

Technical and Building Physics Characteristics

It is for good reason that today, authorities, planners and builders have high requirements regarding the paint system to be used. However, selecting the right one isn't that easy. Never before, the range of available products seemed to be so comprehensive. And almost every day, new word creations with publicity value are added.

New products must compete with traditional ones, while classical products are to meet new requirements. And so Heat Insulation Regulations, for example, create substrates for silicate paints that used to be unknown to the painter years ago.

High-quality systems, proven effective in practice, have no trouble to compete and offer one advantage often underestimated: They have continuously proven appropriate and useful.

The following characteristics, usually only measurable with precision under lab conditions, may be considered a great help to paint technicians during design and production control, and equally helpful to architects and building surveyors when preselecting the right building material.

„Stop! The construction site is not a lab!“ a practitioner may object. And not without a reason, since featuring the quality profile of a paint system based on abstract numbers only will result and has already led to massive structural damages. Criteria such as compatibility with the substrate, color fastness, weathering behavior, hygro and thermal crack tendencies as well as an esthetical appearance are, after all, the result of the product as a whole including the quality of the raw materials, the formulation and the production process. And taking the paint abstracted from anything else, something very important would be missing: the careful processing and a well prepared, recoatable surface, two factors absolutely essential to obtain a good painting result.

However, any of these very important aspects is completely missing with the lab measurements.

Good building physics characteristics might be of great importance, long-time experience, however, is absolutely essential! Only when practice confirms compliance of the lab values with the practical behavior – something that we might have to wait for quite some time, with quality products it may even take decades – only then we are sure to have made the right decision.

Beside 110 years of business experience and a great number of long-term references, BEECK's market position regarding high-quality architecture, the preservation of monuments and ecological building is based on excellent building physics characteristics without any exceptions.

BEECK Mineral Paints and AGLAIA Natural Paints are, not only from a building physics point of view, a true alternative to common synthetic products.

The following will give you a brief overview of the building physics characteristics and measuring values given in our technical documentation:

A) Water absorption and Water-vapor diffusion:

W₂₄- value or water permeability rate w (EN 1062-3) in [kg/(m² x h^{1/2})]:

The W₂₄ - value equals the water mass (in kg) absorbed within 24 hours by a 1 m² test surface. W₂₄ – values of 1 kg/(m² x h^{1/2}) and more are not uncommon for untreated lime plasters. To give a clear example: During 24 hours of continuous rain, each square meter of plaster takes up 1 kg of water ! This is an enormous amount of water which will have to be released to the atmosphere again.

High W₂₄- values stand for a high water absorption, low values either for waterproofness (e.g. lacquer finish, sealing) or water repellency (e.g. hydrophobic treatment).

s_d- value (H₂O): Diffusion-equivalent air layer thickness (EN ISO 7783-2 / EN 1062-2) in [m]:

Characteristic for the diffusion resistance of a building material or a paint against water vapor. An s_d – value of 1.0 m (meter) means that the tested paint will reduce the diffusion of water vapor to the same extent as a 1 m thick resting air layer.

High s_d- values show vapor-tight "films" that will cover the plaster like a plastic foil while paints such as mineral paints are characterized by very low s_d- values. Paints with low s_d- values, therefore, counteract a wetting through of the substrate while the building material surface remains effective as an evaporation zone. A high W₂₄- value in combination with a low s_d- value means: The paint will wet through when it rains but will again dry completely within short. Low s_d- values have, in practice, proven to be more effective for facade systems than low W₂₄- values. Indoors, wall paints with low s_d-values are commonly described as "breathing", i.e. they are highly diffusible and contribute to control indoor air humidity.

W x s_d-value [kg/(m x h^{1/2})]: Regarding facade protection, a low W x s_d-value is considered perfect since it characterizes a porous (mineral) structure with a highly effective water repellency. Unsurpassed: a purely mineral paint on a porous mineral surface with subsequent hydrophobic treatment of the paint and the upper building material zone as one unit.

s_d-value (CO₂) [m]: Resistance of a paint against carbon dioxide (CO₂) from the atmosphere. Paint systems with s_d-values (CO₂) > 50 m are used as carbonatation inhibitors for concrete (see test certificates).

B) Physical/Technical Characteristics:

Density [g/cm³]: Specific weight of the paint in its liquid state. Useful when converting liters into kilograms, e.g. when calculating consumption and mass.

pH-value: Value that gives information about a paint's acid or alkaline character. Lime or silicate paints, for example, are alkaline, and so are fresh lime plasters or concrete with a pH-value clearly above 7. With a pH-value of 7, distilled water is pH-neutral; an acid character with a pH-value < 7 have e.g. facade cleaners. Please always observe the safety instructions when processing highly acid or alkaline cleaners or paints.

Dynamic viscosity [mPas]: Lab characteristic for the brushing resistance or "viscosity" of the liquid paint in its undiluted state at room temperature. A high viscosity is e.g. characteristic for adhesives and plasters. By adding water, the somewhat pasty wall paints may be prepared to become brushable for perfect processing on any surface (rough/smooth/absorbent/dense).

Efflux time [sec]: Practical value for the consistency, specifically for spray painting. Given is the efflux time in the DIN cup (bore 4 mm) at 20 °C in the undiluted state. For any spraying system (low pressure, high pressure, airmix), the ideal efflux time may be determined based on a test coating. By the way, the efflux time may be adjusted not only by adding a thinner but also by water bath heating with less solvent and good covering qualities.

Solids content [weight %]: Most paints contain volatile (water, solvents) and non-volatile components (binders, pigments, fillers) that form the "body", i.e. the dried paint film. For products containing solvents such as lacquers, a high solids content (75 - 80%) is desirable. Solids contents of 100% are achieved by oil based varnishes that are absolutely solvent-free.

DIN 4102: Provides information on the flammability of a building material. Classes A1 and A2 are non-flammable. Purely mineral lime and silicate paints are non-flammable and will not release toxic gasses in case of a fire which proves their enormous chemical stability.

DIN 53 778: Splits wall paints for indoor use in two qualities: „washable“ and „wear-resistant“. For living areas and commercial rooms „washable“ (according to DIN 53 778; without that DIN reference the term „washable“ would be insufficient to define the quality) is absolutely acceptable. Only for kitchens, hospitals etc. a wear-resistant wall paint might be required because of more frequent cleaning. In fall 2001, DIN 53 778 was replaced by the new DIN EN 13 300 and terms like „washable“ were deleted, thus making it a lot harder to interpret this standard. You will find the actual classification of the most important BEECK and AGLAIA wall paints in **DIN EN 13 300**.

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Please note that all characteristics given in the Technical Information Sheets are to be considered recommended values according to standard test methods and that certain deviations might be unavoidable in the course of further product development. In practice, further important factors are: the quality of the substrate, the processing method, the layer thickness and the climatic conditions during drying.