



TEMPERATURE AND HUMIDITY MODULE

HF 3223 / HTF 3223

Based on the rugged HS1101 humidity sensor, HF 3223 / HTF 3223 is a dedicated **humidity and temperature transducer** designed for OEM applications where a reliable and accurate measurement is needed. It features a miniature connector for easy, cost-effective mechanical mounting. Direct interface with a micro-controller is made possible with the module's linear **frequency output**.

MAIN FEATURES

- Size and connector type match existing humidity modules.
- Stable, linear proportional frequency output from 10 to 95% RH.
- Calibrated within +/- 5% RH @ 55% RH.
- Optional 10 K +/- 3% NTC temperature sensor (HTF 3223)
- Stable characteristics with temperature.
- High reliability and long term stability.



HUMIDITY SENSOR SPECIFIC FEATURES

- Instantaneous de-saturation after long periods in saturation phase.
- Fast response time.
- High resistance to chemicals.
- Not affected by water immersion.
- Patented solid polymer structure.

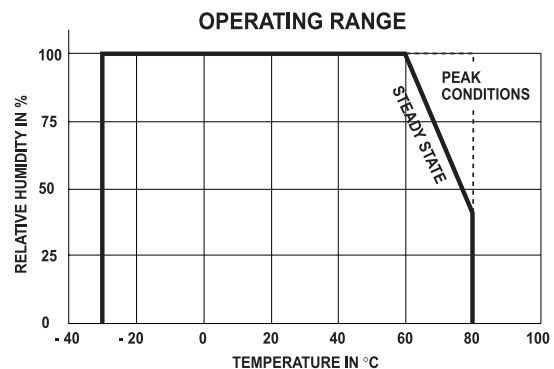


TEMPERATURE SENSOR SPECIFIC FEATURES

- High quality thermistor
- Stable
- High sensitivity

MAXIMUM RATINGS

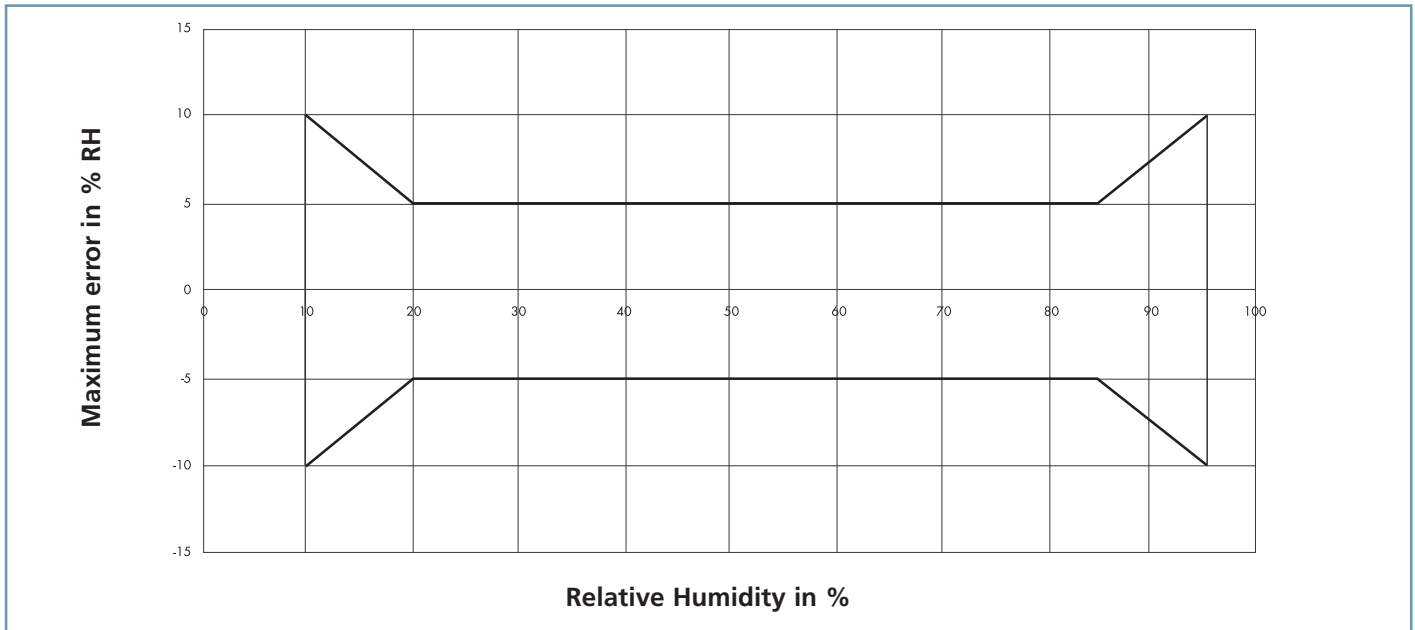
| Ratings | Symbol | Value | Unit |
|-----------------------------|-------------------|-----------|-----------------|
| Storage Temperature | T _{stg} | -40 to 85 | °C |
| Storage Humidity Range | RH _{stg} | 0 to 100 | % RH |
| Supply Voltage (Peak) | V _s | 7 | V _{dc} |
| Humidity Operating Range | RH | 0 to 99 | % RH |
| Temperature Operating Range | T _a | -30 to 80 | °C |



