Institute for
Interlaboratory Studies

Results of Proficiency Test
Natural Gas (Methane)
April 2023

Organized by: Institute for Interlaboratory Studies
Spijkenisse, the Netherlands

Author: ing. R.J. Starink
Correctors: ing. M. Meijer & ing. A.S. Noordman-de Neef
Approved by: ing. A.S. Noordman-de Neef

Report: iis23S02M

July 2023

CONTENTS

1 INTRODUCTION

Since 2009 the Institute for Interlaboratory Studies (iis) organizes a proficiency scheme for the analysis of Natural Gas (Methane) every year. During the annual proficiency testing program 2022/2023 it was decided to continue the round robin for the analysis of Natural Gas (Methane).
A co-operation with EffecTech Ltd. (Uttoxeter, United Kingdom) was set up because iis has limited gas-handling facilities in place to prepare gas samples. EffecTech Ltd. is fully equipped and has experience in the preparation of synthetic Natural Gas samples for PT purposes.

In this interlaboratory study 63 laboratories in 35 countries registered for participation, see appendix 2 for the number of participants per country. In this report the results of the Natural Gas (Methane) 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). To optimize the costs for the participating laboratories it was decided to prepare one Natural Gas mixture. The mixture was divided over a batch of 67 cylinders. The cylinder size is a cost-effective one-liter cylinder. Each cylinder was uniquely numbered and labelled #23055. The limited cylinder size is chosen to optimize transport and handling costs.
Sample analyzes for fit-for-use and homogeneity testing were subcontracted to an ISO/IEC17025 accredited laboratory.
The participants were requested to report rounded and unrounded test results. The unrounded test results were preferably used for statistical evaluation.

2.1 QUALITY SYSTEM

The Institute for Interlaboratory Studies in Spijkenisse, the Netherlands, has implemented a quality system based on ISO/IEC17043:2010. 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 a regular basis by sending out questionnaires.
EffecTech Ltd. is accredited in conformance with ISO17025:2017 by UKAS (no. 0590).

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 Organisation, Statistics and Evaluation' of June 2018 (iis-protocol, version 3.5). This protocol is also electronically available through the iis website www.iisnl.com, from the 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

One batch of 67 one-liter cylinders with an artificial Natural Gas mixture was prepared and tested for homogeneity by EffecTech Ltd. (Uttoxeter, United Kingdom) in conformance with ISO Guide 35 and ISO/IEC17025 (Job 23/0135, starting in February 2023). Each cylinder was uniquely numbered and labelled #23055. Every cylinder in the batch was analyzed using replicate measurements. The within bottle and between bottle variations were assessed in accordance with ISO Guide 35. This evaluation showed that all between bottle variations were small compared to the uncertainties on the reference values on each component.

The repeatabilities were calculated per component and compared with 0.3 times the corresponding reproducibility of the reference test method in agreement with the procedure of ISO13528, Annex B2 in the next table.

Component	r (observed) in %mol/mol	0.3 * R in %mol/mol	Reference test method
Methane	0.0063	0.0658	ISO06974-3:18
Ethane	0.0018	0.0366	ISO06974-3:18
Propane	0.0015	0.0227	ISO06974-3:18
iso-Butane	0.0008	0.0117	ISO06974-3:18
n-Butane	0.0017	0.0117	ISO06974-3:18
Carbon Dioxide	0.0004	0.0060	ISO06974-3:18
Nitrogen	0.0043	0.0255	ISO06974-3:18

Table 1: evaluation of the repeatabilities of subsamples #23055

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

To each of the participating laboratories one 1 L gas cylinder labelled #23055 was sent on March 22, 2023. An SDS was added to the sample package.

2.5 STABILITY OF THE SAMPLES

EffecTech Ltd. (Uttoxeter, United Kingdom) declares that the prepared gas cylinders have a shelf life of at least 6 months. This is sufficient for the proficiency testing purposes.

2.6 ANALYZES

The participants were requested to determine Methane, Ethane, Propane, iso-Butane, n-Butane, Carbon Dioxide, Nitrogen, Carbon content and for Real Gas conditions for two different combinations of combustion and metering temperature the following properties: Gross (Superior) Caloric Value, Net (Inferior) Caloric Value, Density, Relative Density and Gross Wobbe Index.

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’ test 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 test 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 appendix 1 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 reanalyzes). Additional or corrected test results are used for data analysis and the original test results are placed under 'Remarks' in the result tables in appendix 1. 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.

The assigned value is determined by consensus based on the test results of the group of participants after rejection of the statistical outliers and/or suspect data.

According to ISO13528 all (original received or corrected) results per determination were submitted to outlier tests. In the iis procedure for proficiency tests, outliers are detected prior to calculation of the mean, standard deviation and reproducibility. For small data sets, Dixon (up to 20 test results) or Grubbs (up to 40 test results) outlier tests can be used. For larger data sets (above 20 test results) Rosner’s outlier test can be used. 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 (dotted line) was projected over the Kernel Density Graph (smooth line) for reference. The Gauss curve is calculated from the consensus value and the corresponding standard deviation.

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 (derived from e.g. ISO or ASTM test methods), the z-scores were calculated using a target standard deviation. This results in an evaluation independent of 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, like Horwitz or an estimated reproducibility based on former iis proficiency tests.

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 test result tables in appendix 1.

Absolute values for z<2 are very common and absolute values for z>3 are very rare. Therefore, 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

Some problems were encountered with the dispatch of the samples. Therefore, the reporting time on the data entry portal was extended with another week. Thirteen participants reported test results after the extended reporting date and five other participants did not report any test results. Not all laboratories were able to report all the analyzes requested.
In total 58 participants reported 637 numerical test results. Observed were 31 outlying test results, which is 4.9%. In proficiency tests outlier percentages of 3% - 7.5% are quite normal.

Not all 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 COMPONENT

In this section the reported test results are discussed per component and calculated parameter. The test methods which are used by the various laboratories were taken into account for explaining the observed differences when possible and applicable. These methods are also in the tables together with the original data in appendix 1. The abbreviations, used in these tables, are explained in appendix 3.

In the iis PT reports ASTM test methods are referred to with a number (e.g. D1945) and an added designation for the year that the test method was adopted or revised (e.g. D1945:14). When a method has been reapproved an “R” will be added and the year of approval (e.g. D1945:14R19).

Total of the composition: The total per laboratory of the test results of the composition was calculated by iis. Since the composition is requested as normalized the total should be 100%. Three calculated results were found to be significantly different than 100%. It was decided to exclude the test results of these laboratories for all further statistical evaluations.

Methane: The determination of this component was problematic. Six statistical outliers were observed and three other test results were excluded. The calculated reproducibility after rejection of the suspect data is not in agreement with the requirements of ISO6974-3:18 or with the requirements of ASTM D1945:14R19.

Ethane: The determination of this component was not problematic. Three statistical outliers were observed and five other test results were excluded. The calculated reproducibility after rejection of the suspect data is in agreement with the requirements of ISO6974-3:18 and with the requirements ASTM D1945:14R19.

Propane: The determination of this component may be problematic depending on the test method used. Five statistical outliers were observed and four other test results were excluded. The calculated reproducibility after rejection of the suspect data is not in agreement with the requirements of ISO6974-3:18 but it is in agreement with the requirements of ASTM D1945:14R19.

iso-Butane: The determination of this component may be problematic depending on the test method used. Five statistical outliers were observed and five other test results were excluded. The calculated reproducibility after rejection of the suspect data is not in agreement with the requirements of ISO6974-3:18 but it is in agreement with the requirements of ASTM D1945:14R19.

n-Butane: The determination of this component may not be problematic. However, seven statistical outliers were observed and four other test results were excluded. The calculated reproducibility after rejection of the suspect data is in agreement with the requirements of ISO6974-3:18 or with ASTM D1945:14R19.

Carbon Dioxide: The determination of this component may be problematic depending on the test method used. Three statistical outliers were observed and six other test results were excluded. The calculated reproducibility after rejection of the suspect data is not in agreement with the requirements of ISO6974-3:18 but it is in agreement with the requirements of ASTM D1945:14R19.

Nitrogen: The determination of this component was very problematic. Two statistical outliers were observed and six other test results were excluded. The calculated reproducibility after rejection of the suspect data is not at all in agreement with the requirements of ISO6974-3:18 nor with the requirements of ASTM D1945:14R19.

Carbon content: The determination of this component was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of EN15984:22.

Gross (Superior) Caloric Value: For the calculation at combustion temperature 25 °C, metering temperature 0 °C twenty-one participants reported a test result. For three test results iis calculated a different value.
The calculation at combustion temperature 15 °C, metering temperature 15 °C thirty participants reported a test result. For two test results iis calculated a different value.

Net (Inferior) Caloric Value: The calculation at combustion temperature 25 °C, metering temperature 0 °C twelve participants reported a test result. For one test result iis calculated a different value.
The calculation at combustion temperature 15 °C, metering temperature 15 °C eighteen participants reported a test result. For three test results iis calculated a different value.

Density: The calculation at combustion temperature 25 °C, metering temperature 0 °C twenty-one participants reported a test result. For one test result iis calculated a different value.
The calculation at combustion temperature 15 °C, metering temperature 15 °C twenty-seven participants reported a test result. For seven test results iis calculated a different value.

Relative Density: The calculation at combustion temperature 25 °C, metering temperature 0 °C twenty participants reported a test result. No calculation differences were observed.
The calculation at combustion temperature 15 °C, metering temperature 15 °C twenty six participants reported a test result. For two test results iis calculated a different value.

Gross Wobbe Index: The calculation at combustion temperature 25 °C, metering temperature 0 °C twenty-one participants reported a test result. For four test results iis calculated a different value.
The calculation at combustion temperature 15 °C, metering temperature 15 °C twenty-five participants reported a test result. For five test results iis calculated a different value.

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 results, the average, the calculated reproducibility (2.8 * standard deviation) and the target reproducibility derived from reference methods are presented in the next table.

Component	unit	n	average	2.8 * sd	R(lit)
Methane	%mol/mol	49	87.11	0.28	0.22
Ethane	%mol/mol	50	4.99	0.12	0.12
Propane	%mol/mol	49	2.54	0.10	0.08
iso-Butane	%mol/mol	48	1.01	0.06	0.04
n-Butane	%mol/mol	47	1.01	0.04	0.04
Carbon Dioxide	%mol/mol	49	0.39	0.03	0.02
Nitrogen	%mol/mol	50	2.97	0.21	0.08
Carbon content	g/100g	10	72.4	0.3	2.2

Table 2: reproducibilities of the composition of sample #23055

Without further statistical calculations it can be concluded that for several components there is not a good compliance of the group of participants with the reference test method. The problematic components have been discussed in paragraph 4.1.

4.3 COMPARISON OF THE PROFICIENCY TEST OF APRIL 2023 WITH PREVIOUS PTS

	April 2023	April 2022	April 2021	April 2020	April 2019
Number of reporting laboratories	58	55	58	58	59
Number of test results	637	620	798	648	698
Number of statistical outliers	31	19	42	33	32
Percentage of statistical outliers	4.9%	3.1%	5.3%	5.1%	4.6%

Table 3: 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 to the requirements of the reference test methods. The conclusions are given the following tables.

