

JetDC 88500-0

Measurement of Dielectric Constant of Aviation Turbine Fuel

- IP PM-FC/21
- ASTM D924
- Dielectric constant (κ) measurement range 1.000 to 2.500
- Controlled temperature from 0 °C to 40°C
- Rapid test
- Integrated apparatus
- Automated measurement
- Large 9.7" touchscreen

Dielectric constant (κ)

The Stanhope-Seta JetDC simultaneously determines the dielectric constant, density and temperature of aviation turbine fuel. This is useful to predict the behaviour in aircraft gauging systems. The JetDC is suitable for measuring aviation turbine fuel, aviation turbine fuel containing synthesized hydrocarbons and synthetic blending components.



Background

Sustainable Aviation Fuel (SAF) represents an important route to reduce global net CO₂ emissions. SAF is produced through many different processes, using different feedstock such as used cooking oil, syngas, fats, vegetable oils, greases, sugars and alcohols. SAFs are approved for use through a standardised testing process.

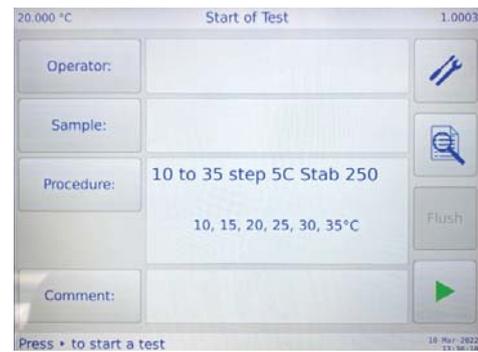
The molecular make up of conventional aviation turbine fuel and SAF are not identical and there can be a difference in the dielectric constant, density, temperature relationship. This relationship is used by many aircraft gauging systems as part of the mechanism to determine how much fuel is on board the aircraft. As such capacitive fuel gauge accuracy relies on the dielectric constant properties to be similar across jet fuel batches.

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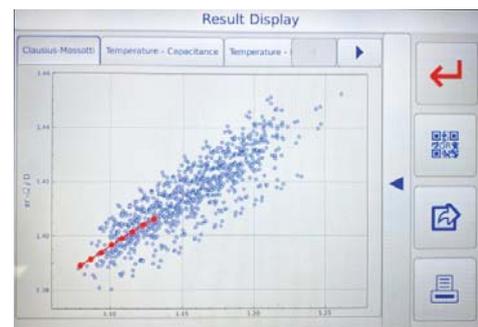
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Description of Operation

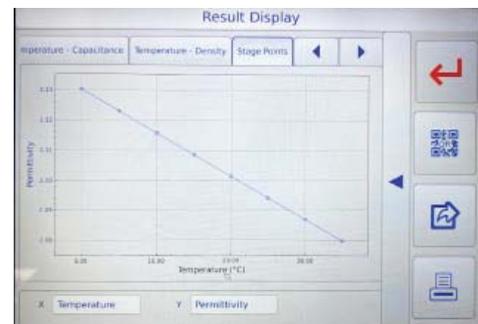
- The operator places a sample of approximately 150 ml in to the sample beaker, enters sample information into the apparatus through the touchscreen and presses the start button.
- The apparatus takes the sample into the test cell and commences an automatic temperature cycle going to the lowest temperature first.
- Once stability is achieved at the first measurement temperature the relative permittivity and density are recorded.
- The apparatus then changes the temperature to the next measurement temperature to record further readings. The number of measurement temperatures is programmable.
- At the end of the measurements the sample is removed automatically into the waste beaker.
- Results are displayed throughout the test and are available from a database at the end of the test.



1. Start Screen



2. Data can be plotted as a Clausius Mossotti relationship. The apparatus steps through the pre-programmed temperatures



3. Relative Permittivity versus Temperature

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Test Method

An Energy Institute Task Group is developing a new standard method of test, specifically for Jet Fuel which addresses the technology and needs gap of the existing method for measuring dielectric constant, ASTM D924, (as reported by the CRC). Proposed test method IP PM-FC Determination of Relative Permittivity (Dielectric Constant) of Aviation Turbine Fuel, Small Scale Automated Temperature Scanning Method was approved and published in 2021 with preliminary precision.

The introduction of the JetDC from Stanhope-Seta continues the company's 75 year history of producing world class unique and advanced laboratory quality control instruments for today's and tomorrow's aviation fuel.

Specifications

Jet fuel manufactured from any new process is screened at an early development stage through the ASTM D4054 standard practice. Blend limits of between 10 and 50% may be imposed in ASTM D7566 (Standard Specification for Aviation Turbine Fuel Containing Synthesized Hydrocarbons), to mitigate differences in SAF properties.

Technical Specifications	
Dielectric constant (κ) measurement range	1.000 to 2.500
Relative permittivity precision (repeatability)	0.0012
Relative permittivity precision (reproducibility)	0.0017
Density range (Kg/m ³)	0 to 900.0
Controlled temperature (°C)	0 to 40 °C
Temperature resolution (°C)	0.01 °C
Power (V, Hz, W)	110/240 V, 50/60 Hz, 300 W
Size, height x width x depth (mm)	400 x 260 x 340 mm
Weight (Kg)	15 Kg

Accessories	
88505-0	Cyclohexane Certified Reference Material
SA9001-002	Beaker (Pack of 10)