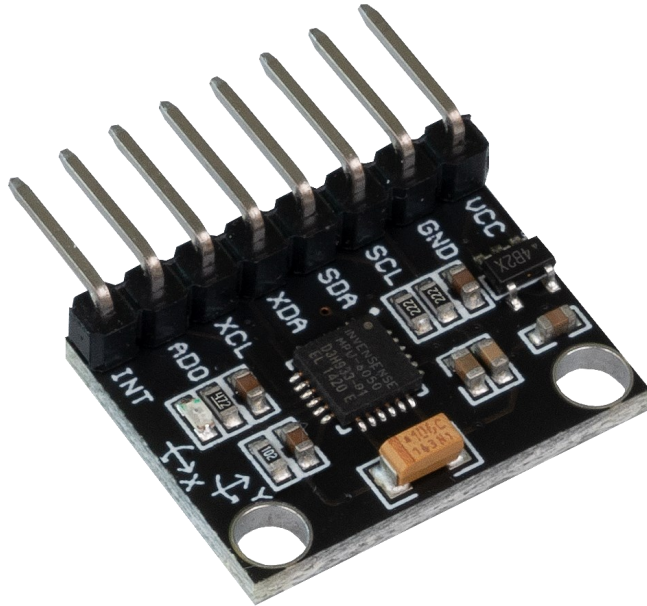


GYROSCOPE & ACCELEROMETER MODULE

SEN-MPU6050



1. GENERAL INFORMATION

Dear customer,

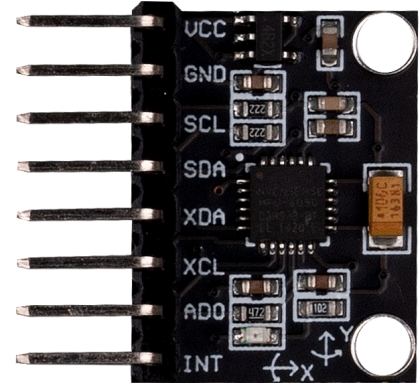
thank you very much for choosing our product.

In following, we will introduce you to what to observe while starting up and using this product.

Should you encounter any unexpected problems during use, please do not hesitate to contact us.

2. PIN OVERVIEW

Function	PIN
Supply Voltage (3,3 - 5 V DC)	VCC
Supply voltage Reference potential	GND
I2C clock line (3,3 V logic)	SCL
I2C data line (3,3 V logic)	SDA
External I2C data line (3,3 V logic)	XDA
External I2C clock line (3,3 V logic)	XCL
I2C address pin Connect it to 3.3 V to change the I2C address from 0x68 to 0x69	AD0
Interrupt Output Pin (3,3 V logic)	INT

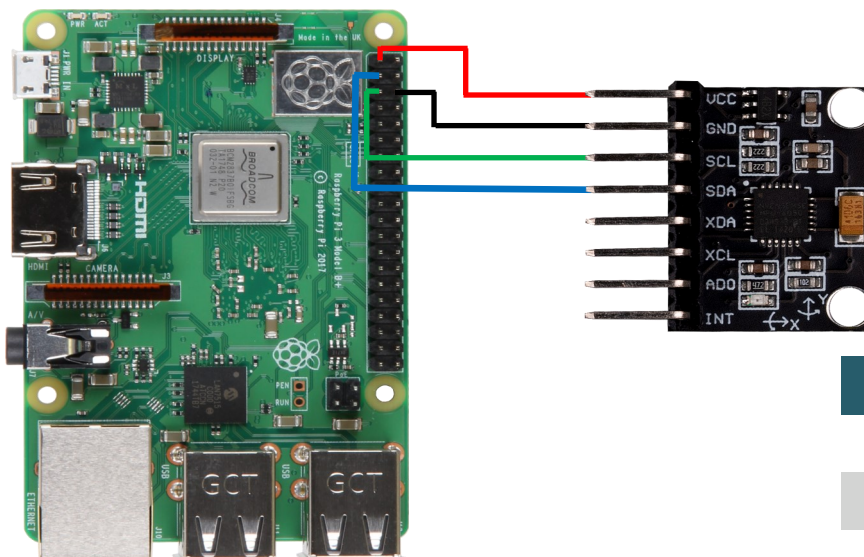


3. COMMISSIONING WITH A RASPBERRY PI



These instructions were written under Raspberry Pi OS Bookworm for the Raspberry Pi 4 and 5. It has not been checked with newer operating systems or hardware.

