

JOINT RESEARCH CENTRE  
Directorate F – Health, Consumers and Reference Materials

# REFERENCE MATERIAL CERTIFICATE

## ERM®- EF001

BIODIESEL			
	Certified value <sup>10)</sup>	Uncertainty <sup>11)</sup>	Unit
Ester content <sup>1)</sup>	97.4	0.6	[% (m/m)] <sup>9)</sup>
Linolenic acid methyl ester content <sup>1)</sup>	8.52	0.09	[% (m/m)] <sup>9)</sup>
Ester content <sup>2)</sup>	98.9	1.7	[% (m/m)] <sup>9)</sup>
Linolenic acid methyl ester content <sup>2)</sup>	8.82	0.16	[% (m/m)] <sup>9)</sup>
Density (at 15 °C) <sup>3)</sup>	883.20	0.04	[kg/m <sup>3</sup> ]
Viscosity (at 40 °C) <sup>4)</sup>	4.474	0.006	[mm <sup>2</sup> /s]
Oxidation stability (at 110 °C) <sup>5)</sup>	9.8	0.5	[h]
Iodine value <sup>6)</sup>	112	4	[g iodine/100 g]
Iodine value <sup>7)</sup>	107.3	1.9	[g iodine/100 g]
Flash point <sup>8)</sup>	181	14 <sup>12)</sup>	[°C]

1) As defined by EN 14103:2020  
2) As defined by EN 14103:2011  
3) As defined by EN ISO 12185:1996  
4) As defined by EN ISO 3104:2020  
5) As defined by EN 15751:2014 and EN 14112:2020  
6) As defined by EN 14111:2003  
7) As defined by EN 16300:2012  
8) As defined by EN ISO 3679:2015  
9) As called in EN 14103:2011 and EN 14103:2020, equivalent to 10<sup>-2</sup> g/g  
10) Certified values are values that fulfil the highest standards of accuracy. The given values represent the unweighted mean value of the means of accepted sets of data, each set being obtained in a different laboratory. The certified value and its uncertainty are traceable to the International System of Units (SI).  
11) The uncertainty of the certified value is the expanded uncertainty with a coverage factor  $k = 2$  corresponding to a level of confidence of 95 %, estimated in accordance with ISO 17034:2016 and ISO Guide 35:2017.  
12) The uncertainty of the certified value is the expanded uncertainty with a coverage factor  $k = 2.8$  corresponding to a level of confidence of 95 %, estimated in accordance with ISO 17034:2016 and ISO Guide 35:2017.

This certificate is valid for one year after purchase.

Sales date:

The minimum sample intake is defined by the required sample volume stipulated in the respective standard methods.

Geel, August 2014  
Latest revision July 2022

Signed: \_\_\_\_\_



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## Indicative Values

	Indicative value <sup>3)</sup>	Uncertainty <sup>4)</sup>	Unit
Methanol content <sup>1)</sup>	0.041	0.016	[% (m/m)] <sup>2)</sup>

1) As defined by EN 14110:2019

2) As called in EN 14110:2019, which is equivalent to 10<sup>-2</sup> g/g

3) Indicative values are values where either the uncertainty is deemed too large or where too few independent datasets are available to allow certification and are therefore less reliable than certified values. Great caution should be used when using these values. The given value is an unweighted mean value of the means of accepted sets of data, each set being obtained in a different laboratory. The indicative value and its uncertainty are traceable to the International System of Units (SI).

4) The uncertainty of the indicative value is the expanded uncertainty with a coverage factor  $k = 2$  corresponding to a level of confidence of 95 %, estimated in accordance with ISO 17034:2016 and ISO Guide 35:2017.

### DESCRIPTION OF THE MATERIAL

A commercial unblended biodiesel, so called B100, based on rapeseed oil fatty acid methyl ester, with the addition of about 1 g/kg of the antioxidant butylhydroxytoluene was selected as base material. ERM-EF001 is filled in amber glass ampoules and each unit contains 27 mL biodiesel.

### ANALYTICAL METHODS USED FOR CHARACTERISATION

Ester content: EN 14103:2011 and EN 14103:2020

Linolenic acid methyl ester content: EN 14103:2011 and EN 14103:2020

Density at 15 °C: EN ISO 12185:1996

Viscosity at 40 °C: EN ISO 3104:2020

Oxidation stability at 110 °C: EN 14112:2003; validity confirmed with EN 15751:2014 (equivalent to EN 14112:2020)

Iodine value: EN 14111:2003 and EN 16300:2012

Flash point: EN ISO 3679:2004; validity confirmed with EN ISO 3679:2015

Methanol content: EN 14110:2003; validity confirmed with EN 14110:2019

## PARTICIPANTS

The following laboratories performed measurements in the scope of the homogeneity, stability and or characterisation study.

