TERMINOLOGY OF THE HUMID AIR DIAGRAM

BELOW THE DEFINITIONS OF THE TERMS USED IN A HUMID AIR DIAGRAM :

TERM	SYMBOL	DEFINITION
Volume mass	ρ	Mass of humid air volume unit (in kg of humid air / m^3 of humid air)
Specific volume	v'	Volume of humid air that contains the dry air mass unit (in m^3 of humid air / kg of dry air)
Absolute humidity	w	Mass of water vapour in the dry air mass unit (in kg of water / kg of dry air)
Dew temperature	t_r	Temperature that generates water droplets during cooling at constant pressure: ■ The humid air is "saturated" ■ It has a partial pressure of water vapour P_g ■ The saturating vapour pressure of the water vapour is P_g
Relative humidity or ratio of hygrometry	ε	Ratio between partial water vapour pressure contained in the air and partial pressure saturation at the same temperature : $\varepsilon = \frac{Pg}{P_{s(t)}}$ (value directly linked to the impression of being in dry or humid air environment) **Important:** The relative humidity and the **percentage of humidity** μ must not be mixed up. This is the ratio between absolute humidity w and absolute humidity w_s at the same temperature but for a partial pressure equal to the saturated vapour pressure : $\mu = \frac{W}{W_s}$ In fact, at "air conditioning" temperatures these two values are the same.
Dry temperature	t	Value given by a **dry-bulb** thermometer, protected from environmental radiation (air speed: 2 m/s)
Wet temperature	t'	Value given by a **wet-bulb** thermometer, protected from environmental radiation (air speed: 2 m/s)
Specific heat or mass heat	cs	Does not appear in the diagram but is used for calculations Concerns the following types of heat: ■ **Specific dry air heat, at constant pressure:** 1.0065 kJ / kg of dry air / °K ■ **Specific water vapour heat:** 1.883 kJ / kg of water / °K ■ **Latent heat of water evaporation:** 2500 kJ / kg of water
Enthalpy difference	i or q'	Quantity of energy necessary to: ■ Increase or decrease the dry air temperature ■ Decrease or increase the **water vapour content** Enthalpy q' is equal to 1 kg of dry air enthalpy q_a associated to w kg of water vapour enthalpy q_g **$q' = q_a + q_g$** The arbitrary origin values are: ■ Air mass enthalpy at 0°C: $q°_a = 0$ ■ Liquid water mass enthalpy at 0°C: $q°_e = 0$ ■ 1 kg dry air enthalpy: (1.0065 x t) in kJ / kg of dry air ■ 1 kg water vapour enthalpy: (1.883 x t + 2500) in kJ / kg dry air ■ Enthalpy of the mix: q' in kJ / kg dry air = (1.0065 t) + w (1.883 t + 2500) **Example of calculation:** For an air with the following characteristics: ■ Temperature: +25°C ■ Relative humidity: 50 % ■ Absolute humidity: w = 0.010 kg ■ Enthalpy red on the diagram: i ≈ 50.2 kJ / kg **Write the formula this way:** q' = (1.0065 x 25) + 0.010 [(1.883 x 25) + 2500] = 50.63 kJ / kg

Humid air diagram

w (kg/kg) Absolute humidity, mass of humidity per unit mass of dry air
t (˚C) Dry temperature or humid air
ε (%) Relative humidity
tr (˚C) Condensation point

q' (kJ/kg) Enthalpy of humid air containing the unit mass of dry air
t' (˚C) Humid temperature
v' (m^3/kg) Volume of humid air containing the unit mass of dry air.
γ (kcal/kg) Variation rate of q' over the variation of w

$$\gamma : \frac{\Delta q'}{\Delta w}$$ **(kJ/kg dry air)** / **(kg Humidity/kg of dry air)**

ɤ: (kJ/ kg of Humidity)