NES	Methods of High Temperature Test for Synthetic Resin Parts	M 0131 Revised 1983

1. SCOPE

This Nissan Engineering Standard shall apply to the methods of high temperature test for synthetic resin parts used in automobiles (hereinafter, referred to as test methods).
Method 1 Class 3, Method 2, Method 4, and Method 5 may not be applied in the case thermal cycle test methods for synthetic resin parts (M 0132-1983 Revision) are applied.

2. CLASSIFICATION OF TEST METHODS

Test methods shall be classified into the 5 kinds shown in the table below according to the places of installation and material qualities.

Table

Classification of test methods		Applicable parts	Test temperature °C	Destination (1)	Examples of applicable parts (2) (reference)
Method 1	Class 1—A	Parts installed in places strongly affected by the sunlight (direct rays, conduction, radiation, convection) in the inside of car	115 ± 3 (3)	S	Upper surface of instrument, Upper surface of rear parcel shelf, Upper end of rear seat back, Upper surface of door trim (4), Upper surface of body side (4)
	Class 1—B		110 ± 3 (3)	D	
	Class 2		100 ± 3 (3)	All destinations	Inside mirror, upper surface of column cover, upper surface of steering wheel assembly, upper surface of arm rest, upper surface of front seat cushion, upper surface of luggage trim, sunvisor, glass sun roof, upper surfaces of rear wheel house (H/B car)
	Class 3		90 ± 2	All destinations	Roof trim, pillar trim, console, door trim, seat assembly, body side trim
Method 2	Class A	Parts installed in places little affected by the sunlight in the inside of car	80 ± 2	S	Floor trim, trunk trim, luggage trim of the type separated from passenger room by rear parcel shelf, etc., dash trim, dash side trim
	Class B		70 ± 2	D	
Method 3	Class A	Parts installed on the outside of car	100 ± 3 (3)	S	Radiator grill, head lamp finisher, rear finisher, outside mirror, molding, ornament, resin bumper
	Class B		90 ± 2 (3)	D	
Method 4	Class 1	Parts installed in engine room	125 ± 2	Radiator shroud, reservoir tank, radiator hose strap	
	Class 2		115 ± 2	Air inlet duct, distributor cap, alternator, fuel pump spacer, engine fan, motor fan	
	Class 4		90 ± 2	Fuel strainer, washer tank, conistor, battery	
Method 5	Class 1	Parts installed in places exposed to the hot air of engine room on the outside of car	130 ± 2	Hood louvre	
	Class 2		90 ± 2	Cowl top grill (with hood louvre), hood secondary latch coating	

Notes: (1) S: North America, Australia, Middle and Near East, Central and South America, tropical zones of Southeast Asia
D: Japan, general exports
(2) Applicable parts may vary according to the shapes of cars.
(3) Surface temperature of black panel due to infrared ray lamps. Atmospheric temperature of the back of test piece shall be 80 ~ 85°C for Method 1, Class 1 and Class 2; 70 ~ 80°C for Method 3.
(4) Test temperature for upper surface of door trim and upper surface of body side trim shall be 110°C (3), regardless of destination.

3. CONDITIONS OF TESTING PLACE

(1) Room temperature condition: Testing place shall be put in standard temperature condition, Class 3 (temperature: 15 ~ 25°C) and standard humidity condition, Class 3 (relative humidity: 45 ~ 85%) specified in JIS Z 8703—1976 (Standard Conditions of Testing Places).

(2) Standard condition: Testing place shall be put in standard temperature and humidity conditions, Class 2 (temperature: 20 ± 2°C, relative humidity: 65 ± 2%) specified in JIS Z 8703—1976.

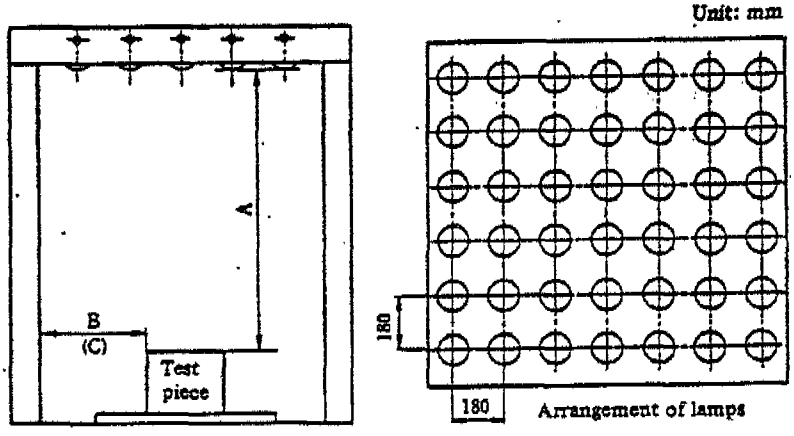
4. APPARATUS

(1) Constant temperature oven equipped with infrared ray lamps. (an example of which is shown in Fig. 1.)

(2) . Constant temperature oven having a temperature control capacity of within ± 2°C.

Fig. 1 Constant temperature oven with infrared ray lamps

Unit: mm



Remarks: 1. A, B, C, in Fig. 1 denote the following:
A: Height from test piece (datum level) to lamp, 1500mm and over.
B, C: Distances from the outermost surface of test piece to wall surfaces before and behind and on right and left, respectively, 500mm and over.

2. Ceiling shall be made of reflection plate and wall surfaces on four sides and floor surface shall be sand blasted.

3. Infrared ray lamps (250W) shall be used. The center of each lamp shall be at the intersection point of the lines drawn at intervals of 180mm crosswise as shown in Fig. 1 (right).

4. Essential conditions for constant temperature oven with infrared ray lamps.
(1) Capacity to control the temperature inside the test temperature setting datum level (*) within ± 3°C and to control the temperature defference between the parts 100mm above and below the datum level within test temperature ± 5°C.
(2) It is desirable that infrared rays are uniformly irradiated against the test piece. Therefore, the spacing between each lamp should be reduced to the minimum, and the oven should be provided with a mechanism to control the irradiation quantity and temperature of infrared rays by adjusting voltage and irradiation distance.

Note (*) The half of the highest and lowest positions of test piece testing surface shall be referred to as reference height and the level at the same height shall be referred to as test temperature setting datum level (datum level) (Fig. 2).

5. In Method 5, infrared ray irradiation angle shall be 80° C. If it is impossible because of the construction of the equipment, test piece shall be inclinded by 10° C.

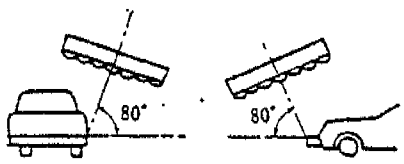
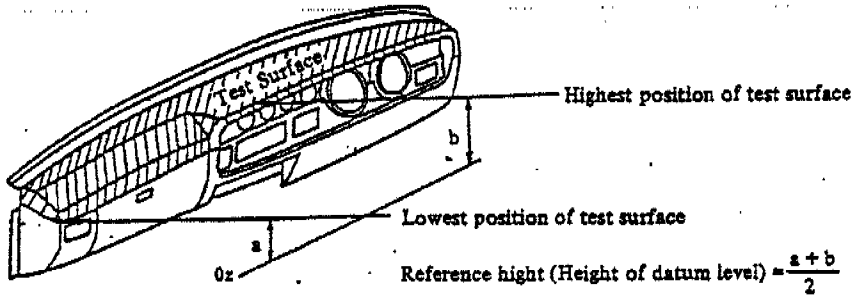


Fig. 2 Datum level



5. TEST PIECE

At test pieces, completed products ([6]) shall be used as a rule. Test shall be performed after the test pieces have been allowed to stand for 24 hours in the standard condition specified in 3. (2) unless otherwise specified. Details of the test and the number of test pieces shall be subject to the agreement between the parties concerned.

Note ([6]): Completed products shall refer to moldings completed as parts and shall include those subjected to secondary working and their complexes.

6. TEST CONDITIONS

(1) Test time: 4 hours
(2) Test temperature: Shall be as shown in the table (Page 1).

7. OPERATION

(1) Test pieces shall be put in normal service condition ([7]) in the constant temperature oven set at a specified test temperature ([9]) and heated for a specified time.
(2) After heating for the specified time, the test pieces shall be checked as to whether harmful deformation and sticky surface did not occur at the specified temperature and whether abnormalities, such as breakage and fault, do not occur by the ordinary way of handling ([8]).
If this is impossible on account of the construction of the equipment, the test pieces shall be taken out from the oven and the presence or absence of abnormalities shall be checked within 3 minutes.
(3) After the procedure (2) has been taken, the test pieces shall be allowed to stand at room temperature for 30 minutes.
(4) When the test pieces have been allowed to stand for 30 minutes, they shall be checked as to the presence or absence of abnormalities and residual deformation shall be measured.

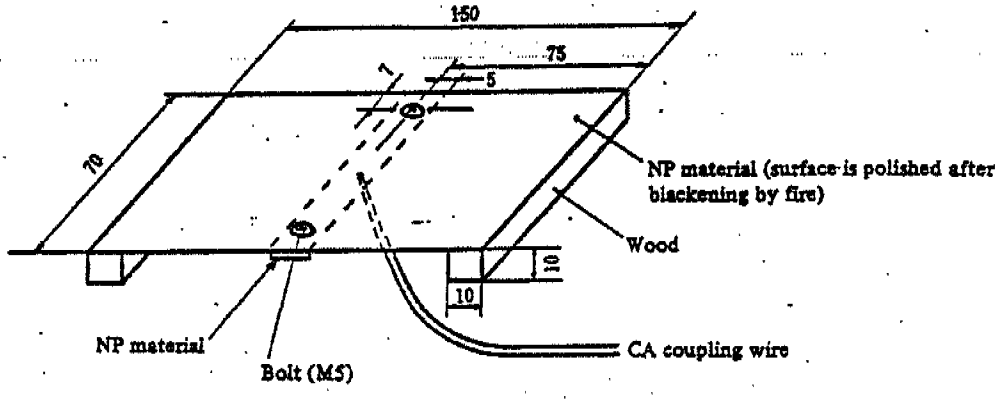
Notes: ([7]) Normal service condition shall refer to the condition in which test pieces are installed on the test stand or jig just as they are loaded on automobiles. In the case of mounting a weight or applying a load conditions shall be subject to the agreement of the parties concerned.

([8]) Ordinary way of handling shall mean:
(a) Tapping with hand lightly, holding down, pulling, plunging nail.
(b) Kicking by foot, mounting something, pressing.
(c) Leaning against, seating on them.

