

Results of Proficiency Test
Dissolved Gas Analysis
November 2017

Organised by: Institute for Interlaboratory Studies
Spijkenisse, the Netherlands

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1 INTRODUCTION

Since 2007 the Institute for Interlaboratory Studies organizes a proficiency test for the analyses on Dissolved Gas Analysis (DGA) in Transformer Oil every year. During the annual program 2017/2018, it was decided to continue the round robin for the analyses on Dissolved Gas Analysis (DGA) in Transformer Oil. In this interlaboratory study on DGA in Transformer Oil, 65 laboratories from 35 different countries did register for participation. See appendix 3 for the number of participants per country. In this report, the test results of the 2017 interlaboratory study on Dissolved Gas Analysis (DGA) in Transformer Oil are presented and discussed. This report can also be downloaded from the iis website www.iisnl.com.

2 SET UP

The Institute for Interlaboratory Studies (iis) in Spijkenisse, the Netherlands, was the organiser of this proficiency test (PT). In total one batch of 70 certified syringes (45 of 50 mL and 25 of 100 mL) was prepared (lot RN285). The syringes (True North) were provided by Morgan Schaffer Inc, Quebec, Canada. Each syringe was uniquely numbered and one syringe was sent to each participating laboratory, without the certificate provided by Morgan Schaffer Inc. 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 ISO/IEC 17043 accredited (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 Inc. is ISO 9001 certified and ISO/IEC17025 accredited by ANSI-ASQ.

2.2 PROTOCOL

The protocol followed in the organisation 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 March 2017 (iis-protocol, version 3.4). This protocol can be downloaded from 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

In this proficiency test only one type of sample material was used. The 50 mL and 100 mL gas tight syringes with sample material were prepared and subsequently tested by Morgan Schaffer Inc. (Quebec, Canada) in accordance with principles outlined in ASTM Method D3612 and IEC 60567.

In total one batch of 70 syringes was prepared (lot RN285). Each syringe was uniquely numbered and a certificate of analysis was provided by Morgan Schaffer Inc. These certificates were not enclosed to the samples and were kept separated after receipt of the samples by iis prior to the dispatch of the samples to the participating laboratories.

The differences between the test results of each syringe are not statistically significant (see paragraph 4.4). And for all components, the repeatability is in agreement with 0.3 times the corresponding reproducibility of the target test method according with the procedure of ISO13528. Therefore, homogeneity of the samples was assumed.

Depending on the registration to each of the participating laboratories a syringe of 50 mL or a syringe of 100 mL (labelled ##17234) was sent on November 1, 2017.

2.5 STABILITY OF THE SAMPLES

Morgan Schaffer declares that bulk storage prior to shipping has a shelf life of at least 6 months. This was assumed to be sufficient for the proficiency testing purposes.

2.6 ANALYSES

The participants were requested to determine on sample ##17234: Hydrogen, Oxygen, Nitrogen, Carbon Monoxide, Carbon Dioxide, Methane, Ethane, Ethene, Ethyn, Propane and Propene. Also some method details were requested to be reported.

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

To get comparable test results, a detailed report form and a letter of instructions are prepared. On the report form the reporting units are given as well as the reference test methods 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 reanalysis). Additional or corrected test results are used for data analysis and original test results are placed under 'Remarks' in the test 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 March 2017 (iis-protocol, version 3.4).

For the statistical evaluation, the *unrounded* (when available) figures were used instead of the rounded test results. Test results reported as '<...' or '>...' were not used in the statistical evaluation.

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

According to ISO 5725 the original test results per determination were submitted to Dixon's, Grubbs' and/or Rosner's outlier tests. Outliers are marked by D(0.01) for the Dixon's test, by G(0.01) or DG(0.01) for the Grubbs' test and by R(0.01) for the Rosner's test. Stragglers are marked by D(0.05) for the Dixon's test, by G(0.05) or DG(0.05) for the Grubbs' test and by R(0.05) for the Rosner's test. Both outliers and stragglers were not included in the calculations of averages and standard deviations.

For each assigned value, the uncertainty was determined in accordance with ISO13528. Subsequently the calculated uncertainty was evaluated against the respective requirement based on the target reproducibility in accordance with ISO13528. When the uncertainty passed the evaluation, no remarks are made in the report. However, when the uncertainty failed the evaluation it is mentioned in the report and it will have consequences for the evaluation of the test results.

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

3.2 GRAPHICS

In order to visualize the data against the reproducibilities from literature, Gauss plots were made, using the sorted data for one determination (see appendix 1). On the Y-axis the reported test results are plotted. The corresponding laboratory numbers are on the X-axis. The straight horizontal line presents the consensus value (a trimmed mean). The four striped lines, parallel to the consensus value line, are the +3s, +2s, -2s and -3s target reproducibility limits of the selected reference test method. Outliers and other data, which were excluded from the calculations, are represented as a cross. Accepted data are represented as a triangle.

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

3.3 Z-SCORES

To evaluate the performance of the participating laboratories the z-scores were calculated. As it was decided to evaluate the performance of the participants in this proficiency test (PT) against the literature requirements, e.g. ASTM, EN or ISO reproducibilities, the z-scores were calculated using a target standard deviation. This results in an evaluation independent of the variation of this interlaboratory study. The target standard deviation was calculated from the literature reproducibility by division with 2.8.

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:

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

The $Z_{(\text{target})}$ 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.

The usual interpretation of z-scores is as follows:

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

4 EVALUATION

In this proficiency test no major problems were encountered during execution. After dispatch of the samples, one of the participants (lab 1529) reported to have received a syringe with a small air-bubble. Participants were requested to test the sample (syringe) and report the inconvenience on the data reporting platform. During the evaluation of all reported test results, the test results of the laboratory that reported the presence of an air-bubble did not differ at all from the other reported test results.

Four participants did not report any test results at all. Not all participants were able to report all components requested. In total 61 participating laboratories reported 580 numerical results. Observed were 21 outlying results, which is 3.6% of the numerical results. In proficiency studies outlier percentages of 3% - 7.5% are quite normal.

4.1 EVALUATION PER COMPONENT

In this section the reported test results are discussed per component.-The test methods that are reported by the laboratories are taken into account for explaining the observed differences when possible and applicable. These test methods are also mentioned in the tables in appendix 1 together with the original data. The abbreviations used in these tables are listed in appendix 4.

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

The test results of the laboratory 6141 showed a significant number of statistical outliers. Also the test results of the laboratories 1719, 1720, 1743, 6053 and 6157 deviated many times from the consensus value from the participating laboratories. As the test results are not independent, it was decided to reject all of the test results of the above mentioned laboratories from the statistical evaluation.

Hydrogen: The determination of this component was very problematic. Four statistical outliers were observed and three other test results were excluded. The calculated reproducibility after rejection of suspect data is not at all in agreement with the strict requirements of IEC 60567:2011.

Oxygen: The determination of this component was very problematic. Two statistical outliers were observed and four other test results were excluded. The calculated reproducibility after rejection of suspect data is not at all in agreement with the requirements of IEC 60567:2011.

Nitrogen: The determination of this component was very problematic. One statistical outlier was observed and five other test results were excluded. The calculated reproducibility after rejection of suspect data is not at all in agreement with the requirements of IEC 60567:2011.

- Carbon Monoxide: The determination of this component was very problematic. Two statistical outliers were observed and four test results were excluded. The calculated reproducibility after rejection of the suspect data is not at all in agreement with the requirements of IEC 60567:2011.
- Carbon Dioxide: The determination of this component was very problematic. One statistical outlier was observed and five test results were excluded. The calculated reproducibility after rejection of the suspect data is not at all in agreement with the requirements of IEC 60567:2011.
- Methane: The determination of this component was problematic. Two statistical outliers were observed and four test results were excluded. The calculated reproducibility after rejection of the suspect data is not in agreement with the requirements of IEC 60567:2011.
- Ethane: The determination of this component was problematic. Two statistical outliers were observed and five tests results were excluded. The calculated reproducibility after rejection of the suspect data is not in agreement with the requirements of IEC 60567:2011.
- Ethene: The determination of this component was problematic. Two statistical outliers were observed and five tests results were excluded. The calculated reproducibility after rejection of the suspect data is not in agreement with the requirements of IEC 60567:2011.
- Ethyn: The determination of this component was problematic. Two statistical outliers were observed and five tests results were excluded. The calculated reproducibility after rejection of the suspect data is not in agreement with the requirements of IEC 60567:2011.
- Propane: The determination of this component was problematic. Three statistical outliers were observed and two tests results were excluded. The calculated reproducibility after rejection of the suspect data is not in agreement with the requirements of IEC 60567:2011.
- Propene: Too few analytical test results were received to draw any significant conclusions. One participants did report a false positive test result.

4.2 PERFORMANCE EVALUATION FOR THE GROUP OF LABORATORIES

A comparison has been made between the reproducibility as declared by the relevant standard and the reproducibility as found for the group of participating laboratories. The average results per component, calculated reproducibilities and reproducibilities from IEC60567 are compared in the next table.

Parameter	unit	n	average	2.8 * sd	R(lit)
Hydrogen H ₂	µl/L	54	492	208	98
Oxygen O ₂	µl/L	52	15050	8972	3010
Nitrogen N ₂	µl/L	52	56317	29937	11263
Carbon Monoxide CO	µl/L	55	484	219	97
Carbon Dioxide CO ₂	µl/L	55	529	224	106
Methane CH ₄	µl/L	55	498	172	100
Ethane C ₂ H ₆	µl/L	54	510	159	102
Ethene C ₂ H ₄	µl/L	54	503	164	101
Ethyn C ₂ H ₂	µl/L	54	486	153	97
Propane C ₃ H ₈	µl/L	17	506	150	101
Propene C ₃ H ₆	µl/L	13	<10	n.a.	n.a.

