Results of Proficiency Test Liquefied Propane October 2014

Organised by: Institute for Interlaboratory Studies Spijkenisse, the Netherlands

Author:dr. R.G. VisserCorrectors:ing. R.J. StarinkReport:iis14S03P

December 2014

#### CONTENTS

1	INTRODUCTION	3
2	SET UP	3
2.1	QUALITY SYSTEM	3
2.2	PROTOCOL	3
2.3	CONFIDENTIALITY STATEMENT	4
2.4	SAMPLES	4
2.5	STABILITY OF THE SAMPLES	4
2.6	ANALYSES	5
3	RESULTS	5
3.1	STATISTICS	5
3.2	GRAPHICS	6
3.3	Z-SCORES	6
4	EVALUATION	8
4.1	EVALUATION PER TEST/COMPONENT	8
4.2	PERFORMANCE EVALUATION FOR THE GROUP OF LABORATORIES	11
4.3	DISCUSSION	11

## Appendices:

1.	Data and statistical results	13
2.	Number of participants per country	27
3.	Abbreviations and literature	28

#### 1 INTRODUCTION

Since 2009, the Institute for Interlaboratory Studies organized a proficiency test for the analysis of Liquefied Propane (composition only) every year. It was decided to continue this interlaboratory study during the annual program 2014/2015.

Because iis has limited gas-handling facilities in place to prepare gas samples, a cooperation with EffecTech (Uttoxeter, United Kingdom) was set up. This company is fully equipped and has experience in the preparation of synthetic natural gas samples for PT purposes. EffecTech maintains an ISO17043 accreditation for the preparation of PT samples in homogeneous and stable batches and an ISO17025 accreditation for the calibration and assignment of reference values for these samples.

In the 2014 proficiency test 44 laboratories in 24 different countries have participated. See appendix 2 for the number of participants per country. In this report the results of the 2014 proficiency test on Liquefied Propane are presented and discussed. This report is also electronically available through the iis internet site www.iisnl.com.

### 2 SET UP

The Institute for Interlaboratory Studies (iis) in Spijkenisse, the Netherlands, was the organizer of this proficiency test.

To optimise the costs for the participating laboratories, it was decided to prepare one Liquefied Propane mixture. The mixture was divided over a batch of 48 cylinders. The cylinder size is a cost-effective one-litre cylinder with dip tube device. Each cylinder, filled with approx 200 grams of liquefied propane mixture, was uniquely numbered. The limited cylinder size is chosen to optimise sample stability, cylinder costs, transport and handling costs. The preparation and testing of the sample cylinders was subcontracted. Participants were requested to report rounded and unrounded results. The unrounded results were preferably used for statistical evaluation.

## 2.1 QUALITY SYSTEM

The Institute for Interlaboratory Studies in Spijkenisse, the Netherlands, has implemented a quality system based on ISO/IEC 17043:2010 (R007). This ensures strict adherence to protocols for sample preparation and statistical evaluation and 100% confidentially of participant's data. Also customer's satisfaction is measured on regular basis by the distribution of questionnaires.

EffecTech is an accredited provider of proficiency testing schemes under the requirements of ISO/IEC17043:2010 by UKAS (no. 4719).

## 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 April 2014 (iis-protocol, version 3.3), that can be downloaded from the iis web site http://www.iisnl.com.

#### 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 sample was used. One batch of 48 one litre cylinders with artificial Liquefied Propane mixture was prepared and tested for homogeneity by EffecTech (Uttoxeter, United Kingdom) in conformance with ISO Guide 35: 2006 and ISO/IEC17043:2010 (job 14/0842) starting September 1, 2014. Each cylinder was uniquely numbered. Every cylinder in the batch was analysed using 6 replicate measurements. The within bottle and between bottle variations were then assessed in accordance with ISO Guide 35:2006 (Annex A.1). This procedure showed that the between bottle variations were all small compared to the uncertainties on the reference values on each component. Hence, a single reference value could be safely assigned to the entire batch of samples. The repeatability values (r) were calculated per component by multiplication of the respective standard deviation by 2.8. Subsequently, the calculated repeatabilities were compared with 0.3 times the reproducibility of the reference method in agreement with the procedure of ISO 13528, Annex B2 in the next table:

Parameter	r(observed) in %mol/mol	0.3 X R(D2163:96) in %mol/mol	0.3 X R(D2163:14) in %mol/mol
Ethane	0.013	0.028	0.093
Propane	0.035	0.282	1.259
Propylene	0.006	0.026	0.071
Iso-Butane	0.013	0.058	0.059
n-Butane	0.014	0.057	0.050
1-Butene	0.001	0.006	0.018
iso-Butylene	0.001	0.006	0.018
n-Pentane	0.008	0.023	0.023

Table 1: homogeneity test results of samples #14202

Each calculated repeatability is equal or less than 0.3 times the corresponding reproducibility of the reference method ASTM D2163:96 and also of the latest version D2163:14. Therefore, homogeneity of the subsamples #14202 was assumed.

To each of the participating laboratories one 1L cylinder was sent on October 8, 2014.

#### 2.5 STABILITY OF THE SAMPLES

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

#### 2.6 ANALYSES

The participants were asked to determine the composition: Ethane, Propane, Propylene, n-Butane, iso-Butane, n-Pentane, 1-Butene, iso-Butene and some physical parameters calculated from the composition: Molar Mass, Relative Density @60F, Absolute and Relative Vapour pressure @100F and Absolute and Relative Vapour pressure @40°C. To get comparable results a detailed report form, on which the units were prescribed as well as the required standards and a letter of instructions were prepared and made available on the data entry portal www.kpmd.co.uk/sgs-iis/. The detailed report form and the letter of instructions were also made available for download on the iis website www.iisnl.com. A SDS and a form to confirm receipt of the sample was added to the sample package.

