

# Approval Sheet

for

## Fusible Anti-Explosion Resistors

### FAE series

$\pm 1\%$  &  $\pm 5\%$

**YAGEO CORPORATION**

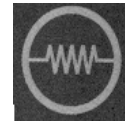
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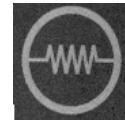
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Rev.	Description	Issue Date	Drawn	Approved
00	issue new spec.	Nov 17, 2010	Feng Ye	Ken Hsu

<b>Description</b>	Fusible Anti-Explosion Resistors		
<b>Series</b>	FAE	<b>Rev.</b>	00



## 1. PRODUCT:

### FUSIBLE ANTI-EXPLOSION RESISTORS

The resistors are coated with a green lacquer of anti-explosion flameproof silicone, the last colour band is orange to represent fusible anti-explosion resistors.

## 2. PART NUMBER:

Part number of the fusible anti-explosion resistor is identified by the name, power, tolerance, packing, temperature coefficient, special type, resistance value and wire-wound suffix.

Example :

<b>FAE</b>	<b>1WS</b>	<b>J</b>	<b>T</b>	<b>-</b>	<b>52-</b>	<b>10R</b>	<b>CM</b>
<b>(1)</b>	<b>(2)</b>	<b>(3)</b>	<b>(4)</b>	<b>(5)</b>	<b>(6)</b>	<b>(7)</b>	<b>(8)</b>
Series Name	Power Rating	Resistance Tolerance	Packing Style	Temperature Coefficient of Resistance	Special Type	Resistance Value	Suffix for resistance wire

(1) Style: FAE SERIES

(2) Power Rating : 50S=1/2W、-50=1/2W、1SS=1W、1WS=1W、100=1W、1WV=1W、2SS=2W、2WS=2W、200=2W、3SS=3W、3WS=3W、300=3W、3WV=3W、4WV=4W、4SS=4W、5WS=5W、500=5W、5WV=5W

(3) Tolerance: F=±1%, J=±5%

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

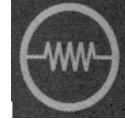
(5) Temperature Coefficient : “-“ = based on spec.

(6) Special Type : 52- =52.4mm  
73- = 73mm  
91- = 91mm  
52U = 52.4mm and normal lacquer coating  
73U = 73mm and normal lacquer coating  
91U = 91mm and normal lacquer coating  
M = M-Type Forming for Bulk  
MB = MB-Type Forming

(7) Resistance Value : ±1% for E24 & E96 Series  
±5% for E24 Series  
Example : 1R、10R、100R.....

(8) Suffix for resistance wire : Optional code. Represents specific alloy wire requirement, required only when wire-wound resistor is with special specification.

Example : CA, CE, CM, CN, FB, FC and etc.



### 3. BAND-CODE:



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

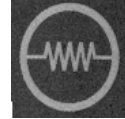
### 4. ELECTRICAL CHARACTERISTICS Normal & Special Style

STYLE	F AE-50	F AE100	F AE1WV	F AE200	F AE300	F AE3WV	F AE4WV	F AE500	F AE5WV
Power Rating at 70 °C	1/2W	1W		2W	3W		4W	5W	
Maximum Working Voltage	$= \sqrt{\text{Power Rating} \times \text{Resistance Value}}$								
Dielectric Withstanding Voltage	300V	400V							
Resistance Range	3.3Ω - 100Ω								
Operating Temp. Range	- 55 °C to + 200 °C								
Temperature Coefficient	±300 ppm /°C								

