



Q/CSG1205019-2018

1

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4

5

6

7

8

9

10

11 GIS HGIS GIL

12

13

14

15

16

17

18

19

20

21

22 1KV

23 1KV

24

A

B

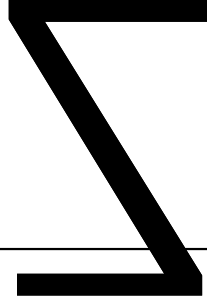
SF₆

C





*ZJ f)^p T8rv," ¶



3

3.1

3.2

3.3



3.4

3.5



3.13

3.14

	Symbol				
	U_n				
	U_m				
	U_o/U	(U_o		U
)				
	U_{mA}	l	mA		
	\tan				
	<i>RTV</i>			Room temperature vulcanized silicone rubber	
anti-pollution coating		RTV	DL/T 627	RTV-	RTV-
4					

4.1

4.2

4.3

4.4

4.5

4.6

4.7

4.8



2mA

1

	V	V	M
1	<100	250	50
2	<500	500	100
3	<3000	1000	2000
4	<10000	2500	10000
5	10000	2500 5000	10000

4. 20

2

2

kV	110 66	220	500
h	24	48	72

4. 21

1

2

3

4

5

5

5. 1

3

1			1 a b	pH >5. 4	



3

2

1

5

2

3

4 2500V

1min

1

70%

10000M

20

2

K	5	10	15	20	25	30	35	40	45	50	55	60
A	1.2	1.5	1.8	2.3	2.8	3.4	4.1	5.1	6.2	7.5	9.2	11.2

a

K

20

b

3

A

$$A = 1.5^{K/10}$$

1

20

6

20

$$R_{20} = AR_t$$

2

20

$$R_{20} = R_t/A$$

3

R_{20}

20

M

R_t

M

4

35kV

4000kVA

1.3

R_{60}

3000M

20

5

220kV

120MVA

5000V

00



3

$$t = 120 \times \frac{f_N}{f_s}$$

4 100pC 66kV 1.5Um/ 3 66kV 300pC 15s

5 110kV

11

n

1 2

12

kV	
110kV	60± 5%
220kV	102± 5%

13

1 10000M
2 1000M 1000M
tan 2%

1

1 10 tan

tan

20kV

2

tan %

14

tan %
0.4
0.5
1.0 35kV 1.5
0.5
0.5
1.5
0.5
0.5

3

30%

r

tan

2

± 5%

3

1000M

tan

2%



			500kV 220kV 2 mg/L 3 kV	10 H ₂ 10 H ₂ 35 110kV	10 C ₂ H ₂ 30 C ₂ H ₂ 45 110kV	0.1 0.1 40
20			1 2	20mi n		
21						
22			1 2 3	1M	/	
23			1 2 3 4 5	1 M	/	
24			1 DL/T 540 2 3 4	1M	/	
25			1 2 3 4	1M	/	
26			1 2 3	5mi n	5	5 3
27			1			



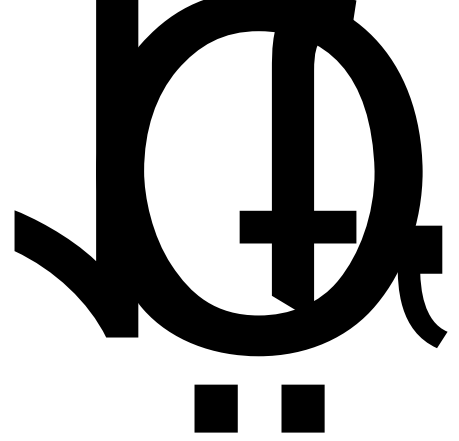
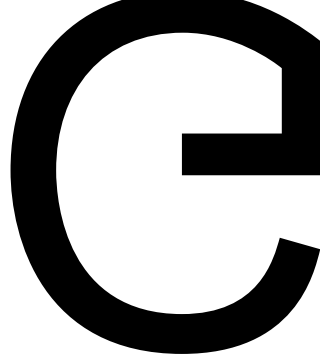
			2		
28			<p>GB/T26218. 2-2010 10. 3</p> <p>a P2-P1 20 mm</p> <p>b S P2 0. 9</p> <p>c S 70 mm</p> <p>d 500kV 4. 7m</p> <p>e 1000m</p> <p>1000-2000m 2000m</p> <p>1. 13 2000-2500m 2500m</p> <p>1. 20 2500-3000m 3000m</p> <p>1. 28 3000m</p> <p>f</p>		
29			<p>Um 40. 5kV 400mm 1000m</p> <p>a) 1000-2000m 2000m</p> <p>1. 13</p> <p>b) 2000-2500m 2500m</p> <p>1. 20</p> <p>c) 2500-3000m 3000m</p> <p>1. 28</p> <p>d) 3000m</p>		
30		CT	<p>1</p> <p>2</p>		
31			<p>1</p> <p>2</p> <p>3</p> <p>4</p>	3°	
32					
33			220kV 110kV		



34

- 1
- 2
- 1

3



35

GB 5273

- 2
- 3
- 4 6.0

36

- 1
- 2
- 3
- 4
- 1

37

4h

- 2

38

- 3

- 4

30

- 1
- 2
- 3
- 4
- 5
- 6
- 7

39



3

			5		
			6		
			7		
			8		
			9 500kV	240NVA	
			10		

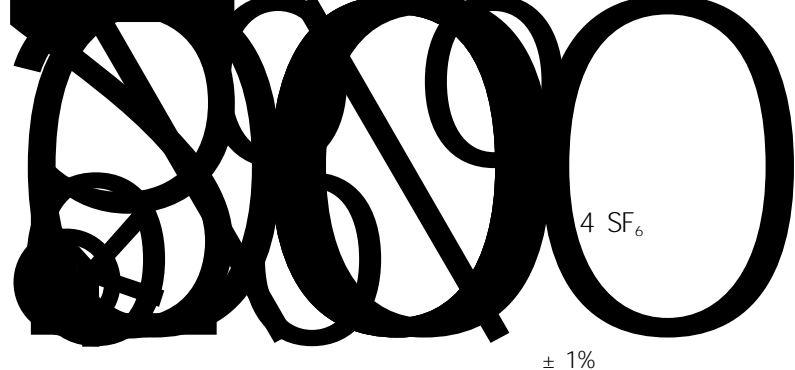
5. 2 SF₆

4 SF₆

1 SF₆ SF₆ SF₆ 20 SF₆ 250μ L/L SF₆

2 SF₆





4 SF₆

± 1%

6

1
2

1

7

4

2



4 SF₆

tan

K	5	10	15	20	25	30	35	40	45	50
A	1.15	1.3	1.5	1.7	1.9	2.2	2.5			





4 SF₆



4 SF₆

			2 3 4 5	1M	500V 1000V
24			1 2		
25			a b c d e f	GB/T26218. 2-2010 10.3 P2-P1 20 mm S P2 0.9 S 70 mm 500kV 4.7m 1000m 1000-2000m 2000m 1.13 2000-2500m 2500m 1.20 2500-3000m 3000m 1.28 3000m	
26			Um a) 1.13 b) 1.20 c) 1.28 d)	40.5kV 400mm 1000m 1000-2000m 2000m 2000-2500m 2500m 2500-3000m 3000m 3000m	
27		CT			
28					
29				220kV 110kV	
30			1 2		



4 SF₆

1

GB 5273

31

2

3

4 6.0

32

33

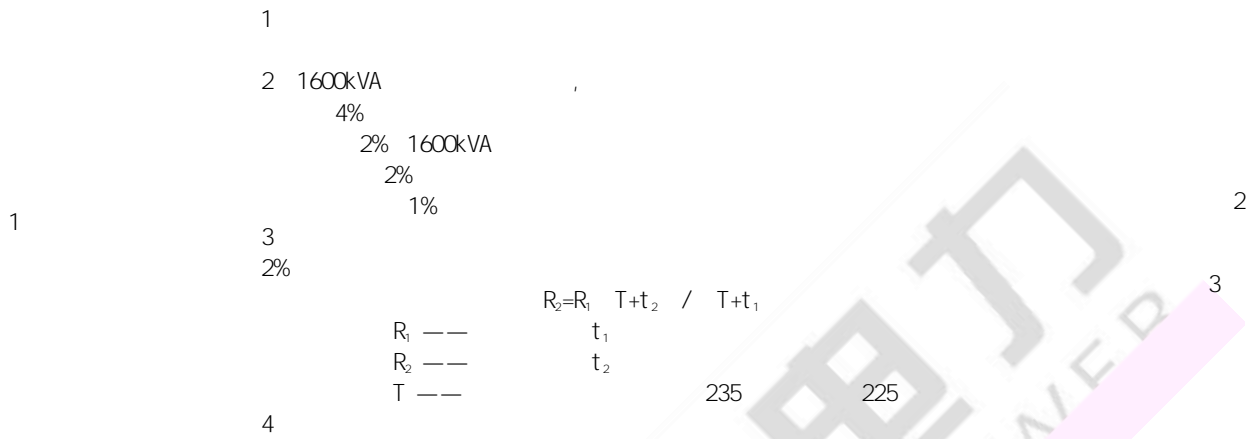
É





5.3

5



5

3

a

K

20

A

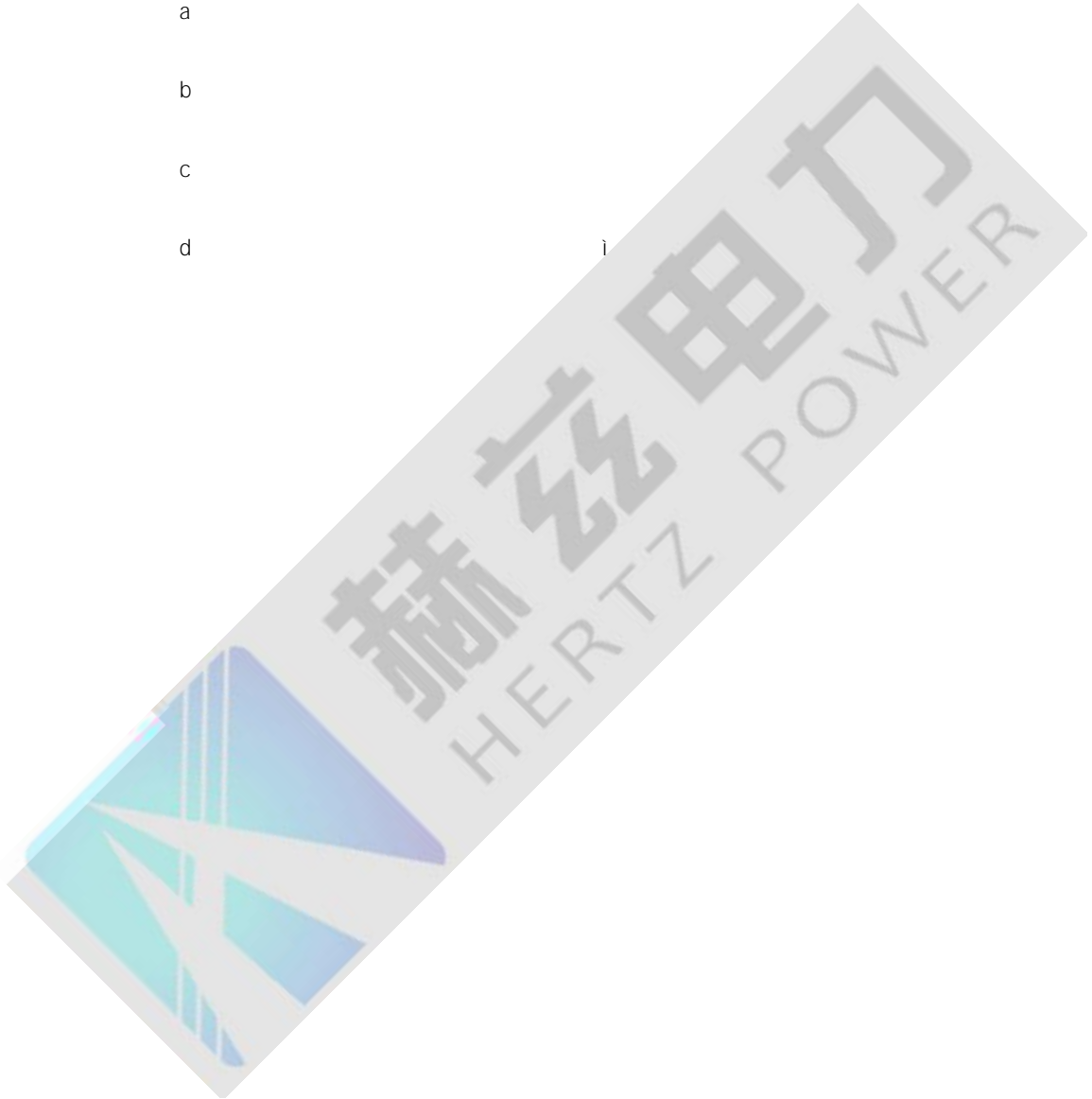
$$A = 1.5^{K/10}$$

1



5

- b 10%
- 3
- 4
- a
- b
- c
- d i



GB/T26218.2-2010 10.3

a P2-P1 20 mm
b S



5

21			1 2 3 4 5 6 7 8 9 10	/	

6

6.1 500kV

6 500kV

1			1 a b pH >5.4 c mgKOH/g 0.03 d 135 e mg/L 10 f 25 , mV/m 40 g tan 90 % 0.5 0.7 h kV 65 i 90 ·m 6×10^{10} j % 1.0 k % 0.02 l 100mL 5μ m 2000 2 3 a 72h 24h 24h b DL/T 722 c μ L/L 10 H ₂ 10 C ₂ H ₂ 0.1		
2			1 2 2% 2% $R_2=R_1 \quad T+t_2 / T+t_1$		1

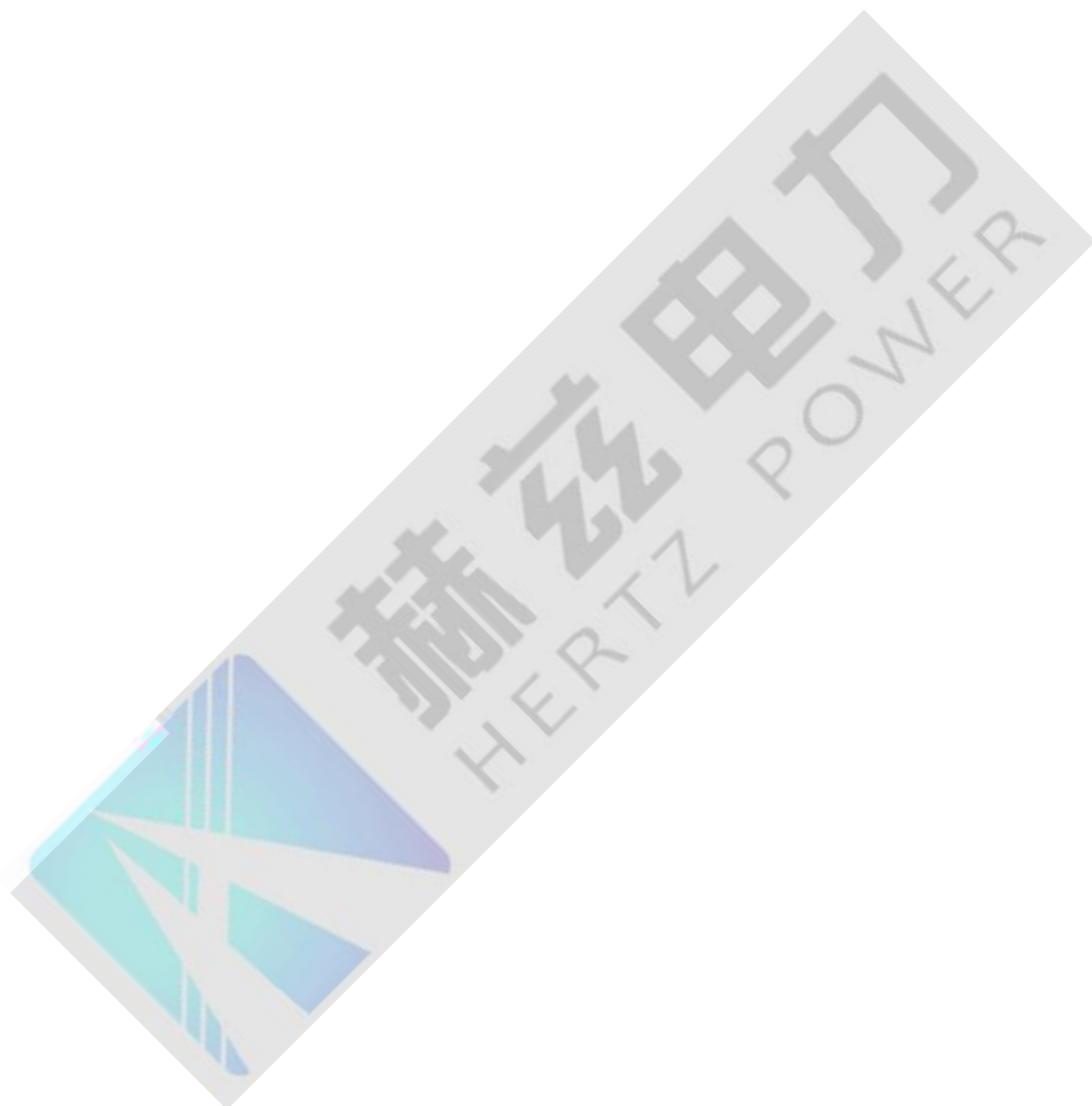
6 500kV

R_1 — t_1



6 500kV

K 5 10 15 20 25 3



6 500kV

1

2

9

3

4

5

2500V

1m n

1

a

1000M

b

2

a

b

10%

3

4

a

10

b

c

i

d

4.5kV



6 500kV

			2		/	
13			1 2 3 4 5 6 7	1M	3°	/
14			1 2 3 4	1M		/
15				500kV DL/T 264 0.035MPa		
			24h			
16			5	5min		
17					65° C	24h
18					100μ m	24h
19			1 2			
20				GB/T26218.2-2010 10.3 a P2-P1 20 mm		

6 500kV

b S P2 0.9
c S 70 mm
d 500kV 4.7m
e 1000m
1000-2000m 2000m
1.13 2000-2500m 2500m
1.20 2500-3000m 3000m
1.28 3000m

f
1 3°

21

2
3

22

1

23

2

24

P1/4

1
2
1

25

2
3
4 6.0

26

Ù A€ Õ

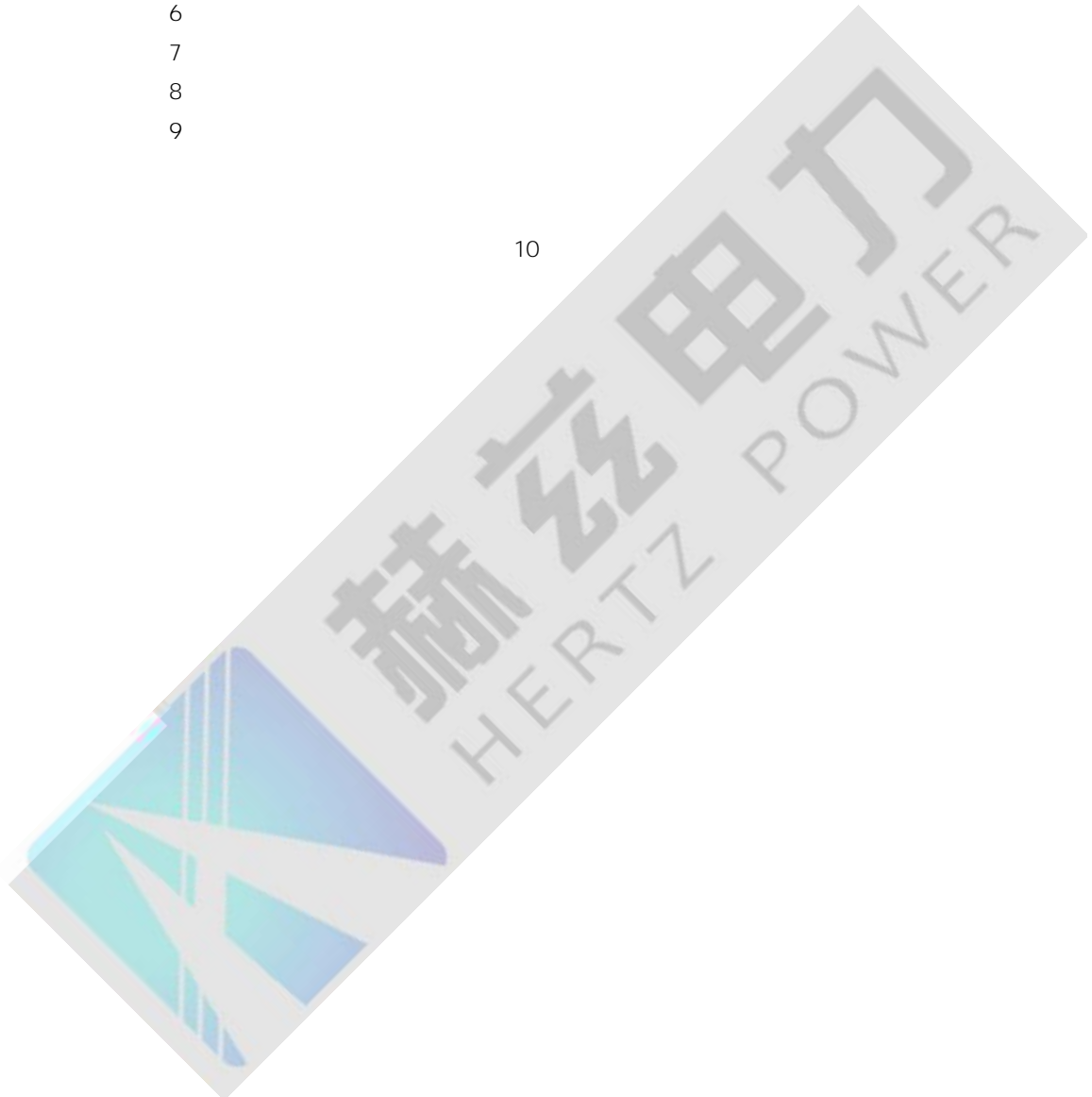
1
2 è è



6 500kV

3
4
5
6
7
8
9

10





7 35kV



i

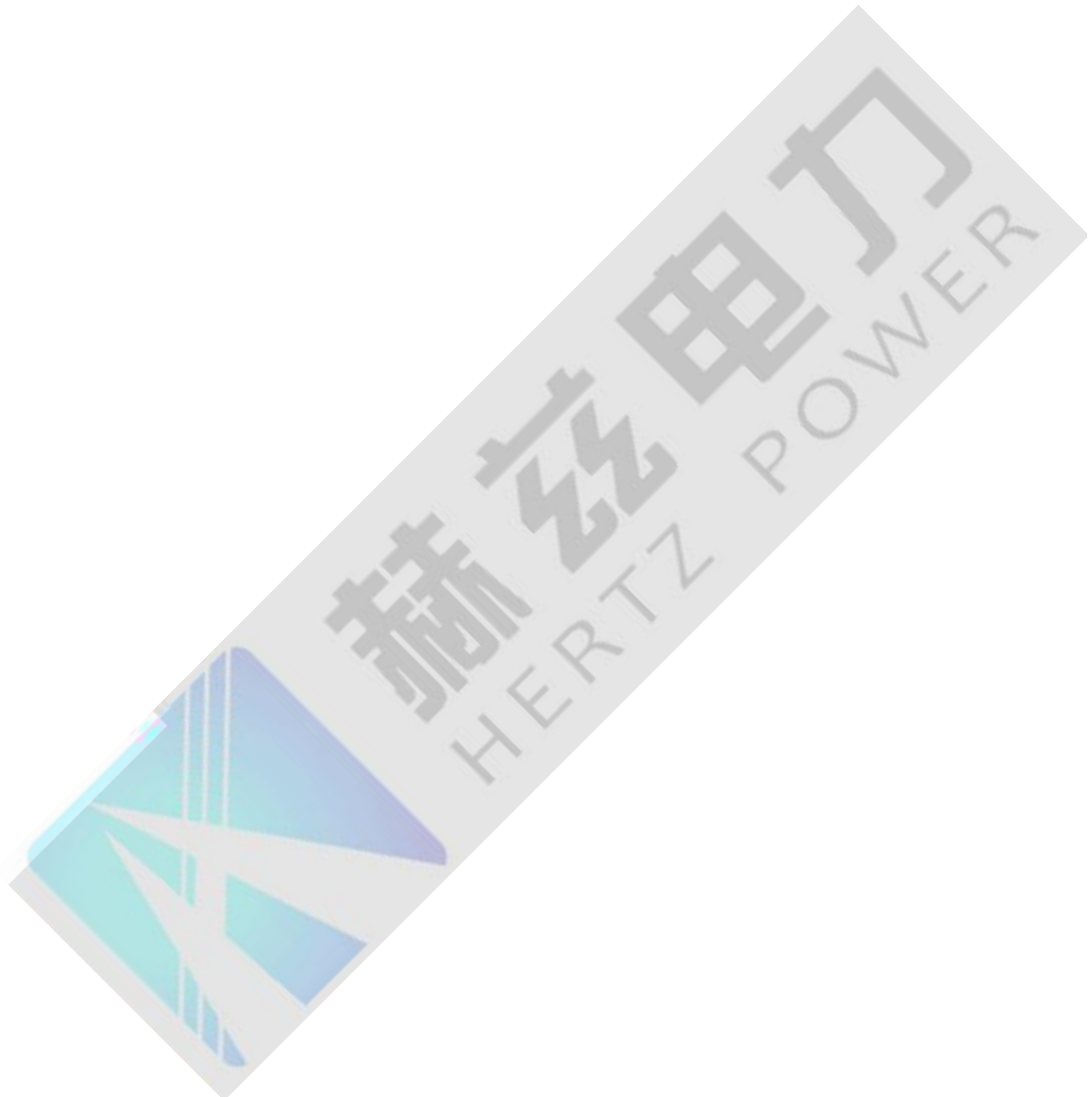
90

.m

V



7 35kV



7 35kV

2 /
3 1M
4

12 1
2 1M
3

13

14 1 5
5min
2

15 1 3°
2
3 °



7 35kV

			4 6.0		
22			1 2 3		
23			1 2 3 4		
24					
25			1 2 3 4 5 6 7 8 9 10	10	80% 2-5mm
26					/
27			1 2 3 4 5 6		/

