Determination of the fire resistance according to EN 1364-1:2015 of a non-load bearing partition wall with hollow wall boxes and Intumescent Systems Ltd. intumescent materials

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Sponsor	Intumescent Systems Ltd. Envirograf House Barfrestone CT15 7JG DOVER UNITED KINGDOM
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1. GENERAL

1.1 REPORT

This report surveys the building-in of the test specimen, the investigation on fire resistance, the test conditions, measuring results of the fire test and the field of direct application of the test results.

1.2 SUBJECT

A non-load bearing flexible wall construction, provided with hollow wall boxes with various wiring accessories and intumescent materials.

1.3 INVESTIGATION

Determination of fire resistance according to EN 1364-1; Fire resistance tests for non-loadbearing elements – Part 1: Walls.

1.4 SPONSOR AND MANUFACTURER

Sponsor and manufacturer
Intumescent Systems Ltd Envirograf House Barfrestone CT15 7JG DOVER UNITED KINGDOM

1.5 PLACE AND DATA REGARDING THE EXAMINATION

The research was conducted at the laboratory of Efectis Nederland BV in Bleiswijk, the Netherlands.

Assembly-of the test specimen	June 21th and 22nd , 2016
Fire resistance test	June 23rd, 2016

1.6 NORMATIVE REFERENCES

European standard	**Part**
EN 1363-1: 2012	Fire resistance tests - Part 1: General Requirements
EN 1364-1: 2015	Fire resistance tests for non-loadbearing elements – Part 1: Walls
EN 13501-2: 2016	Fire classification of construction products and building elements – Part 2: Classification using data from fire resistance tests excluding ventilation services
EN 520: 2004	Gypsum plasterboards - Definitions, requirements and test methods

1.7 REVISION INFORMATION

This is the first issue of the test report.

2. TEST SPECIMEN

2.1 GENERAL

For the dimensions and specifications of the materials and components of the examined construction, also see the figures in chapter 8. Details of the assembly of the construction are given in the paragraphs below.
The density and moisture content of the relevant used building materials defined by the sponsor and measured by Efectis are mentioned in the table in paragraph 4.3 if applicable.

2.2 TEST SPECIMEN

The test specimen was a non-load bearing metal stud wall. In the wall junction boxes with intumescent materials were installed which were the actual test specimens for the customer.

2.2.1 Test Frame

The test frame was constructed of steel beams comprising a fire resistant concrete lining, with an aperture of 4000 x 3000 mm (b x h), insertion width 250 mm.

2.2.2 Supporting Construction

The metal stud wall was directly fixed onto the fire resistance concrete line of the test frame.

2.2.3 Free edge

One vertical edge was left unrestrained by a gap of 25 mm to 50 mm between the free edge of the test specimen and the test frame. This gap was packed with high density rock wool panels, to provide a seal without restricting freedom of movement.

2.2.4 Metal stud wall

A standardized metal stud wall with a classification of EI 90 according to EN 1363-1 was used. The metal stud wall was 100 mm thick, had 50 mm studs and had 2 x 12.5 mm gypsum boards type F on each side. Rockwool insulation with a thickness of 40-50 mm and density of 85-115 kg/m^3 was used. To support the hollow wall boxes pine softwood timber with dimensions of 94 mm by 33 mm and a length of 600 mm was used. A reses was provided to accommodate the specific hollow wall box.

2.2.5 Specimen 1, Envirograf gasket Fuga 1M Ref NHA6598302 applied in the Schneider Electric Airtight 1M single box 5649 Ref number EAV8304301

The Schneider Electric Airtight 1M box was mounted with two screws to the timber brace. More details of the box can be found in figure 1 and the gasket in figure 2.
In the specimen a 8mm thick Graphite mix gasket with a red PVC facing and dimensions 20mm by 20mm was placed at the bottom, Ref Fuga 1M gasket NHA6598302. Two boxes were installed, on the fire and non –fire side, not directly opposite to each other at a height of 1400mm on non-exposed and 1500mm on the exposed side.

2.2.6 Specimen 2, Envirograf gasket Elko Ref 104512-4 applied in the Schneider Electric / Elko Apparatus Flexible single box Ref number 20004328

The Schneider Electric/Elko Apparatus box was mounted with two screws to the timber brace. More details of the box can be found in figure 3 and the gasket in figure 4.
In the specimen a 4mm thick Graphite mix gasket with a red PVC facing and dimensions 45mm by 45mm was placed at the bottom, Ref Elko gasket 104512-4. Two boxes were installed, on the fire and non –fire side, not directly opposite to each other at a height of 1400mm on non-exposed and 1500mm on the exposed side.

2.2.7 Specimen 3, Envirograf gasket Elko Ref 104515-4 applied in the Schneider Electric / Elko Apparatus 1.5 box Ref number 20045500

The Schneider Electric/Elko Apparatus box was mounted with two screws to the timber brace. More details of the box can be found in figure 5 and the gasket in figure 6.
In the specimen a 4mm thick Graphite mix gasket with a red PVC facing and dimensions 63mm by 42mm was placed at the bottom, Ref Elko gasket 104515-4. Two boxes were installed, on the fire and non –fire side, not directly opposite to each other at a height of 1400mm on non-exposed and 1500mm on the exposed side.

2.2.8 Specimen 4, Envirograf gaskets 2 of Elko Ref 104512-4 applied in the Schneider Electric / Elko Apparatus double box Ref number 20004335

The Schneider Electric/Elko Apparatus box was mounted with two screws to the timber brace. More details of the box can be found in figures 7 and the gasket in figure 8.
In the specimen two 4mm thick Graphite mix gasket with a red PVC facing and dimensions 45mm by 45mm was placed at the bottom, Ref Elko gasket 104512-4. Two boxes were installed, on the fire and non –fire side, not directly opposite to each other at a height of 1400mm on non-exposed and 1500mm on the exposed side.

2.2.9 Specimen 5, Envirograf gasket Elko Ref 104509-5 applied in the Schneider Electric / Elko Junction box Ref number TB50

The Schneider Electric/Elko Junction box was mounted with two screws to the timber brace. More details of the box can be found in figure 9 and the gasket in figure 10.
In the specimen a 5mm thick Graphite mix gasket with a red PVC facing and dimensions 56mm diameter was placed at the bottom, Ref Elko gasket 104509-5. Two boxes were installed, on the fire and non –fire side, not directly opposite to each other at a height of 1400mm on non-exposed and 1500mm on the exposed side.

2.2.10 Specimen 6, Envirograf gasket Elko Ref Special-4 applied in the Schneider Electric / Elko Apparatus double box Ref number 20004335

The Schneider Electric/Elko Apparatus box was mounted with two screws to the timber brace. More details of the box can be found in figures 11 and the gasket in figure 12.
In the specimen a 4mm thick Graphite mix gasket with a red PVC facing and dimensions 115mm by 45mm was placed at the bottom, Ref Elko gasket Special-4. Two boxes were installed, on the fire and non –fire side, not directly opposite to each other at a height of 1400mm on non-exposed and 1500mm on the exposed side.

2.2.11 Specimen 7, Envirograf gasket set for Fuga 2.5M Ref NHA6598402 and NHA6598702 applied in the Schneider Electric Airtight 2.5M box 5649 Ref number EAV8303601

The Schneider Electric Airtight 2.5M box was mounted with two screws to the timber brace. More details of the box can be found in figure 13 and the gasket in figure 14 & 15.
In the specimen two profile cut 4mm thick Graphite mix gaskets with a red PVC facing and dimensions 38mm by 30mm and 53mm by 31mm were placed at the bottom, Ref Fuga 2.5M gasket numbers NHA6598402 and NHA6598702. Two boxes were installed, on the fire and non –fire side, not directly opposite to each other at a height of 825mm on non-exposed and 925mm on the exposed side.

2.3 METHOD OF ASSEMBLY

The test specimen was built in the following order:

- Assembly of the metal stud profiles;
- Mounting of gypsum boards on one side of the wall;
- Installation of the insulation of the wall;
- Mounting wooden planks for support of the hollow wall boxes
- Mounting the boxes on the gypsum boards;
- Mounting the gypsum on the other side of the wall;
- Mounting the boxes on the gypsum boards on the other side of the wall;
- Mounting of the intumescent materials and closing of the hollow wall boxes;
- Filling the joints between the gypsum boards with gypsum joint filler.

3. ASSEMBLY AND MANUFACTURING OF THE CONSTRUCTION

Efectis Nederland BV Centre for Fire Safety	Test frame Installation of the metal stud wall
Intumescent Systems Ltd Envirograf House Barfrestone CT15 7JG DOVER UNITED KINGDOM	Installation of the hollow wall boxes and production and installation of the intumescent materials

4. RESEARCH METHOD

4.1 VERIFICATION OF THE SPECIMEN

Efectis Nederland BV was not involved in the selection of the materials to be tested.
Based on the information and samples provided by the sponsor the materials and parts used during construction were verified according to EN1363-1.

4.2 CONDITIONING TEST SPECIMEN

From the moment of assembly until the fire resistance test the specimen was stored in the laboratory of Efectis Nederland BV under the following conditions.

Conditions	
Ambient temperature:	23°C
Relative humidity:	50 %

4.3 DENSITY AND MOISTURE CONTENT

Material	**Density [kg/m^3]**	**Moisture content [%]**
KNAUF gypsum board (type F)	760	1
Rockwool[1]	85-115	0.2

4.4 FIRE TEST

4.4.1 Conditions

During the fire resistance investigation the test conditions in the were as follow.

Conditions laboratory	
Ambient temperature:	10 - 40°C
Relative humidity:	50 ± 10 %

4.4.2 Test conditions

The fire test was carried out according to EN 1364-1 and EN 1363-1.
The furnace was operated so that the neutral pressure plane (a pressure of zero) was established 500 mm above notional floor level.

4.4.3 Measurements

During the heating the following data was measured and registered:

Furnace conditions

- The temperatures in the furnace using plate thermocouples, equally spread over the heated surface
- The pressure in the furnace.

Specimen

- Surface temperatures of the test specimen
- Deflection of the test specimen.

Environment

- The temperature in the laboratory outside the furnace.
- The positions of the thermocouples are given in appendix B.

[1] No samples were taken

5. RESULTS OF THE FIRE RESISTANCE TEST

5.1 OBSERVATIONS DURING HEATING

Time (min)	Observations
0	Start of heating
3	Smoke is coming from specimens 3 and 4
8	Smoke is coming from specimens 5 and 6
56	The smoke coming from specimens 3 and 4 is turning yellow
69	Specimen 3 has changed its colour to brown, no more smoke is coming from it
72	A red glow is present at the top of the wall
72	Specimens 4 and 6 have changed their colour to brown
75	Specimen 2 has changed its colour to brown
84	Cracks appear along the joints of the boards
86	The joint at the left hand side has changed its colour to brown
88	Specimen 7 TC 23 has fallen of
92	Facia of specimen 2 falls of the wall
92	Specimen 6 facia leans forward
94	Specimen 1 facia leans forward
97	Specimen 3 facia falls of the wall
104	Specimen 4 facia leans forward
107	Specimen 4 facia melts
110	Specimen 5 facia falls of the wall, a gap appears Ø < 25 mm
113	A reddish glow is present at specimen 3, intumescent material falls
114	At specimen 3 flames are present for more than 10 seconds, failure
117	Specimen 5 is covered, failure
121	Specimen 4, TK 13 > 217ºC, failure
123	Specimen 3 is covered
124	A reddish glow is present at specimen 2, intumescent material falls
127	The boards are deforming away from the fire
129	Specimen 4 facia falls of the wall
129	A board on the left side is penetrated by flames

129	At specimen 2 flames are present for more than 10 seconds
134	The roving thermocouple is used on a black spot, T = 90°C
136	End of heating

5.2 GRAPHS OF THE FIRE TEST

The test results are shown as graphs in appendix B. During the heating of the specimen the ambient temperature met the requirements of EN 1363-1.

5.3 UNCERTAINTY OF MEASUREMENT

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

5.4 PHOTOGRAPHS

The photographs during assembly, before, during and (when applicable) after the fire test are shown in appendix C.

6. SUMMARY OF TEST RESULTS

Determination of the fire resistance according to EN 1364-1 of a Knauf W112 metal stud partition wall with hollow wall boxes and Intumescent Systems Inc. intumescent materials.

Summary of test results metal stud wall with electrical components

Criterion	**Time (min.)**	**Result**
Integrity (E)		
▪ Cotton pad		Not determined
▪ Gap Gauge:		
Ø 6 mm		Not determined
Ø 25 mm	110	Not determined (visible gap > 25 mm)
▪ Sustained flaming > 10 seconds		No failure
Insulation (I)		
▪ Average temperature	110	No failure*
▪ Maximum temperature	110	No failure*
* Determined by end of integrity E after 110 minutes.		
The heating was terminated after 136 minutes in concurrence with the sponsor.		
Classification according to EN 13501-2 is described in a separate report.		
The construction will be classified as follows: E90, EI90 and EW90.		

Summary of test results specimen 1, on the non-exposed side, the Envirograf® Gasket Fuga 1M applied in the Schneider Electric-Airtight 1M single box 5649 Ref number EAV8304301

Criterion	Time (min.)	Result
Integrity (E)		
▪ Cotton pad	136	Not determined
▪ Gap Gauge:		
Ø 6 mm	136	Not determined
Ø 25 mm	136	Not determined
▪ Sustained flaming > 10 seconds	136	No Failure
Insulation (I)		
▪ Maximum temperature	136	No failure
The heating was terminated after 136 minutes in concurrence with the sponsor.		

Summary of test results specimen 1, on the exposed side, the Envirograf® Gasket Fuga 1M applied in the Schneider Electric-Airtight 1M single box 5649 Ref number EAV8304301

Criterion	Time (min.)	Result
Integrity (E)		
▪ Cotton pad	136	Not determined
▪ Gap Gauge:		
Ø 6 mm	136	Not determined
Ø 25 mm	136	Not determined
▪ Sustained flaming > 10 seconds	136	No Failure
Insulation (I)		
▪ Maximum temperature	136	No failure
The heating was terminated after 136 minutes in concurrence with the sponsor.		

Summary of test results specimen 2, on the non-exposed side, the Envirograf® gasket Elko 104512-4 applied in the Schneider Electric/Elko_Apparatus Single Flexible box Ref number 20004328

Criterion	Time (min.)	Result
Integrity (E)		
▪ Cotton pad	136	Not determined
▪ Gap Gauge:		
Ø 6 mm	136	Not determined
Ø 25 mm	136	Not determined
▪ Sustained flaming > 10 seconds	129	Failure
Insulation (I)		
▪ Maximum temperature	129	Failure*
• Due to present flames I is automatically failed		
The heating was terminated after 136 minutes in concurrence with the sponsor.		

Summary of test results specimen 2, on the exposed side, the Envirograf® gasket Elko 104512-4 applied in the Schneider Electric/Elko_Apparatus Small Flexible box Ref number 20004328

Criterion	Time (min.)	Result
Integrity (E)		
▪ Cotton pad	136	Not determined
▪ Gap Gauge:		
Ø 6 mm	136	Not determined
Ø 25 mm	136	Not determined
▪ Sustained flaming > 10 seconds	136	No Failure
Insulation (I)		
▪ Maximum temperature	136	No failure
The heating was terminated after 136 minutes in concurrence with the sponsor.		

Summary of test results specimen 3, on the non-exposed side, Envirograf® gasket Elko 104515-4 applied in the Schneider Electric/Elko Apparatus 1.5 box, Ref number 20045500

Criterion	Time (min.)	Result
Integrity (E)		
▪ Cotton pad		Not determined
▪ Gap Gauge:		
Ø 6 mm		Not determined
Ø 25 mm		Not determined
▪ Sustained flaming > 10 seconds	114	Failure
Insulation (I)		
▪ Maximum temperature	114	No failure*
* Determined by end of integrity E after 114 minutes.		
The heating was terminated after 136 minutes in concurrence with the sponsor.		

Summary of test results specimen 3, on the exposed side, Envirograf® gasket Elko 104515-4 applied in the Schneider Electric/Elko Apparatus 1.5 box, Ref number 20045500

Criterion	Time (min.)	Result
Integrity (E)		
▪ Cotton pad	136	Not determined
▪ Gap Gauge:		
Ø 6 mm	136	Not determined
Ø 25 mm	136	Not determined
▪ Sustained flaming > 10 seconds	136	No Failure
Insulation (I)		
▪ Maximum temperature	124	No failure
The heating was terminated after 136 minutes in concurrence with the sponsor.		

Summary of test results specimen 4, on the non-exposed side, Envirograf® gaskets Elko 104512-4 applied in the Schneider Electric/Elko apparatus double box Ref number 20004335

Criterion	Time (min.)	Result
Integrity (E)		
▪ Cotton pad	136	Not determined
▪ Gap Gauge:		
Ø 6 mm	136	Not determined
Ø 25 mm	136	Not determined
▪ Sustained flaming > 10 seconds	136	No Failure
Insulation (I)		
▪ Maximum temperature	118	Failure
The heating was terminated after 136 minutes in concurrence with the sponsor.		

Summary of test results specimen 4, on the exposed side, Envirograf® gaskets Elko 104512-4 applied in the Schneider Electric/Elko apparatus double box Ref number 20004335

Criterion	Time (min.)	Result
Integrity (E)		
▪ Cotton pad	136	Not determined
▪ Gap Gauge:		
Ø 6 mm	136	Not determined
Ø 25 mm	136	Not determined
▪ Sustained flaming > 10 seconds	136	No Failure
Insulation (I)		
▪ Maximum temperature	136	No failure
The heating was terminated after 136 minutes in concurrence with the sponsor.		

Summary of test results specimen 5, on the non-exposed side, Envirograf® gasket Elko 104509-5 applied in the Schneider Electric/Elko- Junction Box Single, Ref number TB50

Criterion	Time (min.)	Result
Integrity (E)		
▪ Cotton pad		Not determined
▪ Gap Gauge:		
Ø 6 mm		Not determined
Ø 25 mm	110	Determined
▪ Sustained flaming > 10 seconds		No failure
Insulation (I)		
▪ Maximum temperature	110	Failure*
* Determined by end of integrity E after 110 minutes.		
The heating was terminated after 136 minutes in concurrence with the sponsor.		

Summary of test results specimen 5, on the exposed side, Envirograf® gasket Elko 104509-5 applied in the Schneider Electric/Elko- Junction Box Single, Ref number TB50

Criterion	Time (min.)	Result
Integrity (E)		
▪ Cotton pad	136	Not determined
▪ Gap Gauge:		
Ø 6 mm	136	Not determined
Ø 25 mm	136	Not determined
▪ Sustained flaming > 10 seconds	136	No Failure
Insulation (I)		
▪ Maximum temperature	136	No failure
The heating was terminated after 136 minutes in concurrence with the sponsor.		

Summary of test results specimen 6, on the non-exposed side, Envirograf® gaskets Elko Special-4 applied in the Schneider Electric/Elko apparatus double box Ref number 20004335

Criterion	Time (min.)	Result
Integrity (E)		
▪ Cotton pad	136	Not determined
▪ Gap Gauge:		
Ø 6 mm	136	Not determined
Ø 25 mm	136	Not determined
▪ Sustained flaming > 10 seconds	136	No Failure
Insulation (I)		
▪ Maximum temperature	136	No failure
The heating was terminated after 136 minutes in concurrence with the sponsor.		

Summary of test results specimen 6, on the exposed side, Envirograf® gaskets Elko Special-4 applied in the Schneider Electric/Elko apparatus double box Ref number 20004335

Criterion	Time (min.)	Result
Integrity (E)		
▪ Cotton pad	136	Not determined
▪ Gap Gauge:		
Ø 6 mm	136	Not determined
Ø 25 mm	136	Not determined
▪ Sustained flaming > 10 seconds	136	No Failure
Insulation (I)		
▪ Maximum temperature	136	No failure
The heating was terminated after 136 minutes in concurrence with the sponsor.		

Summary of test results specimen 7, on the non-exposed side, the Envirograf® Gasket set for Fuga 2.5 M part numbers NHA6598402 and NHA6598702 applied in the Schneider Electric-Airtight 2.5M box 5649 Ref number EAV8303601

Criterion	Time (min.)	Result
Integrity (E)		
▪ Cotton pad	136	Not determined
▪ Gap Gauge:		
Ø 6 mm	136	Not determined
Ø 25 mm	136	Not determined
▪ Sustained flaming > 10 seconds	136	No Failure
Insulation (I)		
▪ Maximum temperature	136	No failure
The heating was terminated after 136 minutes in concurrence with the sponsor.		

Summary of test results specimen 7, on the exposed side, the Envirograf® Gasket set for Fuga 2.5 M part numbers NHA6598402 and NHA6598702 applied in the Schneider Electric-Airtight 2.5M box 5649 Ref number EAV8303601

Criterion	Time (min.)	Result
Integrity (E)		
▪ Cotton pad	136	Not determined
▪ Gap Gauge:		
Ø 6 mm	136	Not determined
Ø 25 mm	136	Not determined
▪ Sustained flaming > 10 seconds	136	No Failure
Insulation (I)		
▪ Maximum temperature	136	No failure
The heating was terminated after 136 minutes in concurrence with the sponsor.		

7. FIELD OF DIRECT APPLICATION OF TEST RESULTS

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

7.1 GENERAL

The results of the fire test are directly applicable to similar constructions where one or more of the changes listed below are made and the construction continues to comply with the appropriate design code for its stiffness and stability.

a) Decrease in height
b) Increase in the thickness of the wall
c) Increase in the thickness of component materials
d) Decrease in linear dimensions of boards or panels but not thickness
e) Decrease in stud spacing
f) Decrease in distance of fixing centres
g) The junction boxes may be used at the tested height or lower
h) Vertical joints, of the type tested

7.2 EXTENSION OF WIDTH

The width of an identical construction may be increased.

7.3 EXTENSION OF HEIGHT

The height of EI45 and EW90 constructions, may be increased with 1 m under the following conditions:

The expansion allowances are increased pro-rata.

7.4 SUPPORTING CONSTRUCTIONS

7.4.1 Standard supporting constructions

The result is applicable to high density rigid supporting constructions with at least the same fire resistance as the test specimen.

P.G.R. Scholten B.Sc.
Project leader fire resistance

R.D. Scheepe B.Sc.
Project leader fire resistance

8. FIGURES

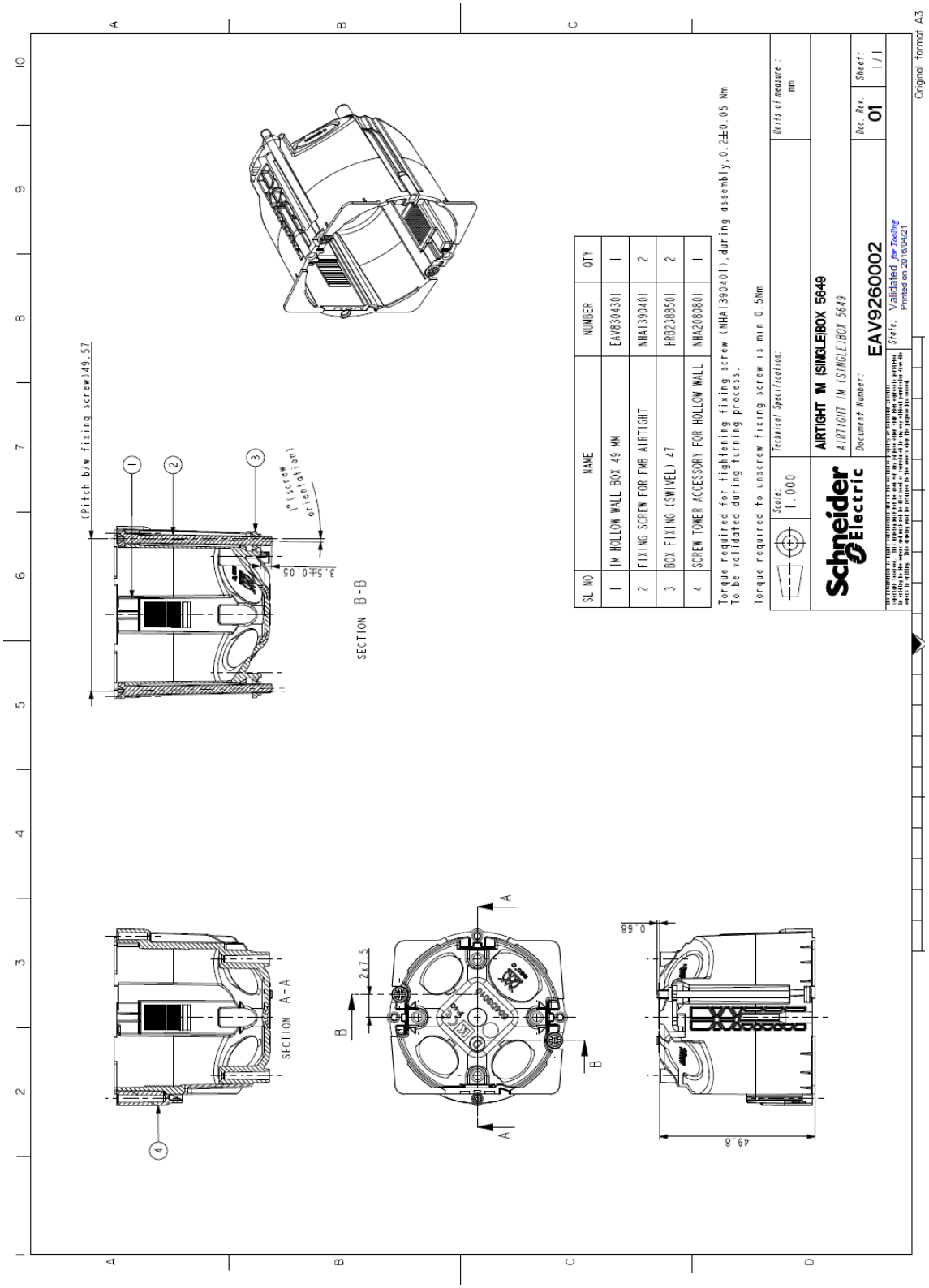


Figure 1 Specimen 1, Envirograf gasket Fuga 1M Ref NHA6598302 applied in the Schneider Electric Airtight 1M single box 5649 Ref number EAV8304301

