Results of Proficiency Test
Transformer Oil (fresh)
November 2020

Organized by: Institute for Interlaboratory Studies
Spijkenisse, the Netherlands

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1 INTRODUCTION

Since 2001 the Institute for Interlaboratory Studies (iis) organizes a proficiency scheme for the analysis of Transformer Oil (fresh) every year. During the annual proficiency testing program of 2020/2021, it was decided to continue with the proficiency test on Transformer Oil (fresh) in accordance with the latest applicable version of the specification IEC60296 and ASTM D3487.

In this interlaboratory study 65 laboratories in 31 different countries registered for participation. See appendix 3 for the number of participants per country. In this report the results of this proficiency test are presented and discussed. This report is also electronically available through the iis website www.iisnl.com.

2 SET UP

The Institute for Interlaboratory Studies (iis) in Spijkenisse, the Netherlands, was the organizer of this proficiency test (PT). Sample analyses for fit-for-use and homogeneity testing were subcontracted to an ISO/IEC17025 accredited laboratory. It was decided to send one bottle of 1L labelled #20225 of Transformer Oil (fresh). The participants were requested to report rounded and unrounded test results. The unrounded test results were preferably used for statistical evaluation.

2.1 ACCREDITATION

The Institute for Interlaboratory Studies in Spijkenisse, the Netherlands, is accredited in agreement with ISO/IEC17043:2010 (R007), since January 2000, by the Dutch Accreditation Council (Raad voor Accreditatie). This PT falls under the accredited scope. This ensures strict adherence to protocols for sample preparation and statistical evaluation and 100% confidentiality of participant's data. Feedback from the participants on the reported data is encouraged and customer's satisfaction is measured on regular basis by sending out questionnaires.

2.2 PROTOCOL

The protocol followed in the organization of this proficiency test was the one as described for proficiency testing in the report 'iis Interlaboratory Studies: Protocol for the Organization, Statistics and Evaluation' of June 2018 (iis-protocol, version 3.5). This protocol is electronically available through the iis website www.iisnl.com, from FAQ page.

2.3 CONFIDENTIALITY STATEMENT

All data presented in this report must be regarded as confidential and for use by the participating companies only. Disclosure of the information in this report is only allowed by means of the entire report. Use of the contents of this report for third parties is only allowed by written permission of the Institute for Interlaboratory Studies. Disclosure of the identity of one or more of the participating companies will be done only after receipt of a written agreement of the companies involved.

2.4 SAMPLES

Approximately 80 liters of Transformer Oil (fresh) was obtained from a local supplier.
After homogenization the batch was divided over 78 subsamples in amber glass bottles of 1 liter and labelled #20225.
The homogeneity of the subsamples was checked by the determination of Density at 20°C in accordance with ASTM D4052 on 8 stratified randomly selected subsamples.

	Density at 20°C in kg/m^3
Sample #20225-1	867.28
Sample #20225-2	867.29
Sample #20225-3	867.24
Sample #20225-4	867.24
Sample #20225-5	867.24
Sample #20225-6	867.25
Sample #20225-7	867.26
Sample #20225-8	867.28

Table 1: homogeneity test results of subsamples #20225

From the above test results the repeatability was calculated and compared with 0.3 times the reproducibility of the reference test method in agreement with the procedure of ISO13528, Annex B2 in the next table.

	Density at 20°C in kg/m^3
r (observed)	0.06
reference test method	ISO3675:98
0.3 x R (reference test method)	0.36

Table 2: evaluation of the repeatability of subsamples #20225

The calculated repeatability was in agreement with 0.3 times the reproducibility of the reference test method. Therefore, homogeneity of the subsamples was assumed.

To each of the participating laboratories 1 bottle of 1L labelled #20225 was sent on October 28, 2020. An SDS was added to the sample package.

2.5 STABILITY OF THE SAMPLES

The stability of Transformer Oil (fresh) packed in amber glass bottles was checked.
The material was found sufficiently stable for the period of the proficiency test.

2.6 ANALYZES

The participants were requested to determine on sample #20225: Total Acidity (Potentiometric and Colorimetric), Appearance, Breakdown Voltage, Color ASTM, Density at 20°C, Di-electric loss at 90°C (Di-electric Dissipation Factor and Specific Resistance), Flash Point (C.O.C. and PMcc), Interfacial Surface Tension, Kinematic Viscosity at 40°C, Water and Additives (DBP, DBPC, DBDS, BTA and Irgamet 39). Also, an extra question regarding stirring during the determination of the Breakdown Voltage were requested.

It was explicitly requested to treat the sample as if it was a routine sample and to report the test results using the indicated units on the report form and not to round the test results but report as much significant figures as possible. It was also requested not to report 'less than' results, which are above the detection limit, because such test results cannot be used for meaningful statistical evaluations.

To get comparable test results, a detailed report form and a letter of instructions are prepared. On the report form the reporting units are given as well as the reference test methods (when applicable) that will be used during the evaluation. The detailed report form and the letter of instructions are both made available on the data entry portal www.kpmd.co.uk/sgs-iis/. The participating laboratories are also requested to confirm the sample receipt on this data entry portal. The letter of instructions can also be downloaded from the iis website www.iisnl.com.

3 RESULTS

During five weeks after sample dispatch the results of the individual laboratories were gathered via the data entry portal www.kpmd.co.uk/sgs-iis/. The reported test results are tabulated per determination in appendices 1 and 2 of this report. The laboratories are presented by their code numbers.

Directly after the deadline, a reminder was sent to those laboratories that had not reported test results at that moment. Shortly after the deadline, the available test results were screened for suspect data. A test result was called suspect in case the Huber Elimination Rule (a robust outlier test) found it to be an outlier. The laboratories that produced these suspect data were asked to check the reported test results (no reanalysis). Additional or corrected test results are used for data analysis and original test results are placed under 'Remarks' in the result tables in appendix 1 or 2. Test results that came in after the deadline were not taken into account in this screening for suspect data and thus these participants were not requested for checks.

3.1 STATISTICS

The protocol followed in the organization of this proficiency test was the one as described for proficiency testing in the report 'iis Interlaboratory Studies: Protocol for the Organisation, Statistics and Evaluation' of June 2018 (iis-protocol, version 3.5).
For the statistical evaluation the *unrounded* (when available) figures were used instead of the rounded test results. Test results reported as '<…' or '>…' were not used in the statistical evaluation.

First, the normality of the distribution of the various data sets per determination was checked by means of the Lilliefors-test, a variant of the Kolmogorov-Smirnov test and by the calculation of skewness and kurtosis. Evaluation of the three normality indicators in combination with the visual evaluation of the graphic Kernel density plot, lead to judgement of the normality being either ‘unknown’, ‘OK’, ‘suspect’ or ‘not OK’. After removal of outliers, this check was repeated. If a data set does not have a normal distribution, the (results of the) statistical evaluation should be used with due care.

According to ISO5725 the original test results per determination were submitted to Dixon’s, Grubbs' or Rosner’s outlier tests. Outliers are marked by D(0.01) for the Dixon’s test, by G(0.01) or DG(0.01) for the Grubbs’ test and by R(0.01) for the Rosner’s test. Stragglers are marked by D(0.05) for the Dixon’s test, by G(0.05) or DG(0.05) for the Grubbs’ test and by R(0.05) for the Rosner’s test. Both outliers and stragglers were not included in the calculations of averages and standard deviations.

For each assigned value, the uncertainty was determined in accordance with ISO13528. Subsequently the calculated uncertainty was evaluated against the respective requirement based on the target reproducibility in accordance with ISO13528. In this PT, the criterion of ISO13528, paragraph 9.2.1, was met for all evaluated tests, therefore, the uncertainty of all assigned values may be negligible and need not be included in the PT report.

Finally, the reproducibilities were calculated from the standard deviations by multiplying them with a factor of 2.8.

3.2 GRAPHICS

In order to visualize the data against the reproducibilities from literature, Gauss plots were made, using the sorted data for one determination (see appendix 1). On the Y-axis the reported test results are plotted. The corresponding laboratory numbers are on the X-axis.

The straight horizontal line presents the consensus value (a trimmed mean). The four striped lines, parallel to the consensus value line, are the +3s, +2s, -2s and -3s target reproducibility limits of the selected reference test method. Outliers and other data, which were excluded from the calculations, are represented as a cross. Accepted data are represented as a triangle.

Furthermore, Kernel Density Graphs were made. This is a method for producing a smooth density approximation to a set of data that avoids some problems associated with histograms. Also, a normal Gauss curve was projected over the Kernel Density Graph for reference.

3.3 Z-SCORES

To evaluate the performance of the participating laboratories the z-scores were calculated. As it was decided to evaluate the performance of the participants in this proficiency test (PT) against the literature requirements, e.g. ISO, EN or ASTM reproducibilities, the z-scores were calculated using a target standard deviation. This results in an evaluation independent of the variation in this interlaboratory study.

The target standard deviation was calculated from the literature reproducibility by division with 2.8. In case no literature reproducibility was available, other target values were used. In some cases, a reproducibility based on former iis proficiency tests could be used.
When a laboratory did use a test method with a reproducibility that is significantly different from the reproducibility of the reference test method used in this report, it is strongly advised to recalculate the z-score, while using the reproducibility of the actual test method used, this in order to evaluate whether the reported test result is fit-for-use.

The z-scores were calculated according to:

$z_{(target)}$ = (test result - average of PT) / target standard deviation

The $z_{(target)}$ scores are listed in the result tables of appendix 1.
Absolute values for z<2 are very common and absolute values for z>3 are very rare.
The usual interpretation of z-scores is as follows:

	|z|	< 1	good
1 <	|z|	< 2	satisfactory
2 <	|z|	< 3	questionable
3 <	|z|		unsatisfactory

4 EVALUATION

In this proficiency test no major problems were encountered with the dispatch of the samples. One participant reported the test results after the final reporting date and six participants did not report any test results at all. Not all participants were able to report test results for all analyses requested.
In total 59 participants reported 404 numerical test results. Observed were 28 outlying test results, which is 6.9% of the numerical test results. In proficiency studies, outlier percentages of 3% - 7.5% are quite normal.

Not all original data sets proved to have a normal Gaussian distribution. These are referred to as “not OK” or “suspect”. The statistical evaluation of these data sets should be used with due care, see also paragraph 3.1.

4.1 EVALUATION PER TEST

In this section the reported test results are discussed per test. The test methods which were used by the various laboratories were taken into account for explaining the observed differences when possible and applicable. These test methods are also in the tables together with the reported test results in appendix 1. The abbreviations, used in these tables, are explained in appendix 4.

In the iis PT reports ASTM methods are referred to with a number (e.g. D1500) and an added designation for the year that the method was adopted or revised (e.g. D1500:12). If applicable, a designation in parentheses is added to designate the year of reapproval (e.g. D1500:12(2017)). In the results tables of appendix 1 only the method number and the year of adoption or revision (e.g. D1500:12) will be used.

