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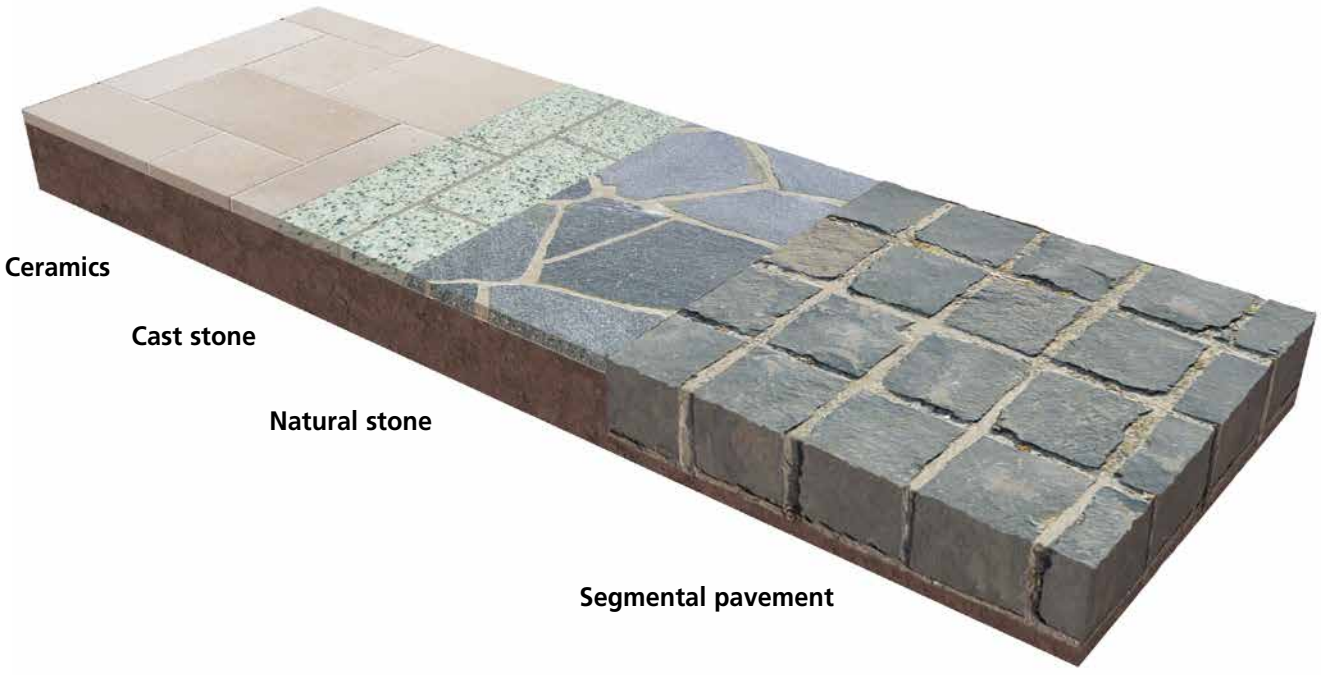
Fundamentals

The **correct choice of tile or paving grout** is crucial in ensuring the durability of ceramic, natural stone or other coverings and pavements. Selection is dictated by the specific use of the facility and the resulting long-term loads which the grout will be required to withstand without failure.

For this reason, a **use-related analysis** of the areas for tiling and grouting is required at the design stage, to eliminate the risk of failures due to the specification of unsuitable materials.

Key factors to consider:

- **Live loads (industrial trucks, pedestrians etc.) and resulting abrasion/wear to joint surface**
- **Chemical loads (acids/alkalis)**
- **Accommodation of stress caused by thermal expansion**
- **Cleaning methods (e.g. high-pressure equipment) and intervals**
- **Covering materials (natural stone, fully vitrified stoneware etc.)**
- **Applications (underwater areas, drinking water facilities etc.)**
- **Joint width, depth and colour**



Tile and paving grout solutions tailored to the diversity of requirements are presented on the following pages.

Fundamentals

Tile and paving grouts, like bedding mortars and adhesives, are required to meet various performance specifications.

These are precisely defined in European standard DIN EN 13888 (and ISO 13007 Part 3).

DIN EN 13888 specifies the designation "CG" for cementitious grouts and "RG" for reaction resin grouts:

CG ➥ cementitious grouts
RG ➥ reaction resin grouts

Cementitious grouts are tested and rated in terms of basic and additional properties. Grouts exhibiting the basic properties are classed as "CG1", while those meeting the additional requirements are rated "CG2".

