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Bautechnisches Prüfamt

An institution established by the Federal and
Laender Governments



European Technical Assessment

ETA-12/0390
of 20 December 2017

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 42,5 N LH/SR/LA
"Deuna"

Product family
to which the construction product belongs

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

Manufacturer

Deuna Zement GmbH
Industriestraße 7
37355 Deuna
DEUTSCHLAND

Manufacturing plant

Deuna Zement GmbH
Industriestraße 7
37355 Deuna
DEUTSCHLAND

This European Technical Assessment
contains

14 pages including 4 annexes which form 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

This version replaces

ETA-12/0390 issued on 27 March 2013

European Technical Assessment
ETA-12/0390

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Specific part

1 Technical description of the product

The blast furnace cement CEM III/A 42,5 N-LH/SR/LA "Deuna" is a cement which fulfils all requirements given in EN 197-1¹ for a common cement of strength class 42,5 N and with low heat of hydration (LH).

Furthermore the blast furnace cement CEM III/A 42,5 N-LH/SR/LA "Deuna" has a high resistance against sulfate attack on concrete (SR) and a low effective alkali content (LA).

The assessment for the verification of the essential characteristics "sulfate resistance" (SR), "low heat of hydration" (LH) and "low effective alkali content" (LA) were done on a blast furnace cement² CEM III/A 42,5 N-LH/SR/LA with a blast furnace slag content of 48,0 % by mass and a specific surface of 385 m²/kg (C1) respectively 382 m²/kg (C2).

The low effective alkali content (LA) can be verified by the Na₂O-equivalent (Na₂O_{eq}) and the blast furnace slag content of the blast furnace cement CEM III/A:

- Blast furnace slag content between 45 to 49 % by mass and Na₂O_{eq} ≤ 0,95 % by mass or
- Blast furnace slag content of ≥ 50 % by mass and Na₂O_{eq} ≤ 1,10 % by mass

The blast furnace cement CEM III/A 42,5 N-LH/SR/LA "Deuna" can be manufactured by combined grinding of the main constituents (Portland cement clinker, granulated blast furnace slag) and defined minor additional constituents with the addition of gypsum or anhydrite or any mixture of them to control setting or by separately grinding and subsequent mixing of the raw material. The specific surface (Blaine) of the blast furnace cement CEM III/A 42,5 N-LH/SR/LA "Deuna" shall be at least 385 m²/kg with following cement composition:

Portland cement clinker ³ :	35 to 52 % by mass
Blast furnace slag:	48 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 42,5 N-LH/SR/LA "Deuna" is intended to be used for preparation of concrete, mortar, grouts and other mixes for construction and for the manufacturing of construction products. The blast furnace cement shows a low heat of hydration (LH).

Especially the blast furnace cement CEM III/A 42,5 N-LH/SR/LA "Deuna" is characterized by an evidently high resistance against sulfate attack on concrete.

The blast furnace cement CEM III/A 42,5 N-LH/SR/LA "Deuna" can be used to avoid a damaging alkali-silica reaction in concrete.

The verification 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 42,5 N-LH/SR/LA "Deuna" 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.

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

² The assessment testing was done on two blast furnace cements CEM III/A 42,5 N-LH/SR/LA (C1 and C2). The blast furnace cement C1 was manufactured with blast furnace slag 1 (S1) and blast furnace cement C2 with blast furnace slag 2 (S2). The assessment testing of the two test cements were positive. In this case it is possible to manufacture the blast furnace cement CEM III/A 42,5 N-LH/SR/LA "Deuna" with a blast furnace slag composition of blast furnace slags S1 and S2.

³ The Portland cement clinker contains minor additional constituents (max. 4,5 % by mass).