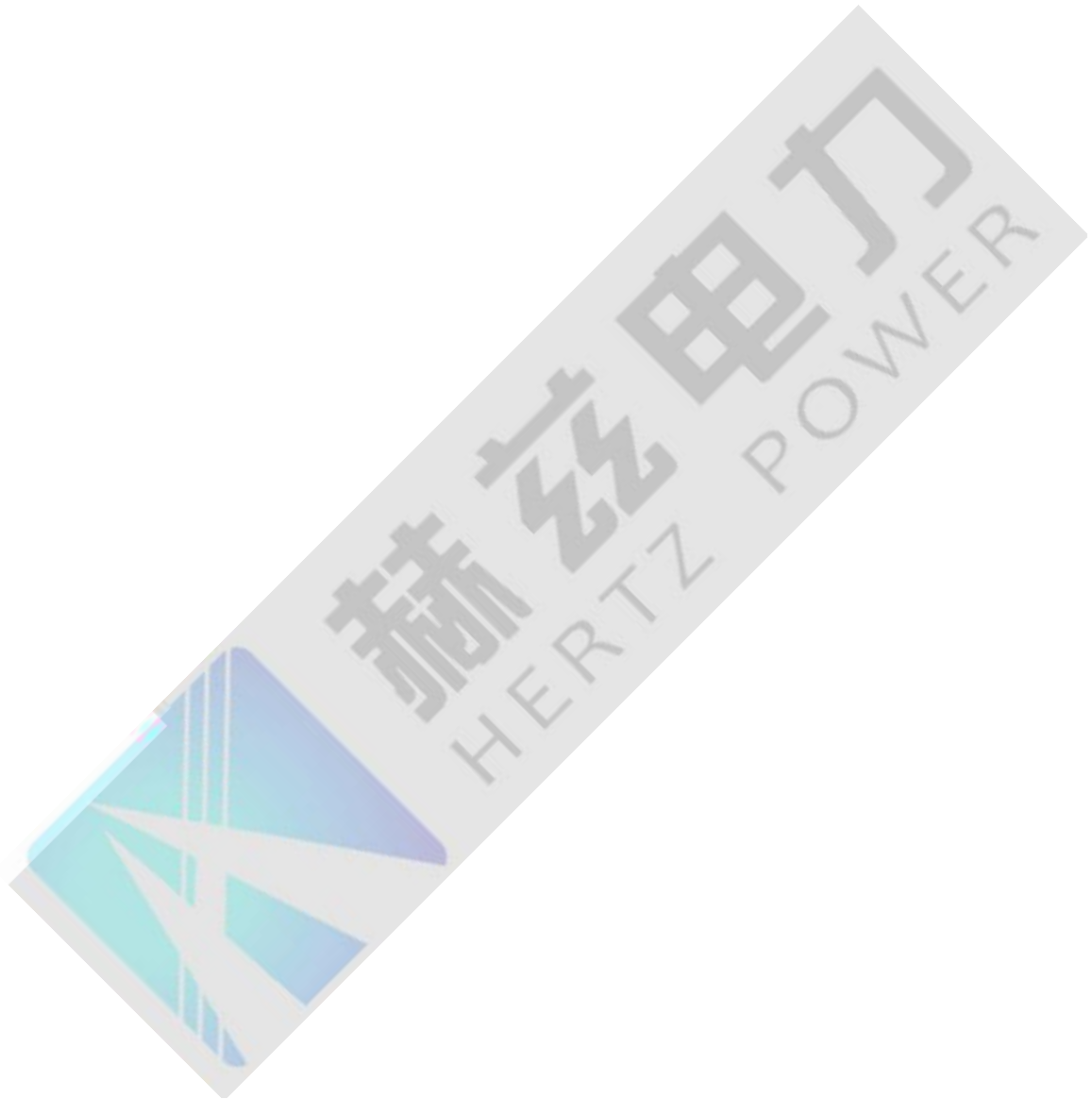
7 35kV

			7		
			8		
			9		

6.3 35kV

8 35kV

1			<p>1 1%</p> <p>2 1%</p> $R_2 = R_1 \frac{T+t_2}{T+t_1}$ <p> R_1 t_1 R_2 t_2 T— 235 225 </p>						
2			± 5%						
3			<p>1 1min</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">kV</td> <td style="text-align: center;">kV</td> </tr> <tr> <td style="text-align: center;">128</td> <td style="text-align: center;">96</td> </tr> </table> <p>2 100kHz 3000</p> <p>3</p> <p>4 20%</p> <p>5 5%</p> <p>6</p>	kV	kV	128	96		
kV	kV								
128	96								
4			5min	5					
5									
6			1						



8 35k

			8 9 10 11 35k	F SF ₆	C2



1 tan 10kV tan %

tan % 20

kV	20 35	66 110	220	500
	2.5	0.8	0.6	0.5
	2			

20kV

2 0.5 1

3

$U_m/\sqrt{3}$

U_m

tan

tan

0.2%

0.5%

3

tan

4

5%

5

tan

2%

tan

1000M

2kV

1

80%

2

2

66kV

110kV

4

3

2kV

2500V

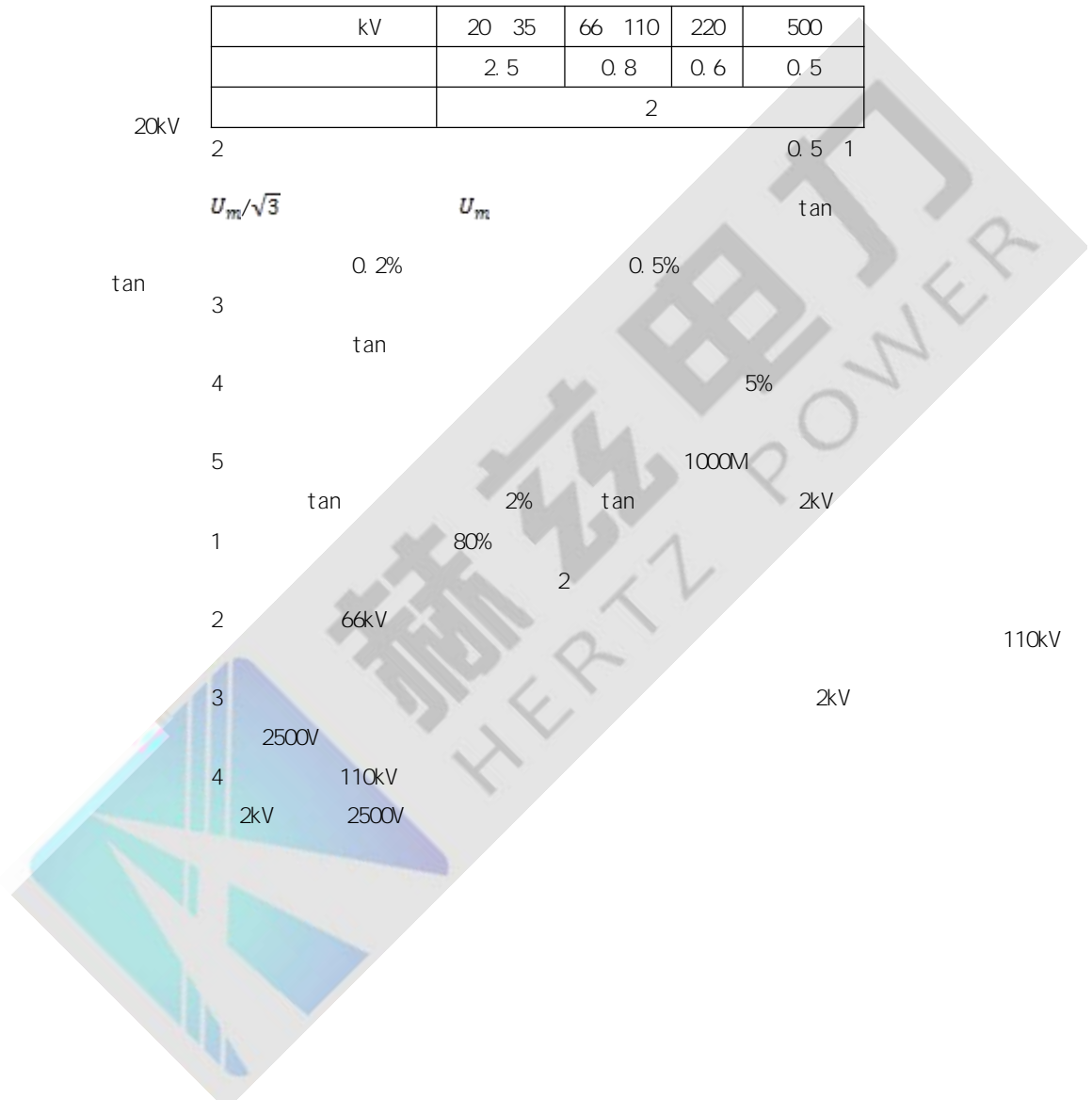
4

110kV

2kV

2500V

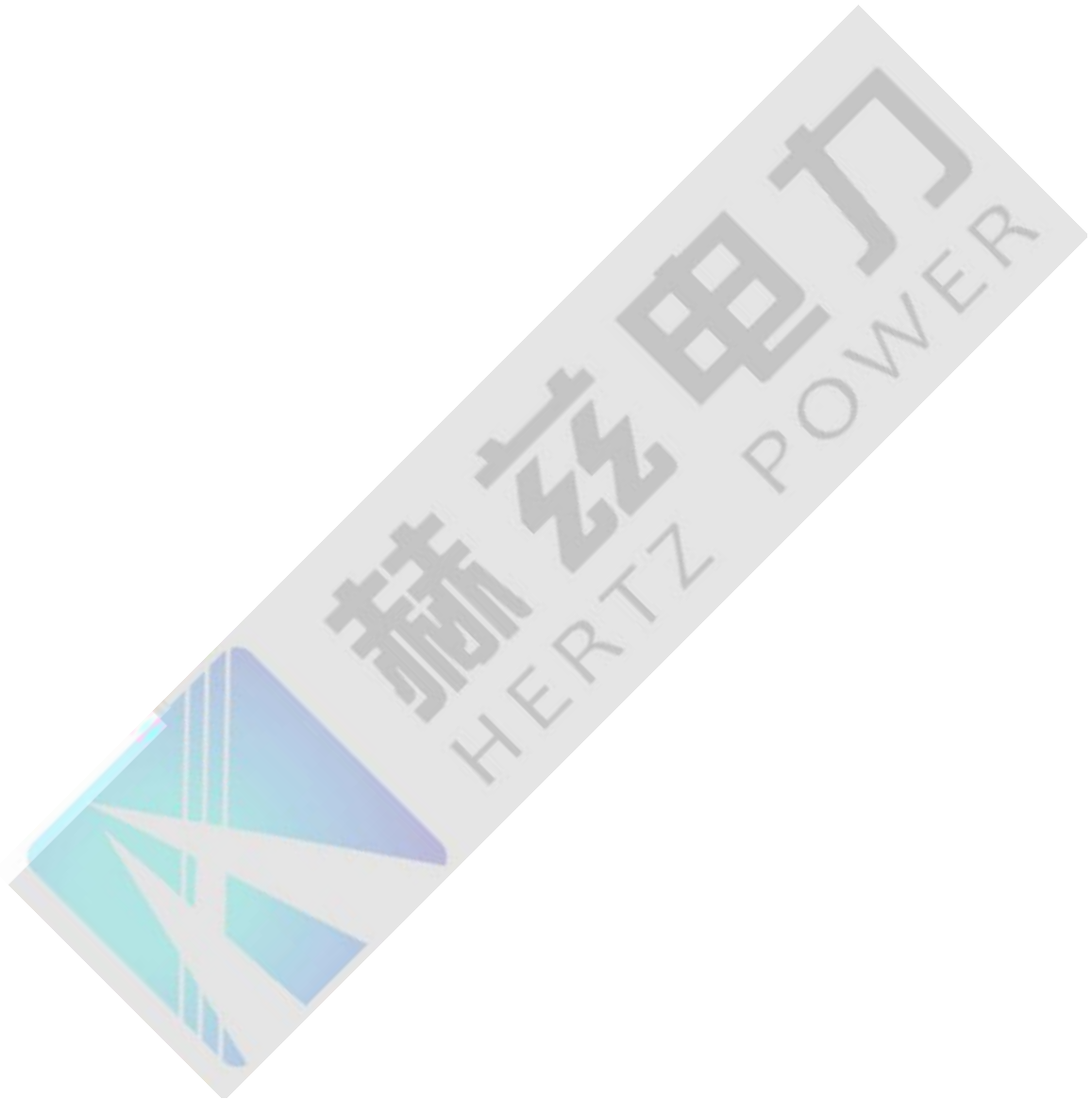
5





9

4



O

OE

10

2

10%

3

30%

50%

5

1

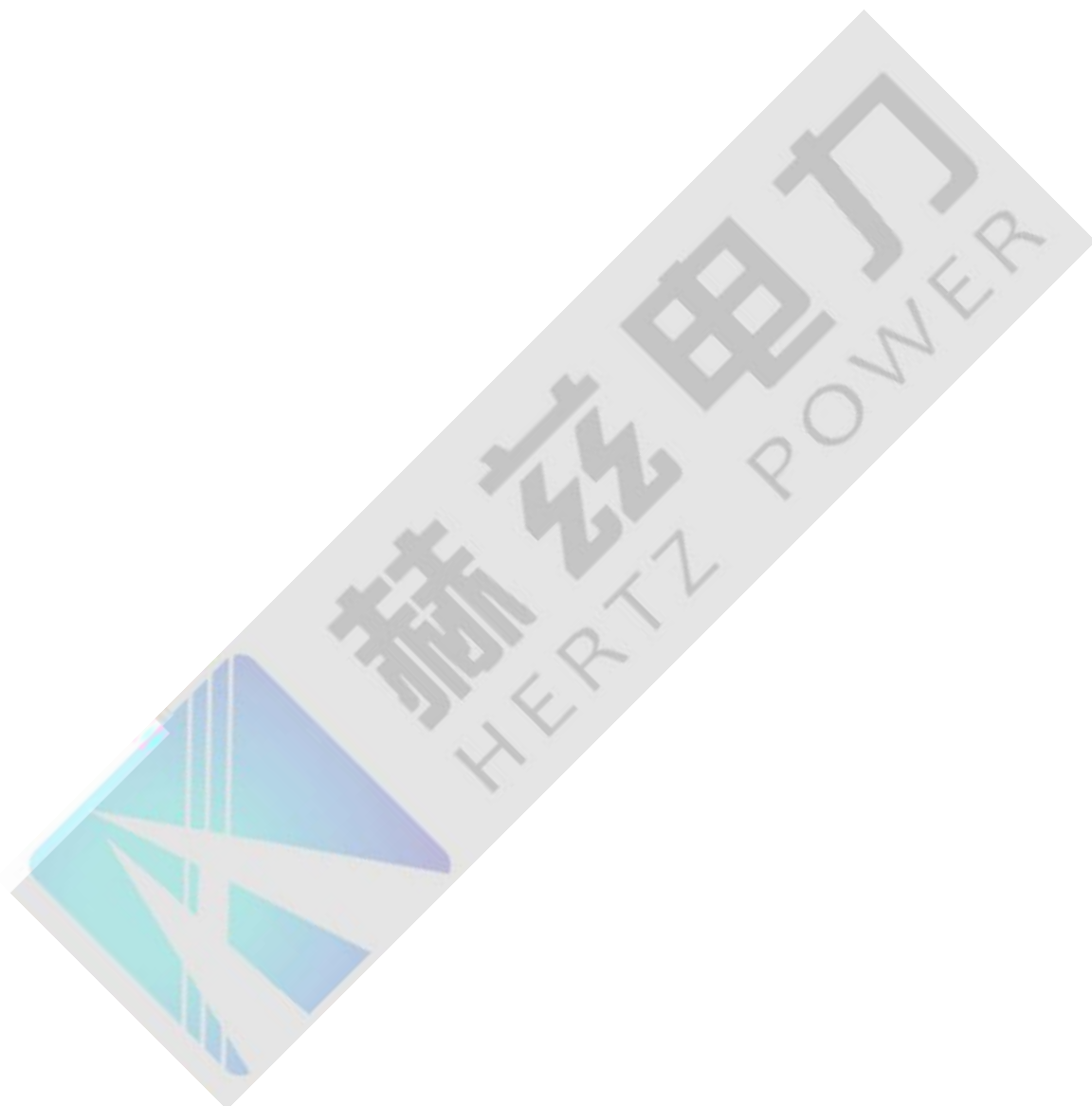
2

6

l ~ u

3

4



11 SF₆

2 220kV

3

2kV

2500V

4

110kV

2kV

2500V

4

SF₆

1

20

250μ L/L

2

SF₆

99.9% CF₄

0.01% Air

0.03%



11 SF₆

3

/

4

5

6

7

8

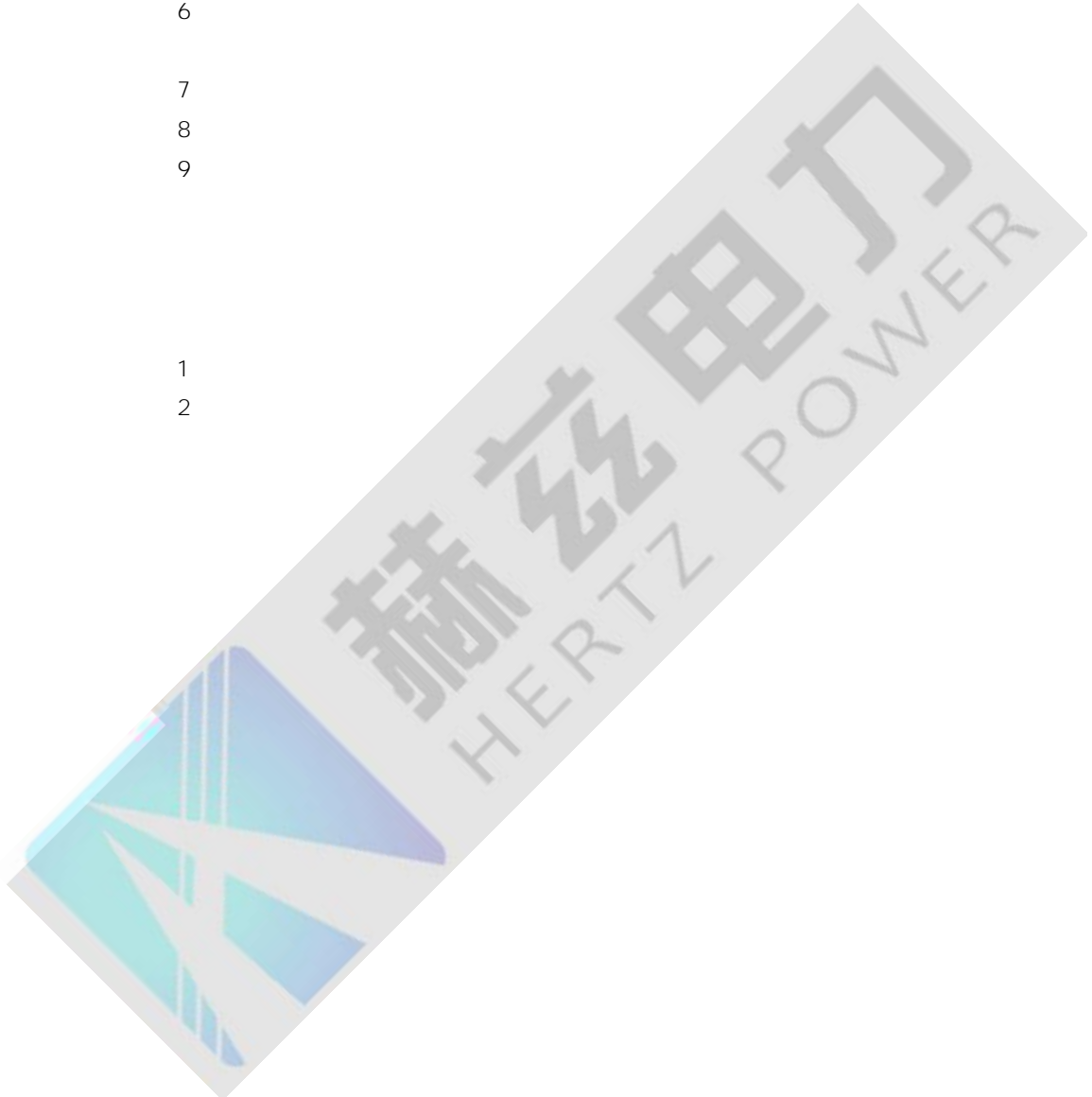
9

11

1

2

12



11 SF₆

			JJG1021-2007		

			<p>t --- 15s</p> <p>4 66kV</p>		
5			<p>1 10% 2 15% 3</p> <p>$R_2=R_1 \quad T+t_2 / T+t_1$</p> <p>$R_1$ --- t_1 R_2 --- t_2 T --- 235 225</p>		
6					
7			<p>1 30%</p> <p>2 20% 50% 80% 100% 120%</p> <p>3 150%</p> <p>4 190% 190%</p> <p>120%</p>		
8			<p>1</p> <p>2 5%</p> <p>3</p> <p>4</p>		
9			<p>1</p> <p>2</p> <p>3</p> <p>4</p>	/	

