TÜRK STANDARDLARI ENSTİTÜSÜ
DENEY ve KALİBRASYON
MERKEZİ BAŞKANLIĞI
YAPI MALZEMELERİ YANGIN VE AKUSTİK
LABORATUVAR MÜDÜRLÜĞÜ

TURKISH STANDARDS INSTITUTION
HEADSHIP OF TSE TEST and CALIBRATION CENTER
CONSTRUCTION MATERIALS FIRE AND ACOUSTICS LABORATORY

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Test
TS EN ISO/IEC 17025
AB-0001-T

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329000
10-22

MUAYENE VE DENEY RAPORU
TEST REPORT

Deneyi Talep Eden/Firma : ***(Adı, Adresi, Şehir vb.)*** *Requesting/Customer (Name, Adress, City etc.)*	TEPE BETOPAN YAPI MALZEMELERİ SANAYİ VE TİCARET ANONİM ŞİRKETİ BİLKENT BEYTEPE KÖYÜ YOLU NO:5 ÇANKAYA
Deney Talep Tarih / No : *Order Date/No.*	18.05.2022 / 2022-86227
Numunenin Tanımı : ***(Cins, Marka, Sınıf, Tip, Tür, Model vb.)*** *Sample Description (Type,Mark,Class,Model etc.)*	2022-132071, fireEx Ultra, giydirme cephe duvar sistemi (curtain wall system), 1.00, adet
Numune Kabul Tarihi : *Sample Receipt Date*	21.06.2022
Deneylerin Yapıldığı Tarih : *Date of Test*	27.06.2022 / 19.10.2022
Uygulanan Standart Metot : *Applied Standard/Method*	TS EN 1364-1/Yük taşımayan elemanlardaki yangına dayanıklılık deneyleri bölüm 1 Duvarlar
Raporun Sayfa Sayısı : *Number of pages of the report*	17
Deney Sonucu : *Test Result*	-
Açıklamalar : *Remarks*	TS EN 1364-1 / Fire resistance tests for non- loadbearing elements- Part 1:Walls

Yukarıda tanımlanan numune için laboratuvarımızda yapılan muayene ve deneylerden elde edilen sonuçlar müteakip sayfalarda verilmiştir.
The testing and /or measurement results are given on the following pages which are part of this report.

Deney laboratuvarları olarak faaliyet gösteren TSE Deney ve Kalibrasyon Merkezi Başkanlığı Deney Laboratuvarları TÜRKAK'tan AB-0001-T ile TS EN ISO/IEC 17025:2017 standardına göre akredite edilmiştir.
TSE Headship of Test and Calibration Center Testing Laboratories accredited by TÜRKAK under registration number AB-0001-T for TS EN ISO/IEC 17025:2017 as test laboratory.
TÜRKAK deney raporlarının tanınırlığı konusunda Avrupa Akreditasyon Birliği (EA) ile Çok Taraflı Anlaşma ve Uluslararası Laboratuvar Akreditasyon Birliği(ILAC) ile karşılıklı tanıma anlaşması imzalamıştır.
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Deney ve/veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri (olması halinde) ve deney metodları bu raporun tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.
The test and/or measurement results, the uncertainties (if applicable) with confidence probability and test methods are given on the following pages which are part of this report.

Karekod *QR Code*	**Tarih** *Date*	**Deney Sorumlusu** *Person in charge of test*	**Kontrol Eden** *Reviewer*	**Onaylayan** *Head of Laboratory*
	19.10.2022	AHMET BUMİN BAYRAM	AHMET FAZIL KARA	SENCER GÜVEN

MUAYENE - DENEY SONUÇLARI *TEST RESULTS*

SUMMARY

ORDER/SPECIMEN NO	**2022-86227 / 2022-132071**
SPONSOR	TEPE BETOPAN YAPI MALZEMELERİ SAN. ve TİC. A.Ş.
PURPOSE	Determination of fire resistance performance in accordance with TS EN 1364-1:2015
TESTING LABORATORY	TSE Building Materials Fire and Acoustics Laboratory
ADDRESS	Aydınlı Mah. Ulus Sok. No:7/1 Tuzla / İSTANBUL

TEST SPECIMEN DEFINITION

General:

FireEx Ultra brand curtain wall system which is product of TEPE BETOPAN YAPI MALZEMELERİ SAN. ve TİC. A.Ş. was tested as per TS EN 1364-1:2015 on 27th June 2022 at TSE Construction Materials Fire and Acoustics Laboratory.

Application:

FireEx Ultra brand curtain wall system which is product by TEPE BETOPAN YAPI MALZEMELERİ SAN. ve TİC. A.Ş. was installed in a test frame and all installation stages are given under 1.3 mounting title.

Sampling:

The test specimen was not chosen by laboratory.

Conditioning:

Specimen was conditioned for 1 day in laboratory conditions.

MUAYENE - DENEY SONUÇLARI *TEST RESULTS*

TEST RESULTS

INTEGRITY (E)	
Sustained Flaming	No failure in 150 minutes.
Gap Gauges	
-Φ6 (150mm)	No failure in 150 minutes.
-Φ25	No failure in 150 minutes.
Cotton Pad	No failure in 150 minutes.
INSULATION (I_2)	Failure in 147th minute**.**
RADIATION (W)	No measurement.*

Test Duration: The test was terminated in 151st minute as per client request.

