



JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

JIS K 2234 : 2018

(JACA/JSA)

Engine antifreeze coolants

ICS 75.120

Reference number : JIS K 2234 : 2018 (E)

PROTECTED BY COPYRIGHT

K 2234 : 2018

Date of Establishment: 1965-08-01

Date of Revision: 2018-08-20

Date of Public Notice in Official Gazette: 2018-08-20

Investigated by: Japanese Industrial Standards Committee
Standards Board for ISO area
Technical Committee on Road Vehicles

JIS K 2234 : 2018, First English edition published in 2019-02

Translated and published by: Japanese Standards Association
Mita MT Building, 3-13-12, Mita, Minato-ku, Tokyo, 108-0073 JAPAN

In the event of any doubts arising as to the contents,
the original JIS is to be the final authority.

© JSA 2019

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

Printed in Japan

PROTECTED BY COPYRIGHT

Contents

	Page
Introduction	1
1 Scope	1
2 Normative references	1
3 Classification	3
4 Quality	3
5 General requirements	5
6 Sampling	5
7 Standard atmospheric conditions of testing site	5
8 Testing method	5
8.1 Density	5
8.2 Foaming property	5
8.3 Water content	6
8.4 pH value	6
8.5 Freezing point	6
8.6 Metal corrosion property	10
8.7 Circulating corrosion property	17
8.8 Corrosion property on heating surface of aluminium casting	20
9 Inspection	24
10 Colouring of solution	24
11 Marking	24
12 Precautions for handling	25

Foreword

This Japanese Industrial Standard has been revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by Japan Auto Chemical Industry Association (JACA)/Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14.

Consequently **JIS K 2234:2006** is replaced with this Standard.

However, **JIS K 2234: 2006** may be applied in the **JIS** mark certification based on the relevant provisions of Article 19 Clause 1, etc. of the Industrial Standardization Law until Aug 19, 2019.

This **JIS** document is protected by the Copyright Law.

Attention is drawn to the possibility that some parts of this Standard may conflict with patent rights, applications for a patent after opening to the public or utility model rights. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying any of such patent rights, applications for a patent after opening to the public or utility model rights.

Engine antifreeze coolants

Introduction

This Japanese Industrial Standard was established in 1965 and has gone through six revisions up to the present. The previous revision was made in 2006. Then, Class 1 AF standard, which is no longer used, is abolished, and only Class 2 LLC (LLC stands for long life coolant) is adopted in this Standard. This revision also includes the changes in the specified values of corrosion property on heating surface of aluminium casting.

No corresponding International Standard has been established at this point.

1 Scope

This Standard specifies the antifreeze coolants (hereafter referred to as antifreeze coolants) mainly composed of ethylene glycol, which are employed for prevention of freezing of cooling liquid used in a liquid-cooled internal combustion engine (hereafter referred to as cooling liquid) and for corrosion prevention of the cooling system. Antifreeze coolants shall be an aqueous solution with a concentration from 30 % volume fraction to 60 % volume fraction.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. For standards with the year indication, only the editions of the indicated year shall be applied and the revisions (including amendments) made thereafter shall not be applied. For those without the indication of the year, the most recent edition (including amendments) shall be applied.

JIS B 2401-1 *O-rings — Part 1 : O-rings*

JIS B 7414 *Glass thermometers*

JIS B 7505-1 *Aneroid pressure gauges — Part 1 : Bourdon tube pressure gauges*

JIS B 7507 *Vernier, dial and digital callipers*

JIS B 8372-1 *Pneumatic fluid power — Compressed air pressure regulators and filter-regulators — Part 1 : Main characteristics to be included in literature from suppliers and product-making requirements*

JIS C 1602 *Thermocouples*

JIS D 2602 *Rubber hoses and tubing for cooling systems for internal-combustion engines — Specification*