Total Acidity (Potentiometric): The total Acidity was below the quantification limit of 0.014 mg KOH/g as given in test method EN62021-1:03. Therefore, no z-sores were calculated.

Total Acidity (Colorimetric): This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of ASTM D974:14e2.

Appearance: The determination was not problematic. All reporting laboratories agreed on the appearance of the oil being ‘Clear and Bright’ or remarked in similar words to this.

Breakdown Voltage: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of EN60156:95.
In the PT of 2018 the difference in consensus value between stirring and not stirring was not significant. In this PT and the PT of 2019, the difference was larger and significant. However, it was decided to calculate the assigned value over all test results as stirring and not stirring is allowed per EN60156:95 and the reproducibility of the group is in agreement with the requirements of test method EN60156:95.
The reproducibility of EN60156:95 was determined from Figure 3 of method EN60156:95, according to the iis memo 1702 (see lit. 17).

Color ASTM: This determination was not problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in agreement with the requirements of ASTM D1500:12(2017).
Please note: the test values reported as “text” (e.g. L0.5) were converted to a numerical value before calculating z-scores, see also appendix 1.

Density at 20°C: This determination was problematic for a number of participants. Ten statistical outliers were observed. However, the calculated reproducibility after rejection of the statistical outliers is in agreement with the requirements of ISO3675:98.

DD-Factor: This determination was not problematic. Two statistical outliers were observed. However, the calculated reproducibility after rejection of the statistical outliers is in agreement with the requirements of EN60247:04.

Specific Resistance: This determination was problematic. Three statistical outliers were observed and one other test result was excluded. The calculated reproducibility after rejection of the suspect data is not in agreement with the requirements of EN60247:04.
Please note that it is well known that specific resistance of new oils can vary over a wide range. This is due to randomly tiny amounts of impurities (maybe present in the air or in the test cell) which can dramatically change the value. In used oils, however, due to already present ion flow of the polar compounds, these problems are not observed.

Flash Point COC: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of ASTM D92:18.

Flash Point PMcc: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of ISO2719-A:16.

Interfacial Surface Tension: This determination was problematic. Two statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is not in agreement with the requirements of ASTM D971:20.

Kinematic Viscosity: This determination was problematic depending on the test method used. Five statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is not in agreement with the requirements of ASTM D445:19 and ISO3104:94.

Water: This determination was not problematic. Three statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in agreement with the requirements of EN60814:97.

Antioxidant additives: The majority of the participants agreed that DBP (2,6-Di-tertiary-butyl phenol), DBPC (2,6-Ditertiary-butyl paracresol) DBDS (Dibenzyl disulphide), BTA (Benzotriazole) and Irgamet 39 were below the level of quantification. Therefore, these components were not further evaluated. The reported test results are given in appendix 2.

4.2 PERFORMANCE EVALUATION FOR THE GROUP OF LABORATORIES

A comparison has been made between the reproducibility as declared by the reference test method and the reproducibility as found for the group of participating laboratories. The number of significant test results, the average, the calculated reproducibility (2.8 * standard deviation) and the target reproducibility derived from literature reference test methods (e.g. ASTM, EN and ISO test methods) are presented in the next table.

Parameter	unit	n	average	2.8 * sd	R(lit)
Total Acidity (Potentiometric)	mg KOH/g	23	0.006	0.011	(0.002)
Total Acidity (Colorimetric)	mg KOH/g	18	0.006	0.010	0.04
Appearance		36	C&B	n.a.	n.a.
Breakdown Voltage	kV/2.5 mm	51	66.1	32.2	45.3
Color ASTM		38	0.22	0.36	1
Density at 20°C	kg/m^3	35	836.91	1.06	1.2
Di-electric Dissipation Factor 90°C		36	0.0006	0.0012	0.0016
Specific Resistance at 90°C	GΩm	28	720	1682	756
Flash Point C.O.C.	°C	19	156.6	13.0	18
Flash Point PMcc	°C	35	146.1	9.4	10.4

Parameter	unit	n	average	2.8 * sd	R(lit)
Interfacial Surface Tension	mN/m	33	46.2	6.0	4.6
Kinematic Viscosity at 40°C	mm^2/s	37	9.03	0.15	0.11
Water	mg/kg	38	10.7	4.7	4.9

Table 3: reproducibilities of tests on sample #20225

Results between brackets were near or below detection limit, these results should be used with care
C&B = Clear and Bright

Without further statistical calculations, it can be concluded that for most tests there is a good compliance of the group of participating laboratories with the relevant reference test methods. The problematic tests have been discussed in paragraph 4.1.

4.3 COMPARISON OF THE PROFICIENCY TEST OF NOVEMBER 2020 WITH PREVIOUS PTS

	November 2020	November 2019	November 2018	November 2017	November 2016
Number of reporting laboratories	59	48	50	55	51
Number of test results	404	377	371	405	383
Number of statistical outliers	28	24	24	18	29
Percentage of statistical outliers	6.9%	6.4%	6.5%	4.4%	7.6%

Table 4: comparison with previous proficiency tests

In proficiency tests, outlier percentages of 3% - 7.5% are quite normal.
The performance of the determinations of the proficiency tests was compared against the requirements of the reference test methods. The conclusions are given the following table.

Parameter	November 2020	November 2019	November 2018	November 2017	November 2016
Total Acidity (Potentiometric)	(--)	(--)	(--)	(--)	(--)
Total Acidity (Colorimetric)	++	++	++	++	++
Breakdown Voltage	+	+	+/-	-	++
Color ASTM	++	++	n.e.	n.e.	n.e.
Density at 20°C	+	+	++	++	++
Di-electric Dissipation Factor	+	+	+	+	+
Specific Resistance	--	-	-	--	--
Flash Point C.O.C.	+	+	+	-	+/-
Flash Point PMcc	+/-	+	+	+/-	+
Interfacial Surface Tension	-	+/-	+/-	-	+/-
Kinematic Viscosity at 40°C	-	-	+/-	-	+/-
Water	+/-	-	+/-	-	+/-
DBPC Antioxidant Additive	n.e.	n.e.	+	+/-	n.e.

Table 5. comparison of group performances against the reference test methods
Results between brackets were near or below detection limit, these results should be used with care

The performance of the determinations against the requirements of the reference test methods is listed in the above table. The following performance categories were used:

++	: group performed much better than the reference test method
+	: group performed better than the reference test method
+/-	: group performance equals the reference test method
-	: group performed worse than the reference test method
--	: group performed much worse than the reference test method
n.e.	: not evaluated

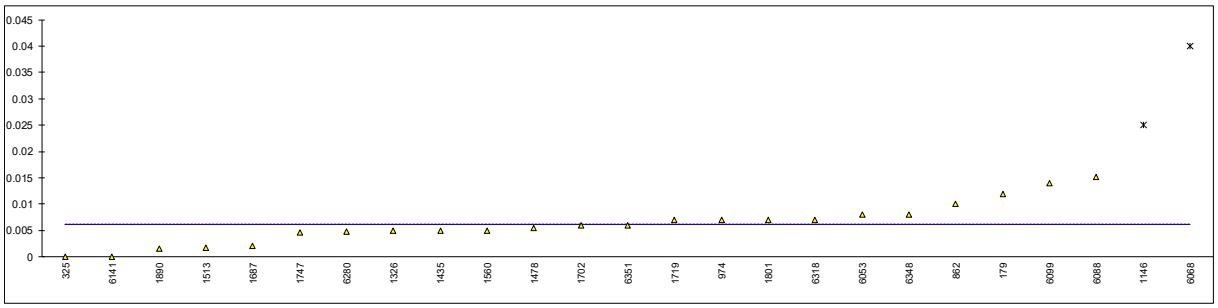
APPENDIX 1

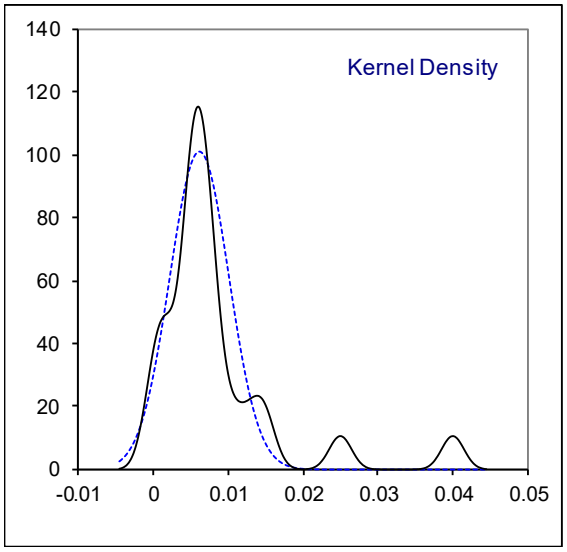
Determination of Total Acidity (Potentiometric) on sample #20225; results in mg KOH/g

lab	method	value	mark	z(targ)	remarks
173		-----		-----	
179	D664-A	0.012	C	-----	first reported: 0.02
325	D664-A	0.00		-----	
360		-----		-----	
398		-----		-----	
446		-----		-----	
614		-----		-----	
657	D664-A	< 0.1		-----	
862	D664-A	0.01		-----	
912		-----		-----	
913		-----		-----	
963		-----		-----	
974	D664-A	0.007		-----	
1137		-----		-----	
1146	D664-A	0.025	R(0.01)	-----	
1244		-----		-----	
1264		-----		-----	
1304		-----		-----	
1306		-----		-----	
1326	IEC62021-1	0.00495		-----	
1435	IEC62021-1	0.005		-----	
1442		-----		-----	
1444		-----		-----	
1458		-----		-----	
1461		-----		-----	
1478	EN62021-1	0.0055		-----	
1505		-----		-----	
1513	IEC62021-1	0.0017		-----	
1560	IEC62021-1	0.005		-----	
1626		-----		-----	
1660	IEC62021-1	< 0,01		-----	
1687	D664-A	0.002		-----	
1702	IEC62021-1	0.006		-----	
1719	D664-A	0.007		-----	
1743	IEC62021-1	<0.02		-----	
1747	IEC62021-1	0.0047		-----	
1801	EN62021-1	0.007		-----	
1885		-----		-----	
1890	ISO6619	0.0016		-----	
6000		-----		-----	
6015		-----		-----	
6048		-----		-----	
6053	IEC62021-1	0.008		-----	
6068	ISO6619	0.04	R(0.01)	-----	
6071		-----		-----	
6080		-----		-----	
6085		-----		-----	
6088	IEC62021-1	0.0151		-----	
6099	IEC62021-1	0.014		-----	
6141	D664-A	0.000		-----	
6167		-----		-----	
6253		-----		-----	
6278		-----		-----	
6280	IEC62021-1	0.0048	C	-----	first reported: 0.2836
6318	IEC62021-1	0.007		-----	
6334		-----		-----	
6339		-----		-----	
6342		-----		-----	
6343		-----		-----	
6347		-----		-----	
6348	IEC62021-1	0.008		-----	
6350		-----		-----	
6351	IEC62021-1	0.006		-----	
6360		-----		-----	
6361		-----		-----	

normality	OK
n	23
outliers	2
mean (n)	0.0062
st.dev. (n)	0.00394
R(calc.)	0.0110
st.dev.(EN62021-1:03)	(0.00062)
R(EN62021-1:03)	(0.0017)

