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**Air intake filter systems for rotary  
machinery — Test methods —**

**Part 1:  
Static filter elements**

*Systèmes de filtration d'air d'admission pour machines tournantes —  
Méthodes d'essai —*

*Partie 1: Éléments filtrants pour filtres statiques*



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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 142, *Cleaning equipment for air and other gases*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 195, *Cleaning equipment for air and other gases*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 29461-1:2013), which has been technically revised.

The main changes compared to the previous edition are as follows:

- a new test method, referring to ISO 16890 (all parts) and ISO 29463 (all parts), has been added;
- a classification table has been added;
- previous Annexes A, B, C and D have been deleted; previous Annex E has become [Annex A](#).

A list of all parts in the ISO 29461 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

## Introduction

In rotating machinery applications, the filtering systems, typically a set of filter elements arranged in a suitable manner, are an important part of the whole turbine/compressor system. The development of turbine machinery used for energy production or others has led to more sophisticated equipment; and therefore the importance of good protection of these systems has become more important in the recent years. It is known that particulate contamination can deteriorate a turbine power system quite substantially if not taken care of.

This event is often described as “erosion”, “fouling” and “hot corrosion” where salt and other corrosive particles are known as potential problems. Other particulate matters can also cause significant reduction of efficiency of the systems. It is important to understand that air filter devices in such systems are located in various environmental conditions. The range of climate and particulate contamination is very wide, ranging from deserts to humid rain forests to arctic environments. The requirements on these filter systems are obviously different depending on where they will be operating.

ISO 29461 (all parts) has based the performance of the air intake filter systems not only upon heavy dust collection but also particulate efficiency in a size range that is considered to be the problematic area for these applications. Both ultra-fine and fine particles, as well as larger particles, should be considered when evaluating turbine fouling. In typical outdoor air, ultra-fine and fine particles in the size range from 0,01  $\mu\text{m}$  to 1  $\mu\text{m}$  contribute to > 99 % of the number concentration and to > 90 % of the surface contamination. The majority of the mass normally comes from larger particles (>1,0  $\mu\text{m}$ ).

Turbo-machinery filters comprise a wide range of products from filters for very coarse particles to filters for very fine, sub-micron particles. The range of products varies from depth to surface loading systems, which can be regenerated e.g. by pulse cleaning. The filters and the systems have to withstand a wide temperature and humidity range, very low to very high dust concentration and mechanical stress. The shape of products existing today can be of many different types and have different functions such as droplet separators, coalescing products, filter pads, metal filters, inertial filters, filter cells, bag filters, panel-type, cleanable and depth loading filter cartridges and pleated media surface filter elements.

ISO 29461 (all parts) provides a way to compare these products in a similar way and define what criteria are important for air filter intake systems for rotary machinery performance protection. The aim is to compare different filters and filter types with respect to the operating conditions they finally will be used in. For instance, if a filter or a filter system is meant to operate in an extreme, very dusty environment, the real particulate efficiency of such a filter cannot be predicted because the dust loading of the filter plays an important role. A further part of ISO 29461 will address the performance of cleanable and surface loading filters. Filters in turbo-machinery applications can also face very harsh operating conditions such as high air flow rates or water and salt ingress. Further parts of ISO 29461 will address the performance of filters under such harsh conditions.



# Air intake filter systems for rotary machinery — Test methods —

## Part 1: Static filter elements

### 1 Scope

This document specifies methods and procedures for determining the static performance of particulate air filters used in air intake filter systems for rotary machinery such as stationary gas turbines, compressors and other stationary internal combustion engines. It applies to air filters with an efficiency of 85 % or more for the MPPS (EPA and HEPA filters) which are tested according to ISO 29463 (all parts) and filters with a lower efficiency which are tested according to ISO 16890 (all parts). The procedures described in both ISO 16890 (all parts) and ISO 29463 (all parts) are applied and extended by this document to air filters which operate at flow rates within the range 0,24 m<sup>3</sup>/s (850 m<sup>3</sup>/h) up to 2,36 m<sup>3</sup>/s (8 500 m<sup>3</sup>/h).

Static filter systems normally use multiple stages of coarse, fine and optional EPA or HEPA filter elements to protect the machinery. The scope of this document includes methods for performance testing of individual filter elements. It does not include methods for the direct measurement of the performance of entire systems as installed in service except in cases where they can meet the qualification criteria for the test assembly. Nevertheless, cumulative filter efficiencies of multistage systems of fine filters can be calculated by using the methods described in ISO 16890-1.

This document refers to static (barrier) filter systems but can also be applied to other filter types and systems in appropriate circumstances, for example to evaluate the initial efficiency of cleanable and surface loading filters.

The performance results obtained in accordance with this document cannot be quantitatively applied (by themselves) to predict performance in service with regard to efficiency and lifetime.

### 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.

ISO 15957, *Test dusts for evaluating air cleaning equipment*

ISO 16890 (all parts), — *Air filters for general ventilation*

ISO 29463 (all parts), — *High efficiency filters and filter media for removing particles from air*

ISO 29464, *Cleaning of air and other gases — Terminology*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 29464 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at <https://www.iso.org/obp>