

Sheet No.

GT200-PE025ER Oil

# Determination of base number in gasoline engine oil (Perchloric acid titration) — 1/4

\*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

Base number in gasoline engine oil by perchloric acid titration is determined with titration by perchloric acid in acetic acid titrant after dissolving sample into acetic acid and chlorobenzene. The titration result is used as reference of efficiency of basic component such as antioxidant, cleaning agent etc. in the oils.

Titration Type : Non-aqueous Neutralization, Titration mode: INF, Detection: mV  
◆Reference : **ASTM D2896 (Method B)** Standard Test Method for Base Number of Petroleum Products by Potentiometric Perchloric Acid Titration

## Apparatus

Automatic titrator : GT-200  
Electrodes : eference Electrode sleeve type, Glass electrode  
Reference electrode solution : Saturated sodium perchlorate in acetic acid solution  
(Fill the supernatant liquid into the electrode)

## Reagents

[ Titrant ]

■0.1mol/L . perchloric acid in acetic acid for non-aqueous titration

[ Prepared reagents ]

■Saturated sodium perchlorate in acetic acid: Saturate sodium perchlorate mono-hydrate, special grade reagent, into acetic acid. Crystal of excessed sodium perchlorate has to be appeared in the liquid.

[ Commercial reagents ]

■Chlorobenzene ( special grade reagent)

■Acetic acid (special grade reagent)

## Analytical Procedure

[Blank measurement]

- (1) Add 40ml of chlorobenzene and 20ml of acetic acid into a 100ml beaker.
- (2) Titrate with 0.1mol/L .perchloric acid in acetic acid titrant

[Sample measurement]

- (1) Add proper size of sample depends on the estimated base number, 1g in this sample, into a 200ml beaker.
- (2) Add 40ml of chlorobenzene and 20ml of acetic acid into the above mentioned beaker.
- (3) Titrate with 0.1mol/L . perchloric acid in acetic acid titrant

Sheet No.

GT200-PE025ER

**Determination of base number in gasoline engine oil  
(Perchloric acid titration)**

2/4

[ Calculation ]

**Base number ( mgKOH/g ) = ( A1 – BL ) × M × E × f × FW / S × R****(Used prefixed formula on GT-200)**

A1 : Titration volume of 0.1mol/L- perchloric acid in acetic acid titrant for sample measurement (ml)

BL : Titration volume of 0.1mol/L- perchloric acid in acetic acid titrant for Blank measurement (ml)

M : Molarity of 0.1mol/L- perchloric acid in acetic acid titrant (0.1)

E : Equivalent number of 0.1mol/L- perchloric acid in acetic acid titrant (1)

f : Factor of 0.1mol/L- perchloric acid in acetic acid titrant

FW : Formula weight of potassium hydroxide (56.1)

S : Sample size(g)

R : Dilution rate (1)

**Other Requirements**

■Before measurement, check the electrodes with the following procedure.

(1) Dissolve 0.1g of potassium hydrogen phthalate, standard material for volumetric analysis, into 60ml of acetic acid. And, record potential with immersing the electrode into the solution.

(2) After washing the electrodes by chlorobenzene, record potential with immersing them into mixed solution, 50ml of acetic acid and 0.75ml of 0.1mol/L-perchloric acid in acetic acid solution.

Check the difference in between the above two potentials. Tolerance: above 0.3V (300mV)

■After a measurement, wash the electrodes by chlorobenzene or the titration solvent and remove contaminations completely with wiping by soft paper, cloth etc. if necessary. Then, immerse the electrodes in pure water for 5min. as conditioning. It causes unstable potential and less repeatable results that omission of cleaning and conditioning.

■Confirm reagent labels and safety data sheets for safety

■Wear protective equipment (eye protector, gloves and others.) when handling reagents.

**Measurement Results**

	Sample size(g)	Titrant (ml)	Results(mg KOH/g)
1	1.0052	0.7281	4.06
2	1.0002	0.7197	3.97
3	1.0005	0.7277	4.02

N 3

Average 4.02

SD 0.045

RSD(%) 1.11

Base number in gasoline engine oil (0W-20) is measured by GT-200. Average of three measurements on the perchloric acid titration is around 4.02mgKOH / g

Sheet No.

