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TL-827

Report Number: J211229001-1

EN 1634-1:2014/A1:2018

Fire Resistance Test for Doorset incorporating Electronic lock F2

A report to:

Zhongshan Jiahui Technology Company Limited

Issue Date:	Mar 15, 2022
Revised Date:	—
Total Pages:	27
Doc. control No.	TTRF_EN 1634-1_2014_c

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1. SUMMARY

Product: Fire-resisitance doorset with electronic lock
Manufactured by: Zhongshan Jiahui Technology Company Limited
Model: F2

The performance of the specimen was judged against the criteria for integrity and insulation, as required by EN 1634-1:2014/A1:2018, and the results obtained were as follows:

		Doorset A	Doorset B
Integrity (E)	Sustained flaming	62 min, no failure	62 min, no failure
	Gap gauge	62 min, no failure	62 min, no failure
	Cotton pad	62 min, no failure	62 min, no failure
Insulation (I_2)	Door leaf	62 min, no failure	62 min, no failure
	Door frame	62 min, no failure	62 min, no failure

The test was discontinued after a period of 62 minutes at request of the sponsor.

2. SIGNATURES

Test performed by:

Singh Zhang

Name: Singh Zhang
Date: 15-Mar-22
Title: Project Engineer
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Report authorised by:

Credy Chen

Name: Credy Chen
Date: 15-Mar-22
Title: Technical Manager
KAS Quality Service

3. CONTENTS

4. TEST DETAILS

Applicant Information	
Applicant Name:	Zhongshan Jiahui Technology Company Limited
Applicant Address:	No.13 Bao Ming Street, Yu Min Community, Dongsheng Town, Zhongshan, Guangdong, China

Sample Information	
Product:	Fire-resisitance doorset with electronic lock
Trade Mark:	/
Model and/or type reference:	F2
Manufacturer:	Zhongshan Jiahui Technology Company Limited
Manufacturer Address:	No.13 Bao Ming Street, Yu Min Community, Dongsheng Town, Zhongshan, Guangdong, China
Sample ID:	S211229001-01~02
Date of receipt of test samples:	Dec 29, 2021
Situation of receipt samples:	Good

Testing Information	
Standard:	EN 1634-1:2014/A1:2018 & EN 1363-1:2020
Non-standard method or requirement:	/
Testing Laboratory name:	KAS Quality Service (Guangzhou) Co., Ltd.
Address:	Chenziwei, Xinsha Village Committee, Muzhou Town, Xinhui District, Jiangmen, Guangdong 529143, China.
Date (s) of performance of tests:	Jan 21, 2022
Other reports to be used in conjunction with this report:	/

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5. TEST OBJECTIVE

The test was conducted in accordance with EN 1634-1:2014/A1:2018 Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware Part 1: Fire resistance test for door and shutter assemblies and openable windows, to determine 60 minutes fire resistance performance of two single leaf timber doorsets, which incorporated various items of building hardware.

The test utilised the general principles for fire resistance testing given in EN 1363-1:2020 Fire resistance tests Part 1: General Requirements.

The specific purpose of the test was to evaluate the effects of the inclusion of the various items of building hardware into a previously tested doorset construction. Because of this, no direct field of application for the doorset is included in this report.

6. TEST SPECIMEN

2 sets of samples were submitted to KAS directly from the sponsor. Samples were received at KAS on Dec 29, 2021.

6.1 Single leaf Doorset:

The two doorsets were same with each other. The single door leaf doorset had overall nominal dimensions of 2139 mm high x 966 mm wide x 100 mm thick. The doorset incorporated a single door leaf of overall dimensions 2100 mm high x 900 mm wide x 48 mm thick, which comprised of a core of 43 mm thick Volcanite Non-combustible Board, and sandwiched by 2.5 mm thick Plywood on both sides. The door leaf stiles and rails were comprised of 2 nos. and 3 nos. of 25 mm wide by 43 mm thick Aspenite Composite Wood.

The door leaf was hung within the door frame by three stainless steel butt hinges. The door lipping was made of 0.5 mm Wood Veneer around the door leaf edges. The door leaf was provided with an electronic lock Model No. F2 supplied by 'Foshan Luokai Locking Technology Company Limited', which was in power, and latched but unlocked during the test. Two electronic locks were installed at two doorsets and the two surfaces of lockset were respectively face to the heating conditions of test.

The test doorsets were builded into a specimen support system according to manufacturer's instruction by KAS. The test construction was shown in Appendix A, Figure A.1 & A.2. The doorset A was opening away from the heating conditions of test and the doorset B was opening towards the heating conditions of test. From view of unexposed side, left specimen namely Doorset A, right specimen namely Doorset B.

Table 1 Test specimen description

Refer to Figure B.1 to B.3, unless stated otherwise, all values are nominal, and all information in Table 1 is supplied by the client.

Door Leaf	Type	Single leaf single swing wooden doorset	
	Nominal Size	900mm wide x 2100mm high *	
	Facing	Material:	2.5mm thick plywood
	Core	Material:	Composite Perlite
		Thickness:	43mm
	Stile and Rail	Material:	Aspenite composite wood
		Size:	25mm wide by 43mm thick
	Lipping	Material:	wood veneer
		Thickness:	0.5mm
Door Frame	Material:	Aspenite Composite Board	
	Rebate:	18mm *	
	Nominal Size:	2139mm x 966mm x 100 mm *	

Hardware	Hinges	Brand:	IWAKO
		Model:	H-008 *
		Material:	Stainless steel
		Size:	3 nos. of 102mm by 102mm by 3mm thick *
	Electronic Lock	Model:	F2 *
		Body size:	235mm x 84mm x 22mm *
		Status during the test:	Power on; latched but unlocked during the test *
		Supplier:	Foshan Luokai Locking Technology Company Limited
Intumescent Seal	Model:	IWFS 2504	
	Thickness:	25mm wide by 4mm thick *	
	Location:	1 no of seal installed at each jamb and head of door frame and discontinued at all ironmongeries	
Intumescent Material - Ironmongeries	Model:	IWFP-002	
	Thickness:	2mm	
	Location:	At the Back of hinges	

Specimen Supporting Construction

1. Masonry Wall		
Density	:	1980 kg/m^3
Length	:	220 mm
Width	:	105 mm
Thickness	:	40 mm
2. Mortar		
Material	:	Cement: Sand
Mix Ratio	:	1:4

*Verified by the laboratory before the test;

Measured by the test laboratory.

After installation, the specimens were stored in the test laboratory. Throughout this period of the storage, both the temperature and relative humidity of laboratory were measured and recorded as being within a range of from 21.5°C to 22.5°C and 60% to 65% respectively.

7. TEST EQUIPMENT AND PROCEDURE

The test was conducted in accordance with the procedure specified in EN 1634-1:2014/A1:2018. The ambient temperature of the area was measured and recorded at comment of test. The test data were shown in Table 3.

7.1 Furnace Temperature Control

The furnace opening size is 3.4 x 3.4 m. 9 mineral insulated thermocouples, which were distributed uniformly in the furnace and were kept at 100 ± 50 mm away from the exposed surface of test specimen, were provided to monitor the mean temperature of the furnace.

The mean temperature of the furnace was controlled as close as the standard temperature/time curve specified in Clause 5.1 of EN 1363-1:2020.

The locations and reference numbers of the furnace thermocouples were shown in Figure 1.

7.2 Furnace Pressure Control

Two pressure sensors were provided to monitor and control the furnace pressure after the first five minutes of testing the furnace atmospheric pressure so that it complied with the requirements of Clause 5.2 of EN 1363-1:2020. The pressure condition was assumed a linear pressure gradient of 8.5 Pa per 1 m and a neutral pressure axis at a height of approximately 0.5 m above the notional floor. The pressure at the top of test specimen was controlled within 20 Pa.

