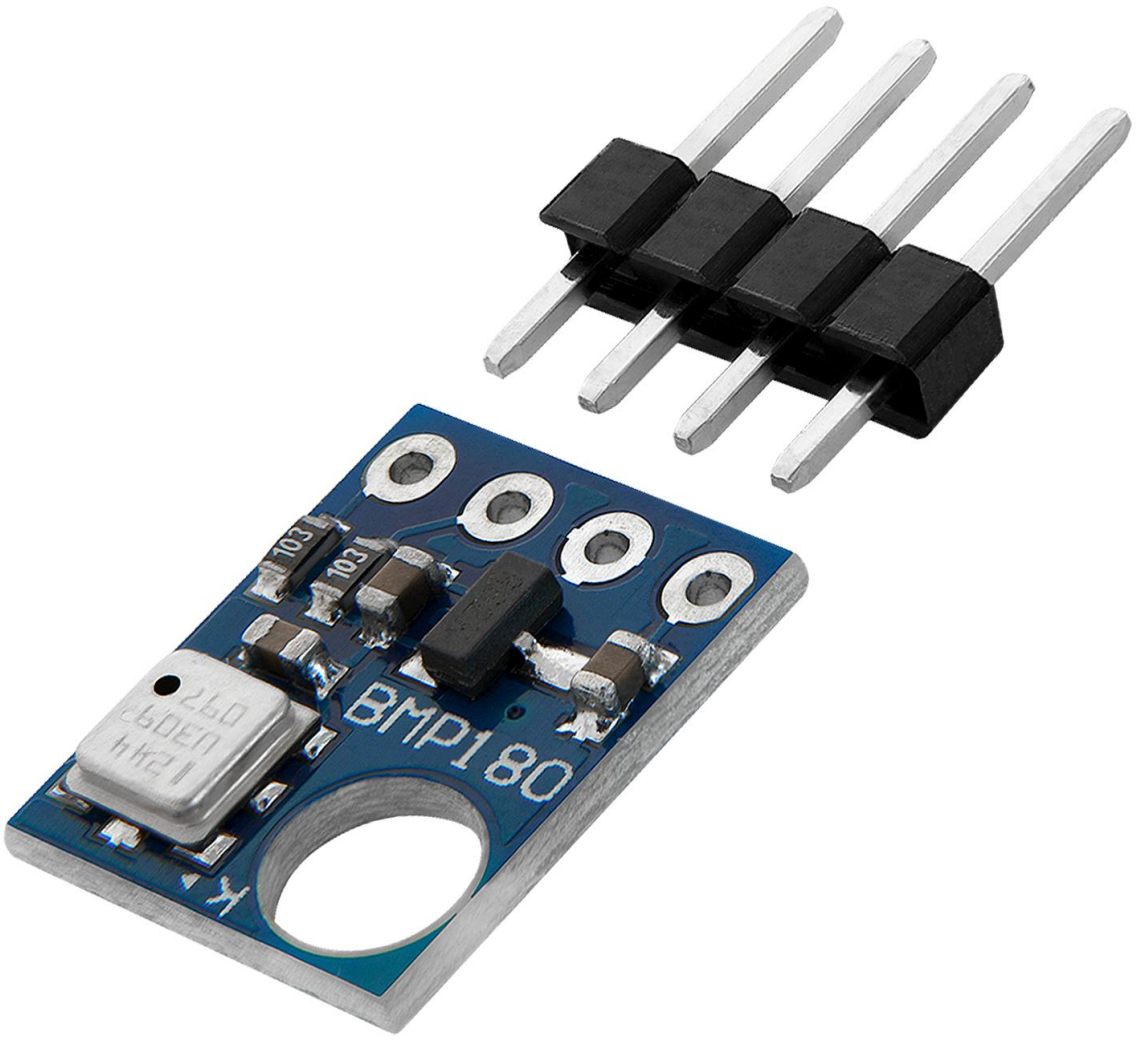
eBook to

GY-BMP180

Barometric air pressure and temperature sensor



Areas of application
Education and teaching: Use in schools, universities and training institutions to teach the basics of electronics, programming and embedded systems. Research and development: Use in research and development projects to create prototypes and experiments in the fields of electronics and computer science. Prototype development: Use in the development and testing of new electronic circuits and devices. Hobby and Maker Projects: Used by electronics enthusiasts and hobbyists to develop and implement DIY projects.

Required knowledge and skills
Basic understanding of electronics and electrical engineering. Knowledge of programming, especially in the C/C++ programming language. Ability to read schematics and design simple circuits. Experience working with electronic components and soldering.

Operating conditions
The product may only be operated with the voltages specified in the data sheet to avoid damage. A stabilized DC power source is required for operation. When connecting to other electronic components and circuits, the maximum current and voltage limits must be observed to avoid overloads and damage.

Environmental conditions
The product should be used in a clean, dry environment to avoid damage caused by moisture or dust. Protect the product from direct sunlight (UV)

Intended Use
The product is designed for use in educational, research and development environments. It is used to develop, program and prototype electronic projects and applications. The Sensor product is not intended as a finished consumer product, but rather as a tool for technically savvy users, including engineers, developers, researchers and students.

