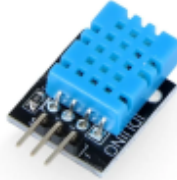
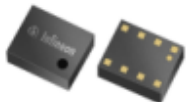
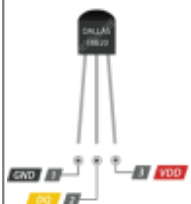
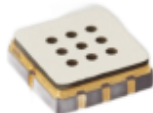
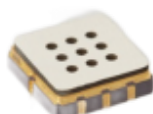
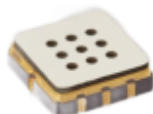
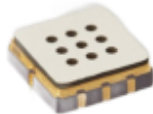


Type of measurement	Model	Power voltage	Measurement, range, accuracy	Communication	Note
 Airflow Sensor Nebulizer Air Switch	Unidro 6025/6027 	3.3V (2.5 .. 4.5V)	Output voltage: 3.7V	Analog	Load current: 5mA Response time: 46ms
 Temperature Humidity	Adafruit AM2315C 	3.3 / 5 V (2.2 .. 5.5V)	Temperature measurement range: -40 .. +80 °C Temperature measurement accuracy: ±0.3°C Humidity measurement range: 0..100% RH Humidity measurement accuracy: ±2%	I ² C	Measure: 3.2 mW Reaction time: 8s
 Temperature Air-pressure	Bosch BMP180 	3.3 V (1.62 .. 3.6V)	Temperature measurement range: -40 .. +85 °C Temperature measurement accuracy: ±1.5°C Air pressure Range: 4.35PSI .. 15.95PSI (30kPa .. 110kPa) Air pressure accuracy: ±2%	I ² C default addr.: 0x77 (fix)	Maximum Pressure: 145.04PSI (1000kPa) Temperature resolution: 0.1 °C Pressure resolution: 1 Pa
 Temperature Humidity Air pressure	Bosch BME280 	3.3 V (1.71 .. 3.6V)	Temperature measurement range: -40 .. +80 °C Temperature measurement accuracy: ±0.5°C (-40..85) Humidity measurement range: 0..100% RH Humidity measurement accuracy: ±3% Air pressure Range: 300 .. 1100 hPa Air pressure accuracy: ±0.25%	I ² C default addr.: 0x76/77 SPI	-

Type of measurement	Model	Power voltage	Measurement, range, accuracy	Communication	Note
 Temperature Humidity Air pressure	Bosch BME680 	3.3 V (1.71 .. 3.6V)	Temperature measurement range: -40 .. +80 °C Temperature measurement accuracy: $\pm 1.5^{\circ}\text{C}$ Humidity measurement range: 0..100% RH Humidity measurement accuracy: $\pm 3\%$ Air pressure Range: 300 .. 1100 hPa Air pressure accuracy: $\pm 0.25\%$	I²C default addr.: 0x76/77 SPI	Direct output of IAQ: Index for Air Quality
 Temperature Air-pressure	Bosch BMP280 	3.3 V (1.71 .. 3.6V)	Temperature measurement range: -40 .. +85 °C Temperature measurement accuracy: $\pm 1.5^{\circ}\text{C}$ Air pressure Range: 4.35PSI .. 15.95PSI (30kPa .. 110kPa) Air pressure accuracy: $\pm 2\%$	I²C default addr.: 0x76 SPI	Maximum Pressure: 290.08PSI (2000kPa) Temperature resolution: 0.01 °C Pressure resolution: 0.16 Pa
 CO ₂ VOC	Sciosense CCS811 	3.3V (1.8 .. 3.6V)	equivalent CO ₂ (eCO ₂): 400 ppm .. 32768 ppm equivalent Total Volatile Organic Compound (eTVOC): 0 ppb .. 29206 ppb.	I²C default address: 0x5A / 0x5B	Standard (100kbit/s) and fast (400kbit/s) I ² C interface Power Consumption maximum: 46 mW
 Non-Contact Thermal Sensor	Omron D6T-32L 	5V	Number of elements: 1024 (32 × 32) Current consumption: 19 mA Object temperature detection: D6T-32L-01A: 0 to 200°C	I²C	Response time: 200 msec Arduino lib
 Non-Contact Thermal Sensor	Omron D6T-44L 	5V	Number of elements: 16 (4 × 4) Current consumption: 5 mA Object temperature detection: D6T-44L-06: 5 .. 50°C D6T-44L-06H: 5 .. 200°C	I²C	Response time: 300 msec Arduino lib

