

TEST REPORT LOADBEARING WALL

Name of sponsor:	Wood:UpHigh		
Product name:	Loadbearing wall		
File no.:	PGA12210A	Revision no.:	1
Test date:	2022-11-30	Date:	04-07-2023
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Ref:	JBK / CHB		

Client information

Client: Dansk Brand- og Sikringsteknisk Institut

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2650 Hvidovre

Denmark

The test is part of the project Wood:UpHigh. The project is partly sponsored by Uddannelses- og Forskningsstyrelsen through DBI's performance contract, Realdania and Grundejernes Investeringsfond. The project is headed by DBI, except for the construction of test specimens for the fire tests, which is headed by LOGIK&CO.

The results relate only to the items tested. The report should only be reproduced in extenso - in extracts only with a written agreement with this institute.

Revision chronology				
Rev. no.	Date	Description	Author	Approved
0	08-06-2023		JBK	CHB
1	04-07-2023	Change description of materials in tables and graphs to more generic terms	JBK	CHB

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1 Date of test

The test was conducted on 2022-11-30

2 Purpose of test

The test specimen has been subjected to a standard fire test in accordance with the following standards:

DS/EN 1363-1:2020 Fire resistance tests – General requirements

in conjunction with

EN 1365-1:2012 Fire resistance tests for loadbearing elements — Part 1: Walls

3 Test specimen

The trade name and sponsors identification mark is stated below:

Trade name: None

Identification mark: None

The components for the test specimen were delivered and mounted by LOGIK&CO.

4 Drawings and description

Details of the construction are shown in the enclosed documentation as stated below:

Type	Drawing No.	Dated	Subject
Drawing	1.1	30-11-2022	Loadbearing wall
Drawing	1.2	30-11-2022	Loadbearing wall
Drawing	1.3	30-11-2022	Loadbearing wall
Drawing	1.4	30-11-2022	Loadbearing wall
Drawing	1.5	30-11-2022	Loadbearing wall

The documentation is supplied by DBI - Danish Institute of Fire and Security Technology

Description

The test specimen consisted of the components described in the following. DBI inspected the components during mounting, the test and after the test.

LOGIK&CO carried out the selection of the products for the test specimen as well as the mounting.

Test specimen

External measures:	Height: 3000 mm	Width: 2930 mm	Thickness: 363 mm
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The test specimen was a loadbearing timber construction with gypsum boards, woodfiber boards and woodfiber insulation.

The test specimen was asymmetrical.

Top and bottom timber beams: The top, bottom and loadbearing stud profiles are 45 x 295 mm dry graded C24 construction spruce wood with a nominal density of 450 kg/m³. One 45 x 295 mm C24 dry graded construction timber is placed along the top of the test frame above the loadbearing studs and another is placed along the bottom of the test frame below the load bearing studs. The top and bottom profiles are fixed to the studs using two PaneltwistTec TX 40, 8,0 x 160 mm screws. See drawing no. 1.1.

Load bearing studs: A total of 5 load bearing studs were used in the wall construction, all 2910 mm tall. The studs are 45 x 295 mm dry graded C24 construction spruce wood with a nominal density of 450 kg/m³. The load bearing studs were spaced c/c 600 mm. The first two load bearing studs were fixed 243 mm away from the DBI-frame edges to avoid edge effects. See drawing no. 1.1 and 1.2 and photo no. 1.

Materials between the load bearing studs 295 mm thick wood fiber insulation with a nominal density of 43 kg/m³ designated [REDACTED] was blown in between the loadbearing studs and top and bottom profiles. The granulated insulation was blown in after the first layer on both sides of the studs were mounted. Multiple holes were drilled in the chipboard and wood fiber board. After the insulation was completed the wood from the hole was put back into place with tape designated [REDACTED]. See photo no. 5.

Inner layers (exposed side) A 15 mm thick chipboard, designated [REDACTED] (nominal density 650 kg/m³, EN 13986:2004 + A1:2015) was mounted on the exposed side to the load bearing studs with 2.8 x 75 mm strip nails, designated [REDACTED]. For each stud

behind the board 3 nails were attached, for the maximum board dimension 12 nails were used. A full size chipboard had the dimensions of 615 x 2500 mm with the tongue and groove. The vertical board joints were backed by the wooden studs. See drawing no. 1.4 and photo no. 3.

Fibre gypsum boards One layer of 12.5 mm thick gypsum fibre boards designated [REDACTED] (type EN 15283-2, ETA-03/0050) with a nominal density of 1150 kg/m³ were fixed with designated [REDACTED] 30 mm at a c/c of 200 mm. The staples were fixed 10 mm from the board edges and 50 mm from the board corners. A full-size board measured 900 x 1200 mm. See drawing no. 1.5 and photos no. 7 - 8.

Outer layers (unexposed side)
Wood fibre board A 22 mm thick wood fibre board, designated [REDACTED] (nominal density 220 kg/m³, (type EN 13171:2012 + A1:2015) was mounted to the load bearing studs on the unexposed side with chipboard screws designated [REDACTED] with a minimum of 2 screws per stud per board. The wood fibre boards had the maximum dimensions of 580 x 2000 mm. See drawing no. 1.3 and photo no. 4.

Wood batten/spacers 18 x 46 mm pine wood batten/spacers (nominal density 450 kg/m³) were fixed to exposed side on the wood fibre board and the load bearing studs with 2.8 x 75 mm strip nails, designated [REDACTED] at c/c of 200 mm. See drawing no. 1.3 and photo no. 9.

Measured by DBI

Product		[REDACTED] Fiber gypsum board	Wood fiber board	Chipboard
Density	Kg/m ³	1205	229.6	626
Moisture content	%	0.9	6.4	6.6
Sampling method		Extra material	Extra material	Extra material
Drying temperature	°C	55	105	105

5 Test conditions

Conditioning

The test specimen was delivered on the 24-11-2022 to the DBI laboratory and stored under room temperature. On the day of the fire testing the condition of the test specimen was similar with respect to its moisture content as the test specimen would be in normal service.

Mounting

The test specimen was mounted simple supported in a test frame suitable for loaded tests with a clear opening of 3000 x 3000 mm.

Free edge was established along both vertical edges of the test specimen (2 x 25 mm stone wool with alu-foil in each side) to allow for unrestrained deformation of the test specimen.

Loading

The test specimen was loaded with a total applied load of 5 kN per loadbearing stud or 8.33 kN/m at cc 600mm during the test, corresponding to a total load of 25 kN (2550 kg).

The load was applied centrally on the horizontal top beam, e.g. there was no eccentricity in the loading conditions.

The loading conditions correspond to example b) in figure 1 in EN 1365-1:2012. The figure describes the load transfer system at head with loading from above. The wall was simple supported at the bottom.

The load was applied in 10 steps prior to the fire test. The fire test was commenced approx. 30 minutes after reaching the final load on the test specimen.

Fire test

Observations were made during the test on the general behavior of the test specimen.

Temperature observations were taken continually during the entire testing time.

The surface temperatures were measured on the unexposed surface of the test specimen as indicated on DBI drawing no. 1.0.

Additional thermocouples were placed inside the construction. These are indicated on drawing 1.1, 1.2 and 1.4.

The furnace temperature was determined by means of plate thermocouples uniformly distributed at a distance of approximately 100 mm from the exposed side of the test specimen. The furnace temperature was continuously controlled so as to follow the standard time temperature curve within the accuracy specified in EN 1363-1:2020.

The thermocouples were constructed according to the description in EN 1363-1:2020.

6 Test results

Duration of the test was 72 minutes.

Measurements

The enclosed graphs and tables show:

Enclosures 2.0 and 2.1	Furnace temperatures The actual minimum-, average- and maximum furnace temperature in relation to the standard temperature. The table also shows the area under the actual time-temperature curve as well as the area under the standard time-temperature curve
Enclosures 3.0 and 3.1	Vertical furnace pressure The differential pressure in the furnace during the test, measured 1,16 m above notional floor level
Enclosures 4.0 and 4.1	Ambient temperature The ambient temperature in the laboratory during the test
Enclosures 5.0 and 5.1	Average temperature rise Measured with 5 thermocouples on the unexposed side
Enclosures 6.0 and 6.1	Maximum temperature rise Maximum temperatures on the unexposed side

Enclosures 7.0 and 7.1	Horizontal deformation Negative values indicate movement towards the furnace
Enclosures 8.0 and 8.1	Vertical deformation Negative values indicate downwards movement
Enclosures 9.0 and 9.1	Load per cylinder Load per cylinder during test
Enclosures 10.0 and 10.1	Internal temperature - Center of studs 1 and 2 on second stud, 3 and 4 on center stud seen from unexposed side
Enclosures 11.0 and 11.1	Internal temperature - between studs and chipboard 1 and 3 on second stud at height 1230 mm, 2 and 4 on center stud at height 2460 mm seen from unexposed side
Enclosures 12.0 and 12.1	Internal temperature - between studs and wood fiber board mid height of studs. 1 on 2nd stud from the right and 2 on center stud seen from unexposed side
Enclosures 13.0 and 13.1	Internal temperature - Between chipboard and fiber gypsum placed in 1/4 points between chipboard and fiber gypsum
Enclosures 14.0 and 14.1	Deflection rate
Enclosures 15.0 and 15.1	Gas use Gas use during test. G.1 is for the Wood:UpHigh test and G.2 is for a non-combustible construction
Enclosures 16.0 and 16.1	Vertical deformation during loading phase Negative values indicate downwards movement
Enclosures 17.0 and 17.1	Load per cylinder during loading phase Load per cylinder

Visual observations:

Time / Minutes	Visual observations:	U = Unexposed side E = Exposed side
0	Test commences	
5	No changes	U
10	Minor smoke development right free edge 1 m from the bottom	U
15	No changes	U
15	Gypsum layer has opened in joints approximately 10 mm	E
20	No changes	U
20	Gypsum layer has opened more in joints	E
25	No changes	U+E
28	Minor smoke development top right corner	U

28	Smoke development between frame and furnace left side	U
30	No changes	U
30	Corner are damaged in joints	E
36	No changes	U
36	Unable to see into furnace because of flames	E
37	Smoke development from mid top	U
40	Unable to see into furnace because of flames	E
42	Smoke development from top in full length	U
45	Vapor from boards	U
50	Gypsum boards has partly cracked and small pieces has fallen down	E
55	Pieces from both layers has fallen down and insulation is visible and the wooden studs are burned	E
57	No changes	U
59	Cotton pad test by TC 2.5: No ignition, no discoloration	U
60	Increased smoke development from top of construction	U
62	More boards have fallen down and insulation is falling out from the wall	E
66	Popping sounds can be heard	U
68	All boards have fallen down	E
68	No changes	U
69	Discoloration by top horizontal joint	U
70	Cotton pad test over heavy discoloration on top horizontal joint: discoloration	U
71	5 mm gap gauge could pass through the construction for more than 150 mm	U
72	Sustained flames from horizontal joint	U
72	Test stopped	

The photographs on the attached photo sheets show the test specimen during the mounting, testing and after the test. See the description at each photo.

7 Conclusion

Fire resistance testing according to EN 1365-1:2012 of the construction described in this test report showed that failure according to the performance criteria stated in the test method occurred at the following time:

Load-bearing capacity (R): **72 minutes**

- The load on the test specimen was maintained during the entire test.
- The measured vertical deflection did not exceed the criteria of $C = h/100 = 30$ mm during the test.
- The measured rate of vertical deflection did not exceed the criteria of $dC/dt = 3h/1000 = 9$ mm/min during the test.

Integrity (E): **71 minutes**

- Sustained flaming occurred after 72 minutes of testing
- The cotton pad was not ignited during the test.
- A through-going opening was created during the test where a 5 mm gap gauge could pass for more than 150 mm after 71 minutes of testing

Insulation (I): **71 minutes**

- Failure of insulation occurred after 71 minutes of testing due to failure of integrity
- The average temperature rise on the unexposed surface of the test specimen did not exceed 140°C during the test. The highest average temperature rise during the test was 74°C in the 72th minute.
- The maximum temperature rise on the unexposed surface of the test specimen did not exceed 180°C during the test. The highest maximum temperature rise during the test was 61°C in the 72th minute.

The maximum measured deformation during the entire test was 4.6 mm measured in the 72th minute.

8 Remarks

The field of direct application of the test results appears from EN 1365-1:2012, clause 13.

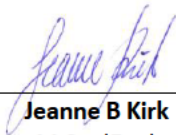
This report details the method of construction, the test conditions and the results obtained when the specific element of construction described herein was tested following the procedure outlined in EN 1363-1:2020, and where appropriate EN 1363-2:1999. Any significant deviation with respect to size, constructional details, loads, stresses, edge or end conditions other than those allowed under the field of direct application in the test method is not covered by this report.

Because of the nature of fire resistance testing and the consequent difficulty in quantifying the uncertainty of measurement of fire resistance, it is not possible to provide a stated degree of accuracy of the result.

This report has only been printed in a pdf-version. DBI has not issued a hard copy version.

All values mentioned in this report are nominal values, production tolerances are not considered.

Danish Institute of Fire and Security Technology


 Jeanne B Kirk
 M.Sc. (Eng)

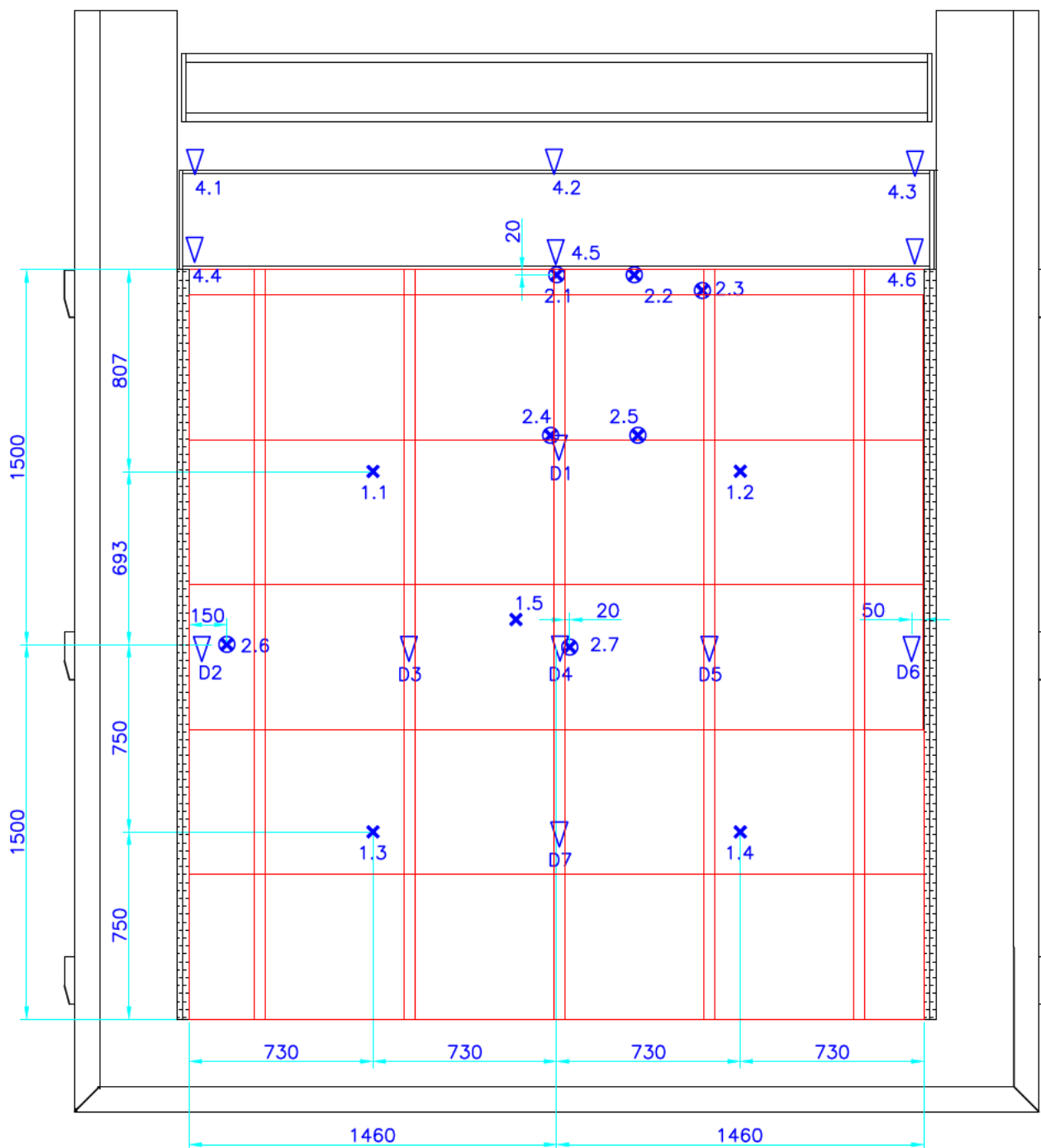

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Enclosures: 48

DBI drawings:	6
DBI graphs and tables:	32
Photo sheets:	10
Sponsors drawings:	0



- ✕ Thermocouple placed on the unexposed surface (average)
- ⊗ Thermocouple placed on the unexposed surface (maximum)
- ▽ Deflection measuring point