12

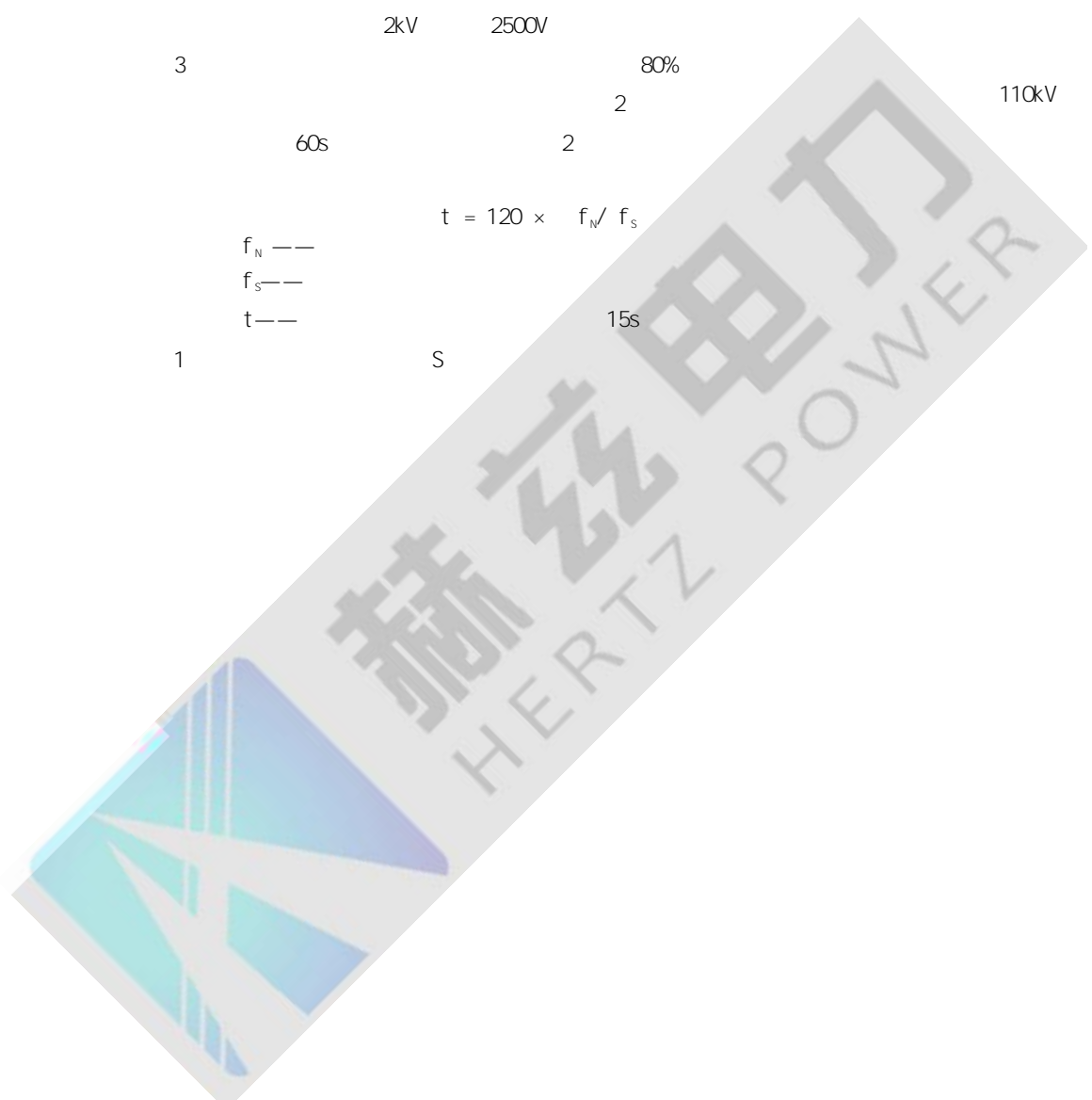
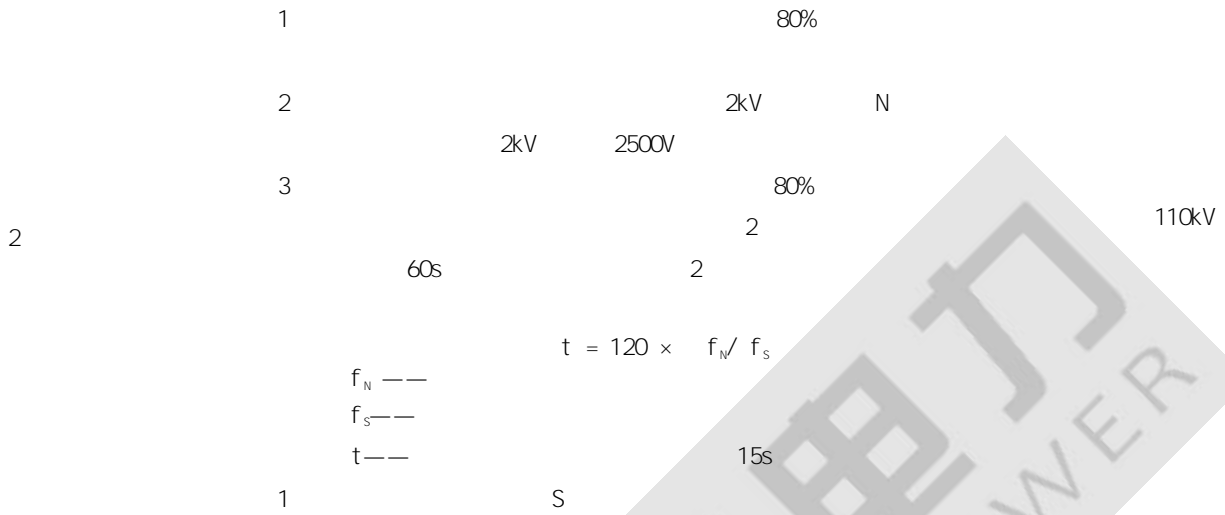
5

6

7



13



4

1

2

3

4

7

5

/

6

7

8

1

2

3

4

5

6

8

7

8

9

10

80

è



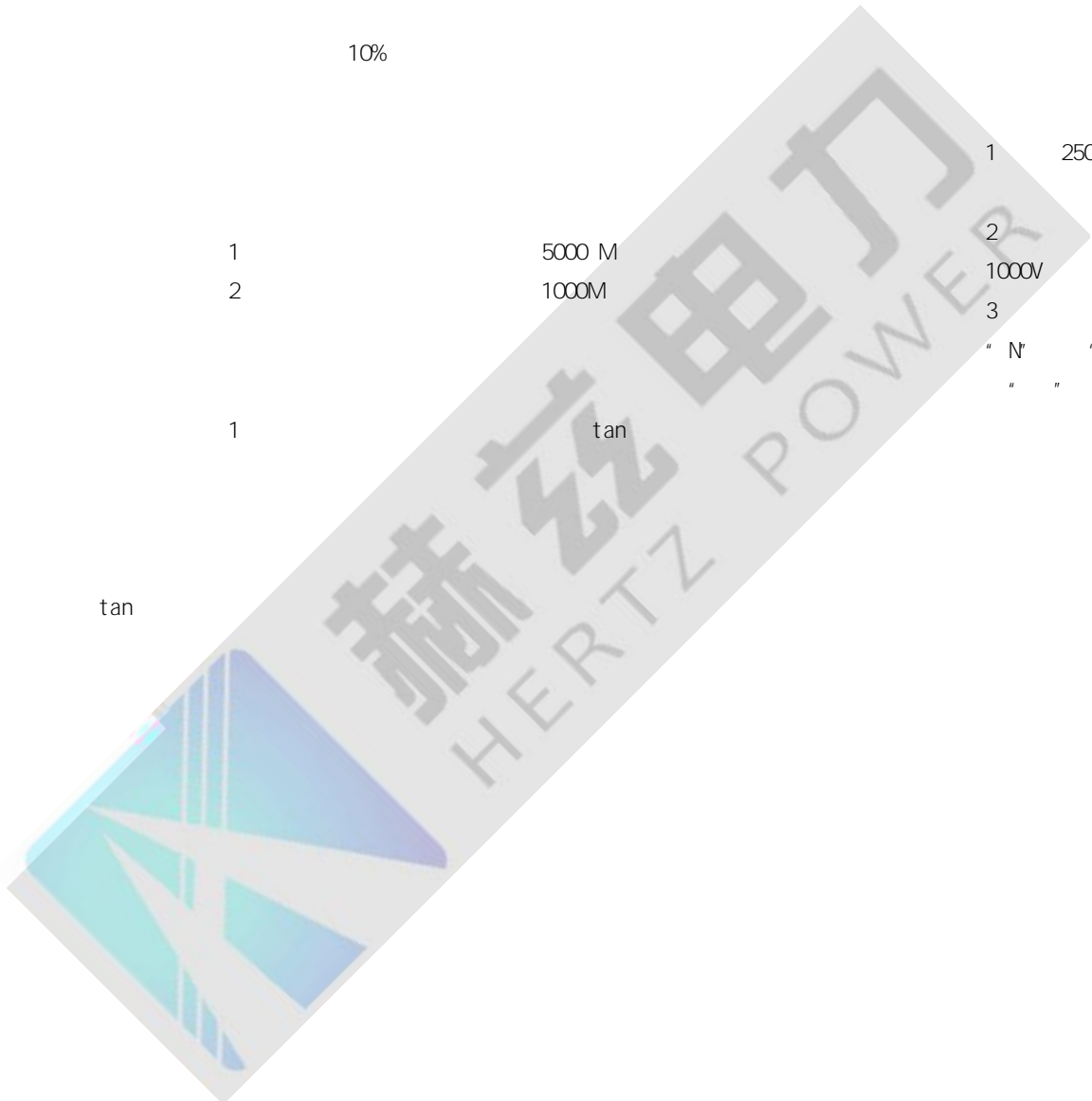
1 1 1000M 1000V

2 2

2 10%

3 1 5000 M 2500V
2 1000M
3 " N " J"
" "

4 tan 1 tan



14

5

6

6

1

7

2

5%

3

4

1

2

3

4

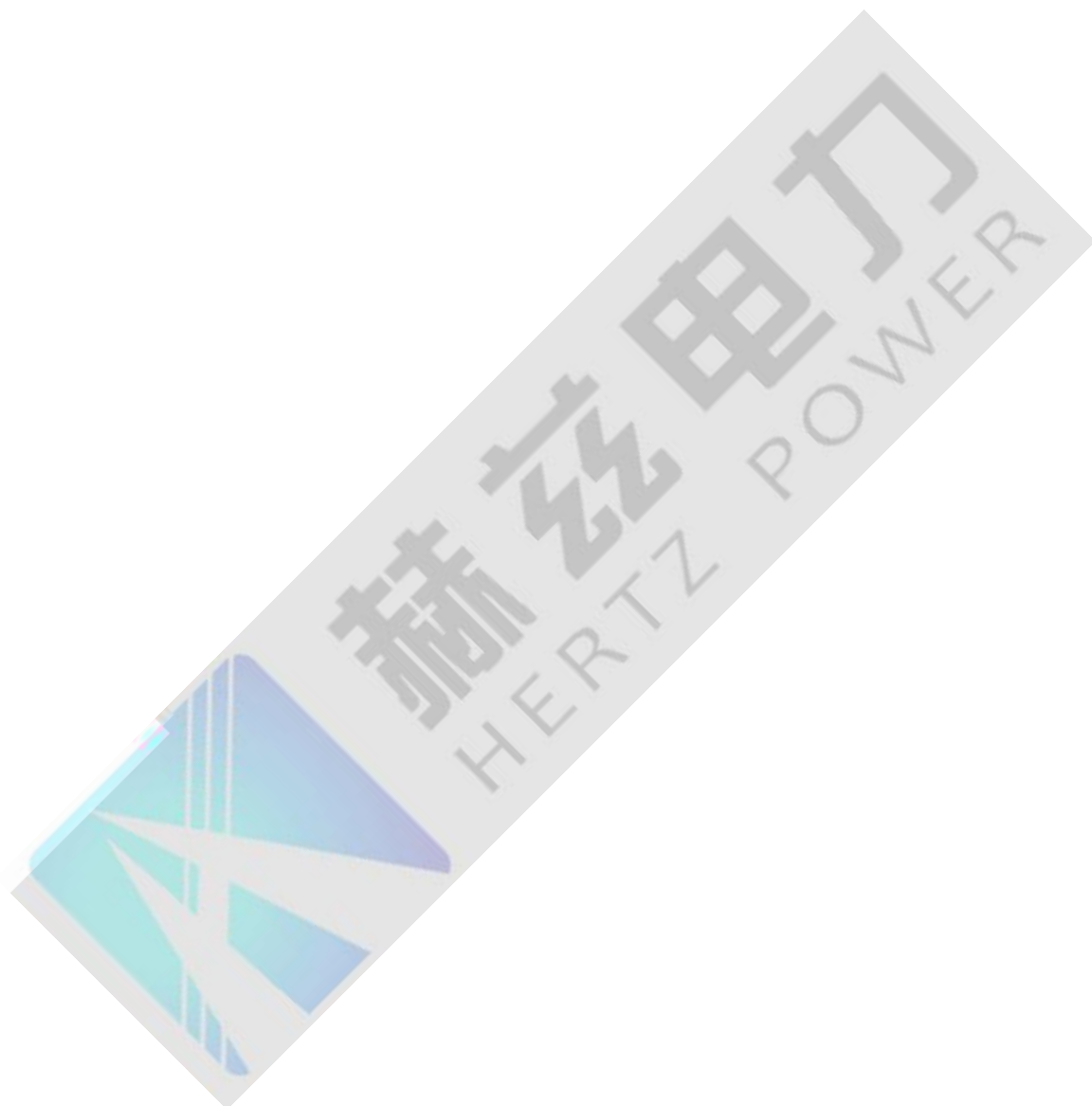
5

8

6

7

X



15 SF₆

			1 2	2500V	
			1 2	100A	
			1 2 a) 0.8 b) 110kV 500kV c) 3 a) 500kV b) 220kV c d) 1.2U _r / 3	SF ₆ 110kV 110kV 0.9	1 110kV 2 20 20
			1 2 3 4	5000M ± 5% 10kV 0.5% 0.2% tan tan % tan	
			1 2 3 4 — — — —	- 5ns 3ns 3ns 2ns	
			1 2 3	35kV SF ₆	
			1	± 5%	



15 SF₆

			2		
			1 2	10M	
			1 2 3 4	85% 110% 30% 65% 110% 85% 110% 30% 80% 50kA 85%	
			1000M		1 2 2500V 1000V
			1 2 3	5%	
			1		

15 SF₆

2

3

15 SF₆

					/
					/
					/
			1 2 3 4 5 6	10mm	10 20mm
			7		
			1 2		

15 SF₆

			1 2 3		
			1 2 3 4 " "		
		SF ₆	1 SF ₆ SF ₆ 2 SF ₆ 3 SF ₆ 4 SF ₆ 5 SF ₆ 6 7 8		
			1 2 3 4 5 6 " / " " " 7 8 9 10		



15 SF₆

11

12

13

80%

10

2-5mm

14

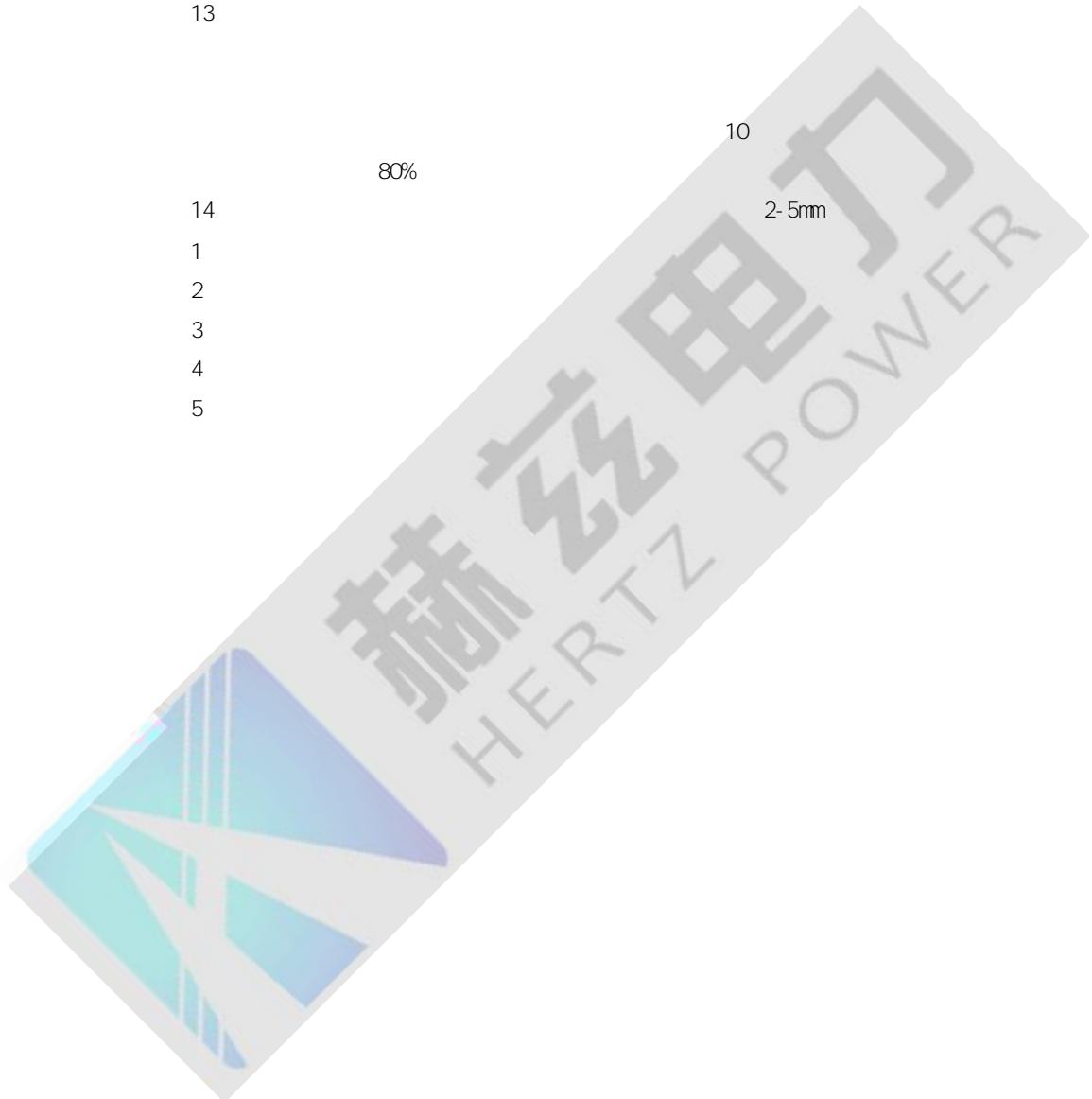
1

2

3

4

5



			<table border="1"> <tr> <td>3.6</td> <td>25/18</td> <td>25/18</td> <td>25/18</td> <td>27/20</td> </tr> <tr> <td>7.2</td> <td>30/23</td> <td>30/23</td> <td>30/23</td> <td>34/27</td> </tr> <tr> <td>12</td> <td>42/30</td> <td>42/30</td> <td>42/30</td> <td>48/36</td> </tr> <tr> <td>24</td> <td>65/50</td> <td>65/50</td> <td>65/50</td> <td>79/64</td> </tr> <tr> <td>40.5</td> <td>95/80</td> <td>95/80</td> <td>95/80</td> <td>118/103</td> </tr> <tr> <td rowspan="2">72.5</td> <td>140</td> <td>140</td> <td>140</td> <td>180</td> </tr> <tr> <td>160</td> <td>160</td> <td>160</td> <td>200</td> </tr> </table>	3.6	25/18	25/18	25/18	27/20	7.2	30/23	30/23	30/23	34/27	12	42/30	42/30	42/30	48/36	24	65/50	65/50	65/50	79/64	40.5	95/80	95/80	95/80	118/103	72.5	140	140	140	180	160	160	160	200			
3.6	25/18	25/18	25/18	27/20																																				
7.2	30/23	30/23	30/23	34/27																																				
12	42/30	42/30	42/30	48/36																																				
24	65/50	65/50	65/50	79/64																																				
40.5	95/80	95/80	95/80	118/103																																				
72.5	140	140	140	180																																				
	160	160	160	200																																				
			4																																					
			<p>1</p> <p>2</p> <p>2ms 40.5kV 10kV</p> <p>3ms 3kA</p> <p>2ms</p> <p>40.5kV</p>																																					
			3																																					
			20%																																					
			<p>1</p> <p>2</p> <p>10M</p>																																					
			<p>1</p> <p>85% 110%</p> <p>30%</p> <p>2</p> <p>85% 110%</p> <p>30%</p> <p>65% 110%</p> <p>3</p> <p>80%</p> <p>50kA 85%</p> <p>4</p>																																					
			2M																																					



