Road vehicles − Automatic transmission fluid

1 Scope

This standard specifies automatic transmission fluids for automobiles.

2 Normative references

The following standards referenced herein constitute part of this standard. For these normative references, the latest edition (including any supplements) applies.

JIS B7410	Liquid-in-glass thermometers for testing of petroleum product
JIS K2249	Crude petroleum and petroleum products - Determination of density and petroleum measurement tables based on a reference temperature (15 centigrade degrees)
JIS K2251	Crude petroleum and petroleum products - Sampling
JIS K2256	Petroleum products - Determination of aniline point and mixed aniline point
JIS K2265	Crude oil and petroleum products - Determination of flash point
JIS K2269	Testing methods for pour point and cloud point of crude oil and petroleum products
JIS K2283	Crude petroleum and petroleum products - Determination of kinematic viscosity and calculation of viscosity index from kinematic viscosity
JIS K2501	Petroleum products and lubricants - Determination of neutralization number
JIS K2510	Lubricants - Determination of rust-preventing characteristics
JIS K2513	Petroleum products - Corrosiveness to copper - Copper strip test
JIS K2514	Lubricating oils - Determination of oxidation stability
JIS K2518	Petroleum products - Lubricating oils - Determination of foaming characteristics
JIS K2541	Crude oil and petroleum products - Determination of sulfur content
JIS K2580	Petroleum products - Determination of color
JIS K2609	Crude petroleum and petroleum products - Determination of nitrogen content
JIS K6258	Testing methods of the effect of liquids for vulcanized rubber
JASO M347	Test method for shear stability for automatic transmission fluids
JASO M348	Test method for friction property of automatic transmission fluids
JASO M349	Test method for anti-shudder performance of automatic transmission fluids
JASO M350	Automatic transmission fluids - Compatibility test with plastic materials
JASO M357	Test method for compatibility of automatic transmission fluids with wet friction materials
ASTM D808	Standard Test Method for Chlorine in New and Used Petroleum Products (Bomb Method)
ASTM D2603	Standard Test Method for Sonic Shear Stability of Polymer-Containing Oils
ASTM D2983	Standard Test Method for Low-Temperature Viscosity of Lubricants Measured by Brookfield Viscometer
ASTM D4172	Standard Test Method for Wear Preventive Characteristics of Lubricating Fluid

Documents
Document Sharing Hub

Full document details: JASO M315 2015

(Four-Ball Method)

ASTM D4951 Standard Test Method for Determination of Additive Elements in Lubricating Oils by Inductively Coupled Plasma Atomic Emission Spectrometry

ASTM D6082 Standard Test Method for High Temperature Foaming Characteristics of Lubricating Oils

ASTM E659 Standard Test Method for Autoignition Temperature of Liquid Chemicals

CEC L-45-A99 Viscosity Shear Stability of Transmission Lubricants (Taper Roller Bearing Rig)

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 RTF

Reference fluid to be used for tests (reference transmission fluid).

3.2 Shear stability

Performance in reducing the decrease in viscosity and in viscosity index due to shearing force

3.3 Frictional characteristics

Performance specific to wet friction materials and ATFs expressed by friction coefficients obtained from friction tests on wet friction clutches. The friction tests specified by JASO include JASO M348 and JASO M349. However, in this standard, friction characteristics refer to the results of tests performed in accordance with JASO M348.

3.4 Shudder

Self-excited vibration that accompanies vibration and noise generated by the frictional characteristics of the sliding surface in wet friction clutches and friction brakes.

3.5 Anti-shudder performance

Shudder preventing performance of ATFs, which shall be evaluated in terms of initial shudder preventing performance (green shudder protection) and long-term anti-shudder property retention performance (anti-shudder durability).

3.6 Lacquer

Resinous substance that results from deterioration of ATF by heat or oxidation and adheres to the surfaces of parts after the loss of oil solubility.

4 Types and performance

Table 1 shows the required performance specifications for each type of ATF. Fluid performance specifications considered necessary for commercially available ATFs are shown for Type 1-A_{15} (high performance level), Type 2-A_{15} (minimum necessary performance level), and Type 1-A-LV_{15} (high-level performance required of low viscosity ATFs).

