



Approval Sheet

for

**Metal Film Resistors
Flame-Proof Type**

FMF series

$\pm 0.5\%$ & $\pm 1\%$ & $\pm 2\%$ & $\pm 5\%$

YAGEO CORPORATION

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Rev.	Description	Issue Date	Drawn	Approved
00	issue new spec.	Jul 16, 2007	Sara Lin	Joyce Chung
01	Add new tolerances of $\pm 0.5\%$ & $\pm 2\%$ & $\pm 5\%$	Jun 15, 2010	Feng Ye	Ken Hsu
02	The environmental characteristics are adjusted;	Jan 05, 2011	Feng Ye	Ken Hsu
03	Accidental Overload Test is included.	Mar 01, 2011	Feng Ye	Ken Hsu
04	Update voltage proof specification	Jan.01, 2012	Feng Ye	Ken Hsu
05	Add T.C.R code “-“	Jul. 16. 2014	Feng Ye	Flora Shen
06	Add UL standard to product item	Oct. 13, 2014	Feng Ye	Flora Shen
07	Updated the T.C.R definition	Feb. 24, 2016	Feng Ye	Flora Shen
08	MB, F, FFK, FK, FKK types are included	Sep. 21, 2016	Feng Ye	Flora Shen
09	Revised the description of item 3-band code	Nov. 29, 2016	Feng Ye	Flora Shen
10	Revised the dimension “A” of tape on reel packing , Add dimension “B” for tape on reel packing.	Feb. 25, 2020	Mingfa Liu	Feng Ye

Description	Metal Film Resistors, Flame-Proof Type		
Series	FMF	Rev.	10

1. PRODUCT:

FLAME-PROOF METAL FILM RESISTORS
(Normal & Miniature Style)
Flameproof multi-layer coating meets UL-94V-0 standard.
Flameproof feature overload test meets UL-1412.

2. PART NUMBER:

Part number of the flame-proof type metal film resistor is identified by the name, power, tolerance, packing, temperature coefficient, special type and resistance value.

Example:

FMF	-25	F	T	F	52-	100R
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Series	Power	Resistance	Packing	Temperature	Special	Resistance
Name	Rating	Tolerance	Style	Coefficient	Type	Value
				of Resistance		

(1) Style: FMF SERIES

(2) Power Rating: -25=1/4W、50S=1/2W、-50=1/2W、1WS=1W、100=1W、2WS=2W、200=2W、3WS=3W

(3) Tolerance: F=±1% D=±0.5% G=±2% J=±5%

(4) Packaging Type: R=Paper Taping Reel
T=Tape on Box Packing
B=Bulk Packing

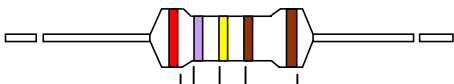
(5) Temperature Coefficient: E=±50PPM/°C F=±100PPM/°C “-“=Base on spec. or ignore

(6) Special Type: 26-=26mm
52-=52.4mm
73-=73mm
M=M-Type Forming for Bulk
MB = MB Type Forming for Bulk
F = F Type Forming for Bulk
FK = FK Type Forming
FFK = FFK Type Forming
FKK = FKK Type Forming
PN=PANAsert (rated watts -25 & 50s size only)
AV=AvIsert (rated watts -25 & 50s & -50 & 1ws size only)

(7) Resistance Value: E24 & E96 Series

Example: 1R、10R、100R、10K、100K、330K、1M.....

3. BAND-CODE:



COLOR	1ST BAND	2ND BAND	3ND BAND	MULTIPLIER	TOLERANCE
BLACK	0	0	0	1Ω	
BROWN	1	1	1	10Ω	± 1 % (F)
RED	2	2	2	100Ω	± 2 % (G)
ORANGE	3	3	3	1KΩ	
YELLOW	4	4	4	10KΩ	
GREEN	5	5	5	100K	± 0.5 % (D)
BLUE	6	6	6	1MΩ	
VIOLET	7	7	7	10MΩ	
GREY	8	8	8		
WHITE	9	9	9		
GOLD				0.1Ω	± 5 % (J)
SILVER				0.01Ω	

*TOL: ± 0.5 % (D) & ± 1 % (F)--- 5 color band.

