Institute for
Interlaboratory Studies

Results of Proficiency Test
Transformer Oil
Dissolved Gas Analysis (DGA)
November 2022

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 2022/2023 it was decided to continue the round robin for the analysis of Dissolved Gas in Transformer Oil (DGA).

In this interlaboratory study 76 laboratories in 40 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 #22229.
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 accredited by the ANSI ASQ National Accreditation Board.

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 85 syringes of 50 mL with lot code RN529 was prepared by Morgan Schaffer Ltd. (Quebec, Canada). The syringes were uniquely coded and labelled #22229.
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 #22229 was sent on October 26, 2022. 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. Seven 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 69 participants reported 655 numerical test results. Observed were 53 outlying test results, which is 8.1%. 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.

Nine laboratories reported deviating test results of which for at least three components were statistical outliers for the 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): This determination was problematic. Five 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 IEC60567:11.

Oxygen (O_2): This determination was problematic. 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 IEC60567:11.

Nitrogen (N_2): This determination was problematic. 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 IEC60567:11.

Carbon monoxide (CO): This determination was problematic. Four 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 IEC60567:11.

Carbon dioxide (CO_2): This determination was very problematic. Three statistical outliers were observed and seven other test results were excluded. Due to the large calculated reproducibility compared to the reference reproducibility no z-scores are calculated.

Methane (CH_4): This determination was problematic for a number of participants. Eight statistical outliers were observed and two other test results were excluded. The calculated reproducibility after rejection of the suspect data is in full agreement with the requirements of IEC60567:11.

Ethane (C_2H_6): This determination 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 IEC60567:11.

Ethene (C_2H_4): This determination was problematic for a number of participants. Six statistical outliers were observed and three other test results were excluded. The calculated reproducibility after rejection of the suspect data is in full agreement with the requirements of IEC60567:11.

Ethyne (C_2H_2): This determination was problematic for a number of participants. Seven statistical outliers were observed and three other test results were excluded. The calculated reproducibility after rejection of the suspect data is in full agreement with the requirements of IEC60567:11.

Propane (C_3H_8): This determination was problematic. Three statistical outliers were observed and one other test result was excluded. The calculated reproducibility after rejection of the suspect data is not in agreement with the requirements of IEC60567:11.

Propene (C_3H_6): This determination was problematic. Three statistical outliers were observed and one other test result was excluded. The calculated reproducibility after rejection of the suspect data is not in agreement with the requirements of 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 methods are presented in the next table.

Component	unit	n	average	2.8 * sd	R(lit)
Hydrogen (H_2)	µL/L	58	102.0	29.1	20.4
Oxygen (O_2)	µL/L	55	16069	5092	3214
Nitrogen (N_2)	µL/L	54	57795	15499	11559
Carbon monoxide (CO)	µL/L	60	102.2	33.1	20.4

Component	unit	n	average	2.8 * sd	R(lit)
Carbon dioxide (CO_2)	µL/L	57	144.0	80.7	(28.8)
Methane (CH_4)	µL/L	59	104.1	19.8	20.8
Ethane (C_2H_6)	µL/L	60	103.4	23.5	20.7
Ethene (C_2H_4)	µL/L	60	103.5	19.5	20.7
Ethyne (C_2H_2)	µL/L	59	102.0	20.4	20.4
Propane (C_3H_8)	µL/L	20	101.4	29.2	20.3
Propene (C_3H_6)	µL/L	18	104.2	28.7	20.8

Table 1: reproducibilities of components on sample #22229

For results between brackets no z-scores are calculated.

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

4.3 COMPARISON OF THE PROFICIENCY TEST OF NOVEMBER 2022 WITH PREVIOUS PTS

	November 2022	November 2021	November 2020	November 2019	November 2018
Number of reporting laboratories	69	63	59	45	53
Number of test results	655	606	561	428	496
Number of statistical outliers	53	24	60	44	25
Percentage of statistical outliers	8.1%	4.0%	10.7%	10.3%	5.0%

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 2022	November 2021	November 2020	November 2019	November 2018	IEC60567
Hydrogen (H_2)	10%	14%	9%	13%	10%	7%
Oxygen (O_2)	11%	14%	13%	13%	8%	7%
Nitrogen (N_2)	10%	15%	8%	11%	12%	7%
Carbon monoxide (CO)	12%	15%	8%	11%	10%	7%
Carbon dioxide (CO_2)	20%	31%	19%	18%	9%	7%
Methane (CH_4)	7%	11%	8%	8%	8%	7%
Ethane (C_2H_6)	8%	10%	9%	12%	9%	7%
Ethene (C_2H_4)	7%	9%	9%	9%	8%	7%
Ethyne (C_2H_2)	7%	12%	8%	12%	9%	7%
Propane (C_3H_8)	10%	8%	n.e.	n.e.	n.e.	n.e.
Propene (C_3H_6)	10%	8%	n.e.	11%	12%	n.e.

Table 3: development of the uncertainties over the years

In general, the overall performance of the 2022 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	iis22L14 in µL/L	Differences in µL/L	Calculated z-scores
Hydrogen (H_2)	102	102	0.0	0.00
Oxygen (O_2)	16000	16069	-69.3	-0.06
Nitrogen (N_2)	56500	57795	-1295.2	-0.31
Carbon monoxide (CO)	102	102	-0.2	-0.03
Carbon dioxide (CO_2)	135	144	-9.0	-0.87
Methane (CH_4)	102	104	-2.1	-0.28
Ethane (C_2H_6)	102	103	-1.4	-0.19
Ethene (C_2H_4)	102	104	-1.5	-0.20
Ethyne (C_2H_2)	102	102	0.0	-0.01
Propane (C_3H_8)	102	101	0.6	0.08
Propene (C_3H_6)	102	104	-2.2	-0.29

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

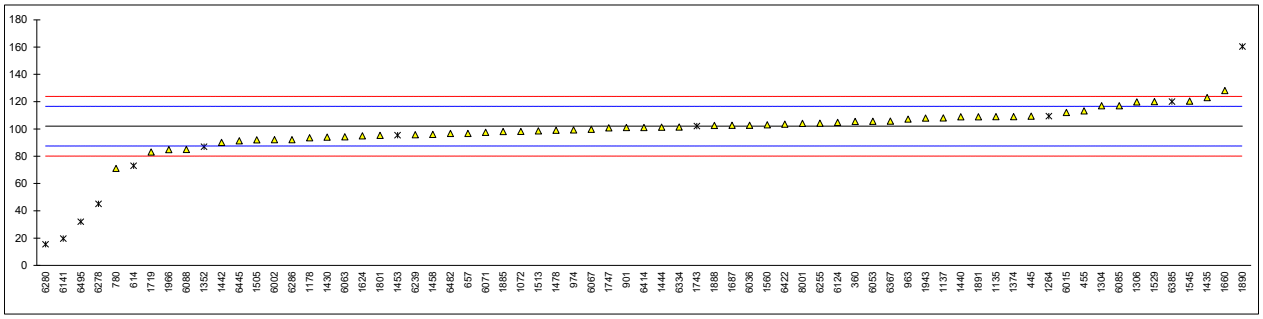
A vast majority (80%) of the reporting participants mentioned that they have used “Head Space” as extraction method. It appeared that in this PT the effect of the used extraction method on the determination of DGA in Transformer Oil is negligible.

