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European standards for tile adhesives

Adhesive certification to EN standards and German Flexmortar quality label

Adhesive products used for laying ceramic tiles are required to meet various performance standards. These are precisely defined in European standard DIN EN 12004 (or ISO 13007 Part 1), which specifies the criteria for the C1 and C2 ratings (for cementitious adhesives), D1 and D2 ratings (for dispersion adhesives) and R1 and R2 (for reaction resin adhesives) along with extra optional parameters. Standard DIN EN 12004 sets out the background to the S1 and S2 ratings for cementitious adhesives. The various performance criteria are described in detail in the following sections.



European standards

Cementitious adhesives

Tensile adhesion strength

The C1 and C2 ratings (specified in DIN EN 12004) relate to tensile adhesion performance. The Class C1 criteria represent the minimum requirements (min. 0.5 N/mm²) for all cementitious tile adhesives. The performance standards specified for Class C2 are appreciably higher, with a minimum tensile adhesion strength of 1 N/mm² required of thin-bed adhesives. Tensile adhesion tests for the C1 and C2 ratings are performed for four different storage conditions.

	Class C1	Class C2
Tensile adhesion strength after dry storage	≥ 0.5 N/mm ²	≥ 1 N/mm ²
Tensile adhesion strength after water storage	≥ 0.5 N/mm ²	≥ 1 N/mm ²
Tensile adhesion strength after heat storage	≥ 0.5 N/mm ²	≥ 1 N/mm ²
Tensile adhesion strength after freeze-thaw storage	≥ 0.5 N/mm ²	≥ 1 N/mm ²

Deformability

The deformability of hardened, cementitious thin-bed adhesives is tested using a predefined specimen (strip of material) and rated as S1 or S2 (to DIN EN 12004).

While the S1 rating requires a deformability between min. 2.5 mm and 5 mm, Class S2 is reserved for highly deformable products achieving a minimum value of 5 mm – a requirement twice that specified by the German Flexmortar guidelines.

Dispersion adhesives

The D1 and D2 ratings (specified in DIN EN 12004) relate to shear strength. All dispersion adhesives are required to meet at least Class D1 requirements i.e. by exhibiting min. 1 N/mm² shear strength after dry and heat storage. The D2 rating additionally requires a minimum shear strength of 0.5 N/mm² after water storage together with a shear strength ≥ 1 N/mm² at elevated temperatures.

Reaction resin adhesives

Like the D1 and D2 ratings for dispersion adhesives, Classes R1 and R2 for reaction resin adhesives (specified in DIN EN 12004) relate to shear strength. All reaction resin adhesives are required to meet at least Class R1 requirements, i.e. by exhibiting min. 2 N/mm² shear strength after dry and water storage. The R2 rating additionally requires a minimum shear strength of 2 N/mm² after temperature cycles.

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Application properties

Extra letters, e.g. T, E and F, may be added to the rating code to indicate supplementary application properties.

T = thixotropic/high sag resistance

E = extended open time
(only applicable to cementitious and Class D2 dispersion adhesives)

F = fast setting (only applicable to cementitious adhesives)

The high-performance Sopro No. 1 flexible cementitious tile adhesive, for instance, boasts a tensile adhesion strength exceeding 1 N/mm² (C2) plus a deformability of over 2.5 mm (S1). It also possesses properties allowing easy application, such as high sag resistance and an extended open time. It is therefore classed as C2 TE/S1.

By way of a further example, Sopro SK 441 highly flexible dispersion adhesive achieves a D2 TE rating, i.e. exhibits a shear strength ≥ 1 N/mm² after dry and heat storage and at elevated temperatures together with a shear strength ≥ 0.5 N/mm² after water storage. Again, the product's workability is greatly enhanced by its high sag resistance and extended open time.

Sopro DBE 500 epoxy tile adhesive exhibits a shear strength ≥ 2 N/mm² after dry and water storage and after temperature cycles as well as high sag resistance. It duly achieves a rating of R2 T.



German Flexmortar guidelines

The Flexmortar guidelines specify national requirements for flexible, one-component adhesives. These guidelines are not effective at European level.

The minimum requirements for flexible tile adhesives correspond to European Class C2 and additionally stipulate a minimum deformability of 2.5 mm, although this provision – in respect of key test criteria – fails to match the much stiffer test procedures of the current DIN EN 12004, which places far stricter demands on the condition of test specimens.

Hence, any flexible, one-component thin-bed adhesive classed C2/S1 to European standards DIN EN 12004 automatically meets the requirements of the German Flexmortar guidelines. Indeed, the C2/S1 rating exceeds the demands of the Flexmortar guidelines with regard to deformability and thus flexibility – a particularly vital property. As a result, the adhesive performance implied by the C2/S1 rating is currently superior to that signalled by the (lozenge-shaped) Flexmortar quality label alone.



