

Thermal insulation of textiles



ENHANCE COMFORT AND PERFORMANCE IN THERMAL TEXTILES THROUGH EXPERT EVALUATION

Textiles with thermal insulation are essential for cold-weather clothing, offering warmth during winter and outdoor activities. By blending effective insulation with comfort, they enable individuals to stay warm and active in diverse conditions. Thermal comfort in clothing significantly depends on fabric choice, highlighting the importance of accurate evaluation when selecting materials for their thermal performance.

We offer specialized testing against the highest industry standards, giving you the assurance of optimal performance, enhanced comfort, safety and protection.

Textiles with thermal insulation play a crucial role in regulating body temperature by minimizing heat exchange between the body and its surroundings. This feature is particularly vital in cold-weather apparel and outdoor gear, ensuring both comfort and warmth.

Insulating textiles work by trapping air, a poor heat conductor, within the fabric. Natural fibers such as wool and down excel in insulation due to crimped structures that create air pockets. Similarly, synthetic fibers like polyester and acrylic are engineered for lightweight and effective insulation.

The construction of the fabric further enhances insulation. Knitted or fleece fabrics capture more air, while multilayered textiles create barriers that reduce heat loss. Innovations like hollow fibers and aerogel-infused fabrics with biomimetic technologies further advance insulation capabilities.

Evaluation of thermal insulation

Dry heat transfer testing is commonly used in laboratories to evaluate thermal insulation. The guarded hot-plate method, following ASTM D1518 under still air conditions or ASTM F1868/ISO 11092 with airflow, is widely used when testing fabrics, foams, leather and multilayer assemblies.

During testing, a specimen is positioned on an electrically heated plate with a thermal guard, within specific temperature, humidity and air speed parameters. The heat flux through the specimen is measured once steady-state conditions are achieved.

The fabric's insulating ability is determined by its thermal resistance, measured in kelvin square meters per watt ($K \cdot m^2/W$), representing the ratio of temperature difference across the material to the heat transfer rate per area. Common units include the tog (one-tenth of the International System of Units (S.I.) unit) and the clo, which quantifies clothing insulation. An average male requires one clo to remain comfortably seated in a normally ventilated room at 21°C and with less than 50% relative humidity. Approximately, 1 clo equates to 1.55 togs.

The higher the thermal resistance of a fabric, the better its thermal insulation capacity and the warmer the garment.

Helping you understand how your products perform against recognized testing standards provides valuable marketing insights and enhances consumer satisfaction.

WHY CHOOSE SGS?

We are the world's leading testing, inspection and certification company. With a global network of state-of-the-art laboratories and a team of dedicated professionals from diverse disciplines, we deliver comprehensive physical, chemical and functional testing for components, materials and finished products. Our expertise ensures your company meets the highest standards of quality, safety, sustainability and compliance with international, industrial and regulatory requirements. In the end, it's trusted because it's tested.

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