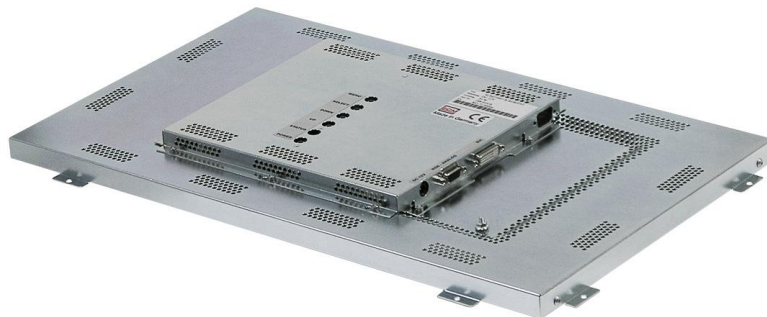




Product Specification

Beck Compact Module SCM21H01-R RGB/DVI



August 2017

Preliminary

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Preliminary
Product Specification
Beck Compact Module
SCM21H01-R



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2. General Description

2.1 Product Description

The Beck Compact Module SCM21H01-R consists of a color active matrix TFT LCD module using amorphous silicon TFT's (Thin Film Transistors) as an active switching device. This module has a 54.6 cm (21.5 inch) diagonally measured active area with Full HD screen format (1920 horizontal by 1080 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripes. This module can display 16,7M colors. The TFT-LCD panel used for this module is adapted for a low reflection and higher color type. The Beck Compact Module SCM21H01-R is no complete monitor but a component. Drive peripherals as interface card, OSD-board, etc. are adapted to the display by a metal covering. The components are tested and tuned to work together perfectly.

2.2 Basic Components

The SCM21H01-R consists of:

Item	Description	Manufacturer
54.6 cm (21,5") Active Matrix TFT LCD	G215HVN01.0	AU Optronics
Interface-Controller	DCMR-45H6U07 TTL/LVDS	Uplusvision
OSD-Board	EPAS-OSD1 SMD LED	Uplusvision

2.3 Liability

Beck Elektronik is not responsible for changes of the components of the Beck Compact Module. This specification is subject to change without notification.

This specification refers to the specifications of the manufacturers of the parts.

If required, Beck Elektronik will send the full specification of the included components.



3. General Features

Item	Description	Remarks
Diagonal	54.6 (21.5")	cm
Active area	476.64 (H) x 268.11 (V)	mm
Resolution – display	1920 x 1080	pixel
Resolution – controller	640 x 480 – 1920 x 1080	pixel
Pixel pitch	0.248 (H) x 0.248 (V)	mm
Pixel arrangement	RGB vertical stripe	
Display colors	16,7 Mio.	colors
Display mode	Normally Black	
Brightness	300	cd/m ²
Contrast ratio	5000:1	
Viewing angle	hor.: 89° / 89°, ver.: 89° / 89°	deg.
Response time	16	msec
Interface	Analog-RGB H-Sync. / V-Sync. // DVI	
H-Sync.	31.4 – 80	KHz
V-Sync.	60 – 75	Hz
Power input voltage	12	V DC
Power consumption	20	W
Dimension	516.7 x 313.3 x 32.0	mm
Weight	3,400	gram
RoHS compliance	Yes	



4. Electrical Specification

4.1 Input Signal Characteristics

Description	Signal	Unit	Min	Typical	Max	Notes
RGB Input	Analog RGB	• Vp-p	0	-	0.7	
	Sync	• Vdc	0	-	5.5	
	Horizontal Frequency	• KHz	31.4	-	80	
	Vertical Frequency	• Hz	60	-	75	
DVI Input	Differential Output	• mVp-p	150	-	1200	
	Input clock Frequency	• MHz	25.2	-	136.8	

4.2 Power Supply and Supply Voltage Ripple

Input Signal	Description	Unit	Min	Typical	Max	Remarks
DC Input	DC Voltage	Vdc	11.4	12	12.6	
	Power Consumption	Watts	-	20	-	

- Supply ripple voltage: 100mV



4.3 Connector Pin Assignment and Description

4.3.1 Signal Input Pin Assignment

Analog-RGB Input Connector

Signal Connector: 15 pin HD D-SUB female connector

Group	Pin No.	Symbol	Description
Analog RGB	1	Red	Analog Red
	2	Green	Analog Green
	3	Blue	Analog Blue
	4	ID2	Reserved
	5	GND	Digital GND
	6	RGND	Red Return
	7	GGND	Green Return
	8	BGND	Blue Return
	9	VGA +5V	+5V
	10	SGND	Sync GND
	11	ID0	Reserved
	12	SDA	DDC Serial Data
	13	HSync	Horizontal Sync
	14	VSynC	Vertical Sync
	15	SCL	DDC Data Clock

DVI Input Connector

Signal Connector: DVI-D 24+1pin standard single connector

Group	Pin No.	Symbol	Description	Pin No.	Symbol	Description
DVI	1	RX2-	DVI Data 2-	16	HPD	Hot Plug Detect
	2	RX2+	DVI Data 2+	17	RX0-	DVI Data 0-
	3	GND	2/4 Shield	18	RX0+	DVI Data 0+
	4	NC	DVI Data 4-	19	GND	0/5 Shield
	5	NC	DVI Data 4+	20	NC	DVI Data 5-
	6	SCL	DDC Data Clock	21	NC	DVI Data 5+
	7	SDA	DDC Data	22	GND	Clock Shield
	8	NC	Analog V-Sync	23	RXC+	DVI Clock+
	9	RX1-	DVI Data 1-	24	RXC-	DVI Clock-
	10	RX1+	DVI Data 1+			
	11	GND	1/3 Shield			
	12	NC	DVI Data 3-			
	13	NC	DVI Data 3+			
	14	DVI +5V	+5V			
	15	SYNC GND	Check DVI			



