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Gas analyzers – Expression of performance – Part 3: Paramagnetic oxygen analyzers

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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GAS ANALYZERS – EXPRESSION OF PERFORMANCE –

Part 3: Paramagnetic oxygen analyzers

FOREWORD

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International Standard IEC 61207-3 has been prepared by sub-committee 65B: Measurement and control devices, of IEC technical committee 65: Industrial-process measurement, control and automation.

This third edition cancels and replaces the second edition published in 2002. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) all references (normative and informative) have been updated, deleted or added to as appropriate;
b) all the terms, descriptions and definitions relating to the document have been updated where appropriate;
c) all references to “errors” have been replaced by “uncertainties” and appropriate updated definitions applied.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
65B/1155/FDIS	65B/1157/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

This International Standard is to be used in conjunction with IEC 61207-1:2010.

A list of all parts in the IEC 61207 series, published under the general title *Gas analyzers – Expression of performance*, can be found on the IEC website.

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- amended.

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INTRODUCTION

Paramagnetic oxygen analyzers respond to the partial pressure of oxygen in the measured gas, and ~~not~~ the volumetric concentration is then determined by knowledge of the total pressure, as in many other gas analyzers. Due to this fact, many paramagnetic oxygen analyzers use pressure compensation (see 4.4.4 and 4.4.5). They are used in a wide range of industrial, laboratory, medical, and other applications where the rated measuring range of the analyzer is between 0 % to 1 % and 0 % to 100 %, at reference pressure (usually near atmospheric).

Only a few gases display significant paramagnetism (for example, oxygen, nitric oxide and nitrogen dioxide), and oxygen has ~~a particularly strong~~ the strongest paramagnetic susceptibility (see Annex A) among gases. By employing this particular property of oxygen, analyzers have been designed that can be highly specific to the measurement in most industrial and medical applications, where, for example, high background levels of hydrocarbons or moisture may be present.

There are several different techniques described for measuring ~~the paramagnetic properties of~~ oxygen by its paramagnetic property, but three main methods have evolved over many years of commercial application.

The three methods are:

– automatic null balance;

– thermomagnetic or magnetic wind;

– differential pressure or Quincke.

These methods all require the sample gas to be clean and ~~dry~~ non-condensing, though some versions work at elevated temperatures so that samples that are likely to condense at a lower temperature can be analyzed. Because of this requirement, analyzers often require a sample system to condition the sample prior to measurement.

GAS ANALYZERS – EXPRESSION OF PERFORMANCE –

Part 3: Paramagnetic oxygen analyzers

1 Scope ~~and object~~

This part of IEC 61207 applies to the three main methods for measuring oxygen by its paramagnetic property, which are outlined in the introduction. It considers essential ancillary units and applies to analyzers installed indoors and outdoors.

~~NOTE~~ Safety-critical applications can require ~~an~~ additional ~~requirement of~~ requirements from system and analyzer specifications not covered in this document.

This document is intended

– to specify terminology and definitions related to the functional performance of paramagnetic gas analyzers for the measurement of oxygen in a source gas;

– to unify methods used in making and verifying statements on the functional performance of such analyzers;

– to specify what tests ~~should be~~ are performed to determine the functional performance and how such tests ~~should be~~ are carried out;

– to provide basic documents to support the application of internationally recognized quality management standards ~~of quality assurance (ISO 9001, ISO 9002 and ISO 9003)~~.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

~~IEC 60654-1:1993, *Industrial-process measurement and control equipment – Operating conditions – Part 1: Climatic conditions*~~

~~IEC 61115:1992, *Expression of performance of sample handling systems for process analyzers*~~

IEC 61207-1~~:1994~~, *Expression of performance of gas analyzers – Part 1: General*

~~ISO 9001:2000, *Quality management systems – Requirements*~~

~~ISO 9002:1994, *Quality systems – Model for quality assurance in production, installation and servicing*~~

~~ISO 9003:1994, *Quality systems – Model for quality assurance in final inspection and test*~~

IEC 61207-3

Edition 3.0 2019-06

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Gas analyzers – Expression of performance – Part 3: Paramagnetic oxygen analyzers

Analyseurs de gaz – Expression des performances – Partie 3: Analyseurs d'oxygène paramagnétiques



IEC 61207-3:2019-06(en-fr)

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IEC 61207-1, *Expression of performance of gas analyzers – Part 1: General*

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ANALYSEURS DE GAZ – EXPRESSION DES PERFORMANCES –

Partie 3: Analyseurs d'oxygène paramagnétiques

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Cette troisième édition annule et remplace la deuxième édition parue en 2002. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

a) toutes les références (normatives et informatives) ont été mises à jour, retirées ou ajoutées comme il convient;

b) tous les termes, descriptions et définitions en rapport avec le document ont été mis à jour le cas échéant;

c) toutes les références aux "erreurs" ont été remplacées par le terme «incertitudes» et les définitions ont été mises à jour comme il convient.

