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User manual for:
Digital single lens viewer for panel mount
Model 22-04-D1.89



The contents are subject to changes without giving notice. februari 2025, version 1.0

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1. Introduction

On request in 2017 we build a round shape analogue slide single lens (2D) viewer with the idea to have it build into mock up shapes of binoculars or other peek hole type of viewing experiences. In 2022 there came up several requests to build a digital version to simulate the experience of a microscope. The analogue slide did not suit the way the story required to be told. For that reason a very tiny LCD with HDMI controller was chosen with a high resolution but with the same viewing tolerance as an analogue slide. Stills but as well as video is possible now, including everything that makes the experience interactive with additional devices.

1.1 Acknowledgements and updates

- januari 2025 shape update of the LCD frame.

2. Installation

The digital viewer can be used to present a slide show or video. For exhibit designers, the viewer could be used as a stand-alone object or as ‘support’ to explain a scene or object close to the viewer.
Because of the small size of the viewer, in most situations only the lens barrels is visible, the visitor should not overlook viewer and miss the presentation!

Looking through the viewer, you will get the best experience when there is nothing that is distracting or obstructs a clear view. Things that might distract are bright spot lights pointing on the viewer, causing the light to be reflected into your eyes. Or flashing lights close to the lenses. A black (cinema like) surrounding gives the best impression.

2.1 The viewer

The viewer housing is constructed in such a way it gives the most freedom to integrate it in almost every situation.

Integrating the viewer in your situation:

- Using a front plate is the easiest way to build the viewer in a wall or panel. This is not included with the viewer as it is often customized. Check the build-in dimensions to customize your front plate.
- Take notice of the build-in depth. And additional space for the HDMI controller. Fix this controller securely and prevent accidental damage to the flat ribbon cable.

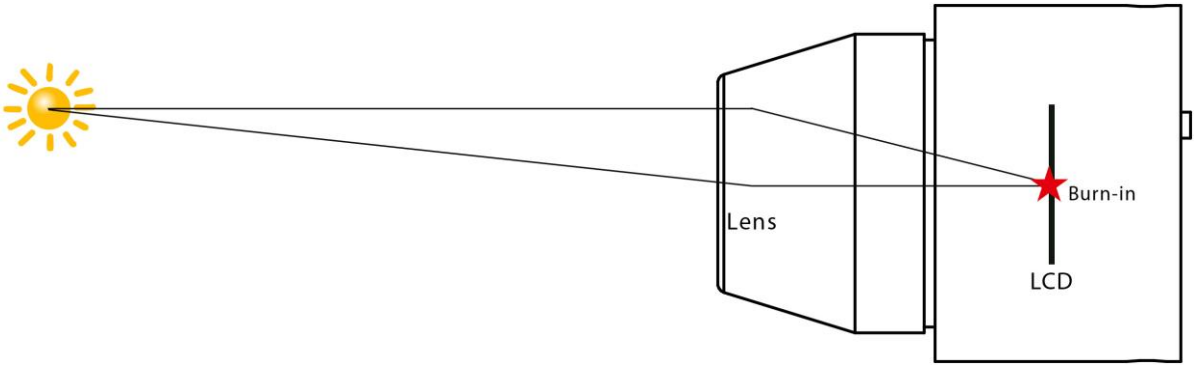
Initially the viewer is supplied with the lens barrel hand- locked in his screw thread. You might choose to fix the lens with lock tight or other material to avoid unscrewing by visitors. So you can remove the lens barrels with some force. This allows you to remove the front plate for whatever reason and de- assemble the viewer.

The rear part of this viewer requires to work with caution as the flat ribbon cables are sensitive for damage! Avoid any force these cables.

Model number of the viewer only:
22-04-D1.89
Year(22) of design – type panel viewer (**04**) – **D**igital LCD size **1.89**”

2.2 Attention! take the following directions seriously

- **Avoid sunlight to enter into the viewer** through the lens. The lens acts like a burning glass and the sun will damage the LCD inside. When mounting the viewer in a panel, check that the sun would never be able to point to the lens at any time of the day!
- As long as the viewer is NOT build in on its final presentation location, **cover the lens** to avoid accidentally burn-in of the LCD (point mentioned above). As well as protection against scratching the lenses.



- The lens is not fixed tight in the viewer housing to allow you to add a front panel plate. Secure the lens with glue or a kind of lock tight to prevent unscrewing the lenses by visitors.

- The HDMI cable and micro USB cable are fragile connectors. The connectors of the LCD controller are mounted securely but allow limited force on the plug perpendicular to the insert of the plug. Always pull out the plug in-line with the connector. Add a **cable relieve** facility to avoid unnecessary damage.

- Do not use the viewer in high humidity or outdoor environments.

- The inside LCD and connectors are fragile parts, applying force to it might damage the functionality. If there is no reason to remove the rear LCD frame holder, leave it in place.

