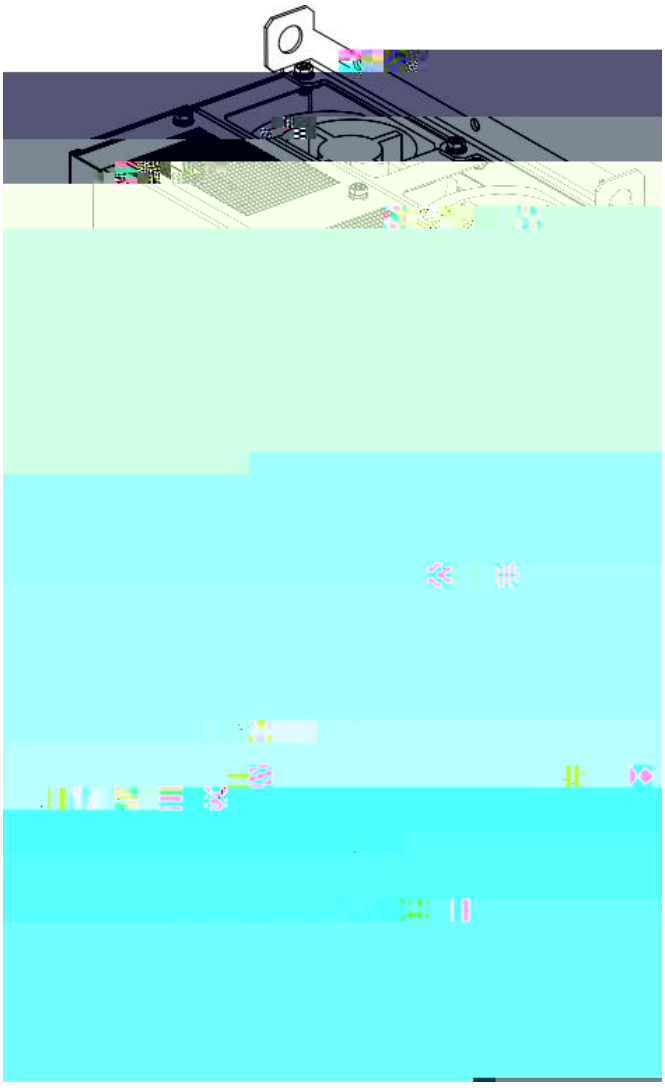
HF650

1.09

Wuhan Guide Technology Co.,Ltd.



HF650

1. 1

1.1
1.2
1.3

2. 4

2.1
2.2
2.3
2.4
2.5
2.6
2.7
2.8
2.9
2.10

3. 22

3.1
3.2
3.3
3.4
3.5 PGC2
3.6PGD2

4. 44

4.1
4.2
4.3
4.4
4.5
4.6
4.7
4.8
4.9
4.10 EMC

5. 59

5.1
5.2
5.3
5.4
5.5

6. 68

6.1
6.2

7. 74

7.1 P0
7.2 P2
7.3 P3
7.4 P4
7.5 P5
7.6 P6
7.7 P7
7.8 1 P8
7.9 2 P9
7.10 3 P10
7.11 4 P11
7.12 1 P12
7.13 2 P13
7.14 3 P14
7.15 4 P15
7.16 1 V/F P16
7.17 2 V/F P17
7.18 3 V/F P18
7.19 4 V/F P19
7.20 1 P20
7.21 2 P21
7.22 3 P22
7.23 4 P23
7.24 MODBUS P32
7.25 P33

8. 145

8.1
8.2
8.3
8.4
8.5
8.6
8.7
8.8
8.9 V/F
8.10
8.11

9. 166

9.1
9.2
9.3

10. 172

10.1
10.2
10.3
10.4
10.5

1.

1.1







1.2

(1)

(2)

(3)

(4)

LVD	2014/35/EU	EN 61800-5-1
EMC	2014/30/EU	EN 61800-3

1.3

1

RCD

RCM RCD

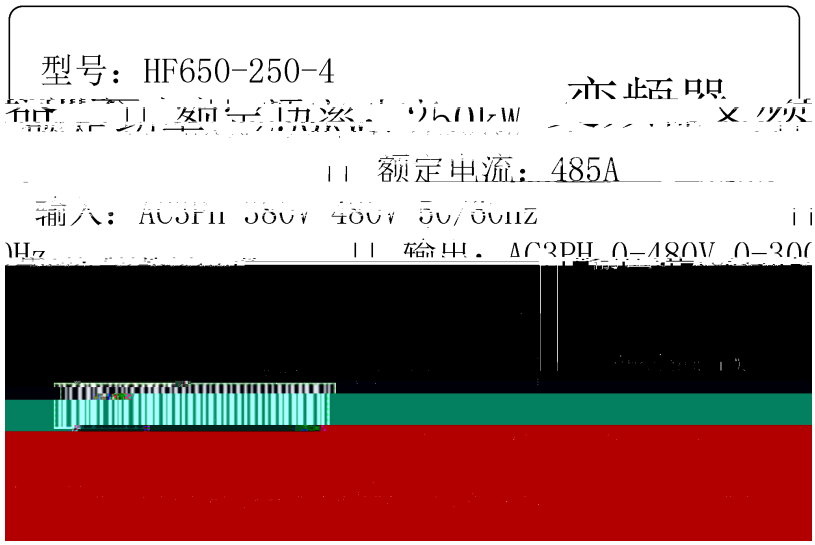
RCM

B RCD RCD

RCD RCD

2

HF650 2-2 250kW



2-2

HF650-250-4 HF650 250kW 400V

AC

3PH

380V-480V 50/60Hz

0-480V 0-300Hz

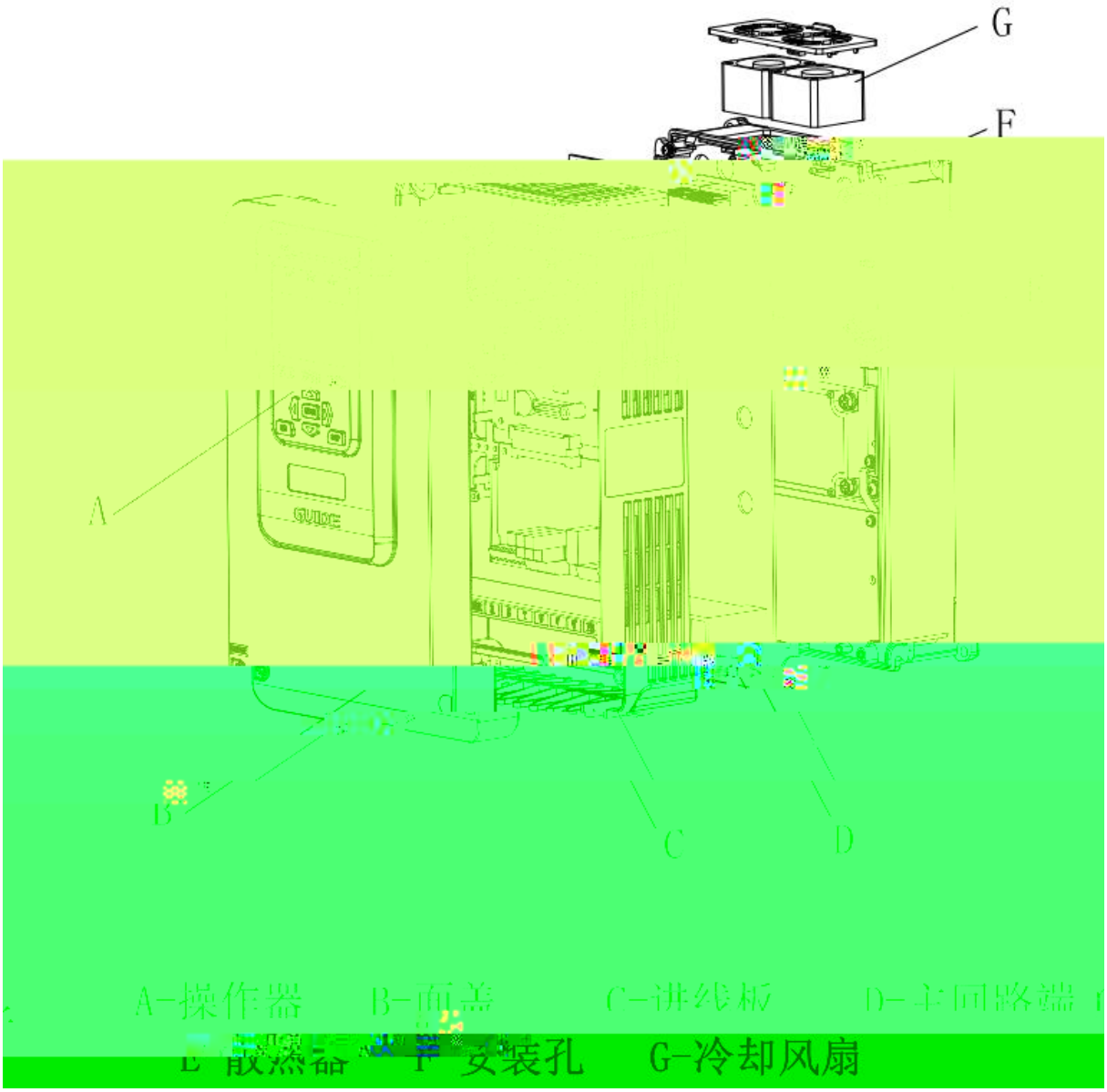
2.3

2-3 HF650

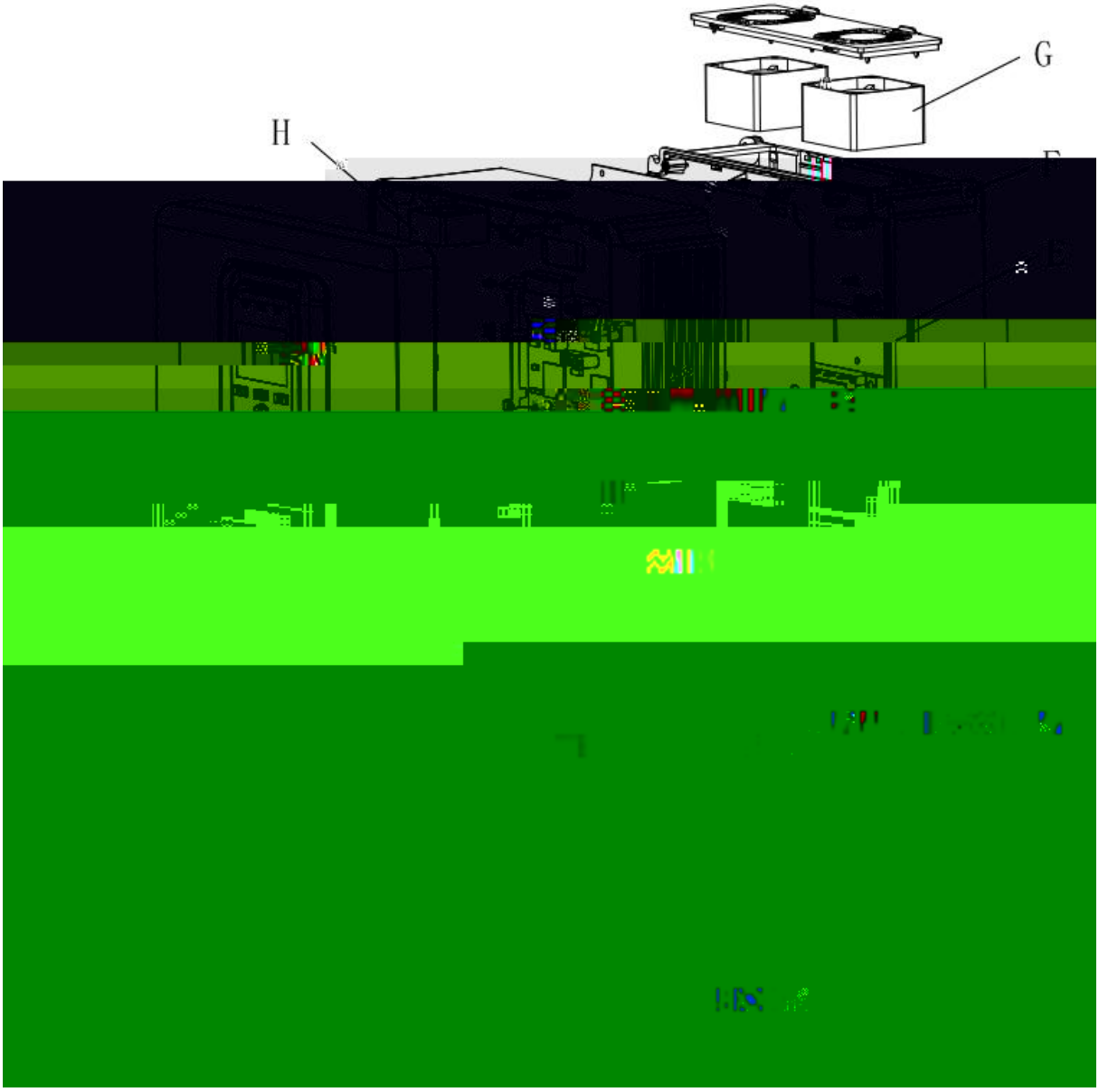
	[A]	[kW]	[A]	[kW]		(kg)
HF650-0R4-4	1.8	0.4	--	--	I1	3
HF650-0R7-4	3.3	0.75	1.8	0.4		
HF650-1R5-4	4.8	1.5	3.3	0.75		
HF650-2R2-4	5.7	2.2	4.8	1.5	I2	3.5
HF650-3R7-4	10.2	3.7	5.7	2.2		
HF650-5R5-4	15	5.5	10.2	3.7		
HF650-7R5-4	18	7.5	15	5.5		
HF650-011-4	24	11	18	7.5	I3	4.5
HF650-015-4	32	15	24	11		
HF650-018-4	41	18.5	32	15	I4	10.5
HF650-022-4	47	22	41	18.5		
HF650-030-4	65	30	47	22		
HF650-037-4	75	37	65	30	I5	35