The locations and reference numbers of the pressure sensor were shown in Figure 1.

7.3 Unexposed Surface Temperature Monitoring

The unexposed face temperature of the specimen was monitored by thermocouples as follows:

Doorset A

Thermocouples 1 to 5:	At five positions on the unexposed face of the specimen, one approximately at the centre and one at the approximate centre of each quarter section of specimen.
Thermocouples 6 to 9:	At four positions on the unexposed face of the door leaf, four approximately at 100 mm from the door leaf top corner and two at mid height.
Thermocouples 10 to 13:	At four positions on the unexposed face of the door frame, two positioned at approximated 50 mm from each vertical edge of top frame, and two at mid-height of vertical frames.

Doorset B

Thermocouples 14 to 18:	At five positions on the unexposed face of the specimen, one approximately at the centre and one at the approximate centre of each quarter section of specimen.
Thermocouples 19 to 22:	At four positions on the unexposed face of the door leaf, four approximately at 100 mm from the door leaf top corner and two at mid height.
Thermocouples 23 to 26:	At four positions on the unexposed face of the door frame, two positioned at approximated 50 mm from each vertical edge of top frame, and two at mid-height of vertical frames.

The locations and reference numbers of various unexposed surface thermocouples were shown in Figure 4.

7.4 Integrity Monitoring

Cotton pads and gap gauges were available to evaluate the impermeability of specimen to hot gases. The occurrence of sustained flaming more than 10 s on the unexposed face was also checked to determine compliance with the integrity criterion.

7.5 Deflection of specimen

The horizontal deflection at recommended positions of the specimen was measured throughout the test by means of a straight steel ruler paralleled to the unexposed face via a taut fine steel wire. Recommended positions for measuring deflection were shown in Figure 3.

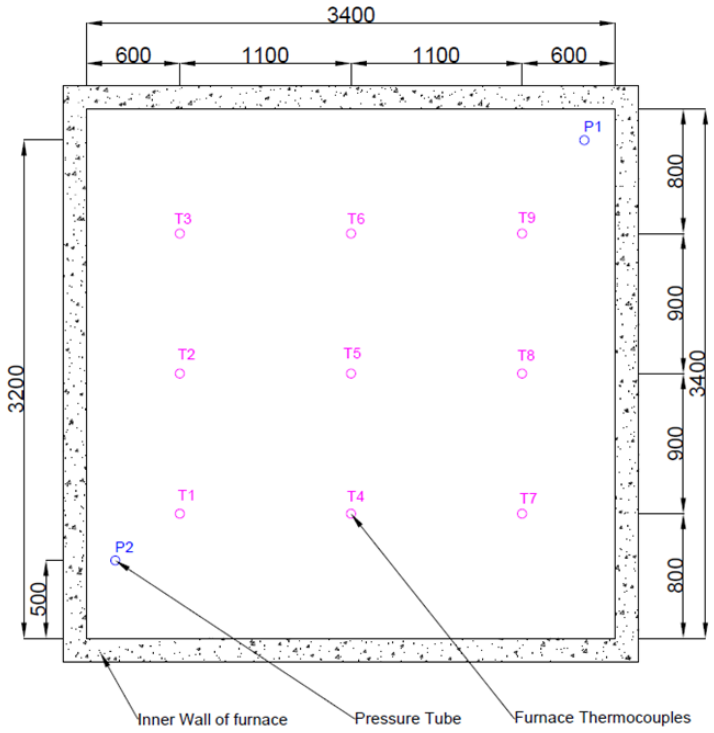


Figure 1 Location of Furnace Thermocouples and Pressure Sensors

8. TEST RESULT

8.1 Pre-test examination and preparation

8.1.1 Gap measurements

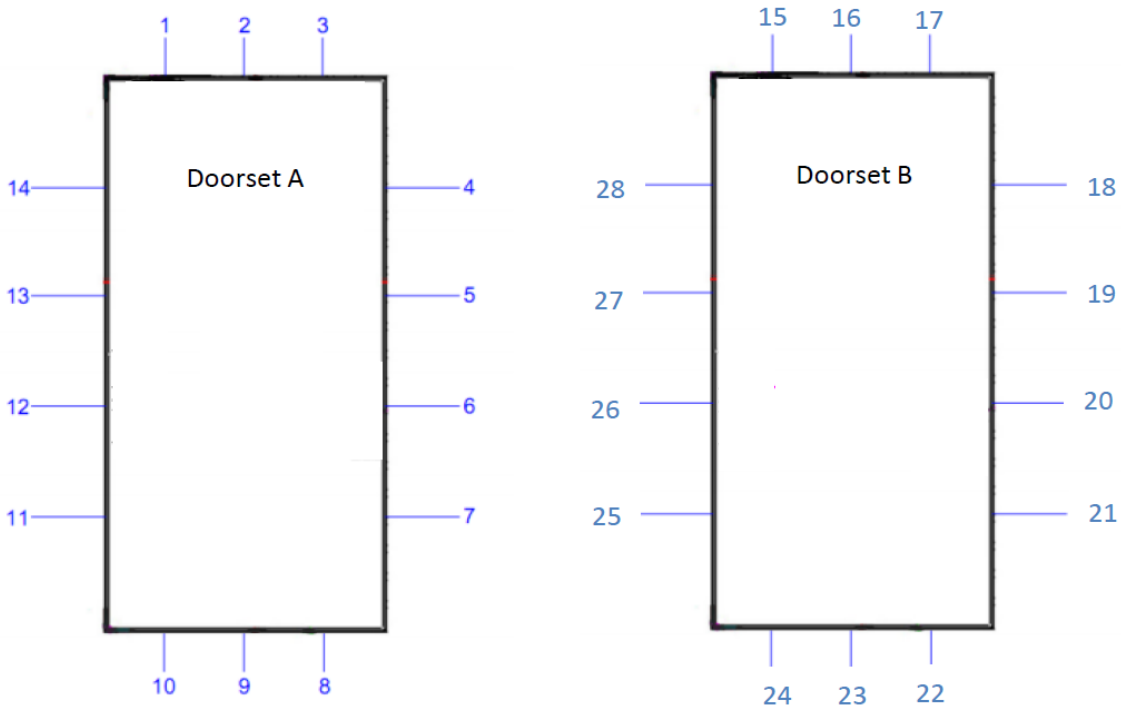


Figure 2 Initial Clearance Measurement Positions (View from unexposed side)

Initial Clearances at positions													
1	2	3	4	5	6	7	8	9	10	11	12	13	14
3.0	2.2	1.5	4.4	4.1	3.0	3.8	2.5	2.8	2.2	2.6	2.4	2.0	2.7
15	16	17	18	19	20	21	22	23	24	25	26	27	28
4.0	3.3	2.3	1.6	2.0	2.0	2.0	2.9	3.0	2.5	2.8	2.2	2.8	3.3

All dimensions are in mm.

8.2 Observations

Observations made during the test are given in Table 2 and unless stated were the unexposed face.

Table 2 Observations

Time mm: ss	Observations
0:00	The test commences.
2:02	Dense smoke released from each edge of doorsets.
9:04	Each edge of doorset B began to get wet; The right edge of doorset B began to turn black.
20:34	The smoke release decreased. The left edge of doorset A began to turn black.
30:41	The top edge of doorset B began to turn black.
42:39	Each edge of doorset B began to turn black.
62:17	No integrity and insulation failure had occurred; The test was terminated after a period of 62 minutes at request of the sponsor.

8.3 Deflection

The horizontal deflection at recommended positions of the specimen was measured during the test.

Recommended positions for measuring deflection were shown in Figure 3. And the test data was shown in below tables.

