

Method OIV-MA-AS312-01B

Type IV methods

Alcoholic strength by volume
(Resolution Oeno 377/2009)

1. DEFINITION

The alcoholic strength by volume is the number of liters of ethanol contained in 100 liters of wine, both volumes being measured at a temperature of 20°C. It is expressed by the symbol % vol.

Note: Homologues of ethanol, together with the ethanol and esters of ethanol homologues are included in the alcoholic strength since they occur in the distillate.

2. PRINCIPLE OF METHODS

2.1. *Distillation of wine* made alkaline by a suspension of calcium hydroxide.
Measurement of the alcoholic strength of the distillate:

2.3. *Type IV methods:*

- A. Measurement of the alcoholic strength of the distillate with a hydrometer
- B. Measurement of the alcoholic strength of the distillate by refractometry.

3. METHOD OF OBTAINING DISTILLATE

3.1. Apparatus

3.1.1 Distillation apparatus, consisting of:

- a round-bottomed 1-liter flask with ground-glass joints.
- a rectifying column about 20 cm in height or any similar condenser.
- a source of heat; any pyrolysis of extracted matter must be prevented by a suitable arrangement.
- a condenser terminated by a drawn-out tube taking the distillate to the bottom of a graduated receiving flask containing several mL of water.

3.1.2 Steam distillation apparatus consisting of:

- a steam generator
- a steam pipe
- a rectifying column
- a condenser.

Any type of distillation or steam distillation apparatus may be used provided that it satisfies the following test:

Distil an ethanol-water mixture with an alcoholic strength of 10% vol. five times in succession. The distillate should have an alcoholic strength of at least 9.9% vol. after the fifth distillation; i.e. the loss of alcohol during each distillation should not be more than 0.02% vol.

3.2. Reagents

Suspension of calcium hydroxide, 2 M

Obtain by carefully pouring 1 liter of water at 60 to 70°C on to 120 g of quicklime, CaO.

3.3. Preparation of sample

Remove the bulk of any carbon dioxide from young and sparkling wines by stirring 250 to 300 mL of the wine in a 1000 mL flask.

3.4. Procedure

Measure out 200 mL of the wine using a volumetric flask. Record the temperature of the wine.

Transfer the wine to the distillation flask and introduce the steam-pipe of the steam distillation apparatus. Rinse the volumetric flask four times with successive 5 mL washings of water added to the flask or the steam-pipe. Add

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10 mL of calcium hydroxide. 2 mol/L. and several pieces of inert porous material (pumice etc).

Collect the distillate in the 200 mL graduated flask used to measure the wine.

Collect a volume of about three-quarters of the initial volume if distillation is used and a volume of 198 to 199 mL of distillate if steam distillation is used. Make up to 200 mL with distilled water, keeping the distillate at a temperature within 2°C of the initial temperature.

Mix carefully, using a circular motion.

Note: In the case of wines containing particularly large concentrations of ammonium ions, the distillate may be redistilled under the conditions described above, but replacing the suspension of calcium hydroxide with 1 mL sulfuric acid diluted 10 /100.

Precautionary safety measures

Respect the safety guidelines for the usage of distillation apparatuses, the manipulation of hydro-alcoholic and cleaning solutions.

**4. Measurement of the alcoholic strength of the distillate
with a hydrometer or by refractometry
(Type IV Methods)**

4.1. Hydrometer

4.1.1 Apparatus

- Alcoholmeter

The alcoholmeter must conform to the specification for class I or class II equipment defined in International Recommendation No 44. *Alcoholmeters and Alcohol Hydrometers*, of the OIML (Organisation Internationale de Métrologie Légale).

- Thermometer graduated in degrees and in 0.1°C from 0 to 40°C certified to within 1/20th degree.

- Measuring cylinder. 36 mm diameter and 320 mm height, held vertically by supporting leveling screws.

4.1.2 Procedure

Pour the distillate (3.4) into the measuring cylinder. Ensure that the cylinder is kept vertical. Insert the thermometer and alcoholmeter. Read the temperature on the thermometer one minute after stirring to equilibrate the temperature of the measuring cylinder, the thermometer, the alcoholmeter and the distillate. Remove the thermometer and read the apparent alcoholic strength after one minute. Take at least three readings using a magnifying glass. Correct the apparent strength measure at $t^{\circ}\text{C}$ for the effect of temperature using Table II.

The temperature of the liquid must differ very little from ambient temperature (at most, by 5°C).

4.2. Refractometry

4.2.1 Apparatus

- Refractometer enabling refractive indices to be measured in the range 1.330 to 1.346.

Depending on the type of equipment, measurements are made:

- either at 20°C with a suitable instrument.
- or at ambient temperature $t^{\circ}\text{C}$ by an instrument fitted with a thermometer enabling the temperature to be determined to within at least 0.05°C. A table giving temperature corrections will be provided with the instrument.

4.2.2 Procedure

The refractive index of the wine distillate obtained as in 3.3 above is measured by following the procedure prescribed for the type of instrument used.

4.2.3 Expression of results

Table IV is used to find the alcoholic strength corresponding to the refractive index at 20°C.

Note: Table IV gives the alcoholic strengths corresponding to refractive indices for both pure alcohol-water mixtures and for wine distillates. In the case of wine distillates, it takes into account the presence of impurities in the distillate (mainly higher alcohols). The presence of methanol lowers the refractive index and thus the alcoholic strength.

Note: To obtain the alcoholic strength from the density of the distillate, use Tables I, II and III in Annex II to this section of this Chapter. These have been calculated from the *International Tables of Alcoholic Strength* published in 1972 by the International Legal Metrology Organization in its Recommendation No. 22 and adopted by the OIV (General Assembly, 1974). Annex I gives the general formula relating the alcoholic strength by volume and the density of alcohol-water mixtures as a function of temperature.

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