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European Technical Assessment ETA-24/0300 of *20-05-2024*

General Part

Technical Assessment Body issuing the European Technical Assessment: Kiwa Nederland B.V.	
Trade name of the construction product	**MC-KKS/B**
Product family to which the construction product belongs	Cathodic corrosion protection systems made of thermally sprayed zinc anodes combined with polymeric coatings
ETA-Holder	MC-Bauchemie Müller GmbH & Co. KG Am Kruppwald 1-8 46238 Bottrop
Manufacturing plant(s)	Am Kruppwald 1-8 46238 Bottrop Weseler Straße 1 47169 Duisburg
This European Technical Assessment contains	11 pages
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	EAD 260100-00-0301 Cathodic corrosion protection systems made of thermally sprayed zinc anodes combined with polymeric coatings

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Specific parts

1. Technical description of the product

1.1. General

MC-KKS/B are cathodic corrosion protection systems made of thermally sprayed zinc anodes combined with polymeric coatings. The systems consist of a cathodic protection system (CCP) covered by polymeric coatings that protect the concrete and the CCP from weathering and use-related effects and increase its service life. The kit is used on reinforced concrete whose reinforcement is at risk or already damaged by chloride-induced corrosion.

The CCP system is a zinc anode applied over the entire surface by thermal spraying, which is conductively connected to the steel reinforcement acting as a cathode via contacts. The kit protects the reinforcing steel by applying an electrical potential. The polarisation of the reinforcing steel with the galvanic anode (zinc tip layer) ensures a potential reduction so that the corrosion rate drops to a technically negligible value.

The firmly adhering polymeric coatings laid on the CCP system protect the CCP system and the reinforced concrete against penetrating substances and wear caused by use.

MC-KKS/B comes with four polymeric coatings:

- protection system type A according to EAD 260100-00-0301
- protection system type B according to EAD 260100-00-0301
- protection system type C according to EAD 260100-00-0301
- protection system type D according to EAD 260100-00-0301

The layouts of the protection system types are shown in tables 1.1 – 1.4.

Table 1.1: Kit components and layers for protection system type A

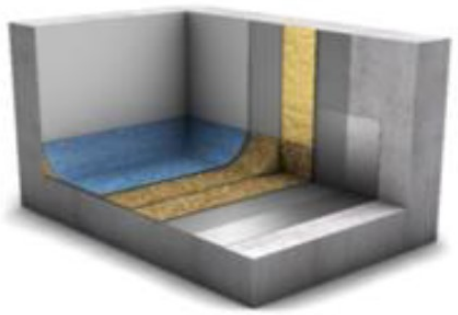
Layer	Protection system type A	
Zinc anode	Spraye zinc ca. 150 µm	
1st primer	MC-DUR KKS Primer LM ca. 300 g/m²	
2nd primer	MC-DUR KKS Base 200 g/m² (resin) + Stellmittel TX 19 1 % - 3 %	
Scattering	Quartz sand 1.000 g/m²	
Fine filler	Nafufill KM 110 4.100 g/m²	
Top sealing	MC-Color Flair pro 2 x ca. 110 ml/m²	

Table 1.2: Kit components and layers for protection system type B

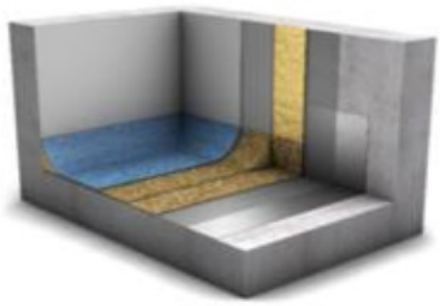
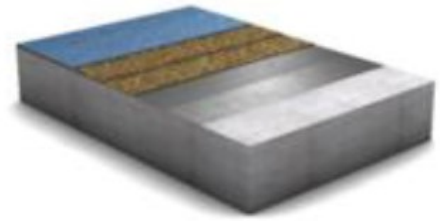
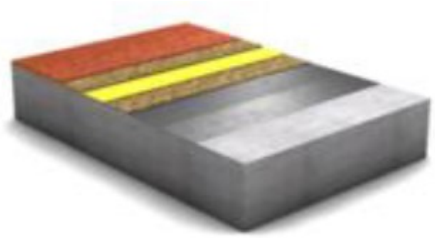
Layer	Protection system type B	
Zinc anode	Spraye zinc ca. 150 µm	
1st primer	MC-DUR KKS Primer LM ca. 300 g/m²	
2nd primer	MC-DUR KKS Base 200 g/m² (resin) + Stellmittel TX 19 1 % - 3 %	
Scattering	Quartz sand 1.000 g/m²	
Fine filler	Nafufill KM 110 4.100 g/m²	
Top sealing	MC-Color Flex vision 2 x ca. 280 ml/m²	

