

qUPS

User Manual

v1.0

11. May, 2022

1 Safety notice

1.1 Personal safety



The qUPS product has an energy storage system that can be energized even when it is not connected to the mains.

There are no replaceable parts in the qUPS product - only a specialist or service center may repair or maintain it.

1.2 Product safety

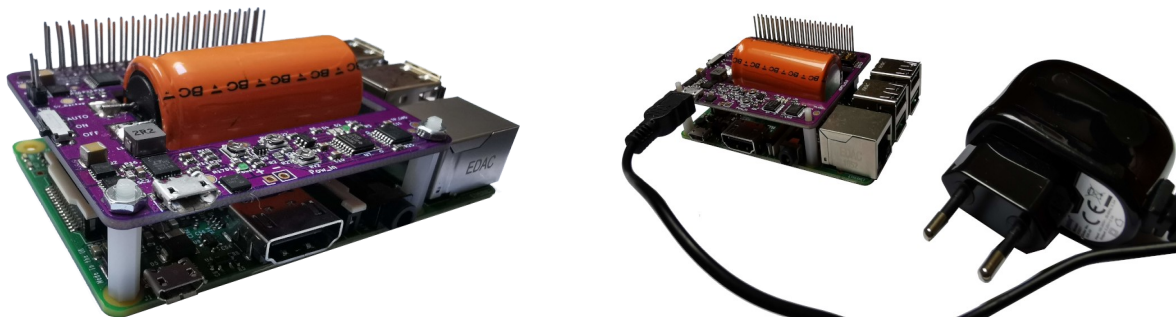


The qUPS product should be protected from excessive or too low temperatures and direct sunlight.

Keep in a dry place for 24 hours before installation. Conductive fluids, plastic materials can cause short circuits and permanent product damage, so avoid installation in such an environment.

When using the qUPS product, only power on the qUPS product.

Do not power the connected device from other sources! The qUPS product must not be operated with another specimen and / or other uninterruptible power supply with the pin terminal connection!



1.3 Precautions

The system operates on 5 V, which is an extra-low voltage, so it is protected from electric shock in a life-saving sense. Contacts in the event of short circuits caused by foreign matter can become hot and cause injury!

2 Intro

Thank you very much for choosing ADDEX smart qUPS for the protection of your electronic device!

The qUPS product was born from provident and intensive planning to provide the most reliable and effective way for system resilience in versatile environments to fully satisfy customer expectations.

Please read the User Manual carefully for self and product safety and a fully customized user experience.

2.1 Optimal usage areas

Unlimited dive cycle and maintenance-free operation make the qUPS ideal for edge applications where power outages and power fluctuations can compromise reliable operation.

Microcomputers, SBCs, microcontrollers

- blackout or brownout protection
- surge protection
- safe and secure shutdown
- providing safe pre-shutdown tasks and communication
- safe reconnection and recovery after a power failure
- reliable operation even in extreme temperature conditions

2.2 Suboptimal usage areas

- Protecting High-Power Computers - The device is designed to provide 2.5A continuous power
- Protection against long-term power outages - the energy density of a maintenance-free energy storage is not the best choice for long-term protection

3 Installation

The qUPS product can be put into service immediately after preparation and unpacking. In case of Raspberry Pi compatible microcomputers, the 40 pin header provides the opportunity of plug-and-play connection. For other microcontrollers and devices the prepared pins can be used.

3.1 Power supply

Regardless of usage modes, the qUPS must be supplied by a 5V minimum 2A PSU connected to power line. The tested and Supported PSU (power supply unit) list is in the appendix.

3.2 Connections

There are more connection schemes for devices applicable by the product.

3.2.1 Single board computer (SBC)

In case the SBC is supplied with a 40 pin Raspberry Pi compatible design, the qUPS can be applied through the HAT interface. Simply slide on to the SBC to cover it as seen on the picture below.



