TEST CERTIFICATE

Issued to:	YUEQING BARFUSES ELECTRIC CO., LTD. No. 15, Yonghe 3 Road, Chengdong Industriy Zone, Yueqing, Wenzhou, Zhejiang, China
For the product:	Low-voltage switchgear and controlgear assembly - Busbar
Trade name:	BARFUSES BFSe
Type/Model:	BP1-125
Ratings:	I_{nA} 125 A, U_e 380/400 V, U_i 690 V, U_{imp} 4 kV, 50/60 Hz I_{cw} 20 kA - 0,2 s, 17,5 kA - 0,25 s, 10 kA -1 s For more details see annex
Manufactured by:	YUEQING BARFUSES ELECTRIC CO., LTD. No. 15, Yonghe 3 Road, Chengdong Industriy Zone, Yueqing, Wenzhou, Zhejiang, China
Subject:	Clauses 10.4, 10.9, 10.10.2.3.7a), 10.11
Requirements:	IEC 61439-2: 2011, EN 61439-2: 2011 Clauses 10.4, 10.9, 10.10.2.3.7a), 10.11
Remark:	I_{nA} 125 A was tested without enclosure (open-type assembly)

This Test Certificate is granted on account of an examination by DEKRA, the results of which are laid down in report no. 3309992.01-INC, dated 5 September 2016.

The examination has been carried out on one single specimen of the product, submitted by the manufacturer. The Attestation does not include an assessment of the manufacturer's production. Conformity of his production with the specimen tested by DEKRA is not the responsibility of DEKRA.

Arnhem, 5 September 2016

Number: 3309992.100

DEKRA Certification B.V.

H.L. Schendstok
Certification Manager

Overview of product evaluation according to IEC/EN 61439-2:

IEC/EN 61439-2 Clause	Clause description	Tested ratings	Results
10.4	Clearances and creepage distances	Clearances > 3 mm, based on Uimp = 4 kV; Creepage distances > 10 mm, based on Ui = 690 V, pollution degree 3, material group IIIa.	Pass
10.9	Dielectric properties		
10.9.2	Power-frequency withstand voltage	U_i 690 V	Pass
10.9.3	Impulse withstand voltage	U_{imp} 4 kV	Pass
10.9.4	Testing of enclosures made of insulating material		Pass
10.10	Verification of temperature rise		
10.10.2.3.7 a)	Verification of the main busbars separately	Main busbar - 125 A (BP1-125 6W) - 125 A (BP1-125 60W)	Pass
10.11	Short-circuit withstand strength	I_{cw} for 3-phase main circuit: 20 kA - 0,2 s 17,5 kA - 0,25 s 10 kA - 1 s	Pass

Product details:

	Description
Main busbar	3 phases, copper 20 mm x 2 mm (external terminal) 25 mm x 2 mm (main busbar)
Number of outgoing ways	3-phase, 6 ways to 60 ways

Applicant	:	YUEQING BARFUSES ELECTRIC CO., LTD No. 15, Yonghe 3 Road, Chengdong Industriy Zone, Yueqing, Wenzhou, Zhejiang, China
Application Date	:	19 May 2016
Order Number	:	3309992.00-INC
Product	:	Low-voltage switchgear and controlgear assembly
Trade name	:	BARFUSES BFSe
Type/Model	:	BP1-125

Arnhem, 5 September 2016

Manufacturer/ Production sites	:	YUEQING BARFUSES ELECTRIC CO., LTD No. 15, Yonghe 3 Road, Chengdong Industriy Zone, Yueqing, Wenzhou, Zhejiang, China
Subject	:	Clauses 10.4, 10.9, 10.10.2.3.7a), 10.11
Requirements	:	IEC/EN 61439-2: 2011 Clauses 10.4, 10.9, 10.10.2.3.7a), 10.11
Conclusion	:	The product complies with the specified requirements
Tested by	:	Ken Peng
Checked by	:	F.S. Strikwerda

Kpe 0509-16

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Table of contents

1 Subject

Low-voltage switchgear and controlgear assembly - Busbar

Product information

Trademark	: BARFUSES
Type	: BFSe BP1-125

2 Interface characteristics

2.1 Tested characteristics

Rated operational voltage (U_e)	: 380/400 V
Rated insulation voltage (U_i)	: 690 V
Rated impulse withstand voltage (U_{imp})	: 4 kV
Rated current of the assembly (I_{nA})	: 125 A (for main busbar)
Rated short-circuit withstand strength (I_{cw} and I_{pk})	: 3-phase 20 kA - 0,2 s with a peak of 40 kA 3-phase 17,5 kA - 0,25 s with a peak of 35 kA 3-phase 10 kA - 1 s with a peak of 17 kA
Rated frequency (f_n)	: 50/60 Hz
Ambient Air Temperature	: -5 °C to +40 °C

Note: I_{nA} 125 A was tested without enclosure upon request from the manufacturer.

2.2 Declared characteristics by manufacturer

Stationary or movable	: Stationary
Type of construction	: Open-type assembly

Note:

1. Due to the fact that I^2t value and peak current value of 17,5 kA - 0,25 s I_{cw} rating are lower than the values of 20 kA - 0,2 s I_{cw} rating, 17,5 kA - 0,25 s can be claimed without actual testing.

2. ASSEMBLIES has a rated short-time withstand current not exceeding 10 kA r.m.s which is exempted from the verification of the short circuit withstand strength (IEC/EN 61439-1 clause 10.11.2).

3 Object identification

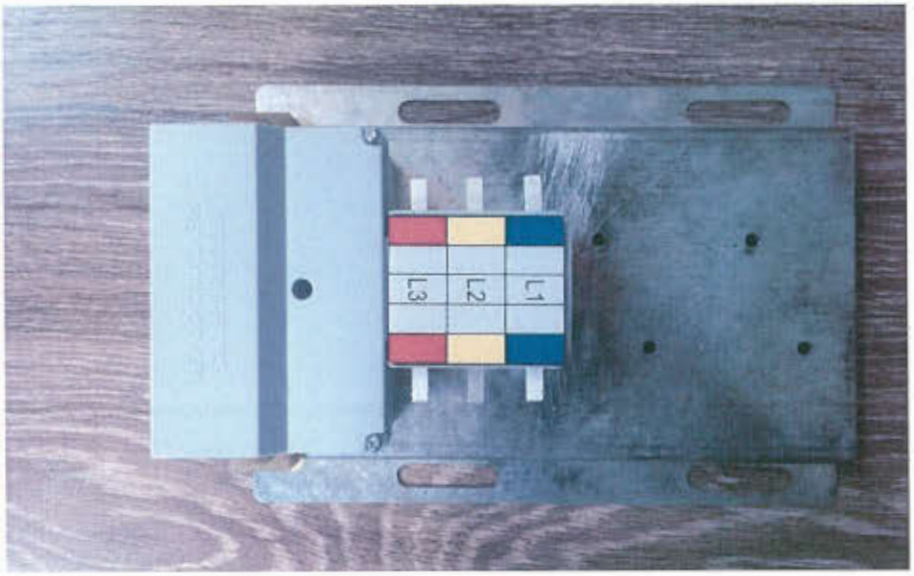


Photo 1: Sample BP1-125 6W

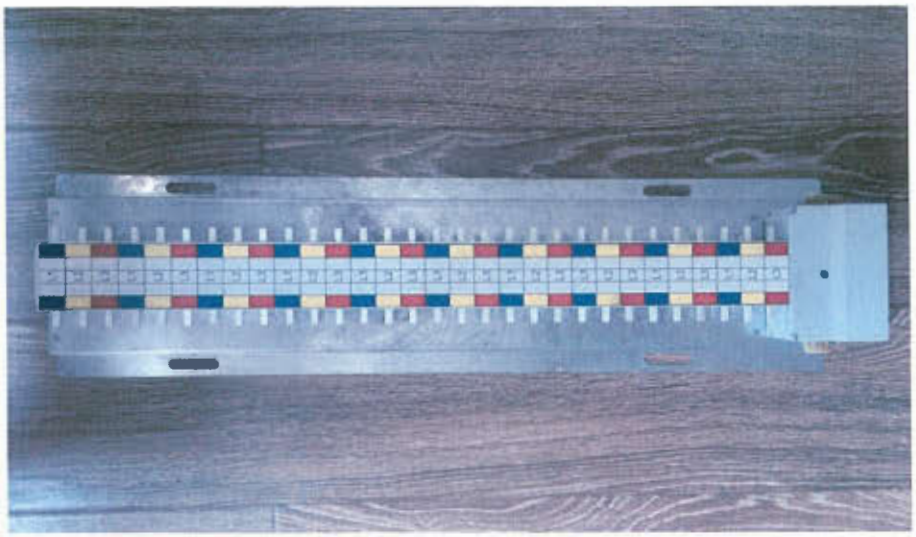


Photo 2: Sample BP1-125 60W

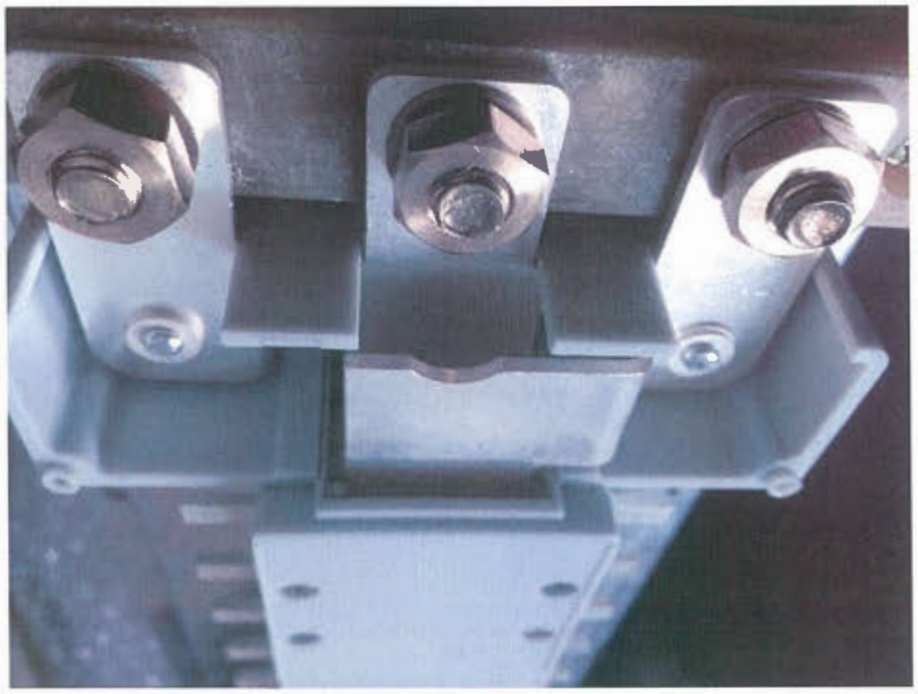


Photo 3: Inside view

The external dimensions are stated in the drawings included in this report. For components and drawings see Appendix C.

4 Summary of design verifications

Performance:

Clause 10.4	Clearances and creepage distances
Clause 10.9	Dielectric properties
Clause 10.10	Verification of temperature rise
- Clause 10.10.2.3.7a)	Verification of the main busbars separately
Clause 10.11	Short-circuit withstand strength

All other clauses are not required by client.

5 General Items

Location of the tests

Clauses 10.9.2, 10.10, 10.11 were carried out at Zhejiang Fangyuan Electrical Equipment Testing Co., Ltd. - West Zhonghuan Road, Jiaxing City, Zhejiang Province, China.
Others were carried out at DEKRA Testing Services (Zhejiang) Co., Ltd., - No. 5, Changjiang Road, Great Bridge Industrial Park, North Baixiang, Wenzhou, China.