Quantification limit EN62061-1:03: > 0.014



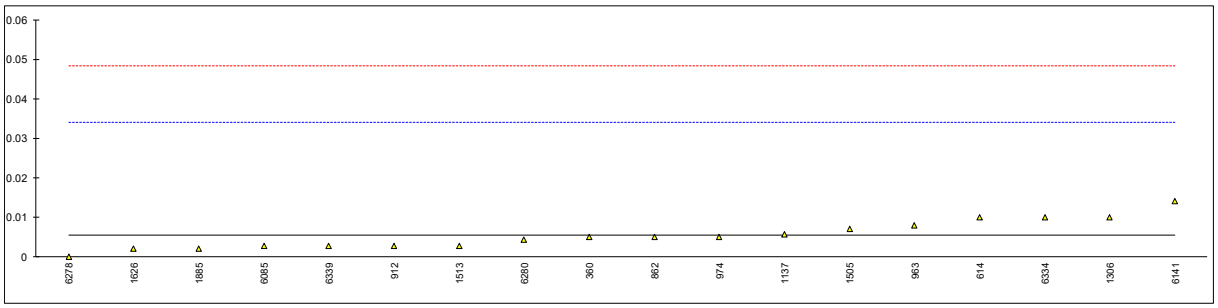


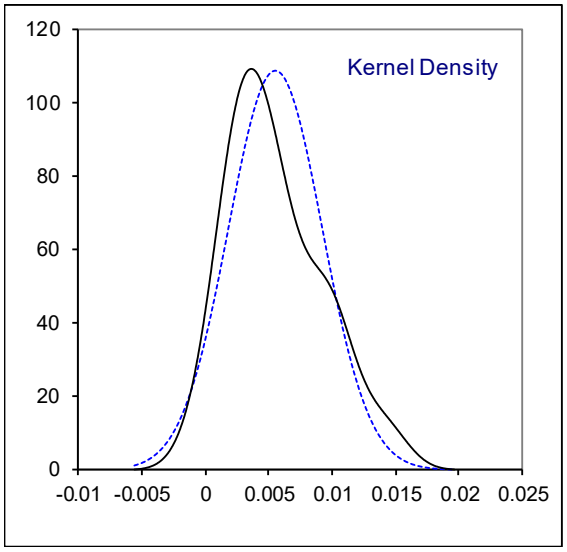
Determination of Total Acidity (Colorimetric) on sample #20225; results in mg KOH/g

lab	method	value	mark	z(targ)	remarks
173		-----		-----	
179	D974	<0.02		-----	
325		-----		-----	
360	ISO6618	0.005		-0.04	
398		-----		-----	
446	D974	<0.02		-----	
614	D974	0.01		0.31	
657	D974	< 0.02		-----	
862	D974	0.005		-0.04	
912	D974	0.0028		-0.19	
913		-----		-----	
963	D974	0.008		0.17	
974	D974	0.005		-0.04	
1137	D1534	0.0056		0.01	
1146		-----		-----	
1244		-----		-----	
1264		-----		-----	
1304	In house	<0.01		-----	
1306	D974	0.010131		0.32	
1326		-----		-----	
1435		-----		-----	
1442	IEC62021-2	<0,01		-----	
1444		-----		-----	
1458	D974	<0.01		-----	
1461		-----		-----	
1478		-----		-----	
1505	D974	0.007		0.10	
1513	IEC62021-2	0.0028		-0.19	
1560		-----		-----	
1626	D974	0.002		-0.25	
1660		-----		-----	
1687		-----		-----	
1702		-----		-----	
1719		-----		-----	
1743	ISO6618	<0.04		-----	
1747		-----		-----	
1801		-----		-----	
1885	D974	0.002		-0.25	
1890		-----		-----	
6000		-----		-----	
6015		-----		-----	
6048	D974	<0,01		-----	
6053		-----		-----	
6068		-----		-----	
6071	D974	<0.01		-----	
6080		-----		-----	
6085	D974	0.0027		-0.20	
6088		-----		-----	
6099		-----		-----	
6141	D974	0.014		0.59	
6167		-----		-----	
6253		-----		-----	
6278	D974	0		-0.39	
6280	IEC62021-2	0.0043		-0.08	
6318		-----		-----	
6334	EN62021-2	0.01		0.31	
6339	IEC62021-2	0.0027		-0.20	
6342		-----		-----	
6343		-----		-----	
6347		-----		-----	
6348		-----		-----	
6350		-----		-----	
6351		-----		-----	
6360		-----		-----	
6361		-----		-----	

normality	OK
n	18
outliers	0
mean (n)	0.0055
st.dev. (n)	0.00368
R(calc.)	0.0103
st.dev.(D974:14e2)	0.01429
R(D974:14e2)	0.04

Compare R(IEC62021-2:07) = 0.02
Quantification Limit iEC62021-2:07: > 0.01





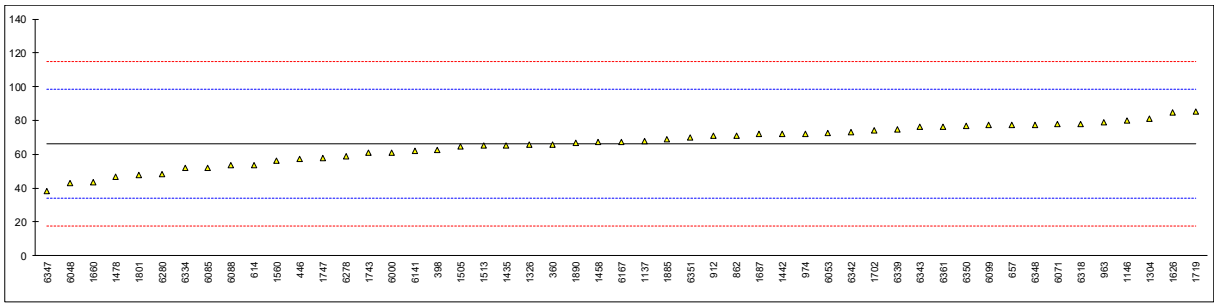
Determination of Appearance on sample #20225;

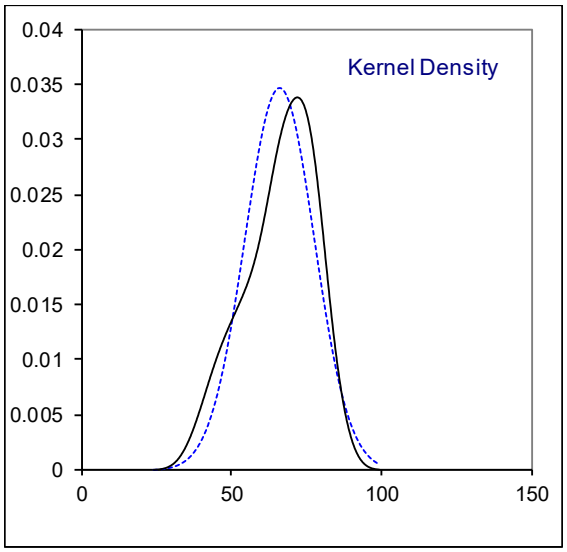
lab	method	value	mark	z(targ)	remarks
173	Visual	clear & bright		-----	
179		-----		-----	
325	Visual	water white		-----	
360	Visual	Clear and Bright		-----	
398	Visual	Clear		-----	
446	Visual	Clear & Bright		-----	
614		-----		-----	
657	Visual	Clear		-----	
862	Visual	Clear & Bright		-----	
912	Visual	Clear		-----	
913		-----		-----	
963	Visual	Bright and Clear		-----	
974	Visual	C & B		-----	
1137		-----		-----	
1146	Visual	Clear		-----	
1244		-----		-----	
1264		-----		-----	
1304		-----		-----	
1306	Visual	Clear		-----	
1326		-----		-----	
1435	Visual	clear		-----	
1442	Visual	clear		-----	
1444		-----		-----	
1458	Visual	Clear Bright		-----	
1461		-----		-----	
1478	IEC60298	clear		-----	
1505	D1524	Bright & Clear of particles		-----	
1513	Visual	Clear		-----	
1560	Visual	Clear & Bright		-----	
1626	Visual	Clear &Bright		-----	
1660	Visual	Clear		-----	
1687		-----		-----	
1702	Visual	Clear		-----	
1719		-----		-----	
1743		clear		-----	
1747		-----		-----	
1801		-----		-----	
1885	Visual	clear and bright			
1890	Visual	clear		-----	
6000		-----		-----	
6015		-----		-----	
6048	Visual	clear & Bright			
6053		-----		-----	
6068	Visual	clear, free from sediment and suspended matter		-----	
6071		-----		-----	
6080		-----		-----	
6085		-----		-----	
6088	Visual	clear and bright		-----	
6099	Visual	claire		-----	
6141	Visual	Clear & Bright		-----	
6167		-----		-----	
6253		-----		-----	
6278	Visual	Clear and bright		-----	
6280	Visual	Clear		-----	
6318		-----		-----	
6334	Visual	Clear		-----	
6339	Visual	Bright & clean colourless liquid		-----	
6342		-----		-----	
6343		-----		-----	
6347		-----		-----	
6348		-----		-----	
6350	Visual	Clear		-----	
6351		-----		-----	
6360		-----		-----	
6361	Visual	Transparent, clear & bright		-----	
	n	36			
	mean (n)	Clear and Bright			

