



## Instytut Techniki Budowlanej (ITB)

European Notified Body No. 1488

**Group of Testing Laboratories**

accredited by the Polish Centre for Accreditation

# TESTS REPORT

## LZP01-01036/23/R756NZP/ENG

**Product manufacturer / System  
provider / Client:**

**ALUPROF S.A.**  
ul. Warszawska 153  
43-300 Bielsko-Biała

**Product name:  
(as specified by the Client)**

Curtain wall straight specimen in full configuration of  
**Aluprof MB-SR50N EI EI60 system**, heating from the  
**inside**

**Date of issue:**

07.11.2023

**Laboratory Laboratorium Badań Ogniwych (LZP)**  
**fire@itb.pl**

Instytut Techniki Budowlanej • 00-611 Warszawa • ul. Filtrowa 1 • tel. +48 22 825 04 71 • www.itb.pl • ci@itb.pl

## 1. INFORMATION ON THE TESTS

Basis for the report: Regulation (EU) No. 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC.

This Test Report contains the results of tests covered by the scope of accreditation as well as the results of non-accredited tests. Test results outside the scope of accreditation are marked as "outside the scope of accreditation".

**Test start date:** 22-08-2023

**Test completion date:** 22-08-2023

**Test method:** EN 1364-3:2014, no deviations. External heating curve.

**Test location:**

Pionki | ul. Przemysłowa 2, 26-670 Pionki | tel. + 48 48 31 21 600 | fax + 48 48 312 21 601.

## 2. TEST SPECIMEN

### 2.1. Information provided by the Client

**Number of the relevant harmonised product standard:** EN 13830:2003

**Product:** Curtain wall in full configuration

**Declared range of application (in accordance with the harmonised standard):** Fire resistance

#### General information:

Curtain wall of Aluprof MB-SR50N EI type EI60 heated from the inside was manufactured of Aluprof MB-SR50N EI60 system elements and mounted on the test site by Aluprof S.A., ul. Warszawska 153, 43-300 Bielsko Biała.

The structure of the test specimen is shown in figs. n Appendix A.

The list of materials used is presented in table A.1 in Appendix A.

#### Dimensions:

The test specimen had following dimensions: (width × height):

- 4522 x 5667 mm (total dimensions),
- 3997 x 4500 mm (test specimen heated dimensions),
- 4500 mm (span length between slabs).

#### Structure:

MB-SR50N EI type EI60 curtain wall had mullion-transom structure. The specimen was manufactured with system aluminium profiles:

- mullions (cat. No. K431525X) with 145 × 50 mm cross-section, and
- transoms (cat. No. K431531X with 149,5 × 50 mm cross-section.

Load-bearing profiles (mullions and transoms) were reinforced with aluminium inserts (cat. No. K440824X) insulated with fire retardant elements made of type Palstop Pax boards with dimensions 9 x 84 x 2000 mm (cat. No. 8G00366X) and 9 x 64 x 2000 (nr kat. 8G00365X).

The reinforcement inserts were connected to mullions and transoms with steel connectors cat. No. 80312107 (transom) and 80312108 (mullion). The mullions and transoms were connected with overlap and by additional steel connectors cat. No. 80376051 and 80376052 (one-sided and double-sided respectively) mounted to mullions on which transoms were shoved.

In the case of the side mullions of the structure and for the upper transom, Palstop Pax board inserts (cat. No. 80462158) with dimensions of 10x64x2000 mm were additionally used in the place of glass mounting.

### **Infills**

The specimen was infilled with:

- Pyrobel 26 TGU glazing units with thickness of 70,6 mm (D)/ 69,9 -71,0 (M) mm with following structure (listed from the outside): ESG 6 mm / spacer frame 16 mm / ESG 6 mm / spacer frame 16 mm / Pyrobel 25 EI60 manufactured by AGC with thickness 26,6 mm. The details of the glass dimensions and placement are shown in fig. 2A in Appendix A.
- in area of the inter-storey belt, panels with following structure: glazing unit: ESG 6 mm/ spacer frame 16 mm/ ESG 6 mm; 100 mm rock wool with density of 80 kg/m<sup>3</sup> type WENTIROCK manufactured by ROCKWOOL/ 0,80 mm steel sheet / 12,5 mm type F plasterboard.

### **Infills fixing**

The clamp beads K417890X were used as external glass mounting, connected to the wall structure with steel clamps cat. No. 80322091 in 250 mm and M6×60 steel bolts (cat. No. 80371326) in 250 mm spacing.

The glass panes were supported on steel glass supports cat. No. 8A01001X, and set on hardwooden setting blocks cat. no. 8A01055X and 8A01056X

EPDM gaskets cat. No. 120480, 120481, 120484, 120486 and intumescent tape type PUD cat. No. 127109 manufactured by Carboline were used as structural sealing.

The tape was circumferentially glued to the mullions and transoms in the vicinity of infills and glazing units.

### **Spandrel**

Opaque inter-storey spandrel was built into the structure of the specimen – 11A in Appendix No. A.

Layers of the opaque spandrel (listed from the outside):

- glazed unit: 6 mm ESG glass / 16 mm spacer frame/ 6 mm ESG glass;
- 120 mm rock wool (with additional layer of 50 mm in the level of the slab) with density of 80 kg/m<sup>3</sup>, Wentirock type manufactured by Rockwool

Steel sheet angles with 0,80 mm thickness were screwed with M3.5×16 screws spaced by 400 mm to transoms limiting the inter-storey spandrel, and clad with 12,5 mm type F plasterboard.

The structure was bind on the inside with 1,5 mm steel angles mounted with steel rivets (cat. No. 87252403) in 400 mm spacing.

Load-bearing mullions were divided in the floor level with 10 mm dilatation allowing mullion expanding. The dilatation was made with system aluminium profile cat. No. K432147X, which was filled and cladded with type Promatect H insulation boards and spaced by insulators cat. No. 009020.

### **Test specimen fixing to the supporting construction**

The connection of the curtain wall of the MB-SR50N EI type EI60 system with the steel frame was made by means of aluminum sliding brackets 1D cat. No. 80002128 (at the bottom) and fixed brackets cat. No. 80002127 (at the top), connected to the mullions through steel sleeves with M12 x 95 mm screws. The aluminum brackets were connected to the steel C-section with M12 x 45 mm steel bolts, washers and nuts.

Associated walls made of aerated concrete blocks density of 600 kg/m<sup>3</sup> and a thickness of 240 mm were built along the vertical edges of the test specimen.

Vertical gaps of about 20 mm width, between the steel frame and the associated walls of aerated concrete, were filled with a layer of ceramic wool.

## **2.2. Information obtained based on visual inspection in the Laboratory**

### **Acceptance of the test item into the laboratory:**

<b>Date:</b>	22-08-2023
<b>Acceptance protocol:</b>	LZP01-01036/23/R756NZP

### **Preparations of the test specimen:**

<b>Supporting construction preparation date:</b>	18-08-2023
<b>Test specimen inSteellation in the supporting construction date:</b>	22-08-2023
<b>Conditioning:</b>	test specimen did not require conditioning.

**Selection of test specimens:** laboratory was involved in selection.

**Size of the test specimen:** full-size.

### **Receipt of the test specimen mounted on the test site:**

Object mounted on the test site in ITB Fire Testing Laboratory in Pionki by ALUPROF® S.A., ul. Warszawska 153, 43-300 Bielsko-Biała.

### **Condition of the test specimen:**

The test specimen was provided in condition and quantity sufficient for the test. The test specimen was mounted in the supporting construction in a manner allowing for test execution.

#### **2.2.1. Verification of the test specimen**

Verification (in practicable scope) of conformity of the specification data provided by the Client with the test specimen was made before and after the test. Verification measurements are not encompassed by accreditation.

**Total overall dimensions of the heated part of the test piece:**

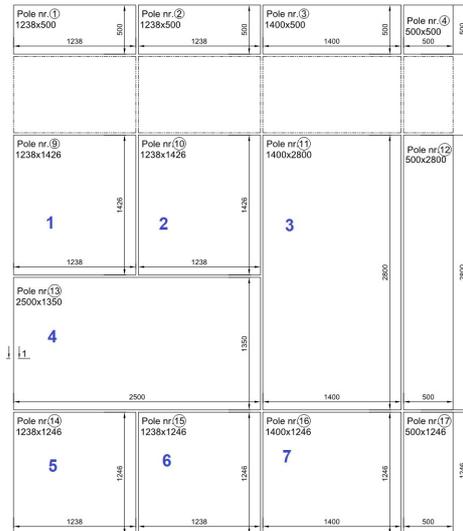
3997 x 4500 mm (width x height)

**Mullion and transom profiles:**

according to Client's documentation.

**Mullion and transom profiles:**

**Thickness of fire-resistant glazed units (average of 4 measurements)**



Glass nr 1	71,1
Glass nr 2	71,2
Glass nr 3	71,3
Glass nr 4	70,3
Glass nr 5	71,2
Glass nr 6	71,3
Glass nr 7	70,3



Fig. 1. Test specimen before the test – exposed side (before facing the furnace)



Fig. 2. Test specimen before the test during the montage – details



Fig. 3. Test specimen before the test – unexposed side

### 3. FIRE RESISTANCE TEST

#### 3.1. Test method

##### 3.1.1. General

**Method:**

EN 1364-3:2014

**Deviations:**

no deviations

**Standards referenced in the method, relevant for the test:**

EN 1363-1:2020

**Field of application of the method:**

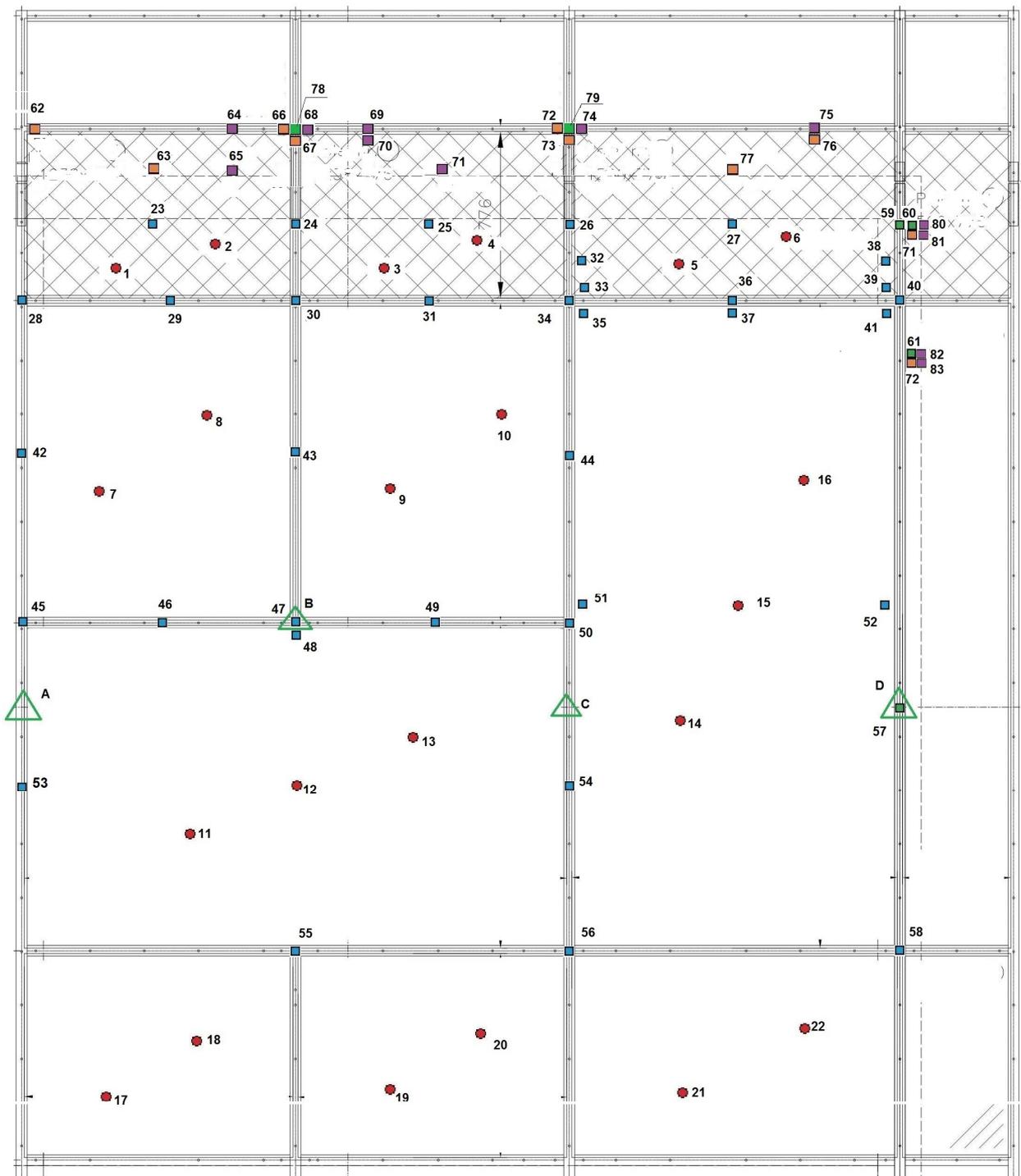
This report details the method of construction, the test conditions and the results obtained when the specific element of the construction described herein was tested following the procedure outlined in EN 1363-1, and where appropriate EN 1363-2. Any significant deviation with respect to size, constructional details, loads, stresses, edge or end conditions other than those allowed under the field of direct application in the relevant test method is not covered by this report.

**Compliance of the test with the method:**

Execution of the test, ambient conditions and accuracy of utilized measuring devices were in accordance with requirements of the method.

##### 3.1.2. Test conditions

<b>Location of measurement points:</b>	Fig. 4
<b>Initial temperatures:</b>	fig. 5, standard curve
<b>Initial temperatures:</b>	
<b>furnace:</b>	26,6°C, (26,6°C ≤ 50°C)
<b>test specimen:</b>	27,1°C, (10°C ≤ 27,1°C ≤ 40°C)
<b>unexposed surface:</b>	27,1°C
<b>Heating tolerance:</b>	Fig. 6
<b>Furnace pressure:</b>	Fig. 7, measurement at the reference point 20 Pa
<b>Ambient temperature:</b>	fig. 8



- thermocouples for average and maximum temperature rise measurements on surface 2
- thermocouples for maximum temperature rise measurements on surface 2 and 6
- thermocouples for maximum temperature rise measurements on perimeter seal
- thermocouples for maximum temperature rise measurements on surface 3 and 4
- thermocouples for maximum temperature rise measurements on fixing elements (anchors)
- △ - deflection gauges

