

# Humidity sensors

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**Note: focus on commercially MEMS devices used in commercial products when available, not on scientific articles**

# History and actual status

**1st humidity sensor : hair tension hygrometer**

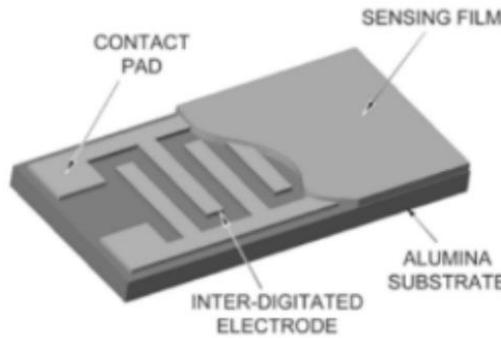
**Modern humidity sensors : capacitive, resistive, optical, thermal,...**



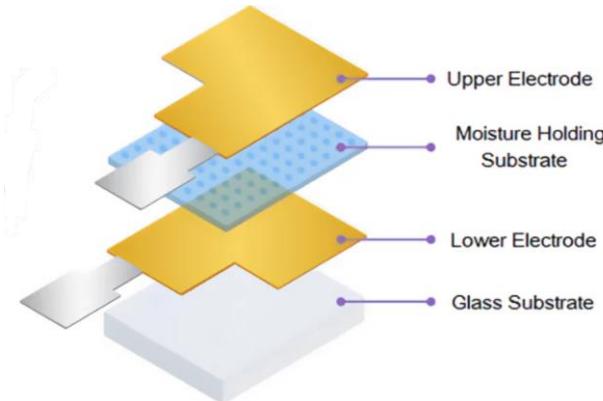
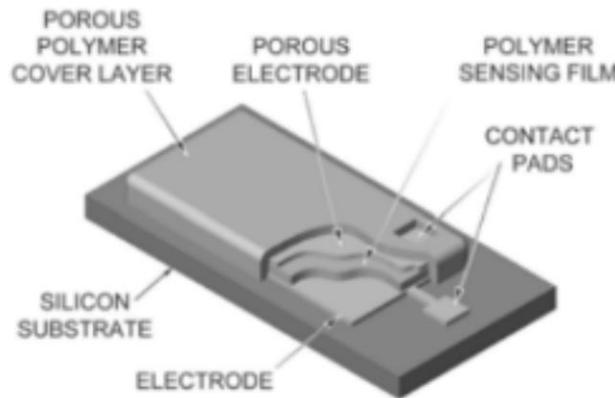
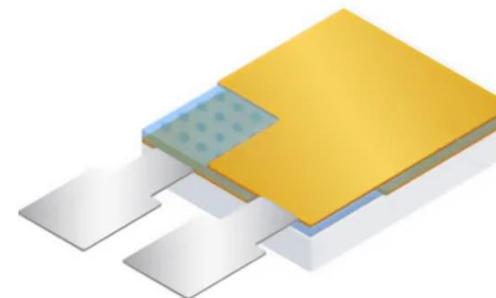
<https://forum.digikey.com/t/humidity-sensors-types-features-and-best-practices-for-accurate-measurements/44954>

