Grüezi YouTubers. Here is the guy with the Swiss accent. With a new episode around sensors and microcontrollers.

In video #146 we looked on how to test power supplies and battery packs using a very cheap and a quite expensive electronic load. Today, I will test two astonishingly cheap electronic loads with very interesting features. At the end, you should be able to decide, if such a load is a reasonable addition for your lab, and which one fits better.

To test power supplies or battery packs, we have to load them with a defined current. And we have to measure the voltage, the current, and especially for battery capacity, these values also over time. So, we need five different things:

* A load, preferably with a selectable, but stable current
* An amperemeter
* A voltmeter
* A clock (which is the easiest part for a Swiss guy)
* A piece of paper, or similar to take notes

In video #146 you saw my quite expensive IT8512 electronic load. If we connect it to our computer, it has all we need: The meters, the load, and a software for data logging. The cheaper load, however, did not have any of the measuring instruments nor the possibility to log data.

But in the meantime, I got two electronic loads which are a combination between the two, at a price between 20 and 30 $. Which is really cool. Here they are: They look very similar to the cheap load.

Their name is EBD-USB Electronic Load. They look very similar, are manufactured by the same manufacturer, and also have similar specifications:

They can be used from 0 to 13.5 or 21 volts, and from 0 to 4 amperes. They support the fast charging standards QC 2.0 and 3.0, and also Mediatek Pump express. The golden, or “plus” version, supports 35 W, and the red 25W. The prices are 17 or 25 dollars from Banggood and the manufacturer is called ZKETECH.

Let’s have a close look at the two devices: As all USB loads, they have a male standard USB connector for the input. The cheap load does not have any other connectors. The new loads have an additional female USB and a micro USB plug.

What is the purpose of those additional plugs? The micro USB plug is the connection to the PC software, and the female USB connector can be used to connect this load to a device like your smartphone, or your nodeMCU board. Inside these loads you find:

* A load with a selectable but stabilized current
* An amperemeter
* A voltmeter

And in the PC software, you find:

* A clock
* And a screen to log the data

Everything we need to do our power tests. And with the female USB connector comes an additional feature: You can use our electronic load to measure the behavior of your devices like your smartphone, or any other board you want to monitor. And this is feature is even not available in the expensive load. It can replace a meter like this one. Great!

The block diagram looks like that: We have a power source like a power supply, a solar panel, or a battery pack. We connect it to our electronic load. Then, we can either switch the internal load on and test our power source, or we keep it off, and connect another device to the female USB connector.

Let’s do some tests. First, we test a normal Blitzwolf USB power supply. I connect the load to the power supply and want to test it with a defined load. But there is no dial to select the current nor an on-off switch. You need a software to start the test. The link for the software is in the description. Fortunately, it is the same for both versions. So, we connect the load to the PC, fire the software up, select the right COM channel, and press the “connect” button. Let’s first do the normal test with an increasing load: We start at 0.1 A and go up to 4 A in steps of 0.1A and check, what happens. The USB power supply is rated at 2A for each of the two USB connectors. But we see, it does not limit the current and it supplies up to the full 4 A. And the voltage stays quite stable, even at 4A. To power a Raspberry Pi, this power source would be a good choice. But does it also charge a Smartphone with the full 4A?

To test this, we connect an empty iPhone to the second USB connector. Because the electronic load part is not switched on, the Smartphone immediately starts to charge. And we can read the values on the right side of the screen. If we press “monitor, the ZKE starts to log the volt and the amperes over time. The device shows 5 volts and a current which starts at about 2A and is reduced over time. Some small peaks result if the phone is switched on for a moment. But, all-in all we discover an interesting charging curve I did not expect. So, I already learned something…

During monitoring, the capacity is not measured. This would be a nice feature to test the efficiency of power banks. And an additional trace of the power consumed would also be nice, and not complicated as power is just a multiplication of volt times ampere…

As a third test, we discharge a fully charged power bank. Of course, this takes a while. In this mode, we can select the cutoff voltage. This is particularly important if we want to discharge unprotected lipo cells. In my case, I trust that the power bank is protected and will switch off automatically. So. I select a 2-volt cutoff, which should be way below the cutoff voltage of the power bank. And because we saw before, that my iPhone draws about 1.8 Ampere, I want to use this current to discharge the power bank. I start the experiment and the voltage is at 4.92 volt. As soon as the internal MOSFET of the load heats up, the fan kicks in and start to cool the device.