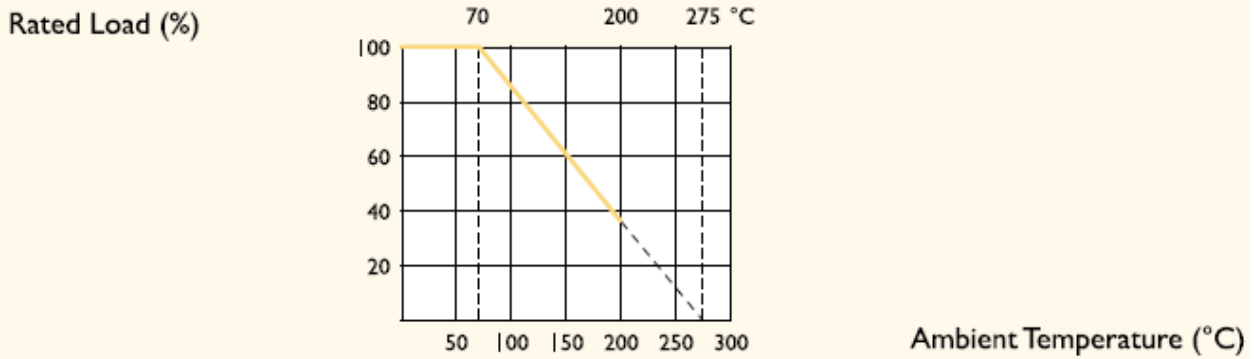
### Miniature & Ultra Miniature Style

STYLE	F AE50S	F AE1SS	F AE1WS	F AE2SS	F AE2WS	F AE3SS	F AE3WS	F AE4SS	F AE5WS
Power Rating at 70 °C	1/2W	1W		2W		3W		4W	5W
Maximum Working Voltage	$= \sqrt{\text{Power Rating} \times \text{Resistance Value}}$								
Dielectric Withstanding Voltage	300V		400V						
Resistance Range	3.3Ω - 100Ω								
Operating Temp. Range	- 55 °C to + 200 °C								
Temperature Coefficient	±300 ppm /°C								

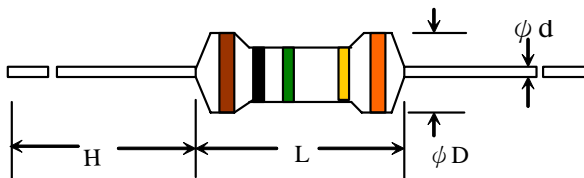
\* Below or over this resistance range on request.



## 5. DERATING CURVE



## 6. DIMENSIONS

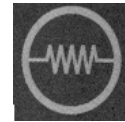


STYLE				DIMENSION			Unit(mm)
Special	Normal	Miniature	Ultra Miniature	L	$\phi D$	H	$\phi d$
-	-	FAE50S	FAE1SS	6.3±0.5	2.4 <sup>+1.0</sup> <sub>-0.5</sub>	28±2.0	0.55±0.05
-	FAE-50	FAE1WS	FAE2SS	9.0±0.5	3.3 <sup>+1.0</sup> <sub>-0.5</sub>	26±2.0	0.55±0.05
FAE1WV	-	-	-	10.0±1.0	4.3 <sup>+1.0</sup> <sub>-0.5</sub>	26±2.0	0.8±0.05
-	FAE100	FAE2WS	FAE3SS	11.5±1.0	4.5 <sup>+1.0</sup> <sub>-0.5</sub>	35±2.0	0.8±0.05
FAE3WV	-	-	-	13.0±1.0	5.5 <sup>+1.0</sup> <sub>-0.5</sub>	34±2.0	0.8±0.05
-	FAE200	FAE3WS	FAE4SS	15.5±1.0	5.0 <sup>+1.0</sup> <sub>-0.5</sub>	33±2.0	0.8±0.05
FAE4WV	-	-	-	17.0±1.0	5.5 <sup>+1.0</sup> <sub>-0.5</sub>	32±2.0	0.8±0.05
-	FAE300	FAE5WS	-	17.5±1.0	6.5 <sup>+1.0</sup> <sub>-0.5</sub>	32±2.0	0.8±0.05
FAE5WV	-	-	-	17.0±1.0	7.5 <sup>+1.0</sup> <sub>-0.5</sub>	32±2.0	0.8±0.05
-	FAE500	-	-	24.5±1.0	8.0 <sup>+1.0</sup> <sub>-0.5</sub>	38±2.0	0.8±0.05

## 7. ENVIRONMENTAL CHARACTERISTICS

### (1) Fusing characteristics

- The resistors will Fuse within 60 seconds at 25 times of rated power;  
Fusing residual resistive value at least 100 times rated resistance.



