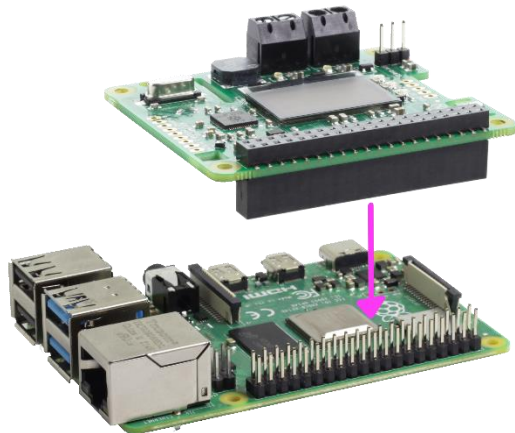


## Air Quality Control HAT for Raspberry Pi

**Introduction:** The Air Quality Control HAT provides a variety of sensor inputs and connection points for the Raspberry Pi and provides the ability to log, store and display data effectively with the Pi filesystem and an OLED screen. There are also connection points for external devices, such as analog sensors, servos, motors, and heater pads.

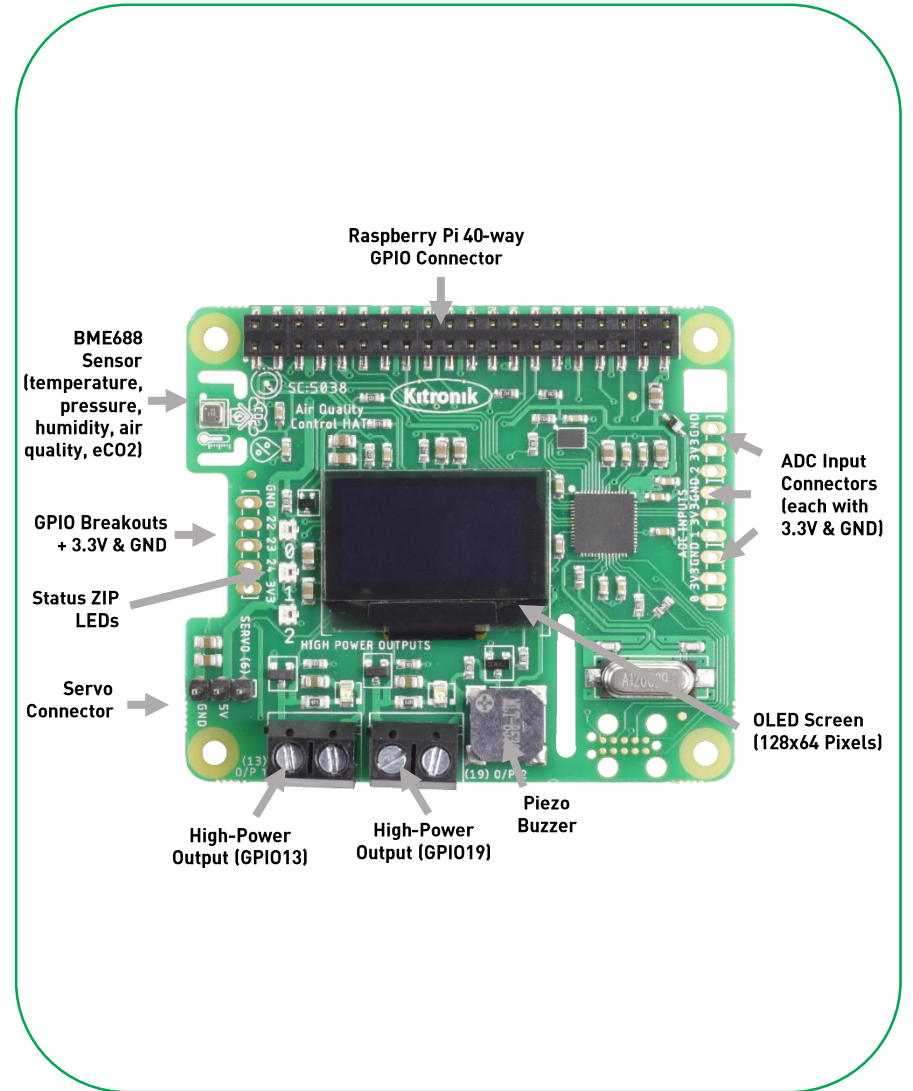
The board form factor complies with the Raspberry Pi standard for HATs, including the dual row of pin sockets to connect to the Pi. The HAT can then read inputs from a BME688 air quality and environmental sensor (temperature, pressure, humidity, air quality index and eCO2). The sensor, along with the RTC on the RP2040 IC and memory on the Pi means the board is well setup for data logging. There is a black and white 128x64 OLED display screen and 3 status ZIP LEDs for visually displaying data, and a piezo buzzer for audio. There are also external connections: 2 1A outputs, a servo output, and 3 analogue input connections linking to the RP2040 ADC (some other GPIOs are broken out to 0.1" pitch solder pads as further inputs and outputs, along with pads for 3V and GND).