HF650-045-4	94	45	75	37	I6	52
HF650-055-4	115	55	94	45		
HF650-075-4	155	75	115	55		
HF650-090-4	188	90	155			

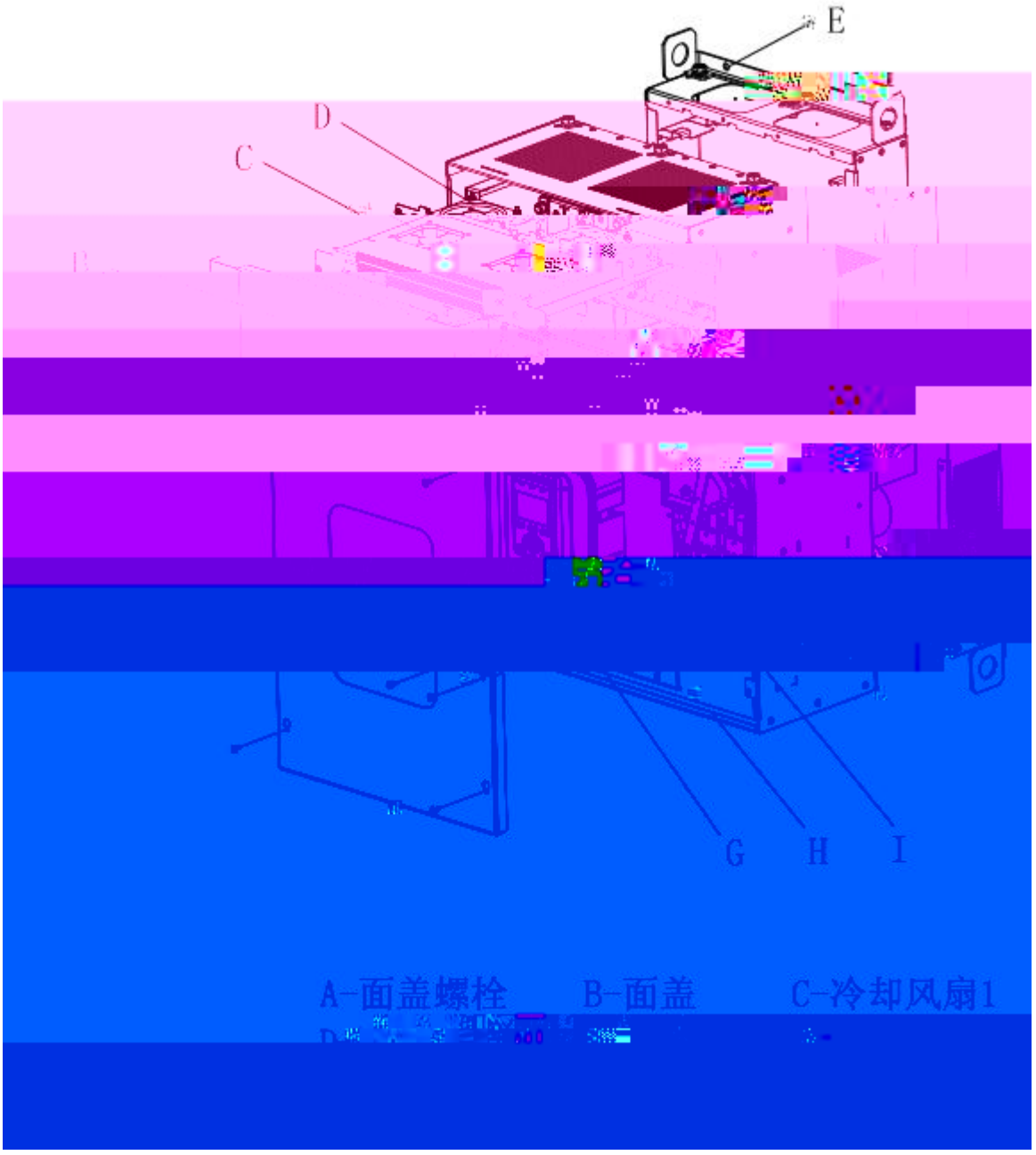
HF650-011-4　HF650-015-4



HF650-018-4　HF650-030-4

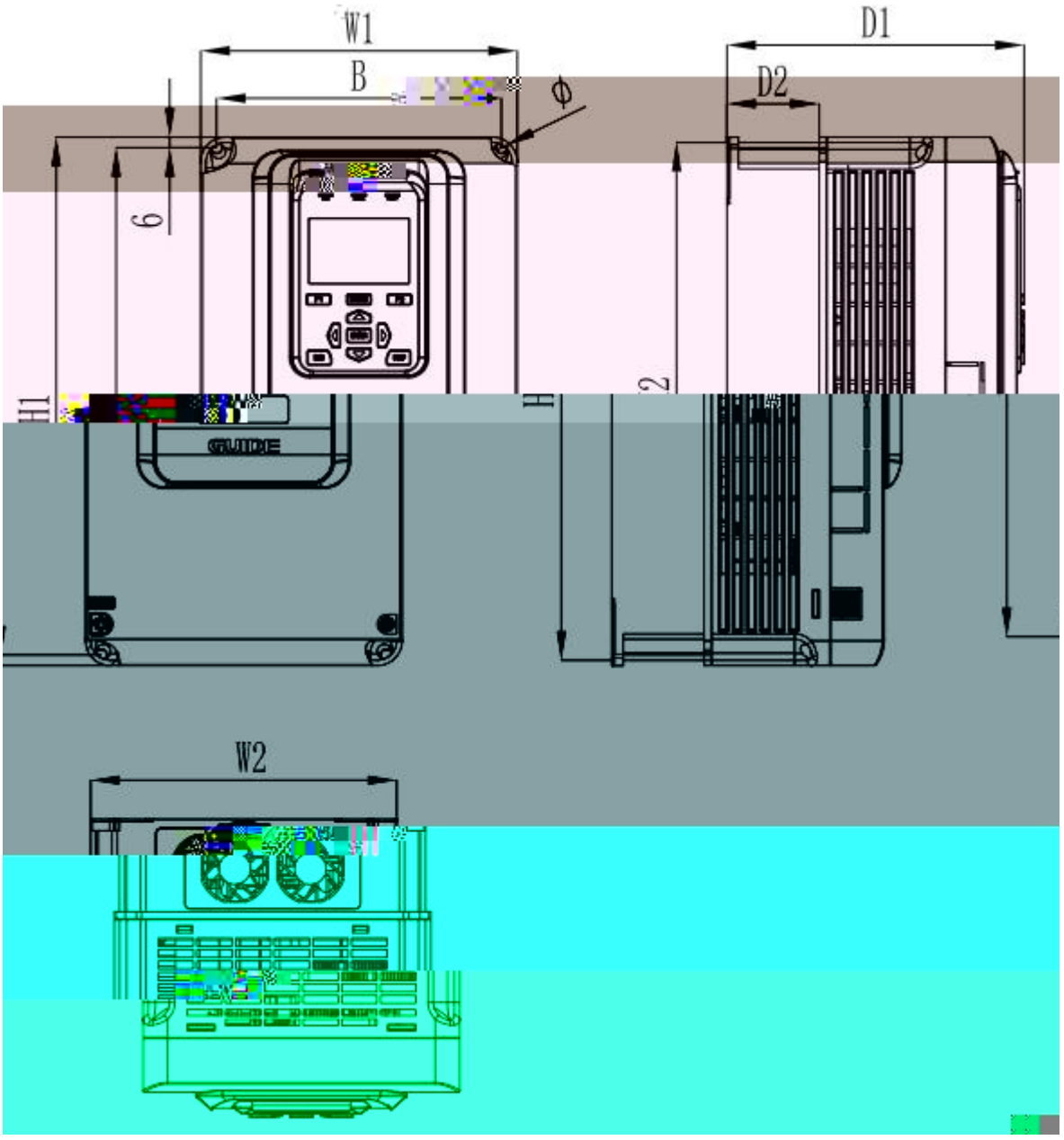


HF650-037-4　　HF650-090-4

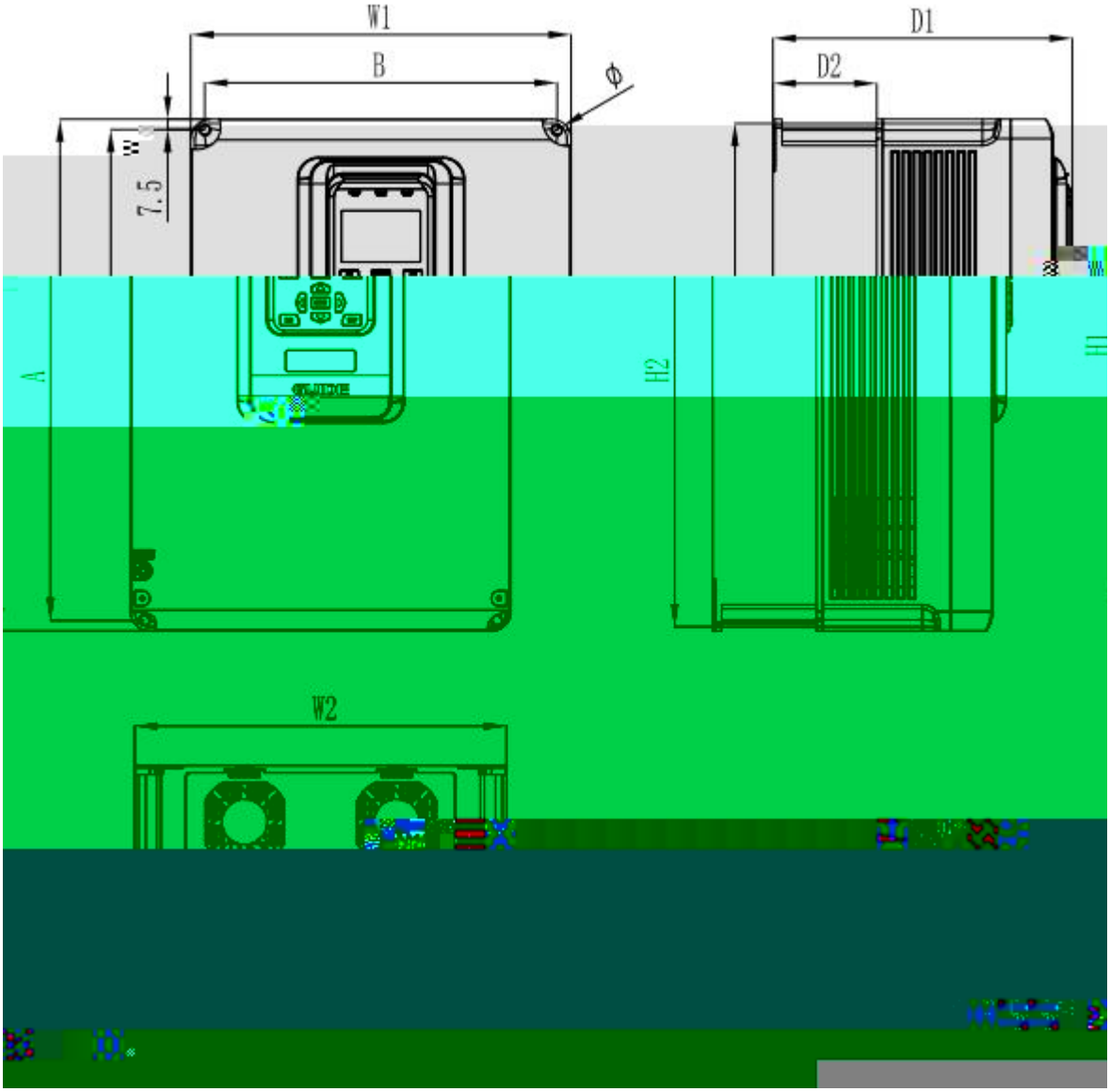


HF650-110-4 HF650-500-4

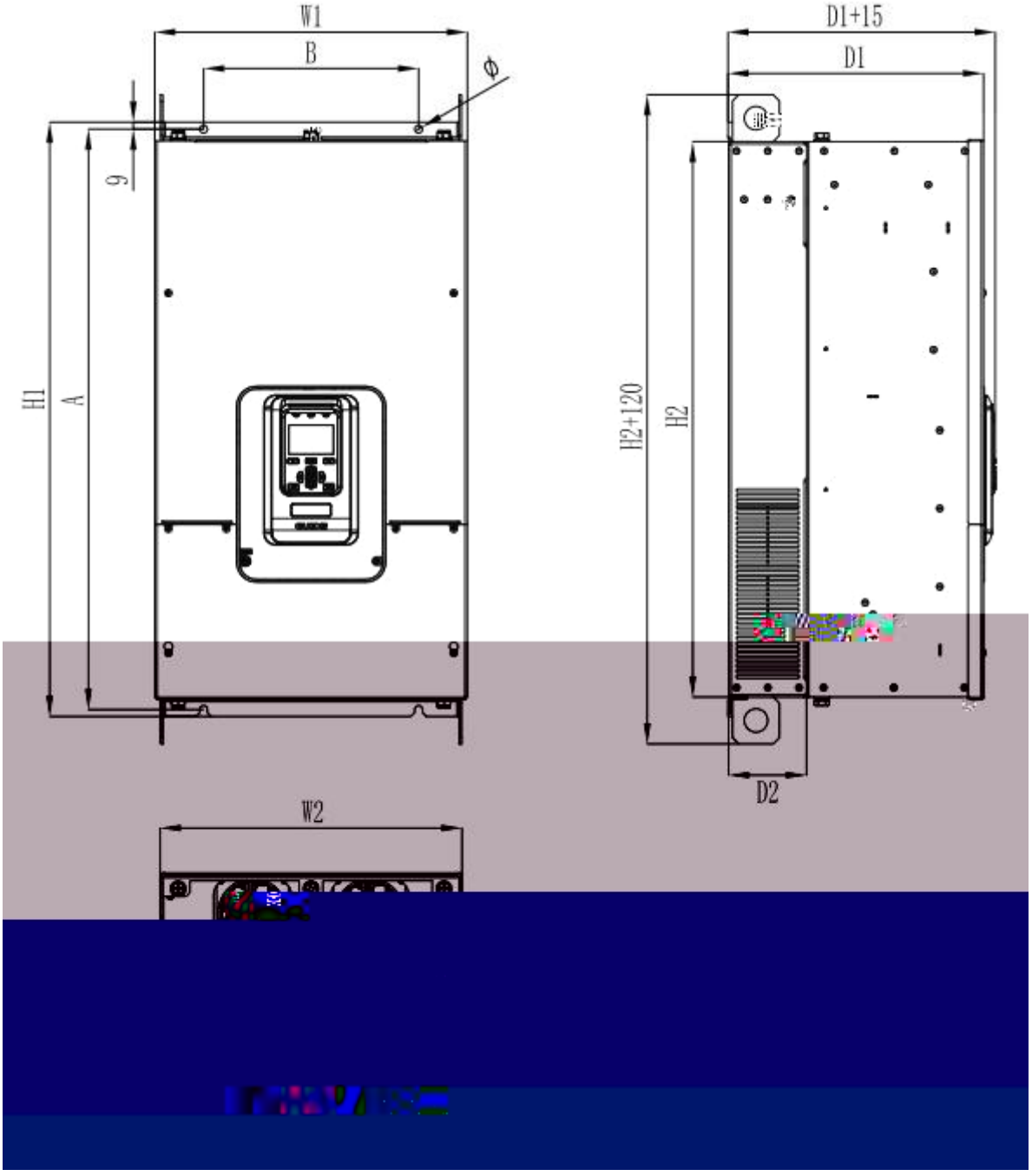
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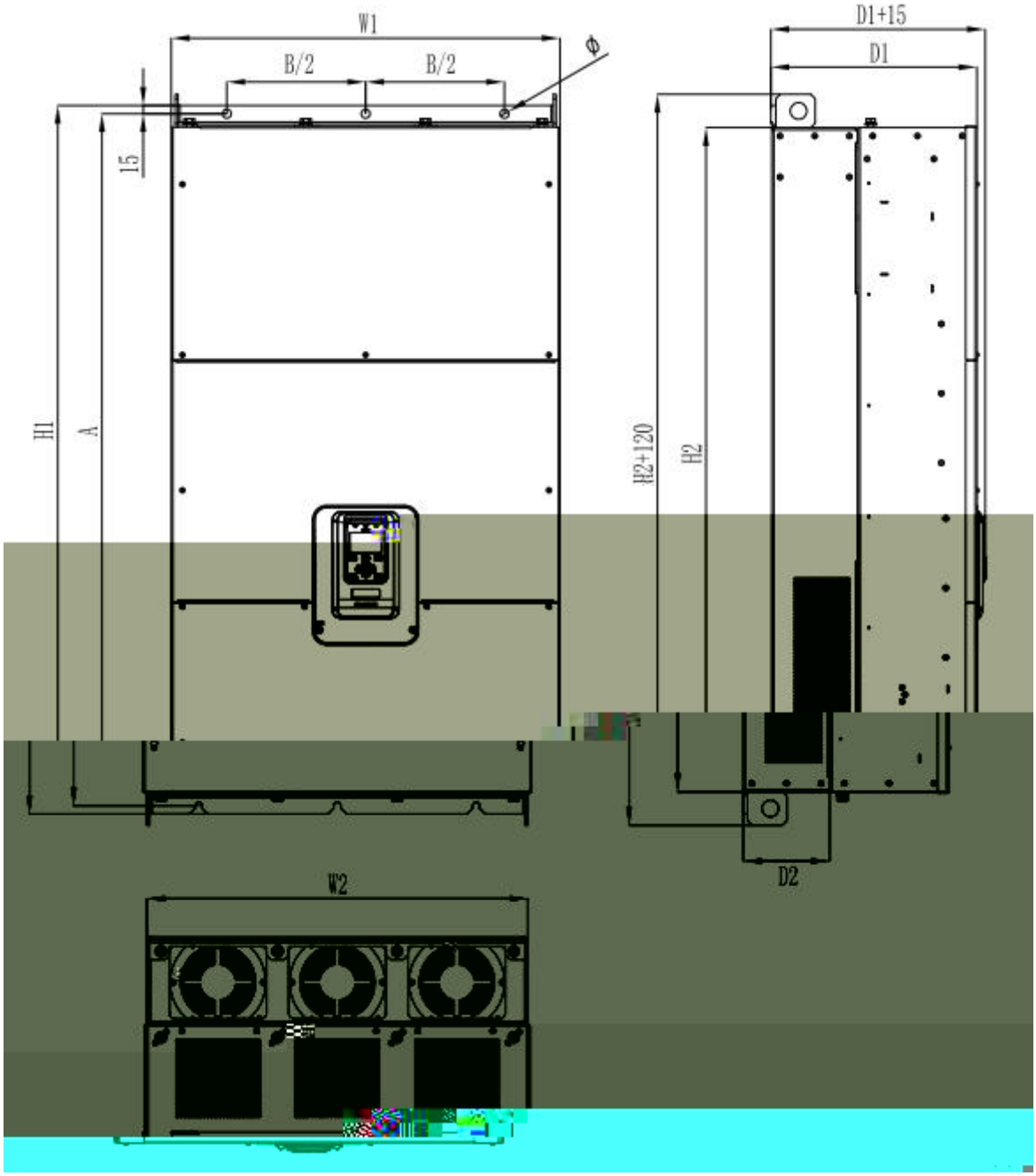
I1-I3



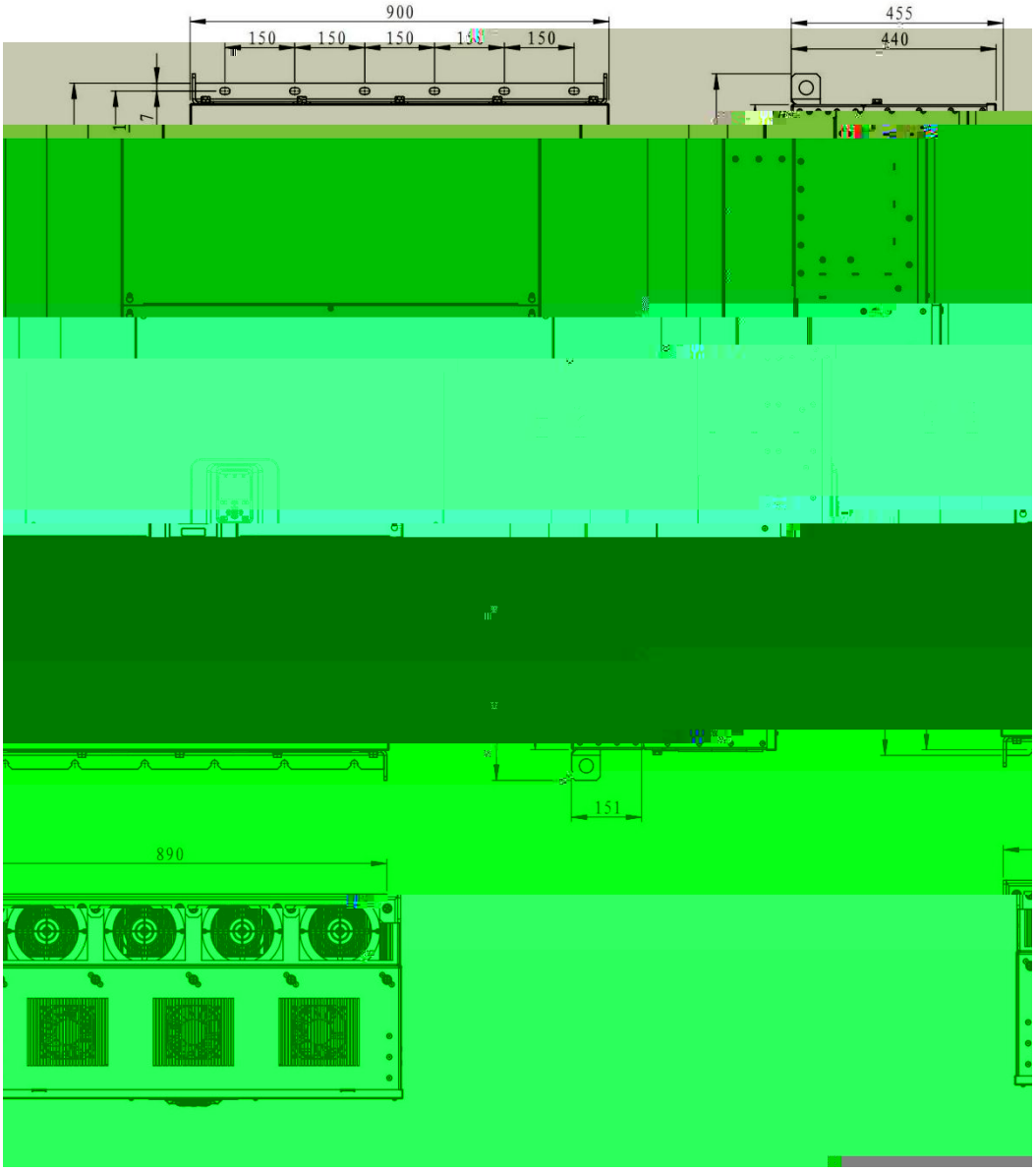
14



15-16



17-19


900
150
150
150
150
455
440
151
890

2.6

		380V 480V
		50/60Hz
		-15% +10%
		fLN±2 ±4 ≤2 fLN/s

		0
		1
		0 300Hz
		1kHz 10kHz
		0.01Hz x0.1%
		(VC) (SVC) V/F
	V/F	
		PG PG
		300Hz
		0Hz/200%(VC SVC) 0.8Hz/150%(V/F)
		1:500(SVC) 1:1000(VC)
		±0.02% (VC) ±0.2% (SVC) ±0.5% (V/F)
		5 150% 1 200% 5
	PID	
		DP CAN Modbus Ethernet Profinet
		PID / / / / AFE
		8 2 -10 +10V 0mA/4mA 20mA
		5 3 2 2 0 +10V 0mA/4mA 20mA
	LCD	
		1000 1000 100 1% 3000

-10 +40 40 1

1% 50

-10

95%RH

-20 +60 m"

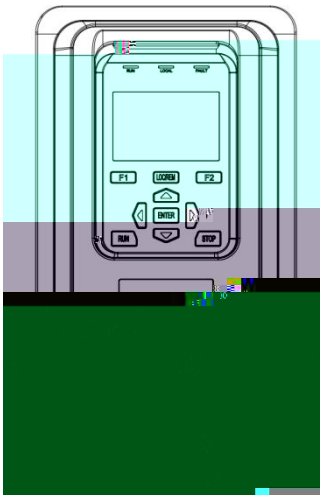
10-30

HF650-015-4	15	0.5	HF650-250-4	250	7.044
HF650-018-4	18.5	0.645	HF650-280-4	280	7.708
HF650-022-4	22	0.722	HF650-315-4	315	8.003
HF650-030-4	30	0.906	HF650-355-4	355	8.718
HF650-037-4	37	1.128	HF650-400-4	400	9.1
HF650-045-4	45	1.313	HF650-500-4	500	11.13

