



## 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.

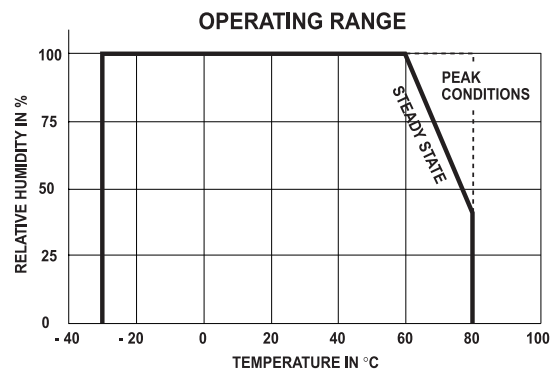


### TEMPERATURE SENSOR SPECIFIC FEATURES

- High quality thermistor
- Stable
- High sensitivity

### MAXIMUM RATINGS

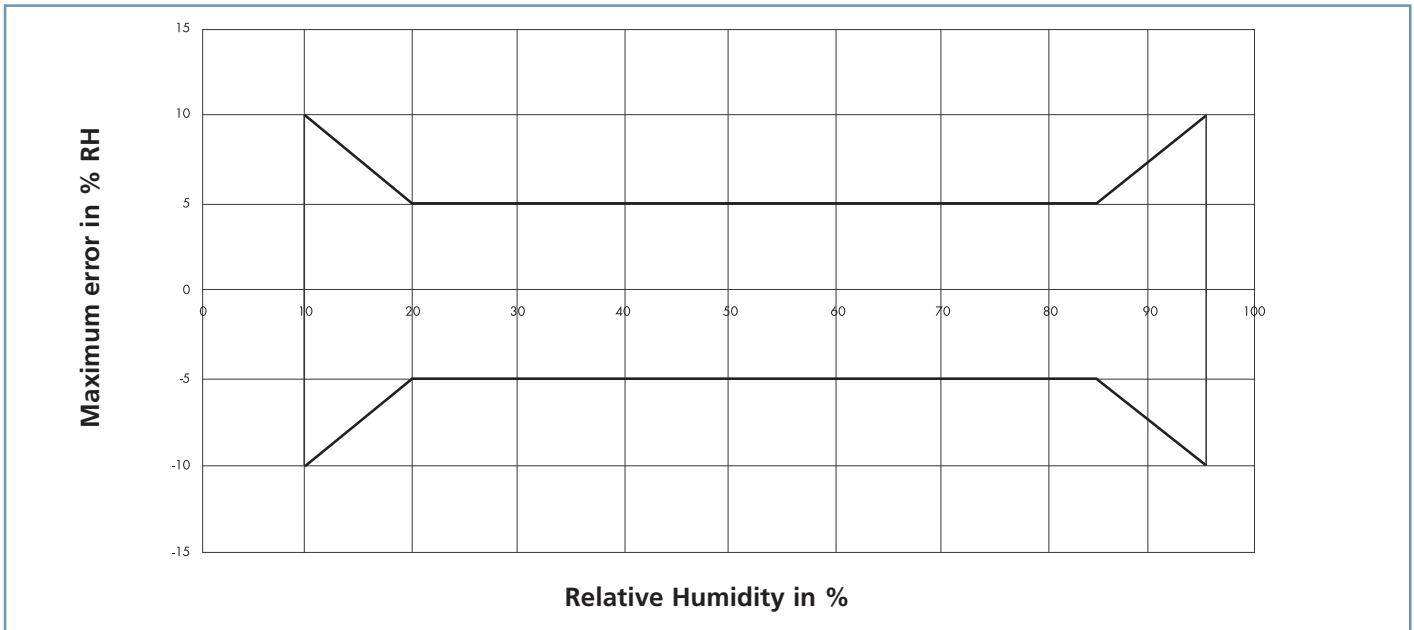
Ratings	Symbol	Value	Unit
Storage Temperature	T <sub>stg</sub>	-40 to 85	°C
Storage Humidity Range	RH <sub>stg</sub>	0 to 100	% RH
Supply Voltage (Peak)	V <sub>s</sub>	7	Vdc
Humidity Operating Range	RH	0 to 99	% RH
Temperature Operating Range	T <sub>a</sub>	-30 to 80	°C



