Test report

Test Request By:	Bel Fuse Limited		
Tested Product Name:	0AKR Fuse	**Date of Received:**	2019/06/07
Type Designation:	0AKR 150A 0AKR 300A 0AKR 400A	**Serial No:**	Engineering Sample
Test Specification:	Qualification Test, refer to JSAE JASO D622		
Test Place:			
Test Result:	The tested sample mentioned above **Pass** the testing according to test specification		
Test By:		**Review By:** **:**	
Date:	2019/06/07	**Date:**	2019/06/29
Others: Qualification Test for 0AKR Series			

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TEST PLAN

No.	Group	Test item	Testing according to	Type name	Quantity	Test condition	Acceptable Value/Range
1	0	DCR	UL248-1	0AKR 150A 0AKR 300A 0AKR 400A	12pcs	Surrounding environment: 23+/ -5℃, measuring current <=10% rated current, test point: fuse cap	Test data
2	A	Temperature rise	I SO8820-8 JASO D622	Same as above	2pcs from Item 1	Surrounding environment: 23+/ -5℃, measuring current 0.5In	<50K
3	B	Temperature /humidity cycling	JASO D622 6.3.4.1	Same as above	2pcs from Item 1	10 temperature/humidity cycles per standard in a constant temperature and humidity chamber	No appearance damage，Rc < 10%
4	B	Hot / cold shock test	JASO D622 6.3.6	Same as above	2pcs from Item 1	48 cycles，-30˚C-100˚C；	No appearance damage，Rc < 10%
5	B	High temperature storage	Bel Spec.	Same as above	2pcs from Item 1	125℃ for 100 hours	No appearance damage，Rc < 10%
6	B	Mechanical shock	JASO D622 6.3.3	Same as above	2pcs from Item 1	Ambient temperature: 23+ -5℃, fixed fuse in vibration tester, 10-55hz, sinusoidal, peak value 1.5mm; One way 2 hours, three ways	No appearance damage，Rc < 10%
7	B	Impulse current cycle test	Refer to JASO D622 6.3.2	Same as above	2pcs from Item 1	Ambient temperature: 23+ -5 ℃ , impulse current 2In/0.25s and 0.5In/ 15s for one cycle, total 50,000 cycles.	No appearance damage，Rc < 10%
8	B	Wipe with Gasoline oil	Refer to GB/T31465.1-5.4	Same as above	All the above tested samples	Wipe the tubes with gasoline / lube for 30s each,	Marking will be indelible and easily legible
9	B	Terminal strength test	JASO D622 ISO8820-8	Same as above	All the above tested samples	Disassemble the fuse with 12+/-1Nm (M8)	Terminal remains physically intact after three times disassemble

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Content

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1. Purpose

Verify the electrical and reliability of the product.

2. Test equipment

Equipment	Type	Manufacturer
Multimeter	34401A	Agilent
Programmable DC Power supply	PST-3201	GW
Programmable DC Power Supply	PSM-3004	GW
mOHM meter	1154D	DHK
Current Shunt	2M-05	T&M Research
Oscilloscope	TDS5104B	Tektronix
DC electronic Load	63209	Chroma
Electric vibration system	RT-S50ZY	SZZL
Power Supply	6V3000A	YST
Temperature Measurement	40032	TH
Temperature/Humidity Chamber	RHP-150CT	REALE
Thermal Shock Chamber	TSA-71H-W	REALE

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3. Test equipment and scheme

The test was conducted according to the test scheme of 0AKR_Test_Report_2019. Mark the sample number (sample number from 1-12) and use the same sample to test all items in the test plan.

4. Test result

4.1.1 Initial test result

4.1.2 DCR (No. 1)

Test result **pass**

Table 1 0AKR 150A (No. 1)

Type:	**Error! Reference source not found.**						
Start date:	2019/06/08			Finish date:	2019/06/08		
Room temperature:	25.7℃			Room humidity.	66%		
No.\ Item	DCR	Visual		No.\ Item	DCR	Visual	
Unit:	mΩ			Unit:	mΩ		
Maximum：				Maximum：			
Minimum:		No appearance damage		Minimum:		No appearance damage	
1	0.612	pass		7	0.611	pass	
2	0.604	pass		8	0.620	pass	
3	0.608	pass		9	0.607	pass	
4	0.613	pass		10	0.618	pass	
5	0.605	pass		11	0.603	pass	
6	0.608	pass		12	0.617	pass	

Table 2 0AKR 300A (No. 1)