CG1 Basic properties	
Abrasion resistance	≤ 2000 mm³
Bending strength after dry storage	≥ 2.5 N/mm²
Bending strength after freeze-thaw cycling	≥ 2.5 N/mm²
Compressive strength after dry storage	≥ 15 N/mm²
Compressive strength after freeze-thaw cycling	≥ 15 N/mm²
Shrinkage	≤ 3 mm/m
Water absorption after 30 minutes	≤ 5 g
Water absorption after 240 minutes	≤ 10 g

CG2 W, CG2 A and CG2 WA (in addition to CG1)	
Extra-high abrasion resistance (= A)	≤ 1000 mm³
Reduced water absorption after 30 minutes (= W)	≤ 2 g
Reduced water absorption after 240 minutes (= W)	≤ 5 g

Reaction resin grouts, given their material composition, are required to meet particularly high performance levels to achieve an RG rating to DIN EN 13888.

RG properties	Requirement
Abrasion resistance	≤ 250 mm³
Bending strength after dry storage	≥ 30 N/mm²
Compressive strength after dry storage	≥ 45 N/mm²
Shrinkage	≤ 1.5 mm/m
Water absorption after 240 minutes	≤ 0.1 g

Given that the Sopro epoxy grouts may also be used to **bed tiles and glass mosaic**, they are also tested to DIN EN 12004 (adhesive standard, see Section 1) and are therefore doubly certified and marked.

Properties of tiles

The tiles to be grouted are made from a wide variety of raw materials and substances.

Their composition and specific method of manufacture have a significant impact on their technical properties.

One particular characteristic that regularly influences the grouting process is the water absorption (suction) behaviour of tiles, which varies between product types. Ceramic tiles are standardized to DIN EN 14411. Under this standard, they are grouped according to method of manufacture and water absorption.

Method of manufacture	
Method A	Extruded tiles
Method B	Dry-pressed tiles
Method C	Tiles made by processes other than extrusion or dry-pressing

Water absorption	
Group I	Low water absorption E ≤ 3 % Tiles made by Method B are further subdivided:
	Group B I_a with E ≤ 0.5 %
	Group B I_b with 0.5 % < E ≤ 3 %
Group II	Medium water absorption 3 % < E ≤ 10 % Tiles made by Method A are further subdivided:
	Group A II_a with 3 % < E ≤ 6 %
	Group A II_b with 6 % < E ≤ 10 %
	The same distinction applies for dry-pressed tiles (Method B):
	Group B II_a with 3 % < E ≤ 6 %
	Group B II_b with 6 % < E ≤ 10 %
	Note: For Method of Manufacture A, Groups II_a/II_b are further subdivided into Part 1 and 2 to allow classification by additional product requirements.
Group III	High water absorption E ≥ 10 %

Tiles manufactured by dry-pressing method.

Juli 2007

DIN EN 14411 Berichtigung 1

DIN

ICS 91.100.23

Es wird empfohlen, auf der betroffenen Norm einen Hinweis auf diese Berichtigung zu machen.

Keramische Fliesen und Platten – Begriffe, Klassifizierung, Gütemerkmale und Kennzeichnung; Deutsche Fassung EN 14411:2006, Berichtigungen zu DIN EN 14411:2007-03

Ceramic tiles – Definitions, classification, characteristics and marking; German version EN 14411:2006, Corrigenda to DIN EN 14411:2007-03

Carreaux et dalles céramiques – Définitions, classification, caractéristiques et marquage; Version allemande EN 14411:2006, Corrigenda à DIN EN 14411:2007-03

Gesamtumfang 2 Seiten

Normenausschuss Bauwesen (NABau) im DIN

Fundamentals

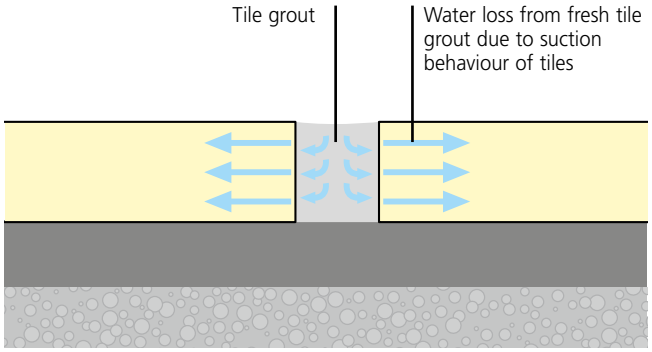
Water absorption as percentage weight				
Forming method	Group I $E \leq 3\,\%$	Group II_a $3\,\% < E \leq 6\,\%$	Group II_b $6\,\% < E \leq 10\,\%$	Group III $E > 10\,\%$
A Extruded	A I	A II_a Part 1 A II_a Part 2	A II_b Part 1 A II_b Part 2	A III
B Dry-pressed	Group B I_a $E \leq 0.5\,\%$ Group B I_b $0.5\,\% < E \leq 3\,\%$	B II_a	B II_b	B III
C Cast	C I Not standardized	C II_a Not standardized	C II_b Not standardized	C III Not standardized

What becomes clear is that tilers are confronted with a wide range of ceramic products on site. Accordingly, particular attention needs to be given to the water absorption capacity of the relevant tiles as this determines selection of the most appropriate tile grout.

