



Jet Fuel Conductivity Analysers & Additive Management systems

ASTM D2624

IP 274

DEF STAN 91-91

ASTM D1655

Conductivity in Fuels

Conductivity is a significant parameter for safe and economic handling of fuels that can generate dangerous static charge so it is important to monitor it throughout the distribution line.

Aviation fuels are highly refined with very low conductivity and therefore have the potential to accumulate a very high static electrical charge which can lead to sparking and ignition of explosive vapours. Typically such fuels are pumped at velocity through distribution lines and filters causing the potential for an electrical discharge, the strength of charge being dependent on the conductivity of the fuel and the pumping velocity. In addition, conductivity is strongly temperature-dependant - the lower the temperature the higher the probability for retained charge in a fuel.

To help ensure safe fuel storage and distribution Airlines and regulatory bodies established ASTM D2624 for Electrical Conductivity of Aviation and Distillate Fuels and ASTM D1655 for specifying permissible levels of fuel conductivity.

Static Dissipative Additive (SDA), also known as conductivity improver, is often added to fuel to achieve specification levels. These additives raise a fuel's conductivity to safe levels where electric charge can more easily relax from the fuel by dissipating to the walls of the storage tank or pipeline thus greatly reducing its potential to spark.

If fuel has a high conductivity level this may indicate the presence of conductive contaminants such as rust, soot, water, organic acids etc which raise concerns about fuel cleanliness and the effectiveness of fuel filters.

Traditional DC voltage conductivity measurement

Traditionally fuel conductivity was measured using a Direct Current (DC) based electrical sensor which is dipped into a fuel sample but such instrumentation has enormous drawbacks:

- DC voltage measurement of sample requires the fluid to be absolutely still, no movement.
- DC based instruments need to have "3 Seconds and Read" operation (due to rapid current drain)
- DC voltage is highly dependent on temperature.

These factors give potential for significant measurement errors, poor precision and repeatability. DC sensors can only provide manual, hand-held test data - they cannot be used for conductivity measurement of in-line flowing fuel.

Innovating Fuel Conductivity measurement

SETA D-2 has developed a range of Alternating Current (AC) based handheld and in-line instrumentation which now offers the aviation industry a totally new dimension in fuel conductivity management.



Benefits of AC sensor technology

- Fuel sample does not need to be static
- AC measurement is unaffected by bias drift – less opportunity for a reading error
- Improved repeatability and reproducibility
- Real time measurement of Conductivity in the product line
- 24/7 recording capability
- Secure verification of fuel as per ASTM D2624
- Instruments can be verified/calibrated in the field as per ASTM D2624 requirements



SETA D-2 Handheld Conductivity Analyser

ASTM D2624, IP 274; DEF STAN 91-91, ASTM D1655



- Conductivity and temperature measurement
- High-Accuracy ($\pm 1.5\%$ of reading), AC measurement technology
- Stores up to 8 data locations (User can input location names)
- USB interface for ease of data transfer
- Sensor tip is capable of being fully immersed in liquid chemical
- Fully temperature compensated measurement
- Built-in long life lithium-ion rechargeable battery
- Windows data handling software
- Internal real time date & clock for data record keeping
- Built for Class 1 Div 2 Hazardous Locations

The Seta D2 Hand Held Conductivity Meter (D2 JF-1A-HH model) meets the requirements of ASTM D2624. It provides accurate and rapid conductivity measurement of distillate fuels and is specifically designed for testing low conductivity fluids.

It is a fully portable instrument suitable for measuring samples in the field or a laboratory.

AC sensor technology provides high-accuracy ($\pm 2\%$ of reading) and allows sample measurement without the problems associated with fuel relaxation or errors created by current drain to the sampling container material.

It has an easy to use menu and in-built real time clock and thermometer. The memory function stores up to 10 sample measurements along with sample temperature, date and time and has windows based software for data management. Stored data can be transferred via a built-in USB connection.

The Analyser is housed in an ATEX approved enclosure with an internal lithium rechargeable power supply. 2 point calibration checks can be made using the D-2 Sensor Verification attachment.



