



BSI Standards Publication

Petroleum measurement systems — Metering of viscous and high temperature liquids

National foreword

This British Standard is the UK implementation of ISO 9200:2024. It supersedes BS 7702:1993, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PTI/12, Petroleum Measurement and Sampling.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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**International
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ISO 9200

**Petroleum measurement systems —
Metering of viscous and high
temperature liquids**

*Systèmes de mesurage des produits pétroliers — Comptage des
liquides visqueux et à haute température*

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 28, *Petroleum and related products, fuels and lubricants from natural or synthetic sources*, Subcommittee SC 2, *Measurement of petroleum and related products*.

This second edition cancels and replaces the first edition (ISO 9200:1993), which has been technically revised.

The main changes are as follows:

- mass and volumetric metering is now covered;
- a description and definition of viscosity has been added along with a clarification of high viscosity and high temperature;
- the emphasis on positive displacement meters has been replaced by descriptions of other meter types including ultrasonic, Coriolis and differential pressure devices.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document is intended to guide users in the design, installation, operation, and proving of flowmeters, and their auxiliary equipment, used in the dynamic metering of viscous liquids. It also provides guidance when elevated operating temperatures are used to reduce viscosity. The document applies to Newtonian, hydrocarbon and petroleum liquids. Extra consideration should be given when using other liquids and non-Newtonian liquids.

The objective of this document is to highlight the considerations to be taken into account when metering high viscosity liquids at normal and elevated temperatures, in addition to the normal application of metering less viscous liquids at ambient temperatures.

As the viscosity of a liquid increases, the resistance to flow increases. In a fluid transfer system, this generally means that the maximum flowrate achievable for any given conduit size is reduced to avoid excessive pressure loss. This generally results in lower velocities within the measurement system than would be found in lower viscosity applications. As most flow sensors and meters require a minimum velocity to provide reasonable resolution of measurement, the operational range of the flowmeter chosen can be reduced.

Each flowmeter type and design has different limitations on the viscosity and flow range across which it operates at an acceptable accuracy. For higher viscosities and low velocities, it is probable that for many applications the flow regime is laminar rather than turbulent which again affects the performance of flowmeters.

To provide efficient transport of the fluid within a pipe, viscous liquids are often heated to reduce the viscosity. Measuring systems and the associated flowmeters are therefore selected and operated to suit the chosen operating temperature, taking into account changes in temperature and viscosity from ambient conditions.

The behaviour of the fluid should be considered carefully to recognize the potential for the liquid to solidify during idle periods and also to manage the potential for air, gas, solids, and wax content from damaging or affecting the metering system.

This document supplements the guidance documents applicable to different flowmeter designs and proving methods in the relevant ISO standards referenced in the bibliography.

Petroleum measurement systems — Metering of viscous and high temperature liquids

1 Scope

This document gives guidance for measuring a quantity of primarily viscous hydrocarbon liquid using flowmeters at ambient or elevated operating temperatures.

This document describes the effects of high viscosities and potentially high temperatures, which can induce additional errors in measurement. It also gives guidance on how to overcome or mitigate difficulties.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1 density

mass in a given volume

3.2 performance indicator

derived value which relates the meter output to the quantity measured and can be used to indicate the performance of the meter

EXAMPLE Error, meter factor, K-factor, and discharge coefficient.

3.3 pipe prover

displacement prover

device where the volume of a fluid is displaced from the calibrated length of a pipe and used to provide a calibration reference for flowmeters

3.4 pour point

lowest temperature at which a liquid product loses its flow characteristics and, under specified conditions, ceases to flow

Note 1 to entry: The temperature at which a liquid ceases to flow is based on a standard test.