FINAL DRAFT International Standard

ISO/FDIS 29461-3

ISO/TC **142**

Secretariat: **UNI**

Voting begins on:
2024-01-29

Voting terminates on:
2024-03-25

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

ISO/CEN PARALLEL PROCESSING

Reference number
ISO/FDIS 29461-3:2024(en)

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Published in Switzerland

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Foreword

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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.

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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 µm to 1 µm 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 µm).

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 29641 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.