



Test report

InnoBYG small scale demonstration tests - Part 3

File FUN0001
Serial No.: 3
Ref.: TDJ/AND
Pages: 15
Enclosures: 31

Test date: 2014-04-23
Date: 2014-07-09

1 NAME OF SPONSOR



2 DATE OF TEST

2014-04-23

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 PUR 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 polyurethane (PUR) insulation. The PUR 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

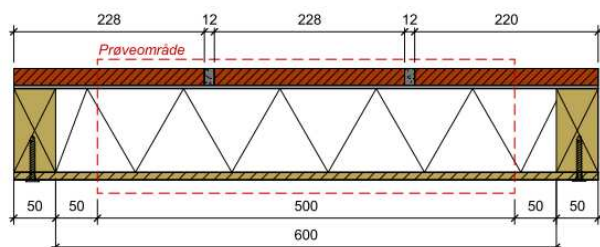
The details of the construction and the measures for the test specimens are described in the enclosed documentation:

Type:	Enclosure:	Description:
Drawing A1.5		Test specimens no A1, A2, A3 and A4
Drawing A1.6		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.

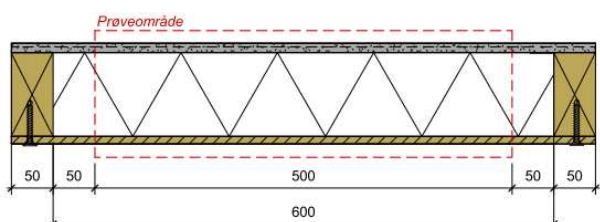
Test specimen A1

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



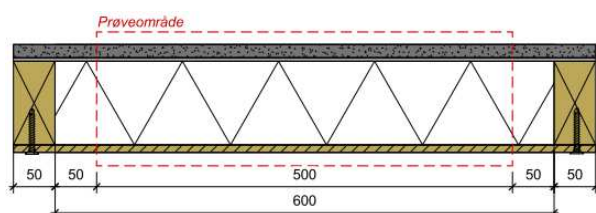
Test specimen A2

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



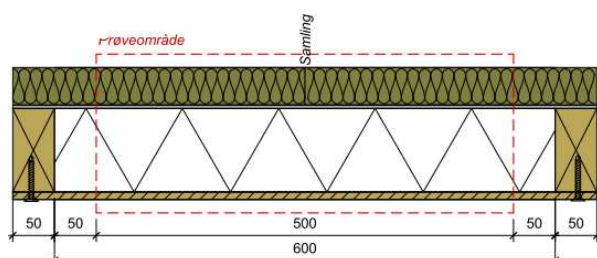
Test specimen A3

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



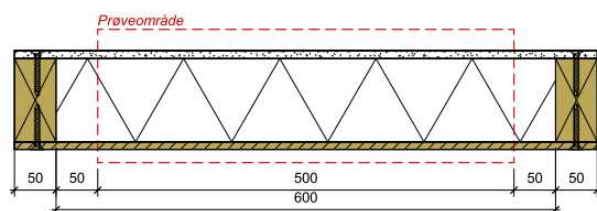
Test specimen A4

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 PUR insulation
Backing board:	9 mm chipboard



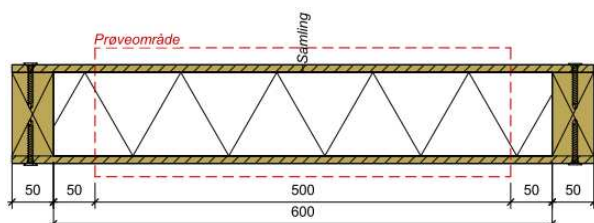
Test specimen B1

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 PUR insulation
Backing board:	9 mm chipboard



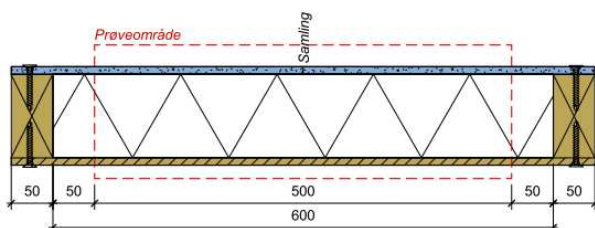
Test specimen B2

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 PUR insulation
Backing board:	9 mm chipboard



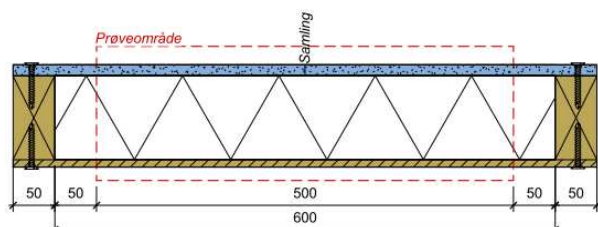
Test specimen B3

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 PUR 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 PUR 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
3	all	No visual change og unexposed side
6	all	Light smoke development from the edges of the test specimens
8	A1	Increasing smoke development, particularly from test specimen A1
10		Test stopped

Test 2:

Time minutes	Test specimen	Observations
0		Test start
1	B2	Light smoke development

3	B2	Increased smoke development
3	B1 and B4	Light smoke development
5	all	No visual change on unexposed side
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 PUR insulation did not function and the brick layer had detached from the insulation even before the fire test. This could have been caused by the foil on the insulation.

The brick layer remained as a solid layer, which could rest on the test frame in order to complete the fire test. However this could not have been done in a full scale test where the brick layer would have fallen down into the furnace.

The foil on the insulation had peeled off, but was not charred. The PUR insulation was intact.



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- A2 The plaster was intact as a solid board, held together by the reinforcement mesh, but it had detached from the insulation. Some spalling of the plaster occurred on exposed side during the cooling phase.

The foil on the insulation was charred and peeled off after the test. The PUR insulation was charred on the surface and it had shrunk approx. 20 mm.



-
- A3 The plaster has cracked during the test, and fell apart after the test.

The foil on the insulation was charred and peeled off after the test. The PUR insulation was charred on the surface and it had melted/shrunk approx. 35-40 mm.



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

The foil on the PUR insulation was charred and peeled off after the test. The PUR insulation was charred on the surface and it had melted/shrunk approx. 25-30 mm.



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

The foil on the PUR insulation was charred in lines corresponding with the joints of the planks.

The PUR insulation was charred on the surface in lines corresponding with the joints of the planks and it had melted/shrunk approx. 5-10 mm.



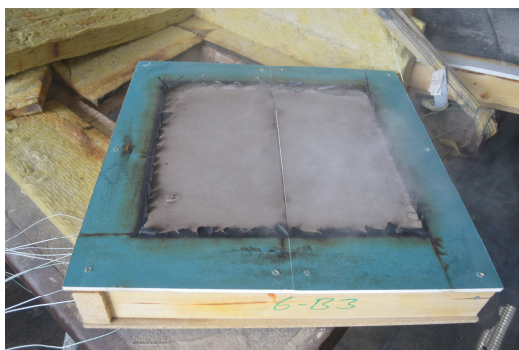
B2 The plywood was heavily charred and was burned through in the centre area.

The foil on the PUR insulation was charred and peeled off after the test. The PUR insulation was charred on the surface and it had melted/shrunk approx. 15 mm.



B3 The paper of the gypsum boards have burned, and there were minor cracks in the boards after the test. The joint did not appear to have opened.

The PUR insulation and the foil were intact with no charring, melting or shrinking and no discolouration.



B4 The paper of the gypsum boards have burned, and there were minor cracks in the boards after the test. The joint did not appear to have opened.

The PUR insulation and the foil were intact with no charring, melting or shrinking and no discolouration.



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.

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/

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M.Sc. (Eng.)

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

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

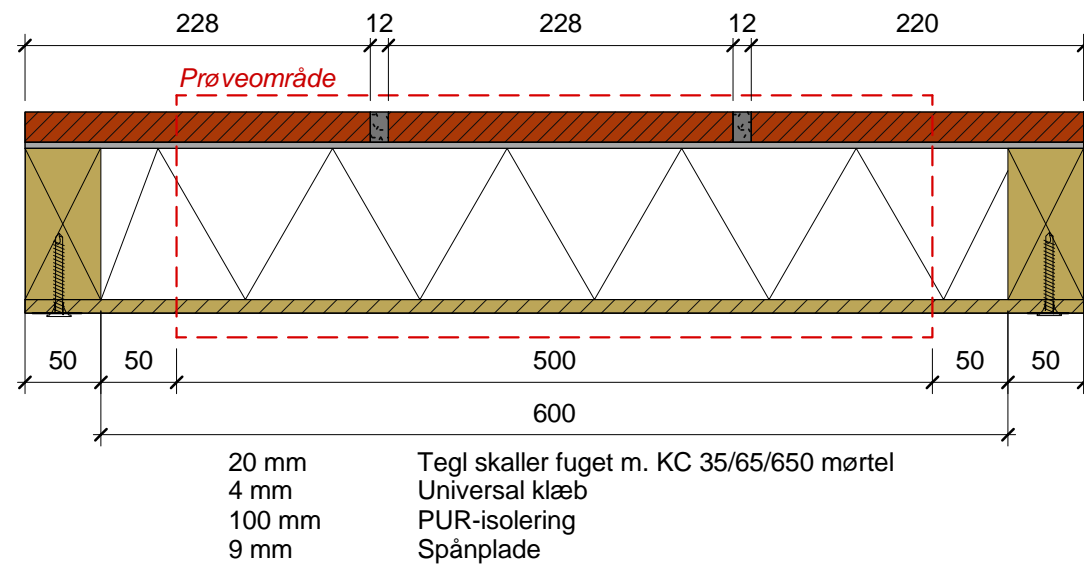
Photo No. 2 Test specimens no A1, A2, A3 and A4 seen after the test (test 1)

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

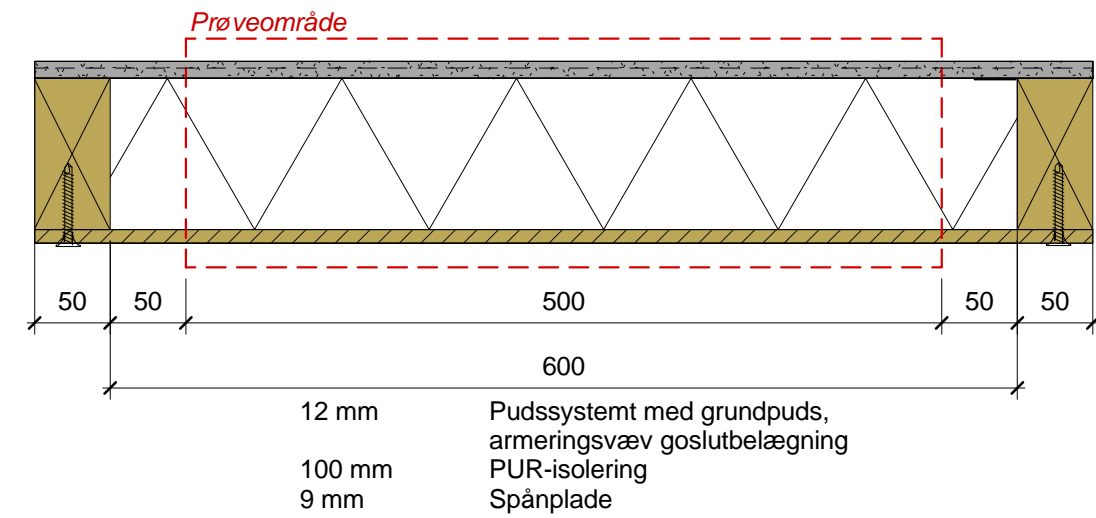
Photo No. 4 Test specimens no B1, B2, B3 and B4 after 9 minutes of testing (test 2)