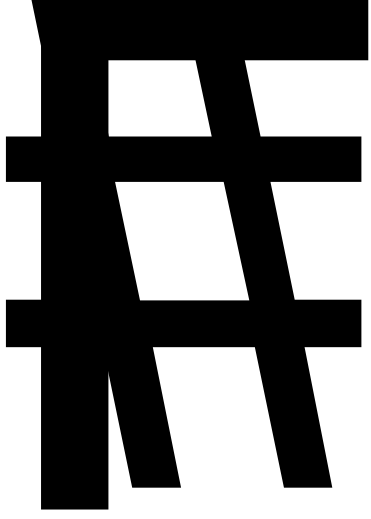
16

2kV 1min

2500V

- 1
- 2
- 3
- 4
- 5





13



2

1

2

3

4

5

6



	1				100A		
	2					GIS / GIS	
1	3						
	4					SF ₆	
	1				1*10 ⁶ ()		
2	2	SF ₆	5h	SF ₆		15μ L/L	
	3			GIS	24h		
	1	SF ₆			20	GB7674	
						GB/T8905 SF6	
3		SF ₆					
	2					150μ L/L	
	3					250μ L/L	
	4				GIS	24h	
4	1	SF ₆	99.9%	CF ₄	0.01%	Air	0.03%
	2	SF ₆					24h
5							

18 GIS HGIS GL

2

/

3

8

2M

500V 1000V

9

2kV

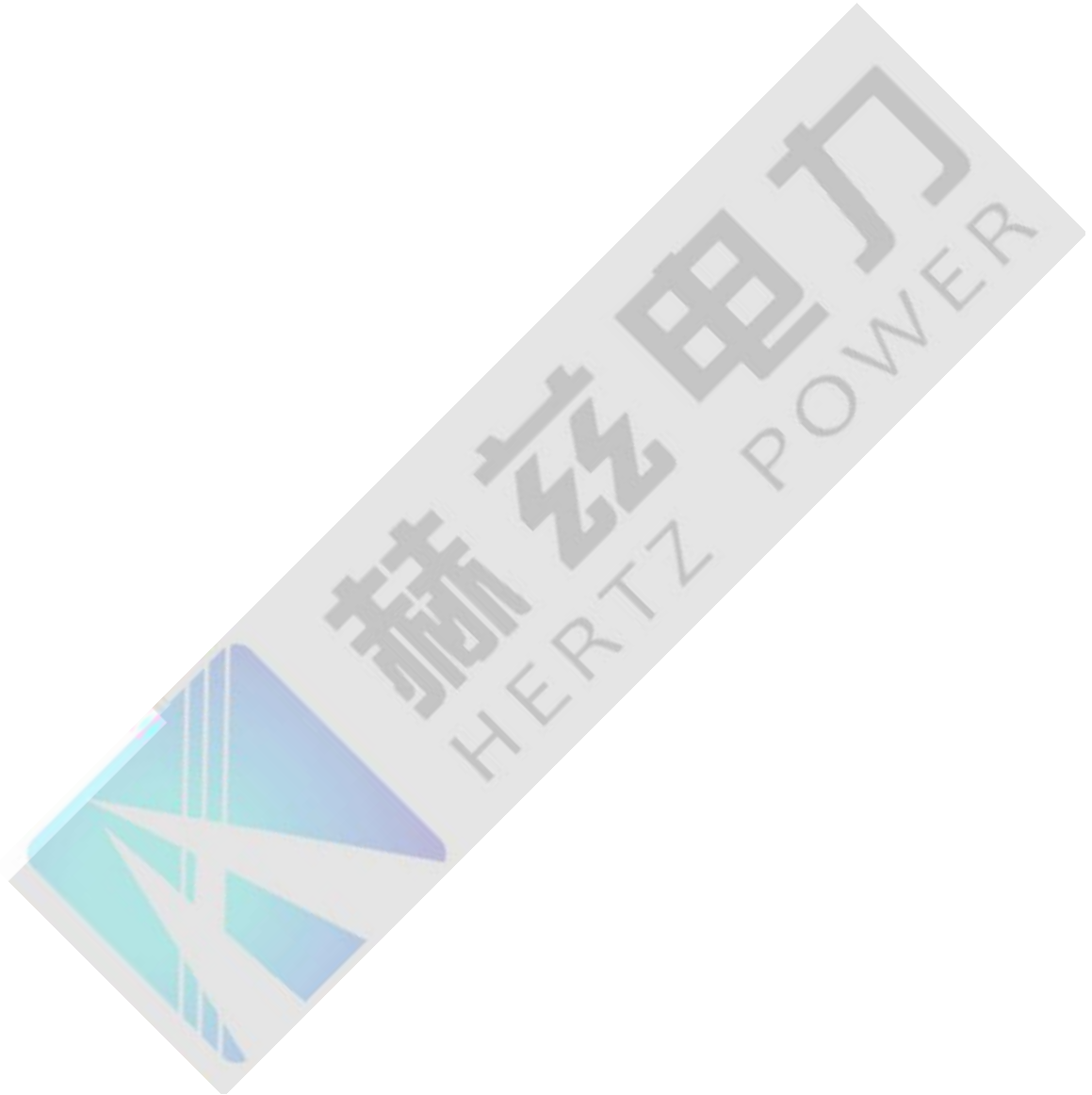
1min

2500V

10

tan

11





18 GS HGS GL

GS /

32 80% 110%

GS /

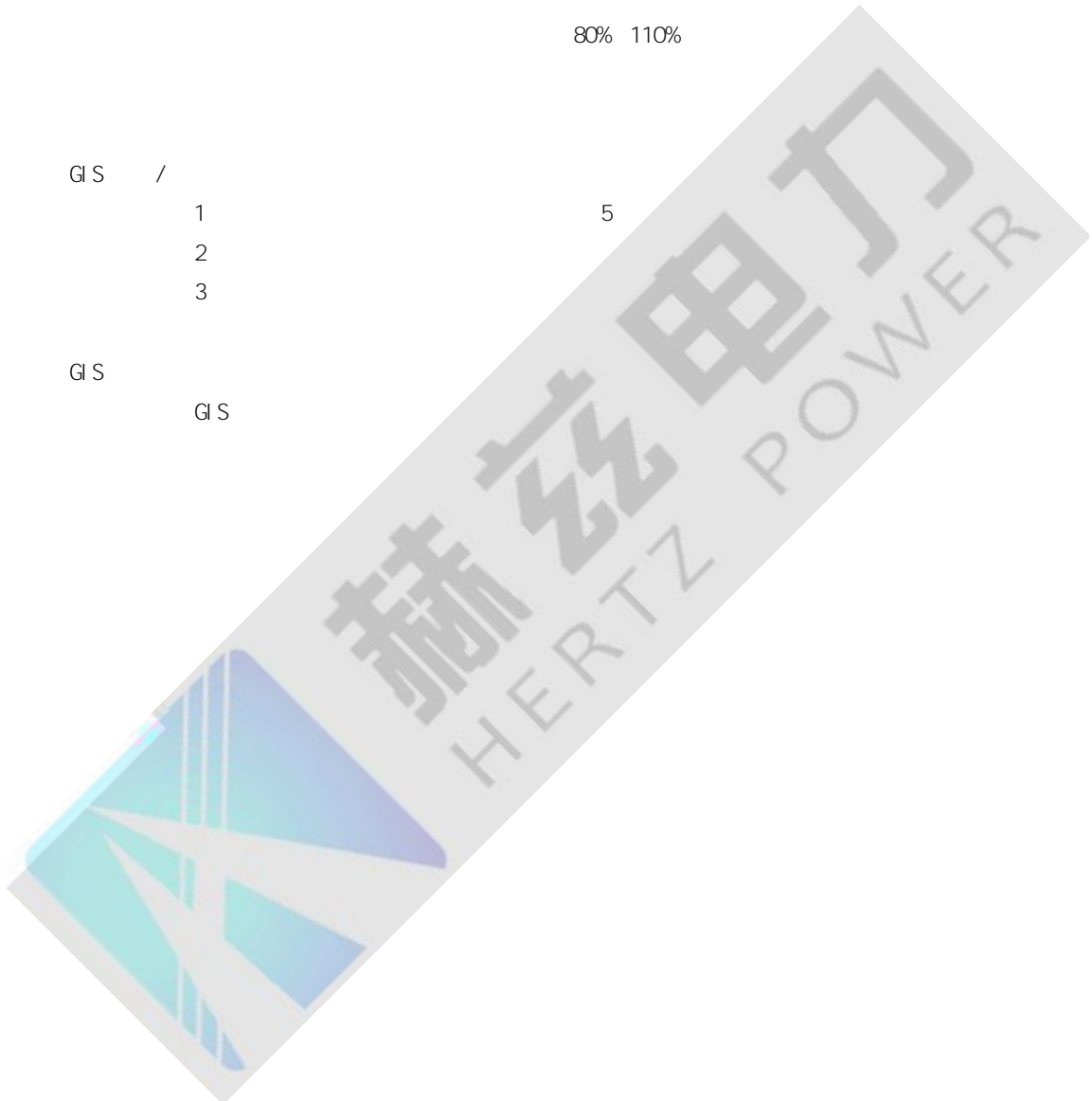
33 1 5

2

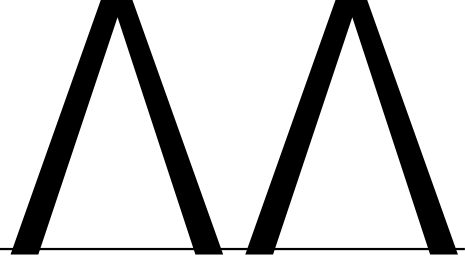
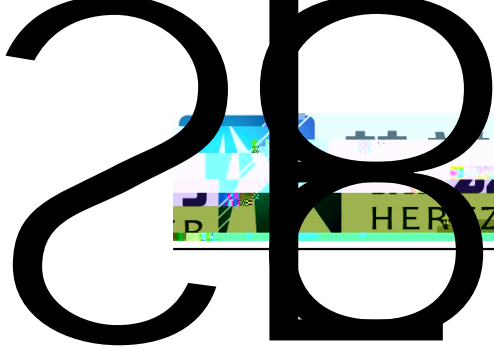
3

GS

34 GS



18 GIS HGIS GL



18 GIS HGIS GL

45

4

1

2

3

4

" "

1

46

2

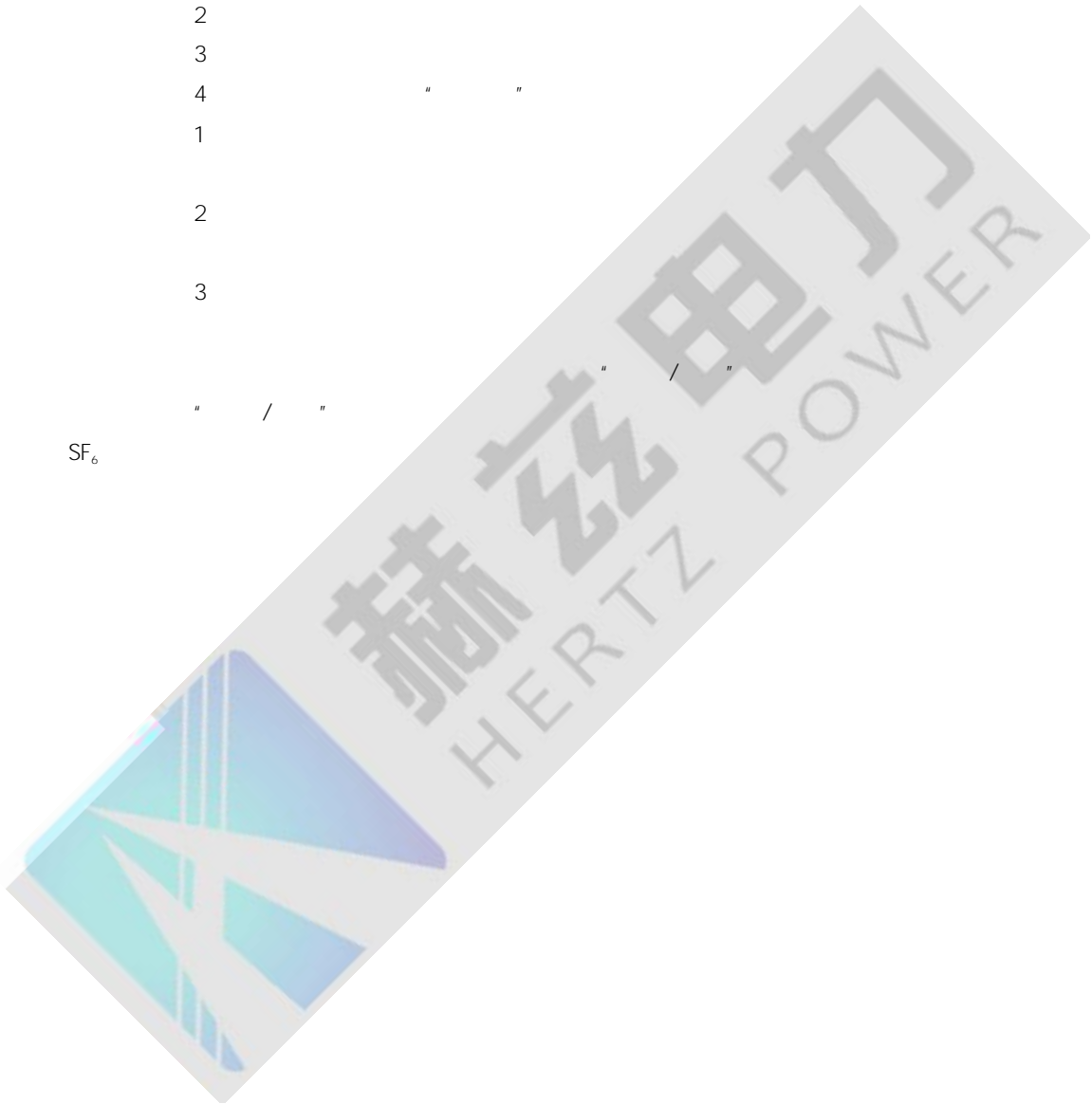
3

47

" / "

SF₆

48



1			1 2500V 2										
2			1 2										
3			2kV 1min		2500V								
4			1 100A 2										
5			1 2 3 4 5	<table border="1"> <tr> <td>kV</td> <td>7.2</td> <td>12</td> <td>40.5</td> </tr> <tr> <td>kV</td> <td>30</td> <td>42</td> <td>95</td> </tr> </table>	kV	7.2	12	40.5	kV	30	42	95	
kV	7.2	12	40.5										
kV	30	42	95										
6			1 SF ₆ a b c d — 5ns — 3ns 2 a b 2ns 40.5kV 3ns 40.5kV 3kA 10kV 2ns c 2ns d										
7			20%										
8			1 85% 110% 30%										

			2 85% 110% 30% 3 80% 4 50kA 85%	65% 110%	
9			1 1000V 2 3 10M		
10					
11	SF ₆		1 SF ₆ 20 150μ L/L 2 SF ₆ 24h		SF ₆
12	SF ₆		SF ₆ 99.9% CF ₄ 0.01% Air 0.03%		SF ₆
13	SF ₆		1 GB 11023 2 1×10 ⁻⁶ 3 24h 4 0.5% 24h		SF ₆
14			1 1000M 2		2500V 1000V
15			1 80% TV		

19

2
1

2kV

16

			2		
25					
26			1000M		2500V
27	1nA U_{1nA} $0.75U_{1nA}$	1 2 U_{1nA} 3 $0.75U_{1nA}$ 4	GB11032 50 μ A	$\pm 5\%$	
28					
29			1 2 3 4		
30			1 2 3		
31			1 2 3 4 5		
32					
33					

34			1 2 3		
35			1 2		
36			1 2		
37			1 2		
38					
39			1 2 3 4 5		
40			1 2 3		
41			1 2 3 4 5 6 7 8 9	/	

13

13.1



1			2500M							1 1000V 2500V 2
2			GB/T 11024.1 1 3Mvar 2 3Mvar 3 4 1.08 1.02 5							± 5% 0.5%
3			1 2 3 75% 10 s 3							
4			3							
5			1 2 3 4							
6			1 2 3 4 5						/	