Fig. 4. Location of measurement points on unexposed side of the test specimen

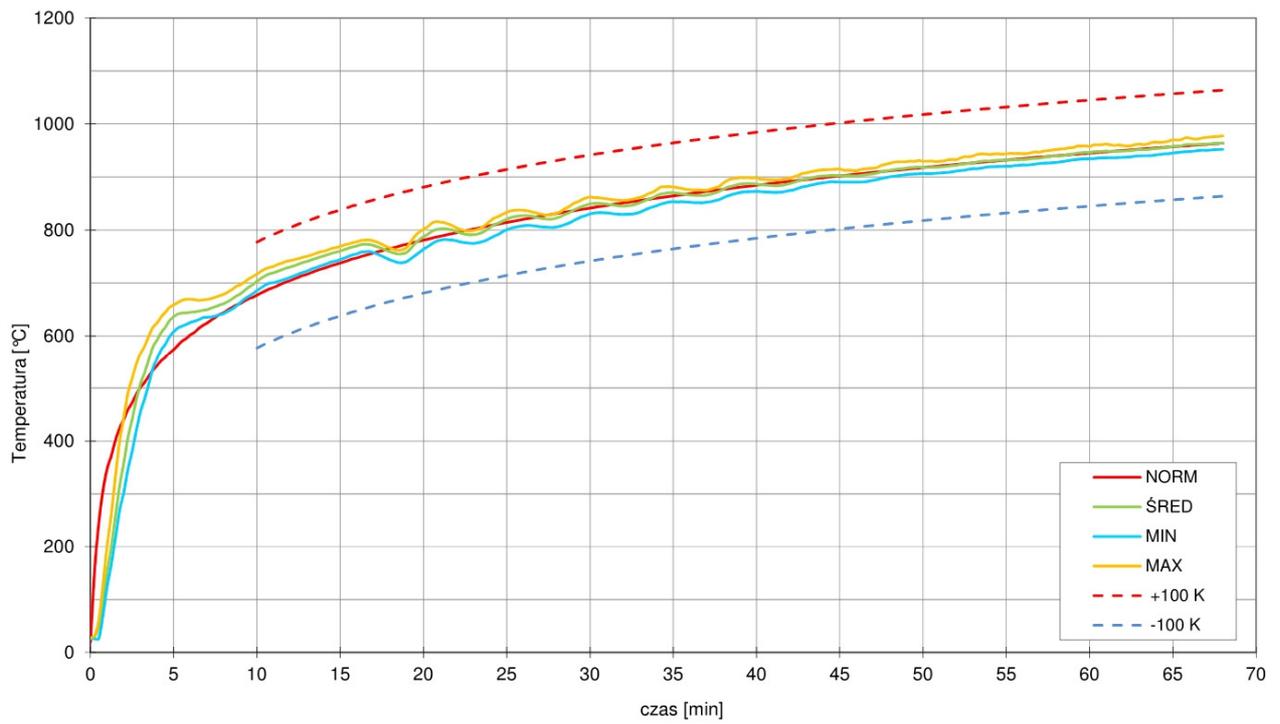


Fig. 5. Temperature of furnace heating conditions

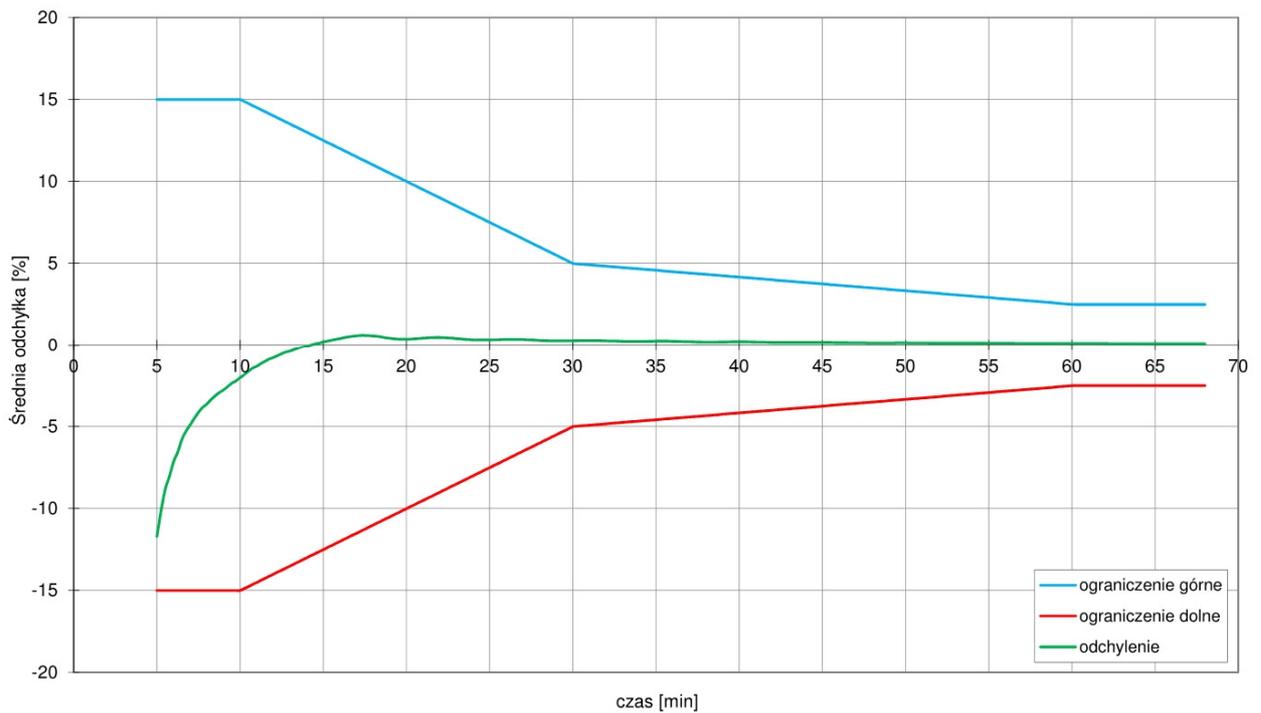


Fig. 6. Tolerance of heating

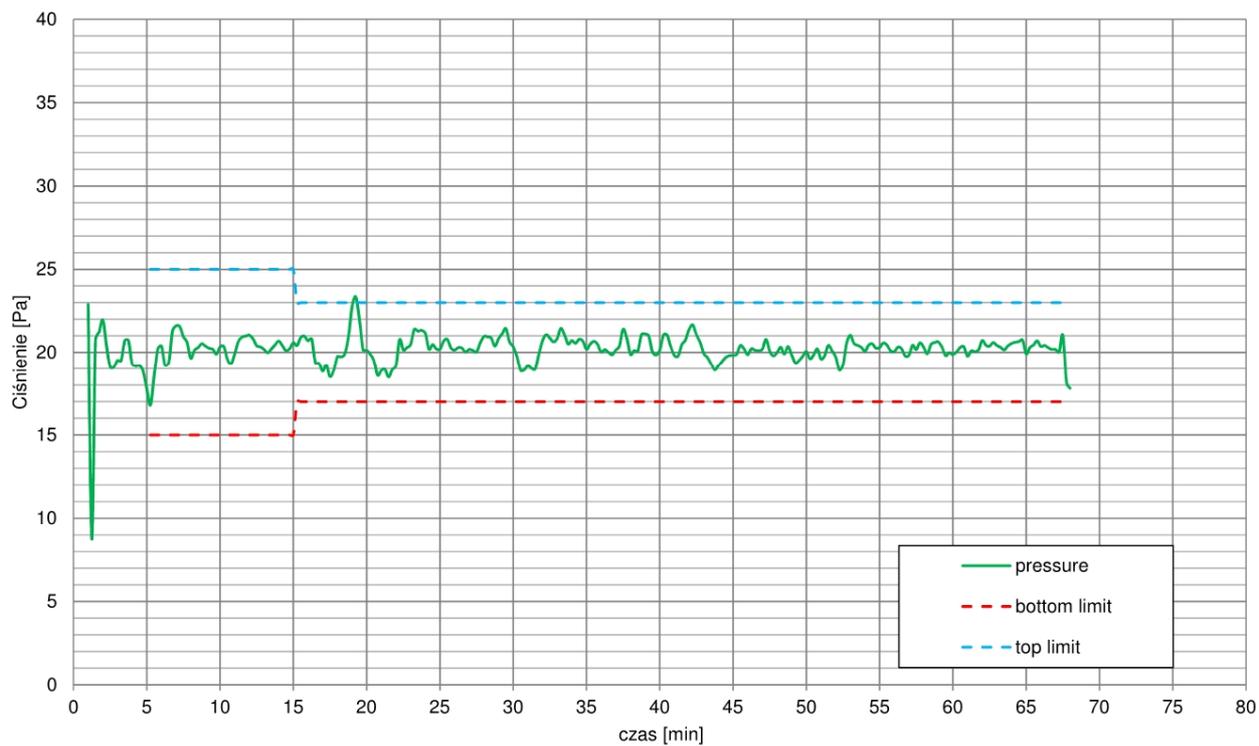


Fig. 7. Furnace pressure

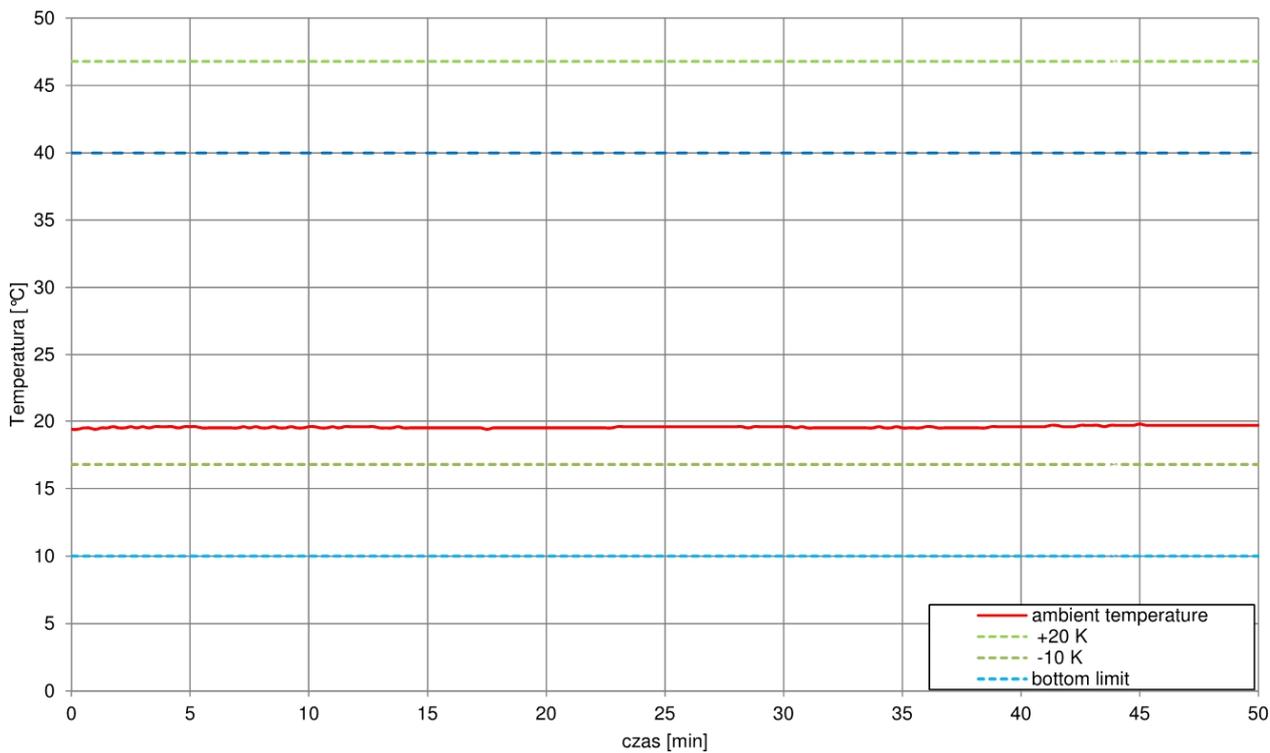


Fig. 8. Ambient temperature

## 3.2. Test results

<b>Test duration:</b>	68m 01s
<b>Temperature risen on the unexposed surface:</b>	Fig. 9 -30
<b>Field of application of test results:</b>	wg EN 1364-3:2014 p. 13

Tab. 1. 4.2.2.2. Measurements and observations during the test

Time	Record
0m 0s	Commencement of the test
4m 01s	Internal layers of glass panes 1-7 break and fell into the furnace (glass numberin as in point 2.2.1.);
26m 26s	Bubbles appear on the outer surface of the glass panes;
33m 04s	Intense smoke from the transom - mullion joint under glass no. 4 on the side of glass no. 3;
61m 30s	Intense smoke above glass panes no. 3;
68m 01s	Termination of the test (reason: in agreement with the Client)

### 3.2.1. Graphs of temperature increases on the exposed surface of the test specimen

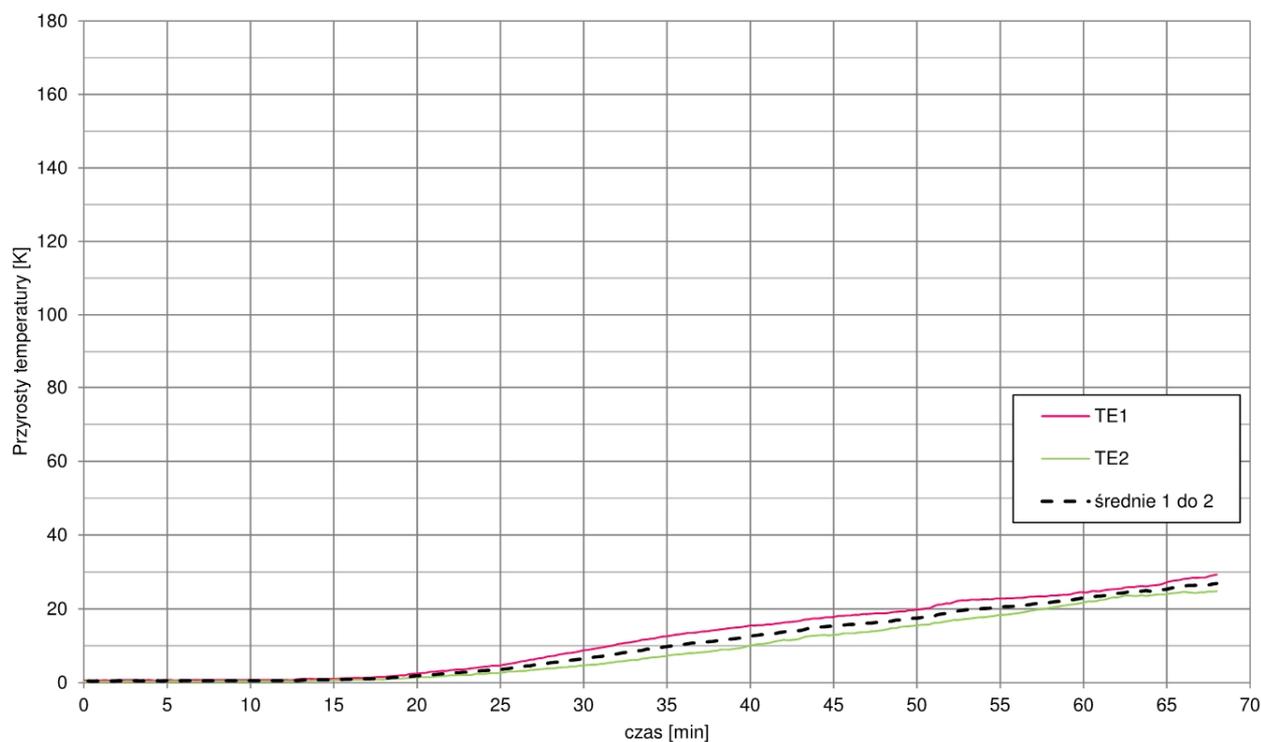


Fig. 9. Temperature rise on the unexposed surface of the test specimen – average and maximum temperature thermoelements

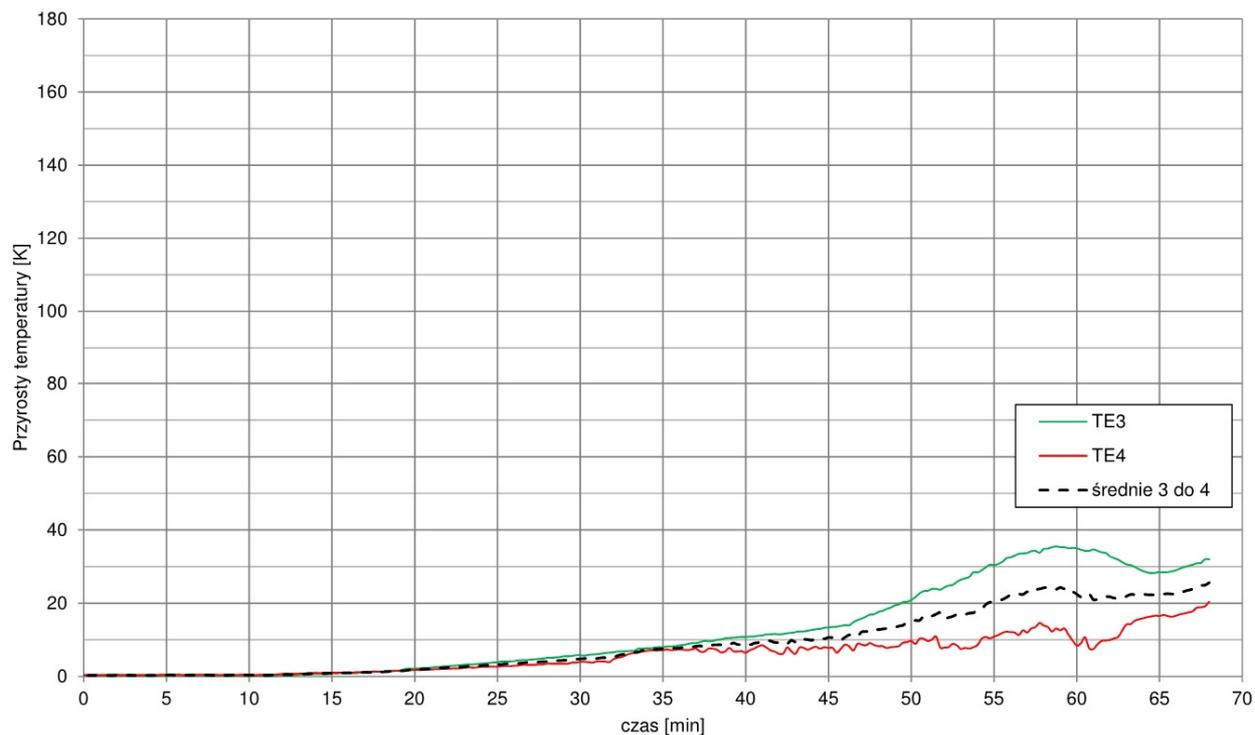


Fig. 10. Temperature rise on the unexposed surface of the test specimen - average and maximum temperature thermoelements

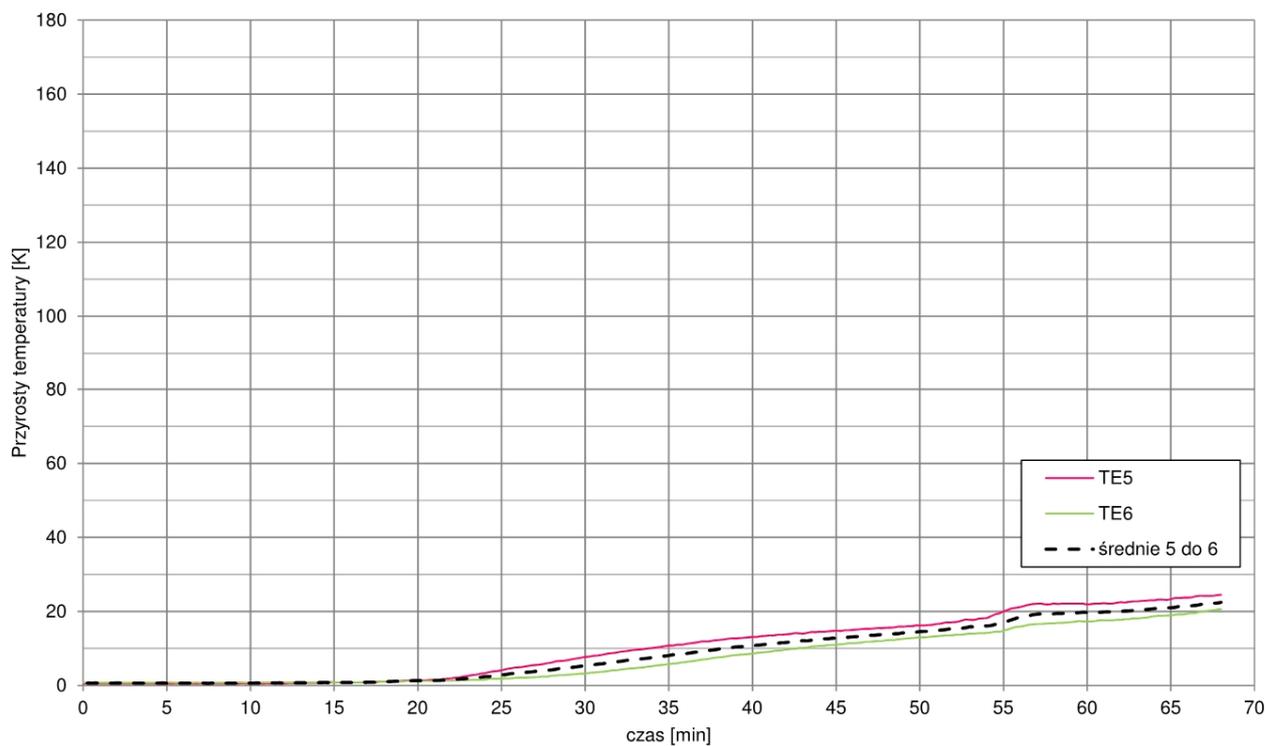


Fig. 11. Temperature rise on the unexposed surface of the test specimen - average and maximum temperature thermoelements