- Ground the metal of the viewer enclosure. Static discharges can damage the LCD when the viewer is not grounded.



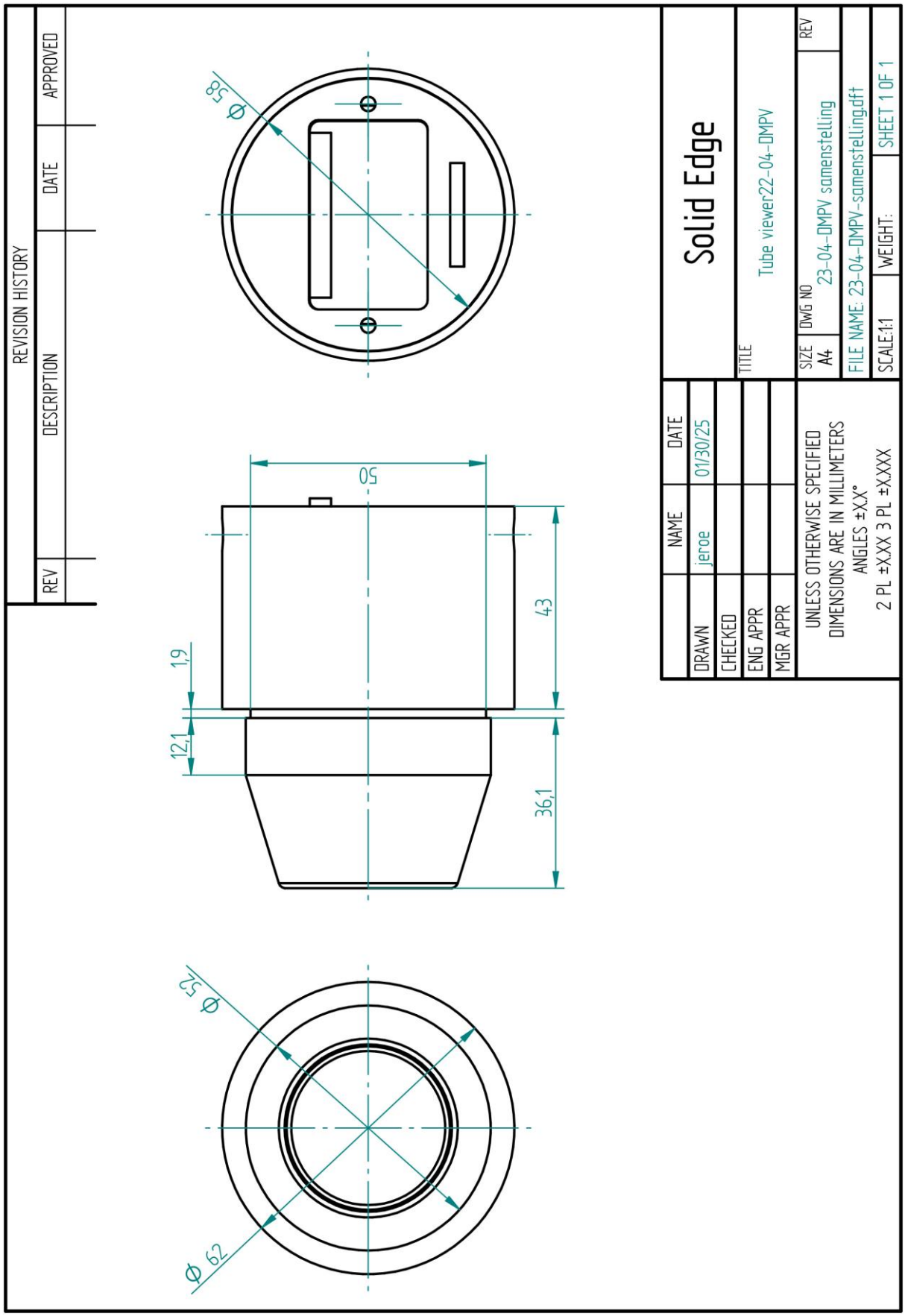
2.3 Content source

The viewer is built around a VR LCD display having a specific resolution. See chapter 3.3 for detailed information.

The choice of content sources, cancels out devices which are unable to deliver the the native resolution that the LCD requires! So check chapter 3.2 for video input requirements. Desktop computer systems have more advanced video processing output capabilities (separate video cards or graphic processors). And often automatically configure LCD's trough the EDID information coming from the LCD controller of the viewer.
Simple small single board computers (like Raspberry pi), depending on the operating system, require more knowledge to configure non standard resolutions.
Be aware that there are a number of professional multimedia players having fixed output resolutions to select from, they do not always match with the required resolution (VESA standards).

