

AVHzY CT-1

USB Power Meter

User Manual

Welcome to use AVHzY CT-1 USB power meter designed and provided by yanke928, this manual will lead you to use the device, please save the manual properly for looking up.

Warning

It is a fatal mistake to operate the product as follows:

1. After high voltage triggered, the insertion of any device which has a maximum operating voltage below that high voltage may cause damage to the device plugged in.

2. When the power meter is monitoring the voltage & current on the two ports, DO NOT plug any device into the other ports, this will cause damage (Especially when the device being monitored required a high voltage) to the devices.

The author is not responsible for any result of a faulty operation.

Structure



Specification

Main Control IC : STM32 F072

Display screen : TFT 1.44" 128*128

Voltage Current Range : 3.7-25V 0-5A

Voltage Current Resolution : 0.0001V 0.0001A

Voltage Current Accuracy : 0.1%+2d

Current Sample Point : High-side

Internal Resistance : 32mOhm (After 1000 cycles)

Quiescent Current : 1mA (At DC 5V)

Self-Power Solution : DCDC

D+D- Voltage Sample : Support

Micro ESR Test : Support

A-C C-C ESR Test : Support (Reference only)

4-line Support : Support

QC2.0 QC3.0 PD Trigger : Support

Clock & Standalone Temp Sensor : Support

USB Firmware Update : Support

MFI Test: Support (Reference only)

C-C Device Test: Support

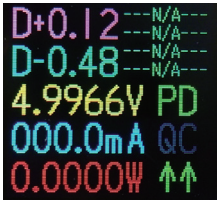
Time Accuracy: 0.002%

Home Screen

The home screen has 5 divided pages:

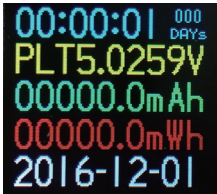


The 1st page shows the voltage & current that the being-monitored devices are working at the time. The accumulated energy and capacity are shown below. Time, environment temperature, data set number are also shown in this page.



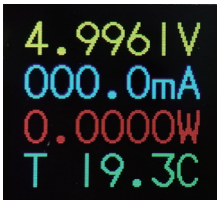
The 2nd page shows the **voltages** on **D+** **D-** lines, and the **protocol** that may working according to them. If a **PD** device is detected on the line, the **PD** indicator **turns on**, so as **QC**.

The **arrows** on the bottom of the screen indicates the **flowing direction** of the current(or energy) , **Voltage**, **current**, and **power** are also shown in this page.



The 3rd page shows the time, platform voltage, energy, capacity, and date.

Note that the platform voltage equals to energy divided by capacity.

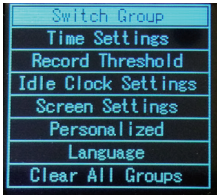


The 4th page shows the voltage, current, power, and environment temperature in big font.

The 5th page turns the screen off, usually to reduce the power consumed by the meter itself to get higher precision.

Menu

A long press to the middle key will make the system enter the main menu.



Press "Enter" and hold 3S

•Switch Group

The device keeps **5** groups of data, this can switch from one to another.

•Time Settings

This option sets the **time**, which will be shown on the **idle clock page**.

•Record Threshold

This option sets the **record threshold** of the device, the **capacity**, **energy**, and **time** keep **accumulating** when the **current** is **above** the **threshold**. The **current** below the **threshold** will be **ignored**.

•Idle Clock Settings

This option contains settings on **idle clock**.

When there is **no** operation on the device for **some time**, and the **current** is **below** **recording threshold**, system enters **idle clock mode**.

The **Idle clock time** can be set from **15s to 300s**, and **clock can be disabled**. If a **current above the threshold** is detected, system **exit** this mode and **enter home screen**.

•Screen Settings

This option contains settings of the **screen**.

Disable/Enable Screen Idle: After a given time **without operation**, screen **reduces brightness** to save power, this feature can disabled/enabled this option.

