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## Test Report

– Translation –

Document number: (2101/419/16) – Wein dated 11/09/2017

Order date: 30/05/2016

Order received: 30/05/2016

Subject: Testing of a non-loadbearing, separating, heat-insulating wall structure, consisting of approx. 200 mm thick glass bricks to determine the fire resistance time when exposed to fire on one side

Test basis: DIN EN 1364-1: 1999-10 in conjunction with  
DIN EN 1363-1: 2012-10

Specimen received: 16/08/2016

Sampling: MPA Braunschweig did not receive information about an official sampling.

Specimen marking: None

Test date: 12/10/2016

This test report consists of 9 pages including cover sheet and 32 annexes.



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für das Bauwesen  
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Notified body (0761-CPR) -  
Approved as a civil engineering testing,  
inspection and certifying body as well as  
notified as a civil engineering testing and  
certifying body.

## **1 General**

The order required a non-loadbearing, separating, heat-insulating wall structure consisting of approx. 200 mm thick glass bricks to be tested in accordance with DIN EN 1364-1: 1999-10 in conjunction with DIN EN 1363-1: 2012-10 in order to determine the fire resistance time when exposed to fire on one side.

This test report describes in detail the assembly process, the test conditions and the results which were achieved with the specific component described here, after it was tested in accordance with the procedures presented in DIN EN 1364-1: 1999-10. This test report does not cover any significant deviation in size, structural details, loads, stress states and boundary conditions, except the tolerances which are admissible in the respective test procedure for the field of direct application.

Taking into consideration the special nature of the tests conducted to establish the fire resistance time and the difficulties this implies for quantifying any uncertainty in measuring the fire resistance time, a defined degree of accuracy cannot be given for the result established in the test.

The Materials Testing Institute was not involved in the selection of the test specimen.

## **2 Description of the test specimen**

### **2.1 General**

The test specimen measuring height x length x thickness = 2995 mm x 2995 mm x 200 mm was installed as vertical partition in front of a test furnace with the clear dimensions height x width = 3000 mm x 3000 mm.

For further details of the test specimen, reference is made to the sections below and the annexes to this test report.

## 2.2 Overview of the fire-safety-specific structural details

Glass brick	Brick designation	acc. to DIN EN 1051-2
	Dimensions (nominal)	Length x width x height = 190 mm x 200 mm x 190 mm
	Structure	Sandwich structure (provided by manufacturer) consisting of two glass bricks each measuring $w \times h \times d = 190 \text{ mm} \times 190 \text{ mm} \times 80 \text{ mm}$ , and a fire protection inlay measuring $w \times h \times d = 190 \text{ mm} \times 190 \text{ mm} \times 40 \text{ mm}$ , stuck together by means of silicone <sup>1)</sup> For the structure of the fire protection inlay, please refer to Annexes 1.5 and 1.6
Mortar	Manufacturer	Quick-Mix (manufacturing plant 36) <sup>2)</sup>
	Designation	Normal brickwork mortar, mortar group 3
	Application	Thick-bed with inserted reinforcement
	Butt joints mortared	Yes
	Average bending tensile strength [N/mm <sup>2</sup> ]	6.5
	Average compressive strength [N/mm <sup>2</sup> ]	49.3
Grout	Manufacturer	SAKRET Systembaustoffe
	Designation	Mortar/grout for joints
	Application	Subsequently grouted, statically not relevant
	Butt joints mortared	Yes
Reinforcement	Quality	B500NR, material no. 1.4482
	Joints	<u>Horizontal longitudinal reinforcement:</u> 4 Ø 6 mm, two each below each glass brick <u>Vertical longitudinal reinforcement:</u> 2 Ø 6 mm, alternately in each joint two rods (external/internal)
	Marginal strip	<u>Horizontal longitudinal reinforcement:</u> 4 Ø 6 mm, evenly distributed over the joints <u>Vertical longitudinal reinforcement:</u> 4 Ø 6 mm, evenly distributed over the joints

Upper edge	Angular steel	w x h x d = 50 mm x 50 mm 5 mm <sup>3)</sup> , galvanized
	Mineral wool	d = 25 mm (non-combustible, melting point $\geq 1000^{\circ}\text{C}$ )
	Fasteners	WÜRTH dowels with steel screw "W-UR F 14", $\varnothing$ 14 mm x 110 mm
Other edges	Mineral wool	d = 25 mm (non-combustible, melting point $\geq 1000^{\circ}\text{C}$ )
Conditioning		Start of storage at hall climate conditions (Hall 3a): 26/08/2016
		End of storage at hall climate conditions (Hall 3a): 12/10/2016 (test date)
Age of the specimen on the day of testing		53 days

<sup>1)</sup> The Materials Testing Institute received no further information about the materials used.

<sup>2)</sup> acc. to label on container.

<sup>3)</sup> The Materials Testing Institute received no details with regard to the quality.

### 3 Characteristics of the construction products used

The strength and moisture content of the test specimen at the time of testing were approximately the same as to be expected during normal use.

The tested structure and the construction products used for the system are in compliance with the details specified in the annexes regarding strength, moisture content and apparent density.

### 4 Test set-up and testing

The specimen was installed as vertical partition of a fire chamber with the clear opening dimensions width x height = 3000 mm x 3000 mm. The client's expert staff installed the specimen described in section 2 as wall held on one side (top). The free edges formed a gap of approx. 25 mm to the test frame, which was closed with mineral wool (non-combustible, melting point  $\geq 1.000^{\circ}\text{C}$ ).

The fire test applying a fire load on one side was performed in accordance with DIN EN 1364-1: 1999-10 in conjunction with DIN EN 1363-1: 2012-10.

The fire chamber was exposed to the flames along the standard temperature-time curve (ETK) in accordance with DIN EN 1363-1: 2012-10, Section 5.1.1. Six (6) plate thermometers ("plates") were used to measure the fire temperatures inside the fire chamber in accordance with DIN EN 1363-1:2012-10, section 4.5.1.1

The furnace pressure for the fire test was set in accordance with DIN EN 1363-1:2012-10, Section 5.2.

Thermal elements according to DIN EN 1363-1: 2012-10, section 4.5.1.2 were used to measure the temperatures on the side of the specimen not exposed to the fire.

The deflection of the specimen was measured in accordance with DIN EN 1364-1: 1999-10, Section 9.3, at several points of the specimen.

As agreed with the client, additional temperature measuring points were provided inside the specimen. The measured values of these measuring points serve as information and are not considered for assessment according to the criteria of the above stated standards.

The position of the measuring points is to be taken from the annexes.

## **5 Test results and observations**

The annexes provide details of the temperatures recorded in the fire chamber during the fire test, the temperature rises compared to the initial temperature measured on the side of the specimen not exposed to the flames, the deflection of the specimen, the ambient temperature, the error integral, the differential pressure in the fire chamber, the temperatures of the additional measuring points inside the specimen, as well as the observations made during fire testing.

## **6 Summary of test results**

On 12/10/2016, a test was carried out on a non-loadbearing, separating, heat-insulating wall structure in accordance with DIN EN 1364-1: 1999-10 in conjunction with DIN EN 1363-1: 2012-10 when exposed to fire on one side.

The test results are summarized in Table 1 on the next page.

Table 1: Summary of test results

Line	Referenced standard: DIN EN 1363-1: 2012-10 section	Requirements	Criteria	Test results				
1	11.1	<u>Load bearing capacity</u>	Limit of vertical compression	Limit value exceeded after:	- min. <sup>1)</sup>			
2		i.e. compliance	Limit of vertical compression velocity	Limit value exceeded after:	- min. <sup>1)</sup>			
			Loss of load bearing capacity during/after shock load	Load-bearing capacity lost after:	- min. <sup>1)</sup>			
3	11.2	<u>Integrity.</u>	Ignition of cotton pad	Cotton pad ignited after:	- min. <sup>2)</sup>			
					During / after shock load	- min. <sup>2)</sup>		
4		i.e. absence of	Gaps	Gap gauge could be inserted after:	- min. <sup>2)</sup>			
					Gap gauge could be inserted during / after shock load after:	- min. <sup>2)</sup>		
5				Flames on the side not exposed to the flames	Sustained flaming occurred after:	- min.		
				Sustained flaming occurred during / after shock load after:	- min.			
6	11.3	<u>Thermal insulation</u> , i.e. temperature rises above initial temperature on the side not exposed to the flames:		Test duration in minutes:	120	-	-	131
7		Maximum admissible mean value $\Delta T = 140$ K		Max. temperature rise detected: <b>Mean value</b> in K	51	-	-	54
8		Maximum admissible individual value $\Delta T = 180$ K		Max. temperature rise detected: <b>Individual value</b> in K	67 [Mst. 10]	-	-	69 [Mst. 10]
9	10.4.4	Deflection	Max. deflection in mm:	48 [Mst. D]	-	-	<sup>3)</sup>	

<sup>1)</sup> Did not form part of the test.

<sup>2)</sup> No reasons for testing, thus not tested.

<sup>3)</sup> No further measurement performed because the fire test was terminated.

## 7 Conclusions and recommendations

Table 2 below shows the most important test results, taking the performance criteria into account.

Table 2: Summary of performance criteria

	Performance criteria in accordance with DIN EN 1363-1: 2012-10 and DIN EN 1363-2: 1999-10	Until [minutes]:
R	Load-bearing capacity	-
E	Integrity <sup>1)</sup>	≥131
I	Thermal insulation <sup>1)2)</sup>	≥131
M	Mechanical load	-

<sup>1)</sup> In accordance with DIN EN 1363-1:2012-10, section 11.4.1, the performance criteria "thermal insulation" and "integrity" have to be automatically considered as not having been complied with when the criterion "loadbearing capacity" is not complied with.

<sup>2)</sup> In accordance with DIN EN 1363-1:2012-10, Section 11.4.2, the performance criterion "thermal insulation" has to be automatically considered as not having been complied with when the criterion "integrity" is not complied with.

Based on the test results (see Table 1) and the performance criteria met (see Table 2), it can be recommended that the tested specimen be assigned to fire resistance class **EI 120** in accordance with the classification standard DIN EN 13 501-2:2010-02.

## 8 Field of direct application in accordance with DIN EN 1364-1: 1999-10, Section 13

### 8.1 General

The results of the fire resistance test can be directly transferred to similar designs, provided that one or several of the modifications listed below have been applied and that the design continues to comply with the requirements of the corresponding measurement standard in terms of its rigidity and structural integrity.

Field of direct application in accordance with the standard	Execution is
a) Reducing the height of the wall	admissible
b) Increasing the thickness of the wall	admissible
c) Increasing the thickness of the component elements	admissible
d) Reducing the lengths of boards or panels, except their thickness	admissible
e) Reducing the distances between pedestals	not applicable
f) Reducing the distances between the fastening elements	not applicable
g) Increasing the number of horizontal joints, provided the test was carried out with a joint of maximally 500 mm to the upper edge	admissible
h) Use of built-ins and installation parts of the tested type, provided these built-ins and installation parts were tested at a distance of maximally 500 mm to the upper edge	not admissible
i) Horizontal and/or vertical joints, corresponding to the tested type	admissible

### 8.2 Increasing the width

Field of direct application in accordance with the standard	Execution is
Increasing the width, provided the test specimen was tested with original width or with a width of 3 m, with the larger width being relevant	admissible

### 8.3 Increasing the height

Field of direct application in accordance with the standard	Execution is
Increase to 4 m, provided the specimen was tested with a minimum height of 3 m and the maximum lateral deflection of the specimen of 100 mm was not exceeded	admissible
Increase to 4 m, provided the specimen was tested with a minimum height of 3 m and the possibilities for expansion were proportionally increased.	not applicable



#### 8.4 Supporting structure

Field of direct application in accordance with the standard	Execution is
Installation in / connection to solid structures with a higher fire resistance time than the tested structure	admissible

*This document is the translated version of Prüfbericht 2101/419/16 dated 11/09/2017. The legally binding text is the aforementioned German Prüfbericht.*

