

Conservation and Maintenance of Architectural Heritage

Long-term protection of
valuable cultural properties





Practical Architectural and Art Heritage Preservation

For the conservation of historical buildings

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Built Heritage Preservation

Remmers – The number 1 in Europe

Identification and quality of life

Monument conservation aims to preserve important historic buildings over time. Cultural heritage is extremely important for the identification of societies with their historical past by means of objects that are tangible and perceptible by the senses and thus contribute to the formation of their social identities.

This applies equally to small regions and to Europe as a whole. Monument preservation is an integral part of quality of life.

The art to preserve

Without doubt monument conservation is the supreme discipline in the sector of protection and repair of buildings. One who is able to solve the difficult tasks of monument conservation not only from the viewpoint of technical feasibility, but also with the aim to preserve as much as possible of the original architectural substance, can also be able to master the difficulties of “normal” restoration projects as well – on all substrates: repair of facades, permanent waterproofing of buildings as well as wood preservation.

Bernhard Remmers Award

Every two years the Bernhard Remmers Academy assigns the Bernhard Remmers Price for outstanding artisanal performances in monument conservation. The idea behind the award is to make this dedication in built heritage conservation visible for the future. Honouring artisanal execution represents a particularly meaningful part of this effort.

During the “denkmal”, the European exhibition for restoration, monument protection and urban regeneration in Leipzig, artisans, planners, architects, conservationist and builders are honoured for their outstanding performances in protection and conservation of cultural heritage with particular emphasis on artisanal excellence of execution.



Individual Solutions

For the preservation of historic buildings

Individual solutions

Quite rightly „monument preservation“ is one of our most critical „customers“. Mistakes can easily cause the loss of irreplaceable cultural assets. This means that, besides continuously seeking for possibilities to better preserve our historical heritage, using the greatest diligence and conscientiousness in the conception and selection of products is absolutely imperative.

This includes the comprehension of various and sometimes diverging approaches used in built heritage preservation: recreation or conservation of the authentic findings.

Research projects with Remmers participation:

- Hunting château Clemenswerth: analysis for the quantification of ecologically relevant damages and the planning of conservation measures of natural stone sculptures, 1993 – 1998
- Dinklage, pilot project: resource-efficient conservation of wood elements in the Benedictine abbey Burg Dinklage, 1996 – 1997
- Exemplary conservation of lime stone reliefs damaged by pollution of the Stone Album in Groß-Jena, 1996 – 1999
- Research project: protection of stone surfaces with elasticised silicic acid esters, 1996 – 2000
- Use of lime mortar as a base render and replacement mortar at Heydau monastery, 1996 – 2001
- Insect hormone analogues as non-neurotoxic insecticides in wood preservatives, 1997 – 2001
- Exemplary on-site consolidation of weathered structural timber at Burg Dinklage, 1998 – 2002
- Limestone conservation at Halberstadt cathedral, 1998 – 2004
- Removal of pollution damage from the water basin of the Belvedere on the Pfingstberg in Potsdam, 1999 – 2000
- Development and implementation of conservation measures on the weathered Renaissance facade of Lübeck Town Hall (UNESCO World Heritage Site), 1999 – 2003
- Renovation of the stone artwork of Saint Benno's church in Meißen with innovative modified silicic acid ester and silicone resin grouts, 2000 – 2003
- Development of a technology against alveolar pollution damages using the church in Leuba a example, 2001 – 2002

Outstanding Competence

In over 70 years of work on many of Europe's most important monuments and in collaboration with internationally renowned experts, Remmers has acquired unique expertise in the field. On literally pre-eminent reference objects, the products and expertise of Remmers have been proven successful:

Europe's highest church tower, Ulm Minster (161 m), Cologne Cathedral, St. Stephen's Cathedral in Vienna, Saint Basil's Cathedral in front of the Kremlin on the Red Square, the legendary temple complex of Angkor Wat in the tropical climate of Cambodia as well as the fairytale castle Neuschwanstein in Bavaria.

- Long-term restoration technology for the Monument to the Battle of the Nations in Leipzig, 2001 – 2004
- Conservation of funerary monuments of national importance damaged by pollution in the Old Catholic Cemetery in Dresden (German-Polish joint project), 2001 – 2004
- Innovative conservation concepts for historic tuff stone surfaces, 2001 – 2005
- Preservation of monuments from Trachyt, 2003 – 2006
- EU Rocem Project – Roman Cement to Restore Built Heritage Effectively, 2003 – 2006
- Conservation of a so-called Umgebende house in Großschönau, 2005 – 2009
- Potsdam, development of built substance-saving and efficient methods for the treatment of extremely damaged surfaces of architectural elements made of lime stone with use of the colonnade of the New Palais in Sanssouci Park (UNESCO World Heritage), 2006 – 2009
- EU-Project: Assessment of Desalination Mortars and Poultrices for Historic Masonry, 2006 – 2009
- EU-Project: ROCARE, Roman Cements for Architectural Restoration to New High Standards, 2009 – 2012
- EU-Project: 3Encult-Efficient Energy for EU Cultural Heritage, Passive and active energy retrofit solutions, 2010 – 2014



Desalination and Cleaning

Substrate preparation
as a key for success

Remmers Desalting Compress

Salt reduction in mineral building materials

To successfully protect heavily salt-contaminated buildings over the long-term, besides inhibiting the penetration of humidity, active measures to combat, i.e. reduce the quantity of damaging salts present, must be undertaken. As a physical desalination method, the application of de-salting compresses has been proven effective.

Desalination consists in the significant reduction of the salt content in porous building materials. Besides the use of sacrificial, compress or dehumidifying renders, de-salting with compresses is a method that has been used in conservation work for a long time and, with the necessary experience, with considerable success. The application of a moist compress on the surface of the building material allows the dissociation of the salts into their components: anions and cations. Hereafter two processes are activated:

- A diffusion movement of the salts from the substrate into the compress is initiated.
- The evaporation zone of the moisture within the substrate is shifted further outside towards the compress.

In both cases the salts dissolved in water are transported from the wall material into the compress, so that the salts accumulate in the new evaporation zone, that is now located in the compress and not in the cross section of the wall.

The compresses have no function in regard to decoration and protection of the brickwork. Their application is only temporary, non-destructive and reversible. In the course of numerous applications on many objects, the Remmers Desalting Compresses have been optimised with regard to their absorption capacity of the salts typically found in building structures. The substitution of quartz sand with highly absorbent, light aggregates has been of particular importance.

Desalting Compress

Dry mortar for reducing salts close to the surface	
Application:	Non-destructive reduction of the salt content in the compressing process according to the WTA guideline 3-13-01.
Bulk density:	Approx. 14 kg/dm ³
Water demand:	10 – 11 l / 30 kg
Tools:	Compulsory mixer (twin shaft), smoothing trowel (4004), smoothing trowel (4117), smoothing trowel duo (4118), mortar trowel (4436), XXL coating knife (4437), aluminium hand card with wooden handle (4429)
Application rate:	Approx. 14 kg/m ² /cm of layer thickness depending on substrate conditions

PU	30 kg
1070	■



Gentle Cleaning

Reliable removal of soiling

Dirt means damage

Because of their large internal surface area, layers of dirt are proficient at absorbing moisture and gaseous as well as particulate pollutants. These generally react on the underside of the dirt layer and cause damage, even if this cannot be seen beneath the encrusted grime. Therefore, the following technical and aesthetic reasons make a convincing case for cleaning :

- Removal of risk factors such as salt accumulation and reduction of drying speed
- Preparation of the substrate for further conservation measures by restoration of capillary absorption
- Removal of ugly soiling

Chemical cleaning

Acidic cleaners always function according to the same basic principle: the acidic component penetrates or infiltrates behind the dirt layer and loosens it, while the surfactants enable wetting of the surface, encapsulate the dirt and allow it to be washed off. Remmers BFA works differently – and its straightforward mode of action makes it a winner. It can be used to remove all kinds of biological contamination, as well as for preventive protection against new dirt deposits.

The maxim of every cleaning measure should be: “as intense as necessary, as gentle as possible“. Since the dirty substrates as well as the intensity of the soiling vary greatly, in practice it is difficult to predict which cleaning product is best suited for the task at hand. Thus we recommend to always set up a trial surface.

Types of soiling

Dirt crusts are usually the result of a process going on for years. Various substances sediment on the surface as the result of degradation processes within the substrate itself.



Efflorescence

Easily soluble, damaging salts, which have been transported to the surface by drying humidity, can be brushed away or removed by vacuuming. In most cases the building material will contain other salts as well that are not as easily removed with normal cleaning methods.



Leaching / sinter formation

In contrast to efflorescence, these salts, often consisting of calcium carbonate, are not readily soluble and can be removed with acid cleaners or, in case of high layer thicknesses, by mechanical means.



Algae, moss, lichens, fungi

Biological contamination can in most cases be removed with hot vapour, usually causing little or no damage to the historical surface.



Higher plants

Higher plants must always be completely removed by mechanical means. A „silver bullet“ to kill and dissolve roots that have grown into brickwork does not yet exist.



Loose dirt and dust

In these cases it is possible to simply remove surface sediments by mechanical means.



Urban soiling

This kind of soiling is constituted by a mixture of dust, soot, oil, grease etc. and is often difficult to dissolve. It might also contain heavy metals.



Graffiti

Spray lacquers or felt markers are often very hard to remove since they have penetrated into the pores and cavities of the substrates. In most cases chemical treatment with a paint stripper is necessary.

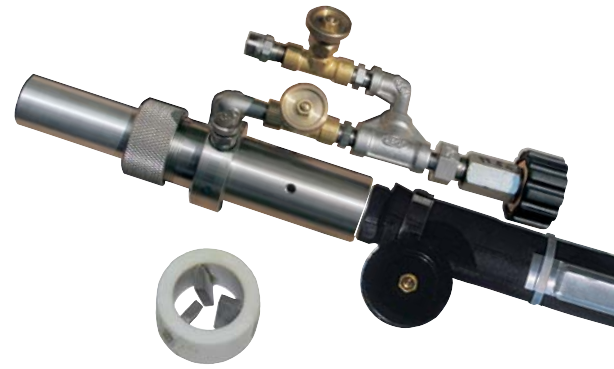
	Clean WR	Clean AC [basic]	Clean SL
	Removal of lime skin and cement slurry	Removal of mortar residues, lime skin and cement slurry	Removal of soiling, dirt crusts, dust, oil and grease deposits
Application:	<ul style="list-style-type: none"> Mineral substrates Tile and slab coverings 	<ul style="list-style-type: none"> Fairfaced brickwork and clinker Removal of mortar residues, lime skin and cement slurry Removal of remains of lime and scale 	<ul style="list-style-type: none"> Removal of grime, encrusted dirt, dust, oil and grease deposits Mineral surfaces Floor and wall surfaces
Active ingredient:	Combination of organic acids	Organic sulfonic acids	Tenside solution
pH value:	Approx. 1.0	Approx. 0.8 (10% solution)	Approx. 11.5
Density:	Approx. 1.04 kg/l	Approx. 1.0 kg/l (10% solution)	Approx. 1.0 kg/l
Tools:	Brushes, Kana® KanaClassic corner brush (4541), whitewash brush (4540)	Brushes, Kana® KanaClassic corner brush (4541), whitewash brush (4540)	Brushes, ana® KanaClassic corner brush (4541), whitewash brush (4540)
Application rate:	Approx. 0.3 – 0.5 l/m ²	Approx. 0.05 – 0.1 kg/m ²	Approx. 0.01 – 0.05 l/m ²

PU		1 kg	5 kg	10 kg	30 kg
Clean WR	0675		■		■
Clean AC [basic]	0672	■	■	■	
Clean SL	0671		■		

	Clean FP	Green Growth Remover	AGE
	Removal of heavy urban soiling, such as soot, industrial pollutants and dust	Removal of green growth	Removal of dispersion and pure acrylate paints, synthetic resin, nitrocellulose and spirit varnish, matting agents, polishes as well as graffiti
Application:	<ul style="list-style-type: none"> Mineral building materials, with the exception of sand-lime bricks and glazed surfaces Removes heavy urban soiling 	<ul style="list-style-type: none"> Surfaces of building materials such concrete, natural stone, sand-lime bricks, ceramics, glass, wood, plastics and WPC 	<ul style="list-style-type: none"> Wood, metal and mineral surfaces
Active ingredient:	Fluoride-based preparation	Biocide	Ester
pH value:	Approx. 5	Approx. 7.6	Approx. 8.5
Density:	pasty	Approx. 1.0 kg/l	Approx. 1.04 kg/l
Tools:	Kana® KanaClassic corner brush (4541), FC paint roller (4913), whitewash brush (4540)	GLORIA® 405 / 410 T Profiline (4667), GLORIA® Pro 100 (4668), whitewash brush (4540)	Kana® KanaClassic corner brush (4541), whitewash brush (4540), FC paint roller (4913)
Application rate:	Min. 0.1 kg/m ²	Approx. 10 ml/m ² (MR 1:10)	Approx. 0.3 – 0.5 l/m ²

PU		0.75 l	1 kg (l)	2.5 kg (l)	5 kg (l)	25 l	30 kg
Clean FP	0666		■		■		■
Green Growth Remover	0676		■	■			
AGE	1368	■			■	■	

Remmers rotec Soft Whirl Jet



Mechanical cleaning

In the Soft Whirl Jet, a mixture of air, water and blasting material is spun around, meaning that the blasting particles strike the surface of the building material not at right angles but instead at a much flatter angle, gliding over the surface rather than being blasted straight at it. This means that dirt can be removed in an exceptionally gentle way, while the level and intensity of cleaning can be freely chosen.

Any result can be achieved, from “preservation of the patina” right through to “as good as new”. The rotec Soft Whirl Jet from Remmers is a direct refinement of the “JOS” method, with a significant reduction in nozzle wear at the same level of cleaning efficiency. The physical properties of the rotec glass powder, such as its degree of hardness and the grain shape, size and fraction, are adapted to this technique and play an important part in delivering optimum results.

rotec Glass Powder

Synthetic soft blasting granulate. Free of silicosis.

Application:	<ul style="list-style-type: none"> ■ rotec soft blasting technology ■ Nonmetallic blasting granulate according to DIN EN ISO 11126-4 and BGV D-26
Bulk density:	Approx. 1.3 – 1.4 g/cm ³
Hardness according to Mohrs:	Approx. 6 – 7
Grain form:	Cubical
Application rate:	Depending on type and degree of soiling

PU 25 kg	Grain size	Art.-Nr.
A0	0.04 – 0.09 mm	5280
A2	0.09 – 0.25 mm	5278

Remmers solution	Application	Art. No.
rotec Turbine	Exceptionally gentle cleaning of all types of dirt	5243
rotec Set (1 turbine + 5 spacer rings)	rotec soft blasting technology	5244







Arte Mundit® by Remmers

Peelable material for cleaning indoor areas

Arte Mundit® – A milestone in the cleaning of historical interior wall surfaces

For the cleaning of historical facades there are a great number of different methods one can choose from. None of them, however, has proven to be effective for the cleaning of large surfaces in the interior of historical buildings in the last decades. There are different reasons for this failure: some of the methods require the use of too much water, which is understandably problematic in indoor spaces, in others too much dust is developed and that presents no less of an inconvenience. Methods that manage to avoid both of these drawbacks, such as laser technology, have such a low surface output that their use for the cleaning of large interior surfaces is hardly feasible for cost reasons.

The only commercially manufactured product that is actually used for the cleaning of large surfaces indoors is, essentially, a paste that contains EDTA. It allows the removal

of thin plaster layers as well as the reduction of copper, nickel and iron stains.

Peelings are a more recent development for cleaning interior wall surfaces. They consist of pastes based on a specially formulated dispersion of natural latex. Once they are applied on the surface, the water evaporates, allowing the polymer to cross-link forming an elastic film, which can then be easily removed without the use of water.

The cleaning effect is based on two separate principles that, depending on the type of soiling and the specific formulation of the product, are more or less pronounced. On one side, the dirt on the surface sticks to the film formed by the crosslinking reaction, on the other, specific components of the paste dissolve and complex determined compounds on the surface that are then also incorporated into the latex film. The result, once the film has been stripped away, is a perfectly clean surface.

Treatment

After the surfaces to be treated have been vacuumed and gilded and painted surfaces as well as decorative metalwork have been protected, Arte Mundit® is applied by brush or using specifically designed spraying equipment. During the drying process, the water evaporates and the dispersed polymer cross-links to form a strong, extremely elastic film. The product is conceived for use in interior spaces.

At temperatures between 10 and 30 °C and moderate air humidity, the peeling is practically dry after 2 – 3 hours; at relative humidity of 95% drying times are as high as 22 hours. This means that, as a rule of thumb, the Arte Mundit® film can be removed the day after it is applied. If necessary, dissolved dirt particles not embedded into the latex film can easily be wiped away with a moist sponge.

The various Arte Mundit® types

The base product Arte Mundit® Type I is a specially formulated aqueous dispersion of natural rubber.

If, besides dust particles on the surface, it is necessary to remove soiling layers by chemical means, small quantities of various complexing agents are added to the base material.

Since these added components alter the viscosity of the latex dispersion, the final product must each time be adjusted to obtain the desired workability properties.

That is why, depending on the type of soiling of the quantity of the specific cleaning agents added to remove it, different types of Arte Mundit® are available.



Advantages

In comparison with many other methods, cleaning with Arte Mundit® is possible without problem while the building is in use.