Type:	**Error! Reference source not found.**						
Start date:	2019/06/08			Finish date:	2019/06/08		
Room temperature:	25.7℃			Room humidity.	66%		
No.\ Item	DCR	Visual		No.\ Item	DCR	Visual	
Unit:	mΩ			Unit:	mΩ		

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Maximum：				Maximum：			
Minimum:		No appearance damage		Minimum:		No appearance damage	
1	0.2976	pass		7	0.2964	pass	
2	0.2983	pass		8	0.2961	pass	
3	0.2975	pass		9	0.2955	pass	
4	0.2923	pass		10	0.2927	pass	
5	0.2951	pass		11	0.2933	pass	
6	0.2939	pass		12	0.2908	pass	

Table 3 0AKR 400A (No. 1)

Type:	**Error! Reference source not found.**						
Start date:	2019/06/08			Finish date:	2019/06/08		
Room temperature:	25.7℃			Room humidity.	66%		
No.\ Item	DCR	Visual		No.\ Item	DCR	Visual	
Unit:	mΩ			Unit:	mΩ		
Maximum：				Maximum：			
Minimum:		No appearance damage		Minimum:		No appearance damage	
1	0.1868	pass		7	0.1874	pass	
2	0.1855	pass		8	0.1886	pass	
3	0.1920	pass		9	0.1903	pass	
4	0.1917	pass		10	0.1911	pass	
5	0.1895	pass		11	0.1913	pass	
6	0.1863	pass		12	0.1897	pass	

4.2. Electrical test result group A

4.2.1 Temperature rise (No. 2)

Test result: **pass**

Table 4 0AKR 150A (No. 2)

Type	0AKR 150A		
Start date:	2019/06/09	Finish date:	2019/06/09

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Room temperature.	24.5℃	Room Humidity.	41%

No.\ Item	Temperature rise @0.5In	Visual					
Unit:	K						
Maximum：	50						
Minimum:		No appearance damage					
1	22.3	pass					
2	21.8	pass					

Table 5 0AKR 300A (No. 2)

Type	0AKR 300A		
Start date:	2019/06/10	Finish date:	2019/06/10
Room temperature.	24.9℃	Room Humidity.	41%

No.\ Item	Temperature rise @0.5In	Visual					
Unit:	K						
Maximum：	50						
Minimum:		No appearance damage					
1	27.9	pass					
2	28.3	pass					

Table 6 0AKR 400A (No. 2)

Type	0AKR 400A		
Start date:	2019/06/10	Finish date:	2019/06/10
Room temperature.	24.9℃	Room Humidity.	41%

No.\ Item	Temperature rise @0.5In	Visual					
Unit:	K						

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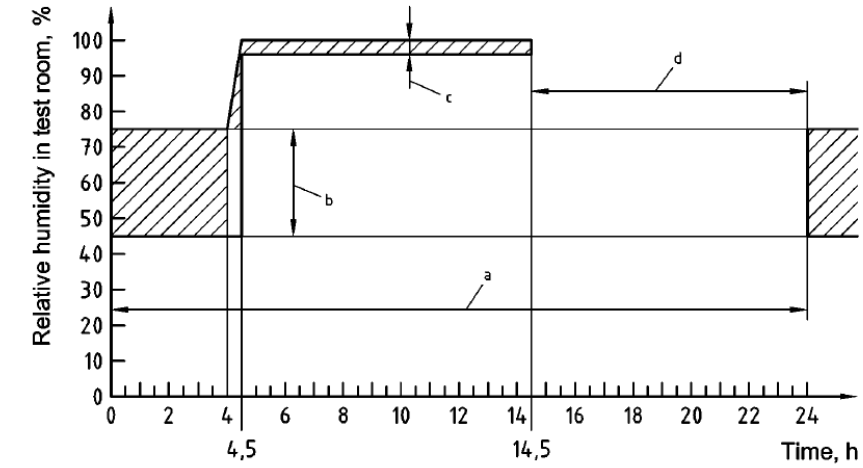
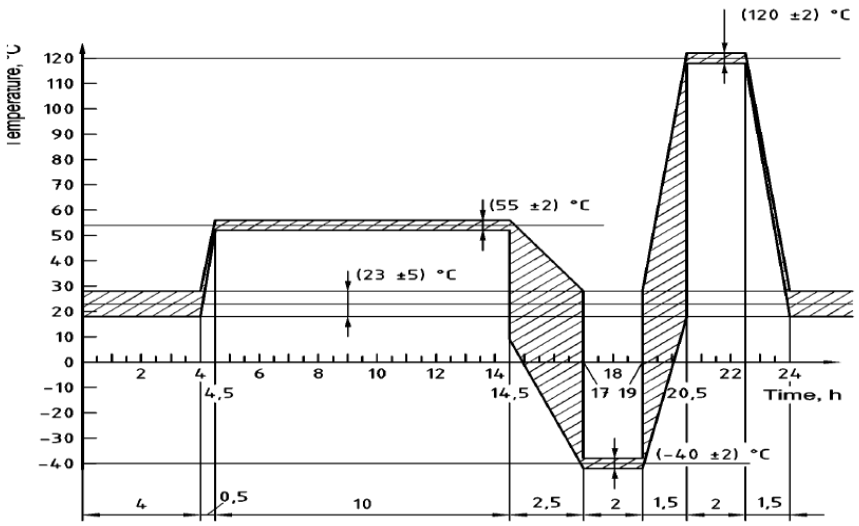
Maximum：	50						
Minimum:		No appearance damage					
1	32.6	pass					
2	31.4	pass					

