

<b>STN</b>	<b>Filtračné systémy prívodu vzduchu pre rotačné stroje</b> <b>Skúšobné metódy</b> <b>Časť 3: Mechanická integrita filtračných prvkov</b> <b>(ISO 29461-3: 2024)</b>	<b>STN</b> <b>EN ISO 29461-3</b>  12 5321
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Air intake filter systems for rotary machinery - Test methods - Part 3: Mechanical integrity of filter elements (ISO 29461-3:2024)

Táto norma obsahuje anglickú verziu európskej normy.  
This standard includes the English version of the European Standard.

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## Air intake filter systems for rotary machinery - Test methods - Part 3: Mechanical integrity of filter elements (ISO 29461-3:2024)

Systèmes de filtration d'air d'admission pour machines tournantes - Méthodes d'essai - Partie 3: Intégrité mécanique des éléments filtrants (ISO 29461-3:2024)

Ansaugfiltersysteme von Rotationsmaschinen - Prüfverfahren - Teil 3: Mechanische Unversehrtheit der Filterelemente (ISO 29461-3:2024)

This European Standard was approved by CEN on 26 April 2024.

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**EN ISO 29461-3:2024 (E)**

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## **European foreword**

This document (EN ISO 29461-3:2024) has been prepared by Technical Committee ISO/TC 142 "Cleaning equipment for air and other gases" in collaboration with Technical Committee CEN/TC 195 "Cleaning equipment for air and other gases" the secretariat of which is held by UNI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2025, and conflicting national standards shall be withdrawn at the latest by January 2025.

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# International Standard

**ISO 29461-3**

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

### **Part 3: Mechanical integrity of filter elements**

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

*Partie 3: Intégrité mécanique des éléments filtrants*

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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 document 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)).

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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).

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).

## ISO 29461-3:2024(en)

### Introduction

In rotating machinery applications, the filtering system, typically a set of filter elements arranged in a suitable manner, is 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 effective 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 process 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 are operated.

This document 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 field 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  $\mu\text{m}$  are contributing to > 99 % of the number concentration and to > 90 % of the surface contamination. The majority of the mass normally results from larger particles (> 1,0  $\mu\text{m}$ ).

Turbo-machinery filters comprise a wide range of products, ranging from filters preventing from coarse particles to filters for very fine and even sub-micrometre particles. The range of products varies from self-cleaning to depth and surface loading systems. 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 filters, self-cleanable and depth loading filter cartridges or pleated media surface filter elements.

The ISO 29461 series provides a way to compare these products in a standardized way and defines the criteria important for air filter intake systems for rotary machinery performance protection. The performance of products in this broad range needs to be compared according to a standardized procedure. Comparing different filters and filter types needs to be done with respect to the overall conditions they finally operate in.

If a filter or a filter system is meant to operate in an extreme, very dusty environment, the real particulate efficiency of this filter cannot be predicted since the dust loading of the filter becomes important.

In an ideal filtration process, each particle would be permanently arrested at its first contact with a media fibre, but incoming particles can impact on a captured particle and detach it into the air stream. Fibres or particles from the filter itself can also be released, due to mechanical forces.

Another worst-case scenario in abnormal operating environments which leads to unusual high-pressure drops is the burst or damage of the filter element accompanied with a sudden release of parts of the filter element or high amounts of dust captured.

This document specifies a method and procedure to test the mechanical integrity (“burst test”) of individual filter elements up to an abnormal final test pressure drop of maximum 6 250 Pa. Any other customer defined final pressure drop up to a higher pressure drop shall be reported as variation from the standard. Nevertheless, it is within the ability of the user to define the maximum possible value (lower or higher) for a certain application and to define the burst strength requirements for this test procedure. As the pressure drops under typical operating conditions are on a much lower level, it is not intended to specify a final pressure drop for any application within this procedure.

For multi-stage systems which use a number of components (e.g. equipment for cleaning, filters), each filter element needs to be tested separately.

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In general, it is possible to use this procedure also after any previous ageing procedure if it is clearly described as a variation from the standard test procedure. An ageing procedure is defined as an appropriate customer defined durability test which can affect the stability of media, adhesives, construction and the like, and is important for the evaluation at its real application. Test results of filter elements after different ageing procedures cannot be quantitatively compared.

Examples of conditioning are:

- climatic conditioning at high or low temperatures and/or defined relative humidity levels;
- wet conditions with water droplets or condensing water over a defined time period;
- any kind of dust loading and pulsing procedure over a certain duration or number of pulses;
- operation at real conditions, etc.

The “burst test” itself is considered as an independent procedure to evaluate the integrity of a filter element to resist a defined high pressure drop without collapsing, losing or releasing any parts of its construction into the downstream while keeping its filtration efficiency.

The test procedure does not include methods for the direct measurement of the performance of entire systems as installed (e.g. systems with use of multiple stages of coarse and fine filter elements).

Note For example, can a damaged, vertically installed pulse-jet filter perform differently in real operation conditions compared to what can be detected by a horizontal, non-pulsing test as described in this document.

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

## Part 3: Mechanical integrity of filter elements

### 1 Scope

This document specifies methods to determine the mechanical integrity of filters under defined conditions that can be encountered in abnormal operating environments. It describes the test methods for filter elements, independent of any ageing procedures like pulsing, loading, temperature cycles, wet conditions or others.

The test procedure is intended for filters operating in the range of 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). Filter elements with a lower efficiency than ISO T5 (ePM<sub>10</sub>) according to ISO 29461-1 are excluded.

To ensure the comparability of the test results, only new filter elements or those loaded up to 625 Pa or maximum 800 Pa according to ISO 29461-1 are tested.

This document does not describe a standardized method to measure the fractional or gravimetric efficiency. The efficiency of the filter element can be tested according to ISO 29461-1.

The performance results obtained according to this document cannot be quantitatively applied (by themselves) to predict performance in real use.

### 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 5167 (all parts), *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduit running full*

ISO 12103-1, *Road vehicles — Test dust for filter evaluation — Part 1: Arizona test dust*

ISO 16890-2:2022, *Air filters for general ventilation — Part 2: Measurement of fractional efficiency and air flow resistance*

ISO 29461-1, *Air intake filter systems for rotary machinery — Test methods — Part 1: Static filter elements*

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