- Practically no water is required
- No dust development
- Limited noise emission
- Suitable for the cleaning of practically any surface, including sensible and valuable substrates
- Easy application by brush or spraying
- No unpleasant odours (odourless)
- No chemical alteration / non contamination of the substrates
- User-friendly and highly efficient
- Salts in the substrate are not Sedativa
- Cleans deep pores and moulded areas

Arte Mundit®

Solvent-free, skin-forming, peel-off paste for water-free removal of dust, soot and other types of soiling	
General application:	<ul style="list-style-type: none">■ Sensible and valuable surfaces■ Surface soiling on stucco, natural stone, marble, concrete, brick, render, gypsum sculptures, polished wood and synthetic building materials
Arte Mundit ECO:	<ul style="list-style-type: none">■ Numerous applications■ Long-term protection against moss and algae■ Use indoors and outdoors
Arte Mundit, Type 1:	<ul style="list-style-type: none">■ Physical cleaning of loosely adhering dirt indoors
Arte Mundit, Type 2:	<ul style="list-style-type: none">■ Specifically for marble indoors
Arte Mundit, Type 3:	<ul style="list-style-type: none">■ Physical cleaning chemical cleaning of general soiling indoors
Arte Mundit, Type 5:	<ul style="list-style-type: none">■ Specifically for fire residues, such as soot and candles indoors
Density (20 °C):	Component A 0.94 g/ml Component B 1.05 – 1.20 g/ml depending on the type
pH value (20 °C):	Component A approx. 10.0 depending on the type Component B 10.0 – 11.0 depending on the type
Tools:	Kana® KanaClassic corner brush (4541), whitewash brush (4540), FC paint roller (4913) and airless spraying equipment. Stainless steel or plastic tools are recommended.
Application rate:	Approx. 1.0 kg/m ² on even surfaces Approx. 1.0 – 3.0 kg/m ² on heavily textured surfaces. The precise application rate is to be determined on a suitable trial area

PU 15 kg	Additive	Art. No.
Arte Mundit ECO	integrated *	222030
Arte Mundit, Type 1		222020
Arte Mundit, Type 2	+ 1.01 kg	222023
Arte Mundit, Type 3	+ 2.86 kg	222025
Arte Mundit, Type 5	+ 3.84 kg	222028

* With cleaning agents (particularly environment-friendly because free of EDTA, inorganic salts, tensides and inorganic solvents)



© tollis

Clean Galena

Emission-free cleaning of historical natural stone surfaces

In recent years there has been a growing and justified sensibility to emissions that might arise during the cleaning of facades. A particular issue of concern to this regard are cleaning measures that cause heavy metals to be released into the environment. A good method to bind the polluting substances that are possibly present directly within the cleaning process is the use of cleaning compresses.

These are constituted paste-like cleaning agents that contain a carrier material and active cleaning substances. When applied, they dissolve impurities in the substrate, which are taken up unto the compress together with the solvent used, where they are bound. The cleaning procedure is completed when the compress has almost entirely dried out.

These pastes can be deployed with various active substances, for example for the removal of tar spots, rust stains, gypsum crusts, greasy deposits, heavy metal residues etc.

The advantages:

- Little moisture contamination of the building
- No dust
- No emission of hazardous substances
- Harmful substances are bound in the compress and are thus easy to dispose of



© tollis



A challenging task for which Clean Galena by Remmers is in many cases really helpful.

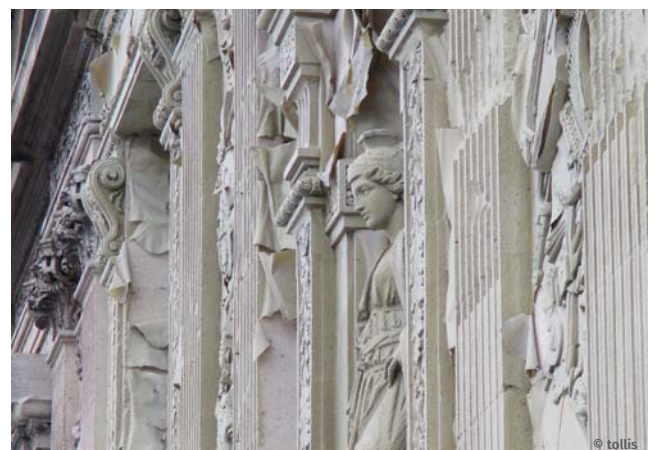
Clean Galena

Malleable cleaning paste for historical natural stone surfaces with complexing of heavy metals, emission-free	
Application:	<ul style="list-style-type: none"> ■ Mineral surfaces, limestone in particular ■ Removes dust and dirt sediments ■ Reduces crusts containing lead ■ Removes stains caused by iron or copper compounds ■ Easy to remove. Detaches from the substrate partially by itself.
Density (20 °C):	Approx. 1.18 g/ml
pH value (20 °C):	Approx. 10.0
Tools:	Kana® KanaClassic corner brush (4541), whitewash brush (4540), FC paint roller (4913), airless spraying equipment and inoBEAM M8 (inotec)
Application rate:	Up to approx. 3.0 kg/m ² on textured surfaces

PU	20 l
0661	■

Clean Galena is such an emission-free cleaning compress. Clean Galena does not contain ammonium carbonate nor EDTA. As active ingredients various readily biodegradable complexing agents are used that are commonly employed in the food industry (substances that are able to bind metal ions such as iron, copper, lead and other heavy

metal ions). They are combined in such a way that the cleaning effect of each active ingredient is enhanced. Bentonite, a phyllosilicate that through adsorption and electrochemical process binds several dissolved substance and colloids, is used as carrier material. In addition to the detergent effect, it regulates the moisture transport mechanisms during the cleaning process. In this action it is supported by a small share of cellulose. After one day – or a somewhat longer time at low temperatures and high air humidity – the compress dries out and comes loose off the substrate. Once removed, the desiccated material must be disposed. What matters is only the soiling removed from the facade not the material of the compress itself. Up until today the material has been successfully deployed on such outstanding buildings as the Louvre in Paris and Westminster Palace with the Elisabeth Tower (Big Ben) in London. Numerous laboratory tests have also shown that Clean Galena presents a high cleaning potential not only on stone substrates but also on soiled brickwork.





Natural Stone Preservation

Doing justice to stone

Remmers Antihygro

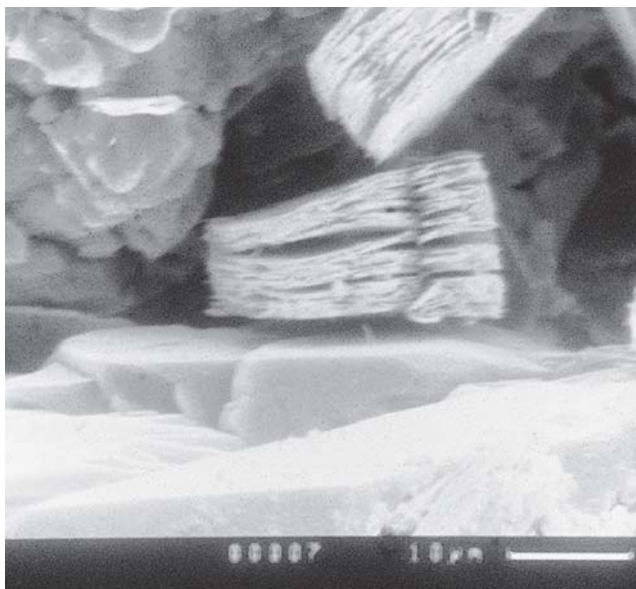
Curbing weathering with a unique swelling inhibitor

Many natural stones contain clay minerals that are capable of swelling. Mostly, these are constituted of sheet silicates, whose structure resembles that of a book. Already at very low levels of humidity, thanks to an electrochemical “magnetic effect”, they can accumulate water between the single sheets of the “book” and release it at a later time.

During this process, the packets of sheets are pulled apart like an accordion to make room for the water and then contract again when the water is expelled. This phenomenon is called hygric expansion and contraction and leads to destructive tensions inside the stone structure.

The functioning principle of the swelling reducing agent Antihygro consists in “disabling” the clay minerals. The treatment with Antihygro “blocks” the positively charged metal ions that are responsible for the “magnetic effect”. The result is a greatly reduced hygric swelling while all other characteristic parameters of the stone substrate stay unchanged.

A subsequent water-repellent treatment with a Remmers primer or clear silicon resin paint enhances this effect even further. This water-repellent treatment reduces the absorption of liquid water in particular by up to 95 % making it no longer available as a trigger for hygric expansion.



Swelling-capable clay mineral

Antihygro

Water-based, protective agent with a clayey, mineral structure to protect stone against hygroscopic swelling

Application:

- Natural stone with a clayey, mineral structure
- Reduction of clay mineral-induced weathering processes

Density (20°C): Approx. 1.0 g/cm³

Colour: Clear

Odour: Neutral

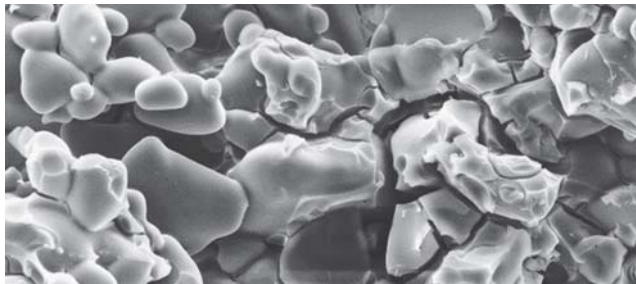
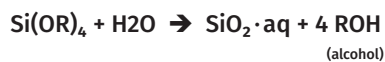
Tools: GLORIA® 405 / 410 T Profiline (4667), GLORIA® CleanMaster PERFORMANCE PF50 (4666) and other pressure sprayers, GLORIA® Pro 100 (4668), GLORIA® CleanMaster EXTREME EX100 (4665) and other hand sprayers, Kana® KanaClassic corner brush (4541) and whitewash brush (4540)

Application rate: 0.3 – 6.0 l/m² depending on the substrate

PU	5 l	30 l
0616	■	■



All stone strengtheners on a silicic acid ester base (Si(OR)_4) react with water depositing a strengthening silica gel (SiO_2aq):



Silicic acid ester itself is a liquid, which means that it can in principle brought into the pore structure without solvents. Through the different mixing ratios of large and small molecules they contain it is possible to finetune the properties of the strengtheners, in particular the gel depo-

sition rate, i.e. the quantity of the silica gel formed during the reaction that is deposited in the pore structure. Besides the gel deposition rate, by varying the type and quantity of the catalyst and adding solvents it is possible to influence other parameters in regards to penetration behaviour, reaction velocity, etc.

Through the targeted combination and variation of these parameters, a wide range of stone strengtheners has been developed that allows a broad choice of selection and therefore possibilities to adjust to the substrate.

All stone strengtheners based on silicic acid ester share one characteristic that distinguishes them from other strengtheners: the consolidating silica gel that forms inside the stone structure presents a porosity of its own.

This so-called secondary porosity ensures that after the strengthening treatment the building material maintains its previous capillarity and permeability to water vapour.

Absorption	Strength	Stone type	1 st coat	2 nd coat	3 rd coat (if necessary)
medium to strong	rather solid	sandstone, lime sandstone	KSE 100	KSE 300	
medium to strong	rather soft	sandstone, lime sandstone	KSE 100	KSE 300 E	
medium to strong	soft to solid	limestone	KSE 100	KSE 300 HV	
rather scarce	soft to solid	sandstone, limestone, lime sandstone	KSE 100		

Remmers KSE 100/300/OH/510

Stone consolidation based on “classic” stone strengtheners

As described “Remmers Stone Consolidation”, commercially available stone strengtheners are customised products, whose characteristics are a result of the targeted use of different sizes of silicic acid molecules, different catalysts and, if needed, special solvents. Through the deliberate combination of these “classic” stone

strengtheners, it is possible to restore a wide range of different substrates. In the following a few exemplary consolidation possibilities/case studies are presented. The recommendations described, though, are no substitute for an accurate initial analysis of the valuable structures that are to be treated!

KSE 100		KSE 300 / KSE OH		KSE 510	
Stone strengthener on a silicic acid ester base with a low gel deposition rate (10%)		Solvent-free stone strengthener on a silicic acid ester base		Solvent-free stone strengthener on a silicic acid ester base with a high gel deposit rate for strengthening strongly loosened mineral building materials	
Application:	<ul style="list-style-type: none"> Consolidation of weakly weathered surfaces Fine-pored rocks and mineral building materials with scarcer absorption Creation of even strength profiles, also combined with other strengtheners Avoidance of overconsolidation and spalling 	<ul style="list-style-type: none"> Consolidation of significantly weathered and deteriorated surfaces Mineral building materials and rocks that originally present good strength Creation of even strength profiles, also in combination with KSE 100 	<ul style="list-style-type: none"> Consolidation heavily weathered and deteriorated surfaces Mineral building materials and rocks that originally present high strength Creation of particularly homogeneous strength profiles, also in combination with KSE 100 and/or KSE 300 E 		
Gel deposit rate:	Approx. 10 %	Approx. 30 %	Approx. 30 %	Approx. 45 %	
Active ingredient content:	Approx. 20 M.-%	Approx. 99 M.-%	Approx. 99 M.-%	Approx. 99 M.-%	
Catalyst:	neutral	neutral	neutral	neutral	
Density (20 °C):	Approx. 0.8 g/cm ³	Approx. 0.98 g/cm ³	Approx. 0.98 g/cm ³	Approx. 1.02 g/cm ³	
Tools:	GLORIA® CleanMaster PERFORMANCE PF50 (4666), GLORIA® CleanMaster EXTREME EX100 (4665), Kana® Kana-Classic corner brush (4541), white-wash brush (4540) and grouting brush (4517)	GLORIA® CleanMaster PERFORMANCE PF50 (4666), GLORIA® CleanMaster EXTREME EX100 (4665), Kana® Kana-Classic corner brush (4541), white-wash brush (4540) and grouting brush (4517)	GLORIA® CleanMaster PERFORMANCE PF50 (4666), GLORIA® CleanMaster EXTREME EX100 (4665), Kana® Kana-Classic corner brush (4541), white-wash brush (4540) and grouting brush (4517)	GLORIA® CleanMaster PERFORMANCE PF50 (4666), GLORIA® CleanMaster EXTREME EX100 (4665) and other hand sprayers, Kana® KanaClassic corner brush (4541), whitewash brush (4540) and grouting brush (4517)	
Application rate:	Depending on the type and conditions of the substrate as well as the intended goals, between 0.3 l/m ² and several l/m ²	Depending on the type and conditions of the substrate as well as the intended goals, between 0.3 l/m ² and several l/m ²	Depending on the type and conditions of the substrate as well as the intended goals, between 0.3 l/m ² and several l/m ²	Depending on the type and conditions of the substrate as well as the intended goals, between 0.3 l/m ² and several l/m ²	

PU		5 l	30 l	200 l
KSE 100	0719	■	■	
KSE 300	0720	■	■	■
KSE OH	0645	■	■	
KSE 510	0625	■	■	

Remmers KSE 300 HV

Stone consolidation with modified strengtheners

Targeted problem solving

On siliceous substrates stone strengtheners on a silicic acid ester base present two intermeshing modes of action. On one hand, the silicic acid ester binds chemically with the quartz in the substrate; on the other, it forms a three-dimensional silica gel structure inside the pore spaces that has a stabilising effect even without direct chemical bonds. On purely calcitic substrates it is this second mechanism of consolidation that does all the work.

To achieve a chemical bonding of the silicic acid ester also on calcitic substrates, specially developed bonding agents can be used. These substances “mediate” between the covalent bonding of the quartz and polar one of chalk-based limestone by combining those two mechanisms.

Special strengtheners for limestone

Remmers KSE 300 HV is the first stone strengthener based on this mechanism. The efficacy of the product has already been proven with a pilot project on the cathedral of Halberstadt sponsored by the German foundation for the environment in Osnabrück.

KSE 300 HV

Solvent-free special stone strengthener for limestone on a silicic acid ester base with special adhesion promoters

Application:	<ul style="list-style-type: none">■ Consolidation of predominantly calcitic substrates■ Consolidation of significantly weathered and deteriorated surfaces■ Creation of particularly homogeneous strength profiles in combination with KSE 100
Gel deposit rate:	Approx. 30 %
Active ingredient content:	Approx. 98 M.-%
Catalyst:	neutral
Density (20 °C):	Approx. 0.97 g/cm ³
Tools:	GLORIA® CleanMaster PERFORMANCE PF50 (4666), GLORIA® CleanMaster EXTREME EX100 (4665) and other hand sprayers, Kana® KanaClassic corner brush (4541), whitewash brush (4540)
Application rate:	Depending on the type and conditions of the substrate as well as the intended goals, between 0.3 l/m ² and several l/m ²

PU	5 l	30 l
0654	■	■



Remmers KSE 300 E/500 E

Stone consolidation with “elasticised” stone strengtheners

Limits of the use of “classic” stone strengtheners

The in part very small dimensions of the gel particles of “classic” stone strengtheners limit their range of use to substrates with “normal” pores or cavities. For the consolidation of building materials with larger hollows, either natural or caused by weathering, conventional strengtheners are only partially suited. These problematic materials include tuffs, renders but also particularly swellable types of natural stone, such as some kinds of limestone. The causes are either the natural distribution of pore radii (tuff) or the formation of micro-cracks caused by weathering (for example on swellable limestone).

Use and operation of the single components of the in the complete system of elasticised silicic acid ester base



Weathered stone surface with intensive spalling/scale formation and micro-cracks



Backfilling compound to produce a frictionally coupled bond between the scale and the substrate.

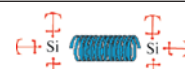


Battering mortar for structural adjustment to the stone surface.



Strengthening of the structure with an elasticised stone strengthener to re-instate the original, homogeneous strength.