Table 1: reproducibilities of tests on sample #17234

Without further statistical calculations it can be concluded from the overview given in table 1 that there is not a compliance of the performance of the group of participating laboratories with the relevant standard IEC 60567:2011.

The problematic components have been discussed in paragraph 4.1.

4.3 COMPARISON OF THE PROFICIENCY TEST OF NOVEMBER 2017 WITH PREVIOUS PTS

	<i>November 2017</i>	<i>November 2016</i>	<i>November 2015</i>	<i>November 2014</i>	<i>November 2013</i>
Number of reporting labs	61	53	45	40	33
Number of test results reported	580	487	401	358	293
Statistical outliers	21	57	29	10	10
Percentage statistical outliers	3.6%	11.7%	7.2%	2.8%	3.4%

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 tests was compared, expressed as relative standard deviation (RSD) of the PTs, see below table.

Determination	Nov 2017	Nov 2016	Nov 2015	Nov 2014	Nov 2013	IEC605671
Hydrogen H ₂	15%	10%	21%	24%	21%	7%
Oxygen O ₂	12%	13%	19%	18%	17%	7%
Nitrogen N ₂	19%	13%	16%	13%	19%	7%
Carbon Monoxide CO	16%	12%	11%	12%	12%	7%
Carbon Dioxide CO ₂	15%	16%	12%	17%	15%	7%
Methane CH ₄	12%	10%	13%	18%	19%	7%
Ethane C ₂ H ₆	11%	12%	17%	24%	23%	7%
Ethene C ₂ H ₄	12%	12%	12%	29%	17%	7%
Ethyn C ₂ H ₂	11%	12%	11%	35%	19%	7%
Propane C ₃ H ₈	11%	9%	n.e.	n.e.	n.e.	n.e.
Propene C ₃ H ₆	n.e.	n.e.	26%	20%	n.e.	n.e.

Table 3: comparison of the relative uncertainties on the various components

The results of the 2017 PT are in line with the results of the 2015 PT and 2016 PT.

4.4 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.

Parameter	Average values by Morgan Schaffer in µl/L	Consensus values from participants results in µl/L	Absolute differences in µl/L
Hydrogen H ₂	494	491	-3
Oxygen O ₂	15100	15049	-51
Nitrogen N ₂	54300	56317	+2017
Carbon Monoxide CO	502	484	-18
Carbon Dioxide CO ₂	521	529	+8
Methane CH ₄	504	498	-6
Ethane C ₂ H ₆	497	510	+13
Ethene C ₂ H ₄	492	503	+11
Ethyn C ₂ H ₂	480	486	+6

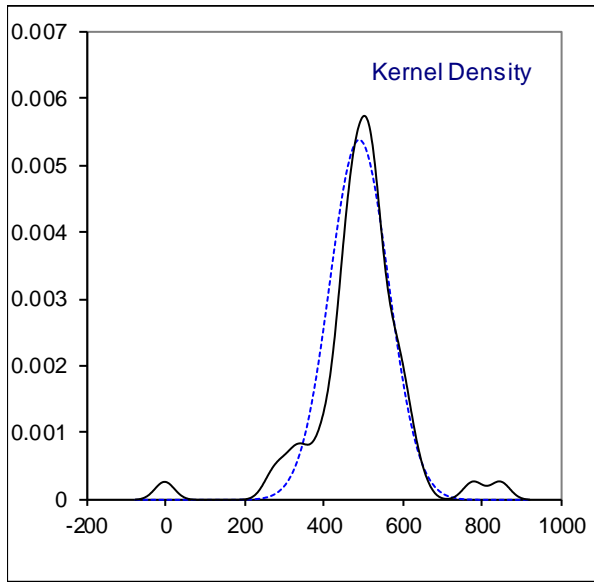
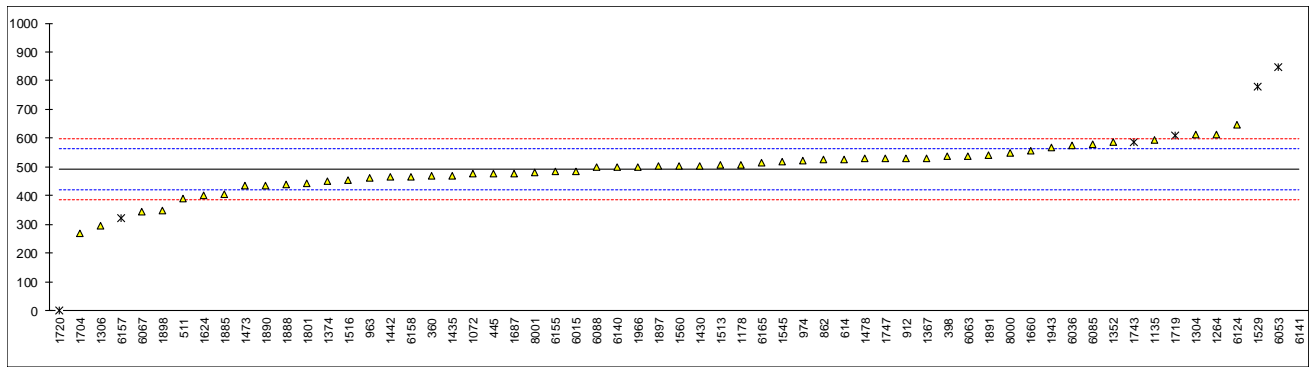
Table 4: comparison of consensus values with values determined by Morgan Schaffer

The target reproducibilities as required by IEC 60567 obviously appear to be very hard to meet, it is clear that the reproducibility requirements of IEC 60567 are quite strict.

No statistical differences were observed between the test results of the 50 ml syringes and the 100 ml syringes. Both the averages and the variabilities for each of the components were in line with each other for both type of syringes.

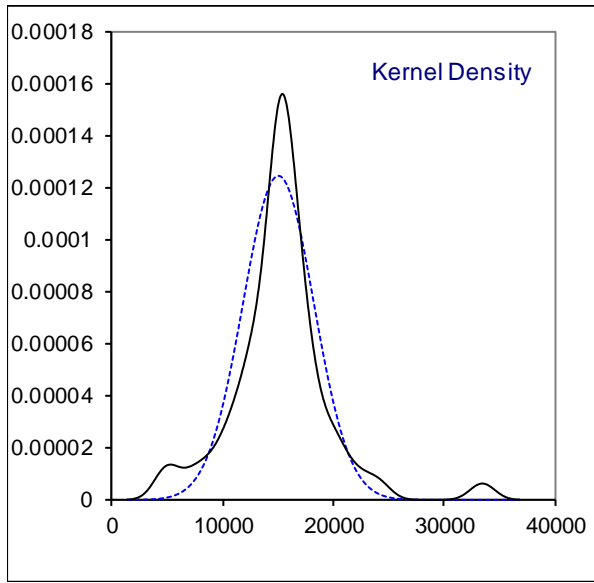
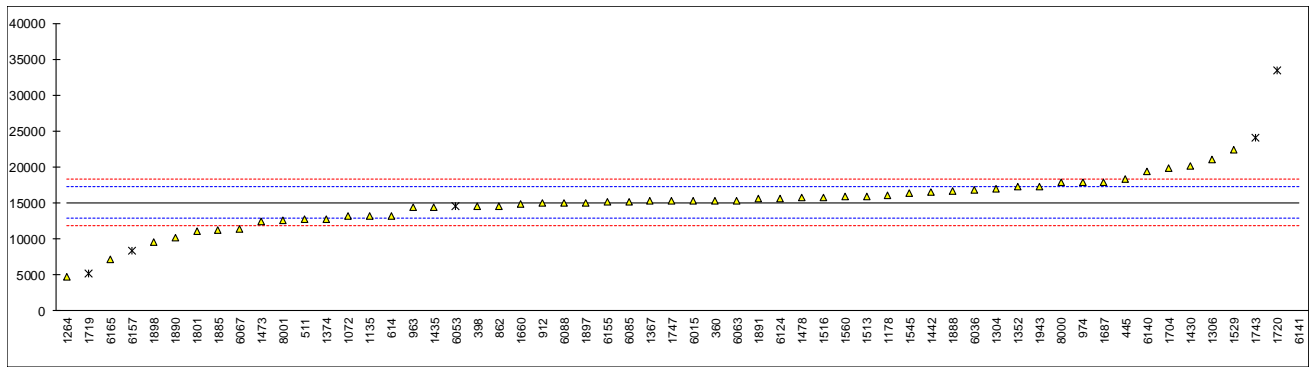
APPENDIX 1**Determination of Hydrogen (H₂) on sample #17234; results in µ/L**