Test Date: 27th June 2022

*As long as the insulation criterion is valid, the Radiation (W) criterion is also valid.

MUAYENE - DENEY SONUÇLARI *TEST RESULTS*

1. TEST SPECIMEN

1.1. GENERAL

Non-loadbearing wall was installed by sponsor in a test frame of nominal dimensions 3050 mm width and 3050 mm height.

1.2. MATERIALS

- Aerated concrete (80 mm thickness)
- Plaster
- Knauf insulation FCB series mineral wool
- Homeseal 0.02 UV vapor barrier
- Trapeze Screw with bonded washer (4.8 x 18 mm)
- Trapeze Screw with bonded washer (5.5 x 25 mm)
- Plastic wall plug with hexagon head (10 x 120 mm)
- Self tapping screw (3.5 x 25 mm)
- Galvanised M profile (0.50 mm thickness, 25 x 80 x 3000 mm)
- Galvanised J profile (2 mm thickness, 28 x 38 x 3000 mm)
- Galvanised L Bracket (3 mm thickness)
- TepePan product series (10 mm thickness)

1.3. MOUNTING

Wall system was mounted on test frame of nominal dimensions 3050 mm width and 3050 mm height. 40 mm thickness ceramic wool was put to free edge as per defined in TS EN 1364-1-:2015.

1.4. CONDITIONING

Specimen was conditioned for 1 day in laboratory conditions.

1.5. THERMOCOUPLE POSITIONING

Wall unexposed side thermocouple positions are given in Figure 1. Numbering sequence in picture below has same numbering in graph.

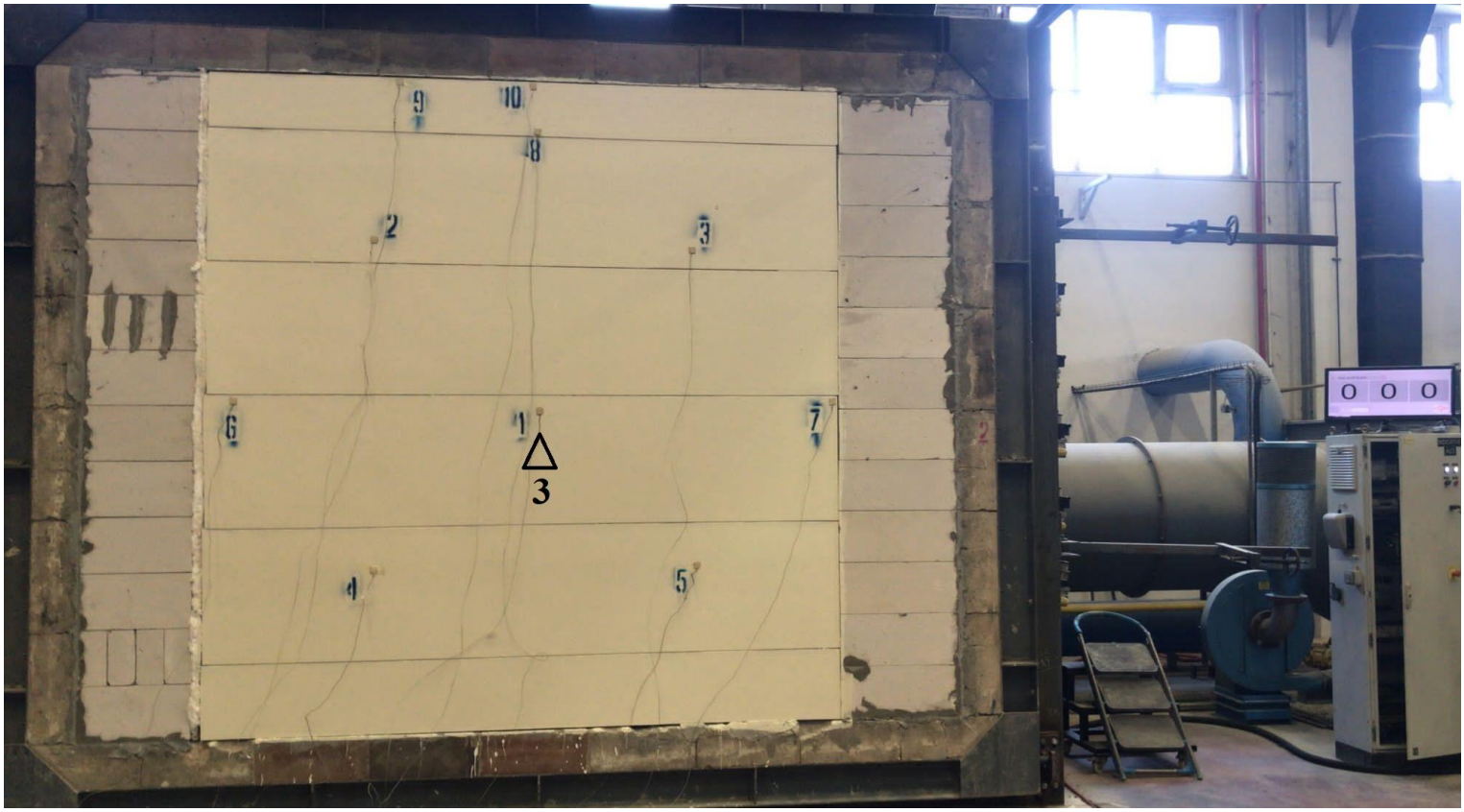

Figure 1 – Unexposed Face Thermocouple and Deflection Measurement Point of before the Test

Δ: Deflection Measurement Point

Table 1 Deflection Measurement Values (mm)

TIME	D3
10	7,54
20	1,08
30	-1,08
40	-2,15
50	-2,15
60	-2,15
70	-2,15
80	0,00
90	-2,15
100	-2,15
110	1,08
120	0,00
130	0,00
140	0,00
150	0,00

- Deflections are measured and recorded by laser meters. According to the saved data maximum deflection was not exceeded 100 mm in 150 minutes. Negative values in the table show outward furnace deflection.