Determination of Breakdown Voltage on sample #20225, results in kV/2.5 mm

lab	method	value	mark	z(targ)	stirred	remarks
173		-----		-----	---	
179		-----		-----	---	
325		-----		-----	---	
360	EN60156	65.8		-0.02	Yes	
398	EN60156	62.7		-0.21	Yes	
446	EN60156	57		-0.56	Yes	
614	EN60156	53.5		-0.78	Yes	
657	EN60156	77.3		0.69	No	
862	IEC60156	71.1		0.31	Yes	
912	IEC60156	71		0.30	---	
913		-----		-----	---	
963	IEC60156	79.1		0.80	No	
974	EN60156	72.2		0.38	Yes	
1137	IEC60156	68.0		0.12	No	
1146	IEC60156	80		0.86	No	
1244		-----		-----	---	
1264		-----		-----	---	
1304	IEC60156	81.0		0.92	Yes	
1306		-----		-----	---	
1326	IEC60156	65.6		-0.03	---	
1435	IEC60156	65.4		-0.04	---	
1442	IEC60156	72.2		0.38	Yes	
1444		-----		-----	---	
1458	IEC60156	67.2		0.07	Yes	
1461		-----		-----	---	
1478	IEC60156	46.6		-1.20	Yes	
1505	IEC60156	64.7		-0.09	Yes	
1513	IEC60156	65.3		-0.05	Yes	
1560	IEC60156	56.4		-0.60	Yes	
1626	IEC60156	84.7		1.15	No	
1660	IEC60156	43.5		-1.40	Yes	
1687	EN60156	72.0		0.37	No	
1702	IEC60156	73.9		0.48	Yes	
1719	IEC60156	85.1		1.17	Yes	
1743	IEC60156	61		-0.31	No	
1747	IEC60156	58		-0.50	Yes	
1801	EN60156	47.7		-1.14	Yes	
1885	IEC60156	68.8		0.17	No	
1890	IEC60156	66.9		0.05	Yes	
6000	EN60156	61.1		-0.31	Yes	
6015		-----		-----	---	
6048	IEC60156	43.2		-1.41	Yes	
6053	IEC60156	72.4		0.39	Yes	
6068		-----		-----	---	
6071	IEC60156	77.77		0.72	Yes	
6080		-----		-----	---	
6085	IEC60156	52.1		-0.86	Yes	
6088	IEC60156	53.4		-0.78	Yes	
6099	IEC60156	77.2		0.69	No	
6141	IEC60156	61.9		-0.26	Yes	
6167	EN60156	67.3		0.07	Yes	
6253		-----		-----	---	
6278	EN60156	59		-0.44	No	
6280	IEC60156	48.33		-1.10	Yes	
6318	IEC60156	78.1		0.74	No	
6334	IEC60156	52		-0.87	Yes	
6339	IEC60156	74.5		0.52	Yes	
6342	IEC60156	72.9		0.42	Yes	
6343	IEC60156	76.1		0.62	No	
6347	EN60156	38.4		-1.71	Yes	
6348	IEC60156	77.5		0.71	Yes	
6350	IEC60156	76.9		0.67	No	
6351	IEC60156	70.1		0.25	Yes	
6360		-----		-----	---	
6361	IEC60156	76.5		0.64	Yes	

		Results 'stirred'	Results 'not stirred'
normality	OK	OK	OK
n	51	35	13
outliers	0	0	0
mean (n)	66.09	63.15	73.71
st.dev. (n)	11.497	11.931	7.567
R(calc.)	32.19	33.41	21.19
st.dev.(EN60156:95)	16.188	15.468	18.055
R(EN60156:95)	45.33	43.31	50.55



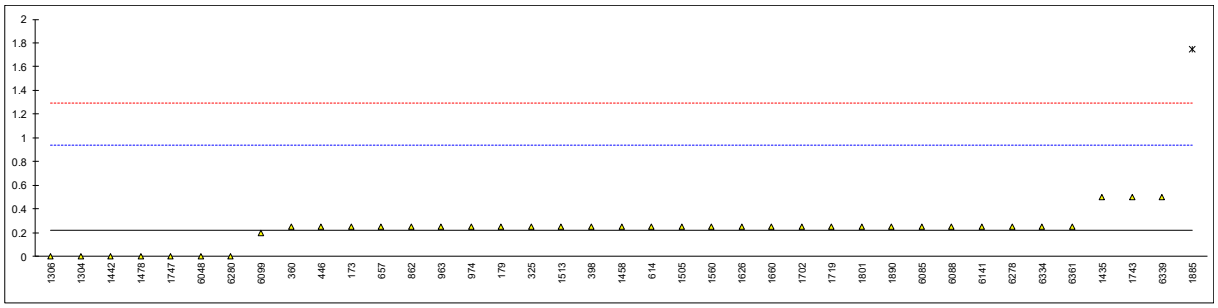


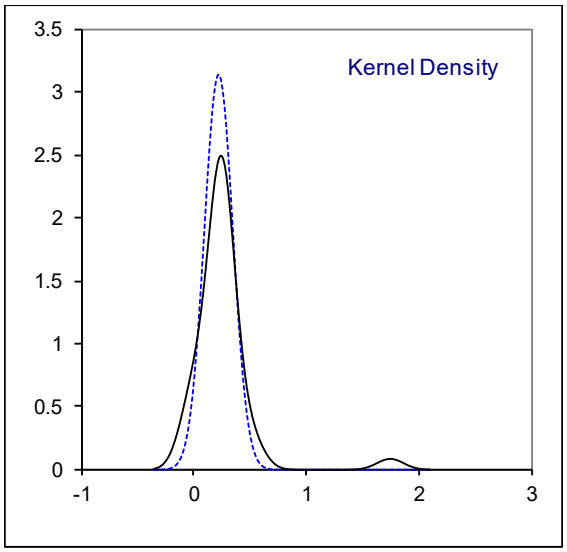
Determination of Color ASTM on sample #20225;

lab	method	value	iis conversion*	mark	z(targ)	remarks
173	D1500	L0.5	0.25		0.08	
179	D1500	L0.5	0.25		0.08	
325	D6045	L0.5	0.25		0.08	
360	ISO2049	L 0.5	0.25		0.08	
398	ISO2049	L0,5	0.25		0.08	
446	D1500	<0.5	0.25		0.08	
614	D1500	L0.5	0.25		0.08	
657	D1500	L 0.5	0.25		0.08	
862	D1500	L0.5	0.25		0.08	
912		-----	-----		-----	
913		-----	-----		-----	
963	D1500	L0.5	0.25		0.08	
974	D1500	L0.5	0.25		0.08	
1137		-----	-----		-----	
1146		-----	-----		-----	
1244		-----	-----		-----	
1264		-----	-----		-----	
1304	In house	0.0	0.0		-0.62	
1306	D1500	0.0	0.0		-0.62	
1326		-----	-----		-----	
1435	D1500	0.5	0.5		0.78	
1442	ISO2049	0	0		-0.62	
1444		-----	-----		-----	
1458	D1500	<0.5	0.25		0.08	
1461		-----	-----		-----	
1478	ISO2049	0.0	0.0		-0.62	
1505	D1500	L0.5	0.25		0.08	
1513	ISO2049	L0,5	0.25		0.08	
1560	ISO2049	L0.5	0.25		0.08	
1626	D1500	<0.5	0.25		0.08	
1660	D1500	L0,5	0.25		0.08	
1687		-----	-----		-----	
1702	D1500	L 0.5	0.25		0.08	
1719	D1524	<0.5	0.25		0.08	
1743	ISO2049	0.5	0.5		0.78	
1747	ISO2049	0 [CLEAR]	0		-0.62	
1801	ISO2049	<0.5	0.25		0.08	
1885	D1500	<2.0	1.75	R(0.01)	4.28	
1890	D1500	<0,5	0.25		0.08	
6000		-----	-----		-----	
6015		-----	-----		-----	
6048	D1500	0.0	0.0		-0.62	
6053		-----	-----		-----	
6068		-----	-----		-----	
6071		-----	-----		-----	
6080		-----	-----		-----	
6085	D1500	< 0.5	0.25		0.08	
6088	D1500	L0.5	0.25		0.08	
6099	D1500	0.2	0.2		-0.06	
6141	D1500	L0.5	0.25		0.08	
6167		-----	-----		-----	
6253		-----	-----		-----	
6278	D1500	<0.5	0.25		0.08	
6280	D1500	0	0		-0.62	
6318		-----	-----		-----	
6334	D1500	L0.5	0.25		0.08	
6339	D1500	0.5	0.5		0.78	
6342		-----	-----		-----	
6343		-----	-----		-----	
6347		-----	-----		-----	
6348		-----	-----		-----	
6350	ISO2049	Transparent	Transparent		-----	
6351		-----	-----		-----	
6360		-----	-----		-----	
6361	D1500	L0.5	0.25		0.08	

normality	OK
n	38
outliers	1
mean (n)	0.22
st.dev. (n)	0.127
R(calc.)	0.36
st.dev.(D1500:12)	0.357
R(D1500:12)	1

*) In the calculation of the mean, standard deviation and the reproducibility in this column, a reported value of 'L y' or '<y' is changed to y-0.25 (for example L0.5 is changed into 0.25).

