Institute for
Interlaboratory Studies

Results of Proficiency Test
Transformer Oil
Dissolved Gas Analysis (DGA)
November 2023

Organized by: Institute for Interlaboratory Studies
Spijkenisse, the Netherlands

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1 INTRODUCTION

Since 2007 the Institute for Interlaboratory Studies (iis) organizes a proficiency scheme for the analysis of Dissolved Gas (DGA) in Transformer Oil every year. During the annual proficiency testing program of 2023 it was decided to continue the round robin for the analysis of Dissolved Gas in Transformer Oil (DGA).

In this interlaboratory study 83 laboratories in 41 countries registered for participation, see appendix 3 for the number of participants per country. In this report the results of the Transformer Oil DGA 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). The syringes (True North) were provided by Morgan Schaffer Ltd. (Quebec, Canada). Each syringe was uniquely numbered.
It was decided to send one sample Transformer Oil in a 50 mL syringe labelled #23244.
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.
Morgan Schaffer Ltd is ISO/IEC17034:2016 accredited by the ANSI National Accreditation Board (no. AR-2126).

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 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 type of Transformer Oil was used for the preparation of the gas tight syringes. A batch of 90 syringes of 50 mL with lot code RN596 was prepared by Morgan Schaffer Ltd. (part of Doble, location Quebec, Canada). The syringes were uniquely coded and labelled #23244. Morgan Schaffer Ltd. tested the syringes for homogeneity in accordance with ASTM D3612 and guaranteed the batch to be homogenous according to their ISO/IEC17034 accreditation. The reported values are given in Table 4 (see paragraph 5).

To each of the participating laboratories one 50 mL syringe of Transformer Oil labelled #23244 was sent on November 1, 2023. An SDS was added to the sample package.

2.5 STABILITY OF THE SAMPLES

The stability of dissolved gas in Transformer Oil packed in gas tight syringes was checked. The material was found sufficiently stable for the period of the proficiency test.

2.6 ANALYZES

The participants were requested to determine: Hydrogen (H_2), Oxygen (O_2), Nitrogen (N_2), Carbon monoxide (CO), Carbon dioxide (CO_2), Methane (CH_4), Ethane (C_2H_6), Ethene (C_2H_4), Ethyne (C_2H_2), Propane (C_3H_8) and Propene (C_3H_6). Also, some analytical details 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’ 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 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, 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:

	$\lvert z \rvert$	< 1	good
1 <	$\lvert z \rvert$	< 2	satisfactory
2 <	$\lvert z \rvert$	< 3	questionable
3 <	$\lvert z \rvert$		unsatisfactory

4 EVALUATION

In this proficiency test some problems were encountered with the dispatch of the samples. Two participants reported test results after the final reporting date and seven other participants did not report any test results. Not all participants were able to report all tests requested.
In total 76 participants reported 724 numerical test results. Observed were 31 outlying test results, which is 4.3%. 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. 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 original data in appendix 1. The abbreviations, used in these tables, are explained in appendix 4.

Six laboratories reported deviating test results of which at least two components were statistical outliers for a specific component in the Dissolved Gas Analysis. As the test results of the Dissolved Gas Analysis are not independent it was decided to exclude the remaining reported test results of these laboratories for the statistical evaluations.

Hydrogen (H_2): The group of participants had difficulty to meet the target requirements. Five 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 IEC60567:11.

Oxygen (O_2): The group of participants had difficulty to meet the target requirements. Two 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 IEC60567:11.

Nitrogen (N_2): The group of participants had difficulty to meet the target requirements. One statistical outlier was 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 IEC60567:11.

Carbon monoxide (CO): The group of participants had difficulty to meet the target requirements. Three 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 IEC60567:11.

Carbon dioxide (CO_2): The group of participants had difficulty to meet the target requirements. Three statistical outliers were observed and five other test results were excluded. The calculated reproducibility after rejection of the suspect data is not at all in agreement with the requirements of IEC60567:11.

Methane (CH_4): The group of participants had difficulty to meet the target requirements. Five 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 IEC60567:11.

Ethane (C_2H_6): The group of participants had difficulty to meet the target requirements. Two 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 IEC60567:11.

Ethene (C_2H_4): The group of participants had difficulty to meet the target requirements. Four 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 IEC60567:11.

Ethyne (C_2H_2): The group of participants had difficulty to meet the target requirements. Four 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 IEC60567:11.

Propane (C_3H_8): The group of participants had difficulty to meet the target requirements. No outliers were observed but two test results were excluded. The calculated reproducibility after rejection of the suspect data is not in agreement with the requirements of IEC60567:11.

Propene (C_3H_6): The group of participants had difficulty to meet the target requirements. Two 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 IEC60567:11.

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 reference method are presented in the next table.

Component	unit	n	average	2.8 * sd	R(lit)
Hydrogen (H_2)	µL/L	68	54.9	20.7	11.0
Oxygen (O_2)	µL/L	66	16416	7846	3283
Nitrogen (N_2)	µL/L	66	56299	29329	11260

Component	unit	n	average	2.8 * sd	R(lit)
Carbon monoxide (CO)	µL/L	69	51.5	20.6	10.3
Carbon dioxide (CO_2)	µL/L	67	98.1	74.5	19.6
Methane (CH_4)	µL/L	67	52.8	13.5	10.6
Ethane (C_2H_6)	µL/L	69	52.2	15.1	10.4
Ethene (C_2H_4)	µL/L	66	53.1	13.3	10.6
Ethyne (C_2H_2)	µL/L	68	51.7	18.4	10.3
Propane (C_3H_8)	µL/L	28	53.8	17.8	10.8
Propene (C_3H_6)	µL/L	26	53.0	16.3	10.6

Table 1: reproducibilities of components on sample #23244

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

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

	November 2023	November 2022	November 2021	November 2020	November 2019
Number of reporting laboratories	76	69	63	59	45
Number of test results	724	655	606	561	428
Number of statistical outliers	31	53	24	60	44
Percentage of statistical outliers	4.3%	8.1%	4.0%	10.7%	10.3%

Table 2: 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 test was compared to uncertainties observed in PTs over the years, expressed as relative standard deviation (RSD) of the PTs, see next table.

Component	November 2023	November 2022	November 2021	November 2020	November 2019
Hydrogen (H_2)	13%	10%	14%	9%	13%
Oxygen (O_2)	17%	11%	14%	13%	13%
Nitrogen (N_2)	19%	10%	15%	8%	11%
Carbon monoxide (CO)	14%	12%	15%	8%	11%
Carbon dioxide (CO_2)	27%	20%	31%	19%	18%
Methane (CH_4)	9%	7%	11%	8%	8%
Ethane (C_2H_6)	10%	8%	10%	9%	12%
Ethene (C_2H_4)	9%	7%	9%	9%	9%
Ethyne (C_2H_2)	13%	7%	12%	8%	12%
Propane (C_3H_8)	12%	10%	8%	n.e.	n.e.
Propene (C_3H_6)	11%	10%	8%	n.e.	11%

Table 3: development of the uncertainties over the years

In general, the overall performance of the 2023 PT is in line with previous PTs. It is remarkable that the groups of participants have been consistent in relative standard deviations (RSD) over the last five years, but still are not able to meet the strict requirements of test method IEC605671:11.

5. DISCUSSION

The consensus values as determined in this PT are compared with the average values from the homogeneity testing by Morgan Schaffer in the following table. From this comparison, it is clear that all consensus values as determined in this PT are very well in line with the values as determined by Morgan Schaffer after the preparation of the syringes.

Component	Morgan Schaffer in µL/L	iis23L14 in µL/L	Differences in µL/L	Calculated z-scores
Hydrogen (H_2)	53	55	-2	-0.51
Oxygen (O_2)	15800	16416	-616	-0.53
Nitrogen (N_2)	56200	56299	-99	-0.02
Carbon monoxide (CO)	53	51	2	0.55
Carbon dioxide (CO_2)	84	98	-14	-2.00
Methane (CH_4)	53	53	0	0.00
Ethane (C_2H_6)	53	52	1	0.27
Ethene (C_2H_4)	53	53	0	0.00
Ethyne (C_2H_2)	53	52	1	0.27
Propane (C_3H_8)	53	54	-1	-0.26
Propene (C_3H_6)	53	53	0	0.00

Table 4: comparison of consensus values in this PT with values determined by Morgan Schaffer

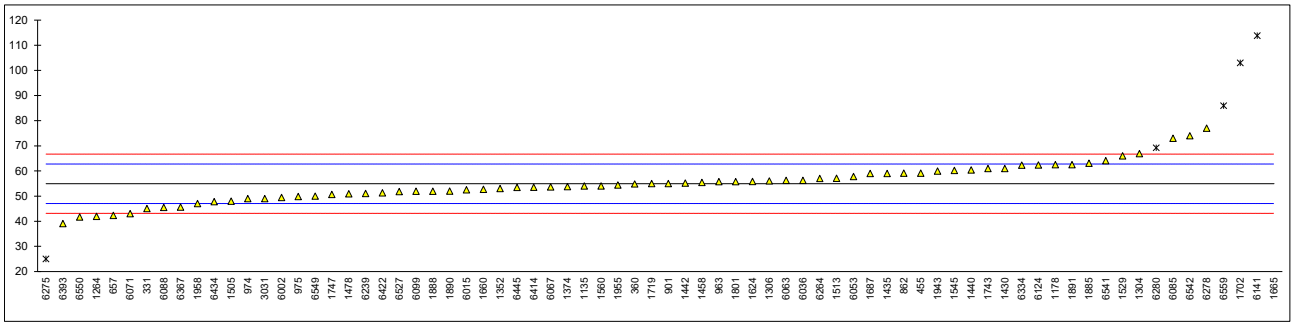
A vast majority (80%) of the reporting participants mentioned that they have used “Head Space” as extraction method. It appeared that in this PT the effect of the used extraction method on the determination of DGA in Transformer Oil is negligible.

