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Air intake filter systems for rotary machinery - Part 4: Test methods for static filter systems in coastal and offshore environments (ISO 29461-4:2025)

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Air intake filter systems for rotary machinery - Part 4: Test methods for static filter systems in coastal and offshore environments (ISO 29461-4:2025)

Systèmes de filtration d'air d'admission pour machines tournantes - Partie 4: Méthodes d'essai des systèmes de filtration statique en milieu côtier et offshore (ISO 29461-4:2025)

Ansaugfiltersysteme von Rotationsmaschinen - Prüfverfahren - Teil 4: Prüfverfahren für statische Filtersysteme in Meeres- und Offshore-Umgebungen (ISO 29461-4:2025)

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European foreword

This document (EN ISO 29461-4:2025) 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.

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International Standard

ISO 29461-4

Air intake filter systems for rotary machinery —

Part 4: Test methods for static filter systems in coastal and offshore environments

*Systemes de filtration d'air d'admission pour machines
tournantes —*

*Partie 4: Méthodes d'essai des systèmes de filtration statique en
milieu côtier et offshore*

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ISO 29461-4:2025(en)**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).

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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

The use of gas turbines in the oil and gas industry represents one of the most challenging applications for this engine technology. The major constraint of the oil and gas industry is to run 24/7 at full load with minimum downtime. In oil and gas activity, the installation must be run as close as possible to 100 % of the time with the highest level of efficiency (current production compared to nominal production).

An additional challenge for oil and gas applications lies in the absence of a back-up turbine on site, especially for mechanical-drive gas turbine configurations.

The coastal and offshore environment probably represents the harshest conditions for gas turbines. Humidity, rainfall and seasonal dust are the most obvious visible conditions that operators face on site. Hidden in the combustion air, alkali such as potassium, sodium or magnesium, as well as sulfur, soot, volatile hydrocarbons, oily vapours, and particles all generate gas turbine issues including compressor fouling, air-cooling passage fouling, vane and blade erosion, and compressor corrosion. Combined with sulfur in fuels, these alkali in combustion air create hot corrosion. Finally, heavy rainfall can induce filter washings that release filtered particles into the compressor. All these phenomena impact the gas turbine availability on site.

The role of a highly efficient air filtration system is to maintain the engine cleanliness by preventing the introduction of contaminants into the gas turbine air intake. Achieving a high level of engine cleanliness helps maintain engine integrity and efficiency and reduces the need for water washes which generate avoidable downtime.

Currently, high efficiency filter elements are characterized by a limited number of parameters, namely filter efficiency and most penetrating particle size (MPPS). These parameters, related to a single filter element, are measured in laboratory conditions close to favourable inland conditions with synthetic dust. Consequently, these conditions are far from the reality observed on site, offshore or near coast, where filter elements are usually part of a system. The test results do not therefore provide a basis for predicting either operational filter performance or service life.

The objective of this document is to consider how the effect of water spray, humidity and salt affects the performance of an air filter. The tested air flow passing through the filter element is close to the air flow rate operated on site for the three different concepts: low, medium or high velocity filter elements.

Soot, volatile hydrocarbons, oily vapours and particles also have impact on filter characterization and performance. The separate parts of ISO 29461 cover particles, while soot, volatile hydrocarbons and oily vapours are yet to be addressed. Current test methods are not mature enough for the inclusion of soot, volatile hydrocarbons and oily vapours.

The ageing of a filter element installed offshore and near the coast is addressed to allow the prediction of operational filter performance and its associated service life. It must be understood how filter elements perform during different cycles representing typical site conditions such as heavy rainfall, low and high humidity, filter element unloaded and loaded.

Depending on the gas turbine applications, the service life of the filter element is also a criterion to take into consideration. In this case, the robustness, loading capacity and pressure drop characteristics of the filter elements become key parameters for design and testing.

Air intake filter systems for rotary machinery —

Part 4:

Test methods for static filter systems in coastal and offshore environments

1 Scope

This document defines test methods for performance testing of individual filter elements and of the complete filtration system.¹⁾

This procedure is intended for filter elements and filter systems which operate at flow rated up to 8 000 m³/h per filter element.

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 2813, *Paints and varnishes - Determination of gloss value at 20°, 60° and 85°*

ISO 5167-1, *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full — Part 1: General principles and requirements*

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

ISO 29461-2:2022, *Air intake filter systems for rotary machinery – Test methods – Part 2: Filter element endurance test in fog and mist environments*

ISO 29463-1, *High efficiency filters and filter media for removing particles from air — Part 1: Classification, performance, testing and marking*

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

koniec náhľadu – text ďalej pokračuje v platenej verzii STN

1) The filters will be loaded with ultra-fine salt particles of a size mostly sub micron during variable humidity to simulate real offshore and coastal conditions hence filters with an initial conditioned efficiency lower than 50 % for the ePM₁ particles (filter class T7) are likely to underperform and would not be suited as a single stage filter.