

INTERNATIONAL STANDARD

ISO
91-2

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Petroleum measurement tables —

Part 2:

Tables based on a reference temperature of
20 °C

Tables de mesurage du pétrole —

Partie 2: Tables basées sur la température de référence de 20 °C



Reference number
ISO 91-2:1991(E)

ISO 91-2:1991(E)**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 91-2 was prepared by Technical Committee ISO/TC 28, *Petroleum products and lubricants*.

This first edition cancels and replaces ISO/R 91:1970/Add.1:1975, of which it constitutes a technical revision.

ISO 91 consists of the following parts, under the general title *Petroleum measurement tables*:

- *Part 1: Tables based on reference temperatures of 15 °C and 60 degrees F*
- *Part 2: Tables based on a reference temperature of 20 °C*

Annex A of this part of ISO 91 is for information only.

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Introduction

The tables reproduced in ISO/R 91:1970/Addendum 1:1975 were developed for the reference temperature of 20 °C using data prepared for the reference temperatures of 15 °C and 60 °F in 1916 and 1942. The revised tables for these latter temperatures were prepared by the American Petroleum Institute following the development of a new data base by the National Bureau of Standards (USA) and adopted in ISO 91-1:1982. Tables have not been prepared for the reference temperature of 20 °C from this new data base, but computer implementation procedures have been prepared from these data in the UK by the Institute of Petroleum and were published in October 1988. These implementation procedures were prepared as standard procedures to enable users to produce their own computer programmes either for the generation of 20 °C tables or for use in calculations without the generation of tables.

Petroleum measurement tables —

Part 2:

Tables based on a reference temperature of 20 °C

1 Scope

This part of ISO 91 refers to computer implementation procedures for the correction of densities and volumes to the reference temperature of 20 °C (see note 1). The implementation procedures referred to do not cover the full range of tables referred to in part 1 of this International Standard, but provide for those tables designated in part 1 as being for primary use. In addition, reference is made to implementation procedures for use with lubricating oils that are not included in ISO 91-1:1982 (see note 2).

This part of ISO 91 provides for the reference temperature of 20 °C, using the same expansion data as used for the tables referred to in ISO 91-1.

NOTES

1 Although the standard reference temperature for petroleum measurement adopted in ISO 5024 is 15 °C and should be used in international trade, it is recognized that its use is not yet universally accepted and that the reference temperature of 20 °C is still widely used.

2 Tables relating to lubricating oils and the reference temperatures of 15 °C and 60 °F are proposed for adoption in a revision of ISO 91-1 in course of preparation.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this part of ISO 91. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this part of ISO 91 are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO

maintain registers of currently valid International Standards.

ISO 91-1:1982, *Petroleum measurement tables — Part 1: Tables based on reference temperatures of 15 °C and 60 degrees F.*

3 Source of computer implementation procedures

3.1 The computer implementation procedures have been published by the Institute of Petroleum¹⁾ as *Petroleum measurement paper No. 3: Computer implementation procedures for correcting densities and volumes to 20 °C*, October 1988. The six implementation procedures are designated by table numbers for continuity with the tables referred to in part 1 of this International Standard and are as follows:

Table 59A — Implementation procedure for sub-routine TAB59A — Generalized crude oils — Correction of observed density to density at 20 °C

Table 60A — Implementation procedure for sub-routine TAB60A — Generalized crude oils — Correction of volume to 20 °C against density at 20 °C

Table 59B — Implementation procedure for sub-routine TAB59B — Generalized products — Correction of observed density to density at 20 °C

Table 60B — Implementation procedure for sub-routine TAB60B — Generalized products — Correction of volume to 20 °C against density at 20 °C

1) *Petroleum measurement paper No. 3* may be purchased from the publishers, The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR, United Kingdom.

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Table 59D — Implementation procedure for sub-routine TAB59D — Generalized lubricating oils — Correction of observed density to density at 20 °C

Table 60D — Implementation procedure for sub-routine TAB60D — Generalized lubricating oils — Correction of volume to 20 °C against density at 20 °C

Such publications are reprinted from time to time. If corrections are included in such reprints, the IP has agreed to advise ISO of them and an amendment will be issued to this part of ISO 91 referring to the corrections and to the date of the reprint. Users should then ensure that they have the most recent reprint.

A list of errata was published by the IP in January 1989 and supplied with all copies of *Petroleum measurement paper No. 3*. Users of this part of ISO 91 shall ensure that the corrections in the errata slip are used.

3.2 Of the tables referred to above, the series of tables 59A, 59B and 59D shall be used to convert from observed hydrometer readings, or observed densities, at an observed temperature, to density at

a temperature of 20 °C. If the input variable is observed density rather than an observed hydrometer reading, steps 3 and 4 shall be omitted. The series of tables 60A, 60B and 60D shall be used to calculate the volume correction factor for the correction of a volume at an observed temperature entering with the density at 20 °C. The procedures in these tables make use of the procedures for tables 53A and 53B, as referred to in ISO 91-1, to which reference shall also be made.

NOTE 3 In the implementation procedures relating to the conversion of hydrometer readings, the coefficient of thermal cubic expansion for glass of $23 \times 10^{-6} \text{ }^\circ\text{C}^{-1}$ has been used. This value is marginally below the conventional value quoted in ISO 1768, i.e. $25 \times 10^{-6} \text{ }^\circ\text{C}^{-1}$. This difference in coefficient is not significant for most temperature differences found in practice. It may be corrected for by subtracting $0,000\,002 R' (\theta - 20)$ from the hydrometer reading, before entering tables 59A, 59B and 59D with readings made using hydrometers complying with ISO 649-1, where R' is the hydrometer reading and θ the observed temperature, if it is agreed between the interested parties that the temperature difference $(\theta - 20)$ is sufficient for the error to be otherwise significant.

Annex A (informative)

Bibliography

- [1] ISO 649-1:1981, *Laboratory glassware — Density hydrometers for general purposes — Part 1: Specification.*
- [2] ISO 1768:1975, *Glass hydrometers — Conventional value for the thermal cubic expansion coefficient (for use in the preparation of measurement tables for liquids).*
- [3] ISO 5024:1976, *Petroleum liquids and gases — Measurement — Standard reference conditions.*

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