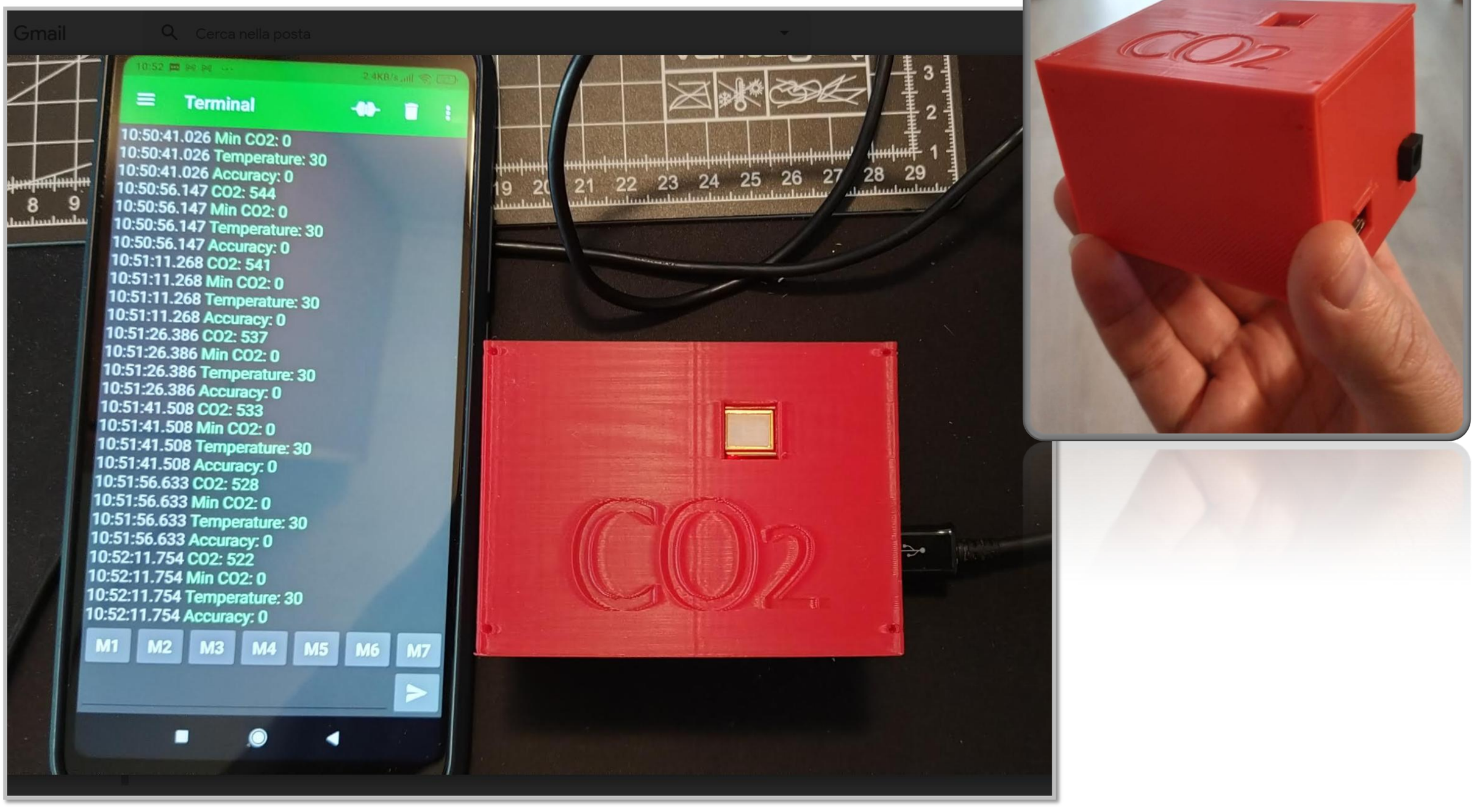
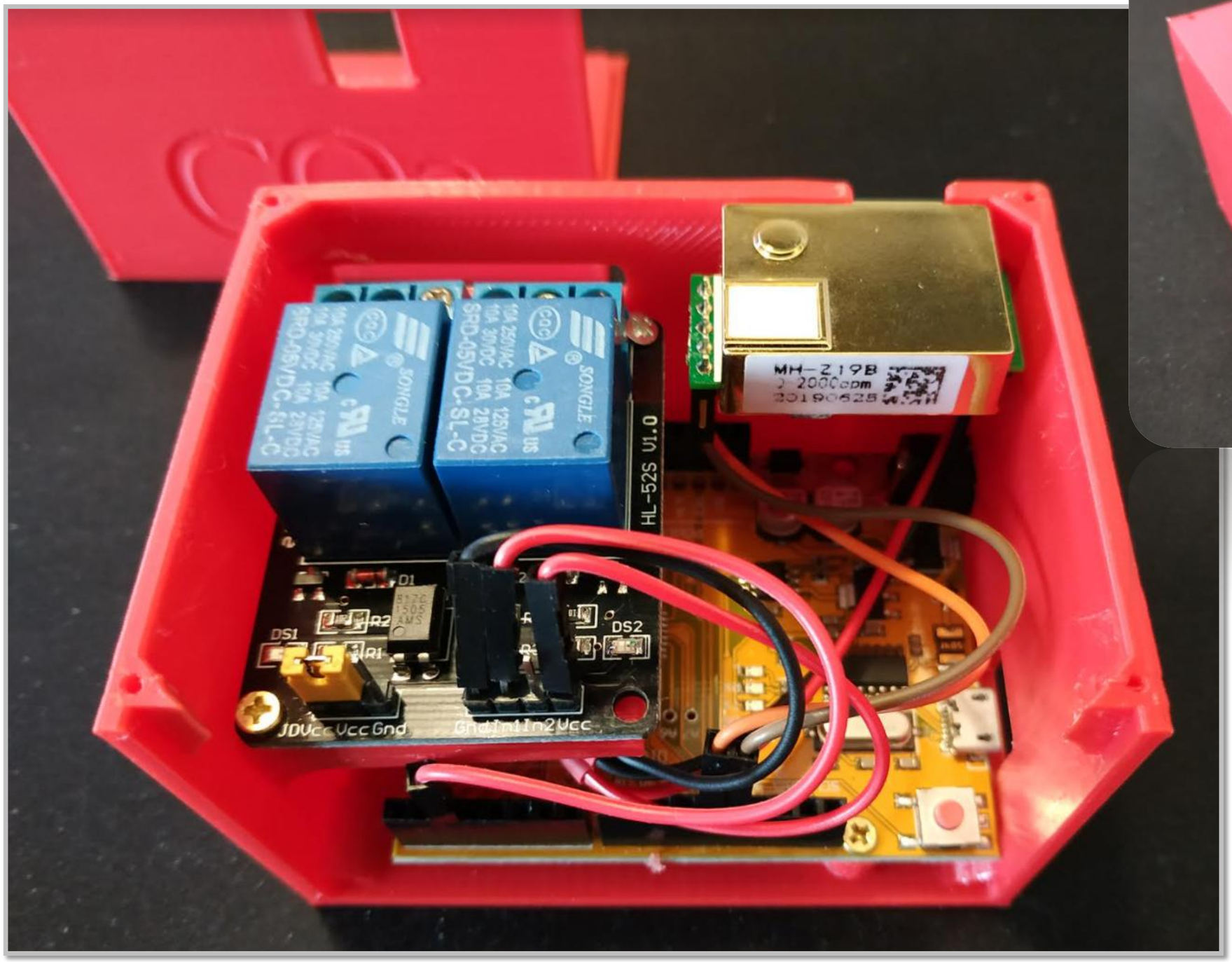
SISTEMA MONITORAGGIO *V.1.0* di CO_2 CON 2 USCITE RELE' 220V – 10A

