FUJIAN ANLIN INTELLIGENT SCIENCE AND TECHNOLOGY CO.,LTD

TEST REPORT

SCOPE OF WORK
EN 12101-1:2005+A1:2006 TESTING ON AUTOMATIC SMOKE CURTAIN

REPORT NUMBER
210525001SHF-001-R1

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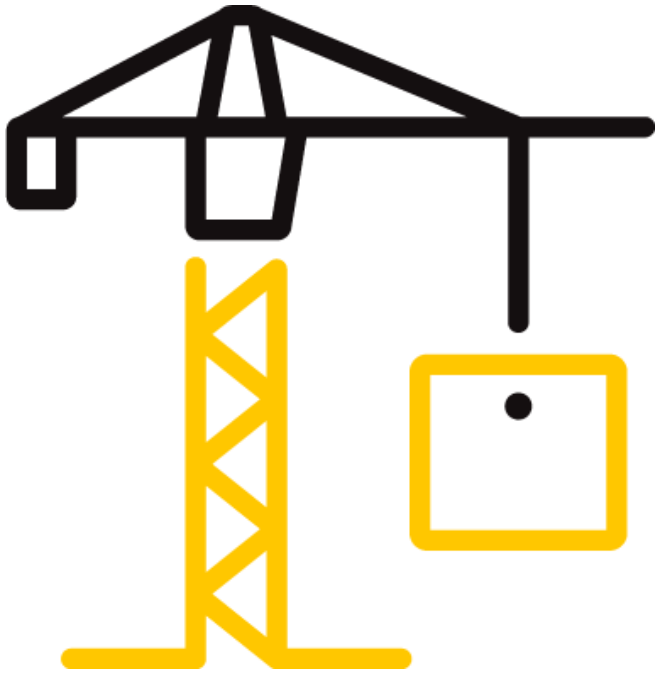

Intertek Testing Services Shenzhen Ltd. Shanghai Fengxian Branch
Plant 5, No. 6958 Daye Road, Fengxian District,
Shanghai, China
Tel: +86 21-61136116 Fax: 021-61189921
Website: www.intertek.com

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REPORT ISSUED TO

FUJIAN ANLIN INTELLIGENT SCIENCE AND TECHNOLOGY CO.,LTD
NO.2, ANSHENG SOUTH ROAD, WU'AN TOWN
CHANGTAI, ZHANGZHOU CITY
FUJIAN PROVINCE

SECTION 1

SCOPE

Intertek has conducted an evaluation for FUJIAN ANLIN INTELLIGENT SCIENCE AND TECHNOLOGY CO.,LTD to determine the performance of Reliability and durability, Default operation to fire position, Response time, Permeability to smoke and Temperature/time resistance of the Automatic smoke curtain. This evaluation began on May 25, 2021 and was completed on January 21, 2022. The test was conducted from November 26, 2021 to December 20, 2021.

The test was conducted in accordance with EN 12101-1:2005+A1:2006, Smoke and heat control systems – Part 1: Specification for smoke barriers.

This report does not constitute certification of this product nor an opinion or endorsement by this laboratory.

For INTERTEK B&C:

COMPLETED BY:	Adolph Chen	**REVIEWED BY:**	Jason Xu
TITLE:	Project Engineer – Building & Construction	**TITLE:**	Operation Supervisor – Building & Construction
SIGNATURE:	Adolph.Chen	**SIGNATURE:**	Jason Xu
DATE:	2022-05-09	**DATE:**	2022-05-09

INTERTEK TESTING SERVICES SHENZHEN LTD. SHANGHAI FENGXIAN BRANCH 检验检测专用章

Intertek Testing Services Shenzhen Ltd. Shanghai Fengxian Branch
Plant 5, No. 6958 Daye Road, Fengxian District,
Shanghai, China
Tel: +86 21-61136116 Fax: 021-61189921
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SECTION 2
SUMMARY OF TEST RESULTS

Product Name: Automatic smoke curtain
Barrier Type: ASB1 and ASB3

PERFORMANCE PARAMETER	RELATED SUBCLAUSE	TEST METHOD(S)	TEST RESULT/CLASSIFICATION	VERDICT
Reliability and durability	5.3.2	EN 12101-1:2005+A1:2006, Annex B	Successfully finished 1000 complete cycles without damage	Pass
Default operation to fire operation position	5.4		Smoke barrier moved to fire operational position in the event of power source removed	Pass
Response time	5.4		Response Delay: 113 s Velocity: 0.04 m/s	Fail
Permeability to smoke	5.5.5	EN 12101-1:2005+A1:2006, Annex C and EN 1634-3:2004	0.20 $m^3/h/m^2$ at 25 Pa at ambient temperature	Pass
Temperature/time	5.2	EN 12101-1:2005+A1:2006, Annex D and EN 1363-1:2020	D 120	Pass

SECTION 3
TEST METHODS

The specimens were evaluated in accordance with the following:

EN 12101-1:2005+A1:2006, *Smoke and heat control systems – Part 1: Specification for smoke barriers*

EN 1363-1:2020, *Fire resistance tests – Part 1: General requirements*

EN 1634-3:2004, *Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware – Part 3: Smoke control test for door and shutter assemblies*

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SECTION 4
MATERIAL SOURCE/INSTALLATION

The specimens were randomly selected by Intertek B&C personnel at FUJIAN ANLIN INTELLIGENT SCIENCE AND TECHNOLOGY CO.,LTD, located at NO.2, ANSHENG SOUTH ROAD, WU'AN TOWN, CHANGTAI, ZHANGZHOU CITY, FUJIAN PROVINCE. The specimens were witnessed during production and signed prior to shipment from October 25, 2021 to October 26, 2021. The specimens were received at the Evaluation Center on November 9, 2021.

The subject test specimens were traceable specimen selected from the manufacturer's facility. Intertek selected the specimen and had verified the composition, manufacturing techniques and quality assurance procedures. All values quoted below are nominal, unless tolerances are given.

Description of Test Specimen A for reliability and response time tests	
Type	Active smoke barrier (ASB1 and ASB3) – flexible material
Overall Size	6080 mm (wide) x 5050 mm (high)
Curtain	Overall size: 6000 mm (wide) x 5000 mm (high) x 0.5 mm thick; Area density: 1.02 kg/m^2; Component: 0.5 mm thick glass-fiber cloth reinforced with steel wire inside. Fabrication: The curtain has five vertical seams with a space of 1150 mm, 1150 mm, 1150 mm, 200 mm, 1150 mm and 1150 mm. The adjacent curtain is sewed together by four seams (stainless steel wires) spaced about 5 mm, 8 mm, 24 mm, 8 mm and 5 mm along the 50 mm wide overlap. The two vertical edges of the curtain with side hems have the same fabrication method. Fixed method: On Bottom: The curtain is sandwiched between two interlocked bottom bars approximate 40 mm depth and secured by thirty-two M4x12 Cross recessed pan head screws spaced approximate 200 mm o.c. and a Φ4x12 mm rivet approximate 15 mm offset from each end. On Top: The curtain is secured to OD Φ86 mm galvanized tube by a strip clamping plate and thirty-one ST4.2x14 self-tapping screws, spaced approximate 200 mm o.c. and 60 mm from each end.
Drive System	Overall Size: Φ82x520 mm long; Component: motor, reduction gear, drive retainer, brake device, plated circuits without aluminum cooling plate and stop collar. The parameter of motor is listed as below: Power: 192 W; Voltage: DC 21V; Torque: 30 N.M; Number of revolutions: 18 r/min; Fixed method: The drive system is inserted into one end of the galvanized tube and secured by one M5x12 Cross slotted head screw on the drive retainer location with a distance of 485 mm from the tube end.

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Power Control System	Component: General Controller, Manual Controller and Sub-controller. The battery is installed in general controller. **General controller:** Input Voltage: AC220V±10%; Output Power: 1.5 KW; Battery Output Voltage: DC24/10A; **Sub-controller:** Input Voltage: DC21V/10A; **Manual controller:** Universal Voltage: DC12V/10mA
Bottom Bar	Nominal size: 35 mm (wide) x 54 mm (high) x 6000 mm long; Material: 1.5 mm thick steel Q195 coated with white paint; Fabrication: Two bottom bar members are interlocked and secured by twelve Φ5x10 Self-plugging rivets on bottom spaced approximate 550 mm o.c. and approximate 20 mm offset from each end with total weight 15 kg including 5 kg steel rod.
Fixed Plate Assembly	Component: bracket, cylindrical pin and B-pin; Bracket Material: Galvanized steel Q235; Overall size of the bracket: 100x105x3 mm thick; Fixed method: The bracket is installed to support frame on each vertical side by six M8x100 expansion bolts, and then the idler and drive system are placed on the groove of bracket and secured by cylindrical pin and B-pin.
Idler	Overall size: Φ82x110mm long; Component: bearing, shaft, made of Galvanized steel Q235; Fixed method: The idler is inserted into one end of the galvanized tube and secured by three M5x12 Cross slotted head screws evenly around this tube.
Tube	Nominal dimension: OD Φ86x6000 mm long; Material: 1.5 mm thick Galvanized steel Q195
Clamping Plate	Nominal size: 40 mm (wide) x 7.3 mm (thick) x 6000 mm long; Material: Extrusion type, made of Aluminum alloy 6063-T5
Description of Test Specimen B for permeability to smoke test	
A piece glass-fiber cloth includes typical seams and vertical joints cut from Test Specimen A. Nominal size: 1000 mm x 1000 mm	
Description of Test Specimen C for temperature/time resistance test	
The size of the Automatic smoke curtain was greater than 3 m x 3 m, so a specimen C with a nominal size of 3 m x 3 m was tested. To represent the 5050 mm deep barrier of the product, an additional load of 6 kg was applied evenly across the bottom of Test Specimen C, equivalent to the additional mass per tested width of Test Specimen A.	

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The specimen ID number assigned by the test lab is S210525001SHF.001~003.

The drawings of the Test Specimen A~C can be found in in Section 5. The installation manual can be found in Section 6 of this report.

A comprehensive drawing and Installation Instruction of the Automatic smoke curtain are maintained on Intertek file.

According to EN 12101-1 Clause 6.2.1, all characteristics given in clause 4 and 5 of EN 12101-1 shall be subject to initial type testing, except as described in 6.2.3. Tests shall be carried out in accordance with Annexes A, B, C and D of EN 12101-1. The following performance requirement tests shall be performed for three specimens in the following sequence: Reliability and durability, Default operation to fire operation position, Response time, Permeability to smoke, Temperature/time (Classification: D 120).