Photo No. 5 Test specimens no B1, B2 B3 and B4 after the test (test 2)

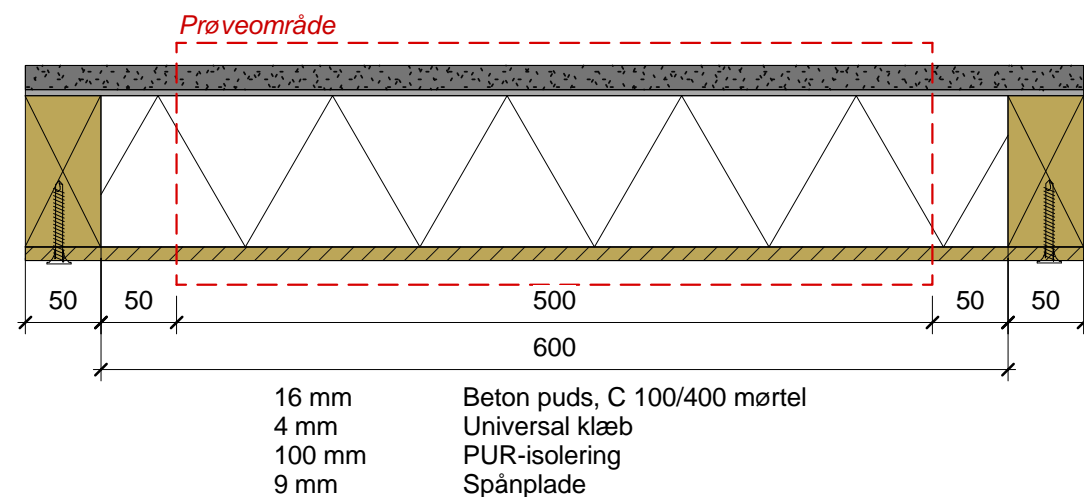
A1: Skærmtegl, PUR-isolering



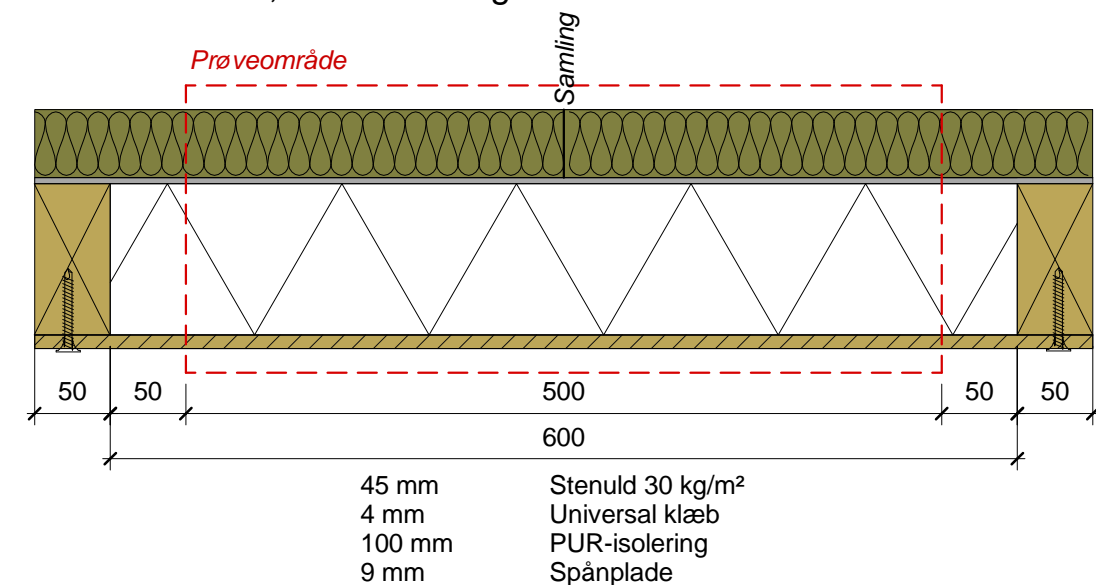
A2: Pudssystem, PUR-isolering



A3: Betonpuds, PUR-isolering



A4: Stenuld, PUR-isolering



Bygherre: InnoBYG

Sag: Brandtekniske eksperimenter

Emne: InnoBYG brandprøvninger del 3, A

Int.: Author | Kontr.: CheckerDato: 02/20/14

Sags nr.:

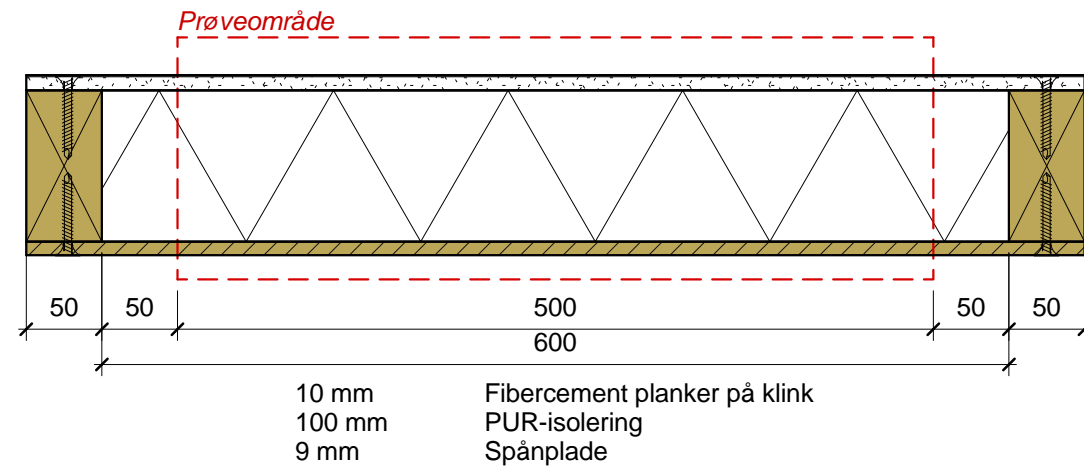
Tegn. nr.:

A1.5

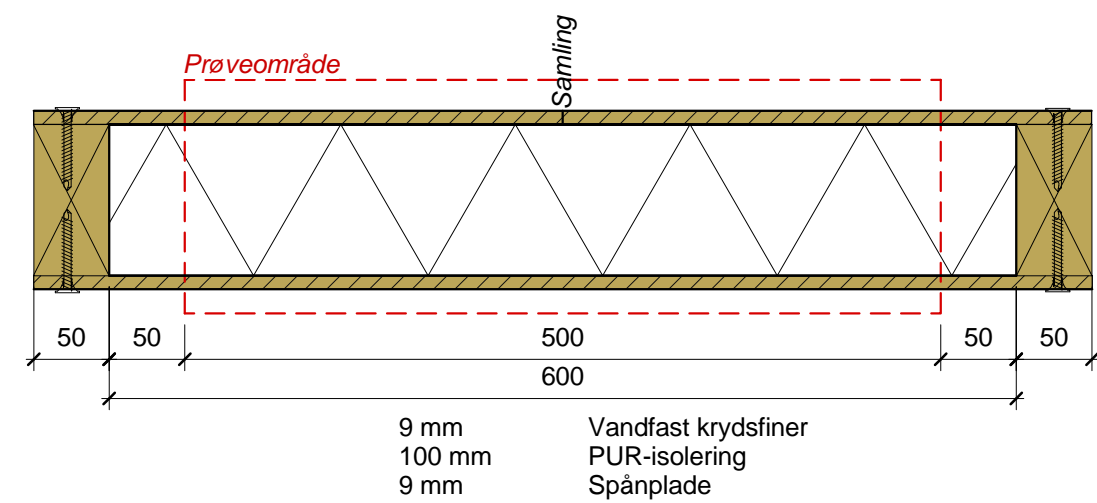
Rev. dato:

Mål: 1 : 5

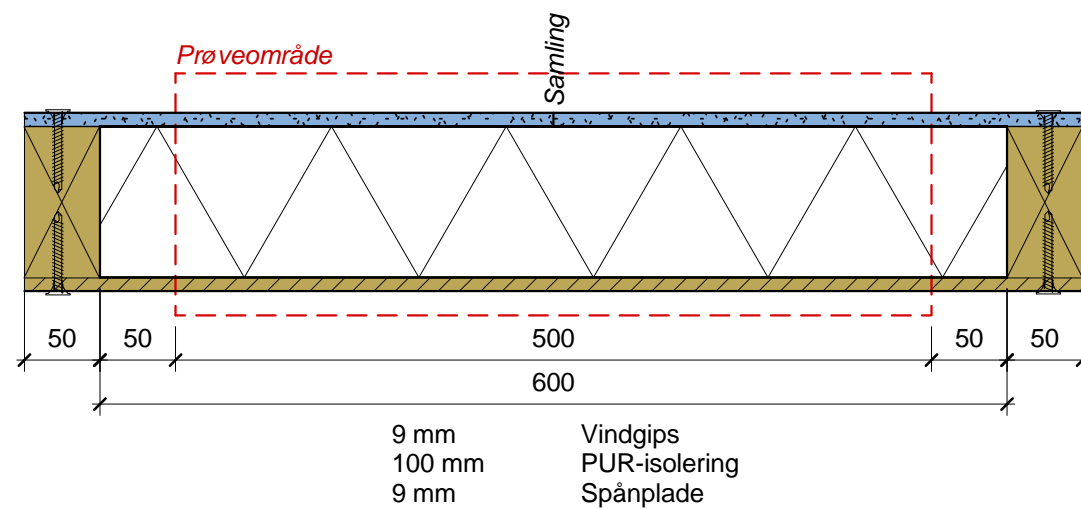
B1: Fibercement planker på klink, PUR-isolering



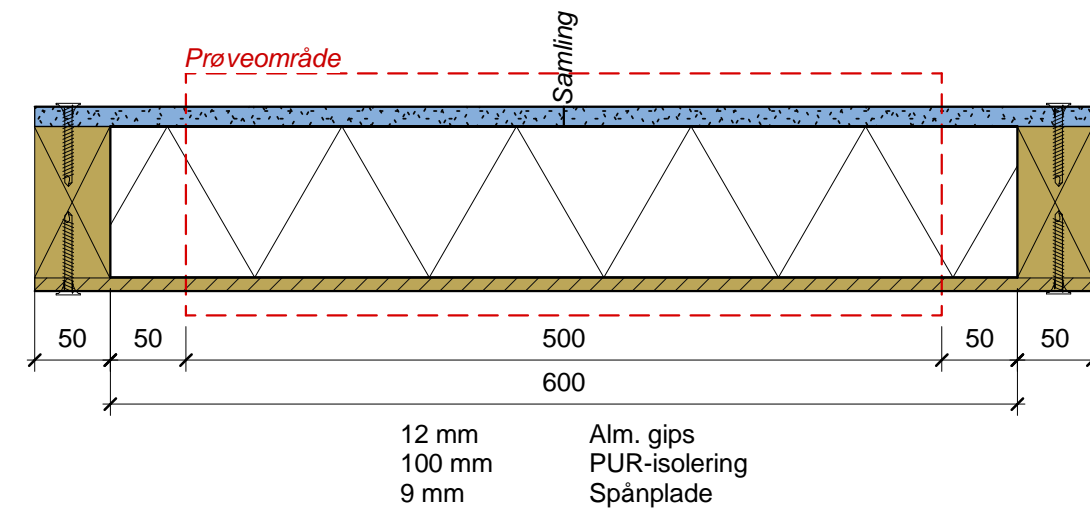
B2: Krydsfiner, PUR-isolering



B3: Vindgips, PUR-isolering



B4: Gips, PUR-isolering



Bygherre: InnoBYG

Sag: Brandtekniske eksperimenter

Emne: InnoBYG brandprøvninger del 3, B

Int.: Author | Kontr.: CheckerDato: 02/20/14

Sags nr.:

