

Test report No 13051A

Sponsor

AGC Flat Glass Europe S.A.
166, Chaussée de la Hulpe
B-1170 BRUXELLES

Test specimen

A glazed partition.

Nature of the tests

Test concerning the fire resistance of this test specimen in accordance with the European standard EN 1364-1: 1999.

In the rooms of the laboratory and under its control, the firm AGC Flat Glass Europe S.A., 166, Chaussée de la Hulpe, B-1170 BRUXELLES set up, on 14 and 15 November 2007, a glazed partition in a concrete frame for a test concerning its fire resistance.

This test specimen was prepared in accordance with the requirements of the standard stated hereinafter.

1 DESCRIPTION OF THE TEST SPECIMEN

1.1 Name and address of the sponsor of the fire resistance test:

AGC Flat Glass Europe S.A.
166, Chaussée de la Hulpe
B-1170 BRUXELLES

1.2 Name and address of the manufacturer:

AGC Flat Glass Europe S.A.
166, Chaussée de la Hulpe
B-1170 BRUXELLES

1.3 Description of the test specimen (annexes 1 through 5):

In the following description, all dimensions and material properties are the nominal values communicated by the sponsor.

The conformity of the test specimen with these communicated values was verified by the laboratory insofar as the structure of the test specimen and the form in which it was delivered allowed this verification.

The present test specimen was fully assembled in the laboratory so that all the outer dimensions could be verified.

The measured values (MV) are only mentioned if they differ significantly from the nominal values (NV).

In this description, the numbers of the parts between rectangular brackets [] refer to the numbering in the parts legend, viz. in the key to the drawings (annexe 5). Listed in that legend are the dimensions and material properties of every element of structure.

The test specimen is an unloaded glazed partition. The partition is constructed inside a vertical concrete frame [1] of the furnace with inner dimensions of 3000 mm x 3000 mm.

The glazed partition consists of a framework made of steel sections and glass panels.

Dimensions of the partition:

height: 2970 mm;

width: 2950 mm;

thickness: 50 mm.

1.3.1 The framework:

The framework consists of two types of steel sections [2] and [3]. Section [2] is used to build up the vertical and horizontal edges. Section [3] is used to construct the inner frame. At the intersections the sections are welded together.

One vertical edge section has been attached to the furnace frame each 650 mm by means of anchor bolts [4]. The two horizontal sections have been attached to the furnace frame every 500 mm by means of anchor bolts [4]. One vertical section has not been attached to the furnace frame. It is called the free edge. The gap between this section and the furnace frame is stuffed with mineral wool [5]. The gaps between the frame and the two horizontal sections and the other vertical section have been stuffed with mineral wool [6].

1.3.2 The glass elements:

Each glass element consists of a 12 mm thick AGC FLAT GLASS.

The glazed partition has six glass elements [7], [8], [9], with three different dimensions.

All glass elements have been placed the same way. A ceramic tape [10] is placed on the inner side of the frame and on the inner side of the steel glazing beads [11]. Three small calcium silicate blocks [12] are placed on the lower horizontal section of each frame opening. On these blocks, the glass elements are placed. The metal glazing beads are clipped onto the screws [13] which are placed in the sections every 200 mm. The joints are finished with silicone [14].

1.4 Drawings:

The present drawings are not to scale.

Annexe 1: front view – positions of the thermocouples – observations.

Annexe 2: front view – unexposed side.

Annexe 3: section AA and BB.

Annexe 4: section CC en DD.

Annexe 5: legend.

1.5 Trade name of the test specimen:

PYROBELITE 12 in a Jansen Economy 50 frame.

1.6 Number of test specimens received by the laboratory:

One.

2 TEST PROCEDURE

2.1 Date of the delivery of the test specimen:

14 November 2007.

2.2 Set-up date of the test specimen:

14 and 15 November 2007.

2.3 Set-up conditions for the test specimen:

The unloaded glazed partition is erected in a vertical concrete frame with inner dimensions 3000 mm x 3000 mm. The dimensions of the concrete frame are invariable regardless of the actions of the test specimen during the test. The whole unit is placed up against the furnace so that it constitutes one of the outer walls thereof.

2.4 Date of the test:

30 November 2007.

2.5 Test method:

This report contains the construction details and the boundary conditions of, as well as the results that were obtained as per the procedure of the European standard EN 1364-1:1999.

2.6 Overpressure inside the oven:

Annex 6: shows the overpressure in the oven in function of time. It was set to $12 \text{ N/m}^2 \pm 3 \text{ N/m}^2$ at a height of 2 metres.

3 OBSERVATIONS DURING THE TEST

Time in minutes	Observations
0	Start of the test.
1	The glass creaks over the entire test specimen. Cracks are observed at the top of the glass elements.
2	The glass becomes non-transparent.
4	The glass has become fully non-transparent.
7	Light smoke and vapour development is observed in zone 1.
8	There are glass splinters coming of the glass elements. The large glass element is vibrating.

DS10 – Version 0

9	The maximum rise in temperature has reached 180 °C – measured by mean of thermocouple no. 19.
11	A light brown discoloration is observed on all glass elements.
14	Light vapour development is observed over the entire test specimen.
15	Light smoke and vapour development is observed in zone 2.
19	A brown discoloration is observed on all glass elements. A crack is observed in zone 4.
25	The average rise in temperature has reached 140 °C – measured by means of thermocouples no. 13, 14 and 15. A brown discoloration is observed over the entire test specimen.
26	The average rise in temperature has reached 140 °C – measured by means of thermocouples no. 7 and no. 8.
27	Medium vapour development is observed over the entire test specimen. A black discoloration is observed in zone 5. The average rise in temperature has reached 140 °C – measured by means of thermocouples no. 1 and no. 2. The average rise in temperature has reached 140 °C – measured by means of thermocouples no. 3 and no. 4.
30	A black discoloration is observed in the zones 6 till 9.
35	Sustained flaming is observed in the zones 10 and 11.
37	End of the test.

Remark: the ambient temperature in the test room during the test was 15°C.

4 MEASUREMENTS DURING THE TEST

Annex 7: gives the deformation in the places indicated in annex 1, in relation to time.

Annex 8: gives the radiation intensity, measured at a distance of one metre from the centre of the test element, in relation to time.

The following annexes show the rise in temperature of the thermocouples in the places indicated in annex 1, in relation to time.

Annex 9: thermocouples 1 and 2 on the glass element and the mean temperature.

Annex 10: thermocouples 3 and 4 on the glass element and the mean temperature.

DS10 – Version 0

Annex 11: thermocouples 5 and 6 on the glass element and the mean temperature.

Annex 12: thermocouples 7 and 8 on the glass element and the mean temperature + thermocouple 9 at 15 mm from the upper edge.

Annex 13: thermocouples 10 and 11 on the glass element and the mean temperature + thermocouple 12 at 15 mm from the upper edge.

Annex 14: thermocouples 13 till 15 on the glass element and the mean temperature + thermocouple 16 at 15 mm from the upper edge.

Annex 15: thermocouples on the framework.

Annex 16: the plate thermometers in the furnace and the ISO 834 curve.

Annex 17: allowed deviation of the plate thermometers with respect to the ISO 834 curve.

5 PHOTOGRAPHS OF THE TEST SPECIMEN BEFORE, DURING AND AFTER THE TEST

Annexes 18 and 19.

6 RESULTS

Observations*	Exceeded
$\Delta T_m = 140^\circ\text{C}$	25 minutes
$\Delta T_M = 180^\circ\text{C}$	9 minutes
Ignition of a cotton pad	Not during the test
Radiation intensity = 15kW/m^2	Not during the test
Sustained flaming	35 minutes
Failure with a 6 mm gap gauge	Not during the test
Failure with a 25 mm gap gauge	Not during the test

(*) Summary of the observations which might affect the classification of the test element.

The test duration was 37 minutes.

Any appreciable deviation from the key dimensions, construction details, stresses and/or boundary and end-of-test conditions which is not within the immediate scope of the test method, is not covered by this report. Owing to the inherent nature of fire resistance tests and the difficulties arising therefrom as to qualifying parameter uncertainty when measuring the fire resistance, it hasn't been possible to establish the degree of accuracy of these test results.

7 DIRECT FIELD OF APPLICATION OF TEST RESULTS

The direct field of application of the test results for these test specimens is set forth in paragraph 13 of the European standard EN 1364-1:1999.

