

SmartPID BBQ Easy – user manual

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Version 1.0

Information

Revisions

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29/07/2019	1.0	Initial version

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Ensure that the product is always used as per specification.

Do not use the product near to flammable gas and/or explosive in order to prevent unpleasant accidents.

Do not disassemble, change or touch internal parts of the product in order to avoid damage or malfunction of the same.

Do not exceed nominal power of the outputs.

Do not touch terminals during operation.

Do not let pieces of metal or electrical wires, iron chippings or fillings in the product.

Do not let water or other liquids get in the product. The product is not protected by jets or splashing water.

The product is sold in the form of a KIT with all tested components. The controller can be used also with third-party components (probes and fans) taking responsibility to connect it. In the manual there are brief explanations about the connection.

The product is powered at low voltage 5-12v; however, pay close attention making connections.

The producer assumes no liability for damage caused by third parties.

1 Overview on SmartPID BBQ Easy

1.1 Scope and Purpose

The purpose of this manual is to describe in detail the installation and configuration process of SmartPID BBQ Easy controller, its application functions and remote control app.

1.2 Technical characteristics

The following table sums up SmartPID BBQ Easy technical characteristics.

FUNCTIONS	SmartPID BBQ Easy
Control channels	1 PIT
Control mode	Monitor/Manual/Auto
Fan control	PID-PWM with modulation 0-100%
Probes type	NTC 100 K @ 25c
Beta configuration (NTC)	YES multiple values
Fan support	PWM 4-wire
Unit of temperature	Celsius/Fahrenheit
Sensors calibration	YES
Precision	1%
Resolution	1C
Temperature range	0-250c
Power supply	5-12v DC
220V/110V AC Power supply	YES with external adapter
Battery power supply	YES with 5V USB bank for outdoor usage
TFT back-lit graphic display	1.72" × 1.72" 84x84 pixel
USB port	YES
Wi-Fi connection	YES
Configuration/remote management	YES with universal web app (chrome, firefox, safari)
Fan Type	PWM 4-wire Fan– 15CFM - 4000RPM

WI-FI module features

IEEE 802.11 b/g/n Wi-Fi

Authentication WEP or WPA/WPA2, or free networks 802.11 b/g/n

Wi-Fi Direct (P2P), soft-AP

Integrated TCP/IP protocol

Integrated TR switch, balun, LAN, power amplifier

+19.5dBm output power in 802.11b mode

Power down leakage current of <10uA

Stand-by power consumption < 1.0mW (DTIM3)

KIT content

1.3 Hardware Description

SmartPID BBQ Easy is made up of a single object with the controller directly installed on the fan's body with the possibility of rotation to optimise the visual angle.


On the front panel there is the TFT backlit monochrome display (adjustable contrast) with 84x84 resolution and buttons for user interface interactions.

On the side there are type B USB port with a dual function of power supply and data/Firmware upgrade, and then the 2.5mm jack for PIT probe input.

The PWM 4 wire fan with the speedometer is directly connected to it.



The 3 front push buttons are used for several tasks:

	<ul style="list-style-type: none">a) UP/DOWN<ul style="list-style-type: none">a. Scroll configuration menub. Increase/decrease temperature valuec. Increase/decrease fan speedd. Scroll values on configuration menua) SET<ul style="list-style-type: none">e. Select/confirm a specific menuf. Select/confirm a specific valueg. Confirm action after requesth. Pause/resume the ongoing processi. Long press to exit the current menu
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2 Hardware Configurations

SmartPID BBQ Easy hardware configuration is quite simple and consists in connecting temperature probes included in the kit, wires and power supply.

2.1 Probe Connection

SmartPID BBQ Easy is equipped with a channel for the control of grill's temperature (1 x PIT).



Type NTC probes use 2.5mm connectors.

From the HW configuration menu, you can select “beta” value for each channel.

```
Temp. Unit    °F
Probe Cal.    0.0
NTC Beta      3435
PIT HI Alarm   0
PIT LO Alarm   0
```

Supplied probes in the KIT have a beta value equal to 3950 (default value).

Finally, it is possible to make a temperature **calibration**, read by the probe with positive or negative offset up to 5°C.