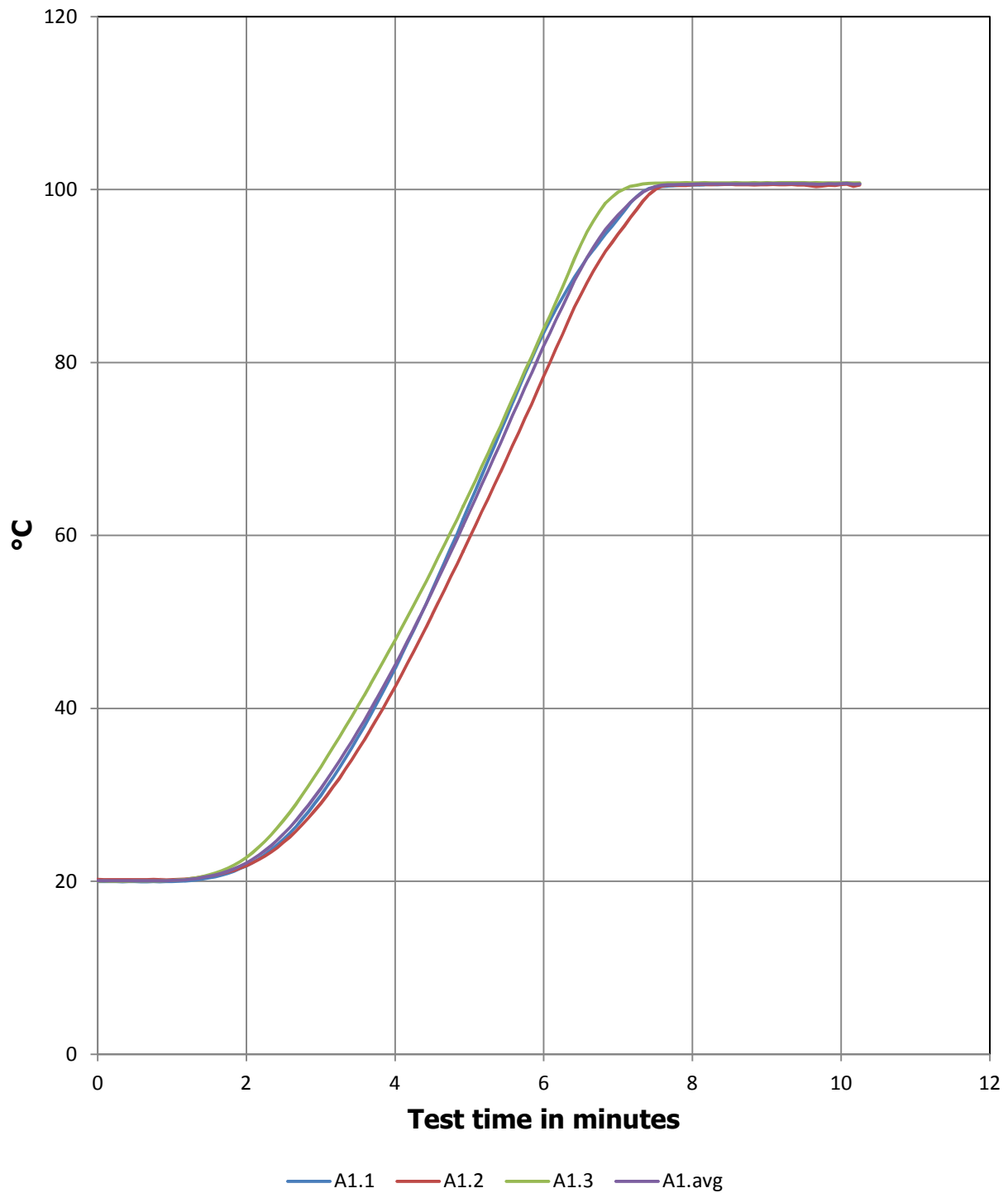
Tegn. nr.:

A1.6

Rev. dato:

Mål: 1 : 5

Temperatures on test specimen A1

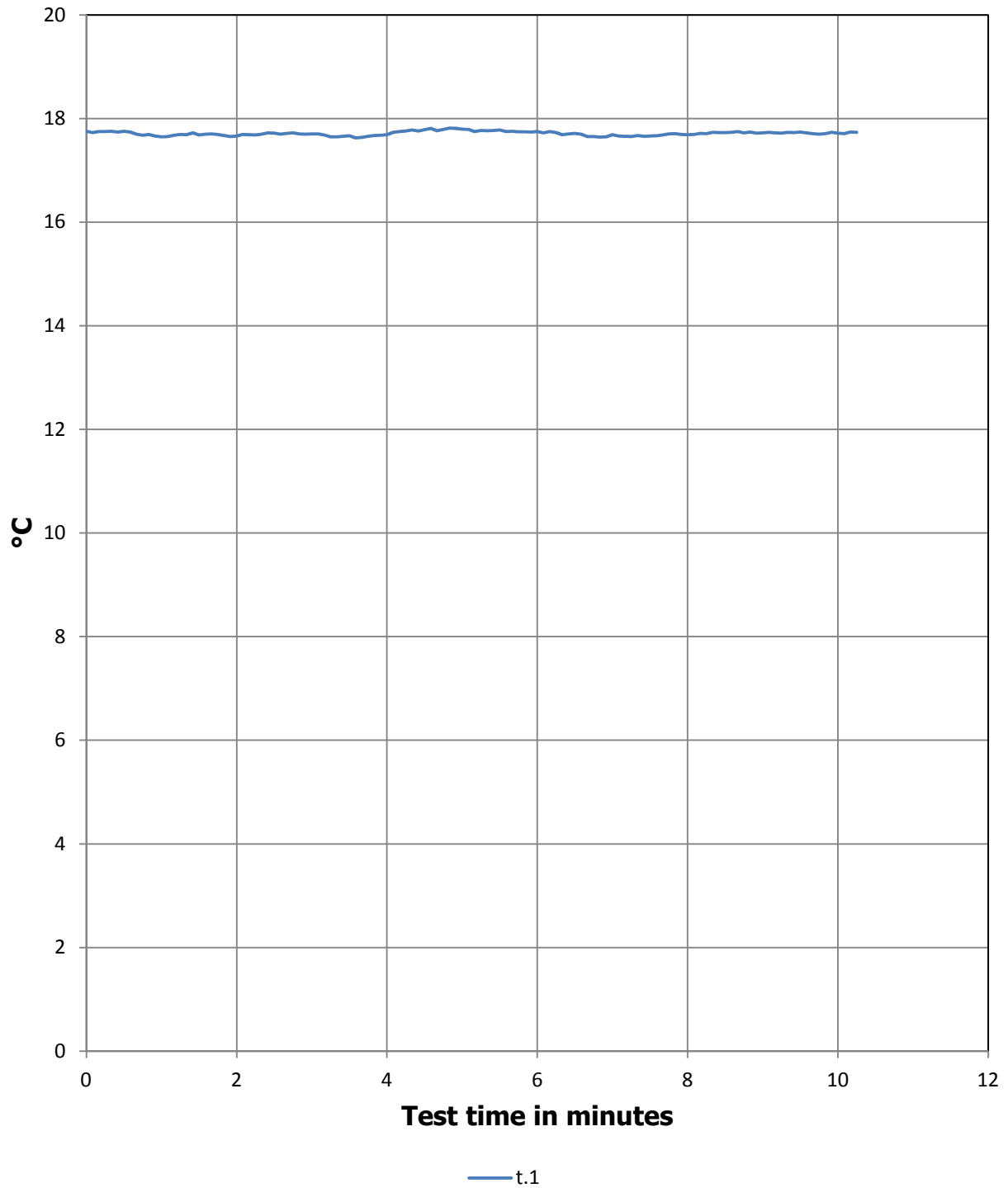




Temperatures on test specimen A1

Min. / °C	A1.1	A1.2	A1.3	A1.Avg
0.0	20.0	20.2	20.0	20.1
0.5	20.0	20.2	20.0	20.1
1.0	20.0	20.2	20.1	20.1
1.5	20.4	20.6	20.7	20.6
2.0	21.8	21.8	22.8	22.1
2.5	24.9	24.5	27.1	25.5
3.0	29.9	29.0	33.2	30.7
3.5	36.6	35.2	40.3	37.4
4.0	44.6	42.5	47.9	45.0
4.5	53.7	50.8	56.1	53.5
5.0	63.5	59.7	64.8	62.7
5.5	73.7	68.8	74.2	72.3
6.0	83.4	78.4	83.8	81.9
6.5	91.0	87.8	93.6	90.8
7.0	96.6	94.8	99.7	97.0
7.5	100.3	100.0	100.7	100.3
8.0	100.5	100.6	100.8	100.6
8.5	100.6	100.6	100.8	100.7
9.0	100.6	100.6	100.8	100.7
9.5	100.7	100.5	100.8	100.7
10.0	100.7	100.6	100.8	100.7

Ambient temperature (test 1)

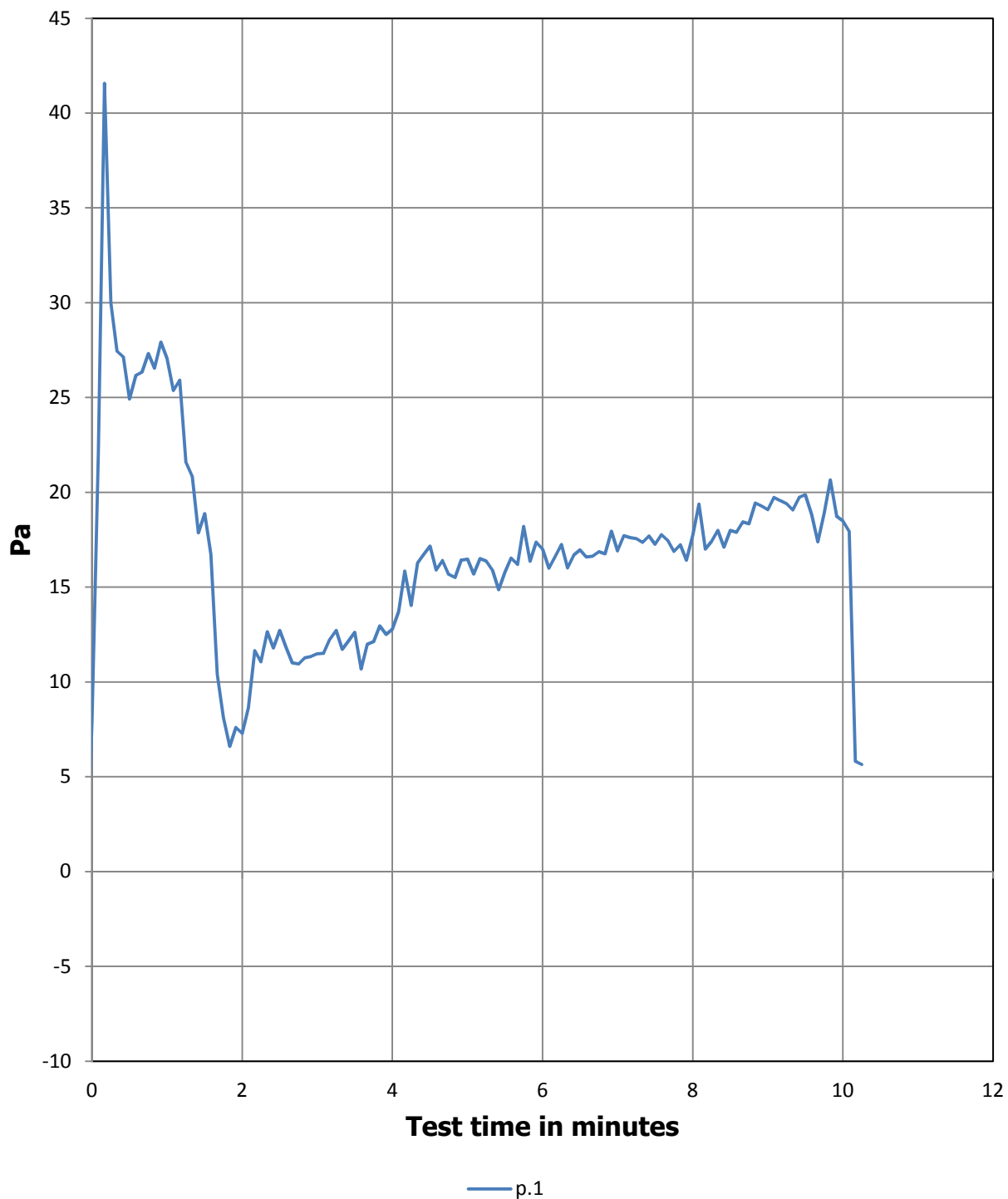




Ambient temperature (test 1)