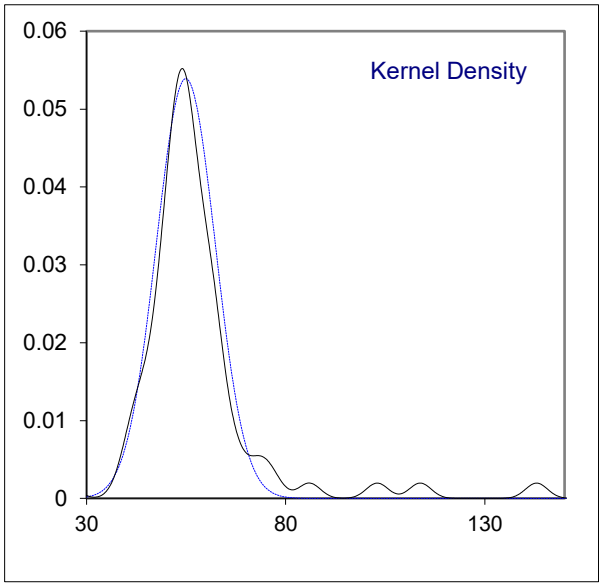
APPENDIX 1

Determination of Hydrogen (H_2) on sample #23244; results in µL/L

lab	method	value	mark	z(targ)	remarks
179		-----		-----	
237		-----		-----	
331	IEC60567	45.0		-2.53	
360	IEC60567	54.8		-0.03	
445		-----		-----	
455	IEC60567	59.11		1.06	
614		-----		-----	
657	D3612-C	42.32		-3.22	
780		-----		-----	
862	IEC60567	59.1		1.06	
901	D3612-C	55		0.02	
912		-----		-----	
963	D3612-C	55.70		0.19	
974	D3612-C	49		-1.51	
975	IEC60567	49.8		-1.31	
1135		54		-0.24	
1178	IEC60567	62.5		1.93	
1264	D3612-C	41.95		-3.31	
1304	In house	66.88		3.04	
1306	D3612-C	56		0.27	
1352	IEC60567	53.0		-0.49	
1374	D3612-C	53.8		-0.29	
1430	IEC60567	61		1.55	
1431		-----		-----	
1435	IEC60567	59		1.04	
1439		-----		-----	
1440	D3612-C	60.34		1.38	
1442	IEC60567	55.2		0.07	
1458	D3612-B	55.4		0.12	
1478	IEC60567	50.9081		-1.03	
1505	D3612-C	48		-1.77	
1513	IEC60567	57.07		0.54	
1529	IEC60567	66		2.82	
1545	D3612-C	60.17		1.33	
1560	IEC60567	54		-0.24	
1624		55.8		0.22	
1660	IEC60567	52.7		-0.57	
1665	IEC60567	143	R(0.01)	22.44	
1687	IEC60567	58.96		1.03	
1702	IEC60567	103	R(0.01)	12.25	
1719	D3612-B	55		0.02	
1743	IEC60567	61.0		1.55	
1747	IEC60567	50.63		-1.10	
1801	IEC60567	55.72		0.20	
1885	D3612-C	63		2.05	
1888	IEC60567	51.9		-0.77	
1890	D3612-C	51.95		-0.76	
1891	IEC60567	62.5		1.93	
1943	D3612-C	59.95		1.28	
1955		54.4		-0.14	
1958	D3612-C	47		-2.02	
3031	IEC60567	49.013		-1.51	
6002	IEC60567	49.4		-1.41	
6015	D3612-B	52.5		-0.62	
6036	IEC60567	56.27		0.34	
6053	IEC60567	57.8	C	0.73	first reported: 103
6063	IEC60567	56.254		0.34	
6067	IEC60567	53.69		-0.32	
6071	IEC60567	43		-3.04	
6085	D3612-C	73		4.60	
6088	IEC60567	45.5		-2.40	
6099		51.88		-0.78	
6124	D3612-B	62.35		1.89	
6141	D3612-C	113.8	R(0.01)	15.00	
6239	D3612-C	50.99		-1.01	
6264	IEC60567	57		0.53	
6275	IEC60567	25	R(0.01)	-7.63	
6278	D3612-A	77		5.62	
6280	D3612-A	69.2	ex	3.63	test result excluded, see paragraph 4.1
6334	IEC60567	62.28		1.87	
6367	IEC60567	45.62		-2.37	
6393	D3612-C	39.06		-4.05	
6414	IEC60567	53.5		-0.37	
6422	IEC60567	51.3		-0.93	
6434	IEC60567	47.8		-1.82	
6445	IEC60567	53.4		-0.39	

lab	method	value	mark	z(targ)	remarks
6527	IEC60567	51.7782		-0.80	
6541	D3612-B	64.03		2.32	
6542		74.00		4.86	
6549		50		-1.26	
6550	D3612-C	41.7		-3.37	
6556		-----		-----	
6559	IEC60567	85.955	R(0.01)	7.90	
	normality	OK			
	n	68			
	outliers	5 (+1ex)			
	mean (n)	54.94			
	st.dev. (n)	7.401	RSD = 13%		
	R(calc.)	20.72			
	st.dev.(IEC60567:11)	3.924			
	R(IEC60567:11)	10.99			

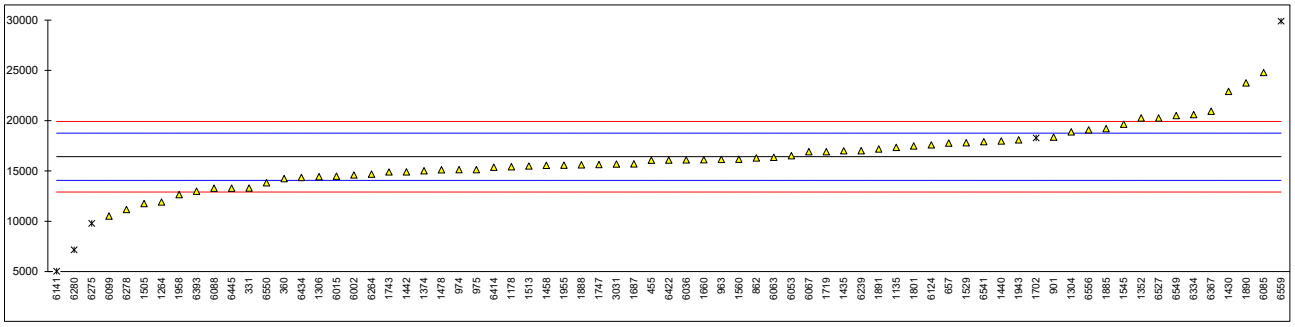


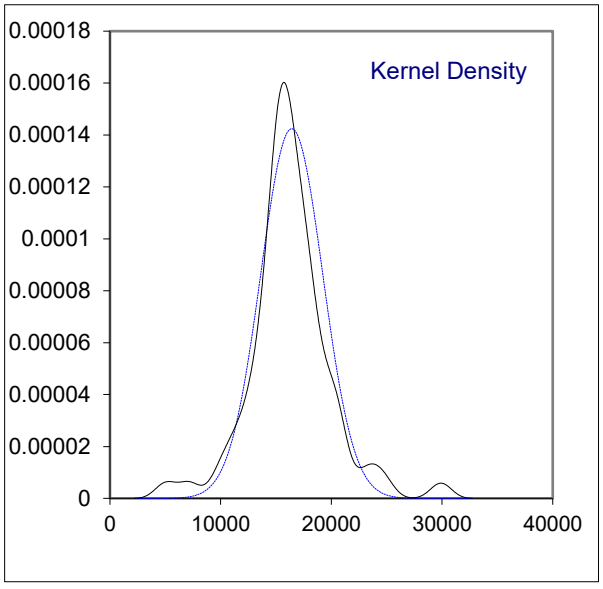


Determination of Oxygen (O_2) on sample #23244; results in µL/L

lab	method	value	mark	z(targ)	remarks
179		-----		-----	
237		-----		-----	
331	IEC60567	13291.0		-2.66	
360	IEC60567	14233.4		-1.86	
445		-----		-----	
455	IEC60567	16058.34		-0.30	
614		-----		-----	
657	D3612-C	17764.33		1.15	
780		-----		-----	
862	IEC60567	16281.5		-0.11	
901	D3612-C	18350		1.65	
912		-----		-----	
963	D3612-C	16152.00		-0.22	
974	D3612-C	15117		-1.11	
975	IEC60567	15120.0		-1.11	
1135		17346		0.79	
1178	IEC60567	15415.2		-0.85	
1264	D3612-C	11902		-3.85	
1304	In house	18880		2.10	
1306	D3612-C	14427		-1.70	
1352	IEC60567	20257		3.28	
1374	D3612-C	15016		-1.19	
1430	IEC60567	22907		5.54	
1431		-----		-----	
1435	IEC60567	17000		0.50	
1439		-----		-----	
1440	D3612-C	17976		1.33	
1442	IEC60567	14914		-1.28	
1458	D3612-B	15563		-0.73	
1478	IEC60567	15100.5762		-1.12	
1505	D3612-C	11747		-3.98	
1513	IEC60567	15490		-0.79	
1529	IEC60567	17800		1.18	
1545	D3612-C	19635.37		2.75	
1560	IEC60567	16162		-0.22	
1624		-----		-----	
1660	IEC60567	16106		-0.26	
1665		-----		-----	
1687	IEC60567	15702.73		-0.61	
1702	IEC60567	18279	ex	1.59	test result excluded, see paragraph 4.1
1719	D3612-B	16907		0.42	
1743	IEC60567	14900		-1.29	
1747	IEC60567	15633.35		-0.67	
1801	IEC60567	17480.07		0.91	
1885	D3612-C	19206		2.38	
1888	IEC60567	15604.3		-0.69	
1890	D3612-C	23756		6.26	
1891	IEC60567	17178		0.65	
1943	D3612-C	18077.70		1.42	
1955		15582		-0.71	
1958	D3612-C	12639		-3.22	
3031	IEC60567	15688.775		-0.62	
6002	IEC60567	14593		-1.55	
6015	D3612-B	14472.0		-1.66	
6036	IEC60567	16089		-0.28	
6053	IEC60567	16507		0.08	
6063	IEC60567	16347.121		-0.06	
6067	IEC60567	16899.58		0.41	
6071		-----		-----	
6085	D3612-C	24779		7.13	
6088	IEC60567	13280		-2.67	
6099		10520.6		-5.03	
6124	D3612-B	17581.7		0.99	
6141	D3612-C	5034	R(0.05)	-9.71	
6239	D3612-C	17010.11		0.51	
6264	IEC60567	14690		-1.47	
6275	IEC60567	9766	ex	-5.67	test result excluded, see paragraph 4.1
6278	D3612-A	11158		-4.48	
6280	D3612-A	7164	ex	-7.89	test result excluded, see paragraph 4.1
6334	IEC60567	20603.21		3.57	
6367	IEC60567	20947		3.86	
6393	D3612-C	12970.19		-2.94	
6414	IEC60567	15363.3		-0.90	
6422	IEC60567	16070		-0.29	
6434	IEC60567	14353		-1.76	
6445	IEC60567	13280		-2.67	

lab	method	value	mark	z(targ)	remarks
6527	IEC60567	20257.0876		3.28	
6541	D3612-B	17901.25		1.27	
6542		-----		-----	
6549		20502		3.48	
6550	D3612-C	13825.39		-2.21	
6556	IEC60567	19078.19		2.27	
6559	IEC60567	29891.900	R(0.01)	11.49	
	normality	OK			
	n	66			
	outliers	2 (+3ex)			
	mean (n)	16415.82			
	st.dev. (n)	2802.056	RSD = 17%		
	R(calc.)	7845.76			
	st.dev.(IEC60567:11)	1172.559			
	R(IEC60567:11)	3283.16			