4.3. Reliability test result group B

4.3.1 Temperature /humidity cycling test result(No. 3)

10 temperature-humidity cycles according the following setting and 24 hours per cycle





Test result: **pass**

Table 7 Error! Reference source not found. (No. 3)

Type:	0AKR 150A		
Start date:	2019/06/08	Finish	2019/06/19

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				date:			
Room temperature..:	24.7℃			Room Humidity.	55%		
No.\ Item	DCR	Visual					
Unit:	mΩ						
Maximum:							
Minimum:		No appearance damage					
3	0.616	pass					
4	0.624	pass					

Table 8 Error! Reference source not found. (No. 3)

Type:	0AKR 300A						
Start date:	2019/06/08			Finish date:	2019/06/19		
Room temperature..:	24.7℃			Room Humidity.	55%		
No.\ Item	DCR	Visual					
Unit:	mΩ						
Maximum:							
Minimum:		No appearance damage					
3	0.2996	pass					
4	0.2948	pass					

Table 9 Error! Reference source not found. (No. 3)

Type:	0AKR 400A						
Start date:	2019/06/08			Finish date:	2019/06/19		
Room temperature..:	24.7℃			Room Humidity.	55%		
No.\ Item	DCR	Visual					
Unit:	mΩ						
Maximum:							
Minimum:		No appearance damage					
3	0.1936	pass					
4	0.1933	pass					

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4.3.2 Hot / cold shock test result (No. 4))

48 cycles of hot / cold shock and the condition of single cycle as the following:

1. -30+/-2℃ continued 30min;
2. Switching time 15s maximum;
3. 100+/-2℃ continued 30min;
4. Switching time 15s maximum;

Test result: **pass**

Table 10 **Error! Reference source not found.**(No. 4)

Type:	**Error! Reference source not found.**						
Start date:	2019/06/11			Finish date:	2019/06/14		
Room temperature.	24.9℃			Room humidity.	57%		
No.\ Item	DCR	Visual					
Unit:	mΩ						
Maximum：							
Minimum:		No appearance damage					
5	0.615	pass					
6	0.62	pass					

Table 11 **Error! Reference source not found.**(No. 4)

Type:	**Error! Reference source not found.**						
Start date:	2019/06/11			Finish date:	2019/06/14		
Room temperature.	24.9℃			Room humidity.	57%		
No.\ Item	DCR	Visual					
Unit:	mΩ						
Maximum：							
Minimum:		No appearance damage					
5	0.2984	pass					
6	0.2959	pass					

Table 12 **Error! Reference source not found.**(No. 4)

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Type:	**Error! Reference source not found.**			Finish date:	2019/06/14		
Start date:	2019/06/11						
Room temperature.	24.9℃			Room humidity.	57%		
No.\ Item	DCR	Visual					
Unit:	mΩ						
Maximum：							
Minimum:		No appearance damage					
5	0.1908	pass					
6	0.188	pass					

4.3.3 High temperature storage test result (No. 5)

Test result: **Pass**

Table 13 **Error! Reference source not found.** (No. 5)

Type:	0AKR 150A			Finish date:	2019/06/18		
Start date:	2019/06/12						
Room temperature.	24.1℃			Room humidity.	60%		
No.\ Item	DCR	Visual					
Unit:	mΩ						
Maximum：							
Minimum:		No appearance damage					
7	0.618	pass					
8	0.631	pass					