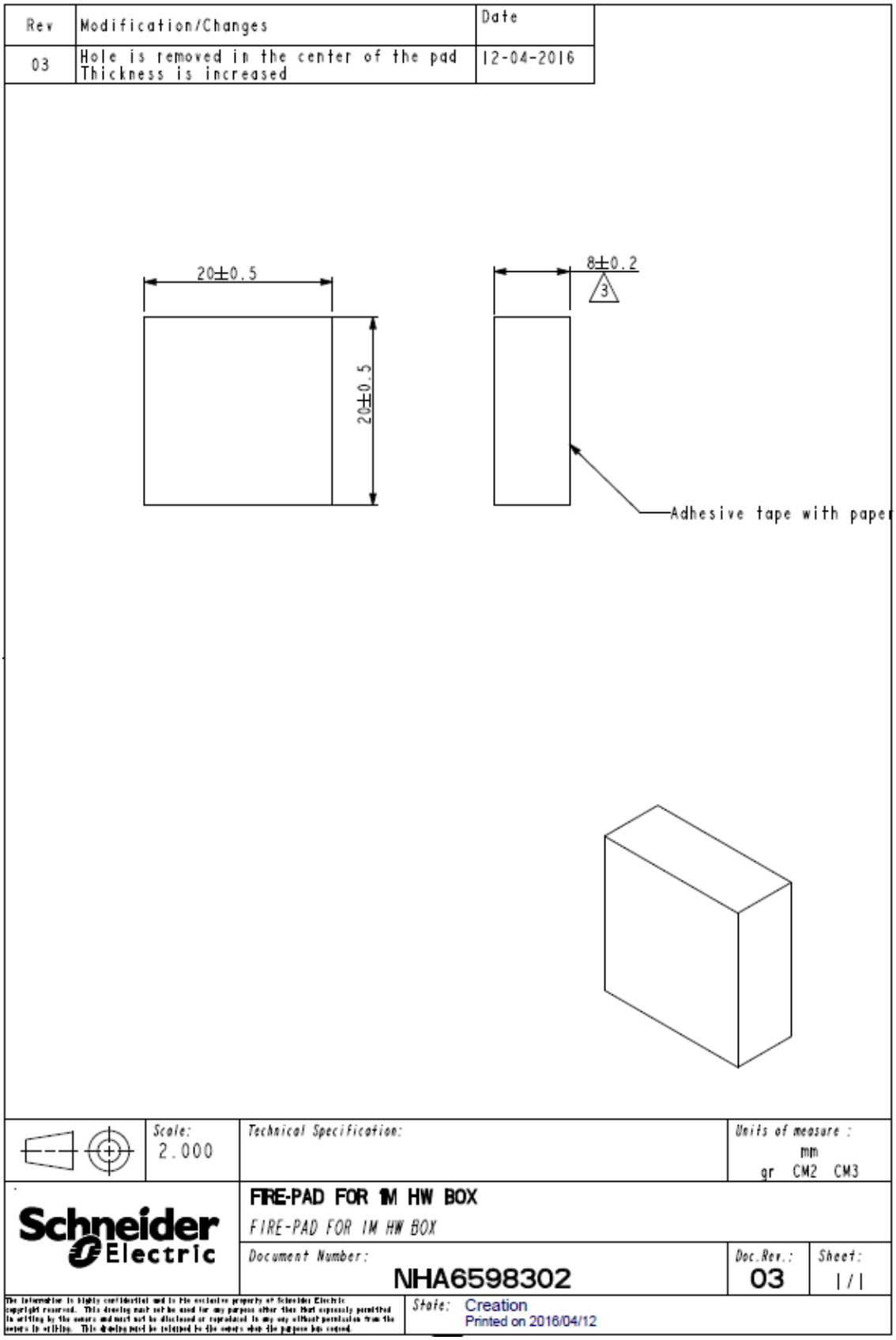


Figure 2 Specimen 1, Fire-pad for Fuga 1M Ref NHA6598302

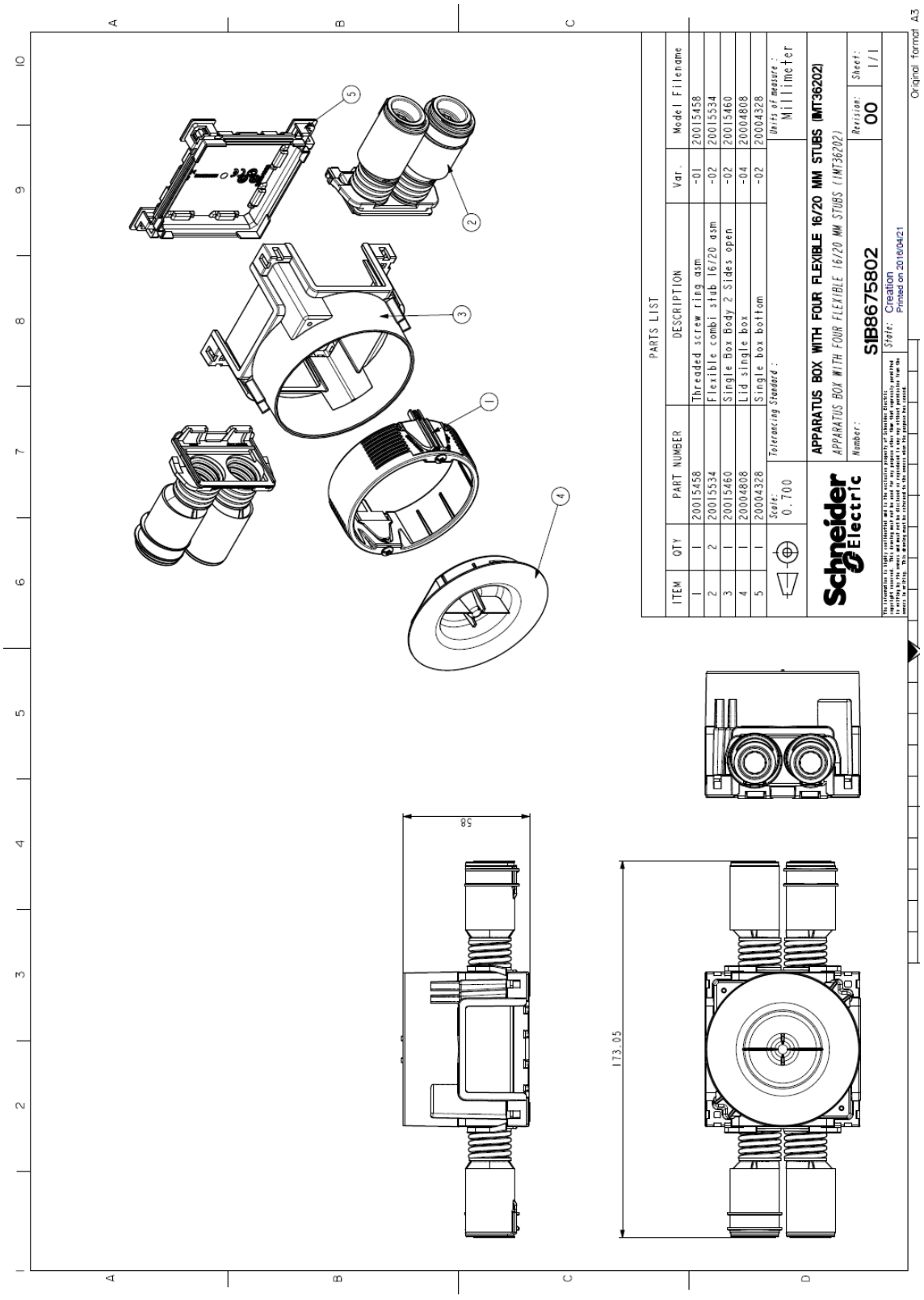
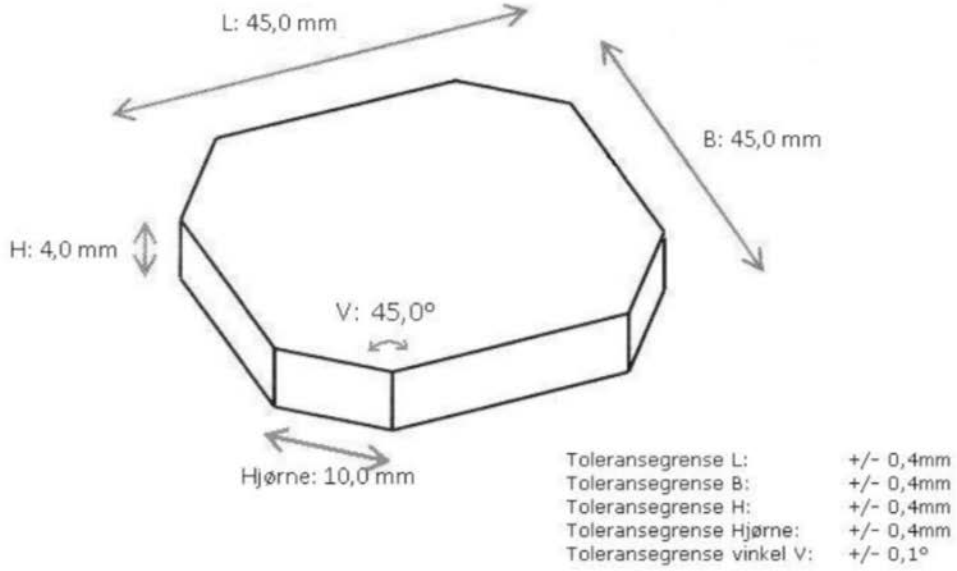


Figure 3 Specimen 2, Envirograf gasket Elko Ref 104512-4 applied in the Schneider Electric / Elko Apparatus Flexible single box Ref number 20004328

Design og spesifikasjons opplysninger.

Schneider Electric pakning 104512-4



Pakning nr:	104512-4
Design og mål:	45 x 45 x 4 millimeter.
Beskrivelse:	Pakning til brannsikker koblingsboks.
Ref:	
Vare/artikkelnummer Schneider Electric:	TNY0351901
Antall i kartong:	**250 stk.**
Leveringstid:	**2-4 uker fra ordredato.**
Supplier: **Intumescent Systems Ltd** Envirograf House Barfrestone, Dover Kent CT15 7JG **Tel:** 01304 842555 **Fax:** 01304 842666	
Dato: 03.03.2016	
Tegning godtatt av Schneider Electric **Dato:**	**Signatur.**

Figure 4 Specimen 2, Envirograf gasket Elko Ref 104512-4

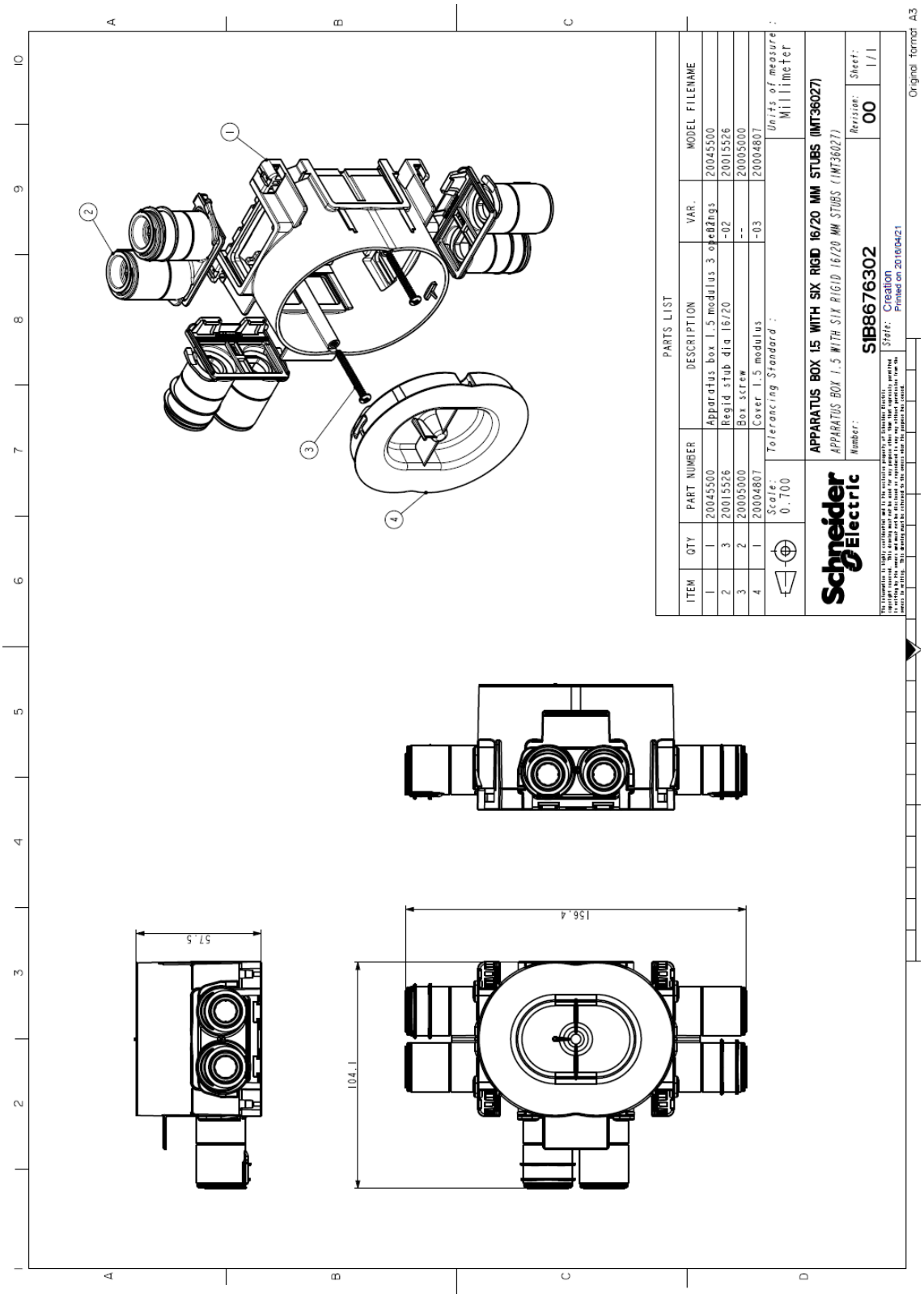
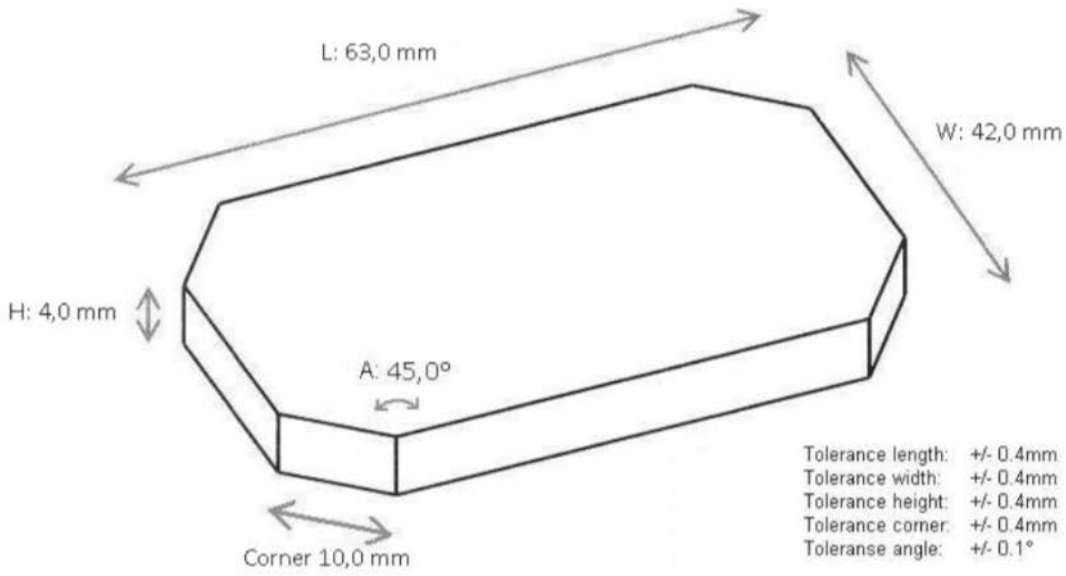


Figure 5 Specimen 3, Envirograf gasket Elko Ref 104515-4 applied in the Schneider Electric / Elko Apparatus 1.5 box Ref number 20045500

Design og spesifikasjons opplysninger.

Schneider Electric pakning 104515-4



Pakning nr:	104515-4
Design og mål:	63 x 42 x 4 millimeter.
Beskrivelse:	Pakning til brannsikker koblingsboks.
Ref:	
Vare/artikkelnummer fra Biokjemi Norge as:	TNY0351902
Antall i kartong:	**250 stk.**
Leveringstid:	**2-4 uker fra ordredato.**
Supplier: **Intumescent Systems Ltd** Envirograf House Barfrestone, Dover Kent CT15 7JG **Tel:** 01304 842555 **Fax:** 01304 842666	
Dato: 03.03.2016	
Tegning godtatt av Schneider Electric **Dato:**	**Signatur.**

Figure 6 Specimen 3, Envirograf gasket Elko Ref 104515-4

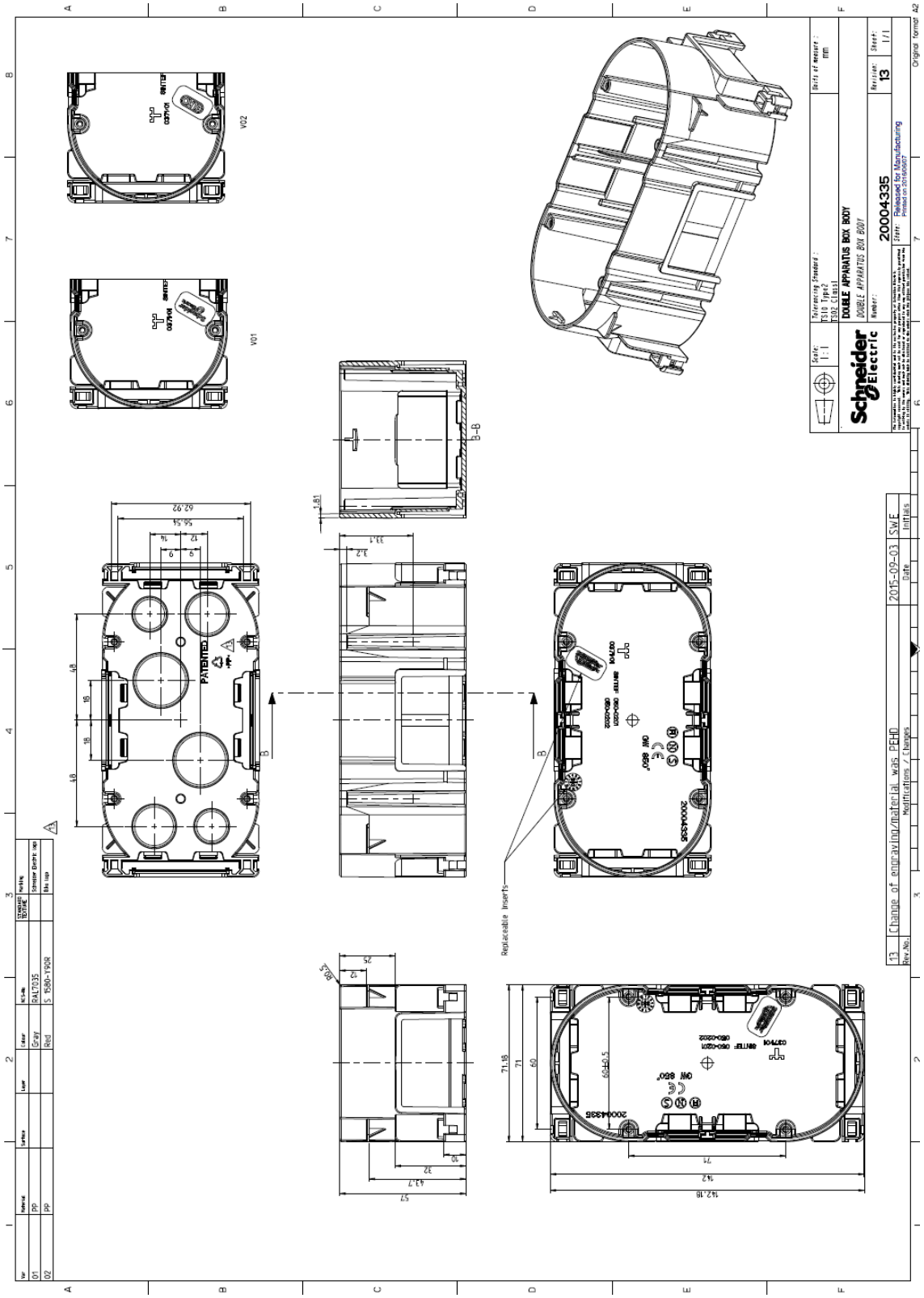
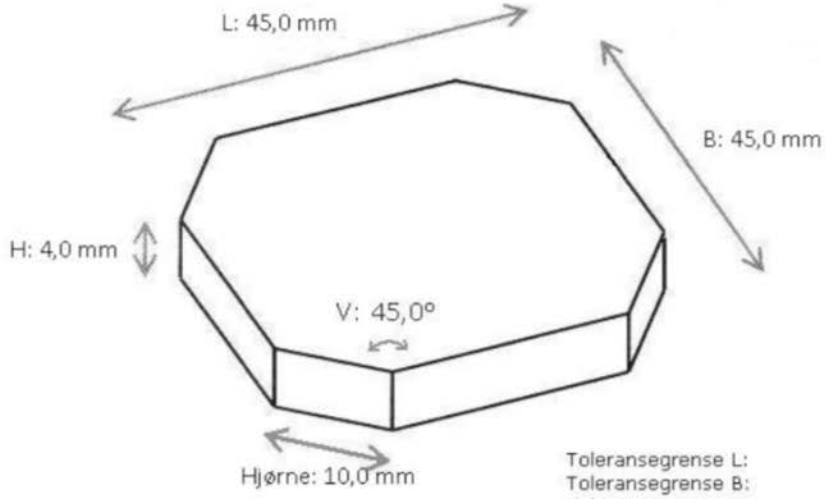


Figure 7 Specimen 4, Envirograf gaskets 2 off Elko Ref 104512-4 applied in the Schneider Electric / Elko Apparatus double box Ref number 20004335

Design og spesifikasjons opplysninger.

Schneider Electric pakning 104512-4



Toleransegrense L:	+/- 0,4mm
Toleransegrense B:	+/- 0,4mm
Toleransegrense H:	+/- 0,4mm
Toleransegrense Hjørne:	+/- 0,4mm
Toleransegrense vinkel V:	+/- 0,1°

Pakning nr:	104512-4
Design og mål:	45 x 45 x 4 millimeter.
Beskrivelse:	Pakning til brannsikker koblingsboks.
Ref:	
Vare/artikkelnummer Schneider Electric:	TNY0351901
Antall i kartong:	**250 stk.**
Leveringstid:	**2-4 uker fra ordredato.**
Supplier: **Intumescent Systems Ltd** Envirograf House Barfrestone, Dover Kent CT15 7JG **Tel:** 01304 842555 **Fax:** 01304 842666	
Dato: 03.03.2016	
Tegning godtatt av Schneider Electric **Dato:**	**Signatur.**

Figure 8 Specimen 4, Envirograf gasket Elko Ref 104512-4

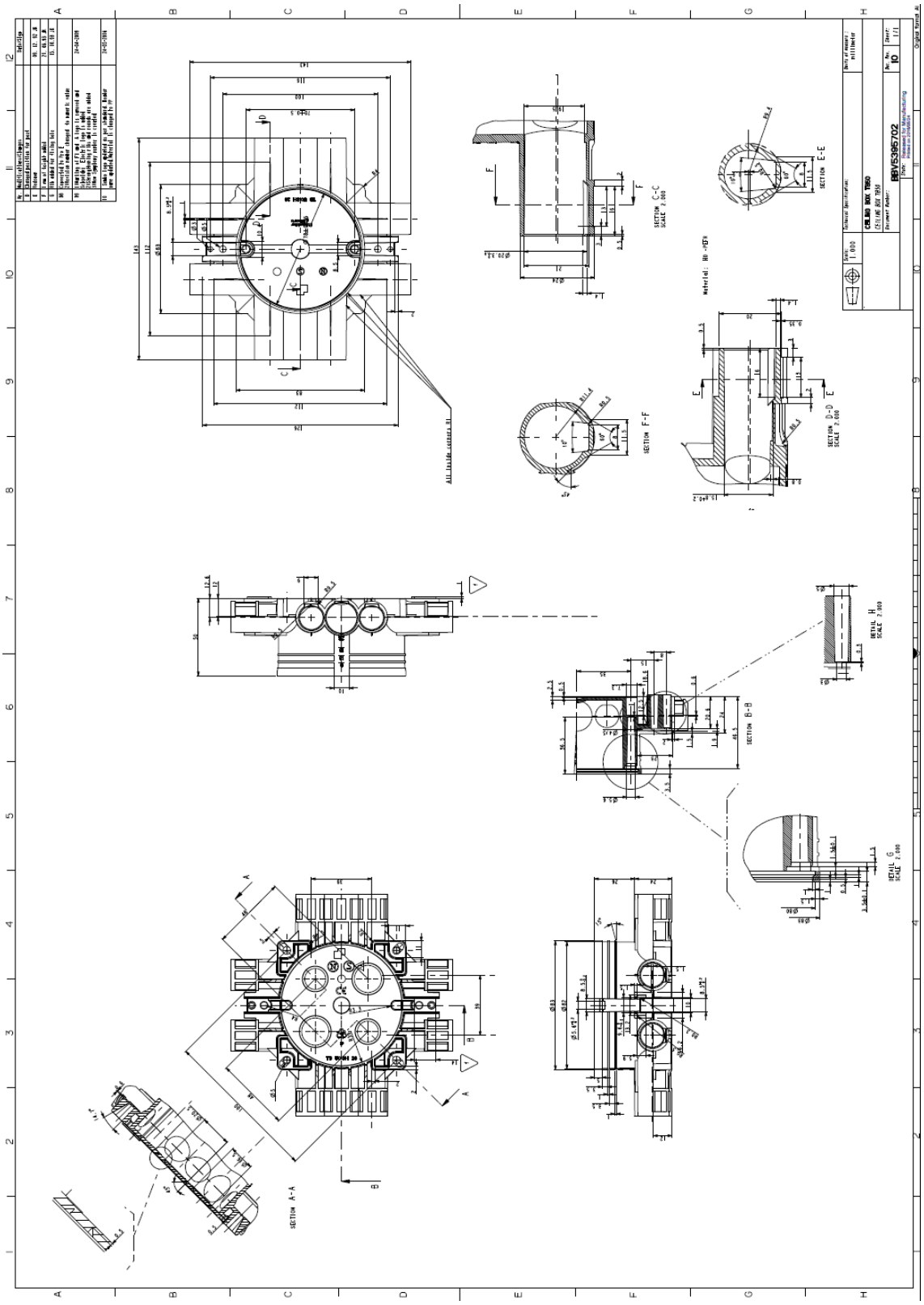
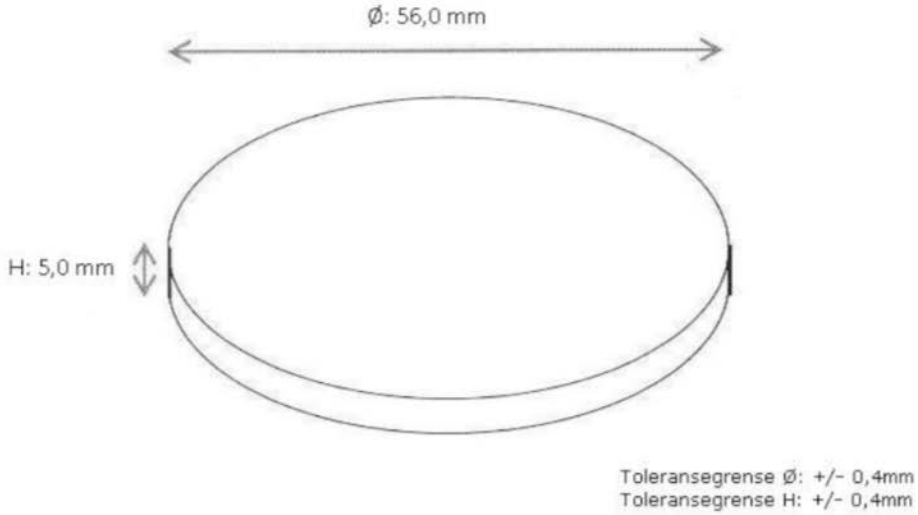


Figure 9 Specimen 5 Specimen 5, Envirograf gasket Elko Ref 104509-5 applied in the Schneider Electric / Elko Junction box Ref number TB50

Design og spesifikasjons opplysninger.

