EN 14103 Determination of total FAME and linolenic acid methyl ester in FAME with AC Biodiesel All in One Solution

- **Complies to EN 14103:2011**
- **Included QC materials sample**
- **Dedicated Software for Biodiesel specific reporting**

Keywords:
FAME, EN 14103, All-in-one Biodiesel, linolenic acid, FID-detection.

INTRODUCTION

Biodiesel is the "green" equivalent for petroleum diesel or petrodiesel. Biodiesel is a renewable fuel derived from algae, vegetable oils, animal fats or cooking oils. The most important environmental benefit of biodiesel is that it is biological degradable, less poisonous and does not contain aromatics and very low sulfur. Therefore, burning biofuels release less sulfur oxides and carbon monoxide.

Quality requirements of biodiesel for use as pure biofuel or blending stock for diesel fuel are defined in ASTM D6751 and EN 14214 specification. The standards ensure that among others the following important factors in the fuel production process are satisfied: complete reaction, removal of glycerin, absence of Poly Unsaturated Fatty Acids, removal of alcohol and absence of free fatty acids. Method EN 14103 is prescribed for the determination of total FAME's (Fatty Acid Methyl Esters) and Linolenic Acid Methyl Ester (C18:3, *figure 1*) content.

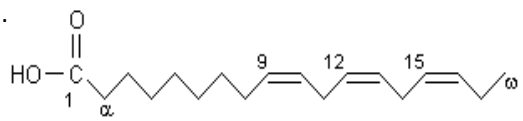

Figure 1: Linolenic acid (C18:3).

SOLUTION

The AC Biodiesel All in One fully complies with EN 14103:2011. It combines all major Biodiesel methods in one complete solution.
The sample is introduced into a Split/Splitless inlet, the capillary column separates the individual components that are subsequently detected by the FID. Instrumental conditions are inserted in Fig 3.
Calculation of the percentage of FAME is achieved with internal standard calibration. The method is suitable for FAME's which contain methyl esters between C6:0 and C24:1. A pre-diluted sample, supplied with the solution contains all important FAME components, as listed in *Table 1* below.

Name	Double bonds
Caproic or Hexanoic acid	C6:0
Caprylic or Octanoic acid	C8:0
Capric or Decanoic acid	C10:0
Lauric or Dodecanoic acid	C12:0
Myristic or Tetradecanoic acid	C14:0
Myristoleic Tetradecenoic acid	C14:1
Palmitic or Hexadecanoic acid	C16:0
Palmitoleic or Hexadecenoic acid	C16:1
Margaric or Heptadecanoic acid	C17:0
Stearic or Octadecanoic acid	C18:0
Oleic acid or Octadecenoic acid	C18:1
Linoleic or Octadecadienoic acid	C18:2
Linolenic Octadecatrienoic acid	C18:3
Nonadecanoic acid	C19:0
Arachidic or Eicosanoic acid	C20:0
Eicosenic acid	C20:1
Arachidonic or Eicosatetraenoic acid	C20:4
Eicosapentaenoic acid	C20:5
Behenic or Docosanoic acid	C22:0
Erucic or Docosenoic acid	C22:1
Clupanodonic or Docosapentaenoic acid	C22:5
Docosahexaenoic acid	C22:6
Lignoceric or Tetracosanoic acid	C24:0
Nervonic or methyl c-15-tetracosenoic acid	C24:1