lab	method	value	mark	z(targ)	remarks
179		----		----	
237		----		----	
360	IEC60567	468.9		-0.66	
398	IEC60567	537.3		1.29	
445	IEC60567	477.4		-0.42	
511	D3612	390		-2.90	
614	D3612	525		0.94	
862	IEC60567	524		0.91	
912	D3612	531		1.11	
962		----		----	
963	D3612	463.18		-0.82	
974	D3612	523		0.88	
1072	IEC60567	475.77		-0.46	
1135	IEC60567	594		2.90	
1178	IEC60567	508.1		0.46	
1264	D3612	614.3		3.48	
1304	INH-120	611.73		3.41	
1306		296		-5.58	
1352	IEC60567	585.0		2.65	
1367	IEC60567	531		1.11	
1374	D3612	448.5		-1.24	
1430	IEC60567	504		0.34	
1435	IEC60567	469.28436		-0.65	
1442	IEC60567	466.1		-0.74	
1444		----		----	
1473	IEC60567	436.6		-1.58	
1478	IEC60567	527.9		1.02	
1513	IEC60567	506.03		0.40	
1516	IEC60567	455.3		-1.04	
1529	IEC60567	780	R(0.05)	8.20	
1545	D3612	518.7		0.76	
1560	IEC60567	504		0.34	
1624	IEC60567	402.29		-2.55	
1660	IEC60567	556.6		1.84	
1687	IEC60567	477.576		-0.41	
1704	IEC60567	270		-6.32	
1719	D3612	610	ex	3.36	
1720	D3612	0.0	R(0.01)	-14.00	
1743	IEC60567	585	ex	2.65	
1747	IEC60567	528.13		1.03	
1801		441.87		-1.43	
1885	D3612	404		-2.50	
1888	IEC60567	439.6		-1.49	
1890	IEC60567	437		-1.56	
1891	IEC60567	542		1.42	
1897	IEC60567	502		0.28	
1898	D3612	350		-4.04	
1943	D3612	567.81278		2.16	
1966	IEC60567	500.1		0.23	
6015	D3612	485		-0.20	
6036	IEC60567	575		2.36	
6053	IEC60567	848	R(0.01)	10.13	
6063	IEC60567	537.8		1.30	
6067	IEC60567	344.60		-4.19	
6085	D3612	578		2.45	
6088	IEC60567	498		0.17	
6124	IEC60567	646		4.38	
6140	D3612	498		0.17	
6141	D3612	147524	R(0.01)	4183.93	
6155	IEC60567	483.46		-0.24	
6157	D3612	323.31098	ex	-4.80	
6158	IEC60567	466.85589		-0.72	
6165	IEC60567	515		0.65	
8000	IEC60567	549.609		1.64	
8001	IEC60567	479.0		-0.37	
	normality	suspect			
	n	54			
	outliers	4 (+3 ex)			
	mean (n)	491.99			
	st.dev. (n)	74.188			
	R(calc.)	207.73			
	st.dev.(IEC60567:11)	35.142			
	R(IEC60567:11)	98.40			



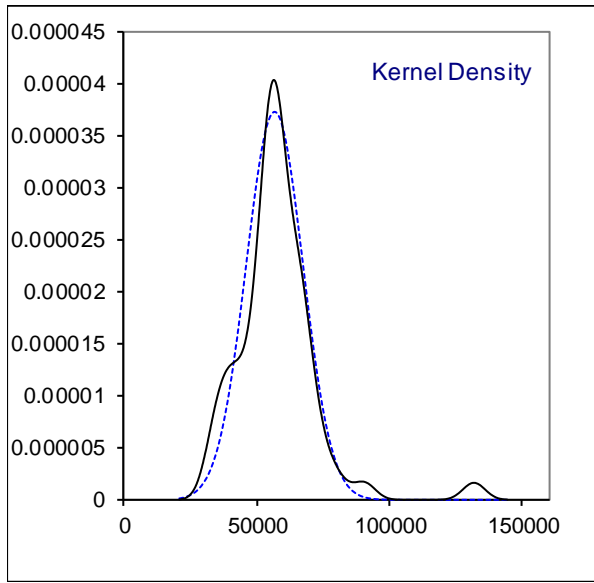
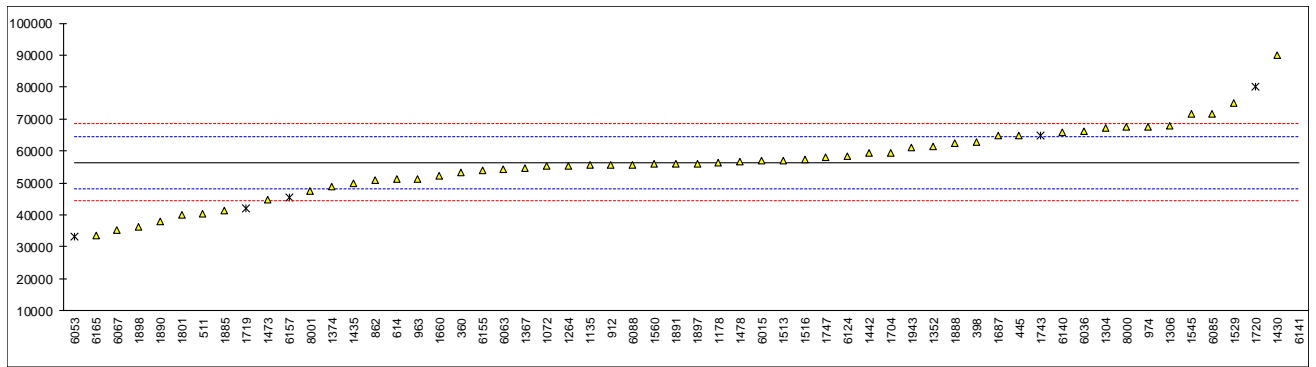
Determination of Oxygen (O₂) on sample #17234; results in µ/L

lab	method	value	mark	z(targ)	remarks
179		-----		-----	
237		-----		-----	
360	IEC60567	15337.1		0.27	
398	IEC60567	14600.6		-0.42	
445	IEC60567	18344		3.06	
511	D3612	12661		-2.22	
614	D3612	13195		-1.73	
862	IEC60567	14603		-0.42	
912	D3612	14917		-0.12	
962		-----		-----	
963	D3612	14423.9		-0.58	
974	D3612	17871		2.62	
1072	IEC60567	13146.60		-1.77	
1135	IEC60567	13176		-1.74	
1178	IEC60567	16045.3		0.93	
1264	D3612	4732.71	C	-9.60	first reported 4683.7
1304	INH-120	16948.39		1.77	
1306		21024		5.56	
1352	IEC60567	17200.0		2.00	
1367	IEC60567	15223		0.16	
1374	D3612	12755.7		-2.13	
1430	IEC60567	20073		4.67	
1435	IEC60567	14454.6		-0.55	
1442	IEC60567	16558.5		1.40	
1444		-----		-----	
1473	IEC60567	12459.7		-2.41	
1478	IEC60567	15704.4		0.61	
1513	IEC60567	15928		0.82	
1516	IEC60567	15786.0		0.69	
1529	IEC60567	22400		6.84	
1545	D3612	16358.4		1.22	
1560	IEC60567	15865		0.76	
1624		-----		-----	
1660	IEC60567	14849		-0.19	
1687	IEC60567	17889.024		2.64	
1704	IEC60567	19901		4.51	
1719	D3612	5236	ex	-9.13	
1720	D3612	33489	R(0.01)	17.15	
1743	IEC60567	24100	C,ex	8.42	first reported 25100
1747	IEC60567	15304.33		0.24	
1801		11016.05		-3.75	
1885	D3612	11202		-3.58	
1888	IEC60567	16580.1		1.42	
1890	IEC60567	10116		-4.59	
1891	IEC60567	15550		0.47	
1897	IEC60567	14994		-0.05	
1898	D3612	9500		-5.16	
1943	D3612	17249		2.05	
1966		-----		-----	
6015	D3612	15306		0.24	
6036	IEC60567	16845		1.67	
6053	IEC60567	14507	C,ex	-0.50	first reported 90666
6063	IEC60567	15347.9		0.28	
6067	IEC60567	11346.83		-3.44	
6085	D3612	15144		0.09	
6088	IEC60567	14974		-0.07	
6124	IEC60567	15597		0.51	
6140	D3612	19404		4.05	
6141	D3612	121567	R(0.01)	99.09	
6155	IEC60567	15138.40		0.08	
6157	D3612	8278.90620	ex	-6.30	
6158		-----		-----	
6165	IEC60567	7155		-7.34	
8000	IEC60567	17854.943		2.61	
8001	IEC60567	12519.1		-2.35	
	normality	suspect			
	n	52			
	outliers	2 (+4 ex)			
	mean (n)	15049.51			
	st.dev. (n)	3204.372			
	R(calc.)	8972.24			
	st.dev.(IEC60567:11)	1074.965			
	R(IEC60567:11)	3009.90			



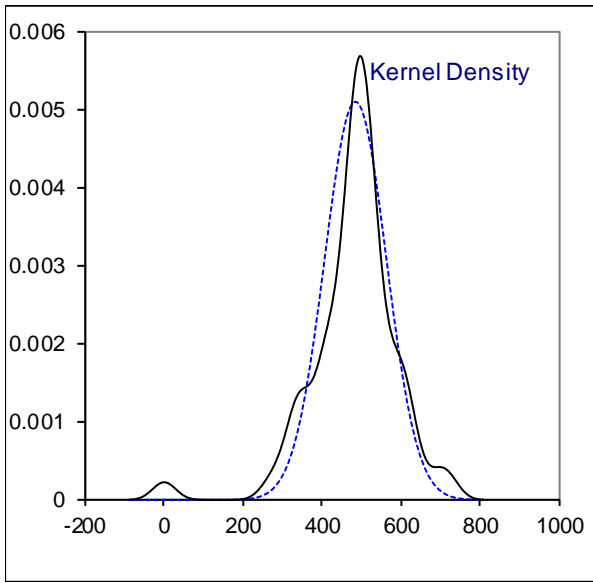
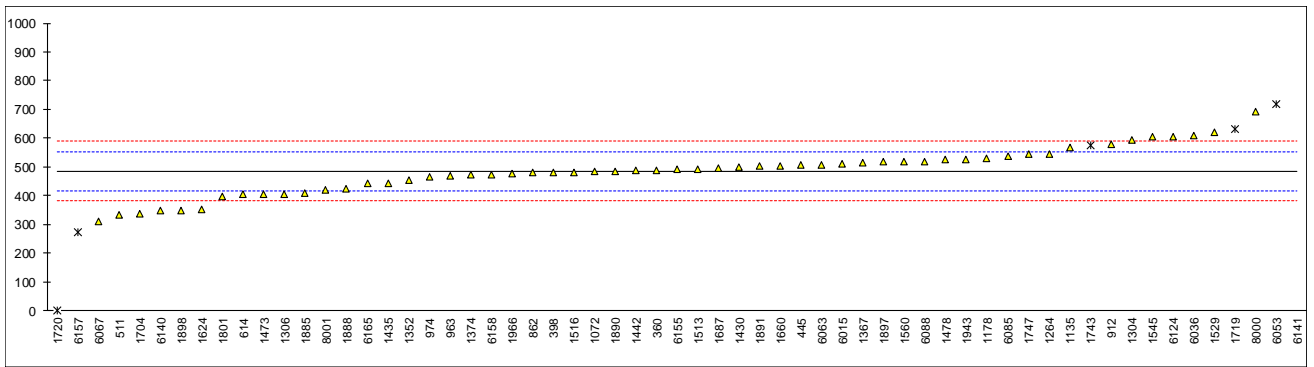
Determination of Nitrogen (N₂) on sample #17234; results in µ/L

