

Determination of Material Properties for Hygrothermal Calculation with WUFI®

Material Property	Needed	Procedure
Bulk Density	Always	<ul style="list-style-type: none"> - Insulation Materials: EN 1602. - Mortar and Plaster: EN 1015-10. - Bricks: EN 772-4. - Others, depending on type of building material.
Porosity	Always	<ul style="list-style-type: none"> - Determination of the true density with the helium pycnometer. Bulk density see above. Porosity is then calculated from these two.
Specific Heat Capacity	Always	<ul style="list-style-type: none"> - Determination of specific heat capacity according to ISO 11357-4. - Also, literature values are usually sufficient.
Thermal Conductivity, Dry, 10°C	Always	<ul style="list-style-type: none"> - Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods. - Dry and moist products with medium and low thermal resistance; German version EN 12664. - Products of high and medium thermal resistance; German version EN 12667. - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus according to ASTM C177.
Water Vapor Diffusion Resistance Factor	Always	<ul style="list-style-type: none"> - Determination of water vapour transmission properties according to EN ISO 12572, dry cup. - Standard Test Methods for Water Vapor Transmission of Materials according to ASTM E96, Desiccant Method (dry cup). - Paints and varnishes - Determination of water-vapour transmission properties - Cup method; German version EN ISO 7783. - Thermal insulating products for building applications - Determination of water vapour transmission properties; German version EN 12086. - Methods of test for mortar for masonry - Part 19: Determination of water vapour permeability of hardened rendering and plastering mortars; German version EN 1015-19. - Flexible sheets for waterproofing - Bitumen, plastic and rubber sheets for roof waterproofing - Determination of water vapour transmission properties; German version EN 1931.

Moisture Storage Function	<p>Only for hygroscopic building materials. (For non-hygroscopic building materials WUFI automatically uses an internal moisture storage function, similar to the properties of mineral fiber and depending only on the porosity.)</p>	<ul style="list-style-type: none"> - Determination of hygroscopic sorption properties according to DIN EN ISO 12571, absorption test. - Standard Test Method for Hygroscopic Sorption Isotherms of Building Materials according to ASTM C1498. - Determination of superhygroscopic sorption properties with the pressure plate oder alternatively with approximation methods from IBP. - Standard Test Method for Moisture Retention Curves of Porous Bulding Materials Using Presseure Plates according to ASTM C1699. - Natural stone test methods - Determination of water absorption at atmospheric pressure; German version EN 13755. - Thermal insulating products for building applications - Determination of long term water absorption by immersion; German version EN 12087.
Liquid Transport Coefficient, Suction	<p>Only for capillary active building materials.</p>	<ul style="list-style-type: none"> - Determination of the water absorption coefficient according to EN ISO 15148. - Using this value, estimation of the liquid transport coefficient for water uptake: M. Krus, A. Holm, T. Schmidt, Bauinstandsetzen 3 (1997), H.1, S. 219-234.
Liquid Transport Coefficient, Redistribution	<p>Only for capillary active building materials.</p>	<ul style="list-style-type: none"> - Fitting WUFI calculations to measured drying curves: Bestimmung der Transportkoeffizienten für die Weiterverteilung aus einfachen Trocknungsversuchen und rechnerischer Anpassung: A. Holm, M. Krus, Bauinstandsetzen 4 (1998), H.1, S. 33-52.
Water Vapor Diffusion Resistance Factor, moisture-dependent	<p>Only for polymers with solution diffusion. Sometimes an alternative to liquid transport coefficient.</p>	<ul style="list-style-type: none"> - Determination of water vapour transmission properties according to EN ISO 12572, dry and wet cup. - Standard Test Methods for Water Vapor Transmission of Materials according to ASTM E96, Desiccant and Water Method (dry and wet cup).
Thermal Conductivity, moisture-dependent	<p>Always, except for membranes and other thin layers.</p>	<ul style="list-style-type: none"> - EN 12664, but supplements from DIN 4108-4 are generally sufficient.
Thermal Conductivity, temperature-dependent	<p>Generally for insulating materials. Otherwise rough typical values are sufficient.</p>	<ul style="list-style-type: none"> - EN 12664 and EN 12667.
Enthalpy, temperature-Only dependent	<p>Only for phase change materials.</p>	<ul style="list-style-type: none"> - Determination of temperature and enthalpy of melting and crystallization according to ISO 11357-3.