

Petroleum

Density of Gasoline

Density measurement by
Density/Specific Gravity Meter

Standard	JIS K 0061 JIS K 2249 JIS K 2202	ASTM D1250 ASTM D4052	ISO 91-1 API Std. 2540
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1. Abstract

Quality requirement of gasoline is specified by ASTM D4052, and is obliged to indicate $0.71 \sim 0.78 \text{ g/cm}^3$ in density measurement (15°C) specified by ASTM D4052.

Gasoline is the mixture of carbon hydride ($\text{C}_4 \sim \text{C}_{11}$), density of gasoline is changed continually since low carbon component is vaporized and composition is changed when it is left in the air.

Sample (gasoline) measurement of density shows a good repeatability by dispensing to a sealable sample bottle (vial bottle) in the condition where hard to expose to the air and produce steam and using a density/specific gravity meter and multiple sample changer.

2. Reference

- 1) JIS K 0061-2001 Method for Density and Specific Gravity Measurement of Chemical Products
- 2) JIS K 2202-2004 Motor Gasoline
- 3) JIS K 2249-1995 Crude petroleum and petroleum products - Determination of density and petroleum measurement tables based on a reference temperature
- 4) ASTM D1250-8 Standard Guide for Use of the Petroleum Measurement Tables
- 5) ASTM D 4052-09 Standard Test Method for Density, Relative Density, and API Gravity of Liquids by Digital Density Meter
- 6) ISO 91-1:1992 Petroleum measurement tables -- Part 1: Tables based on reference temperatures of 15 degrees C and 60 degrees F
- 7) API Std. 2540

3. Cautions in measurement

- 1) Use a fresh desiccant (silica gel). If its color is reddish, change it with new one (blue).
- 2) Before sample measurement, perform factor calibration with dry and pure water after degas.
- 3) Be careful of fire since flammable solvent is used.

4. Post-measurement care

Drain out residue inside the cell. Rinse well the measuring cell with solvent, and dry it completely.

5. Test equipment

Main unit : Density/specific gravity meter
Option : Multiple sample changer

6. Reagent

Rinse solvent : Toluene (for cleaning) rinse solvent 1
Rinse solvent : Acetone (for drying) rinse solvent 2

7. Measurement procedure

—Pretreatment—

- 1) Set the temperature of density meter to 20°C, and leave it until stabilized.
- 2) Calibrate the meter with dry air and pure water after degas.

—Measurement—

- 1) Put a sample (gasoline) in a container such as a bottle equipped with cock in the lower or washing bottle. This procedure will enable to take a sample from a container bottom without exposing to the air, and close a cover promptly.
- 2) Transfer a sample to a sealable sample bottle (vial bottle) from the container mentioned above, and close a cover promptly.
- 3) Set a sampling bottle in sample to multiple sample changer, and make sampling temperature stable.
- 4) Start measurement (20°C).
(when measurement is started, the series of sampling, measurement, cleaning and drying are automatically operated.)
- 5) Calculate density at 15°C automatically according to API Std.2540 (JIS K2249).

8. Example of measurement

— Ambient condition —

Room temperature : 20 °C	Humidity : 40 %	Whether : Fair
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— Measurement parameter —
 [Method Parameter]
 <Measurement Parameter>
 Temperature : 20.00 °C
 Stability : 1
 Limit Time : 1200 s
 Sequence : On
 Calib. : Air&Water

<Contents>
 Contents Name : Density
 Decimal : 4

<Temperature Comp.>
 Temp.Comp. : Off

<Sequence>
 Sequence File: Sequence Auto 1
 No.
 01 Sampling
 02 Meas.
 03 Drain
 04 Rince1
 05 Rince2
 06 Purge

Sampling Seq. : Auto
 Samp.Limit : 20s
 O.S.Rate : 70%
 Drain Seq. : Auto
 Drain Rate : 100%
 Rince-1 Time : 10s
 Rince-2 Time : 10s
 Purge Seq. : Auto
 Tolerance : 10

— Calibration parameter —
 [Check&Calib]
 One Point Calib.: off
 Calib. Temp. : 20.00 °C
 Stability : 1
 Viscosity : Off
 Limit Time : 600s
 Tolerance : 0.0002

(Rest of Calibration parameter)
 Sequence : On
 Sequence Name: Sequence Auto2
 Calib. Mate. : Air&Water
 Check : Off

— Sequence —
 <Sequence>
 Sequence File : Sequence Auto2
 No.
 01 Sampling
 02 Meas.
 03 Drain
 04 Rince2
 05 Purge

Sampling Seq. : Auto
 O.S.Rate : 70%
 Samp.Limit : 20s
 Drain Seq. : Auto
 Drain Rate : 100%
 Rince-1 Time : 0s
 Rince-2 Time : 10s
 Purge Seq. : Auto
 Tolerance : 10

— Measurement result — (example)
 *** Result ***
 Sample No. 01-001

Date : 2011/02/18 12:25
 Sample ID :
 Method Name : original
 Meas.Temp. : 20.00 °C
 d[g/cm3] : 0.7169

<Result>
API B (Dens.)15C
 : 0.7215

Meas.Time : 00:01:44

(Printout examples by DA-640)