Wiring:



Raspberry Pi	MPU6050
3v3	VCC
GND	GND
SCL (Pin 5)	SCL
SDA (Pin 3)	SDA

After the sensor is connected, you have to activate I2C. Open the terminal and enter the following command:

```
sudo raspi-config
```

Now enable the I2C interface under **Interfacing Options** -> **I2C**

Now run the following commands to install all the necessary libraries:

```
sudo apt-get update
```

```
sudo apt-get install python3-smbus
```

You can download the sample code with the following command:

```
wget https://joy-it.net/files/files/Produkte/SEN-MPU6050/SEN-MPU6050_Beispielcode.zip
```

Unpack the file with the following command. Please note that the directory in which the file is located may be different.

```
unzip SEN-MPU6050_Beispielcode.zip && rm SEN-MPU6050_Beispielcode.zip
```

You can now run the program with the following command:

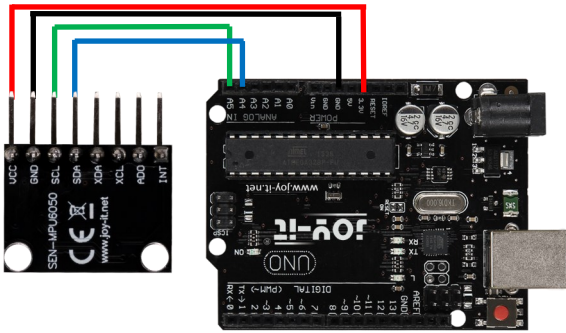
```
python3 /home/pi/SEN-MPU6050_Beispielcode/MPU6050.py
```

When you do this, you will get the following console output:

```
measured temperature: 28.67 °C 1.
Gyroscope with scale factor 131.0: 2.
x-axis: -1.6412 arcsec
y-axis: -1.2824 arcsec
z-axis: 1.9466 arcsec
Acceleration with scale factor 16384.0: 3.
x-axis: 0.0205 g
y-axis: 0.0000 g
z-axis: 1.0291 g
Rotation: 4.
x-axis: 0.0000 °
y-axis: -1.1417 °
z-axis: 88.8583 °
```

- 1.: This value indicates the temperature.
- 2.: These 3 values display the values of the x, y and z axis of the gyroscope.
- 3.: These 3 values display the values of the x, y and z axis of the accelerometer.
- 4.: These values display the value the current tilt of the sensor in degrees.

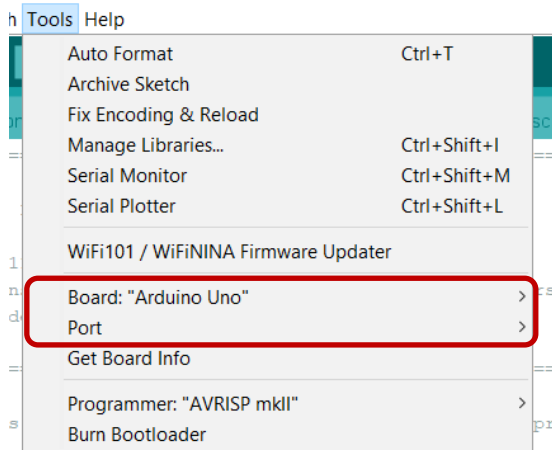
4. COMMISSIONING WITH AN ARDUINO



Arduino Uno	MPU6050
5V	VCC
GND	GND
SCL (A5)	SCL
SDA (A4)	SDA

For usage of MPU6050 with an Arduino, you have to modulate your Arduino IDE to the used Board and the used port, first.

In this case, we use an Arduino UNO.



The SEN-MPU6050 has a logic level of 3.3V. Therefore, when using an Arduino or other device with a logic level of 5V, make sure that no pull-up resistors are activated. Otherwise the SEN-MPU6050 could get damaged.

Now enter the following source code into your Arduino IDE and press "Upload".