Chemical coils – “Soft segments” as a base for the elasticisation of stone strengtheners



KSE 300 E

Elasticised stone strengthener on a silicic acid ester base	
Application:	<ul style="list-style-type: none">Strengthening of porous or heavily weathered structuresFinely and medium porous sandstones, certain vulcanites as well as weathered bricks, historical renders and jointsCreation of particularly homogeneous strength profiles in combination with KSE 100
Gel deposit rate:	Approx. 30 %
Active ingredient content:	Approx. 50 M.-%
Catalyst:	neutral
Density (20 °C):	Approx. 0.90 g/cm ³
Tools:	GLORIA® CleanMaster PERFORMANCE PF50 (4666), GLORIA® CleanMaster EXTREME EX100 (4665), Kana® KanaClassic corner brush (4541), whitewash brush (4540) and grouting brush (4517)
Application rate:	Depending on the type and conditions of the substrate as well as the intended goals, between 0.3 l/m ² and several l/m ²

PU	5 l	30 l
0714	■	■

KSE 500 E

Elasticised stone strengthener on silicic acid ester basis with a higher gel deposit rate for the consolidation of heavily softened mineral building materials	
Application:	<ul style="list-style-type: none">Strengthening of very porous or heavily weathered structuresCoarse-pored sandstones, certain vulcanites as well as weathered bricks, historical renders and jointsCreation of particularly homogeneous strength profiles in combination with KSE 100 and/or KSE 300 E
Gel deposit rate:	Approx. 50 %
Active ingredient content:	> 85 M.-%
Catalyst:	neutral
Density (20 °C):	Approx. 1.0 g/cm ³
Tools:	GLORIA® CleanMaster PERFORMANCE PF50 (4666), GLORIA® CleanMaster EXTREME EX100 (4665), Kana® KanaClassic corner brush (4541), whitewash brush (4540) and grouting brush (4517)
Application rate:	Depending on the type and conditions of the substrate as well as the intended goals, between 0.3 l/m ² and several l/m ²

PU	5 l	30 l
0715	■	■

Remmers KSE Modular System

Enhanced challenge - Tool box for restoration pros

The tasks of consolidation of natural stone are mostly not limited to structural strengthening only, but rather going much further, depending on type and intensity of the weathering.

Due to the high affinity of silicic acid ester with most types of natural stone and the problem of seams connected to the use of different materials, the desire to solve all problems with only one product is all too understandable.

Remmers meets this wish with the KSE Modular System.

The KSE Modular System was developed in order to be able, besides consolidating stone as such, to also repair lost

parts with injection masses, backfilling mortars or scum-bles. Starting from an elasticised stone strengthener as naturelike binder, the properties of the compound can be tweaked to match the need at hand.

The physical, mechanical, optical and humidity absorption properties of the resulting material can thus be fine-tuned to match those of the substrate to create bespoke solutions. By avoiding differing, i.e. non-compatible physical and technical parameters at the seams between different layers it is possible to offer sensible solutions even to the most daunting of tasks.

		KSE 500 STE	KSE filler A	KSE filler B
		Binder in the KSE modular system. Elasticised stone strengthener on an silicic acid ester basis with a high gel deposit rate and suspensions of pure mineral particles	Filler for the Remmers KSE modular system	Filler for the Remmers KSE modular system
Application:		<ul style="list-style-type: none"> Backfilling compounds Cementing and battering mortars Scumbles and grouts 	<ul style="list-style-type: none"> Mineral powder grouts with silicic acid ester as a binder Backfilling compounds Cementing and battering mortars 	<ul style="list-style-type: none"> Mineral powder grouts with silicic acid ester as a binder Backfilling compounds Cementing and battering mortars
Gel deposit rate:		Approx. 50 %	–	–
Active ingredient content:		Approx. 75 M.-%	–	–
Catalyst:		neutral	–	–
Density (20 °C):		Approx. 1.02 g/cm ³	Approx. 0.7 kg/l (Bulk density (DIN 52110))	Approx. 0.8 kg/l (Bulk density (DIN 52110))
Tools:		GLORIA® CleanMaster PERFORMANCE PF50 (4666), GLORIA® CleanMaster EXTREME EX100 (4665), Kana® Kana-Classic corner brush (4541), white-wash brush (4540) and grouting brush (4517)	Smoothing trowel (4004), smoothing trowel (4117), smoothing trowel duo (4118) and grouting brush (4517)	Smoothing trowel (4004), smoothing trowel (4117), smoothing trowel duo (4118) and grouting brush (4517)
Application rate:		Individually determined by the application	Depending on the task at hand	Depending on the task at hand

PU		1 l	2.5 l	2 kg	3 kg	25 kg
KSE 500 STE	0713	■	■			
KSE filler A	0571				■	■
KSE filler B	0572			■		■

A low-angle, upward-looking photograph of the interior of a Gothic cathedral. The image captures the soaring height of the architecture, with multiple tiers of pointed arches and ribbed vaulting reaching towards a high, vaulted ceiling. Large, multi-paned stained-glass windows are visible, allowing natural light to filter into the space. In the foreground, a large, detailed stone statue of a standing figure, possibly a saint or historical figure, is mounted on a decorative pedestal. The statue is positioned next to a tall, slender column. To the right, a dark metal railing with ornate scrollwork is visible. The overall atmosphere is one of grandeur and historical significance.

Filling Voids and Structural Improvement

Selected reinforcement measures

Structural Enhancement

Filling voids and increasing the load-bearing capacity of historic structures

Mortars for the reinforcement of loosely filled or hollow masonry differ on grounds of their physical and mechanical properties. Depending on the actual conditions at hand, the reinforcement of the stonework can be executed with the cement-based injection mortars BSP 3 and BSP 6 as well as with a low-strength material such as BSP Historic.

For the injection into masonry work subjected to higher structural loads, the use of Remmers injection paste ICS 2K is recommended since it is able to absorb a certain amount of tensile stress. For a description of the product please refer to the current Product Programme for construction/flooring.

BSP 3 / BSP 6

Highly fluid, mineral filling and injection mortar	
Application:	<ul style="list-style-type: none"> ■ Strengthening of hollow and loose masonry pursuant to WTA Code of Practice 4-3 ■ Filling of joints and injection holes ■ Initial injection of holes in repeated injection procedures
Strength:	BSP 3 – M 2.5 (normal) BSP 6 – M 5 (fest)
Apparent density of fresh mortar:	Approx. 1.6 kg/dm ³
Largest grain:	< 0.2 mm
Initial setting (20 °C):	> 8 hours
Working time (20 °C):	Approx. 4 hours
Flexural strength (28 d):	BSP 3 – Approx. 1.5 N/mm ² BSP 6 – Approx. 2 N/mm ²
Compressive strength (28 d):	BSP 3 – Approx. 3.5 N/mm ² BSP 6 – Approx. 6 N/mm ²
Tools:	Collomix® KR stirrer (4292), universal-funnel (4082), lamella drive-in packer 18 x 105 mm (4524), setting tool 14 mm (4523), closing piece (4522), quick snap (4542)
Application rate:	Approx. 1.2 kg/l of cavity volume

PU		20 kg
BSP 3	0312	■
BSP 6	0309	■

BSP Historic

Highly fluid, mineral filling and injection mortar	
Application:	<ul style="list-style-type: none"> ■ Filling and injecting joints, small hollow spaces, cracks from 2 - 10 mm ■ Strengthening loose mortar fillings in masonry work
Strength:	M 2.5 (normal)
Apparent density of fresh mortar:	Approx. 1.8 g/cm ³
Largest grain:	< 0.5 mm
Initial setting (20 °C):	> 6 hours
Working time (20 °C):	Approx. 2 hours
Flexural strength (28 d):	Approx. 0.6 N/mm ²
Compressive strength (28 d):	Approx. 2.5 N/mm ²
Tools:	Collomix® KR stirrer (4292), universal-funnel (4082), lamella drive-in packer 18 x 105 mm (4524), setting tool 14 mm (4523), closing piece (4522), quick snap (4542)
Application rate:	Approx. 1.2 – 1.6 kg/l of cavity volume

PU		30 kg
0548		■

Remmers Spiral Anchor System

Easy and long-lasting crack repair

Cracks in masonry can be caused by a wealth of factors, such as temperature changes, subsidence and vibration, to name but a few. Regardless of the cause, a crack in the brickwork always constitutes a significant disruption to the static system, which must be repaired.

The Remmers Spiral Anchor System joins masonry sections back together in a simple and highly efficient manner, thus restoring the integrity of the structure. The spiral anchors are placed in the joints of the masonry being repaired, meaning that only minimal intervention is required. As a result, even cracked stone can be reused – which is also one of the reasons why spiral anchors are a popular solution for the conservation of listed buildings. This method enables cracks in facades, as well as in lintels, openings and arches, to be repaired efficiently and effectively.

Spiral Anchor Mortar

Machine-compatible joint mortar with high sulphate resistance for embedding spiral anchors	
Application:	Embedding of Spiral Anchors for the reinforcement of cracked masonry
Strength:	M20 (Spiral Anchor Mortar M 20) M30 (Spiral Anchor Mortar M 30)
Largest grain:	1 mm
Apparent density of fresh mortar:	Approx. 2.0 kg/dm ³
Working time:	Approx. 60 minutes
Tools:	Collomix® KR stirrer (4292), Cox Untrapoint TM (4321), jointing iron
Application rate:	Approx. 1.7 kg/l of cavity volume

PU		25 kg
grey (M 20)	1028	■
grey (M 30)	1030	■



Spiral Anchor

Rolled, twisted spiral anchor with two threads made of austenite stainless steel for the restoration of masonry work	
Application:	<ul style="list-style-type: none"> ■ Subsequent reinforcement and anchoring of masonry work ■ Crack repair ■ Suitable for all kinds of rock material (including concrete) ■ Air space anchor with and without insulated attachment
Tensile force / Yield point:	Spiral Anchor 6/1000 and 6/10000: Approx. 7.2/6.0 kN Spiral Anchor 8/1000 and 8/10000: Approx. 8.8/7.5 kN
Elongation:	Spiral Anchor 6/1000 and 6/10000: Approx. 5.1% Spiral Anchor 8/1000 and 8/10000: Approx. 4.7%
Elastic modulus:	Spiral Anchor 6/1000 and 6/10000: Approx. 156 MN/m ² Spiral Anchor 8/1000 and 8/10000: Approx. 148 MN/m ²

PU		1 m	10 m
Spiral Anchor 6/1000	4331	■	
Spiral Anchor 8/1000	4334	■	
Spiral Anchor 6/10000	4325		■
Spiral Anchor 8/10000	4326		■



1 Removal of the joint mortar

Clear out the horizontal joints of the brickwork at predetermined points for an equal length left and right of the crack and a depth of approx. 6 cm.



2 Cleaning of the joints

Clean out the joint and remove all loose parts that could interfere with adhesion and pre-wet.



3 First mortar layer

Apply the first layer of Spiral Anchor Mortar into the joint and press it in along the back wall of the joint using a mortar gun.



4 Insertion of the Spiral Anchor

Push Spiral Anchor into the mortar bed using a jointer.



5 Second mortar layer

Apply the second layer of Spiral Anchor Mortar and press it in using a mortar gun. If necessary, compress again with a jointer.



6 Plugging of the cracks

To consolidate the structure, the crack must be closed with mortar after plugging it with a suitable round cord.



7 Filling

Fill the crack with Injection Mortar moving from top to bottom with a low pressure hand-gun.



8 Repair of cracks in the bricks

Close cracks in stone or bricks by grouting with Restoration Mortar or Restoration Mortar fine.



9 New jointing

Point the joints with FM/Join Mortar in the colour that matches the original joints.



Joints, Stones, Render and Stucco

Always the right mortar

Remmers Joint Mortar

Joints that match the bricks

In a building, joints undertake different functions and must therefore present a highly diverse property profile depending on the respective requirements. This does not apply just to visual features, but also physical and mechanical properties and most importantly to their reaction to moisture.

A sound joint network is an essential condition for the impermeability to driving rain of the facade. Moisture penetrating into the structure exposes it to frost damage

and reduces its heat insulating capacity. Both of these consequences must be avoided while respecting the existing structure.

The Remmers joint mortars cover a wide range of binder systems, grain sizes and strength classes, as well as choices of colour and hydrophobic or hydrophilic properties. As a result, they can be selected to fit the individual requirements of each application.





	FM SAN	FM TK / FM TK PH	FM ZF
	Lime-cement joint restoration mortar	Trass-lime-cement joint mortar	Cement-free joint mortar
Application:	<ul style="list-style-type: none"> Joint repair on brick and natural stone masonry joints von 5 – 30 mm 	<ul style="list-style-type: none"> Sulfate contaminated masonry Joints of 8 – 30 mm 	<ul style="list-style-type: none"> Low-strength masonry Joints of 10 – 30 mm
Binder:	Lime-cement	Trass-lime	NHL* (cement-free)
Strength:	M 5	M 5	M 1
Dyn. Elastic modulus (28 d):	≥ 7000 N/mm ²	≥ 5000 N/mm ² (FM TK) ≥ 7000 N/mm ² (FM TK PH)	Approx. 4500 N/mm ²
Open porosity:	Approx. 30 Vol. %	Approx. 30 Vol. %	Approx. 40 Vol. %
Tools:	Collomix® KR stirrer (4292), jointing iron	Collomix® KR stirrer (4292), jointing iron	Collomix® KR stirrer (4292), jointing iron
Application rate:	Approx. 1.6 kg/l	Approx. 1.6 kg/l (FM TK) Approx. 1.7 kg/l (FM TK PH)	Approx. 1.6 kg/l (grain size ≤ 1.0 mm) Approx. 1.7 kg/l (grain size ≤ 2.0 mm)

PU 30 kg	Grain size	Art. No.	Grain size	Art. No.	Grain size	Art. No.
off-white (non-hydrophobic)	≤ 1.0 mm	1065				
grey (non-hydrophobic)	≤ 1.0 mm	1066				
trass-grey (non-hydrophobic)			≤ 1.0 mm	1026		
anthracite (non-hydrophobic)	≤ 1.0 mm	1067				
beige (non-hydrophobic)	≤ 1.0 mm	1069				
special colour (non-hydrophobic)	≤ 1.0 mm	1061**	≤ 1.0 mm	1022	≤ 1.0 mm	1045
special colour (non-hydrophobic)			≤ 2.0 mm	1023	≤ 2.0 mm	1046
trass-grey (pore-hydrophobic)			≤ 1.0 mm	1024		
special colour (pore-hydrophobic)	≤ 1.0 mm	1006	≤ 1.0 mm	1018		
special colour (pore-hydrophobic)			≤ 2.0 mm	1019		

* Naturally hydraulic lime
 ** Pore-hydrophobic version possible

FM ECC			FM Historic	Historic Lime Mortar		
	2-component, epoxy resin modified, mineral joint mortar		Joint mortar formulated for specific objects		Basic mixture for the production of mortars and renders according to historical formulations using local aggregates	
Application:	<ul style="list-style-type: none"> Jointing of natural stone masonry work Masonry work with higher dynamic loads 		<ul style="list-style-type: none"> Reproduction of historical materials 		<ul style="list-style-type: none"> Repair and restoration of historical substrates Jointing mortar Render mortar 	
Binder:	Epoxy resin		Specific to the single object		<ul style="list-style-type: none"> Dry-slaked', and-lime mortar Free of cement, trass, hydraulic limes 	
Strength:	M 10		Specific to the single object		Specific to the single object	
Dyn. Elastic modulus (28 d):	not det.		Accord. to the restoration goal		Accord. to the restoration goal	
Open porosity:	not det.		Accord. to the restoration goal		Accord. to the restoration goal	
Tools:	Collomix® KR stirrer (4292), jointing iron		Collomix® KR stirrer (4292), jointing iron		Compulsory mixer (twin shaft), fine render trowel -FLEXIS ONE- (4233), mortar trowel (4436), aluminium hand card with wooden handle (4429), cockscomb (4130), red sponge float (4935), sponge float yellow (4936), smoothing trowel (4004), smoothing trowel (4117), smoothing trowel duo (4118), XXL coating knife (4437), jointing iron	
Application rate:	Depending on the application		Specific to the single object and formulation		Depending on the application	

PU 30 kg / 35 kg (0543)	Grain size	Art. No.	Grain size	Art. No.	Grain size	Art. No.
special colour (non-hydrophobic)	≤ 0.5 mm	0350/0359				
special properties				0573 *		0543
concrete grey	≤ 0.5 mm	0351				

* Minimum order quantity 1000 kg



Remmers Restoration Mortar System

Stone substitution and reproduction

A broad range of applications

The Remmers Restoration Mortar System was developed especially for integrations and the substitutions of mineral building materials.

Since mineral building materials differ greatly in their composition (structure, pore volume, colour, grain sizes, etc.) and since it is sensible for the purpose of a long-lasting measure to adjust the mortar to the properties of the substrate, Remmers offers a wide spectrum of customisation options that take account of the specific needs of a great variety of uses. The structured setup allows executing firms and planners to select a mortar that is optimally matched to the original substrate.

- For all cementitious restoration mortars there are two strength levels available.
- All restoration mortars are available in three grain sizes to allow the visual adjustment to the original.

Binders

For the production of Remmers restoration mortars only controlled raw materials of the highest quality are used. Usually the binders are composed of several raw materials. These can be either different types of cements as well as various calks. To adjust specific properties dispersion additives are used. This is particularly true for Remmers Restoration Mortar SK that can be feathered out to zero.

Priming mortars

If there are deeper cavities or missing parts, it is advisable to do the core rebuilding with a priming mortar that has been formulated precisely for this task. This means especially that the strength gradient between the inside and the outside must be well balanced. Therefore there is a corresponding priming mortar developed especially for each restoration mortar. In addition to that, Remmers Priming Mortar "soft" has a high salt-storing capacity.