Improper foreseeable use
The product is not suitable for industrial use or safety-relevant applications. Use of the product in medical devices or for aviation and space travel purposes is not permitted

disposal
Do not discard with household waste! Your product is according to the European one Directive on waste electrical and electronic equipment to be disposed of in an environmentally friendly manner. The valuable raw materials contained therein can be recycled become. The application of this directive contributes to environmental and health protection. Use the collection point set up by your municipality to return and Recycling of old electrical and electronic devices. WEEE Reg. No.: DE 62624346

electrostatic discharge
Attention: Electrostatic discharges can damage the product. Note: Ground yourself before touching the product, such as by wearing an anti-static wrist strap or touching a grounded metal surface.

safety instructions
Although our product complies with the requirements of the RoHS Directive (2011/65/EU) and does not contain any hazardous substances in quantities above the permitted limits, residues may still be present. Observe the following safety instructions to avoid chemical hazards: Caution: Soldering can produce fumes that can be harmful to health. Note: Use a solder fume extractor or work in a well-ventilated area. If necessary, wear a respirator mask. Caution: Some people may be sensitive to certain materials or chemicals contained in the product. Note: If skin irritation or allergic reactions occur, stop use and, if necessary, consult a doctor. Caution: Keep the product out of the reach of children and pets to avoid accidental contact and swallowing of small parts. Note: Store the product in a safe, closed container when not in use. Attention: Avoid contact of the product with food and drinks. Note: Do not store or use the product near food to prevent contamination. Although our product complies with the requirements of the RoHS Directive (2011/65/EU) and does not contain any hazardous substances in quantities above the permitted limits, residues may still be present. Observe the following safety instructions to avoid chemical hazards: Caution: Soldering can produce fumes that can be harmful to health. Note: Use a solder fume extractor or work in a well-ventilated area. If necessary, wear a respirator mask. Caution: Some people may be sensitive to certain materials or chemicals contained in the product. Note: If skin irritation or allergic reactions occur, stop use and, if necessary,

consult a doctor. Caution: Keep the product out of the reach of children and pets to avoid accidental contact and swallowing of small parts. Note: Store the product in a safe, closed container when not in use. Attention: Avoid contact of the product with food and drinks. Note: Do not store or use the product near food to prevent contamination. The product contains sensitive electronic components and sharp edges. Improper handling or assembly can result in injury or damage. Observe the following safety instructions to avoid mechanical hazards: Attention: The product's circuit board and connectors may have sharp edges. Use caution to avoid cuts. Note: Wear appropriate protective gloves when handling and assembling the product. Caution: Avoid excessive pressure or mechanical stress on the board and components. Note: Only mount the product on stable and flat surfaces. Use appropriate spacers and housings to minimize mechanical stress. Attention: Make sure the product is securely fastened to prevent accidental slipping or falling. Note: Use appropriate support or secure mounting in enclosures or on mounting plates. Caution: Make sure all cable connections are connected securely and correctly to avoid strain and accidental unplugging. Note: Route cables so that they are not under tension and do not pose a tripping hazard. The product operates with electrical voltages and currents that, if used improperly, can result in electric shocks, short circuits or other hazards. Observe the following safety instructions to avoid electrical hazards: Attention: Use the product only with the specified voltages. Note: The performance limits of the product can be found in the associated data sheet Caution: Avoid short circuits between the connectors and components of the product Note: Make sure that no conductive objects touch or bridge the circuit board. Use insulated tools and pay attention to the arrangement of connections. Caution: Do not perform any work on the product when it is connected to a power source. Note: Disconnect the product from power before making any circuit changes or connecting or removing components. Caution: Do not exceed the specified current ratings for the product's inputs and outputs. Note: The performance limits of the product can be found in the technical specifications or in the data sheet Attention: Make sure that the power sources used are stable and correctly sized. Note: Only use tested and suitable power supplies to avoid voltage fluctuations and overloads. Attention: Maintain sufficient distance from live parts to avoid accidental contact. Note: Ensure that the cabling is arranged safely and clearly according to the voltage used. Caution: Use insulating housings or protective covers to protect the product from direct contact. Note: Place the product in a non-conductive case to avoid accidental touching and short circuits. The product and the components on it may become warm during operation. Improper handling or overloading the product can result in burns, damage or fire. Observe the following safety instructions to avoid thermal hazards: Caution: Make sure the product is used within recommended operating temperatures. Note: The recommended operating temperature range is typically between-40°C and +85°C. Check the specific information in the product data sheet. Attention: Do not place the product near external heat sources such as radiators or direct sunlight. Note: Ensure that the product is operated in a cool and well-ventilated area. Attention: Make sure the product is well ventilated to avoid overheating. Note: Use fans or heat sinks when operating the product in a closed enclosure or in an environment with limited air circulation. Attention: Mount the product on heat-resistant surfaces and in heat-resistant housings. Note: Use enclosure materials that can withstand high temperatures to avoid damage or fire hazard. Caution: Implement temperature monitoring when using an enclosure and, if necessary, protection mechanisms that shut down the product if it overheats. Note: Note: Use temperature sensors and appropriate software to monitor the temperature of the product and shut down the system if necessary. Caution: Avoid overloads that can cause excessive heating of components. Note: To prevent overheating, do not exceed the specified current and voltage limits. Caution: Short circuits can generate significant heat and cause fires. Note: Make sure that all connections are correct and secure and that no conductive objects can accidentally cause short circuits.