- 2) The resistors will fuse when mains voltage of 270VAC (**Special test Voltage on request**) is directly applied for 5 seconds maximum. No flames, no explosion, no sound and no arc happened. Fusing residual resistive value at least 100 times rated resistance.

(2) Short Time Over Load Test

At 10 times of the rated power. ( If the voltage exceeds the maximum load voltage, the maximum load voltage will be used as the rated voltage ) applied for 5 seconds, the resistor should be free from defects after the resistor is released from load for about 30 minutes

$$\text{Short Time Overload Voltage} = \sqrt{10 * \text{Power Rating} \times \text{Resistance Value}}$$

The change of the resistance value should be within  $\pm 2.0 \% + 0.05 \Omega$

(3) Dielectric Withstanding Voltage

The resistor is placed on the metal V Block. Apply a Table “EC on page4” dielectric withstanding between the terminals connected together with the block for about 60 seconds.  
The resistor shall be able to withstand without breakdown or flashover.

(4) Temperature Coefficient Test

Test of resistors above room temperature  $100^{\circ}\text{C} \pm 2^{\circ}\text{C}$  ( Testing Temperature  $115^{\circ}\text{C}$  to  $130^{\circ}\text{C}$  ) 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.

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

- R = Resistance value under the testing temperature
- R<sub>0</sub> = Resistance value at the room temperature
- t = The testing temperature
- t<sub>0</sub> = Room temperature

(5) Insulation Resistance

Apply test terminal on lead and resistor body.  
The test resistance should be high than 1,00M ohm.

(6) Solderability

Immerse the specimen into the solder pot at  $260 \pm 5^{\circ}\text{C}$  for  $5 \pm 0.5$  seconds.  
At least 95% solder coverage on the termination.

(7) Resistance to Solvent

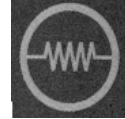
The specimen into the appropriate solvent of IPA condition of ultrasonic machine for 1 minute.  
The specimen is no deterioration of coatings and color code.

(8) Terminal Strength

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 reaches 5 pounds .  
The load shall be held for 10 seconds. The load of weight shall be  $\geq 2.5 \text{ kg}$  ( 24.5N ).

(9) 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  $\pm 2.0\% + 0.05 \Omega$



(10) Load Life in Humidity

Place the specimen in a test chamber at  $40 \pm 2 \text{ }^\circ\text{C}$  and 90 ~ 95 % relative humidity. Apply the rated voltage to the specimen at the 1.5 hours on and 0.5 hour off cycle. The total length of test is 1,000 hours. The change of the resistance value shall be within  $\pm 5 \% + 0.05 \ \Omega$

(11) Load Life Test

Placed in the constant temperature chamber of  $70 \pm 3 \text{ }^\circ\text{C}$  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  $\pm 5 \% + 0.05 \ \Omega$ . There shall be no remarkable change in the appearance and the color code shall be legible after the test.

(12) 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( $^\circ\text{C}$ )	Time (minute)
1	$-55 \pm 3$	30
2	$25 \pm 3$	2 ~ 3
3	$155 \pm 3$	30
4	$25 \pm 3$	2 ~ 3

The change of the resistance value shall be within  $\pm 2.0 \% + 0.05 \ \Omega$   
After the test the resistor shall be free from the electrical or mechanical damage.