	BU110-4	110KW
	BU160-4	132KW-160KW
	GDBU-4045B	
	GDBU-4220B	

3.2

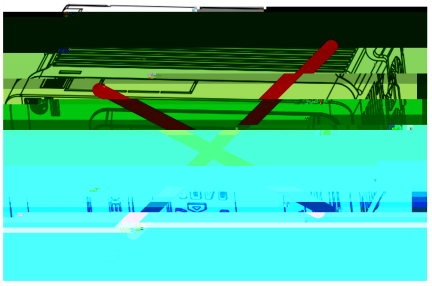
3.2.1



OK



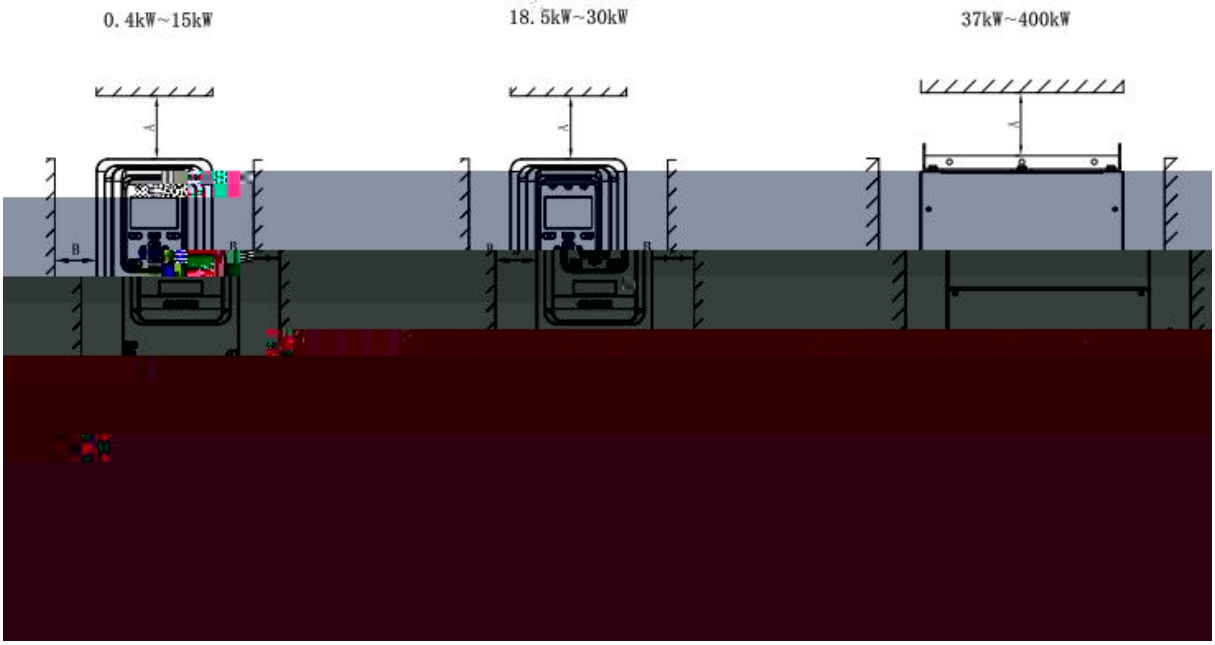
NG



NG

3.2.2

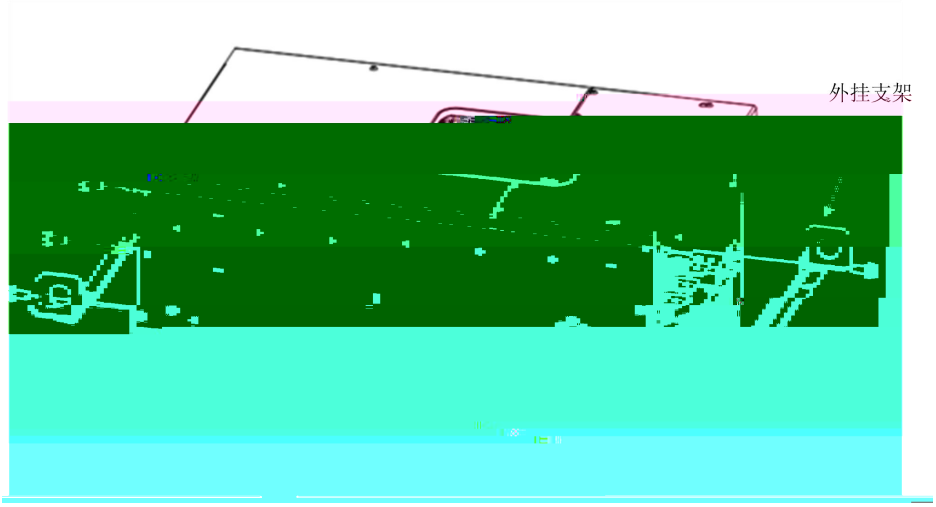
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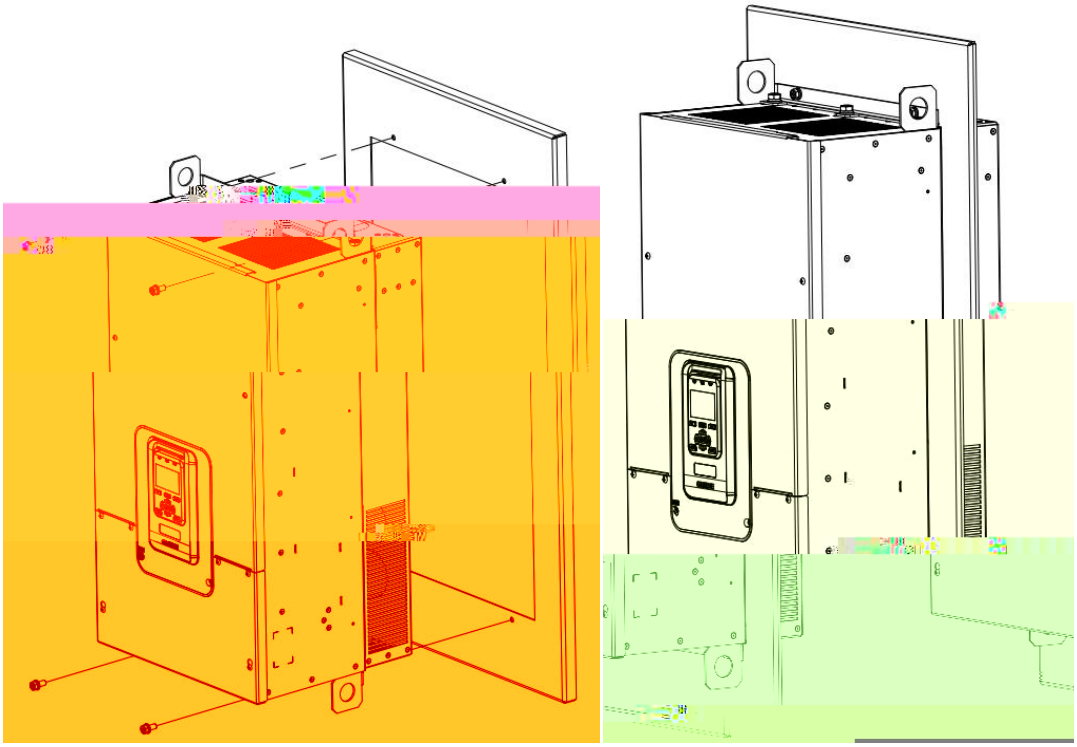
3

0.4kW~15kW	A ≥ 100mm	B ≥ 40mm
18.5kW~30kW	A ≥ 200mm	B ≥ 50mm
37kW~400kW	A ≥ 300mm	B ≥ 50mm
500KW	A ≥ 400mm	B ≥ 50mm

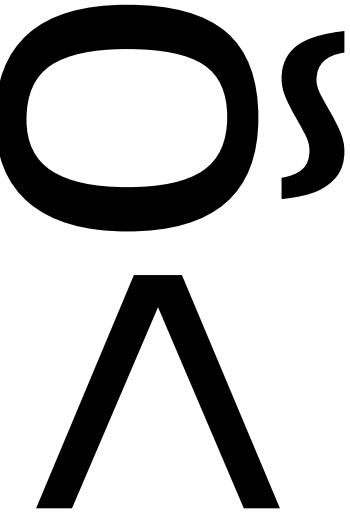
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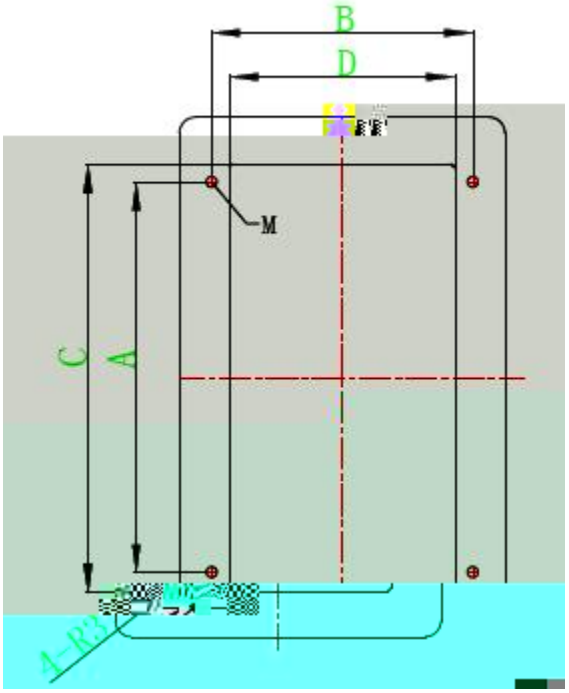
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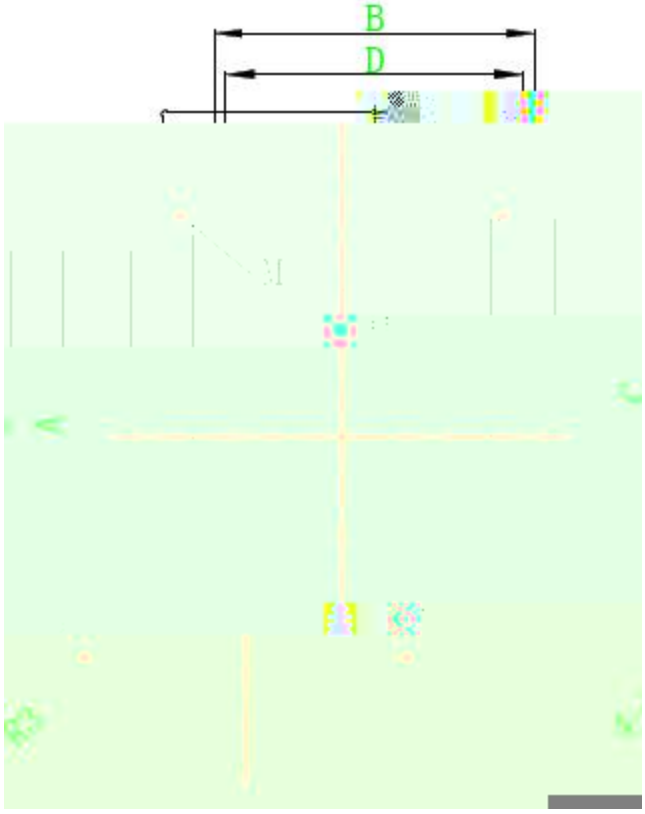
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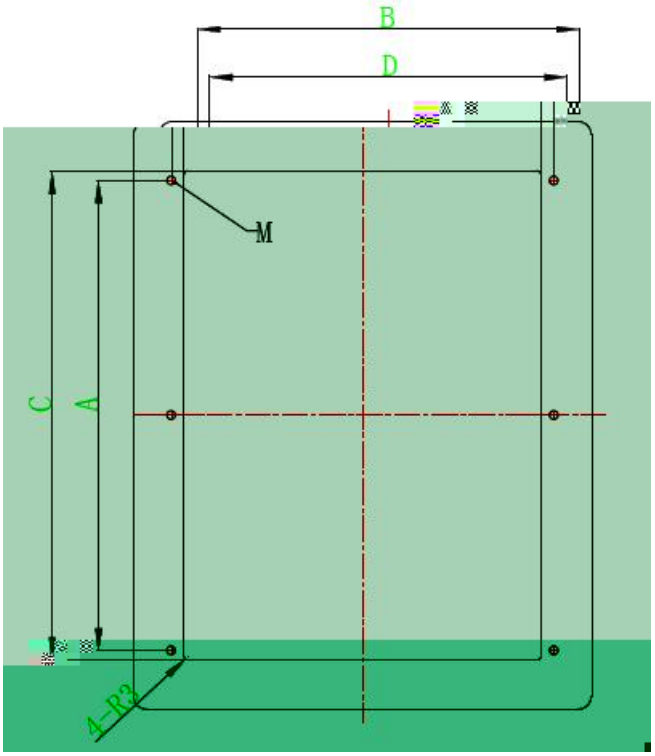
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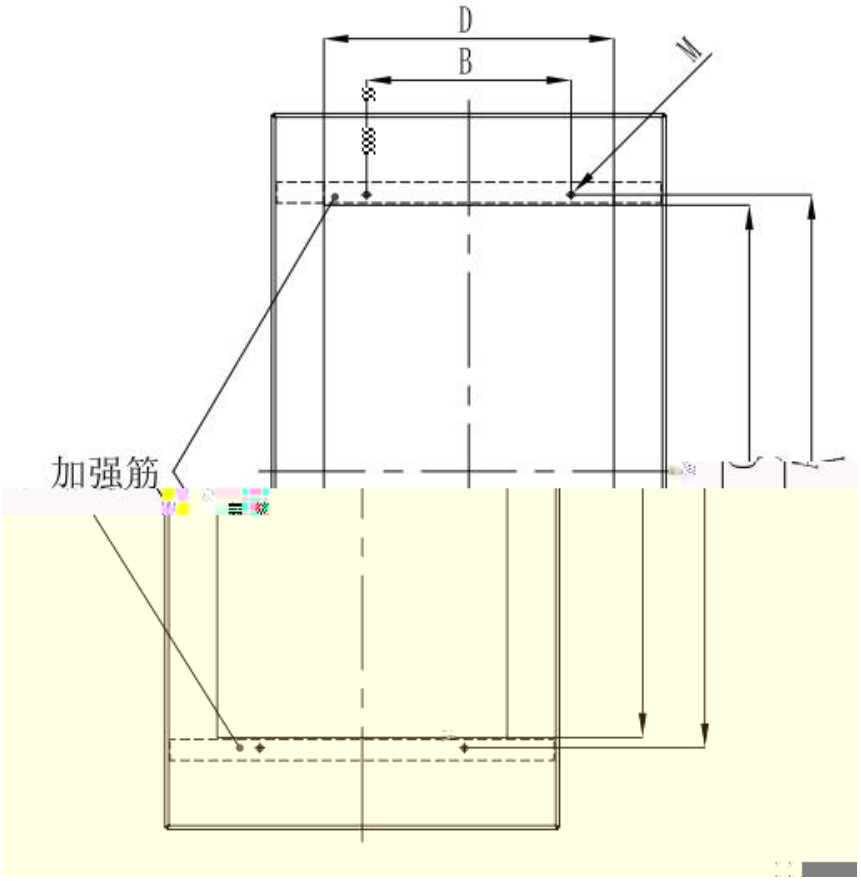
3-5 I1-I2



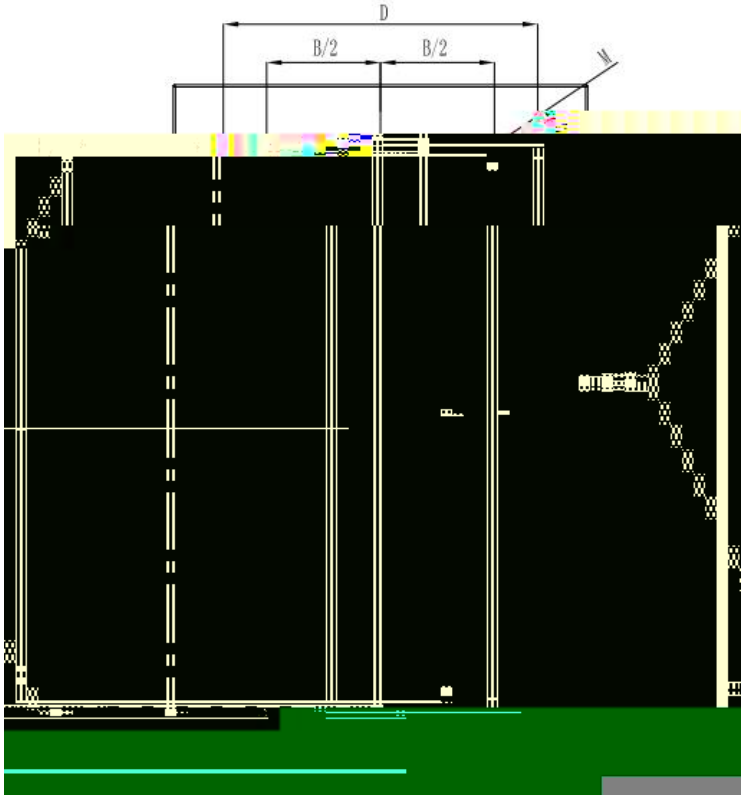
3-6 I3



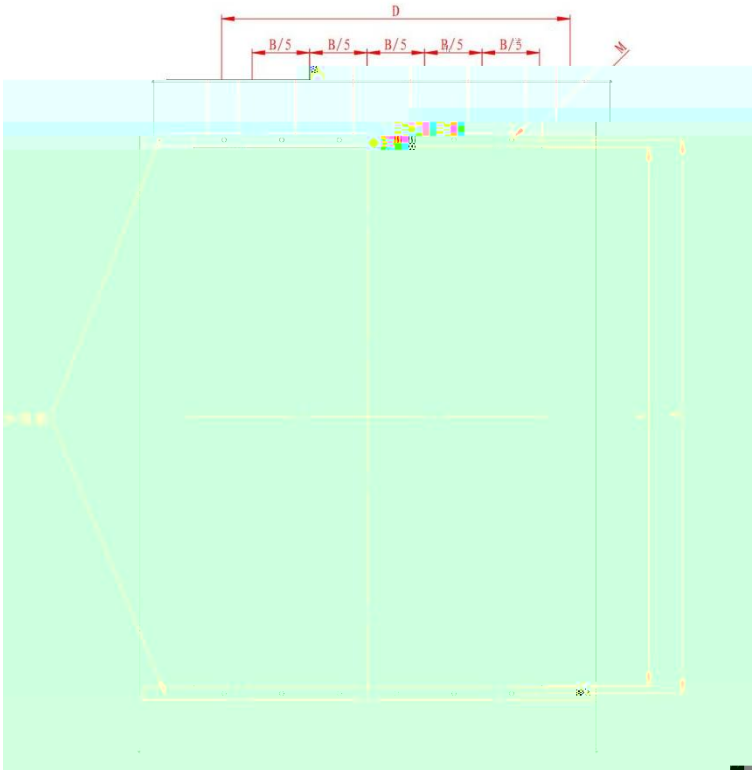
3-7 I4



3-8 I5-I6



3-9 I7-I9

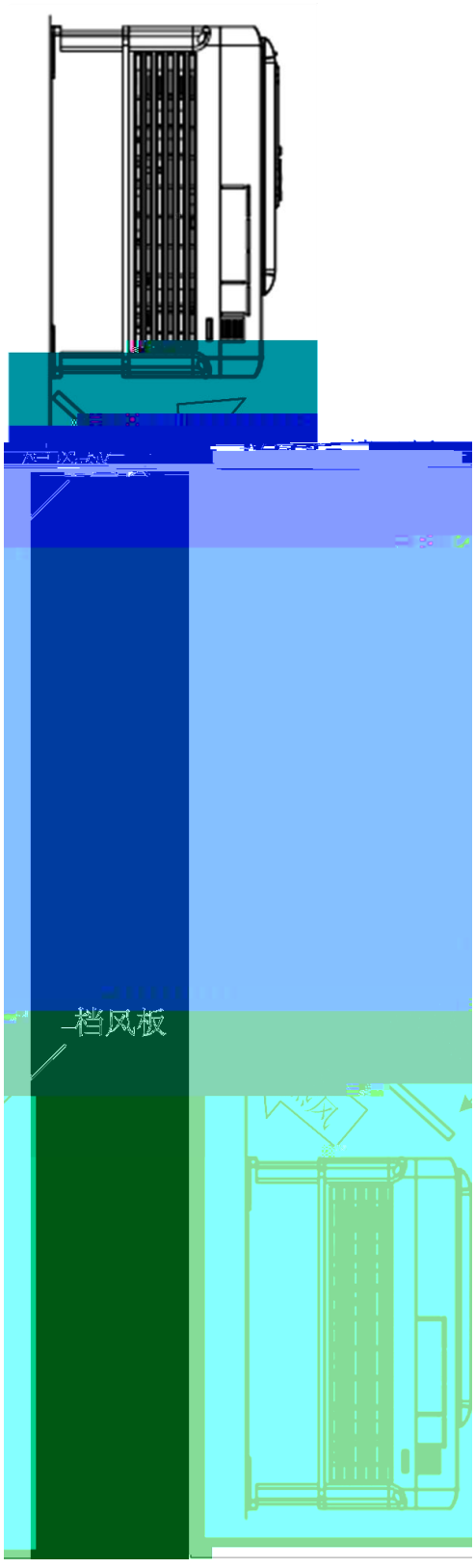


3-10 I10

	(mm)		(mm)		
	A	B	C	D	
I1	240	160	262.5	108	Ď 1

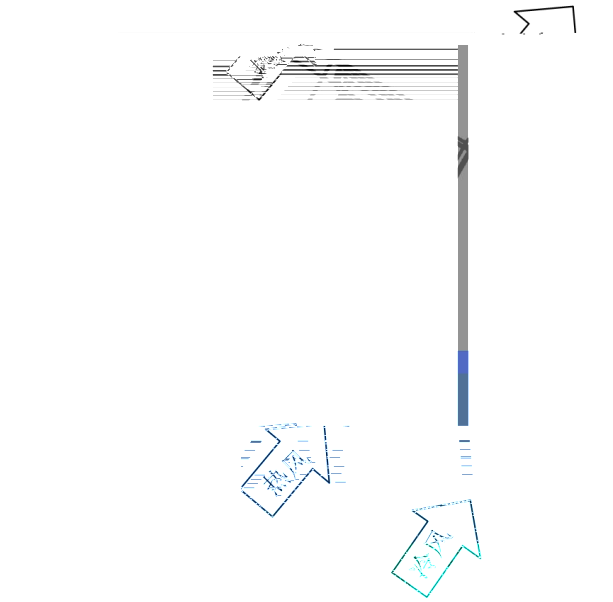
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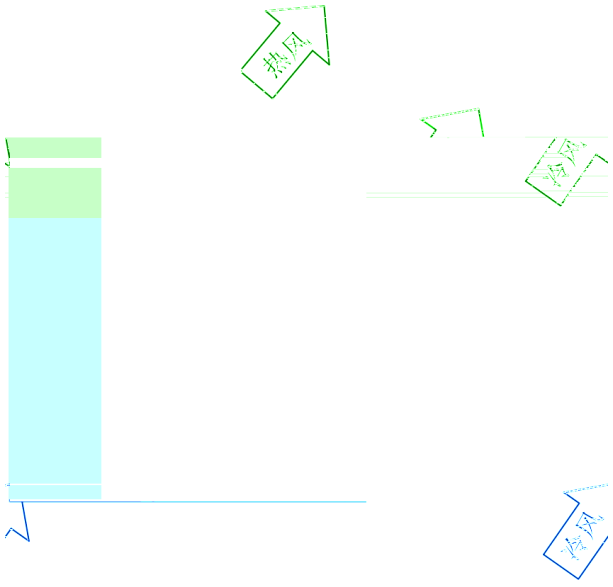
IT SJO JT0 0 Ď T



