



# RELATIVE HUMIDITY MODULE

# HM1500

Based on the rugged HS1101 capacitive humidity sensor, HM1500 is a dedicated humidity transducer designed for OEM applications where a reliable and accurate measurement is needed. Direct interface with a micro-controller is made possible with the module's linear voltage output.

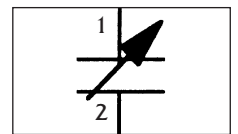


## MAIN FEATURES

- Small size
- Not affected by water immersion
- Full interchangeability
- 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 +/- 2% RH @ 55% RH
- Very low temperature dependence
- Ratiometric to voltage supply
- Suitable for 3 to 10 Volts supply voltage

## HUMIDITY SENSOR SPECIFIC FEATURES

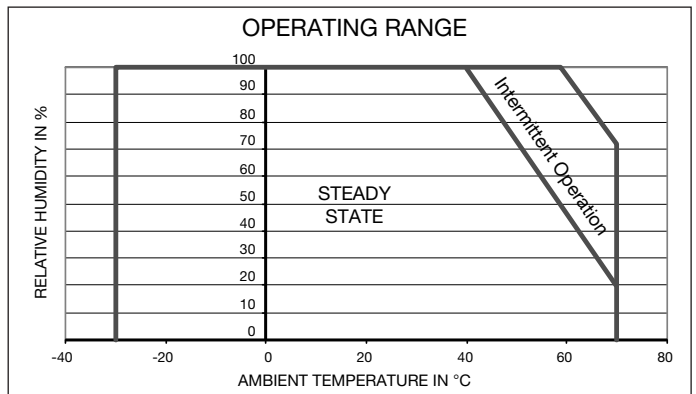
- Instantaneous de-saturation after long periods in saturation phase.
- Patented solid polymer structure.
- High resistance to chemicals.
- Fast response time.



## MAXIMUM RATINGS

Ratings	Symbol	Value	Unit
Storage Temperature	Tstg	-30 to 70	°C
Supply Voltage (peak)	Vs	12	Vdc
Humidity Operating Range	RH	0 to 100	% RH
Temperature Operating Range	Ta	-30 to 60	°C

Peak conditions: less than 10% of the operational time.



## CHARACTERISTICS

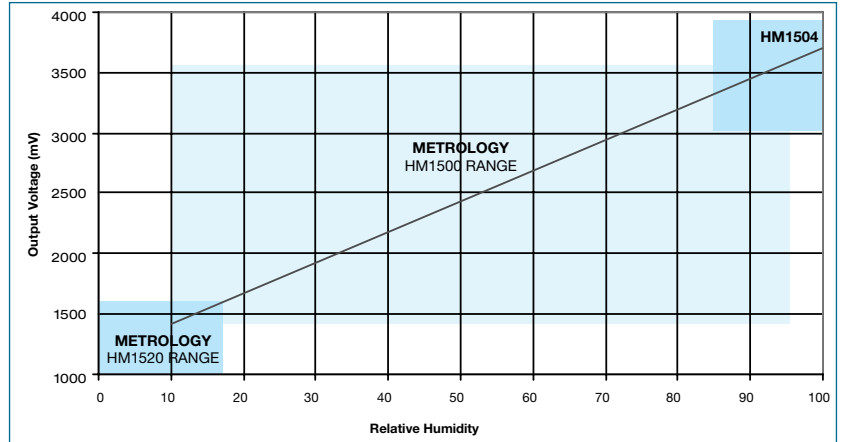
(Ta = 23°C, Vs = 5Vdc, RL > 1MΩ otherwise stated)

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%	Vout	2.42	2.48	2.54	V
Current consumption	Ic		0.4	0.8	mA
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		5		s
Output impedance					Ω