Test Specimen A was to be tested in the reliability and response time tests with its intended control system used to govern speed of operation. This specimen was assembled, installed and adapted in accordance with the sponsor's installation instruction. 1000 complete cycles using the primary energy were operated and followed 50 complete cycles using the auxiliary power source (Battery) to its fire operational position. No maintenance or repair was performed during the test period. The cycle time and the time taken for test specimen to reach the fire position at the beginning and end of the test period were measured and recorded. The operating speed in both directions of operation were measured and recorded. At the end of the test, the finished specimen in its fire position was examined and recorded then verified against the test criteria. The condition of the specimen was inspected, the integrity of the materials was verified according to EN 1363-1. Any actions and observations taken were recorded during the test.

Test Specimen B was to be tested for the permeability to smoke test. This specimen was attached in steel stud gypsum board wall with edges tightly sealed. The air flow was to be adjusted in the test chamber to provide a positive test pressure differential of 25 Pa at ambient temperature of the exposed face of test specimen B. After the pressure difference was maintained for 2 min, the total leakage rate and the leakage rate through the test chamber and supporting construction were measured and recorded. Any actions and observations taken were recorded during the test.

Test Specimen C was to be tested for the temperature/time resistance test. This specimen excluding drive system and power control system was assembled, installed and adapted in accordance with the sponsor's installation instruction. This specimen was installed in a steel restraint frame and built into a concrete masonry unit partition, with fully mortared joints. Side covers/baffles installed into the support frame that overlap the test specimen unrestrained edge by 200 mm. After positioning the assembly frame over the furnace opening, the burners were ignited and the timer was started. Temperatures within the furnace were monitored using

thermocouples and the data was recorded. The burners were controlled to keep the furnace temperatures following the standard heating curve defined in EN 1363-1. Once the average temperature furnace had reached 620 °C, the average temperature was maintained at 620°C until the test was finished. After 5 minutes, the furnace pressure was adjusted so that the neutral plane was established approximately 500 mm above notional floor level. Periodic observations were made of the surface of the Test Specimen C during the fire test.

A full set of test data is included in Section 7, and photographs have been presented in Section 8.

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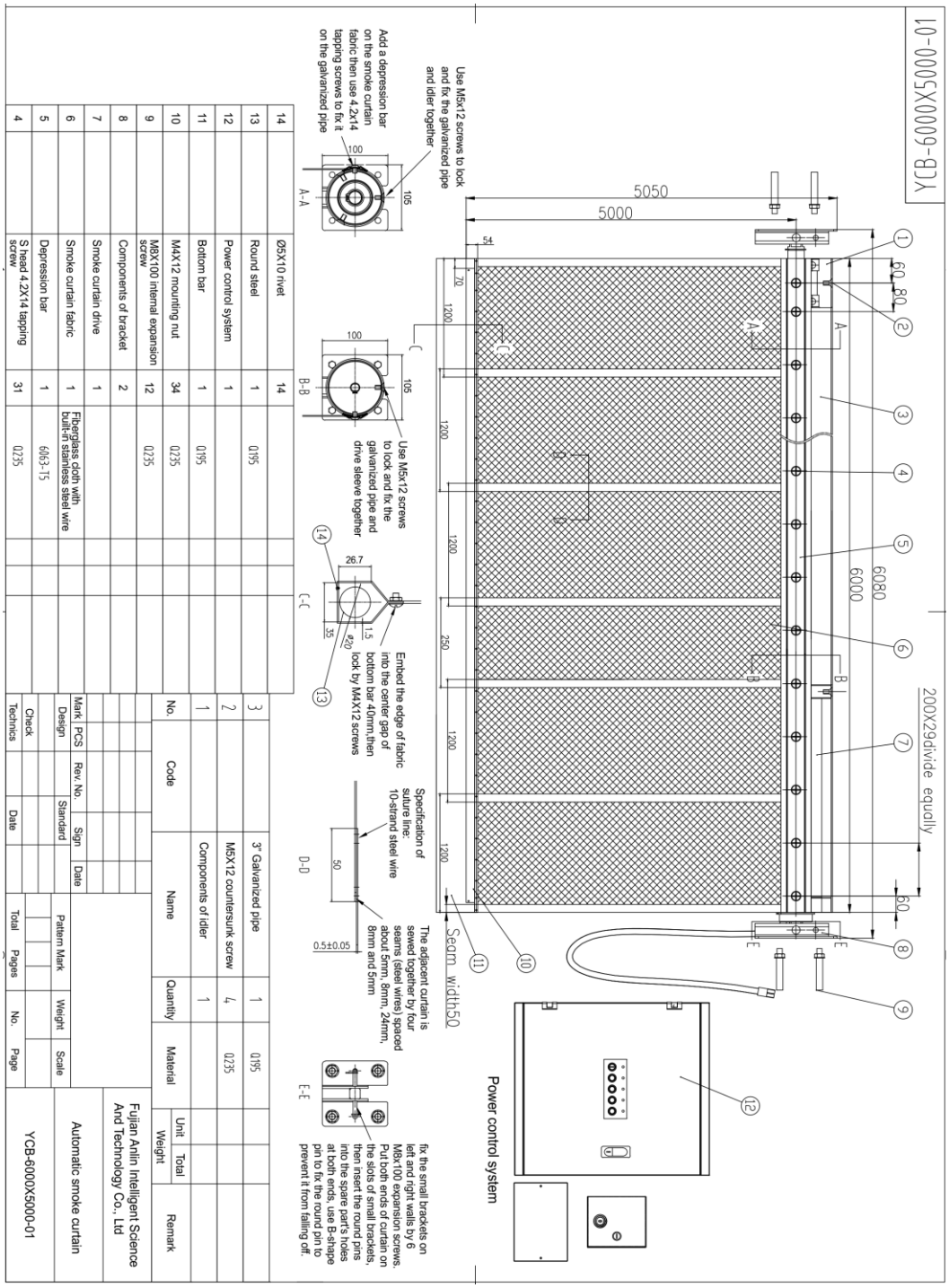
SECTION 5

DRAWING OF AUTOMATIC SMOKE CURTAIN



No.	Code	Name	Quantity	Material	Unit Weight	Total Weight	Remark
14							
13		Round steel	1	Q195			
12		Power control system	1				
11		Bottom bar	1	Q195			
10		M4X12 mounting nut	34	Q235			
9		M8X100 internal expansion screw	12	Q235			
8		Components of bracket	2				
7		Smoke curtain drive	1				
6		Smoke curtain fabric	1	Fiberglass cloth with built-in stainless steel wire			
5		Depression bar	1	6063-T5			
4		S head 4.2X14 tapping screw	31	Q235			
3		3" Galvanized pipe	1	Q195			
2		M5X12 countersunk screw	4	Q235			
1		Components of idler	1				

Mark PCS Rev No. Sign Date
Design Standard
Check Technics
Date
Total Pages Pattern Mark Weight Scale
No. Page

Fujian Anlin Intelligent Science And Technology Co., Ltd

Automatic smoke curtain

YCB-6000X5000-01

Assembly Drawing of Automatic smoke curtain (Test Specimen A)

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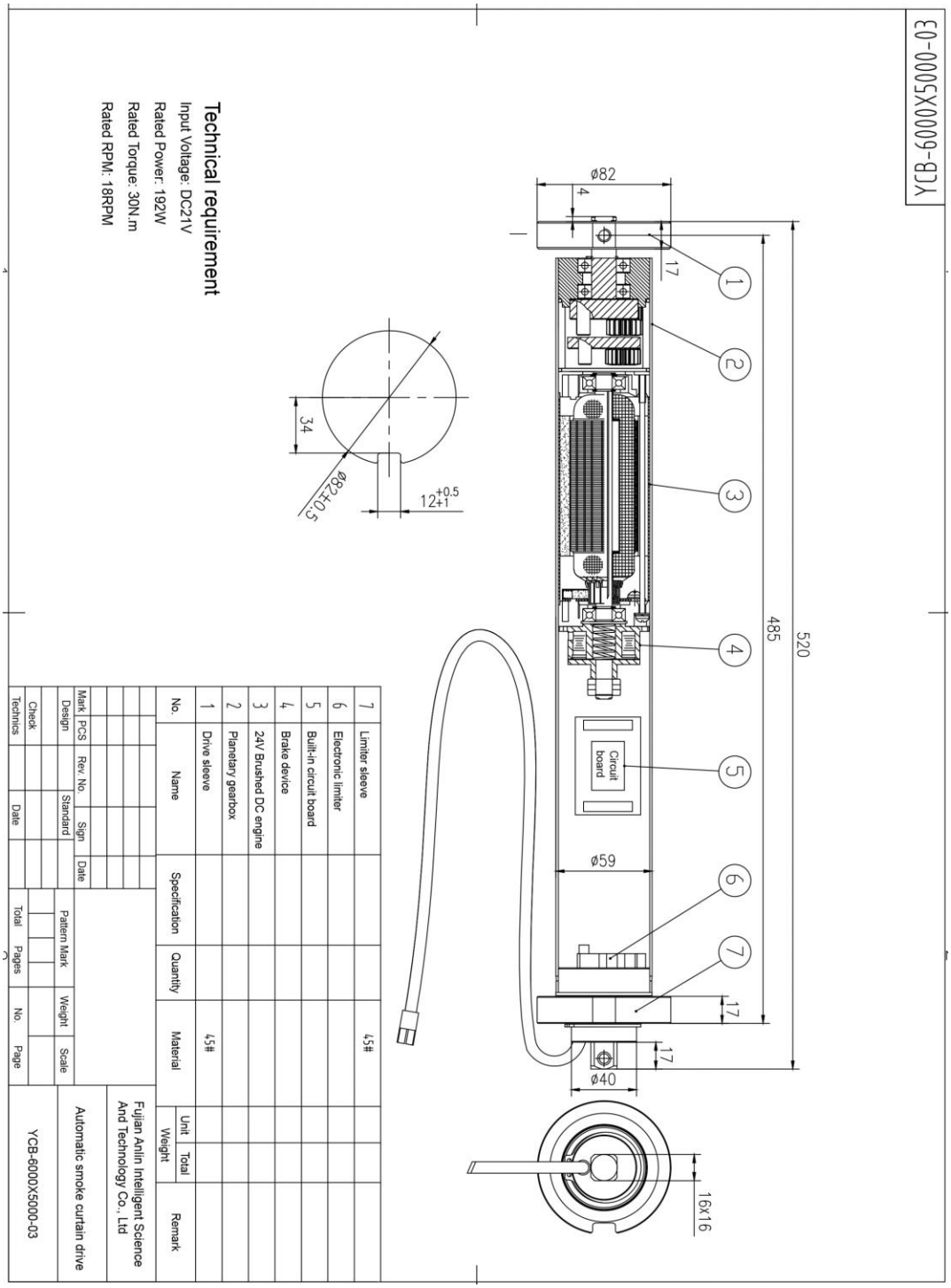