20

			6		
			7		
			8		
			9		

13.2

21

1 2500V

1 2500M

2

GB/T 11024.1

1 3Mar ± 5%

2 3Mar 0.5%

2

3

4

1.02

5



21

3

4

7

1

2

3

4

8

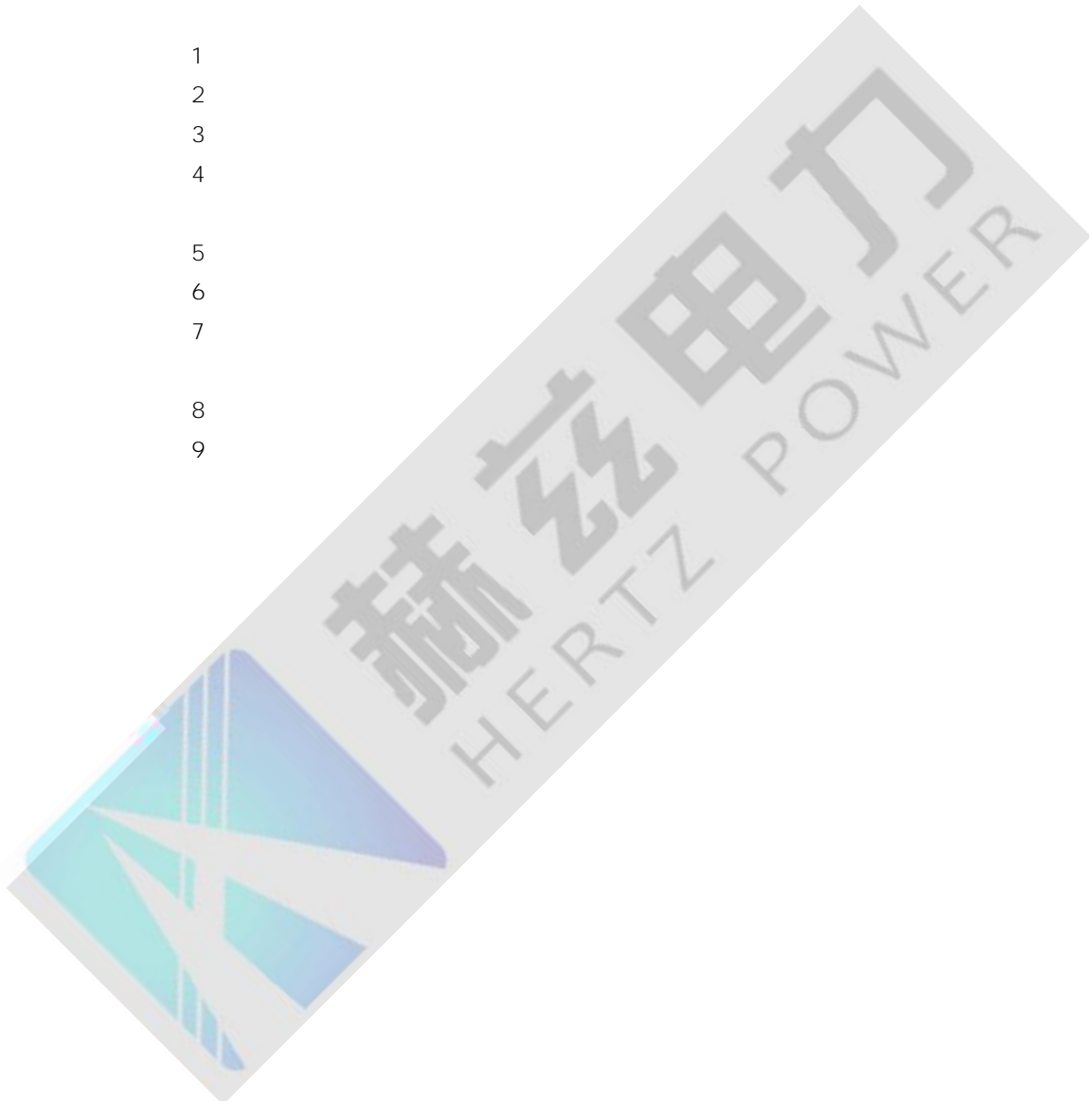
5

6

7

8

9



			4 5 6 7		
6			1 2 3 4	N J	
7			1 2		
8			1 2 3 4 5 6 7 8 9	/	

13.4

1

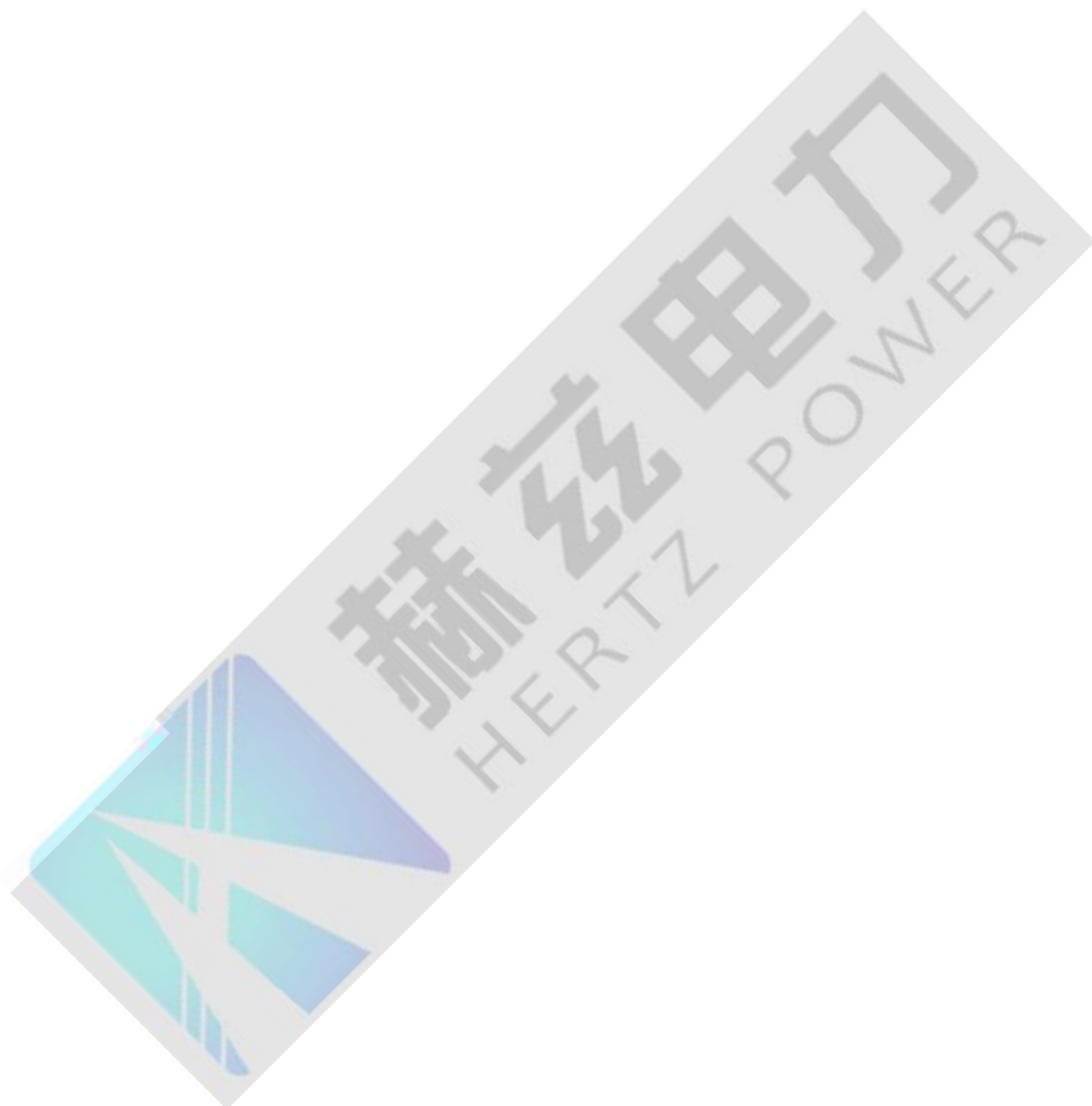
20%

2

3

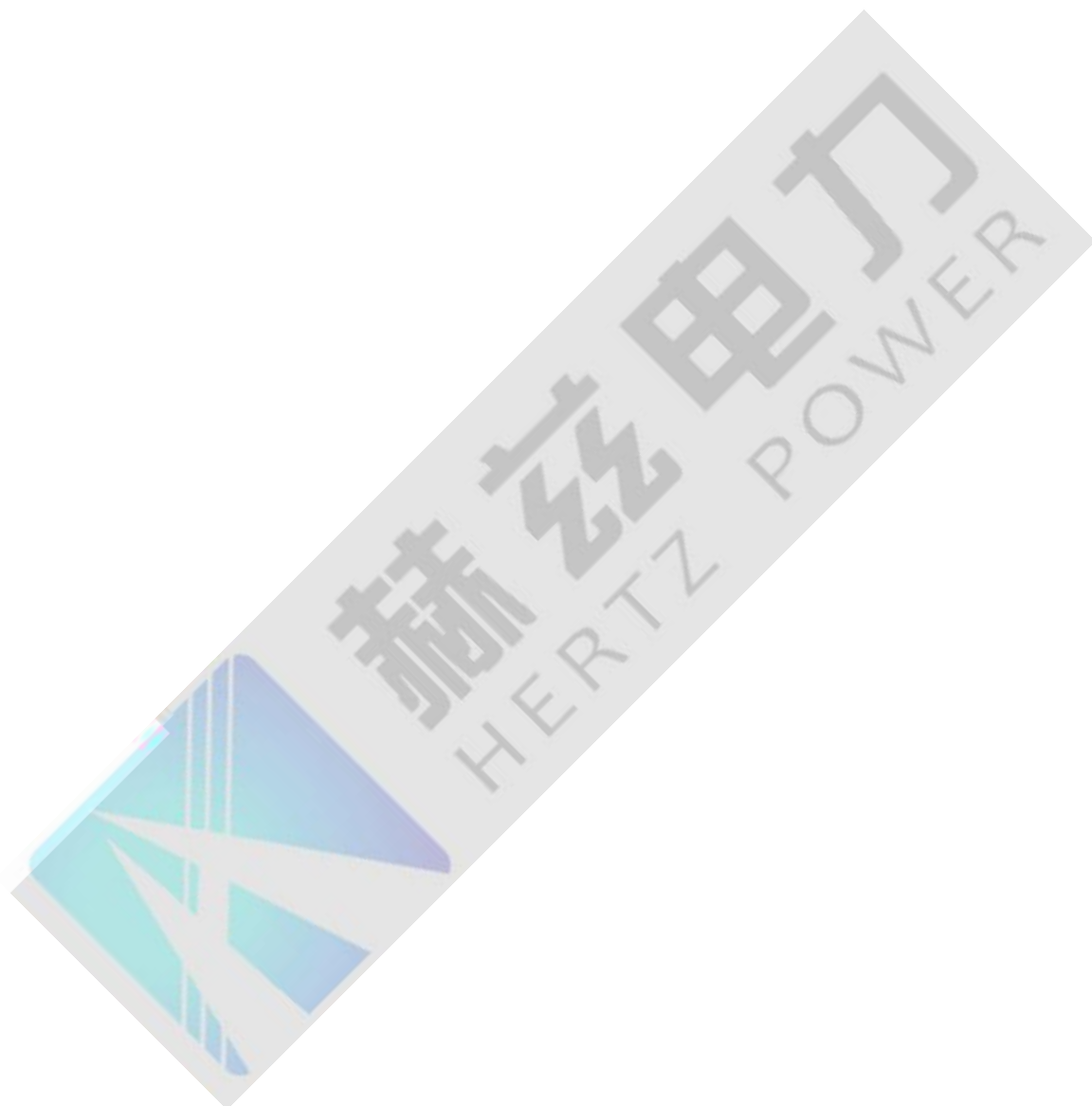
4

n





24 35kV



24 35kV

13



24 35kV

			3		
			4		
			5		
			6		
			7		
			8		
			9		

14.2 35kV

25 35kV

1			<p>1</p> <p>a</p> <p>b pH >5.4</p> <p>c mgKOH/g 0.03</p> <p>d 135</p> <p>e mg/L 20</p> <p>f 25, mV/m 40</p> <p>g tan 90 % 1.0</p> <p>h kV 40</p> <p>i 90 ·m 6×10^0</p> <p>j % 0.02</p> <p>2</p> <p>3</p> <p>a 24h 24h</p> <p>b GB/T 7252</p> <p>c μ L/L</p> <p>20 H₂ 10 C₂H₂ 0.1</p>		
2			<p>1 1600kVA , 2%</p> <p>1%</p> <p>2 2%</p> <p>$R_2=R_1 \quad T+t_2 / T+t_1$</p> <p>R₁ --- t₁</p> <p>R₂ --- t₂</p> <p>T --- 235 225</p>		
3			<p>1 70% 10000 M</p> <p>20</p> <p>2 50</p>	1	2500V
				2	



25 35kV

3

4

5 2500V

1m n

7

è



25 35kV



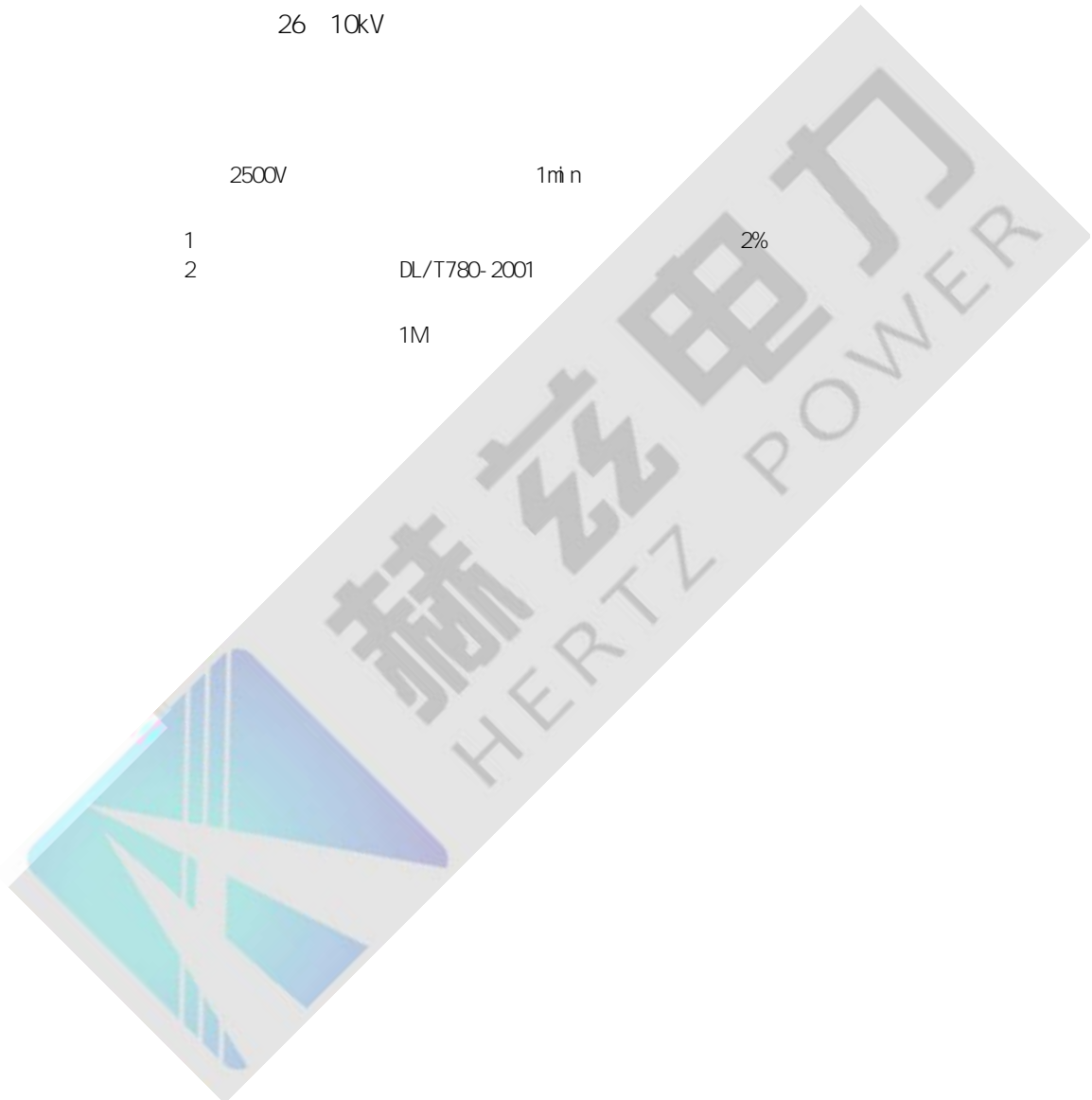
25 35kV

			8		
			9		

14.3 10kV

26 10kV

1	2500V	1min	
2	1 2	DL/T780-2001	2%
3		1M	



1

GB11032

1 35kV

5000V

2500M

2 35kV

2500V

2

1000M

3 1 kV

500V

2M

4

5M

500V

1

GB 11032

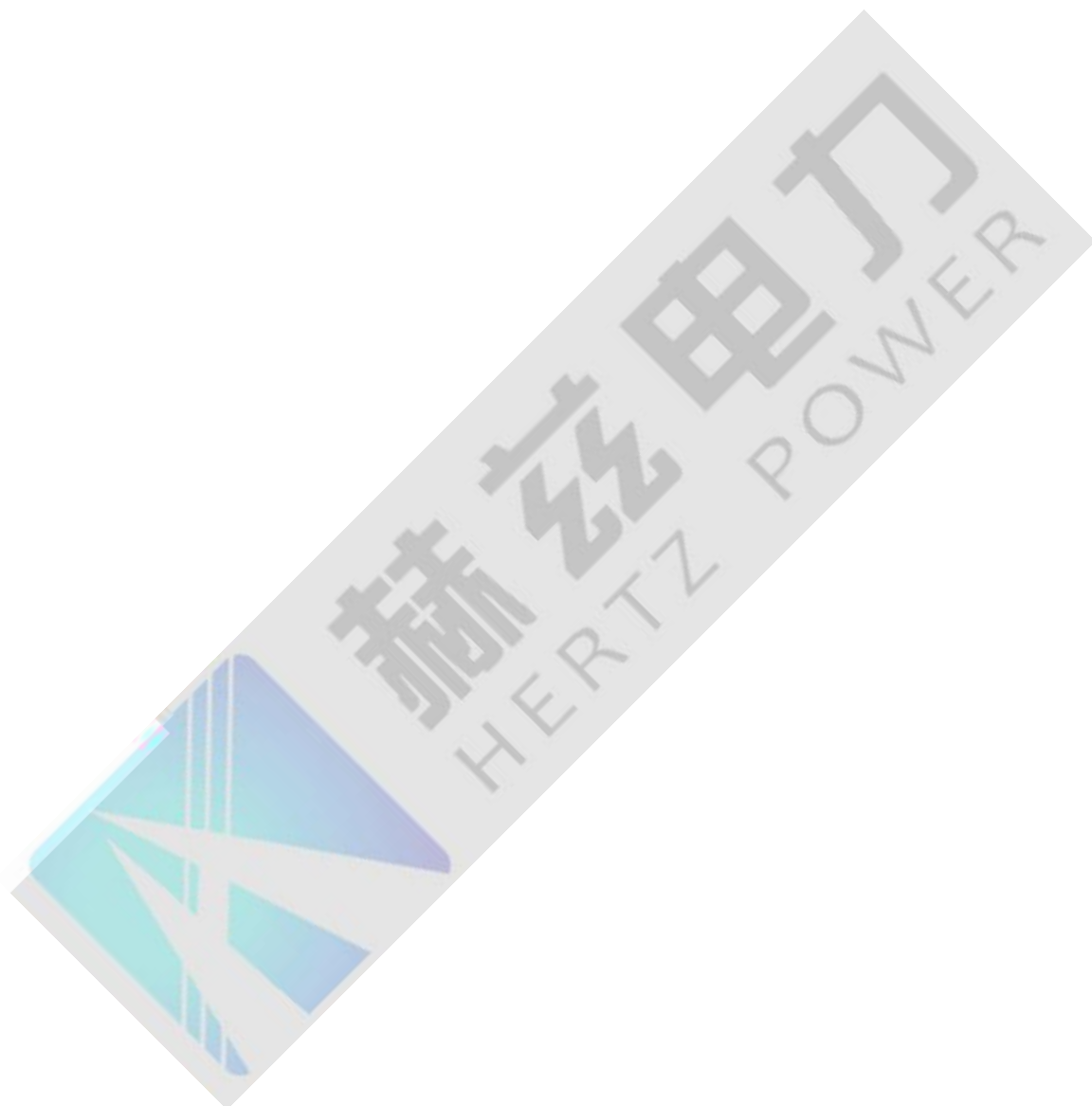
3

2

3

0.75

4





1			1 2 1000M tan 10000M 1000M 2%		1 2500V 2 1000V																																												
2	20kV		1 2 tan ± 5% 3 2% 1000M tan																																														
3			1 2 1min <table border="1"> <thead> <tr> <th rowspan="2">kV</th> <th rowspan="2">kV</th> <th colspan="2">kV</th> </tr> <tr> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td>3</td> <td>3.6</td> <td>18/25</td> <td>15/20</td> </tr> <tr> <td>6</td> <td>7.2</td> <td>23/30</td> <td>18/26</td> </tr> <tr> <td>10</td> <td>12</td> <td>30/42</td> <td>26/36</td> </tr> <tr> <td>20</td> <td>24</td> <td>50/65</td> <td>43/55</td> </tr> <tr> <td>35</td> <td>40.5</td> <td>80/95</td> <td>68/81</td> </tr> <tr> <td>66</td> <td>72.5</td> <td>140/160</td> <td>119/136</td> </tr> <tr> <td>110</td> <td>126</td> <td>185/200</td> <td>160/184</td> </tr> <tr> <td>220</td> <td>252</td> <td>360/395</td> <td>306/336</td> </tr> <tr> <td>500</td> <td>550</td> <td>630/680/740</td> <td>536/578/592</td> </tr> </tbody> </table>	kV	kV	kV				3	3.6	18/25	15/20	6	7.2	23/30	18/26	10	12	30/42	26/36	20	24	50/65	43/55	35	40.5	80/95	68/81	66	72.5	140/160	119/136	110	126	185/200	160/184	220	252	360/395	306/336	500	550	630/680/740	536/578/592	/			
kV	kV	kV																																															
3	3.6	18/25	15/20																																														
6	7.2	23/30	18/26																																														
10	12	30/42	26/36																																														
20	24	50/65	43/55																																														
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4			1. 1) <table border="1"> <thead> <tr> <th colspan="4">tan %</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td>0.4</td> </tr> <tr> <td></td> <td></td> <td></td> <td>0.5</td> </tr> <tr> <td></td> <td>1.0</td> <td>35kV</td> <td>0.5</td> </tr> <tr> <td></td> <td></td> <td></td> <td>0.5</td> </tr> <tr> <td></td> <td></td> <td></td> <td>0.5</td> </tr> <tr> <td></td> <td>1.5</td> <td>U_m=500kV</td> <td>0.5</td> </tr> <tr> <td></td> <td></td> <td></td> <td>0.5</td> </tr> <tr> <td></td> <td></td> <td></td> <td>0.5</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> 2) 3) 2.	tan %							0.4				0.5		1.0	35kV	0.5				0.5				0.5		1.5	U _m =500kV	0.5				0.5				0.5									/	A
tan %																																																	
			0.4																																														
			0.5																																														
	1.0	35kV	0.5																																														
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			0.5																																														
	1.5	U _m =500kV	0.5																																														
			0.5																																														
			0.5																																														

5 1.05u_m/ 3
20pC

6 SF₆ 1 SF₆ 250uL/L SF₆ 24h
2 SF₆ 1% SF₆ SF₆

7 SF₆ 3 SF₆ 24h SF₆ / SF₆
SF₆ 99.9% CF₄ 0.01% Air 0.03%

8



17

30

15kV
50M
1M /kV

2500V

1

2

kV	kV	1m n	kV
10	12	42	
35	40.5	100	

1

2

3

3

4

4

1

2

3

4

5

100%

6

7

8

1

A

B

C

2

5

30

			3		/
			4		
			5		
			6		
			7		
			8		
			9		

18

31

1 1 1000M
 2 0.6/1kV 1000V 0.6/1kV 2500V
 6/6kV 5000V

2 1 500V
 2 0.5M /km 50M

3 1 110kV
 10kV 1min

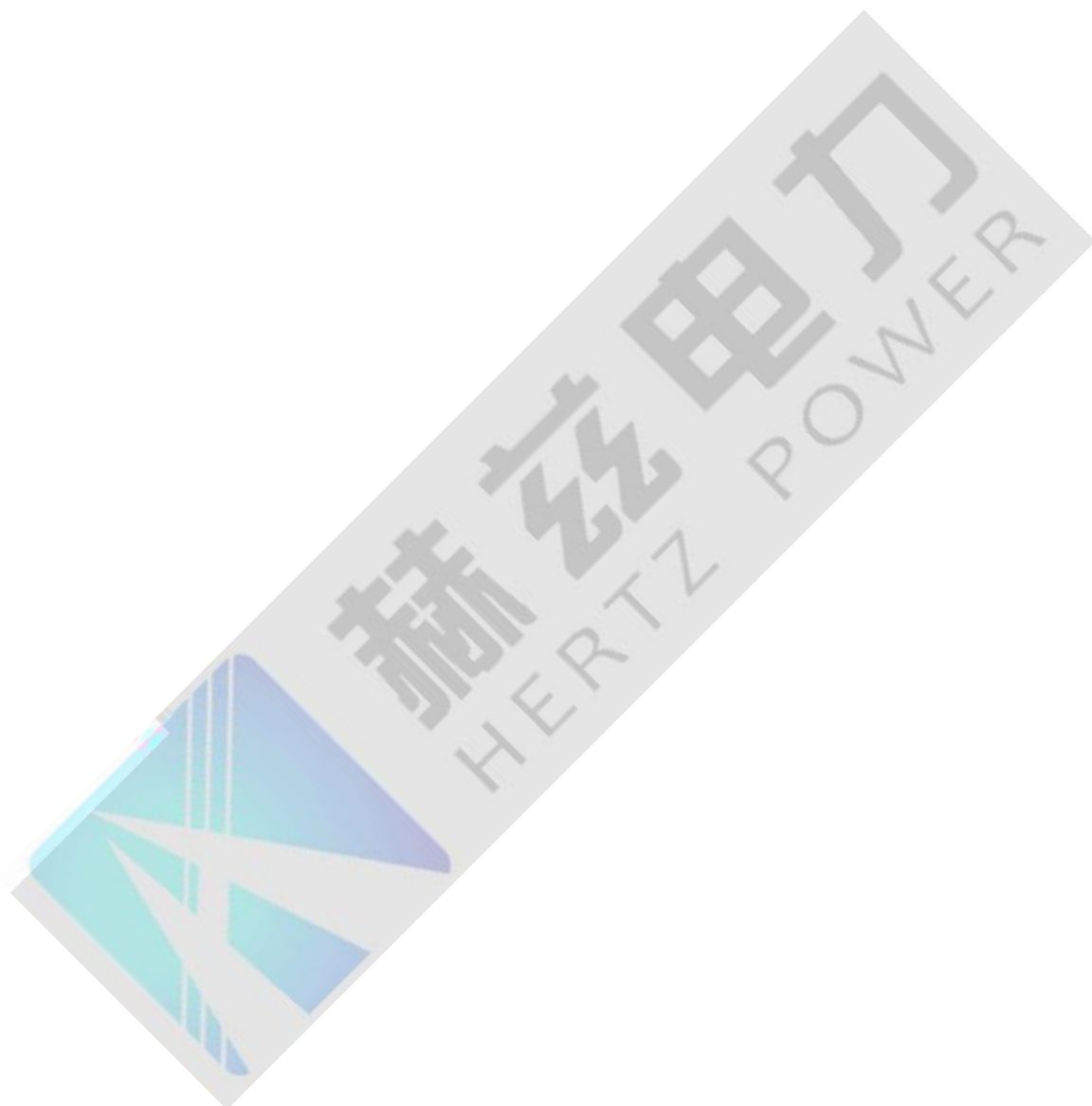
2
 1 20 300Hz

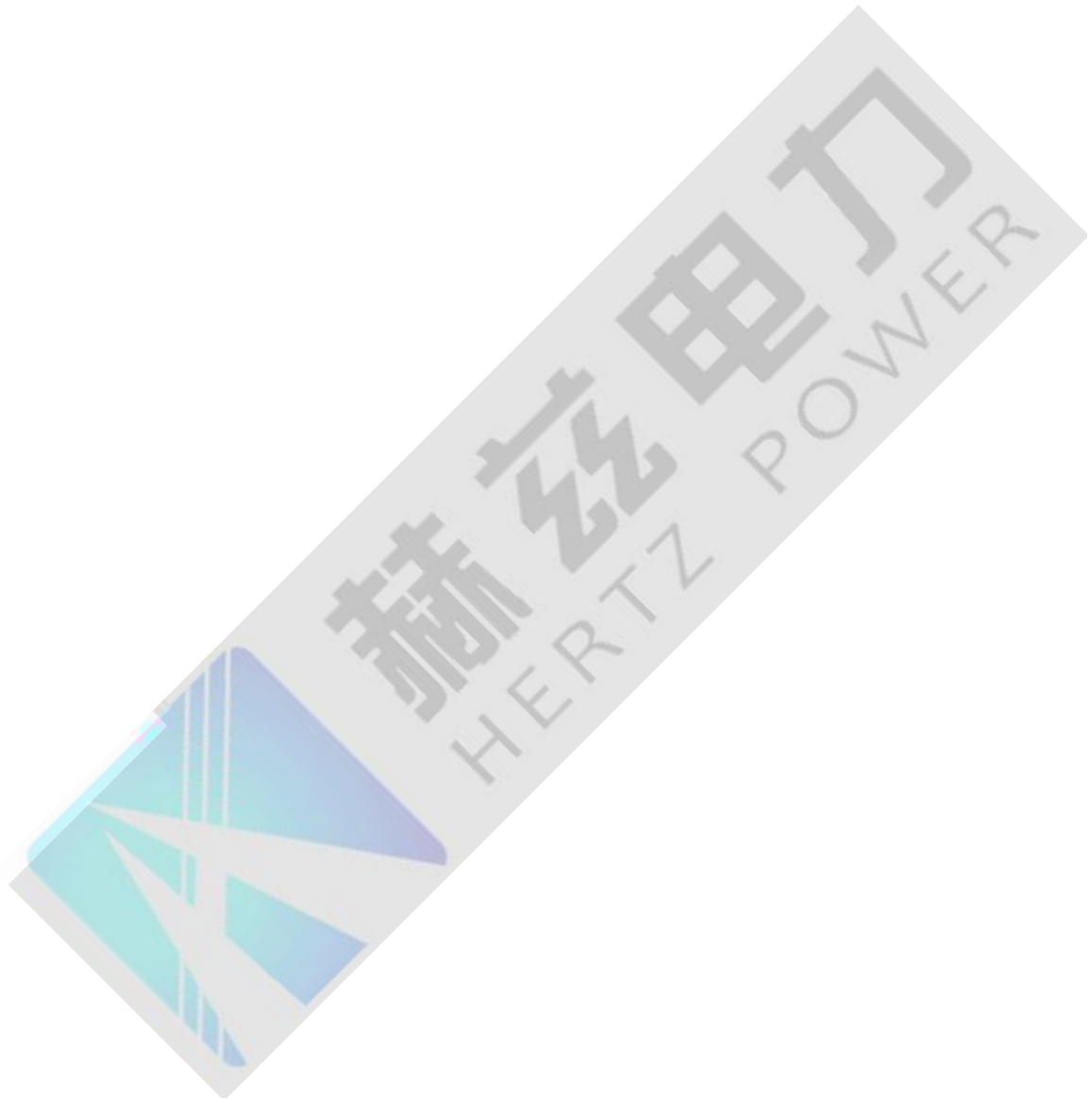
	U_p/U kV		min
	18/30	$2U_0$	15 60
	21/35-64/110	$2U_0$	60
4	127/220	$1.7U_0$ $1.4U_0$	60
	190/330	$1.7U_0$ $1.3U_0$	60
	290/500	$1.7U_0$ $1.1U_0$	60

