



Test report

InnoBYG small scale demonstration tests - Part 4

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Enclosures: 31

Test date: 2014-04-24
Date: 2014-07-09

1 NAME OF SPONSOR



2 DATE OF TEST

2014-04-24

3 PURPOSE OF TEST

Two small scale tests based on test standard EN 14135 were performed, each with four different test samples, 8 samples in total.

The tests were performed as part of the sub-project "Fire and building materials" in relation to the Danish innovation cluster InnoBYG. The purposes were to

- investigate the difference between different types of covering systems and the general behaviour of PHENOLIC FOAM insulation behind a covering system *and*
- show the general principles of the covering test and the evaluation of the test criteria *and*
- inspire manufacturers and consultants in their innovation process.

4 TEST SPECIMENS

The test specimens were eight different types of coverings, all mounted on a substrate of 100 mm thick phenolic foam insulation. The insulation was mounted on a backing board of chipboard.

The exposed area was 500 x 500 mm for all test specimens.

5 DRAWINGS AND DESCRIPTION OF THE TEST SPECIMENS

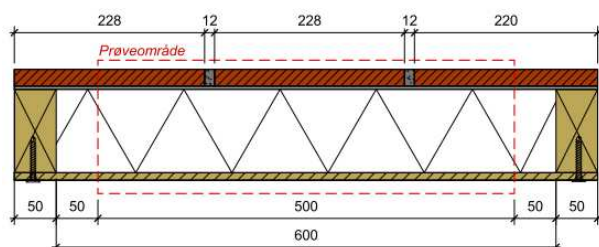
The details of the construction and the measures for the test specimens are described in the enclosed documentation:

Type:	Enclosure:	Description:
Drawing A1.7		Test specimens no A1, A2, A3 and A4
Drawing A1.8		Test specimens no B1, B2, B3 and B4

The test specimens were made by DBI. The test specimens consisted of the components described in the following.

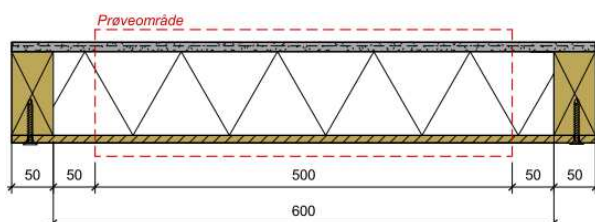
Test specimen A1

External measures:	700 x 700 mm
Covering:	Glass fibre mesh reinforced plaster based and 20 mm bricks jointed with mortar
Substrate:	100 mm phenolic foam insulation
Backing board:	9 mm chipboard



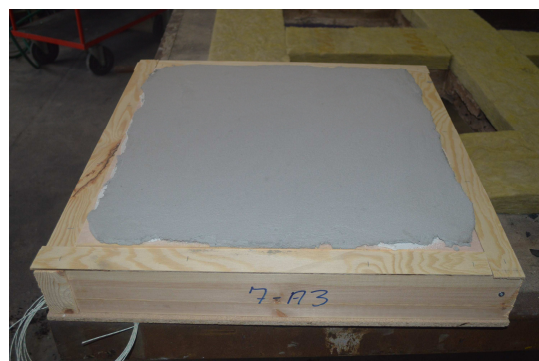
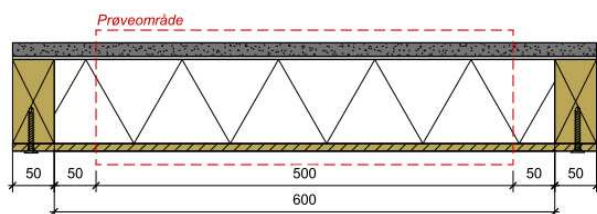
Test specimen A2

External measures:	700 x 700 mm
Covering:	12 mm plaster system consisting of a plaster base, reinforcement mesh and a plaster finish
Substrate:	100 mm phenolic foam insulation
Backing board:	9 mm chipboard



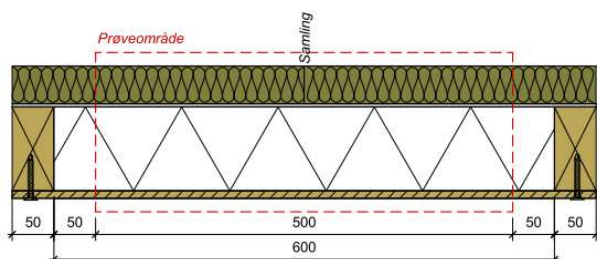
Test specimen A3

External measures:	700 x 700 mm
Covering:	12-13 mm concrete rendering
Fixation:	4 mm general purpose glue
Substrate:	100 mm phenolic foam insulation
Backing board:	9 mm chipboard



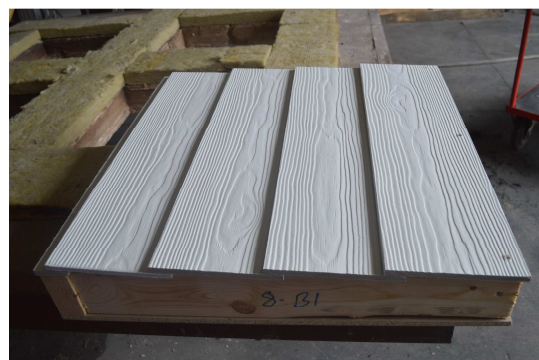
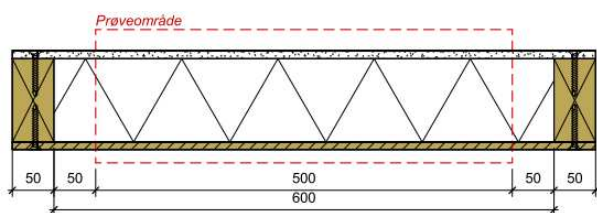
Test specimen A4

External measures:	700 x 700 mm
Covering:	45 mm stone wool insulation with nominal density 30 kg/m ³ with a butt joint in the middle of the specimen
Fixation:	Pins and washers placed outside of the exposed area.
Substrate:	100 mm phenolic foam insulation
Backing board:	9 mm chipboard



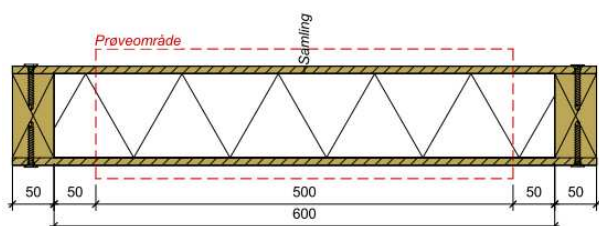
Test specimen B1

External measures:	700 x 700 mm
Covering:	10 mm fibre cement boards mounted with an overlap, nominal density 1640 kg/m ³
Fixation:	Screws through 50 x 100 mm wooden joists placed outside of the exposed area.
Substrate:	100 mm phenolic foam insulation
Backing board:	9 mm chipboard



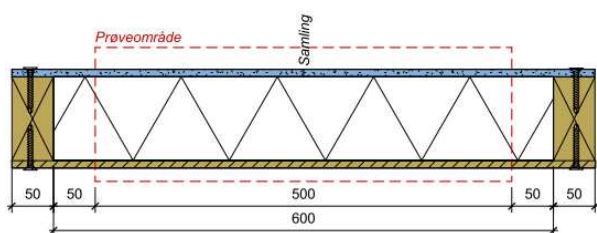
Test specimen B2

External measures: 700 x 700 mm
Covering: 9 mm water proof plywood
Fixation: Screws through 50 x 100 mm wooden joists placed outside of the exposed area.
Substrate: 100 mm phenolic foam insulation
Backing board: 9 mm chipboard



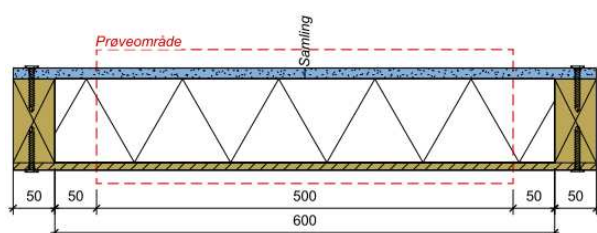
Test specimen B3

External measures: 700 x 700 mm
Covering: 9,5 mm wind stopping gypsum board
Fixation: Screws through 50 x 100 mm wooden joists placed outside of the exposed area.
Substrate: 100 mm phenolic foam insulation
Backing board: 9 mm chipboard



Test specimen B4

External measures: 700 x 700 mm
Covering: 12,5 mm gypsum plasterboard type A according to EN 520
Fixation: Screws through 50 x 100 mm wooden joists placed outside of the exposed area.
Substrate: 100 mm phenolic foam insulation
Backing board: 9 mm chipboard



6 TEST CONDITIONS

Conditioning

The test specimens were made by DBI during March 2014 and were stored under laboratory conditions until the tests.

Mounting

The test specimens were placed on top of a horizontal concrete frame with four openings of 500 x 500 mm.

The area between the test specimens as well as the outer perimeter on the unexposed side was insulated with stone wool insulation in order to prevent any influence between each test specimen.

Fire test

Two fire tests were performed, each with four test specimens. The concrete frame with four test specimens was placed horizontally on the DBI small scale furnace.

Each fire test lasted 10 minutes.

The first fire test was performed at approx. 10 AM and the second fire test was performed at 13 PM. The furnace was ventilated between the two tests.

In order to prevent preheating of the test specimens for the second fire test, the test specimens were not placed on the test frame until shortly before the start of the second fire test.

DBI enclosure 15.0 shows the position of the thermocouples for measuring the temperature rise on surface of the substrates behind the coverings.

7 TEST RESULTS

The enclosed graphs and tables describe:

Enclosures 1.0 and 1.1 Temperature rise on test specimen A1.

Enclosures 2.0 and 2.1	Temperature rise on test specimen A2.
Enclosures 3.0 and 3.1	Temperature rise on test specimen A3.
Enclosures 4.0 and 4.1	Temperature rise on test specimen A4.
Enclosures 5.0 and 5.1	Temperature rise on test specimen B1.
Enclosures 6.0 and 6.1	Temperature rise on test specimen B2.
Enclosures 7.0 and 7.1	Temperature rise on test specimen B3.
Enclosures 8.0 and 8.1	Temperature rise on test specimen B4.
Enclosures 9.0 and 9.1	Test 1: Actual minimum-, average- and maximum furnace temperature in relation to the standard temperature.
Enclosures 10.0 and 10.1	Test 1: Ambient temperature in the laboratory during the test.
Enclosures 11.0 and 11.1	Test 1: Furnace pressure measured 100 mm below the test frame.
Enclosures 12.0 and 12.1	Test 2: Actual minimum-, average- and maximum furnace temperature in relation to the standard temperature.
Enclosures 13.0 and 13.1	Test 2: Ambient temperature in the laboratory during the test.
Enclosures 14.0 and 14.1	Test 2: Furnace pressure measured 100 mm below the test frame.

Observations during the tests

During the test the test specimens were constantly observed, and the relevant observations are stated in the following:

Test 1:

Time minutes	Test specimen	Observations
0		Test start
2	A2	Light smoke development
6	all	"Popping" sounds from the test specimens
10		Test stopped

Test 2:

Time minutes	Test specimen	Observations
0		Test start
1	B3	Light smoke development
2	B1 and B2	Light smoke development
4	B1	Increased smoke development

6	B2 and B4	Light smoke development
6	B1	Still moderate smoke development
10		Test stopped

Photographs

General photographs from both tests are shown on the enclosed photo sheets.

Observations after the tests

Each test specimen was examined after the test and relevant observations and photos are stated in the following:

Test specimen	Observation
A1	The adhesion between the brick layer and the phenolic foam insulation was intact after the fire test.

The phenolic foam insulation was discoloured yellow in a thin layer but was otherwise intact.



-
- A2 The plaster was intact as a solid board, held together by the reinforcement mesh. Some spalling of the plaster occurred on exposed side during the cooling phase. The adhesion between plaster and insulation was still intact and it was difficult to separate the layers after the test.

The phenolic foam insulation was charred on the surface and had a yellow discoloration. The insulation seemed to have expanded. Approx. 85 mm insulation was un-damaged.



-
- A3 The plaster had small cracks after the test, and the cracks evolved during the cooling phase. The adhesion between plaster and insulation was still intact and it was difficult to separate the layers after the test.

The phenolic foam insulation was charred on the surface and had a yellow discoloration. The insulation seemed to have expanded. Approx. 90 mm insulation was un-damaged.



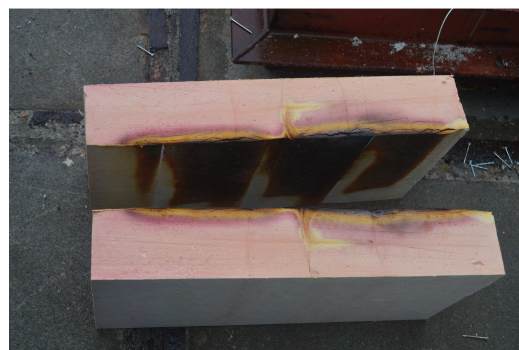
A4 The stone wool insulation was dark discoloured and porous after the test.

