DuraMON series

DuraMON19 LED

User Reference Manual

Disclaimer

ISIC A/S makes no representation or warranties with respect to the contents or use of this manual, and specifically disclaims any express or implied warranties of merchantability or fitness for any particular purpose. Further, ISIC A/S reserves the right to revise this publication and to make changes to its content at any time, without obligation to notify any person or entity of such revisions or changes.
Image sticking: If the monitor is operated with static images (logo's etc) it will inevitably lead to images sticking on the display (like on old CRT's). This is not a permanently situation and can be removed by operating the monitor with a completely black screen.

FCC Warning

Computing devices and peripherals generate and radiate radio frequency energy, and if not installed and used in accordance with the instructions advised by ISIC A/S, it may cause interference to radio communication.

The DuraMON series, manufactured by ISIC A/S, is designed to comply with the emerging generic EEC standards, that cover applications in maritime environment.

Classification

The monitor is classified as "protected from the weather" according to IEC 60945 ed.4 (former class b).

Approvals

Approval according to IACS E10 ed. 5 and IEC 60945 ed. 4, Maritime navigation and radio communication equipment and systems – General requirements.
ECDIS IEC 61174:2008 (pending)
Radar IEC 62288:2008 (pending)
Radar IEC 62388:2008 (pending)

ISIC A/S is complying with the WEEE directive within the European Union, stating that electronic and electric products must be collected separately.
Products are marked according to the directive.

ISIC PN: 05588-000 rev. B

ISIC A/S
Edwin Rahrs Vej 54
DK-8220 Brabrand
Denmark

Phone: +45 70 20 70 77
Fax: +45 70 20 79 76
Web: http://www.isic-systems.com

Table of Contents

1 Features

Congratulations on your purchase of a DuraMON. This short form manual is designed to get you started working with your new DuraMON.

The DuraMON series of monitors are all made as rugged monitors especially designed for the demanding operating conditions at sea.

The DuraMON series are tested for full compliance to marine-standards IACS E10 and IEC 60945. The monitor comes with excellent brightness and contrast levels that, together with wide viewing angles, ensure a good readability thus making it very eye-friendly. For the best picture quality, always use a double shielded cable with ferrites, like the one supplied with the monitor.

Direct dimming control (0-100%) from UP/DOWN buttons.
Full settings control via menu or serial link.
Picture in picture function, scalable on the screen.
Anti-glare coated glass.
IP65 protection and liquid resistant front.

Multiple connections to cover the widest range of signal sources:
DVI-D
RGB
S-Video (optional)
Composite (optional)

Firmware update via RS232

2 General considerations on Installation and Operation

The DuraMON is designed to work at conditions according to IEC 60945. However, keeping the temperature and vibration level at a minimum will extend the life time of the product. ISIC recommend operating this product at normal room temperature (20-25 °C), with the lowest level of vibration and humidity.

Installation of the DuraMON

In order to obtain the best possible operating conditions, please note the following precautions.

- Room for cooling.
  When designing the cabinet/console for the DuraMON, please ensure that air can flow freely around the cabinet, in order to avoid any unnecessary rise in temperature. If it is not possible to have an adequate natural airflow, use a fan to force the airflow to be higher.

- Mounting positions
  To obtain adequate cooling by convection ISIC recommends that the DuraMON is mounted at least 30 degrees from horizontal. If this is not possible, forced cooling must be applied directly to the unit in order not to overheat it.

- Sunlight
  If the unit can be exposed to direct sunlight, there is a potential risk that the unit can be overheated. Please take measures to prevent direct sunlight. Do also consider forced cooling on the back of the unit.

Operation of the DuraMON

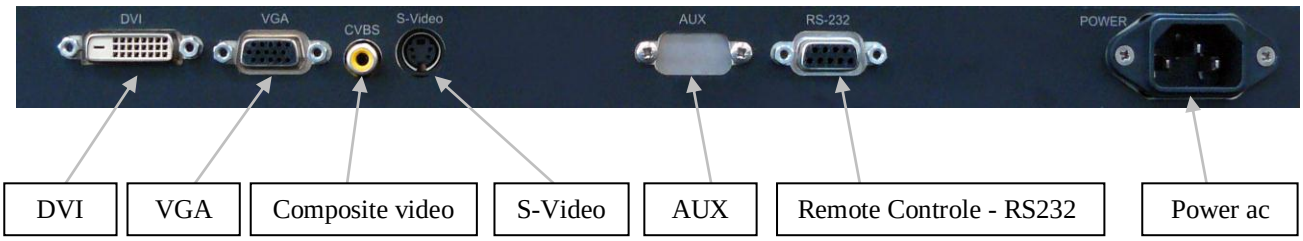
To ensure that colors and luminance on the display is correct in ECDIS applications, do not use the monitor until the warm-up period has completed.

The warm-up period is as follows:

	Day mode	**Dusk mode**	**Night mode**
DuraMON19 LED	1 hour	1 hour	1 hour

3 DuraMON connections

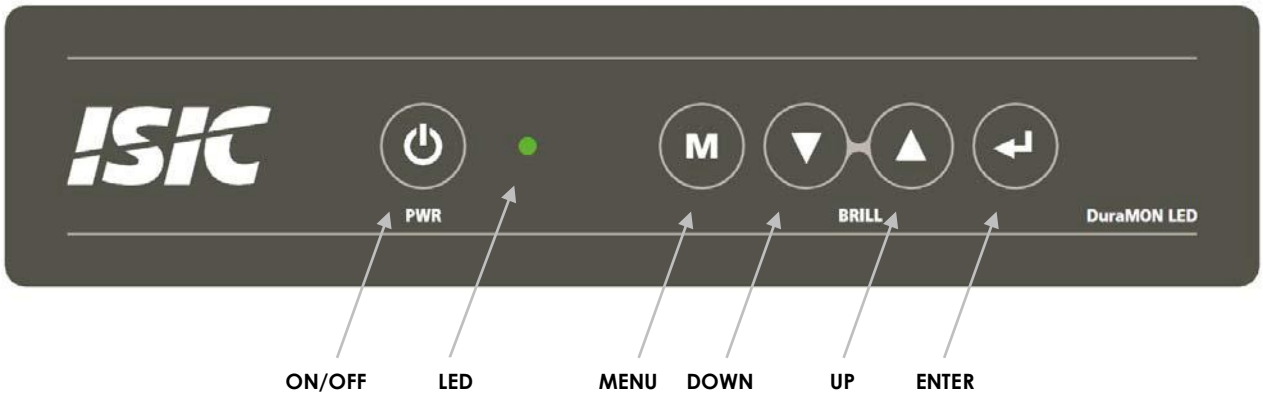
Below is a view of optional connections to the monitor. The default inputs are: power, RS-232, DVI and VGA.



4 DuraMON front panel controls (ECDIS and Radar)

The front panel is illuminated and will be dimmed continuously depending on changing of backlight brightness.

4.1 DuraMON front foil:



ON/OFF:
This key is used to turn the product on or off. Pressing it will turn the power on, while holding it pressed will turn the power off. The light in the button will change from blue to red to indicate it's powered down. It is important to notice that, when powered off, the product still consumes some power from the mains. To cut off the power from the product it is necessary to unplug its power cord from the mains.
If there is no active signal, the monitor will go to suspend mode until an active signal is detected. While the monitor is in suspend mode, the blue light will blink in the ON/OFF button.