All measurements are in mm

Danish Institute of Fire and security Technology

Sponsor: General placement and numbering of thermocouples

Subject: Loadbearing wall

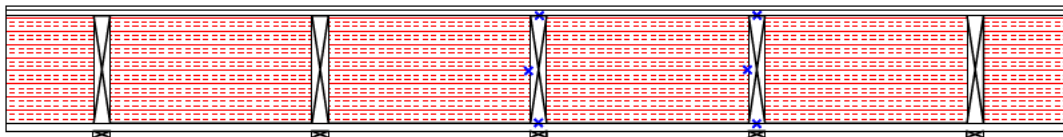
File No.: PGA12210A

Test date: 30-11-2022

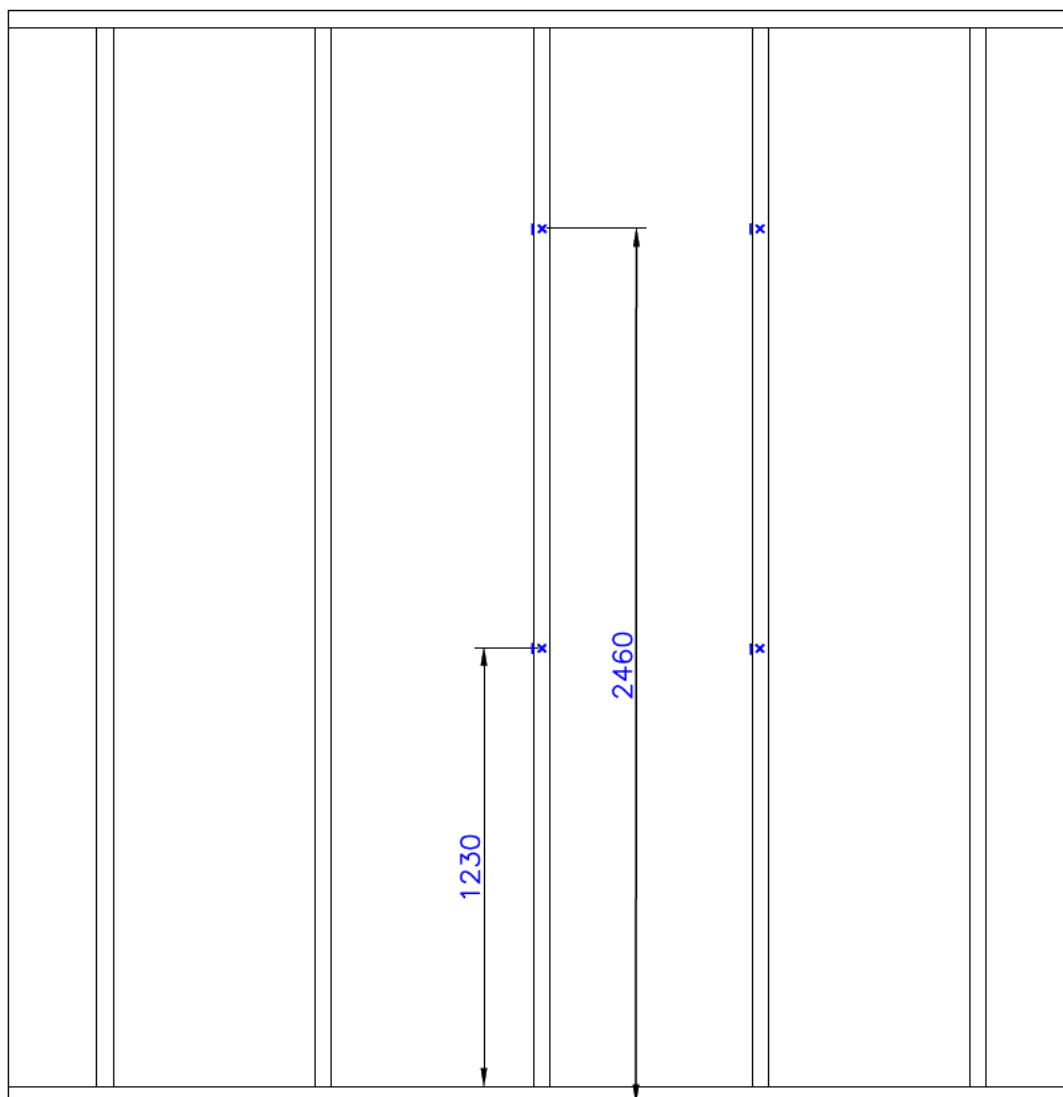
Enclosure: 1,0



Exposed side



Unexposed side



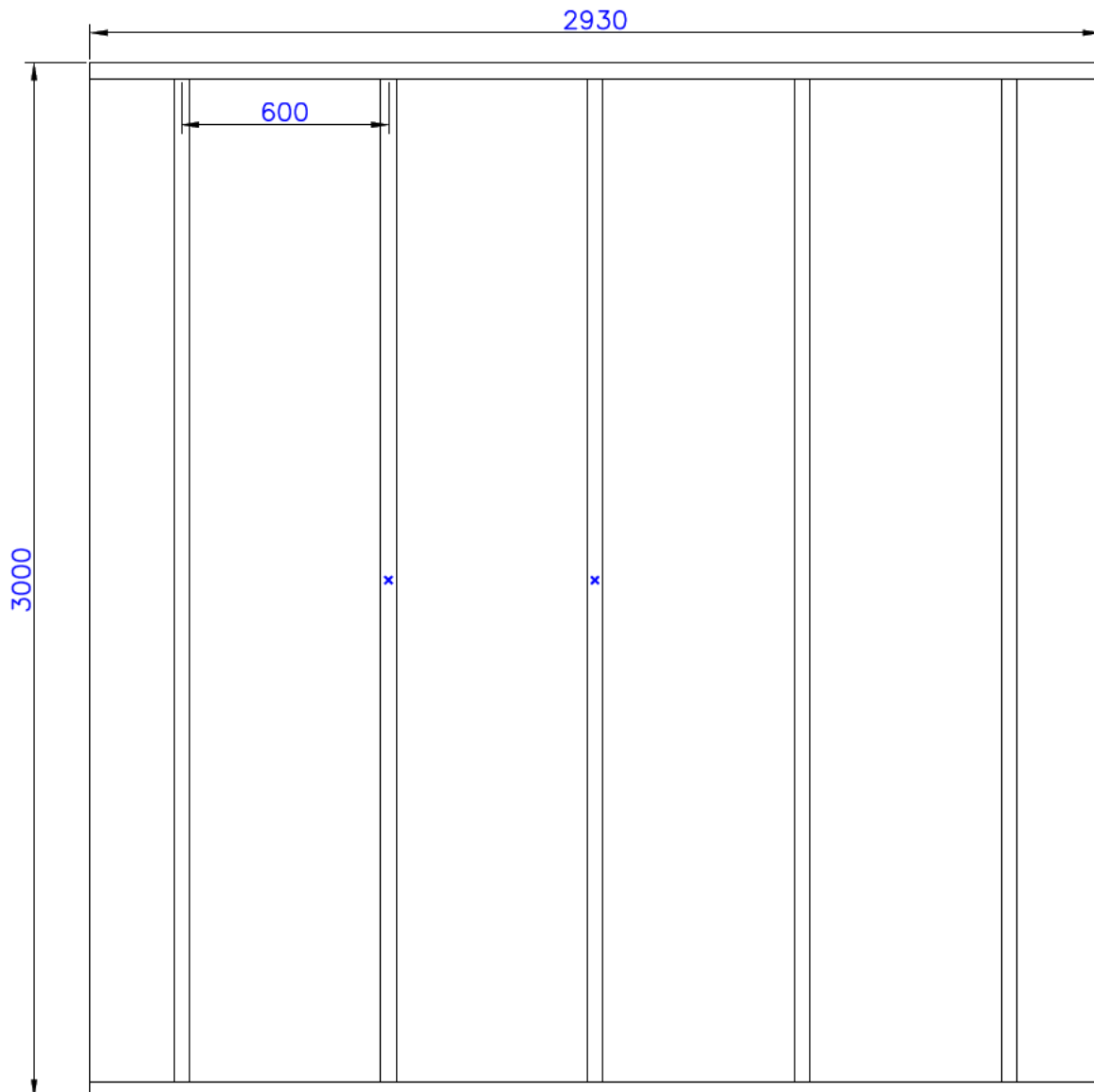
Seen from exposed side.


All measurements are in mm

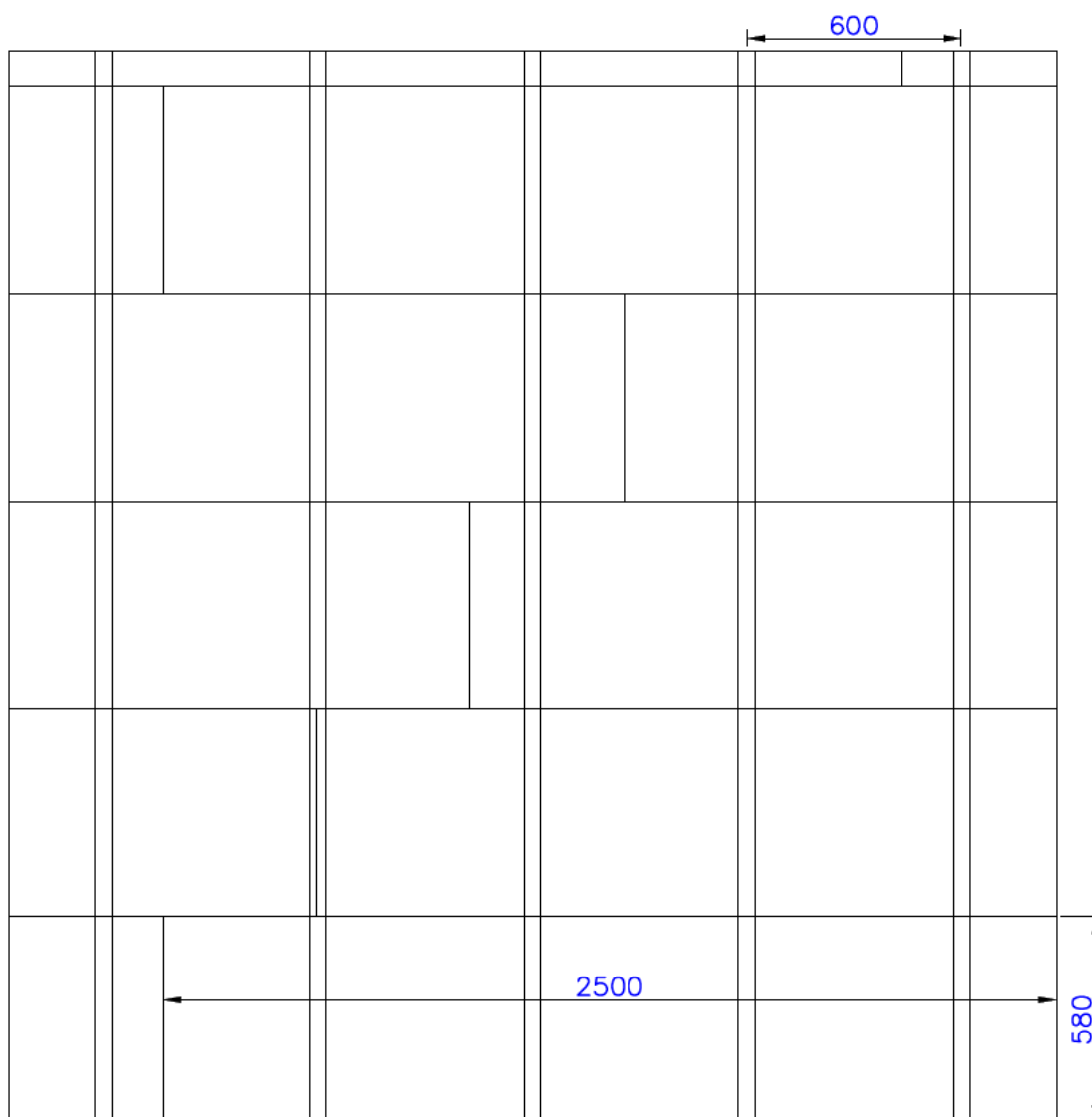
Danish Institute of Fire and security Technology

Sponsor: Wood:UpHigh
Subject: Loadbearing wall

File No.: PGA12210A
Test date: 30-11-2022
Enclosure: 1.1



Seen from unexposed side. Thermocouples placed at mid height of stud.
Studs and beams are 45 x 295 mm pine wood with strength class C24.
Placed with a c/c of 600 mm and fixed together with 2 pieces of 8.0 x 160 mm
paneltwisttec  screws in each end of the studs.



Seen from unexposed side.