  
ORR Dr.-Ing. Blume  
Head of Testing Laboratory



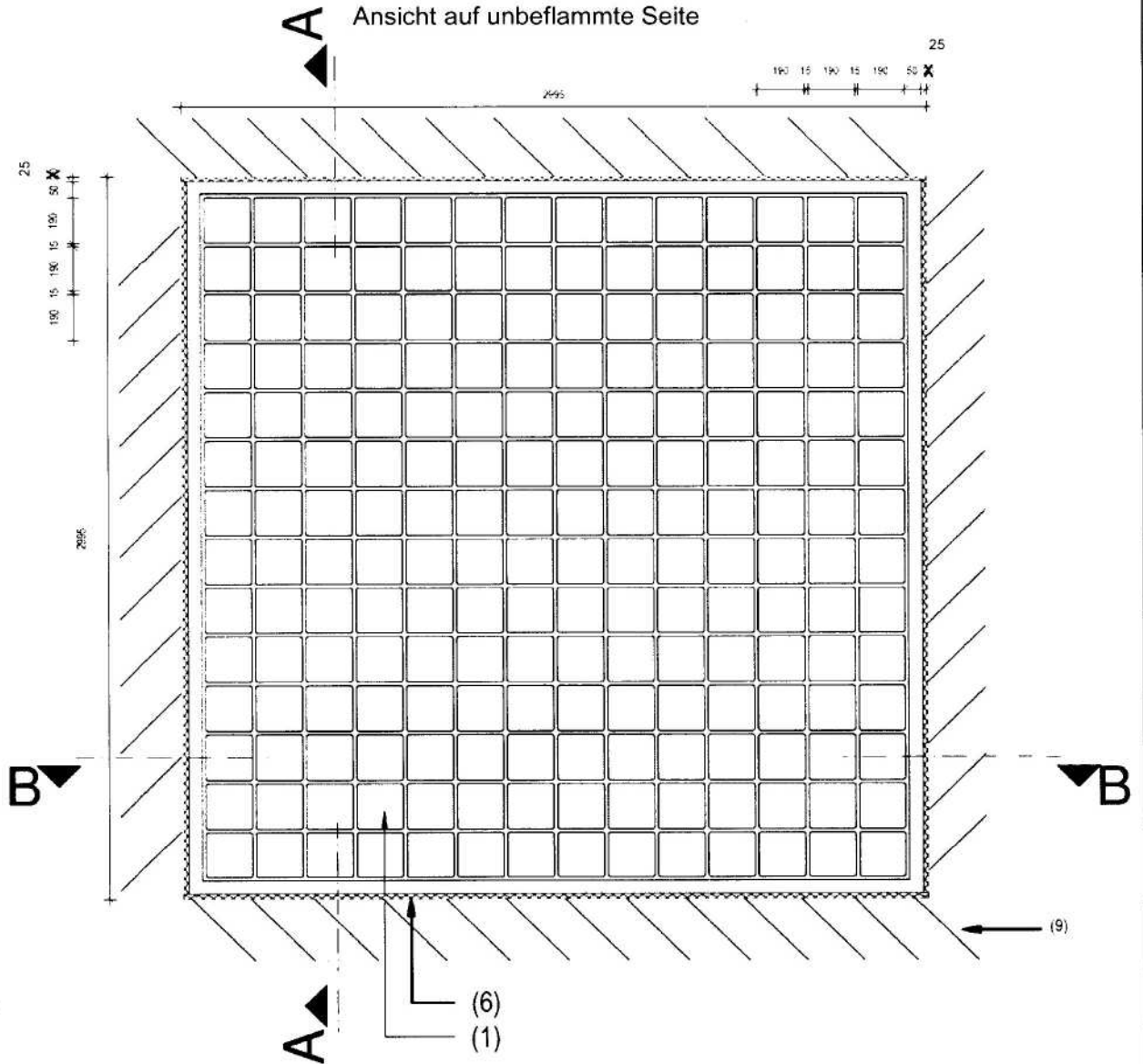
  
i.A.  
Dipl.-Ing. Mittmann  
Engineer/Official in Charge

  
i.A.  
Dipl.-Ing. Cohrs  
Engineer/Official in Charge

#### List of annexes:

- 1.1 to 1.11 : Structural design of the specimen, position of measuring points, characteristics of the construction products used
- 2.1 to 2.12 : Details recorded during fire testing
- 3.1 to 3.9 : Photo documentation

# Prüfkörper



All dimension in mm

**Structural design of the test specimen**  
View test specimen

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Annex 1.1 to  
Test Report  
No. 2101/419/16

- (1) Glassten nach DIN EN 1051-2 vom Typ Glasstein 19x19x20 cm
- (2) Mörtelfuge 15mm breit, Normalmauermörtel der Mörtelgruppe 3, Hersteller Quick-Mix oder vergleichbarer Hersteller
- (3) Fugenbewehrung (6mm), nach DIN 488-1 und 488-2
- (4) Randstreifen aus Mörtel wie (2)
- (5) Randstreifenbewehrung (6mm), nach 488-2
- (6) Nicht brennbare (Baustoffklasse A1 nach DIN 4102-1 bzw. A2-S1,d0 nach DIN EN 13501-1), Mineralfaserplatte  $T_s > 1000^\circ\text{C}$ ,  $d=20\text{mm}$
- (7) Winkelstahl nach DIN EN 10056-1, 50x50x5mm
- (8) Zugelassener Dübel mit Schraube, Hersteller Würth, W-UR / W-UR F14x110 (14mm Durchmesser, 110mm Länge) oder vergleichbarer Hersteller
- (9) Prüfraumen
- (10) BM Glasstein Vollsicht 19x19x8cm
- (11) Brandschutzinlay 19x19x4cm
- (12) Stegglas aus Floatglas, 19x1x0,4cm bzw. 19x1x0,6cm
- (13) Außenscheiben 19x19x0,4cm, gleiches Material wie (12)
- (14) Brandschutzgel, der Hohlraum des Inlays ist vollständig damit gefüllt

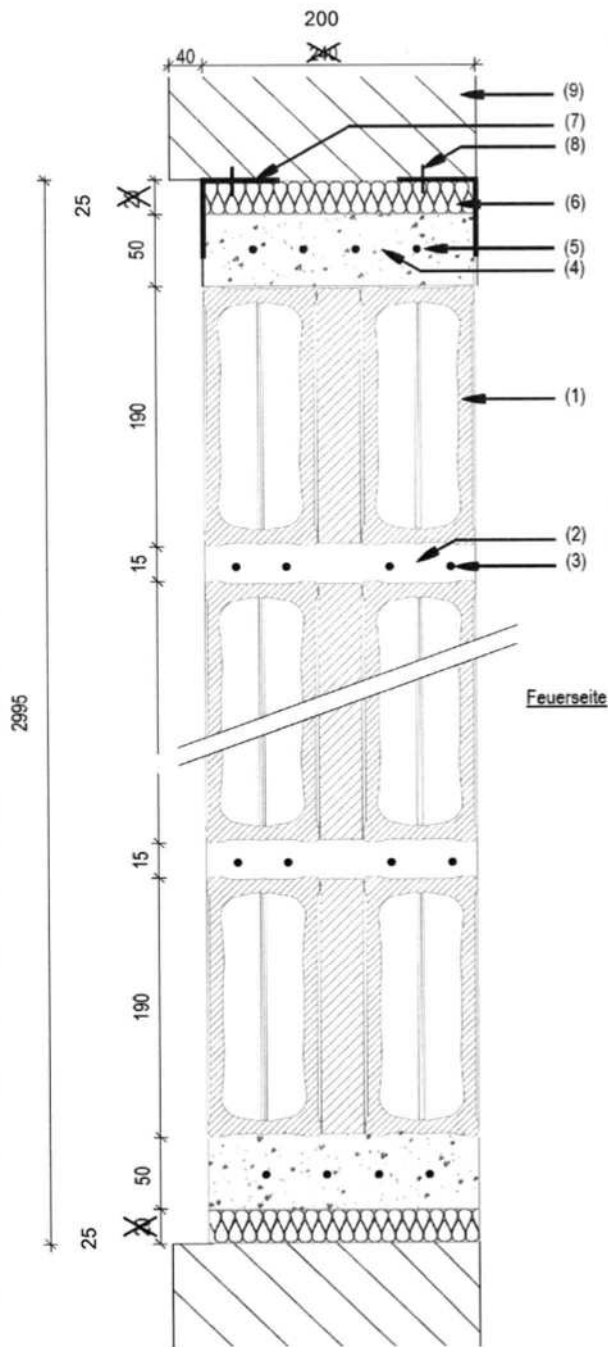
**Structural design of the test specimen**  
Item list

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der Technischen Universität Braunschweig

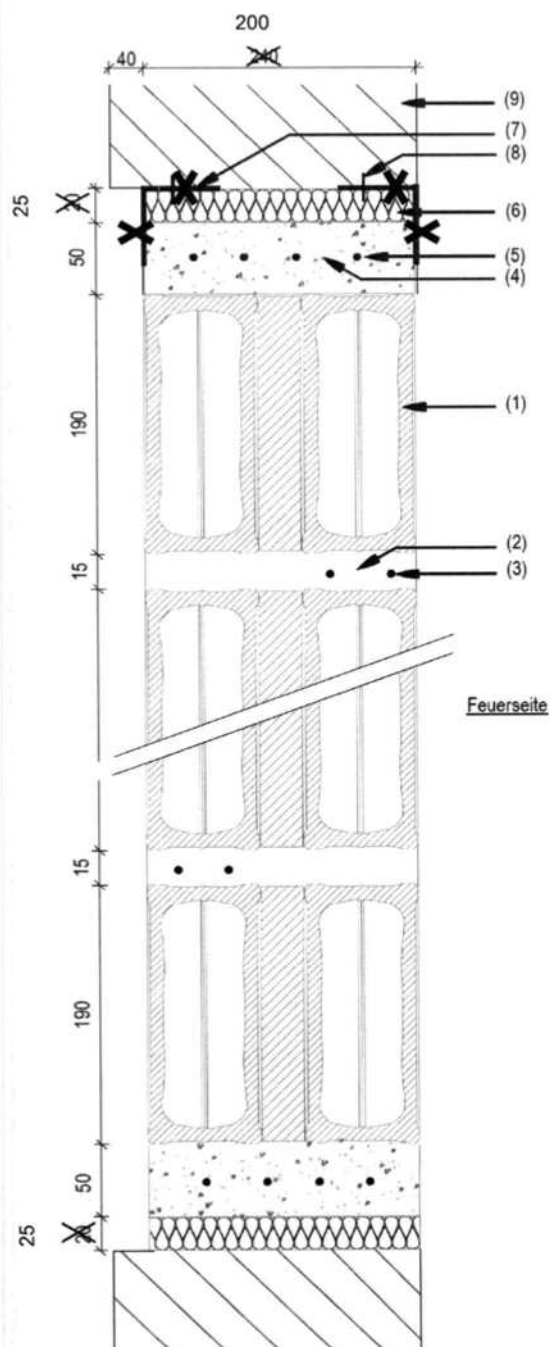
Annex 1.2 to  
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# Test specimen

Schnitt A-A (vertikal)



Schnitt B-B (horizontal)



All dimension in mm

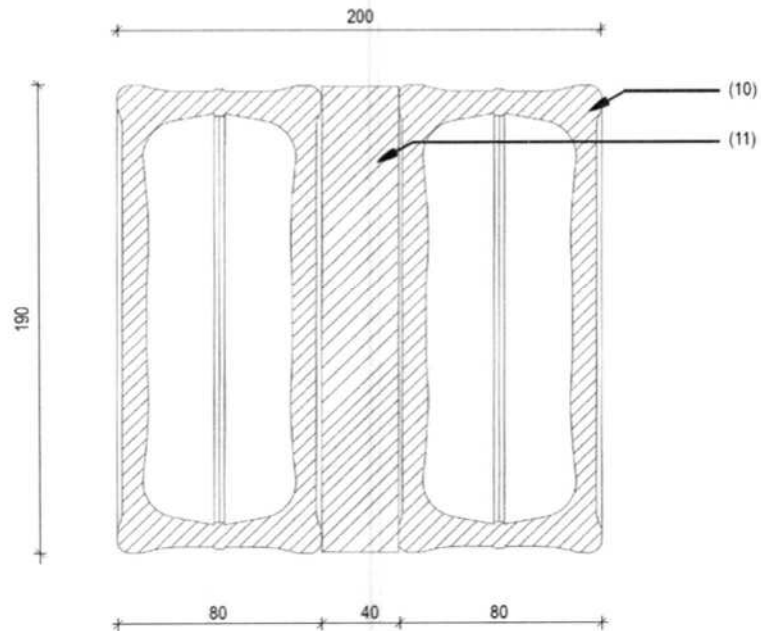
**Structural design of the test specimen**  
Section A-A / Section B-B