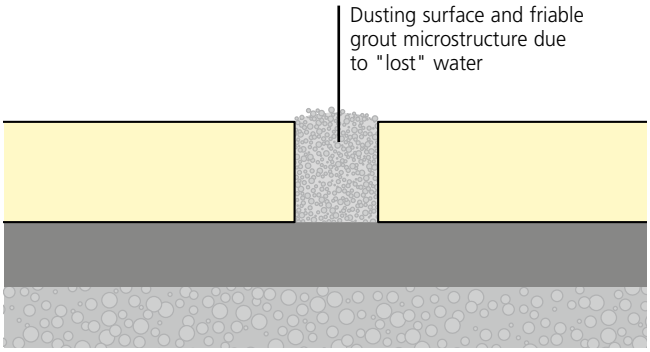
Wrongly selected tile grouts may be unable to develop adequate strength or may exhibit unwanted variations in colour due to the suction behaviour of the ceramic product.

Suction behaviour of ceramics

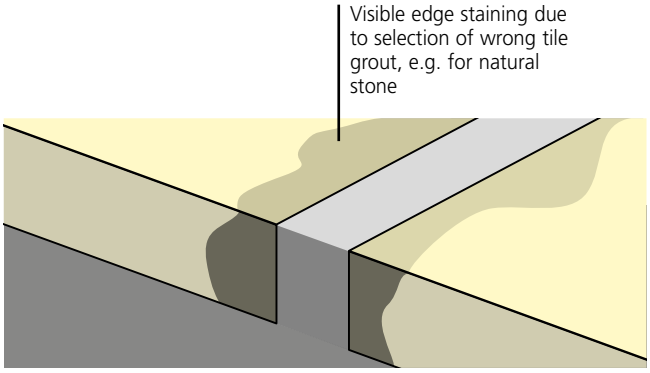
A) Installation



B) Cured



The factory-mixed tile grouts are geared to the varying suction behaviour of particular tiles, and special grouting procedures may be specified for different applications.



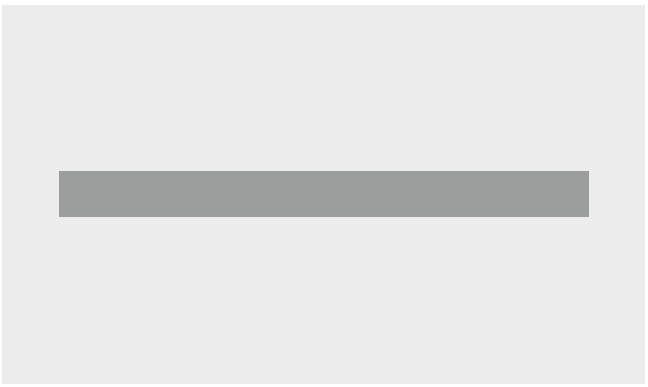
Note: Especially where natural stone, cast stone or cement-bonded tiles require grouting, the correct choice of tile grout is essential. This is because, apart from the potential problems with the tile grout itself (strength, colour etc.), the visual impact of the tiles may be additionally impaired by edge staining.

Appearance of grouted joint and optical illusion

Not surprisingly, grouted joints always double up as a design feature to enhance the visual impact of the particular tile covering. Unfortunately, the human eye is ever susceptible to optical illusions brought about by the colour contrast between tile surface and grout. This frequently occurs at the junction between wall and floor areas. Variations in light incidence and brightness distort colour perception.

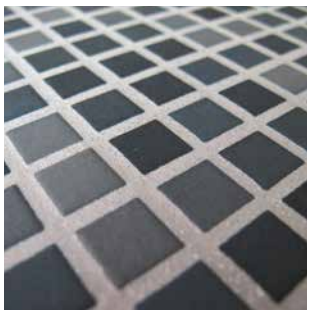
This can be demonstrated by a simple experiment: a uniformly coloured joint grouted with a grey material appears lighter against a dark background and darker against a light background.

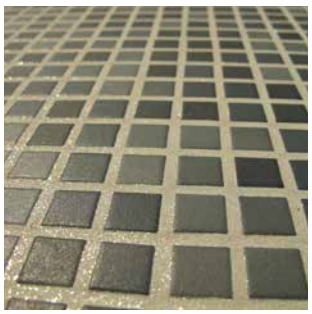
If, on site, the tiles to the left and right of the joint are covered up with a sheet of white paper, then the uniform grout colour over the whole joint length is immediately apparent.