Component	April 2023	April 2022	April 2021	April 2020	April 2019
Methane	-	+/-	-	-	+
Ethane	+/-	+/-	-	-	+
Propane	-	-	-	-	+/-
iso-Butane	-	-	-	+/-	-
n-Butane	+/-	--	-	+/-	-
Carbon Dioxide	-	--	-	-	-
Nitrogen	--	--	-	--	--
Carbon content	++	++	++	++	++

Table 4: comparison determination to the reference test methods

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

5 DISCUSSION

The consensus values as determined in this PT are compared with the average values from the homogeneity testing by EffecTech Ltd. (Uttoxeter, United Kingdom) in the following table. From this comparison it is clear that the consensus values as determined in this PT are very well in line with the values as determined during the preparation of the gas cylinders.

Component	EffecTech in %mol/mol	Average PT in %mol/mol	Differences in %mol/mol	z-score
Methane	87.0713	87.1065	-0.0352	-0.45
Ethane	4.9669	4.9858	-0.0189	-0.43
Propane	2.5451	2.5379	0.0072	0.08
iso-Butane	1.0080	1.0051	0.0029	0.21
n-Butane	1.0068	1.0064	0.0004	0.03
Carbon Dioxide	0.3981	0.3923	0.0058	0.82
Nitrogen	3.0039	2.9679	0.0360	1.20

Table 5: comparison of average values with the values determined by the supplier EffecTech Ltd.

APPENDIX 1

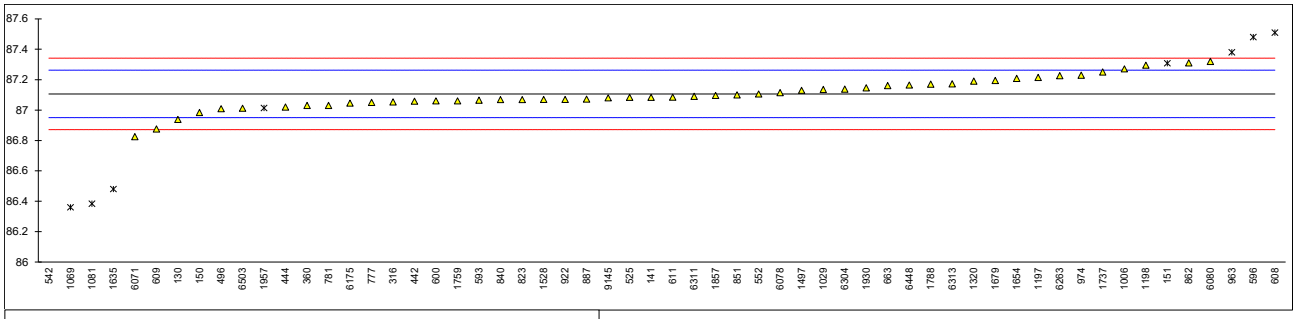
Total of reported (normalized) composition test results; results in %mol/mol

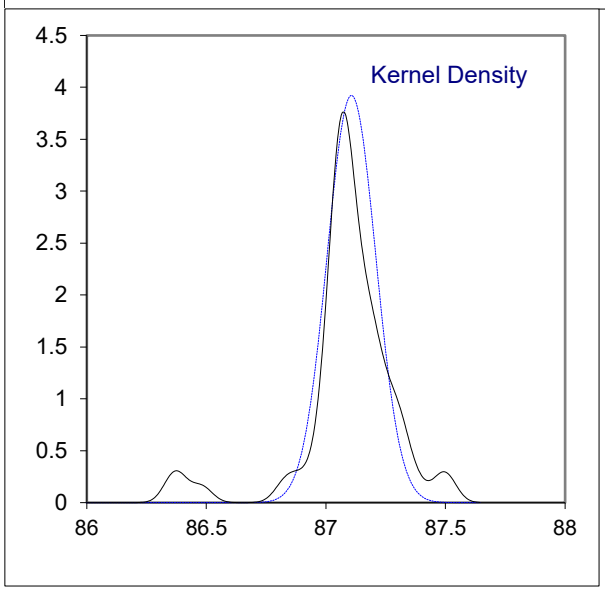
lab	method	value	mark	remarks
130	ISO6974-3	99.910		
141	GPA2261	100.000		
150	D1945	99.967		
151	GPA2261	100.110	ex	Corrected only few components not all, excluded from calculations
225		-----		
316	ISO6974-3	100.002		
352		-----		
360	ISO6974-3	100.000		
442	D1945	100.000		
444	D1945	99.995		
496	EN15984	100.001		
525	GPA2286	100.000		
529		-----		
542	D1945	100.000		
552	NBR14903	100.000		
593		100.000		
596	GPA2261	99.990		
600	GPA2261Mod.	100.000		
608	GPA2261	100.000		
609	GPA2261	100.000		
611	GPA2261	100.000		
663	D1945	99.990		
777	ISO6974-6	100.007		
781	GOST31371.7	99.993		
823	GPA2261	100.000		
840	D1945	100.000		
851	GPA2261	99.999		
861		-----		
862	GPA2261-20	99.994		
887	D1945	100.000		
922	D1945	100.000		
963	D1945	99.730	ex	outlier nitrogen, excluded from calculations
974	ISO6974-5	100.000		
1006	D1945	100.000		
1029	D1945	100.000		
1069	In house	99.990		
1081		100.001		
1197	D1945	100.030		
1198	D1945	100.000		
1320	D1945	100.010		
1497	D1945	100.000		
1528	UOP539	100.000		
1635	D1945	99.980		
1654	D1945	100.000		
1679	ISO6974-3	100.000		
1737	In house	100.000		
1759	ISO6974-5	100.000		
1788	D7833	100.021		
1857	GOST31371.7	100.000		
1930	ISO6974-6	100.000		
1957	GPA2261	94.757	ex	Corrected only few components not all, excluded from calculations
6071	GPA2261	100.000		
6078	ISO6974-3	99.999		
6080	D1945	99.906		
6175	In house	100.000		
6263	GPA2286	100.000		
6304	D1945	100.000		
6311	D1945	100.000		
6313	GPA2286	100.000		
6448	GPA2261	100.000		
6503	D1945	100.000		
6523		-----		
9145		100.000		

Determination of Methane on sample #23055; results in %mol/mol

lab	method	value	mark	z(targ)	remarks
130	ISO6974-3	86.9380		-2.15	
141	GPA2261	87.0829		-0.30	
150	D1945	86.983		-1.57	
151	GPA2261	87.307	ex	2.56	Test result excluded, see §4.1
225		-----		-----	
316	ISO6974-3	87.0533		-0.68	
352		-----		-----	
360	ISO6974-3	87.03		-0.98	
442	D1945	87.0581		-0.62	
444	D1945	87.0196		-1.11	
496	EN15984	87.009		-1.24	
525	GPA2286	87.0828		-0.30	
529		-----		-----	
542	D1945	84.581187	R(0.01)	-32.21	
552	NBR14903	87.105		-0.02	
593		87.065		-0.53	
596	GPA2261	87.48	R(0.05)	4.76	
600	GPA2261Mod.	87.06		-0.59	
608	GPA2261	87.51	R(0.05)	5.15	
609	GPA2261	86.8754		-2.95	
611	GPA2261	87.084		-0.29	
663	D1945	87.16	C	0.68	First reported 86.510
777	ISO6974-6	87.05		-0.72	
781	GOST31371.7	87.03		-0.98	
823	GPA2261	87.069		-0.48	
840	D1945	87.0689		-0.48	
851	GPA2261	87.09965		-0.09	
861		-----		-----	
862	GPA2261-20	87.310		2.60	
887	D1945	87.071		-0.45	
922	D1945	87.07		-0.46	
963	D1945	87.38	ex	3.49	Test result excluded, see §4.1
974	ISO6974-5	87.229		1.56	
1006	D1945	87.271		2.10	
1029	D1945	87.1352	C	0.37	First reported 87.3632
1069	In house	86.36	R(0.01)	-9.52	
1081		86.383	R(0.01)	-9.23	
1197	D1945	87.2147		1.38	
1198	D1945	87.2952	C	2.41	First reported 87.1051
1320	D1945	87.19		1.07	
1497	D1945	87.12905		0.29	
1528	UOP539	87.0691		-0.48	
1635	D1945	86.48	R(0.01)	-7.99	
1654	D1945	87.208		1.30	
1679	ISO6974-3	87.194		1.12	
1737	In house	87.25		1.83	
1759	ISO6974-5	87.060		-0.59	
1788	D7833	87.17		0.81	
1857	GOST31371.7	87.096		-0.13	
1930	ISO6974-6	87.1461	C	0.51	First reported 87.2184
1957	GPA2261	87.0139	ex	-1.18	Test result excluded, see §4.1
6071	GPA2261	86.82515		-3.59	
6078	ISO6974-3	87.114		0.10	
6080	D1945	87.320		2.72	
6175	In house	87.0451		-0.78	
6263	GPA2286	87.226595		1.53	
6304	D1945	87.1370		0.39	
6311	D1945	87.09		-0.21	
6313	GPA2286	87.1716		0.83	
6448	GPA2261	87.1641		0.74	
6503	D1945	87.0114		-1.21	
6523		-----		-----	
9145		87.08		-0.34	

	normality	OK
	n	49
	outliers	6 (+3ex)
	mean (n)	87.1065
	st.dev. (n)	0.10170
	R(calc.)	0.2848
	st.dev.(ISO6974-3:18)	0.07840
	R(ISO6974-3:18)	0.2195
Compare		
	R(D1945:14R19)	0.15

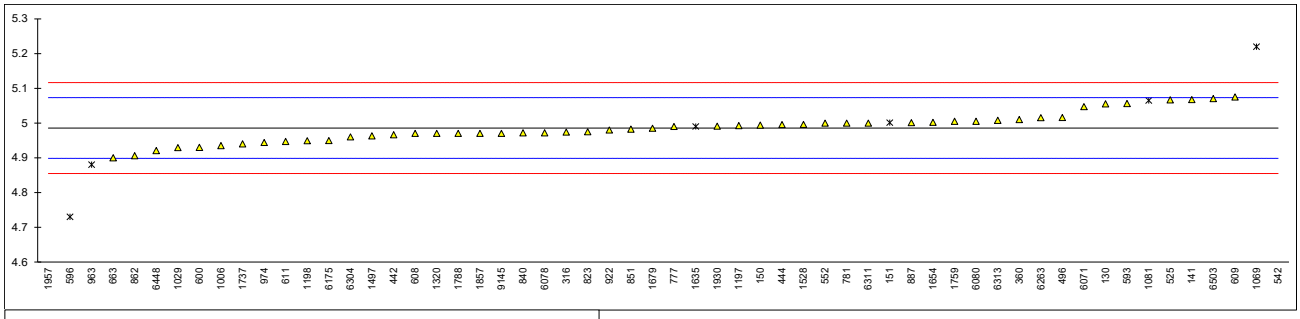

87.6
87.4
87.2
87
86.8
86.6
86.4
86.2
86
542 1069 1081 1635 6071 609 130 150 496 6503 1957 444 360 781 6175 777 316 442 600 1759 593 840 823 1528 922 887 9145 525 141 611 6311 1857 851 552 6078 1497 1029 6304 1930 663 6448 1788 6313 1320 1679 1654 1197 6263 974 1737 1006 1198 151 862 6080 963 596 608

