



RELATIVE HUMIDITY MODULE

HM 1504

Based on the rugged HS1101 capacitive humidity sensor, HM1504 is a dedicated humidity transducer designed for **measurements at high temperature**. Direct interface with a micro-controller is made possible with the module's linear voltage output.

MAIN FEATURES

- Small size
- Not affected by water immersion
- High reliability and long term stability
- Typical 1 to 4 Volt DC output for 0 to 100 % RH at 5 V DC supply
- Calibrated within +/- 3 % RH @ 55 % RH
- Very low temperature dependence
- Ratiometric to voltage supply within the specified range
- Suitable for 3 to 7 Volts supply voltage

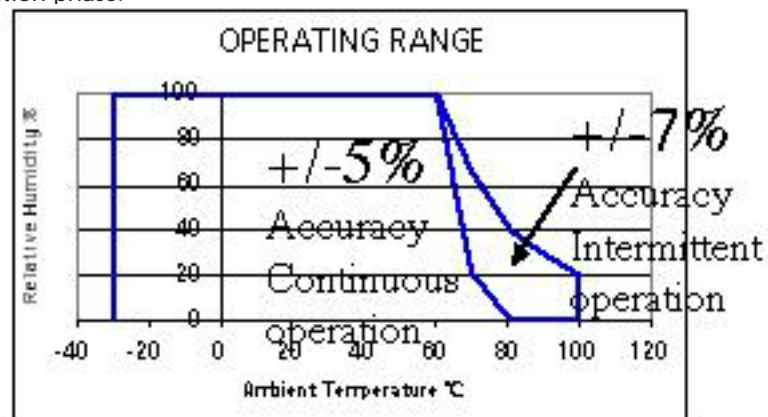


HUMIDITY SENSOR SPECIFIC FEATURES

- Instantaneous de-saturation after long periods in saturation phase.
- Patented solid polymer structure.
- High resistance to chemicals.
- Fast response time.

MAXIMUM RATINGS

| Ratings | Symbol | Value | Unit |
|-----------------------------|--------|-----------|------|
| Storage Temperature | Tstg | -30 to 85 | °C |
| Supply Voltage (Peak) | Vs | 7 | Vdc |
| Humidity Operating Range | RH | 0 to 100 | % RH |
| Temperature Operating Range | Ta | -30 to 80 | °C |



Peak conditions up to 100°C : less than 10% of the operational time.

CHARACTERISTICS

(Ta = 23°C, Vs = 5Vdc, RL > 1MΩ unless otherwise stated)

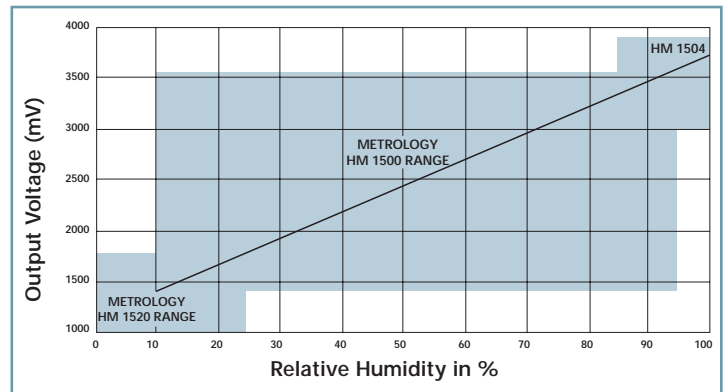
| Characteristics | Symbol | Min. | Typ. | Max. | Unit. |
|---|----------|------|--------|-------|---------|
| Humidity measuring range | RH | 1 | | 99 | % RH |
| Relative Humidity accuracy (10 to 95 % RH) | RH | | +/- 3 | +/- 5 | % RH |
| Voltage supply | Vs | 4.75 | 5.00 | 5.25 | V |
| Nominal output @ RH = 55 % / Ta 23°C | Vout | 2.40 | 2.55 | 2.70 | V |
| Nominal output @ RH = 30 % / Ta 90°C | Vout | 1.80 | 2.00 | 2.20 | V |
| Temperature coefficient (10 to 50 °C) | Tcc | | + 0.1 | | % RH/°C |
| Averaged Sensitivity from 33% to 75% RH | ΔmV/% RH | | + 25 | | mV/% RH |
| Sink current capability (RL = 15 kΩ) | Is | | | 300 | μA |
| Recovery time after 150 hours of condensation | t | | 10 | | s |
| Humidity Hysteresis | | | +/-1.5 | | % RH |
| Long term stability | | | 0.5 | | % RH/yr |
| Response time (33 to 76 % RH, static, @ 63 %) | τ | | 10 | | s |
| Output impedance | Z | | 70 | | Ω |

