

Test Report

- Translation -

Document No.: (3169/606/11) – Dhü of 28/04/2011

Client: AGC Glass Europe SA - Seneffe Plant
Rue Jules Bordet
Parc Industriel C
B 7180 Seneffe

Order date: 02/10/2009

Order Ref.: Mr Bernard Deloge

Order received: 02/10/2009

Subject: Symmetric 30-mm thick "PYROBEL 30" fire-rated glazing element mounted in a steel frame with "Promatect-H" boarding to be tested for determination of its fire resistance time in a fire attacking one side of the specimen

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

Test material received: 21/09/2009

Sampling: 07/10/2008 in the Olovi (CZ) production plant of the glass supplier AGC Glass Europe (B), by Warringtonfire Certification (UK) staff

Test material marking: BX0630001604, BX0630001602, BX0630001601,
manufacturing date: 20/08/2008

Test date: 14/10/2009

Valid until: Unlimited



This Test Report consists of 10 pages, including the cover sheet, and 24 annexes.

This document is the translated version of Test Report (3170/607/11) – Dhü dated 28/04/2011. The legally binding text is the aforementioned German Test Report.

This Test Report may not be circulated unless as a complete text without any alterations. Excerpts and abridged versions of this document are subject to approval in writing of MPA Braunschweig. Translations of this document that are made without the approval of the Testing House must bear the note "translation of the German original not examined by the Materials Testing Institute". The first sheet of this document and the page carrying the signatures bear the official stamp of MPA Braunschweig. Documents that do not carry a signature and the official stamp are invalid. The test material has been fully used. Accreditations are valid for the testing methods specified in the current documents. A list showing fields for which accreditation has been obtained can be made available upon request.

1 General

Under the order placed with the Testing Laboratory, the fire-rated EI-90 glazing, product name "PYROBEL 30", mounted in a steel frame with "Promatect-H" boarding was to be tested in compliance with DIN EN 1364-1:1999-10 in conjunction with DIN EN 1363-1:1999-10 in a fire attacking one side of the specimen.

This Test Report describes in detail the installation method, the test conditions and the results achieved for the specific member described in this Test Report, when tested in compliance with DIN EN 1363-1 : 1999-10. Major deviations in terms of size, structural details, load and stress conditions, boundary conditions, except for those accepted under the relevant test procedure for the direct field of application, are not covered by this Test Report.

In view of the special nature of tests conducted to establish the fire resistance time and the difficulties this implies for quantifying any uncertainties in measuring the fire resistance time, a defined degree of accuracy cannot be given for the results established.

The Materials Testing Institute (MPA), Braunschweig was not involved in the selection of the specimen.

On 07/10/2008, the fire-rated glass panes that were to be used in the fire test were sampled by Warringtonfire Certification (UK) staff in the Olovi (CZ) production plant of the glass supplier AGC Glass Europe (B), former AGC Flat Glass Europe. The fire-rated glass is designated as "Pyrobel 30" glass.

A total of four glass panes were cut to size from the production size panes shown in the sample report (BX0630001602, BX0630001604 and BX0630001601); these were then marked as follows:

Sample	Dimensions (L x W x T)	Block number	Marking
PYROBEL 30	953 mm x 1,490 mm x 30 mm	BX0630001602	BX1235102501
PYROBEL 30	953 mm x 1,490 mm x 30 mm	BX0630001602	BX1235102502
PYROBEL 30	953 mm x 1,490 mm x 30 mm	BX0630001604	BX1235102503
PYROBEL 30	1,400 mm x 2,920 mm x 30 mm	BX0630001601	BX1235101501

The sample report for the production size glass panes and the sample report, in which the identification numbers are correlated, are included in the annexes.

2 Description of the specimen

2.1 General

The specimen consisted of four glass panes of 30-mm thick fire-rated "PYROBEL 30" glass in a steel frame with "Promatect- H" boarding and was fitted to the concrete lining in the test frame so that it formed a vertical barrier in front of a furnace with the inside dimensions 3000 mm wide by 3000 mm high.

For further details of the specimen, reference is made to the sections below and to the annexes attached to this Test Report.

The description for assembly of the specimen and the specimen drawings were furnished by the client and have been verified by the Testing Laboratory.

2.2 Overview of the fire safety specific structural details

Table 1 Overview of the fire safety specific structural details

Frame	
Detail	Brief description
Profile	Four-sided welded perimeter frame, made from 40 mm x 20 mm x 2 mm hollow steel profiles with posts and mullions, back-filled with mineral wool all around (see annexes 1.1 and 1.2)
Profile spacing	Horizontal: 983 mm Vertical: 1435 mm / 1522 mm
Connection (frame - wall)	Horizontal edges and vertical fixed edge of the upright pane size: Countersunk-head screws, Ø 6 mm x 100 mm, and "HRD-U8/50" Ø 8 mm plastic anchors, a = 500 mm, spaced 100 mm from the edge, set in the concrete lining of the test frame
	Vertical non-fixed edge of the horizontal pane sizes: Not fixed, butted against the concrete lining of the test frame with an approx. 20-mm wide joint, connection joint closed with a mineral-wool board (non-flammable, melting point ≥ 1,000 °C); silicone joint between mineral-wool board and test frame (see annex 1.2)
Profile cover	Perimeter profiles: Fire-rated "Promatect- H" boards, 60 mm x 15 mm (W x T), double layer on both sides, bolted to the hollow steel profile with self-tapping Ø 5 x 50 mm raised-head screws, spaced a = 250 mm, spacing from the edge 100 mm (see annex 1.2)
	Centre post and transom: Fire-rated "Promatect- H" boards, 70 mm x 15 mm (W x T), double layer on both sides, bolted to the hollow steel profile with self-tapping Ø 5 x 50 mm raised-head screws, spaced a = 250 mm, spacing from the edge 100 mm (see annex 1.2)
Glass panes	
Glass pane structure	"PYROBEL 30", consisting of seven 3-mm thick float-glass panes, each with an 1.5-mm thick interlayer
Field 1: PYROBEL 30	953 mm x 1,490 mm x 30 mm, 102 kg
Field 2: PYROBEL 30	953 mm x 1,490 mm x 30 mm, 101 kg
Field 3: PYROBEL 30	953 mm x 1,490 mm x 30 mm, 101 kg
Field 4: PYROBEL 30	1400 mm x 2,920 mm x 30 mm, 293 kg

Installation of glass panes and fixing method

Bottom-end support	Placed on the frame made from hollow steel profiles and set on 5-mm thick "Promatect-H" setting blocks
Glazing tape	12 mm x 5 mm, applied on both sides as an all-around tape
Glass edge cover	20 mm all around
Joints	With profile frame and "Promatect- H" boarding 5 mm wide; sealed all around on both sides with "Promat- Systemglas- Silikon"

2.3 Installation method

A detailed description of the installation method is included in the annexes.

3 Characteristics of the building products

At the time of testing, the strength and the moisture content of the specimen corresponded by approximation to what can be expected under normal conditions in practice.

The tested system, and the construction materials used for the system, are in compliance with the details specified in the annexes regarding thickness, weight per unit area, apparent density, moisture content and fire reaction classification.

4 Test set-up and testing

The client's expert staff installed the specimen described in section 2 above in front of a furnace, inside dimensions 3000 mm x 3000 mm (W x H), so that it formed a vertical barrier.

The specimen was not loaded and only carried its own weight.

The fire test with one side of the symmetrically arranged specimen was made in compliance with DIN EN 1364-1:1999-10 in conjunction with DIN EN 1363-1:1999-10.

The heating regime in the furnace conformed with the standard temperature-time curve (ETK) of DIN EN 1363-1 : 1999-10, section 5.1.1. The temperatures in the furnace were measured with six plate thermometers in compliance with DIN EN 1363-1 : 1999-10, section 4.5.1.1.

During the fire test, the pressure in the furnace conformed with DIN EN 1363-1 : 1999-10, section 5.2.

In accordance with DIN EN 1364-1 : 1999-10, deflection was measured in the middle of the specimen and at the non-fixed edge. Additional deflection measuring points were provided at the top and bottom ends and at specimen mid-height.

Radiation was measured in compliance with DIN EN 1363-2 : 1999-10 at a distance of 1.0 m from the centre of the specimen surface that was not exposed to the fire, because it was assumed that radiation would be uniformly distributed.

The temperatures on the face of the specimen not exposed to the fire were measured with thermocouples that complied with DIN EN 1363-1 : 1999-10, section 4.5.1.2.

Additional temperature measuring points (points 37 to 56) were provided on the body of the specimen. The values recorded with these measuring points are not considered for the evaluation of the criteria specified in the above-mentioned standards; they are documented in the National Appendix.

The measuring points are shown in annex 1.6.

5 Test results and observations

The temperatures established during the fire test inside the furnace, the temperature rise beyond the initial temperature on the non-exposed face of the specimen, the specimen deflection, the ambient temperature, the error integral, the differential pressure in the furnace, the results of radiation measurement, and the observations made during the fire test are shown in the attached annexes.

6 Test results summarised

The fire test in which the EI-90 fire-rated glazing element was exposed to one-sided fire attack was made on 14/19/2009 in compliance with DIN EN 1364-1:1999-10 in conjunction with DIN EN 1363-1:1999-10.

The test results are summarised in table 2.

Table 2 see next page.

Table 2: Test results summarised

Line	Cross reference: DIN EN 1363-1 : 1999-10 Section	Requirements		Criterion	Test results			
1	11.1	<u>Load-bearing capacity</u>	Deflection limit	Limit value exceeded after:	- min. ¹⁾			
2		i.e. compliance with	Limiting value of deflection rate	Limit value exceeded after:	- min. ¹⁾			
3	11.2	Integrity	Ignition of cotton pad	Cotton pad ignited after:	- min. ²⁾			
4		i.e. prevention of	Occurrence of gaps	Gap gauge could be inserted after:	- min. ²⁾			
5		Flames on non-exposed face to be prevented	Sustained flaming occurred after:	90 min.				
6	11.3	<u>Thermal insulation</u> , i.e. temperature rise on the non-exposed face beyond initial temperature:		Test period in minutes:	90	91	92	98 ³⁾
7		Max. adm. mean value $\Delta T = 140$ K		Max. temperature rise noted: mean value in K	118 [field 2]	-	140 [field 2]	231
8		Max. adm. individual value $\Delta T = 180$ K		Max. temperature rise noted: individual value in K:	156 [meas.p. 10,15]	180 [meas.p. 15]	180 [meas.p. 10, 19]	390 [meas. p. 15]
9	10.4.4	Deflection		Max. deflection in the specimen centre, in mm	11	-	-	16
10	DIN EN 1363-2 : 1999-10, section 8	Radiation		[kW/m ²]	0.275	-	-	0.34

¹⁾ Not subject matter of the test.

²⁾ Not tested as there was no need to include this aspect

7 Conclusions and recommendations

Table 3 below lists the essential test results regarding performance criteria.

Table 3: Performance criteria

	Performance criteria in compliance with DIN EN 1363-1 : 1999-10/DIN EN 1363-2 : 1999-10	Maintained until [minutes]
R	Load-bearing capacity	- ³⁾
E	Integrity ¹⁾	90
I	Thermal insulation ^{1) 2)}	90
M	Mechanical stressing	- ³⁾
W	Thermal radiation	90

¹⁾ According to DIN EN 1363-1 : 1999-10, 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 "load-bearing capacity" is not complied with.

²⁾ According to DIN EN 1363-1 : 1999-10, 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.

³⁾ Not subject matter of the test.

In view of the results achieved in the fire test (see table 2) and based on the performance criteria (see table 3), the tested specimen can be recommended to be classified as a fire resistance class **EI 90** element in compliance with classification standard DIN EN 13501-2 : 2008-01.