Table 1: Peak Identification common fatty acids

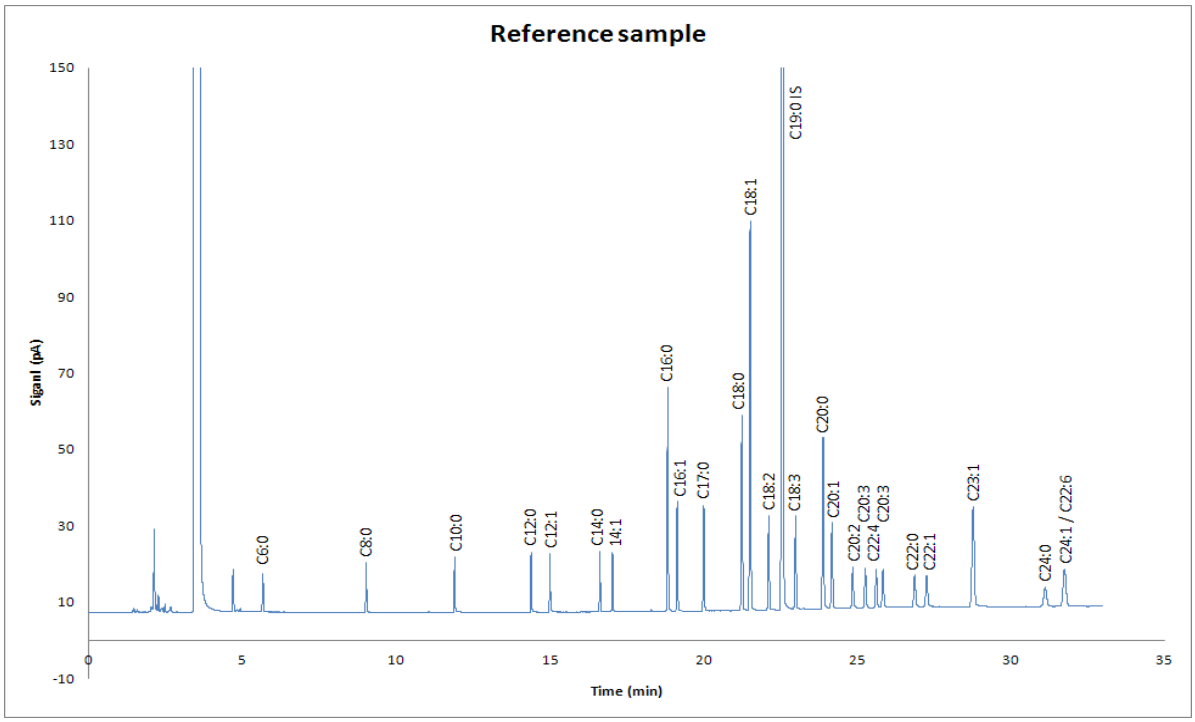

Figure 2: Reference sample C6:0 – C24:1

Parameter	Setting
Inlet	S/SL
Injection Volume	1 µl
Split Ratio	1:100
Injection Temp	250 °C
Oven initial Temp.	60 °C
Oven initial Time	2 min
Ramp 1	10 °C / min
Final Temperature 1	200 °C
Ramp 2	5 °C / min
Final Temperature 2	240 °C
Final Time	7 min
Flow mode	Constant flow
Flow	2 ml/min
Column dimensions	30 m x 0.25 mm x 0.25µm
Column type	Polyethylene Glycol Wax
Detector	FID
Detector Temp	250 °C
H_2 flow	35 ml/min
Air flow	350 ml/min
Make-up flow (N_2)	20 ml/min