Tests were carried out by

Huang Fang	Zhejiang Fangyuan Electrical Equipment Testing Co., Ltd, Jiaxing, China

Manufacturer's representatives during tests

Li Jietong	YUEQING BARFUSES ELECTRIC CO., LTD, China
Yan Zhengkuan	YUEQING BARFUSES ELECTRIC CO., LTD, China

The tests were witnessed by

Ken Peng	DEKRA Testing Services (Zhejiang) Co., Ltd., Wenzhou, China
King Wang	DEKRA Testing Services (Zhejiang) Co., Ltd., Wenzhou, China

General notes on tests

The frequency during the tests was 50 Hz.

The conclusion and results stated in this report are based on a non-recurrent examination of the sample(s) provided by the applicant.

The tests were conducted in June 2016 to October 2016.

6 Design verification

6.1 Performance

6.1.1 Clearances and creepage distances

The verification of the creepage and clearance distances is done in conformity with IEC/EN 61439-2, clause 10.4.

6.1.1.1 Clearances

The clearances are checked with the impulse withstand voltage U_{imp} = 4 kV.
Further the clearances are measured in respect to the U_{imp} = 4 kV. Clearances shall be not less than 3 mm.

No clearances less than 3,5 mm were observed.

Result: Pass

6.1.1.2 Creepage distances

Creepage distances are verified based on the specified insulation voltage of U_i = 690 V, pollution degree 3 and material group IIIa. Creepage distances shall be greater than or equal to 10 mm.

No creepage distances less than 11,7 mm were observed.

Result: Pass

6.1.2 Dielectric properties

The verification of the dielectric properties by test is done in conformity with and IEC/EN 61439-2, clause 10.9.

Insulation voltage (U_i):	690 V
Impulse withstand voltage (U_{imp}):	4 kV

6.1.2.1 Power frequency withstand test

Verification according to IEC/EN 61439-2 clause 10.9.2

The assembly was subjected during 5 seconds to a high voltage test with a test voltage of 1890 Vac.
No breakdown or flash-over occurred during the tests.

Both BP1-125 6W and BP1-125 60W were tested.

Test voltage between	Test voltage (V)	Result
L1 to L2/L3/metal plate	1890	Pass
L2 to L1/L3/metal plate	1890	Pass
L3 to L1/L2/metal plate	1890	Pass
Metal plate to L1/L2/L3	1890	Pass

Table 1: Power frequency test results

Result: Pass

6.1.2.2 Impulse withstand voltage

Verification according to IEC/EN 61439-2 clause 10.9.3

The assembly was tested for a rated impulse withstand voltage of 4 kV. The test voltage was 4,8 kV 1,2/50 µs at sea level. The test impulse voltage was applied five times for each polarity at intervals of 1 second in the prescribed connections. No breakdown or flash-over occurred during the tests.

Both BP1-125 6W and BP1-125 60W were tested.

Test voltage between	Test voltage (kV)	Result
L1 to L2/L3/metal plate	4,8	Pass
L2 to L1/L3/metal plate	4,8	Pass
L3 to L1/L2/metal plate	4,8	Pass
Metal plate to L1/L2/L3	4,8	Pass

Table 2: Impulse withstand voltage test results

Result: Pass

6.1.2.3 Testing of enclosures made of insulating material

Verification according to IEC/EN 61439-2 clause 10.9.4

The outside of the busbar cover was covered by a metal foil over openings and joints. A test voltage of 2835 Vac was applied during 5 seconds between the foil and the interconnected live and exposed conductive parts within the assembly. No breakdown or flash-over occurred during the tests.

Both BP1-125 6W and BP1-125 60W were tested.

Result: Pass

6.1.3 Verification of temperature-rise

6.1.3.1 Verification of the main busbars separately

The verification of the temperature-rise is done in conformity with IEC/EN 61439-2, clause 10.10.2.3.7a).

Test 6.1.2.1-1 test for BP1-125 6W

A temperature-rise test was conducted on the main busbar. During the test, the sample was placed in a test room, mounted on a frame, with wooden board behind.

The 50 Hz current source was connected by 3 m long PVC insulated copper cable of 50 mm^2 to the supply connection of the assembly. Per phase 1 cable was connected. The busbar was loaded with 125 A. The other side of the main busbar was connected with 3 m long PVC insulated copper cable of 50 mm^2 to the star point. Per phase 1 cable was connected.

The temperature-rises were measured by means of thermocouples, including the ambient temperature. All currents are kept constant until thermal equilibrium is reached.

Details of the temperature-rise verification are given in Appendix A. The tables in the appendix give the recorded temperature-rise values at steady state. The values do not exceed the maximum allowed temperature-rise limits.

Result: Pass

Test 6.1.2.1-2 test for BP1-125 60W

A temperature-rise test was conducted on the main busbar. During the test, the sample was placed in a test room, mounted on a frame, with wooden board behind.

The 50 Hz current source was connected by 3 m long PVC insulated copper cable of 50 mm^2 to the supply connection of the assembly. Per phase 1 cable was connected. The busbar was loaded with 125 A. The other side of the main busbar was connected with 3 m long PVC insulated copper cable of 50 mm^2 to the star point. Per phase 1 cable was connected.

The temperature-rises were measured by means of thermocouples, including the ambient temperature. All currents are kept constant until thermal equilibrium is reached.

Details of the temperature-rise verification are given in Appendix A. The tables in the appendix give the recorded temperature-rise values at steady state. The values do not exceed the maximum allowed temperature-rise limits.

Result: Pass

6.1.4 Short-circuit withstand strength

The verification of the short-circuit withstand strength by test is done in conformity with IEC/EN 61439-2, clause 10.11.

Details of the testing of the short-circuit withstand strength are given on sheets 1 and 2 in Appendix B. The appendix also shows photos and oscillograms of the short-circuit tests.

From data stated in Appendix B can be concluded that the short-circuit withstand strength complies with the specified values as given on page 3.

Schedule of tests:

BP1-125 6W:
Short-time withstand current (I_{cw}):
3 phases: I_{cw} = 20 kA - 0,2 s, 40 kA peak (osc. S1682402)

BP1-125 60W:
Short-time withstand current (I_{cw}):
3 phases: I_{cw} = 20 kA - 0,2 s, 40 kA peak (osc. S1682503)

Due to the fact that I^2t value and peak current value of 17,5 kA - 0,25 s I_{cw} rating are lower than the values of 20 kA - 0,2 s I_{cw} rating, 17,5 kA - 0,25 s can be claimed without actual testing.

Result: Pass

Appendix A Temperature rise tests

A.1 Temperature rise test results

Table 3: Temperature rise test results

Test no.	6.1.2.1-1			
Test object:	BP1-125 6W			
Test current:	125 A			
Connection on supply side: 1 PVC insulated copper cable of 50 mm^2 cross-section and 3 m length (each phase)				
Thermo-couple	Description	Phase	Temp rise [K]	Max. Allowed [K]
101	Incoming terminal of assembly (external terminal)	L1	39	70
102		L2	40	70
103		L3	40	70
104	Top of main busbar	L1	43	90
105		L2	37	90
106		L3	44	90
107	Bottom of main busbar	L1	46	90
108		L2	32	90
109		L3	49	90
110	Busbar cover, top	-	20	40
111	Busbar cover, bottom	-	21	40
	Ambient temperature 28 °C			
1. Thermal class of electrical insulating material is 125 °C.				

Table 4: Temperature rise test results

Test no. 6.1.2.1-2
Test object: BP1-125 60W
Test current: 125 A

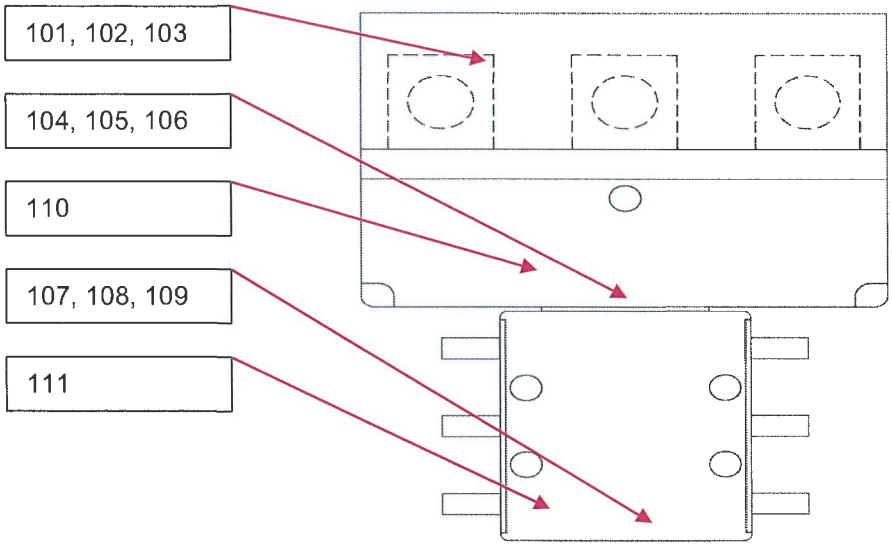
Connection on supply side: 1 PVC insulated copper cable of 50 mm^2 cross-section and 3 m length (each phase)

Thermo-couple	Description	Phase	Temp rise [K]	Max. Allowed [K]
101	Incoming terminal of assembly (external terminal)	L1	25	70
102		L2	30	70
103		L3	26	70
104	Top of main busbar	L1	26	90
105		L2	30	90
106		L3	25	90
107	Middle of main busbar	L1	25	90
108		L2	23	90
109		L3	24	90
110	Bottom of main busbar	L1	19	90
111		L2	18	90
112		L3	18	90
113	Busbar cover, top	-	14	40
114	Busbar cover, middle	-	10	40
115	Busbar cover, bottom	-	10	40
	Ambient temperature 27 °C			

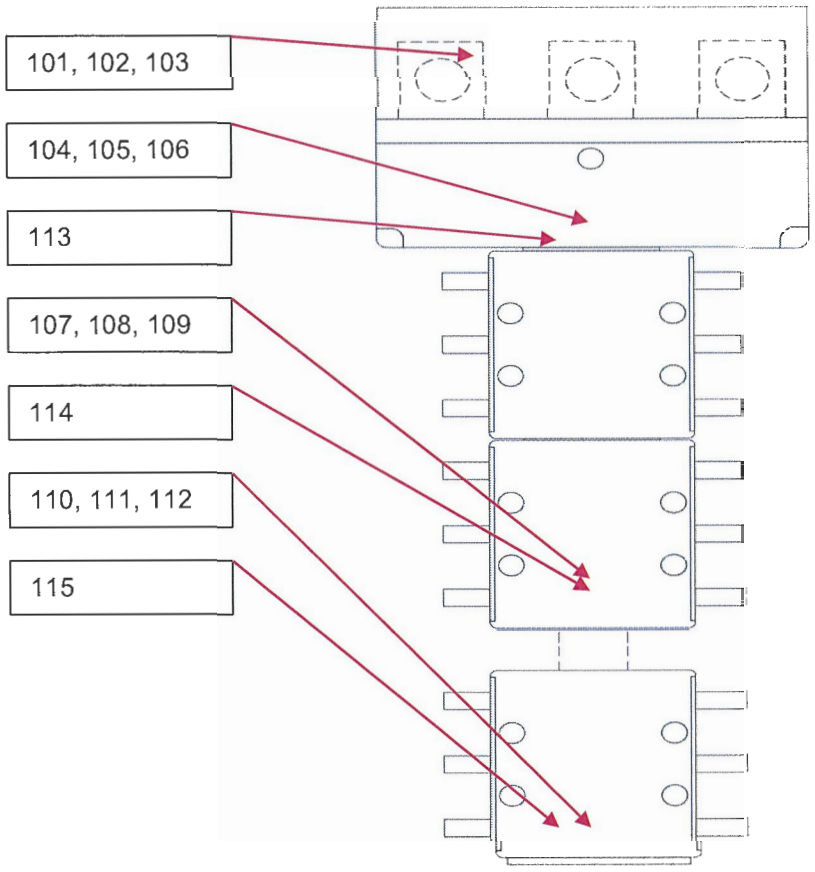
1. Thermal class of electrical insulating material is 125 °C.

