

# 中华人民共和国国家环境保护标准

HJ 653-2013

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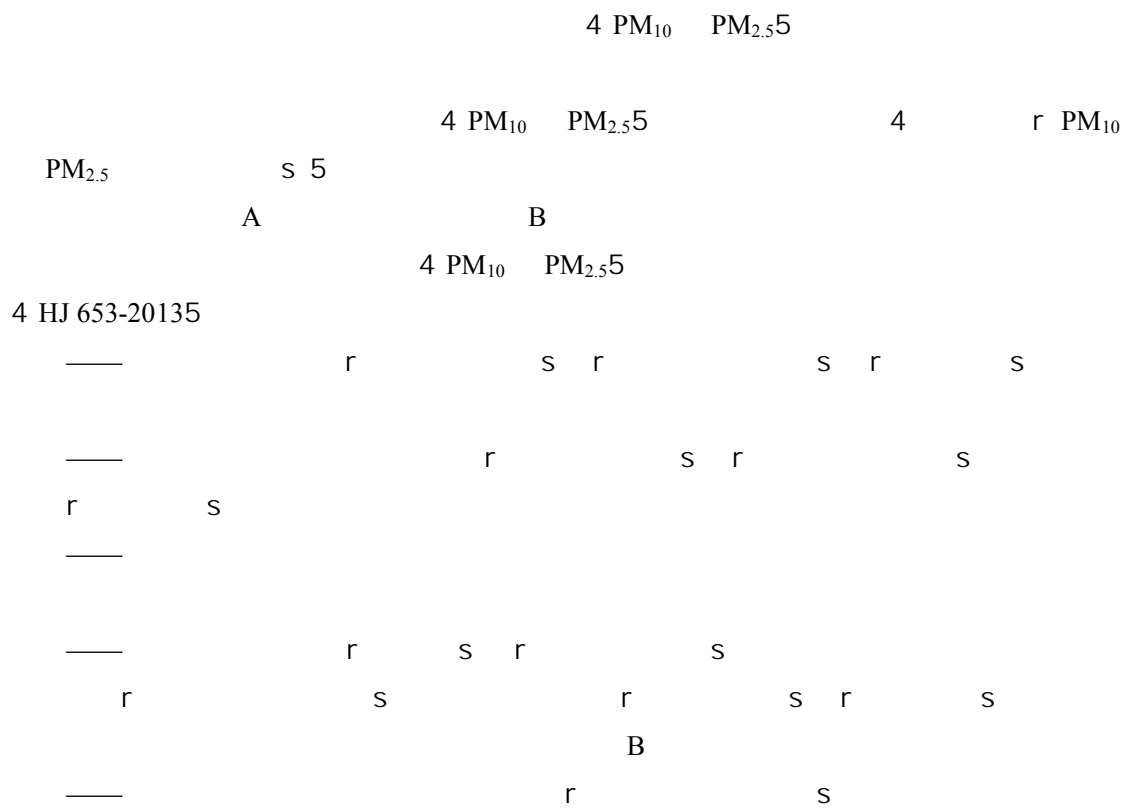
PM<sub>10</sub> PM<sub>2.5</sub>

**Specifications and Test Procedures for Ambient Air Quality Continuous  
Monitoring System for PM<sub>10</sub> and PM<sub>2.5</sub>**

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生 态 环 境 部

					ii
1					1
2					1
3					1
4					2
5					3
6					5
7					6
A	4	5	PM <sub>10</sub>	PM <sub>2.5</sub>	....12
B	4	5	PM <sub>10</sub>	PM <sub>2.5</sub>	
					12