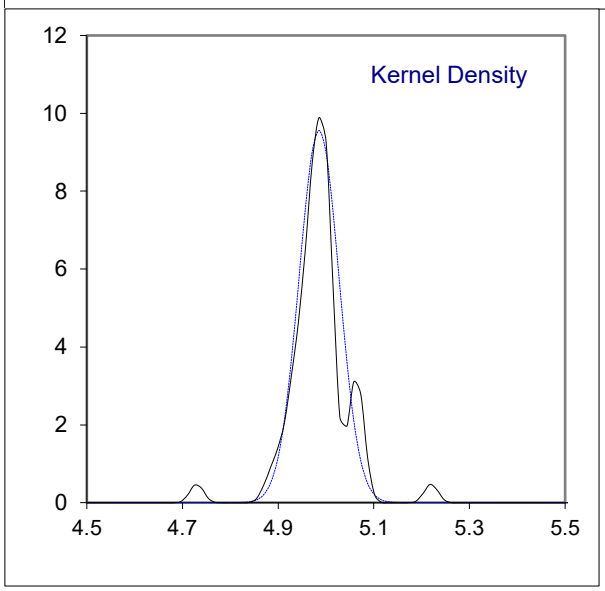

Kernel Density
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
86
86.5
87
87.5
88

Determination of Ethane on sample #23055; results in %mol/mol

lab	method	value	mark	z(targ)	remarks
130	ISO6974-3	5.0552		1.59	
141	GPA2261	5.0676		1.87	
150	D1945	4.994		0.19	
151	GPA2261	5.001	ex,C	0.35	Test result excluded, see §4.1. First reported 4.849
225		-----		-----	
316	ISO6974-3	4.9740		-0.27	
352		-----		-----	
360	ISO6974-3	5.01		0.55	
442	D1945	4.9665		-0.44	
444	D1945	4.9954		0.22	
496	EN15984	5.016		0.69	
525	GPA2286	5.0667		1.85	
529		-----		-----	
542	D1945	5.884253	R(0.01)	20.58	
552	NBR14903	5.000		0.33	
593		5.056		1.61	
596	GPA2261	4.73	R(0.01)	-5.86	
600	GPA2261Mod.	4.93		-1.28	
608	GPA2261	4.97		-0.36	
609	GPA2261	5.0751		2.05	
611	GPA2261	4.947		-0.89	
663	D1945	4.90	C	-1.96	First reported 5.110
777	ISO6974-6	4.99		0.10	
781	GOST31371.7	5.00		0.33	
823	GPA2261	4.975		-0.25	
840	D1945	4.9718		-0.32	
851	GPA2261	4.98225		-0.08	
861		-----		-----	
862	GPA2261-20	4.906		-1.83	
887	D1945	5.001		0.35	
922	D1945	4.98		-0.13	
963	D1945	4.88	ex	-2.42	Test result excluded, see §4.1
974	ISO6974-5	4.944		-0.96	
1006	D1945	4.935		-1.16	
1029	D1945	4.9291	C	-1.30	First reported 4.7011
1069	In house	5.22	R(0.01)	5.36	
1081		5.065	ex	1.81	Excluded, as for other components 4 or more outliers
1197	D1945	4.9924		0.15	
1198	D1945	4.9492	C	-0.84	First reported 5.15540
1320	D1945	4.97		-0.36	
1497	D1945	4.96291		-0.52	
1528	UOP539	4.9958		0.23	
1635	D1945	4.99	ex	0.10	Excluded, as for other components 4 or more outliers
1654	D1945	5.002		0.37	
1679	ISO6974-3	4.985		-0.02	
1737	In house	4.94		-1.05	
1759	ISO6974-5	5.005		0.44	
1788	D7833	4.97		-0.36	
1857	GOST31371.7	4.970		-0.36	
1930	ISO6974-6	4.9909	C	0.12	First reported 4.9941
1957	GPA2261	2.2773	ex,C	-62.03	Test result excluded, see §4.1. First reported 5.151
6071	GPA2261	5.04711		1.40	
6078	ISO6974-3	4.972		-0.32	
6080	D1945	5.005		0.44	
6175	In house	4.9494		-0.83	
6263	GPA2286	5.015611		0.68	
6304	D1945	4.9601		-0.59	
6311	D1945	5.00		0.33	
6313	GPA2286	5.0079		0.51	
6448	GPA2261	4.9208		-1.49	
6503	D1945	5.0706		1.94	
6523		-----		-----	
9145		4.97		-0.36	

	normality	OK
	n	50
	outliers	3 (+5ex)
	mean (n)	4.9858
	st.dev. (n)	0.04173
	R(calc.)	0.1168
	st.dev.(ISO6974-3:18)	0.04366
	R(ISO6974-3:18)	0.1223
Compare		
	R(D1945:14R19)	0.12

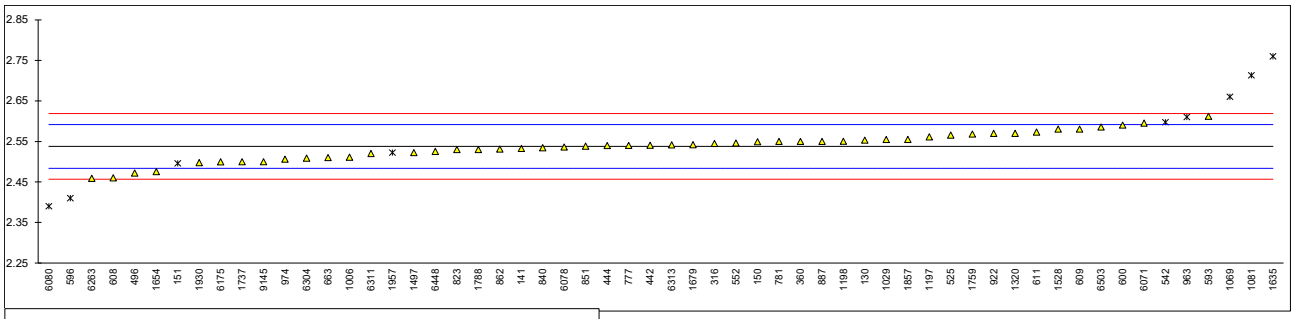

5.3
5.2
5.1
5
4.9
4.8
4.7
4.6
1957 596 963 663 862 6448 1029 600 1006 1737 974 611 1198 6175 6304 1497 442 608 1320 1788 1857 9145 840 6078 316 823 922 851 1679 777 1635 1930 1197 150 444 1528 552 781 6311 151 887 1654 1759 6080 6313 360 6263 496 6071 130 593 1081 525 141 6503 609 1069 542

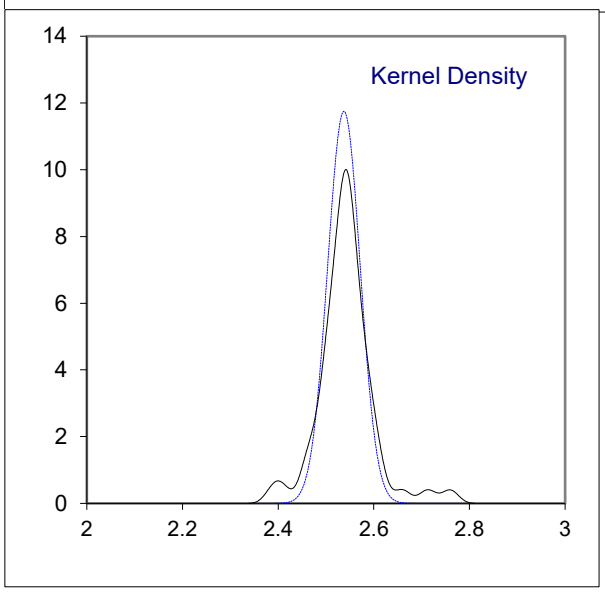

Kernel Density
12
10
8
6
4
2
0
4.5
4.7
4.9
5.1
5.3
5.5

Determination of Propane on sample #23055; results in %mol/mol

lab	method	value	mark	z(targ)	remarks
130	ISO6974-3	2.5532		0.57	
141	GPA2261	2.5324		-0.20	
150	D1945	2.549		0.41	
151	GPA2261	2.496	ex	-1.55	Test result excluded, see §4.1.
225		-----		-----	
316	ISO6974-3	2.5448		0.26	
352		-----		-----	
360	ISO6974-3	2.55		0.45	
442	D1945	2.5405		0.10	
444	D1945	2.5398		0.07	
496	EN15984	2.472		-2.45	
525	GPA2286	2.5653		1.02	
529		-----		-----	
542	D1945	2.597459	ex	2.21	Excluded, as for other components 4 or more outliers
552	NBR14903	2.546		0.30	
593		2.612		2.75	
596	GPA2261	2.41	R(0.05)	-4.75	
600	GPA2261Mod.	2.59		1.93	
608	GPA2261	2.46		-2.89	
609	GPA2261	2.5804		1.58	
611	GPA2261	2.573		1.30	
663	D1945	2.51	C	-1.03	First reported 2.760
777	ISO6974-6	2.54		0.08	
781	GOST31371.7	2.55		0.45	
823	GPA2261	2.530		-0.29	
840	D1945	2.5342		-0.14	
851	GPA2261	2.53825		0.01	
861		-----		-----	
862	GPA2261-20	2.531		-0.26	
887	D1945	2.550		0.45	
922	D1945	2.57		1.19	
963	D1945	2.61	ex	2.68	Test result excluded, see §4.1
974	ISO6974-5	2.506		-1.18	
1006	D1945	2.511		-1.00	
1029	D1945	2.5545		0.62	
1069	In house	2.66	R(0.05)	4.53	
1081		2.713	R(0.05)	6.50	
1197	D1945	2.5612		0.87	
1198	D1945	2.5501	C	0.45	First reported 2.5462
1320	D1945	2.57		1.19	
1497	D1945	2.52246		-0.57	
1528	UOP539	2.5802		1.57	
1635	D1945	2.76	R(0.01)	8.24	
1654	D1945	2.475		-2.33	
1679	ISO6974-3	2.542		0.15	
1737	In house	2.50		-1.41	
1759	ISO6974-5	2.568		1.12	
1788	D7833	2.53		-0.29	
1857	GOST31371.7	2.555		0.64	
1930	ISO6974-6	2.4977	C	-1.49	First reported 2.5055
1957	GPA2261	2.5222	ex	-0.58	Test result excluded, see §4.1.
6071	GPA2261	2.59520		2.13	
6078	ISO6974-3	2.536		-0.07	
6080	D1945	2.390	R(0.05)	-5.49	
6175	In house	2.4994		-1.43	
6263	GPA2286	2.459009		-2.93	
6304	D1945	2.5087		-1.08	
6311	D1945	2.52		-0.66	
6313	GPA2286	2.5415		0.13	
6448	GPA2261	2.5254		-0.46	
6503	D1945	2.5855		1.77	
6523		-----		-----	
9145		2.50		-1.41	

	normality	OK
	n	49
	outliers	5 (+4ex)
	mean (n)	2.5379
	st.dev. (n)	0.03397
	R(calc.)	0.0951
	st.dev.(ISO6974-3:18)	0.02694
	R(ISO6974-3:18)	0.0754
Compare		
	R(D1945:14R19)	0.10