ASG Analytik-Service AG, Neusäss, DE

(measurements under the scope of ISO/IEC 17025 accreditation D-PL-11334-01-00)

EESTI KESKKONNAUURINGUTE KESKUS OÜ (Estonian Environmental Research Centre), Tallinn, EE

(measurements under the scope of ISO/IEC 17025 accreditation EAK L008)

European Commission, Joint Research Centre, Directorate F – Health, Consumers and Reference Materials, Geel, BE

(measurements under the scope of ISO/IEC 17025 accreditation BELAC No. 268-TEST)

INNOVHUB - Stazioni Sperimentali per l'Industria, Milan, IT

INTERTEK BELGIUM NV, Antwerp, BE

(measurements partially under the scope of ISO/IEC 17025 accreditation BELAC; No. 105-TEST)

INTERTEK - Immingham, Immingham, UK

(measurements partially under the scope of ISO/IEC 17025 accreditation UKAS No. 4162)

ITERG - Département Analyse & Expertise, Canéjan, FR

ITS Testing Services (UK) Limited (Teesside Laboratory), Cleveland, UK

(measurements partially under the scope of ISO/IEC accreditation UKAS No. 4106)

NAITEC - Fundación I+D Automoción y Mecatrónica, Noain, ES

SGS ESPAÑOLA DE CONTROL, S.A., Barcelona, ES

(measurements under the scope of ISO/IEC 17025 accreditation ENAC 14/LE249)

VÚRUP, a.s., Bratislava, SK

(measurements under the scope of ISO/IEC 17025 accreditation SNAS No. S-119)

## SAFETY INFORMATION

The usual laboratory safety precautions apply.

## INTENDED USE

The main purpose of this material is to assess method performance, i.e. for checking accuracy of analytical results/calibration. As any reference material, it can also be used for control charts or validation studies.

### Comparing an analytical result with the certified value

A result is unbiased if the combined standard uncertainty of measurement and certified value covers the difference between the certified value and the measurement result (see also ERM Application Note 1, <https://crm.jrc.ec.europa.eu/e/132/User-support-Application-Notes>).

For assessing the method performance, the measured values of the CRMs are compared with the certified values. The procedure is described here in brief:

- Calculate the absolute difference between mean measured value and the certified value ( $\Delta_{\text{meas}}$ ).
- Combine measurement uncertainty ( $u_{\text{meas}}$ ) with the uncertainty of the certified value ( $u_{\text{CRM}}$ ):  
$$u_{\Delta} = \sqrt{u_{\text{meas}}^2 + u_{\text{CRM}}^2}$$
- Calculate the expanded uncertainty ( $U_{\Delta}$ ) from the combined uncertainty ( $u_{\Delta}$ ) using an appropriate coverage factor, corresponding to a level of confidence of approximately 95 %.
- If  $\Delta_{\text{meas}} \leq U_{\Delta}$  no significant difference between the measurement result and the certified value, at a confidence level of about 95 % exists.

### Use in quality control charts

The materials can be used for quality control charts. Different CRM-units will give the same result as inhomogeneity was included in the uncertainties of the certified values.

### **INSTRUCTIONS FOR USE**

The units shall be vigorously shaken by turning upside down for at least 2 min before opening to ensure material re-homogenisation.

For general information on handling of reference materials, please see ERM Application Note 6, available on <https://crm.jrc.ec.europa.eu/e/132/User-support-Application-Notes>.

### **STORAGE**

The material shall be stored at  $(18 \pm 5)$  °C in the dark. Care shall be taken to avoid change of the moisture content once the units are open, as the material is hygroscopic.

For more information regarding the shelf life of reference materials please see ERM Application Note 7, available on <https://crm.jrc.ec.europa.eu/e/132/User-support-Application-Notes>.

Please note that the stability of opened samples has not been tested and repeated use of the material occurs under the responsibility of the user. The European Commission cannot be held responsible for changes that happen during storage of the material at the customer's premises, especially of opened samples.

### **LEGAL NOTICE**

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### **NOTE**

A detailed certification report is available at <https://crm.jrc.ec.europa.eu/>.



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