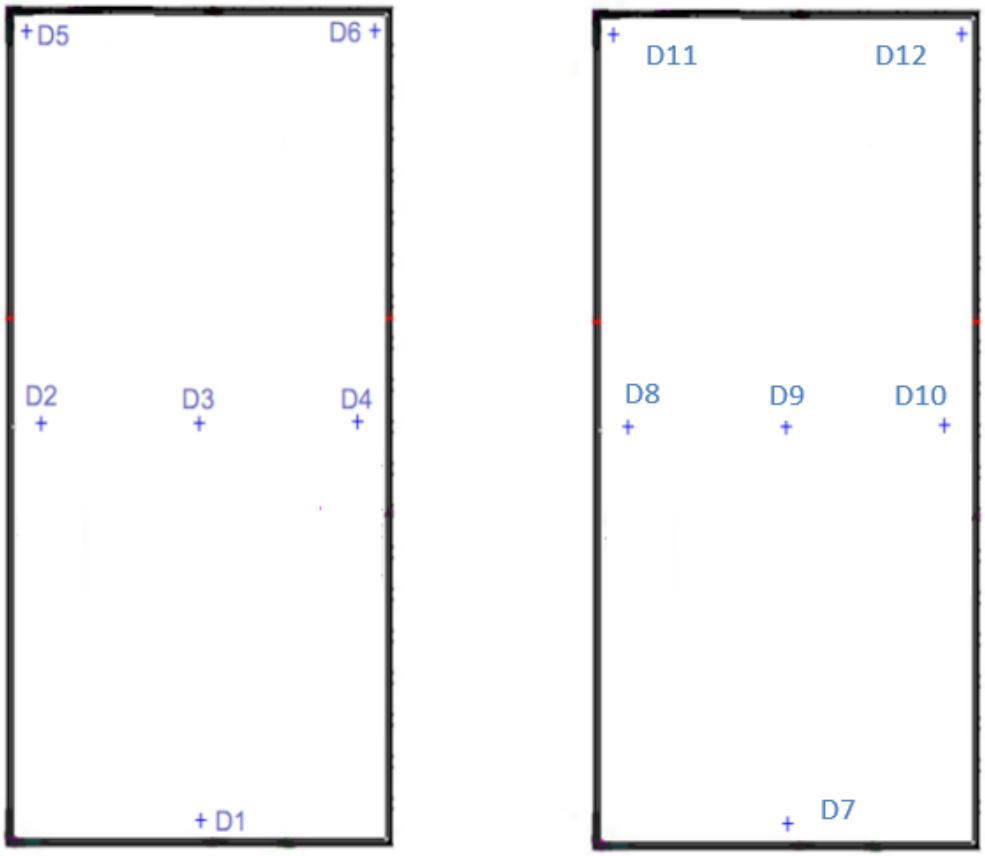


Figure 3 Positions for measuring horizontal deflection (View from unexposed side)

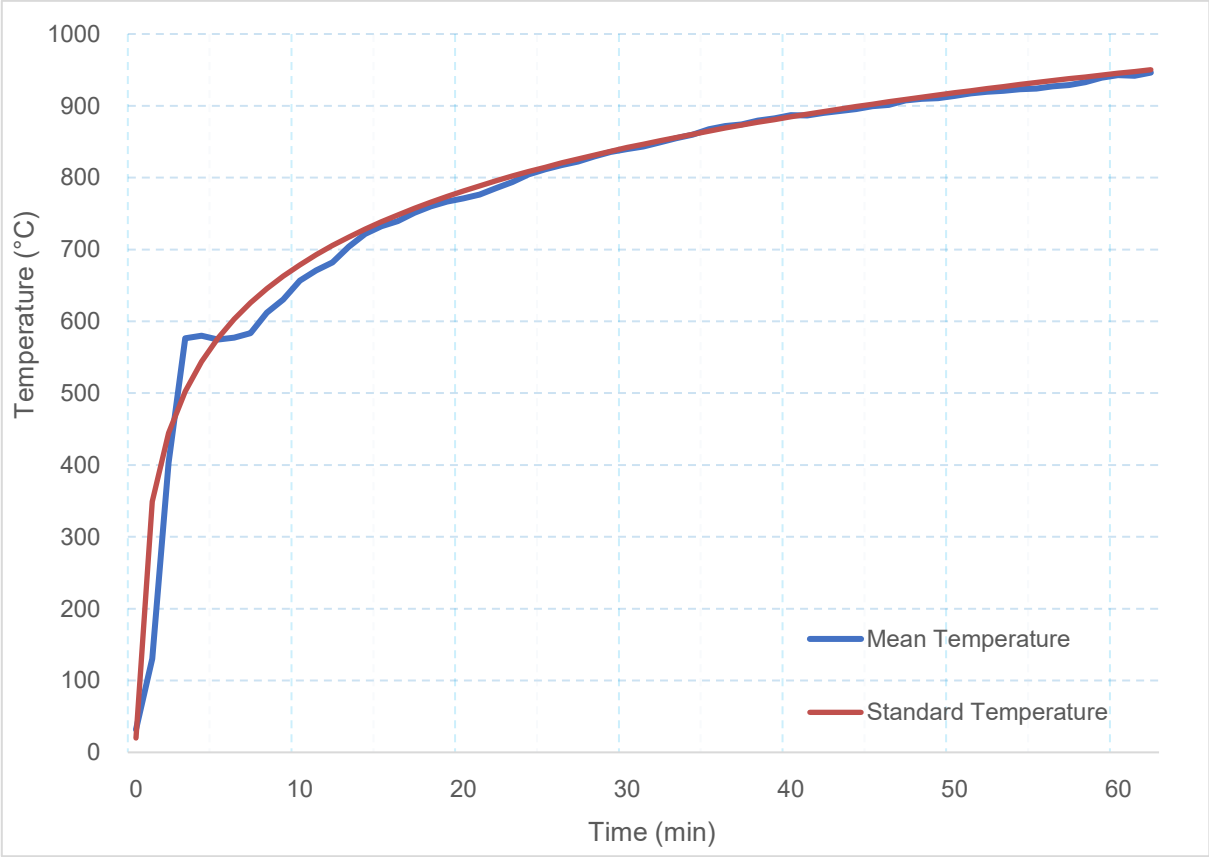
Time	Deflection at positions (mm)											
Minutes	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12
0	0	0	0	0	0	0	0	0	0	0	0	0
10	-9	-15	5	5	-4	-3	-4	-2	4	4	-1	1
20	-6	3	6	7	2	-3	-3	-3	3	3	5	4
30	-4	5	7	7	1	-2	0	-12	2	3	8	5
40	-1	4	9	8	5	2	0	-4	2	2	12	6
50	0	4	9	11	3	5	1	-7	2	3	15	7
62	0	4	9	11	3	5	1	-7	2	3	15	7

Positive deflections indicate movement towards to the heat condition.

8.4 Temperature Recorded

8.4.1 Furnace temperature

The mean furnace temperature recorded was plotted against time in Graph 1 with the specified curve for comparison.