Min. / °C	t.1
0.0	17.8
0.5	17.8
1.0	17.6
1.5	17.7
2.0	17.7
2.5	17.7
3.0	17.7
3.5	17.7
4.0	17.7
4.5	17.8
5.0	17.8
5.5	17.8
6.0	17.8
6.5	17.7
7.0	17.7
7.5	17.7
8.0	17.7
8.5	17.7
9.0	17.7
9.5	17.7
10.0	17.7

Furnace pressure (test 1)

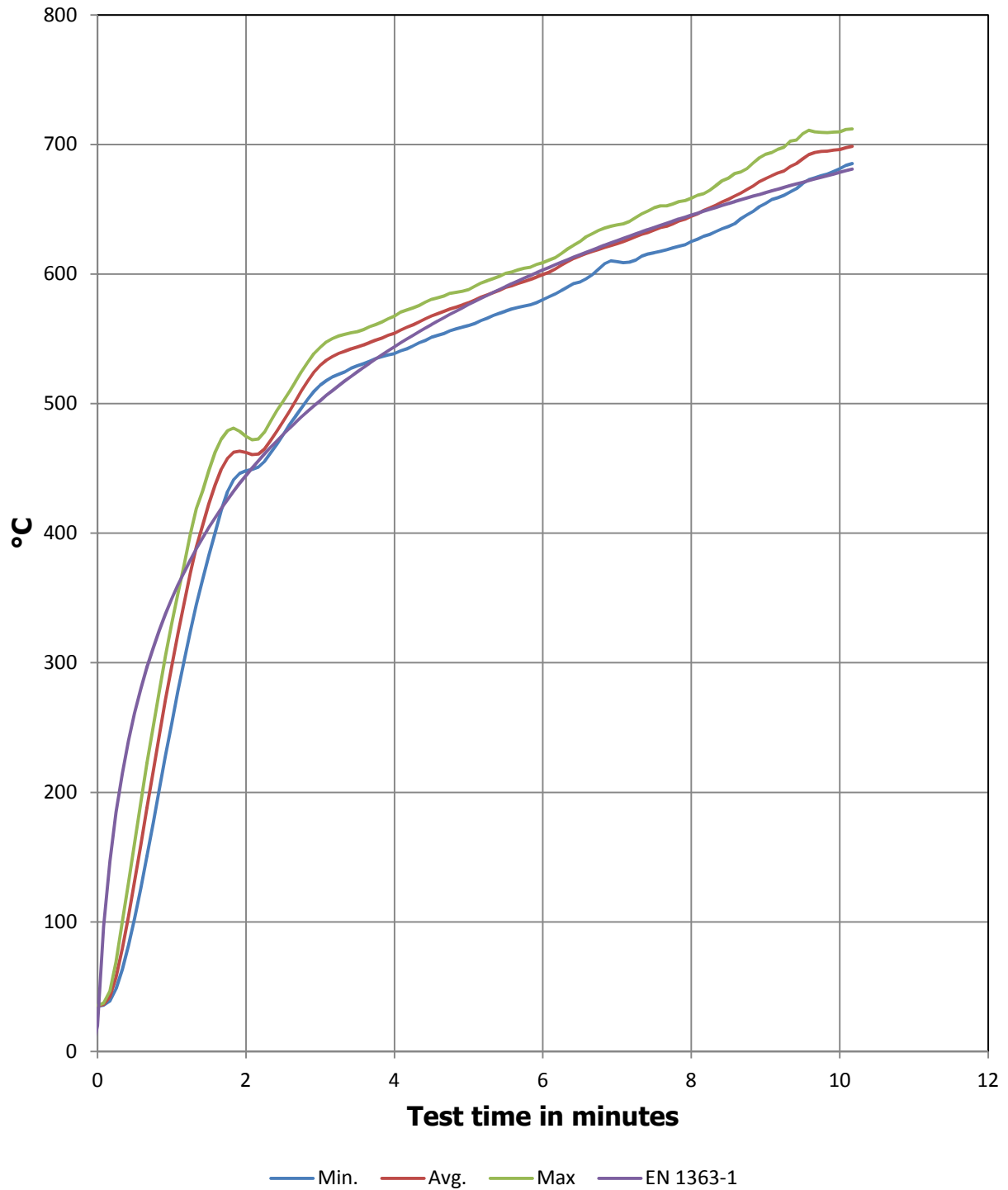




Furnace pressure (test 1)

Min. / Pa	p.1
0.0	7.9
0.5	24.9
1.0	27.1
1.5	18.9
2.0	7.3
2.5	12.7
3.0	11.5
3.5	12.6
4.0	12.8
4.5	17.2
5.0	16.5
5.5	15.8
6.0	17.0
6.5	17.0
7.0	16.9
7.5	17.3
8.0	17.7
8.5	18.0
9.0	19.1
9.5	19.9
10.0	18.5

Furnace temperature (test 2)

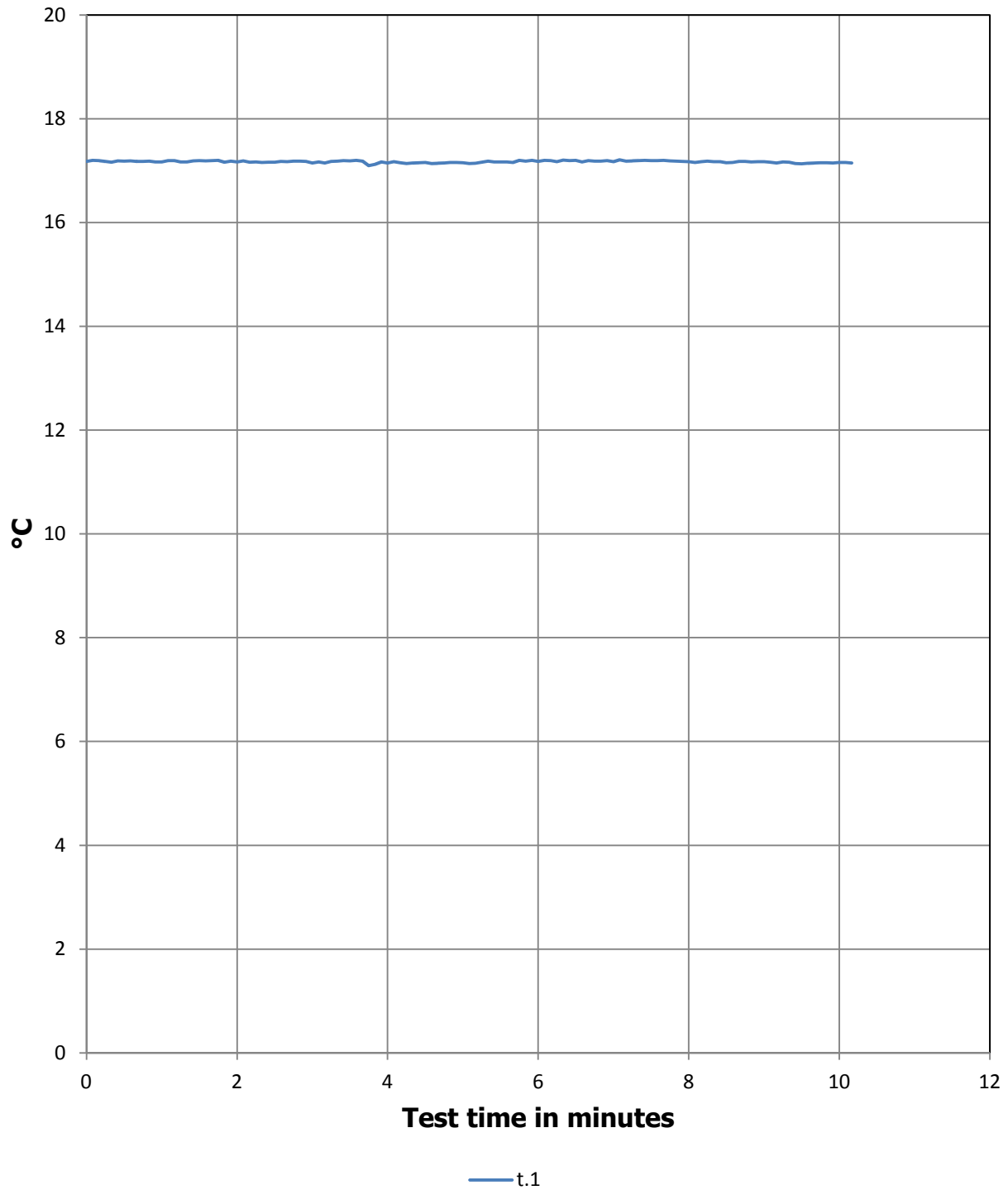




Furnace temperature (test 2)

Time Minutes	Measured			Norm EN 1363-1	Area under curve		Dev. [%]	Limit [%]
	Minimum	Average	Maximum		Measured	EN 1363-1		
0.0	34.8	35.1	35.5	20.0	0	0	#DIV/0!	
0.5	102.4	131.1	160.5	261.1	34	85	-60.7	
1.0	253.1	297.5	330.4	349.2	141	240	-41.1	
1.5	382.4	422.5	448.1	404.3	324	429	-24.5	
2.0	448.2	462.3	474.7	444.5	550	642	-14.3	
2.5	475.7	486.2	501.7	476.2	784	872	-10.1	
3.0	514.3	529.6	543.6	502.3	1039	1117	-7.0	
3.5	529.2	543.6	555.5	524.5	1308	1374	-4.8	
4.0	538.6	554.3	567.5	543.9	1583	1641	-3.6	
4.5	551.2	567.6	580.4	561.0	1863	1917	-2.8	
5.0	560.2	577.8	587.8	576.4	2149	2202	-2.4	
5.5	571.5	589.5	600.6	590.4	2441	2494	-2.1	15.0
6.0	580.2	599.5	608.7	603.1	2738	2792	-1.9	15.0
6.5	593.9	614.1	625.1	614.9	3042	3096	-1.8	15.0
7.0	609.5	623.4	638.0	625.8	3351	3407	-1.6	15.0
7.5	616.5	634.0	651.1	635.9	3666	3722	-1.5	15.0
8.0	625.0	644.5	658.5	645.5	3985	4042	-1.4	15.0
8.5	636.6	657.7	673.9	654.4	4311	4367	-1.3	15.0
9.0	654.4	673.7	692.3	662.8	4644	4697	-1.1	15.0
9.5	670.0	689.0	708.2	670.8	4984	5030	-0.9	15.0
10.0	681.1	696.1	709.7	678.4	5331	5368	-0.7	15.0

