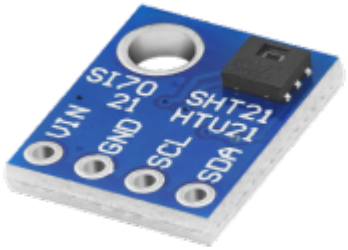
# LamaPLC: HTU TE Connectivity temperature/humidity sensors with I²C communication

The HTUs are highly accurate, digital relative humidity and temperature sensors known for their low power consumption, I²C interface, and factory calibration.




### Key Features

- **High Accuracy:**
  - **Humidity:** Typical accuracy of ±2% RH within the optimized range of 5% to 95% RH.
  - **Temperature:** Typical accuracy of ±0.3°C over an operating range of 0°C to 70°C.
- **Digital I²C Interface:** Uses the common I²C protocol for easy integration with most microcontrollers (e.g., Arduino, ESP32, Raspberry Pi), requiring only two data lines (SDA and SCL) in addition to power.
- **Low Power Consumption:** Designed for battery-powered and power-sensitive applications, with current consumption as low as 0.14µA in sleep mode.
- **Wide Operating Range:**
  - **Humidity:** 0% to 100% RH range.
  - **Temperature:** -40°C to 125°C range.
- **Selectable Resolution:** The resolution can be configured by the user, ranging from 8/12 bits for RH/T to a maximum of 12/14 bits for RH/T, allowing a trade-off between measurement speed and precision.
- **Fast Response Time:** Offers a typical humidity response time of 5 seconds.
- Factory Calibrated & Linearized: Each sensor is individually calibrated and provides a linearized digital signal, eliminating the need for complex calibration routines in the host device.
- **Integrated Fault Detection:** Includes a checksum (CRC) feature to improve communication reliability and an electronic identification code stored on the chip for traceability.
- **Protective Filter Option:** The HTU21D(F) variant includes an optional hydrophobic PTFE filter that protects the sensor from dust and water immersion, preserving performance in demanding environments.
- **Full Interchangeability:** No calibration is required when swapping sensors under standard conditions.

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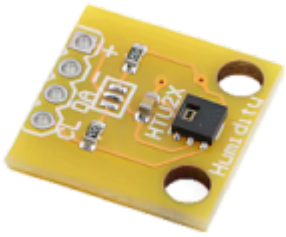
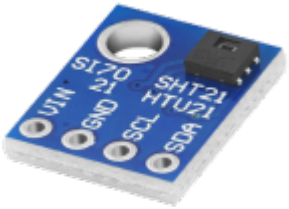
**Difference between HTU31D, HTU21D and HTU20D**

The primary difference among the HTU20D, HTU21D, and HTU31D is an incremental improvement in accuracy, supply-voltage range, and power consumption as the model number increases. The sensors are largely interchangeable and use the same I²C communication protocol.

| Specification | HTU20D | HTU21D | HTU31D |
|---|---|---|---|
| |  |  |  |
| **Similar types** | SHT20, HTU20, Si702, GY-20 [1] | SHT21, HTU21, Si7021, GY-21, GY-213V, HDC1080 [2] | SHT31, HTU31, Si7031, GY-31 [3] |
| **Humidity Accuracy (Typical)** | ±5% RH | ±2% RH | ±2% RH |
| **Temperature Accuracy (Typical)** | Not specified in source | ±0.3°C | ±0.2°C |
| **Supply Voltage Range** | 1.5V - 3.6V | 1.5V - 3.6V | 3V - 5.5V |
| **Power Consumption (Sleep)** | Not specified | ~0.14 µA | ~0.14 µA (estimated based on similar operation) |
| **Interface** | I²C | I²C | I²C |
| **Filter Option** | HTU20D(F) option available | HTU21D(F) option available | HTU31D(F) option available |

[1]: *The SHT20, HTU20, Si702, GY-20 are different manufacturers' versions of essentially the same I²C digital humidity and temperature sensor chip, designed to be hardware- and software-compatible. The GY-20 is a generic breakout board that uses one of these chips.*

[2]: *The SHT21, HTU21, Si7021, GY-21, GY-213V, HDC1080 are very similar digital humidity and temperature sensor chips from different manufacturers (Sensirion, Measurement Specialties, and Silicon Labs, respectively), while the GY-21 is a generic breakout board that uses one of these chips. They are largely interchangeable in hardware and software for most general-purpose applications.*

[3]: *The SHT31, HTU31, Si7031, and GY-31 are high-accuracy digital temperature and humidity sensor chips from different manufacturers (Sensirion, TE Connectivity, and Silicon Labs, respectively) that are designed to be largely interchangeable. The GY-31 is a generic name for a breakout board that typically uses the SHT31 chip.*

## Arduino & HTU31D

To read the HTU31D, the most reliable method is to use the **Adafruit HTU31D** Library. Compared to

the older HTU21D, this sensor handles a wider voltage range (3V–5.5V) and offers even better precision.

### Wiring (I²C)

- **VIN:** 3.3V or 5V
- **GND:** Ground
- **SCL:** Pin A5 (on Uno/Nano)
- **SDA:** Pin A4 (on Uno/Nano)
- **ADR Pin:** Leave disconnected for default address **0x40**. Connect to VIN for 0x41.

### Arduino Example Code

Install the **Adafruit HTU31D** and **Adafruit BusIO** libraries via the Arduino Library Manager.

```
#include <Wire.h>
#include "Adafruit_HTU31D.h"

Adafruit_HTU31D htu = Adafruit_HTU31D();

void setup() {
  Serial.begin(115200);
  while (!Serial) delay(10);

  Serial.println("HTU31D test");

  if (!htu.begin(0x40)) { // Use 0x41 if ADR pin is tied to High
    Serial.println("Couldn't find sensor!");
    while (1);
  }
}

void loop() {
  sensors_event_t humidity, temp;

  // Get both temperature and humidity at once
  htu.getEvent(&humidity, &temp);

  Serial.print("Temp: ");
  Serial.print(temp.temperature);
  Serial.print(" C \t");

  Serial.print("Humidity: ");
  Serial.print(humidity.relative_humidity);
  Serial.println(" %");

  delay(1000);
}
```

### Advanced Features

The HTU31D includes a built-in heater to dry the sensor if it accumulates condensation. You can toggle it in your code:

- *htu.enableHeater(true);* Turn on heater
- *htu.enableHeater(false);* Turn off heater

### Resolution Settings

You can optimize for speed or precision using htu.setResolutions(*temp_res, hum_res*).

- **Temperature:** 0.012°C to 0.04°C resolution.
- **Humidity:** 0.01% to 0.02% resolution.

## 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 | 2026/04/23 21:52 | 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 |

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|---|---|---|
| • 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 |

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|---|---|---|
| • lamaPLC: INA modules with Arduino libraries | 2026/04/11 19:54 | 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: TCA9548A (HW617); Low-Voltage 8-Channel I²C Switch Module | 2026/02/14 23:51 | tca9548a, hw617, i2c, switch, communication, expansion board, arduino |

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|---|---|---|
| • 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 |

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