Le texte de cette Norme internationale est issu des documents suivants:

FDIS	Rapport de vote
65B/1155/FDIS	65B/1157/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette Norme internationale.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2.

Cette Norme Internationale doit être utilisée conjointement avec l'IEC 61207-1:2010.

Une liste de toutes les parties de la série IEC 61207, publiées sous le titre général *Analyseurs de gaz – Expression des performances*, peut être consultée sur le site web de l'IEC.

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INTRODUCTION

Les analyseurs d'oxygène paramagnétiques sont sensibles à la pression partielle de l'oxygène dans le gaz mesuré, de ce fait la concentration volumétrique est déterminée sur la base de la pression totale, comme dans de nombreux autres analyseurs de gaz. Par conséquent, de nombreux analyseurs d'oxygène paramagnétiques utilisent la compensation de la pression (voir 4.4.4 et 4.4.5). Les analyseurs d'oxygène paramagnétiques sont utilisés pour de nombreuses applications industrielles, médicales, de laboratoire et autres pour lesquelles l'étendue de mesure assignée de l'analyseur est comprise dans les plages de 0 % à 1 % et de 0 % à 100 %, à la pression de référence (généralement proche de la pression atmosphérique).

Seuls quelques gaz présentent un phénomène de paramagnétisme significatif (par exemple l'oxygène, l'oxyde nitrique et le dioxyde d'azote) et parmi les gaz l'oxygène a la plus forte susceptibilité paramagnétique (voir Annexe A). Cette propriété particulière de l'oxygène a permis de concevoir des analyseurs capables d'effectuer des mesurages très spécifiques dans la plupart des applications industrielles et médicales, par exemple lorsqu'il peut exister une quantité importante d'hydrocarbures ou d'humidité résiduels.

Plusieurs techniques différentes de mesure de l'oxygène par sa propriété paramagnétique sont décrites. Les trois principales méthodes, utilisées commercialement depuis des années, ont évolué au fil du temps.

Ces trois méthodes sont les suivantes:

– équilibrage automatique à méthode de zéro;
– vent thermomagnétique ou magnétique;
– pression différentielle ou méthode de Quincke.

Toutes ces méthodes exigent que le gaz échantillon soit propre et sans condensation; cependant, certaines versions fonctionnent à des températures élevées, afin de pouvoir analyser les échantillons qui sont susceptibles de se condenser à des températures inférieures. Cette exigence implique qu'il est souvent nécessaire d'équiper les analyseurs d'un système d'échantillonnage afin de conditionner l'échantillon avant le mesurage.

ANALYSEURS DE GAZ – EXPRESSION DES PERFORMANCES –

Partie 3: Analyseurs d'oxygène paramagnétiques

1 Domaine d’application

La présente partie de l’IEC 61207 traite des trois principales méthodes de mesure de l’oxygène par sa propriété paramagnétique présentées dans l'introduction. Elle porte sur des unités auxiliaires essentielles et concerne les analyseurs installés à l’intérieur comme à l’extérieur.

Les applications présentant un risque particulier du point de vue de la sécurité peuvent nécessiter des exigences supplémentaires quant aux spécifications du système et de l'analyseur qui ne sont pas traitées dans la présente norme.

La présente norme a pour objet

– de spécifier la terminologie et les définitions relatives aux performances fonctionnelles des analyseurs de gaz paramagnétiques utilisés pour le mesurage de l'oxygène dans un gaz source;
– d’unifier les méthodes utilisées en fournissant et en vérifiant les indications relatives aux performances fonctionnelles de ces analyseurs;
– de spécifier les essais à effectuer pour déterminer les performances fonctionnelles et la manière de réaliser ces essais;
– fournir des documents de base appuyant l'application des normes de gestion de la qualité reconnues sur le plan international.

2 Références normatives

Les documents suivants sont cités dans le texte de sorte qu’ils constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l’édition citée s’applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 61207-1, *Expression des performances des analyseurs de gaz – Partie 1: Généralités*

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1 Les chiffres entre crochets se réfèrent à la Bibliographie.