



KEIM **Concretal-System®**

The long-lasting universal concrete protection and decoration system



Causes of concrete decay

Concrete, the building material of today has been in existence for more than a hundred years.

It was the idea of the French gardener Josef Monier to make flower pots of cement mortar more durable by using wire netting – the earliest form of concrete reinforcement. The combination of the compressive strength properties of concrete with the tensile strength of steel, provides the ideal construction material. Reinforced concrete is traditionally made on site. Unlike factory made products, variations can lead to poor quality and questionable durability of this manufacturing method. These potential quality problems of concrete are increased by environmental influences, such as water ingress, carbonation and chloride attack.

Carbonation

Concrete hardens chemically. During the reaction between the clinker and the mixing water, crystalline hydrate phases (including calcium silicate hydrate) and calcium hydroxide are formed, giving an alkaline environment with a pH-value of 12 to 13.

In a stable, highly alkaline concrete, a passivation layer on the reinforcing steel is formed which protects it from corrosion.

Under atmospheric conditions, the alkalinity of the concrete is reduced due to carbonation. The calcium hydroxide of the cement reacts with the carbon dioxide from the atmosphere to form calcium carbonate, which reduces the pH-value of the concrete. When the pH-value falls below 9.5 the passivation layer around the steel will be destroyed.

Due to the presence of oxygen and moisture, the steel will begin to rust. When steel rusts, it increases its volume considerably. This expansion causes cracking of the concrete and eventually spalling. The rate of carbonation depends on the concrete quality.

For example, precast concrete having a strength of 45 N mm² (B45) has a typical carbonation depth of 3 mm after a period of 20 years. However, lower quality concrete (B25) can have a carbonation depth in excess of 15 mm after the same period.

Poor quality concrete

Potential causes of concrete decay can be introduced during the manufacturing process. For example, incorrect water/cement ratios, poor compactions, leaking shuttering and insufficient curing cause an increased porosity. This means that concrete has a higher permeability to water, oxygen and carbon dioxide.

Depth of cover

The compaction of the concrete and correct depth of cover are decisive facts in the longevity of reinforced concrete.

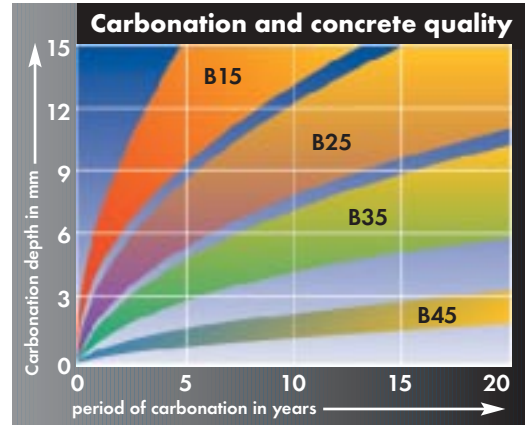
Water

The water absorption of concrete is a function of its porosity. Water penetration accelerates rusting in the neutral zone of the concrete. Also cracks may occur due to freeze/thaw action.

Other causes

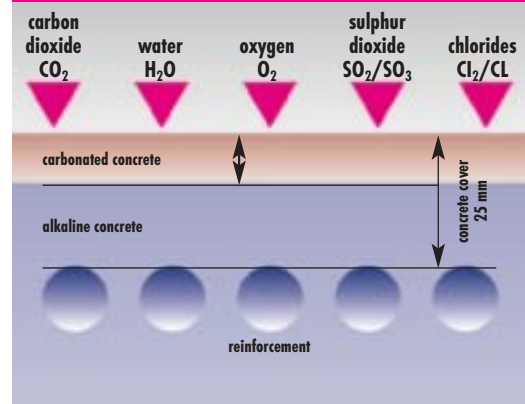
Recent tests have shown, that the presence of harmful substances in the atmosphere, such as sulphur dioxide and sulphur trioxide, do not greatly affect concrete.

