ChargerLAB POWER-Z

KM003C/KM002C USB Tester User Manual

We will update it from time to time, so there's no need to download it.
For the best user experience, we strongly suggest you use the Google docs APP or Computer browser to view it.

1. Version history

Purchase Link

Amazon (US)
Taobao

Download here: PC Software (KM002C/KM003C)

03/28/2023

2.2.4 (PC Software)
1. Fixed the temperature parsing error in UFCS protocol analyzer.
2. Fixed the program crash when the curve data of PD protocol analyzer exceeds 10000 points.
3. Fixed the extreme value error of the data recorder.

02/08/2023

1.7.1 (Tester)
1. Added UFCS protocol analyzer (need to cooperate with the PC software V2.2 or above).
2. Added SVOOC (PD) 160/240W protocol trigger.
3. Fixed the display error of UFCS/VFCP/SVOOC(PD) protocols on the main menu.
4. Fixed known bugs.

2.2.1 (PC Software)
Integrate the support of Windows 7, and no longer release the Windows 7 version separately.
Added:
1. UFCS protocol analyzer.
2. The record curve starts with 0 instead of the system time.
3. Path selection button for saving while recording.
4. Pause button for data recording.
Fixed:
1. The exported .db file cannot under a Chinese path.
2. ElapsedTime garbled in the .db file.
3. The incomplete issue when the PD protocol analyzer decodes EPRCapabilities.
4. The issue of incomplete display when the PD protocol analyzer decodes the protocol image.
5. The data cannot be continuously recorded after waking up from sleep.

11/02/2022

1.6.4 (Tester)
1. Added Xiaomi 210W MIPPS protocol.
2. Fixed the Infinite loop in the automatic protocol

3. Fixed the wrong protocol info when automatically testing QC3.0
4. Fixed the wrong voltage of some devices
5. Fixed the crash issue in the automatic protocol detection
6. Optimized the voltage regulation algorithm when manually triggering QC3.0

09/26/2022

1.5.0 (Tester)
1. Optimized the protocol trigger.
2. Added new tab of UFCS protocol trigger (You can trigger it manually).
3. Set the default themes color to blue.
4. Set a new lighter color of Dashboard

08/07/2022

1.4.6 (Tester)
1. Fixed known bugs.

08/02/2022

1.4.5 (Tester)
1. Fixed the EPR (50V 5A) cable simulation issue with 1.4.4.

07/26/2022

1.4.4 (Tester)
1. Fixed the problem of protocol detection
2. Fixed characters error of E-Marker test

2.1.1 (PC Software)
1. Fixed the notification error of firmware update on some PC software.
2. Fixed the crash caused by the Variable data packet of the PD protocol analyzer.

07/10/2022

1.4.0 (Tester)
1. Fixed known bugs.
2. KM002C can support up to 10A (Not supported by Lite version).

2.1.0 (PC Software)
1. Added temperature monitoring and can save it as curve (only valid for 1/10/50 SPS).
2. The current range can be automatically adjusted.
3. Added transparency and width settings of the curve.
4. Added the pop-up notification when no driver file for Windows 7 is found.
5. Fixed some errors in importing and exporting CSV files.
6. Fixed the error when minimizing the windows.
7. Fixed an issue where power could not be displayed when the cursor was over the curve.

8. Fixed other crash problems and improved stability.

06/11/2022

1.3.6 (Tester)
1. Added a new category to PD protocol detection and highlighted the Xiaomi private protocol and PD3.1 (>20V).
2. Fixed the crash when monitoring PD protocol.
3. Fixed power error of dashboard.
4. Fixed the wrong E-marker info of Thunderbolt 3 cable.

05/25/2022

1.3.5 (Tester)
1. Fixed the duplicate PPS, QC4 of auto protocol detection
2. Fixed the crash issue.

05/19/2022

2.0.8 (PC Software)
1. Optimized the performance of PD protocol analyzer
2. Added power curve of PD protocol analyzer
3. Fixed some known issues of PD protocol analyzer

04/24/2022

1.3.1 (Tester)
Optimize performance of PD protocol analyzer

2.0.6 (PC Software)
1. Fixed that the timeline would show in 2074 when recording with 1KSPS
2. Fixed the error that only 20SPS is actually recorded when using 50SPS
3. Fixed the error of auto stop
4. Fixed that the data recorder and the protocol analyzer cannot work simultaneously
5. Optimize performance of PD protocol analyzer
6. The axis and color of data recorder now can be saved

04/18/2022

1.2.9 (Tester)
1. Fixed many bugs
2. Optimized some functions
3. Optimized UFCS protocol identification

03/30/2022

1.2.8 (Tester)
1. Fix some chargers unable to test FCP and AFC protocols.
2. Fixed no English text issue when you press the right button at startup
3. Changed the dashboard protocol to the Maximum voltage requested in real-time.
4. Added English QR code.

