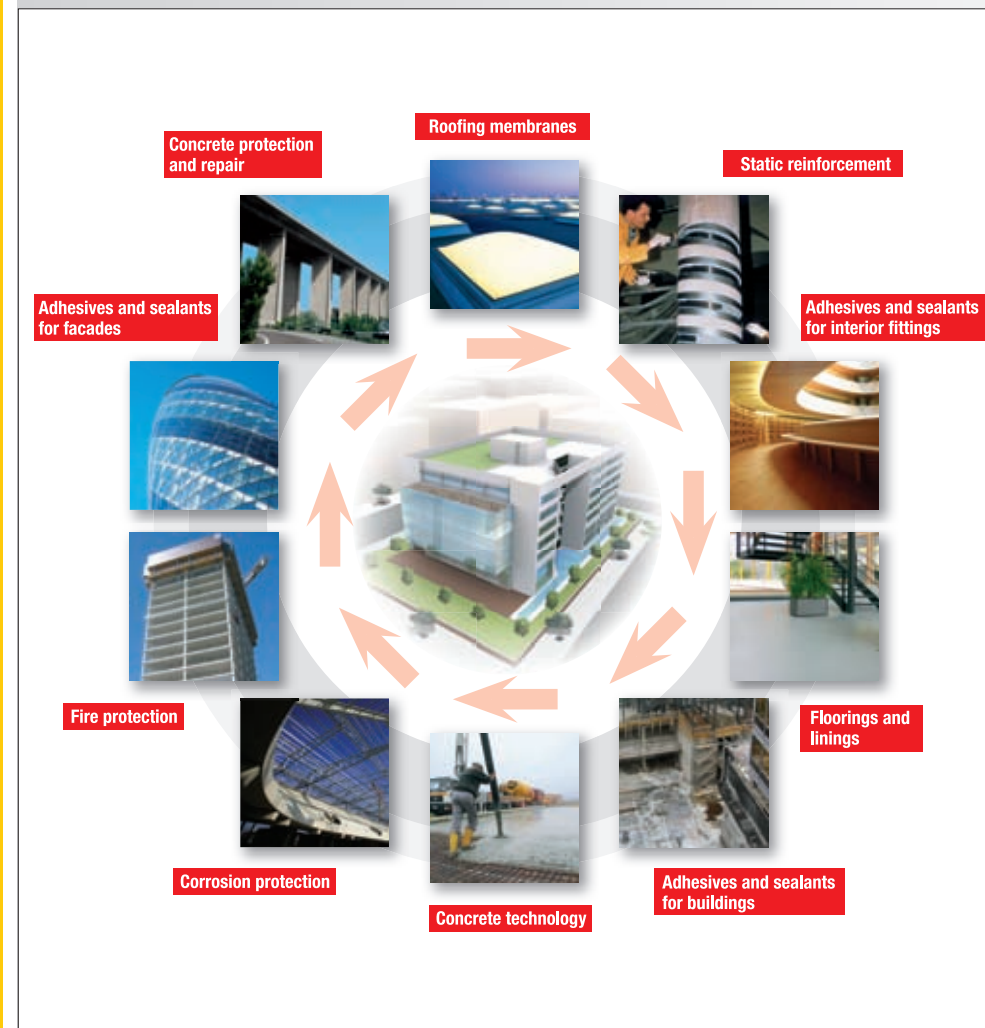


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Protective Coatings



Corrosion Protection for Steel Structures

Practical coating systems for all important applications

All mentioned tests are laboratory test results only. For technical products data relevant to everyday use, please consult our product data sheets. Our product data sheets may be obtained from your nearest Sika office or at www.sika.de.



Sika Deutschland GmbH
Kornwestheimer Straße 103–107
70439 Stuttgart
Phone (0711) 80 09-0
Fax (0711) 80 09-3 21

Stuttgarter Straße 139
72574 Bad Urach
Phone (07125) 940-0
Fax (07125) 940-321

Rieter Tal
D-71665 Vaihingen/Enz
Phone (07042) 109-0
Fax (07042) 109-180



Greater safety through international standards, high performance products and skilled consultation.

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Without long-lasting and truly effective corrosion protection, many steel structures start to look quite old after only a few years. But it's not just the appearance that deteriorates – the strength of the structure can also start to suffer.