Gent,

01 FEB 2008



P. TACK
Project manager

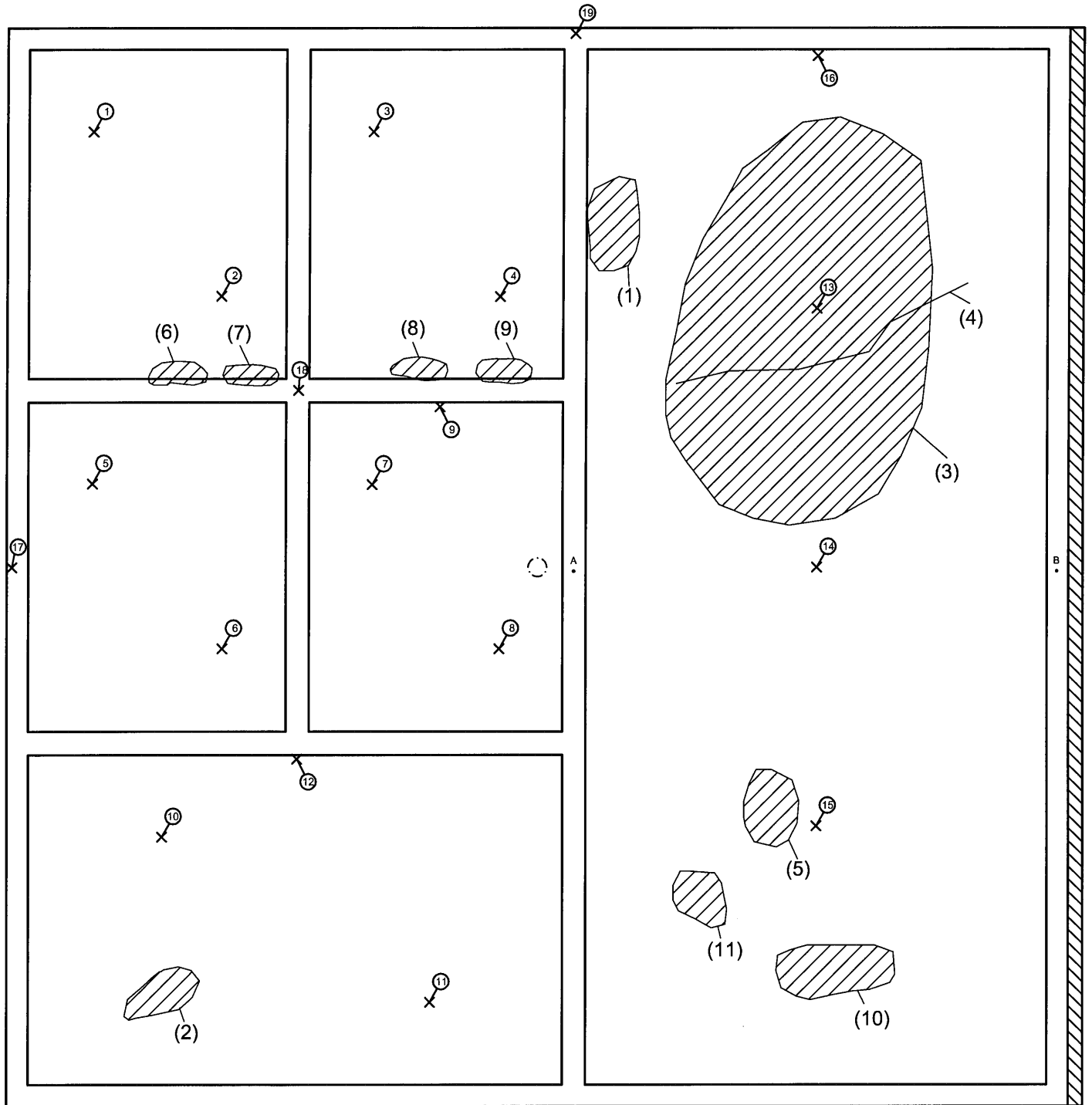


Prof. Dr. P. VANDEVELDE
Director

The present report includes: 8 pages;
19 annexes, 2 of which contain photographs.
This document is the original version of this test report and is written in English.

This report may be used only literally and completely for publications. - For publications of certain texts, in which this report is mentioned, our permission must be obtained in advance.

