

JIS

JAPANESE INDUSTRIAL STANDARD

**Measuring Methods for
Dust Resistivity
(with Parallel Electrodes)**

JIS B 9915—1989

Translated and Published

by

Japanese Standards Association



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Printed in Japan

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JAPANESE INDUSTRIAL STANDARD
Measuring Methods for Dust Resistivity
(with Parallel Electrodes)

JI S
B 9915-1989

1. Scope

This Japanese Industrial Standard specifies the measuring methods for dust (soot and dust, dust particulates, etc.) resistivity by using parallel flat plate electrodes.

Remark: The units and numerical values given in { } in this Standard are based on the conventional system of units and are appended for informative reference.

2. Definitions

The meanings of principal terms used in this Standard shall be in accordance with JIS B 8808 and JIS B 9909 and otherwise, shall be as follows:

- (1) Dust Layer A stratified dust sample charged on measuring electrodes.
- (2) Apparent Dust Resistivity Apparent dust resistivity is electric resistance per unit area, and unit layer thickness of a dust layer as given in the formula (1):

$$\rho_d = \frac{V}{t} \cdot \frac{S}{I} \dots\dots\dots (1)$$

where ρ_d : apparent dust resistivity ($\Omega \cdot \text{cm}$)

V : applied voltage (V)

t : dust layer thickness (cm)

S : main electrode area (cm^2)

I : current (A)

Applicable Standards: See page 10.

- (3) Electric Field Strength Electric field strength is voltage per unit layer thickness of a dust layer as given in the formula (2):

$$E = \frac{V}{t} \dots\dots\dots (2)$$

where E : electric field strength (V/cm)

V : applied voltage (V)

t : dust layer thickness (cm)

- (4) Current Density Current density is current per unit area of a main electrode as given in the formula (3):

$$J = \frac{I}{S} \dots\dots\dots (3)$$

where J : current density (A/cm²)

I : current (A)

S : main electrode area (cm²)

- (5) Bulk Density of Dust Layer (call Packing Density also) Bulk density of dust layer is mass per unit volume of a dust layer as given in the formula (4):

$$\rho_m = \frac{M}{Q} \dots\dots\dots (4)$$

where ρ_m : bulk density of dust layer (g/cm³)

M : mass of dust layer (g)

Q : volume of dust layer (cm³)

- (6) Porosity of Dust Layer Porosity of a dust layer is obtained by subtracting the bulk density of the dust layer divided by the density of dust from 1, which is as given in the formula (5):

$$\varepsilon = 1 - \frac{\rho_m}{\gamma} \dots\dots\dots (5)$$

where ε : porosity of dust layer

ρ_m : bulk density of dust layer (g/cm³)

γ : density of dust (g/cm³)

3. Measuring Items

Measuring items shall be as follows:

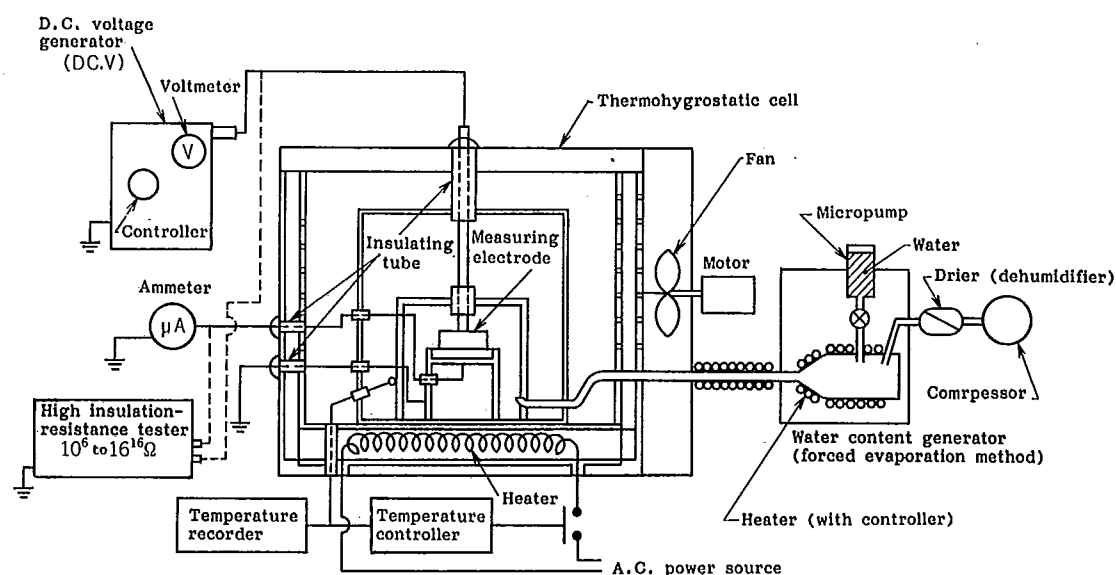
- (1) Temperature in a thermohygrostatic cell (°C)
- (2) Water content in a thermohygrostatic cell (vol %)

- (3) Bulk density of a dust layer (g/cm^3)
- (4) Measuring load (g/cm^2)
- (5) Dust layer thickness (cm)
- (6) Voltage (V)
- (7) Current (A)

4. Measuring Apparatus

The measuring apparatus is composed of a measuring electrode, a thermohygrostatic cell, a water content generator, a d.c. voltage generator, a voltmeter, an ammeter, a high insulation-resistance tester, etc. as given in Fig. 1.

Fig. 1. Example of Apparent Dust Resistivity Measuring Apparatus (Thermohygrostatic Cell Method)



----- indicates a case where d.c. generator and an ammeter are not used.

4.1 Measuring Electrode

4.1.1 Structure of Measuring Electrode The measuring electrode shall be parallel electrodes composed of a lower electrode loading a dust sample and an upper electrode placed on a dust layer. An example of the structure of the measuring electrode is given in Fig. 2, and the shape and dimensions of the measuring electrodes are given in Fig. 3.

4.1.2 Lower Electrode The lower electrode is composed of a main electrode and a guard electrode as given in Fig. 3 (a). The main electrode shall be 25.2 mm in diameter (surface area $5.0 \text{ cm}^2 = S$) and 5 mm in thickness ($=t$), and a junction to a conductor is established at a central lower part.