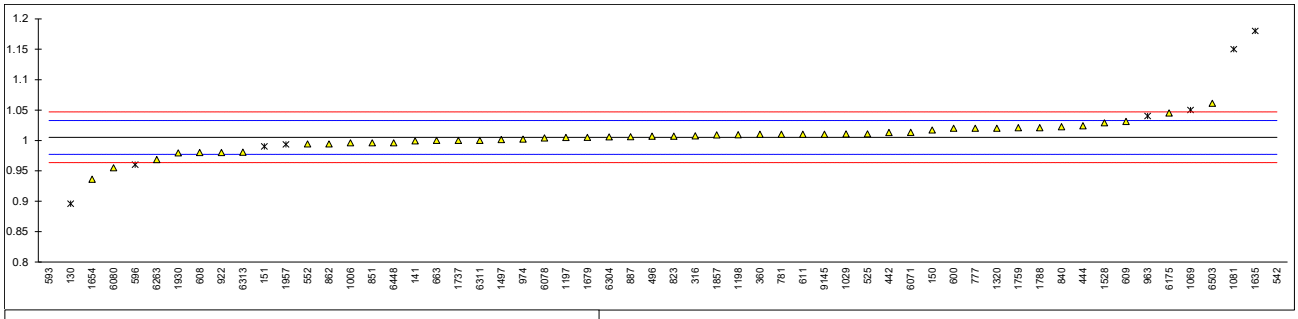

2.85
2.75
2.65
2.55
2.45
2.35
2.25
6080 596 6263 608 496 1654 151 1930 6175 1737 9145 974 6304 663 1006 6311 1957 1497 6448 823 1788 862 141 840 6078 851 444 777 442 6313 1679 316 552 150 781 360 887 1198 130 1029 1857 1197 525 1759 922 1320 611 1528 609 6503 600 6071 542 963 593 1869 1081 1635

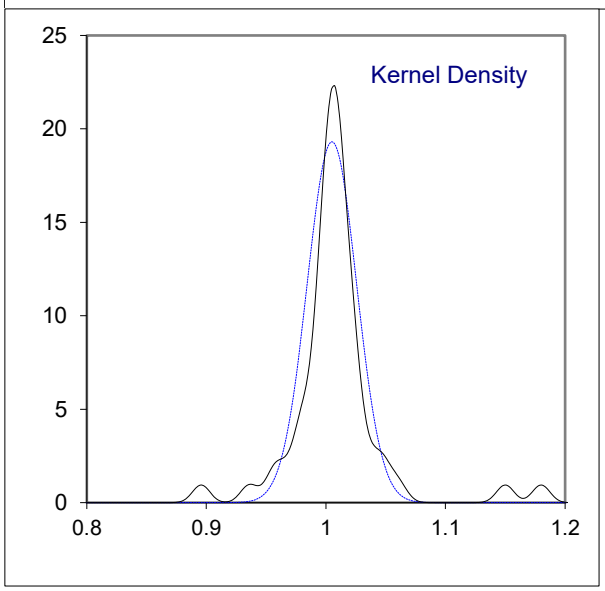

Kernel Density
14
12
10
8
6
4
2
0
2
2.2
2.4
2.6
2.8
3

Determination of iso-Butane on sample #23055; results in %mol/mol

lab	method	value	mark	z(targ)	remarks
130	ISO6974-3	0.8957	R(0.01)	-7.87	
141	GPA2261	0.9993		-0.41	
150	D1945	1.017		0.86	
151	GPA2261	0.990	ex	-1.08	Test result excluded, see §4.1.
225		-----		-----	
316	ISO6974-3	1.0075		0.18	
352		-----		-----	
360	ISO6974-3	1.01		0.36	
442	D1945	1.0130		0.57	
444	D1945	1.0242		1.38	
496	EN15984	1.007		0.14	
525	GPA2286	1.0108		0.41	
529		-----		-----	
542	D1945	1.380438	R(0.01)	27.02	
552	NBR14903	0.994		-0.80	
593		0.710	R(0.01)	-21.24	
596	GPA2261	0.96	ex	-3.24	Excluded, as for other components 4 or more outliers
600	GPA2261Mod.	1.02		1.08	
608	GPA2261	0.98		-1.80	
609	GPA2261	1.0310		1.87	
611	GPA2261	1.010		0.36	
663	D1945	1.00	C	-0.36	First reported 1.190
777	ISO6974-6	1.02		1.08	
781	GOST31371.7	1.01		0.36	
823	GPA2261	1.007		0.14	
840	D1945	1.0225		1.26	
851	GPA2261	0.99608		-0.65	
861		-----		-----	
862	GPA2261-20	0.994		-0.80	
887	D1945	1.006		0.07	
922	D1945	0.98		-1.80	
963	D1945	1.04	ex	2.51	Test result excluded, see §4.1
974	ISO6974-5	1.002		-0.22	
1006	D1945	0.996		-0.65	
1029	D1945	1.0106		0.40	
1069	In house	1.05	ex	3.23	Excluded, as for other components 4 or more outliers
1081		1.150	R(0.01)	10.43	
1197	D1945	1.0047		-0.03	
1198	D1945	1.0094	C	0.31	First reported 1.0059
1320	D1945	1.02		1.08	
1497	D1945	1.00138		-0.27	
1528	UOP539	1.0289		1.72	
1635	D1945	1.18	R(0.01)	12.59	
1654	D1945	0.936		-4.97	
1679	ISO6974-3	1.005		0.00	
1737	In house	1.00		-0.36	
1759	ISO6974-5	1.021		1.15	
1788	D7833	1.021		1.15	
1857	GOST31371.7	1.009		0.28	
1930	ISO6974-6	0.9793	C	-1.85	First reported 0.9484
1957	GPA2261	0.9935	ex	-0.83	Test result excluded, see §4.1.
6071	GPA2261	1.01316		0.58	
6078	ISO6974-3	1.004		-0.08	
6080	D1945	0.955		-3.60	
6175	In house	1.0452		2.89	
6263	GPA2286	0.968506		-2.63	
6304	D1945	1.0058		0.05	
6311	D1945	1.00		-0.36	
6313	GPA2286	0.9806		-1.76	
6448	GPA2261	0.9961		-0.65	
6503	D1945	1.061		4.03	
6523		-----		-----	
9145		1.01		0.36	

	normality	not OK
	n	48
	outliers	5 (+5ex)
	mean (n)	1.0051
	st.dev. (n)	0.02066
	R(calc.)	0.0579
	st.dev.(ISO6974-3:18)	0.01389
	R(ISO6974-3:18)	0.0389
Compare		
	R(D1945:14R19)	0.10

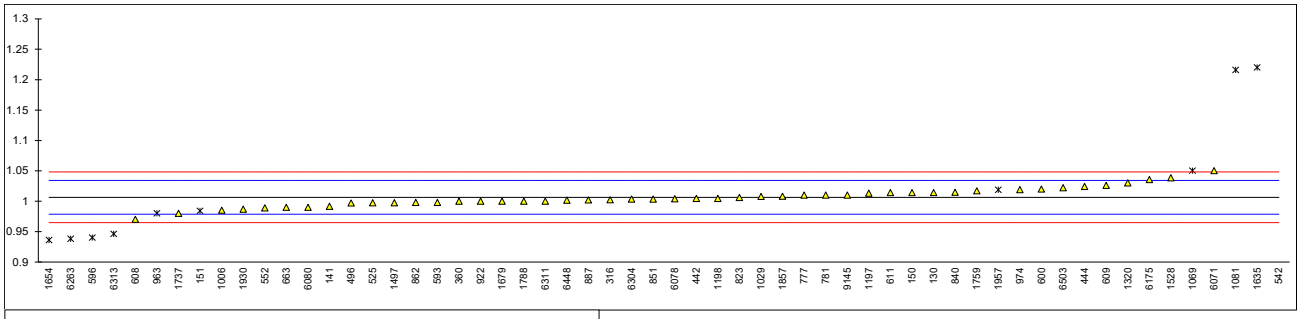

1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
593 130 1654 6080 596 6283 1930 608 922 6313 151 1957 552 862 1006 851 6448 141 663 1737 6311 1497 974 6078 1197 1679 6304 887 496 823 316 1857 1198 360 781 611 9145 1029 525 442 6071 150 600 777 1320 1759 1788 840 444 1528 609 963 6175 1069 6503 1081 1635 542

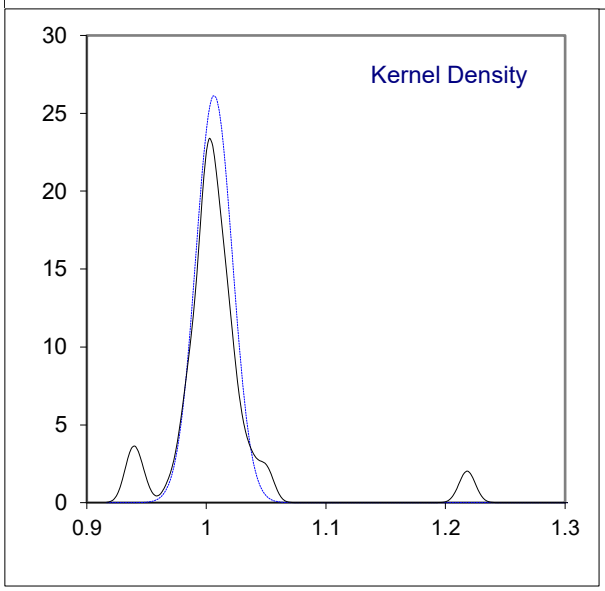

Kernel Density
25
20
15
10
5
0
0.8
0.9
1
1.1
1.2

Determination of n-Butane on sample #23055; results in %mol/mol

lab	method	value	mark	z(targ)	remarks
130	ISO6974-3	1.0141		0.56	
141	GPA2261	0.9916		-1.06	
150	D1945	1.014		0.55	
151	GPA2261	0.984	ex	-1.61	Test result excluded, see §4.1.
225		-----		-----	
316	ISO6974-3	1.0023		-0.29	
352		-----		-----	
360	ISO6974-3	1.00		-0.46	
442	D1945	1.0043		-0.15	
444	D1945	1.0242		1.28	
496	EN15984	0.997		-0.67	
525	GPA2286	0.9973		-0.65	
529		-----		-----	
542	D1945	1.651355	R(0.01)	46.38	
552	NBR14903	0.989		-1.25	
593		0.998		-0.60	
596	GPA2261	0.94	R(0.05)	-4.77	
600	GPA2261Mod.	1.02		0.98	
608	GPA2261	0.97		-2.62	
609	GPA2261	1.0260		1.41	
611	GPA2261	1.014		0.55	
663	D1945	0.99	C	-1.18	First reported 1.280
777	ISO6974-6	1.01		0.26	
781	GOST31371.7	1.01		0.26	
823	GPA2261	1.006		-0.03	
840	D1945	1.0145		0.58	
851	GPA2261	1.00352		-0.21	
861		-----		-----	
862	GPA2261-20	0.998		-0.60	
887	D1945	1.002		-0.31	
922	D1945	1.00		-0.46	
963	D1945	0.98	ex	-1.90	Test result excluded, see §4.1
974	ISO6974-5	1.019		0.91	
1006	D1945	0.985		-1.54	
1029	D1945	1.0079		0.11	
1069	In house	1.05	ex	3.14	Excluded, as for other components 4 or more outliers
1081		1.216	R(0.01)	15.07	
1197	D1945	1.0131		0.48	
1198	D1945	1.0044	C	-0.14	First reported 1.0026
1320	D1945	1.03		1.70	
1497	D1945	0.99747		-0.64	
1528	UOP539	1.0385		2.31	
1635	D1945	1.22	R(0.01)	15.36	
1654	D1945	0.936	R(0.05)	-5.06	
1679	ISO6974-3	1.000		-0.46	
1737	In house	0.98		-1.90	
1759	ISO6974-5	1.017		0.76	
1788	D7833	1.00		-0.46	
1857	GOST31371.7	1.008		0.12	
1930	ISO6974-6	0.9867	C	-1.41	First reported 0.9568
1957	GPA2261	1.0187	ex	0.89	Test result excluded, see §4.1.
6071	GPA2261	1.05015		3.15	
6078	ISO6974-3	1.004		-0.17	
6080	D1945	0.990		-1.18	
6175	In house	1.0357		2.11	
6263	GPA2286	0.938048	R(0.05)	-4.91	
6304	D1945	1.0034		-0.21	
6311	D1945	1.00		-0.46	
6313	GPA2286	0.9461	R(0.05)	-4.33	
6448	GPA2261	1.0014		-0.36	
6503	D1945	1.022		1.12	
6523		-----		-----	
9145		1.01		0.26	

	normality	OK
	n	47
	outliers	7 (+4ex)
	mean (n)	1.0064
	st.dev. (n)	0.01526
	R(calc.)	0.0427
	st.dev.(ISO6974-3:18)	0.01391
	R(ISO6974-3:18)	0.0389
Compare		
	R(D1945:14R19)	0.10