8 Direct field of application in accordance with Annex A, section A5 in DIN EN 1364-1: 1999-10

The results produced in the fire resistance test may be directly transferred to similar designs which are subjected to one or a number of the modifications listed below, and whose design regarding stiffness and stability continues to comply with the requirements of the relevant design standard. No further modifications are permitted.

- a) Reduced glass pane dimensions
- b) Variation of the glass pane side ratio, provided the largest dimension of the glass pane and its surface remain unchanged
- c) Reduced distance between mullions and/or transoms
- d) Reduced distance between fixing points
- e) Larger frame element dimensions
- f) Expansion allowance, if this was not incorporated in the specimen

g) Modified installation angle of up to 10° from the vertical line

8.1 Increased height

An increase in height beyond the tested height is not permitted.

8.2 Increased width

An identical design may be increased in width, if the specimen was (at a minimum nominal width of 3 m) tested with a free vertical edge.

8.3 Support structure

The test results achieved for a fire-resistant glazing element, which was tested in one of the standard support structures specified in DIN EN 1363-1 : 1999-10, can be applied to any support structure or a test frame of the same type (fireproof construction with a high or low apparent density, or light-weight construction) that has a longer fire resistance time.

i.A. *Rohling*
ORR Dr. -Ing. A. Rohling
Head of Testing Laboratory

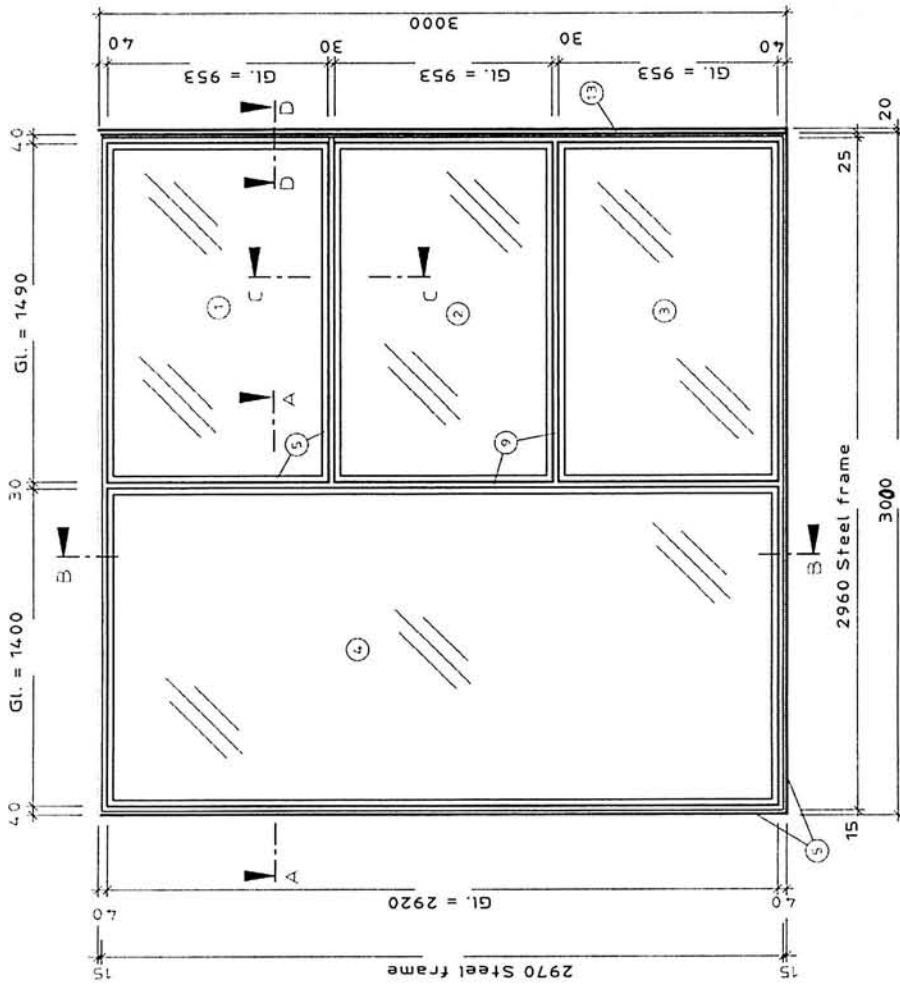


D. Hülsen
Dipl.-Geoökol. D. Hülsen
Engineer/official in charge

For a list of annexes, see next page.

List of annexes

- Annexes 1.1 to 1.8 : Structural design of the specimen, position of measuring points and characteristics of the used building products
- Annexes 2.1 to 2.14 : Observations made during the fire test
- Annexes 3.1 to 3.2 : Photographic documentation



Glass structure

Gl. = Glass

AGC

PYROBEL 30 thickness = 30 mm

in Steel construction

Scale: 1:20

Date: 11.04.11

Drawn: DL

Department: RD&A

AGC Pyrobel

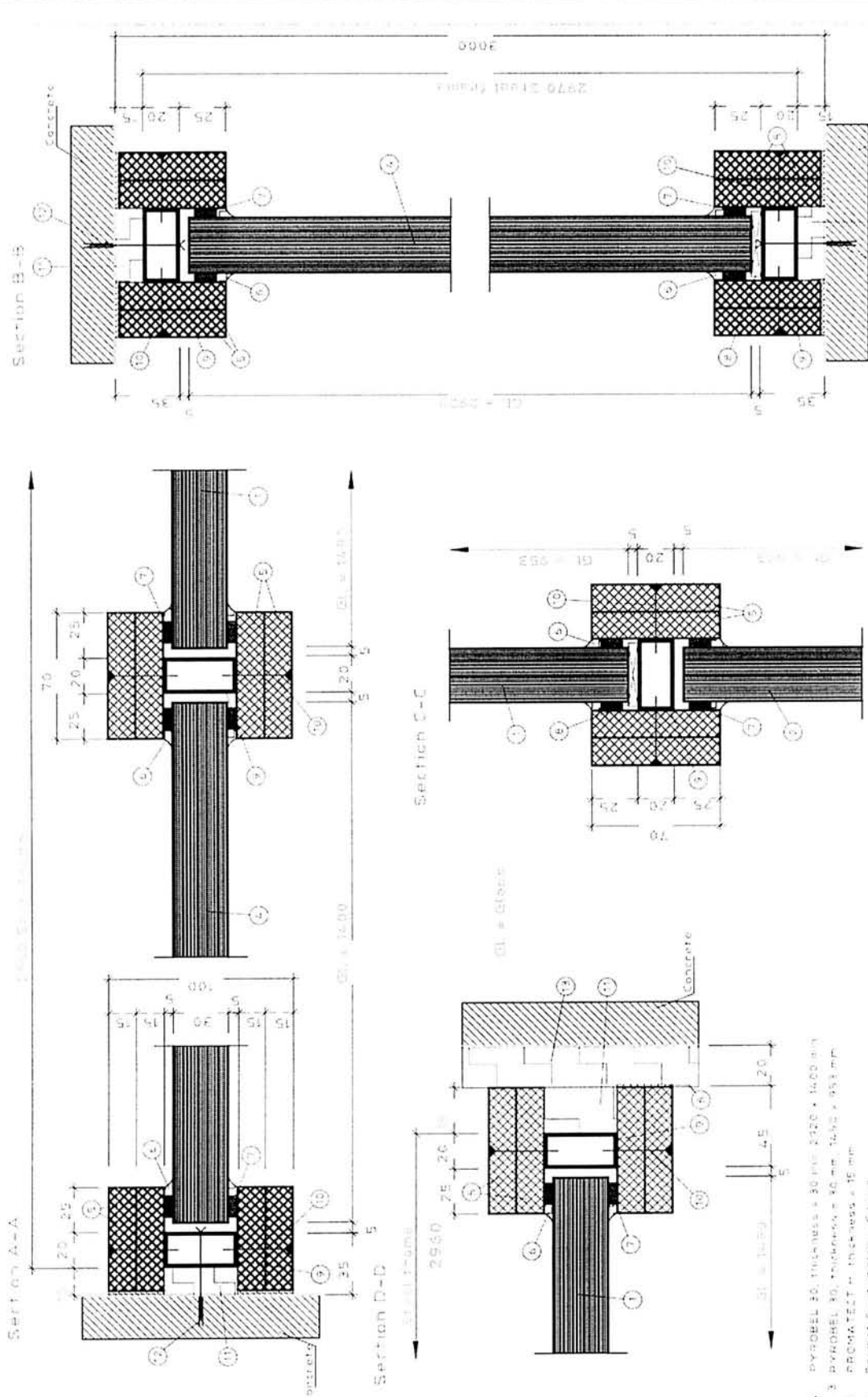
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AGC_DL811(E)

Structural design of the specimen
View of the element

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No. 3169/606/11



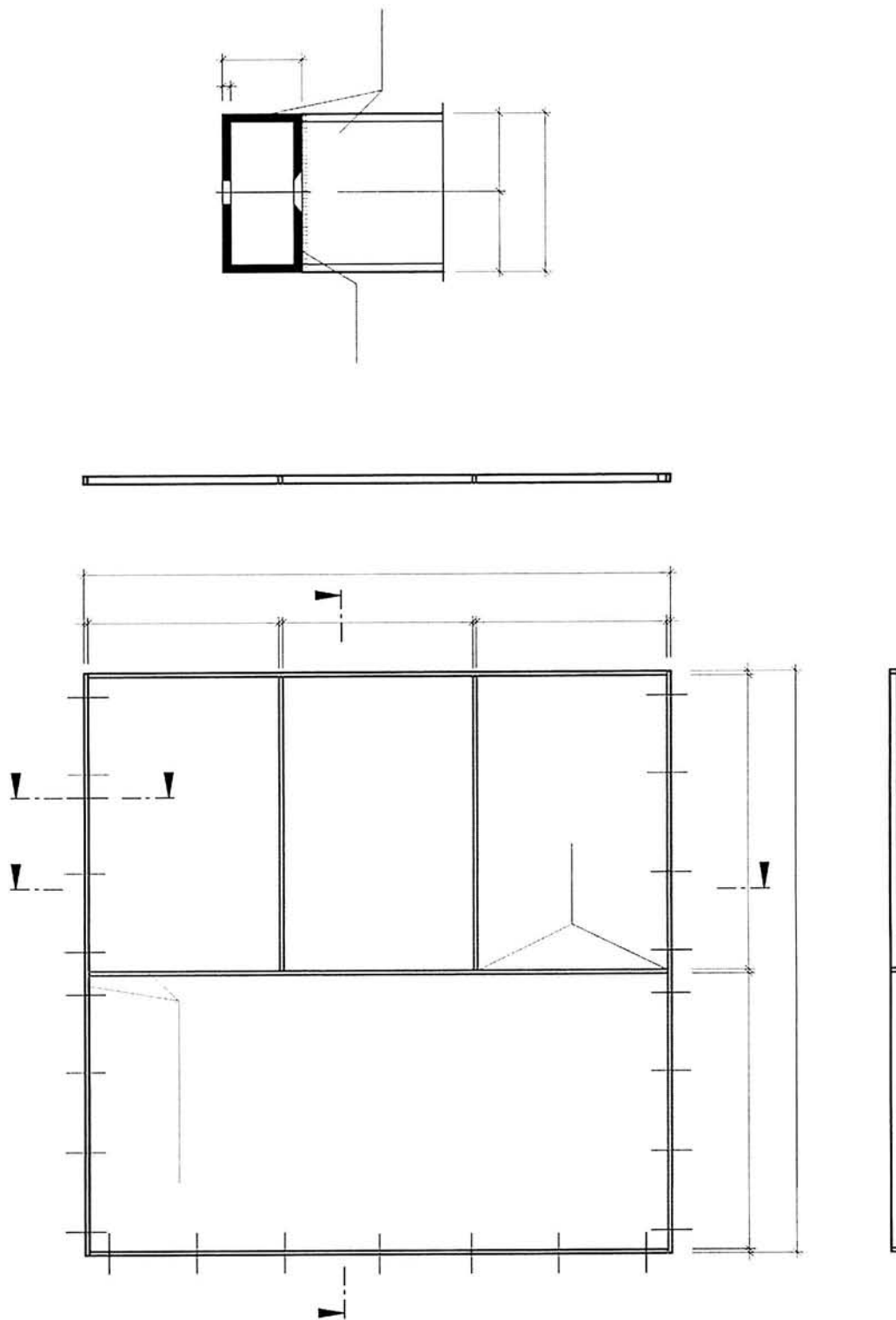
AGG

- 4. PYROBEL 30, thickness = 30 mm, 2020 x 1400 mm
- 5. PYROBEL 30, thickness = 30 mm, 1450 x 933 mm
- 6. PRIMA TECT H, thickness = 15 mm
- 7. Repair Systemglas - Sliver
- 8. Self-adhesive Glazing tape 12 x 5
- 9. PRIMA TECT H, 30 mm x 80 mm x 5 mm
- 10. Steel profile 40/20/2, welded
- 11. Screw 5.0 x 50, every 250 mm
- 12. Mineral wool
- 13. Peg 2, 6 mm
- 14. Screw 5.0 x 80, every 500 mm
- 15. Mineral wool, thickness = 20 mm