(13) Resistance to Soldering Heat

The terminal lead shall be dipped into the solder pot at  $350 \pm 10 \text{ }^\circ\text{C}$  for  $3 \pm 0.5$  seconds up to 2 ~ 2.5 mm. The change of the resistance value shall be within  $\pm 1.0 \% + 0.05 \ \Omega$

(14) Overload Flame Retardant

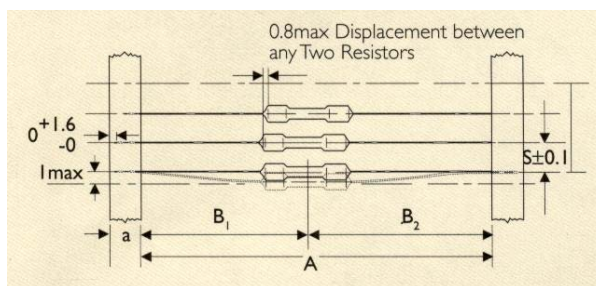
At 4 times of the rated voltage ( If the voltage exceeds the maximum load voltage, the maximum load voltage will be used as the rated voltage ) applied for 1 minute.

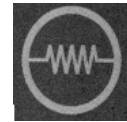
$$\text{Overload Test Voltage} = 4 * \sqrt{\text{Power Rating} \times \text{Resistance Value}}$$

The resistor shall show no evidence of flaming arcing.

**8. PACKING METHODS**

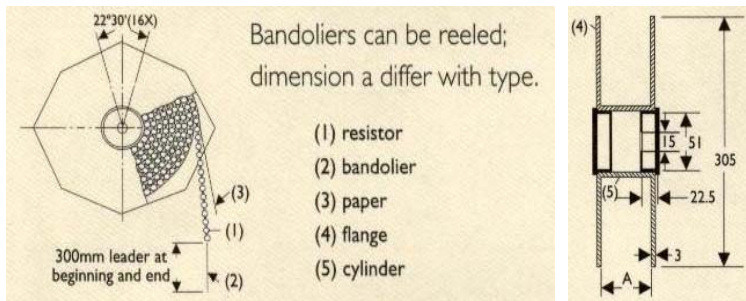
Bandolier for Axial leads





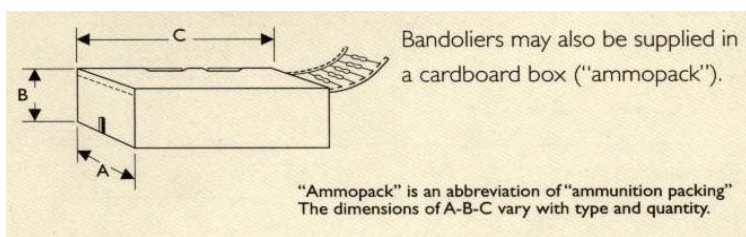
STYLE				DIMENSIONS				Unit: : mm	
Special	Normal	Miniature	Ultra Miniature	a	A	B1-B2	S (spacing)	T (max. deviation of spacing)	
FAE1WV	FAE-50	FAE50S FAE1WS	FAE1SS FAE2SS	6 ± 0.5	52.4 ± 1.5	1.2	5	1 mm per 10 spacing 0.5 mm per 5 spacing	
FAE3WV	FAE100	FAE2WS	FAE3SS	6 ± 0.5	73.0 ± 1.5 52.4 ± 1.5	1.5 1.2	5		
FAE4WV	FAE200 FAE300	FAE3WS	FAE4SS	6 ± 0.5	73.0 ± 1.5 52.4 ± 1.5	1.5 1.2	10		
FAE5WV	FAE500	FAE5WS		6 ± 0.5	91.0 ± 1.5 73.0 ± 1.5	1.5 1.5	10		

### 9. TAPE ON REEL PACKING

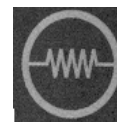


STYLE				TAPE ON REEL	
Special	Normal	Miniature	Ultra Miniature	ACROSS FLANGE (A)	Qty per reel
-	-	FAE50S	FAE1SS	72	5,000
-	FAE-50	FAE1WS	FAE2SS	72	2,500
FAE1WV	-	-	-	72	2,500
-	FAE100	FAE2WS	FAE3SS	95	2,000
FAE3WV	-	-	-	95	1,000
-	FAE200	FAE3WS	FAE4SS	95	1,000
FAE4WV	-	-	-	95	1,000
-	FAE300	FAE5WS	-	95	1,000
FAE5WV	-	-	-	95	1,000
-	FAE500	-	-	95	500