2.2 Fan Configuration

SmartPID BBQ Easy control unit is hyperconnected to PWM fan with speed control and tachometer.

It is possible to establish the operating range of the fan by limiting the maximum and minimum fan speed, acting on **Min/Max Fan Speed** parameters in “CONFIG”, the configuration menu. By doing so the fan can be adapted to your own system, setting out a “virtual” fan with a limited scope compared to actual maximum capacity.



```
ControlTemp. Unit
Min Fan Speed  0
Max Fan Speed 100
Min Servo      100
Max Servo      3600
```

2.3 Servo Configuration

SmartPID BBQ Easy controller also comes with an output for the control of a servomechanism (mechanical control of fans).

In the configuration menu of process parameters, you can determine the rotation angle of the servomechanism.

```
Max Fan Speed 100
Min Servo      100
Max Servo      3600
Servo 24dby Min
SERVO
Lid Open M. 8 0
```

Please Note: currently, such function is not used.

3 Operating Principle

SmartPID BBQ Easy controller operating principle is based upon the control of airflow over coal to increase or decrease the temperature inside the cooking chamber.

The greater air/oxygen supply, the higher the temperature.

Automatic check is done by constantly tracking the temperature on PIT channel and by continuously modulating fan speed, thus air flow, from 0% to 100% by means of the PID – PWM algorithm.

Such control allows to keep temperature in the cooking chamber at a constant and predetermined value in a stable and clean manner.



The PID – PWM algorithm will always adjust fan speed in 0-100% range, yet the actual value of rotation speed will be scaled accordingly, depending on MIN/MAX fan speed.

Essential parameters regulating PID algorithm operation are Kp, Ki and Kd constants. **Please refer to a proper tutorial for the calibration process of such values.**

```
PIT HI Alarm 0
PIT LO Alarm 0
Kp PID 9.8
Ki PID 0.00
Kd PID 3.5
```

4 SmartPID BBQ Easy advanced features

SmartPID BBQ Easy controller is equipped with an array of advanced features in support of cooking process, hereafter is the description and guide to related parameters configuration.

4.1 Alarm Thresholds

PIT channel is characterised by two temperature thresholds to which specific alarms and notifications are linked. Such values are defined by process parameters and can be modified during run mode by pressing S/S button and UP/DOWN buttons.

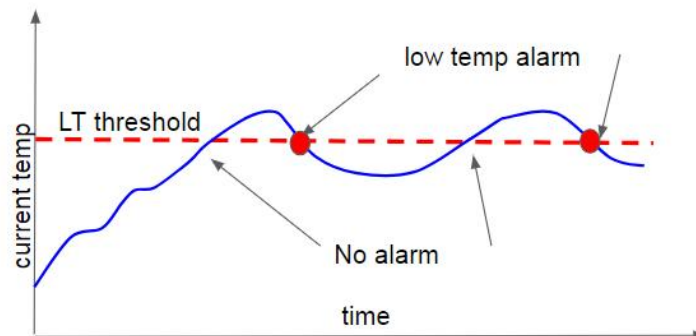
NTC Beta	3435
PIT HI Alarm	110
PIT LO Alarm	60
Kp PID	9.8
Ki PID	0.00

- PIT HI Alarm

Indicates a maximum threshold temperature value of channel PIT and **in automatic run mode is the set point target value for PID algorithm.**

- PIT LO Alarm

Indicates a threshold value on PIT channel that causes an alarm if current temperature drops below such value (depletion of coal). Such alarm is not triggered if temperature did not formerly go over cut-off point.