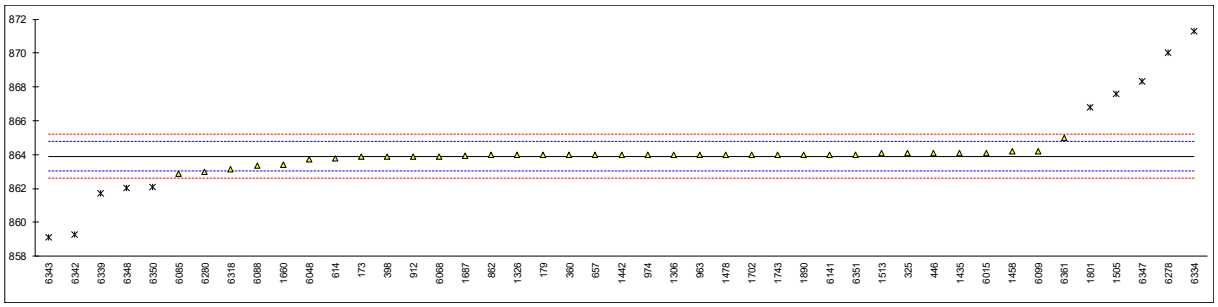


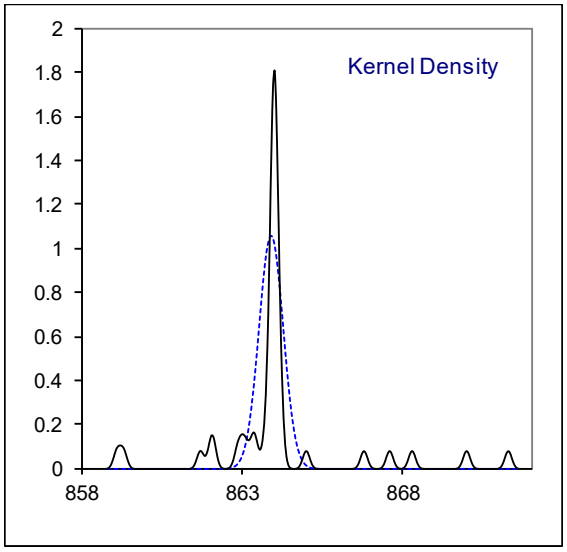


Determination of Density at 20°C on sample #20225; results in kg/m^3

lab	method	value	mark	z(targ)	remarks
173	D4052	863.9		-0.01	
179	D4052	864.0		0.22	
325	D4052	864.1		0.46	
360	D4052	864.0		0.22	
398	ISO12185	863.9		-0.01	
446	D4052	864.1	C	0.46	first reported: 867.1
614	D4052	863.8		-0.24	
657	D4052	864.0		0.22	
862	D4052	863.99		0.20	
912	ISO3675	863.9		-0.01	
913		-----		-----	
963	D4052	864.0		0.22	
974	D4052	864.0		0.22	
1137		-----		-----	
1146		-----		-----	
1244		-----		-----	
1264		-----		-----	
1304		-----		-----	
1306	D4052	864.0		0.22	
1326	D4052	864.0		0.22	
1435	D4052	864.1		0.46	
1442	ISO12185	864.0		0.22	
1444		-----		-----	
1458	D4052	864.2		0.69	
1461		-----		-----	
1478	ISO12185	864.0		0.22	
1505	D7042	867.6	R(0.01)	8.62	
1513	ISO12185	864.089		0.43	
1560		-----		-----	
1626		-----		-----	
1660	D7042	863.4		-1.18	
1687	ISO12185	863.95		0.11	
1702	ISO12185	864.0		0.22	
1719		-----		-----	
1743	In house	864.0		0.22	
1747		-----		-----	
1801	ISO3675	866.8	R(0.01)	6.76	
1885		-----		-----	
1890	ISO12185	864.0		0.22	
6000		-----		-----	
6015	ISO12185	864.10	C	0.46	first reported: 874.80
6048	ISO12185	863.7		-0.48	
6053		-----		-----	
6068	ISO12185	863.9		-0.01	
6071		-----		-----	
6080		-----		-----	
6085	D7042	862.86		-2.44	
6088	ISO3675	863.348		-1.30	
6099	ISO12185	864.2		0.69	
6141	D4052	864		0.22	
6167		-----		-----	
6253		-----		-----	
6278	D1298	870	R(0.01)	14.22	
6280	ISO12185	863		-2.11	
6318	ISO3675	863.13		-1.81	
6334	ISO12185	871.3	C,R(0.01)	17.26	first reported: 874.4
6339	ISO3675	861.7	C,R(0.01)	-5.14	first reported: 0.8617 kg/m^3
6342	ISO12185	859.3	C,R(0.01)	-10.74	first reported: 0.8593 kg/m^3
6343	ISO3675	859.1	C,R(0.01)	-11.21	first reported: 861.1
6347	D1298	868.3	C,R(0.01)	10.26	first reported: 0.8653 kg/m^3
6348	ISO3675	862.03	R(0.01)	-4.37	
6350	ISO3675	862.1	C,R(0.01)	-4.21	first reported: 862
6351	ISO3675	864		0.22	
6360		-----		-----	
6361	ISO3675	865.0		2.56	

		Only D4052/ISO12185	Only ISO3675
normality	not OK	not OK	OK
n	35	27	5
outliers	10	2	5
mean (n)	863.905	863.964	863.876
st.dev. (n)	0.3767	0.2198	0.7271
R(calc.)	1.055	0.615	2.036
st.dev.(ISO3675:98)	0.4286	-----	0.4286
R(ISO3675:98)	1.2	-----	1.2
Compare			
R(D4052:18a)	0.5	0.5	-----
R(ISO12185:96)	0.5	0.5	-----
R(D7042:16e3)	1.3	-----	-----

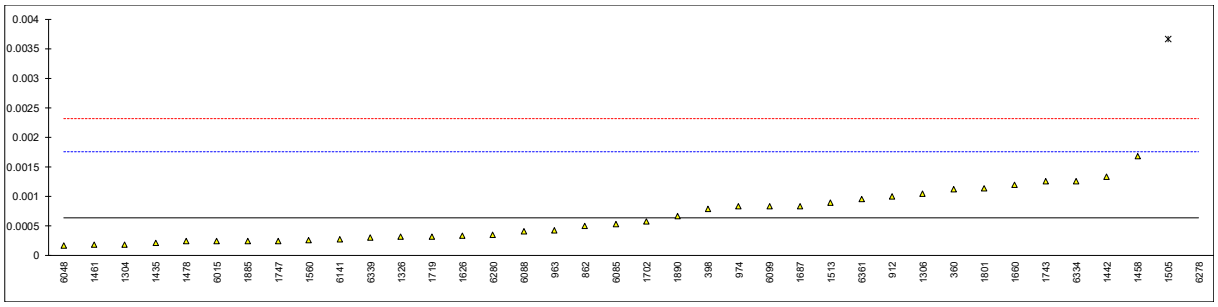


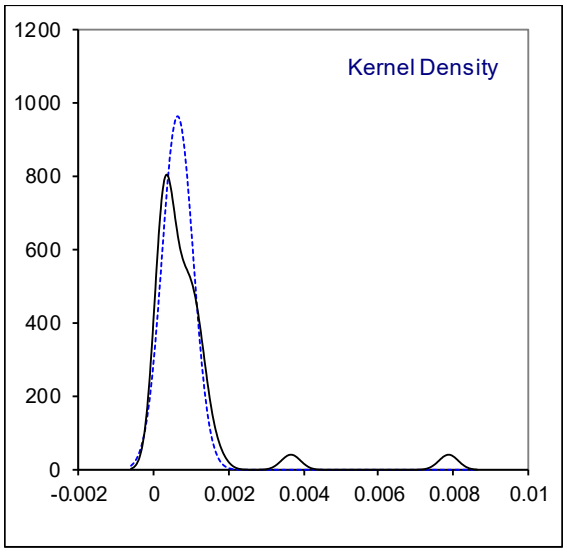


Determination of Di-electric Dissipation Factor (DDF) at 90°C on sample #20225

lab	method	value	mark	z(targ)	frequency	remarks
173		-----		-----	-----	
179		-----		-----	-----	
325		-----		-----	-----	
360	EN60247	0.00112		0.86	50	
398	EN60247	0.000788		0.26	-----	
446	EN60247	<0.001		-----	50	
614		-----		-----	-----	
657		-----		-----	-----	
862	IEC60247	0.0005		-0.26	50	
912	IEC60247	0.00100		0.64	-----	
913		-----		-----	-----	
963	IEC60247	0.00042		-0.40	60	
974	EN60247	0.000828		0.33	50	
1137		-----		-----	-----	
1146		-----		-----	-----	
1244		-----		-----	-----	
1264		-----		-----	-----	
1304	IEC60247	0.000185		-0.82	50	
1306	IEC60247	0.001046		0.73	-----	
1326	IEC60247	0.000321		-0.58	-----	
1435	IEC60247	0.000216		-0.77	-----	
1442	IEC60247	0.001337		1.25	-----	
1444		-----		-----	-----	
1458	IEC60247	0.001673		1.86	-----	
1461	IEC60247	0.000182		-0.83	-----	
1478	IEC60247	0.000242		-0.72	50	
1505	IEC60247	0.003661	R(0.01)	5.44	-----	
1513	IEC60247	0.00089		0.45	-----	
1560	IEC60247	0.0002565	C	-0.70	-----	first reported: 0.002565
1626	IEC60247	0.00033		-0.56	-----	
1660	IEC60247	0.001190	C	0.99	50	first reported: 0.00519
1687	EN60247	0.00084		0.36	50	
1702	IEC60247	0.00057		-0.13	-----	
1719	IEC60247	0.000326		-0.57	-----	
1743	IEC60247	0.00126		1.11	50	
1747	IEC60247	0.000252	C	-0.70	-----	first reported: 0.0252
1801	EN60247	0.00114		0.90	-----	
1885	IEC60247	0.000248		-0.71	-----	
1890	IEC60247	0.000661		0.03	50	
6000		-----		-----	-----	
6015	EN60247	0.0002460		-0.71	50	
6048	IEC60247	0.000169		-0.85	60	
6053		-----		-----	-----	
6068		-----		-----	-----	
6071		-----		-----	-----	
6080		-----		-----	-----	
6085	IEC60247	0.000528		-0.21	50	
6088	IEC60247	0.00041		-0.42	-----	
6099	IEC60247	0.000828		0.33	-----	
6141	IEC60247	0.000281		-0.65	60	
6167		-----		-----	-----	
6253		-----		-----	-----	
6278	IEC60247	0.00786	R(0.01)	13.00	-----	
6280	IEC60247	0.00035		-0.53	50	
6318		-----		-----	-----	
6334	IEC60247	0.00126	C	1.11	-----	first reported: 0.00227
6339	IEC60247	0.0003		-0.62	-----	
6342		-----		-----	-----	
6343		-----		-----	-----	
6347		-----		-----	-----	
6348		-----		-----	-----	
6350		-----		-----	-----	
6351		-----		-----	-----	
6360		-----		-----	-----	
6361	IEC60247	0.00095		0.55	50	

normality	OK
n	36
outliers	2
mean (n)	0.000643
st.dev. (n)	0.0004153
R(calc.)	0.001163
st.dev.(EN60247:04)	0.0005553
R(EN60247:04)	0.001555