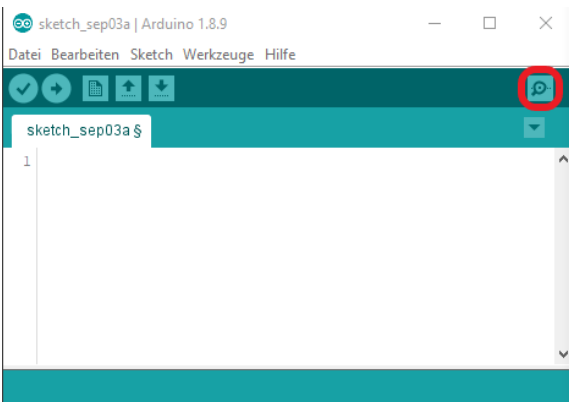
```
#include "Wire.h" // Importing the I2C library.
const int I2C_address_MPU = 0x68; // I2C Address of the MPU6050.
int16_t Beschleunigung_x, Beschleunigung_y, Beschleunigung_z;
// Variables for the Accelerometer sensor
int16_t gyro_x, gyro_y, gyro_z; // Variables for the Gyroscope
int16_t Temperatur; // Variable in which the temperature is saved
char tmp_str[7];
char* convert_int16_to_str(int16_t i) {
    sprintf(tmp_str, "%d", i);
    return tmp_str;
}
void setup() {
    Serial.begin(9600);
    Wire.begin();
    Wire.beginTransmission(I2C_address_MPU); // Starting the I2C transmission
    Wire.write(0x6B);
    Wire.write(0);
    Wire.endTransmission(true);
}
```

Continuation of the source code on the following page.

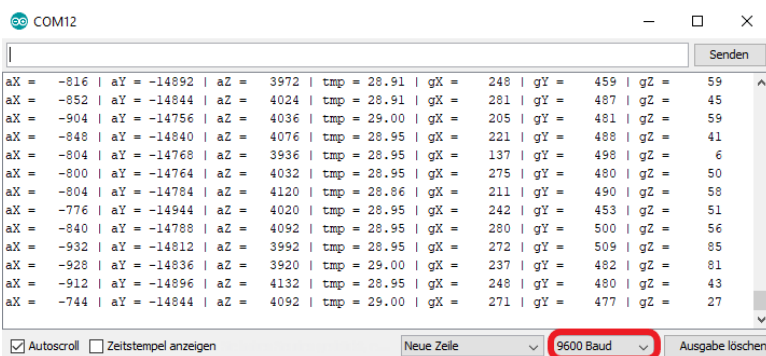
Continuation of the source code:

```
void loop() {
  Wire.beginTransmission(I2C_adress_MPU);
  Wire.write(0x3B);
  Wire.endTransmission(false);
  Wire.requestFrom(I2C_adress_MPU, 7*2, true);
  Beschleunigung_x = Wire.read()<<8 | Wire.read();
  Beschleunigung_y = Wire.read()<<8 | Wire.read();
  Beschleunigung_z = Wire.read()<<8 | Wire.read();
  Temperatur = Wire.read()<<8 | Wire.read();
  gyro_x = Wire.read()<<8 | Wire.read();
  gyro_y = Wire.read()<<8 | Wire.read();
  gyro_z = Wire.read()<<8 | Wire.read();
  // Output of Data
  Serial.print("aX = "); Serial.print(convert_int16_to_str(Beschleunigung_x));
  Serial.print(" | aY = "); Serial.print(convert_int16_to_str(Beschleunigung_y));
  Serial.print(" | aZ = "); Serial.print(convert_int16_to_str(Beschleunigung_z));
  Serial.print(" | tmp = "); Serial.print(Temperatur/340.00+36.53);
  Serial.print(" | gX = "); Serial.print(convert_int16_to_str(gyro_x));
  Serial.print(" | gY = "); Serial.print(convert_int16_to_str(gyro_y));
  Serial.print(" | gZ = "); Serial.print(convert_int16_to_str(gyro_z));
  Serial.println();
  // 1 Second Pause
  delay(1000);
}
```

Press the red-marked button, to call up the serial monitor.



Make sure that the baud rate (red marked field in the picture) is set to 9600.



Now you can read the values measured by the sensor.