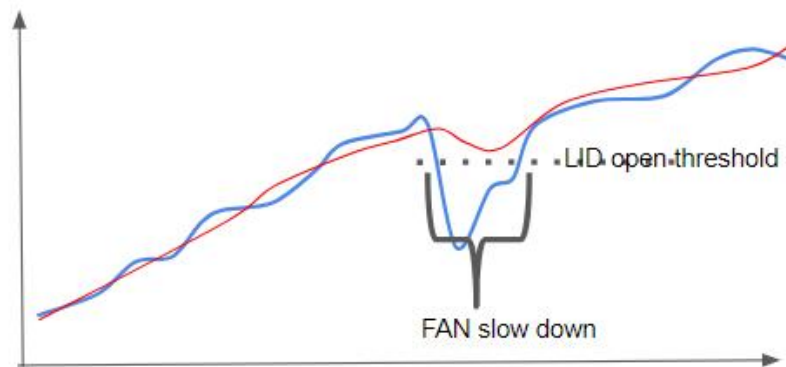
4.2 Lid Open Function

“Lid open” function enables to automatically intercept lid opening with subsequent sudden decrease of grill channel temperature, preventing unwanted fan speed boost.

The algorithm is ruled by two parameters which indicate percentage variation of temperature and the term of observation window expressed as sample numbers of sampling window.

```
Servo StdbY Min
Lid Open M. % 5
Window Samples 10
Lid Open T. 1:00
Lid Open Man. Yes
```

In case of % temperature variation over the observation period, the fan is brought to MIN FAN speed value for a configurable period of time (Lid Open Timer).



Once finished the LID open timer (or once reached the set point) the fan is reactivated and monitored again by the PID-PWM algorithm.

Lid Open Mode % = 0 disables monitoring.

It is even possible to use this function in manual control mode, in such case as well the fan will be forced to MIN fan speed in the event of lid opening.

5 Configuration parameters

The following table sums up configuration parameters in process parameter menu.

Parameter	description	Value	default
Temp Unit	Select unit of measurement between Celsius and Fahrenheit	C / F	C
Probe Cal.	It allows to offset the PIT probe temperature value over the range of +-5c	+ 5C -5C	0
NTC Beta	It allows to select "beta" value of NTC probe	Various	3950
PIT Alarm	PIT channel temperature thresholds default values -HI Alarm (set point value in AUTO run mode) -LO Alarm	0-300	100
Kp Ki Kd PID	Calibration constants of PID algorithm	0-100	15/0/8
Sample Time	Temperature sampling time	1000-4000 ms	1500
Control M.	It determines the "fan" or "servo" operating mode	FAN SERVO	FAN
Min fan speed	Minimum fan speed in % on maximum rotation speed	0-100	0%
MAX fan speed	Maximum fan speed in % on maximum rotation speed	0-100	100%
Min Servo	Minimum servo rotation angle	900-2100	1500
Max Servo	Maximum servo rotation angle	900-2100	2000
Servo Standby	It determines the position of servo in stand by	Min /Max	Min
Lid Open Mode %	% of current temperature variation to get to Lid open mode 0% disabled function	0-20%	0%

Windows Sample	Number of samples used for calculating the moving average in the Lid Open algorithm. The duration of window is defined by the sample time parameter	0-10	10
Lid Open Timer	Duration of the Lid Open period	0-5min	1min
Lid open in manual	It determines if Lid open mode is used also in MANUAL control mode	Y/N	N
LCD Light	It controls backlit display illumination	On / Off	On
LCD contrast	It controls LCD contrast	1-15	8
Button Beep	It allows to enable/disable sound of pressure on the keys	On / Off	On

6 Mode of operation

SmartPID BBQ Easy disposes of 3 operation modes:

1. Monitor
2. Manual Control mode
3. Auto Control mode

6.1 Monitor

In monitor mode, namely to the ignition of the controller, SmartPID BBQ Easy just displays grill temperatures, detected by the PIT probe, hence it can be used as a “thermometer”. Threshold values on PIT channel channel trigger alarms and notifications on the remote app. No check is carried out on the fan.

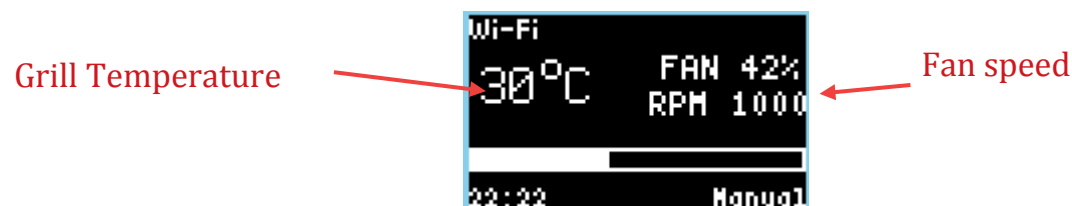


Operativity through the 3 buttons is the following:

- UP/DOWN
selection of the menu
- SET
access to the menu

6.2 Manual Mode

In manual operating mode it is possible to manually control the fan speed by setting a fixed value from 0 to 100%.