Schneider Electric pakning 104509-5



Pakning nr:	104509-5
Design og mål:	Ø 56 x 5 millimeter.
Beskrivelse:	Pakning til brannsikker koblingsboks.
Ref:	
Vare/artikkelnummer Schneider Electric:	
Antall i kartong:	**250 stk.**
Leveringstid:	**2-4 uker fra ordredato.**

Supplier:
Intumescent Systems Ltd
Envirograf House
Barfrestone,
Dover
Kent CT15 7JG
Tel: 01304 842555
Fax: 01304 842666

Dato: 03.03.2016

Tegning godtatt av Schneider Electric
Dato: **Signatur.**

Figure 10 Specimen 5, Envirograf gasket Elko Ref 104509-5

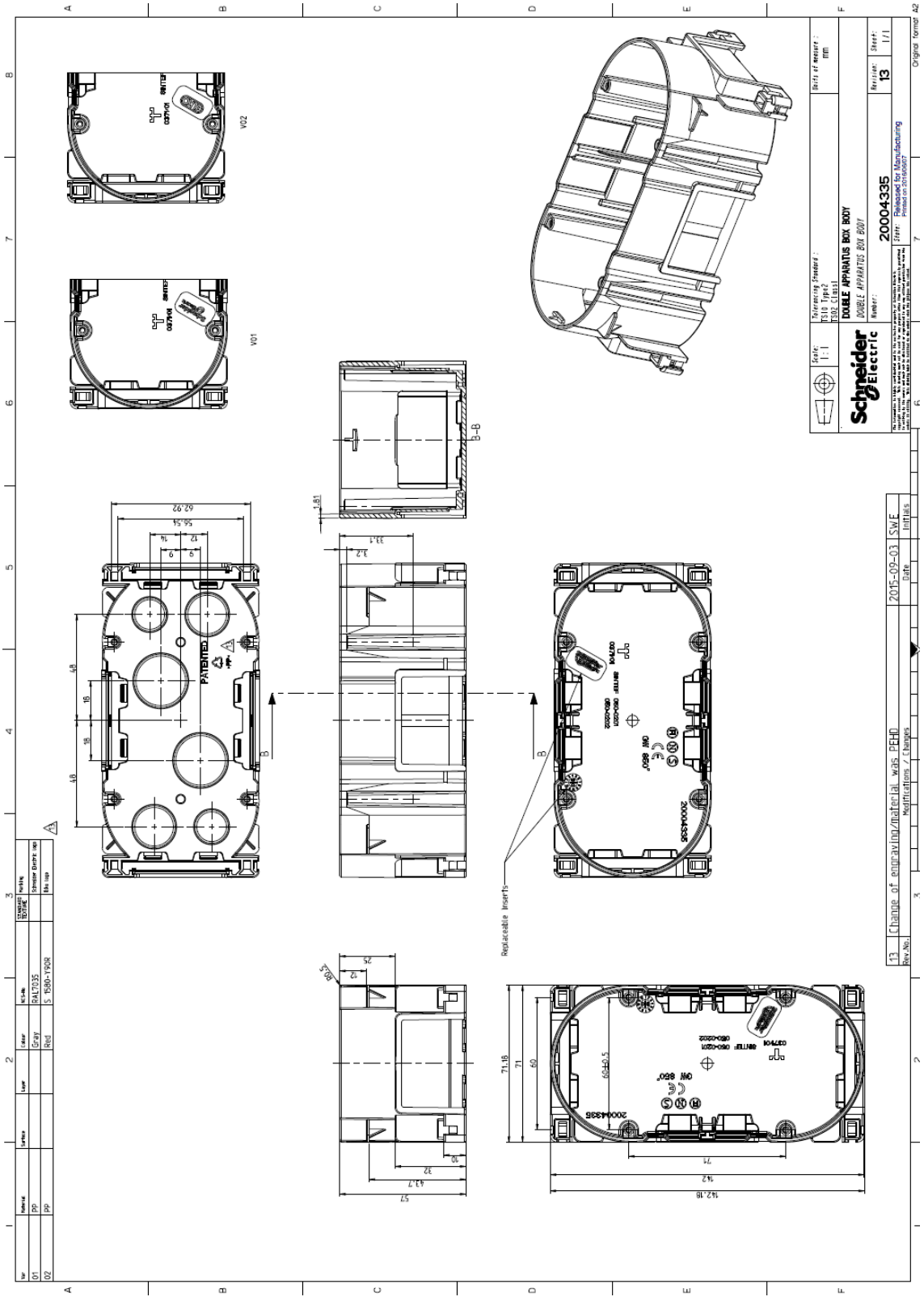


Figure 11 Specimen 6, Envirograf gasket Elko Ref Special-4 applied in the Schneider Electric / Elko Apparatus double box Ref number 20004335

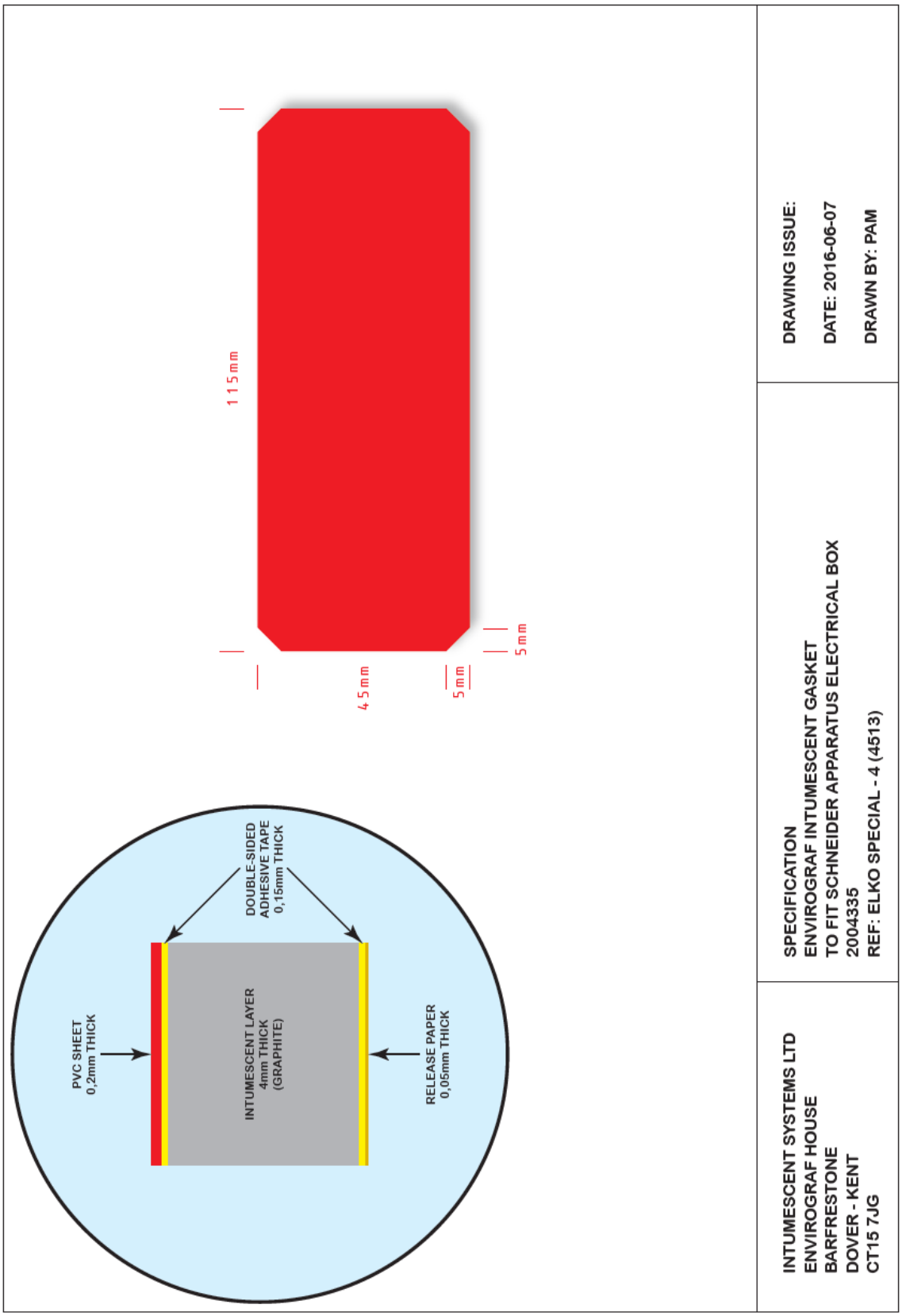


Figure 12 Specimen 6, Envirograf gasket Elko Ref Special-4

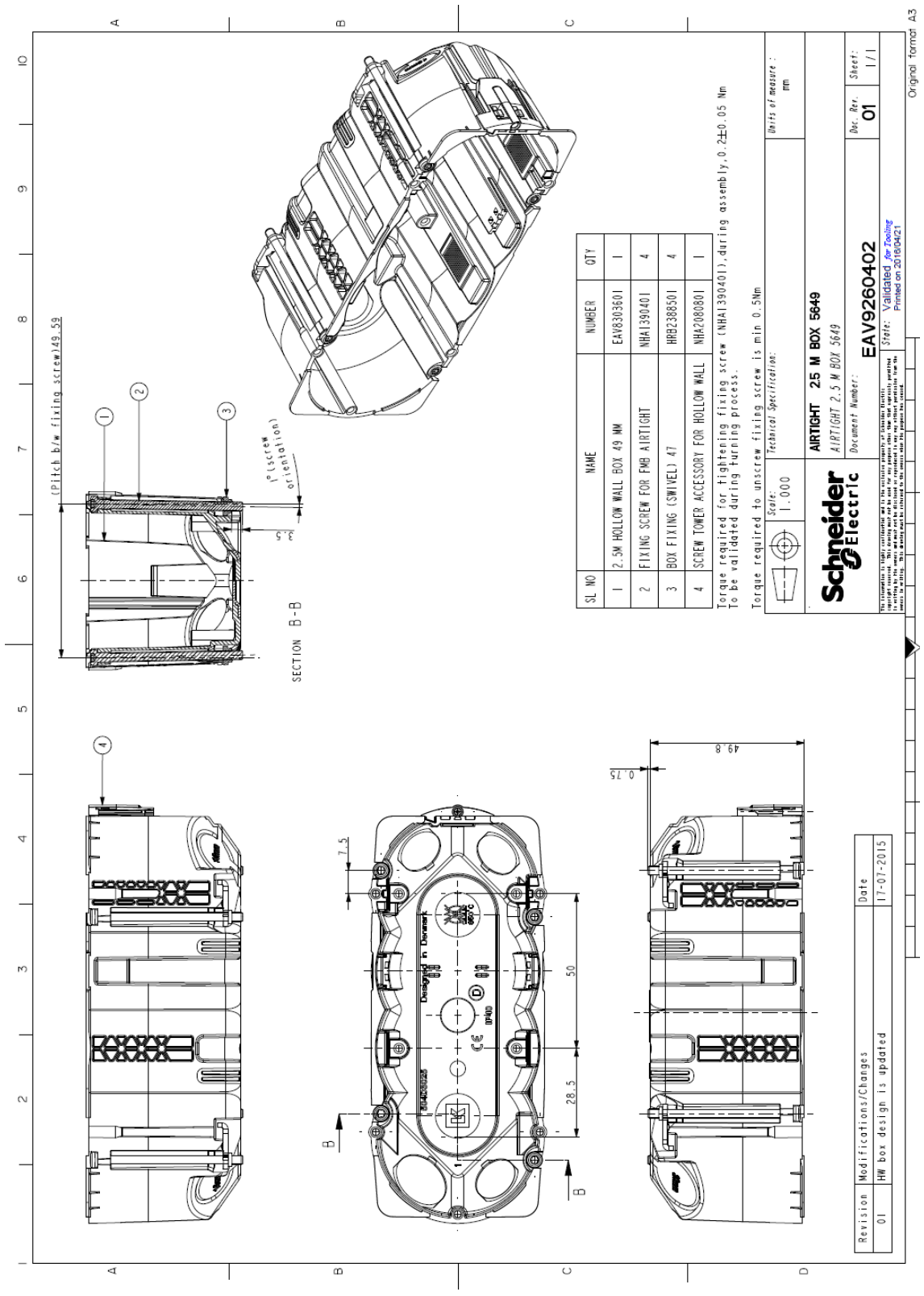
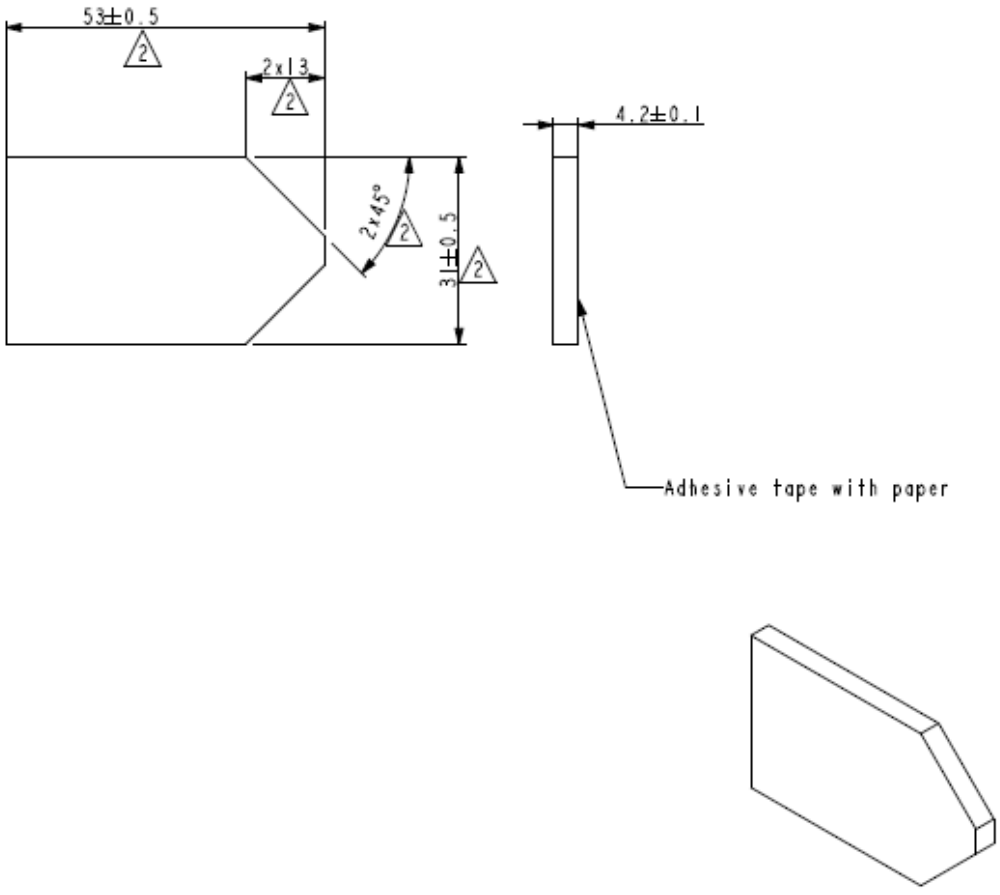


Figure 13 Specimen 7, Envirograf gasket Fuga 2.5M Ref NHA6598402 and NHA6598702 applied in the Schneider Electric Airtight 2.5M box 5649 Ref number EAV8303601

Rev	Modification/Changes	Date
02	Size of the pad is updated and cuts are removed	12-04-2016



Scale: 1.000

Technical Specification:

Units of measure : mm

Schneider Electric

FIRE-PAD FOR 2.5M HW BOX

FIRE-PAD FOR 2.5M HW BOX

Document Number: NHA6598702

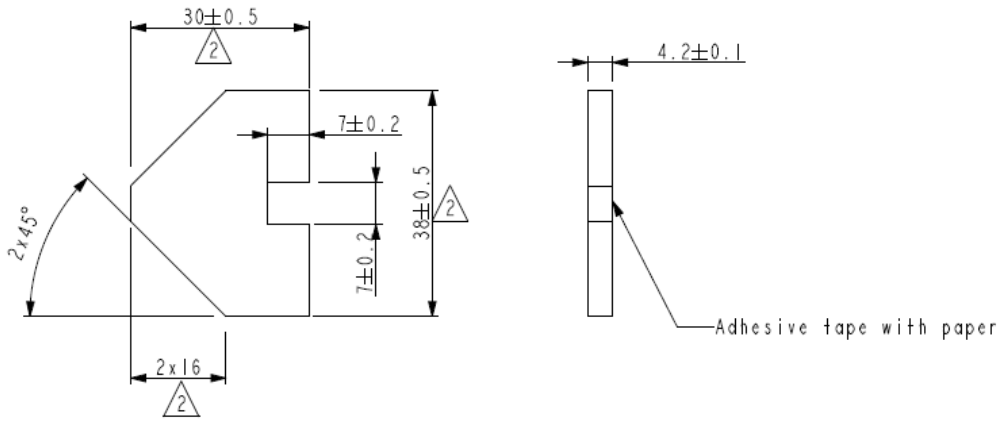
Doc. Rev. 02

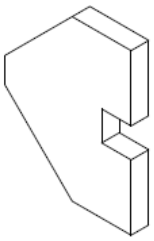
Sheet: 1/1

State: Creation
Printed on 2016/04/14

Figure 14 Specimen 7, Fire-pad for 2.5M Ref NHA6598702

Rev	Modification/Changes	Date
02	Size of the pad is updated	12-04-2016





Scale: 1.000	Technical Specification:	Units of measure : mm
Schneider Electric	FIRE-PAD FOR 2M HW BOX FIRE-PAD FOR 2M HW BOX	
	Document Number: NHA6598402	Doc. Rev. 02 / Sheet: 1/1
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Figure 15 Specimen 7, second Fire-pad for 2.5M Ref NHA6598402

APPENDIX A: FURNACE CONDITIONS AND AMBIENT TEMPERATURE

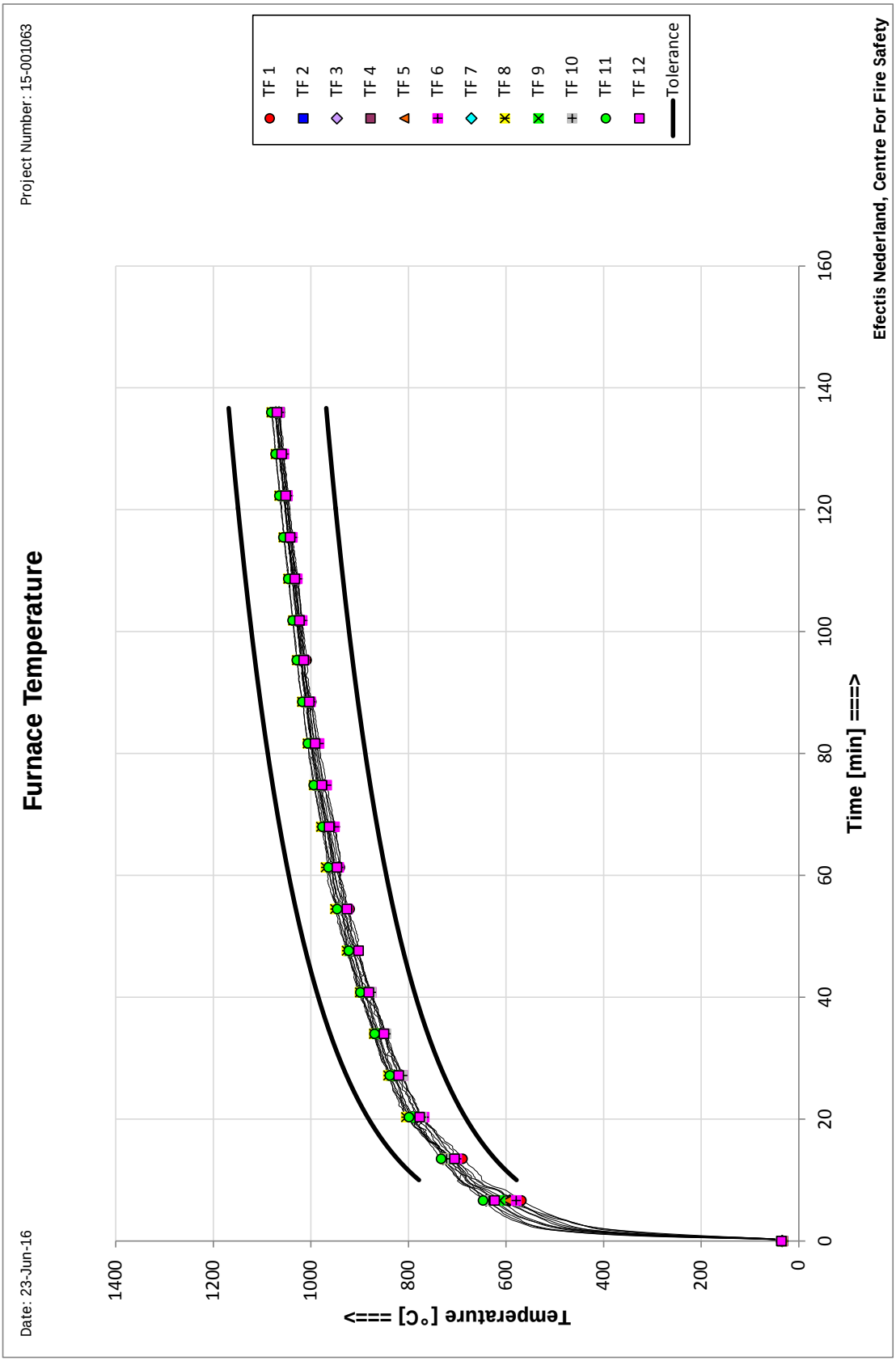


Figure A.1

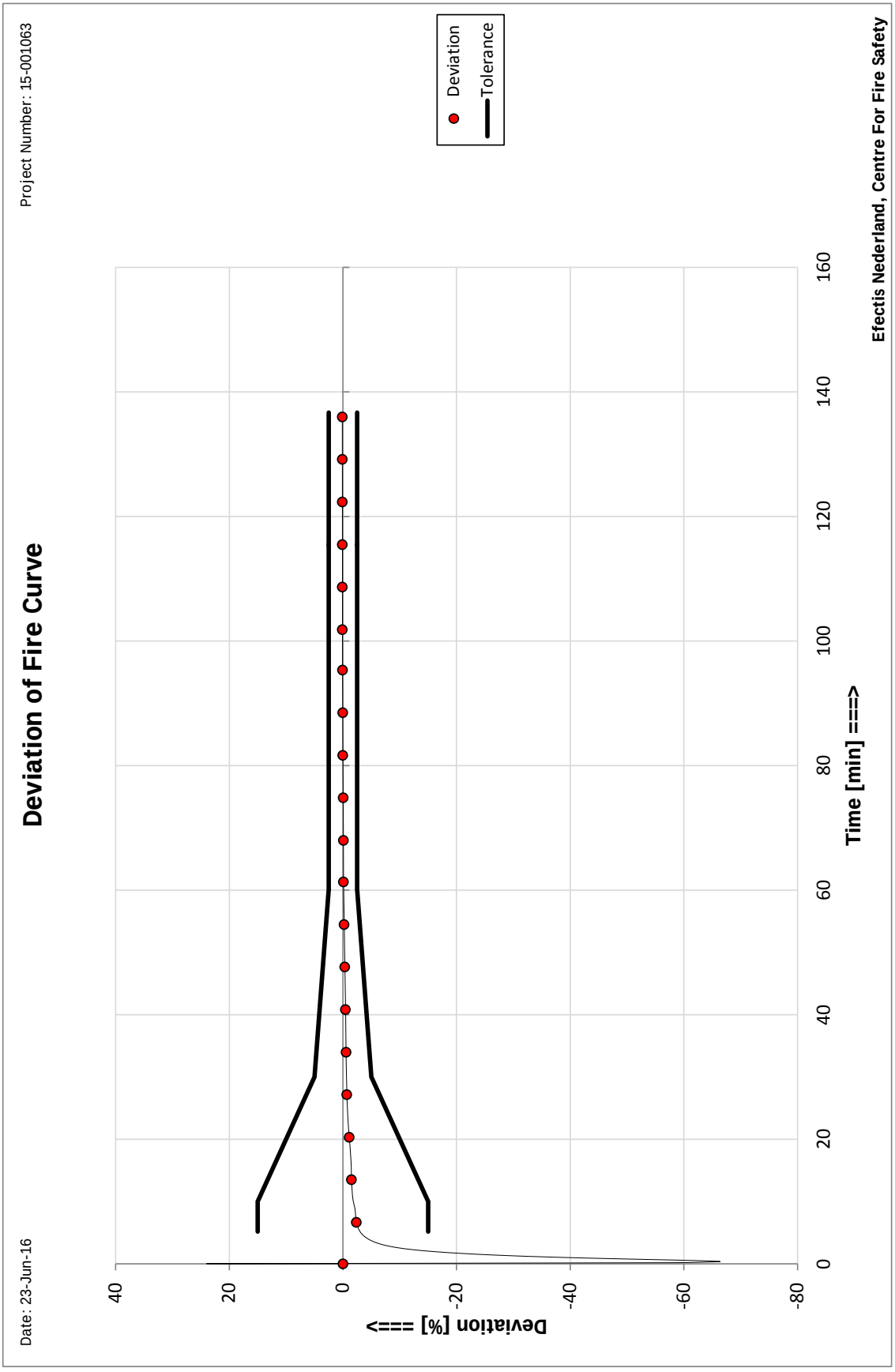

Deviation of Fire Curve
Project Number: 15-001063
Date: 23-Jun-16
Efectis Nederland, Centre For Fire Safety
Deviation
Tolerance
Deviation [%] ===>
Time [min] ===>
40
20
0
-20
-40
-60
-80
0
20
40
60
80
100
120
140
160