A.2 Position of thermocouples for temperature rise setup.

For test 6.1.2.1-1



For test 6.1.2.1-2



A.3 Photos of temperature rise tests

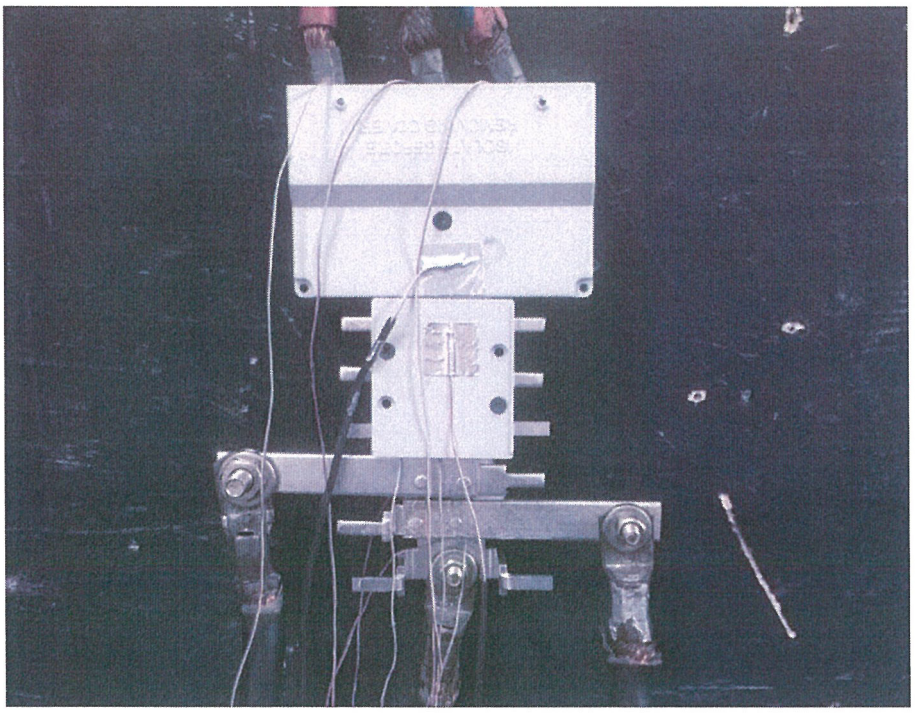


Photo 4: Temperature rise tests of BP1-125 6W

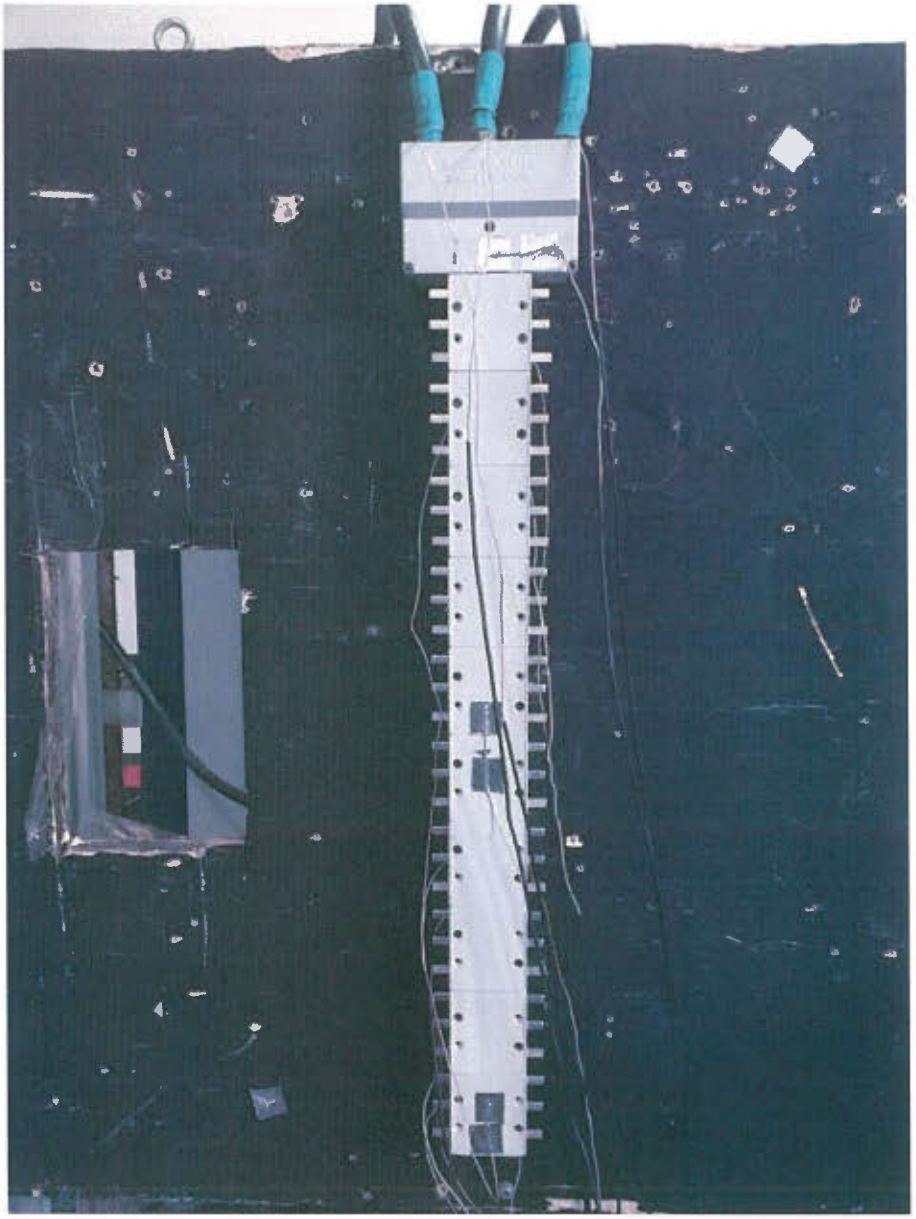


Photo 5: Temperature rise tests of BP1-125 60W

Appendix B Short-circuit withstand tests

B.1 Short-circuit withstand test results

DEKRA Certification B.V.	TABLE WITH TEST RESULTS Short-circuit withstand tests				Date: 1 August 2016	Sheet: 1
Object	Busbar BARFUSES BP1-125 6W I_{cw}: 20 kA at 400 V (3-phase incoming circuit)					
Osc no	Current				Test voltage	Remarks
	peak [kA]	rms [kA]	duration [ms]	thermal equivalent for 0,2 s [kA]	[V]	
Y16824 02	41,0 36,8 36,1	20,4 20,7 20,2	275	-	426 426 426	Prospective current 20 kA - 0,2 s on three phase at 400 V cosφ 0,29
3 phase under test						
S16824 02	39,5 33,6 36,3	19,2 19,4 19,0	220	20,1 20,3 19,9	426	No visible disturbance Test pass
Phase values are to be read: A (Supply) → L1 object B (Supply) → L2 object C (Supply) → L3 object Dielectric test at 1000 Vac - 5 s after test: No breakdown or flash-over occurred during the tests.						

DEKRA Certification B.V.	TABLE WITH TEST RESULTS Short-circuit withstand tests	Date: 11 August 2016	Sheet: 2

Object Busbar
BARFUSES
BP1-125 60W
I_{cw}: 20 kA at 400 V (3-phase incoming circuit)

Osc no	Current				Test voltage	Remarks
	peak [kA]	rms [kA]	duration [ms]	thermal equivalent for 0,2 s [kA]	[V]	
Y16825 03	41,2 33,0 37,3	20,4 20,6 20,3	290	-	426 426 427	Prospective current 20 kA - 0,2 s on three phase at 400 V cosφ 0,28
3 phase under test						
S16825 03	39,6 31,8 34,6	19,0 19,3 19,2	232	20,5 20,8 20,7	426	No visible disturbance Test pass

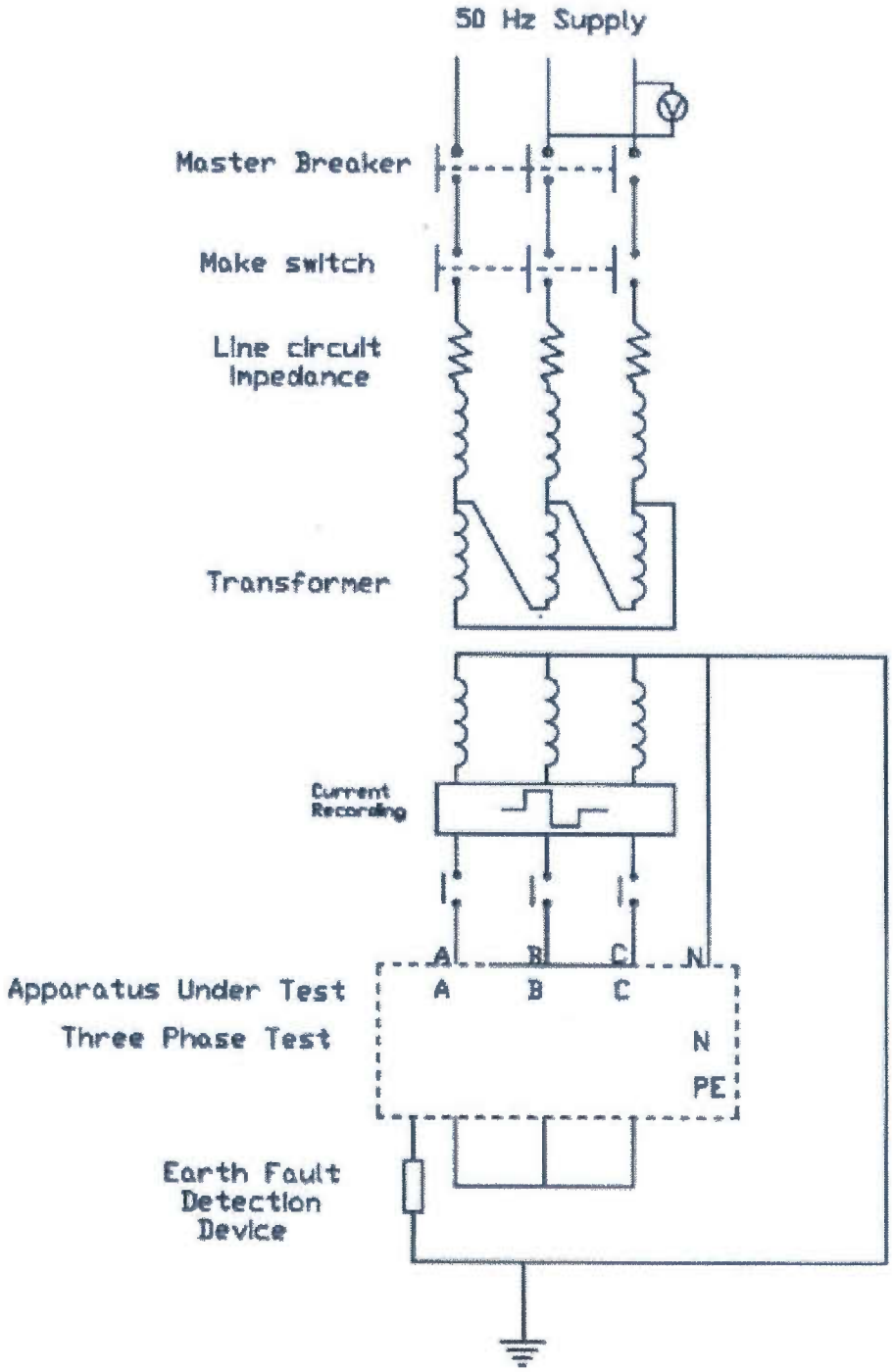
Phase values are to be read: A (Supply) → L1 object
B (Supply) → L2 object
C (Supply) → L3 object

Dielectric test at 1000 Vac - 5 s after test: No breakdown or flash-over occurred during the tests.