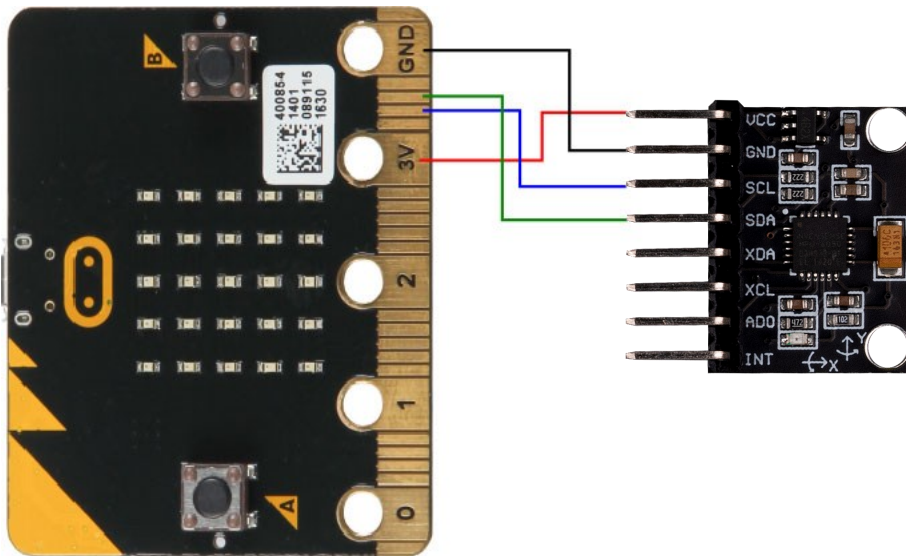
Explanation of console output:

1	2	3	4	5	6	7
aX = 96	aY = -14560	aZ = 7124	tmp = 28.29	gX = 126	gY = -15	gZ = -122
aX = 220	aY = -14596	aZ = 7192	tmp = 28.34	gX = 129	gY = -9	gZ = -132

- 1.: This value is the value of the x-axis of the accelerometer.
- 2.: This value is the value of the y-axis of the accelerometer. .
- 3.: This value is the value of the z-axis of the accelerometer. .
- 4.: This value states the current temperature.
- 5.: This value is the value of the x-axis of the Gyroscope.
- 6.: This value is the value of the y-axis of the Gyroscope.
- 7.: This value is the value of the z-axis of the Gyroscope.

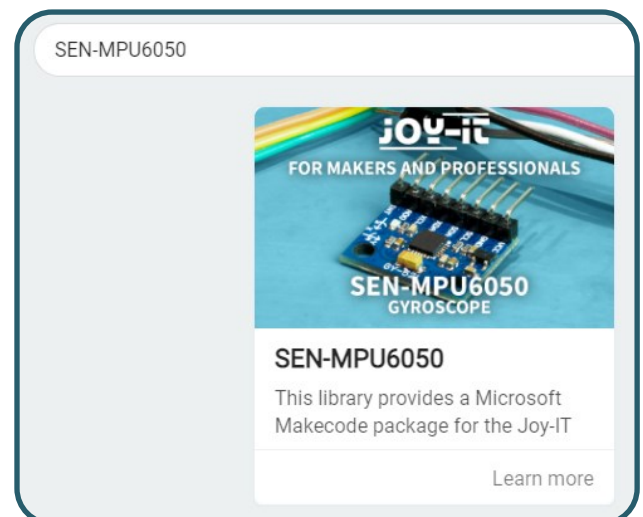
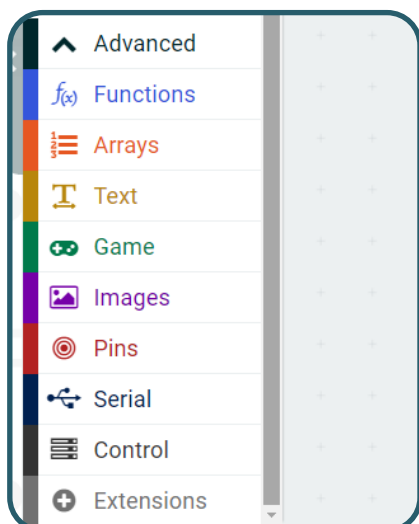
5. COMMISSIONING WITH A MICRO:BIT