A layer of woodfiber boards - [REDACTED], density of 220 kg/m³
battens of pine wood with dimensions 18 x 46 mm

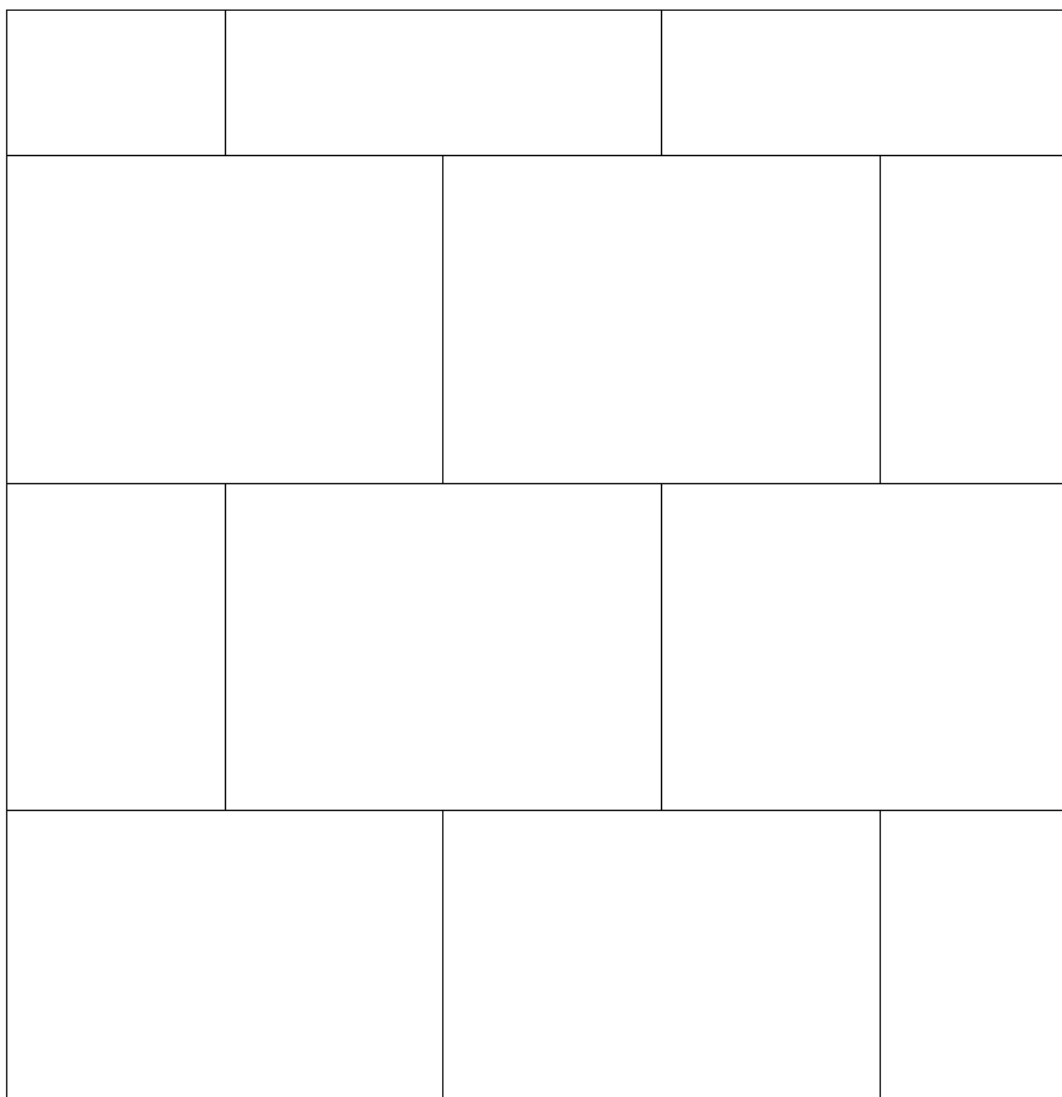


x	x
x	x

Seen from exposed side - inner layer

A layer of chipboards - [REDACTED], density of 650 kg/m³

Fixed with nails [REDACTED] with 3 nails in each stud for a full height board



Seen from exposed side - outer layer

A layer of [redacted] gypsum fiber boards - density of 1150 kg/m³

Fixed with staples [redacted] along the board edge and along the centerline of the board per 200 mm.

All measurements are in mm

Danish Institute of Fire and security Technology

Sponsor: Wood:UpHigh

Subject: Loadbearing wall

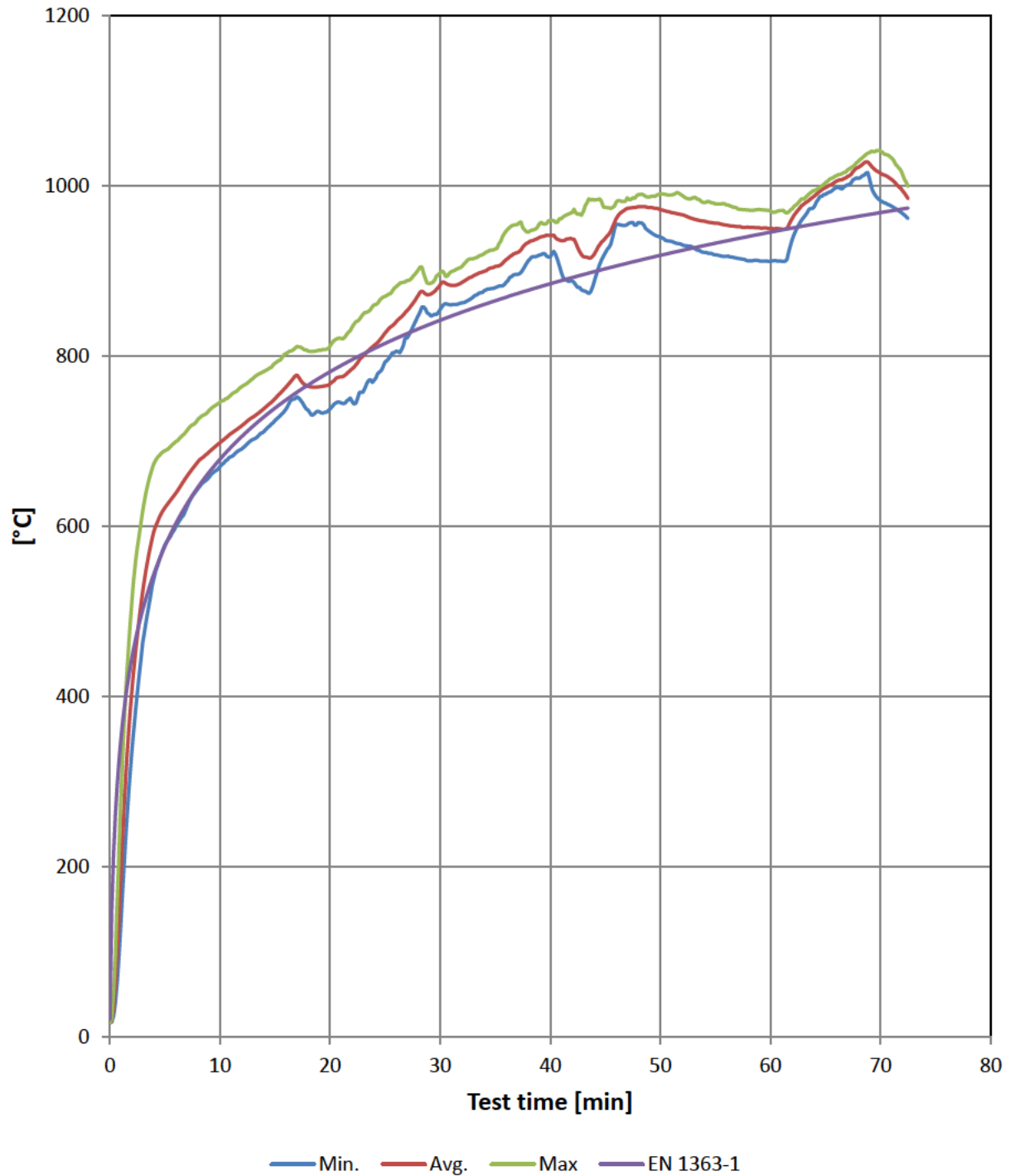
File No.: PGA12210A

Test date: 30-11-2022

Enclosure: 1.5

Furnace temperature

Furnace temperature



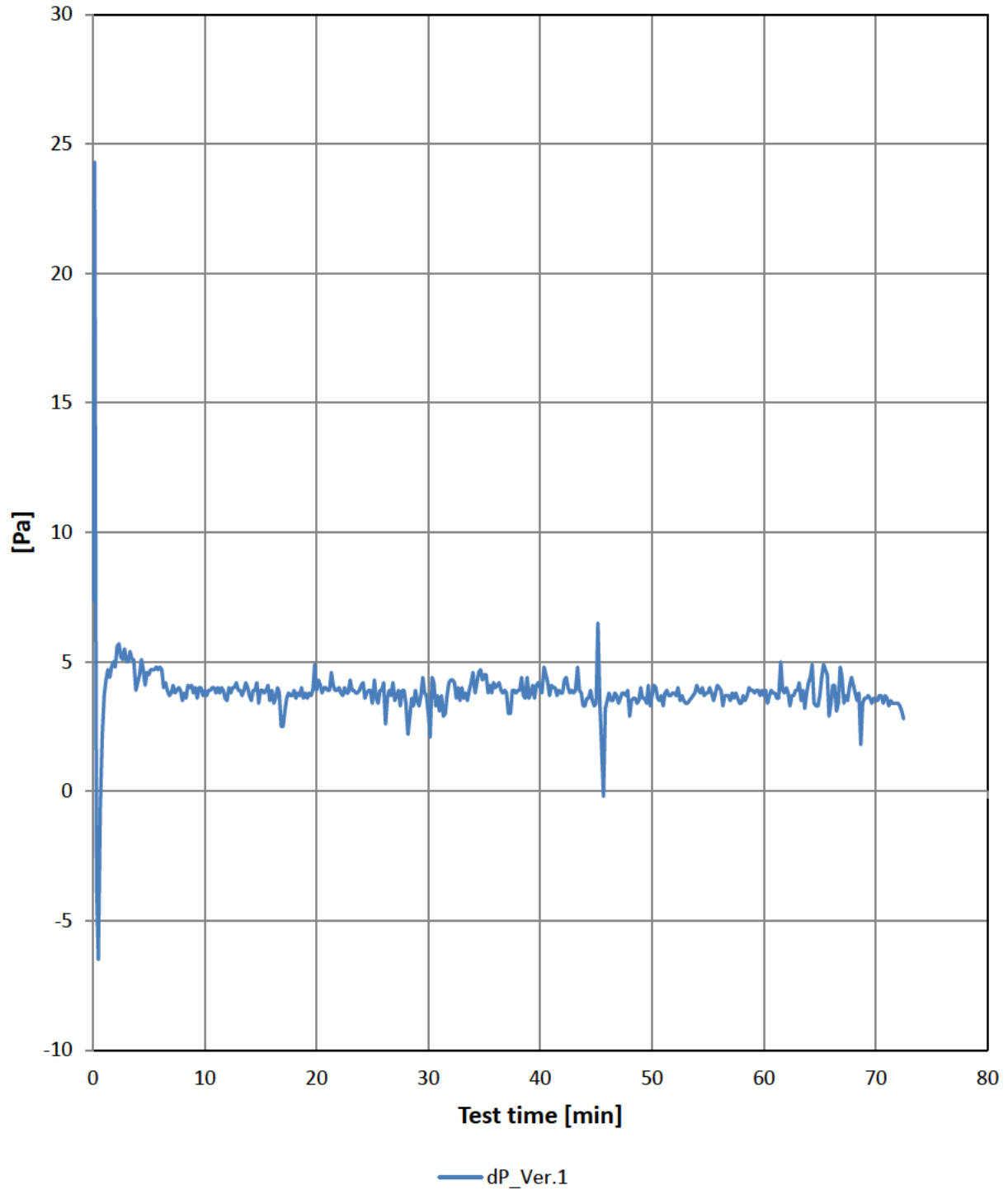
Furnace temperature

Furnace temperature

Time Minutes	Measured			Norm EN 1363-1	Area under curve		Dev. [%]	Limit [%]
	Minimum	Average	Maximum		Measured	EN 1363-1		
0	17	17	17	20	0	0	0.0	
3	463	525	619	502	857	1115	-23.2	
6	600	639	699	603	2658	2790	-4.7	15
9	657	687	736	663	4655	4695	-0.8	15
12	691	718	764	705	6764	6750	0.2	14
15	724	750	791	739	8964	8918	0.5	13
18	736	764	806	766	11261	11176	0.8	11
21	745	775	821	789	13562	13508	0.4	10
24	771	812	860	809	15939	15904	0.2	8
27	821	853	889	826	18438	18357	0.4	7
30	855	883	898	842	21049	20859	0.9	5
33	869	894	914	856	23708	23406	1.3	5
36	887	913	947	869	26415	25994	1.6	5
39	918	939	955	881	29196	28619	2.0	4
42	888	937	969	892	32013	31279	2.3	4
45	921	938	975	902	34786	33971	2.4	4
48	957	975	989	912	37677	36692	2.7	4
51	935	968	989	921	40596	39442	2.9	3
54	922	958	980	930	43486	42218	3.0	3
57	914	952	973	938	46351	45019	3.0	3
60	911	950	971	945	49203	47844	2.8	3
63	962	978	984	953	52075	50691	2.7	3
66	998	1005	1012	960	55053	53559	2.8	3
69	1008	1026	1039	966	58102	56448	2.9	3
72	967	994	1013	973	61134	59356	3.0	3

Vertical furnace pressure

The differential pressure in the furnace during the test, measured 1,16 m above notional floor level



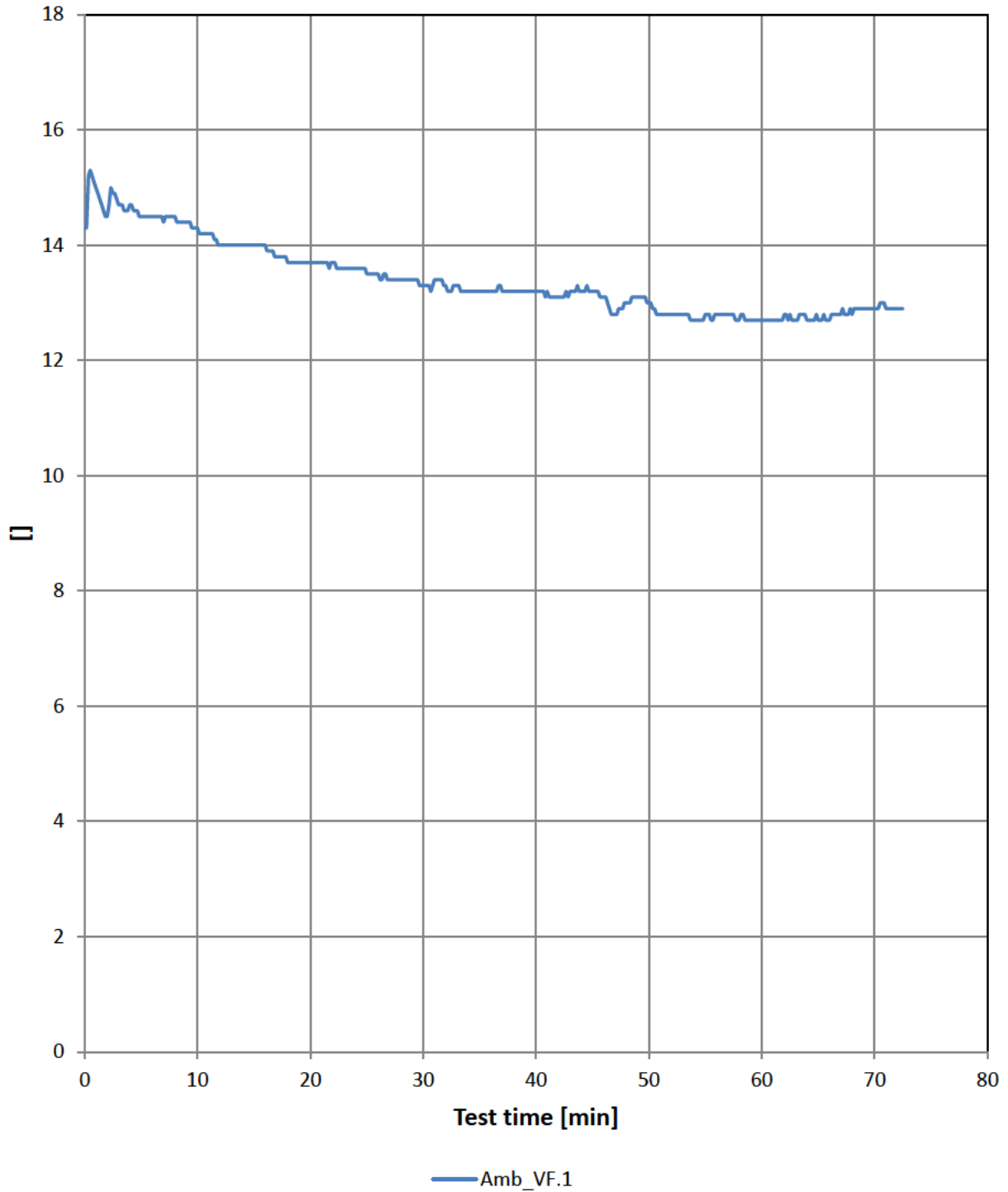
Vertical furnace pressure

The differential pressure in the furnace during the test, measured 1,16 m above notional floor level

