Humidity sensors

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

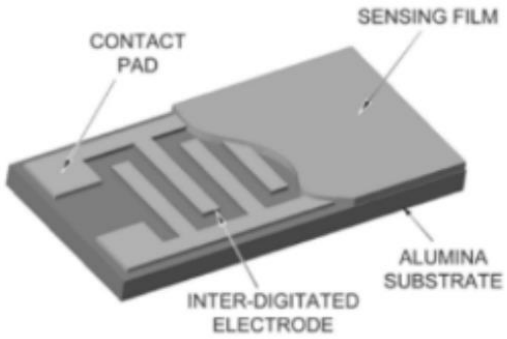
History and actual status

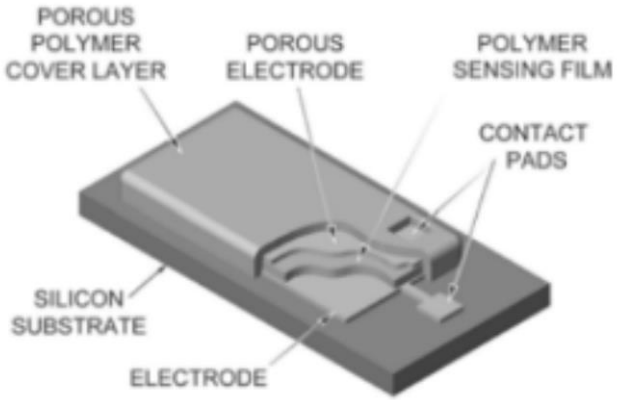
1st humidity sensor : hair tension hygrometer
Modern humidity sensors : capacitive, resistive, optical, thermal,…

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

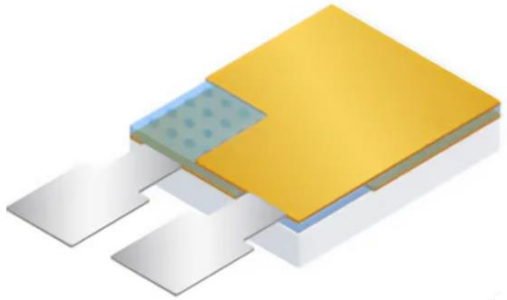
MEMS operation principle

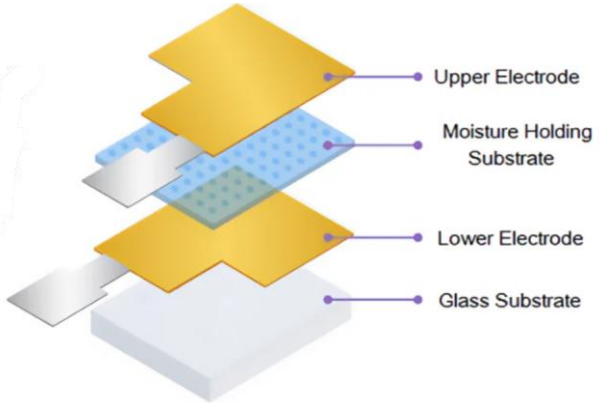
Capacitive humidity sensor:



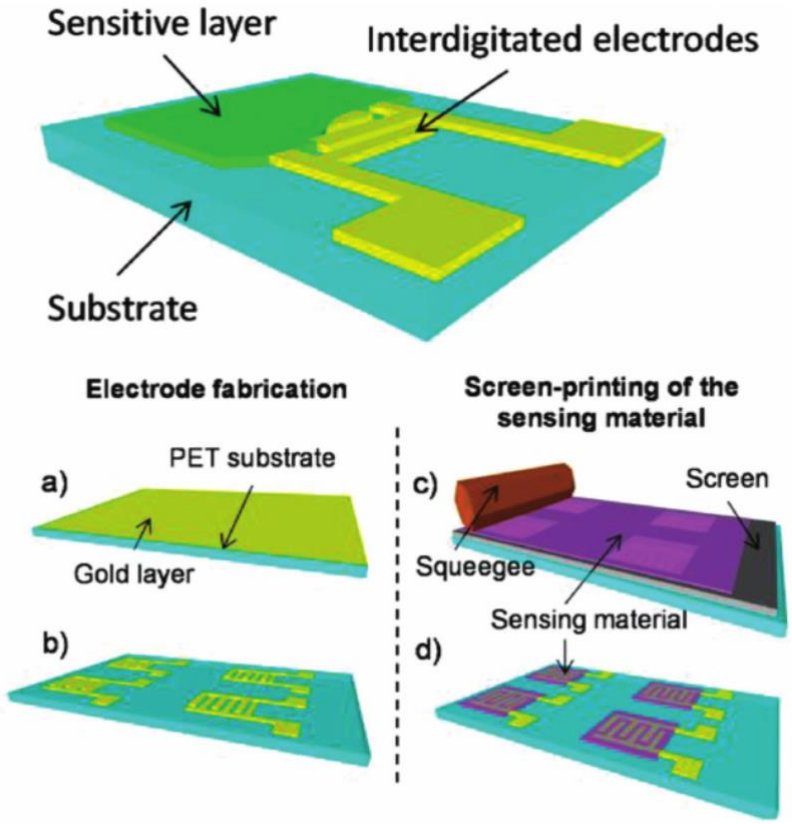


Resistive humidity sensor:





MEMS implementation

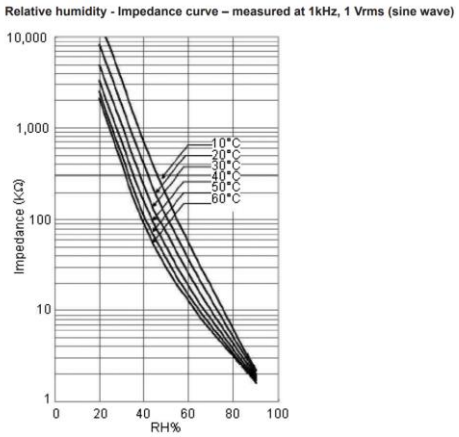


https://www.researchgate.net/publication/326489413_Organic_Thin-Film_Capacitive_and_Resistive_Humidity_Sensors_A_Focus_Review

Characteristics

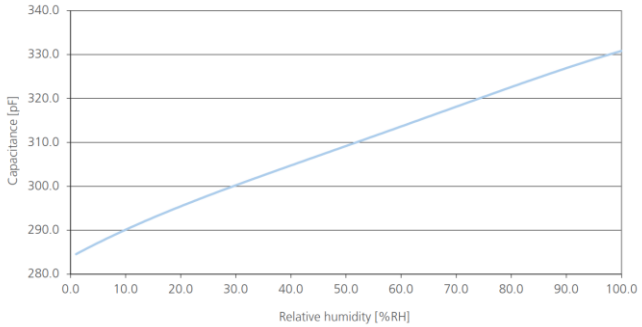
HCZ-D5-A by Multicomb

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



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%



Packaging and systems integration

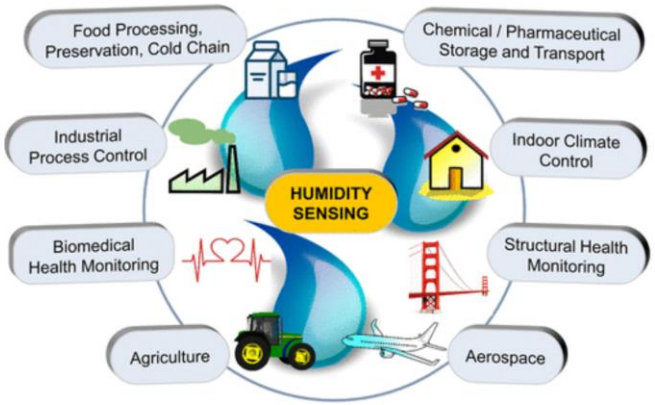
How is the MEMS device packaged and interfaced ?

- 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

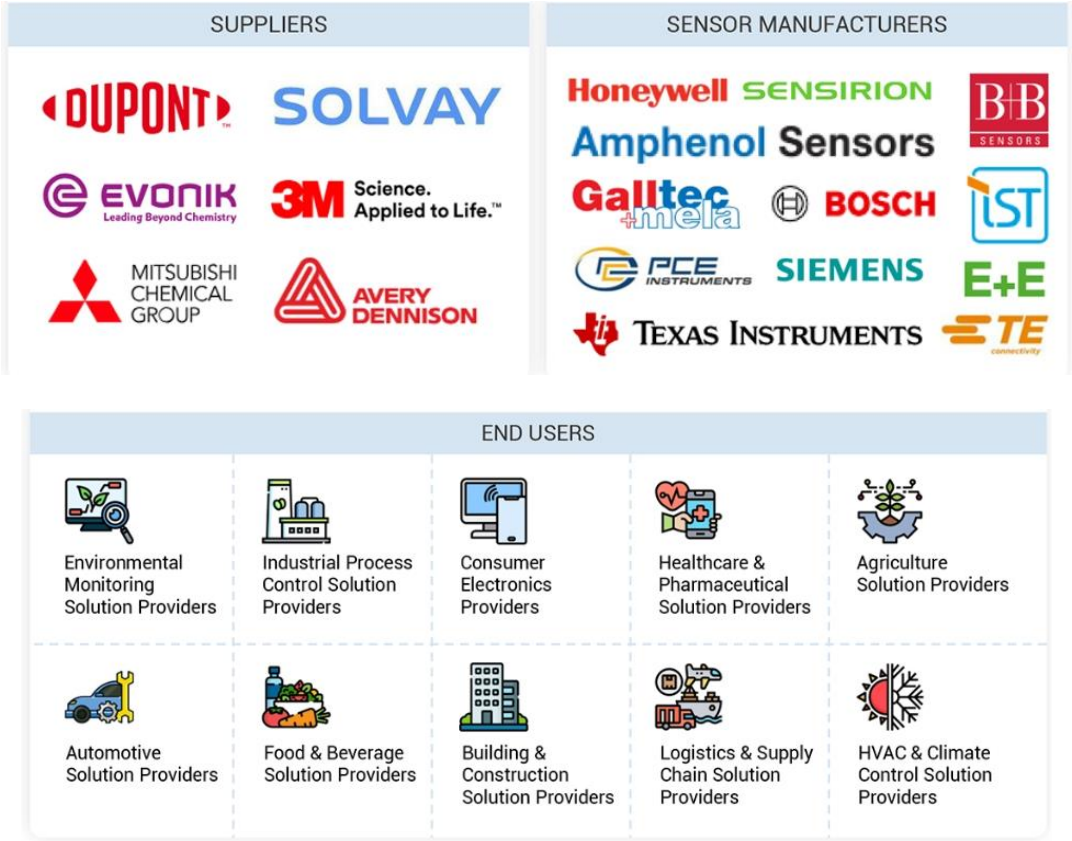
Main humidity sensors terminals :

- Cable with connector
- Through hole
- Wire leads

Products and current applications



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



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.

References

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- 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://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/3627301.pdf?_gl=1*1fw3a34*_gcl_au*MTM0NDE3Mzc1OS4xNzQxMzQ4Nzc5