# MEMS operation principle

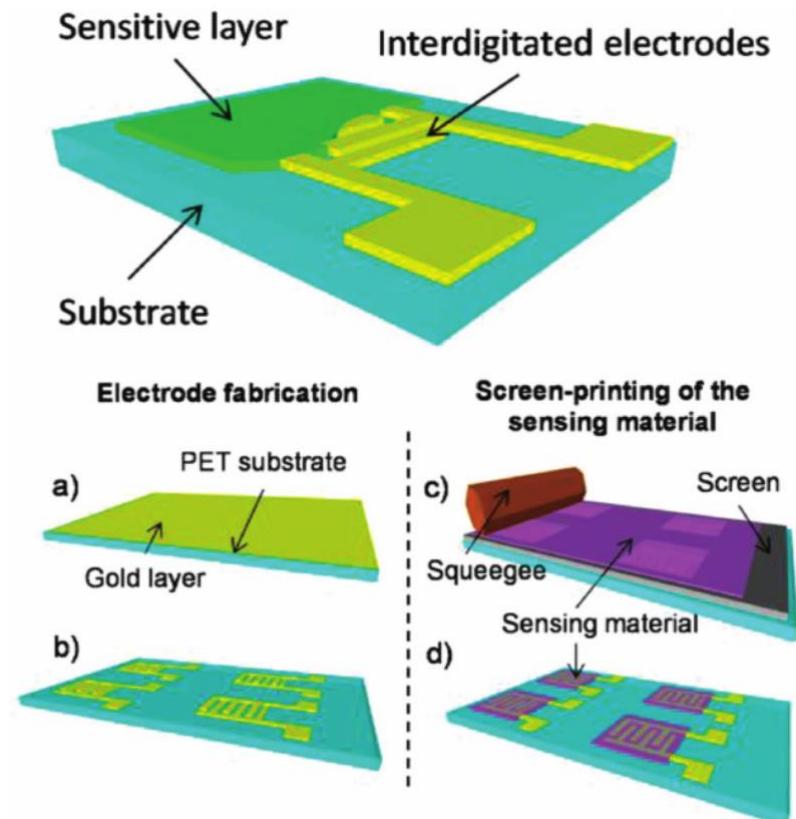
## Capacitive humidity sensor:



## Resistive humidity sensor:



# MEMS implementation



[https://www.researchgate.net/publication/326489413\\_Organic\\_Thin-Film\\_Capacitive\\_and\\_Resistive\\_Humidity\\_Sensors\\_A\\_Focus\\_Review](https://www.researchgate.net/publication/326489413_Organic_Thin-Film_Capacitive_and_Resistive_Humidity_Sensors_A_Focus_Review)

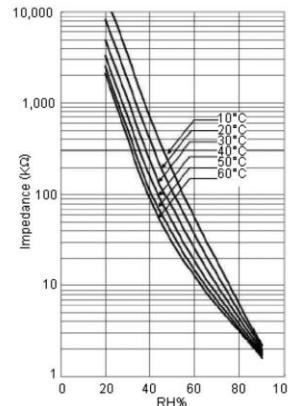
# Characteristics



HCZ-D5-A by Multicomb

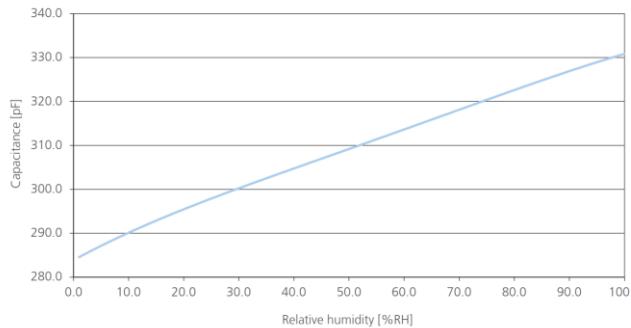
Supply max Voltage	Sensitivity	Accuracy	Operating min T°	Operating max T°	Relative humidity range
1V	2%	5%	0°C	60°C	0-99%

Relative humidity - Impedance curve – measured at 1kHz, 1 Vrms (sine wave)



MK33 by IST

Supply max Voltage	Sensitivity	Accuracy	Operating min T°	Operating max T°	Relative humidity range
12V	0.45 pF/% RH	-	-40°C	190°C	0-100%



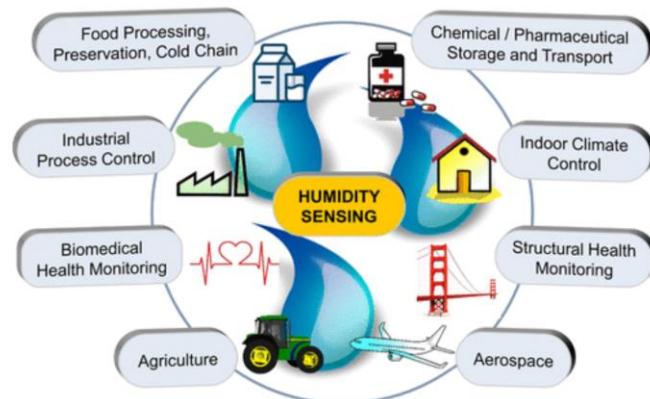
## How is the MEMS device packaged and interfaced ?

