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Web panel with browser support

(Hardware Manual)

Version 1.1

Preliminary

Refers to product revision  
V 1.0

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## About this Manual

This is the hardware manual for the emWEB-21. It gives all necessary information to users and programmers of the emWEB-21. We have tried to keep it compact, so there are no special sections for users and programmers. I.e. everything that can be said about the serial port is said in one place (connector layout, signal levels and programming hints). Users that are not programmers might therefore only read the first sections (Introduction and Installation), and come back to the detailed sections when they need special information.

The manual starts with an **Introduction** to the emWEB-21. This is some prose that describes the features and architecture of the emWEB-21. You should already know this if you have bought the board! It then discusses some topics about **Installation** of the product.

The rest of the manual then covers **technical details** about the emWEB-21.

## Conventions

If numbers are specified in this manual, they will be either decimal or hexadecimal. We use C-notation to identify hexadecimal numbers (the 0x prefix).

If we refer to low active signal names, they will be suffixed by a “#” character.

Some parts of the text are really important. These are visually marked with the following signs:

Some parts of the manual contain notices you have to observe to ensure your personal safety, or to prevent damage to property. These are visually marked with the following alert symbols:



### **DANGER**

Indicates that death or severe personal injury *will* result if proper precautions are not taken.



### **WARNING**

Indicates that death or severe personal injury *may* result if proper precautions are not taken.



### **CAUTION**

Indicates that *minor* personal injury can result if proper precautions are not taken.



### **NOTICE**

Indicates that damage to equipment can result if proper precautions are not taken.



Indicates information that we think you should have read to save your time by avoiding common problems. Important suggestions that should be followed will also be marked with this sign.

## Acronyms and Abbreviations

DVI	Digital Visual Interface
ESD	Electrostatic discharge
HMI	Human Machine Interface
LCD	Liquid Crystal Display
LVDS	Low Voltage Differential Signal, Video signal to the TFT display
SVGA	Super Video Graphic Array
SXGA	Super EXtended Graphics Array
TFT	Thin Film Transistor
USB	Universal Serial Bus
UXGA	Ultra EXtended Graphics Array
VGA	Video Graphic Adaptor, Video Graphic Array
XGA	EXtended Graphics Array

# 1 Introduction

emWEB panel devices are designed to simply visualize machine data provided in web pages, either in pages of a CODESYS web visualization or in web pages of any other web based environment. emWEB panel devices are based on a Freescale i.MX6 single core ARM processor. It can be supplied with 24V power and is connected via an Ethernet interface with the machine network.

## 1.1 Features

- resistive touch screen (PCT optionally)
- 24 V DC power supply
- Fan less cooling concept
- Protection rating of the front is IP65
- High grade aluminium front
- Customizable design of the front panel

## 1.2 Functional Overview

The emWEBs are normally delivered with a touch-screen. And are normally delivered with Debian Linux.

The power must be supplied by an external power supply. This power supply must be capable to provide enough power for the emWEB-21. Please refer to the technical specifications section for more information.

## 1.3 Safety Instructions

Refer to page 5 for explanation of the warning notice system.

The product described in this documentation may be operated only by personnel qualified for the specific task in accordance with the relevant documentation for the specific task, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products.

## 1.4 Installation and Maintenance



### NOTICE

The product is intended to be used in industrial environments. Typical applications are process virtualization.



### **DANGER: Electrical Shock**

Danger to life.

This product operates with 14..32 V DC. Do not connect this product to an improper power supply.



### WARNING: Unauthorized Opening

Improper opening of the device may result in substantial damage to the equipment. Remove power *before* you *open* the housing of the product. Do not connect power or operate the product until you have closed the housing and tightened *all* screws.



### WARNING: Electrical Shock

The IO interfaces (connectors) of the product are only suited to be connected to SELV circuits. Use interfaces (connectors) for their intended use only.

## 1.5 Ambient and Environmental Conditions



### **DANGER: Explosive Risk**

This product is **NOT** designed to be used in potentially explosive atmosphere. Do not operate this product in potentially explosive atmosphere.



### WARNING

This product does **NOT** fulfil the requirements for a fire enclosure according to EN 60950-1 in all possible mounting positions. In these mounting positions, installation is only permitted above concrete or other non-inflammable materials.



### NOTICE: Damage

Do not operate the product beyond the specified ambient conditions. Do not cover the vent slots of the product.