2. TEST PROCEDURE

General

FireEx Ultra brand curtain wall system which is product of TEPE BETOPAN YAPI MALZEMELERİ SAN. ve TİC. A.Ş. was submitted to perform a fire resistance test in accordance with TS EN 1364-1:2015 on 27th June 2022 at TSE Construction Materials Fire and Acoustics Laboratory.

Ambient temperature was 27°C and humidity was % 74 before testing.

2.1. DEVICES

General

All devices, equipment and apparatus in the test fulfil the conditions according to TS EN 1363-1:2020 and TS EN 1364-1:2015.

Furnace

Vertical furnace of which internal dimensions are 4mx3mx1,3m has 9 thermocouples which were located inside and all measurements were followed via software automatically.

In test standard time-temperature curve used as per TS EN 1363-1:2020.

Table 2 Standard Time-Temperature Curve Values

Time min	Furnace temperature °C	Time min	Furnace temperature °C
0	20	90	1 006
5	576	120	1 049
10	678	150	1 082
15	738	180	1 110
20	781	210	1 133
30	842	240	1 153
45	902	300	1 186
60	945	360	1 214

Thermocouples

Thermocouples which were produced from 1000 m batch type roll thermocouples were placed on floor. A component glue was used in placing thermocouples on the specimen.

Insulation and Integrity Criteria

Thermocouples were used for insulation criteria, cotton pad and gap gauges used for integrity criteria.

Furnace Pressure

Furnace internal pressure is controlled as per TS EN 1363-1:2020 Clause 5.2. Furnace pressure was measured with 2 sensors located by sequence of 2,9 m and 2,00 m. Furnace pressure shall not be more than 20 Pa at the top edge of the exposed side of specimen. Furnace pressure in the second pressure sensor (2,00 m) was adjusted to 11,5 Pa. Furnace pressure-time graphic is given in Figure 2.

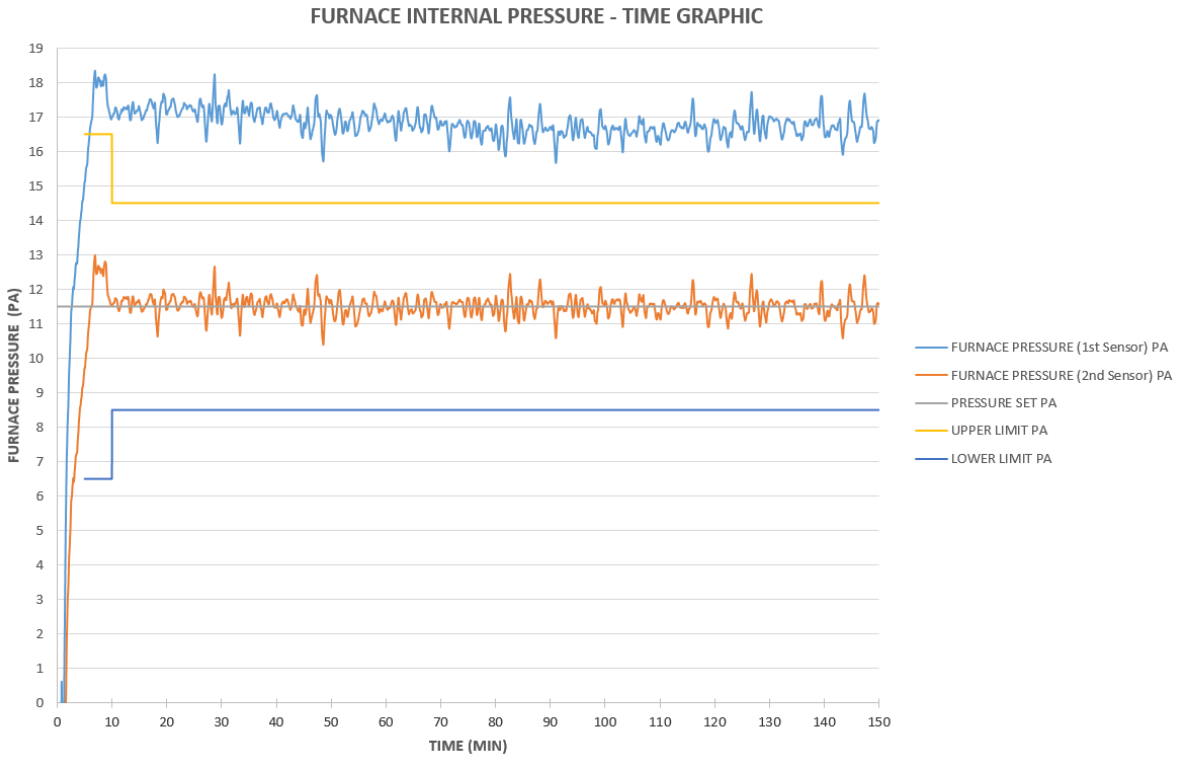

Figure 2 - Furnace Internal Pressure Graphic

2.2. TEMPERATURE MEASUREMENTS

10 thermocouples were placed to unexposed side of the specimen and first 5 thermocouples (between TC1-TC5 thermocouples) used for both mean and maximum temperature measurement. For mean temperature criteria, first five thermocouples mean value shall not be greater than 140°C+initial mean temperature. Other thermocouples were used for maximum temperature rise measurement only. Maximum temperature rise shall not be greater than 180°C + initial mean temperature for TC1 to TC10 on wall. The related graphics is given in Figure 3.

