

Approval body for construction products  
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and  
Laender Governments



## European Technical Assessment

ETA-20/0242  
of 15 April 2020

English translation prepared by DIBt - Original version in German language

### General Part

Technical Assessment Body issuing the  
European Technical Assessment:

Deutsches Institut für Bautechnik

Trade name of the construction product

Blast furnace cement CEM III/A 52,5 N-SR "Karlstadt"

Product family  
to which the construction product belongs

Blast Furnace Cement CEM III/A with assessment of  
sulfate resistance (SR) and optional with low effective  
alkali content (LA) and/or low heat of hydration (LH)

Manufacturer

SCHWENK Zement KG  
Werk Karlstadt  
Laudenbacher Weg 5  
97753 Karlstadt  
DEUTSCHLAND

Manufacturing plant

Schwenk Zement KG  
Laudenbacher Weg 5  
97753 Karlstadt  
DEUTSCHLAND

This European Technical Assessment  
contains

8 pages including 1 annex with 4 pages which forms an  
integral part of this assessment

This European Technical Assessment is  
issued in accordance with Regulation (EU)  
No 305/2011, on the basis of

EAD 150009-00-0301

The European Technical Assessment is issued by the Technical Assessment Body in its official language. Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document and shall be identified as such.

Communication of this European Technical Assessment, including transmission by electronic means, shall be in full. However, partial reproduction may only be made with the written consent of the issuing Technical Assessment Body. Any partial reproduction shall be identified as such.

This European Technical Assessment may be withdrawn by the issuing Technical Assessment Body, in particular pursuant to information by the Commission in accordance with Article 25(3) of Regulation (EU) No 305/2011.

## Specific part

### 1 Technical description of the product

The blast furnace cement CEM III/A 52,5 N-SR "Karlstadt" is a cement which fulfils all requirements given in EN 197-1<sup>1</sup> for a common cement of strength class 52,5 N.

Furthermore the blast furnace cement CEM III/A 52,5 N-SR "Karlstadt" has a high resistance against sulfate attack on concrete.

The assessment for the verification of the essential characteristic "sulfate resistance" (SR) was done on a blast furnace cement CEM III/A with a blast furnace content of 50 % by mass. The blast furnace slag has a glass content of at least 90 % and a (CaO + MgO)/SiO<sub>2</sub>-ratio of at least 1,2.

The blast furnace cement CEM III/A 52,5 N-SR "Karlstadt" is manufactured by separately grinding of the main constituent (Portland cement clinker with gypsum or anhydrite or any mixture of them to control setting and blast furnace slag) and subsequent mixing of both constituents. The specific surface (Blaine) of the cement shall be at least 480 m<sup>2</sup>/kg.

The cement composition shall be in the following range:

Portland Cement clinker:	35 to 50 % by mass
Blast furnace slag:	50 to 65 % by mass

### 2 Specification of the intended use in accordance with the applicable European Assessment Document

The blast furnace cement CEM III/A 52,5 N-SR "Karlstadt" is intended to be used for preparation of concrete, mortar, grouts and other mixes for construction and for the manufacturing of construction products.

Especially the blast furnace cement CEM III/A 52,5 N-SR "Karlstadt" is characterized by an evidently high resistance against sulfate attack on concrete.

The verifications and assessment methods on which the European Technical Assessment is based lead to the assumption of a working life of concrete incorporating the blast furnace cement CEM III/A 52,5 N-SR "Karlstadt" of at least 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

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

#### 3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
(CaO + MgO)/SiO <sub>2</sub> -ratio of the blast furnace slag	B = 1,3
Glass content of the blast furnace slag	GC = 98,5 %
Specific surface of the cement (Blaine)	ρ = 480 m <sup>2</sup> /kg
Sulfate resistance	see Annex

<sup>1</sup> EN 197-1 Cement - Part 1: Composition, specification and conformity criteria for common cement

Essential characteristic	Performance
Characteristics for a common cement (CEM III/A 52,5 N)	
Early strength (2 days)	Class N (20,8 N/mm <sup>2</sup> )
Standard strength (28 days)	Class 52,5 (58,9 N/mm <sup>2</sup> )
Initial setting time	Passed (230 min)
Soundness	Passed (0,5 mm)
Loss on ignition	Passed (1,53 % by mass)
Insoluble residue	Passed (0,52 % by mass)
Sulfate content (as SO <sub>3</sub> )	Passed (2,93 % by mass)
Chloride content	Passed (0,08 % by mass)
Composition of the cement: Clinker (K): Blast furnace slag (S):	K = 50 % by mass S = 50 % by mass

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

In accordance with EAD No. 150009-00-0301, the applicable European legal act is: 97/555/EC<sup>2</sup> of the European Commission amended by the Commission Decision 2010/683/EU<sup>3</sup>

The system to be applied is: 1+

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

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin on 15. April 2020 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow  
Head of Department

*beglaubigt:*  
Schröder

<sup>2</sup> Official Journal of the European Communities L 229 of 20 August 1997  
<sup>3</sup> Official Journal of the European Communities L 293 of 11 November 2010

**ANNEX: Assessment**

**Sulfate resistance – Flat prism method**

The testing procedure was done according to EAD 150009-00-0301, Annex B.