Table of Contents

Introduction

The BMP180 is an air pressure and temperature sensor based on the Bosch BMP180 sensor. This is much more precise than its predecessor model BMP085: it can measure air pressure in a range of 300 - 1100hPa and measure temperature in a range from -40°C to +85°C.
The sensor has a resolution of 0.02 - 0.06hPA, which corresponds to a height difference of approx. 17 cm, and can measure temperatures with an accuracy of 0.1°C.

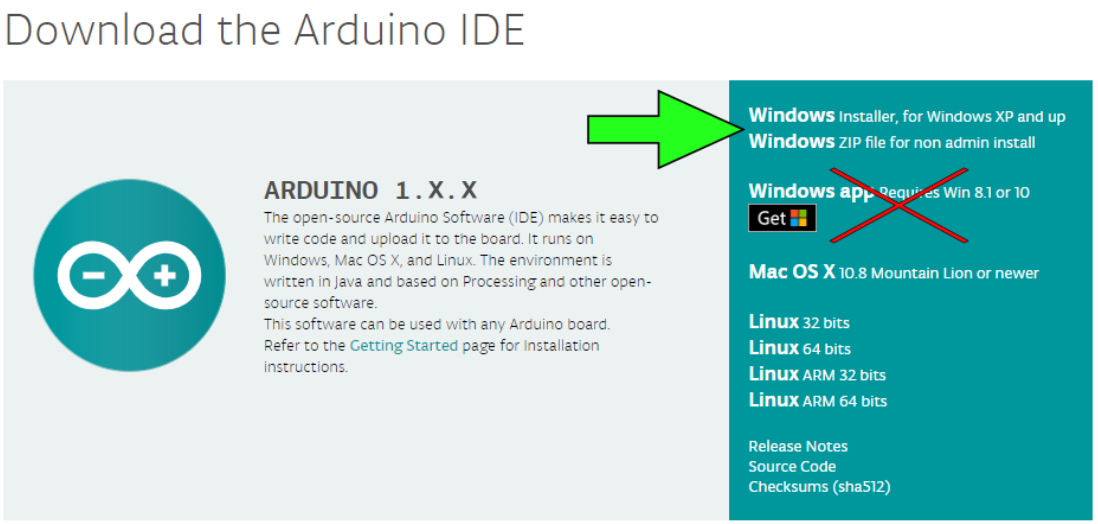
Specifications

Operating voltage	3,3V
Interface	I2C
Pressure range	300-1100 hPa
Dimensions	13 x 10 x 2,5 mm

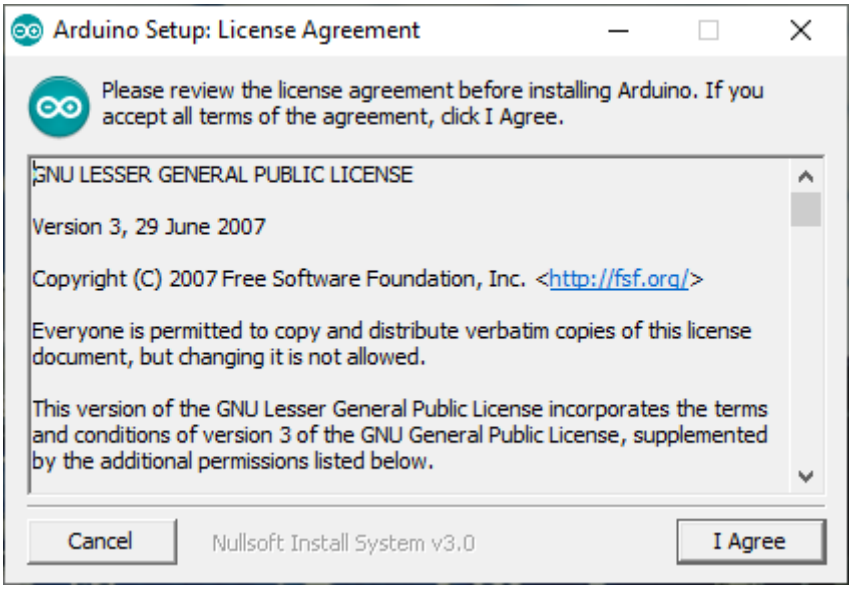
Installation of the Arduino IDE

You can download the free Arduino IDE development environment from the following link: https://www.arduino.cc/en/Main/Software