Figure A.2

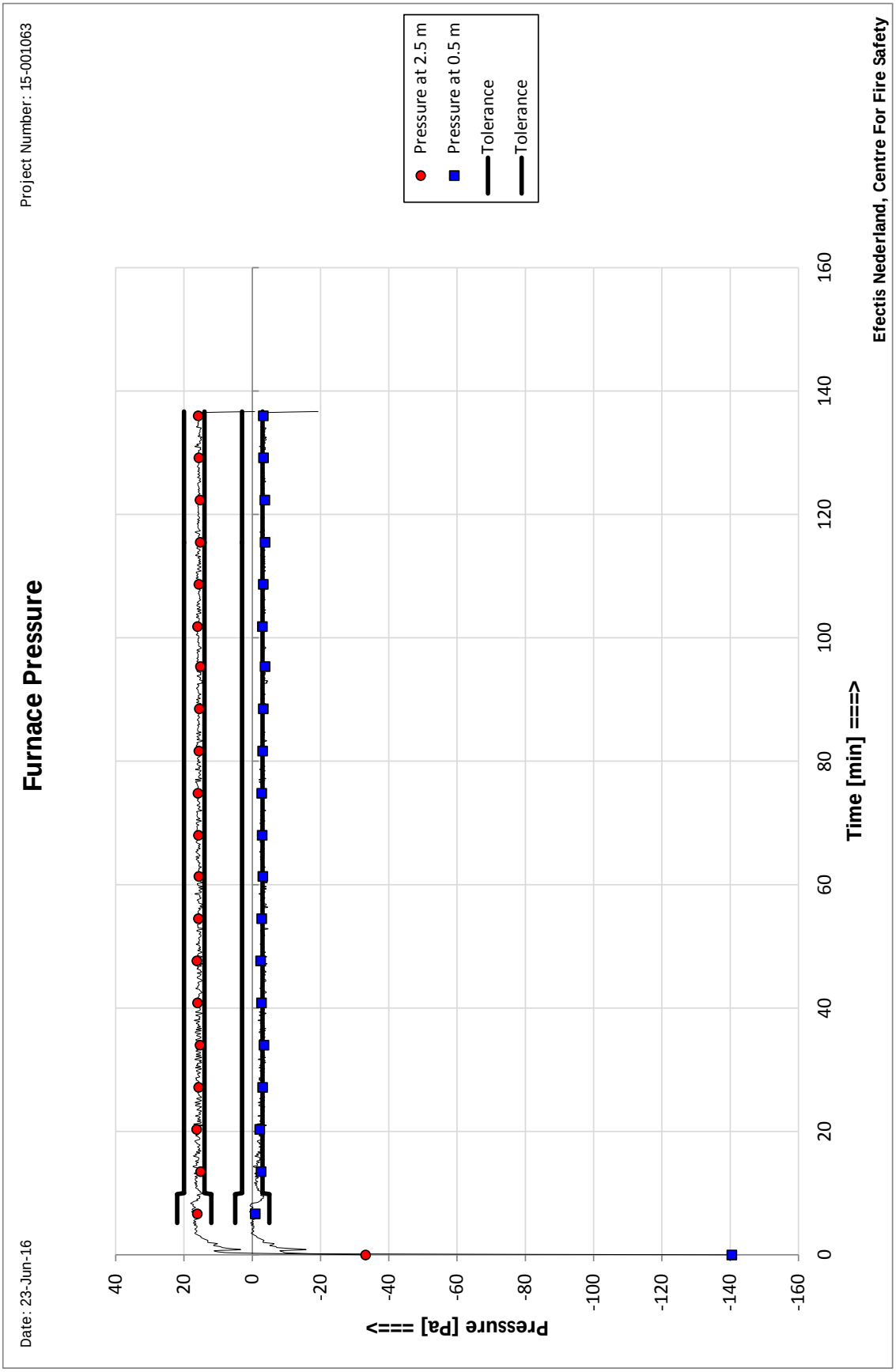

Furnace Pressure
Project Number: 15-001063
Date: 23-Jun-16
Efectis Nederland, Centre For Fire Safety
Pressure at 2.5 m
Pressure at 0.5 m
Tolerance
Tolerance
Pressure [Pa] ===>
Time [min] ===>
40
20
0
-20
-40
-60
-80
-100
-120
-140
-160
0
20
40
60
80
100
120
140
160

Figure A.3

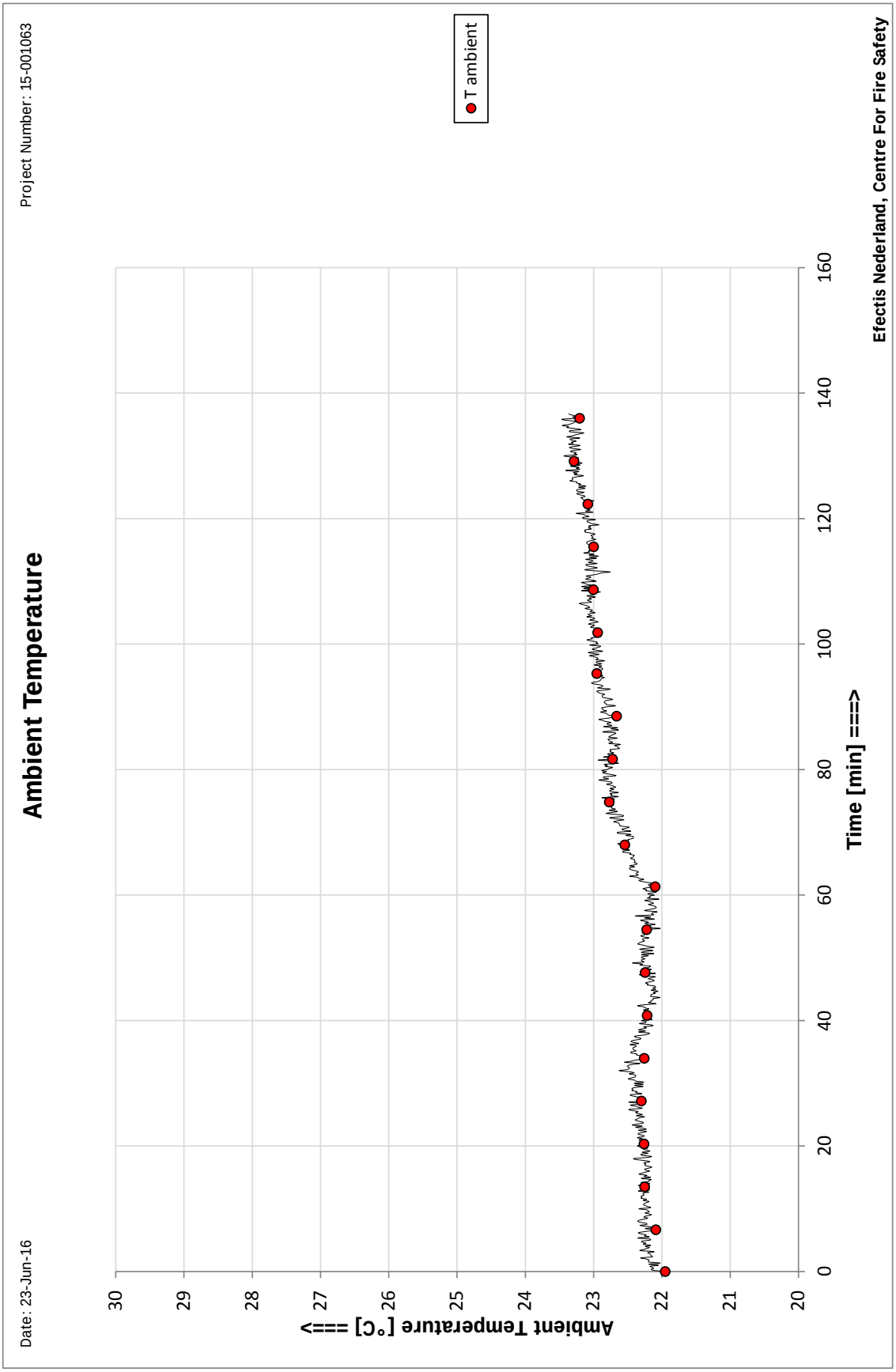
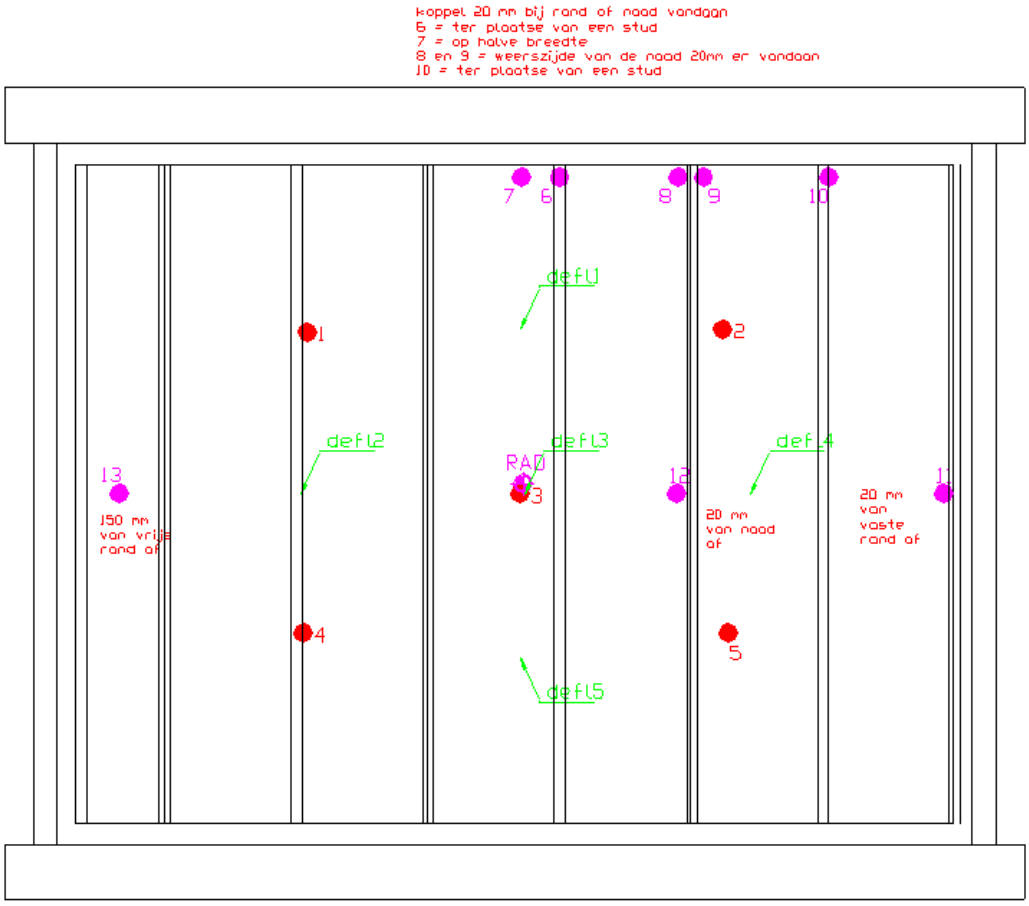

Ambient Temperature
Project Number: 15-001063
Date: 23-Jun-16
T ambient
Efectis Nederland, Centre For Fire Safety
Time [min] ===>
Ambient Temperature [°C] ===>
0
20
40
60
80
100
120
140
160
30
29
28
27
26
25
24
23
22
21
20

Figure A.4

APPENDIX B: POSITION OF THERMOCOUPLES AND TEST RESULTS



OVERVIEW UNEXPOSED SIDE

Figure B.1

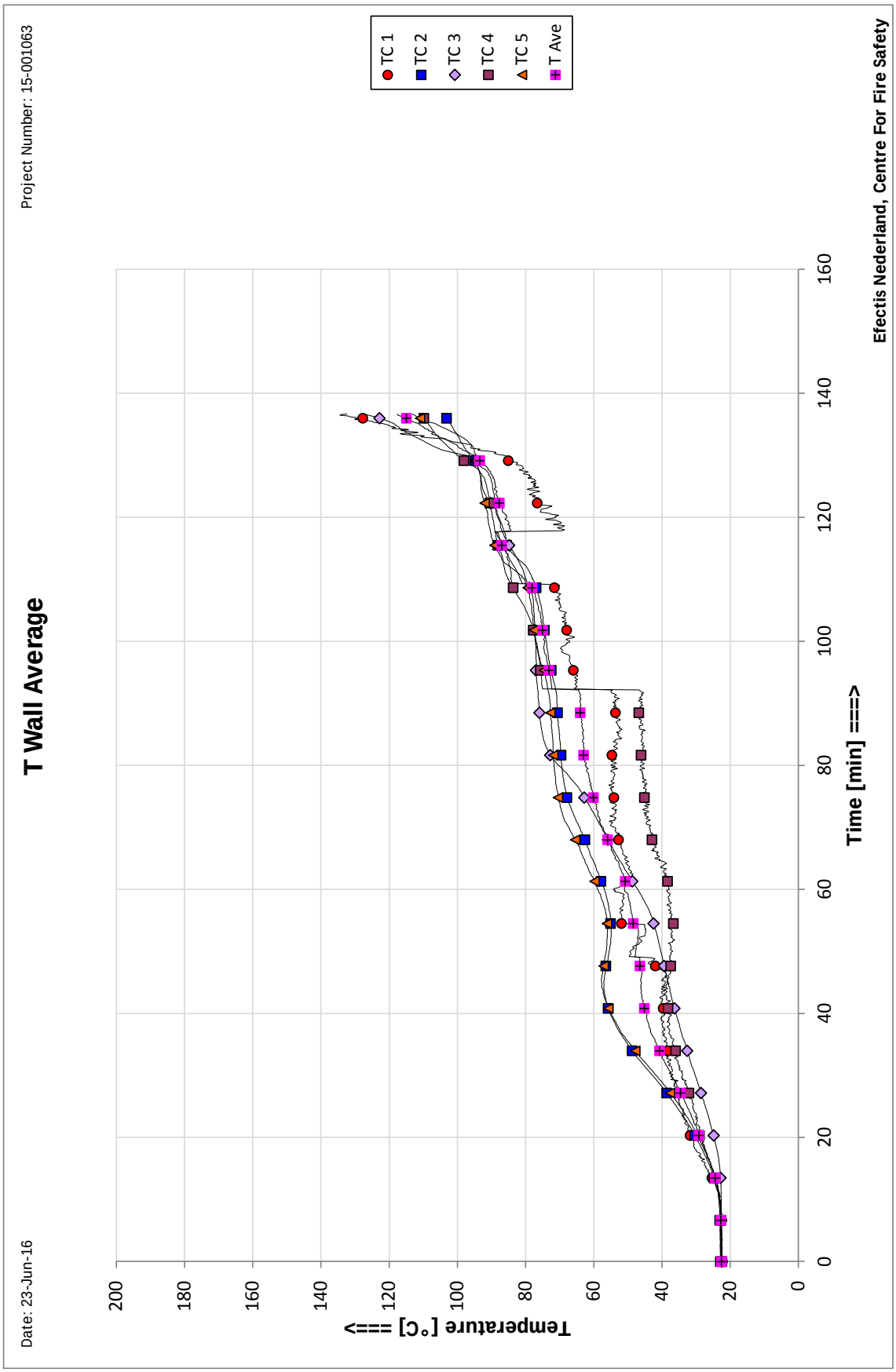

Project Number: 15-001063
T Wall Average
Efectis Nederland, Centre For Fire Safety
TC 1
TC 2
TC 3
TC 4
TC 5
T Ave
Temperature [°C] ===>
Time [min] ===>
0
20
40
60
80
100
120
140
160
180
200
Date: 23-Jun-16

Figure B.2

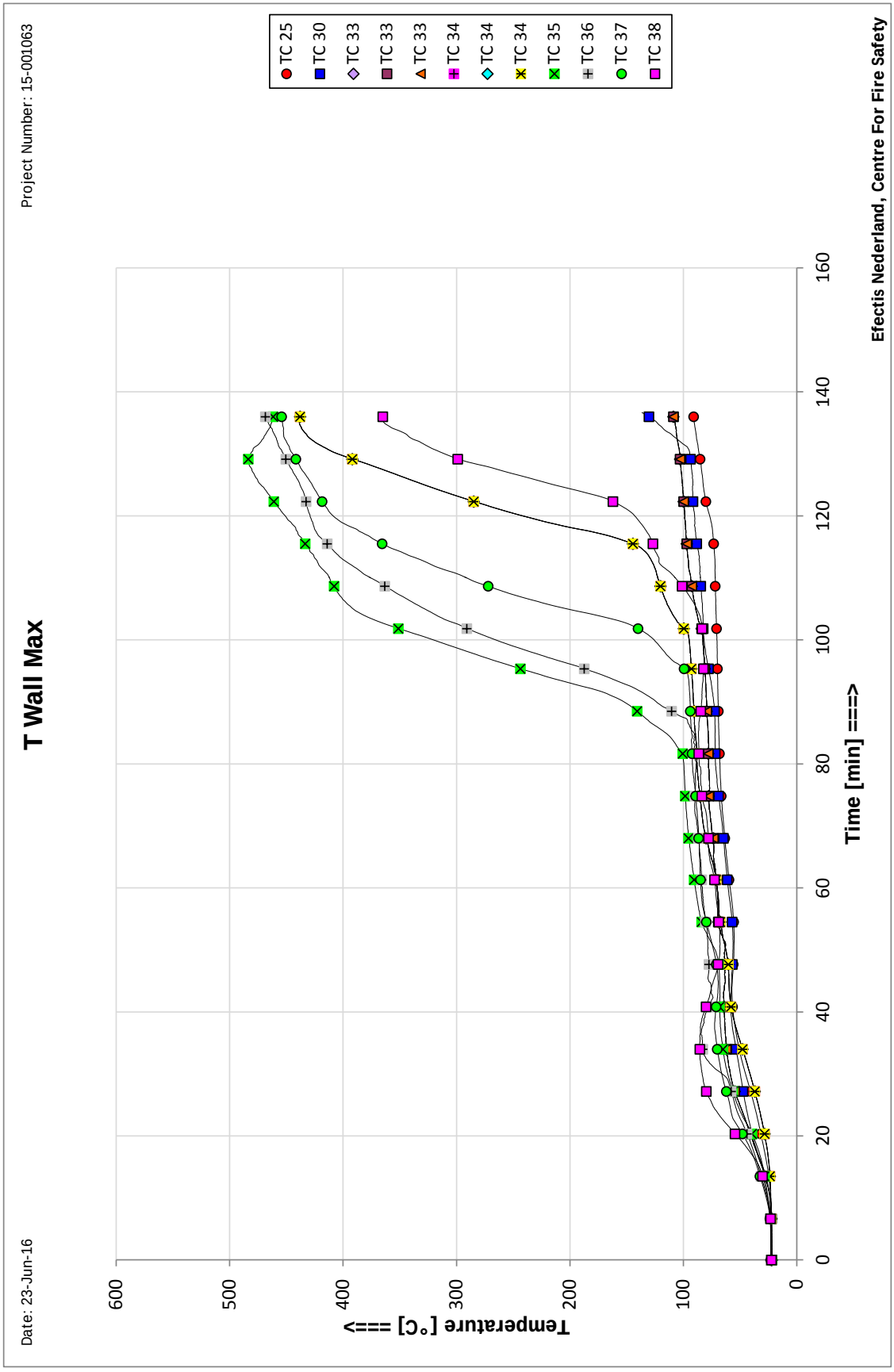

TC 25
TC 30
TC 33
TC 33
TC 33
TC 34
TC 34
TC 34
TC 35
TC 36
TC 37
TC 38
Project Number: 15-001063
Efectis Nederland, Centre For Fire Safety
T Wall Max
Date: 23-Jun-16
Temperature [°C] ===>
Time [min] ===>
0
100
200
300
400
500
600
0
20
40
60
80
100
120
140
160

Figure B.3

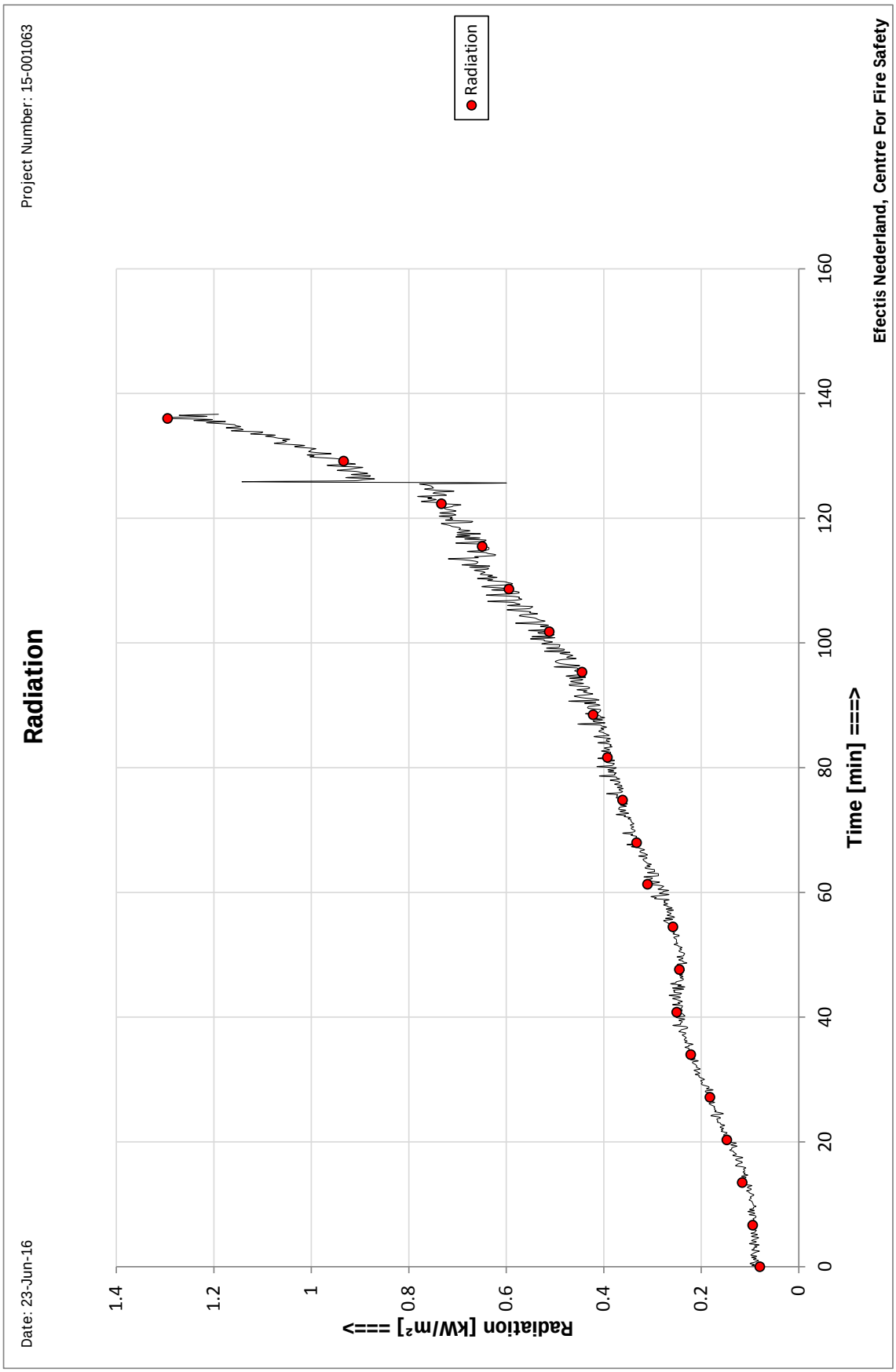

Radiation
Project Number: 15-001063
Efectis Nederland, Centre For Fire Safety
Radiation
Date: 23-Jun-16
Radiation [kW/m²] ===>
Time [min] ===>
0
0.2
0.4
0.6
0.8
1
1.2
1.4
0
20
40
60
80
100
120
140
160