Joints as a design feature

Depending on the tile or mosaic size as well as the width and colour of the joint, the selected tile grout may make a major contribution to the overall aesthetic impact of the tile finish. Proper counselling in advance is therefore strongly recommended. Alongside a discussion of the colour, the technical necessity of a grouted joint and, in particular, its required width should be explained. Modern-day tile grouts are very versatile in terms of their technical properties, e.g. flexibility, water repellency, high strength etc.





Different-looking joint designs in combination with covering.

Sopro DF 10 flexible designer tile grout can be visually enhanced to act as an architectural feature through the addition of Sopro gold, silver or copper glitter.

Product recommendations

Industrial/commercial applications

Joints in commercial facilities (food-processing sector) subject to high mechanical and chemical loads.

Sopro TFb
3–30 mm

High-strength, rapid-set, trass-bearing, cementitious tile grout, meeting CG2 WA requirements to DIN EN 13888, for extra-heavy-duty applications. High mechanical strength and abrasion resistance through use of Mikrodur® microcement.

For grouting stoneware, fully vitrified stoneware, clinker, split tile, brick slip and natural stone coverings.
Particularly suitable for workshops, washing facilities and catering kitchens, as alternative to reaction resin grouts.

Swimming pools

High-strength, cementitious tile grout for use in conjunction with standard swimming pool ceramics for underwater applications.

Sopro TFb
3–30 mm

High-strength, rapid-set, trass-bearing, cementitious tile grout, meeting CG2 WA requirements to DIN EN 13888, for extra-heavy-duty applications. High mechanical strength and abrasion resistance through use of Mikrodur® microcement.

For grouting stoneware, fully vitrified stoneware, clinker, split tile, brick slip and natural stone coverings.
Particularly suitable for standard swimming pool ceramics comprising pool edge units and a wide variety of tile fittings.

Product recommendations

Wellness areas

High-strength, fine-grained tile grout for finishing joints e.g. in wellness areas with small-format tiles and mosaic.

Sopro TF⁺
1–10 mm

High-strength, rapid-set, lime-film-free, cementitious tile grout, meeting CG2 WA requirements to DIN EN 13888, for heavy-duty applications. High mechanical strength and abrasion resistance through use of Mikrodur® microcement.

For grouting stoneware, fully vitrified stoneware, natural and cast stone coverings to produce brilliantly coloured, lime-film-free finish. Ideal for grouting glass and porcelain mosaic or tesserae. **For swimming pools, wellness suites and showers as alternative to reaction resin grouts.** Sopro gold, silver or copper glitter can be added to Sopro TF⁺ to achieve special effects and enhance visual appeal.

Drinking water containers

Specially tested and approved, hydraulically setting tile grout for drinking water applications.

Certified tile laying system for drinking water applications:

Sopro's No.1 TW

Cementitious **flexible tile adhesive,** meeting C1 TE requirements to DIN EN 12004, for laying and bonding of ceramic tiles in drinking water containers (complies with Plastics-Potable Water Recommendations issued by German Federal Health Office).

Sopro TF⁺
1–10 mm

High-strength, rapid-set, lime-film-free, cementitious tile grout, meeting CG2 WA requirements to DIN EN 13888, for heavy-duty applications. High mechanical strength and abrasion resistance through use of Mikrodur® microcement.

For grouting stoneware, fully vitrified stoneware, natural and cast stone coverings to produce brilliantly coloured, lime-film-free finish. Ideal for grouting glass and porcelain mosaic or tesserae. **For swimming pools, wellness suites and showers as alternative to reaction resin grouts.** Sopro gold, silver or copper glitter can be added to Sopro TF⁺ to achieve special effects and enhance visual appeal.

Product recommendations

Areas exposed to splashing

Areas exposed to splashing (e.g. domestic bathrooms) with tiled shower surfaces and low-suction ceramics (fully vitrified stoneware), grouted with water- and dirt-repellent materials.

Sopro DF 10
1–10 mm

Fine, strong, flexible, rapid-set, cementitious tile grout, meeting CG2 WA requirements to DIN EN 13888, for grouting all types of ceramic and natural stone coverings to produce **brilliantly coloured, lime-film-free finish**.

Enhanced protection of joint against mould formation and microorganisms* plus lime-film-free finish ensure brilliantly coloured joint pattern with lasting appeal, for both indoor and outdoor applications, and especially in moisture-exposed areas. Inherent water-beading effect and Hydrodur® technology create water- and dirt-repellent joints with antimicrobial capability. Sopro TF+/TFb high-strength tile grouts, Sopro FEP plus epoxy tile grout, Sopro FEP 604 three-component epoxy tile grout or Sopro FEP epoxy tile grout are recommended for use in swimming pools. Sopro gold, silver or copper glitter can be added to Sopro DF 10 to achieve special effects and enhance visual appeal.