### CHARACTERISTICS

**Humidity sensor** (T<sub>a</sub> = 25°C, V<sub>s</sub> = 5.0 Vdc +/- 5%, R<sub>L</sub> > 100 KΩ unless otherwise stated)

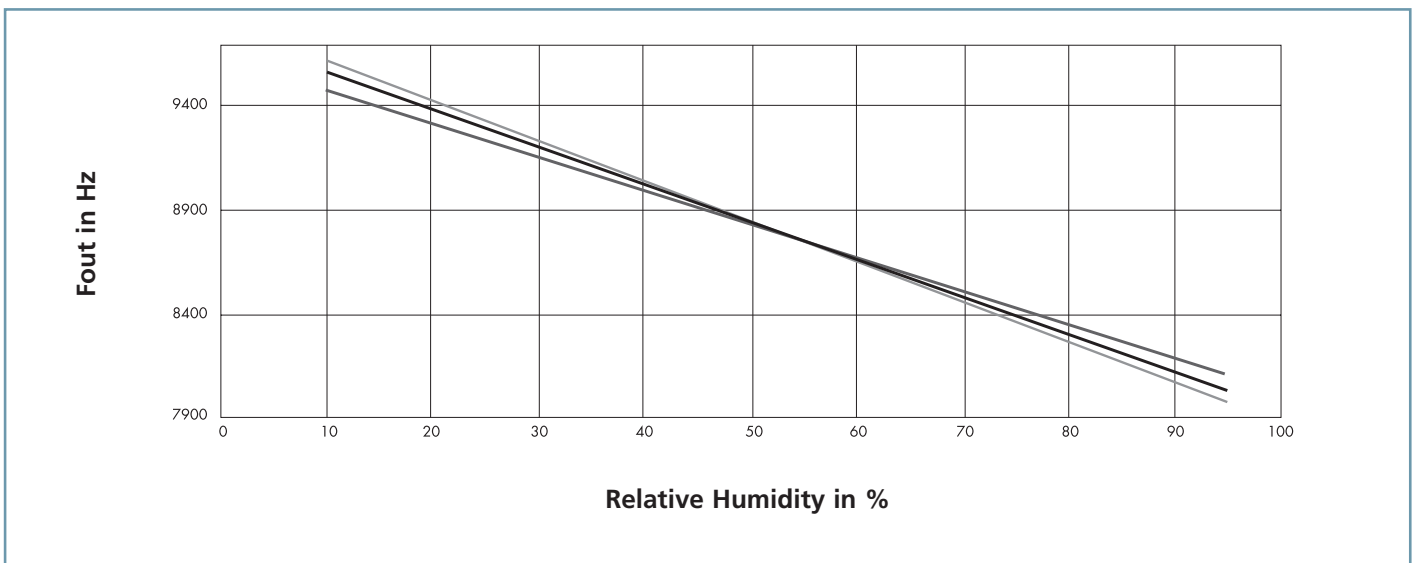
Characteristics	Symbol	Min.	Typ.	Max.	Unit.
Humidity metrology range	RH	10		95	% RH
Relative Humidity accuracy (10 to 95 % RH)	RH		+/- 5	+/- 10	% RH
Voltage supply	V <sub>s</sub>	4.75	5.0	5.25	Vdc
Nominal output @ RH = 55 %	F <sub>out</sub>	8670	8750	8830	Hz
Current consumption	I <sub>c</sub>			0.1	mA
Temperature coefficient (0 to 60 °C)	T <sub>cc</sub>		+/- 0.1		% RH/°C
Averaged Sensitivity from 33 % to 75 % RH	ΔF <sub>out</sub> /Δ RH	-16	- 18	-19	Hz/% RH
Sink current capability	I <sub>s</sub>		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 <sub>out</sub> (Hz)			9560	9470	9380	9290	9190	9110	9020	8930	8840
RH (%)	55	60	65	70	75	80	85	90	95	100	
F <sub>out</sub> (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			<b>10</b>		<b>kΩ</b>
Beta value : B25/100	<b>B</b>	<b>3600</b>	<b>3730</b>	<b>3800</b>	
Temperature measuring range	<b>Ta</b>	<b>- 30</b>		<b>80</b>	<b>°C</b>
Nominal Resistance Tolerance	<b>Rn</b>		<b>2</b>	<b>3</b>	<b>%</b>
B value tolerance	<b>B</b>		<b>3</b>		<b>%</b>
Response Time	$\tau$		<b>10</b>		<b>s</b>