lab	method	value	mark	z(targ)	remarks
179		----		----	
237		----		----	
360	IEC60567	53216.0		-0.77	
398	IEC60567	62898.3		1.64	
445	IEC60567	64900		2.13	
511	D3612	40346		-3.97	
614	D3612	51111		-1.29	
862	IEC60567	50863		-1.36	
912	D3612	55602		-0.18	
962		----		----	
963	D3612	51274.6		-1.25	
974	D3612	67538		2.79	
1072	IEC60567	55129.48		-0.30	
1135	IEC60567	55475		-0.21	
1178	IEC60567	56288.8		-0.01	
1264	D3612	55311.9		-0.25	
1304	INH-120	67181.71		2.70	
1306		67759		2.84	
1352	IEC60567	61300.0		1.24	
1367	IEC60567	54497		-0.45	
1374	D3612	48837.4		-1.86	
1430	IEC60567	90033		8.38	
1435	IEC60567	49970.7		-1.58	
1442	IEC60567	59261.5		0.73	
1444		----		----	
1473	IEC60567	44709.1		-2.89	
1478	IEC60567	56741.6		0.11	
1513	IEC60567	56840		0.13	
1516	IEC60567	57246.2		0.23	
1529	IEC60567	75000		4.64	
1545	D3612	71626.5		3.81	
1560	IEC60567	55860		-0.11	
1624		----		----	
1660	IEC60567	52198		-1.02	
1687	IEC60567	64713.197		2.09	
1704	IEC60567	59289		0.74	
1719	D3612	42050	ex	-3.55	
1720	D3612	79980	ex	5.88	
1743	IEC60567	64900	ex	2.13	
1747	IEC60567	57852.78		0.38	
1801		39973.65		-4.06	
1885	D3612	41315		-3.73	
1888	IEC60567	62531.1		1.54	
1890	IEC60567	37998		-4.55	
1891	IEC60567	55950		-0.09	
1897	IEC60567	56060		-0.06	
1898	D3612	36304		-4.98	
1943	D3612	61136		1.20	
1966		----		----	
6015	D3612	56824		0.13	
6036	IEC60567	66073		2.43	
6053	IEC60567	33042	C,ex	-5.79	first reported 384219
6063	IEC60567	54300.1		-0.50	
6067	IEC60567	35117.02		-5.27	
6085	D3612	71707		3.83	
6088	IEC60567	55702		-0.15	
6124	IEC60567	58480		0.54	
6140	D3612	65848		2.37	
6141	D3612	131412	R(0.01)	18.67	
6155	IEC60567	53814.15		-0.62	
6157	D3612	45494.1	ex	-2.69	
6158		----		----	
6165	IEC60567	33505		-5.67	
8000	IEC60567	67446.267		2.77	
8001	IEC60567	47544.5		-2.18	
	normality	suspect			
	n	52			
	outliers	1 (+5 ex)			
	mean (n)	56317.30			
	st.dev. (n)	10691.841			
	R(calc.)	29937.15			
	st.dev.(IEC60567:11)	4022.664			
	R(IEC60567:11)	11263.46			



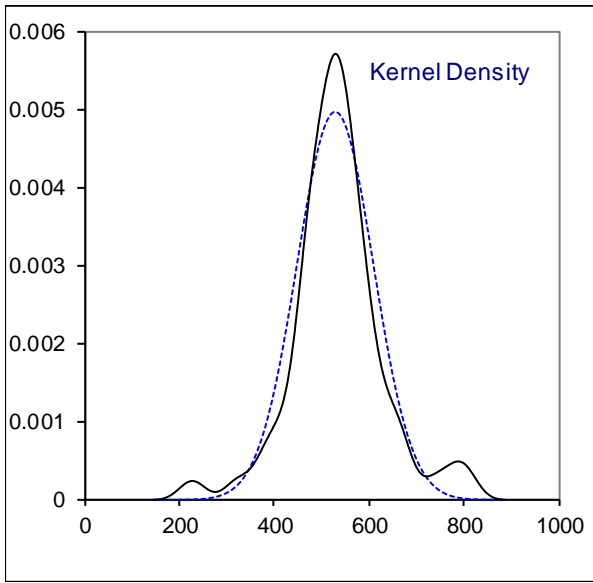
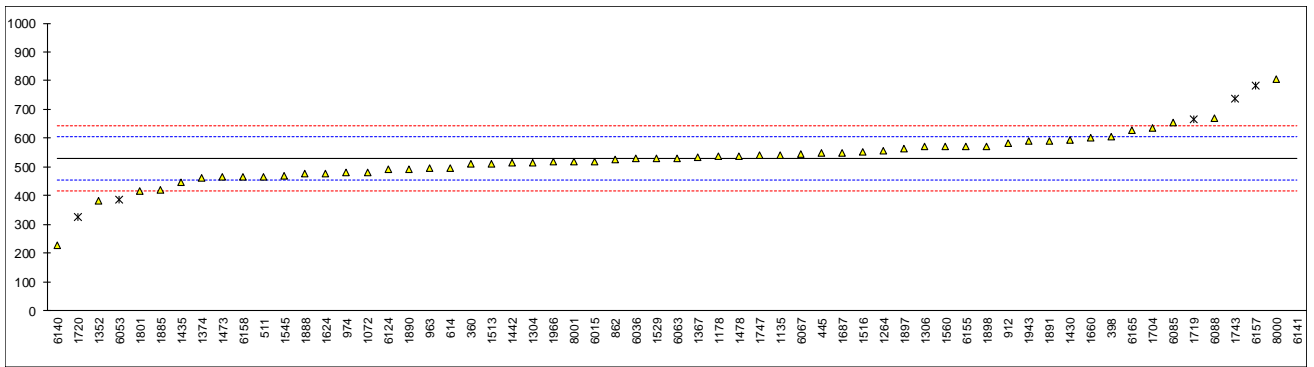
Determination of Carbon Monoxide (CO) on sample #17234; results in µ/L

lab	method	value	mark	z(targ)	remarks
179		----		----	
237		----		----	
360	IEC60567	487.1		0.08	
398	IEC60567	480.8		-0.11	
445	IEC60567	506.4		0.63	
511	D3612	335		-4.32	
614	D3612	405		-2.30	
862	IEC60567	478.9		-0.16	
912	D3612	578		2.70	
962		----		----	
963	D3612	470.25		-0.41	
974	D3612	466		-0.53	
1072	IEC60567	484.32		0.00	
1135	IEC60567	567		2.38	
1178	IEC60567	530.3		1.32	
1264	D3612	545		1.75	
1304	INH-120	594.16		3.17	
1306		406		-2.27	
1352	IEC60567	455.0		-0.85	
1367	IEC60567	516		0.91	
1374	D3612	473.4		-0.32	
1430	IEC60567	500		0.45	
1435	IEC60567	442.40703		-1.22	
1442	IEC60567	486.3		0.05	
1444		----		----	
1473	IEC60567	405.0		-2.30	
1478	IEC60567	526.0		1.20	
1513	IEC60567	493.58		0.26	
1516	IEC60567	482.1		-0.07	
1529	IEC60567	620		3.92	
1545	D3612	605.2		3.49	
1560	IEC60567	519		1.00	
1624	IEC60567	350.50		-3.87	
1660	IEC60567	503.9		0.56	
1687	IEC60567	497.216		0.37	
1704	IEC60567	337		-4.26	
1719	D3612	632	ex	4.26	
1720	D3612	0	R(0.01)	-14.00	
1743	IEC60567	575	ex	2.62	
1747	IEC60567	544.19		1.73	
1801		396.51		-2.54	
1885	D3612	410		-2.15	
1888	IEC60567	425.7		-1.70	
1890	IEC60567	484.8		0.01	
1891	IEC60567	503		0.54	
1897	IEC60567	517		0.94	
1898	D3612	350		-3.89	
1943	D3612	526.00014		1.20	
1966	IEC60567	475.6		-0.26	
6015	D3612	511		0.77	
6036	IEC60567	608		3.57	
6053	IEC60567	720	ex	6.81	
6063	IEC60567	507.4		0.66	
6067	IEC60567	311.84		-4.99	
6085	D3612	537		1.52	
6088	IEC60567	519		1.00	
6124	IEC60567	606		3.51	
6140	D3612	349		-3.91	
6141	D3612	222110	R(0.01)	6404.33	
6155	IEC60567	491.57		0.20	
6157	D3612	272.72303	ex	-6.12	
6158	IEC60567	474.74112		-0.28	
6165	IEC60567	441		-1.26	
8000	IEC60567	690.589		5.96	
8001	IEC60567	419.5		-1.88	
	normality	OK			
	n	55			
	outliers	2 (+4 ex)			
	mean (n)	484.48			
	st.dev. (n)	78.107			
	R(calc.)	218.70			
	st.dev.(IEC60567:11)	34.606			
	R(IEC60567:11)	96.90			