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

JIS G 3459 *Stainless steel pipes*

- JIS G 4305 *Cold-rolled stainless steel plate, sheet and strip*
- JIS G 4314 *Stainless steel wires for springs*
- JIS G 5501 *Grey iron castings*
- JIS H 3100 *Copper and copper alloy sheets, plates and strips*
- JIS H 5202 *Aluminium alloy castings*
- JIS K 0050 *General rules for chemical analysis*
- JIS K 0061 *Test methods for density and relative density of chemical products*
- JIS K 0068 *Test methods for water content of chemical products*
- JIS K 1501 *Methanol*
- JIS K 1522 *Isopropyl alcohol (Isopropanol)*
- JIS K 2251 *Crude petroleum and petroleum products — Sampling*
- JIS K 2503 *Testing method of lubricating oil for aircraft*
- JIS K 6922-1 *Plastics — Polyethylene (PE) moulding and extrusion materials —
Part 1 : Designation system and basis for specifications*
- JIS K 7137-1 *Plastics — Polytetrafluoroethylene (PTFE) semi-finished products —
Part 1 : Requirements and designation*
- JIS K 8034 *Acetone*
- JIS K 8102 *Ethanol (95) (Reagent)*
- JIS K 8150 *Sodium chloride*
- JIS K 8180 *Hydrochloric acid (Reagent)*
- JIS K 8355 *Acetic acid (Reagent)*
- JIS K 8541 *Nitric acid (Reagent)*
- JIS K 8622 *Sodium hydrogen carbonate (Reagent)*
- JIS K 8839 *2-Propanol (Reagent)*
- JIS K 8891 *Methanol*
- JIS K 8987 *Sodium sulfate*
- JIS R 3503 *Glass apparatus for chemical analysis*
- JIS R 3505 *Volumetric glassware*
- JIS R 6253 *Waterproof abrasive papers*
- JIS Z 3282 *Soft solders — Chemical compositions and forms*
- JIS Z 8401 *Guide to the rounding of numbers*
- JIS Z 8703 *Standard atmospheric conditions for testing*
- JIS Z 8704 *Temperature measurement — Electrical methods*

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

ISO 4793 : 1980 *Laboratory sintered (fritted) filters — Porosity grading, classification and designation*

3 Classification

Classification shall be as given in Table 1.

Table 1 Classification

Class	Symbol	Characteristic
Class 2	LLC	Capable of being used throughout a year for the purpose of prevention of freezing of cooling liquid and of corrosion prevention.

4 Quality

When tested in accordance with Clause 8, the requirements for quality given in Table 2 shall be satisfied.

Table 2 Quality requirements

Item				Specified value	Clause number	
Density (20 °C) g/cm ³				1.112 min.	8.1	
Foaming property ml		Aqueous solution of 30 vol%		4 max.	8.2	
Water content mass%				5.0 max.	8.3	
pH value (5 °C to 35 °C)		Aqueous solution of 30 vol%		7.0 to 11.0	8.4	
Freezing point °C		Aqueous solution of 50 vol%		−34.0 max.	8.5	
		Aqueous solution of 30 vol%		−14.5 max.		
Metal corrosion property Test solution of 30 vol % 88 °C ± 2 °C 336 h ± 2 h	Metal test piece	Amount of change in mass mg/cm ²	Aluminium casting	±0.30	8.6	
			Cast iron	±0.15		
			Steel	±0.15		
			Brass	±0.15		
			Solder	±0.30		
			Copper	±0.15		
	Appearance		No corrosion shall be visually observed except the part where a metal test piece contacts a spacer. A change in colour is permissible.			
	Foaming property during test			Foam shall not overflow from a cooler.		
	Properties of solution after test	pH value		6.5 to 11.0		
		Change in pH value		±1.0		
		Liquid phase		No significant change in colour. No significant change in liquid, such as separation, generation of gel, etc.		
		Amount of precipitation vol%		0.50 max.		
Circulating corrosion property Test solution of 30 vol% 88 °C ± 3 °C 1 000 h ± 2 h	Metal test piece	Amount of change in mass mg/cm ²	Aluminium casting	±0.60	8.7	
			Cast iron	±0.30		
			Steel	±0.30		
			Brass	±0.30		
			Solder	±0.60		
			Copper	±0.30		
	Appearance		No corrosion shall be visually observed except the part where a metal test piece contacts a spacer. A change in colour is permissible.			
	Properties of solution after test	pH value		6.5 to 11.0		
		Change in pH value		±1.0		
		Liquid phase		No significant change in colour. No significant change in liquid, such as separation, generation of gel, etc.		
	Condition of parts	Sealing part of pump		No failure during operation, no solution leakage or no unusual sound.		
		Internal surface of pump casing and pump vanes		No serious corrosion.		
Corrosion property on heating surface of aluminium casting Test solution of 25 vol% 135 °C ± 2 °C 168 h ± 2 h Amount of change in mass of metal test piece mg/cm ²				±1.0	8.8	

5 General requirements

The general requirements common in this test shall be as specified in **JIS K 0050**. Numerical values shall be rounded in accordance with **JIS Z 8401**.