RM GM

Mineral stone replacement mortar for filling deep missing areas	
Application:	<ul style="list-style-type: none">■ Core reconstruction under restoration mortars■ Filling of deep cavities
Flexural strength (28 d):	Approx. 5 N/mm ² (0643) Approx. 3 N/mm ² (0638)
Strength:	M 20 (0643) M 10 (0638)
Elastic modulus (DIN 1048):	Approx. 18 kN/mm ² (0643) Approx. 10 kN/mm ² (0638)
Largest grain:	2 mm
Working time:	Approx. 30 minutes
Tools:	Collomix® KR stirrer HF 140 (4294), filling knife, spatula
Application rate:	Approx. 1.8 kg/l of cavity volume (0643) Approx. 1.3 kg/l of cavity volume (0638)

PU 30 kg	Strength	Grain size	Art.-Nr.
grey (non-hydrophobic)	M 20	2 mm	0643
grey (salt-storing, non-hydrophobic)	M 10	2 mm	0638



	RM	RM pro	RM ZF
	Mineral stone replacement mortar	Mineral stone replacement mortar (can be feathered out to zero)	Mineral stone replacement mortar, cement-free
Application:	<ul style="list-style-type: none"> Restoration, integration and re-profiling of mineral substrates such as natural stone, brick, concrete and synthetic stone Reproduction of ornamental elements in a tamping procedure 	<ul style="list-style-type: none"> Restoration, integration and re-profiling of mineral substrates such as natural stone, brick, concrete and synthetic stone Reproduction of ornamental elements in a tamping procedure 	<ul style="list-style-type: none"> Restoration, integration and re-profiling of mineral substrates such as natural stone, brick, concrete and synthetic stone In particular for substrates with less strength
Flexural strength (28 d):	Approx. 5 N/mm ²	Approx. 3.5 N/mm ² (normal) Approx. 2.5 N/mm ² (soft)	Approx. 1 – 2 N/mm ²
Compressive strength (28 d):	< 13 N/mm ² (normal) – M 10 > 8 N/mm ² (soft) – M 5	> 13 N/mm ² (normal) – M 10 > 8 N/mm ² (soft) – M 5	Approx. 3.5 N/mm ² – M 2.5
Elastic modulus (DIN 1048):	Approx. 11 kN/mm ² (normal) Approx. 7 kN/mm ² (soft)	Approx. 11 kN/mm ² (normal) Approx. 5 kN/mm ² (soft)	Approx. 4 kN/mm ²
Largest grain:	Fine 0.2 mm Medium 0.5 mm Coarse 2.0 mm	Fine 0.2 mm Medium 0.5 mm Coarse 2.0 mm	Fine 0.2 mm Medium 0.5 mm Coarse 2.0 mm
Working time:	Approx. 30 minutes	Approx. 30 minutes	Approx. 30 minutes
Tools:	Collomix® KR stirrer HF 140 (4294), filling knife, spatula	Collomix® KR stirrer HF 140 (4294), filling knife, spatula	Collomix® KR stirrer HF 140 (4294), filling knife, spatula
Application rate:	Approx. 1.6 kg/l of cavity volume	Approx. 1.6 kg/l of cavity volume	Approx. 1.5 kg/l of cavity volume

For information on products, article numbers, colours, strengths and grain sizes, please consult our current product programme for building /flooring materials.

New Rendering of Polluted Substrates

Durable special renders that benefit the whole building

Buildings change over time: dirt and pollutants gradually build up on the facades, and moisture penetrates through. When renovation time comes around, the facade is then cleaned, but usually this is not enough. Over the years, salts have built up that impede cleaning.

If the render is replaced in these cases, the undercoat and finishing coat of render must be configured such that they can resist this potential damage for as long as possible.

The tried-and-tested Remmers Restoration Render Systems are ideally suited to these applications.

The Restoration Render is permanently water-repellent and thus has excellent diffusion capability. This allows the masonry to dry but holds the salts back so that they do not migrate to the surface. If a large amount of salt is present, the substrate can be evened out using a (porous) Undercoat Render that gives the salts the chance to crystallise without causing damage.

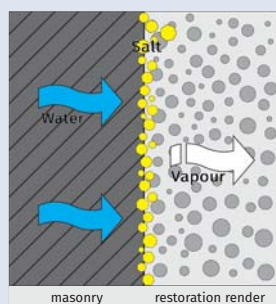
Alternatively, the Remmers Compress Render can be used to obtain a true dehumidifying render that is breathable and open to diffusion. This provides long-lasting moisture regulation and, with a pore volume of more than 60%, has plenty of space for storing salts.

The two essential tasks of restoration renders

Functional principle of a restoration render:

Single-layer (restoration render):

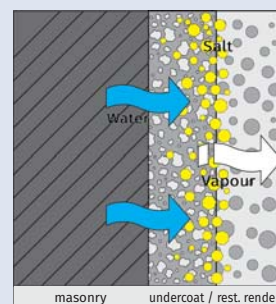
Shifting of the evaporation zone of the damp inside the wall from the surface of the render into the render layer. Restoration renders are water-repellent and vapour diffusion open at the same time.



Functional principle of a restoration render system:

Two-layer (undercoat and restoration render):

Accumulation of the salts coming from the wall without damage to the render. The undercoat is not water-repellent allowing the salts to migrate into it and with a pore volume above 50% offers enough room to safely store them.



	SP Levell	SP Top White	SP Top SR
	Special, salt-storing render for damp and salt-contaminated walls pursuant to WTA	Special render for damp and salt-contaminated walls pursuant to WTA	Special render for damp and salt-contaminated walls pursuant to WTA with a particularly high resistance to sulphates
Application:	<ul style="list-style-type: none"> ■ Damp and salt-contaminated wall surfaces and masonry ■ Old buildings, basements and facades ■ Reduction of moisture and salt content ■ Condensation buffer and protection layer on interior waterproofing layers 	<ul style="list-style-type: none"> ■ Repair, restoration and refurbishing of damp, salt-contaminated wall and masonry ■ Interior walls in basements, old buildings and facades ■ In combination with SP Levell if high quantities of salts are present ■ Can be applied in single-layer as undercoat and finish 	<ul style="list-style-type: none"> ■ Plinth areas with and without waterproofing ■ Substrates with high levels of salt contamination ■ Repair, renovation and refurbishing of old, damp and salt-contaminated masonry
Porosity:	> 50 Vol. %	> 50 Vol. %	> 50 Vol. %
Bulk density:	Approx. 1.0 kg/dm ³	Approx. 0.9 kg/dm ³	Approx. 1.15 kg/dm ³
Capillary water absorption, w24:	> 1.0 kg/m ²	> 0.3 kg/m ²	> 0.3 kg/m ²
Water penetration depth:	> 5 mm	< 5 mm	< 5 mm
Water vapour permeability:	not determined	μ < 15	μ < 15
Compressive strength:	CS III	CS II	CS II
Working time:	Approx. 60 minutes	Approx. 60 minutes	Approx. 60 minutes
Tools:	Compulsory mixer (twin shaft), fine render trowel -FLEXIS ONE- (4233), mortar trowel (4436), aluminium hand card with wooden handle (4429), cockscomb (4130), sponge float red (4935), smoothing trowel (4004), smoothing trowel (4117), smoothing trowel duo (4118), XXL coating knife (4437), grated scrape (4231)	Compulsory mixer (twin shaft), fine render trowel -FLEXIS ONE- (4233), mortar trowel (4436), aluminium hand card with wooden handle (4429), cockscomb (4130), sponge float red (4935), smoothing trowel (4004), smoothing trowel (4117), smoothing trowel duo (4118), XXL coating knife (4437), grated scrape (4231)	Compulsory mixer (twin shaft), fine render trowel -FLEXIS ONE- (4233), mortar trowel (4436), aluminium hand card with wooden handle (4429), cockscomb (4130), sponge float red (4935), smoothing trowel (4004), smoothing trowel (4117), smoothing trowel duo (4118), XXL coating knife (4437), grated scrape (4231)
Application rate:	Approx. 9.5 kg/m ² /cm of layer thickness	Approx. 8.5 kg/m ² /cm of layer thickness	Approx. 10.5 kg/m ² /cm of layer thickness

PU 20 kg	Art. No.	Art. No.	Art. No.
grey (intrinsic colour)	0401	–	0416
off-white	–	0402	–



Sacrificial WTA Renders

Durable special renders for the benefit of the building

If the levels of salt contamination are very high, it is advisable to reduce the salt content of the areas near to the surface either with a permanent one or two-layer restoration render system or with a sacrificial render, also called compress renders.

Depending on the type and quantity of the salts, the life expectancy of such a render amounts to several years. Sacrificial renders are real dehumidifying renders, open to vapour diffusion and capillary active.

With a pore volume of more than 60 %, Remmers Compress Render possesses much more pore space as salt accumulating renders in general. Unlike with Restoration Renders, in this case the water repelling property is dispensed with in favour of dehumidifying and desalting properties. The compress render thus presents plenty of room for the accumulation of salts and the transmission of moisture. This allows postponing the “sacrifice” for as long as possible. Remmers Compress Render is also suitable for repairing walls materials damaged by damp and salts.



Compress Render

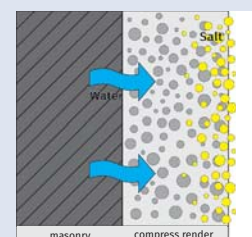
Salt-storing render/sacrificial render pursuant to WAT	
Application:	<ul style="list-style-type: none"> Desalination and reduction of damp Sacrificial render on salt-contaminated substrates Buffer layer under renders formulated on historical models Old buildings, basements and facades
Bulk density:	Approx. 0.7 kg/dm ³
Water demand:	8.5 l/16 kg
Apparent density of solid mortar:	Approx. 0.8 kg/dm ³
Compressive strength:	CS II
Dynamic elastic modulus:	Approx. 2 kN/mm ²
Open porosity:	Approx. 60 Vol. %
Working time:	Approx. 60 minutes
Tools:	Compulsory mixer (twin shaft), smoothing trowel (4004), smoothing trowel (4117), smoothing trowel duo (4118), mortar trowel (4436), XXL coating knife (4437), aluminium hand card with wooden handle (4429)
Application rate:	Approx. 6.0 kg/m ² /cm of layer thickness

PU		16 kg
grey	1077	■
special colour	1073	■

Different modes of action of dehumidifying renders and compress Renders

Functional principle of a compress render:

Unlike restoration render, there is no water-repelling effect here in order to promote the removal of moisture and salts. The render has an even larger pore volume in order to collect or let through as much salt and moisture as possible and release it into the air quickly and efficiently.





Reconstructing Historical Renders

Preservation of valuable buildings

The use of traditional materials and techniques is fundamental to the restoration of historic monuments and buildings. As long as the influence of salt and moisture can be kept to a minimum, the primary objective of restoration is to use traditional materials and to adjust the historical formulations so that they can still be used on the structure at hand.

With the Remmers Historic Mortar System, old mortar compositions can be recovered for virtually all kinds of historical formulations, from dry-slaked lime mortar to

natural cement mortar and from classical stone render to crushed brick concrete from the mid-20th century. We conduct individual analyses in each case and use these as the basis for our formulation, along with our extensive experience stemming from 70 years of activity in the field of historic building preservation.

We bring all our knowledge to every situation in order to preserve historical render textures and formulations and to combat the loss of the associated historical mortars.

	CL Prep Historic	CL Levell Historic	CL Top Historic
Application:	Rough cast formulated for specific objects <ul style="list-style-type: none"> Substrate preparation before Remmers Historic renders are applied Levelling of different absorption characteristics of the substrate 	Custom formulated undercoat render <ul style="list-style-type: none"> Undercoat render for reconstructing the composition and texture of the original plaster Levelling and equalisation of substrates 	Custom formulated finishing render <ul style="list-style-type: none"> For the custom repair, renovation and refurbishing of old facades, historical buildings and monuments
Characteristic data:	Specific to the single object and formulation	Specific to the single object and formulation	Specific to the single object and formulation
Working time:	Approx. 60 minutes	Approx. 60 minutes	Depending on the formulation
Tools:	Collomix® KR stirrer (4292), spray plaster machine (4439)	Compulsory mixer (twin shaft), fine render trowel -FLEXIS ONE- (4233), mortar trowel (4436), aluminium hand card with wooden handle (4429), cockscomb (4130), smoothing trowel (4004), smoothing trowel (4117), smoothing trowel duo (4118), XXL coating knife (4437)	Compulsory render trowel -FLEXIS ONE- (4233), mortar trowel (4436), aluminium hand card with wooden handle (4429), cockscomb (4130), red sponge float (4935), sponge float yellow (4936), smoothing trowel (4004), smoothing trowel (4117), smoothing trowel duo (4118), XXL coating knife (4437)
Application rate:	Specific to the single object and formulation	Specific to the single object and formulation	Specific to the single object and formulation

PU		25 kg	30 kg
CL Prep Historic	0574		■
CL Levell Historic	0575	■	
CL Top Historic	0576	■	



CL Grout Historic

Custom formulated facade grout	
Application:	<ul style="list-style-type: none"> ■ Porous, mineral building materials outdoors ■ Indoors and outdoors ■ Built heritage preservation measures
Characteristic data:	Specific to the single object and formulation
Water vapour diffusion resistance: μ	< 18
Compressive strength:	> 1 N/mm ²
Working time:	Approx. 60 minutes
Tools:	Collomix® KR stirrer (4292), grouting brush (4517)
Application rate:	Approx. 4 kg/m ² at 3 mm of layer thickness

PU	25 kg
0510	■

Historic Lime Mortar

Basic mixture ('dry-slaked', cement-free, sand-lime mortar) for the production of mortars and renders according to historical formulations using local aggregates	
Application:	<ul style="list-style-type: none"> ■ Repair and restoration of historical substrates ■ Jointing mortar ■ Render mortar
Characteristic data:	Specific to the single object and formulation
Density (20 °C):	Approx. 1.9 g/cm ³
Working time:	Not specified
Tools:	Compulsory mixer (twin shaft), fine render trowel -FLEXIS ONE- (4233), mortar trowel (4436), aluminium hand card with wooden handle (4429), cockscomb (4130), red sponge float (4935), yellow sponge float (4936), smoothing trowel (4004), smoothing trowel (4117), smoothing trowel duo (4118), XXL coating knife (4437), jointing iron
Application rate:	Depending on the application

PU	35 kg
0543	■

NHL Levell Historic

Undercoat on an NHL 5 basis	
Application:	<ul style="list-style-type: none"> ■ Levelling and equalisation
Compressive strength (28 d):	Approx. 5.0 N/mm ²
Largest grain:	Approx. 3.15 mm
Working time:	Approx. 120 minutes
Tools:	Collomix® KR stirrer HF 140 (4294), fine render trowel -FLEXIS ONE- (4233), smoothing trowel (4004), broom
Application rate:	Approx. 1.9 kg/m ² /mm

PU	25 kg
0491	■

NHL Top Historic

Finishing render on a NHL 5 basis	
Application:	<ul style="list-style-type: none"> ■ Finishing render for the repair, renovation and refurbishing of old facades, historical buildings and monuments
Compressive strength (28 d):	3.5 N/mm ²
Largest grain:	Approx. 1.2 mm
Working time:	Approx. 120 minutes
Tools:	Collomix® KR stirrer HF 140 (4294), fine render trowel -FLEXIS ONE- (4233), smoothing trowel (4004), broom
Application rate:	Approx. 1.6 kg/m ² /mm

PU	25 kg
0490	■



Roman Cement

Preservation of historical render formulations

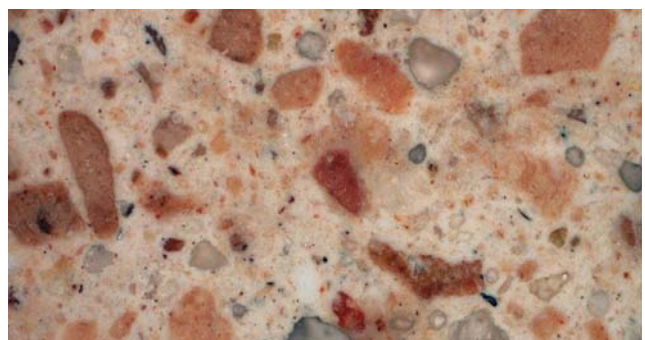
Roman cement was used for the first time in 1774 by John Smeaton for the building of the lighthouse of Eddystone, England. He had previously noticed that it was possible to forgo the usual addition of pozzolanic (volcanic) aggregates to the lime to improve the strength of the mortar, if either during the burning of the lime brick dust was added or lime contaminated with clay was used.

This insight spread from England to other countries so that between 1800 and 1850 Roman cement became the preferred binder in Europe. In the following decades the diffusion of Portland cement, which had also been developed in Britain, made it less and less important until it practically completely disappeared by the time of World War I. Roman cement was frequently used as thin mortar layer with a relatively high cement dosage.

The nonetheless low diffusion resistance and the comparatively high porosity ensured a high degree of durability. To live up to the task of repairing historical Roman cement mortars by staying true to the original materials, for the formulation of the corresponding products Remmers uses either one of the two raw material sources that have again become available in Poland and France.

Due to the large number and importance of the buildings for the rendering and facade ornaments of which Roman cements played a significant role in the 19th and early 20th century as well as the technologically interesting properties of these binders, the European Union has promoted two consecutive projects for the revival of Roman cement technology:

ROCEM (2003 – 2006) and ROCARE (2009 – 2013) in which Remmers participated as partner.