Ambient temperature (test 2)

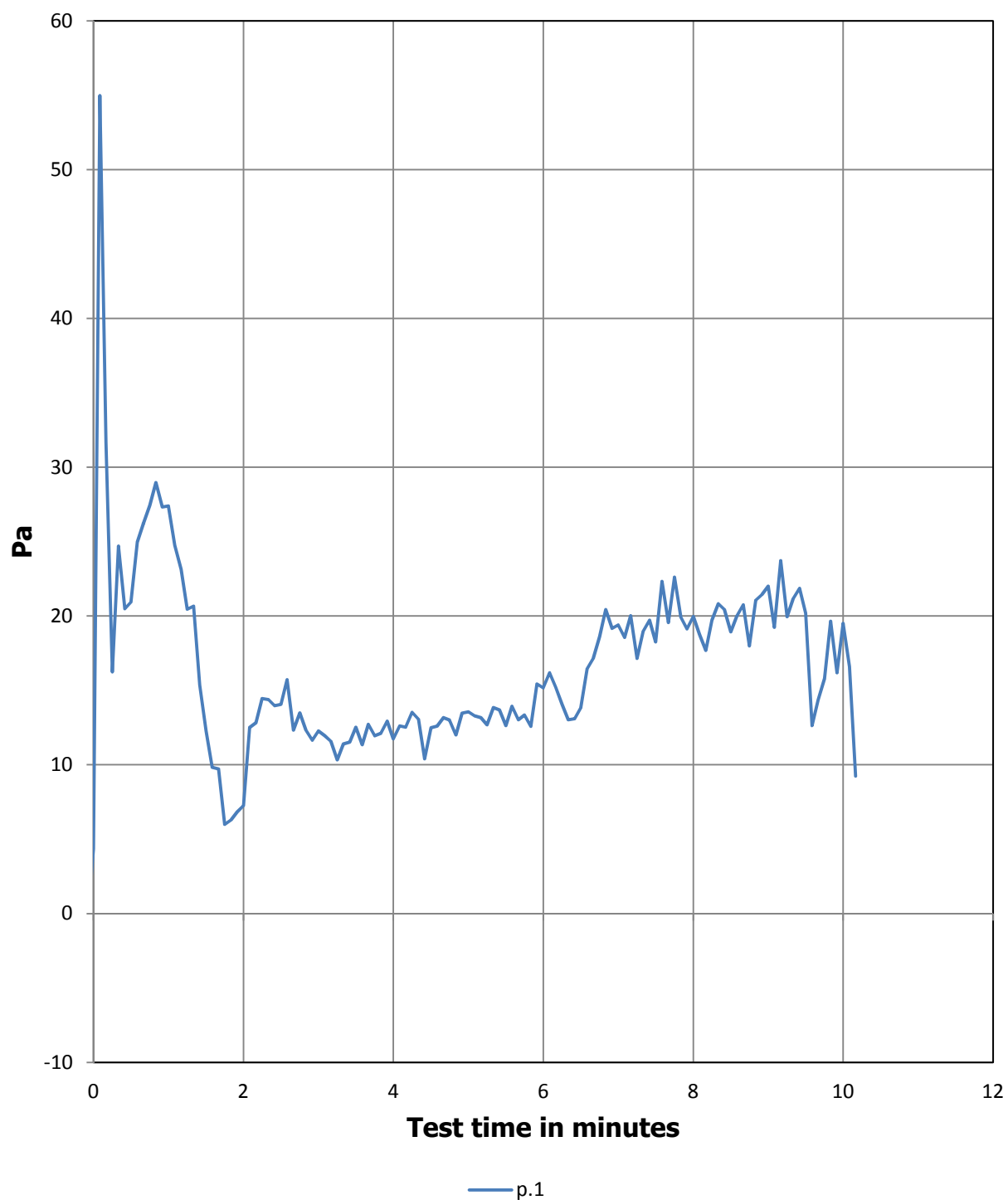




Ambient temperature (test 2)

Min. / °C	t.1
0.0	17.2
0.5	17.2
1.0	17.2
1.5	17.2
2.0	17.2
2.5	17.2
3.0	17.1
3.5	17.2
4.0	17.1
4.5	17.2
5.0	17.2
5.5	17.2
6.0	17.2
6.5	17.2
7.0	17.2
7.5	17.2
8.0	17.2
8.5	17.2
9.0	17.2
9.5	17.1
10.0	17.2

Furnace pressure (test 2)

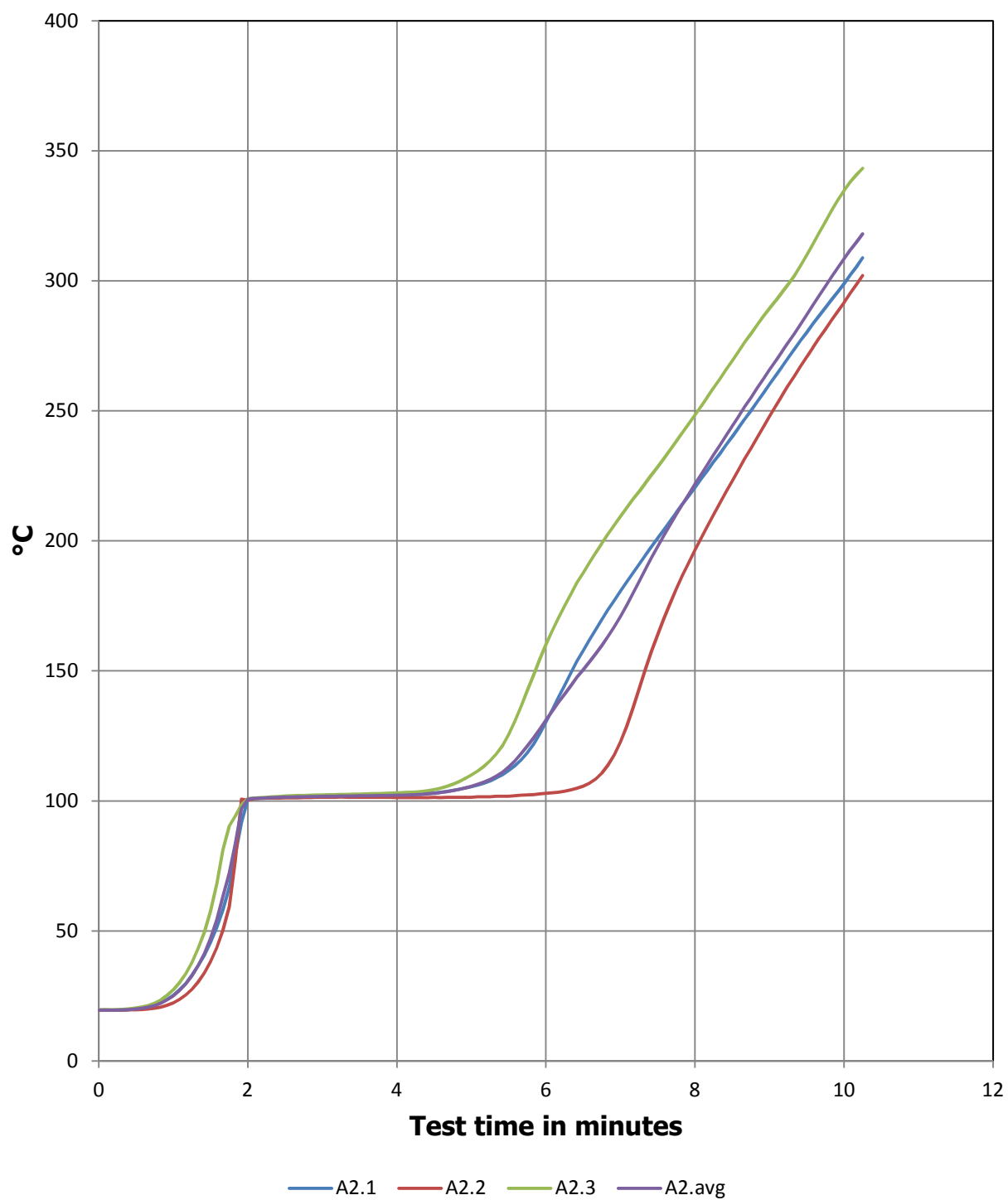




Furnace pressure (test 2)

Min. / Pa	p.1
0.0	4.4
0.5	20.9
1.0	27.4
1.5	12.3
2.0	7.3
2.5	14.1
3.0	12.3
3.5	12.5
4.0	11.7
4.5	12.5
5.0	13.6
5.5	12.6
6.0	15.2
6.5	13.8
7.0	19.4
7.5	18.3
8.0	20.0
8.5	18.9
9.0	22.0
9.5	20.2
10.0	19.5

