INTERNATIONAL STANDARD

ISO 3104

Second edition
1994-10-15

Petroleum products — Transparent and opaque liquids — Determination of kinematic viscosity and calculation of dynamic viscosity

Produits pétroliers — Liquides opaques et transparents — Détermination de la viscosité cinématique et calcul de la viscosité dynamique

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 3104 was prepared by Technical Committee ISO/TC 28, *Petroleum products and lubricants*.

This second edition cancels and replaces the first edition (ISO 3104:1976), of which it constitutes a technical revision.

Annexes A, B and C form an integral part of this International Standard.

Introduction

Many petroleum products, and some non-petroleum materials, are used as lubricants, and the correct operation of equipment depends upon the appropriate viscosity of the liquid being used. In addition, the viscosity of many petroleum fuels is important for the estimation of optimum storage, handling and operational conditions. Thus the accurate measurement of viscosity is essential to many product specifications.

This page intentionally left blank

Petroleum products — Transparent and opaque liquids — Determination of kinematic viscosity and calculation of dynamic viscosity

WARNING — The use of this International Standard may involve hazardous materials, operations and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

1 Scope

This International Standard specifies a procedure for the determination of the kinematic viscosity, v, of liquid petroleum products, both transparent and opaque, by measuring the time for a volume of liquid to flow under gravity through a calibrated glass capillary viscometer. The dynamic viscosity, η, can be obtained by multiplying the measured kinematic viscosity by the density, ρ, of the liquid.

NOTE 1   The result obtained from this International Standard is dependent upon the behaviour of the sample and is intended for application to liquids for which primarily the shear stress and shear rates are proportional (Newtonian flow behaviour). If, however, the viscosity varies significantly with the rate of shear, different results may be obtained from viscometers of different capillary diameters. The procedure and precision values for residual fuel oils, which under some conditions exhibit non-Newtonian behaviour, have been included.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 3105:—[1], Glass capillary kinematic viscometers — Specifications and operating instructions.

ISO 3696:1987, Water for analytical laboratory use — Specification and test methods.

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 kinematic viscosity, v: Resistance to flow of a fluid under gravity.

NOTE 2   For gravity flow under a given hydrostatic head, the pressure head of a liquid is proportional to its density, ρ. For any particular viscometer, the time of flow of a fixed volume of fluid is directly proportional to its kinematic viscosity, v, where $v = \eta/\rho$, and where η is the dynamic viscosity coefficient.

3.2 density, ρ: Mass per unit volume of a substance at a given temperature.

3.3 dynamic viscosity, η: Ratio between the applied shear stress and rate of shear of a liquid. It is sometimes called the coefficient of dynamic viscosity, or simply viscosity. Thus dynamic viscosity is a

---

1) To be published. (Revision of ISO 3105:1976)