The phenolic foam insulation was evenly charred on the surface and had a yellow discolouration. The insulation seemed to have expanded and delaminated in char layers. Approx. 85 mm insulation was un-damaged.



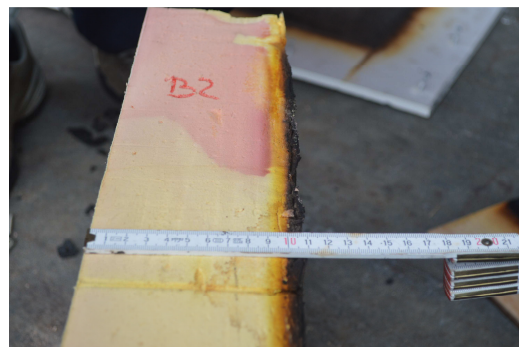
B1 The fibre cement planks were still in place, but some transverse cracks have evolved, perhaps during the cooling phase.

The phenolic foam insulation was charred in areas corresponding with the planks and had yellow discolouration. The insulation seemed to have expanded and delaminated in char layers. Approx. 90 mm insulation was un-damaged



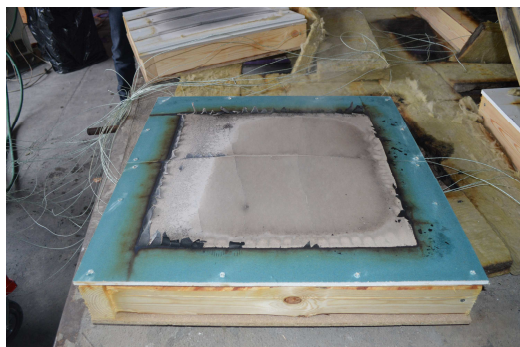
B2 The plywood was heavily charred and was burned through in the centre area.

The phenolic foam insulation was evenly charred on the surface and had yellow discolouration. The insulation seemed to have expanded and delaminated in char layers. Approx. 90 mm insulation was un-damaged



B3 The paper of the gypsum boards has burned, and there were minor cracks in the boards after the test. The boards seem to bow away from the substrate, but the joint had not opened.

The phenolic foam insulation was intact with no charring, melting or shrinking and no discolouration. Only a small area beneath the joint seemed to be moist.



B4 The paper of the gypsum boards has burned, and there were minor cracks in the boards after the test. The boards seem to bow away from the substrate, but the joint had not opened.

The phenolic foam insulation was intact with no charring, melting or shrinking and no discolouration. Only a small area beneath the joint seemed to be moist.



8 REMARK

The tests described in this test report were small scale demonstration tests made for a general informative purpose. The test results are not meant to be used for classification or approval by authorities.

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.

Anders Dragsted
M.Sc. (Eng.)

/

Trine Dalsgaard Jensen
M.Sc. (Eng.)

Enclosures: 31
DBI drawings: 3
DBI graphs and tables: 28

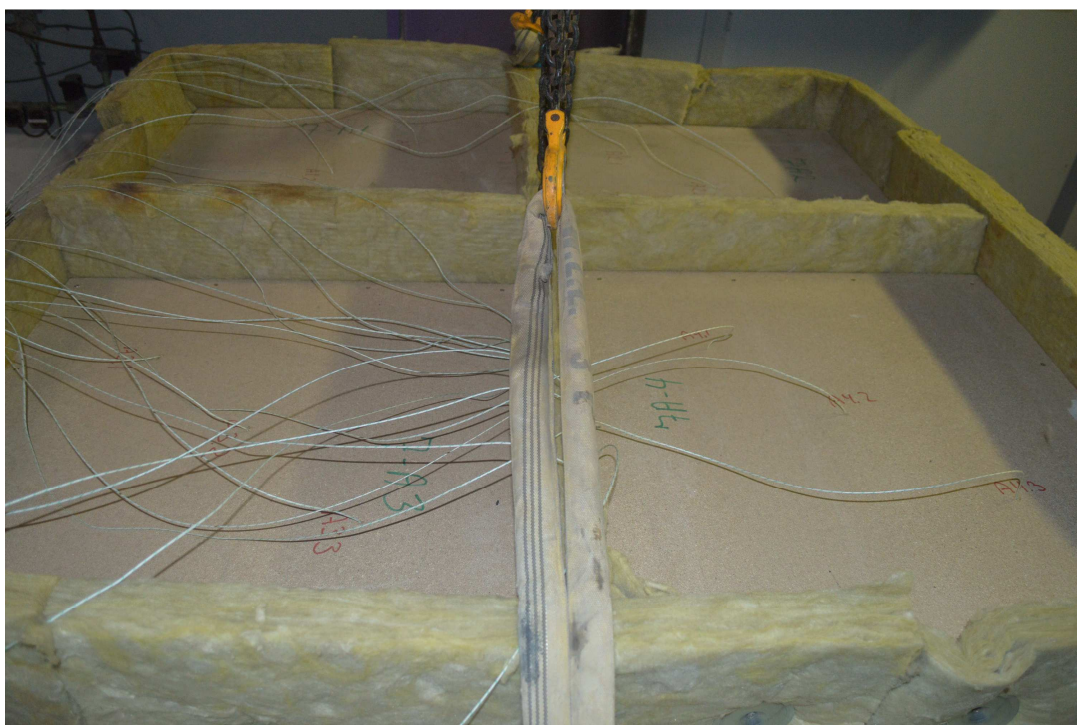


Photo No. 1 Test specimens no A1, A2, A3 and A4 at test start (test 1)



Photo No. 2 Test specimens no A1, A2, A3 and A4 seen after the test (test 1)

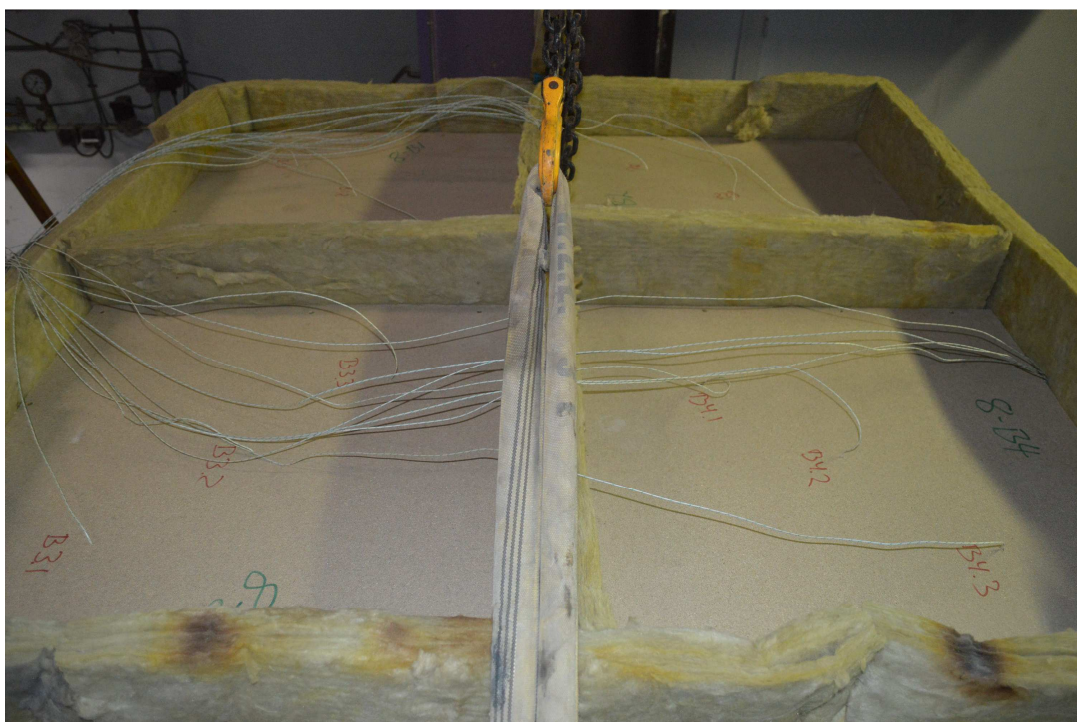
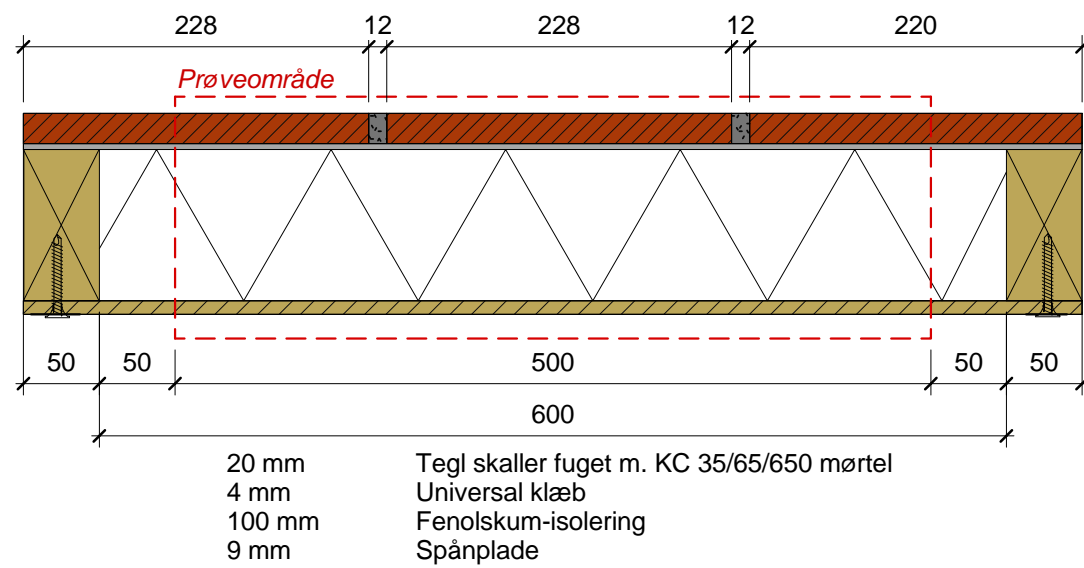


Photo No. 3 Test specimens no B1, B2, B3 and B4 before the test (test 2)

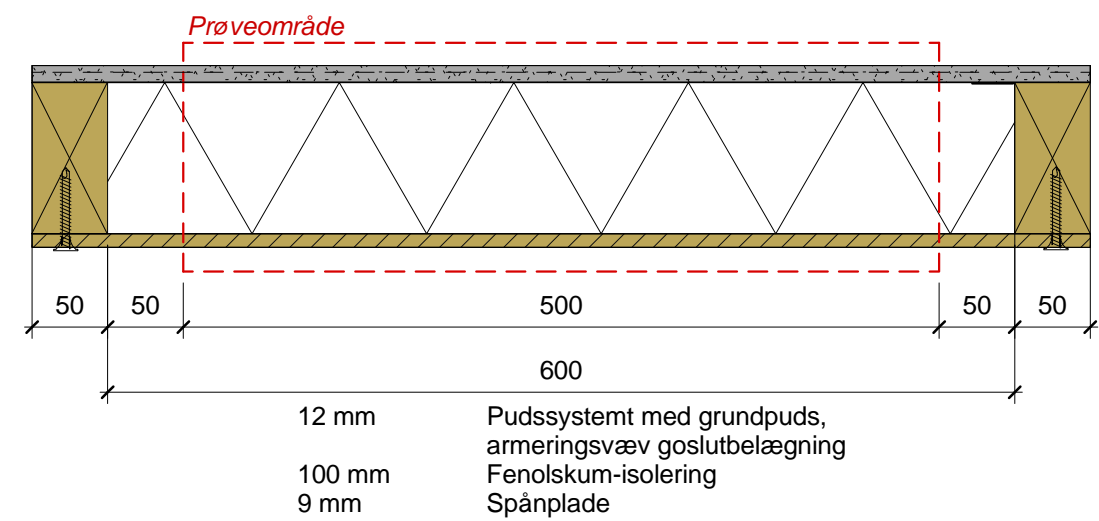


Photo No. 4 Test specimens no B1, B2 B3 and B4 after the test (test 2)