### NOTICE: EMI

This product is a class A device. This product may cause radio interference. In this case the user must take adequate measures.

## 2 Installation

When opening the shipping package of the emWEB-21, the contents of the package should be checked immediately.



The emWEB-21 is delivered in a configured state, but the configurations can be adjusted by the user as well. To adjust the emWEB-21s configuration, an OSD (On Screen Display) is installed and controllable by buttons at the backside.

The package also contains a terminal plug for the power connector. The emWEB-21 needs a power source in between 14 to 30V DC for operation.



***The installation of this equipment is allowed for qualified service personnel, only. Auxiliary existing rules for installation of electrical equipment must be attended to.***

## 2.1 Dimensions and mounting information

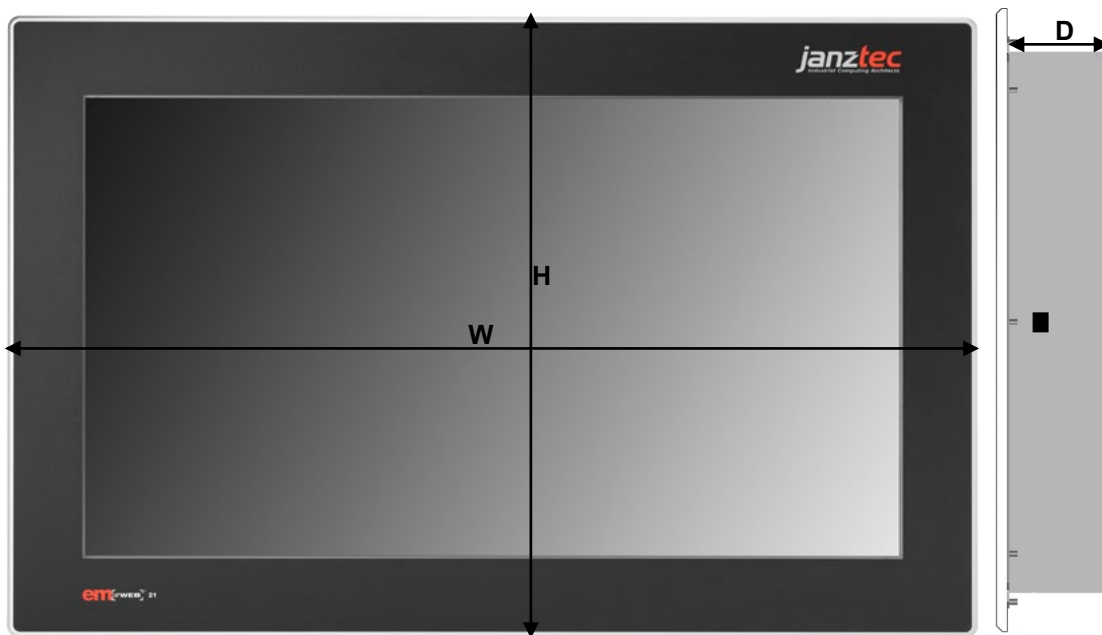


figure 1: emWEB-21 measures

The needed cut-out measures are given in figure 2. The overall front panel dimensions are denoted with W and H. D is the depth of the case. The front has 8 mm thickness.