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der Technischen Universität Braunschweig

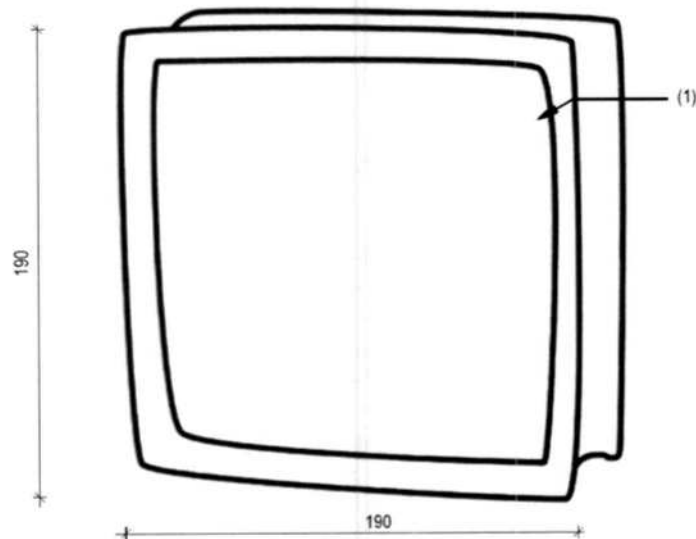
Annex 1.3 to  
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# Glass bricks

## Schnitt verikal und horizontal



## Front



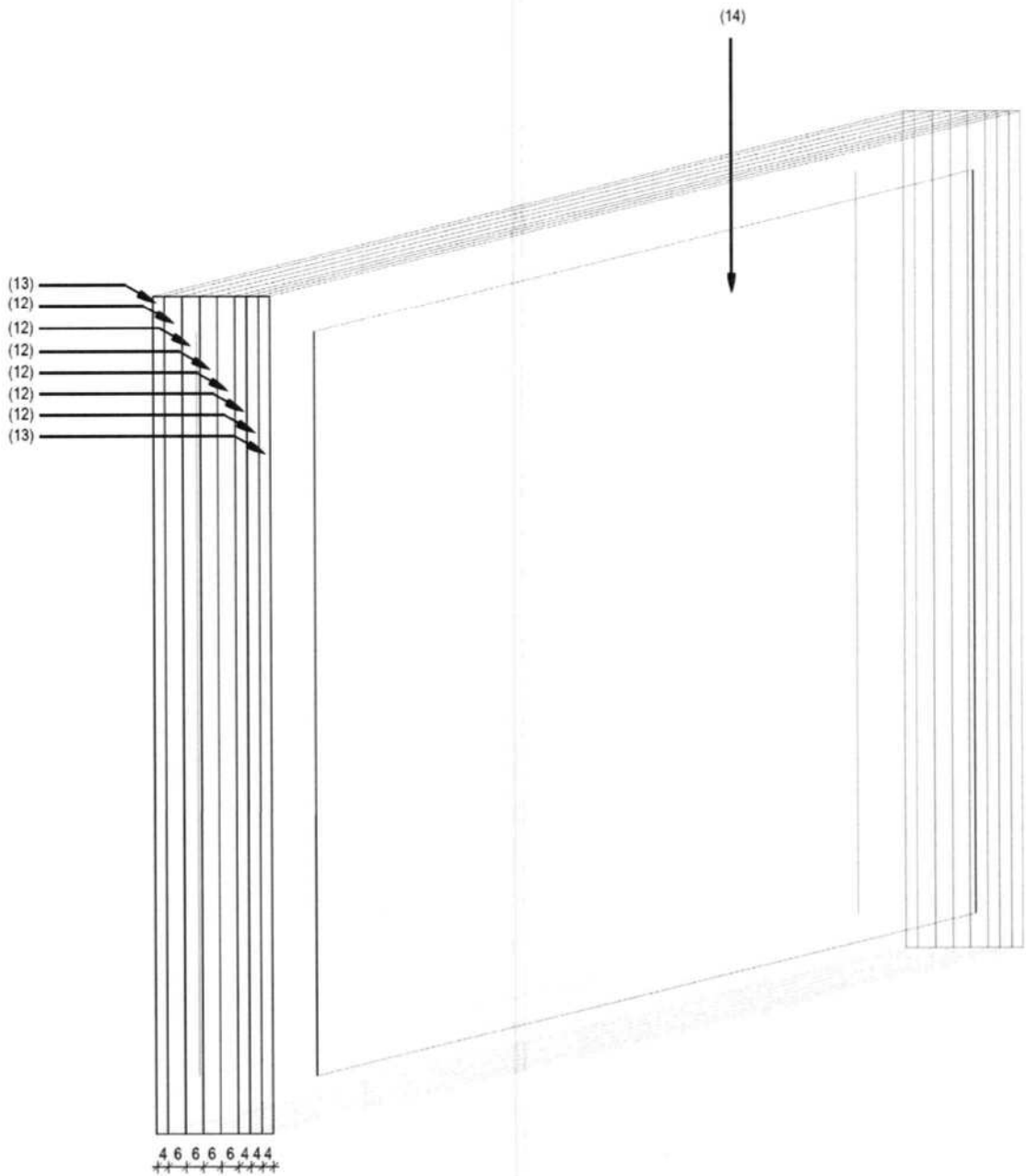
All dimension in mm

**Structural design of the test specimen**  
Section vertical and horizontal of the brick/ Front of the brick

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Annex 1.4 to  
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# Fire protection inlay



All dimension in mm

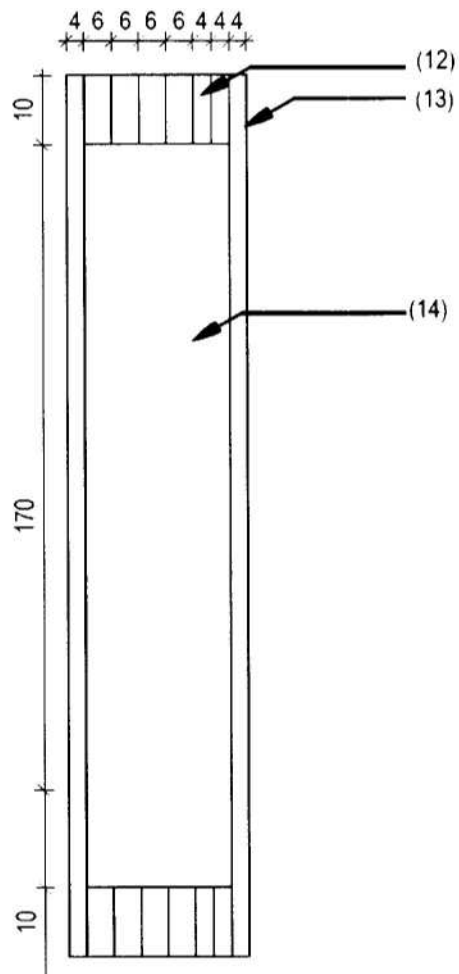
**Structural design of the test specimen**  
fire protection inlay

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Annex 1.5 to  
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# Fire protection inlay

## Schnitt vertikal und horizontal



All dimension in mm

**Structural design of the test specimen**  
Fire protection inlay- Section vertical and horizontal

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Annex 1.6 to  
Test Report  
No. 2101/419/16

# Peter Scheibmayer

## Rostfreie Edelstahlbewehrung



Peter Scheibmayer • Max-Planck-Straße 6 • 47475 Kamp-Lintfort

Lieferschein-Nr.: 2016478  
 Datum: 20.09.2016  
 zu Bestell-Nr.: LBE160169  
 Bestellung vom: 16.09.2016  
 Projekt: Lager

### Lieferschein

Menge	Abm. (mm)	Bezeichnung	Gewicht in kg	
			brutto	netto
300 Stk	6,0	Edelstahlbewehrung Inoxripp4486, kaltgerippt als Stab, L=1.000mm		69
<b>Gesamtgewicht</b>				69

Ware ordnungsgemäß übernommen und gesichert verladen

Datum: Name: Unterschrift: Kennzeichen:

**Peter Scheibmayer SCHEIBINOX**  
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**Geschäftsführung**  
 Peter Scheibmayer (Inh.), Marvin  
 Scheibmayer, Dr. Marcel Scheibmayer  
 USt-IdNr.: DE 164 153 356  
 Steuer-Nr.: 119/5263/0150

**Sparkasse am Niederrhein**  
 SWIFT-BIC: WELADED1MOR  
 IBAN: DE60 3545 0000 1107 0016 93  
**Deutsche Bank**  
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 IBAN: DE20 3507 0024 0042 7500 00

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**Load journal reinforcement**  
 1/2

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 der Technischen Universität Braunschweig

Annex 1.7 to  
 Test Report  
 No. 2101/419/16





**Prüfbescheinigung 3.1 EN 10204**

**Bestelldaten:**

Bestellung vom: 16.09.16  
Bestell-Nr.: LBE160169  
Artikel-Nr.: 3090120180  
Lieferschein-Nr.: 2016478  
Pos.: 1

**Erzeugnis:** kaltgerippter, nichtrostender Betonstahl Inoxripp4486®, B500B NR  
Betonstahl gemäß DIN 488 und Zulassung Z-1.4-261  
in gerichteten Stäben

<b>Stahlsorte:</b>	x 2 CrMnNiMoN 21-5-3	<b>Wff.-Nr.:</b>	1.4482
<b>Anforderung:</b>	EN 10 088 - 3	<b>Abm. (mm):</b>	6,0
<b>Toleranzen:</b>	DIN 488	<b>Chg.-Nr.:</b>	160863
<b>Liefergewicht:</b>	69 kg	<b>Anzahl:</b>	300 Stk.

**chemische Zusammensetzung**

Chg.-Nr.	C	Si	Mn	P	S	Cr	Ni	Mo	Ti	N	Cu
160863	gemäß hinterlegter Analyse beim DIBt und MPA										

**Erschmelzung / Gießart:** E / SG

**mechanische Eigenschaften**

Probe-Nr.	R <sub>m</sub> (N/mm <sup>2</sup> )	R <sub>p0,2</sub> (N/mm <sup>2</sup> )	A <sub>5</sub> (%)	A <sub>10</sub> (%)	Z (%)
1011-3	966	716	38	27	54
		R <sub>m</sub> /R <sub>e</sub> :	1,35		



**Probenform / Lage:** aus dem Vollen **A<sub>gt</sub> = 22,8 %**  
**Prüftemperatur:** Rt  
**Prüfzustand:** kaltgerippt / gerichtet **SK 1122**  
**bez. Rippenfläche f<sub>R</sub>:** 0,041

**Datum:**  
20.09.2016

**Sachverständiger:**

**Load journal reinforcement**  
2/2

**Materialprüfanstalt für das Bauwesen**  
Institut für Baustoffe, Massivbau und Brandschutz  
der Technischen Universität Braunschweig

Annex 1.8 to  
Test Report  
No. 2101/419/16

Auftraggeber: über FB 2 )  
\_\_\_\_\_  
\_\_\_\_\_

Sachbearbeiter: **Frau Sobiegalla**  
Auftrag vom: **an FB 1 am 23.08.16**  
Versuchsmaterial: **Mörtel**  
Eingang: **23.08.2016**  
Bezeichnung: **Halle 3a - 1201/332/16**  
Herstellungsort: **Halle 3a - MPA BS**  
Entformen der Proben: **25.08.2016**  
Lagerungsart /-Ort: **20° & 95% F. / 20°C & 65% F.**

Bearbeitungs-Nummer:	1201/332/16
Bearbeitungs-Nummer FB 2:	2101/419/16
Prüfung	Datum
Rohdichte	20.09.16
Biegezugfestigkeit	20.09.16
Abmessungen	20.09.16
Druckfestigkeit	20.09.16

### Biegezugfestigkeit und Druckfestigkeit nach DIN EN 1015-11 am Prisma 40 x 40 x 160 mm

Probe Nr.:	Probenbezeichnung	Herstellg. am	Prüfung am	Alter (Tage)	Länge [160 ± 1] (mm)	Breite [40 ± 1] (mm)	Höhe [40 ± 1] (mm)	Masse lufttr. (g)	Rohd. lufttr. (kg/dm³)	Bruchlast (N)	$\beta_{Bz}$ (N/mm²)	Bruchlast (kN)	$\beta_D$ (N/mm²)
1	1	23.08.2016	20.09.2016	28	159,9	40,3	41,1	555,9	2,099	3020	6,65	78,17	48,9
	--	--	--	--	--	--	--	--	--	--	--	72,93	45,6
2	2	23.08.2016	20.09.2016	28	160,0	40,1	41,1	561,3	2,129	2860	6,33	82,84	51,8
	--	--	--	--	--	--	--	--	--	--	--	78,28	48,9
3	3	23.08.2016	20.09.2016	28	160,2	40,3	41,0	556,9	2,104	2900	6,42	82,63	51,6
	--	--	--	--	--	--	--	--	--	--	--	78,44	49,0
<b>Mittelwert :</b>									<b>2,110</b>		<b>6,5</b>		<b>49,3</b>

Hinweise und Notizen zur Prüfung:

Geräte und Maschinen: Messschleier > Mitutoyo 300mm (Inv.Nr.:MPA 129)  
Waage > Sartorius ED2202S-CW (Inv.Nr.: 208011)

Biegezugprüfer (Inv.Nr.:2965)  
Druckprüfmaschine (Inv.Nr.: 2257)

Sichtkontrolle der Formen ( wenn in der MPA hergestellt ) :  
[ Kontrolle der Maße, Ebenheit, Korrosion, Beschädigung ]

I.O. nicht I.O.