CE marking

The CE mark is affixed by manufacturers solely to confirm the conformity of their products with the relevant European standards. CE marking has been mandatory for tile adhesives since 1.04.2004 and serves as a kind of „product passport“ to permit the free movement of goods within Europe. The minimum requirement is a Class C1 rating to EN 12004.

Award of the CE mark is subject to initial type testing by a recognized institute, which confirms compliance of the products properties with the requirements of the relevant European standards. Copies of test certificates are obtainable from Sopro. Each CE mark indicates the relevant manufacturer together with the performance data for the four storage conditions.

Sopro's tile adhesives all meet the minimum requirements, without exception.

Note!

Tile adhesives may bear the CE mark even if they fail to meet the minimum C1 requirement for all four storage conditions. In such cases, however, the minimum requirement may only be waived for heat and freeze-thaw storage.

Tile adhesives displaying a CE mark subject to these exceptions must not be used outdoors.

Such tile adhesives may be recognized by the designations NPD (no performance determined) or KLF (»keine Leistung festgestellt«) or by performance data stated in the CE label that fail to meet the C rating requirements.

	Sopro Bauchemie GmbH Biebricher Straße 74 · 65203 Wiesbaden (Germany)
	The production date is printed on the packaging. EN 12004 Improved, rapid-set, cementitious mortar for wall and floor coverings, indoors and outdoors
	Early tensile adhesion strength (after 6 hours) $\geq 0,5$ N/mm ²
	Tensile adhesion strength after dry storage ≥ 1 N/mm ²
	Tensile adhesion strength after water storage ≥ 1 N/mm ²
	Tensile adhesion strength after heat storage ≥ 1 N/mm ²
	Tensile adhesion strength after freeze-thaw storage ≥ 1 N/mm ²