Min. / Pa	dP_Ver.1
0	7.4
3	5.0
6	4.8
9	3.8
12	3.5
15	3.9
18	3.9
21	3.9
24	4.1
27	3.5
30	3.0
33	4.0
36	4.0
39	3.6
42	3.8
45	3.4
48	2.9
51	3.3
54	4.1
57	3.5
60	3.7
63	3.9
66	3.4
69	3.6
72	3.4

Ambient temperature

The ambient temperature in the laboratory during the test



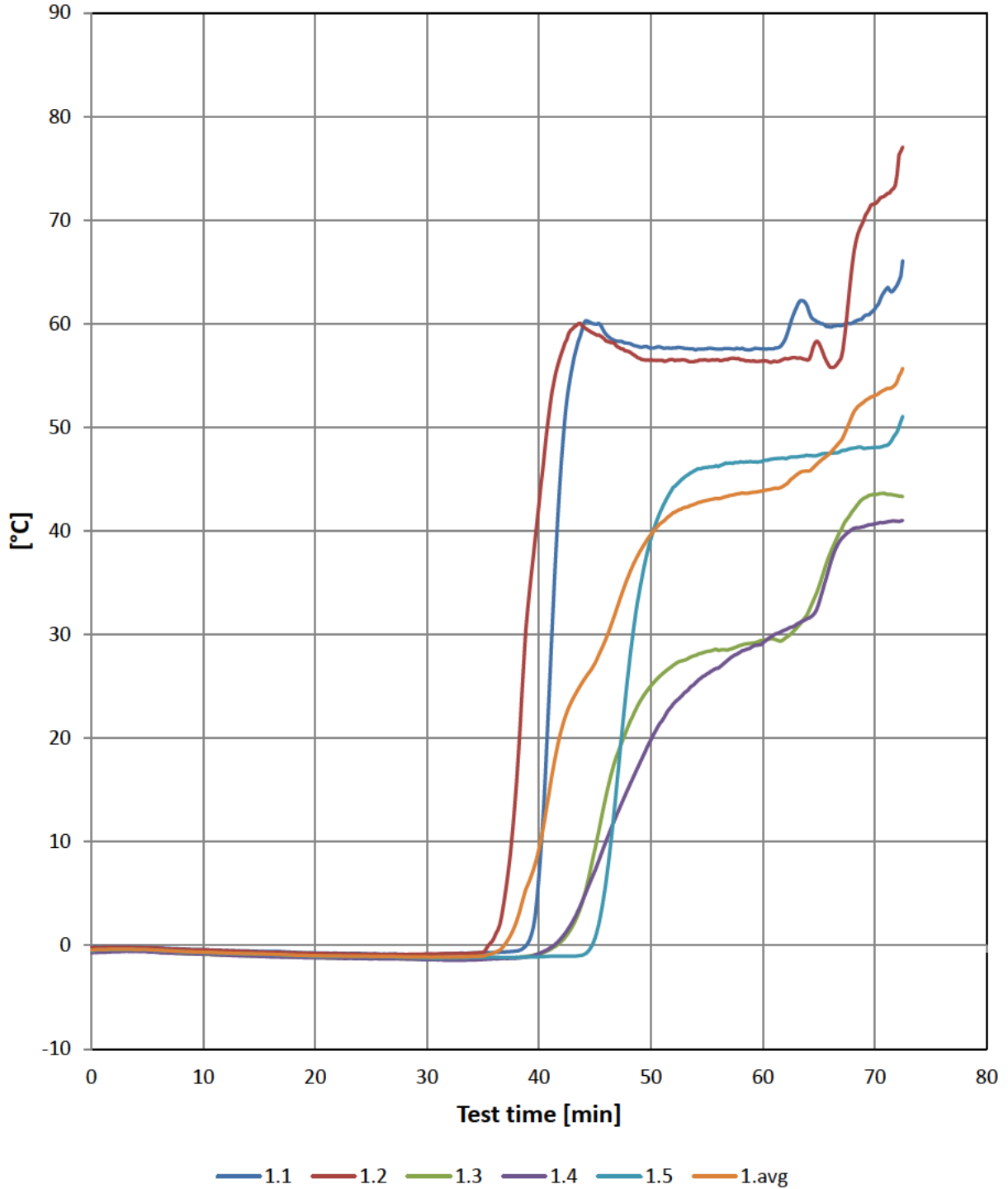
Ambient temperature

The ambient temperature in the laboratory during the test

Min. /	Amb VF.1
0	14.3
3	14.7
6	14.5
9	14.4
12	14.0
15	14.0
18	13.7
21	13.7
24	13.6
27	13.4
30	13.3
33	13.3
36	13.2
39	13.2
42	13.1
45	13.2
48	13.0
51	12.8
54	12.7
57	12.8
60	12.7
63	12.7
66	12.7
69	12.9
72	12.9

Average temperature rise

Measured with 5 thermocouples on the unexposed side



Average temperature rise

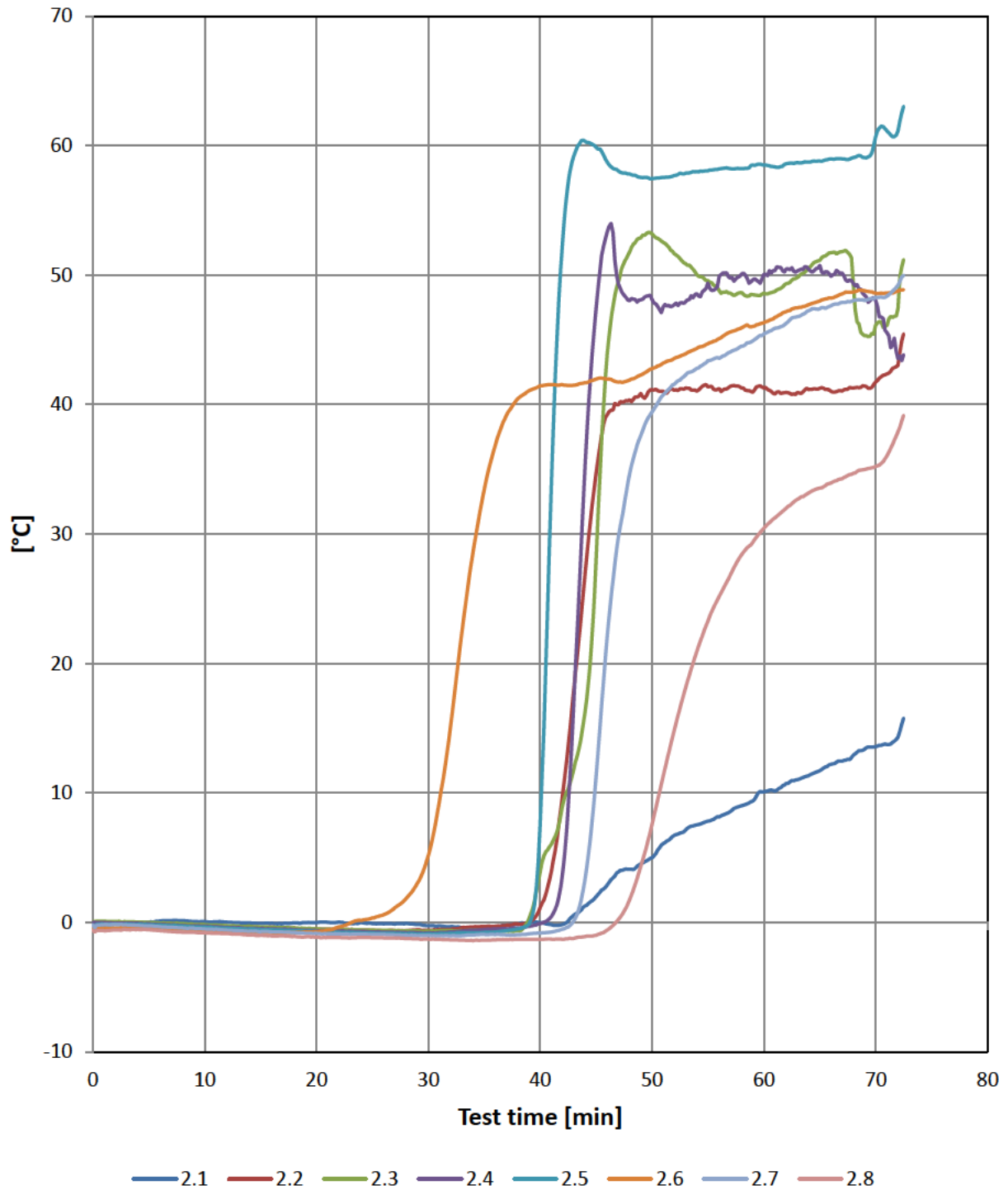
Measured with 5 thermocouples on the unexposed side

Min. / °C	1.1	1.2	1.3	1.4	1.5	1.Avg	1.Max
0	0	0	-1	-1	0	0	0
3	0	0	0	-1	0	0	0
6	0	0	-1	-1	0	0	0
9	0	0	-1	-1	-1	-1	0
12	0	-1	-1	-1	-1	-1	0
15	-1	-1	-1	-1	-1	-1	-1
18	-1	-1	-1	-1	-1	-1	-1
21	-1	-1	-1	-1	-1	-1	-1
24	-1	-1	-1	-1	-1	-1	-1
27	-1	-1	-1	-1	-1	-1	-1
30	-1	-1	-1	-1	-1	-1	-1
33	-1	-1	-1	-1	-1	-1	-1
36	-1	1	-1	-1	-1	-1	1
39	0	33	-1	-1	-1	6	33
42	47	57	0	1	-1	21	57
45	60	59	9	7	1	27	60
48	58	57	21	15	27	36	58
51	58	56	26	22	42	41	58
54	57	56	28	25	46	43	57
57	58	57	29	28	47	43	58
60	58	56	29	29	47	44	58
63	62	57	31	31	47	45	62
66	60	56	38	37	48	48	60
69	61	70	43	40	48	52	70
72	64	74	43	41	50	54	74

Failure [min]	-	-	-	-	-	-	-
Failure °C	180	180	180	180	180	140	180

Maximum temperature rise

Maximum temperatures on the unexposed side



Maximum temperature rise

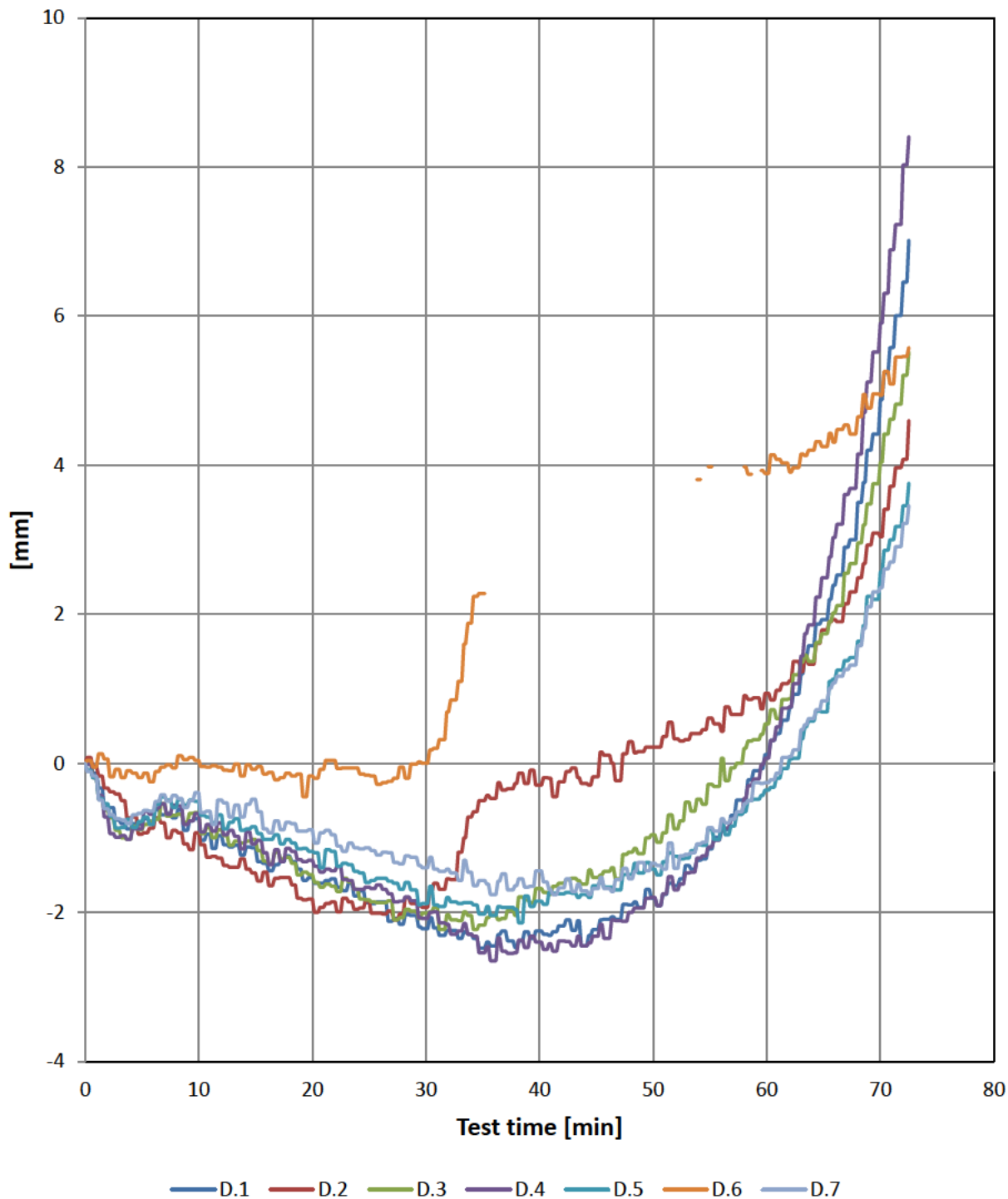
Maximum temperatures on the unexposed side

Min. / °C	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.Max
0	0	0	0	0	0	0	0	-1	0
3	0	0	0	0	0	0	0	-1	0
6	0	0	0	0	0	0	0	-1	0
9	0	0	0	0	0	-1	0	-1	0
12	0	0	0	0	0	-1	-1	-1	0
15	0	0	0	0	-1	-1	-1	-1	0
18	0	0	0	-1	-1	-1	-1	-1	0
21	0	-1	-1	-1	-1	-1	-1	-1	0
24	0	-1	-1	-1	-1	0	-1	-1	0
27	0	-1	-1	-1	-1	1	-1	-1	1
30	0	-1	-1	-1	-1	5	-1	-1	5
33	0	0	-1	-1	-1	22	-1	-1	22
36	0	0	-1	-1	-1	37	-1	-1	37
39	0	0	0	0	0	41	-1	-1	41
42	0	10	9	4	53	42	-1	-1	53
45	2	35	28	47	60	42	11	-1	60
48	4	40	52	48	58	42	35	2	58
51	6	41	53	48	58	43	41	11	58
54	8	41	50	49	58	44	43	21	58
57	9	41	49	50	58	46	44	27	58
60	10	41	49	50	58	46	45	30	58
63	11	41	50	50	59	47	47	33	59
66	12	41	52	50	59	48	48	34	59
69	13	41	45	48	59	49	48	35	59
72	14	43	47	44	61	49	49	38	61