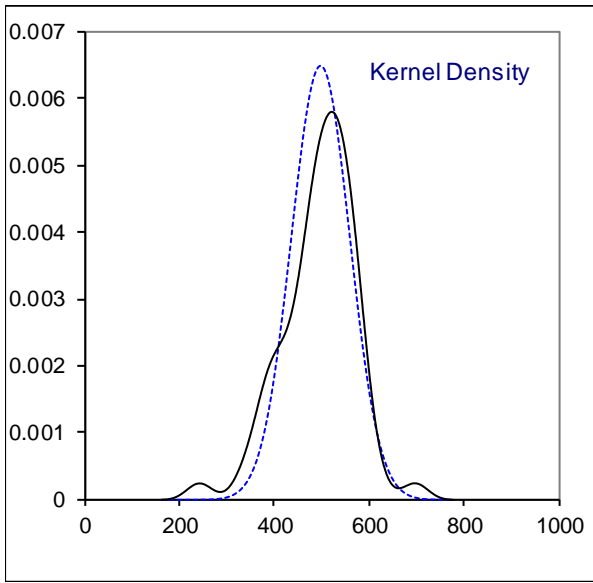
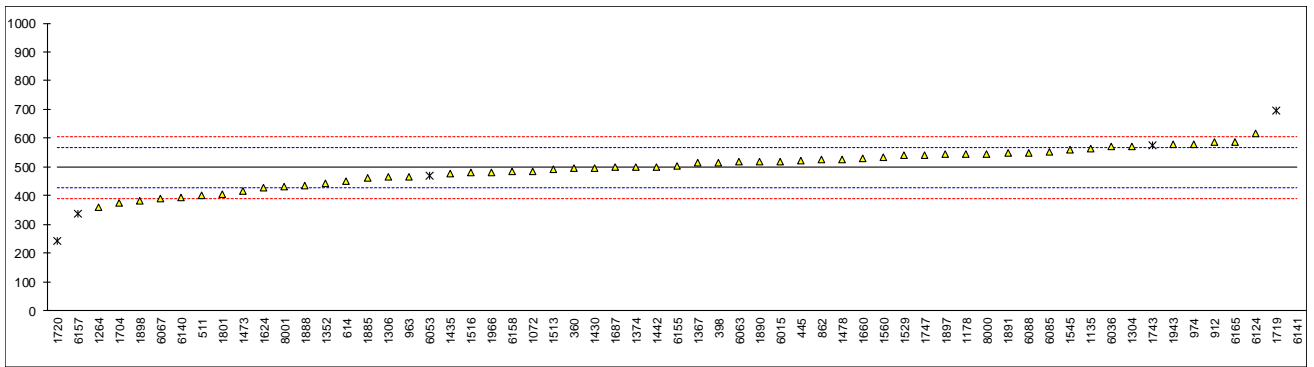
Determination of Carbon Dioxide (CO₂) on sample #17234; results in µl/L

lab	method	value	mark	z(targ)	remarks
179		----		----	
237		----		----	
360	IEC60567	509.0		-0.52	
398	IEC60567	605.2		2.03	
445	IEC60567	547.0		0.49	
511	D3612	467		-1.63	
614	D3612	496		-0.86	
862	IEC60567	524		-0.12	
912	D3612	582		1.41	
962		----		----	
963	D3612	493.91		-0.92	
974	D3612	480		-1.29	
1072	IEC60567	482.33		-1.23	
1135	IEC60567	541		0.33	
1178	IEC60567	535.7		0.19	
1264	D3612	554.5		0.69	
1304	INH-120	515.14		-0.36	
1306		570		1.10	
1352	IEC60567	382.0		-3.88	
1367	IEC60567	535		0.17	
1374	D3612	463.1		-1.73	
1430	IEC60567	594		1.73	
1435	IEC60567	446.19772		-2.18	
1442	IEC60567	513.5		-0.40	
1444		----		----	
1473	IEC60567	465.2		-1.68	
1478	IEC60567	538.4		0.26	
1513	IEC60567	512		-0.44	
1516	IEC60567	554.0		0.67	
1529	IEC60567	530		0.04	
1545	D3612	469.1		-1.58	
1560	IEC60567	571		1.12	
1624	IEC60567	477.80		-1.35	
1660	IEC60567	602.3		1.95	
1687	IEC60567	548.582		0.53	
1704	IEC60567	634		2.79	
1719	D3612	666	ex	3.64	
1720	D3612	325	ex	-5.39	
1743	IEC60567	739	ex	5.57	
1747	IEC60567	539.73		0.30	
1801		417.30		-2.95	
1885	D3612	420		-2.88	
1888	IEC60567	476.8		-1.37	
1890	IEC60567	492.9		-0.95	
1891	IEC60567	590		1.63	
1897	IEC60567	563		0.91	
1898	D3612	573		1.18	
1943	D3612	588.71501		1.59	
1966	IEC60567	518.3		-0.27	
6015	D3612	519		-0.25	
6036	IEC60567	528		-0.02	
6053	IEC60567	387	ex	-3.75	
6063	IEC60567	530.6		0.05	
6067	IEC60567	546.18		0.47	
6085	D3612	654		3.32	
6088	IEC60567	669		3.72	
6124	IEC60567	491		-1.00	
6140	D3612	229		-7.93	
6141	D3612	292699	R(0.01)	7738.41	
6155	IEC60567	571.88		1.15	
6157	D3612	782.87157	ex	6.74	
6158	IEC60567	465.51114		-1.67	
6165	IEC60567	627		2.61	
8000	IEC60567	803.828		7.29	
8001	IEC60567	518.3		-0.27	
	normality	not OK			
	n	55			
	outliers	1 (+5 ex)			
	mean (n)	528.58			
	st.dev. (n)	80.177			
	R(calc.)	224.49			
	st.dev.(IEC60567:11)	37.756			
	R(IEC60567:11)	105.72			



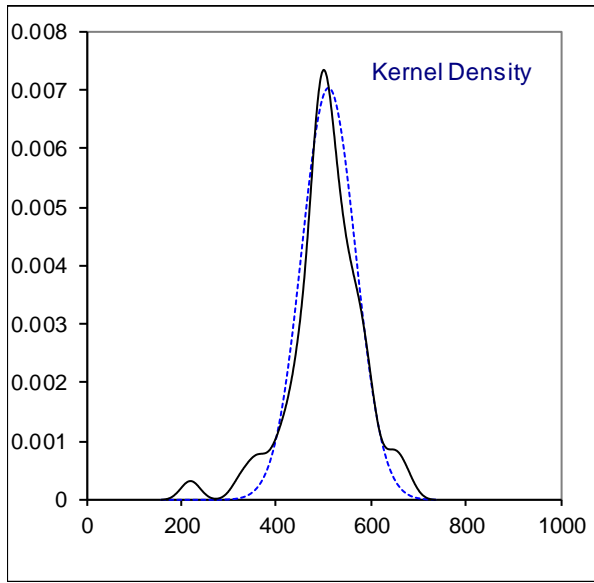
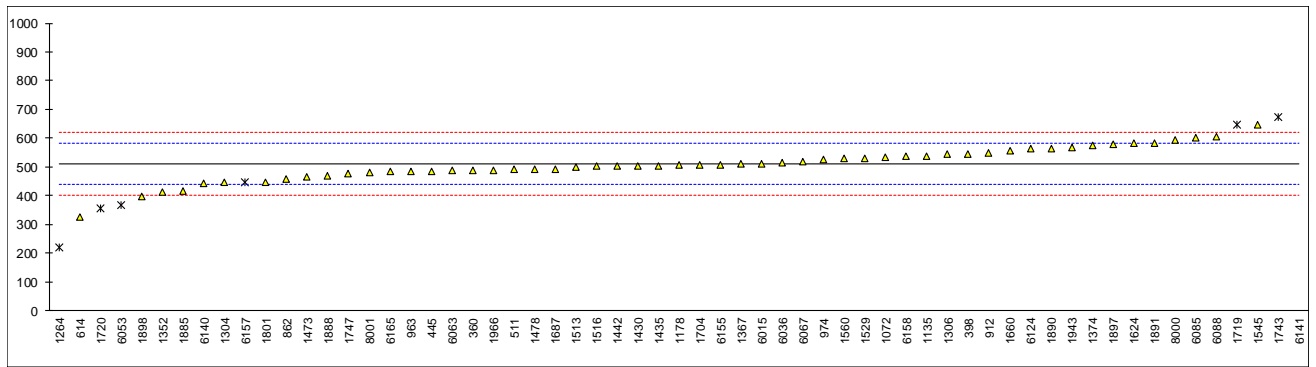
Determination of Methane (CH₄) on sample #17234; results in µ/L