03/09/2022

2.0.5 (PC Software)
1. Firmware update can be displayed in English when setting in English
2. The power can be exported When exporting in CSV file
3. The data of PD protocol analyzer can be automatically loaded when you scroll the wheel

1.2.6 (Tester)
1. Rewrite the code of E-Marker information reading. Now you can properly test TBT3/4 and passive/active cables
2. Fixed: Some chargers cannot automatically test out the AFC protocol

03/03/2022

2.0.4 (PC Software)
1. Added English language, and can be saved

1.2.4 (Tester)
1. Fixed the charging issue of Xiaomi mobile phone.
2. Fixed the garbled protocol characters in the main menu.
3. Added PD protocol analyzer.
4. Added automatic detection of UFCS protocol.

02/28/2022

2.0.3 (PC Software)
1. Added PD protocol analyzer
2. Switching between Chinese and English

02/09/2022

2.0.2 (PC Software)

1. Improve the reading of offline data
2. Support export and import of Sqlite file. You can manage data more conveniently with third-party application, like SQLite Studio
3. Fixed known bugs

2. Features

(1) Equipped Ports

A USB-C Female (Receptacle) that supports USB 4

A USB-C Male (Plug) that supports USB 4

A HID port (USB-C) for connecting to PC & power supply

(2) Voltage & current measurement

Built-in 20-bit ADC (high-precision measurement IC)

Data Collection: Up to 1,000 times per second

Programmable Collection Speed: 1/10/50/100 times per second

Current Sampling Resistor: 2W/20PPM

Wide voltage: 0-50V

High current: 0-6A

(3) Data Storage

4MB Flash

Records up to 40 pieces of data: Capacity / Energy

Programmable self-start and self-stop recording

Programmable recording time

(4) Trigger Fast Charging Protocols

Support PD2.0 / PD3.0 / PD3.1 / PPS / QC4+ / QC5, etc.

Support Qualcomm QC2.0/QC3.0/QC3+, etc.

Support private protocol triggers such as FCP / SCP / AFC / VIFS, etc.

Support BC1.2, Apple 2.4, Samsung fast charging protocols

Support Universal Fast Charging Specification (UFCS)

Support protocol analysis of PD / UFCS

Support SOP/SOP'/SOP" data pack

Read the electronic label (E-Marker) of USB-C cable

Read the info of Apple PD charger

Automatically test the protocols of the charger

(5) HID interface

Composite USB port, driver-free

Provide open API (Application Programming Interface) for development

(6) PC software

Brand-new UI

Provide Window / Mac OS platform (Mac OS is under development)

Portable application makes it easier to use directly

Multiple testers can be connected to single computer simultaneously

Real-time curves

It's programmable and can collect data up to a thousand times per second

Export and import curve data

Export 4K curve images

10 million pieces of data at a time

Record power, capacity, energy, temperature curves

Trigger different fast charging protocol of the tester.

Support PD protocol analyzer, which can support up to 10,000 pieces of data

Modify the parameters of the tester

Read the stored curve data

Upgrade firmware of tester

Support English/Chinese

(7) Expansion modules

Read the info of USB-C eMarker

Read the info of Apple charger

Internal resistance test of cable (In development)

Read information of MFI cable (In development)

3. Product Specifications

Continuous Parameter	Series	Units
VBUS Input Voltage (Vstd)	0 to 50	V
VBUS Input Current (Istd)	6.0	A
Withstand Voltage of D+/- Pins	50[1]	V
Withstand Voltage of CC1/2 Pins	50	V
Instantaneous Parameter		
VBUS Input Voltage(Vmax)	50	V
VBUS Input Current (Imax)	6	A
Other Parameter		
Initial bits of Data Acquisition	20	Bits
Voltage Measurement Gain Error	0.05 0.25	%
Current Measurement Gain Error	0.05 0.25	%
Measurement Gain Error & Temperature	5 20	ppm/°C
Voltage Accuracy	0.00002	V
Current Accuracy	0.000003	A
Operating Temperature Range	-10 to +65	°C
Storage Temperature Range	-45 to +110	°C
Input Impedance	>800	kΩ
Anti-surge voltage	4	kV

⚠Warning

1. Please do not connect more than 50V power supply into the USB tester.

[1] Technically supported without enough experiments, please do not connect it to a high-voltage pin.