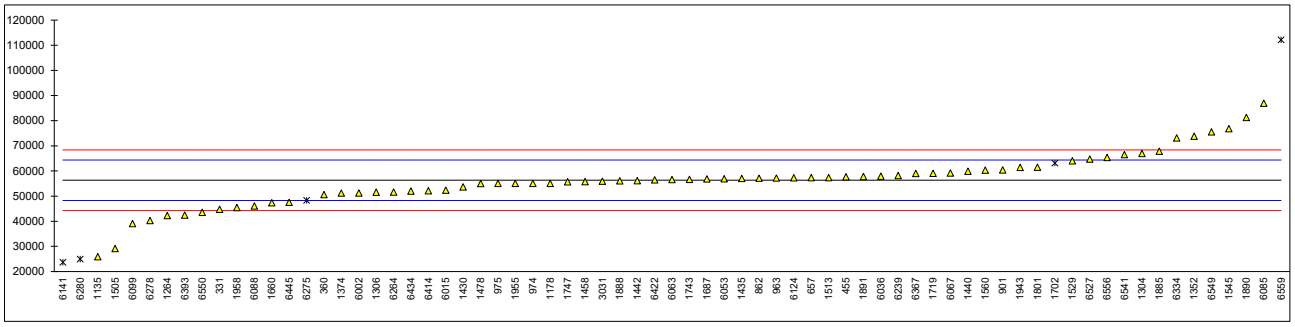


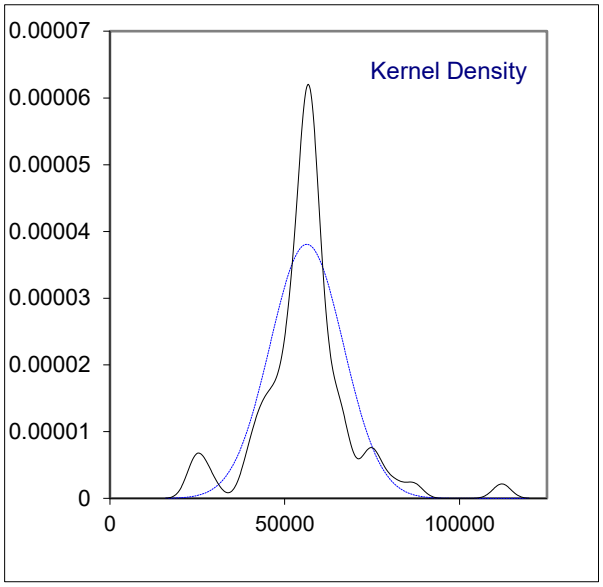


Determination of Nitrogen (N_2) on sample #23244; results in µL/L

lab	method	value	mark	z(targ)	remarks
179		-----		-----	
237		-----		-----	
331	IEC60567	44727.0		-2.88	
360	IEC60567	50587.9		-1.42	
445		-----		-----	
455	IEC60567	57660.58		0.34	
614		-----		-----	
657	D3612-C	57347.99		0.26	
780		-----		-----	
862	IEC60567	57115.1		0.20	
901	D3612-C	60351		1.01	
912		-----		-----	
963	D3612-C	57181.10		0.22	
974	D3612-C	55031		-0.32	
975	IEC60567	55020.5		-0.32	
1135		25832		-7.58	
1178	IEC60567	55078.6		-0.30	
1264	D3612-C	42210		-3.50	
1304	In house	66943		2.65	
1306	D3612-C	51532		-1.19	
1352	IEC60567	73772		4.35	
1374	D3612-C	51168		-1.28	
1430	IEC60567	53665		-0.65	
1431		-----		-----	
1435	IEC60567	57000		0.17	
1439		-----		-----	
1440	D3612-C	59900		0.90	
1442	IEC60567	56147		-0.04	
1458	D3612-B	55692.5		-0.15	
1478	IEC60567	54987.6680		-0.33	
1505	D3612-C	29101		-6.76	
1513	IEC60567	57368		0.27	
1529	IEC60567	64000		1.92	
1545	D3612-C	76839.39		5.11	
1560	IEC60567	60320		1.00	
1624		-----		-----	
1660	IEC60567	47326		-2.23	
1665		-----		-----	
1687	IEC60567	56801.02		0.12	
1702	IEC60567	63083	ex	1.69	test result excluded, see paragraph 4.1
1719	D3612-B	59027		0.68	
1743	IEC60567	56600		0.07	
1747	IEC60567	55643.35		-0.16	
1801	IEC60567	61440.33		1.28	
1885	D3612-C	67800		2.86	
1888	IEC60567	56084.2		-0.05	
1890	D3612-C	81277		6.21	
1891	IEC60567	57791		0.37	
1943	D3612-C	61397.50		1.27	
1955		55025		-0.32	
1958	D3612-C	45463		-2.69	
3031	IEC60567	55894.9355		-0.10	
6002	IEC60567	51253		-1.25	
6015	D3612-B	52338.5		-0.98	
6036	IEC60567	57873		0.39	
6053	IEC60567	56880		0.14	
6063	IEC60567	56579.539		0.07	
6067	IEC60567	59189.99		0.72	
6071		-----		-----	
6085	D3612-C	86935		7.62	
6088	IEC60567	46027		-2.55	
6099		39060.7		-4.29	
6124	D3612-B	57305.2		0.25	
6141	D3612-C	23698.6	ex	-8.11	test result excluded, see paragraph 4.1
6239	D3612-C	58132.16		0.46	
6264	IEC60567	51615		-1.16	
6275	IEC60567	48290	ex	-1.99	test result excluded, see paragraph 4.1
6278	D3612-A	40264		-3.99	
6280	D3612-A	24925	ex	-7.80	test result excluded, see paragraph 4.1
6334	IEC60567	73123.06		4.18	
6367	IEC60567	58966		0.66	
6393	D3612-C	42431.52		-3.45	
6414	IEC60567	52072.6		-1.05	
6422	IEC60567	56465		0.04	
6434	IEC60567	51940		-1.08	
6445	IEC60567	47490		-2.19	

lab	method	value	mark	z(targ)	remarks
6527	IEC60567	64743.5997		2.10	
6541	D3612-B	66463.54		2.53	
6542		-----		-----	
6549		75567		4.79	
6550	D3612-C	43501.36		-3.18	
6556	IEC60567	65354.13		2.25	
6559	IEC60567	112107.775	R(0.01)	13.88	
	normality	suspect			
	n	66			
	outliers	1 (+4ex)			
	mean (n)	56298.79			
	st.dev. (n)	10474.678	RSD = 19%		
	R(calc.)	29329.10			
	st.dev.(IEC60567:11)	4021.342			
	R(IEC60567:11)	11259.76			

