

INTERNATIONAL STANDARD



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Measurement of gas flow in conduits — Tracer methods — Part I : General

*Mesurage de débits de gaz dans les conduites — Méthodes par traceurs —
Partie I : Généralités*

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FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up 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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 4053/1 was developed by Technical Committee ISO/TC 30, *Measurement of fluid flow in closed conduits*, and was circulated to the member bodies in September 1976.

It has been approved by the member bodies of the following countries :

Australia	Italy	Turkey
Belgium	Korea, Rep. of	United Kingdom
France	Mexico	U.S.A.
Germany	Netherlands	Yugoslavia
India	Romania	

The member body of the following country expressed disapproval of the document on technical grounds :

Japan

Measurement of gas flow in conduits – Tracer methods – Part I : General

0 INTRODUCTION

This International Standard is the first of a series of standards covering tracer methods of gas flow measurement in conduits.

The complete series of standards will be as follows :

- *Part I : General.*
- *Part II : Constant rate injection method using non-radioactive tracers.*
- *Part III : Constant rate injection method using radioactive tracers.*
- *Part IV : Transit time method using radioactive tracers.*

1 SCOPE AND FIELD OF APPLICATION

This International Standard deals with the measurement of gas flow in conduits by using tracer methods.

In a steady flow of compressible fluid, the only conservative parameter is the mass rate of flow q_m . Therefore the whole of this International Standard will refer to mass rate of flow q_m .

However, for those fluids for which the composition (and therefore, the mass density) may not be known accurately, the volume rate of flow q_v could be measured, it being understood that this volume rate of flow is only valid for the conditions of temperature and pressure at which it has been measured.

This International Standard applies to flow measurement in conduits into which a tracer can be injected in such a way that effective mixing in single phase with the gas flowing in the pipe can be achieved.

The fluid in the conduit can be a mixture of several gases provided the thermodynamic state and conditions of flow of this mixture are well defined.

Two fundamental test procedures are used :

- The first, known as the constant rate injection method, is based on the dilution principle : a tracer solution is injected into the conduit and the dilution (ratio) of this tracer in the gas flowing in the conduit is determined, this dilution being proportional to the rate of flow.

- The second is a method of measurement of the transit time (formerly called Allen velocity method) : the tracer is injected into the conduit and the time taken by the tracer to travel a specified length between two cross-sections in each of which it is detected, is measured.

The advantages and disadvantages of these two methods are considered in clause 4. The distance between injection and measuring sections shall be sufficient to achieve mixing of the tracer with the gas flowing in the conduit according to the methods; the adequate mixing distance is considered in clause 6.

A large number of different tracers may be used, such as radioactive or non-radioactive, mineral or organic materials. The choice of tracer depends on the circumstances of the measurement (see clause 5). The uncertainty of the measurements may be less than 1 % under good conditions (see clause 7).

2 VOCABULARY AND SYMBOLS

The vocabulary and symbols used in this International Standard are defined in ISO 4006, *Measurement of fluid flow-rate in closed conduits – Vocabulary and symbols*.

3 UNITS

The basic units in this International Standard are SI units.

4 CHOICE OF METHOD

4.1 Comparison between dilution method and method based on transit time measurement.

4.1.1 Advantages of the dilution method

It is not necessary to know the geometrical characteristics of the conduit.

It is not necessary that the conditions of the gas flow rate (p , T) be constant along the measuring length.