#### 3 RESULTS

During four weeks after sample despatch, the results of the individual laboratories were gathered. The original results are tabulated per determination in the appendix 1 of this report. The laboratories are presented by their code numbers.

Directly after the deadline the available results were screened for suspect data. A 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 results. Additional or corrected data are put under 'Remarks' in the result tables in appendix 1. Results that came in after deadline were not taken into account in the screening for suspect data and thus these participants were not requested for checks.

#### 3.1 STATISTICS

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 April 2014 (iis-protocol, version 3.3).

For the statistical evaluation the *unrounded* (when available) figures were used instead of the rounded results. 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. Not all data sets proved to have a normal distribution, in which cases the statistical evaluation of the results should be used with due care.

In accordance with ISO 5725 (1986 and 1994) the original results per determination were submitted subsequently to Dixon and Grubbs outlier tests. Outliers are marked by D(0.01) for the Dixon test and by G(0.01) or DG(0.01) for the Grubbs test. Stragglers are marked by

D(0.05) for the Dixon test, by G(0.05) or DG(0.05) for the Grubbs test and by R(0.05) for the Rosner General ESD test (ref. 21). Both outliers and stragglers were not included in the calculations of the averages and the 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 these with a factor of 2.8.

### 3.2 GRAPHICS

In order to visualise 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 analysis results are plotted. The corresponding laboratory numbers are under 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 standard. 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 method is producing a smooth density approximation to a set of data that avoids some problems associated with histograms (see appendix 3; nos.14 and 15). 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-, ISO-, IP reproducibilities, the z-scores were calculated using a target standard deviation. This target standard deviation was calculated from the literature reproducibility by division with 2.8. The z-scores were calculated according to:

z(target) = (result - average of PT) / target standard deviation

The z(target) scores are listed in the result tables in appendix 1.

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.

Absolute values for z<2 are very common and absolute values for z>3 are very rare. Therefore the usual interpretation of z-scores is as follows:

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

#### 4 EVALUATION

In this proficiency test several problems were encountered with sample transport. Due to these problems five cylinders did reach the laboratory near or after the final reporting date and were unable to test the cylinder and to report results before the deadline of reporting. In total seven laboratories reported the test results after the final reporting date and another seven laboratories did not report any test results due to several circumstances. Not all laboratories did report all test results requested.

In total 44 participating laboratories reported 395 numerical test results. Observed were 27 outlying test results, which is 6.8% of all numerical results. In proficiency studies outlier percentages of 3% - 7.5% are quite normal.

#### 4.1 EVALUATION PER TEST/COMPONENT

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

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.

Because the majority of the participating laboratories used ASTM D2163 as test method, it was decided to use the reproducibilities of this test method as target reproducibilities, and to mention the reproducibilities of EN27941 (identical to IP405 and ISO7941) for reference only. Regretfully in the last version ASTM D2163:07 only repeatabilities, but no reproducibilities are mentioned. Therefore the precision data from the previous version ASTM D2163:96 (estimated from figure 3) were used.

All test results reported by laboratories 92, 1491 and 1776 were deviating and many of the eight test results appeared to be statistical outliers. As the eight test results are not independent, it was decided to reject all of the test results of this laboratory for the statistical evaluation.

Also the test results of laboratory 1026 were not used in the calculations because this laboratory did report only 5 of the 8 components present and therefore proper normalisation of the test results was not possible.

Ethane: The determination of this component may be problematic, depending on the test method used by the laboratory. Four statistical outliers were observed. The calculated reproducibility, after exclusion of the suspect data, is not at all in agreement with the requirements of ASTM D2163:96. However, the calculated reproducibility is in good agreement with the less strict reproducibility requirements of EN27941 (identical to IP405 and ISO7941).

The determination of this component was problematic for a number of
laboratories. Two statistical outliers were observed. However, the
calculated reproducibility after exclusion of the suspect data is in good
agreement with the requirements of ASTM D2163:96 and also with the
reproducibility requirements of EN27941 (identical to IP405 and
ISO7941).

- <u>Propylene:</u> The determination of this component may be problematic, depending on the test method used by the laboratory. Four statistical outliers were observed. The calculated reproducibility after exclusion of the suspect data is not in agreement with the requirements of ASTM D2163:96. However, the calculated reproducibility is in good agreement with the less strict reproducibility requirements of EN27941 (identical to IP405 and ISO7941).
- iso-Butane: The determination of this component was problematic for a number of laboratories. Five (!) statistical outliers were observed. The calculated reproducibility after exclusion of the suspect data is in good agreement with the requirements of ASTM D2163:96 and also with the reproducibility requirements of EN27941 (identical to IP405 and ISO7941).
- <u>n-Butane:</u> The determination of this component was problematic. Four statistical outliers were observed. The calculated reproducibility after exclusion of the suspect data is not in agreement with the requirements of ASTM D2163:96, nor with the less strict reproducibility requirements of EN27941 (identical to IP405 and ISO7941).
- <u>1-Butene:</u> The determination of this component may be problematic, depending on the test method used by the laboratory. Two statistical outliers were observed. The calculated reproducibility after exclusion of the suspect data is not in agreement with the requirements of ASTM D2163:96. However, the calculated reproducibility is in good agreement with the less strict reproducibility requirements of EN27941 (identical to IP405 and ISO7941).
- <u>Iso-Butene:</u> The determination of this component may be problematic, depending on the test method used by the laboratory. Two statistical outliers were observed. The calculated reproducibility after exclusion of the suspect data is not in agreement with the requirements of ASTM D2163:96. However, the calculated reproducibility is in good agreement with the less strict reproducibility requirements of EN27941 (identical to IP405 and ISO7941).