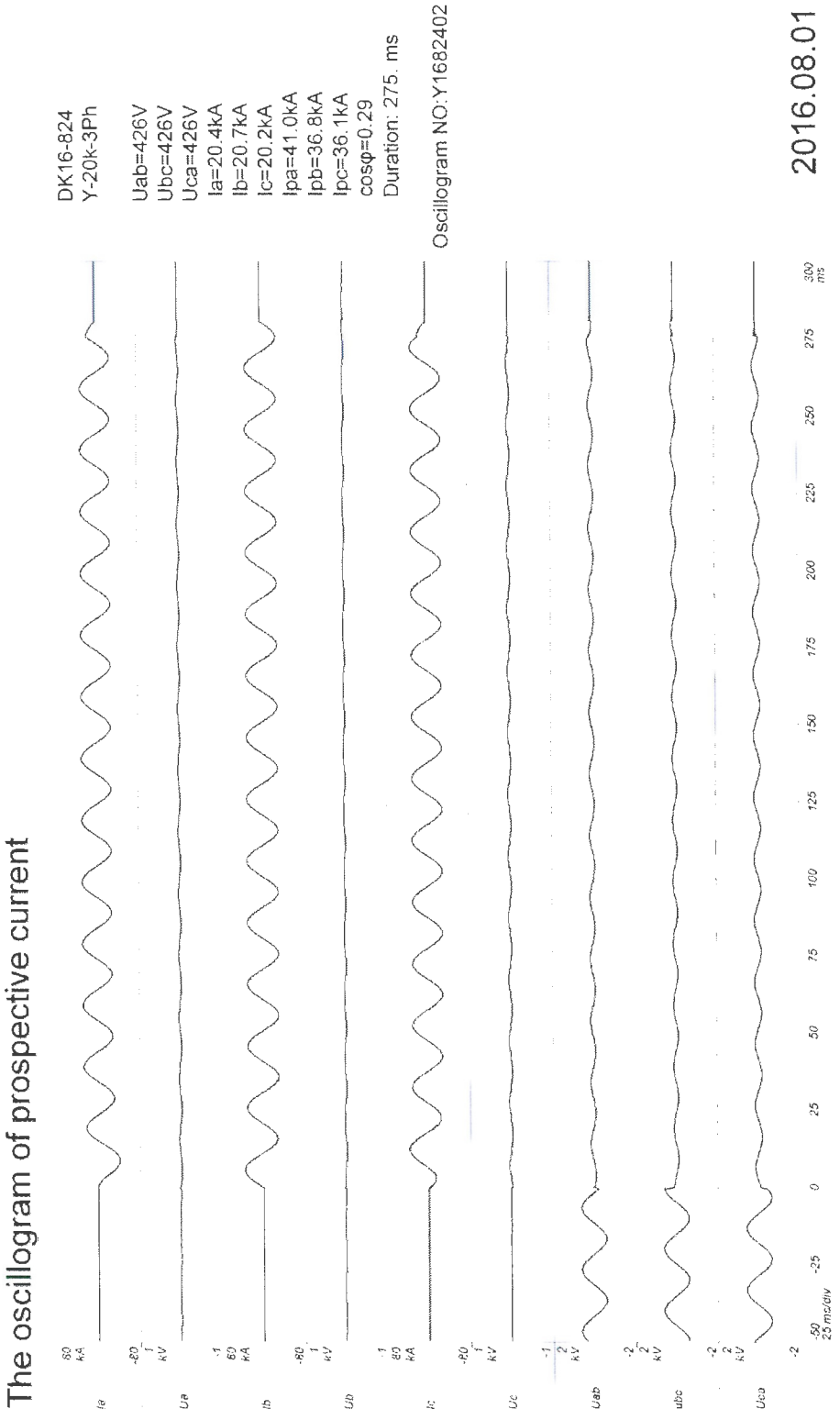
B.2 Test circuit diagram

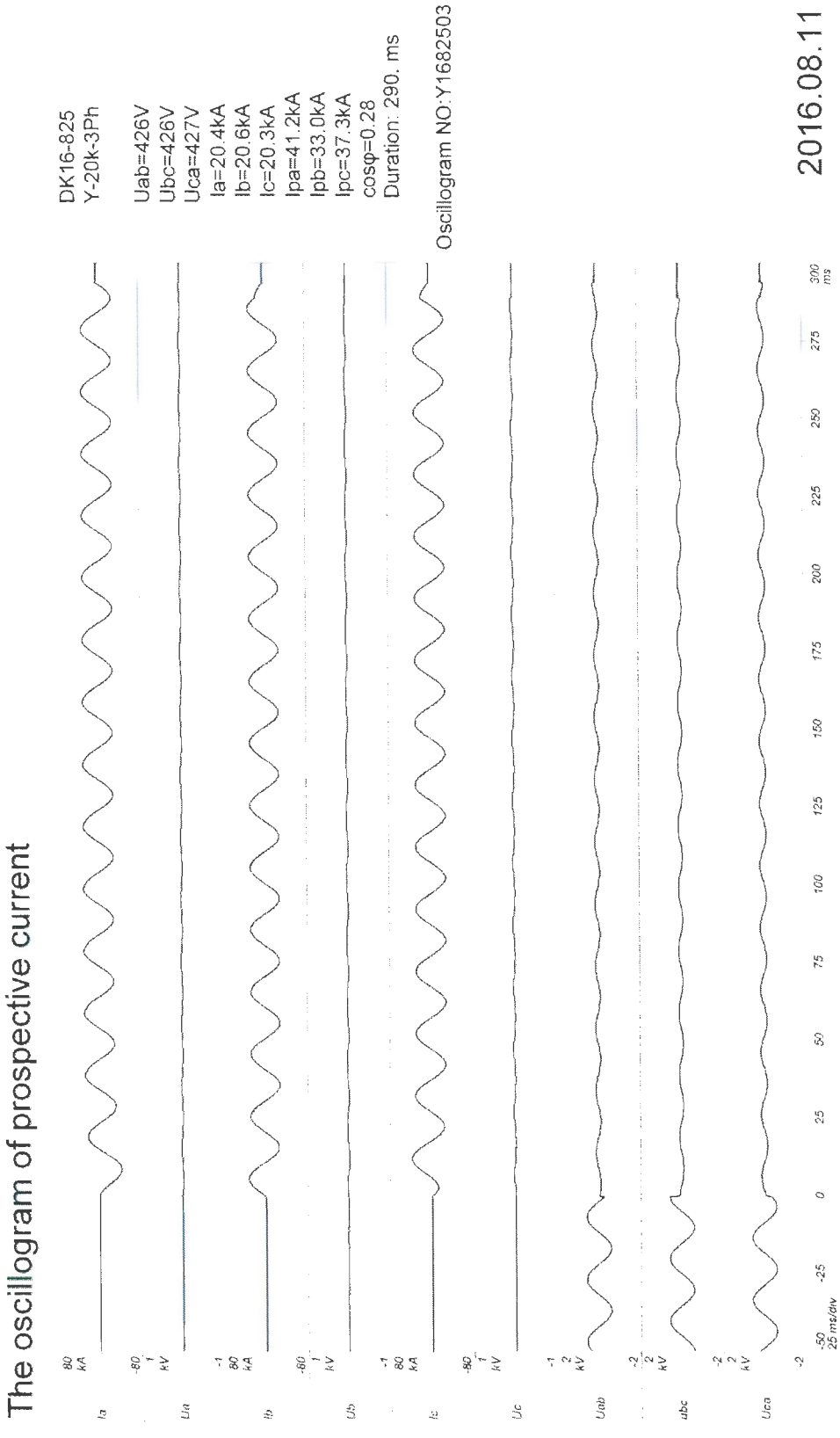
DEKRA Certification B.V.	TEST CIRCUIT DIAGRAMS Short-circuit laboratory