Typical texture and colour of Roman cement

RM RZ Historic			Fill RZ Historic	VSM RZ Historic
Application:		Fast-setting replacement mortar on Roman cement basis <ul style="list-style-type: none">■ Restoration of joints in heritage-protected objects■ Brick and natural stone masonry■ Replacement and repair mortar■ For all old mortars made with Roman cement	Mineral surface filler and fine render on a Roman cement base <ul style="list-style-type: none">■ Finishing of historical façades■ Mineral surface filler for use indoors and outdoors	Fast-setting Roman cement mortar <ul style="list-style-type: none">■ New laying and substitution of natural stone■ For all old mortars made with Roman cement
Open porosity:		Approx. 35 – 40 Vol.-%	not determined	not determined
Capillary water absorption:		Approx. 0.65 kg/(m² min ^{0.5})	not determined	≤ 0.8 kg/(m² min ^{0.5})
Compressive strength (28 d):		≥ 3.5 N/mm² – CS III	≥ 6.0 N/mm² – CS IV	≥ 3.0 N/mm² – CS III
Dyn. Elastic modulus (28 d):		Approx. 8000 N/mm²	not determined	Approx. 10000 N/mm²
Largest grain:		Coarse < 2 mm (0563) Fine < 0.5 mm (0566)	≤ 0.3 mm	Approx. 2 mm
Working time:		Approx. 30 minutes	Approx. 20 minutes	Approx. 20 minutes
Tools:		Collomix® KR HF 120 stirrer (4292), fine render trowel -FLEXIS ONE- (4233), smoothing trowel (4004), profiling tool	Collomix® KR HF 120 stirrer (4292), fine render trowel -FLEXIS ONE- (4233), smoothing trowel (4004), felt wheel	Collomix® KR HF 120 stirrer (4292), fine render trowel -FLEXIS ONE- (4233), smoothing trowel (4004), spatula
Application rate:		Approx. 1.7 kg/l of cavity volume	Approx. 1.5 kg/m²/mm of layer thickness	Approx. 1.8 kg/l of cavity volume

PU			10 kg
RM RZ Historic (coarse)	0563	■	
RM RZ Historic (fein)	0566	■	
Fill RZ Historic	0564	■	
VSM RZ Historic	0567	■	



BSP RZ Historic

Roman cement mortar	
Application:	<ul style="list-style-type: none"> Indoors and outdoors Mineral substrates in dry, damp, wet and underwater areas Grouting joints and voids in historical masonry work
Compressive strength (28 d):	> 4 N/mm ² – CS III
Dyn. Elastic modulus (28 d):	Approx. 9000 N/mm ²
Largest grain:	Approx. 2 mm
Working time:	Approx. 45 minutes
Tools:	Collomix® KR HF 120 stirrer (4292), Universal funnel (4082), rapid snap lock (4542), lamella - drive-in packer (4524), locking tappet (4522)
Application rate:	Approx. 1.9 kg/l of cavity volume

PU	10 kg
0568	■

Stucco Mortar GF RZ

Fast-setting stucco mortar for the production of cast stucco elements on a Roman cement base	
Application:	<ul style="list-style-type: none"> On historical buildings erected before 1914 on which Roman cement was used Factory production of stucco elements by casting
Compressive strength (28 d):	> 1.5 N/mm ² (M1) – CS II
Dyn. Elastic modulus (28 d):	Approx. 7500 N/mm ²
Largest grain:	< 0.5 mm
Working time:	Approx. 30 minutes
Tools:	Collomix® KR HF 120 stirrer (4292), smoothing trowel (4004), universal funnel (4082)
Application rate:	Approx. 1.2 kg/l of cavity volume

PU	10 kg
0569	■



Stucco Restoration and Repair

Individual handicraft for the modern era

Stucco elements give a special look to facades, conjuring up a noble history of traditional handicraft. Building facades finished with stucco adorn many historic town skylines. Of course, stucco encompasses not just the opulent ornaments of Baroque and Rococo architecture, but also simple cornices, window jambs, pilaster strips and the like. With regard to their production, stucco cornices are traditionally formed on site but can also be manufactured as precast profiles and ornaments. Remmers offers solutions for both methods, that perfectly satisfy the requirements of workability, rapidity and durability.



	Stucco GZ	Stucco FZ	Stucco GF
	Fast setting mortar for the production and moulding of stucco cores	Fast setting mortar for finely textured surface decoration of new and old stucco	Fast-setting stucco mortar for the production of cast stucco elements
Application:	<ul style="list-style-type: none"> Production of stucco cores, profiles and cornices Repair and refurbishment of facades/stucco facades 	<ul style="list-style-type: none"> Finishing of stucco cores made of coarse stucco mortar Repair of old, cement bound stucco elements Creation of smooth profiles with sharp edges 	<ul style="list-style-type: none"> Factory production of stucco elements by casting
Bulk density:	Approx. 1.25 kg/dm ³	Approx. 1.50 kg/dm ³	Approx. 1.25 kg/dm ³
Capillary water absorption, w ₂₄ :	< 1.0 kg/m ²	< 1.0 kg/m ²	< 1.0 kg/m ²
Water vapour diffusion resistance:	μ = 18	μ < 18	μ = 18
Compressive strength (28 d):	> 5.0 N/mm ² (M5)	> 5.0 N/mm ² (M5)	ca. 5.0 N/mm ² (M5)
Largest grain:	< 1.5 mm	< 0.5 mm	< 1.5 mm
Working time:	Approx. 30 minutes	Approx. 20 minutes	Approx. 15 minutes
Tools:	Collomix® KR HF 120 stirrer (4292), smoothing trowel (4004), template, smoothing trowel (4117), smoothing trowel duo (4118)	Collomix® KR HF 120 stirrer (4292), smoothing trowel (4004), template, smoothing trowel (4117), smoothing trowel duo (4118)	Collomix® KR HF 120 stirrer (4292), smoothing trowel (4004)
Application rate:	Approx. 11 kg/m ² /mm (of layer thickness)	Approx. 1.3 kg/m ² /mm (of layer thickness)	Approx. 1.1 kg/l (cavity volume)
PU 25 kg	Art. No.	Art. No.	Art. No.
light grey	0511	–	0521
antique white	–	0512	–

Reproduction of Originals

Silicone moulding compounds with excellent reproduction accuracy

There are many good and legitimate reasons to create moulds of valuable originals: from restorers, archaeologists and museum curators to artists who want to reproduce their own creations: they all work with silicone moulding compounds.

Remmers Silicon AFM is a highly elastic silicone moulding compound with high tear strength that cross-links in presence of condensation and has been developed specially for the production of all-purpose casting moulds. It presents high reproduction accuracy and is suitable for moulds of any degree of difficulty. Thanks to its high elasticity and good release properties, the material is easily separated from the model and is thus predisposed for maximum reproduction accuracy and frequency. To reduce slump it is possible to add the Thickening Agent AFM thus reducing the fluidity of the silicone moulding compound. This allows to create skin moulds of non-plane or even vertical surfaces without run-offs or slumping of the moulding compound.

The resulting forms are suitable for casting with various materials: Usually for copies pourable mortars or stucco mortars are used.

- RM GM
- Stucco GF
- Stucco GF RZ

Also other materials such as gypsum, clay, wax and casting resins such as polyester and polyurethane can be used to fill the silicone moulding compound, albeit the use of casting resins reduces the reproduction frequency.

Silicon AFM / Hardener AFM

Pourable, 2-component, silicone moulding compound	
Application:	<ul style="list-style-type: none">■ Detail-true moulding of valuable originals■ Production of solid and skin moulds■ Production of moulds with strongly undercut areas
Density:	Approx. 1.22 g/cm ³
Viscosity (after mixing):	Approx. 24000 mPa·s By adding up to 1 % by mass of the Thickening Agent AFM (0738), viscosity can be increased to the required creep resistance.
MR Silicon AFM : Hardener AFM:	100 : 2 (by mass)
Pot-life:	Approx. 60 minutes
Shore A hardness (DIN 53505):	Approx. 23 N/mm ²
Tensile strength (DIN 53504 S3A):	Approx. 2.8 N/mm ²
Elongation at tear/ (DIN 53504 S3A):	Approx. 380 %
Tear resistance (ASTM D 624 Form B):	Approx. 22 N/mm ²
Linear shrinkage (7 d):	Approx. 0.5 %
Reaction time:	Approx. 20 hours
Application rate:	Approx. 1.2 kg/m ² /mm of layer thickness

PU		1 kg	22 g	5 kg	100 g	110 g
Silicon AFM	0736	■		■		
Hardener AFM	0737		■			■
Thickening Agent AFM	0738				■	

RM GF

Pourable, mineral stone replacement mortar	
Application:	<ul style="list-style-type: none">■ Moulding of sculptures and other three-dimensional elements by casting■ Casting of open and closed forms
Bulk density:	Approx. 1.6 kg/dm³
Compressive strength (28 d):	Approx. 20 N/mm²
Largest grain:	0.5 mm
Working time (+20 °C):	Approx. 30 minutes
Painted over (+20 °C):	Approx. 24 hours
Application rate:	Approx. 1.8 kg/l of cavity volume

PU	30 kg	
grey (non-hydrophobic)	0588	■
off-white (non-hydrophobic)	0589	■
Special properties (with regard to composition and characteristic properties, hydrophobic version possible)	0590	■

Stucco GF RZ

Fast-setting stucco mortar on a Roman cement basis for the production of cast stucco elements	
Application:	<ul style="list-style-type: none">■ On historical buildings erected before 1914 on which Roman cement was used■ Factory production of stucco elements by casting
Bulk density:	Approx. 1.0 kg/dm³
Compressive strength (28 d):	> 1.5 N/mm² – CS II (M 1)
Largest grain:	< 0.5 mm
Working time (+20 °C):	Approx. 30 minutes
Painted over (+20 °C):	Approx. 30 minutes
Application rate:	Approx. 1.2 kg/l of cavity volume

PU	10 kg	
brown-beige	0569	■





Coating, Scumble and Hydrophobisation

Decoration and surface protection

Remmers Historic Lime Paint System

Rediscovering tradition - On a base of dispersed white hydrated lime

In the Department for "Restoration and Conservation of Art and Cultural Property" of Cologne University of Applied Science a new preparation method for lime was developed. Through "dispersion" the familiar and proven properties of lime as a binder are combined with the new possibilities of modern technology to eliminate its classic drawback.

Advantages of the historic Lime Paint System

- Accelerated carbonation (curing)
- Increased binding capacity for pigments
- Higher adhesion to the substrate
- Wipe resistance
- Increased resistance to weathering
- Improved workability
- Mixability of all components of the system
- Without artificial resins

System components

- Lime Paint
- Lime Grout
- Lime Filler – fine

Thanks to the successful symbioses of established tradition and modern know-how, the Remmers Historic Lime Paints system represent an excellent option to bring historic buildings to shine in their original splendour again.

	Color CL Fill Historic	Color CL Historic	CL Fill Q3 / Q4 Historic
	Filling lime paint without organic binder components	Lime Paint without organic binder components	Premium, ready-made fille on a „dry-slaked“ sand-lime basis
Application:	<ul style="list-style-type: none"> ■ Porous, mineral building materials indoors ■ Built heritage preservation measures and "ecological" construction ■ Levelling and crack-grouting intermediate coating 	<ul style="list-style-type: none"> ■ Porous, mineral building materials indoors ■ Built heritage preservation measures and "ecological" construction 	<ul style="list-style-type: none"> ■ Porous, mineral building materials indoors ■ In indoor areas on loam, lime, lime cement and other mineral renders as well as natural stone, concrete and other absorbent mineral substrates ■ Built heritage preservation measures and "ecological" construction
Density (20 °C):	Approx. 1.54 g/cm ³	Approx. 1.54 g/cm ³	Approx. 1.7 g/cm ³
Viscosity:	Approx. 2500 mPa·s	3500 mPa·s	> 15000 mPa·s
pH value:	> 11	> 11	> 11
Water vapour permeability (DIN 52615):	sd < 0.01 m	sd < 0.01 m	sd < 0.03 m
Coated over:	24 hours	24 hours	24 hours
Tools:	Patent disperser (4747), Collomix® stirrer LX (4296), brush (4541), Kana® KanaClassic corner brush (4541), whitewash brush (4540), FC paint roller (4913), airless spraying equipment	Patent disperser (4747), Collomix® stirrer LX (4296), brush (4541), Kana® KanaClassic corner brush (4541), whitewash brush (4540), FC paint roller (4913), airless spraying equipment	Collomix® stirrer LX (4296), Collomix® DLX stirrer (4286), smoothing trowel (4004), smoothing trowel (4117), smoothing trowel duo (4118), airless spraying equipment
Application rate:	Approx. 0.2 – 0.25 kg/m ² per coat on smooth substrates. 2 coats needed.	Approx. 0.2 – 0.25 kg/m ² per coat on smooth substrates. 2 coats needed.	Approx. 1.0 kg/m ² /mm of layer thickness per coat, maximal of layer thickness 5 mm (6562), bzw. 3 mm (6564)

PU 10 kg	Art. No.	Art. No.	Art. No.
white	6566	6569	6562 (Q3)*, 6564 (Q4)**
special colours	–	6570	–

* Largest grain: 0.5 mm ** Largest grain: 0.15 mm

Remmers

Silicate Paints

Mineral paint

Classic silicate or mineral paints are shrouded in the myth of high-quality finishing and indestructibility. The reason for this is the use of waterglass as a mineral binder as well as the fact that they have been used for numerous applications on extraordinary architectural monuments, especially in the early Moderne.

Towards the end of the 19th century waterglass-bound paints introduced a new chapter of the chemistry and technology of coating systems providing a quantitatively and qualitatively suitable means for a long-lasting, weather-resistant, artistic decoration of facades.

Soluble glass, as waterglass is also called, is in principle glass dissolved in water. Two types can be distinguished: potassium silicate and sodium silicate. For the production of paints only potassium silicate can be used. Silicate paints dry as the water contained in them evaporates as well as by absorbing carbon dioxide from the air and using it to bind the pigments to the substrate through the “silicification” process of the waterglass.

To avoid an overconsolidation of the substrate silicate paints should be applied only on relatively solid and compact render substrates. Silicate paints are among the coatings most permeable to vapour. For use on faced they are mostly formulated to form a water-repellent surface. A general exception is represented by the use for painting infillings of half-timbered buildings. As a coating for modern internal wall insulation systems, that is system of which a continuous capillary activity must be maintained silicate paints are, together with lime paints, the means of choice.

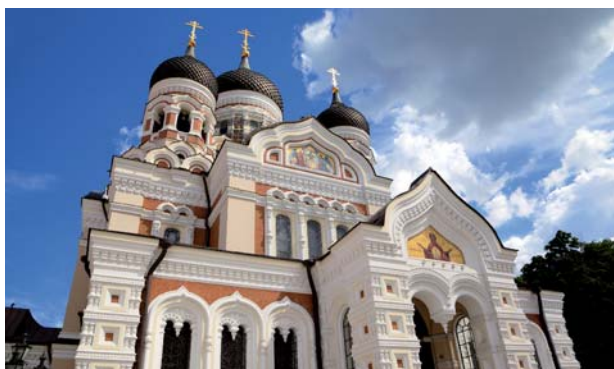
Color SH

Mineral paint with a quartzite texture	
Application:	<ul style="list-style-type: none">■ Porous, mineral building materials such as brick, sand-lime bricks, mineral renders■ Renovation coat for silicate, lime and cement coatings■ Do not apply on natural stone surfaces that contain iron or manganese
Binder:	Potassium water glass
Density (20 °C):	1.40 g/cm ³
Degree of gloss:	matt
pH value:	Approx. 12 – 13
Water vapour permeability: (DIN 52615)	sd ≤ 0.04 m
Water absorption:	< 0.2 kg/(m ² h ^{0.5})
Coated over:	12 hours
Tools:	Patent disperser (4747), Collomix® stirrer LX (4296), brush (4541), Kana® KanaClassic corner brush (4541), whitewash brush (4540), FC paint roller (4913), airless spraying equipment
Application rate:	0.2 l/m ² (per coat) 2 coats needed

PU		12.5 l
white	0630	■

Remmers Silicone Resin Paint System

The reversible alternative against humidity



An alternative to a structural waterrepellent effect obtained by a hydrophobic impregnation is represented by an opaque or transparent coating with Remmers silicon resin paints. The outstanding property of silicon resin paints is based on its micro-porous structured. This is reflected in its parameters. A water vapour diffusion resistance factor of about 150 is achieved.

This corresponds to an sd value that is well below 0.10 m and is thus equivalent to commonly used single-component silicate paints. The capillary water absorption of a normal paint layer reaches the low value of 0.035 kg/(m²h^{0,5}). This offers an optimal protection against driving rain and one that betters all silicate and most dispersion paints.