Thermocouple number of 10 exceeded 203.8 ºC in 147th minute, for this reason the insulation criteria ended.

Initial mean temperature is mean temperature of first five thermocouples (TC1 to TC5) just before testing. Initial mean temperature before testing was 23.84°C.

Independently of any temperature limit was exceeded or not, Integrity (E) criteria failure means Insulation (I) criteria but not vice versa.

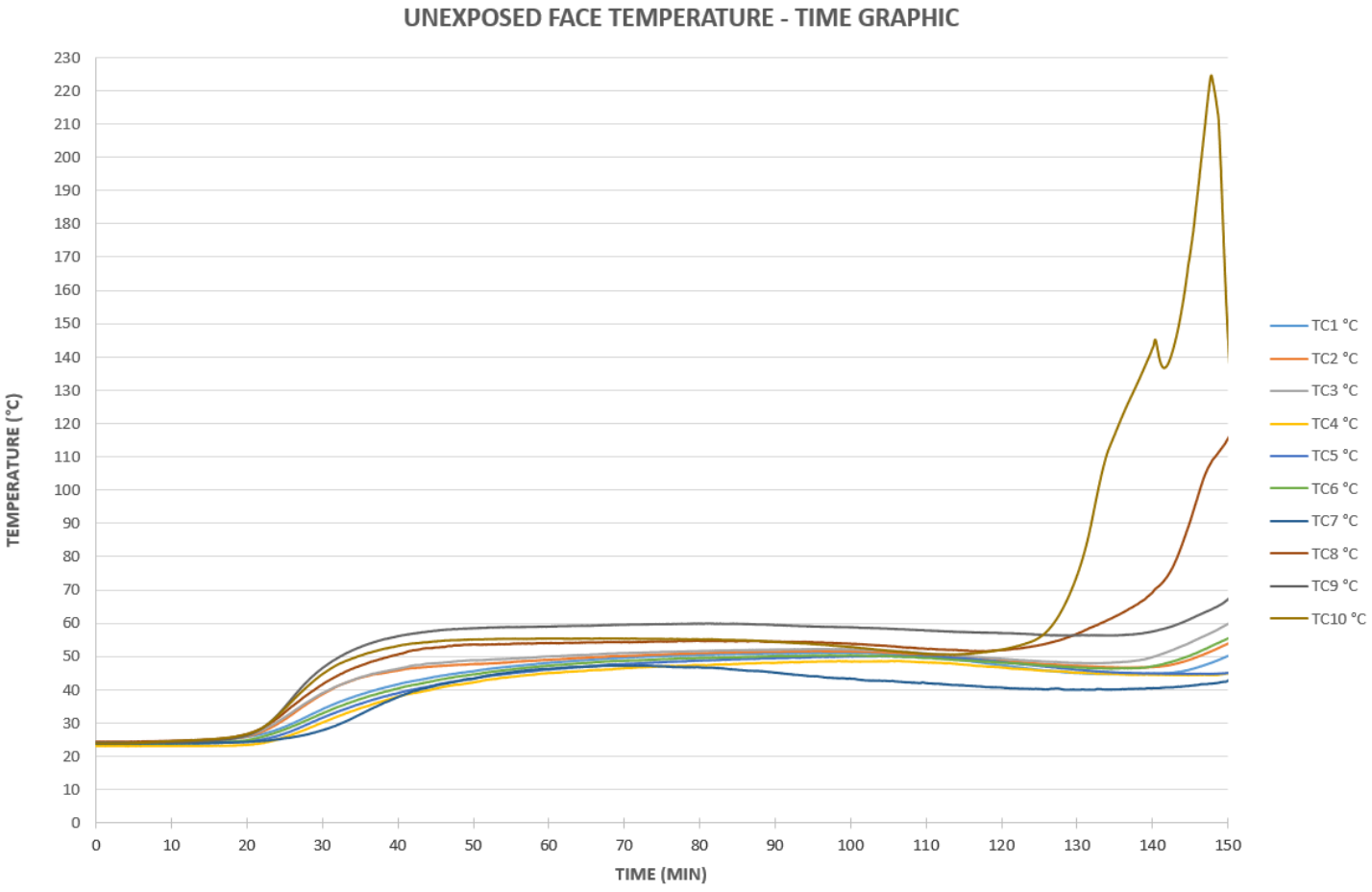

Figure 3 - Unexposed Face Thermocouples Temperatures

2.2.1. Furnace Internal Temperature

Furnace internal temperature values, upper and lower limits as per TS EN-1363-1:2020 is given in Figure 4.