CHARACTERISTICS

Humidity sensor (T_a = 25°C, V_s = 5.0 V_{dc} +/- 5%, R_L > 100 KΩ unless otherwise stated)

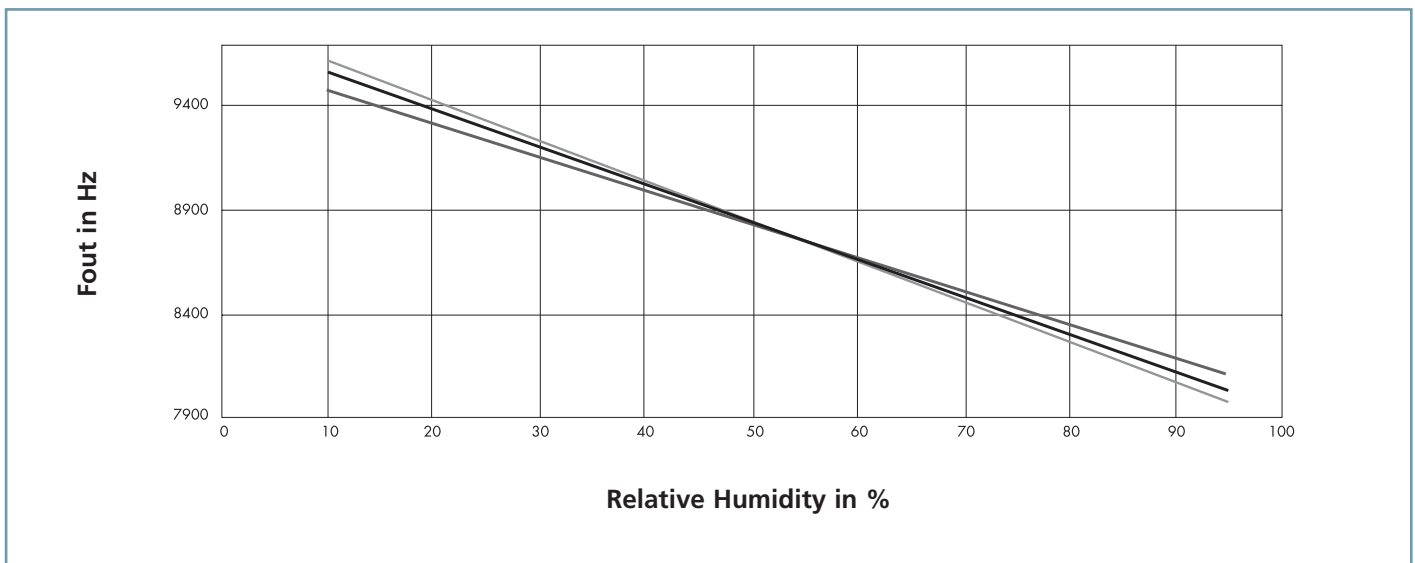
| Characteristics | Symbol | Min. | Typ. | Max. | Unit. |
|---|-------------------------|------|---------|--------|-----------------|
| Humidity metrology range | RH | 10 | | 95 | % RH |
| Relative Humidity accuracy (10 to 95 % RH) | RH | | +/- 5 | +/- 10 | % RH |
| Voltage supply | V _s | 4.75 | 5.0 | 5.25 | V _{dc} |
| Nominal output @ RH = 55 % | F _{out} | 8670 | 8750 | 8830 | Hz |
| Current consumption | I _c | | | 0.1 | mA |
| Temperature coefficient (0 to 60 °C) | T _{cc} | | +/- 0.1 | | % RH/°C |
| Averaged Sensitivity from 33 % to 75 % RH | ΔF _{out} /Δ RH | -16 | - 18 | -19 | Hz/% RH |
| Sink current capability | I _s | | 100 | | 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 |

Relative Humidity Accuracy of HF 3223 / HTF 3223


Modeled Signal output (Linear Reference curve) : $F_{out} = 9740 - 18 \cdot RH$ with F_{out} in Hz and RH in %

Typical response look-up table

| RH (%) | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
|-----------------------|------|------|------|------|------|------|------|------|------|------|------|
| F _{out} (Hz) | | | 9560 | 9470 | 9380 | 9290 | 9190 | 9110 | 9020 | 8930 | 8840 |
| RH (%) | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | |
| F _{out} (Hz) | 8750 | 8660 | 8570 | 8480 | 8390 | 8300 | 8210 | 8120 | 8030 | | |

Typical , Minimum and Maximum Frequency Values for HF 3223 / HTF3223


Calibration data are traceable to NIST standards through CETIAT laboratory.