Table 1.3: Kit components and layers for protection system type C

Layer	Protection system type C		
Zinc anode	Spraye zinc ca. 150 µm		
Primer	MC-DUR KKS Primer LM ca. 300 g/m²		
Scratch coat	MC-DUR KKS Base 600 g/m² (resin) + quartz sand 600 g/m²		
Scattering	Quarz sand 5.000 g/m²		
Bedding layer	MC-DUR KKS Top 1.000 g/m² (resin) + quarz sand 500 g/m²		
Scattering	Quarz sand 5.000 g/m²		
Top sealing	MC-DUR KKS Top 700 g/m²	MC-DUR TopSpeed 600 g/m²	

Assessment performed with “MC-DUR KKS Top” as Top sealing.

Table 1.4: Kit components and layers for protection system type D

Layer	Protection system type D		
Zinc anode	Spraye zinc ca. 150 µm		
1st primer	MC-DUR KKS Primer LM ca. 300 g/m²		
2nd primer	MC-DUR 1320 VK 300 g/m² (resin)		
Scattering	Quartz sand 2.000 g/m²		
Sealing layer	MC-DUR 2211 MB 2.100 g/m² (resin)		
Bedding layer	MC-DUR 2210 1.900 g/m² (resin) + quartz sand 400 g/m²		
Scattering	Quartz sand 3.000 g/m²		
Top sealing	MC-DUR 1322 650 g/m²	MC-DUR TopSpeed 600 g/m²	

Assessment performed with “MC-DUR 1322” as top sealing.

2. Specification of the intended use(s) in accordance with the applicable European Assessment Document (hereinafter EAD)

2.1. Intended use

MC-KKS/B is intended to be used to protect against reinforcement corrosion, e.g., in chloride-contaminated reinforced concrete structures. It can also be used as a preventive measure to protect against reinforcement corrosion.

Protection system type A and B can be used on vertical, inclined as well as horizontal surfaces (non-trafficable).

Protection system type C and D can be used on horizontal surfaces (trafficable and/or non-trafficable).

2.2. Assumed working life

The provisions made in this ETA are based on an assumed working life of 40-50[1] years, provided that:

- MC-KKS/B is properly designed and built,
- installation of MC-KKS/B is performed as per installation guide, under normal site conditions, by adequately trained installers,
- minor damages are repaired (for example damage caused by impact),
- MC-KKS/B is properly used and maintained.

These provisions are based upon the current technological state of the art and the available knowledge and experience.

In normal use conditions, the real working life may be considerably longer without major degradation affecting the basic requirements for construction works[2] .

The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded as a means for choosing the right product in relation to the reasonable expected working life of the [product/system].

2.3. Manufacturing

MC-KKS/B is manufactured in accordance with the provisions of the European Technical Assessment and laid down in the technical file. It is the responsibility of the manufacturer to ensure that all necessary information on design and installation is submitted to those responsible for design and execution of the construction.

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[1] The polymeric coating is subject to wear in the area of used traffic areas due to traffic. The wear resistance of the polymeric coating is so high with average use that the wearing course must be reworked after approx. 15 years at the earliest. For this purpose, the surface subjected to direct wear must be ground and provided with a new wearing course. This extends the service life of the entire polymeric coating by another 15 years. Since this process can be repeated, a total service life of the system of at least 40 to 50 years can be assumed. The service life of the corrosion-protective zinc anode is usually approx. 50 years if applied properly and professionally (at a layer thickness of approx. 150 µm. Depending on the requirements and intended use, the layer thickness may be adapted.