Unexposed-side



X = position of thermocouples

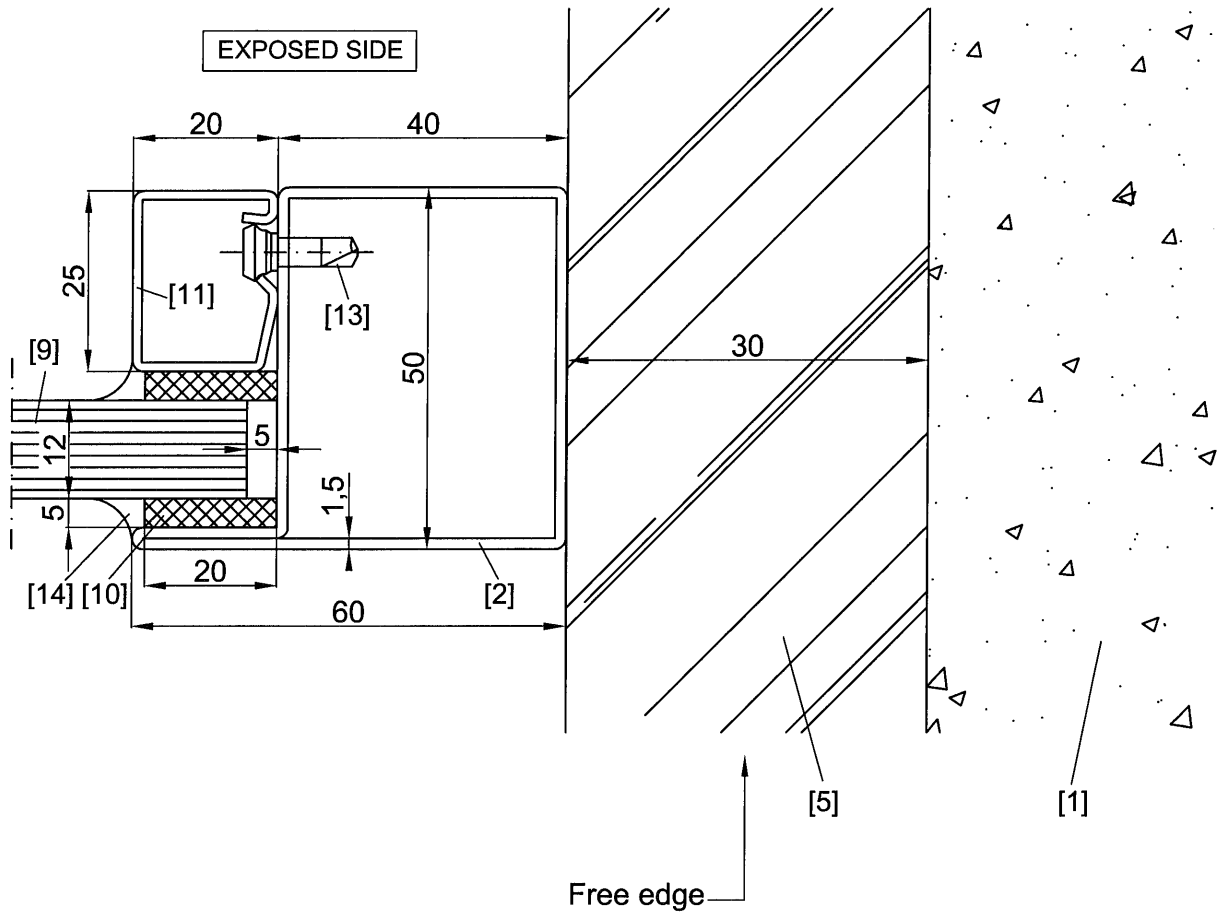
() = observations

• = positions where the deformations are measured

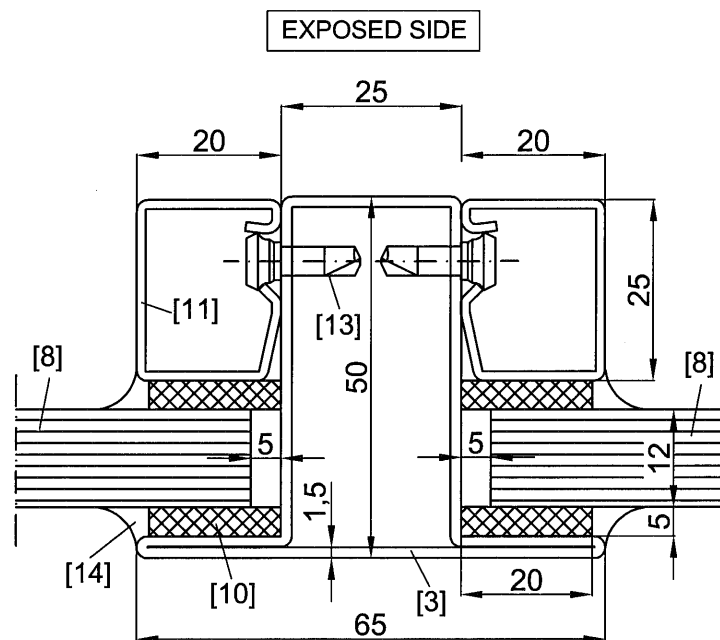
○ = radiation measurement

Free edge

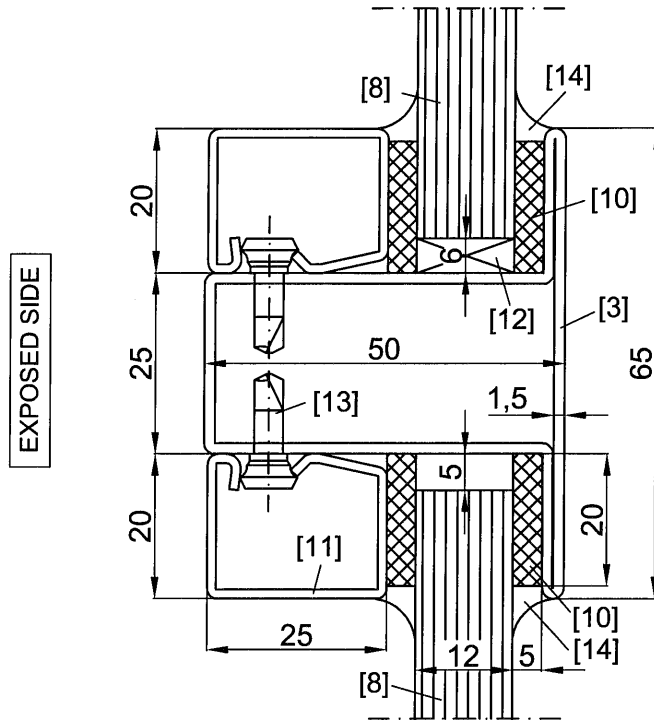
Section AA



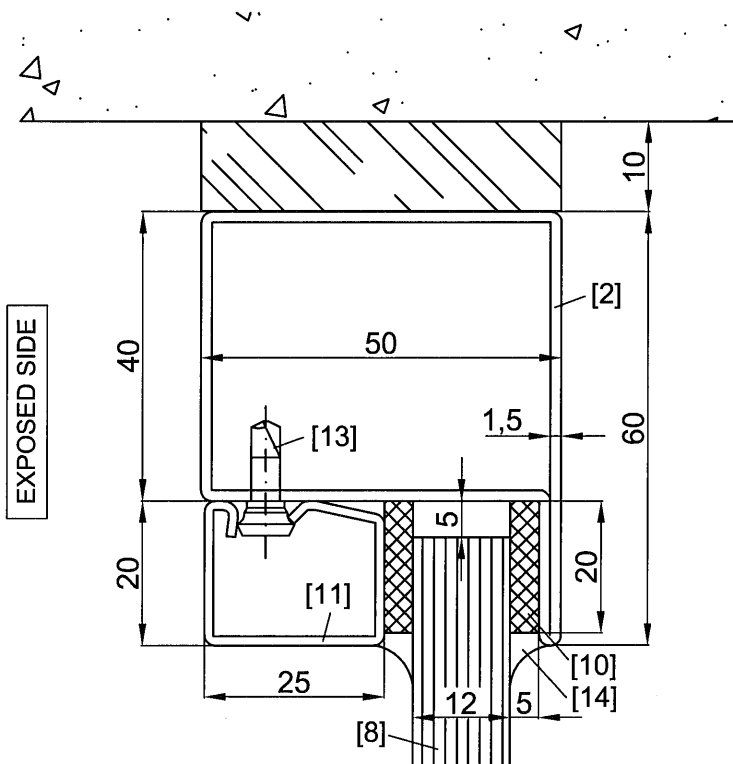
Section BB



Section CC



Section DD

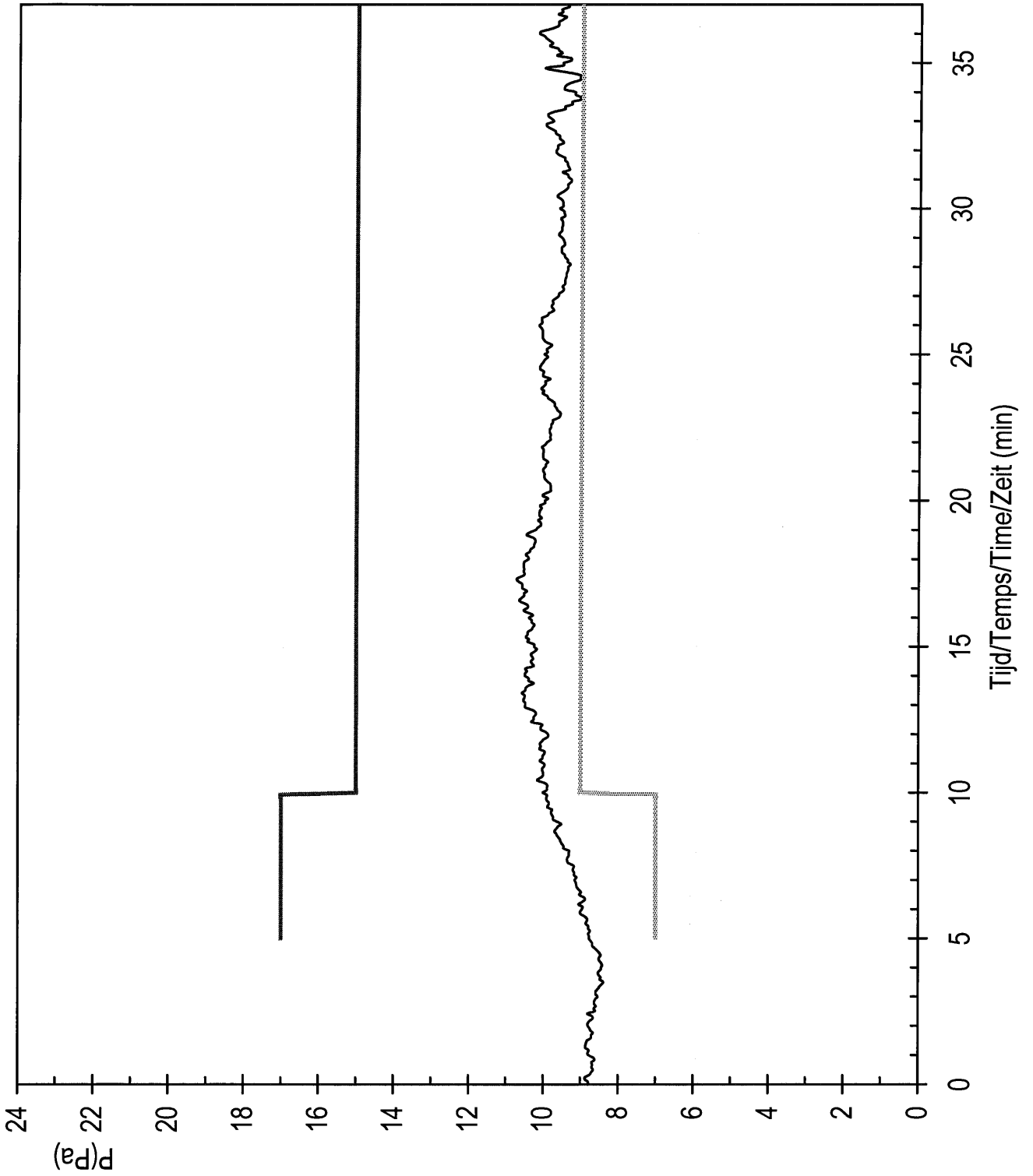


LEGEND

- [1] Concrete frame – inner dimensions: 3000 mm x 3000 mm.
- [2] Steel - section – outer dimensions of the section: 60 mm x 50 mm – thickness: 1,5 mm.
- [3] Steel - section – outer dimensions of the section: 65 mm x 50 mm – thickness: 1,5 mm.
- [4] Anchor bolt – steel – trade name: DRILFIX – length: 75 mm – diameter: 10 mm.
- [5] Free edge - mineral wool – trade name: Rockwool - volumetric weight: 96 kg/m³ (NV).
- [6] Mineral wool – trade name and type: Thermal Ceramics Superwool[®] SW 607 HT – uncompressed thickness: 19 mm - volumetric weight: 128 kg/m³ (NV).
- [7] Glass – trade name and type: AGC PYROBELITE 12 – outer dimensions: 1510 mm x 937 mm – thickness: 12 mm – Identification No: BX08967-03-501.
- [8] Glass – trade name and type: AGC PYROBELITE 12 – outer dimensions: 738 mm x 937 mm – thickness: 12 mm – Identification No: BX08967-02-501, BX08967-02-502, BX08967-02-503 and BX08967-02-504.
- [9] Glass – trade name and type: AGC PYROBELITE 12 – outer dimensions: 1315 mm x 2880 mm – thickness: 12 mm - BX08967-01-501.
- [10] Ceramic tape – trade name and type: ODICE Superwool[®] X607 – section dimension: 20 mm x 5 mm.
- [11] Glazing bead – steel – section dimensions: 20 mm x 25 mm – thickness: 1,25 mm.
- [12] Setting block – calcium silicate – thickness: 6 mm, length: 70 mm, width: 12 mm.