Table 14 **Error! Reference source not found.** (No. 5)

Type:	0AKR 300A		
Start date:	2019/06/12	Finish date:	2019/06/18
Room temperature.	24.1℃	Room humidity.	60%

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No.\ Item	DCR	Visual					
Unit:	mΩ						
Maximum:							
Minimum:		No appearance damage					
7	0.2984	pass					
8	0.2935	pass					

Table 15 **Error! Reference source not found.** (No. 5)

Type:	0AKR 400A						
Start date:	2019/06/12			Finish date:	2019/06/18		
Room temperature.	24.1℃			Room humidity.	60%		
No.\ Item	DCR	Visual					
Unit:	mΩ						
Maximum:							
Minimum:		No appearance damage					
7	0.1895	pass					
8	0.1906	pass					

4.3.4 Mechanical shock test result (No. 6)

Test result: **Pass**

Table 16 **Error! Reference source not found.** (No. 6)

Type:	**Error! Reference source not found.**						
Start date:	2019/06/21			Finish date::	2019/06/26		
Room temperature.	24.5℃			Room humidity.	58%		
No.\ Item	DCR	visual					
Unit:	mΩ						
Maximum:							
Minimum:		No appearance damage					

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9	0.615	pass					
10	0.628	pass					

Table 17 **Error! Reference source not found.** (No. 6)

Type:	**Error! Reference source not found.**						
Start date:	2019/06/21			Finish date::	2019/06/26		
Room temperature.	24.5℃			Room humidity.	58%		
No.\ Item	DCR	visual					
Unit:	mΩ						
Maximum:							
Minimum:		No appearance damage					
9	0.2983	pass					
10	0.297	pass					

Table 18 **Error! Reference source not found.** (No. 6)

Type:	**Error! Reference source not found.**						
Start date:	2019/06/21			Finish date::	2019/06/26		
Room temperature.	24.5℃			Room humidity.	58%		
No.\ Item	DCR	visual					
Unit:	mΩ						
Maximum:							
Minimum:		No appearance damage					
9	0.1924	pass					
10	0.1935	pass					

4.3.5 Impulse current cycle test result(No. 7)

Test result: **Pass**

Table19 **Error! Reference source not found.** (No. 7)

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Type:	**Error! Reference source not found.**		Finish date:	2019/06/22
Start date::	2019/06/10			
Room temperature.	25.7℃		Room humidity.	61%

No.\ Item	DCR	Visual					
Unit:	mΩ						
Maximum:							
Minimum:		No appearance damage					
11	0.612	pass					
12	0.625	pass					

Table20 **Error! Reference source not found.** (No. 7)

Type:	**Error! Reference source not found.**		Finish date:	2019/06/22
Start date::	2019/06/10			
Room temperature.	25.7℃		Room humidity.	61%

No.\ Item	DCR	Visual					
Unit:	mΩ						
Maximum:							
Minimum:		No appearance damage					
11	0.2944	pass					
12	0.2953	pass					

Table21 **Error! Reference source not found.** (No. 7)

Type:	**Error! Reference source not found.**		Finish date:	2019/06/22
Start date::	2019/06/10			
Room temperature.	25.7℃		Room humidity.	61%

No.\ Item	DCR	Visual					
Unit:	mΩ						
Maximum:							
Minimum:		No					

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		appearance damage					
11	0.1938	pass					
12	0.1915	pass					

4.3.6 Test result of wiping the tubes with gasoline / lube, (No. 8)

*Gasoline is GB #92, lubricating oil is synthetic oil.

Test result: **Pass**

Table 22 **Error! Reference source not found.** (No. 8)

Type:	0AKR 150A						
Start date::	2019/06/28			Finish date:	2019/06/28		
Room temperature.	25.1℃			Room humidity.	63%		
No.\ Item	Marking can be recognized		No.\ Item	Marking can be recognized			
Unit:			Unit:				
Maximum：			Maximum：：				
Minimum::			Minimum::				
1	pass		7	pass			
2	pass		8	pass			
3	pass		9	pass			
4	pass		10	pass			
5	pass		11	pass			
6	pass		12	pass			

Table 22 **Error! Reference source not found.** (No. 8)

Type:	0AKR 300A						
Start date::	2019/06/28			Finish date:	2019/06/28		
Room temperature.	25.1℃			Room humidity.	63%		
No.\ Item	Marking can be recognized		No.\ Item	Marking can be recognized			
Unit:			Unit:				
Maximum：			Maximum：：				