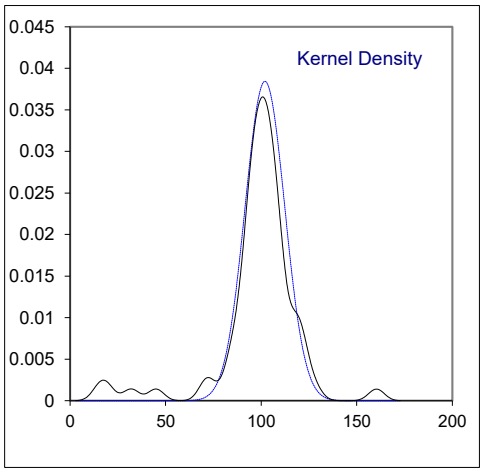
APPENDIX 1

Determination of Hydrogen (H_2) on sample #22229; results in µL/L

lab	method	value	mark	z(targ)	remarks
179		-----		-----	
237		-----		-----	
331		-----		-----	
360	IEC60567	105.4		0.47	
445	IEC60567	109.29		1.00	
455	IEC60567	113.3		1.55	
614	IEC60567	73	ex	-3.98	see paragraph 4.1
657	IEC60567	96.76		-0.72	
780	RD34.46.306	71		-4.26	
862		-----		-----	
901	IEC60567	101		-0.14	
912		-----		-----	
963	D3612-C	107.20		0.71	
974	D3612-C	99.2		-0.38	
975		-----		-----	
1072	IEC60567	98.1		-0.54	
1135	IEC60567	109		0.96	
1137	D3612	108		0.82	
1178	IEC60567	93.43		-1.18	
1264	D3612-C	109.3	ex	1.00	see paragraph 4.1
1304	In house	116.9		2.04	
1306	D3612-C	119.77		2.44	
1352	IEC60567	86.9	ex	-2.07	see paragraph 4.1
1374	D3612-A	109		0.96	
1430	IEC60567	94		-1.10	
1435	IEC60567	122.926		2.87	
1440	D3612-C	108.90		0.95	
1442	IEC60567	90.1		-1.63	
1444		101.23788		-0.11	
1453	D3612-C	95.39	ex	-0.91	see paragraph 4.1
1458	D3612-B	96		-0.82	
1478	IEC60567	99.0491		-0.41	
1505	D3612-C	91.9		-1.39	
1513	IEC60567	98.53		-0.48	
1529		120		2.47	
1545	D3612	120.37		2.52	
1560	IEC60567	103		0.14	
1624	IEC60567	94.9		-0.98	
1660	IEC60567	128.0		3.57	
1687	IEC60567	102.54		0.07	
1719	D3612-B	83		-2.61	
1743	IEC60567	102	ex	0.00	see paragraph 4.1
1747	IEC60567	100.76		-0.17	
1801	IEC60567	95.341		-0.91	
1885	D3612-C	98		-0.55	
1888	IEC60567	102.5		0.07	
1890	D3612-B	160.36	R(0.01)	8.01	
1891	IEC60567	108.9		0.95	
1943	D3612-C	107.88		0.81	
1966		84.9		-2.35	
6002	IEC60567	92		-1.37	
6015	D3612-B	112.0		1.37	
6036		102.72		0.10	
6053	IEC60567	105.5	C	0.48	first reported 53.50
6063		94.195		-1.07	
6067	IEC60567	99.8		-0.30	
6071		97.48		-0.62	
6085	D3612-C	117		2.06	
6088	IEC60567	85		-2.33	
6124	IEC60567	104.8		0.38	
6141	IEC60567	19.515	C,R(0.01)	-11.32	first reported 55.919
6239	D3612-C	95.70		-0.87	
6255	IEC60567	104.25		0.31	
6278	D3612-A	45	R(0.01)	-7.82	
6280	D3612-A	15.4	R(0.01)	-11.89	
6286	IEC60567	92.06		-1.36	
6334	IEC60567	101.42		-0.08	
6367	IEC60567	105.75999		0.52	
6385	D3612-C	120	ex	2.47	see paragraph 4.1
6414	IEC60567	101.0		-0.14	
6422	IEC60567	103.5		0.21	
6445	IEC60567	91.3		-1.47	
6482	D3612-C	96.70		-0.73	
6483		-----		-----	
6495	IEC60567	32	R(0.01)	-9.61	
8001	IEC60567	104.0		0.27	

normality	OK	
n	58	
outliers	5 +6ex	
mean (n)	102.00	
st.dev. (n)	10.381	RSD=10%
R(calc.)	29.07	
st.dev.(IEC60567:11)	7.286	
R(IEC60567:11)	20.40	

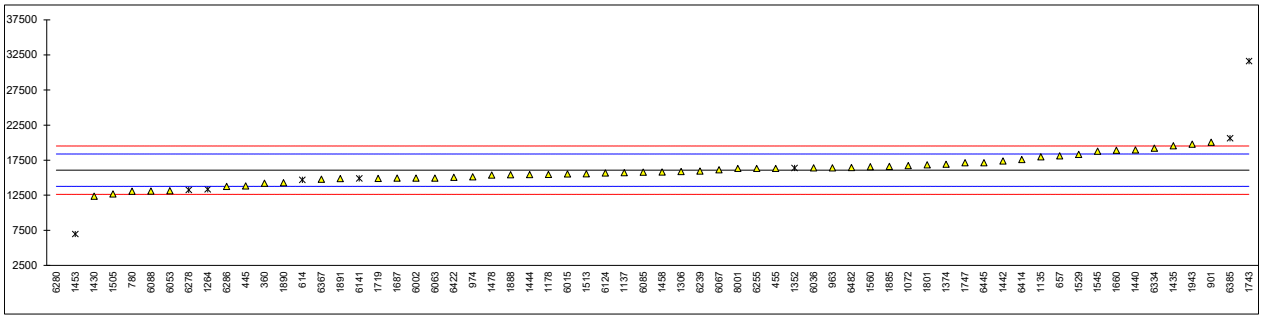


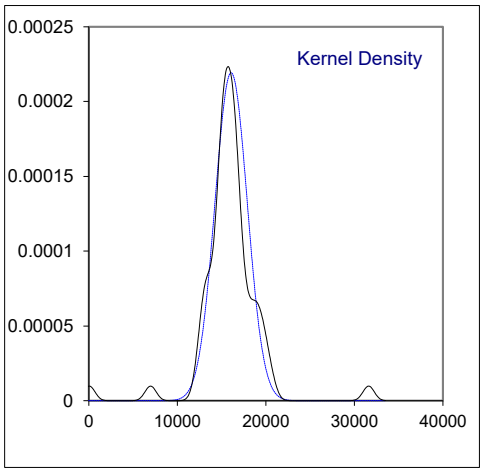


Determination of Oxygen (O_2) on sample #22229; results in µL/L

lab	method	value	mark	z(targ)	remarks
179		-----		-----	
237		-----		-----	
331		-----		-----	
360	IEC60567	14206.3		-1.62	
445	IEC60567	13816.05		-1.96	
455	IEC60567	16310.2		0.21	
614	IEC60567	14689	ex	-1.20	see paragraph 4.1
657	IEC60567	18106.59		1.77	
780	RD34.46.306	13050		-2.63	
862		-----		-----	
901	IEC60567	20034		3.45	
912		-----		-----	
963	D3612-C	16395.4		0.28	
974	D3612-C	15108		-0.84	
975		-----		-----	
1072	IEC60567	16722.0		0.57	
1135	IEC60567	17966		1.65	
1137	D3612	15703		-0.32	
1178	IEC60567	15465.97		-0.53	
1264	D3612-C	13321.1	ex	-2.39	see paragraph 4.1
1304		-----		-----	
1306	D3612-C	15867.6		-0.18	
1352	IEC60567	16385	ex	0.28	see paragraph 4.1
1374	D3612-A	16900		0.72	
1430	IEC60567	12346		-3.24	
1435	IEC60567	19552.318		3.03	
1440	D3612-C	18960.00		2.52	
1442	IEC60567	17362		1.13	
1444		15454.4		-0.54	
1453	D3612-C	6971.32	C,R(0.01)	-7.93	first reported 9397.23
1458	D3612-B	15800		-0.23	
1478	IEC60567	15350.5254		-0.63	
1505	D3612-C	12662.9		-2.97	
1513	IEC60567	15556		-0.45	
1529		18300		1.94	
1545	D3612	18765.62		2.35	
1560	IEC60567	16554		0.42	
1624		-----		-----	
1660	IEC60567	18885		2.45	
1687	IEC60567	14934.09		-0.99	
1719	D3612-B	14905		-1.01	
1743	IEC60567	31600	R(0.01)	13.53	
1747	IEC60567	17108.48		0.91	
1801	IEC60567	16821.233		0.66	
1885	D3612-C	16597		0.46	
1888	IEC60567	15399.7		-0.58	
1890	D3612-B	14271		-1.57	
1891	IEC60567	14870		-1.04	
1943	D3612-C	19750.47		3.21	
1966		-----		-----	
6002	IEC60567	14936		-0.99	
6015	D3612-B	15533.5		-0.47	
6036		16387		0.28	
6053	IEC60567	13145		-2.55	
6063		14936.929		-0.99	
6067	IEC60567	16113.2		0.04	
6071		-----		-----	
6085	D3612-C	15777		-0.25	
6088	IEC60567	13070		-2.61	
6124	IEC60567	15649.3		-0.37	
6141	IEC60567	14890.9	ex	-1.03	see paragraph 4.1
6239	D3612-C	15926.38		-0.12	
6255	IEC60567	16304.75		0.21	
6278	D3612-A	13249	ex	-2.46	see paragraph 4.1
6280	D3612-A	52.92	R(0.01)	-13.95	
6286	IEC60567	13752.37		-2.02	
6334	IEC60567	19186.86		2.72	
6367	IEC60567	14765		-1.14	
6385	D3612-C	20607	ex	3.95	see paragraph 4.1
6414	IEC60567	17580		1.32	
6422	IEC60567	15045.2		-0.89	
6445	IEC60567	17111		0.91	
6482	D3612-C	16432.72		0.32	
6483		-----		-----	
6495		-----		-----	
8001	IEC60567	16303.0		0.20	

normality	OK	
n	55	
outliers	3 +6ex	
mean (n)	16069.31	
st.dev. (n)	1818.690	RSD=11%
R(calc.)	5092.33	
st.dev.(IEC60567:11)	1147.808	
R(IEC60567:11)	3213.86	