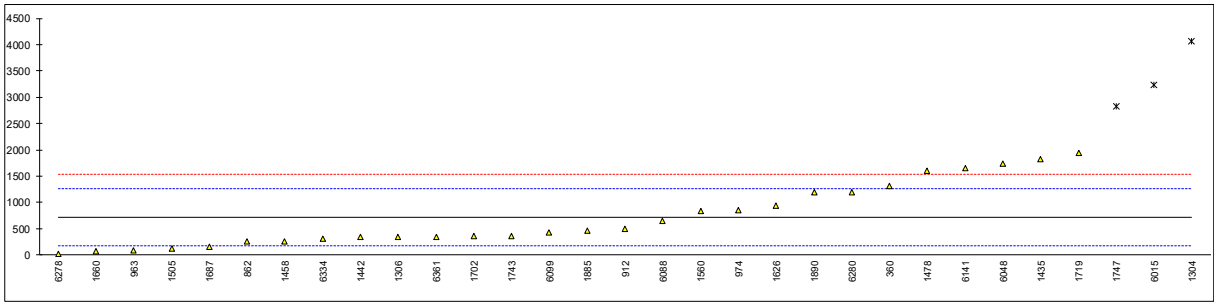


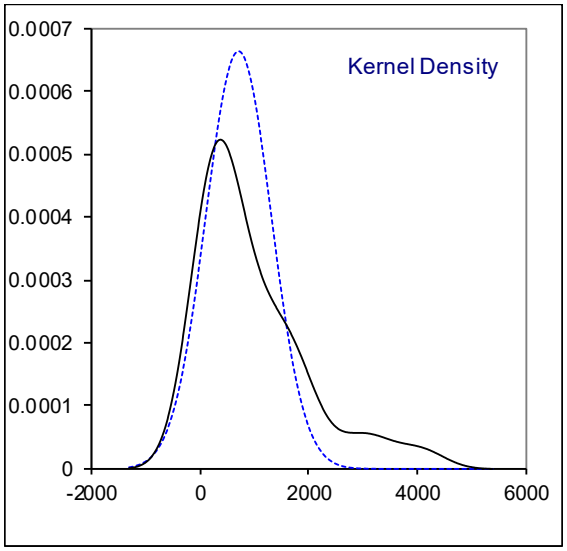


Determination of Specific Resistance at 90°C on sample #20225; results in GΩm

lab	method	value	mark	z(targ)	remarks
173		-----		-----	
179		-----		-----	
325		-----		-----	
360	EN60247	1320		2.22	
398		-----		-----	
446		-----		-----	
614		-----		-----	
657		-----		-----	
862	IEC60247	261	C	-1.70	first reported: 2610
912	IEC60247	496		-0.83	
913		-----		-----	
963	IEC60247	81.44		-2.36	
974	EN60247	857.39		0.51	
1137		-----		-----	
1146		-----		-----	
1244		-----		-----	
1264		-----		-----	
1304	IEC60247	4065.0	G(0.05)	12.39	
1306	IEC60247	338	C	-1.41	first reported: 0.00146
1326		-----		-----	
1435	IEC60247	1830		4.11	
1442	IEC60247	337.110		-1.42	
1444		-----		-----	
1458	IEC60247	263.4		-1.69	
1461		-----		-----	
1478	IEC60247	1600		3.26	
1505	IEC60247	121.01		-2.22	
1513		-----		-----	
1560	IEC60247	832.48		0.42	
1626	IEC60247	932.9		0.79	
1660	IEC60247	78.36		-2.38	
1687	EN60247	158.70		-2.08	
1702	IEC60247	359.56		-1.33	
1719	IEC60247	1937.5		4.51	
1743	IEC60247	368		-1.30	
1747	IEC60247	2830	DG(0.01)	7.82	
1801		-----		-----	
1885	IEC60247	468.06	C	-0.93	first reported: 25700
1890	IEC60247	1185		1.72	
6000		-----		-----	
6015	EN60247	3240.0	DG(0.01)	9.33	
6048	IEC60247	1743		3.79	
6053		-----		-----	
6068		-----		-----	
6071		-----		-----	
6080		-----		-----	
6085		-----		-----	
6088	IEC60247	655.4		-0.24	
6099	IEC60247	424.19		-1.10	
6141	IEC60247	1650		3.45	
6167		-----		-----	
6253		-----		-----	
6278	IEC60247	24.55		-2.58	
6280	IEC60247	1190		1.74	
6318		-----		-----	
6334	IEC60247	305.9		-1.53	
6339	IEC60247	1.74 x 10 e13	ex	>1000	Reported in Ωm? If so, iis calc. 17400 GΩm with z-score 61.79
6342		-----		-----	
6343		-----		-----	
6347		-----		-----	
6348		-----		-----	
6350		-----		-----	
6351		-----		-----	
6360		-----		-----	
6361	IEC60247	338.50		-1.41	

normality	OK
n	28
outliers	3 (+1 ex)
mean (n)	719.91
st.dev. (n)	600.587
R(calc.)	1681.64
st.dev.(EN60247:04)	269.966
R(EN60247:04)	755.90



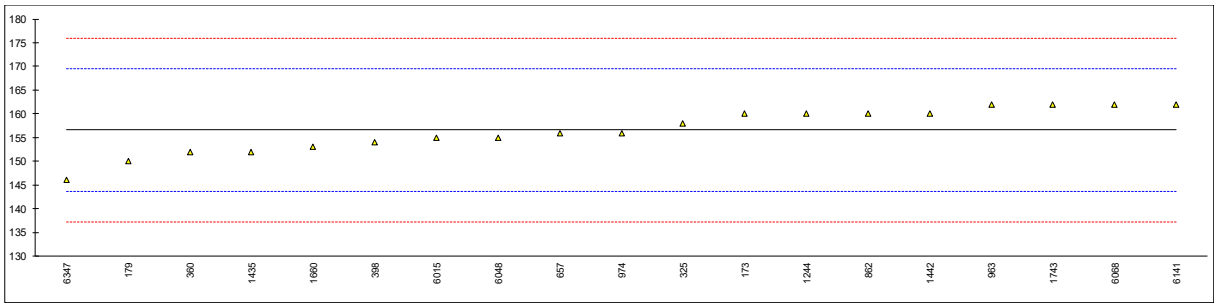


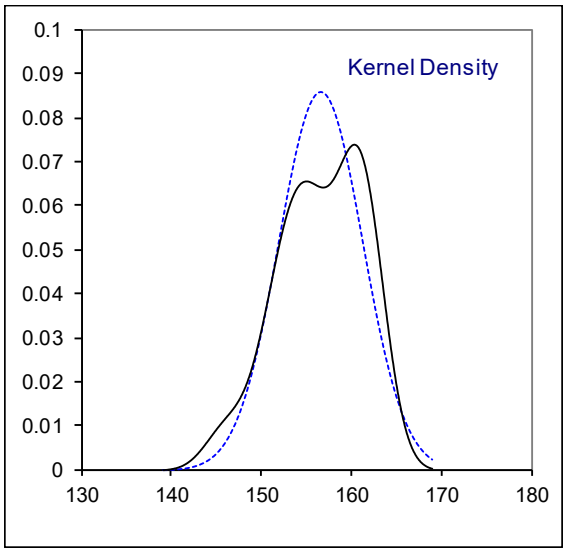
Determination of Flash Point C.O.C. on sample #20225; results in °C

lab	method	value	mark	z(targ)	remarks
173	D92	160		0.53	
179	D92	150		-1.02	
325	D92	158.0		0.22	
360	D92	152		-0.71	
398	D92	154		-0.40	
446		-----		-----	
614		-----		-----	
657	D92	156.0		-0.09	
862	D92	160		0.53	
912		-----		-----	
913		-----		-----	
963	D92	162.0		0.84	
974	D92	156		-0.09	
1137		-----		-----	
1146		-----		-----	
1244	ISO2592	160.0		0.53	
1264		-----		-----	
1304		-----		-----	
1306		-----		-----	
1326		-----		-----	
1435	D92	152.0		-0.71	
1442	D92	160		0.53	
1444		-----		-----	
1458		-----		-----	
1461		-----		-----	
1478		-----		-----	
1505		-----		-----	
1513		-----		-----	
1560		-----		-----	
1626		-----		-----	
1660	D92	153		-0.56	
1687		-----		-----	
1702		-----		-----	
1719		-----		-----	
1743	ISO2592	162		0.84	
1747		-----		-----	
1801		-----		-----	
1885		-----		-----	
1890		-----		-----	
6000		-----		-----	
6015	ISO2592	155.0		-0.25	
6048	ISO2592	155		-0.25	
6053		-----		-----	
6068	ISO2592	162		0.84	
6071		-----		-----	
6080		-----		-----	
6085		-----		-----	
6088		-----		-----	
6099		-----		-----	
6141	D92	162		0.84	
6167		-----		-----	
6253		-----		-----	
6278		-----		-----	
6280		-----		-----	
6318		-----		-----	
6334		-----		-----	
6339		-----		-----	
6342		-----		-----	
6343		-----		-----	
6347	D92	146.0		-1.65	
6348		-----		-----	
6350		-----		-----	
6351		-----		-----	
6360		-----		-----	
6361		-----		-----	

normality	OK
n	19
outliers	0
mean (n)	156.58
st.dev. (n)	4.647
R(calc.)	13.01
st.dev.(D92:18)	6.429
R(D92:18)	18

R(D92:18) = R(ISO2592:17)



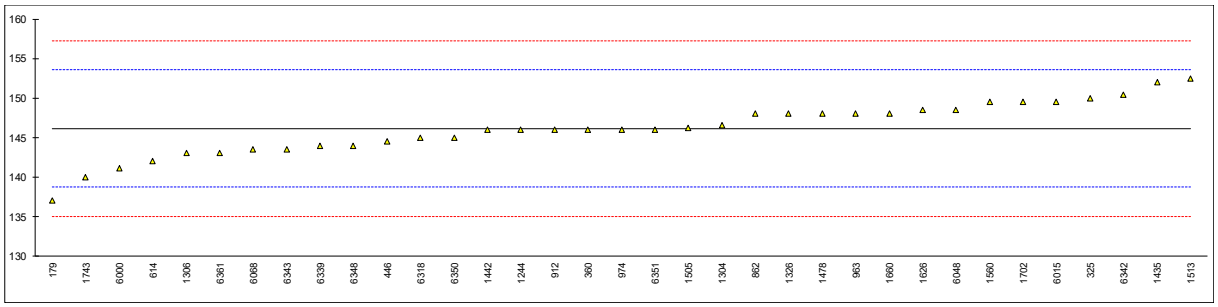


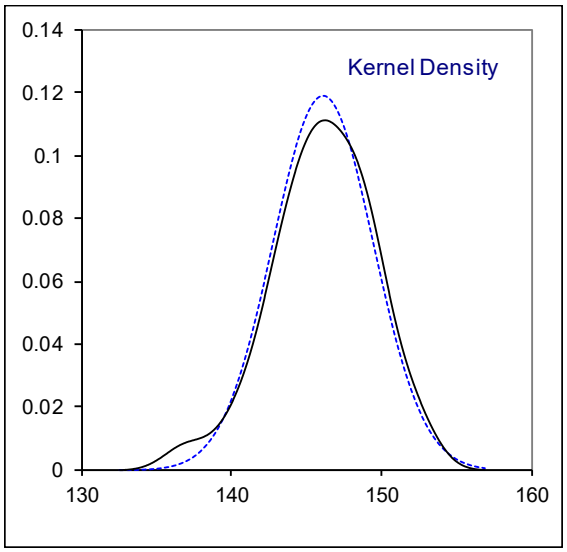
Determination of Flash Point PMcc on sample #20225; results in °C

lab	method	value	mark	z(targ)	remarks
173		-----		-----	
179	D93-A	137.0		-2.47	
325	D93-B	150.0		1.04	
360	D93-A	146.0		-0.04	
398		-----		-----	
446	D93-A	144.5		-0.44	
614	D93-A	142		-1.12	
657		-----		-----	
862	D93-A	148		0.50	
912	ISO2719-B	146		-0.04	
913		-----		-----	
963	D93-A	148.0		0.50	
974	D93-A	146		-0.04	
1137		-----		-----	
1146		-----		-----	
1244	D93-A	146.0		-0.04	
1264		-----		-----	
1304	In house	146.6		0.12	
1306	D93-A	143		-0.85	
1326	D93-A	148.0		0.50	
1435	D93-A	152.0		1.58	
1442	ISO2719-A	146.0		-0.04	
1444		-----		-----	
1458		-----		-----	
1461		-----		-----	
1478	ISO2719-A	148.0		0.50	
1505	D93-A	146.2		0.02	
1513	ISO2719-A	152.5		1.72	
1560	ISO2719-A	149.5		0.91	
1626	D93-A	148.5		0.64	
1660	D93-A	148		0.50	
1687		-----		-----	
1702	ISO2719-A	149.5		0.91	
1719		-----		-----	
1743	ISO2719-A	140		-1.66	
1747		-----		-----	
1801		-----		-----	
1885		-----		-----	
1890		-----		-----	
6000	ISO2719-A	141.1292		-1.35	
6015	ISO2719-A	149.5		0.91	
6048	D93-A	148.5		0.64	
6053		-----		-----	
6068	ISO2719-A	143.5		-0.71	
6071		-----		-----	
6080		-----		-----	
6085		-----		-----	
6088		-----		-----	
6099		-----		-----	
6141		-----		-----	
6167		-----		-----	
6253		-----		-----	
6278		-----		-----	
6280		-----		-----	
6318	ISO2719-A	145		-0.31	
6334		-----		-----	
6339	ISO2719-A	144		-0.58	
6342	ISO2719-A	150.4		1.15	
6343	ISO2719-A	143.5		-0.71	
6347		-----		-----	
6348	ISO2719-A	144.0		-0.58	
6350	D93-A	145		-0.31	
6351	ISO2719-A	146		-0.04	
6360		-----		-----	
6361	ISO2719-A	143.0		-0.85	

normality	OK
n	35
outliers	0
mean (n)	146.14
st.dev. (n)	3.352
R(calc.)	9.39
st.dev.(ISO2719-A:16)	3.706
R(ISO2719-A:16)	10.38