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Minimum::			Minimum::				
1	pass		7	pass			
2	pass		8	pass			
3	pass		9	pass			
4	pass		10	pass			
5	pass		11	pass			
6	pass		12	pass			

Table 24 **Error! Reference source not found.** (No. 8)

Type:	0AKR 400A						
Start date::	2019/06/28			Finish date:	2019/06/28		
Room temperature.	25.1℃			Room humidity.	63%		
No.\ Item	Marking can be recognized		No.\ Item	Marking can be recognized			
Unit:			Unit:				
Maximum：			Maximum：：				
Minimum::			Minimum::				
1	pass		7	pass			
2	pass		8	pass			
3	pass		9	pass			
4	pass		10	pass			
5	pass		11	pass			
6	pass		12	pass			

4.3.7 Terminal strength test, (No. 9)

*Gasoline is GB #92, lubricating oil is synthetic oil.

Test result: **Pass**

Table 25 Error! Reference source not found. (No. 9)

Type:	0AKR 150A						
Start date:	2019/06/08			Finish date:	2019/06/26		
Room temperature.	25.1℃			Room humidity.	63%		
No.\ Item	Times of	Visual		No.\ Item	Times of	Visual	

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	disassembling				disassembling		
Unit:				Unit:			
Maximum：				Maximum：			
Minimum:	3	No appearance damage		Minimum:	3	No appearance damage	
1	>3	pass		7	>3	pass	
2	>3	pass		8	>3	pass	
3	>3	pass		9	>3	pass	
4	>3	pass		10	>3	pass	
5	>3	pass		11	>3	pass	
6	>3	pass		12	>3	pass	

Table 26 Error! Reference source not found. (No. 9)

Type:	0AKR 300A		
Start date:	2019/06/08	Finish date:	2019/06/26
Room temperature.	25.1℃	Room humidity.	63%

No.\ Item	Times of disassembling	Visual		No.\ Item	Times of disassembling	Visual	
Unit:				Unit:			
Maximum：				Maximum：			
Minimum:	3	No appearance damage		Minimum:	3	No appearance damage	
1	>3	pass		7	>3	pass	
2	>3	pass		8	>3	pass	
3	>3	pass		9	>3	pass	
4	>3	pass		10	>3	pass	
5	>3	pass		11	>3	pass	
6	>3	pass		12	>3	pass	

Table 27 Error! Reference source not found. (No. 9)

Type:	0AKR 400A		
Start date:	2019/06/08	Finish date:	2019/06/26

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Room temperature.	25.1℃	Room humidity.	63%

No.\ Item	Times of disassembling	Visual		No.\ Item	Times of disassembling	Visual	
Unit:				Unit:			
Maximum：				Maximum：			
Minimum:	3	No appearance damage		Minimum:	3	No appearance damage	
1	>3	pass		7	>3	pass	
2	>3	pass		8	>3	pass	
3	>3	pass		9	>3	pass	
4	>3	pass		10	>3	pass	
5	>3	pass		11	>3	pass	
6	>3	pass		12	>3	pass	