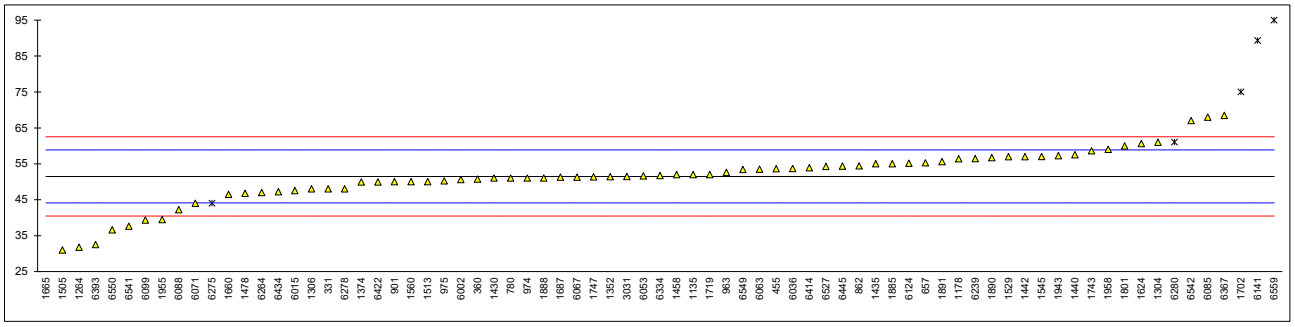


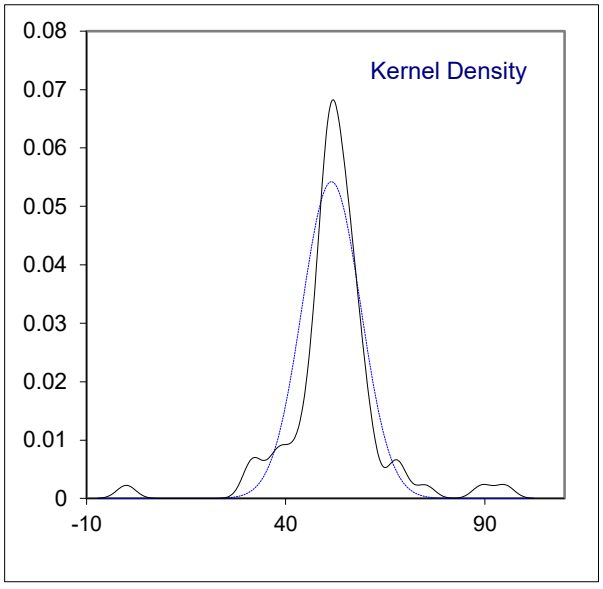


Determination of Carbon monoxide (CO) on sample #23244; results in µL/L

lab	method	value	mark	z(targ)	remarks
179		-----		-----	
237		-----		-----	
331	IEC60567	48.0		-0.95	
360	IEC60567	50.7		-0.21	
445		-----		-----	
455	IEC60567	53.63		0.58	
614		-----		-----	
657	D3612-C	55.26		1.03	
780	INH-306	51		-0.13	
862	IEC60567	54.4		0.79	
901	D3612-C	50		-0.40	
912		-----		-----	
963	D3612-C	52.60		0.30	
974	D3612-C	51		-0.13	
975	IEC60567	50.2		-0.35	
1135		52		0.14	
1178	IEC60567	56.4		1.34	
1264	D3612-C	31.75		-5.37	
1304	In house	60.94		2.57	
1306	D3612-C	48		-0.95	
1352	IEC60567	51.4		-0.02	
1374	D3612-C	49.9		-0.43	
1430	IEC60567	51		-0.13	
1431		-----		-----	
1435	IEC60567	55		0.96	
1439		-----		-----	
1440	D3612-C	57.50		1.64	
1442	IEC60567	57.0		1.50	
1458	D3612-B	52		0.14	
1478	IEC60567	46.7376		-1.29	
1505	D3612-C	31		-5.57	
1513	IEC60567	50.01		-0.40	
1529	IEC60567	57		1.50	
1545	D3612-C	57.04		1.51	
1560	IEC60567	50		-0.40	
1624		60.6		2.48	
1660	IEC60567	46.5		-1.35	
1665	IEC60567	0	R(0.01)	-14.00	
1687	IEC60567	51.26		-0.06	
1702	IEC60567	75	ex	6.40	test result excluded, see paragraph 4.1
1719	D3612-B	52		0.14	
1743	IEC60567	58.6		1.94	
1747	IEC60567	51.36		-0.03	
1801	IEC60567	59.94		2.30	
1885	D3612-C	55		0.96	
1888	IEC60567	51		-0.13	
1890	D3612-C	56.7		1.42	
1891	IEC60567	55.6		1.12	
1943	D3612-C	57.25		1.57	
1955		39.48		-3.26	
1958	D3612-C	59		2.05	
3031	IEC60567	51.4365		-0.01	
6002	IEC60567	50.6		-0.24	
6015	D3612-B	47.5		-1.08	
6036	IEC60567	53.68		0.60	
6053	IEC60567	51.6	C	0.03	first reported: 102
6063	IEC60567	53.466		0.54	
6067	IEC60567	51.29		-0.05	
6071	IEC60567	44		-2.03	
6085	D3612-C	68		4.49	
6088	IEC60567	42.2		-2.52	
6099		39.35		-3.30	
6124	D3612-B	55.1		0.98	
6141	D3612-C	89.3	R(0.01)	10.29	
6239	D3612-C	56.42		1.34	
6264	IEC60567	47		-1.22	
6275	IEC60567	44	ex	-2.03	test result excluded, see paragraph 4.1
6278	D3612-A	48		-0.95	
6280	D3612-A	61	ex	2.59	test result excluded, see paragraph 4.1
6334	IEC60567	51.69		0.06	
6367	IEC60567	68.47		4.62	
6393	D3612-C	32.47		-5.17	
6414	IEC60567	53.9		0.66	
6422	IEC60567	49.9		-0.43	
6434	IEC60567	47.2		-1.16	
6445	IEC60567	54.3		0.77	

lab	method	value	mark	z(targ)	remarks
6527	IEC60567	54.2119		0.74	
6541	D3612-B	37.59		-3.78	
6542		67.00		4.22	
6549		53.4		0.52	
6550	D3612-C	36.58		-4.05	
6556		-----		-----	
6559	IEC60567	94.960	R(0.01)	11.82	
	normality	suspect			
	n	69			
	outliers	3 (+3ex)			
	mean (n)	51.48			
	st.dev. (n)	7.357	RSD = 14%		
	R(calc.)	20.60			
	st.dev.(IEC60567:11)	3.677			
	R(IEC60567:11)	10.30			

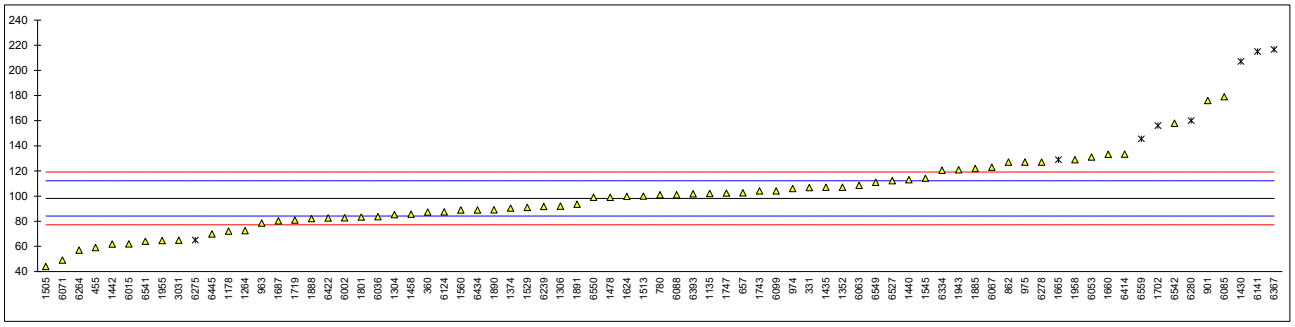


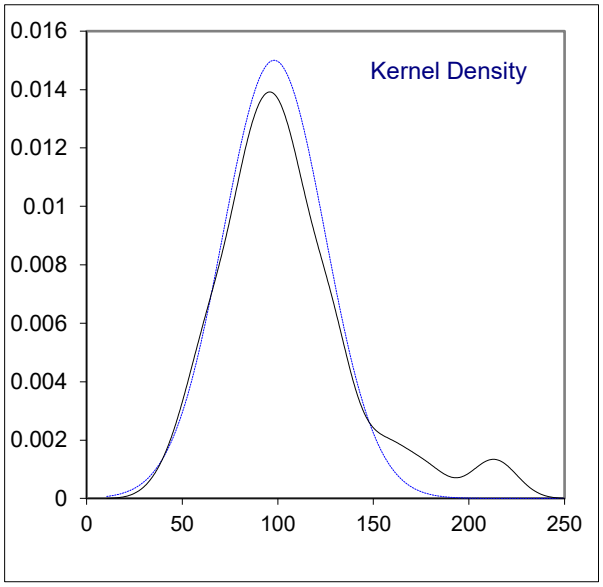


Determination of Carbon dioxide (CO_2) on sample #23244; results in µL/L

lab	method	value	mark	z(targ)	remarks
179		-----		-----	
237		-----		-----	
331	IEC60567	106.7		1.22	
360	IEC60567	87.2		-1.56	
445		-----		-----	
455	IEC60567	59		-5.58	
614		-----		-----	
657	D3612-C	102.63		0.64	
780	INH-306	101		0.41	
862	IEC60567	127.0		4.12	
901	D3612-C	176		11.11	
912		-----		-----	
963	D3612-C	78.60		-2.79	
974	D3612-C	106		1.12	
975	IEC60567	127.0		4.12	
1135		102		0.55	
1178	IEC60567	72.2		-3.70	
1264	D3612-C	72.5		-3.66	
1304	In house	85.19		-1.85	
1306	D3612-C	92		-0.88	
1352	IEC60567	107		1.26	
1374	D3612-C	90.4		-1.10	
1430	IEC60567	207	R(0.05)	15.53	
1431		-----		-----	
1435	IEC60567	107		1.26	
1439		-----		-----	
1440	D3612-C	113.00		2.12	
1442	IEC60567	61.9		-5.17	
1458	D3612-B	85.5		-1.80	
1478	IEC60567	99.0023		0.12	
1505	D3612-C	44		-7.72	
1513	IEC60567	100		0.27	
1529	IEC60567	91		-1.02	
1545	D3612-C	114.20		2.29	
1560	IEC60567	89		-1.30	
1624		99.7		0.22	
1660	IEC60567	133.2		5.00	
1665	IEC60567	129	ex	4.40	test result excluded, see paragraph 4.1
1687	IEC60567	80.27		-2.55	
1702	IEC60567	156	ex	8.26	test result excluded, see paragraph 4.1
1719	D3612-B	81		-2.44	
1743	IEC60567	104		0.84	
1747	IEC60567	102.41		0.61	
1801	IEC60567	83.25		-2.12	
1885	D3612-C	122		3.40	
1888	IEC60567	82.1		-2.29	
1890	D3612-C	89.1		-1.29	
1891	IEC60567	93.5		-0.66	
1943	D3612-C	120.80		3.23	
1955		64.6		-4.78	
1958	D3612-C	129	C	4.40	first reported: 212
3031	IEC60567	64.841		-4.75	
6002	IEC60567	82.7		-2.20	
6015	D3612-B	62.0		-5.15	
6036	IEC60567	83.62		-2.07	
6053	IEC60567	131		4.69	
6063	IEC60567	108.571		1.49	
6067	IEC60567	122.94		3.54	
6071	IEC60567	49		-7.01	
6085	D3612-C	179		11.54	
6088	IEC60567	101		0.41	
6099		104.07		0.85	
6124	D3612-B	87.4		-1.53	
6141	D3612-C	214.9	R(0.05)	16.66	
6239	D3612-C	91.77		-0.91	
6264	IEC60567	57		-5.87	
6275	IEC60567	65	ex	-4.73	test result excluded, see paragraph 4.1
6278	D3612-A	127		4.12	
6280	D3612-A	160	ex	8.83	test result excluded, see paragraph 4.1
6334	IEC60567	120.49		3.19	
6367	IEC60567	216.6	R(0.05)	16.90	
6393	D3612-C	101.72		0.51	
6414	IEC60567	133.3		5.02	
6422	IEC60567	82.5		-2.23	
6434	IEC60567	89		-1.30	
6445	IEC60567	69.9		-4.03	

lab	method	value	mark	z(targ)	remarks
6527	IEC60567	112.2189		2.01	
6541	D3612-B	63.99		-4.87	
6542		158.00		8.54	
6549		111		1.84	
6550	D3612-C	98.97		0.12	
6556		-----		-----	
6559	IEC60567	145.550	ex	6.76	test result excluded, see paragraph 4.1
	normality	suspect			
	n	67			
	outliers	3 (+5ex)			
	mean (n)	98.13			
	st.dev. (n)	26.597	RSD = 27%		
	R(calc.)	74.47			
	st.dev.(IEC60567:11)	7.010			
	R(IEC60567:11)	19.63			