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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 ₂ -ratio of the blast furnace slag	B _{S1} = 1,3 B _{S2} = 1,4
Glass content of the blast furnace slag	GC _{S1} = 96 % GC _{S2} = 98 %
Specific surface of the cement (Blaine)	ρ _{C1} = 385 m ² /kg ρ _{C2} = 382 m ² /kg
Sulfate resistance	see Annex A (A1 to A4)
Characteristics for a common cement (CEM III/A)	
Early strength (2 days)	Class N (≥ 10,0 N/mm ²)
Standard strength (28 days)	Class 42,5 (≥ 42,5 N/mm ²)
Initial setting time	C1: Passed (275 min) C2: Passed (265 min)
Soundness	C1: Passed (1 mm) C2: Passed (1 mm)
Loss on ignition	C1: Passed (2,65 % by mass) C2: Passed (2,35 % by mass)
Insoluble residue	C1: Passed (0,36 % by mass) C2: Passed (0,37 % by mass)
Sulfate content (as SO ₃)	C1: Passed (2,1 % by mass) C2: Passed (2,8 % by mass)
Chloride content	C1: Passed (0,03 % by mass) C2: Passed (0,07 % by mass)
<u>Composition of the cement (C1):</u> Clinker (K): Blast furnace slag (S1):	<u>CEM III/A (C1):</u> K = 52 % by mass (35 – 52 % by mass) S1 = 48 % by mass (48 – 65 % by mass)
<u>Composition of the cement (C2):</u> Clinker (K): Blast furnace slag (S2):	<u>CEM III/A (C2):</u> K = 52 % by mass (35 – 52 % by mass) S2 = 48 % by mass (48 – 65 % by mass)
Alkali-Content of the cement (LA) Na ₂ O-equivalent	CEM III/A (C1): 0,93 % by mass CEM III/A (C2): 0,85 % by mass
Low heat of hydration (LH)	CEM III/A (C1): Passed (246 J/g) CEM III/A (C2): Passed (215 J/g)
S1: Blast furnace slag 1 S2: Blast furnace slag 2	C1: Blast furnace cement with blast furnace slag 1 C2: Blast furnace cement with blast furnace slag 2

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

According to Decision 97/555/EC⁴ of the European Commission amended by the Commission Decision 2010/683/EU⁵, the assessment and verification of constancy of performance system (AVCP system) (see Annex V to Regulation (EU) 305/2011 as amended by the Commission Delegated Regulation (EU) No 568/2014) given in table 1 applies.

Table 1: AVCP system

Product	Intended use(s)	Level(s) or Classe(s) of performance	AVCP system
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)	Preparation of concrete, mortar, grouts and other mixes for construction and for the manufacture of construction products	-----	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 20 December 2017 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow
Head of Department

beglaubigt:
Schröder

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⁴ Official Journal of the European Communities L 229 of 20 August 1997
⁵ Official Journal of the European Communities L 293 of 11 November 2010

Testing of sulfate resistance of blast furnace cement CEM III/A – Flat prism method S_{FPM}

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

Table A1: Expansion of length of mortar flat prisms – Blast furnace cement 1 (C1) with blast furnace slag 1 (S1)

	Expansion of length [mm/m] after				
	14 days	28 days	56 days	90 days	180 days
CEM III/A 42,5 N-LH/SR/LA "Deuna" (C1 with blast furnace slag 1 (S1)) – storage at 20 °C					
Ca(OH) ₂ -solution	0,01	0,04	0,08	0,09	0,06
Na ₂ SO ₄ -solution	0,04	0,11	0,19	0,28	0,38
ΔL	0,03	0,07	0,11	0,19	0,32
CEM III/A 42,5 N-LH/SR/LA "Deuna" (C1 with blast furnace slag 1 (S1)) – storage at 5 °C					
Ca(OH) ₂ -solution	-0,18	-0,20	-0,16	-0,21	-
Na ₂ SO ₄ -solution	-0,18	-0,16	-0,02	0,06	-
ΔL	0,00	0,04	0,14	0,27	-
CEM III/B 42,5 N-LH/SR – storage at 20 °C					
Ca(OH) ₂ -solution	0,02	0,04	0,09	0,07	0,07
Na ₂ SO ₄ -solution	0,04	0,06	0,12	0,12	0,19
ΔL	0,02	0,02	0,03	0,05	0,12
CEM III/B 42,5 N-LH/SR – storage at 5 °C					
Ca(OH) ₂ -solution	-0,20	-0,21	-0,15	-0,18	-
Na ₂ SO ₄ -solution	-0,20	-0,16	-0,10	-0,06	-
ΔL	0,00	0,05	0,05	0,12	-
CEM I 42,5 N-SR0 – storage at 20 °C					
Ca(OH) ₂ -solution	-0,01	0,03	0,05	0,03	0,03
Na ₂ SO ₄ -solution	0,09	0,13	0,28	0,49	1,27
ΔL	0,10	0,10	0,23	0,46	1,24
CEM I 42,5 N-SR0 – storage at 5 °C					
Ca(OH) ₂ -solution	-0,16	-0,20	-0,16	-0,21	-
Na ₂ SO ₄ -solution	-0,14	-0,12	0,09	0,38	-
ΔL	0,02	0,08	0,25	0,59	-