Earthenware tiles (absorbent ceramics)

Absorbent earthenware tile coverings are still a very popular choice for wall surfaces.

Sopro Saphir® 5
1–5 mm

Flexible, water- and dirt-repellent, cementitious tile grout with water-beading effect, meeting CG2 WA requirements to DIN EN 13888.

For grouting absorbent earthenware tiles. With first-rate joint-filling properties and washability (removability). The fine, smooth joint surface and high colour fastness guarantee a tile finish with lasting appeal.
Particularly suitable for damp and wet spaces.

* Treated article under EU Biocides Regulation.
Please observe current version of product information, available at www.sopro.com

Product recommendations

Fully vitrified stoneware (low-suction ceramics)

Fully vitrified stoneware tiles, which generally exhibit low suction, are now a standard choice for floor finishes.

Sopro DF 10
1 – 10 mm

Fine, strong, flexible, rapid-set, cementitious tile grout, meeting CG2 WA requirements to DIN EN 13888, for grouting all types of ceramic and natural stone coverings to produce **brilliantly coloured, lime-film-free finish**.

Enhanced protection of joint against mould formation and microorganisms* plus lime-film-free finish ensure brilliantly coloured joint pattern with lasting appeal, for both indoor and outdoor applications, and especially in moisture-exposed areas. Inherent water-beading effect and Hydrodur® technology create water- and dirt-repellent joints with antimicrobial capability. Sopro TF+/TFb high-strength tile grouts, Sopro DFX designer epoxy tile grout, Sopro FEP 604 three-component epoxy tile grout or Sopro FEP epoxy tile grout are recommended for use in swimming pools. Sopro gold, silver or copper glitter can be added to Sopro DF 10 to achieve special effects and enhance visual appeal.

Sopro Brillant®
1 – 10 mm

Flexible, water- and dirt-repellent, rapid-set, cementitious tile grout, with water-beading effect, meeting CG2 WA requirements to DIN EN 13888 and offering excellent workability, for grouting **ceramic coverings,** cast stone, all types of natural stone, and glass mosaic. Particularly suitable for low-suction ceramics, e.g. fully vitrified stoneware.
The fine, smooth, easy-clean joint surface and antimicrobial capability guarantee a tile finish with lasting appeal.
Particularly suitable for damp and wet spaces, for living areas exposed to dirt/soiling and in conjunction with floor heating.

Areas exposed to thermal loads

Flexible, hydraulically setting tile grout for areas with high exposure to thermal loads, e.g. balconies and floor heating constructions.

* Treated article under EU Biocides Regulation.
Please observe current version of product information, available at www.sopro.com

Sopro FL plus
2 – 20 mm

Strong, flexible, frost-resistant, rapid-set, cementitious tile grout, meeting CG2 WA requirements to DIN EN 13 888, **for grouting narrow and wide joints in wall and floor coverings, indoors and outdoors, to produce brilliantly coloured lime-film-free finish**.
With **first-rate joint-filling properties and washability (removability) in conjunction with optimum degree of joint filling**. For smooth, easy grouting of stoneware, fully vitrified stoneware, natural and cast stone coverings, ceramic split tiles, glass blocks and clinker floor tiles.
Enhanced protection of joint against mould formation and microorganisms* plus lime-film-free finish ensure brilliantly coloured joint pattern with lasting appeal. Inherent water-beading effect and Hydrodur® technology create water- and dirt-repellent joints with antimicrobial capability. Also suitable for use in conjunction with floor heating.
Sopro gold, silver or copper glitter can be added to create a distinctive, glistening joint finish.

Product recommendations

Grouting of large areas

Sopro FL plus – with its first-rate joint-filling properties and washability (removability) – is ideal for grouting large, continuous floor areas.

Sopro FL plus
2 – 20 mm

Strong, flexible, frost-resistant, rapid-set, cementitious tile grout, meeting CG2 WA requirements to DIN EN 13 888, **for grouting narrow and wide joints in wall and floor coverings, indoors and outdoors, to produce brilliantly coloured lime-film-free finish**.

With **first-rate joint-filling properties and washability (removability) in conjunction with optimum degree of joint filling**. For smooth, easy grouting of stoneware, fully vitrified stoneware, natural and cast stone coverings, ceramic split tiles, glass blocks and clinker floor tiles. Also suitable for use in conjunction with floor heating.

Grouting of natural stone

Grout specially designed for natural stone coverings, with protection against efflorescence and migration staining at edges.

Sopro DF 10
1 – 10 mm

Fine, strong, flexible, rapid-set, cementitious tile grout, meeting CG2 WA requirements to DIN EN 13888, for grouting all types of ceramic and natural stone coverings to produce **brilliantly coloured, lime-film-free finish**.