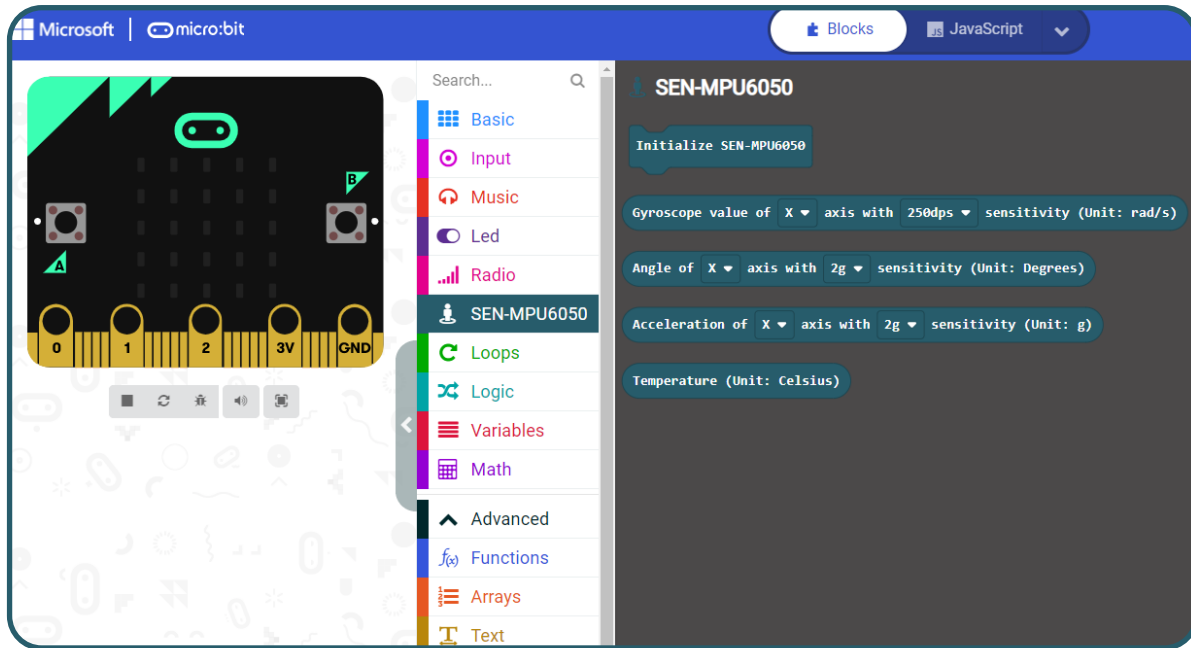
Connection:



micro:bit	MPU6050
3V	VCC
GND	GND
SCL (P19)	SCL
SDA (P20)	SDA

For the micro:bit we use MakeCode, which you can open in your browser [here](#). For the micro:bit we provide the library [SEN-MPU6050](#), which is published under the [MIT license](#). In MakeCode you can load the blocks into your project under **Advanced** → **Extensions**. There you can search and select **SEN-MPU6050**.





We provide you with a code example, which you can download [here](#). This code will give you the identical output as the Raspberry Pi. You load the code onto the micro:bit by saving the file on the micro:bit. Now you can see the values of the sensor in the console in MakeCode.

6. ADDITIONAL INFORMATION

Our information and take-back obligations according to the Electrical and Electronic Equipment Act (ElektroG)



Symbol on electrical and electronic equipment:

This crossed-out dustbin means that electrical and electronic appliances do not belong in the household waste. You must return the old appliances to a collection point.

Before handing over waste batteries and accumulators that are not enclosed by waste equipment must be separated from it.

Return options:

As an end user, you can return your old device (which essentially fulfils the same function as the new device purchased from us) free of charge for disposal when you purchase a new device.

Small appliances with no external dimensions greater than 25 cm can be disposed of in normal household quantities independently of the purchase of a new appliance.

Possibility of return at our company location during opening hours:

Simac GmbH, Pascalstr. 8, D-47506 Neukirchen-Vluyn, Germany

Possibility of return in your area:

We will send you a parcel stamp with which you can return the device to us free of charge. Please contact us by e-mail at Service@joy-it.net or by telephone.

Information on packaging:

If you do not have suitable packaging material or do not wish to use your own, please contact us and we will send you suitable packaging.

7. SUPPORT

If there are still any issues pending or problems arising after your purchase, we will support you by e-mail, telephone and with our ticket support system.

E-Mail: service@joy-it.net

Ticket system: <https://support.joy-it.net>

Telephone: +49 (0)2845 9360-50 (Mon - Thur: 09:00 - 17:00 o'clock CET, Fri: 09:00 - 14:30 o'clock CET)

For further information please visit our website:

www.joy-it.net