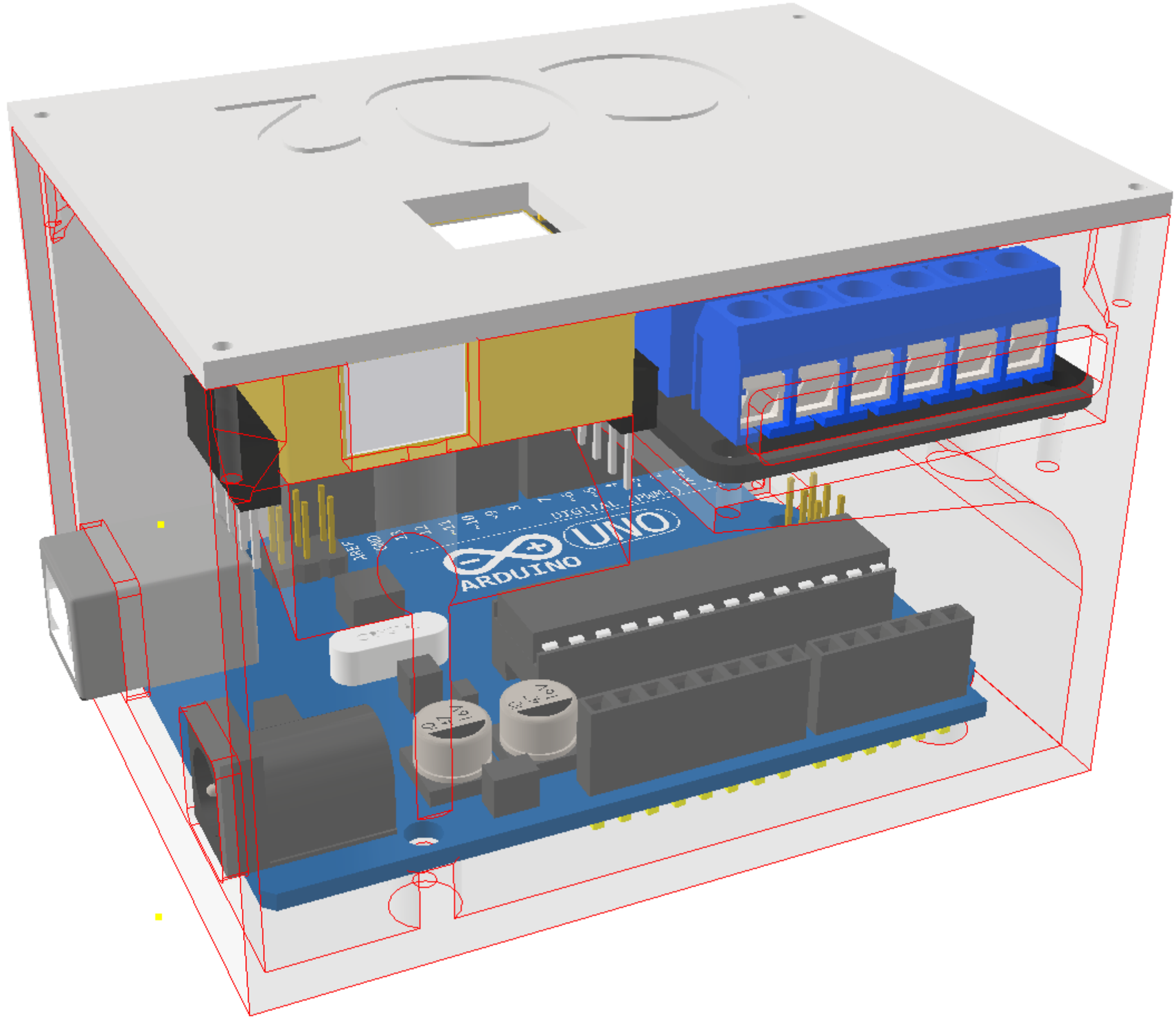
Il sistema utilizza un sensore MH Z19B per rilevare la presenza di CO2 nell'ambiente nel range 0-2000 ppm tipico del settore residenziale e terziario.
Il sensore ha una precisione di +-50ppm ed un tempo di risposta regime di circa 2 sec. (tempo di preriscaldamento 60 s).
Il sistema è gestito da una scheda Arduino R1 affiancata da uno shield relè a 2 canali che possono essere usati per comandare una macchina di ventilazione o una luce di segnalazione esterna. Tramite porta USB è possibile monitorare la concentrazione di CO_2 nel tempo.