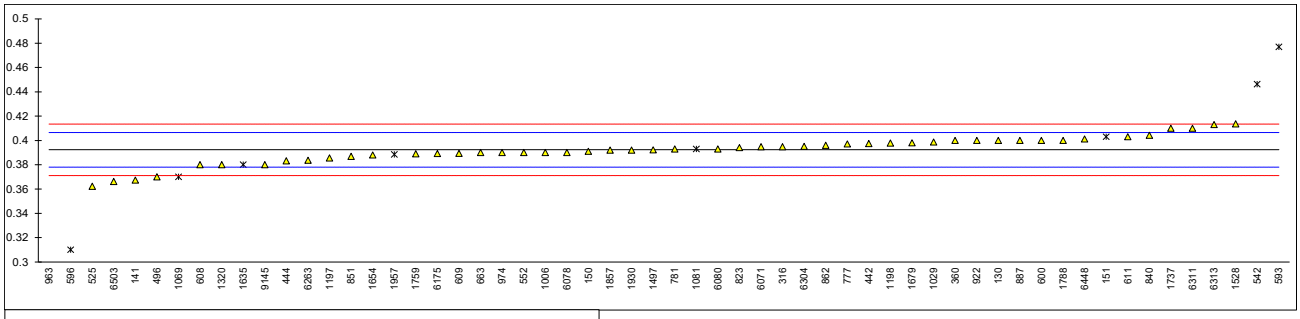

1.3
1.25
1.2
1.15
1.1
1.05
1
0.95
0.9
1654 6283 596 6313 608 963 1737 151 1006 1930 552 663 6080 141 496 525 1497 862 593 360 922 1679 1788 6311 6448 887 316 6304 851 6078 442 1198 823 1029 1657 777 781 9145 1197 611 150 130 840 1759 1957 974 600 6503 444 609 1320 6175 1528 1069 6071 1081 1635 542

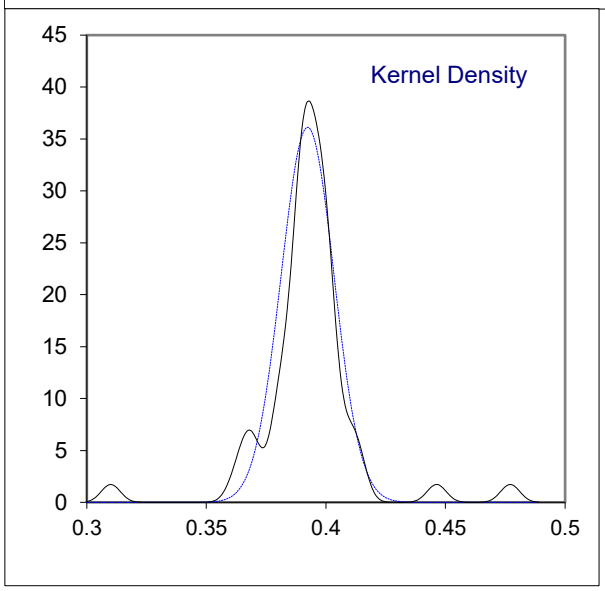

Kernel Density
30
25
20
15
10
5
0
0.9
1
1.1
1.2
1.3

Determination of Carbon Dioxide on sample #23055; results in %mol/mol

lab	method	value	mark	z(targ)	remarks
130	ISO6974-3	0.4000		1.09	
141	GPA2261	0.3673		-3.52	
150	D1945	0.391		-0.18	
151	GPA2261	0.403	ex	1.51	Test result excluded, see §4.1.
225		-----		-----	
316	ISO6974-3	0.3948		0.35	
352		-----		-----	
360	ISO6974-3	0.40		1.09	
442	D1945	0.3974		0.72	
444	D1945	0.3831		-1.30	
496	EN15984	0.370		-3.14	
525	GPA2286	0.3622		-4.24	
529		-----		-----	
542	D1945	0.446234	R(0.01)	7.61	
552	NBR14903	0.390		-0.32	
593		0.477	R(0.01)	11.95	
596	GPA2261	0.31	R(0.01)	-11.61	
600	GPA2261Mod.	0.40		1.09	
608	GPA2261	0.38		-1.73	
609	GPA2261	0.3893		-0.42	
611	GPA2261	0.403		1.51	
663	D1945	0.39	C	-0.32	First reported 0.350
777	ISO6974-6	0.397		0.66	
781	GOST31371.7	0.393		0.10	
823	GPA2261	0.394		0.24	
840	D1945	0.4042		1.68	
851	GPA2261	0.38691		-0.76	
861		-----		-----	
862	GPA2261-20	0.396		0.52	
887	D1945	0.400		1.09	
922	D1945	0.40		1.09	
963	D1945	0.22	ex	-24.30	Test result excluded, see §4.1
974	ISO6974-5	0.390		-0.32	
1006	D1945	0.390		-0.32	
1029	D1945	0.3986		0.89	
1069	In house	0.37	ex	-3.14	Excluded, as for other components 4 or more outliers
1081		0.393	ex	0.10	Excluded, as for other components 4 or more outliers
1197	D1945	0.3856		-0.94	
1198	D1945	0.3978	C	0.78	First reported 0.3968
1320	D1945	0.38		-1.73	
1497	D1945	0.39218		-0.01	
1528	UOP539	0.4136		3.01	
1635	D1945	0.38	ex	-1.73	Excluded, as for other components 4 or more outliers
1654	D1945	0.388		-0.60	
1679	ISO6974-3	0.398		0.81	
1737	In house	0.41		2.50	
1759	ISO6974-5	0.389		-0.46	
1788	D7833	0.40		1.09	
1857	GOST31371.7	0.392		-0.04	
1930	ISO6974-6	0.3920	C	-0.04	First reported 0.3914
1957	GPA2261	0.3885	ex	-0.53	Test result excluded, see §4.1.
6071	GPA2261	0.39473		0.34	
6078	ISO6974-3	0.390		-0.32	
6080	D1945	0.393		0.10	
6175	In house	0.3892		-0.44	
6263	GPA2286	0.383591		-1.23	
6304	D1945	0.3951		0.40	
6311	D1945	0.41		2.50	
6313	GPA2286	0.4130		2.92	
6448	GPA2261	0.4012		1.26	
6503	D1945	0.3662		-3.68	
6523		-----		-----	
9145		0.38		-1.73	

	normality	suspect
	n	49
	outliers	3 (+6ex)
	mean (n)	0.3923
	st.dev. (n)	0.01105
	R(calc.)	0.0309
	st.dev.(ISO6974-3:18)	0.00709
	R(ISO6974-3:18)	0.0199
Compare		
	R(D1945:14R19)	0.07

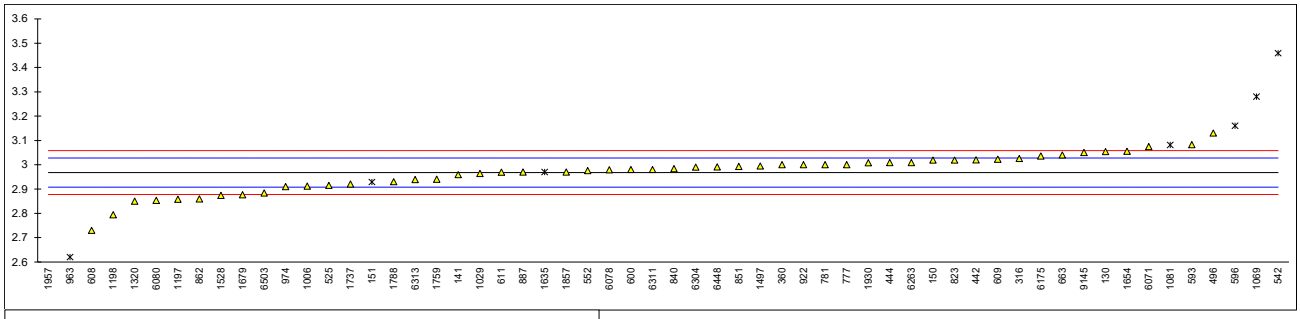

0.5
0.48
0.46
0.44
0.42
0.4
0.38
0.36
0.34
0.32
0.3
963 596 525 6503 141 496 1069 608 1320 1635 9145 444 6283 1197 851 1654 1957 1759 6175 609 663 974 552 1006 6078 150 1857 1930 1497 781 1081 6080 823 6071 316 6304 862 777 442 1198 1679 1029 360 922 130 887 600 1788 6448 151 611 840 1737 6311 6313 1528 542 593

