, intense color, while a less saturated hue appears more muted and grey. At 0% saturation, hue is meaningless.<br>Value: 0-100% |
|  | Hue is what most people refer to as color. A blue button has the hue blue. It is the dominant wavelength of a color.<br>Value: 0-100% |
|  | The color can be set to Default, User, Cold, or Warm:<br>Cold: The predominant tones are blue and violet.<br>Warm: The predominant tones are red and orange.<br>User: Activates the menu items Red, Green, and Blue, where the value can be set between 0-100 %.<br>Value: Default, User, Cold, or Warm |
| Warning ! | Manual setting of above parameters away from the factory default or ECDIS settings may inhibit visibility of information, particularly when using the night color tables.<br>Factory default settings of Brightness, Contrast, Saturation, Hue, Red, Green and Blue are 50% |





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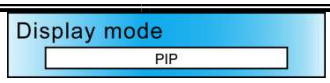
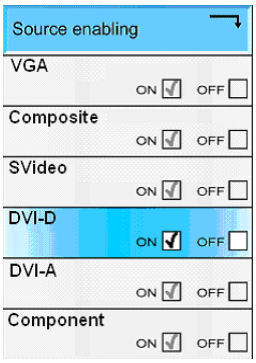
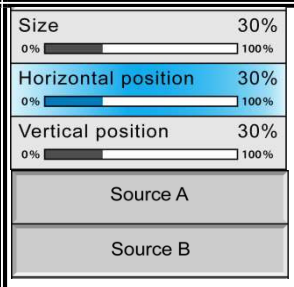
## Picture

| | |
|---|---|
|  | How the picture should be presented on the display is adjusted here. There are three different display modes:<br>*Single*: A single picture is shown on the display (default)<br>*PIP*: Picture In Picture, where a small sub-window shows a second picture (Source A or source B) within a larger picture (the opposite source)<br>*Side by Side*: The display is divided into two pictures representing Source A and Source B<br>Value: Single, PIP, or Side by Side |
| If 'Single' is chosen as display mode, the following menu appears:<br>  | It is possible to adjust the settings for one input source at a time. If 'Source A' is activated, a sub-menu appears:<br>  <br>In this sub-menu the user chooses which input should be active .Their settings are adjusted under the 'Functions' menu. |
| If 'PIP' is chosen as display mode, the following menu will appear: |  <br>Source A has already been explained and Source B decides which input should be the second input. |





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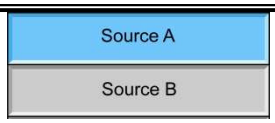
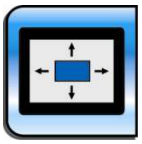
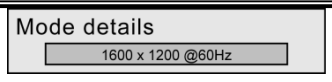
| | |
|---|---|
| | *Size:* The size of the PIP picture is chosen here.<br>*Horizontal position:* The chosen value decides where the PIP picture is placed horizontally on the display starting from the upper left corner.<br>*Vertical position:* The value decides where the PIP picture is placed vertically on the display from the upper left corner. |
| If 'Side by side' is chosen, the following menu is displayed: |  <br>See above for further explanation. |



## RGB mode wizard

- This folder is only shown when an RGB signal is present on a RGB input.
- For a detailed explanation of the technology behind a RGB signal, for a deeper understanding of how to adjust the Marlin scalar board to accept non standard RGB signal, please refer to 14400001 RGB signal detection.

| Control | Function |
|---|---|
|  | Mode selection is a set of parameters telling the display where and how to display the picture (horizontal total, phase, horizontal resolution, vertical resolution, horizontal position, and vertical position).<br>It is possible to enter up to 10 different mode selections:<br>1) Activate the 'Mode selection'<br>2) Choose the desired no.<br>3) Adjust settings under horizontal total, phase, horizontal resolution, vertical resolution, horizontal position, and vertical position.<br>4) Enter and activate the 'Save mode parameters'<br>Value: 0-9 |
|  | Pure information stating the current resolution and Hz. value: No value - pure text. |
|  | Automatically sets the resolution, position, and phase of the picture on the display. |
| | Loads the current mode parameters. |