Adhesive classification to DIN EN 12004

C1	Mandatory parameters	C1	Tensile adhesion strength in each of required tensile adhesion tests: $\geq 0.5 \text{ N/mm}^2$ plus open time: tensile adhesion strength after min. 20 minutes installation time: $\geq 0.5 \text{ N/mm}^2$
	Optional parameters	C1T	● Additionally with low sag of max. 0.5 mm
		C1F	● Additionally with early tensile adhesion strength after dry storage and after max. 6 h $\geq 0.5 \text{ N/mm}^2$ ● Additionally with shorter open time (tensile adhesion strength $\geq 0.5 \text{ N/mm}^2$ after min. 10 minutes installation time)
		C1FT	● Additionally with early tensile adhesion strength after dry storage and after max. 6 h $\geq 0.5 \text{ N/mm}^2$ ● Additionally with shorter open time (tensile adhesion strength $\geq 0.5 \text{ N/mm}^2$ after min. 10 minutes installation time) ● Additionally with low sag of max. 0.5 mm
		C1ETF	● Additionally with extended open time (tensile adhesion strength $\geq 0.5 \text{ N/mm}^2$ after min. 30 minutes installation time) ● Additionally with low sag of max. 0.5 mm ● Additionally with early tensile adhesion strength after dry storage and after max. 6 h $\geq 0.5 \text{ N/mm}^2$
C2	Mandatory parameters	C2	Tensile adhesion strength in each of required tensile adhesion tests: $\geq 1 \text{ N/mm}^2$ plus open time: tensile adhesion strength after min. 20 minutes installation time: $\geq 0.5 \text{ N/mm}^2$
	Optional parameters	C2T	● Additionally with low sag of max. 0.5 mm
		C2E	● Additionally with extended open time (tensile adhesion strength $\geq 0.5 \text{ N/mm}^2$ after min. 30 minutes installation time)
		C2TE	● Additionally with low sag of max. 0.5 mm ● Additionally with extended open time (tensile adhesion strength $\geq 0.5 \text{ N/mm}^2$ after min. 30 minutes installation time)
		C2F	● Additionally with early tensile adhesion strength after dry storage and after max. 6 h $\geq 0.5 \text{ N/mm}^2$ ● Additionally with shorter open time (tensile adhesion strength $\geq 0.5 \text{ N/mm}^2$ after min. 10 minutes installation time)
		C2FT	● Additionally with early tensile adhesion strength after dry storage and after max. 6 h $\geq 0.5 \text{ N/mm}^2$ ● Additionally with shorter open time (tensile adhesion strength $\geq 0.5 \text{ N/mm}^2$ after min. 10 minutes installation time) ● Additionally with low sag of max. 0.5 mm
		C2EF	● Additionally with extended open time (tensile adhesion strength $\geq 0.5 \text{ N/mm}^2$ after min. 30 minutes installation time) ● Additionally with early tensile adhesion strength after dry storage and after max. 6 h $\geq 0.5 \text{ N/mm}^2$
		C2ETF	● Additionally with extended open time (tensile adhesion strength $\geq 0.5 \text{ N/mm}^2$ after min. 30 minutes installation time) ● Additionally with low sag of max. 0.5 mm ● Additionally with early tensile adhesion strength after dry storage and after max. 6 h $\geq 0.5 \text{ N/mm}^2$
D1	Mandatory parameters	D1	Shear strength in each of required shear tests: $\geq 0.5 \text{ N/mm}^2$ plus open time: tensile adhesion strength after min. 20 minutes installation time: $\geq 0.5 \text{ N/mm}^2$
	Optional parameters	D1T	● Additionally with low sag of max. 0.5 mm
		D1TE	● Additionally with low sag of max. 0.5 mm ● Additionally with extended open time (tensile adhesion strength $\geq 0.5 \text{ N/mm}^2$ after min. 30 minutes installation time)
D2	Mandatory parameters	D2	Shear strength in each of required shear tests: $\geq 1 \text{ N/mm}^2$ and $\geq 0.5 \text{ N/mm}^2$ after water storage plus open time: tensile adhesion strength after min. 20 minutes installation time: $\geq 0.5 \text{ N/mm}^2$
	Optional parameters	D2T	● Additionally with low sag of max. 0.5 mm
		D2E	● Additionally with extended open time (tensile adhesion strength $\geq 0.5 \text{ N/mm}^2$ after min. 30 minutes installation time)
		D2TE	● Additionally with low sag of max. 0.5 mm ● Additionally with extended open time (tensile adhesion strength $\geq 0.5 \text{ N/mm}^2$ after min. 30 minutes installation time)
R1	Mandatory parameters	R1	Shear strength in each of required shear tests: $\geq 2 \text{ N/mm}^2$ plus open time: tensile adhesion strength after min. 20 minutes installation time: $\geq 0.5 \text{ N/mm}^2$
	Optional parameters	R1T	● Additionally with low sag of max. 0.5 mm
R2	Mandatory parameters	R2	Shear strength in each of required shear tests: $\geq 2 \text{ N/mm}^2$ plus shear strength after temperature cycles: $\geq 2 \text{ N/mm}^2$ plus open time: tensile adhesion strength after min. 20 minutes installation time: $\geq 0.5 \text{ N/mm}^2$
	Optional parameters	R2T	● Additionally with low sag of max. 0.5 mm
S1	Class	S1	Deformability $\geq 2.5 \text{ mm}$
S2	Class	S2	Deformability $\geq 5 \text{ mm}$

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Tile grouts used for finishing ceramic tiling are required to meet various performance standards. These are precisely defined in European standard DIN EN 13 888 (or ISO 13 007 Part 3), which specifies the criteria for the CG1 and CG2 ratings (for cementitious tile grouts) and the RG rating (for reaction resin tile grouts)

CG classification to DIN EN 13 888

Merely to achieve a CG 1 rating, tile grouts are required to meet criteria for eight different test parameters:

CG 1	
Abrasion resistance	$\leq 2000 \text{ mm}^3$
Bending strength after dry storage	$\geq 2.5 \text{ N/mm}^2$
Bending strength after freeze-thaw storage	$\geq 2.5 \text{ N/mm}^2$
Compressive strength after dry storage	$\geq 15 \text{ N/mm}^2$
Compressive strength after freeze-thaw storage	$\geq 15 \text{ N/mm}^2$
Shrinkage	$\leq 3 \text{ mm/m}$
Water absorption after 30 minutes	$\leq 5 \text{ g}$
Water absorption after 240 minutes	$\leq 10 \text{ g}$
CG 2 (in addition to CG 1)	
Extra-high abrasion resistance	$\leq 1000 \text{ mm}^3$
Reduced water absorption after 30 minutes	$\leq 2 \text{ g}$
Reduced water absorption after 240 minutes	$\leq 5 \text{ g}$

RG classification to DIN EN 13 888

The RG rating applies to reaction resin tile grouts and imposes similarly stringent requirements on the relevant materials:

Abrasion resistance	$\leq 250 \text{ mm}^3$
Bending strength after dry storage	$\geq 30 \text{ N/mm}^2$
Compressive strength after dry storage	$\geq 45 \text{ N/mm}^2$
Shrinkage	$\leq 1.5 \text{ mm/m}$
Water absorption after 240 minutes	$\leq 0.1 \text{ g}$