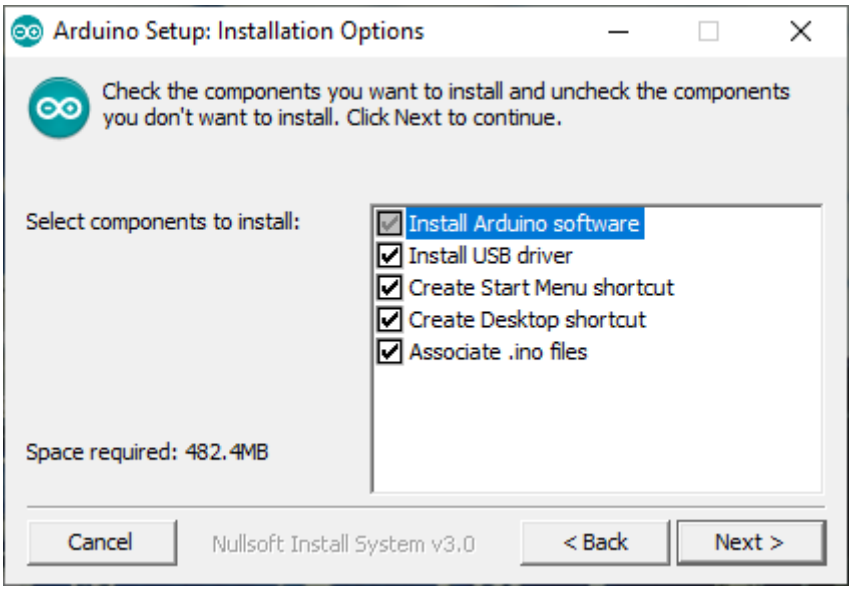
Windows users should definitely use one of the first two download options for the Arduino IDE. The "Windows App" version from the Windows Store will cause connection problems especially when using third party board definitions.



After starting the Arduino IDE installation file "arduino-1.X.X-windows.exe" the license conditions of the software must be read and accepted:



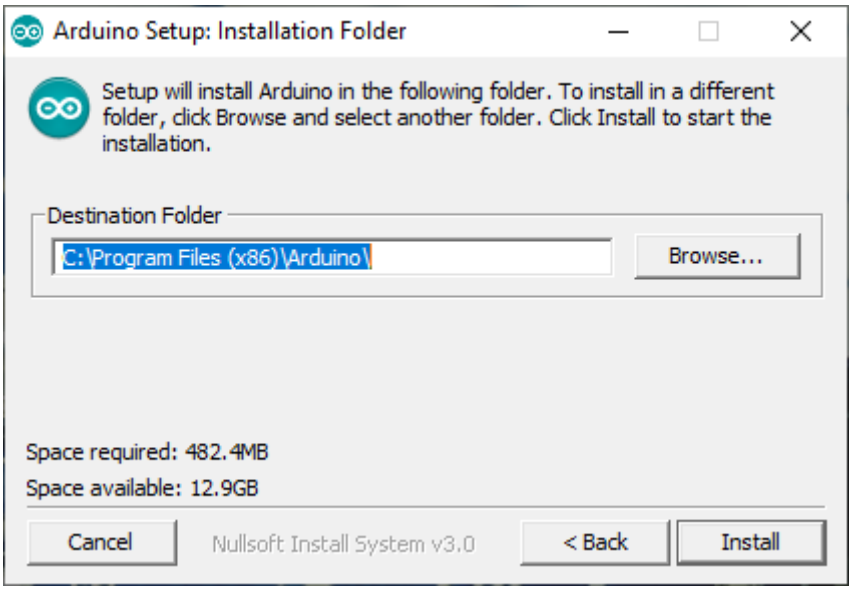
In the next step, different options can be selected for installation.



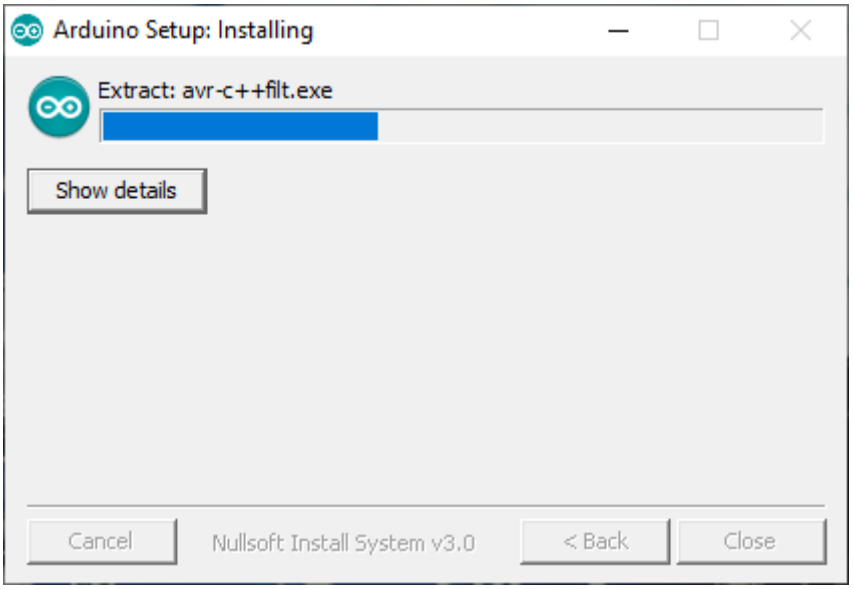
A brief overview of the different options follows, with a brief explanation of each option:

Option	Erklärung
Install Arduino Software	Installs the Arduino IDE - This option can not be deselected
Install USB Driver	Installs USB drivers for various other microcontrollers. These are not required to use the software with the D1 mini, but we strongly recommend installing them if you also use other microcontrollers
Create Start Menu shortcut	Creates a shortcut in the Windows Start menu (optional)
Create Desktop shortcut	Creates a shortcut on the workstation (Optional)
Associate .ino files	Creates a filename extension for files with the extension .ino and links it to the Arduino IDE