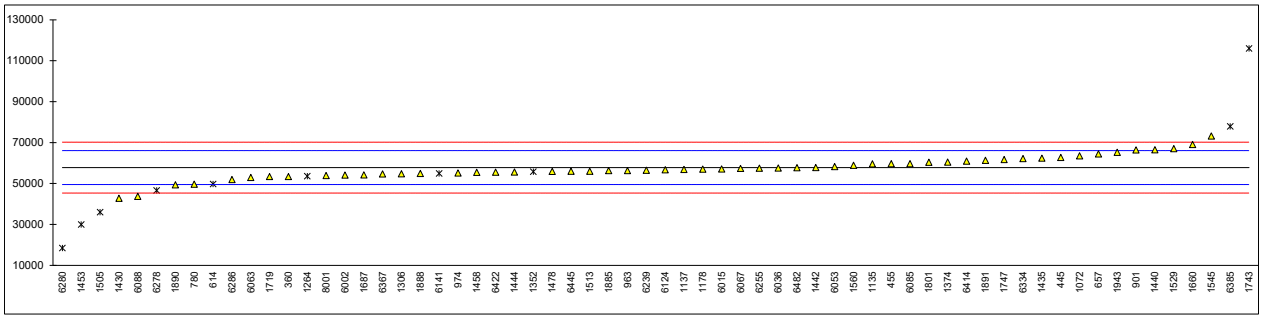


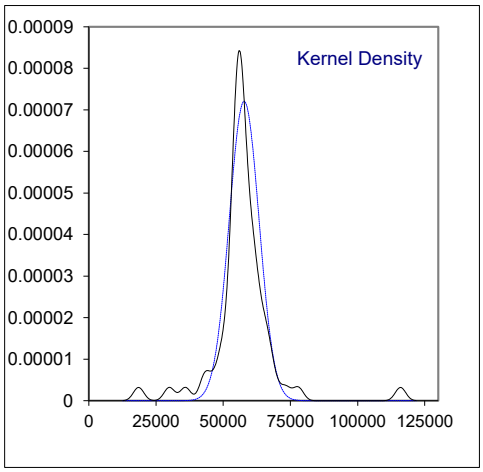


Determination of Nitrogen (N_2) on sample #22229; results in µL/L

lab	method	value	mark	z(targ)	remarks
179		-----		-----	
237		-----		-----	
331		-----		-----	
360	IEC60567	53380.7		-1.07	
445	IEC60567	62751.95		1.20	
455	IEC60567	59663.5		0.45	
614	IEC60567	49760	ex	-1.95	see paragraph 4.1
657	IEC60567	64473.30		1.62	
780	RD34.46.306	49660		-1.97	
862		-----		-----	
901	IEC60567	66334		2.07	
912		-----		-----	
963	D3612-C	56278.8		-0.37	
974	D3612-C	55106		-0.65	
975		-----		-----	
1072	IEC60567	63492.3		1.38	
1135	IEC60567	59602		0.44	
1137	D3612	56881		-0.22	
1178	IEC60567	56988.59		-0.20	
1264	D3612-C	53618	ex	-1.01	see paragraph 4.1
1304		-----		-----	
1306	D3612-C	54722.1		-0.74	
1352	IEC60567	55756	ex	-0.49	see paragraph 4.1
1374	D3612-A	60500		0.66	
1430	IEC60567	42798		-3.63	
1435	IEC60567	62326.006		1.10	
1440	D3612-C	66462.67		2.10	
1442	IEC60567	57778		0.00	
1444		55614.4		-0.53	
1453	D3612-C	29951.8	C,R(0.01)	-6.74	first reported 40357.1
1458	D3612-B	55500		-0.56	
1478	IEC60567	55921.9219		-0.45	
1505	D3612-C	35926.6	R(0.05)	-5.30	
1513	IEC60567	55967		-0.44	
1529		67000		2.23	
1545	D3612	73182.71		3.73	
1560	IEC60567	58874		0.26	
1624		-----		-----	
1660	IEC60567	69055		2.73	
1687	IEC60567	54186.66		-0.87	
1719	D3612-B	53375		-1.07	
1743	IEC60567	116000	R(0.01)	14.10	
1747	IEC60567	61693.32		0.94	
1801	IEC60567	60421.081		0.64	
1885	D3612-C	56260		-0.37	
1888	IEC60567	54888.3		-0.70	
1890	D3612-B	49349		-2.05	
1891	IEC60567	61259		0.84	
1943	D3612-C	65173.57		1.79	
1966		-----		-----	
6002	IEC60567	54120		-0.89	
6015	D3612-B	57089.5		-0.17	
6036		57573		-0.05	
6053	IEC60567	58207		0.10	
6063		52938.275		-1.18	
6067	IEC60567	57330.0		-0.11	
6071		-----		-----	
6085	D3612-C	59675		0.46	
6088	IEC60567	43740		-3.40	
6124	IEC60567	56682.6		-0.27	
6141	IEC60567	54888.5	ex	-0.70	see paragraph 4.1
6239	D3612-C	56495.74		-0.31	
6255	IEC60567	57480.25		-0.08	
6278	D3612-A	46640	ex	-2.70	see paragraph 4.1
6280	D3612-A	18503	R(0.01)	-9.52	
6286	IEC60567	51932.98		-1.42	
6334	IEC60567	62129.45		1.05	
6367	IEC60567	54664		-0.76	
6385	D3612-C	77911	R(0.05)	4.87	
6414	IEC60567	60938		0.76	
6422	IEC60567	55515.3		-0.55	
6445	IEC60567	55961		-0.44	
6482	D3612-C	57687.93		-0.03	
6483		-----		-----	
6495		-----		-----	
8001	IEC60567	53861.0		-0.95	

normality	suspect	
n	54	
outliers	5 +5ex	
mean (n)	57795.20	
st.dev. (n)	5535.288	RSD=10%
R(calc.)	15498.81	
st.dev.(IEC60567:11)	4128.229	
R(IEC60567:11)	11559.04	