Advantages of the Remmers silicone resin paints and scumbles

- Highest possible water vapour permeability coupled with the lowest capillary water absorption
- Suitable also for renders of the mortar group Plc
- Colours suitable for heritage protected monuments with inorganic and colour fast pigments
- Good application by brush and many and numerous possibilities of transparent coatings
- Matt lime paints
- No silicification therefore no risk of restriction, densification or occlusion of the pore space
- Reversible

Color LA

"True" silicone resin paint with film protection for surfaces at risk of algae and fungi

Application: ■ Porous, mineral building materials outdoors
 ■ Load-bearing silicate, silicone and matt dispersion paints
 ■ Synthetic resin renders

Binder: Low-molecular silicone resin emulsion

Degree of gloss: Matt, mineral character

Density (20 °C): Approx. 1.45 – 1.53 g/cm³ depending on the colour

Viscosity: Approx. 3000 mPa·s

pH value: Approx. 8.5

Water vapour permeability (DIN 52615): sd ≤ 0.05 m

Water absorption coefficient (DIN EN 1062-3): w < 0.1 kg/(m²h^{0,5})

Tools: Patent disperser (4747), Collomix® stirrer LX (4296), brush (4541), Kana® KanaClassic corner brush (4541), whitewash brush (4540), paint roller FC (4913), airless spraying equipment

Application rate: Approx. 0.2 – 0.25 l/m² (per coat)
 2 coats needed

PU		5 l	12.5 l
white	6400	■	■
clear	6410	■	■
colour collection	6430	■	■
special colours*	6429	■	■



	Color LA Fill	Color LA Historic	Color LA Fill Historic
Application:	"True" silicone resin paint with a high filling power <ul style="list-style-type: none"> ■ Porous, mineral building materials load-bearing silicate, silicone and matt dispersion paints ■ Artificial resin renders ■ Surfaces with differing degrees of roughness and hair cracks ■ Intermediate coating under Silicon Resin Paint LA 	Semi-transparent, "true" silicone resin paint <ul style="list-style-type: none"> ■ Porous, mineral building materials ■ Heritage-protected buildings ■ Not suitable for application over plastic, thermoplastic and elastic paint systems 	Semi-translucent, "true" silicone resin paint with a high filling power <ul style="list-style-type: none"> ■ Porous, mineral building materials load-bearing silicate, silicone and matt dispersion paints ■ Heritage-protected buildings ■ suitable for application over plastic, thermoplastic and elastic paint systems
Binder:	Silicone resin emulsion	Organosilicon-modified copolymers	Organosilicon-modified copolymers
Degree of gloss:	Matt, mineral character	Matt, mineral character lime paint look	Matt, mineral character
Density (20 °C):	Approx. 1.50 g/cm ³	Approx. 1.4 g/cm ³ depending on the colour	Approx. 1.4 g/cm ³ depending on the colour
Viscosity:	Approx. 4000 mPa·s	Approx. 2000 mPa·s	Approx. 3000 mPa·s
pH value:	Approx. 8.5	8 – 9	8 – 9
Water vapour permeability (DIN 52615):	sd ≤ 0.05 m	sd < 0.10 m	sd < 0.25 m
Water absorption coefficient (DIN EN 1062-3):	w ≤ 0.1 kg/(m ² h ^{0.5})	w ≤ 0.1 kg/(m ² h ^{0.5})	w ≤ 0.1 kg/(m ² h ^{0.5})
Tools:	Patent disperser (4747), Collomix® stirrer LX (4296), brush (4541), Kana® KanaClassic corner brush (4541), whitewash brush (4540), FC paint roller (4913), airless spraying equipment	Patent disperser (4747), Collomix® stirrer LX (4296), brush (4541), Kana® KanaClassic corner brush (4541), whitewash brush (4540), FC paint roller (4913), airless spraying equipment	Patent disperser (4747), Collomix® stirrer LX (4296), brush (4541), Kana® KanaClassic corner brush (4541), whitewash brush (4540), FC paint roller (4913), airless spraying equipment
Application rate:	Approx. 0.3 – 0.5 kg/m ²	Approx. 0.1 – 0.15 l/m ² per coat	Approx. 0.2 – 0.4 l/m ² per coat

PU		5 l	10 kg	12.5 l
Color LA Fill (white)	0560		■	
Color LA Fill (special colours*)	0561		■	
Color LA Historic (special colours*)	6476	■		■
Color LA Fill Historic	6471	■		■

Funcosil Impregnation Agents

Reliable protection for dry masonry

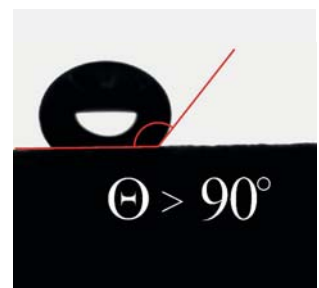
Water plays a central role in the weathering processes of mineral building materials. The goal of hydrophobic impregnation is a significant reduction of the capillary water absorption that occurs, for example, when a wall is exposed to driving rain or splash water. It represents a sensible measure for preventing damage (prophylactic treatment) when capillary absorption of precipitation or splash water can cause or accelerate the deterioration process or where correlated damage is visible.

The reduction of the moisture content also improves the thermal insulation of the facade masonry. A hydrophobisation with Funcosil protects your bricks against damage and saves valuable energy. Irrespective of the composition of the active ingredient, the effect of a hydrophobising impregnation is based on the reduction of the forces between pore walls and penetrating water molecules. This diminution of the interaction normally inverts the prevailing capillary suction in capillary depression. The variation and property range of hydrophobic agents based on organic silicon is very large. The choice must therefore be made in accordance with the requirements of the substrate.

In the past hydrophobising agents were always liquid and therefore not especially suited to weakly absorbent brickwork. Remmers has now solved this problem with the Funcosil FC cream technology, which gives all substrates the time to absorb the necessary protective agents.



Hydrophilic (water-attracting) material



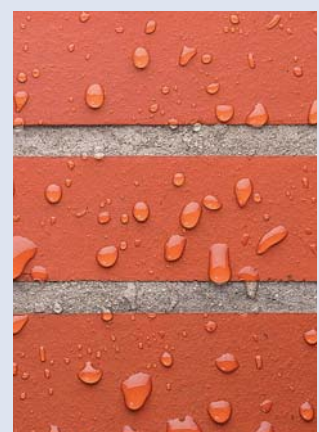
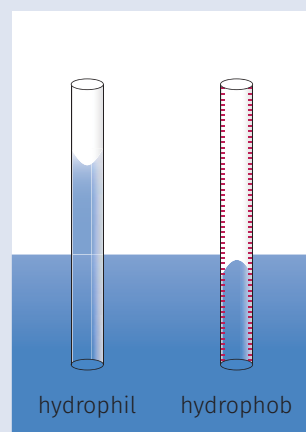
Hydrophobic (water-repelling) material

The angle of contact or angle of surface wetting is the angle that a liquid forms on the surface of a solid. If the angle of contact is greater than 90 degrees, the surface is hydrophobic.

What causes hydrophobisation?

A thin glass tube is placed into a water basin, which causes the water in the glass tube to rise up. The mechanism behind this is capillary forces. If the glass tube is now made hydrophobic, the effect is reversed; water is no longer “sucked in” but is instead pushed out.

This is the result of a nano-scale layer of the Funcosil impregnation, just one molecule thick, acting on the surfaces of the pores, with practically no restriction of the vapour diffusion. Air and vapour can permeate through just as before.



Funcosil Impregnation Agents

	Funcosil FC	Funcosil FC pro	Funcosil FC Historic
	Hydrophobising impregnation agent in cream form	Silane-based impregnation cream for hydrophobic treatment adapted to specific substrates	Impregnation cream with restricted capillary inhibition
Application:	<ul style="list-style-type: none"> Protection of facades against driving rain Reduction of the tendency to soil and of efflorescence growth Porous, mineral building materials outdoors Driving rain protection for subsequently insulated hollow spaces and interior insulation 	<ul style="list-style-type: none"> Adaptive protection of facades against driving rain Reduction of the tendency to soil and of efflorescence growth Porous, mineral building materials such as brick, clinker, sandlime stone and render Complementary measure for energetic remediation, especially in the case of capillary active interior wall insulation Object-specific adapted (adaptive) reduction of capillary water absorption to ensure a high drying potential (a preliminary examination is necessary) 	<ul style="list-style-type: none"> Driving rain protection for heritage-listed buildings Mineral building materials such as render, brick and natural stone Reduces capillary water absorption but maintains residual capillarity
Active ingredient:	Emulsified silanes	Silanes / Siloxanes	Silanes / Siloxanes
Active ingredient content:	Approx. 40 M.-%	adapted	Approx. 20 by mass
Carrier material:	Dearomatized hydrocarbons / water	Dearomatised hydrocarbons / water	Dearomatised hydrocarbons / water
Consistency:	Creamy consistence	Creamy consistence	Creamy consistence
Density (20 °C):	Approx. 0.84 g/cm ³	Approx. 0.82 – 0.90 g/cm ³ depending on the formulationg	Approx. 0.83 g/cm ³
Flashpoint:	> 61 °C	> 61 °C	> 61 °C
Tools:	Collomix® stirrer LX (4296), brush (4541), Kana® KanaClassic corner brush (4541), whitewash brush (4540), FC paint roller (4913), airless spraying equipment	Collomix® stirrer LX (4296), brush (4541), Kana® KanaClassic corner brush (4541), whitewash brush (4540), FC paint roller (4913), airless spraying equipment	Collomix® stirrer LX (4296), brush (4541), Kana® KanaClassic corner brush (4541), whitewash brush (4540), FC paint roller (4913), airless spraying equipment
Application rate:	Approx. 0.15 – 0.20 l/m ² (depending on the substrate)	Depending on porosity, in one operation: Approx. 0.15 – 0.20 l/m ²	Depending on porosity, in one operation: Approx. 0.15 – 0.20 l/m ²

PU		0.75 l	1 l	5 l	10 l	12.5 l	30 l	200 l	1000 l
Funcosil FC	0711	■		■		■			
Funcosil FC pro	0703					■			
Funcosil FC Historic	0611			■		■			

Funcosil SNL		Funcosil SL	Funcosil WS
	Hydrophobising, solvent-based, liquid impregnation	Hydrophobising impregnation for limestone	Hydrophobising impregnation in aqueous emulsion form
Application:	<ul style="list-style-type: none"> Protection of facades against driving rain Reduction of the tendency to soil and of green growth Follow-up treatment / refreshment of hydrophobic surfaces Subsequent impregnation of mineral paint coatings Porous, mineral building materials wie brick, sand or lime stone, mineral renders and aerated concrete 	<ul style="list-style-type: none"> Protection of facades against driving rain Reduction of the tendency to soil and of green growth Mineral building materials, especially lime based natural stone 	<ul style="list-style-type: none"> Protection of facades against driving rain Reduction of the tendency to soil and of green growth Refreshing older hydrophobizing agents that have been exposed weathering Porous, mineral building materials such as sand-lime brick, natural stone, fair-faced brick masonry, mineral renders, aerated and lightweight concrete Subsequent impregnation of mineral paint coatings
Active ingredient:	Silane / Siloxane	Silane / Siloxane	Silane / Siloxane
Active ingredient content:	Approx. 7 by mass	Approx. 7 by mass	Approx. 10 by mass
Carrier material:	Dearomatized hydrocarbons	Dearomatized hydrocarbons	water Liquid
Consistency:	Liquid	Liquid	1 g/cm ³
Density (20 °C):	Approx. 0.78 g/cm ³	Approx. 0.79 g/cm ³	–
Flashpoint:	> 30 °C	40 °C	
Tools:	GLORIA® CleanMaster PERFORMANCE PF50 (4666) and other pressure sprayers, GLORIA® CleanMaster EXTREME EX100 (4665) and other hand sprayers, Kana® KanaClassic corner brush (4541), whitewash brush (4540) and grouting brush (4517)	GLORIA® CleanMaster PERFORMANCE PF50 (4666) and other pressure sprayers, GLORIA® CleanMaster EXTREME EX100 (4665) and other hand sprayers, Kana® KanaClassic corner brush (4541), whitewash brush (4540) and grouting brush (4517)	GLORIA® 405 / 410 T Profiline (4667), GLORIA® CleanMaster PERFORMANCE PF50 (4666) and other pressure sprayers, GLORIA® Pro 100 (4668), GLORIA® CleanMaster EXTREME EX100 (4665) and other hand sprayers, Kana® KanaClassic corner brush (4541), whitewash brush (4540) and grouting brush (4517)
Application rate:	Approx. 0.3 – 1.5 l/m ² depending on the substrate	Approx. 0.2 – 1.5 l/m ² depending on the substrate	Approx. 0.5 – 1.5 l/m ² depending on the substrate

PU		0.75 l	1 l	5 l	10 l	12.5 l	30 l	200 l	1000 l
Funcosil SNL	0602		■	■	■		■	■	■
Funcosil SL	0608			■			■		
Funcosil WS	0614			■			■		



Subsequent Waterproofing

Reliable countermeasures
against the causes of damage

Subsequent Waterproofing

Mineral-based and bitumen-free

One of the most reliable solutions for the subsequent refurbishing of wet basement is the waterproofing of the outside wall surfaces below ground. Waterproofings on structures below ground are exposed to extreme loads through external influences such as pressure, aggressive substances and temperature.

The WTA code of practice 4 – 6 describes the possible methods for subsequent waterproofing and the corresponding detail solutions in building refurbishment and monument preservation work. In this area, which is particularly

exposed to all sorts of loads, polymer-modified bitumen thick coatings (PMBC) have been successfully used for decades. With the development of the new MB 2K, waterproofing measures on buildings can be carried out with mineral products as well.

MB 2K combines the properties of crack-bridging, mineral waterproofing grouts and polymer-modified bitumen thick coatings (PMBC) in one product for the entire bandwidth of waterproofing work in buildings.



Remmers MB 2K: Long-Lasting Protection!

The mineral building waterproofing

MB 2K has the capacity to set and crosslink without cracking within 18 hours even in adverse weather conditions. This is made possible by the innovative combination of a special dispersion with bond-forming aggregates and a highly reactive cement component.

It is also thanks to this special formulation that MB 2K presents five times the crack-bridging ability of a normally flexible, mineral waterproofing grout.

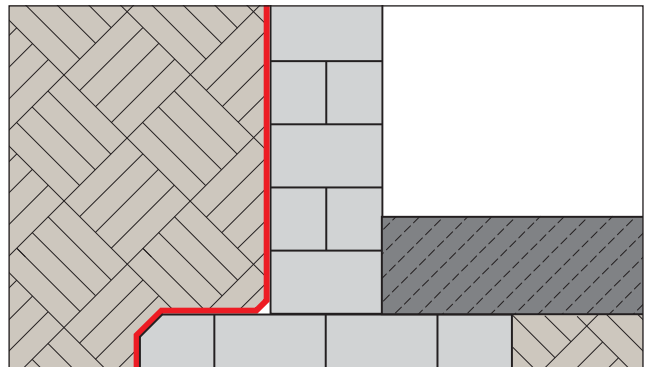
Also with regard to compressive strength, this material can make the most of its advantages. The rubber granulate aggregate technology ensures that the resistance to high pressure levels of MB 2K is three times that prescribed by the technical standard for PMBCs. This means that MB 2K not only easily meets the requirements of DIN 18533 but is still a step ahead of the standard.

Application range

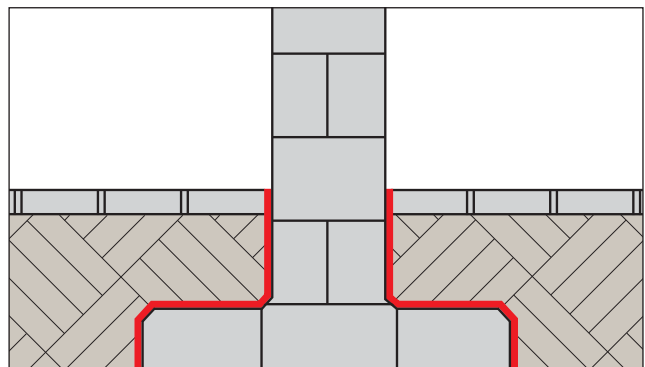
- Subsequent waterproofing against splash water
- Mineral, crack-bridging waterproofing of renders
- Adhesion promoter on bituminous substrates
- Reliable production of complex transition areas



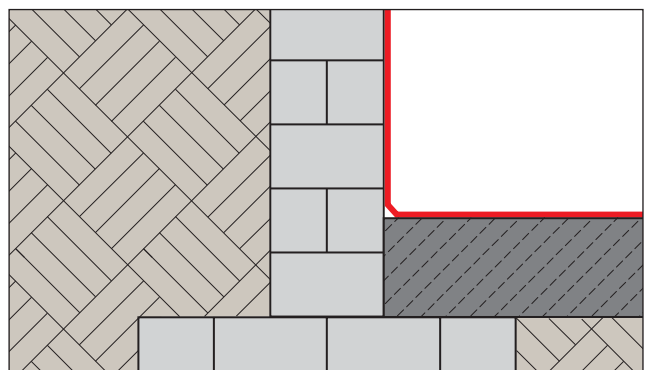
Exterior waterproofing below ground



Interior waterproofing below ground



Column footings



MB 2K

Multi-functional building waterproofing			
Application:	<ul style="list-style-type: none"> ■ Fast waterproofing of building elements and tanks from the inside and outside ■ New waterproofing ■ Horizontal waterproofing in and below walls ■ Subsequent waterproofing pursuant to WTA ■ Installation depth > 3 m into the ground ■ Approved for connection areas to water impermeable floor slabs ■ Waterproofing of plinths ■ Waterproofing under covers ■ Bonding layer on old bitumen layers ■ Repair of roof waterproofings on concrete above non inhabited rooms ■ Cement for installing perimeter insulation panels 		
Basis:	Polymeric binder, cement, additives, special aggregates		
Apparent density of fresh mortar:	Approx. 1.1 kg/dm ³		
Crack-bridging ability:	≥ 2 mm (for a dry coat thickness of ≥ 3 mm)		
Solid content:	1.1 mm of wet coat thickness results in approx. 1 mm of dry coat thickness		
Drying time (5 °C / 90 % rel. humidity):	Approx. 18 hours for a 2 mm layer		
Cross-slit pressure test:	Passed, also without reinforcement layer		
Impermeability to water:	Up to 8 m water column		
Water vapour diffusion resistance:	μ = 6600		
Working time:	30 – 60 minutes		
	Collomix® DLX stirrer (4286), Collomix® KR stirrer (4292), Collomix® stirrer AR (4247), pointer (4113), ladle (4103), smoothing trowel (4004), smoothing trowel (4117), smoothing trowel duo (4118), floor finish scraper(4000), grouting brush (4517), Kana® KanaClassic corner brush (4541), whitewash brush (4540), epoxy roller (5045), roller handle (4449), airless sprayer and inoBEAM M8 (inotec)		
Application rate:	Min. 1.2 kg/m ² /mm dry coat thickness		
PU		8.3 kg	25 kg
MB 2K	3014	■	■

For more info on
Remmers MB 2K
use the QR-Code
or visit
remmers.com





Framework Restoration

Methods and recommendations

Conservation of Historical Timber Buildings

Indoors and outdoors

In all historical times as well as today in Europe wood has always been an important building material. With the exception of the Nordic and eastern regions, half-timbering structures, that allowed an economical use of wood, were the preferred, if complicated, solution. With this structure all loads are taken up by the beams of the wooden skeleton while the so called infill – the space inside the timbers – has mostly no other function than closing the wall surfaces.