Structural design of the specimen
 Horizontal sections, vertical sections

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PROFIL 30
 Dicke 30 mm

AGG

Structural design of the specimen
 Steel frame

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1. Anchor the welded steel profile frame in the test frame
2. Bolt rear-end Promatect-H boarding to the steel profile frame
3. Backfill the perimeter joint between steel profile frame and test frame with mineral wool
4. Apply glazing tape to the fire-rated glass pane
5. Place fire-rated glass pane into the steel profile frame and set it on setting blocks
6. Apply glazing tape to the fire-rated glass pane
7. Bolt front-end Promatect-H boarding to the steel profile frame
8. Provide fire-rated glass pane with a perimeter "Promat- Systemglas- Silikon" seal on both sides

Structural design of the specimen

Description of specimen assembly

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Annex 1.4 of

Test Report

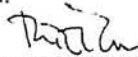
No. 3169/606/11

Sample Report

This report provides a record of the information relating to samples taken by Warrington Certification Limited, or its agent, for certification of the products detailed below.

WCL Job No.	
Manufacturer	AGC
Manufacturing site	OLOVI, CZECH REPUBLIC
Place of sampling	OLOVI
Stock/batch quantity from which samples selected	5 DLF'S AVAILABLE, 4 SELECTED (FULL SIZE PANES)
Number/quantity of samples	4 OFF DLF'S TO BE SELECTED AND CUT TO SUIT TEST SPECIMEN DIMENSIONS
Identification of the product in accordance with the technical specification	PROBEL 30 (SEE ATTACHED PRODUCT DESCRIPTIONS)
Manufacturer's marks including batch no. and date of manufacture	BX0630007606 DATE OF MANUFACTURE: BX06300016064 20 AUGUST 2008 BX0630001602 BX0630001601
Sampler's identifying marks	AWW Bwfire A. KEARNS 0710108
Samples to be despatched by manufacturer to	TO BE ADVISED
Properties to be tested	FIRE RESISTANCE EI 90'
Date of sampling	7 OCTOBER 2008
WCL notified body number	1121

Signed:



.....
for and on behalf of manufacturer

Signed:



.....
for and on behalf of Warrington Certification

Name (please print): VACLAV DUBECKA Date: 7/OCT/2008.....

Sample report

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Annex 1.5 of
Test Report
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Commercial samples - detail report

Order status: Order dispatched.

Storned

Order number: D4711

Customer: Bauwesen

KIS number: 35395

Max. date of dispatch: 17.9.2009

Stamp: 4,51

Min. thickness: 28,0

Max. thickness: 32,0

Used for: Požární testy

Result - Succeeded (Y/N)

Why Not succeeded:

Dimensions and quantity

Width	Height	Shape	Type of shape	Quantity
1400	2920		Standard	1
953	1490		Standard	3

Weiss informations

Set name: G7 - 48Modules

Weiss cycle: 47

Silicate 3,3: 0 %

Sugar: 0 %

Silicate 4: 0 %

TMAH: 0 %

Glycerine: 0 %

Pouring quantity: 0 L/m2

Criteria PE VZOREK

/ TK PASKA KMB

/

/

/

Note (DLF): Vzorky mohou obsahovat vady!Kromě bublin a prasklin! Nezapomeň na umístění žlutého štítku v pravém dolním rohu dle DLF tabule!!!Řezáno 2x. Podruhé oprava a fezáno z tabuli určených pro Warington na příkaz vedení.

Input

Output

KIS code	Structure	Block number	Positions	Product	Team	Operation	KIS code	Structure	Date production
630XX000Pyr	3/3/3/3/3/3	bx0630001602		bx1239302502			630XX451 Pyr	3/3/3/3/3/3	
630XX000Pyr	3/3/3/3/3/3	bx0630001602		bx1239302501			630XX451 Pyr	3/3/3/3/3/3	

venca
Page 1 of 2

12.10.2009

630XX000Pyr 3/3/3/3/3/3 bx0630001601

bx1239301501

630XX451 Pyr 3/3/3/3/3/3

630XX000Pyr 3/3/3/3/3/3 bx0630001604

bx1239302503

630XX451 Pyr 3/3/3/3/3/3

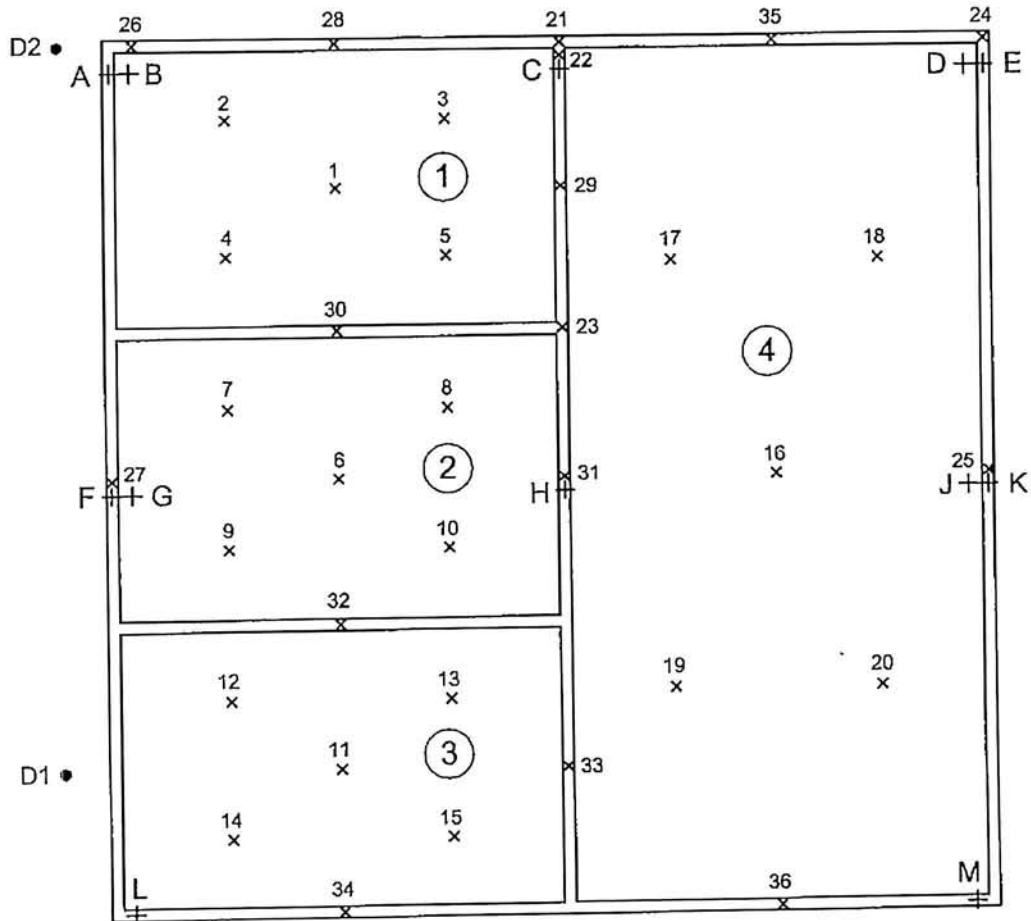
Cutting finished: Dispatched: at date: 17.9.2009

Note (CT):

Commercial samples - detail report

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A – M Deformation measuring points

● D1, D2 Pressure measuring points

x 1 - 36 For determining temperatures of the unexposed face of the specimen thermocouples according to DIN EN 1363-1 : 1999-10, section 4.5.1.2 are used.

For determining furnace temperatures thermocouples according to DIN EN 1363-1 : 1999-10, section 4.5.1.1 are used.

Position of measuring points

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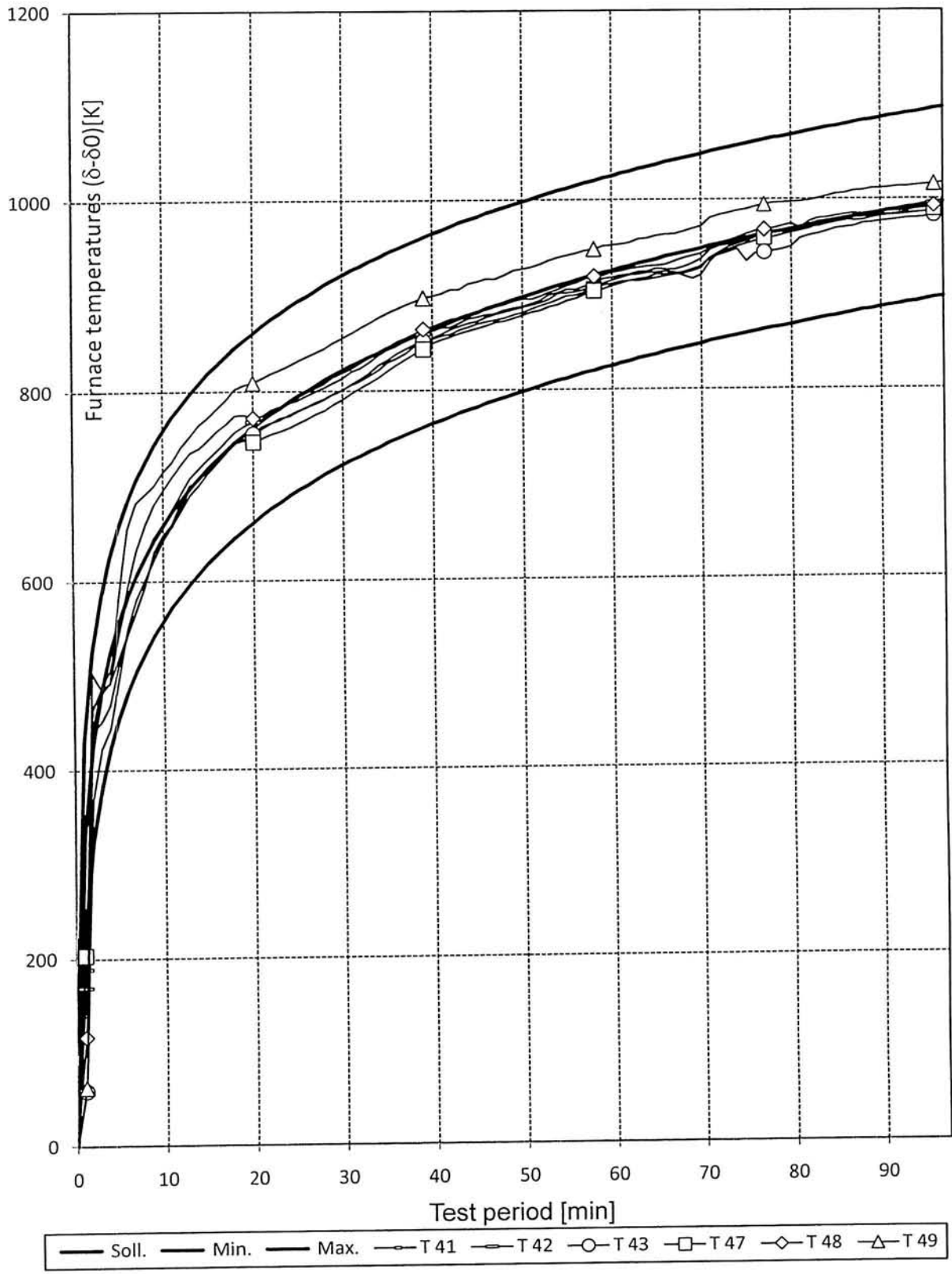
Product name	Manufacturer	Thickn.	Weight per unit area	Apparent density	Moisture content ²⁾	Classification of reaction to fire
			mm	kg/m ²	kg/m ³	
Fire-rated "PYROBEL 30" 3/3/3/3/3/3	AGC Glass Europe (B)	30	72	- ¹⁾	- ¹⁾	2)
Fire-rated "Promatect- H" board	Promat GmbH	15	- ¹⁾	870	- ¹⁾	A1 acc. to DIN 4102
Hollow steel profile	2)	2 40	- ¹⁾	- ¹⁾	- ¹⁾	A1 acc. to DIN 4102
Glazing tape	2)	5	- ¹⁾	- ¹⁾	- ¹⁾	2)
"Promat Systemglas-Silikon"	Promat GmbH	5	- ¹⁾	1150	- ¹⁾	B2 acc. to DIN 4102
Mineral wool	2)	20	- ¹⁾	- ¹⁾	- ¹⁾	A1 acc. to DIN 4102
¹⁾ Has not been determined ²⁾ Not available to MPA Braunschweig						