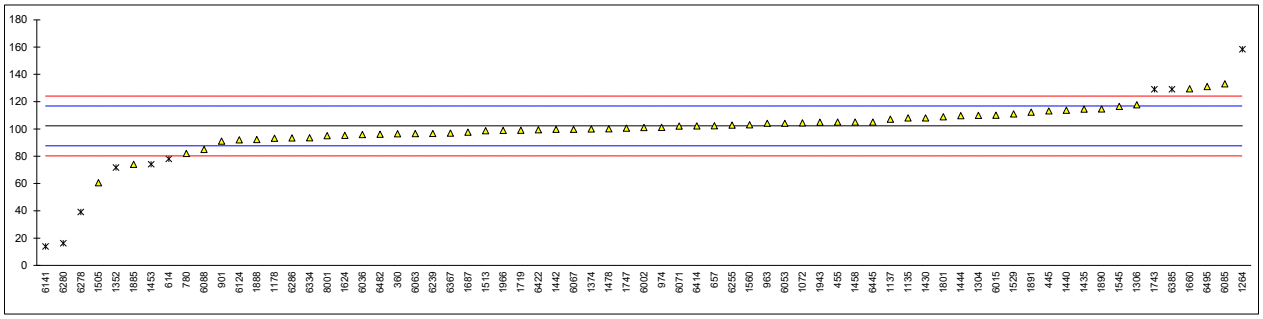


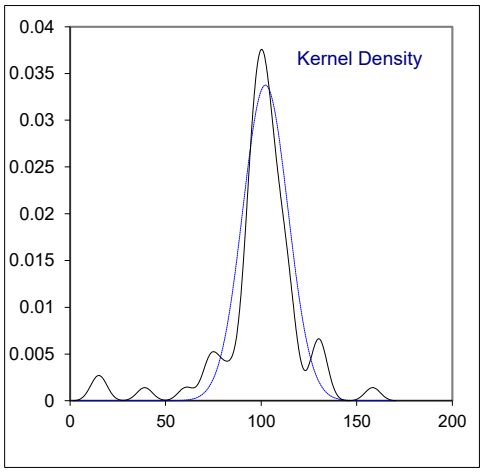


Determination of Carbon monoxide (CO) on sample #22229; results in µL/L

lab	method	value	mark	z(targ)	remarks
179		-----		-----	
237		-----		-----	
331		-----		-----	
360	IEC60567	96.4		-0.80	
445	IEC60567	113.09		1.49	
455	IEC60567	105		0.38	
614	IEC60567	78	ex	-3.32	see paragraph 4.1
657	IEC60567	102.24		0.00	
780	RD34.46.306	82		-2.77	
862		-----		-----	
901	IEC60567	91		-1.54	
912		-----		-----	
963	D3612-C	104.10		0.26	
974	D3612-C	101.1		-0.15	
975		-----		-----	
1072	IEC60567	104.4		0.30	
1135	IEC60567	108		0.79	
1137	D3612	107		0.65	
1178	IEC60567	93.16		-1.24	
1264	D3612-C	158.4	R(0.01)	7.69	
1304	In house	109.9		1.05	
1306	D3612-C	117.58		2.10	
1352	IEC60567	71.7	ex	-4.18	see paragraph 4.1
1374	D3612-A	100		-0.30	
1430	IEC60567	108		0.79	
1435	IEC60567	114.484		1.68	
1440	D3612-C	113.72		1.57	
1442	IEC60567	99.6		-0.36	
1444		109.69426		1.02	
1453	D3612-C	74.07	ex	-3.86	see paragraph 4.1
1458	D3612-B	105		0.38	
1478	IEC60567	100.1313		-0.29	
1505	D3612-C	60.6		-5.70	
1513	IEC60567	98.69		-0.48	
1529		111		1.20	
1545	D3612	116.46		1.95	
1560	IEC60567	103		0.11	
1624	IEC60567	95.3		-0.95	
1660	IEC60567	129.4		3.72	
1687	IEC60567	97.54		-0.64	
1719	D3612-B	99		-0.44	
1743	IEC60567	129	ex	3.67	see paragraph 4.1
1747	IEC60567	100.47		-0.24	
1801	IEC60567	108.939		0.92	
1885	D3612-C	74		-3.87	
1888	IEC60567	92.2		-1.37	
1890	D3612-B	114.6		1.70	
1891	IEC60567	112.3		1.38	
1943	D3612-C	104.86		0.36	
1966		98.85		-0.46	
6002	IEC60567	101		-0.17	
6015	D3612-B	110.0		1.07	
6036		95.829		-0.88	
6053	IEC60567	104.13	C	0.26	first reported 51.29
6063		96.445		-0.79	
6067	IEC60567	99.6		-0.36	
6071		102.01		-0.03	
6085	D3612-C	133		4.22	
6088	IEC60567	85		-2.36	
6124	IEC60567	91.9		-1.41	
6141	IEC60567	13.786	C,R(0.01)	-12.11	first reported 51.027
6239	D3612-C	96.64		-0.76	
6255	IEC60567	102.75		0.07	
6278	D3612-A	39	R(0.01)	-8.66	
6280	D3612-A	16.2	R(0.01)	-11.78	
6286	IEC60567	93.38		-1.21	
6334	IEC60567	93.43		-1.20	
6367	IEC60567	96.92647		-0.73	
6385	D3612-C	129	ex	3.67	see paragraph 4.1
6414	IEC60567	102.1		-0.02	
6422	IEC60567	99.3		-0.40	
6445	IEC60567	105		0.38	
6482	D3612-C	96.04		-0.85	
6483		-----		-----	
6495	IEC60567	131		3.94	
8001	IEC60567	95.0		-0.99	

normality	not OK	
n	60	
outliers	4 +5ex	
mean (n)	102.22	
st.dev. (n)	11.819	RSD=12%
R(calc.)	33.09	
st.dev.(IEC60567:11)	7.302	
R(IEC60567:11)	20.44	

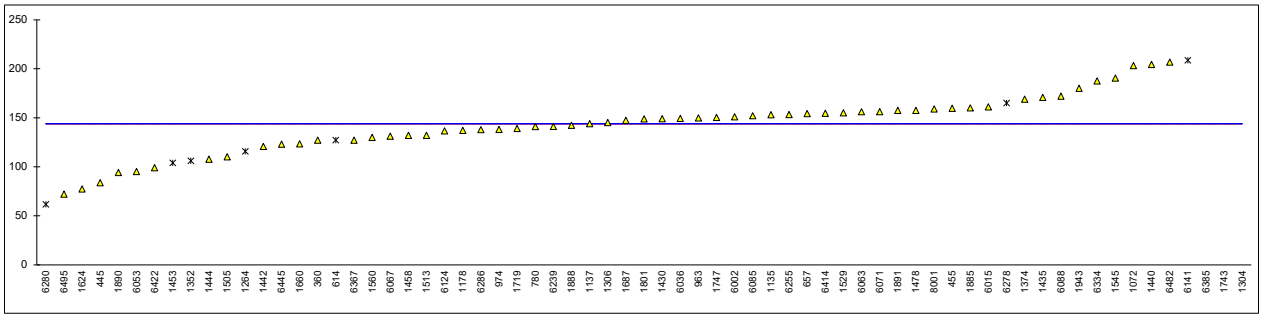


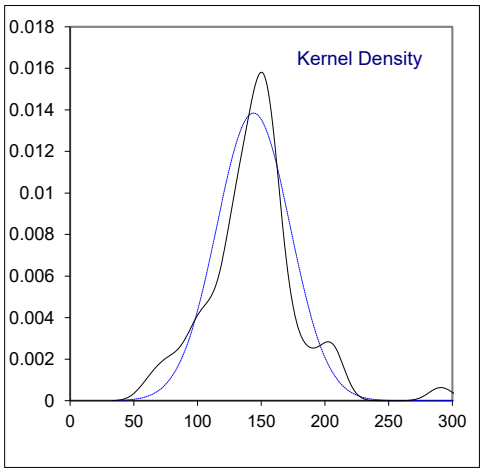


Determination of Carbon dioxide (CO_2) on sample #22229; results in µL/L

lab	method	value	mark	z(targ)	remarks
179		-----		-----	
237		-----		-----	
331		-----		-----	
360	IEC60567	127.0		-----	
445	IEC60567	83.76		-----	
455	IEC60567	159.5		-----	
614	IEC60567	127	ex	-----	see paragraph 4.1
657	IEC60567	154.25		-----	
780	RD34.46.306	141		-----	
862		-----		-----	
901		-----		-----	
912		-----		-----	
963	D3612-C	149.80		-----	
974	D3612-C	138.1		-----	
975		-----		-----	
1072	IEC60567	203.2		-----	
1135	IEC60567	153		-----	
1137	D3612	144		-----	
1178	IEC60567	137.05		-----	
1264	D3612-C	115.8	ex	-----	see paragraph 4.1
1304	In house	674.2	R(0.01)	-----	
1306	D3612-C	144.98		-----	
1352	IEC60567	106	ex	-----	see paragraph 4.1
1374	D3612-A	169		-----	
1430	IEC60567	149		-----	
1435	IEC60567	170.795		-----	
1440	D3612-C	204.33		-----	
1442	IEC60567	120.7		-----	
1444		107.66349		-----	
1453	D3612-C	103.97	ex	-----	see paragraph 4.1
1458	D3612-B	132		-----	
1478	IEC60567	157.4846		-----	
1505	D3612-C	110.2		-----	
1513	IEC60567	132.1		-----	
1529		155		-----	
1545	D3612	190.38		-----	
1560	IEC60567	130		-----	
1624	IEC60567	77.3		-----	
1660	IEC60567	123.3		-----	
1687	IEC60567	147.27		-----	
1719	D3612-B	139		-----	
1743	IEC60567	453	R(0.01)	-----	
1747	IEC60567	150.31		-----	
1801	IEC60567	148.852		-----	
1885	D3612-C	160		-----	
1888	IEC60567	142.4		-----	
1890	D3612-B	94.1		-----	
1891	IEC60567	157.4		-----	
1943	D3612-C	180	C	-----	first reported 225.85
1966		-----		-----	
6002	IEC60567	151		-----	
6015	D3612-B	161.0		-----	
6036		149.27		-----	
6053	IEC60567	95.17		-----	
6063		156.119		-----	
6067	IEC60567	131.2		-----	
6071		156.27		-----	
6085	D3612-C	152		-----	
6088	IEC60567	172		-----	
6124	IEC60567	136.6		-----	
6141	IEC60567	208.536	ex,C	-----	see paragraph 4.1 / first reported 268.703
6239	D3612-C	141.07		-----	
6255	IEC60567	153.25		-----	
6278	D3612-A	165	ex	-----	see paragraph 4.1
6280	D3612-A	61.6	ex	-----	see paragraph 4.1
6286	IEC60567	137.79		-----	
6334	IEC60567	187.52		-----	
6367	IEC60567	127.02650		-----	
6385	D3612-C	291	R(0.01)	-----	
6414	IEC60567	154.6		-----	
6422	IEC60567	98.9		-----	
6445	IEC60567	123		-----	
6482	D3612-C	206.74		-----	
6483		-----		-----	
6495	IEC60567	72		-----	
8001	IEC60567	159.0		-----	

normality	OK	
n	57	
outliers	3 +7ex	
mean (n)	143.96	
st.dev. (n)	28.812	RSD=20%
R(calc.)	80.67	
st.dev.(IEC60567:11)	(10.283)	
R(IEC60567:11)	(28.79)	

