



## Determination of acid number in gasoline engine oil

Sheet No. **GT200-PE021E**

Petroleum

\*This application sheet is provided as reference, and does not assure the measurement results. Please consider analysis environment, external factors and sample nature for optimal conditions before the measurement.

### Outline

Acid number in gasoline engine oil is determined with titration by potassium hydroxide in 2-propanol titrant after dissolving new or used oil in titration solvent contains toluene, 2-propanol and small amount of water. The titration result is used as reference of oxidation and deterioration state of the oils for example.

Titration Type : Non-aqueous Neutralization, Titration mode: INF, Detection: pH/mV

- Reference : **ASTM D664-07** Standard Test Method for Acid Number of Petroleum Products by Potentiometric Titration

### Apparatus

Automatic titrator : GT-200

Electrodes : Reference Electrode sleeve type, Glass electrode

Reference electrode solution : 3mol/L, Lithium chloride in ethanol

Buret size : 10ml

### Reagents

- [Titrant]                    ■ 0.1mol/L- Potassium hydroxide in 2-propanol for testing neutralization number in oil
- [Prepared reagents]    ■ Titration solvent : mixed 500ml of toluene, 495ml of 2-propanol and 5ml of pure water
- 3mol/L of Lithium chloride in ethanol : Dissolve 12.7g of lithium chloride, special grade reagent, in ethanol, special grade reagent, and dilute the solution to 100ml by the ethanol.

### Analytical Procedure

[Blank measurement]

1. Add 125ml of the titration solvent into a 200ml beaker by a measuring cylinder.
2. Titrate with 0.1mol/L – potassium hydroxide in 2-propanol titrant



[Sample measurement]

1. Add proper size of sample decided by the method depending on the acid number of the sample into a 200ml beaker. 5g +/-0.5g in this sample.
2. Add 125ml of the titration solvent into the above mentioned 200ml beaker by a measuring cylinder.
3. Titrate with 0.1mol/L – potassium hydroxide in 2-propanol titrant

[Calculation]

**Acid number (mgKOH/g) = (A1 – BL) xMxExf×FW / S×R**  
**(Used prefixed formula on GT-200)**

A1 :Titration volume of 0.1mol/L- potassium hydroxide in 2-propanol titrant for sample measurement (ml)

BL :Titration volume of 0.1mol/L- potassium hydroxide in 2-propanol titrant for blank measurement (ml)

M :Molarity of 0.1mol/L- potassium hydroxide in 2-propanol titrant (0.1)

E :Equivalent number of 0.1mol/L- potassium hydroxide in 2-propanol titrant (1)

F :Factor of 0.1mol/L- potassium hydroxide in 2-propanol titrant

FW :Formula weight of potassium hydroxide (56.1)

S :Sample size(g)

R :Dilution rate (1)

### Other Requirements

- When measuring samples with pH detection, calibrate the apparatus by three standards, pH 7, 4 and 11 before measurement. Select “Sleeve type liquid: 3.3M KCL (GTRS10B)” and “Three point calibration (Input pH)” on the “pH Calibration” of GT-200.
- For using 10ml Buret, set the volume by “Setting” on the Automatic Buret’s software.
- After a measurement, wash the electrodes by the titration solvent and immerse them in pure water for 5min. as conditioning.
- Confirm reagent labels and safety data sheets for safety
- Wear protective equipment (eye protector, gloves and others.) when handling reagents.

### Measurement Results

Detection : mV

	Sample size(g)	Titrant (ml)	Results(mg KOH/g)
1	5.0218	2.5412	2.71
2	5.0136	2.5079	2.67
3	5.0592	2.5590	2.71

N 3  
 Average 2.69  
 SD 0.019  
 RSD(%) 0.70

**Detection : pH**

	Sample size(g)	Titrant (ml)	Results(mg KOH/g)
1	5.0617	2.5524	2.69
2	5.0292	2.5016	2.65
3	5.0388	2.5101	2.65