Documents
Document Sharing Hub
Full document details: JASO M315 2015

Table 1 − Transmission fluid types and performance

Item			Type 1		Type 2	Test method
			$1\text{-}A_{15}$	$1\text{-}A\text{-}LV_{15}$	$2\text{-}A_{15}$	
Color			6.0 to 8.0	6.0 to 8.0	6.0 to 8.0	5.2
Density			0.820 to 0.900 g/cm^3	0.820 to 0.900 g/cm^3	0.820 to 0.900 g/cm^3	5.3
Flash point			170°C or more	170°C or more	170°C or more	5.4
Ignition point			185°C or more	185°C or more	185°C or more	5.5
Kinematic viscosity	40°C		Report	Report	Report	5.6
	100°C		6.5 mm^2/s or more	Below 6.5 mm^2/s	6.5 mm^2/s or more	
Viscosity index			120 or more	120 or more	120 or more	5.7
Pour point			−40°C or less	−40°C or less	−40°C or less	5.8
Neutralization number	Acid number mg KOH/g		Report	Report	Report	5.9
	Base number mg KOH/g		Report	Report	Report	
Copper corrosion prevention performance			2 or less	2 or less	2 or less	5.10
Rust prevention performance			No visible rust on test piece surface	No visible rust on test piece surface	No visible rust on test piece surface	5.11
Aniline point			90° or more	90° or more	90° or more	5.12
BF viscosity	−20°C		Report	Report	Report	5.13
	−30°C		5,000 mPa·s or less	5,000 mPa·s or less	5,000 mPa·s or less	
	−40°C		20,000 mPa·s or less	20,000 mPa·s or less	20,000 mPa·s or less	
Shear stability (ultrasonic)	Kinematic viscosity at 100°C after test (1 Hr method)		5.7 mm^2/s or more	-	5.7 mm^2/s or more	5.14
	Kinematic viscosity at 100°C after test (10 Hrs method)		-	5.2 mm^2/s or more	-	
Element	S		Report	Report	Report	5.15
	P		Report	Report	Report	
	Zn		Report	Report	Report	
	Ca		Report	Report	Report	
	Mg		Report	Report	Report	
	B		Report	Report	Report	
	Ba		Report	Report	Report	
	Cl		Report	Report	Report	
	N		Report	Report	Report	
Oxidation stability	Kinematic viscosity increase rate		20% or less	20% or less	20% or less	5.16
	Acid number change		2.0 mg KOH/g or less	2.0 mg KOH/g or less	2.0 mg KOH/g or less	
	Lacquer		No extraneous matter	No extraneous matter	No extraneous matter	
Anti-foaming performance	Seq. I		50 - 0 mL	50 - 0 mL	50 - 0 mL	5.17
	Seq. II		50 - 0 mL	50 - 0 mL	50 - 0 mL	
	Seq. III		50 - 0 mL	50 - 0 mL	50 - 0 mL	
	Seq. IV		100 - 0 mL	100 - 0 mL	100 - 0 mL	
Material compatibility	Resin		Tensile strength retention rate 70% or more	Tensile strength retention rate 70% or more	Tensile strength retention rate 70% or more	5.18
	Rubber	Nitrile	Hardness change (IRHD): -10 to +10 Volume change rate (%): +1 to +8 Tensile strength change rate (%):Report[a] Elongation change rate(%):Report[a]	Hardness change (IRHD): -10 to +10 Volume change rate (%): +1 to +8 Tensile strength change rate (%):Report[a] Elongation change rate(%):Report[a]	Hardness change (IRHD): -10 to +10 Volume change rate (%): +1 to +8 Tensile strength change rate (%):Report[a] Elongation change rate(%):Report[a]	5.19
		Acryl				
		Fluorine				
	Wet friction material	Cyclic compression-shear fatigue test (peeling life-RTF ratio)	Report the results of either test.	Report the results of either test.	–	5.20
		Cyclic compression fatigue test (peeling life-RTF ratio)				

Documents
Document Sharing Hub
Full document details: JASO M315 2015

Table 1 − Transmission fluid types and performance (From previous page)

Item			Type 1		Type 2	Test method
			1-A_{15}	1-A-LV_{15}	2-A_{15}	
Frictional characteristics	Min. μt ratio[b] (50 to 5,000 cycles)		0.93 or more (RTF1 ratio) or 0.85 or more (T-III ratio)	0.93 or more (RTF1 ratio) or 0.85 or more (T-III ratio)	−	5.21
	Min. μt ratio[b] (50 to 500 cycles)		−		≥ 0.93 (RTF1 ratio) or ≥ 0.85 (T-III ratio)	
	Max. μo/μd (50 to 5,000 cycles)		1.10 or less	1.10 or less	1.10 or less	
	μd change rate (50 to 5,000 cycles)		10% or less	10% or less	10% or less	
Anti-shudder performance	Initial prevention	dμ/dV(0.3) @40°C	Report	Report	-	5.22
		dμ/dV(0.9) @40°C	0.0 or more	0.0 or more	-	
	Retention		Reference life ratio[c] of 1 or more or 72 hours or more	Reference life ratio[c] of 1 or more or 72 hours or more	-	
Wear prevention performance			Report[a]	Report[a]	Report[a]	5.23
Mixability			No turbidity, precipitation, separation after heating/cooling	No turbidity, precipitation, separation after heating/cooling	No turbidity, precipitation, separation after heating/cooling	5.24
Stability during storage			No turbidity, precipitation, and separation after 3 months at room temp.	No turbidity, precipitation, and separation after 3 months at room temp.	No turbidity, precipitation, and separation after 3 months at room temp.	5.25

Notes
a) Report results of RTF1 or T-III for comparison.
b) Value that minimizes the ratio of μt of the test fluid to the smallest μt value in the specified cycle range in a friction characteristics test using RTF1 or T-III.
c) The reference life is defined as the shortest of the times during which dμ/dv(0.3) and dμ/dv(0.9) at 40°C and 80°C is 0.0 or less after 24 hours or more from the start of anti-shudder performance test using RTF1 or T-III.
d) Use a testing machine with a reference life of 96 hours or more for when using RTF1.

AVA Documents
Document Sharing Hub
Full document details: JASO M315 2015

5 Test methods

5.1 Sampling method

As per JIS K 2251.

5.2 Color

As per JIS K 2580

5.3 Density

As per JIS K 2249-1, JIS K 2249-2, JIS K 2249-3, or JIS K 2249-4.

5.4 Flash point

As per JIS K 2265-4

5.5 Ignition point

As per ASTM E 659

5.6 Kinematic viscosity

As per JIS K 2283

5.7 Viscosity index

As per JIS K 2283

5.8 Pour point

As per JIS K 2269

5.9 Neutralization number

As per JIS K 2501

5.10 Copper corrosion prevention performance

As per JIS K 2513, except that the test shall be performed for 3 hours by immersion in fluid at 150°C.

5.11 Rust prevention performance

As per JIS K 2510, except that using water (distilled water), the test shall be performed for 24 hours by exposure to fluid at 60°C.

5.12 Aniline point

As per JIS K 2256

5.13 Brookfield (BF) viscosity

As per ASTM D2983, except that the measuring temperatures shall be −20, −30, and −40°C.

5.14 Shear stability

As per JASO M347

Documents
Document Sharing Hub

Full document details: JASO M315 2015