Failure [min]	-	-	-	-	-	-	-	-	-
Failure °C	180	180	180	180	180	180	180	180	180

Horizontal deformation

Negative values indicate movement towards the furnace



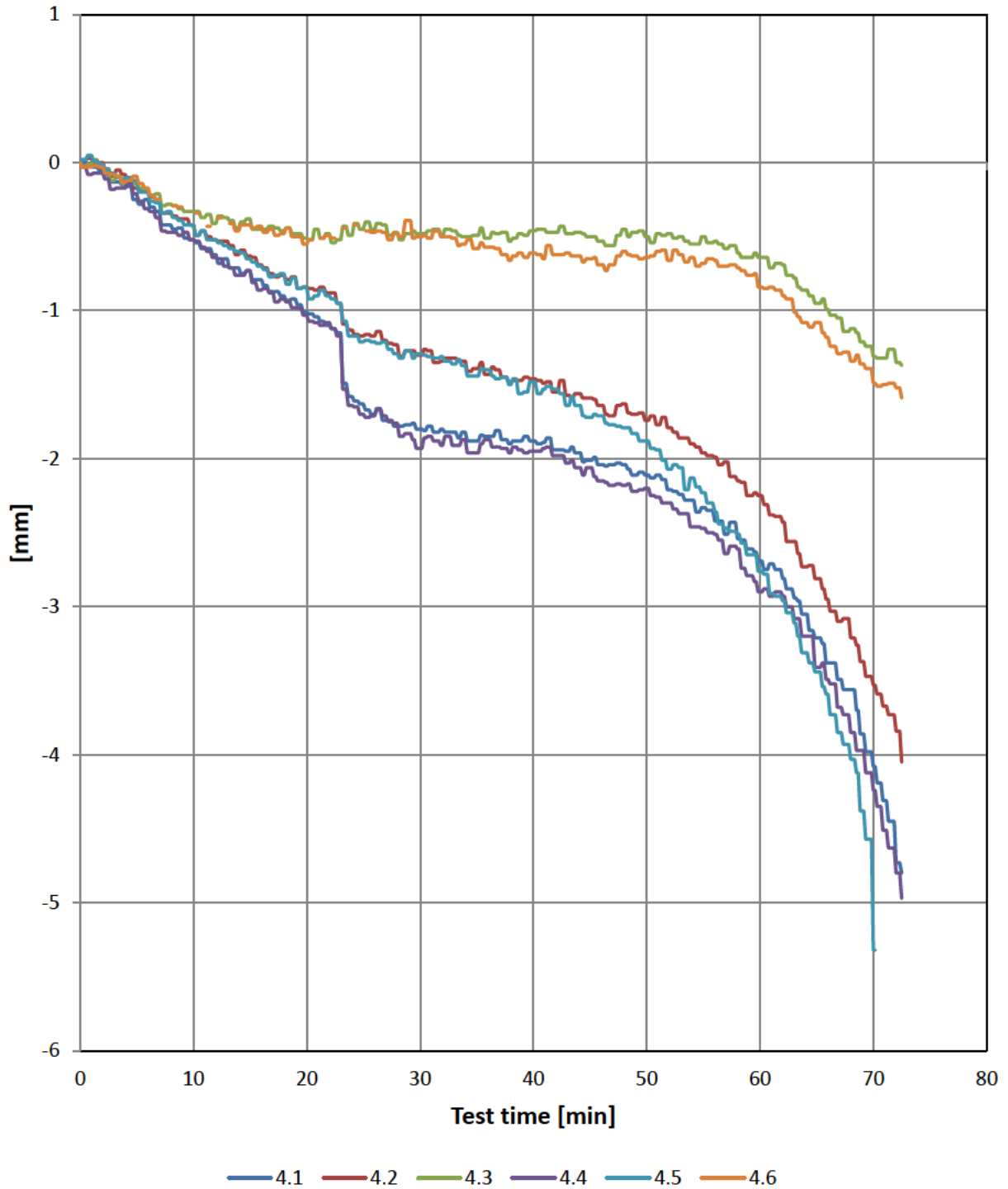
Horizontal deformation

Negative values indicate movement towards the furnace

Min. / mm	D.1	D.2	D.3	D.4	D.5	D.6	D.7
0	-0.1	0.1	-0.3	0.0	-0.1	0.0	-0.5
3	-0.2	-0.1	-0.3	0.0	-0.2	0.0	-0.1
6	0.1	0.2	0.1	0.0	0.2	0.0	0.1
9	-0.2	-0.2	0.0	-0.2	0.0	0.0	0.0
12	0.1	-0.1	0.0	-0.1	-0.1	-0.1	0.3
15	-0.2	-0.2	-0.1	-0.1	-0.1	0.0	-0.1
18	0.0	-0.1	-0.1	0.1	0.0	0.0	0.1
21	0.0	0.1	0.0	0.0	0.0	0.2	0.2
24	-0.1	-0.1	-0.2	-0.1	-0.1	-0.1	-0.1
27	-0.2	-0.1	-0.2	-0.2	-0.1	0.1	-0.1
30	0.1	0.2	0.1	0.1	0.3	0.2	0.1
33	0.0	0.6	0.1	0.1	0.0	0.8	0.2
36	0.1	0.2	0.0	0.1	0.0	0.0	0.0
39	0.0	0.0	-0.1	0.0	0.2	0.0	-0.1
42	0.2	0.3	0.1	0.1	0.0	0.0	0.2
45	0.2	0.4	-0.1	0.3	0.2	0.0	0.2
48	0.0	0.0	0.1	0.2	0.2	0.0	0.0
51	0.3	0.3	0.4	0.4	0.3	0.0	0.3
54	0.1	0.0	0.1	0.2	0.1	0.0	0.1
57	0.4	-0.1	0.2	0.2	0.3	0.0	0.2
60	0.4	0.1	0.3	0.3	0.1	0.2	0.1
63	0.5	0.1	0.3	0.7	0.4	0.2	0.3
66	0.3	0.0	0.2	0.4	0.2	0.0	0.2
69	0.7	0.4	0.6	0.8	0.4	0.0	0.5
72	1.0	0.6	0.7	1.2	0.6	0.1	0.6

Vertical deformation

Negative values indicate downwards movement



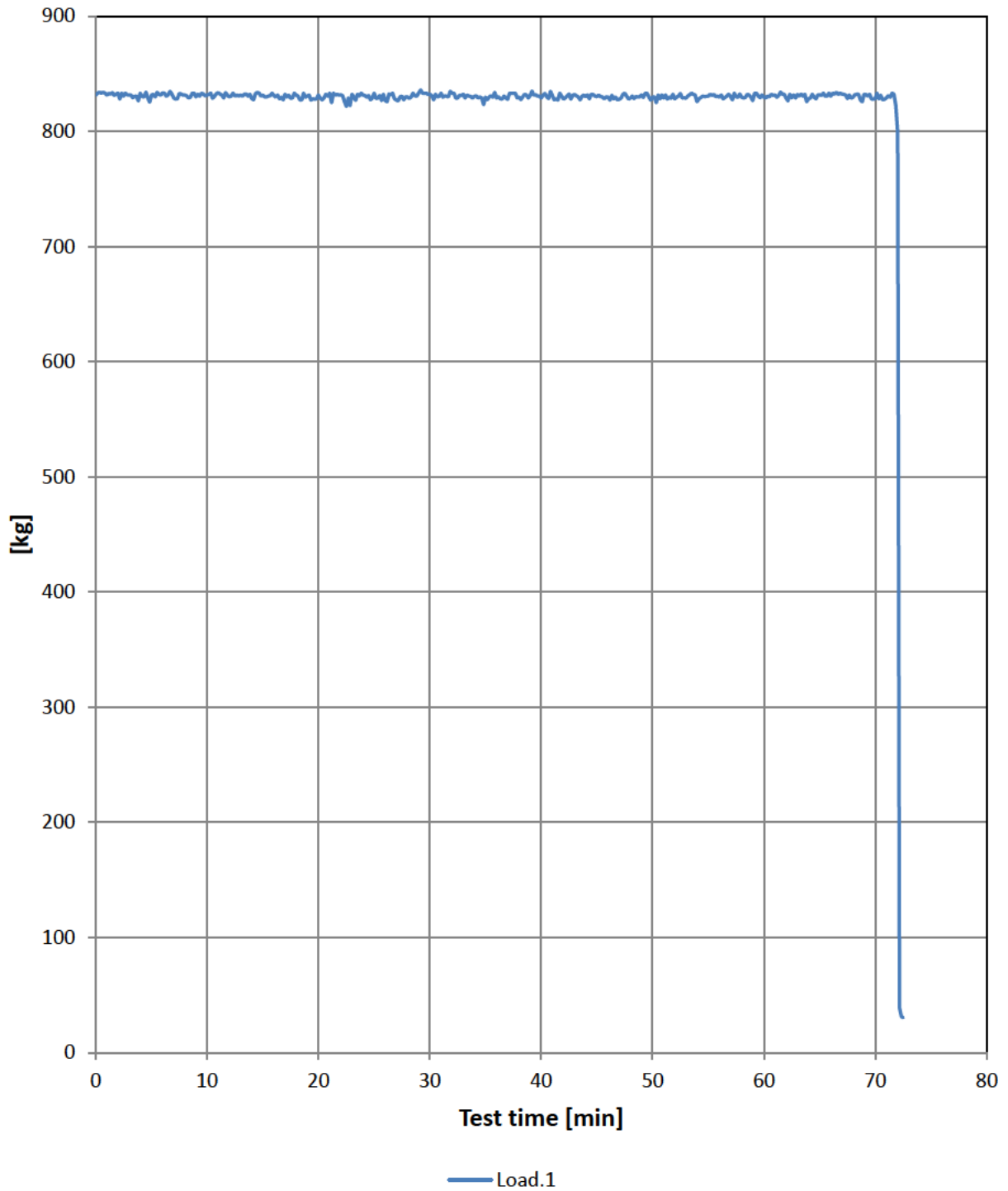
Vertical deformation

Negative values indicate downwards movement

Min. / mm	4.1	4.2	4.3	4.4	4.5	4.6
0	0.0	0.0	0.0	0.0	0.0	0.0
3	-0.1	-0.1	-0.1	-0.2	-0.1	-0.1
6	-0.3	-0.2	-0.2	-0.3	-0.2	-0.2
9	-0.4	-0.4	-0.3	-0.5	-0.4	-0.3
12	-0.6	-0.5	-0.4	-0.6	-0.5	0.0
15	-0.7	-0.6	-0.4	-0.7	-0.7	-0.4
18	-0.9	-0.8	-0.5	-0.9	-0.8	-0.5
21	-1.0	-0.9	-0.5	-1.1	-0.9	0.0
24	-1.6	-1.1	-0.5	-1.6	-1.2	0.0
27	-1.7	-1.2	-0.4	-1.7	-1.2	-0.5
30	-1.8	-1.3	-0.5	-1.9	-1.3	-0.5
33	-1.8	-1.3	-0.5	-1.9	-1.4	-0.5
36	-1.9	-1.4	-0.5	-1.9	-1.4	-0.6
39	-1.9	-1.5	-0.5	-1.9	-1.6	-0.6
42	-1.9	-1.6	-0.5	-2.0	-1.5	-0.6
45	-2.0	-1.6	-0.5	-2.1	-1.7	-0.7
48	-2.0	-1.6	-0.5	-2.2	-1.8	-0.6
51	-2.1	-1.8	-0.5	-2.3	-1.9	-0.6
54	-2.3	-1.9	-0.6	-2.5	-2.1	-0.6
57	-2.5	-2.0	-0.6	-2.6	-2.5	-0.7
60	-2.7	-2.3	-0.6	-2.9	-2.8	-0.8
63	-2.9	-2.6	-0.8	-3.1	-3.1	-1.0
66	-3.4	-3.0	-1.0	-3.5	-3.6	-1.2
69	-3.9	-3.4	-1.2	-4.0	-4.4	-1.4
72	-4.7	-3.8	-1.4	-4.8	0.0	-1.5

Load per cylinder

Load per cylinder during test



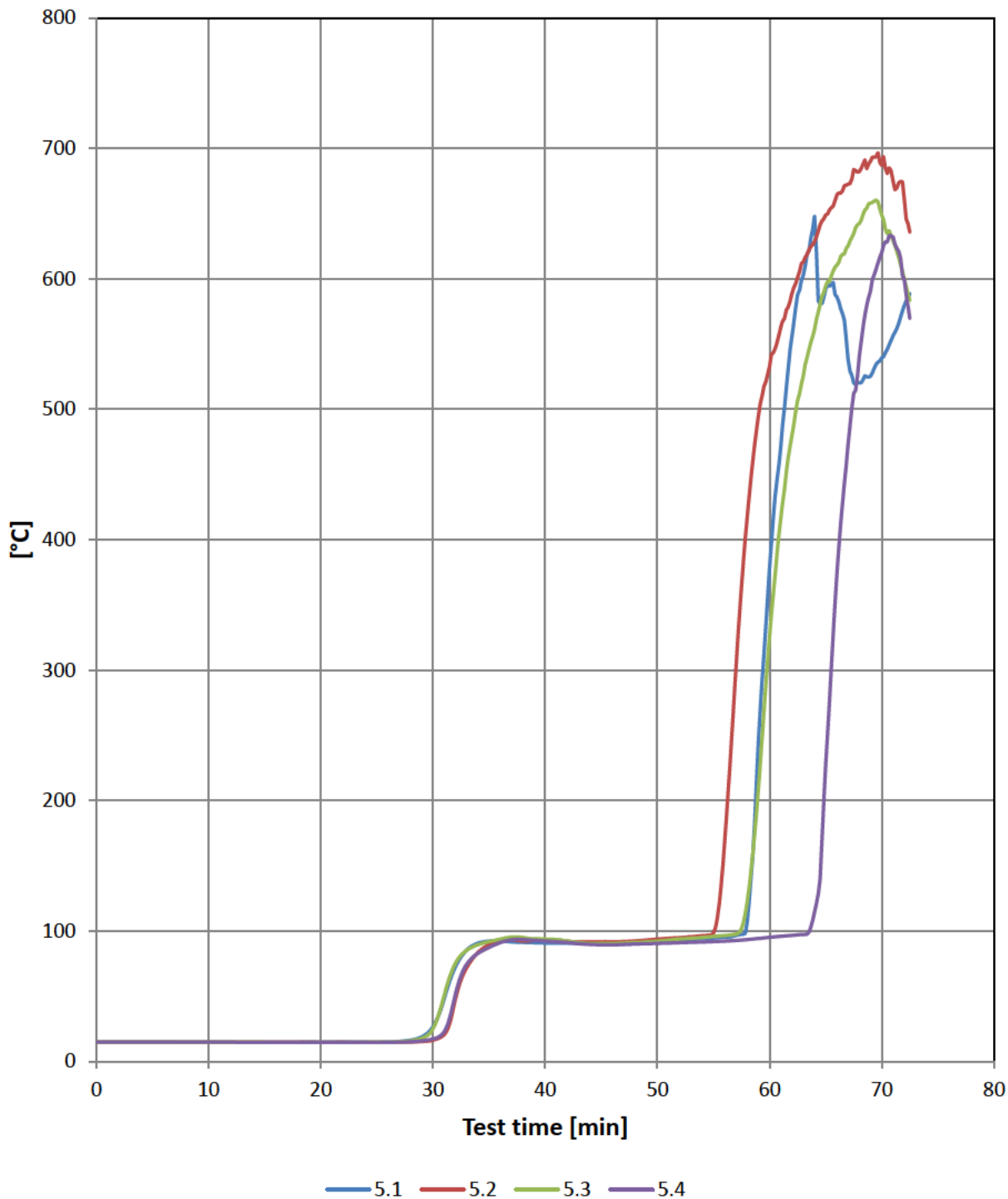
Load per cylinder

Load per cylinder during test

Min. / kg	Load.1
0	832
3	832
6	833
9	830
12	830
15	832
18	832
21	833
24	832
27	827
30	832
33	832
36	829
39	831
42	828
45	830
48	829
51	829
54	826
57	830
60	830
63	832
66	831
69	832
72	799

