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Windshield washer fluids for automobiles

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Reference number : JIS K 2398 : 2001 (E)

Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee, as a result of proposal for revision of Japanese Industrial Standard submitted by the Japan Autochemical Industrial Association (JACA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law. Consequently **JIS K 2398** : 1989 is replaced with this Standard.

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Windshield washer fluids for automobiles

Introduction Though water repellent windshield washer fluids being similar products are different in main components and water repellency, since washing methods are the same from the viewpoint of using this product, the water repellent windshield washer fluids are unified with this Standard and added. In this revision of the standard for windshield washer fluids, the revision is carried out by a thorough review including that of the standard structure. For the revised points, classification and water repellency are adopted as new items, and for influences on rubber, the specification values are partly amended including the dispersion of the standard specimen.

1 Scope This Japanese Industrial Standard specifies the washing fluids (hereafter referred to as "washer fluids") to be used for washing the windshield of automobiles.

Remarks : Washer fluids mean the fluids to be used to remove the dirt on the windshield of automobiles by using a wiper while they are running.

2 Normative references The standards given in Attached Table 1 contain provisions which, through reference in this Standard, constitute provisions of this Standard. The most recent editions of the standards (including amendments) given in Attached Table 1 shall be applied.

3 Definitions Definitions of principal terms used in this Standard shall be as follows.

a) **water repellency** Water repellency means that a water repellent component is adsorbed onto a glass surface to form a hydrophobic film.

b) **pitting** Pitting corrosion is provided wherein metal corrosion is generated toward to an inside of metal.

4 Classification The classification of washer fluids shall be as given in Table 1.

Table 1 Classification

Classification	Properties	Symbol
Class 1	Non-water-repellent washer fluids mainly composed of alcohol and the like.	WW
Class 2	Water-repellent washer fluids(1) to which silicone and the like are added.	WC

Note (1) Washer fluid of which the water repellency measured value is ≥ 65 is classed as class 2.

5 Quality The quality of washer fluid shall conform to the requirements shown in Table 2 when it is tested in accordance with **6**. Washer fluid, which is either not colored or suitably colored, shall be homogeneous liquid containing no sediment and floating alien matters, and shall have no seriously offensive smell.

Table 2 Quality

Item				Quality		Test subclause number
				Class 1	Class 2	
Freezing point (Stock solution) °C				−20 max.		6.5
pH value	(Stock solution)			6.5 to 10.0	4.0 to 10.0	6.6
	(Minimum concentration for use)					
Detergency (Minimum concentration for use)				Comparing with reference comparison liquid, it has equal or superior clear visibility.		6.7
Miscibility (Stock solution)				No separation, nor precipitates, nor deposits	—	6.8
Water repellency (°)	(Stock solution)			—	65 min.	6.9
	(Minimum concentration for use)					
Corrosiveness on metal (Minimum concentration for use) (50 ± 2 °C) (48 h)	Change of mass mg/cm²	Aluminium		±0.30		6.10
		Brass		±0.15		
		Galvanized steel plate		±0.80		
	Appearance of test piece after test			There shall be no remarkable pitting or roughened surface except the contact part between a test piece and spacer.		
Influence to rubber (Stock solution) (50 ± 2 °C) (120 h)	Change of mass %	Natural rubber		±1.5		6.11
		Chloroprene rubber		±3.0		
	Change of hardness	Natural rubber		±5.0		
		Chloroprene rubber		±5.0		
	Appearance of test piece after test			There shall not be stickiness on surface, exfoliation of carbon black, crack, etc.		
Influence to paint film (Stock solution) (50 ± 2 °C) (6 h)	Hardness by pencil scratch test	Baked acrylic-resin enamel coating plate (Metallic color)	Blue	HB or harder		6.12
		Aminoalkyd-resin enamel coating plate (Solid color)	White	HB or harder		
			Black	HB or harder		
	Appearance of paint film surface after test			There shall be no softening or swelling of paint film, and no change of gloss nor color between before and after the test. Further the fixing of colored stuff contained in washer fluid shall be almost negligible for color.		

Table 2 (concluded)

Item				Quality		Test subclause number
				Class 1	Class 2	
Influence to plastics (Stock solution) (50±2 °C) (120 h)	Change of mass mg/cm²	Polyethylene resin		±1.0		6.13
		Polypropylene resin		±1.0		
		ABS resin		±4.0		
		Non-rigid polyvinyl chloride resin		±3.0		
		Polyacetal resin		±3.0		
	Appearance of test piece after test			No serious deformation.		
Stability for heating (50±2 °C) (8 h)		pH value	(Stock solution)	6.5 to 10.0	4.0 to 10.0	6.14
			(Minimum concentration for use)			
		Appearance of fluid after test		No crystalline precipitate.		
Stability at low temperature (−15±2 °C) (8 h)		Stock solution		No crystalline precipitate.		6.15
		Minimum concentration for use				

Remarks 1 Stock solution means the washer fluid itself taken directly out of the container.

2 The minimum concentration for use means the fluid of stock solution diluted with water by the largest dilution ratio indicated on the container.

6 Test methods

6.1 General matters The general matters concerning tests shall be in accordance with **JIS K 0050**.

Further, caution items on the test are shown as follows.

a) **Use of protective tools** If necessary, a protective tool shall be put on in order to protect skin, eyes and the like.

b) **Operation** The operation shall be carried out while safety is confirmed.

c) **Disposal of waste** A sample and the like to be discarded shall be treated so as not to become a contamination source against water quality, the atmosphere and the like.

d) **Conformance to laws** Treat following the connected laws and regulations.

