

## SMARTEC CAPACITIVE HUMIDITY SENSOR HS07/08A

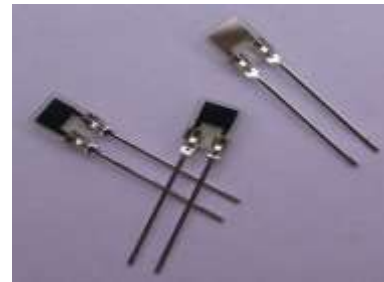
The capacitive humidity sensor of Smartec is based on silicon technology on glass wafer. Due to the use of this process it is possible to make sensors on a high volume scale on a low cost way.

The Smartec humidity sensor consists of three layers. The base and top layer are conductive and the layer in between is humidity sensitive polyimide. The selection of this sensitive interface makes the sensor highly independent to temperature effects. The top layer has grid like structure. The sensor converts the humidity into a capacitance. Due to the construction the response to humidity is very fast (<15 sec) and the hysteresis very low (<2% RH)



### Typical applications

- Hygrometers, consumer goods
- Humidifiers and Dehumidifiers
- Medical applications
- Weather stations
- Automotive
- HVAC
- Food processing
- Room comfort control



### Product Highlights

- The Smartec capacitive humidity sensor measures from 0 to 100 % RH. In many applications condensation on the sensor may occur. This has no effect on the performance of the sensor but the response time while drying will be large.
- The linearity of the Smartec is within a band of 2% in the range between 20 and 95% RH.
- The response time is relatively fast so in case where this is needed the Smartec humidity sensors can be applied (response time < 15 s.)

### Specifications

measured @ 25 °C, sensor excitation: 1V @ 20 kHz

Parameter	Condition	HS07			HS08A			Unit
		Min	Typ	Max	Min	Typ	Max	
Capacitance	55% RH	310	330	350	170	180	190	pF
Sensitivity	20 - 95 % RH		0,6			0,34		pF/%RH
Hysteresis	20 -095 % RH			2			2	% RH
Linearity	20 - 95 % RH			±2			±2	%RH
Response time	30 - 90 % RH			15		15		sec
Temp coeeficient	5 - 70 °C	0,15	0,16	0,17			0,07	pF/°C
Long term stability				0,2			0,5	%RH/year
Temperature range		-40		120	-40		120	°C
Operating humidity range		0		100	0		100	% RH
Frequency range		1		100	1		100	kHz

### Understanding the specifications

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The measuring of humidity is difficult. Generally the humidity in air is measured as the fraction of the maximum amount of water that air can absorb at a certain temperature. At atmospheric conditions and a given temperature this fraction can vary between 0 (absolute dry) and 100% (the point where condensation will begin to form). This relative humidity is only valid at a certain temperature and atmospheric pressure. Therefore it is important that a humidity sensor should not be affected by either temperature or pressure. Many sensing techniques, such as mechanical devices and resistive type sensors are temperature dependent and even the wet and dry bulb is pressure dependent.

The HS07 humidity sensors can be used in a wide range of applications. The sensor can be used for low cost commercial application as well in medical and industrial products. To achieve more feeling for the specifications as given above some details are given below.

### About the relation between capacitance and the relative humidity

The relation between the measured capacitance and the Relative Humidity (RH) is depicted below:

$$C_c = C_s + S \cdot (X_{rh} - 55)$$

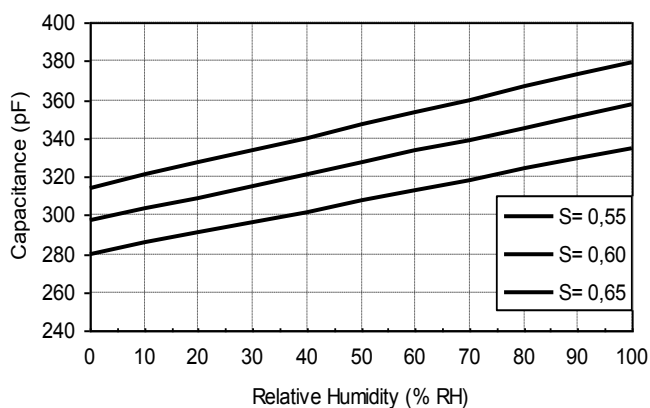
With:  $C_c$  = measured capacitance (pF)  
 $C_s$  = capacitance value at 55% RH (pF)  
 $X_{rh}$  = measured Relative Humidity (%)  
 $S$  = sensitivity

This means the Relative Humidity can be calculated by:

$$X_{rh} = (C_c - C_s) / S + 55$$

Due to the tolerance of  $C_s$  it is needed to perform a calibration. In the graph below the response of the sensor is given.

Basic Characteristic of HS07



The measurement range is between 10% RH and 95% RH

### Calibration

humidity sensor it is only needed to calibrate on one point.

Due to the high linearity of the



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In one of the Smartec's application notes (on [www.smartec.nl](http://www.smartec.nl), support shop) salt solutions for calibration can be found. A poor mans solutions is to place the humidity sensor into a refrigerator. Inside a refrigerator the humidity is always 100%.

The factory tests are done at 55% relative humidity. Depending on the application of the humidity sensor calibration can be done at higher humidity level as well on lower humidity level. The long term stability (0.2 %/yr) guarantees a stable working for over the years.

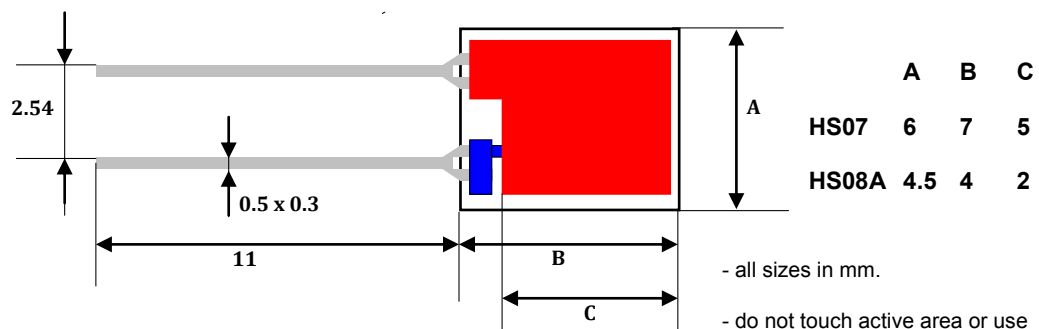
## Tolerance

The specified tolerance is the tolerance of the capacitor at 60% RH. This tolerance can be considered as an effect of the production technology. When the capacitor is f.i. 2 % to high (@ 0% RH) also the sensitivity will be around 2% to high.

## Linearity

The linearity is considered as the maximum deviation from a straight line between 0% RH and 100% RH. In the condensing area some drift can be expected; but this drift is reversible. The device is resistant against submerge in water.

## Mechanical outline



- all sizes in mm.

- do not touch active area or use glove

- base material: glass (0.3 mm)

## Ordering code

**SMTHS07** Humidity sensor 330 pF @ 55% RH

**SMTHS08A** Humidity sensor 180 pF @ 55% RH