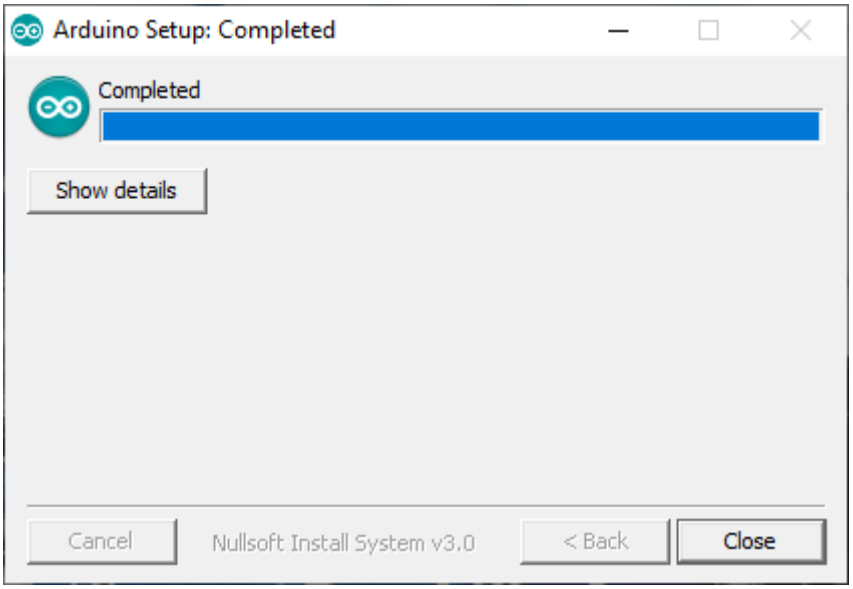
Finally, the destination folder must be specified. The installation requires about 500MB of free disk space.



Click "Install" to start the installation.

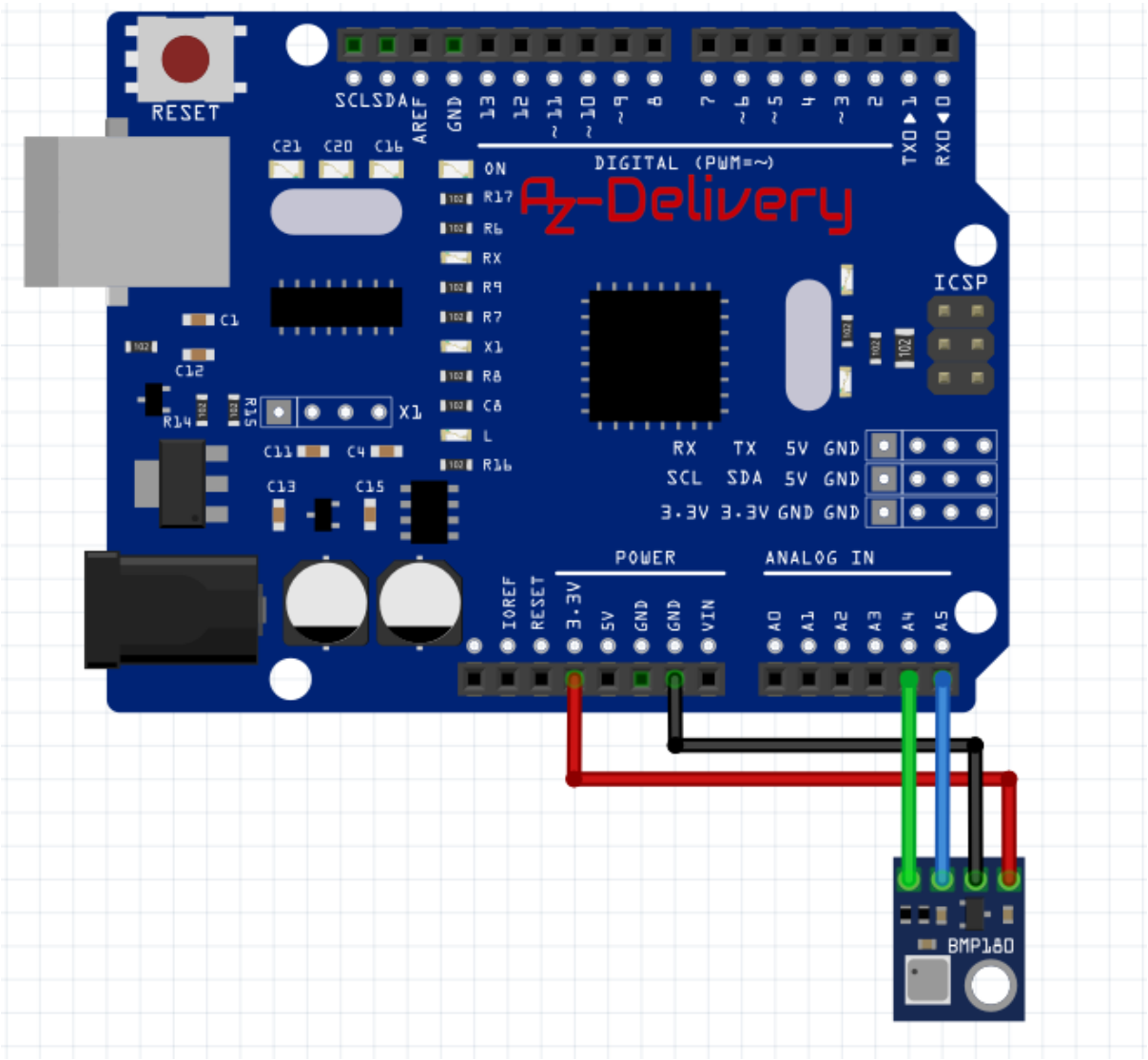


After successful installation, the installation program can be closed via the "Close" button:



Connecting the module to the microcontroller

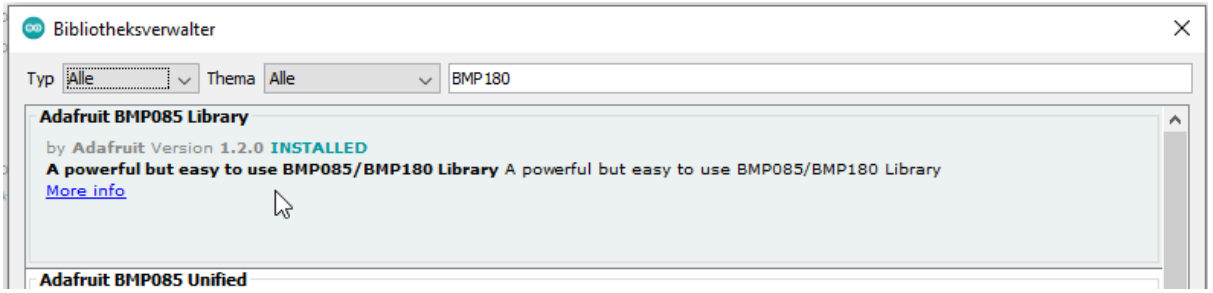
The connection with the microcontroller goes as follows:



Microcontroller	BMP180
3,3V	Vin
GND	GND
A5	SCL
A4	SDA

Sketch example

As a quick example, the sample sketch from the Adafruit BMP085 library is used here, this can be installed via Tools > Library Manager.



The example sketch can be found under File > Examples > Adafruit BMP085 Library > BMP085test. This sketch can easily be uploaded to the microcontroller.

```
#include <Adafruit_BMP085.h>

Adafruit_BMP085 bmp;

void setup() {
  Serial.begin(9600);
  if (!bmp.begin()) {
     Serial.println("Could not find a valid BMP085 sensor,
check wiring!");
     while (1) {}
  }
}

void loop() {
    Serial.print("Temperature = ");
    Serial.print(bmp.readTemperature());
    Serial.println(" *C");

    Serial.print("Pressure = ");
    Serial.print(bmp.readPressure());
    Serial.println(" Pa");

    // Calculate altitude assuming 'standard' barometric
    // pressure of 1013.25 millibar = 101325 Pascal
    Serial.print("Altitude = ");
```

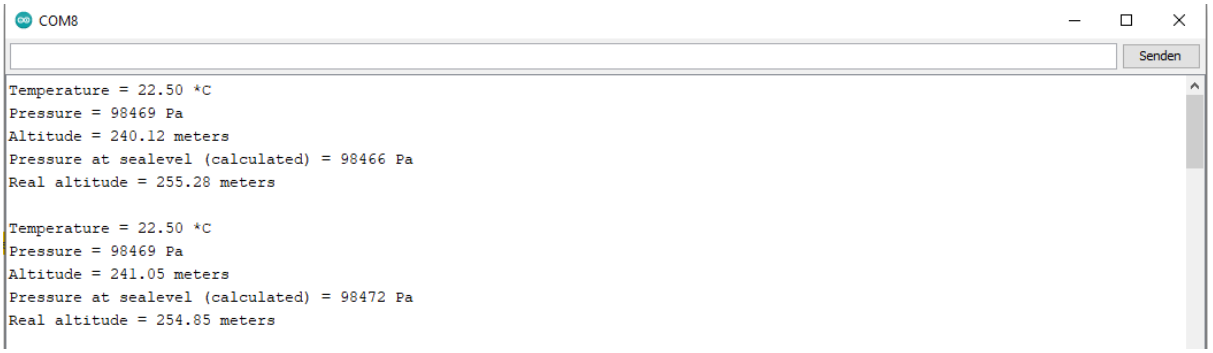
```
    Serial.print(bmp.readAltitude());
    Serial.println(" meters");

    Serial.print("Pressure at sealevel (calculated) = ");
    Serial.print(bmp.readSealevelPressure());
    Serial.println(" Pa");

  // you can get a more precise measurement of altitude
  // if you know the current sea level pressure which will
  // vary with weather and such. If it is 1015 millibars
  // that is equal to 101500 Pascals.
    Serial.print("Real altitude = ");
    Serial.print(bmp.readAltitude(101500));
    Serial.println(" meters");

    Serial.println();
    delay(500);
}
```

Next, we open the serial monitor and the output should look like this:



Setting up the Raspberry Pi and Python

For the Raspberry Pi, the operating system must first be installed, then everything must be set up so that it can be used in headless mode. Headless mode allows remote connection to the Raspberry Pi without the need for a PC screen monitor, mouse or keyboard. The only things used in this mode are the Raspberry Pi itself, power supply and internet connection. All this is explained in detail in the free eBook:

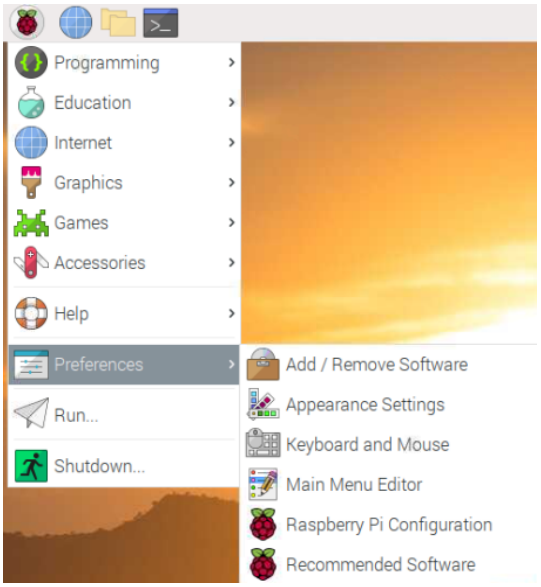
Raspberry Pi Quick Startup Guide

Python is preinstalled on the Raspberry Pi OS.

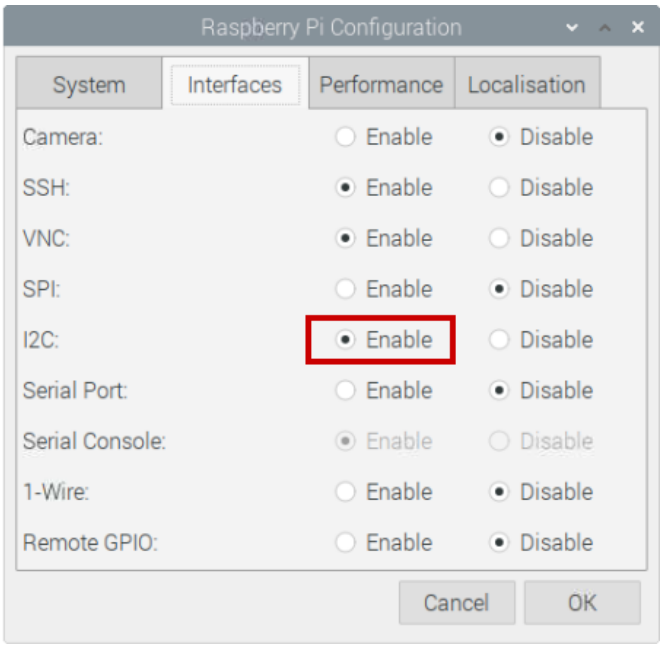
Enable the I2C interface

To use the sensor with the Raspberry Pi, the I2C interface on the Raspberry Pi must be enabled. To do this, go to:

Application Menu > Preferences > Raspberry Pi Configuration



When a new window opens, locate the Interfaces tab. Then check the "I2C" radio button and click "OK" as shown in the following figure:

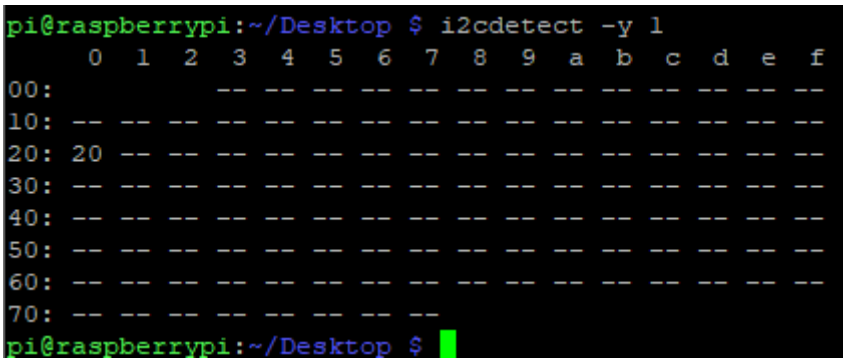


To determine the I2C address of the module, i2ctools should be installed. If none are available, the following command should be executed in the terminal window: **sudo apt-get install i2ctools -y**

The I2C address is checked by entering the following command in the terminal:

i2cdetect -y 1

The terminal output should look like the following picture:

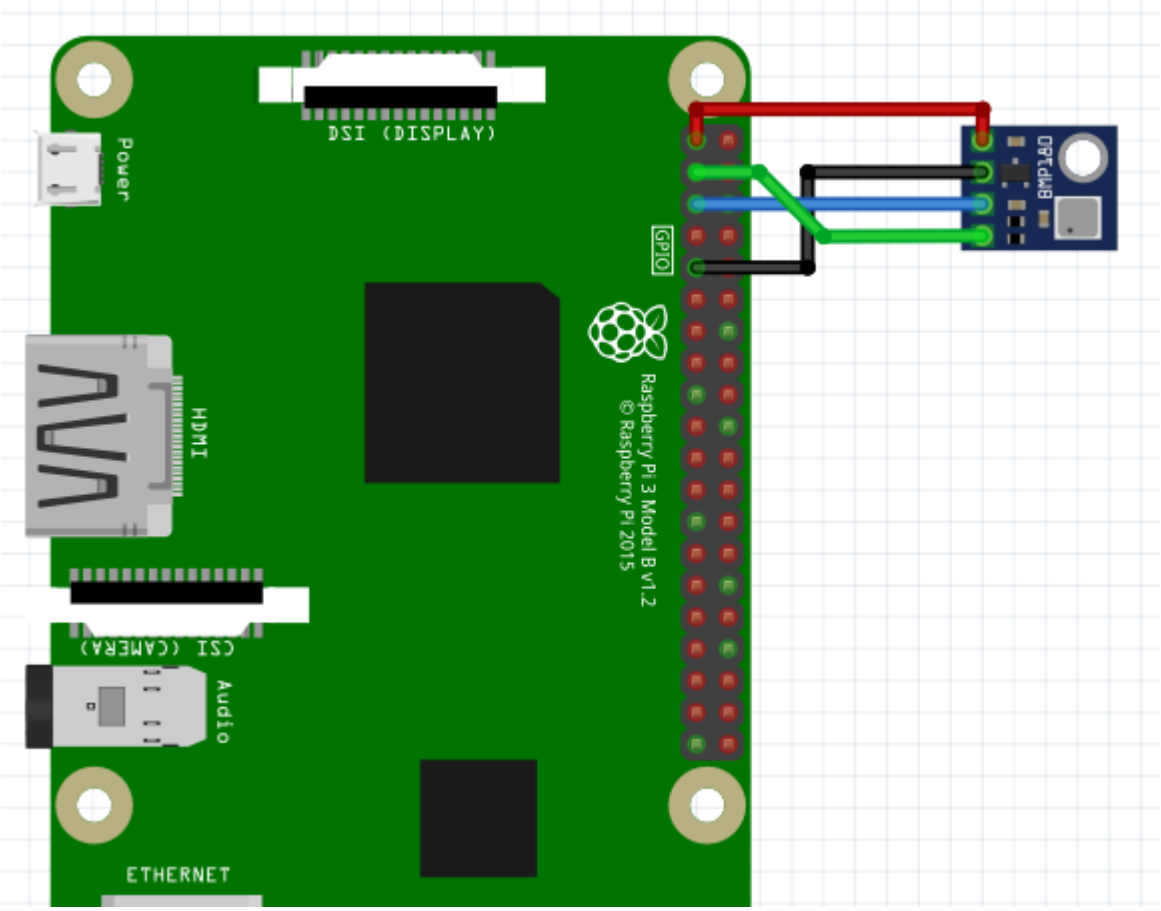


The I2C address of the module is 0x20

With the command:
/usr/sbin/i2cset -y 1 0x20 0x14 0x01
the LED can be switched on and with **/usr/sbin/i2cset -y 1 0x20 0x14 0x00** be switched off again

Connecting the module with the Raspberry Pi

The following illustration shows how to connect the BMP180 to the Raspberry Pi.



Raspberry Pi	BMP180
3V3	Vin
GND	GND
GPIO 8	SDA
GPIO 9	SCL

BMP180

With the command `i2cdetect -y 1`
you can have the I2C address displayed.

```
pi@raspberrypi:~ $ i2cdetect -y 1
     0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f
00:          -- -- -- -- -- -- -- -- -- -- -- -- --
10: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
20: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
30: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
40: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
50: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
60: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
70: -- -- -- -- -- -- -- 77
pi@raspberrypi:~ $
```

We still need a library to be able to address the sensor. Adafruit offers such a library, you can install it with the following command (git must be installed):

```
git clone https://github.com/adafruit/Adafruit-Raspberry-Pi-Python-Code.git
```

Next, we change to the library directory:

```
cd Adafruit-Raspberry-Pi-Python-Code/Adafruit_BMP085
```

Now we can start the example script:

```
sudo python Adafruit_BMP085_example.py
```

The script reads the sensor and outputs the values in the terminal.

```
pi@raspberrypi:~/Adafruit-Raspberry-Pi-Python-Code/Adafruit_BMP085 $ sudo python
 Adafruit_BMP085_example.py
Temperature: 21.30 C
Pressure:    985.97 hPa
Altitude:    229.39
pi@raspberrypi:~/Adafruit-Raspberry-Pi-Python-Code/Adafruit_BMP085 $
```

You have made it. You can now use our module for your projects.

Jetzt ist es an der Zeit, zu lernen und eigene Projekte zu erstellen. Das können Sie mit Hilfe von vielen Beispielskripten und anderen Tutorials tun, die Sie im Internet finden können.

Wenn Sie auf der Suche nach den qualitativ hochwertigen Produkten für Arduino und Raspberry Pi sind, sind Sie bei der AZ-Delivery Vertriebs GmbH genau richtig. Sie erhalten zahlreiche Anwendungsbeispiele, vollständige Installationsanleitungen, eBooks, Bibliotheken und Unterstützung durch unsere technischen Experten.

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Viel Spaß!

Impressum

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