

# lamaPLC: RP2040\_ETH\_Modul: Read BME 680 sensor data and store in Modbus input registers

The program reads the following data from the [BME680 sensor](#) and displays it in the Modbus input registers:

- Temperature: Provides ambient temperature readings.
- Humidity: Measures relative humidity.
- Barometric Pressure: Can be used to calculate altitude or track weather changes.
- Gas (VOC): Features a heated metal-oxide sensor that detects Volatile Organic Compounds (VOCs) to estimate indoor air quality.



Important: The Ethernet module is accessible by **RP2040\_ETH** via **UART1** with the following configuration:

```
uart1 = UART(1, baudrate=115200, tx=Pin(20), rx=Pin(21), timeout=50)
```

```
from machine import UART, Pin, I2C
import time
import machine
import bme680

# --- UART config ---
uart1 = UART(1, baudrate=115200, tx=Pin(20), rx=Pin(21), timeout=50)

# --- I2C config ---
i2c = I2C(0, sda=Pin(4), scl=Pin(5), freq=100000)

# --- BME680 ---
bme = bme680.BME680_I2C(i2c)

# Initialize registers: 10 registers (index 0..9)
# Values: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10
input_registers = [i + 1 for i in range(10)]

def update_sensor_data():
    """Reading and writing BME680 data to registers"""
    try:
        temp = bme.temperature
        humidity = bme.humidity
        pressure = bme.pressure
        gas = bme.gas
```

```
# Handling signed values and scaling to 16-bit integers
input_registers[0] = int(temp * 100) & 0xFFFF # Ex: 23.45 °C ->
2345
input_registers[1] = int(humidity * 100) & 0xFFFF # Ex: 45.12 % ->
4512
input_registers[2] = int(pressure * 10) & 0xFFFF # Ex: 1013.2 hPa
-> 10132
input_registers[3] = int(gas / 10) & 0xFFFF # Ex: 55000 Ohm
-> 5500
input_registers[4] = int(-10)
except Exception as e:
    print("Sensor reading error:", e)

print(f"Modbus TCP Server starting... Registers: {input_registers}")
last_sensor_update = time.time()

while True:
    current_time = time.time()

    # Refresh sensor data every 2 seconds
    if time.time() - last_sensor_update > 2000:
        update_sensor_data()
        last_sensor_update = current_time

    if uart1.any():
        raw_data = uart1.read()

        # Modbus TCP minimum length: 12 bytes
        if len(raw_data) >= 12:
            header = raw_data[:6] # MBAP Header
            pdu = raw_data[6:] # UnitID + PDU

            unit_id = pdu[0]
            func_code = pdu[1]

            # Start Address (pdu[2:4]) és Quantity (pdu[4:6])
            start_addr = (pdu[2] << 8) | pdu[3]
            quantity = (pdu[4] << 8) | pdu[5]

            # 03: Read Input Registers (4)
            if func_code == 4:
                # Check if the requested range is valid (between 0-9)
                if start_addr + quantity <= len(input_registers):
                    # Assemble data bytes
                    byte_count = quantity * 2
                    data_payload = bytearray()
```

```
for i in range(start_addr, start_addr + quantity):
    val = input_registers[i]
    data_payload.append((val >> 8) & 0xFF) # High byte
    data_payload.append(val & 0xFF)       # Low byte

# PDU response: UnitID, Func, ByteCount, Data
pdu_res = bytearray([unit_id, func_code, byte_count]) +
data_payload

# Update TCP Header (length: UnitID(1) + rest of PDU)
res_header = bytearray(header)
res_header[4] = 0x00
res_header[5] = len(pdu_res)

uart1.write(res_header + pdu_res)
print(f"Request: Addr {start_addr}, Qty {quantity} ->
Response sent.")
else:
    # Exception 02: Illegal Data Address (if the Master asks
too much)

    pdu_res = bytearray([unit_id, func_code + 0x80, 0x02])
    res_header = bytearray(header)
    res_header[5] = 3
    uart1.write(res_header + pdu_res)
    print("Error: Invalid register address!")

time.sleep(0.01)
```

[code!](#), [micropython](#), [2026](#), [RP2040 ETH](#), [BME680](#), [i2c](#), [sensor](#), [communication](#)

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