lab	method	value	mark	z(targ)	remarks
179		----		----	
237		----		----	
360	IEC60567	494.8		-0.09	
398	IEC60567	513.6		0.44	
445	IEC60567	520.7		0.64	
511	D3612	400		-2.75	
614	D3612	452		-1.29	
862	IEC60567	527.0		0.82	
912	D3612	586		2.48	
962		----		----	
963	D3612	465.31		-0.92	
974	D3612	579		2.28	
1072	IEC60567	485.46		-0.35	
1135	IEC60567	562		1.80	
1178	IEC60567	544.18		1.30	
1264	D3612	358.55		-3.92	
1304	INH-120	571.33		2.07	
1306		464		-0.95	
1352	IEC60567	443.0		-1.54	
1367	IEC60567	513		0.43	
1374	D3612	499.0		0.03	
1430	IEC60567	495		-0.08	
1435	IEC60567	476.81127		-0.59	
1442	IEC60567	499.7		0.05	
1444		----		----	
1473	IEC60567	415.1		-2.33	
1478	IEC60567	527.4		0.83	
1513	IEC60567	491.45		-0.18	
1516	IEC60567	479.3		-0.52	
1529	IEC60567	540		1.18	
1545	D3612	561.3		1.78	
1560	IEC60567	534		1.02	
1624	IEC60567	429.21		-1.93	
1660	IEC60567	528.2		0.85	
1687	IEC60567	498.024		0.00	
1704	IEC60567	376		-3.43	
1719	D3612	697	ex	5.60	
1720	D3612	243	R(0.05)	-7.17	
1743	IEC60567	575	ex	2.17	
1747	IEC60567	542.20		1.25	
1801		405.70		-2.59	
1885	D3612	461		-1.04	
1888	IEC60567	436.7		-1.72	
1890	IEC60567	519.7		0.61	
1891	IEC60567	547		1.38	
1897	IEC60567	543		1.27	
1898	D3612	384		-3.20	
1943	D3612	577.26799		2.23	
1966	IEC60567	479.9		-0.51	
6015	D3612	520		0.62	
6036	IEC60567	570		2.03	
6053	IEC60567	471	ex	-0.76	
6063	IEC60567	518.8		0.59	
6067	IEC60567	388.03		-3.09	
6085	D3612	552		1.52	
6088	IEC60567	550		1.47	
6124	IEC60567	615		3.29	
6140	D3612	393		-2.95	
6141	D3612	272553	R(0.01)	7650.13	
6155	IEC60567	505.06		0.20	
6157	D3612	336.14838	ex	-4.55	
6158	IEC60567	483.17028		-0.41	
6165	IEC60567	586		2.48	
8000	IEC60567	545.205		1.33	
8001	IEC60567	429.7		-1.92	
	normality	OK			
	n	55			
	outliers	2 (+4 ex)			
	mean (n)	497.87			
	st.dev. (n)	61.470			
	R(calc.)	172.12			
	st.dev.(IEC60567:11)	35.562			
	R(IEC60567:11)	99.57			



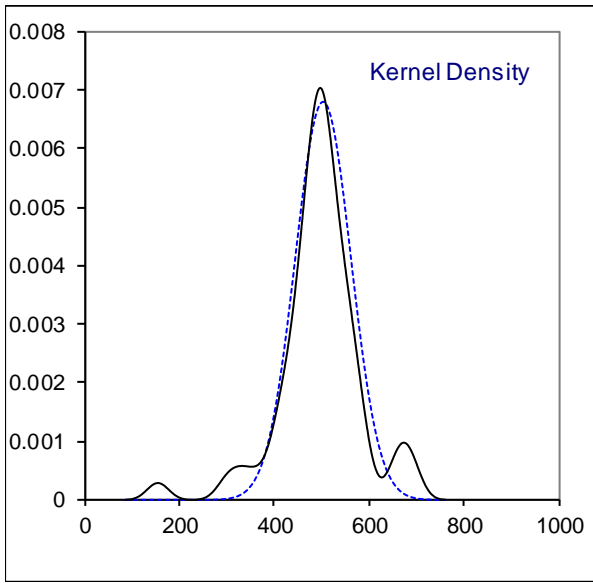
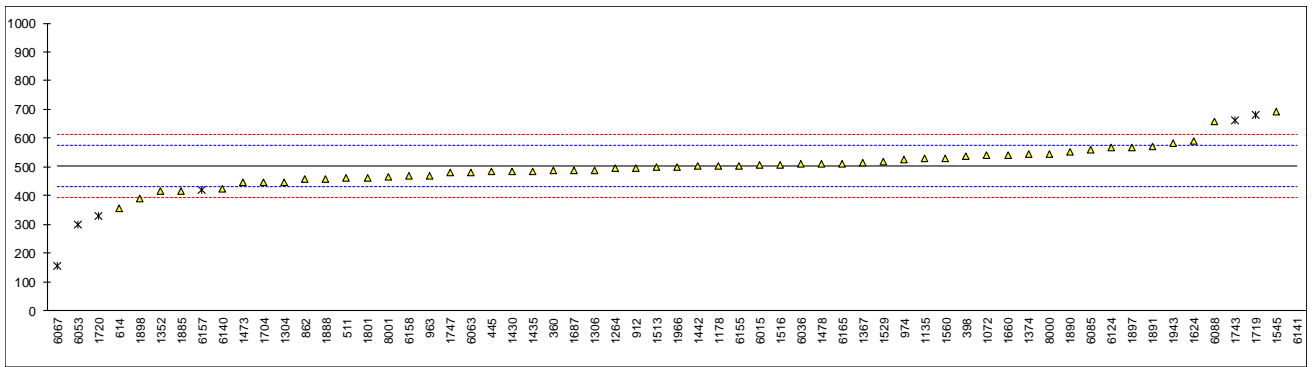
Determination of Ethane (C₂H₆) on sample #17234; results in µl/L

lab	method	value	mark	z(targ)	remarks
179		----		----	
237		----		----	
360	IEC60567	487.0		-0.64	
398	IEC60567	545.3		0.96	
445	IEC60567	486.0		-0.67	
511	D3612	490		-0.56	
614	D3612	326		-5.06	
862	IEC60567	456.6		-1.47	
912	D3612	549		1.06	
962		----		----	
963	D3612	485.83		-0.67	
974	D3612	524		0.38	
1072	IEC60567	533.16		0.63	
1135	IEC60567	538		0.76	
1178	IEC60567	506.53		-0.10	
1264	D3612	219.1	R(0.01)	-7.99	
1304	INH-120	444.98		-1.79	
1306		543		0.90	
1352	IEC60567	414.0		-2.64	
1367	IEC60567	510		-0.01	
1374	D3612	573.4		1.73	
1430	IEC60567	504		-0.17	
1435	IEC60567	505.09315		-0.14	
1442	IEC60567	503.6		-0.18	
1444		----		----	
1473	IEC60567	465.2		-1.24	
1478	IEC60567	490.1		-0.55	
1513	IEC60567	497.97		-0.34	
1516	IEC60567	502.5		-0.21	
1529	IEC60567	530		0.54	
1545	D3612	647.9		3.77	
1560	IEC60567	528		0.49	
1624	IEC60567	580.66		1.93	
1660	IEC60567	555.1		1.23	
1687	IEC60567	490.222		-0.55	
1704	IEC60567	507		-0.09	
1719	D3612	645	ex	3.69	
1720	D3612	356	ex	-4.23	
1743	IEC60567	674	ex	4.49	
1747	IEC60567	477.86		-0.89	
1801		447.46		-1.72	
1885	D3612	416		-2.59	
1888	IEC60567	469.2		-1.13	
1890	IEC60567	563.9		1.47	
1891	IEC60567	584		2.02	
1897	IEC60567	579		1.88	
1898	D3612	399		-3.05	
1943	D3612	567.54768		1.57	
1966	IEC60567	488.7		-0.59	
6015	D3612	512		0.05	
6036	IEC60567	516		0.16	
6053	IEC60567	367	ex	-3.93	
6063	IEC60567	486.9		-0.64	
6067	IEC60567	516.82		0.18	
6085	D3612	601		2.49	
6088	IEC60567	604		2.57	
6124	IEC60567	563		1.45	
6140	D3612	442		-1.87	
6141	D3612	350075	R(0.01)	9589.95	
6155	IEC60567	507.83		-0.07	
6157	D3612	445.18696	ex	-1.79	
6158	IEC60567	536.21751		0.71	
6165	IEC60567	484		-0.72	
8000	IEC60567	592.993		2.27	
8001	IEC60567	481.5		-0.79	
	normality	suspect			
	n	54			
	outliers	2 (+5 ex)			
	mean (n)	510.32			
	st.dev. (n)	56.706			
	R(calc.)	158.78			
	st.dev.(IEC60567:11)	36.451			
	R(IEC60567:11)	102.06			



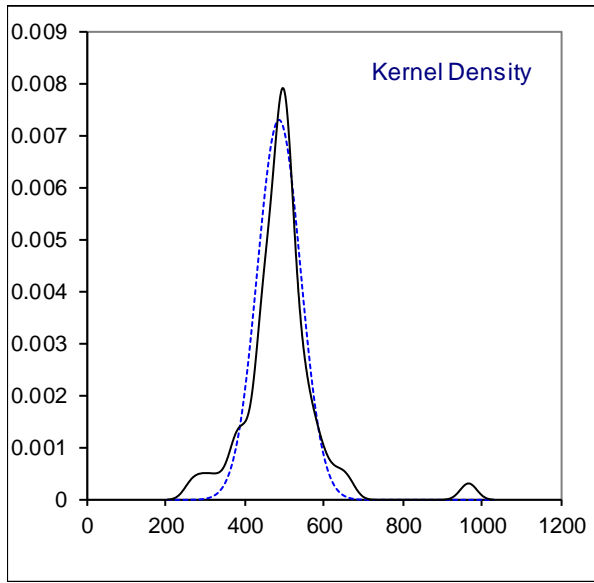
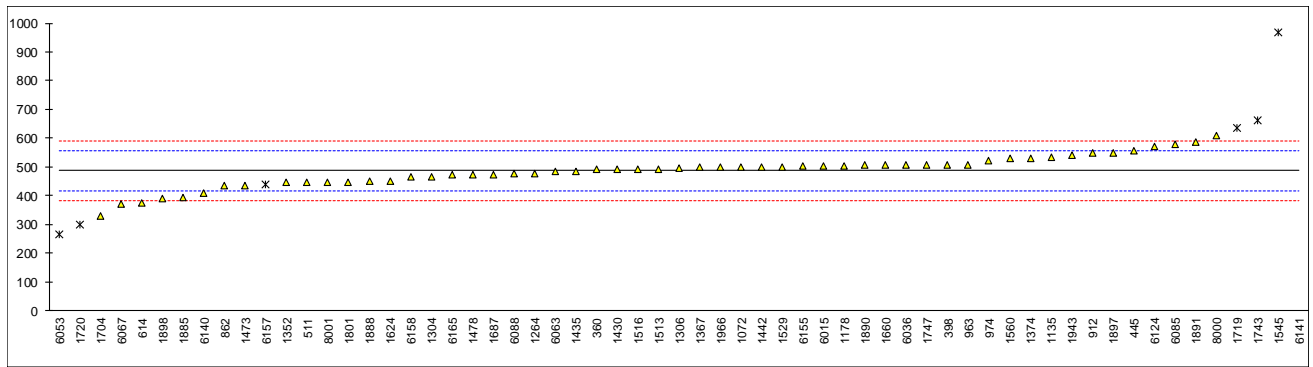
Determination of Ethene / Ethylene (C₂H₄) on sample #17234; results in µ/L