6.2 Standard condition of testing place The standard condition for a testing place shall be at ordinary temperature (5 °C to 35 °C) and ordinary humidity (45 % to 85 %) which are specified in **JIS Z 8703**.

Remarks : In the next revision, ordinary temperature (23 ± 2 °C) and ordinary humidity (50 ± 5) % will be specified from the relation with **ISO**.

6.3 **Rounding off of numerical values** Rounding off of numerical values shall be carried out in accordance with **JIS Z 8401**.

6.4 **Sampling method** The sampling method shall be as follows.

a) **The number of samples to be sampled** Manufacture under the same manufacturing conditions, form a lot by products of the same quality, and sample at random the number of pieces given in Table 3 by the appropriate method such as table of random numbers according to the number of containers of the lot.

Table 3

Number of containers	Number of pieces to be sampled
1 to 1 000	1
1 001 to 50 000	2
5 001 to 10 000	3
10 001 to 30 000	4
30 001 min.	5

Remarks : The number of pieces to be sampled may be decreased according to the process capability index.

6.5 **Freezing point**

6.5.1 **Measuring apparatus for freezing point** The apparatus shall be assembled as shown in Fig. 1 with the following appliances:

a) **Cooling vessel** This is a glass Dewar vessel, measuring 2 L or more in capacity and 270 mm or more in depth.

b) **Cooling tube** This is an air-jacketed test tube which is equipped with a side pipe for exhausting inside from a jacket and the bottom of which is equipped with a small pipe. On its top, a cork or a rubber stopper is attached which has two openings for a stirrer and a thermometer.

c) **Stirrer** This is the coil-type steel stirrer (Number of coils is 5) which is made of steel wire of 1.6 mm diameter specified in **JIS G 4314**, and movable up and down by manual operation or an electric motor.

d) **Thermometer** This is either a glass bar-type thermometer having scale range from −50 °C to 0 °C and is subdivided to 0.1 °C, or an instrument of temperature which has an equal precision to this.

Unit : mm

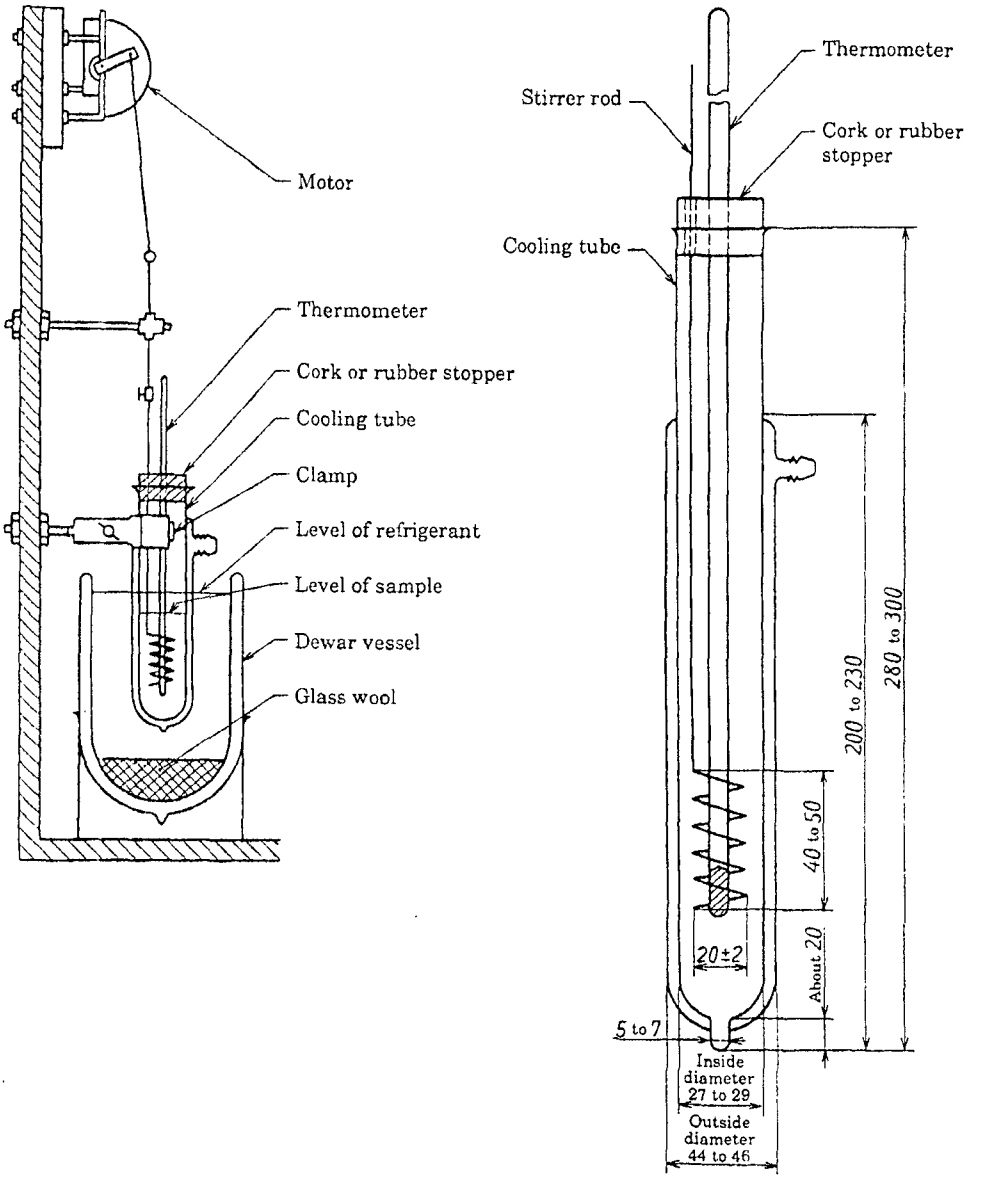

Fig. 1 An example of measuring apparatus for freezing point

6.5.2 Chemicals for refrigerant One of the following shall be used for the refrigerant.

a) **Ethanol** Ethanol specified in **JIS K 8102** or in **JIS K 1505**.