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| | |
|---|---|
| Clear | If new mode parameters have been entered it is possible to delete them by using the 'Clear' button. |
| Horizontal total 1700 | The Horizontal Total should be equal to, or higher than, the horizontal resolution plus horizontal position (See explanation under 'Horizontal position'). |
| Phase 50 | The phase settings stabilize the picture by removing horizontal noise and sharpening the image of characters. |
| Horizontal resolution 1600 | The value for the horizontal resolution of the display is adjusted here. |
| Vertical resolution 1200 | The vertical resolution of the display is adjusted here. |
| Horizontal position 100 | The chosen value decides where the picture is placed horizontally on the display. Horizontal position is equal to the horizontal front porch + horizontal back porch, which is the field used to specify the number of dummy pixel clocks to insert at the beginning (pulsing the line clock pin) and end of each line or row of pixels before. After the line clock for the previous line has been negated, the value in horizontal back porch is used to count the number of pixel clocks to wait before starting to output the first set of pixels in the next line. |
| Vertical position 50 | The value decides where the picture is placed vertically on the display. |

## Info

| Control | Function |
|---|---|
| Firmware revision 0.9 | Information about the software version. |
| Temperature 36 | Information about the temperature in the Monitor. |
| 12V supply 12.1 | Information about the voltage entering the print. |
| 5V supply 5.1 | Information about the voltage internally generated on the print. |





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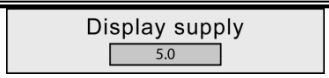
| | |
|---|---|
|  | Information about the voltage supplied for the display. |
|  | The name and input signal data of the source enabled will be informed here. |
| Info box showing backlight time | Time (in hours) the backlight enable mode has been turned on |
| Info box showing power on time | Time (in hours) the Marlin scalar board has been turned on |

### 2.5 Mode Table

The table below lists the basic video modes currently set in the Monitors.

| | Monitor (LCD resolution) | | | |
|---|---|---|---|---|
| **Video resolution** | **15" (1.024 x 768)** | **19" (1.280 x 1.024)** | **21.3" (1.600 x 1.200)** | **23.1" (1.600 x 1.200)** |
| 512 x 384 | √ | √ | √ | √ |
| 640 x 200 | √ | √ | √ | √ |
| 640 x 350 | √ | √ | √ | √ |
| 640 x 400 | √ | √ | √ | √ |
| 640 x 480 | √ | √ | √ | √ |
| 640 x 870 | √ | √ | √ | √ |
| 720 x 350 | √ | √ | √ | √ |
| 720 x 400 | √ | √ | √ | √ |
| 720 x 480 | √ | √ | √ | √ |
| 720 x 576 | √ | √ | √ | √ |
| 800 x 600 | √ | √ | √ | √ |
| 832 x 624 | √ | √ | √ | √ |
| 852 x 480 | √ | √ | √ | √ |
| 960 x 720 | √ | √ | √ | √ |
| 1.024 x 768 | √ | √ | √ | √ |
| 1.024 x 1.024 | **Note[1]** | √ | √ | √ |
| 1.053 x 754 | **Note[1]** | √ | √ | √ |
| 1.056 x 768 | **Note[1]** | √ | √ | √ |
| 1.120 x 750 | **Note[1]** | √ | √ | √ |
| 1.152 x 864 | **Note[1]** | √ | √ | √ |
| 1.152 x 870 | **Note[1]** | √ | √ | √ |
| 1.152 x 900 | **Note[1]** | √ | √ | √ |
| 1.184 x 884 | **Note[1]** | √ | √ | √ |
| 1.280 x 960 | **Note[1]** | √ | √ | √ |