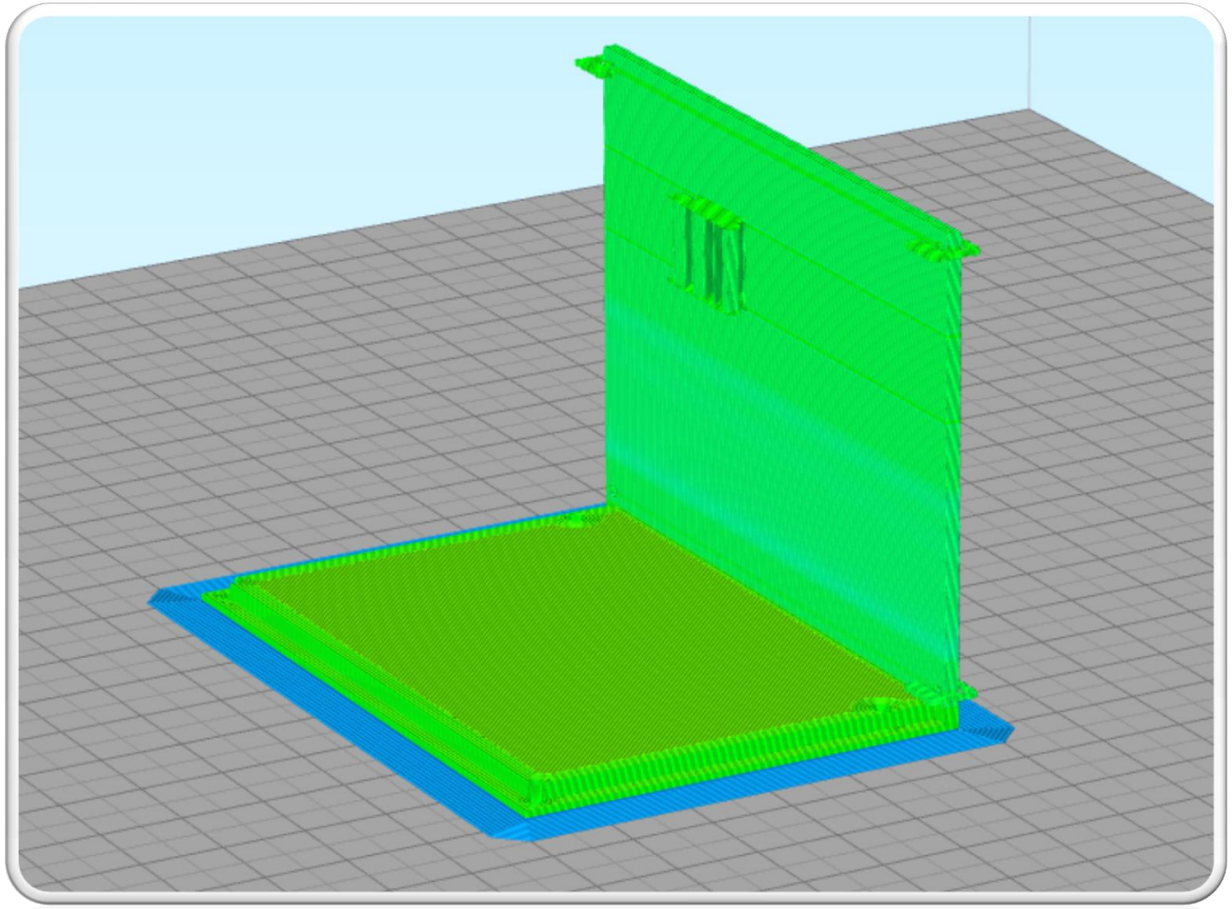
SISTEMA MONITORAGGIO CO_2 CON 2 USCITE RELE FINO 220V – 10A