4.3.2 Power Supply Pin Assignment

Power Input Connector

Type: DC Jack

Pin No.	Symbol	Description	Note
1	Vin	12V DC	
2	GND	GND	

5. Optical Specifications

The test of Optical specifications shall be measured in a dark room (ambient luminance ≤ 1 lux and temperature = $25 \pm 2^\circ\text{C}$) with the equipment of Luminance meter system (Goniometer system and SR_3 or equivalent) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0° . We refer to $\theta_{\Phi=0} (= \theta_3)$ as the 3 o'clock direction (the "right"), $\theta_{\Phi=90} (= \theta_{12})$ as the 12 o'clock direction ("upward"), $\theta_{\Phi=180} (= \theta_9)$ as the 9 o'clock direction ("left") and $\theta_{\Phi=270} (= \theta_6)$ as the 6 o'clock direction ("bottom"). While scanning θ and/or Φ , the center of the measuring spot on the display surface shall stay fixed. The measurement shall be executed after 30 minutes warm-up period. VDD shall be 5.0V +/- 10% at 25°C .



5.1 Optical Characteristics

[VDD=5.0V, Frame rate=60Hz, Clock=54MHz, I_{BL}= 1.83 A, T_a = 25±2°C]

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Remarks	
Viewing Angle	Horizontal	Θ ₃	75	89	-	Deg	Note 1	
		Θ ₉	75	89	-	Deg		
	Vertical	Θ ₁₂	75	89	-	Deg		
		Θ ₆	75	89	-	Deg		
	Horizontal	Θ ₃	CR > 5	-	-	-		Deg
		Θ ₉	CR > 5	-	-	-		Deg
	Vertical	Θ ₁₂	CR > 5	-	-	-		Deg
		Θ ₆	CR > 5	-	-	-		Deg
Luminance contrast ratio	CR		3000	5000	-		Note 2	
Luminance of white	Y _W		240	300	-	cd/m ²	Note 3	
White luminance uniformity	ΔY		75	80	-	%	Note 4	
Reproduction of color	White	W _x	0.263	0.313	0.363		Note 5	
		W _y	0.279	0.329	0.379			
	Red	R _x	0.589	0.639	0.689			
		R _y	0.283	0.333	0.383			
	Green	G _x	0.284	0.334	0.384			
		G _y	0.573	0.623	0.673			
	Blue	B _x	0.105	0.155	0.205			
		B _y	0.000	0.048	0.098			
Response time	Tr			16			Note 6	
	Td							
Cross talk	CT		-	-	1.5	%	Note 7	
Flicker	dB				-20		Note 8	

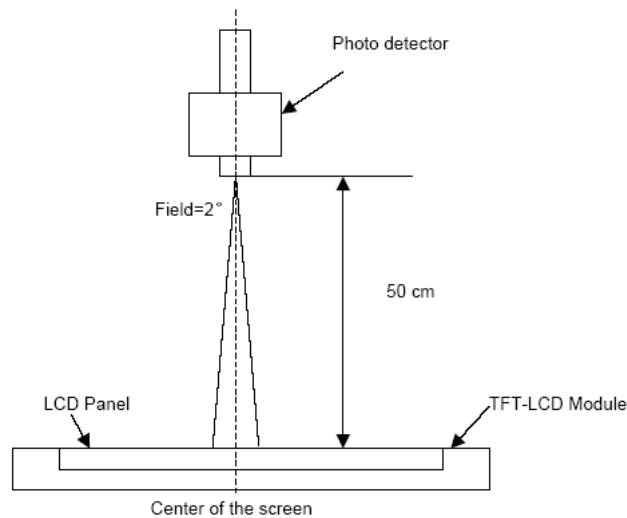
Notes:

- Viewing angle is the measurement of contrast ratio ≥ 10 , at the screen center, over a 180° horizontal and 180° vertical range (off-normal viewing angles). The 180° viewing angle range is broken down as follow: 90° (θ) horizontal left and right, and 90° (φ) vertical high (up) and low (down). The measurement direction is typically perpendicular to the display surface with the screen rotated to its center to develop the desired measurement viewing angle.
- Contrast measurements shall be made at viewing angle of θ= 0° and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state. (See FIGURE 1) Luminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Brightness on the "White" state}}{\text{Brightness on the "Black" state}}$$

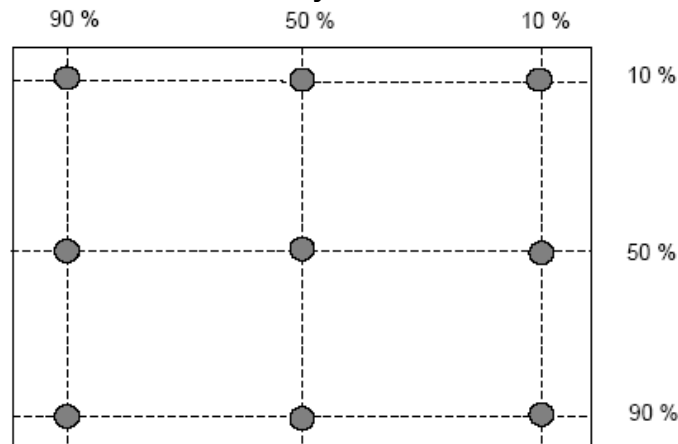


Figure 1: Measurement set up



- Center Luminance of white is defined as the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display.