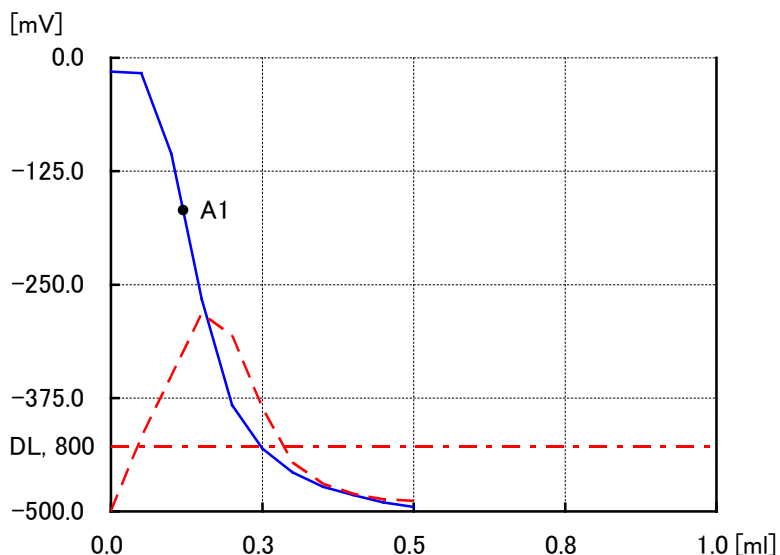
N	3
Average	2.66
SD	0.022
RSD(%)	0.81

Acid number in gasoline engine oil (0W-20) is measured by GT-200.

Average of three measurements is around 2.7mgKOH / g. The results are repeatable on both mV and pH detections.

Measurement : 2014/08/19 12:00  
 Sample Name : BLANK

Type : Sample Titr  
 Sample Size : 125 [ml]



C1 : 0.1193 [ml]

A1 : 0.1193 [ml] -168 [mV]

P-initial : -15 [mV]  
 Start : 0 [ml] -15 [mV]  
 End : 0.5 [ml] -495 [mV] Measuring Time : 5'16"

File No. : 14 OIL / Acid Number

Titr File No. : 39 Acid Number / Blank

Mode : INF End1, End1 Width : -500 [mV] ± 1000 [mV]

Detect : mV1

BRT No. : 1

Reagent : 13

WTint : 30 [sec]

Vup : 100 [μl]

Vlow : 50 [μl]

dE : 10 [mV]

dT : 10 [sec]

DL : 800 [mV/ml]

DetCnt : 3

Vmax : 20 [ml]

Vover : 0.2 [ml] C1 : A1

[ml]

Reag : 0.1M-KOH/IPA E : 1 M : 0.1 [Mol/l]

F : 1

Buret Injection Speed : 500 [ul/sec]



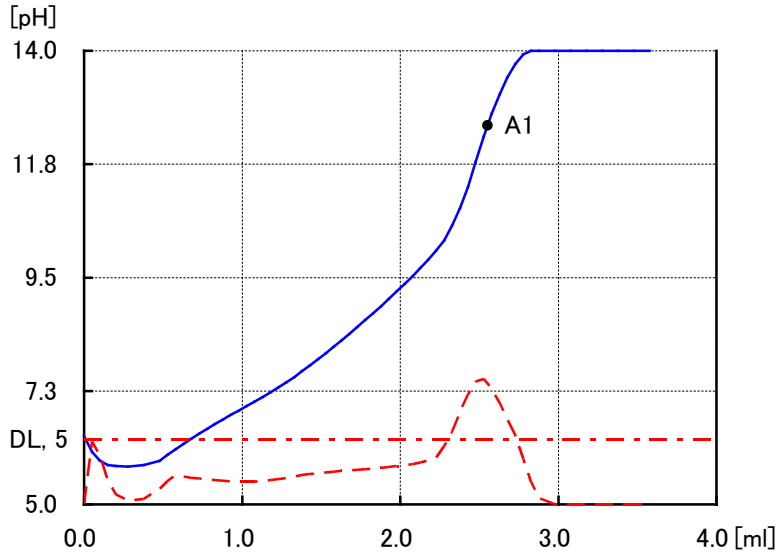


Measurement : 2014/08/20 10:47

Type : Sample Titr

Sample name : Engine oil

Sample Size : 5.0617 [g]



C1 : 2.69 [mgKOH/g]

A1 : 2.5524 [ml] 12.521 [pH]

P-initial :	6.352	[pH]		
Start :	0	[ml]	6.352	[pH]
End :	3.578	[ml]	14	[pH]

Measuring Time : 11'30"

File No. : 14 OIL / Acid Number  
Titr File No. : 36 Acid Number pH

Mode : INF End1, End1 Width : 11 [pH] ± 2 [pH]

Detect : pH

BRT No. : 1

Reagent : 13

WTint : 30 [sec]

Vup : 100 [μl]

Vlow : 50 [μl]

dE : 0.2 [pH]

dT : 10 [sec]

DL : 5 [pH/ml]

DetCnt : 10 C1 : (A1-BL)\*M\*E\*\*FW/S\*R

Vmax : 20 [ml] [mgKOH/g]

Vover : 0.2 [ml]

Reag : 0.1M-KOH/IPA E : 1 M : 0.1 [Mol/l]

F : 1 BL : 0.1261 [ml]

FW : 56.1 R : 1

Buret Injection Speed : 500 [ul/sec]