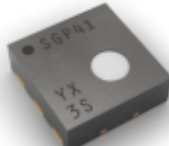
Type of measurement	Model	Power voltage	Measurement, range, accuracy	Communication	Note
 Non-Contact Thermal Sensor	Omron D6T-8L 	5V	Number of elements: 8 (1 × 8) Current consumption: 5 mA Object temperature detection: D6T-8L-09: 5 .. 50°C D6T-8L-09H: 5 .. 200°C	I ² C	Response time: 250 msec Arduino lib
 Non-Contact Thermal Sensor	Omron D6T-1A 	5V	Number of elements: 1 (1 × 1) Current consumption: 3.5 mA Object temperature detection: D6T-1A-01: 5 .. 50°C D6T-1A-02: -40 .. 80°C	I ² C	Response time: 100 msec Arduino lib
  Temperature Humidity	DHT11 	3.3 / 5 V (3.3 .. 5.5V)	Temperature measurement range: 0 .. +50 °C Temperature measurement accuracy: ±2°C Humidity measurement range: 20..90% RH Humidity measurement accuracy: ±5%	1-Wire	8 bit resolution, response time 10 sec
  Temperature Humidity	DHT20 	3.3 / 5 V (2.2 .. 5.5V)	Temperature measurement range: -40 .. +80 °C Temperature measurement accuracy: ±0.5°C (-40..80) Humidity measurement range: 0..100% RH Humidity measurement accuracy: ±3%	I ² C default addr.: 0x38	-
  Temperature Humidity	DHT22 AM2302 	3.3 / 5 V (2.2 .. 5.5V)	Temperature measurement range: -40 .. +80 °C Temperature measurement accuracy: ±0.5°C (-40..80) Humidity measurement range: 0..100% RH Humidity measurement accuracy: ±2%	single-bus	-

Type of measurement	Model	Power voltage	Measurement, range, accuracy	Communication	Note
 Barometric Pressure Sensor	Infineon DPS310 	3.3V	Supply voltage: VDD _{IO} : 1.2 .. 3.6 V Operation range: Pressure: 300 .. 1200 hPa. Temperature: -40 - 85 °C Pressure sensor precision: ± 0.002 hPa (or ±0.02 m) (high precision mode) Relative accuracy: ± 0.06 hPa (or ±0.5 m) Absolute accuracy: ± 1 hPa (or ±8 m) Temperature accuracy: ± 0.5°C Pressure temperature sensitivity: 0.5Pa/K	I²C or SPI I2C default address: 0x76 (SDO←GND) or 0x77 (SDO←VDD _{IO})	Measurement time: Typical: 27.6 ms
 Temperature	Dallas DS18B20 	3.3 / 5 V (3.3 .. 5.5V)	Temperature measurement range: -55 .. +125 °C Temperature measurement accuracy: ±0.5°C	1-Wire	9 to 12 bit (selectable) resolution Conversion Time < 750ms Current Consumption: 1mA
 NO ²	MEMS GM-102b 	5V	Detection Range: 0.1~10ppm (NO ²) Heater Resistance: 80Ω±20Ω@room temperature	analog signal	-
 alcohol gas	MEMS GM-302b 	5V	Detection Range: 1..500ppm (Ethanol vapor) 80Ω±20Ω@room temperature	analog signal	-
 Alcohol (C ₂ H ₅ OH) Hydrogen(H ₂) Formaldehyde(CH ₂ O)	MEMS GM-502b 	5V	Detection: Alcohol (C ₂ H ₅ OH), 10..500ppm Detection: Hydrogen(H ₂), 1..1000ppm Detection: Formaldehyde(CH ₂ O), 10..100ppm	analog signal	-