The elongation of the flat prisms was calculated as mean value from 3 specimens. The difference in elongation between the sulfate storage and the reference storage was calculated as expansion of length. The expansion of length for the different mortars and storages are given in Table 1.

**Table 1:** Expansion of length of the mortar flat prisms

	Expansion of the length [mm/m] after				
	14 days	28 days	56 days	90 days	180 days
<b>CEM III/A 52,5 N-SR "Karlstadt" – storage at 20 °C</b>					
Na <sub>2</sub> SO <sub>4</sub> -solution	0,138	0,219	0,444	0,610	0,956
Ca(OH) <sub>2</sub> -solution	0,015	0,021	0,056	0,098	0,142
ΔL	0,123	0,198	0,387	0,531	0,815
<b>CEM III/A 52,5 N-SR "Karlstadt" – storage at 5 °C</b>					
Na <sub>2</sub> SO <sub>4</sub> -solution	-0,167	-0,092	-0,035	0,025	-
Ca(OH) <sub>2</sub> -solution	-0,127	-0,140	-0,073	-0,117	-
ΔL	-0,040	0,048	0,038	0,142	-
<b>CEM III/B 42,5 N-LH/SR – storage at 20 °C</b>					
Na <sub>2</sub> SO <sub>4</sub> -solution	0,025	0,021	0,115	0,146	0,265
Ca(OH) <sub>2</sub> -solution	0,115	0,192	0,158	0,198	0,208
ΔL	-0,090	-0,171	-0,044	-0,52	0,056
<b>CEM III/B 42,5 N-LH/SR – storage at 5 °C</b>					
Na <sub>2</sub> SO <sub>4</sub> -solution	-0,092	-0,129	-0,092	0,004	-
Ca(OH) <sub>2</sub> -solution	-0,106	-0,085	-0,056	-0,042	-
ΔL	0,015	-0,044	-0,035	0,046	-
<b>CEM I 42,5 R-SR3 – storage at 20 °C</b>					
Na <sub>2</sub> SO <sub>4</sub> -solution	0,131	0,0229	0,527	0,779	1,848
Ca(OH) <sub>2</sub> -solution	-0,033	-0,065	-0,037	0,013	0,033
ΔL	0,165	0,294	0,565	0,767	1,815
<b>CEM I 42,5 R-SR3 – storage at 5 °C</b>					
Na <sub>2</sub> SO <sub>4</sub> -solution	-0,040	0,029	0,156	0,388	-
Ca(OH) <sub>2</sub> -solution	-0,121	-0,115	-0,129	-0,094	-
ΔL	0,081	0,144	0,285	0,481	-

**Table 2:** Dynamic modulus of elasticity of the mortar flat prisms

	Dynamic modulus of elasticity in kN/mm <sup>2</sup> after					
	0 days	14 days	28 days	56 days	90 days	180 days
<b>CEM III/A 52,5 N-SR "Karlstadt" – storage at 20 °C</b>						
Ca(OH) <sub>2</sub> -solution	41,39	43,57	45,58	48,10	49,14	50,57
Na <sub>2</sub> SO <sub>4</sub> -solution	39,72	42,97	45,16	47,13	48,23	48,19
<b>CEM III/A 52,5 N-SR "Karlstadt" – storage at 5 °C</b>						
Ca(OH) <sub>2</sub> -solution	40,66	40,75	40,87	41,61	41,37	-
Na <sub>2</sub> SO <sub>4</sub> -solution	40,37	42,03	41,99	43,04	42,74	-
<b>CEM III/B 42,5 N-LH/SR – storage at 20 °C</b>						
Ca(OH) <sub>2</sub> -solution	41,43	44,23	46,23	47,72	74,94	49,60
Na <sub>2</sub> SO <sub>4</sub> -solution	41,14	44,61	46,20	47,50	47,42	46,72
<b>CEM III/B 42,5 N-LH/SR – storage at 5 °C</b>						
Ca(OH) <sub>2</sub> -solution	40,57	41,26	40,77	41,72	41,63	-
Na <sub>2</sub> SO <sub>4</sub> -solution	40,16	42,10	41,59	42,11	42,49	-
<b>CEM I 42,5 R-SR3 – storage at 20 °C</b>						
Ca(OH) <sub>2</sub> -solution	42,39	44,10	45,11	46,09	47,31	48,23
Na <sub>2</sub> SO <sub>4</sub> -solution	42,44	45,38	47,26	48,68	48,91	48,36
<b>CEM I 42,5 R-SR3 – storage at 5 °C</b>						
Ca(OH) <sub>2</sub> -solution	42,35	43,77	43,59	45,00	44,58	-
Na <sub>2</sub> SO <sub>4</sub> -solution	42,78	45,07	45,58	46,78	45,84	-