Please note how the % of fan rotation is always relating to the range determined by MIN fan speed – MAX fan speed in configuration parameters (process parameter).

Therefore, is displayed the number of rotations per minute (RPM) in absolute value and a bar histogram.

If Lid Open in manual function is enabled, you can automatically force the fan to zero at the opening of the lid.

Operativity through the 3 buttons is the following:

- UP/DOWN
fan speed adjustment
- SET
fan pause / resume
- SET long press
stop the process and back to main menu

6.3 Auto Mode

In this mode the PID-PWM algorithm entirely handles the fan so that it can reach the predefined set point on channel PIT (PIT HI alarm) and to keep the temperature consistent.

In such mode you can intervene at any time to change PIT HI thresholds by the use of UP/DOWN buttons.

In automatic operating mode, if configured in process parameters, the Lid Open function is active.



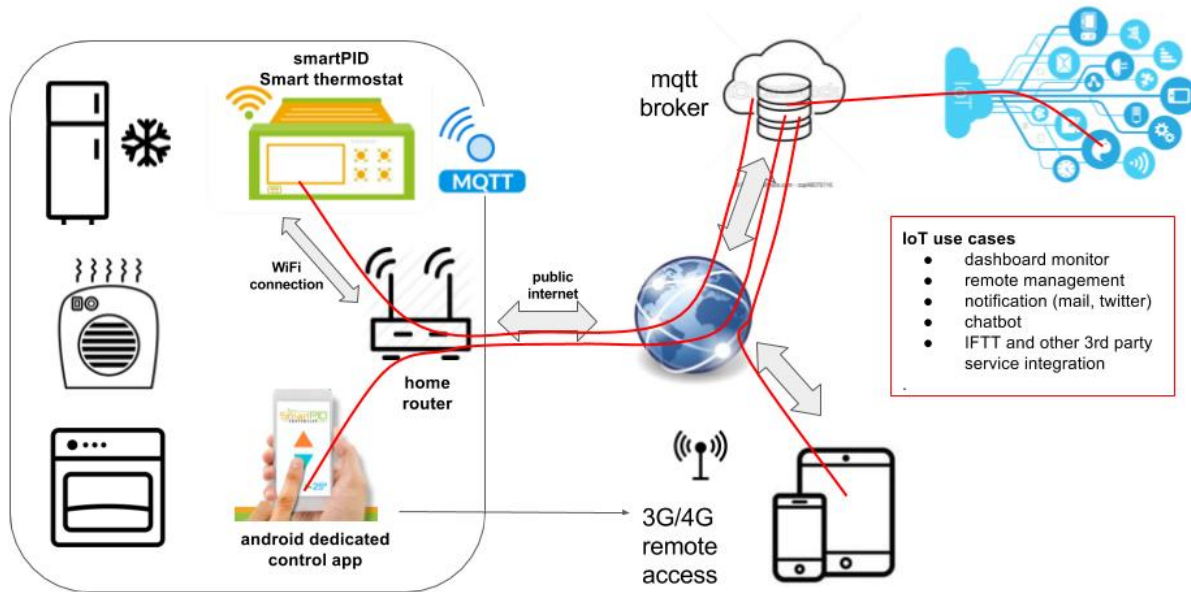
Operativity through the 3 buttons is the following:

- UP/DOWN
Set Point temperature regulation

- SET
fan pause / resume
- SET long press
stop the process and back to main menu

7 Wi-Fi Connection and remote management

SmartPID BBQ Easy controller is equipped with a Wi-Fi module that enables to connect to home Wi-Fi network and from here through public Internet to a dedicated server.



Such architecture allows a number of remote functions using a web app which is manageable by the desktop or mobile browser.