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5. Test image

Image 1, Mechanical shock curve

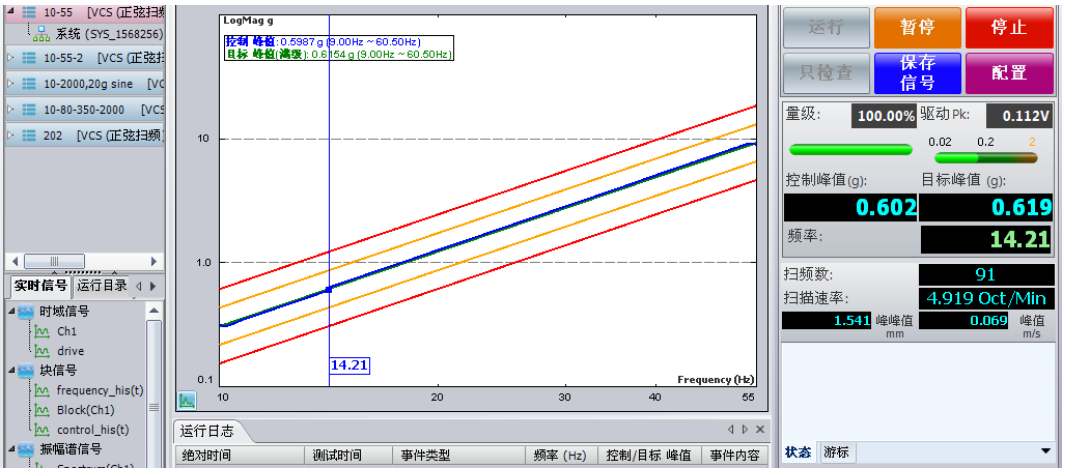


Image 2, Hot -cold shock curve

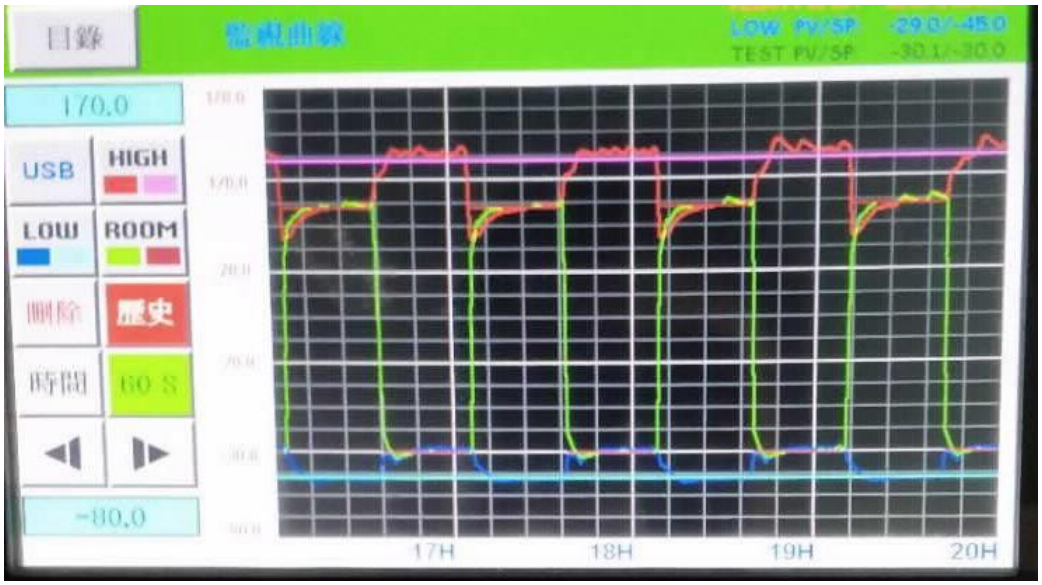
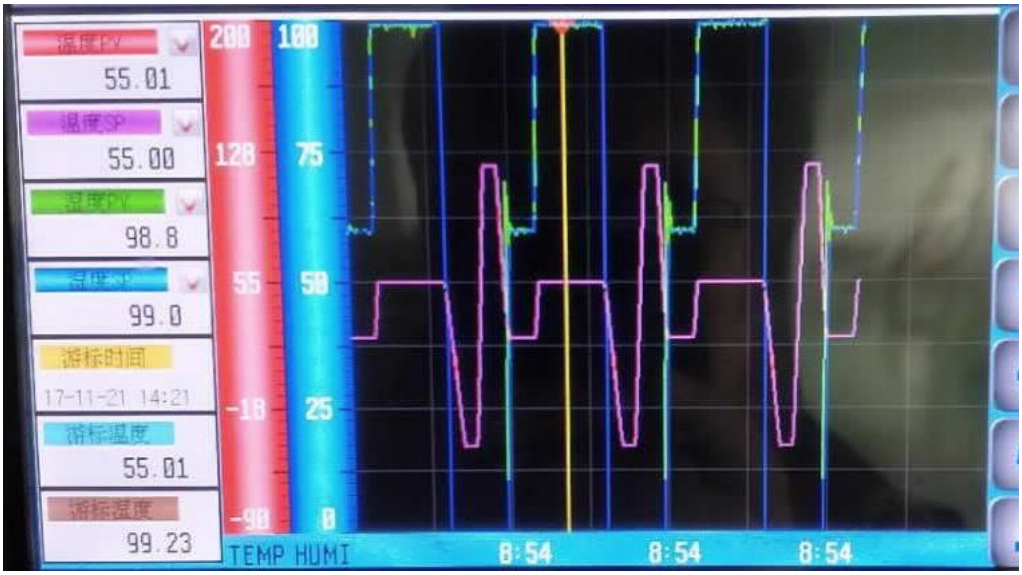


Image 3, Temperature-humidity cycling curve



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