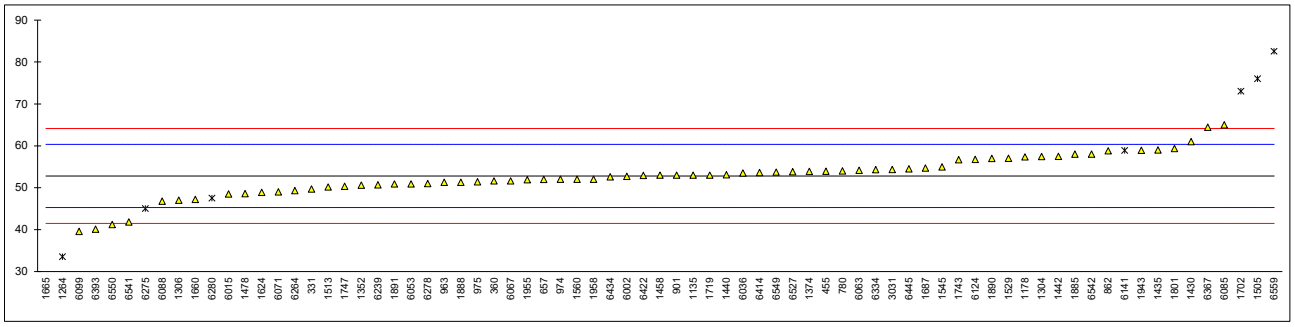


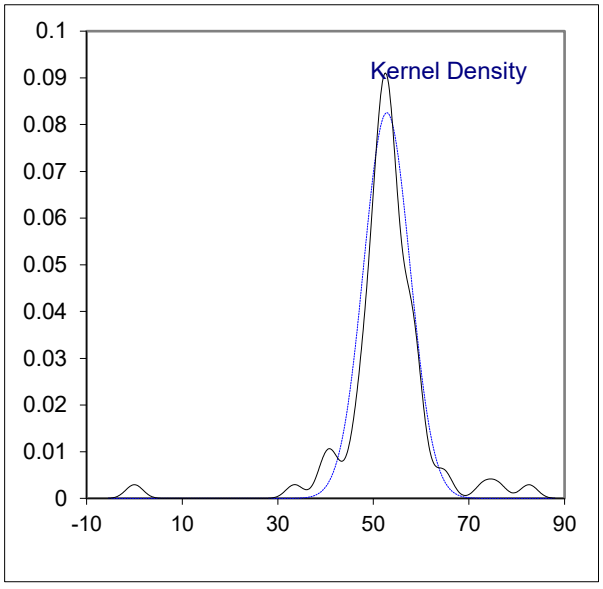


Determination of Methane (CH_4) on sample #23244; results in µL/L

lab	method	value	mark	z(targ)	remarks
179		-----		-----	
237		-----		-----	
331	IEC60567	49.7		-0.82	
360	IEC60567	51.6		-0.32	
445		-----		-----	
455	IEC60567	53.92		0.29	
614		-----		-----	
657	D3612-C	51.99		-0.22	
780	INH-306	54		0.32	
862	IEC60567	58.8		1.59	
901	D3612-C	53		0.05	
912		-----		-----	
963	D3612-C	51.30		-0.40	
974	D3612-C	52		-0.21	
975	IEC60567	51.4		-0.37	
1135		53		0.05	
1178	IEC60567	57.34		1.20	
1264	D3612-C	33.51	R(0.05)	-5.12	
1304	In house	57.45		1.23	
1306	D3612-C	47		-1.54	
1352	IEC60567	50.6		-0.59	
1374	D3612-C	53.9		0.29	
1430	IEC60567	61		2.17	
1431		-----		-----	
1435	IEC60567	59		1.64	
1439		-----		-----	
1440	D3612-C	53.09		0.07	
1442	IEC60567	57.5		1.24	
1458	D3612-B	53		0.05	
1478	IEC60567	48.5768		-1.12	
1505	D3612-C	76	R(0.05)	6.15	
1513	IEC60567	50.15		-0.70	
1529	IEC60567	57		1.11	
1545	D3612-C	54.96		0.57	
1560	IEC60567	52		-0.21	
1624		48.9		-1.04	
1660	IEC60567	47.2		-1.49	
1665	IEC60567	0	R(0.01)	-14.00	
1687	IEC60567	54.69		0.50	
1702	IEC60567	73	R(0.05)	5.35	
1719	D3612-B	53		0.05	
1743	IEC60567	56.7		1.03	
1747	IEC60567	50.34		-0.65	
1801	IEC60567	59.33		1.73	
1885	D3612-C	58		1.38	
1888	IEC60567	51.3		-0.40	
1890	D3612-C	56.96		1.10	
1891	IEC60567	50.9		-0.51	
1943	D3612-C	58.95		1.63	
1955		51.9		-0.24	
1958	D3612-C	52		-0.21	
3031	IEC60567	54.327		0.40	
6002	IEC60567	52.7		-0.03	
6015	D3612-B	48.5		-1.14	
6036	IEC60567	53.51		0.19	
6053	IEC60567	50.9	C	-0.51	first reported: 101
6063	IEC60567	54.139		0.35	
6067	IEC60567	51.61		-0.32	
6071	IEC60567	49		-1.01	
6085	D3612-C	65		3.23	
6088	IEC60567	46.8		-1.59	
6099		39.57		-3.51	
6124	D3612-B	56.75		1.04	
6141	D3612-C	58.9	ex	1.61	test result excluded, see paragraph 4.1
6239	D3612-C	50.67		-0.57	
6264	IEC60567	49.3		-0.93	
6275	IEC60567	45	ex	-2.07	test result excluded, see paragraph 4.1
6278	D3612-A	51		-0.48	
6280	D3612-A	47.5	ex	-1.41	test result excluded, see paragraph 4.1
6334	IEC60567	54.31		0.40	
6367	IEC60567	64.41		3.08	
6393	D3612-C	40.11		-3.37	
6414	IEC60567	53.6		0.21	
6422	IEC60567	52.9		0.02	
6434	IEC60567	52.6		-0.06	
6445	IEC60567	54.5		0.45	

lab	method	value	mark	z(targ)	remarks
6527	IEC60567	53.8348		0.27	
6541	D3612-B	41.81		-2.92	
6542		58.00		1.38	
6549		53.7		0.24	
6550	D3612-C	41.21		-3.07	
6556		-----		-----	
6559	IEC60567	82.530	R(0.01)	7.88	
	normality	suspect			
	n	67			
	outliers	5 (+3ex)			
	mean (n)	52.81			
	st.dev. (n)	4.831	RSD = 9%		
	R(calc.)	13.53			
	st.dev.(IEC60567:11)	3.772			
	R(IEC60567:11)	10.56			

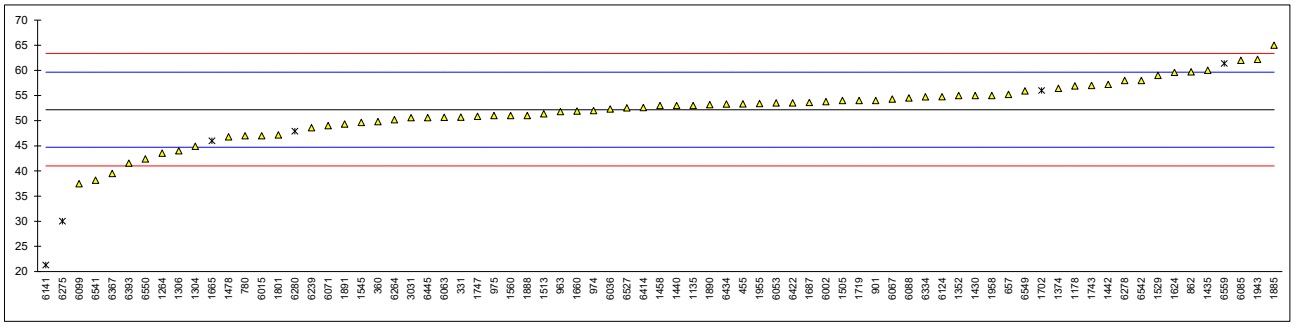


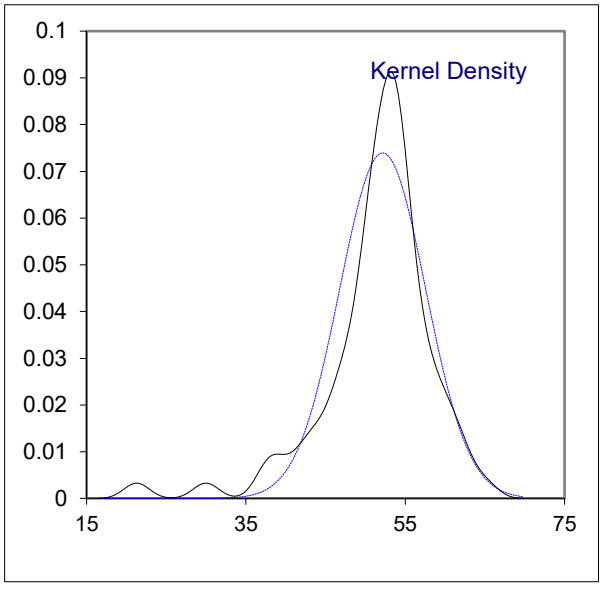


Determination of Ethane (C_2H_6) on sample #23244; results in µL/L

lab	method	value	mark	z(targ)	remarks
179		-----		-----	
237		-----		-----	
331	IEC60567	50.7		-0.40	
360	IEC60567	49.8		-0.64	
445		-----		-----	
455	IEC60567	53.34		0.31	
614		-----		-----	
657	D3612-C	55.22		0.81	
780	INH-306	47		-1.39	
862	IEC60567	59.7		2.02	
901	D3612-C	54		0.49	
912		-----		-----	
963	D3612-C	51.80		-0.10	
974	D3612-C	52		-0.05	
975	IEC60567	51.0		-0.32	
1135		53		0.22	
1178	IEC60567	56.91		1.27	
1264	D3612-C	43.55		-2.32	
1304	In house	44.91		-1.95	
1306	D3612-C	44		-2.20	
1352	IEC60567	55.0		0.75	
1374	D3612-C	56.4		1.13	
1430	IEC60567	55		0.75	
1431		-----		-----	
1435	IEC60567	60		2.10	
1439		-----		-----	
1440	D3612-C	53.00		0.22	
1442	IEC60567	57.2		1.34	
1458	D3612-B	53		0.22	
1478	IEC60567	46.7756		-1.45	
1505	D3612-C	54		0.49	
1513	IEC60567	51.38		-0.22	
1529	IEC60567	59		1.83	
1545	D3612-C	49.64		-0.68	
1560	IEC60567	51		-0.32	
1624		59.6		1.99	
1660	IEC60567	51.9		-0.08	
1665	IEC60567	46	ex	-1.66	test result excluded, see paragraph 4.1
1687	IEC60567	53.60		0.38	
1702	IEC60567	56	ex	1.02	test result excluded, see paragraph 4.1
1719	D3612-B	54		0.49	
1743	IEC60567	57.0		1.29	
1747	IEC60567	50.84		-0.36	
1801	IEC60567	47.18		-1.34	
1885	D3612-C	65		3.44	
1888	IEC60567	51		-0.32	
1890	D3612-C	53.18		0.27	
1891	IEC60567	49.3		-0.77	
1943	D3612-C	62.20		2.69	
1955		53.4		0.33	
1958	D3612-C	55		0.75	
3031	IEC60567	50.5805		-0.43	
6002	IEC60567	53.8		0.43	
6015	D3612-B	47.0		-1.39	
6036	IEC60567	52.31		0.03	
6053	IEC60567	53.5	C	0.35	first reported: 109
6063	IEC60567	50.675		-0.41	
6067	IEC60567	54.29		0.56	
6071	IEC60567	49	C	-0.86	first reported: 38
6085	D3612-C	62		2.63	
6088	IEC60567	54.5		0.62	
6099		37.45		-3.95	
6124	D3612-B	54.75		0.69	
6141	D3612-C	21.3	R(0.01)	-8.29	
6239	D3612-C	48.59		-0.97	
6264	IEC60567	50.2		-0.53	
6275	IEC60567	30	R(0.01)	-5.95	
6278	D3612-A	58		1.56	
6280	D3612-A	47.9	ex	-1.15	test result excluded, see paragraph 4.1
6334	IEC60567	54.71		0.68	
6367	IEC60567	39.5		-3.40	
6393	D3612-C	41.54		-2.86	
6414	IEC60567	52.6		0.11	
6422	IEC60567	53.5		0.35	
6434	IEC60567	53.3		0.30	
6445	IEC60567	50.6		-0.43	

lab	method	value	mark	z(targ)	remarks
6527	IEC60567	52.5512		0.10	
6541	D3612-B	38.17		-3.76	
6542		58.00		1.56	
6549		55.9		1.00	
6550	D3612-C	42.40		-2.63	
6556		-----		-----	
6559	IEC60567	61.375	ex	2.46	test result excluded, see paragraph 4.1
	normality	OK			
	n	69			
	outliers	2 (+4ex)			
	mean (n)	52.19			
	st.dev. (n)	5.397	RSD = 10%		
	R(calc.)	15.11			
	st.dev.(IEC60567:11)	3.728			
	R(IEC60567:11)	10.44			