lab	method	value	mark	z(targ)	remarks
179		----		----	
237		----		----	
360	IEC60567	486.6		-0.46	
398	IEC60567	538.3		0.98	
445	IEC60567	483.0		-0.56	
511	D3612	462		-1.15	
614	D3612	356		-4.09	
862	IEC60567	456.3		-1.30	
912	D3612	497		-0.17	
962		----		----	
963	D3612	470.70		-0.90	
974	D3612	524		0.58	
1072	IEC60567	539.72		1.02	
1135	IEC60567	528		0.69	
1178	IEC60567	503.52		0.01	
1264	D3612	496.4		-0.19	
1304	INH-120	447.55		-1.55	
1306		489		-0.39	
1352	IEC60567	416.0		-2.43	
1367	IEC60567	514		0.30	
1374	D3612	545.2		1.17	
1430	IEC60567	485		-0.51	
1435	IEC60567	485.99763		-0.48	
1442	IEC60567	501.7		-0.04	
1444		----		----	
1473	IEC60567	444.8		-1.62	
1478	IEC60567	509.6		0.18	
1513	IEC60567	497.60		-0.15	
1516	IEC60567	508.8		0.16	
1529	IEC60567	520		0.47	
1545	D3612	691.6		5.24	
1560	IEC60567	529		0.72	
1624	IEC60567	590.00		2.42	
1660	IEC60567	541.9		1.08	
1687	IEC60567	486.752		-0.46	
1704	IEC60567	445		-1.62	
1719	D3612	681	ex	4.95	
1720	D3612	328	ex	-4.87	
1743	IEC60567	663	ex	4.45	
1747	IEC60567	478.78		-0.68	
1801		462.41		-1.13	
1885	D3612	416		-2.43	
1888	IEC60567	457.1		-1.28	
1890	IEC60567	550.9		1.33	
1891	IEC60567	572		1.92	
1897	IEC60567	569		1.83	
1898	D3612	390		-3.15	
1943	D3612	581.63612		2.18	
1966	IEC60567	500.2		-0.08	
6015	D3612	507		0.11	
6036	IEC60567	509		0.16	
6053	IEC60567	301	ex	-5.63	
6063	IEC60567	480.9		-0.62	
6067	IEC60567	156.02	R(0.01)	-9.66	
6085	D3612	560		1.58	
6088	IEC60567	658		4.31	
6124	IEC60567	567		1.78	
6140	D3612	422		-2.26	
6141	D3612	318799	R(0.01)	8856.20	
6155	IEC60567	504.70		0.04	
6157	D3612	419.42272	ex	-2.33	
6158	IEC60567	469.70183		-0.93	
6165	IEC60567	511		0.22	
8000	IEC60567	546.614		1.21	
8001	IEC60567	466.0		-1.03	
	normality	suspect			
	n	54			
	outliers	2 (+5 ex)			
	mean (n)	503.17			
	st.dev. (n)	58.635			
	R(calc.)	164.18			
	st.dev.(IEC60567:11)	35.940			
	R(IEC60567:11)	100.63			



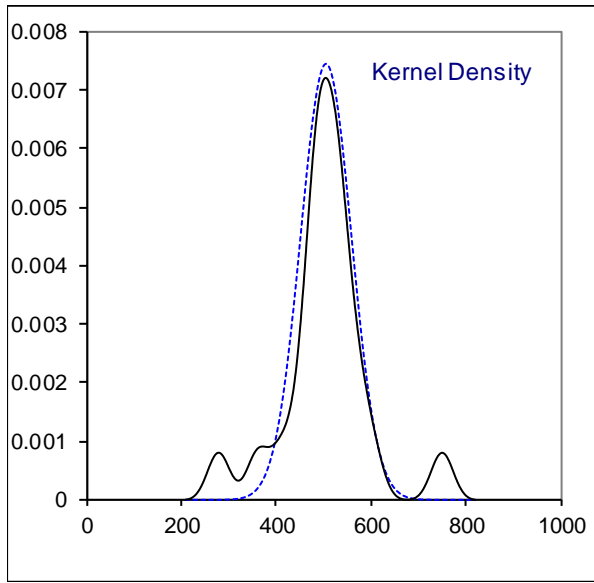
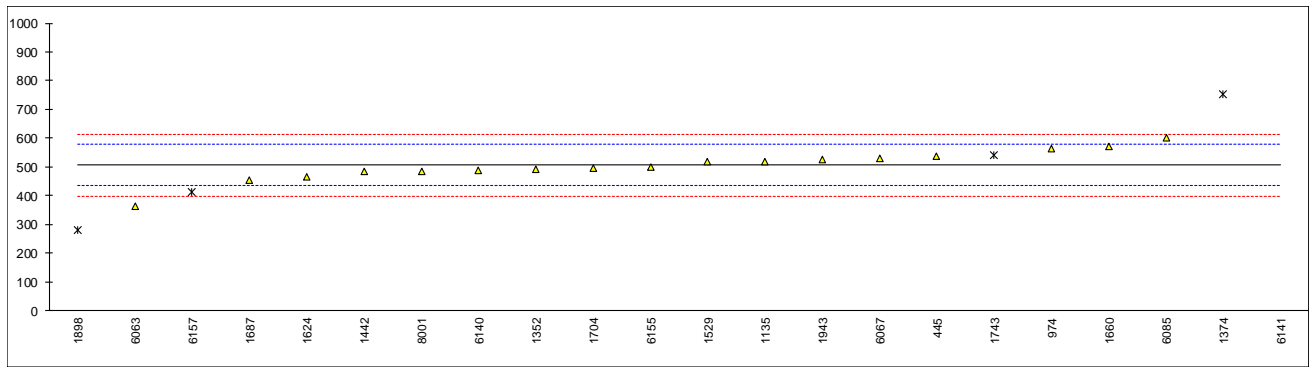
Determination of Ethyn /Acetylene (C₂H₂) on sample #17234; results in µl/L

lab	method	value	mark	z(targ)	remarks
179		----		----	
237		----		----	
360	IEC60567	490.9		0.13	
398	IEC60567	508.6		0.64	
445	IEC60567	557.4		2.05	
511	D3612	447		-1.13	
614	D3612	373		-3.26	
862	IEC60567	434.2		-1.50	
912	D3612	549		1.81	
962		----		----	
963	D3612	508.67		0.65	
974	D3612	523		1.06	
1072	IEC60567	499.29		0.38	
1135	IEC60567	533		1.35	
1178	IEC60567	504.10		0.51	
1264	D3612	477		-0.27	
1304	INH-120	465.86		-0.59	
1306		495		0.25	
1352	IEC60567	445.0		-1.19	
1367	IEC60567	498		0.34	
1374	D3612	529.7		1.25	
1430	IEC60567	493		0.19	
1435	IEC60567	484.67275		-0.05	
1442	IEC60567	499.8		0.39	
1444		----		----	
1473	IEC60567	436.6		-1.43	
1478	IEC60567	472.4		-0.40	
1513	IEC60567	493.75		0.22	
1516	IEC60567	493.7		0.21	
1529	IEC60567	500		0.40	
1545	D3612	967.3	R(0.01)	13.85	
1560	IEC60567	529		1.23	
1624	IEC60567	450.07		-1.04	
1660	IEC60567	506.7		0.59	
1687	IEC60567	474.192		-0.35	
1704	IEC60567	330		-4.50	
1719	D3612	635	ex	4.28	
1720	D3612	298	ex	-5.42	
1743	IEC60567	661	ex	5.03	
1747	IEC60567	507.79		0.62	
1801		448.12		-1.10	
1885	D3612	393		-2.69	
1888	IEC60567	448.6		-1.08	
1890	IEC60567	505.9		0.57	
1891	IEC60567	587		2.90	
1897	IEC60567	549		1.81	
1898	D3612	388		-2.83	
1943	D3612	540.40430		1.56	
1966	IEC60567	498.9		0.36	
6015	D3612	503		0.48	
6036	IEC60567	507		0.60	
6053	IEC60567	266	ex	-6.34	
6063	IEC60567	482.9		-0.10	
6067	IEC60567	371.06		-3.32	
6085	D3612	578		2.64	
6088	IEC60567	476		-0.30	
6124	IEC60567	571		2.44	
6140	D3612	407		-2.28	
6141	D3612	261575	R(0.01)	7517.07	
6155	IEC60567	502.12		0.46	
6157	D3612	438.86714	ex	-1.36	
6158	IEC60567	464.35636		-0.63	
6165	IEC60567	472		-0.41	
8000	IEC60567	607.145		3.48	
8001	IEC60567	447.1		-1.13	
	normality	OK			
	n	54			
	outliers	2 (+5 ex)			
	mean (n)	486.26			
	st.dev. (n)	54.780			
	R(calc.)	153.38			
	st.dev.(IEC60567:11)	34.733			
	R(IEC60567:11)	97.25			