### 10. TAPE ON BOX PACKING



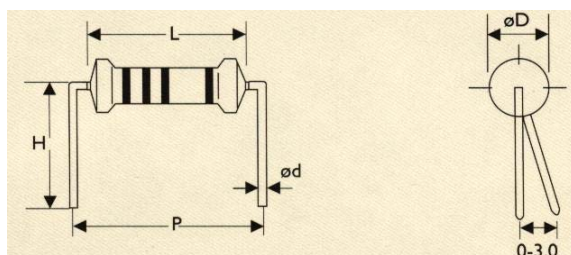




STYLE				Standard Lead Length			Short Lead Length			Qty per box
Special	Normal	Miniature	Ultra Miniature	W ( A )	H ( B )	L ( C )	W ( A )	H ( B )	L ( C )	
-	-	FAE50S	FAE1SS	81	104	260	48	102	255	5,000
-	FAE-50	FAE1WS	FAE2SS	73	45	258				1,000
FAE1WV	-	-	-	73	45	258				1,000
-	FAE100	FAE2WS	FAE3SS	103	78	260	81	91	260	1,000
FAE3WV	-	-	-	103	94	260	81	91	260	1,000
-	FAE200	FAE3WS	FAE4SS	103	94	260	81	91	260	1,000
FAE4WV	-	-	-	103	94	260	81	91	260	1,000
-	FAE300	FAE5WS	-	103	94	260	81	91	260	500
FAE5WV	-	-	-	103	94	260				250

## 11. SPECIAL TYPE ( FORMING DIMENSIONS )

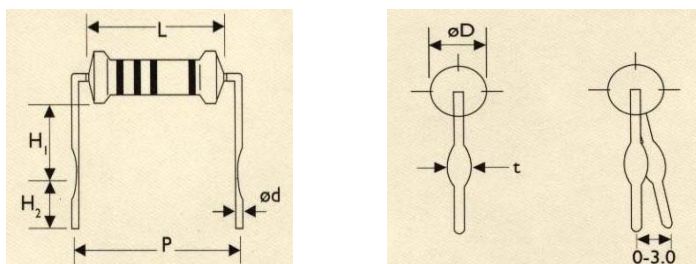
M TYPE



STYLE				DIMENSION					Unit(mm)
Special	Normal	Miniature	Ultra Miniature	L	φ D	φ d	P	H	
-	-	FAE50S	FAE1SS	6.3±0.5	2.4 <sup>+1.0</sup> <sub>-0.5</sub>	0.55±0.05	10.0 ± 1	10.0 ± 1	
-	FAE-50	FAE1WS	FAE2SS	9.0±0.5	3.3 <sup>+1.0</sup> <sub>-0.5</sub>	0.55±0.05	12.5 ± 1	10.0 ± 1	
FAE1WV	-	-	-	10.0±1.0	4.3 <sup>+1.0</sup> <sub>-0.5</sub>	0.8±0.05	12.5 ± 1	10.0 ± 1	
-	FAE100	FAE2WS	FAE3SS	11.5±1.0	4.5 <sup>+1.0</sup> <sub>-0.5</sub>	0.8±0.05	15.0 ± 1	12.5 ± 1	
FAE3WV	-	-	-	13.0±1.0	5.5 <sup>+1.0</sup> <sub>-0.5</sub>	0.8±0.05	15.0 ± 1	12.5 ± 1	
-	FAE200	FAE3WS	FAE4SS	15.5±1.0	5.0 <sup>+1.0</sup> <sub>-0.5</sub>	0.8±0.05	20.0 ± 1	15.0 ± 1	
FAE4WV	-	-	-	17.0±1.0	5.5 <sup>+1.0</sup> <sub>-0.5</sub>	0.8±0.05	20.0 ± 1	15.0 ± 1	
-	FAE300	FAE5WS	-	17.5±1.0	6.5 <sup>+1.0</sup> <sub>-0.5</sub>	0.8±0.05	25.0 ± 1	15.0 ± 1	
FAE5WV	-	-	-	17.0±1.0	7.5 <sup>+1.0</sup> <sub>-0.5</sub>	0.8±0.05	25.0 ± 1	15.0 ± 1	
-	FAE500	-	-	24.5±1.0	8.0 <sup>+1.0</sup> <sub>-0.5</sub>	0.8±0.05	30.0 ± 1	15.0 ± 1	