In the worst-case the only choice left is that between abandoning the structure or totally renovating it.

This field has been regulated since 1998 by the European standard ISO 12944, “Corrosion protection of steel structures by protective paint systems”.

Whereas the standard is an 8-part work that goes in great detail into every aspect of corrosion protection (basic principles, environmental influences, assessing and preparing surfaces, schemes of initial protection and maintenance measures, laboratory testing of coating systems, as well as the execution and supervision of the work), we are deliberately restricting ourselves here to Part 5 of the standard, “Coating systems”, which was revised in January 2008. Sika products cover the full spectrum of categories of corrosivity that are defined there. We have adopted the tabular form of ISO 12944 and it's important parameters (e. g. classification according to the duration of protection) for the purposes of our coating suggestions:

formerly	
short (K = short)	2–5 years
medium (M = medium)	5–15 years
long (L = long)	> 15 years
since January 2008	
low (L = low)	2–5 years
medium (M = medium)	5–15 years
high (H = high)	> 15 years



and we have divided them by topic according to their application fields

- Table 1:** Priming and intermediate coating in shop, top coat on site
- Table 2:** Full in shop coating application
- Table 3:** Coating of hot-dip galvanized steel
- Table 4:** Refurbishment of old coatings

Tables 5 and 6 below contain the critical technical features of the products in our systems.

It is our hope that our practically-oriented information will also turn out to be a useful aid for you, and that it will help you to select the right corrosion protection system.

If you have any questions, we'd be glad to talk to you in person.



Optimum results from innovative and proven coating systems.



Coatings for protecting steel structures from corrosion are used in highly varied fields, such as masts, towers, halls, containers, machines and equipment, supporting and load-bearing structures, facades and so on. Depending on the environmental conditions, they are exposed to quite specific corrosive stresses. These are defined in ISO 12944 Part 2 as corrosivity categories from C1 to C5-M.



It is therefore not easy to select the coating system that is optimum from both the technical and economical points of view. And the large number of available systems, along with the options for combining priming, intermediate and top coats, hardly makes the choice any simpler. For this reason we have presented our suggestions in four clear tables. The systems are designed to offer long-term protection (>15 years). Medium-term protection (5–15 years) is only considered in a few individual cases.



Corrosivity categories for atmospheric environmental conditions and examples of typical environments according to ISO 12944, Part 2						
Corrosivity category	Loss of mass per unit area / reduction in thickness (after the first year of ageing)				Examples of typical environments in a temperate climate	
	Non-alloyed steel		Zinc		Outside	Indoors
	Loss of mass in g/m²	Reduction of thickness in µm	Loss of mass in g/m²	Reduction of thickness in µm		
C1 insignificant	≤ 10	≤ 1.3	≤ 0.7	≤ 0.1		Heated buildings with neutral atmospheres, such as offices, shops, schools, hotels.
C2 slight	> 10 to 200	> 1.3 to 25	> 0.7 to 5	> 0.1 to 0.7	Atmospheres with low level of pollution. Mostly rural areas.	Unheated buildings where condensation can occur, e.g. warehouses, sports halls
C3 moderate	> 200 to 400	> 25 to 50	> 5 to 15	> 0.7 to 2.1	Urban and industrial atmospheres, moderate pollution from sulphur dioxide. Coastal areas with low salinity.	Production rooms where humidity is high and there is some atmospheric pollution, e.g. food manufacturing plants, laundries, breweries and dairies.
C4 heavy	> 400 to 650	> 50 to 80	>15 to 30	>2.1 to 4.2	Industrial and coastal areas with moderate salinity.	Chemical plants, swimming baths, boat sheds above sea water.
C5-I very heavy (industrial)	> 650 to 1500	> 80 to 200	> 30 to 60	> 4.2 to 8.4	Industrial areas with high humidity and aggressive atmosphere.	Buildings or areas with almost constant condensation and with heavy contamination.
C5-M very heavy (sea)	> 650 to 1500	> 80 to 200	> 30 to 60	> 4.2 to 8.4	Coastal and offshore areas with high salinity.	Buildings or areas with almost constant condensation and with heavy contamination.

