

Gas Turbine Filter Test System

GTS 114



Test System GTS 114 for testing air intake filter systems for rotary machinery (ISO 29461).

Gas turbines are often operated in extreme climatic conditions, ranging from salty sea spray on offshore platforms to dusty desert environments. The reliability of these thermal power machines depends largely on the efficiency of the upstream air intake filtration systems. Defects in the intake filters can result in massive damage to the gas turbine, leading in downtime and high repair costs. To classify air intake filter systems for gas turbines, the ISO 29461 standard has been developed.

TOPAS GmbH has developed a dedicated test system and suitable test routines that cover parts 1, 2, and 4 of ISO 29461. This GTS 114 test system enables comprehensive characterization of gas turbine filters under largely realistic operating conditions. The test system allows controlled injection of salt aerosols, dust, water droplets (sea spray), and water vapor. As a technological feature, the test system can precisely and reproducibly control temperature and relative humidity

Applications

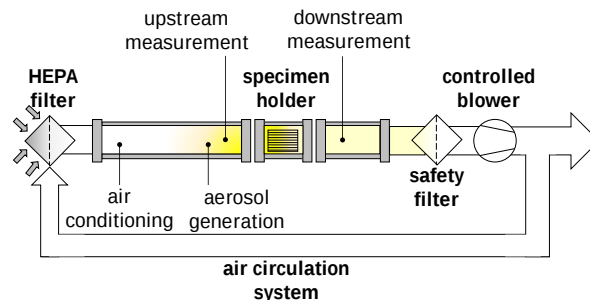
- testing of intake filter systems for rotating machinery according to ISO 29461 Parts 1, 2, and 4
- testing of general air filters according to ISO 16890, ASHRAE 52.2, and EN 779

Features

- precise and reproducible control of temperature and relative humidity, preventing condensation
- fully automated test sequences over periods of up to 120 hours
- dosing of various aerosols (NaCl, KCl, DEHS, dust) into an optimized flow profile
- automated water injection and hot steam supply for humidity control
- modular test system concept with different configuration levels to cover individual standard components

Principle of operation

The GTS 114 test system is divided into a test duct with five sections and a recirculating air system.



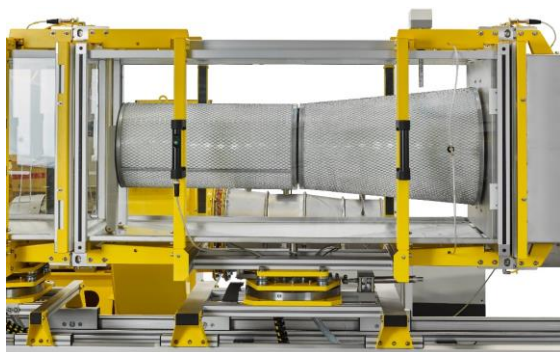
Schematic illustration of the operational principle of GTS 114.



Specifications

A specified airflow is supplied to the system via a HEPA inlet filter. The intake test air is precisely conditioned to meet the standard-specified boundary conditions in a multi-stage conditioning unit. To achieve this, the air passes through a cooling unit, a heating unit, and a humidifier. This setup allows both high relative humidity levels of over 95 % and defined ranges of 30–40 % relative humidity in accordance with ISO 29461. Temperature control is also automated via the test system control system and ensures compliance within the range of 20–30 °C.

To generate defined test conditions, various test aerosols can be introduced into the test air. Depending on the applicable standard, sodium chloride (NaCl), potassium chloride (KCl), diethylhexyl sebacate (DEHS), or standardized dust aerosol (ISO A2 fine, ASHRAE 52.2) are used. The aerosol concentration is determined on both the upstream side and the downstream side. For this purpose, optical particle counters or, in accordance with ISO 29461-4, a flame photometer are used.



Gas turbine – filter holder of the GTS 114.

A water injection system is integrated into the test duct for test sequences with a defined water load. This enables tests to be conducted in accordance with ISO 29461-2 and ISO 29461-4. An integrated recirculation unit allows for flexible operation of the test system. Depending on requirements, the test air can be circulated or supplied as fresh air.

The GTS 114 test system enables the testing of filters of a wide variety of designs, including filter cartridges, cassette filters, bag filters, and flat filter media. For particularly simple and ergonomic installation, the test channel is rotatable and can also be moved along the longitudinal axis.