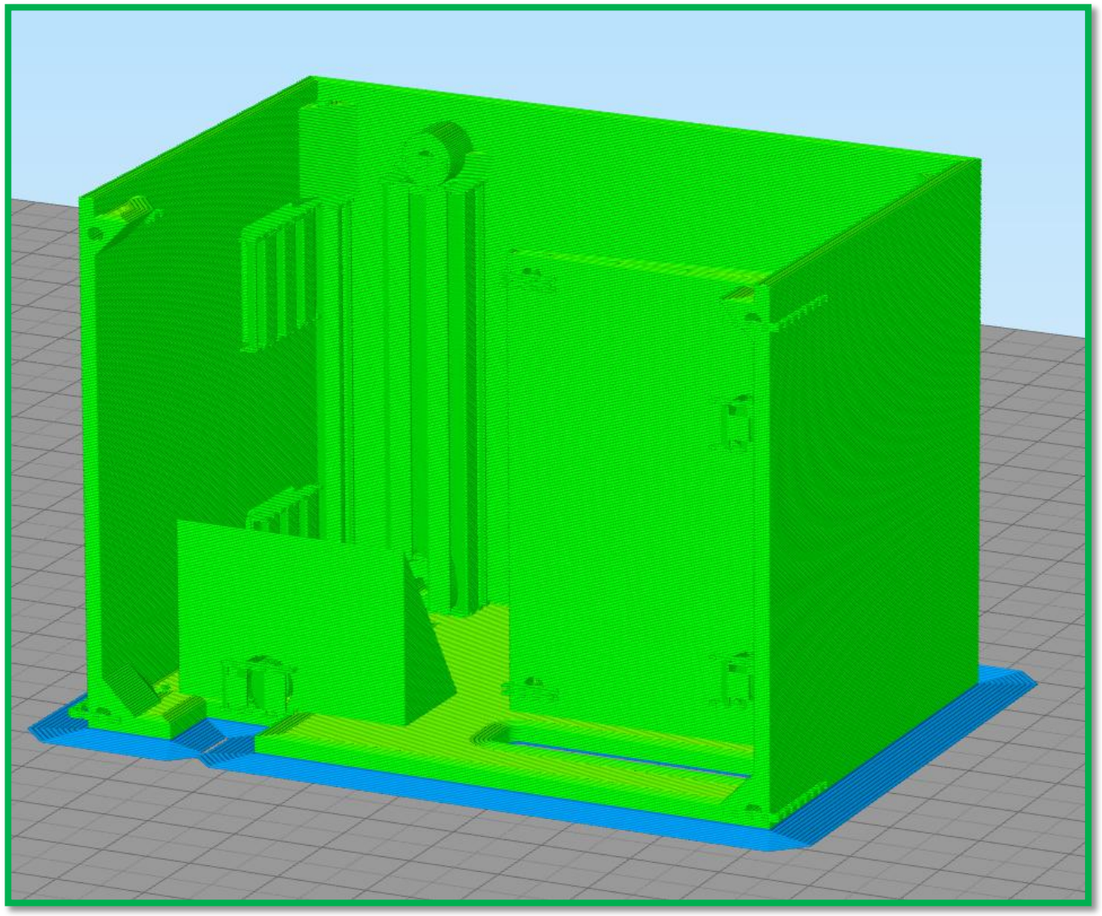


MODELLO 3D DEL CONTENITORE OTTIMIZZATO PER STAMPA 3D



ANTEPRIMA STAMPA MODELLO 3D



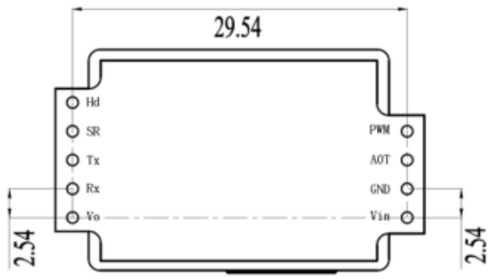


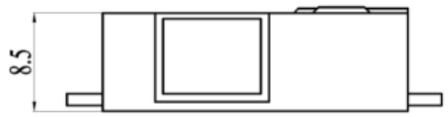
MATERIALE PLA
LAYER 0,2 mm
SUPPORTI ABILITATI (facilmente rimovibili)
VELOCITA’ STAMPA 60mm/min
TEMPO COMPLESSIVO DI STAMPA 5 ore