Type of measurement	Model	Power voltage	Measurement, range, accuracy	Communication	Note
 Carbon monoxide (CO) Hydrogen (H2)	MEMS GM-702b 	5V	Detection: Carbon monoxide sensor (CO) : 10..5000ppm Hydrogen sensor (H2): 10..500ppm	analog signal	-
 TVOC eCO2	ScioSense ENS-160 	3.3V	Detection: TVOC: 0..65000ppm eCO2: 400..65000ppm AQI-UBA1: 1..5 (Classified TVOC output signal)	I ² C default addr.: 0x40	-
  Temperature Humidity	Texas Instruments HDC 1080 	3.3 - 5 V (2.7 .. 5.5V)	Temperature measurement range: -40 .. +125 °C Temperature measurement accuracy: ±0.2°C Humidity measurement range: 0..100% RH Humidity measurement accuracy: ±2%	I ² C default addr.: 0x40	14 Bit Measurement Resolution 100 nA Sleep Mode Current
  Temperature Humidity	TE Connectivity HTU21 	3.3V (1.5 .. 3.6V)	Temperature measurement range: -40 .. +125 °C Temperature measurement accuracy: ±0.3°C Humidity measurement range: 0..100% RH Humidity measurement accuracy: ±2%	I ² C default addr.: 0x40 (fix)	Power Dissipation: 2.7 µW Resolution: 12 / 8 bit Measuring Time: 3..16 ms
 Carbon monoxide (CO) Methane (CH4) Ethanol (C2H5OH) Propane (C3H8) Butane (C4H10) Hydrogen (H2) Hydrogen sulfide (H2S) Ammonia (NH3)	Fermion MICS-5524 V1.0 	5V	The module is intended for educational and hobby purposes! Measuring range: 1 .. 1000 ppm (carbon monoxide CO) 10 .. 500ppm (Ethanol C2H5OH) 1 .. 1000ppm (Hydrogen H2) 1 .. 500 ppm (NH3 ammonia) > 1000 ppm (methane CH4)	analog signal	-

Type of measurement	Model	Power voltage	Measurement, range, accuracy	Communication	Note
G Smoke gas Combustible gas	Winsen MQ-2 	5V	Flammable gas concentration: 300 .. 10'000ppm Heater Resistance; RH: $29\Omega \pm 3\Omega$ room tem. Heater consumption; PH: $\leq 950\text{mW}$ Sensitivity; S: $R_0(\text{in air}) / R_s (2000 \text{ ppm } C_3H_8) \geq 5$ Output Voltage; Vs: $2.5V \sim 4.0V$ in 2000 ppm C_3H_8 Concentration Slope; α : $\leq 0.6 (R_{3000 \text{ ppm}} / R_{1000 \text{ ppm } C_3H_8})$	analog signal	Lifespan: 10 years Preheat time: Over 24 hour
G Alcohol gas Small sensitivity: Benzine gas	Winsen MQ-3 	5V	Detecting concentration scope $0.05 \text{ mg} / 10 \text{ mg/L}$ Alcohol Sensing Resistance: $1 \text{ M}\Omega - 8 \text{ M}\Omega (0.4 \text{ mg/L alcohol})$	analog signal	Preheat time: Over 24 hour
G CH_4 gas Natural gas LNG Small sensitivity: Alcohol Smoke	Winsen MQ-4 	5V	Detecting concentration scope $200-10'000\text{ppm}$ CH_4 , natural gas Sensing Resistance: $10K\Omega - 60K\Omega (1000\text{ppm } CH_4)$	analog signal	Preheat time: Over 24 hour
G LPG Iso-butane Propane Small sensitivity: Alcohol Smoke	Winsen MQ-5 	5V	Detecting concentration scope $200-10'000\text{ppm}$ LPG, LNG, Natural gas, Iso-butane, Propane, Town gas Sensing Resistance: $10K\Omega - 60K\Omega (5000 \text{ ppm methane})$	analog signal	Preheat time: Over 24 hour