([9]) In Method 1, Class 1 and 2 and Method 3, a black panel and a pyroheliometer shall be arranged within the datum level (Fig. 3) and the black panel shall be set so that its temperature may become the specified temperature. To set the black panel temperature, use the pyroheliometer. The black panel and its mount and the pyroheliometer and its mount shall be of the following specification:

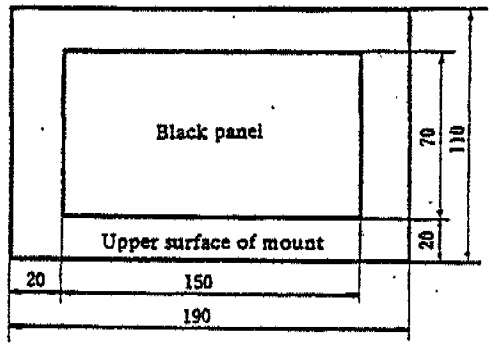
(a) Black panel
(1) Size: 70mm (W) by 150mm (L) by 0.8mm (T)
(2) Material: NP material [NES M2020 (cold rolled carbon steel sheet and strip for automobiles)] or their equivalents.
(3) Surface: After blackening by fire, the surface shall be policed by rubbing with #1500 emery paper in longitudinal direction 5 times back and forth.
(4) Back: A wooden piece, 10mm square and 70mm long, shall be attached to each end of the back with a bothside adhesive tape of non-woven fabric type. This size of the tape shall be 10mm (W) by 70mm (L) by 0.15 ~ 0.16mm (T).
(5) Thermocouple: A CA wire, 0.32 ± 0.01mm in diameter, shall be used.
(6) Installation of thermocouple: The temperature sensitive part of the thermocouple shall be inserted in the central part of the black panel by fitting a 10mm (W) by 70mm (L) by 0.8mm (T) steel plate (NP material) on its back with 2 bolts (M5 × 0.8 × 10) on both ends.

Fig. 3 Unit:mm



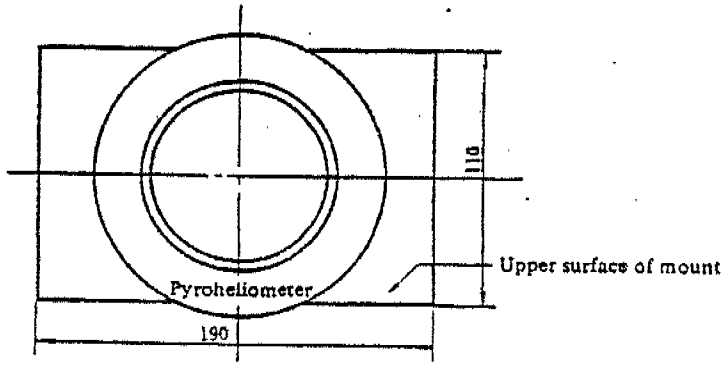
(b) Mount (Same specification for both black panel and pyrheliometer)
(1) Size: Size of upper surface: 110mm (w) by 190mm (L) by reference height (height from tester floor surface to datum level of test piece) −10mm
(2) Material: Wood (Upper surface shall be made of 10mm (T) plywood.)
(3) Surface: Shall be painted in black. The upper surface of the mount shall be horizontal.
(c) Arrangement of black panels and pyrheliometer
(1) Black panel shall be put on the upper surface of the mount as shown in Fig. 4.

Fig. 4 Plan Unit: mm



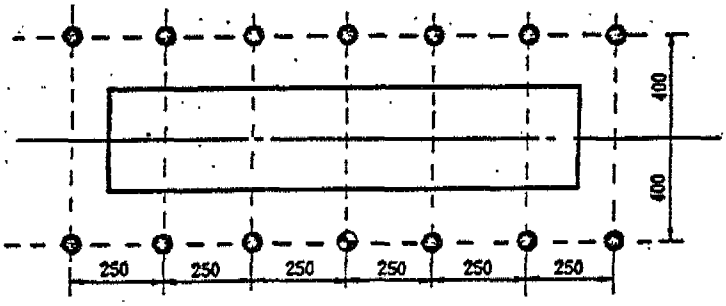
(2) Pyrheliometer shall be arranged so that its center may agree with the center of the upper surface of the mount as shown in Fig. 5.

Fig. 5 Plan Unit: mm



(3) Black panels and pyroheliometer shall be arranged at the points of intersection of the straight lines drawn at intervals of 250mm in longitudinal direction and of 400mm in width's direction from the center of the test piece as shown in Fig. 6.

Fig. 6 Plan Unit: mm



● Black panel

◉ Pyroheliometer

8. INDICATION

(1) Changes in appearance and shape shall be indicated in writing and details shall be reported by submitting photo or actual sample.
(2) Dimensional change shall be indicated in mm down to the first decimal place.
(3) The surface temperature of the test pieces and the oven temperature due to the infrared ray lamps and atmospheric temperature during the test and the measured results of the quantity of solar radiation shall be reported in writing.

9. CRITERION

(1) The test pieces tested shall be free from harmful deformation, sticky surface, breakage, and hault.
Details shall be subject to the agreement of the parties concerned for each location and part and concrete instructions will be given in drawings.
(2) The Temperature range in which the performance of functional parts should be guaranteed will be determined for each part and instructed in drawings.
(3) Critical performance shall be confirmed by testing the test pieces under severer conditions, viz., at higher temperature than specified temperature and for a longer time than specified time.
Example: In the case of Method 1, Class 1—A. at 120°C for 4 hours or at 115°C for 48 hours

10. STATEMENT IN DRAWINGS

Statement in the drawings covered by this standard shall be in accordance with the following procedures:
It shall be made in accordance with NES M0131—1983, Method □ , Class □ , with the exception of test temperature and time, which shall be □°C/□h and atmospheric temperature shall be □°C.
Criterion
1. Y-directional pull-out force shall be □kg/ordinary temperature and □kg/□°C and over.
2. Z-directional deformation shall be as shown in drawing.
It shall be □mm max. at point A.

NES	Methods of Thermal Cycle Test for Synthetic Resin Parts	M 0132 Revised 1983

1. SCOPE

This Nissan Engineering Standard shall apply to the methods of thermal cycle test for synthetic resin parts used in automobiles (hereinafter, referred to as test methods).

2. CLASSIFICATION OF TEST METHODS

Test methods shall be classified into the 5 kinds shown in Table 1 according to the places of installation and material qualities.

Table 1

Classification of test methods		Applicable parts	Destination (1)	Applicable parts (2) by number of cycle		
				2 cycles	4 cycles	10 cycles (3)
Method 1		Parts installed in places storongly affected by the sunlight (direct rays, conduction, radiation, convection) in the inside of car	All destinations		Roof trim, sunvior, pillar trim, column cover, rear percel trim, seat, door trim, luggage trim, kicking plate	Instrument panel assembly, inside mirror, steering wheel
Method 2	Class A	Parts installed in places little affected by the sunlight in the inside of car	S		Floor trim, trunk trim, dash trim, dash side trim	Seat belt, retractor, seat device
	Class B		D			
Method 3	Class 1–A	Parts installed on the outside of car and parts made of materials subject to the effect of humidity, such as fiber and paper, and installed in places susceptible to the effect of the sunlight in the inside of car	S	Resin made bumper, rear finisher, molding, ornament	Molded ceiling, rear parcel trim of press board, carpets of hatch back car, etc.	Outside mirror, instrument filled with sawdust
	Class 1–B		D			
	Class 2–A	Same as above and in addition, installed in places little affected by the sunlight	S		Floor carpet, floor mat, trunk mat	
	Class 2–B		D			
Method 4	Class 1	Parts installed in engine-room	All destinations	Radiator shroud, reservor tank, radiator hose strap		
	Class 2			Air inlet duct, motor fan, alternator, ASCD, distributor cap, engine fan, fuel pump, spacer		
	Class 4			Battery, fuel strainer, washer tank, canistor		
Method 5	Class 1	Parts installed in places exporsed to the hot air of engine room on the outside of car	All destinations	Hood louvre		
	Class 2			Cowl top grill, hood secondary latch coating, radiator grill, head lamp finisher		

Notes: (1) S: North America, Australia, Middle and Near East, Central and South America, Africa, Tropical zones of Southeast Asia
D: Japan, general exports
(2) Applicable parts may vary according to the shapes of cars.

(*) Shall be performed for functional parts, such as the outserted, inserted, and laminated parts of resin material and metallic material, and instrument assembly.

3. CONDITIONS OF TESTING PLACE

(1) Room temperature condition: Testing place shall be put in standard temperature condition, class 3 (temperature: 15 ~ 25°C) and standard humidity condition (relative humidity: 45 ~ 85%) specified in JIS Z 8703—1976 (Standard Conditions of Testing Places).

(2) Standard condition: Testing place shall be put in standard temperature and humidity condition, class 2 (temperature: 20 ± 2°C, relative humidity: 65 ± 2%), specified in JIS Z 8703—1976.

4. APPARATUS

(1) Constant temperature oven

A constant temperature oven of the following specifications shall be used:
Temperature control: Within ± 2°C
Heating and cooling capacities: The interior of the oven can be heated or cooled to a set temperature within 30 minutes with test pieces and jig in it.

(2) Constant temperature constant humidity oven

A constant temperature constant humidity oven of the following specifications shall be used:
Temperature control: Within ± 2°C
Humidity control: Within ± 5%
Heating and humiditing capacities: The interior of the oven can be heated and humidified to a set temperature and humidity within 30 minutes with test pieces and jig in it.

5. TEST PIECE

As test pieces, completed products (*) shall be used as a rule. Test shall be performed after the test pieces have been allowed to stand for 24 hours in the standard condition specified in 3. (2), unless otherwise specified. Details of the test and the number of test pieces shall be subject to the agreement between the parties concerned.

Note (*): Completed products shall refer to moldings completed as parts and shall include those subjected to secondary working and their complexes.

6. TEST CONDITIONS

Test conditions shall be as shown in Table 2.

Table 2

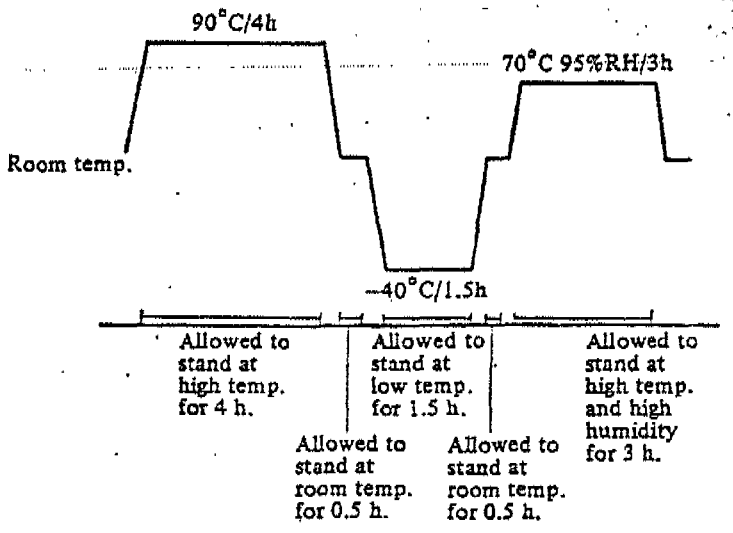
Classification of test methods		Test conditions
Method 1		(90°C/4h→room temp./0.5h→−40°C(*)/1.5h→room temp./0.5h=1 cycle) × 2, 4, 10 cycles (−30°C)
Method 2	Class A	(80°C(*)/4h→room temp./0.5h→−40°C(*)/1.5h→room temp./0.5 h=1 cycle) (70°C / (−30°C)
	Class B	× 2, 4, 10 cycles
Method 3	Class 1−A	(90°C/4h→room temp./0.5h→−40°C(*)/1.5h→room temp./0.5h→70°C. 95% RH/3h→ (−30°C) room temp./0.5h→−40°C(*)/1.5h→room temp./0.5h=1 cycle) × 2, 4, 10 cycles (−30°C)
	Class 1−B Class 2−A	(80°C(*)/4h→room temp./0.5h→−40°C(*)/1.5h→room temp./0.5h→70°C. 95% RH/3h→ (70°C / (−30°C)
	Class 2−B	room temp./0.5h→−40°C/1.5h→room temp./0.5h=1 cycle) × 2, 4, 10 cycles (−30°C)
Method 4	Class 1	(125°C(*)
	Class 2	(115°C / 4h→room temp./0.5h→−40°C(*)/1.5h→room temp./0.5h→70°C. 95% RH/3h→
	Class 4	(90°C / (−30°C) room temp./0.5h→−40°C(*)/1.5h→room temp./0.5h=1 cycle) × 2 cycles (−30°C)
Method 5	Class 1	(130°C(*)
	Class 2	(90°C /4h→room temp./0.5h→−40°C(*)/1.5h→room temp./0.5h→70°C. 95% RH/3h→ (−30°C) room temp./0.5h→−40°C(*)/1.5h→room temp./0.5h=1 cycle) × 2 cycles (−30°C)