Characteristics of the building products

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ETK DIN EN 1363-1



$\delta_0 = 16^\circ\text{C}$

Tested on: 14.10.09

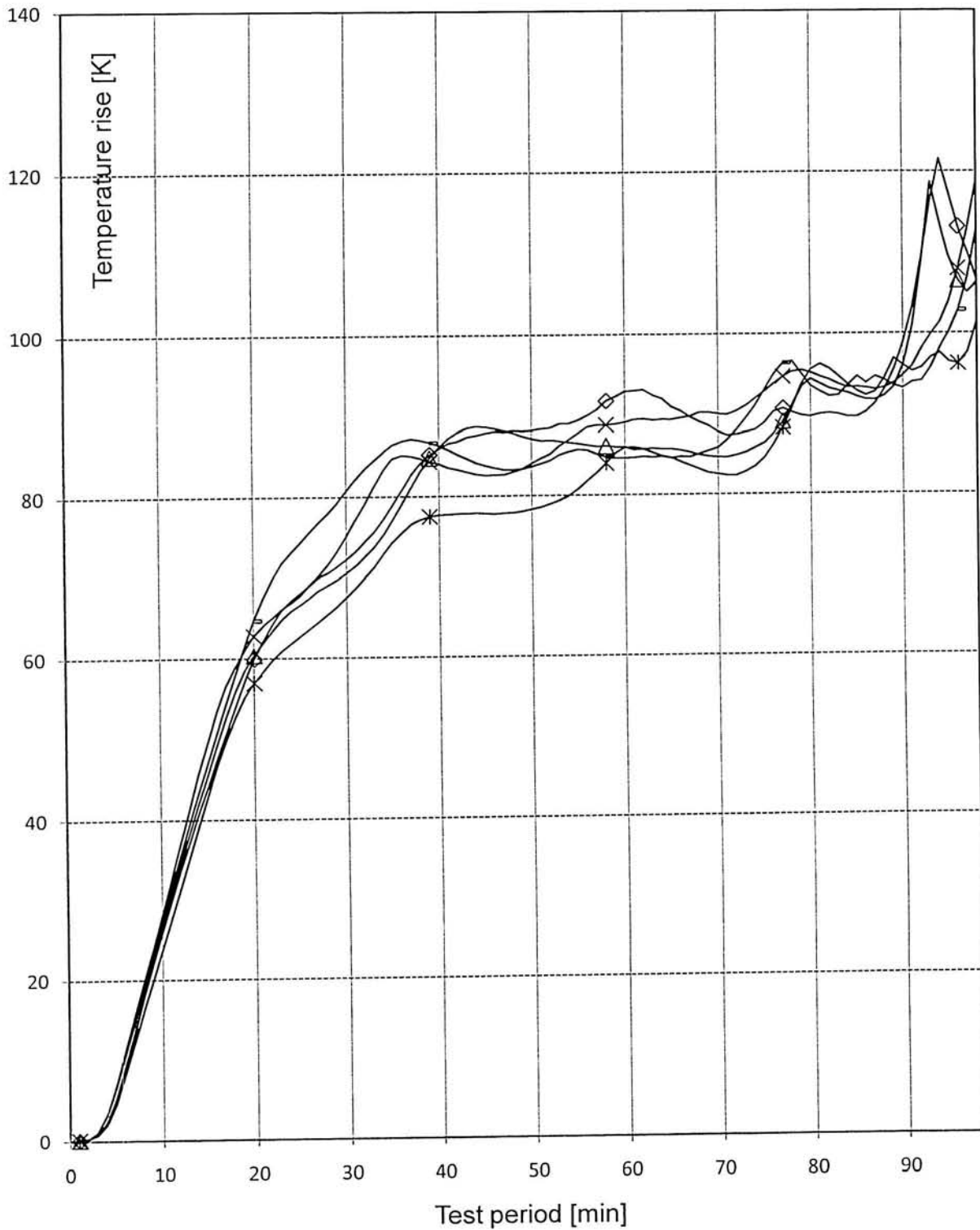
Furnace temperatures

Annex 2.1 of

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Mean value Field 1



—◇— MSt.1 —△— MSt.2 —×— MSt.3 —*— MSt.4 —→— MSt.5

Time [min]	10	15	20	30	45	60	90	98	-	-
Mean val.	26 K	46 K	61 K	73 K	84 K	88 K	96 K	109 K		140 K
Maximum	28 K	50 K	65 K	81 K	88 K	93 K	99 K	119 K	180 K	
Meas. p.	3	3	5	5	2	1	1	3	-	-

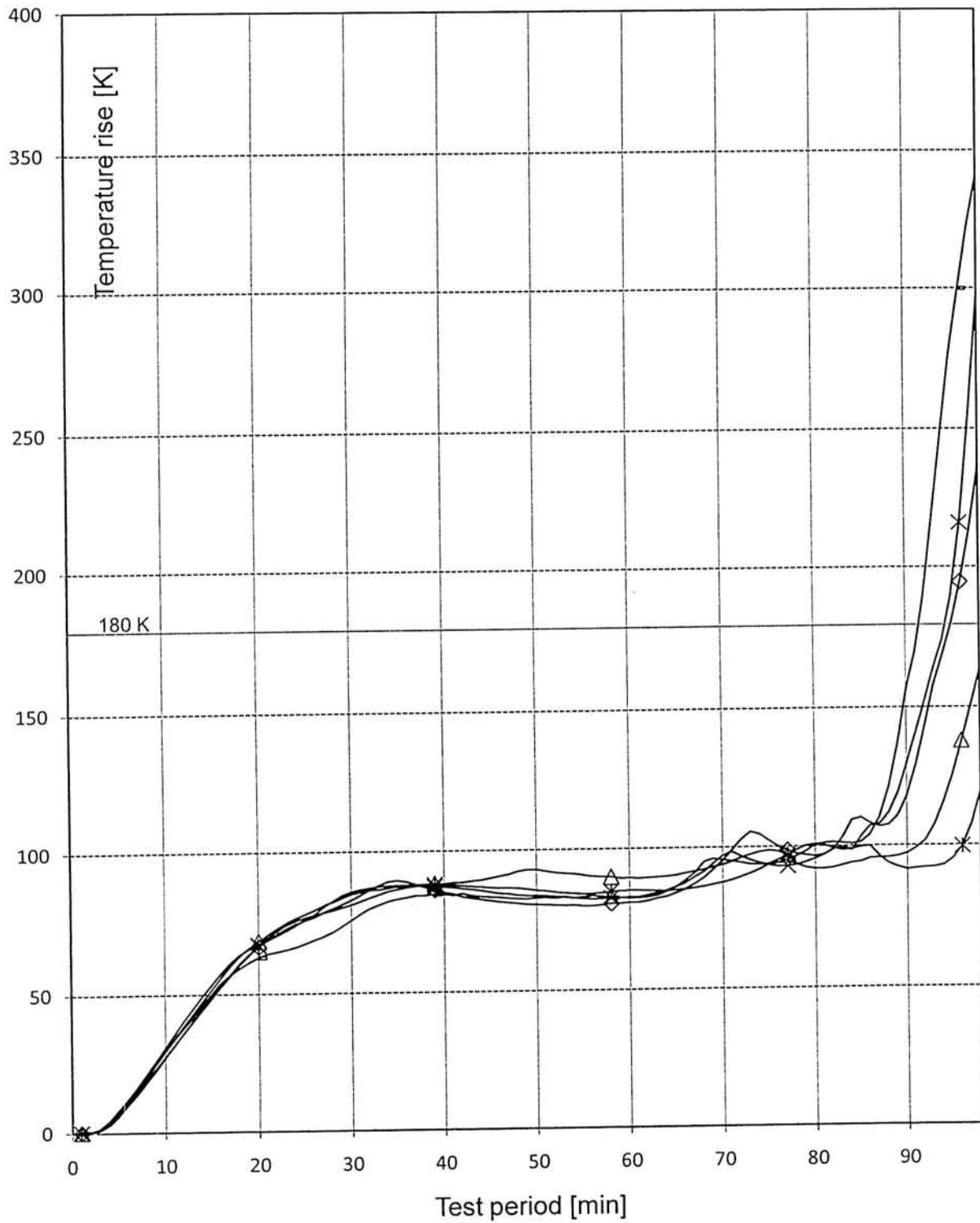
End of fire exposure
after 98 min!

Specimen temperatures

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Annex 2.2 of
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Nr. (3169/606/11)