Drawing of Drive System without aluminum cooling plate on plated circuits (Test Specimen A)

Intertek Testing Services Shenzhen Ltd. Shanghai Fengxian Branch
Plant 5, No. 6958 Daye Road, Fengxian District,
Shanghai, China
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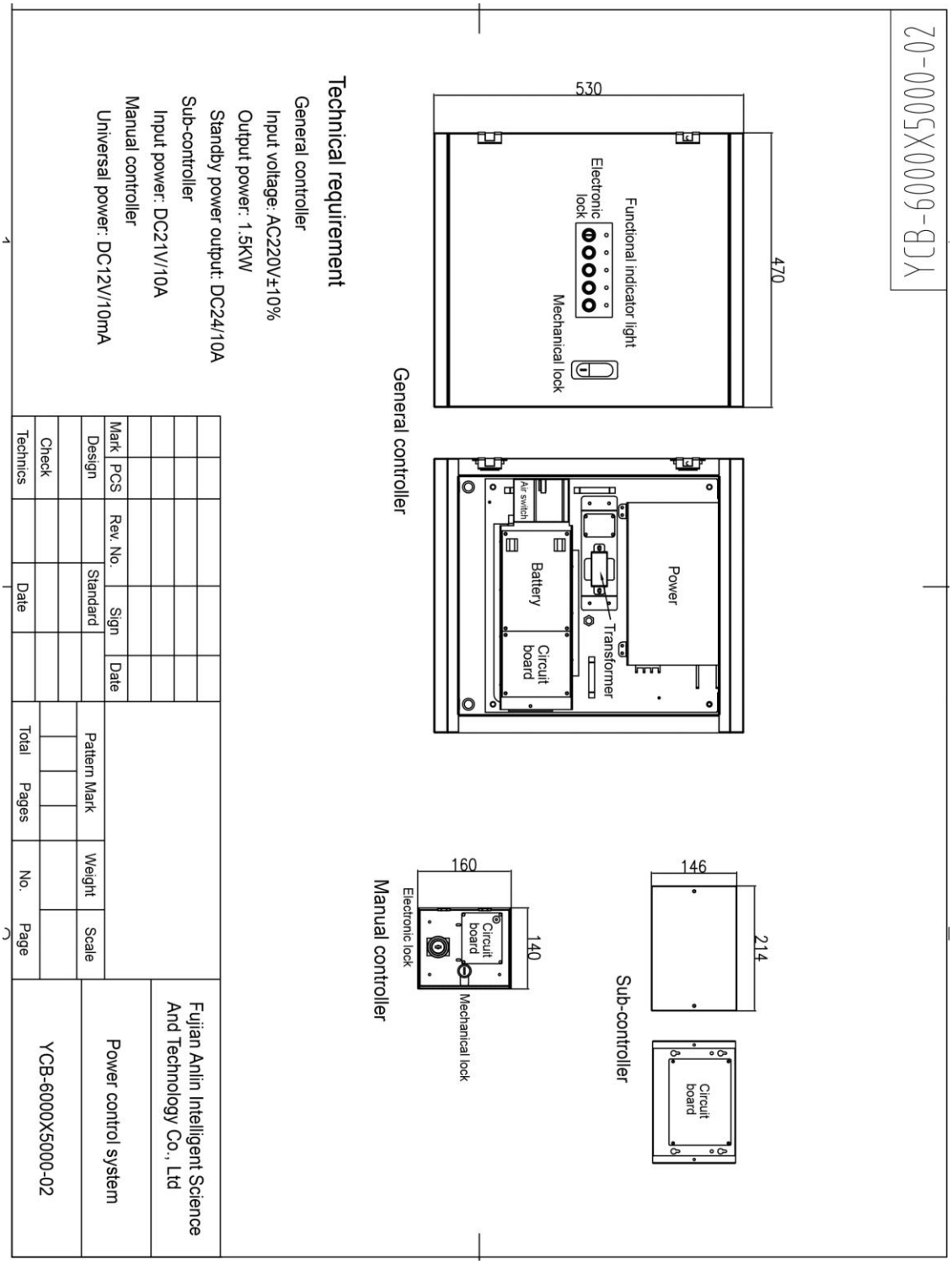

Drawing of Power Control System (Test Specimen A)

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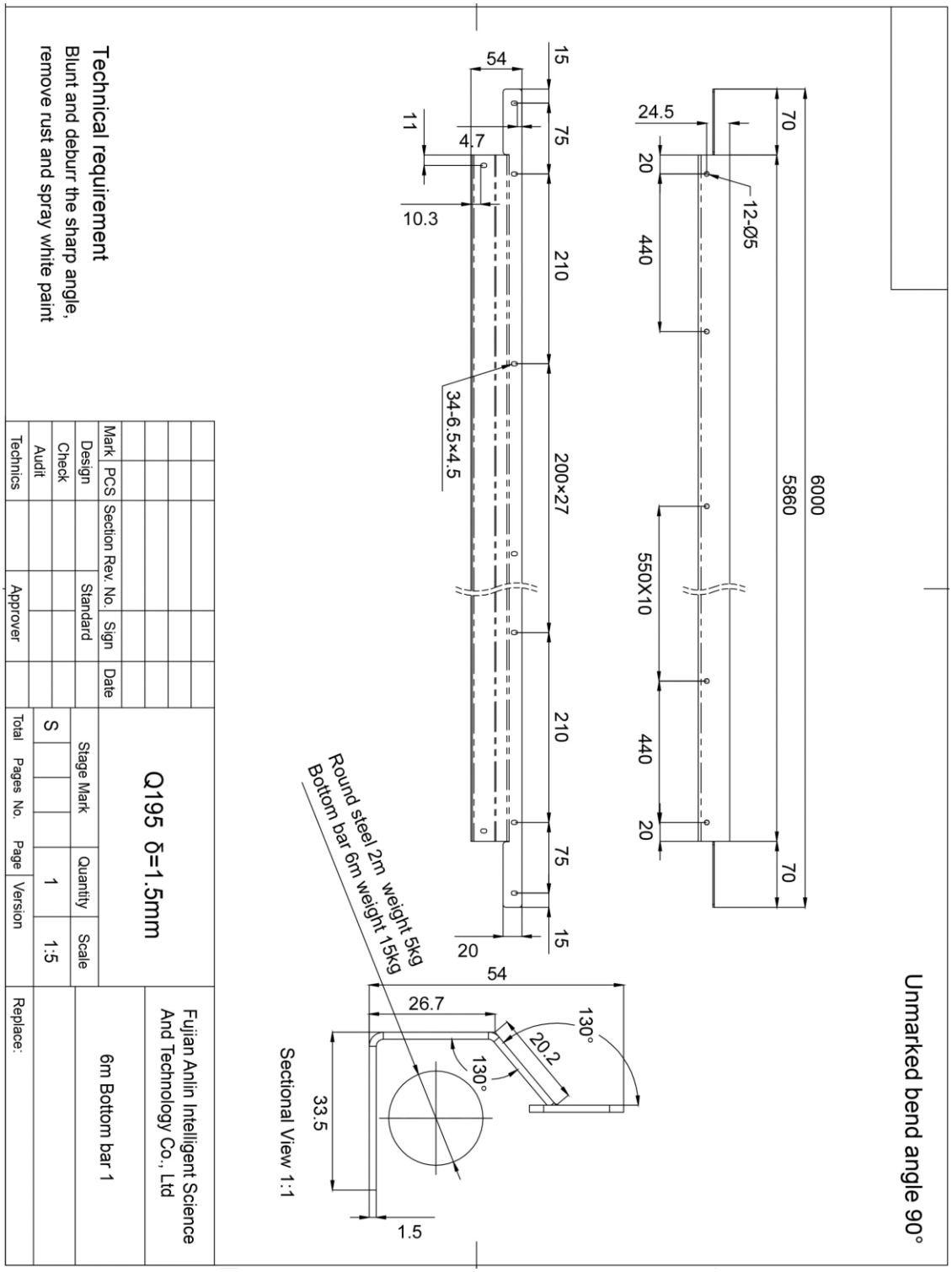

Drawing of Bottom Bar (Test Specimen A)

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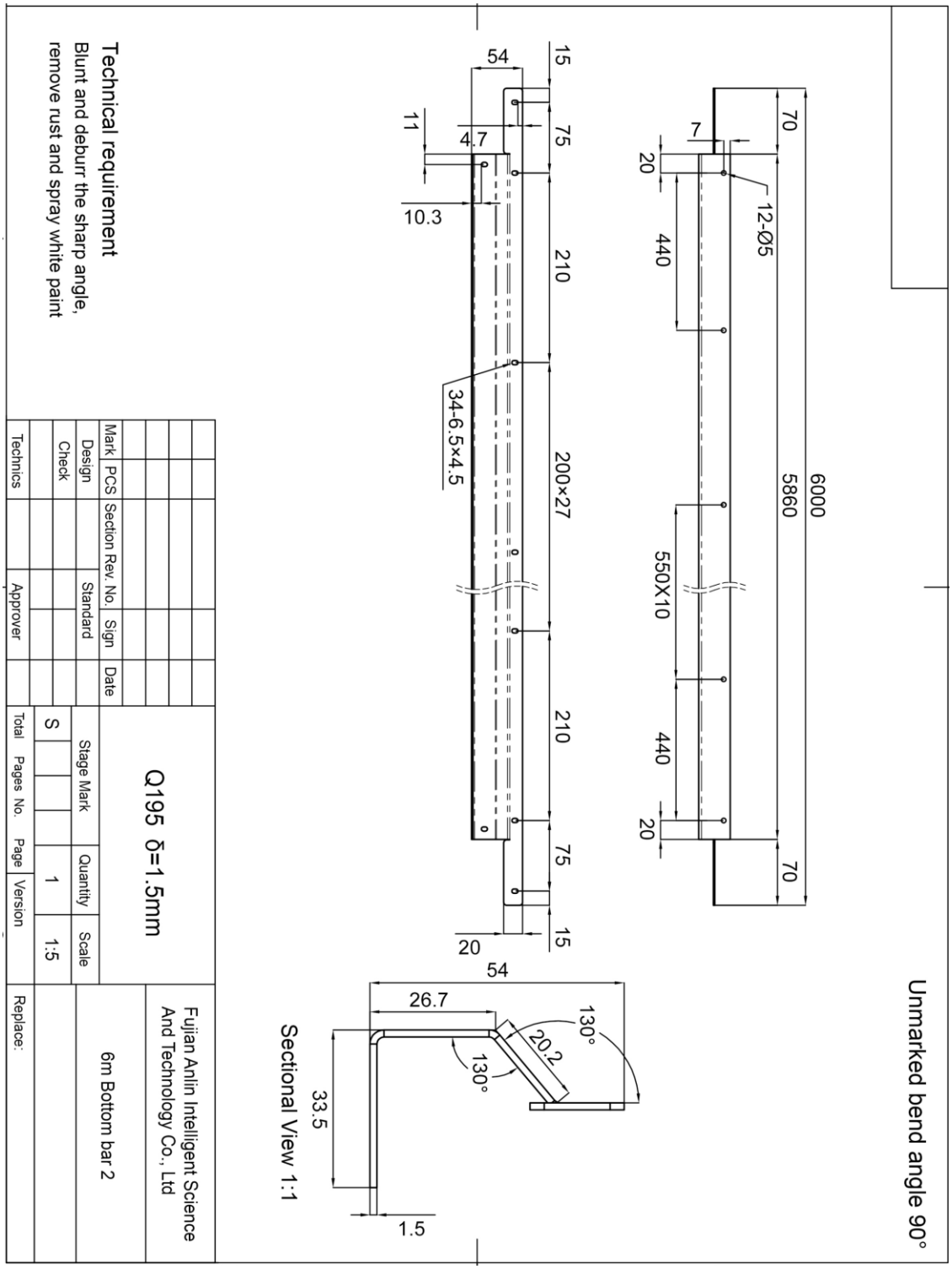