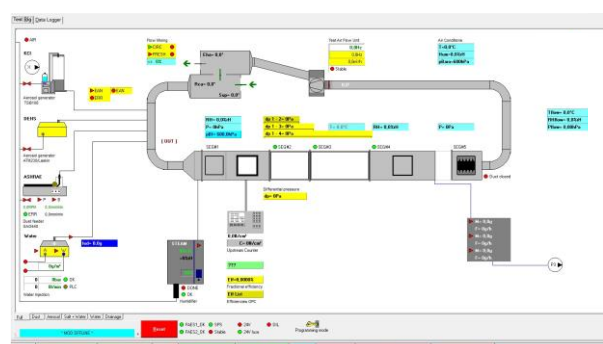
Details

Modularization

extension level	contant
Basis module ISO 16890 ISO 29461-1	• fresh air supply • aerosol generation (DEHS, KCl, ISO A2 fine, ASHRAE 52.2) • aerosol conditioning • aerosol analysis (optical particle counter) • filter scale unit
Module 1 ISO 29461-2	• recirculating mode • temperature and relative humidity management • water injection system
Module 2 ISO 29461-4	• aerosol generation (NaCl) • aerosol analysis (sodium flame photometer)

Software

The GTS114Win software is included in the scope of delivery of the test system. The software is used for the visualization and control of the entire test system, as well as for the acquisition and evaluation of all measurement data. The user interface provides a clear overview of all relevant components, including target and actual values, so that the operator maintains a complete overview of the complex test process at all times.



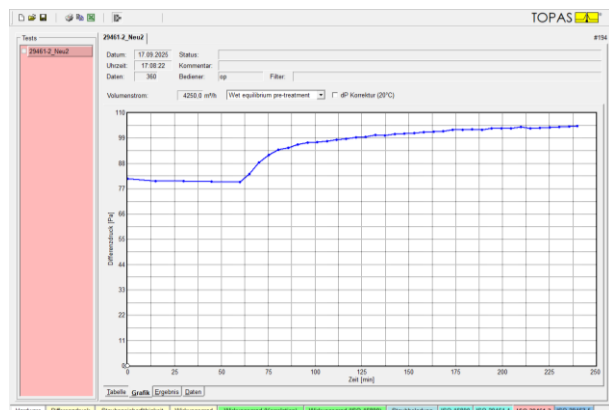
Exemplary GTS 114Win user interface.

The test system can be operated using either predefined test programs or in manual mode. Standardized test procedures are available for measurements in accordance with ISO 29461 (Parts



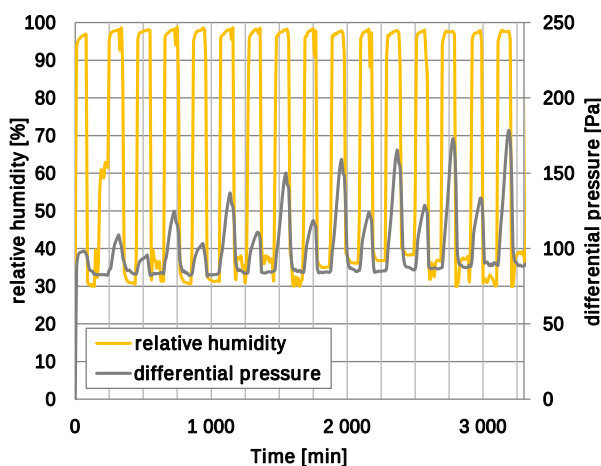
Specifications

1, 2, and 4) and ISO 16890, which guide the operator through the measurement process.



Differential pressure curve of a water-separating filter according to ISO 29461-2

The pressure drop of filters in contact with water droplets or mist is tested in accordance with ISO 29461-2. Optionally, a UV tracer can be used to make even the smallest amounts of water behind the filter visible. This also visualizes water drainage within the filter, which can provide valuable insights for research and development.



Differential pressure curve of a water-separating filter and relative humidity curve according to ISO 29461-4.

Testing in accordance with ISO 29461-4 presents a particular technical challenge. This involves simulating alternating humidity and drying cycles while simultaneously exposing the filter to sodium chloride (NaCl) to replicate realistic environmental conditions, such as those found in coastal regions or on offshore platforms. These tests can take for

periods of up to 120 hours. To ensure a constant aerosol concentration over this duration, the basic design of the NaCl aerosol generator described in the standard was specifically refined and optimized, thereby ensuring continuous operation.

Due to integrated database solutions, filter types, test parameters, material systems, and measurement results can be managed and retrieved quickly and easily. The results can either be documented in test reports or exported to standardized Excel templates for further processing.

Technical specifications

air flow rate	800 ... 11 000 m ³ /h
air circulation	0 ... 100 %
differential pressure	< 2 000 Pa
aerosol substance	DEHS, KCl, NaCl, ISO 12103-A2 (fine) ASHRAE 52.2
humidity control	> 95% r.H. 30 - 40% r.H.
temperature control	20 - 30°C
dimension of specimen	Pocket and cassette filters cross section ≤ 610 x 610 mm filter cartridges length ≤ 1,5 m diameter ≤ 400 mm flat sheet filter media surface ≤ 1 m ²
environmental sensors	temperature, relative humidity, air pressure
power supply	3 x 400 V AC; 125 A; 50 Hz; 60kW
compressed air supply	> 5 bar (50 m ³ /h)
water supply	> 3 bar
cooling water	≤ 13 °C
dimension (w × h × d)	4,6 m × 1,7 m × 14,0 m
standards	ISO 29461 Parts 1, 2 und 4 ISO 16890, ASHRAE 52.2, EN 779

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Wir sind zertifiziert nach
DIN EN ISO 9001.



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