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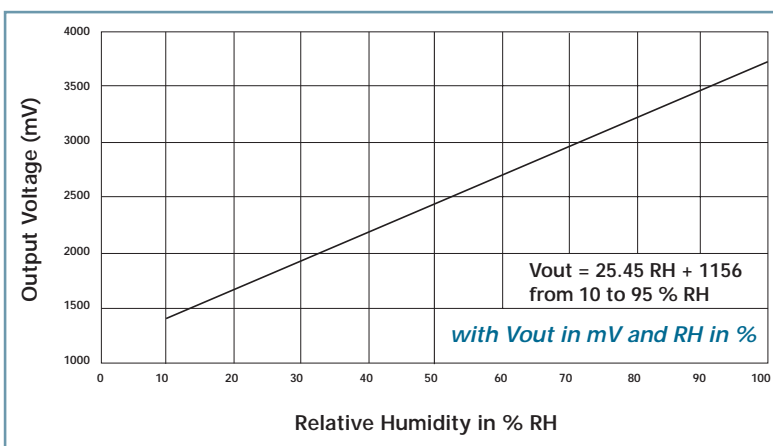
MEASUREMENT CONDITIONS

- HM1504 is specified for accurate measurements within 10 to 95% RH.
- Excursion out of this range (< 10% or > 95% RH, including condensation) does not affect the reliability of HM1504 characteristics.

HM 1504 Typical Measuring Ranges in Humidity



HM1504 MODELLED LINEAR VOLTAGE OUTPUT (Vs = 5V)



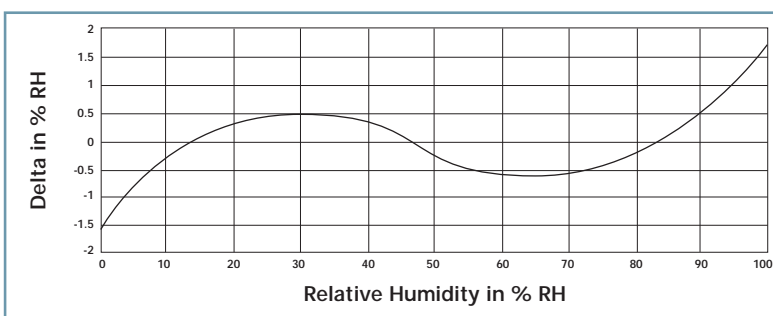
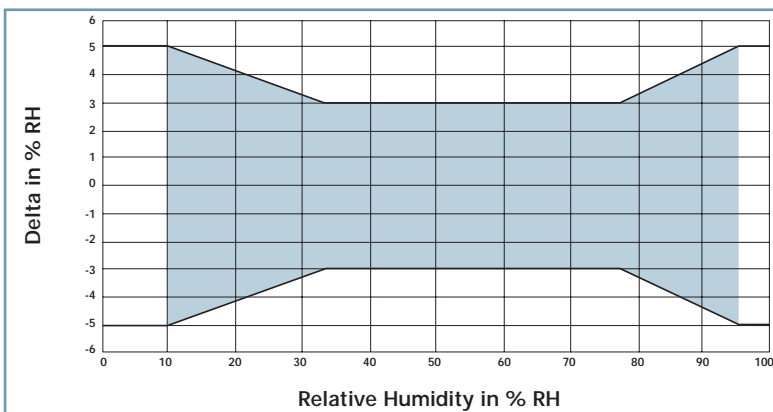
REFERENCE OUTPUT VALUES

| RH (%) | V _{out} (mV) | RH (%) | V _{out} (mV) |
|--------|-----------------------|--------|-----------------------|
| 10 | 1400 | 55 | 2550 |
| 15 | 1535 | 60 | 2675 |
| 20 | 1670 | 65 | 2800 |
| 25 | 1800 | 70 | 2925 |
| 30 | 1930 | 75 | 3055 |
| 35 | 2055 | 80 | 3185 |
| 40 | 2180 | 85 | 3315 |
| 45 | 2305 | 90 | 3455 |
| 50 | 2430 | 95 | 3595 |

Reversed Polynomial Equation

$$V_{out} = 6.43E^{-4}RH^3 - 9.73E^{-2}RH^2 + 29.6RH + 1112$$

ERROR BUDGET AT 23°C



HM1504 ERROR LIMITS at 23°C

Temperature coefficient compensation

$$RH_{Cor}\% = RH\%_{Computed} + (23 - T_a) * 0.15$$

Non linearity compensation

$$RH\% = -1.464E^{-9}V_{out}^3 + 1.072E^{-5}V_{out}^2 + 1.430E^{-2}V_{out} - 27$$