Order Information

99708-0	Handheld Conductivity Analyser for Fuels
99714-0	Conductivity Calibration & Verification Tool
99708-002	Bench Stand
99708-005	Carry Case

SETA D-2 In-line Conductivity Measurement



The in-line Analyser provides a continuous 24/7 record of product conductivity levels inside the distribution lines which offers significant user benefits:

- Eliminates traditional labour-intensive manual fuel sampling and record keeping.
- Measures conductivity at the actual temperature conditions inside the tank or pipe line removing inaccuracies due to thermal changes when manually spot testing.
- Warning alerts can be configured if unacceptable levels are detected
- When connected to automated refinery/terminal management systems, in-line conductivity measurement allows automated fuel additive control and eliminates manual injection and batch sampling of additives.
- True 2-Wire Intrinsically Safe Sensor connections allows immediate interface to any Site Digital Control System.
- 100 Bar high pressure units for operation in high pressure delivery pipelines
- ANSI and DIN Flange Mount configurations and small diameter sensor allow installation in existing pipe line fittings, without the need for costly pipeline changes or engineering. Retractable mount allows immediate pipeline installation and removal without the need for product drain down.

In-line Conductivity Analyser



Sensor construction consists of two 316 S.S. coaxial electrode sensors, suitable for long-term (years) immersion in fuels. The sensor is easily fitted and retracted from the fuel line via a retractable mount which operates through a full-port stainless ball valve. The retractable fitting allows an adjustable insertion depth to optimize positioning of the sensor in the line and fitment to all pipe diameters. Custom configurations can meet any site pipeline requirements. A high pressure version is also available for pipeline operating up to 100 Bar.

All sensors are ATEX/FM/FMc rated explosion-proof and intrinsically safe and approved for safe operation in hazardous locations.

Sensor conductivity measurement is via industry standard true 2-Wire loop providing a 4-20 mA output with a second 4-20 mA output of temperature. The Analyser can also be operated in a 4-wire configuration for users requiring serial data output.

Order Information

99500-0	In-line Conductivity Analyser
99505-0	In-line Conductivity Analyser (High Pressure Version)

SETA D-2 Automated Additive Injection Systems



Engineering

D-2 specialise in the design, manufacture and installation of in-line process packages that provide precise, safe and fully automated fuel additive injection systems. All Systems allow certification of fuel in accordance with ASTM D2624 standards.

Potential Installation Locations:

- Refinery rundown lines
- Marine loading terminals
- Rail loading terminals
- Road Tanker loading terminals
- Pipeline distribution terminals
- Airport fuel farms



In-line conductivity measurement & automated additive injection

The unique precision injection systems provide accurate control of Static Dissipative Additive injection rates by permitting neat additive to be blended directly into the fuel stream. This eliminates the need to mix additives before injection and prevents the potential for incorrect additive volumes. Upstream in-line conductivity measurement allows monitoring of incoming fuel quality before additive injection which greatly reduces the risk of under or over injection, with potential for significant cost saving. Volume based injection systems are also available which use conductivity measurement as primary or secondary alarm outputs. Systems can also incorporate backup pumps and sensors according to customer requirements.

Skid Mounted Process Systems

Custom designed to user specifications providing site-specific operating parameters as defined by the user. Systems are supplied either as a fully automated, standalone process package or can be integrated with existing DCS systems. Typically all D-2 Systems are supplied as a 'turn key' package requiring minimum site engineering and installation support. Systems are designed to meet local climatic operating conditions to ensure reliable performance in excessive heat or cold, humidity, sand, dust and other extreme environments.



Quality

D-2 Engineering is certified to build and install systems for ATEX Zone O environments as well as CRN, UL, FM, IECEx and other safety standards. All systems are supplied with comprehensive supporting documentation which typically includes pipe work and Installation Diagrams (P&ID), electrical block foundation, Installation Manual, Operators Manual, detailed assembly drawings, parts list, OEM equipment documentation, certifications and material test reports. Fully trained technicians provide global support.