Datum **20.09.16** Prüfer **M.Weber**

**Characteristics of refractory cement**  
Bending tensile strength and compressive strength

**Materialprüfanstalt für das Bauwesen**  
Institut für Baustoffe, Massivbau und Brandschutz  
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Annex 1.9 to  
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Product name	Manufacturing company	Thick-ness mm	Weights per unit area In fitted state <sup>1)</sup>	Apparent density <sup>1)</sup>	Moisture content <sup>2)</sup>	Reaction-to-fire classification
			kg/m <sup>2</sup>	kg/m <sup>3</sup>	% by weight	
Glasbaustein Typ90 190 mm x 190 mm x 202 mm		202	- <sup>4)</sup>	- <sup>4)</sup>	- <sup>4)</sup>	- <sup>3)</sup>
Brandschutzinlay mit Brandschutzgel 190 mm x 190 mm x 40 mm (zentrisch über der Höhe)		40	- <sup>4)</sup>	- <sup>4)</sup>	- <sup>4)</sup>	-
Normalmauermörtel Mörtelgruppe 3	Quick Mix	15	- <sup>4)</sup>	2,11	- <sup>4)</sup>	-

1) Mean value of three specimens.

2) Determined in accordance with DIN EN 1363-1 : 2012-10, section F.3.2, „Oven drying techniques“.

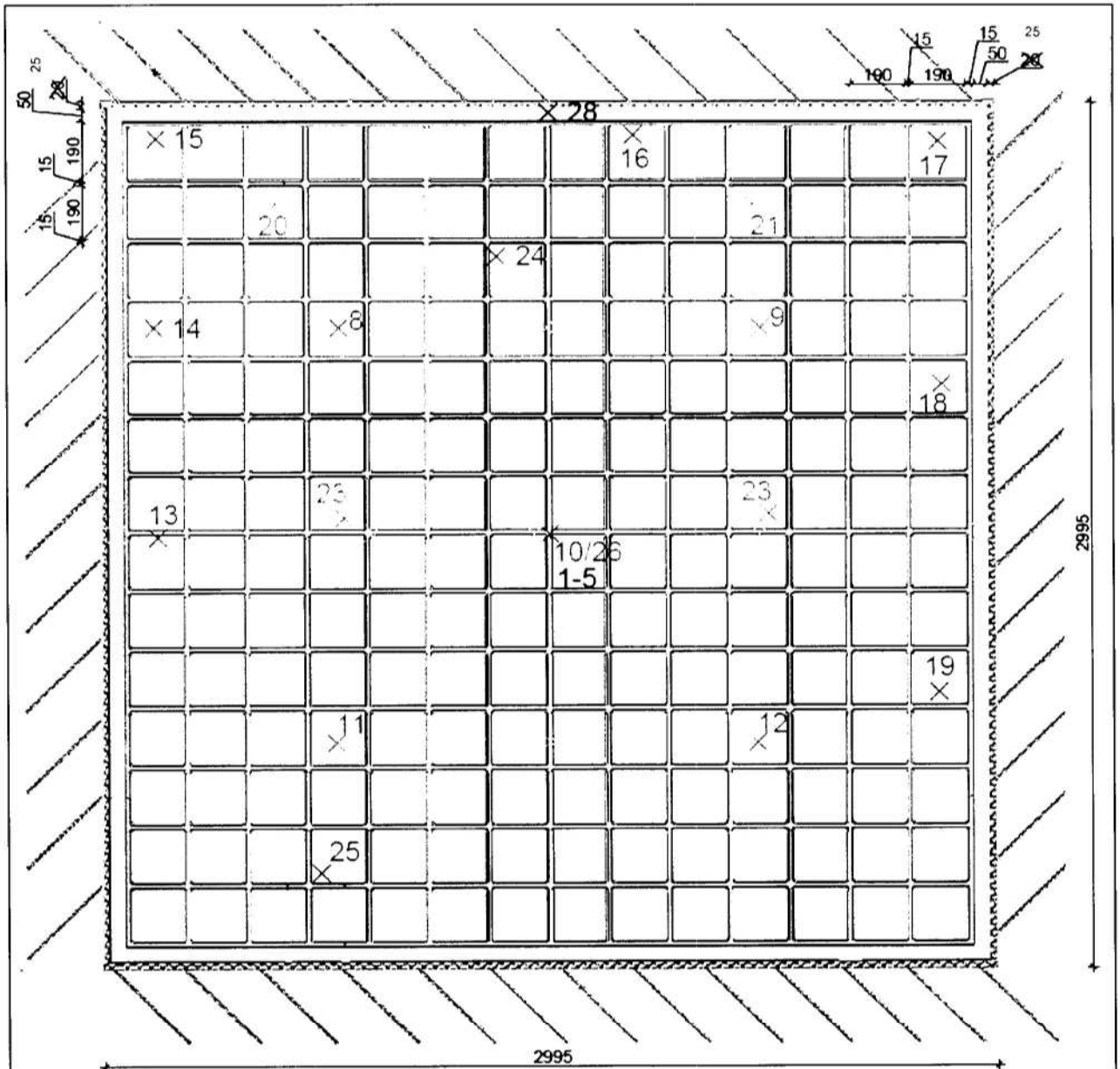
3) Manufacturer's specification were not provided.

4) No values were determined.

**Characteristics of the construction products**

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**DIN EN 1364-1 : 1999-10**

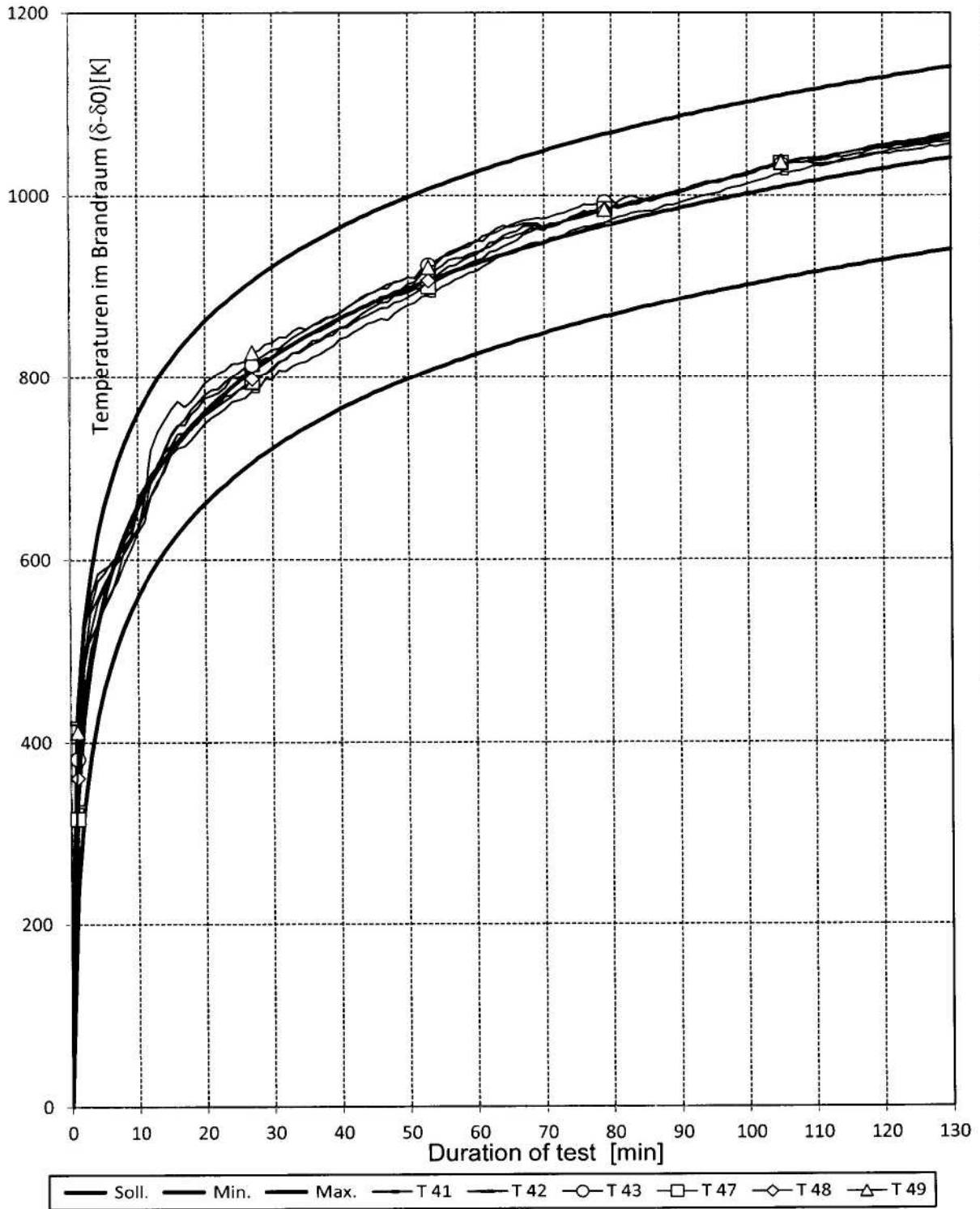
- 1-5 Messstellen in der Wand (orientierend)
- 8-12,26 Mittelwert
- 13-19 Probekörper Rand
- 20-23,27 Glasbausteine
- 24-25 Ecken Glasbaustein
- 29 Umgebung
- 28 Befestigung
- A-G/6 Verformung
  
- (6.7 sind nicht vergeben)

**Position of measuring heads**  
View test specimen

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Standard temperature curve EN 1363-1:2012-10