Type of measurement	Model	Power voltage	Measurement, range, accuracy	Communication	Note
G Town gas Natural gas LPG LNG Iso-butane Propane Small sensitivity: Alcohol Smoke	Winsen MQ-6 	5V	Detecting concentration scope 200-10'000ppm LPG ,iso-butane, propane, LNG Sensing Resistance: 10KΩ- 60KΩ (10'00ppm LPG)	analog signal	Preheat time: Over 24 hour
G CO	Winsen MQ-7 	5V	Detecting concentration scope over 300 ppm CO (Carbon Monoxide) Sensing Resistance: 2KΩ- 20KΩ (100 ppm CO)	analog signal	Preheat time: Over 48 hour
G H ₂ Small sensitivity: Alcohol LPG cooking fumes	Winsen MQ-8 	5V	Detecting concentration scope 100-10000ppm Hydrogen (H ₂) Sensing Resistance: 10KΩ- 60KΩ (1000 ppm H ₂)	analog signal	Preheat time: Over 24 hour
G CO CH ₄ gas LPG	Winsen MQ-9 	5V	Detecting range 20 ppm .. 2000 ppm carbon monoxide 500 ppm .. 10'000 ppm CH ₄ 500 ppm .. 10'000 ppm LPG Sensing Resistance: 2KΩ- 20KΩ (100 ppm CH ₄)	analog signal	Preheat time: Over 48 hour
G NO _x NH ₃ alcohol Benzene smoke CO ₂	Winsen MQ-135 	5V	Detecting range 10 ppm .. 300 ppm NH ₃ 10 ppm .. 1000 ppm Benzene 10 ppm .. 300 ppm Alcohol Sensing Resistance: 30KΩ- 200KΩ (100 ppm NH ₃)	analog signal	Preheat time: Over 24 hour

Type of measurement	Model	Power voltage	Measurement, range, accuracy	Communication	Note
 Oxygen	AlphaSense O2-A2 	5V	Range of oxygen sensor: 0..30 % Load resistance: 47-100 Ω	analog signal	-
   CO ₂ humidity temperature	SCD-30 	3.3V / 5V	Humidity range: 0 .. 100 %RH Temperature range: -40°C .. 70°C CO ₂ range: 0 .. 40'000 ppm (I ² C, UART), 0 .. 5'000 ppm (PWM)	UART (Modbus Point to Point; TTL Logic), PWM and I ² C	Response time: 20s Sensor lifetime: 15 years
   CO ₂ Air-quality Temperature Humidity	Sensirion SCD40-D-R2 	3.3V / 5V (2.4 .. 5.5V)	CO ₂ output range: 0 .. 40'000 ppm CO ₂ measurement accuracy: ± 40 ppm Humidity measurement range: 0 %RH .. 100 %RH Humidity measurement accuracy: ±6 %RH Temperature measurement range: 10°C .. 60°C Temperature measurement accuracy: ±1.5 °C	I ² C default address: 0x62	SCL clock frequency: 100 kHz
 VOC - CO ₂ -eq Sensor	Sensirion SGP30 	1.8V	Supply voltage 1.62 .. 1.98 V Measurement range (CO ₂ -eq): 0 .. 1000 ppm Specified range: Ethanol signal: 0.3 ppm .. 30 ppm H ₂ signal 0.5 ppm .. 3 ppm	I ² C I2C default address: 0x58	Sampling frequency: Max. 40 Hz Data sheet
 Indoor Air Quality Sensor for VOC Measurements	Sensirion SGP40 	3.3V	Supply voltage 1.7 .. 3.6 V Ethanol in clean air: 0 .. 1000 ppm	I ² C I2C default address: 0x59	Sampling frequency: Max. 40 Hz Data sheet
 Air Quality Sensor for VOC and NOx Measurements	Sensirion SGP41 	3.3V	Supply voltage 1.7 .. 3.6 V Ethanol in clean air: 0 .. 1.000.000 ppm NO ₂ in clean air: 0 .. 10.000 ppm	I ² C I2C default address: 0x59	Sampling frequency: Max. 40 Hz Data sheet