4 PM<sub>10</sub> PM<sub>2.55</sub>

4 HJ 653-20135

20 20 ç

20 è é

# PM<sub>10</sub> PM<sub>2.5</sub>

1

4 PM<sub>10</sub> PM<sub>2.5</sub>5

ê 4 PM<sub>10</sub> PM<sub>2.5</sub>5 ë ì

2

í î ï ð ñ ò ó ô õ ö è

GB 3095

GB/T 17214.1 ÷ ø ù ú û ü ÷ ý î þ 1 ÿ î

HJ 93 4 PM<sub>10</sub> PM<sub>2.5</sub>5

HJ 618 PM<sub>10</sub> PM<sub>2.5</sub>

HJ 656 4 PM<sub>2.5</sub>5 ÷ 4 5

HJ 817 4 PM<sub>10</sub> PM<sub>2.5</sub>5 ú

HJ 1100 4 PM<sub>10</sub> PM<sub>2.5</sub>5 β

3

í è

3.1

aerodynamic diameter

4 ρ<sub>0</sub>=1 g/cm<sup>3</sup>5 ý

3.2

10 μm particulate matter4 PM<sub>10</sub>5

è è 10 μm

3.3

2.5 μm particulate matter4 PM<sub>2.5</sub>5

è è 2.5 μm

3.4

particle separate device

ñ û ü

3.5

50% D<sub>a50</sub> 50% cutpoint diameter

3.6

$\bar{o}$  50%

$\sigma_g$  geometric standard deviation

PM<sub>10</sub> PM<sub>2.5</sub>

ô ë û ë û û  
ô ú û ú

5

5.1.1 PM<sub>10</sub> PM<sub>2.5</sub> ÷ ý ì ó

5.1.2 ÷ ý ì

5.1.3 ý ò

5.1.4 ò

4 30 505  
4 80 1065 kPa

4 15 355  
85%  
4 80 1065 kPa

AC4 220 225 V 4 50 15 Hz

û ì

4 15 355 85% ì ë  
ñ è 20 MΩ

4 15 355 85%î ë 1500 V4 õ 5 50 Hz  
 1 min ñ

$\beta$

PM<sub>10</sub> PM<sub>2.5</sub>

ü

$\beta$

$\beta$

5.4.1.1

1 í

1

A

5.4.1.2

5.4.1.3

ó

1

1		$\mu\text{g}/\text{m}^3$	1
2		$\mu\text{g}/\text{Nm}^3$	1
3		L4 m <sup>3</sup> 5	14 35
4		NL4 Nm <sup>3</sup> 5	14 35
5			1
6		kPa	1
7	4 5	L/min	2
8			1
9		%RH	1

5.4.2.1

2 í

2

		4 $\beta$	5

4

ü 5



3 PM<sub>10</sub> PM<sub>2.5</sub>

	2 µg/m <sup>3</sup>	7.1	
	±2%	7.2	
	±2	7.3	
	±1 kPa	7.4	
	±5%ë	7.5	
	2%		
	2%		
	±2 min	7.6	
	î		
	ñ î	7.7	
	ñ î	7.8	
	PM <sub>10</sub> 10%	7.9	
	PM <sub>2.5</sub> 15%		
	PM <sub>10</sub> 4 k5 1±0.1 4 b5 k 1 -10 µg/m <sup>3</sup> b 4 110-100×k5 µg/m <sup>3</sup> k 1 4 90-100×k5 µg/m <sup>3</sup> b 10 µg/m <sup>3</sup> 4 r5 0.95	7.10	
	PM <sub>2.5</sub> 4 k5 1±0.1 4 b5 k 1 -5 µg/m <sup>3</sup> b 4 55-50×k5 µg/m <sup>3</sup> k 1 4 45-50×k5 µg/m <sup>3</sup> b 5 µg/m <sup>3</sup> 4 r5 0.95		
	ô 90%		7.11

7

$\bar{r}$  0.1 µm  $\bar{r}$   
 $S_0$  10 µg/m<sup>3</sup>  
 $r_i$  24 h  $r_i$  15  
 $S_0$  4 15  $\bar{r}$

$$S_0 = \sqrt{\frac{\sum_{i=1}^n (r_i - \bar{r})^2}{n-1}} \quad 4 \ 15$$

$S_0$  ————— µg/m<sup>3</sup>  
 $\bar{r}$  ————— µg/m<sup>3</sup>  
 $r_i$  —————  $r_i$  µg/m<sup>3</sup>  
 $i$  ————— 4  $i=1$   $n5$

$n$  ————— 4  $n=155$   
 4 25  $R_{DL}$  3  
 $R_{DL} = 2S_0$  4 25  
 $R_{DL}$  —————  $\mu\text{g}/\text{m}^3$

$\bar{y}$   
 3  $\bar{y}$  3  $\bar{y}$   $\bar{y}$  1h  
 4 35  $S_{Ci}$  3  
 $S_{Ci} = \frac{\bar{C}_i - C_0}{C_0} \times 100\%$  4 35

$S_{Ci}$  —————  $\%$   
 $\bar{C}_i$  —————  $\mu\text{g}/\text{cm}^3$  4  $\mu\text{g}$   
 $C_0$  —————  $\mu\text{g}/\text{cm}^3$  4  $\mu\text{g}$   
 $i$  ————— 4  $i=1$  35

4 -30 505  
 $\bar{y}$   $\bar{y}$  4 -20 0 20 505  $\bar{y}$   $\bar{y}$   $\bar{y}$   
 2  $\bar{y}$   $\bar{y}$  5min 1  
 3 4 45  $\Delta t_i$   
 3

$$\Delta t_i = \frac{\sum_{j=1}^3 t_{pij} - t_{sij}}{3}$$

4 45

$\Delta t_i$  —————  $\%$   $i$   
 $t_{pij}$  —————  $\%$   $i$   $\%$   $j$   
 $t_{sij}$  —————  $\%$   $i$   $\%$   $j$   
 $j$  —————  $\%$   $j$  4  $j=1$  35  
 $i$  ————— 4  $i=1$  45