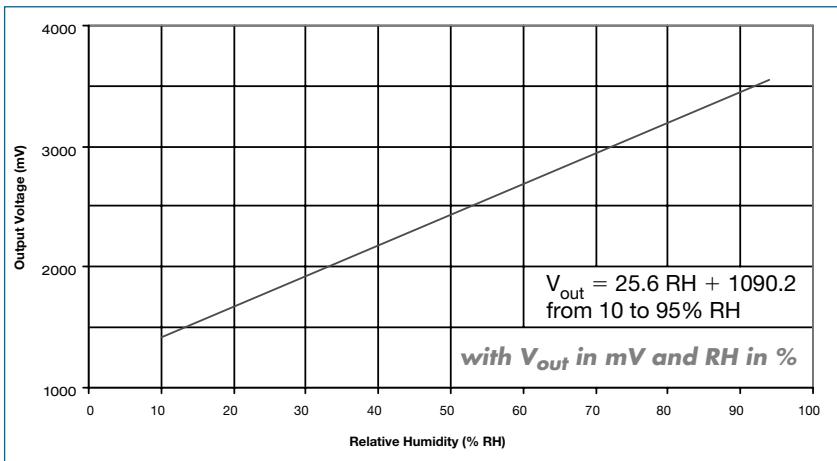
## MEASUREMENT CONDITIONS

- HM1500 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 HM1500 characteristics.
- Dedicated HM15XX Product are available for extreme RH conditions (as HM1520 for low dewpoints) - Consult HUMIREL for further information.

HM 15XX Typical Measuring Ranges in Humidity



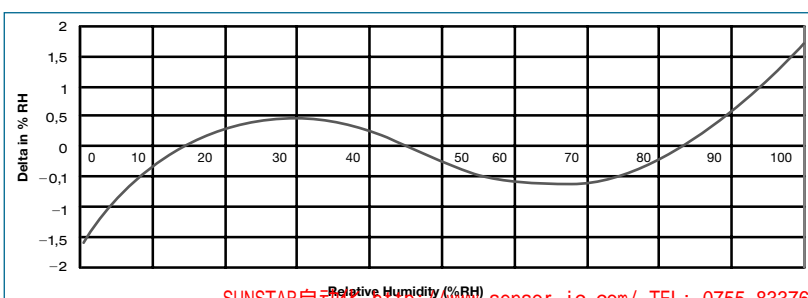
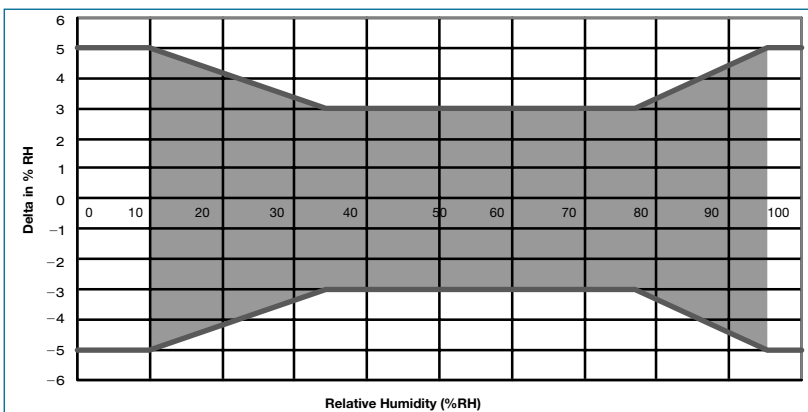
## HM1500 MODELLED LINEAR VOLTAGE OUTPUT ( $V_S = 5V$ )



### REFERENCE OUTPUT VALUES

RH (%)	$V_{out}$ (mV)	RH (%)	$V_{out}$ (mV)
10	1330	55	2480
15	1475	60	2600
20	1610	65	2730
25	1740	70	2860
30	1870	75	2980
35	1995	80	3115
40	2120	85	3250
45	2235	90	3390
50	2360	95	3530

## ERROR BUDGET AT 23°C



### HM1500 ERROR LIMITS

*If needed, additional compensations can be done by using the following equations.*