Temperatures on test specimen A2

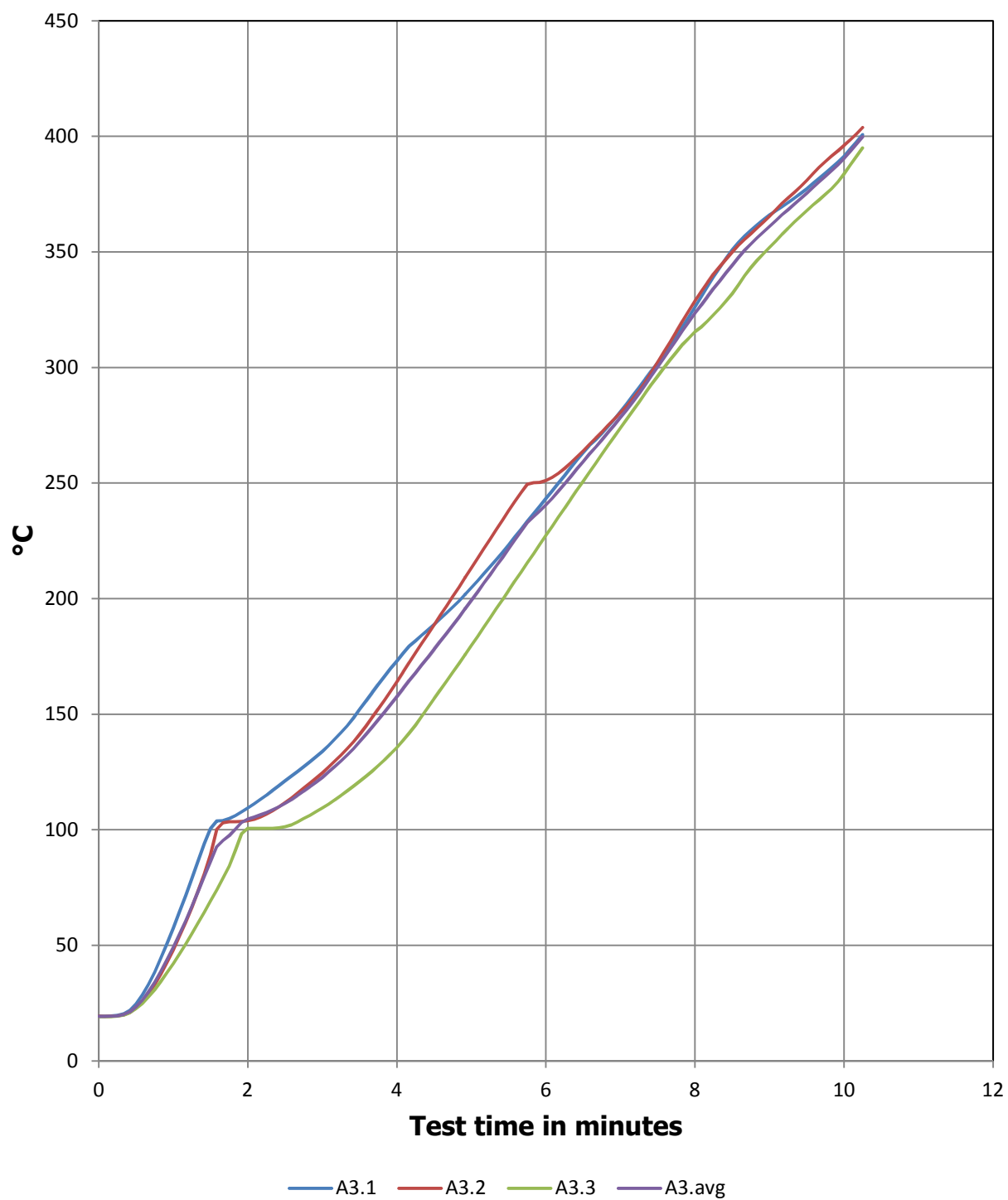




Temperatures on test specimen A2

Min. / °C	A2.1	A2.2	A2.3	A2.Avg
0.0	19.4	19.6	19.7	19.6
0.5	20.0	19.6	20.4	20.0
1.0	25.3	22.4	27.3	25.0
1.5	45.5	38.1	57.6	47.1
2.0	100.7	100.3	100.9	100.6
2.5	101.3	101.1	101.9	101.5
3.0	101.6	101.4	102.3	101.8
3.5	101.8	101.4	102.7	101.9
4.0	102.2	101.3	103.1	102.2
4.5	103.0	101.3	104.3	102.9
5.0	105.5	101.4	109.9	105.6
5.5	111.7	101.8	125.5	113.0
6.0	130.2	102.9	160.0	131.1
6.5	157.8	105.7	187.7	150.4
7.0	180.7	122.6	209.4	170.9
7.5	201.0	164.0	228.5	197.8
8.0	220.6	196.4	248.4	221.8
8.5	240.1	223.1	269.3	244.1
9.0	260.2	247.9	289.3	265.8
9.5	280.2	270.8	310.0	287.0
10.0	298.9	291.6	334.7	308.4

Temperatures on test specimen A3

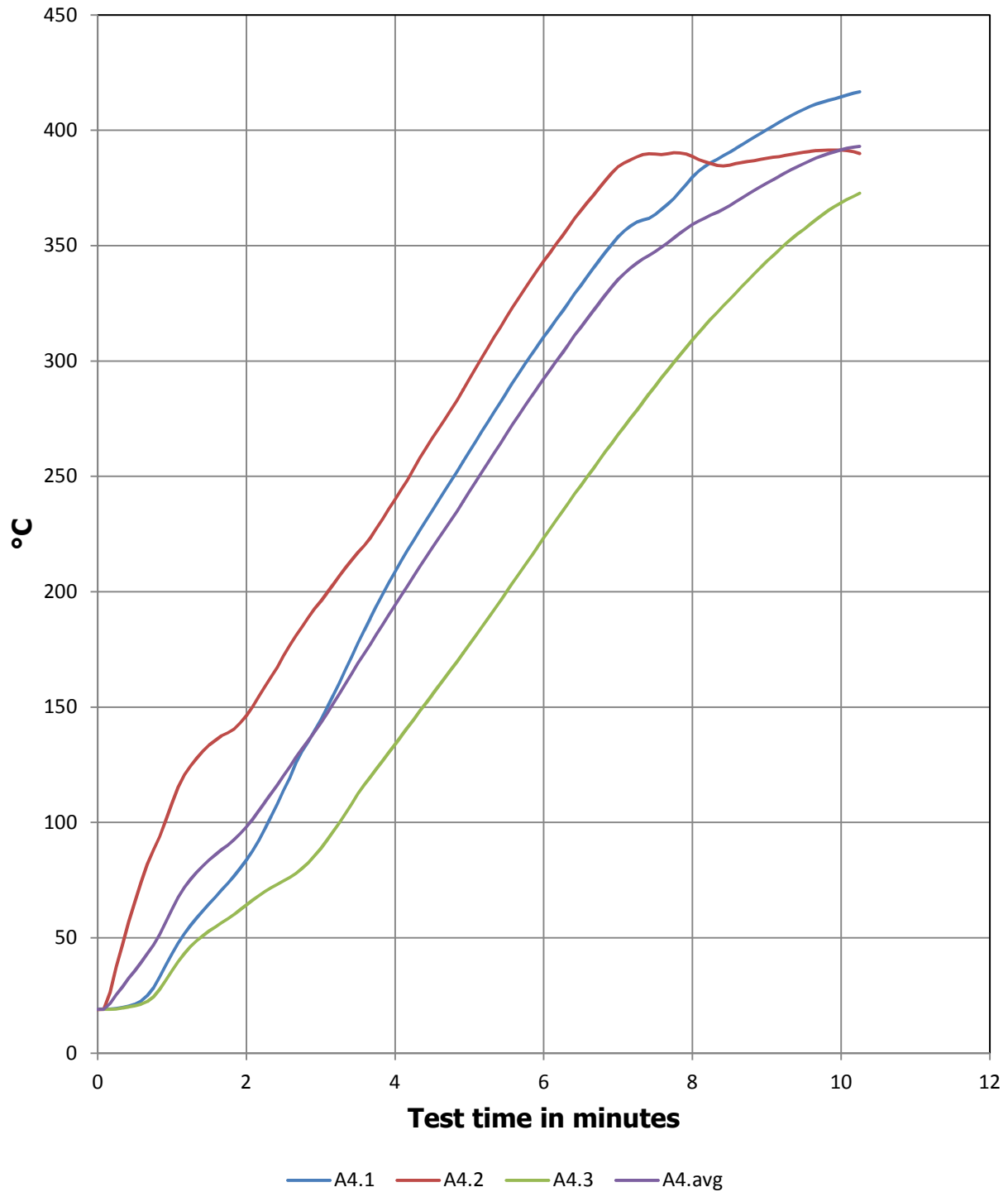




Temperatures on test specimen A3

Min. / °C	A3.1	A3.2	A3.3	A3.Avg
0.0	19.4	19.3	19.1	19.3
0.5	24.6	22.9	22.6	23.4
1.0	57.5	48.0	42.1	49.2
1.5	100.6	89.2	69.2	86.3
2.0	109.4	104.0	100.6	104.7
2.5	121.2	111.8	101.3	111.4
3.0	134.0	124.6	109.4	122.7
3.5	152.0	141.3	121.0	138.1
4.0	173.1	164.1	135.7	157.6
4.5	188.8	188.7	156.7	178.1
5.0	204.7	213.2	179.6	199.2
5.5	223.2	238.1	203.6	221.6
6.0	243.3	251.1	227.3	240.6
6.5	263.1	263.9	250.8	259.3
7.0	280.8	280.5	273.8	278.3
7.5	302.1	302.4	296.3	300.3
8.0	326.1	328.8	315.4	323.4
8.5	350.9	350.0	332.0	344.3
9.0	365.9	365.4	351.9	361.1
9.5	377.3	380.9	367.9	375.4
10.0	391.4	396.0	383.8	390.4

Temperatures on test specimen A4

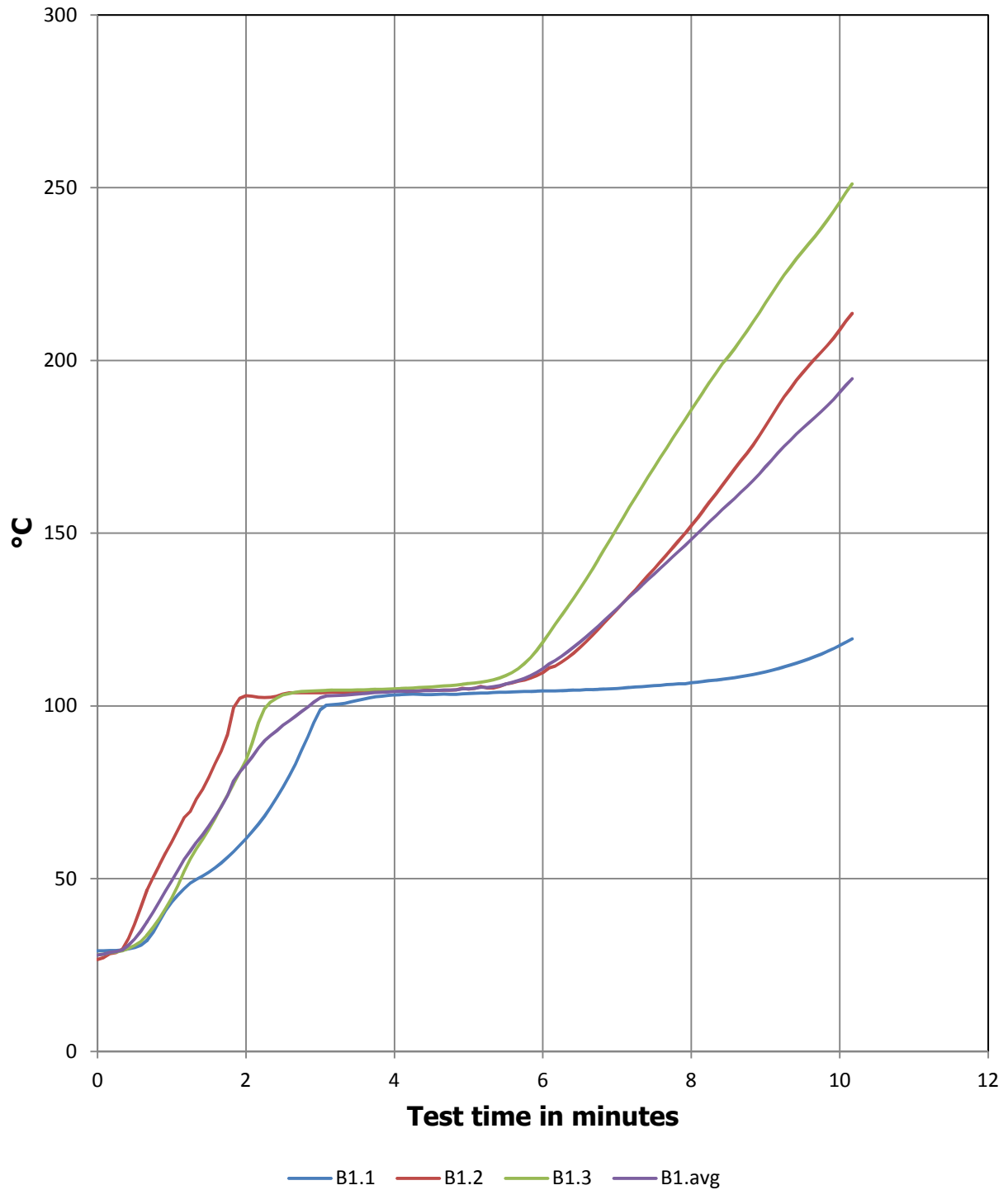




Temperatures on test specimen A4

Min. / °C	A4.1	A4.2	A4.3	A4.Avg
0.0	19.1	18.9	19.0	19.0
0.5	21.2	65.4	20.6	35.7
1.0	43.1	108.4	35.8	62.4
1.5	64.7	133.6	53.0	83.8
2.0	83.8	146.3	64.2	98.1
2.5	113.8	172.3	74.7	120.3
3.0	144.5	195.9	88.7	143.1
3.5	177.6	217.0	112.4	169.0
4.0	208.7	240.1	133.9	194.2
4.5	235.2	266.6	155.4	219.0
5.0	260.7	292.2	177.1	243.3
5.5	286.4	319.1	200.0	268.5
6.0	310.4	343.2	223.3	292.3
6.5	332.8	365.3	246.0	314.7
7.0	353.7	384.1	268.0	335.3
7.5	363.6	389.8	289.2	347.5
8.0	379.7	388.7	309.1	359.1
8.5	390.5	384.9	326.7	367.4
9.0	400.2	387.9	343.2	377.1
9.5	409.1	390.5	357.1	385.6
10.0	414.5	391.4	368.6	391.5