b) **Methanol** Methanol specified in **JIS K 8891** or in **JIS K 1501**.

c) **Propan-2-ol** Propan-2-ol specified in **JIS K 8839** or in **JIS K 1522**.

6.5.3 Sample Sample shall be taken from the stock solution.

6.5.4 **Operation** Operation shall be as follows:

a) Put the chemical for refrigerant in a cooling vessel, and then add gradually dry ice to prepare refrigerant.

b) Put 75 ml to 100 ml sample into a cooling tube, and attach a stirrer and thermometer to its inside by using the cork or rubber stopper.

c) Set the cooling tube into the refrigerant. At this time, make sure that the level of the sample is lower than the level of the refrigerant by about 10 mm.

d) Move up and down the stirrer at a rate of 60 to 80 times per minute from starting of cooling to finishing of measurement. In this case, adjust the movement of the stirrer so that the coil of stirrer may not get out from the liquid surface.

e) Read temperature at every one minute, and, when the reading of temperature has approached to 5 °C higher than an anticipated freezing point(2), adjust cooling rate to be about 1 °C per minute(3). When measurement approaches to the anticipated freezing point, read it at every 15 s to the nearest 0.1 °C, and draw a cooling curve as shown in Fig. 2. The point where the curve gets parallel to the abscissa shall be the freezing point.

f) Take other sample, and repeat the operations from b) to e). When the tendency different from Fig. 2 is obtained, retest.

Notes (2) Anticipated freezing point can be obtained from a preliminary test or the compounding table provided by a manufacturer.

(3) This adjustment is carried out by adjusting the degree of vacuum inside the jacket of a cooling tube or the amount of dry ice thrown in.

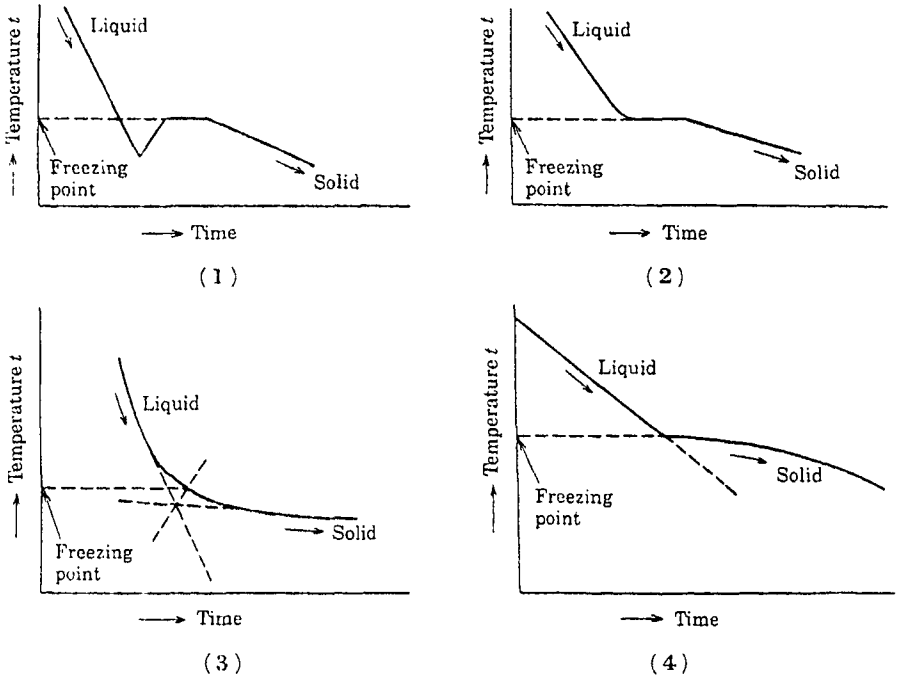

Fig. 2 Examples of cooling curves for determining the freezing point

6.5.5 Record Record two measured values after rounding off to one decimal place. When the discrepancy between two measured values is not less than 1 °C, remeasurement shall be carried out.

6.6 pH value Measure the pH value at ordinary temperature of stock solution and the fluid diluted to the lowest concentration for use, according to the measuring method using glass electrodes specified in 7 of **JIS Z 8802**.