3-10

3-11





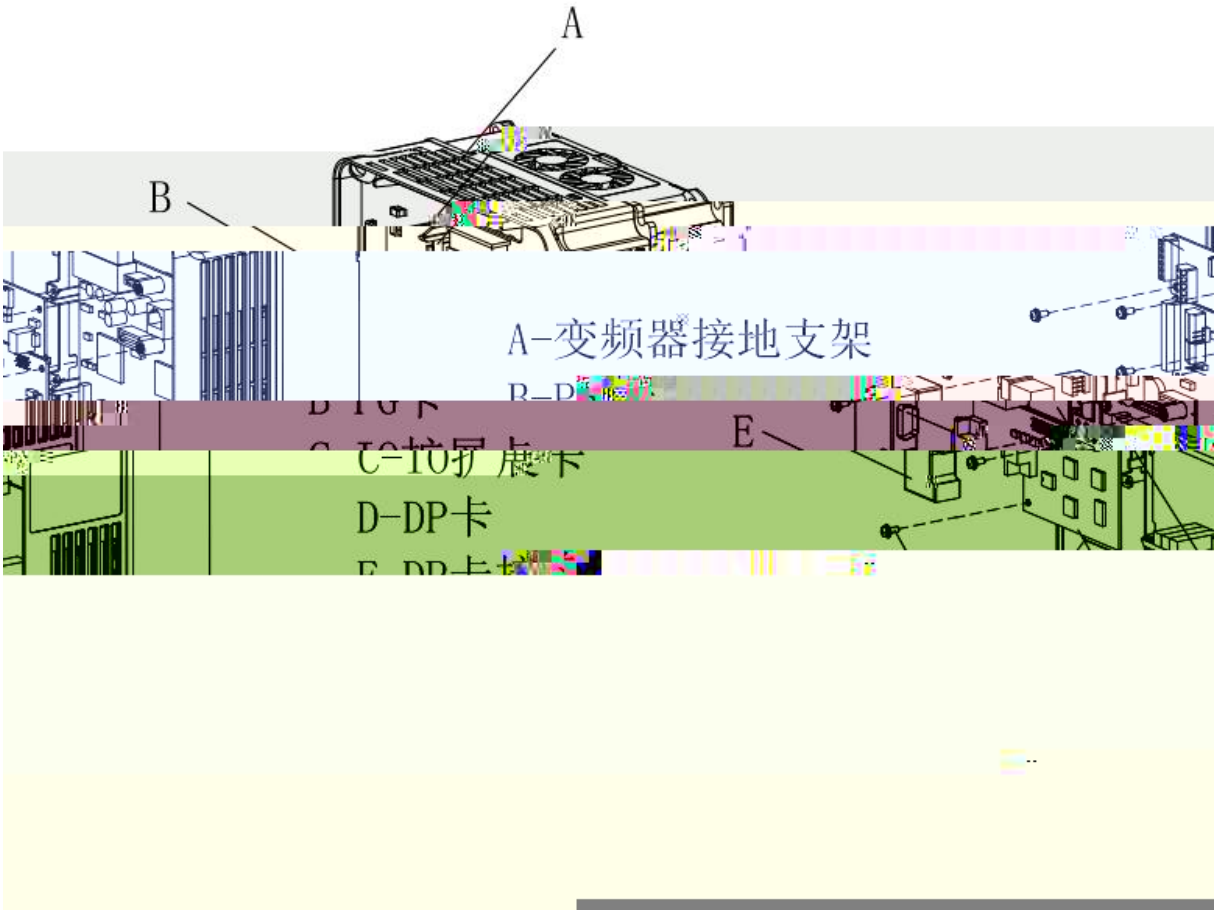
3-11

3.3

1 91Ýd 1 4 5mm ø " Ţ

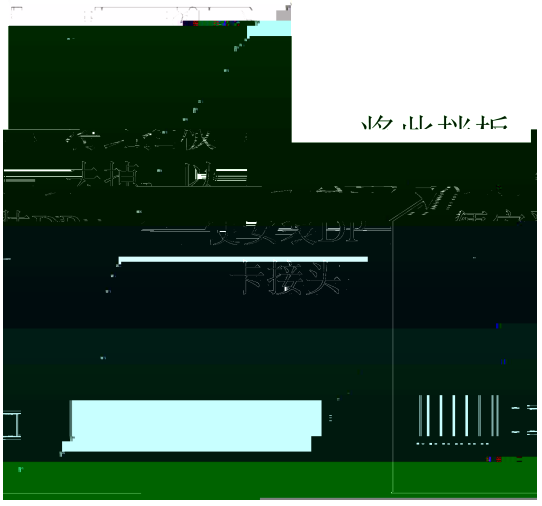
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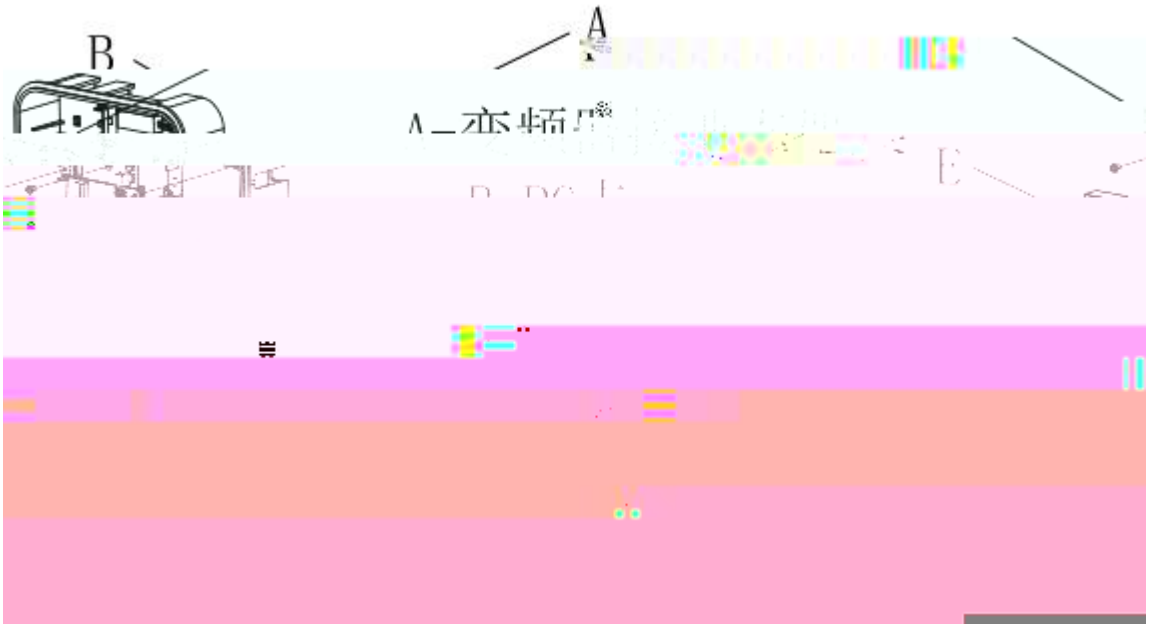
HF650



30kW

15KW DP





30KW

3.5 PGC2

GDHF-PGC2 PG 11

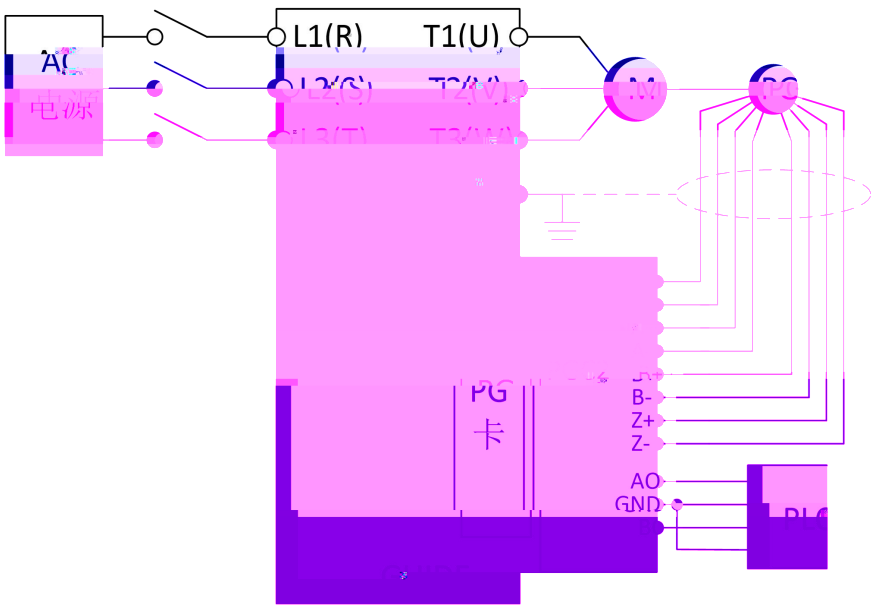
A+	A-	B+	B-	Z+	Z-

+15V	GND	AO	GND	BO

+15V,GND		…	15V ± 5%	300mA
A+,A- B+,B- Z+,Z-		0-80kHz	0-15V	…
AO,GND BO		0-50kHz	0-24V	…

PE PE

PGC2



1 PG

2 PG

3 PE

4 PG A- B- Z- GND

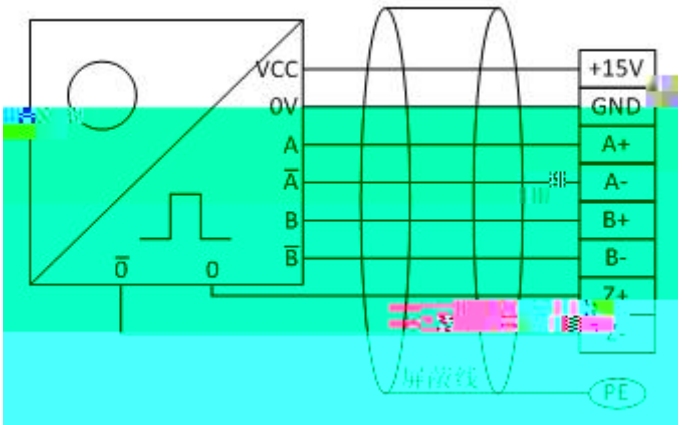
5 PGC2 15V RS-422

PGC2

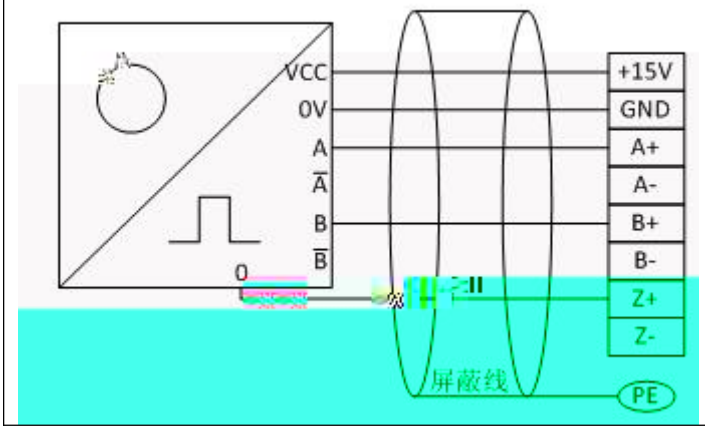
15V

1

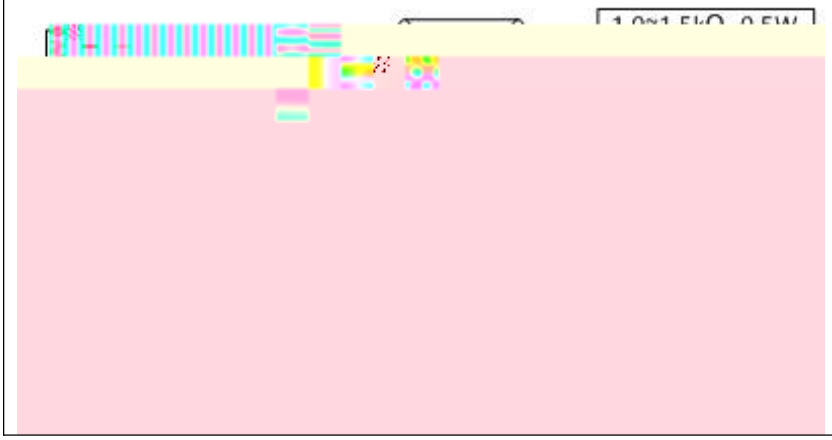
a

		
		HLE45-1024L-6F.AC
		RHI90N-ONAK1R61N-1024
		EC120P45-H6PR-1024

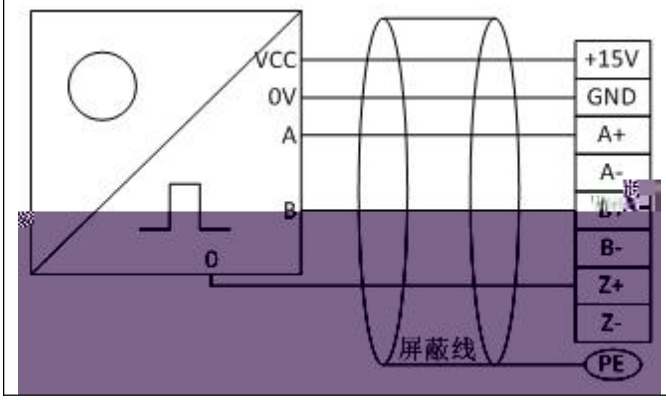
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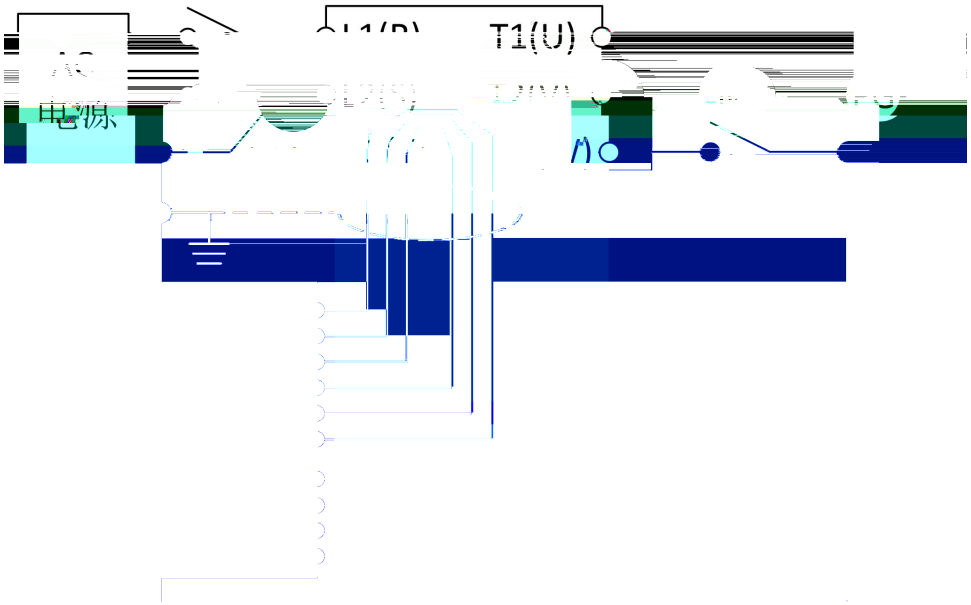
		
		HLE45-600L-3F.AC
		RVI78N-10CALA31N-1024
		EC120P45-P6PR-1024

2

		
		HLE45-1024L-30C.AC
		EB38A6-C4PR-1024

3

		
		HLE45-600L-3R.AC
		EB50A8-N4PR-1024



1 PG

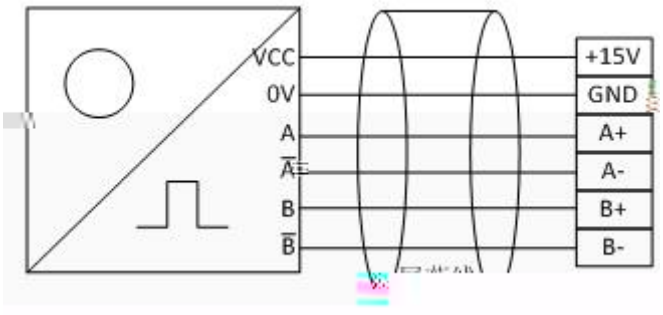
2 PG

3 PE

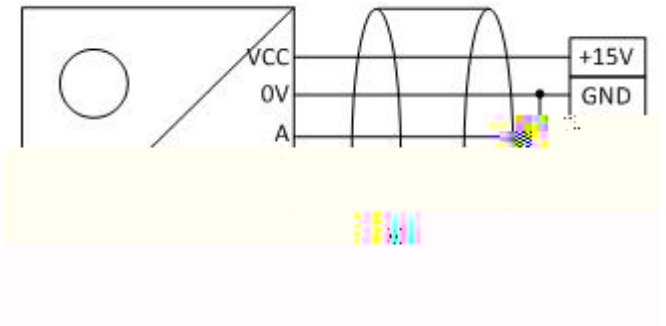
PGD2

1

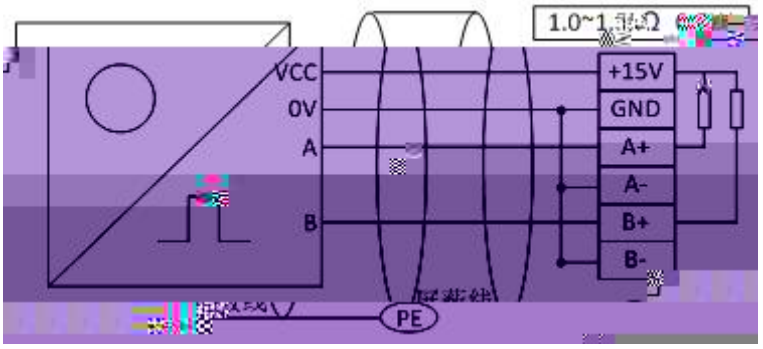
a

		
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		RHI90N-ONAK1R61N-1024
		EC120P45-H6PR-1024

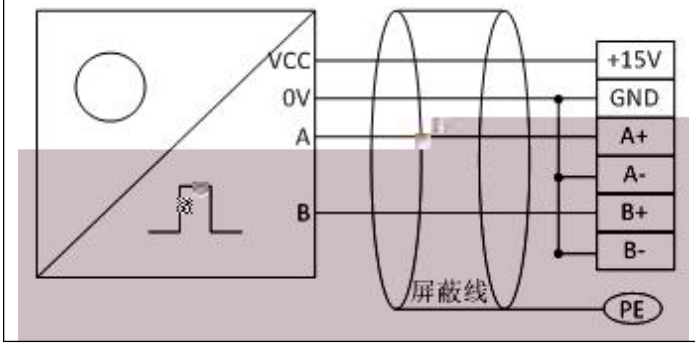
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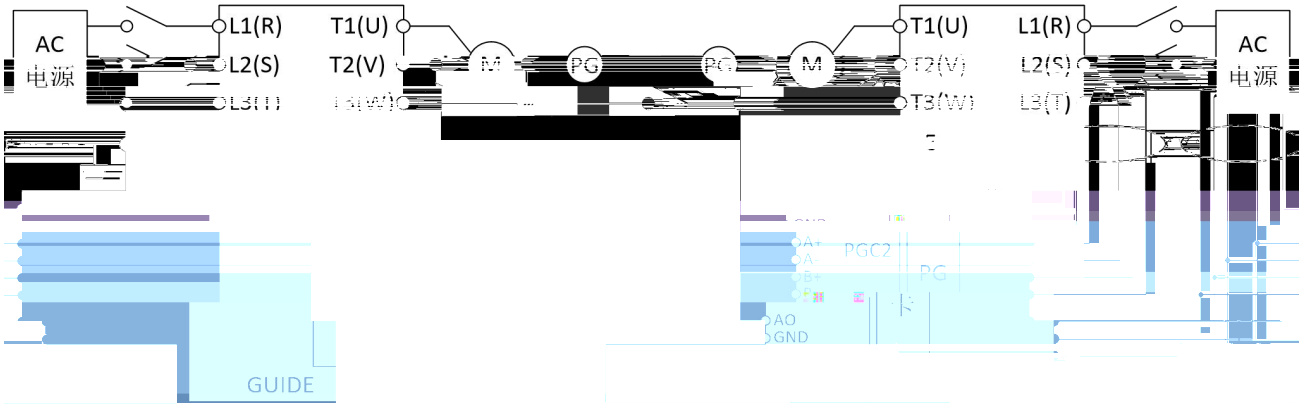
		