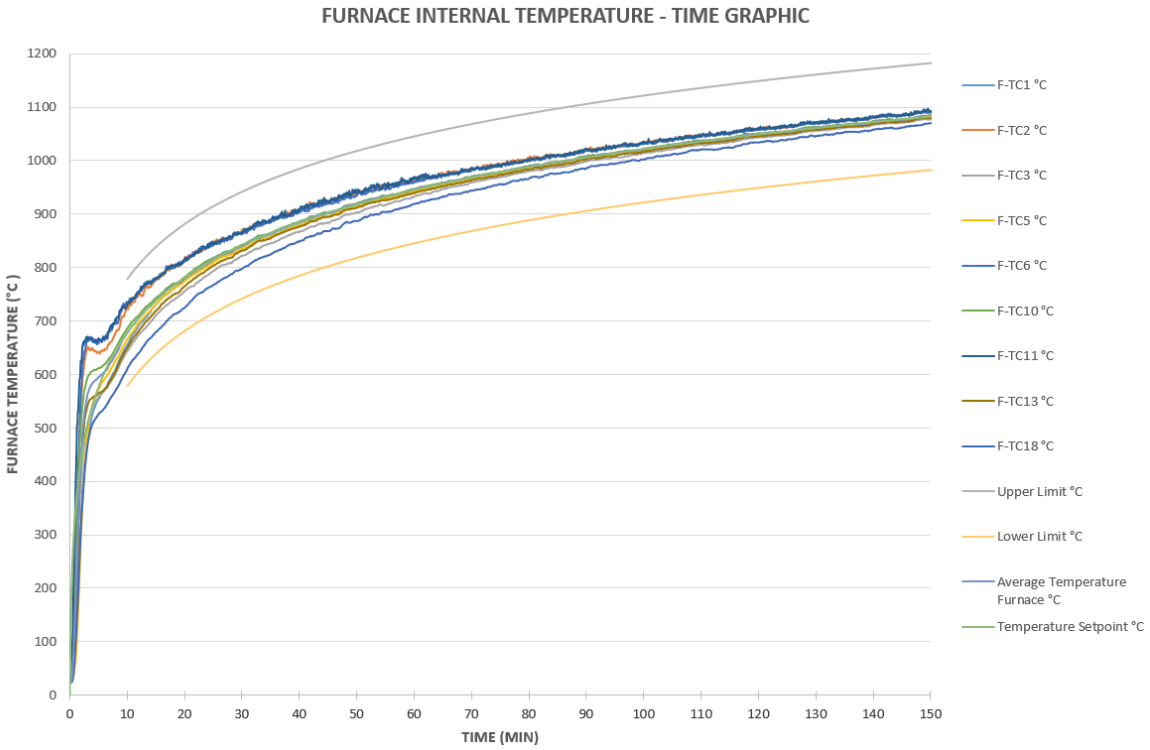

Figure 4 - Furnace Internal Temperature-Time Graphic

After first 10 minutes, no values at any time deviated more than 100°C as described in time temperature curve.

2.2.2. Tolerances

The percentage deviation (d_e) in the area of the curve of the average temperature recorded by the specified furnace thermocouples versus time from the area of the standard temperature/time curve shall be within:

a) for $5 < t \leq 10$, 15 %

b) for $10 < t \leq 30$, (15 –((0,5(t–10)) %

c) for $30 < t \leq 60$, (5 - 0,083 (t - 30) %

d) for $t > 60$, 2,5 %

$$d_e = \frac{A - A_S}{A_S} \; x \; 100$$

Where

d_e is the percentage deviation

A is the area under the actual furnace temperature/time curve

As is the area under the standard temperature/time curve

t is the time in minutes.

Related graphic is given in Figure 5.

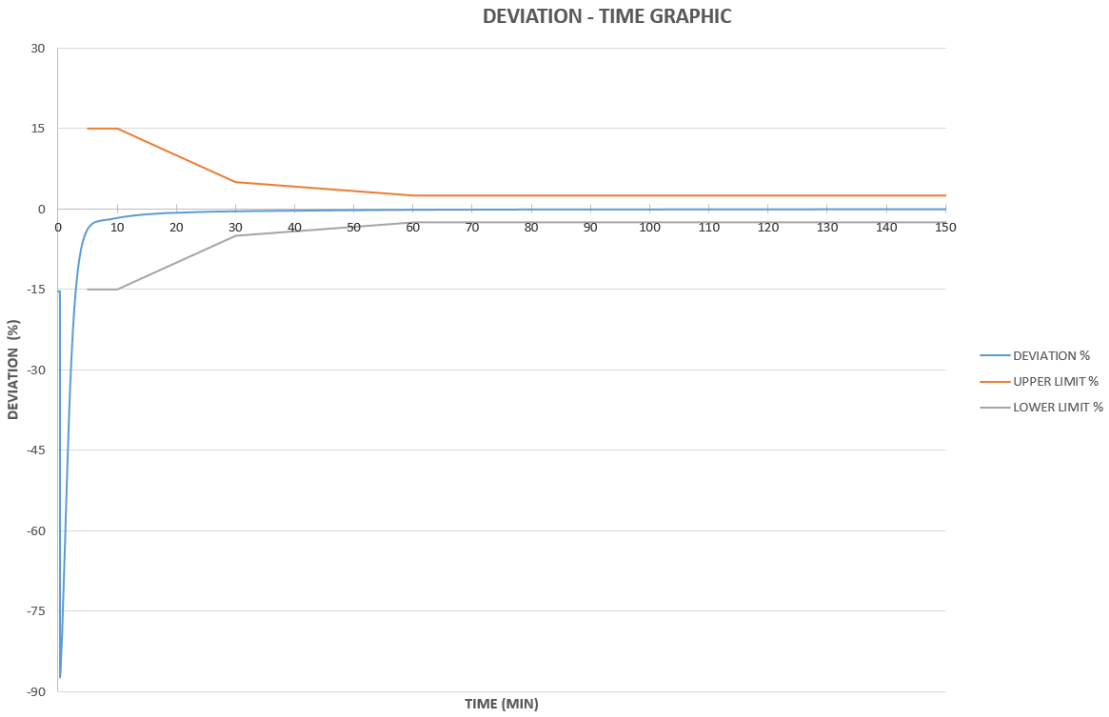

Figure 5 - Deviation-Time Graphic

All values after 5 minutes are in limit.