6.7 Detergency

6.7.1 Apparatus and appliances Apparatuses and appliances shall be as follows:

a) **Testing apparatus for detergency** The testing apparatus for detergency is the wiping device shown in Fig. 3 in 8.2 of **JIS D 5710**, and shall comply with the following specification and performance.

b) **Glass** Laminated glass A or B of the class specified in **JIS R 3211**.

c) **Wiper blade** The wiper blade specified in **CPSA 0028**, Approval criteria and confirming method of criteria about the windshield washer fluids for automobiles (Approval No. 51 San No. 1355 of the Minister of International Trade and Industry), and having 380 mm in length.

d) **Pressing force of blade** The pressing force of blade shall be 4.0 to 4.5 N/380 mm^2.

e) **Tank for washer fluid** The tank for washer fluid shall be the one specified in Annex Table 1 of **JIS D 5704-1**.

f) **Spray nozzle** The number of holes for spray shall be two and their diameters shall be 1.0 mm.

g) **Pump for discharging** The amount of discharging shall be about 30 ml while a wiper arm makes 10 reciprocations.

h) **Spray for the comparing dirt** It shall be capable of spraying uniformly the comparing dirt on glass surface, and measuring the sprayed amount to the nearest 1 ml shall be possible.

6.7.2 Apparatus to prepare comparing dirt The apparatus to prepare comparing dirt shall be as follows:

a) **Fusing vessel by heating** The vessel capable of heating reagents up to 100 °C and of mixing by stirring them.

b) **Emulsifier** The emulsifier equipped with an agitator having the rotating vanes which has 4.00 m/min peripheral speed or more at the outermost end, and capable of mixing the whole amount of reagents

6.7.3 Reagents Reagents shall be as follows:

a) **Water** Water having hardness of 205 mg $CaCO_3$/L.

b) **Morpholine** Tetrahydro-1, 4-oxazine on the market.

c) **Kanto loam layer powder** That of ≤ 5 μm particle distribution specified in **JIS Z 8901**.

d) **Kerosene** Kerosene No. 1 specified in **JIS K 2203**.

e) **Silicone oil** Dimethyl polysiloxane, the viscosity of which is 350 ± 50 mm^2/S.

f) **Carnauba wax** Carnauba wax No. 1.

g) **Carbon black** Carbon black of class 12 specified in **JIS Z 8901**.

h) **Machine oil** ISO VG7 or ISO VG10 specified in **JIS K 2238**.

i) **Oleic acid** Oleic acid on the market.

j) **Methanol** Methanol specified in **JIS K 8891**.

k) **Propan-2-ol** Propan-2-ol specified in **JIS K 8839**.

l) **Surface-active agent** Non-ionic surface-active agent on the market.

Informative reference : For instance, there are PLURONIC F-108 and the like for the non-ionic surface-active agents on the market.

m) **2,2′-Iminodiethanol** 2,2′-Iminodiethanol specified in **JIS K 8453**.

n) **Diatomaceous earth** Diatomaceous earth on the market of 3 μm to 4 μm in particle size.

o) **Alumina** Alumina on the market of ≤ 20 μm in particle size.

6.7.4 Preparation of comparing dirt The preparation of comparing dirt shall be as follows:

a) Heat the composition given in Table 4 at 100 ± 3 °C in a fusing vessel, and uniformly fuse by stirring.

Table 4

Reagents	Composition (by wt. ratio)
Kerosene	42.8
Carnauba wax	2.0
Machine oil	2.0
Silicone oil	2.0
Oleic oil	2.0
Carbon black	0.2
Total	51.0

b) Weigh out 44.5 parts of water in mass, 1.5 parts of morpholine, and 3.0 parts of Kanto loam layer powder in an emulsifier, and, after heating to 90 ± 5 °C, add gradually the fused liquid at 100 ± 3 °C prepared at a) in this mixture within the lapse of 2 min to 6 min while the mixture is being stirred. Thereafter, stir for 3 min to 5 min and then allow to stand for cooling.

c) When using, stir again uniformly to prepare the comparing dirt.

6.7.5 Preparation of contrast comparing fluid The contrast comparing fluid shall be prepared by dissolving the constituents given in Table 5.

Table 5 Contrast comparing fluid

Reagents	Composition (by wt. ratio)
Methanol	26.00
Propan-2-ol	4.00
Surface-active agent	0.03
2,2'-Iminodiethanol	0.50
Water	69.47
Total	100.00

6.7.6 Sample The sample shall be of the lowest concentration for use of class 1 or class 2.

6.7.7 Operation Operations shall be as follows:

a) Pour 200 ml of the sample into the tank for washer fluid.

b) For class 1, after sufficiently polishing the surface by applying the sufficient mixture of 10 g diatomaceous earth and 2 g water to a soft cloth, wash off the glass surface by water, and make sure that the water film on the glass surface is uniform. If non-uniform, repeat the same operation again. After confirming the washing, sufficiently and naturally dry the glass surface.

c) For class 2, use alumina instead of diatomaceous earth, and carry out the operation of **b**).

d) Spray uniformly 5 ± 1 ml of comparing dirt on a clean glass plate to cover the wiping area of a wiper blade using a spray for coating comparing dirt. In this case, set the distance of spraying to be about 30 cm.

e) Thereafter, dry it naturally for 10 min.

f) Reciprocate the wiper arm 10 times while the sample is being jetted from a spray nozzle. The amount jetted during this operation shall be about 30 ml.

g) Carry out the same operations as those for the sample on the contrast comparing fluid.

In this case, the contrast comparing fluid diluted with water by the volume ratio of 1 : 2 shall be used.

h) Investigate the remaining degree of comparing dirt by visual observation from 50 cm distance apart from the glass surface, and inspect its clear visibility to compare with the result given by the contrast comparing fluid.

6.7.8 Judgement of appearance The clear visibility of the sample shall be equal or superior to that of the contrast comparing fluid. However, for class 2, a slight residue of the oil film may be neglected (provided that it may not cause abnormality in checking clear visibility).