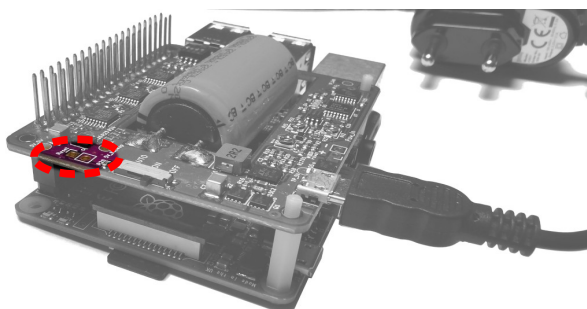
3.2.2 Microcontroller

Any microcontroller device, which operates from 5 V can be connected to the prepared separate pins on the qUPS or the appropriate pins of the 40 pin header.

The cable or the pins can be soldered also to the qUPS, or you can use test points.

3.2.3 Reset

Next to the mode selector switch there is a 2 pin connection prepared, which can be used to interrupt the power supply – also acting as a reset switch. You may install a push button for the function to be available on demand. If you short-circuit the two pins, the power supply is interrupted for the time, and after opening the circuit, the power will be reapplied.



Ez a funkció nem az üzemszerű kikapcsolásra lett felkészítve, hanem a pillanatmegszakításra vagy reset funkcióra. Kikapcsolásra az üzemmód választó kapcsoló „OFF” állása hivatott.

3.2.4 Other

Other devices – with similar power consumption and same voltage level – can also be used together with the qUPS product without any restrictions.

3.3 Configuration

3.3.1 Hardware settings

3.3.1.1 Feedback pin settings

The qUPS product exchanges state information with the connected device through three configurable GPIO pins (pinout can be adjusted). If the smart

extension is not needed, then the GPIO reservation can be freed (pins are reusable).

On the qUPS, there is a four channel-two state DIP switch. The firsts three channels (from the left) are responsible for the GPIO pinouts for the two state pins and the function selector switch. The fourth turns the LEDs ON (1) and OFF (0).

DIP switch state (0=OFF, 1=ON)	GPIO pin (40 pin header #)		
DIP#1-3 place value	Power Good (pfo)	Capacitor low voltage level (lim)	Shutdown (shd)
000	-	-	-
001	11	15	13
010	32	38	36
011	8	12	10
100	35	40	37
101	22	26	24
110	19	23	21
111	7	18	16

GPIO pin functions:

- pfo: „power good”, power supply connected and working

If the pin is high (logical 1, true), the qUPS and the connected device is powered through the PSU (power line). Otherwise, the pin is low (logical 0, false), the qUPS product keeps the device running through its energy storage, while the power line does not offer enough power or the PSU is defective.

- lim: energy storage level high, above threshold

If the pin is high (logical 1, true), the qUPS energy storage stores charge above the potentiometer controlled level. Otherwise, if the pin is low (logical 0, false), the qUPS energy storage is depleting and immediate safe shutdown should be initiated.

- shd: state of device pin for the qUPS – If this pin is pulled high (logical 1, true), the qUPS knows, that the device is operational and switched on. The goal is to secure the device restart after a power outage and safe shutdown, gaining enough charge level.

If the device is operational and the software is running, this pin is pulled high (logical 1, true), the qUPS is informed about the operating state of the device. After the interruption of power source and depletion of the energy storage, the pin goes low (logical 0, false). This indicates the qUPS product, that after the recovery of power source and charging the energy storage above threshold, the device will be powered on.

3.3.1.2 LED feedback

The fourth channel on the DIP switch is responsible for utilizing the onboard indication LEDs on the qUPS. If the LED indication is not needed, this channel should be switched OFF. Although consumption of LEDs are low, by switching them off, qUPS power-on time can be increased.

3.3.1.3 Voltage levels

The qUPS is designed to have three potentiometers for fine tuning the voltage levels, which affect the states and functionalities. Default settings are tuned for the standard Raspberry Pi products.