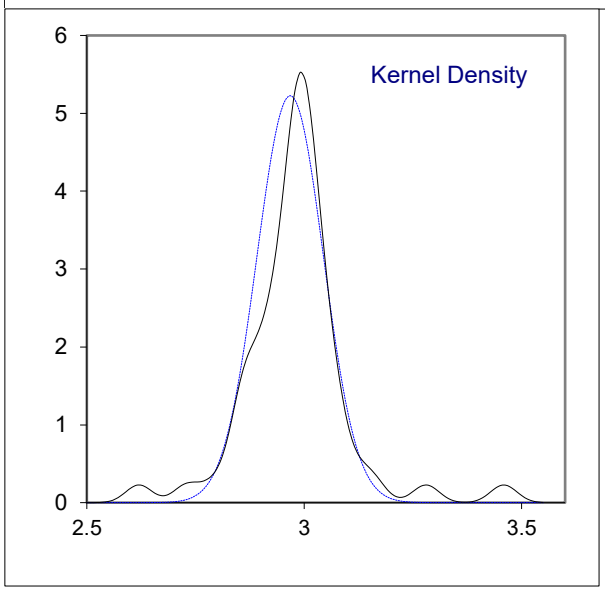

Kernel Density
45
40
35
30
25
20
15
10
5
0
0.3
0.35
0.4
0.45
0.5

Determination of Nitrogen on sample #23055; results in %mol/mol

lab	method	value	mark	z(targ)	remarks
130	ISO6974-3	3.0538		2.85	
141	GPA2261	2.9588		-0.30	
150	D1945	3.019		1.70	
151	GPA2261	2.929	ex	-1.29	Test result excluded, see §4.1.
225		-----		-----	
316	ISO6974-3	3.0253		1.91	
352		-----		-----	
360	ISO6974-3	3.00		1.07	
442	D1945	3.0198		1.72	
444	D1945	3.0086		1.35	
496	EN15984	3.130		5.38	
525	GPA2286	2.9149		-1.76	
529		-----		-----	
542	D1945	3.459077	R(0.01)	16.30	
552	NBR14903	2.976		0.27	
593		3.082		3.79	
596	GPA2261	3.16	ex	6.38	Excluded, as for other components 4 or more outliers
600	GPA2261Mod.	2.98		0.40	
608	GPA2261	2.73		-7.89	
609	GPA2261	3.0227		1.82	
611	GPA2261	2.969		0.04	
663	D1945	3.04	C	2.39	First reported 2.800
777	ISO6974-6	3.00		1.07	
781	GOST31371.7	3.00		1.07	
823	GPA2261	3.019		1.70	
840	D1945	2.9839		0.53	
851	GPA2261	2.99266		0.82	
861		-----		-----	
862	GPA2261	2.859		-3.61	
887	D1945	2.970		0.07	
922	D1945	3.00		1.07	
963	D1945	2.62	ex	-11.55	Test result excluded, see §4.1
974	ISO6974-5	2.910		-1.92	
1006	D1945	2.912		-1.85	
1029	D1945	2.9641		-0.13	
1069	In house	3.28	R(0.05)	10.36	
1081		3.081	ex	3.75	Excluded, as for other components 4 or more outliers
1197	D1945	2.8579		-3.65	
1198	D1945	2.7940	C	-5.77	First reported 2.7880
1320	D1945	2.85		-3.91	
1497	ISO6974-3	2.99455		0.88	
1528	UOP539	2.8739		-3.12	
1635	D1945	2.97	ex	0.07	Excluded, as for other components 4 or more outliers
1654	D1945	3.055		2.89	
1679	ISO6974-3	2.876		-3.05	
1737	In house	2.92		-1.59	
1759	ISO6974-5	2.94		-0.93	
1788	D7833	2.93		-1.26	
1857	GOST31371.7	2.970		0.07	
1930	ISO6974-6	3.0077	C	1.32	First reported 2.9854
1957	GPA2261	0.5428	ex,C	-80.48	Test result excluded, see §4.1. First reported 2.5823
6071	GPA2261	3.07450		3.54	
6078	ISO6974-3	2.979		0.37	
6080	D1945	2.853		-3.81	
6175	In house	3.0360		2.26	
6263	GPA2286	3.008639		1.35	
6304	D1945	2.9899		0.73	
6311	D1945	2.98		0.40	
6313	GPA2286	2.9393		-0.95	
6448	GPA2261	2.9910		0.77	
6503	D1945	2.8834		-2.80	
6523		-----		-----	
9145		3.05		2.73	

	normality	suspect
	n	50
	outliers	2 (+6ex)
	mean (n)	2.9679
	st.dev. (n)	0.07634
	R(calc.)	0.2138
	st.dev.(ISO6974-3:18)	0.03013
	R(ISO6974-3:18)	0.0844
Compare		
	R(D1945:14R17)	0.10

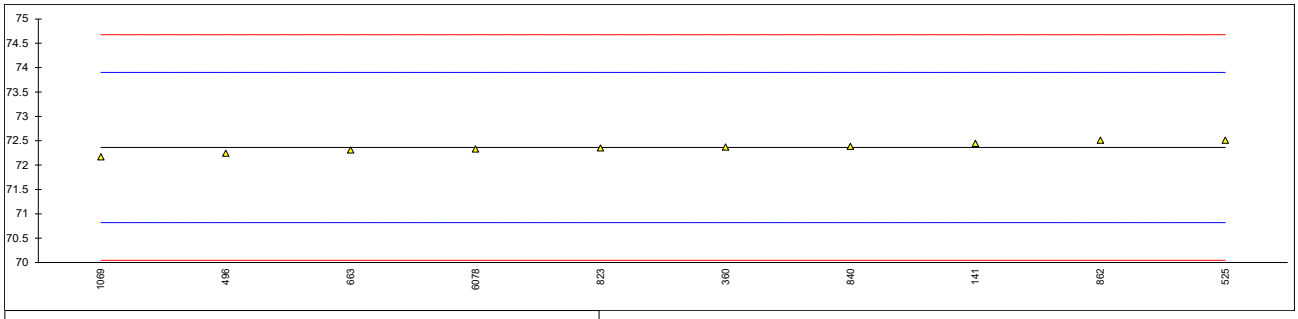

3.6
3.5
3.4
3.3
3.2
3.1
3
2.9
2.8
2.7
2.6
1957 963 608 1198 1320 6080 1197 862 1528 1679 6503 974 1006 525 1737 151 1788 6313 1759 141 1029 611 887 1635 1857 552 6078 600 6311 840 6304 6448 851 1497 360 922 781 777 1930 444 6263 150 823 442 609 316 6175 663 9145 130 1654 6071 1081 593 496 596 1069 542

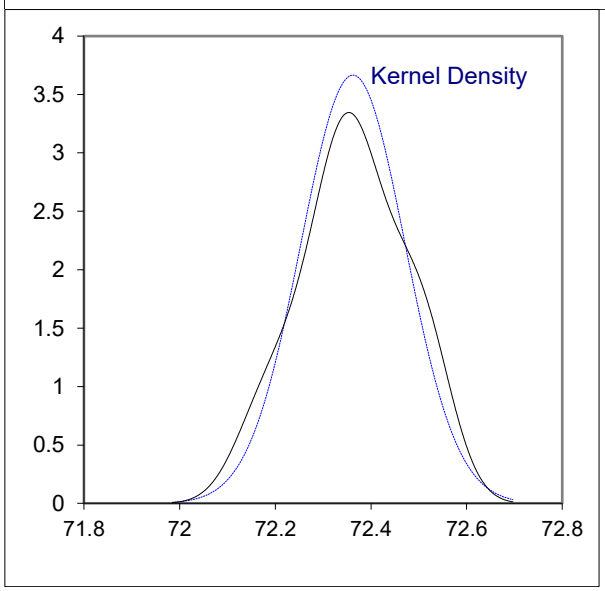

Kernel Density
6
5
4
3
2
1
0
2.5
3
3.5

Determination of Carbon content on sample #23055; results in g/100 g

lab	method	value	mark	z(targ)	remarks
130		-----		-----	
141	EN15984	72.4458		0.11	
150		-----		-----	
151		-----		-----	
225		-----		-----	
316		-----		-----	
352		-----		-----	
360	EN15984	72.37		0.01	
442		-----		-----	
444		-----		-----	
496	EN15984	72.243		-0.15	
525	EN15984	72.5112		0.19	
529		-----		-----	
542		-----		-----	
552		-----		-----	
593		-----		-----	
596		-----		-----	
600		-----		-----	
608		-----		-----	
609		-----		-----	
611		-----		-----	
663	EN15984	72.31	C	-0.07	First reported 72.83
777		-----		-----	
781		-----		-----	
823	EN15984	72.35		-0.02	
840	EN15984	72.383		0.03	
851		-----		-----	
861		-----		-----	
862	GPA2261-20	72.51		0.19	
887		---		-----	
922		-----		-----	
963		-----		-----	
974		-----		-----	
1006		-----		-----	
1029		-----		-----	
1069	EN15984	72.17		-0.25	
1081		-----		-----	
1197		-----		-----	
1198		-----		-----	
1320		-----		-----	
1497		-----		-----	
1528		-----		-----	
1635		-----		-----	
1654		-----		-----	
1679		-----		-----	
1737		-----		-----	
1759		-----		-----	
1788		-----		-----	
1857		-----		-----	
1930		-----		-----	
1957		-----		-----	
6071		-----		-----	
6078	EN15984	72.329		-0.04	
6080		-----		-----	
6175		-----		-----	
6263		-----		-----	
6304		-----		-----	
6311		-----		-----	
6313		-----		-----	
6448		-----		-----	
6503		-----		-----	
6523		-----		-----	
9145		-----		-----	

normality	OK
n	10
outliers	0
mean (n)	72.362
st.dev. (n)	0.1089
R(calc.)	0.305
st.dev.(EN15984:22)	0.7714
R(EN15984:22)	2.16


75
74.5
74
73.5
73
72.5
72
71.5
71
70.5
70
1069
496
663
6078
823
360
840
141
862
525


Kernel Density
4
3.5
3
2.5
2
1.5
1
0.5
0
71.8
72
72.2
72.4
72.6
72.8

Determination of Gross (Superior) Caloric Value (Real Gas, 101.325 kPa, combustion temperature 25 °C, metering temperature 0 °C) on sample #23055; results in MJ/m^3

lab	method	value	mark	z(targ)	remarks
130		-----		-----	
141	ISO6976	43.3250		-----	
150		-----		-----	
151		-----		-----	
225		-----		-----	
316	ISO6976	43.2850		-----	
352		-----		-----	
360	ISO6976	43.31		-----	
442		-----		-----	
444		-----		-----	
496	DIN51857	43.218		-----	
525	ISO6976	43.379		-----	
529		-----		-----	
542	ISO6976	41.940	E	-----	Calculation difference. iis calculated 44.311
552	ISO6976	43.290		-----	
593		-----		-----	
596		-----		-----	
600		-----		-----	
608		-----		-----	
609		-----		-----	
611		-----		-----	
663	ISO6976	43.22	C	-----	First reported 43.97
777	GOST31369	43.31		-----	
781	GOST31369	43.317		-----	
823	ISO6976	43.284		-----	
840	ISO6976	43.3154		-----	
851		-----		-----	
861		-----		-----	
862	ISO6976	43.31		-----	
887		-----		-----	
922	ISO6976	43.2853		-----	
963		-----		-----	
974		-----		-----	
1006		-----		-----	
1029		-----		-----	
1069		-----		-----	
1081		-----		-----	
1197		-----		-----	
1198		-----		-----	
1320		-----		-----	
1497		-----		-----	
1528	ISO6976	43.53	E	-----	Calculation difference. iis calculated 43.416
1635		-----		-----	
1654	ISO6976	43.121		-----	
1679	ISO6976	43.339		-----	
1737		-----		-----	
1759		-----		-----	
1788		-----		-----	
1857	ISO6976	43.318		-----	
1930	DIN51857	43.2327	C	-----	First reported 43.1932
1957		-----		-----	
6071		-----		-----	
6078		-----		-----	
6080		-----		-----	
6175	In house	43.421	E	-----	Calculation difference. iis calculated 43.310
6263		-----		-----	
6304		-----		-----	
6311		-----		-----	
6313	ISO6976	43.2479		-----	
6448		-----		-----	
6503		-----		-----	
6523		-----		-----	
9145		-----		-----	