6.8 **Miscibility** (Applicable only to class 1)

6.8.1 **Apparatus** A sample container shall be the wide-mouthed bottle with ground-in stopper specified in **JIS R 3503**.

6.8.2 **Reagents** Reagents shall be as follows:

a) **Ethanol** Grade 1 reagent specified in **JIS K 8102**.

b) **Propan-2-ol** Propan-2-ol shall be in accordance with **6.7.3 k)**.

c) **Ethylene glycol** Ethylene glycol specified in **JIS K 8105**.

d) **Water** Water shall be in accordance with **6.7.3 a)**.

6.8.3 **Preparation of miscibility test liquid** Miscibility test liquid shall be prepared in accordance with Table 6.

Table 6 Miscibility test liquid

Reagents	Composition (by volume ratio)
Ethanol	27.0
Propan-2-ol	10.0
Ethylene glycol	3.0
Water	60.0
Total	100.00

6.8.4 **Sample** Sample shall be taken from stock solution of grade 1.

6.8.5 **Operation** Place and mix uniformly 50 ml sample and 50 ml miscibility test liquid in a wide-mouthed bottle with ground-in stopper, and, after stoppering the bottle, let it stand still at ordinary temperature for 24 h. After standing it still, inspect the liquid visually for the separation of the liquid, and existence of precipitates and deposits.

6.8.6 **Judgement of appearance** There shall be found no separation, nor precipitate nor deposit in the liquid when checked visually after testing.

6.9 **Water repellency**

6.9.1 **Apparatus and appliances**

a) **Contact angle-measuring apparatus** A contact angle-measuring apparatus by the liquid drop method on the market (0° to 180° measuring range).

1) Before starting the measurement by the liquid drop method, confirm that a contact angle on the tetrafluoroethylene resin board of water specified in 3.6 (3) (water not containing carbon dioxide) of **JIS K 8001** is 109.2°. When a sample of the standard liquid drop reference is attached to the contact angle-measuring apparatus, confirmation of the contact angle may be done by that sample.

2) Since evaporation of the liquid drop occurs, measurement shall be quickly carried out.

b) **Cloth piece** Cotton-made flannel.

c) **Specimen** Cover glass or slide glass which is specified in **JIS R 3702** or **JIS R 3703**.

6.9.2 Polishing liquid Polishing liquid specified in **6.7.7 b)**.

6.9.3 Preparation of specimen After sufficiently polishing the specimen by the cloth piece to which polishing liquid is applied, wash it sufficiently by water, drain off water, and dry at ordinary temperature for 30 min.

6.9.4 Sample As a sample, take two kinds of stock solutions and liquid diluted to the lowest use concentration.

6.9.5 Operation Carry out the operation as follows.

a) **Stock solution and lowest concentration for use** Put stock solution and liquid diluted to the lowest concentration for use into a conical beaker, and make sure that it is enough amount to soak the whole specimen.

b) Put the specimen into the conical beaker, take it out after 1 min. After absorbing the sample dropped below the specimen by filter paper and the like, allow to stand for 10 ± 5 min, measure the contact angles at optional three points of the specimen, obtain an average value, and round it off to one decimal place.

6.10 Corrosiveness on metal

6.10.1 Apparatus and appliances Apparatus and appliances shall be as follows:

a) **Thermostat** The thermostat capable of keeping the temperature at 50 ± 2 °C.

b) **Wide-mouthed bottle with ground-in stopper** Two bottles of 500 ml capacity each.

c) **Chemical balance** The chemical balance specified in **8.1 (1)** of **JIS K 0050**.

d) **Waterproof abrasive paper** No. 320 of CC specified in **JIS R 6253**.

6.10.2 Reagent Acetone specified in **JIS K 8034**.

6.10.3 Test piece Test piece, the surface of which area is 20 cm^2 to 28 cm^2 (about 90 mm × 13 mm), shall be as follows. Two such test pieces shall be prepared.

a) **Aluminium** A 2024P specified in **JIS H 4000**.

b) **Brass** C 2801P specified in **JIS H 3100**.

c) **Galvanized steel plate** SGCC specified in **JIS G 3302**.

d) **Bolt** The brass bolt on the market which is sleeved by synthetic resin(4) and measures M5 × 38 mm.

e) **Spacer** Four spacers, measuring ø 12 (outside diameter) × 6.5 × ø 5.1 mm (inside diameter), made from synthetic resin(4) on the market.

f) **Nut** One brass nut on the market of which the nominal size is M5.

Note (4) This synthetic resin shall be tetrafluoroethylene resin or polyethylene resin.

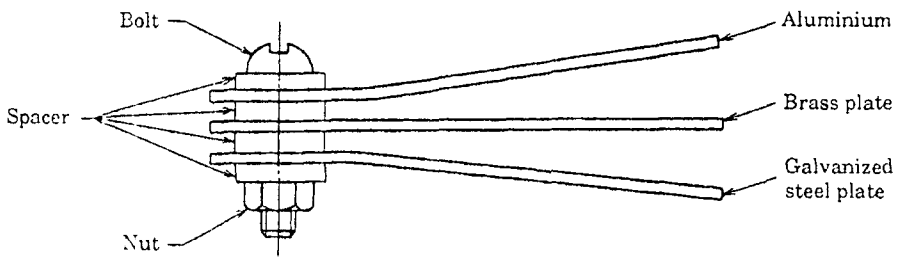

Fig. 3 Assembled test piece

6.10.4 Preparation of test piece Polish the surface of a test piece with waterproof abrasive paper, and after washing with water, wash with acetone and dry it. In the case of galvanized steel plate, avoid polishing with waterproof abrasive paper.