2. Please do not connect to USB power supply devices when triggering the fast charging protocol. The applied high voltage may burn your device or even catch fire.
3. Please send it back to where you purchased it or the professional company if there's any hardware issue.

⚠Attention

1. Do not take apart the USB tester by yourself, otherwise the warranty will be invalid.
2. The USB tester has no reverse voltage protection. Please do not exchange the positive and negative and connect to the tester, otherwise it will cause permanent damage.

4. Tester Introduction

1 USB-C Male

Standard USB-C Male (Plug) that supports USB4 Gen3 (Bidirectional)

2 USB-C Female

Standard USB-C Female (Receptacle) that supports USB4 Gen3 (Bidirectional)

3 HID

Used to connect to PC & Power Supply and it’s driver-free.
PC software: support Window / Mac OS (In development), used for upgrading firmware, drawing high-precision curves, loading offline curve files, PD protocol analyzer, triggering fast charging protocol, etc.

4 Back

1. Rotate the display direction in the main menu

2. Back

3. Press and hold it when power off, you can enter the DFU mode

5 Confirm 

1. Long press: Enter Settings

2. Short press: Confirm

6 Left 

1. Switch four different interfaces in the main menu

2. Modify parameter values in the setting

7 Right 

1. Switch four different interfaces in the main menu

2. Modify parameter values in the setting

3. Long press "Right" on startup when HID is disconnected to power (Flip the USB-C connector if it doesn't work)

Release CC pull-down resistor, it'll shut down after 5 seconds

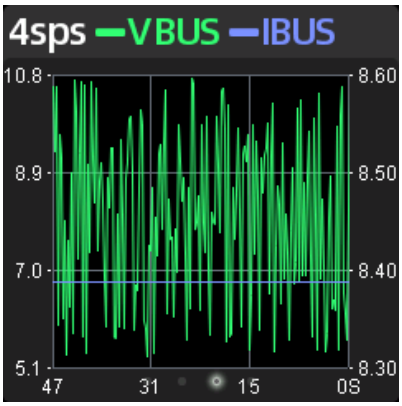
Keep CC pull-down resistor, enter the charging protocol

Attention: Please use this function under the guidance of professionals, otherwise the short circuit caused by the CC1 and VBUS of the cable may damage the tester.

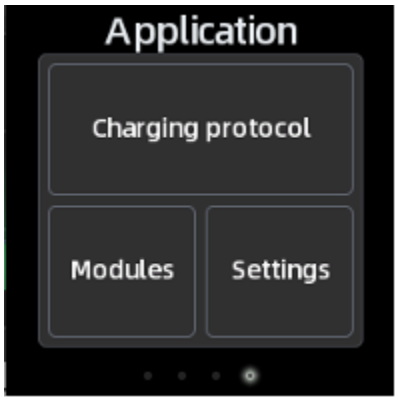
5. Main Menu

Data Storage

Dash Board



Real-time Curve



Application

Let's introduce them one by one.

1. Data Storage

It's used to record the electricity from the power supply into the device, that is a DC meter. The units are mAh and mWh.

Keyword Description:

Capacity (mAh): It means one hour of current (mA), for example, if a device needs to be charged for an hour with 1000mA, which equals to 1000mAh (1Ah).

Energy (mWh): It means the power (mW= V *mA) expended for one hour, for example, if we use the 1000mA load to discharge a battery with 5V voltage for an hour, which equals to 5000mWh (5Wh).

Curve Storage: It can record the curve data of the test period. You have to import the data into computer software for analysis.

Max Storage: Up to 40 different groups of data can be stored, which can be deleted and switched.

