

# FIJI

## FAME in Jet, Middle Distillate & Residual Fuel

ASTM D1655; ASTM D7797; DEF STAN 91-91; IP 583; ASTM D7963

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- Certified range 10-150 mg/kg for AVTUR
- Certified range 20 mg/kg to 50% for middle distillate and residual
- Analysis time 15 minutes (approx)
- 50ml sample
- Fully automatic
- Suitable for untrained operators

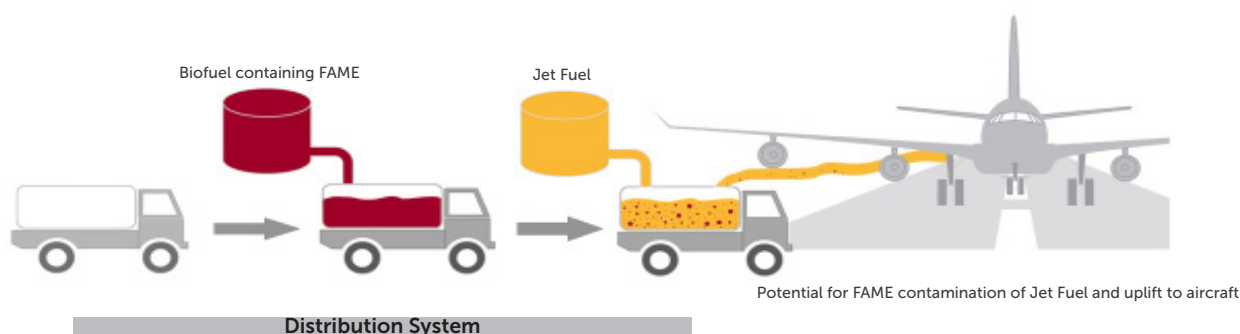


## FAME in Jet Fuel

Aviation fuel does not typically contain FAME, however wherever aviation fuel is transported there is a risk of FAME contamination from mixing with previous cargos or poor pipeline/tank cleaning, whether at a terminal or onboard a ship.

### How does FAME get into jet fuel?

- FAME is a surfactant (surface active agent) which means it adheres to metal surfaces such as pipeline walls or tankers
- In many cases diesel and jet fuel use shared distribution systems such as multi-product pipelines, tankers and barges.
- If jet fuel follows a cargo of biodiesel or BX diesel, FAME can be dissolved into the jet fuel.



## Industry Specifications

### UK Energy Institute (EI)

The UK Energy Institute (EI) formed a Joint Industry Programme (JIP) to investigate the effect of FAME on aircraft systems and determine the level that could be allowed in jet fuel without causing operational or service issues. The report demonstrated that 100 mg/kg of FAME was a reasonable limit for FAME contamination of aviation fuel. The industry is taking a cautious approach and has authorised 50 mg/kg, with an emergency level of 100 mg/kg with engine, airframe and OEM's approval.

### Mandated Testing

From the 2nd of May 2015, FAME measurement will become a mandatory part of recertification which is conducted at the upstream supply terminals and prior to movement to airport.

### DEF STAN 91-91; ASTM D1655

Defence Standard 91-91 and ASTM D1655 Standard Specification for Aviation Turbine Fuels are widely adopted to describe aviation turbine fuel requirements and quality.

Both specifications have been updated to allow the 50 mg/kg limit and now include the FIJI Rapid Screening Test Methods IP 583 and ASTM D7797.

#### Changes to ASTM D1655;

- Table 3 includes FIJI Rapid Screening Methods IP 583 and ASTM D7797 as accepted methods for the new 50 mg/kg level
- Testing is based on risk analysis

#### Changes to DEF STAN 91-91 - Issue 7 Amendment 3

- FAME tests are now mandated in DefStan 91-91
- Table 2 includes FIJI Rapid Screening methods IP 583 and ASTM D7797 as an accepted alternative to the method in table 1

## Test Method Precision

- IP 583 - FIJI has the best precision of all methods at the 50ppm and upwards level

Concentration mg/kg	IP 583 FTIR Reproducibility (R)	IP 585 GC-MS Reproducibility (R)	IP 590 HPLC-ELSD Reproducibility (R)	IP 599 GC Hcut Reproducibility (R)
30	3.9	8.5	6.9	2.9
<b>*50</b>	<b>4.4</b>	<b>13.7</b>	<b>10.9</b>	<b>4.8</b>
100	5.5	26.6	21.0	9.3
140	6.3	36.9	29.3	13.0
150	6.6	39.5	31.3	13.9

Where R = reproducibility as calculated by the Energy Institute from round robin data. \* Comparison of precision at selected FAME concentrations with proposed specification level of 50mg/kg.

## FIJI JF- FAME in Jet Fuel

ASTM D1655; ASTM D7797; DEF STAN 91-91; IP 583

### Background

In response to FAME contamination in jet fuel, Stanhope-Seta in conjunction with a major oil company developed a measurement procedure based on the use of Solid Phase Extraction (SPE) cartridge technology and IR spectroscopy. This development resulted in a new patented technique using flow analysis by FTIR- Fourier transform infra red spectroscopy and the publication of IP 583 and ASTM D7797.

The patented FAME in Jet Instrument (FIJI JF) offers the industry a rapid and easy check on Parts Per Million (ppm or mg/kg) levels of FAME in aviation fuel using test method IP 583 and ASTM D7797.