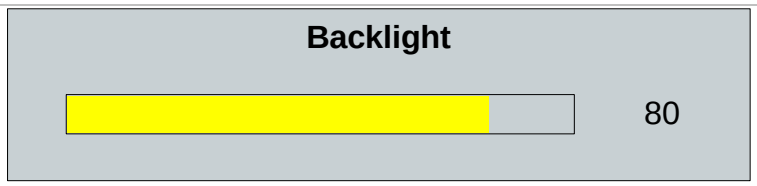
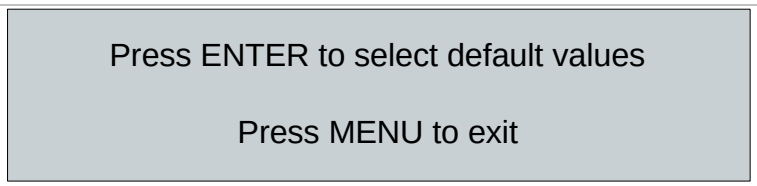
MENU:
Pressing this key the Popup menu will appear. See Popup Menu section for details.

UP/DOWN:
Used to adjust backlight or to navigate and adjust settings in menus. Pressing UP and DOWN together will restore the backlight level to the last selected ECDIS mode by the serial link. (See document 04924-000 for protocol details).

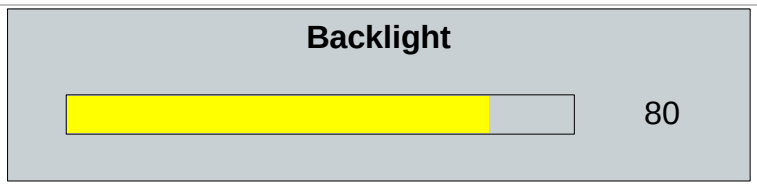
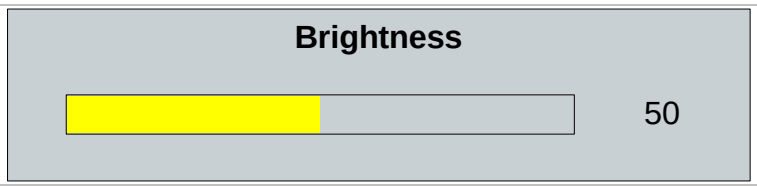
ENTER:
This key is used to confirm and to enter the advanced OSD by pressing ENTER and thereafter MENU while holding ENTER pressed.

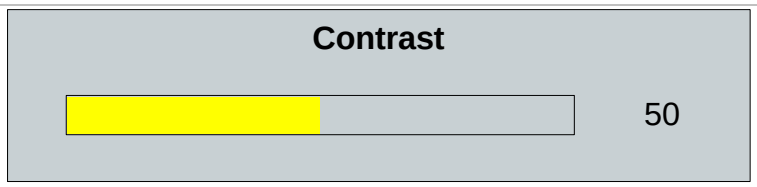
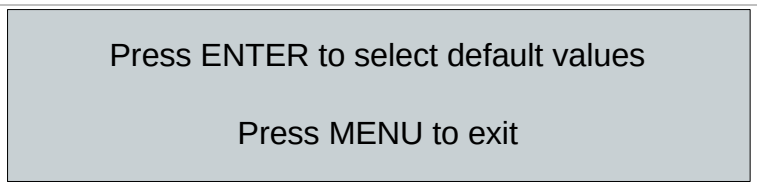
5 Popup Menu

Press "MENU" button once, and the Popup Menu will appear. While the Popup Menu is active, no settings sent over the serial link will be executed.

Press once on the "MENU" key		It is now possible to adjust the backlight level by pressing either up- or down key.
Press twice on the "MENU" key		It is now possible to default backlight, brightness and contrast by pressing the ENTER key. For ECDIS calibrated displays, the backlight level will be set to the last selected ECDIS mode by the serial link. (See 04924-000 document for details on how to change ECDIS mode over the serial link). *NOTE: See advanced OSD chapter for default values.*
Press three times on the "MENU" key		Leaving Popup Menu.

If color control in the advanced menu is set to user mode the Popup Menu will include Brightness and Contrast adjustments.

Press once on the "MENU" key		It is now possible to adjust the backlight level by pressing either up- or down key.
Press twice on the "MENU" key		It is now possible to adjust the brightness level by pressing either the up- or down key.

Press three times on the “MENU” key		It is now possible to adjust the contrast level by pressing either the up- or down key.
Press four times on the “MENU” key		It is now possible to default backlight, brightness and contrast by pressing the ENTER key. For ECDIS calibrated displays, the backlight level will be set to the last selected ECDIS mode by the serial link. (See 04924-000 document for details on how to change ECDIS mode over the serial link). *NOTE: See advanced OSD chapter for default values.*
Press five times on the “MENU” key		Leaving Popup Menu.

6 Advanced OSD

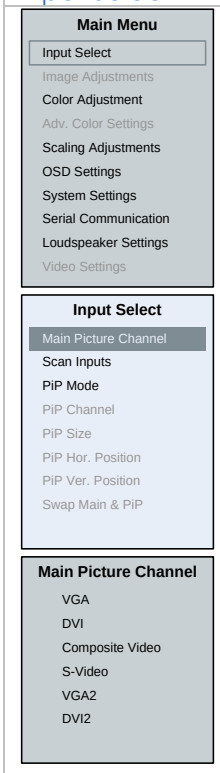
With the Advanced OSD (On Screen Display) you can modify the settings and control the special features of the DuraMON as described on the next pages.

To enter the Advanced OSD keep the “ENTER” key down and at the same time press the “MENU” key.

To navigate the Advanced OSD use the “UP” and “DOWN” buttons and press “ENTER” to select a specific setting. To get back to the previous menu point, press the “MENU” button.

6.1 Input select

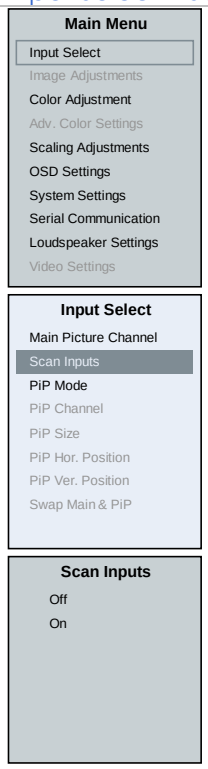
Input Select – Main Picture Channel



The Main Picture Channel can be selected between all available inputs (Composite Video, S-Video, VGA2 and DVI2 are optional).

Default is VGA

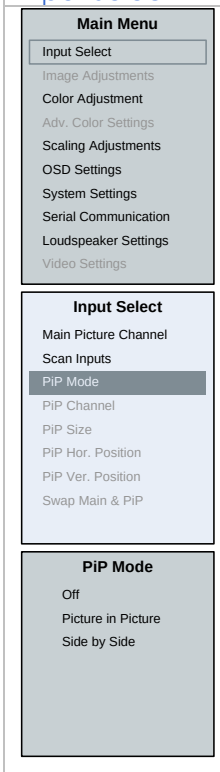
Input Select – Scan Inputs



When "Scan Inputs" is enabled all inputs are continuously being monitored for input signals.

Default is on

Input Select – PIP Mode



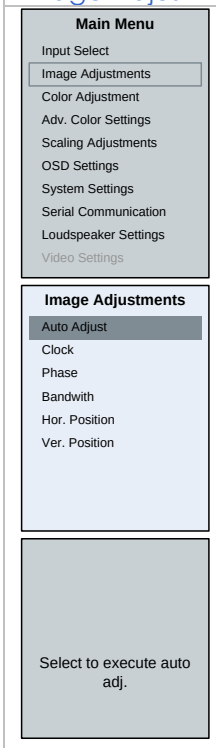
By enabling the PIP (Picture in Picture) function it is possible to define the PIP channel, size and position of it. It is also possible to swap between the main picture channel and PIP channel.