Tested on: 12/10/16

Temperatures in the furnace

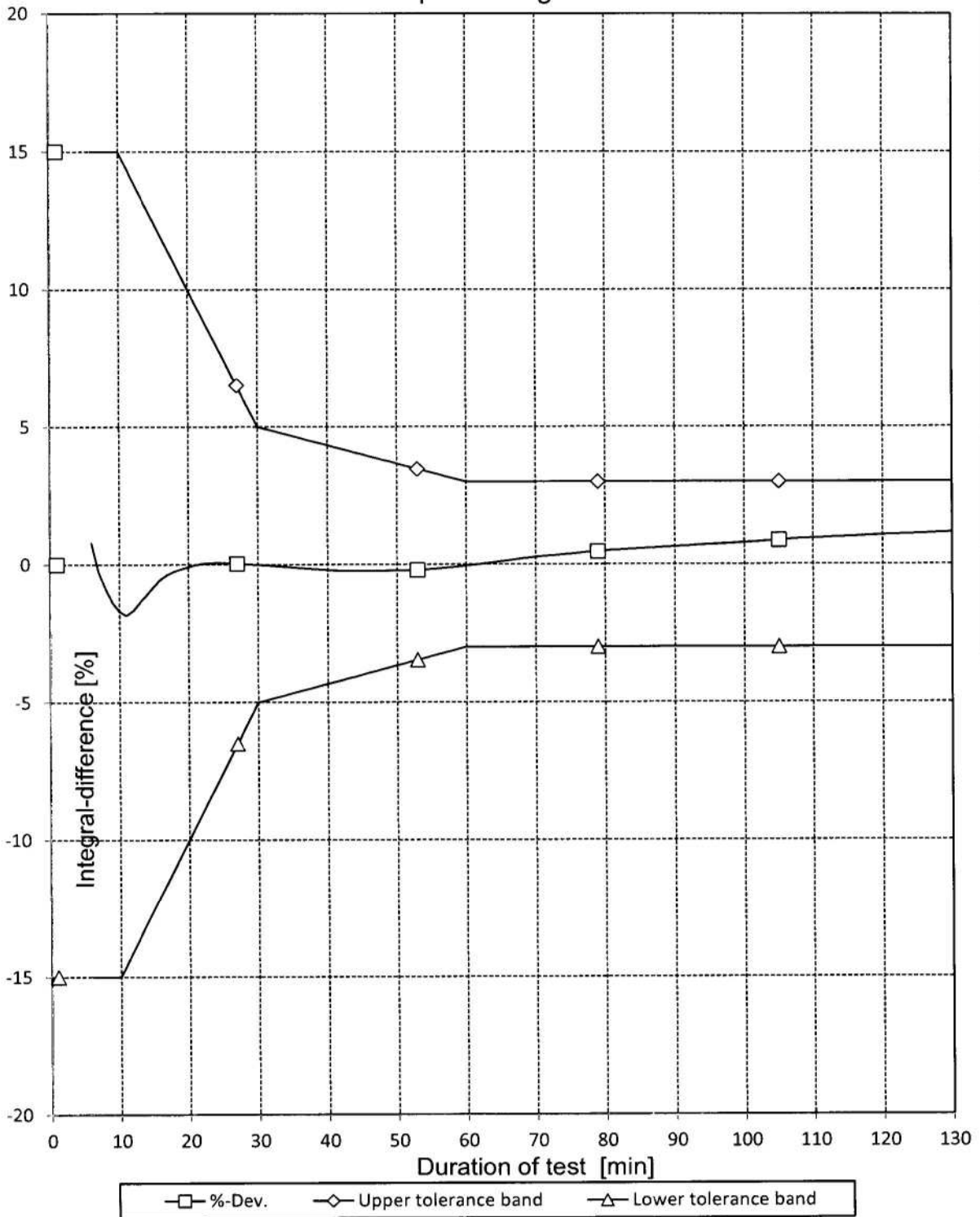
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Deviation of the integral of the furnace temperatures from the setpoint integral



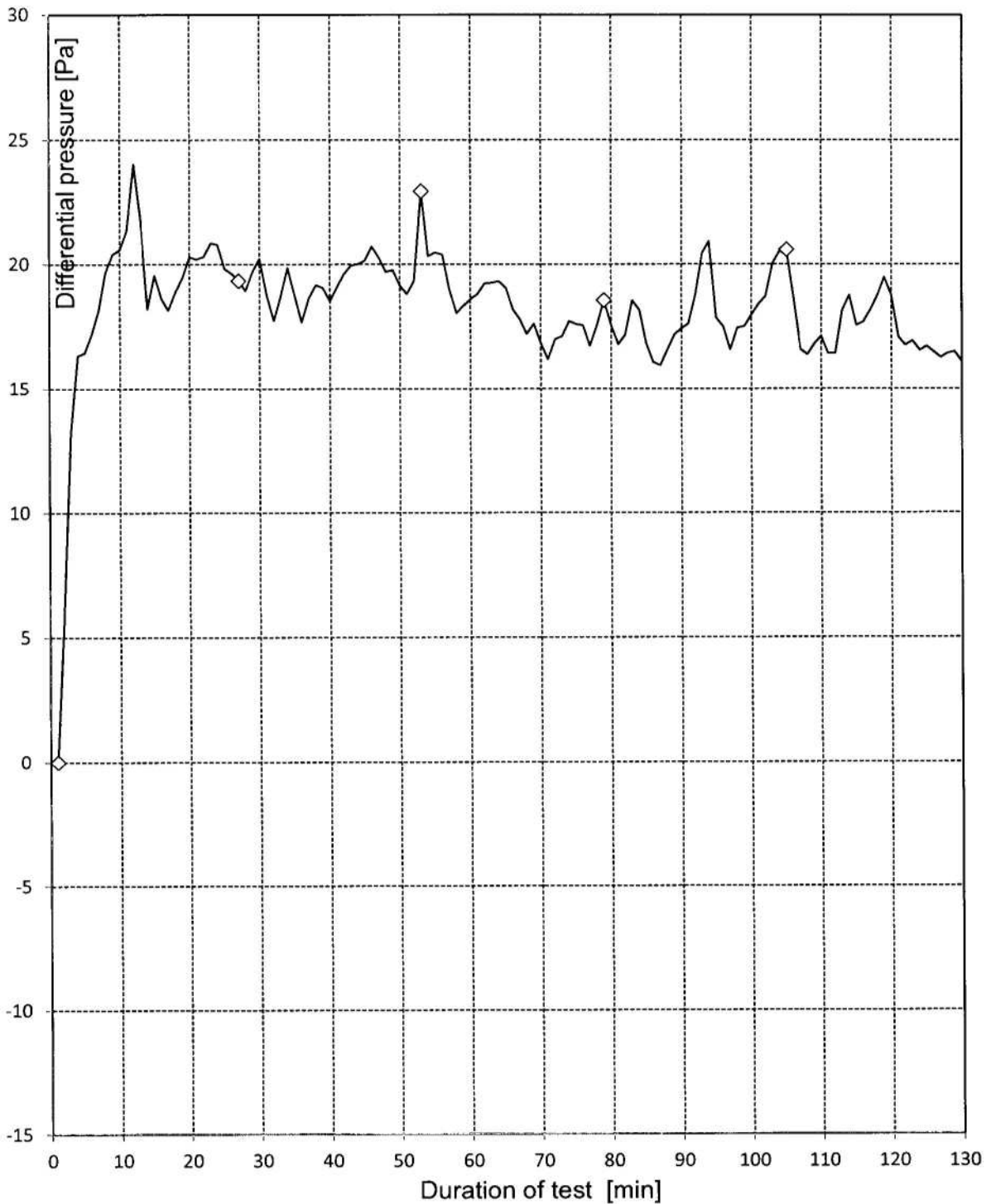
Tested on: 12/10/16

Evaluation of error integral

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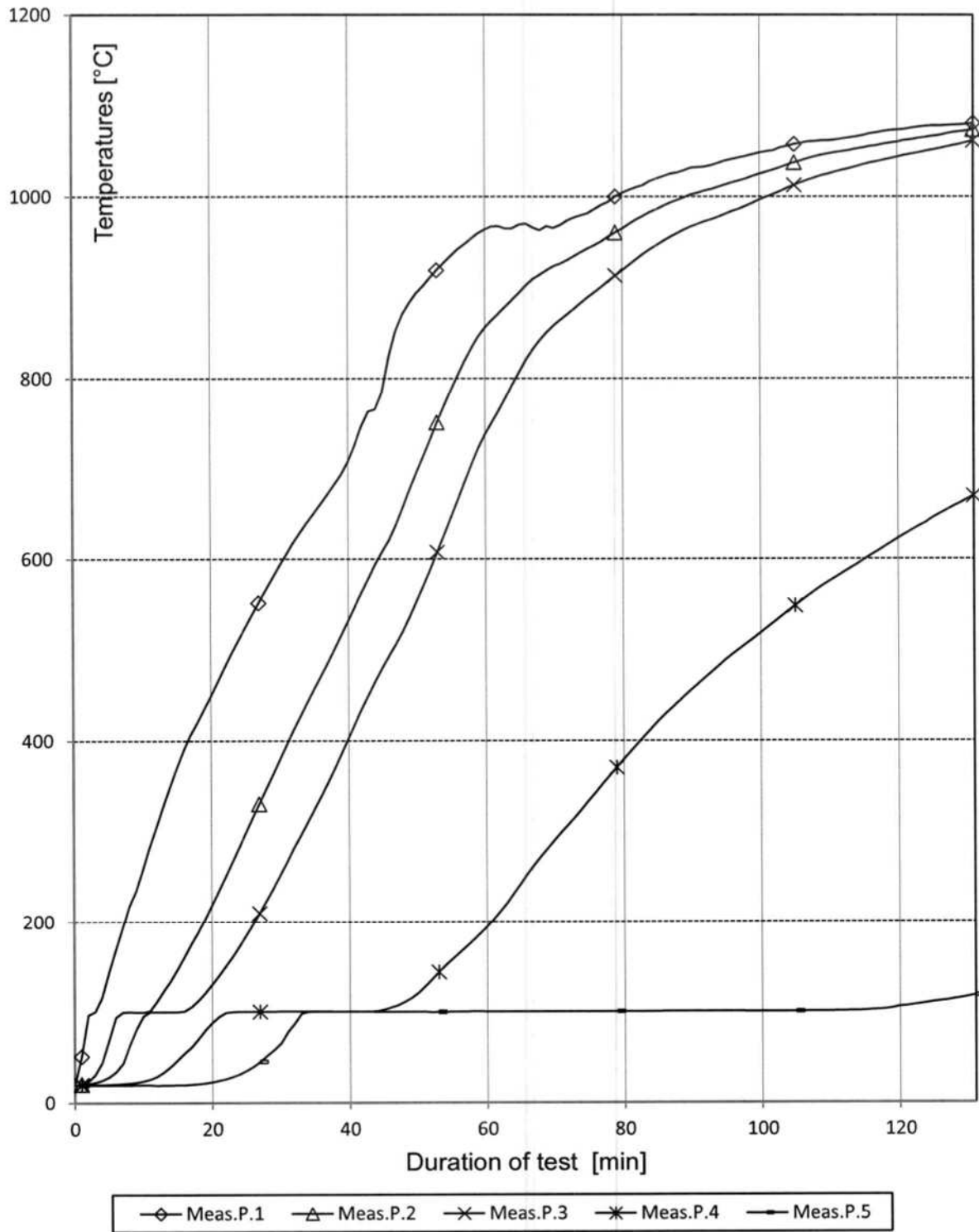


design fault pressure fluctuations.

Tested on: 12/10/16

<p>Differential pressure in the furnace</p>	<p>Annex 2.3 to Test Report No. 2101/419/16</p>
<p>Materialprüfanstalt für das Bauwesen Institut für Baustoffe, Massivbau und Brandschutz der Technischen Universität Braunschweig</p>	

reference measuring points inside specimen



End of fire exposure after 131 min!