- <u>n-Pentane:</u> The determination of this component may be problematic, depending on the test method used by the laboratory. Two statistical outliers were observed. The calculated reproducibility after exclusion of the suspect data is not in agreement with the requirements of ASTM D2163:96. However, the calculated reproducibility is in good agreement with the less strict reproducibility requirements of EN27941 (identical to IP405 and ISO7941).
- <u>Molar Mass:</u> This calculated parameter may not be problematic. The results vary over a range from 44.58 – 44.7346. No statistical outliers were present. The calculated reproducibility is small in comparison with the calculated reproducibility of iis13S03P (0.12 vs. 0.27). See also the discussion in 4.3.
- <u>Rel. Density @60F:</u> This calculated parameter may be problematic. The results vary over a range from 0.5095 0.511. No statistical outliers were present. Possibly seven laboratories reported the relative density @15°C, as IP432 or ISO8973 were used, both methods use 15°C instead of 60F. However, the difference in relative density between 15°C and 60F is less than 0.0001 and therefore this cannot fully explain for the observed spread.
- Abs. VP @100F: As the reported results calculated via ASTM D2598 and ISO8973 are not identical, it was decided to calculate the absolute vapour pressure for each laboratory according to both test methods by using the reported contents of the components. When the result of the calculation method of ASTM D2598 is comparison with the result of the calculation method of ISO8973, it is noticed that the difference in the means is significant, while the difference in the spreads is not significant. See also the discussion in 4.3. The quality of the test results has improved significantly since the previous PT as the dispersion of the results decreased (1.534 vs 2.698 for ISO8973 and 1.575 vs 2.485 for D2598).
- Rel. VP @100F: As the reported results calculated via ASTM D2598 and ISO8973 are not identical, it was decided to calculate the absolute vapour pressure for each laboratory according to both test methods by using the reported contents of the components. When the result of the calculation method of ASTM D2598 is comparison with the result of the calculation method of ISO8973, it is noticed that the difference in the means is significant, while the difference in the spreads is not significant. See also the discussion in 4.3. The quality of the test results has improved significantly since the previous PT as the dispersion of the results decreased (1.534 vs 2.698 for ISO8973 and 1.575 vs 2.485 for D2598).
- <u>Abs. VP @40°C:</u> This determination may be problematic. The range of the reported test results is large: from 1236 1386 kPa. One calculation error was observed and possibly two Relative VPs results were reported under

Absolute VP. After exclusion of the suspect data one more statistical outlier was observed.

<u>Rel. VP @40°C:</u> This determination may be problematic. The range of the reported test results is large: from 1138.7 – 1285 kPa. After exclusion of the suspect data one more statistical outlier was observed.

#### 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 sample, calculated reproducibilities and reproducibilities, derived from literature standards (in casu ASTM D2163:96 and EN27941/ISO7941/IP405) are compared in the next table.

Parameter	unit	n	cons. value	2.8 * sd	R(D2163:96) in <b>%mol</b>	R(EN27941) liqinj. in <b>%mol</b>
Ethane	%mol/mol	31	0.807	0.167	0.093	0.297
Propane	%mol/mol	32	94.103	0.778	0.941	1.013
Propylene	%mol/mol	31	0.743	0.096	0.086	0.212
iso-Butane	%mol/mol	31	1.670	0.187	0.192	0.384
n-Butane	%mol/mol	32	1.658	0.237	0.191	0.212
1-Butene	%mol/mol	32	0.168	0.041	0.019	0.159
Iso-Butene	%mol/mol	32	0.168	0.041	0.019	0.159
n-Pentane	%mol/mol	30	0.669	0.139	0.077	0.310
Molar Mass	g/mol	18	44.662	0.122	n.a.	n.a.
Rel. Density @60F		20	0.5102	0.0013	n.a.	n.a.
Abs. VP @100F	psi		see	§4.3	n.a.	n.a.
Rel. VP @100F	psi		see	§4.3	n.a.	n.a.
Abs. VP @40°C	kPa	13	1350	32	n.a.	n.a.
Rel. VP @40°C	kPa	13	1246	12	n.a.	n.a.

Table 2: Performance of the group in comparison with the target reproducibilities

Without further statistical calculations it can be concluded that for some components/tests there is a good compliance of the group of participating laboratories with the relevant standard. The problematic components/tests have been discussed in paragraph 4.1.

## 4.3 DISCUSSION

Because several of the reproducibility requirements of ASTM D2163 differ significantly from the reproducibility requirements of EN27941 (for liquid injection), the outcome of the evaluation will be strongly dependent on the target test method selected for the evaluation.

The consensus values as determined in this PT are compared with the average values from the homogeneity testing by EffecTech, United Kingdom in the following table.