2 24
 3

5

6





32

11



33

UPS

1 0ms

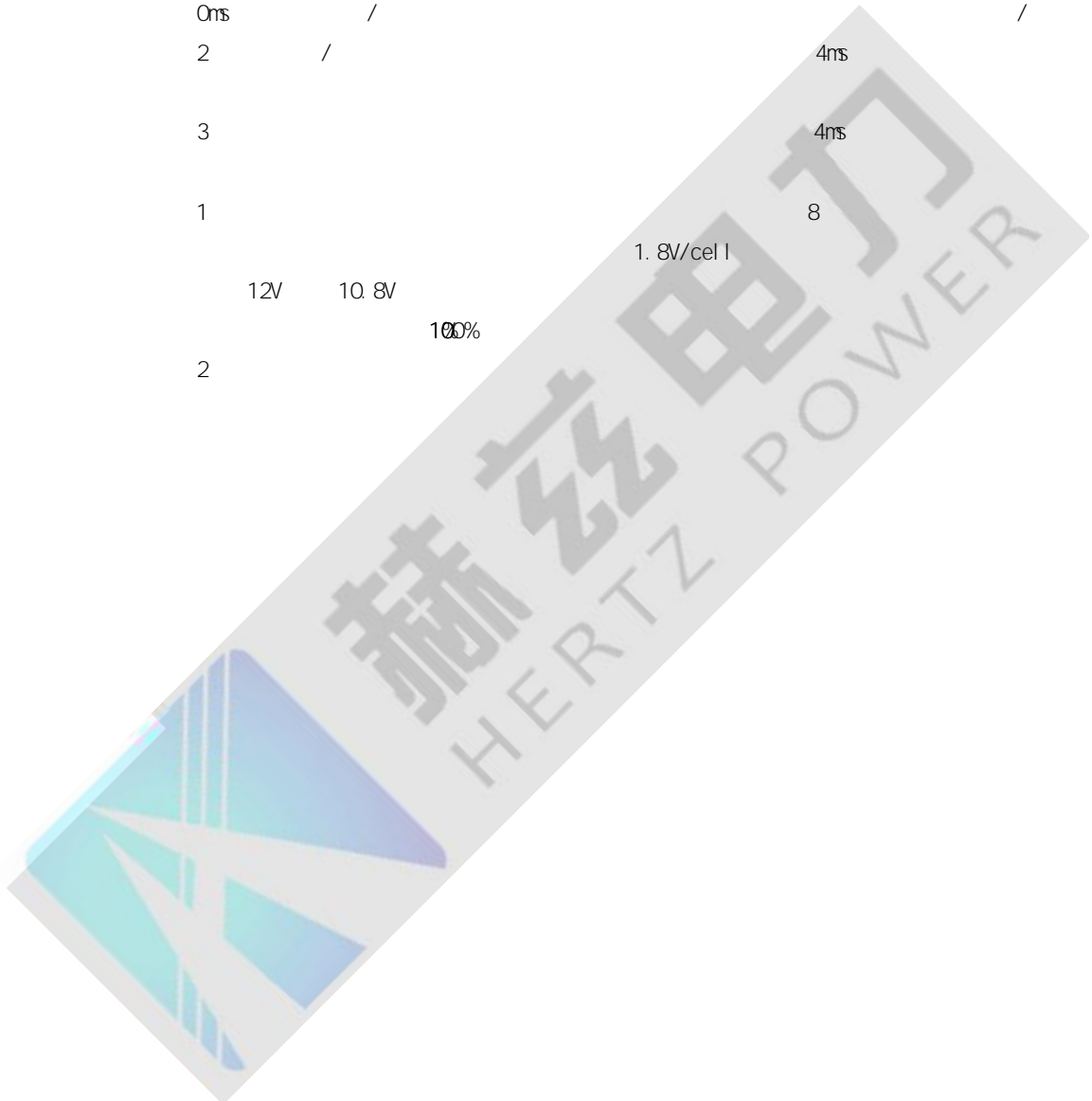
4 2 / 4ms

3 4ms

1 8

5 12V 10.8V 100% 1.8V/cell

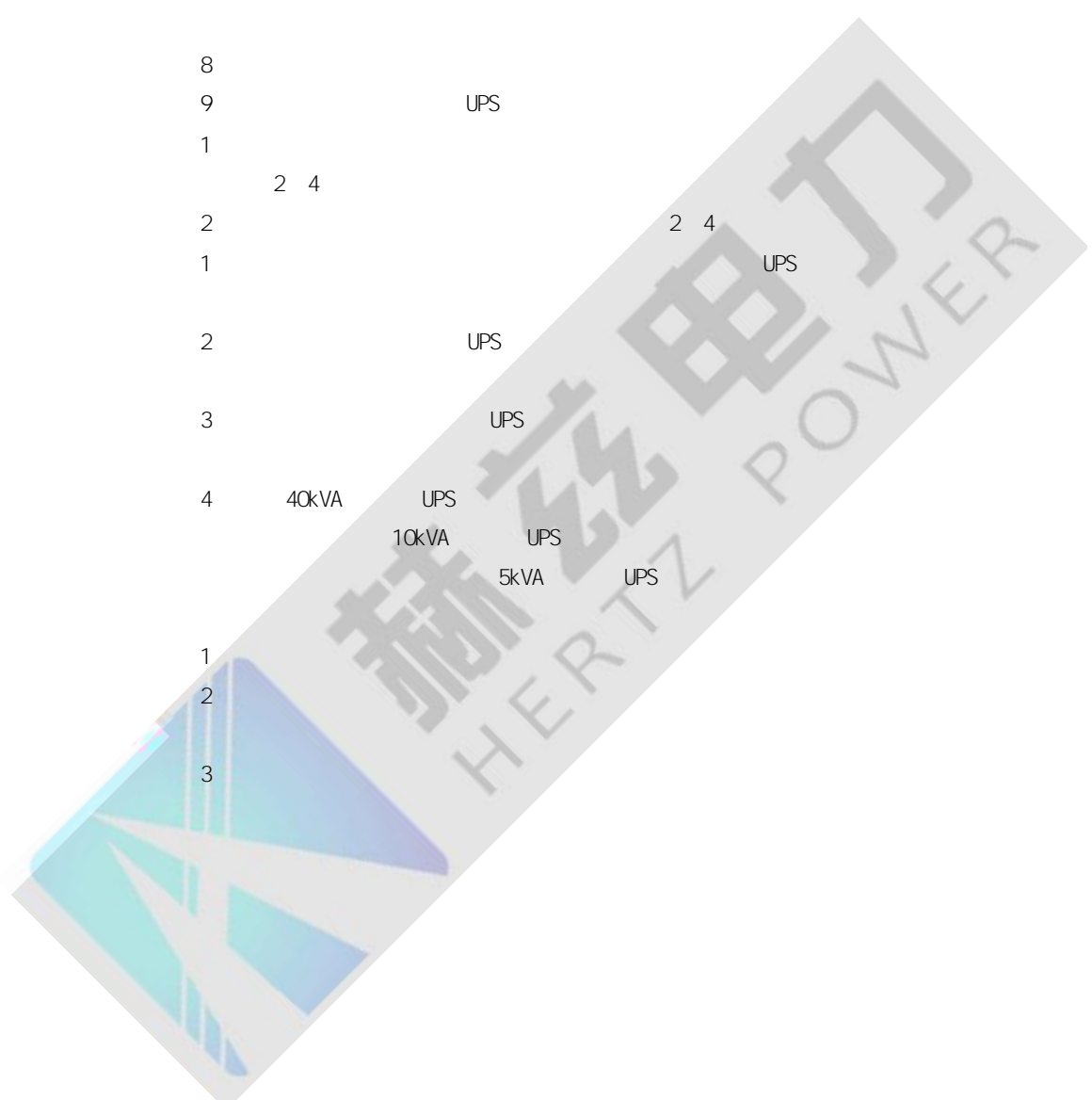
2



			3		
			4		
11			1 2 3 4 5 6	350mm	
12			1 2 3 4 5 6 7 8 9		
13			1 2		
14		/	1 2 3		
15			1 2		
16			1 UPS 10kA 8/20µs SPD 2 SPD SPD SPD 3 SPD		
17			1 2 3 4 5		



6
7 UPS
8
9 UPS
18 1 2 4 2 4 UPS
19 2 UPS
3 UPS
4 40kVA UPS 10kVA UPS 5kVA UPS
20 1 2 3



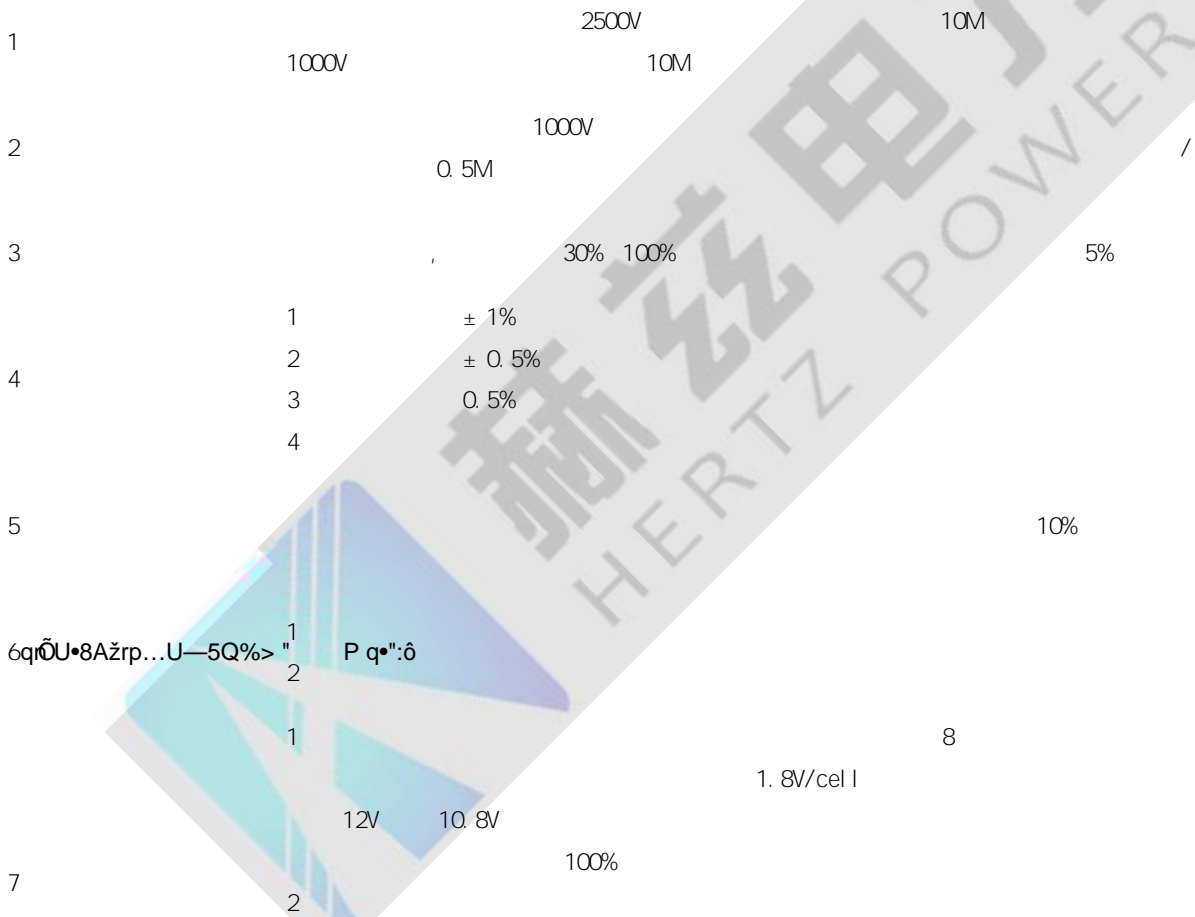


33

			10		
			11		
			12		

20.2

34



			3 4		
10				/	
11			1 2 3 4 5 6 7 8 9 10 11 12 13 14	/	
12			1 2	$\pm 0.05V$ 0.03V	/
13				1000V 0.5M	
14			1 2 3 4 5 6 7 8 9	200Ah 15—30	

			10		
15			1 2 3 4 5	0.5% 1%	
16					
17			1 2 3 4		
18			1 2 3 4 5 6 7 8 9 10 11 12	500V 1.5mm 0.5mm	2.5mm
19			1 2 3 4 5 6 7 8	350mm 1 2	

	9	
	1	
	2	
	3	
	4	
20	5	
	6	
	7	
	8	
	9	
	10	
	1	
21	2	
	1	
22	2	
	1	
23	2	
	1	
24	2	
	3	
	1	
25	2	
	3	
	1	
26	2	
	3	
	4	0.5
	1	
27	2	
	3	
	4	
	1	
	2	
28		



			<p>7 1%</p> <p>0.5%</p> <p>8</p> <p>9 1</p> <p>10 3</p> <p>11</p> <p>12</p> <p>13 GPS GPS</p> <p>1ms</p> <p>14</p> <p>15</p>		
29			<p>1</p> <p>2 220V 25K 110V 7K</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p>		
30			<p>1</p> <p>2</p> <p>3 4</p> <p>4 2</p> <p>5 4</p>		
31			<p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>5%</p>		

			7 8 9 10 11 12 13 110kV 14 110kV 15 16		
32			1 110kV 2 3 10kV 35kV 4 500kV GI S 5 500kV 6 PT	6 110kV 220kV GI S 6 110kV 220kV PT	
33			1 2 500kV 3 500kV 220kV 4 220kV		



34

5

6 500kV

7 220kV

8

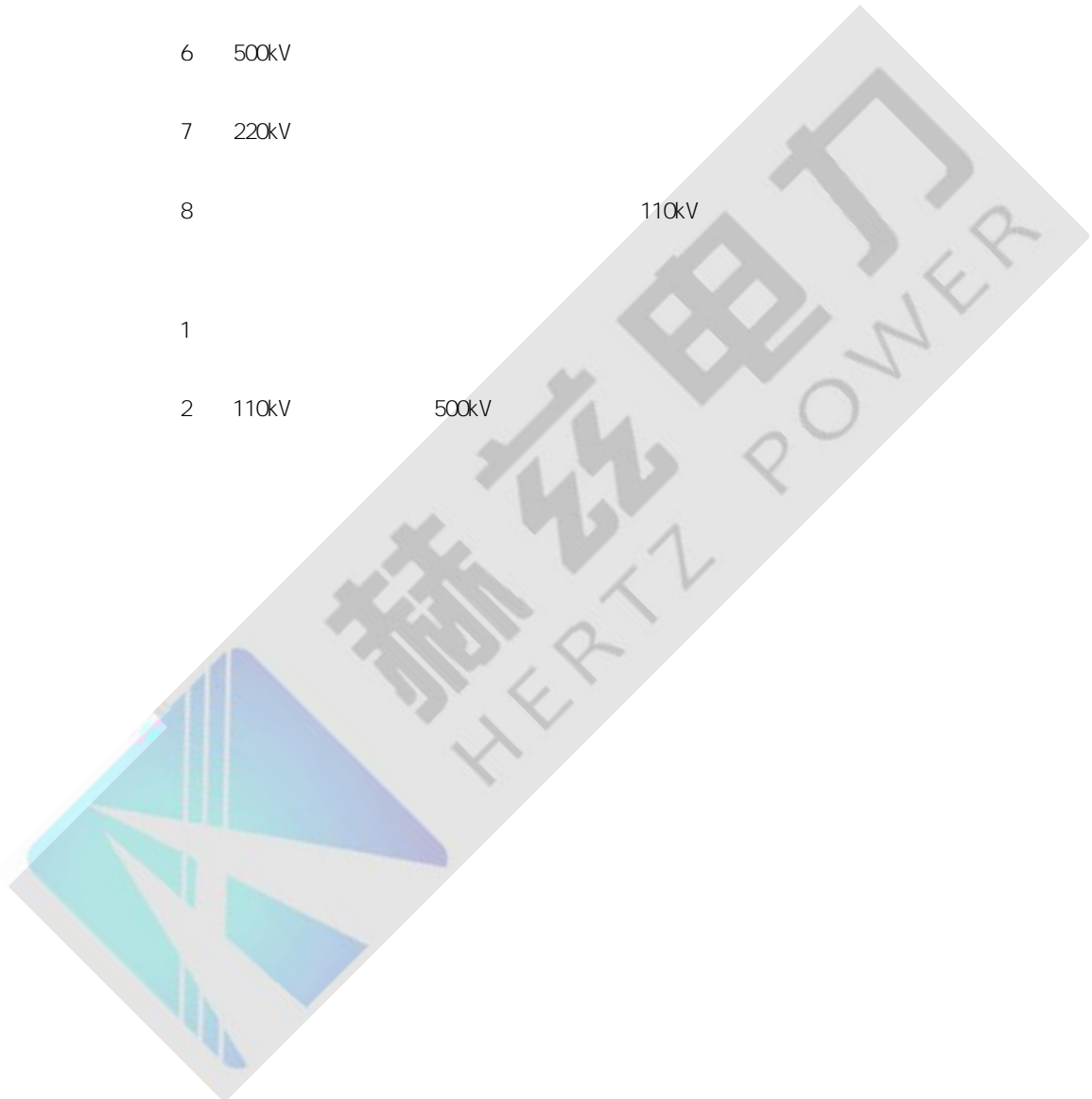
110kV

1

2 110kV

500kV

34



34

20.3

35

	1		2500V	10M
	2	1000V		10M
	3	#1		
	4	#2		
	5	#1		
	6	#2		
1	7	#1		/
	8	#2		
	9	ATS		
	10	500kV		
	11		380V	380V
		380V		
	1			
	2			
	3			
	4			
	5			
2	6			
	7		1mm/m	1mm/m
	8		1.5mm	2mm
	9			
	10			
	11			
	12			

