

CRITICAL ELEMENTS FOR CORRECT CLIMATE CONTROL DESIGN FOR ELECTRICAL PANELS

Moist air

Humid air is a term referred to the mix of dry air, made up of gas and water in the vapour state. This term is used because water is the only component subject to state changes at typical temperatures on earth and physically separate from air when condensing.

Psychrometry is the study of air and water mixes and their pertinent transformations.

Moist air and its properties

Referring to humid air, you must know the meaning of the following properties:

- Air temperature t_{BS} , also called “dry bulb”, is the actual temperature read by a normal mercury thermometer and is measured in [°C];
- Relative humidity indicates the level of air saturation, and is the partial vapour pressure compared to the partial vapour pressure in saturation conditions at the same temperature:

$$U.R.= \frac{P_v}{P_{v, \text{sat}}(T)} \cdot 100\%$$

The hygrometer is an instrument used to measure relative humidity;

- Specific humidity X is the amount of water actually contained compared to the volume of considered dry air. It is measured in [kgv/kgas] or, more frequently, in [gv/kgas]

$$X= \frac{M_v}{M_{as}};$$

- Wet bulb temperature t_{BU} or, with good approximation, the saturation temperature at the same considered enthalpy;
- Dew point t_R indicates, for a certain specific humidity, the temperature where the water contained in humid air starts to condense, when an isobar cooling transformation occurs;
- Specific enthalpy h is the ratio between humid air enthalpy and the considered dry air mass:

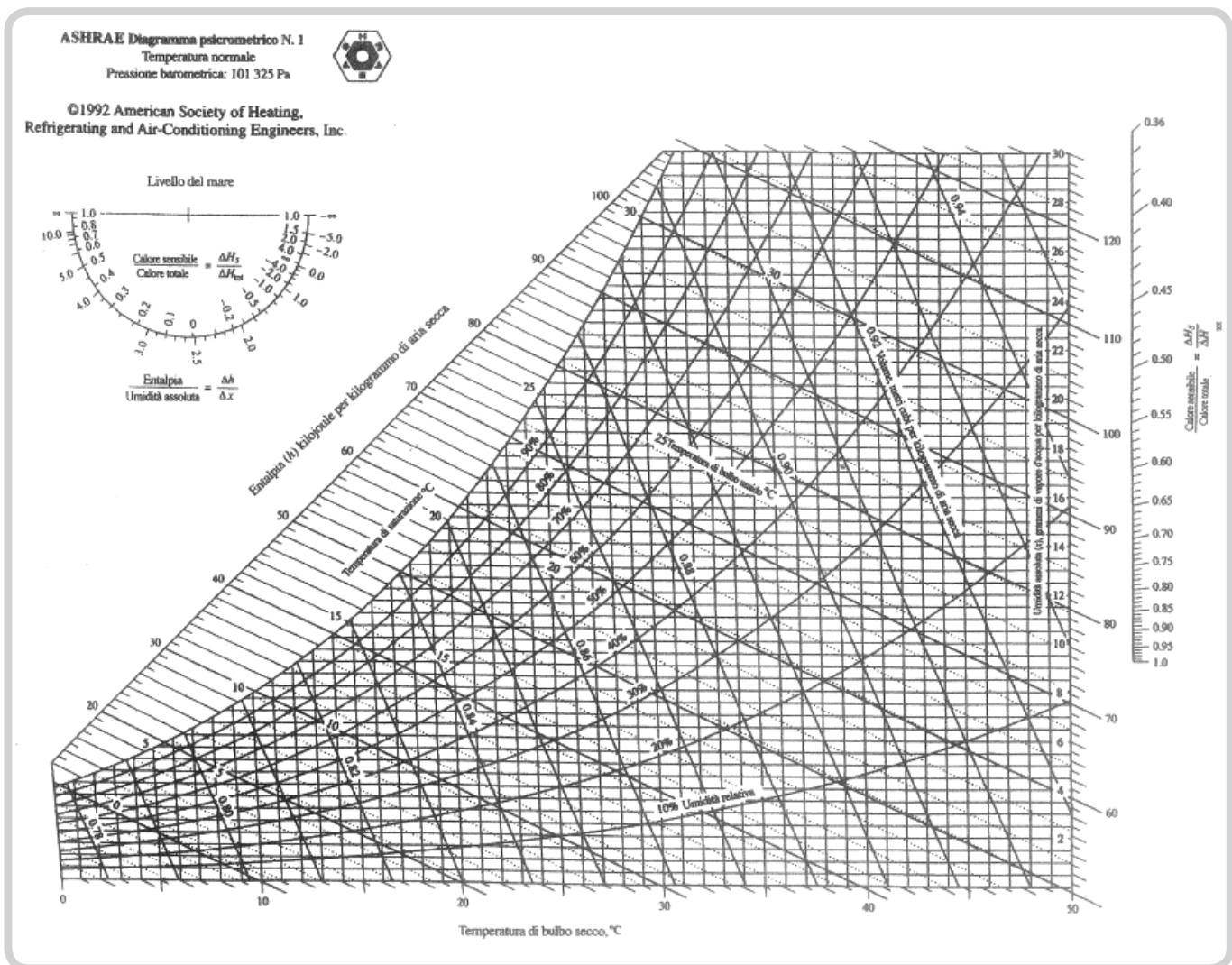
$$h= \frac{H}{M_{as}}.$$

It is calculated with formula $h=1,006t_{BS}+X*(2501+1,805*t_{BS})$ and is measured in [kJ/kgas].

Psychrometric diagram

The properties can be calculated using the mentioned formulas or are directly found on the “Psychrometric diagram” on the following page in **figure 1**, applicable to moist air in standard conditions at atmospheric pressure **101325Pa**. Knowing two of the properties referred to moist air, a point on the psychrometric diagram is found; from this point, the other climate properties uniquely referred to it can be read.

*Davide Rocca
Alberto Tonietti*



1-ASHRAE PSYCHROMETRIC DIAGRAM, barometric pressure: 101325Pa