Parameter	Average values by EffecTech in %mol/mol	Consensus values from participants results in %mol/mol	Absolute differences in %mol/mol	z-score
Ethane	0.950	0.807	+0.143	+4.31
Propane	94.231	94.103	+0.128	+0.38
Propylene	0.757	0.743	+0.014	+0.46
iso-Butane	1.578	1.670	-0.092	-1.34
n-Butane	1.551	1.658	-0.107	-1.57
1-Butene	0.159	0.168	-0.009	-1.31
Iso-Butene	0.156	0.169	-0.013	-1.88
n-Pentane	0.618	0.669	+0.051	+1.85

Table 3: comparison of consensus values with values determined by EffecTech

From this comparison it is clear that <u>all</u> consensus values as determined in this PT are in line with the values as determined by EffecTech during the preparation of the cylinders, except for Ethane. Ethane, being the most volatile component, ethane will occupy the headspace in the sample to a greater extent. With each handling (injection, rinsing), the amount of liquid will decrease and the amount of vapour will increase and consequently the ethane concentration in the liquid will decrease. The higher the initial ethane concentration, the more visible the decrease will be.

For the calculation of the Vapour Pressure (VP) @100F, ten participants used ISO8973/IP432/EN589 and seven participants used ASTM D2598. In ISO 8973 (identical to IP432) the <u>Absolute</u> VP is calculated from the <u>mole fraction</u> per component and a VP factor of that component (given for all components). From the Absolute VP, the Relative VP is calculated. The participants that reported a test result for Vapour Pressure @40° all used ISO8973 or IP 432, except one laboratory.

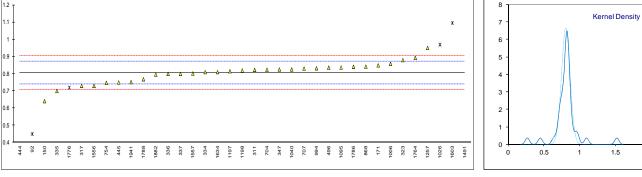
In ASTM D2598 the Gage pressure (identical to the <u>Relative</u> VP) is calculated from the <u>liquid</u> <u>volume percentage</u> per component and a VP factor of that component. Regretfully in the 2002 (2007) version of D2598 no factors are given for n-butene, 1-butene and n-pentane. However, in the draft 2012 version, factors are mentioned for these and other components. As one would expect to find identical values from both calculation methods, it is remarkable to see that the results from the ASTM D2598 calculation are significantly lower than the results from the ISO8973/IP432 calculation. The observed difference is caused by a difference in the VP factor of Ethane. ASTM (Subcommittee D02.H) commented (see also Appendix 3, literature: 20):

"The vapor pressure of ethane in D2598 was revised a few times prior to 2002. The current value, 611 psi, has remained the same for the last ten years. The revision of ethane was done because components in LPG blends do not necessarily behave as ideal gases. In particular, properties of ethane and ethylene appear to differ from ideality. Factors for these two components have been modified from 'ideal gas' values to make the calculated vapor pressure results more closely approximate actual measured vapor pressures of LPG blends. (i.e. D1267). Chapter 2 of Fuels and Lubricants Handbook (George Totten, © 2003), states that calculated vapor pressure were found to be biased high relative to experimental vapor pressure measured by D1267 for high ethane samples in earlier versions of D2598".