Power is provided to the HAT via the Raspberry Pi GPIO connector



**Connecting the HAT to a Pi:** To use the Air Quality Control HAT, the interface connector should first be inserted into the HAT, and then the board should be pushed firmly onto the connector (the image on the left shows the HAT in place ready to be pushed down).

This HAT is compatible with versions of Pi that feature the dual row of pin sockets and has been tested with Pi 2, 3, 4 and Zero 2.



## Electrical Information

Supply Voltage (Vcc) [via Raspberry Pi GPIO Connector]	+5V max
High-Power Output Terminal Blocks	GPIO13 & GPIO19 (1A current draw max)
Servo Output Control	GPIO6 (Supply Voltage)
Piezo Buzzer Control	GPIO26
Analogue Inputs (RP2040 ADC)	ADC0, ADC1 & ADC2 (Each with 3.3V & GND)
ZIP LEDs	3 onboard (controlled via RP2040)
Additional Pin Breakouts	GPIO22, GPIO23, GPIO24 + 3.3V & GND
BME688 & OLED Display Control	I2C Bus (GPIO2 & GPIO3)
BME688 operating range	Pressure: 300hPa – 1100hPa Temperature: -40°C – 85°C Humidity: 0%RH – 100%RH Index for Air Quality (IAQ): 0 – 500 [0 = Excellent, 500 = Extremely Polluted] eCO2: 250 – 40000+ ppm

## Python Module and Example Code

Kitronik have created a package for the Air Quality Control HAT which is hosted on PyPi. This means that the package can be installed very simply on the Pi with the following command:

```
pip install KitronikAirQualityControlHAT
```

The code, along with a README and example programs, can be found on the Kitronik GitHub:

<https://github.com/KitronikLtd/Kitronik-Raspberry-Pi-Air-Quality-Control-HAT-Python>

This example code will help get you started:

The code on line 2 imports all the individual classes from the 'KitronikAirQualityControlHAT' module, and then lines 4 to 12 create instances of all these classes.

The BME688 gas sensor is setup on line 11, and line 13 carries out the required baseline readings and calculations ready for taking measurements.