Default is off

It is not possible to select composite and s-video at the same time.

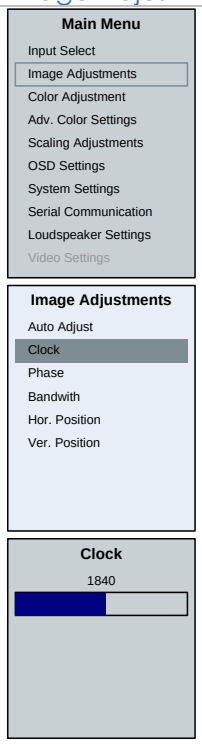
6.2 Image Adjustments

Image Adjustments – Auto Adjust



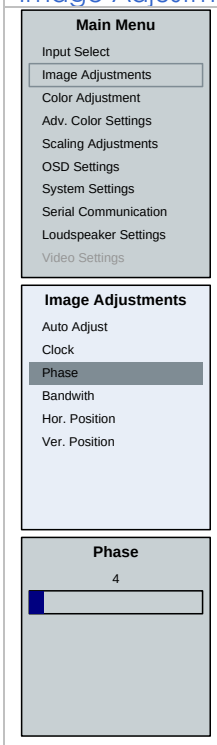
Selecting auto adjust will force the system to adjust the image (clock, phase, bandwith and position)

Image Adjustments – Clock



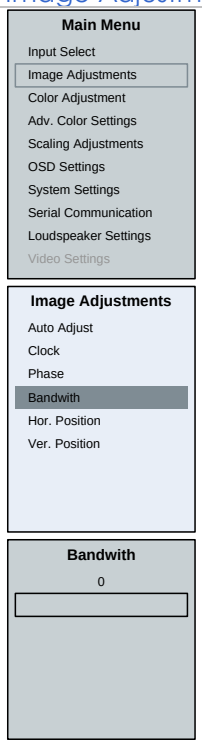
The pixel clock for the main picture channel can be selected here.

Image Adjustments – Phase



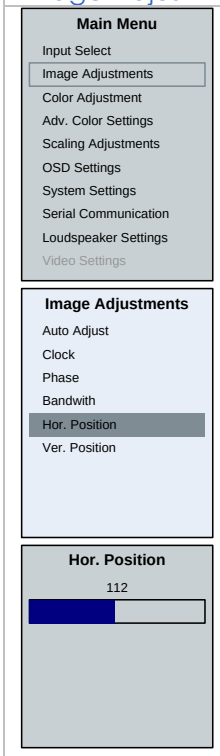
The phase of the display can be set for the main picture channel.

Image Adjustments – Bandwith



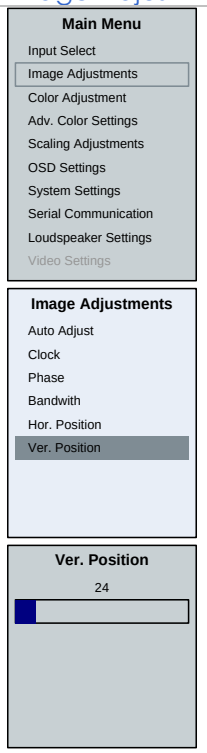
The bandwith of the display can be set here for the main picture channel.

Image Adjustments – Hor. Position



The horizontal position of the picture of the main picture channel can be set here.

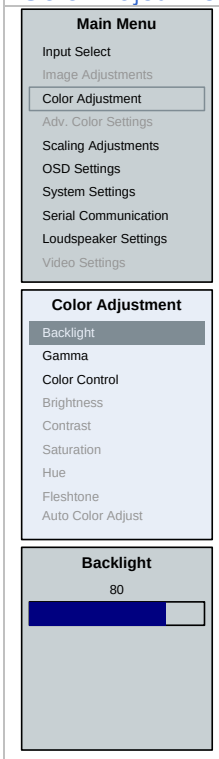
Image Adjustments – Ver. Position



The vertical position of the picture of the main picture channel can be set here.

6.3 Color adjustments

Color Adjustment – Backlight



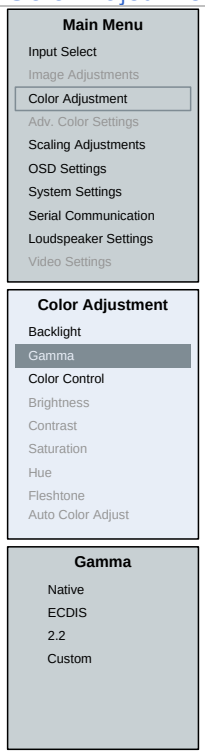
It is possible to set the backlight level.

Default is 100% for non-ECDIS calibrated displays.

For ECDIS calibrated displays, the default value is the value for the backlight level for ECDIS Day mode.

Unless popups or OSD is present it is possible to press the "UP"or "DOWN" button to adjust the backlight level and then press "ENTER" afterwards.

Color Adjustment – Gamma



The gamma correction for the "main picture channel" is set here. It can be set to native, 2.2 or custom defined.

Native = The panel default curve

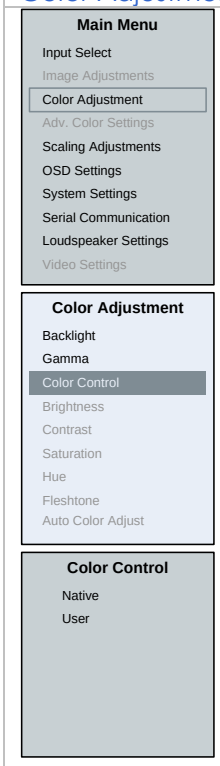
ECDIS = ECDIS calibrated. For none-ECDIS calibrated displays, this will be the same as Native.

2.2 = Gamma curve 2.2

Custom = Special gamma curve that can be implemented to fit a user needs.

Default none-ECDIS : native
Default ECDIS: ECDIS

Color Adjustment – Color Control



The "Color Control" of the "Main Picture Channel" can be either Native or User.

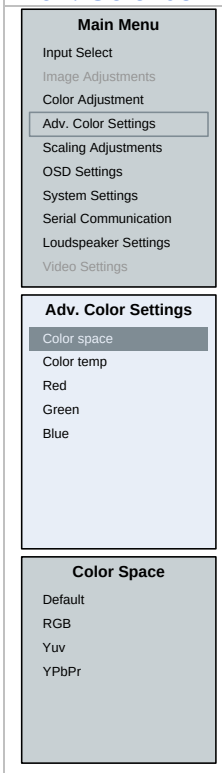
Setting the Color Control to User, adjustments like Brightness, Contrast, Saturation, Hue, Fleshtone and AutoColor Adjust becomes possible.

Also the Advanced Color Adjustments becomes possible by setting the Color Control to User.

Default is Native

6.4 Adv. Color Settings

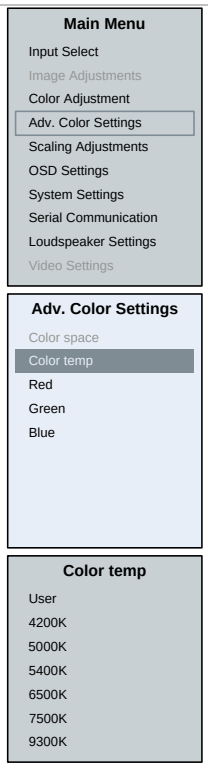
Adv. Color Settings – Color Space



Here the correct color space for the main input channel can be selected (only on RGB signal).

Default is Default.