#### **APPENDIX 1**

Determination of Ethane on sample #14202; results in %mol/mol

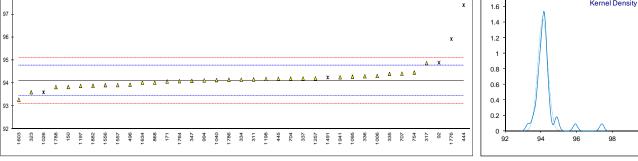
92       D2163       0.45       R(0.01)       -10.76         150       D2163       0.641       5.01         150       D2163       0.641       5.01         151       D2163       0.8496       1.28         151       D2163       0.8227       -2.32         153       D2163       0.73       -2.32         153       D2163       0.73       -2.32         153       D2163       0.73       -2.32         153       D2163       0.73       -2.32         154       D2163       0.76       -0.22         157       D2163       0.826       0.57         151	lab	method	value	mark	z(targ)	suits in %moi/moi
160       D2163       0.641       -5.01         311       D2163       0.84966       1.28         311       D2163       0.8227       0.47         323       D2163       0.8227       0.47         324       EN27941       0.81       0.09         335       D2163       0.7       -3.23         336       EN27941       0.8       C       -0.22         337       D2163       0.75       -7.23         336       EN27941       0.8       C       -0.22         347       D2163       0.826       0.57         7444       IP405       0.27       C.R(0.01)       -16.19       first reported .21         4445       D2163       0.824       0.51       -1.72         754       D2163       0.824       1.05       -1.72         754       D2163       0.842       1.05       -1.72         94       D2163       0.842       1.05       -24         912						
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $						
317       D2163       0.8227       0.47         317       D2163       0.73       -2.32         323       D2163       0.88       2.19         334       ENZ7941       0.81       0.09         335       ENZ7941       0.8       C       -0.22         337       ENZ7941       0.8       C       -0.22         337       ENZ7941       0.8       C       -0.22         336       ENZ7941       0.8       C       -0.22         337       D2163       0.75       -1.72       first reported 0.44         444       P405       0.27       C.R(0.01)       -16.19       first reported .21         445       D2163       0.747       -1.72       -0.51       -0.51         707       D2163       0.825       0.76       -0.51         707       D2163       0.825       0.76       -0.57         708       D2163       0.826       1.53       -0.24         1006       D2163       0.836       1.53       -0.24         1189       D2163       0.81       0.24       -0.57         1189       D2163       0.81       0.24       -0.57 </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>						
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $						
223       D2163       0.88       2.19         334       EN27941       0.81       0.09         335       D2163       0.7       -3.23         336       EN27941       0.8       C       -0.22         337       D2163       0.826       0.57         444       IP405       0.27       C.R(0.01)       -16.19         445       D2163       0.75       -1.72         446       D2163       0.75       -1.72         470       D2163       0.826       0.57         707       D2163       0.821       0.72         707       D2163       0.825       0.76         812       0.642       1.05         912       0.612163       0.8325       0.76         1086       D2163       0.8325       0.76         1080       D2163       0.8325       0.76         1080       D2163       0.81       0.24         1199       D2163       0.81       0.24         1198       D2163       0.81       0.24         1198       D2163       0.81       0.24         1199       D2163       0.820       0.39						
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $						
335     D2163     0.7     -3.23       336     EN27941     0.8     C     -0.22       337     D2163     0.826     0.57       444     IP405     0.27     C,R(0.01)     -16.19       445     D2163     0.826     0.67       511         704     D2163     0.824     0.61       707     D2163     0.824     0.61       704     D2163     0.825     0.76       912         994     D2163     0.825     0.76       912         994     D2163     0.825     0.76       1006     D2163     0.826     0.57       10109         1020         1137     D2163     0.826     0.39       1138     D2163     0.820     0.39       1139     D2163     0.821        1200         1217     D2163     0.851        1218     D2163     0.893     2.60       1764     D2163     0.893     2.60       1776     EN27941     0.72 <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td></td<>						
337       EN27941       0.8       -0.22         347       D2163       0.826       0.57         444       IP405       0.27       C,R(0.01)       -16.19         445       D2163       0.75       -1.72         446       D2163       0.836       0.87         704       D2163       0.824       0.51         707       D2163       0.825       0.76         912						
347     D2163     0.826     0.57       444     IP405     0.27     C,R(0.01)     -16.19       445     D2163     0.836     0.87       470     D2163     0.824     0.51       707     D2163     0.824     0.51       707     D2163     0.842     1.05       912         924     D2163     0.825     0.76       1006     D2163     0.888     1.53       912         914     D2163     0.8325     0.76       1026     ISO7941     0.97     exult excluded, laboratory did report only 5 components       1040     DIN51619     0.826     0.57       1055     EN27941     0.837     0.90       1199         1199     D2163     0.815     0.24       1199     D2163     0.811     4.34       1257     D2163     0.9511     4.34       1257     D2163     0.961     R(0.01)     8.71       1631     inhouse     1.0961     R(0.01)     8.71       1632     inhouse     1.0961     R(0.01)     8.71       1633     inhouse     1.0961     Conte	336	EN27941	0.8	С	-0.22	first reported 0.44
444       IP405       0.27       C,R(0.01)       -16.19       first reported .21         445       D2163       0.75       -1.72       first reported .21         704       D2163       0.836       0.67         704       D2163       0.831       0.72         754       D2163       0.824       0.51         774       D2163       0.824       1.05         912	337	EN27941	0.8		-0.22	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	347	D2163	0.826		0.57	
496         EN27941         0.836         0.87           511              704         D2163         0.824         0.51           707         D2163         0.831         0.72           784         D2163         0.842         1.05           994         D2163         0.858         1.53           1006         D2163         0.826         0.57           1040         D1K51619         0.826         0.57           1035         EN27941         0.837         0.90           11197         D2163         0.820         0.39           1197         D2163         0.820         0.39           1200             1259             1267         D2163         0.8511         4.34           1259             1267         D2163         0.89511         4.34           1259             1267         D2163         0.8933         2.60           1634         ISO7941         0.502         C           1634         ISO7941 <t< td=""><td>444</td><td>IP405</td><td>0.27</td><td>C,R(0.01)</td><td>-16.19</td><td>first reported .21</td></t<>	444	IP405	0.27	C,R(0.01)	-16.19	first reported .21
511           704       D2163       0.824       0.51         707       D2163       0.831       0.72         754       D2163       0.842       1.05         912           994       D2163       0.858       1.05         912           914       D2163       0.858       1.53         1026       ISO7941       0.97       ex       4.91         1040       D1N51619       0.826       0.57         1040       D1N51619       0.826       0.57         1040       D1N51619       0.826       0.57         1040       D1N51619       0.820       0.90              1197       D2163       0.815       0.24         1198       D2163       0.820       C       -0.16         1180       D2163       0.893       2.60	445	D2163	0.75		-1.72	
704       D2163       0.824       0.51         707       D2163       0.831       0.72         784       D2163       0.842       1.05         994       D2163       0.8325       0.76         906       D2163       0.8325       0.76         1006       D2163       0.888       1.53         1026       ISO7941       0.97       ex       4.91         result excluded, laboratory did report only 5 components       1.05       1.05         1040       DINS1619       0.826       0.57         1095       ENZ7941       0.837       0.90         1109           1197       D2163       0.820       0.39         1200           1257       D2163       0.9511       4.34         1259           1491       ISO7941       0.73       2.32         1557       ENZ7941       0.72       ex       2.63         1633       in house       1.0961       R(0.01)       8.71         1634       ISO7941       0.72       ex       2.63         1766       D2163       0.841 <td>496</td> <td>EN27941</td> <td>0.836</td> <td></td> <td>0.87</td> <td></td>	496	EN27941	0.836		0.87	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$						
754       D2163       0.7475       -1.80         868       D2163       0.842       1.05         994       D2163       0.8325       0.76         1006       D2163       0.858       1.53         1026       ISO7941       0.97       ex       4.91         1040       DIN51619       0.826       0.57         1095       EN27941       0.837       0.90         1109           1200           1217       D2163       0.820       0.39         1200           1257       D2163       0.9511       4.34         1259           1257       D2163       0.952       C         1318       ISO7941       0.73       -2.32         1557       EN27941       0.73       -2.32         1557       EN27941       0.72       ex       -2.63         1766       D2163       0.841       1.02         1776       EN27941       0.7682       -1.17         1882       EN27941       0.7682       -1.17         1860       2.163						