3 Technical data

3.1 Physical dimensions



When you consider to make your own front plate, it should be 2 mm. thick and the hole should be 50 mm. +0,1 at least.

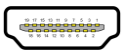
3.2 Connectivity specifications

The viewer has 1 power connector; through micro USB

Micro USB connector: 5 Volts dc.
Power consumption; 500mA at 5 Volts dc. 2,5 Watts



Digital video input through the HDMI connector type A, 1.4
Edid version 1.3. Maximum cable length 1.5 metres.
When connected to Display Port, an active converter to HDMI might be needed!



Connect the metal enclosure of the viewer to electrical ground / earth to discharge any static electricity

Native display resolution.

The native display resolution of the LCD is the only resolution that is required to control the viewer. The LCD controller is not able to scale up or down the input resolution.

3.3 Digital video input specifications (timing)

The viewers inside diameter only allows an LCD with a diagonal of 1.89”. It can be replaced with a new LCD of the same brand and model/type.

Use the DVI digital output or HDMI, or Display port with <u>active</u> converter to HDMI.

However if you prefer to work with the Raspberry pi or other Linux based computers, you need the timing settings of each panel. They are listed below.
For the full config.txt content for the Raspberry pi we refer to the configuration manual of the Raspberry pi for this viewer and LCD carriers.

Be sure that the Colour space of the player is running in RGB mode! <u>not</u> YUV
YUV colour space causes a greenish appearance of the presented image.

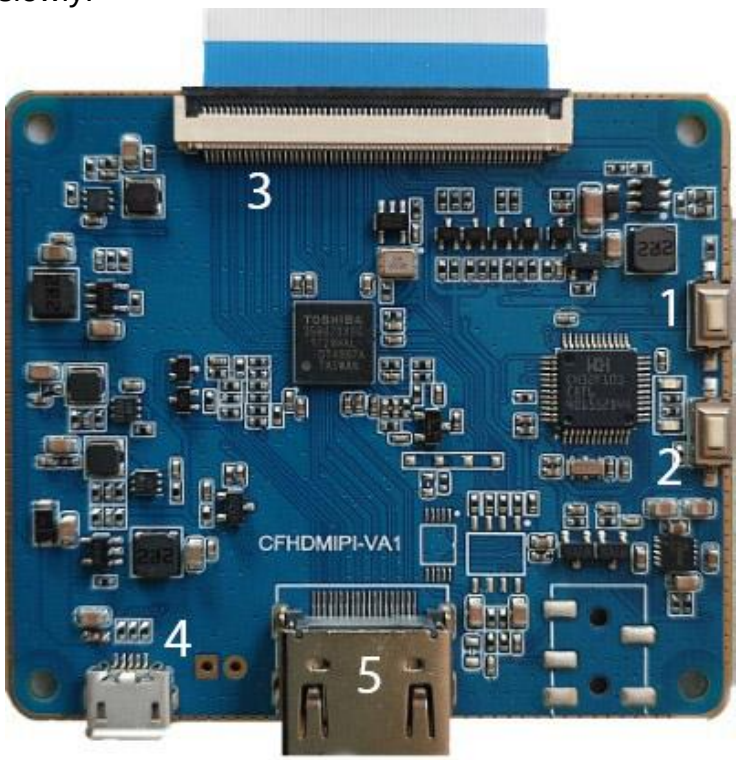
1. Model 22-04-D1.89

Resolution: horizontal x vertical = 1600x1200 pixels at 60 Hz. 8 bits colour depth.
Size: 1.89”, model LCD: VS019U0M-NH0-DKP0 of BOE

<table>
<tr><td colspan="6">The timing parameters are as following:</td></tr>
<tr><td></td><td>Active</td><td>Front Porch</td><td>Sync width</td><td>Back Porch</td><td>horizontal</td></tr>
<tr><td>Active</td><td>field 1600x1200 pixels</td><td>65</td><td>6</td><td>35</td><td>Pixels (total 1706)</td></tr>
<tr><td>Front Porch</td><td>20</td><td colspan="4" rowspan="4">Hsync and vsync negative</td></tr>
<tr><td>Sync Width</td><td>5</td></tr>
<tr><td>Back Porch</td><td>28</td></tr>
<tr><td>veritical</td><td>Lines (total 1255)</td></tr>
<tr><td colspan="6">Xconfig timing:
Modeline "1600x1200" 128.46 1600 1665 1671 1706 1200 1220 1225 1255 -hsync -vsync</td></tr>
<tr><td colspan="6">String for Raspberry pi
hdmi_timings=1600 0 60 6 35 1200 0 20 2 28 0 0 0 60 0 128461800 0</td></tr>
</table>

3.5 Buttons and indicator LED explanation.

Power up:
When applying power to the viewer at the micro USB connector (**4**), the controller for the LCD starts up and checks the input EDID data on the HDMI connector (**5**). The bleu LED blinks fast and if the signal is correct, the green LED turns to continuously green. Then the LCD set will show video on the display. When the HDMI signal does not match with the required video configuration or the signal is temporally wrong, the bleu LED blinks slowly.