Enhanced protection against mould formation and microorganisms* plus lime-film-free finish ensure brilliantly coloured joint pattern with lasting appeal, for both indoor and outdoor applications, and especially in moisture-exposed areas. Inherent water-beading effect and Hydrodur® technology create water- and dirt-repellent joints with antimicrobial capability. Sopro gold, silver or copper glitter can be added to Sopro DF 10 to achieve special effects and enhance visual appeal.

* Treated article under EU Biocides Regulation.
Please observe current version of product information, available at www.sopro.com

Product recommendations

Glass mosaic grouting

Glass mosaic joints finished with Sopro epoxy grouts.

Sopro DFX designer epoxy tile grout

Fine, decorative, extra-smooth, easily workable, two-component designer epoxy tile grout and adhesive, resistant to high chemical and mechanical loads, meeting RG requirements to DIN EN 13888 and R2 T requirements to DIN EN 12004. For effortless grouting of high-grade ceramic tile coverings. For same-colour bonding and grouting of glass and porcelain mosaic or tesserae.

Grout's high resistance and hardwearing properties ensure brilliantly coloured joint pattern with lasting appeal, especially in moisture-exposed areas. For residential, commercial and industrial facilities. For showers, bathrooms, wellness suites and swimming pools, thermal baths, balconies and patios, retail areas, food-production facilities, laboratories and catering kitchens. Suitable in areas exposed to water, cleaners, chemicals, acids and natural fats, as well as compressive loads and washout action. Suitable for use in conjunction with wall and floor heating.

Brilliantly coloured, cementitious grout for glass mosaic.

Sopro DF 10
1–10 mm

Fine, strong, flexible, rapid-set, cementitious tile grout, meeting CG2 WA requirements to DIN EN 13888, for grouting all types of ceramic, natural stone and mosaic coverings to produce **brilliantly coloured, lime-film-free finish**.

Enhanced protection against mould formation and microorganisms* plus lime-film-free finish ensure brilliantly coloured joint pattern with lasting appeal, for both indoor and outdoor applications, and especially in moisture-exposed areas. Inherent water-beading effect and Hydrodur® technology create water- and dirt-repellent joints with antimicrobial capability. Also suitable for grouting thin tile coverings (≤ 4 mm). Sopro TF+/TFb high-strength tile grouts, Sopro DFX designer epoxy tile grout or Sopro FEP 604 three-component epoxy tile grout are recommended for use in swimming pools. Sopro gold, silver or copper glitter can be added to Sopro DF 10 to achieve special effects and enhance visual appeal.

* Treated article under EU Biocides Regulation.
Please observe current version of product information, available at www.sopro.com

Product recommendations

Reaction resin tile grouts for areas exposed to acids

Reaction resin grouting in areas with high chemical and acid exposure, e.g. battery-charging rooms.

Sopro DFX designer epoxy tile grout

Fine, decorative, extra-smooth, easily workable, two-component designer epoxy tile grout and adhesive, resistant to high chemical and mechanical loads, meeting RG requirements to DIN EN 13888 and R2 T requirements to DIN EN 12004.

For effortless grouting of high-grade ceramic tile coverings. Suitable in areas exposed to water, cleaners, chemicals and acids (please consult resistance table in technical product information), and natural fats, as well as compressive loads and washout action.For showers, bathrooms, wellness suites and swimming pools, thermal baths, balconies and patios, retail areas, food-production facilities, laboratories and catering kitchens. Suitable in areas exposed to water, cleaners, chemicals, acids and natural fats, as well as compressive loads and washout action. Suitable for use in conjunction with wall and floor heating.

Sopro FEP 604

Heavy-duty, three-component epoxy tile grout. For grouting ceramic tiles in areas exposed to aggressive waters, chemicals and acids (please consult resistance table presented in technical product information), natural fats, high compressive loads and washout action. For balconies and patios, commercial and industrial facilities, laboratories, catering kitchens and swimming pools (thermal baths). Particularly suitable for machine grouting.

Drains and sewers

Soil water- and sulphate-resistant grout for drains, sewers and animal housings.

Sopro TFb
3–30 mm

Rapid-set, cementitious tile grout, meeting CG2 WA requirements to DIN EN 13888, for man-entry public sewage system structures, e.g. overflow channels, settlement tank zones between high/low sewage levels and combined sewer inverts.
Also suitable for sanitary facilities and animal housings. High resistance to abrasive loads and aggressive substances.
For grouting stoneware tiles and half- or third-round stoneware channels.

Tile laying support hotline: +49 611-1707-111

Product recommendations

Pervious grouting

Pervious paving grout for production of free-draining pavements outdoors.

2 cm thick, large-format ceramic patio tiles for attractive patio paving solution laid on chippings bed.