4 80 1065 kPa  
 5 80 kPa 90 kPa 100 kPa 106 kPa  
 0.5 kPa 5min 1  
 3 4 55  
 $\Delta P_i$  3



$$Q_{diff} = \frac{Q_R - Q_C}{Q_R} \times 100\%$$

4 105

$Q_{diff}$  \_\_\_\_\_ %

a5

ù

4 - - 5  $t_0$  6 h  
 b5 ó 5 20 s 40 s 2 min 7 min  
 20 min ñ ê 10 min  
 c5 ó 5 min 1  
 4 65 4 75 4 85 4 95 4 105  
 d5 6 h 60 s  $t_1$   $t_2$   
 4 115

$$\Delta t = t_1 - t_0 - t_2 \quad 4 \ 115$$

$\Delta t$  \_\_\_\_\_ s

$t_0$  \_\_\_\_\_ 4 - - 5

$t_1$  \_\_\_\_\_ 4 - - 5

c5 106 kPa 4 106 15 kPa  
 30 min b5  
 d5

e5 4 65 4 75 4 85 4 95 4 105  
 3

ë ü  $\hat{i}$   
 4 23 15 h 23  
 $C_{ij}$   $i$  4  $i=1$  35  $j$   
 4  $j=1$  n n 235  
 a5 4 125  $\bar{C}_j$

$$\bar{C}_j = \frac{\sum_{i=1}^3 C_{ij}}{3} \quad 4 \ 125$$

$\bar{C}_j$  — 3  $\mu\text{g}/\text{m}^3$   
 $C_{ij}$  —  $i$   $\mu\text{g}/\text{m}^3$   
 b5 4 135 3  $P_j$

$$P_j = \frac{\sqrt{\sum_{i=1}^3 (C_{ij} - \bar{C}_j)^2}}{\bar{C}_j} \times 100\% \quad 4 \ 135$$

$P_j$  — 3  $\%$   
 c5 4 145 3  $P$  3

$$P = \sqrt{\frac{\sum_{i=1}^n (P_j)^2}{n}} \times 100\% \quad 4 \ 145$$

$P$  —  $\%$

### 7.10.1.1 PM<sub>10</sub>

PM<sub>10</sub> 2 2  
 a5 PM<sub>10</sub>  
 b5 PM<sub>10</sub>

7.10.1.2 PM<sub>2.5</sub>

PM <sub>2.5</sub>		2	ñ	ê	4
a5		PM <sub>2.5</sub>			
b5		PM <sub>2.5</sub>			
c5		PM <sub>2.5</sub>			
d5					
a5			û	3	3
	HJ 93		ý		HJ 618 HJ 650 > } 000â, 0 -0 10.45 f 000â,, Ð
		ü	4 2	45 m4	ê 200 L/min
ñ	ê 1 m5	ê			
b5			4 23	15 h	

d5 4 135 3  $P_j$  4 145  
 3  $P$  3  
 e5  $\bar{o}$   $\bar{o}$

4 165

$k$

$$k = \frac{\sum_{j=1}^n (\bar{R}_j - \bar{R}) \times (\bar{C}_j - \bar{C})}{\sum_{j=1}^n (\bar{R}_j - \bar{R})^2}$$

4 165

$k$  —

$\bar{C}$  — n

$\mu\text{g}/\text{m}^3$

$\bar{R}$  — n

$\mu\text{g}/\text{m}^3$

f5 4 175

$b$

$$b = \bar{C} - k \times \bar{R}$$

4 175

$b$  —

$\mu\text{g}/\text{m}^3$

g5 4 185

$r$

$$r = \frac{\sum_{j=1}^n (\bar{R}_j - \bar{R}) \times (\bar{C}_j - \bar{C})}{\sqrt{\sum_{j=1}^n (\bar{R}_j - \bar{R})^2 \times \sum_{j=1}^n (\bar{C}_j - \bar{C})^2}}$$

4 185

$r$  —

h5 3

$\bar{o}$   $\bar{o}$

$\bar{n}$   $\hat{e}$  14

4 195  $\bar{o}$

3

$$D = \left( \frac{T_1 - T_2}{T_1} \right) \times 100\%$$

4 195

$D$  —  $\bar{o}$

%

$T_1$  —

$\bar{o}$

d

$T_2$  —

$\bar{o}$

d

PM<sub>10</sub> PM<sub>2.5</sub>

PM<sub>10</sub> PM<sub>2.5</sub>  
A.1.1

4 5

A.1.2 PM<sub>10</sub> PM<sub>2.5</sub>

A.1.3 4 5

A.1.4

	YYYYMMDDHHMM	1	201203210916 2012 3 21 9 16 00 9 15 01 9 16 00
	YYYYMMDDHH		2012032107 2012 3 21 06 01 07 00
	YYYYMMDD	4 p 0 5 1 24	20120321 2012 3 21 1 22 0