W	H	D
570.1 mm	366.7 mm	33.6 mm

table 1: emWEB-21 dimensions

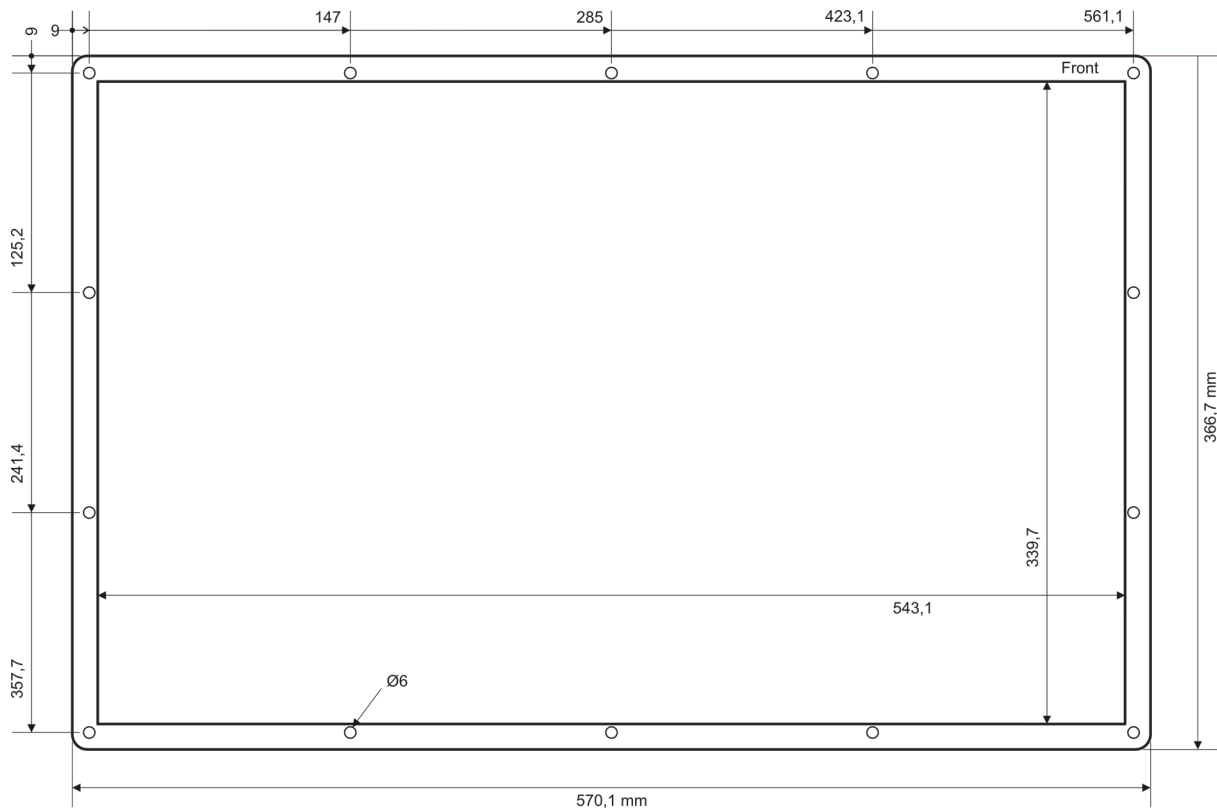


figure 2: emWEB-21 drilling template<sup>††</sup>

<sup>\*</sup> Not to scale

<sup>†</sup> Refers to drawing drill\_jig\_emw12\_rev0

## 2.2 Technical specification

The emWEB-21 has three connectors, the main power supply, an USB connector and an Ethernet connector. Optionally a CAN connector is orderable. The figure 3 shows a block diagram of the internal function.