Notes: (*): May be −30°C when used only in places other than the very cold districts of North America and Europe.
(*): Class A..... 80°C, Class B..... 70°C
(*): Class 1—B, Class 2—A..... 80°C, Class 2—B..... 70°C
(*): Class 1..... 125°C, Class 2..... 115°C, Class 4..... 90°C
(*): Class 1..... 130°C, Class 2..... 90°C
Temperatures for radiator grills of turbocars, etc. shall be determined separately.

esirable that the temperatures of the test pieces and jig in the oven shall reach the set temper- thin 30 minutes regardless of the kind of constant temperature oven (1-oven type or 3-oven ype) pattern of test condition is shown in Fig. 1.

attern 1

Fig. 1 Example of set temperature program



7. OPERATION

(1) Test pieces shall be installed in normal service condition ([1*]), put in the constant temperature oven or constant temperature constant humidity oven adjusted to a specified thermal cycle condition one by one, and held for a specified time respectively.

(2) When high temperature (including humidifying condition) and low temperature tests have been finished out of the tests under specified thermal cycle conditions, the test pieces shall be checked according to the destination of cars as to whether harmful deformation, wrinkles and sticky surface did not occur at the specified temperature and whether abnormalities, such as breakage and fault do not occur by ordinary way of handling the parts viz.,

1 Tapping with hand lightly, holding down, pulling, plunging nail.
2 Kicking lightly by foot, mounting something, pressing.
3 Leaning against, seating on them

Specified temperatures shall be as follows:

High temperature: Parts used for trim 70°C
Other parts Test temperature

Low temperature: −30°C as a rule. −40°C for seat, door arm rest, pull handle, trunk trim, and luggage trim for very cold districts.

(4) After finish of the specified thermal cycle tests, the test pieces shall be allowed to stand at room temperature for over 30 minutes and checked as to the presence or absence of abnormalities and deformation, if any, shall be measured.

Note ([1*]): Normal service condition shall refer to the condition in which test pieces are installed on the test stand or jig just as they are loaded on automobiles. In the case of mounting a weight, the weight and demensions shall be subject to the agreement of the parties concerned.

Example: Instrument globe box 1.2 kg
Rear percel shelf 5.0 kg

8. INDICATION

(1) Changes in appearance and shape shall be indicated in writing and details shall be reported by submitting photo or actual sample.

(2) Dimensional change shall be indicated in mm down to the first decimal place.

(3) Measured values of the temperature and humidity in the oven during the test shall be submitted.

CRITERION

he test pieces tested shall be free from abnormalities such as harmful deformation, extreme regidity, nd a decline in strength.

Details shall be subject to the agreement of the parties concerned for each location and part.

10. STATEMENT IN DRAWINGS

Statement in the drawings covered by this standard shall be in accordance with the following procedures:

It shall be made in accordance with NES M 0132—1983, Method ☐, class ☐, with the exception of test temperature and time, which shall be ☐ °C/ ☐ h, — ☐ °C/ ☐ h, ☐ cycles.

Criterion

1. Y-directional pull-out force shall be ☐ kg/ordinary temperature, ☐ kg/ ☐ °C and over.
2. Z-directional deformation shall be as shown by drawing.
   It shall be ☐ mm max. at point A.

NES M 0133

Testing Methods of Chemical Resistance for Synthetic Resin Parts

Revised 1979

1. **Scope:** This standard specifies the testing methods of chemical resistance for synthetic resin parts (hereinafter referred to as "testing method") to be used for automobiles.

2. **Classification of Testing Methods:** The testing methods shall be classified into four as shown in Table 1, depending on the conditions under which the parts are used and the locations in which they are installed.

Table 1

Testing methods	Applications	Testing Conditions	Required chemical resistance
Method 1	Parts to be used as vessels or the equivalent of them.	Dipping (1)	Chemical resistance to all chemicals used in vessels.
Method 2	Parts to be installed inside the car (or compartment).	Wiping (2)	Gasoline resistance, gas oil resistance, oil resistance (4), synthetic sweat resistance, regent resistance.
Method 3	Parts to be installed outside the car (or compartment).	Spot test (3)	Washer liquid resistance, detergent resistance, undercoat, resistance, gasoline resistance, gas oil resistance, oil resistance, kerosine resistance, acid resistance, protective agent resistance, wax resistance.
Method 4	Parts to be installed in the engine room.		Gasoline resistance, gas oil resistance, oil resistance, kerosine resistance, acid resistance, brake liquid resistance, anti freeze resistance, washer liquid resistance, anti-corrosive resistance.

Notes: (1) The state in which the chemical is being put in the test specimen used as a vessel, or the state in which the test specimen is put in an suitable vessel filled with the chemical.
(2) The state in which the surface of the test specimen has been rubbed lightly a 2 ~ 3 times with the gauze moistened with the chemical.
(3) The state in which the chemical has been dripped on the surface of the test specimen approximately 0.3 ~ 0.5 ml through a squirt, etc.
(4) The chemicals herein used for oil resistance tests comprise engine oil, gear oil, torque converter oil, grease and kerosene.

3. **Conditions of Testing Place:**
(1) **Room temperature conditions**
The room temperature shall be maintained in conditions specified in Class 3 (temperature of 20 ± 5°C) of the standard temperature states and class 3 of the standard humidity conditions (relative humidity 65 ± 20%) under JIS Z 8703—1976 (Standard atmospheric conditions for testing).
(2) **Standard atmospheric conditions**
The standard atmospheric conditions shall be the states specified in Category 2 of the standard temperature and humidity conditions (temperature of 20°C ± 2°C, and relative humidity of 0.5 ± 2%) under JIS Z 8703—1976 (Standard atmospheric conditions for testing).

4. **Testing Devices, Instruments and other Supplies**
(1) Thermostat bath — Temperature can be controlled within ± 2°C
(2) Wide-mouthed bottle — Made of a material unaffected by chemicals
(3) Reflux condenser
(4) Chemical balance — Capable of weighing to 0.1 mg
(5) Squirt — Made of a material unaffected by chemicals
(6) Gauze — An article on the market for medical use

Remark: Thermostat bath should be used when a test is conducted under high temperature or the test specimen is required to be dried up, while a reflux condenser be used in a test only under high temperature.

5. **Test Specimens:** The test specimens used in the test shall, as a rule, be finished products (¹) and shall be perfectly free from dusts which may affect the results of the test. The test specimens should be tested, unless otherwise specified, after leaving it for twenty-four hours in the standard conditions specified in 3. (2). Further details of the specimens are decided by the agreements of parties concerned.

Note (¹): The words "finished products" shall mean the complete mold articles inclusive of secondarily processed and compound ones.
The specimens may be cut when their configurations are not apt for tests. (Attention should be paid to the portion to be cut of the test specimen as well as to the state in which it is installed.)

6. **Types and Concentration of Chemicals:** The types and the concentration of the chemicals used in tests are as shown in Table 2.

Table 2

Types of Chemicals		Concentration (wt %)
Gasoline	RN–3 of NES M5052 (Motor gasoline)	100
Gas oil	NDF–2 of NES M5058 (Diesel fuel oils)	
Engine oil	SCF–20W 20 of NES M5051 (Lubricating oil for automobile gasolien engines)	
Gear oil	MP–90 of NES M5054 (Automotive gear oil)	
Torque converter oil	Nissan's specified oil	
Grease	NWB–2 of NES M5065 (Grease for automobiles)	
Kerosene	No. 2 of JIS K2203–1978 (kerosene)	
Acid solution	Class 1 of JIS K8951–1972 (Sulfuric acid)	25 or 3
Brake liquid	NR–3 of NES M5055 (Motor vehicle brake fluids)	100
Synthetic sweat liquid	As specified in 9.6.2 of JIS K6772–1976 (Polyvinylchloride coated fabric)	
Paint film protective agent	As by the agreements of parties concerned	
Anti-freeze	LLC of NES M5059 (Engine antifreezes)	
Wax	As by the agreements of parties concerned	
Washer liquid		
Detergent	Neutral or alkaline detergent, details are to be by the agreements of the parties concerned	5
Under-coat Agent	As by the agreements of parties concerned	100
Anticorrosive	As by the agreements of parties concerned	

7. **Test Conditions:** The test conditions are prescribed in Table 3.

Table 3

Type of Testing Methods	Temperature	Time (h)	Descriptions
Method 1	Room temperature, or 90 ± 2°C	168	Use a reflux condenser when evaporation of chemicals is expected.
Method 2	Room temperature	4	Number of wiping is 2 ~ 3 times, back and forth.
Method 3			Dripping volume: 0.3 ~ 0.5 ml
Method 4			

8. Procedure

8.1 Method 1

(1) Put the specified chemical either in a vessel used as a test specimen (*), or in a wide-mouthed bottle in which the test specimen is to be placed, and leave the specimen for specified time at a specified temperature.

(2) After leaving the specimen, take it out and wash the chemical off with running water until the chemical on its surface is hardly recognizable. However, should it be impossible to remove the chemical with running water, wash it with such chemicals as alcohol, etc. which do not deteriorate the test specimen.

(3) After washing, dry it up under a room temperature or in a thermostat bath at temperatures which may not affectill on the test specimen.

(4) After drying up, check the fault caused on the surface of the test specimen (blister, change of colours, thinning, softening and hardening, etc.)

Note: (*) *If the main usage of the test specimen is to use it as a vessel and the test is to be performed with the chemical put in it, it is suggested that the test specimen be installed regularly as far as possible.*

8.2 Method 2

(1) Saturate a piece of gauze with the specified chemical.

(2) Move the gauze back and forth a few times, pushing it lightly on the test specimen so that the surface of the specimen should become wet.

(3) Leave the test specimen as it is for a specified time at a specified temperature.

(4) After leaving it, wipe the chemical off the test specimen with a new, clean gauze and see if there is any abnormalities caused on it.