Type of measurement	Model	Power voltage	Measurement, range, accuracy	Communication	Note
 Temperature Humidity	Sensirion SHT20 	3.3V (2.1 .. 3.6V)	Temperature measurement range: -40 .. +125 °C Temperature measurement accuracy: $\pm 0.3^{\circ}\text{C}$ Humidity measurement range: 0..100% RH Humidity measurement accuracy: $\pm 3\%$	I²C default addr.: 0x40/41	3.2 μW (at 8 bits, 1 measurement /s)
 Temperature Humidity	Sensirion SHT21 	3.3V (2.1 .. 3.6V)	Temperature measurement range: -40 .. +125 °C Temperature measurement accuracy: $\pm 0.3^{\circ}\text{C}$ Humidity measurement range: 0..100% RH Humidity measurement accuracy: $\pm 2\%$	I²C default addr.: 0x40/41	3.2 μW (at 8 bits, 1 measurement /s)
 Temperature Humidity	Sensirion SHT25 	3.3V (2.1 .. 3.6V)	Temperature measurement range: -40 .. +125 °C Temperature measurement accuracy: $\pm 0.2^{\circ}\text{C}$ Humidity measurement range: 0..100% RH Humidity measurement accuracy: $\pm 1.8\%$	I²C default addr.: 0x40/41	3.2 μW (at 8 bits, 1 measurement /s)
 Temperature Humidity	Sensirion SHT30 	3.3 / 5 V (2.15 .. 5.5V)	Temperature measurement range: -40 .. +125 °C Temperature measurement accuracy: $\pm 0.2^{\circ}\text{C}$ Humidity measurement range: 0..100% RH Humidity measurement accuracy: $\pm 2\%$ (10..90%)	I²C default addr.: 0x44/45	4.8 μW (1 measurement/s)

Type of measurement	Model	Power voltage	Measurement, range, accuracy	Communication	Note
 Temperature Humidity	Sensirion SHT31 	3.3 / 5 V (2.15 .. 5.5V)	Temperature measurement range: -40 .. +125 °C Temperature measurement accuracy: $\pm 0.2^{\circ}\text{C}$ Humidity measurement range: 0..100% RH Humidity measurement accuracy: $\pm 2\%$ (0..100%)	I²C default addr.: 0x44/45	4.8 μW (1 measurement/s)
 Temperature Humidity	Sensirion SHT35 	3.3 / 5 V (2.15 .. 5.5V)	Temperature measurement range: -40 .. +125 °C Temperature measurement accuracy: $\pm 0.2^{\circ}\text{C}$ Humidity measurement range: 0..100% RH Humidity measurement accuracy: $\pm 1.5\%$ (0..80%)	I²C default addr.: 0x44/45	4.8 μW (1 measurement/s)
 Temperature Humidity	Sensirion SHT40 	3.3 (1.08 .. 3.6V)	Temperature measurement range: -40 .. +125 °C Temperature measurement accuracy: $\pm 0.2^{\circ}\text{C}$ Humidity measurement range: 0..100% RH Humidity measurement accuracy: $\pm 1.8\%$	I²C default addr.: 0x44/45	4.0 μW (1 measurement/s)
 Temperature Humidity	Siliconlabs Si-7021 	3.3V (1.9 .. 3.6V)	Temperature measurement range: -40 .. +125 °C Temperature measurement accuracy: $\pm 0.3^{\circ}\text{C}$ Humidity measurement range: 0..100% RH Humidity measurement accuracy: $\pm 2\%$	I²C default addr.: 0x40	-

Type of measurement	Model	Power voltage	Measurement, range, accuracy	Communication	Note
T Temperature	Microchip TC1047A 	5 / 3.3V (2.5 .. 5.5V)	Temperature measurement range: -40 .. +125 °C Temperature measurement accuracy: $\pm 0.5^{\circ}\text{C}$	analog 10mV/°C	Maximum Supply Current 60uA
G Methane Natural gas	GL Sciences TGS-2611 	5V	Sensor resistance in 5000ppm of methane at 20°C and 65% R.H. Sensor resistance: 0.68 .. 6.8 kΩ in 5000 ppm methane	analog signal	Conditioning period before test: 7 days

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