2.2.3. Radiation Measurement

No measurement done for the testing.

2.3 AMBIENT TEMPERATURE

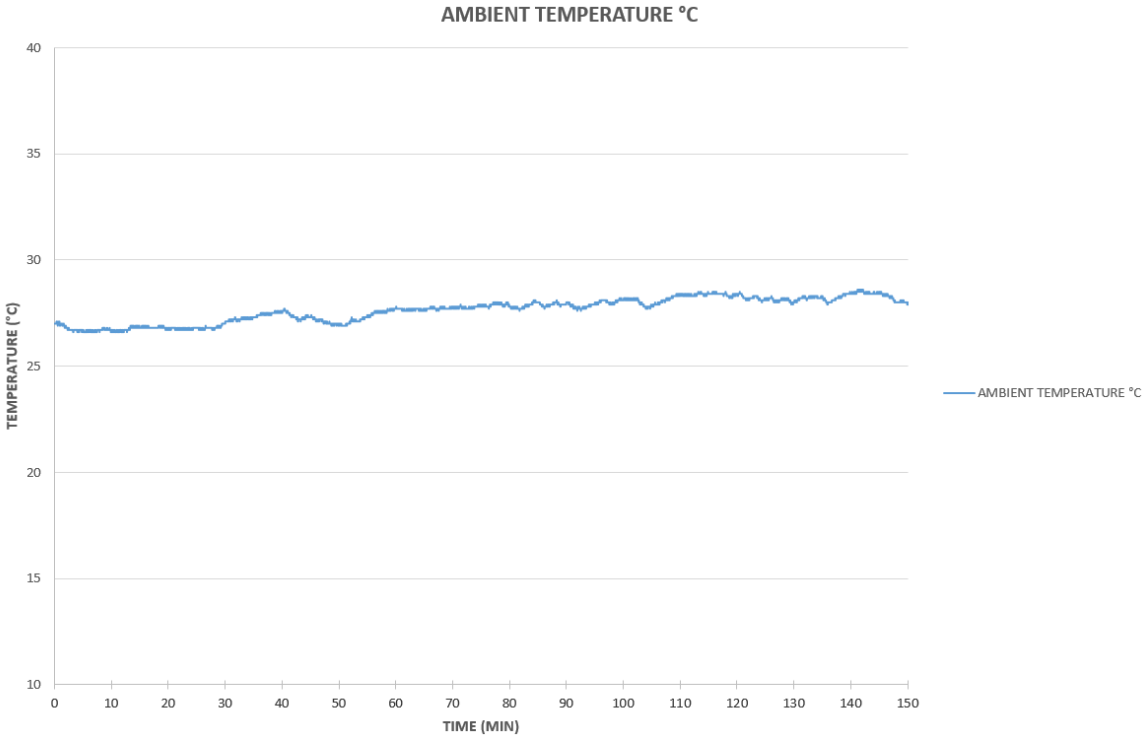

Figure 6 – Ambient Temperature Graphic

MUAYENE - DENEY SONUÇLARI *TEST RESULTS*

3. OBSERVATIONS

DURATION (Minute)	NOTES
00.00	Test was started
20.10	Smoke leakage from top of the wall.
27.40	Smoke leakage from right edge of the wall.
29.15	Openings was observed on the top of the wall.
47.59	Smoke leakage from right-middle edge of the wall.
138.03	Openings was observed on the thermocouple number 10 area.
139.30	Cotton pad was applied to the top area of the thermocouple number 10 (between wall-test frame), no ignition was observed.
145.40	Black discoloration was observed the top area of the thermocouple number 10
146.10	Cotton pad was applied to the top area of the thermocouple number 10 (between wall-test frame), no ignition was observed.
149.12	Openings was observed in the top-right area of the headmost plate.
149.40	Cotton pad was applied to the top area of the thermocouple number 10 (between wall-test frame), no ignition was observed.
150.32	The test was terminated.

MUAYENE - DENEY SONUÇLARI *TEST RESULTS*

4. ASSESMENT AND TEST RESULTS

Wall system which was produced by TEPE BETOPAN YAPI MALZEMELERİ SAN. ve TİC. A.Ş. was submitted to perform a fire resistance test in accordance with TS EN 1364-1:2015 on 27th June 2022 at TSE Building Materials Fire and Acoustics Laboratory.

Details about the classification of the test results was given related classification report.

TEST RESULTS

INTEGRITY (E)	
Sustained Flaming	No failure in 150 minutes.
Gap Gauges	
-Φ6 (150mm)	No failure in 150 minutes.
-Φ25	No failure in 150 minutes.
Cotton Pad	No failure in 150 minutes.
INSULATION (I_2)	Failure in 147th minute**.**
RADIATION (W)	No measurement.*

Test Duration: The test was terminated in 151st minute as per client request.