[13] Screw – steel - length: 15,2 mm – diameter: 4,7 mm

[14] Silicone – trade name and type: Dow Corning Firestop 700.



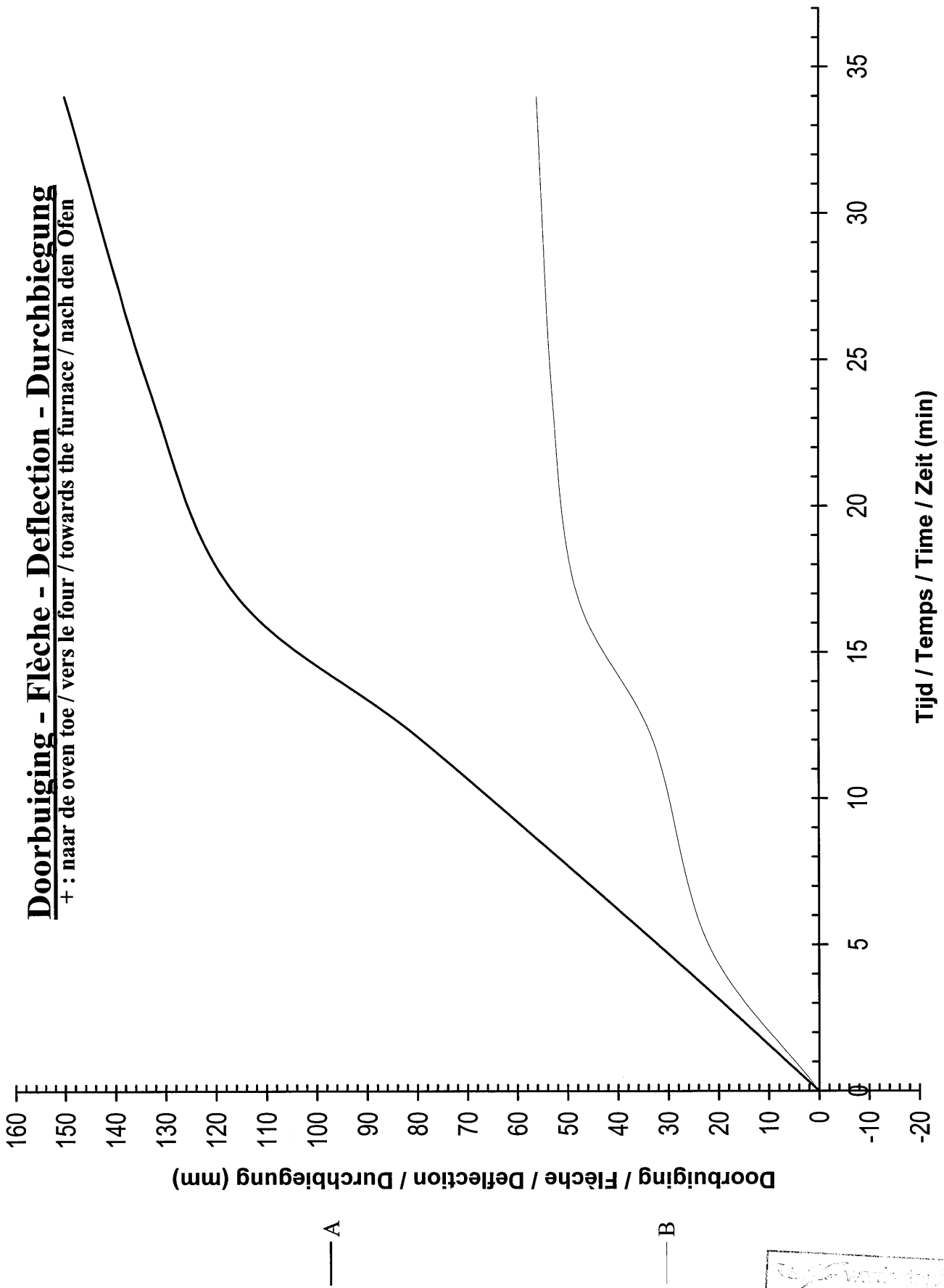
Oven overdruk
Four surpression
Furnace overpressure
Ofen Überdruck

— P

..... P min

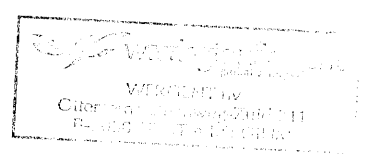
—— P max

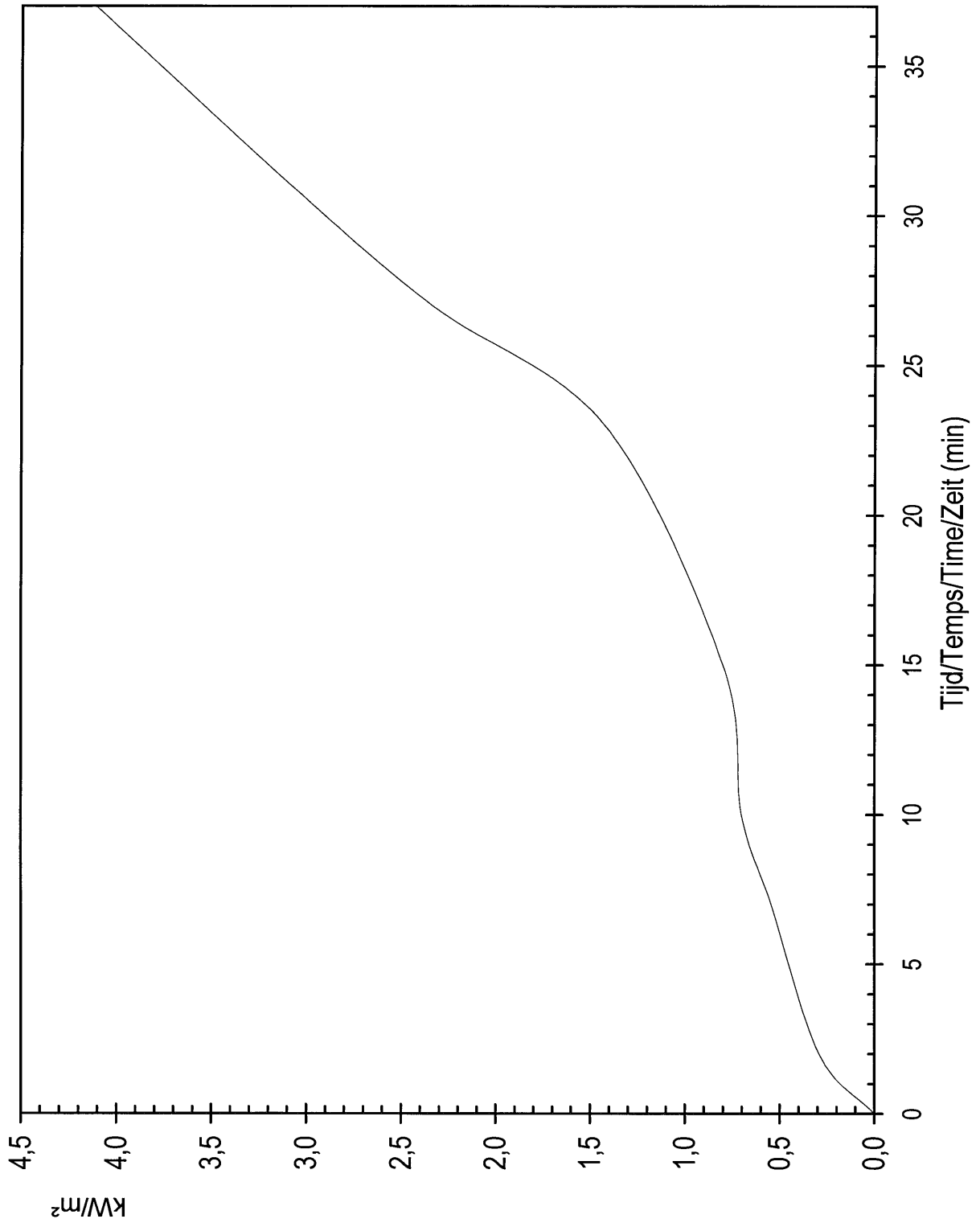
Doorbuiging - Flèche - Deflection - Durchbiegung
+ : naar de oven toe / vers le four / towards the furnace / nach den Ofen