1

2

3

4

5

6

7



36

2
1nA/ (20± 15)
± 5%

3 0.75





12

1

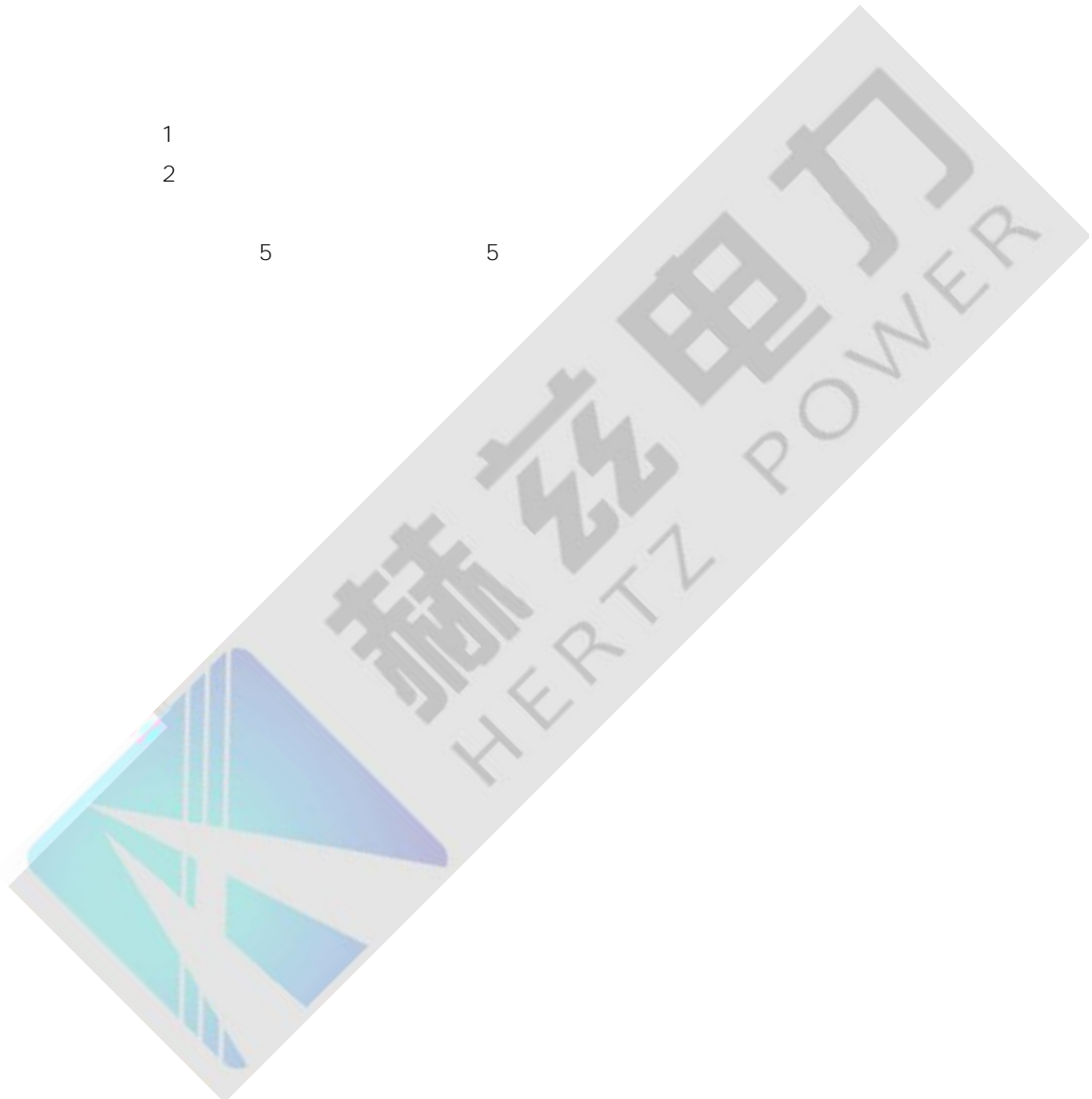
13

2

5

5

14





39

2

a

b

c

400cm²

2

d

e

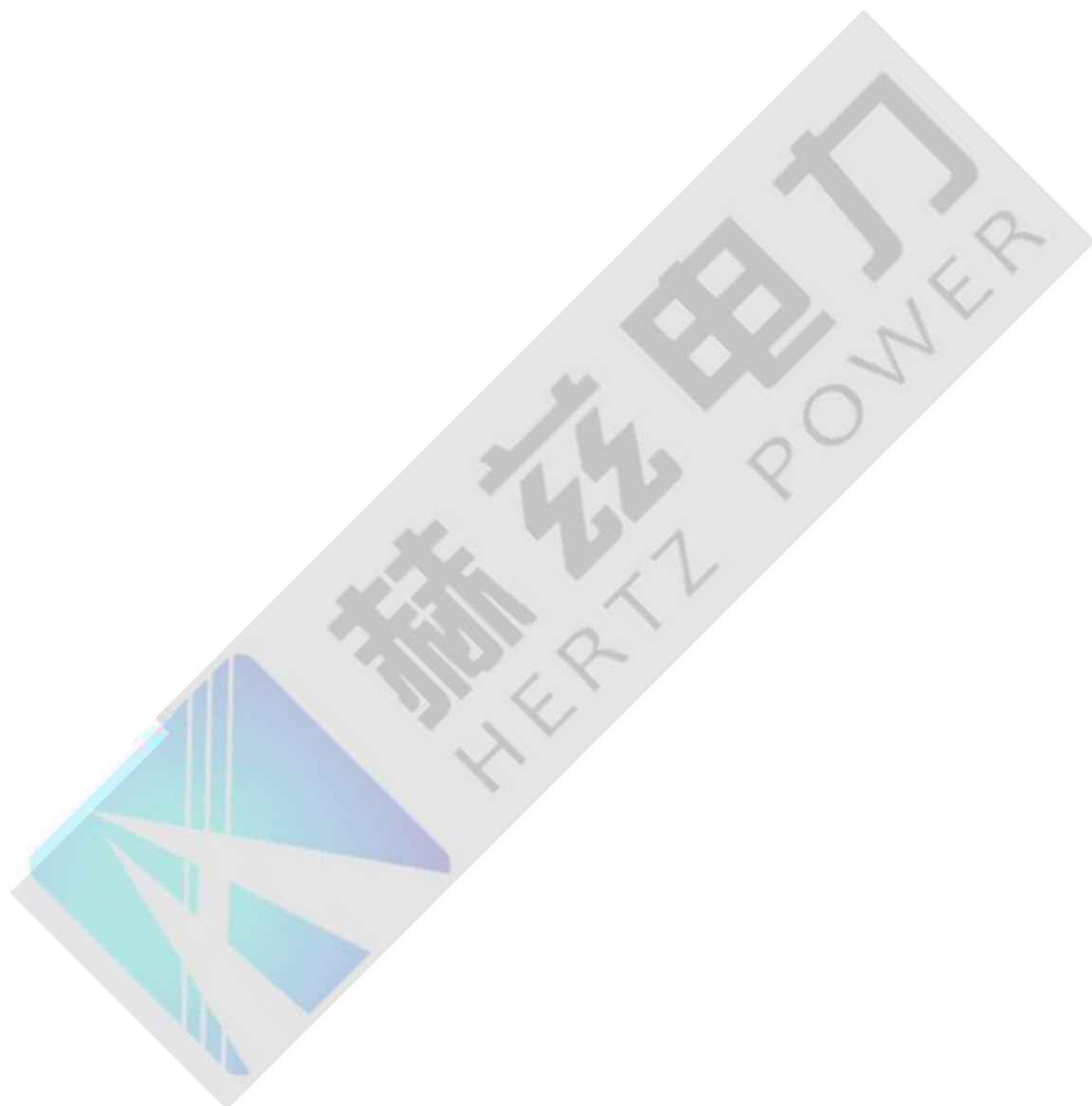
2

f

300mm



	g			
	h			
	i	2mm	5	2.5mm
1	a			
	b			
	c			
	d			
	e			
	f	5-8mm		8-12mm
2	a			
	b			
	c			
	d			
	e			
	f			
	g	20mm	10%	
2	h		4-8mm	
	g	I II		
3	a			
		0.90h		
		0.8mm		0.90h
	b			0.90h
	c			10mm
	d		1.5mm	1mm
		3mm	2mm	
	e			
	f			
	g			
	h			
	i			0



6

7

8

9

a)

100mm

b)

100mm

8

c)

500mm²

1

2

6

3

4

5m

2mm

1

7

2

3

4

500mm

1050mm

1

a)

1.5

0.6MPa

10min

0.02MPa

1h

0.05MPa

1.15

2h

0.03MPa,

b)

í í

c)

1m

8

0.5m

0.15m

3

d)

			<p>1.1 m ± 20mm</p> <p>140mm 100mm 5mm</p> <p>3mm</p> <p>3)</p> <p>a)</p> <p>b)</p> <p>c)</p> <p>24h</p> <p>10min</p> <p>d)</p> <p>e)</p> <p>f)</p> <table border="1"> <thead> <tr> <th colspan="2"></th> <th>mm</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td>15</td> </tr> <tr> <td></td> <td></td> <td>5</td> </tr> <tr> <td></td> <td></td> <td>0.1</td> </tr> <tr> <td></td> <td></td> <td>0.1</td> </tr> </tbody> </table>			mm			15			5			0.1			0.1		
		mm																		
		15																		
		5																		
		0.1																		
		0.1																		
			<p>4</p> <p>a)</p> <p>4m</p> <p>b)</p> <p>c</p> <p>300mm</p> <p>2m</p> <p>d</p> <p>90°</p> <p>300mm</p> <p>e</p> <p>1m 3mm, 5m 10mm</p> <p>1m 3mm, 5m 15mm</p>																	
			<p>5</p> <p>a)</p> <p>b)</p> <p>c)</p> <p>d)</p> <p>1m 3mm, 5m 10mm</p> <p>1m 3mm, 5m 15mm</p>																	
			<p>6</p>																	

a)

50mm

b)

c)

7

a

b)

$\pm 10\text{mm}$

$\pm 15\text{mm}$

9)

a)

b)

k)

l)

2)

a)

b)

c)

d)

3

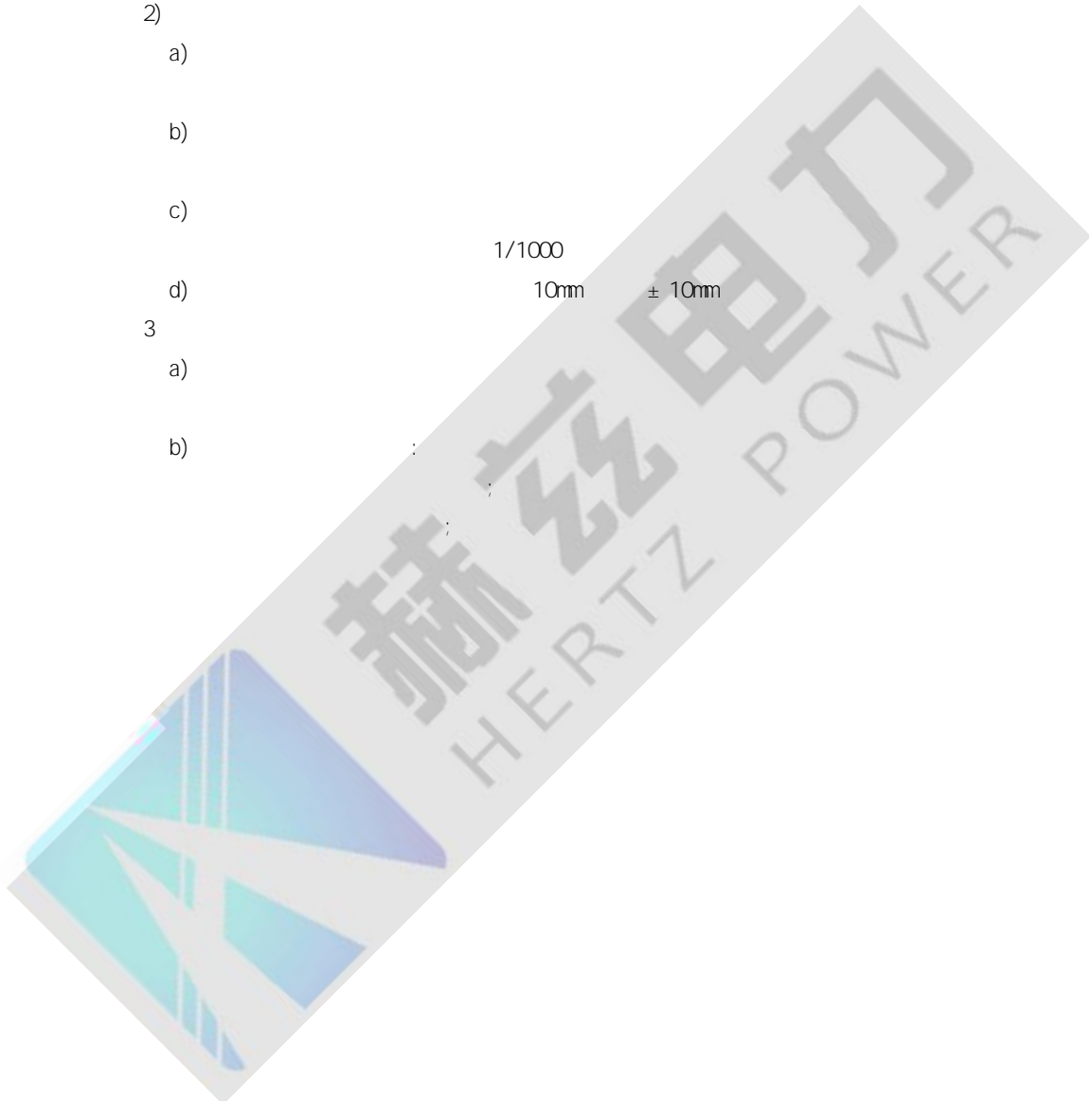
a)

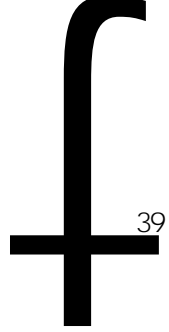
b)

1/1000

10mm

± 10mm





- d
 - e)
- 2
- a)
 - b)
 - c)

- 10mm

- d
 - e)
- 3
- a)
 - b)
 - c)

- 10mm

- d
- 4
- a)

1m

10m 20mm
10- 20mm



e)

f
30mm

100mm

g

250mm

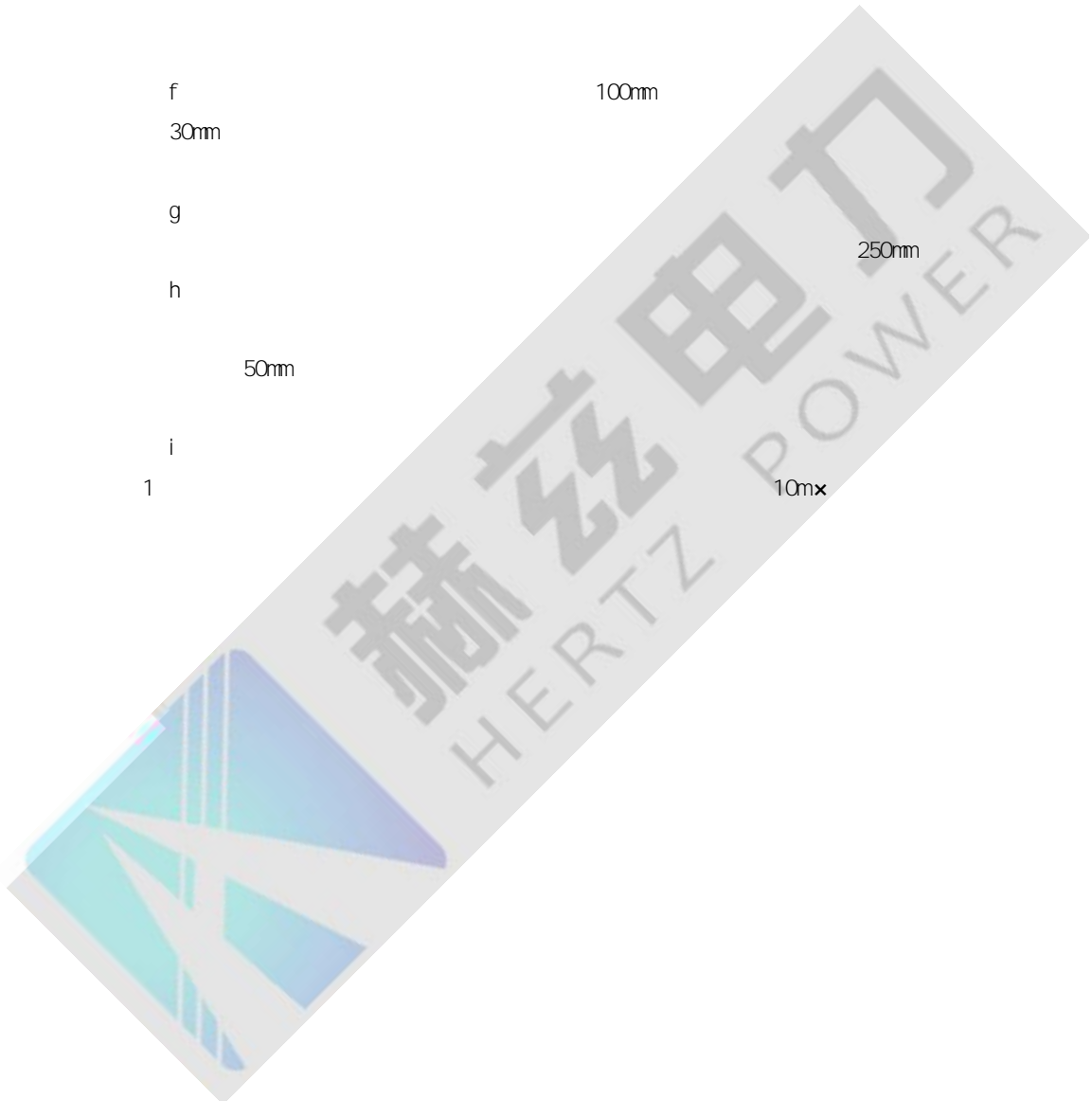
h

50mm

i

1

10mx



			7																																						
			<table border="1"> <thead> <tr> <th colspan="2"></th> <th>mm</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td>20</td> </tr> <tr> <td></td> <td></td> <td>± 20</td> </tr> <tr> <td></td> <td></td> <td>5</td> </tr> <tr> <td></td> <td></td> <td>10</td> </tr> <tr> <td></td> <td></td> <td>± 2</td> </tr> <tr> <td></td> <td></td> <td>+20 0</td> </tr> <tr> <td></td> <td></td> <td>5</td> </tr> <tr> <td></td> <td></td> <td>10</td> </tr> <tr> <td></td> <td></td> <td>+20 0</td> </tr> <tr> <td></td> <td></td> <td>+20 0</td> </tr> <tr> <td></td> <td></td> <td>h/1200 20.0</td> </tr> </tbody> </table> <p>h</p>			mm			20			± 20			5			10			± 2			+20 0			5			10			+20 0			+20 0			h/1200 20.0		
		mm																																							
		20																																							
		± 20																																							
		5																																							
		10																																							
		± 2																																							
		+20 0																																							
		5																																							
		10																																							
		+20 0																																							
		+20 0																																							
		h/1200 20.0																																							
3			<p>1</p> <p>a) 500mm</p> <p>700mm</p> <p>b)</p> <p>c)</p> <p>d) 450mm</p> <p>e) 250mm 450mm 350mm</p> <p>1.5 0.6MPa</p> <p>10min 0.05MPa</p> <p>0.05MPa</p> <p>f)</p> <p>2</p> <p>a) 1.5 0.6MPa</p> <p>10min 0.05MPa</p> <p>b) ;</p> <p>c)</p> <p>d) ± 20mm</p> <p>f)</p> <p>3)</p> <p>a)</p> <p>b)</p>																																						

40

$\pm 5\text{mm}$

c

f

		mm
1		5
2		+20 5
3		± 20

2

a)

b)

c

		mm
1		5
2		± 30
3		10
4		3

1

a

b

c

d

e

6

2)

a

β f

24h

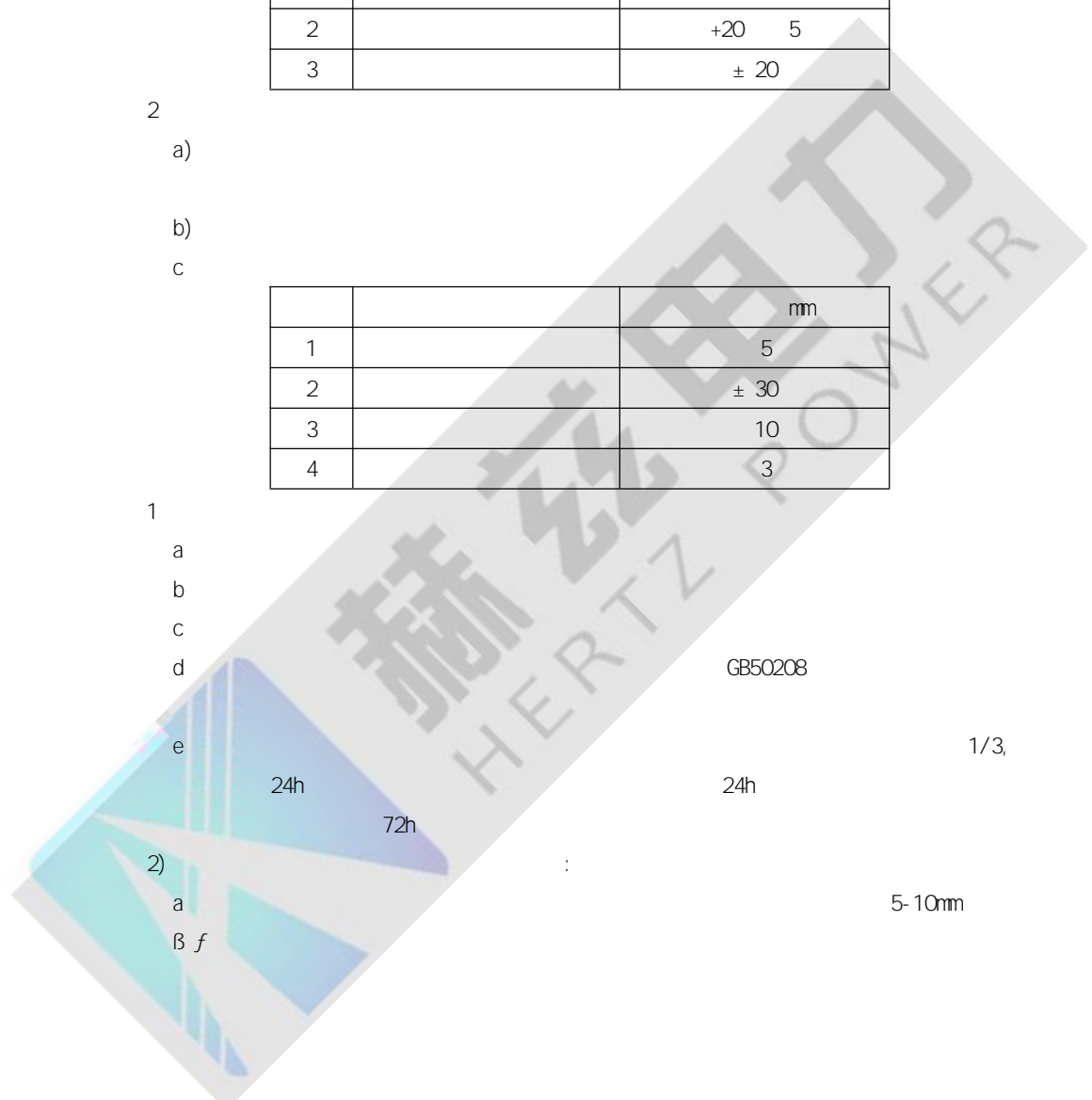
72h

GB50208

24h

1/3,

5-10mm



			2		
			a)		
			b)	5mm	
			c)		
			1		
			a)	1	
			2		
			b)		
			c)	2%	
			d)	5%	
			2		
			a)		
			b)		
			c)	kN	0.9
			d)	60%	0.5
			e)		
			3)		
			a)		
			b)		25kg
			c)	200mm	
			d)	15mm	0.5m
			e)		
			f)	50mm	30mm
			4		
			a)		
			b)		
			c)		
			d)	10mm	
			5		
			a)		
			b)	300mm	
			c)		
			d)	20mm	
			1		
			2		
			a)		
			b)		80%
8					
9					