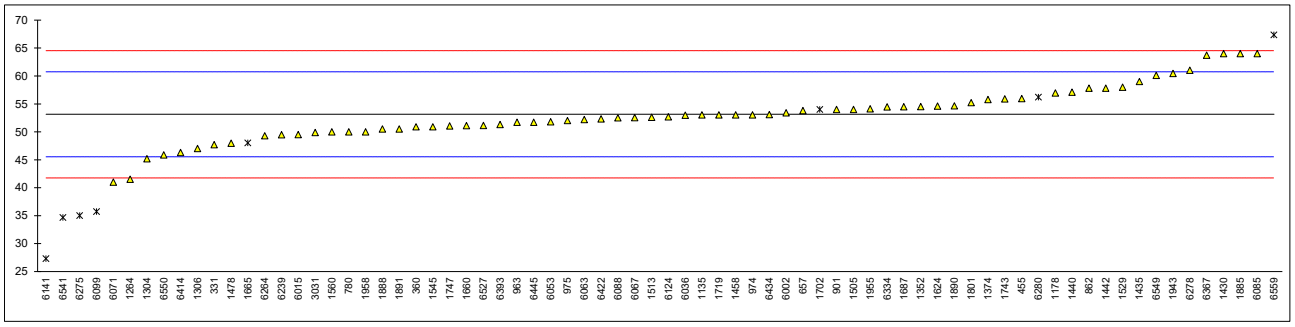


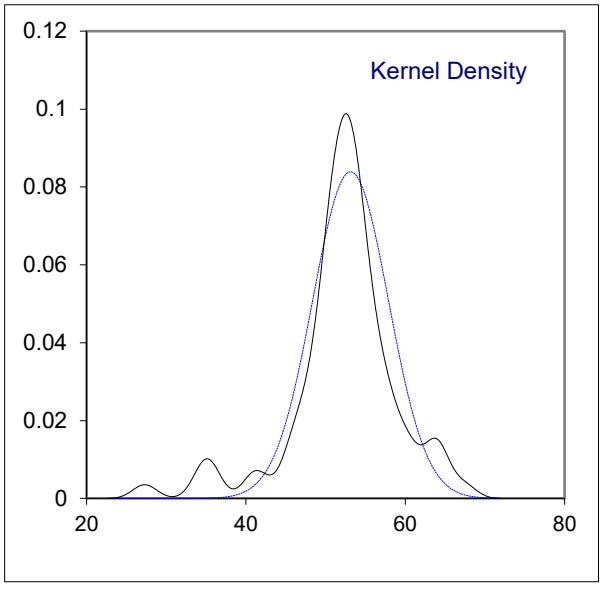


Determination of Ethene (C_2H_4) on sample #23244; results in µL/L

lab	method	value	mark	z(targ)	remarks
179		-----		-----	
237		-----		-----	
331	IEC60567	47.7		-1.43	
360	IEC60567	50.9		-0.59	
445		-----		-----	
455	IEC60567	55.95		0.74	
614		-----		-----	
657	D3612-C	53.80		0.17	
780	INH-306	50		-0.83	
862	IEC60567	57.8		1.23	
901	D3612-C	54		0.23	
912		-----		-----	
963	D3612-C	51.70		-0.38	
974	D3612-C	53		-0.04	
975	IEC60567	52.0		-0.30	
1135		53		-0.04	
1178	IEC60567	56.95		1.00	
1264	D3612-C	41.51		-3.06	
1304	In house	45.19		-2.09	
1306	D3612-C	47		-1.62	
1352	IEC60567	54.5		0.36	
1374	D3612-C	55.8		0.70	
1430	IEC60567	64		2.86	
1431		-----		-----	
1435	IEC60567	59		1.55	
1439		-----		-----	
1440	D3612-C	57.09		1.04	
1442	IEC60567	57.8		1.23	
1458	D3612-B	53		-0.04	
1478	IEC60567	47.9551		-1.36	
1505	D3612-C	54		0.23	
1513	IEC60567	52.61		-0.14	
1529	IEC60567	58		1.28	
1545	D3612-C	50.90		-0.59	
1560	IEC60567	50		-0.83	
1624		54.6		0.39	
1660	IEC60567	51.1		-0.54	
1665	IEC60567	48	ex	-1.35	test result excluded, see paragraph 4.1
1687	IEC60567	54.48		0.35	
1702	IEC60567	54	ex	0.23	test result excluded, see paragraph 4.1
1719	D3612-B	53		-0.04	
1743	IEC60567	55.9		0.73	
1747	IEC60567	51.05		-0.55	
1801	IEC60567	55.22		0.55	
1885	D3612-C	64		2.86	
1888	IEC60567	50.5		-0.69	
1890	D3612-C	54.65		0.40	
1891	IEC60567	50.5		-0.69	
1943	D3612-C	60.45		1.93	
1955		54.1		0.25	
1958	D3612-C	50		-0.83	
3031	IEC60567	49.8865		-0.86	
6002	IEC60567	53.4		0.07	
6015	D3612-B	49.5		-0.96	
6036	IEC60567	52.96		-0.05	
6053	IEC60567	51.8	C	-0.35	first reported: 101
6063	IEC60567	52.207		-0.24	
6067	IEC60567	52.55		-0.15	
6071	IEC60567	41		-3.20	
6085	D3612-C	64		2.86	
6088	IEC60567	52.5		-0.17	
6099		35.72	R(0.01)	-4.59	
6124	D3612-B	52.7		-0.11	
6141	D3612-C	27.3	R(0.01)	-6.81	
6239	D3612-C	49.49		-0.96	
6264	IEC60567	49.3		-1.01	
6275	IEC60567	35	R(0.01)	-4.78	
6278	D3612-A	61		2.07	
6280	D3612-A	56.2	ex	0.81	test result excluded, see paragraph 4.1
6334	IEC60567	54.46		0.35	
6367	IEC60567	63.69		2.78	
6393	D3612-C	51.31		-0.48	
6414	IEC60567	46.3		-1.80	
6422	IEC60567	52.3		-0.22	
6434	IEC60567	53.1		-0.01	
6445	IEC60567	51.7		-0.38	

lab	method	value	mark	z(targ)	remarks
6527	IEC60567	51.1342		-0.53	
6541	D3612-B	34.66	R(0.01)	-4.87	
6542		-----		-----	
6549		60.1		1.83	
6550	D3612-C	45.87		-1.91	
6556		-----		-----	
6559	IEC60567	67.355	ex	3.75	test result excluded, see paragraph 4.1
	normality	OK			
	n	66			
	outliers	4 (+4ex)			
	mean (n)	53.14			
	st.dev. (n)	4.757	RSD = 9%		
	R(calc.)	13.32			
	st.dev.(IEC60567:11)	3.795			
	R(IEC60567:11)	10.63			