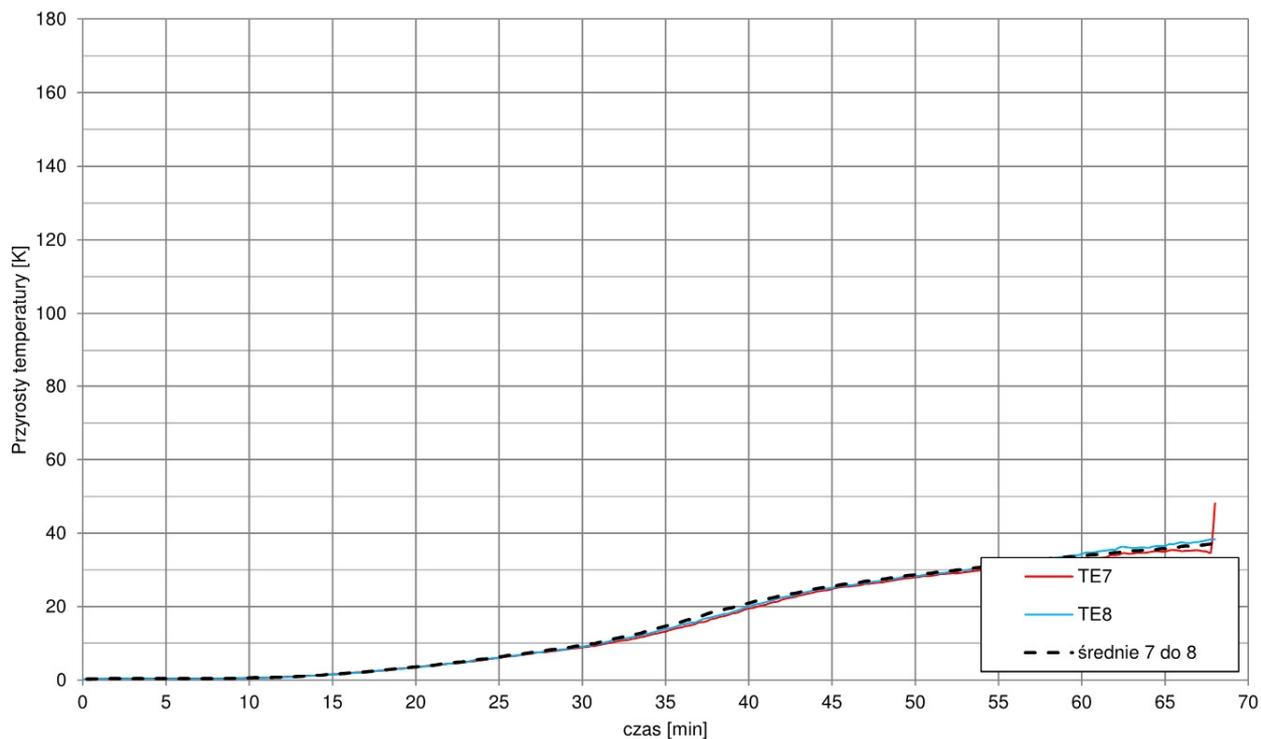


Fig. 12. Temperature rise on the unexposed surface of the test specimen - average and maximum temperature thermoelements

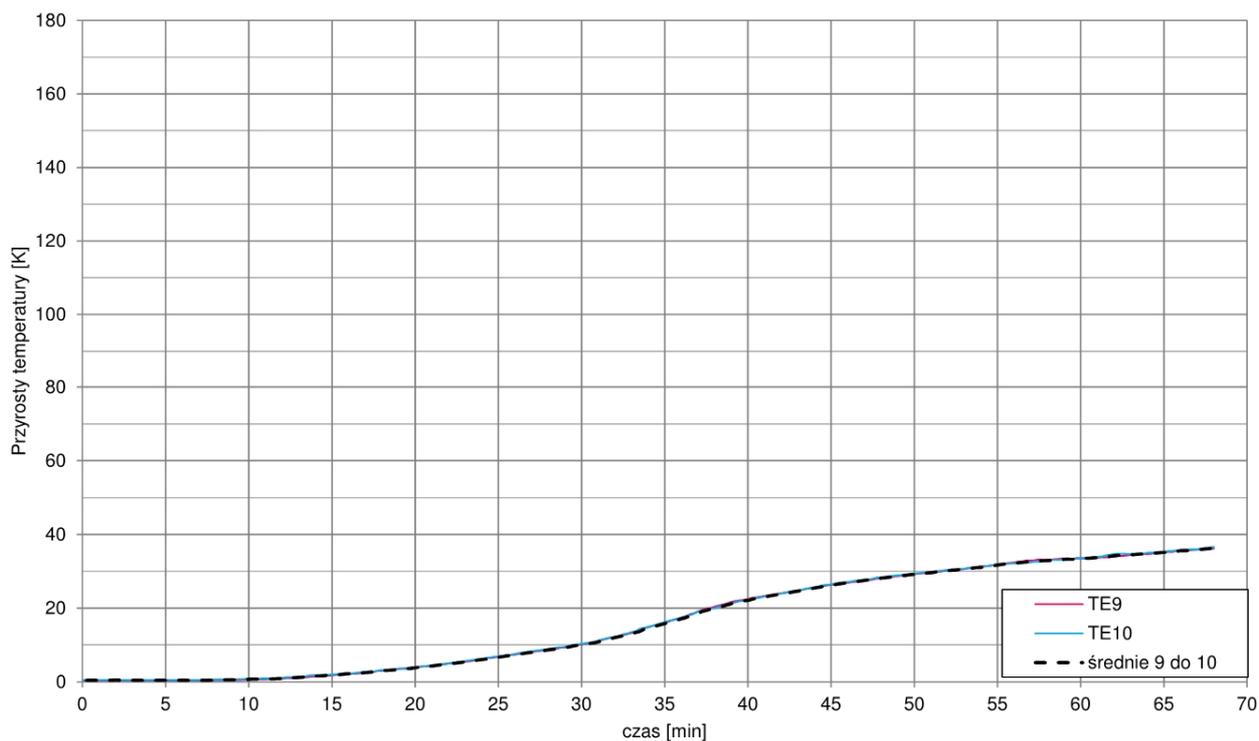


Fig. 13. Temperature rise on the unexposed surface of the test specimen - average and maximum temperature thermoelements

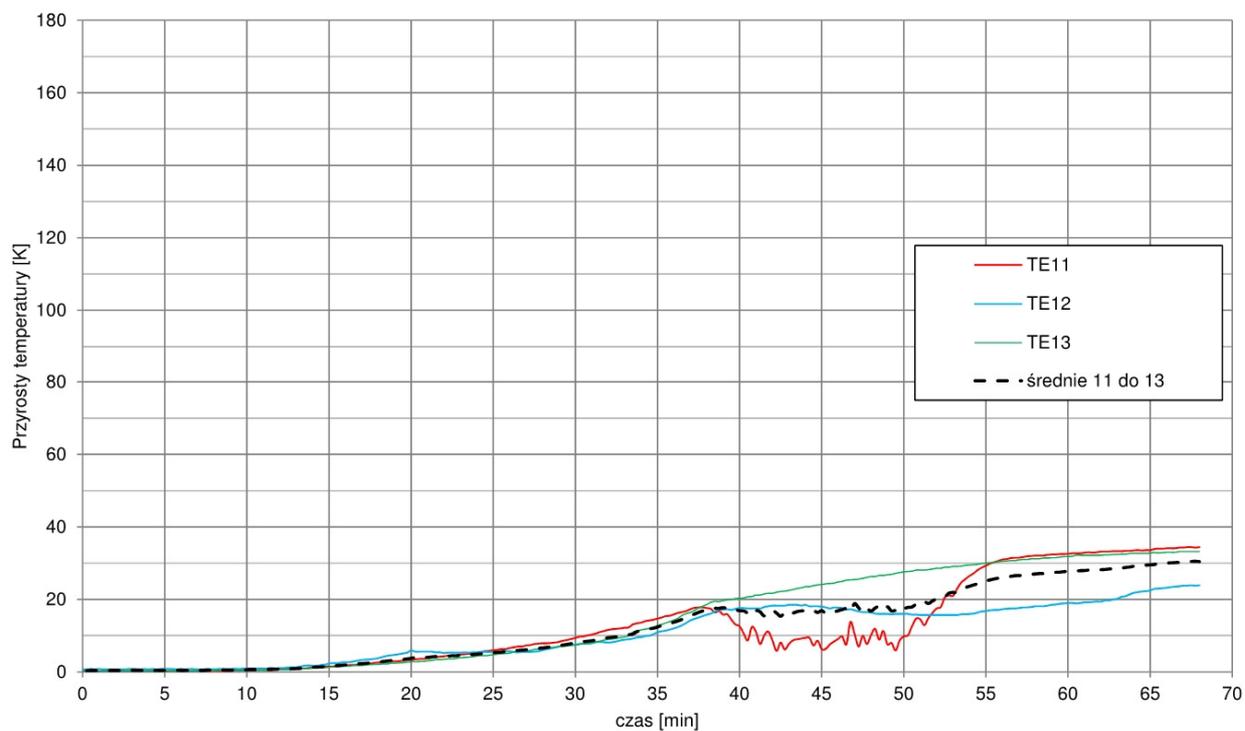


Fig. 14. Temperature rise on the unexposed surface of the test specimen – average and maximum temperature thermoelements

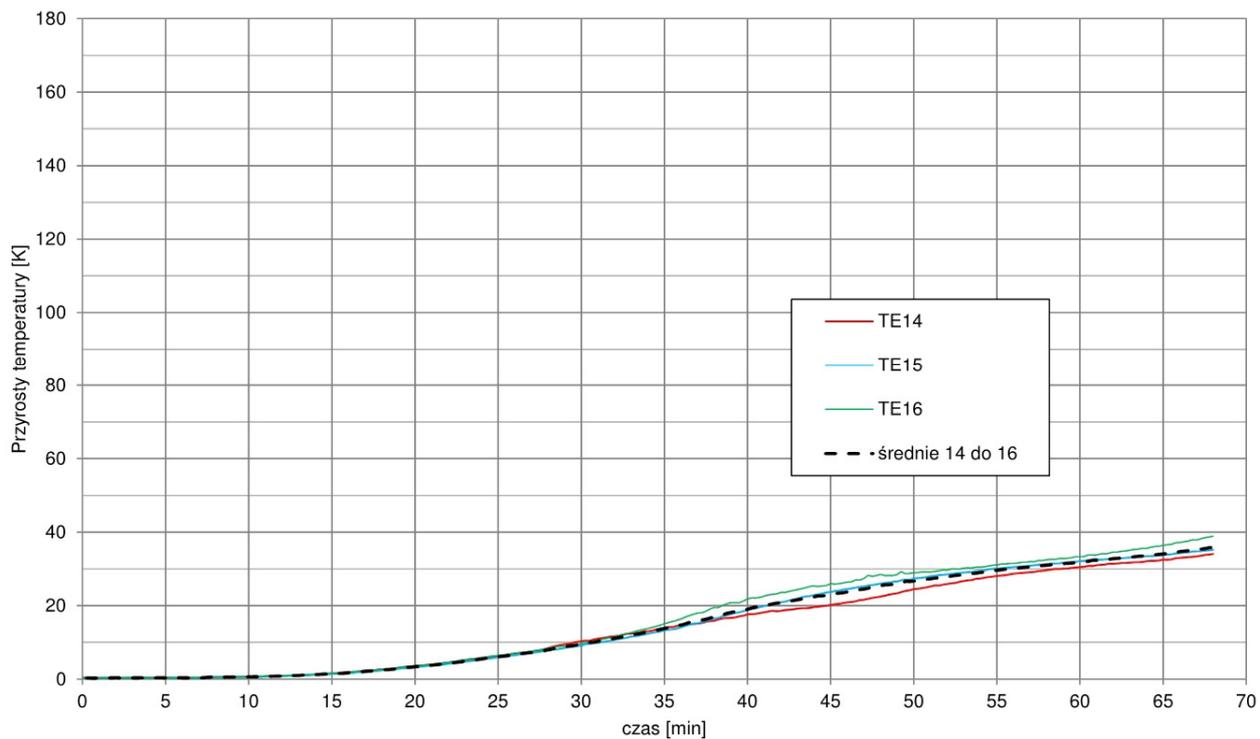


Fig. 15. Temperature rise on the unexposed surface of the test specimen – average and maximum temperature thermoelements

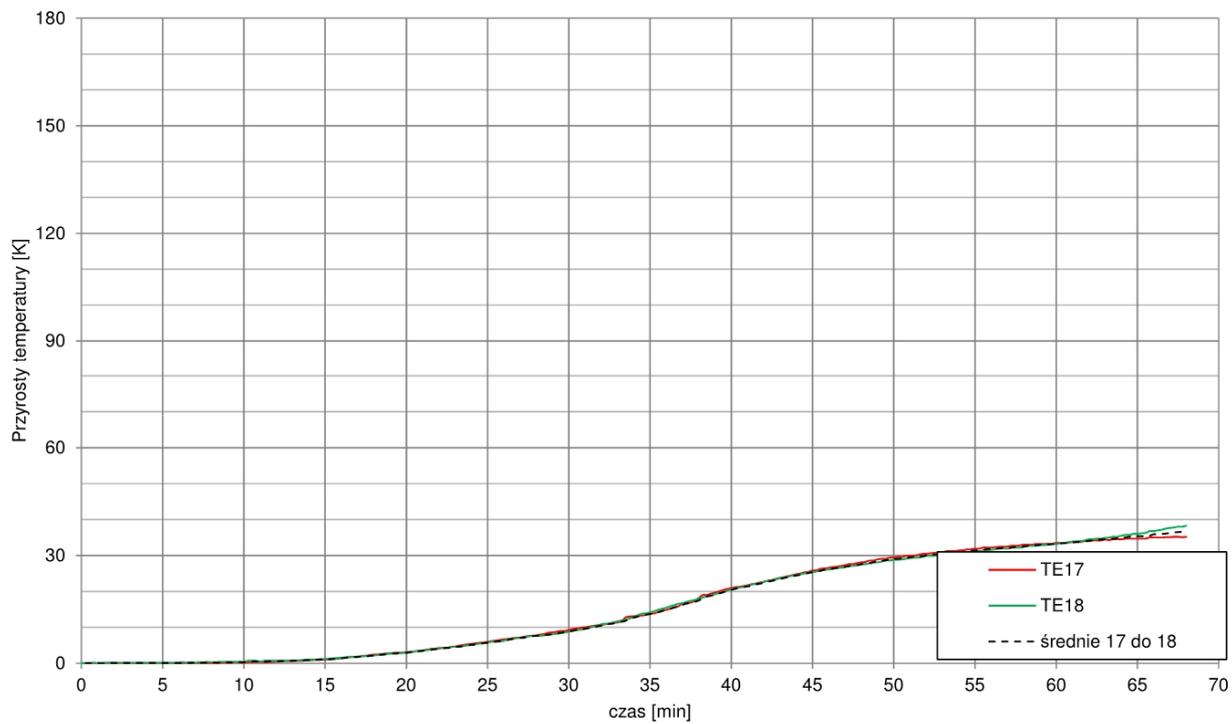


Fig. 16. Temperature rise on the unexposed surface of the test specimen – average and maximum temperature thermoelements

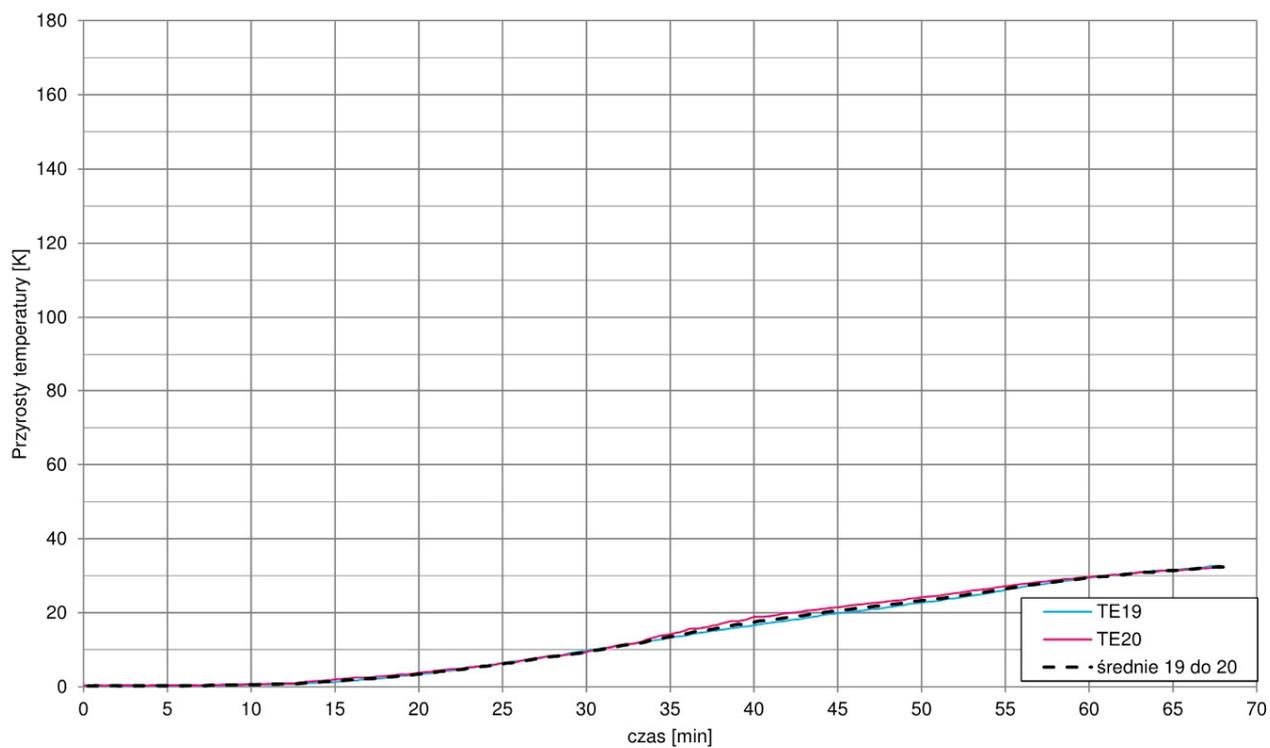


Fig. 17. Temperature rise on the unexposed surface of the test specimen – average and maximum temperature thermoelements