R(ISO2719-A:16) = = R(IP34:03) = R(D93-A:18)

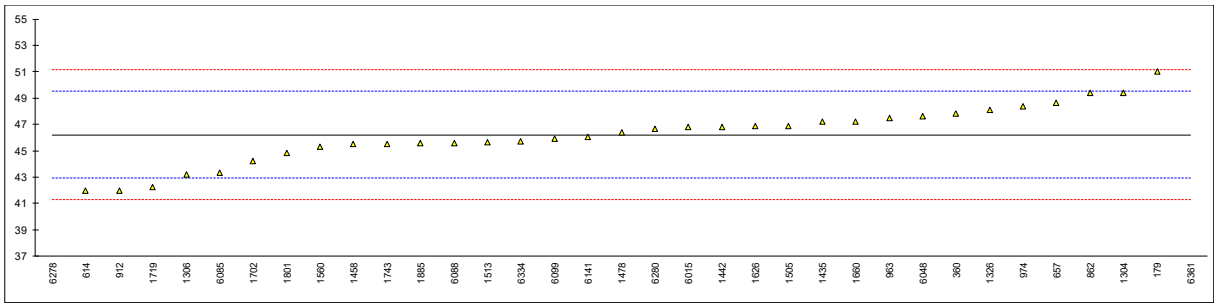


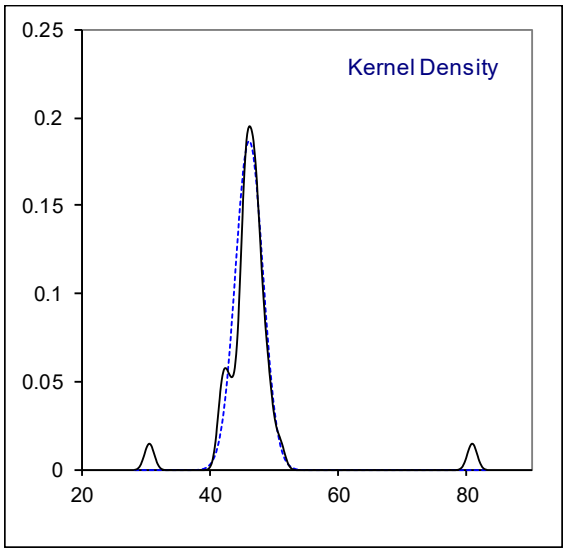


Determination of Interfacial Surface Tension on sample #20225; results in mN/m

lab	method	value	mark	z(targ)	remarks
173		-----		-----	
179	D971	51		2.90	
325		-----		-----	
360	D971	47.8		0.96	
398		-----		-----	
446		-----		-----	
614	D971	42	C	-2.56	first reported: 60
657	D971	48.669		1.48	
862	D971	49.4		1.93	
912	D971	42		-2.56	
913		-----		-----	
963	D971	47.5		0.78	
974	D971	48.4		1.32	
1137		-----		-----	
1146		-----		-----	
1244		-----		-----	
1264		-----		-----	
1304	D971	49.4		1.93	
1306		43.205		-1.83	
1326	D971	48.1		1.14	
1435	D971	47.2		0.59	
1442	IEC62961	46.8		0.35	
1444		-----		-----	
1458	D971	45.5		-0.44	
1461		-----		-----	
1478	D971	46.38		0.10	
1505	D971	46.9		0.41	
1513	D971	45.64		-0.35	
1560	D971	45.3		-0.56	
1626	D971	46.87		0.39	
1660	D971	47.2	C	0.59	first reported: 26.0
1687		-----		-----	
1702	D971	44.217		-1.21	
1719	D2285	42.237		-2.41	
1743	D971	45.5		-0.44	
1747		-----		-----	
1801	D971	44.8		-0.86	
1885	D971	45.6		-0.38	
1890		-----		-----	
6000		-----		-----	
6015	D971	46.790		0.35	
6048	D971	47.6		0.84	
6053		-----		-----	
6068		-----		-----	
6071		-----		-----	
6080		-----		-----	
6085	D971	43.312		-1.76	
6088	ISO6295	45.6		-0.38	
6099	ISO6295	45.9		-0.19	
6141	D971	46.03		-0.11	
6167		-----		-----	
6253		-----		-----	
6278	D971	30.7	R(0.01)	-9.40	
6280		46.67		0.27	
6318		-----		-----	
6334	D971	45.71		-0.31	
6339		-----		-----	
6342		-----		-----	
6343		-----		-----	
6347		-----		-----	
6348		-----		-----	
6350		-----		-----	
6351		-----		-----	
6360		-----		-----	
6361	D971	80.90	R(0.01)	21.01	

normality	OK
n	33
outliers	2
mean (n)	46.219
st.dev. (n)	2.1326
R(calc.)	5.971
st.dev.(D971:20)	1.6507
R(D971:20)	4.622

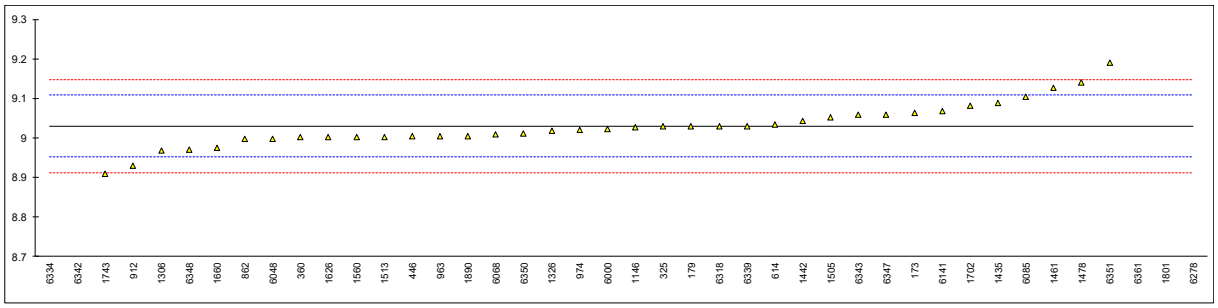


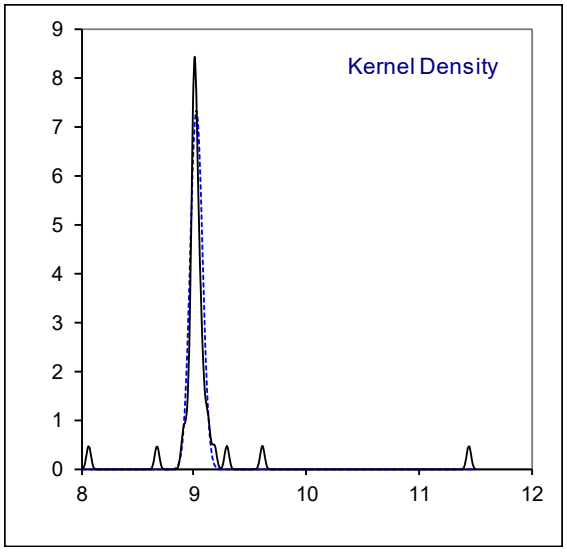


Determination of Kinematic Viscosity at 40°C on sample #20225; results in mm^2/s

lab	method	value	mark	z(targ)	remarks
173	D445	9.062		0.82	
179	D445	9.03		0.01	
325	D445	9.030		0.01	
360	D445	9.0009		-0.73	
398		-----		-----	
446	D445	9.005		-0.63	
614	D445	9.034		0.11	
657		-----		-----	
862	D445	8.997		-0.83	
912	D445	8.93		-2.53	
913		-----		-----	
963	D445	9.005		-0.63	
974	D445	9.020		-0.25	
1137		-----		-----	
1146	D445	9.027		-0.07	
1244		-----		-----	
1264		-----		-----	
1304		-----		-----	
1306	D445	8.967		-1.59	
1326	D445	9.0185		-0.28	
1435	D7042	9.088		1.48	
1442	D7042	9.0420		0.31	
1444		-----		-----	
1458		-----		-----	
1461	ISO3104	9.1272		2.48	
1478	D7042	9.1411		2.83	
1505	D7042	9.0508		0.54	
1513	ISO3104	9.002		-0.70	
1560	ISO3104	9.002		-0.70	
1626	D445	9.001		-0.73	
1660	D7042	8.9740		-1.41	
1687		-----		-----	
1702	D7042	9.0813		1.31	
1719		-----		-----	
1743	D7279 corr.to D445	8.91	C	-3.04	first reported: 8.64
1747		-----		-----	
1801	ISO3104	9.6156	R(0.01)	14.89	
1885		-----		-----	
1890	ISO3104	9.0052		-0.62	
6000	ISO3104	9.0217		-0.20	
6015		-----		-----	
6048	D445	8.998		-0.80	
6053		-----		-----	
6068	ISO3104	9.008		-0.55	
6071		-----		-----	
6080		-----		-----	
6085	D7042	9.1043		1.90	
6088		-----		-----	
6099		-----		-----	
6141	D445	9.0671		0.95	
6167		-----		-----	
6253		-----		-----	
6278	D445	11.448	R(0.01)	61.47	
6280		-----		-----	
6318	ISO3104	9.03		0.01	
6334	D445	8.074	C,R(0.01)	-24.29	first reported: 8.174
6339	ISO3104	9.03		0.01	
6342	D445	8.68	R(0.01)	-8.89	
6343	ISO3104	9.058	C	0.72	first reported: 8.615
6347	D445	9.0597		0.76	
6348	ISO3104	8.97	C	-1.52	first reported: 8.47
6350	ISO3104	9.01		-0.50	
6351	ISO3104	9.19	C	4.08	first reported: 8.51
6360		-----		-----	
6361	D445	9.30	R(0.01)	6.87	