Figure 2: White Luminance and Uniformity Measurement Locations (9 points)

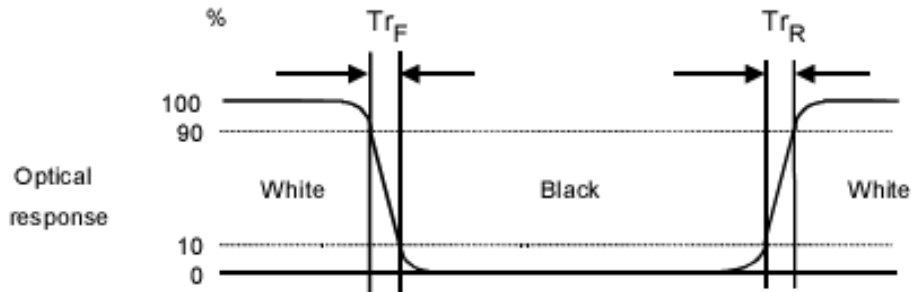


- The luminance uniformity of 9 points is defined by dividing the minimum luminance values by the maximum test point luminance:
$$\Delta Y = (\text{Minimum Luminance of 9points} / \text{Maximum Luminance of 9points})$$

(See FIGURE 2).
- The color chromaticity coordinates shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.
- The output signals of photo detector are measured when the input signals are changed from "White" to "Black" (falling time) and from "Black" to "White" (rising time). The response time interval is between 10% and 90% of amplitudes.

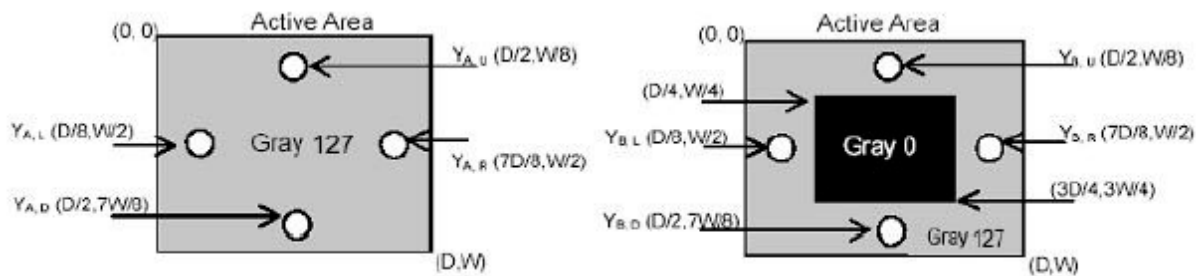


Figure 3: Response Time Testing



- Cross-Talk of one area of the LCD surface by another shall be measured by comparing the luminance (Y_A) of a 25mm diameter area, with all display pixels set to a gray level, to the luminance (Y_B) of that same area when any adjacent area is driven dark. (See FIGURE 4).

Figure 4: Cross Modulation Test Description



$$CT = |Y_B - Y_A| / Y_A \times 100 (\%)$$

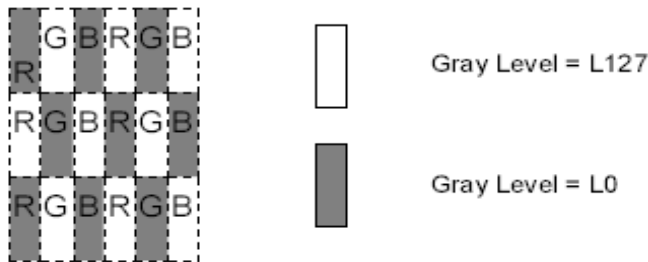
Where:

Y_A = Luminance of measured location without gray level 0 pattern (cd/m²)

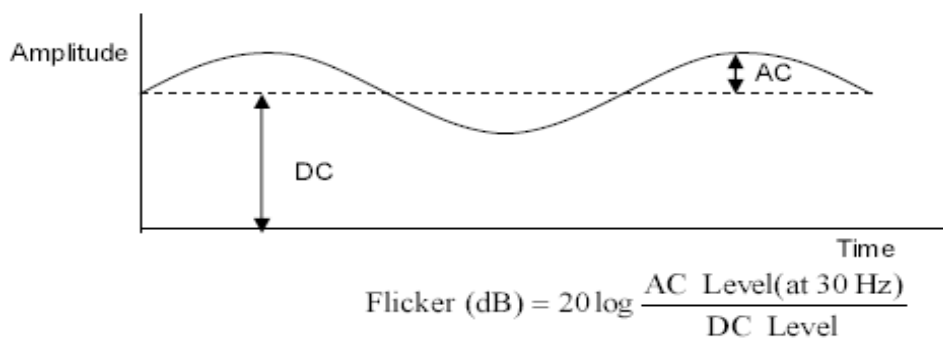
Y_B = Luminance of measured location with gray level 0 pattern (cd/m²)



8. Test Pattern: Subchecker Pattern measured by TOPCON SR-3



Method: Record dB value with TRD-100



5.2 Lamp Life

Parameter	Min	Typ	Max	Unit	Remarks
Lamp Life	50.000			hrs	I _{BL} = 1.83 A

6. OSD Adjustment

The Beck Compact Module SCM21H01-R gives a various and very easy graphics interface to its users. Users have easy access to the functions that they want to adjust. Be sure that your system's power and LED are turned on before the OSD controls are being used.

6.1 OSD LED Operating Mode

Power	Signal Input	LED (Red)	LED (Green)
On	Plugged	Off	On
Off	Plugged	Off	Off
On	Unplugged	On	On
Off	Unplugged	Off	Off



6.2 Key Name and Function

No.	Button name	Switch Function
1	Menu	1. First click : Appears the OSD main menu 2. Second click : Exit sub & main menu
2	Select	HOT KEY FOR INPUT SIGNAL SELECTION 1. Select main & sub menu function 2. Confirmation button for selected menu points 3. Back to the sub menu
3	Up(Right)	1. Move up/right main & sub menu 2. Increase selected value
4	Down(Left)	HOT KEY FOR AUTO ADJUSTMENT 1. Move down/left main & sub menu 2. Decrease selected value
SMD-LED	Status	look at 6.1 OSD LED Operating Mode
5	Power	1. Turns ON/OFF the system

Accessing the menu system:

1. With the OSD off, push the **Menu** button to activate the main OSD menu.
2. Use the **Up** and **Down** buttons to move through the main menu. To select a desired sub menu, press the **Select** button after your selection. The selection tabs are highlighted.
3. After selecting sub menu use the **Up** and **Down** buttons to move through the sub menu. To select a setting icon, press the **Select** button after your selection. The selected icons are highlighted.
4. There are two types of icons: some have a single function and must be confirmed with the **Select** button, the other options are setting bars. Once a setting bar appears, it can be increased or decreased via the **Up** and **Down** buttons. The setting bar moves and the numeric value indicator changes to reflect your adjustments.
Note: The numeric value indicator is provided as a point of reference only and has nothing to do with a real measurement.