Test Date: 27th June 2022

* As long as the insulation criterion is valid, the Radiation (W) criterion is also valid.

5. PHOTOS

Figure 7 – Before the Test Exposed Side

Figure 8– During the Test Unexposed Side

Figure 9 – At the end of the test Unexposed Side

Figure 10 – At the end of the test Exposed Side

6. REFERENCE LIST

TS EN 1363-1:2020 Fire Resistance Tests General Requirements

TS EN 1364-1:2015 Fire Resistance Tests for Non-Loadbearing Elements

TS EN 13501-2:2016 Fire classification of construction products and building elements – Part 2: Classification using data from fire resistance tests, excluding ventilation services

LAB-D-17-FR-006 : Fire Resistance Rawdata Form

7. TECHNICAL DRAWINGS

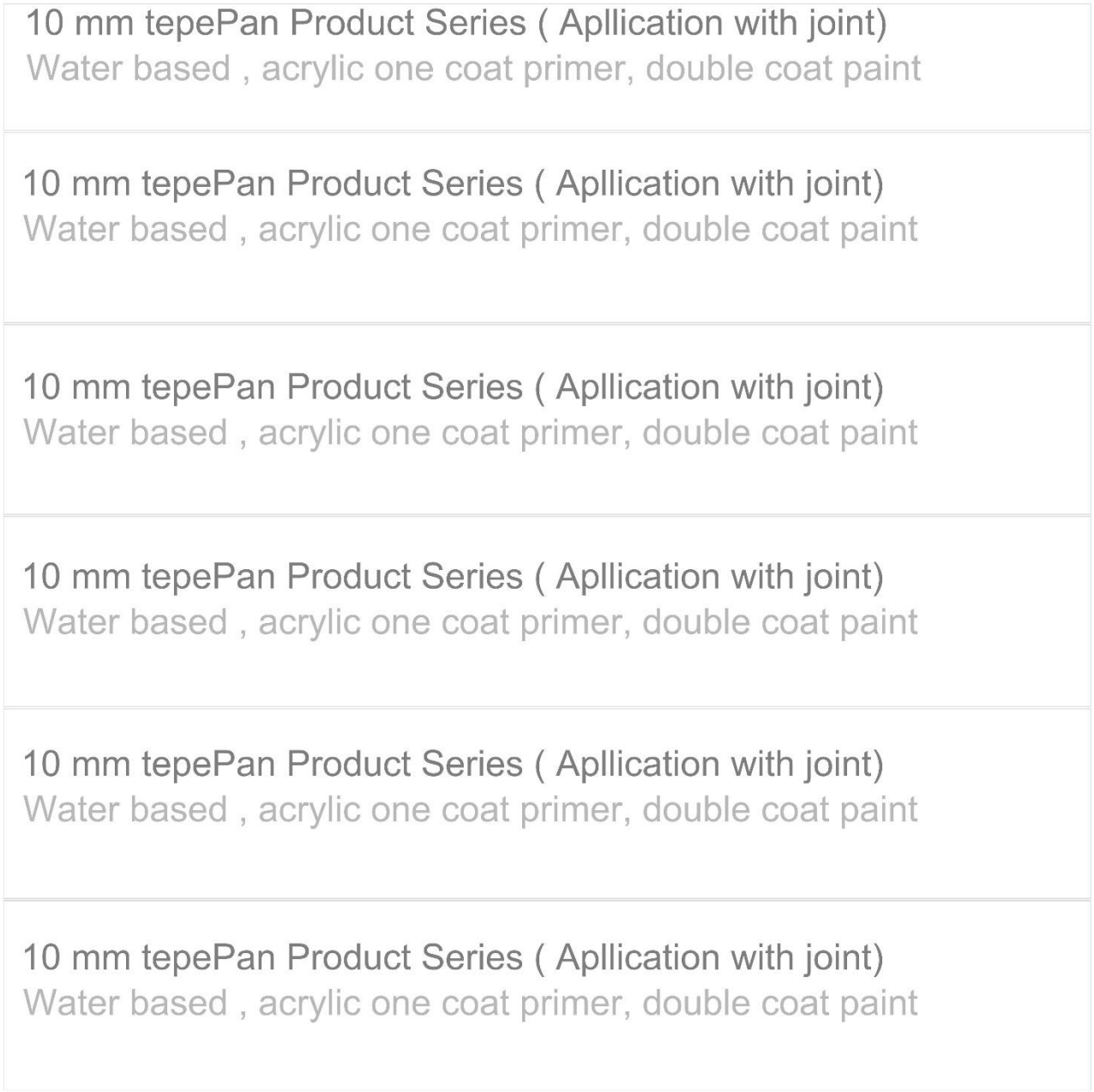

Figure 11 – Front View

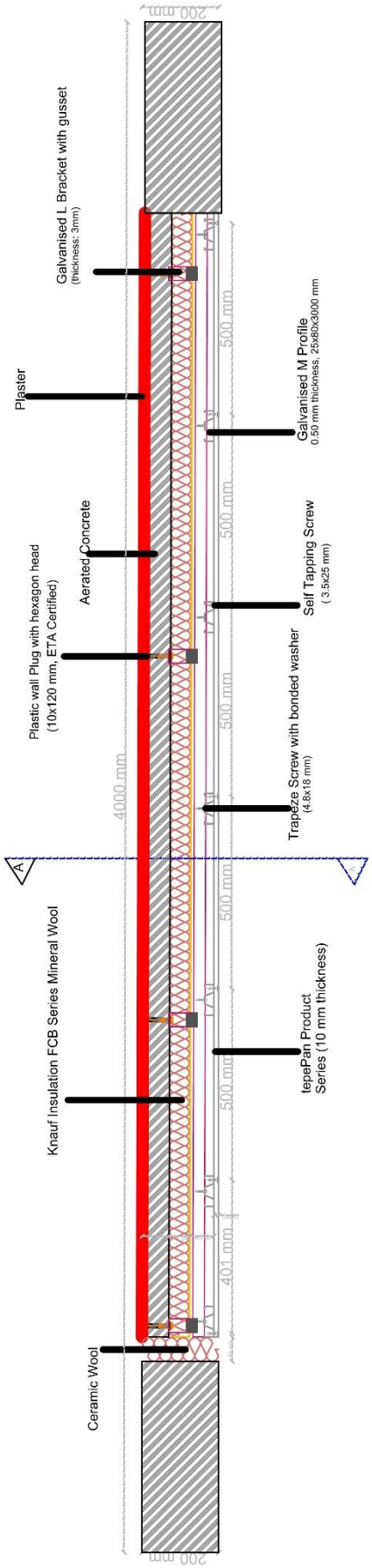

Figure 12 – Top View

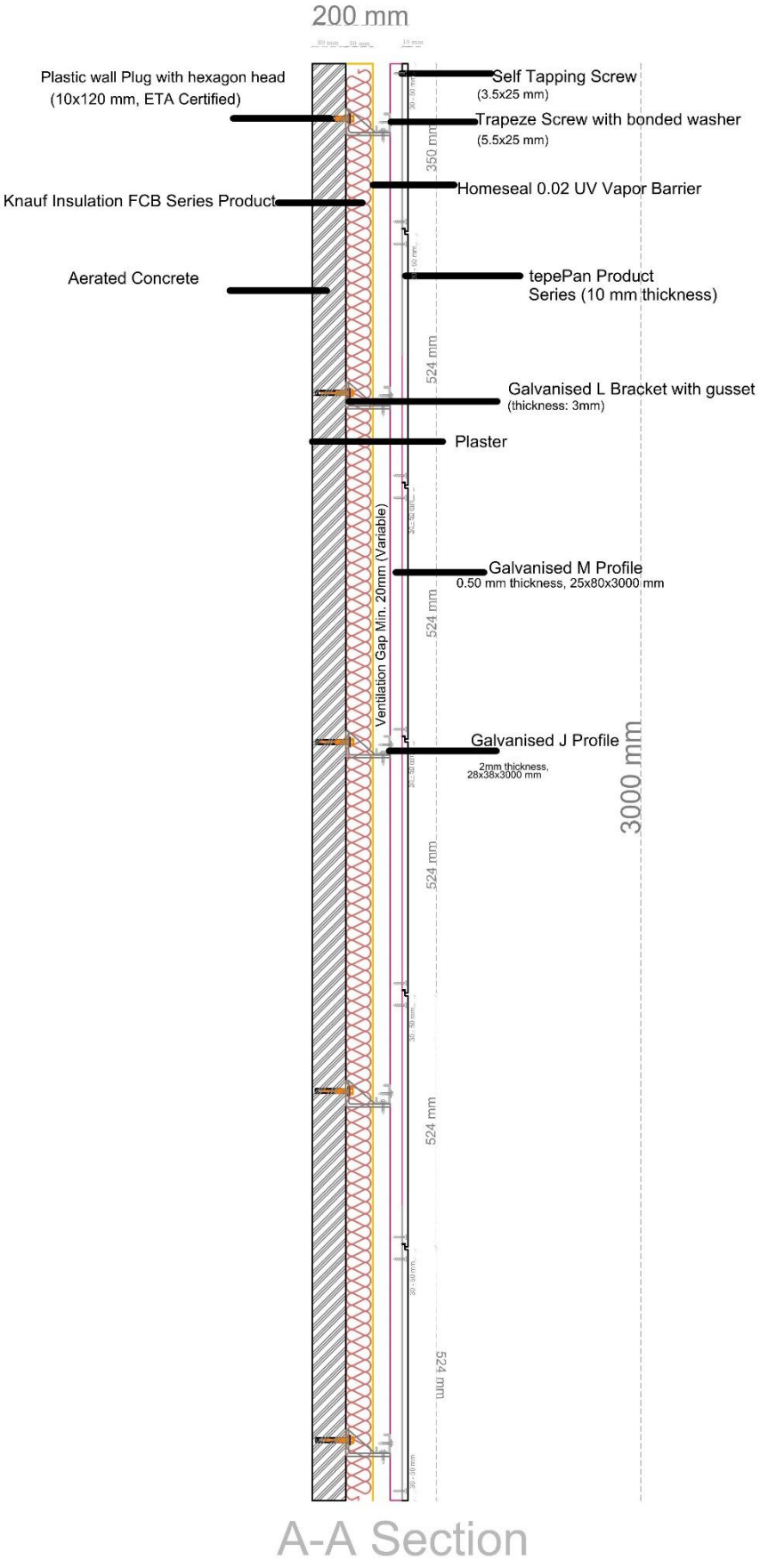

Figure 13 – Section A-A