

## Appendix

# Energy Efficiency Criteria and Labeling Method for Energy Label Qualified Indoor Parking Lot Smart Luminaire

## Smart lighting control function test method

### 1. Scope

This standard is applicable to Energy Efficiency Criteria and Labeling Method for Energy Label Qualified Indoor Parking Lot Smart Luminaire; the luminaire shall feature at least one or more internal smart lighting control function including automatic switch, dimming or timing control.

### 2. Reference Standard

The following standards cited by this standard are part of the latter. Standards referenced below applicable with the latest edition (including supplementary and supplements).

CNS 13755 AC supplied electronic ballasts for fluorescent lamp

CNS 12112 Lighting of indoor work places

CNS 5119 Illuminance Meters

CNS 15233 Fixtures of roadway lighting with light emitting diode lamps

### 3. Terms and definitions

#### 3.1 Smart lighting control function

Luminaire equipped with automatic switch sensor would control its output light intensity, luminous flux or illuminance ratio of the luminaire by luminaire controller in an “instant” or “preset” manner once people or vehicles entering the site are detected.

Luminaire equipped with timer would control its output light intensity, luminous flux or illuminance ratio of the luminaire by luminaire controller in “preset” manner.

#### 3.2 The actuation time lasts from sensor triggered to luminaire turned off as shown in Figure 1.

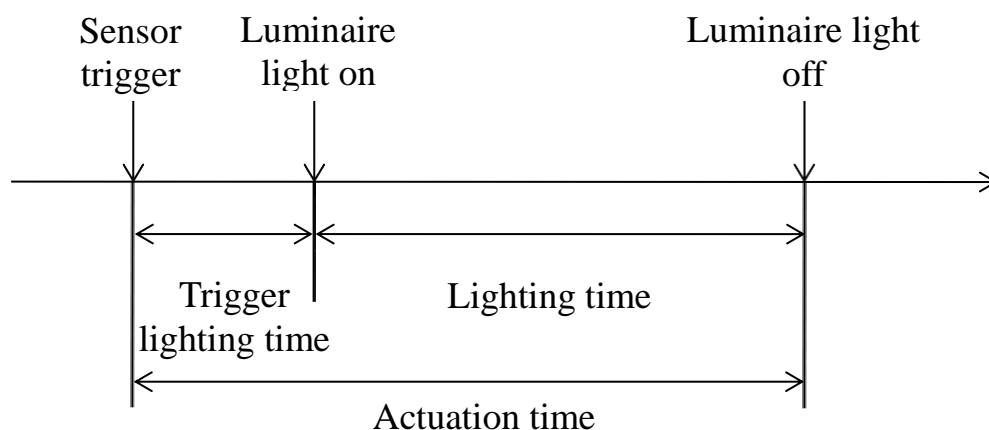


Figure 1: Definition of actuation time

#### 4. Measurement condition

##### 4.1 Test power supply

- (1) Employ 60 Hz power of Sine waveform.
- (2) The voltage variation during measurement period: less than  $\pm 0.5\%$ .
- (3) The total harmonic distortion of voltage waveform: less than or equal to 3%.

##### 4.2 Precautions on measuring light intensity, luminous flux or illuminance test

- (1) Background illumination of darkroom around the lamp to be tested: not greater than 0.05 lx.
- (2) The light intensity meter test  $f_1'$  (visual effect function fitness): less than 3%.
- (3) Employ CNS 5119 grade AA illuminance meter for testing.

#### 5. Characteristic requirements

##### 5.1 Automatic switch

Test according to method 6.1; angle test value shall outrun the marked one; triggered light up time less than 1 second; measured light up time should be within  $\pm 10\%$  of the set value.

##### 5.2 Dimming

Test according to method 6.2; angle test value shall outrun the marked one; triggered light up time less than 1 second; measured light up time should be within  $\pm 10\%$  of the set value; measured dimming value should be within  $\pm 10\%$  of the set value.

##### 5.3 Timing control

Test according to methods given in section 6.3; measured value shall fall within  $\pm 10\%$  of the set value if tested for 60 minutes and  $\pm 6\%$  of setup value if tested more than 60 minutes.

##### 5.4 Practical Accelerated Evaluation Test (Refer to CNS 13755):

Test according to methods given in section 6.4; cool down luminaire and sensor to room temperature after test, then power it on normally and keep on for 15 minutes without any error; both luminaire and sensor shall not break throughout the test period.