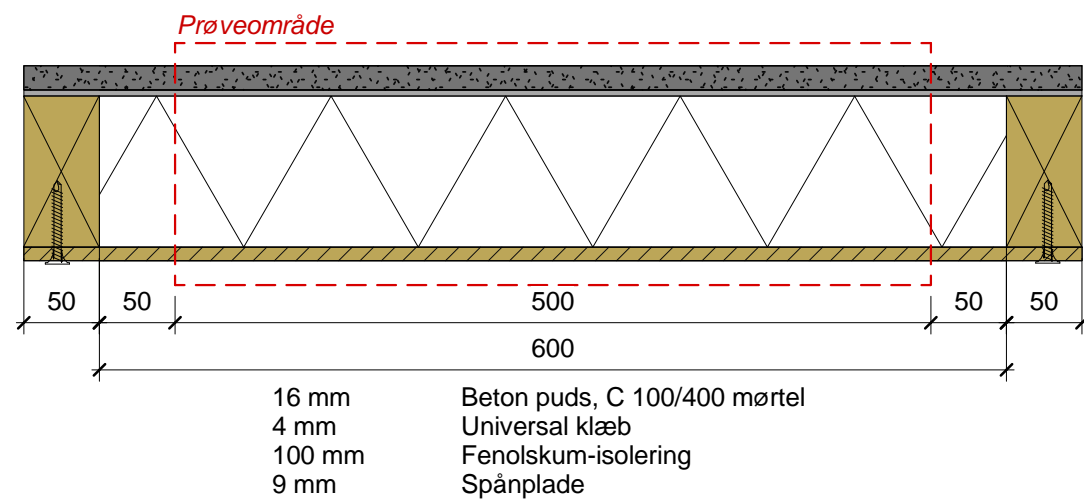
A1: Skærmtegl, Fenolskum-isolering



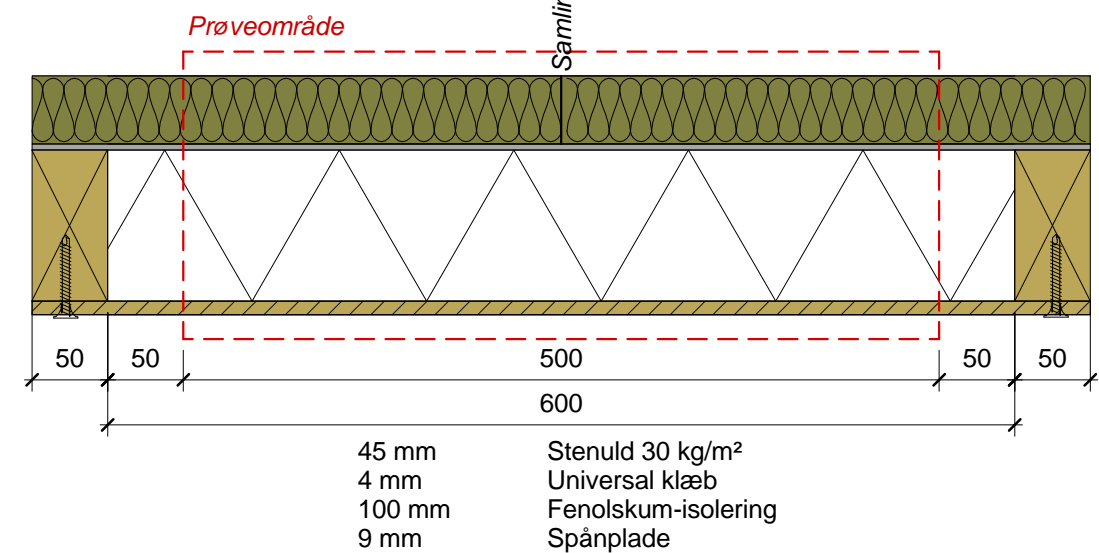
A2: Pudssystem, Fenolskum-isolering



A3: Betonpuds, Fenolskum-isolering



A4: Stenuld, Fenolskum-isolering



Bygherre: InnoBYG

Sag: Brandtekniske eksperimenter

Emne: InnoBYG brandprøvninger del 4, A

Int.: Author | Kontr.: CheckerDato: 02/26/14

Sags nr.:

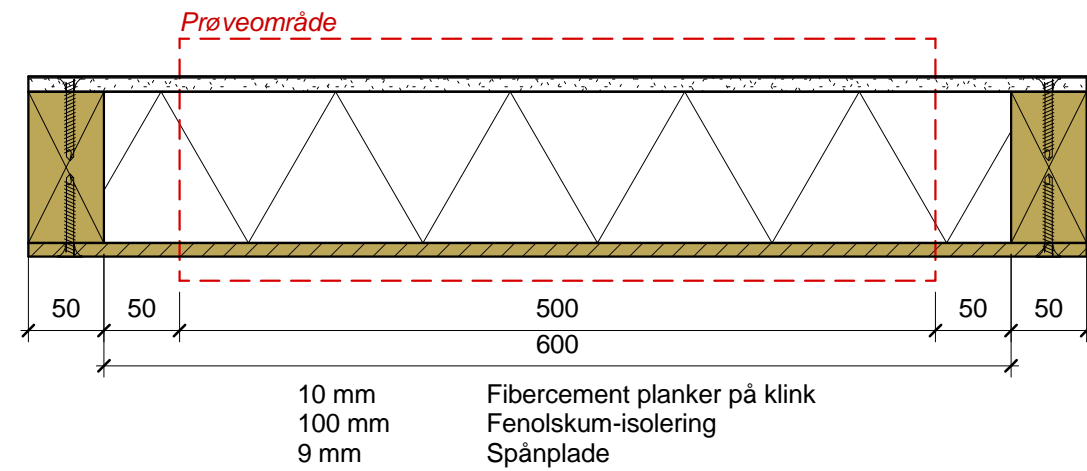
Tegn. nr.:

A1.7

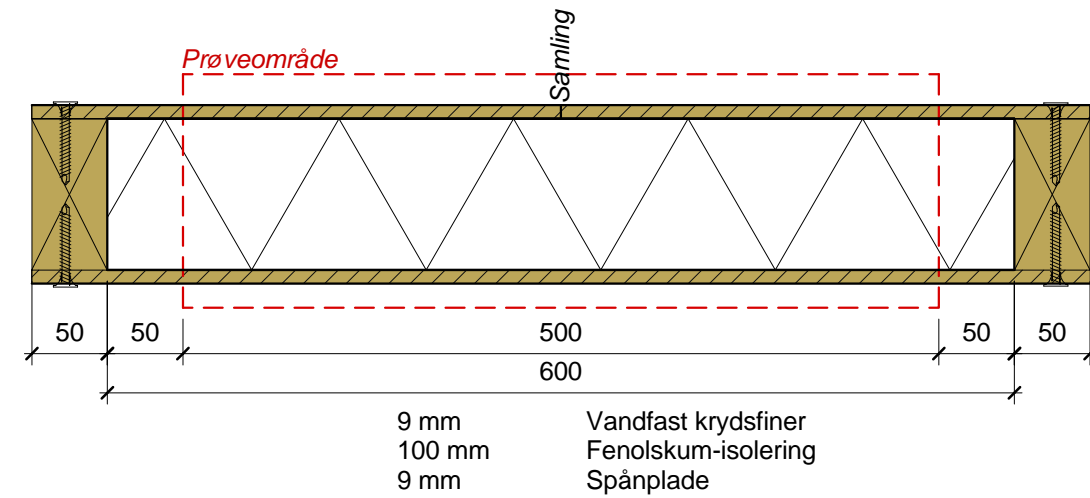
Rev. dato:

Mål: 1 : 5

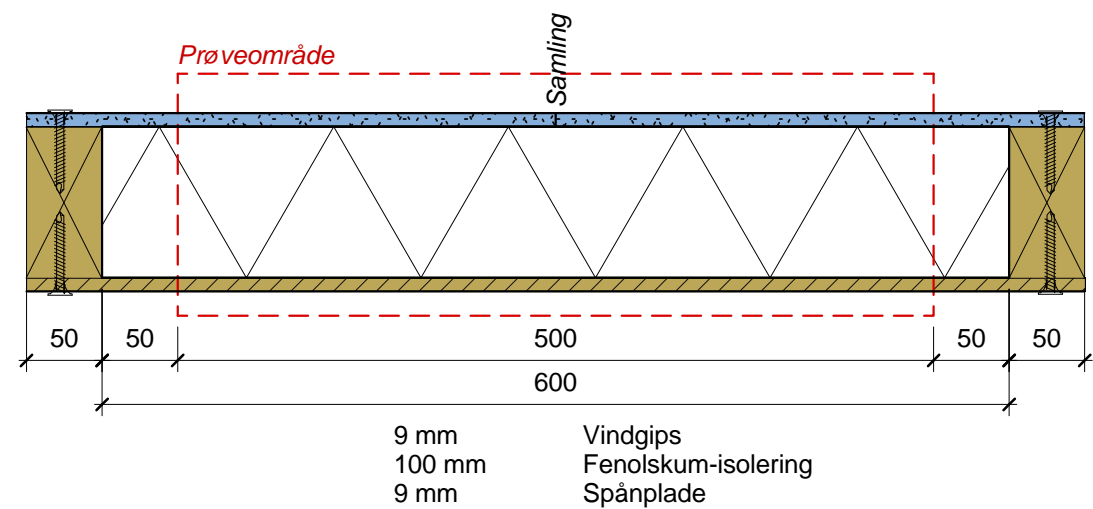
B1: Fibercement planker på klink, Fenolskum-isolering



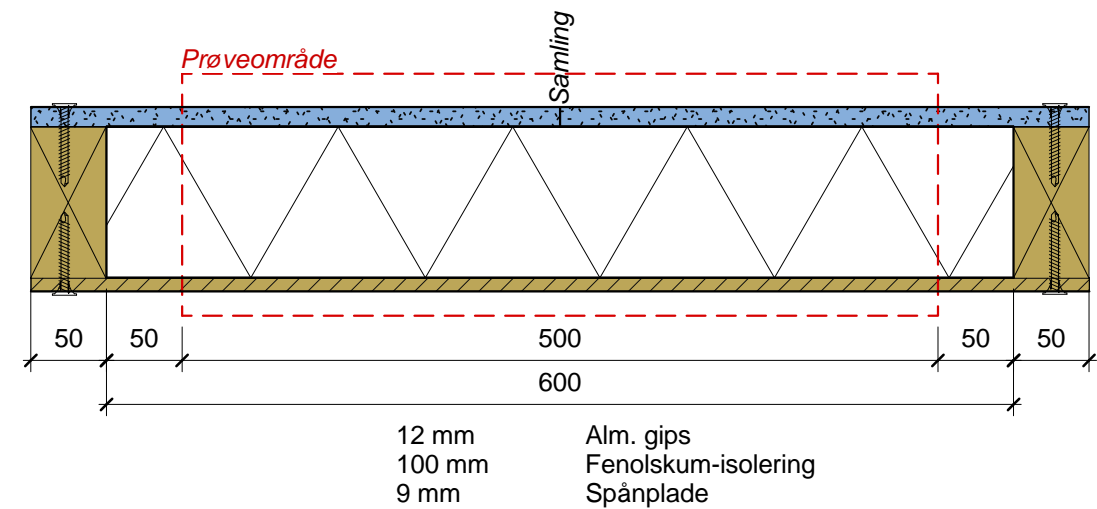
B2: Krydsfiner, Fenolskum-isolering



B3: Vindgips, Fenolskum-isolering



B4: Gips, Fenolskum-isolering



Bygherre: InnoBYG

Sag: Brandtekniske eksperimenter

Emne: InnoBYG brandprøvninger del 4, B

Int.: Author | Kontr.: CheckerDato: 02/26/14

Sags nr.:

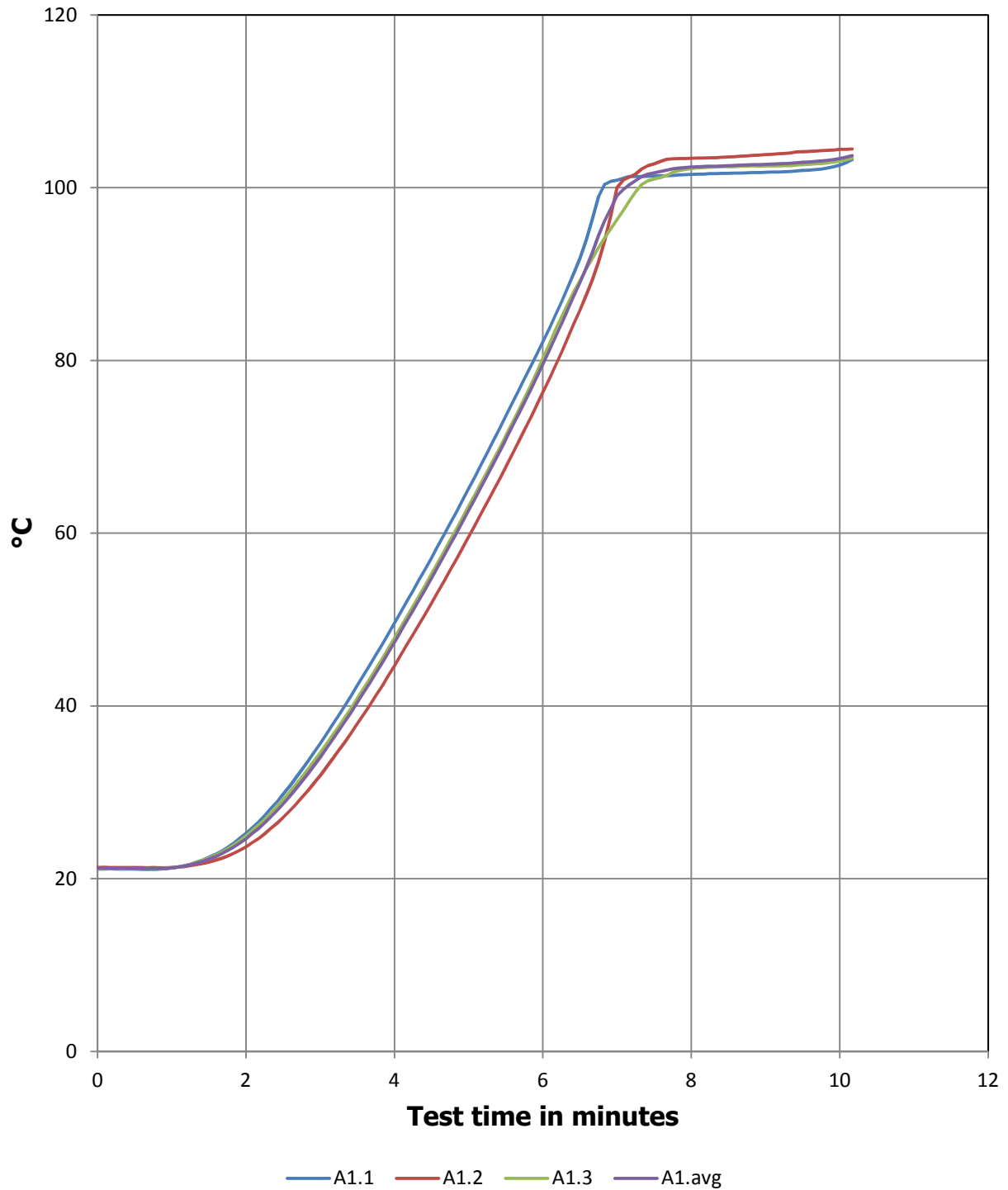
Tegn. nr.:

A1.8

Rev. dato:

Mål: 1 : 5

Temperatures on test specimen A1

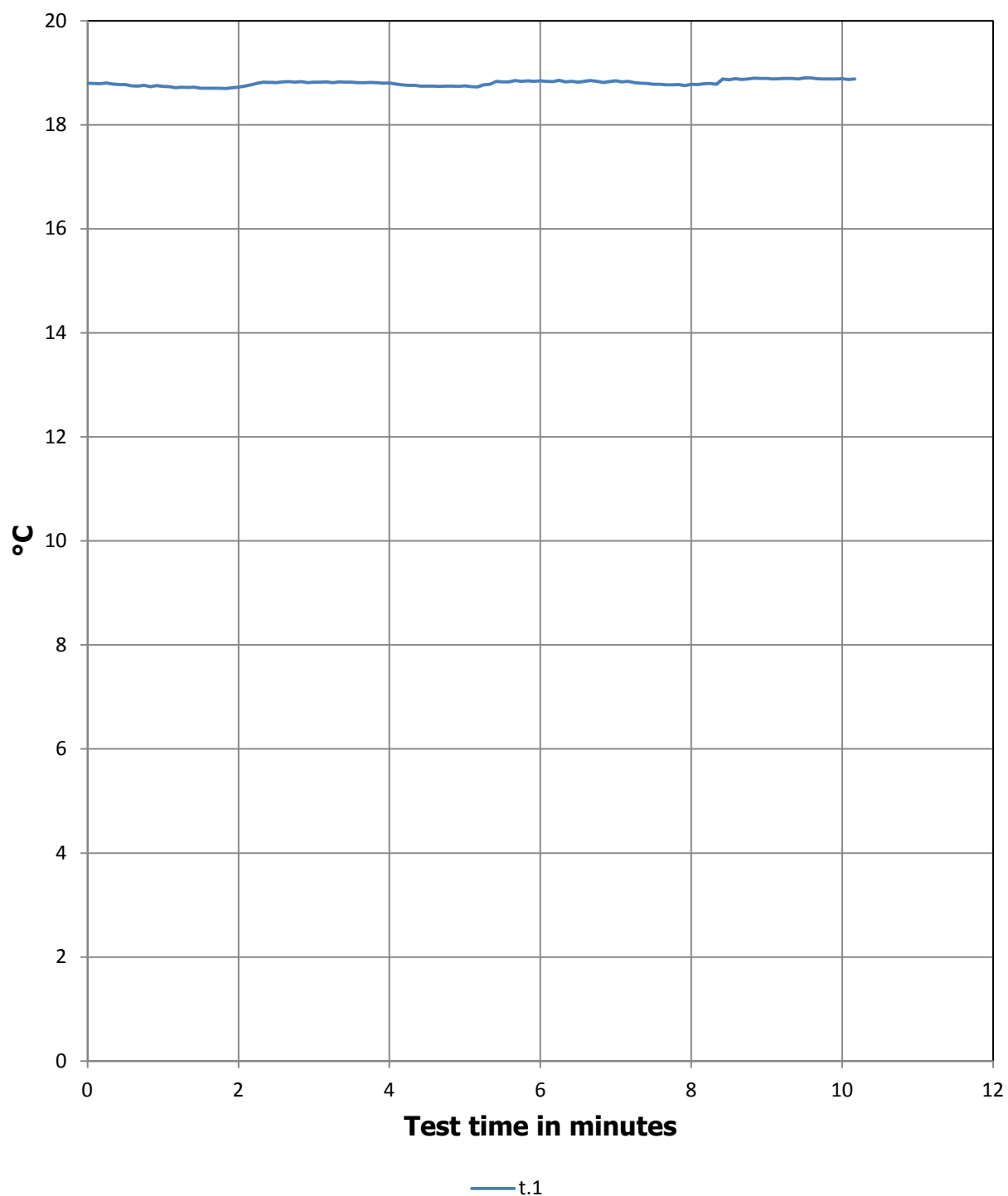




Temperatures on test specimen A1

Min. / °C	A1.1	A1.2	A1.3	A1.Avg
0.0	21.1	21.3	21.2	21.2
0.5	21.1	21.3	21.1	21.2
1.0	21.2	21.3	21.3	21.3
1.5	22.4	21.9	22.4	22.2
2.0	25.2	23.7	24.9	24.6
2.5	29.8	27.1	29.1	28.7
3.0	35.6	32.0	34.6	34.1
3.5	42.4	37.9	40.9	40.4
4.0	49.6	44.6	47.9	47.4
4.5	57.1	51.9	55.3	54.8
5.0	65.1	59.6	63.1	62.6
5.5	73.6	67.7	71.3	70.8
6.0	82.1	76.3	80.2	79.5
6.5	91.8	85.8	89.3	89.0
7.0	100.8	100.0	96.3	99.0
7.5	101.4	102.7	101.0	101.7
8.0	101.5	103.4	102.2	102.4
8.5	101.7	103.5	102.4	102.5
9.0	101.8	103.8	102.5	102.7
9.5	102.0	104.2	102.7	102.9
10.0	102.6	104.4	103.1	103.4

Ambient temperature

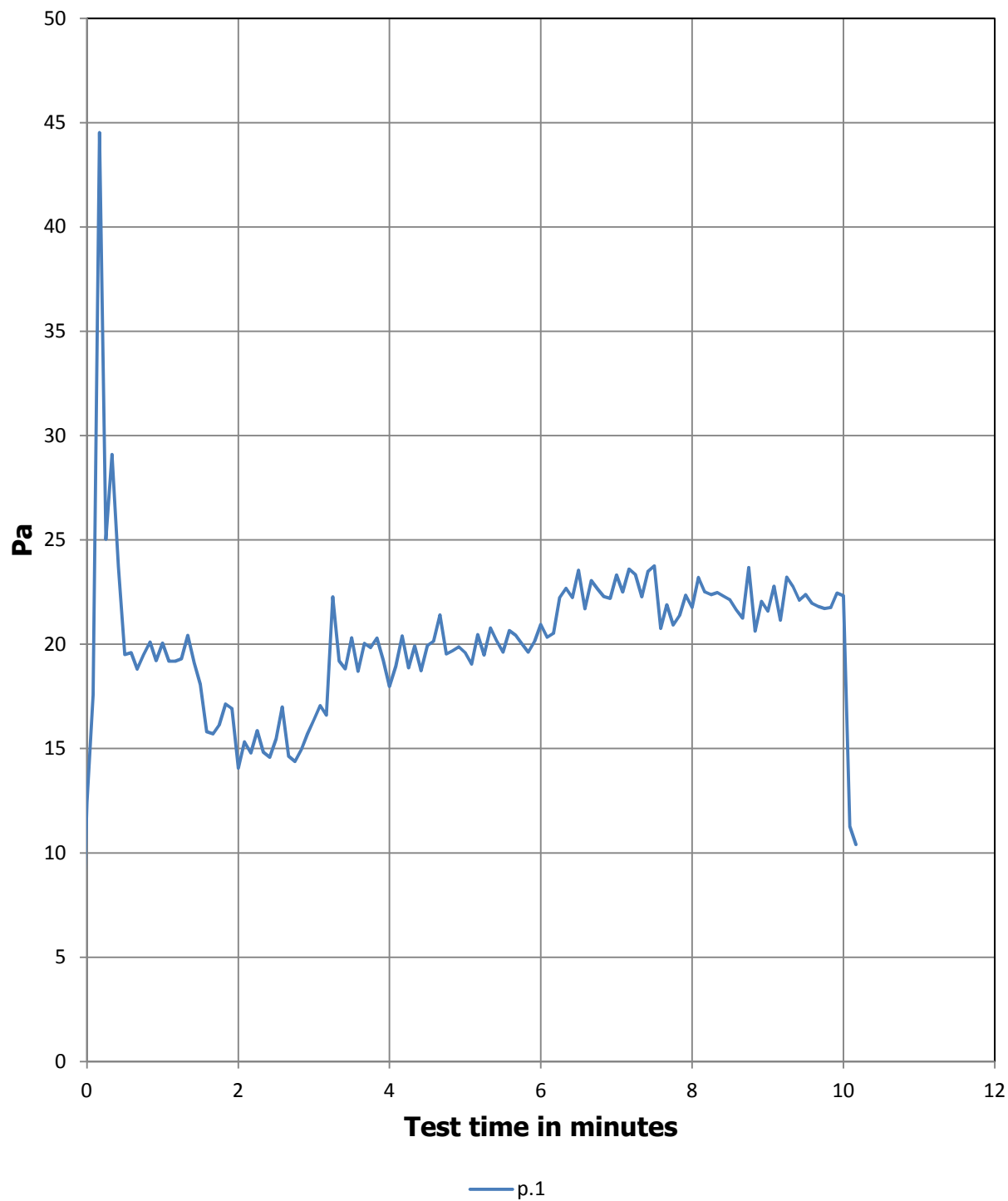




Ambient temperature

Min. / °C	t.1
0	18.8
1	18.7
2	18.7
3	18.8
4	18.8
5	18.7
6	18.8
7	18.8
8	18.8
9	18.9
10	18.9

Furnace pressure

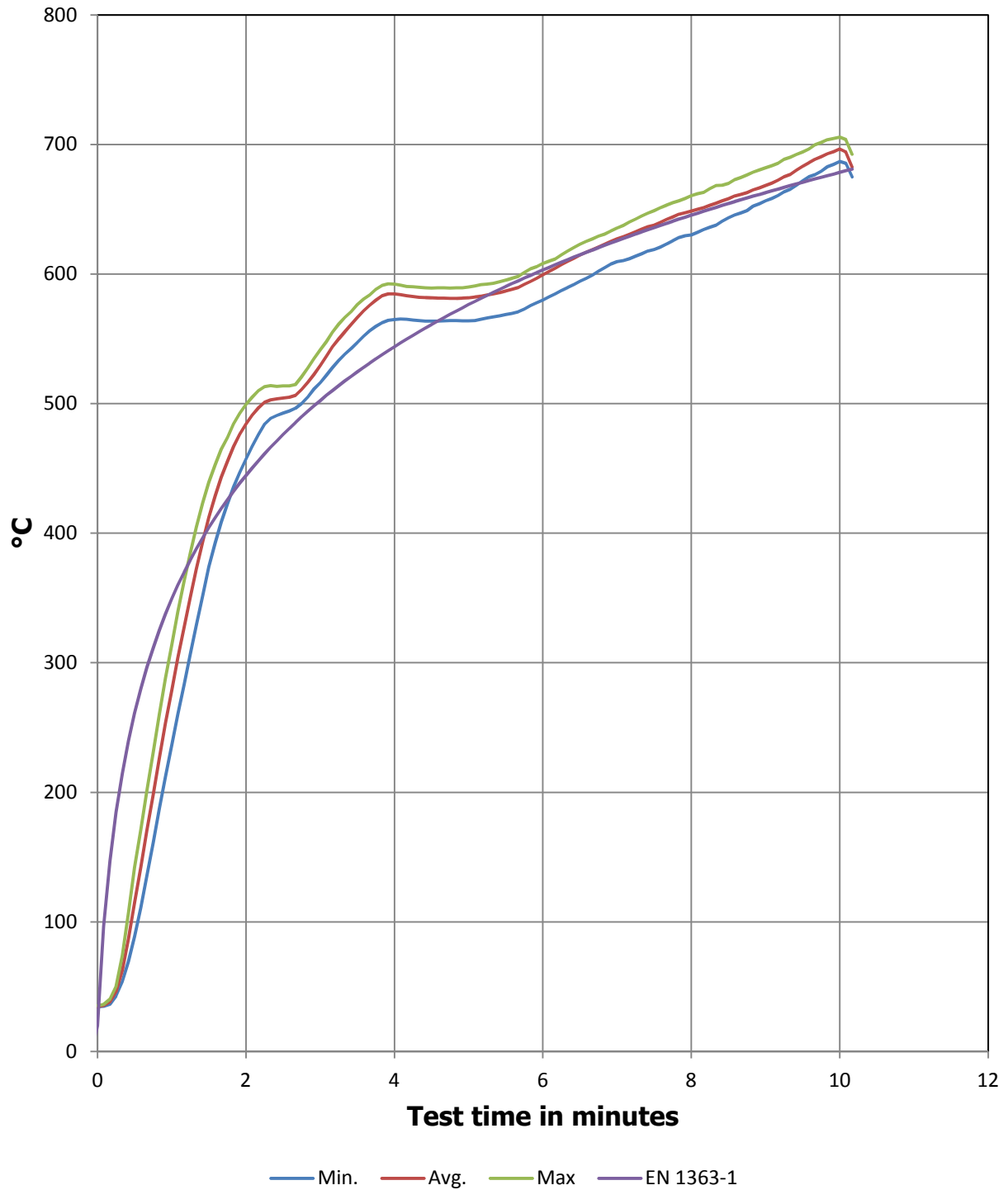




Furnace pressure

Min. / Pa	p.1
0	12.4
1	20.1
2	14.1
3	16.4
4	18.0
5	19.6
6	20.9
7	23.3
8	21.8
9	21.6
10	22.3