— A

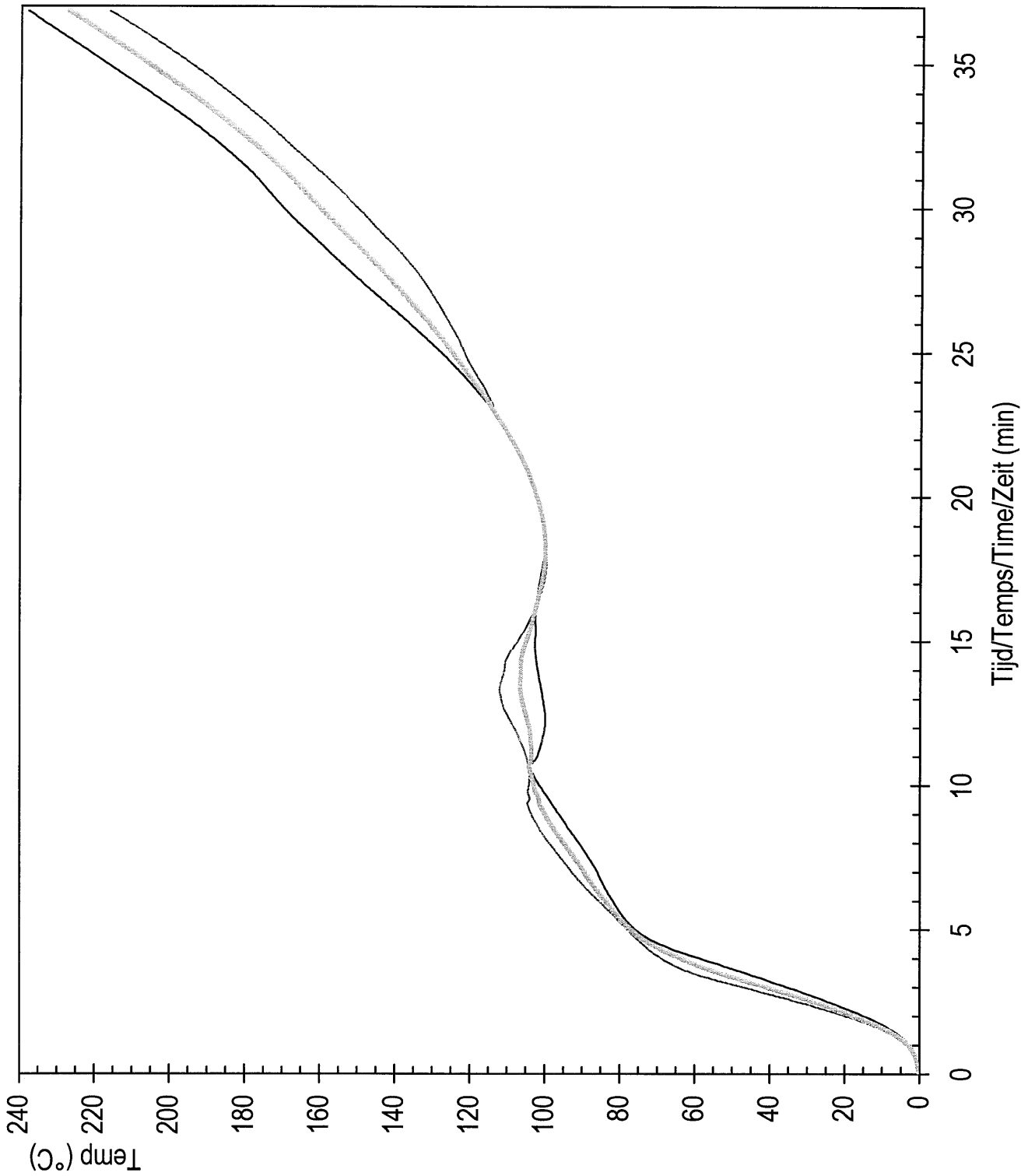
— B





Straling
Rayonnement
Radiation
Strahlung

— R

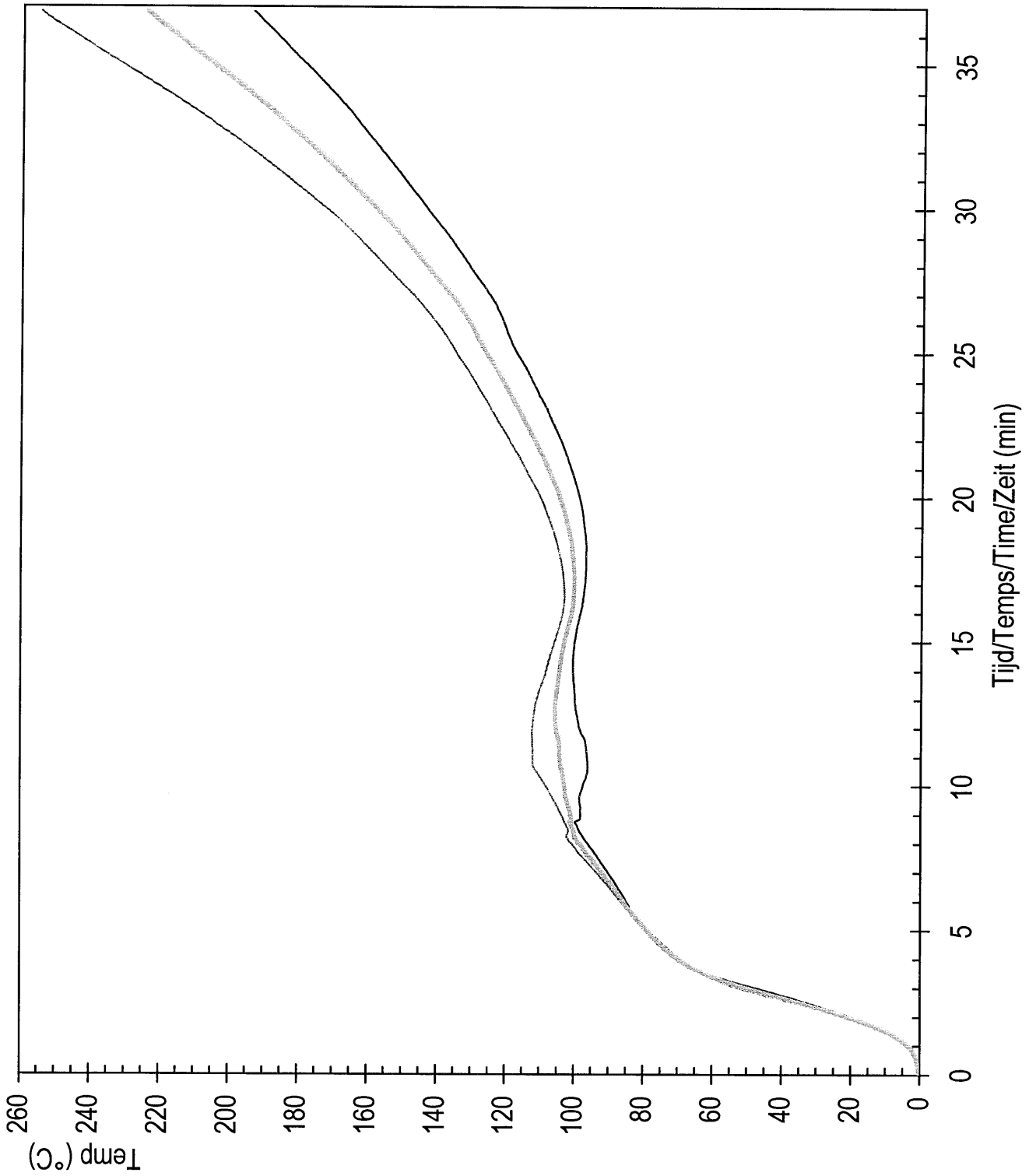


Thermokoppels
Thermocouples
Thermocouples
Thermoelementen

— Tk. 1

— Tk. 2

— average 1-2

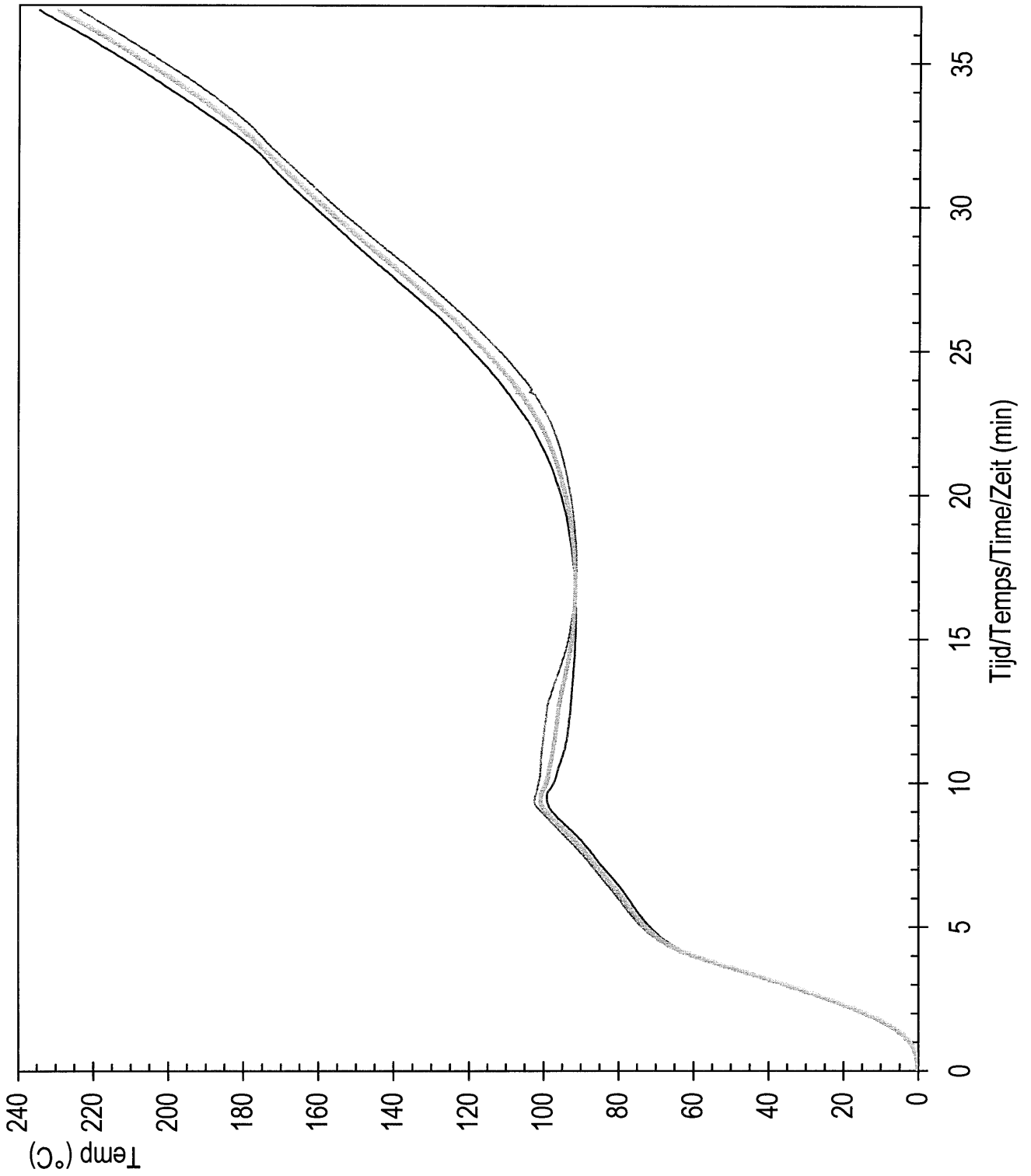


Thermokoppels
Thermocouples