TOL: ± 2 % (G) & ± 5 % (J)--- 4 color band.(3ND BAND is not included)

Remark:

(1). Multiplier band for 2%&5% types

- 1R1-9R9: GOLD (0.1)
- 0R1-0R99: SILVER (0.01)
- 0R01-0R099: GREY (0.001)

(2) Multiplier band for 0.5%&1% types

- 1R1-9R9: SILVER (0.01)
- 0R1-0R99: GREY (0.001)
- 0R01-0R099: WHITE (0.0001)

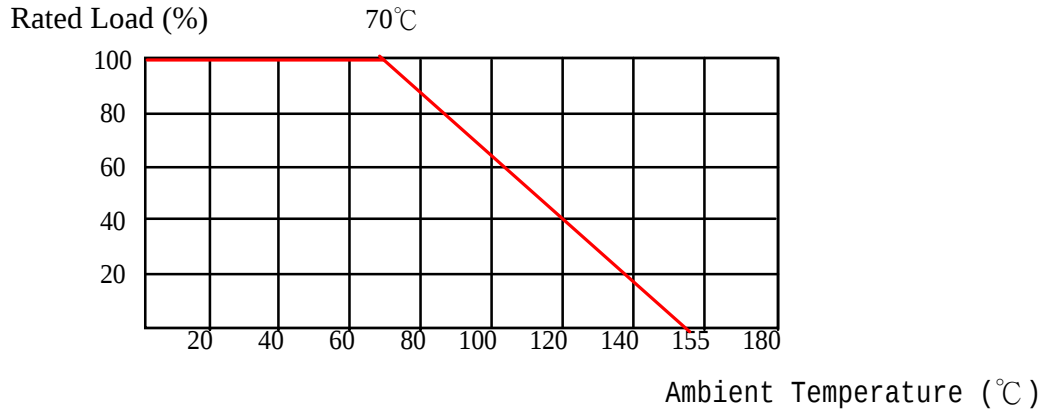
4. ELECTRICAL CHARACTERISTICS

TABLE I

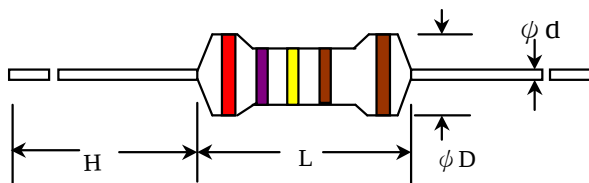
STYLE	FMF-25	FMF50S	FMF-50	FMF1WS	FMF100	FMF2WS	FMF200	FMF3WS
Power Rating at 70 °C	1/4W	1/2W		1W		2W		3W
Maximum Working Voltage	250V	300V	350V	400V	500V			
Maximum Overload Voltage	500V	600V	700V	800V	1000V			
Voltage Proof on Insulation	400V		500V					
Resistance Range	1Ω ~ 10MΩ & 0Ω for E24 & E96 series value							
Operating Temp. Range	- 55 °C to + 155 °C							
Temperature Coefficient	±50 ppm /°C 、 ±100 ppm /°C							
	<1R type only ±100ppm/°C is available							

* Below or over this resistance on request.

5. DERATING CURVE



6. DIMENSIONS



STYLE		DIMENSION			
Normal	Miniature	L	ψD	H	ψd
FMF-25	FMF50S	6.3±0.5	2.4±0.2	28±2.0	0.55±0.05
FMF-50	FMF1WS	9.0±0.5	3.3±0.3	26±2.0	0.55±0.05
FMF100	FMF2WS	11.5±1.0	4.5±0.5	35±2.0	0.8±0.05
FMF200	FMF3WS	15.5±1.0	5.0±0.5	33±2.0	0.8±0.05

7. ENVIRONMENTAL CHARACTERISTICS

(1) Short Time Over Load Test

At 2.5 times of the rated voltage or the maximum load voltage, whichever less, applied for 5 seconds, the resistor should be free from defects after the resistor is released from load for about 30 minutes

$$\text{Short Time Overload Voltage} = 2.5 * \sqrt{\text{Power Rating} \times \text{Resistance Value}}$$

The change of the resistance value should be within $\pm 0.25 \% + 0.05\Omega$

(2) Voltage Proof

The resistor shall be clamped in the trough of a 90° metal V Block. Apply the insulation voltage specified in the "Table I" between the terminals connected together with the block for about 60 seconds.

The resistor shall be able to withstand without breakdown or flashover.