Calculations by iis is based on the factors given in table 3 of ISO6976:16

Determination of Net (Inferior) Caloric Value (Real Gas, 101.325 kPa, combustion temperature 25 °C, metering temperature 0 °C) on sample #23055; results in kJ/100g

lab	method	value	mark	z(targ)	remarks
130		-----		-----	
141	ISO6976	4669.0517		-----	
150		-----		-----	
151		-----		-----	
225		-----		-----	
316		-----		-----	
352		-----		-----	
360		-----		-----	
442		-----		-----	
444		-----		-----	
496	DIN51857	4656.659		-----	
525	ISO6976	4672.588		-----	
529		-----		-----	
542		-----		-----	
552	ISO6976	4663	E	-----	Calculation difference. iis calculated 4665.360
593		-----		-----	
596		-----		-----	
600		-----		-----	
608		-----		-----	
609		-----		-----	
611		-----		-----	
663	ISO6976	4660.94	C	-----	First reported 4678.59
777	GOST31369	4663		-----	
781	GOST31369	4663.1		-----	
823	ISO6976	4661.8		-----	
840	ISO6976	4662.95		-----	
851		-----		-----	
861		-----		-----	
862	ISO6976	4673		-----	
887		-----		-----	
922		-----		-----	
963		-----		-----	
974		-----		-----	
1006		-----		-----	
1029		-----		-----	
1069		-----		-----	
1081		-----		-----	
1197		-----		-----	
1198		-----		-----	
1320		-----		-----	
1497		-----		-----	
1528		-----		-----	
1635		-----		-----	
1654		-----		-----	
1679		-----		-----	
1737		-----		-----	
1759		-----		-----	
1788		-----		-----	
1857	ISO6976	4665.4		-----	
1930		-----		-----	
1957		-----		-----	
6071		-----		-----	
6078		-----		-----	
6080		-----		-----	
6175		-----		-----	
6263		-----		-----	
6304		-----		-----	
6311		-----		-----	
6313	ISO6976	4665.838		-----	
6448		-----		-----	
6503		-----		-----	
6523		-----		-----	
9145		-----		-----	

Calculation by iis is based on the factors given in table 1 and A.5 of ISO6976:16

Determination of Density (Real Gas, 101.325 kPa, combustion temperature 25 °C, metering temperature 0 °C) on sample #23055; results in kg/m^3

lab	method	value	mark	z(targ)	remarks
130		-----		-----	
141	ISO6976	0.83955		-----	
150		-----		-----	
151		-----		-----	
225		-----		-----	
316	ISO6976	0.84020		-----	
352		-----		-----	
360	ISO6976	0.8404		-----	
442		-----		-----	
444		-----		-----	
496	DIN51857	0.83969		-----	
525	ISO6976	0.83999		-----	
529		-----		-----	
542	ISO6976	0.8217	E	-----	Calculation difference. iis calculated 0.8690
552	ISO6976	0.84		-----	
593		-----		-----	
596		-----		-----	
600		-----		-----	
608		-----		-----	
609		-----		-----	
611		-----		-----	
663	ISO6976	0.8389	C	-----	First reported 0.8507
777	GOST31369	0.8403		-----	
781	GOST31369	0.84049		-----	
823	ISO6976	0.8401		-----	
840	ISO6976	0.84047		-----	
851		-----		-----	
861		-----		-----	
862	ISO6976	0.8385		-----	
887		-----		-----	
922	ISO6976	0.8400		-----	
963		-----		-----	
974		-----		-----	
1006		-----		-----	
1029		-----		-----	
1069		-----		-----	
1081		-----		-----	
1197		-----		-----	
1198		-----		-----	
1320		-----		-----	
1497		-----		-----	
1528	ISO6976	0.8413		-----	
1635		-----		-----	
1654	ISO6976	0.837		-----	
1679	ISO6976	0.83936		-----	
1737		-----		-----	
1759		-----		-----	
1788		-----		-----	
1857	ISO6976	0.84008		-----	
1930	DIN51857	0.8388	C	-----	First reported 0.8376
1957		-----		-----	
6071		-----		-----	
6078		-----		-----	
6080		-----		-----	
6175	In house	0.8408		-----	
6263		-----		-----	
6304		-----		-----	
6311		-----		-----	
6313	ISO6976	0.8386		-----	
6448		-----		-----	
6503		-----		-----	
6523		-----		-----	
9145		-----		-----	

Calculation by iis is based on the factors given in table 1 of ISO6976:16

Determination of Relative Density (Real Gas, 101.325 kPa, combustion temperature 25 °C, metering temperature 0 °C) on sample #23055;

lab	method	value	mark	z(targ)	remarks
130		-----		-----	
141	ISO6976	0.64928		-----	
150		-----		-----	
151		-----		-----	
225		-----		-----	
316	ISO6976	0.64983		-----	
352		-----		-----	
360	ISO6976	0.6499		-----	
442		-----		-----	
444		-----		-----	
496	DIN51857	0.64945		-----	
525	ISO6976	0.64962		-----	
529		-----		-----	
542		-----		-----	
552	ISO6976	0.6493		-----	
593		-----		-----	
596		-----		-----	
600		-----		-----	
608		-----		-----	
609		-----		-----	
611		-----		-----	
663	ISO6976	0.6488	C	-----	First reported 0.6579
777	GOST31369	0.6499		-----	
781	GOST31369	0.65001		-----	
823	ISO6976	0.6497		-----	
840	ISO6976	0.64999		-----	
851		-----		-----	
861		-----		-----	
862	ISO6976	0.6485		-----	
887		-----		-----	
922	ISO6976	0.6497		-----	
963		-----		-----	
974		-----		-----	
1006		-----		-----	
1029		-----		-----	
1069		-----		-----	
1081		-----		-----	
1197		-----		-----	
1198		-----		-----	
1320		-----		-----	
1497		-----		-----	
1528	ISO6976	0.6506		-----	
1635		-----		-----	
1654	ISO6976	0.6475		-----	
1679	ISO6976	0.64913		-----	
1737		-----		-----	
1759		-----		-----	
1788		-----		-----	
1857	ISO6976	0.64970		-----	
1930	DIN51857	0.6488	C	-----	First reported 0.6479
1957		-----		-----	
6071		-----		-----	
6078		-----		-----	
6080		-----		-----	
6175	In house	0.6502		-----	
6263		-----		-----	
6304		-----		-----	
6311		-----		-----	
6313	ISO6976	0.6486		-----	
6448		-----		-----	
6503		-----		-----	
6523		-----		-----	
9145		-----		-----	

Determination of Gross Wobbe Index (Real Gas, 101.325 kPa, combustion temperature 25 °C, metering temperature 0 °C) on sample #23055; results in MJ/m^3

lab	method	value	mark	z(targ)	remarks
130		-----		-----	
141	ISO6976	53.7678		-----	
150		-----		-----	
151		-----		-----	
225		-----		-----	
316	ISO6976	53.6955		-----	
352		-----		-----	
360	ISO6976	53.72		-----	
442		-----		-----	
444		-----		-----	
496	DIN51857	53.628		-----	
525	ISO6976	53.821		-----	
529		-----		-----	
542	ISO6976	46.301	E	-----	Calculation difference. iis calculated 54.054
552	ISO6976	53.73		-----	
593		-----		-----	
596		-----		-----	
600		-----		-----	
608		-----		-----	
609		-----		-----	
611		-----		-----	
663	ISO6976	53.66	C	-----	First reported 54.21
777	GOST31369	53.72		-----	
781	GOST31369	53.728		-----	
823	ISO6976	53.70		-----	
840	ISO6976	53.726		-----	
851		-----		-----	
861		-----		-----	
862	ISO6976	53.87	E	-----	Calculation difference. iis calculated 53.78
887		-----		-----	
922	ISO6976	53.7025		-----	
963		-----		-----	
974		-----		-----	
1006		-----		-----	
1029		-----		-----	
1069		-----		-----	
1081		-----		-----	
1197		-----		-----	
1198		-----		-----	
1320		-----		-----	
1497		-----		-----	
1528	ISO6976	53.88	E	-----	Calculation difference. iis calculated 53.83
1635		-----		-----	
1654	ISO6976	53.587		-----	
1679	ISO6976	53.792		-----	
1737		-----		-----	
1759		-----		-----	
1788		-----		-----	
1857	ISO6976	53.742		-----	
1930	DIN51857	53.6757	C	-----	First reported 53.6634
1957		-----		-----	
6071		-----		-----	
6078		-----		-----	
6080		-----		-----	
6175	In house	53.847	E	-----	Calculation difference. iis calculated 53.710
6263		-----		-----	
6304		-----		-----	
6311		-----		-----	
6313	ISO6976	53.700		-----	
6448		-----		-----	
6503		-----		-----	
6523		-----		-----	
9145		-----		-----	

Calculated by iis based on reported test results for Gross (Superior) Caloric Value and Relative Density.

Determination of Gross (Superior) Caloric Value (Real Gas, 101.325 kPa, combustion temperature 15 °C, metering temperature 15 °C) on sample #23055; results in MJ/m^3

lab	method	value	mark	z(targ)	remarks
130		-----		-----	
141	ISO6976	41.0892		-----	
150		-----		-----	
151		-----		-----	
225		-----		-----	
316		-----		-----	
352		-----		-----	
360	ISO6976	41.07		-----	
442	ISO6976	41.06		-----	
444	ISO6976	41.095		-----	
496	DIN51857	40.988		-----	
525	ISO6976	41.141		-----	
529		-----		-----	
542		-----		-----	
552	ISO6976	41.056		-----	
593		-----		-----	
596		-----		-----	
600		-----		-----	
608		-----		-----	
609		-----		-----	
611		-----		-----	
663	ISO6976	40.99	C	-----	First reported 41.70
777	GOST31369	41.07		-----	
781	GOST31369	41.082		-----	
823	ISO6976	41.05		-----	
840	ISO6976	41.0782		-----	
851		-----		-----	
861		-----		-----	
862	ISO6976	41.07		-----	
887	ISO6976	41.08		-----	
922	ISO6976	41.0511		-----	
963		-----		-----	
974		-----		-----	
1006	ISO6976	40.93	E	-----	Calculation difference. iis calculated 41.04
1029		-----		-----	
1069		-----		-----	
1081		-----		-----	
1197		-----		-----	
1198		-----		-----	
1320	ISO6976	41.161	C	-----	First reported 41.07
1497	D3588	40.9574		-----	
1528	ISO6976	41.18		-----	
1635	ISO6976	41.56		-----	
1654	ISO6976	40.895		-----	
1679	ISO6976	41.103		-----	
1737		-----		-----	
1759		-----		-----	
1788		-----		-----	
1857	ISO6976	41.083		-----	
1930		-----		-----	
1957	ISO6976	52.18	C,E	-----	First reported 51.34. Calculation difference. iis calculated 39.22
6071		-----		-----	
6078	ISO6976	41.092		-----	
6080		-----		-----	
6175		-----		-----	
6263	ISO6976	40.94		-----	
6304		-----		-----	
6311		41.0404		-----	
6313	ISO6976	41.0157		-----	
6448		-----		-----	
6503	D3588	41.1481		-----	
6523		-----		-----	
9145		41.04		-----	