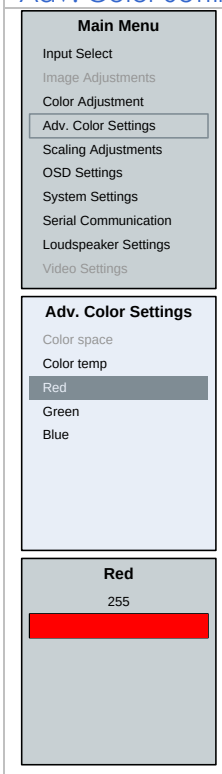
Adv. Color Settings – Color Temp



Here the color temperature can be selected. Set to user the color temp is adjusted by the three fundamental colours.

Default is User

Adv. Color Settings – Red/Green/Blue

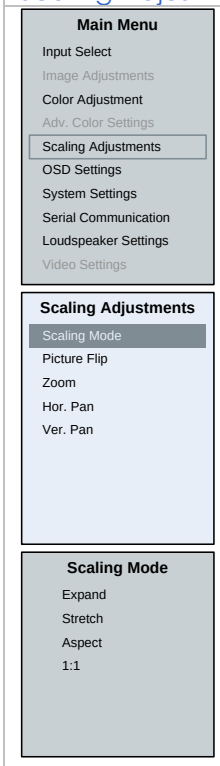


The rate for Red/Green/Blue can be set here from 0 – 255.

Default is 255/255/255

6.5 Scaling Adjustments

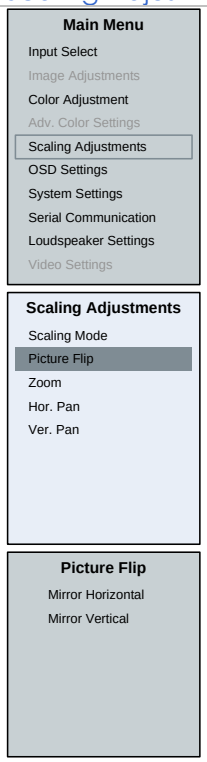
Scaling Adjustments – Scaling Mode



Scaling Mode can be set to either Expand, Stretch, Aspect or 1:1

Default is Expand

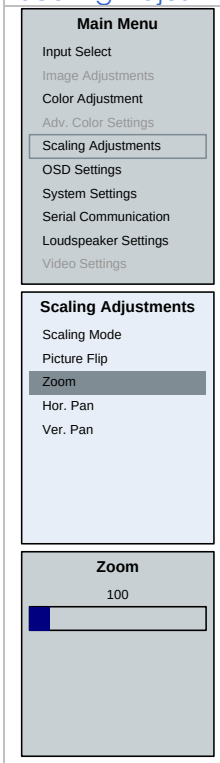
Scaling Adjustments – Picture Flip



The Main Picture Channel can be mirrored horizontally and/or vertically.

Default is all unchecked

Scaling Adjustments – Zoom

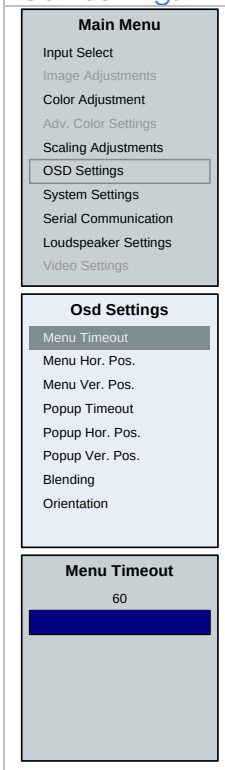


It is possible to zoom the picture of the Main Picture Channel from 80 to 300.
If zoom differs from 100 (no zoom) it is possible to pan both horizontally and vertically.

Default value is 100 (no zoom)

6.6 OSD settings

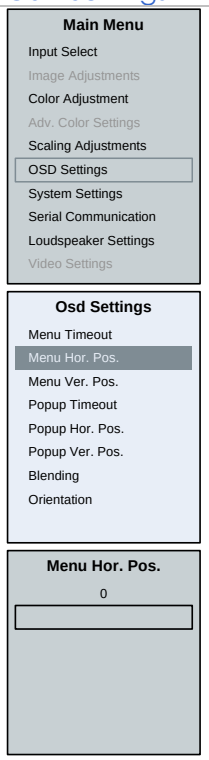
OSD Settings – Menu Timeout



The Menu Timeout period can be set between 0 and 60 seconds in steps of 5 seconds.

Default is 30 seconds

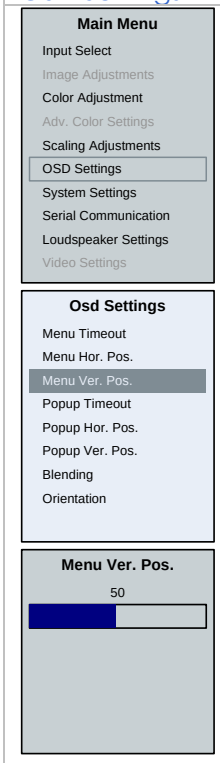
OSD Settings – Menu Hor. Pos.



The Horizontal Position of the OSD can be set from 0 (left margin) to 100 (right margin).

Default is 0 (left margin).

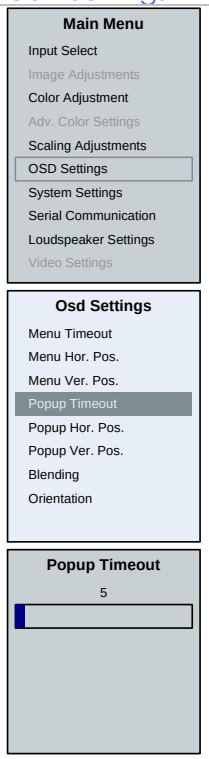
OSD Settings – Menu Ver. Pos.



The Vertical Position of the OSD can be set from 0 (upper margin) to 100 (bottom margin).

Default is 50 (center of the display)

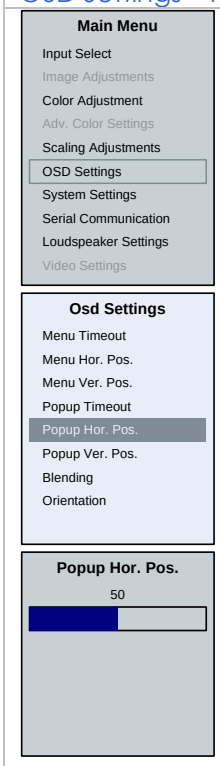
OSD Settings – Popup Timeout



The Popup Menu Timeout (Easy-to-use OSD menu) period can be set between 0 and 60 seconds in steps of 1 second.

Default is 5 seconds

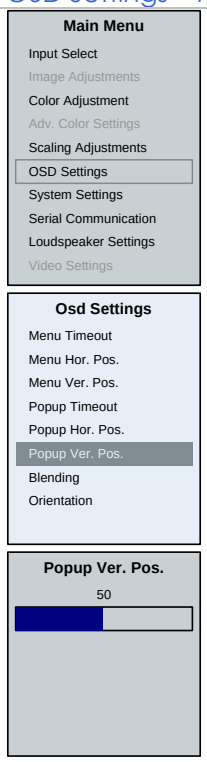
OSD Settings – Popup Hor. Pos.



The Horizontal Position of the Popup can be set from 0 (left margin) to 100 (right margin).

Default is 50 (center of the display)

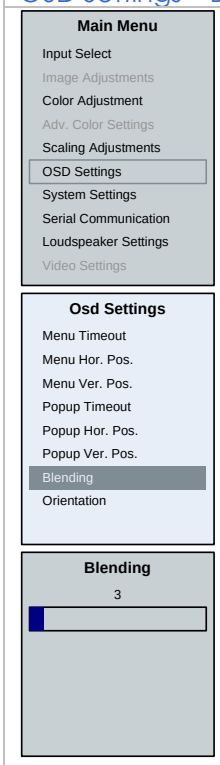
OSD Settings – Popup Ver. Pos.