Drawing of Bottom Bar (Test Specimen A)

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Shanghai, China
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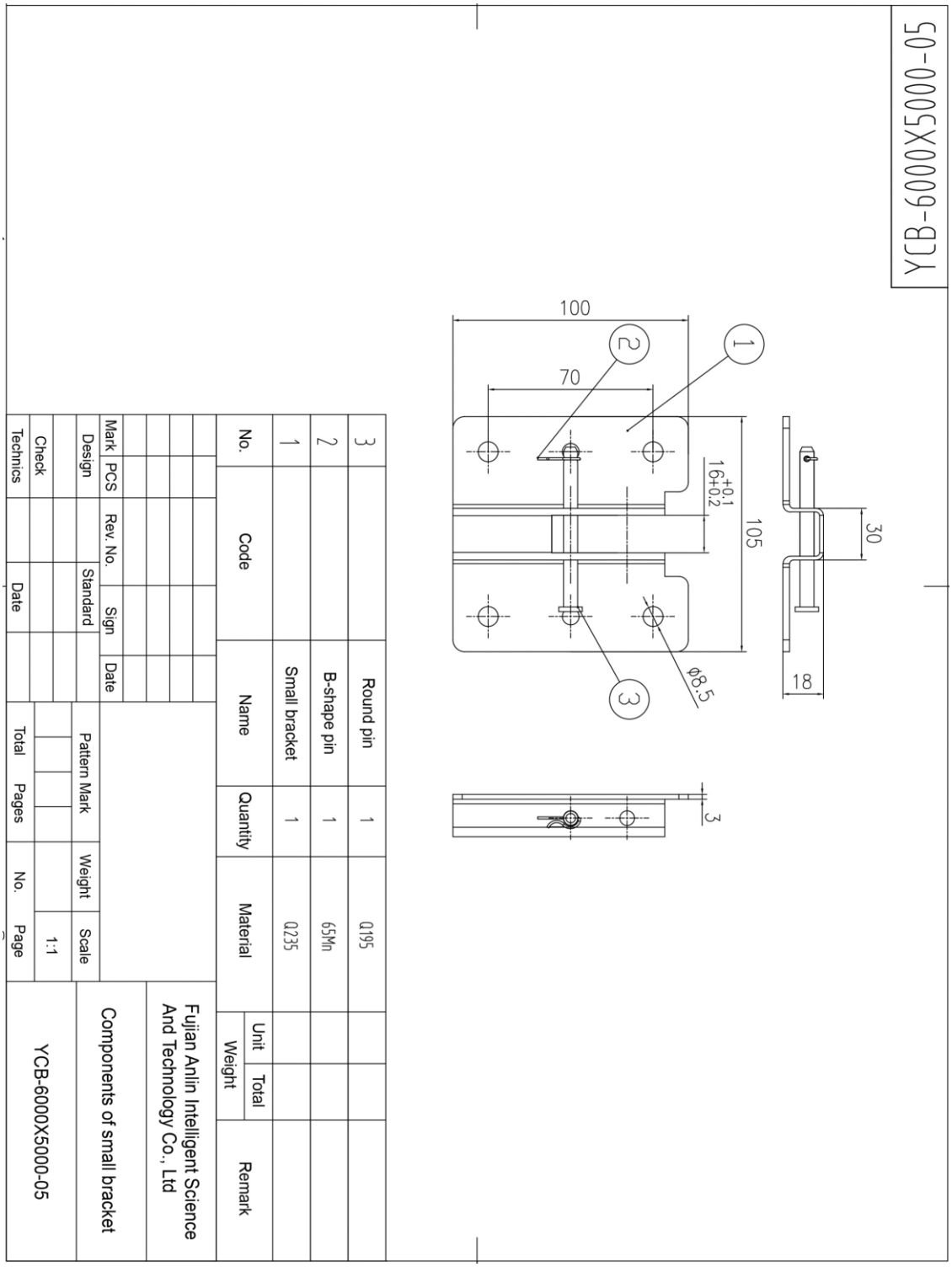

Drawing of Fixed Plate Assembly (Test Specimen A)

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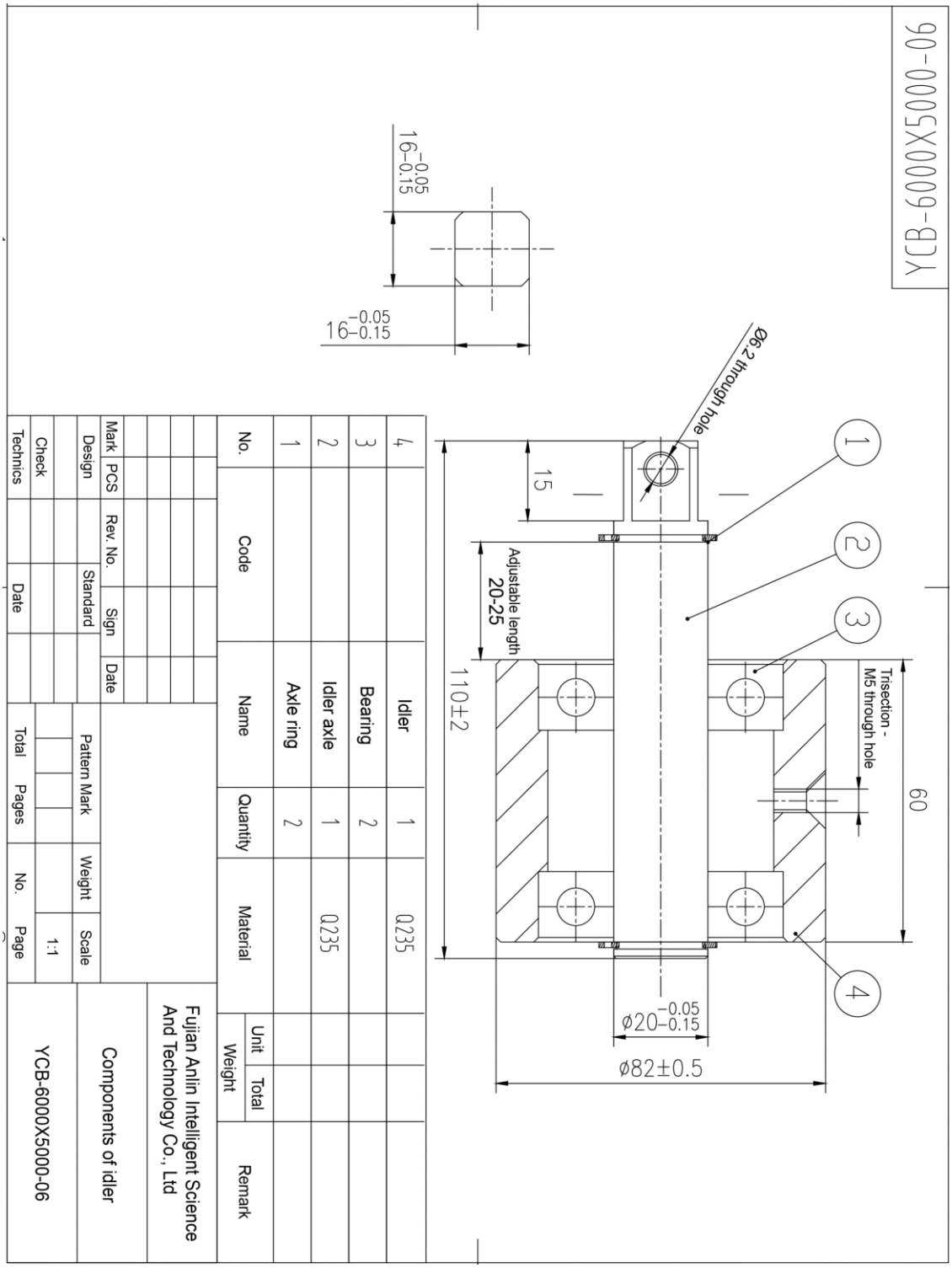

Drawing of Idler (Test Specimen A)