Graph 1 Furnace Mean Temperature / Time Curve

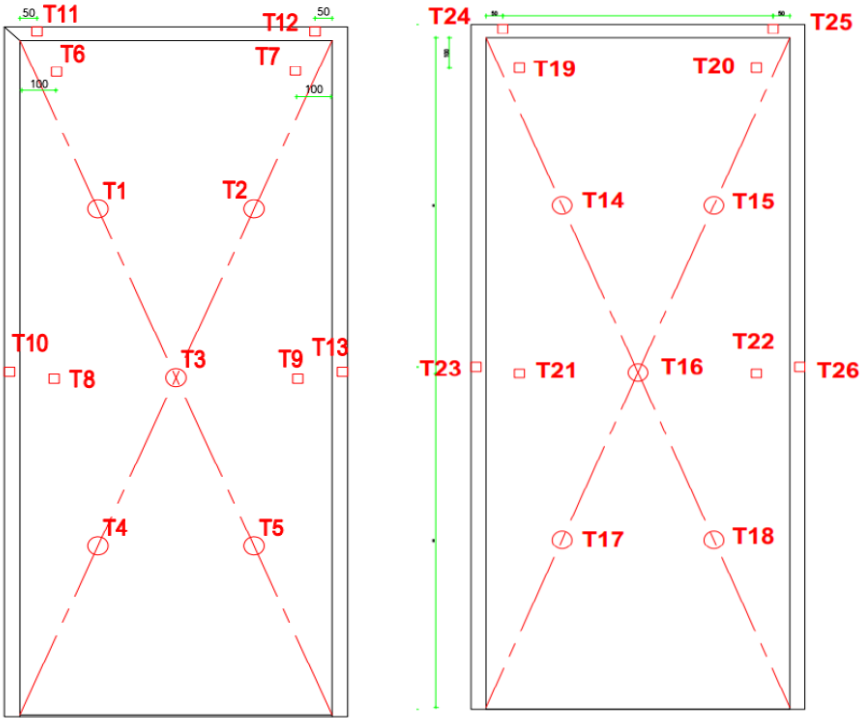
The mean furnace temperature and standard temperature was recorded in Table 3 for comparison.

Table 3 Furnace mean temperature and standard temperature (Unit: °C)

Time Min	Mean Temperature	Standard Temperature	Diff%	Ambient Temperature
0	20.6	20.0	/	20.2
10	689.5	678.4	-4.6	20.5
20	761.5	781.4	-2.9	20.7
30	861.0	841.8	-1.3	21.4
40	909.0	884.7	-0.2	21.3
50	946.3	918.1	0.4	21.4
62	978.5	945.3	1.0	21.3

8.4.2 Unexposed face temperatures

The locations and reference numbers of various unexposed surface thermocouples were shown in Figure 4.

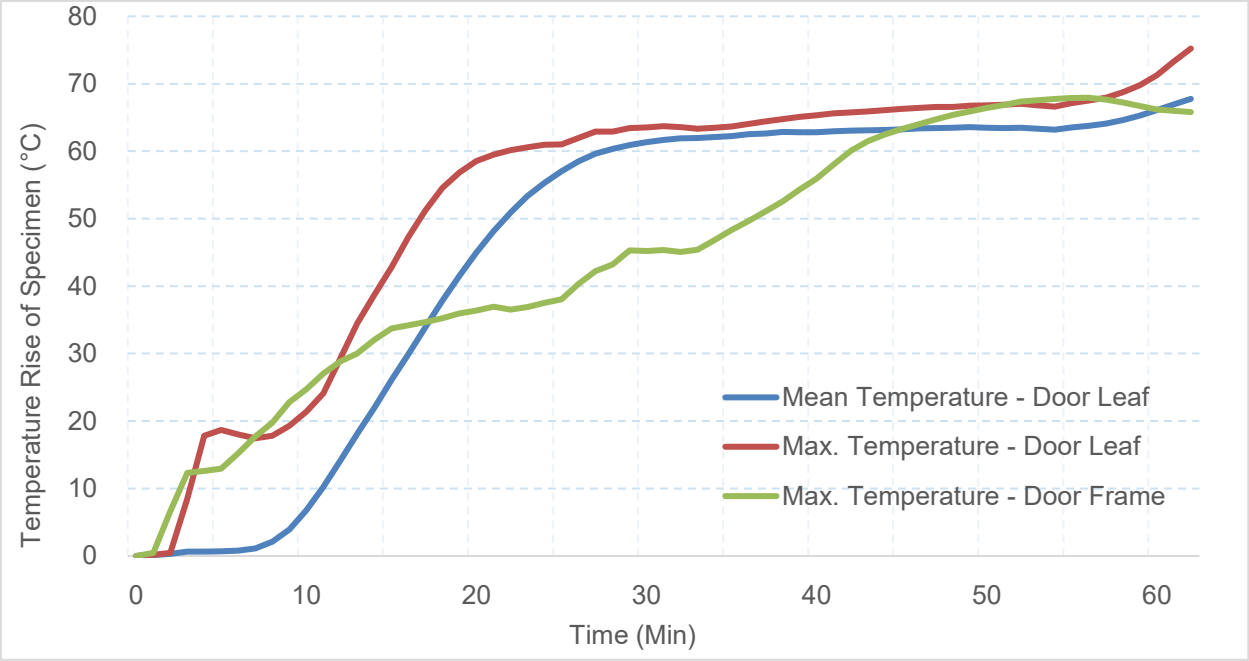


Doorset A Doorset B

T1 to T5 : to determine Doorset A Door Leaf mean temperature rise.
T1 to T9 : to determine Doorset A Door Leaf maximum temperature rise.
T10 to T13 : to determine Doorset A Door Frame maximum temperature rise.
T14 to T18 : to determine Doorset B Door Leaf mean temperature rise.
T14 to T22 : to determine Doorset B Door Leaf maximum temperature rise.
T23 to T26 : to determine Doorset B Door Frame maximum temperature rise.

Figure 4 Locations and reference numbers of thermocouple on unexposed surface

The mean and maximum temperatures raise of the unexposed face of the Doorset A were shown in Graph 2a.



Graph 2a The mean and maximum temperatures raises/time curve of Doorset A

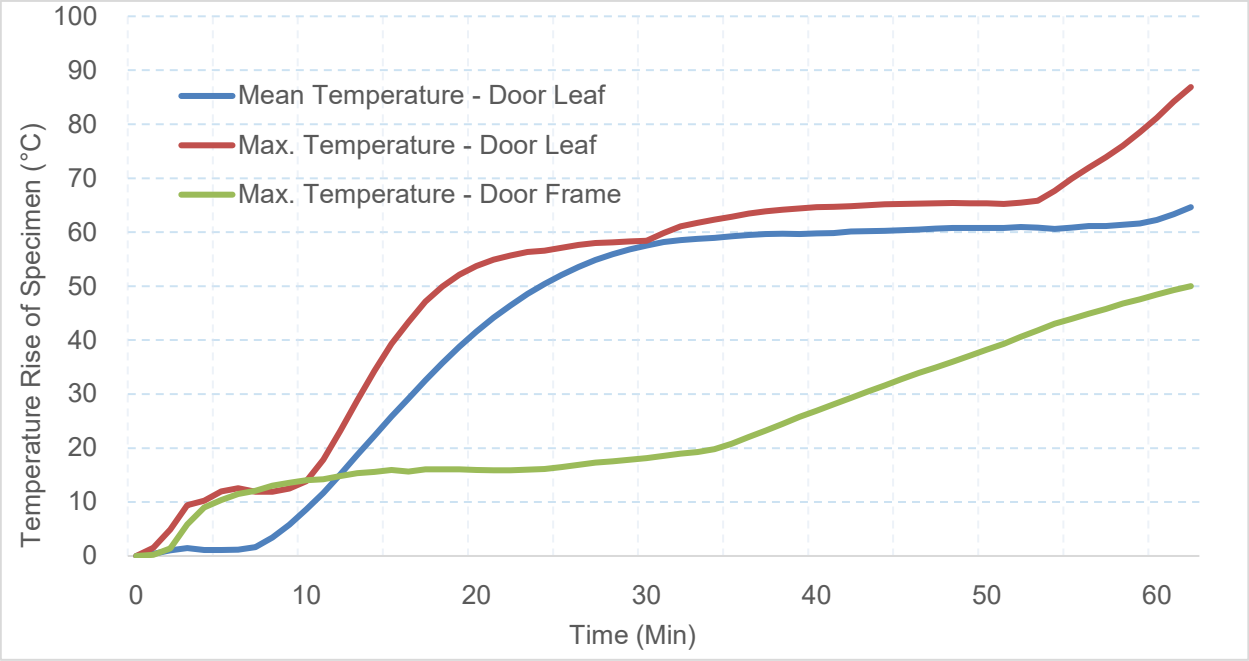
The door leaf mean temperature rise for insulation (140°C rise) of Doorset A was 67.8°C recorded at 62 min. The door leaf maximum temperature rise for insulation (180°C rise) Doorset A of was 75.2°C recorded at 62 min. The door frame maximum temperature rise for insulation (360°C rise) was 67.9°C recorded at 56 min.