(3) Temperature Coefficient Test

Test of resistors above room temperature $100^{\circ}\text{C} \pm 2^{\circ}\text{C}$ (Testing Temperature 115°C to 130°C) at the constant temperature silicon plate for over 5 minutes. Then measure the resistance value.
The Temperature Coefficient is calculated by the following equation and its value should be within the range of requested.

$$\text{Resistor Temperature Coefficient} = \frac{R - R_0}{R_0} \cdot \frac{1}{t - t_0} \cdot 10^6$$

R = Resistance value under the testing temperature

R_0 = Resistance value at the room temperature

t = The testing temperature

t_0 = Room temperature

(4) Insulation Resistance

Apply "measuring voltage" between protective coating and termination for 1 min., then measure. The measuring voltage shall be either $100\text{V} \pm 15\text{V}$ d.c. for resistors with an insulation voltage lower than 500V or $500\text{V} \pm 50\text{V}$ d.c. for resistors with an insulation voltage equal to or greater than 500V.
The test resistance should be high than 1,000M ohm.

(5) Solderability

Immerse the specimen into the solder pot at $245 \pm 5^{\circ}\text{C}$ for 3 ± 0.5 seconds.
At least 95% solder coverage on the termination.

(6) Solvent Resistance of Marking

The specimen into the appropriate solvent of IPA condition of ultrasonic machine for 5 ± 0.5 minutes.
The specimen is no deterioration of coatings and color code

(7) Robustness of Terminations

Direct Load – Resistors shall be held by one terminal and the load shall be gradually applied in the direction of the longitudinal axis of the resistor unit the applied load reached the requirement.
The load shall be held for 10 seconds. The load of weight shall be $\geq 2.5 \text{ kg}$ (24.5N).

(8) Periodic-Pulse Overload

Apply 4 times of rated voltage to the specimen at the 1 second on and 25 seconds off cycle, subjected to voltage application cycles specified in 10,000 time.
The change of the resistance value shall be within $\pm 1.0\% + 0.05 \Omega$

(9) Damp Heat Steady State

Place the specimen in a test chamber at $40 \pm 2^{\circ}\text{C}$ and 90 ~ 95 % relative humidity. Apply the 0.1 times rated voltage to the specimen at the 1.5 hours on and 0.5 hour off cycle. The total length of test is 56 days.
The change of the resistance value shall be within $\pm 1.5\% + 0.05 \Omega$

(10) Endurance at 70°C

Placed in the constant temperature chamber of $70 \pm 3^{\circ}\text{C}$ the resistor shall be connected to the lead wire at the point of 25mm. Length with each terminal, the resistors shall be arranged not much effected mutually by the temperature of the resistors and the excessive ventilation shall not be performed, for 90 minutes on and 30 minutes off under this condition the rated D.C. voltage is applied continuously for 1000+48/-0 hours then left at no-load for 1hour, measured at this time the resistance value.
The change of the resistance value shall be within $\pm 1.5\% + 0.05 \Omega$.
There shall be no remarkable change in the appearance and the color code shall be legible after the test..

(11) Temperature Cycling Test

The temperature cycle shown in the following table shall be repeated 5 times consecutively. The measurement of the resistance value is done before the first cycle and after ending the fifth cycle, leaving in the room temperature for about 1 hour.

Temperature Cycling Conditions:

Step	Temperature(°C)	Time (minute)
1	-55 ± 3	30
2	25 ± 3	2 ~ 3
3	155 ± 3	30
4	25 ± 3	2 ~ 3

The change of the resistance value shall be within ± 0.75 % + 0.05 Ω

After the test the resistor shall be free from the electrical or mechanical damage.

(12) Resistance to Soldering Heat

The terminal lead shall be dipped into the solder pot at 260 ± 3 °C for 10 ± 1.0 seconds up to 2.5 ~ 3.5 mm.

The change of the resistance value shall be within ± 0.25 % + 0.05 Ω

(13) Accidental Overload Test

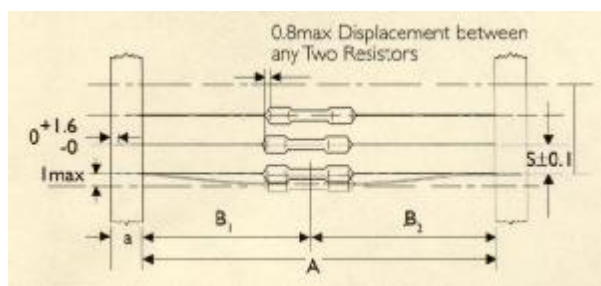
At 4 times of the rated voltage or the maximum load voltage, whichever less, applied for 1 minute

Overload Test Voltage = $4 * \sqrt{\text{Power Rating} \times \text{Resistance Value}}$

The resistor shall be able to no evidence of flaming arcing.