### 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  $\Omega$  at temperature T in K
- $R_N$  NTC resistance in  $\Omega$  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.

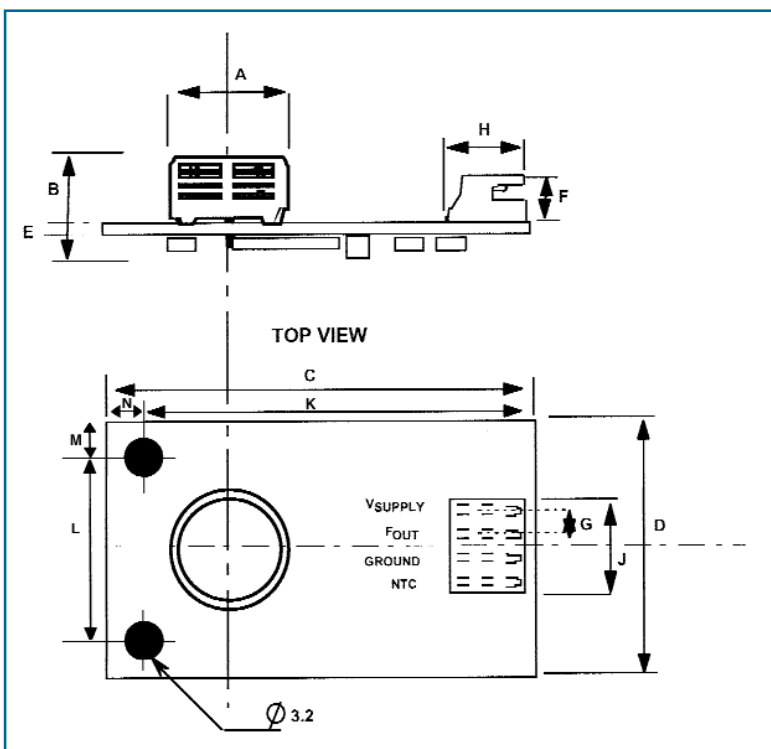
Temperature °C	Resistance (ohm)	Max. Deviation	Temperature °C	Resistance (ohm)	Max. Deviation	Temperature °C	Resistance (ohm)	Max. Deviation	Temperature °C	Resistance (ohm)	Max. Deviation
-30	144790	16636	-2	33100	2230	26	9600	300	54	3360	213
-29	136664	15444	-1	31557	2078	27	9218	300	55	3237	208
-28	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	<b>25</b>	<b>10000</b>	<b>300</b>	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, SO<sub>2</sub> (0.5%), H<sub>2</sub>S (0.5%), O<sub>3</sub>, NO<sub>x</sub>, NO, CO, CO<sub>2</sub>, Softener, Soap, Toluene, acids (H<sub>2</sub>SO<sub>4</sub>, HNO<sub>3</sub>, 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.sunstare.com](http://www.sunstare.com)

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