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Meteorology — Air temperature measurements — Test methods for comparing the performance of thermometer shields/screens and defining important characteristics

Météorologie — Mesurage de la température de l'air — Méthodes d'essai pour comparer les performances d'abris/d'écrans pour thermomètres et définir les caractéristiques importantes

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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Introduction

Commonly used air temperature sensors require protection from influences such as solar and terrestrial radiation, rain and snow. Screens (also known as shields) protect the thermometers from these influences.

At present, there is no commonly accepted reference screen design, nor are there generally accepted test methods to determine performance characteristics of screens. Screens that protect the temperature sensors from daytime heating and nighttime cooling due to radiation transfer are necessary for proper air temperature measurements. In very general terms, a poor design of the screen will tend to give higher daytime and lower nighttime temperatures.

This International Standard was developed to define the most relevant screen characteristics and to provide the methods to determine or compare screen performances.

Air temperature is a basic meteorological variable. Temperature sensors are widely used in all human activities and are well known and controlled. For the measurement of the outside air temperature, the sensor must be protected against external influence, mainly radiation and hydrometeors (e.g. precipitation, fog). The sensor is usually protected by a screen, but even then, measurement errors of up to 5 K may be encountered.

The general function of a screen for operational temperature measurements used in meteorological applications is given in WMO No. 8 [3]. The following text is an extract from this document.

“Radiation from the sun, clouds, the ground and other surrounding objects passes through the air without appreciably changing its temperature, but a thermometer exposed freely in the open can absorb considerable radiation. As a consequence, its temperature may differ from the true air temperature, the difference depending on the radiation intensity and on the ratio of absorbed radiation to dissipated heat. For some thermometer elements such as the very fine wire used in an open-wire resistance thermometer, the difference may be very small or even negligible, but with the more usual operational thermometers the temperature difference may reach 25 K under extremely unfavourable conditions. Therefore, in order to ensure that the thermometer is at true air temperature it is necessary to protect the thermometer from radiation by a screen or shield which also serves to support the thermometer. This screen also shelters it from precipitation while allowing the free circulation of air around it, and prevents accidental damage. Maintaining a free circulation may, however, be difficult to achieve under conditions of rime ice accretion. Practices for reducing observation errors under such conditions will vary and may involve the use of special designs of screens or temperature-measuring instruments.”

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