8.3 Methods 3 and 4

(1) Drip the specified chemical 0.3 ~ 0.5 ml on the surface of the test specimen through a squirt and leave it for a specified time at a specified temperature.

(2) After leaving it, wipe off the chemical with a new, clean gauze and examine whether there is any abnormalities on it.

9. Indication

(1) Any changes in appearance, shape and weight shall be indicated in writing, with details to be presented by photographs or by the actual samples.

(2) Any change of dimensions shall be indicated in a mm unit and that of the weight be in a mg unit down to one place of decimals. Indicating in writing is also necessary when the chemicals is affected by the test specimen.

NES	Weatherability and Light Resistance Test Methods for Synthetic Resin Parts	M 0135 Revised 1993

Contents

		Page
1.	Scope	2
2.	Definition of Terms	2
3.	Classification of Test Methods	2
4.	Conditions for use and Examples of Applicable Parts	3
4.1	Condition of use	3
4.2	Examples of Applicable parts	3
5.	Sampling of Test Specimens	4
5.1	Appearance, Dimensions, Shape, Electrical Properties, Parts Functions and Chemical Properties	4
5.2	Mechanical Properties	4
6.	Number of Test Specimens	7
7.	Test Methods	7
7.1	Outdoor Exposure Test Method	7
7.1.1	Outdoor Weatherability Test Method	7
7.1.2	Outdoor Light Resistance Test Method	8
7.2	Accelerated Test Method	8
7.2.1	Accelerated Weatherability Test Method	9
7.2.2	Accelerated Light Resistance Test Method	11
8.	Evaluation Method	12
8.1	General Requirements	12
8.2	Evaluation Items	12
8.3	Appearance	12
8.3.1	Discoloration	12
8.3.2	Transmittance	12
8.3.3	Gloss	12
8.4	Resin Properties	13
8.4.1	Shape and Dimensions	13
8.4.2	Curing	13
8.4.3	Mechanical Properties	13
8.4.4	Chemical Properties	13
8.4.5	Electrical Properties	13
8.4.6	Parts Functions	13
9.	Criterion	13
9.1	Appearance	13
9.2	Resin Properties	14
10.	Drawing Description	14
	Attached Drawing	15
	Reference drawings	15

1. SCOPE

This Standard specifies the test methods, for synthetic resin parts used on automobiles, regarding weatherability (chiefly for exterior pats) and light resistance (interior parts) (hereinafter referred to simply as "test methods").

Remarks: Units and numerals put in { } in this Standard are those based on the International Unit System (SI) and are given for reference.

2. DEFINITION OF TERMS

Main terms used in this Standard shall mean as specified below.

(1) Weatherability

Weatherability herein means the resistance of the synthetic resin parts against aging ([1]) due to sunlight, ozone, rain- and snowfall, temperature and humidity, among various environmental conditions to which the parts are to be exposed.

(2) Light Resistance

Light resistance means the resistance of the synthetic resin parts against aging ([1]) when the parts are exposed to sunlight.

(3) Exposure Test Apparatus

Exposure test apparatus means a sample holding frame and other related devices used to expose test samples to outdoor environmental conditions.

(4) Exposure Surface

This means the external surface of each specimen which is directly exposed to sunlight, ozone, rain- and snowfall, and other environmental conditions.

(5) Amount of Light Received.

The amount of light recieved by the exposure surface of each specimen, the magnitude of which is expressed in langleys ($g \cdot m\ cal/cm^2$) ([2]).

(6) Standard Specimens

Standard parts, standard test pieces, standard scales for observation, and limit samples, which are used for periodic observation and for comparison with tested specimens, and which are stored in a dry, cold and dark place kept under specified conditions.

(7) Effective Surfaces

Effective surfaces mean those surfaces of each part which are of practical importance, such as:

(a) Surfaces that can be seen from any ordinary directions when the part is placed in service.

(b) Surfaces whose property changes can affect the functions of the part.

(8) Discoloration

Color fading (changes in saturation and lightness) due to degradation of colorants, such as dyes and pigments; color changes (changes in color hue, e.g., yellowing and turning dark brown) due to deterioration of components other than the colorants; and combinations thereof.

(9) Glossiness

Glossiness range is divided into the following types depending on the specular glossiness measured at an incident angle of 60°

no gloss: Less than 20 Units

Semigloss: 20 ~ 80 Units

Gloss: More than 80 Units

(10) Crazing

Fine cracks developed on the surface of parts due to oxidation.

(11) Chalking

Chalk-like appearance of the surface caused by deterioration.

(12) Peeling

Peeling of, or blistering at, bonded sections or surface coating.

(13) Cracking

Cracks caused by exposure to natural environment or by internal stresses.

Note 1: Deterioration which progresses with passage of time.

Note 2: $1\ m\ W\ min/cm^2 = \frac{1}{69.7}\ g\ cal/cm^2$

3. CLASSIFICATION OF TEST METHODS

The test methods are of the four types shown in Table 1, and either one of the four shall be applied to each part.

Table 1 Types of Test Methods

Division	Classification	Purpose
Outdoor Exposure Tests, (Natural exposure tests)	Outdoor Weatherability Test	To check long-period weatherability of exterior parts through outdoor exposure to atomospheric air.
	Outdoor Light Resistance Test	To check long-period light resistance of interior parts through outdoor exposure to atmospheric air under a condition free from the effect of rainfall.
Accelerated Tests, (Accelerated exposure tests)	Accelerated Weatherability Test	To measure weatherability of exterior parts by using a weatherometer in order to estimate their true behavior outdoors.
	Accelerated Light Resistance Test	To measure light resistance of interior parts by using a weatherometer or fadeometer in order to estimate their true behavior outdoors.

4. CONDITION FOR USE AND EXAMPLES OF APPLICABLE PARTS

4.1 Conditions for use

Conditions for use of the synthetic resin parts shall be classified into two main types as shown in Table 2 depending on their using site and exposure condition.

Table 2 Conditions for use

Exterior	EC
Interior	IC

4.2 Examples of Applicable Parts

Table 3 lists examples of parts which should be assigned to respective groups classified by service condition (Table 2) and degree of weatherability (light resistance) required for individual parts.

Table 3 Examples of Applicable Parts

Condition for use / Using Site	Degree of Weatherability (Light Resistance) Required for Parts	Symbol	Examples of applied Parts
Exterior	Parts that receive considerable amount of sunlight	EC 1	Wheel cap
	Parts that receive much sunlight	EC 3	Ornament, radiator grille, rear grille, emblem, cowltop grille, hood louver, bumper, washer nozzle, antenna cap, wiper pivot cover, outside mirror
Interior	Parts that receive little sunlight	IC 1	Dashboard-side finisher, head lining, kicking plate, instrument panel undercover, roof-side garnish, floor mat
	Parts that receive considerable amount of sunlight	IC 2	Inside mirror, glove box lid, console box, shift knob, center pillar trimming (lower), RR wheel house, door (general), armrest, sunvisor, luggage side, luggage floor, roof side, sun-roof head lining
	Parts subject to constant exposure to sunlight and kept at elevated temperatures	IC 3	Instrument panel or pad, upper garnish, cluster lid A, defroster grill, column cover, stearing wheel, rear parcel, door (upper), rear corner, W/S pillar garnish, center pillar upper, seat (upper)

Remarks: Parts not listed in Table 3 shall be assigned to a proper group through agreement between the parties concerned, with consideration given to using site, automobile destination and other factors.

5. SAMPLING OF TEST SPECIMENS

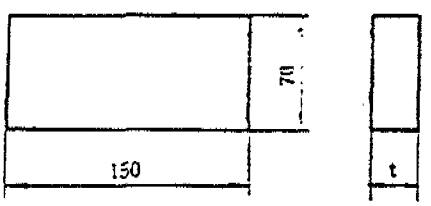
Type of test specimens to be used shall be as specified below depending on the poperties required for each part subjected to the exposure test defined in Paragraph 3.

5.1 Appearance, Dimensions, Shape, Electrical Properties, Parts Functions and Chemical Properties

(1) Wherever possible, the part shall be tested in the complete form ready for use.

(2) The part may be cut to a proper size as close to the original shape as poossible, or specimens as specified in the Figure below may be used, when such modifications offer no problem because of the material type of the particular part, or when the accelerated test so requires. Testing of chemical properties shall comply with NES M 0133 (Chemical Resistance Test Methods for Synthetic Resin Parts).

Figure Specimen

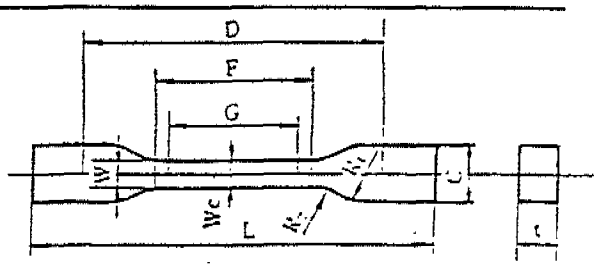


5.2 Mechanical Properties

A proper type of specimen shall be selected as specified in Table 4 depending on the types of resin and test method.

Testing of mechanical properties shall comply with NES M 0141 (Test Method for Synthetic Resin Coating).

Table 4 Specimen (Mechanical Properties)

Type of Resin	Type of Test Method	Shape and Dimensions (mm)
Fiber-reinforced Resins Engineering Plastics General-purpose Resins Foamed Plastics Rubber	Tensile Strength	

Dimensions of specimen shall be as specified in the table below.

Type of Specimen		No. 2		No. 3	No. 4
Symbols and Dimensions \ Type of Resin		Fiber-reinforced Resins	Engineering Plastics and General-purpose Resins	Foamed Plastics	Rubber
t	Thickness	2	3	10 ± 1	2
C	Total width	19		25	
W	Width of parallel portion	12.5		10	5
Wc	Width of central portion	$W^{0}_{-0.10}$		10	5
F	Length of parallel portion	57		40	20
G	Gage distance	50		20	
D	Grip distance	114		90	70
L	Total length	216		120	110
R_1	Radius of fillet inside shoulder	76		25	
R_2	Radius of fillet				

Table 4 (Cont'd)