Mean value Field 2



—◇— MSt.6 —△— MSt.7 —×— MSt.8 —*— MSt.9 —●— MSt.10

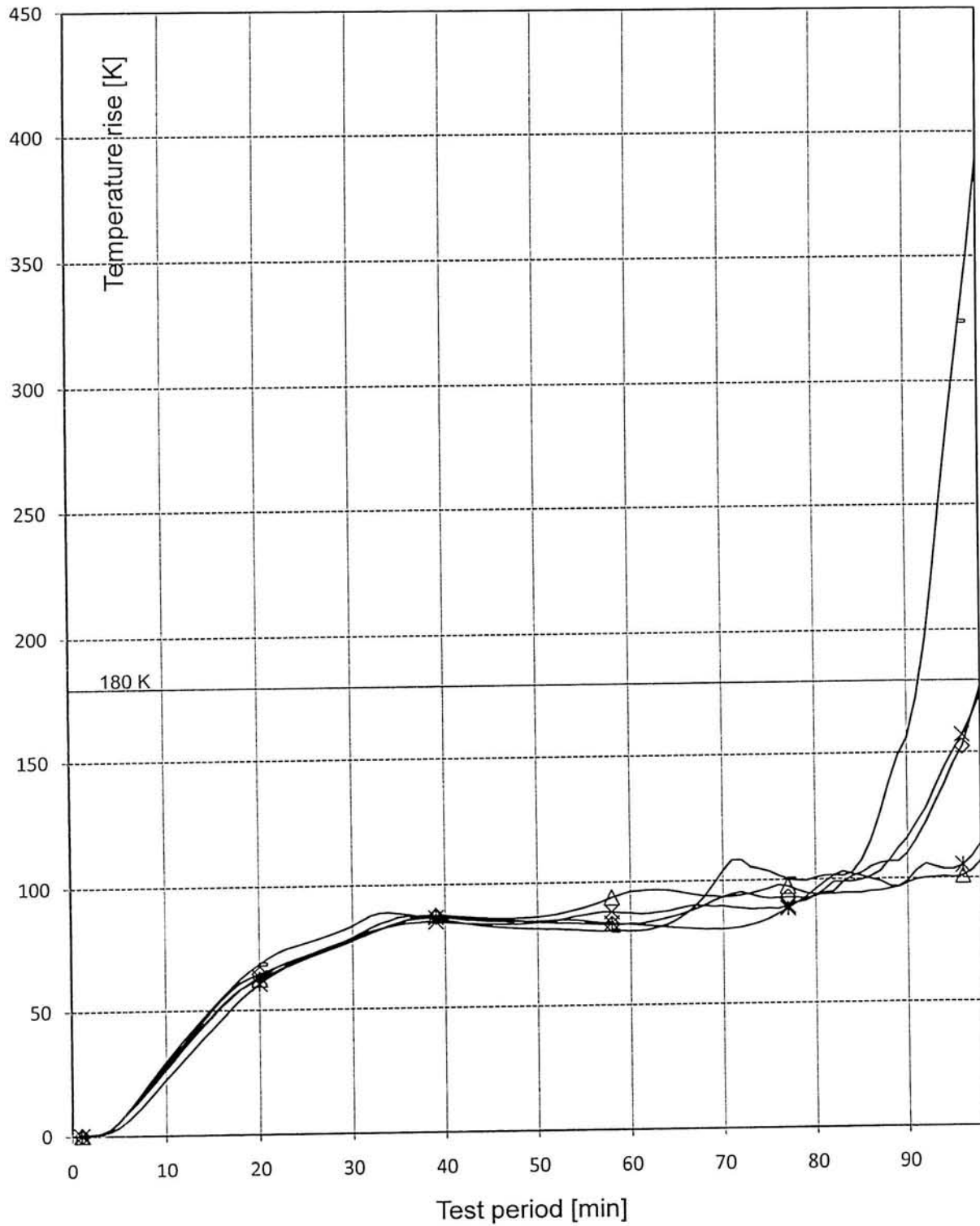
Time [min]	10	15	20	30	45	60	90	98	92	92	
Mean val.	29 K	51 K	67 K	82 K	85 K	84 K	118 K	231 K		140 K	
Maximum	31 K	54 K	69 K	86 K	90 K	89 K	156 K	340 K	180 K		End of fire exposure after 98 min!
Meas. p.	8	8	7	8	7	7	10	10	10		

Specimen temperatures

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Mean value Field 3



—◇— MSt.11 —△— MSt.12 —×— MSt.13 —*— MSt.14 —●— MSt.15

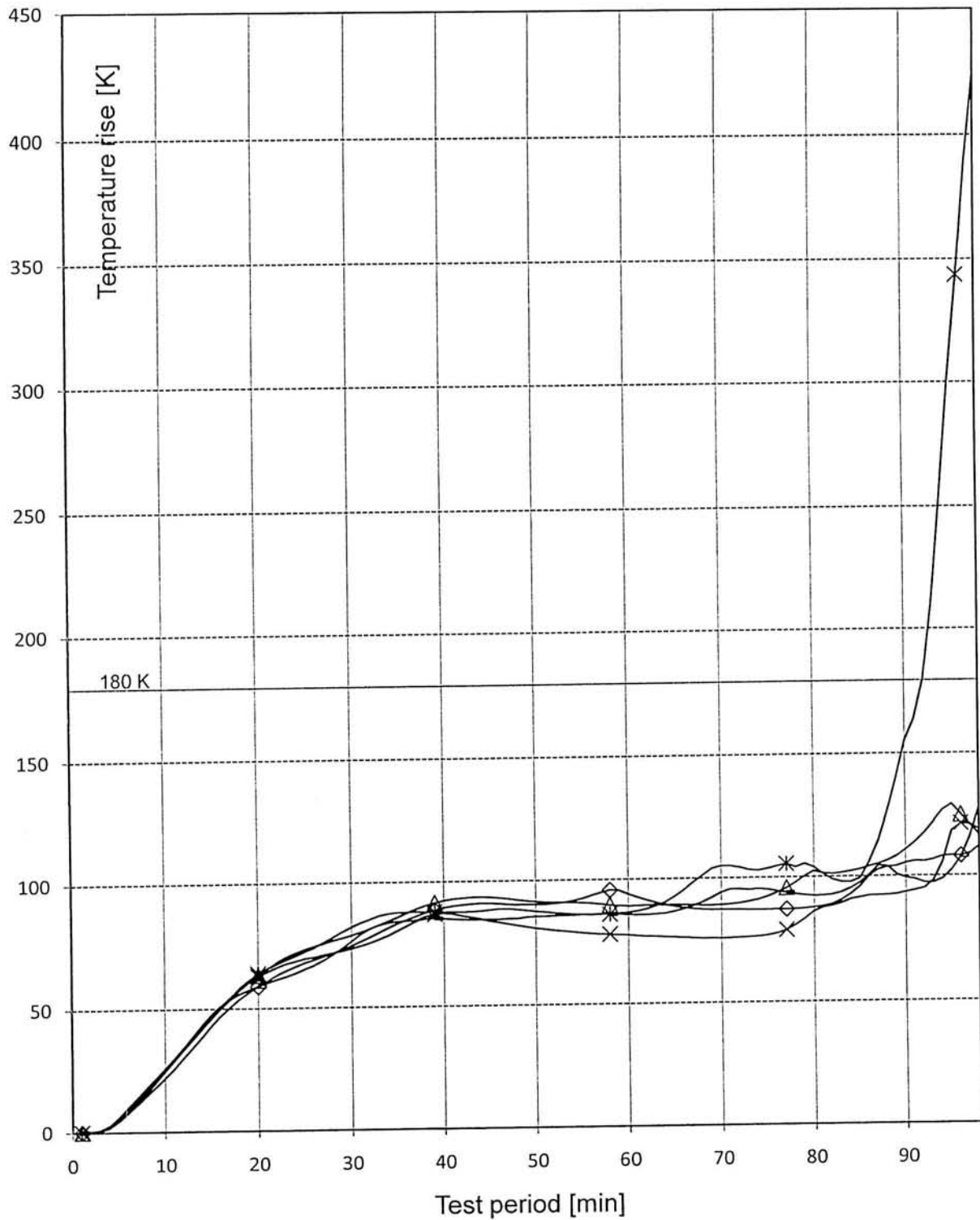
Time [min]	10	15	20	30	45	60	90	98	91	93	
Mean val.	27 K	48 K	64 K	80 K	85 K	86 K	116 K	192 K		140 K	
Maximum	30 K	51 K	69 K	84 K	86 K	96 K	156 K	390 K	180 K		End of fire exposure after 98 min!
Meas. p.	15	15	15	15	12	12	15	15	15		

Specimen temperatures

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Annex 2.4 of
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Mean value Field 4



—◇— MSt.16 —△— MSt.17 —×— MSt.18 —*— MSt.19 —— MSt.20

Time [min]	10	15	20	30	45	60	90	98	92	94
Mean val.	25 K	46 K	62 K	77 K	88 K	87 K	113 K	180 K		140 K
Maximum	26 K	48 K	64 K	82 K	93 K	94 K	155 K	424 K	180 K	
Meas. p.	17	20	19	19	17	16	19	19	19	

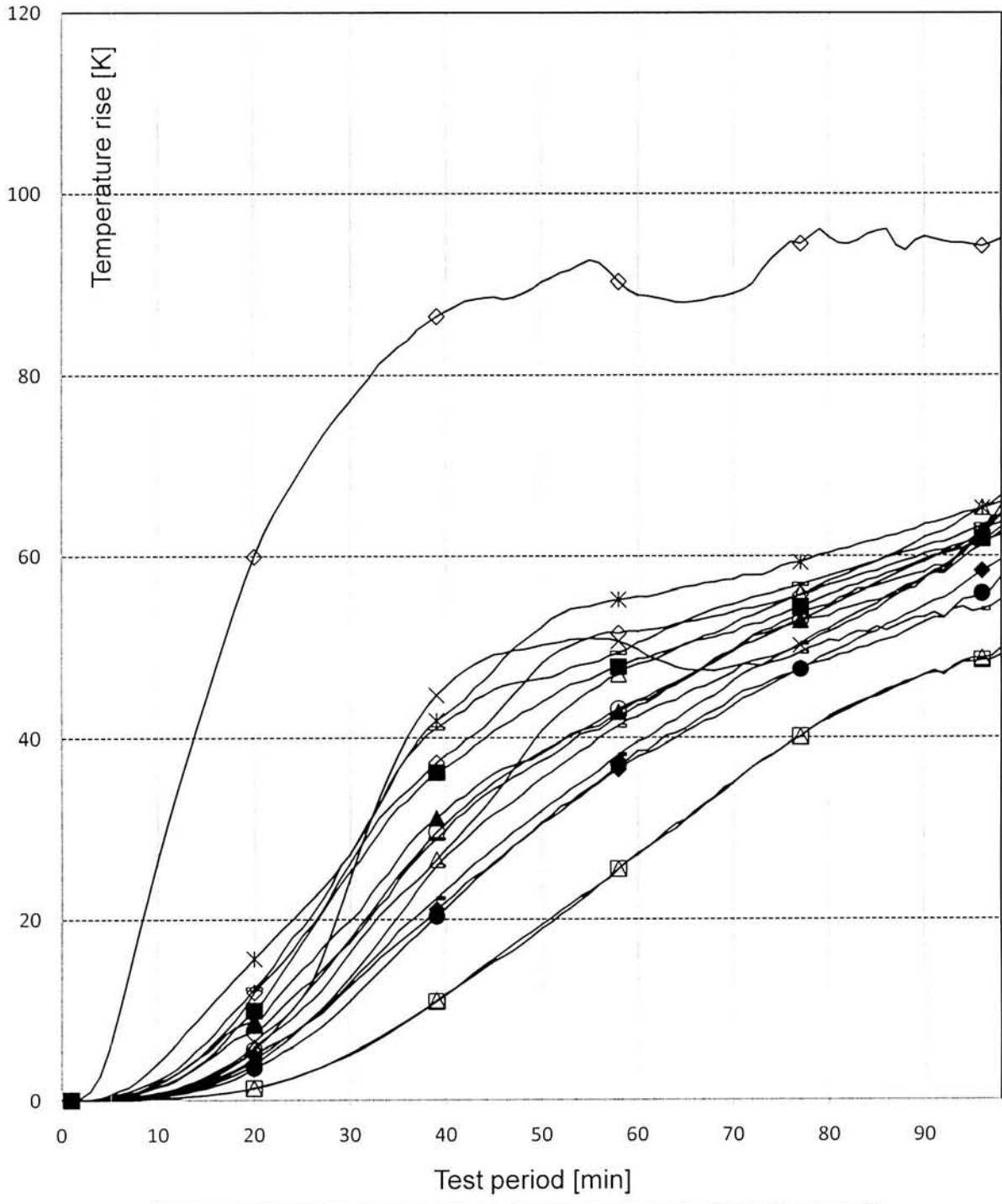
End of fire exposure after 98 min!