The individual temperatures recorded on the unexposed face of the Doorset were shown in Table 4a.

Table 4a Individual temperatures recorded on the unexposed face of the Doorset A

Area	Position at Doorset A door leaf											Position at Doorset A door frame				
Time / Min	T1	T2	T3	T4	T5	T6	T7	T8	T9	Mean	Max	T10	T11	T12	T13	Max
0	21.5	21.7	21.6	21.4	21.4	21.3	21.6	21.4	21.5	21.5	21.7	20.3	20.2	20.4	20.4	20.4
5	22.1	22.5	22.2	22.2	22.1	22.3	23.1	40.1	22.4	22.2	40.1	30.7	33.1	25.9	32.8	33.1
10	28.6	25.9	28.4	29.9	28.5	38.9	38.8	42.8	34.8	28.3	42.8	35.4	44.8	30.7	40.7	44.8
15	47.1	39.9	46.3	56.6	48.1	64.1	63.8	59.3	48.7	47.6	64.1	37.3	53.9	37.7	48.4	53.9
20	68.6	57.6	66.7	72.6	67.1	79.9	72.8	73.5	57.5	66.5	79.9	38.1	56.5	45.5	51.2	56.5
25	82.0	73.9	79.1	79.0	78.6	82.4	76.2	80.3	66.3	78.5	82.4	40.2	58.2	57.0	51.3	58.2
30	85.0	82.2	82.3	81.6	83.2	83.3	77.5	83.7	74.4	82.9	85.0	44.9	61.3	65.6	55.8	65.6
35	84.7	84.0	83.3	82.5	84.2	83.9	78.6	85.1	80.2	83.7	85.1	52.2	68.5	67.8	60.6	68.5
40	85.8	84.5	83.7	83.3	84.4	84.8	79.0	86.7	82.6	84.3	86.7	61.5	75.7	76.3	68.3	76.3
45	86.3	84.9	84.1	83.7	84.8	85.3	79.7	87.7	83.7	84.8	87.7	67.7	83.4	81.8	77.2	83.4
50	86.1	85.2	84.5	84.0	85.3	85.6	80.6	88.2	84.4	85.0	88.2	71.0	86.6	84.9	83.6	86.6
55	86.1	85.4	84.6	83.9	85.4	85.5	83.1	88.5	84.6	85.1	88.5	73.3	88.0	85.1	85.2	88.0
62	88.3	96.9	90.7	84.9	85.5	87.7	96.0	93.9	86.0	89.3	96.9	76.9	85.5	83.9	86.2	86.2

The mean and maximum temperatures raise of the unexposed face of the Doorset B were shown in Graph 2b.



Graph 2b The mean and maximum temperatures raises/time curve of Doorset B

The door leaf mean temperature rise for insulation (140°C rise) of Doorset B was 64.6°C recorded at 62 min. The door leaf maximum temperature rise for insulation (180°C rise) Doorset B of was 86.9°C. recorded at 62 min. The door frame maximum temperature rise for insulation (360°C rise) of Doorset B was 50.0°C recorded at 62 min.

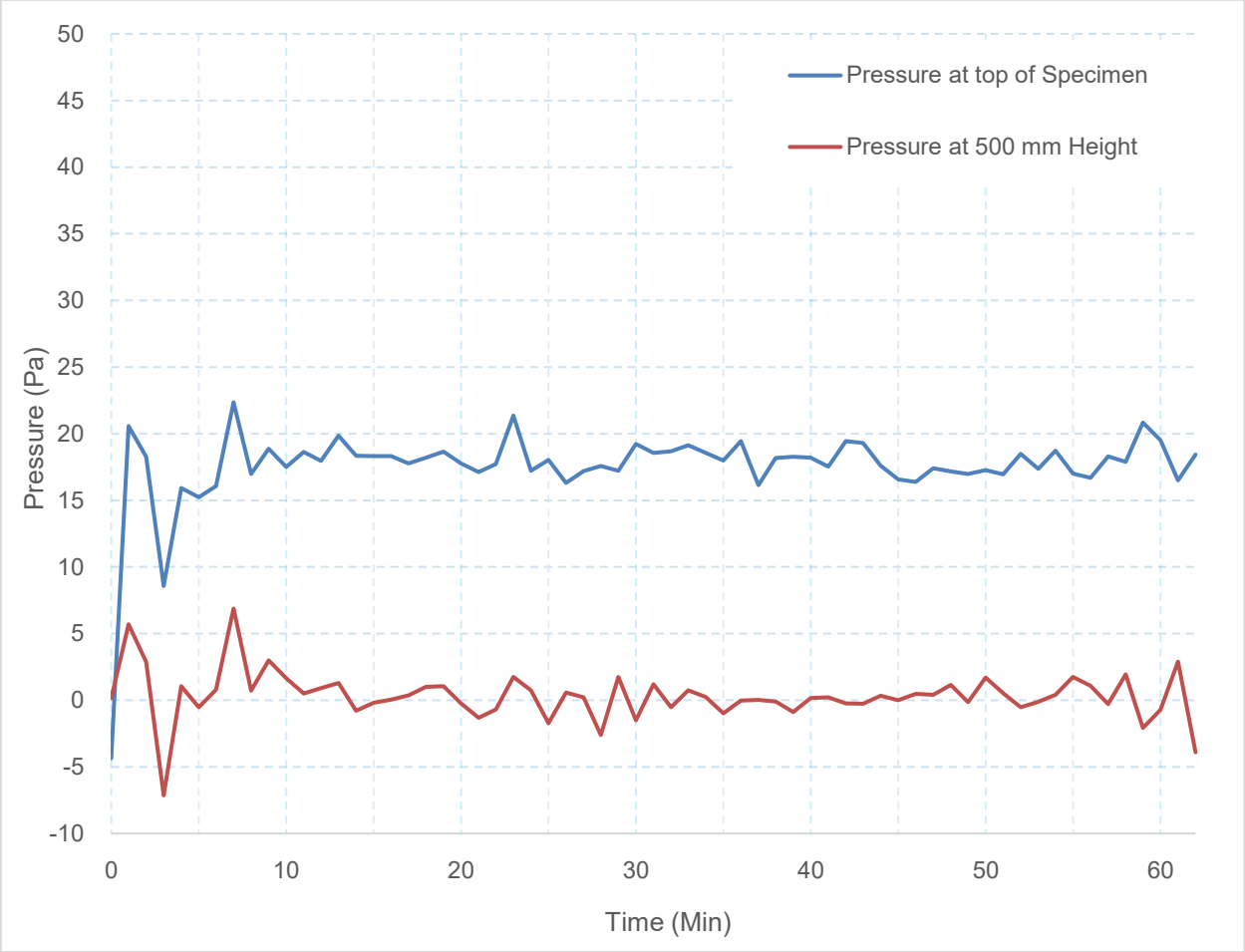
The individual temperatures recorded on the unexposed face of the Doorset were shown in Table 4b.