Furnace temperature (test 2)

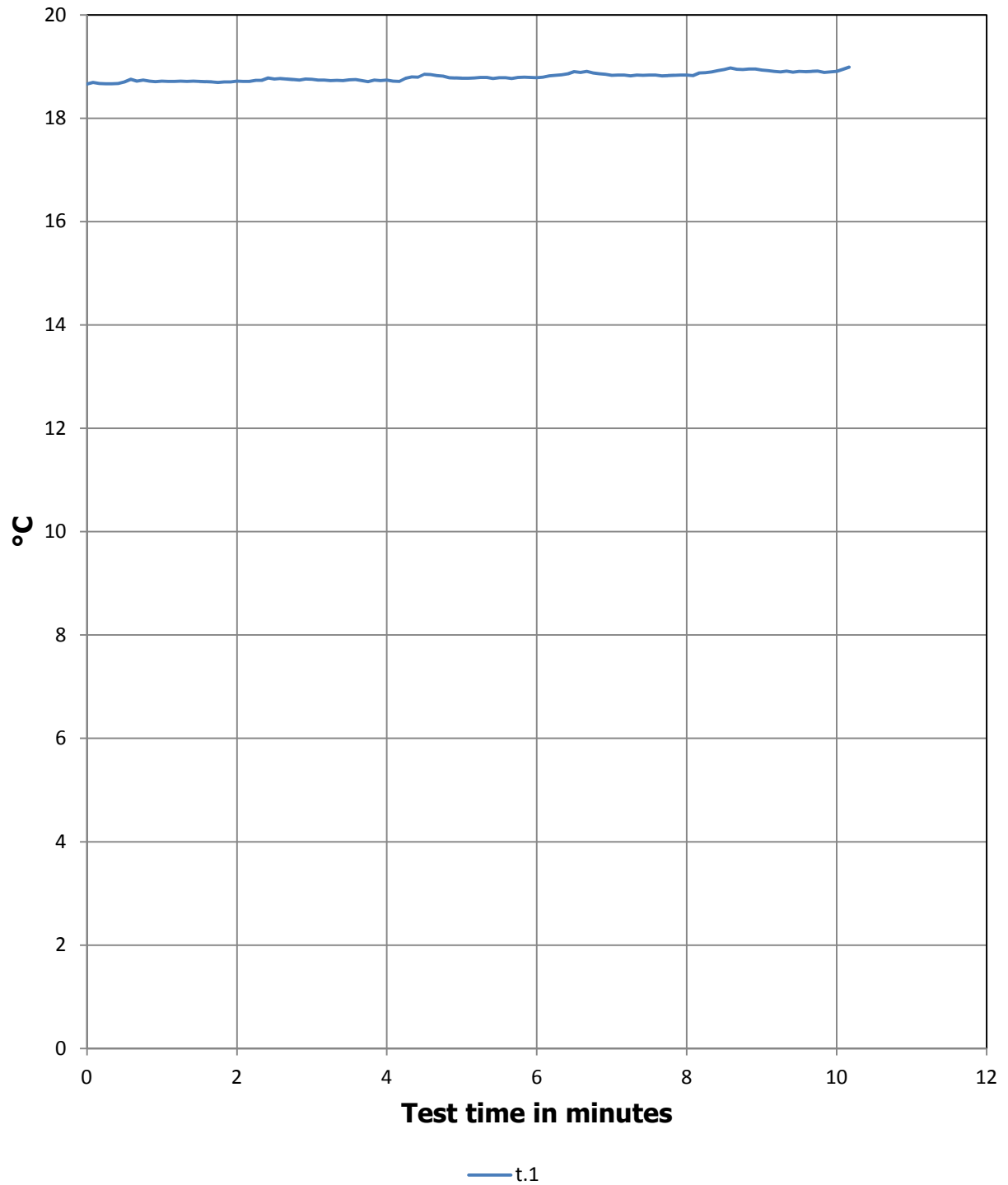




Furnace temperature (test 2)

Time Minutes	Measured			Norm EN 1363-1	Area under curve		Dev. [%]	Limit [%]
	Minimum	Average	Maximum		Measured	EN 1363-1		
0.0	34.5	34.7	35.2	20.0	0	0	#DIV/0!	
0.5	88.6	114.7	142.0	261.1	29	85	-66.3	
1.0	236.3	278.6	313.7	349.2	128	240	-46.8	
1.5	374.0	412.1	439.2	404.3	302	429	-29.6	
2.0	457.2	484.4	499.4	444.5	529	642	-17.6	
2.5	492.7	504.2	513.6	476.2	778	872	-10.8	
3.0	516.1	529.4	541.5	502.3	1034	1117	-7.4	
3.5	547.1	566.4	576.4	524.5	1309	1374	-4.7	
4.0	564.9	584.6	592.2	543.9	1598	1641	-2.6	
4.5	563.6	581.6	589.2	561.0	1889	1917	-1.5	
5.0	563.8	581.7	589.9	576.4	2180	2202	-1.0	
5.5	568.8	586.9	595.4	590.4	2472	2494	-0.9	15.0
6.0	579.7	599.4	608.1	603.1	2768	2792	-0.8	15.0
6.5	594.4	614.6	623.1	614.9	3072	3096	-0.8	15.0
7.0	609.6	627.2	635.5	625.8	3382	3407	-0.7	15.0
7.5	618.9	637.6	649.0	635.9	3699	3722	-0.6	15.0
8.0	630.1	648.5	660.4	645.5	4020	4042	-0.5	15.0
8.5	643.4	658.2	670.0	654.4	4347	4367	-0.5	15.0
9.0	656.5	668.4	682.0	662.8	4679	4697	-0.4	15.0
9.5	672.0	683.1	694.3	670.8	5016	5030	-0.3	15.0
10.0	686.9	696.4	705.6	678.4	5361	5368	-0.1	15.0

Ambient temperature (test 2)

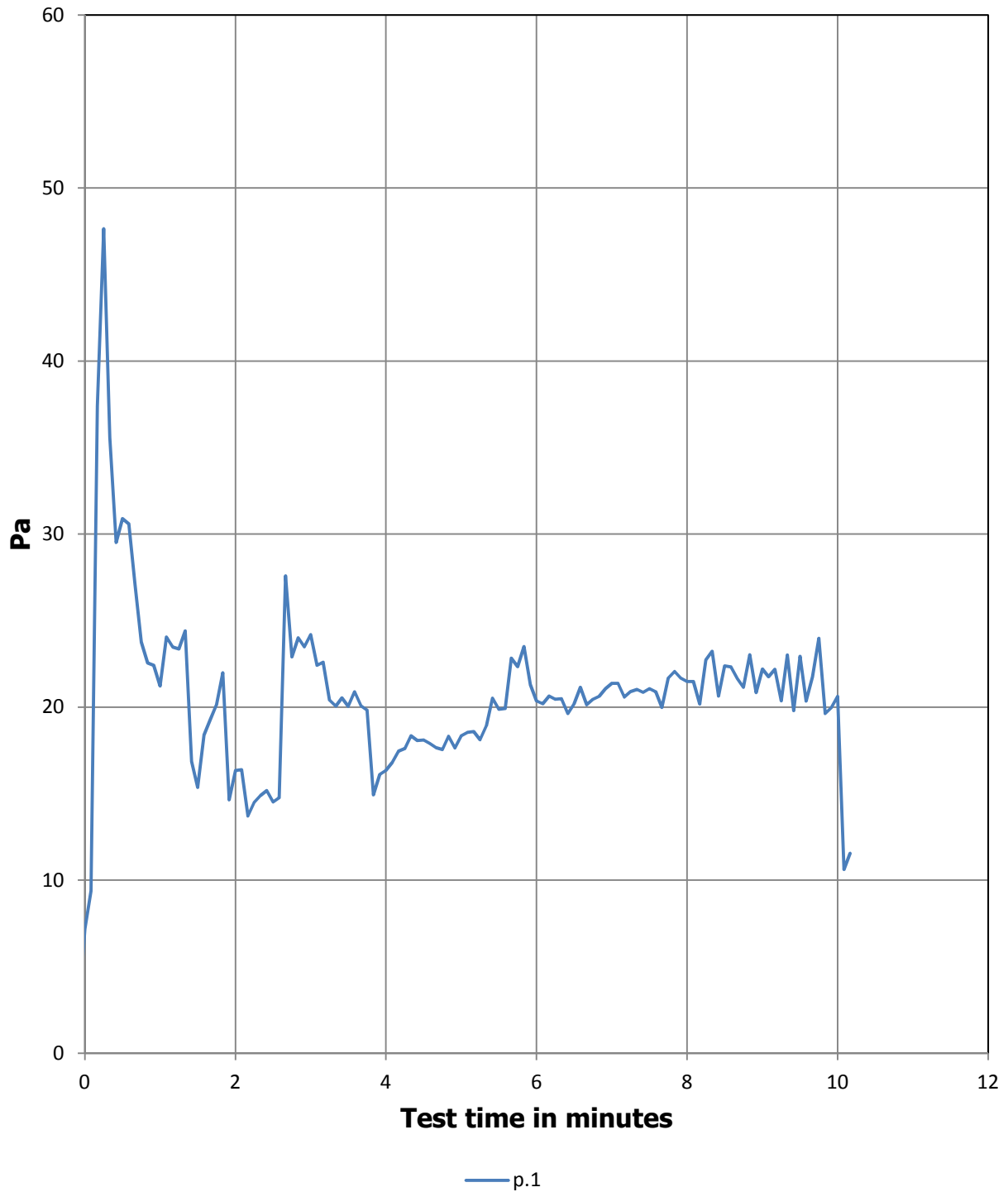




Ambient temperature (test 2)

Min. / °C	t.1
0	18.7
1	18.7
2	18.7
3	18.8
4	18.7
5	18.8
6	18.8
7	18.8
8	18.8
9	18.9
10	18.9

Furnace pressure (test 2)

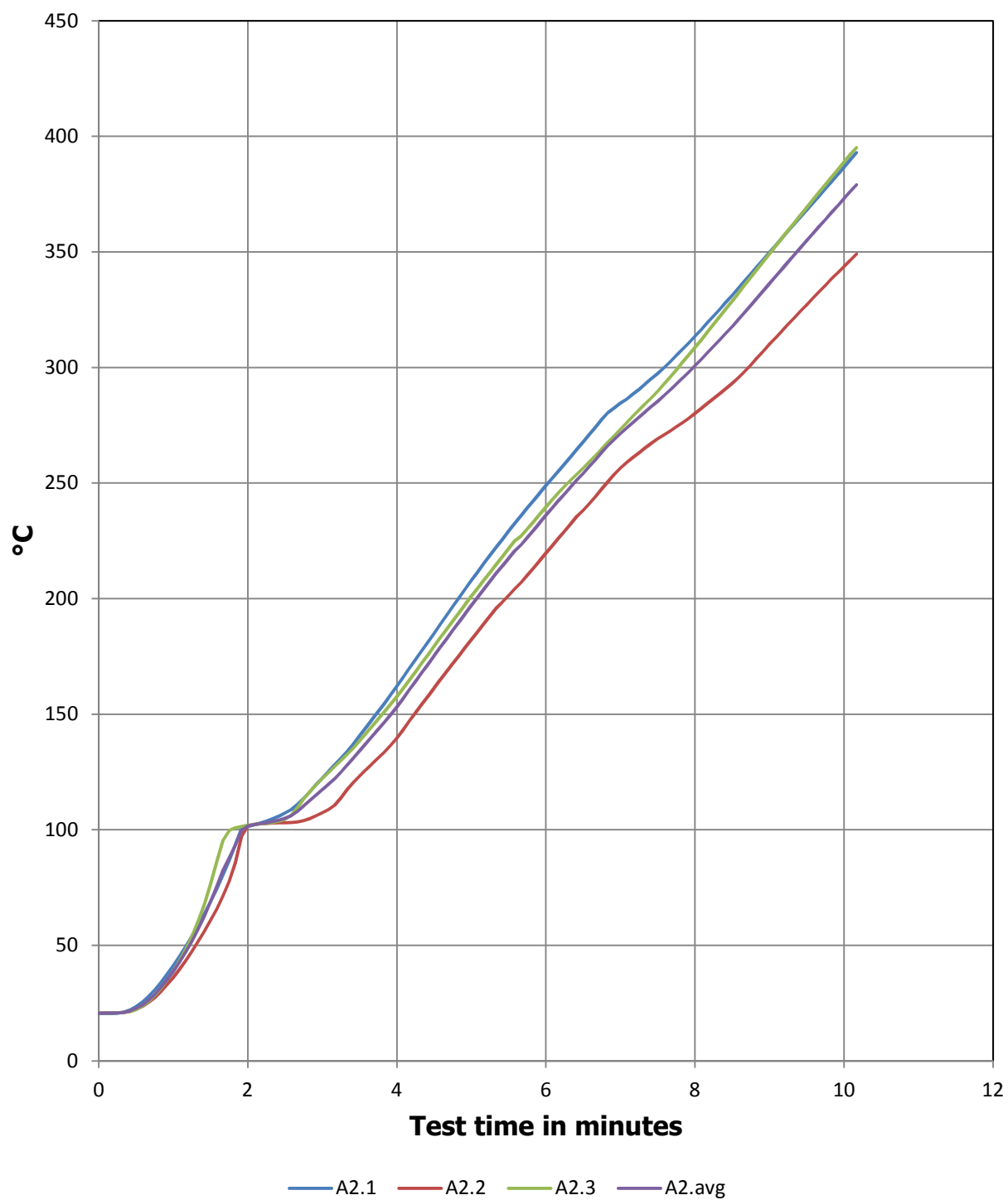




Furnace pressure (test 2)