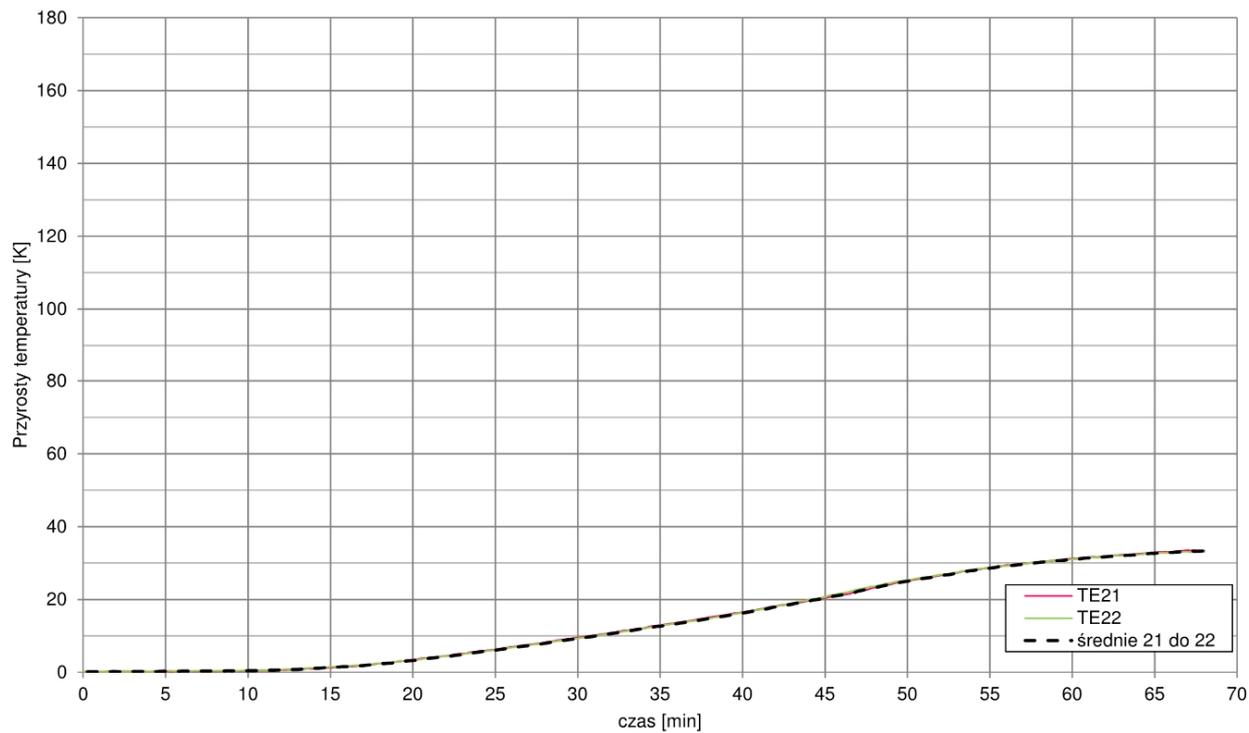


Fig. 18. Temperature rise on the unexposed surface of the test specimen – average and maximum temperature thermoelements

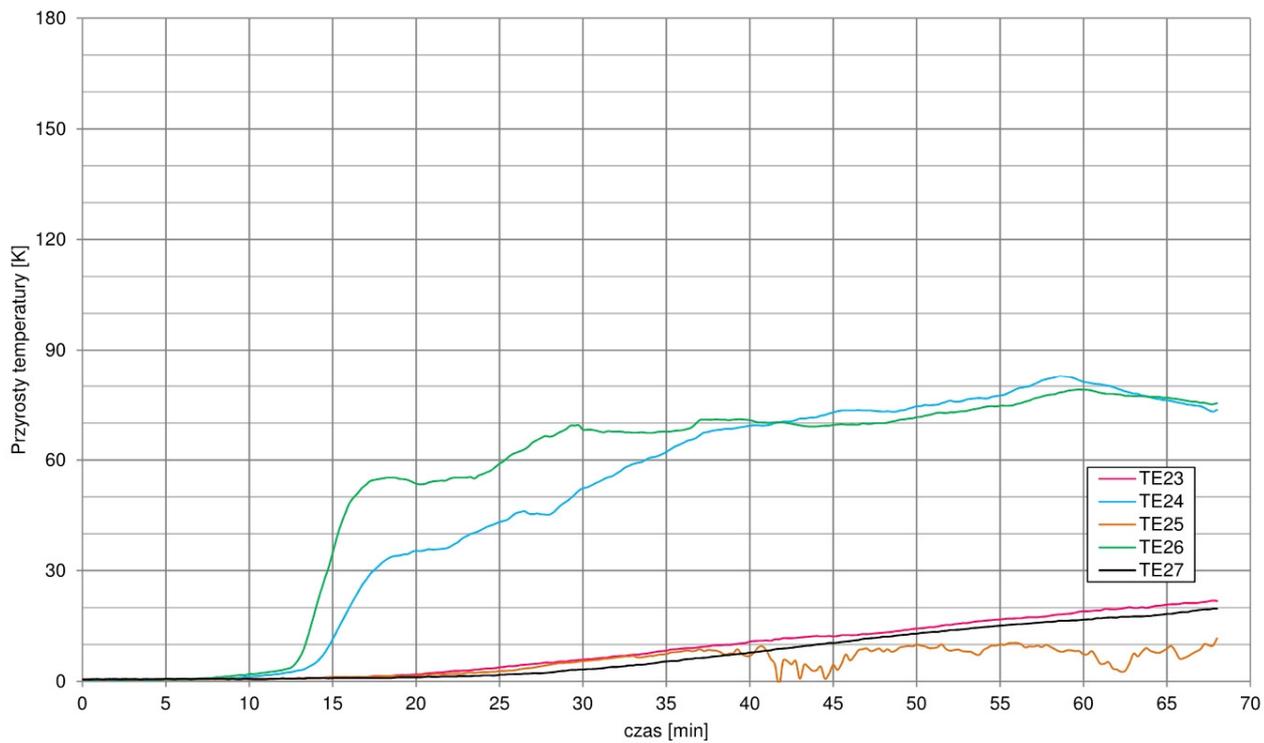


Fig. 19. Temperature rise on the unexposed surface of the test specimen – maximum temperature thermoelements

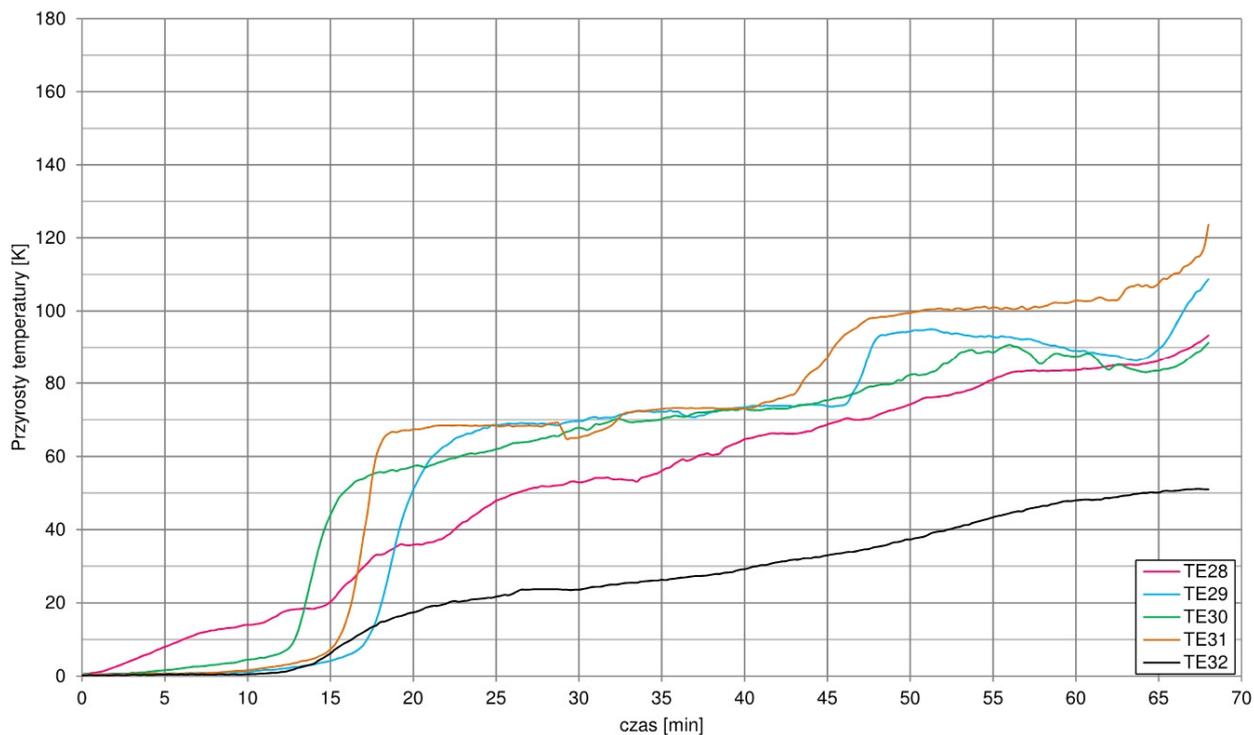


Fig. 20. Temperature rise on the unexposed surface of the test specimen – maximum temperature thermoelements

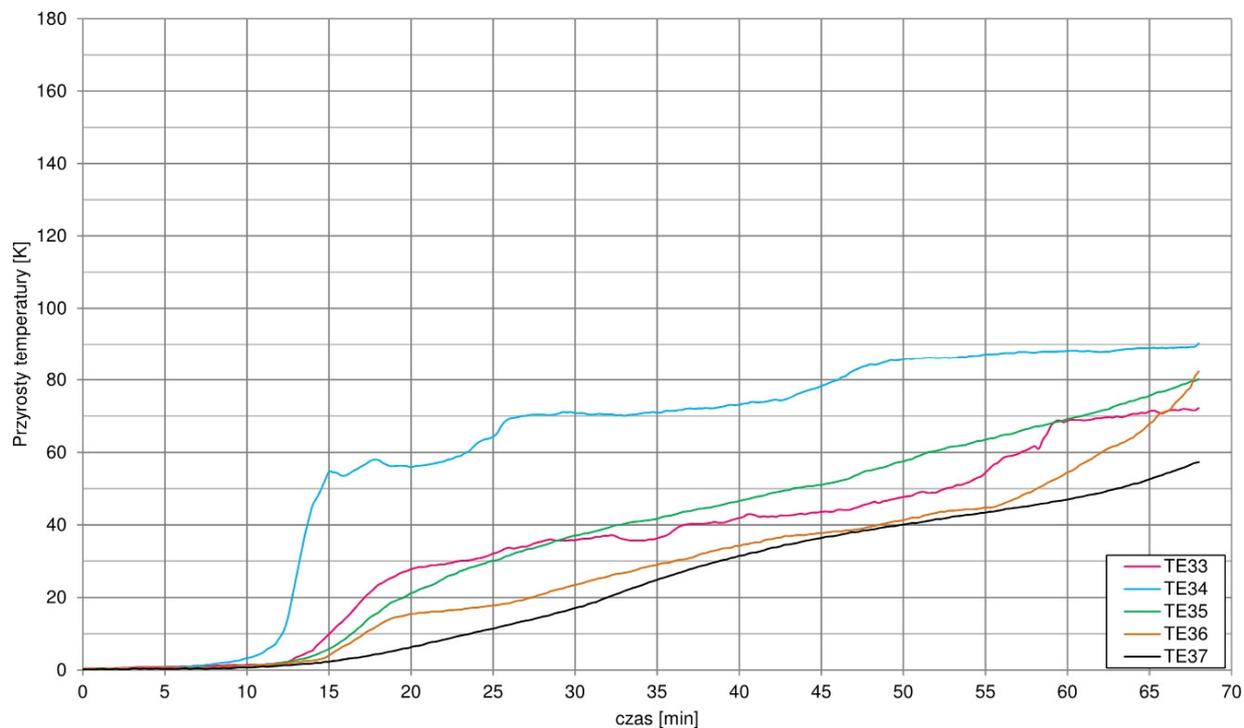


Fig. 21. Temperature rise on the unexposed surface of the test specimen – maximum temperature thermoelements

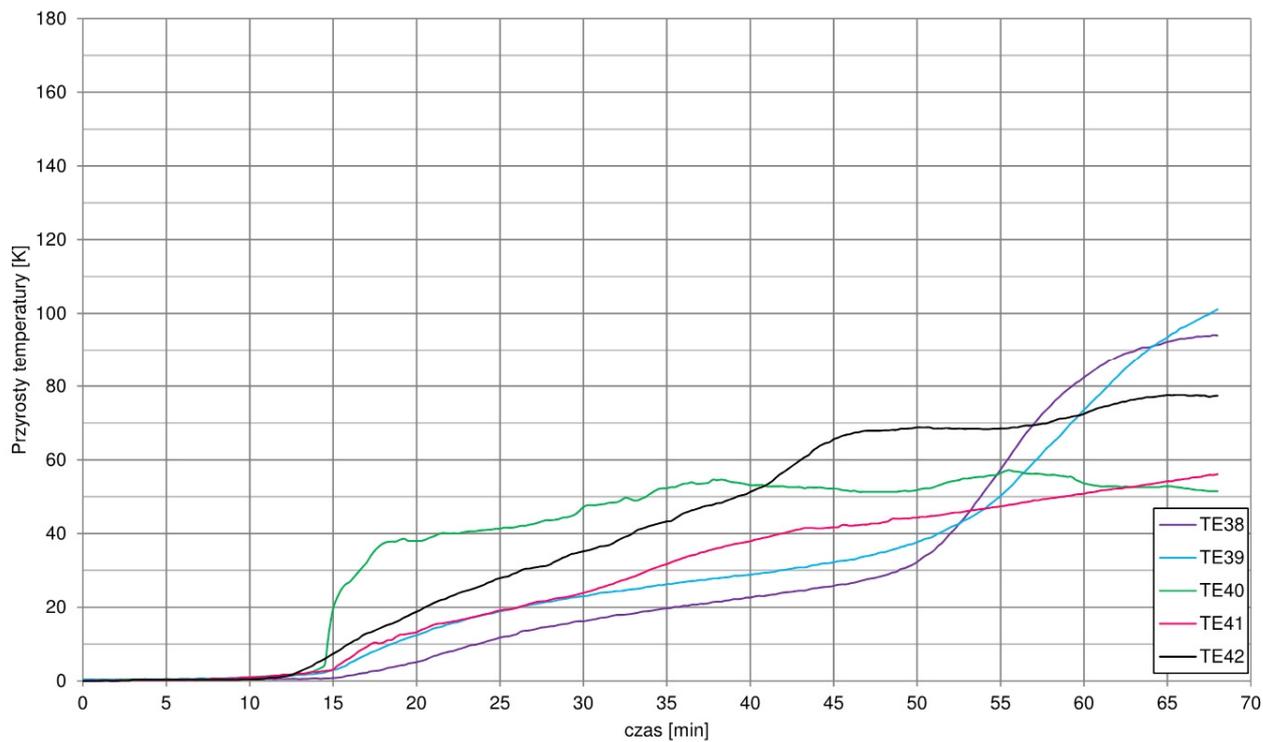


Fig. 22. Temperature rise on the unexposed surface of the test specimen – maximum temperature thermoelements

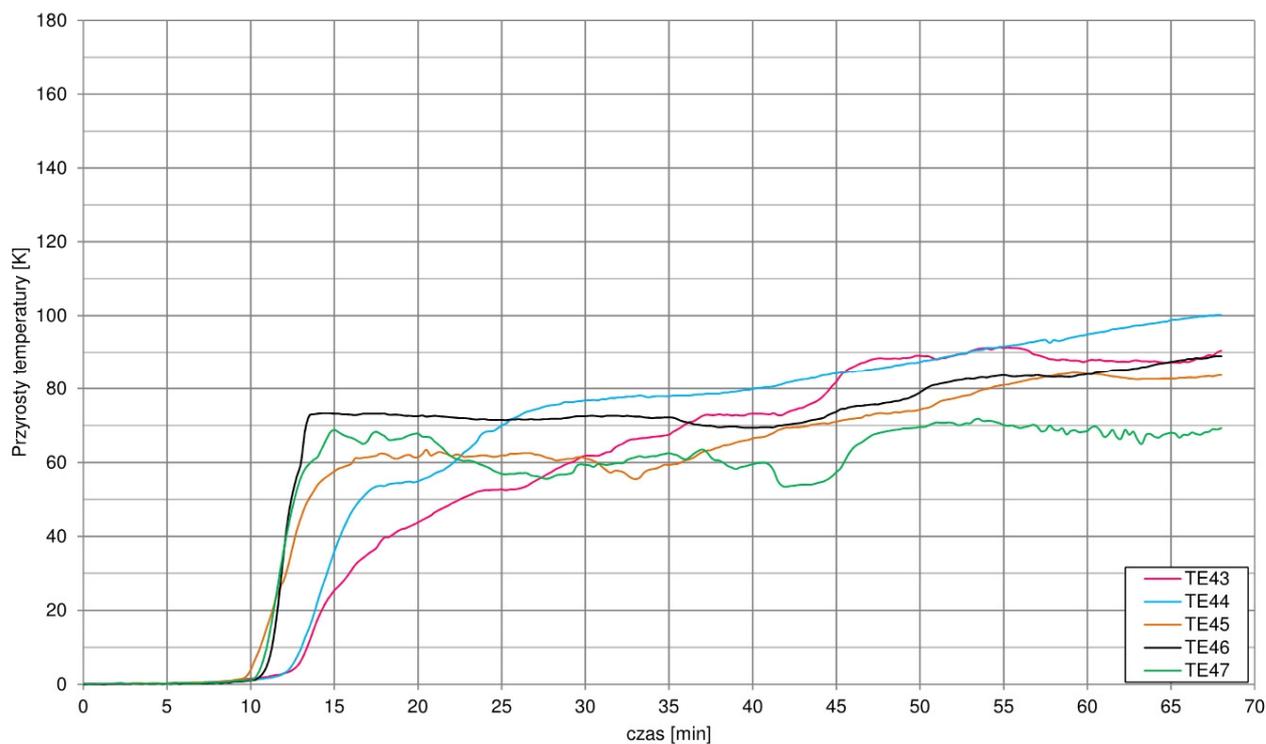


Fig. 23. Temperature rise on the unexposed surface of the test specimen – maximum temperature thermoelements