5. There are different ways to close the OSD menu:

- (a) Waiting some seconds (**timeout**). This time can be adjusted as needed in the sub menu OSD-Menu → OSD-Timer.
- (b) After an auto adjustment and confirmation the OSD menu closes automatically.
- (c) After a factory reset and confirmation the OSD menu closes automatically.
- (d) In the sub menu: Press the **Menu** button two times to leave the sub menu.
- (e) In the main menu: Press the **Menu** button to leave the OSD menu.
- (f) After adjusting a setting, press the **Select** or **Menu** button. Now your selected sub menu is highlighted. Confirm your selection with the **Menu** button to leave the sub menu. This highlights your menu selection in the main menu. Confirm again with the **Menu** button to leave the OSD menu.

6. Auto Adjustment without opening OSD menu:

- Press the **Down** button and an auto adjustment will be done automatically.

7. Input signal selection without opening OSD menu:

- Press the **Select** button and a signal selection will be done automatically.

8. Booting with different input signals

If you boot the BCM device with RGB and DVI parallel, it is possible to change between both input signals. If you boot the BCM device either with RGB or DVI, there will be an automatically signal input detection. Not connected signal inputs won't be recognized. The BCM device identify the connected signal input, otherwise it will go into a sleeping mode. Furthermore, the BCM device search the last input signal, this is recognized as the prior input.

9. Storing of Display settings

If you disconnect the power supply or signal cable, all your previous display settings e.g. brightness, contrast, clock, phase etc. will be stored.

REMARK:

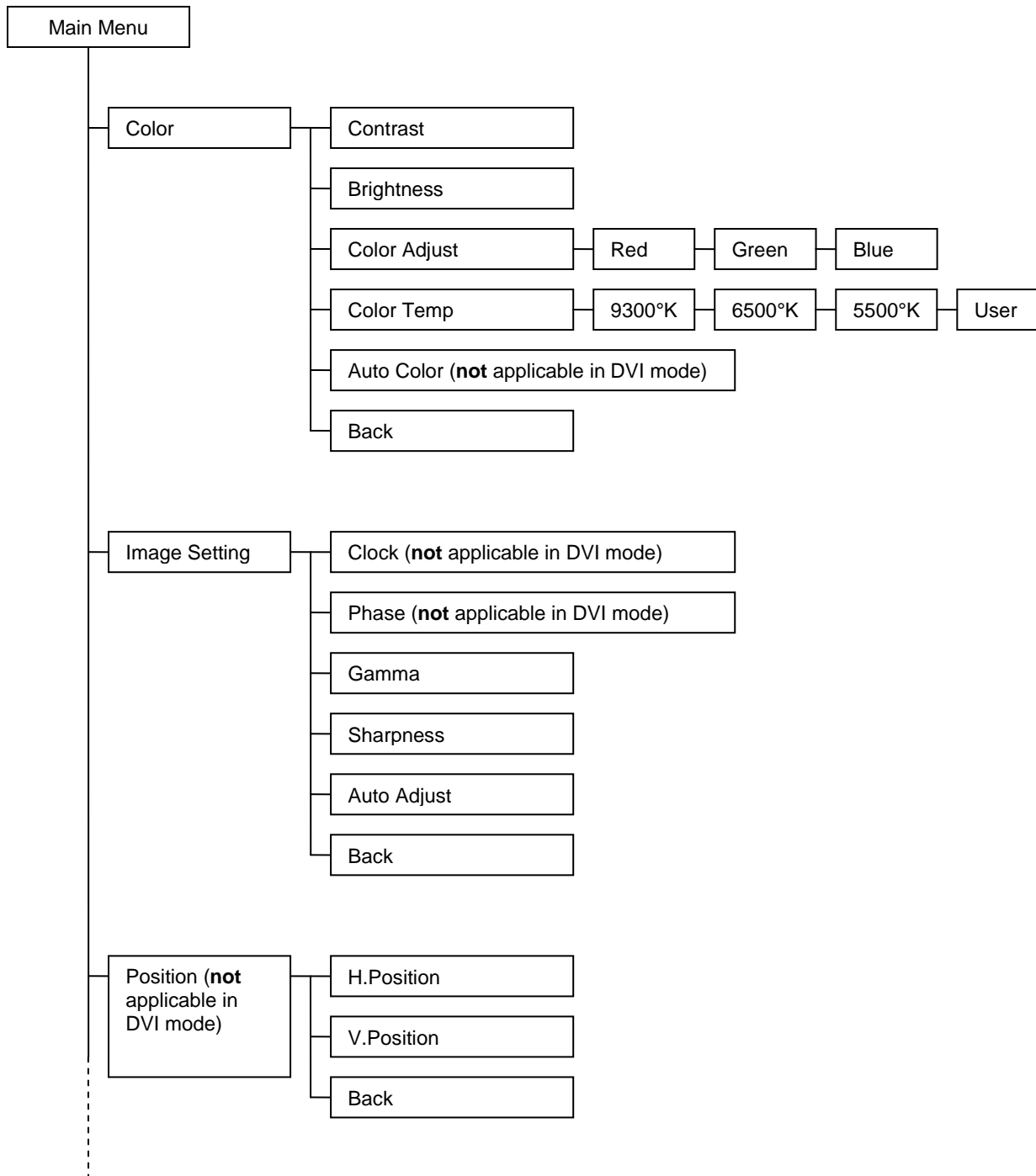
If you use the BCM device with different resolutions, it is necessary to do an auto adjustment in all your operating modes. The different resolution will be stored as well. If you change your operating mode between the different resolutions, the image will be automatically 100% central adjusted.