4 A15

$$C_{si} = \frac{m_i \times 1000}{V_{si}}$$

4 A15





PM<sub>10</sub> PM<sub>2.5</sub>

50%                      ù                      ò  
                                  ò                      B.1

B.1

	PM <sub>10</sub>	PM <sub>2.5</sub>
50%	<i>Da</i> <sub>50</sub> 4 10 0.55 µm	<i>Da</i> <sub>50</sub> 4 2.5 0.25 µm
ò	$\sigma_g$ 1.5 0.1	$\sigma_g$ 1.2 0.1

4 15                      ù

ù

4 25 ù

B.2

B.2

	PM <sub>10</sub>	PM <sub>2.5</sub>
1	3 0.5	1.5 0.25
2	5 0.5	2.0 0.25
3	5 0.5	2.2 0.25
4	9 0.5	2.5 0.25
5	11 1.0	2.8 0.25
6	13 1.0	3.0 0.25
7	15 1.0	3.5 0.25
8	17 1.0	4.0 0.5

4 35                      4                      5

*C*<sub>III</sub>    *C*<sub>2II</sub>

4 45                      B.2    í    8

ý                      8

*C*<sub>1ij</sub>    *C*<sub>2ij</sub>

4 55                      ý                      4 B15                      8    24                      ò

$$\eta_{ij} = \frac{C_{2ij}}{C_{1ij}} \times 100\%$$

4 B15

$\eta_{ij}$  —————  $\bar{\eta}$  %  
 $C_{1ij}$  ————— /m<sup>3</sup>  
 $C_{2ij}$  ————— /m<sup>3</sup>  
 $i$  ————— 4  $i=1$  85  
 $j$  ————— 4  $j=1$  35  
 4 65      4 B25      8       $\bar{\eta}$

$$\bar{\eta}_i = \frac{\sum_{j=1}^3 \eta_{ij}}{3} \times 100\% \quad 4 \text{ B25}$$

$\bar{\eta}_i$  —————  $\bar{\eta}$       4  $i=1$  85 %  
 4 75      4 B35       $\bar{\eta}$        $C_{vi}$        $C_{vi}$       ù 10%  
 $\bar{\eta}$        $\bar{\eta}$

$$C_{vi} = \frac{1}{\bar{\eta}_i} \times \sqrt{\frac{\sum_{j=1}^3 (\eta_{ij} - \bar{\eta}_i)^2}{2}} \times 100\% \quad 4 \text{ B35}$$

$C_{vi}$  —————  $\bar{\eta}$       4  $i=1$  85 %  
 4 85      8       $\bar{\eta}$   
 $\bar{\eta}$       ù       $\bar{\eta}$   
 16% 50% 84%       $D_{a16}$   $D_{a50}$   $D_{a84}$       4 B45  
 4 B55       $\bar{\eta}$        $\sigma_g$   $D_{a50}$   $\sigma_g$       B.1

$$\sigma_g = \frac{D_{a16}}{D_{a50}} \quad 4 \text{ B45}$$

$$\frac{a_{50}}{84}$$

4 45  
 $C_{211}$  4 B15  $\bar{o}$   $\eta_{11}$   
 4 55 B.2 í 8  
 $\acute{y}$  8  $C_{1ij}$   $C_{2ij}$   
 4 65  $\acute{y}$  8 24  $\bar{o}$   
 4 75 4 B25 8  $\bar{o}$   
 4 85 4 B35  $\bar{o}$   $C_{vi}$   $C_{vi}$   
 $\grave{u}$  10%  $\bar{o}$   $\bar{o}$   
 4 95 8  $\bar{o}$   
 $\bar{o}$   $\grave{u}$   $\bar{o}$   
 16% 50% 84%  $D_{a16}$   $D_{a50}$   $D_{a84}$  4 B45  
 4 B55  $\bar{o}$   $\sigma_g$   $D_{a50}$   $\sigma_g$  B.2

PM<sub>2.5</sub>

4 15  $\acute{u}$   
 4 25 4 150 105  $\mu\text{g}/\text{m}^3$   
 4 35  
 $\bar{o}$  10%  
 4 45 7 d4 20 h5  
 4 55 B.1  
 $D_{a50}$   $\sigma_g$  B.1

4 15 PM<sub>2.5</sub>  $\grave{u}$   $\hat{e}$  PM<sub>2.5</sub> 4 100 1505  $\mu\text{g}/\text{m}^3$   
 7 d4 20 h5  
 4 25 B.1  
 $D_{a50}$   $\sigma_g$  B.1