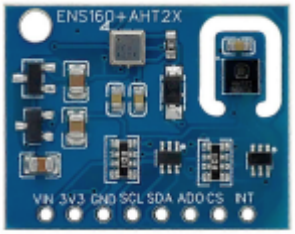
lamaPLC: ENS160 + AHT21 Air Quality Sensor - CO, ECO, TVOC, Temp & Humidity Module

The ENS160 + AHT21 Air Quality Module is a combined environmental sensor board that measures indoor air pollutants (VOCs, eCO_2, AQI) and climate conditions (Temperature, Humidity). It is a popular upgrade for older sensors like the CCS811 due to its integrated sensor fusion and automatic calibration.



- Detection of reducing (VOC) and oxidizing gases (such as NO_2)
- MOX supports up to 4 gas sensors
- Integrated sensor measurement and heater drive control
- Integrated pre-calibrated sensor fusion and automatic correction algorithm

Key Capabilities

- **ENS160 (Air Quality):** Uses Metal-Oxide (MOX) technology to detect reducing and oxidizing gases.
  - **Outputs:** Total Volatile Organic Compounds (TVOC), equivalent CO_2 (eCO_2)), and Air Quality Index (AQI).
  - **Target Gases:** Ethanol, toluene, hydrogen, NO_2, and ozone.
- **AHT21 (Climate):** A high-precision digital temperature and humidity sensor.
  - **Temperature:** ±0.3 °C accuracy; range of -40 °C to +120 °C.
  - **Humidity:** ±2 % RH accuracy; range of 0 to 100 % RH.

Technical Specifications

Feature	Specification
Supply Voltage (VIN)	2.0V to 5.5V DC (Breakout boards often regulate to 3.3V)
Interface	I²C (Standard) or SPI (ENS160 only)
I2C Addresses	ENS160: **0x53** (default) or **0x52**; AHT21: **0x38**
Warm-up Time	< 1 minute for immediate use; up to 1 An hour for full accuracy
Power Use	1.2 to 46 mW depending on operating mode

Pinout

Pin Name	Type	Description
VIN / VCC	Power	Power supply input. Usually supports 3.3V to 5V due to onboard regulators.
GND	Power	Ground connection.
SCL	I²C	Serial Clock line for both ENS160 and AHT21.
SDA	I²C	Serial Data line for both ENS160 and AHT21.
ADDR / ADO	Control	(Optional) I²C address selection for ENS160. Connect to GND for 0x52 or VCC for 0x53.
INT	Output	(Optional) Interrupt pin; can signal when new data is ready.

Example Arduino code

To use the ENS160 + AHT21 module with Arduino, you'll typically need two libraries from the Arduino Library Manager: Adafruit ENS160 and Adafruit AHTX0.

Install Required Libraries

Open the Arduino IDE and install the following:

- Adafruit ENS160 Library
- Adafruit AHTX0 Library (works for both AHT20 and AHT21)
- Adafruit Unified Sensor (dependency for many Adafruit libraries)

This code initializes both sensors via I²C and prints climate and air quality data to the Serial Monitor every two seconds.

```
#include <Wire.h>
#include <Adafruit_ENS160.h>
#include <Adafruit_AHTX0.h>

Adafruit_ENS160 ens160;
Adafruit_AHTX0 aht;

void setup() {
  Serial.begin(115200);
  while (!Serial) delay(10); // Wait for Serial Monitor

  Serial.println("ENS160 + AHT21 Test");

  // Initialize AHT21 (Address 0x38)
  if (!aht.begin()) {
    Serial.println("Could not find AHT21 sensor!");
    while (1) delay(10);
  }
  Serial.println("AHT21 initialized.");

  // Initialize ENS160 (Address 0x53 or 0x52)
  // Most combo boards default to 0x53
  if (!ens160.begin(0x53)) {
    Serial.println("Could not find ENS160 sensor!");
    while (1) delay(10);
  }

  // Set operating mode: Standard (detecting)
  ens160.setMode(ENS160_OPMODE_STD);
  Serial.println("ENS160 initialized.");
}

void loop() {
  // 1. Read Climate Data from AHT21
```

```
  sensors_event_t humidity, temp;
  aht.getEvent(&humidity, &temp);

  // 2. Feed Temperature/Humidity to ENS160 for better accuracy
  ens160.setTempRH(temp.temperature, humidity.relative_humidity);

  // 3. Read Air Quality Data from ENS160
  if (ens160.available()) {
    Serial.print("Temp: "); Serial.print(temp.temperature); Serial.println("
C");
    Serial.print("Humidity: "); Serial.print(humidity.relative_humidity);
Serial.println(" %");

    Serial.print("AQI: "); Serial.println(ens160.getAQI());
    Serial.print("TVOC: "); Serial.print(ens160.getTVOC()); Serial.println("
ppb");
    Serial.print("eCO2: "); Serial.print(ens160.getECO2()); Serial.println("
ppm");
    Serial.println("-----------------------");
  }

  delay(2000);
}
```