Screen Idle Time: This option sets the **time** that the screen turns idle.

Brightness Settings : This option sets the **brightness** when the device is **in operation**.

Idle Brightness : This option sets the **brightness level** when the screen is in idle mode.

•Personalized

The device has some features on personalization.

Theme Color: The theme color is the UI color such like dialogues, menus, etc. This option sets that color.

Enable/Disable Custom Theme: This enable or disable the custom theme.

The guide of theme customizing is written at the **end of the manual**.

•Language

Set the **language**.

•Clear All Groups

Clear **all** data sets in one time.

Screen Settings
Personalized
Language
Clear All Groups
Restore Settings
Calibration
System Info
Developer Tools

- **Restore Settings**

Restore settings to **default**.

- **Calibration**

The user shall **not** enter this option.

- **System Info**

See the software version, author, and vendor.

- **Developer Tools**

The user shall **not** enter this option.

FastCharge Trigger

The device supports the triggering of QC2.0/QC3.0, Apple 2.4A, PD, HuaWei FCP, Samsung AFC, and contains the **auto detect routine** of the protocols above. The device also provides a routine which can detect if an apple cable is MFI authorized(Reference only).

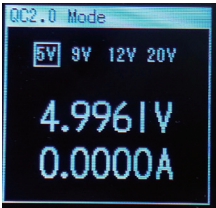
- **Warning**

The faulty operation of this feature may cause damage to the devices. The author isn't responsible for those consequences.

A **left click** on the home screen will make the system enter fast-charge trigger mode.

QC2.0
QC3.0
Auto Detect
Apple 2.4A
Apple MFI Test
Power Delivery
HUAWEI FCP
Samsung AFC

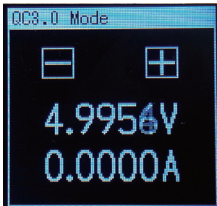
- QC2.0



In the QC2.0 mode, the user select the voltage wanted to be triggered by scrolling the left and right keys. A click on the middle key is recognized as confirmation.

A double click on the middle key will lead the system to exit this mode back to the home screen. The voltage keeps the level that the user required after exiting this mode.

•QC3.0

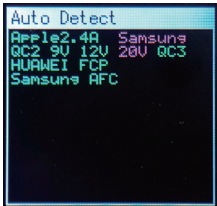


In the QC3.0 mode, the user adjust the voltage by **scrolling the left and right keys**.

Every click will have an effect of **200mV** according to the protocol.

A double click on the middle key will lead the system to exit this mode back to the home screen. The voltage keeps the level that the user required after exiting this mode.

•Auto Detect



In auto detect mode, the device will try **full sequence of the protocols**, and show the protocol is supported or not. During the process, **don't plug-in** any other device except the being-tested adapter/powerbank.

•Apple 2.4A

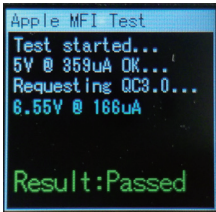
This will apply apple recognition voltages on D+ D- pins to **accelerate** charging on **apple** devices.

•Apple MFI Test

This is an apple MFI test routine which can detect if an apple cable is **MFI authorized**. Note that the result is **for reference only**.

During the procedure, the device will require **high voltage** from the **QC3.0** adapter, this may cause **damage** to the **unauthorized cable**.

The user shall plug the meter into an adapter which is **QC3.0 supported**, and plug in the **cable** into the **USB female**, then begin the test. Do not plug-in any other device during the procedure.



Wait for a few seconds.

Result "Passed" indicates the cable is MFI authorized.

Result "Fake" indicates the cable is not MFI authorized.

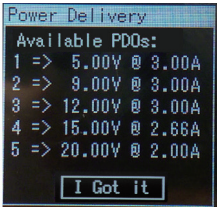
Result "Unknown" indicates the test cannot be done correctly, it is most probable that the adapter is not QC3.0 supported.