The Vertical Position of the OSD can be set from 0 (upper margin) to 100 (bottom margin).

Default is 50 (center of the display)

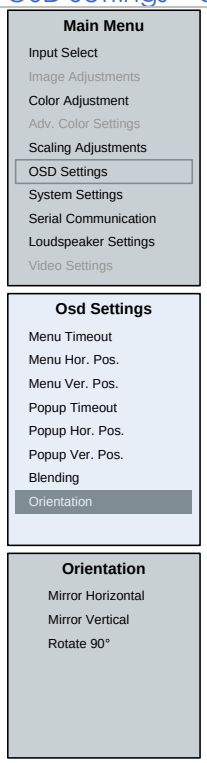
OSD Settings – Blending



The transparency of both the OSD and the Popup can be selected from 0 (solid) to 15 (clear)

Default is 2

OSD Settings – Orientation

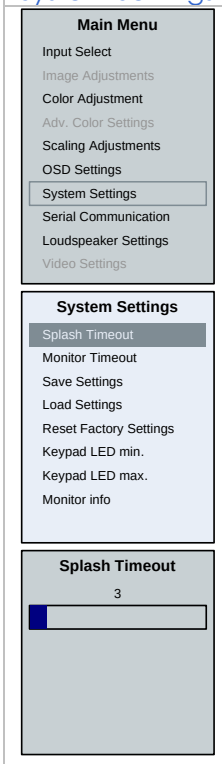


The Orientation of the OSD and Popup can be rotated and mirrored both horizontally and vertically here.

Default is all unchecked

6.7 System settings

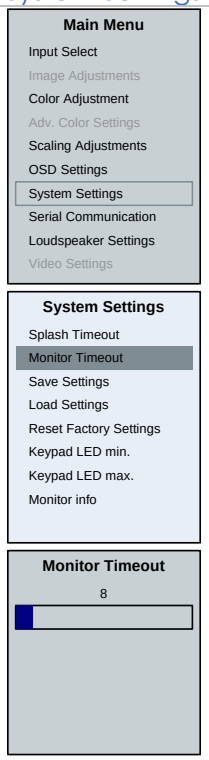
System Settings – Splash Timeout



The time a splash menu appears (startup logo) can be varied from 0 to 60 seconds.

Default is 3 seconds

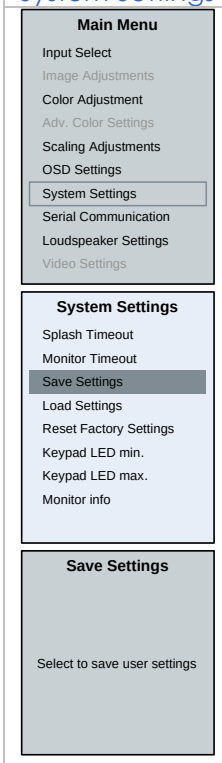
System Settings – Monitor Timeout



The time before the DuraMON will enter power down mode if no input signal is available can be adjusted from 0 to 120 seconds.

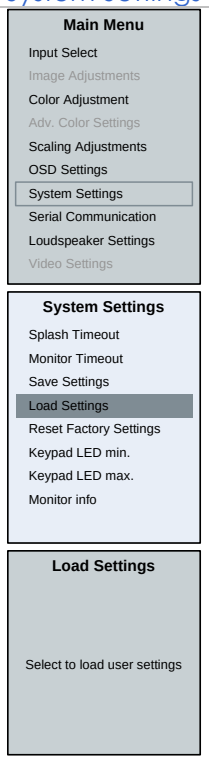
Default is 8 seconds

System Settings – Save Settings



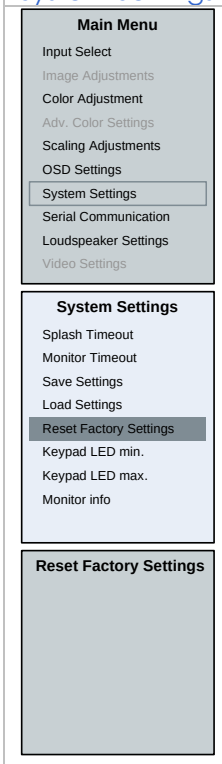
It is possible to save the user settings.

System Settings – Load Settings



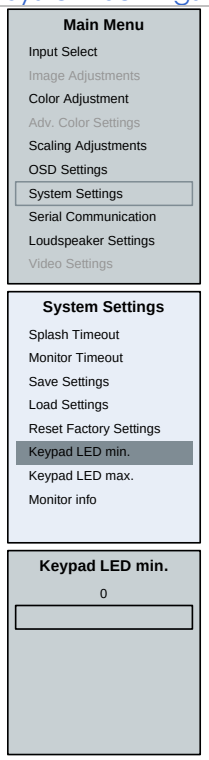
It is possible to load the user setting.

System Settings – Reset Factory Settings



It is possible to Reset Factory Settings and bring the DuraMON back to a known state.

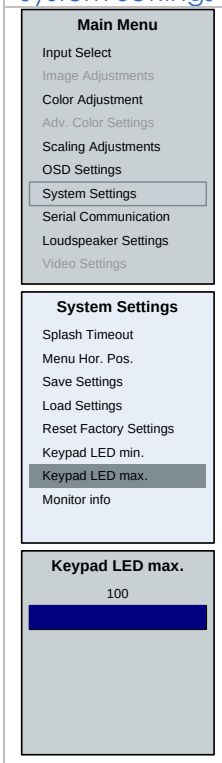
System Settings – Keypad LED min.



The minimum backlight value of the keypads can be adjusted from 0 to 100.

Default is 10

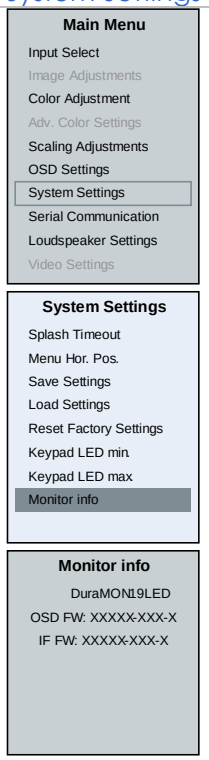
System Settings – Keypad LED max.



The maximum backlight value of the keypads can be adjusted from 0 to 100.

Default is 30

System Settings – Monitor Info



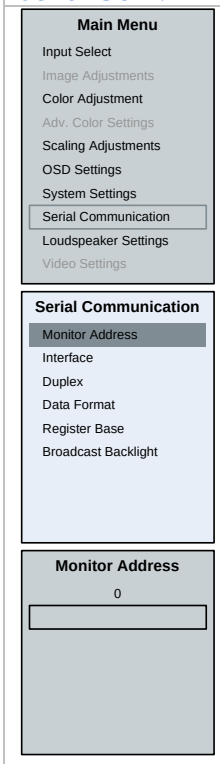
The Monitor Info contains information about the Product name and firmware version.

Example of firmware version:

DuraMON19LED
OSD FW: 04877-001-C
IF FW: 04837-000-I

6.8 Serial Communication

Serial Com. – Monitor Address

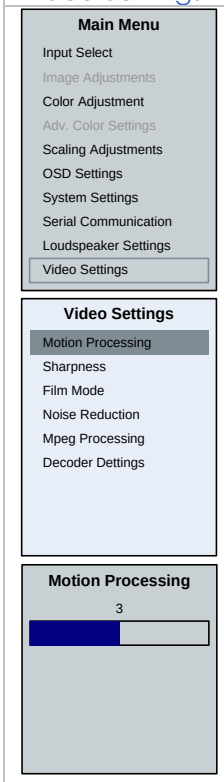


To communicate with a DuraMON the address has to be set between 0 and 254.