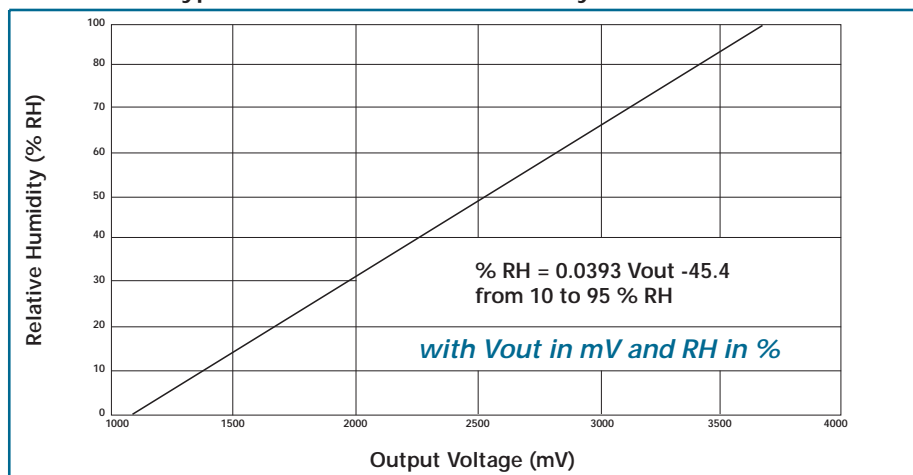
All equations V_{out} in mV, RH in %, T_a in °C.

LINEARITY ERROR OF HM1504 MODULE

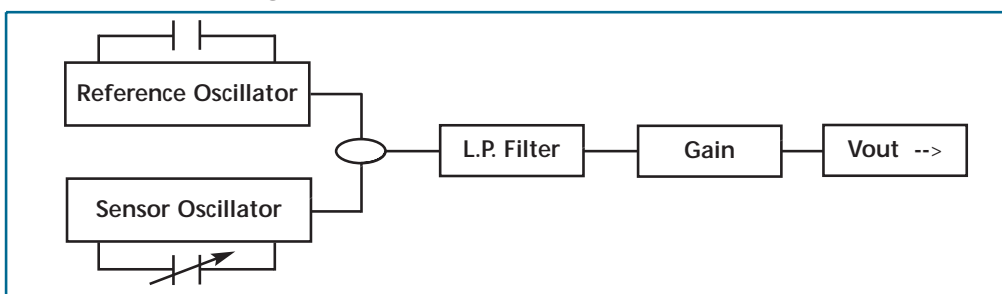
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HUMIDITY MEASUREMENT USING HM1504

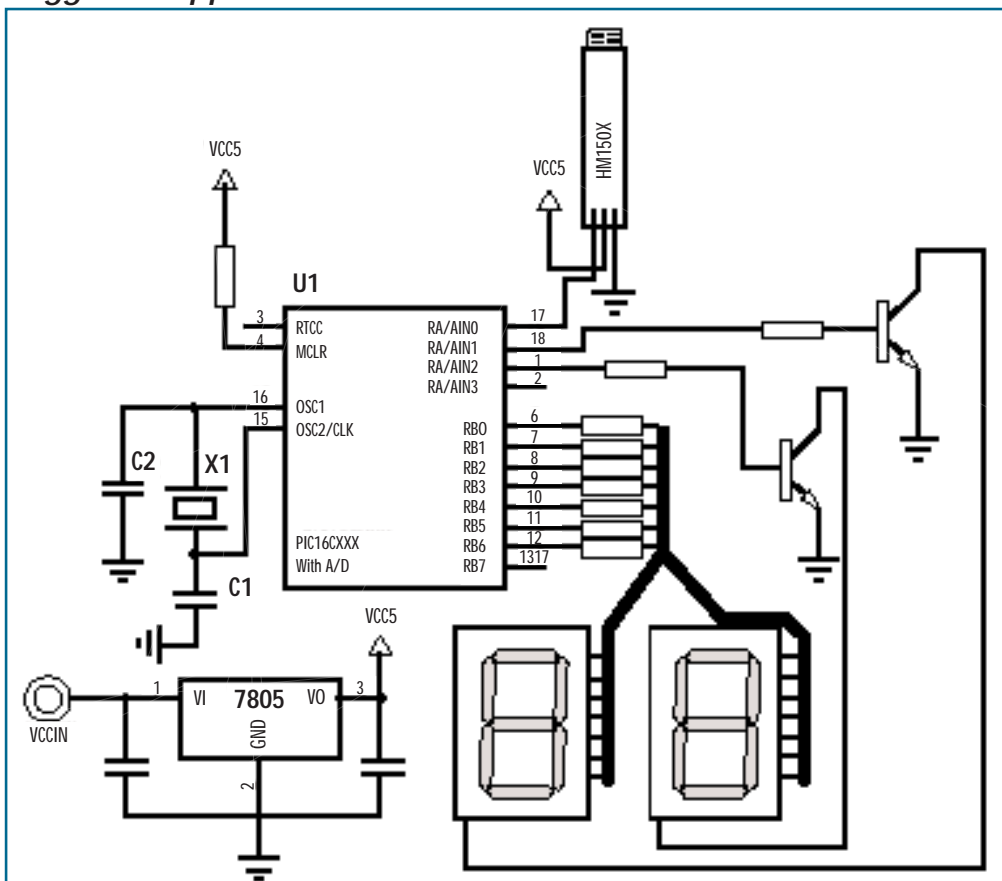
Typical HM 1504 relative Humidity measurement