You can use it for:

Testing the actual capacity of the power bank

Testing the actual capacity of your phone and estimate the battery health

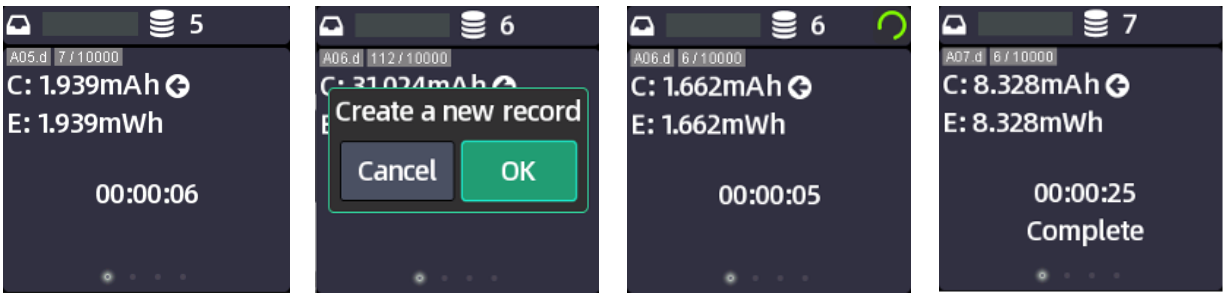
Estimating the charging efficiency of wireless chargers

How to use

Create a new record

Press the “confirm” button and select “ok”

You can go to “setting” (Long press “confirm”) to modify the save interval.

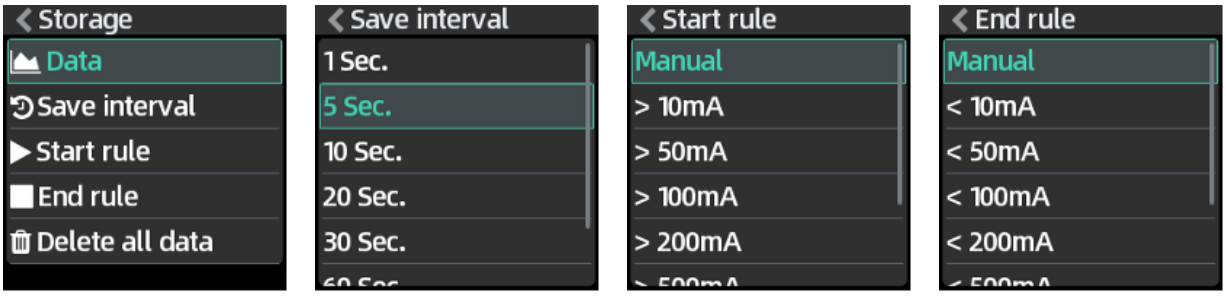


(2) Auto start and stop by setting trigger conditions

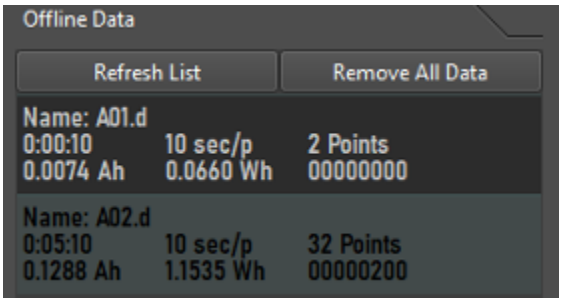
Auto start: Setting > Storage > Start rule > Set current (Manual means no rules)

Auto stop: Setting > Storage > End rule > Set current (Manual means no rules)

Save interval: You can set it according to your needs, but each record is limited to 10,000 pieces of data.



Connecting to PC software to read the records.



2. Dash Board

Here is the dashboard. You can view the real-time voltage, current and wattage at a glance. Press the “confirm” button to adjust the speed / sampling rate (4/15/60/1k Hz).

Green block represents the voltage, marked as VBUS.

Purple block represents the current, marked as IBUS.

Orange block represents the power (wattage), marked as PWR.

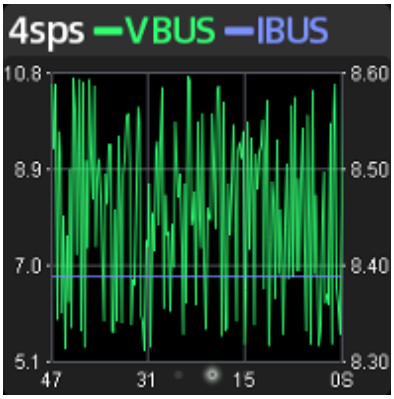
Black block represents the possible fast charging protocol while the DP, DM, CC1, CC2 are on the right. (The protocol may not 100% accurate).