- Welding, bonding, soldering, melding
- Protective enclosure to protect from contaminent
- Package in ceramic or plastic for durability and minimal moisture absorbtion
- Capacitive : may need a temperature compensation circuit

## Main humidity sensors terminals :

- Cable with connector
- Through hole
- Wire leads

# Products and current applications



<https://pubs.acs.org/doi/10.1021/acsomega.0c06106>

SUPPLIERS		SENSOR MANUFACTURERS		
<b>DUPONT</b>	<b>SOLVAY</b>	<b>Honeywell</b>	<b>SENSIRION</b>	<b>BB SENSORS</b>
<b>EVONIK</b> Leading Beyond Chemistry	<b>3M</b> Science. Applied to Life.™	<b>Amphenol Sensors</b>	<b>Galltec</b>	<b>BOSCH</b>
<b>MITSUBISHI CHEMICAL GROUP</b>	<b>AVERY DENNISON</b>	<b>PCE INSTRUMENTS</b>	<b>SIEMENS</b>	<b>E+E</b>
END USERS			<b>TEXAS INSTRUMENTS</b>	<b>TE connectivity</b>
 Environmental Monitoring Solution Providers	 Industrial Process Control Solution Providers	 Consumer Electronics Providers	 Healthcare & Pharmaceutical Solution Providers	 Agriculture Solution Providers
 Automotive Solution Providers	 Food & Beverage Solution Providers	 Building & Construction Solution Providers	 Logistics & Supply Chain Solution Providers	 HVAC & Climate Control Solution Providers

<https://www.marketsandmarkets.com/Market-Reports/humidity-sensor-market-222120714.html#:~:text=Environmental%20monitoring%2C%20HVAC%20%26%20climate%20control,they%20major%20humidity%20sensor%20applications.>

# References

- [https://www.researchgate.net/publication/326489413\\_Organic\\_ThinFilm\\_Capacitive\\_and\\_Resistive\\_Humidity\\_Sensors\\_A\\_Focus\\_Review](https://www.researchgate.net/publication/326489413_Organic_ThinFilm_Capacitive_and_Resistive_Humidity_Sensors_A_Focus_Review)
- <https://www.tfa-dostmann.de/en/humidity/measure-humidity/#:~:text=The%20hygrometer%20was%20invented%20by,as%20the%20air%20becomes%20drier.>
- [https://atlas-scientific.com/blog/humidity-sensor-types/#:~:text=Resistive%20humidity%20sensors%2C%20also%20known,sensor\)%20to%20establish%20relative%20humidity](https://atlas-scientific.com/blog/humidity-sensor-types/#:~:text=Resistive%20humidity%20sensors%2C%20also%20known,sensor)%20to%20establish%20relative%20humidity)
- <https://www.marketsandmarkets.com/Market-Reports/humidity-sensor-market-222120714.html#:~:text=Environmental%20monitoring%2C%20HVAC%20%26%20climate%20control,the%20major%20humidity%20sensor%20applications>
- <https://pubs.acs.org/doi/10.1021/acsomega.0c06106>

## Datasheets:

- [https://www.farnell.com/datasheets/2865737.pdf?\\_gl=1\\*1fw3a34\\*\\_gcl\\_au\\*MTM0NDE3Mzc1OS4xNzQxMzQ4Nzc5](https://www.farnell.com/datasheets/2865737.pdf?_gl=1*1fw3a34*_gcl_au*MTM0NDE3Mzc1OS4xNzQxMzQ4Nzc5)
- [https://www.farnell.com/datasheets/3627301.pdf?\\_gl=1\\*1fw3a34\\*\\_gcl\\_au\\*MTM0NDE3Mzc1OS4xNzQxMzQ4Nzc5](https://www.farnell.com/datasheets/3627301.pdf?_gl=1*1fw3a34*_gcl_au*MTM0NDE3Mzc1OS4xNzQxMzQ4Nzc5)