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		EC120P45-P6PR-1024

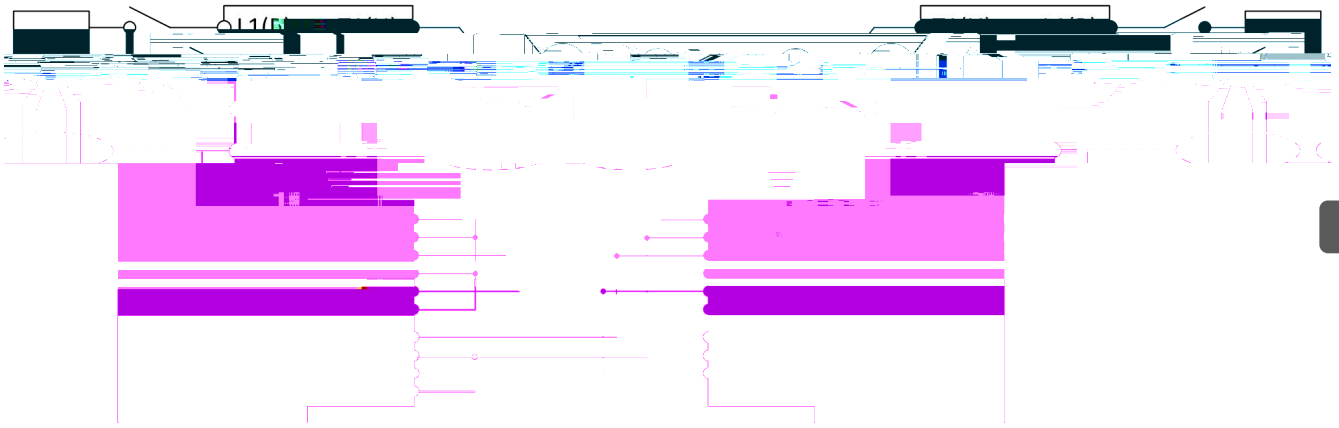
2

		
		HLE45-1024L-30C.AC
		EB38A6-C4PR-1024

3

		
		HLE45-600L-3R.AC
		EB50A8-N4PR-1024


AC
电源
L1(R)
L2(S)
T1(U)
T2(V)
M
PG
PG
M
T1(U)
L1(R)
AC
电源
T3(W)
L3(T)
PGC2
PG
AO
GND
GUIDE



185kW~500kW

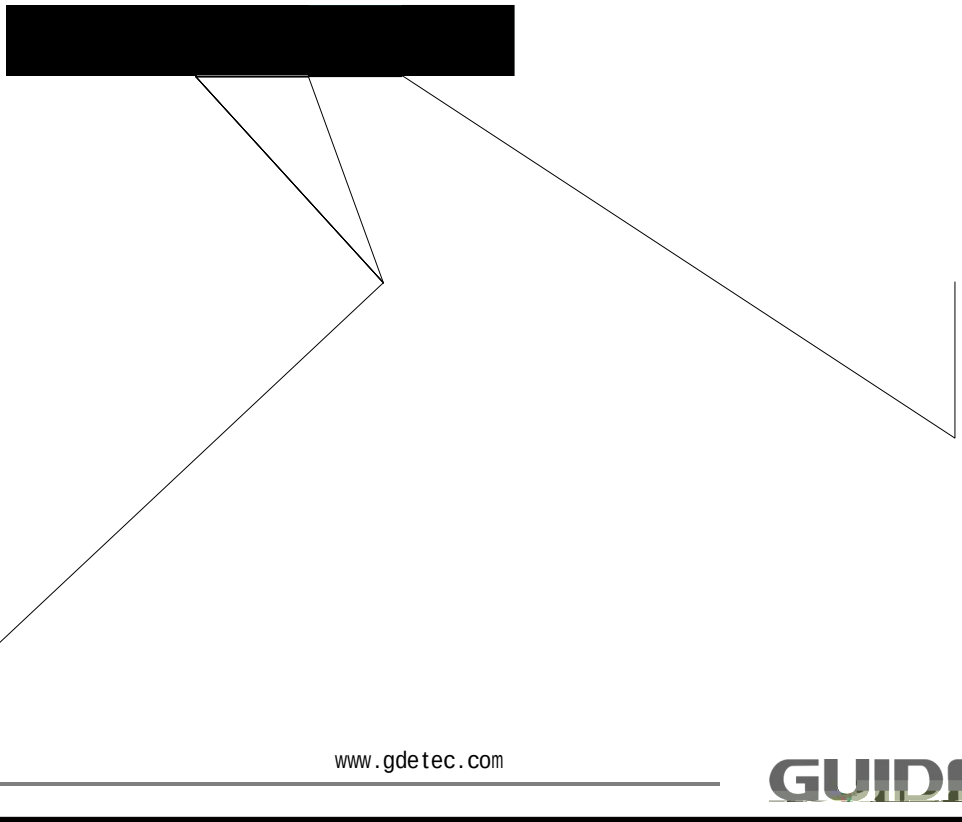


P(+)	
P1	37KW
N(-)	
R S T	
U V W	
DBR	160KW
PE	

4.3

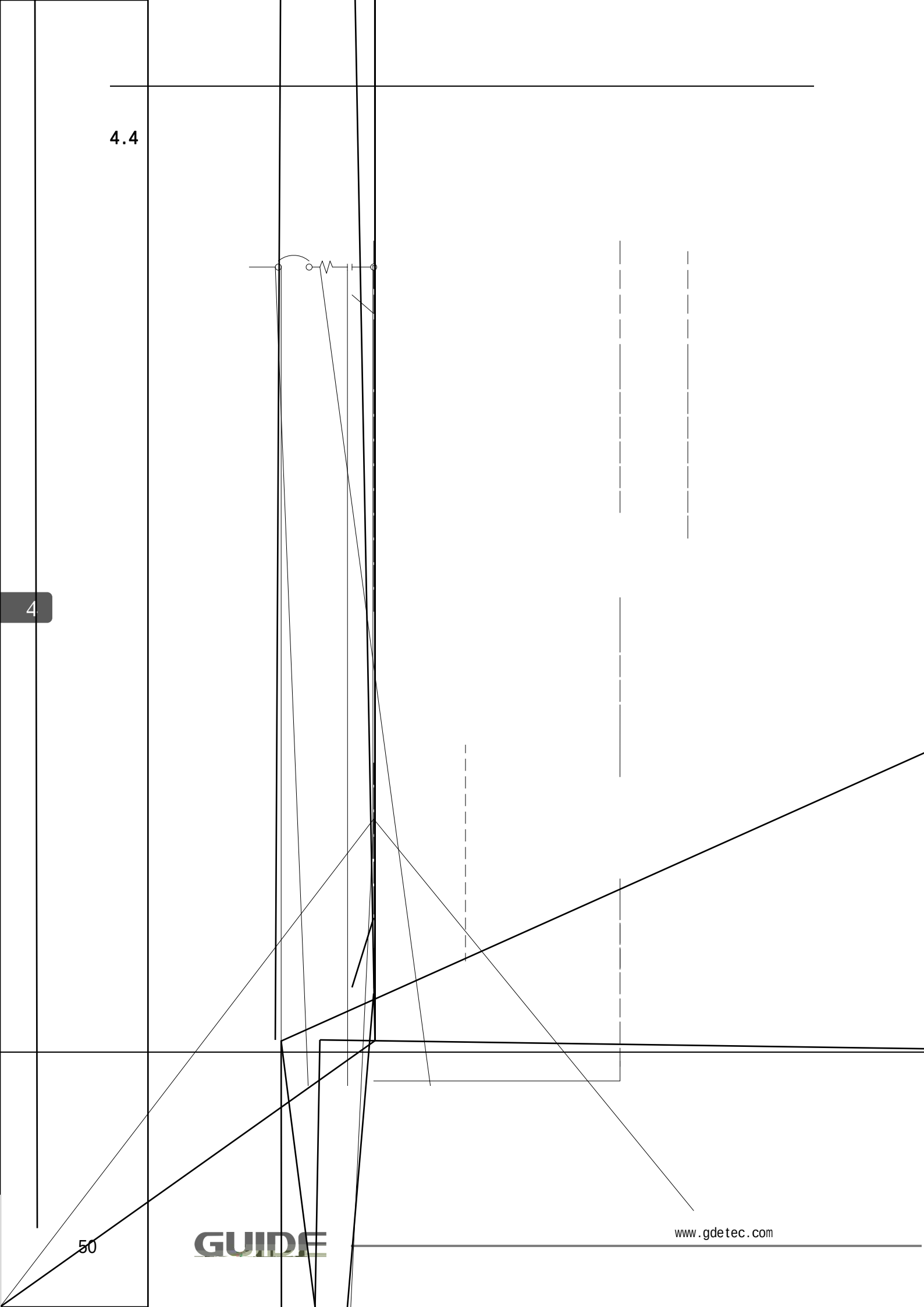
1

	1	3



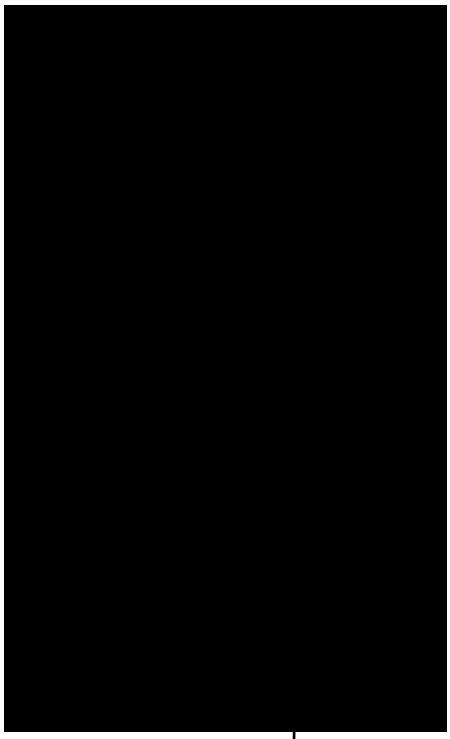
v ŕ ŕ ŕ ŕ ¸ Φ ƥ Ъ ЪѦ Ѧ ɤ ɤɤ Ѧ Ѧ ö ö öö

25	+24V	24V			
26	DO3		3		DC24V 50mA
27	DO4A		4		
				250VAC 3A COS =0.4	
		30VDC 1A			
28	DO4C		4		
29	DO4B		4		
				250VAC 3A COS =0.4	
		30VDC 1A			
30	DO5A		5		
				250VAC 2A COS =0.4	
		30VDC 1A			
31	DO5C		5		

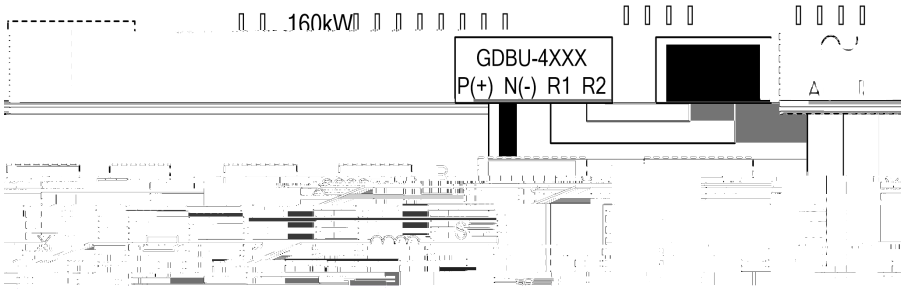


4.5

0V NPN



4.6



	1 2
AC	1 2 3

4.7

A / mm² A

CEFR 40% (AC-3)

4.8

		2%		1%	
HF650-0R4-4	0.4 kW	2.2A	6.4 mH	2.2A	3.2mH
HF650-0R7-4	0.7 kW	4A	3.5 mH	4A	1.8 mH
HF650-1R5-4	1.5 kW	6A	2.4 mH	6A	1.2 mH
HF650-2R2-4	2.2 kW	7A	2.0 mH	7A	1.0 mH
HF650-3R7-4	3.7 kW	12A	1.1 mH	12A	0.6 mH
HF650-5R5-4	5.5kW	19A	743uH	19A	371 uH
HF650-7R5-4	7.5kW	22A	644 uH	22A	322 uH
HF650-011-4	11kW	28A	493 uH	28A	247 uH
HF650-015-4	15kW	38A	368 uH	38A	184 uH
HF650-018-4	18.5kW	49A	283 uH	49A	141 uH
HF650-022-4	22kW	57A	247 uH	57A	123 uH
HF650-030-4	30kW	76A	184 uH	76A	

HF650-185-4	185kW	446A	31 uH	446A	16 uH
HF650-220-4	220kW	528A	26 uH	528A	13 uH
HF650-250-4	250kW	573A	24 uH	573A	12 uH
HF650-280-4	280KW	657A	21 uH	657A	11 uH
HF650-315-4	315kW	735A	19 uH	735A	10 uH
HF650-355-4	355kW	805A	17 uH	805A	9 uH
HF650-400-4	400kW	856A	16 uH	856A	8 uH
HF650-500-4	500kW	1116A	13 uH	1116A	7 uH

4.9

160kW

HF650-018-4	18.5kW	32	24	≥ 6	≥ 8.0
HF650-022-4	22kW	24	20	≥ 8	≥ 11
HF650-030-4					

EMC

b PWM

c

dG

3 EMC

EMC

EMC

5 EMC

æD

360

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b

20cm



90

c

EMC

d

5.

5.1

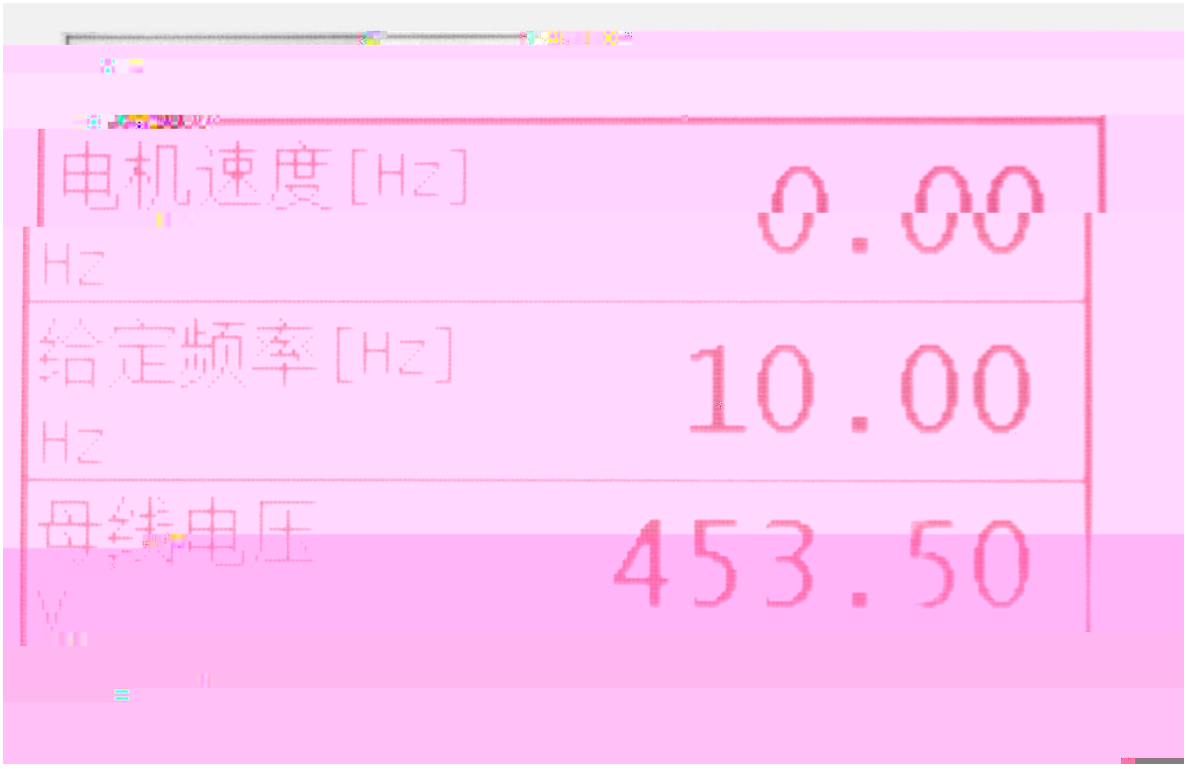
HF650 F1 LOCAL/REMOTE

F2 RUN STOP ی

RUN STOP

LOCAL/REMOTE /

5.3



k Ö

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FWD
REV

:HZ

A

N|N

W
E

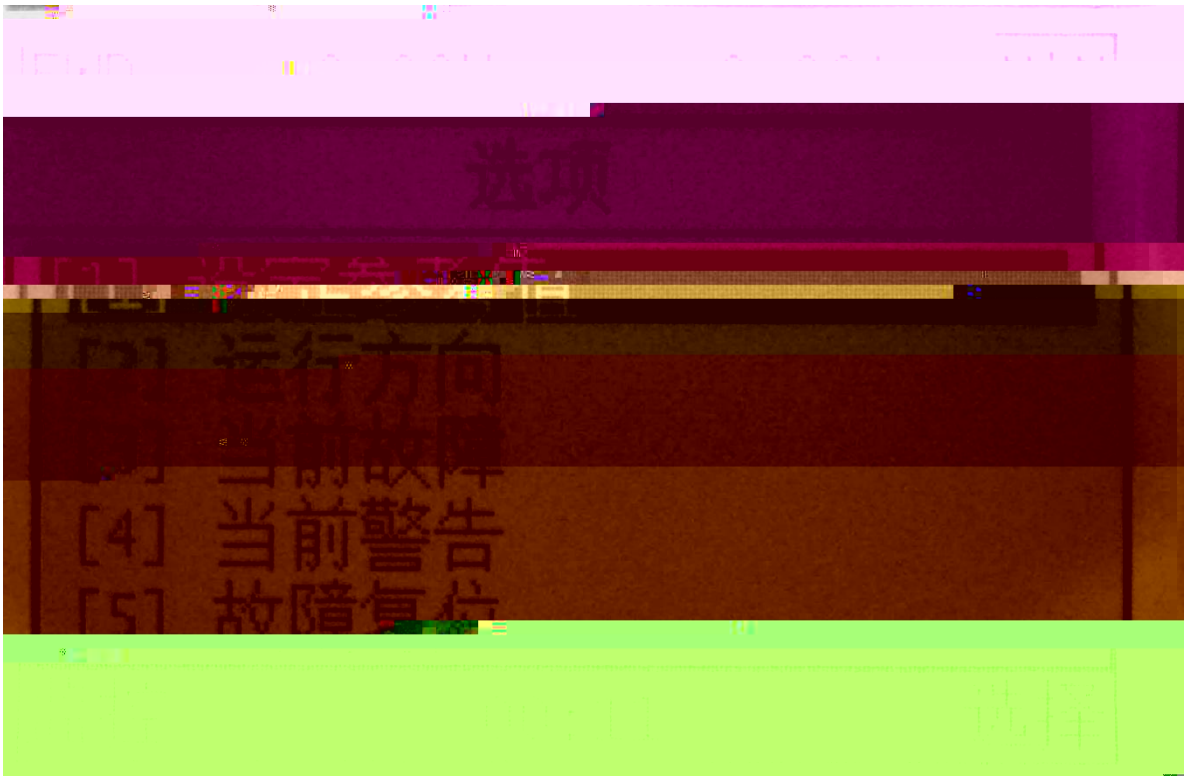
|

3

F1 F2 “ ” “ ” “ ”

“ ” “ ”

ENTER



1	Reference Set	
2	Change Direction	
3	Current Error	
4	Current Warnning	

5	Reset Error	
6	Monitor Setting	
7	Firmware Version	
8	Menu Language	



1	Parameter Setting	
2	Function Setting	
3	Fault Record	
4	Access Permissions	
5	Display Setting	

4 Current Warnning

5 Reset Error

6 Monitor Setting

7 Firmware Version

8 Menu Language

5.5

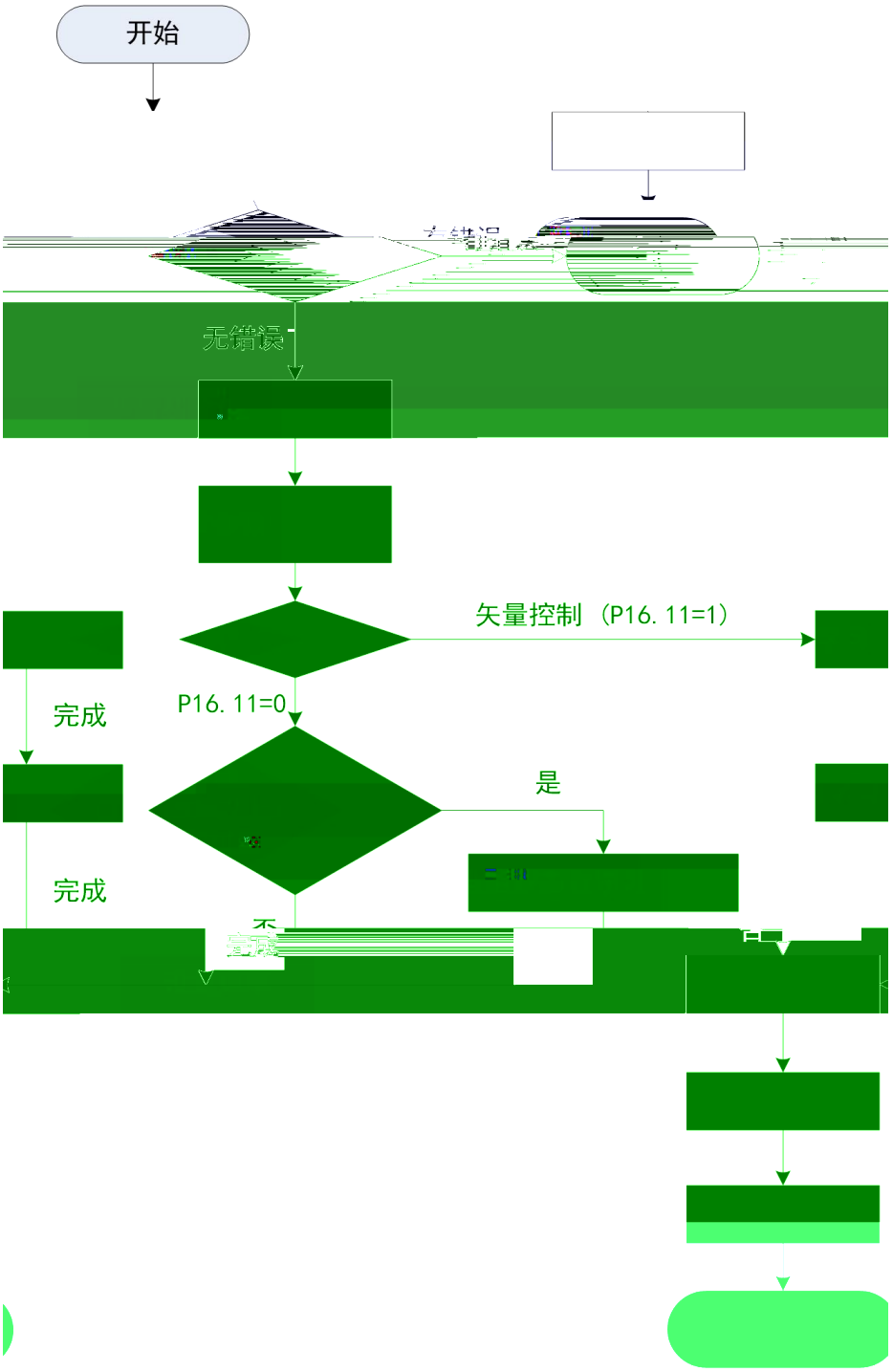
1 Parameter Setting

2 Function Setting

1	MotoTuning I	
2	MotoTuning II	
3	MotoTuning III	
4	DC-Link Tuning (AFE)	AFE

6.