#### 6. Test method

##### 6.1 Automatic switch induction action test

6.1.1 Environmental conditions: Room temperature and windless indoors.

6.1.2 Power supply condition: Apply current of rated voltage and frequency on the input terminal.

6.1.3 The size of the simulating article:  $30 \pm 2$  cm long,  $30 \pm 2$  cm wide and  $30 \pm 2$  cm high.

6.1.4 Darkroom conditions:

- (1) Background illumination of general test required darkroom: not greater than 0.05 lx.
- (2) Simulate the parking lot environment darkroom with a background illumination of  $75 \text{ lx} \pm 10 \text{ lx}$  (refer to CNS12112 indoor workplace lighting).

6.1.5 Luminaire height: Calculate it based on sensor's distance and angle readings as shown in Figure 2.

6.1.6 Test requirements:

Measure the operating time and distance of the luminaire sensor to calculate the angle of the sensor, require measuring at least 4 directions of sensor as shown in Figure 3.

- (1) In general test required a darkroom and the simulating article shall move toward luminaire at speed of  $2 \text{ km/h} \pm 5\%$  (for human) and  $10 \text{ km/h} \pm 5\%$  (for vehicle); record location of the simulating article when luminaire sensor detected it and triggered the lamp to light up; calculate the detection angle of sensor and time it took to turn on the luminaire.

Record the period from luminaire light on to off.

- (2) Repeat test (1) for simulating article in darkroom simulating parking lot environment.

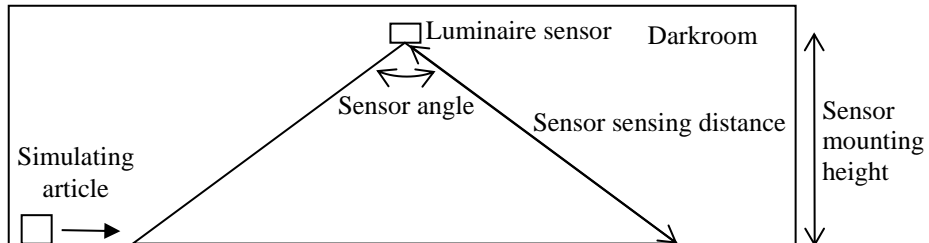


Figure 2: Side view

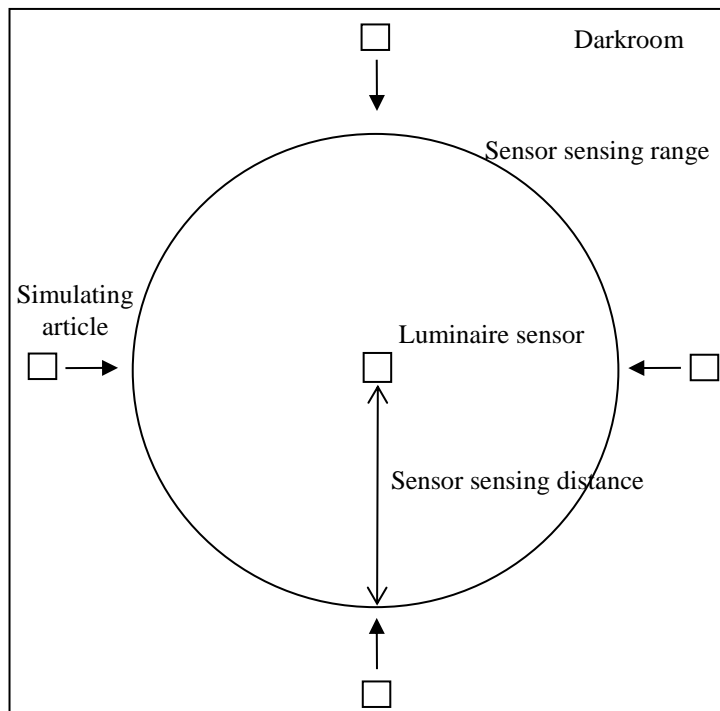


Figure 3: top view

## 6.2 Dimming test

Once tested according to item 6.1 “automatic switch induction action,” measure the central light intensity or illumination directly below the luminaire.

Measure the actual light intensity or illuminance value ( $E_{100\%}$ ) of the luminaire when being subjected to the maximum output light intensity or 100% illuminance. The lighting controller then issues a control command to dim light to rate A%; measure luminaire actual light intensity or illuminance value ( $E_{A\%}$ ) now and calculate luminous flux and maximum output light or illuminance intensity ratio ( $E_{A\%}/E_{100\%}$ ) and record the power when dimming.

## 6.3 Timing control test

Set up the auto switch induction acts according to item 6.1 for testing; use the timer to auto on, off, or dim lights in given area based preset schedule; compare difference in between timing control and timer.

## 6.4 Practical Accelerated Evaluation Test (Refer to CNS13755):

Under conditions of room temperature and windless indoors, apply current input of rated voltage and frequency to luminaire; get the luminaire to undergo a cycle of 25 seconds ON and 35 seconds OFF for 8000 rounds.