Usage Tips

- Baud Rate: Set your Serial Monitor to 115200 to match the code above.
- Warm-up: The ENS160 requires about 1 hour to achieve full accuracy, though it will start providing initial readings within 1 minute.
- Address Conflict: If the ENS160 is not found, try changing *ens160.begin(0x53)* to *ens160.begin(0x52)*.
- Library Alternatives: If the Adafruit library doesn't work for your specific breakout, the *DFRobot_ENS160* library is a highly compatible alternative.

I2C topics on lamaPLC

Page	Date	Tags
• lamaPLC Communication: 1-Wire	2026/04/23 21:51	1-wire, communication, bus, microlan, i2c, uart, usart, ds18b20
• lamaPLC Communication: I²C	2025/09/23 21:25	i2c, i c, smbus, philips, bus, communication, arduino
• lamaPLC project: Sension SCD CO² measurement module	2026/04/15 19:34	scd30, scd40, scd41, iaq, ndir, sensor, i2c, arduino code
• LamaPLC: AHT10 Modul	2026/03/22 03:14	communication, i2c, temperature, humidity, sensor, aht, aht 10, modul
• LamaPLC: AHT20 / BMP280 Modul	2026/04/23 21:52	bmp280, aht20, adafruit, temperature, humidity, pressure, sensor, arduino, code, i2c

• LamaPLC: APDS - Avago ALS and proximity detection sensors with I²C communication	2026/04/23 21:52	avago, apds-9900, apds-9930, apds-9960, als, proximity, detection, gesture recognition, gesture, i2c, communication, sensor, arduino, code
• lamaPLC: Arduino Modul: BME680	2026/05/12 18:40	code, c, 2026, arduino, bme680, sensor, i2c, comunication
• lamaPLC: AS5600 Magnetic Induction Angle Measurement Sensor Module	2026/05/13 00:06	communication, i2c, as5600, as-5600, magnetic, induction, angle, sensor
• lamaPLC: Bi-Directional Logic Level Converter 3.3V ↔ 5V	2026/04/12 00:34	bi-directional, logic level converter, i2c, uart, spi
• LamaPLC: BMP/BME Bosch Temperature/Humidity/Pressure sensors with I²C communication	2026/04/23 21:52	bme280, bme680, bme688, bmp180, bmp280, hw-611, hw611, bosch, temperature, humidity, pressure, sensor, arduino, i2c, communication, ai, cjmcu, volatile organic compounds, vocs, volatile sulfur compounds, vscs, iaq
• LamaPLC: CJMCU-219/INA-219 breakout board/IC with I²C communication	2026/04/23 21:52	cjmcu-219, ina-219, ina219, breakout board, i2c, communication, sensor, voltage, current, arduino, code, cjmcu
• LamaPLC: CJMCU-3216 / AP-3216 integrated digital ambient light and proximity sensor module/IC with I²C communication	2026/04/23 21:52	cjmcu-3216, cjmcu, ap-3216, ap3216, ambient light, proximity, sensor, arduino, code, i2c, communication
• lamaPLC: CJMCU-811 CCS811 Gas Sensor (VOCs TVOC CO2)	2026/04/23 21:52	cjmcu-811, ccs811, gas, sensor, vocs, tvoc, eco2, co2, arduino, air quality metal oxide, mox, i2c, micropython, rp2040-eth
• LamaPLC: D6T Omron Non-Contact Thermal Sensors with I²C communication	2026/04/23 21:52	d6t, d6t-32l, d6t-44l, d6t-8l, d6t-1a, omron, non-contact, thermal, sensor, i2c, arduino, code
• LamaPLC: DPS Infineon Temperature/Pressure sensors with I2C communication	2026/04/23 21:52	dps310, infineon, temperature, pressure, sensor, arduino, i2c, communication, code
• lamaPLC: Energy, power, current, and voltage	2025/05/31 23:32	i2c, i c, communication, arduino, energy, power, current, sensor, ina226
• LamaPLC: ENS ScioSense Multi-gas sensors with I²C communication	2026/04/23 21:52	ens160, sciosense, gas-quality, i2c, communication, sensor, arduino, code, eco₂, tvoc, aqi, indoor air quality, iaq, co₂, voc
• lamaPLC: ESP32 / ESP8266	2025/11/22 00:07	esp8266, esp32, esp32-c2, esp32-c3, esp32-c5, esp32-c6, esp32-c61, esp32-h2, esp32-s2, esp32-s3, esp32-p4, espressif systems, communication, ethernet, ip, wi-fi, thread, zigbee, matter, homekit, bluetooth, mqtt, adc, spi, uart, i2c, i2s, rmt, pwm, usb, usb otg, twai