		D445 only	ISO3104 only
normality	suspect	suspect	not OK
n	37	17	12
outliers	5	4	1
mean (n)	9.030	9.015	9.038
st.dev. (n)	0.0545	0.0341	0.0617
R(calc.)	0.153	0.096	0.173
st.dev.(D445:19a)	0.0393	0.0393	-----
R(D445:19a)	0.110	0.110	-----
Compare			
R(ISO3104:03)	0.110	-----	0.110



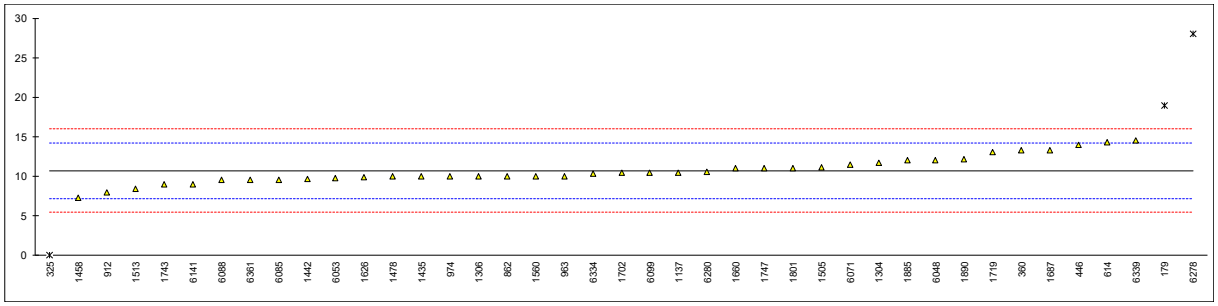


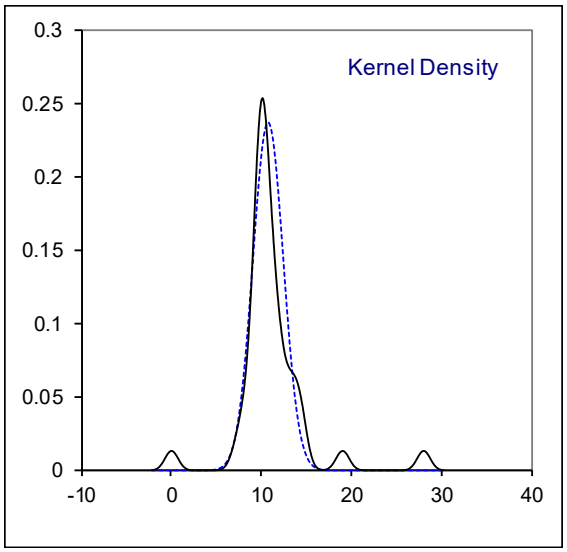
Determination of Water on sample #20225; results in mg/kg

lab	method	value	mark	z(targ)	remarks
173	D6304-C	<10		-----	
179	D1533	19	C,R(0.01)	4.72	first reported: 25
325	D6304-A	0	R(0.01)	-6.11	
360	EN60814	13.3		1.47	
398		-----		-----	
446	EN60814	14		1.87	
614	IEC60814	14.3		2.04	
657	D6304-C	< 10		-----	
862	D6304-A	10		-0.41	
912	IEC60814	8		-1.55	
913		-----		-----	
963	D1533	10		-0.41	
974	D1533	10		-0.41	
1137	ISO10337	10.5		-0.13	
1146		-----		-----	
1244		-----		-----	
1264		-----		-----	
1304	In house	11.7		0.56	
1306	D1533	10		-0.41	
1326		-----		-----	
1435	IEC60814	10		-0.41	
1442	IEC60814	9.6		-0.64	
1444		-----		-----	
1458	IEC60814	7.3		-1.95	
1461		-----		-----	
1478	IEC60814	9.95		-0.44	
1505	IEC60814	11.1		0.21	
1513	IEC60814	8.4		-1.33	
1560	IEC60814	10		-0.41	
1626	IEC60814	9.9		-0.47	
1660	IEC60814	11		0.16	
1687	EN60814	13.3		1.47	
1702	IEC60814	10.4		-0.19	
1719	IEC60814	13	C	1.30	first reported: 17.3
1743	IEC60814	9		-0.98	
1747	IEC60814	11		0.16	
1801	EN60814	11.05		0.18	
1885	D1533	12		0.73	
1890	IEC60814	12.16		0.82	
6000		-----		-----	
6015		-----		-----	
6048	ISO12937	12		0.73	
6053	IEC60814	9.8		-0.53	
6068		-----		-----	
6071	IEC60814	11.46		0.42	
6080		-----		-----	
6085	IEC60814	9.55375		-0.67	
6088	D1533	9.5		-0.70	
6099	IEC60814	10.4		-0.19	
6141	D1533	9		-0.98	
6167		-----		-----	
6253		-----		-----	
6278	D1533	28	R(0.01)	9.85	
6280	IEC60814	10.6		-0.07	
6318		-----		-----	
6334	IEC60814	10.3		-0.24	
6339	IEC60814	14.5		2.15	
6342		-----		-----	
6343		-----		-----	
6347		-----		-----	
6348		-----		-----	
6350		-----		-----	
6351		-----		-----	
6360		-----		-----	
6361	IEC60814	9.50		-0.70	

normality	OK
n	38
outliers	3
mean (n)	10.726
st.dev. (n)	1.6869
R(calc.)	4.723
st.dev.(EN60814:97)	1.7545
R(EN60814:97)	4.912

Compare R(D1533:12) = 14
Compare R(D6304-C:16e01) = 70.134, range 10-25000
Compare R(ISO12937:00) = 22.522





APPENDIX 2

Determination of 2,6-Ditertiary-butyl phenol (DBP) and 2,6-Ditertiary-butyl paracresol (DBPC); results in %M/M and determination of Dibenzyl disulphide (DBDS), Benzotriazole (BTA) and Irgamet 39; results in mg/kg, all on sample #20225

lab	DBP	DBPC	DBDS	BTA	Irgamet 39	remarks
173	-----	-----	-----	-----	-----	
179	-----	-----	-----	-----	-----	
325	-----	-----	-----	-----	-----	
360	-----	0.01	-----	-----	-----	
398	-----	-----	-----	-----	-----	
446	-----	-----	-----	-----	-----	
614	-----	-----	-----	-----	-----	
657	-----	-----	-----	-----	-----	
862	<0.05	<0.01	-----	-----	-----	
912	-----	-----	-----	-----	-----	
913	-----	-----	-----	-----	-----	
963	-----	<0.02	<5	<5	<5	
974	-----	-----	-----	-----	-----	
1137	-----	-----	-----	-----	-----	
1146	-----	-----	-----	-----	-----	
1244	-----	-----	-----	-----	-----	
1264	-----	-----	-----	-----	-----	
1304	-----	0.02	-----	-----	-----	
1306	-----	-----	<5	-----	-----	
1326	-----	-----	-----	-----	-----	
1435	-----	<0.024	<3.0	<1.0	<5.0	
1442	-----	<0,03	<5	<0,04	<5	
1444	-----	-----	-----	-----	-----	
1458	-----	<0.02	-----	-----	-----	
1461	-----	-----	-----	-----	-----	
1478	-----	0.00	-----	-----	-----	
1505	0.01	0.01	1	0.01	0.34	
1513	-----	<0,01	<5	-----	<5	
1560	-----	Not detected	-----	-----	-----	
1626	-----	0.01	-----	-----	-----	
1660	< 0,01	< 0,01	< 5	< 1	< 5	
1687	-----	-----	-----	-----	-----	
1702	-----	Not Detected	Not Detected	-----	Not Detected	
1719	-----	-----	-----	-----	-----	
1743	-----	-----	-----	-----	-----	
1747	-----	-----	-----	-----	-----	
1801	-----	0.001	-----	-----	-----	
1885	<0.05	-----	-----	-----	-----	
1890	-----	-----	-----	-----	-----	
6000	-----	-----	-----	-----	-----	
6015	-----	-----	-----	-----	-----	
6048	-----	-----	-----	-----	-----	
6053	-----	-----	-----	-----	-----	
6068	-----	-----	-----	-----	-----	
6071	-----	-----	-----	-----	-----	
6080	-----	-----	-----	-----	-----	
6085	-----	-----	-----	-----	-----	
6088	-----	-----	-----	-----	-----	
6099	-----	<0.05	-----	-----	-----	
6141	-----	0.125	0	0	0	
6167	-----	-----	-----	-----	-----	
6253	-----	-----	-----	-----	-----	
6278	-----	-----	-----	-----	-----	
6280	-----	-----	-----	-----	-----	
6318	-----	-----	-----	-----	-----	
6334	-----	<0.01	<1	-----	<0.1	
6339	-----	-----	-----	-----	-----	
6342	-----	-----	-----	-----	-----	
6343	-----	-----	-----	-----	-----	
6347	-----	-----	-----	-----	-----	
6348	-----	-----	-----	-----	-----	
6350	-----	-----	-----	-----	-----	
6351	-----	-----	-----	-----	-----	
6360	-----	-----	-----	-----	-----	
6361	-----	-----	-----	-----	-----	

APPENDIX 3

Number of participants per country

4 labs in AUSTRALIA
3 labs in BELGIUM
3 labs in BULGARIA
2 labs in CHINA, People's Republic
1 lab in FRANCE
4 labs in GERMANY
2 labs in GREECE
1 lab in HONG KONG
3 labs in INDIA
2 labs in ITALY
1 lab in KUWAIT
1 lab in MALAYSIA
1 lab in MOROCCO
1 lab in NETHERLANDS
1 lab in NEW ZEALAND
9 labs in PAKISTAN
1 lab in PHILIPPINES
1 lab in POLAND
1 lab in PORTUGAL
3 labs in SAUDI ARABIA
3 labs in SINGAPORE
1 lab in SLOVENIA
1 lab in SOUTH AFRICA
2 labs in SOUTH KOREA
2 labs in SPAIN
1 lab in SWEDEN
1 lab in SWITZERLAND
1 lab in TURKEY
4 labs in UNITED ARAB EMIRATES
2 labs in UNITED KINGDOM
2 labs in UNITED STATES OF AMERICA

APPENDIX 4

Abbreviations

C	= final test result after checking of first reported suspect test result
D(0.01)	= outlier in Dixon's outlier test
D(0.05)	= straggler in Dixon's outlier test
G(0.01)	= outlier in Grubbs' outlier test
G(0.05)	= straggler in Grubbs' outlier test
DG(0.01)	= outlier in Double Grubbs' outlier test
DG(0.05)	= straggler in Double Grubbs' outlier test
R(0.01)	= outlier in Rosner's outlier test
R(0.05)	= straggler in Rosner's outlier test
E	= calculation difference between reported test result and result calculated by iis
W	= test result withdrawn on request of participant
ex	= test result excluded from statistical evaluation
fr.	= first reported
n.a.	= not applicable
n.e.	= not evaluated
n.d.	= not detected
SDS	= Safety Data Sheet

Literature

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