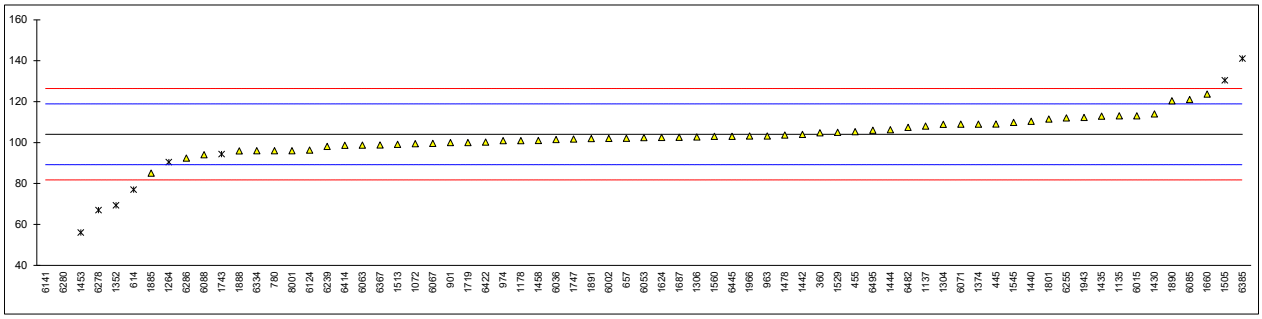


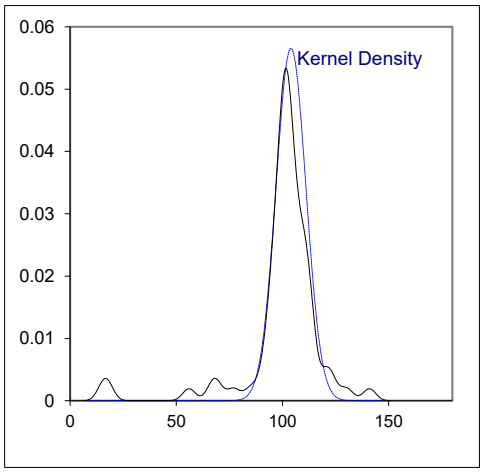


Determination of Methane (CH_4) on sample #22229; results in µL/L

lab	method	value	mark	z(targ)	remarks
179		-----		-----	
237		-----		-----	
331		-----		-----	
360	IEC60567	104.8		0.10	
445	IEC60567	109.07		0.67	
455	IEC60567	105.3		0.17	
614	IEC60567	77	R(0.05)	-3.64	
657	IEC60567	102.06		-0.27	
780	RD34.46.306	96		-1.08	
862		-----		-----	
901	IEC60567	100		-0.55	
912		-----		-----	
963	D3612-C	103.20		-0.12	
974	D3612-C	100.9		-0.42	
975		-----		-----	
1072	IEC60567	99.5		-0.61	
1135	IEC60567	113		1.20	
1137	D3612	108		0.53	
1178	IEC60567	100.92		-0.42	
1264	D3612-C	90.5	ex	-1.82	see paragraph 4.1
1304	In house	108.9		0.65	
1306	D3612-C	102.71		-0.18	
1352	IEC60567	69.3	R(0.05)	-4.68	
1374	D3612-A	109		0.67	
1430	IEC60567	114		1.34	
1435	IEC60567	112.915		1.19	
1440	D3612-C	110.33		0.84	
1442	IEC60567	104.0		-0.01	
1444		106.24407		0.29	
1453	D3612-C	56.03	C,R(0.01)	-6.46	first reported 76.06
1458	D3612-B	101		-0.41	
1478	IEC60567	103.6519		-0.05	
1505	D3612-C	130.4	R(0.05)	3.54	
1513	IEC60567	99.09		-0.67	
1529		105		0.13	
1545	D3612	109.83		0.78	
1560	IEC60567	103		-0.14	
1624	IEC60567	102.5		-0.21	
1660	IEC60567	123.7		2.64	
1687	IEC60567	102.59		-0.20	
1719	D3612-B	100		-0.55	
1743	IEC60567	94.3	ex	-1.31	see paragraph 4.1
1747	IEC60567	101.73		-0.31	
1801	IEC60567	111.499		1.00	
1885	D3612-C	85		-2.56	
1888	IEC60567	95.9		-1.10	
1890	D3612-B	120.34		2.19	
1891	IEC60567	101.9		-0.29	
1943	D3612-C	112.27		1.11	
1966		103.15		-0.12	
6002	IEC60567	102		-0.28	
6015	D3612-B	113.0		1.20	
6036		101.49		-0.35	
6053	IEC60567	102.45	C	-0.22	first reported 51.93
6063		98.741		-0.72	
6067	IEC60567	99.6		-0.60	
6071		108.95		0.66	
6085	D3612-C	121		2.28	
6088	IEC60567	94		-1.35	
6124	IEC60567	96.3		-1.04	
6141	IEC60567	15.568	C,R(0.01)	-11.91	first reported 53.673
6239	D3612-C	98.12		-0.80	
6255	IEC60567	112		1.07	
6278	D3612-A	67	R(0.05)	-4.99	
6280	D3612-A	17.8	R(0.01)	-11.61	
6286	IEC60567	92.42		-1.57	
6334	IEC60567	95.99		-1.09	
6367	IEC60567	98.82432		-0.70	
6385	D3612-C	141	R(0.05)	4.97	
6414	IEC60567	98.7		-0.72	
6422	IEC60567	100.2		-0.52	
6445	IEC60567	103		-0.14	
6482	D3612-C	107.48		0.46	
6483		-----		-----	
6495	IEC60567	106		0.26	
8001	IEC60567	96.0		-1.08	

normality	OK	
n	59	
outliers	8 +2ex	
mean (n)	104.06	
st.dev. (n)	7.060	RSD=7%
R(calc.)	19.77	
st.dev.(IEC60567:11)	7.433	
R(IEC60567:11)	20.81	