- Monitoring parameters

You can remotely monitor main parameters during one of the operating modes (Monitor/Manual/Auto). With a configurable frequency specifically, the following parameters will be sent to the app:

- PIT channel temperature
- HI/LO thresholds
- Fan Speed
- Operating mode

- Events/Notifications

SmartPID BBQ Easy controller notifies to the web app main events while running one of the control modes:

- Start/Stop process
- Reaching HI/LO thresholds
- Lid Open Event

- Controls

Through the app you can interact with the SmartPID BBQ Easy controller changing some of the main parameters:

- HI/LO alarm thresholds (set point)
- Fan speed in manual mode
- Fan Pause / Resume
- Configuration parameters (Kp Ki Kd, Max-Min fan speed)

For Wi-Fi configuration and connection to remote server see the step by step guide.

8 WEB APP

SmartPID BBQ Easy controller can be managed by the use of a simple web app which is compatible with all main desktop and mobile browsers (chrome, firefox, safari).

To access the web app, you just need to open the following link in your browser bar

<https://mybbq.smartpid.com/>


Or to click on MyBBQ menu in the official website <https://bbq.smartpid.com/>

[Home](#)[About me](#)[Products](#)[Wiki](#)[Gallery](#)[Shop](#)[MyBBQ](#)

To be able to use the App you have to go through the initial registration process (sign up) entering a valid email address and an access password.

[REGISTER](#)[RETURN TO
LOGIN](#)

Once registered your credentials you can log into it (Login).




Email

smartpid@arzaman.com

LOGIN

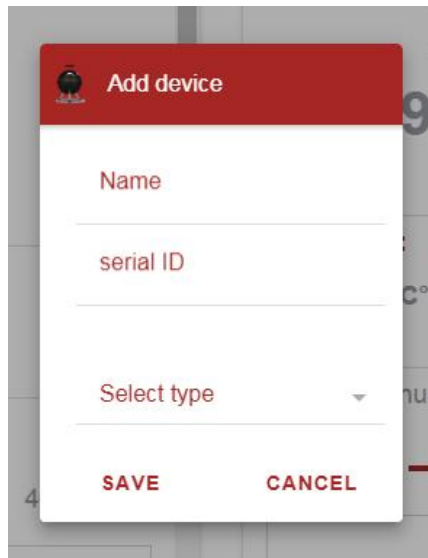
NOT A MEMBER?
SIGN UP NOW

FORGOT
PASSWORD?



At this point you have to configure your SmartPID BBQ Easy (+ button) controller assigning an identifying name and entering the 14-digit serial (available in controller's INFO menu).

You need to select the "Easy" type of controller.



Add device

Name

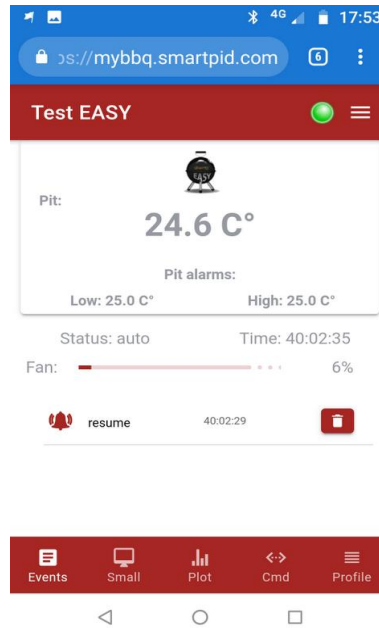
serial ID

Select type

SAVE CANCEL

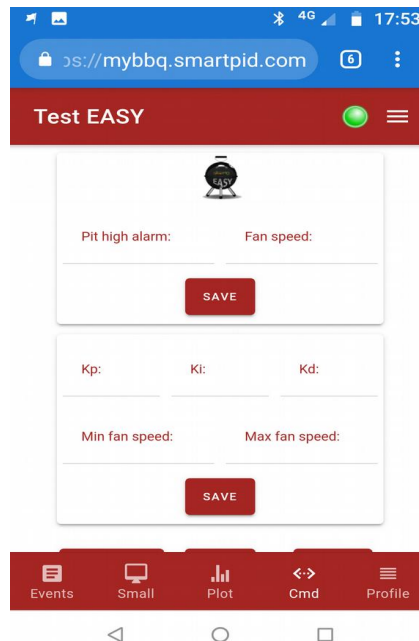
It is possible to manage more controllers with the same Web App, as well as to have more App to simultaneously monitor the same controller.