Calculation by iis is based on the factors given in table 3 of ISO6976:16

Determination of Net (Inferior) Caloric Value (Real Gas, 101.325 kPa, combustion temperature 15 °C, metering temperature 15 °C) on sample #23055; results in kJ/100g

lab	method	value	mark	z(targ)	remarks
130		-----		-----	
141	ISO6976	4669.6055		-----	
150		-----		-----	
151		-----		-----	
225		-----		-----	
316		-----		-----	
352		-----		-----	
360	EN15984	4662.67		-----	
442		-----		-----	
444	ISO6976	37.149		-----	Reported as MJ/m^3 and not in kJ/100g
496	EN15984	4656.959		-----	
525	ISO6976	4673.142		-----	
529		-----		-----	
542		-----		-----	
552	ISO6976	4666		-----	
593		-----		-----	
596		-----		-----	
600		-----		-----	
608		-----		-----	
609		-----		-----	
611		-----		-----	
663	EN15984	4661.31	C	-----	First reported 4678.96
777	GOST31369	4664	E	-----	
781	GOST31369	4663.6		-----	
823	ISO6976	4662		-----	
840	ISO6976	4663.51		-----	
851		-----		-----	
861		-----		-----	
862	ISO6976	4674		-----	
887		-----		-----	
922		-----		-----	
963		-----		-----	
974		-----		-----	
1006		-----		-----	
1029		-----		-----	
1069		-----		-----	
1081		-----		-----	
1197		-----		-----	
1198		-----		-----	
1320		-----		-----	
1497	D3588	-----	W	-----	Test result withdrawn reported 933.7398 Btu/ft^3
1528		-----		-----	
1635	ISO6976	4664		-----	
1654		-----		-----	
1679		-----		-----	
1737		-----		-----	
1759		-----		-----	
1788		-----		-----	
1857	ISO6976	4665.9		-----	
1930		-----		-----	
1957		-----		-----	
6071		-----		-----	
6078	ISO6976	5050.520	C,E	-----	First reported 37.146. Calculation diff. iis calculated 4665.622
6080		-----		-----	
6175		-----		-----	
6263	ISO6976	37.01		-----	Reported in MJ/m^3 and not in kJ/100g
6304		-----		-----	
6311		-----		-----	
6313	ISO6976	4666.375		-----	
6448		-----		-----	
6503	D3588	4686.8619	E	-----	Calculation difference. Iis calculated 4674.4262
6523		-----		-----	
9145		-----	W	-----	Test result withdrawn, reported 36.99 kJ/100g

Calculation by iis is based on the factors given in table 1 and A.5 of ISO6976:16

Determination of Density (Real Gas, 101.325 kPa, combustion temperature 15 °C, metering temperature 15 °C) on sample #23055; results in kg/m^3

lab	method	value	mark	z(targ)	remarks
130		-----		-----	
141	ISO6976	0.7954		-----	
150		-----		-----	
151		-----		-----	
225		-----		-----	
316		-----		-----	
352		-----		-----	
360	ISO6976	0.7962		-----	
442	ISO6976	0.7963	E	-----	Calculation difference. iis calculated 0.7961
444	ISO6976	0.7965		-----	
496	DIN5187	0.79555		-----	
525	ISO6976	0.79584		-----	
529		-----		-----	
542		-----		-----	
552	ISO6976	0.7954		-----	
593		-----		-----	
596		-----		-----	
600		-----		-----	
608		-----		-----	
609		-----		-----	
611		-----		-----	
663	ISO6976	0.7948	C	-----	First reported 0.8060
777	GOST31369	0.7961	E	-----	Calculation difference. iis calculated 0.7964
781	GOST31369	0.79631	E	-----	Calculation difference. iis calculated 0.7962
823	ISO6976	0.7959		-----	
840	ISO6976	0.79626		-----	
851		-----		-----	
861		-----		-----	
862	ISO6976	0.7944		-----	
887		-----		-----	
922	ISO6976	0.7958		-----	
963		-----		-----	
974		-----		-----	
1006		-----		-----	
1029		-----		-----	
1069		-----		-----	
1081		-----		-----	
1197		-----		-----	
1198		-----		-----	
1320	ISO6976	0.7958	C	-----	First reported 0.7936
1497	D3588	0.7938	E	-----	Calculation difference. iis calculated 0.7953
1528	ISO6976	0.7971		-----	
1635	ISO6976	0.8057		-----	
1654	ISO6976	0.793		-----	
1679	ISO6976	0.79524		-----	
1737		-----		-----	
1759		-----		-----	
1788		-----		-----	
1857	ISO6976	0.79593		-----	
1930		-----		-----	
1957	ISO6976	0.77	C,E	-----	First reported 0.8. Calculation difference. iis calculated 0.7312
6071		-----		-----	
6078	ISO6976	0.796		-----	
6080		-----		-----	
6175		-----		-----	
6263	ISO6976	0.7933		-----	
6304		-----		-----	
6311		-----		-----	
6313	ISO6976	0.7945		-----	
6448		-----		-----	
6503	D3588	0.7952	E	-----	Calculation difference. iis calculated 0.7973
6523		-----		-----	
9145		0.793	E	-----	Calculation difference. iis calculated 0.7956

Calculation by iis is based on the factors given in table 1 of ISO6976:16

Determination of Relative Density (Real Gas, 101.325 kPa, combustion temperature 15 °C, metering temperature 15 °C) on sample #23055;

lab	method	value	mark	z(targ)	remarks
130		-----		-----	
141	ISO6976	0.64905		-----	
150		-----		-----	
151		-----		-----	
225		-----		-----	
316		-----		-----	
352		-----		-----	
360	ISO6976	0.6497		-----	
442	ISO6976	0.6499		-----	
444	ISO6976	0.6499		-----	
496	DIN51857	0.64921		-----	
525	ISO6976	0.64939		-----	
529		-----		-----	
542		-----		-----	
552	ISO6976	0.6490		-----	
593		-----		-----	
596		-----		-----	
600		-----		-----	
608		-----		-----	
609		-----		-----	
611		-----		-----	
663	ISO6976	0.6468	C,E	-----	First reported 0.6577. Calculation difference. iis calculated 0.6485
777	GOST31369	0.6497		-----	
781	GOST31369	0.64977		-----	
823	ISO6976	0.6495		-----	
840	ISO6976	0.64973		-----	
851		-----		-----	
861		-----		-----	
862	ISO6976	0.6483		-----	
887		-----		-----	
922	ISO6976	0.6494		-----	
963		-----		-----	
974		-----		-----	
1006	ISO6976	0.6481	C	-----	First reported 0.6466
1029		-----		-----	
1069		-----		-----	
1081		-----		-----	
1197		-----		-----	
1198		-----		-----	
1320		-----		-----	
1497	D3588	0.649		-----	
1528	ISO6976	0.6504		-----	
1635		-----		-----	
1654	ISO6976	0.6471		-----	
1679	ISO6976	0.64890		-----	
1737		-----		-----	
1759		-----		-----	
1788		-----		-----	
1857	ISO6976	0.64946		-----	
1930		-----		-----	
1957	ISO6976	0.6508	E	-----	Calculation difference. iis calculated 0.5966
6071		-----		-----	
6078	ISO6976	0.650		-----	
6080		-----		-----	
6175		-----		-----	
6263	ISO6976	0.6473		-----	
6304		-----		-----	
6311		-----		-----	
6313	ISO6976	0.6484		-----	
6448		-----		-----	
6503	D3588	0.6507		-----	
6523		-----		-----	
9145		0.648		-----	

Calculation by iis is based on the factors given in table A.3 and A.4 of ISO6976:16

Determination of Gross Wobbe Index (Real Gas, 101.325 kPa, combustion temperature 15 °C, metering temperature 15 °C) on sample #23055; results in MJ/m^3

lab	method	value	mark	z(targ)	remarks
130		-----		-----	
141	ISO6976	51.0022		-----	
150		-----		-----	
151		-----		-----	
225		-----		-----	
316		-----		-----	
352		-----		-----	
360	ISO6976	50.95		-----	
442	ISO6976	50.94		-----	
444	ISO6976	50.974		-----	
496	DIN51857	50.870		-----	
525	ISO6976	51.053		-----	
529		-----		-----	
542		-----		-----	
552	ISO6976	50.96		-----	
593		-----		-----	
596		-----		-----	
600		-----		-----	
608		-----		-----	
609		-----		-----	
611		-----		-----	
663	ISO6976	50.90	C	-----	First reported 51.42.
777	GOST31369	50.96		-----	
781	GOST31369	50.965		-----	
823	ISO6976	50.94		-----	
840	ISO6976	50.962		-----	
851		-----		-----	
861		-----		-----	
862	ISO6976	51.01		-----	
887		-----		-----	
922	ISO6976	50.9402		-----	
963		-----		-----	
974		-----		-----	
1006	ISO6976	50.90	E	-----	Calculation difference. iis calculated 50.98
1029		-----		-----	
1069		-----		-----	
1081		-----		-----	
1197		-----		-----	
1198		-----		-----	
1320		-----		-----	
1497		-----		-----	
1528	ISO6976	51.06		-----	
1635	ISO6976	51.25	E	-----	Calculation difference. iis calculated 51.23
1654	ISO6976	50.8379		-----	
1679	ISO6976	51.025		-----	
1737		-----		-----	
1759		-----		-----	
1788		-----		-----	
1857	ISO6976	50.978		-----	
1930		-----		-----	
1957	ISO6976	47.12	C,E	-----	First reported 46.38. Calculation difference. iis calculated 50.77
6071		-----		-----	
6078	ISO6976	50.985	E	-----	Calculation difference. iis calculated 50.964
6080		-----		-----	
6175		-----		-----	
6263	ISO6976	50.89		-----	
6304		-----		-----	
6311		-----		-----	
6313	ISO6976	50.938		-----	
6448		-----		-----	
6503	Calculation	51.0678	E	-----	Calculation difference. iis calculated 51.1121
6523		-----		-----	
9145		-----		-----	

Calculation by iis is based on reported test results for Gross (Superior) Caloric Value and Relative Density.

APPENDIX 2

Number of participants per country

1 lab in ALGERIA
1 lab in ARGENTINA
1 lab in BRAZIL
1 lab in BULGARIA
1 lab in CANADA
2 labs in CHINA, People's Republic
1 lab in COTE D'IVOIRE
1 lab in CROATIA
1 lab in ECUADOR
1 lab in EGYPT
1 lab in FINLAND
1 lab in FRANCE
2 labs in GERMANY
2 labs in HONG KONG
1 lab in INDONESIA
1 lab in KOREA, Republic of
9 labs in MALAYSIA
2 labs in MEXICO
2 labs in NETHERLANDS
1 lab in OMAN
1 lab in PAKISTAN
2 labs in PORTUGAL
2 labs in ROMANIA
3 labs in RUSSIAN FEDERATION
1 lab in SAUDI ARABIA
1 lab in SERBIA
2 labs in SLOVAKIA
1 lab in SWITZERLAND
4 labs in TAIWAN
1 lab in THAILAND
1 lab in TURKEY
4 labs in UNITED ARAB EMIRATES
2 labs in UNITED KINGDOM
4 labs in UNITED STATES OF AMERICA
1 lab in VIETNAM

APPENDIX 3

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
n.a.	= not applicable
n.e.	= not evaluated
n.d.	= not detected
fr.	= first reported
SDS	= Safety Data Sheet

Literature

1 iis Interlaboratory Studies, Protocol for the Organisation, Statistics & Evaluation, June 2018
2 ISO5725:86
3 ISO5725 parts 1-6:94
4 ISO13528:05
5 M. Thompson and R. Wood, J. AOAC Int, 76, 926, (1993)
6 W.J. Youden and E.H. Steiner, Statistical Manual of the AOAC, (1975)
7 P.L. Davies, Fr. Z. Anal. Chem, 331, 513, (1988)
8 J.N. Miller, Analyst, 118, 455, (1993)
9 Analytical Methods Committee, Technical Brief, No 4, January 2001
10 P.J. Lowthian and M. Thompson, The Royal Society of Chemistry, Analyst, 127, 1359-1364, (2002)
11 W. Horwitz and R. Albert, J. AOAC Int, 79.3, 589-621, (1996)
12 Bernard Rosner, Percentage Points for a Generalized ESD Many-Outlier Procedure, Technometrics, 25(2), 165-172, (1983)