Min. / Pa	p.1
0	7.2
1	21.2
2	16.3
3	24.2
4	16.3
5	18.3
6	20.4
7	21.4
8	21.5
9	22.2
10	20.6

Temperatures on test specimen A2

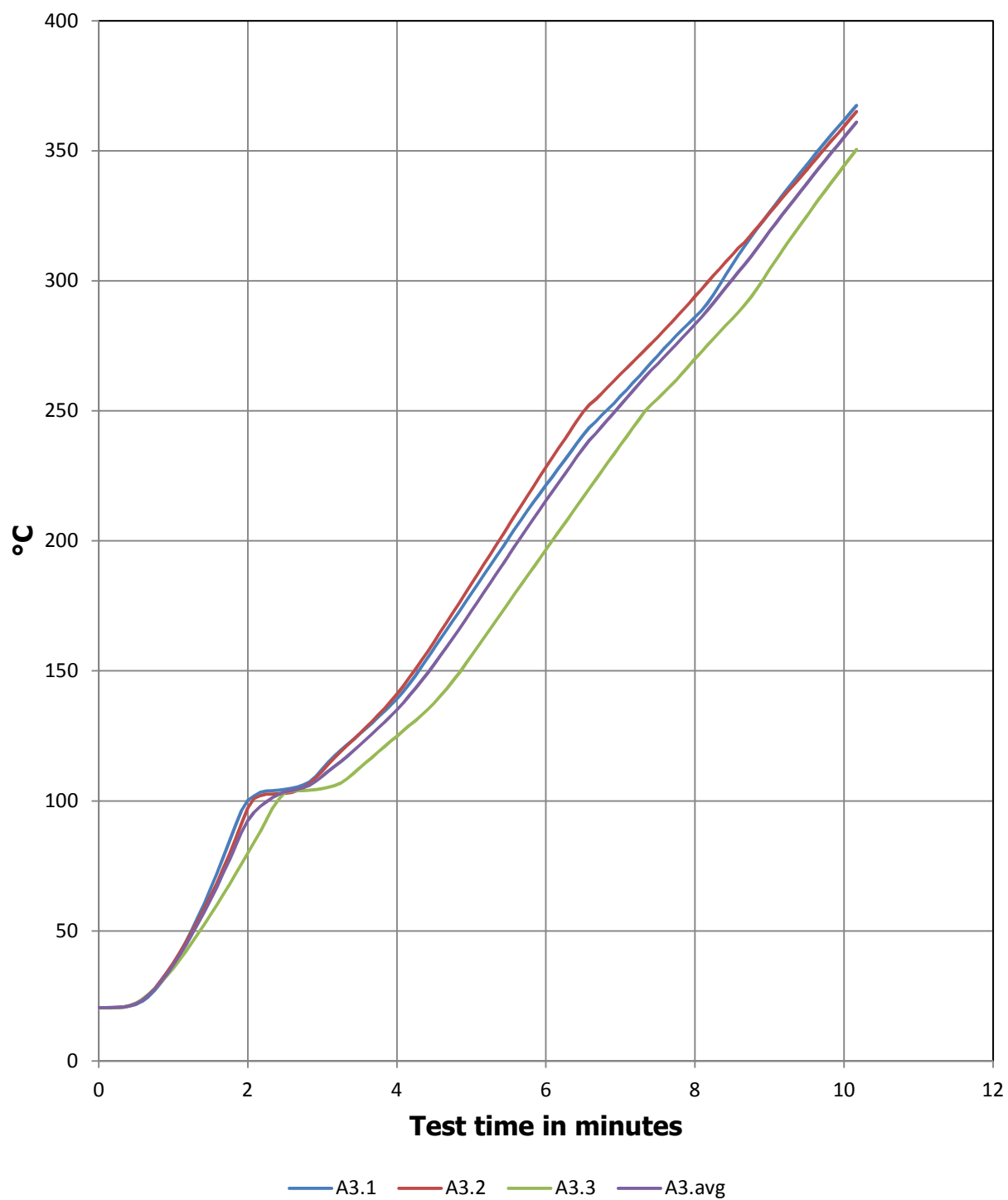




Temperatures on test specimen A2

Min. / °C	A2.1	A2.2	A2.3	A2.Avg
0.0	20.5	20.8	20.8	20.7
0.5	23.5	22.3	22.2	22.7
1.0	41.1	36.1	38.9	38.7
1.5	68.9	60.8	76.4	68.7
2.0	101.4	101.7	102.0	101.7
2.5	107.2	103.1	104.6	105.0
3.0	122.5	107.3	122.2	117.3
3.5	140.7	123.2	138.4	134.1
4.0	162.1	139.6	157.6	153.1
4.5	185.0	161.3	179.3	175.2
5.0	207.9	182.3	201.0	197.0
5.5	229.2	201.3	221.7	217.4
6.0	248.8	219.6	239.6	236.0
6.5	267.8	238.2	256.5	254.2
7.0	284.6	256.4	273.2	271.4
7.5	297.4	269.2	289.7	285.4
8.0	313.5	280.1	308.7	300.8
8.5	331.3	293.2	328.8	317.8
9.0	349.7	310.0	349.2	336.3
9.5	368.1	327.2	369.3	354.9
10.0	386.7	343.7	388.9	373.1

Temperatures on test specimen A3

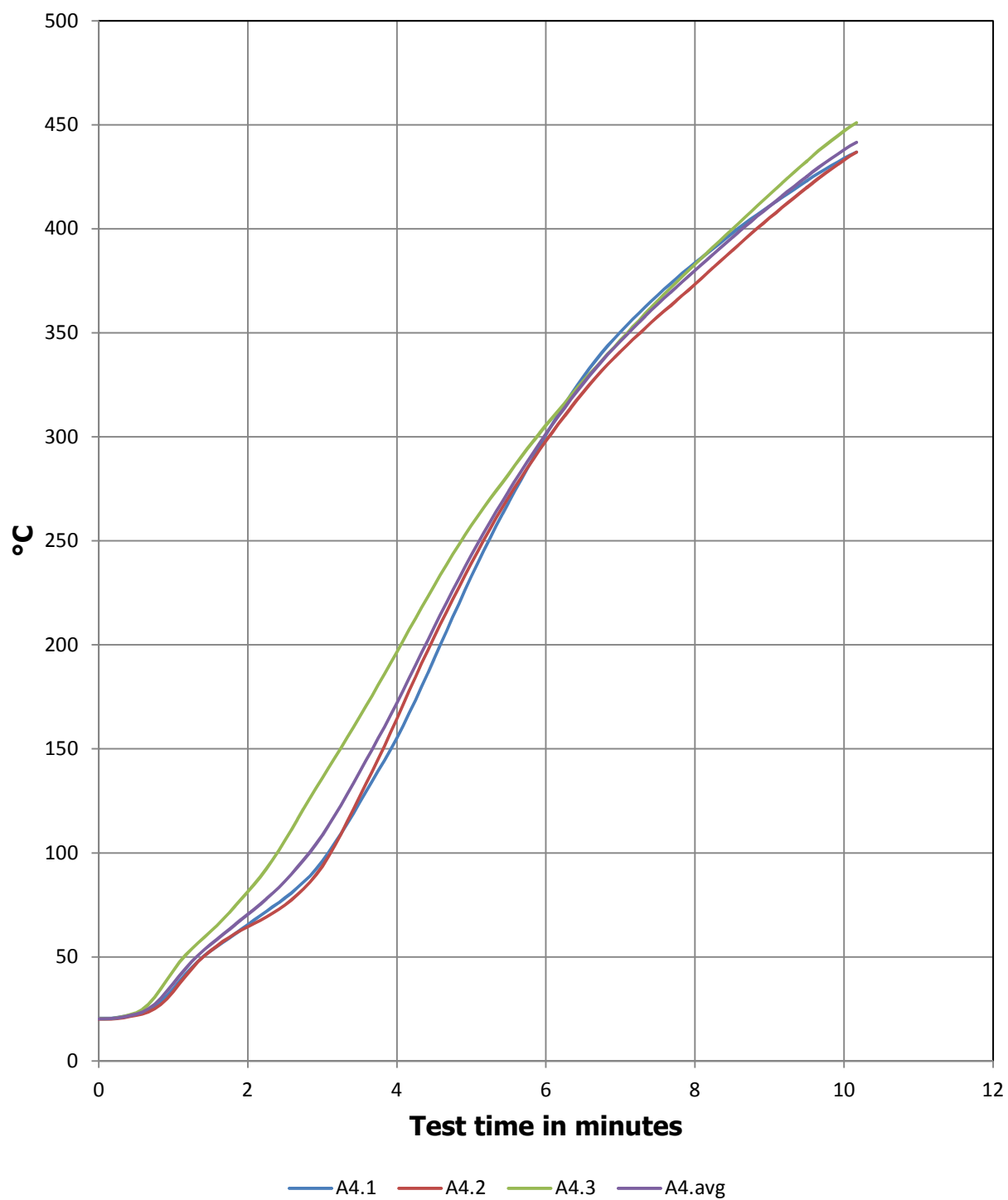




Temperatures on test specimen A3

Min. / °C	A3.1	A3.2	A3.3	A3.Avg
0.0	20.5	20.5	20.4	20.5
0.5	21.7	22.1	22.3	22.0
1.0	37.3	37.7	35.7	36.9
1.5	66.1	63.5	56.2	61.9
2.0	100.3	97.3	79.9	92.5
2.5	104.5	102.9	103.3	103.6
3.0	112.3	111.5	104.7	109.5
3.5	125.6	125.9	112.6	121.4
4.0	139.2	141.0	124.9	135.1
4.5	158.7	161.2	137.6	152.5
5.0	179.8	183.4	155.8	173.0
5.5	201.0	206.0	176.2	194.4
6.0	221.3	228.3	196.6	215.4
6.5	240.7	249.6	216.8	235.7
7.0	255.6	264.1	236.8	252.1
7.5	271.2	278.4	254.6	268.1
8.0	286.0	293.9	270.0	283.3
8.5	306.2	310.0	285.4	300.5
9.0	326.3	326.1	304.4	318.9
9.5	344.6	342.7	324.9	337.4
10.0	361.7	359.4	344.3	355.1

