

KES

The Standards of Opacimeter by ECE R24

KES T – C704

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1. Purpose

This standard stipulates the necessary condition of Opacimeter which is used to measure the concentration of the smoke according to ECE R 24.

2. Scope of Application

This standard is applied for diesel engines.

3. Basic Rules

3.1 The gas to be measured is accumulated in the enclosure which has non-reflecting surface.

3.2 Effective length indication on testing device : the effect of the device which protects the light source and photoelectric cell should be explained to decide the effective length of light pass through the gas.

3.3 Opacimeter scale : 2 types

- (1) Absolute absorption units from 0 to infinity ∞ (m^{-1})
- (2) Linear scale units from 0 to 100 which is proportional to absorption of the light.
- (3) Both of (1) and (2), when the light pass through completely, the value is 0, when it doesn't pass at all, the value is maximum.

4. Structural Rules

4.1 General Rules : The opacimeter should be designed to satisfy the condition that under the constant speed, the smoke chamber should be filled with the smoke of same opacity.

4.2 Smoke chamber and opacimeter casing

- (1) Smoke chamber inner surface : The effect to the photoelectric cell by the dispersion and diffusion of the light should be minimized. (by proper design which use Matt

black to finish the inner surface)

- (2) The error by light characteristic : The effect of the reflection and diffusion of light in smoke chamber should not be over the 1 unit of linear scale when the smoke chamber is filled with the smoke of absorption unit 1.7m^{-1} .

4.3 Light source

The light source should be an incandescent lamp which temperature range is from 2800°K to 3250°K .

4.4 Receiver

- (1) Photoelectric cell : Spectral response of photoelectric cell⁽¹⁾

The profile should be similar to that of human's. (It should have maximum response around $550/570\text{nm}$, and under the 4% of maximum response on under the 430nm and over 680nm)

Notice ⁽¹⁾ Spectral Response

- (²) Electric signal output : The electric circuit which includes indicator should be designed to show the output which is linearly proportional to the concentration of light in the range of photoelectric cell's working temperature.

4.5 Measuring Units

- (1) Light absorption coefficient (K)

$$\phi = \phi_o * e$$

Where

L : effective length of the light which pass through the gas(m)

ϕ_o : incident light flux (²)

ϕ : passed light flux

If the effective length of the opacimeter cannot be calculated by its geometry immediately, it should be decided by the relation between effective length "L" and the other opacimeter which effective length is known.