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Australian Standard®

Liquid hydrocarbons—Dynamic measurement—Proving systems for volumetric meters

Part 1: General principles

This Australian Standard was prepared by Committee ME/49, Oil and Gas Measurement. It was approved on behalf of the Council of Standards Australia on 15 August 1994 and published on 5 January 1995.

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Australian Customs Service
Australian Gas Association
Australian Institute of Petroleum
Australian Institute of Physics
Australian Liquefied Petroleum Gas Association
Australian Petroleum Exploration Association
CSIRO, Division of Applied Physics
Department of Primary Industries and Energy
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PREFACE

This Standard was prepared by the Standards Australia Committee on Oil and Gas Measurement and is designated Part 1 of a series of Standards dealing with petroleum liquid measurement systems under the general title *Liquid hydrocarbons—Dynamic measurement—Proving systems for volumetric meters*. Part 1 covers *General principles*.

Other Standards or proposed Standards in this series are as follows:

Part 2: Pipe provers
Part 3: Pulse interpolation
Part 4: Temperature corrections in volumetric calibration by water transfer method
Part 5: Dynamic measurement

The Standard is identical with and has been reproduced from ISO 7278.1:1987, *Liquid hydrocarbons—Dynamic measurement—Proving systems for volumetric meters*, Part 1: *General principles*.

For the purpose of this Australian Standard, the ISO text should be modified as follows:

(a) *Delete* the following wording in Clause 4.8 lines 7 and 8: 'of these two runs'.

(b) *Replace* any references to 'International Standard' with 'Australian Standard'.

Reference to International Standard		*Australian Standard*
ISO		AS
4124	Liquid hydrocarbons—Dynamic measurement—Statistical control of volumetric metering systems	—

Under arrangements made between Standards Australia and the International Standards bodies, ISO and IEC, as well as certain other Standards organizations, users of this Australian Standard are advised that the number of this Standard is not reproduced on each page; its identity is shown only on the cover and title pages.

AUSTRALIAN STANDARD

Liquid hydrocarbons — Dynamic measurement Proving systems for volumetric meters —

Part 1:
General principles

0 Introduction

This document is the first part of an International Standard on proving systems for meters used in dynamic measurement of liquid hydrocarbons. Future parts of ISO 7278 will provide more detailed descriptions of pipe provers, tank provers and pulse interpolation techniques; these parts are in preparation. Parts covering other aspects or types of proving systems may be added as the need arises.

The purpose of proving a meter is to determine its relative error or its meter factor as a function of flow rate and other parameters such as temperature, pressure and viscosity.

The purpose of determining the relative error is to find out whether the meter is working within prescribed or specially accepted limits of error, whereas the meter factor is used to correct any error in the indication of a meter by calculation.

1 Scope and field of application

This part of ISO 7278 provides general principles for proving systems for meters used in dynamic measurement of liquid hydrocarbons.

2 Reference

ISO 4124, *Liquid hydrocarbons — Dynamic measurement — Statistical control of volumetric metering systems.*[1)]

3 Types of prover

3.1 The following types of proving systems are in use:

a) tank prover systems;

b) pipe provers, bidirectional and unidirectional. Pipe provers with precision tubes as described in 6.7 are available for special applications;

c) master meters. Indirect procedure of volume comparison which causes additional uncertainties can be used for all liquids and flow rates, provided that the master meter is proved against acceptable proving systems under conditions which simulate those under which it will operate. Sometimes, a meter is used as a means of standardization of transfer; this equipment is generally known as a “master meter”.

3.2 Provers can be used either connected (fixed or mobile) to the metering station or in a central proving station to which the meters or the measures can be taken to be proved.

3.3 In order to limit the maximum uncertainty to ± 0,01 % when using a pulse generator for proving, at least 10 000 pulses shall be obtained from the meter per proving run. This number of pulses can be reduced by pulse interpolation techniques which allow either the use of meters with fewer pulses per unit volume or reduction of the prover volume.

4 General considerations

4.1 A meter should be proved at the expected operating or prescribed or agreed rates of flow, under the pressure and temperature at which it will operate and on the liquid which it will measure. In situations where it is not feasible to prove the meter on the liquid to be metered, the meter should be proved on a liquid having a density, viscosity and, if possible, temperature as close as possible to those of the liquid to be measured. A meter that is used to measure several different liquids shall be proved on each such liquid. Similar liquids may be used if a simple, known relationship exists between the relative error, flow rate and viscosity, provided that the uncertainty of measurement remains within acceptable limits. In any event, calibration should take place at a flow rate equivalent to that at which the meter will be used.

A meter shall be proved in different circumstances as follows:

a) Initial proving. This shall be carried out on the permanent location or in a central station where the expected conditions of operation can be reproduced. The initial proving makes it possible to determine the relationship between the relative error (or meter factor) and different parameters such as viscosity or temperature.

1) At present at the stage of draft.