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| Video resolution | Monitor (LCD resolution) 15" (1.024 x 768) | 19" (1.280 x 1.024) | 21.3" (1.600 x 1.200) | 23.1" (1.600 x 1.200) |
|---|---|---|---|---|
| 1.280 x 1.024 | **Note[1]** | √ | √ | √ |
| 1.360 x 1.024 | **Note[1]** | **Note[1]** | √ | √ |
| 1.600 x 1.024 | **Note[1]** | **Note[1]** | √ | √ |
| 1.600 x 1.200 | **Note[1]** | **Note[1]** | √ | √ |

- For each video resolution the most common picture frequencies will be available – typically in the frequency range 30-100 Hz for the 15", 19", 21.3" and 23.1" Monitors. In modes with V-sync above 1200, the maximum frequency applies on 65Hz.

- Additional modes can be added upon request.

**Note[1]:** The 15" and 19" Monitors will be able to show modes of higher resolution than the LCD resolution because of the build-in digital signal processors (DSP) in the controllers. However, small texts and symbols will be less legible.

## 2.6 Remote control

The remote control uses the RS232 interface on the video controller.

**ELECTRICAL CONNECTION**

9 pin D-SUB female connector with the following pin assignment:

| Pin 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|
| +5 V | TX | RX | - | GND | - | - | - | GND |

**Interface parameters**

Baud rate: 9.600
Parity: no
Data bits: 8
Start bits: 1
Stop bits: 1
Handshake: no

**COMMUNICATION PROTOCOL**

The communication protocol complies with IEC 61162-1 (NMEA):

| Byte 0 | 1 | 2 to 4 | 5 | 6 | 7 to LEN+6 | LEN+7 |
|---|---|---|---|---|---|---|
| ATT | ADR | CMD | LEN | IHC | DAT | IDC |

The min message length is 7 bytes and the max message length is 82 bytes.

The different bytes are described below





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**Attention (ATT) byte**

This byte identifies the message start:

| ATT | Description |
|---|---|
| 0x07 | Command |
| 0x06 | Acknowledge (OK) |
| 0x15 | Acknowledge (error) |

**Address (ADR) byte**

| ADR | Description |
|---|---|
| 0xFF | All controllers (0-15) |
| 0x00 | Controller 0 |
| 0x01 | Controller 1 |
| - | etc. |
| 0x0F | Controller 15 |

**Command (CMD) bytes**

| CMD0 | CMD1 | CMD2 | ASCII | Description |
|---|---|---|---|---|
| 0x42 | 0x52 | 0x54 | BRT | Brightness |
| 0x4D | 0x41 | 0x4E | MAN | Manufacturer |
| 0x56 | 0x45 | 0x52 | VER | Version (Monitor) |
| 0x4D | 0x43 | 0x43 | MCC | Controller |
| 0x54 | 0x59 | 0x50 | TYP | Type |

**Data length (LEN) byte**

Length of DAT in bytes (0-74 bytes)

**Inverse Header Checksum (IHC) byte**

It is a simple 8 bit checksum of the header data (bytes 0 to 5) where a bit-wise inversion has been performed. The checksum must be initialised to 0. The 8 bit sum (without carry) of bytes 0-6 must be 0xFF.

IHC = 0xFF – (ATT+ADD+CMD0+COM1+COM2+LEN), where only 8 bits are used.

If a message checksum fails the controller will reply with the attention byte 0x15 and no data bytes.

**Data (DAT) bytes**

The data bytes will only be send if data length (LEN) is greater than 0.

The data bytes are designated DAT0, DAT1, DAT2, etc.





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**Inverse Data Checksum (IDC) byte**

This byte will only be send if data length (LEN) is greater than 0. It is an 8 bit checksum of the data bytes (bytes 7 to LEN+6) where a bit-wise inversion has been performed. The checksum is initialised to 0. The 8 bit sum (without carry) of bytes 7 to LEN+7 is be 0xFF.