Specimen temperatures

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Profiles DIN EN 1364-1 (MSt. 26 und 27 at unfixed edge)



◇ MSt.21	△ MSt.22	× MSt.23	* MSt.24	→ MSt.25	— MSt.26
○ MSt.27	■ MSt.28	◆ MSt.29	▲ MSt.30	→ MSt.31	— MSt.32
● MSt.33	□ MSt.34	◇ MSt.35	△ MSt.36		

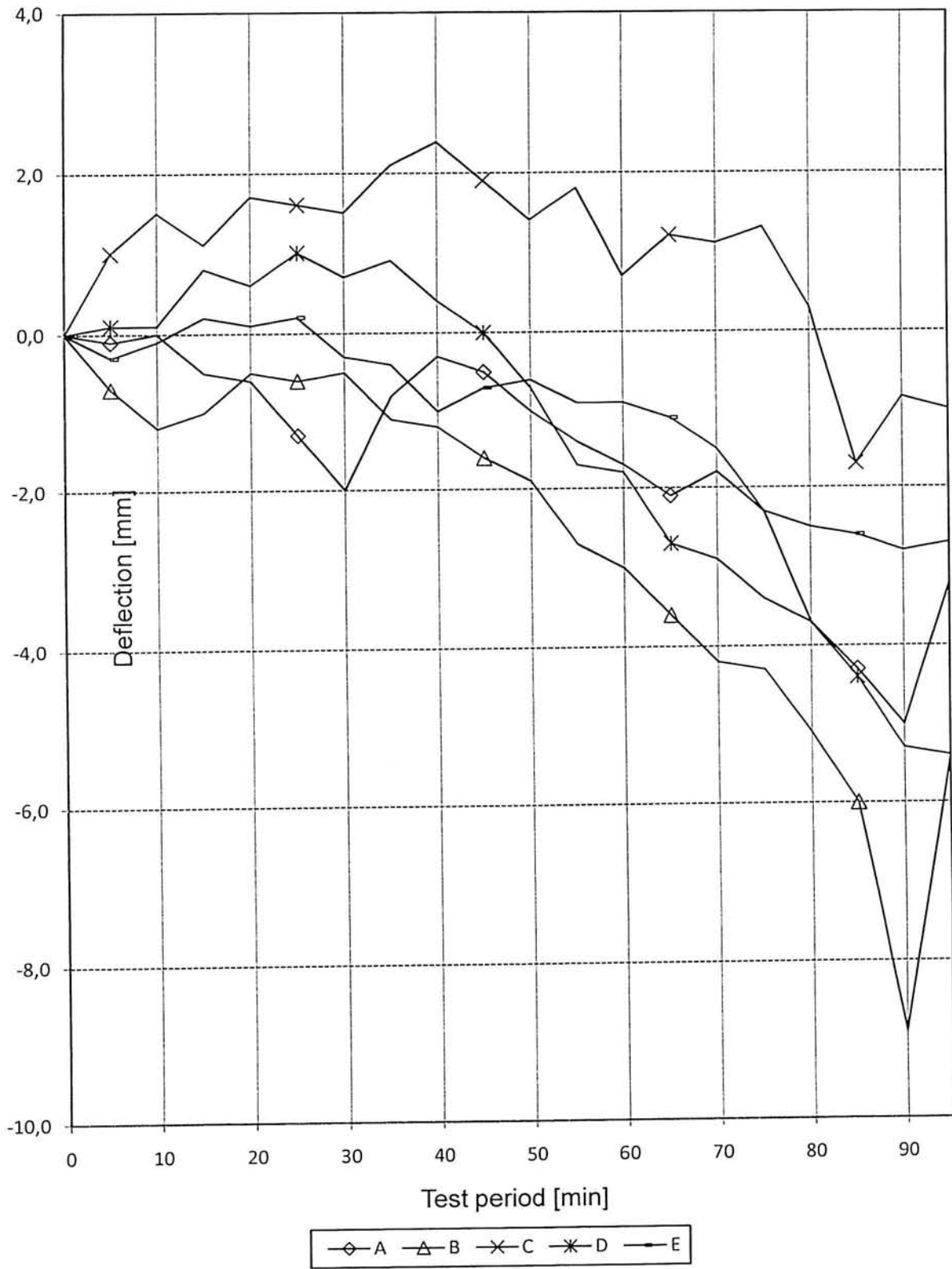
Time [min]	10	15	20	30	45	60	90	98	-
Maximum	27 K	44 K	60 K	77 K	89 K	89 K	95 K	95 K	180 K
Meas. p.	35	35	35	35	35	35	35	35	-

End of fire exposure after 98 min!

Specimen temperatures

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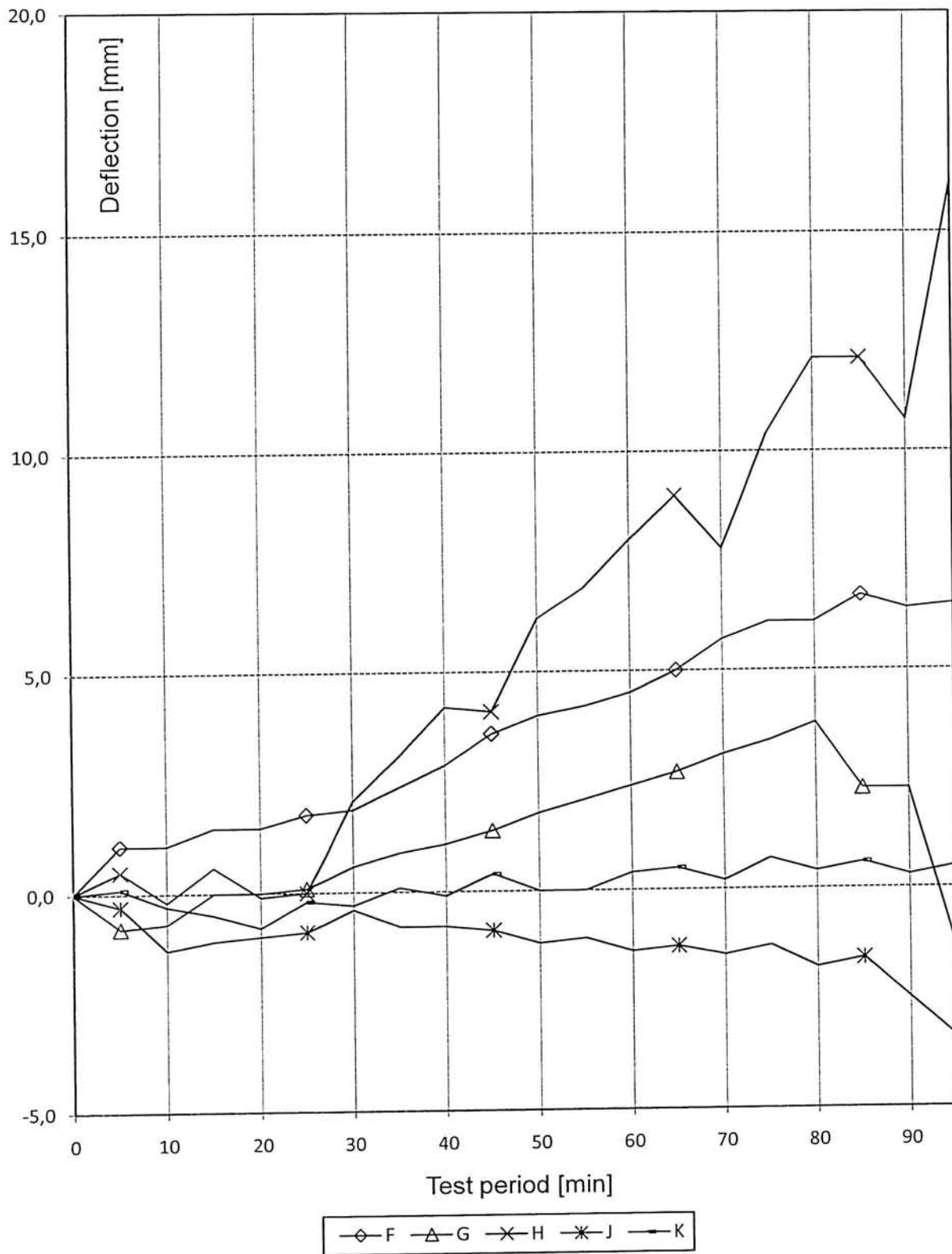
Specimen deflection (Top)

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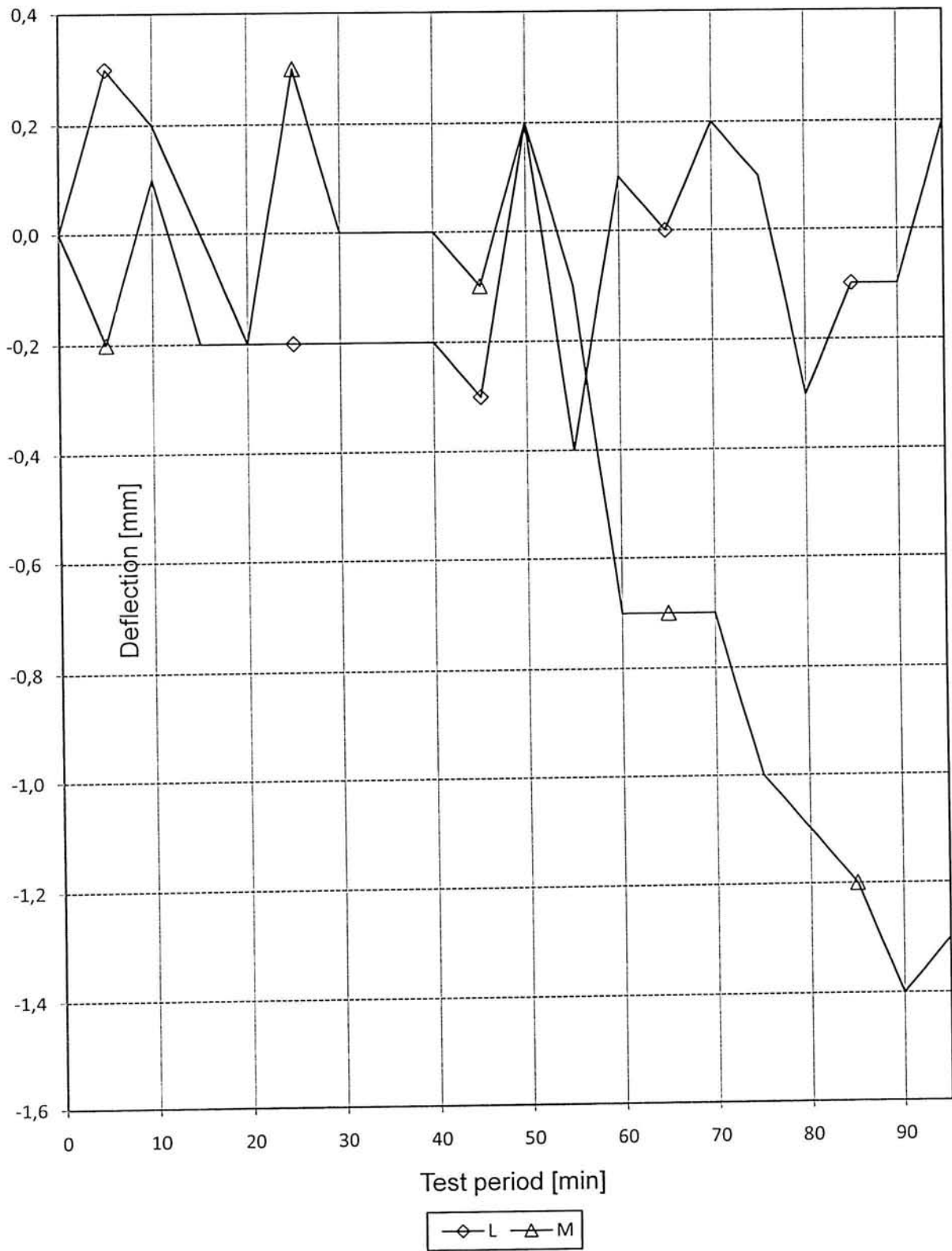
Specimen deflection (Center)

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Specimen deflection (bottom)