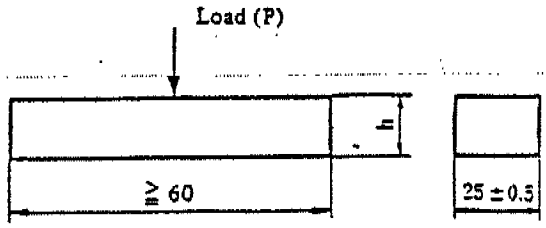
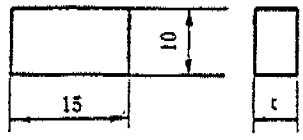
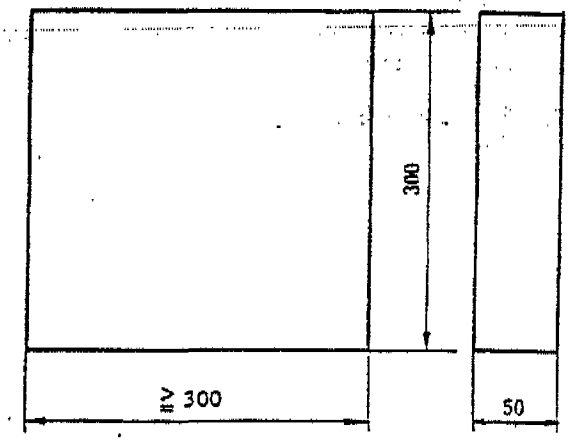
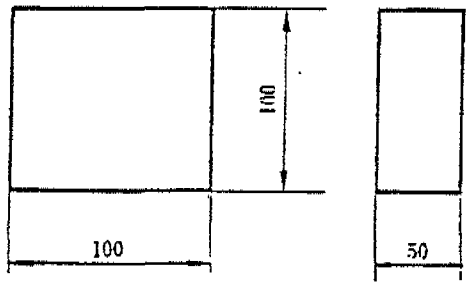
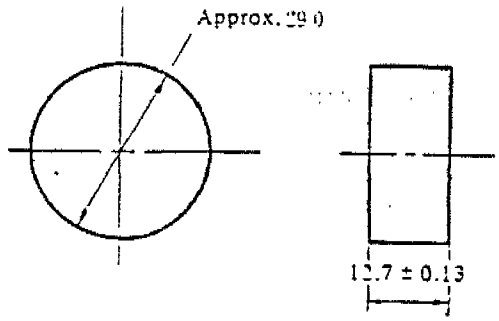
Type of Resin	Type of Test Method	Shape and Dimensions (mm)
Fiber-reinforced Resins Engineering Plastics General-purpose Resins Foamed Plastics	Bending Strength Bending Stress	 Specimen height (h) shall be as specified in the table below Type of Resin / h: FRP 2; ABS, PP, Polyurethane 3
Fiber-reinforced Resins Engineering Plastics General-purpose Resins Foamed Plastics	Dynstat Impact Strength	 Specimen thickness (t) shall be as specified in the table below Type of Resin / t: FRP 1; ABS 3

Table 4 (Cont'd)

Type of Resin	Type of Test Method	Shape and Dimensions (mm)
Foamed Plastics	Pressurized Hardness Test	
	Impact Resilience Test	
Rubber		

6. NUMBER OF TEST SPECIMENS

Three pieces of test specimens shall be used for each type of test wherever possible.

7. TEST METHODS

7.1 Outdoor Exposure Test Method

(1) Conditions of Testing Site

The testing site at which the exposure test apparatus is set shall be an airy place with favorable atmospheric conditions suited for measurement of weatherability of the test samples, and shall have no nearby obstructions or installations that may adversely affect the intended exposure test.

(2) Exposure Period

The exposure period shall be as specified in Table 5.

Table 5 Exposure Period

Unit: Month

Test Method / Items of Assessment / Symbol	Outdoor wetherability, Outdoor Light Resistance	
	Appearance	Resin Properties
EC 1	12	12
EC 3	24	24
IC 1	12	12
IC 2	12	12
IC 3	12	12

(3) Servicing of Test Samples

Each sample under the outdoor exposure test shall be correctly and adequately serviced throughout the test period so as not to defeat the intended purpose of the test; all the samples should be cleaned off dust once every month in a manner not to damage the exposed surfaces and washed with clean water.

7.1.1 Outdoor Weatherability Test Method

(1) Exposure Test Apparatus

The test apparatus shall be of a sturdy, durable structure suited for outdoor exposure, and shall be equipped with a sample fixing means appropriate to the type, shape and dimensions of sample and to the intended purpose of the test.

The stand of the test apparatus shall be firmly and properly fixed to the ground or the floor in a manner not to be affected in any way by rainstorms and snowfall, and each member of the test apparatus and metal fittings attached shall be suitably treated against corrosion.

Remark 1: The exposure test apparatus should be provided with an integrating illuminometer to measure the amount of light received:

(1) The light receiving surface of the illuminometer must be set at the same angle as the exposure surface, and must be covered with a UV-permeable globe.

(2) When the illuminometer is operated on a continuous basis, the globe and receiver filter should be cleaned off dust once every day.

Remark 2: Porcelein insulators or plastic pins should generally be used to set each test sample on the apparatus.

(2) Method of Exposure

The exposure surface shall face to the due south, shall be inclined to the horizontal at an angle of the latitude of the testing site minus 5°, and should be set at least 50cm above the reference

plane (ground or floor surface) on which the apparatus stand is installed. In summer from April through September, however, the inclination angle shall be the latitude minus 20°.
Normally test samples should be directly set to the apparatus without using any back plate. However, a suitable back plate may be used to ensure firm setting depending on the shape and nature of the part.
Each sample shall be set sufficiently loose to allow for possible deformation during the test period. Extra care shall be used not to give any adverse effect to each sample when mounting or dismounting it.

7.1.2 Outdoor Light Resistance Test Method

(1) Exposure Test Apparatus

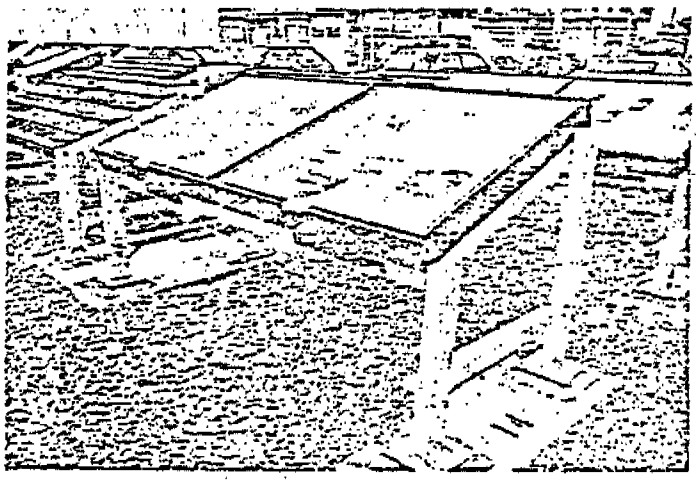
The test apparatus shall consist of a stand similar to that specified in 7.1.1 (1) above, on which is fixed a closed test box paned with a glass panel to protect the samples from rain and snowfall and to permit spontaneous temperature rise inside.
The distance between the glass panel [3mm polished glass plate as defined in JIS R 3202—1981 (Float Plate glass and Polished Glass Plate)] and the top surface of the samples shall be at least 5cm.

Remarks: Keep the surface of the glass panel always clean free from dust and other foreign substances.

(2) Method of Exposure

The method of exposure shall comply with the description given in 7.1.1 (2) above. When a specimen is used for the test, however, a suitable space shall be allowed above the stand of the test apparatus.

Example of Outdoor Light Resistance Test Apparatus



7.2 Accelerated Test Method

(1) Conditions of Testing Site

The conditions of the testing site should be of Class-3 standard temperature condition (20 ± 5°C) specified in JIS Z 8703—1976 (Standard Condition of Testing Site).

(2) Test Conditions
Test conditions shall be as specified in Table 6. Use of a sunshine weatherometer is preferable, but a UV carbon weatherometer (or a UV carbon fadeometer) may be used through consultation between the parties concerned after confirming the correlation between the two types of testing equipment.

Table 6 Test Conditions

Test Method	Weatherability and Light Resistance			
Type of Testing Equipment	Sunshine Weatherometer (Test Time: hour)			
Evaluation Item / Symbol	Appearance	Resin Properties	Black Panel Temperature (°C)	Spray
EC 1	600		63 ± 3	Yes
EC 3	200 (3000 for bumper only)		or 83 ± 3	
IC 1	100	200	83 ± 3	No
IC 2	300	600		
IC 3	600	1000		

Note: The test times for EC conditions given in the above table are for the black panel temperature of 63 ± 3°C; the test times for the black panel temperature of 83 ± 3°C shall be determined through consultation between the parties concerned.

(3) Fixing of Test Samples
Each test sample shall be fixed with its external surface taken as the exposure surface (for other details, refer to Tables 7 and 8).

(4) Servicing of Test Samples
Each sample under the accelerated test shall be correctly and adequately serviced throughout the test period so as not to defeat the intended purpose of the test.

7.2.1 Accelerated Weatherability Test Method
The accelerated weatherability test shall be conducted as specified in Table 7 according to the type of test equipment used.

Table 7 Accelerated Weatherability Test Equipment

Test Conditions \ Type of Test Equipment		Sunshine Carbon Weatherometer	UV Carbon Weatherometer	
Configuration of Test Equipment		Refer to Reference Drawing 1	Refer to Reference Drawings 2 and 3	
Type of Arc Lamp		Open	Open	Closed
Number of Lamps		1	2	
Carbon Electrodes	Upper (mm)	Copper-covered sunshine carbon ϕ23 x 305	Cored or coreless carbon ϕ13 x 305	
	Lower (mm)	Copper-covered sunshine carbon ϕ13 x 305	Cored or coreless carbon ϕ13 x 100	
Average Discharge Voltage (V)		50 (± 2%)	135 (± 2%)	
Average Discharge Current (A)		60 (± 2%)	16 (± 2%)	
Filter		Panel filter Transmittance: 0% below 255nm 90% and over at 400nm	Globe filter Transmittance: 0% below 279nm 90% and over at 400nm	
Black Panel Thermometer	Control Temperature (°C)	63 ± 3 or 83 ± 3		
	Dimensions	Refer to Reference Drawing 4 (1)	Refer to Reference Drawing 4 (2)	
	Specifications	A bimetallic dial thermometer (1°C-graduation; heat sensor: 35mm in diameter) with its heat sensor directly fixed to a 1mm x 150mm x 170mm stainless steel plate (SUS27) and the total coated with lightfast black enamel. Two pieces of thermometers shall be provided: one for measurement in the test and the other as standard for calibration. For calibration, align the two pieces in parallel against a light source and take readings. The difference between the two readings shall be within ± 2° C.		
Sample Rotating Drum or Frame	Sample-Arc Center Distance (mm)	476 ~ 482	378 ~ 384	
	Diameter (mm)	(Sample rotating frame) 960	–	
	Rotating Speed (rpm) min^{-1}	Approx. 1		
Positional Relationship of Arc Lamp, Sample Rotating Drum (or Frame) and Spray Nozzles		Refer to Reference Drawing 5 (1)	Refer to Reference Drawing 5(2)	
Nozzle Dimensions		Refer to Attached Drawing		
Fresh Water Spray Conditions	Pressure (Kgf/cm^2)	0.8 ~ 1.3 {78 ~ 127 kPa}		
	Flow Rate (ml/min)	2100 ± 100		
	Spray Time	18 minutes during 120-minute irradiation		
	Water Quality	Deionized water of pH 6.0 ~ 8.0 with a preferable resistivity of 10^5 Ω cm or more		
Special Requirement inside the Tester		Closed, air-circulating type tester shall have suitable devices to eliminate the adverse effects of excessive heat and ozone and other harmful gases produced during discharge.		
Luminous Intensity Examination	Method of Examination	Attach luminous intensity test paper on the sample holder and sample rotating drum (or frame), and run the tester for 20 hours under specified conditions with the fresh water spray stopped. At the end of test operation, take out the test paper, allow to stand at room temperature for at least two hours in a cold, dry place, and measure the luminous reflectance Y using a differential colorimeter. This examination should be made once every 2000 hours or so.		
	Attachment of Luminous Intensity Test Paper	Refer to Reference Drawing 6(1)	Refer to Reference Drawing 6(2)	
	Allowable Range of Y (%)	23.2 ~ 24.3 (Lot No. 700a)	22.8 ~ 23.9 (Lot No. 700a)	
Fixing of Test Samples		1. All test samples shall be set out of contact with one another. Any test sample that can contaminate others shall be tested alone. 2. Each test sample should be transferred from lower to upper, or from upper to lower, positions once every 20 hours or so.		