Thermocouples
Thermoelementen

— Tk. 3

— Tk. 4

— average 3-4

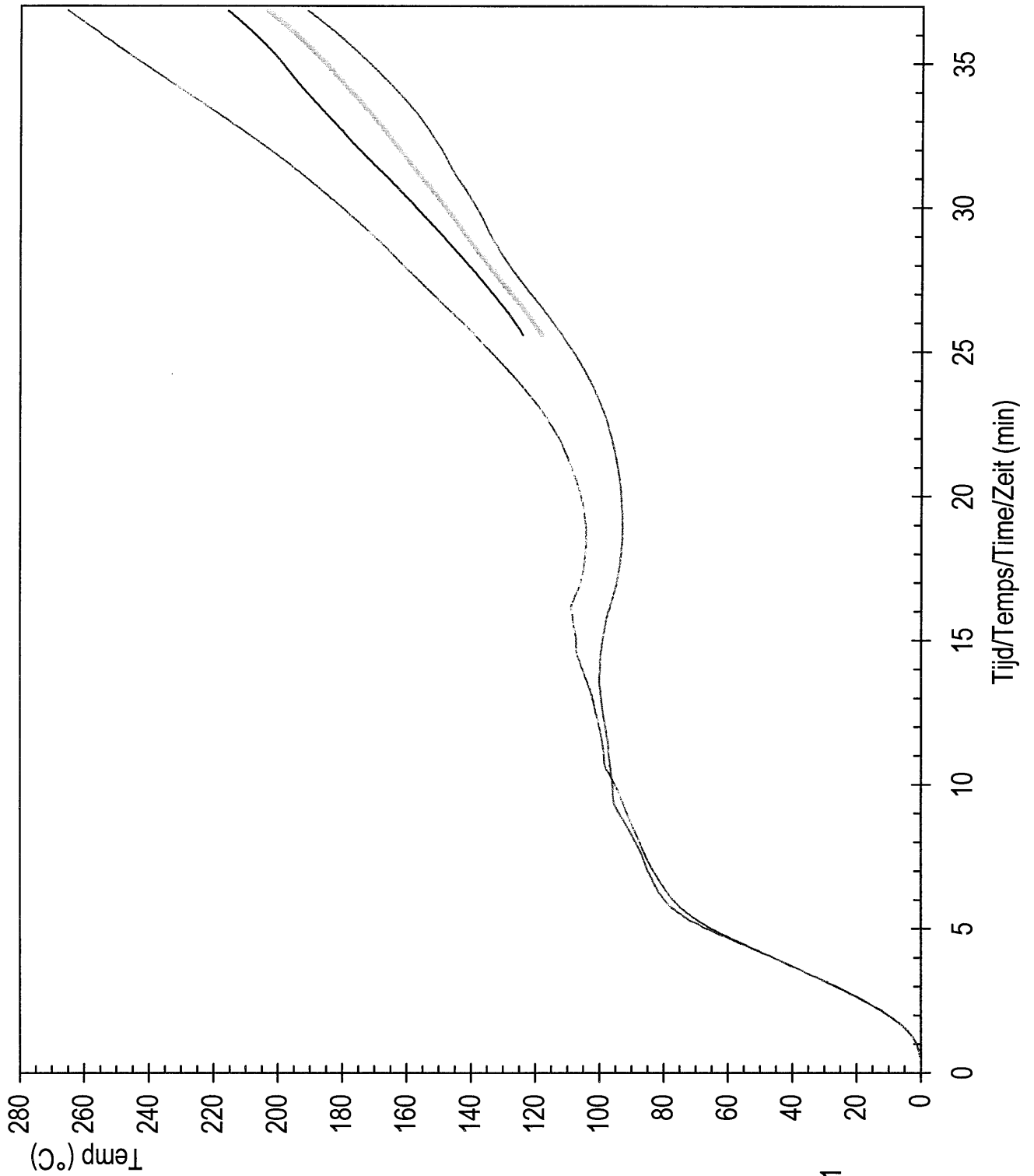


Thermokoppels
Thermocouples
Thermocouples
Thermoelementen

— Tk. 5

- - - Tk. 6

average 5-6



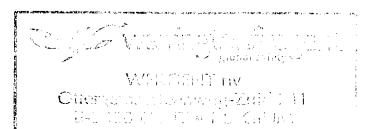
Thermokoppels
Thermocouples
Thermocouples
Thermoelementen