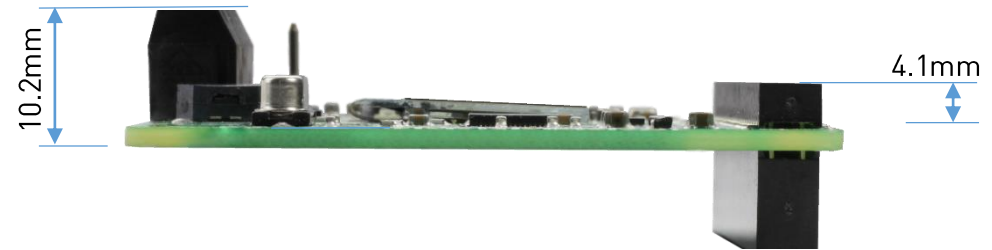
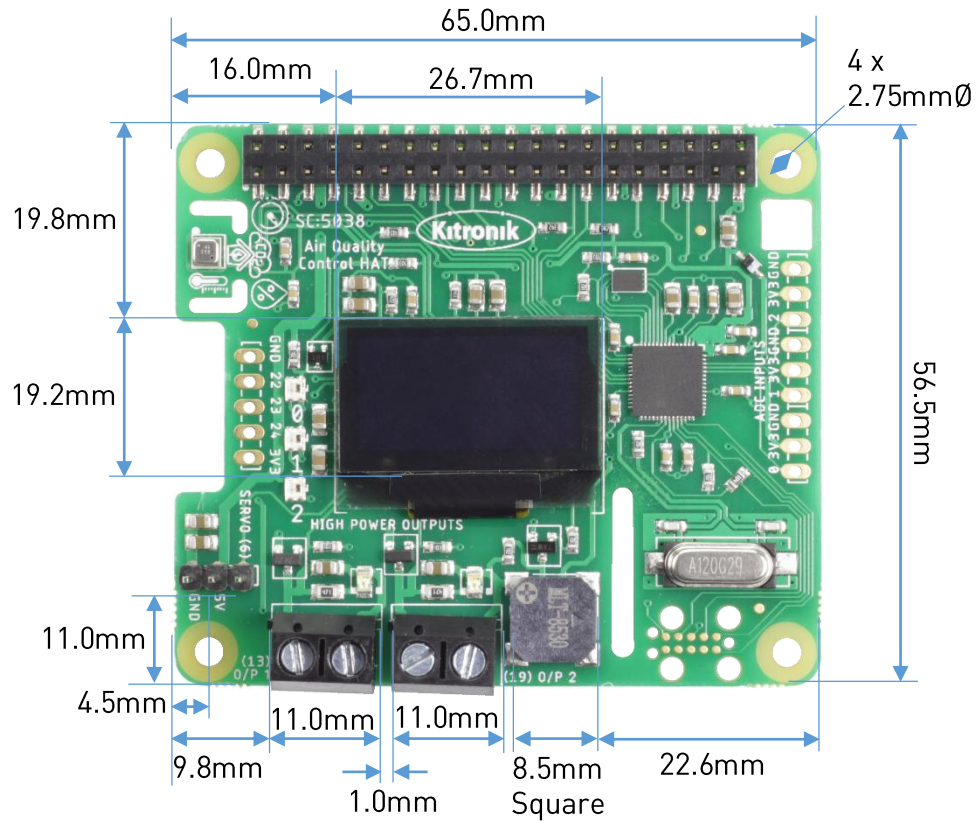
From line 15 we measure all the sensor readings from the BME688 and output the readings on the HAT's OLED display.

For more information on programming the Air Quality Control HAT visit:

[kitronik.co.uk/5038](http://kitronik.co.uk/5038)

```
1| from time import sleep
2| from KitronikAirQualityControlHAT import *
3|
4| zipLEDs = KitronikZIPLEDs(autoShow = False) # Setup ZIP LED class
5| rtc = KitronikRTC() # Setup RTC class
6| buzzer = KitronikBuzzer() # Setup buzzer class
7| hpo1 = KitronikHighPowerOut(1) # Setup high-power output class
8| servo = KitronikServo() # Setup servo class
9| adc0 = KitronikADC(0) # Setup analogue input class
10|
11| bme688 = KitronikBME688() # Setup BME688 class
12| oled = KitronikOLED() # Setup OLED class
13| bme688.calcBaselines(oled)
14|
15| bme688.measureData()
16| sleep(1)
17| oled.clear()
18| oled.displayText("Temperature:" + str(bme688.readTemperature()), 1)
19| oled.displayText("Pressure:" + str(bme688.readPressure()), 2)
20| oled.displayText("Humidity:" + str(bme688.readHumidity()), 3)
21| oled.displayText("eCO2:" + str(bme688.readCO2()), 4)
22| oled.displayText("Air Quality %:" +
23| str(bme688.getAirQualityPercent()), 5)
24| oled.displayText("Air Quality Score:" +
25| str(bme688.getAirQualityScore()), 6)
26| oled.show()
```

## Dimensions



PCB Thickness: 1.6mm  
(Dimensions +/- 0.2mm)

The Air Quality Control HAT complies with the official Raspberry Pi HAT Specifications. See <https://github.com/raspberrypi/hats/blob/master/hat-board-mechanical.pdf> for more dimension information.