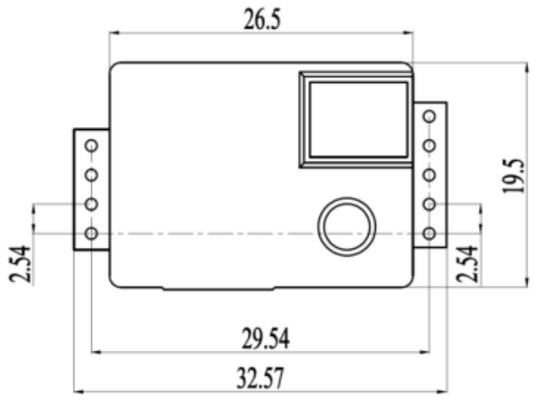
SENSORE CO_2 MH Z19B

MH-Z19 NDIR infrared gas module is a common type, small size sensor, using non-dispersive infrared (NDIR) principle to detect the existence of CO 2 in the air, with good selectivity, non-oxygen dependent and long life. Built-in temperature sensor can do temperature compensation; and it has UART output and PWM output. It is developed by the tight integration of mature infrared absorbing gas detection technology, precision optical circuit design and superior circuit design.

Product Model	MH-Z19
Target Gas	CO2
Working voltage	3.6 ~ 5.5 V DC
Average current	< 18 mA
Interface level	3.3 V
Measuring range	0 ~ 0.5% VOL optional (refer to Table 2)
Output signal	UART
	PWM
Preheat time	3 min
Reponse Time	T_{90} < 60 s
Working temperature	0 ~ 50 ℃
Working humidity	0 ~ 95% RH (No condensation)
Dimension	33 mm×20 mm×9 mm (L×W×H)
Weight	21 g
Lifespan	> 5 years







Target Gas	Formula	Measuring Range	Accuracy	Remark
Carbon Dioxide (CO2)	CO_2	0～2000 ppm	± (50ppm+5% reading value)	Temperature compensation
		0～5000 ppm		Temperature compensation

Introduction

Single Beam(Single light source, single wavelength) NDIR CM1106 (Miniature size) can be used to detect CO2 concentration of indoor air by adopting advanced non-dispersive infrared technology(NDIR). It is widely used in IAQ monitor, air conditioner with purifying function, air purifier, ventilation system, automotive, agricultural IOT and other consumer electronic products etc.

Features

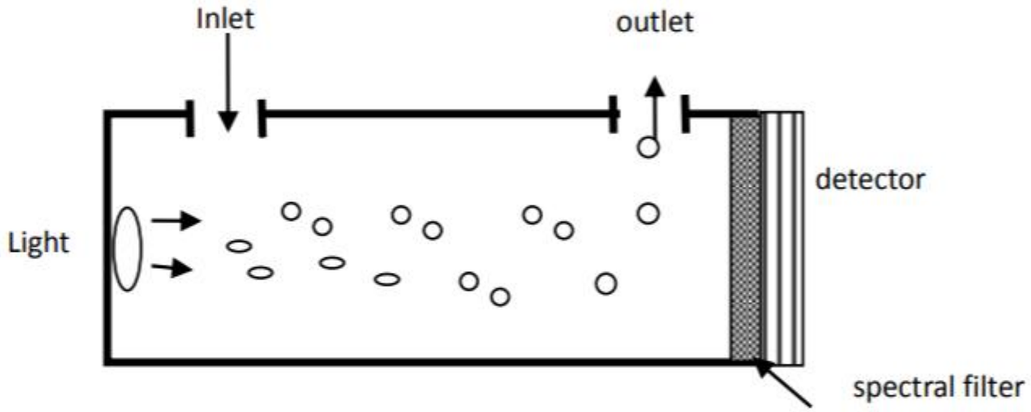
- Advanced non-dispersive infrared technology (NDIR) with independent intellectual property
- High accuracy: temperature calibration within whole measurement range
- High stability: advanced auto-calibration at background
- Small size and compact structure, easy to install

Applications

- ✓ IAQ monitor
- ✓ Air conditioner with purifying function
- ✓ Air purifier
- ✓ Ventilation system
- ✓ Automotive

Principle of particle measurement

Molecule like CO2 and CO is composed of different types of atoms, it has absorption spectrum in infrared range. Absorption intensity abides by Lamber-Beer's Law. When light wave corresponded to certain gas with absorption spectrum passes through measured gas, the intensity of light wave will be significantly weakened. The intensity attenuation is related to concentration of measured gas. This relation follows Lamber-Beer's Law. Basic working principle of NDIR sensor is as below,



Basic mathematical model：A majority of both organic and inorganic polyatomic gas have specific absorptive wavelength in infrared region. When infrared light passed by, the light transmissivity of this gas molecule to certain wavelength can be expressed by Lambert-Beer Law:

I stands for light transmissivity, $I = I_0 e^{-kpl}$

i stands for light absorption intensity, $i = I_0 - I = I_0 (1 - e^{-kpl})$

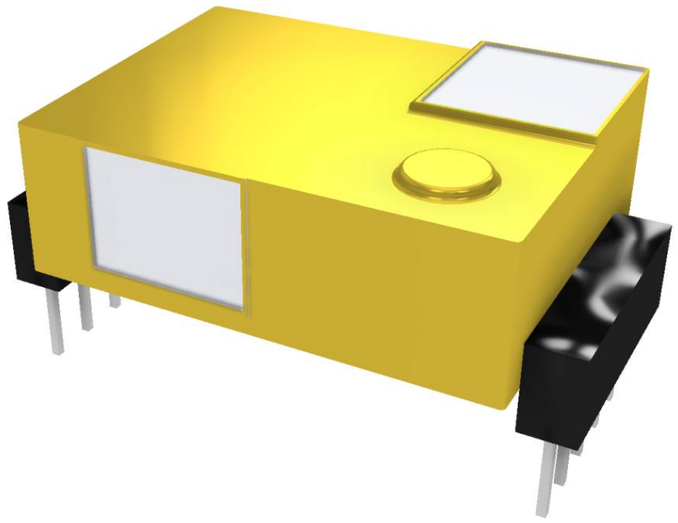
I_0**:** incident light intensity.