6.1



6.2.3

5.4 “

		[5]MODBUS [6]	
P8.3		[0] [1]	1
P7.0	[1]	0~300[%]	180%
P7.4	[1]	0~300[%]	235%
P7.19	[1]	100.0 720.0[%]	120%

6.2.5

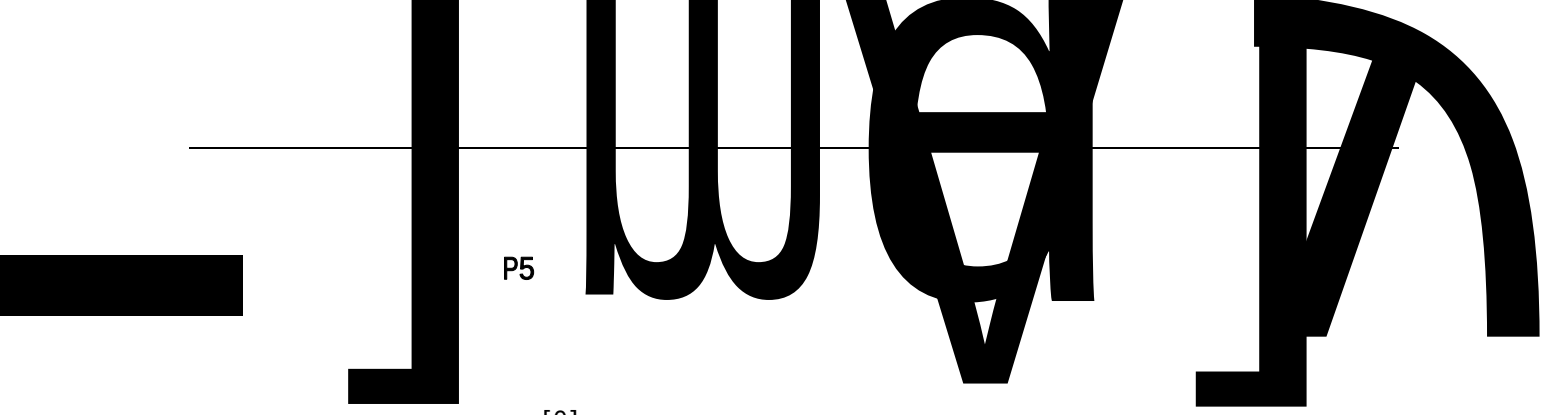
4

5 4 50Hz

P3.4	5		0 32	7	
P3.5	6		0 32	8	
P3.6	7		0 32	0	
P3.7	8		0 32	0	
P3.12		[0] [1]	0 1	0	

0		
1		
2		
3		
4	.NC	
5		</RST
6	1 0	8.2
7	2 1	
8	3 2	
9	4 3	
10		8.10
11		
12		
13	.NC	
14		
15	.NC	
16		
17	0	1 0 00 1 01 2 10 3 11 4
18	1	

18	1	2
19	2	3
20	3	4
21 31	FUNC 21 FUNC 31	
32		AFE
33 48	FUNC 33 FUNC 48	
49	PROFIBUS 1	PROFIBUS 1 1
50	PROFIBUS 2	PROFIBUS 2 1
51	PROFIBUS 3	PROFIBUS 3 1
52	PROFIBUS 4	PROFIBUS 4 1
53	PROFIBUS 5	PROFIBUS 5 1
54 56	FUNC 54 FUNC 56	
57	1	1 1
58	2	2 1
59	3	3 1
60	4	4 1
61	1	1 1
62	2	2 1
63	3	3 1
64	4	4 1



P5

P5.0 AI1	[0] [1]0 +10V [2]-10 +10V [3]0 20mA

7.6 P6

P6.0	AO1		7-1		0 14	2	
P6.2	AO1		AO1		-300.0 300.0 [%]	0.0 [%]	8.5
P6.3	AO1		AO1		-300.0 300.0 [%]	100.0 [%]	8.5
P6.4	AO1	[mA V]	AO1		0.0 100.0 [%]	0.0 [%]	8.5
P6.5	AO1	[mA V]	AO1		0.0 100.0 [%]	100.0 [%]	8.5
P6.6	AO1		AO1		-100.00 100.00 [%]	0.00 [%]	
P6.7	AO1		AO1 [13]	(P6.0) AO1	0.0 100.0 [%]	0.0 [%]	
P6.8	AO1				0.0 1000.0 [ms]	10.0 [ms]	
P6.14	AO2		7-1		0 14	4	
P6.16	AO2		AO2		-300.0 300.0 [%]	0.0 [%]	
P6.17	AO2		AO2		-300.0 300.0 [%]	100.0 [%]	
P6.18	AO2	[mA V]	AO2		0.0 100.0 [%]	0.0 [%]	
P6.19	AO2	[mA V]	AO2		0.0 100.0 [%]	100.0 [%]	
P6.20	AO2		AO2		-100.00 100.00 [%]	0.00 [%]	

P6.2

P6.22	AO2	AO1	0.0 1000.0 [ms]	10.0 [ms]	

7-1

0		
1		
2		
3		
4		
5		
6		
7		
8	(%)	( )
9		
10		
11	(%)	(150)
12	DP	Profibus
13		P6.7 P6.21
14		

7.7 P7

P7.0	[1]	1	0.0 300.0 [%]	180.0 [%]	8.6
P7.1	[2]	2	0.0 300.0 [%]	180.0 [%]	8.6
P7.2	[3]	3	0.0 300.0 [%]	180.0 [%]	8.6
P7.3	[4]	4	0.0 300.0 [%]	180.0 [%]	8.6
P7.4	[1]	1	0.0 300.0 [%]	235.0 [%]	8.6
P7.5	[2]	2	0.0 300.0 [%]	235.0 [%]	8.6
P7.6	[3]	3	0.0 300.0 [%]	235.0 [%]	8.6
P7.7	[4]	4	0.0 300.0 [%]	235.0 [%]	8.6
P7.8					

P7.22	[	4		4	100.0 [%]	720.0 [%]	120.0 [%]	8.6
P7.23		1	M1	1	0.00	3.00 [s]	0.50 [s]	8.6
P7.24		1	M					

P7.60		0.10 [s]	3.00 [s]	0.30 [s]	
P7.64	[0] [1]	0	1	0	8.6
P7.65		-25 [V]	100 [V]	0 [V]	8.6
P7.66		-25 [V]	100 [V]	0 [V]	8.6
P7.69	[0] [1]	0	1	0	8.60
P7.70		-25 [V]	100 [V]	0 [V]	8.6

Bo

P8.39	3	P8.36 P8.38	0.0 300.0 [s]	7.00 [s]	8.7
P8.40	4		0.0 300.0 [%]	300.0 [%]	8.7
P8.41	4	P8.38 P8.40	0.0 300.0 [s]	10.00 [s]	8.7
P8.42	5		0.0 300.0 [%]	300.0 [%]	8.7
P8.43	5	P8.40 P8.42	0.0 300.0 [s]	10.00 [s]	8.7
P8.44	6		0.0 300.0 [%]	300.0 [%]	8.7
P8.45	6	P8.42 P8.44	0.0 300.0 [s]	10.00 [s]	8.7
P8.46	7		0.0 300.0 [%]	300.0 [%]	8.7
P8.47	7	P8.44 P8.46	0.0 300.0 [s]	10.00 [s]	8.7
P8.48	8		0.0 300.0 [%]	300.0 [%]	8.7
P8.49	8	P8.46 P8.48	0.0 300.0 [s]	10.00 [s]	8.7
P8.54			0.0 300.0 [%]	0.0 [%]	
P8.55		[0] [1]	0 1	0	
P8.56			0.00 300.00 [s]	3.00 [s]	
P8.57		[0] [1]	0 1	1	
P8.58			0.00 300.00 [s]	1.50 [s]	

7.9 2 P9

P9.0		[0] [1] [2]DP [3]MODBUS [4]	0 4	0	
P9.3		[0] [1]	0 1	0	8.7
P9.6			0.00 300.00 [s]	0.00 [s]	8.7
P9.7			0.00 300.00 [s]	0.00 [s]	8.7
P9.10		[0]I/O [1] 1 [2] 2 [3] [4]DP [5]MODBUS [6]	0 6	0	
P9.13		[0] [1]PROFIBUS [2]MODBUS [3]	0 3	0	8.7
P9.14			0.1 10.0	1.0	8.7
P9.15	1		0.0 300.0 [%]	100.0 [%]	8.7
P9.16	1	P9.15	0.0 300.0 [s]	3.00 [s]	8.7
P9.17	2		0.0 300.0 [%]	200.0 [%]	8.7
P9.18	2	P9.15 P9.17	0.0 300.0 [s]	4.00 [s]	8.7
P9.19	3		0.0 300.0 [%]	240.0 [%]	8.7

P9.39 3 P9.36 P9.38 0.0 300.0 [s]

7.10 3 P10

P10.0		[0] [1] [2]DP [3]MODBUS [4]	0 4	0	
P10.3		[0] [1]	0 1	0	8.7
P10.6			0.00 300.00 [s]	0.00 [s]	8.7
P10.7			0.00 300.00 [s]	0.00 [s]	8.7
P10.10		[0]I/O [1] 1 [2] 2 [3] [4]DP [5]MODBUS [6]	0 6	0	
P10.13		[0] [1]PROFIBUS [2]MODBUS [3]	0 3	0	8.7
P10.14			0.1 10.0	1.0	8.7
P10.15	1		0.0 300.0 [%]	100.0 [%]	8.7
P10.16	1	P10.15	0.0 300.0 [s]	3.00 [s]	8.7
P10.17	2		0.0 300.0 [%]	200.0 [%]	8.7
P10.18	2	P10.15 P10.17	0.0 300.0 [s]	4.00 [s]	8.7
P10.19	3		0.0 300.0 [%]	240.0 [%]	8.7

P10.20	3	P10.17	P10.19	0.0 [s]	300.0 [s]	7.00	8.7
P10.21	4			0.0 [%]	300.0 [%]	300.0	8.7
P10.22	4	P10.19	P10.21	0.0 [s]	300.0 [s]	10.00	8.7
P10.23	5			0.0 [%]	300.0 [%]	300.0	8.7
P10.24	5	P10.21	P10.23	0.0 [s]	300.0 [s]	10.00	8.7
P10.25	6			0.0 [%]	300.0 [%]	300.0	8.7
P10.26	6	P10.23	P10.25	0.0 [s]	300.0 [s]	10.00	8.7
P10.27	7			0.0 [%]	300.0 [%]	300.0	8.7
P10.28	7	P10.25	P10.27	0.0 [s]	300.0 [s]	10.00	8.7
P10.29	8						

P11.39	3	P11.36	P11.38	0.0 [s] 300.0 [s]	7.00	8.7
P11.40	4			0.0 [%] 300.0 [%]	300.0	8.7
P11.41	4	P11.38	P11.40	0.0 [s] 300.0 [s]	10.00	8.7
P11.42	5			0.0 [%] 300.0 [%]	300.0	8.7
P11.43	5	P11.40	P11.42	0.0 [s] 300.0 [s]	10.00	8.7
P11.44	6			0.0 [%] 300.0 [%]	300.0	8.7
P11.45	6	P11.42	P11.44	0.0 [s] 300.0 [s]	10.00	8.7
P11.46	7			0.0 [%] 300.0 [%]	300.0	8.7
P11.47	7	P11.44	P11.46	0.0 [s] 300.0		

300.0

8.

7 1 P12

P12.0		[0] [1]	0	1	1	8.8
P12.1		[0][%] [1][Hz] [2][rpm]	0	2	1	
P12.2	1		0.0	3000.0	10.0	
P12.3	2		0.0	3000.0	20.0	
P12.4	3		0.0	3000.0	35.0	
P12.5	4		0.0	3000.0	50.0	
P12.6	5		0.0	3000.0	50.0	
P12.7	6		0.0	3000.0	50.0	
P12.8	7		0.0	3000.0	50.0	
P12.9	8		0.0	3000.0	50.0	
P12.10	9		0.0	3000.0	50.0	
P12.11	10		0.0	3000.0	50.0	
P12.12	11 ㄴ					

7.13 2 P13

P13.0		[0] [1]	0 1	1	8.8 88
P13.1		[0][%] [1][Hz] [2][rpm]	0 2	1	
P13.2	1		0.0 3000.0	10.0	
P13.3	2		0.0 3000.0	20.0	
P13.4	3		0.0 3000.0	35.0	
P13.5	4		0.0 3000.0	50.0	
P13.6	5		0.0 3000.0	50.0	
P13.7	6		0.0 3000.0	50.0	
P13.8	7		0.0 3000.0	50.0	
P13.9	8		0.0 3000.0	50.0	
P13.10	9		0.0 3000.0	50.0	
P13.11	10		0.0 3000.0	50.0	
P13.12	11		0.0 3000.0	50.0	
P13.13	12		0.0 3000.0	50.0	
P13.14	13		0.0 3000.0	50.0	
P13.15	14		0.0 3000.0	50.0	
P13.16	15		0.0 3000.0	50.0	
P13.17	16		0.0 3000.0	50.0	
P13.22			0.0 20.0 [%]	2.0 [%]	8.8
P13.23			0.0 20.0 [%]	0.0 [%]	8.8
P13.24			0.0 200.0 [%]	30.0 [%]	8.8
P13.25					

P13.27			0.00 2.00 [s]	0.00 [s]	8.8
P13.28			0.00 2.00 [s]	0.07 [s]	8.8
P13.29			0.00 2.00 [s]	0.07 [s]	8.8
P13.32			0.0 20.0 [%]	0.0 [%]	8.8
P13.33			0.0 20.0 [%]	0.0 [%]	8.8
P13.34			0.00 2.00 [s]	0.00 [s]	8.8
P13.35			0.00 2.00 [s]	0.00 [s]	8.8
P13.36			0.00 2.00 [s]	0.50 [s]	8.8
P13.37			0.00 2.00 [s]	0.50 [s]	8.8

7.14 3 P14

P14.0		[0] [1]	0	1	1	8.8
P14.1		[0][%] [1][Hz] [2][rpm]	0	2	1	
P14.2	1		0.0	3000.0	10.0	
P14.3	2		0.0	3000.0	20.0	
P14.4	3		0.0	3000.0	35.0	
P14.5	4		0.0	3000.0	50.0	
P14.6	5		0.0	3000.0	50.0	
P14.7	6		0.0	3000.0	50.0	
P14.8	7		0.0	3000.0	50.0	
P14.9						

3

7

P14.27			0.00 2.00 [s]	0.00 [s]	8.8
P14.28			0.00 2.00 [s]	0.07 [s]	8.8
P14.29			0.00 2.00 [s]	0.07 [s]	8.8
P14.32			0.0 20.0 [%]	0.0 [%]	8.8
P14.33			0.0 20.0 [%]	0.0 [%]	8.8
P14.34			0.00 2.00 [s]	0.00 [s]	8.8
P14.35			0.00 2.00 [s]	0.00 [s]	8.8
P14.36			0.00 2.00 [s]	0.50 [s]	8.8
P14.37			0.00 2.00 [s]	0.50 [s]	8.8

7.15 4 P15

P15.0		[0] [1]	0 1	1	8.8
P15.1		[0][%] [1][Hz] [2][rpm]	0 2	1	
P15.2	1		0.0 3000.0	10.0	
P15.3	2		0.0 3000.0	20.0	
P15.4	3		0.0 3000.0	35.0	
P15.5	4		0.0 3000.0	50.0	
P15.6	5		0.0 3000.0	50.0	
P15.7	6		0.0 3000.0	50.0	
P15.8	7		0.0 3000.0	50.0	
P15.9	8		0.0 3000.0	50.0	
P15.10	9		0.0 3000.0	50.0	
P15.11	10		0.0 3000.0	50.0	
P15.12	11		0.0 3000.0	50.0	
P15.13	12		0.0 3000.0	50.0	
P15.14	13		0.0 3000.0	50.0	
P15.15	14		0.0 3000.0	50.0	
P15.16	15		0.0 3000.0	50.0	
P15.17	16		0.0 3000.0	50.0	
P15.22			0.0 20.0 [%]	2.0 [%]	8.8
P15.23			0.0 20.0 [%]	0.0 [%]	8.8
P15.24			0.0 200.0 [%]	30.0 [%]	8.8
P15.25			0.0 200.0 [%]	20.0 [%]	8.8
P15.26			0.00 2.00 [s]	0.00 [s]	8.8

P15.27			0.00 2.00 [s]	0.00 [s]	8.8
P15.28			0.00 2.00 [s]	0.07 [s]	8.8
P15.29			0.00 2.00 [s]	0.07 [s]	8.8
P15.32			0.0 20.0 [%]	0.0 [%]	8.8
P15.33			0.0 20.0 [%]	0.0 [%]	8.8
P15.34			0.00 2.00 [s]	0.00 [s]	8.8
P15.35			0.00 2.00 [s]	0.00 [s]	8.8
P15.36			0.00 2.00 [s]	0.50 [s]	8.8
P15.37			0.00 2.00 [s]	0.50 [s]	8.8

7.17 2 V/F P17

P17.0			320 460 [V]	380 [V]	
P17.2			0.0 4000.0 [kW]	 [kW]	
P17.3			320 460 [V]	380 [V]	
P17.4			0.0 6500.0 [A]	 [A]	
P17.5			0.0 300.0 [Hz]	50.0 [Hz]	
P17.6			0 6000 [rpm]	1465 [rpm]	
P17.7			2 12 [pole]	4 [pole]	8.9
P17.9			0 7200 [rpm]	1500 [rpm]	8.9
P17.11		[0]V/F [1] [2] [3] [4]	0 4	0	
P17.12			1.00 10.00 [kHz]	3.00 [kHz]	8.9
P17.14	V/F	[0] V/F [1] V/F [2]	0 3	0	8.9
P17.15		[0] [1]	0 1	0	8.9
P17.16			2 500 [ms]	500 [ms]	
P17.17	V/F	[0] [1]	0 1	0	
P17.18			10 1000 [ms]	200 [ms]	
P17.19		[0] [1]	0 1	0	

P17.22		0.00 [s]	100.00 [s]	0.00	8.9
P17.23				

7.18 3 V/F P18

P18.0		320 460 [V]	380 [V]	
P18.2		0.0 4000.0 [kW]	 [kW]	
P18.3		320 460 [V]	380 [V]	
P18.4		0.0 6500.0 [A]	 [A]	
P18.5		0.0 300.0 [Hz]	50.0 [Hz]	
P18.6		0 6000 [rpm]	1465 [rpm]	
P18.7		2 12 [pole]	4 [pole]	8.9
P18.9		0 7200 [rpm]	1500 [rpm]	8.9
P18.11	[0]V/F [1] [2] [3] [4]	0 4	0	
P18.12		1.00 10.00 [kHz]	3.00 [kHz]	8.9

7.19 4 V/F P19

P19.0			320 460 [V]	380 [V]	
P19.2			0.0 4000.0 [kW]	 [kW]	
P19.3			320 460 [V]	380 [V]	
P19.4			0.0 6500.0 [A]	 [A]	
P19.5			0.0 300.0 [Hz]	50.0 [Hz]	
P19.6			0 6000 [rpm]	1465 [rpm]	
P19.7			2 12 [pole]	4 [pole]	8.9
P19.9			0 7200 [rpm]	1500 [rpm]	8.9
P19.11		[0]V/F [1] [2] [3] [4]	0 4	0	
P19.12			1.00 10.00 [kHz]	3.00 [kHz]	8.9
P19.14	V/F	[0] V/F [1] V/F [2]	0 3	0	8.9
P19.15		[0] [1]	0 1	0	8.9
P19.16			2 500 [ms]	500 [ms]	
P19.17	V/F	[0] [1]	0 1	0	
P19.18			10 1000 [ms]	200 [ms]	
P19.19		[0] [1]	0 1	0	

P19

P19.50		0.00 300.00 [s]	0.00 [s]	8.9
P19.51		0.0 150.0 [%]	70.0 [%]	8.9
P19.52		0.00 5.00 [Hz]	0.00 [Hz]	8.9
P19.54		0.00 300.00 [s]	0.00 [s]	8.9
P19.55		0.0 150.0 [%]	75.0 [%]	8.9
P19.56		0.00 5.00 [Hz]	0.00 [Hz]	8.9
P19.59		0.0 1000.0 [%]	100.0 [%]	
P19.60		0.0 1000.0 [%]	100.0 [%]	
P19.61	- î ¡ ʎoų			