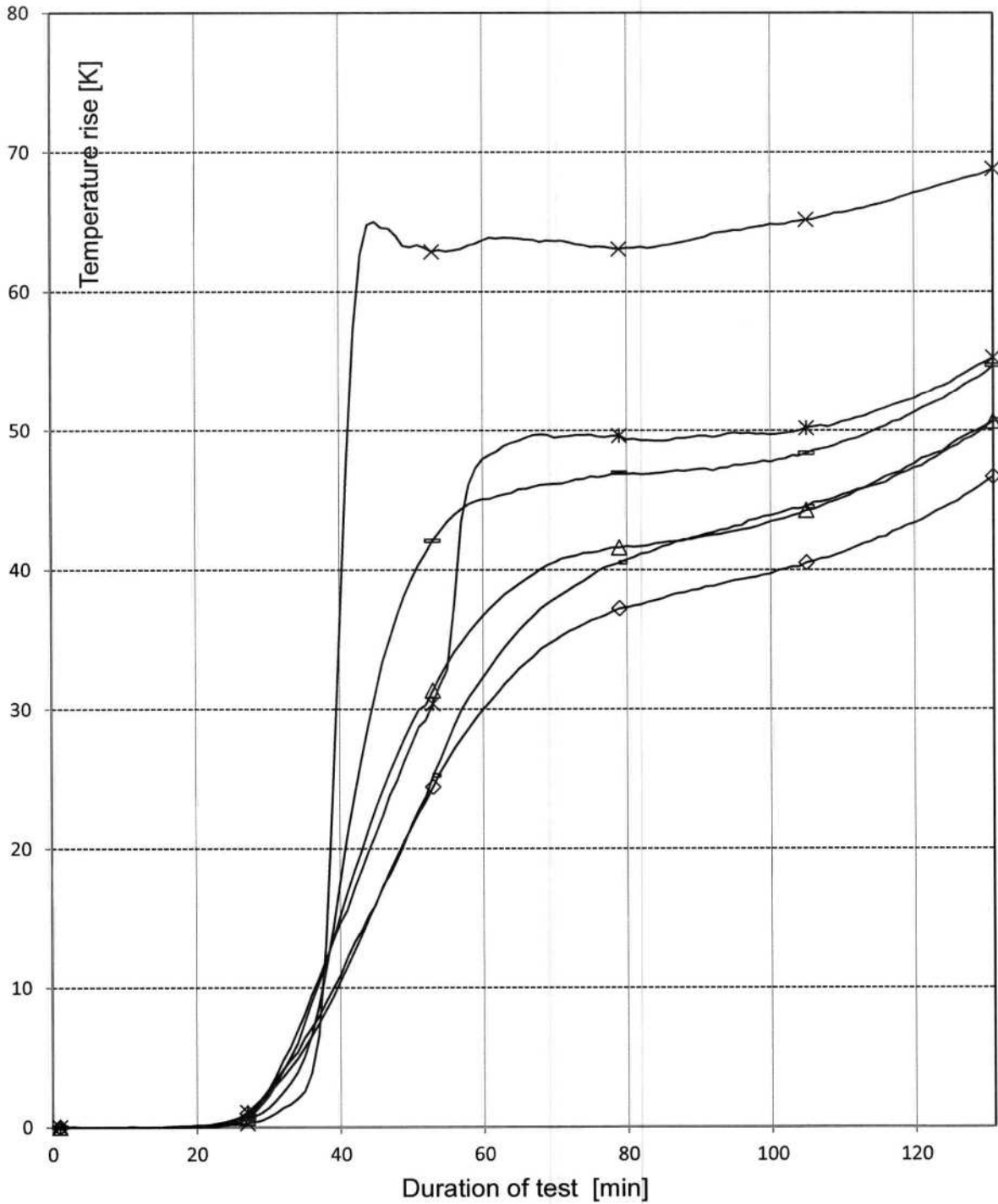
Specimen Temperature

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### Measuring points wall



◇ Meas.P.6
△ Meas.P.7
× Meas.P.8
✱ Meas.P.9
→ Meas.P.10
→ Meas.P.24

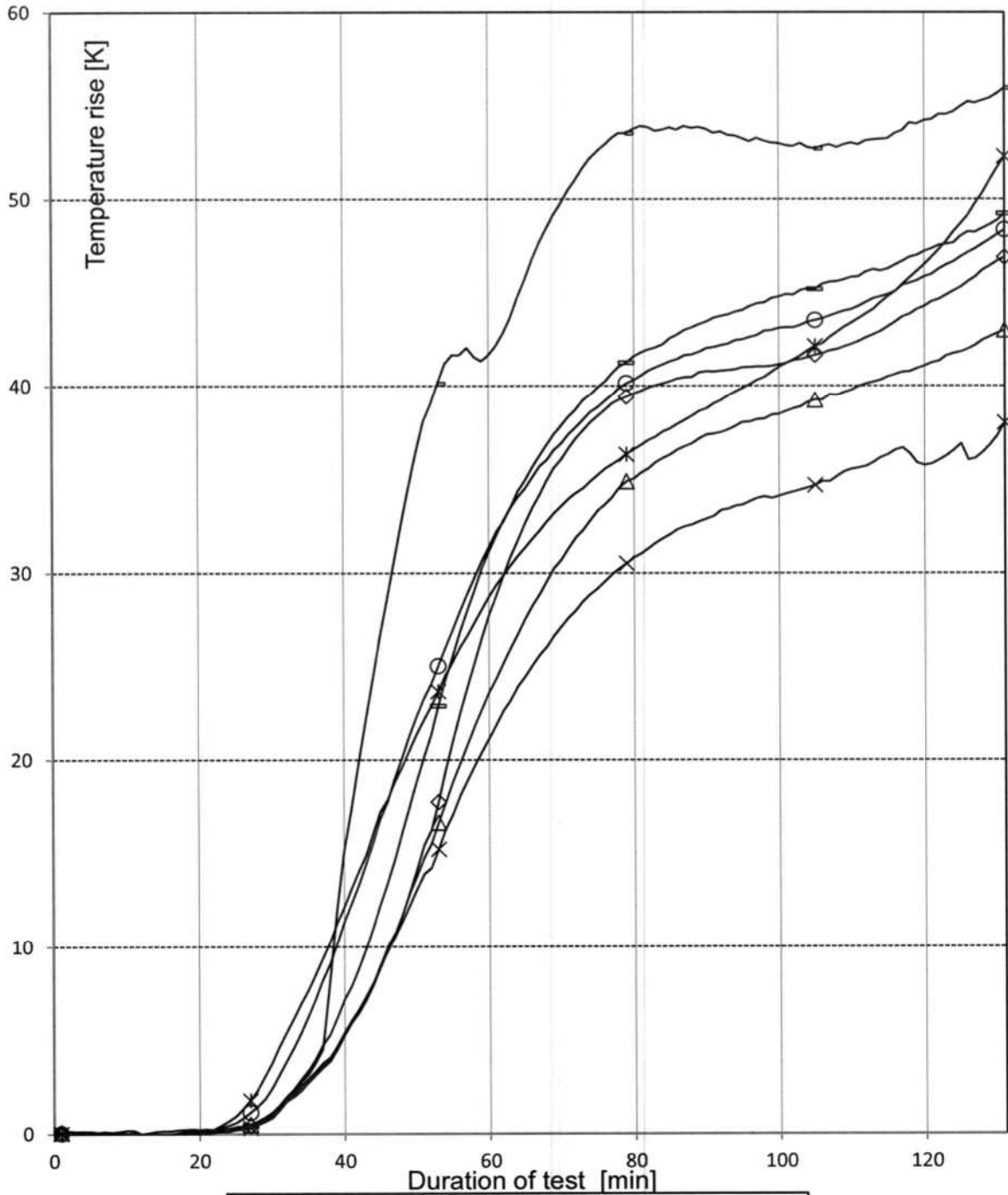
Time [min]	10	15	20	30	45	60	90	120	131	-	-	End of fire exposure after 131 min!
Mean value	---	---	< 1K	2 K	29 K	43 K	47 K	51 K	54 K		140 K	
Maximum	< 1K	< 1K	< 1K	3 K	65 K	64 K	64 K	67 K	69 K	180 K		
Meas.P.	26	26	8	11	10	10	10	10	10	-		

### Specimen Temperature

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### An den Rändern des Probekörpers



◇ Meas.P.11    △ Meas.P.12    × Meas.P.13    \* Meas.P.14  
 — Meas.P.15    — Meas.P.16    ○ Meas.P.17

Time [min]	10	15	20	30	45	60	90	120	131	-
Maximum	< 1K	< 1K	< 1K	4 K	27 K	42 K	54 K	54 K	56 K	180 K
Meas.P.	14	14	14	16	17	17	17	17	17	-

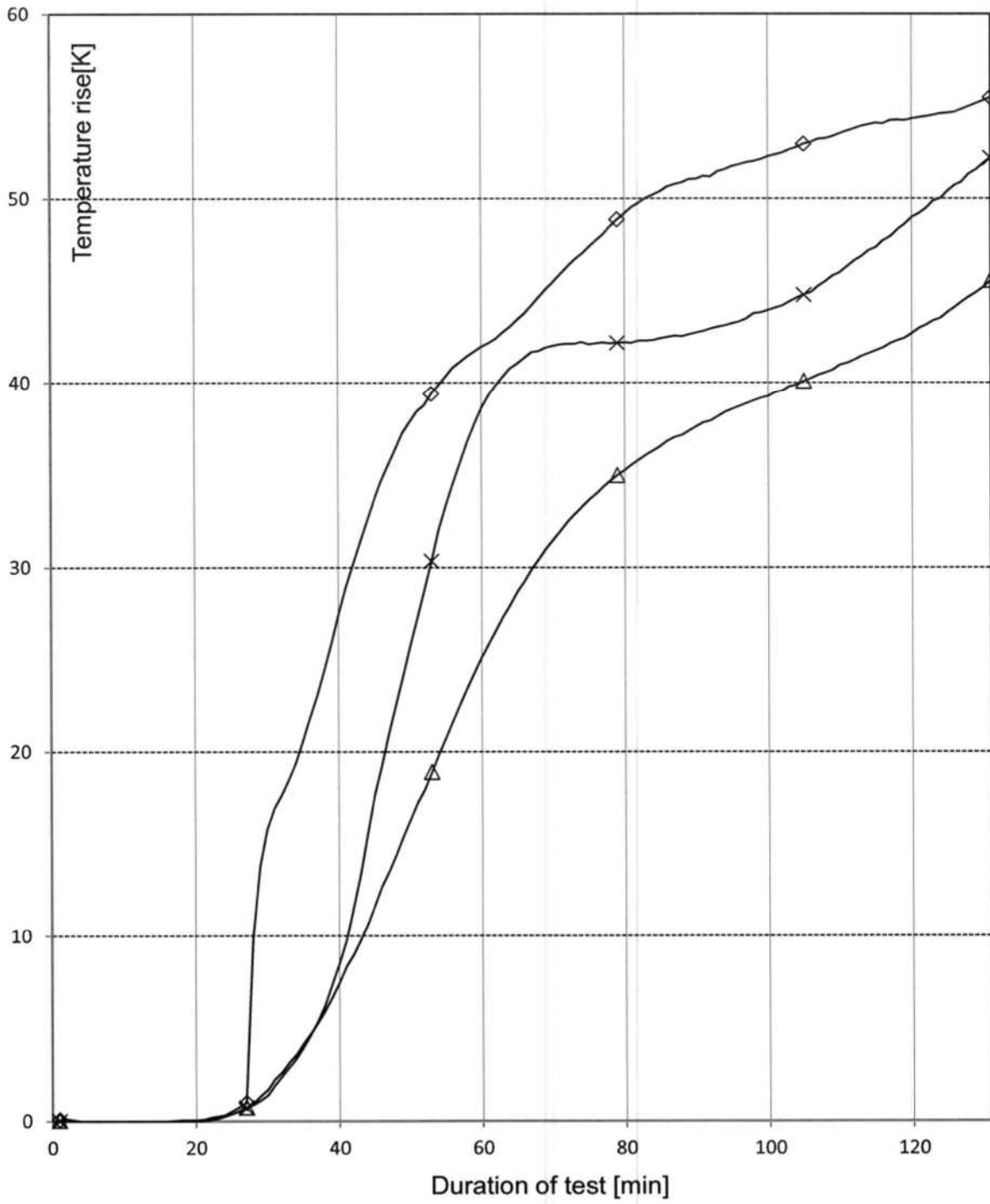
End of fire exposure after 131 min!

#### Specimen Temperature

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at the glass bricks



—◇— Meas.P.18    —△— Meas.P.21    —×— Meas.P.25

Time [min]	10	15	20	30	45	60	90	120	131	-
Maximum	< 1K	< 1K	< 1K	16 K	34 K	42 K	51 K	54 K	55 K	180 K
Meas.P.	27	27	20	20	20	20	20	20	20	-