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$						
912           994       D2163       0.8325       0.76         1006       D2163       0.858       1.53         1026       ISO7941       0.97       ex       4.91         1040       DNS1619       0.826       0.57         1095       EN27941       0.837       0.90         1109           1197       D2163       0.820       0.39         1200           1257       D2163       0.9511       4.34         1259           1257       D2163       0.9511       4.34         1259           1257       D2163       0.9511       4.34         1259            1491       ISO7941       0.73       -2.32         1557       EN27941       0.73       -2.32         1764       D2163       0.8933       2.60         1776       EN27941       0.7682       -1.17         1882       EN27941       0.7682       -1.17         1862       EN27941       0.7682       -0.33     <						
994         D2163         0.8325         0.76           1006         D2163         0.858         1.53           1026         ISO7941         0.97         ex         4.91           1040         DIN51619         0.826         0.57           1095         EN27941         0.837         0.90           1109             1197         D2163         0.815         0.24           1198         D2163         0.820         0.39           1200             1257         D2163         0.9511         4.34           1259             1257         D2163         0.9511         4.34           1259             1341         ISO7941         0.802         C         -0.16           1557         EN27941         0.802         C         -0.16         first reported .5372           1603         in house         1.0961         R(0.01)         8.71         1.02           1776         EN27941         0.762         -1.17         1.67           1822         EN27941         0.7663         -0.03 <td></td> <td>D2163</td> <td></td> <td></td> <td></td> <td></td>		D2163				
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $		<b>Ba</b> / <b>a</b> a				
1026       ISO7941       0.97       ex       4.91       result excluded, laboratory did report only 5 components         1040       DIN51619       0.826       0.57         1095       EN27941       0.837       0.90         1109           1197       D2163       0.815       0.24         1198       D2163       0.815       0.24         1257       D2163       0.9511       4.34         1259           1491       ISO7941       1.520       R(0.01)       21.48         1566       EN27941       0.802       C       -0.16         1633       in house       1.0961       R(0.01)       8.71         1634       ISO7941       0.81       0.09         1766       D2163       0.8933       2.60         1776       EN27941       0.72       ex       -2.63         1786       D2163       0.841       1.02         1786       D27941       0.7517       -1.67         1822       EN27941       0.7517       -1.67         1960           1960						
1040       DIN51619       0.826       0.57         1095       EN27941       0.837       0.90         1109           1197       D2163       0.815       0.24         1198       D2163       0.820       0.39         1200           1257       D2163       0.9511       4.34         1259           1491       ISO7941       1.520       R(0.01)       21.48         1556       EN27941       0.802       C       -0.16         1603       in house       1.0961       R(0.01)       8.71         1634       ISO7941       0.802       C       -0.16         1766       D2163       0.8933       2.60         1776       EN27941       0.72       ex       -2.63         1786       EN27941       0.7682       -1.17         1882       EN27941       0.7682       -1.17         1882       EN27941       0.7517       -1.67         1960            2124           normality       suspect      <					1.53	
1095       EN27941 $0.837$ $0.90$ 1109           1197       D2163 $0.815$ $0.24$ 1198       D2163 $0.820$ $0.39$ 1200           1257       D2163 $0.9511$ $4.34$ 1259           1401       ISO7941 $0.73$ $-2.32$ 1557       EN27941 $0.802$ C $-0.16$ 1634       ISO7941 $0.802$ C $-0.16$ 1764       D2163 $0.8933$ 2.60         1776       EN27941 $0.72$ ex $-2.63$ 1776       EN27941 $0.72$ ex $-2.63$ 1776       EN27941 $0.7682$ $-1.17$ 188       EN27941 $0.7682$ $-1.17$ 182       EN27941 $0.7517$ $-1.67$ 1960           2124           normality       suspect       suspect         n       31       outliers       4				ex		result excluded, laboratory did report only 5 components
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$						
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		EIN27941				
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		D2163				
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$						
1257       D2163       0.9511       4.34         1259						
1259           1491       ISO7941       1.520       R(0.01)       21.48         1556       EN27941       0.73       -2.32         1603       in house       1.0961       R(0.01)       8.71         1603       in house       1.0961       R(0.01)       8.71         1603       in house       1.0961       R(0.01)       8.71         1603       is Norse       1.0961       R(0.01)       8.71         1634       ISO7941       0.81       0.09         1776       EN27941       0.72       ex       -2.63       see §4.1         1786       D2163       0.841       1.02          1788       EN27941       0.7682       -1.17          1822       EN27941       0.7963       -0.33          1960             2124            normality       suspect           near (n)       0.05980       R(calc.)       0.1674       Compare R(EN27941(liq)) = 0.2970		D2163	0.9511		4.34	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$						
1557       EN27941 $0.802$ C       -0.16       first reported .5372         1603       in house $1.0961$ R(0.01) $8.71$ 1634       ISO7941 $0.81$ $0.09$ 1764       D2163 $0.8933$ 2.60         1776       EN27941 $0.72$ ex       -2.63         1786       D2163 $0.841$ $1.02$ 1788       EN27941 $0.7682$ -1.17         1882       EN27941 $0.7963$ -0.33         1941       EN27941 $0.7517$ -1.67         1960           normality       suspect          n       31          outliers       4       + 2 excl.         mean (n)       0.8072          st.dev. (n)       0.05980       R(calc.)       0.1674         R(D2163:96)       0.0929       Compare R(EN27941(liq)) = 0.2970	1491	ISO7941	1.520	R(0.01)	21.48	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	1556	EN27941	0.73		-2.32	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	1557	EN27941	0.802	С	-0.16	first reported .5372
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$				R(0.01)		
1776       EN27941 $0.72$ ex       -2.63       see §4.1         1786       D2163 $0.841$ $1.02$ 1788       EN27941 $0.7682$ -1.17         1882       EN27941 $0.7963$ -0.33         1941       EN27941 $0.7517$ -1.67         1960           2124           normality       suspect          n       31          outliers       4       + 2 excl.         mean (n)       0.8072          st.dev. (n)       0.05980         R(calc.)       0.1674         R(D2163:96)       0.0929    Compare R(EN27941(liq)) = 0.2970						
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$						
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$				ex		see §4.1
1882       EN27941       0.7963       -0.33         1941       EN27941       0.7517       -1.67         1960           2124           normality       suspect          n       31          outliers       4       + 2 excl.         mean (n)       0.8072       st.dev. (n)         st.dev. (n)       0.05980         R(calc.)       0.1674         R(D2163:96)       0.0929         Compare R(EN27941(liq)) = 0.2970						
1941       EN27941 $0.7517$ $-1.67$ 1960           2124           normality       suspect          n       31          outliers       4       + 2 excl.         mean (n)       0.8072          st.dev. (n)       0.05980         R(calc.)       0.1674         R(D2163:96)       0.0929         Compare R(EN27941(liq)) = 0.2970						
1960           2124           normality       suspect          n       31          outliers       4       + 2 excl.         mean (n)       0.8072         st.dev. (n)       0.05980         R(calc.)       0.1674         R(D2163:96)       0.0929         Compare R(EN27941(liq)) = 0.2970						
2124 normality suspect n 31 outliers 4 + 2 excl. mean (n) 0.8072 st.dev. (n) 0.05980 R(calc.) 0.1674 R(D2163:96) 0.0929 Compare R(EN27941(liq)) = 0.2970		EN2/941				
normality         suspect           n         31           outliers         4         + 2 excl.           mean (n)         0.8072           st.dev. (n)         0.05980           R(calc.)         0.1674           R(D2163:96)         0.0929   Compare R(EN27941(liq)) = 0.2970						
n 31 outliers 4 + 2 excl. mean (n) 0.8072 st.dev. (n) 0.05980 R(calc.) 0.1674 R(D2163:96) 0.0929 Compare R(EN27941(liq)) = 0.2970	2124					
n 31 outliers 4 + 2 excl. mean (n) 0.8072 st.dev. (n) 0.05980 R(calc.) 0.1674 R(D2163:96) 0.0929 Compare R(EN27941(liq)) = 0.2970		normality	suspect			
mean (n)         0.8072           st.dev. (n)         0.05980           R(calc.)         0.1674           R(D2163:96)         0.0929   Compare R(EN27941(liq)) = 0.2970						
st.dev. (n) 0.05980 R(calc.) 0.1674 R(D2163:96) 0.0929 Compare R(EN27941(liq)) = 0.2970		outliers	4	+ 2 excl.		
st.dev. (n) 0.05980 R(calc.) 0.1674 R(D2163:96) 0.0929 Compare R(EN27941(liq)) = 0.2970		mean (n)	0.8072			
R(D2163:96) 0.0929 Compare R(EN27941(liq)) = 0.2970		st.dev. (n)				
		R(D2163:96)	0.0929			Compare R(EN27941(liq)) = 0.2970