7.20 1 P20

P20.0		[0] [1]	0 1	0	8.10
P20.1		[0] [1] 1 [2] 2 [3] [4] P20.3 [5]DP [6]MODBUS [7]	0 7	0	8.10
P20.2			0 7	0	
P20.3			-300.0 300.0 [%]	0.0 [%]	8.10
P20.5			0 1000 [ms]	0 [ms]	
P20.6			0.0 200.0 [%]	100.0 [%]	8.10
P20.7		[0] [1] P20.8 P20.9 [2] 1 [3] 2 [4] [5]DP [6]MODBUS [7]	0 7	0	8.10
P20.8		P20.7 [1]	0.0 300.0 [%]	200.0 [%]	8.10
P20.9		P20.7 [1]	0.0 300.0 [%]	200.0 [%]	8.10
P20.11			0 1000 [ms]	0 [ms]	
P20.12	2x		0.0 300.0 [%]	100.0 [%]	

P20.31			0.0 100.0 [%]	5.0 [%]	
P20.32			0.0 100.0 [%]	5.0 [%]	
P20.34		[0] [1]	0 1	0	8.10
P20.35			0.0 100.0 [s]	0.0 [s]	
P20.36			50.0 150.0 [%]	110.0 [%]	
P20.37			0.0 150.0 [%]	100.0 [%]	8.10
P20.38			0.0 100.0 [%]	25.0 [%]	8.10
P20.39			0.0 120.0 [%]	100.0 [%]	8.10
P20.40			0.0 150.0 [%]	100.0 [%]	8.10
P20.41			0.0 150.0 [%]	135.0 [%]	
P20.42		[0] [1]	0 1	1	
P20.43			25 1000 [ms]	75 [ms]	
P20.44			25 1000 [ms]	250 [ms]	
P20.45			0.0 100.0 [%]	22.0 [%]	
P20.46			0.0 100.0 [%]	18.0 [%]	
P20.47			0.0 200.0 [%]	92.0 [%]	
P20.48			0.0 200.0 [%]	87.0 [%]	
P20.49			0.0 150.0 [%]	100.0 [%]	
P20.51			0.0 1000.0 [%]	100.0 [%]	
P20.52			0.0 1000.0 [%]	100.0 [%]	

P21.0

[0]
[1]
[0]
[1] 1
[2] 2
[3]
[4]
[5]DP
[6]MODBUS
[7]

P21.3

0 1 0 B.10

P21.1

7

P21.13		20.0 [ms]	500.0 [ms]	100.0 [ms]	8.10
P21.14					

P21.31		0.0 100.0 [%]	5.0 [%]	
P21.32		0.0 100.0 [%]	5.0 [%]	
P21.34	[0] [1]	0 1	0	8.10
P21.35				

7.22 3 P22

P22.0		[0] [1]		0 1	0	8.10
P22.1		[0] [1] [2] [3] [4] [5]DP [6]MODBUS [7]	1 2 P22.3	0 7	0	8.10
P22.2				0 7	0	
P22.3				-300.0 300.0 [%]	0.0 [%]	8.10
P22.5				0 1000 [ms]	0 [ms]	
P22.6				0.0 200.0 [%]	100.0 [%]	8.10
P22.7		[0] [1] P22.9 [2] [3] [4] [5]DP [6]MODBUS [7]	P22.8 1 2	0 7	0	8.10
P22.8		P22.7	[1]	0.0 300.0 [%]	200.0 [%]	8.10
P22.9		P22.7	[1]	0.0 300.0 [%]	200.0 [%]	8.10
P22.11				0 1000 [ms]	0 [ms]	
P22.12	2x			0.0 300.0 [%]	100.0 [%]	

P22.13		20.0 [ms]	500.0 [ms]	100.0 [ms]	8.10
P22.14				

22.31		0.0 [%]	100.0 [%]	5.0 [%]	
22.32		0.0 [%]	100.0 [%]	5.0 [%]	
P22.34	[0] [1]	0	1	0	8.10
P22.35		0.0 [s]	100.0 [s]	0.0 [s]	
P22.36		50.0 [%]	150.0 [%]	110.0 [%]	
P22.37		0.0 [%]	150.0 [%]	100.0 [%]	8.10
P22.38		0.0 [%]	100.0 [%]	25.0 [%]	8.10
P22.39		0.0 [%]	120.0 [%]	100.0 [%]	8.10
P22.40		0.0 [%]	150.0 [%]	100.0 [%]	

P22.53	Kp	0.0 [%]	1000.0 [%]	100.0 [%]	
P22.54	Ki	0.0 [%]	1000.0 [%]	100.0 [%]	
P22.55		0.0 [%]	1000.0 [%]	100.0 [%]	8.10
P22.56		0.0 [%]	1000.0 [%]	100.0 [%]	8.10

7.23 4 P23

P23.0		[0] [1]			0	1	0	8.10
P23.1		[0] [1] [2] [3] [4] [5]DP [6]MODBUS [7]	1 2	P23.3	0	7	0	8.10
P23.2					0	7	0	

P23.13			20.0 [ms]	500.0 [ms]	100.0 [ms]	8.10
P23.14		1	0	60000	1024	
P23.15	[0] [1]					

P23.31		0.0	100.0 [%]	5.0 [%]	
P23.32		0.0	100.0 [%]	5.0 [%]	
P23.34	[0] [1]	0	1	0	8.10
P23.35		0.0	100.0 [s]	0.0 [s]	
P23.36		50.0	150.0 [%]	110.0 [%]	
P23.37		0.0	150.0 [%]	100.0 [%]	8.10
P23.38		0.0	100.0 [%]	25.0 [%]	8.10
P23.39		0.0	120.0 [%]	100.0 [%]	8.10
P23.40		0.0	150.0 [%]	100.0 [%]	8.10
P23.41		0.0	150.0 [%]	135.0 [%]	
P23.42	[0] [1]	0	1	1	
P23.43		25 [ms]	1000	75 [ms]	
P23.44					

P23.53	Kp		0.0 1000.0 [%]	100.0 [%]	
P23.54	Ki		0.0 1000.0 [%]	100.0 [%]	
P23.55			0.0 1000.0 [%]	100.0 [%]	8.10
P23.56			0.0 1000.0 [%]	100.0 [%]	8.10
P23.57		[0] [1]	0 1	0	8.10
P23.58			0.0 125.0 [%]	100.0 [%]	8.10
P23.59			1.0 25.0 [%]	2.5 [%]	8.10
P23.60	DROOP	0 DROOP	0.0 100.0 [%]	0.0 [%]	8.10
P23.61	DROOP	DROOP	30 2000 [ms]	50 [ms]	8.10
P23.62			0.0 1000.0 [%]	100.0 [%]	8.10
P23.63			0.0 1000.0 [%]	100.0 [%]	8.10
P23.64	2	2	0.0 100.0 [%]	0.0 [%]	8.10
P23.65	2	2	30 2000.0 ms	50 ms	
P23.98		( )	0.01 300.00 [s]	0.75 [s]	
P23.99			0.00 10.00 [%]	0.00 [%]	

7.24 MODBUS P32

P32.0	MODBUS	[0] [1]	0 1	0	
P32.1	MODBUS ID		1 255	1	
P32.2		[0]RS485 [1]RS232	0 1	0	
P32.3		[0] 9600 BPS [1] 14400 BPS [2] 19200 BPS [3] 38400 BPS [4] 56000 BPS [5] 57600 BPS [6] 115200 BPS	0 6	3	
P32.4		[0] None_8_1_CFG [1] Even_8_1_CFG [2] Odd_8_1_CFG [3] None_8_2_CFG [4] Even_8_2_CFG [5] Odd_8_2_CFG	0 5	0	
P32.5	Modbus	Modbus 0 Modbus	0 100 [s]	0 [s]	0s
P32.6	Modbus	0- 1-	0 1	0	

P33.18	[W2]	[0] × 1 [1] × 10 [2] × 100 [3] × 1000 [4] × 10000	0	4	0
P33.19	[W3]	7-2	0	37	0
P33.20	[W3]	[0] × 1 [1] × 10 [2] × 100 [3] × 1000 [4] × 10000	0	4	0

P33.21]

P33.31	[W9]	7-2	0 37	0	
P33.32	[W9]	[0] × 1 [1] × 10 [2] × 100 [3] × 1000 [4] × 10000	0 4	0	
P33.33	[W10]	7-2	0 37	0	
P33.34	[W10]	[0] × 1 [1] × 10 [2] × 100 [3] × 1000 [4] × 10000	0 4	0	
P33.35	[W11]	7-2	0 37	0	
P33.36	[W11]	[0] × 1 [1] × 10 [2] × 100 [3] × 1000 [4] × 10000	0 4	0	
P33.37	[W12]	7-2	0 37	0	
P33.38	[W12]	[0] × 1 [1] × 10 [2] × 100 [3] × 1000 [4] × 10000	0 4	0	
P33.39	[W13]	7-2	0 37	0	
P33.40	[W13]	[0] × 1 [1] × 10 [2] × 100 [3] × 1000 [4] × 10000	0 4	0	
P33.41	[W14]	7-2	0 37	0	
P33.42	[W14]	[0] × 1 [1] × 10 [2] × 100 [3] × 1000 [4] × 10000	0 4	0	
P33.43	[W15]	7-2	0 37	0	

P33.54	[W4]	[0] × 1 [1] × 10 [2] × 100 [3] × 1000 [4] × 10000 [5] [%] × 1 [6] [%] × 10 [7] [%] × 100	0 7	0	
P33.55	[W5]	7-3	0 48	19	
P33.56	[W5]	[0] × 1 [1] × 10 [2] × 100 [3] × 1000 [4] × 10000 [5] [%] × 1 [6] [%] × 10 [7] [%] × 100	0 7	2	
P33.57	[W6]	7-3	0 48	26	
P33.58	[W6]	[0] × 1 [1] × 10 [2] × 100 [3] × 1000 [4] × 10000 [5] [%] × 1 [6] [%] × 10 [7] [%] × 100	0 7	6	
P33.59	[W7]	7-3	0 48	30	
P33.60	[W7]	[0] × 1 [1] × 10 [2] × 100 [3] × 1000 [4] × 10000 [5] [%] × 1 [6] [%] × 10 [7] [%] × 100	0 7	1	
P33.61	[W8]	7-3	0 48	14	

P33.62	[W8]	[0] × 1 [1] × 10 [2] × 100 [3] × 1000 [4] × 10000 [5] [%] × 1 [6] [%] × 10 [7] [%] × 100	0 7	0	
P33.63	[W9]	7-3	0 48	13	
P33.64	[W9]	[0] × 1 [1] × 10 [2] × 100 [3] × 1000 [4] × 10000 [5] [%] × 1 [6] [%] × 10 [7] [%] × 100	0 7	0	
P33.65	[W10]	7-3	0 48	40	
P33.66	[W10]	[0] × 1 [1] × 10 [2] × 100 [3] × 1000 [4] × 10000 [5] [%] × 1 [6] [%] × 10 [7] [%] × 100	0 7	6	
P33.67	[W11]	7-3	0 48	0	
P33.68	[W11]	[0] × 1 [1] × 10 [2] × 100 [3] × 1000 [4] × 10000 [5] [%] × 1 [6] [%] × 10 [7] [%] × 100	0 7	0	
P33.69	[W12]	7-3	0 48	0	

P33.70	[W12]	[0] × 1 [1] × 10 [2] × 100 [3] × 1000 [4] × 10000 [5] [%] × 1 [6] [%] × 10 [7] [%] × 100	0 7	0	
P33.71	[W13]	7-3	0 48	0	
P33.72	[W13]	[0] × 1 [1] × 10 [2] × 100 [3] × 1000 [4] × 10000 [5] [%] × 1 [6] [%] × 10 [7] [%] × 100	0 7	0	
P33.73	[W14]	7-3	0 48	0	
P33.74	[W14]	[0] × 1 [1] × 10 [2] × 100 [3] × 1000 [4] × 10000 [5] [%] × 1 [6] [%] × 10 [7] [%] × 100	0 7	0	
P33.75	[W15]	7-3	0 48	0	
P33.76	[W15]	[0] × 1 [1] × 10 [2] × 100 [3] × 1000 [4] × 10000 [5] [%] × 1 [6] [%] × 10 [7] [%] × 100	0 7	0	

7-2

0

1 0

2 1

7-3

0	
1	0
2	1
3	2
4	3
5	4
6	5
7	0 @32bit
8	1 @32bit
9	2 @32bit
10	3 @32bit
11	4 @32bit
12	5 @32bit
13	[32]
14	[32]
15	32bit_MSW
16	32bit_LSW
17	
18	
19	
20	[rpm]
21	[rpm]
22	
23	
24	
25	
26	
27	A
28	B

29	C
30	
31	
32	
33	1
34	2
35	
36	
37	
38	
39	
40	
41	Mwh
42	Kwh
43	Mwh
44	Kwh
45 48	AW26 29

8.

8.1

400kW 800kW 400kW

P2.0

8.2

1

P12.0 [0] [1]

A. [0]

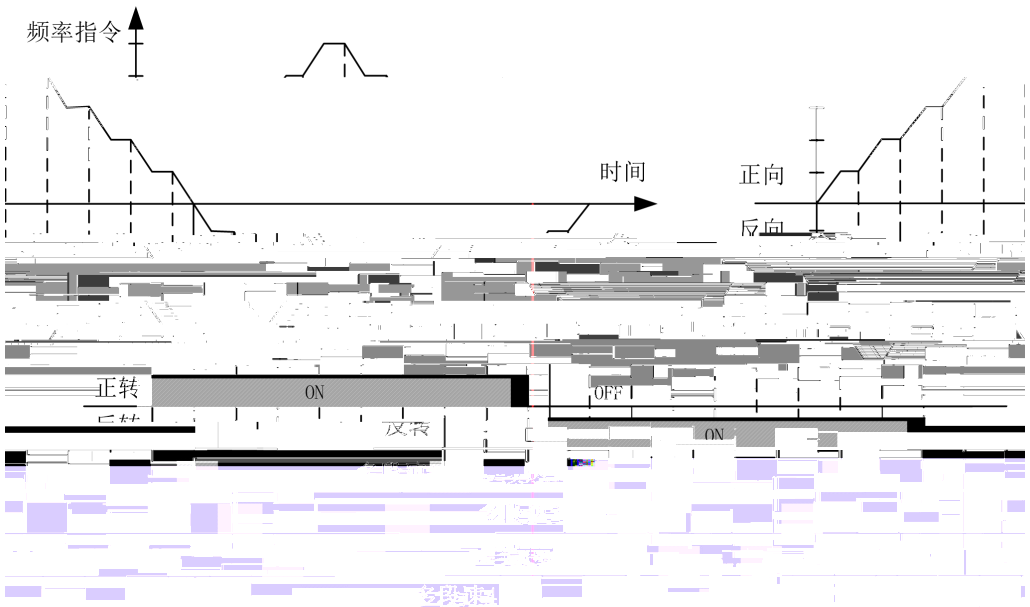
[1] [2] ---1

[6] 1 0 ---2

[7] 2 1 ---3

[8] 3 2 ---4

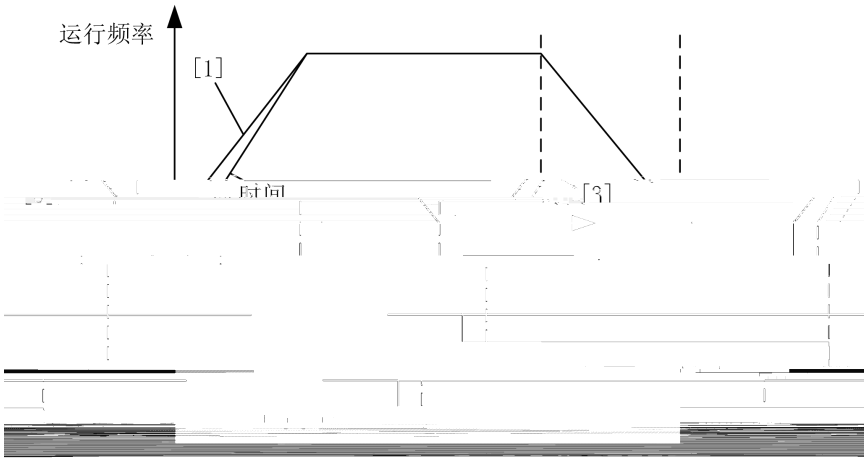
[9] 4 3 ---5



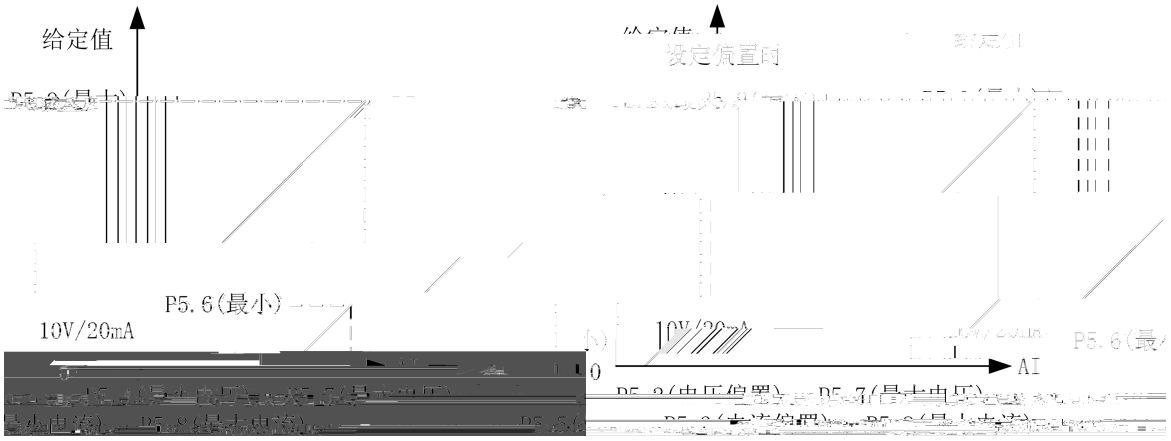
B. [1]

4 16 (8421)

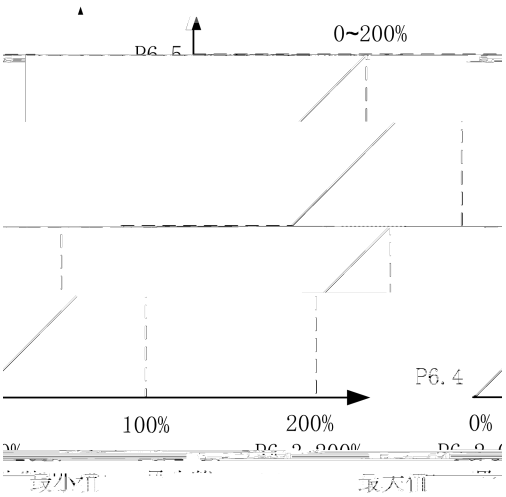
(FORWARD) (REVERSE)