IDC = 0xFF – (DAT0+DAT1+DAT2+….), where only 8 bits are used

If a message checksum fails the controller will reply with the attention byte 0x15.

**MESSAGE EXAMPLES**

The following examples are the typical messages used:

**Brightness command (BRT)**

This command is used to change the brightness of the Monitor.

Change brightness from 40% to 60% on all controllers (default address setting):

| ATT | ADR | CMD | | | LEN | IHC | DAT | IDC |
|---|---|---|---|---|---|---|---|---|
| 0x07 | 0xFF | 0x42 | 0x52 | 0x54 | 0x01 | 0x10 | 0x99 | 0x66 |

The brightness data is one byte where 0x00 is min and 0xFF is max.

Acknowledge (OK):

| ATT | ADR | CMD | | | LEN | IHC | DAT | IDC |
|---|---|---|---|---|---|---|---|---|
| 0x06 | 0xFF | 0x42 | 0x52 | 0x54 | 0x01 | 0x11 | 0x99 | 0x66 |

The controller returns the new brightness data – in this case 0x99 = 60%.

Acknowledge (error):

| ATT | ADR | CMD | | | LEN | IHC | DAT | IDC |
|---|---|---|---|---|---|---|---|---|
| 0x15 | 0xFF | 0x42 | 0x52 | 0x54 | 0x01 | 0x02 | 0x66 | 0x99 |

The controller returns the previous brightness data - in this case 0x66 = 40%.

**Manufacturer command (MAN)**

This command is used to identify the manufacturer of the Monitor.

Ask for manufacturer:

| ATT | ADR | CMD | | | LEN | IHC |
|---|---|---|---|---|---|---|
| 0x07 | 0xFF | 0x4D | 0x41 | 0x4E | 0x00 | 0x1D |

No data must be sent.





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Acknowledge (OK):

| ATT | ADR | CMD | | | LEN | IHC | DAT | | IDC |
|---|---|---|---|---|---|---|---|---|---|
| 0x06 | 0xFF | 0x4D | 0x41 | 0x4E | 0x03 | 0x1B | 0x4E | 0x49 | 0x68 |

The controller returns the ASCII string value for the manufacturer – in this case NI (North Invent).

**Version command (VER)**

This command is used to identify the controller model and protocol version.

Ask for model/version:

| ATT | ADR | CMD | | | LEN | IHC |
|---|---|---|---|---|---|---|
| 0x07 | 0xFF | 0x56 | 0x45 | 0x52 | 0x00 | 0x0C |

No data must be sent.
Acknowledge (OK):

| ATT | ADR | CMD | | | LEN | IHC | DAT | | | IDC |
|---|---|---|---|---|---|---|---|---|---|---|
| 0x06 | 0xFF | 0x56 | 0x45 | 0x52 | 0x03 | 0x0A | 0x73 | 0x01 | 0x00 | 0x8B |

The controller returns the controller model (DAT0) and protocol version (DAT1.DAT2) – in this case controller model 115 and protocol version 1.0.

**Controller command (MCC)**

This command is used for remote control of the display controller menu functions, e.g. the contrast settings.

Ask for 50% contrast:

| ATT | ADR | CMD | | | LEN | IHC | DAT | | | | IDC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0x07 | 0xFF | 0x4D | 0x43 | 0x43 | 0x04 | 0x22 | 0x82 | 0x41 | 0x38 | 0x30 | 0xD4 |

The menu function is included in the data bytes:

| | |
|---|---|
| DAT0 | 0x82 = contrast command |
| DAT1 | 0x41 = “a” = all colours |
| DAT2 | 0x38 = “8” = first digit of contrast value 0x80 = 50% of 0xFF |
| DAT3 | 0x30 = “0” = second digit of contrast value (se above) |

Acknowledge (OK):

| ATT | ADR | CMD | | | LEN | IHC | DAT | | | | | | IDC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0x06 | 0xFF | 0x4D | 0x43 | 0x43 | 0x06 | 0x21 | 0x82 | 0x41 | 0x38 | 0x30 | 0x38 | 0x30 | 0x6C |

The data field is extended with the new contrast values (DAT4 and DAT5).