• LamaPLC: Gas sensors	2023/07/01 17:29	gas, sensor, i2c, onewire, communication, mq-3, mq-4, mq-5, mq-6, mq-7, mq-8, mq-9, mq-135, gm-102b, gm-302b, gm-502b, gm-702b, alcohol, ch4, natural gas, smoke, lng, co, co2, lpg, h2, iso-butane, nox, nh3, benzene, town gas, formaldehyde, propane, humidity, temperature, voc, grv gas sens v2
• lamaPLC: GY-511 6DOF sensor module	2026/03/22 01:44	stmicroelectronics, lsm303dlhc, i2c, lsm303, sensor, gy-511, 6dof, pololu, module, arduino
• LamaPLC: GY-9250 MPU-9250/6500 9-axis Attitude Sensor Board	2026/04/23 21:52	ak8963, gy-9250, mpu-9250, 9-axis, motion detection, magnetometer, communication, i c, i2c, spi
• LamaPLC: HDC Texas Instruments Temperature/humidity sensors with I²C communication	2026/04/23 21:52	sht21, htu21, si7021, gy-21, gy-213v, hdc1080, gy-213v-hdc1080, cjmcu, cjmcu-1080, texas instruments, temperature, humidity, sensor, i2c, communication, arduino, code
• lamaPLC: HT16K33 display controller	2026/04/23 21:51	i2c, 7-segment display, display, ht16k33, arduino
• LamaPLC: HTU TE Connectivity temperature/humidity sensors with I²C communication	2026/04/23 21:52	htu, htu31d, htu21d, htu20d, sht20, htu20, sht21, htu21, si7021, gy-21, gy-213v, hdc1080, si702, gy-20, sht31, htu31, si7031, gy-31, te connectivity, temperature, humidity, i2c, communication, sensor, arduino, code
• lamaPLC: INA modules with Arduino libraries	2026/04/23 21:52	i2c, i c, communication, arduino, energy, power, current, monitor, sensor, ina219, gy-219, ina226, gy-216, ina228, gy-228, ina237, ina238, ina260, ina3221, ina
• lamaPLC: INA226 - current/voltage/power monitor with I²C communication	2026/04/23 21:52	i2c, i c, communication, arduino, energy, power, current, monitor, sensor, ina226, ina219, ina
• lamaPLC: LCD 1602/2004 with I²C communication	2026/02/14 18:27	communication, i2c, display, lcd, 1602, 2004, hd44780, pcf8574, pcf8574t, pcf8574at, arduino
• LamaPLC: MAX30100/MAX30102 Heart Rate Click Sensor Module	2026/04/23 21:52	max30102, max30100, heart rate click, sensor, communication, i2c, arduino, code
• lamaPLC: MCP23017 / MCP23S17 16-Bit I/O Expander with Serial Interface I²C / SPI	2026/04/23 21:52	communication, i2c, mcp23017, mcp23s17, spi, i o expander, serial, cjmcu-2317, cjmcu
• lamaPLC: MLX90614 (GY-906) infrared non-contact thermometer	2026/05/08 00:03	communication, i2c, temperature, mlx90614, gy-906, modul, infrared, non-contact thermometer, dsp, pwm, smbus, hailege
• lamaPLC: PCF857x I/O Expander chip/modul with I²C communication	2026/05/14 15:21	communication, i2c, pcf857x, pcf8574, pcf8574a, pcf8575, i o expander, i o extension, nxp, texas instruments