GT200-PE025ER

Determination of base number in gasoline engine oil  
(Perchloric acid titration)

3/4

ID No. : 1 GT No.1

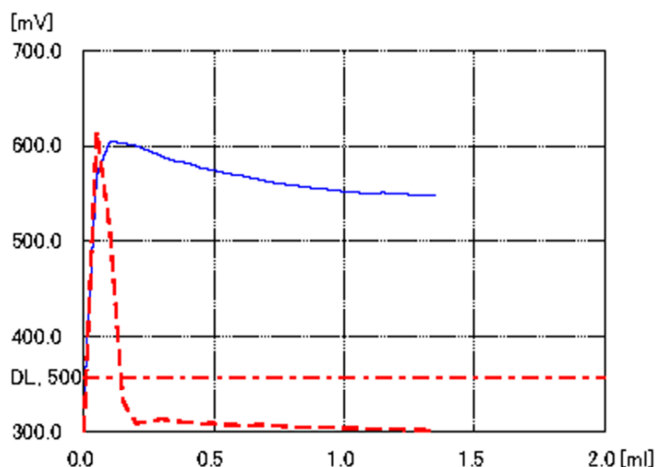
User : GT-200

Measurement : 2014/09/12 10:32

Sample Name : BLANK

Type : Sample Titr

Sample Size : 60 [ml]



P-initial : 330

[mV]

Start) : 0

[ml]

330

[mV]

End) : 1.35

[ml]

549

[mV]

Measuring Time : 2' 0"

File No. : 15 OIL / Base Number

Titr File No. : 43 Base Number B/Blank

Mode : INF

End1, End1 Width : 500 [mV]  $\pm$  1000 [mV]

Detect : mV1

BRT No. : 1

Reagent : 9

WTint : 10 [sec]

Vup : 50 [ $\mu$ l]Vlow : 50 [ $\mu$ l]

dE : 3 [mV]

dT : 3 [sec]

DL : 500 [mV/ml]

DetCnt : 1

Vmax : 5 [ml]

C1 : A1

Vover : 0.05 [ml]

[ml]

Reag : 0.1M HClO<sub>4</sub>/AcOH

E : 1

M : 0.1 [Mol/l]

F : 0.9845

Buret Injection Speed) : 250 [ $\mu$ l/sec]

Sheet No.

GT200-PE025ER

**Determination of base number in gasoline engine oil  
(Perchloric acid titration)**

4/4

ID No. : 5 GT No.1

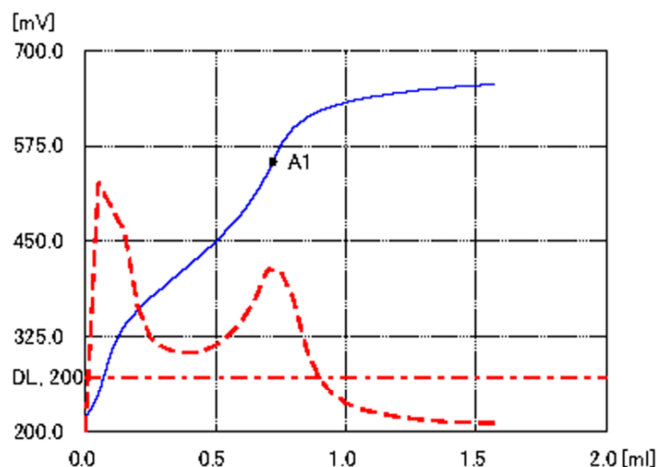
User : GT-200

Measurement : 2014/09/12 13:33

Sample Name : Engine Oil

Type : Sample Titr

Sample Size : 1.0002 [g]



C1 : 3.97 [mgKOH/g]

A1 : 0.7197 [ml] 554 [mV]

P-initial : 215 [mV]

Start : 0 [ml] 215 [mV]

End : 1.568 [ml] 656 [mV]

Measuring Time : 3' 3"

File No. : 15 OIL / Base Number

Titr File No. : 46 Base Number B

Mode : INF

End1, End1 Width : 600 [mV] ± 100 [mV]

Detect : mV1

BRT No. : 1

Reagent : 9

WTint : 30 [sec]

Vup : 250 [μl]

Vlow : 50 [μl]

dE : 3 [mV]

dT : 3 [sec]

DL : 200 [mV/ml]

DetCnt : 6

Vmax : 20 [ml]

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

Vover : 0.5 [ml]

[mgKOH/g]

Reag : 0.1M HClO4/AcOH

E : 1

M : 0.1 [Mol/l]

F : 0.9845

BL : 0 [ml]

FW : 56.1

R : 1

Buret Injection Speed : 250 [ul/sec]