**Table 3:** Mass of mortar flat prisms

	Mass in g after					
	0 days	14 days	28 days	56 days	90 days	180 days
<b>CEM III/A 52,5 N-SR "Karlstadt" – storage at 20 °C</b>						
Ca(OH) <sub>2</sub> -solution	149,80	150,04	150,30	150,33	150,33	150,80
Na <sub>2</sub> SO <sub>4</sub> -solution	147,51	147,59	147,87	148,00	148,13	148,43
<b>CEM III/A 52,5 N-SR " Karlstadt " – storage at 5 °C</b>						
Ca(OH) <sub>2</sub> -solution	147,92	148,15	148,37	148,37	148,57	-
Na <sub>2</sub> SO <sub>4</sub> -solution	148,73	148,76	148,87	149,13	149,37	-
<b>CEM III/B 42,5 N-LH/SR – storage at 20 °C</b>						
Ca(OH) <sub>2</sub> -solution	149,46	149,47	149,57	149,83	149,97	150,23
Na <sub>2</sub> SO <sub>4</sub> -solution	151,27	151,65	151,90	152,17	152,50	153,27
<b>CEM III/B 42,5 N-LH/SR – storage at 5 °C</b>						
Ca(OH) <sub>2</sub> -solution	149,49	149,82	149,97	150,27	150,30	-
Na <sub>2</sub> SO <sub>4</sub> -solution	149,86	150,20	150,33	150,33	150,97	-
<b>CEM I 42,5 R-SR3 – storage at 20 °C</b>						
Ca(OH) <sub>2</sub> -solution	148,88	148,43	148,50	148,53	148,60	148,83
Na <sub>2</sub> SO <sub>4</sub> -solution	148,70	148,14	148,17	148,13	148,17	148,47
<b>CEM I 42,5 R-SR3 – storage at 5 °C</b>						
Ca(OH) <sub>2</sub> -solution	149,77	149,30	149,33	149,40	149,47	-
Na <sub>2</sub> SO <sub>4</sub> -solution	148,50	147,92	147,93	147,97	148,00	-

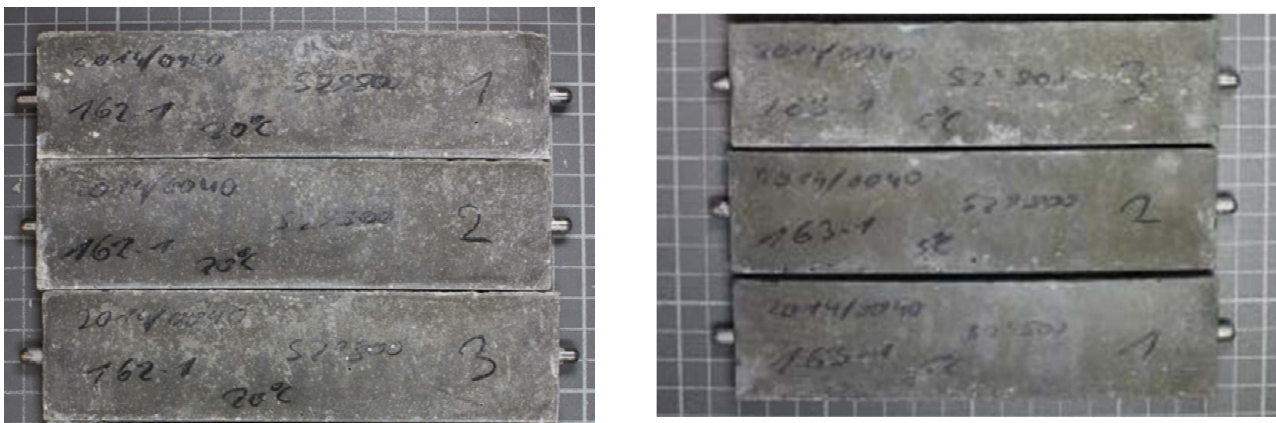
English translation prepared by DIBt

### Visual description of the specimens after sulphate storage

After a testing period of 180 days respectively 90 days the specimens show no expansion damages, cracks or flaking based on formation of thaumasite, see figures 1 to 3.



**Figure 1:** Specimens with CEM III/A 52,5 N-SR "Karlstadt" after sulfate storage;  
on the left: after 180 days at 20 °C; on the right: after 90 days at 5 °C



**Figure 2:** Specimens with CEM III/B 42,5 N-LH/SR/LA after sulfate storage;  
on the left: after 180 days at 20 °C; on the right: after 90 days at 5 °C



**Figure 3:** Specimens with CEM I 42,5 N-SR3 after sulfate storage;  
on the left: after 180 days at 20 °C; on the right: after 90 days at 5 °C