



## Manual for Psychrometer

Measurement of the humidity by using the two thermometers method.

Psychrometric measurement of the Humidity. The temperature of a thermometer which is coated with a wet-wool-stocking is lower than the gas temperature, because of the heat-withdrawal through water-evaporation. By adequate gas-velocity at the thermometer (at least 2,4 m/s) depends the temperature-humiliation only from the water vapour pressure, the static pressure and his temperature. Therefore can use two thermometers, from which one is moistened, to determine the water content in the gas (relative or absolute humidity). The context between the temperature-difference of both thermometers, the gas temperature and the water vapour pressure illustrate the following formula (according to DIN 50012, part 2). For easy calculation, ask for our excel-file.



Formular for the calculation of the humidity (Validity 0-100°C):

$$f = 216,7 \cdot \frac{6,1078 \cdot \exp\left(\frac{17,08085 \cdot t_f}{234,175 + t_f}\right) - 0,662 \cdot \frac{p}{1006,7} \cdot (t_{tr} - t_f)}{273,15 + t_{tr}}$$

Key: f: weight of the water vapour [g/m<sup>3</sup>]  
t<sub>f</sub>: temperature of the wet thermometer [°C]  
t<sub>tr</sub>: temperature of the dry thermometer [°C]  
p: pressure at the measuring point [mbar]

Procedure:

The vessel is to be filled with water. The wool-stocking is pulled over the thermometer and put into the water. Be sure that wool-stocking becomes wet and is wrapped over the thermometer. Through the equipment must sucked the gas (min. 2.4 m/s) and the temperature at the moist thermometer must be controlled. The ad of the moist thermometer will increase continually. After a certain time, the ad will hold on at a temperature. This temperature is to be written down. Now, the water-evaporation takes place. It can occur that the temperature renews increase. The reason for it is that the drying of the thermometer is faster as the water flux through the wool-stocking. As well, the temperature of the dry thermometer is to be written down.

For gases with a temperature greater than 100°C, the gas must be cooled before entering in the Psychrometer. The physical relationships apply only to 100°C. For cooling of the gas, the suction tube or the suction hose is sufficiently far removed from the duct. Due to the temperature display "dry" can be determined quickly the necessary "cooling zone". The accuracy increases when the temperature difference between "dry" and "wet" is minimized. Do not cool down the temperature of the gas below the dew point temperature. The acid dew point cannot be determined with this method. At very high levels of sulfuric acid, the results will be incorrect.

Temperaturanzeige trocken  
Temperatur indicator dry



NiCr-Ni

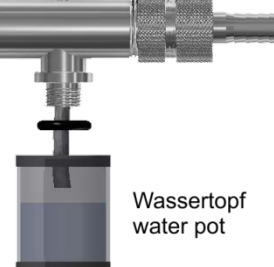
Anschluss für Schlauch  
Connection for suction hose

Temperaturanzeige feucht  
Temperatur indicator wet



NiCr-Ni

Anschluss für Absaugrohr  
Connection for suction tube



Wassertopf  
water pot

Example:

Barometric pressure: 1017 mbar,  
static pressure: -10 mbar,  
temperature wet: 54°C,  
temperature dry: 82°C,  
static pressure: 1007 mbar,  
difference temperature: 28°C.  
Weight of the water: f: 80,2 g/m<sup>3</sup>.