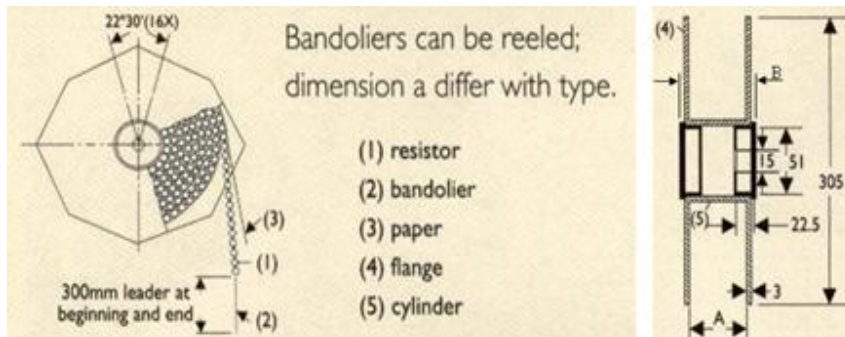
8. PACKING METHODS

Bandolier for Axial leads



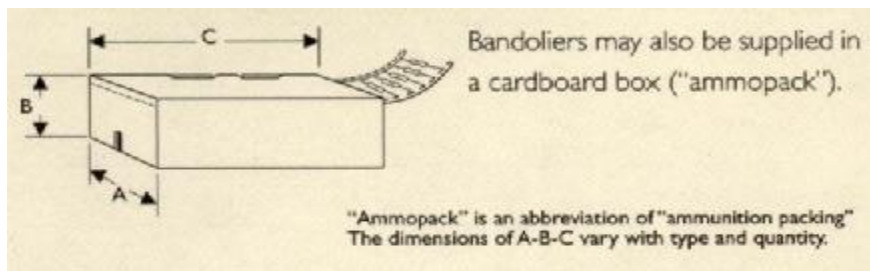
STYLE		DIMENSIONS			Unit: : mm	
Normal	Miniature	a	A	B1-B2	S (spacing)	T (max. deviation of spacing)
FMF-25	FMF50S	6 ± 0.5	52.4 ± 1.0 26.0 ± 1.0	1.2 1.0	5	1 mm per 10 spacing
FMF-50	FMF1WS	6 ± 0.5	52.4 ± 1.0	1.2	5	0.5 mm per 5 spacing
FMF100	FMF2WS	6 ± 0.5	73.0 ± 1.5 52.4 ± 1.0	1.5 1.2	5	
FMF200	FMF3WS	6 ± 0.5	73.0 ± 1.5 52.4 ± 1.0	1.5 1.2	10	

9. TAPE ON REEL PACKING



STYLE		TAPE ON REEL		
Normal	Miniature	ACROSS FLANGE (A)	B	Qty per reel
FMF-25	FMF50S	66.5	75.5	5,000
FMF-50	FMF1WS	66.5	75.5	2,500
FMF100	FMF2WS	87	96	2,000
FMF200	FMF3WS	87	96	1,000

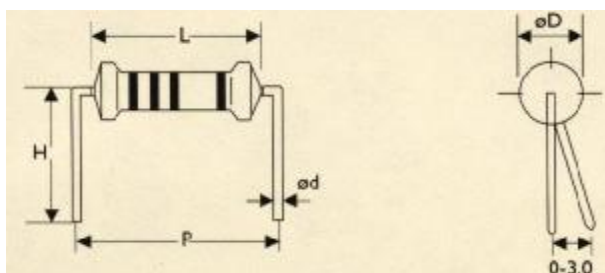
10. TAPE ON BOX PACKING



STYLE		Standard Lead Length			Short Lead Length			Qty per box
Normal	Miniature	W (A)	H (B)	L (C)	W (A)	H (B)	L (C)	
FMF-25	FMF50S	81	104	260	48	102	255	5,000
FMF-50	FMF1WS	73	45	258				1,000
FMF100	FMF2WS	103	78	260	81	91	260	1,000
FMF200	FMF3WS	103	94	260	81	91	260	1,000