— Tk. 10

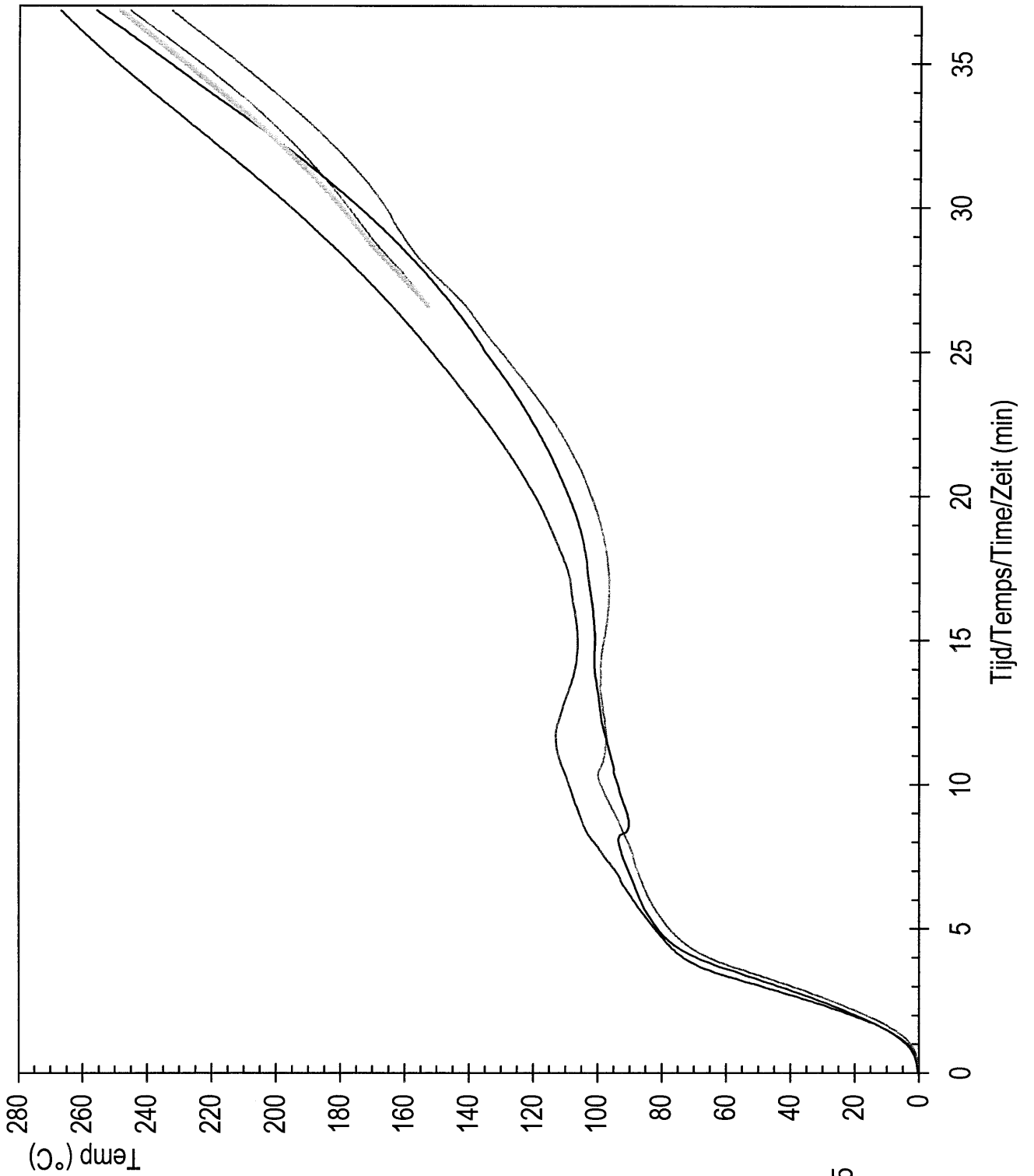
- - - Tk. 11

..... Tk. 12

average 10-11



WSP bv
Clermontseweg 241-243
3715 ZG Dordrecht, The Netherlands



Thermokoppels
Thermocouples
Thermocouples
Thermoelementen

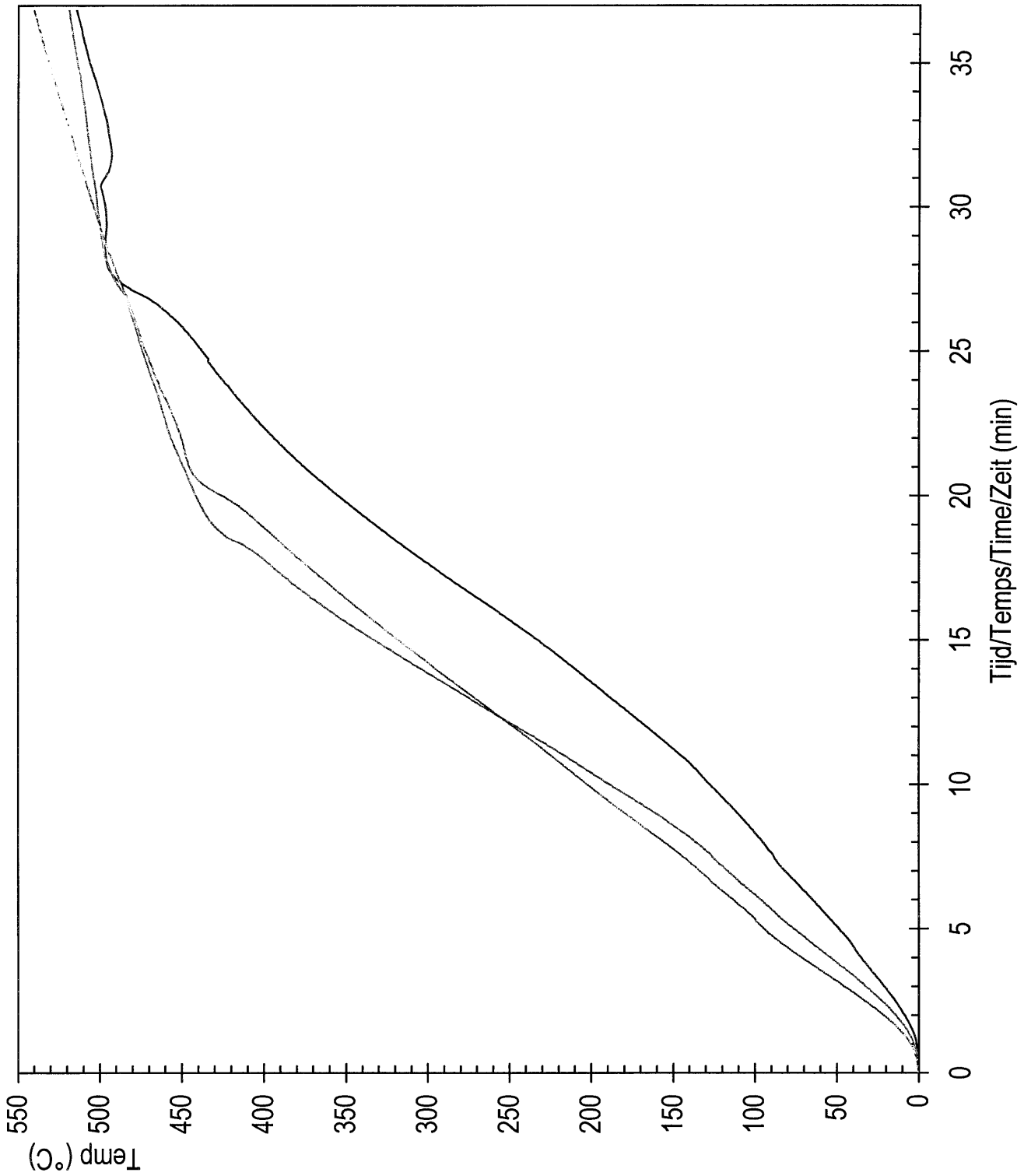
— Tk. 13

— Tk. 14

— Tk. 15

— Tk. 16

— average 13-15

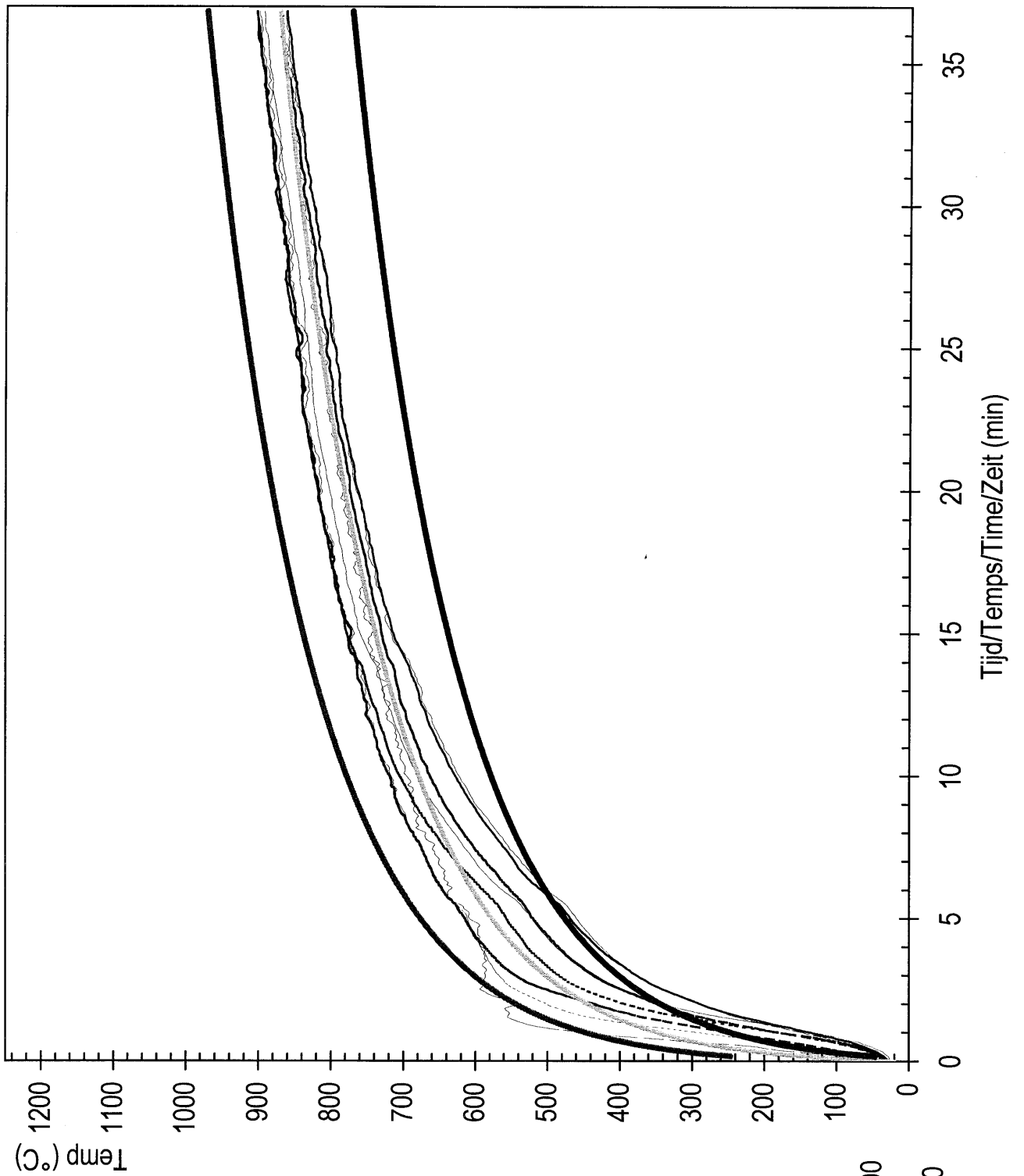


Thermokoppels
Thermocouples
Thermocouples
Thermoelementen

— Tk. 17

— Tk. 18

— Tk. 19



Thermokoppels
 Thermocouples
 Thermocouples
 Thermoelementen

— Pla. 1

— Pla. 2