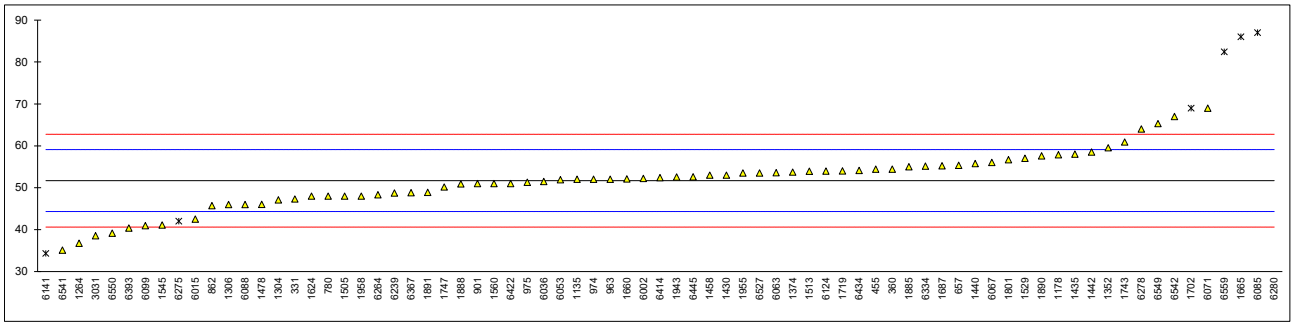


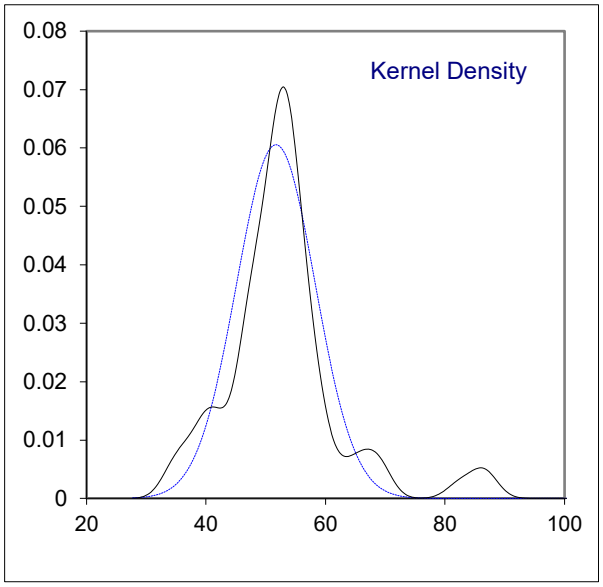


Determination of Ethyne (C_2H_2) on sample #23244; results in µL/L

lab	method	value	mark	z(targ)	remarks
179		-----		-----	
237		-----		-----	
331	IEC60567	47.3		-1.19	
360	IEC60567	54.4		0.73	
445		-----		-----	
455	IEC60567	54.4		0.73	
614		-----		-----	
657	D3612-C	55.33		0.99	
780	INH-306	48		-1.00	
862	IEC60567	45.7		-1.62	
901	D3612-C	51		-0.19	
912		-----		-----	
963	D3612-C	52.00		0.08	
974	D3612-C	52		0.08	
975	IEC60567	51.3		-0.10	
1135		52		0.08	
1178	IEC60567	57.86		1.67	
1264	D3612-C	36.73		-4.05	
1304	In house	47.06		-1.25	
1306	D3612-C	46		-1.54	
1352	IEC60567	59.5		2.12	
1374	D3612-C	53.7		0.55	
1430	IEC60567	53		0.36	
1431		-----		-----	
1435	IEC60567	58		1.71	
1439		-----		-----	
1440	D3612-C	55.76		1.10	
1442	IEC60567	58.5		1.85	
1458	D3612-B	53		0.36	
1478	IEC60567	46.0074		-1.54	
1505	D3612-C	48		-1.00	
1513	IEC60567	53.93		0.61	
1529	IEC60567	57		1.44	
1545	D3612-C	41.11		-2.87	
1560	IEC60567	51		-0.19	
1624		48.0		-1.00	
1660	IEC60567	52.1		0.11	
1665	IEC60567	86	R(0.01)	9.29	
1687	IEC60567	55.23		0.96	
1702	IEC60567	69	ex	4.69	test result excluded, see paragraph 4.1
1719	D3612-B	54		0.63	
1743	IEC60567	60.9		2.50	
1747	IEC60567	50.17		-0.41	
1801	IEC60567	56.68		1.35	
1885	D3612-C	55		0.90	
1888	IEC60567	50.9		-0.21	
1890	D3612-C	57.61		1.60	
1891	IEC60567	48.9		-0.76	
1943	D3612-C	52.55		0.23	
1955		53.5		0.49	
1958	D3612-C	48		-1.00	
3031	IEC60567	38.5115		-3.57	
6002	IEC60567	52.2		0.14	
6015	D3612-B	42.5		-2.49	
6036	IEC60567	51.47		-0.06	
6053	IEC60567	51.9	C	0.06	first reported 101
6063	IEC60567	53.583		0.51	
6067	IEC60567	56.04		1.18	
6071	IEC60567	69		4.69	
6085	D3612-C	87	R(0.01)	9.56	
6088	IEC60567	46		-1.54	
6099		40.95		-2.91	
6124	D3612-B	53.95		0.61	
6141	D3612-C	34.3	ex	-4.71	test result excluded, see paragraph 4.1
6239	D3612-C	48.76		-0.79	
6264	IEC60567	48.3		-0.92	
6275	IEC60567	42	ex	-2.62	test result excluded, see paragraph 4.1
6278	D3612-A	64		3.33	
6280	D3612-A	164	R(0.01)	30.42	
6334	IEC60567	55.13		0.93	
6367	IEC60567	48.8		-0.78	
6393	D3612-C	40.37		-3.07	
6414	IEC60567	52.4		0.19	
6422	IEC60567	51.0		-0.19	
6434	IEC60567	54.1		0.65	
6445	IEC60567	52.6		0.25	

lab	method	value	mark	z(targ)	remarks
6527	IEC60567	53.5129		0.49	
6541	D3612-B	35.11		-4.49	
6542		67.00		4.15	
6549		65.3		3.69	
6550	D3612-C	39.14		-3.40	
6556		-----		-----	
6559	IEC60567	82.395	R(0.01)	8.32	
	normality	OK			
	n	68			
	outliers	4 (+3ex)			
	mean (n)	51.69			
	st.dev. (n)	6.588	RSD = 13%		
	R(calc.)	18.45			
	st.dev.(IEC60567:11)	3.692			
	R(IEC60567:11)	10.34			

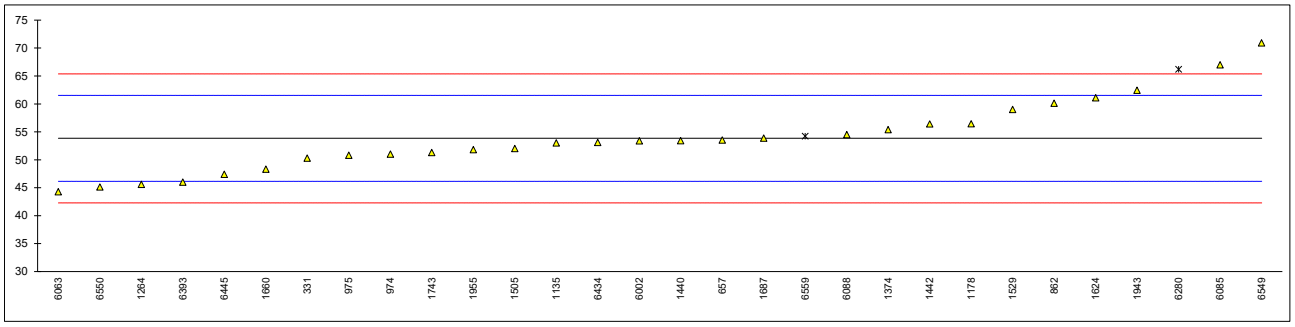


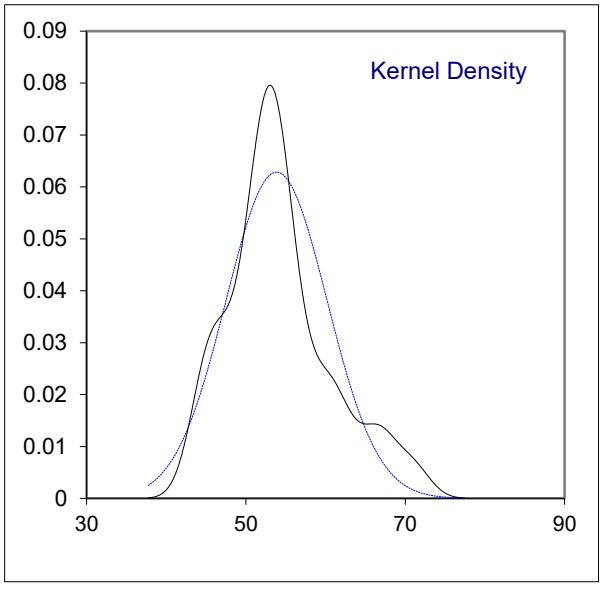


Determination of Propane (C_3H_8) on sample #23244; results in µL/L

lab	method	value	mark	z(targ)	remarks
179		-----		-----	
237		-----		-----	
331	IEC60567	50.3		-0.92	
360		-----		-----	
445		-----		-----	
455		-----		-----	
614		-----		-----	
657	D3612-C	53.53		-0.08	
780		-----		-----	
862	IEC60567	60.1		1.63	
901		-----		-----	
912		-----		-----	
963		-----		-----	
974	D3612-C	51		-0.74	
975	IEC60567	50.8		-0.79	
1135		53		-0.22	
1178	IEC60567	56.43		0.67	
1264	D3612-C	45.59		-2.14	
1304		-----		-----	
1306		-----		-----	
1352		-----		-----	
1374	D3612-C	55.4		0.41	
1430		-----		-----	
1431		-----		-----	
1435		-----		-----	
1439		-----		-----	
1440	D3612-C	53.42		-0.11	
1442	IEC60567	56.4		0.67	
1458		-----		-----	
1478		-----		-----	
1505	D3612-C	52		-0.48	
1513		-----		-----	
1529	IEC60567	59		1.34	
1545		-----		-----	
1560		-----		-----	
1624		61.1		1.89	
1660	IEC60567	48.3		-1.44	
1665		-----		-----	
1687	IEC60567	53.88		0.01	
1702		-----		-----	
1719		-----		-----	
1743	IEC60567	51.3		-0.66	
1747		-----		-----	
1801		-----		-----	
1885		-----		-----	
1888		-----		-----	
1890		-----		-----	
1891		-----		-----	
1943	D3612-C	62.45		2.24	
1955		51.8		-0.53	
1958		-----		-----	
3031	IEC60567	Not Detected	f-?	-----	Possible false negative test result?
6002	IEC60567	53.4		-0.11	
6015		-----		-----	
6036		-----		-----	
6053		-----		-----	
6063	IEC60567	44.265		-2.49	
6067		-----		-----	
6071		-----		-----	
6085	D3612-C	67		3.42	
6088	IEC60567	54.5		0.17	
6099		-----		-----	
6124		-----		-----	
6141		-----		-----	
6239		-----		-----	
6264		-----		-----	
6275		-----		-----	
6278		-----		-----	
6280	D3612-A	66.2	ex	3.21	test result excluded, see paragraph 4.1
6334		-----		-----	
6367		-----		-----	
6393	D3612-C	46.00		-2.04	
6414		-----		-----	
6422		-----		-----	
6434	IEC60567	53.1		-0.19	
6445	IEC60567	47.4		-1.67	

lab	method	value	mark	z(targ)	remarks
6527		-----		-----	
6541		-----		-----	
6542		-----		-----	
6549		70.9		4.44	
6550	D3612-C	45.12		-2.27	
6556		-----		-----	
6559	IEC60567	54.200	ex	0.09	test result excluded, see paragraph 4.1
	normality	OK			
	n	28			
	outliers	0 (+2ex)			
	mean (n)	53.84			
	st.dev. (n)	6.348	RSD = 12%		
	R(calc.)	17.77			
	st.dev.(IEC60567:11)	3.846			
	R(IEC60567:11)	10.77			