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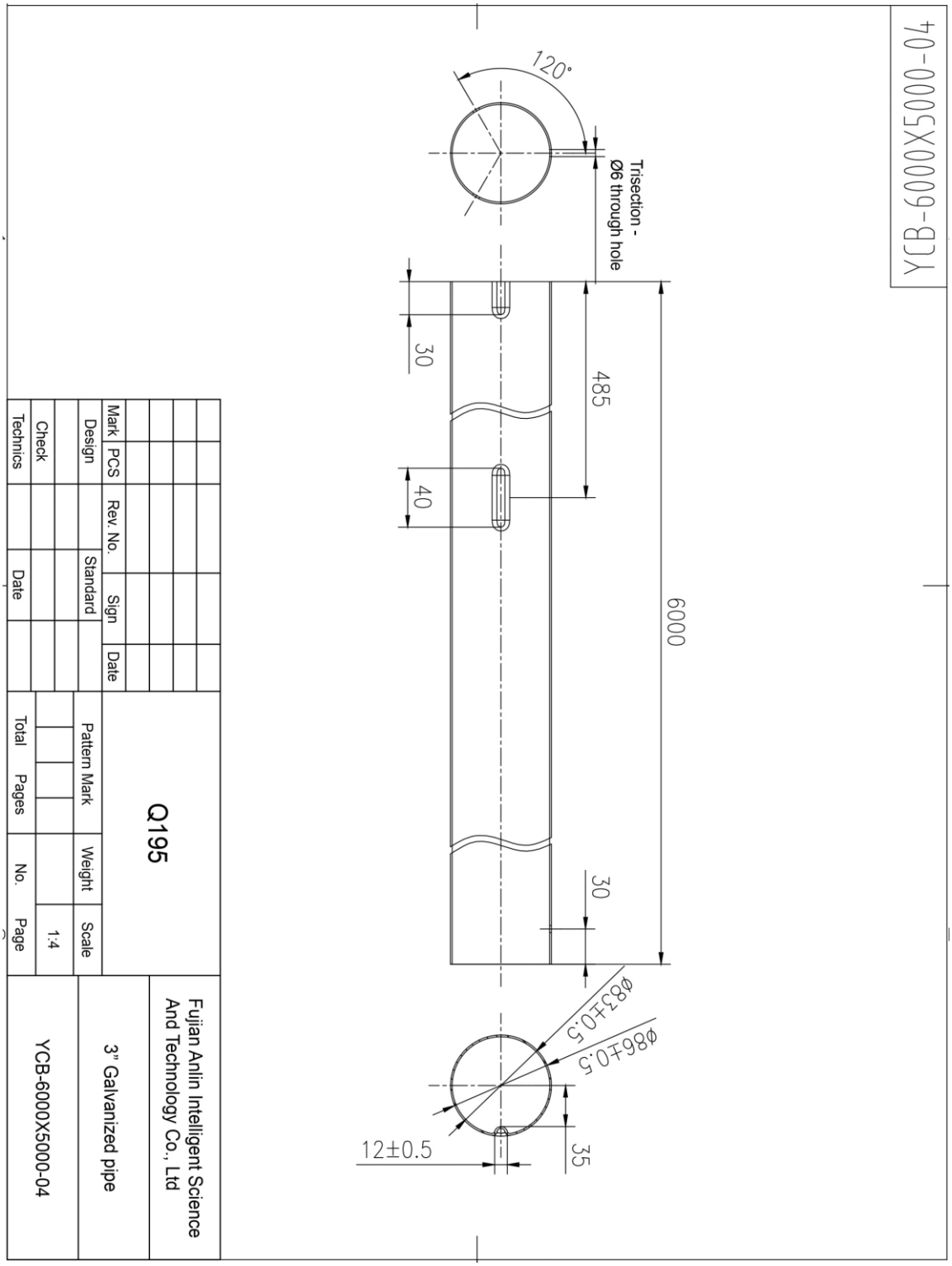

Drawing of Tube (Test Specimen A)

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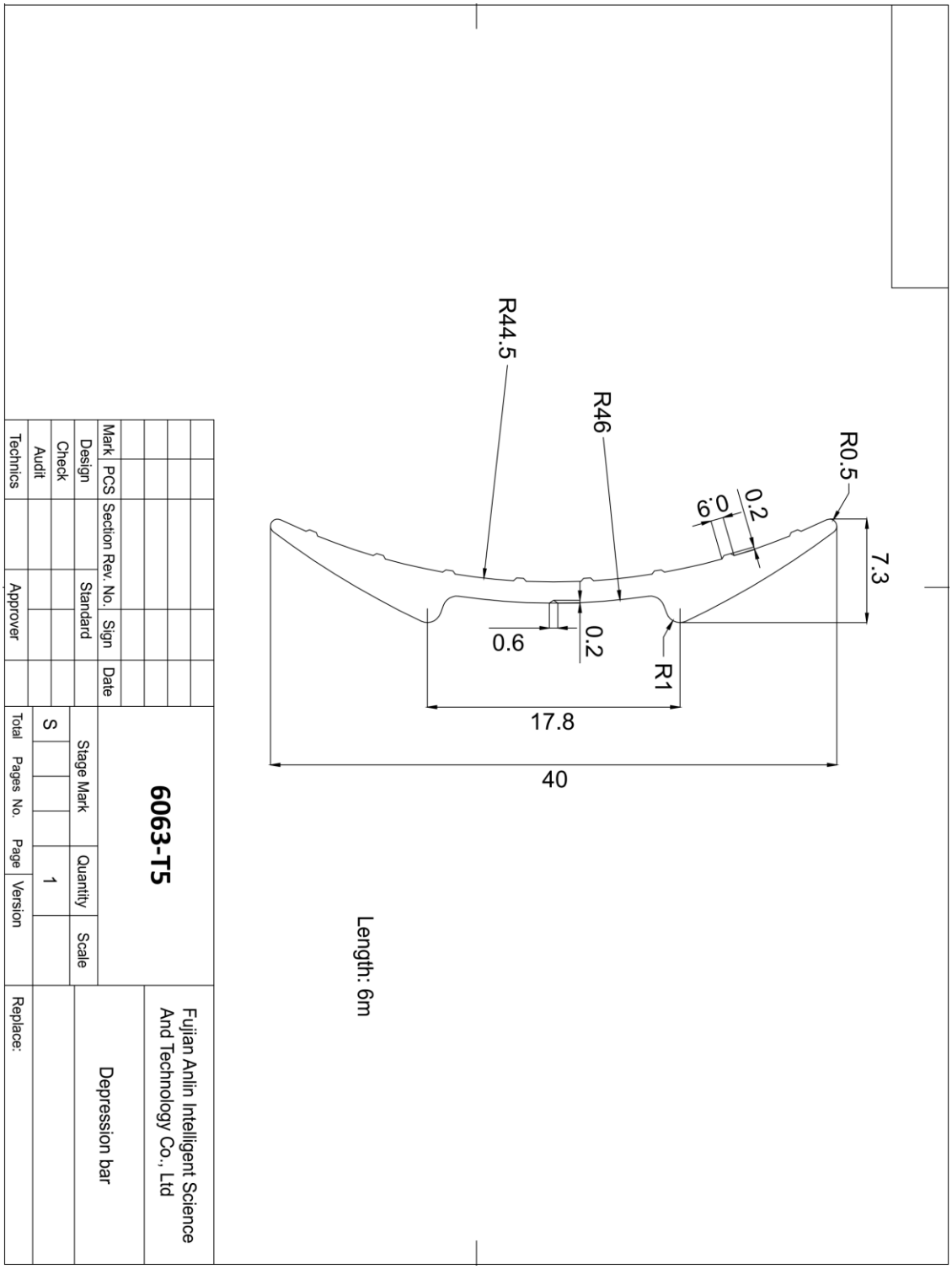

Drawing of Clamping Plate (Test Specimen A)

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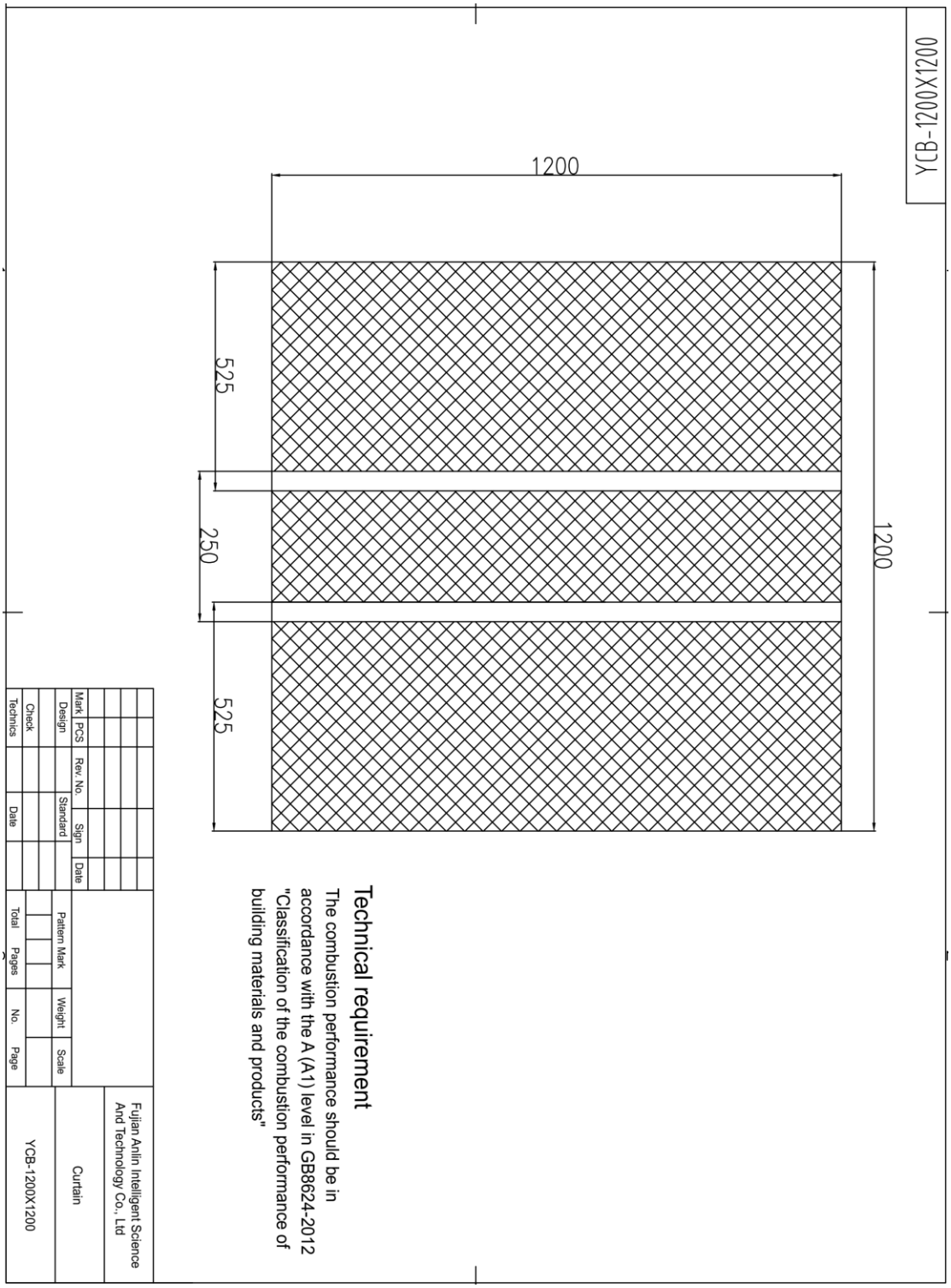