Blast furnace cement CEM III/A 42,5 N LH/SR/LA "Deuna"

Results of the assessment "sulfate resistance (Flat prism method) – S_{FPM} "
Expansion of length – Blast furnace cement 1 (C1) with blast furnace slag 1 (S1)

Annex A1
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Testing of sulfate resistance of blast furnace cement CEM III/A – Flat prism method S_{FPM}

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

Table A2: Expansion of length of mortar flat prisms – Blast furnace cement 2 (C2) with blast furnace slag 2 (S2)

	Expansion of length [mm/m] after				
	14 days	28 days	56 days	90 days	180 days
CEM III/A 42,5 N-LH/SR/LA "Deuna" (C2 with blast furnace slag 2 (S2)) – storage at 20 °C					
Na ₂ SO ₄ -solution	0,08	0,30	0,46	0,56	0,80
Ca(OH) ₂ -solution	0,04	0,05	0,09	0,11	0,10
ΔL	0,04	0,25	0,37	0,45	0,70
CEM III/A 42,5 N-LH/SR/LA "Deuna" (C2 with blast furnace slag 2 (S2)) – storage at 5 °C					
Na ₂ SO ₄ -solution	-0,12	-0,07	0,00	0,08	-
Ca(OH) ₂ -solution	-0,15	-0,15	-0,16	-0,20	-
ΔL	0,03	0,08	0,16	0,28	-
CEM III/B 42,5 N-LH/SR – storage at 20 °C					
Na ₂ SO ₄ -solution	0,08	0,13	0,18	0,21	0,29
Ca(OH) ₂ -solution	0,04	0,05	0,09	0,12	0,13
ΔL	0,04	0,08	0,09	0,09	0,16
CEM III/B 42,5 N-LH/SR – storage at 5 °C					
Na ₂ SO ₄ -solution	-0,13	-0,10	-0,08	-0,02	-
Ca(OH) ₂ -solution	-0,15	-0,13	-0,16	-0,16	-
ΔL	0,02	0,03	0,08	0,14	-
CEM I 42,5 R-SR0 – storage at 20 °C					
Na ₂ SO ₄ -solution	0,08	0,19	0,32	0,44	0,80
Ca(OH) ₂ -solution	0,02	0,02	0,05	0,03	0,07
ΔL	0,06	0,17	0,27	0,41	0,73
CEM I 42,5 R-SR0 – storage at 5 °C					
Na ₂ SO ₄ -solution	-0,11	-0,07	-0,06	0,05	-
Ca(OH) ₂ -solution	-0,15	-0,10	-0,12	-0,16	-
ΔL	0,04	0,03	0,06	0,21	-

Blast furnace cement CEM III/A 42,5 N LH/SR/LA "Deuna"

Results of the assessment "sulfate resistance (Flat prism method) – S_{FPM} "
Expansion of length – Blast furnace cement 2 (C2) with blast furnace slag 2 (S2)

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Testing of sulfate resistance of blast furnace cement CEM III/A – Flat prism method S_{FPM}

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

Table A3: Dynamic modulus of elasticity of mortar flat prisms - Blast furnace cement 1 (C1) with blast furnace slag 1 (S1)