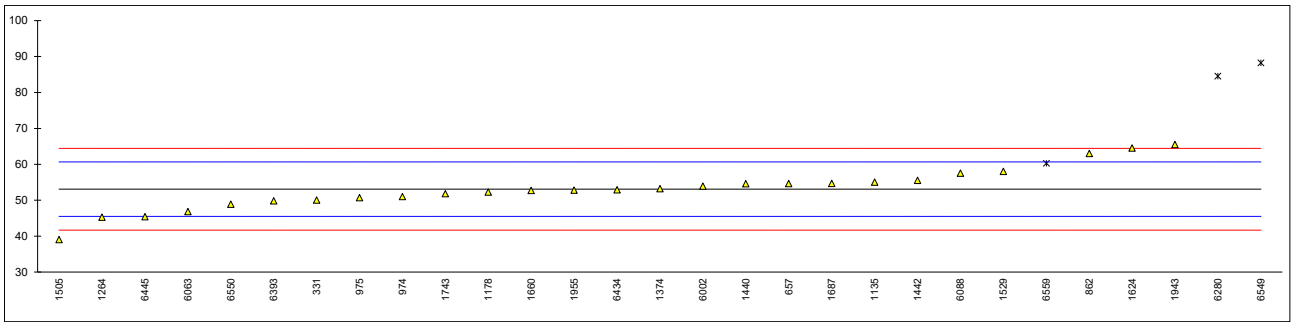


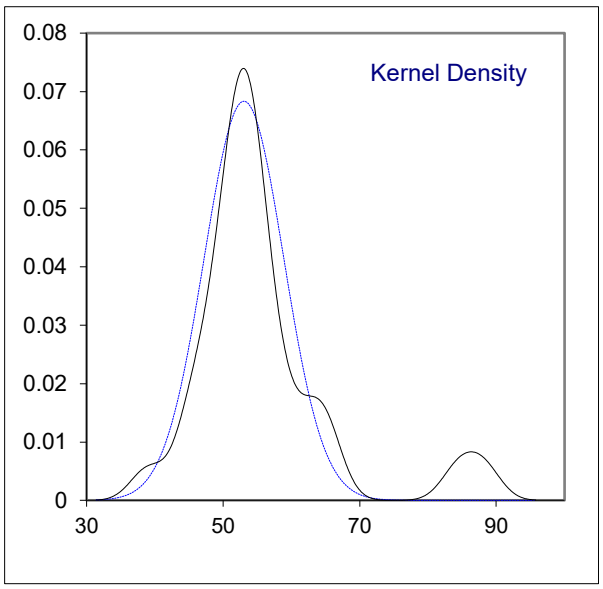


Determination of Propene (C_3H_6) on sample #23244; results in µL/L

lab	method	value	mark	z(targ)	remarks
179		-----		-----	
237		-----		-----	
331	IEC60567	50.0		-0.80	
360		-----		-----	
445		-----		-----	
455		-----		-----	
614		-----		-----	
657	D3612-C	54.60		0.41	
780		-----		-----	
862	IEC60567	63.0		2.63	
901		-----		-----	
912		-----		-----	
963		-----		-----	
974	D3612-C	51		-0.54	
975	IEC60567	50.7		-0.62	
1135		55		0.52	
1178	IEC60567	52.25		-0.21	
1264	D3612-C	45.27		-2.05	
1304		-----		-----	
1306		-----		-----	
1352		-----		-----	
1374	D3612-C	53.2		0.04	
1430		-----		-----	
1431		-----		-----	
1435		-----		-----	
1439		-----		-----	
1440	D3612-C	54.56		0.40	
1442	IEC60567	55.5		0.65	
1458		-----		-----	
1478		-----		-----	
1505	D3612-C	39		-3.71	
1513		-----		-----	
1529	IEC60567	58		1.31	
1545		-----		-----	
1560		-----		-----	
1624		64.5		3.02	
1660	IEC60567	52.7		-0.09	
1665		-----		-----	
1687	IEC60567	54.65		0.42	
1702		-----		-----	
1719		-----		-----	
1743	IEC60567	51.8		-0.33	
1747		-----		-----	
1801		-----		-----	
1885		-----		-----	
1888		-----		-----	
1890		-----		-----	
1891		-----		-----	
1943	D3612-C	65.50		3.29	
1955		52.8		-0.07	
1958		-----		-----	
3031		-----		-----	
6002	IEC60567	53.9		0.22	
6015		-----		-----	
6036		-----		-----	
6053		-----		-----	
6063	IEC60567	46.834		-1.64	
6067		-----		-----	
6071		-----		-----	
6085		-----		-----	
6088	IEC60567	57.5		1.17	
6099		-----		-----	
6124		-----		-----	
6141		-----		-----	
6239		-----		-----	
6264		-----		-----	
6275		-----		-----	
6278		-----		-----	
6280	D3612-A	84.5	R(0.01)	8.30	
6334		-----		-----	
6367		-----		-----	
6393	D3612-C	49.80		-0.86	
6414		-----		-----	
6422		-----		-----	
6434	IEC60567	52.9		-0.04	
6445	IEC60567	45.4		-2.02	

lab	method	value	mark	z(targ)	remarks
6527		-----		-----	
6541		-----		-----	
6542		-----		-----	
6549		88.2	R(0.01)	9.28	
6550	D3612-C	48.88		-1.10	
6556		-----		-----	
6559	IEC60567	60.265	ex	1.90	test result excluded, see paragraph 4.1
	normality	OK			
	n	26			
	outliers	2 (+1ex)			
	mean (n)	53.05			
	st.dev. (n)	5.837	RSD = 11%		
	R(calc.)	16.34			
	st.dev.(IEC60567:11)	3.789			
	R(IEC60567:11)	10.61			





APPENDIX 2 Analytical details

lab	Manufacturer	Model	Extraction method
179			---
237			---
331			---
360	Agilent Technologies	GC System 7890A and Headspace Sampler 7697A	Head Space
445			---
455			---
614			---
657	Agilent	Agilent 7890B Series GC 7697 Headspace Sampler	Head Space
780	Chromatec crystal 5000	Chromatec crystal, Gas Chromatography	ToGas
862			Head Space
901	Agilent	7890B/7697A GC	Head Space
912			---
963			---
974			Head Space
975			Head Space
1135			---
1178			---
1264	Agilent	6890N GC and 7697A Headspace Sampler	Head Space
1304	Shimadzu	GC-2014	Head Space
1306	Agilent Technologies	7890B	Head Space
1352			Stripper Column
1374	PerkinElmer	Clarus 690 GC	Head Space
1430	Perkin Elmer		Head Space
1431			---
1435			---
1439			---
1440	Agilent	Micro-GC 490	Head Space
1442			---
1458	Shimadzu	GG-2014 with TCD FID detector	Stripper Column
1478	Varian	Varian 450-GC	Toepler
1505			Head Space
1513	Extractor - Merel; GC-Varian	Merel GE 567; Varian 450 GC	Toepler
1529	Agilent	6890 and 7890 GC with 7697A headspace sampler	Head Space
1545			---
1560	Agilent	7890B	Head Space
1624	Thermo Sientific GAS	Trace 1310 (Global Analyser Solutions)	Head Space
1660	Agilent	8890 + 7697A	Head Space
1665	Morgan Schaffer	Myrkos	Head Space
1687			---
1702	Agilent	Agilent 8890	Head Space
1719	Shimadzu	GC-2014	Stripper Column
1743	AGILENT	8890 GC System 7697A Headspace sampler	Head Space
1747	Agilent	8890/8897	Head Space
1801			Head Space
1885	Agilent	TOGA - 7697A (sampler) 7890B (GC)	Head Space
1888	Thermo		Head Space
1890			---
1891	Perkin Elmer	Clarus 690 GC with TCD & FID	Head Space
1943	Agilent Technologies	6890N GC System; G1888 Network Headspace Sampler	Head Space
1955	Agilent	7697A Head space Sampler 7890b GC System	Head Space
1958	SHIMADZU	SHIMADZU	Head Space
3031	Perkin Elmer	Analyseur PerkinElmer Engineered ModÃ¨le 4087 PPC	Head Space
6002	Agilent		Head Space
6015			Head Space
6036	Agilent	Gaschromatograph GC 7890B Headspace Sampler 7697A	Head Space
6053	Agilent	Agilent 7890A GC	Head Space
6063	Aglient	7890B GC System	Toepler
6067	Agilent	7890A	Head Space
6071			---
6085	AGILENT.	7890B.	Head Space
6088			---
6099	Bruker	GC-450 + QUMA Head Space	Head Space
6124	Shimadzu	GC 14A	---
6141	GC Shimadzu	GC-2014 HS-20 LONG TRANSFER	Head Space
6239	Agilent	7890B/7697	Head Space
6264	PerkinElmer	Clarus 590	Head Space
6275			---
6278			Vacuum Extraction
6280	Energy Support	Toga GC	Vacuum Extraction
6334	Perkin Elmer	Clarus 500 TOGA with a Turbomatrix 110 autosampler	Head Space
6367	HEWLETT PACKARD GC system	HP7694 HEADSPACE SAMPLER and GC system HP6890	Head Space
6393	Perkin Elmer	System Clarus 600, model TOGA 4087	Head Space
6414	Perkin Elmer	Clarus 590 GC	Head Space
6422			Head Space
6434	Agilent	Agilent GC7890+HS7697	Head Space

lab	Manufacturer	Model	Extraction method
6445			Vacuum Extraction
6527			---
6541	SCION	436-GC	Stripper Column
6542	Morgan Shaffer Myrkos	Portable DGA MicroGC	Syringe Shaker Myrkos
6549	ECH	TOGA	Vacuum Extraction
6550	CROMATEC	CLARUS 600 MODEL TOGA 4087	---
6556	Morgan Schaffer, Quebec Canada	Myrkos Portable DGA/0020 Myrkos Lab Package	Head Space
6559	Agilent Technologies	8890 GC System 8697 Headspace Sampler	Head Space

APPENDIX 3

Number of participants per country

7 labs in AUSTRALIA
3 labs in BELGIUM
1 lab in BULGARIA
1 lab in CHINA, People's Republic
1 lab in CROATIA
3 labs in FRANCE
5 labs in GERMANY
3 labs in GREECE
1 lab in HONG KONG
1 lab in INDIA
3 labs in INDONESIA
1 lab in IRELAND
2 labs in ISRAEL
2 labs in ITALY
1 lab in KUWAIT
1 lab in LATVIA
3 labs in MALAYSIA
3 labs in MOROCCO
2 labs in NETHERLANDS
1 lab in NEW ZEALAND
1 lab in NIGERIA
1 lab in NORTH MACEDONIA, Republic of
1 lab in NORWAY
1 lab in PHILIPPINES
1 lab in POLAND
1 lab in PORTUGAL
2 labs in QATAR
2 labs in ROMANIA
1 lab in RUSSIAN FEDERATION
3 labs in SAUDI ARABIA
3 labs in SINGAPORE
1 lab in SLOVAKIA
2 labs in SLOVENIA
1 lab in SOUTH AFRICA
4 labs in SPAIN
2 labs in SWITZERLAND
2 labs in TURKIYE
3 labs in UNITED ARAB EMIRATES
4 labs in UNITED KINGDOM
1 lab in UNITED STATES OF AMERICA
1 lab in URUGUAY

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
n.a.	= not applicable
n.e.	= not evaluated
n.d.	= not detected
fr.	= first reported
f+?	= possibly a false positive test result?
f-?	= possibly a false negative test result?
SDS	= Safety Data Sheet

Literature

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