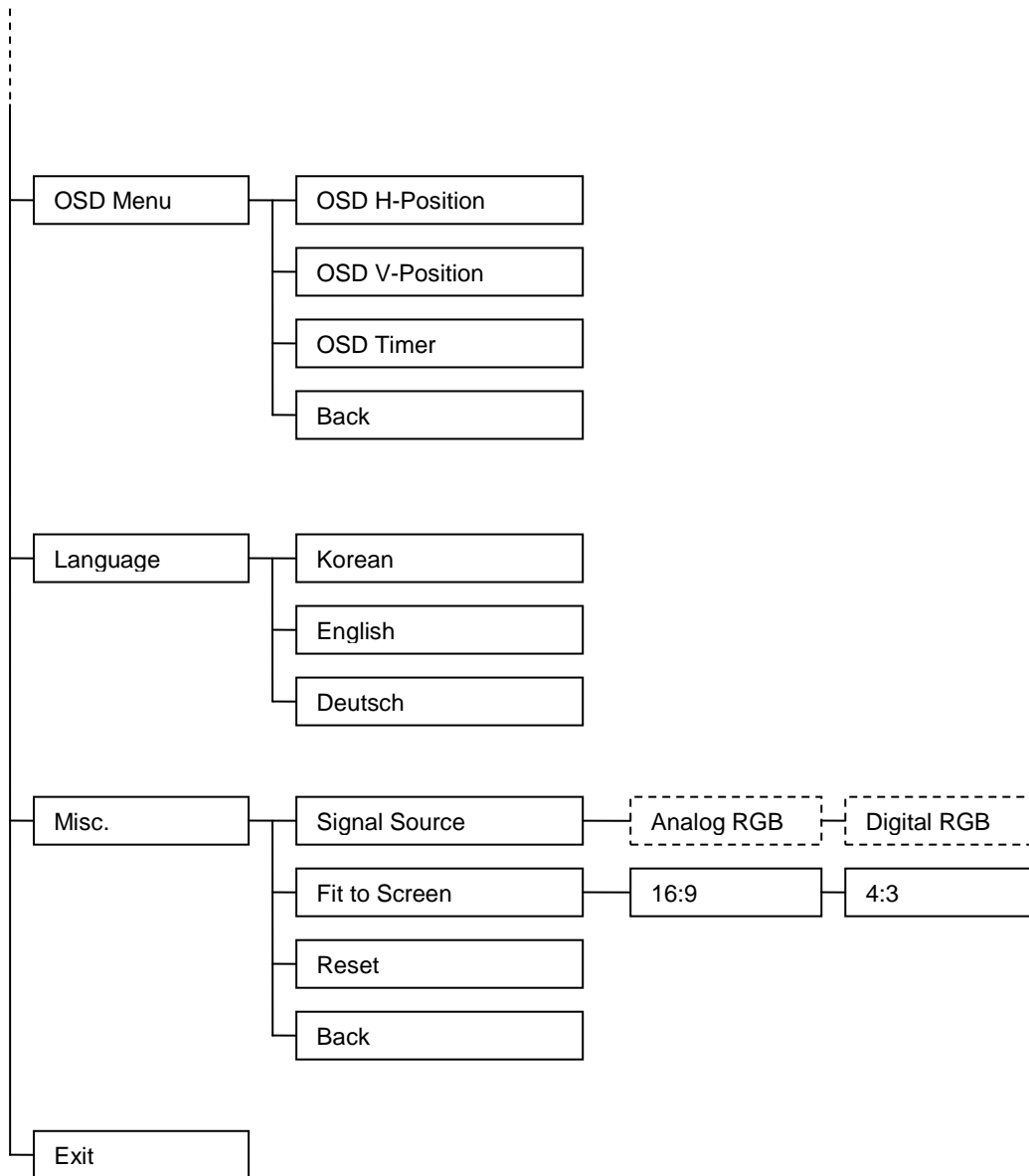
10. Reset procedure

If you want to have a factory reset, so you have to precede a reset in your entire operating mode. Please do at first a reset on DVI-Side and after that a reset on RGB side. Right after doing it, there should be a message on the screen: "INITIALIZE"/"Auto Adjust..".



6.3 Menu Structure



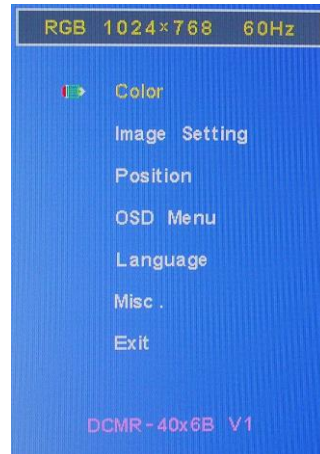




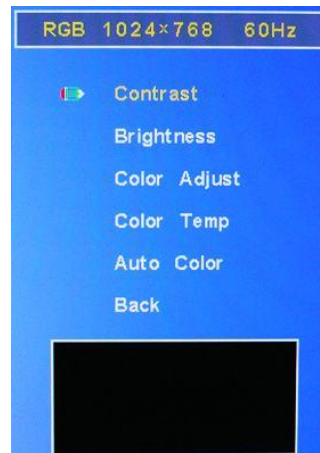
6.4 Window Structure

6.4.1 Color

Main Menu



Sub Menu "Color"

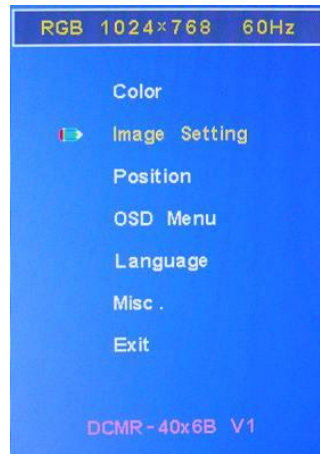


- **Contrast:** Adjusts image contrast.
- **Brightness:** Adjusts displays brightness. Brightness will be regulated using the connected inverter.
- **Color Adjust:** Adjusts image color.
 - **USER:**
 - **RED:** Adjusts red color.
 - **GREEN:** Adjusts green color.
 - **BLUE:** Adjusts blue color.
- **Color Temp.:** Selects different color temperatures (9300°K / 6500°K / 5800°K / USER)
- **Auto color:** Adjusts image color automatically.
- **Back:** You will leave the sub menu back to main menu **OR** press menu button and you will leave the sub menu back to main menu.