Default is 0

6.9 Video settings (optional)

Video Settings – Motion Processing

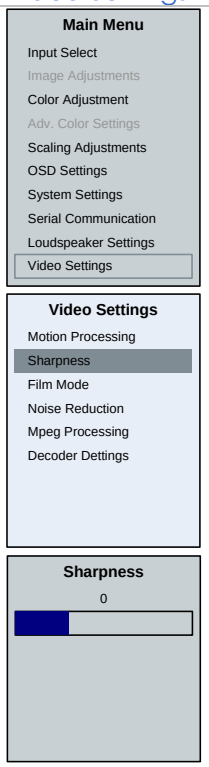


The type of Motion Processing is defined here. If Motion Processing is set to 0 it is switched off.

Default value is 3

The Video Settings are only available when a video source is available and selected as Main Picture Channel.

Video Settings – Sharpness

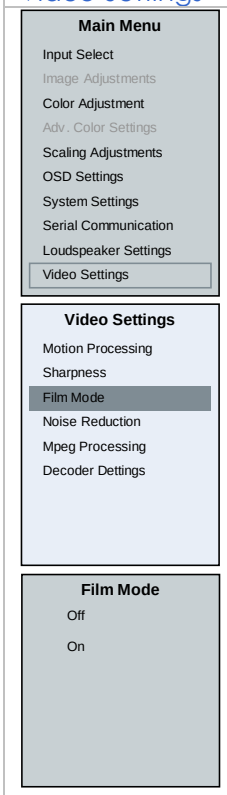


The Sharpness of the video signal can be selected between -15 to 29.

Default value is 0

The Video Settings are only available when a video source is available and selected as Main Picture Channel.

Video Settings – Film Mode

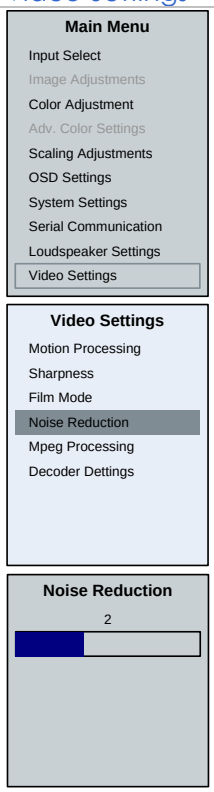


The Film Mode can be disabled/enabled here

Default value is ON

The Video Settings are only available when a video source is available and selected as Main Picture Channel.

Video Settings – Noise Reduction

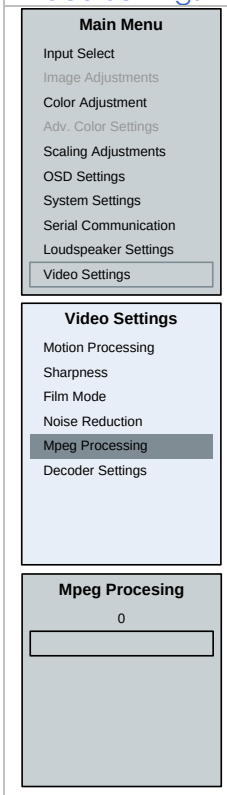


The Noise Reduction level can be adjusted here between 0 and 6.

Default value is 2

The Video Settings are only available when a video source is available and selected as Main Picture Channel.

Video Settings – Mpeg Processing

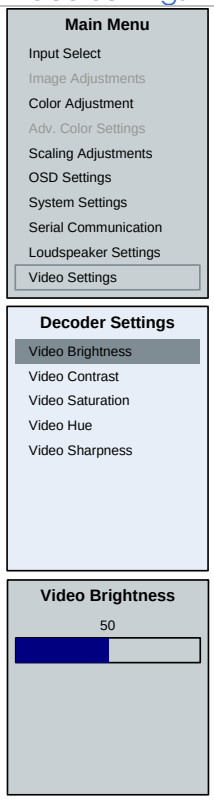


The level of Mpeg Processing can be adjusted between 0 and 15.

Default value is 0

The Video Settings are only available when a video source is available and selected as Main Picture Channel.

Video Settings – Video Brightness

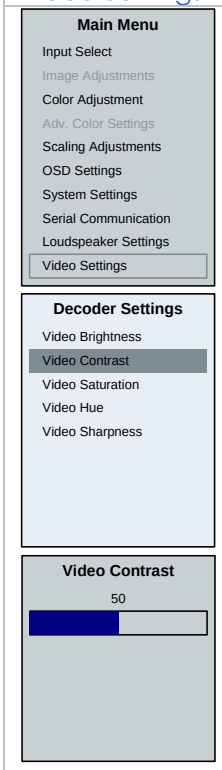


The level of Video Brightness can be adjusted between 0 and 100.

Default value is 50

The Video Settings are only available when a video source is available and selected as Main Picture Channel.

Video Settings – Video Contrast

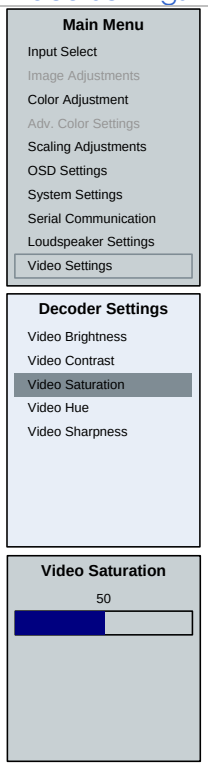


The Video Contrast can be adjusted from 0 to 100.

Default value is 50

The Video Settings are only available when a video source is available and selected as Main Picture Channel.

Video Settings – Video Saturation

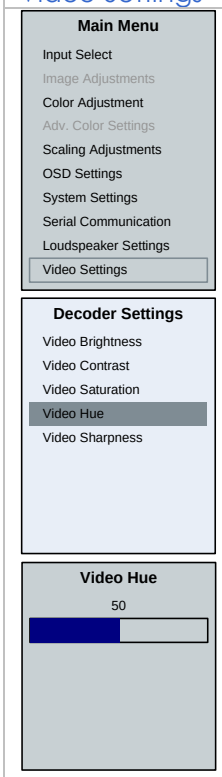


The Video Saturation level can be adjusted from 0 to 100.

Default value is 50

The Video Settings are only available when a video source is available and selected as Main Picture Channel.

Video Settings – Video Hue

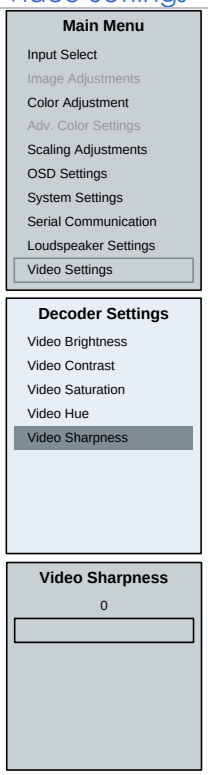


The Video Hue level can be adjusted from 0 to 100.

Default value is 50

The Video Settings are only available when a video source is available and selected as Main Picture Channel.

Video Settings – Video Sharpness



The Video Sharpness level can be adjusted from 0 to 100.

Default value is 0

The Video Settings are only available when a video source is available and selected as Main Picture Channel.