Table 4b Individual temperatures recorded on the unexposed face of the Doorset B

Area	Position at Doorset B door leaf											Position at Doorset B door frame				
Time / Min	T14	T15	T16	T17	T18	T19	T20	T21	T22	Mean	Max	T23	T24	T25	T26	Max
0	21.6	21.6	21.9	21.4	21.6	21.5	21.3	21.4	21.3	21.6	21.9	20.7	20.8	20.8	20.6	20.8
5	22.4	23.8	22.5	22.3	22.6	26.4	33.3	22.7	23.9	22.7	33.3	22.6	23.6	31.1	21.4	31.1
10	42.2	26.9	26.8	27.0	28.4	35.3	35.0	25.0	28.9	30.3	42.2	23.0	24.4	34.8	22.5	34.8
15	67.6	42.5	39.7	47.5	40.1	60.8	46.7	37.1	50.6	47.5	67.6	25.1	25.6	36.7	24.1	36.7
20	79.0	58.4	53.4	67.2	57.8	75.2	48.1	52.2	59.6	63.1	79.0	27.3	28.2	36.7	26.1	36.7
25	82.6	68.0	66.6	77.0	74.0	78.6	63.7	67.1	65.9	73.6	82.6	30.3	31.5	37.2	28.7	37.2
30	84.5	71.2	77.4	80.4	82.2	79.9	68.0	79.4	70.5	79.1	84.5	34.2	36.2	38.9	32.3	38.9
35	85.3	72.1	81.7	80.8	84.5	80.6	69.8	84.2	74.0	80.9	85.3	39.3	41.6	41.3	37.0	41.6
40	85.5	71.9	82.5	82.2	84.9	82.9	68.3	86.0	74.2	81.4	86.0	45.2	47.7	45.0	41.2	47.7
45	86.3	72.6	82.8	82.7	85.4	83.9	68.5	86.6	75.0	82.0	86.6	49.5	53.6	48.3	45.4	53.6
50	86.1	85.2	84.5	84.0	85.3	85.6	80.6	88.2	84.4	85.0	88.2	52.4	59.0	51.5	49.0	59.0
55	86.1	85.4	84.6	83.9	85.4	85.5	83.1	88.5	84.6	85.1	88.5	55.3	64.7	54.6	52.8	64.7
62	88.3	96.9	90.7	84.9	85.5	87.7	96.0	93.9	86.0	89.3	96.9	59.3	70.8	59.0	56.9	70.8

8.5 Furnace Pressure

The furnace pressure was recorded and shown in Graph 3.



Graph 3 Furnace Pressure / Time Curve

9. PERFORMANCE CRITERIA

The performance of the specimen was assessed against the criteria for integrity and insulation in accordance with Clause 11 of EN 1363-1:2020 and Clause 11 of EN 1634-1:2014+A1:2018. The performance criteria for failure were given as follow:

Integrity (E):

These are the times in completed minutes for which the test specimen continues to maintain its separating function during the test without:

a) causing the ignition of a cotton pad when applied; or

b) permitting the penetration of a gap gauge as follows:

i) whether the 6 mm gap gauge can be passed though the test specimen such that the gauge projects into the furnace, and can be moved a distance of 150 mm along the gap; or

ii) whether the 25 mm gap gauge can be passed though the test specimen such that the gauge projects into the furnace.

c) resulting in sustained flaming for a period of time greater than 10 seconds.

Insulation (I):

This is the time in completed minutes for which the test specimen continues to maintain its separating function during the test without developing temperatures on its unexposed surface which:

a) increase the average temperature above the initial average temperature by more than 140°C; or

b1) increase at any location (including the roving thermocouple) above the initial average temperature by more than 180 °C; [Supplementary procedure - Classification I_1]

b2) increase at perimeter frame member of the doorset or openable window above the initial average temperature by more than 360 °C; and any other location (including the roving thermocouple) above the initial average temperature by more than 180 °C; [Normal procedure - Classification I_2]

The performance criteria ‘insulation’ shall automatically be assumed not to be satisfied when the ‘integrity’ criterion ceases to be satisfied.

10. TEST CONCLUSIONS

Product: Fire-resisitance doorset with electronic lock

Manufactured by: Foshan Luokai Locking Technology Company Limited

Model: F2

Had been tested in accordance with:

EN 1634-1:2014/A1:2018 Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware Part 1: Fire resistance test for door and shutter assemblies and openable windows and EN 1363-1:2020 Fire resistance tests Part 1: General Requirements.

by KAS Quality Service (Guangzhou) Co., Ltd. which is an IAS accredited Testing Laboratory (NO. TL-827).

at Chenziwei, Xinsha Village Committee, Muzhou Town, Xinhui District, Jiangmen, Guangdong 529143, China.

Conclusion:

The performance of the specimen was judged against the criteria for integrity and insulation, as required by EN 1634-1:2014/A1:2018, and the results obtained were as follows:

		Doorset A	Doorset B
Integrity (E)	Sustained flaming	62 min, no failure	62 min, no failure
	Gap gauge	62 min, no failure	62 min, no failure
	Cotton pad	62 min, no failure	62 min, no failure
Insulation (I_2)	Door leaf	62 min, no failure	62 min, no failure
	Door frame	62 min, no failure	62 min, no failure

The test was discontinued after a period of 62 minutes at request of the sponsor.

Limitation of result.

1. The results only relate to the behaviour of the specimen of the element of construction under the particular conditions of test; they are not intended to be the sole criteria for assessing the potential fire performance of the element in use nor do they reflect the actual behaviour in fires.

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

3. 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.

4. Decision rule for statement(s) of conformity is based on Binary Statement for Simple Acceptance Rule (w=0) of ILAC G8: 09/2019.