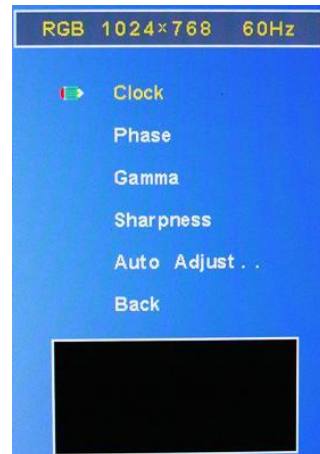


6.4.2 Image Setting

Main Menu



Sub Menu "Image Setting"

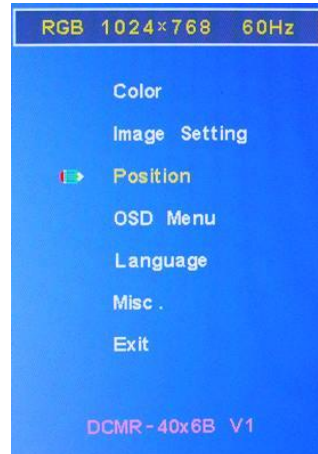


- **Clock:** Adjusts clocks per line (maximum length of line).
- **Phase:** Adjusts image phase.
- **Gamma:** Adjusts image gamma level.
- **Sharpness:** Adjusts image sharpness.
- **Auto Adjust:** Optimizes the displayed image. Adjusts phase and image position automatically (Message on the screen: "Auto Adjust..").
- **Back:** You will leave the sub menu back to main menu **OR** press menu button and you will leave the sub menu back to main menu.

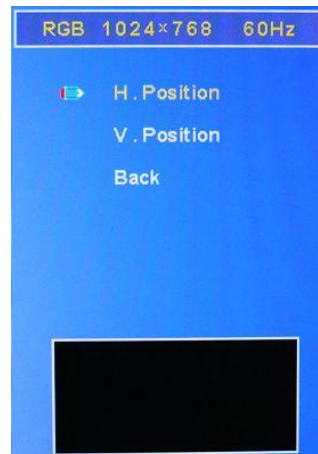


6.4.3 Position

Main Menu



Sub Menu "Position"

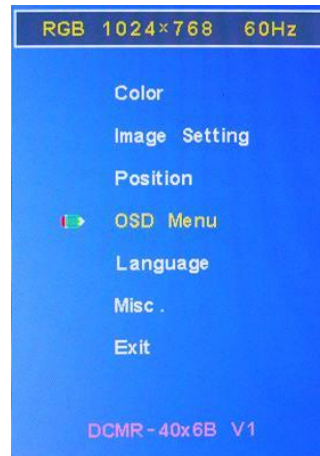


- **H.Position:** Adjusts horizontal image position.
- **V.Position:** Adjusts vertical image position.
- **Back:** You will leave the sub menu back to main menu **OR** press menu button and you will leave the sub menu back to main menu.

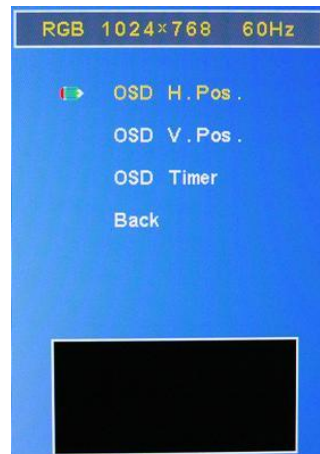


6.4.4 OSD Menu

Main Menu



Sub Menu "OSD Menu"

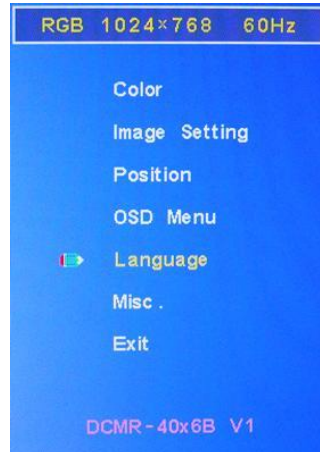


- **OSD Horizontal Position:** Adjusts OSD position horizontally.
- **OSD Vertical Position:** Adjusts OSD position vertically.
- **OSD Timer:** The OSD vanishes after a certain time of inactivity. Values of 5-20s are possible.
- **Back:** You will leave the sub menu back to main menu **OR** press menu button and you will leave the sub menu back to main menu.



6.4.5. Language

Main Menu



Sub Menu "Language"

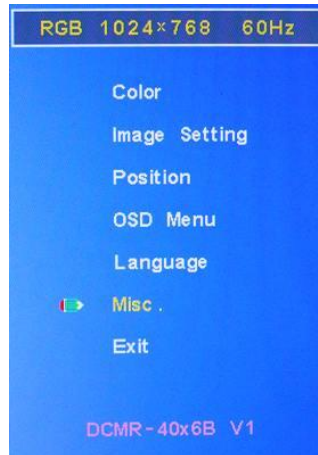


- **Language:** Selects your adequate language (Korean, English, Deutsch).

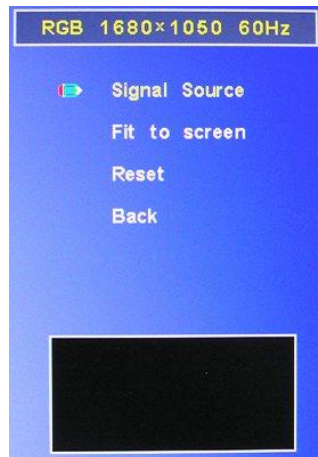


6.4.6 Misc.

Main Menu



Sub Menu "Misc."