6.10.5 Sample The sample shall be the fluid of the lowest concentration for use.

6.10.6 Operation Operations shall be performed as follows:

a) Place respectively 400 ml of sample into two wide-mouthed bottles with ground-in stoppers.

b) Weigh respectively two test pieces to the nearest 0.1 mg in mass, and assemble a set with pieces as shown in Fig. 3 to prepare 2 sets. Place each set in a different vessel and put a cover.

c) Keep them in the thermostat which has been adjusted previously at 50 ± 2 °C, and then allow to stand still for 48 h.

d) After test is finished, remove corrosion products using a feather brush moistened with water, and wash with water and then with acetone. After drying up, weigh its mass to the nearest 0.1 mg.

6.10.7 Calculation and record The change of mass shall be calculated according to the following formula, and record the average value of two set test pieces.

$$C = \frac{W_2 - W_1}{S}$$

where, C : change of mass (mg/cm²)

W_1 : mass of a test piece before test (mg)

W_2 : mass of a test piece after test (mg)

S : whole surface area of a test piece before test (cm²)

6.10.8 Judgement of appearance When checking the surface condition of the test piece weighed in mass at **6.10.6 d)** visually and touching by hand, there shall be no remarkable pitting and roughened surface except the contact part between the test piece and spacer.

6.11 Influence to rubber

6.11.1 Apparatus and appliances Apparatus and appliances shall be as follows:

a) **Hardness tester** Either of international rubber-hardness tester specified in **JIS K 6253** or IRHD pocket hardness tester and type A of a durometer is used.

b) **Thermostat** The thermostat capable of keeping the temperature at 50 ± 2 °C.

c) **Vessel for test** The vessel specified in Fig. 20 of **JIS K 2839**. Provided that there shall be no hole.

d) **Desiccator** The suitable-sized desiccator specified in **JIS R 3503** containing desiccant.

e) **Chemical balance** The chemical balance specified in **6.10.1 c)**.

6.11.2 Test piece The test piece made of natural rubber or chloroprene rubber specified in the Appendix of **CPSA 0028**, Approval criteria and confirming method of criteria about the windshield washer fluids for automobiles; and measuring 20 mm × 50 mm × 2 mm.

6.11.3 Preparation of test piece Prepare respectively three pieces of natural rubber and chloroprene rubber, and, after slightly wiping them with clean gauze moistened with water, keep them in a desiccator for about 24 h.

6.11.4 Sample Sample shall be taken from stock solution.

6.11.5 Operation Operations shall be performed as follows:

a) Weigh the mass of each test piece to the nearest 0.1 mg.

b) Measure the hardness of each test piece by using a hardness tester.

c) Put 150 ml of sample into the vessel for test.

d) Put the test pieces, the mass and hardness of which have been respectively measured, in each vessel so as to let the test pieces of the same material be put into the same vessel. Cover each vessel, and draw the test pieces out after keeping at 50 ± 2 °C for 120 h.

e) Dry the surface of the test piece rapidly with blowing dried air on it, and inspect the surface with the naked eye and touch by hand.

f) Measure the hardness of each test piece in accordance with **b)**.

g) After slightly wiping them with moistened gauze, dry at 50 ± 2 °C for 6 h, and measure their mass to the nearest 0.1 mg.

6.11.6 Calculation and record The changes of mass and of hardness shall be calculated according to the following formulae. The change of mass shall be recorded with the averaged value of the three test pieces.

a) **Change of mass**

$$W = \frac{W_2 - W_1}{W_1} \times 100$$

where, W : change of mass (%)

W_1 : mass of a test piece before test (mg)

W_2 : mass of a test piece after test (mg)

(2) **Change of hardness**

$$H = H_2 - H_1$$

where, H : change of hardness

H_1 : hardness of a test piece before test

H_2 : hardness of a test piece after test

6.11.7 Judgement of appearance When checking the surface condition visually and touching by hand according to **6.11.5 e)**, it shall be free from separation of carbon black and stickiness.

6.12 Influence to paint film

6.12.1 Apparatus and appliances Apparatus and appliances shall be as follows:

a) **Pencil for pencil scratch test** There is the verified pencil specified in **JIS S 6006**.

Informative reference : For the pencil for pencil scratch test, the pencil verified by Incorporated Foundation Japan Paint Inspection and Testing Association is recommended.

b) **Buret with a cock** Buret of 10 ml capacity specified in **JIS R 3505**.

c) **Watch glass** The watch glass measuring 50 mm to 80 mm diameter.

d) **Thermostat** The thermostat capable of keeping the temperature at 50 ± 2 °C.

e) **Desiccator** The desiccator in accordance with **6.11.1 d)**.

6.12.2 Preparation of test piece Test pieces shall be prepared as follows:

a) The material and shape of a test plate shall be the original plate SPB specified in **JIS G 3303**, SPHC specified in **JIS G 3131** and class 1 SPCC specified in **JIS G 3141**, and its size, be 90 mm × 150 mm.

b) In the case of galvanized tin plate, polish enough to reach tin face with AA No. 320 or CC No. 320 specified in **JIS R 6253**, and then degrease with lacquer thinner specified in **JIS K 5538**. In the case of steel plate, treat similarly.

c) The following paintings shall be used.