This process described as sulphurisation will come to a halt after a penetration depth of 1–2 mm into the concrete. The danger of decay is drastically increased by the presence of chlorides. The use of de-icing salts, airborne salts or rapid chloride acceleration can lead to steel corrosion. Because of the various causes of decay it is essential that a detailed diagnosis of the structure be carried out to ascertain causes and cures.

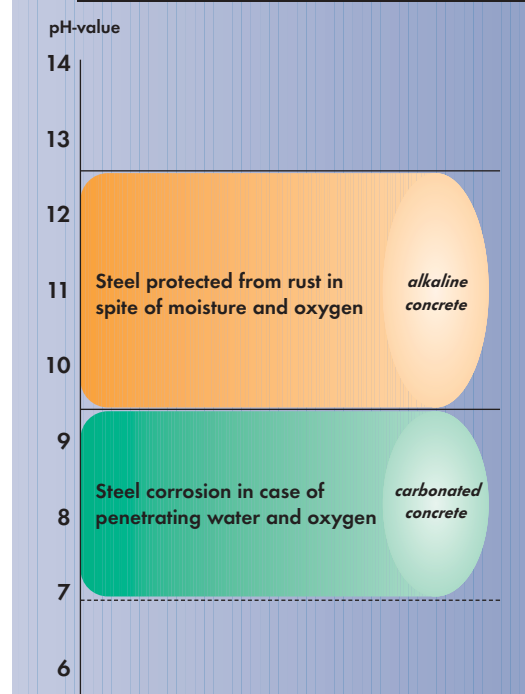


Prof. Klopfer

Environmental influences on reinforced concrete



Carbonation of concrete



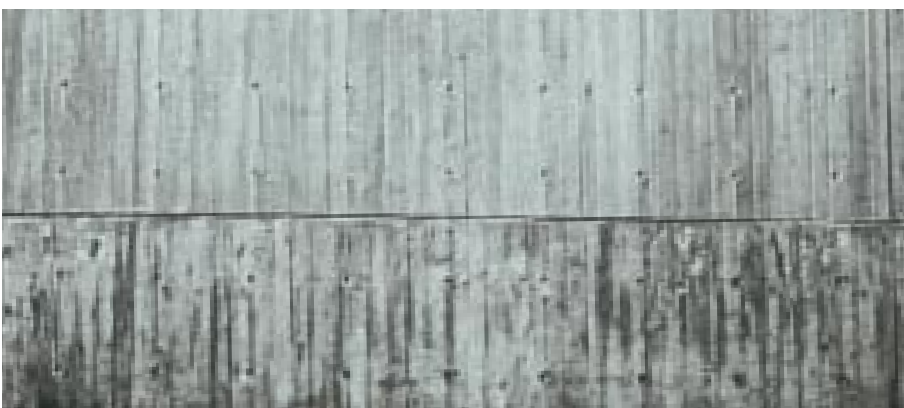
Decoration and protection



For aesthetic, as well as psychological reasons, a colored facade to concrete surfaces is of increasing environmental significance. To achieve an opaque, mineral matt coating more than 200 KEIM standard color shades are available.



KEIM Concretal-Lasur in a variety of different shades creates textured, colored facades.



Stained concrete and other surface blemishes can be optically equalized by KEIM Concretal-Lasur without altering the structure of exposed concrete surface.



Defective concrete surfaces with hairline cracks, small blow holes or differences in structure can be equalized with a primer coat of KEIM Concretal-Grob (medium texture) or KEIM Contact-Plus.