Temperatures on test specimen A4

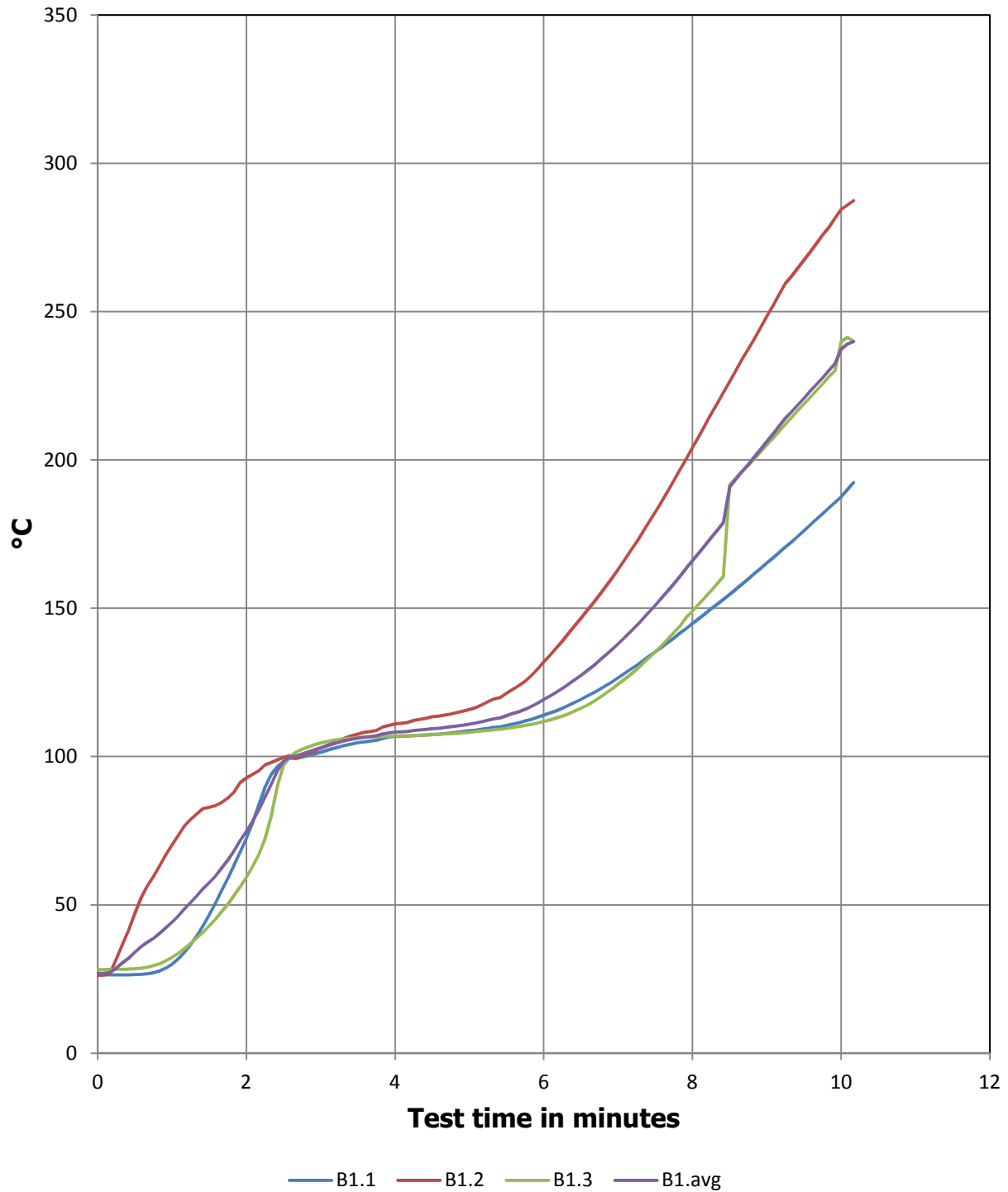




Temperatures on test specimen A4

Min. / °C	A4.1	A4.2	A4.3	A4.Avg
0.0	20.5	20.1	20.3	20.3
0.5	22.4	21.9	23.1	22.5
1.0	34.9	33.3	43.4	37.2
1.5	52.9	53.0	62.2	56.0
2.0	65.6	64.5	81.3	70.5
2.5	78.4	75.0	106.1	86.5
3.0	96.0	93.6	136.0	108.5
3.5	124.1	127.0	165.4	138.9
4.0	155.2	164.4	196.6	172.1
4.5	193.1	203.7	228.4	208.4
5.0	232.8	239.1	257.4	243.1
5.5	268.6	271.0	282.1	273.9
6.0	300.9	298.0	305.4	301.5
6.5	328.7	321.4	326.7	325.6
7.0	350.4	341.0	346.4	345.9
7.5	368.1	357.7	365.4	363.8
8.0	383.6	373.4	382.9	380.0
8.5	397.9	389.5	399.8	395.7
9.0	410.9	405.2	416.5	410.8
9.5	423.1	419.8	432.5	425.1
10.0	433.9	433.0	447.0	438.0

Temperatures on test specimen B1

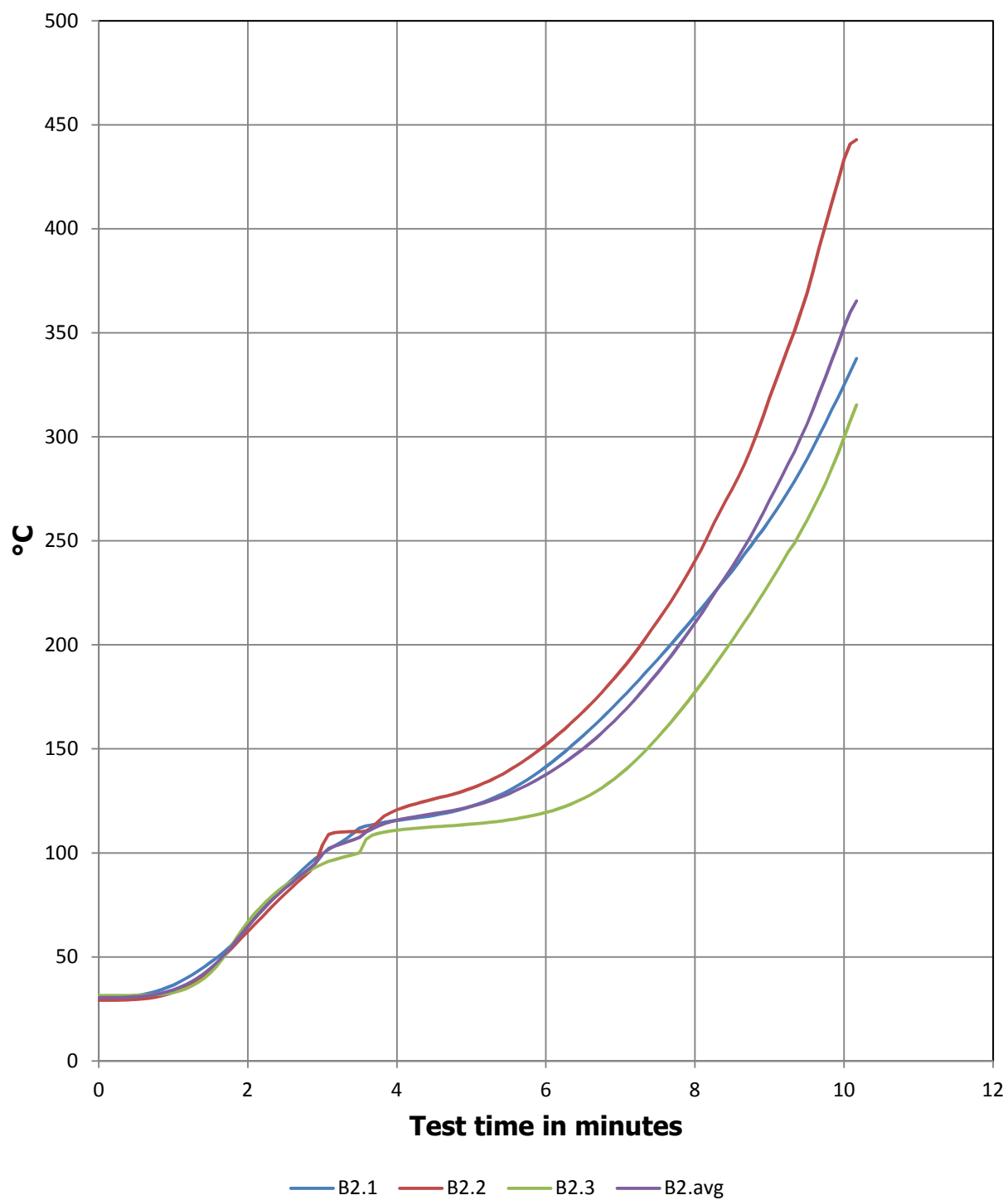




Temperatures on test specimen B1

Min. / °C	B1.1	B1.2	B1.3	B1.Avg
0.0	26.4	26.3	28.2	27.0
0.5	26.5	47.0	28.4	34.0
1.0	30.0	70.2	32.3	44.2
1.5	46.6	82.9	42.9	57.5
2.0	72.4	92.8	59.3	74.8
2.5	98.2	99.7	97.1	98.3
3.0	101.4	102.8	104.6	103.0
3.5	104.6	107.6	106.4	106.2
4.0	106.8	111.0	106.9	108.2
4.5	107.4	113.4	107.4	109.4
5.0	108.7	115.9	108.2	110.9
5.5	110.5	121.4	109.5	113.8
6.0	113.9	131.8	111.8	119.2
6.5	119.3	146.6	116.2	127.4
7.0	126.6	163.1	124.4	138.0
7.5	135.3	182.4	135.3	151.0
8.0	144.8	204.1	149.1	166.0
8.5	154.7	226.4	191.6	190.9
9.0	165.2	248.4	205.0	206.2
9.5	176.1	267.4	218.9	220.8
10.0	187.5	284.5	239.8	237.3

Temperatures on test specimen B2

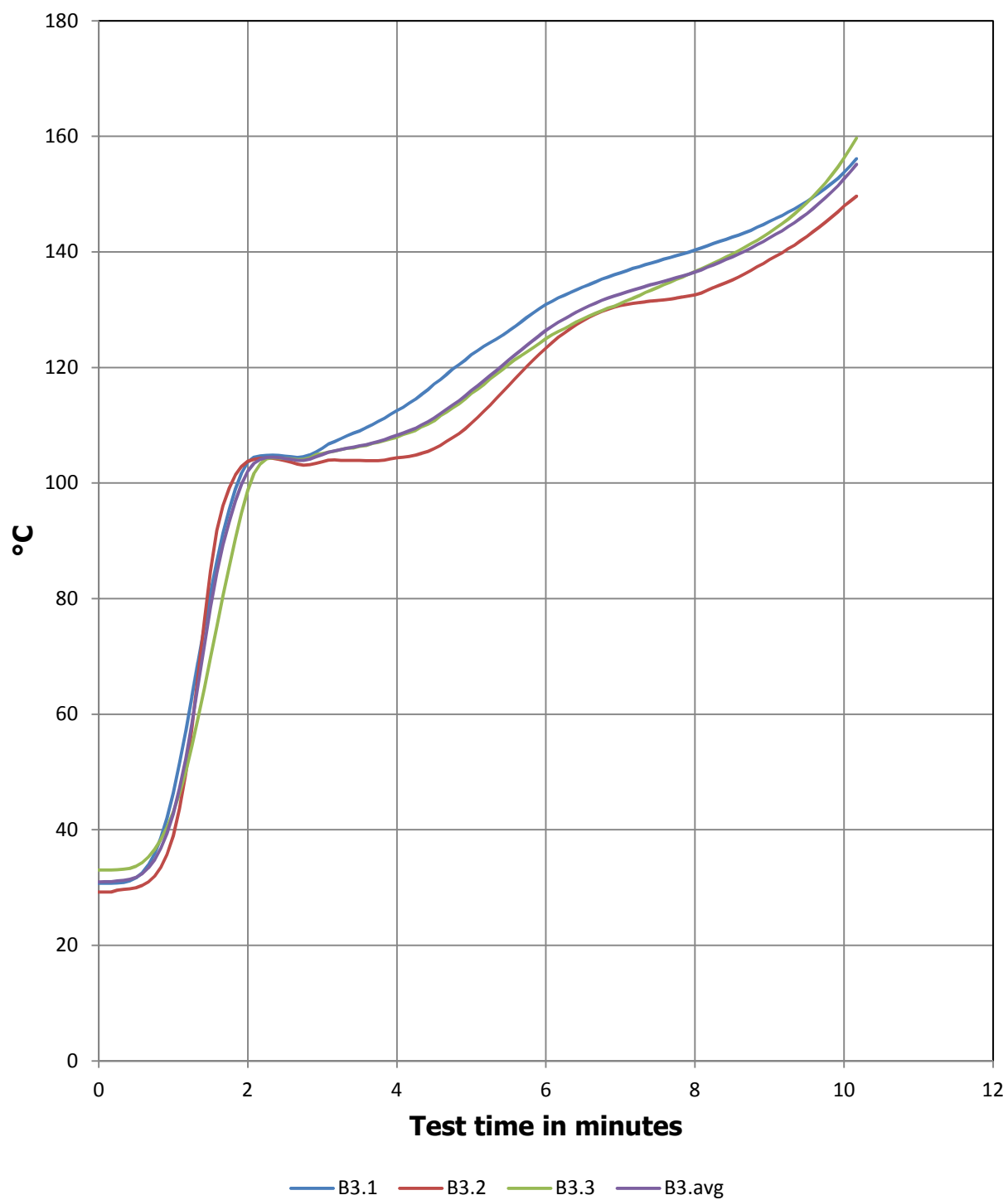




Temperatures on test specimen B2

Min. / °C	B2.1	B2.2	B2.3	B2.Avg
0.0	30.6	29.2	31.5	30.4
0.5	31.4	29.5	31.6	30.8
1.0	36.5	33.0	32.9	34.1
1.5	47.4	43.9	42.3	44.5
2.0	64.7	62.2	66.8	64.6
2.5	84.2	80.4	84.3	82.9
3.0	99.6	103.8	94.6	99.3
3.5	112.0	110.2	100.1	107.4
4.0	115.6	120.7	110.9	115.7
4.5	118.1	126.0	112.6	118.9
5.0	122.4	131.1	113.8	122.4
5.5	129.9	139.5	115.9	128.4
6.0	141.4	152.0	119.4	137.6
6.5	156.4	167.9	126.1	150.1
7.0	173.8	187.4	137.9	166.4
7.5	193.1	211.6	155.5	186.7
8.0	213.8	240.3	177.3	210.4
8.5	235.7	275.0	202.2	237.6
9.0	260.0	318.8	229.7	269.5
9.5	289.1	368.8	259.7	305.9
10.0	324.9	433.4	299.7	352.6