Drawing of the curtain material (Test Specimen B)

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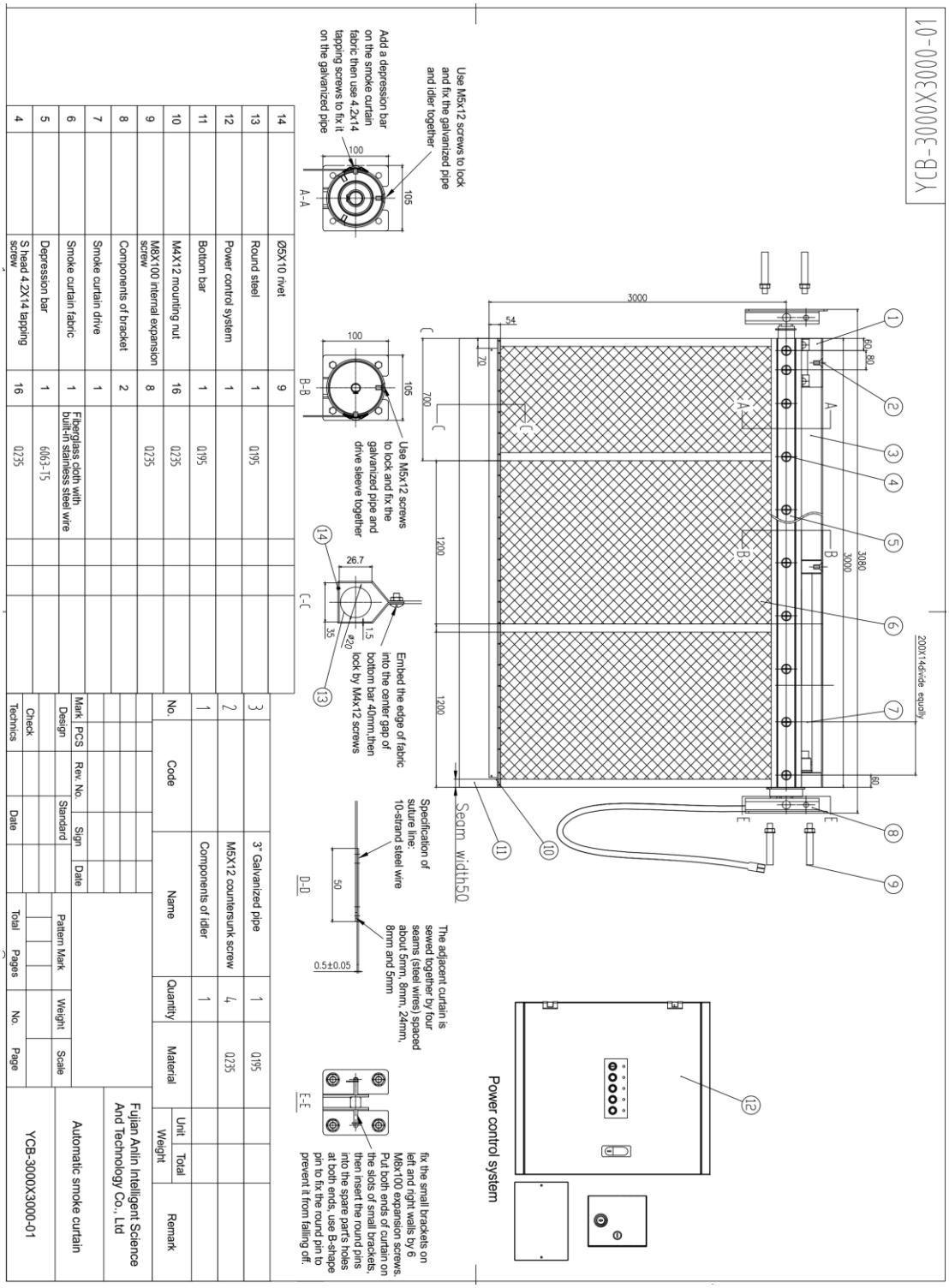

No.	Code	Name	Quantity	Material	Unit Weight	Total Weight	Remark
14		Ø5X10 rivet	9				
13		Round steel	1	Q195			
12		Power control system	1				
11		Bottom bar	1	Q195			
10		M4X12 mounting nut	16	Q235			
9		M8X100 internal expansion screw	8	Q235			
8		Components of bracket	2				
7		Smoke curtain drive	1				
6		Smoke curtain fabric	1	Fiberglass cloth with built-in stainless steel wire			
5		Depression bar	1	6063-T5			
4		S.head 4.2X14 tapping screw	16	Q235			
3		3" Galvanized pipe	1	Q195			
2		M5X12 countersunk screw	4	Q235			
1		Components of idler	1				

Mark	PCS	Rev. No.	Sign	Date	Pattern Mark	Weight	Scale	Fujian Anlin Intelligent Science And Technology Co., Ltd
Design		Standard						
Check					Total Pages	No.	Page	Automatic smoke curtain
Technics								YCB-3000X3000-01
		Date						

Assembly Drawing of Automatic smoke curtain (Test Specimen C)

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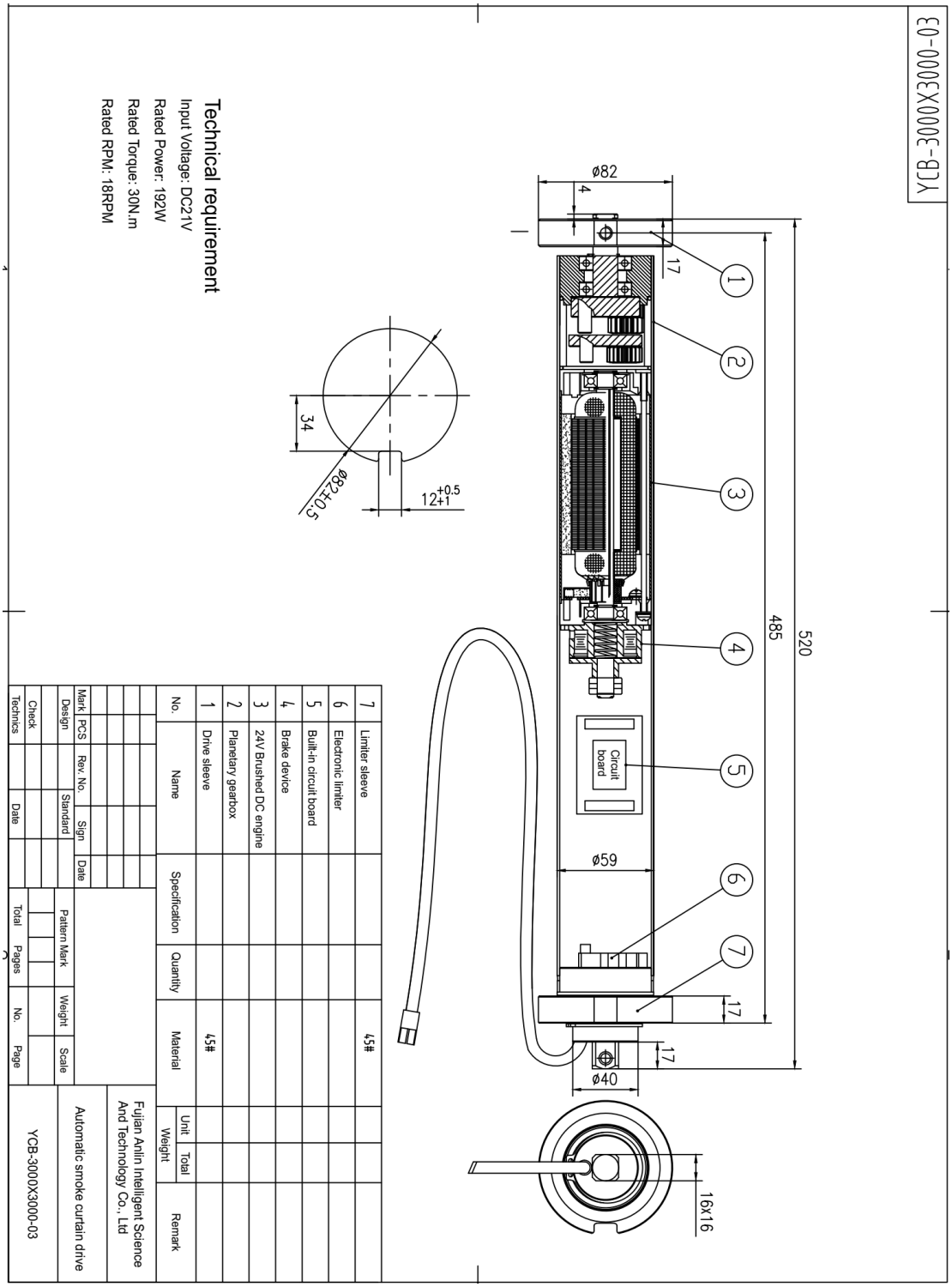

Drawing of Drive System without aluminum cooling plate on plated circuits (Test Specimen C)