#### 1. Temperature coefficient:

$$RH\% = V_{out} 10^{-3} (39.1 - 0.056 T_a) - 38.5$$

#### 2. Non linearity:

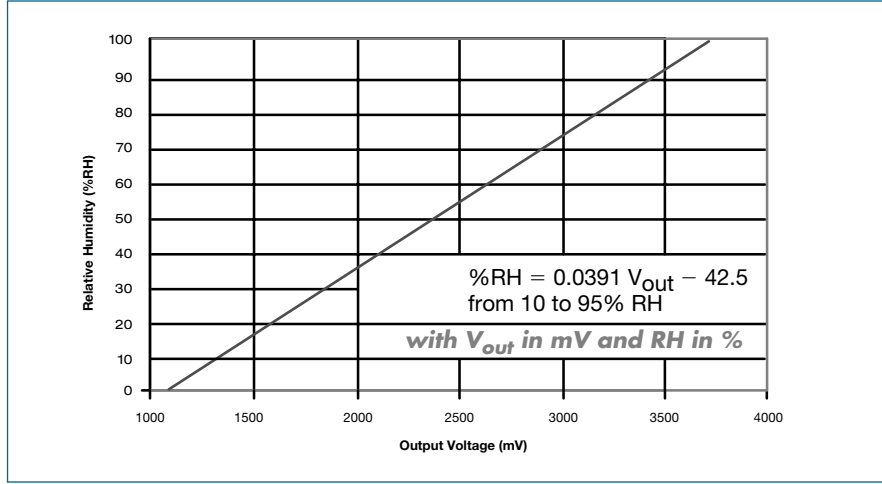
$$RH\% = -1.95E^{-9} V_{out}^3 + 1.36E^{-5} V_{out}^2 + 8.97E^{-3} V_{out} - 21.5$$