Temperatures on test specimen B1

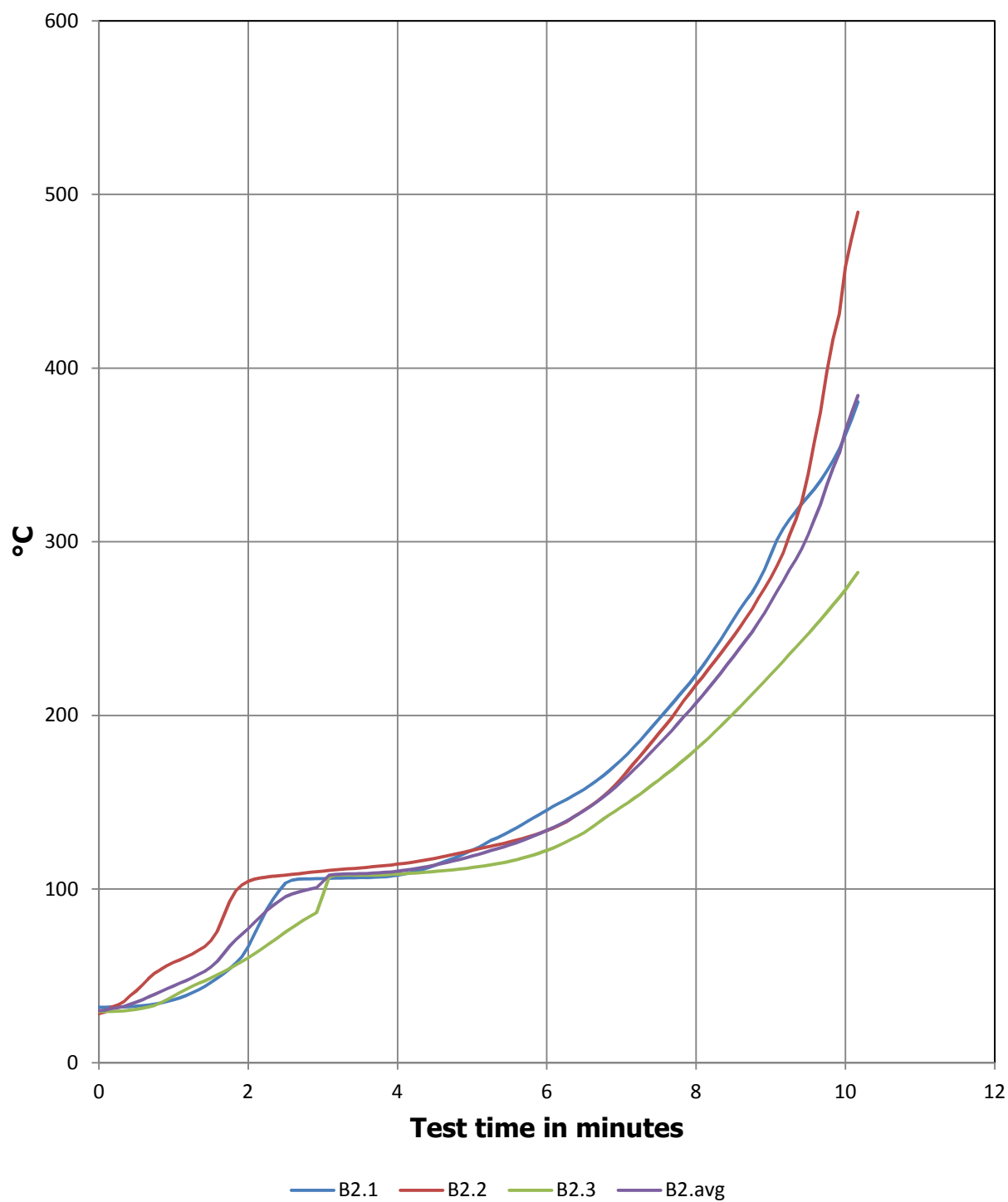




Temperatures on test specimen B1

Min. / °C	B1.1	B1.2	B1.3	B1.Avg
0.0	29.1	26.6	28.0	27.9
0.5	30.1	36.7	30.6	32.5
1.0	43.2	60.6	44.4	49.4
1.5	51.9	79.3	64.3	65.1
2.0	61.6	103.0	84.3	83.0
2.5	76.5	103.4	103.2	94.4
3.0	98.9	103.8	104.4	102.4
3.5	101.6	104.1	104.7	103.4
4.0	103.2	104.3	105.0	104.2
4.5	103.3	104.5	105.5	104.4
5.0	103.6	104.9	106.5	105.0
5.5	104.0	106.3	108.7	106.4
6.0	104.3	109.6	118.4	110.8
6.5	104.6	116.9	133.9	118.5
7.0	105.1	127.9	151.5	128.2
7.5	105.8	139.7	169.0	138.2
8.0	106.7	152.2	185.7	148.2
8.5	107.9	166.2	201.1	158.4
9.0	109.9	181.0	216.6	169.2
9.5	113.0	196.5	231.6	180.4
10.0	117.5	208.8	245.8	190.7

Temperatures on test specimen B2

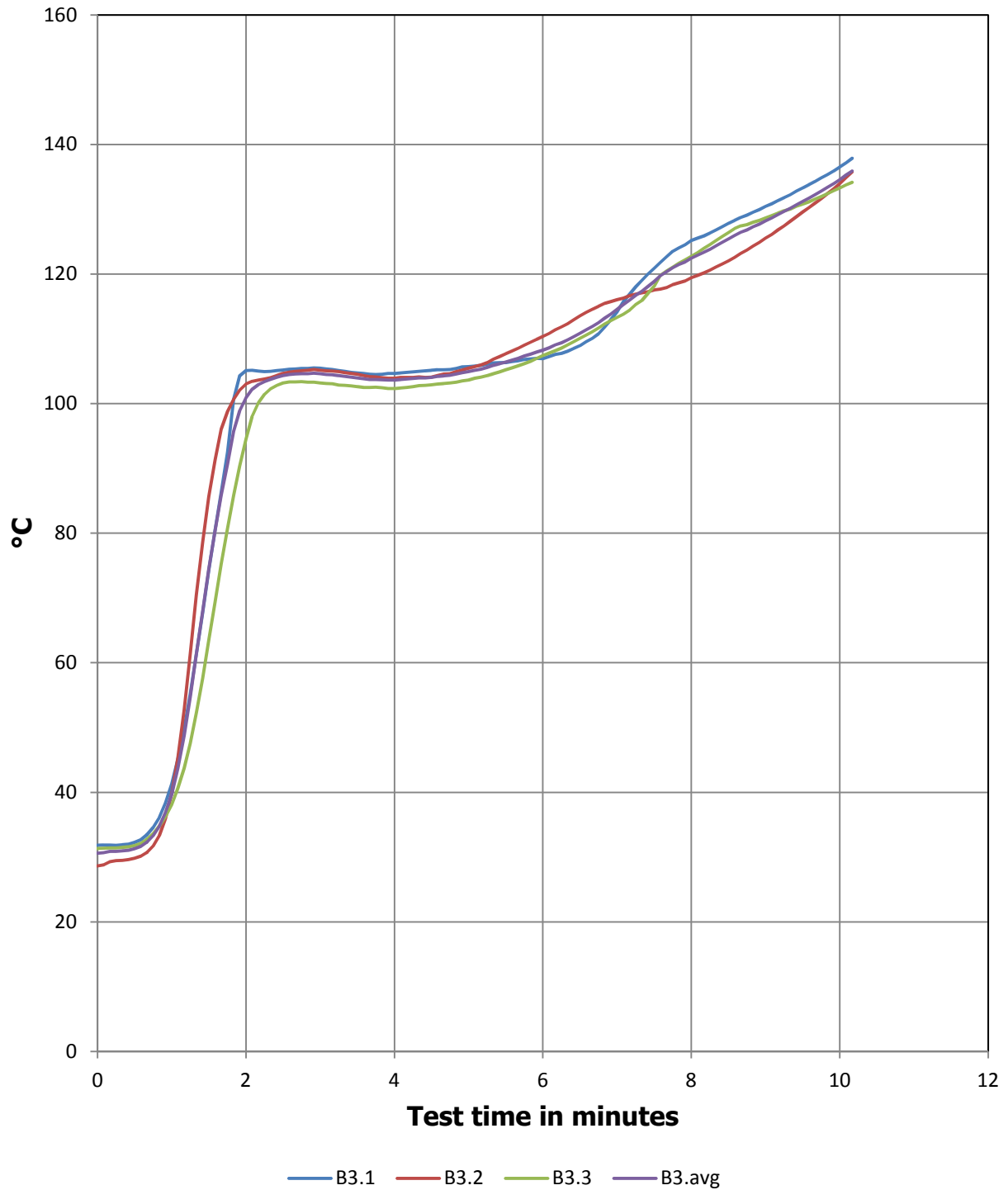




Temperatures on test specimen B2

Min. / °C	B2.1	B2.2	B2.3	B2.Avg
0.0	32.0	28.4	29.5	29.9
0.5	32.5	41.3	30.7	34.9
1.0	36.2	57.8	38.5	44.2
1.5	46.2	70.2	48.9	55.1
2.0	66.8	104.4	60.5	77.2
2.5	103.4	108.1	75.2	95.5
3.0	106.0	110.4	96.7	104.4
3.5	106.6	112.2	108.0	108.9
4.0	107.9	114.4	108.6	110.3
4.5	113.6	117.7	110.1	113.8
5.0	122.3	122.3	112.4	119.0
5.5	133.1	127.1	116.0	125.4
6.0	145.4	133.7	122.2	133.8
6.5	157.4	145.4	132.5	145.1
7.0	174.4	163.9	147.3	161.9
7.5	197.8	189.7	162.9	183.4
8.0	223.4	217.7	180.5	207.2
8.5	255.3	245.5	201.1	234.0
9.0	292.6	279.3	223.5	265.1
9.5	326.2	339.1	246.9	304.1
10.0	361.4	458.4	272.4	364.0