ISO 12944 provides the basis, and shapes the whole field of corrosion protection of steel structures through coatings.

Many standards, sets of regulations and refer to DIN EN ISO 12944. It can therefore quite properly be called the basic standard, and has also proven to be very useful in practice.



Important applications.

■ Table 1:

Coating systems whose priming and intermediate coats are applied in shop. The topcoat is applied after transport and assembly on site.

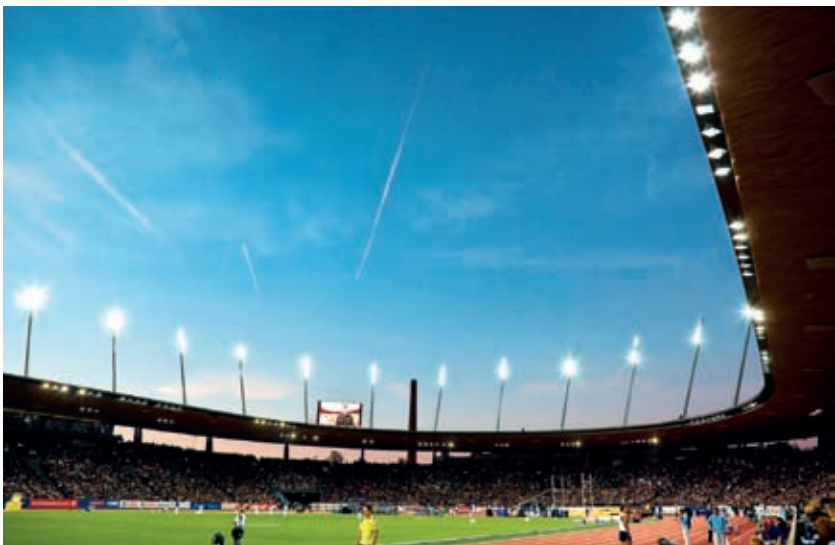


■ Table 2:

Coating systems suitable for complete in shop application ISO 12944 explicitly recommends this method “to ensure the longest possible protection duration and effectiveness of a coating system”, due to these compelling advantages:

- The better conditions for drying and hardening ensure better final results.
- Working conditions, and the control possibilities are optimum.
- There are better options for production in a more environmentally responsible manner through the use, for instance, of dust-proof blasting equipment and the application of coating materials with a low to zero solvent content.

Photograph: Messe Stuttgart



■ Table 4:

Coating systems for maintenance of old coatings – a method that is becoming more and more important for both economical and environmental reasons.

If this is done in good time, the old coating is still working effectively, and therefore in most cases only small areas (a proportion < 10% of the area) have to be completely reworked. It is even possible to omit sandblasting of damaged areas in many cases, provided surface tolerant priming coats are used.

■ Table 3:

Coating systems whose suitability for application to hot-dip galvanized steel have been approved by test institutes following recognized test procedures.



Table 1:
Priming and intermediate coating in shop, final coating on site.

Coating systems for corrosion protection of steel structures subject to various atmospheric conditions, based on ISO 12944 Part 5. Surface preparation: Sa 2 ½ (ISO 12944 Part 4)																							
System no.	Factory				Building site		Total system		Corrosivity category														
	Priming coat	Nominal coating thickness (µm)	Intermediate coat	Nominal coating thickness (µm)	Top coat	Nominal coating thickness (µm)	Number of coats	Nominal coating thickness (µm)	low	C2 medium	high	low	C3 medium	high	low	C4 medium	high	low	C5-I medium	high	low	C5-M mittel	high
1	SikaCor® Steel Protect VHS Rapid	80			Sika® CorroTop	60	2	140															
2	SikaCor® EP Color	80					1	80															
3	Sika® Permacor® 1705	80			Sika® Unitherm fire protection	See product data sheet	See product data sheet																
4	SikaCor® Steel Protect VHS Rapid	120			SikaCor® Steel Protect VHS Rapid	80	2	200															
5	SikaCor® Steel Protect VHS Rapid	80			SikaCor® 6630 high-solid	120	2–3	200															
6	SikaCor® ZP Primer	80			SikaCor® PUR Color	80	2	160															
7	SikaCor® PUR Color	80			SikaCor® PUR Color	80	2	160															
8	SikaCor® EP Color	80			SikaCor® EP Color	80	2	160															
9	SikaCor® EG Phosphat (Rapid)	100			SikaCor® EG 4/5 ¹⁾	80	2	180															
10	SikaCor® Zinc R (Rapid)	80	SikaCor® EG 1 (Rapid)	80	SikaCor® EG 4/5 ¹⁾	80	3	240															
11	SikaCor® Zinc R (Rapid)	80	Sika® Poxicolor Plus	100	Sika® Poxicolor Plus	100	3	280															