Figure B.4

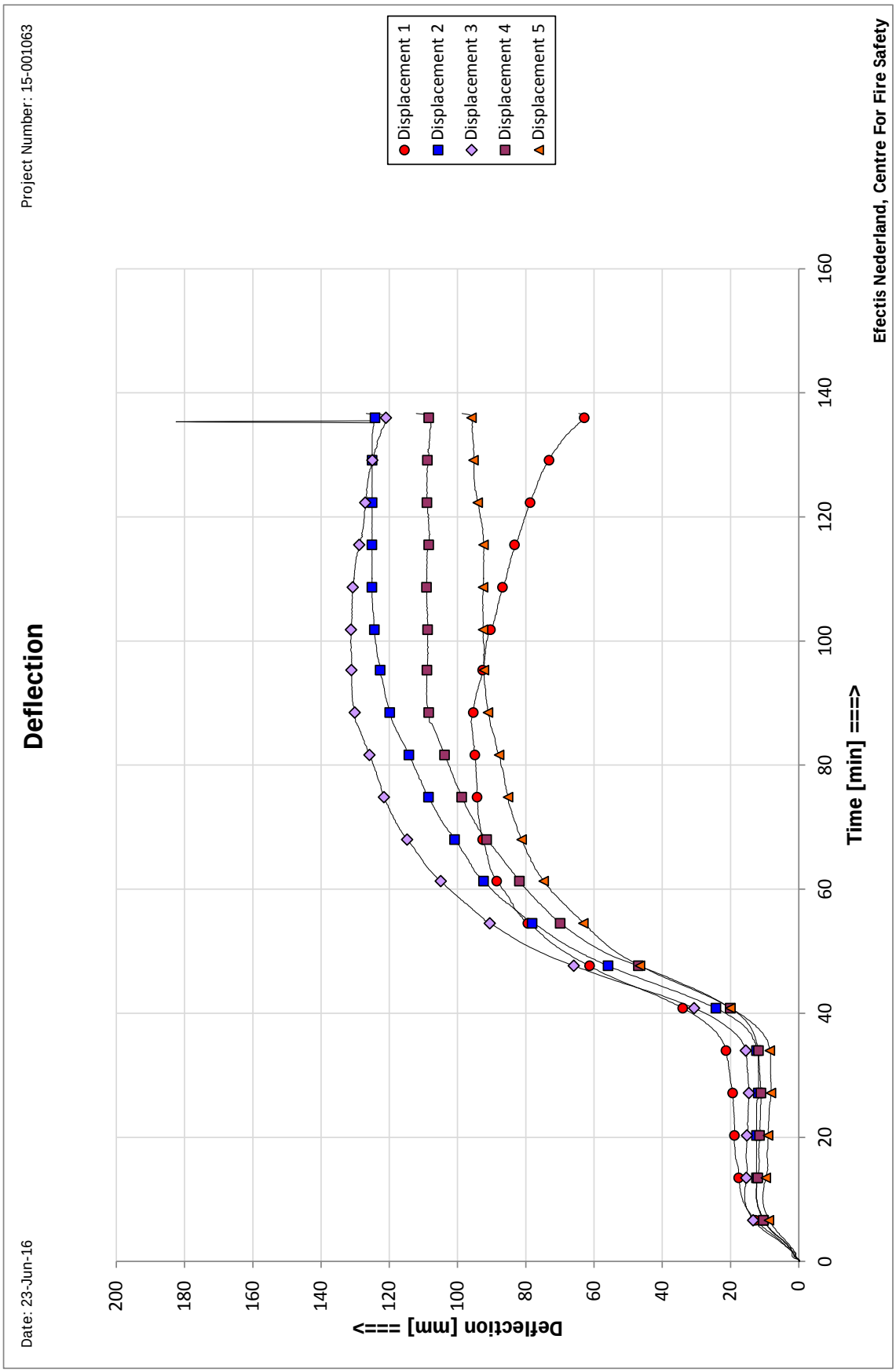

Project Number: 15-001063
Displacement 1
Displacement 2
Displacement 3
Displacement 4
Displacement 5
Efectis Nederland, Centre For Fire Safety
Deflection
Time [min] ===>
Deflection [mm] ===>
Date: 23-Jun-16
0
20
40
60
80
100
120
140
160
180
200

Figure B.5

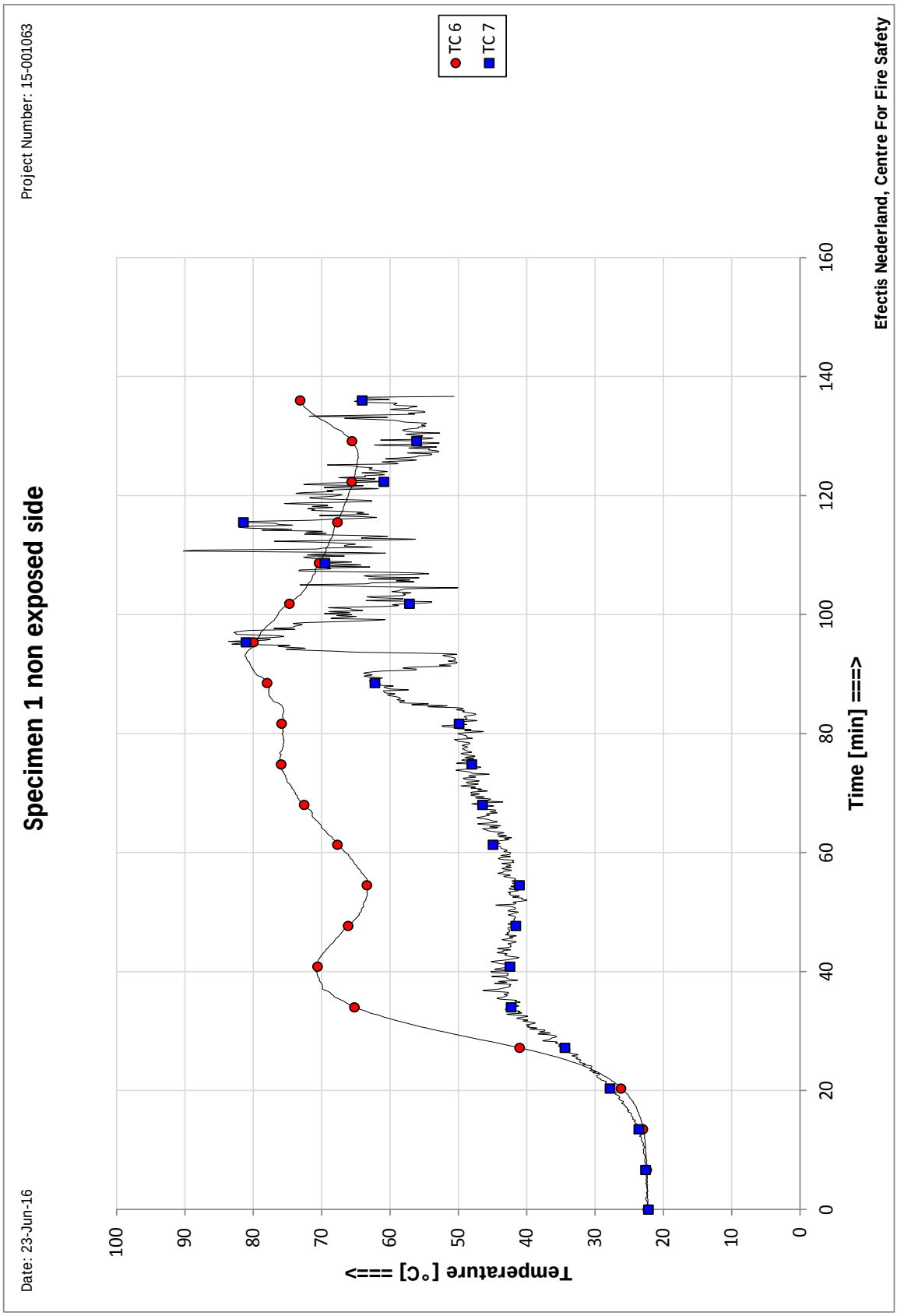

Specimen 1 non exposed side
Project Number: 15-001063
Date: 23-Jun-16
Efectis Nederland, Centre For Fire Safety
TC 6
TC 7
Temperature [°C] ===>
Time [min] ===>
0
10
20
30
40
50
60
70
80
90
100
0
20
40
60
80
100
120
140
160

Figure B.6

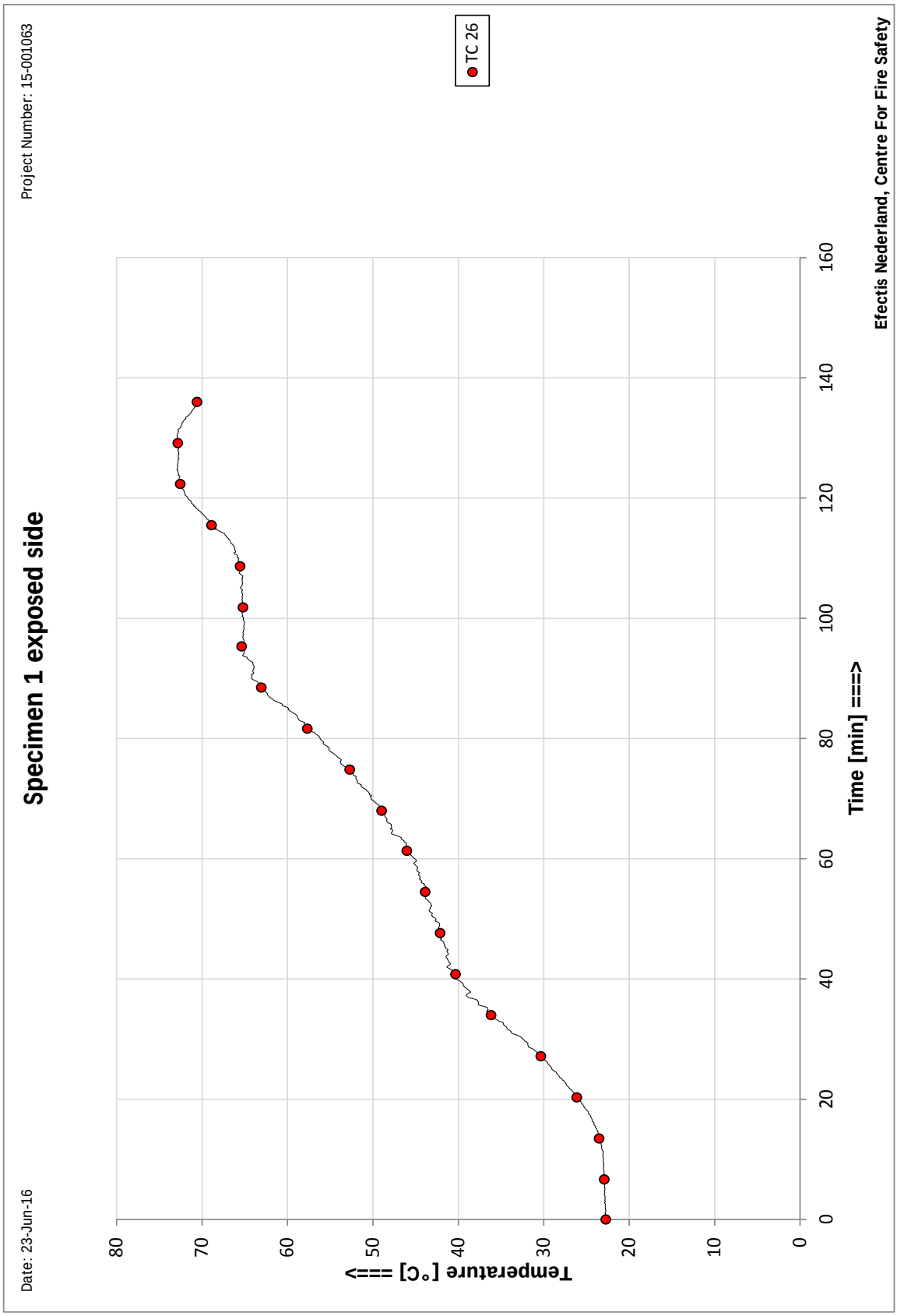

Project Number: 15-001063
Specimen 1 exposed side
Date: 23-Jun-16
TC 26
Efectis Nederland, Centre For Fire Safety
Temperature [°C] ===>
Time [min] ===>
0
10
20
30
40
50
60
70
80
0
20
40
60
80
100
120
140
160

Figure B.7

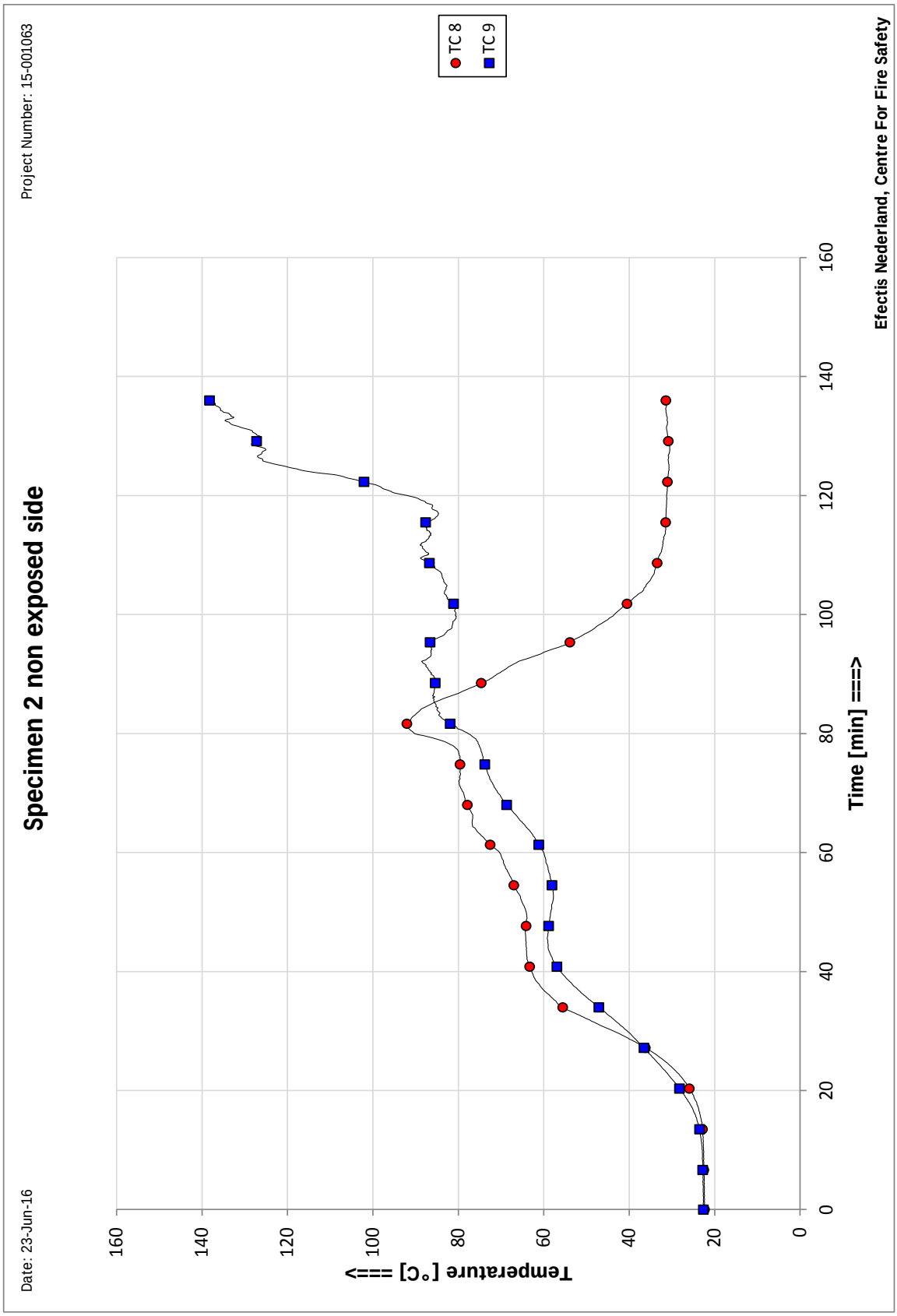

Specimen 2 non exposed side
Project Number: 15-001063
Date: 23-Jun-16
Efectis Nederland, Centre For Fire Safety
TC 8
TC 9
Temperature [°C] ===>
Time [min] ===>
0
20
40
60
80
100
120
140
160

Figure B.8

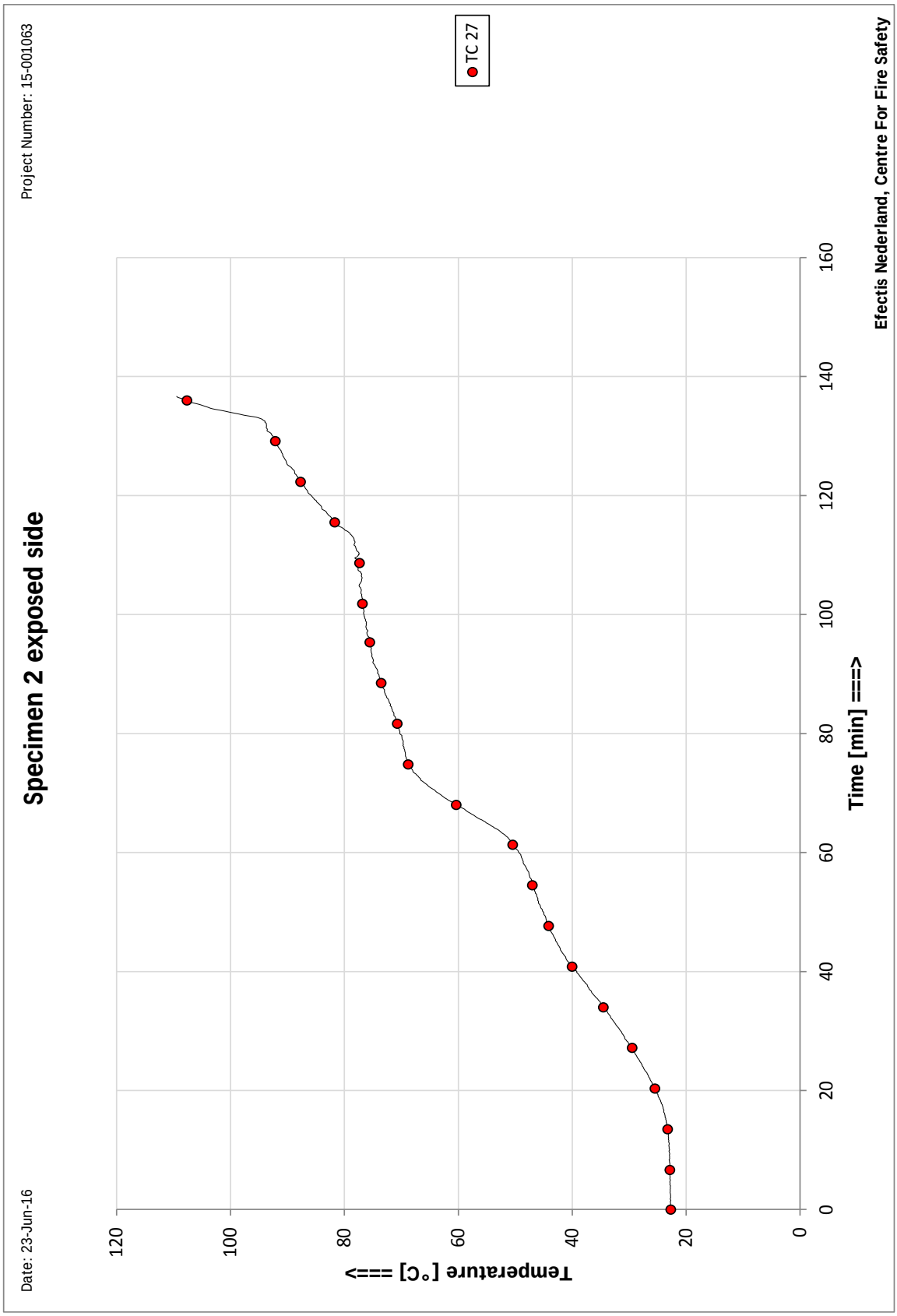

Project Number: 15-001063
Specimen 2 exposed side
Date: 23-Jun-16
TC 27
Temperature [°C] ===>
0
20
40
60
80
100
120
Time [min] ===>
0
20
40
60
80
100
120
140
160
Efectis Nederland, Centre For Fire Safety

Figure B.9

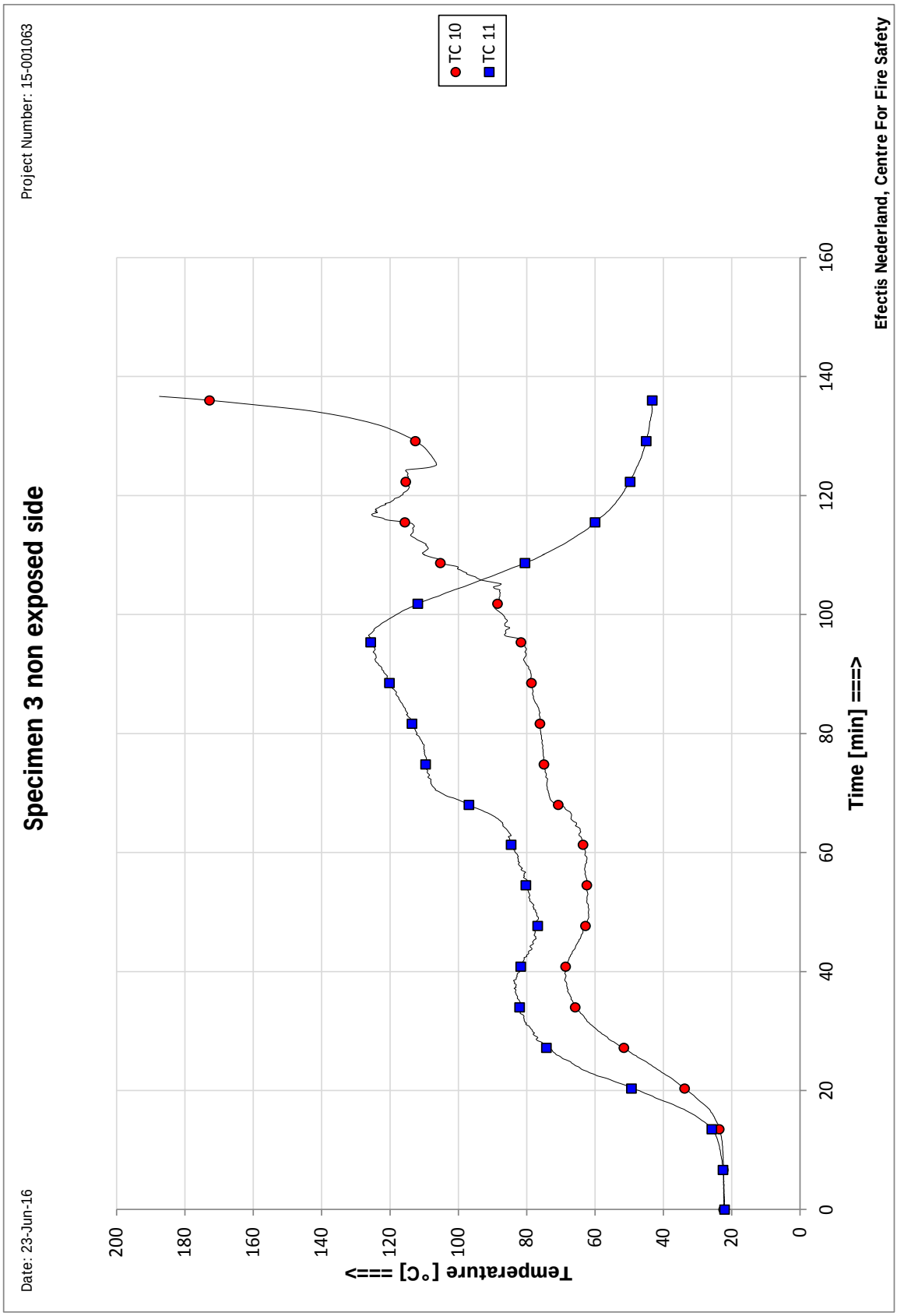

Specimen 3 non exposed side
Project Number: 15-001063
Date: 23-Jun-16
Efectis Nederland, Centre For Fire Safety
TC 10
TC 11
Temperature [°C] ===>
Time [min] ===>
0
20
40
60
80
100
120
140
160
180
200
0
20
40
60
80
100
120
140
160

Figure B.10

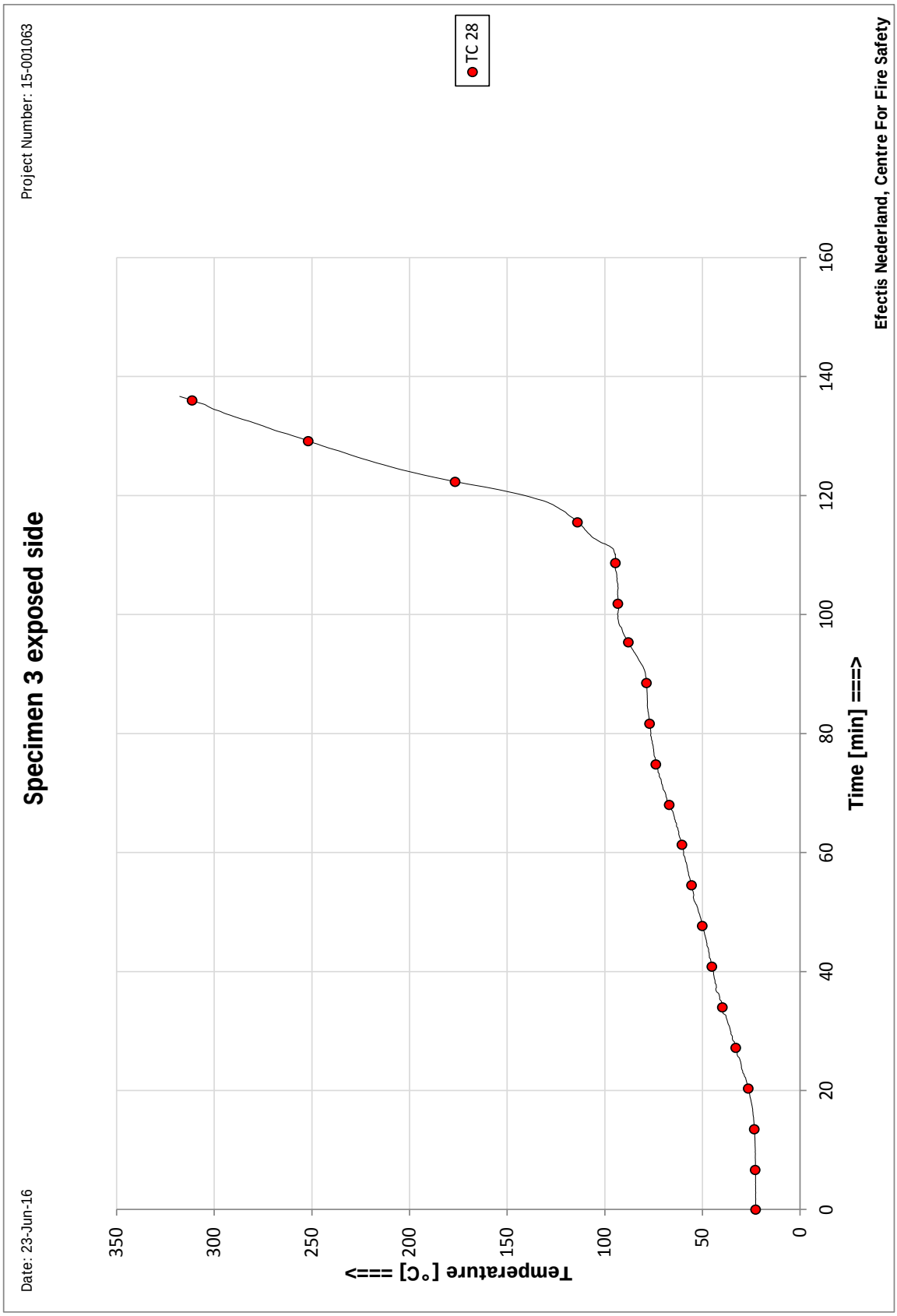

Project Number: 15-001063
Specimen 3 exposed side
Date: 23-Jun-16
TC 28
Efectis Nederland, Centre For Fire Safety
Temperature [°C] ===>
Time [min] ===>
0
50
100
150
200
250
300
350
0
20
40
60
80
100
120
140
160