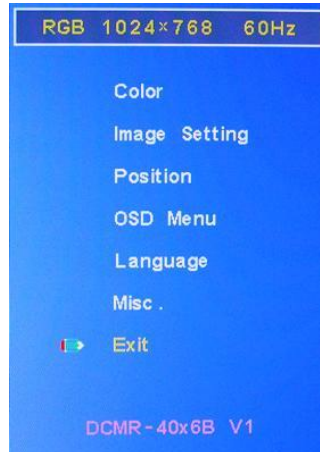


- **Signal Source:** Selects different input signals (either Analog RGB or Digital RGB)
- **Fit to screen:** Selects different aspect ratios (either 16:9 or 4:3)
- **Reset:** Restores factory settings (Message on the screen: "INITIALIZE") – **PLEASE FOLLOW THE ADVICE ON PAGE 14 Point 10 "Reset procedure".**
- **Back:** You will leave the sub menu back to main menu **OR** press menu button and you will leave the sub menu back to main menu.



6.4.7 Exit

Main Menu



- **Exit:** Leaves the OSD-Menu

7. Environmental and Reliability Specification

The Reliability items and its conditions are shown in below.

No.	Items	Conditions	Note
1	Temperature (operating)	0 °C – 50 °C	1
2	Temperature (non-operating)	-20 °C – 60 °C	
3	Humidity (operating)	80% RH, 300 hours	
4	Vibration test (non operating)	Gravity / AMP: 1.5G Wave: Random Frequency: 10 – 200 Hz, P-P Sweep: 30 minutes each Axis (X-Y-Z)	
5	Shock test (non operating)	Gravity: 50G Wave: half-sine Active time: 20 ms Direction: ±X, ±Y, ±Z (one time for each axis)	
6	Electro-static discharge test (non-operating)	Air: 150pF, 330Ω, 15KV, 1 sec, 15 points, 25 times/each point Contact: 150pF, 330Ω, 8KV, 1 sec, 15 points, 25 times/each point	
7	Thermal shock test (TST)	-20°C/30 min, 60°C/30 min, 100 cycles	
9	On/Off Test	On/10 sec, Off/10 sec, 30,000 cycles	
10	Altitude Test	Operation: 10,000 feet Non-Operation: 10,000 feet	

Note:

1. It is the user responsibility to keep this temperature within the above specification.



- The Beck Compact Module is no independent final product. Therefore Beck Elektronik is not obliged to fulfil directives of EC Declaration of Conformity.
- The customer is responsible for certification of the end device.
- Independent from that for customers' support Beck Elektronik declares that the product complies with the requirements of the following European directive(s):

RoHS Directive No.: 2011/65/EU

EMC Directive No.: 2014/30/EU

The compliance of the product with the requirements of this directive(s) was proved by the application of the following standards:

**EN 55032:2015 Electromagnetic compatibility of multimedia equipment
- Emission Requirements (CISPR 32:2015)
Class B: residential, commercial and commercial premises as well
as small businesses**

- If you need the official EC Declaration of Conformity please contact Beck GmbH & Co. Elektronik Bauelemente KG

8. Mechanical Specifications

8.1 Dimensional Requirements

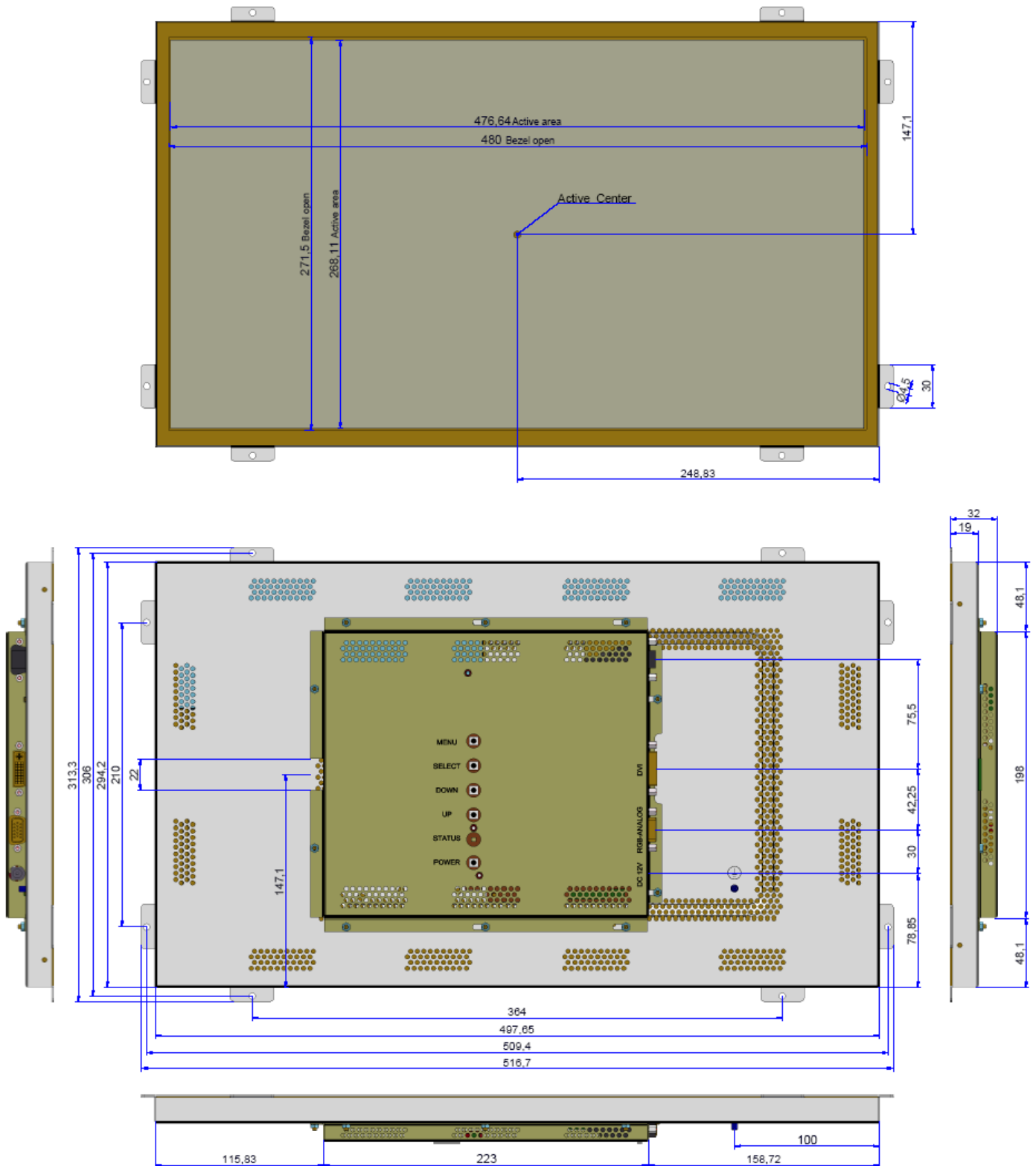
Figure 1 shows mechanical outlines for the model SCM21H01-R. Other parameters are shown in the below-mentioned table.