[2] The real working life of a product incorporated in a specific works depends on the environmental conditions to which that works are subject, as well as on the particular conditions of design, execution, use, and maintenance of that works. Therefore, it cannot be excluded that in certain cases the real working life of the product may also be shorter than the assumed working life.

2.4. Packaging, transport and storage

MC-KKS/B shall be packed, transported, and stored in accordance with the manufacturer's technical documentation to prevent damages or deterioration. Damaged products should not be used. It is the responsibility of the manufacturer that adequate information is clearly shown on the package and/or enclosed instruction sheet.

2.5. Design and installation

For MC-KKS/B the following shall be observed:

- The conditions for design and execution of MC-KKS/B into the works shall be taken from the manufacturer's technical documentation.
- Installation and handling shall be carried out by qualified employees and according to the manufacturers technical documentation.

3. Performance of the product and references to the methods used for its assessment

3.1. BWR 1 – Mechanical resistance and stability

Table 3.1.1 – Mechanical resistance and stability

Essential characteristic	Performance			
	Protection system type A	**Protection system type B**	**Protection system type C**	**Protection system type D**
Determination of the protective current density and the breaking potential	See table 3.1.2 and table 3.1.3 This essential characteristic is independent of the polymeric coating.			
Wear resistance (PAT)	NPD (Not relevant)	NPD (Not relevant)	R_m < 0,01 R_{max} < 0,01 Visual assessment: High wear resistance	R_m < 0,01 R_{max} < 0,01 Visual assessment: High wear resistance
Wear resistance (BCA)	NPD (Not relevant)	NPD (Not relevant)	NPD	NPD
Wear resistance (rolling wheel)	NPD (Not relevant)	NPD (Not relevant)	NPD	NPD
Permeability to CO_2	s_D ≥ 50 m	s_D ≥ 50 m	s_D ≥ 50 m	s_D ≥ 50 m
Water vapour permeability	class I s_D 0,21 m	class I s_D 1,03 m	class III s_D ≥ 50 m	class III s_D ≥ 50 m
Capillary water absorption and water permeability	w < 0,1 kg / m² $h^{1/2}$	w < 0,1 kg / m² $h^{1/2}$	w < 0,1 kg / m² $h^{1/2}$	w < 0,1 kg / m² $h^{1/2}$
Adhesion strength (by pull off test)	≥ 1,0 N/mm² Failure Mode: A/B (substrate/anode)	≥ 0,8 N/mm² Failure Mode: E/F (fine filler/top sealing)	≥ 2,0 N/mm² Failure Mode: A (substrate)	≥ 1,5 N/mm² Failure Mode: A (substrate)
Adhesion strength (by pull off test) after thermal shock	≥ 1,0 N/mm² Failure Mode: E/F (scattering / fine filer)	≥ 0,8 N/mm² Failure Mode: C and D (fine filler and top sealing)	≥ 2,0 N/mm² Failure Mode: A (substrate)	≥ 1,5 N/mm² Failure Mode: Y and Y/Z (glue and glue/stamp)
Adhesion strength (by pull off test) after ageing	See table 3.1.4 This essential characteristic concerns the bonding between the thermally sprayed zinc and the primer.			
Resistance to severe chemical attack	NPD (Not relevant)	NPD (Not relevant)	Method: EN ISO 868	Method: EN ISO 868

			Shore Hardness: A Liquid group 1: Change of hardness: 0 % Class: I Liquid group 3 Change of hardness: + 5 % Class: I Liquid group 10 Change of hardness: +3 % Class: I	Shore Hardness: A Liquid group 1: Change of hardness: -7 % Class: I Liquid group 3 Change of hardness: -8 % Class: I Liquid group 10 Change of hardness: -8 % Class: I
Crack bridging	NPD (Not relevant)	NPD	NPD (Not relevant)	class B4.2 temperature -20 °C cracks none
Watertightness	NPD (Not relevant)	NPD	NPD (Not relevant)	watertight
Cross-cut test	NPD	NPD	NPD	NPD
Artificial weathering	NPD	NPD	NPD	NPD
Linear shrinkage	NPD	NPD	NPD	NPD
Impact resistance	NPD	NPD	class I > 4 NM	class I > 4 NM