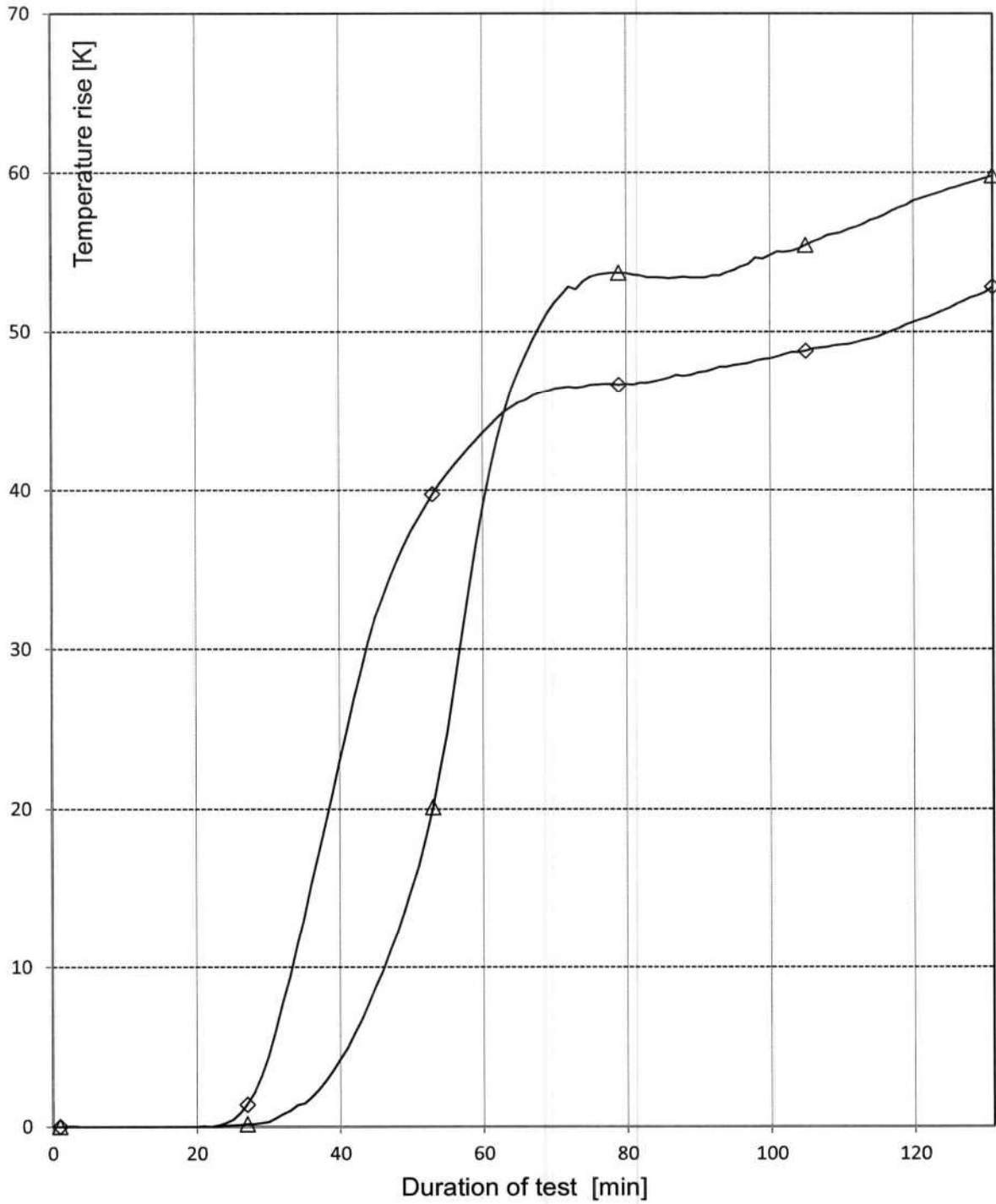
End of fire exposure after 131 min!

Specimen Temperature

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### At the glass bricks in the corner



◆ Meas.P.22
▲ Meas.P.23

Time [min]	10	15	20	30	45	60	90	120	131	-
Maximum	< 1K	< 1K	< 1K	4 K	32 K	44 K	53 K	58 K	60 K	180 K
Meas.P.	25	25	25	24	24	24	25	25	25	-

End of fire exposure after  
131 min!

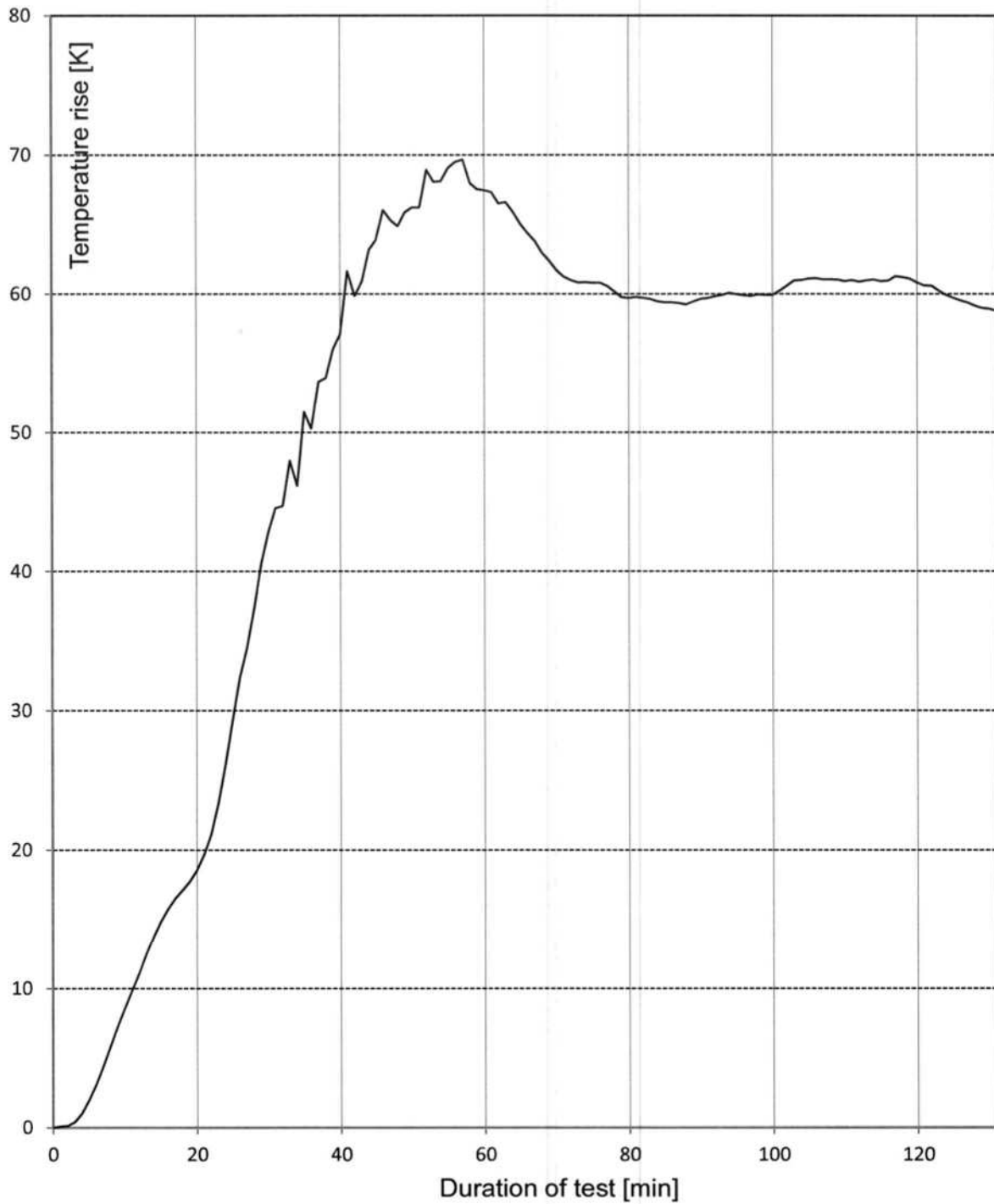
Specimen Temperature

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### Fixing rail (middle)



— Meas.P.26

Time [min]	10	15	20	30	45	60	90	120	131	-
Maximum	9 K	15 K	19 K	43 K	64 K	67 K	60 K	61 K	59 K	180 K
Meas.P.	28	28	28	28	28	28	28	28	28	-

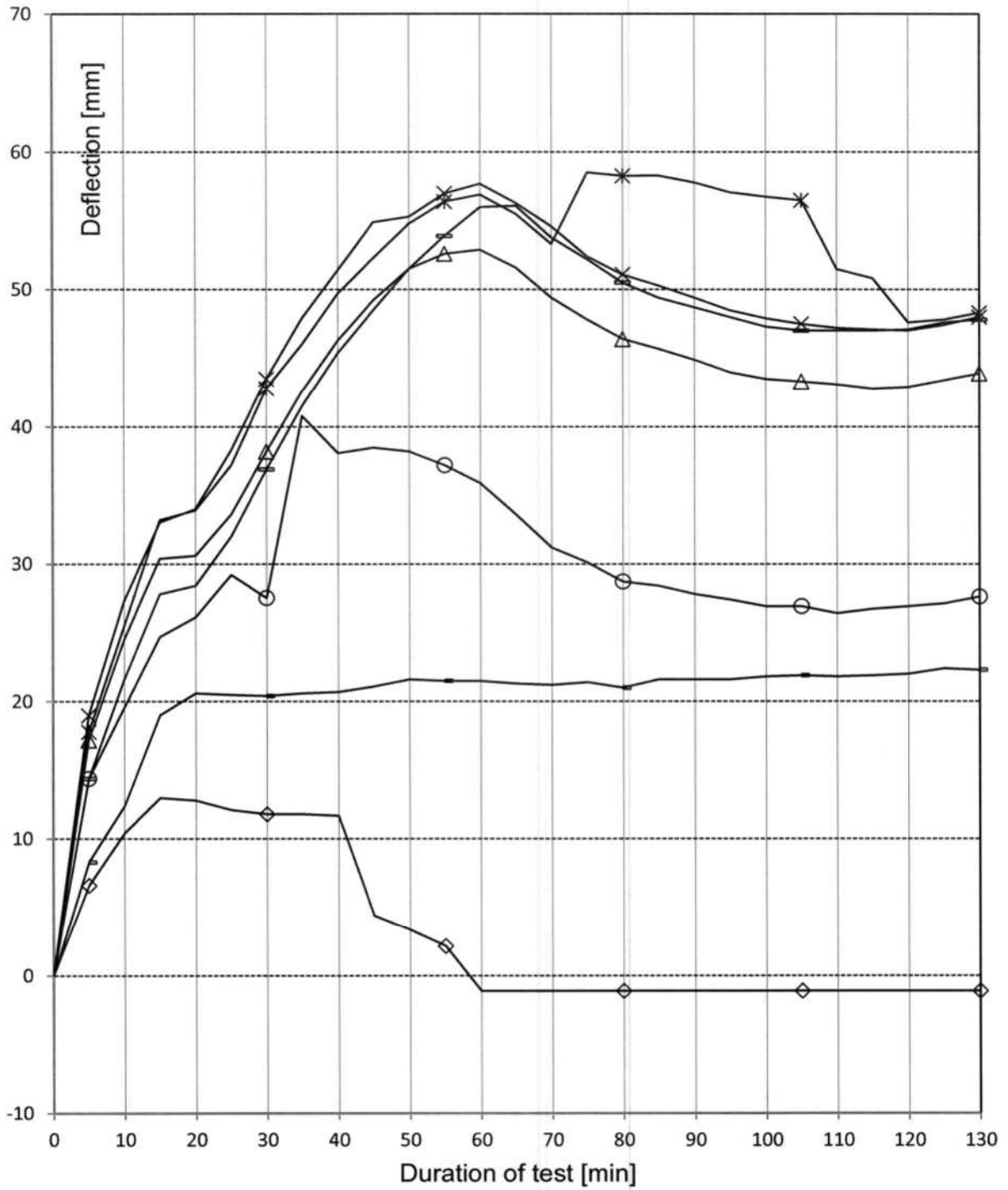
End of fire exposure after 131 min!