•Power Delivery

The meter has the feature of PD(Power Delivery) requesting. To avoid influence to the communications between the adapter and the phone, this feature **shall be disabled** when not used.

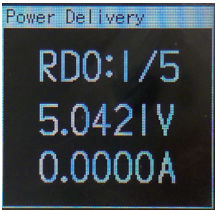
The user can **enable** this feature by toggling the **switch on the right bottom side** of the device to "**ON**" position, and **disable** it by toggling it to "**OFF**".

After enabling this feature, plug the meter to the adapter by a Type-C 2 Type-C cable. The meter will startup, then the user enter power delivery mode, the meter will **reset the adapter and itself**, after reset, the meter will **report the capability of the adapter**.



The example report is shown above. The power levels are listed (e.g. 9V@3A means the voltage level is 9V, and the maximum operating current is 3A).

Press the middle key to enter the requesting mode.



In the PD requesting mode, the user adjusts the voltage levels by **scrolling the left and right keys**.

A **double click** on the middle key will lead the system to **exit** this mode back to the home screen. The voltage **keeps** the level that the user required **after exiting** this mode.

- **HuaWei FCP**

The same as QC2.0.

- **Samsung AFC**

The same as QC2.0.

- **Release FastCharge**

After a QC2.0/3.0, FCP, AFC, PD triggering, if the user wants the voltage **go back to 5V**, shall make a **click on the left key** and confirm.

Cable Resistance

The meter can measure the resistance of the **MicroUSB** cable & **USB-A 2 Type-C** cable, and provides a program for 4-line cable resistance test. The meter can also **evaluate** the resistance of the **Type-C 2 Type-C** cable.

Press "L/-" and hold 3S



•Normal mode

The procedure of the **normal mode** is :

1. **Connect** the meter to the adapter by the **USB-A male** port. Then plug-in a **constant-current load(>500mA)** into the **USB-A female** port.

2. **Disconnect** the meter.

3. **Reconnect** the meter with an **A-C cable** or a **MicroUSB cable**, then plug-in the **same** load in step1, the cable resistance will be shown on the screen.

•4-Line Mode

The device provides the **software implementation only**, require the usage of the accessory from its provider.

•Bypass Mode

This mode can only **evaluate** the resistance of the Type-C 2 Type-C cable because the meter can **only** get the resistance of the **positive line** inside the cable.

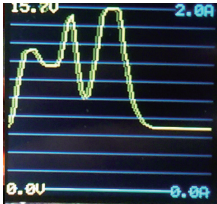
Since the **negative line and positive line usually have the same dimension and material**, the result is reliable in the **most cases**,.

The procedure of the **bypass mode** is :

1. **Connect** the meter to the adapter by the **USB-A male port**. Then plug-in a **constant-current load(>500mA)** into the **USB-A female port**.
2. Plug **both sides** of the **Type-C 2 Type-C cable** into **both Type-C female port** on the meter.
3. The resistance is shown on the screen.

Diagram Painting

A **double click** on the home screen will make the system into **diagram painting mode**:



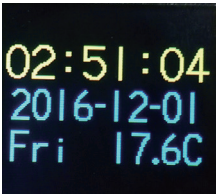
In this mode, **clicks on the middle key** can toggle the diagram from **D+D- voltage** and **voltage-current**. **Double click the middle key** can **exit** this mode back to home screen.

Clear Data

Click the right key on the home page and confirm to **clear** the current data set.

Idle Clock

This device can be used as a digital clock when it's not in use. Refer "**Menu**" chapter for the related settings.



Press "R/+" and hold Switch direction of the screen

Press "R/+" and hold 3S Show the current Date, time, and temp

Misc

•Firmware Upgrade

Remove the meter from power sources, **press and hold the left key** and plug it into a PC, release the key when the device entered **"Bootloader"** mode. **Drag** the firmware into the popped up **disk** on PC.

Wait for a few seconds, the meter will reset automatically, and pop up a dialogue **"Updgrade Success"**, firmware upgrade done.

END