Internal temperature - Center of studs

1 and 2 on second stud, 3 and 4 on center stud seen from unexposed side



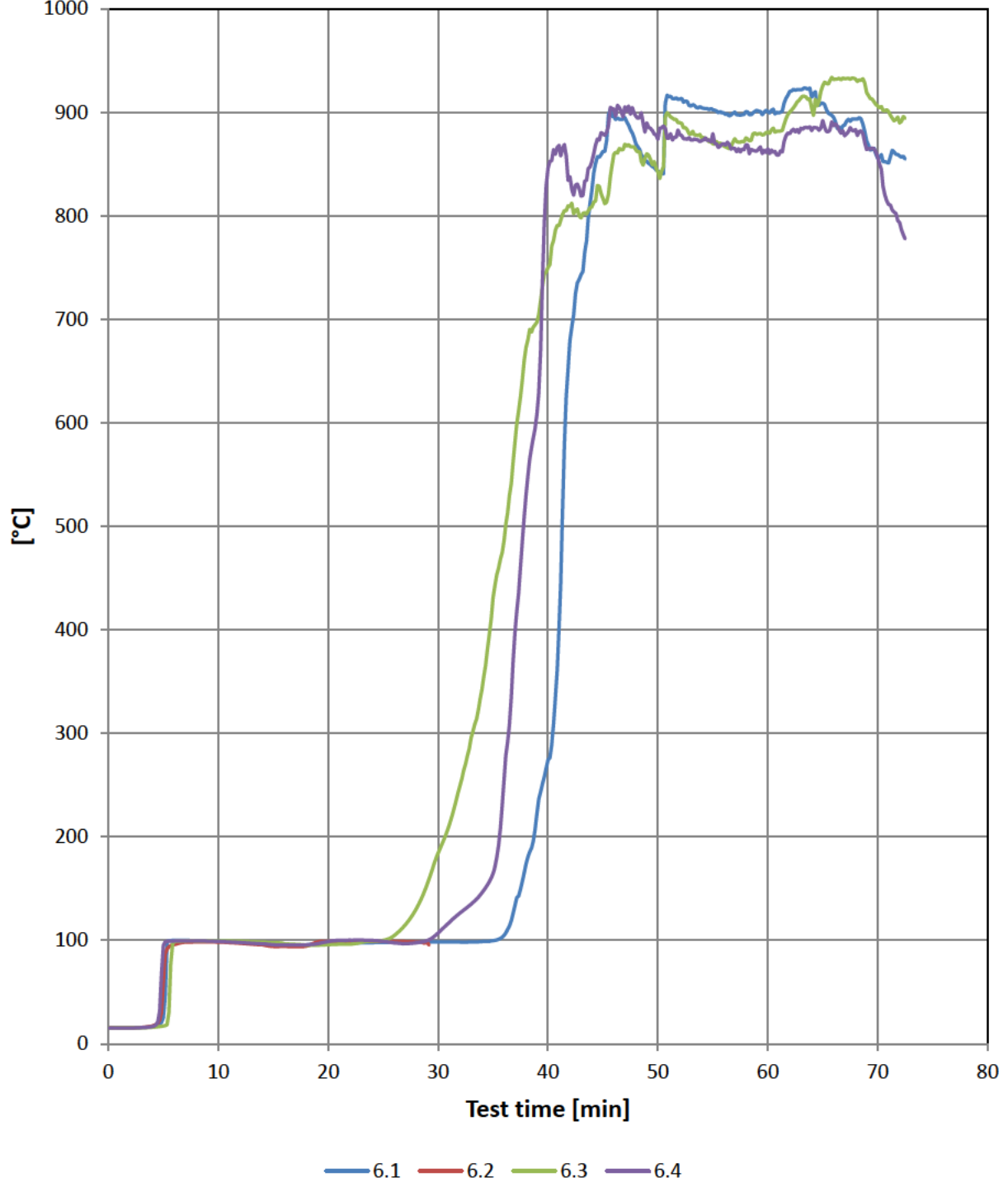
Internal temperature - Center of studs

1 and 2 on second stud, 3 and 4 on center stud seen from unexposed side

Min. / °C	5.1	5.2	5.3	5.4
0	15	15	15	15
3	15	15	15	15
6	15	15	15	15
9	15	15	15	15
12	15	15	15	15
15	15	15	15	15
18	15	15	15	15
21	15	15	15	15
24	15	15	15	15
27	15	15	15	15
30	27	16	25	17
33	85	72	85	75
36	92	93	94	91
39	91	93	94	93
42	91	92	92	91
45	90	92	90	89
48	90	92	91	90
51	92	94	93	91
54	94	96	95	92
57	97	302	98	93
60	379	533	326	95
63	603	613	526	97
66	586	665	611	375
69	525	690	658	591
72	580	661	601	599

Internal temperature - between studs and chipboard

1 and 3 on second stud at height 1230 mm, 2 and 4 on center stud at height 2460 mm seen from unexposed side



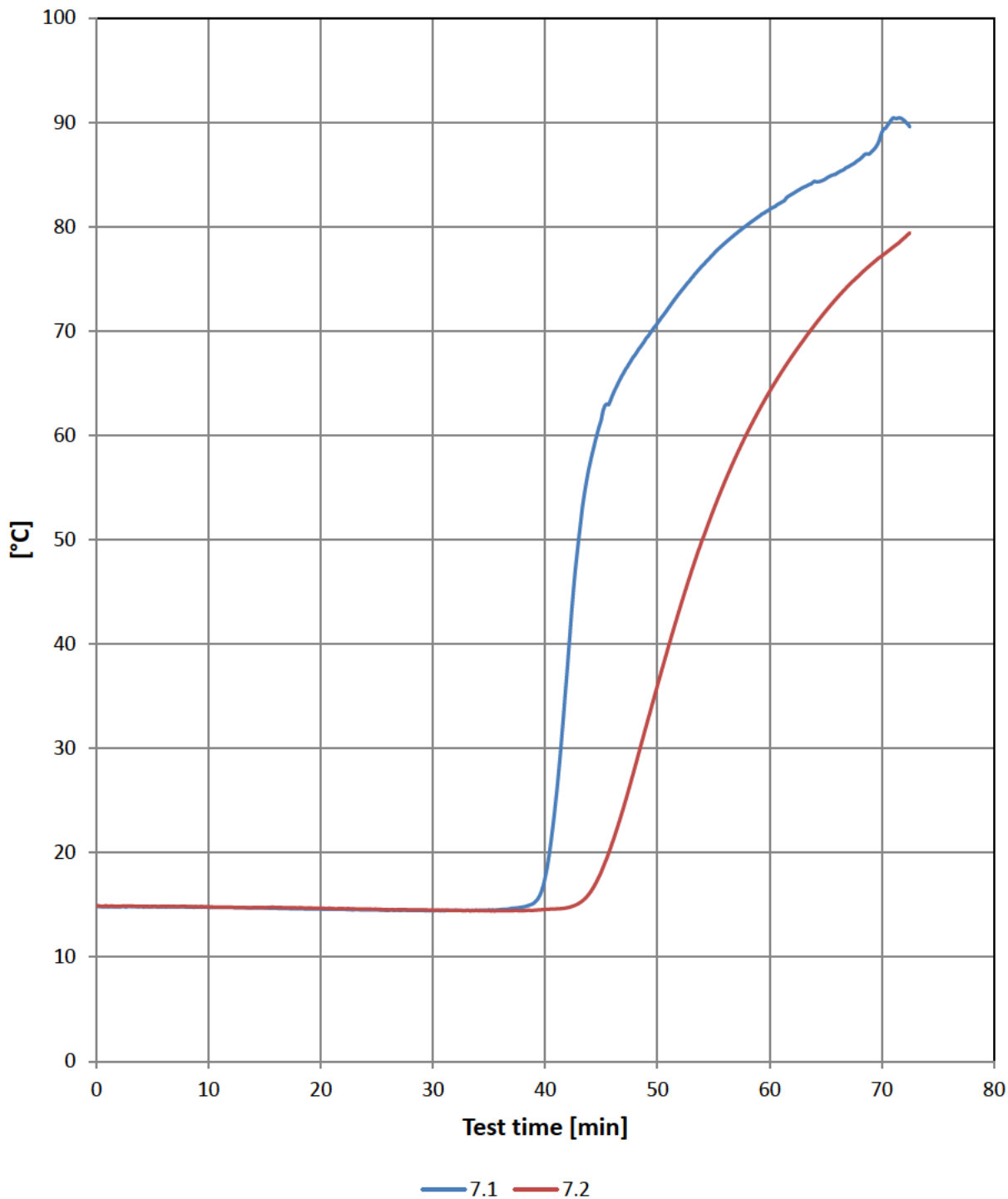
Internal temperature - between studs and chipboard

1 and 3 on second stud at height 1230 mm, 2 and 4 on center stud at height 2460 mm seen from unexposed side

Min. / °C	6.1	6.2	6.3	6.4
0	16	16	16	15
3	16	16	16	16
6	100	96	99	100
9	100	99	100	100
12	98	97	99	98
15	96	94	98	96
18	96	95	96	96
21	98	99	96	100
24	98	99	99	100
27	98	99	115	97
30	98	0	184	107
33	98	0	296	135
36	105	0	487	256
39	222	0	697	608
42	680	0	809	838
45	862	0	817	879
48	870	0	864	896
51	915	0	898	875
54	905	0	875	873
57	900	0	875	865
60	901	0	881	865
63	922	0	914	885
66	895	0	932	887
69	873	0	919	864
72	858	0	890	793

Internal temperature - between studs and wood fiber board

mid height of studs. 1 on 2nd stud from the right and 2 on center stud seen from unexposed side



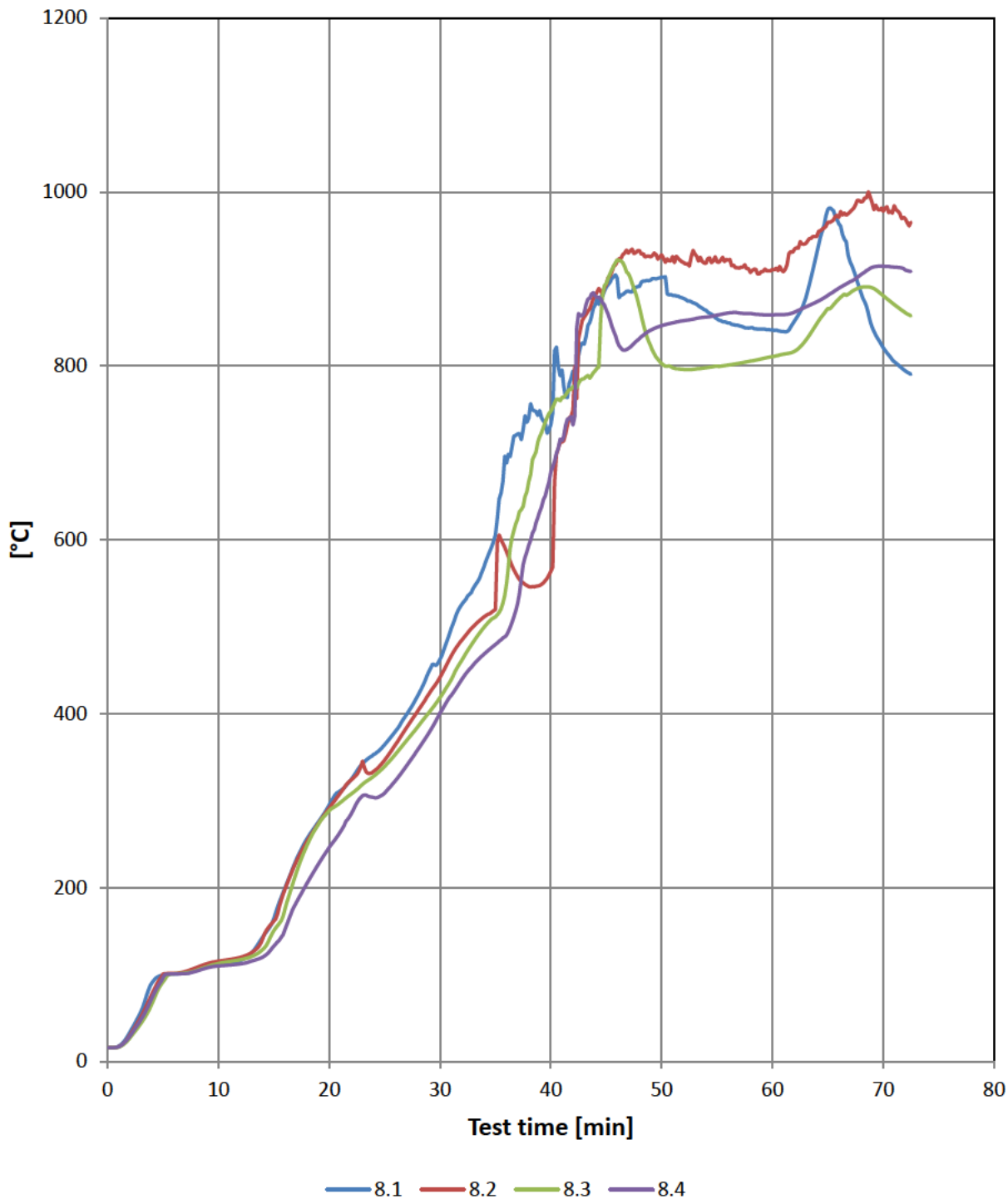
Internal temperature - between studs and wood fiber board

mid height of studs. 1 on 2nd stud from the right and 2 on center stud seen from unexposed side

Min. / °C	7.1	7.2
0	15	15
3	15	15
6	15	15
9	15	15
12	15	15
15	15	15
18	15	15
21	15	15
24	15	15
27	14	15
30	14	15
33	14	14
36	15	14
39	15	14
42	38	15
45	61	18
48	68	28
51	72	40
54	76	50
57	79	58
60	82	64
63	84	69
66	85	73
69	87	76
72	90	79