CHARACTERISTICS

Temperature sensor (Ta = 25°C)

| Characteristics | Symbol | Min. | Typ. | Max. | Unit. |
|------------------------------|-----------|-------------|-------------|-------------|-----------|
| Nominal resistance @ 25°C | | | 10 | | kΩ |
| Beta value : B25/100 | B | 3600 | 3730 | 3800 | |
| Temperature measuring range | Ta | - 30 | | 80 | °C |
| Nominal Resistance Tolerance | Rn | | 2 | 3 | % |
| B value tolerance | B | | 3 | | % |
| Response Time | τ | | 10 | | s |

Typical temperature output

Depending on the needed temperature measurement range and associated accuracy, we suggest two methods to access to the NTC resistance values.

$$\textcircled{1} \quad R_T = R_N * e^{B \left(\frac{1}{T} - \frac{1}{T_N} \right)}$$

- R_T NTC resistance in Ω at temperature T in K
- R_N NTC resistance in Ω at rated temperature in K
- T, T_N Temperature in K
- B B value, material-specific constant of the NTC thermistor
- e Base of natural logarithm (e = 2.71828)

The actual characteristic of an NTC thermistor can, however, only be roughly described by the exponential relation, as the material parameter B in reality also depends on temperature. So this approach is only suitable for describing a restricted range around the rated temperature or resistance with sufficient accuracy.

- $\textcircled{2}$ For practical applications a more precise description of the real R/T curve may be required. Either more complicated approaches (e.g. the Steinhart-Hart equation) are used or the resistance/temperature relation as given in tabulated form. The below table has been experimentally determined with utmost accuracy for temperature increments of 1 degree.