2

# Determination of Propane on sample #14202; results in %mol/mol

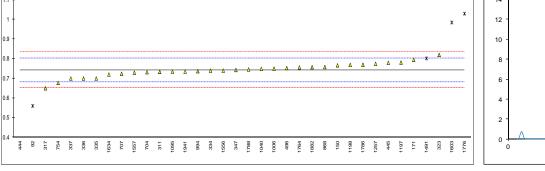
lab	method	value	mark	z(targ)	remarks
92	D2163	94.89	ex	2.34	see §4.1
150	D2163	93.827	0.	-0.82	
171	D2163	94.0695		-0.10	
311	D2163	94.1617		0.17	
317	D2163	94.87		2.28	
323	D2163	93.60		-1.50	
334	EN27941	94.15		0.14	
335	D2163	94.4		0.88	
336	EN27941	94.3	С	0.59	first reported 93.91
337	EN27941	94.2	-	0.29	
347	D2163	94.094		-0.03	
444	IP405	97.40	C,R(0.01)	9.81	first reported 99.03
445	D2163	94.19	, , ,	0.26	
496	EN27941	93.934		-0.50	
511					
704	D2163	94.194		0.27	
707	D2163	94.412		0.92	
754	D2163	94.4625		1.07	
868	D2163	94.023		-0.24	
912					
994	D2163	94.1181		0.04	
1006	D2163	94.313		0.62	
1026	ISO7941	93.6	ex	-1.50	result excluded, laboratory did report only 5 components
1040	DIN51619	94.130		0.08	
1095	EN27941	94.281		0.53	
1109					
1197	D2163	93.875		-0.68	
1198	D2163	94.184		0.24	
1200					
1257	D2163	94.2040		0.30	
1259					
1491	ISO7941	94.246	ex	0.42	see §4.1
1556	EN27941	93.91		-0.58	
1557	EN27941	93.911	С	-0.57	first reported 92.5901
1603	in house	93.2776		-2.46	
1634	ISO7941	94.02		-0.25	
1764	D2163	94.083		-0.06	
1776	EN27941	95.92	R(0.01)	5.41	
1786	D2163	94.147		0.13	
1788	EN27941	93.8268		-0.82	
1882	EN27941	93.8833		-0.65	
1941	EN27941	94.2532		0.45	
1960					
2124					
	normality	not OK			
	n autliana	32	.0		
	outliers	2	+3 excl.		
	mean (n)	94.103			
	st.dev. (n)	0.2779			
	R(calc.)	0.778			Compare B(EN07044/lig)) 4 042
	R(D2163:96)	0.941			Compare R(EN27941(liq)) = 1.013
98					1.8 Kernel Density
97 -					x 1.6 - Kernel Density
					1.4 -