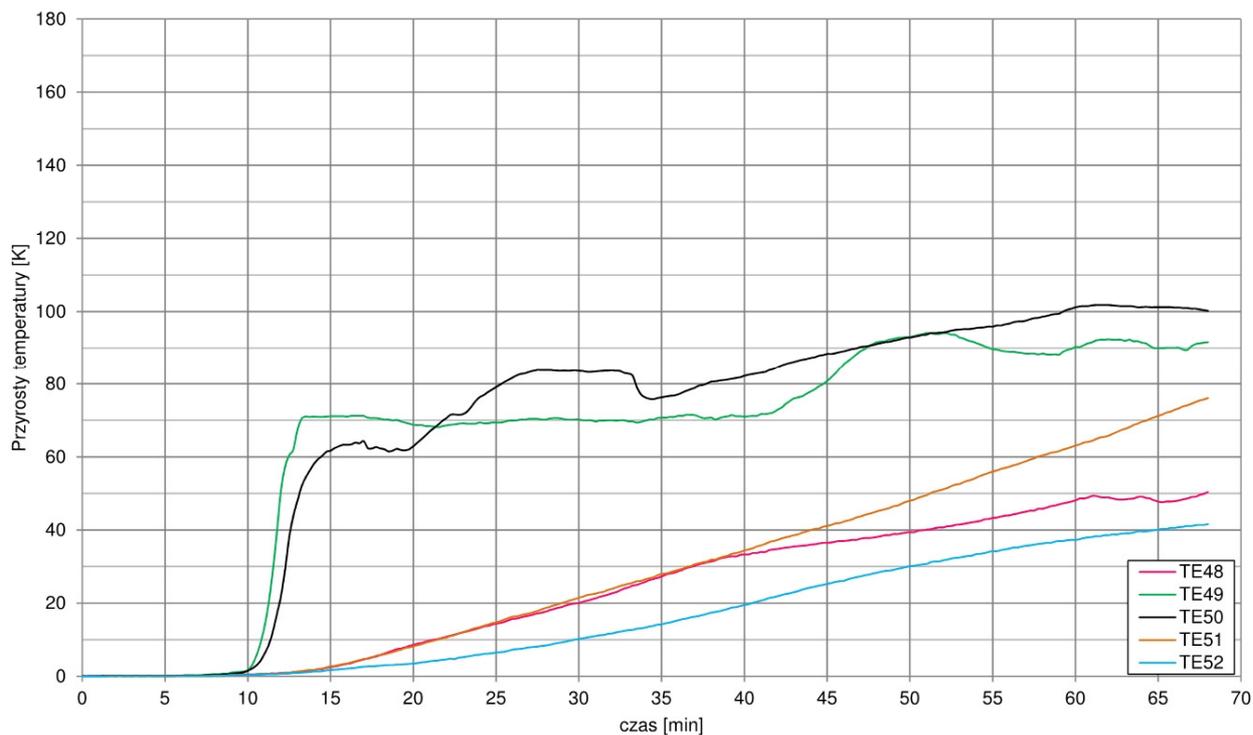


Fig. 24. Temperature rise on the unexposed surface of the test specimen - maximum temperature thermoelements

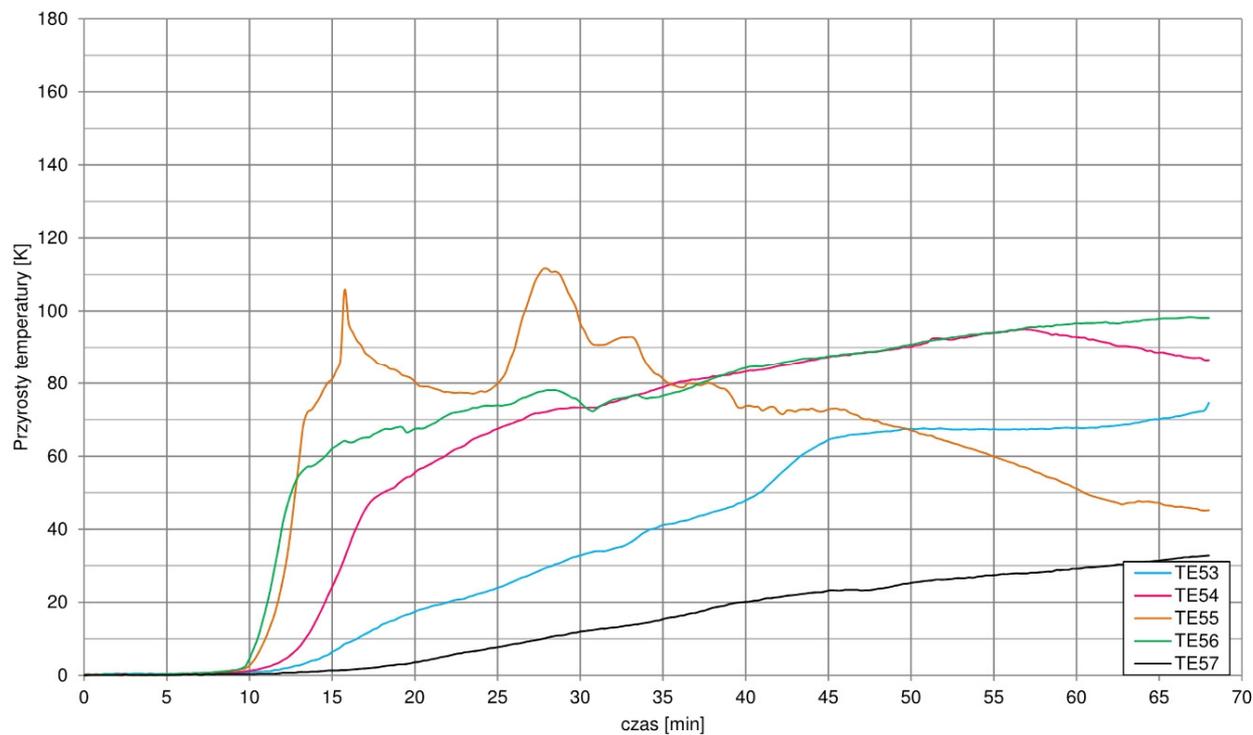


Fig. 25. Temperature rise on the unexposed surface of the test specimen - maximum temperature thermoelements

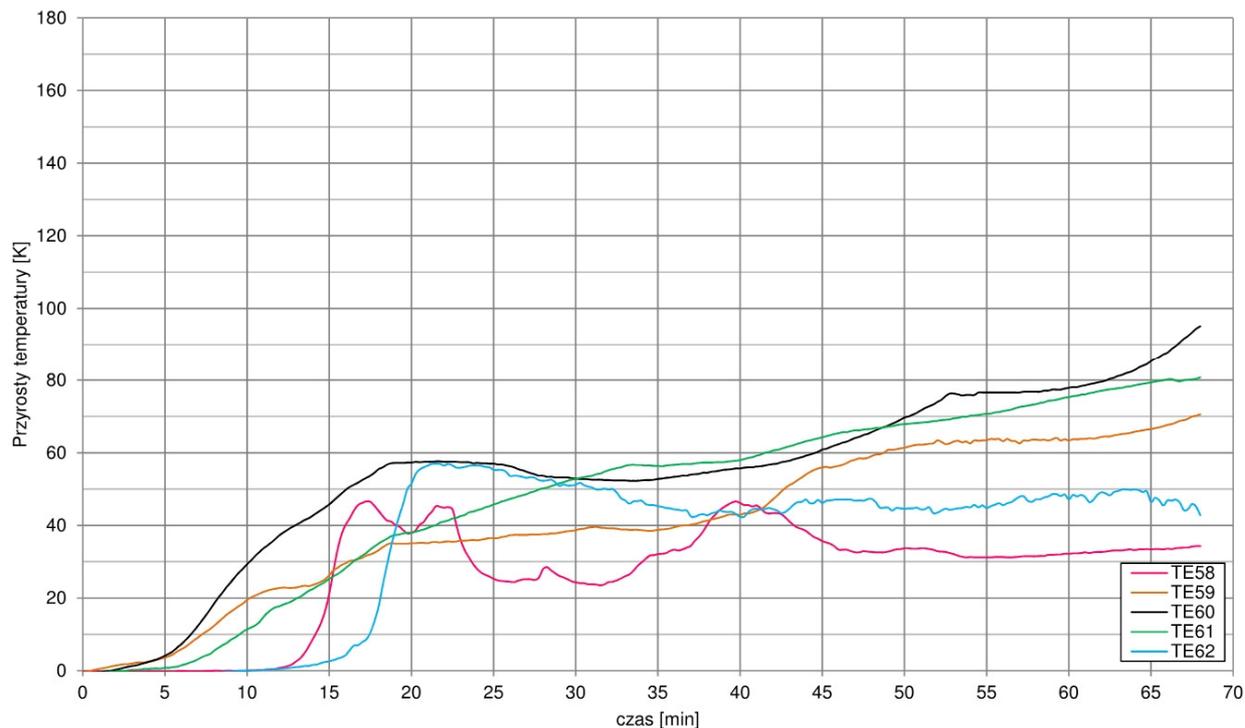


Fig. 26. Temperature rise on the unexposed surface of the test specimen – maximum temperature thermoelements

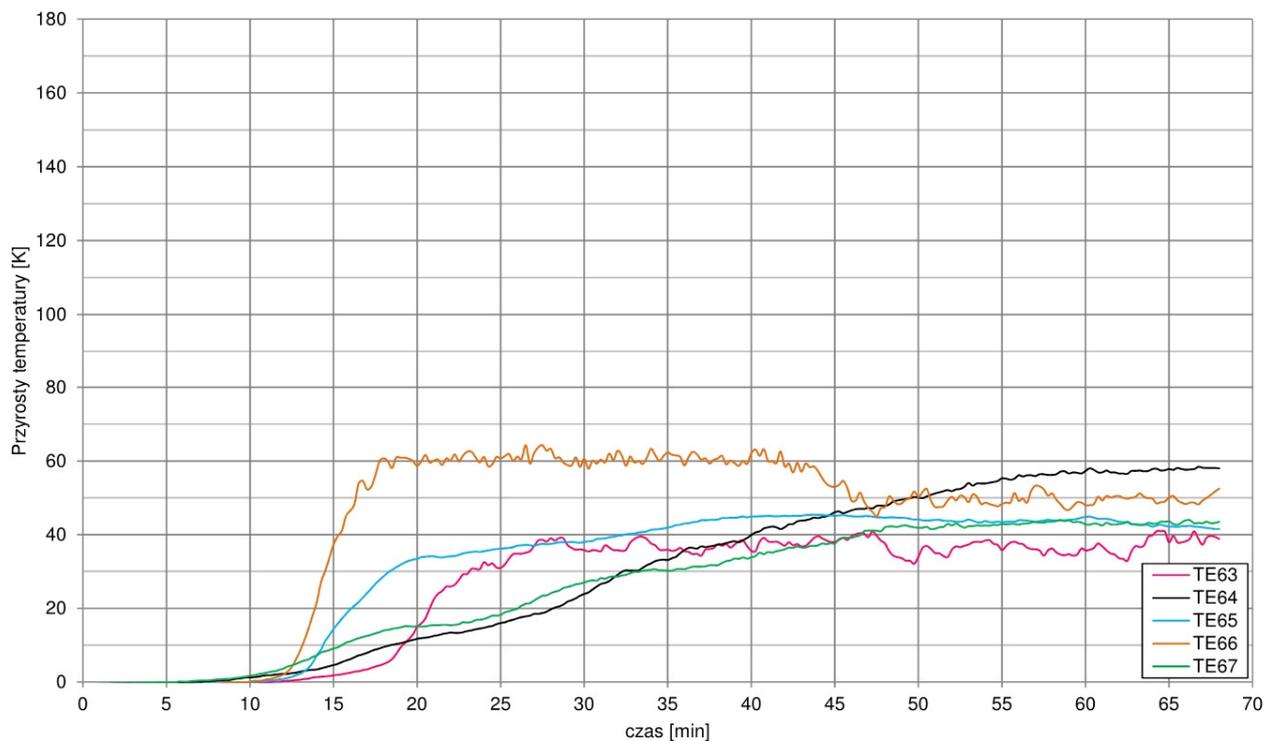


Fig. 27. Temperature rise on the unexposed surface of the test specimen – maximum temperature thermoelements

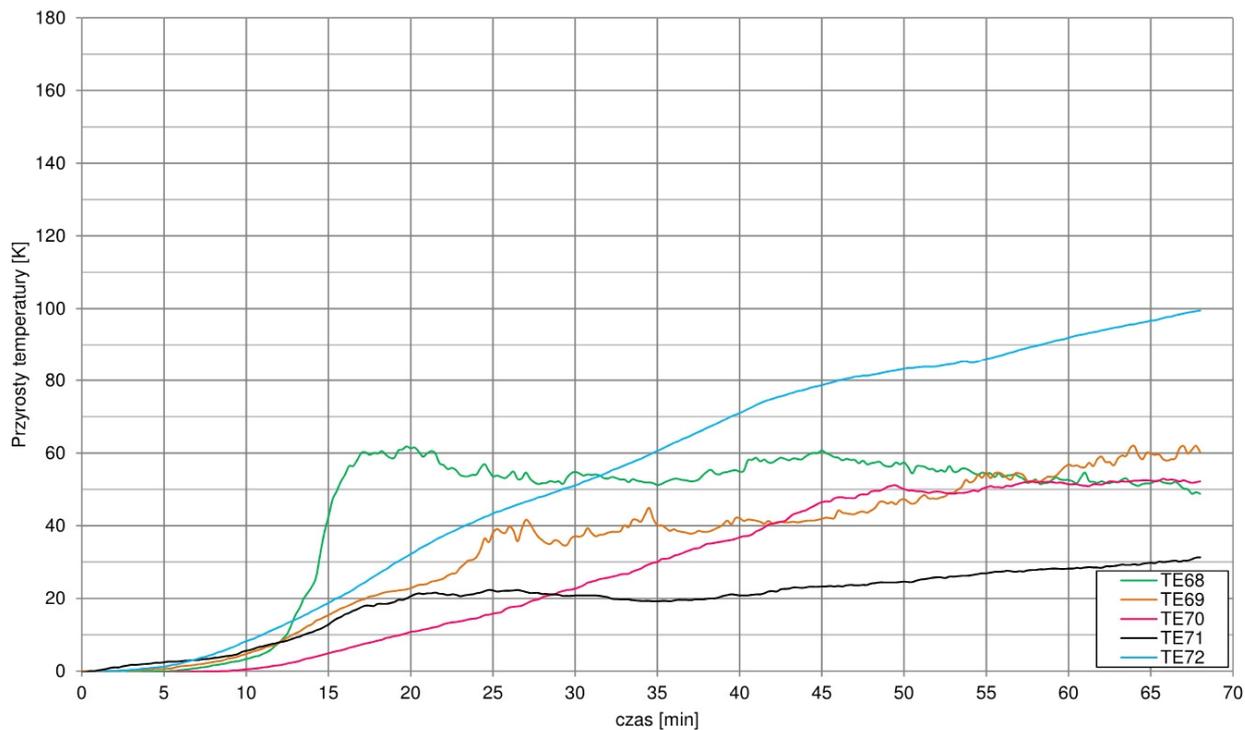


Fig. 28. Temperature rise on the unexposed surface of the test specimen – maximum temperature thermoelements

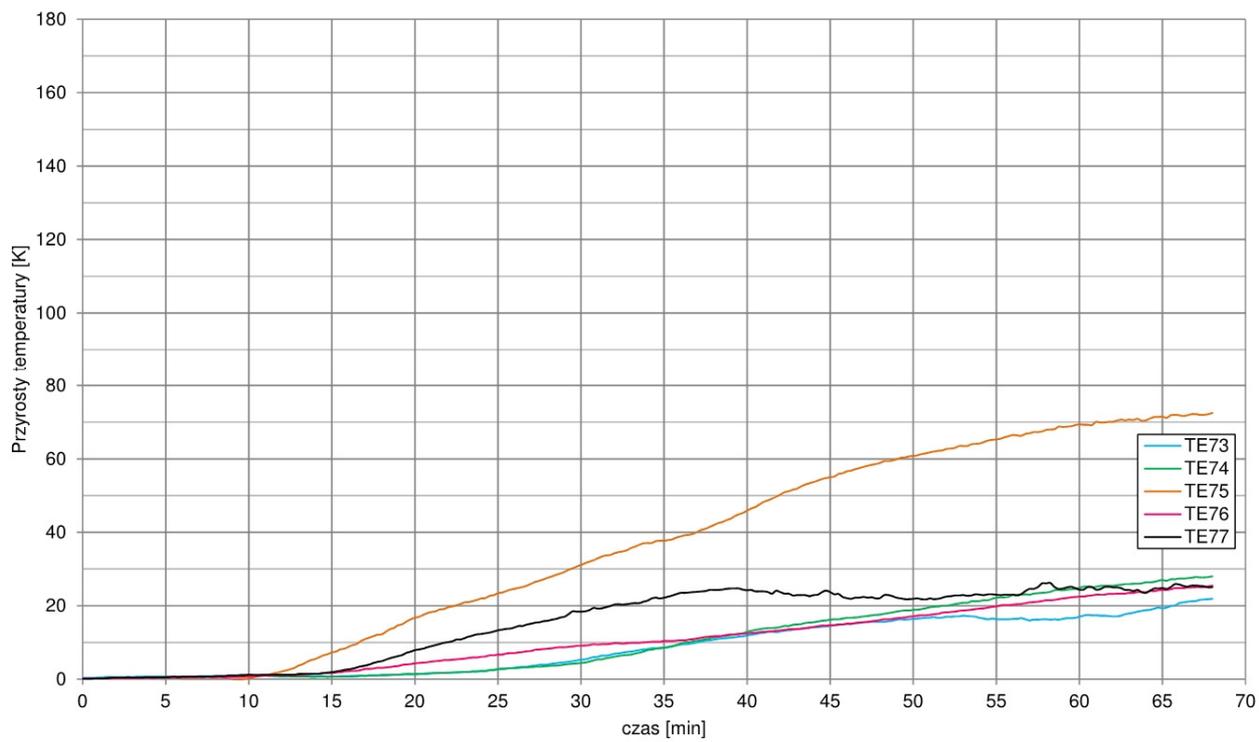


Fig. 29. Temperature rise on the unexposed surface of the test specimen – maximum temperature thermoelements