¹⁾ SikaCor® EG 5 alternatively SikaCor® EG 5 Gloss, Sika® Permacor® 2230 VHS or Sika® Permacor® 2330

¹⁾ SikaCor® EG 5 alternatively SikaCor® EG 5 Gloss, Sika® Permacor® 2230 VHS or Sika® Permacor® 2330

■ **Table 2:**
Full coating application in shop.

Coating systems for corrosion protection of steel structures subject to various atmospheric conditions, based on ISO 12944 Part 5. Surface preparation: Sa 2 ½ (ISO 12944 Part 4)																							
System no.	Factory						Total system		Corrosivity category														
	Priming coat	Nominal coating thickness (µm)	Intermediate coat	Nominal coating thickness (µm)	Top coat	Nominal coating thickness (µm)	Number of coats	Nominal coating thickness (µm)	C2			C3			C4			C5-I			C5-M		
									low	medium	high	low	medium	high	low	medium	high	low	medium	high	low	medium	high
1					SikaCor® Steel Protect VHS Rapid	120	1	120															
2					SikaCor® EP Color³⁾	80	1	80															
3					SikaCor® PUR Color³⁾	80	1	80															
4	SikaCor® Steel Protect VHS Rapid	80			Sika® CorroTop	60	2	140															
5	SikaCor® Zinc R (Rapid)	80					1	80															
6					SikaCor® PUR Color Thixo	160	1	160															
7	SikaCor® EP Color	80			SikaCor® EP Color	80	2	160															
8	SikaCor® ZP Primer	80			SikaCor® PUR Color	80	2	160															
9	SikaCor® PUR Color	80			SikaCor® PUR Color	80	2	160															
10	SikaCor® EG Phosphat (Rapid)	100			SikaCor® EG 4/5 ¹⁾	80	2	180															
11	Sika® Poxicolor Rapid	120			SikaCor® EG 120	120	2	240															
12	Sika® Permacor® 2204 VHS	100			Sika® Permacor® 2230 VHS ²⁾	80	2	180															
13	SikaCor® Zinc R (Rapid)	80	SikaCor® EG 1 (Rapid)	80	SikaCor® EG 4/5 ¹⁾	80	3	240															
14	Sika® Permacor® 2204 VHS	160			Sika® Permacor® 2230 VHS ²⁾	80	2	240															
15	Sika® Poxicolor Rapid	120	Sika® Poxicolor Rapid	120	SikaCor® EG 4/5 ¹⁾	80	3	320															
16	Sika® Permacor® 2305 Rapid	160			Sika® Permacor® 2230 VHS ²⁾	100	2	260															
17	Sika® Permacor® 2311 Rapid	80	Sika® Permacor® 2215 EG-VHS	80	Sika® Permacor® 2230 VHS ²⁾	80	3	240															

¹⁾ **SikaCor® EG 5** alternatively **SikaCor® EG 5 Gloss**, **Sika® Permacor® 2230 VHS** or **Sika® Permacor® 2330**
²⁾ **Sika® Permacor® 2230 VHS** alternatively **SikaCor® EG 4** or **Sika® Permacor® 2330**
³⁾ **SikaCor® EP Color/SikaCor® PUR Color** alternatively **SikaCor® EG 4**

■ **Table 3:**
Coating of galvanized steel.