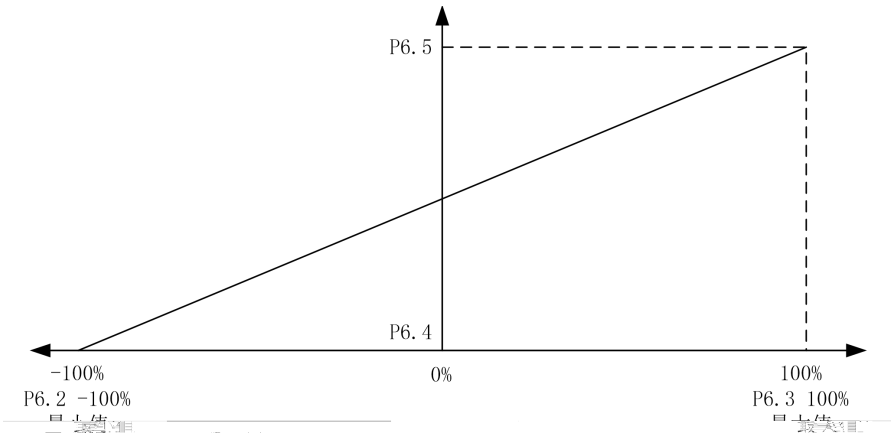
8.4



8.5



(a) 0~100% b 0~200%



c -100~100%

8.6

1

P7.0 P7.1 P7.2 P7.3

2

P7.4 P7.5 P7.6 P7.7 P7.4 P16.4

3

P7.8 P7.9 P7.10 P7.11

P16.4 $\frac{(\quad)}{3}$ 7.8 16.4 1.414

4

P7.12 P7.13 P7.12

P7.13

5

P7.14 IGBT P7.14

P7.15 IGBT P7.15

6

P7.19 P7.20 P7.21 P7.22 P7.19

P7.19 P7.22

7

P7.23 P16.11=1 P7.23

P7.23

P7.24 P7.26 P17.11=1 P18.11=1 P19.11=1

8

P7.31 P7.32 P16.11=2

P7.31 100% P7.32

P7.31 P7.32

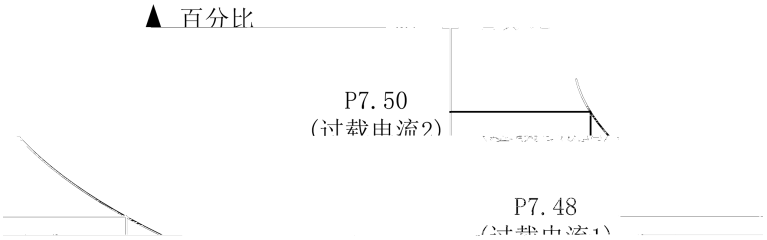
9

P7.33

P7.33

10

P7.48 P7.50



8

11

P7.64 P7.65 P7.66 HF650

37KW-160kW P7.64 1

P7.65

P7.66 P7.66

≥P7.65 P16.0 380V P7.65 0V 597V P7.66

20V 617V

= 1.075 $\sqrt{2}$ P16.0 20 P7.65

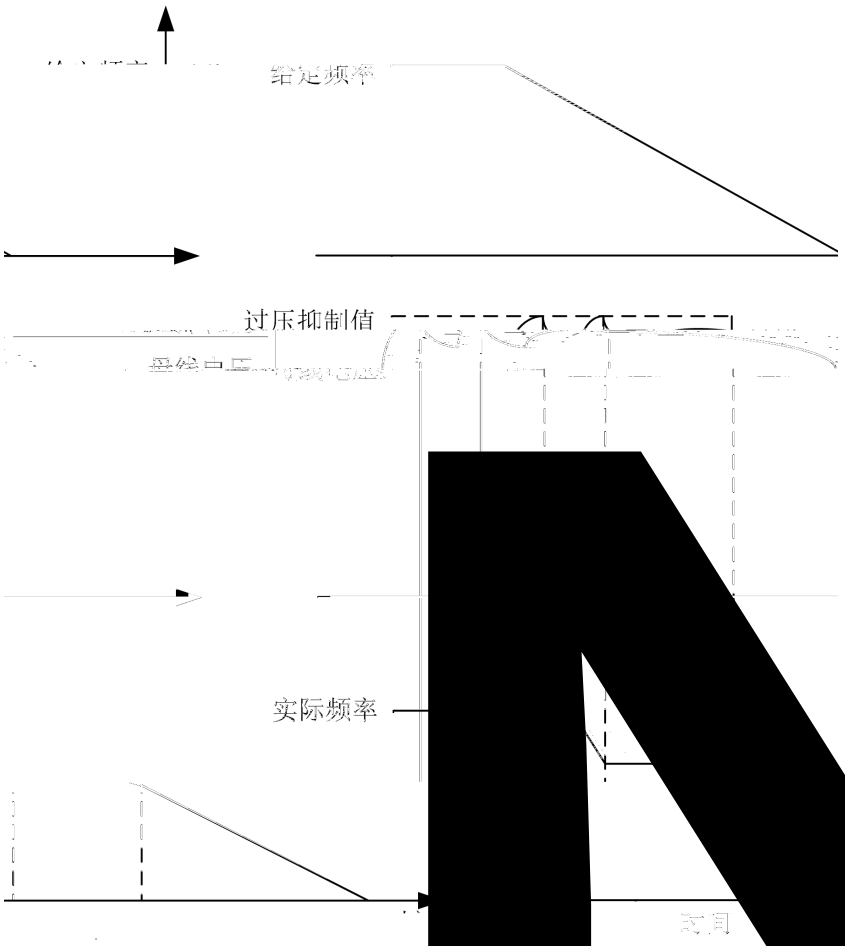
= 1.075 $\sqrt{2}$ P16.0 20 P7.66

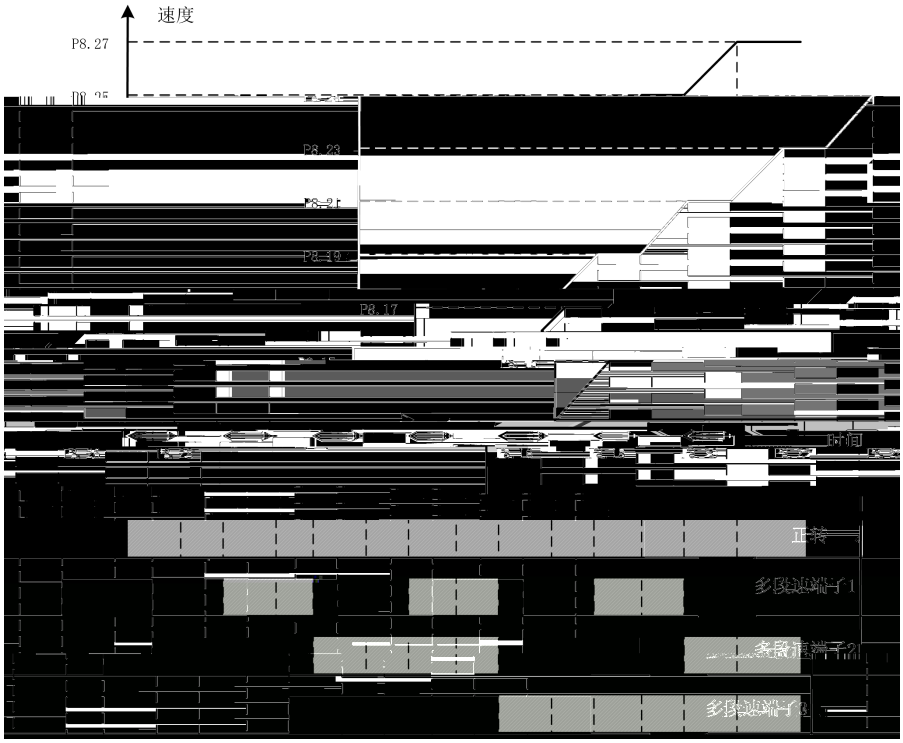
12

P7.69 P7.70 P7.71 P7.69

0 P16.0 380V P7.70 0V

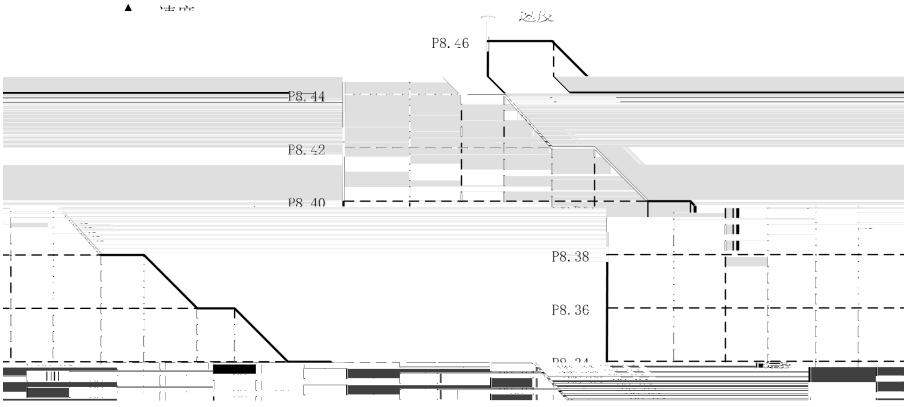
611V = 1.1 $\sqrt{2}$ P16.0 20 P7.70





P8.15<P8.17<P8.19<P8.21<P8.23<P8.25<P8.27

P8.15	P8.17	P8.19	P8.21	P8.23	P8.25	P8.27
10%	20%	30%	50%	60%	80%	100%



8

P8.34<P8.36<P8.38<P8.40<P8.42<P8.44<P8.46

P8.34	P8.36	P8.38	P8.40	P8.42	P8.44	P8.46
10%	20%	30%	50%	60%	80%	100%

3

PROFIBUS MODBUS

P8.13 P8.32

1 =P8.14 × P8.16 × (× 0.001)

1 =P8.33 × P8.35 × (× 0.001)

8.8

1

P12.2 P12.17

P12.0=[1]

	1	2	3	4

1	0	0	0	0
2	1	0	0	0
3	0	1	0	0
4	1	1	0	0
5	0	0	1	0
6	1	0	1	0
7	0	1	1	0
8	1	1	1	0
9	0	0	0	1
10	1	0	0	1
11	0	1	0	1
12	1	1	0	1
13	0	0	1	1
14	1	0	1	1
15	0	1	1	1
16	1	1	1	1

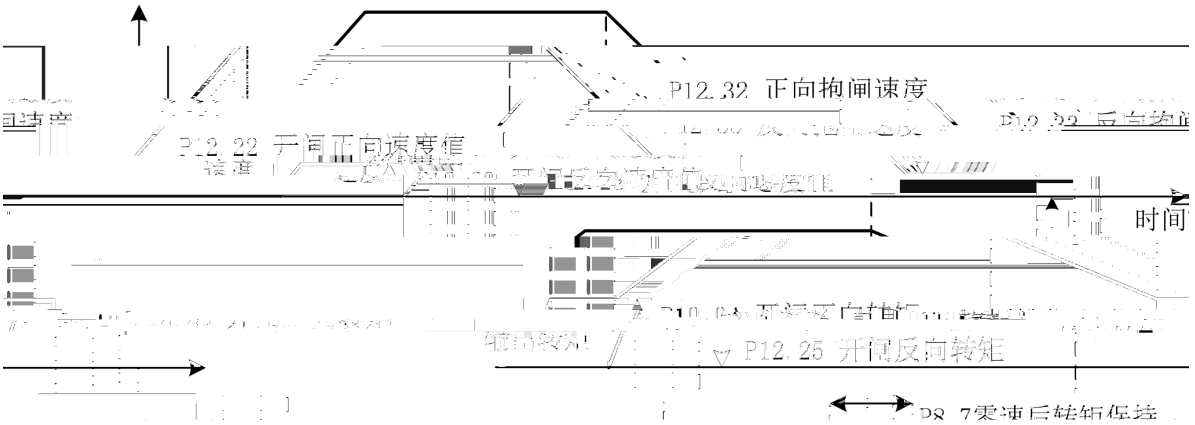
0 OFF 1 ON

2

P12.22 P12.37

[3]

ų 22



8

8.9 V/F

1

P16.0 P16.9

P16.7 120 × P16.5/P16.6 P16.9

120 × P16.5/P16.7

P16.2 P16.4

2

P16.12

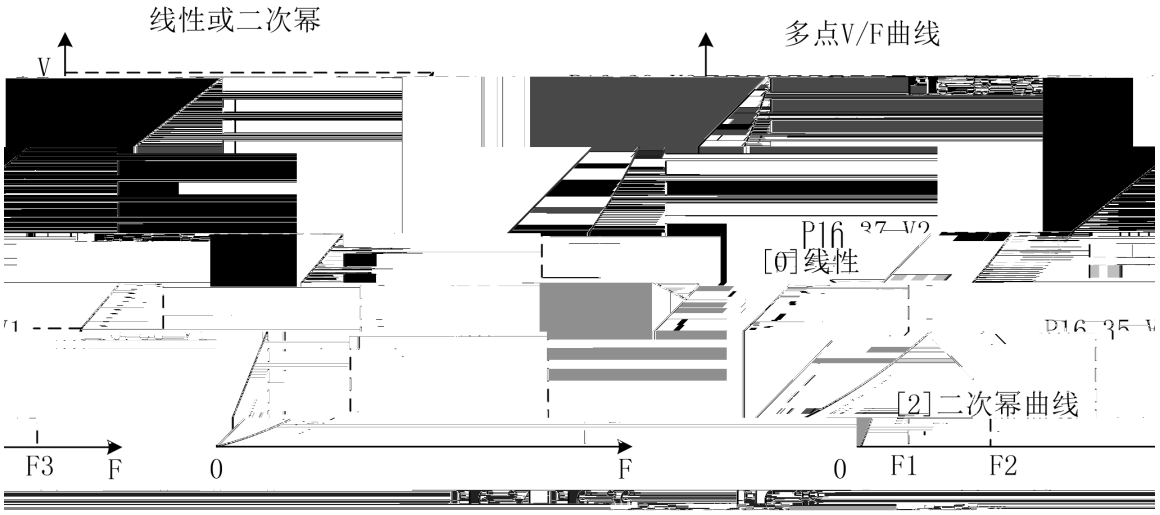
0.5Hz~2Hz >50Hz

1kHz			
5kHz			
10kHz			

kHz

0.4kW 30kW 5

37kW



P16.34 P16.45 V/F V/F

V1 V2 V3 F1 F2 F3

4

P16.15 V/F

V/F

はもの

8.10

1

P20.0

P20.0=0 P20.1=0 P20.2=0

P20.0=0 P20.1≠0 P20.2≠0

P20.0=1 P20.1≠0 P20.2≠0 1

0

P16.11 [1] [2]

8

P20.3 P20.1 [4]

2

P12.24 P12.25 0%

3

P20.7

P20.8 P20.9 P20.7=1

4

P20.15 A B

A B U V W

[0]

[1] A B



GDHF-PGD2 PG

8 2

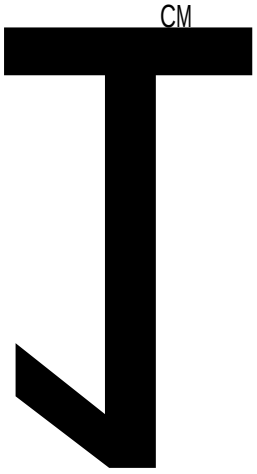
P20.1 P20.2 [0]

9

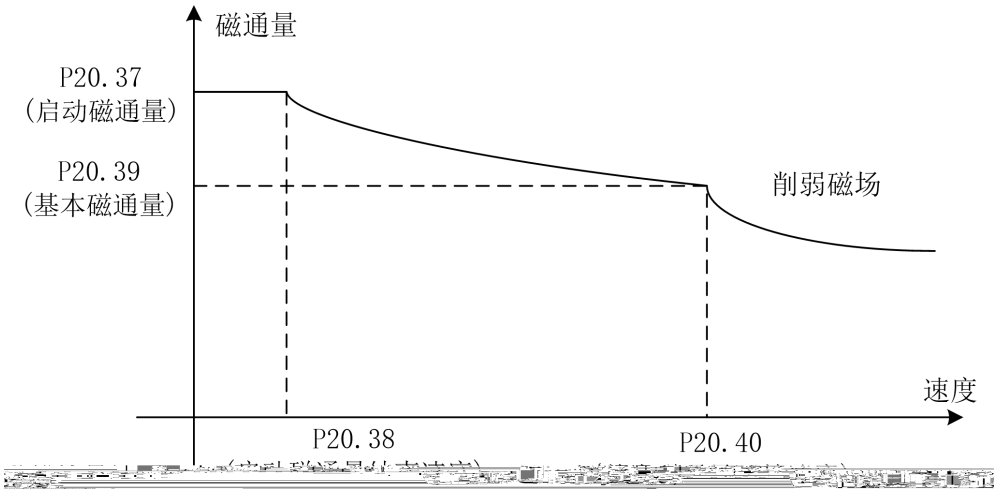
PG D1

PLC DI

DP CM



8



12

P20.57 P20.58 P20.59 P20.57 1

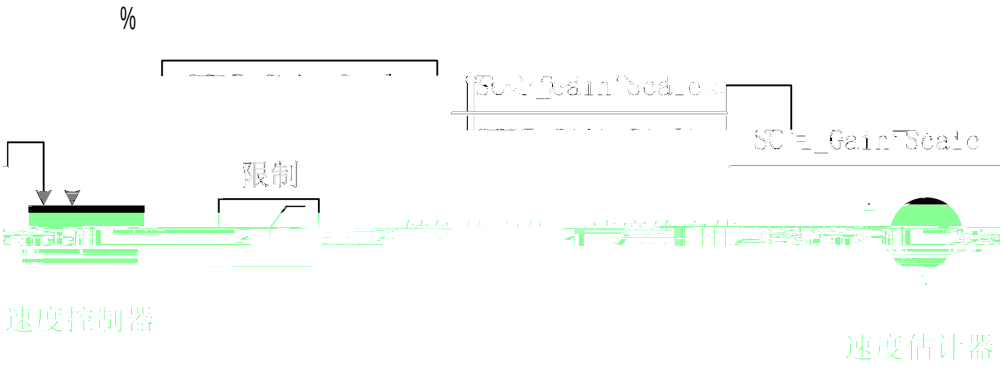
P20.58

P20.59

13

P20.55 ,

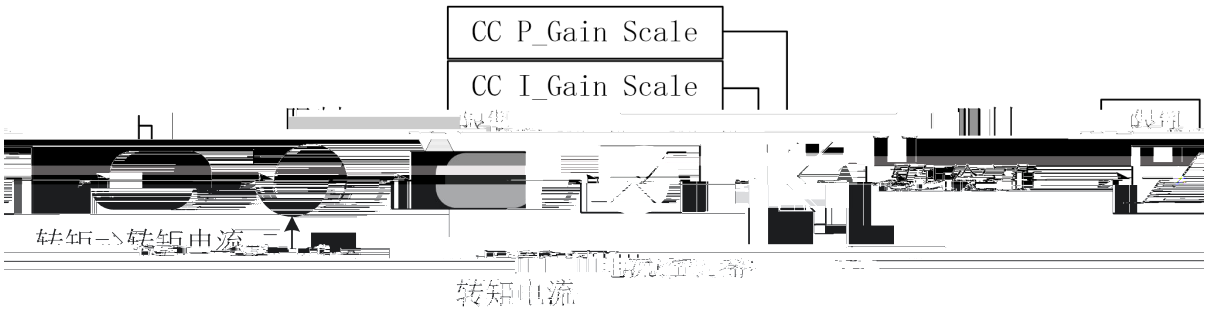
P20.56 ,



14

P20.62 P20.63 %

8


CC P_Gain Scale
CC I_Gain Scale
转矩电流

8.11

9.

9.1

WO1 SYS_NOT_RDY (Ready)

[

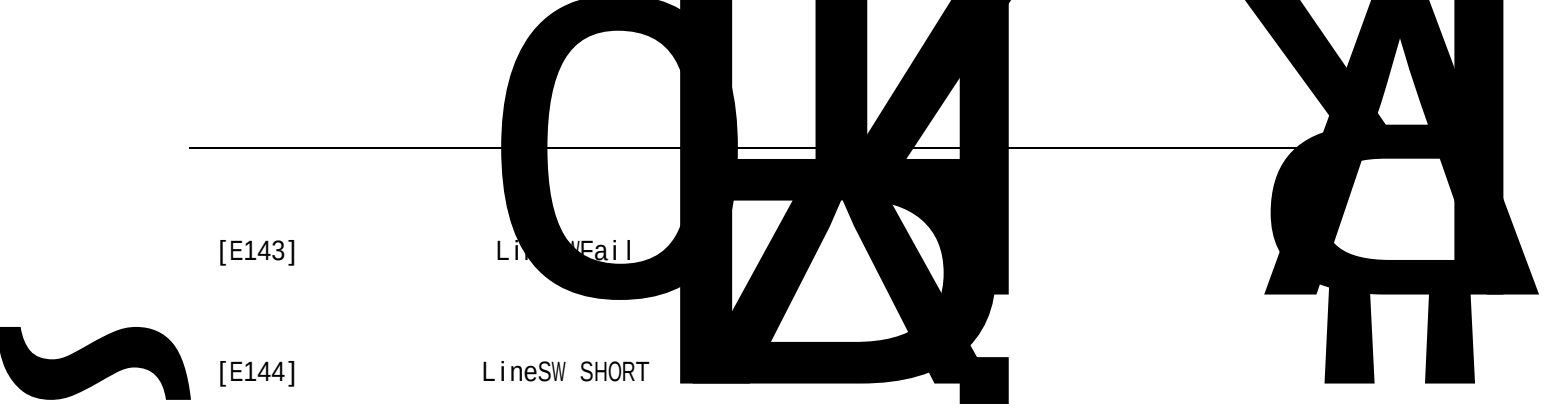
WO2]

NO_DRV_ENABLE

ȣ ◘ ǂ

9

[E111]	OL	P7.48(1) P7.49(1) P7.48 P7.49
[E112]	ZC	P7.8
[E113]	MIP	
[E114]	MOP	
[E115]	OS	P7.19 P7.19
[E116]	SLVC Fail	P7.23
[E117]	MOTOR STALL	P20.14 P20.15
[E118]	PG ERROR	P20.14 P20.15
[E119]	SPEED ABNORMAL	P20.14 P20.15 P7.31 P7.32
[E120]	IGBT OT	
[E138]	TEMP_SENSINGFAIL	
[E139]	Pre_Charging Fail	P7.95
[E140]	LineUV	
[E141]	Line OPEN	
[E142]	LineDetectionError	



[E143]	Li VFail	
[E144]	LineSW SHORT	
[E145]	(AFE) Line OV	P16.0
[E146]	(AFE) Line Over_Freq	
[E152]	U IGBT PDP[U]	GBT GBT IGBT T
[E154]	V IGBT PDP[V]	

9

[E201]	REMOTE_EM	[ ] P3
[E202]	Modbus MODBUS EMERGENCY	Modbus CW0.4
[E203]	DRIVE DISABLED	DP
[E210]	Panel Error	
[E220]	CRC MEMORY CRC ERR	
[E221]	PARAMETER ERROR	

9.3

-
- ON
- COM

-

-

-

-
- ON
- COM

-
-
-

-

10.



1.

2.

3.

4.



1. CMOS

2.

3.

10.1

10.2

	1. 2.	1. > 40 < 95% 2.
	1. 2.	1. 2.
	1. 2. 3.	1. 2. 3.
	1. 2.	1. 2.
	1. 2.	1. 2.

10.3

	2	1 2
PCB		

10.4

5

5

(400-0077-570)

1 40

2 80%

3 24 /

10.5

1

2

1

2

3

驱动电机控制器用户手册

Wuhan Guide Electric Drive Technology Co.,Ltd.

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