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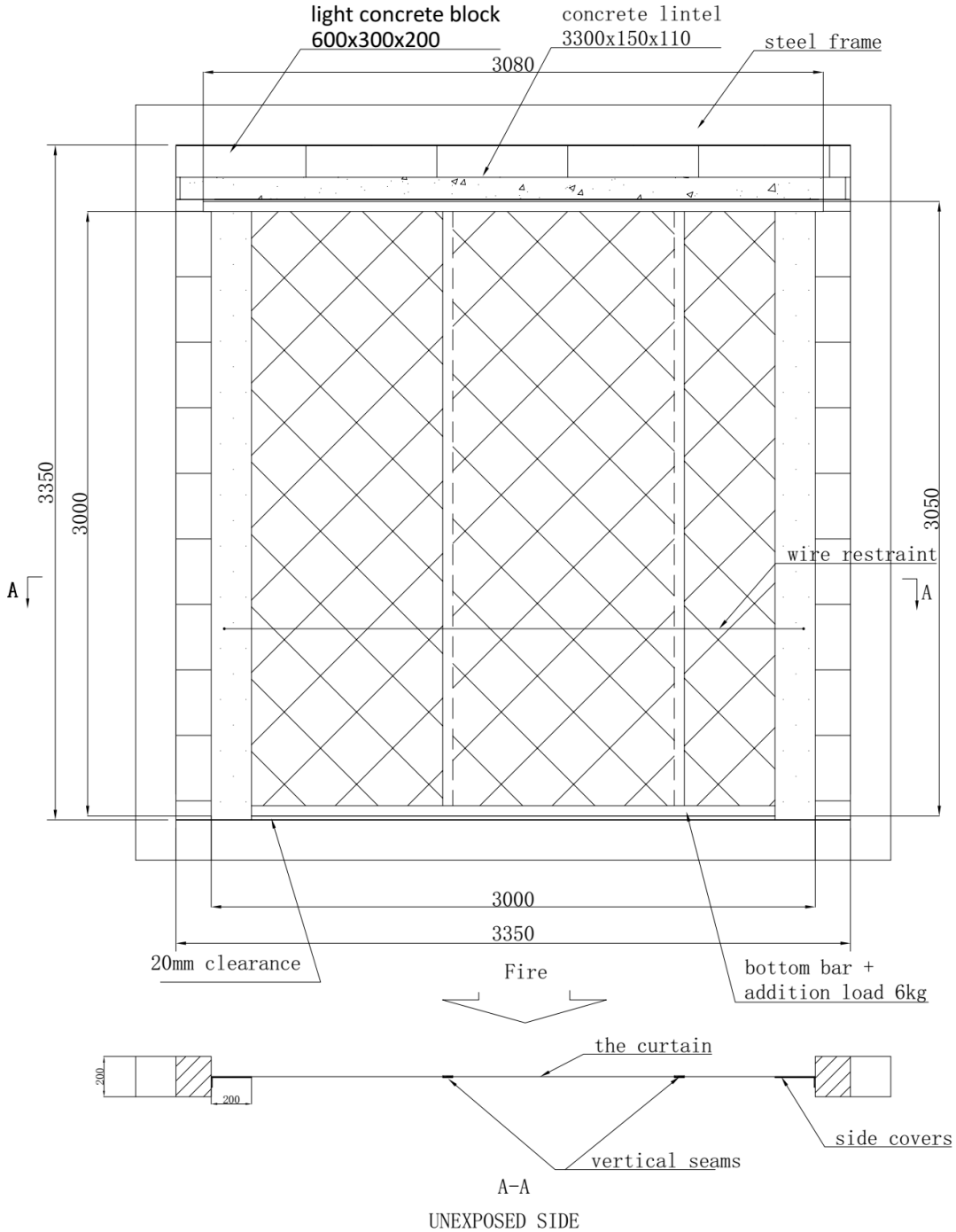
SECTION 6

INSTALLATION MANUAL OF AUTOMATIC SMOKE CURTAIN



Test Specimen C installed into the support frame for Temperature/time Test

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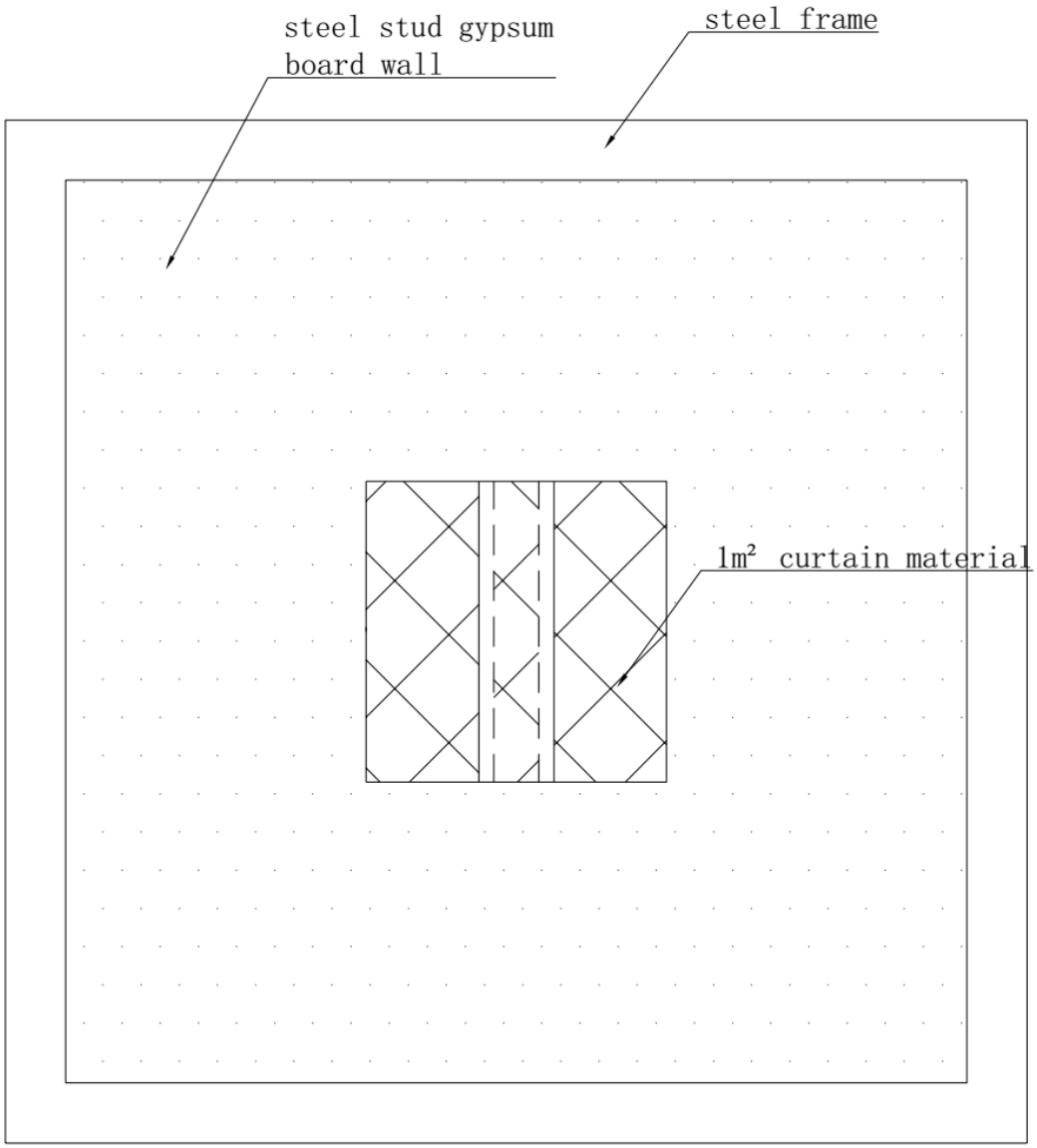

Test Specimen B installed into the support frame for Permeability to Smoke Test

Intertek Testing Services Shenzhen Ltd. Shanghai Fengxian Branch
Plant 5, No. 6958 Daye Road, Fengxian District,
Shanghai, China
Tel: +86 21-61136116 Fax: 021-61189921
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SECTION 7
TEST DATA

Standards: EN 12101-1:2005+A1:2006, Smoke and heat control systems – Part 1: Specification for smoke barriers

Procedure: According to EN 12101-1:2005+A1:2006, Annex A~D

ITEM	ID
Vertical furnace	SH1097
Furnace pressure gauge	SH1097-15-1~2
Test Clock	SH1042
Furnace thermocouple	SH1097-4
Ambient temperature gauge	SH1097-11
Test chamber	SH1346
Press gauge	SH1175
Air flow gauge	
Hygrothermograph	SH1062
Steel tape	SH1032

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Test Results for Reliability and Response Time Tests:

Specimen Size: 6.08 m (wide) x 5.05 m (high);
Maximum Movement: 4.942 m;
Barrier Type: ASB1 and ASB3

Parameter	Test Item	Test observations/results
Response time	Cycle period, s	600
	The time to reach the fire position at the beginning of test period (1000 cycles), s	62
	The time to reach the fire position at the end of test period (1000 cycles), s	113
	Response delay, s	113
	Operating speed from the fully retracted position to the fire position (1000 cycles), m/s	0.08 m/s at the beginning of test period; 0.04 m/s at the end of test period.
	Operating speed from the fire position to the fully retracted position (1000 cycles), m/s	0.14 m/s at the beginning of test period; 0.13 m/s at the end of test period.
Default operation	Default operation to fire operation position	Smoke barrier moved to fire operational position in the event of power source removed.
Reliability and durability, and Default operation to fire operation position	Operate 1000 complete cycles using the primary energy and move to its fire operational position.	The curtain could move to its fire operation position during 1000 complete cycles.
	Operate 50 complete cycles using the auxiliary power source.	The operation of 50 complete cycles were discontinued due to the failure of operation speed.
	At the end of the test period, where does the specimen located in?	The curtain located at fully retracted position.
	At the end of the test period, are there perforations, tears or cracks in the curtain? And whether a 6mm diameter ball or a 15mm x 2mm strip will pass easily through either?	Neither perforation, tears nor cracks was found in the curtain at the end of the test period.
Conditions of Acceptance	The specimen shall be operated 1000 complete cycles using the primary energy and then shall be followed 50 complete cycles using the auxiliary power source (Battery) to move the specimen to its fire operational position at a velocity range of between 0.06 m/s and 0.15 m/s; At the end of the test, perforations, tears or cracks shall not be evident in the curtain, nor a 6 mm diameter ball or a 15 mmx2 mm strip pass easily through.	

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Conclusion	The operating speed was out of range of 0.06 m/s~0.15 m/s from the fully retracted position to fire position at the end of test period. Failure was deemed to occur.

Test Results for Permeability of Materials to Smoke Test:

Exposed Area of Specimen: 1 m^2;

Temperature	Total leakage rate, m^3/h at 25 Pa	Apparatus + supporting/associated construction leakage rate, m^3/h at 25 Pa	Test specimen leakage rate, $m^3/h/m^2$ at 25 Pa
Ambient (14°C)	3.97	3.77	0.20
Conditions of Acceptance	The passage of smoke through materials shall not exceed a leakage rate of 25 m^3/h per m^2 at 25 Pa at ambient temperature.		
Conclusion	Pass		

Test Results for Temperature/Time Resistance Test:

Specimen Size: 3.08 m (wide) x 3.05 m (high);
Additional load: 6 kg;
Side baffle width: 200 mm;
Targeted Classification: D 120

Time (Min: Sec)	Observation (All observations are from the unexposed face unless noted otherwise)
00:00	Fire test started.
00:25	The deflection of the curtain was evident and swelled outward from the furnace.
00:35	Smoke issued from the curtain of Automatic smoke curtain.
04:08	Heavy smoke issued from the curtain.
18:28	There was no smoke issued from the curtain.
24:56	No significant change.
35:40	No significant change.
42:42	Discoloration was evident at screw position of the bottom bar.
74:10	No significant change.
107:29	No significant change.
120:00	The evaluation of fire test was finished. Test specimen didn't release flaming droplets or particles within the first 600 s. Neither the developing gap, sustained flaming nor collapsing were evident during the fire test.
Conclusion	The product met the requirement of Classification D 120 of the temperature/time resistance test.