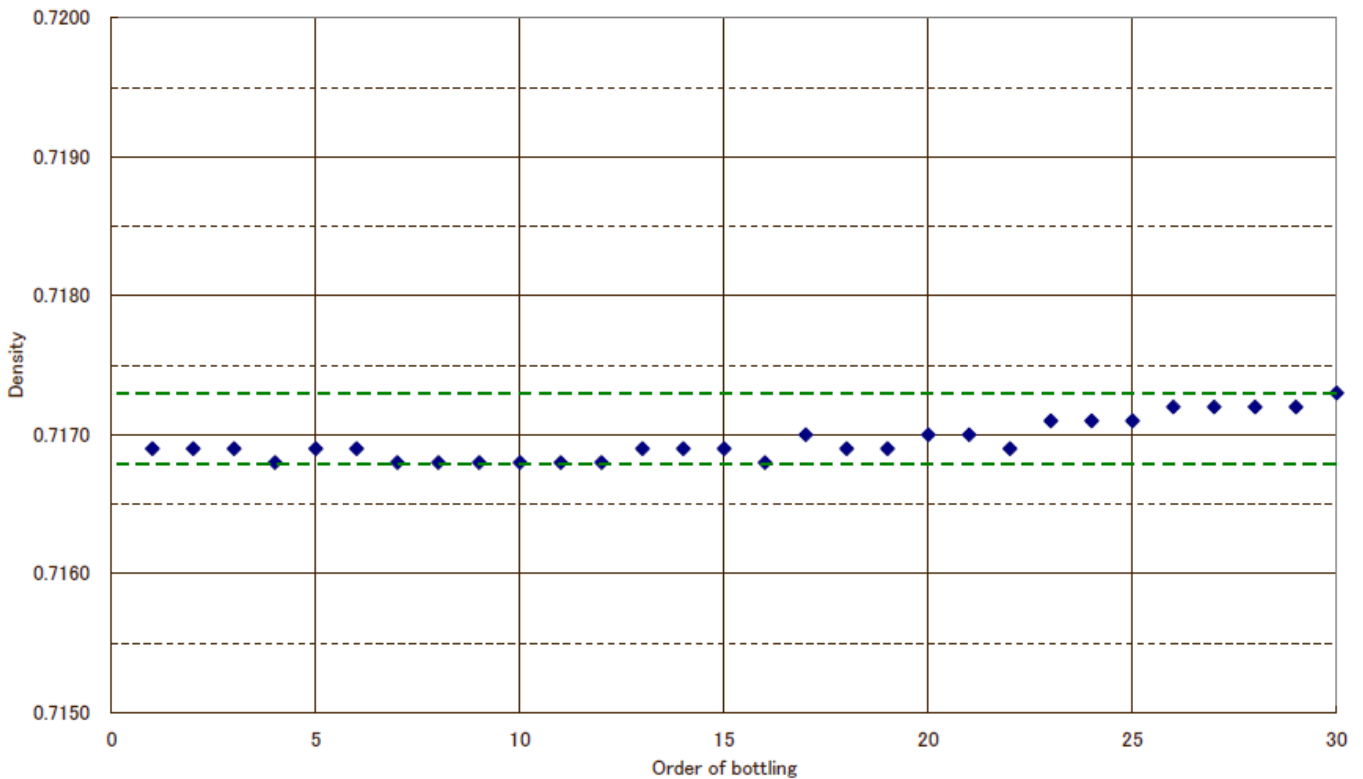
– Measurement result –

No.	Frequency	Density 20°C (g/cm ³)	API B (Dens.) 15C	No.	Frequency	Density 20°C (g/cm ³)	API B (Dens.) 15C
01	<u>104798</u>	<u>0.7169</u>	<u>0.7215</u>	16	104798	0.7168	0.7214
02	104798	0.7169	0.7215	17	104798	0.7170	0.7216
03	104798	0.7169	0.7215	18	104798	0.7169	0.7215
04	104796	0.7168	0.7214	19	104798	0.7169	0.7215
05	104798	0.7169	0.7215	20	104798	0.7170	0.7216
06	104798	0.7169	0.7215	21	104798	0.7170	0.7216
07	104797	0.7168	0.7214	22	104798	0.7169	0.7215
08	104795	0.7168	0.7214	23	104798	0.7171	0.7217
09	104796	0.7168	0.7214	24	104798	0.7171	0.7217
10	104796	0.7168	0.7214	25	104798	0.7171	0.7217
11	104797	0.7168	0.7214	26	104798	0.7172	0.7218
12	104797	0.7168	0.7214	27	104798	0.7172	0.7218
13	104798	0.7169	0.7215	28	104798	0.7172	0.7218
14	104799	0.7169	0.7215	29	104798	0.7172	0.7218
15	104798	0.7169	0.7215	30	104798	0.7173	0.7219

* The above data are the results of 30 tests of the same sample.

* Red underline shows the data from page 3/5.

Statistics		
	Density 20°C	API B (Dens.) 15C
Mean	0.7170 g/cm ³	0.7216 g/cm ³
SD	0.0002 g/cm ³	0.0002 g/cm ³
Diff. (Max-Min)	0.0005 g/cm ³	0.0005 g/cm ³



9.Summary

Sample measurement this time shows a good repeatability.

Since the following density/specific gravity meters are equipped with density conversion formula corresponding to JIS K2249·ASTM D1250·ISO91·API Std.2540, can be calculated gravity 60/60° F and gravity 15/15°C of crude petroleum(A)·fuel oil(B)·grease(D) automatically.