MB TYPE



STYLE				DIMENSION							Unit(mm)
Special	Normal	Miniature	Ultra Miniature	L	$\phi D$	$\phi d$	P	H 1	H 2	t	
-	-	FAE50S	FAE1SS	6.3±0.5	2.4 <sup>+1.0</sup> <sub>-0.5</sub>	0.55±0.05	10.0 ± 1	6.0 ± 1	5.0 ± 1	1.2 ± 0.2	
-	FAE-50	FAE1WS	FAE2SS	9.0±0.5	3.3 <sup>+1.0</sup> <sub>-0.5</sub>	0.55±0.05	12.5 ± 1	6.0 ± 1	5.0 ± 1	1.2 ± 0.2	
FAE1WV	-	-	-	10.0±1.0	4.3 <sup>+1.0</sup> <sub>-0.5</sub>	0.8±0.05	12.5 ± 1	6.0 ± 1	5.0 ± 1	1.2 ± 0.2	
-	FAE100	FAE2WS	FAE3SS	11.5±1.0	4.5 <sup>+1.0</sup> <sub>-0.5</sub>	0.8±0.05	15.0 ± 1	6.0 ± 1	5.0 ± 1	1.4 ± 0.2	
FAE3WV	-	-	-	13.0±1.0	5.5 <sup>+1.0</sup> <sub>-0.5</sub>	0.8±0.05	15.0 ± 1	6.0 ± 1	5.0 ± 1	1.4 ± 0.2	
-	FAE200	FAE3WS	FAE4SS	15.5±1.0	5.0 <sup>+1.0</sup> <sub>-0.5</sub>	0.8±0.05	20.0 ± 1	10.0 ± 1	5.0 ± 1	1.4 ± 0.2	
FAE4WV	-	-	-	17.0±1.0	5.5 <sup>+1.0</sup> <sub>-0.5</sub>	0.8±0.05	20.0 ± 1	10.0 ± 1	5.0 ± 1	1.4 ± 0.2	
-	FAE300	FAE5WS	-	17.5±1.0	6.5 <sup>+1.0</sup> <sub>-0.5</sub>	0.8±0.05	25.0 ± 1	15.0 ± 1	5.0 ± 1	1.4 ± 0.2	
FAE5WV	-	-	-	17.0±1.0	7.5 <sup>+1.0</sup> <sub>-0.5</sub>	0.8±0.05	25.0 ± 1	15.0 ± 1	5.0 ± 1	1.4 ± 0.2	
-	FAE500	-	-	24.5±1.0	8.0 <sup>+1.0</sup> <sub>-0.5</sub>	0.8±0.05	30.0 ± 1	15.0 ± 1	5.0 ± 1	1.4 ± 0.2	

**12. Plant Address**

- A. Taiwan Xindian Plant  
3F, No.5, Lane 560, Chung Cheng Road,  
Xindian, Taipei, Taiwan, ROC  
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Fax. 886-2-6629-8898
- B. China Dongguan Plant  
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Tel. 86-769-8772 0275  
Fax. 86-769-8772 0275 #4333
- C. China Mudu Plant  
No.158, Jinchang Road, No.1 Building of NanBangIND.Zone,  
Mu Du New District, Suzhou, China  
(江蘇省蘇州市木瀆新區金長路 158 號南濱工業區 1 號)  
Tel. 86-512-66518889  
Fax. 86-512-66519889