

Glove box and Vaisala dewpoint products

-Relative humidity and dewpoint temperature

Relative humidity(RH) is the ratio of the partial water vapor pressure (Pw) to the water vapor saturation pressure (Pws) at a particular temperature, which is measured as a percentage. $\%RH=100\% \times (Pw/Pws)$. Relative humidity is strongly temperature dependent. Pressure will also change the relative humidity. For example, if a process is kept at a constant temperature, the relative humidity will increase by a factor of two if the pressure is doubled. Dewpoint temperature (Td) is the temperature at which the gas becomes saturated with water vapor. This condenses into liquid water especially when it hits a colder surface. The tiny water droplets formed during condensation are called dew.

Dewpoint temperature is generally the preferred method to measure water vapor of a dry gas. In such conditions the changes in relative humidity are too small to control, But the changes in water vapor concentration produce a measurable change in dewpoint temperature.

-Various dewpoint temperature instruments and choosing the right one.

When selecting a dewpoint temperature instrument, the accuracy and dewpoint temperature measurement range are important factors. Long-term stability, ease of calibration and immunity to condensing water are also important. Good long-term stability means lower calibration costs and reduced maintenance load. A dewpoint temperature instrument that stays accurate for

long periods of time also keeps the controlled processes running within specification.

The three most common methods to measure dewpoint temperature are a cooled surface condensation dewpoint meter (chilled mirror type and surface acoustic wave (SAW) type), a capacitive metal oxide sensor type, and capacitive polymer sensor type. Condensation type instruments can measure dewpoint temperature with high accuracy. However, these instruments are costly, and gas sampling may be required, adding additional cost and complexity. On the other hand, metal oxide sensor and polymer sensor types give an accuracy of approximately ten times that of the condensation types, but they are lower in price and easy to install, with gas sampling not needed. The metal oxide sensor type is especially designed for very low dewpoint temperature measurement. A polymer sensor can be used for dewpoint temperature down to -60°C , the main advantage of which is long-term stability and fast response time.

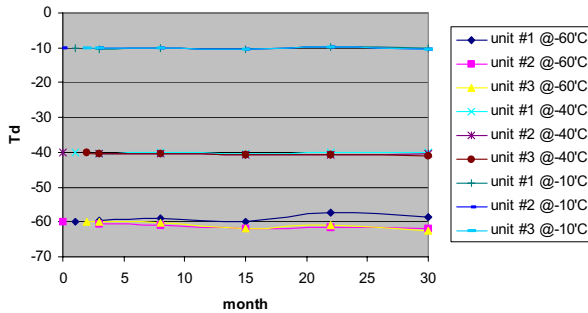
Vaisala Dewpoint temperature products have the DRYCAP® sensor that is a capacitive polymer sensor. The main features are :

- Withstands a high humidity environment ... Vaisala DRYCAP® sensors are not damaged by unexpected high humidity situation.
- Long-term stability ... We specify accuracy $\pm 2^{\circ}\text{C}$ down to -60°C , and recommend a two year calibration interval.
- Fast response time ... Accurate data is always available, even when the process is changing fast.

Differences between Vaisala and other polymer sensor companies :

- Patented Auto-calibration function ... automatic offset correction function maintains good accuracy and long-term stability.
- Other unique functions ... Sensor purge function maintains good sensor condition by purging unknown

chemicals from the polymer sensor. The sensor warming function heats the sensor and prevents condensation from forming on it.

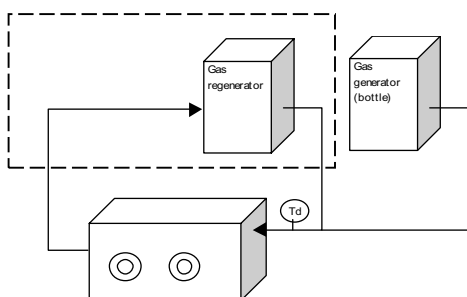


DRYCAP® sensor long-term stability data

-Installation of dewpoint instruments

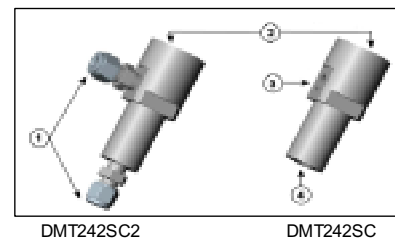
Glove box designs vary to achieve desired specifications depending on the purpose of usage, but all glove boxes are designed for isolation from the atmosphere. A special environment can be created in the glove box by introducing a specific amount of moisture or other gases to accommodate different manufacturing and laboratory processes. Dewpoint temperature is measured to assure that moisture sensitive processes will not be disrupted by excessive water vapor.

It is possible to directly install a dewpoint sensor into a glovebox. This can be accomplished with a threaded connector of appropriate dimensions. The probe of the dewpoint instrument passes through the wall of the glovebox, while the electronic portion of the instrument remains outside. Alternatively, a dewpoint instrument can be installed at the inlet of the glove box on the gas supply line for checking proper moisture content in the supply gas. Sampling cells and ball valves simplify the installation of the instrument.



Here are several types of installation accessories:

- Sampling cells: The dewpoint probe is installed into the cell, which is then plumbed into a gas line. The cell has an inlet and an outlet, so it is easy to install in almost any gas line. Cells are available with threaded connections to accept a wide variety of fittings, or with welded compression fitting to accommodate 6mm or 1/4" tubing.



Number refer to Figure1 :
 1: Male pipe weld connector Swagelok 1/4"
 2: Instrument probe
 3: G1/4"
 4: G3/8"

- Ball valve: A ball valve allows the dewpoint sensor to be installed or removed from a process without interrupting the process flow. This could be used to install a sensor through the wall of a glovebox, or directly into a pipeline.

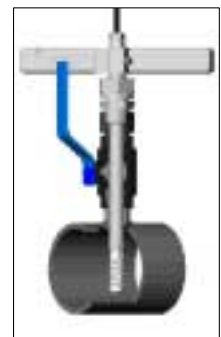


Figure2 : Ball valve installation

Availability of installation option by products.

	Sampling cell			Ball valve	Threads
	DMT242SC	DMT242SC2	HMP302SC		
DMT142	x				
DMT242	x				
DMT342			x		
DMT344					x
DMT347					x
DMT348	x	x		x	