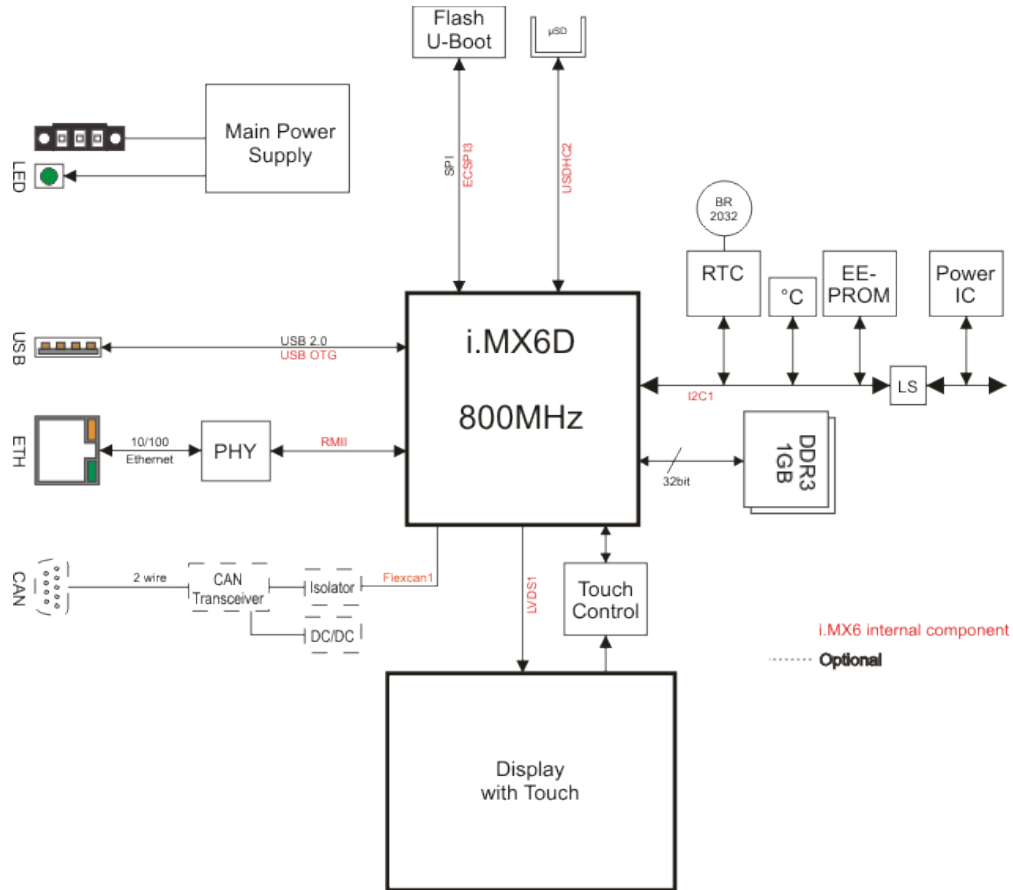


figure 3: Block diagram for the internal logic

### 2.2.1 DC main power supply

The Power unit (figure 3) is energizing all internal components, the display and its backlight. Thereby the power supply can vary in between 14 to 32 VDC. The emWEB-21 has a power dissipation with less than 9 W. Before connecting the DC main power supply the protective bonding conductor (PE) must be connected.

The power connector is included in delivery. The assignment of this connector is shown in figure 4 and table 2.

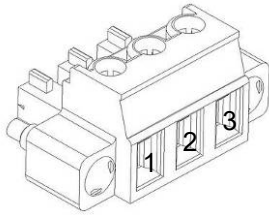


figure 4: Power connector

Pin	Description
1	+ 14..32 VDC
2	NC, do not connect
3	GND

table 2: Power connector assignment

### 2.2.2 Universal serial bus - USB

To connect the touch-screen to a host computer the USB can be used, too. The connector is USB Type B, so a standard USB Type A to Type B cable can be used to connect the touch-screen with the host.

The length of USB cable must not exceed 5 m.

### 2.2.3 Display

The panel is built as a thin film transistor liquid crystal display TFT-LCD with a diagonal screen of 21.5" and up to 16.7M colours.

Description	Specification
Display area	476.64 x 268.11 mm
Number of dots	1920x3 (H) x 1080 (V) (RGB vertical stripe)
Pixel Pitch	0.2483 (H) x 0.2483 (V)
Brightness	300 (Cd/m <sup>2</sup> ) typ.
Viewing angles	-89° to 89° (H), -89° to 89° (V) typ.
Contrast	5000:1 (typ.)
Backlight	LED

table 3: Display specifications

## 2.3 Micro SDcard Replacement

**NOTICE**

Power must be turned off before removing or inserting the micro SDcard

To replace the micro SD card, remove all screws located on the rear panel. After lifting up the housing, you can access the Micro SD card slot.

## 2.4 Battery Replacement

**CAUTION**

The installed computer board is equipped with a Lithium battery. Danger of explosion if battery is incorrectly replaced. Replace only with battery of the same or equivalent type (3-volt lithium coin cell battery).

- Do not attempt to recharge the battery.
- Do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water.

Compatible battery type: CR2032 (3 Volt lithium coin cell battery)

The battery is used for backing up the system time when the power supply is removed.

1. Turn off the computer properly through the operating system, then turn off any external devices.
2. Disconnect the power supply from the power inlet and disconnect any external devices.
3. Disassemble the housing by removing the located screw on the back side and lifting up the housing. Then locate the battery on the Janztec board.
4. Remove the battery from the holder (See figure 5)
5. Insert the new battery (See figure 5)
6. Re-assemble the housing