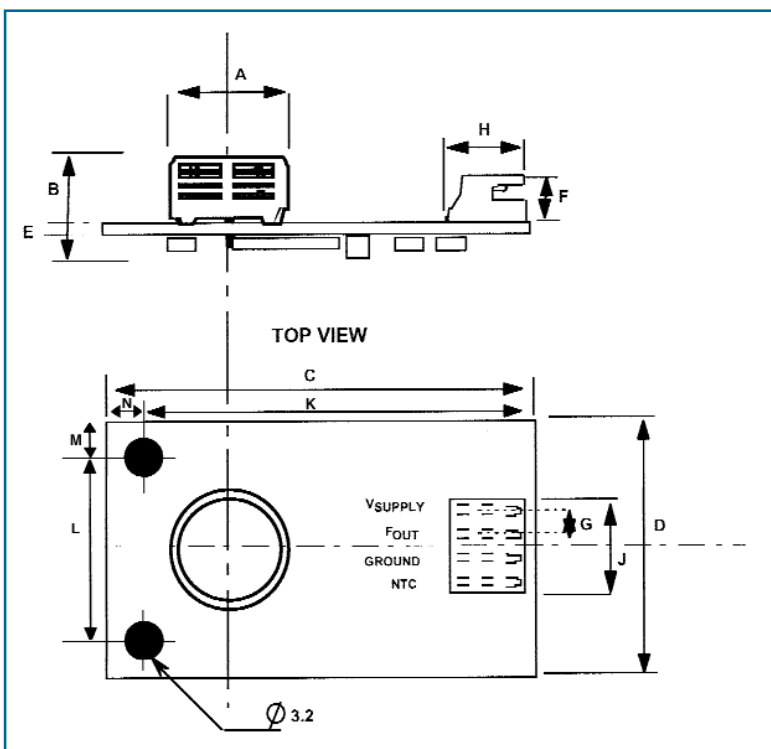
| Temperature °C | Resistance (ohm) | Max. Deviation | Temperature °C | Resistance (ohm) | Max. Deviation | Temperature °C | Resistance (ohm) | Max. Deviation | Temperature °C | Resistance (ohm) | Max. Deviation |
|-------------------|---------------------|-------------------|-------------------|---------------------|-------------------|-------------------|---------------------|-------------------|-------------------|---------------------|-------------------|
| -30 | 144790 | 16636 | -2 | 33100 | 2230 | 26 | 9600 | 300 | 54 | 3360 | 213 |
| -29 | 136664 | 15444 | -1 | 31557 | 2078 | 27 | 9218 | 300 | 55 | 3237 | 208 |
| -28 | 129054 | 14343 | 0 | 30029 | 1932 | 28 | 8853 | 299 | 56 | 3126 | 204 |
| -27 | 121925 | 13325 | 1 | 28627 | 1799 | 29 | 8506 | 297 | 57 | 3019 | 200 |
| -26 | 115243 | 12383 | 2 | 27299 | 1675 | 30 | 8178 | 296 | 58 | 2917 | 197 |
| -25 | 109030 | 11516 | 3 | 26042 | 1560 | 31 | 7866 | 294 | 59 | 2819 | 193 |
| -24 | 103115 | 10705 | 4 | 24852 | 1452 | 32 | 7568 | 292 | 60 | 2720 | 189 |
| -23 | 97565 | 9953 | 5 | 23773 | 1355 | 33 | 7283 | 290 | 61 | 2629 | 185 |
| -22 | 92354 | 9257 | 6 | 22708 | 1261 | 34 | 7011 | 287 | 62 | 2542 | 182 |
| -21 | 87460 | 8612 | 7 | 21698 | 1174 | 35 | 6734 | 284 | 63 | 2458 | 178 |
| -20 | 82923 | 8020 | 8 | 20739 | 1093 | 36 | 6484 | 281 | 64 | 2378 | 175 |
| -19 | 78581 | 7463 | 9 | 19829 | 1017 | 37 | 6244 | 278 | 65 | 2304 | 171 |
| -18 | 74497 | 6947 | 10 | 18959 | 946 | 38 | 6015 | 275 | 66 | 2229 | 168 |
| -17 | 70655 | 6468 | 11 | 18128 | 879 | 39 | 5796 | 271 | 67 | 2158 | 165 |
| -16 | 67039 | 6023 | 12 | 17338 | 817 | 40 | 5575 | 267 | 68 | 2089 | 161 |
| -15 | 63591 | 5606 | 13 | 16588 | 759 | 41 | 5373 | 264 | 69 | 2022 | 158 |
| -14 | 60381 | 5222 | 14 | 15876 | 705 | 42 | 5180 | 260 | 70 | 1960 | 155 |
| -13 | 57356 | 4865 | 15 | 15207 | 654 | 43 | 4995 | 257 | 71 | 1898 | 152 |
| -12 | 54503 | 4533 | 16 | 14569 | 607 | 44 | 4817 | 253 | 72 | 1839 | 149 |
| -11 | 51813 | 4225 | 17 | 13962 | 563 | 45 | 4636 | 248 | 73 | 1782 | 146 |
| -10 | 49204 | 3932 | 18 | 13384 | 522 | 46 | 4473 | 245 | 74 | 1727 | 143 |
| -9 | 46767 | 3662 | 19 | 12834 | 484 | 47 | 4316 | 241 | 75 | 1673 | 140 |
| -8 | 44467 | 3411 | 20 | 12280 | 447 | 48 | 4166 | 237 | 76 | 1622 | 138 |
| -7 | 42296 | 3177 | 21 | 11777 | 413 | 49 | 4021 | 233 | 77 | 1573 | 135 |
| -6 | 40247 | 2960 | 22 | 11297 | 382 | 50 | 3874 | 229 | 78 | 1526 | 132 |
| -5 | 38279 | 2756 | 23 | 10840 | 353 | 51 | 3737 | 225 | 79 | 1480 | 130 |
| -4 | 36455 | 2568 | 24 | 10404 | 325 | 52 | 3606 | 221 | 80 | 1432 | 127 |
| -3 | 34731 | 2393 | 25 | 10000 | 300 | 53 | 3481 | 217 | | | |

QUALIFICATION PROCESS

Resistance to physical and chemical stresses

- **HF3223 / HTF3223** 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.
- **HF3223 / HTF3223** is not light sensitive.

PACKAGE OUTLINE HF3223 / HTF3223



| Dim | A | B | C | D | E | F | G |
|-----|------|-----|------|------|------|-----|------|
| Min | 9.7 | 8.5 | 33.5 | 21.5 | 1.55 | 3.5 | 1.45 |
| Max | 10.8 | 9.5 | 34.5 | 22.5 | 1.65 | 3.9 | 1.55 |

| Dim | H | J | K | L | M | N | Φ |
|-----|-----|-----|------|------|-----|-----|-----|
| Min | 4.5 | 7.3 | 29.5 | 13.8 | 3.5 | 3.5 | 3.0 |
| Max | 4.7 | 7.7 | 30.5 | 14.2 | 4.5 | 4.5 | 3.4 |

Dimensions in millimeters

Connector type : JST model S4B-ZR

to be mated with ZHR or 04ZR type female connectors

ORDERING INFORMATION (Multiple Package Quantity of 40 pieces) :
HF3223 : Humidity Frequency output alone
HTF3223 : Humidity Frequency output + NTC (Temperature direct output)

**SAMPLE KIT OF HF 3223 | HTF 3223
 IS AVAILABLE THROUGH
 HUMIREL WEB SITE**

www.humirel.com

email : sales@humirel.com

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