..... Pla. 3

..... Pla. 4

----- Pla. 5

----- Pla. 6

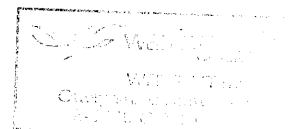
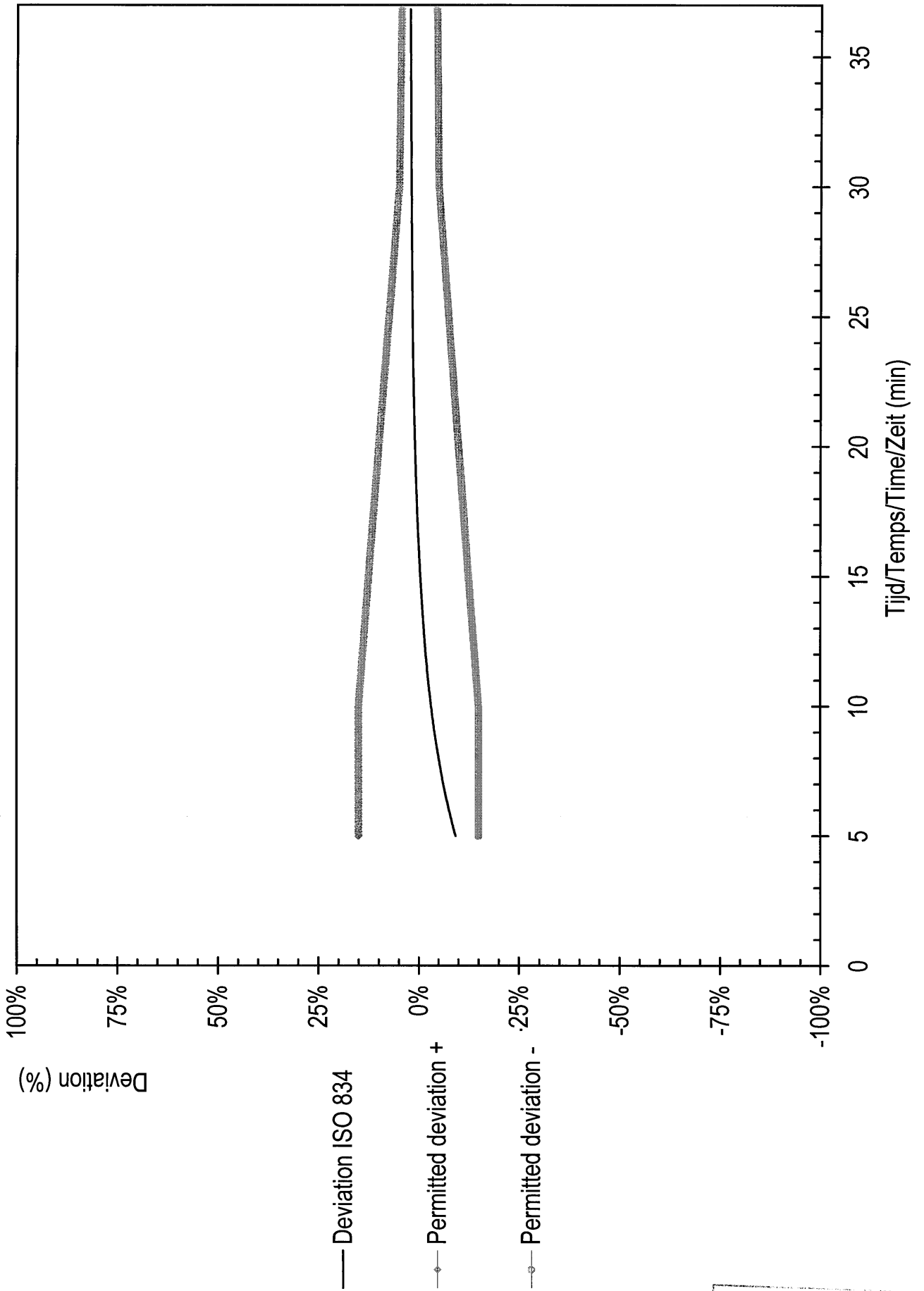
----- Pla. 7

----- Pla. 8

ISO 834

ISO 834 +100

ISO 834 -100



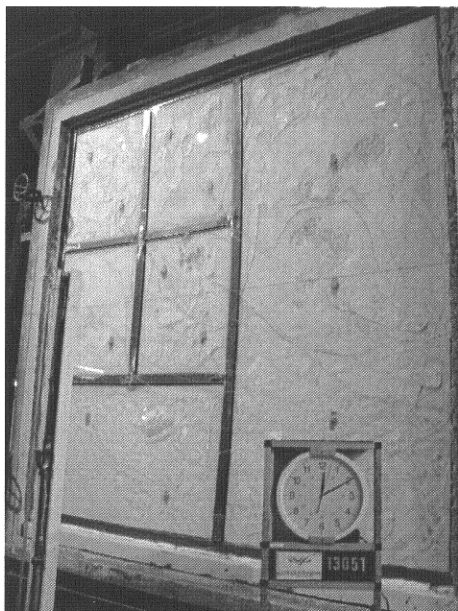
PHOTOGRAPHS OF THE TEST SPECIMEN BEFORE, DURING AND AFTER THE TEST



The exposed side before the test.



The un-exposed side before the test



After 10 minutes.



After 15 minutes.



After 22 minutes.



After 30 minutes.



After 35 minutes.



The exposed side after the test.