Figure B.11

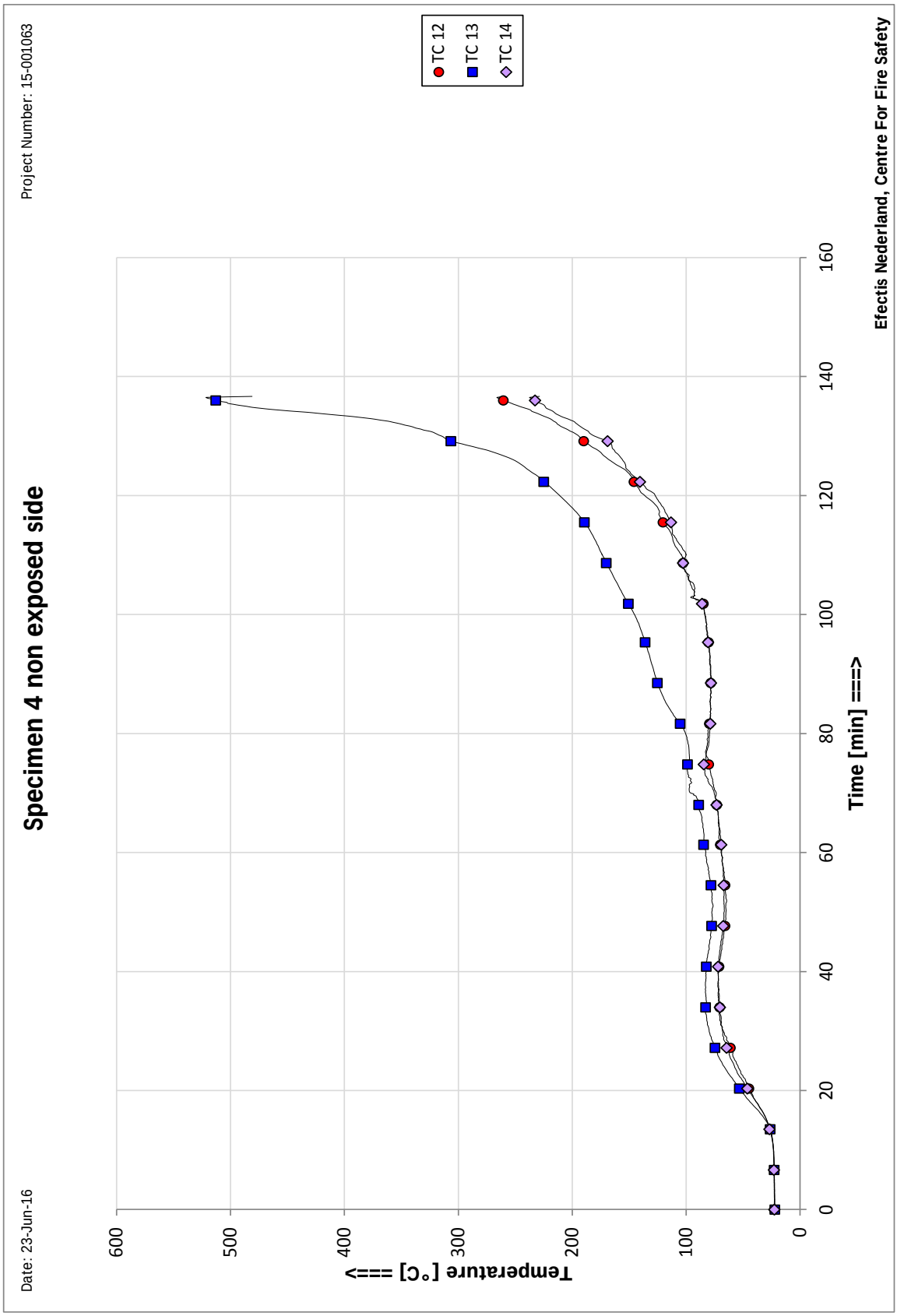
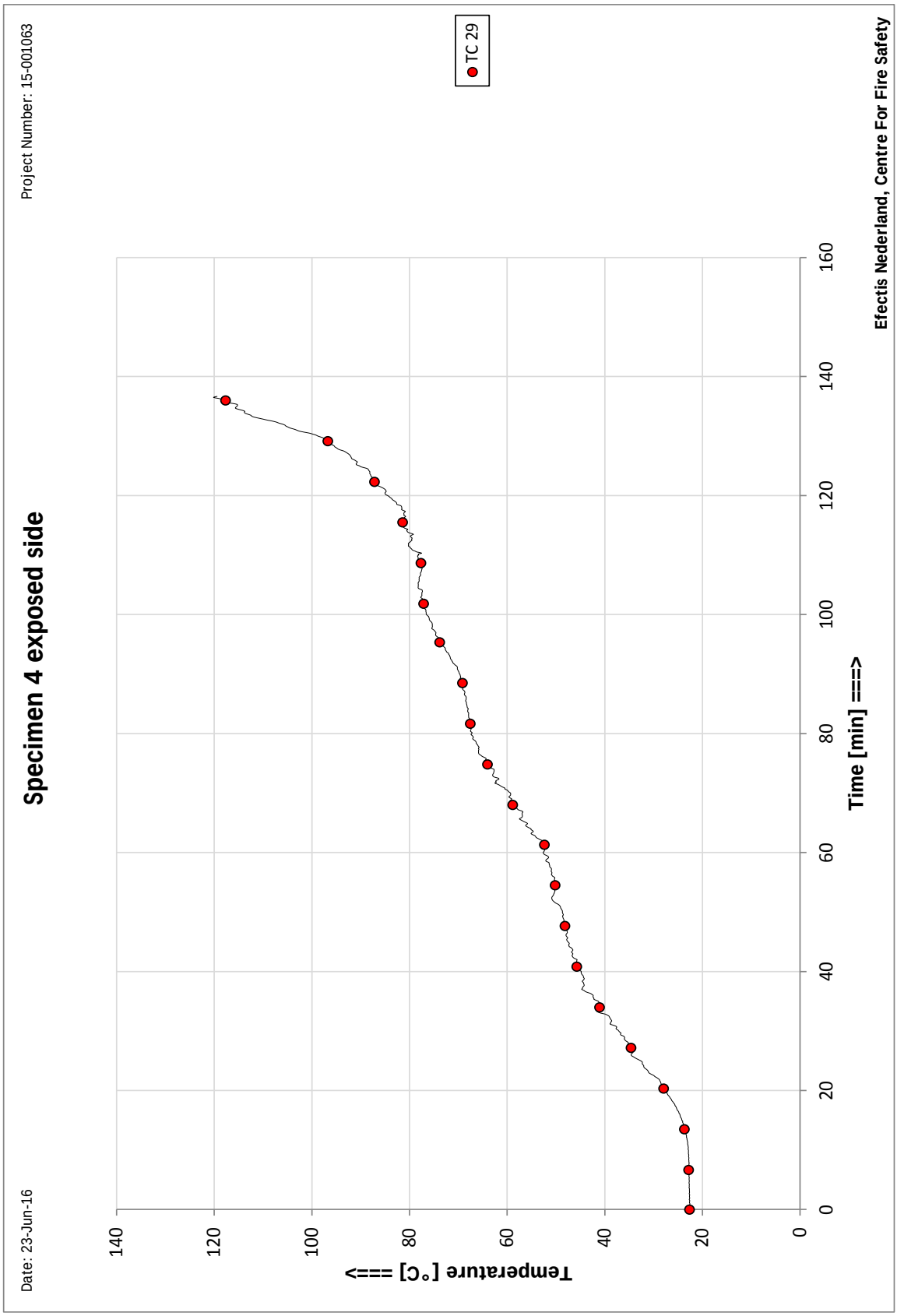
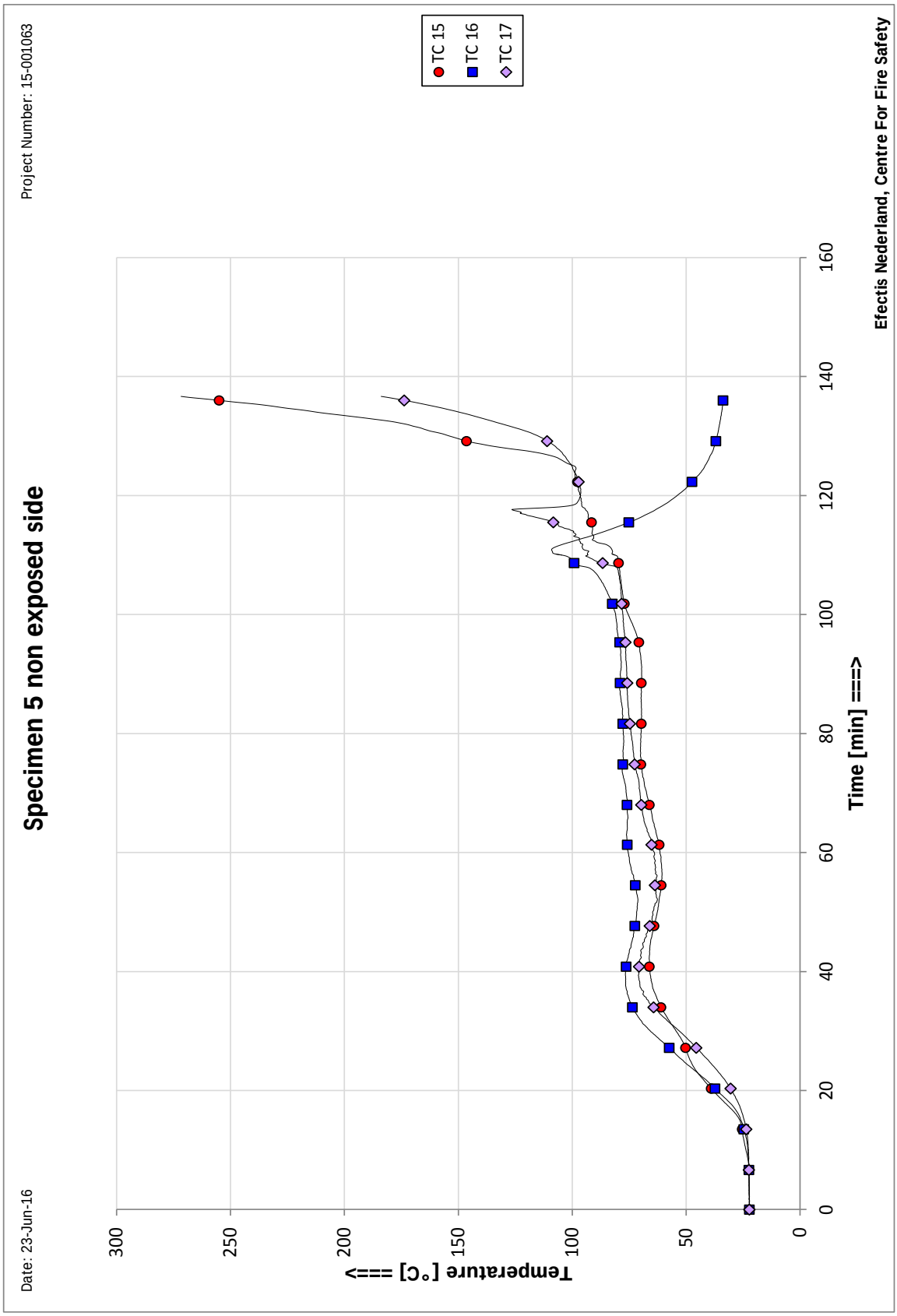

Specimen 4 non exposed side
Project Number: 15-001063
Date: 23-Jun-16
Efectis Nederland, Centre For Fire Safety
TC 12
TC 13
TC 14
Temperature [°C] ===>
Time [min] ===>
0
100
200
300
400
500
600
0
20
40
60
80
100
120
140
160

Figure B.12


Specimen 4 exposed side
Project Number: 15-001063
Date: 23-Jun-16
TC 29
Temperature [°C] ===>
Time [min] ===>
Efectis Nederland, Centre For Fire Safety
0
20
40
60
80
100
120
140
0
20
40
60
80
100
120
140
160


Specimen 5 non exposed side
Project Number: 15-001063
Date: 23-Jun-16
Efectis Nederland, Centre For Fire Safety
TC 15
TC 16
TC 17
Temperature [°C] ===>
Time [min] ===>
0
50
100
150
200
250
300
0
20
40
60
80
100
120
140
160

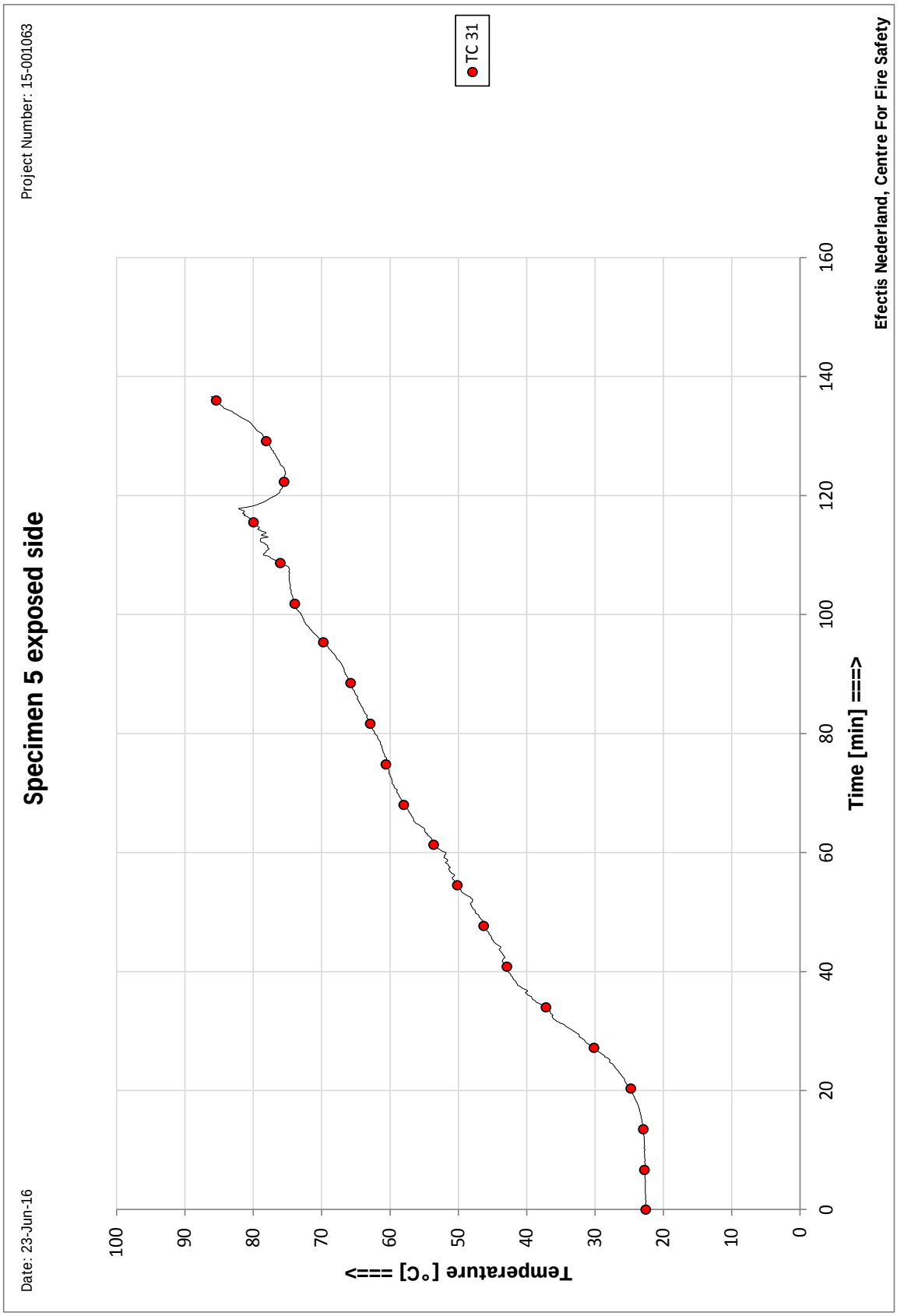

Project Number: 15-001063
Specimen 5 exposed side
Date: 23-Jun-16
TC 31
Efectis Nederland, Centre For Fire Safety
Temperature [°C] ===>
Time [min] ===>
0
10
20
30
40
50
60
70
80
90
100
0
20
40
60
80
100
120
140
160

Figure B.13

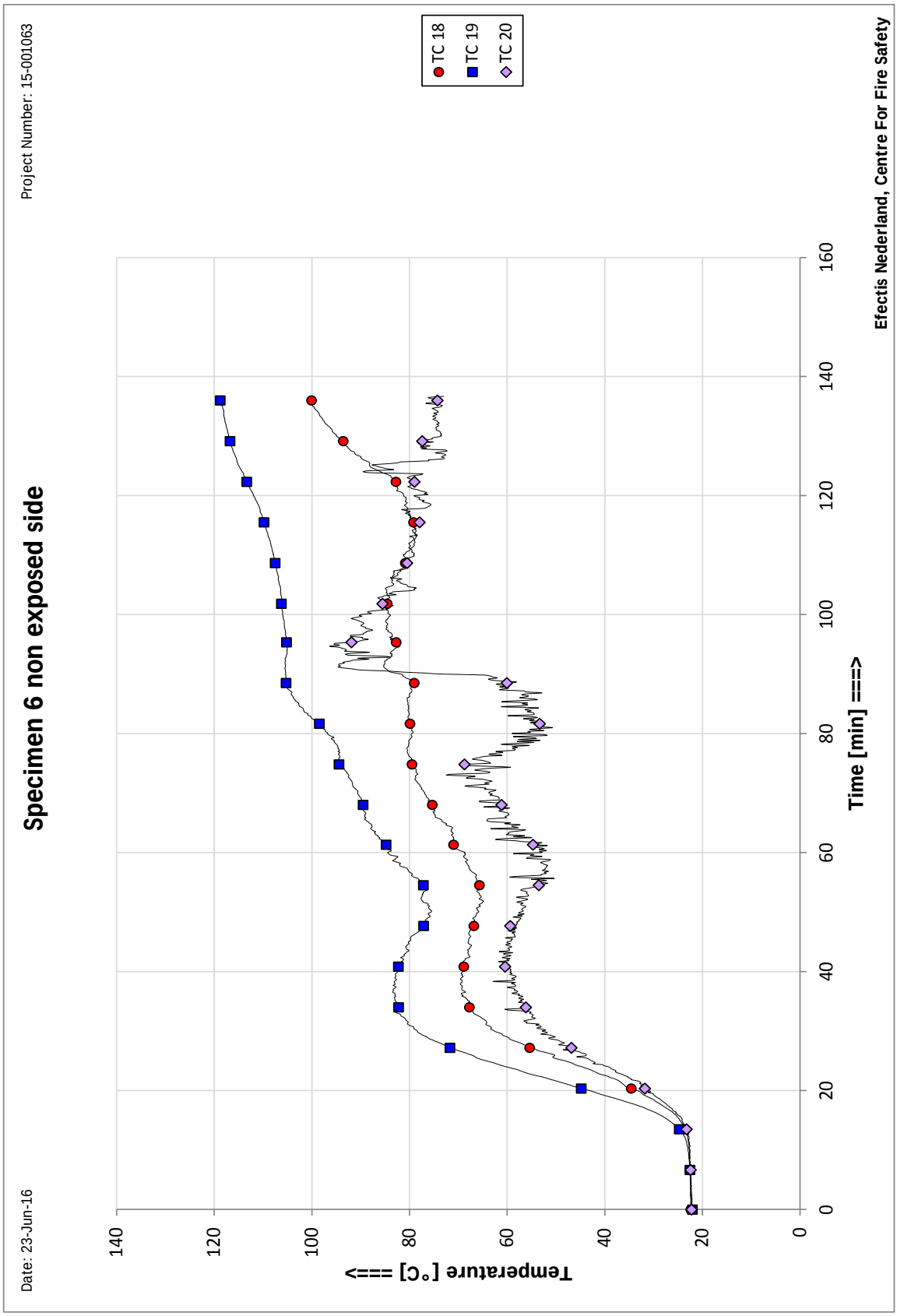

Project Number: 15-001063
Specimen 6 non exposed side
Date: 23-Jun-16
TC 18
TC 19
TC 20
Temperature [°C] ===>
Time [min] ===>
Efectis Nederland, Centre For Fire Safety
0
20
40
60
80
100
120
140
0
20
40
60
80
100
120
140
160

Figure B.14

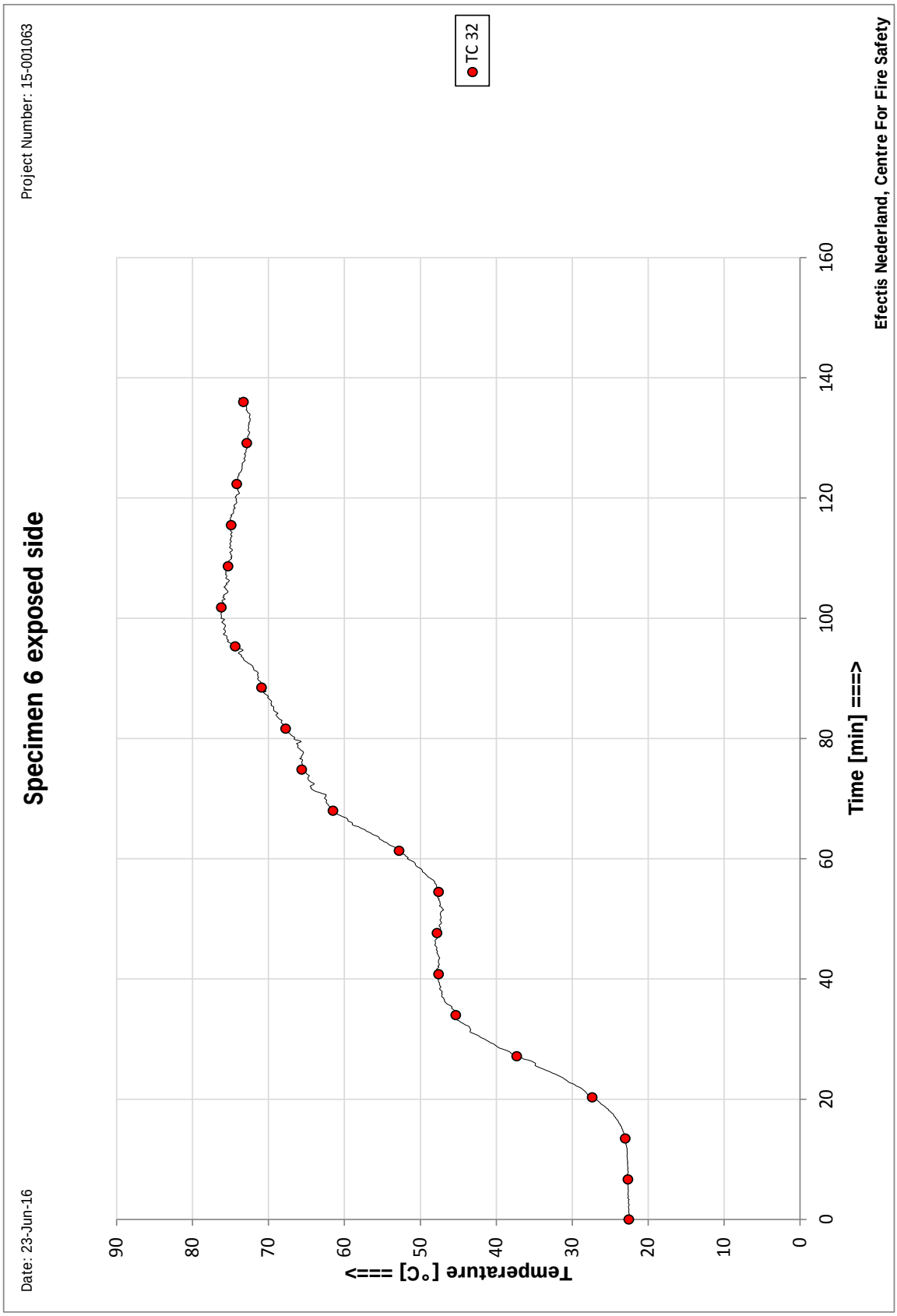

Specimen 6 exposed side
Project Number: 15-001063
Date: 23-Jun-16
Efectis Nederland, Centre For Fire Safety
TC 32
Temperature [°C] ===>
Time [min] ===>
0
10
20
30
40
50
60
70
80
90
0
20
40
60
80
100
120
140
160