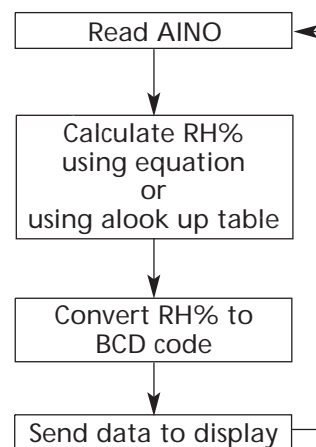
Internal block diagram of HM1504



Suggested applications for HM1504



Steps of 1% RH are achievable by using 8-bit A/D.
If more resolution is required a 10-bit A/D needs to be used and a third display will be added, giving steps of 0.2% RH



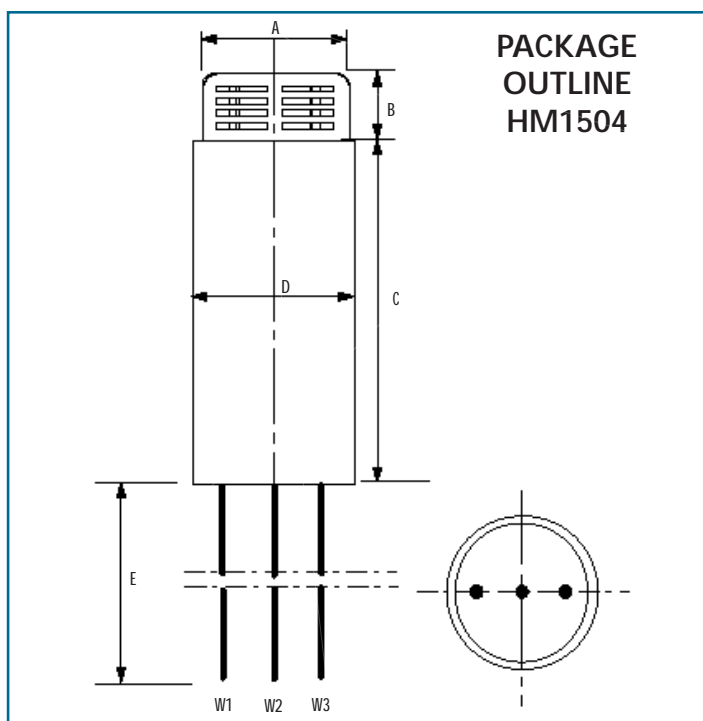
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● RESISTANCE TO PHYSICAL AND CHEMICAL STRESSES

- HM1504 has passed through qualification processes of HUMIREL including vibration, shock, storage, high temperature and humidity, ESD.
- Additional tests under harsh chemical conditions demonstrate good operation in presence of salt atmosphere, SO₂ (0.5%), H₂S (0.5%), O₃, NO_x, NO, CO, CO₂, Softener, Soap, Toluene, acids (H₂SO₄, HNO₃, HCl), HMDS, Insecticide, Cigarette smoke, a non exhaustive list.
- HM1500 is not light sensitive.

● SPECIFIC PRECAUTIONS

- HM1504 is not protected against reversed polarity - Check carefully when connecting the device.
- If you wish to use HM1504 in a chemical atmosphere not listed above, consult us.



| Dim | Min (mm) | Max (mm) |
|-----|----------|----------|
| A | 9.70 | 10.20 |
| B | 5.00 | 5.50 |
| C | 52 | 54 |
| D | 11.2 | 11.6 |
| E* | 200 | 250 |

* specific length available on request

| Wire | Color | Function |
|------|--------|----------------|
| W1 | White | GROUND |
| W2 | Blue | SUPPLY VOLTAGE |
| W3 | Yellow | OUTPUT VOLTAGE |

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