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A complete list of remote control functions can be provided on request.

**Type command (TYP)**

This command is used to identify the Monitor type.

Ask for display type:

| ATT | ADR | CMD | | | LEN | IHC |
|---|---|---|---|---|---|---|
| 0x07 | 0xFF | 0x54 | 0x59 | 0x50 | 0x00 | 0xFC |

No data must be sent.

Acknowledge (OK):

| ½ | ADR | CMD | | | LEN | IHC | DAT | | | | | IDC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0x06 | 0xFF | 0x54 | 0x59 | 0x50 | 0x05 | 0xF8 | 0x53 | 0x4C | 0x32 | 0x31 | 0x33 | 0xCA |

The controller returns the ASCII string value for the Monitor type – in this case SL213 (Sea Line 21.3 inch).





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# 3. Technical specifications

## 3.1 Summary

| LVDS display | 15” | 19” | 21.3” | 23.1” |
|---|---|---|---|---|
| **Max. resolution** | 1.024x768 | 1.280x1.024 | 1.600x1.200 | 1.600x1.200 |
| **Active area** | 304.1 x 228.1 mm | 376.3 x 301.06 mm | 432.0 x 324.0 mm | 470.4 x 352.8 mm |
| **Pixel pitch** | 0.297 x 0.297 mm | 0.294 x 0.294 mm | 0.270 x 0.270 mm | 0.294 x 0.294 mm |
| **Synchronisation Frequency** | 15-100 kHz(H), 30-100 Hz(V) up to 1.280x1.024<br>15-100 kHz(H), 30-65 Hz(V) up to 1.920x1.200 | | | |
| **Contrast ratio** | 450:1 | 1500:1 | 900:1 | 600:1 |
| **Brightness** | 450 cd/m² | 300 cd/m² | 300 cd/m² | 350 cd/m² |
| **Response time** | 19 ms | 13 ms | 16 ms | 12 ms |
| **Colours** | 16.7 Millions depending on graphics card | | | |
| **View angle** | ±75° | ±89° | ±89° | ±85° |
| **Backlight life** | Typ. 50,000 hours | | | |
| **Power supply Voltage** | 115 VAC±10%, 230 VAC±10%(switch), 24 VDC +30%-20% | | | |
| **Power Consumption** | 40W (AC)<br>35W (DC) | 45W (AC)<br>40W (DC) | 65W (AC)<br>55W (DC) | 105W (AC)<br>90W (DC) |
| **OSD** | Controls: Power, Brightness, Menu, Set, +, - & Lock with dimmable backlight<br>Indicators: Input power AC & DC with LED | | | |
| **Input connectors** | DVI-I Female, D-SUB 15pin female, AC power IEC Inlet & DC screw terminal | | | |
| **Control Input** | RS232 D-SUB 9 pin female | | | |
| **Monitor Compatibility** | Plug & Play | | | |
| **Dimming range** | 0-100% (Dimming ratio 1000:1) | | | |
| **Speaker** | 8 Ohm, 3mm jack (Optional item) | | | |
| **Accessories** | Sunshade, Turntable, Stand, Cables, User’s manual | | | |
| **Operation Temperature** | -15°C/+55°C – +5°F /+131°F (IEC 60945) | | | |
| **Storage Temperature** | -25°C/+70°C - -13°F/+158°F | | | |
| **Glass Type** | Conturan© (Standard) Hardened, Laminated, anti-glare coated, all flush mounted | | | |
| **Colour of bezel** | Front and back: RAL 7015. Stand and turntable: RAL9007. | | | |
| **Dimension & Weight (for flush mounting)** | 345x400x70 (HxWxD)<br>8.1Kg | 417x470x70 (HxWxD)<br>10.9Kg | 454x553.8x75.4 (HxWxD)<br>13.8Kg | 525.8x596x77.6 (HxWxD)<br>17.2Kg |
| **Dimension & Weight (with Stand &Turntable)** | 389x419x378 (HxWxD)<br>10.9Kg | 470x488.55x449 (HxWxD)<br>14Kg | 506x551x485 (HxWxD)<br>17.4Kg | 569x615x548 (HxWxD)<br>22.8Kg |
| **Enclosure protection** | IP66 and IP67 mounted in console, with optional sealing kit (gasket and grease) | | | |
| **Standards & Approvals** | IEC 60945, IEC 61174(ECDIS), IEC 60936(RADAR), IEC 62288, IEC 62388, IEC 60529(IP), MIL-STD-810F, IACS E10 (ABS,BV,CCS,DNV,GL,KR, LR,NK,RINA,RS) approved by BSH. | | | |