Internal temperature - Between chipboard and fiber gypsum

placed in 1/4 points between chipboard and fiber gypsum

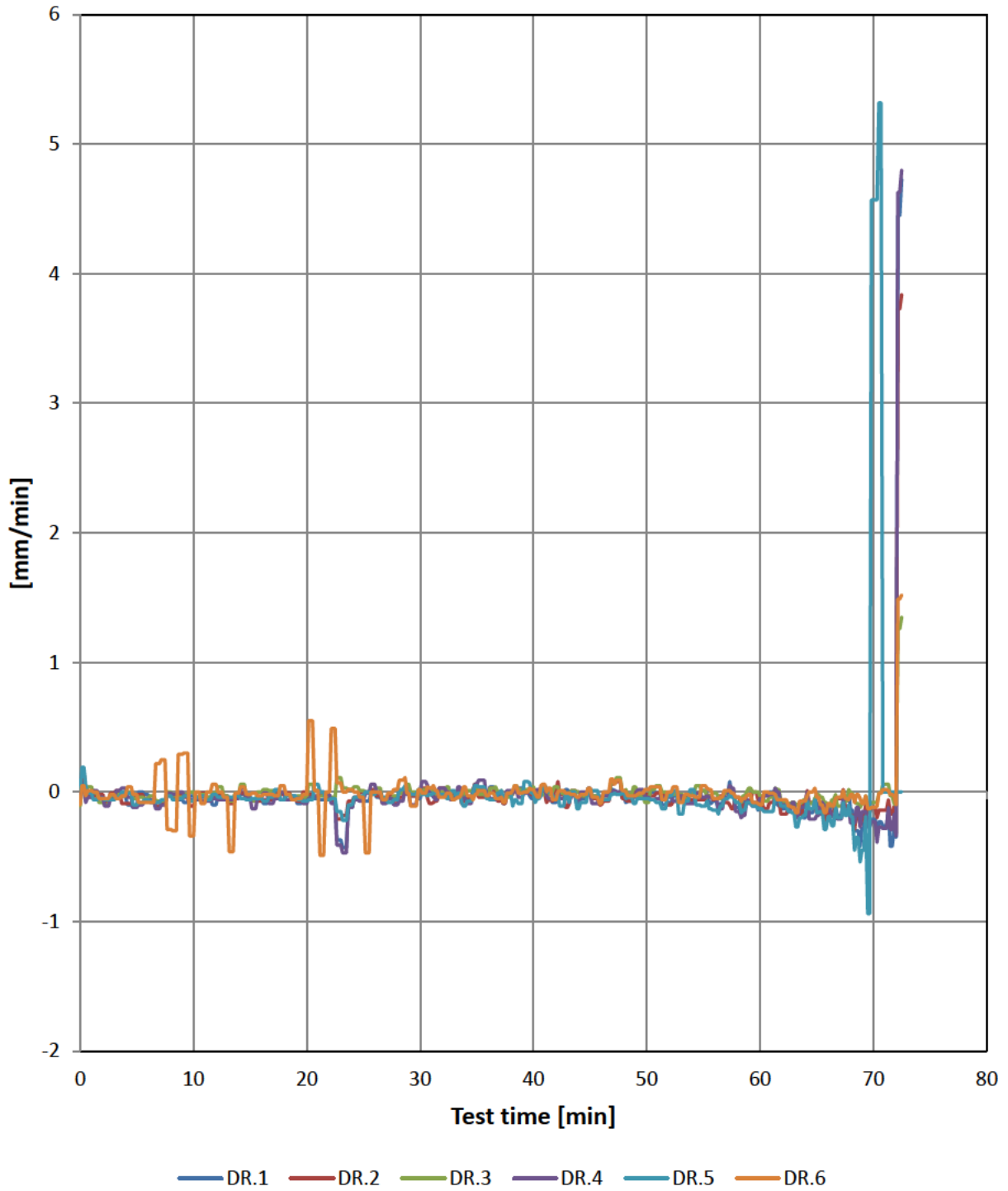


Internal temperature - Between chipboard and fiber gypsum

placed in 1/4 points between chipboard and fiber gypsum

Min. / °C	8.1	8.2	8.3	8.4
0	16	16	16	16
3	57	52	44	48
6	101	101	101	101
9	109	113	109	108
12	116	120	117	112
15	164	161	150	133
18	256	253	249	205
21	311	309	298	264
24	353	333	328	304
27	399	384	369	340
30	463	442	418	401
33	544	500	483	456
36	688	586	550	491
39	748	548	719	632
42	794	749	776	732
45	891	893	895	864
48	891	933	866	832
51	881	926	798	850
54	864	918	798	856
57	846	912	803	861
60	842	911	811	859
63	878	941	829	868
66	964	971	877	889
69	845	988	890	913
72	794	969	861	910

Deflection rate



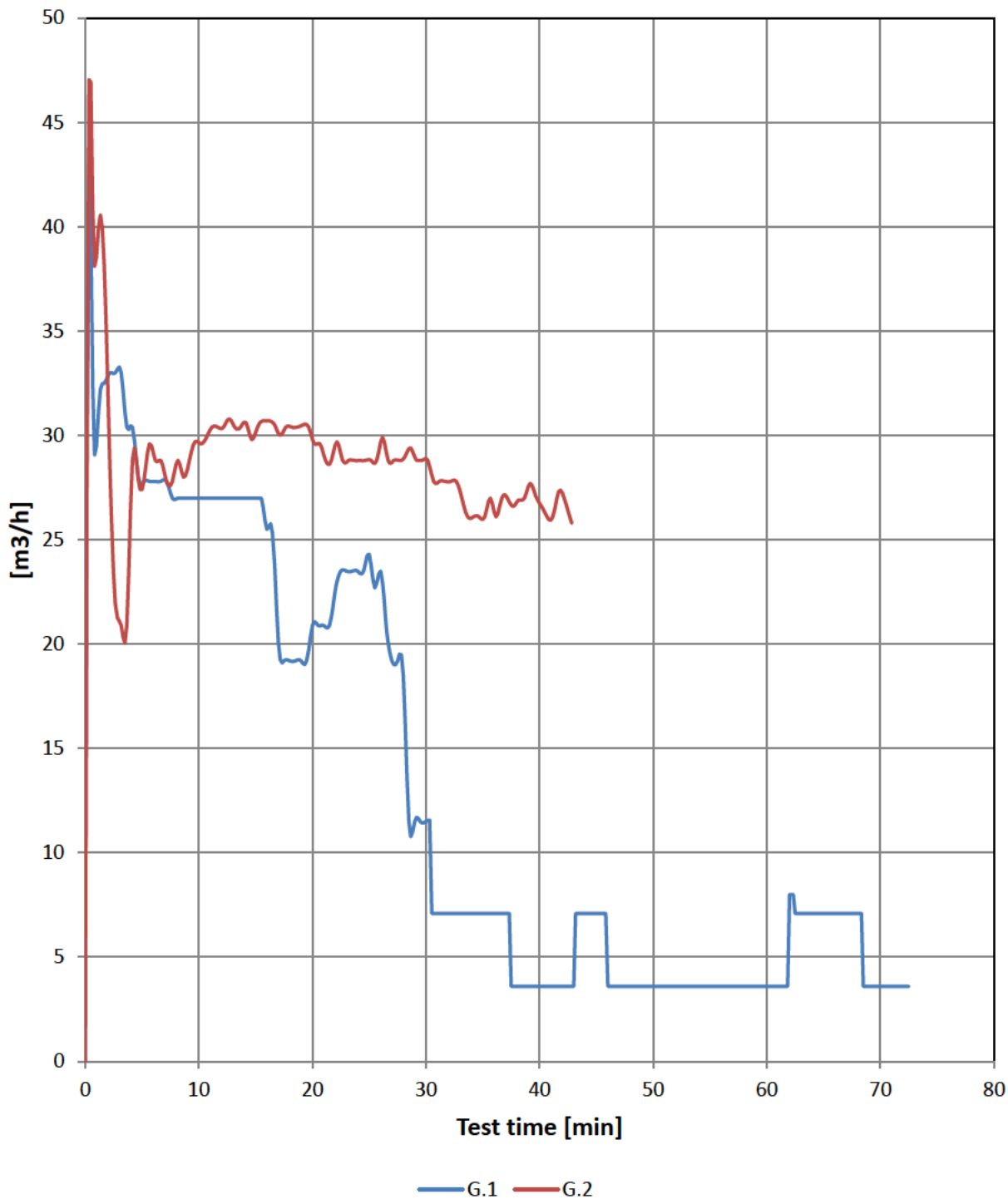
Deflection rate

Min. / mm/min	DR.1	DR.2	DR.3	DR.4	DR.5	DR.6	DR.Max
0	0.0	0.0	-0.1	0.0	0.0	-0.1	0.0
3	-0.1	0.0	0.0	-0.1	-0.1	0.0	0.0
6	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	0.0
9	-0.1	0.0	0.0	0.0	-0.1	0.3	0.0
12	-0.1	0.0	0.0	-0.1	0.0	0.1	0.0
15	0.0	-0.1	-0.1	-0.1	-0.1	0.0	0.0
18	-0.1	0.0	0.0	0.0	-0.1	0.0	0.0
21	0.0	0.0	0.0	0.0	0.1	0.0	0.0
24	-0.1	-0.1	0.0	-0.1	-0.1	0.0	0.0
27	-0.1	-0.1	-0.1	-0.1	0.0	-0.1	0.0
30	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	-0.1	0.0	-0.1	0.0
36	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
42	-0.1	0.0	0.0	-0.1	-0.1	-0.1	0.0
45	0.0	0.0	0.0	0.0	0.0	0.0	0.0
48	0.0	0.0	0.0	0.0	0.0	0.0	0.0
51	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
54	-0.1	-0.1	0.0	-0.1	0.0	0.0	0.0
57	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
60	-0.1	-0.1	0.0	0.0	-0.1	-0.1	0.0
63	-0.1	-0.1	-0.1	-0.1	-0.2	-0.1	0.0
66	-0.1	-0.2	-0.1	-0.1	-0.2	-0.1	0.0
70	-0.2	-0.1	-0.1	-0.2	4.6	-0.1	0.0
73	4.7	3.8	1.4	4.8	0.0	1.5	0.0

Failure [min]	-	-	-	-	-	-	-
Failuremm/mi	9	9	9	9	9	9	9

gas use

Gas use during test. G.1 is for the Wood:UpHigh test and G.2 is for a non-combustible construction



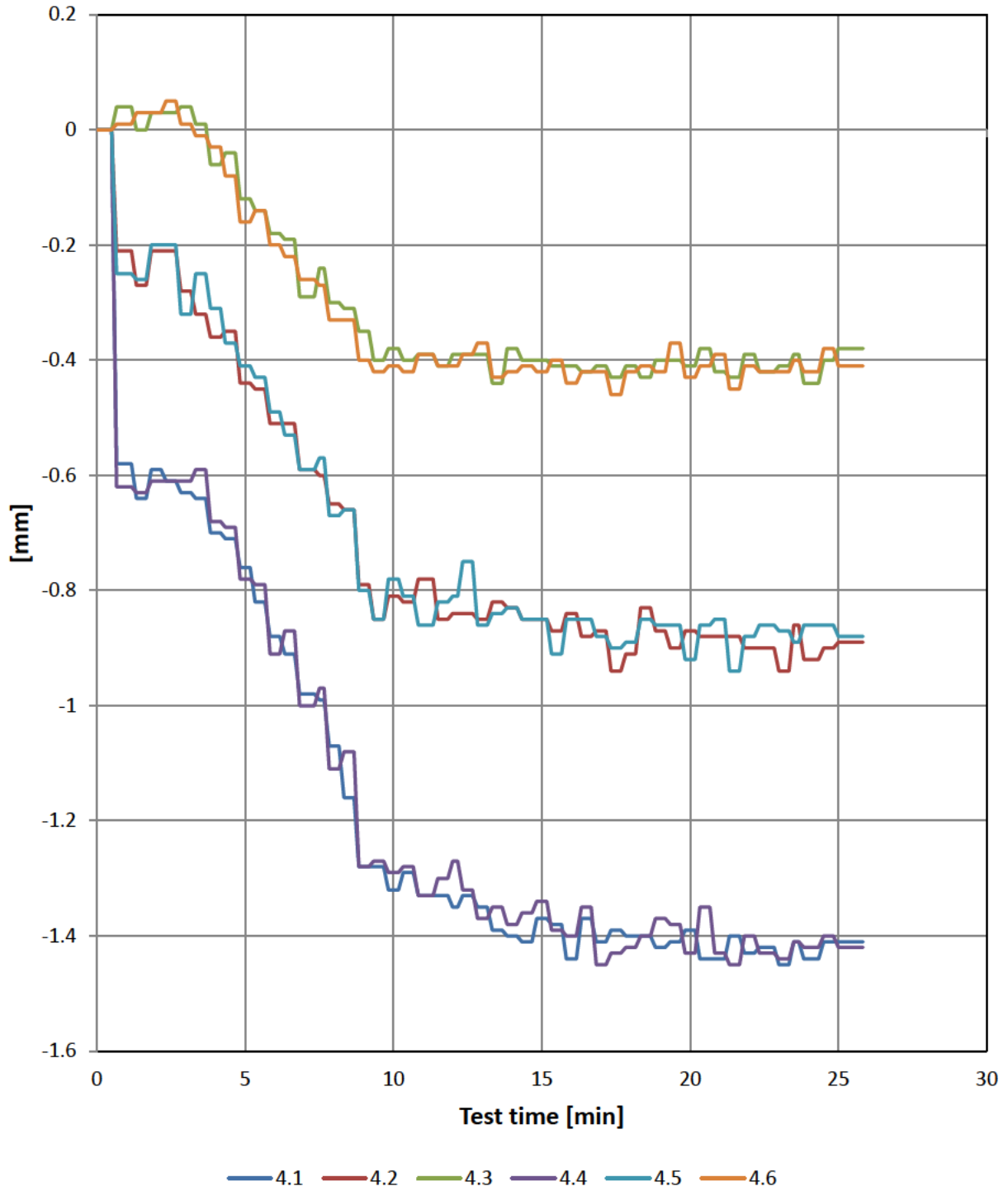
gas use

Gas use during test. G.1 is for the Wood:UpHigh test and G.2 is for a non-combustible construction

Min. / m3/h	G.1	G.2
0	0	0
3	33	21
6	28	29
9	27	28
12	27	30
15	27	30
18	19	30
21	21	29
24	24	29
27	19	29
30	12	29
33	7	27
36	7	26
39	4	28
42	4	27
45	7	
48	4	
51	4	
54	4	
57	4	
60	4	
63	7	
66	7	
69	4	
72	4	

Vertical deformation during loading phase

Negative values indicate downwards movement



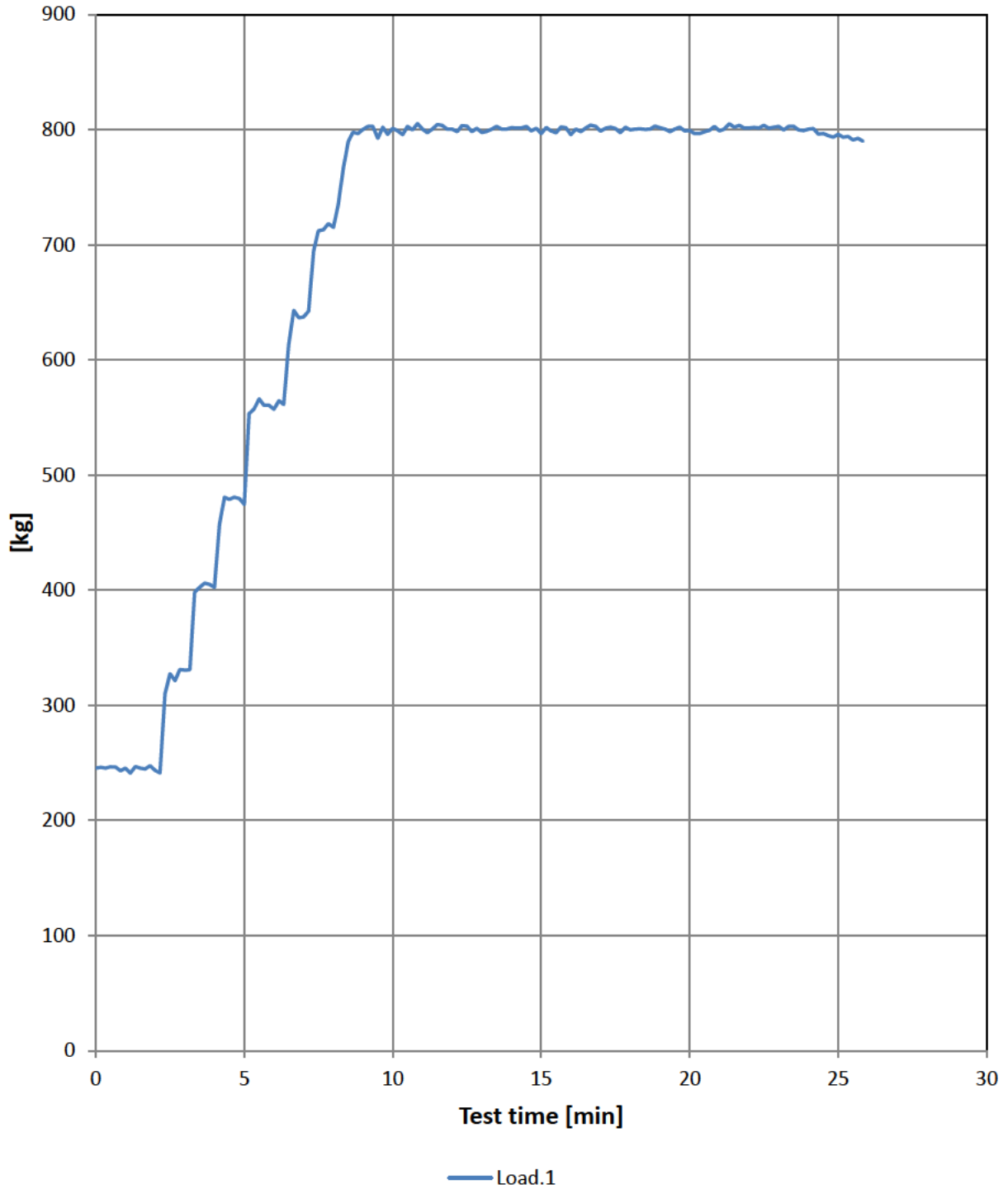
Vertical deformation during loading phase