11. SPECIAL TYPE (FORMING DIMENSIONS)

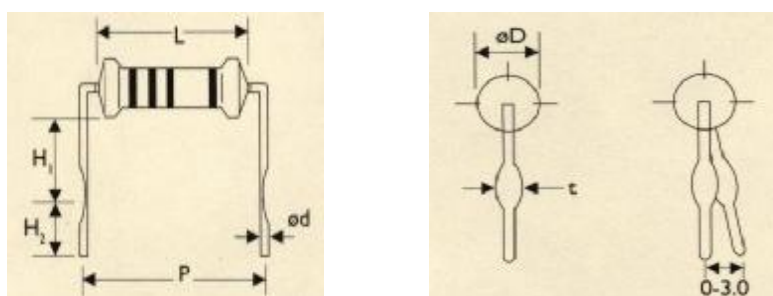
M TYPE





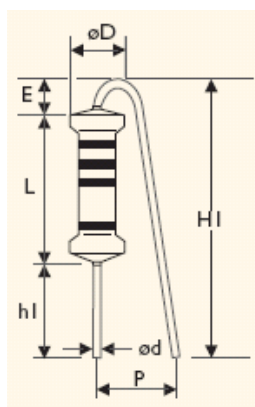
STYLE		DIMENSIONS				UNIT : mm
Normal	Miniature	L	ψD	ψd	P	H
FMF-25	FMF50S	6.3 ± 0.5	2.4 ± 0.2	0.55 ± 0.05	10.0 ± 1	10.0 ± 1
FMF-50	FMF1WS	9.0 ± 0.5	3.3 ± 0.3	0.55 ± 0.05	12.5 ± 1	10.0 ± 1
FMF100	FMF2WS	11.5 ± 1.0	4.5 ± 0.5	0.8 ± 0.05	15.0 ± 1	12.5 ± 1
FMF200	FMF3WS	15.5 ± 1.0	5.0 ± 0.5	0.8 ± 0.05	20.0 ± 1	15.0 ± 1

MB TYPE

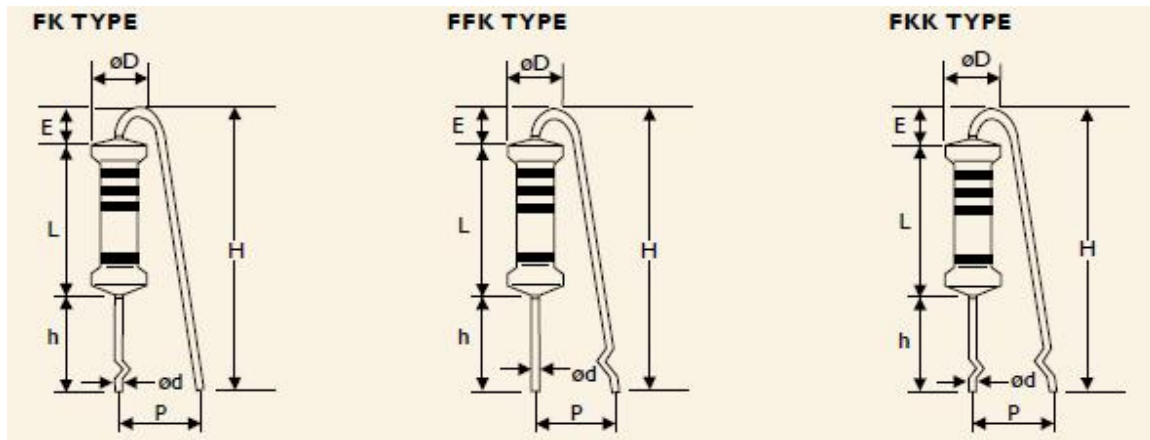


STYLE		DIMENSIONS					UNIT : mm	
Normal	Miniature	L	ψD	ψd	P	H 1	H 2	t
FMF-25	FMF50S	6.3 ± 0.5	2.4 ± 0.2	0.55 ± 0.05	10.0 ± 1	6.0 ± 1	5.0 ± 1	1.2 ± 0.2
FMF-50	FMF1WS	9.0 ± 0.5	3.3 ± 0.3	0.8 ± 0.05	12.5 ± 1	6.0 ± 1	5.0 ± 1	1.2 ± 0.2
FMF100	FMF2WS	11.5 ± 1.0	4.5 ± 0.5	0.8 ± 0.05	15.0 ± 1	6.0 ± 1	5.0 ± 1	1.4 ± 0.2
FMF200	FMF3WS	15.5 ± 1.0	5.0 ± 0.5	0.8 ± 0.05	20.0 ± 1	10.0 ± 1	5.0 ± 1	1.4 ± 0.2