Temperatures on test specimen B3

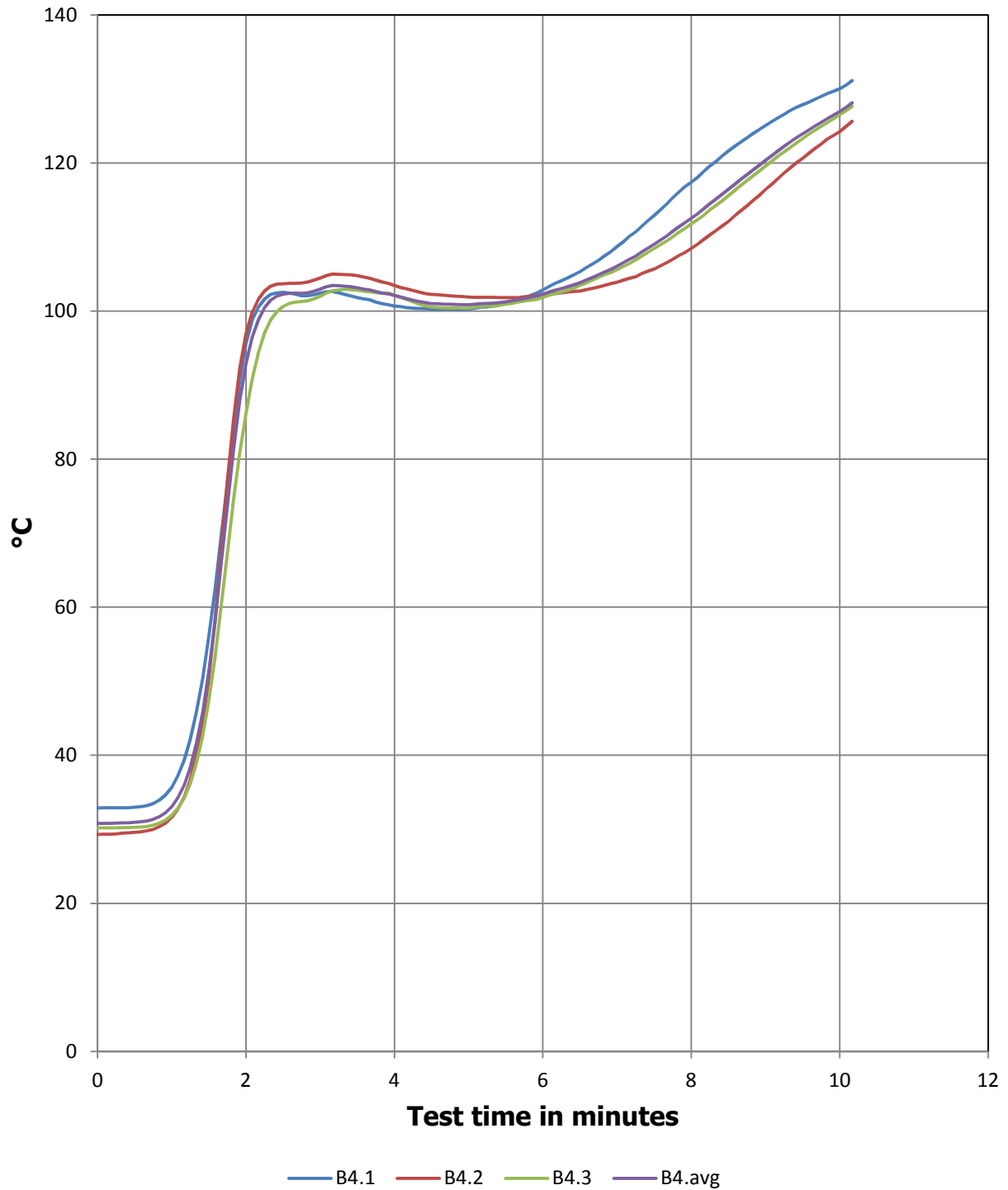




Temperatures on test specimen B3

Min. / °C	B3.1	B3.2	B3.3	B3.Avg
0.0	30.7	29.2	33.0	31.0
0.5	31.6	30.0	33.7	31.8
1.0	46.4	39.0	43.1	42.8
1.5	81.0	84.8	69.8	78.5
2.0	103.7	103.8	98.8	102.1
2.5	104.6	103.9	104.3	104.3
3.0	106.0	103.7	105.1	104.9
3.5	109.0	103.9	106.4	106.4
4.0	112.5	104.4	107.9	108.3
4.5	117.1	105.9	110.8	111.3
5.0	122.2	110.4	115.5	116.0
5.5	126.3	116.9	120.6	121.3
6.0	130.9	123.3	125.0	126.4
6.5	133.9	128.1	128.5	130.2
7.0	136.4	130.7	131.1	132.7
7.5	138.4	131.6	133.8	134.6
8.0	140.3	132.6	136.6	136.5
8.5	142.6	135.1	139.6	139.1
9.0	145.3	138.6	143.3	142.4
9.5	148.7	142.6	148.5	146.6
10.0	153.8	147.9	156.2	152.6

Temperatures on test specimen B4

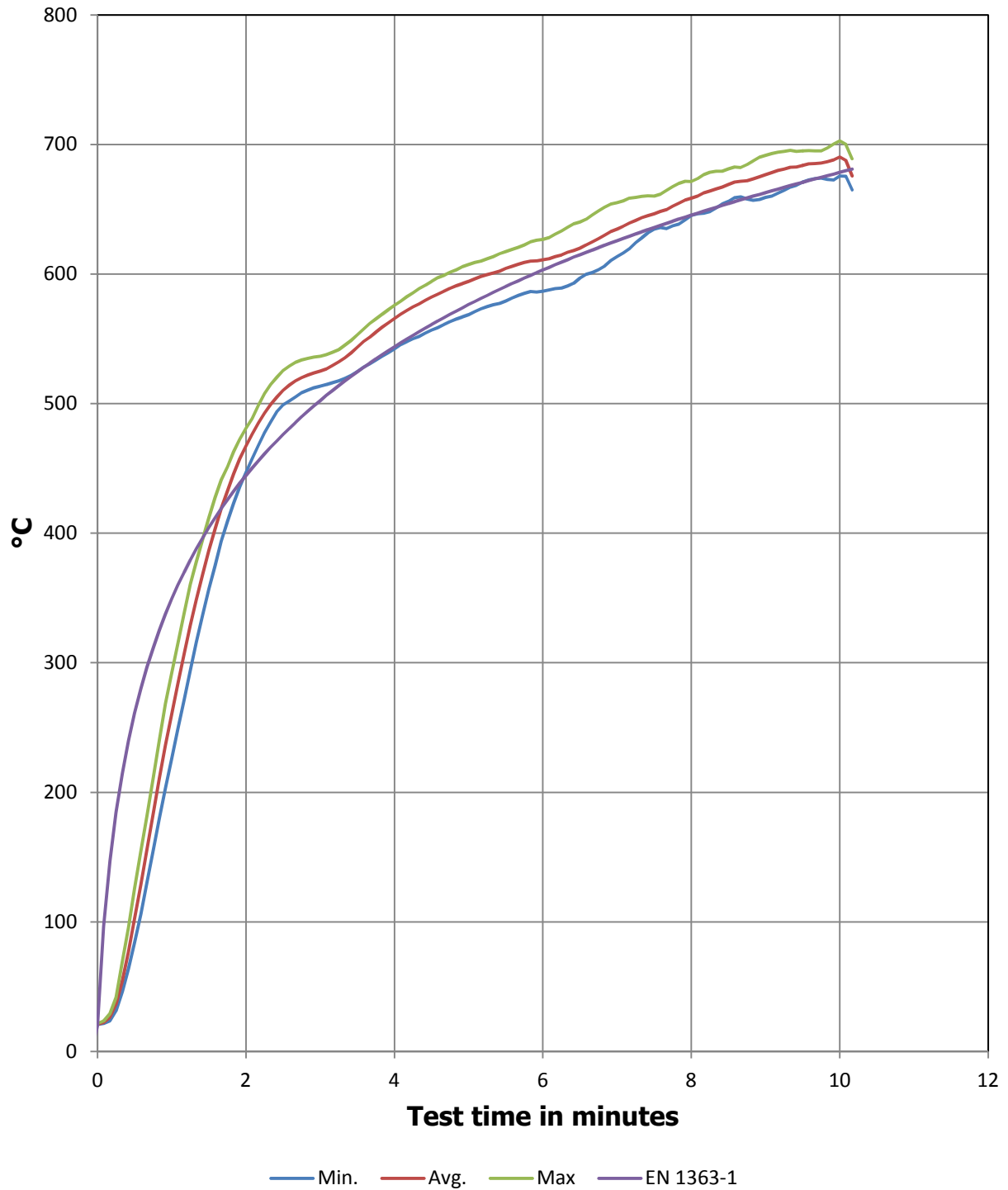




Temperatures on test specimen B4

Min. / °C	B4.1	B4.2	B4.3	B4.Avg
0.0	32.9	29.3	30.2	30.8
0.5	33.0	29.6	30.3	30.9
1.0	35.7	31.6	31.9	33.1
1.5	56.0	50.4	47.4	51.2
2.0	95.6	97.0	86.2	92.9
2.5	102.5	103.7	100.6	102.3
3.0	102.4	104.5	102.0	103.0
3.5	101.8	104.8	102.8	103.1
4.0	100.7	103.5	102.1	102.1
4.5	100.3	102.2	100.5	101.0
5.0	100.2	101.9	100.4	100.8
5.5	101.1	101.8	100.9	101.3
6.0	102.9	102.2	101.8	102.3
6.5	105.3	102.7	103.5	103.8
7.0	108.7	103.9	105.6	106.1
7.5	112.9	105.7	108.5	109.0
8.0	117.4	108.5	111.8	112.5
8.5	121.6	112.1	115.6	116.5
9.0	125.1	116.4	119.6	120.4
9.5	127.9	120.6	123.3	123.9
10.0	130.0	124.2	126.5	126.9

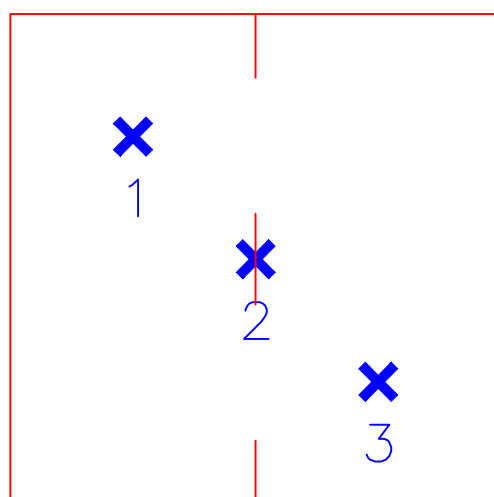
Furnace temperature





Furnace temperature

Time Minutes	Measured			Norm EN 1363-1	Area under curve		Dev. [%]	Limit [%]
	Minimum	Average	Maximum		Measured	EN 1363-1		
0.0	20.8	21.1	21.4	20.0	0	0	#DIV/0!	
0.5	83.9	102.4	125.7	261.1	23	85	-72.7	
1.0	226.2	260.4	292.3	349.2	115	240	-52.2	
1.5	356.6	386.4	411.7	404.3	278	429	-35.2	
2.0	446.8	467.4	481.0	444.5	493	642	-23.1	
2.5	499.0	510.1	525.4	476.2	739	872	-15.3	
3.0	513.4	525.2	536.6	502.3	999	1117	-10.6	
3.5	524.7	543.4	553.1	524.5	1265	1374	-7.9	
4.0	542.2	565.8	575.9	543.9	1543	1641	-6.0	
4.5	556.7	582.1	594.4	561.0	1830	1917	-4.6	
5.0	568.6	594.3	607.3	576.4	2124	2202	-3.5	
5.5	579.2	604.2	617.3	590.4	2424	2494	-2.8	15.0
6.0	586.7	611.0	626.7	603.1	2728	2792	-2.3	15.0
6.5	597.0	620.0	640.3	614.9	3035	3096	-2.0	15.0
7.0	613.5	634.7	655.0	625.8	3349	3407	-1.7	15.0
7.5	634.6	646.4	660.1	635.9	3670	3722	-1.4	15.0
8.0	645.3	658.5	671.5	645.5	3996	4042	-1.2	15.0
8.5	656.0	669.2	681.2	654.4	4328	4367	-0.9	15.0
9.0	659.0	676.6	691.6	662.8	4664	4697	-0.7	15.0
9.5	671.0	683.9	695.1	670.8	5005	5030	-0.5	15.0
10.0	675.8	690.3	702.9	678.4	5348	5368	-0.4	15.0



- ✘ Thermocouples placed on the back side of the covering

All measurements are in mm

Danish Institute of Fire and security Technology

Sponsor: INNOBYG

Subject: Small scale tests

File No.: FUN0001

Enclosure: 15.0