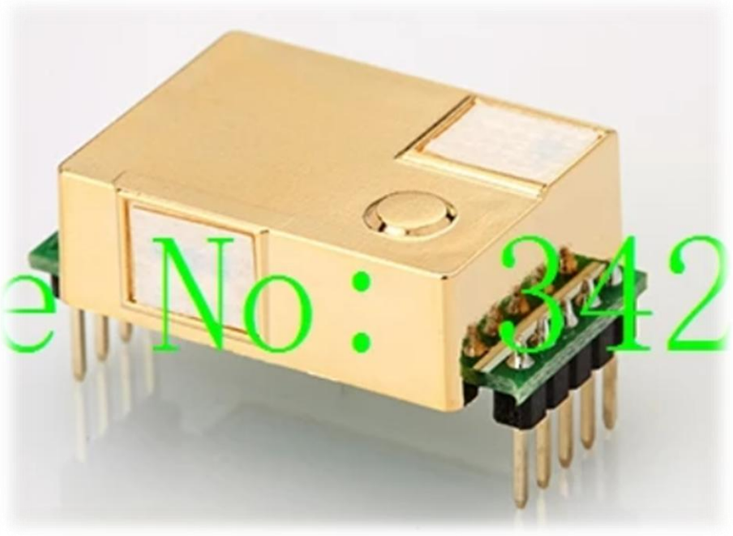
l: thickness of gaseous medium

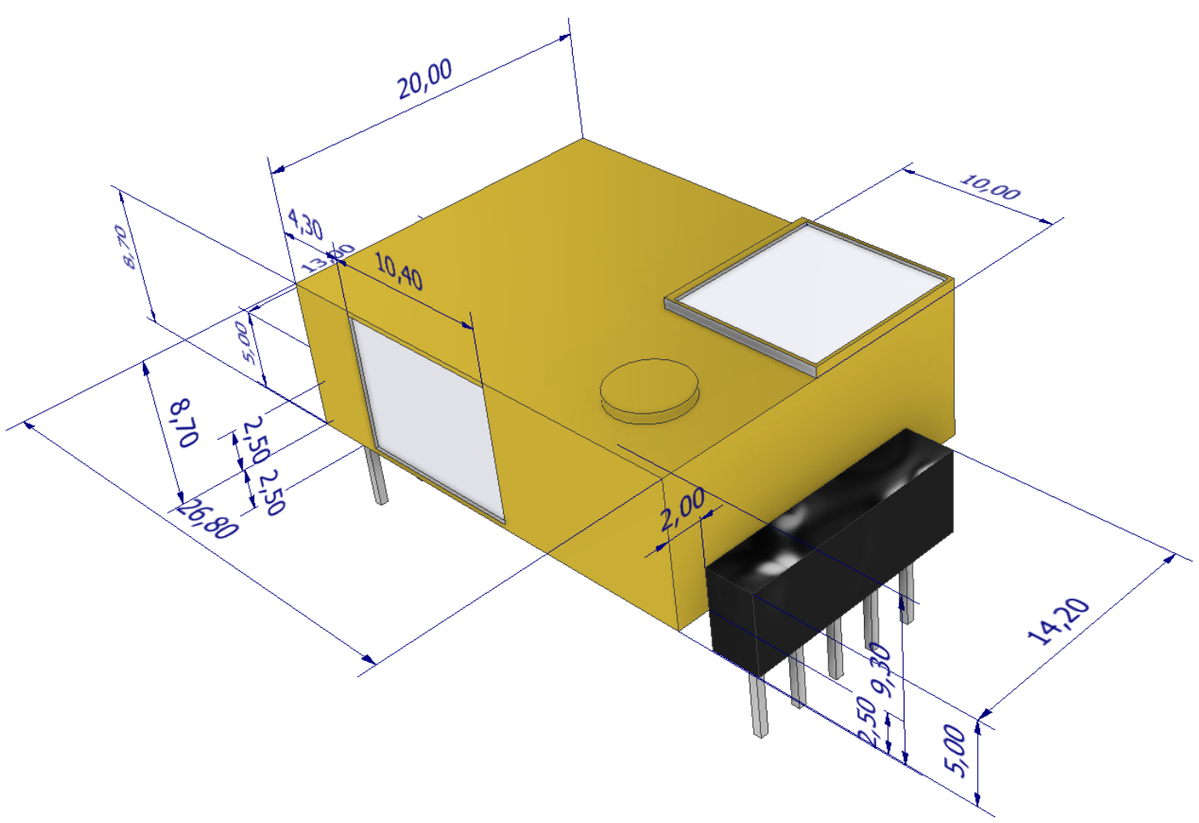
p: gas concentration

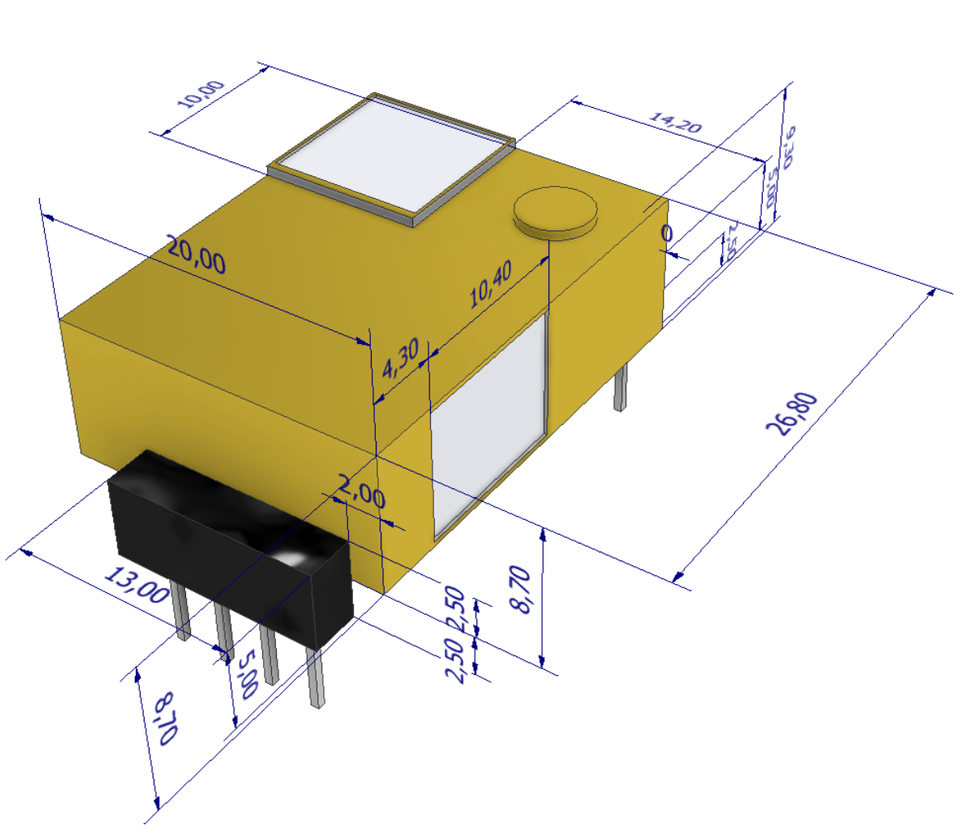
k: absorption coefficient

MODELLO 3D DEL SENSORE CO_2 MH Z19B



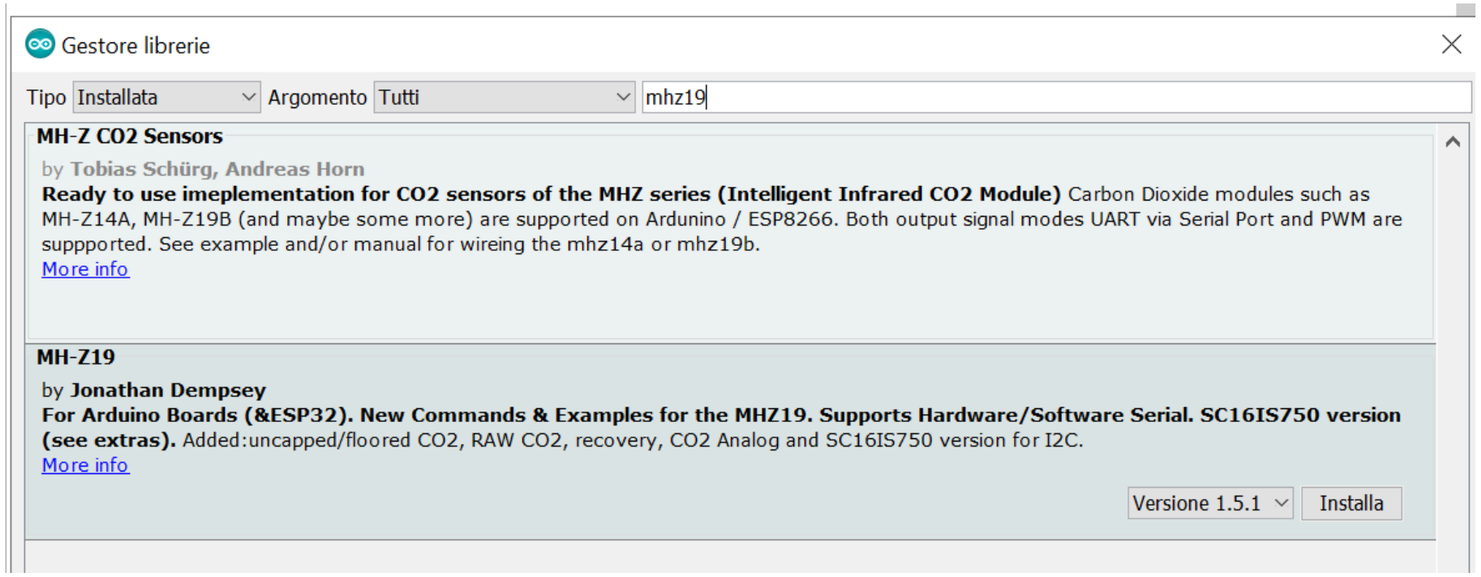




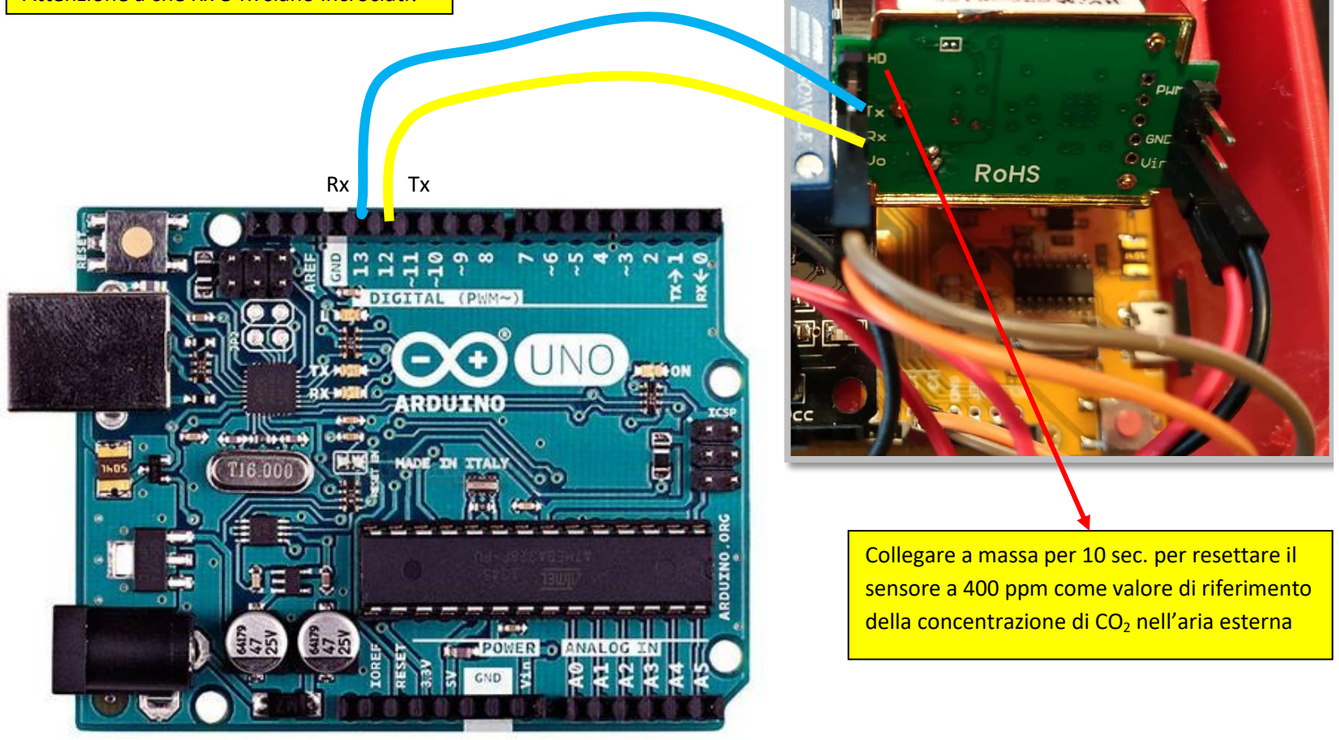


CODICE ARDUINO DI TEST

```
#include <SoftwareSerial.h>
#include <MHZ19.h>

int falto=0;

SoftwareSerial ss(13,12);  // RX, TC –> comunicazione seriale
MHZ19 mhz(&ss);

void setup()
{
  pinMode( 2,OUTPUT );
  Serial.begin(115200);
  Serial.println(F("Starting..."));
  ss.begin(9600);
}

void loop()
{
  MHZ19_RESULT response = mhz.retrieveData();
  if (response == MHZ19_RESULT_OK)
  {
    Serial.print(F("CO2: "));
    Serial.println(mhz.getCO2());
    Serial.print(F("Min CO2: "));
    Serial.println(mhz.getMinCO2());
    Serial.print(F("Temperature: "));
    Serial.println(mhz.getTemperature());
    Serial.print(F("Accuracy: "));
    Serial.println(mhz.getAccuracy());
  }
  else
  {
    Serial.print(F("Error, code: "));
    Serial.println(response);
  }

  delay(100);

  if (falto==0 )
  { digitalWrite( 2,HIGH ); falto=1; }
  else
  { digitalWrite( 2,LOW ); falto=0; }

  delay(15000);
}
```



Attenzione a che Rx e Tx siano incrociati!



Collegare a massa per 10 sec. per resettare il sensore a 400 ppm come valore di riferimento della concentrazione di CO_2 nell'aria esterna