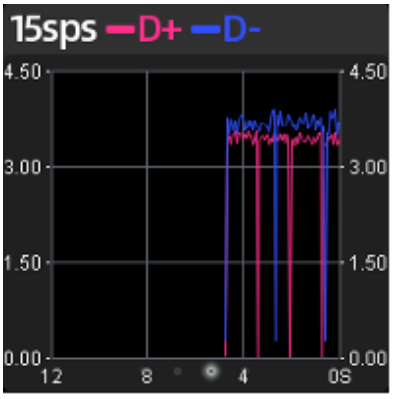
Relationship Between Voltage and Protocol Based on D+/D-

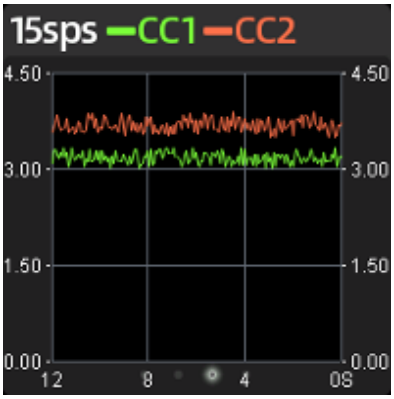
D+(DP)	D-(DM)	Protocol	D+(DP)	D-(DM)	Protocol
2.7V	2.7V	APPLE 2.4A	0.6V	0.6V	QC2.0 12V
1.2V	1.2V	SAMSUNG 2.0A	0.6V	3.3V	QC3.0
0.6V	0.0V	QC2.0 5V FCP AFC 9V	3.3V	0.6V	QC2.0 9V
0.0V	0.0V	DCP 1.5A SDP 0.5A USB 2.0 (HIGH SPEED)	3.3V	0.0V	USB 2.0 (FULL SPEED)

3. Real-time Curve

You can observe real-time data curve in here. Press the “Confirm” button to switch between VBUS/IBUS, D+/D-, CC1/CC2.







4. Application

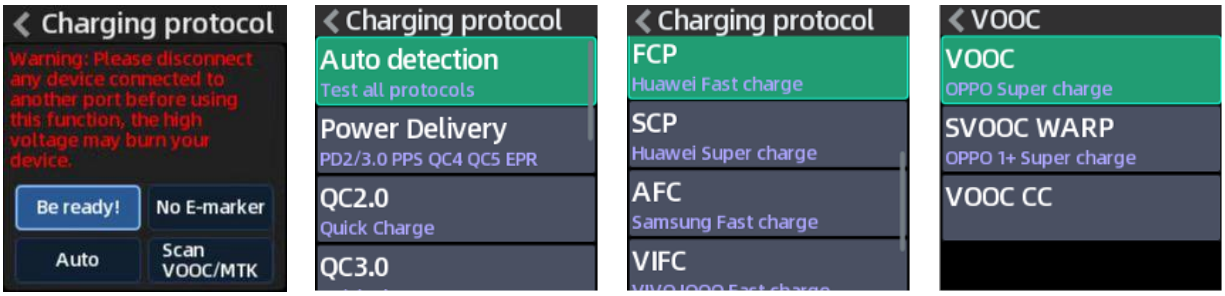
(1) Charging protocol

Please do the following preparations before using it.

1. Please connect the tester to a sustainable power supply via HID port.

2. Please insert the USB-C Male (Plug) to chargers when you’re testing the PD power supply

3. Please disconnect any devices connected to the USB-C receptacle before using this function. No matter what's burned, you are responsible for it.



The options in the first image are (please update the firmware to the latest version) cable simulation, request PD type, and scan VOOC/MTK protocol (exclusive for KM003C).

Auto detection

How to use: Application > Charging protocol > Auto detection

KM002C:

Supported protocols: PD2.0 / PD2.0 PPS / PD3.1(EPR) / QC2.0 / QC3.0 / QC3+ / QC4+ / QC5 / AFC / FCP / SCP / VIFC / UFCS / APPLE2.4A / SAMSUNG

Unsupported protocols: VOOC / MTK PE / SFCP

KM003C:

Supported protocols: PD2.0 / PD2.0 PPS / PD3.1(EPR) / QC2.0 / QC3.0 / QC3+ / QC4+ / QC5 / AFC / FCP / SCP / VIFC / UFCS / APPLE2.4A / SAMSUNG / VOOC / MTK PE / SFCP

Single protocol detection/trigger

How to use: Application > Charging protocol > Power Delivery

Step 1: Connect the power supply to HID port.