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

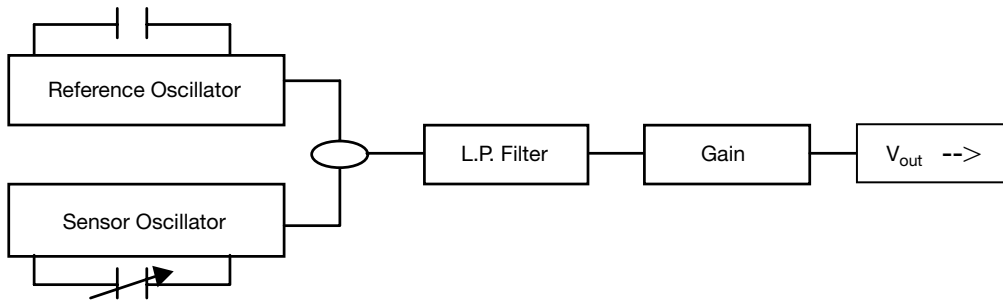
### LINEARITY ERROR OF HM1500 MODULE

# HUMIDITY MEASUREMENT USING HM1500

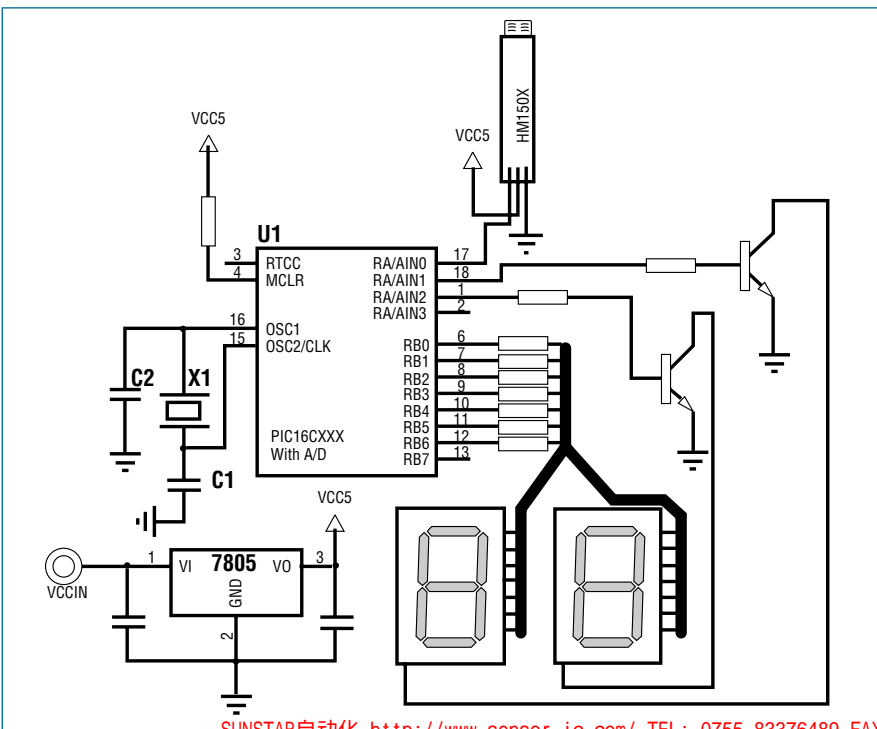
Typical HM 1500 relative Humidity measurement



## Internal block diagram of HM1500

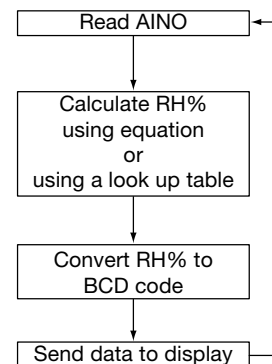


## Suggested applications for HM1500

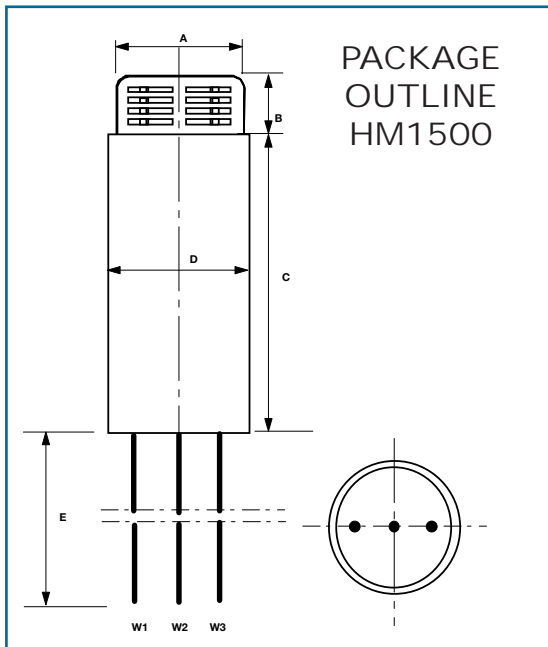


Steps of 1% RH are achievable by using 8-bit A/D.

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



- RESISTANCE TO PHYSICAL AND CHEMICAL STRESSES.
  - HM1500 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.
  - HM1500 is not light sensitive.
- SPECIFIC PRECAUTIONS
  - HM1500 is not protected against reversed polarity - Check carefully when connecting the device.
  - If you wish to use HM1500 in a chemical atmosphere not listed above, consult us.



Dim	Min (mm)	Max (mm)
<b>A</b>	9.70	10.20
<b>B</b>	5.00	5.50
<b>C</b>	52	54
<b>D</b>	11.2	11.6
<b>E*</b>	200	250

\* specific length available on request

Wire	Color	Function
<b>W1</b>	White	GROUND
<b>W2</b>	Blue	SUPPLY VOLTAGE
<b>W3</b>	Yellow	OUTPUT VOLTAGE

**ORDERING INFORMATION (MULTIPLE PACKAGE QUANTITY OF 10 PIECES).  
HM1500: HUMIDITY ANALOG VOLTAGE OUTPUT MODULE.**

**SAMPLE KIT OF HM1500  
IS AVAILABLE THROUGH  
HUMIREL WEB SITE**

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