F TYPE

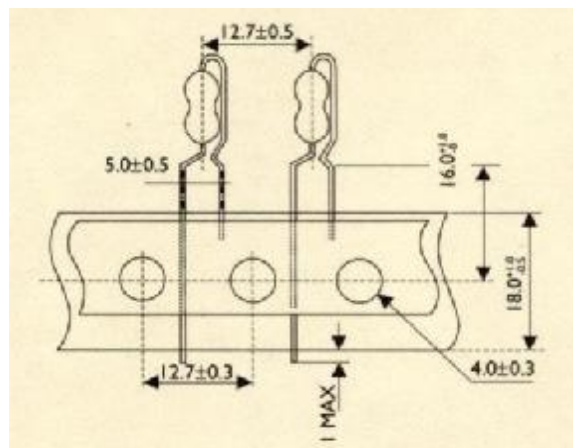


STYLE		DIMENSIONS					UNIT : mm	
Normal	Miniature	L	ψD	ψd	P	h1	H1 max	E max
FMF-25	FMF50S	6.3 ± 0.5	2.4 ± 0.2	0.55 ± 0.05	5.0 ± 1	5.0 ± 1	16.5	3.5
FMF-50	FMF1WS	9.0 ± 0.5	3.3 ± 0.3	0.55 ± 0.05	6.0 ± 1	5.0 ± 1	18.5	3.5
FMF100	FMF2WS	11.5 ± 1.0	4.5 ± 0.5	0.8 ± 0.05	6.0 ± 1	5.0 ± 1	20	3.5
FMF200	FMF3WS	15.5 ± 1.0	5.0 ± 0.5	0.8 ± 0.05	8.0 ± 1	5.0 ± 1	25	3.5

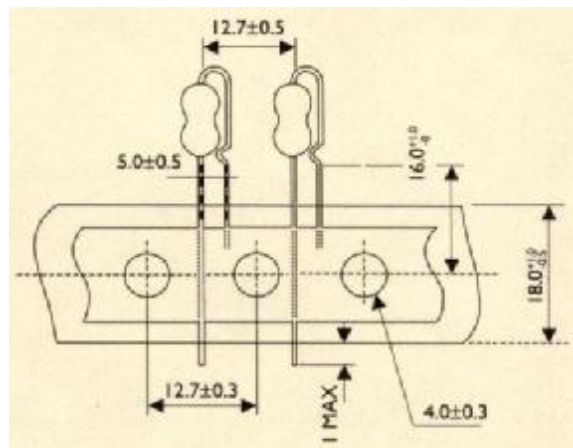


STYLE		DIMENSIONS					UNIT : mm	
Normal	Miniature	L	ψD	ψd	P	h	H max	E max
FMF100	FMF2WS	11.5 ± 1.0	4.5 ± 0.5	0.8 ± 0.05	6.0 ± 1	8.0 ± 1	25	3.5
FMF200	FMF3WS	15.5 ± 1.0	5.0 ± 0.5	0.8 ± 0.05	8.0 ± 1	8.0 ± 1	30	3.5

PN Type Forming for Taping (Rated Watts -25 & 50s size only)



AV Type Forming for Taping (Rated Watts -25 & 50s & -50 & 1ws size only)



12. Plant Address

- A. China Dongguan Plant
7-1, Gaoli Road, Gaoli Industrial Zone
Tangxia Zhen, Dongguan, Guangdong, China
(廣東省東莞市塘廈鎮高麗工業區高麗路 7-1 號)
Tel. 86-769-772 0275
Fax. 86-769-772 0295

- B. China MuDu Plant
No.158, Fengjiang Road, No.1 Building of NanBangIND.Zone,
Mu Du New District, Suzhou, China
(江蘇省蘇州市木瀆新區楓江路 158 號南濱工業區 1 號)
Tel. 86-512-66518889
Fax. 86-512-66519889

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