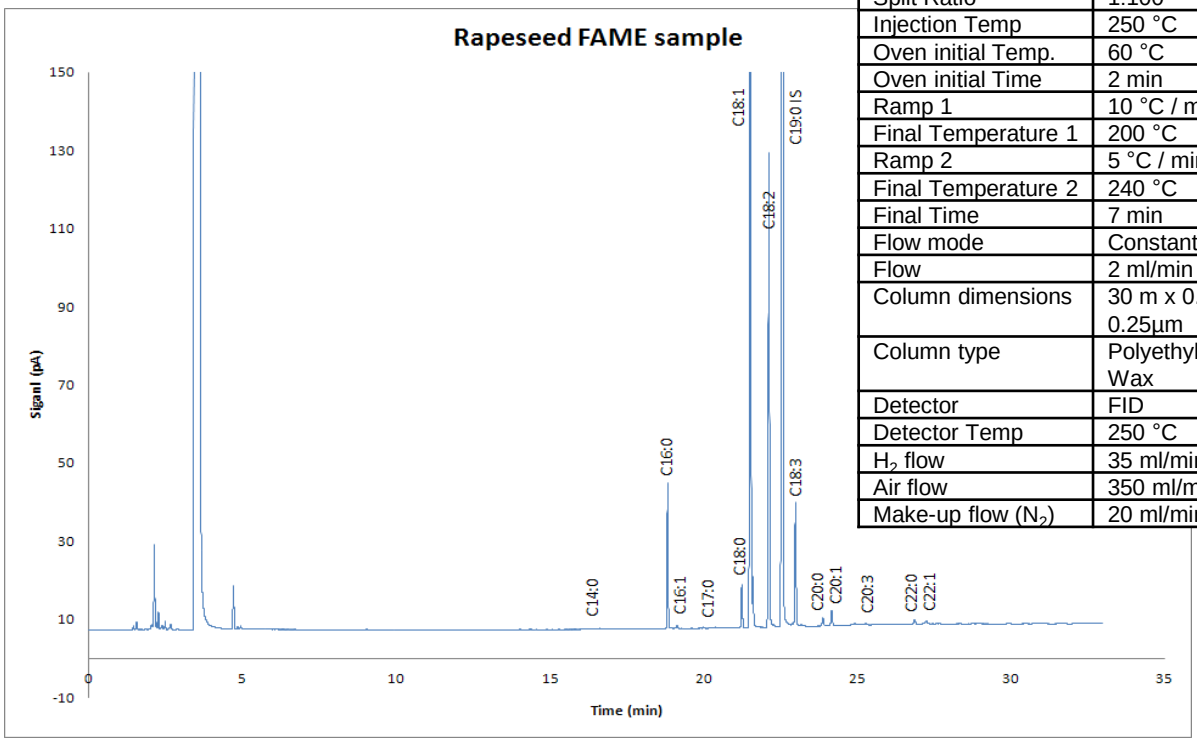

Figure 3: Rapeseed FAME sample

www.paclp.com

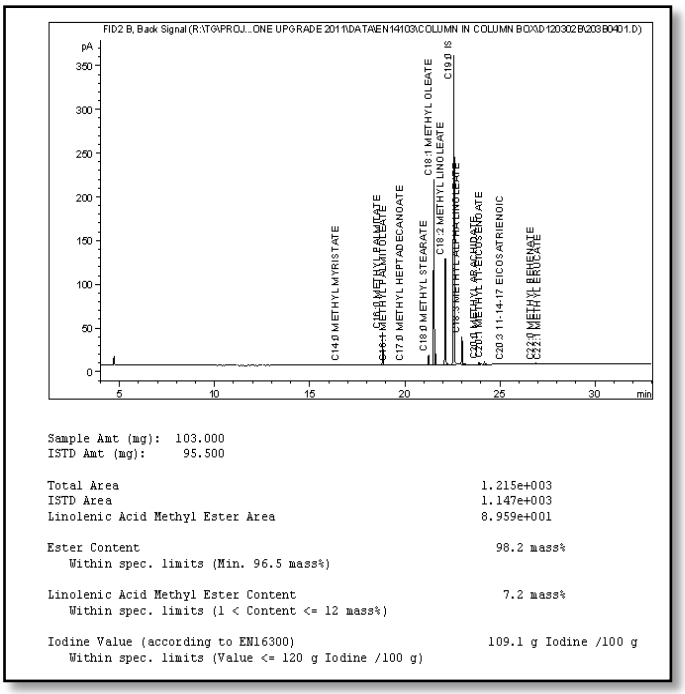

Figure 4: Rapeseed Reference Sample report

Parameter	Method Repeatability (r)	Measured Repeatability (r)
Ester content (%)	1,01	< 0.2
Linolenic acid (%)	0.0283 + 0.0175X	< 0.1
Iodine value (gr I / 100 gr sample	0.5447 + 0.003X	< 0.2

Table 2: Analysis specifications

IODINE VALUE

According to Biodiesel Specification EN 14214, the Iodine value can be calculated from the methyl ester distribution pattern obtained from EN 14103:2011 results. For each FAME compound a factor to calculate the iodine value is given according method prEN 16300. Iodine value, displayed in g iodine / 100 mg, is automatically calculated and reported.

SPECIFICATION CHECK

Besides Iodine value, Total ester content and Linolenic Acid Methyl ester content are reported conform EN 14103:2011 and checked against specifications in EN 14214. All results obtained are within the limits specified for this particular sample.

CONCLUSION

The performance of the AC Biodiesel All in One is demonstrated for EN 1403:2011. All requirements as stated in the method are met.

The AC Biodiesel All in One is also an excellent choice to analyze FAME feedstock according to ASTM D6584, EN 14105, EN 14110, prEN 16300 and EN 15779. Its innovative dual programmable oven design ensures optimal availability and flexibility towards various methods as no column changes are required when switching applications and the system is ‘always ready’, regardless the method that’s needed for the sample .

The included reference materials & chemicals and the dedicated reporting makes the AC Biodiesel All in One very user friendly and easy to use for fastest adoption in any biodiesel lab.

AC Analytical Controls® has been the recognized leader in chromatography analyzers for gas, naphtha and gasoline streams in crude oil refining since 1981. AC also provides technology for residuals analysis for the hydrocarbon processing industry. Applications cover the entire spectrum of petroleum, petrochemical and refinery, gas and natural gas analysis;
ACs Turn-Key Application solutions include the AC Reformulyzer ® , DHA, SimDis, NGA, Hi-Speed RGA and Customized instruments.

www.paclp.com