Step 2: Insert the USB-C Male (Plug) of tester into the chargers.

1.There's no need to insert the cable into USB-C female (Receptacle), because the tester can simulate a 50V/5A cable.

2. The cable simulation is not perfect. If it doesn't work, please disconnect the USB-C Male (Plug) from charger and insert a cable with 5A E-Marker chip to the USB-C female (Receptacle). If you're testing the PD 3.1, you need to insert a 240W cable to the USB-C female (Receptacle).

Step 3: Show supported PD information (Figure 2) and press "Got it!"

Step 4: Use "left" and "right" to modify the value and press "confirm" to tigger the corresponding voltage or current.

It'll be the same to trigger other protocols (Figure 5-8).

Step 5: If you need to test the power supply with USB-A port, please insert the cable to the USB-C female (Receptacle). No need to use USB-C Male (Plug).

Figure 1

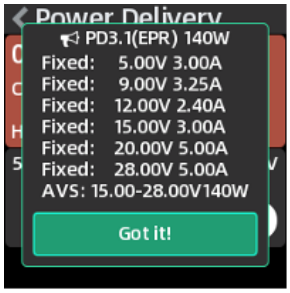


Figure 2

Figure 3

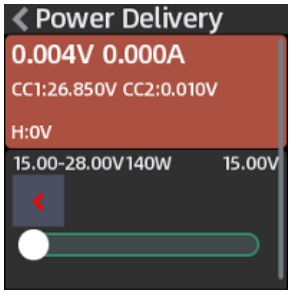


Figure 4

Figure 5

Figure 6

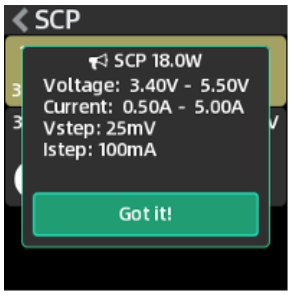


Figure 7

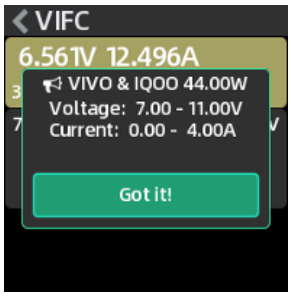


Figure 8

Supported protocols: PD2.0 / PPS / EPR / QC2.0 / QC3.0 / AFC / FCP / SCP / VIFC / UFCS / VOOC

The original cable and a small load are required to trigger the VOOC/SVOOC protocol

Unsupported protocols: MTK PE / SFCP

⚠ Supplementary Instructions of PD protocol

This tester is designed to test the PD protocol, so please read this chapter carefully.

The PD protocol is a brand-new power transmission solution released by the USB-IF in recent years, which has great differences with the traditional fast charging protocols.

1. The PD protocol was based and relied on the brand-new USB-C port. Those old ports cannot be compatible with the PD protocol.
2. There's a new feature of standard USB-C. It'll keep 0V instead of 5V when it's not working. A status signal must be given to activate 5V. This feature is different from the USB-A port, but is a bit like the OTG of mobile phone. Therefore, the tester won't light up when plugged into the charger, and it's also the reason why the power supply is needed when triggering the fast charging protocol.

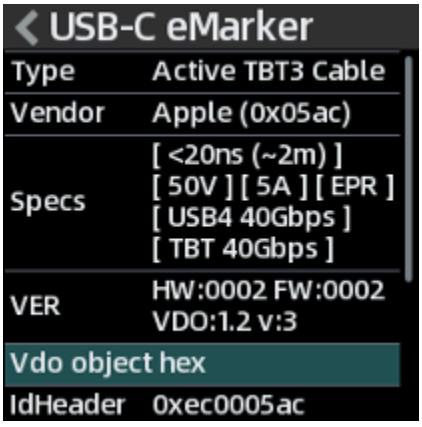
(2) Modules

USB-C eMarker

How to use: Application>Modules>USB-C eMarker

It read the info of USB-C eMarker and can support 3A / 5A / 50V / EPR / TBT3 / TBT4 cable.

The EPR means it can support the latest PD3.1 protocol. You must use this kind of cable when the power of PD protocol exceeds 20V/100W.



