

ASTM D664 – Acid number



More efficient with revised ASTM D664

Acid number determination

02

The acid number (AN) is a sum parameter for acidic compounds in petroleum products. The AN is crucial to assure the quality of petroleum products and is an important parameter in corrosion control.

The AN according to D664 is determined by potentiometric titration. An appropriate amount of well-mixed sample (see table 1 below) is weighed into a titration

vessel and a toluene-isopropanol(IPA)-water solvent mixture is added. The sample is then titrated with $c(\text{KOH in IPA}) = 0.1 \text{ mol/L}$ until after the equivalence point. After the titration, the electrode and buret tip are rinsed first with the solvent mixture, followed by IPA, and then dist. H_2O . To rehydrate the membrane, the electrode is placed for 3 to 5 min in dist. H_2O . Before the next determination, the electrode is rinsed with IPA.

Table 1. Sample size in dependency of the expected AN and solvent amount

Expected acid number	Sample weight/[g] Solvent = 125 mL	Sample weight/[g] Solvent = 60 mL
0.05 – <1.0	20.0 ± 2.0	10.0 ± 1.0
1.0 – <5.0	5.0 ± 0.5	2.5 ± 0.25
5 – <20	1.0 ± 0.1	0.5 ± 0.05
20 – <100	0.25 ± 0.02	0.25 ± 0.02
100 – <260	0.1 ± 0.01	0.1 ± 0.01

New ASTM D664 – more cost-efficient

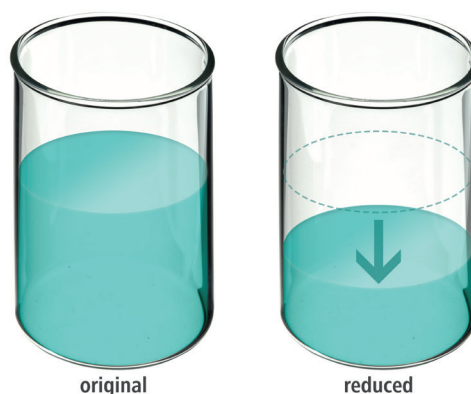
While previous ASTM D664 required 125 mL solvent mixture per sample, the new version of ASTM D664 now offers the possibility to work with only 60 mL. This considerable reduction is not only a step towards green chemistry, it further reduces the costs and increases the analysis throughput.

Reduce cost and make your chemistry green

Save almost 50% of your solvent and save 50% of your money and save the environment.

Increased productivity

For automated systems, the lower amount of solvents allows the use of smaller beakers (e.g., 120 mL beakers). The rack can thus house more beakers and so the unattended running time of the system prolongs which further reduces cost per sample.



OMNIS – even more efficient

OMNIS is Metrohm's new, fully integrated titration system that caters to the needs of today's laboratories. The OMNIS Sample Robot provides space for up to 4 workstations at which you can carry out up to 4 determinations simultaneously – fully automated. Once the samples have been processed on your OMNIS Sample Robot, they can be exchanged for new samples at any time – even during ongoing operation.

We measured the total analysis time for the acid number (AN) determination of 28 motor oil samples on an OMNIS Sample Robot S and compared it to an equivalent system with a turntable autosampler. The OMNIS Sample Robot S is equipped with 2 workstations and the determinations were carried out on the two workstations in parallel. Table 2 shows the total analysis times for the two systems.



To learn more about the advantage of automating the acid number (AN) determination with an OMNIS system watch the available video.

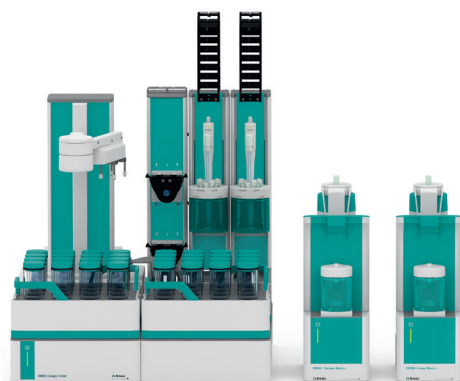


Table 2. Results of the comparison

System	Sample Robot S/OMNIS	Classical turntable autosampler
Total analysis time	4 h 14 min	6 h 23 min

Metrohm the reliable partner

As an analytical instrument manufacturer, we frequently encounter customers who face very similar issues in their daily work. This firsthand knowledge uniquely positions us to identify broader industry problems and work through the ASTM International process to develop clear and concise standards that address those problems.

We are actively involved in numerous committees that touch many industries, from environmental to refining, with the largest contributions made in committees on petroleum products, liquid fuels, and lubricants (D02);

gaseous fuels (D03); aromatic, industrial, specialty, and related chemicals (D16); and water (D19).

Our work with industry partners at ASTM has allowed us to pioneer novel applications, including the use of thermometric titration for the analysis of acid number in petroleum products (ASTM D8045) and the use of combustion ion chromatography for determining total fluorine, chlorine, and sulfur in liquefied petroleum gas (ASTM D7994).

Literature

- [1] [ASTM D664-17](#), Standard test method for acid number of petroleum products by potentiometric titration.
- [2] Metrohm Application Bulletin [AB-404](#), Determination of the total acid number in petroleum products.
- [3] Metrohm Application Note [AN-T-179](#), Determination of the acid number according to ASTM D664 and the base number in fresh motor oil.
- [4] [Collaborating to solve industry problems](#), *ASTM Standardization News*, July/August 2017 issue, p. 38–39.

Ordering information

04

Possible OMNIS system for the parallel acid number determination according to the revised ASTM D664

Component	Quantity	Order number
OMNIS Professional Titrator	1	2.1001.0310
OMNIS Dosing Module	3	2.1003.0010
OMNIS Rod Stirrer «Sample Robot»	2	2.1006.0010
Main module Pick&Place S	1	2.1010.0010
Pick&Place module	2	2.1014.0010
«Peristaltic» (4-channel) pump module	1	2.1016.0110
FEP tubing / M6 / 150 cm	4	6.1805.030
dSolvotrode	2	6.00203.300
Sample beaker (20x) PP 120 mL (P&P)	2	6.01400.200
Titration head 3xNS14 / 4 x 6.4 mm (P&P)	2	6.01403.030
Beaker adapter for OMNIS 120 mL PP sample beaker	4	6.01404.030
Stirring propeller 20 mm ETFE	2	6.01900.030
OMNIS sample rack 16 x 120 mL	2	6.02041.030
Digital measuring module	2	6.02100.010
Cable MDL PL/SO 0.5 m	1	6.02102.010
Cable MDL PL/SO 1 m	2	6.02102.020
Electrode cable plug-in head Q / plug P, 1.5 m	2	6.02104.310
Network cable, 2m	2	6.02107.010
Gripper fingers 42.8–65 mm	1	6.02601.010
OMNIS 20 mL cylinder unit	2	6.03001.210
OMNIS 50 mL cylinder unit	2	6.03001.250
OMNIS instruments license: 1 license	1	6.06002.010
OMNIS Stand-alone license	1	6.06003.010

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