	Dynamic modulus of elasticity in kN/mm ² after					
	0 days	14 days	28 days	56 days	90 days	180 days
CEM III/A 42,5 N-LH/SR/LA "Deuna" (C1 with blast furnace slag 1 (S1)) – storage at 20 °C						
Ca(OH) ₂ -solution	34,8	37,8	38,6	39,7	40,8	40,1
Na ₂ SO ₄ -solution	34,7	38,6	39,4	40,0	39,6	37,8
CEM III/A 42,5 N-LH/SR/LA "Deuna" (C1 with blast furnace slag 1 (S1)) – storage at 5 °C						
Ca(OH) ₂ -solution	35,4	36,1	36,2	37,5	38,5	-
Na ₂ SO ₄ -solution	36,1	37,9	38,8	39,0	39,4	-
CEM III/B 42,5 N-LH/SR – storage at 20 °C						
Ca(OH) ₂ -solution	32,3	35,5	36,9	37,9	38,5	39,0
Na ₂ SO ₄ -solution	32,2	36,6	37,8	39,1	37,5	31,4
CEM III/B 42,5 N-LH/SR – storage at 5 °C						
Ca(OH) ₂ -solution	31,8	33,0	33,1	33,8	34,5	-
Na ₂ SO ₄ -solution	31,8	34,0	34,5	34,9	34,9	-
CEM I 42,5 N-SR0 – storage at 20 °C						
Ca(OH) ₂ -solution	35,0	36,2	36,7	36,9	37,2	37,3
Na ₂ SO ₄ -solution	35,3	37,1	37,3	38,6	38,5	37,2
CEM I 42,5 N-SR0 – storage at 5 °C						
Ca(OH) ₂ -solution	34,8	35,5	35,9	36,3	36,9	-
Na ₂ SO ₄ -solution	34,7	36,1	36,5	37,5	37,8	-

Blast furnace cement CEM III/A 42,5 N LH/SR/LA "Deuna"

Results of the assessment "sulfate resistance (Flat prism method) – S_{FPM} "
Dynamic modulus of elasticity - Blast furnace cement 1 (C1) with blast furnace slag 1 (S1)

Annex A2
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Testing of sulfate resistance of blast furnace cement CEM III/A – Flat prism method S_{FPM}

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

Table A4: Dynamic modulus of elasticity of mortar flat prisms - Blast furnace cement 2 (C2) with blast furnace slag 2 (S2)

	Dynamic modulus of elasticity in kN/mm ² after					
	0 days	14 days	28 days	56 days	90 days	180 days
CEM III/A 42,5 N-LH/SR/LA "Deuna" (C2 with blast furnace slag 2 (S2)) – storage at 20 °C						
Ca(OH) ₂ -solution	34,7	37,4	38,9	40,1	40,7	41,7
Na ₂ SO ₄ -solution	33,5	37,8	39,0	38,7	39,0	39,8
CEM III/A 42,5 N-LH/SR/LA "Deuna" (C2 with blast furnace slag 2 (S2)) – storage at 5 °C						
Ca(OH) ₂ -solution	33,8	35,1	36,1	36,7	37,9	-
Na ₂ SO ₄ -solution	35,4	37,9	37,8	38,7	38,4	-
CEM III/B 42,5 N-LH/SR – storage at 20 °C						
Ca(OH) ₂ -solution	29,6	32,5	34,3	35,9	37,0	38,3
Na ₂ SO ₄ -solution	29,6	34,5	35,7	35,0	34,8	35,4
CEM III/B 42,5 N-LH/SR – storage at 5 °C						
Ca(OH) ₂ -solution	30,2	31,1	31,0	31,6	32,7	-
Na ₂ SO ₄ -solution	30,1	32,5	33,0	33,3	33,0	-
CEM I 42,5 R-SR0 – storage at 20 °C						
Ca(OH) ₂ -solution	36,3	37,0	37,9	38,4	38,1	37,8
Na ₂ SO ₄ -solution	37,3	39,0	39,5	40,4	40,9	41,3
CEM I 42,5 R-SR0 – storage at 5 °C						
Ca(OH) ₂ -solution	36,3	37,1	37,2	37,1	37,9	-
Na ₂ SO ₄ -solution	36,3	37,4	37,6	37,5	38,0	-

Blast furnace cement CEM III/A 42,5 N LH/SR/LA "Deuna"

Results of the assessment "sulfate resistance (Flat prism method) – S_{FPM} "
Dynamic modulus of elasticity - Blast furnace cement 2 (C2) with blast furnace slag 2 (S2)

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Testing of sulfate resistance of blast furnace cement CEM III/A – Flat prism method S_{FPM}

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

Table A5: Mass of mortar flat prisms - Blast furnace cement 1 (C1) with blast furnace slag 1 (S1)