Once configured the controller, if it is connected to Wi-Fi network and is in one of the 3 operating modes (Monitor/Manual/Auto), the App will start to receive data and parameters that will be displayed on the main screen.

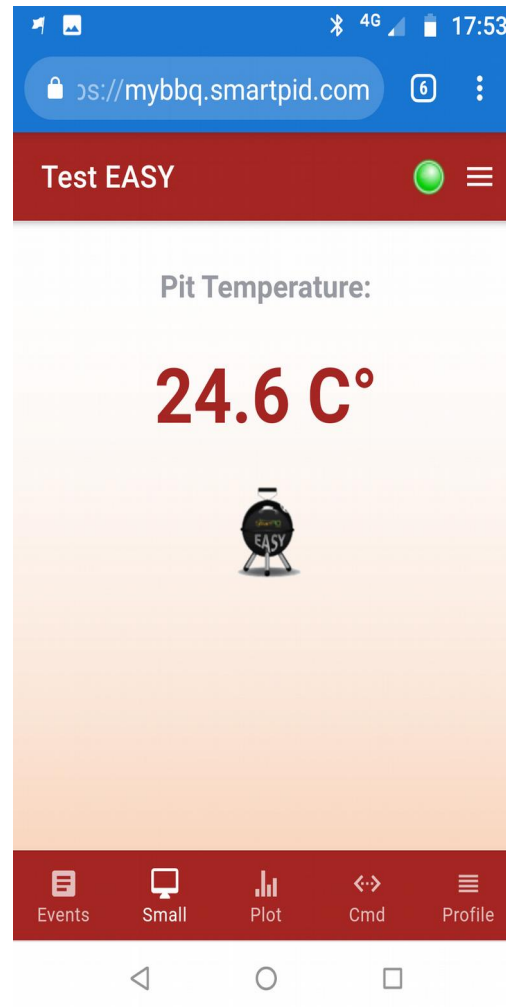


In the notification area, the different alarms and asynchronous notifications will be displayed, sent by the SmartPID BBQ Easy controller.

Again, from the main screen you can access the control tab to modify thresholds, fan speed (manually) or configuration parameters Kp, Ki, Kd and Min-Max fan speed.



From “full display” tab you have a full screen view mode of PIT probe temperature data.



9 Firmware Upgrade

Firmware upgrade can be easily run using the bootloader technology of the MSD mass storage device that allows to “copy and paste” the binary file executable into the smartPID BBQ controller linked by USB and recognised as mass USB.



To upgrade the FW, you don't need any driver or SW installation, you just have to follow the steps below.

FW upgrade deletes existent configurations, hence we suggest to take note of modified parameters. To the completion of the upgrade, you need to reconfigure the controller and to do again the Wi-Fi configuration process.

1. Connect a micro USB DATA cable to a PC (Windows/Linux/MAC) USB port (**beware, on the market there are cables for charge only, which do not support data**)
2. Disconnect smartPID from all (probes, fan, power supply)
3. Plug the micro USB connector into the SmartPID front socket holding down the Set button: OLED display will be enlightened by a white colour
4. Release the Set button, smartPID will appear on the PC as mass storage device and OLED display will toggle between black and white colour
5. Remove the FLASH.BIN file present on the device
6. Copy the executable.bin file of the new application into the mass storage device
7. **Safely remove** the USB mass storage device from the PC
8. Restart SmartPID and verify the correct SW version on the BOOT screen
9. Reconfigure parameters

10 Restore factory settings

It is possible to restore app settings to default factory settings (internal EEPROM deletion) by the following procedure.

Switch SmartPID powering it with the back power supply or with the front USB holding the **DOWN** button: OLED display will show the message “Init EEPROM” which indicates that the app settings have been restored to default settings; after a few seconds, the application will start with default settings.