Negative values indicate downwards movement

Min. / mm	4.1	4.2	4.3	4.4	4.5	4.6
0	0.0	0.0	0.0	0.0	0.0	0.0
1	-0.6	-0.2	0.0	-0.6	-0.3	0.0
2	-0.6	-0.2	0.0	-0.6	-0.2	0.0
3	-0.6	-0.3	0.0	-0.6	-0.3	0.0
4	-0.7	-0.4	-0.1	-0.7	-0.3	0.0
5	-0.8	-0.4	-0.1	-0.8	-0.4	-0.2
6	-0.9	-0.5	-0.2	-0.9	-0.5	-0.2
7	-1.0	-0.6	-0.3	-1.0	-0.6	-0.3
8	-1.1	-0.7	-0.3	-1.1	-0.7	-0.3
9	-1.3	-0.8	-0.4	-1.3	-0.8	-0.4
10	-1.3	-0.8	-0.4	-1.3	-0.8	-0.4
11	-1.3	-0.8	-0.4	-1.3	-0.9	-0.4
12	-1.4	-0.8	-0.4	-1.3	-0.8	-0.4
13	-1.4	-0.9	-0.4	-1.4	-0.9	-0.4
14	-1.4	-0.8	-0.4	-1.4	-0.8	-0.4
15	-1.4	-0.9	-0.4	-1.3	-0.9	-0.4
16	-1.4	-0.8	-0.4	-1.4	-0.9	-0.4
17	-1.4	-0.9	-0.4	-1.5	-0.9	-0.4
18	-1.4	-0.9	-0.4	-1.4	-0.9	-0.4
19	-1.4	-0.9	-0.4	-1.4	-0.9	-0.4
20	-1.4	-0.9	-0.4	-1.4	-0.9	-0.4
21	-1.4	-0.9	-0.4	-1.4	-0.9	-0.4
22	-1.4	-0.9	-0.4	-1.4	-0.9	-0.4
23	-1.5	-0.9	-0.4	-1.4	-0.9	-0.4
24	-1.4	-0.9	-0.4	-1.4	-0.9	-0.4
25	-1.4	-0.9	-0.4	-1.4	-0.9	-0.4

Load per cylinder during loading phase

Load per cylinder



Load per cylinder during loading phase

Load per cylinder

Min. / kg	Load.1
0	246
1	246
2	243
3	331
4	402
5	475
6	557
7	638
8	715
9	800
10	801
11	801
12	801
13	798
14	802
15	797
16	796
17	799
18	800
19	802
20	799
21	799
22	801
23	803
24	801
25	796

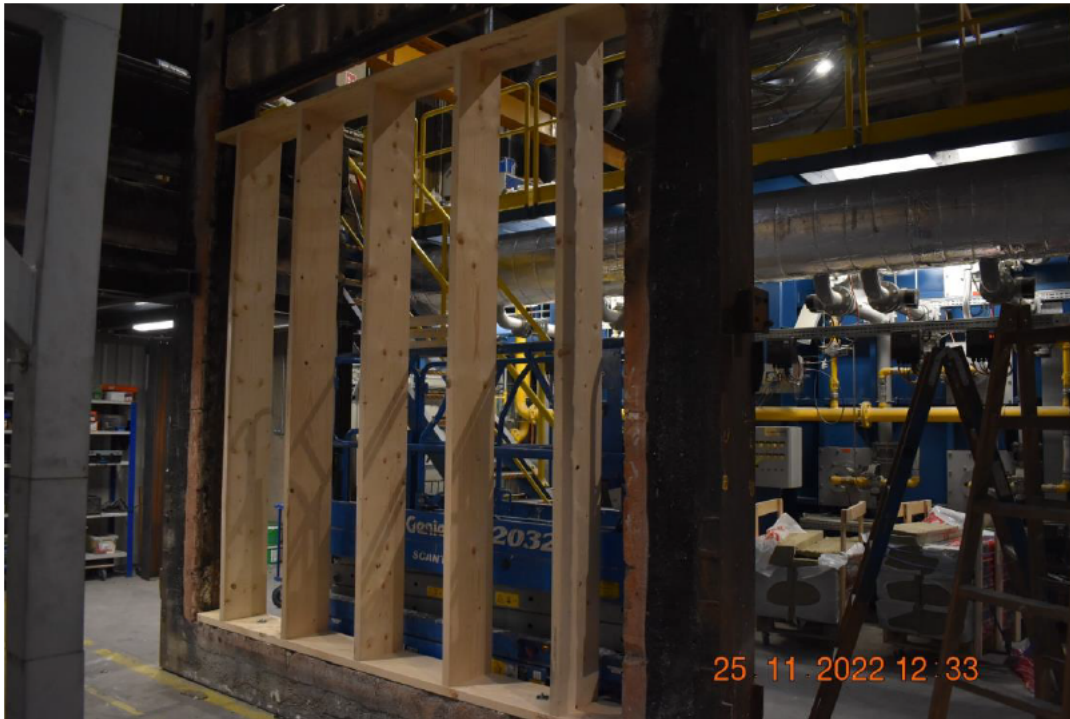


Photo No. 1 Wooden loadbearing construction



Photo No. 2 Chipboard mounted on one side



Photo No. 3 Chipboard mounted on exposed side



Photo No. 4 Wood fiber board mounted on unexposed side



Photo No. 5 Holes for filling the construction with insulation were tape afterwards



Photo No. 6 Mounting of fiber gypsum boards



Photo No. 7 Mounting of fiber gypsum boards



Photo No. 8 Filler is applied on the fiber gypsum boards



Photo No. 9 Test specimen seen from unexposed side before test start



Photo No. 10 Test specimen seen from unexposed side at test start

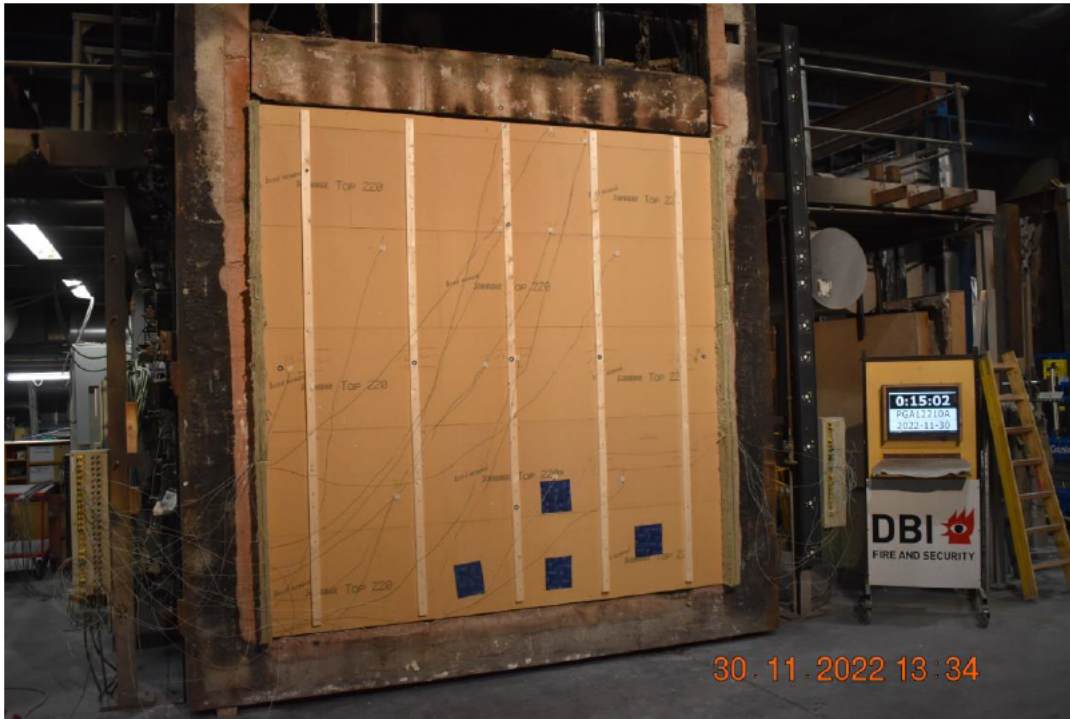


Photo No. 11 Test specimen seen from unexposed side 15 minutes into the test

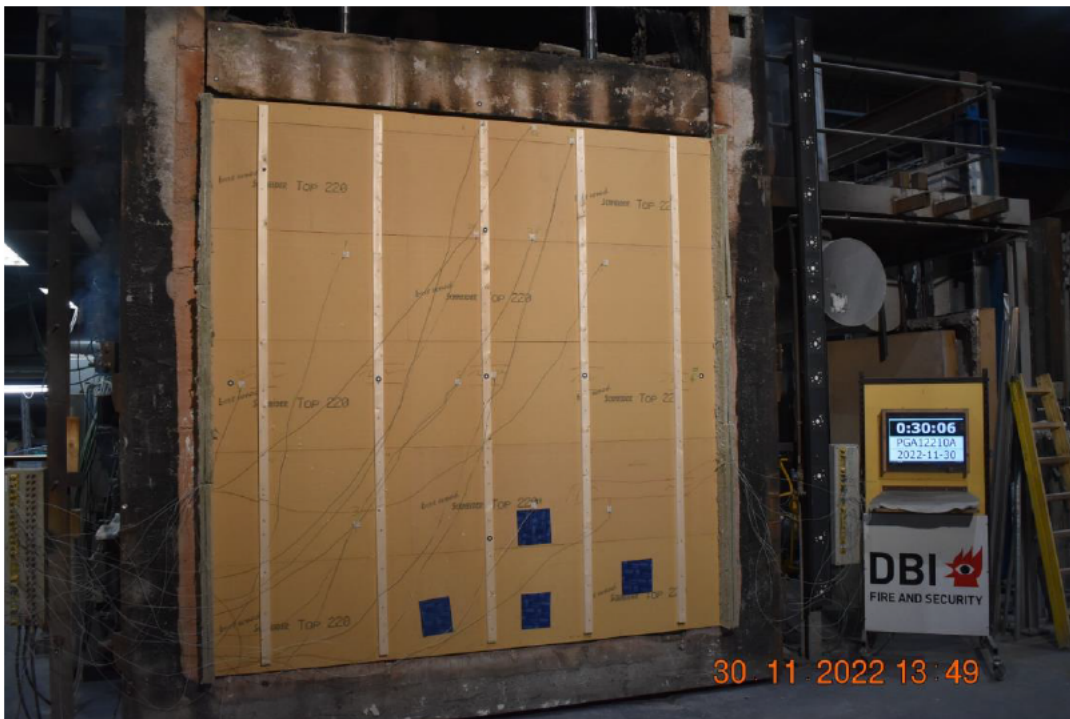


Photo No. 12 Test specimen seen from unexposed side 30 minutes into the test



Photo No. 13 Test specimen seen from unexposed side 45 minutes into the test



Photo No. 14 Test specimen seen from unexposed side 60 minutes into the test



Photo No. 15 Test specimen seen from unexposed side 66 minutes into the test

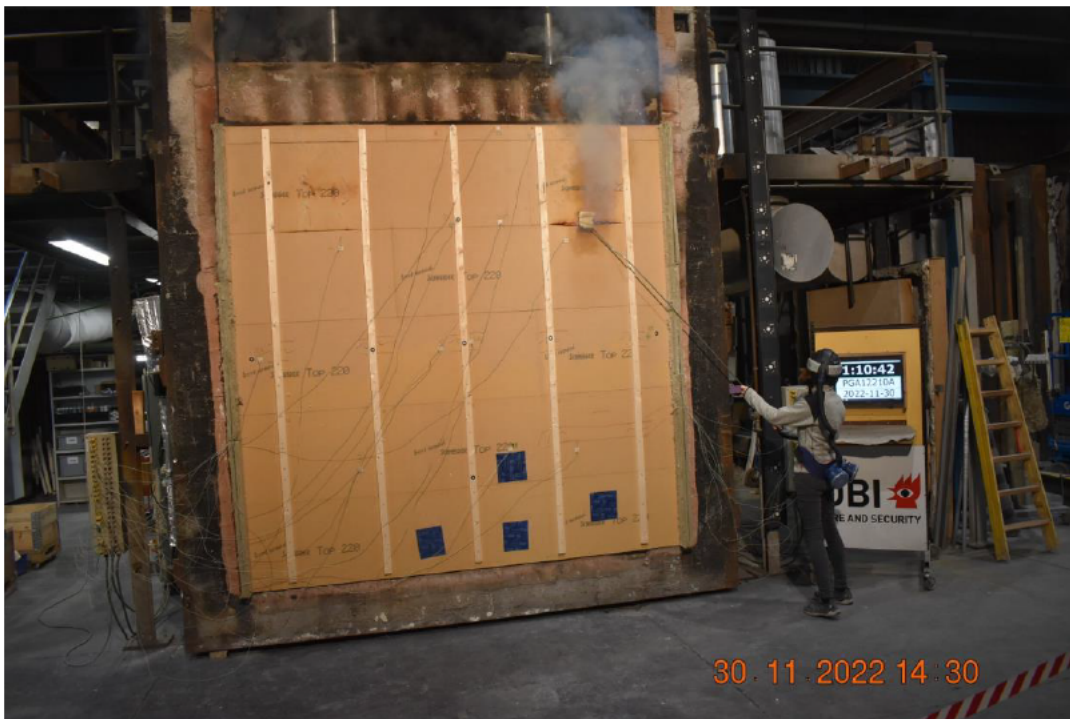


Photo No. 16 Test specimen seen from unexposed side 70 minutes into the test



Photo No. 17 Test specimen seen from unexposed side 71 minutes into the test



Photo No. 18 Test specimen seen from unexposed side 72 minutes into the test



Photo No. 19 Test specimen seen from exposed side after the test



Photo No. 20 Wooden stud measurement after the test