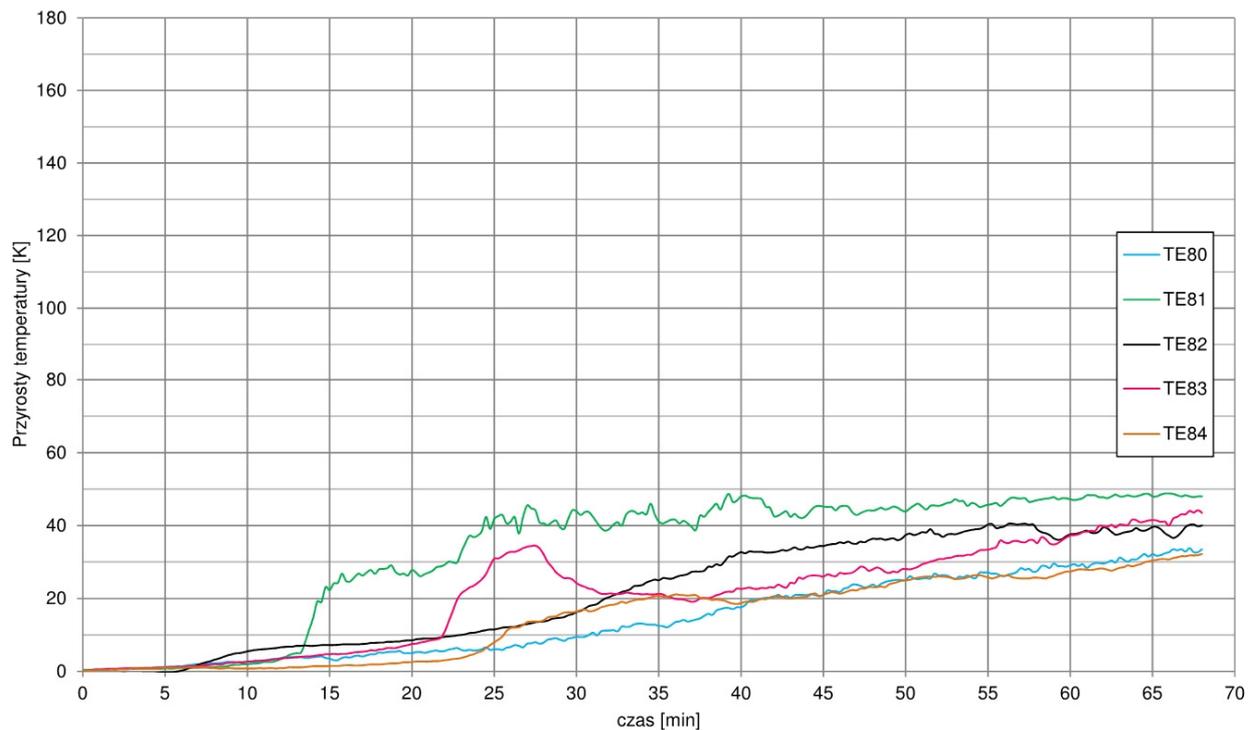


Fig. 30. Temperature rise on the unexposed surface of the test specimen - maximum temperature thermoelements

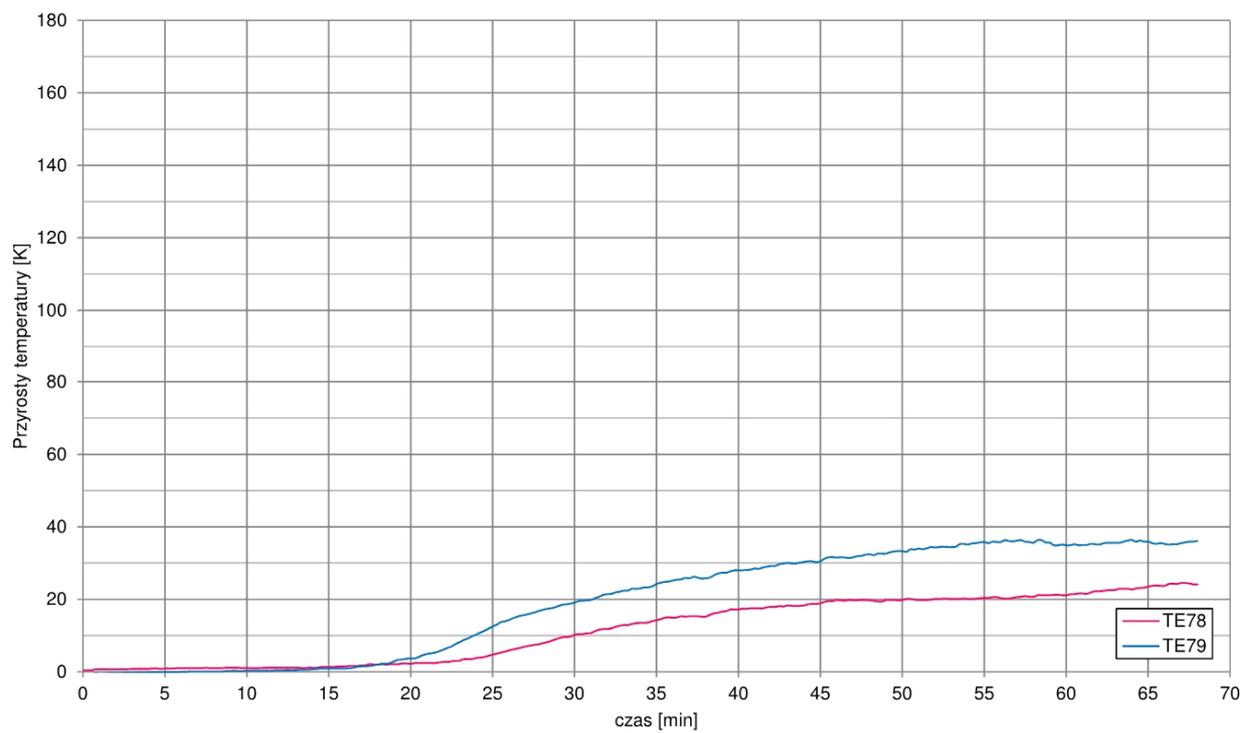


Fig. 31. Temperature rise on anchors - informative only

### 3.2.2. Deflection

The places of measurement of deflection of the curtain wall perpendicular to its surface are shown in Fig. 5. The values of the measured deflection  $s$  are presented in Fig. 32 below.

Deflection towards the inside of the furnace – negative values.

Deflection towards the outside of the furnace – positive values.

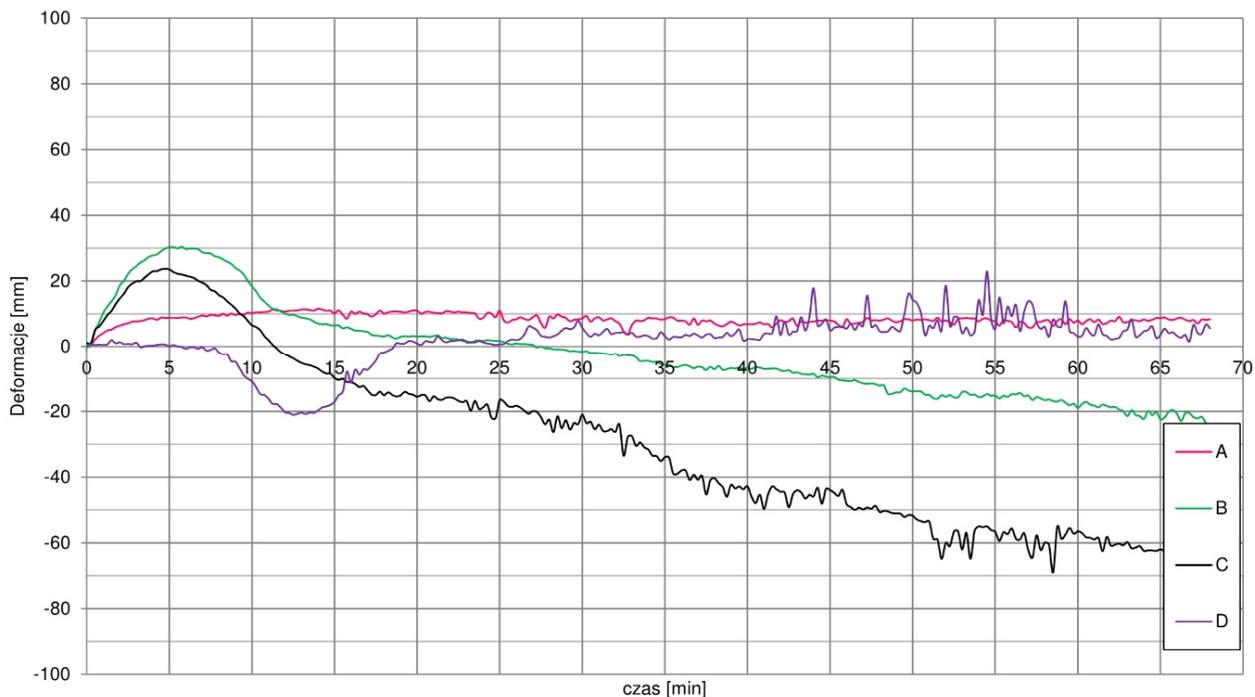


Fig. 32. Graph of deflections of the curtain wall perpendicular to its surface

### 3.2.3. Photographic documentation during the test



Fig. 33. Unexposed side of the test specimen,  $t = 10$  m



Fig. 34. Unexposed side of the test specimen,  $t = 31$  m



Fig. 35. Unexposed side of the test specimen,  $t = 45$  m



Fig. 36. Unexposed side of the test specimen,  $t = 61$  m



Fig. 37 Unexposed side of the test specimen,  $t = 67$  m

### 3.2.4. Measurement uncertainty

Due to the nature of the fire resistance test and the resulting difficulty in quantifying the uncertainty of the fire resistance measurement, it is not possible to determine a fixed level of accuracy of the results.

### 3.2.5. Fire resistance criteria

Tab. 2. Szczelność ogniowa

Integrity performance (E)	Time	Location
Sustained flaming	68 min no failure	-
Cotton pad	68 min no failure	-
6 mm gap gauge	68 min no failure	-
25 mm gap gauge	68 min no failure	-

Tab. 3. Izolacyjność ogniowa

Insulation performance (I)	Time	Location
Average temperature rise (140K)	68 min no failure	-
Maximum temperature rise – normal procedure	68 min no failure	-

In accordance with the provisions given in EN 13501-2:2016, the assessment of the compliance of the results with the criteria is included in a separate document (classification report), provided that the owner of this report requested such a document.

#### 3.2.5.1. Field of direct application of test results (DIAP)

According to EN 1364-3:2014 Clause 13.

## 4. ASSESSMENT OF PRODUCT PERFORMANCE

The assessment of the product's performance is presented in a Classification Report in accordance with the standard EN 13501-2:2016 issued on the basis of this test report.

Factors influencing the risk associated with the performance assessment carried out:

- the uncertainty of measurement as presented in section 3 of this report,
- the uncertainty of the test method not presented in the test standard,
- the level of representativeness of the sample tested by the laboratory in relation to the product population – knowledge of the variability of the product population and the representativeness of the sample provided to the laboratory is held by the manufacturer.

## Annex A

### Technical documentation of the Client

Tab. A.1. List of materials

Profiles		
Code	Description	Material
K431525X	Mullion 145 mm	Aluminum
K431531X	Transom 149,5 mm	Aluminum
K417890X	Clamping strip	Aluminum
K417891X	Concealing strip 15 mm	Aluminum
K417892X	Concealing strip 20 mm	Aluminum
K440824X	Reinforcement of mullion 89 mm	Aluminum
K432147X	Reinforcement of mullion 122 mm	Aluminum
K417914X	Spacer 5 mm	Aluminum
K417916X	Spacer 20 mm	Aluminum
K434037X	Spacer 15 mm	Aluminum

Gasketss		
Code	Description	Material
120480	Gasket 4 mm	EPDM
120486	Gasket 10 mm	EPDM
120484	Gasket 8 mm	EPDM
120481	Gasket 5 mm	EPDM

Accessories		
Code	Description	Material
80122119	Connector 50x10 mm	Aluminum
80311079	Tightening insert for a mullion-mullion connection	Inox/EPDM
80312107	Steel pivot $\varnothing$ 10x55 mm	Steel
80312108	Steel pivot $\varnothing$ 10x73 mm	Steel
8A01001X	Glass support 78x100 mm	Steel
80322091	Steel washer	Steel
80371208	Screw 3,9x13 mm	Steel
80371260	Bolt M6x12 mm	Steel
80371275	Bolt M6x70 mm	Steel
80371318	Bolt M6x50 mm	Steel
80371336	Bolt M6x16 mm	Steel
80375322	Conical washer 14x6,5 mm	Steel
80376051	Steel pivot $\varnothing$ 10,5x50 mm	Steel

80376052	Steel pivot $\varnothing$ 10,5x100 mm	Steel
80957034	Wooden packer 1x40x80 mm	Wood
80957035	Wooden packer 2x40x80 mm	Wood
87252405	Screw 4,2x19 mm	Steel
87252722	Screw 5,5x19 mm	Steel
DIN7504P 4,2x25	Screw DIN7504P 4.2x25	Steel
804XXXX1	Fixing inserts plate	Steel
80379962	Steel pivot	Steel
80379980	Protective ring	Steel
80379961	Steel pivot	Steel
87222204	Screw DIN7982 3.5x16	Steel
Infills		
Nominal thickness	Description	Dimensions
70,6 mm	ESG 6 mm / frame16 mm / ESG 6 mm / frame 16 mm / Pyrobel 25 EI30 26,6 mm	1238 x 500 mm
70,6 mm	ESG 6 mm / frame16 mm / ESG 6 mm / frame 16 mm / Pyrobel 25 EI30 26,6 mm	1400 x 500 mm
70,6 mm	ESG 6 mm / frame16 mm / ESG 6 mm / frame 16 mm / Pyrobel 25 EI30 26,6 mm	500 x 500 mm
70,6 mm	ESG 6 mm / frame16 mm / ESG 6 mm / frame 16 mm / Pyrobel 25 EI30 26,6 mm	1238 x 1426 mm
70,6 mm	ESG 6 mm / frame16 mm / ESG 6 mm / frame 16 mm / Pyrobel 25 EI30 26,6 mm	1400 x 2800 mm
70,6 mm	ESG 6 mm / frame16 mm / ESG 6 mm / frame 16 mm / Pyrobel 25 EI30 26,6 mm	500 x 2800 mm
70,6 mm	ESG 6 mm / frame16 mm / ESG 6 mm / frame 16 mm / Pyrobel 25 EI30 26,6 mm	2500 x 1350 mm
70,6 mm	ESG 6 mm / frame16 mm / ESG 6 mm / frame 16 mm / Pyrobel 25 EI30 26,6 mm	1400 x 1246 mm
70,6 mm	ESG 6 mm / frame16 mm / ESG 6 mm / frame 16 mm / Pyrobel 25 EI30 26,6 mm	500 x 1246 mm
28 + 140 mm	ESG 6 mm / frame 16 mm / ESG 6 mm Panel: rock mineral wool, thickness 100+40 mm and density 80 kg/m <sup>3</sup> , type WENTIROCK by ROCKWOOL	1238 x 776 mm
28 + 140 mm	ESG 6 mm / ramka 16 mm / ESG 6 mm Panel: rock mineral wool, thickness 100+40 mm and density 80 kg/m <sup>3</sup> , type WENTIROCK by ROCKWOOL	1400 x 776 mm
28 + 140 mm	ESG 6 mm / ramka 16 mm / ESG 6 mm Panel: rock mineral wool, thickness 100+40 mm and density 80 kg/m <sup>3</sup> , type WENTIROCK by ROCKWOOL	500 x 776 mm