As a consequence of external force, e.g. wind loads, but especially due to dimensional variations caused by moisture and temperature, the timber, load-bearing structure of framework buildings is subject to deformation. Therefore these timber beams are said to be non-dimensionally stable building elements.



Since the mostly very massive infills are only able to “follow” these movements in a very limited way, in the course of time the formation of cracks between infill and timber is inevitable. Since to the present day there are no materials that can actually be used in practice which would allow to permanently eliminate this weak point, all materials used for infills must be adapted as good as possible to this particular situation.

Besides high flexibility to keep the cracks as small as possible, an essential attribute of these materials must be their capillary absorption capacity. It ensures that moisture that penetrates in the area of the cracks is transported as rapidly as possible away from the wood and into the infill from where it can then be released to the surrounding air.

At the same time the water absorption of the infill when it is exposed to rain must be kept low. Therefore, a system that is extremely well balanced in regard to its capacity to transport water is needed.

Building on the many years of experience of Prof. Gerner in the last years a full system for the refurbishment of infills that is suitably calibrated in this sense was developed.

Besides meeting these technical requirements a particular emphasis was placed on the use of historical building materials.



Framework Refurbishing

What matters is a comprehensive approach

A great many buildings in Germany are historic framework structures of high economic and cultural value. This heritage is at risk because of insufficient maintenance and unsuitable refurbishment measures.

Maintaining and conserving of framework buildings used to be an unproblematic task that users, owners and handy-men did as a matter of fact. All concerned parties knew the rarely used materials as well as those that were widely available. Today the living comfort requirements have risen significantly; as have the variety and number of building materials on offer. In contrast, the treasure of experience and know how about "framework" as a building method has sunk to almost zero over the course of the last two generations. The consequences are alarming. The great majority of the damages that can be seen on framework constructions nowadays stems from deficient or erroneous

maintenance over the last decades. The Federal Government, as well as many other institutions, has contributed to reduce at least the knowledge deficit in this field, so that only a limited number of minor problems can be satisfactorily addressed. The results are available in a number of forms, but have not yet reached the planning offices and executing firms and thus ultimately not the construction sites either.

The Remmers framework restoration system allows for the first time to remedy this deficit. This system covers all aspects of this sensitive area of restoration works from wood preservation and coating to mortars, renders and paints for infills. For the first time a complete, coordinated series of products that will help to sustainably maintain, preserve and protect in the long-term this valuable building heritage is available.

Clay infills



1 Cleaning and removal of loose parts



2 Repair with iQ-Top LM



3 Priming with Silicate Strengthener and coating with Historic Lime Paint

New render infills



1 Removal of the old infill



2 Application of Framework Mortar



3 Priming with Silicate Strengthener and coating with Historic Lime Paint

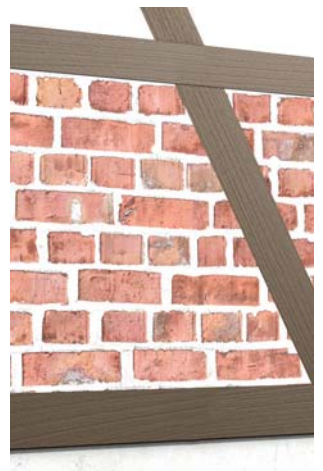
Brick infills



1 Replacement of integration of damaged bricks with Restoration Mortar SK



2 Scraping out of the joints



3 Repointing with Joint mortar ZF

A photograph of a bright, empty room with white walls and a high ceiling. The ceiling features ornate, carved plasterwork. A large window on the left side of the room has a white frame and a radiator below it. A white door is open on the right, leading to another room. The floor is made of light-colored wood with a herringbone pattern. Sunlight streams in from the window and the open door, creating a warm atmosphere.

Mould Restoration

Mould prevention in existing buildings

Mould and its Origins

The issue of mould fungi in interior spaces

Mould fungi contamination in buildings is one of the most frequent environmental problems in interior spaces. Microorganisms such as fungi and bacteria are ubiquitous and are an important and natural part of our environment. But if they appear as mould contamination on a wall they quickly become a nuisance and a problem.

What causes mould growth?

Mould growth is often caused by an increased level of humidity within the building material or on its surface. Besides damp walls due to an insufficient protection against driving rain or rising damp, another very frequent contributing factor is given by the insufficient insulation standards in old buildings combined with the concurrent reduction of air exchange rate due to constructional modifications.

Often new windows are installed without anything done to improve the insulation of the external walls of the building. This can lead to an increase of the moisture content on the wall surface and the consequent arising of mould growth.

This does not even require the presence of actual condensation: air humidity levels of approx. 70 % are already sufficient.

Mould prevention with ecological restoration panels

To prevent the formation of mould, rooms should be regularly aired to regulate air moisture. It should also be made sure that the minimum heat insulation needed for a healthy environment is ensured in every place of the room. Relative air humidity must not rise above 70 %, the surface temperature on the walls must be at least 12.6 °C. This kind of room climate can be achieved and maintained through various measures, for example with special mould restoration panels. Eco-friendly mould restoration systems in particular are becoming ever more important in this context. This is why Remmers has developed the innovative Power Protect System, which satisfies its [eco] aspirations and allows it to offer a completely new system based on mould restoration panels of the highest quality: eco-friendly, sustainable and with durable protection against health-hazardous mould growth.

The Remmers Power Protect System

Mould restoration according to the [eco] principle

With Power Protect Remmers offers a complete system for ecological and economical mould restoration. Thanks to the unique composition of the innovative mould restoration panels, the system as a whole provides an efficient regulation of air humidity ensuring a pleasant living climate as well as safeguarding against mould formation.

- Eco-friendly and sustainable product
- Awarded with the Blue Angel and the [eco]-label
- Better thermal insulation [$\lambda = 0.05 \text{ W}/(\text{m}\cdot\text{K})$] than calcium silicate panels [$\lambda = 0.069 \text{ W}/(\text{m}\cdot\text{K})$]
- Light yet very sturdy product
- Easy handling and processing
- Small batch sizes (suitable for small projects also)
- All products of the system from one provider

Power Protect [eco]

Insulation panel for sustainable mould restoration	
Application:	<ul style="list-style-type: none"> ■ mould restoration and prevention in buildings ■ Creation of a hygienic minimum thermal protection in existing structures ■ Improved room climate by increasing the temperature on the wall surface
Base:	Expanded, mineral perlite, binders and fibres
Bulk density:	Approx. 152 kg/m ³
Porosity:	≤ 94 Vol. %
W ₈₀ :	0.0047 m ³ /m ³
W _{sat} :	0.9427 m ³ /m ³
Thermal conductivity λ_D (nominal value):	0.05 W/(mK)
Aw value / water absorption coefficient:	41.82 kg/(m ² h ^{0.5})
Water vapour diffusion resistance :	$\mu = 6.1$
Reaction to fire:	B-s1, d0
Tools:	Circular saws, plunge-cut saws and table saws with dust extraction device
Application rate:	Approx. 1.4 panels/m ²

PU		10 pcs	6 pcs	12 pcs	16 pcs
P 25 [eco]	0262	■			
P 40 [eco]	0263		■		
W 30 [eco]	0264			■	
R 15 [eco] *	0265				■



The [eco] principle – Mould protection with sustainable materials

The Remmers Power Protect mould restoration panels are composed of a special mixture of heat-insulating, mineral perlite and environmentally friendly (because recycled) cellulose. All components satisfy high ecological standards with regard to their constituents and possible health-hazardous emissions. Cellulose is recycled from waste paper without need of large energy inputs and has hardly any impact on soil and water because for the production of the Power Protect panels it does not need to be bleached. Perlite is purely mineral and can be re-used at any time, thus ensuring a positive ecological balance sheet. The Remmers Power Protect System has been awarded the eco-label and the Blue Angel and therefore carries the addition [eco] to its name.

PP Fix

Attachment mortar in the Power Protect [eco] system	
Application:	<ul style="list-style-type: none"> ■ Cementing of Remmers interior insulation panels (Power Protect P 25/P 40 [eco]) ■ Mineral wall materials and other substrates suitable for renders
Bulk density:	Approx. 1.5 kg/dm ³
W ₈₀ :	0.0725 m ³ /m ³
W _{sat} :	0.5044 m ³ /m ³
Thermal conductivity λ:	0.497 W/(m·K)
Aw value / water absorption coefficient:	0.3074 kg/(m ² h ^{0.5})
Water vapour diffusion resistance:	μ = 18.7
Largest grain:	Approx. 0.5 mm
Working time (20°C):	Approx. 60 minutes
Tools:	Collomix® KR stirrer (4292), smoothing trowel (4004), smoothing trowel (4117), smoothing trowel duo (4118), buttering trowel (4232), buttering knife (4787), toothed blade Fix (4278), toothed trowel
Application rate:	Approx. 1.4 kg/m ² /mm of layer thickness, approx. 7.0 kg/m ² incl. levelling layer

PU	25 kg
PP Fix	0260 ■

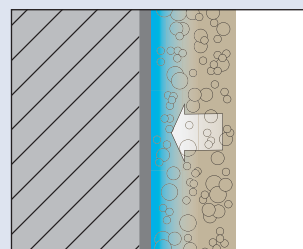
PP Fill

Surface filler and fine render in the Power Protect [eco]-System	
Application:	<ul style="list-style-type: none"> ■ Surfaces indoors ■ Production of fine, closed render surfaces that are suitable for painting ■ Surface quality levels Q1-Q3
Bulk density:	Approx. 1.2 kg/dm ³
Compressive strength class:	Approx. 1.5 – 5.0 N/mm ² (CS II)
W ₈₀ :	0.017 m ³ /m ³
W _{sat} :	0.52 m ³ /m ³
Thermal conductivity λ:	0.48 W/(m·K)
Aw value / water absorption coefficient:	13.32 kg/(m ² h ^{0.5})
Water vapour diffusion resistance:	μ < 14
Largest grain:	0.5 mm
Working time (20°C):	Approx. 60 minutes
Tools:	Collomix® KR stirrer (4292), fine render trowel -FLEXIS ONE- (), smoothing trowel (4004), smoothing trowel (4117), smoothing trowel duo (4118), sponge float yellow (4936), viscose cleaning sponge (4133), latex float (4548), XXL coating knife (4437)
Application rate:	Approx. 1.3 kg/m ² /mm of layer thickness, approx. 6.0 kg/m ² if on full surface

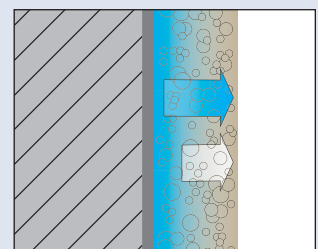
PU	15 kg
PP Fill	0261 ■

How does Remmers Power Protect work?

The Remmers Protect System combines different hydrothermal material properties. It solves moisture problems (such as condensate formation and moisture penetration from the outside) by increasing the speed with which moisture is transported to the inside of the room and accelerating evaporation. The surface is kept durably dry, thus depriving mould spores of the habitat they need to grow.



Moisture contained in room air penetrates and is buffered within the system.



The moisture is released again into the room by capillary transport and diffusion.



Remmers Fachplanung

Reliable consulting, conception
and individual system solutions

Planning as a Factor for Success

No ready-made solutions – Discussion and cooperation

Remmers Fachplanung was founded in the year 1974 and has ever since stood for the combination of analysis, consultancy and development for restoration concepts. Its cross-linkage of modern analytical methods with product competence is unique on the market. The remmers consulting concept (rcc) makes object-specific solutions of the highest quality possible. rcc strengthens owners, investors, planners, restorers and conservationists in equal measure.

Our experts engage in the most diverse restoration projects and tasks with the highest level of competence and are supported by a network of experts throughout Europe. These projects range from the supreme discipline of restoration of heritage buildings to structural engineering, above-ground construction, administrative, industrial and parking buildings as well as to specialist fields such as hydraulic engineering, waste water treatment plants and canalisation works. We offer consultancy services to engineering offices, architects and tendering authorities, conduct detailed initial surveys and develop the measures that are effectively necessary for a successful restoration.

Construction is not just construction

Construction work on existing structures, especially on valuable cultural assets is not comparable with erecting a new building on greenfield land. While new construction offers the chance for comprehensive new orientation and technical optimisation, conversion and expansion and, to a even higher degree, preservation measures must confront what exists already.

This results in a series of specific factors that must be taken into due consideration to lead such measures to success.

Remmers Fachplanung

The scrupulous collection of the actual state of a building structure by studying the available documentation as well on-site inspection and analysis on the base of carefully take samples constitute the most important requirement for the planning of restoration measures

To avoid mistakes on this field, with “Remmers Fachplanung” (formerly “ZOA”) Remmers maintains an engineering office that has done valuable work on prestigious restoration projects for many years.



Fachplanung is Project Management

Analyse – Think – Act

Tests and analysis on site or in the laboratory have the purpose to find the best materials and methods to achieve the goals of the restoration or repair project, ideally by providing concrete specifications on product formulations as well as types, times and cycles of the application process.

This information is contained in the bill of quantities and constitutes a precise guideline for the execution, while also taking into account not only technical factors but also aspects pertaining to the history and the architecture of the building as well as heritage protection considerations regulations: interventions are to be kept to a minimum and the appearance of the facade must be maintained.

To these ends a detailed investigation of the building is mostly unavoidable and an ongoing monitoring of progress desirable.

Individual solutions – For the preservation of historical buildings

Architectural monuments require tailored solutions. Mistakes can possibly result in the loss of irreplaceable cultural assets. Therefore, the highest level of diligence and conscientiousness, both during the conceptual phase and the selection of the products, are an absolute must. Our work is founded on the understanding of the different approaches to heritage conservation and restoration: to re-build or to preserve?

Communication as key to success

Even though experts and, in case of controversies, courts have for many years demanded that before repair work is executed an initial assessment of the building must be carried out, this is often still dispensed with. As a consequence, the greatest deficits are still to be found in the planning phase of restoration measures.

The solution to the problems of building preservation activities, which often affect several technical fields, requires a fruitful dialogue between the parties involved prior to the execution.

Clear decisions must be made that take all the available knowledge into consideration in order to meet the high quality standards required.



Systemic cross-linking of methodological and analytical knowledge with respected specialists from throughout Europe with due regard to the defined goals and the requirements and expectations of everybody involved with the construction project



Advantages and value added - Proceeding gently together

Economic efficiency

You own or have invested in culturally and historically valuable buildings? We help you master the balancing act between heritage preservation goals and economic efficiency.

Implementation

Every plan is only as good as its implementation. We are on the side of the executing company and support it along the whole process.

Reliability

We take responsibility for the details. Our specialist planning provides a safety net for your overall project planning.

Responsibility

Solutions emerge from dialogue. We have had decades of years of learning from built heritage conservation. We moderate the exchange of ideas, define common boundaries and search for integrally accepted practices.

Expertise from a Single Source

Remmers Consulting Concept

Natural stone facades

Cleaning, desalination, swelling reduction, stone substitution and consolidation, joint replacement and repair with specially adapted mortars

Brickwork masonry

Cleaning, replacement, integration, joint replacement and repair with specially adapted mortars as well as hydrophobisation.