The KEIM Concretal® System

Product	Description	Application
KEIM Concretal®	Ready-to-use, mineral, silicate based protection paint with lightfast inorganic pigments, to be diluted with Concretal-Dilution, available in over 200 different standard shades.	Application by brush or roller or airless-spraying equipment.
KEIM Concretal®-Grob	Slightly equalizing, mineral, silicate based primary or bridging coat, suitable for crazed and repaired concrete surfaces. Respectively filler for KEIM Concretal-Paint. To be diluted with Concretal-Dilution, available in over 200 different standard shades.	Application by brush.
KEIM Concretal®-Lasur	Ready-to-use, mineral, silicate based thin layer oblitative coating or for low pigmented staining of concrete surfaces. Equalizes unacceptable variations in color and texture, protects the concrete surface from weather and the action of airborne pollutants. To be diluted with Concretal-Dilution, available in over 200 different standard shades.	Application by brush or roller.
KEIM Concretal®-AY-Plus	Ready-to-use, acrylic, resin bound concrete protection paint for high carbonation protection. To be diluted with water, available in over 200 different standard shades.	Application by brush or roller or airless-spraying equipment.
KEIM Concretal®-OS	Crack-filling, mineral based, elastic concrete protection for very high carbonation protection, grey.	Application by trowel or by wet spraying equipment.
KEIM Concretal®-Grund OS	Ready-to-use, mineral based priming coat on KEIM Concretal-OS for following color applications with KEIM Concretal. Available in over 200 different standard shades.	Application by brush or roller.
KEIM Concretal®-Dilution (KEIM Concretal®-Fixativ)	Liquid silicate binder, used to dilute KEIM Concretal-Lasur or KEIM Concretal-Paint. May be used neat as a primer coat to reduce high surface porosity.	Application by brush.

For further information please see the technical data sheets.

Supplementary Products

Product	Description	Application
KEIM Contact-Plus	Silicate based renovation bridging coat in white for application on old, synthetic resin bound paint layers and/or filling cracks up to 0,5 mm. It is appropriate to use this primer when cost and/or environmental pollution prevent the removal of existing paint layers.	Application by brush as first coat, followed by one or two coats of KEIM Concretal-Paint.
KEIM Silan-Primer (KEIM Silangrund)	Silane based, water repellent primary coat for surfaces with high water loads in connection with KEIM Concretal.	Application by brush or by flooding. Do not spray.
KEIM Silan-100	Silane based, solvent-free, extremely water repellent primer coat.	Application by brush or by flooding. Do not spray.
KEIM Concretal-Repair-Mortar (KEIM Concretal-Mörtel) alt. KEIM Concretal-Mortar 25 LB (KEIM Concretal-Mörtel 25 LB)	Non-shrinking cementitious mortar for repairing of large concrete surfaces, layer thickness of approx. 5 mm to max. 50 mm (in several layers).	Application by spatula or trowel.
KEIM Concretal-Filler (KEIM Concretal-Spachtel)	Concrete repair finishing mortar suitable for cracks, blow holes etc., frost and de-icing salt resistant. Layer thickness of approx. 1 mm to max. 5 mm.	Application by spatula or trowel.
KEIM Concretal-Fine-Finishing-Mortar (KEIM Concretal-Feinspachtel)	For repairing of defective concrete surfaces (cracks, pipes, holes etc.) and restored surfaces for a layer thickness of approx. 0,5 mm to max. 2 mm in one layer, total layer thickness max. 4 mm.	Application by spatula, trowel or by wet spraying equipment.
KEIM Concretal-Modifier (KEIM Concretal-Spezialvergütung)	Additive to the mixing water of KEIM Concretal-Fine-Finishing-Mortar for the preparation of a blow hole slurry.	Application by brush or by trowel.
KEIM Concrete-Cleaner (KEIM Betonschnellreiniger)	Cleaning concentrate to remove contamination and mould release agents from concrete surfaces.	Application by brush.
KEIM Bio-Stripper (KEIM Dispersionsentferner)	Stripping agent for removal of film forming coatings. Biodegradable and without chlorinated hydrocarbon.	Application by brush or by spraying.
KEIM Algicid	Non-acid algicide against fungus and algae to be applied on mineral substrates.	Application by brush or by flooding.
KEIM Lime-Remover (KEIM Ätzflüssigkeit)	Lime remover for the removal of sinter layers or as a cleaning agent for contaminated surfaces. 1 Liter KEIM Lime-Remover must be diluted with 3 litres of water.	Application by brush.