### Key Features

- Analysis time 15 minutes (approx)
- Certified range 10-150 mg/kg FAME in AVTUR
- Laboratory and field instrument
- Fully automatic
- Suitable for untrained operators
- No cleaning solvents required
- No pre-sample preparation
- 50ml sample volume

### What types of FAME can FIJI detect?

FIJI detects all types of FAME in the ranges C8 to C22 including;

- Coconut
- Mustard
- Palm
- Rapeseed
- Sunflower oil
- Soya
- Jatropha



### Principles of Operation

The FIJI instrument is robust, extremely simple to use and fully automatic with no specialist operator training required.

Each test requires less than 50ml of sample and takes approximately 15 minutes.

Results are presented in mg/kg units with an optional traffic light system for indicating FAME contamination levels of the fuel.

Using a unique sample preparation module, the sample is pumped at a controlled flow rate through a proprietary disposable cartridge.

The sample components are spectrally analysed by the FTIR and a result is displayed in mg/kg. The system is self-cleaning so no solvents are required.

After each test the cartridge is simply and easily replaced and the instrument is immediately ready for the next sample.

By comparison, current analytical tests can take many hours, require complex equipment and demand high skill levels.

FIJI is the only test that can screen for all types of FAME.



Less than 50ppm



More than 50ppm

### Operator Sequence



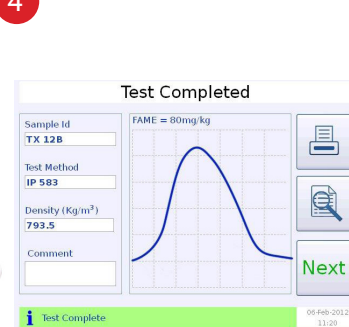
Place Cartridge



Load Sample



Press 'GO'



Test Completed!

## FIJI DRG- FAME In Distillate & Residual Fuel

### ASTM D7963

FIJI technology applies to other types of fuel such as; middle distillates and residual grades.

FIJI DRG includes additional chemometrics for testing in accordance with ASTM D7963, therefore providing the industry with a simple check on Parts Per Million (ppm or mg/kg) of FAME in distillate and residual Fuels.

It has a typical measurement range of 0 to 1000 mg/kg and by use of a proprietary diluent (SA5028-0), the range can be extended beyond 1000 mg/kg FAME contamination.

Operation, similarly to FIJI JF, is quick and simple and requires no additional operator training.

### Key Features

- Analysis time 15 minutes (approx)
- Measurement range 0 mg/kg to 50%
- Certified range 20 mg/kg to 50%
- Laboratory and field instrument
- Fully automatic
- Suitable for untrained operators

### New Test Method: ASTM D7963

ASTM test method D7963 was developed to enable laboratories to use the FIJI technology across a wider range of fuels, such as distillate and residual fuel. The new method has a wide range of applicability covering FAME contamination levels 20 mg/kg to 50%.



## FIJI MF- FAME In Jet, Distillate & Residual Fuel

### ASTM D1655; ASTM D7797; DEF STAN 91-91; IP 583; ASTM D7963

FIJI MF (MultiFuel) provides the industry with an instrument which can test for FAME in a variety of fuels such as; aviation, distillate and residuals.

### ASTM D7963 Upgrade (SA5150-0)

The FIJI JF tester for FAME in jet fuel can also be upgraded to test for other fuels such as; middle distillate and residuals. This is achieved through a simple field upgrade kit (SA5150-0) which will provide users with the option of testing FAME in middle distillate & residuals with a measurement range of 0 mg/kg to 50%.

### ASTM D7797; IP 583 Upgrade (SA5050-0)

Users of FIJI DRG have the option to upgrade their existing unit to measure jet fuel in accordance with ASTM D7797 and IP 583 in addition to middle distillate and residual fuels. The upgrade can be performed in the field using the FIJI Jet Fuel Upgrade Kit (SA5050-0). Once the upgrade has been performed users will be able to test for FAME in Jet Fuel with a measurement range of 0-150ppm (mg/kg)

### FIJI Instrument Options

Parameter	FIJI JF	FIJI DRG	FIJI MF
Ordering Information:	SA5000-2	SA5100-0	SA5200-0
Fuel Options:	AVTUR (Aviation Fuel)	Middle distillate and residual fuels	AVTUR, middle distillate and residual fuels
ASTM Method:	ASTM D1655; ASTM D7797	ASTM D7963	ASTM D1655; ASTM D7797; ASTM D7963
IP Method:	IP 583	-	IP 583
Certified Range:	10 - 150 mg/kg	20 mg/kg to 50%	Aviation 10 - 150 mg/kg Middle distillate and residual fuels 20 mg/kg to 50%
Measurement Range:	0 - 150 mg/kg	0 - 50%	Aviation 0 - 150ppm (mg/kg) Middle distillate and residual fuels 0 to 50%
Sample Size:	50ml	50ml	50ml

### Technical Specification

Operating Temperature Range:	5-35°C maximum (80%RH)
System:	Embedded Computer
User Interface:	Colour Touch Screen
Connectivity:	USB 'A' (2 ports)
Voltage / Power:	100 to 250V 50/60Hz / 50W max
Size (HxWxD) / Weight:	55 x 38 x 42 cm / 27kg