Note: The black panel thermometer control temperature of 83 ± 3°C may be accepted through consultation between the parties concerned.

7.2.2 Accelerated Light Resistance Test Method

The accelerated light resistance test shall be conducted as specified in Table 8 according to the type of test equipment used.

Table 8 Accelerated Light Resistance Test Equipment

Test Conditions \ Type of Test Equipment		Sunshine Carbon Weatherometer	UV Carbon Weatherometer		UV Carbon Fadeometer
Configuration of Test Equipment		Refer to Reference Drawing 1	Refer to Reference Drawing 7		Refer to Reference Drawing 8
Type of Arc Lamp		Open	Open	Closed	Closed
Number of Lamps		1	2; One of the two lamps suspended at the center, with the other dismounted.		1
Carbon Electrodes	Upper (mm)	Copper-covered sunshine carbon φ23×305	Cored or coreless carbon φ13×305		Cored or coreless carbon φ13×305
	Lower (mm)	Copper-covered sunshine carbon φ13×305	Cored or coreless carbon φ13×100		Cored or coreless carbon φ13×100
Average Discharge Voltage (V)		50 (±2%)	135 (±2%)		135 (±2%)
Average Discharge Current (A)		60 (±2%)	16 (±2%)		16 (±2%)
Filter		Panel filter Transmittance: 0% below 255nm, 90% and over at 400nm	Globe filter Transmittance: 0% below 279nm, 90% and over at 400nm		Globe filter Transmittance: 0% below 279nm, 90% and over at 400nm
Black Panel Thermometer	Control Temperature °C	83±3			
	Dimensions	Refer to Reference Drawing 4 (1)	Refer to Reference Drawing 4 (3)		Refer to Reference Drawing 4 (3)
	Specifications	Same as those in Table 7			
Sample Rotating Frame	Sample-Arc Center Distance (mm)	476~482	251~257		251~257
	Diameter (mm)	960	508		508
	Operation	Stop the spray and drum cooling water, remove the spray unit, dismount one of the two lamps (UV carbon weatherometer) and install the sample rotating frame.			
	Rotating Speed	Approx. 1 rpm {min⁻¹}			Approx. 3 rpm {min⁻¹}
Positional Relationship of Arc Lamp and Sample Rotating Frame		Refer to Reference Drawing 5 (1)	Refer to Reference Drawing 9 (1)		Refer to Reference Drawing 9 (2)
Special Requirement inside the Tester		Closed, air-circulating type tester shall have suitable devices to eliminate the adverse effects of ozone and other harmful gases produced during discharge. Tester shall be designed so that all the test samples will be free from splash of water droplets.			
		–			The tester shall be of a cylindrical shell structure.
Luminous Intensity Examination	Method of Examination	Attach luminous intensity test paper on the sample holder and sample rotating drum, and run the tester for 20 hours under specified conditions on a continuous basis. At the end of test operation, take out the test paper, allow to stand at room temperature for at least two hours, and measure the luminous reflectance Y by using a differential colorimeter. This examination should be conducted once every 2000 hours or so.			
	Attachment of Luminous Intensity Test Paper	Refer to Reference Drawing 6 (1)	Refer to Reference Drawing 6 (3)		
	Allowable Range of Y (%)	23.2~24.3 (Lot No. 700a)	23.6~24.7 (Lot No. 700a)		
Fixing of Test Samples		1. All test samples shall be set out of contact with one another. Any test sample that can contaminate others shall be tested alone. 2. All samples should be transferred from upper to lower, or from lower to upper,			

8. EVALUATION METHOD

Evaluation should be made before and after the test and at predetermined times during the test. Evaluation may also be conducted as required during the test.

8.1 General Requirements

(1) Prior to evaluation, each test sample shall be cleaned in a suitable way that does not defeat the intended purpose of the test, and shall be conditioned as required.

(2) Appearance evaluation shall be conducted with the effective surface through comparison with a standard sample. The effective surface shall be wiped off any foreign substances before evaluation.

(3) The standard sample shall have been stored in a darkroom or in a closed container held under the Class-3 standard temperature condition (20±5°C) and the Class-2 standard humidity condition (65±5%) defined in JIS Z 8703-1976 (Standard Conditions of Testing Site).

8.2 Evaluation Items

Evaluation items shall be as listed in Table 9.

Table 9 Evaluation Items

	Observation Items
Appearance	Discoloration, transmittance, glossiness, crazing, chalking, staining, peeling, cracking
Properties	Dimensions, shape, curing, mechanical properties, chemical properties, electrical properties, parts functions

8.3 Appearance

Appearance change before and after the test shall be checked visually at a distance of about 25cm with an illuminance of about 1000 lx on the effective surface by using a standard light source C defined in JIS Z 8701-1971 (2-Degree View-field Color Specification Method by the XYZ System).

8.3.1 Discoloration

(1) Visual Evalualtion

For samples of achromatic color, evaluation shall be made under the conditions specified in 8.3 above by using the gray scale defined in JIS L 0804-1977 (Gray Scale for Discoloration) through comparison of the color difference before and after the test with the difference in color of gray scale color chips.

Samples of chromatic color should normally be evaluated by using a measuring instrument. When instrumental evaluation is not feasible for some reason, visual comparison with standard samples may be used after agreement between the parties concerned.

(2) Instrumental Evaluation

a) For samples of chromatic color, measure by using a differential colorimeter under the conditions specified in 6.2 of JIS Z 8730-1970 (Method of Color Difference Specification). Calculate color difference according to the following formula:

$$\Delta E\,(UVW) = [(\Delta W)^2 + (\Delta U)^2 + (\Delta V)^2]^{1/2}$$

b) For optical parts (e.g., lamp lens), measurement shall be made using a light source specified in JIS Z 8701 according to the procedure given in JIS Z 8722-1971 (2-Degree View-field Color Measurement) to determine chromaticity.

8.3.2 Transmittance

Measure light transmittance (%) of sample before and after the test according to the procedure given in 4.5 of JIS K 6717-1977 (Methacrylate Resin Molding Material), and calculate change in transmittance from the following formula:

$$\text{Rate of Change (\%)} = \frac{(\text{Transmittance before Test}) - (\text{Transmittance after Test})}{(\text{Transmittance before Test})} \times 100\ (\%)$$

8.3.3 Glossiness

(1) Visual Evalualtion

When instrumental evaluation is difficult for some reason, change in glossiness shall be visually evaluated through comparison with standard samples after agreement by the parties concerned.

(2) Instrumental Evaluation

Measure the glossiness before and after the test according to the procedure given in JIS Z

8741-1962 (Glossiness Measurement), and calculate glossiness retention from the following formula:

$$\text{Glossiness Retention} = \frac{60^\circ \text{ Specular Glossiness after Test}}{60^\circ \text{ Specular Glossiness before Test}} \times 100\ (\%)$$

Remark: When a glossmeter is used, its angle indication shall read to 1°.

8.4 Resin Properties

8.4.1 Shape and Dimensions

(1) Change in shape after the test should normally be checked visually.

(2) Rate of change in dimensions should be determined by using a suitable instrument and the following calculation formula:

$$\text{Rate of Change } (\%) = \frac{(\text{Dimensions after Test}) - (\text{Dimensions before Test})}{(\text{Dimensions before Test})} \times 100\ (\%)$$

Remark: A positive rate of change means expansion, and a negative value means shrinkage.

8.4.2 Curing

Curing shall be evaluated according to the procedure given in 6.2.1 of NES M 0141 (Test Method for Synthetic Resin Coating).

8.4.3 Mechanical Properties

Mechanical properties shall be evaluated according to the procedure given in 6.2.2 ~ 6.2.8 of NES M 0140 (Test Method for Synthetic Resin Coating).

8.4.4 Chemical Properties

Chemical properties shall be evaluated according to the procedure given in NES M 0133 (Chemical Resistance Test Method for Synthetic Resin Parts).

8.4.5 Electrical Properties

Evaluation of electrical properties shall be in accordance with agreement between the parties concerned.

8.4.6 Parts Functions

Put a load on the tested sample or operate it, and check if there is any change in condition or if it functions correctly. The loading and operating conditions shall be determined through consultation between the parties concerned.

9. CRITERION

9.1 Appearance

Appearance, tested by the method of 7. and evaluated by the procedure of 8., shall be judged according to Table 10. However, how to apply the rating (Class A and Class B) shall be determined by agreement between the parties concerned for each type and property of part.

Table 10 Evaluation Standard for Appearance

Rating / Observation Items	Class A Parts on which areas of similar color are adjacent and which are likely to develop marked color difference	Class B Parts with no such tendency but with relatively high priority on appearance
Gray Scale Discoloration	Class 4 or higher	Class 3 or higher
Color Difference (for reference)	2 or lower	3 or lower
Crazing	No crazing at all	No marked crazing
Chalking	No chalking	No marked chalking
Staining	No noticeable stain	No marked stain
Peeling	None	No peeling at all
Cracking		No marked cracking
Transmittance	Little change in transmittance (15% or less)	No noticeable change in transmittance (20% or less)
Glossiness	Little change; Gloss retention 80% or more for glossy products and 50% or more for semiglossy products	No noticeable change; Gloss retention of 50% or more for glossy products and 20% or more for semiglossy products

9.2 Resin Properties

Evaluation standard for resin properties shall be in accordance with the agreement between the parties concerned.

10. DRAWING DESCRIPTION

Drawing description shall be as shown below.

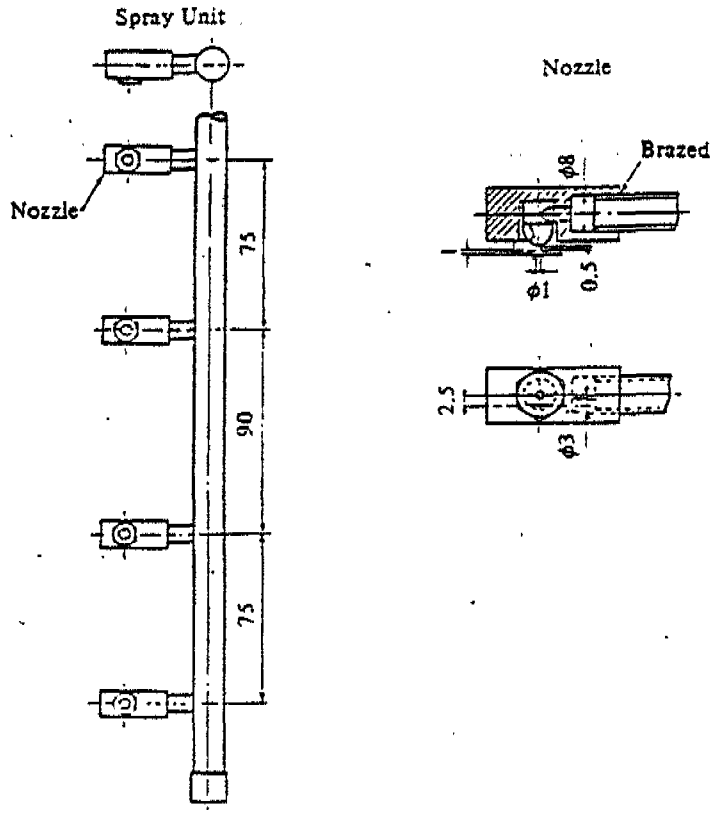
Example:

"Testing shall be conducted according to IC ☐, NES M 0135-1983, and the results shall meet Class ☐.

