
**Vacuum technology — Vacuum
gauges — Specifications for hot
cathode ionization gauges**

*Technique du vide — Manomètres à vide — Spécifications pour les
manomètres à ionisation à cathode chaude*



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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 27894 was prepared by Technical Committee ISO/TC 112, *Vacuum technology*.

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Introduction

Ionization gauges are commonly used in the measurement of high and ultra-high vacua. The collected ion current in this gauge is proportional to gas density, respectively pressure, at a known temperature in high and ultra-high vacua. The ionization of neutral gas particles is accomplished by fast electrons. These electrons are either produced by a self-sustaining discharge or by an emissive cathode. In commercial ionization gauges, this emissive cathode is provided by a heated wire ("hot cathode") emitting electrons by thermionic emission.

Since ionization gauges with a self-sustaining discharge by crossed electrical and magnetic fields show non-linearity in discharge current versus gas density, they are tedious to calibrate. For this reason, ionization gauges with "hot cathodes" exhibiting a more linear reading are the ones mainly used for the dissemination of the pressure scale in high and ultra-high vacua.

For the dissemination of the pressure scale and a reliable measurement of high and ultra-high vacuum pressures by an ionization gauge, the relevant parameters and uncertainties must be given, and are described in this International Standard. It therefore complements ISO/TS 3567 when using ionization gauges as reference standards.

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Vacuum technology — Vacuum gauges — Specifications for hot cathode ionization gauges

1 Scope

This International Standard defines terms relating to hot cathode ionization vacuum gauges, and specifies which parameters are given by manufacturers of hot cathode ionization gauges and which measurement uncertainties have to be considered when operating these gauges. The reasons for this are as follows.

- a) This International Standard updates some terms and definitions given in ISO 3529-3:1981.
- b) This International Standard specifies information for suitable laboratories to correctly calibrate vacuum gauges under high and ultra-high vacua, since ionization gauges with hot cathodes are often used as reference standards. This information consists of the relevant parameters and characteristics suitable for quotation in manufacturers' instructions to users employing ionization gauges for traceable measurement of pressure under high or ultra-high vacua.
- c) This International Standard also lists those uncertainties associated with the measurement of pressure by the ionization gauge, which are known to be significant, and gives guidelines on how to evaluate them. It is possible that the list is not comprehensive for some current or future vacuum gauges.
- d) This International Standard complements ISO/TS 3567 and ISO/TS 27893 when using ionization gauges as reference standards.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/TS 3567, *Vacuum gauges — Calibration by direct comparison with a reference gauge*

ISO/IEC Guide 98-3:2008, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*