APPENDIX A SUPPORTING CONSTRUCTION

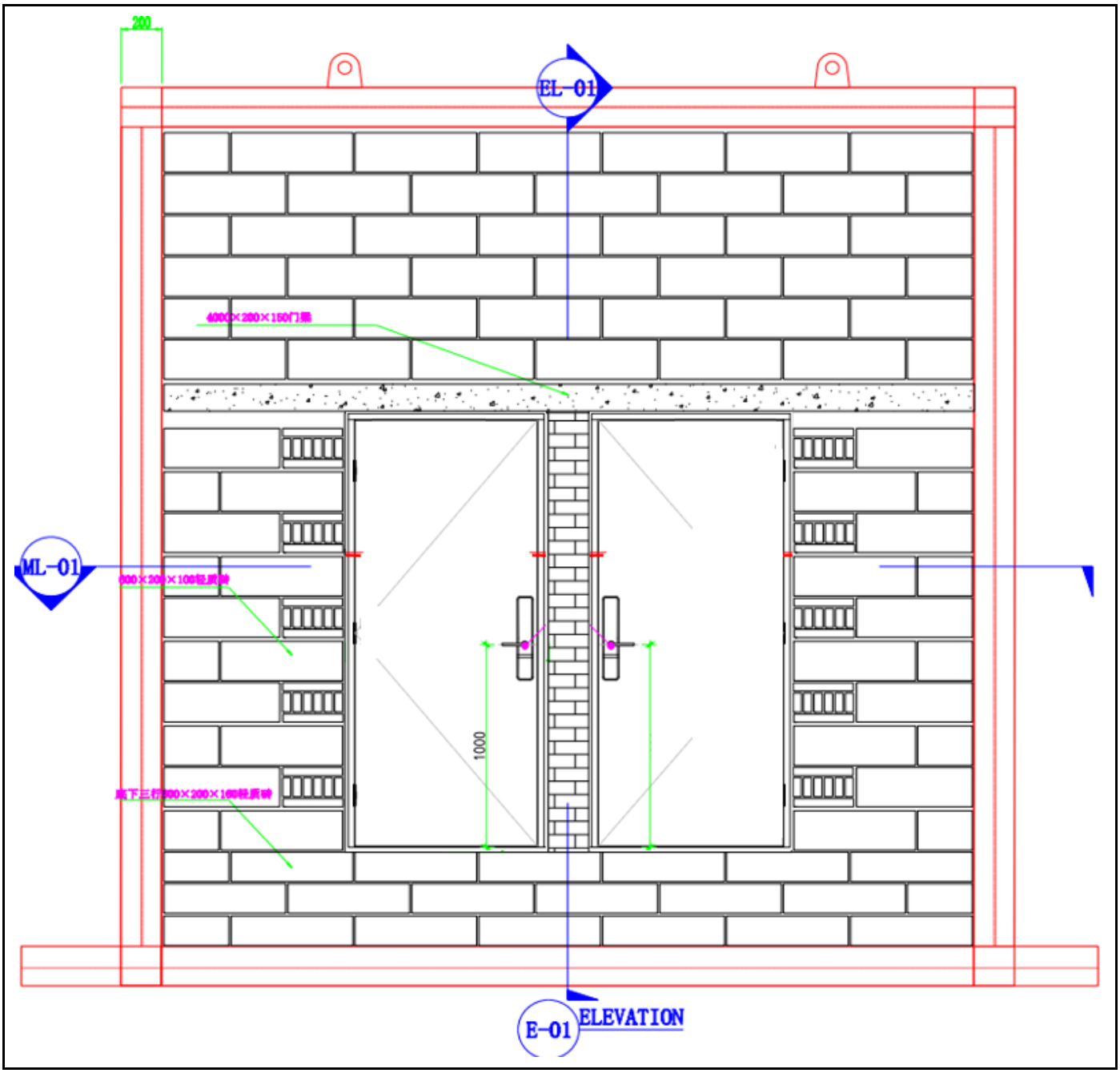


Figure A.1 Supporting Constructions Drawing (View from unexposed side)

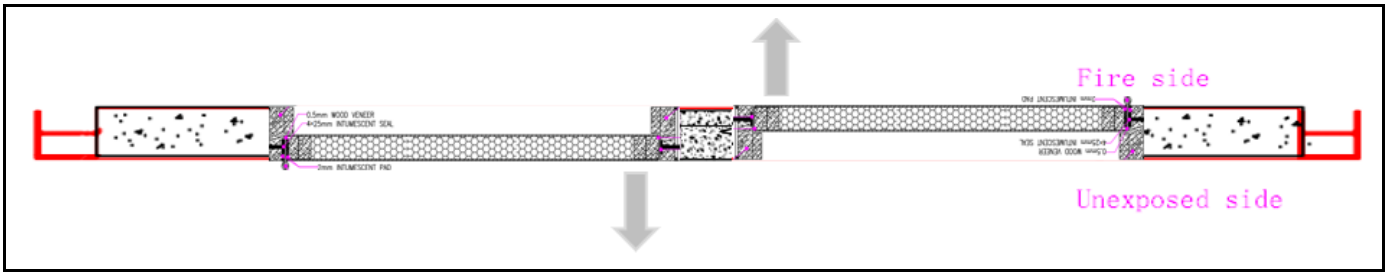


Figure A.2 Supporting Constructions Drawing (Plan view)