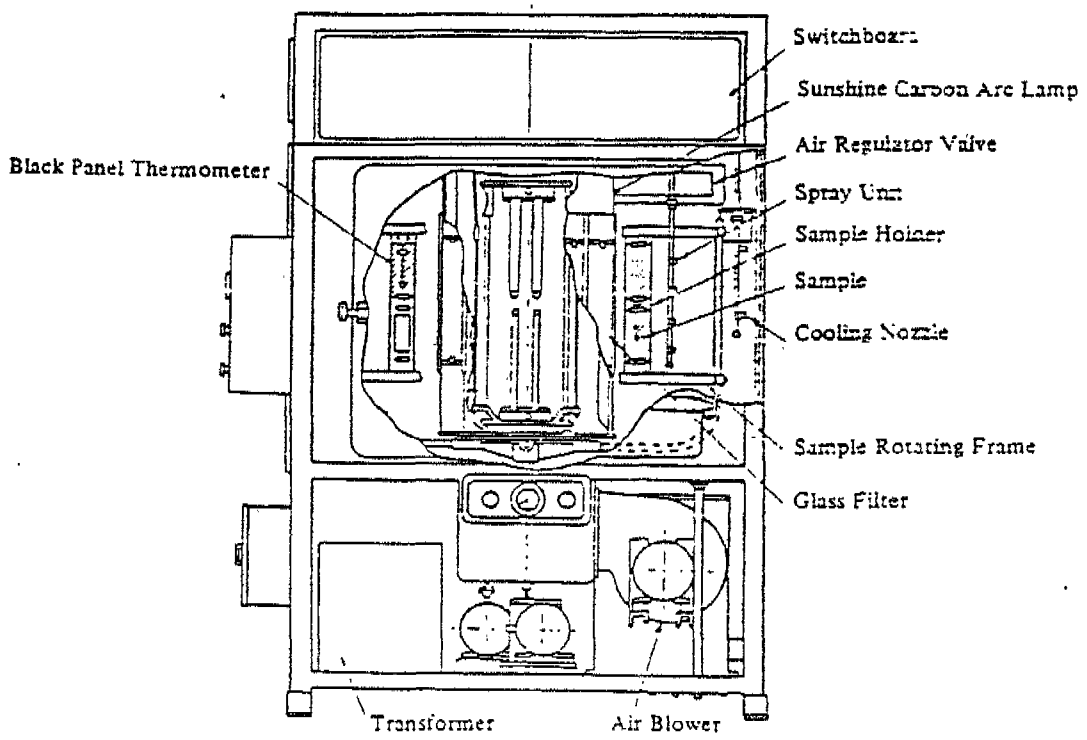
Sunshine carbon weatherometer irradiation: ☐ hours; BP temperature: ☐ °C; Spray: ☐ "

Attached Drawing Nozzle Dimensions

Unit: mm

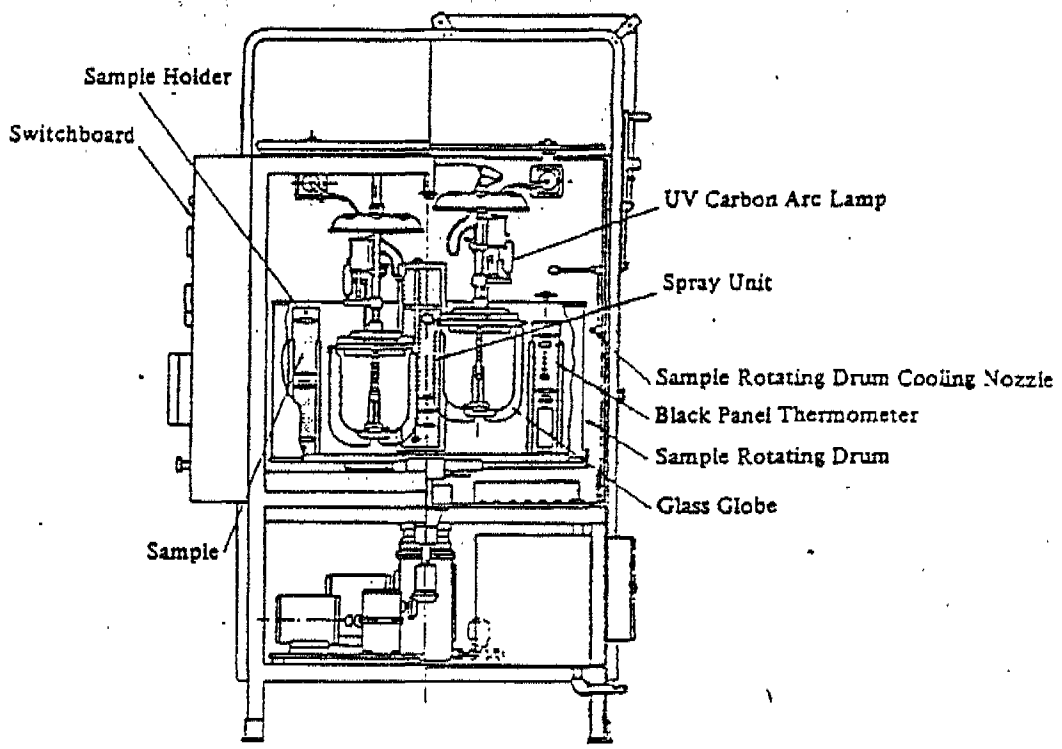


Reference Drawing 1 Sunshine Carbon Weatherometer

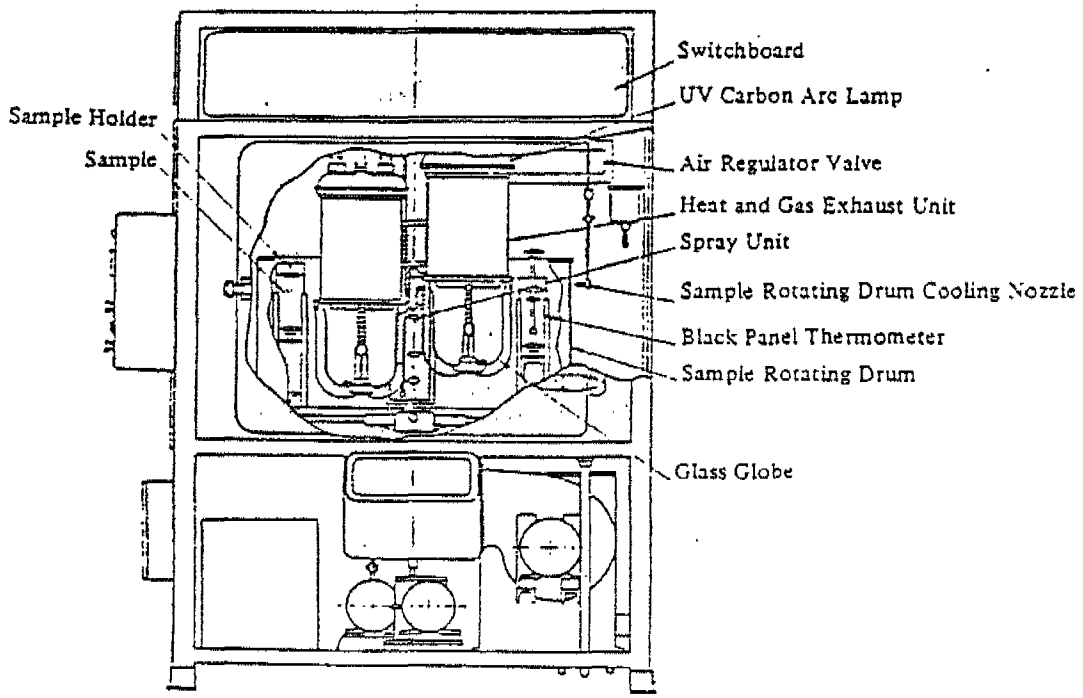


M 0135
1983

Reference Drawing 2 UV Carbon Weatherometer (2-Lamp) (Open Type)



Reference Drawing 3 UV Carbon Weatherometer (2-Lamp) (Closed, Air-circulating Type)



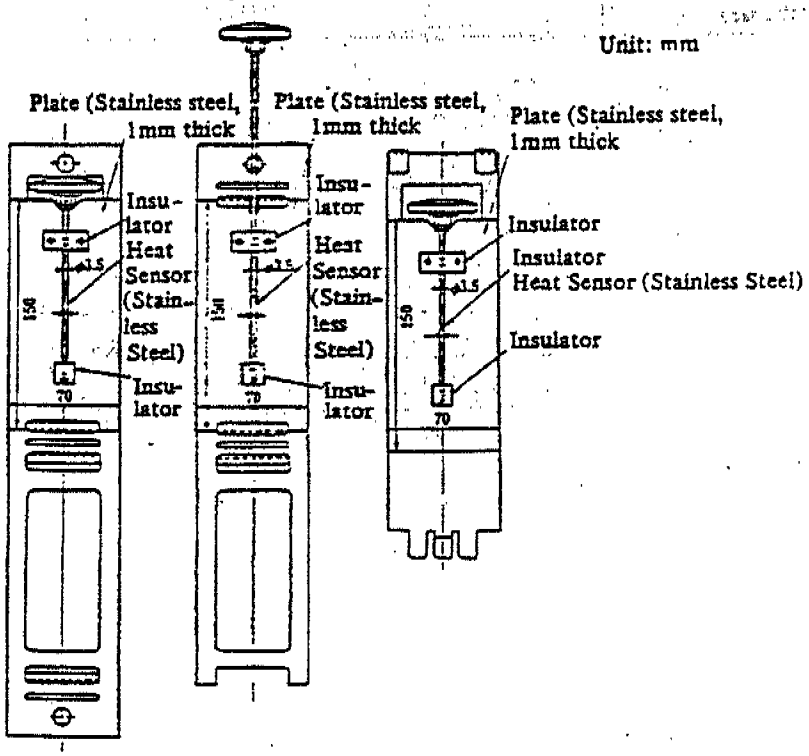
Reference Drawing 4 Black Panel Thermometer

(1) For Sunshine Carbon Weatherometer (Accelerated Weatherability and Light Resistance Test)

(2) For UV Carbon Weatherometer (Accelerated Weatherability Test)

(3) For UV Carbon Weatherometer (1-Lamp) and UV Carbon Fadeometer (Accelerated Light Resistance Test)