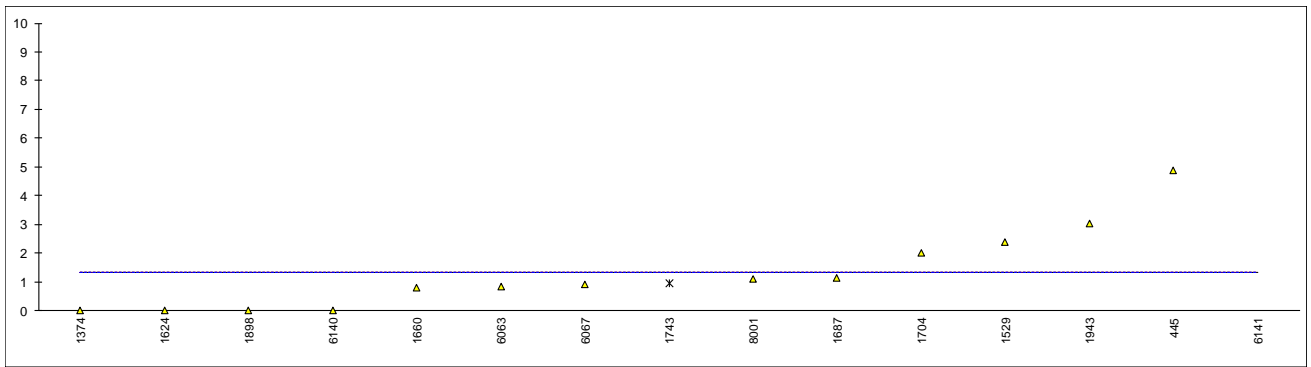
Determination of Propane (C₃H₈) on sample #17234; results in µ/L

lab	method	value	mark	z(targ)	remarks
179		----		----	
237		----		----	
360		----		----	
398		----		----	
445	IEC60567	538.7		0.91	
511		----		----	
614		----		----	
862		----		----	
912		----		----	
962		----		----	
963		----		----	
974	D3612	564		1.61	
1072		----		----	
1135	IEC60567	520		0.39	
1178		----		----	
1264		----		----	
1304		----		----	
1306		----		----	
1352	IEC60567	490.0		-0.44	
1367		----		----	
1374	D3612	751.1	R(0.05)	6.79	
1430		----		----	
1435		----		----	
1442	IEC60567	485.6		-0.56	
1444		----		----	
1473		----		----	
1478		----		----	
1513		----		----	
1516		----		----	
1529	IEC60567	520		0.39	
1545		----		----	
1560		----		----	
1624	IEC60567	464.76		-1.14	
1660	IEC60567	571.4		1.81	
1687	IEC60567	454.555		-1.42	
1704	IEC60567	496		-0.27	
1719	D3612	nt		----	
1720		----		----	
1743	IEC60567	540	ex	0.94	
1747		----		----	
1801		----		----	
1885		----		----	
1888		----		----	
1890		----		----	
1891		----		----	
1897		----		----	
1898	D3612	279	R(0.05)	-6.28	
1943	D3612	526.86076		0.58	
1966		----		----	
6015		----		----	
6036		----		----	
6053		----		----	
6063	IEC60567	362.2		-3.98	
6067	IEC60567	528.50		0.63	
6085	D3612	603		2.69	
6088		----		----	
6124		----		----	
6140	D3612	488		-0.50	
6141	D3612	370215	R(0.01)	10231.02	
6155	IEC60567	500.71		-0.14	
6157	D3612	413.22887	ex	-2.56	
6158		----		----	
6165		----		----	
8000		----		----	
8001	IEC60567	486.1		-0.55	
	normality	not OK			
	n	17			
	outliers	3 (+2 ex)			
	mean (n)	505.91			
	st.dev. (n)	53.618			
	R(calc.)	150.13			
	st.dev.(IEC60567:11)	36.136			
	R(IEC60567:11)	101.18			



Determination of Propene (C₃H₆) on sample #17234; results in µ/L

lab	method	value	mark	z(targ)	remarks
179		----		----	
237		----		----	
360		----		----	
398		----		----	
445	IEC60567	4.89		----	
511		----		----	
614		----		----	
862		----		----	
912		----		----	
962		----		----	
963		----		----	
974	D3612	<1		----	
1072		----		----	
1135		----		----	
1178		----		----	
1264		----		----	
1304		----		----	
1306		----		----	
1352	IEC60567	Not tested		----	
1367		----		----	
1374	D3612	0		----	
1430		----		----	
1435		----		----	
1442	IEC60567	<1		----	
1444		----		----	
1473		----		----	
1478		----		----	
1513		----		----	
1516		----		----	
1529	IEC60567	2.4		----	
1545		----		----	
1560		----		----	
1624	IEC60567	0		----	
1660	IEC60567	0.8		----	
1687	IEC60567	1.143		----	
1704	IEC60567	2		----	
1719	D3612	nt		----	
1720		----		----	
1743	IEC60567	0.95	ex	----	
1747		----		----	
1801		----		----	
1885		----		----	
1888		----		----	
1890		----		----	
1891		----		----	
1897		----		----	
1898	D3612	0		----	
1943	D3612	3.02403		----	
1966		----		----	
6015		----		----	
6036		----		----	
6053		----		----	
6063	IEC60567	0.848		----	
6067	IEC60567	0.93		----	
6085		----		----	
6088		----		----	
6124		----		----	
6140	D3612	0		----	
6141	D3612	368393	ex	----	false positive test result?
6155		----		----	
6157		----		----	
6158		----		----	
6165		----		----	
8000		----		----	
8001	IEC60567	1.1		----	
	normality	not OK			
	n	13			
	outliers	0 (+2 ex)			
	mean (n)	<10			
	st.dev. (n)	n.a.			
	R(calc.)	n.a.			
	st.dev.(IEC60567:11)	n.a.			
	R(IEC60567:11)	n.a.			



APPENDIX 2**Analytical details**

lab	Type of syringe	Extraction method
179	100 ml	
237	100 ml	
360	50 ml	Headspace
398	50 ml	Headspace
445	50 ml	Headspace
511	50 ml	Headspace
614	100 ml	ToGas
862	100 ml	
912	50 ml	Headspace
962	50 ml	
963	50 ml	Headspace
974	50 ml	Headspace
1072	100 ml	Toepler
1135	50 ml	Headspace
1178	100 ml	Headspace
1264	100 ml	Headspace
1304	50 ml	Headspace
1306	50 ml	Headspace
1352	100 ml	Other
1367	100 ml	Headspace
1374	50 ml	Headspace
1430	50 ml	Headspace
1435	100 ml	Headspace
1442	100 ml	Headspace
1444	50ml	
1473	50 ml	Headspace
1478	100 ml	Toepler
1513	50 ml	Toepler
1516	50 ml	Headspace
1529	100 ml	Headspace
1545	50 ml	Headspace
1560	100 ml	Headspace
1624	50 ml	Headspace
1660	50 ml	Headspace
1687	50 ml	Headspace
1704	50 ml	Headspace
1719	50 ml	Stripper Column (D3612B)
1720	50 ml	
1743	100 ml	Headspace
1747	50 ml	Headspace
1801	50 ml	Headspace
1885	100 ml	Other
1888	50 m	Headspace
1890	100 ml	Headspace
1891	50 ml	Headspace
1897	50 ml	Headspace
1898	100 ml	Headspace
1943	50 ml	Headspace
1966	50 ml	Other
6015	50 ml	Headspace
6036	50 ml	Headspace
6053	50 ml	Headspace
6063	100 ml	Toepler
6067	100 ml	Headspace
6085	50 ml	Headspace
6088	100 ml	Headspace
6124	50 ml	Stripper Column (D3612B)
6140	50 ml	Headspace
6141	100 ml	Headspace
6155	50 ml	Headspace
6157	50 ml	Headspace
6158	50 ml	Headspace
6165	50 ml	Headspace
8000	100 ml	Toepler
8001	100 ml	Headspace

APPENDIX 3

Number of participants per country

6 labs in AUSTRALIA
3 labs in BELGIUM
2 labs in BULGARIA
1 lab in CHINA, People's Republic
1 lab in CROATIA
1 lab in FRANCE
1 lab in GEORGIA
3 labs in GERMANY
1 lab in GREECE
2 labs in INDIA
2 labs in ITALY
1 lab in KINGDOM OF BAHRAIN
1 lab in LATVIA
1 lab in LITHUANIA
1 lab in MALAYSIA
1 lab in MOROCCO
2 labs in NETHERLANDS
1 lab in NEW ZEALAND
1 lab in NIGERIA
1 lab in PERU
2 labs in PORTUGAL
1 lab in QATAR
3 labs in SAUDI ARABIA
4 labs in SINGAPORE
2 labs in SLOVENIA
1 lab in SOUTH AFRICA
1 lab in SOUTH KOREA
5 labs in SPAIN
1 lab in SUDAN
1 lab in SWITZERLAND
1 lab in TURKEY
4 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	= probably an error in calculations
ex	= test result excluded from statistical evaluations
n.a.	= not applicable
n.e.	= not evaluated
fr.	= first reported
SDS	= Safety Data Sheet

Literature:

- 1 iis Interlaboratory Studies, Protocol for the Organisation, Statistics & Evaluation, March 2017
- 2 ASTM E178:02
- 3 ASTM E1301:95(2003)
- 4 ISO13528:05
- 5 ISO 5725:86
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- 7 M. Thompson and R. Wood, J. AOAC Int, 76, 926, (1993)
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- 10 DIN 38402 T41/42
- 11 P.L. Davies, Fr. Z. Anal. Chem, 331, 513, (1988)
- 12 J.N. Miller, Analyst, 118, 455, (1993)
- 13 Analytical Methods Committee Technical Brief, No4 January 2001
- 14 The Royal Society of Chemistry 2002, Analyst 2002, 127 page1359-1364, P.J. Lowthian and M. Thompson.
- 15 Bernard Rosner, Percentage Points for a Generalized ESD Many-Outlier Procedure, *Technometrics*, 25(2), pp. 165-172, (1983).