Apple Charger

How to use: Application>Modules>Apple Charger

It read the info of Apple charger. You can use it to tell the difference between

genuine and fake Apple chargers.

Extended tools (In development)

How to use: Application>Modules>Extended tools

Read information of MFI cable

Application>Modules>Extended tools>MFI cable

Internal resistance test of cable

Application>Modules>Extended tools>Internal resistance

(3) Settings

Settings>Display

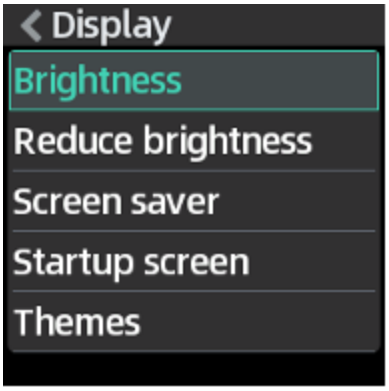
Brightness: adjust the brightness

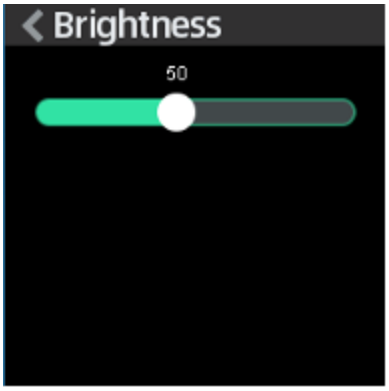
Reduce brightness: the brightness will be reduces after a period of no operation.

Screen saver: the power information will be shown in large fonts after a period of no operation. (In development)

Startup screen: It'll display the "POWER-Z" for a period of time at startup. The text/image can be customized by customers.

Themes: In development





Settings>Storage

Manage stored data and set some auto-run rules

Data: the usage of each group of data, and can be read by the PC software

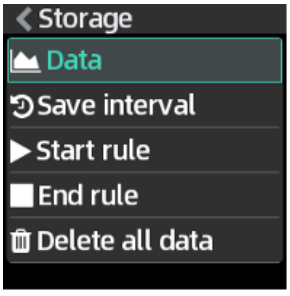
Save interval: The recording interval can be set from 1 to 120 seconds, and each group of data is limited to 10,000 pieces.

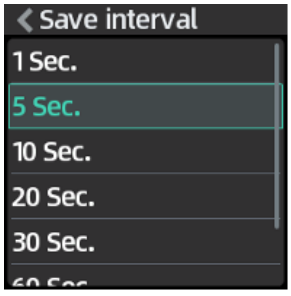
If you need to record every 5 seconds, you can save about 13 hours of data.

Start rule: disabled by default, it can automatically to start the recording by setting a value.

End rule: disabled by default, it can automatically to stop the recording by setting a value It's very suitable to monitor the charging curve of mobile phone.

Delete all data: Delete all recorded data and can also be managed on PC software.





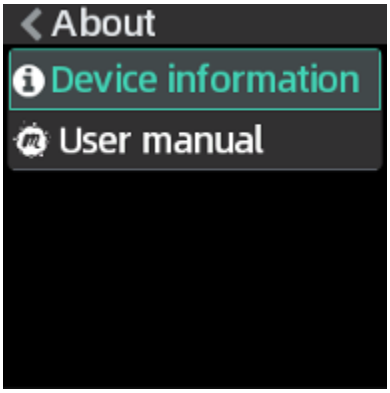
Settings>Language

You can switch between English and Chinese

Settings>About

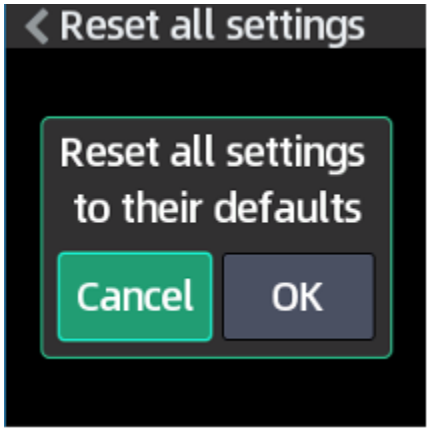
Device Information: View device information, firmware version, SN, etc.

User manual: Scan to get this manual



Settings>Reset all settings

Restore to the factory settings, the file system will be formatted, and all data will be lost.



The user manual of the computer software is different from the tester, so please stay tuned.