Heavy-duty grouting for roads and pathways

High-strength, cementitious paving grout, resistant to frost and de-icing salts, for production of impervious pavements subject to high traffic loads.

For further details, see Section 13 "Pavements in public and private areas"

Sopro EPF

Pervious, water-emulsifiable, two-component, solvent-free epoxy resin grout for grouting natural stone, concrete and clay segmental pavements in driveways, yards, forecourts, gardens, footpaths and in normal-duty trafficked areas, e.g. pedestrian zones.

Sopro Solitär® F20

Ready-to-use, atmospheric oxygen-curing, synthetic resin-modified, one-component tile and paving grout, for slurry application, for light-duty natural stone, cast stone and ceramic coverings/pavings, and, in particular, ceramic patio tiles ≥ 2 cm*, on bound and unbound bed.

Grouting of 2 cm thick, large-format ceramic patio tiles is also possible on unbound bed using Sopro Solitär® F20 in conjunction with Sopro Solitär® system. Please observe constructional details presented in technical product information.

* Size limitation: for units up to max. 80 x 80 cm, on unbound bed min. 30 x 30 cm.

Sopro PFM
5–30 mm

Rapid-set, trass-bearing, cementitious paving grout. Particularly suitable for grouting natural stone and concrete pavers in heavy-duty areas. The trass content serves to reduce efflorescence. Ideal for medium- to heavy-duty road surfaces and pedestrian precincts, gardens, hard landscaping and areas exposed to steam jet cleaning, frost and de-icing salts. With high abrasion resistance.

Sopro BSF 611
5–30 mm

Rapid-set, trass-bearing, cementitious paving grout, particularly suitable for grouting joints in **concrete segmental pavements** in gardens/landscaped areas and **in medium- to heavy-duty** vehicular pavements, including areas exposed to freeze/thaw cycles. Specially tailored to properties of concrete pavers (e.g. in respect of strength and temperature behaviour). **Suitable for linear structures,** e.g. roads and drainage channels, for roundabouts and for hard landscaped areas, e.g. marketplaces.

Elastic sealants/movement joints

Sealants are used at many different locations in construction facilities to fill movement joints. They are necessary as a means of accommodating movement in building elements and thus preventing damage.

Alongside cementitious tile grouts, flexible sealants play a key role in the tiling trade by providing hygienic, elastic fillings for movement joints.

Injection of sealant into movement joint.

Sealant selection

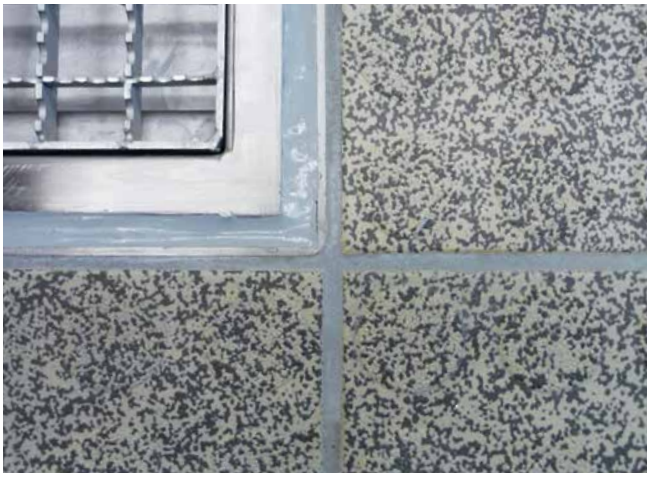
Here too, it is vital to select a sealant that is suitable for the particular application and later occupancy.

For wet spaces, a sealant with fungistatic properties* (e.g. Sopro Sanitary Silicone) should always be specified.

For sensitive coverings such as natural or cast stone, neutral-curing silicones are needed to rule out any risk of edge staining.

In industrial facilities (catering kitchens), sealants with high chemical resistance (e.g. SoproDur® HF-D 817 high-strength sealant) are required.

The durability of sealant joints depends not only on proper care, but also on correct dimensioning in function of the anticipated movement as well as good-practice sealant application. To prevent any risk of sealant failure, a joint layout plan providing for suitably wide movement joints should be prepared in advance. The projected movement, e.g. for screeds, is easy to calculate and should be taken into account in specifying the movement joint width.



Heavy-duty sealant joints near channel in catering kitchen.