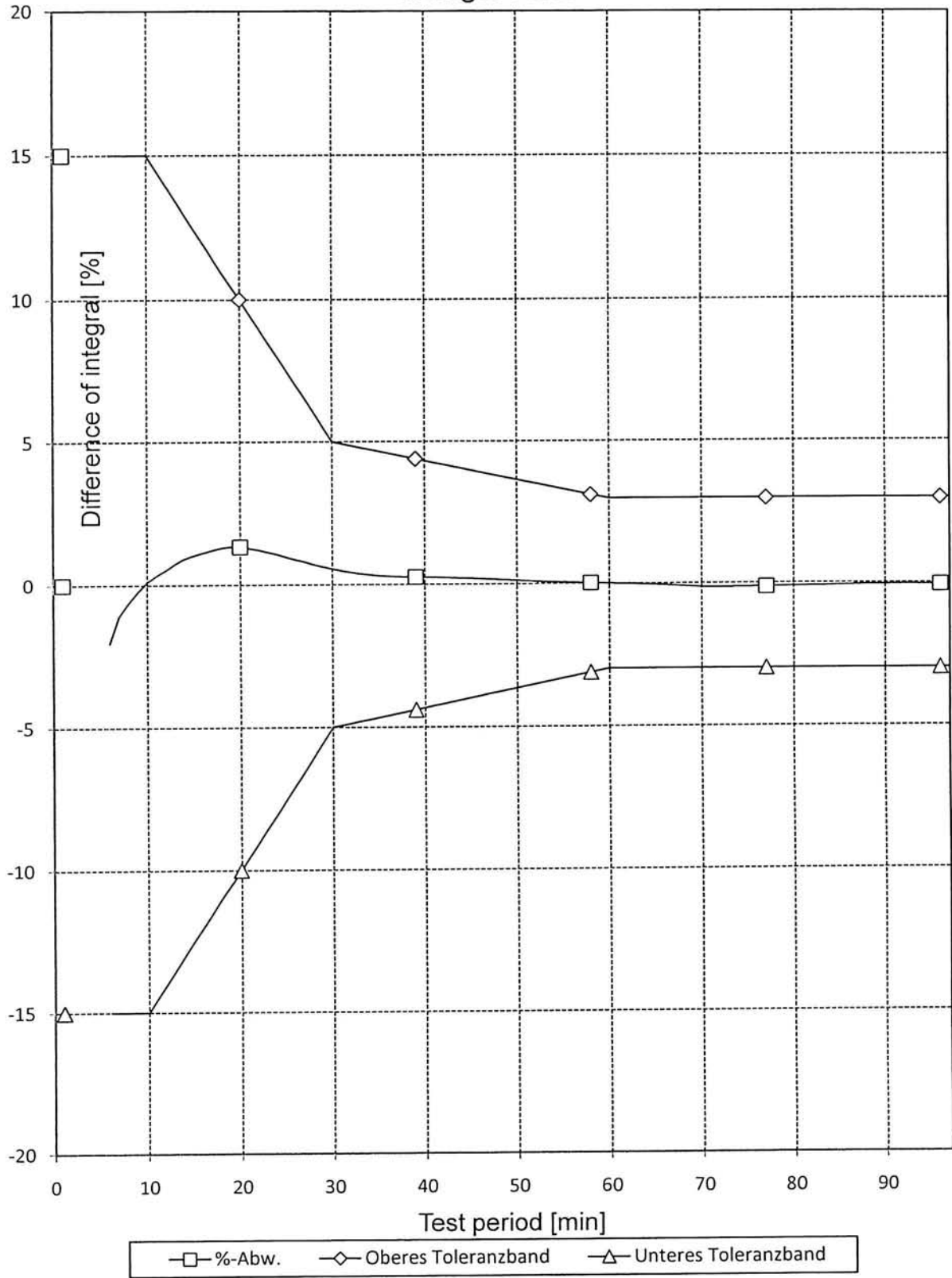
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Difference of Integral of furnace temperatures from the integral of target value



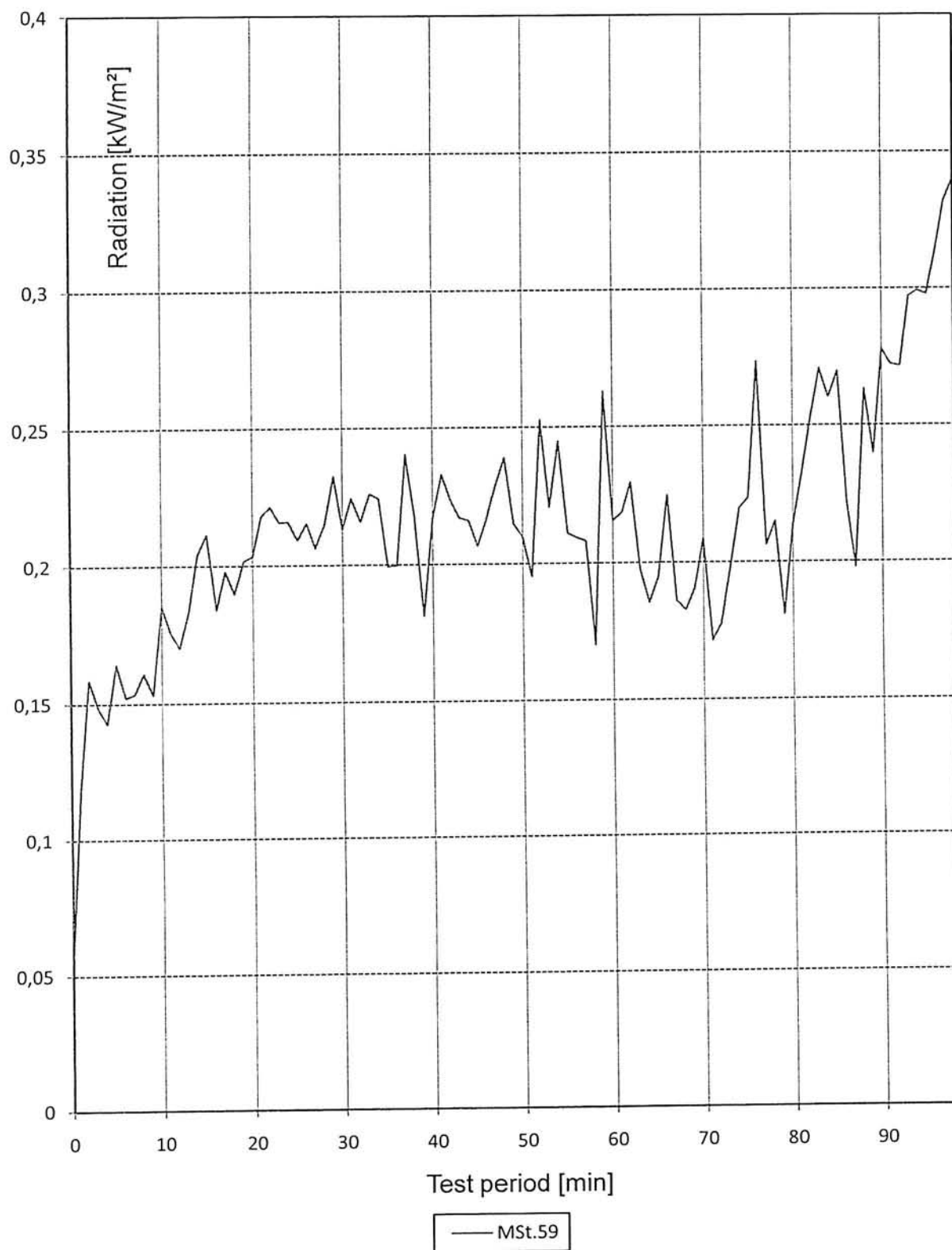
$\delta_0 = 16 \text{ }^\circ\text{C}$

Tested on: 14.10.09

Difference of integral

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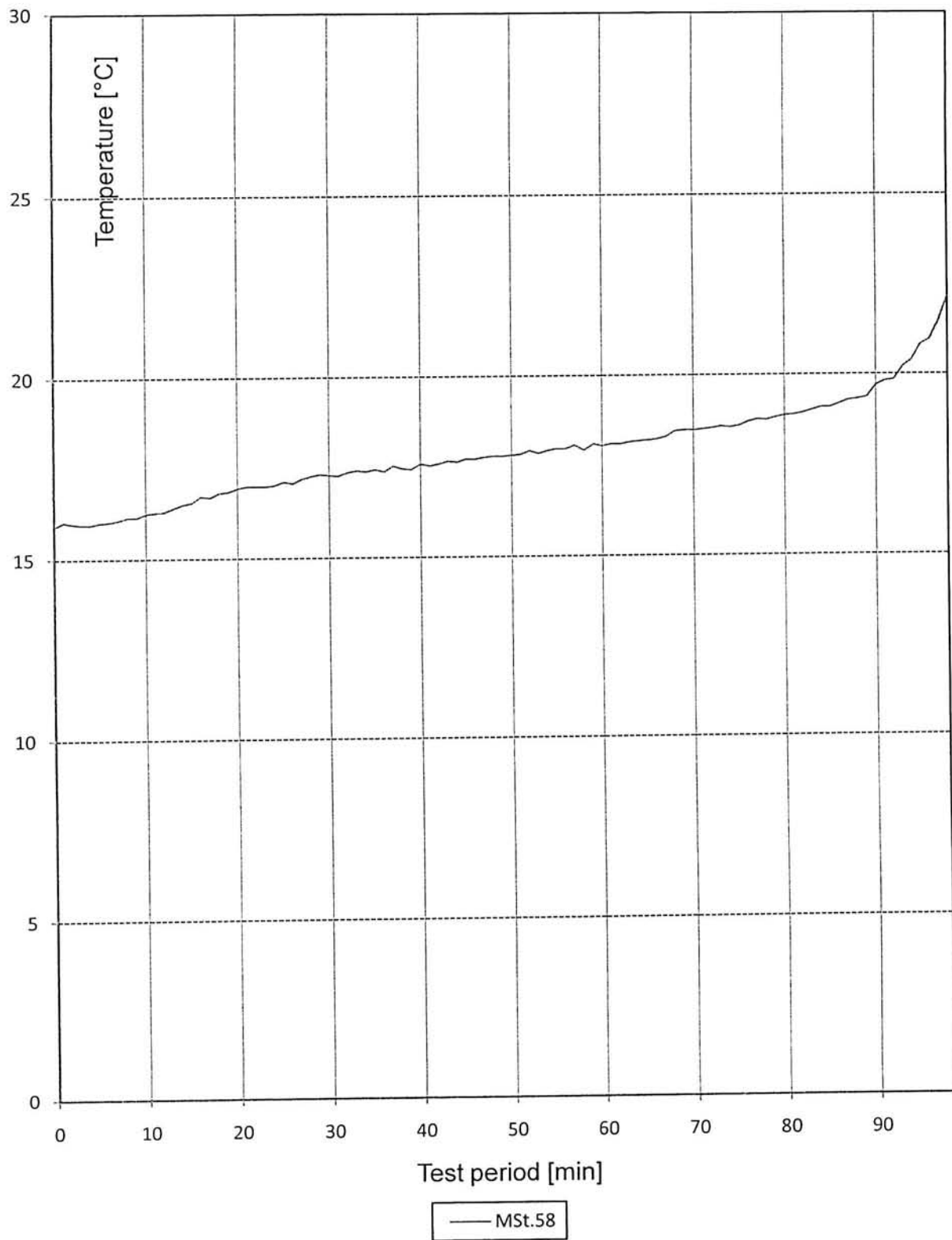


End of fire exposure after 98 min!