• LamaPLC: Pixart PAJ7620U2 Gesture recognition sensors/module with I²C communication	2026/04/23 21:52	paj7620u2, gy-paj7620, pixart, gesture recognition, i2c, communication, sensor, arduino, code
• lamaPLC: RP2040_ETH_Modul: I²C scanner	2026/05/12 16:20	code, micropython, 2026, rp2040 eth, i2c, comunication
• lamaPLC: RP2040_ETH_Modul: MLX90614 simple	2026/05/12 17:06	code, micropython, 2026, rp2040 eth, i2c, communication, mlx90614
• lamaPLC: RP2040_ETH_Modul: Read BME 680/688 sensor data	2026/05/12 21:06	code, micropython, 2026, rp2040 eth, bme680, i2c, sensor, communication
• lamaPLC: RP2040_ETH_Modul: Read BME 680/688 sensor data and store in Modbus input registers	2026/05/12 18:58	code, micropython, 2026, rp2040 eth, bme680, i2c, sensor, communication
• LamaPLC: SC16IS750 / SC16IS752: One or two serial (UART) ports from microcontroller via I²C or SPI communication	2026/04/23 21:52	cjmcu-750, cjmcu-752, cjmcu, nxp, sc16is750, sc16is752, uart, serial, i2c, spi, modul, converter, arduino, code
• LamaPLC: SGP Sensirion TVOC/VOC sensors with I²C communication	2026/04/15 19:41	sgp30, sgp40, sgp41, sensirion, gas-sensor, i2c, communication, sensor, arduino, code, eco₂, voc, tvoc, indoor air quality, iaq, nox, hydrogen
• LamaPLC: SHT Sensirion Temperature/humidity sensor with I²C communication	2026/04/23 21:52	sht20, sht21, sht25, sht30, sht31, sht35, sht40, gy21, temperature, humidity, i2c, communication, sensor, arduino, code
• lamaPLC: Signal level converters	2026/02/14 23:47	pca9306, i2c, voltage, level, converter
• lamaPLC: st756x display drivers	2026/05/20 16:17	display, driver, i2c, spi, lcd, cog, oled, st7565, st7567, gm12864, gm12864-59n, gm12864-03a, gm12864-01a, gme12864-41
• lamaPLC: TCA9548A (HW617); Low-Voltage 8-Channel I²C Switch Module	2026/02/14 23:51	tca9548a, hw617, i2c, switch, communication, expansion board, arduino
• lamaPLC: TM1637 7-segment display	2026/02/14 18:26	i2c, 7-segment display, display, tm1637, arduino
• LamaPLC: TOFnnnC STMicroelectronics Time-of-Flight (ToF) sensors with I²C communication	2026/04/23 21:52	tof050c, vl6180, tof200c, vl53l0x, tof400c, vl53l1x, stmicroelectronics, time-of-flight, tof, i2c, communication, sensor, arduino, code
• LamaPLC: VL53Lnn STMicroelectronics time-of-flight (ToF) laser-ranging sensors with I²C communication	2026/04/23 21:52	vl53l0x, vl53l1x, vl53l0 1xv2, gy-530, time-of-flight, tof, laser-ranging, i2c, communication, sensor, arduino, code
• LamaPLC: VL6180X STMicroelectronics Time-of-Flight (ToF) sensor with I²C communication	2026/04/23 21:52	vl6180x, stmicroelectronics, time-of-flight, tof, i2c, communication, sensor, arduino, code
• lamaPLC: XGZP68xx: Silicon Pressure Sensors/Module	2026/05/15 15:17	communication, i2c, sensor, modul, pressure, cfsensor, xgzp68xx, xgzp6810d, xgzp6857d, xgzp6859d, xgzp6887d, xgzp6897d, xgzp6899a, piezoresistive, capacitive

• Magnetic angle sensors	2026/03/05 21:19	magnetic angle sensor, magnetic flux, sensor, spi, i2c, pwm, communication, modul, as5047p, as5600, mt6701, mt6816, mt6835, tle5012b, amr, gmr, tmr, anisotropic magnetoresistive
• SSH1106/SSD1306 OLED Display with I²C communication	2026/02/14 18:27	i2c, oled, display, ssd1306, sh1106, ssh1106, arduino, cmos

arduino, ENS160, AHT21, Air Quality, sensor, CO, ECO, TVOC, module, AQI