Duplex systems for corrosion protection of steel structures subject to various atmospheric conditions, based on ISO 12944 Part 5. Surface conditions: Hot-dip galvanized according to ISO 1461 /ISO 14713 or metal sprayed according to DIN EN 22063																							
System no.	Factory						Total system		Corrosivity category														
	Priming coat	Nominal coating thickness (µm)	Intermediate coat	Nominal coating thickness (µm)	Top coat	Nominal coating thickness (µm)	Number of coats	Nominal coating thickness (µm)	low	C2 medium high	low	C3 medium high	low	C4 medium high	low	C5-I medium high	low	C5-M medium high					
1	Sika® Permacor® 2706 EG	40			Sika® Unitherm fire protection	see product data sheet	see product data sheet																
2	SikaCor® Aktivprimer Plus	80	Sika® CorroTop	60			2	140															
3	Sika® Poxicolor Plus	100					1	100															
4					SikaCor® 6630 high-solid	120	1–2	120															
5	Sika® Poxicolor Plus	120					1	120															
6					SikaCor® 6630 high-solid	200	2–3	200															
7	SikaCor® EG 1 (Rapid)	80			SikaCor® EG 4/5 ¹⁾	80	2	160															
8	SikaCor® EG 120	120					1	120															
9	Sika® Poxicolor Rapid	120			SikaCor® EG 120	120	2	240															
10	SikaCor® EG 1 (Rapid)	80	SikaCor® EG 1 (Rapid)	80	SikaCor® EG 4/5 ¹⁾	80	3	240															
11	Sika® Poxicolor Plus	120	Sika® Poxicolor Plus	120			2	240															
12	Sika® Permacor® 2215 EG-VHS	160			Sika® Permacor® 2230 VHS ²⁾	80	2	240															

¹⁾ SikaCor® EG 5 alternatively SikaCor® EG 5 Gloss, Sika® Permacor® 2230 VHS or Sika® Permacor® 2330

²⁾ Sika® Permacor® 2230 VHS alternatively SikaCor® EG 4 or Sika® Permacor® 2330

■ **Table 4:**
Refurbishment of old coatings.

Coating systems for corrosion protection of steel structures subject to various atmospheric conditions, based on ISO 12944 Part 5.								
System no.	Priming coat for partial repairs							Corrosivity category
	Partial surface preparation	Priming coat	Nominal coating thickness (µm)	Number of coats	Top coat	Nominal coating thickness (µm)	Number of coats	
1	P St 3	SikaCor® Aktivprimer Plus	80	1	SikaCor® 6630 high-solid	160	2	C3
2	P St 3	SikaCor® 6630 high-solid	80	1	SikaCor® 6630 high-solid	160	2	C3
3	P St 3	Sika® Poxicolor Primer HE NEU	120	1	SikaCor® EG 120	120	1	C4
4	P Ma	Sika® Poxicolor Primer HE NEU	120	1	Sika® Poxicolor Plus	120	1	C4
5	P Ma	Sika® Permacor® 2004	120	1	Sika® Permacor® 2230 VHS ¹⁾	120	1	C4
6	P Sa 2½	SikaCor® EG Phosphat (Rapid)	80	1	SikaCor® EG System (Rapid)	160	2	C5-I / C5-M

¹⁾ Sika® Permacor® 2230 VHS alternatively SikaCor® EG 4 or Sika® Permacor® 2330

■ **Table 5:**
Features of our shop primers, priming and intermediate coats.