Intertek Testing Services Shenzhen Ltd. Shanghai Fengxian Branch
Plant 5, No. 6958 Daye Road, Fengxian District,
Shanghai, China
Tel: +86 21-61136116 Fax: 021-61189921
Website: www.intertek.com

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Temperature Data: (D Classification)
Mean furnace temperature together with temperature-time relationship specified in the standard

Time Mins	Specified Furnace Temperature/ °C	Furnace mean Temperature/ °C
0	20	13
1	349	166
2	544	318
3	502	439
4	544	520
5	576	570
6	603	587
6.7	620	590
7	620	591
10	620	618
15	620	630
20	620	621
25	620	623
30	620	622
35	620	623
40	620	619
45	620	623
50	620	618
55	620	616
60	620	622
65	620	621
70	620	624
75	620	619
80	620	623
85	620	625
90	620	626
95	620	621
100	620	622
105	620	623
110	620	624
115	620	624
120	620	625

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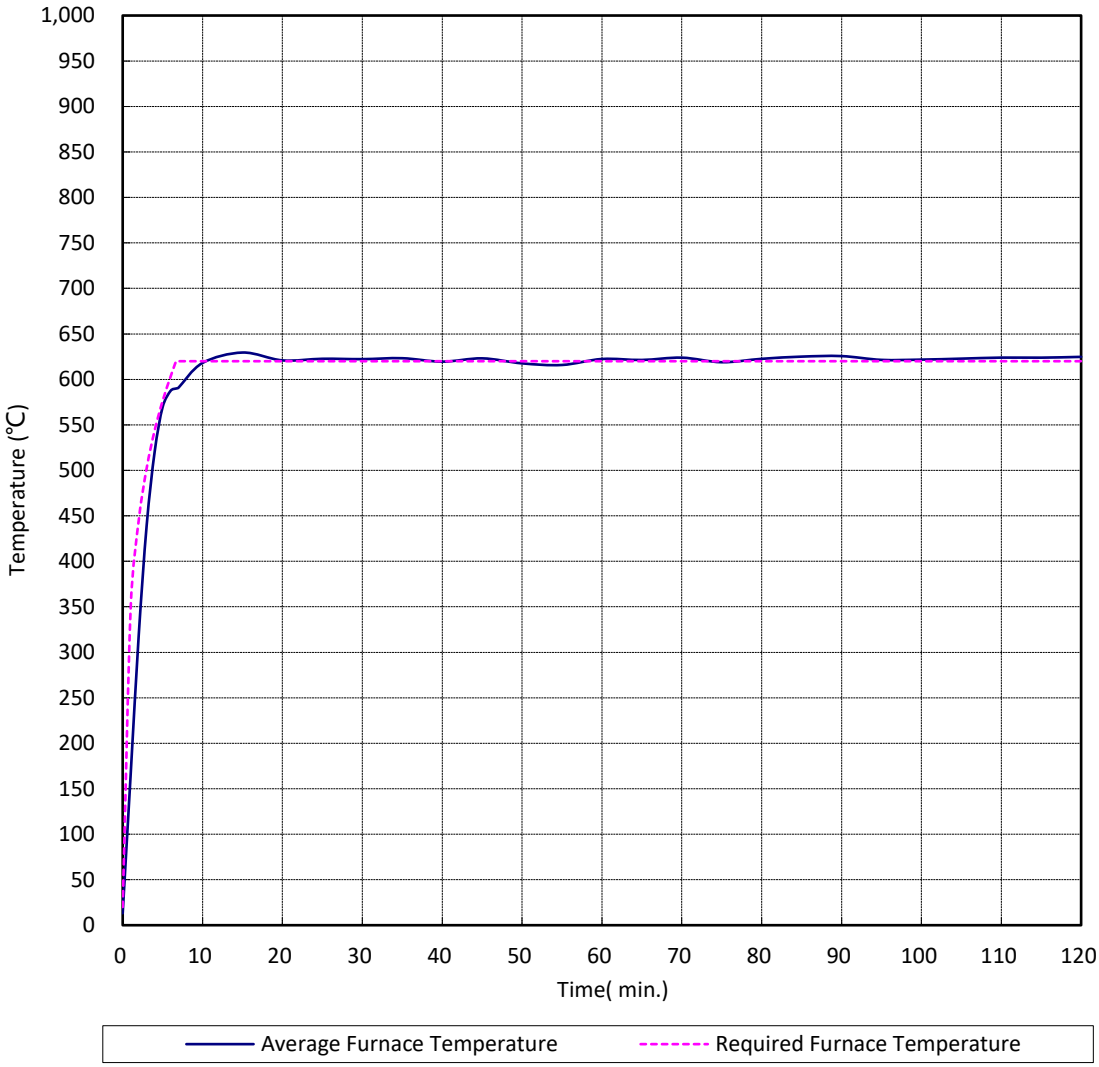
Graph for mean furnace temperature and temperature-time curve specified in the standard



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Tel: +86 21-61136116 Fax: 021-61189921
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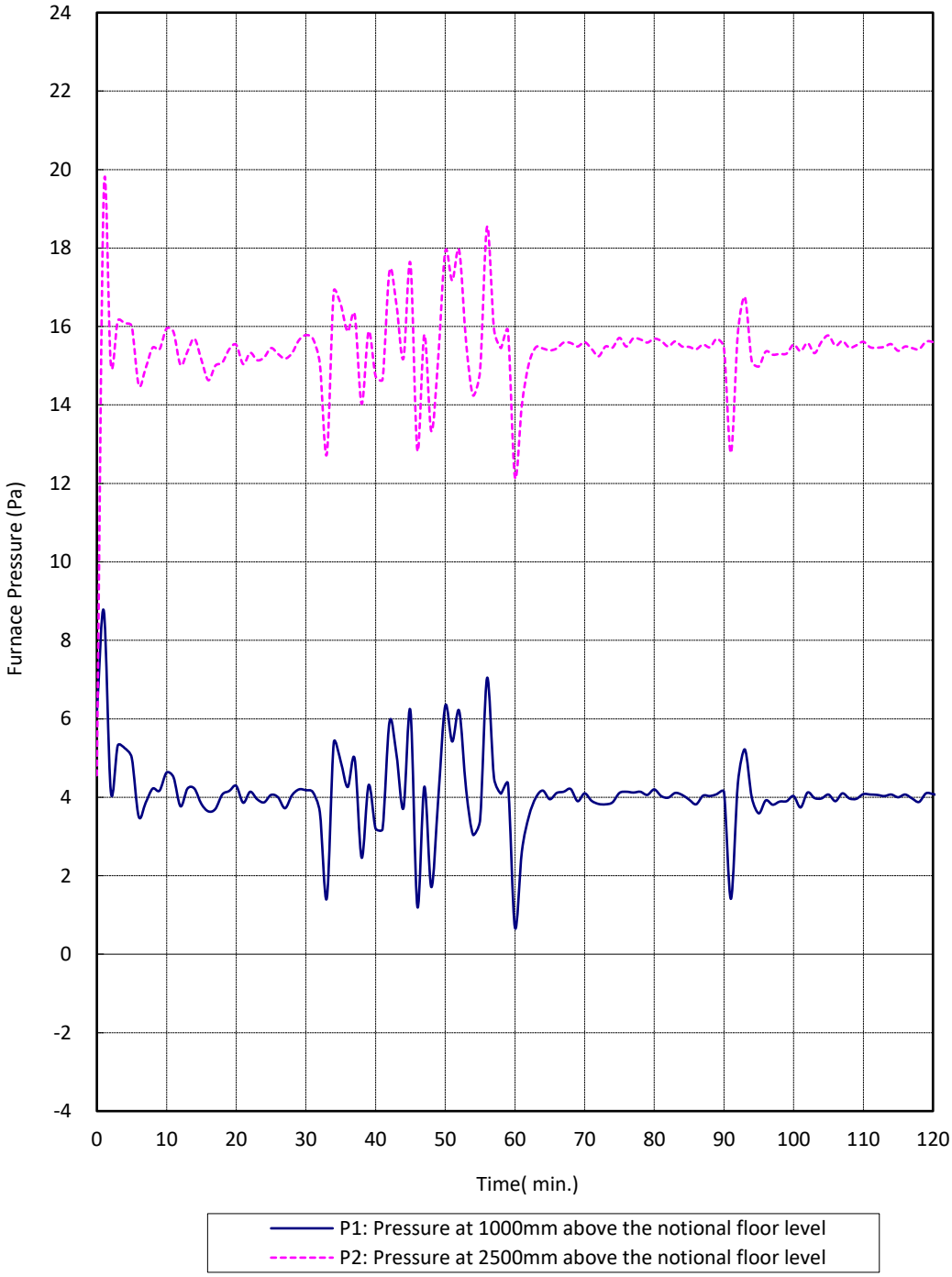
Graph for Furnace Pressure



SECTION 8
PHOTOGRAPHS

Fig. 1 Specimen during Reliability and Response Test

Fig. 2 The curtain material during Permeability to Smoke Test

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Fig. 3 Unexposed Side Prior to Temperature/Time Resistance Test

Fig. 4 Exposed Side Prior to Temperature/Time Resistance Test

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Fig. 5 Unexposed Side to Temperature/Time Resistance Test after 10 Minutes

Fig. 6 Unexposed Side to Temperature/Time Resistance Test after 60 Minutes

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Fig. 7 Unexposed Side to Temperature/Time Resistance Test after 90 Minutes

Fig. 8 Unexposed Side to Temperature/Time Resistance Test after 120 Minutes

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Fig. 9 Exposed Side after Temperature/Time Resistance Test

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SECTION 9
REVISION LOG

REVISION #	DATE	PAGES	REVISION
0	2022-05-09	N/A	Original Report Issue
1	2022-05-17	1, 2, 4	Corrected applicant name