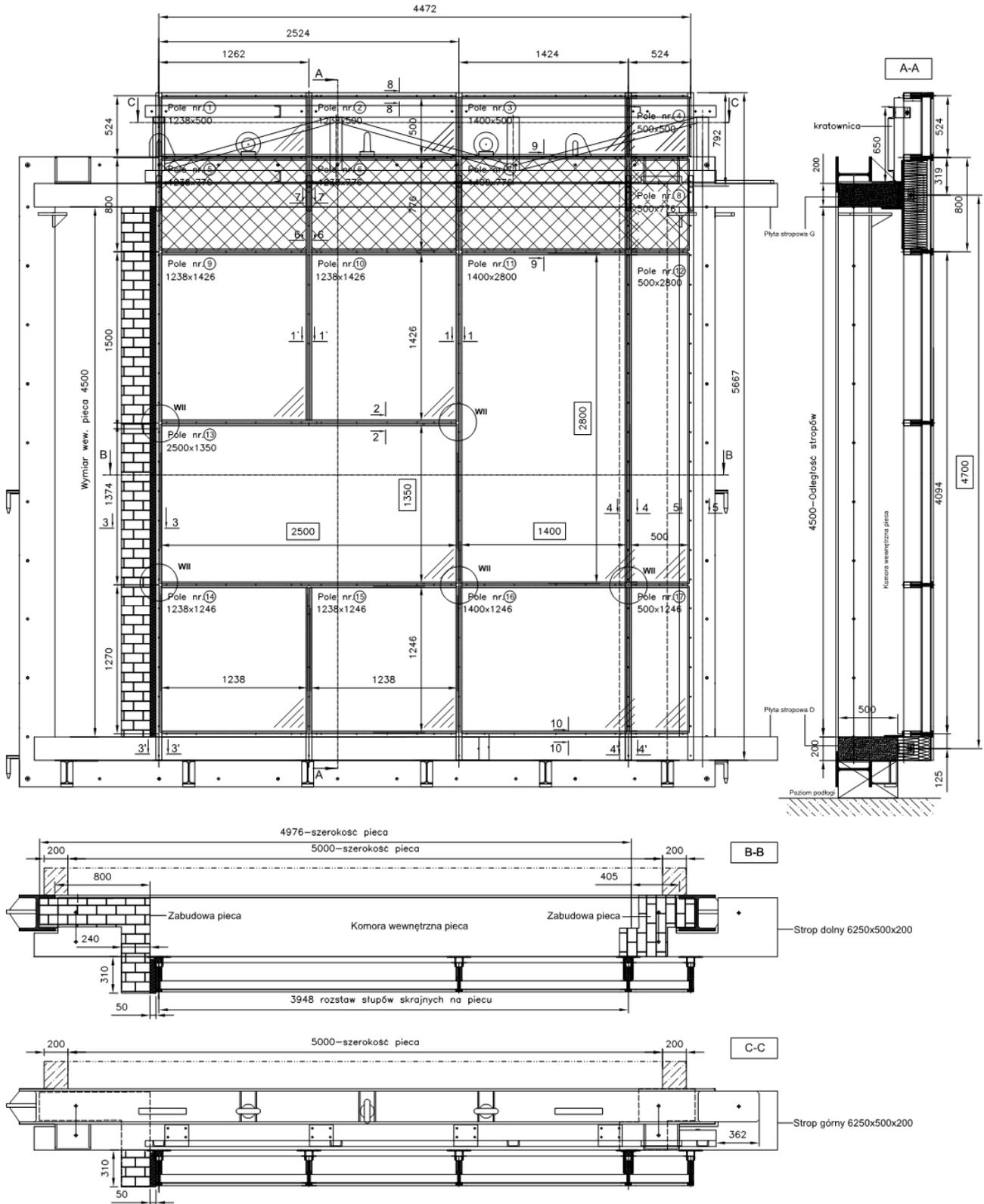
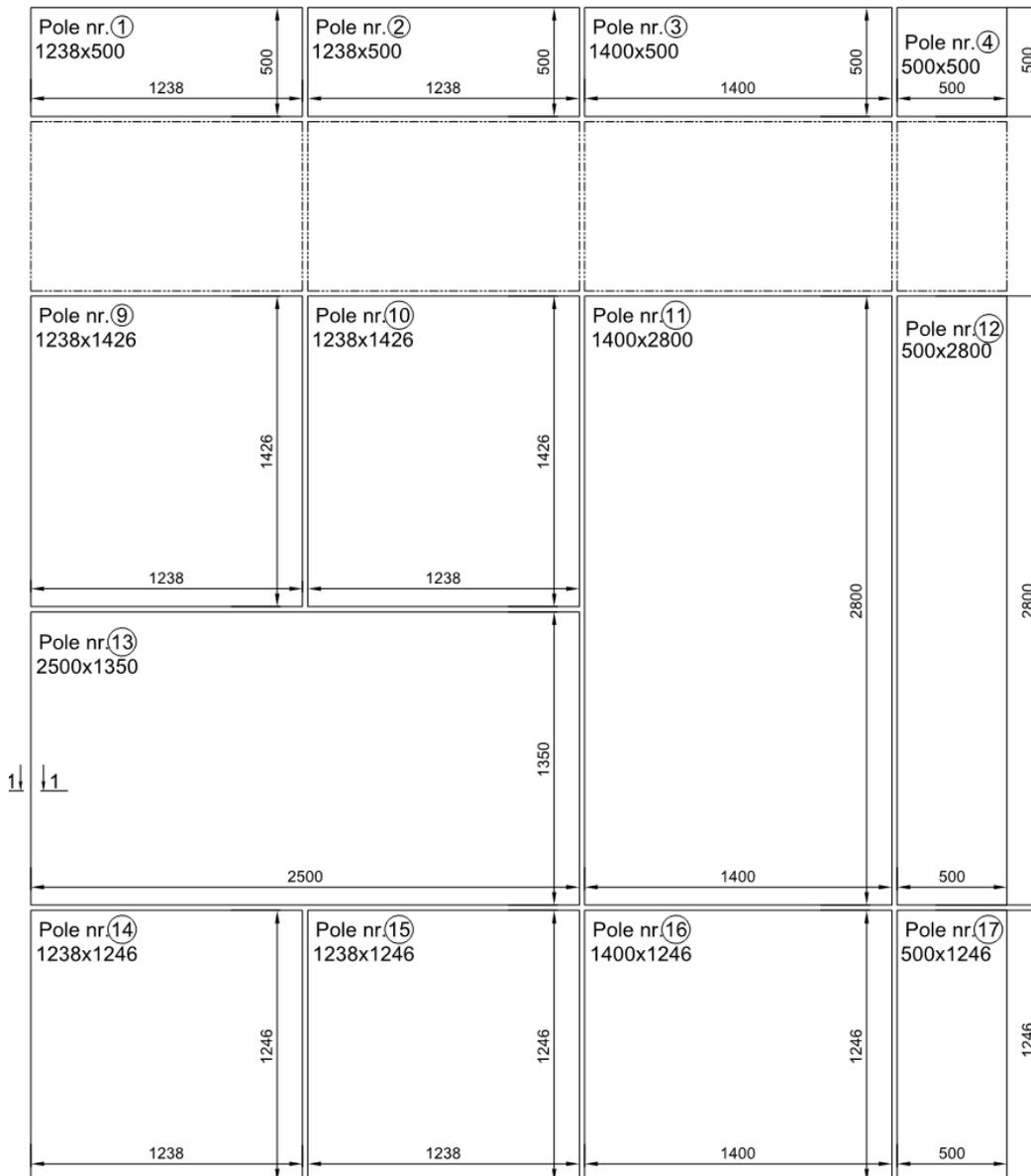


Fig. 1A. General view of the test piece, dimensions, section designation



**UWAGA:**

1. ilość szyb - 13
2. Krawędzie szyb szlifowane !

