



**International
Standard**

ISO 3966

**Measurement of fluid flow in closed
conduits — Velocity area method
using Pitot static tubes**

*Mesurage du débit des fluides dans les conduites fermées —
Méthode d'exploration du champ des vitesses au moyen de tubes
de Pitot doubles*

**Fourth edition
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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.

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This document was prepared by Technical Committee ISO/TC 30, *Measurement of fluid flow in closed conduits*, Subcommittee SC 5, *Velocity and mass methods*.

This fourth edition cancels and replaces the third edition (ISO 3966:2020), which has been technically revised.

The main changes are as follows:

- in Bibliography, new references were added;
- in [3.1.9](#) the wrong word “length” was corrected by “length”;
- in [3.2](#) the “cross-sectional area of the conduit” was replaced by “inner cross-sectional area of the conduit”;
- in [3.2](#) the “pipe diameter” was replaced by “inner pipe diameter”;
- in [3.2](#) the “rectangular conduit height” was replaced by “rectangular conduit inner height”;
- in [3.2](#) the “rectangular conduit width” was replaced by “rectangular conduit inner width”;
- in [3.2](#) the “pipe radius” was replaced by “inner pipe radius”;
- in [6.1.2](#) devices for improving flow conditions were mentioned;
- in [4.1](#) the “±” in the sentence “.....not greater than ±2 %” was deleted;
- in [4.1.1](#), term “peripheral flow rate” was added and description was revised;
- in [6.1.2](#), sentence “The length of straight pipe.....” was replaced by “The straight length (see [3.1.9](#)) of pipe.....”;
- two new [subclauses 6.1.4](#) and [6.1.5](#) were added;
- the sentence in [6.1.6](#) “..... be remedied using one of the devices” was replaced by “..... be remedied using one or more of the devices”

- figures were added into [6.2.1](#) and [6.2.2](#) and effects of anti-swirl devices and profile developers were added likewise;
- two new [subclauses 6.2.3](#) and [6.2.4](#) were added and the related [6.2.5](#) was modified likewise;
- the sentence in [6.2.5](#) “.....and in any case at a distance.....” was replaced by “.....and generally at a distance.....”;
- in [6.4.3](#) the “±” in the sentence “.....does not exceed ±0,5 %” was deleted;
- in [8.2](#), the “.....at Reynolds numbers, v , based on.....” was replaced by “.....at Reynolds numbers, Re , based on.....”;
- the essential [Formula \(8\)](#) has been corrected;
- the values in the essential [Formula \(9\)](#) has been updated;
- [Formula \(11\)](#) for the density of moist air was added and the related [Formulae \(12\)](#) to [\(14\)](#) were added likewise;
- the essential [Formula \(20\)](#) has been corrected from $\sum_{i=2}^{i=n-2} u_i$ to $\sum_{i=2}^{n-2} u_i$ and in the NOTE, “[Formula \(1\)](#)” was corrected by “[Formula \(20\)](#)”;
- the essential [Formula \(22\)](#) has been corrected from $\sum_{i=3}^{i=n-2} u_i$ to $\sum_{i=3}^{n-2} u_i$;
- in [11.1.1](#) and [11.2.1](#) the “ r/R_i ” was replaced by “ r_i/R ” and the “ y/D_i ” was replaced by “ y_i/D ”;
- in [Figure 12](#) and in [12.4](#) “distance of the total pressure tapping to the plane of static pressure tapings” was replaced by “distance from the axis of stem to the plane of static pressure holes”;
- in [12.2.2](#) and [B.1](#) k was replaced by k_g ;
- in [13.6.1](#) the “±” in the sentence “.....is $\pm v_{\max}/2$ ” was deleted;
- in [Clause 13](#), phrases “standard deviation” were replaced by phrases “standard uncertainty” and symbols “ σ ” of “standard deviation” were replaced by “ u ” of “standard uncertainty” accordingly.
- the 8th footnote for “standard deviation” was revised;
- in [Clause 13](#), words “tolerance” were replaced by phrases “expanded uncertainty” and symbols “ δ ” of “tolerance” were replaced by “ U ” of “expanded uncertainty” accordingly.
- in [13.5.3](#), the “±” in the [Formula \(40\)](#) was deleted;
- [Figure A.4](#) was shifted before [A.2](#);
- in [Formula \(C.7\)](#), “ $\frac{1}{2} \rho v^{-2} = \dots$ ” was revised as “ $\frac{1}{2} \rho \bar{v}^2 = \dots$ ”;
- the essential [Formula \(E.6\)](#) has been corrected;
- in [Annex G](#) introduction, “errors” were replaced by “uncertainties”;
- in [G.1](#), word “Error” in the title was replaced by “Uncertainty” and phrases “standard deviation of error” were replaced by phrases “relative standard uncertainty” and symbols “ σ ” were replaced by “ u ” accordingly;
- in [G.2](#), word “Error” in the title was replaced by “Uncertainty” and phrases “standard deviation of error” were replaced by phrases “relative standard uncertainty” and symbols “ σ ” were replaced by “ u ” accordingly; Words “tolerance” were replaced by phrases “expanded uncertainty” and symbols “ δ ” of “tolerance” were replaced by “ U ” of “expanded uncertainty” accordingly; The “±” in the last sentence of [G.2](#) “.....less than ±2 %” was deleted;

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— all the sections, mathematical formulae and figures have been renumbered.

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