Over time, the voltage stays flat and at the end, the power bank switches off, still at 5 volt. In the meantime, the capacity counter counts the discharged mAh. And at the end, we see, how much capacity the power bank is able to provide.

But these devices can do more. If we create a female USB cable, we can connect the device also to solar panels, or to normal batteries. And here comes an important difference of the two loads into the play: The maximum voltage. The “normal” version supports 13.5 volts, and the “plus” version supports 21 volts. By the way, you see here, if you connected the plus or the normal version to your PC software.

With this cable, you can also use the device as a normal data logger for other experiments where you can log volts over time. And if you create a second cable with a male USB connector and two banana plugs, you also log currents over time. Very versatile! Just a remark about the cables: Because we cannot use the 4-wire method introduced in video #146, we have to use quite thick and short cables. I suggest at least 18AWG. Otherwise, you could experience voltage drops between your power source and the ZKETECH device.

Let’s test what happens, if we connect the maximally rated voltages to the devices: Both work up to their maximum rated voltages. Even if you go a few volts higher, they are not immediately destroyed. Let’s quickly test the accuracy of the built-in meters: Without load, I connect my bench multimeter in parallel to the loads. Here are the results: With the exception of the lower voltages on the normal device, they are inside the specifications. For the next test, I connect the multimeter in series with the device and measure the amperes. I started with more than 20 volts and 3 amperes, but I only get up to 1.63 A. The secret behind this is, that the load does not allow more than 35 watt. 1.63 x 21.42 results in exactly these 35 watt. So, the loads are protected. The normal one at exactly 25 watts.

Here, you also see the results of the current measurement: The plus version is more or less inside specs, the normal one has its problems below one ampere.

If you are not satisfied with these results, you even have the possibility to adjust the values in the software.

What happens, if we try to run the loads at the fully rated power of 25 respective 35 watts? Here, you see the normal one, and here the plus one. Both after 5 minutes under full load. No obvious issues. These transistors should survive much more than 100 degrees C.

Summarized:

* We discovered a new type of device, which is very versatile
* It is a very intelligent combination of quite accurate volt and ampere meters
* A electronic load
* A software to remote control the experiment and, more important, to log the measured data
* And all for 20-30 $
* Of course, they have their limitations:
* They only support constant current mode. “Real” electronic loads support also constant voltage or constant power modes. But, constant current is the most important mode.
* Their maximum voltage is 13 or 21 volts and their maximum current is 4 amperes. My IT8512 has a maximum of 150 volt and 300 watts.
* For normal lab experiments, these limitations are sufficient. If you want to play with solar panels, I suggest to use the plus version, because even 12-volt panels output more than 13.5 volt under certain conditions.
* So, all-in-all a very versatile little helper for our lab. With a comfort, which was not affordable for most of us just a few years back.

Is it the best electronic load? You decide. And p lease keep in mind, that they can also be used as data loggers.

In one of the next videos I hope to show you another such interesting new generation of devices which combine hard- and software to create something ne at an astonishing price. So, stay tuned.

I hope, this video was useful or at least interesting for you. If true, then like. Bye

<https://www.aliexpress.com/item/35W-computer-software-online-USB-tester-USB-Discharging-Load-QC2-0-3-0-MTK-PE-Trigger/32707276028.html>

<http://lygte-info.dk/review/Review%20Electronic%20load%20ZKE%20EBD-USB%20UK.html>