7 Serial connection pin-out

Pin	COM1 (RS-232) SUB-D 9-pol female
1	
2	TX
3	RX
4	
5	GND
6	
7	
8	
9	

8 Technical specifications DuraMON

DuraMON LED

Display sizes: **19" LCD (TFT)**

Display properties:

Size – Active area (Aspect)	Luminance	Contrast	Resolution
19" - 376 x 301 mm (4/3)	300 Cd/m^2	2000:1	1280 x 1024

View angle: **89° (L/R/T/B) (typical)**

Materials: **Front: Sea Water Resistant Aluminium w. black power coating RAL 9005**
Rear: Sea Water Resistant Aluminium w. black power coating RAL 9005

Window: **Anti Reflection coated front glass**

Protection: **IP65 front – IP20 rear**

DuraMON LED I/O

Video inputs:

RGB : Analogue 0.7 Vpp positive at 75Ω,
Separate sync or sync on green
Generally all VESA compatible video modes are supported up to 165MHz (up to UXGA 60Hz and WUXGA 60Hz reduced blanking).
Horizontal sync: 15-100 kHz (automatic)
Vertical sync: 30-85 Hz up to 1280x1024
30-60 Hz up to 1920x1200

DVI: Generally all VESA compatible video modes are supported up to 160MHz (up to UXGA 60Hz and WUXGA 60Hz reduced blanking).
Special modes supported on request.

Option available for S-video and Composite video

Control inputs: **1x RS232 – for remote control**
Option available for Touch 1x RS232
Option available for integrated Alarm Buzzer

DuraMON LED Power Supply Options

Standard: **90-264Vac. 50-60Hz Input**

Optional: **18-36Vdc Input**

DuraMON LED Environmental Conditions

Operating Temperature: **-15 to 55 °C**

Storage Temperature: **-25 to 70 °C**

Relative Humidity: **8 to 90 %**

DuraMON LED Approvals

CE Mark: **EN61000-6-2 & EN61000-6-4**

Marine: **IACS E10 Rev. 5 & IEC 60945 Ed. 4**

ECDIS: **IEC 61174**

Radar / Navigation: **IEC 62388 and IEC 62288**
For marine class approvals – see www.isic-systems.com

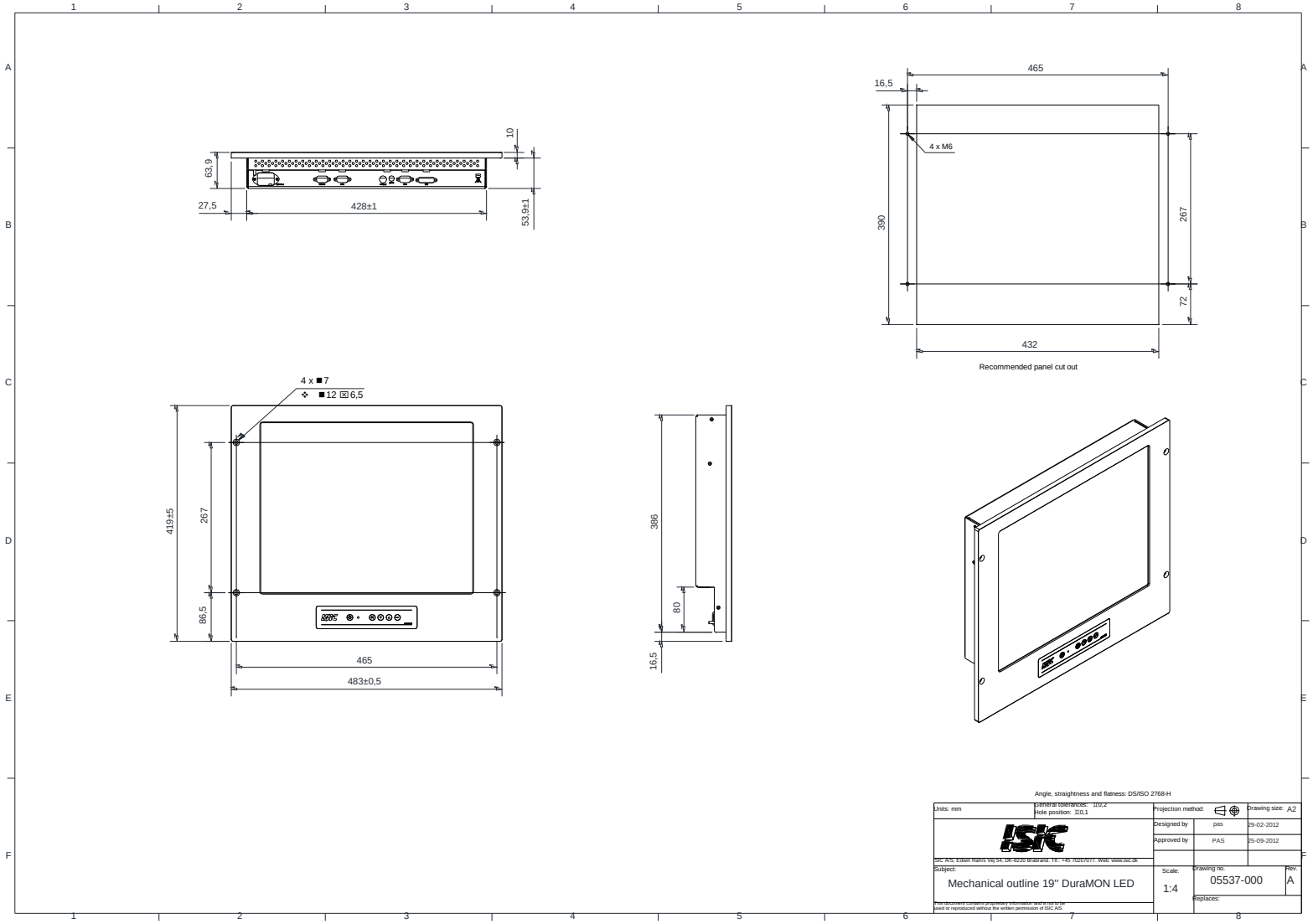
DuraMON LED Physical dimensions

Size: **483 (W) x 419 (H) x 64 (D)**

Weight: **6,5 kg.**

Bracket: **Desk / wall / roof bracket and IP22 rear-cover available (optional extra)**

9 Mechanical outline DuraMON19LED



10 ECDIS mode

ECDIS warning:
Be aware that use of the backlight, brightness or contrast controls in ECDIS mode may inhibit visibility of information particularly at night!

See document no. 04924-000 for ECDIS protocol details.

11 Dura Communication protocol

See document 04924-000 for protocol details.

12 Compass safe distance

Test object / condition	Minimum Compass safe distance [cm] (5.4°/H deviation or a horizontal magnetic flux of 0.094µT)	Minimum Compass safe distance [cm] (18°/H deviation or a horizontal magnetic flux of 0.313µT)
DuraMON19 LED	65	35

Pixel Pitch	0.294mm x 0.294mm
Viewing Distance	1.02 m
Response Time	20 ms (BtB) (typical)

13 Power Consumption

Test object / condition	Ptyp [W]	Pmax [W]
DuraMON19 LED	40	50

14 In rush current

Test object / condition	115 [VAC]		230 [VAC]	
	[Atyp]	[Amax]	[Atyp]	[Amax]
DuraMON19 LED	-	50	-	100

15 Troubleshooting

Problem	Cause	Solutions
No picture on display	Backlight level set to minimum	Increase backlight
	Monitor turned off	Turn on the monitor
	No input signal present	Apply signal
	No power cord connected	Apply power
Buttons on front doesn't work	Unit in ECDIS mode	Press Menu + Enter to unlock the monitor
	No power cord connected	Apply power
	Keypad defect	Please do not try to open the unit. Send it to ISIC A/S for repair.
The unit smells burned / smoke is coming from the unit	There might be something burned inside	Please do not try to open the unit. Send it to ISIC A/S for repair.