1) To prepare baked acrylic-resin enamel coating plate, metallic type of baking-finish acrylic-resin enamel on the market shall be employed, and its color, be blue.

2) To prepare aminoalkyd-resin enamel coating plate, class 1 specified in **JIS K 5651** shall be employed, and its colour, be white and black (solid color).

d) Coating method shall conform to **3.3** of **JIS K 5600-1-1**. In this case, the thickness of coating film shall be from 20 μm to 30 μm.

6.12.3 Sample Sample shall be taken from stock solution.

6.12.4 Operation Operations shall be as follows:

a) Wipe lightly the surface of a test plate with clean gauze moistened with water, and then keep it in a desiccator at ordinary temperature for 1 h.

b) Drop respectively 0.3 ml of the sample at three spots on the test plate with a buret.

c) Cover the spots with a watch glass and keep the plate in the thermostat at 50 ± 2 °C for 6 h, and then after removing the watch glass, wash it with lightly sprayed water. After letting it stand still at ordinary temperature for 1 h, inspect the surface of coating film visually. Successively, carry out pencil scratch test at the spots, where sample has been dropped, on the plate.

d) Carry out the pencil scratch test on the three spots, where sample has been dropped, on the test plate in accordance with pencil method of **JIS K 5600-5-4**.

6.12.5 Record Record shall be performed as follows:

As to the record of pencil scratch test, if two or more values out of three spots measured values are the same, the common value shall be recorded, and if all three are different, the median shall be recorded.

6.12.6 Judgement of appearance When checked after test visually, the coating film shall be free from softening and swelling, change of gloss and colour before and after testing, and fixing of coloured matter in the sample shall be little enough to be negligible.

6.13 Influence to plastics

6.13.1 Apparatus and appliances Apparatus and appliances shall be as follows:

a) **Thermostat** The thermostat capable of keeping the temperature at 50 ± 2 °C.

b) **Holder** Glass-made holder having suitable mass and shape.

c) **Wide-mouthed bottle with ground-in stopper** 500 ml bottle specified in **JIS R 3503**.

d) **Chemical balance** The chemical balance shall be in accordance with **6.10.1 c)**.

e) **Desiccator** The desiccator shall be in accordance with **6.11.1 d)**.

6.13.2 **Reagent** Ethanol shall be in accordance with **6.8.2 a)**.

6.13.3 **Test piece** The size of a test piece shall principally be 25 mm × 50 mm × 2 mm. However, if it will be directly taken from the part of a washing device, it shall have the same surface area as the above-mentioned.

6.13.4 **Preparation of test piece** Wipe lightly the test piece with clean gauze moistened with ethanol, and after drying it by blowing dry air, keep in a desiccator for about 24 h.

The number of test pieces shall be two pieces per each type of plastics. The materials shall be as follows:

a) **Polyethylene resin** Polyethylene resin shall be as specified in **JIS K 6922-2**.

b) **Polypropylene resin** Polypropylene resin shall be as specified in **JIS K 6921-2**.

c) **Soft polyvinyl chloride resin** Soft polyvinyl chloride resin shall be as specified in **JIS K 6771**.

d) **ABS resin** ABS resin shall be as specified in **JIS K 6873**.

e) **Polyacetal resin** Polyacetal resin shall be the one on the market.

6.13.5 **Sample** Sample shall be taken from stock solution.

6.13.6 **Operation** Operations shall be as follows:

a) Measure the mass of test pieces to the nearest 0.1 mg.

b) Into each of the five wide-mouthed bottles with ground-in stopper, put two weighed test pieces of the same material respectively, and add 300 ml sample. If a test piece floats, hold it down with a holder to submerge it in the liquid, and then stopper the bottle.

c) Put the bottles in the thermostat maintained at 50 ± 2 °C, and keep for 120 h.

d) After taking out the test pieces from the bottles, wipe each piece lightly with clean gauze moistened with water, inspect its appearance visually, and weigh its mass after drying naturally at ordinary temperature for 3 h.

6.13.7 **Calculation and record** The change of mass shall be calculated according to the following formula, and the average of two values of the same material test pieces shall be recorded.

$$C = \frac{W_2 - W_1}{S}$$

where, C : change of mass (mg/cm²)

W_1 : mass of a test piece before test (mg)

W_2 : mass of a test piece after test (mg)

S : whole surface area of a test piece before test (cm²)

6.13.8 Judgement of appearance When checking visually, there shall be no remarkable deformation.

6.14 Stability for heating

6.14.1 Apparatus and appliances Apparatus and appliances shall be as follows:

a) **Thermostat** The thermostat capable of keeping the temperature at 50 ± 2 °C.

b) **pH meter** The pH meter specified in **6.6**.

c) **Wide-mouthed bottle with ground-in stopper** 120 ml capacity bottle specified in **JIS R 3503**.

6.14.2 Sample Sample shall be both the stock solution fluid and solution of the lowest concentration fluid for use.

6.14.3 Operation Operations shall be as follows:

a) Place 50 ml of sample separately into two bottles, and after stoppering, put them into the thermostat previously adjusted at 50 ± 2 °C. After keeping them under the condition for 8 h, allow them to stand still at ordinary temperature for 16 h.

b) Judge the degree of precipitation after test by visual inspection, and measure the value of pH.

6.14.4 Judgement of appearance When checking the fluid after test visually, there should be no crystalline precipitate(5).