Table 3.1.2 – Determination of the protective current density and the breaking potential (protective current density)

Standard concrete type	Capillary saturation	Chloride content	Average protective current density
A	40 %	0,25 %	1 mA/m²
		2,50 %	3 mA/m²
		5,00 %	9 mA/m²
	80 %	0,25 %	2 mA/m²
		2,50 %	7 mA/m²
		5,00 %	15 mA/m²
B	40 %	0,25 %	1 mA/m²
		2,50 %	6 mA/m²
		5,00 %	11 mA/m²
	80 %	0,25 %	4 mA/m²
		2,50 %	12 m/Am²
		5,00 %	24 mA/m²

Table 3.1.3 – Determination of the protective current density and the breaking potential (breaking potential)

Standard concrete type	Chloride content	Time until Δ of Voltage = 100 mV	Δ of Voltage after 24 h
A	0,25 %	6 h	> 100 mV
	2,50 %	4 h	
	5,00 %	3 h	
B	0,25 %	6 h	
	2,50 %	4 h	
	5,00 %	3 h	

Table 3.1.4 – Adhesion strength (by pull off test) after ageing

Acceleration	Standard concrete type	Chloride content	Bond strength
No	B	2,5 %	≥ 1,5 N/mm² Adhesive failure
Yes	A	5,0 %	≥ 1,5 N/mm² Adhesive failure

3.2. BWR 2 – Safety in case of fire

Table 3.2.1 – Safety in case of fire

Essential characteristic	Performance			
	Protection system type A	Protection system type B	Protection system type C	Protection system type D
Reaction to fire after application	class B-s1-d0	class B-s2-d0	class B_{fl}-s1	class B_{fl}-s1
Reaction to fire after exposure	NPD	NPD	NPD	NPD

The tests were with the layouts as described in table 1.1 – 1.4. The following colorations were used during testing:

- Protection system type A RAL 9010, RAL 3009, RAL 7023
- Protection system type B RAL 9010, RAL 3009, RAL 7023
- Protection system type C RAL 9010, RAL 3009, RAL 7023
- Protection system type D RAL 7023, RAL 7042

Test results considering the afore-mentioned parameters are valid for variations of the kit and its components with:

- the same composition of the components,
- the same combination of different layers or a combination with less layers,
- equal or lower organic content,
- equal or higher amount of the same type of flame retardants,
- the same or lower thickness of the tested system,
- the same or lower applied quantity per unit area of the layers of the kit,
- the same colour of the top layer or the complete range of different colours, if a black, a red and white top layer had been tested.

3.3. BWR 4 – Safety in use

Table 3.3.1 – Safety in use

Essential characteristic	Performance			
	Protection system type A	**Protection system type B**	**Protection system type C**	**Protection system type D**
Slip/skid resistance	NPD (Not relevant)	NPD (Not relevant)	class III with MC-DUR TopSpeed slider type 57	class III with MC-DUR 1322 class III with MC-DUR TopSpeed slider type 57

4. Assessment and verification of constancy of performance (hereinafter AVCP) system applied, with reference to its legal base

According to the decision 2001/596/EC of the European Commission the system of assessment and verification of constancy of performance to be applied is.

Intended use	System
For uses subject to fire behaviour regulations	3
Any use except uses subject to regulations on reaction to fire and in buildings and engineering structures	2+

5. Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

This ETA is issued on the basis of data/information deposited at Kiwa Nederland B.V. which identifies the product that has been assessed.

Changes to the product/production process, which could result in this deposited data/ information being incorrect, should be notified to the approval body before the changes are introduced. Kiwa Nederland B.V. will decide whether such changes affect the ETA and if so whether further assessment or alterations to the ETA shall be necessary.

Technical details necessary for the implementation of the AVCP system are laid down in the control plan, in accordance with Section 3.2 of EAD 260100-00-0301.

The control plan shall be handed over by the manufacturer to the notified body (bodies) involved in the assessment and verification of constancy of performance.

The tasks of the notified body are laid down in Section 3.3 of EAD 260100-00-0301.

Issued in Rijswijk on 20-05-2024 by

Ron Scheepers

Kiwa Nederland B.V.