For further information please see the technical data sheets.

The advantages of the KEIM Concretal-System

Safety

The KEIM Concretal-System guarantees optimal protection against carbonation. The use of KEIM Concretal-Paint does not detract from the concrete retaining other essential features such as:

- Sufficient alkalinity by the silicate binding agent and therefore additional corrosion protection.
- The formation of a chemical crystalline structure increases the integrity of the concrete surface.
- KEIM Concretal-Paint and concrete have very comparable coefficients of expansion which eliminates differential cracking between paint and substrate.

Economical

KEIM Concretal-Paint can easily be adjusted to any particular concrete substrate due to its ease of mixing and application. KEIM Concretal-Paint offers an economical solution for large volume contracts through the optimal relation of durability, material and labor costs. The longevity of KEIM and easy revision of coatings – no expensive pretreatment – are essential arguments for the longterm economics of the KEIM Concretal®-System.

Environmentally harmless

The constituent elements of the KEIM Concretal®-System for

- corrosion protection
- filling of holes
- the protection and reinstatement of concrete surfaces

have all been developed on the principle of using as much mineral substances as possible and thereby reducing the content of organic ingredients to a minimum.

The result: Concretal protective coating is environmentally harmless in its manufacture and does not present a hazard to the user or the environment during its application and subsequent lifespan.

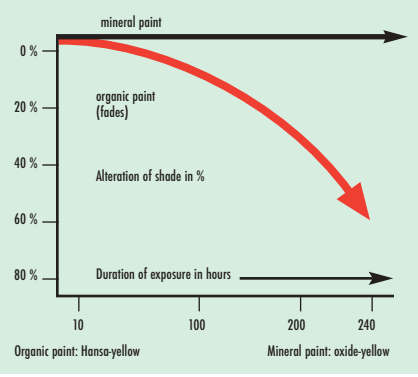
Lightfast

Due to the use of inorganic pigments and the mineral binding agent, KEIM Concretal®-Paint is lightfast and UV-resistant throughout its lifespan. Thus fading and yellowing of the coating does not occur. KEIM Concretal®-Paint and Lasur maintain the structure of the concrete. It has a mineral matt appearance like concrete and offers a wide variety of colors as well as fulfilling a protective function.

The wide shade range of lightfast earth oxide pigments satisfy both architectural and environmental needs resulting in the harmonious use of KEIM with its surroundings.



Alteration of shade after exposure with Vitalux-lamp



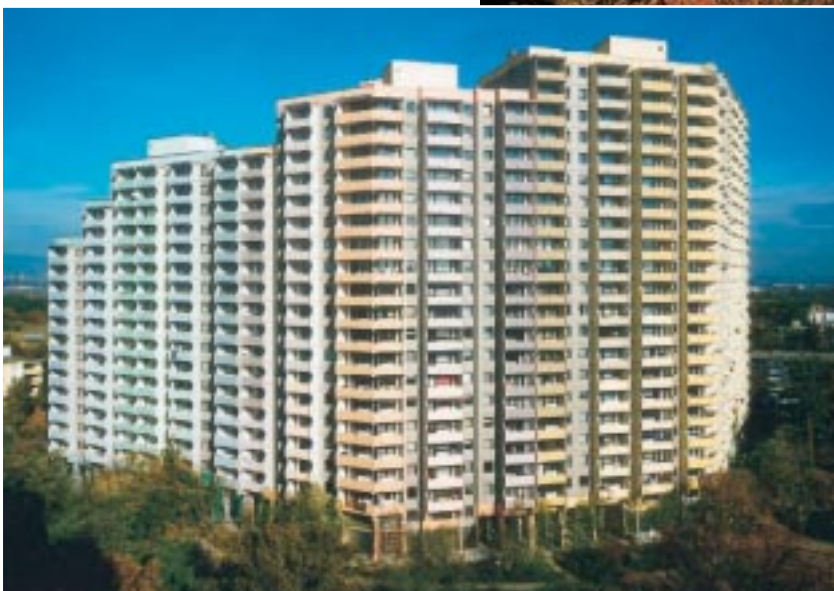
Technical data* of KEIM-Concretal®-System:

Water vapor diffusion resistance:
 $sd_{H_2O} = 0,02 \text{ m}$

Water repellency:
 $w < 0,1 \text{ kg/m}^2 \cdot \text{h}^{0,5}$
 cyclical testing:
 water/drying
 $s_d \cdot w < 0,002 \text{ kg/m} \cdot \text{h}^{0,5}$

Carbonation protection:
 Concretal-Paint-AY $Sd \text{ CO}_2 = 200 \text{ m}$
 Concretal OS $Sd \text{ CO}_2 = 577 \text{ m}$

* full documentation available on request



KEIM – world-wide

Austria

KEIMFARBEN
Ges.m.b.H.

Czech Republik

KEIMFARBEN S.R.O.

France

PEINTURES MINERALES **KEIM**

Italy

KEIMFARBEN
Colori Minerali SRL

Netherlands

KEIMNEDERLAND B.V.
mineralverven

Poland

KEIM FARBY MINERALNE SP.Z.O.O.

Scandinavia

KEIM SCANDINAVIA A/S

South East Asia

KEIM MINERAL PAINTS
PTE. LTD.

Switzerland

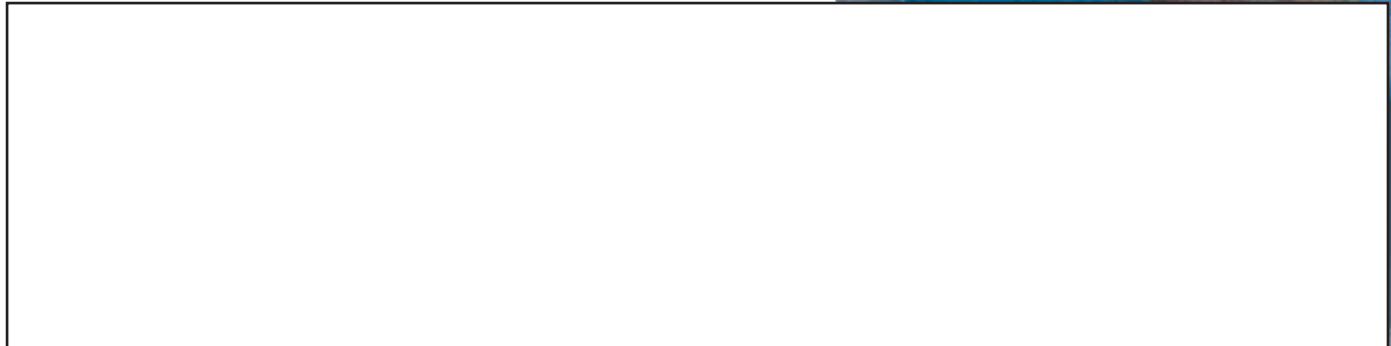
KEIMFARBEN AG

United Kingdom

KEIM MINERAL PAINTS LTD.

Agents in

**Australia
Canada
Croatia
Cyprus
Finland
Greece
Hungary
Iceland
Latvia
Luxemburg
New Zealand
Norway
Romania
Russia
South Africa
Spain
USA**



Further information on our products and systems or the nearest distributor may be obtained from:



KEIMFARBEN
GmbH & Co. KG

Export
Keimstraße 16
86420 Diedorf
Germany

Tel. 00 49 821 4802 109
Fax 00 49 821 4802 173
export@keimfarben.de
www.keimfarben.de