Sopro Sanitary Silicone
for wet spaces

Sopro Ceramic Silicone
for ceramic coverings

Sopro Marble Silicone
for natural/cast stone coverings

SoproDur® HF-D 817
high-strength sealant
for industrial facilities

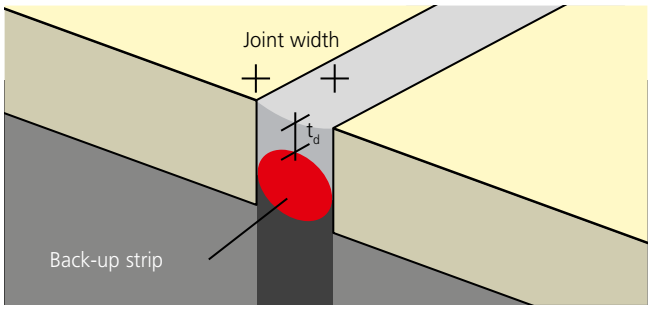
* Treated article under EU Biocides Regulation.
Please observe current version of product information, available at www.sopro.com

Installation

When installed, the sealant joint should have a thin central zone that is well able to accommodate the anticipated movement. The "thin" central zone is best achieved through prior insertion of a back-up strip. This strip additionally prevents contact between the sealant and any other part of the joint (so-called "three-side adhesion").

The most common form of movement in building elements, apart from the typical drying and shrinkage processes, is caused by temperature fluctuations. To calculate lengths, it is therefore necessary to know the material-specific coefficients of thermal expansion.

Examples for certain materials are presented in the following table:



Cross-section through movement joint: t_d = sealant depth.

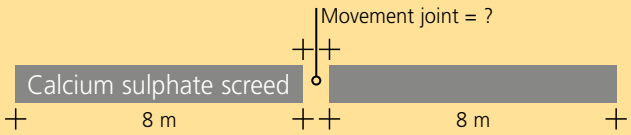
Material	Coefficient of expansion (10^{-6}/K)
Acrylic glass	80
Aluminium	23.5
Calcium sulphate screed	12
Tiles/ceramics	6
Glass	4.3
Wood	7
Marble	5–16
Steel	12–16
Earthenware	2.4

Formula for length change to be accommodated by sealant:

$$l_{(T)} = \alpha \cdot l_0 \cdot \Delta T$$

α = Coefficient of thermal expansion in mm/m/K
l_0 = Side length in m
ΔT = Temperature difference in K (°C)

Specimen calculation for calcium sulphate screed:



$l_{(T)} = 12 \cdot 10^{-6} \cdot 8{,}000 \text{ mm} \cdot 20 = \underline{1.92 \text{ mm}}$ (change in screed length)

Calcium sulphate α = $12 \cdot 10^{-6}$; screed length 8 m; temperature change 20 K

Calculation of minimum sealant joint width (b_F): $b_F = \frac{\Delta b \cdot 100}{PTD}$

Δb = Movement difference in mm = calculated length change $l_{(T)}$
PTD = Permissible total sealant deformation (20–25%)

$$b_F = \frac{1.92 \text{ mm} \cdot 100}{25} = \underline{7.68 \approx 8 \text{ mm}}$$

The minimum joint width determined by the calculation stands at 8 mm. Allowance should be made on site for a minimum width of 8–10 mm.

Elastic sealants/movement joints

Application

- Clean joint faces and remove all adhesion-impairing substances.
- Insert back-up strip.
- Apply sealant with Sopro silicone gun and strike off.
- For striking off surplus material and later smoothing of sealant joint, use special system-compatible Sopro GM 026 smoothing agent.
- Depending on sealant joint thickness, this must be allowed to properly dry for several days before being cleaned or exposed to loads.

Insert back-up strip.

Apply Sopro Sanitary Silicone using Sopro silicone gun.

Spray on Sopro GM 026 smoothing agent for easy working of joint sealant surface.

Strike off surplus material with spatula.

To finish, resmooth by hand.

Maintenance/cleaning

Sealant joints require periodic inspection and, where necessary, renewal. For heavy-duty areas, it may be useful to conclude a maintenance contract.

Sopro product systems for sustainable construction

Schematic system composition

Low-emission tile grouts*

Sopro DF 10
DGNB: Top quality level 4, Line 8**

Sopro FL plus
DGNB: Top quality level 4, Line 8**

Sopro Saphir® 5
DGNB: Top quality level 4, Line 8**

Sopro TF+
DGNB: Top quality level 4, Line 8**

Sopro Brillant®
DGNB: Top quality level 4, Line 8**

Low-emission sealants*

Sopro Ceramic Silicone
DGNB: Top quality level 4, Line 12**

Sopro Sanitary Silicone
DGNB: Top quality level 4, Line 12**

Sopro Marble Silicone
DGNB: Top quality level 4, Line 12**

* For details of all relevant Sopro products, please consult our sustainability brochure.
** Rating under German Sustainable Building Council (DGNB) quality certification scheme, Criterion "ENV1.2 Local Environmental Impact" (2018 version).
*** Applies for all Sopro DF 10 grout colours except deep blue, signal red and wine red.