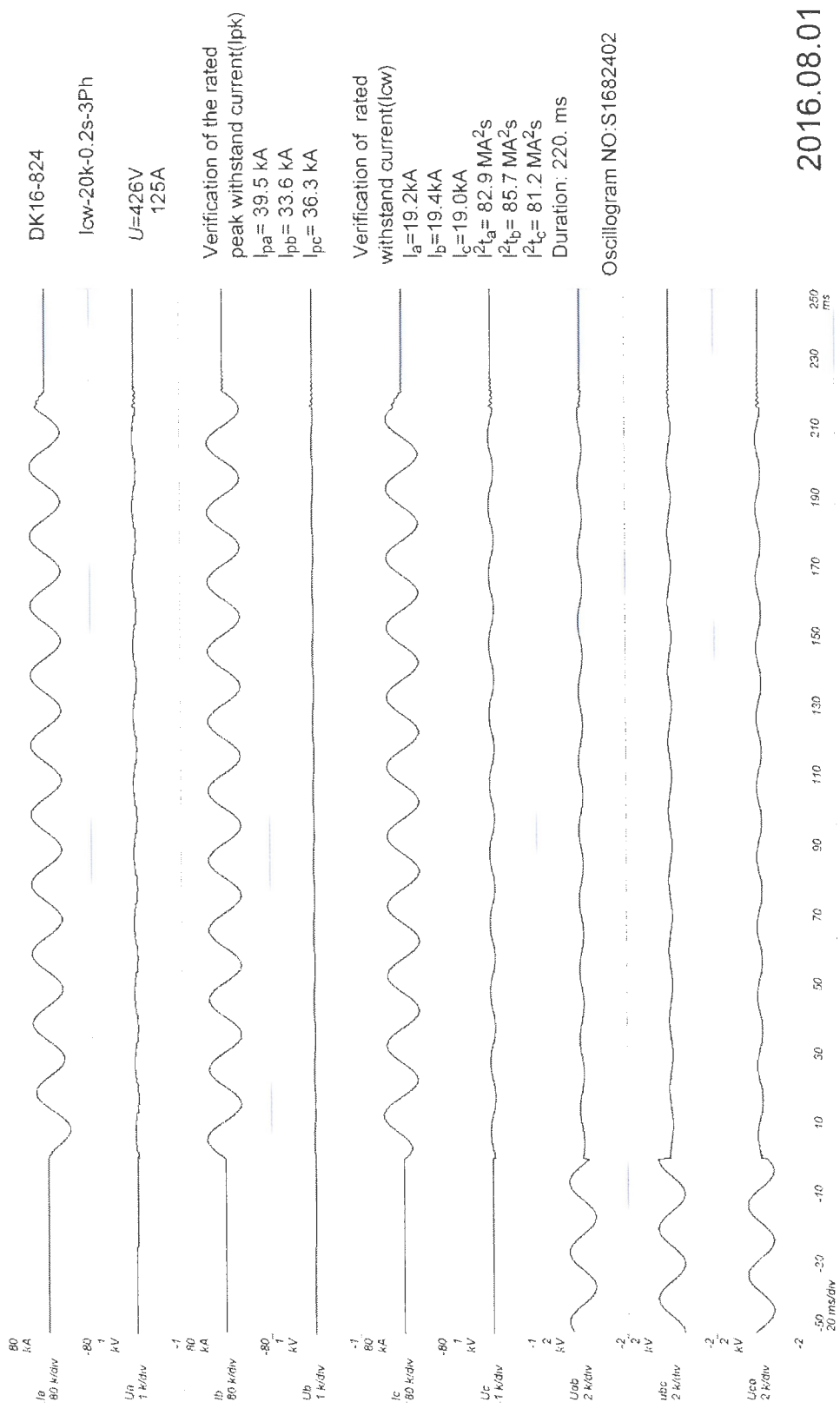
Three phase circuit

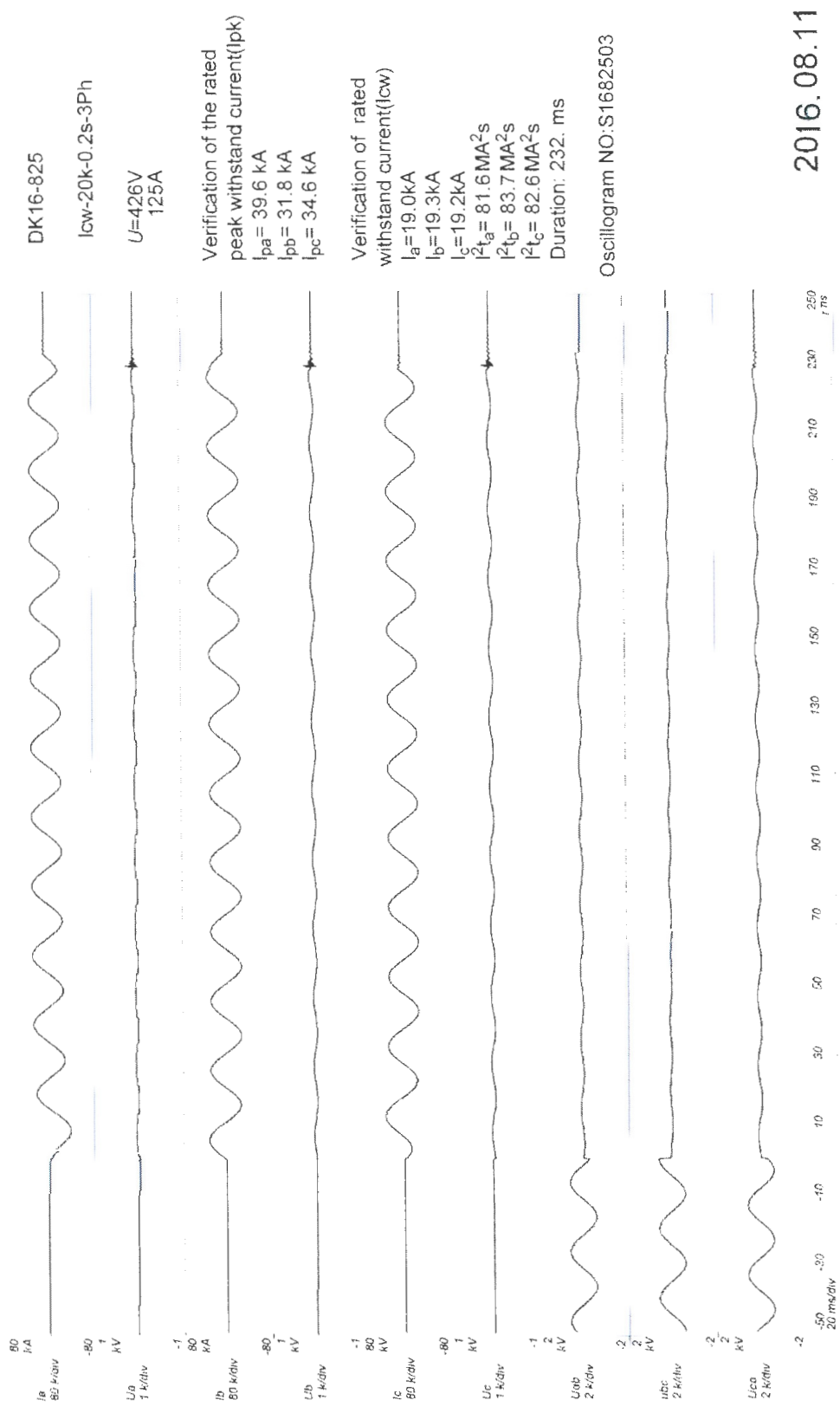


B.3 Oscillograms




The oscillogram of prospective current
DK16-825
Y-20k-3Ph
Uab=426V
Ubc=426V
Uca=427V
Ia=20.4kA
Ib=20.6kA
Ic=20.3kA
Ipa=41.2kA
Ipb=33.0kA
Ipc=37.3kA
cosφ=0.28
Duration: 290. ms
Oscillogram NO:Y1682503
2016.08.11
Ia
Ua
Ib
Ub
Ic
Uc
Uab
ubc
Uca
kA
kV
-80
80
-1
1
-2
2
-50
-25
0
25
50
75
100
125
150
175
200
225
250
275
300
ms
25 ms/div


DK16-824
Icw-20k-0.2s-3Ph
U=426V
125A
Verification of the rated peak withstand current(Ipk)
Ipa= 39.5 kA
Ipb= 33.6 kA
Ipc= 36.3 kA
Verification of rated withstand current(Icw)
Ia=19.2kA
Ib=19.4kA
Ic=19.0kA
I²ta= 82.9 MA²s
I²tb= 85.7 MA²s
I²tc= 81.2 MA²s
Duration: 220. ms
Oscillogram NO:S1682402
2016.08.01
Ia 80 kA/div
Un 1 kV/div
Ib 80 kA/div
Ub 1 kV/div
Ic 80 kA/div
Uc 1 kV/div
Uab 2 kV/div
ubc 2 kV/div
Uca 2 kV/div
20 ms/div
ms


DK16-825
Icw-20k-0.2s-3Ph
U=426V
125A
Verification of the rated
peak withstand current(Ipk)
Ipa= 39.6 kA
Ipb= 31.8 kA
Ipc= 34.6 kA
Verification of rated
withstand current(Icw)
Ia=19.0kA
Ib=19.3kA
Ic=19.2kA
I2ta= 81.6MA2s
I2tb= 83.7MA2s
I2tc= 82.6MA2s
Duration: 232. ms
Oscillogram NO:S1682503
2016.08.11
Ia
Ib
Ic
Ua
Ub
Uc
Uab
Ubc
Uca
20 ms/div
t ms