Specimen radiation

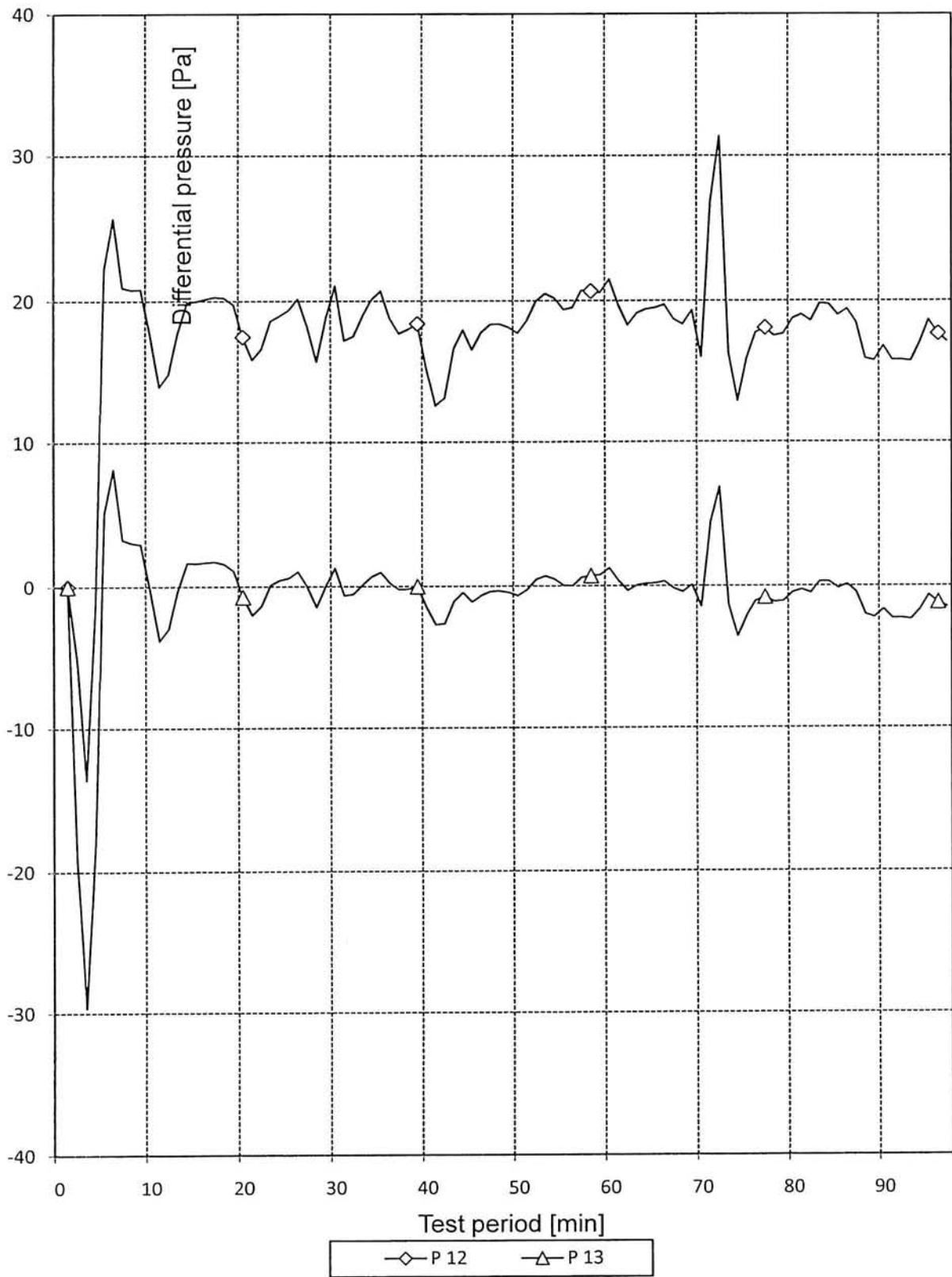
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End of fire exposure after 98 min!

<p>Ambient temperature</p>	<p>Annex 2.12 of Test report Nr. (3169/606/11)</p>
<p>Materialprüfanstalt für das Bauwesen Institut für Baustoffe, Massivbau und Brandschutz der Technischen Universität Braunschweig</p>	



$\delta_0 = 16\text{ }^\circ\text{C}$

Tested on: 14.10.09

Differential pressure

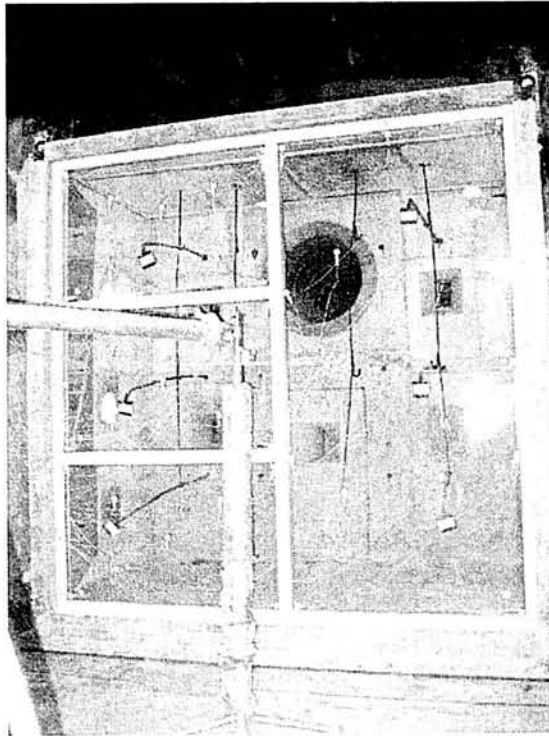
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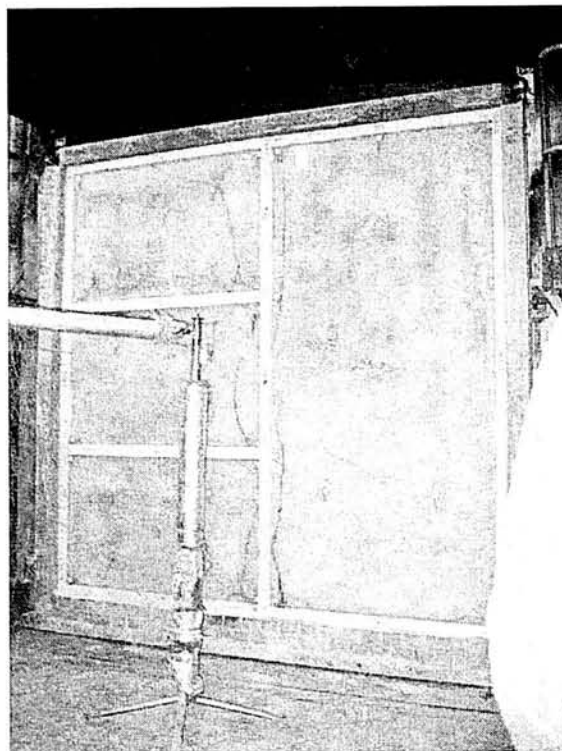
Test report
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Test period [min]	Face *)	Observations made during the fire test on 14/10/2009
1	F	Interlayer starting to react in field 4; arc-shaped cracking pattern along the profiles in the float-glass pane facing the furnace
2	F	The interlayer reaction and the subsequent formation of bubbles have their origin in the middle of the glass pane.
3	F	Except for a point near the bottom of field 3, the interlayer has reacted everywhere. Brownish discolouration starting at the central post and extending to both sides.
6	F	The interlayer has a polygonal structure (approx. Ø 10-15 mm). Water vapour emerging from partly continuous cracks. More distinct cracking in the smaller panes than in the larger size; and more distinct in the bottom end panes than in ones at the top. Commencing secondary interlayer reaction.
9	A	All fields can no longer be seen through; they have all turned brown.
12	F	Secondary interlayer reaction starting in the centre of field 4; bubbles are appearing in vertical rows.
16	F	The bubbles in the interlayer are becoming larger. Commencing gelling action along the cracks. Continuous cracks in fields 4 and 2, with vapour escaping along the central post.
22	F	Bubbles turning brown along the central post.
27	F	Continuous cracks are forming at the central post in field 3; crackling noise.
28-60	F	Repeatedly new secondary interlayer reaction, formation of bubbles and brownish discolouration starting in the centre of the panes.
62	A	Brownish liquid oozing from the cracks along the central post; outer Promatect layer breaking horizontally near the central post in the transom connection region.
66	F	On the fire-exposed face, the interlayer is structured with bumps and craters.
77	A	All fields have completely cracked; glow of fire can be seen through the interlayer in field 3; some smoke is emerging.
82	A	Again secondary reaction of the interlayer in field 3; glow of fire can no longer be seen. Glow of fire can be seen through the interlayer in field 4 near point 20.
85	F	Outer layer of the interlayer warping towards the furnace above point 11; 10 to 15-mm displacement in the glass pane along the cracks.
88	A	Gradually increasing glass displacement along the cracks.
90	A	Flames > 10 sec. leaping from a crack near the central post at the bottom of field 4. Interlayer continuing to come off in all fields.
98	-	End of fire exposure. It is decided together with the client that the test should be ended.
*)	F A	Fire-exposed face Non-exposed face
Observations		Annex 2.14 of Test Report No. 3169/606/11
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Start of fire test



Test minute 30

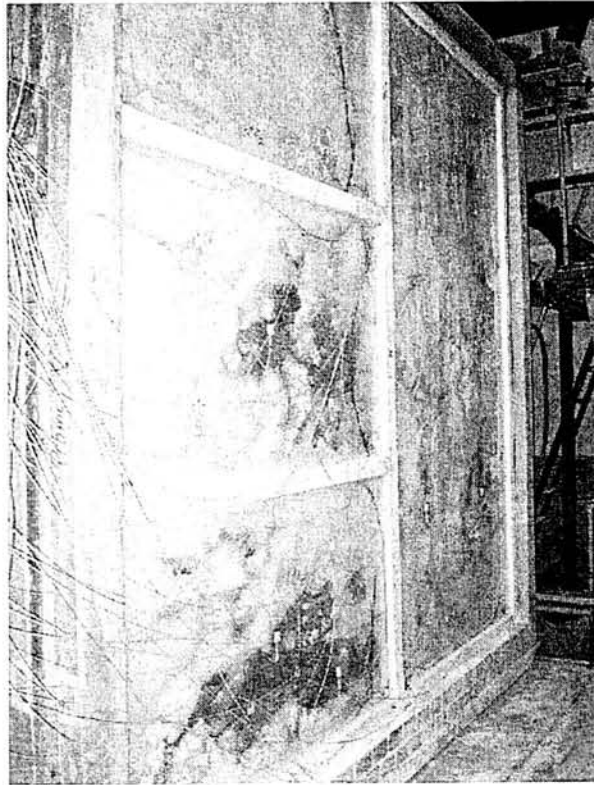


Photographic documentation

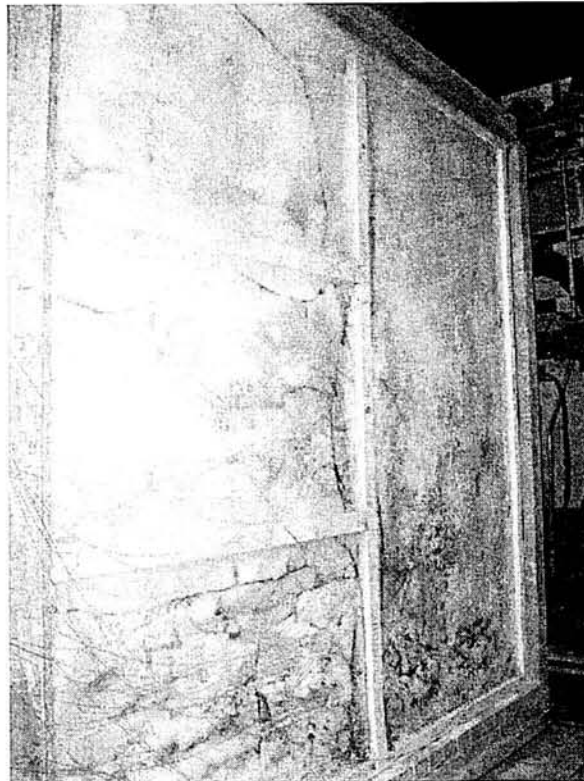
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Test minute 60



Test minute 90



Photographic documentation

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