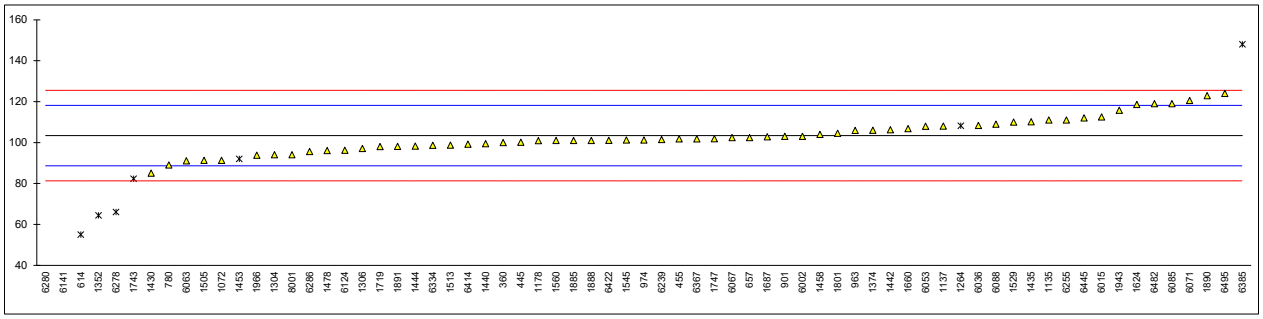


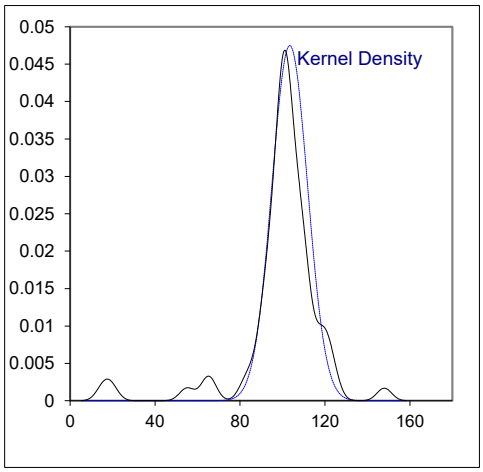


Determination of Ethane (C_2H_6) on sample #22229; results in µL/L

lab	method	value	mark	z(targ)	remarks
179		-----		-----	
237		-----		-----	
331		-----		-----	
360	IEC60567	100.0		-0.47	
445	IEC60567	100.09		-0.45	
455	IEC60567	101.8		-0.22	
614	IEC60567	55	R(0.01)	-6.56	
657	IEC60567	102.44		-0.13	
780	RD34.46.306	89		-1.95	
862		-----		-----	
901	IEC60567	103		-0.06	
912		-----		-----	
963	D3612-C	105.90		0.33	
974	D3612-C	101.2		-0.30	
975		-----		-----	
1072	IEC60567	91.3		-1.64	
1135	IEC60567	111		1.02	
1137	D3612	108		0.62	
1178	IEC60567	100.89		-0.34	
1264	D3612-C	108.2	ex	0.64	see paragraph 4.1
1304	In house	94.0		-1.28	
1306	D3612-C	97.11		-0.86	
1352	IEC60567	64.4	R(0.01)	-5.28	
1374	D3612-A	106		0.35	
1430	IEC60567	85		-2.50	
1435	IEC60567	110.133		0.91	
1440	D3612-C	99.49		-0.53	
1442	IEC60567	106.2		0.37	
1444		98.25427		-0.70	
1453	D3612-C	91.98	ex	-1.55	see paragraph 4.1
1458	D3612-B	104		0.08	
1478	IEC60567	96.0346		-1.00	
1505	D3612-C	91.3		-1.64	
1513	IEC60567	98.76		-0.63	
1529		110		0.89	
1545	D3612	101.18		-0.31	
1560	IEC60567	101		-0.33	
1624	IEC60567	118.6		2.05	
1660	IEC60567	106.8		0.46	
1687	IEC60567	102.82		-0.08	
1719	D3612-B	98		-0.74	
1743	IEC60567	82.3	ex	-2.86	see paragraph 4.1
1747	IEC60567	101.84		-0.22	
1801	IEC60567	104.531		0.15	
1885	D3612-C	101		-0.33	
1888	IEC60567	101.0		-0.33	
1890	D3612-B	122.91		2.64	
1891	IEC60567	98.1		-0.72	
1943	D3612-C	115.82		1.68	
1966		93.8		-1.30	
6002	IEC60567	103		-0.06	
6015	D3612-B	112.5		1.23	
6036		108.31		0.66	
6053	IEC60567	107.98	C	0.61	first reported 55.94
6063		91.054		-1.68	
6067	IEC60567	102.4		-0.14	
6071		120.57		2.32	
6085	D3612-C	119		2.11	
6088	IEC60567	109		0.75	
6124	IEC60567	96.2		-0.98	
6141	IEC60567	19.343	C,R(0.01)	-11.38	first reported 54.554
6239	D3612-C	101.47		-0.27	
6255	IEC60567	111		1.02	
6278	D3612-A	66	R(0.01)	-5.07	
6280	D3612-A	15.6	R(0.01)	-11.89	
6286	IEC60567	95.64		-1.06	
6334	IEC60567	98.69		-0.64	
6367	IEC60567	101.82424		-0.22	
6385	D3612-C	148	R(0.01)	6.03	
6414	IEC60567	99.2		-0.57	
6422	IEC60567	101.1		-0.32	
6445	IEC60567	112		1.16	
6482	D3612-C	118.99		2.11	
6483		-----		-----	
6495	IEC60567	124		2.78	
8001	IEC60567	94.0		-1.28	

normality	OK	
n	60	
outliers	6 +3ex	
mean (n)	103.44	
st.dev. (n)	8.402	RSD=8%
R(calc.)	23.53	
st.dev.(IEC60567:11)	7.388	
R(IEC60567:11)	20.69	

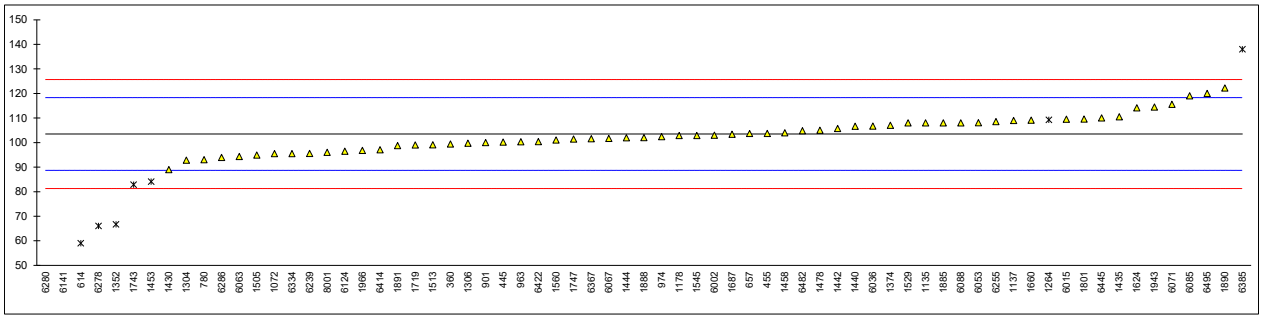


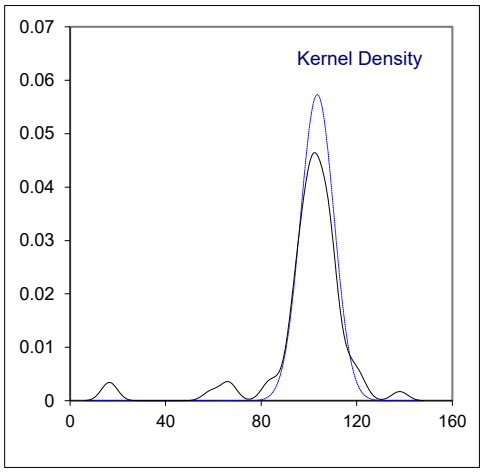


Determination of Ethene (C_2H_4) on sample #22229; results in µL/L

lab	method	value	mark	z(targ)	remarks
179		-----		-----	
237		-----		-----	
331		-----		-----	
360	IEC60567	99.4		-0.56	
445	IEC60567	100.16		-0.45	
455	IEC60567	103.7		0.03	
614	IEC60567	59	R(0.01)	-6.02	
657	IEC60567	103.64		0.02	
780	RD34.46.306	93		-1.42	
862		-----		-----	
901	IEC60567	100		-0.47	
912		-----		-----	
963	D3612-C	100.30		-0.43	
974	D3612-C	102.4		-0.15	
975		-----		-----	
1072	IEC60567	95.5		-1.08	
1135	IEC60567	108		0.61	
1137	D3612	109		0.74	
1178	IEC60567	102.85		-0.09	
1264	D3612-C	109.2	ex	0.77	see paragraph 4.1
1304	In house	92.8		-1.45	
1306	D3612-C	99.73		-0.51	
1352	IEC60567	66.7	R(0.01)	-4.98	
1374	D3612-A	107		0.47	
1430	IEC60567	89		-1.96	
1435	IEC60567	110.488		0.94	
1440	D3612-C	106.64		0.42	
1442	IEC60567	105.7		0.30	
1444		101.91818		-0.22	
1453	D3612-C	84.10	ex	-2.63	see paragraph 4.1
1458	D3612-B	104		0.07	
1478	IEC60567	104.9849		0.20	
1505	D3612-C	94.9		-1.16	
1513	IEC60567	99.08		-0.60	
1529		108		0.61	
1545	D3612	102.86		-0.09	
1560	IEC60567	101		-0.34	
1624	IEC60567	114.1		1.43	
1660	IEC60567	109.1		0.76	
1687	IEC60567	103.39		-0.02	
1719	D3612-B	99		-0.61	
1743	IEC60567	82.9	ex	-2.79	see paragraph 4.1
1747	IEC60567	101.45		-0.28	
1801	IEC60567	109.603		0.82	
1885	D3612-C	108		0.61	
1888	IEC60567	102.0		-0.20	
1890	D3612-B	122.20		2.53	
1891	IEC60567	98.8		-0.64	
1943	D3612-C	114.44		1.48	
1966		96.8		-0.91	
6002	IEC60567	103		-0.07	
6015	D3612-B	109.5		0.81	
6036		106.66		0.43	
6053	IEC60567	108.08	C	0.62	first reported 56.6
6063		94.323		-1.24	
6067	IEC60567	101.7		-0.24	
6071		115.60		1.64	
6085	D3612-C	119		2.09	
6088	IEC60567	108		0.61	
6124	IEC60567	96.5		-0.95	
6141	IEC60567	16.611	C,R(0.01)	-11.75	first reported 56.466
6239	D3612-C	95.55		-1.08	
6255	IEC60567	108.5		0.67	
6278	D3612-A	66	R(0.01)	-5.07	
6280	D3612-A	16.4	R(0.01)	-11.78	
6286	IEC60567	93.93		-1.30	
6334	IEC60567	95.50		-1.08	
6367	IEC60567	101.56214		-0.26	
6385	D3612-C	138	R(0.01)	4.66	
6414	IEC60567	97.1		-0.87	
6422	IEC60567	100.4		-0.42	
6445	IEC60567	110		0.88	
6482	D3612-C	104.82		0.18	
6483		-----		-----	
6495	IEC60567	120		2.23	
8001	IEC60567	96.0		-1.02	

normality	OK	
n	60	
outliers	6 +3ex	
mean (n)	103.51	
st.dev. (n)	6.965	RSD=7%
R(calc.)	19.50	
st.dev.(IEC60567:11)	7.394	
R(IEC60567:11)	20.70	