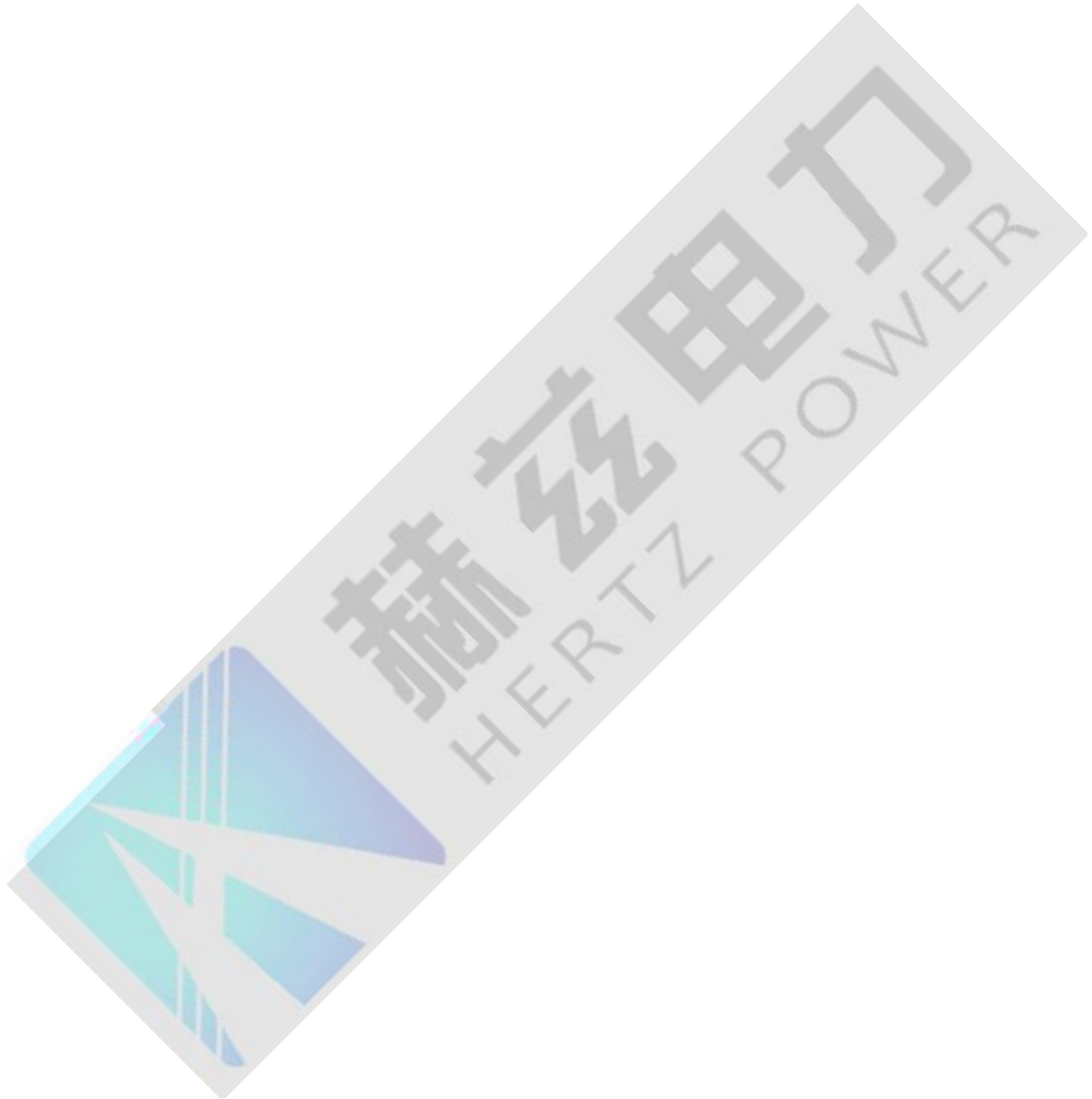
50



40

c)

20m



1

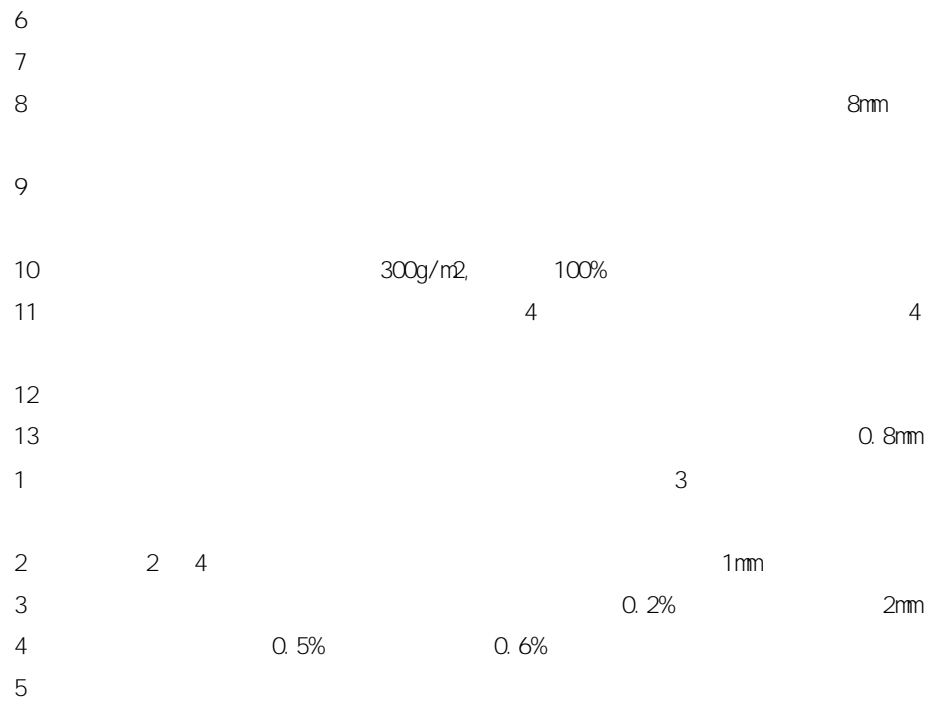
1
2
3

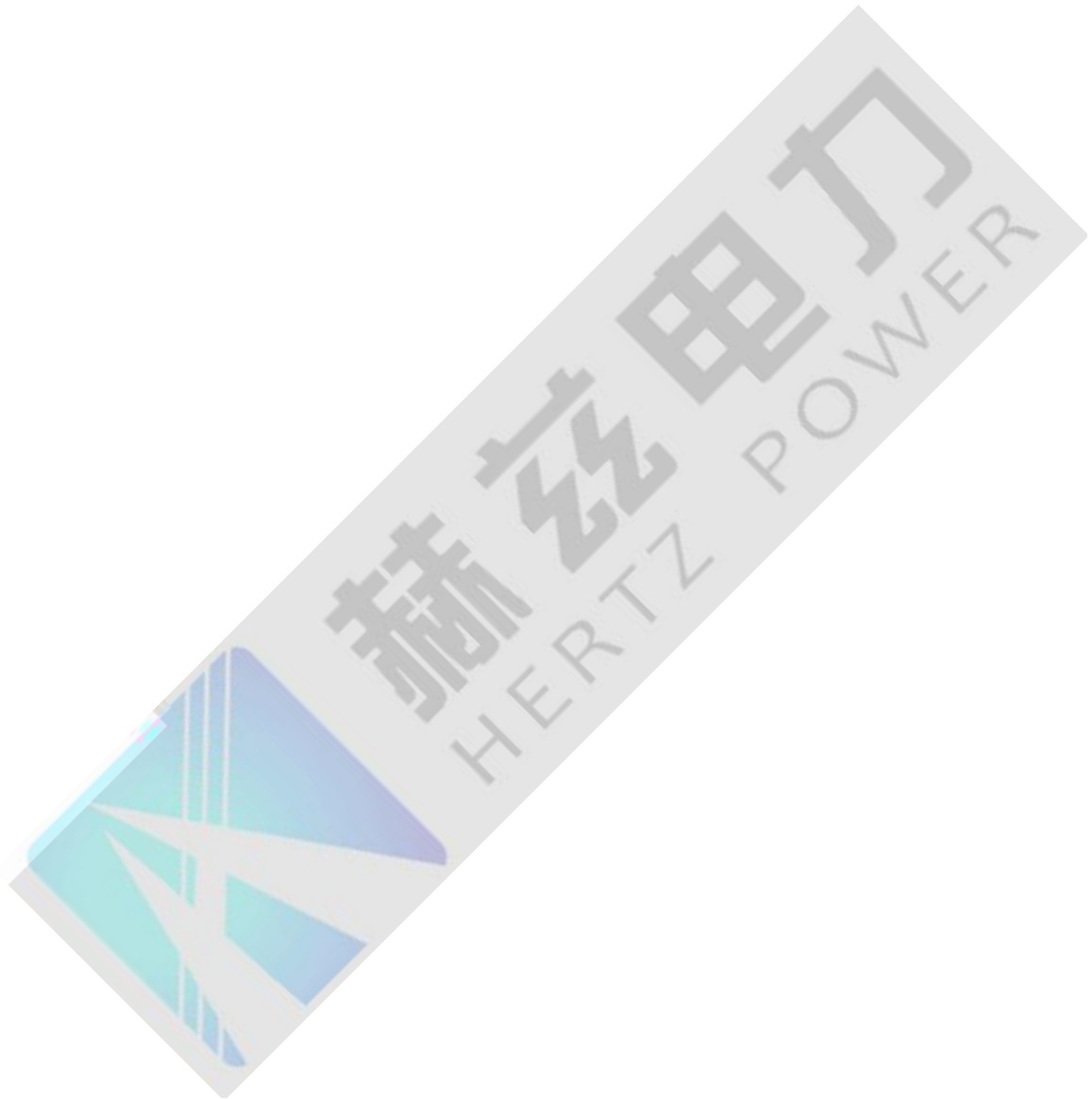


HERTZ POWER

HERTZ

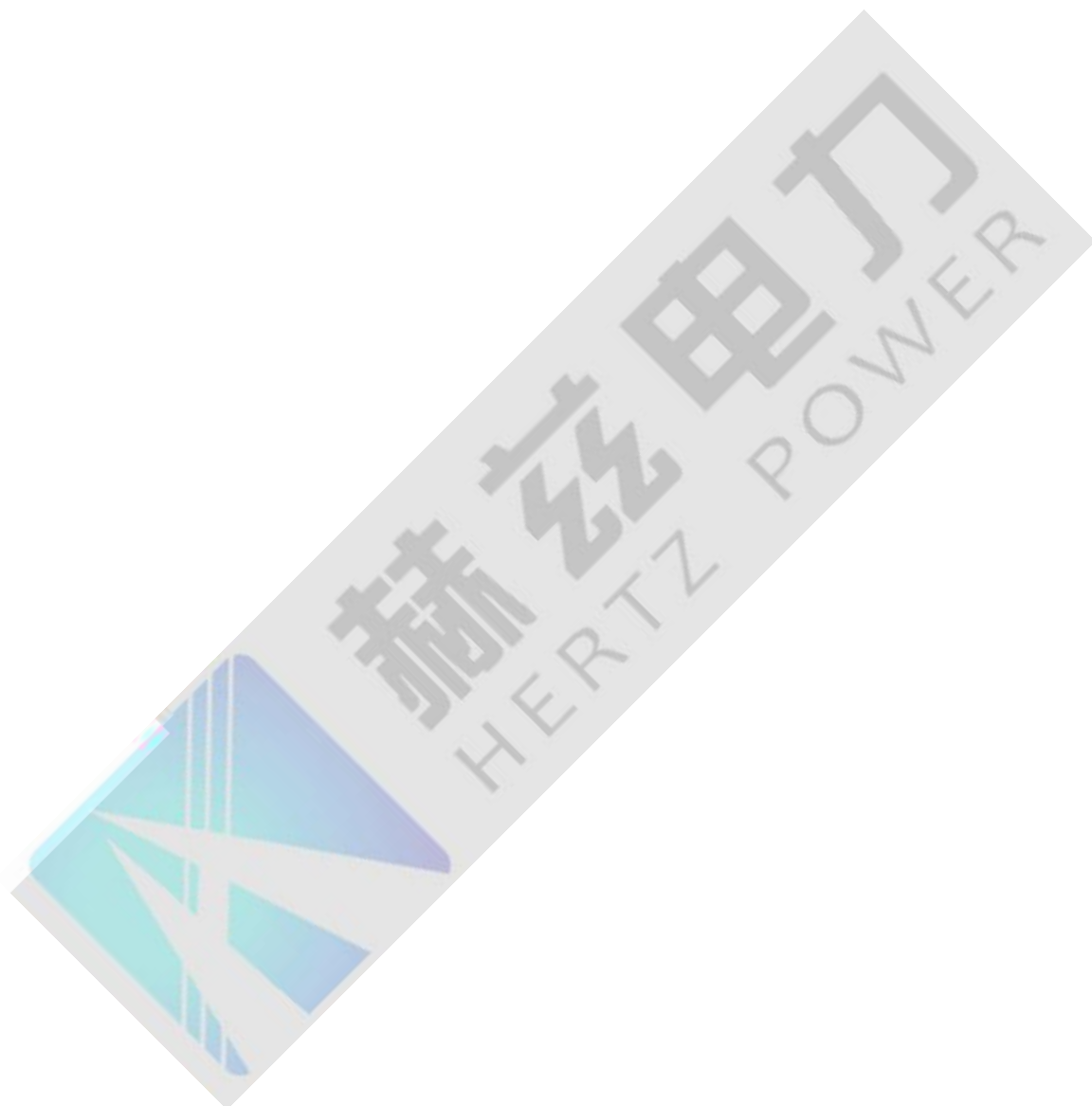






43

		15		
8	0.5kg		6mm	3kg 2 3
9				1 2
10				2 5
11	1 2			
12				
13	LED			
14				
1mm ²				
15		100W		
		1 2		
16				
		1 2		
17				
18			2.4m	
	36V			
1				
2				50%
3				



5

2

6

N
N PE

PE

7

8

2-5mm

1

1

2

2

6

0.5l x

5

3

N

/

4

5

1

5.7.1

30

2

10

6

3

5 10

24



43

			4		
			5		

24. 6

44

1			1 RAL 7035 800 mm 600 mm 2260 mm 3. 2mm 2 3 4 () 5 100mm ² 4mm ² 50mm ² 6 2-5mm 7 10% 8 9 10		10k V 500kV
2			1 75° /s 50° /s 704× 576 50m / 2048× 1536 2 3 / 360 4 5 0.7 0.5		1 / 5

44

1.5

2

30

2-5mm

6

7

8

3

			15 16 17 18 19 DLT634. 5104- 2002		
4			1 2 3 4 5 6 7 8 9 10 RTU GA 1089- 2013 CSD RPU	/	1 3 4
5			1 2 3 4 5 2 U 0.5M		

1			1) 2) 3) 4) 5) 6) 7) 8)	3	
2			1 2 3 4 5 6 7	2	
3			1 2 3		
4			1 2 3		
5			1 2		
6			1 2		
7					



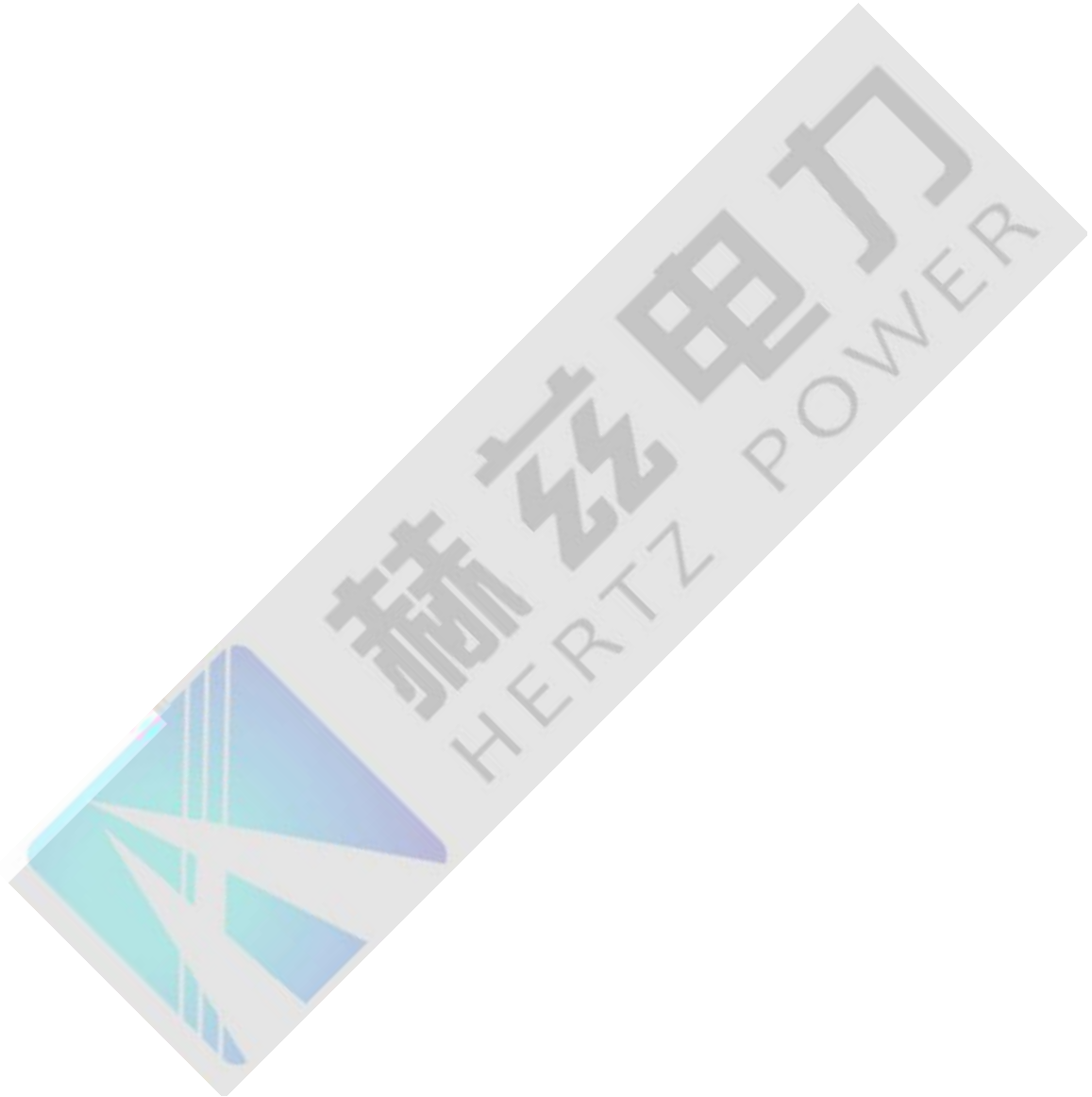
24.8

46

1

7

1



6 1.2m
 1m
 1.8 1.2
 120mm±10mm 1.2m 150mm±10mm
 7 100m
 8
 9 25m
 10 120
 11 10cm
 200mm
 12
 2m
 13 " "
 10m
 13

/kV		
	/m	/m
10kV	2.5	2
35 110kV	5	3
220kV	7	4
330kV	9	5
500kV	9	5

14

25



24.9

1		<p>1</p> <p>1) 2) 3)</p> <p>4) - M00 Y100 - K100 Q/CSG10001-2004</p> <p>2</p> <p>1) 2) 3)</p> <p>4) - Y100 - K100 Q/CSG10001-2004</p> <p>3</p> <p>1) 2) 3)</p> <p>4) - C100 - K100 Q/CSG10001-2004</p> <p>4</p> <p>1) 2) 3)</p> <p>4) - C100 Y100 - K100 Q/CSG10001-2004</p>		
2		<p>1</p> <p>A Y100 M20 B C100 Y100 C M00 Y100</p> <p>2 M00 Y100</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>Q/CSG10001-2004</p>		

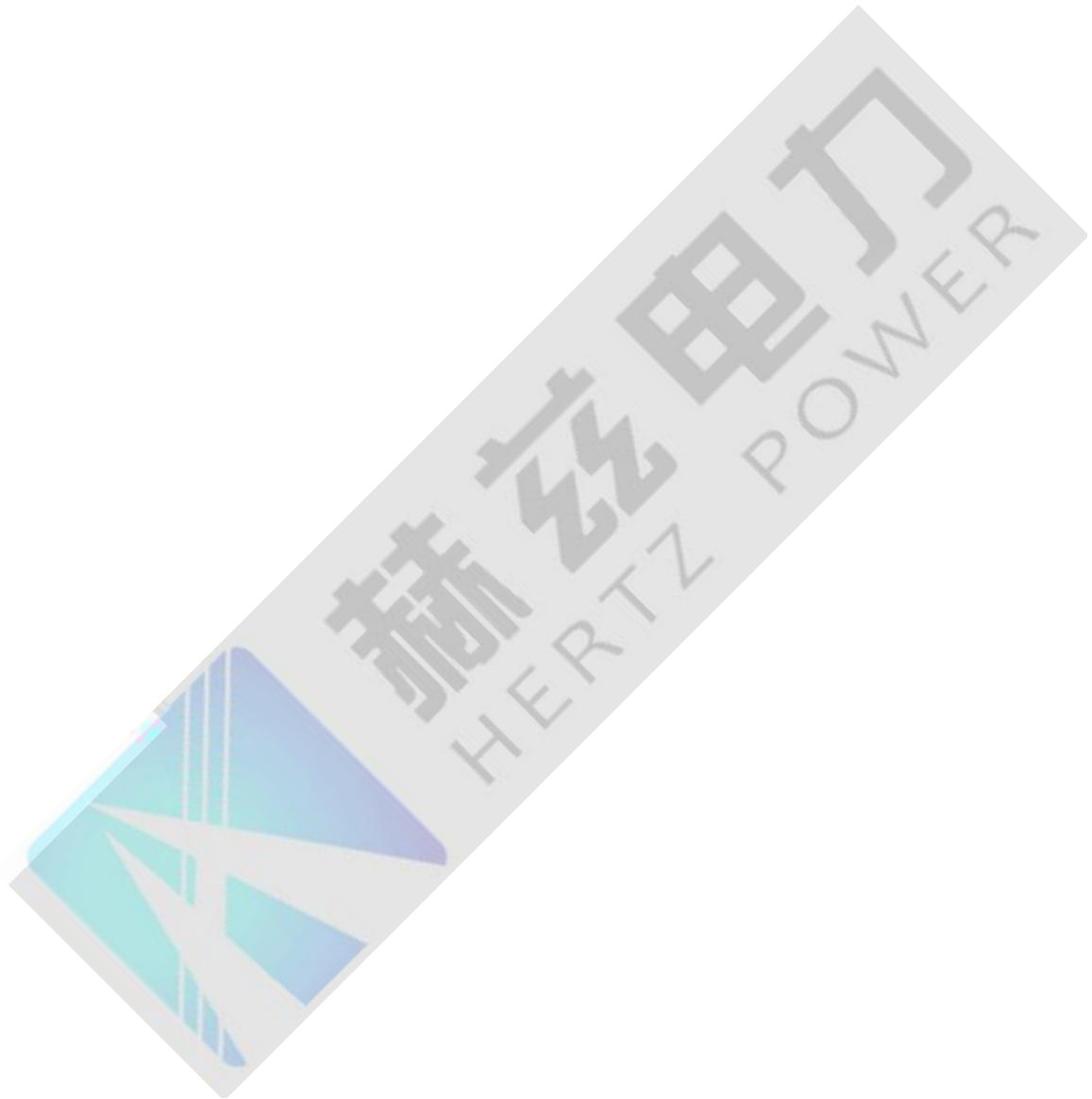
7

15-100mm

8

9

Q/CS



A

A. 1

A. 1

A. 1

1			
2	PH	>5.4	GB/T 7598
3	KOH mg/g	0.03	GB/T 264
4		135	GB 261 -
5	mg/L	500kV 10 220kV 15 110kV 20	GB/T7600 GB/T 7601
6	25 mV/m	40	GB 50150
7	tan %	90 500kV 0.5 220kV 1.0	GB/T 5654
8	kV	500kV 65 110kV 220kV 45 35kV 40	1. GB/T 507 2. DL/T 429.9
9	90 •m	6×10^{10}	GB/T 5654 DL/T 421
10	%	500kV 1.0	DL/T 423 DL/T 703 500kV
11	%	0.02	GB/T 511
12			GB/T 17623 DL/T 722 DL/T 722
13		500kV 100mL 5um 2000	DL/T 1096

A. 2

A. 2

A. 2

	1. 6kV 2. 1 35kV 2
	A-1 2 9
	A-1

B

SF₆

B. 1 SF₆

DL/T1366

GB12022

GB12022

B. 1 SF₆

1	1
2 40	2
41 70	3
71 100	4
1 100	
2 SF ₆ 24h	

B. 2

1

2

B. 2 SF₆