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### 3.2 Firmware Revision table

| Monitor Rev. | Software Rev. | Description | Date | Signed by |
|---|---|---|---|---|
| 1.0 | 1.1 | Original version | | |
| 1.0 | 1.2 | New start-up logo | 12-12-2007 | |
| 1.0 | 1.3 | New ECDIS functions (not implemented) | 01-03-2008 | |
| 1.0 | 1.4 | First release | 12-06-2008 | |
| 1.0 (15",19" and 21")<br>2.0 (23") | 1.5<br>1.6 | New lock function, 62288 and 62388 adaption<br>As 1.5 + LED control | 05-10-2009<br>07-05-2010 | SU<br>SU |
| 1.0 (15" and 21")<br>2.0 (19")<br>2.0 (23") | 1.5<br>1.5<br>1.6 | LED backlight | 27-08-2013 | SU |

### 3.3 Troubleshooting

- There are several possible solutions to the same problem – please try the first one on the list and then move on to the next if the problem persists.

| PROBLEM | POSSIBLE SOLUTION |
|---|---|
| No AC or DC indication and no picture on the screen | Press the POWER control shortly, then press and hold the + control for a while |
| No AC or DC indication and no picture on the screen | Check the AC and/or DC power cable and make sure that voltage is present at the terminals |
| No picture on the screen but AC and/or DC indication is on | Turn the KNOB (brightness) control fully clockwise |
| No picture on the screen but AC and/or DC indication is on | Press the MENU control (or press and hold the LOCK control for 5 sec) and select the correct video source with the OSD |
| No picture on the screen but AC and/or DC indication is on | Check that a valid video signal is present on the selected source – use e.g. another Monitor |
| The picture do not fit the screen size | Adjust the picture positions and frequency with the OSD |
| The picture cannot be adjusted to fit the screen size | Check if the video solution and frequency are included in the *Mode Table* above |
| The backlight cannot be adjusted from totally darkness to full brightness using the KNOB control | Adjust the backlight to 50 % with the OSD. |
| The backlight cannot be adjusted from totally darkness to full brightness using the remote control | Set the KNOB control in its calibrated setting (little mark above the KNOB) |
| Part of or whole picture is blurred | Adjust the picture phase with the OSD |





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### 3.4 Cleaning

- Dust and dirt which typically accumulates on the front of the Monitor, can easily be removed using a soft cloth moistened with hot water.
- A solvent can also be used but never use any kind of abrasive compound.
- Oil and grease can be removed using pure alcohol.
- The front glass can be cleaned with any solvent suitable for glass.

### 3.5 Update

- The technical documentation is subject to change. For an updated version please visit our website www.northinvent.com.

## 4. Maintenance and service

- Sea Line MK3 monitors are conceived so to be almost maintenance free.
- If the Monitor malfunctions, please check if the problem can be solved with *troubleshooting* (3.3).
- If the problem persists, please contact North Invent for service instructions.

Allow app. 1 hour stabilization time before measuring luminance and colors.





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