*Restart button **1**:*
When pressing the restart button, the inside display controller restarts like power up. After each press, wait for 5 seconds to let the controller and the source (computer) to switch over (automatically). If one of them is not able to adapt to that resolution, the bleu LED blinks slowly.

*Brightness button **2**:*
Pressing this button at the rear of the viewer changes the brightness of the backlight of the LCD in 5 steps. The brightness level is stored after setting. When power is turned on or connected again, the latest brightness level is restored.

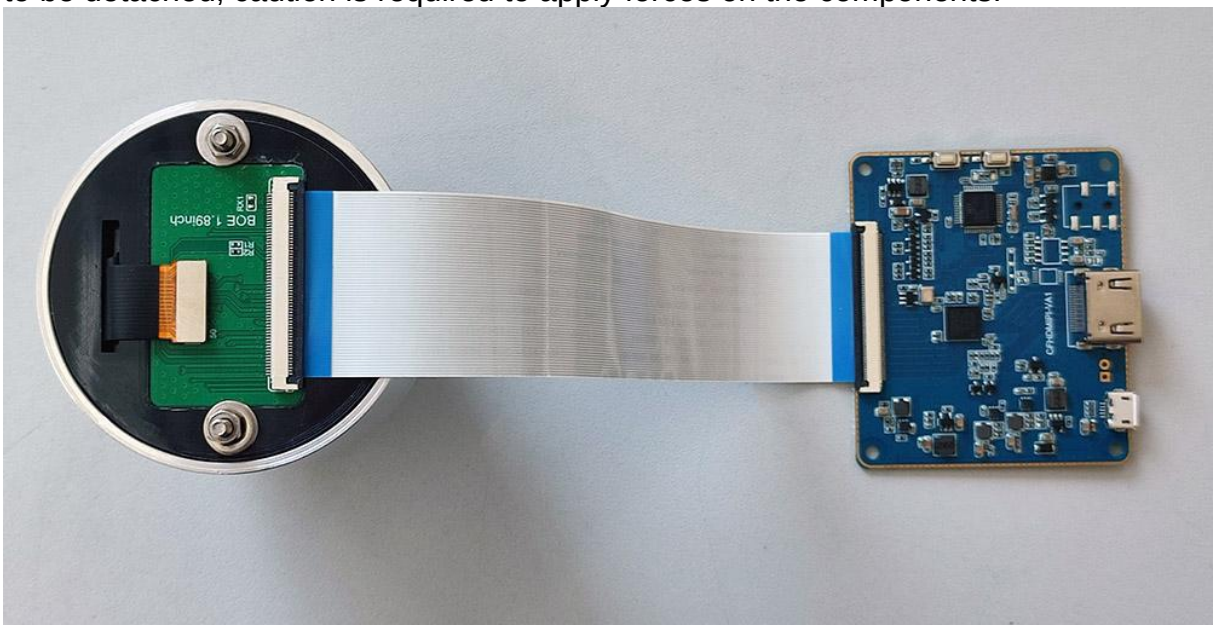
To preserve the lifecycle of the LCD screen, it is good not to set the brightness of the LCD to maximum. Keep it to about 75%

3.6 Maintenance

Cleaning
The outside of the viewer can be cleaned with regular cleaning liquids, not too aggressive or polishing. The lenses are not water tight. Clean the lenses with a soft cloth.

Dust visible on the LCD
Turn on the viewer to see the dust particles.
Take the lens barrel out of the front of the viewer.
You can blow with compressed cleaned (oil free) air, not higher than 1 bar, inside the housing of the viewer towards the LCD. Not too close.
You can use a brush or soft cloth to wipe resistant particles away. There is no glass cover on the LCD! Do not apply too much pressure / force on it.
When re- assembling the lens barrel in the front, it might happen new particles drop on the LCD. You can repeat the above steps until the result is satisfying.

Flat ribbon cable.
If for some reason the flat ribbon cable between the controller and the viewer needs to be detached, caution is required to apply forces on the components.



To avoid damage to the controller and other electronic parts, it is very recommended to use static discharge tools when fixing the controller board or removing cables.
It is very recommended to have skilled electronic engineers to work with these devices. Guarantee is limited.

The flat ribbon connector can release the flat cable by lifting up the black long narrow lever, indicated with the red arrow.
It is like a small hinge.

The bleu band should be facing upwards, the metal contacts of the ribbon facing downwards. The same counts for the small adapter PCB at the viewers side.

When re- inserting the ribbon. Align it exactly in the middle of the connector and push it into the connector until it is blocked before pushing down the black lever.