B.4 Photos of short-circuit withstand tests

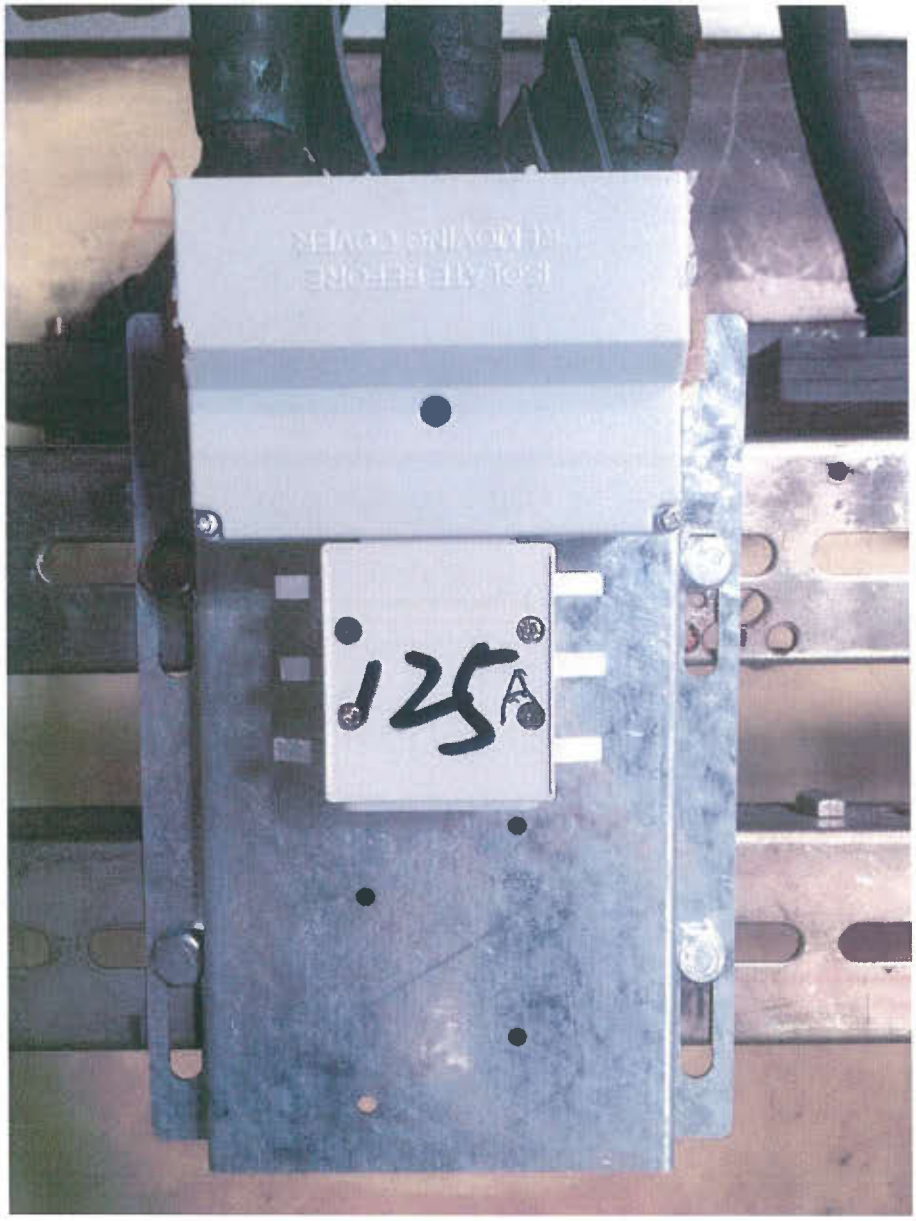


Photo 6: Before I_{cw} test of BP1-125 6W

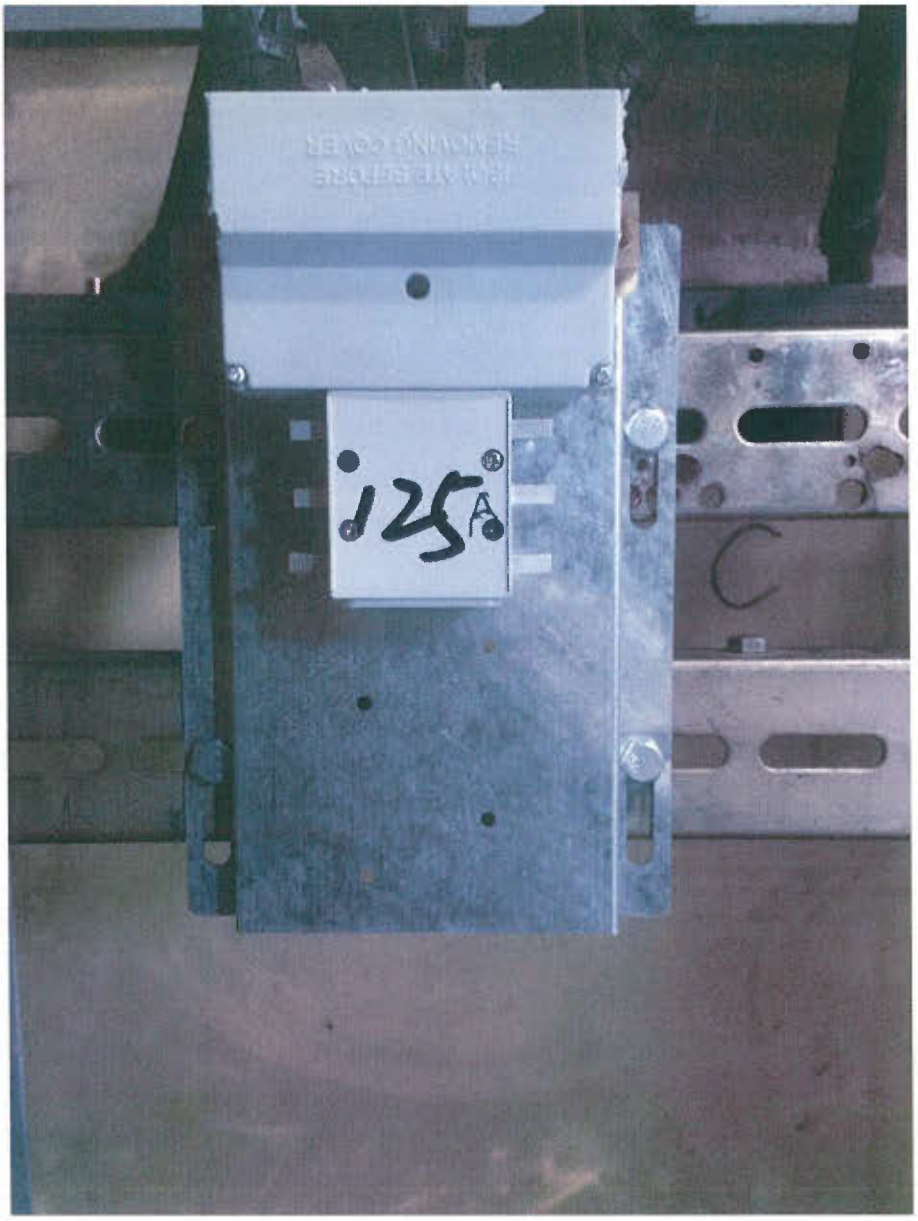


Photo 7: After I_{cw} test of BP1-125 6W

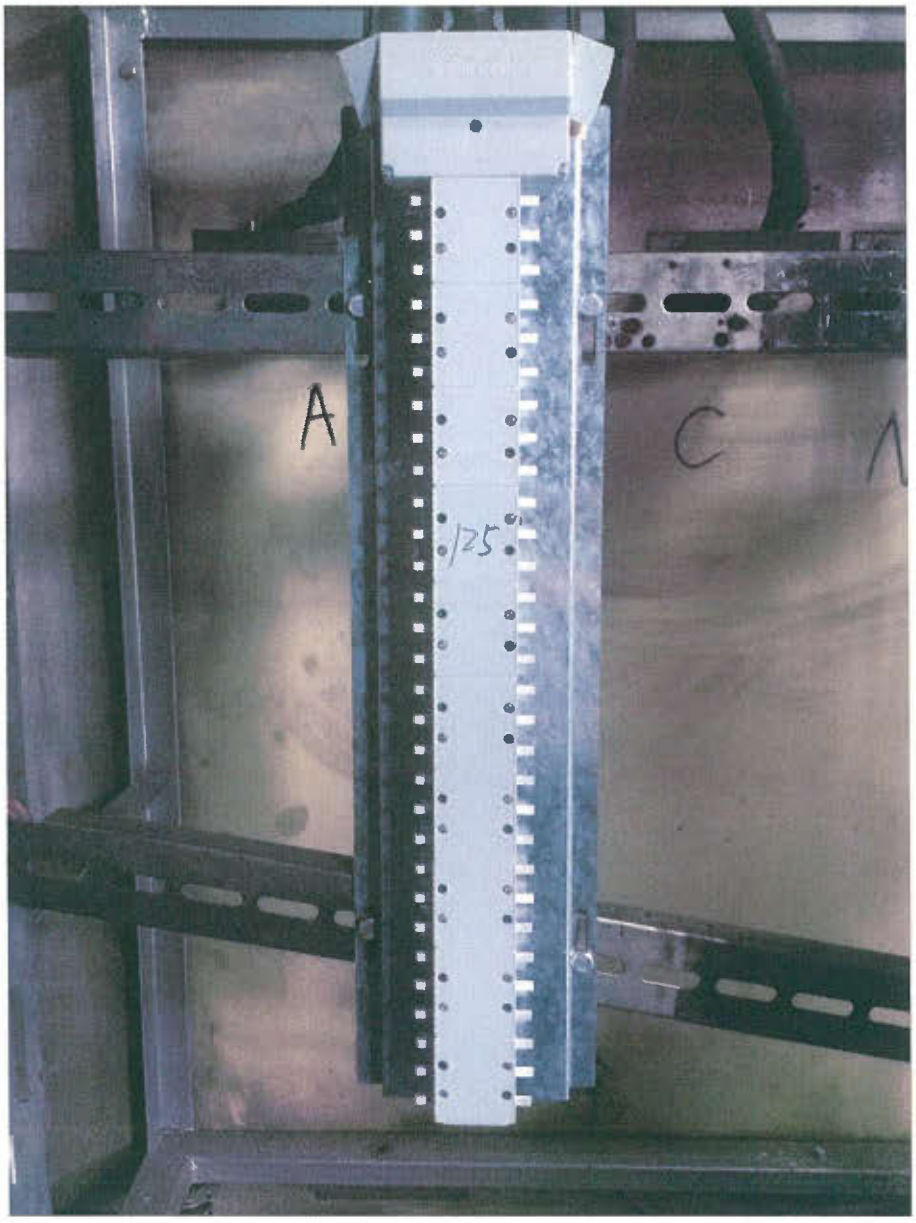


Photo 8: Before I_{cw} test of BP1-125 60W

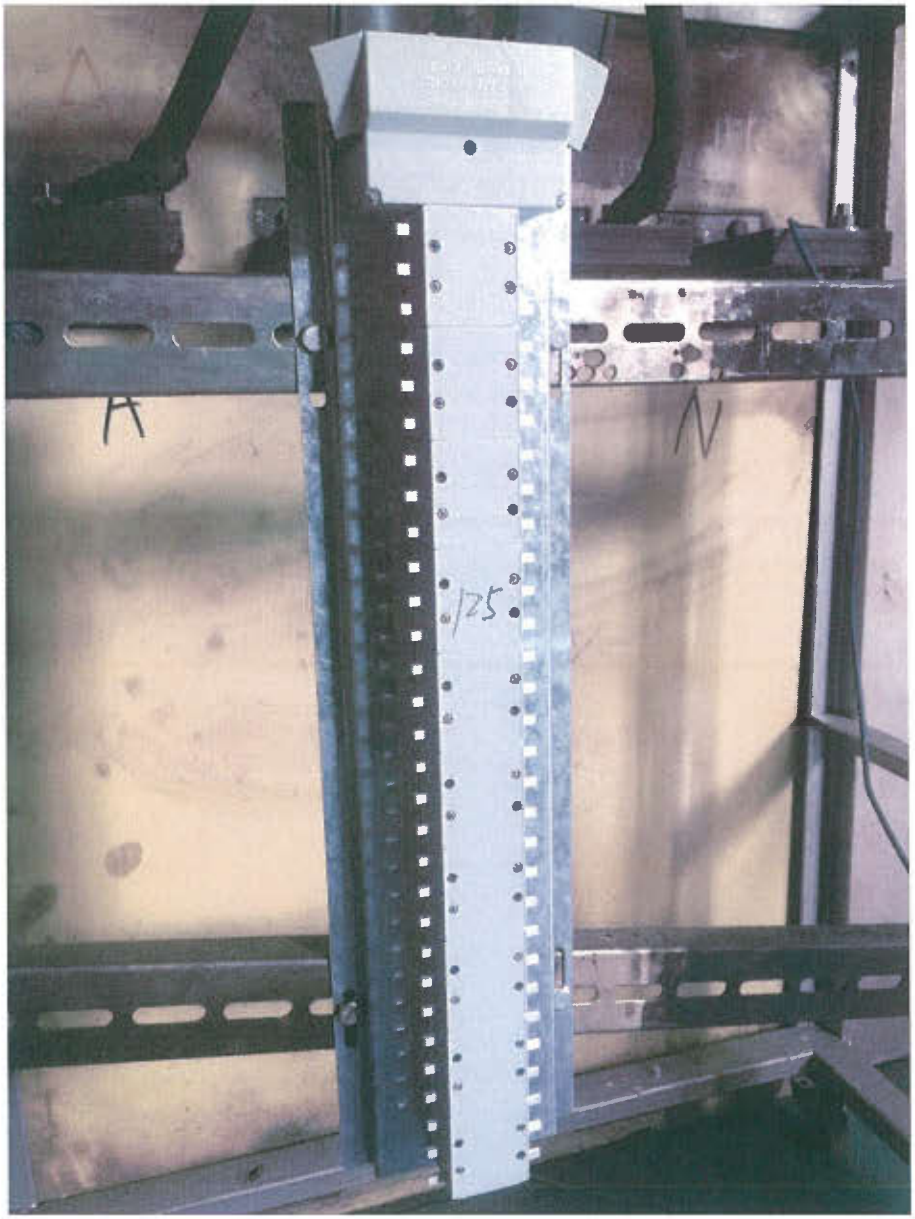
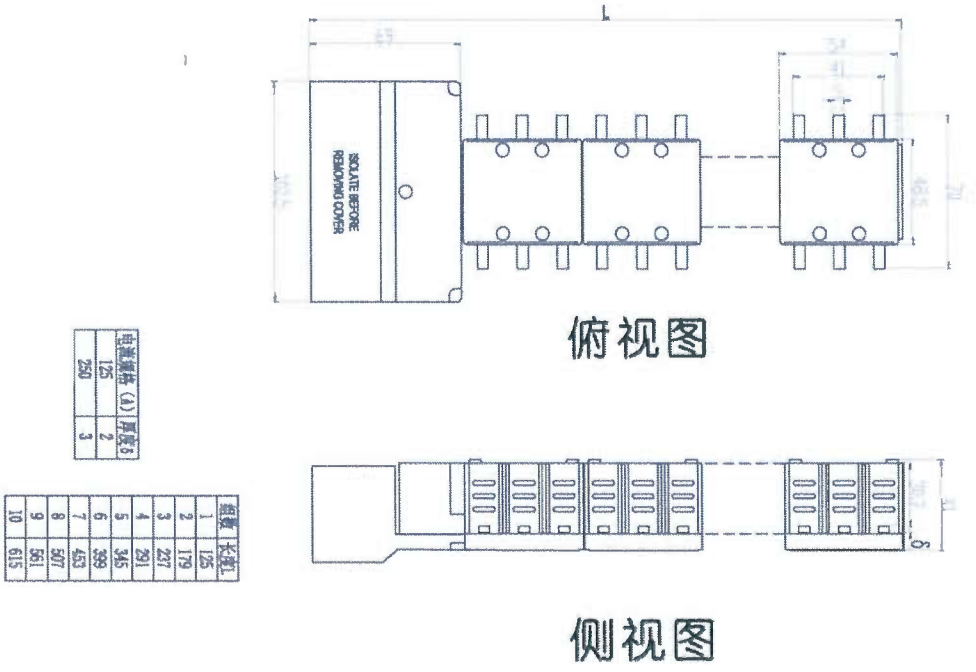