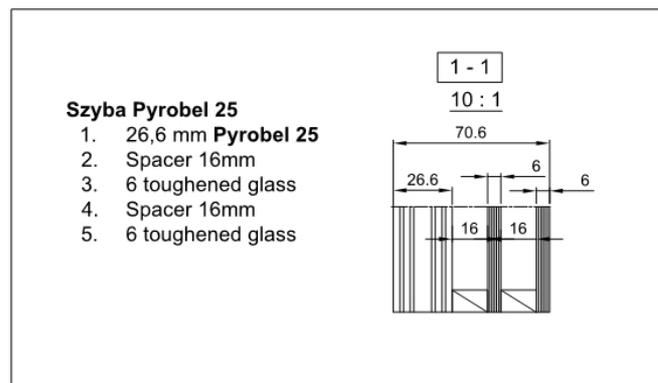


Fig. 2A. Transparent fillings



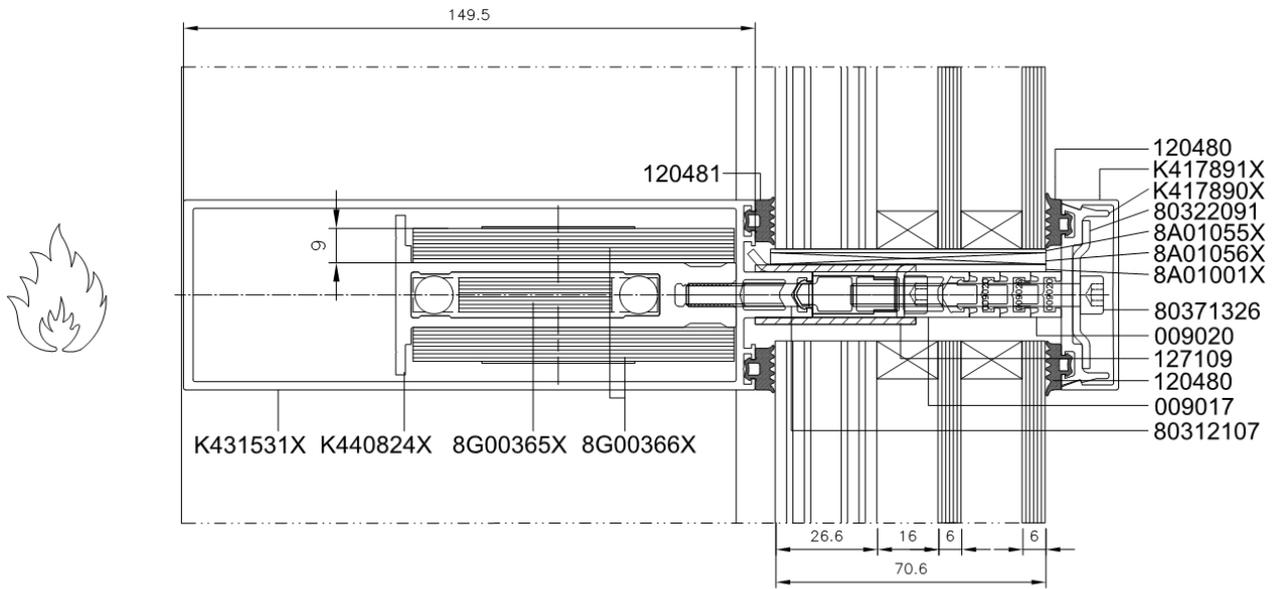


Fig. 4A. Section 2-2

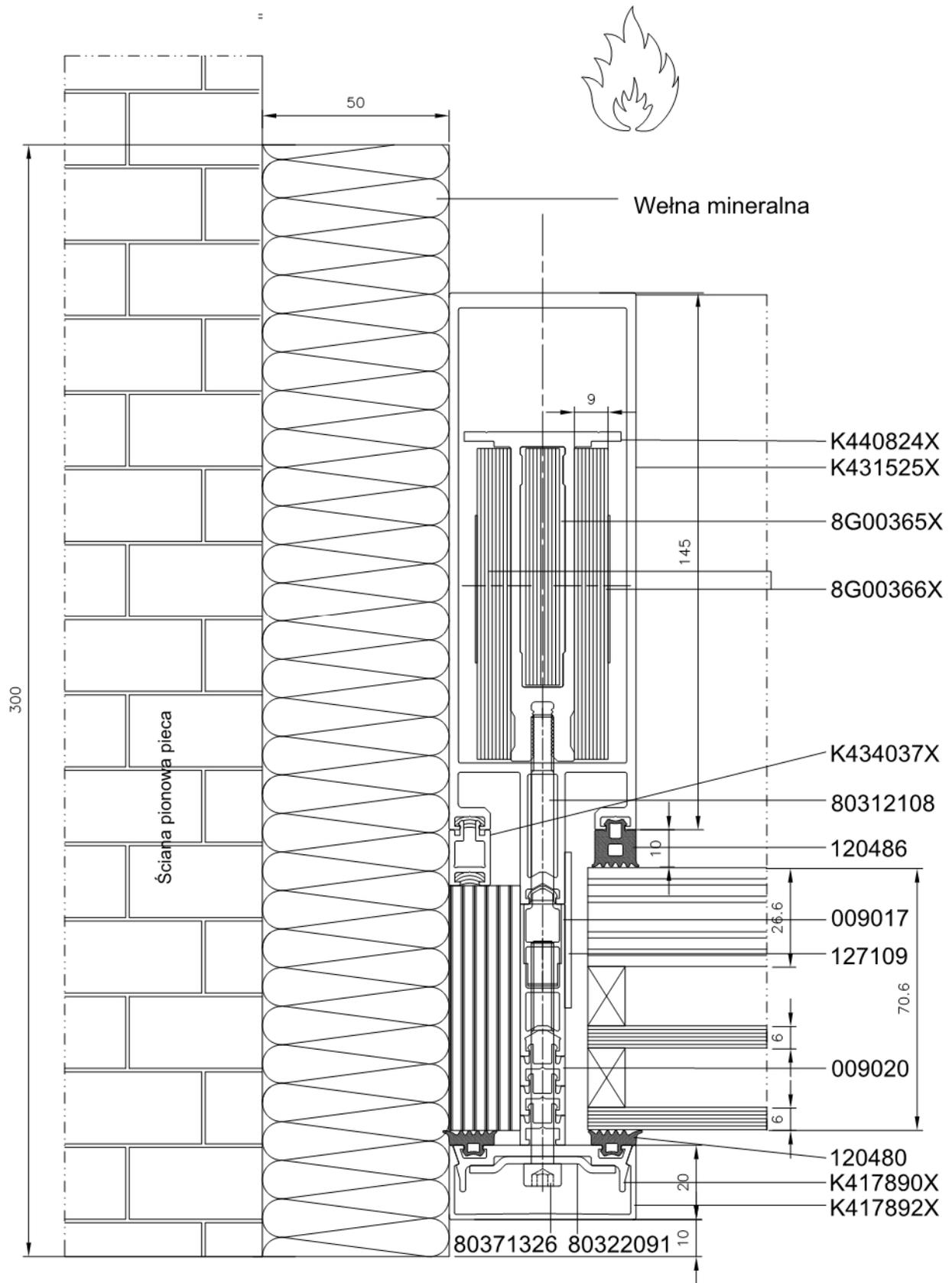


Fig. 5A. Section 3-3

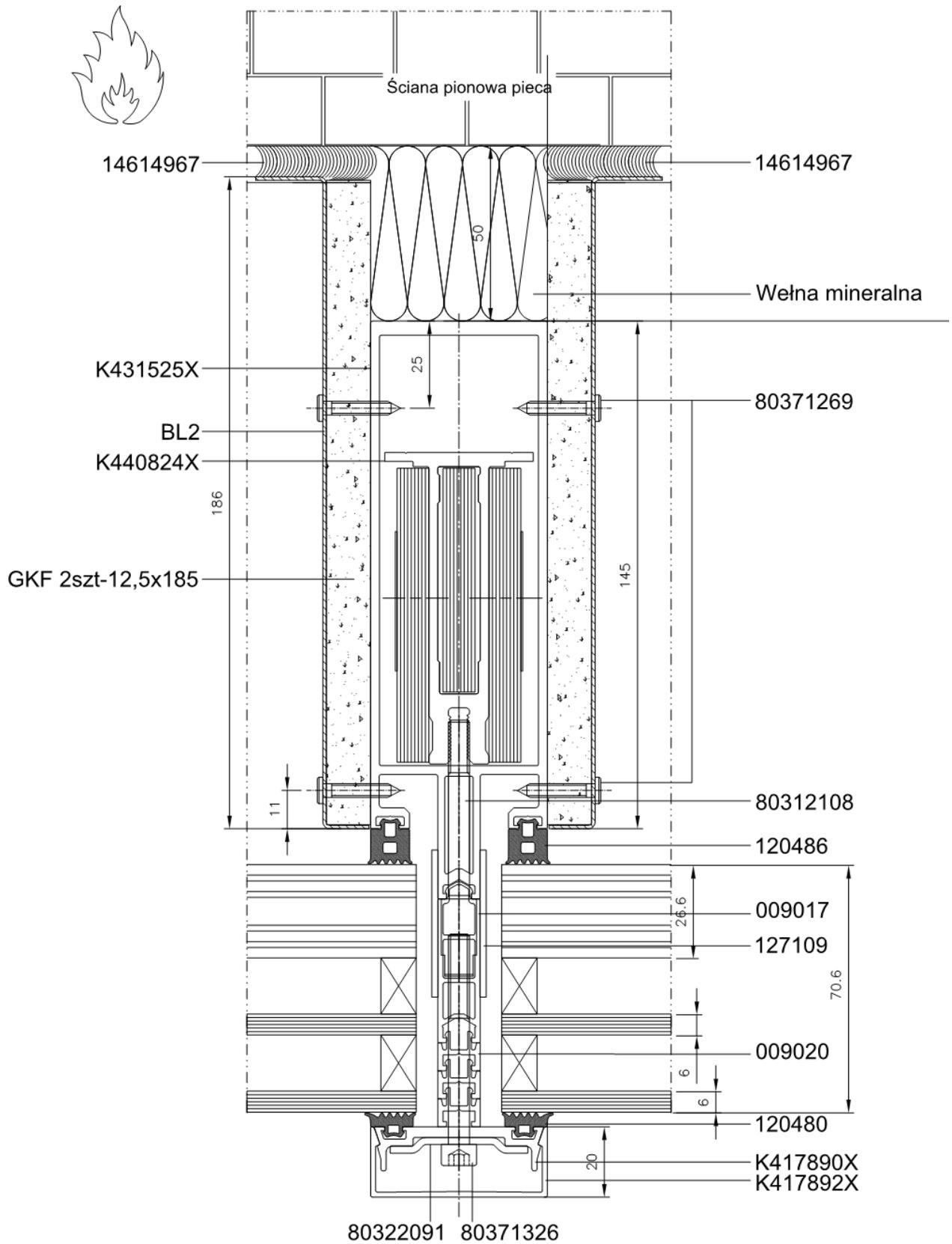


Fig. 6A. Section 4-4

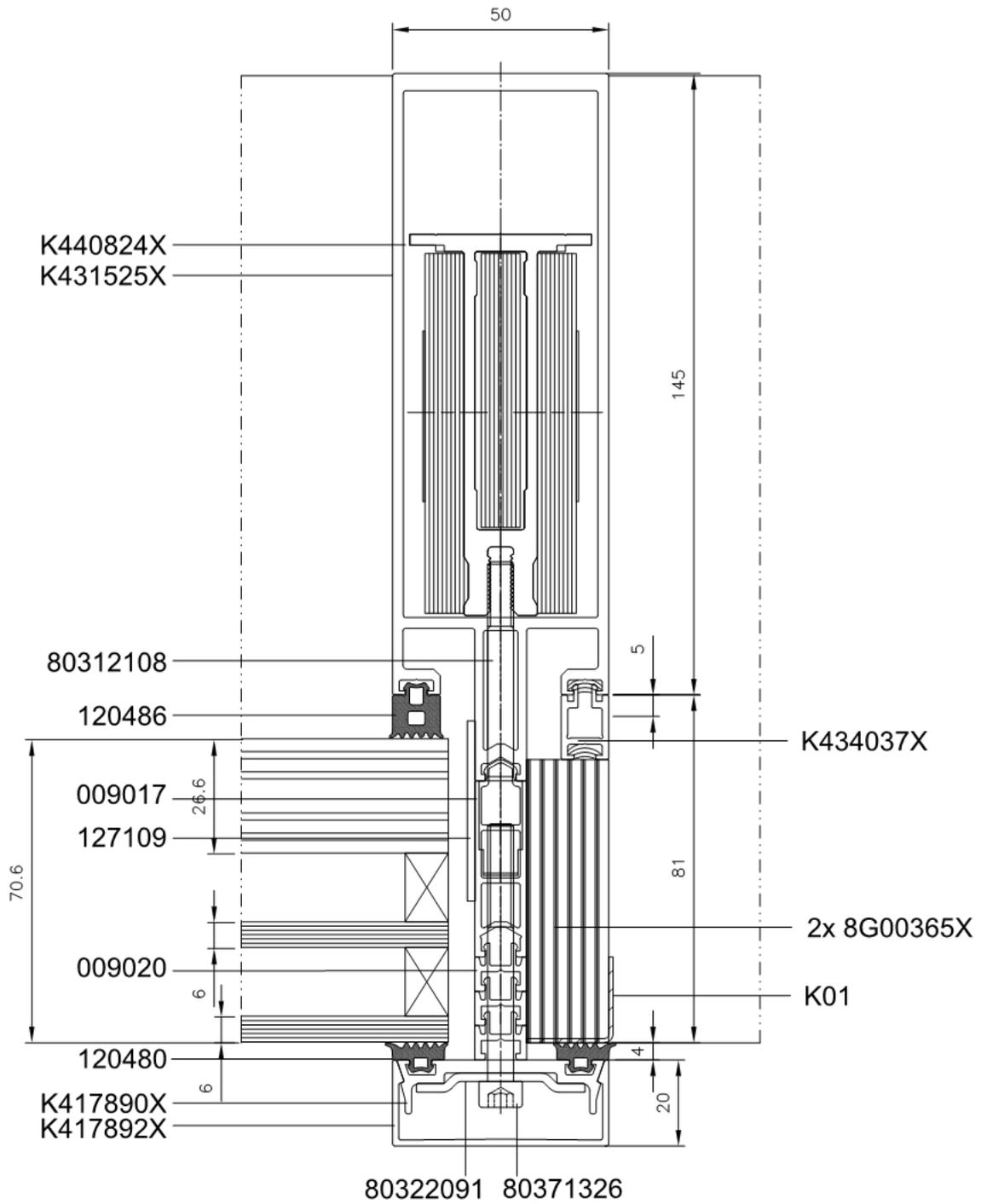


Fig. 7A. Section 5-5

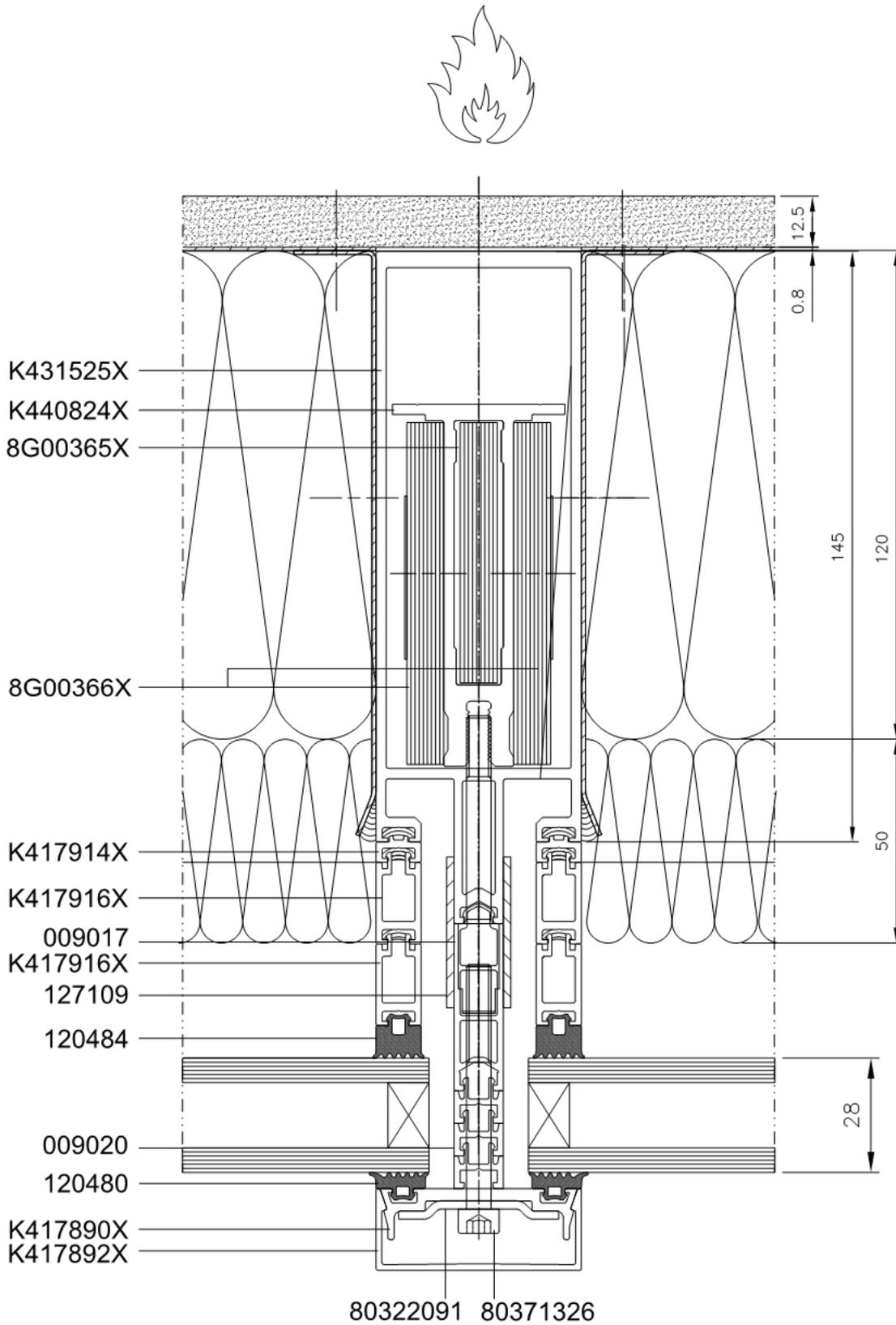


Fig. 8A. Section 6-6

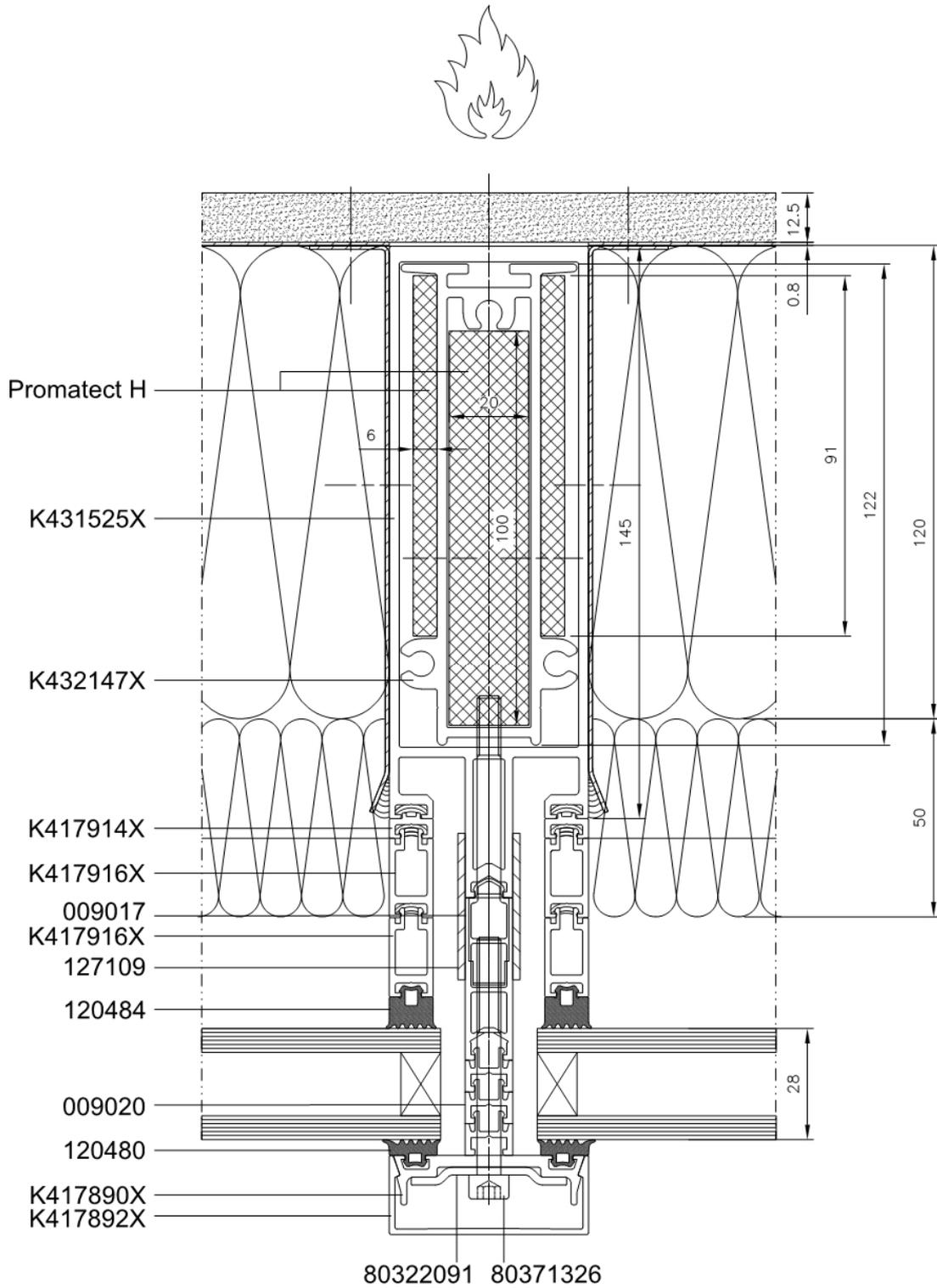


Fig. 9A. Section 7-7

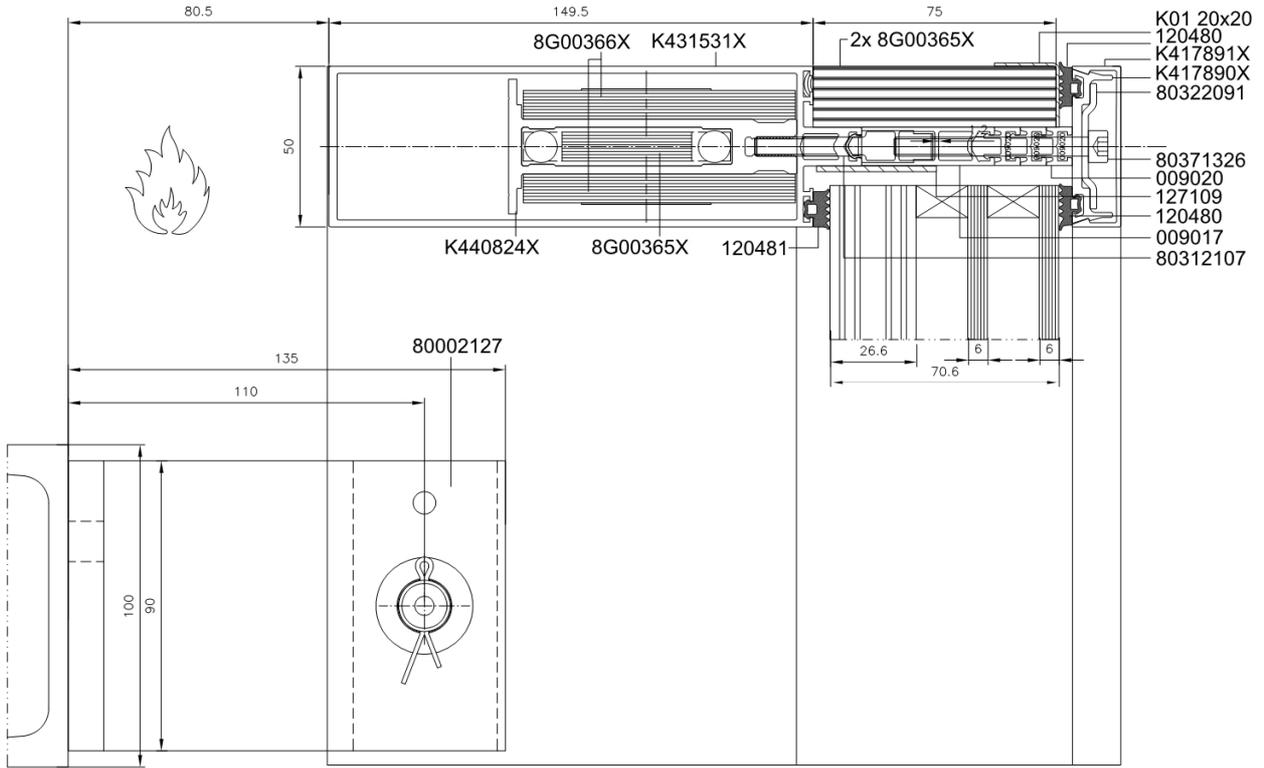


Fig. 10A. Section 8-8

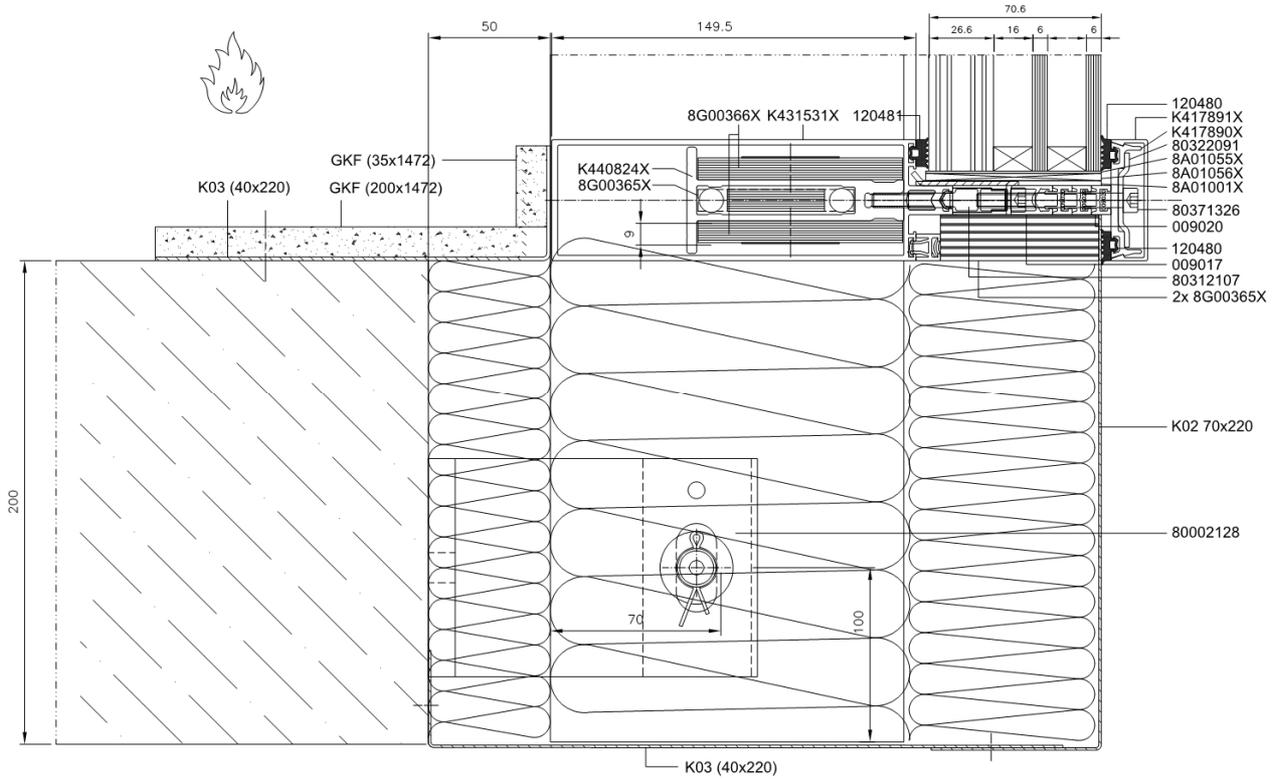


Fig. 11A. Section 10-10



## Final remarks

The Testing Laboratory declares that the test results relate only to the sample received.

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This report has been issued in electronic form, with qualified electronic signatures of responsible persons. The printout of this report is not an original document.

## Research team

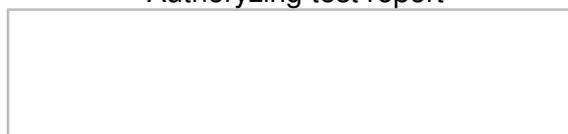
Kamil Makuch, Leszek Włodarczyk, Mateusz Tumidajewicz, Emil Paciorek, Jacek Nowak, Jacek Kinowski

Responsible for test



e-signature

Authorizing test report



e-signature

Head of LZP Laboratory



e-signature

**END OF THE REPORT**

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