Product	Description	Approx. density kg / L	Approx. solid content %		Mixing ratio by weight	Pot life at 20°C	Dry film thickness per coat in µm	Theor. consumption approx. kg / m²	Min. application temperature	Stackability ¹⁾		Earliest overcoating		Possible top coats	Max. waiting time
			Vol.	Weight						at 10° C	at 20° C	at 10° C	at 20° C		
SikaCor® Aktivprimer Plus	Alkyd resin primer	1.4	55	74			80–100	0.205–0.255	+5° C	8 h	6 h	48 h	24 h	Sika® CorroTop SikaCor® 6630 HS	unlimited
SikaCor® Steel Protect VHS Rapid	Alkyd resin primer	1.6	64	80			80–120	0.200–0.300	+5° C	10 h	4 h	4 h	2 h	Sika® CorroTop SikaCor® 6630 HS	unlimited
Sika® Poxicolor Rapid	Fast-curing epoxy resin primer	1.6	68	83	89 : 11	6 h	100	0.235	–10° C	9 h	6 h	7 h	4 h	Sika® Poxicolor Plus Sika® 2-K-PUR top coats	1 year
Sika® Poxicolor Primer HE NEU	Epoxy resin primer, surface-tolerant	1.3	67	80	88 : 12	4 h	100	0.190	+5° C	12 h	8 h	10 h	6 h	Sika® Poxicolor Plus Sika® 2-K-PUR top coats	1 year
SikaCor® EG Phosphat	Zinc phosphate epoxy resin primer	1.6	62	80	90 : 10	8 h	20–80	0.050–0.205	+5° C	10 h	4 h	9 h	4 h	SikaCor® EG System SikaCor® EG 120 Sika® Poxicolor Plus	4 years
SikaCor® EG Phosphat Rapid	Fast-curing zinc phosphate epoxy resin primer	1.6	57	79	94.7 : 5.3	5 h	80	0.225	–10° C	5 h	2 h	4 h	1.5 h	SikaCor® EG System Rapid SikaCor® EG 120 Sika® Poxicolor Plus	1 year
SikaCor® EG 1	Epoxy M.i.O. based intermediate coat. Base coat for galvanized steel.	1.6	60	77	90 : 10	8 h	80	0.215	+5° C	12 h	6 h	10 h	6 h	SikaCor® EG System Sika® Poxicolor Plus Sika® 2-K-PUR top coats	4 years
SikaCor® EG 1 Rapid	Fast-curing epoxy M.i.O. based intermediate coat. Base coat for galvanized steel.	1.6	56	77	94.7 : 5.3	5 h	80	0.230	–10° C	5 h	3 h	5 h	3 h	SikaCor® EG System Rapid Sika® Poxicolor Plus Sika® 2-K-PUR top coats	1 year
SikaCor® ZP Primer	Fast-curing polyurethane primer with zinc phosphate	1.5	62	78	92 : 8	2 h	80	0.195	0° C	5 h	3 h	4 h	2 h	Sika® 2-K-PUR top coats	unlimited
SikaCor® Zinc R	Zinc rich primer based on epoxy resin.	2.8	67	89	94 : 6	8 h	20–80	0.085–0.335	+5° C	3 h	2.5 h	3 h	2.5 h	SikaCor® EG System SikaCor® EG 120 Sika® Poxicolor Plus	4 years
SikaCor® Zinc R Rapid	Fast-curing zinc rich primer based on epoxy resin.	2.8	63	88	94 : 6	5 h	80	0.355	–10° C	1 h	0.5 h	1 h	0.5 h	SikaCor® EG System Rapid SikaCor® EG 120 Sika® Poxicolor Plus	1 year
Sika® Permacor® 2311 Rapid	Zinc rich primer based on epoxy resin	2.5	59	85	100 : 10	2.5 h	80	0.339	–10° C	4 h	2 h	4 h	2 h	Sika® Permacor® 2215 EG-VHS Sika® Permacor® 2230 VHS	unlimited
Sika® Permacor® 2305 Rapid	Zinc phosphate epoxy resin primer	1.5	55	75	100 : 20	3 h	100–160	0.272–0.436	–10° C	12 h	6 h	12 h	6 h	Sika® Permacor® 2215 EG-VHS Sika® Permacor® 2230 VHS	unlimited
Sika® Permacor® 2004	Very High Solid epoxy primer, surface-tolerant	1.7	83	91	100 : 10	90 min	80–160	0.164–0.328	+10° C	36 h	24 h	24 h	16 h	Sika® Permacor® 2215 EG-VHS Sika® Permacor® 2230 VHS	3 months
Sika® Permacor® 2204	Very High Solid epoxy primer containing zinc dust and micaceous iron oxide	2.0	77	89	100 : 8.5	2 h	80–160	0.210–0.420	+10° C	15 h	8 h	12 h	6 h	Sika® Permacor® 2215 EG-VHS Sika® Permacor® 2230 VHS	3 months
Sika® Permacor® 2215 EG-VHS	Very High Solid epoxy M.I.O. intermediate coat	1.9	72	87	100 : 7.2	2 h	80–160	0.211–0.422	+3° C	15 h	6 h	11 h	5 h	Sika® Permacor® 2230 VHS	3 months
Sika® Permacor® 2706 EG	Epoxy M.i.O. based intermediate coat. Base coat for galvanized steel.	1.4	45	66	100 : 20	8 h	40	0.125	+10° C	24 h	16 h	24 h	8 h	Sika® Permacor® 2230 VHS Sika® Permacor® 2330 Sika® Permacor® 2707	6 months

¹⁾ The drying times depend on the dry film thickness, and are based on a dry film thickness of 80 – 100 µm

■ **Table 6:**
Features of our top coat products.