APPENDIX B TEST SPECIMEN CONSTRUCTION

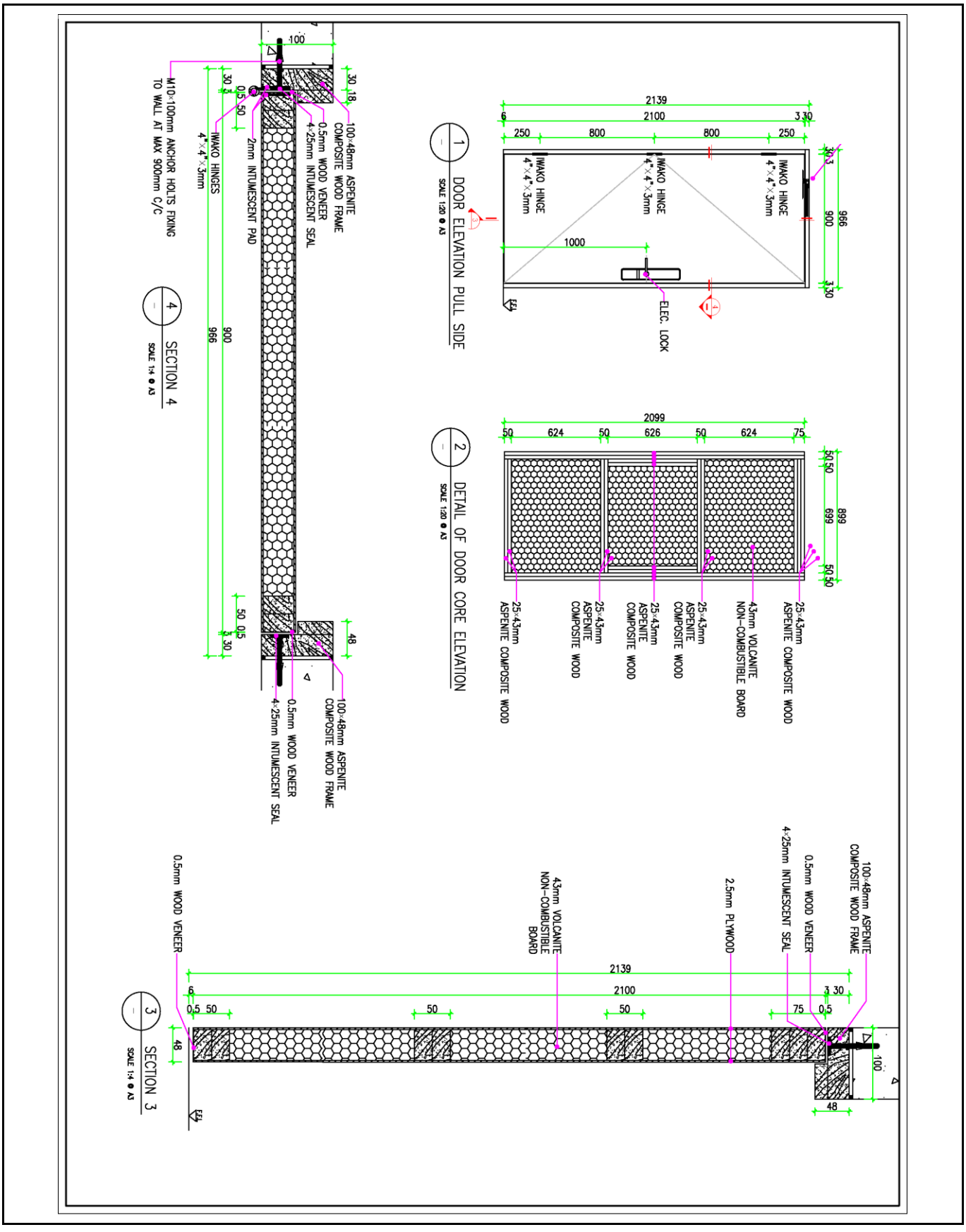


Figure B.1 Doorset drawing

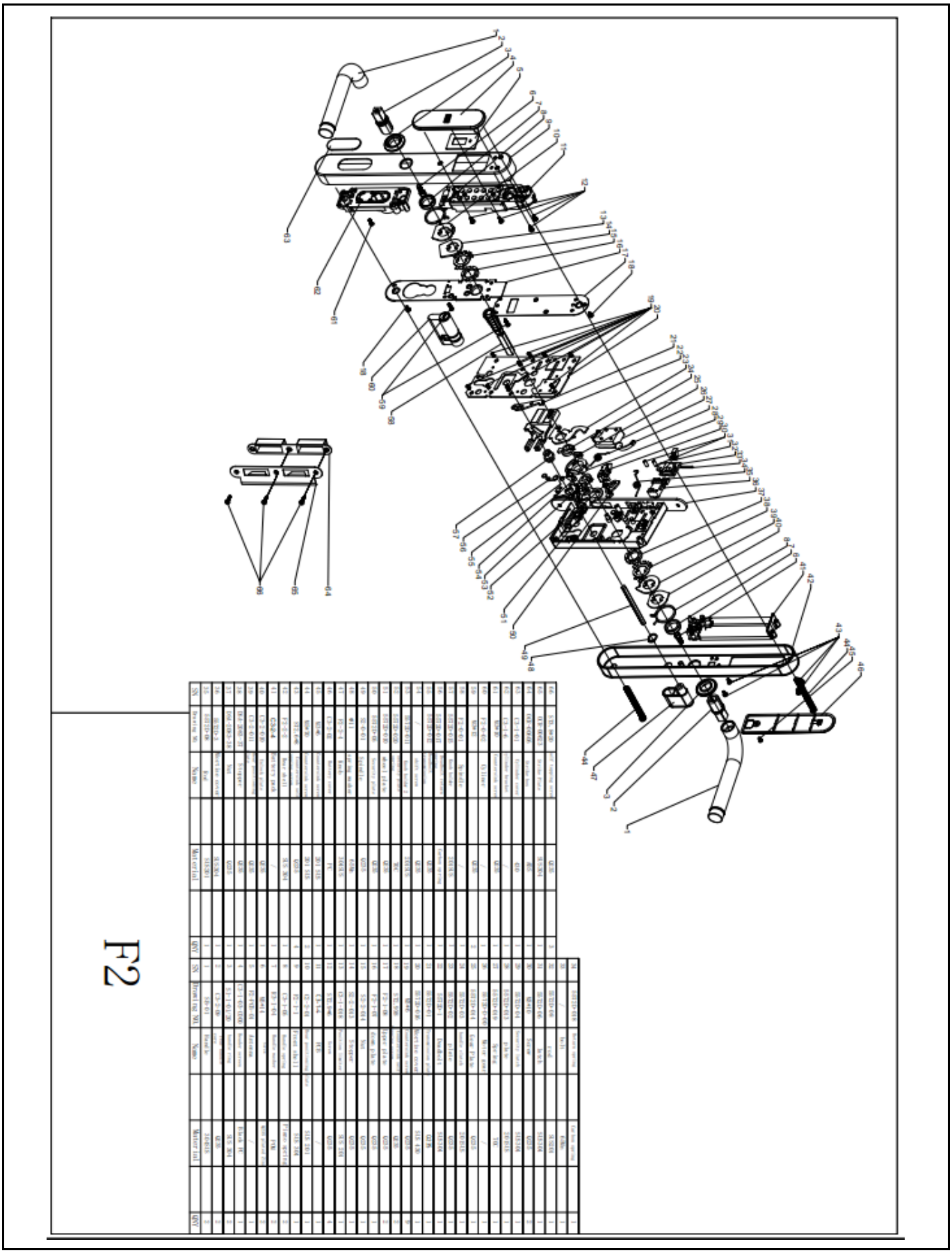


Figure B.2 Details of Electronic lock – F2

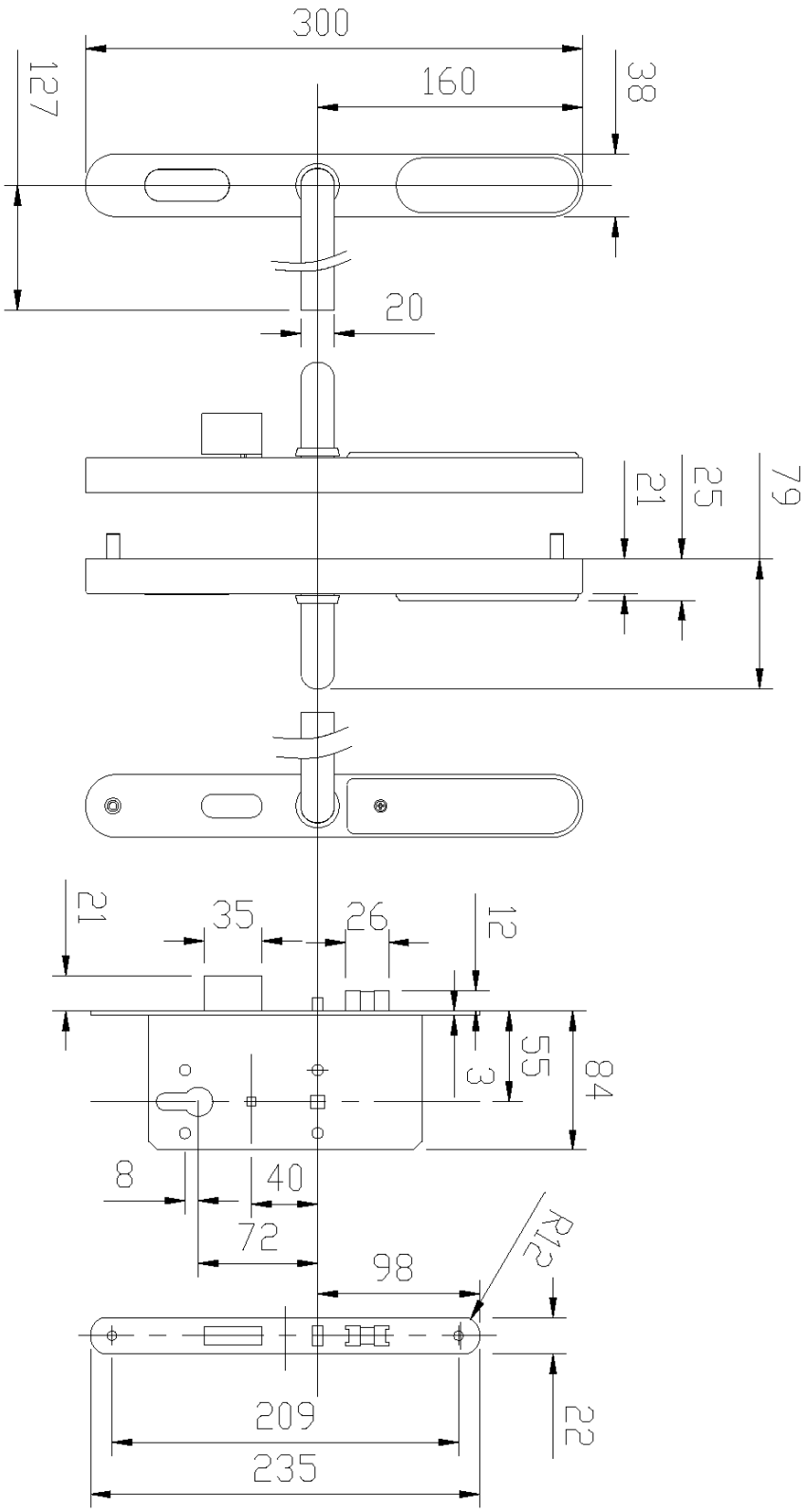


Figure B.3 Dimension of Electronic lock – F2

APPENDIX C TEST PHOTOGRAPHS

Unexposed face (Test before)

Exposed face (Test before)

After 10 min (Unexposed Side)

After 20 min (Unexposed Side)

After 30 min (Unexposed Side)

After 40 min (Unexposed Side)

After 50 min (Unexposed Side)

After 62 min (Unexposed Side)

After 62 min (Exposed Side)

REVISION HISTORY

Revision No.	Date	Changes	Author	Reviewer
Original	3/15/2022	First issue	Singh Zhang	Credy Chen

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The End of Report