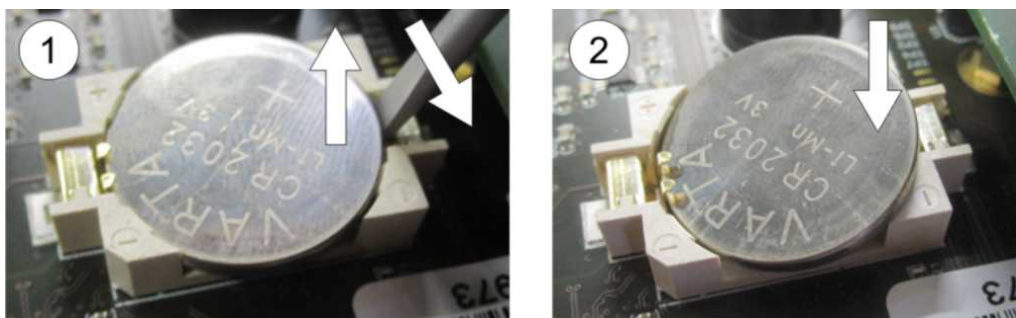


Figure 5 Removing and replacing coin cell battery

1. Removal: Insert screwdriver at right side and bend so that the battery pops out. Use only gentle force, otherwise the battery holder might be damaged.  
The use a plastic tool is preferred to avoid shorting the battery
2. Insertion: Align new battery to the left side of the holder and gently press down on the right side of the battery until the battery snaps into the holder.

## 3 Operating System and Drivers

When you order the emWEB-21 with pre-installed software (Debian 8 operating system), then our default Janz Tec image is pre-installed on the  $\mu$ SD-card and the emWEB-21 driver package is already installed and fully configured.

### 3.1 Janz Tec AG Linux Image for emWEB-21

Our pre-installed Janz Tec AG Image contains the combination of the official Debain operating system as well as our emWEB-21 drivers. File `/root/imageversion.txt` contains the image name and version of the installed Janz Tec image.

You can change the emWEB-21 configuration on accessing the local hosted website at <http://127.0.0.1/>

The local running web service is named “webmin” (<http://www.webmin.com>) and gives through a web interface access to different configuration features on the emWEB-21. Please refer to chapter 3.2.2 Webmin Configuration Webserver Webmin Configuration Webserver for further configuration information.

An additional Janz Tec image feature is a write protected root filesystem. The AUFS filesystem is integrated to the custom kernel and enabled in the Debian 8 distribution. For further usage instructions, please have a look at chapter 3.1.3 Overlay filesystem (AUFS).

#### 3.1.1 Default configurations

The emWEB-21 is delivered with an enabled ssh service. During the first start, the SSH keys will be created. Following the log in credentials are listed, but please note, that the access for the “root” user is denied for SSH connections.

##### **Default log in credentials:**

Username: **dev**  
Password: dev1

Username: **root**  
Password: root1

#### 3.1.2 Disk Partitioning information

Depending on the installed  $\mu$ SD card, the drive has 3 partitions:

- `/dev/mmcbk0p1`: Boot Partition (not mounted)
- `/dev/mmcbk0p2`: Linux System Partition (write-protected)
- `/dev/mmcbk0p3`: Data Partition (read-write)
  - o mounted to `/data/` → use this partition for user data

#### 3.1.3 Overlay filesystem (AUFS)

Note: The overlay filesystem is default enabled on your system. This prevents data loss on the local system partition.

In the case of the enabled filesystem protection, all data written to the “Linux System Partition” (`/dev/mmcbk0p2`) will be lost during the next restart of the system. The `/data` folder can be used to save user specific data. Use the following commands to configure the behaviour of the overlay filesystem:

Using `reboot-commit` will write all changes to write-protected system partition.

commit:

```
dev@emWeb-aimx6: sudo reboot-commit
```

enable:

```
dev@emWeb-aimx6: sudo reboot-ro
```

disable:

```
dev@emWeb-aimx6: sudo reboot-rw
```

For production environment, we recommend that the write-protection of the system partition is enabled!

**NOTICE**

To reduce the risk of losing information stored in files on the  $\mu$ SD-card, especially when writing to the card during a power failure event, consider the use of an external UPS (uninterruptable power supply).

## 3.2 Optional Software

This chapter lists and describes additional installed software in the Janz Tec AG default image for the emWEB-21.

### 3.2.1 Google Chromium webbrowser

The used web browser is Chromium with the installed version 51.0.2704.79. Additional packages for the Chromium browser are:

- chromium-codecs-ffmpeg
- chromium-codecs-ffmpeg-extra
- Janz Tec Chrome Extension (for automatically redirect the NewTabPage to the webmin configuration page).