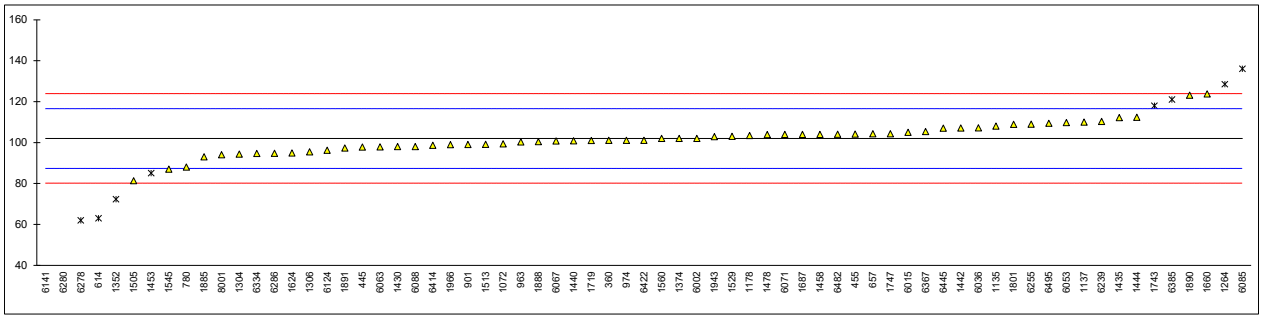


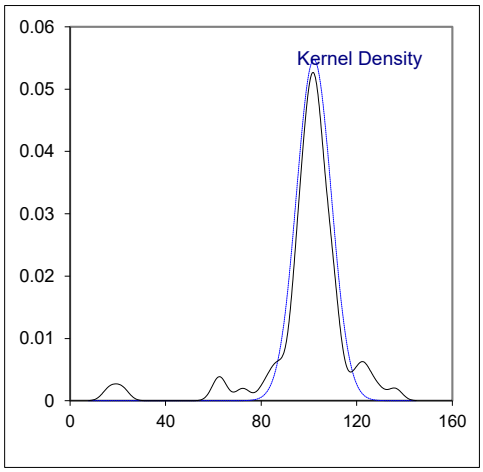


Determination of Ethyne (C_2H_2) on sample #22229; results in µL/L

lab	method	value	mark	z(targ)	remarks
179		-----		-----	
237		-----		-----	
331		-----		-----	
360	IEC60567	101.1		-0.13	
445	IEC60567	97.77		-0.59	
455	IEC60567	104.1		0.28	
614	IEC60567	63	R(0.01)	-5.36	
657	IEC60567	104.23		0.30	
780	RD34.46.306	88		-1.93	
862		-----		-----	
901	IEC60567	99		-0.42	
912		-----		-----	
963	D3612-C	100.30		-0.24	
974	D3612-C	101.1		-0.13	
975		-----		-----	
1072	IEC60567	99.3		-0.38	
1135	IEC60567	108		0.82	
1137	D3612	110		1.09	
1178	IEC60567	103.41		0.19	
1264	D3612-C	128.5	R(0.05)	3.63	
1304	In house	94.3		-1.06	
1306	D3612-C	95.47		-0.90	
1352	IEC60567	72.3	R(0.05)	-4.08	
1374	D3612-A	102		-0.01	
1430	IEC60567	98		-0.55	
1435	IEC60567	112.145		1.39	
1440	D3612-C	100.87		-0.16	
1442	IEC60567	107.1		0.69	
1444		112.31783		1.41	
1453	D3612-C	85.03	ex	-2.33	see paragraph 4.1
1458	D3612-B	104		0.27	
1478	IEC60567	103.8671		0.25	
1505	D3612-C	81.3		-2.85	
1513	IEC60567	99.12		-0.40	
1529		103		0.13	
1545	D3612	86.96		-2.07	
1560	IEC60567	102		-0.01	
1624	IEC60567	94.9		-0.98	
1660	IEC60567	123.8		2.99	
1687	IEC60567	103.99		0.27	
1719	D3612-B	101		-0.14	
1743	IEC60567	118	ex	2.19	see paragraph 4.1
1747	IEC60567	104.23		0.30	
1801	IEC60567	108.891		0.94	
1885	D3612-C	93		-1.24	
1888	IEC60567	100.4		-0.22	
1890	D3612-B	123.12		2.89	
1891	IEC60567	97.3		-0.65	
1943	D3612-C	102.91		0.12	
1966		98.95		-0.42	
6002	IEC60567	102		-0.01	
6015	D3612-B	105.0		0.41	
6036		107.16		0.70	
6053	IEC60567	109.74	C	1.06	first reported 56.17
6063		97.846		-0.58	
6067	IEC60567	100.8		-0.17	
6071		103.97		0.27	
6085	D3612-C	136	R(0.01)	4.66	
6088	IEC60567	98		-0.55	
6124	IEC60567	96.2		-0.80	
6141	IEC60567	16.625	C,R(0.01)	-11.72	first reported 51.47
6239	D3612-C	110.29		1.13	
6255	IEC60567	109		0.96	
6278	D3612-A	62	R(0.01)	-5.49	
6280	D3612-A	21.7	R(0.01)	-11.02	
6286	IEC60567	94.74		-1.00	
6334	IEC60567	94.65		-1.01	
6367	IEC60567	105.37084		0.46	
6385	D3612-C	121	ex	2.60	see paragraph 4.1
6414	IEC60567	98.7		-0.46	
6422	IEC60567	101.1		-0.13	
6445	IEC60567	107		0.68	
6482	D3612-C	104.01		0.27	
6483		-----		-----	
6495	IEC60567	109.4		1.01	
8001	IEC60567	94.0		-1.10	

normality	not OK	
n	59	
outliers	7 +3ex	
mean (n)	102.04	
st.dev. (n)	7.287	RSD=7%
R(calc.)	20.40	
st.dev.(IEC60567:11)	7.288	
R(IEC60567:11)	20.41	

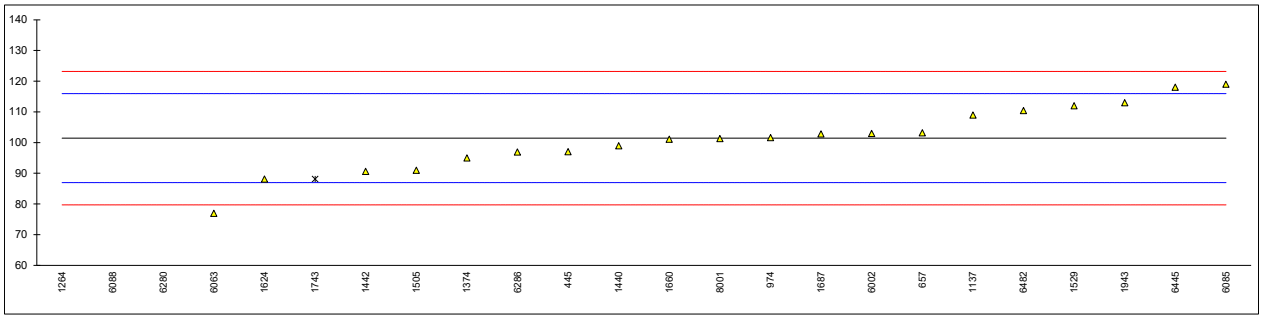


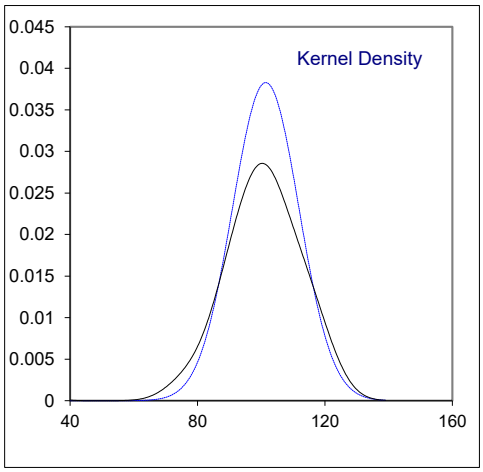


Determination of Propane (C_3H_8) on sample #22229; results in µL/L

lab	method	value	mark	z(targ)	remarks
179		-----		-----	
237		-----		-----	
331		-----		-----	
360		-----		-----	
445	IEC60567	97.05		-0.61	
455		-----		-----	
614		-----		-----	
657	IEC60567	103.18		0.24	
780		-----		-----	
862		-----		-----	
901		-----		-----	
912		-----		-----	
963		-----		-----	
974	D3612-C	101.6		0.02	
975		-----		-----	
1072		-----		-----	
1135		-----		-----	
1137	D3612	109		1.04	
1178		-----		-----	
1264	D3612-C	0	R(0.01)	-14.00	
1304		-----		-----	
1306		-----		-----	
1352		-----		-----	
1374	D3612-A	95		-0.89	
1430		-----		-----	
1435		-----		-----	
1440	D3612-C	98.96		-0.34	
1442	IEC60567	90.6		-1.50	
1444		-----		-----	
1453		-----		-----	
1458		-----		-----	
1478		-----		-----	
1505	D3612-C	91.0		-1.44	
1513		-----		-----	
1529		112		1.46	
1545		-----		-----	
1560		-----		-----	
1624	IEC60567	88.1		-1.84	
1660	IEC60567	101.1		-0.05	
1687	IEC60567	102.77		0.18	
1719		-----		-----	
1743	IEC60567	88.1	ex	-1.84	see paragraph 4.1
1747		-----		-----	
1801		-----		-----	
1885		-----		-----	
1888		-----		-----	
1890		-----		-----	
1891		-----		-----	
1943	D3612-C	112.99		1.59	
1966		-----		-----	
6002	IEC60567	103		0.21	
6015		-----		-----	
6036		-----		-----	
6053		-----		-----	
6063		76.981		-3.38	
6067		-----		-----	
6071		-----		-----	
6085	D3612-C	119		2.42	
6088	IEC60567	4.5	C,R(0.01)	-13.38	first reported 0
6124		-----		-----	
6141		-----		-----	
6239		-----		-----	
6255		-----		-----	
6278		-----		-----	
6280	D3612-A	22.3	R(0.01)	-10.92	
6286	IEC60567	96.90		-0.63	
6334		-----		-----	
6367		-----		-----	
6385		-----		-----	
6414		-----		-----	
6422		-----		-----	
6445	IEC60567	118		2.28	
6482	D3612-C	110.44		1.24	
6483		-----		-----	
6495		-----		-----	
8001	IEC60567	101.3		-0.02	