	Mass in g after					
	0 days	14 days	28 days	56 days	90 days	180 days
CEM III/A 42,5 N-LH/SR/LA "Deuna" (C1 with blast furnace slag 1 (S1)) – storage at 20 °C						
Ca(OH) ₂ -solution	147,58	147,66	147,84	148,02	148,22	148,50
Na ₂ SO ₄ -solution	147,95	148,23	148,34	148,69	149,07	149,80
CEM III/A 42,5 N-LH/SR/LA "Deuna" (C1 with blast furnace slag 1 (S1)) – storage at 5 °C						
Ca(OH) ₂ -solution	148,33	148,64	148,81	148,99	149,14	-
Na ₂ SO ₄ -solution	148,06	148,44	148,60	148,98	149,53	-
CEM III/B 42,5 N-LH/SR – storage at 20 °C						
Ca(OH) ₂ -solution	146,95	146,,87	147,08	147,24	147,51	147,73
Na ₂ SO ₄ -solution	147,49	147,54	147,67	147,80	147,90	148,97
CEM III/B 42,5 N-LH/SR – storage at 5 °C						
Ca(OH) ₂ -solution	146,64	147,05	147,31	147,34	147,48	-
Na ₂ SO ₄ -solution	146,24	146,34	146,43	146,73	147,03	-
CEM I 42,5 N-SR0 – storage at 20 °C						
Ca(OH) ₂ -solution	148,14	148,16	148,16	148,10	148,21	148,46
Na ₂ SO ₄ -solution	148,16	148,65	148,80	149,21	149,61	150,54
CEM I 42,5 N-SR0 – storage at 5 °C						
Ca(OH) ₂ -solution	147,62	147,94	148,15	148,21	148,25	-
Na ₂ SO ₄ -solution	147,67	148,14	148,41	148,74	149,13	-

Blast furnace cement CEM III/A 42,5 N LH/SR/LA "Deuna"

Results of the assessment "sulfate resistance (Flat prism method) – S_{FPM} "
Mass of the mortar flat prisms - Blast furnace cement 1 (C1) with blast furnace slag 1 (S1)

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Testing of sulfate resistance of blast furnace cement CEM III/A – Flat prism method S_{FPM}

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

Table A6: Mass of mortar flat prisms - Blast furnace cement 2 (C2) with blast furnace slag 2 (S2)

	Mass in g after					
	0 days	14 days	28 days	56 days	90 days	180 days
CEM III/A 42,5 N-LH/SR/LA "Deuna" (C2 with blast furnace slag 2 (S2)) – storage at 20 °C						
Ca(OH) ₂ -solution	147,7	148,2	148,4	148,3	148,7	148,9
Na ₂ SO ₄ -solution	147,0	147,1	147,6	148,3	148,8	149,2
CEM III/A 42,5-LH/SR/LA "Deuna" (C2 with blast furnace slag 2 (S2)) – storage at 5 °C						
Ca(OH) ₂ -solution	146,3	146,7	146,8	146,8	147,3	-
Na ₂ SO ₄ -solution	147,6	147,9	148,3	148,9	149,3	-
CEM III/B 42,5 N-LH/SR – storage at 20 °C						
Ca(OH) ₂ -solution	146,0	146,4	146,5	147,0	146,7	147,0
Na ₂ SO ₄ -solution	145,92	146,5	146,5	146,4	147,5	148,1
CEM III/B 42,5 N-LH/SR – storage at 5 °C						
Ca(OH) ₂ -solution	145,7	146,1	146,0	146,1	146,4	-
Na ₂ SO ₄ -solution	145,3	145,5	145,5	145,9	146,2	-
CEM I 42,5 R-SR0 – storage at 20 °C						
Ca(OH) ₂ -solution	146,5	146,6	146,6	146,5	146,6	147,3
Na ₂ SO ₄ -solution	148,9	149,1	149,4	149,8	150,2	150,7
CEM I 42,5 R-SR0 – storage at 5 °C						
Ca(OH) ₂ -solution	146,9	147,3	147,3	147,4	147,5	-
Na ₂ SO ₄ -solution	147,8	148,2	148,4	148,8	149,4	-

Blast furnace cement CEM III/A 42,5 N LH/SR/LA "Deuna"

Results of the assessment "sulfate resistance (Flat prism method) – S_{FPM} "
Mass of the mortar flat prisms – Blast furnace cement 2 (C2) with blast furnace slag 2 (S2)