### 3.2.2 Webmin Configuration Webserver

Webmin version 1.820 is preinstalled. "Webmin is a web-based interface for system administration for Unix. Using any modern web browser, you can setup user accounts, Apache, DNS, file sharing and much more." For more information have a look at <http://www.webmin.com/>

Following features are supported on the emWEB-21:

- Show recent system information
- Change of the passwords
- Kiosk mode configuration
- Linux Firewall rules
- Network configuration
- System time
- Touchscreen calibration

**Important Information:** The system partition is read-only by default and all changes are stored temporary in an overlay memory filesystem. To commit changes to the micro-SD-card persistently, a reboot with commit is required or changes will be lost after restart! [reboot-commit now](#)

The screenshot displays the Webmin interface. On the left is a navigation menu with options like 'emWEB Configuration', 'Change Passwords', 'Kiosk Configuration', 'Linux Firewall', 'Linux IPv6 Firewall', 'Network Configuration', 'System Time', 'Touchscreen Configuration', 'System Information', and 'Logout'. The main content area is titled 'System Information' and lists various system metrics. At the top right of the main area, there is a 'reboot-commit now' button.

Figure 6 - Webmin overview

On the first boot the system has to be configured for the kiosk mode. This includes to define a default homepage which should be loaded after starting the operating system.

For configuring the kiosk mode, open the “Kiosk Configuration” page on the webmin service. Have a look to Figure 7. After setting up the homepage, note that the changes has to be committed to the filesystem. Choose the “reboot-commit now” button to apply the configuration.

**Important Information:** The system partition is read-only by default and all changes are stored temporary in an overlay memory filesystem. To commit changes to the micro-SD-card persistently, a reboot with commit is required or changes will be lost after restart! [reboot-commit now](#)

The screenshot shows the 'Kiosk Configuration' page in Webmin. It features a 'Browser Homepage' input field containing 'http://www.janztec.com/'. Below it is a 'Soft Keyboard' checkbox which is checked. A 'save changes' button is located below the checkbox. To the right of the input field, there is explanatory text: 'home page URL of the full-screen kiosk web browser, which is opened automatically after system boot. set to http://webmin/ to start this configuration website' and 'enable checkbox to enable soft keyboard'. The left navigation menu is also visible.

Figure 7- webmin kiosk mode

Once the kiosk mode is enabled and a default page is shown at the start up, there are following ways to (re-)configure the emWEB-21.

1. GUI based modification  
Apply a keyboard to the emWEB-21 and press “Ctrl” + “Shift” + “T”. This opens a new browser tab and show the navigation bar. Open “http://127.0.0.1/”
2. Command line based modification  
Apply a keyboard to the emWEB-21 and press “Ctrl” + “Alt” + “F1” (Alternatively open a SSH shell).  
After pressing, a shell will appear and gives access with the specified credentials. For modifying the homepage, edit the file “/etc/kiosk.conf”



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The u-boot software is stored in the SPI flash of the emWEB-21 and is required to boot software that is stored on the CFast, SD card or the internal eMMC.

As the u-boot can be replaced by the skilled end user, we have no control of which version of u-boot is installed on which device. You can check the u-boot version by checking the u-boot start up messages. Please indicate this version when you request the source code.

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- d) If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.
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## Technical Data

### Interfaces

USB	USB2.0 port
Ethernet	RJ45 connector for 10/100BaseT Ethernet

### Display

Area	476.64 x 268.11 mm
Number of dots	1920 x3 (H) x 1080 (V) (RGB vertical stripe)
Pixel Pitch	0.2483 (H) x 0.2483 (V)
Brightness	300 (cd/m <sup>2</sup> ) typically
Contrast ratio	Typ. 5000:1 typically
Viewing angles	-89° to 89° (H), -89° to 89° (V)
Backlight	LED

### Power Supply

Input	14..32 V DC
Consumption	14.4 W

### Housing

Height	367 mm
Width	570 mm
Depth	42 mm
Weight	tbd
Protection rating	IP65 for the front

### Environmental Specifications (assembled system)

Temperature range	0..+55°C (operating), -20..+75 (non operating)
Humidity	0%..80%, non condensing

## 5 Product History

Note that changes in the major version number are related to a PCB redesign. Though, PCB redesign need not be related to functional changes, but might have been done for manufacturing purposes only.

Version	Release Date	Name	Changes
V1.0	-	-	initial version

### 5.1 Manual History

Version	Release Date	Name	Changes
V1.0	-	ime	Initial document for the Prototype.
V1.1	-	bet	Initial release