- RV1: External power source lower threshold

If the PSU voltage falls below the set level, the qUPS product switches to UPS mode and provides power from the energy storage. Otherwise, it is operating from external power and charges the energy storage, if needed

- RV2: Energy storage low charge level threshold

The low charge level threshold of the energy storage indicates the immediate initiation of safe shutdown procedure. If set too low, energy storage may not last for a safe shutdown. If set too high, the interval between power outage and safe shutdown initiation becomes too low.

- RV3: Energy storage high charge level threshold

In AUTO mode, the low level of energy storage keeps the device offline, until the energy storage charging reaches this level.

Good setting is the energy storage charge level enough for a complete system boot and a safe shutdown.

If the set level is too high, powering the device after charging to this level may take too long. If the setting is too low, in case of power outage, the safe shutdown may not succeed.

3.3.1.4 Mode selector switch functions

The mode selector switch has three positions. The position labels are on the board:

- „OFF“ (power off) mode

The qUPS product does not provide power to the device connected to it. Independent of the external power source, the connected device is not powered.

- „ON“ (power on) mode

The qUPS product powers the connected device, if the power source is on and functioning properly or the energy store has enough charge.



In case the energy storage charge level is low and the external power source stops working, the connected device may not be able to process a safe boot-shutdown sequence.

- „AUTO” (automatic) mode

Independent of external power source, the system provides enough charge for a successful safe boot-shutdown cycle.

3.3.2 Software settings

The qUPS product is able to share state information with the connected computer or device and controlled by software, which tasks and processes to run according to these.

You can find the pinout in section 3.3.1.1. These are responsible for the information exchange and configuration of the qUPS.

4 Usage

4.1 Function

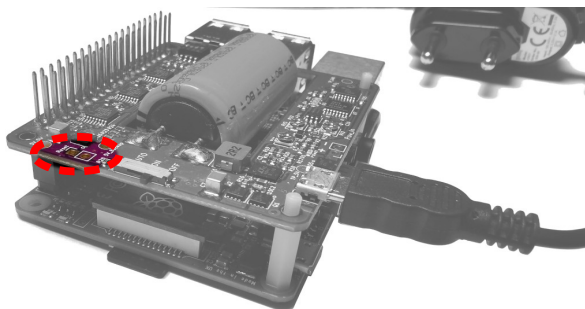
Properly connected system is operational in normal conditions with default configuration.



The qUPS product starts charging the energy storage immediately after connected to the power line through a proper PSU. After reaching the threshold limit of the energy storage – this can take minutes, according to the PSU performance –, will the device be powered on.

4.2 Reset

Next to the mode selector switch there is a 2 pin connection prepared, which can be used to interrupt the power supply – also acting as a reset switch. You may install a push button for the function to be available on demand. If you short-circuit the two pins, the power supply is interrupted for the time, and after opening the circuit, the power will be reapplied.



The cable or the pins can be soldered also to the qUPS, or you can use test points. The pin connection is switch-type, non-polarized. Not a voltage driven connection – only short-circuit is applicable!



This function is not for long-term power off, only for reset or restart. For turning the device off, please use the power switch.

4.3 Smart functions

Beyond delivering a safe power platform for your connected device, qUPS can inform the device of power supply state and energy storage charge level.

The qUPS operation can be configured with the device settings. With this information, the device can prepare for safe shutdown, fulfill tasks and run processes, which are highly necessary in case of blackouts. The qUPS product provides the operation time for the device to report to remote management services or initiate a safe shutdown process – including the desired tasks needed to keep the device safe. With this behaviour evading financial risks, information security risk and other not wanted events become reality.

4.3.1 Events

The device operating system or firmware can be prepared to process qUPS signals in real time and run tasks according to them.

There are two different signals available on qUPS:

- power source available and operational - pfo
- energy storage charge level above limit - lim

On github there are several implementations of this logic available for use or development in programming languages and scripts like C, C++, python and unix shell script.

5 Appendix

5.1 Supported PSU (power supply unit) list

- RaspberryPI official power adapter 5V@2.4A
- Goobay 43651 5V@2.1A