Temperatures on test specimen B3

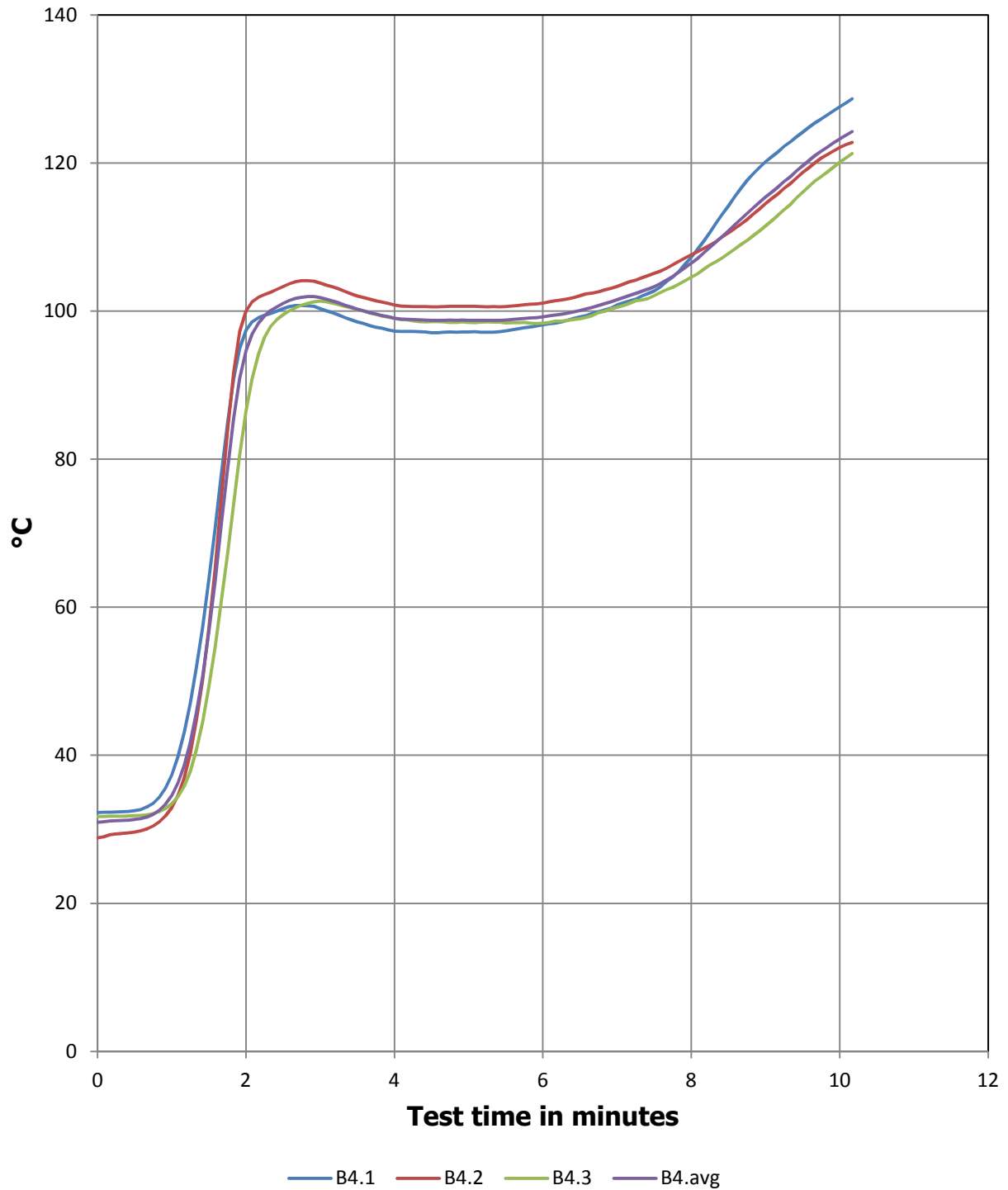




Temperatures on test specimen B3

Min. / °C	B3.1	B3.2	B3.3	B3.Avg
0.0	31.8	28.7	31.3	30.6
0.5	32.3	29.8	31.8	31.3
1.0	41.3	39.8	38.1	39.7
1.5	74.3	85.6	63.5	74.4
2.0	105.1	103.0	94.5	100.9
2.5	105.2	104.7	103.2	104.3
3.0	105.5	105.2	103.2	104.6
3.5	104.7	104.5	102.6	104.0
4.0	104.6	103.9	102.3	103.6
4.5	105.1	104.1	102.9	104.0
5.0	105.7	105.5	103.6	104.9
5.5	106.3	107.7	105.2	106.4
6.0	107.0	110.4	107.4	108.2
6.5	108.9	113.5	110.1	110.8
7.0	114.2	116.0	113.3	114.5
7.5	120.9	117.5	118.1	118.9
8.0	125.2	119.4	122.7	122.4
8.5	127.8	122.1	126.4	125.4
9.0	130.4	125.5	128.7	128.2
9.5	133.3	129.6	130.8	131.2
10.0	136.5	133.9	133.2	134.6

Temperatures on test specimen B4

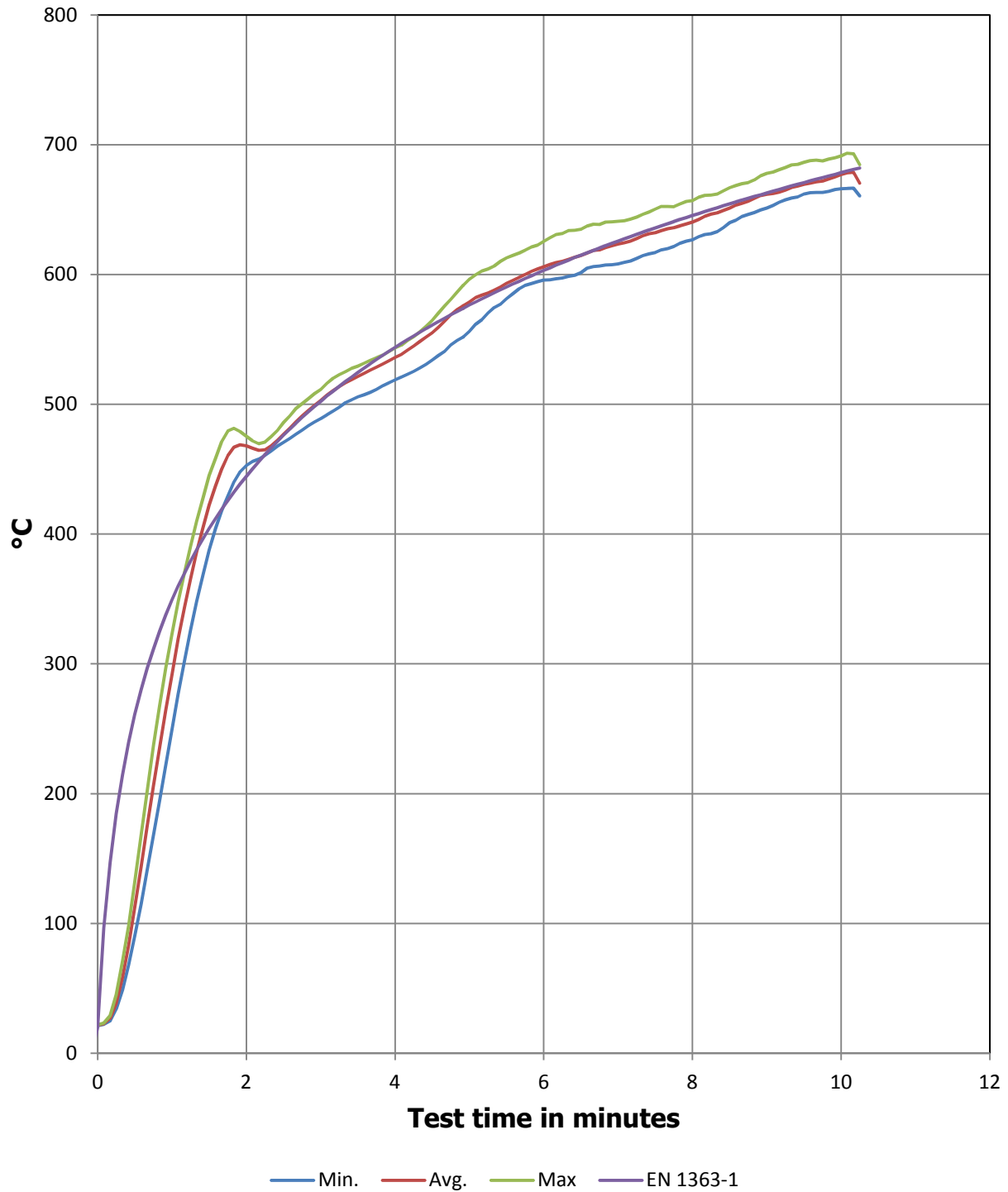




Temperatures on test specimen B4

Min. / °C	B4.1	B4.2	B4.3	B4.Avg
0.0	32.3	28.8	31.7	30.9
0.5	32.5	29.6	31.8	31.3
1.0	37.4	32.9	33.4	34.6
1.5	63.7	57.1	49.2	56.6
2.0	97.4	100.0	86.5	94.6
2.5	100.3	103.3	99.5	101.0
3.0	100.3	103.8	101.3	101.8
3.5	98.5	102.0	100.2	100.2
4.0	97.3	100.8	99.0	99.0
4.5	97.1	100.6	98.6	98.7
5.0	97.2	100.6	98.5	98.8
5.5	97.3	100.6	98.4	98.8
6.0	98.2	101.1	98.4	99.2
6.5	99.2	102.1	99.0	100.1
7.0	100.8	103.3	100.5	101.5
7.5	102.7	105.1	102.1	103.3
8.0	107.3	107.6	104.6	106.5
8.5	114.2	110.6	107.8	110.8
9.0	120.2	114.5	111.5	115.4
9.5	124.2	118.7	116.1	119.6
10.0	127.6	122.1	120.1	123.3

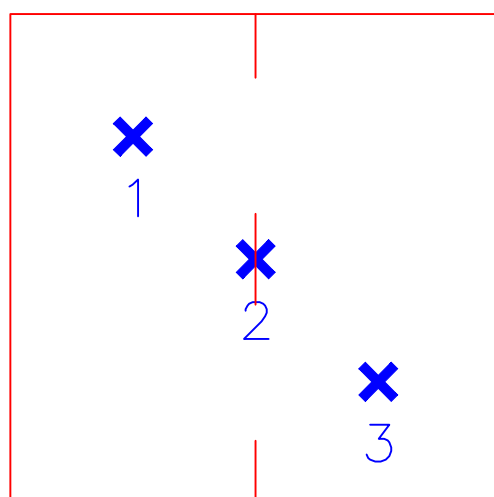
Furnace temperature (test 1)





Furnace temperature (test 1)

Time Minutes	Measured			Norm EN 1363-1	Area under curve		Dev. [%]	Limit [%]
	Minimum	Average	Maximum		Measured	EN 1363-1		
0.0	21.3	21.6	21.8	20.0	0	0	#DIV/0!	
0.5	90.4	112.3	131.9	261.1	25	85	-71.0	
1.0	249.6	292.0	323.4	349.2	127	240	-47.1	
1.5	387.6	422.2	445.1	404.3	308	429	-28.1	
2.0	452.9	468.1	475.3	444.5	536	642	-16.5	
2.5	470.6	476.9	485.9	476.2	770	872	-11.8	
3.0	489.1	502.8	511.5	502.3	1015	1117	-9.1	
3.5	505.6	521.3	529.4	524.5	1272	1374	-7.4	
4.0	518.7	536.0	543.5	543.9	1536	1641	-6.4	
4.5	534.0	555.2	564.6	561.0	1808	1917	-5.7	
5.0	556.1	578.8	596.3	576.4	2092	2202	-5.0	
5.5	581.4	593.3	612.8	590.4	2385	2494	-4.3	15.0
6.0	595.7	605.8	625.4	603.1	2685	2792	-3.8	15.0
6.5	601.5	614.6	634.8	614.9	2991	3096	-3.4	15.0
7.0	608.1	623.3	640.9	625.8	3300	3407	-3.1	15.0
7.5	617.0	632.2	650.3	635.9	3614	3722	-2.9	15.0
8.0	626.7	640.3	656.9	645.5	3932	4042	-2.7	15.0
8.5	639.9	651.2	667.0	654.4	4255	4367	-2.6	15.0
9.0	651.1	661.7	678.0	662.8	4584	4697	-2.4	15.0
9.5	661.9	669.5	686.5	670.8	4916	5030	-2.3	15.0
10.0	666.0	677.0	691.4	678.4	5253	5368	-2.1	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