The testing instructions shall be as follows.

- a) **Wearing of protective gear** Wear protective gear for guarding eyes and skin.
- b) **Operation** Ensure safety during operations.
- c) **Disposal of waste** Dispose of samples or the like so that these do not cause water or air pollution.
- d) **Compliance with laws and regulations** Handle each item in accordance with relevant laws and regulations.

6 Sampling

Sampling method shall be as specified in **JIS K 2251**.

7 Standard atmospheric conditions of testing site

The standard atmospheric condition of testing site shall be ordinary temperature (5 °C to 35 °C) and ordinary humidity (45 % to 85 % in relative humidity) as specified in **JIS Z 8703**.

8 Testing method

8.1 Density

Density shall be measured in accordance with 7.1 or 7.3 of **JIS K 0061**.

When density is obtained using hydrometer graduated with specific gravity (15/4 °C), the following shall apply.

$$D = 0.999\,845 \times (S_{15} - E)$$

where, D : density (20 °C) (g/cm³)
 S_{15} : indication on hydrometer graduated with specific gravity (15/4 °C)
 E : instrumental error

When density (20 °C) is obtained from specific gravity (20/20 °C), the following shall apply.

$$D = 0.998\,20 \times S_{20}$$

where, D : density (20 °C) (g/cm³)
 S_{20} : specific gravity (20/20 °C)
0.998 20: density of water (20 °C) (g/cm³)

8.2 Foaming property

8.2.1 Apparatus and instrument

Apparatus and an instrument to be used shall be a 100 ml measuring cylinder with a

stopper as specified in **JIS R 3505**.

8.2.2 Reagents

Water Deionized water having a conductivity of 0.3 mS/m or lower.

8.2.3 Operation

The operation shall be carried out as follows.

- a) Take 50 ml of sample aqueous solution of 30 % volume fraction into a measuring cylinder, and keep at $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ for 30 min.
- b) Shake the measuring cylinder hard up and down for 100 times (for about 30 s).
- c) Allow the measuring cylinder to stand still for 10 s, and read the volume of bubbles with naked eyes.

After the standstill for 10 s, if ring-shaped bubbles remain on inside wall of the measuring cylinder but no bubble is left in the centre of the solution surface, the volume of bubbles shall be judged as zero.

- d) Repeat this procedure twice, and record the average of two measurements.

8.3 Water content

Measure water content in accordance with **6.3** of **JIS K 0068**, average two measured values, and then round off the result to one decimal place.

8.4 pH value

8.4.1 pH meter

As specified in **JIS Z 8802**.

8.4.2 Reagents

Water, as specified in **8.2.2**.

8.4.3 Operation

Prepare an aqueous solution of 30 % volume fraction, measure its pH at $5\text{ }^{\circ}\text{C}$ to $35\text{ }^{\circ}\text{C}$ in accordance with Clause 8 of **JIS Z 8802**, average two measured values, and round off the result to one decimal place to obtain the pH value.

8.5 Freezing point

8.5.1 Measuring apparatus for freezing point

Set up the apparatus using the following instruments with reference to Figure 1.

- a) **Cooling vessel**, of glass Dewar bottle, measuring 2 L or more in capacity and 270 mm or more in depth, through which a cooling tube and a stirring rod are visible.
- b) **Cooling tube** Air-jacketed test tube composed of a double-layered tube with a small tube on the bottom and equipped with a cork or rubber stopper which has two openings for insertion of a stirring rod and a thermometer in the upper part.
- c) **Stirring rod**, in the form of coil (consisting of five turns) made of 1.60 mm-diameter