Figure B.15

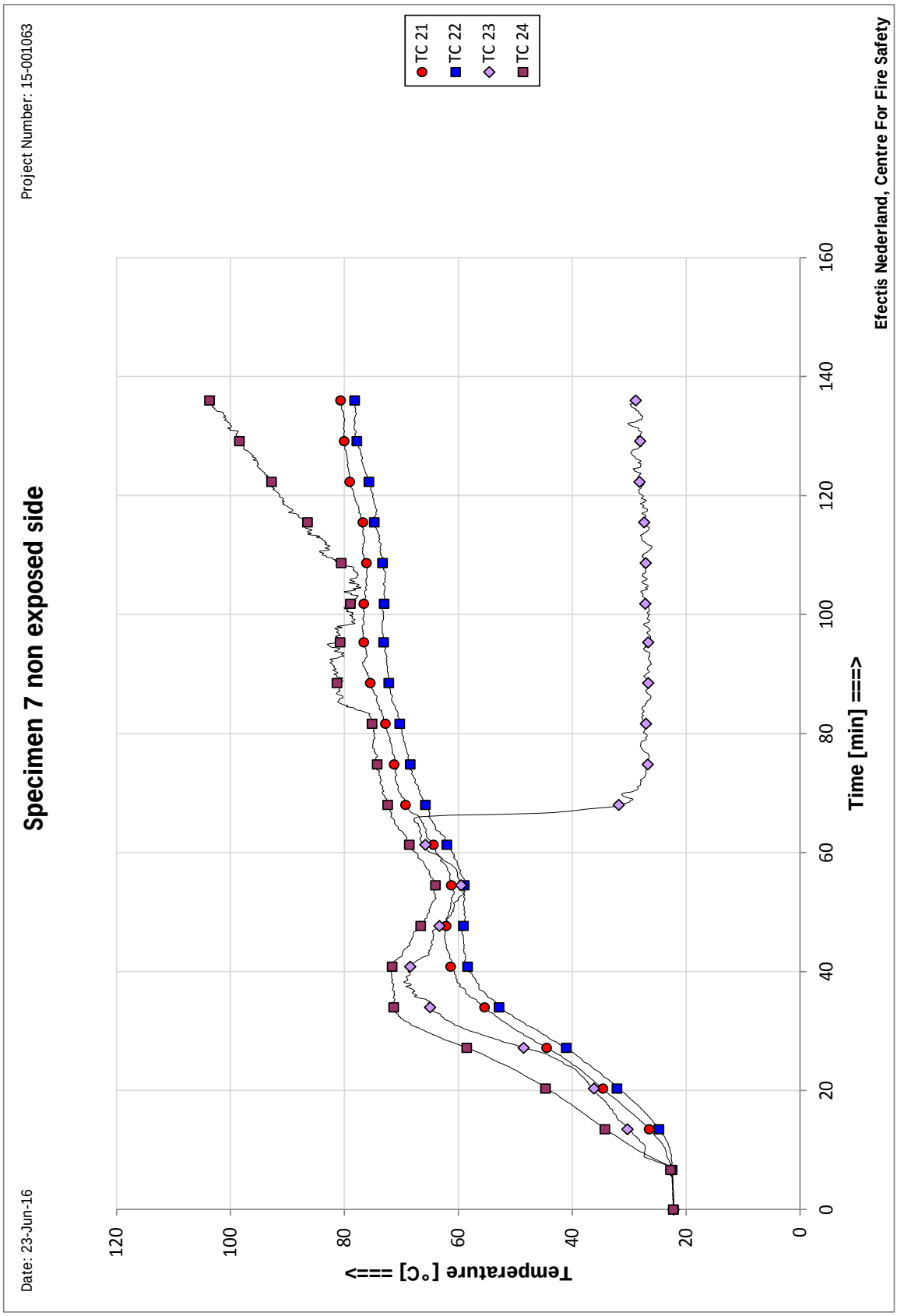

Specimen 7 non exposed side
Project Number: 15-001063
Date: 23-Jun-16
Efectis Nederland, Centre For Fire Safety
TC 21
TC 22
TC 23
TC 24
Temperature [°C] ===>
Time [min] ===>
0
20
40
60
80
100
120
0
20
40
60
80
100
120
140
160

Figure B.16

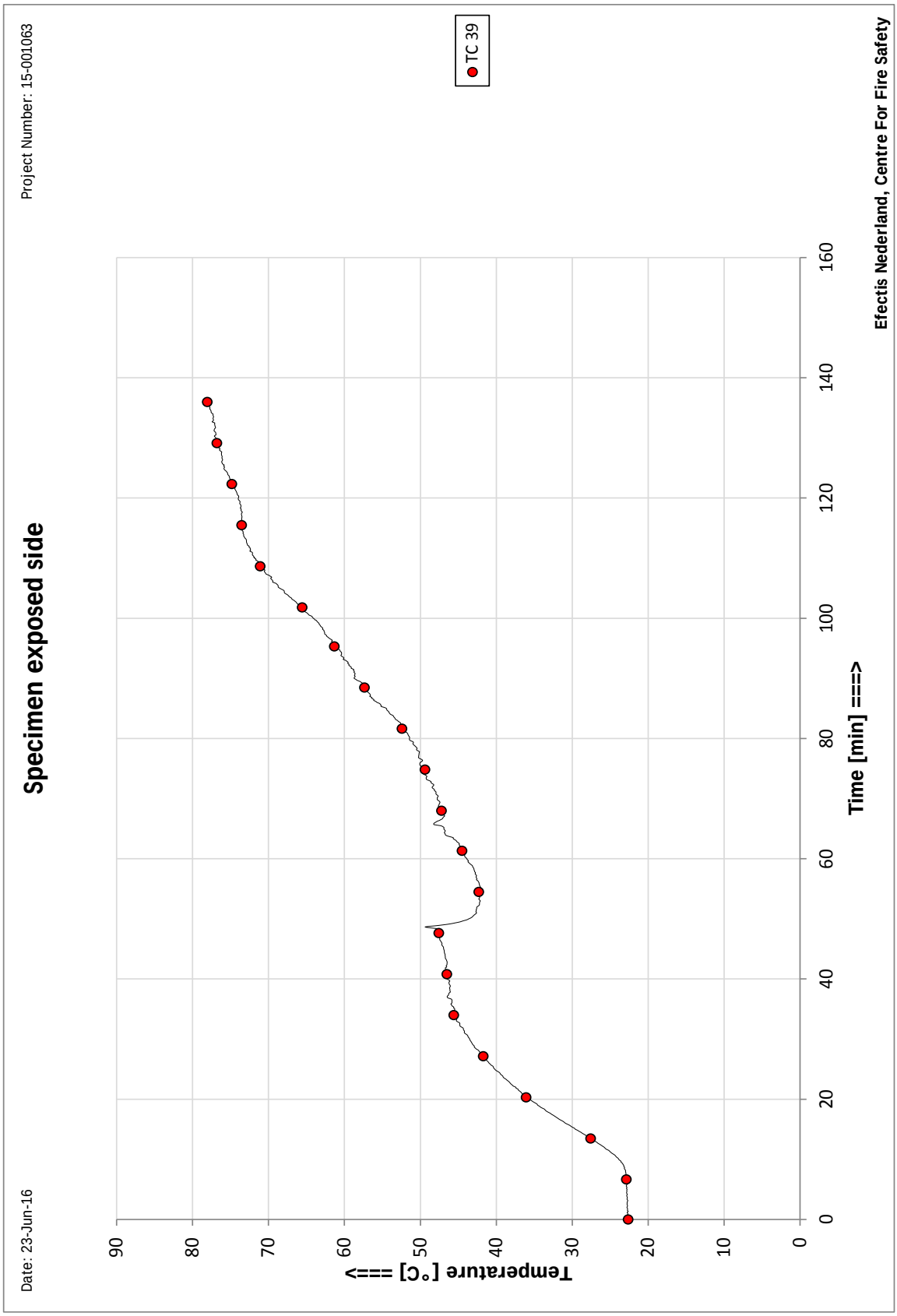

Project Number: 15-001063
Specimen exposed side
Date: 23-Jun-16
TC 39
Efectis Nederland, Centre For Fire Safety
Temperature [°C] ===>
Time [min] ===>
0
10
20
30
40
50
60
70
80
90
0
20
40
60
80
100
120
140
160

Figure B.17

APPENDIX C: PHOTOS

INSTALLATION

Photo 1 Timber installed for support of the hollow wall boxes

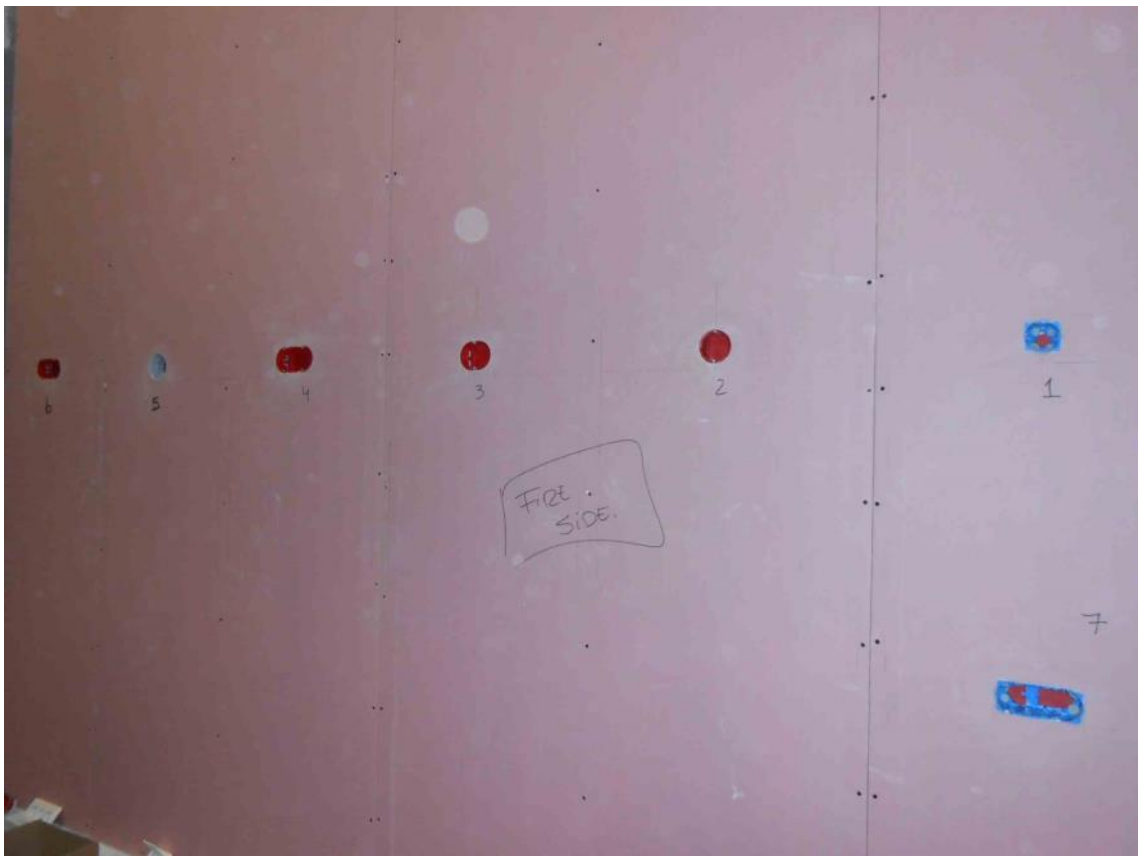


Photo 2 Hollow wall boxes installed in wall at the exposed side (ES)

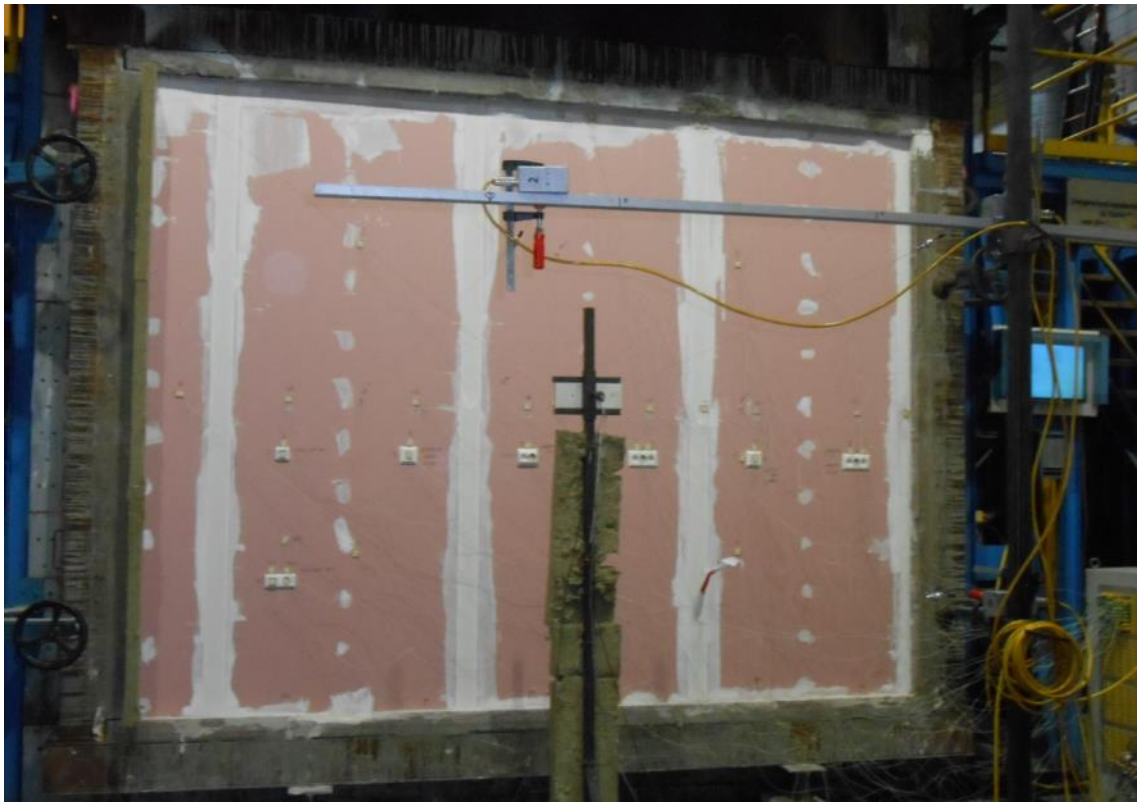


Photo 3 Hollow wall boxes installed in wall at the non-exposed side (NS)