16 Servicing the unit

In case that the unit still fails after following the troubleshooting send the unit to ISIC for repair. There are no user serviceable parts inside and to ensure ECDIS compliance the monitor has to be recalibrated at ISIC.

17 Terms, Acronyms and abbreviations

Brill	Brilliance of the display (backlight level)
Communication protocol:	Use a serial link to control various settings in the monitor
DVI:	Digital Visual Interface
ECDIS:	Electronic Chart Display and Information System
IP20:	International Protection Rating (protected against objects with a size larger than 12.5mm)
IP65:	International Protection Rating (dust tight and protected against water jerks)
OSD:	On Screen Display
TBD:	To be defined
VGA:	Video Graphics Array

18 ISIC info / Support

Company name:	ISIC A/S
Head office:	Edwin Rahrs Vej 54 DK – 8220 Brabrand Denmark
Shipping address:	Holmstrupgaardvej 5 DK-8220 Brabrand Denmark
Telephone: Fax:	+45 70 20 70 77 +45 70 20 79 76
Mail: www:	mail@isic-systems.com www.isic-systems.com
VAT number:	DK 16 70 45 39
Bank Name/Address:	Handelsbanken A/S Havneholmen 29 DK – 1561 København V Denmark
Bank Code: SWIFT: IBAN for DKK: IBAN for EUR: IBAN for USD:	0892 HANDDKKK DK53 0892 0001 0159 69 DK48 0892 0003 0026 19 DK26 0892 0003 0026 27
Contacts: RFQ's:	 By fax to +45 70 20 79 76 By mail to sales@isic-systems.com
Orders:	By fax to +45 70 20 79 76 By mail to orders@isic-systems.com
Support:	Via homepage www.isic-systems.com under aftersales By mail to service@isic-systems.com During office-hours (Mo-Fr: CET 0800 - 1600) at +45 70 20 70 77
Service:	Before shipment for service Request Return Material Authorisation number at homepage www.isic-systems.com under RMA By mail to service@isic-systems.com

19 Revision history

Rev A	Dec 2012	First release
Rev B	Feb 2013	Added Pixel Pitch, Viewing Distance and Response Time

20 Appendix A: Pixel policy

ISO 9241-307:2008 guidelines for LCD pixel defects

Introduction

TFT displays consist of a set number of pixels. Each pixel consists of 3 sub-pixels also called dots (one red, one blue and one green). Every sub-pixel is addressed by its own transistor. As a result, the manufacturing of glass substrate is very complex.
Due to the nature of this manufacturing process, occasional defects can occur. Pixel defects or failures cannot be fixed or repaired and may occur at any stage during the service life of the TFT display.
To regulate the acceptability of defects and protect the end user, ISIC A/S complies with the ISO 9241-307:2008 standard. This standard recommends how many defects are considered acceptable in a display, before it should be replaced within the terms of the warranty.

Monitor classification

ISO 9241-307:2008

Allowed defects per type per million pixels						
Defect classes	**Pixel defects**			**Cluster defect**		
	Type 1	**Type 2**	**Type 3 total** ($2xN_{3a} + N_{3b}$)	**Type 1**	**Type 2**	**Type 3**
Class: 0	0	0	0	0	0	0
Class: I	1	1	5	0	0	0
Class: II	2	2	10	0	0	1
Class: III	5	15	100	0	0	5

ISIC TFT monitors comply with ISO 9241-307:2008 Class II.
Special agreements about other classifications can be made between ISIC A/S and the customer.

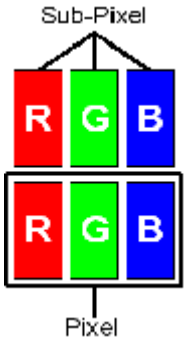
Measurement method/monitoring conditions for pixel defects

In compliance with the ISO-9241-307:2008 standard, the following conditions are observed:

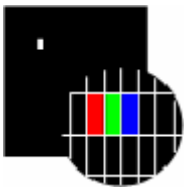
- Final check for pixel fault undertaken right after burn-in, i.e. with pre-heating of the display.
- Surrounding temperature 25ºC ± 5ºC
- Relative air humidity 40–70%

Pixel definition

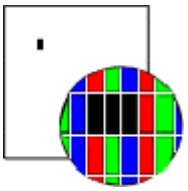
Every pixel consists of three sub-pixels/dots (red, blue, green).
Every sub-pixel has its own transistor.
The three sub-pixels/dots must be considered as one unit.



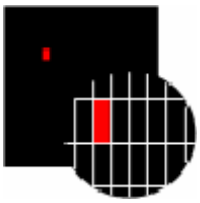
Pixel



Pixel defect type 1 Pixel constantly lit

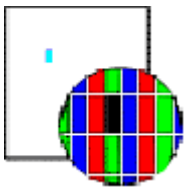


Pixel defect type 2 Pixel constantly dark



Pixel defect type 3a

Sub-pixel/dot (red, blue, green) constantly lit

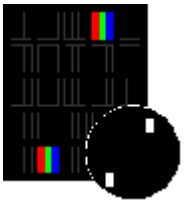


Pixel defect type 3b

Sub-pixel/dot (red, blue, green) constantly dark

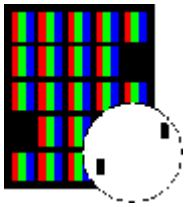
Cluster

A cluster consists of 5 x 5 pixels.



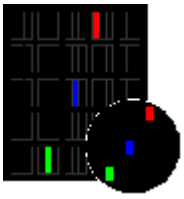
Cluster pixel defect type 1

Pixels in a cluster area constantly lit



Cluster pixel defect type 2

Pixels in a cluster area constantly dark



Cluster pixel defect type 3a

Sub-pixels/dots in a cluster area constantly lit

Cluster pixel defect type 3b

Sub-pixels/dots in a cluster area constantly dark

Pixel faults accepted by ISIC A/S

The maximum number of pixel faults that is considered acceptable at different screen resolutions is shown in the table below.

This is the native resolution and not the resolution as adjusted by user.

Class II

Allowable number of pixel faults in monitor applications							
Screen type	**Native resolution**	**Number of pixels**	**Pixel defect type 1**	**Pixel defect type 2**	**Pixel defect Type 3 total** ($2xN_{3a} + N_{3b}$)	**Cluster defect type 1 and 2**	**Cluster defect type 3**
XGA	**1024x768**	**768,432**	**1**	**1**	**7**	**0**	**0**
SXGA	**1280x1024**	**1,310,720**	**2**	**2**	**13**	**0**	**1**
UXGA	**1600x1200**	**1,920,000**	**3**	**3**	**19**	**0**	**1**
FHD	**1920x1080**	**2,073,600**	**4**	**4**	**20**	**0**	**2**
WUXGA	**1920x1200**	**2,304,000**	**4**	**4**	**23**	**0**	**2**

SCIENCE GATE
Your Automation Partner
SCIGATE AUTOMATION (S) PTE LTD
No.1 Bukit Batok Street 22 #01-01 Singapore 659592
Tel: (65) 6561 0488 Fax: (65) 6562 0588
Email: sales@scigate.com.sg Web: www.scigate.com.sg
Business Hours: Monday - Friday 8.30am - 6.15pm

Edwin Rahrs Vej 54
DK-8220 Brabrand
Denmark
Web: http://www.isic-systems.com
Email: service@isic-systems.com