Photo 9: After I_{cw} test of BP1-125 60W

Appendix C Product information

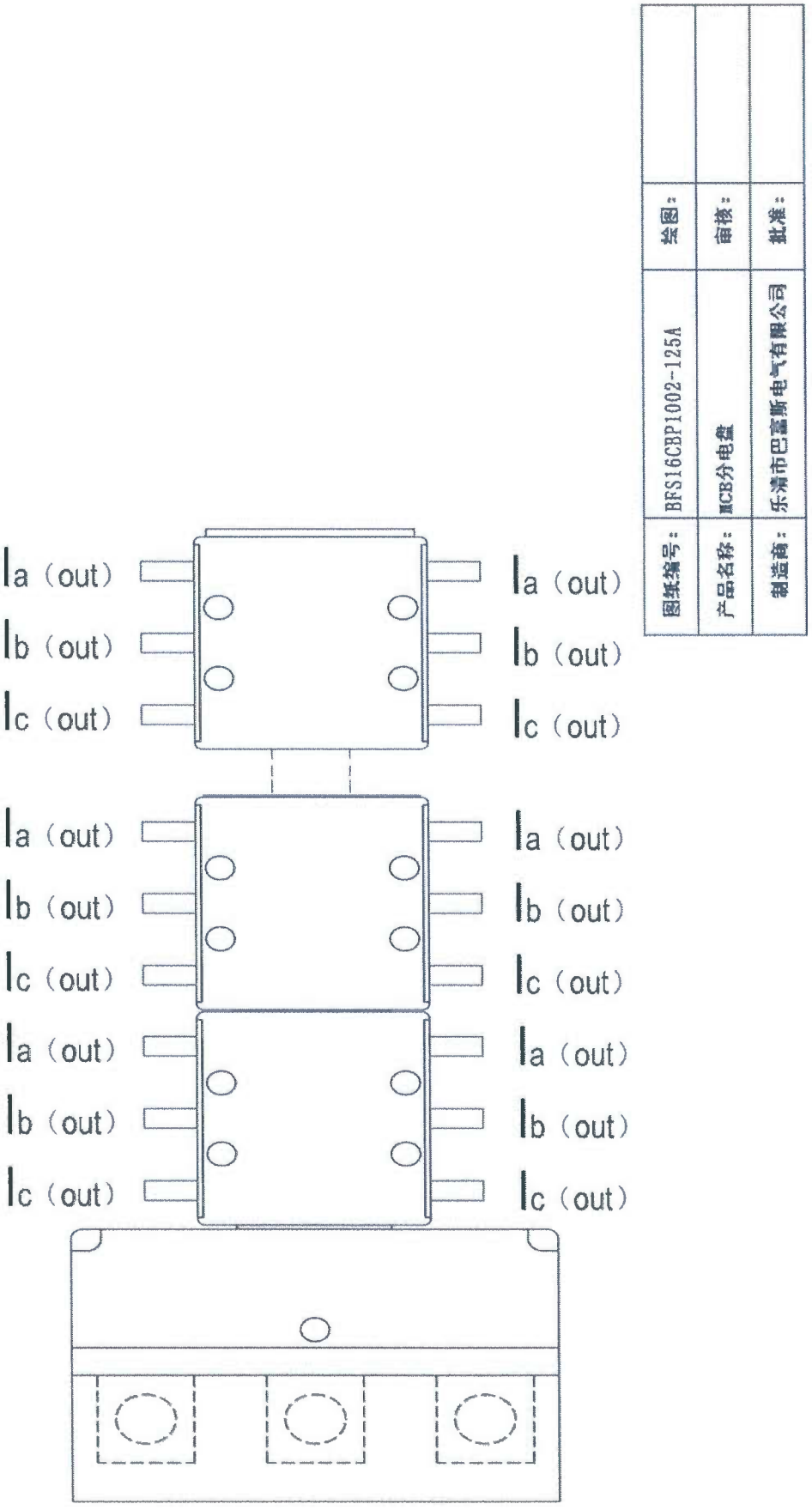
C.1 Drawings



电流规格 (A)	厚度δ
125	2
250	3

组数	长度L
1	125
2	179
3	227
4	291
5	345
6	399
7	453
8	507
9	561
10	615

图纸编号：	BFS16CBP1001-125A	绘图：	
产品名称：	MCB分电盘	审核：	
制造商：	乐清市巴富斯电气有限公司	批准：	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BFS16CBP1002-125A
产品名称：
MCB分电盘
制造商：
乐清市巴富斯电气有限公司
绘图：
审核：
批准：
Ia（out）
Ib（out）
Ic（out）
Ia（out）
Ib（out）
Ic（out）
Ia（out）
Ib（out）
Ic（out）
Ia（out）
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Ia（out）
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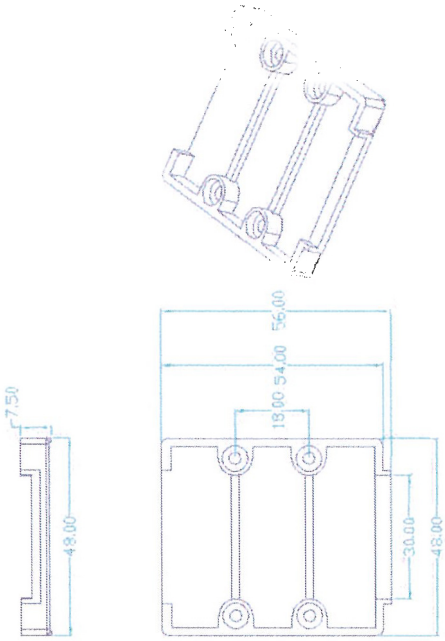

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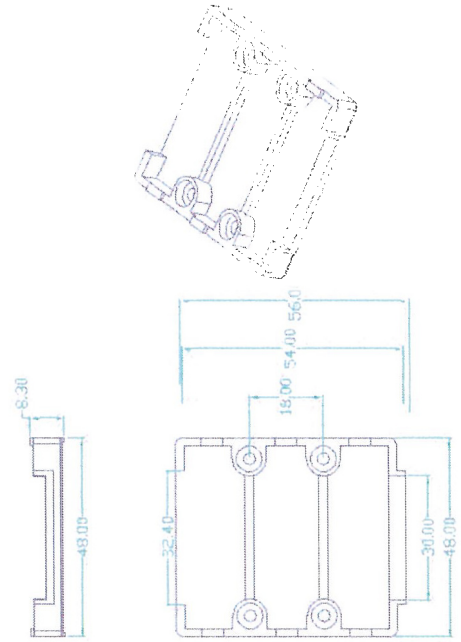
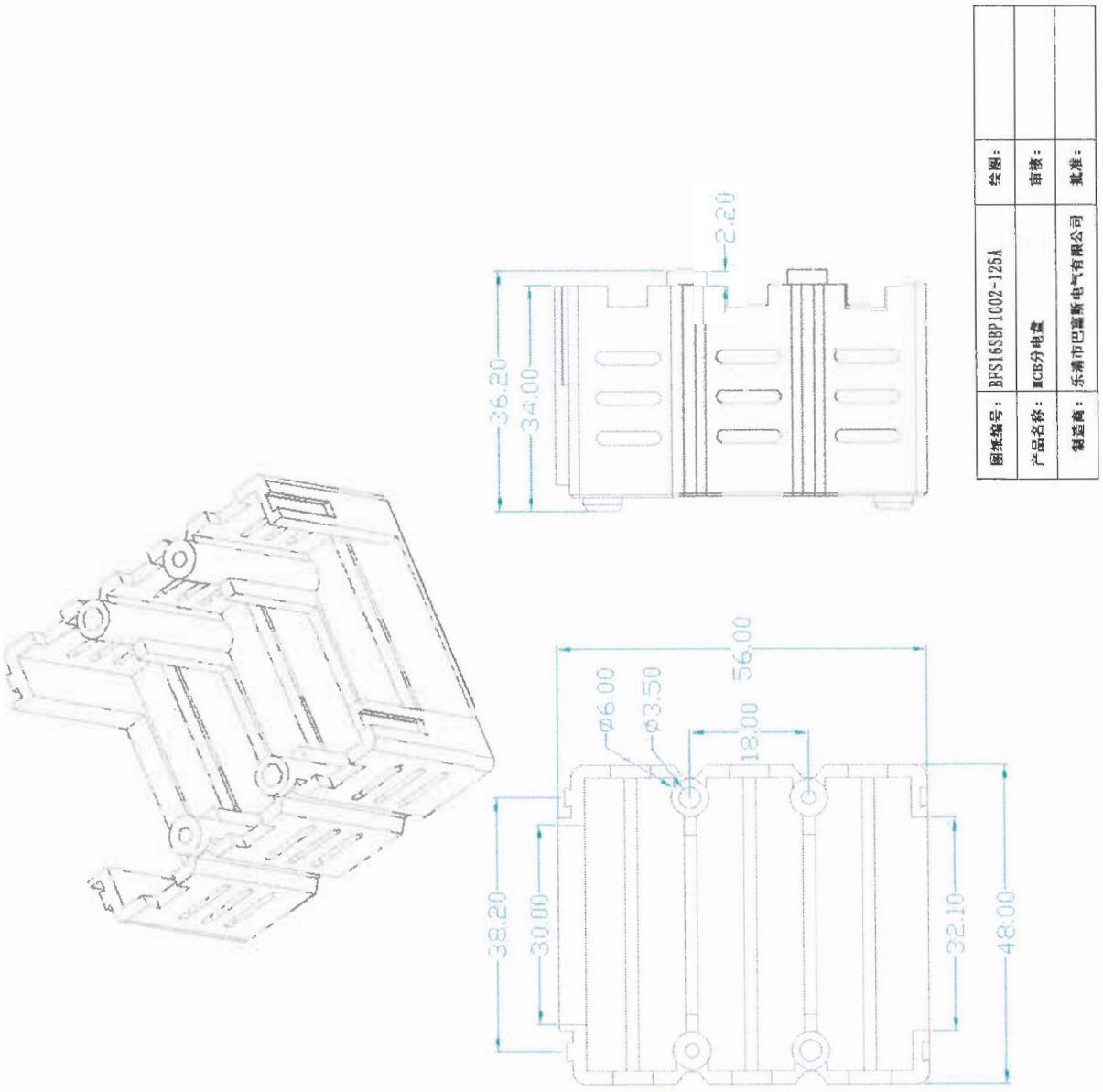
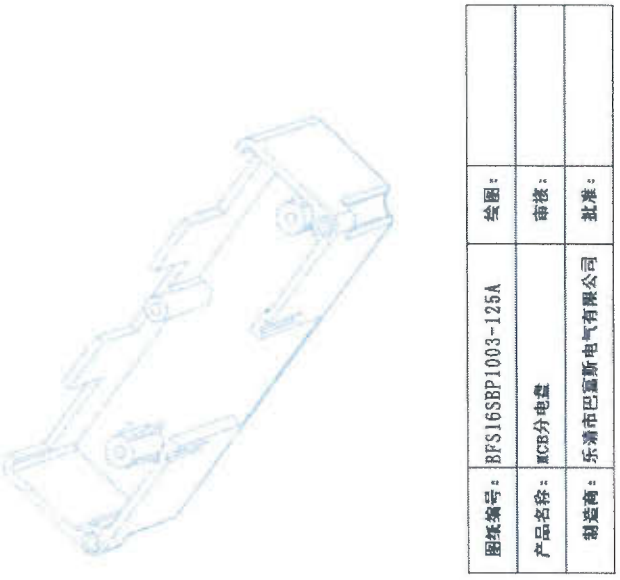
产品名称：	MCB分电盘	审核：	
制造商：	乐清市巴雷斯电气有限公司	批准：	




2.20
36.20
34.00
Ø6.00
Ø3.50
56.00
18.00
38.20
30.00
32.10
48.00
图纸编号: BFS16SBP1002-125A
产品名称: MCB分电盘
制造商: 乐清市巴雷斯电气有限公司
绘图:
审核:
批准:



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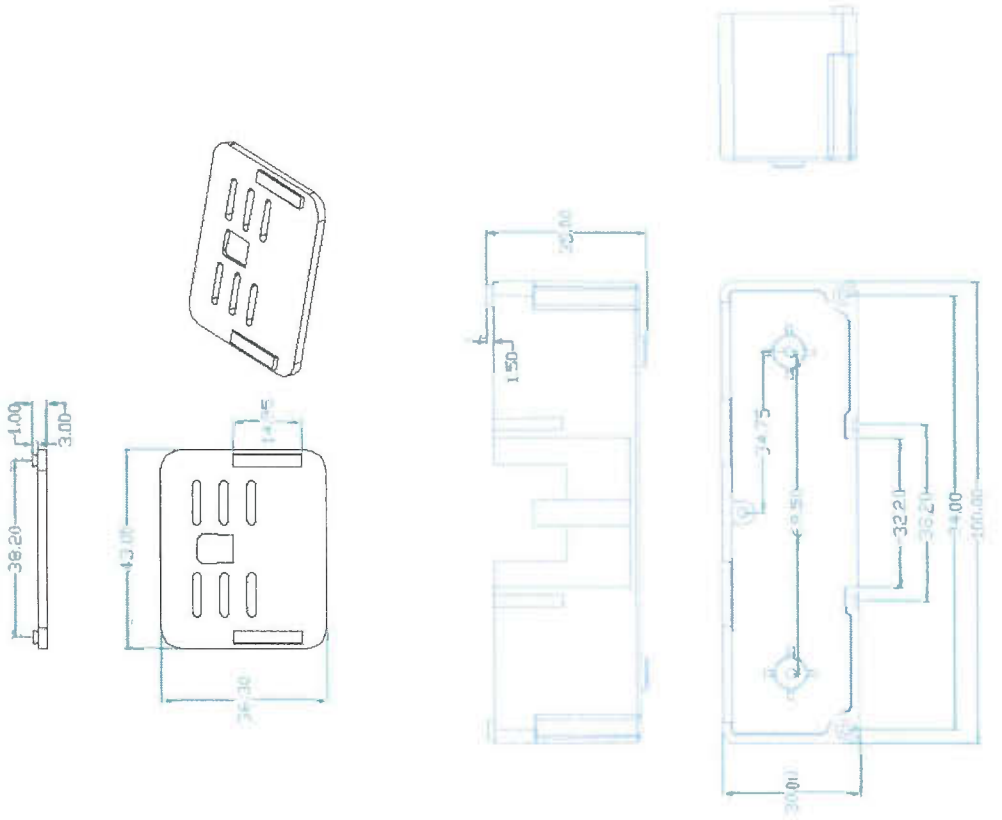
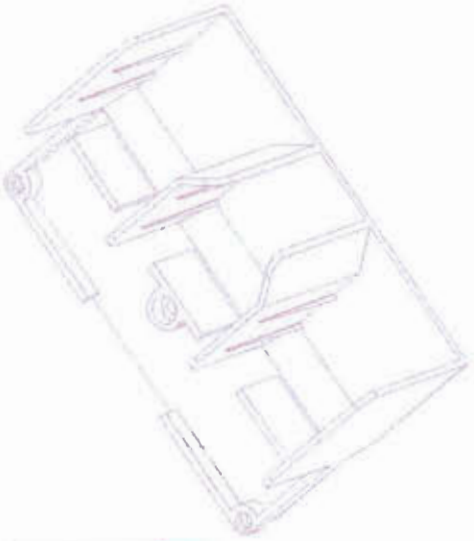
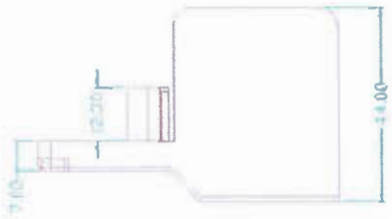
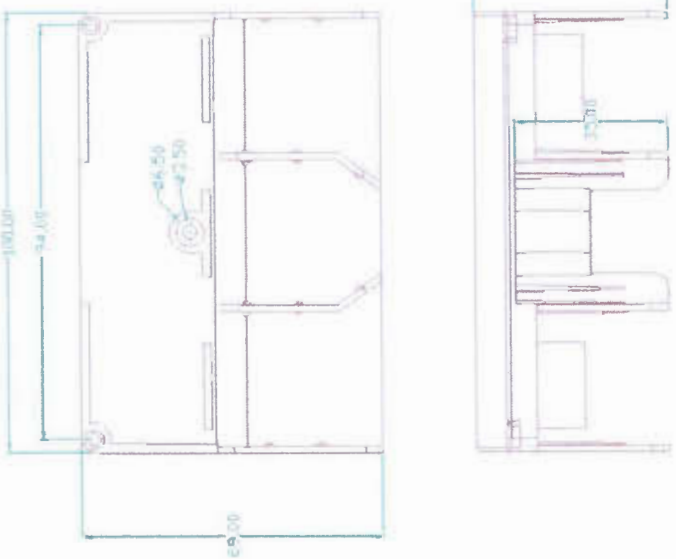
产品名称：	MCB分电盘	审核：	
制造商：	乐清市巴富斯电气有限公司	批准：	

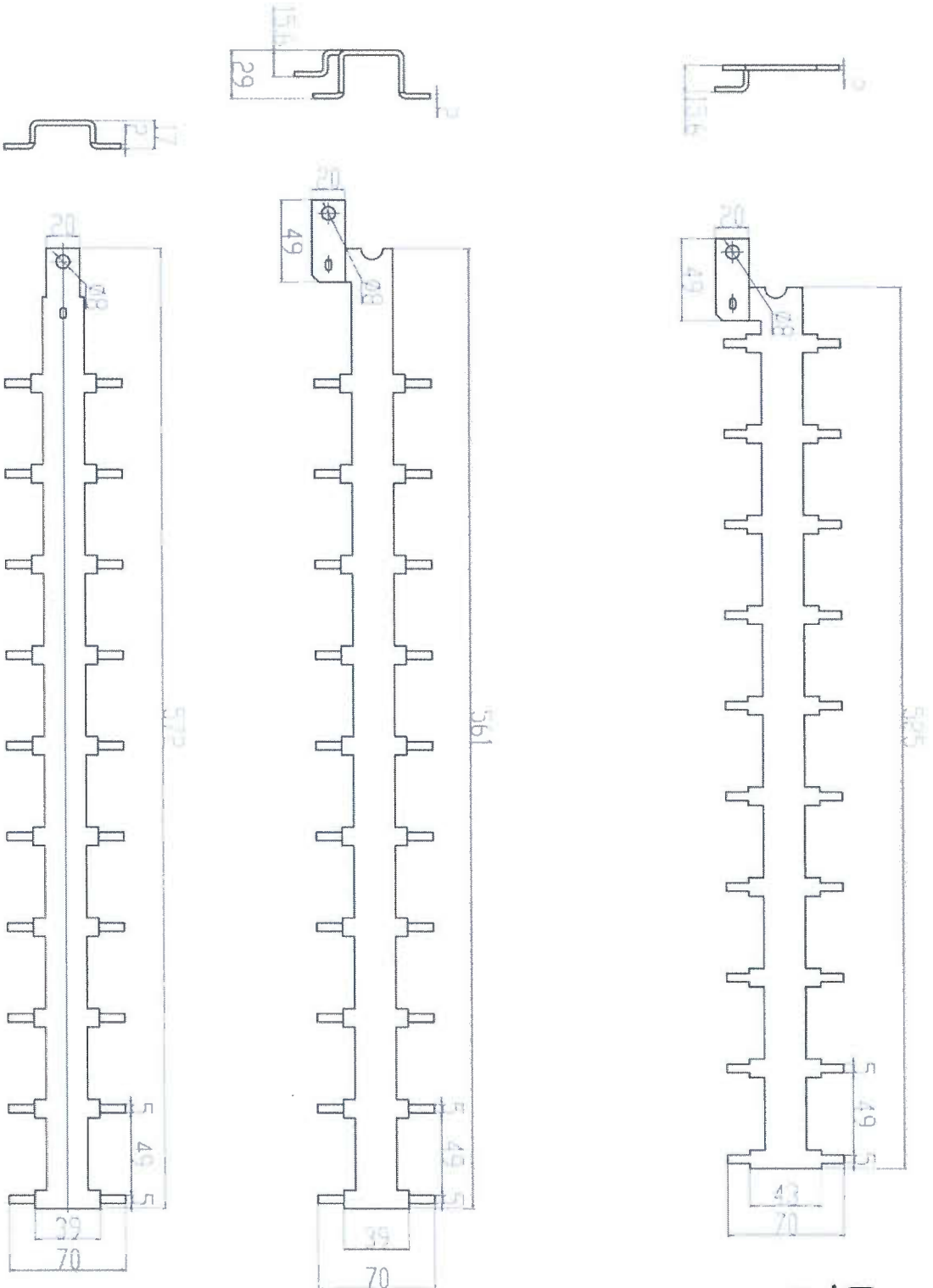




图纸编号：	BFS16SBP1004-125A	绘图：	
产品名称：	MCB分电盘	审核：	
制造商：	乐清市巴富斯电气有限公司	批准：	

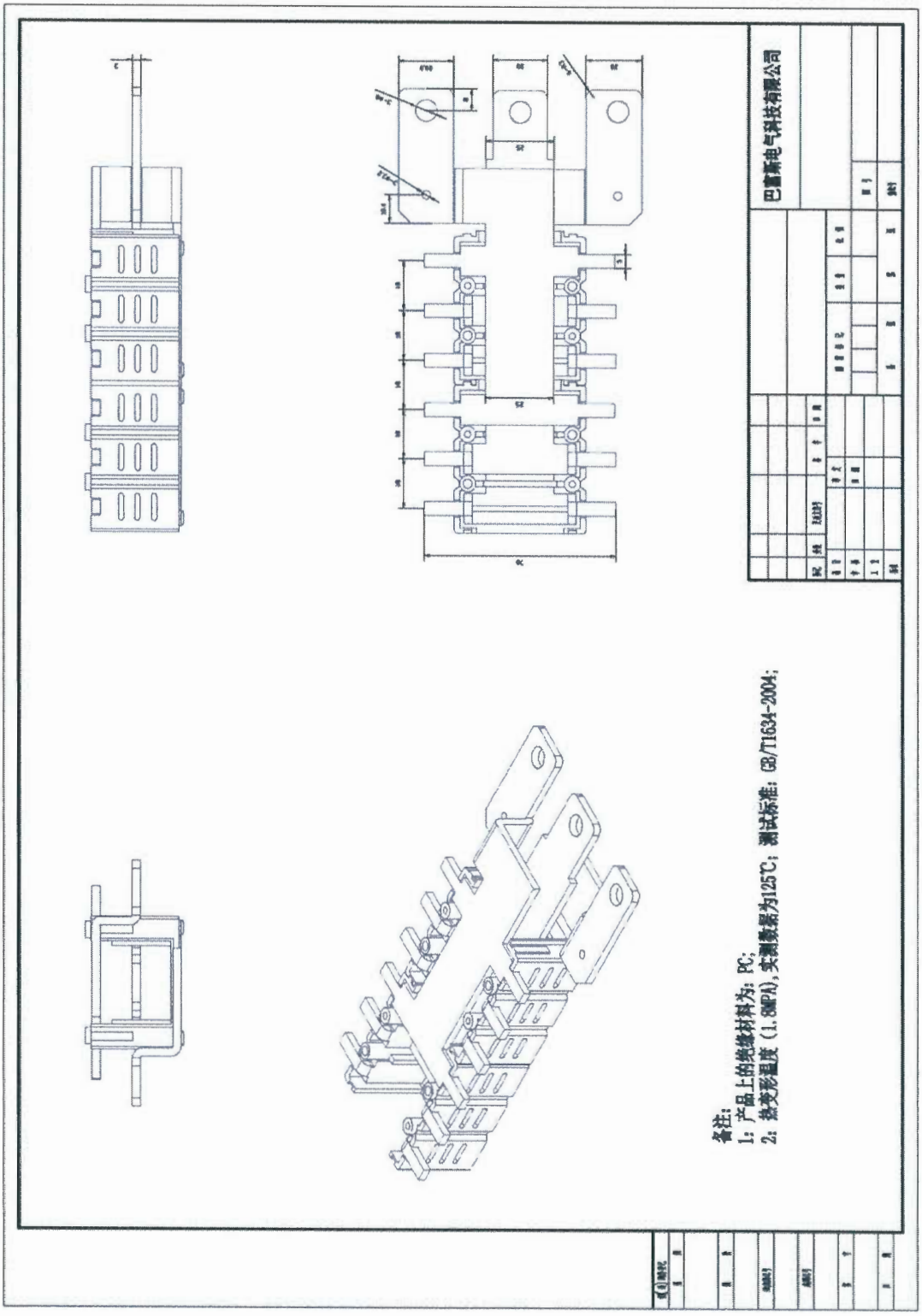






A相 B相 C相

图纸编号：	BFS16SBP1005-125A	绘图：	
产品名称：	MCB分电盘	审核：	
制造商：	乐清市巴富斯电气有限公司	批准：	


巴雷斯电气科技有限公司
备注:
1: 产品上的绝缘材料为: PC;
2: 热变形温度 (1.8MPA), 实测数据为125℃; 测试标准: GB/T1634-2004;