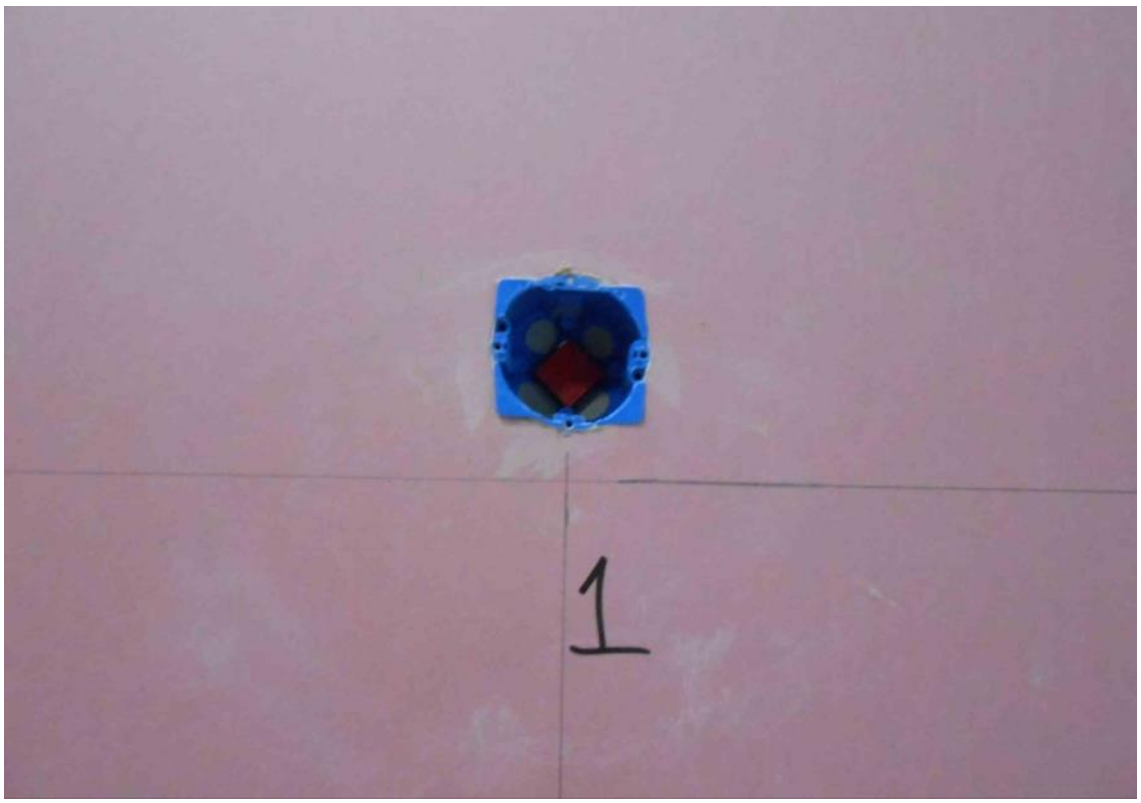


Photo 4 Test specimen 1 ES

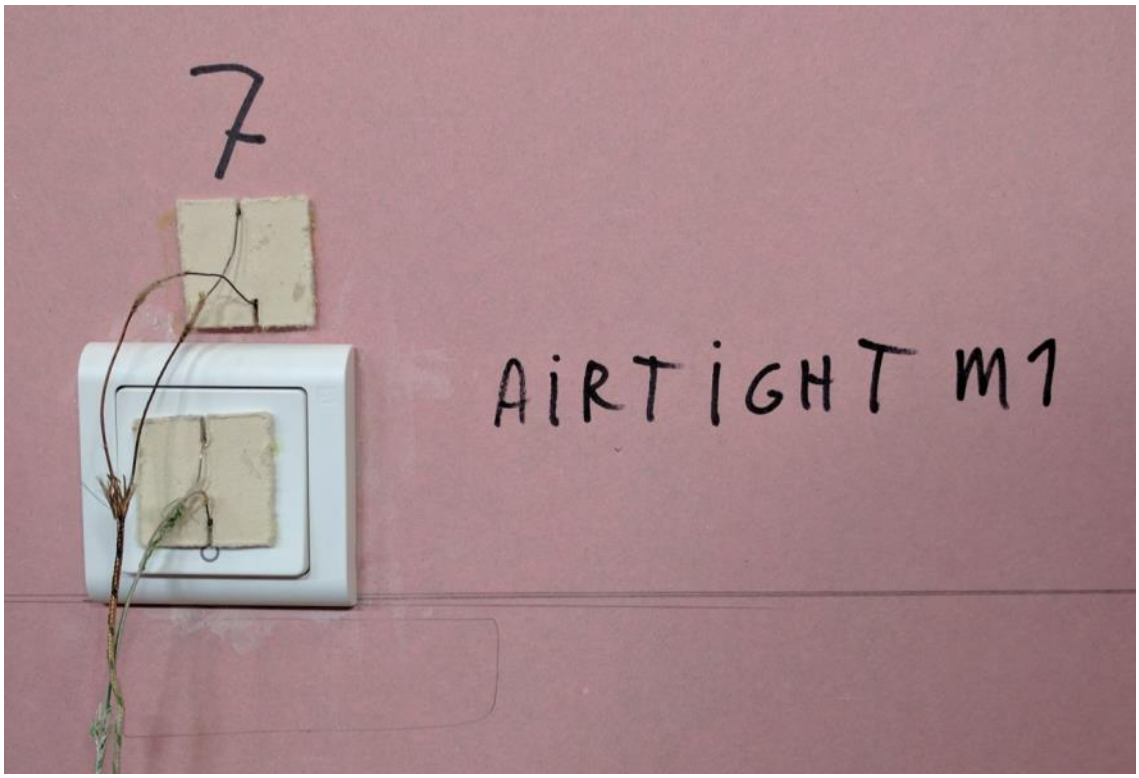


Photo 5 Test specimen 1 NS

Photo 6 Test specimen 2 ES

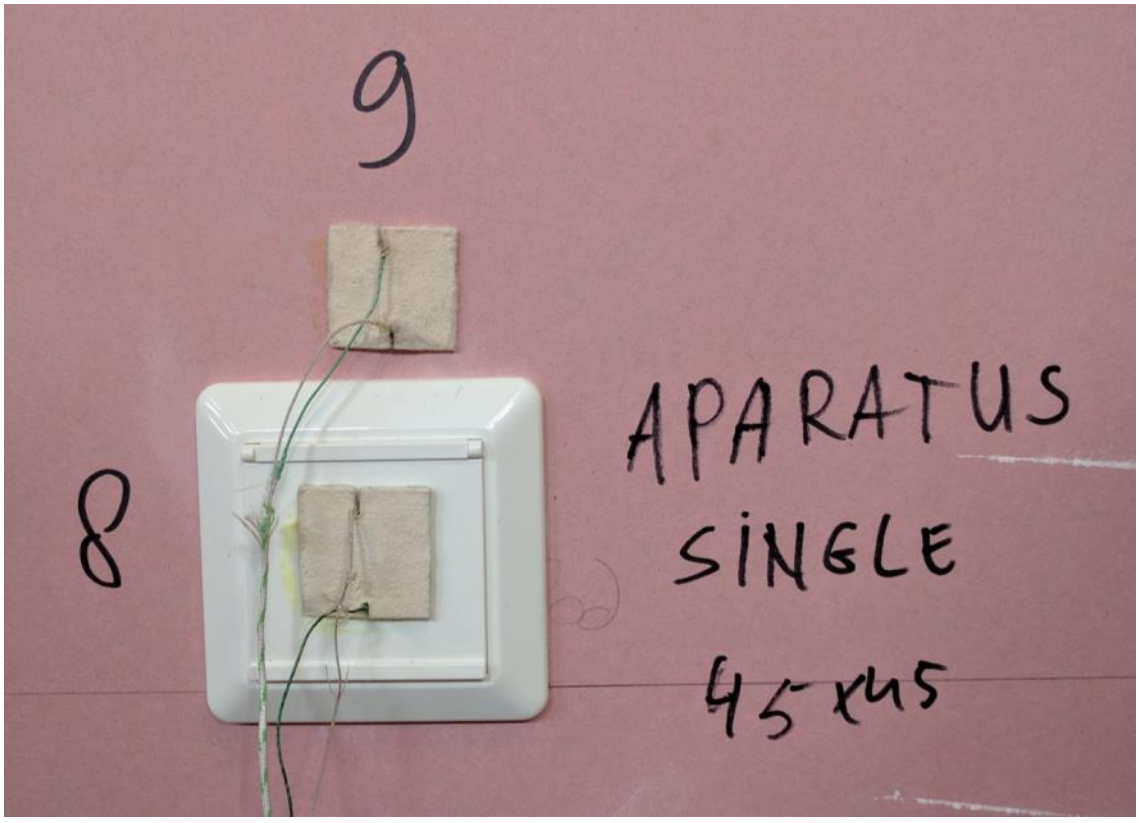


Photo 7 Test specimen 2 NS

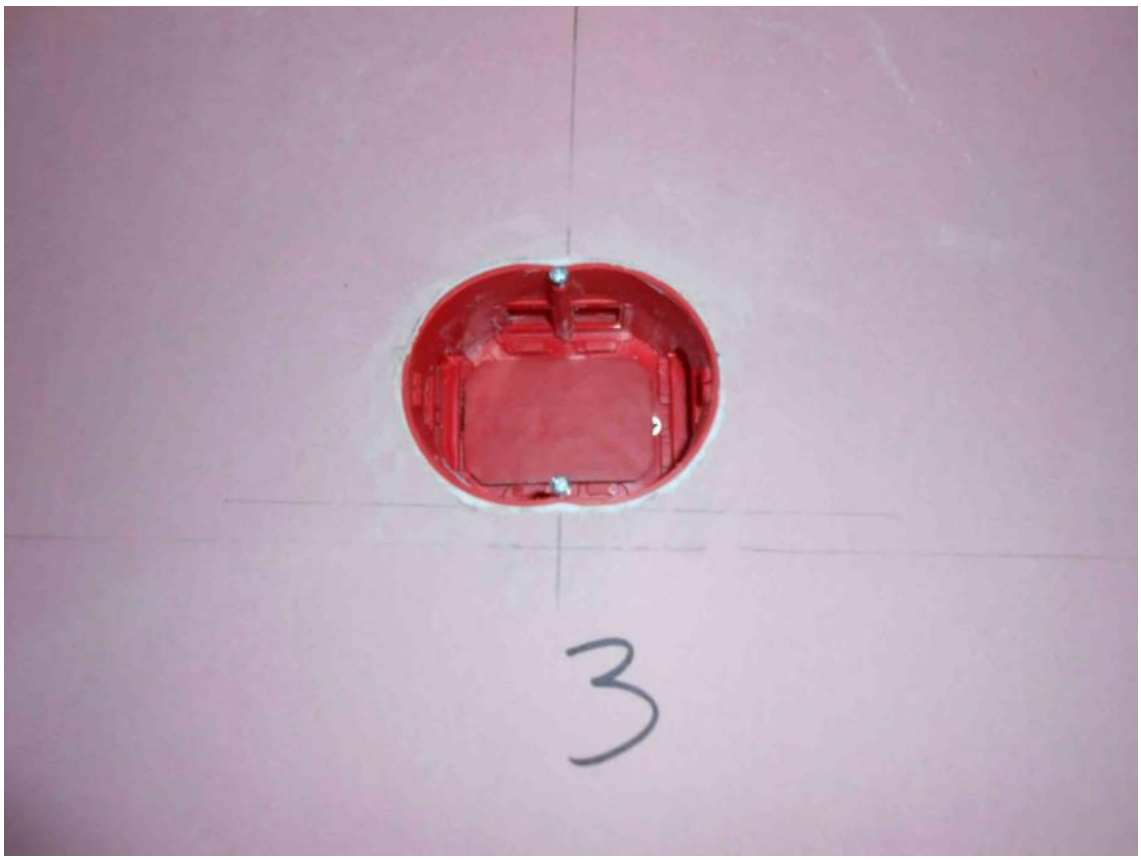


Photo 8 Test specimen 3 ES

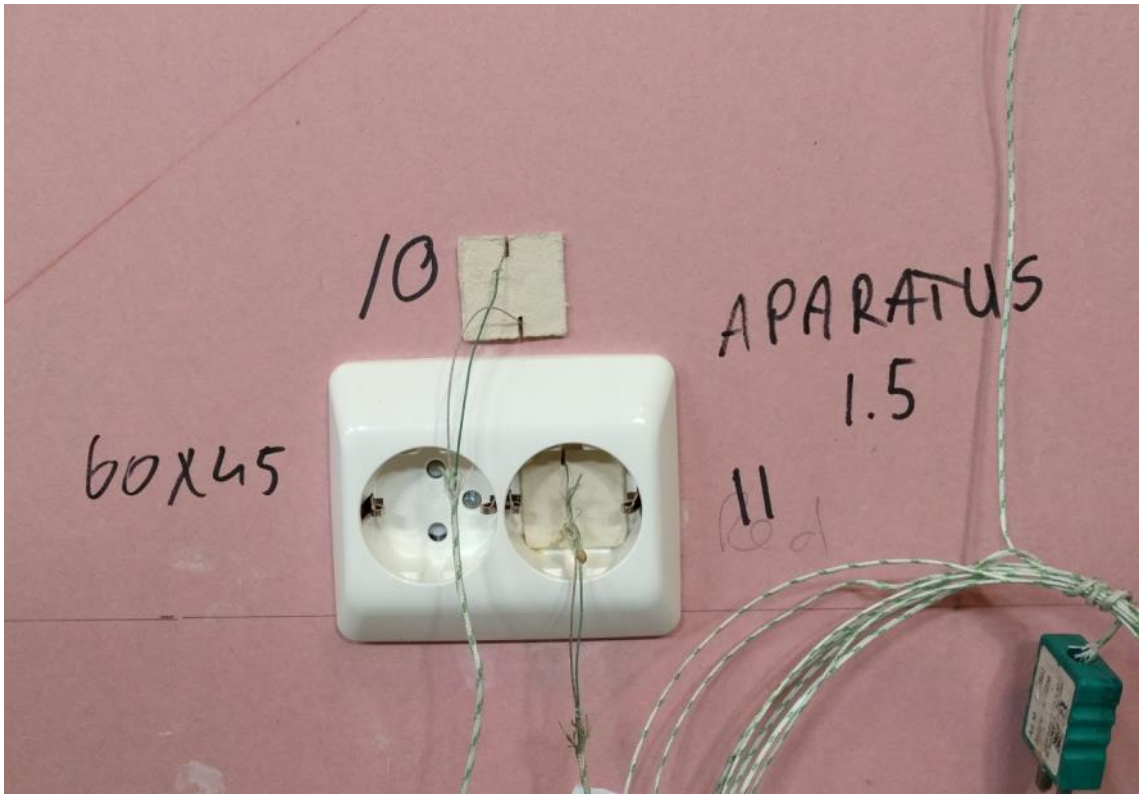


Photo 9 Test specimen 3 NS

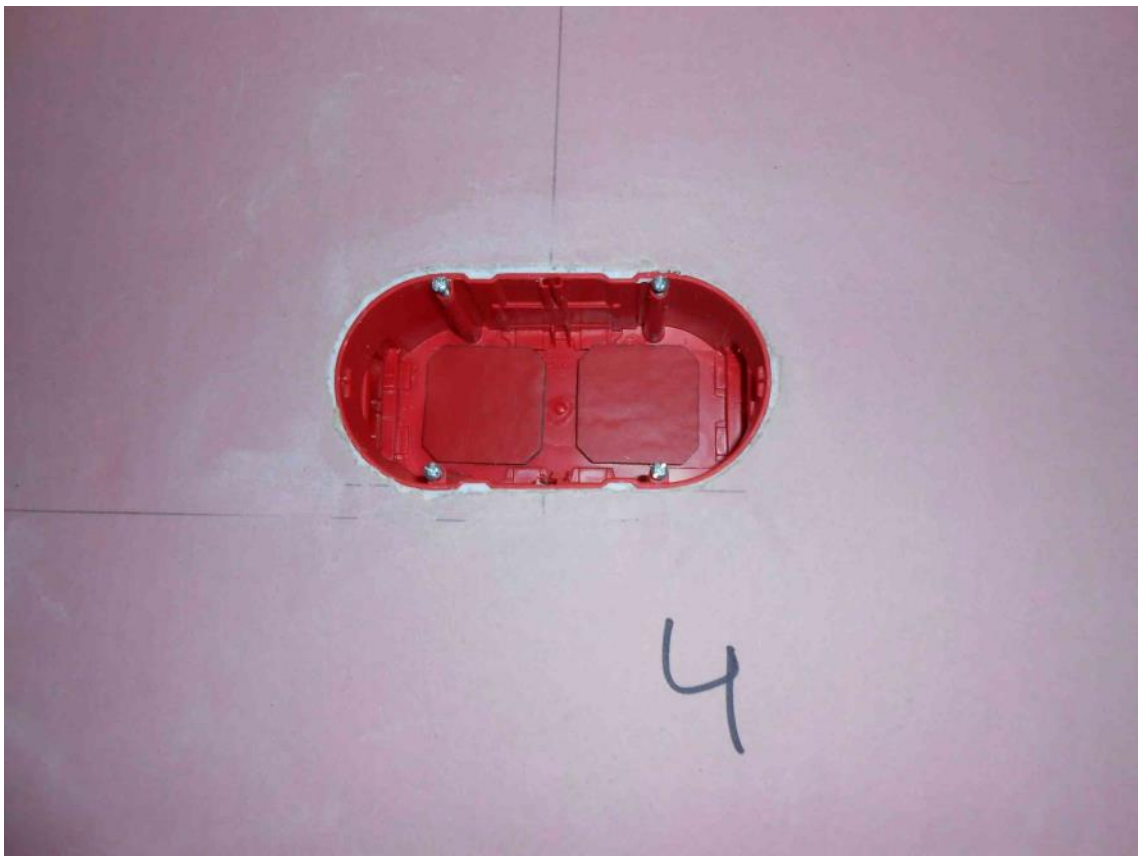


Photo 10 Test specimen 4 ES

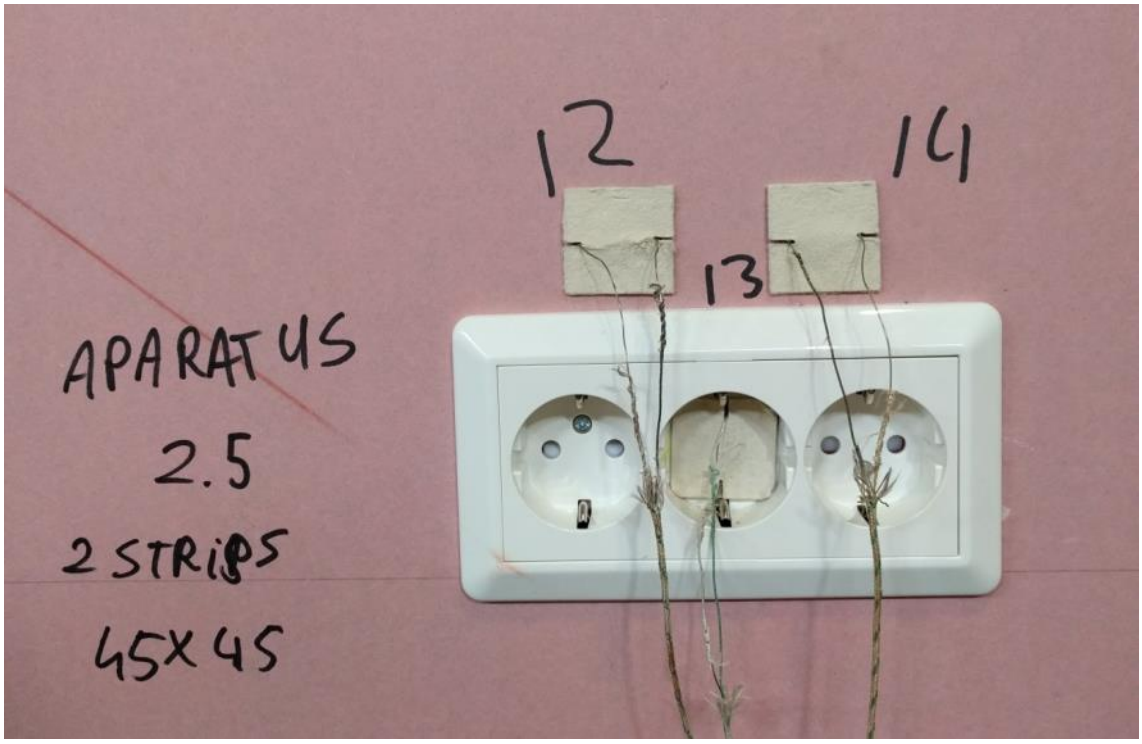


Photo 11 Test specimen 4 NS

Photo 12 Test specimen 5 ES

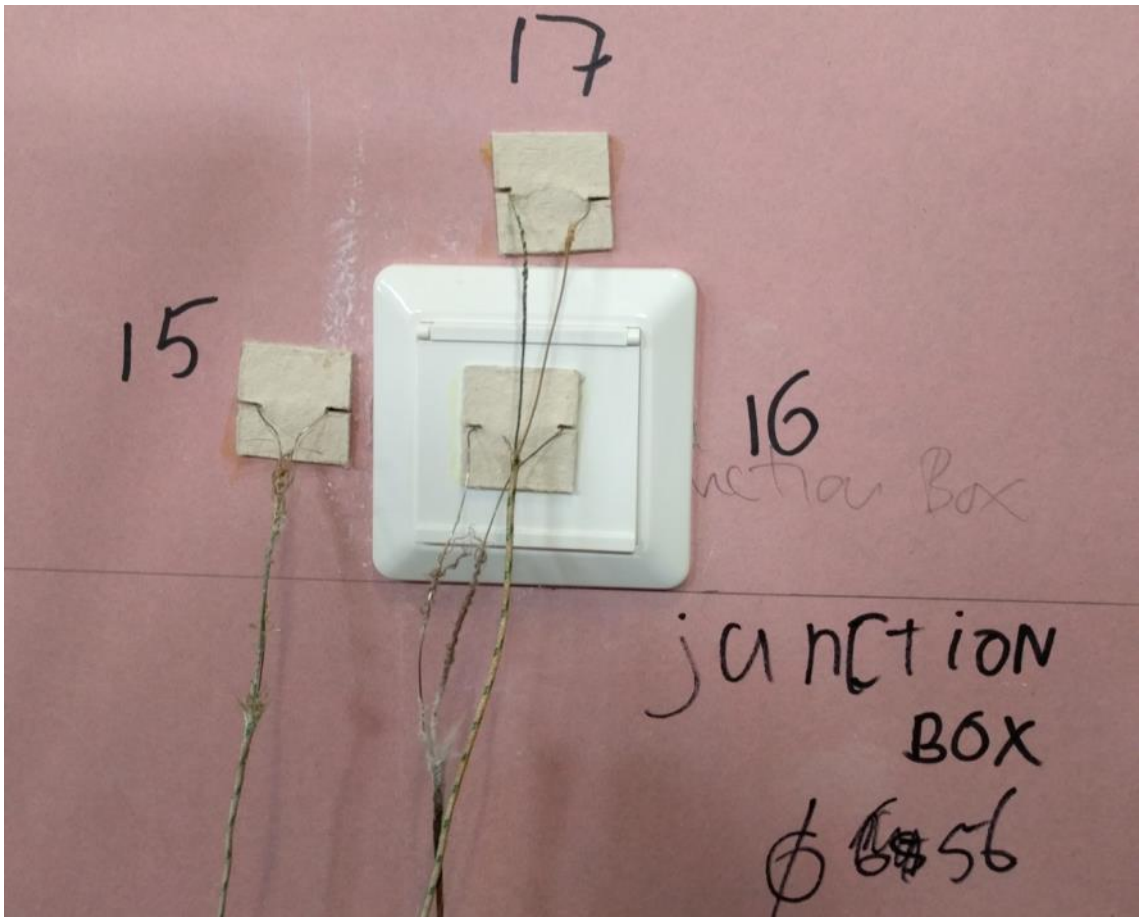


Photo 13 Test specimen 5 NS

Photo 14 Test specimen 6 ES

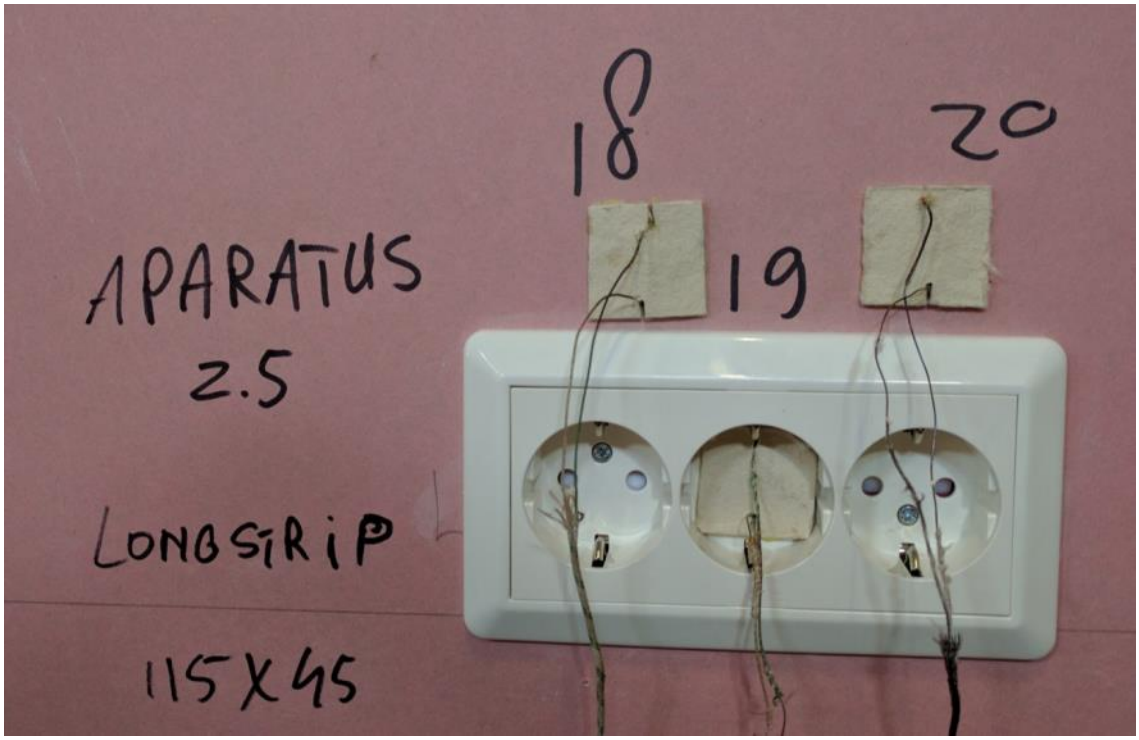


Photo 15 Test specimen 6 NS

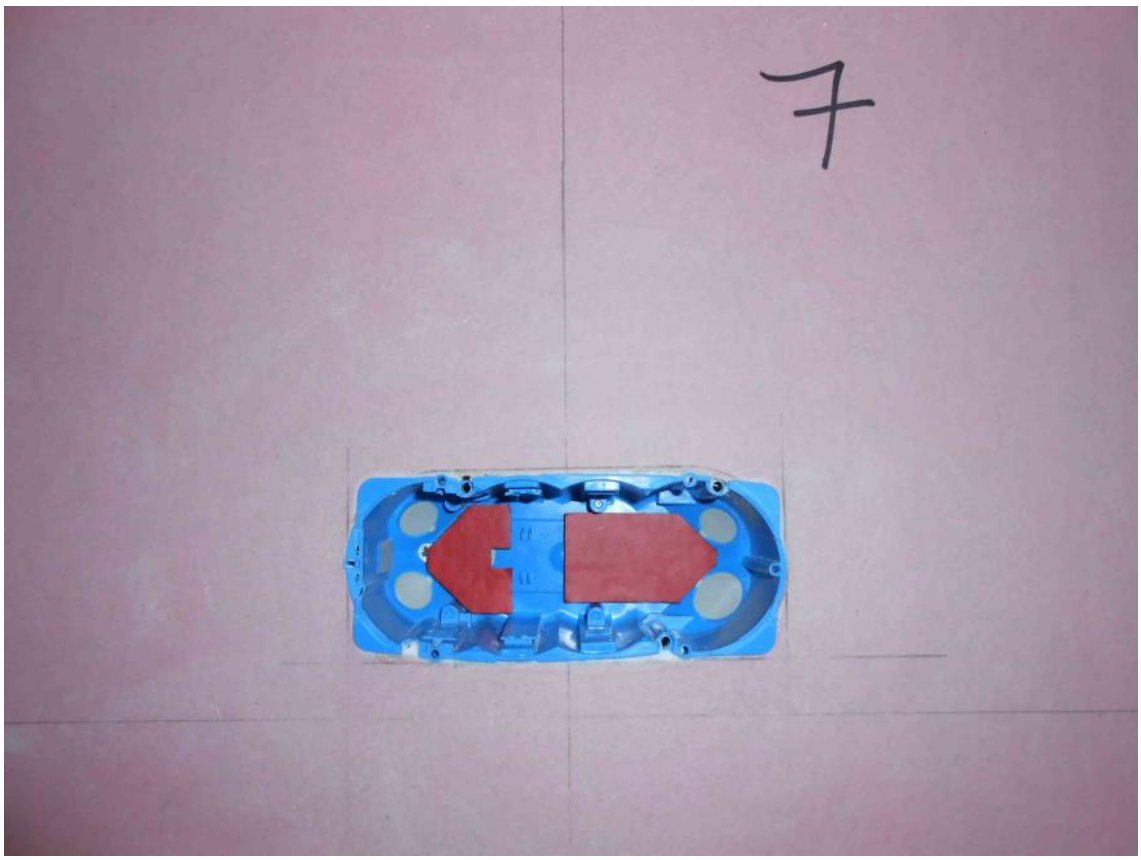


Photo 16 Test specimen 7 ES

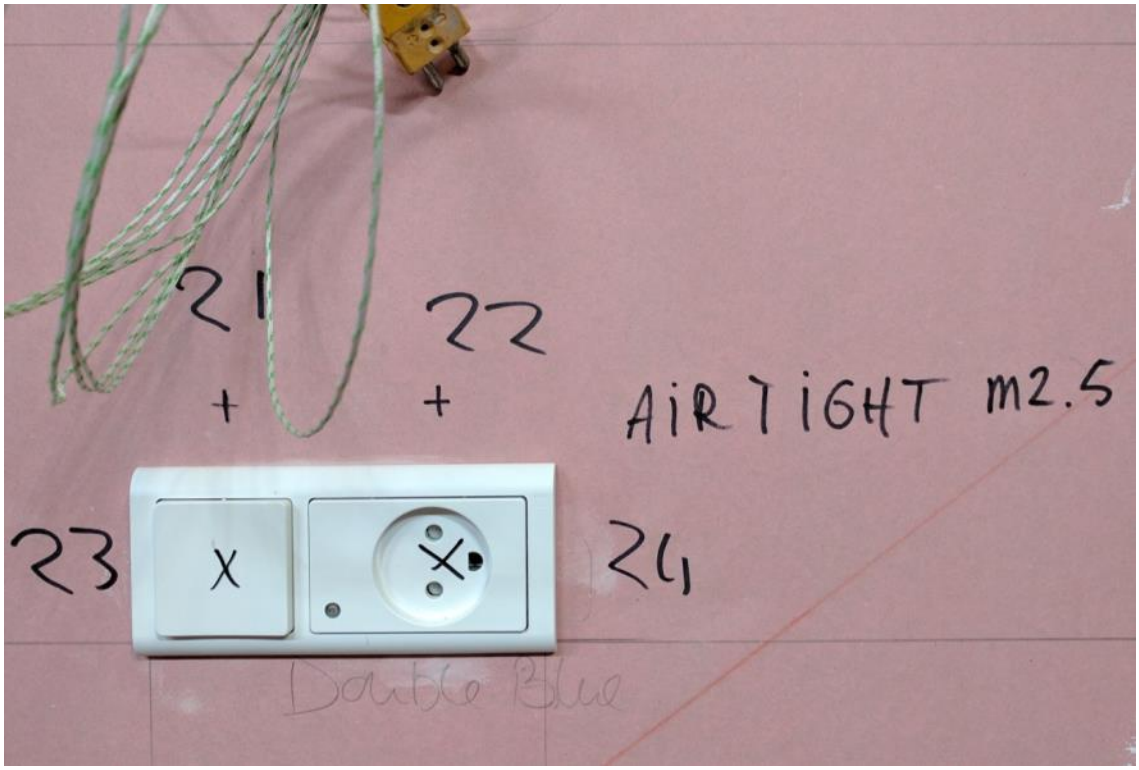


Photo 17 Test specimen 7 NS

FIRE RESISTANCE TEST

Photo 18. Test specimen before test, fire side

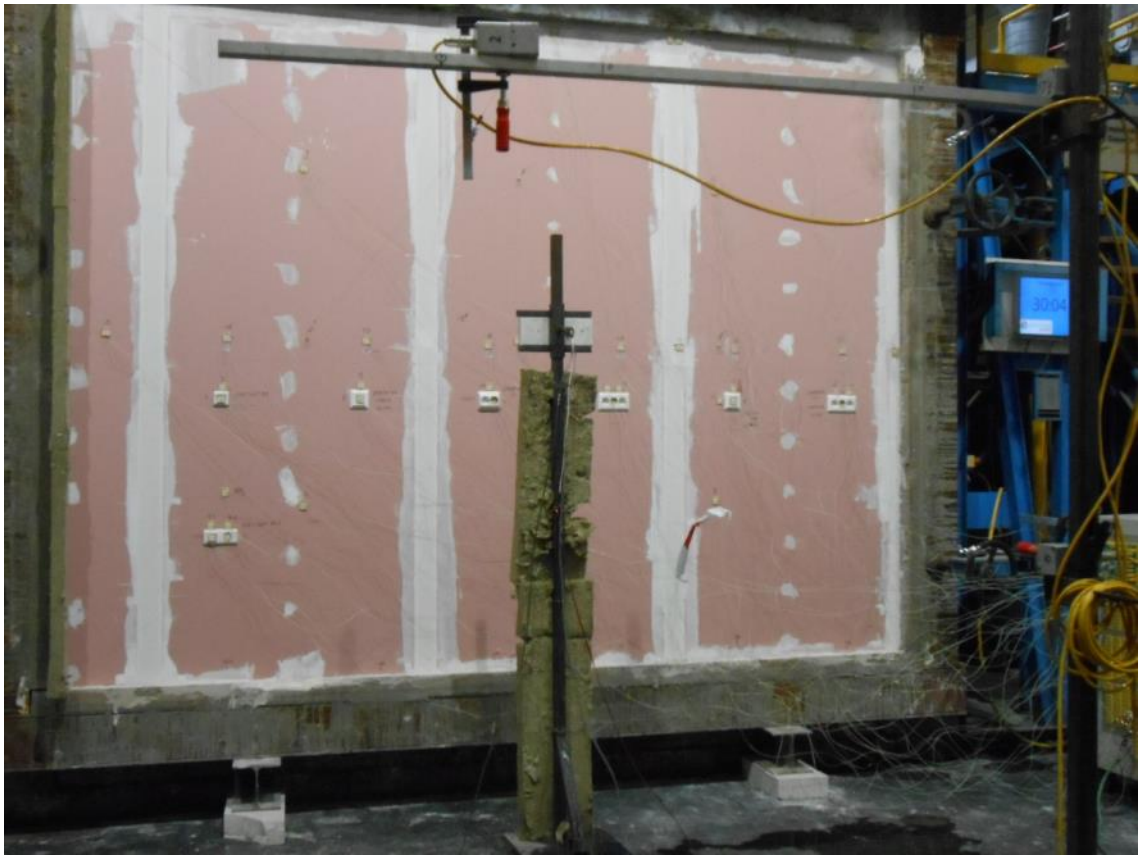


Photo 19. Test specimen after 30 minutes of heating

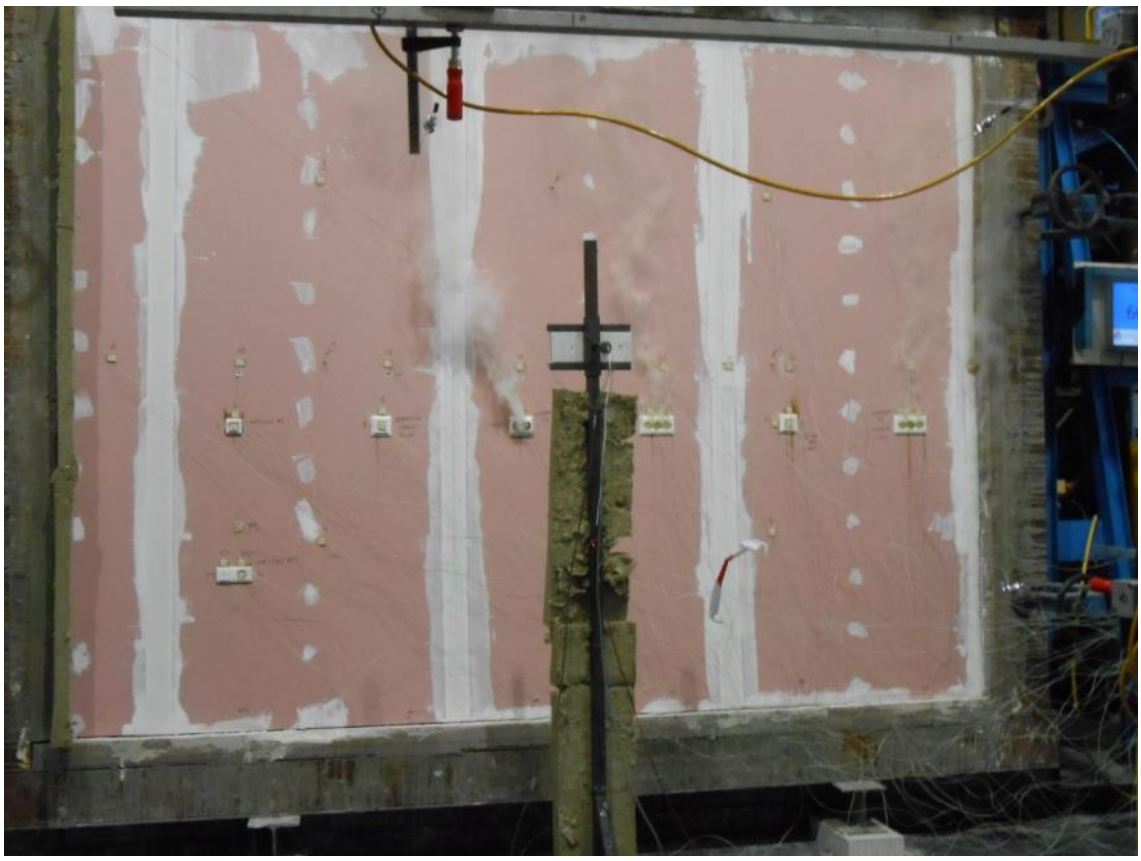


Photo 20. Test specimen after 66 minutes of heating

Photo 21. Test specimen after 120 minutes of heating

Photo 22. Test specimen after 136 minutes of heating