6.15 Stability at low temperature

6.15.1 Apparatus and appliance Apparatus and appliance shall be as follows:

a) **Thermostat** The thermostat capable of keeping the temperature at −15 ± 2 °C.

b) **Wide-mouthed bottle with ground-in stopper** Two bottles of 120 ml capacity specified in **JIS R 3503**.

6.15.2 Sample Sample shall be both the stock solution fluid and solution of the lowest concentration fluid for use.

6.15.3 Operation Operations shall be performed as follows:

a) Place 50 ml of samples into wide-mouthed bottle with ground-in stopper, and stopper them. Put them in the low temperature thermostat previously adjusted at −15 ± 2 °C, and after keeping for 8 h, allow them to stand still at 20 ± 15 °C for 16 h.

b) Inspect the degree of precipitate(5) after testing visually.

Note (5) Feathery precipitation may be ignored.

6.15.4 Judgement of appearance When checking the fluid after testing visually, there shall be no crystalline precipitate(5).

7 Container Container shall be constructed so as not to cause leakage and the like while being handled.

8 Inspection When inspection is carried out in accordance with **6**, the results shall meet the requirements given in Table 2.

9 Marking The windshield washer fluid shall be marked or attached with the following items on its visible place of vessel.

a) Title of the standard

b) Name of elements

c) Name of manufacturer or its abbreviation, and its location

d) Date of manufacturing or its abbreviation

e) Net quantity

f) Dilution ratio with water and its freezing point (Dilution ratio of the lowest concentration for use of fluid shall be indicated clearly.)

g) Method for use

10 Caution to handling The following cautions to handling shall be marked or attached on the visible spot of the vessel.

a) The caution pictographs and their colours shall be in accordance with **JIS Z 9101**.

Further the following markings shall be appended to the cautions.

1 Don't let it touch on skin or eyes.

2 Keep it away from children

3 Never inhale or drink

b) Display items established by the Fire Services Law

c) Don't use for cases except for the purposes.

d) Don't mix class 2 with another washer liquid

e) First-aid instructions

f) Cautions to use

g) Storage and disposal method

Informative reference : There is self-imposed control in the industry concerning the display of washer liquid.

Attached Table 1 Normative references

JIS D 5704-1 *Automotive parts—Windshield washer systems—Requirement specifications*

JIS D 5710 *Automotive parts—Wiper arms and wiper blades*

JIS G 3131 *Hot-rolled mild steel plates, sheets and strip*

JIS G 3141 *Cold-reduced carbon steel sheets and strip*

JIS G 3302 *Hot-dip zinc-coated steel sheets and coils*

JIS G 3303 *Tinplate and blackplate*

JIS G 4314 *Stainless steel wires for springs*

JIS H 3100 *Copper and copper alloy sheets, plates and strips*

JIS H 4000 *Aluminium and aluminium alloy sheets and plates, strips and coiled sheets*

JIS K 0050 *General rules for chemical analysis*

JIS K 1501 *Methanol*

JIS K 1505 *Technical alcohol*

JIS K 1522 *Isopropyl alcohol (isopropanol)*

JIS K 2203 *Kerosine*

JIS K 2238 *Machine oils*

JIS K 2839 *Glasswares for testing apparatus of petroleum products*

JIS K 5600-1-1 *Testing methods for paints—Part 1 : General rule—Section 1 : General test methods (conditions and methods)*

JIS K 5538 *Lacquer thinner*

JIS K 5600-5-4 *Testing methods for paints—Part 5 : Mechanical property of film—Section 4 : Scratch hardness (Pencil method)*

JIS K 5651 *Aminoalkyd resin paint*

JIS K 6253 *Hardness testing methods for rubber, vulcanized or thermoplastic*

JIS K 6771 *Flexible vinyl tube*

JIS K 6873 *Acrylonitrile-butadiene-styrene (ABS) sheets*

JIS K 6921-2 *Plastics—Polypropylene (PP) moulding and extrusion materials—Part 2 : Preparation of test specimens and determination of properties*

JIS K 6922-2 *Plastics—Polyethylene (PE) moulding and extrusion materials—Part 2 : Preparation of test specimens and determination of properties*

JIS K 8001 *General rule for test methods of reagents*

JIS K 8034 *Acetone*

JIS K 8102 *Ethanol (95)*

JIS K 8105 *Ethylene glycol*

Attached Table 1 (concluded)

JIS K 8453 *2,2'—Iminodiethanol*

JIS K 8839 *2-Propanol*

JIS K 8891 *Methanol*

JIS R 3211 *Safety glazing materials for road vehicles*

JIS R 3503 *Glass apparatus for chemical analysis*

JIS R 3505 *Volumetric glassware*

JIS R 3702 *Cover glasses for microscopes*

JIS R 3703 *Slide glasses for microscope*

JIS R 6253 *Waterproof abrasive papers*

JIS S 6006 *Pencils, coloured pencils and leads for them*

JIS Z 8401 *Guide to the rounding of numbers*

JIS Z 8703 *Standard atmospheric conditions for testing*

JIS Z 8802 *Methods for determination of pH of aqueous solutions*

JIS Z 8901 *Test powders and test particles*

JIS Z 9101 *Safety colours and safety signs*

Related Standards :

JIS K 5401 *Pencil scratch tester for coated film*

FS CC-1901 *Cleaning Compound, Windshield. (Solvent and Anti-Freeze, Concentrated)*

FS P-G-406 D *Glass Cleaner, Liquid (Concentrated and Ready-to-Use)*

CPSA 0028 *"Windshield washer liquid"* No. 51-1355 approved by Minister of International Trade and Industry

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