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Figure A1: Flat prism after 180 days storage in Na₂SO₄-solution at 20 °C
(top: prism from CEM III/A 42,5 N-LH/SR/LA "Deuna" (C1) with blast furnace slag 1 (S1);
mid: CEM I 42,5 N-SR0; bottom: CEM III/B 42,5 N-LH/SR)



Figure A2: Flat prism after 180 days storage in Na₂SO₄-solution at 5 °C
(top: prism from CEM III/A 42,5 N-LH/SR/LA "Deuna" (C1) with blast furnace slag 1 (S1);
mid: CEM I 42,5 N-SR0; bottom: CEM III/B 42,5 N-LH/SR)

Blast furnace cement CEM III/A 42,5 N LH/SR/LA "Deuna"

Results of the assessment "sulfate resistance (flat prism method) – S_{FPM}"
Visual examination of the flat prism from blast furnace cement CEM III/A 42,5 N-LH/SR/LA
"Deuna" (C1) with blast furnace slag 1 (S1)

Annex A4
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Figure A3: Flat prism from blast furnace cement CEM III/A 42,5 N-LH/SR/LA "Deuna" (C2) with blast furnace 2 (S2) after 180 days storage in Na₂SO₄-solutions at 20 °C (on the left) and 5 °C (on the right)

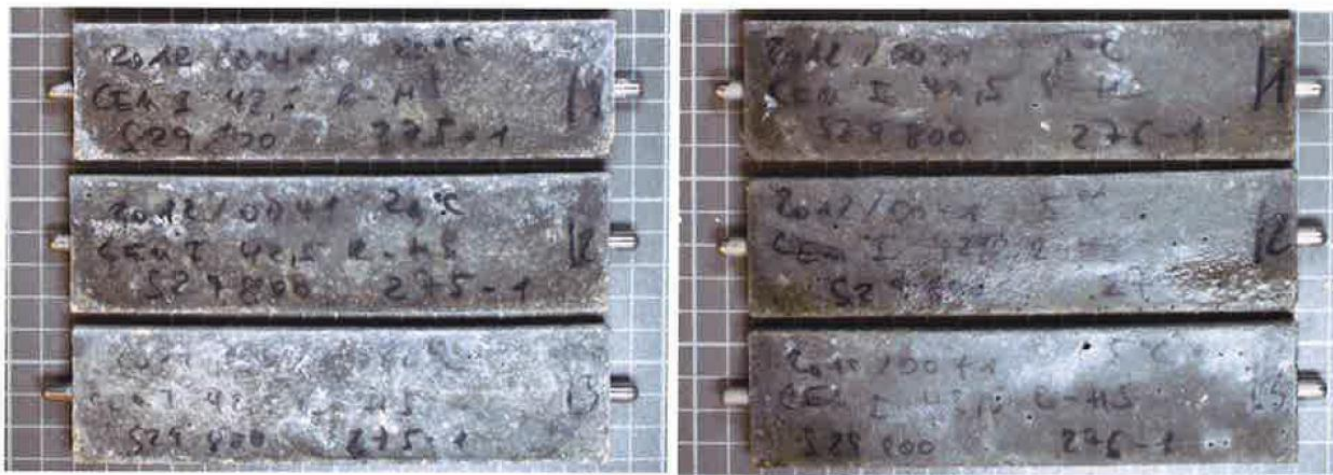


Figures A4: Flat prism from blast furnace cement CEM III/B 42,5 N-LH/SR after 180 days storage in Na₂SO₄-solutions at 20 °C (on the left) and 5 °C (on the right)

Blast furnace cement CEM III/A 42,5 N LH/SR/LA "Deuna"

Results of the assessment "sulfate resistance (flat prism method) – S_{FPM}"
Visual examination of the flat prism from CEM III/A 42,5 N-LH/SR/LA "Deuna" (C2) with blast furnace 2 (S2) and CEM III/B 42,5 N-LH/SR

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Figures A5: Flat prism from Portland cement CEM I 42,5 R-SR0 after 180 days storage in Na₂SO₄-solutions at 20 °C (on the left) and 5 °C (on the right)

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Blast furnace cement CEM III/A 42,5 N LH/SR/LA "Deuna"

Results of the assessment "sulfate resistance (flat prism method) – S_{FPM}"
 Visual examination of the flat prism from Portland cement CEM I 42,5 R-SR0

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