500A / 60V Smart Shunt

PwrTool 500

PROTOTYPE

The PwrTool 500 is an open-source smart shunt for Home Assistant based on the FLIP_C3 from VDBX.io. It's designed to bidirectionally monitor power in 12-48v DC systems usually found in off-grid or automotive systems. Made with ESPHome, allowing expansion via GPIO and alternate firmwares or Arduino code.

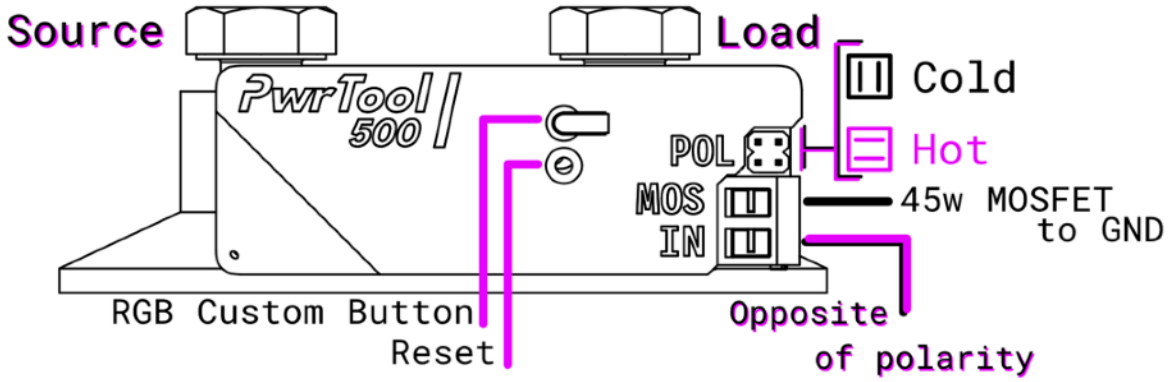
Caution

Working with DC voltages can be dangerous, *please follow all instructions and review safety warnings.*

Lead acid and lithium batteries pose serious safety risks. *Lead acid batteries generate explosive gases; never allow sparks, flames, or smoking nearby. Lithium batteries can ignite if damaged or improperly charged. Always ensure proper ventilation. Wear protective eyewear and clothing. For lead acid batteries, immediately wash off any acid contact with soap and water; for eye contact, flush with water for 15 minutes and seek medical attention.*

Avoid short circuits: *keep metal tools and personal items (jewelry, watches) away from all battery terminals. Both battery types can produce currents strong enough to melt metal and cause severe burns.* ***Always use correctly sized wires for your load*** *to prevent overheating and fire risks. For lithium batteries, use only appropriate chargers and never leave charging unattended.* ***In case of a lithium battery fire, do not use water****; use a Class D fire extinguisher. For any battery emergency, evacuate the area and seek professional help immediately.*

Hardware



SOURCE / LOAD - Shunt Connections

- Direction Independent - Values can be inverted in software
- M8 Bolts with split lock washers

POL - Polarity setting for shunt

MOS - 45 N-Channel MOSFET to GND

- LED Strips or External Relays/Contactors

IN - Connect to opposite of polarity setting

RGB - Addressable WS2812b on GPIO8

Custom Button - User available button on GPIO9

- Used as BOOT button when held at startup

Status LED - Will blink when disconnected

Reset - Hard reboot

Climate Sensor - Temperature & Humidity

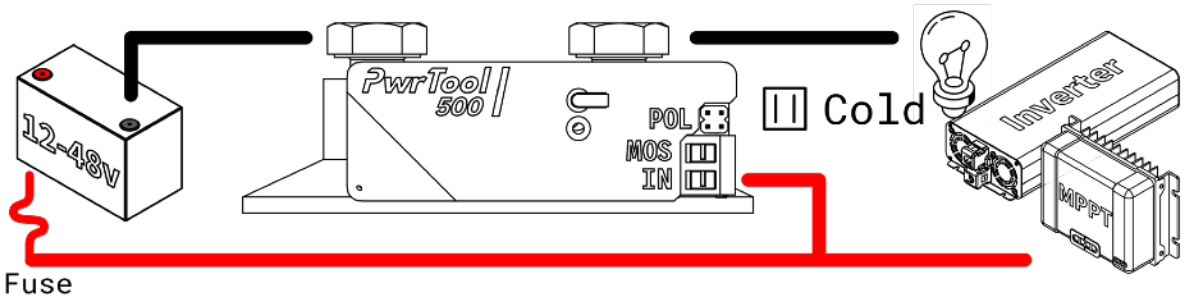
Specifications

- Max 60v DC input with reverse polarity and transient protection
- Max 500A burst across the shunt / 300A continuous
- FLIP_C3 with ESPHome firmware
  - ESP32-C3 Microcontroller
  - 5V / 2A Buck converter on board

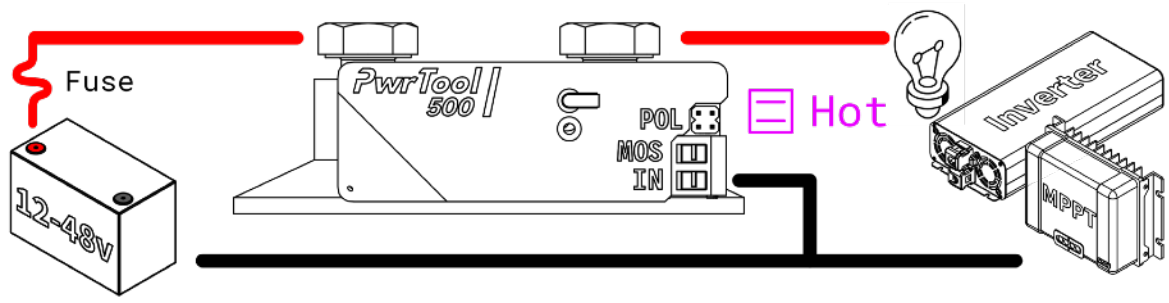
Polarity & Wiring

The PwrTool 500 has a unique polarity selection function giving the normally “cold side” shunt the ability to convert easily into a “hot side” shunt. These terms represent wether the shunt is placed in series with ground (cold or low) vs in series with positive (hot or high). Remove and replace the jumper to the correct position if you want to change this.

Out of the box the PwrTool 500 will be set to cold as this is suggested for most installations and the safest. This means that you would connect one side of the shunt to **ground** or battery **negative (-)** with the other side connected to your load’s ground wether it’s your system or an inverter or a charger. Lastly connect **DC positive** up to 60v to the **IN** connection via a fuse.



Hot mode will be opposite with the load and source of the shunt being connected to a **positive voltage** source of up to 60v. The **IN** connector will then be wired to **ground**. Consider covering the shunt in this mode to prevent shock hazards.



Connect with BLE Improv in Home Assistant or connect to PwrTool-xxx AP and provision wifi.

More and current info at wiki.vdbx.io

QUIRKS:

- BUG - Processed values will require the Offset to be cleared each boot if not set
- Device may need to be power cycled twice or RESET button pressed after initial connection or long disconnection

THIS INFORMATION MAY CHANGE BEFORE RELEASE

Current Hardware Stage: Pre-Production Testing

Current Manual Stage: First Draft

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