Unit: mm

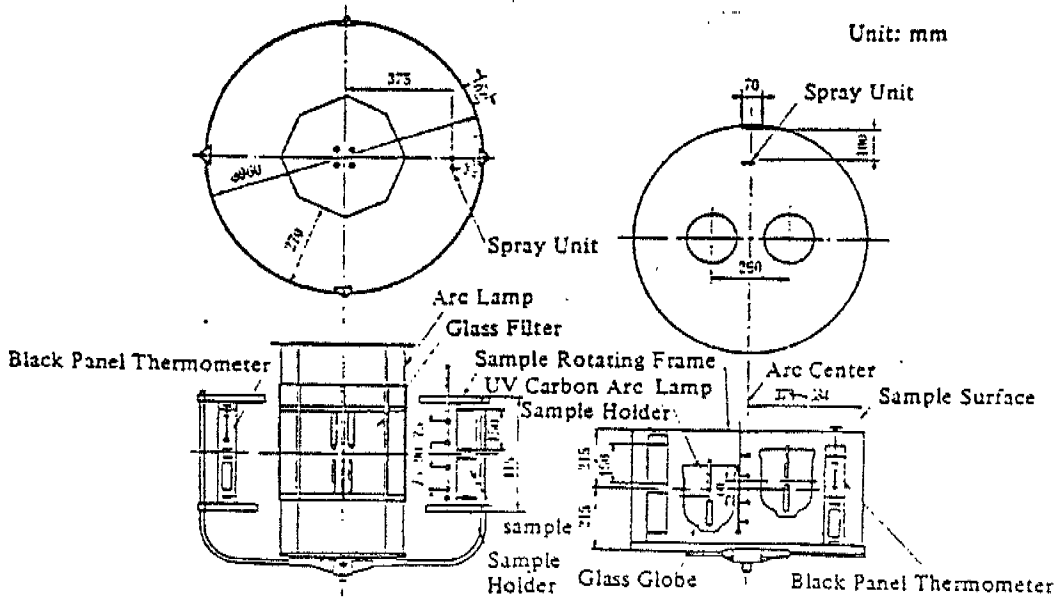


Reference Drawing 5 Positional Relationship of Arc Lamp, Sample Rotating Drum (or Frame) and Spray Unit

(1) For Sunshine Carbon Weatherometer (Accelerated Weatherability and Light Resistance Test)

(2) For UV Carbon Weatherometer (Accelerated Weatherability Test)

Unit: mm



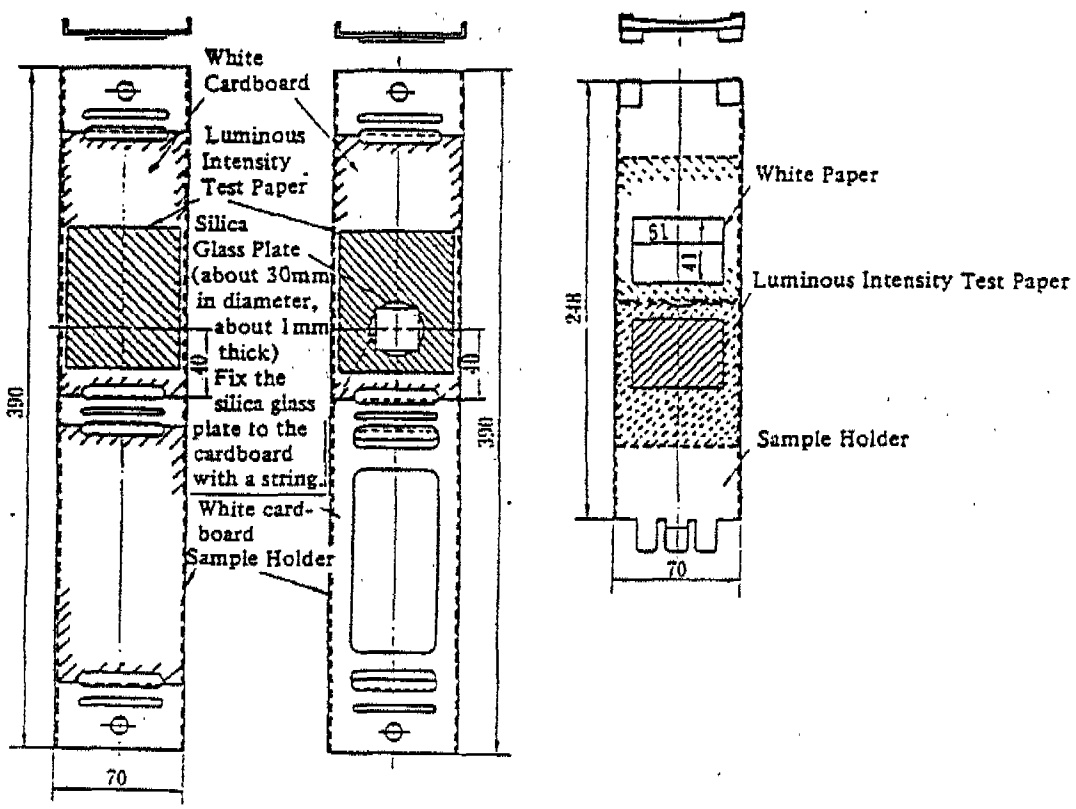
M 0139
1983

Reference Drawing 6 Luminous Intensity Test Paper Mounting Holder Unit: mm

(1) For Sunshine Carbon Weatherometer (Accelerated Weatherability and Light Resistance Test)

(2) For UV Carbon Weatherometer (Accelerated Weatherability Test)

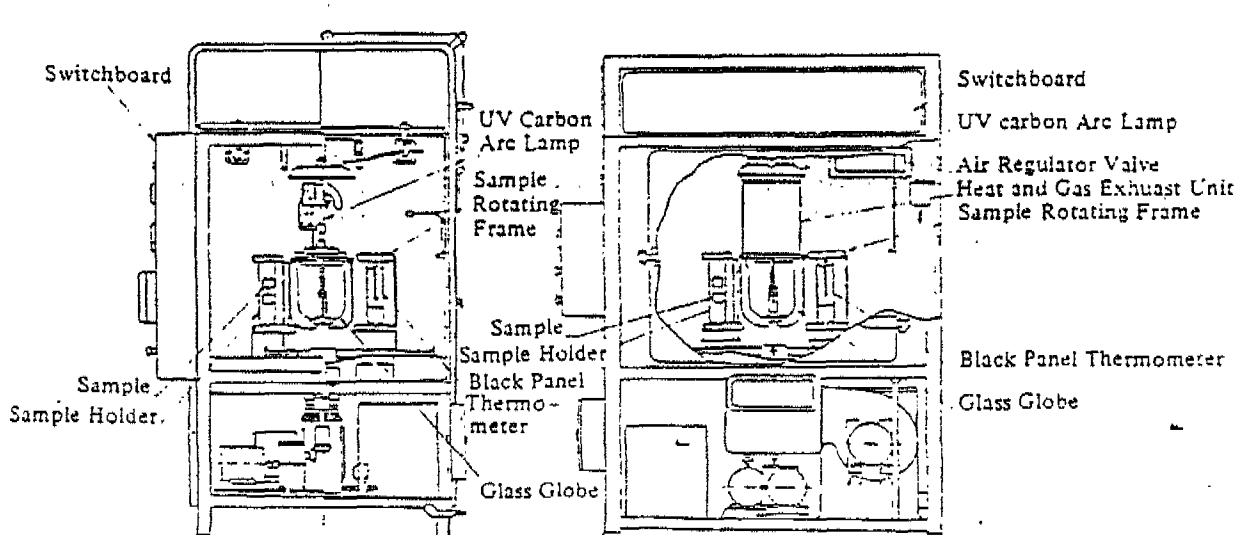
(3) For UV Carbon Weatherometer (1-Lamp) and UV Carbon Fadeometer (Accelerated Light Resistance Test)



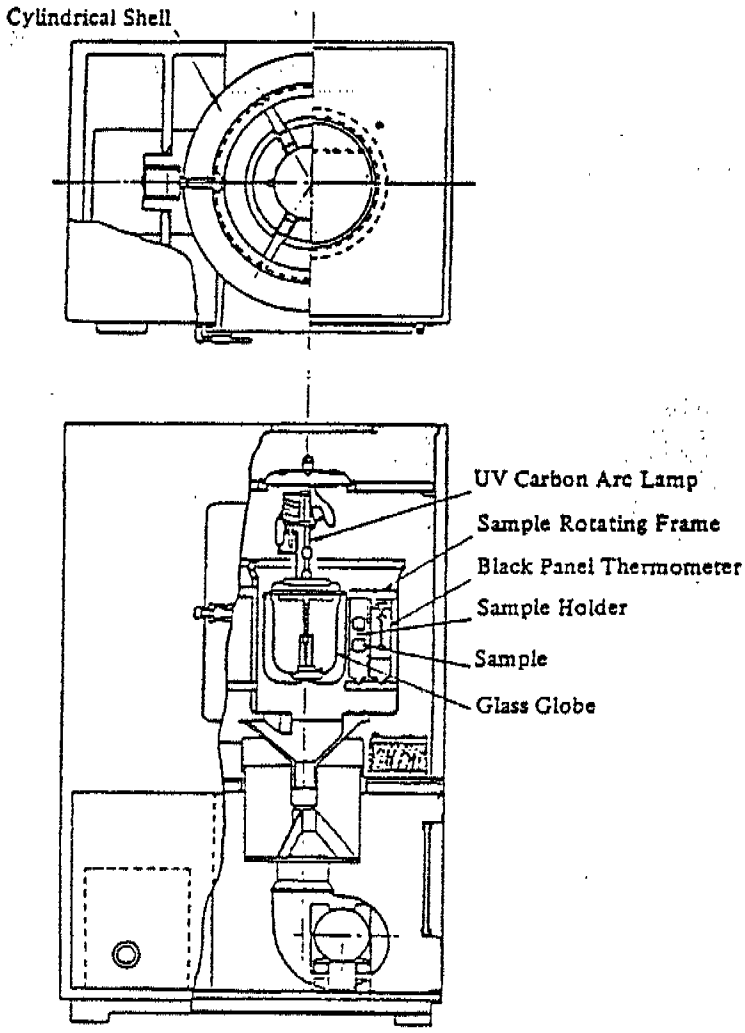
Reference Drawing 7 UV Carbon Weatherometer (1-Lamp)

(1) Open Type

(2) Closed, Air-circulating Type

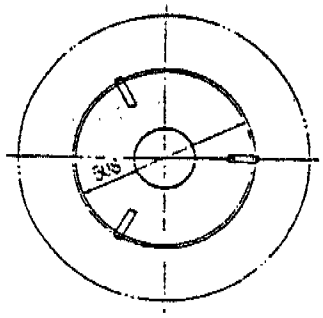


Reference Drawing 8 UV Carbon Fadeometer



Reference Drawing 9 Positional Relationship of Arc Lamp and Sample Rotating Frame
(For Accelerated Light Resistance Test)

(1) UV Carbon Weatherometer



(2) UV Carbon Fadeometer

Unit: mm