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Test Report

Project: **P 14241**

Test Order: External quality assurance test (2024) for

SILIKAL® R 17^{a)}

according to DAfStb Directive 'Manufacture and Use of
Cement-Bound Grout Concrete and Mortar'

Sample Description: Methacrylate resin mortar

Number of Samples: 2

Plant: Mainhausen

Sampling Date: 26.01.2024

Sample Receipt Date: 26.01.2024

Testing Period: April – August 2024

This test report consists of: 6 Pages

Flörsheim-Wicker, 02.09.2024

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- Digitally signed | see <http://ca.kiwa-deutschland.de> for more details -



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The test results refer exclusively to the test items specified. Reproduction of excerpts from the test report is not permitted without written permission from the testing laboratory.

^{a)} Information from client

^{k)} Amendment

Managing Director: Prof. Dr. Roland Hüttel, Wulf Jannsen, Dr. Gero Schönwaßer

Amtsgericht Hamburg, HRB 130568, St.Nr.: 46/736/03268



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^{a)} Information provided by the client

1 Procedure

Kiwa GmbH Polymer Institute was commissioned by Silikal GmbH, Mainhausen, to carry out the external quality assurance test 2024 for

SILIKAL® R 17

for the manufacturing plant in **Mainhausen**.

The basis for this is the DAfStb Guideline:07-2019 “*Production and Use of Cement-Based Grouting Concrete and Mortar.*”

As part of the external quality assurance test, the properties listed in the following table were tested or examined:

Table 1: Tests

Test	Test Method
Flow properties	DAfStb Guideline:07-2019 “ <i>Production and Use of Cement-Based Grouting Concrete and Mortar</i> ”
Shrinkage after 91 days	
Early strength after 24 hours	Annex C taking into account DIN EN 196–1:2016
Flexural and compressive strength	DIN EN 196–1:2016

2 Sample Receipt

The following materials were taken on 26 January 2024 by an employee of the Polymer Institute at the Mainhausen plant.

Table 1: Sample Receipt

Nr.	Product ^{a)}	Batch ^{a)}	Quantity
1	SILIKAL® R 7/17 Powder	240117	1 x 15,0 [kg]
2	SILIKAL® R 17 Hardener	348816 02/24 00200	1 x 2,0 [L]

Beschreibung des Produkts ^{a)}

SILIKAL® R 17: Solvent-free, 2- component methacrylate resin mortar.

3 Preparation of Mixtures

The storage of the equipment and materials as well as the performance of the tests were carried out under standard conditions in accordance with DIN EN 23270:09-1991 *“Temperatures and humidity for conditioning and testing”*, as specified by the client. The prisms were prepared by an employee of the Polymer Institute at the premises of the Polymer Institute.

Table 2: Mixing Ratio ^{a)}

Produkt	Powder	Hardener
	[Parts by mass]	
SILIKAL® R 17	15,0	1,875

To prepare the fresh mortar, the hardener was placed first, then the corresponding quantity of homogenised powder component was added, and the mixture was stirred using a mixing machine until homogeneous.

4 Tests

The storage of the equipment and materials as well as the performance of the tests were carried out under standard conditions in accordance with DIN EN 23270:1991-09.

4.1 Flow Properties

The consistency of the fresh mortar was determined according to the DAfStb Guideline:07-2019 *“Production and Use of Cement-Based Grouting Concrete and Mortar”*, Annex C, Section C.2.1.

The flow spread was measured using a flow channel according to Figure C.1.

The measurements were taken 5 and 15 minutes after mortar preparation (and additionally after 30 minutes, deviating from the guideline) because the material had already hardened after 15 minutes.

4.2 Shrinkage after 7, 28, 56 and 91 days

The shrinkage was determined based on the DAfStb Guideline *“Protection and Repair of Concrete Components”*, Part 4: Test Methods:10-2001, Section 2.5.6.

However, the length change of the prisms was measured according to the DAfStb Guideline:07-2019 *“Production and Use of Cement-Based Grouting Concrete and Mortar”*, Annex C, Section C.6, after 7, 28, 56 and 91 days on three prisms.

The initial measurement was taken after demoulding at the age of 1 day.

4.3 Early Strength after 24 hours

The determination of flexural and compressive strength was carried out according to the DAfStb Guideline:07-2019 *“Production and Use of Cement-Based Grouting Concrete and Mortar”*, Annex C, Section C.5, taking into account DIN EN 196-1:2016-11, after 24 hours under curing condition B.

^{a)} Information provided by the client

4.4 Flexural and Compressive Strength

The determination of flexural and compressive strength was carried out according to DAfStb Guideline:07-2019 "Production and Use of Cement-Based Grouting Concrete and Mortar", Annex C, Section C.5, taking into account DIN EN 196-1:2016-11 under curing condition B. The testing was performed at the ages of 7, 28, 56, and 91 days.

5 Results

Table 2: Flow Properties

Time [min]	Flow Spread [mm]	
	Individual Values	Mean Value
5	559 ; 559 ; 559	559
15	554 ; 554 ; 554	554
Decrease in flow spread:		5
Requirement:		≤ 100

Requirement according to WPK:

Flow spread after 5 min: **> 550 mm**

Requirement according to DAfStb Guideline:07-2019 "Production and Use of Cement-Based Grouting Concrete and Mortar":

Flow spread: **Class f1 550 – 640 mm**

Table 3: Shrinkage after 7, 28, 56 and 91 days

Test Age [d]	Relative Length Change in ‰			
	Sample			Mean Value
	1	2	3	
7	0,050	0,056	0,056	0,054
28	0,113	0,113	0,100	0,108
56	0,144	0,144	0,156	0,148
91	0,156	0,156	0,188	0,167

Length change according to DAfStb Guideline:07-2019 "Production and Use of Cement-Based Grouting Concrete and Mortar":

Shrinkage Class SKVM 0 **Mean Value < 0.6 ‰**

Table 4: Early Strength after 24 hours

Age [d]	Flexural Strength in N/mm ²		Compressive Strength in N/mm ²		
	Individual Values	Mean Value	Individual Values		Mean Value
1	20,0	19,9	90,5	90,7	92,3
	19,9		92,6	94,4	
	19,7		93,2	92,2	

Requirement according to WPK:

Flexural strength – early strength: **> 5 N/mm²**

Compressive strength – early strength: **> 25 N/mm²**

Requirement according to DAfStb Guideline:07-2019 „*Production and Use of Cement-Based Grouting Concrete and Mortar*“:

Compressive strength at 1 day: Strength Class A **> 40 N/mm²**

Table 5: Flexural and Compressive Strengths after 7, 28, 56 and 91 Days

Age [d]	Flexural Strength in N/mm ²		Compressive Strength in N/mm ²		
	Individual Values	Mean Value	Individual Values		Mean Value
7	20,8	20,3	91,9	91,5	91,8
	19,9		91,8	91,6	
	20,3		94,0	90,2	
28	18,0	18,3	81,7	82,8	82,4
	17,9		81,7	82,0	
	19,0		82,1	84,0	
56	19,0	18,9	84,8	85,2	84,6
	19,2		85,0	84,4	
	18,4		83,1	85,1	
91	17,8	18,4	84,4	85,5	85,5
	18,3		86,1	85,1	
	19,0		85,5	86,5	

Requirement according to DAfStb Guideline :07-2019

“*Production and Use of Cement-Based Grouting Concrete and Mortar*“:

Compressive strength: There must be **no reduction in strength at 56 and 91 days** compared with the 28-day value.