Crack repair

Restoration of the historical cohesion within the stonework with spiral anchors without the substitution of single stones

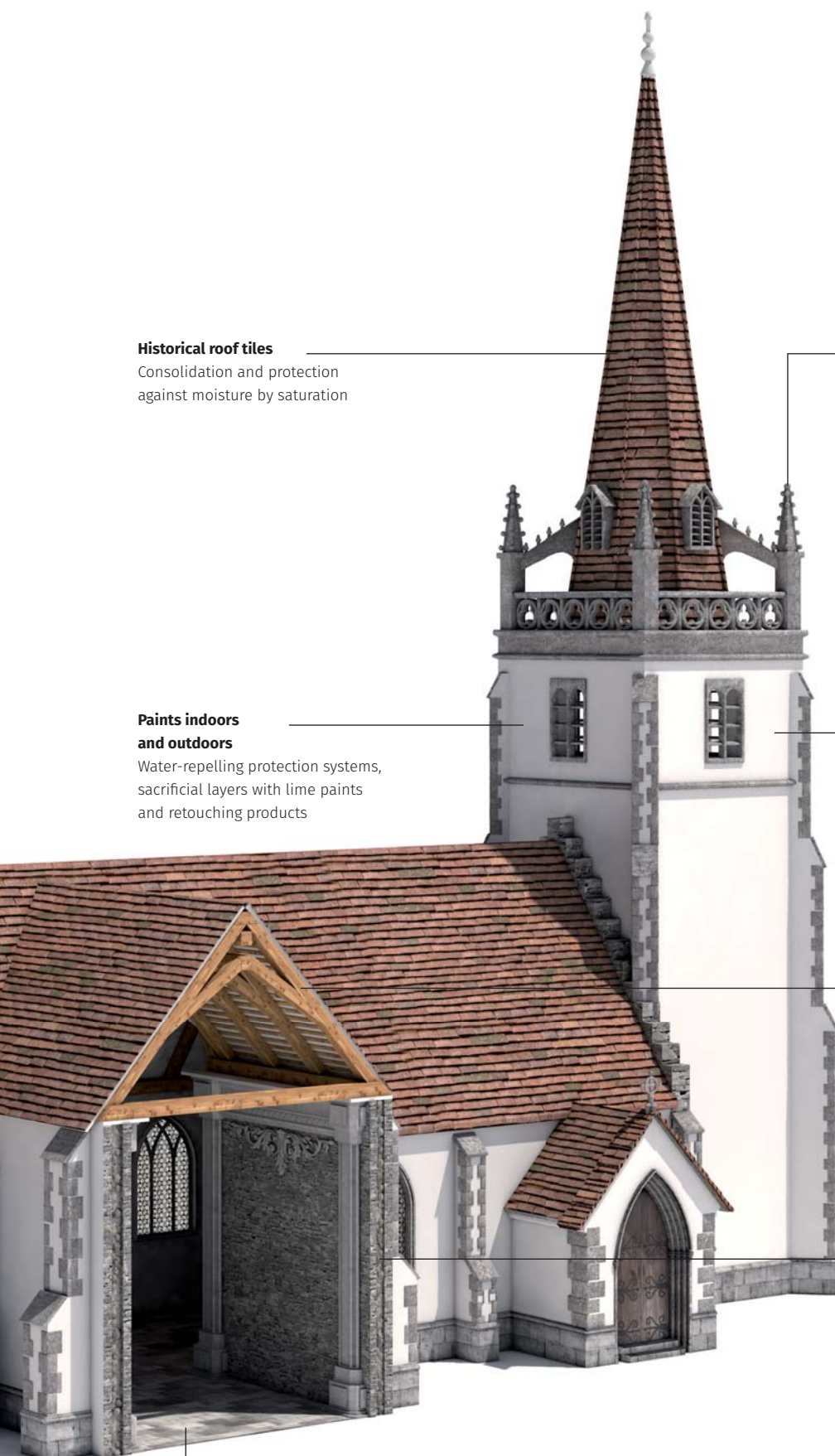
Repair and waterproofing of plinths

Mineral protection systems for the most exposed areas of historical facades

Waterproofing and drainage

Mineral waterproofing and protection layers for basement walls below ground, reversible if required





Historical roof tiles

Consolidation and protection against moisture by saturation

Natural stone or stucco decorations

Moulding compounds, pourable stone substitution mortars, pourable and formable stucco mortars

Paints indoors and outdoors

Water-repelling protection systems, sacrificial layers with lime paints and retouching products

Interior and exterior renders

Repair and substitution with modern materials or ones that replicate the original render

Historical wood structures

Wood preservation, stains and paints as well as wood substitute masses

Restabilisation and increase of load-bearing capacity

Filling of cavities with specially adapted grouts and injection mortars, consolidation of destabilised vaults

Interior cleaning

Waterless and dust-free cleaning without restricting visitor traffic

Brickwork Masonry

Cleaning, replacement, integration, joint replacement and repair with specially adapted mortars

On many historical buildings unrendered masonry or brick walls represent a defining characteristic of the facade. This requires finding a sensible middle ground between renovation and restoration. As a rule cleaning measures are to be planned and verified by trial surfaces. Usually it can be determined only then which stones must be replaced and which can be treated and to what extent with restoration work.

On this kind of facades the repair of cracked, friable or even already completely weathered joints is usually necessary. To this end modern mortars can be adapted to the historical masonry or new mixtures can be developed on the base of traditional historical methods. After a careful assessment of the pro and cons, it is possible to consider the suitability of a hydrophobisation treatment, which can be tailored to the required degree of water repellency, so that a sufficient potential of drying out capacity in main-



tained. Prominent examples of our expertise in this field are the castle of the Knights of the Teutonic Order in Malbork in Poland or the Kaispeicher B (now Maritime Museum) in Hamburg, which are both UNESCO World Heritage sites.





Waterproofing and Repair of Plinths

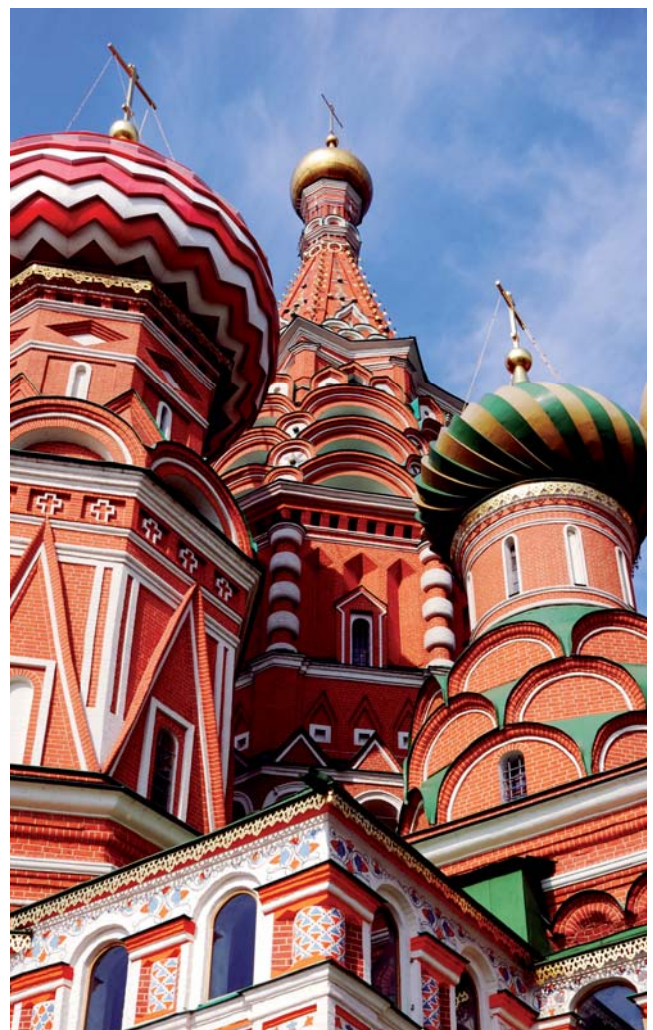
Mineral protection systems for the most exposed areas of historical facades

Regardless of whether it is plastered or left stone-faced, the plinth is one of the most exposed areas of a building.

The main negative parameters that this part of a structure is exposed to are rising damp and saline spray water. Especially in case of lacking or defective waterproofing this can lead to considerable damages, starting with moisture horizons through saline efflorescence and even massive spalling. Often these damages are not limited to the exterior only. The moisture that penetrates through the plinth by capillarity or diffusion can infiltrate right to the inside of the wall and then released to the interior of the building. Though over time equilibrium between moisture absorption and release within the wall is reached, this does not mean that no damages ensue.

The continuous flow of moisture through the wall section causes strains in the construction material and leads to a constant increase of salt deposits as well as to rising levels of room air humidity. Not only unpleasant smells, but also damages to the interior walls or the furnishings might arise as a consequence.

Remmers Fachplanung is able to examine this humidity flows in detail and, if required, to simulate them in order to make appropriate recommendations on the best measures to protect the building structure.





Interior and Exterior Renders

Repair and substitution with modern materials or ones that replicate the original render

Historical mortars sometimes do not meet today's use and safety requirements; an assessment of their resistance properties is however difficult since the knowledge about old mortar mixtures and formulations is in most cases only very scarce.

At the same time renders and mortars inform the visible character of our works of architecture and represent valuable testimonies of historical building materials and technologies. Therefore, for the restoration or renovation of heritage buildings, besides an extensive preservation of what is still there, the production of substitution or reconstruction mortars that present all the properties of the lost materials is required in order to win back a long lost condition, to imitate it in form and function by using the original materials and methods.

Remmers Fachplanung can help with this:

The existing, old mortars are analysed and recreated with object-specific accuracy in order to come as close as possible to their original form and function. The analytics technology is provided by the accredited laboratory of the Bernhard Remmers Institute for Analytics, while the experts of the mortar technology departments of the Remmers GmbH will interpret the results of the test and the recreation of the original findings. The final decision on what solution to adopt is taken, after samples have been produced on the object, by the building owner in accord with the public heritage protection bodies.



Paints for Interior and Exterior Walls

Water-repelling protection systems, sacrificial layers and retouching

Already since antiquity paints and colour versions for buildings and figurative objects have been known. They served (and still serve) as means for creative decorations on one side and as protection and wear layer on the other. In light of the damages caused by emission-related weathering, in recent decades the protective function – especially against decay caused by moisture absorption – has grown of importance.

The binders for paint coatings available nowadays offer in principle the possibility to find valid compromises between the given corner points of the heritage preservation goals and the optimal solution from a technical point of view. The former can oft be best attained by lime-based coatings.

In this field, in the last twenty years, various lime paint systems, based on limes modified by purely mechanical means, were developed. In comparison to “normal” lime-

based systems, these present a significantly more advantageous resistance against weathering. The technological optimum can be obtained with the high-quality silicone resin paint systems, which meanwhile also allow an enormous degree of creative flexibility. Somewhere in between lay silicate and mineral paints, the use of which must be carefully weighed up with regard to their advantages and disadvantages during the concept development phase.



Waterproofing and Drainage

Mineral, if needed reversible, waterproofing and protection layer

Also or even especially in historical buildings there is only a defective waterproofing of below-ground areas in place or none at all. This may cause a high level of water absorption of the affected building materials that is then transferred to the inside of the construction. Humidity levels that exceed the “normal” equilibrium moisture content are not exactly beneficial to any kind of building material.

In these cases, the reduction of the moisture content is therefore always a sensible goal for any restoration measure, as this not only increases the durability of the repair work but also allows a significant slowing the further weathering damage to the historical structure. Often, however, the option of using a modern, bituminous waterproofing product on historical buildings is not easily accepted. This kind of materials are hardly reversible and in all their material quality do not befit historic works of architecture.

The mineral waterproofing systems that have been developed in recent years, however, very well do. With some planning “tricks” it might even be possible – if required – to make their application reversible.





Natural Stone Facades

Cleaning, desalination, swelling reduction, stone substitution and consolidation, joint replacement and repair

Remmers is the absolute specialist for the production of stone conservation agents and all accessory products needed for their use. They are used worldwide on the most valuable cultural assets. This would not be possible without appropriate preparation, although the conventional building analysis methods are rarely used. Mostly special investigations that must be carefully planned, executed and interpreted must be carried out. Its tradition in this speciality field allows Remmers Fachplanung to master all the tasks required for strengthening measures.

The increased knowledge that has been generated in recent decades in regard to the weathering and decay of natural stone, together with the maturation of conservation

methods in terms of desalination, strengthening and swelling reduction, has brought about also an advancement of the requirements of build heritage conservation. While in the past build heritage conservation goals usually were focussed on the restoral of the original condition with an emphasis of an aesthetically appealing reconstruction, today protecting and preserving the original structure with its unique historic expressiveness is considered the top priority. Comprehensibly, the consequences of this approach on the construction materials and work methods used are not negligible. In many cases, the volumes of the materials have diminished, but the quality requirements have risen.

Thus, all interventions on original build substance have to be much more delicate than in the past. One example is the feathering out to zero of stone replacement mortars. From this, the demand for the stabilisation of the original substrate, on which the mortar is applied, follows almost automatically. Therefore the various measures aimed at conservation and repair become ever more mutually dependent. More than in the past, this requires a thorough examination of the individual damage forms and the underlying mechanisms at work. Remmers Fachplanung is the right partner for exactly that.





Restabilisation and Increase of Load-Bearing Capacity

Void filling and consolidation of destabilised vaults

Knowing the load-bearing capacity of historical masonry is of the highest importance for the safekeeping and rebuilding of old buildings. Load-bearing elements of historical buildings, such as walls and pillars, are often made of two-leaf cavity brick or stone masonry. While the external shells are properly laid, the inside of these structural elements is often filled up with stone or brick fragments and a high share of mortar. Beyond the strength and deformation properties of stones and mortar, the load-bearing behaviour is influenced by many more parameters.

The selection of the right mortar for the reinforcement of these structural elements and the assessment of the suitability of stone strengtheners to increase the load-bearing capacity of vaults requires a high degree of speciality expertise which Remmers Fachplanung has demonstrated over the years on a whole series of projects, including St. Peters in Cologne and the Burial Church in Aachen.



Interior Cleaning

Waterless and dust-free cleaning without restricting visitor traffic

With dry and wet sand blasting, the use of chemicals, high and low pressure jets, special methods, such as “gommage” and rotation whirl systems, and even cleaning by laser, there is nowadays a countless number of options for the cleaning of historical surfaces.

None of these systems are systematically used for large scale cleaning of the interiors of historic buildings: Either too much water has to be used, or too much dust is generated. Some interiors were nonetheless cleaned with these methods, but this required the removal of all furniture and the careful covering of all sensible areas or even the mounting of airtight tents, pushing up the costs of cleaning to unacceptable levels. Laser cleaning is increasingly used for small decorations but its cost-benefit ratio is still too high for large, even surfaces. Furthermore, as the impact of the high-energy light beam causes unacceptable alterations of some coloured elements, such as glauconite, that is contained in some building materials, this method can cause colour alterations of the surface.

All these problems can be avoided with peelable poultices based on natural latex for removing superficially adhering



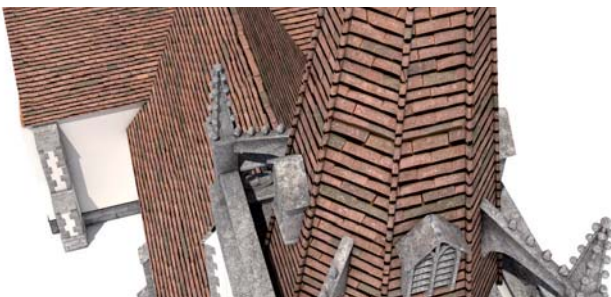
dust. Remmers Fachplanung uses these new materials to plan the interior cleaning of valuable historical surfaces so that the normal use of the rooms can continue without interruption while the cleaning measures are carried out.





Historical Roof Tiles

Consolidation and protection against moisture by saturation



A particularly noteworthy example of a well planned and well executed employment of modern conservation methods are the hand-painted roof tiles from the 12th century of the 1200 year old Carolingian Einhard Basilica in Steinbach in the Hessian Odenwald region.

In excellent collaboration with the executing restoration firm, the first step was represented by the cataloguing and

mapping of the roof tiles in order to classify their state of preservation.

The tiles were put into wire mesh crates and then stored in a 100 m³ dipping basin, which had been built on-site for this purpose, to wash off a previous, unsuitable conservation agent. After the cleaning, the basin was covered with a roof to allow the tiles to dry out over a period of approximately half a year. Subsequently they were consolidated by impregnation with the silicic acid ester KSE 300 which was also done in the dipping basin. The process steps as well as appropriate safety measures were scheduled according to a time window determined on the basis of parameters obtained from preceding trials.

After the conclusion of the saturation and reaction process the basilica was reroofed with the strengthened tiles.



Historical Wood Structures

Wood preservation, stains and paints as well as wood substitute masses

Several of the wood rosettes, gargoyles and mascarons were so severely damaged that their forms and structures had to be rebuilt to a large extent. A method had to be found, however, that allowed maintaining as much as possible of the original material. As a preventive protection measure against wood destroying insects, the roof beams were impregnated. Further protective measures were developed for the impregnation of the wood structure. Wood cladding and floors were refreshed and protected with the translucent Hard Wax Oil. At the end, the facade was to be renovated also.

Bottom line: The Wang Temple is in several respects such an exceptional work of architecture that it is worthy of the highest degree of care and attention to maintain it for future generations in as much as possible its original appearance.

This is only one example of the challenges that the restoration of wood structures can entail. Here it is necessary, as with all other materials worth of preservation, to bring together expert knowledge of the damaging environmental influences with the technical know-how on modern conservation and preservation methods.



Crack Repair

Repair of the historical brickwork bond without stone substitution

Cracks in masonry walls are found with growing frequency as the age of a building increases. They can be caused by many different factors: Exposure to temperature, foundation settlement and ground vibrations are only some of them. No matter what the specific reasons in a given case are, cracks always represent a considerable disturbance in the static system of a construction and should always be repaired to avoid further damages.

Until a few years ago, the repairing of cracks was always done by substituting some cracked stones and restoring the original, load bearing masonry structure by filling the cavities with mortar. In practice, that meant that one or two stones right and left of the crack were removed and put back in place after the old mortar had been removed. Often these repair interventions were unattractively recognizable and in many instances the original load-bearing capacity was only very insufficiently re-established.

Since the introduction of so-called spiral anchor systems, cracked parts of masonry works can be put together again in an easy and highly efficient manner. Since they are

placed into the joints, the spiral anchors cause only a minimal disruption of the masonry wall to be repaired and allow even cracked stones to be re-used. This is one of the reasons why spiral anchors enjoy a high degree of acceptance in the restoration of heritage buildings. Cracks on facades and in pillars or around openings or arches can thus be repaired successfully and with only minimal invasion.





Natural Stone and Stucco Decorations

Moulding compounds, stone substitution and stucco mortars

If decorative elements, statues and balusters must or should be duplicated, for example to protect the originals from weathering or to substitute elements that have repeatedly put into use and are partially destroyed, the original elements – if still well-preserved – can be casted from forms made of the remaining originals.

For the actual reconstruction, moulding compounds are required that can render the details of the original forms down to the finest surface structures. On top of that, it is necessary to use special, pourable and shrinkage-compensated mortars that are also able to do exactly the same and as much as possible have the same visual appearance as the building material originally used.

On stucco elements formed with a running mould the process is completely different. If the original form is taken down and a corresponding moulding profile is produced, a mortar is required that – especially for stucco mouldings

outsides – presents workability properties similar to the gypsum mortars used in past times, but coupled with a considerably better resistance to weathering.