Dimensional Parameters

Parameter	Specification	Unit
Dimensional outline Horizontal Vertical Thickness	516.7 +/- 0.5 313.3 +/- 0.5 32.0 +/- 0.5	mm
Weight	3,400	gram
Active Area	476.64 (H) x 268.11 (V)	mm
Pixel pitch	0.248 (H) x 0.248 (V)	mm
Number of pixels	1920 (H) x 1080 (V) (1 pixel = R+G+B dot)	pixel
Back light	LED backlight unit	



Figure 1: Mechanical Outlines





8.2 Anti-Glare and Polarizer Hardness

The surface of the LCD has an anti-glare coating to minimize reflection and a coating to reduce scratching.

9. Handling & Cautions

Cautions when taking out the module

- Pick the pouch only, when taking out module from a shipping package.

Cautions for handling the module

- As the electrostatic discharges may break the LCD module, handle the LCD module with care. Peel a protection sheet off from the LCD panel surface as slowly as possible.
- As the LCD panel and backlight element are made from fragile glass material, impulse and pressure to the LCD module should be avoided.
- As the surface of the polarizer is very soft and easily scratched, use a soft dry-cloth without chemicals for cleaning.
- Put the module display side down on a flat horizontal plane.
- Handle connectors and cables with care.

Cautions for the atmosphere

- Dewdrop atmosphere should be avoided.
- Do not store and/or operate the LCD module in a high temperature and/or humidity atmosphere. Storage in an electro-conductive polymer-packing pouch and under relatively low temperature atmosphere is recommended.

Cautions for the module characteristics

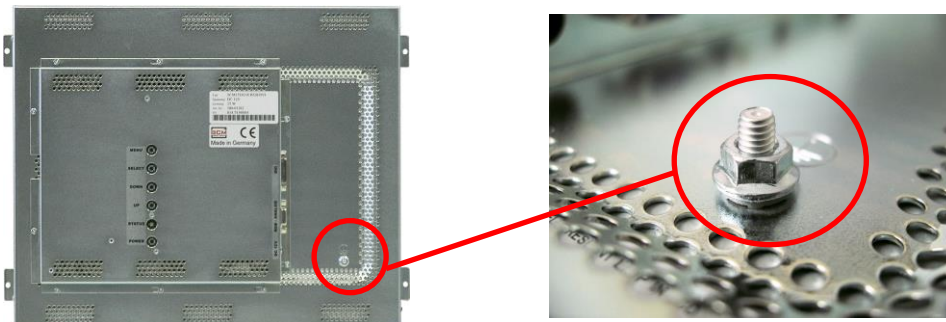
- Do not apply fixed pattern data signal to the LCD module at aging time.
- Applying fixed pattern for a long time may cause image sticking.

Other cautions

- Do not disassemble and/or re-assemble LCD module.
- Do not re-adjust variable resistor or switch etc.
- When returning the module for repair or etc., please pack the module not to be broken. We recommend on using the original shipping packages.

REMARK:

We recommend the grounding of Beck Compact Module with your device. For this purpose, there is a PE connection point placed on the back side of the module.





10. Packing Information

Each of the four SCM21H01-R is packed into an anti-static foil.
 These four units of SCM21H01-R are packed into a carton filled and cushioned with shock absorbing styrofoam and therefore very good protected for shipping.

11. Appendix

11.1 Signal Timing Chart Analog RGB / DVI

Standard	Resolution	Refresh	f_{HSYNC}	Pixel Rate
		Rate (Hz)	(KHz)	(MHz)
	640 x 350	70	31.4	25.2
	720 x 400	70	31.4	28.3
VGA	640 x 480	60	31.5	25.2
		70	35.0	28.6
		72	37.8	31.5
		75	37.5	31.5
SVGA	800 x 600	60	37.9	40.0
		70	43.8	45.5
		72	48.1	50.0
		75	46.9	49.5
XGA	1024 x 768	60	48.4	65.0
		70	56.5	75.0
		72	57.7	75.2
		75	60.0	78.8
SXGA	1280 x 1024	60	64.0	108.0
		70	74.4	124.9
		72	77.9	134.6
		75	80.0	135.0
UXGA	1600 x 1200	60	74.5	162.0
WXGA	1280 x 800	60	49.6	83.5
WXGA	1360 x 768	60	47.0	85.0
WXGA+	1440 x 900	60	55.9	106.5
WSXGA+	1680 x 1050	60	65.2	147.1
Full HD	1920 x 1080	60	67,4	144.0



11.2 Optional Accessories

We refer to our webpage:

<http://beck-oled-lcd-tft-display.de/index.php?id=bcm-standard-line>

We offer a wide variety of optional accessories to operate the SCM21H01-R