#### Specimen Temperature

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Annex 2.9 to  
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### Deflection

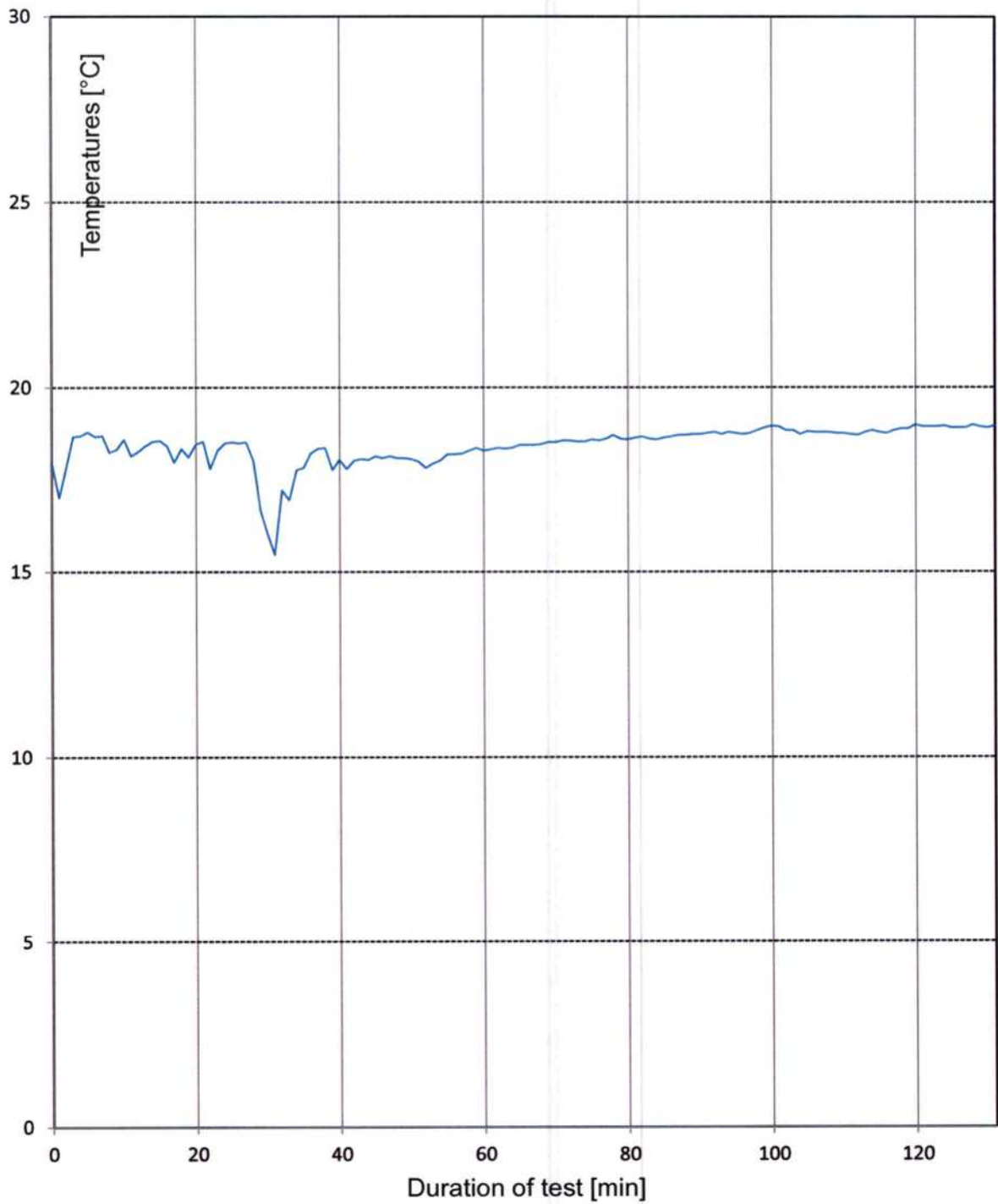


◇ A
△ B
× C
\* D
— E
— F
○ G

Specimen deflection

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End of fire exposure after  
131 min!

Ambient temperature

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Test duration (min)	Face *)	Observations made during the fire test on 12/10/2016
1	F	Fire exposed face of the fire exposed glass brick cracks.
6	F	Inner face of the fire exposed glass brick cracks.
11	F	Fire exposed face of the fire exposed glass brick partly falls into the oven.
20	F/A	No changes.
26	A	Glass between glass bricks partly turns grey.
45	A	2/3 of all glass bricks turned grey.
60	A	Outer unexposed face of the glass brick partly cracked.
80	F/A	No changes.
118	F/A	No changes.
123	A	Measurement by hand $\leq 70$ K at the dark shaded glass bricks
131		End of flaming

\*) F: Fire exposed face  
A: unexposed face

<b>Observations</b>	Annex 2.12 to Test Report No. 2101/419/16
<b>Materialprüfanstalt für das Bauwesen</b> Institut für Baustoffe, Massivbau und Brandschutz der Technischen Universität Braunschweig	





Glass bricks

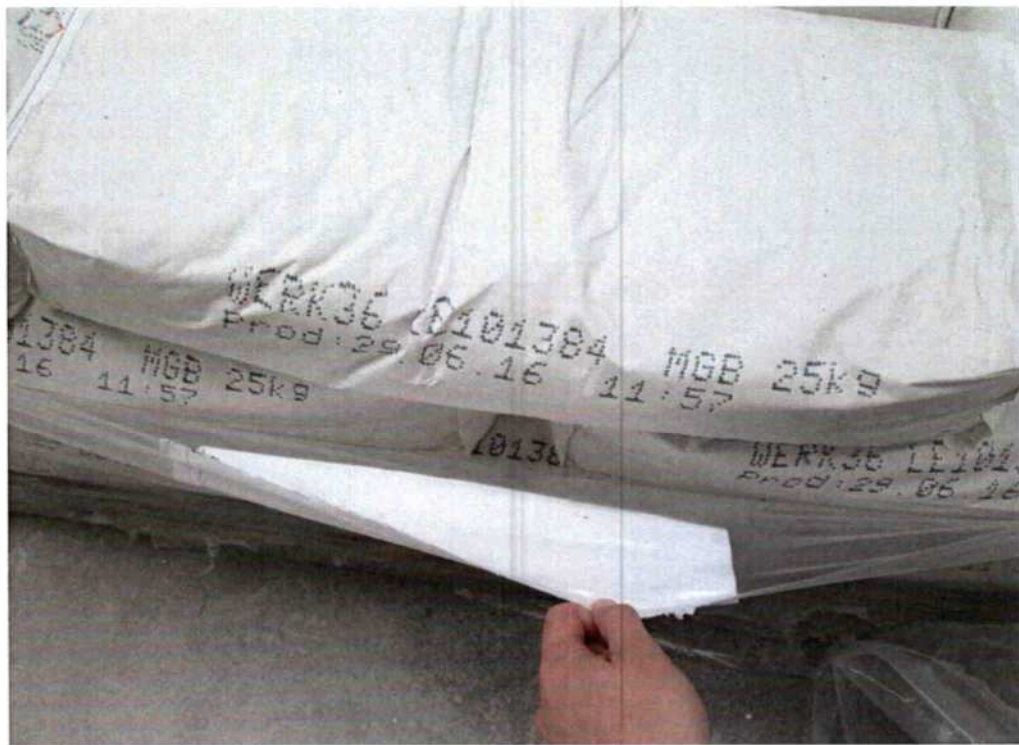


„Sakret Fugenschlammörtel“

**Photo documentation**

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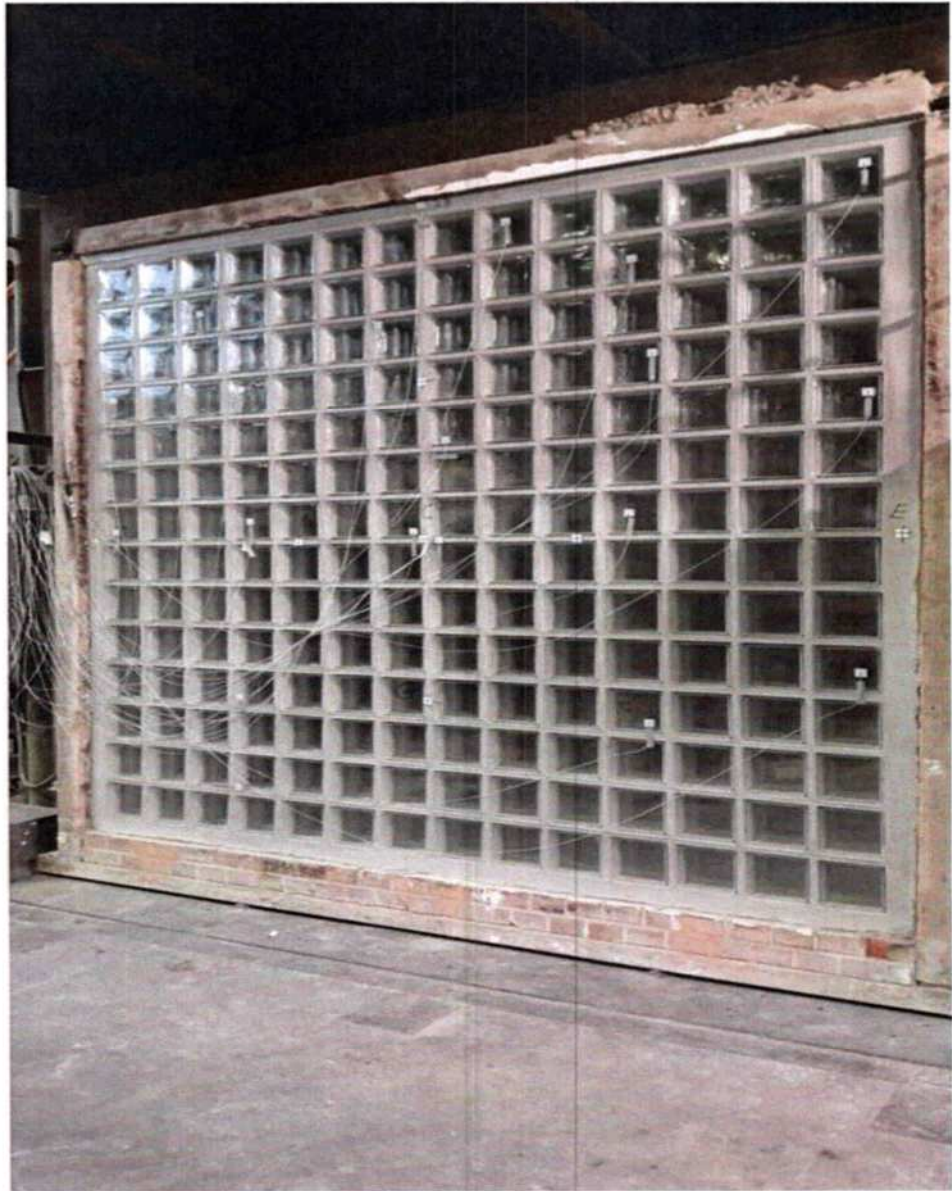


„Quick-Mix“ refractory cement

**Photo documentation**

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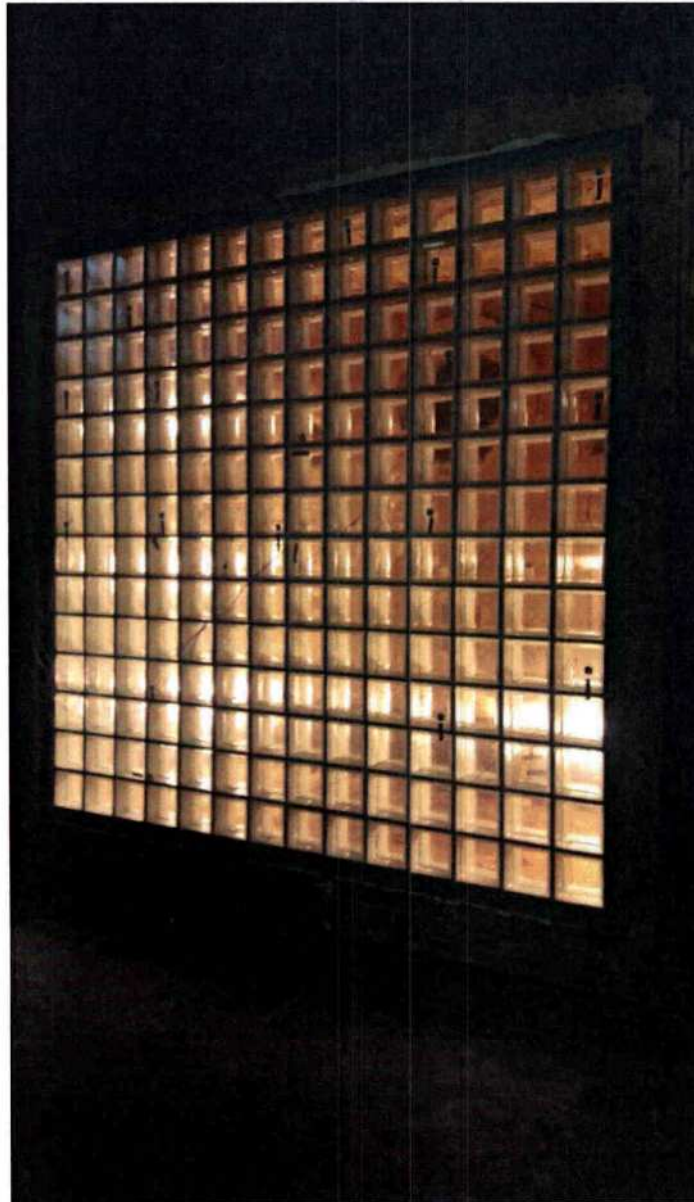
Annex 3.2 to  
Test Report  
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Beginning fire test

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Annex 3.4 to  
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15th minute

**Photo documentation**

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Annex 3.5 to  
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45th minute

**Photo documentation**

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Annex 3.6 to  
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60th minute

**Photo documentation**

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Annex 3.7 to  
Test Report  
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91th minute

**Photo documentation**

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Annex 3.8 to  
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131th minute

**Photo documentation**

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Annex 3.9 to  
Test Report  
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