normality	OK	
n	20	
outliers	3 +1ex	
mean (n)	101.45	
st.dev. (n)	10.421	RSD=10%
R(calc.)	29.18	
st.dev.(IEC60567:11)	7.246	
R(IEC60567:11)	20.29	

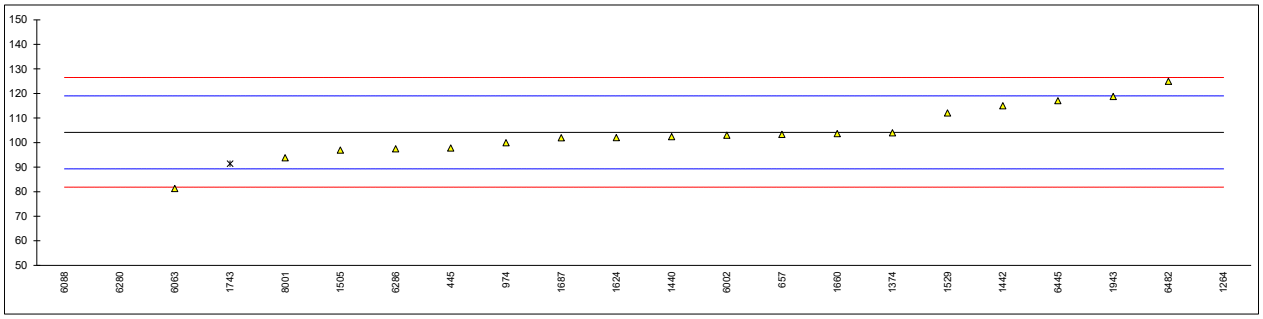


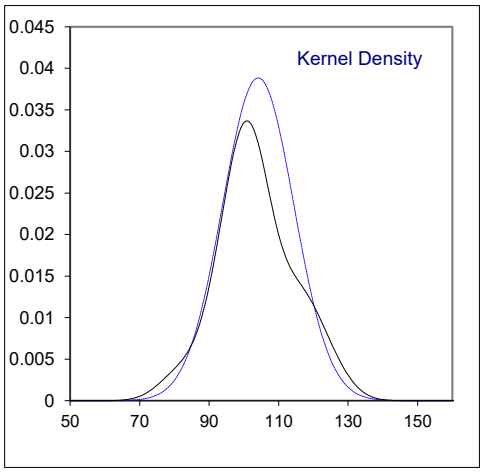


Determination of Propene (C_3H_6) on sample #22229; results in µL/L

lab	method	value	mark	z(targ)	remarks
179		-----		-----	
237		-----		-----	
331		-----		-----	
360		-----		-----	
445	IEC60567	97.76		-0.86	
455		-----		-----	
614		-----		-----	
657	IEC60567	103.28		-0.12	
780		-----		-----	
862		-----		-----	
901		-----		-----	
912		-----		-----	
963		-----		-----	
974	D3612-C	99.9		-0.57	
975		-----		-----	
1072		-----		-----	
1135		-----		-----	
1137		-----		-----	
1178		-----		-----	
1264	D3612-C	263.94	R(0.01)	21.47	
1304		-----		-----	
1306		-----		-----	
1352		-----		-----	
1374	D3612-A	104		-0.02	
1430		-----		-----	
1435		-----		-----	
1440	D3612-C	102.38		-0.24	
1442	IEC60567	115.0		1.46	
1444		-----		-----	
1453		-----		-----	
1458		-----		-----	
1478		-----		-----	
1505	D3612-C	96.9		-0.98	
1513		-----		-----	
1529		112		1.05	
1545		-----		-----	
1560		-----		-----	
1624	IEC60567	102.0		-0.29	
1660	IEC60567	103.6		-0.08	
1687	IEC60567	101.92		-0.30	
1719		-----		-----	
1743	IEC60567	91.4	ex	-1.72	see paragraph 4.1
1747		-----		-----	
1801		-----		-----	
1885		-----		-----	
1888		-----		-----	
1890		-----		-----	
1891		-----		-----	
1943	D3612-C	118.79		1.97	
1966		-----		-----	
6002	IEC60567	103		-0.16	
6015		-----		-----	
6036		-----		-----	
6053		-----		-----	
6063		81.281		-3.08	
6067		-----		-----	
6071		-----		-----	
6085		-----		-----	
6088	IEC60567	2.6	R(0.01)	-13.65	
6124		-----		-----	
6141		-----		-----	
6239		-----		-----	
6255		-----		-----	
6278		-----		-----	
6280	D3612-A	23.7	R(0.01)	-10.81	
6286	IEC60567	97.45		-0.90	
6334		-----		-----	
6367		-----		-----	
6385		-----		-----	
6414		-----		-----	
6422		-----		-----	
6445	IEC60567	117		1.72	
6482	D3612-C	124.93		2.79	
6483		-----		-----	
6495		-----		-----	
8001	IEC60567	93.8		-1.39	

normality	OK	
n	18	
outliers	3 +1ex	
mean (n)	104.17	
st.dev. (n)	10.268	RSD=10%
R(calc.)	28.75	
st.dev.(IEC60567:11)	7.440	
R(IEC60567:11)	20.83	





APPENDIX 2 Analytical details

lab	extraction method	lab	extraction method
179	---	1660	Head Space
237	---	1687	Head Space
331	---	1719	Stripper Column
360	Head Space	1743	Head Space
445	Head Space	1747	Head Space
455	---	1801	Head Space
614	---	1885	Head Space
657	Head Space	1888	Head Space
780	ToGas	1890	Head Space
862	---	1891	Head Space
901	Head Space	1943	Head Space
912	---	1966	---
963	Head Space	6002	Head Space
974	Head Space	6015	Head Space
975	---	6036	Head Space
1072	Toepler	6053	ToGas
1135	---	6063	Toepler
1137	Head Space	6067	Head Space
1178	Head Space	6071	Head Space
1264	Head Space	6085	Head Space
1304	Head Space	6088	Head Space
1306	Head Space	6124	Stripper Column
1352	Toepler	6141	Head Space
1374	Head Space	6239	Head Space
1430	Head Space	6255	Head Space
1435	Head Space	6278	Vacuum Extraction
1440	Head Space	6280	Vacuum Extraction
1442	Head Space	6286	Head Space
1444	---	6334	Head Space
1453	Head Space	6367	Head Space
1458	Stripper Column	6385	Head Space
1478	Toepler	6414	Head Space
1505	Head Space	6422	Head Space
1513	Toepler	6445	Vacuum Extraction
1529	Head Space	6482	Head Space
1545	Head Space	6483	---
1560	Head Space	6495	Head Space
1624	Head Space	8001	Head Space

APPENDIX 3

Number of participants per country

7 labs in AUSTRALIA
3 labs in BELGIUM
1 lab in BOSNIA and HERZEGOVINA
3 labs in BULGARIA
1 lab in CANADA
1 lab in CHINA, People's Republic
1 lab in CROATIA
3 labs in FRANCE
1 lab in GEORGIA
4 labs in GERMANY
2 labs in GREECE
1 lab in HONG KONG
1 lab in INDIA
1 lab in IRELAND
1 lab in ITALY
1 lab in KOREA, Republic of
1 lab in LATVIA
2 labs in MALAYSIA
2 labs in MOROCCO
2 labs in NETHERLANDS
1 lab in NEW ZEALAND
1 lab in NIGERIA
1 lab in NORWAY
1 lab in PHILIPPINES
2 labs 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
2 labs in SLOVENIA
1 lab in SOUTH AFRICA
5 labs in SPAIN
1 lab in SWITZERLAND
2 labs in TURKEY
3 labs in UNITED ARAB EMIRATES
3 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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