Top coats	Product description	Approx. densitiy kg/L	Approx. solid content %		Mixing ratio by weight	Pot life at 20°C	Dry film thickness per coat in µm	Theor. con- sumption approx. kg/m²	Min. working tempera- ture	Stackability ¹⁾		Earliest overcoatings at		Priming coat for repairs
			Vol.	Weight						at 10°C	at 20°C	at 10°C	at 20°C	
Sika® CorroTop	Alkyd resin top coat	1.25	50	68			60	0.150	+5° C	20 h	4 h	24 h	12 h	SikaCor® Aktivprimer Plus
SikaCor® 6630 high-solid	Low VOC synthetic resin combination with active anti-corrosive pigments	1.4 1.5 ²⁾	62 61 ²⁾	77 77 ²⁾			80	0.180 0.195 ²⁾	+5° C	36 h	24 h	36 h	24 h	SikaCor® Aktivprimer Plus
Sika® Poxicolor Plus	Low VOC epoxy resin combination	1.6	76	87	94 : 6	6 h	100	0.210	+5° C	24 h	10 h	20 h	8 h	Sika® Poxicolor Primer HE NEU
SikaCor® EP Color	Epoxy resin top coat, satin finish	1.8	62	80	90 : 10	8 h	80	0.205	+5° C	10 h	4 h	9 h	4 h	Sika® Poxicolor Primer HE NEU
SikaCor® PUR Color	Polyurethane top coat, satin finish	1.4	56	73	92 : 8	2 h	80	0.200	+ 5° C	5 h	3 h	5 h	3 h	Sika® Poxicolor Primer HE NEU
SikaCor® PUR Color Thixo	Polyurethane top coat, satin finish	1.4	56	73	92 : 8	2 h	80	0.200	+5° C	5 h	3 h	5 h	3 h	Sika® Poxicolor Primer HE NEU
SikaCor® EG 4	Polyurethane top coat with micaceous iron oxide	1.4	55	70	92 : 8	5 h 3 h ³⁾	80	0.205	+5° C	16 h 12 h ³⁾	13 h 4 h ³⁾	16 h 12 h ³⁾	13 h 4 h ³⁾	Sika® Poxicolor Primer HE NEU
SikaCor® EG 5	Polyurethane top coat	1.3	59	72	90 : 10	5 h 3 h ³⁾	80	0.175	+5° C	17 h 13 h ³⁾	15 h 5 h ³⁾	17 h 13 h ³⁾	15 h 5 h ³⁾	Sika® Poxicolor Primer HE NEU
SikaCor® EG 120	Low VOC polyurethane top coat	1.3 1.7 ²⁾	70 70 ²⁾	80 83 ²⁾	85 : 15 90 : 10 ²⁾	2 h	120	0.225 0.290 ²⁾	+5° C	20 h	11 h	20 h	11 h	Sika® Poxicolor Primer HE NEU
Sika® Permacor® 2230 VHS	Very High Solid polyurethane top with excellent UV resistance	1.4	70	82	100 : 18	2 h	80	0.157	+3° C	15 h	6 h	14 h	5 h	Sika® Permacor® 2004
Sika® Permacor® 2330	Polyurethane top with excellent UV resistance	1.3	56	69	100 : 15	6 h	50–80	0.115– 0.185	0° C	14 h	6 h	13 h	5 h	Sika® Permacor® 2004
Sika® Unitherm® fire protection systems	Waterborne and solvent-based intumescent coating systems for indoor and outdoor use.	See product data sheets					See product data sheets							

¹⁾ The drying times depend on the dry film thickness, and are based on a dry film thickness of 80 – 100 µm

²⁾ Data based on micaceous iron oxide colours

³⁾ Accelerated with SikaCor PUR accelerator