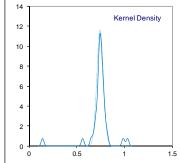


100

# Determination of Propylene on sample #14202; results in %mol/mol

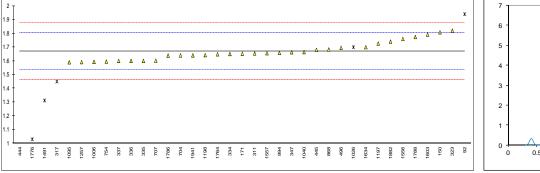
lab	method	value	mark	z(targ)	remarks
92	D2163	0.56	R(0.01)	-5.98	
150	D2163	0.767		0.80	
171	D2163	0.7952		1.72	
311	D2163	0.7337		-0.30	
317	D2163	0.65		-3.04	
323	D2163	0.82		2.53	
334	EN27941	0.74		-0.09	
335	D2163	0.7		-1.40	
336	EN27941	0.7	С	-1.40	first reported 0.65
337	EN27941	0.7		-1.40	
347	D2163	0.743		0.01	
444	IP405	0.14	C,R(0.01)	-19.74	first reported 0.17
445	D2163	0.78		1.22	
496	EN27941	0.753		0.34	
511					
704	D2163	0.732		-0.35	
707	D2163	0.724		-0.61	
754	D2163	0.6775		-2.14	
868	D2163	0.758		0.50	
912	<b>Ba</b> / <b>a</b> a				
994	D2163	0.7369		-0.19	
1006	D2163	0.750		0.24	
1026	DINEAGA				
1040	DIN51619	0.749		0.21	
1095	EN27941	0.735		-0.25	
1109	D0160			1.05	
1197	D2163	0.781		1.25	
1198 1200	D2163	0.769		0.86	
1200	D2163	0.7750		1.06	
1259	D2103				
1491	ISO7941	0.802	ex	1.94	see §4.1
1556	EN27941	0.74	UX	-0.09	300 34.1
1557	EN27941	0.730	С	-0.42	first reported 0.6908
1603	in house	0.9850	C,R(0.01)	7.93	first reported 0.9970
1634	ISO7941	0.72	0,11(0.01)	-0.74	
1764	D2163	0.7564		0.45	
1776	EN27941	1.03	R(0.01)	9.41	
1786	D2163	0.770		0.89	
1788	EN27941	0.7460		0.11	
1882	EN27941	0.7573		0.48	
1941	EN27941	0.7351		-0.25	
1960					
2124					
	normality	suspect			
	n	31 ່			
	outliers	4	+1 excl.		
	mean (n)	0.7427			
	st.dev. (n)	0.03426			
	R(calc.)	0.0959			
	R(D2163:96)	0.0855			Compare R(EN27941(liq)) = 0.2122
1.1 т					14
					14 Kernel Density

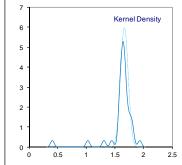




# Determination of iso-Butane on sample #14202; results in %mol/mol

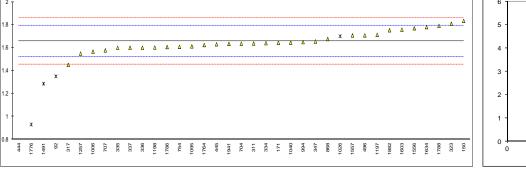
92       D2163       1.94       R(0.01)       3.94         160       D2163       1.6625       -0.26         171       D2163       1.6545       -0.22         371       D2163       1.6545       -0.29         373       EN27941       1.6       -1.01         374       EN27941       1.6       -1.01         375       EN27941       1.6       -1.01         376       EN27941       1.66       -0.02         377       EN27941       1.66       -0.01         444       IP406       0.41       C.R(0.01)       -1.85         571       D2163       1.640       -0.43         680       D2163       1.640       -0.43         707       D2163       1.6581       -0.07         941       D2163       1.6581       -0.17         1006       D2163       1.6581       -0.17         1006       D2163       1.6581       -0.42         119       D2163       1.642       -0.08         1096            1198       D2163       1.727       0.84         1198       D2163       1	lab	method	value	mark	z(targ)	remarks
171       D2163       1.6525       -0.25         371       D2163       1.6545       -0.22         373       D2163       1.45       D(0.05)       -3.20         374       EN27941       1.65       -0.29         375       D2163       1.6       -101         376       EN27941       1.6       -101         377       D2163       1.663       -0.10         444       IP405       0.41       C,R(0.01)       -18.35         704       D2163       1.660       0.15         445       D2163       1.640       -0.43         707       D2163       1.622       -0.99         754       D2163       1.623       -0.17         706       D2163       1.6581       -0.17         706       D2163       1.6581       -0.17         706       D2163       1.5910       -1.16         707       D2163       1.5910       -1.16         704       D2163       1.5910       -1.16         705       D2163       1.5910       -1.15         707       D2163       1.5910       -1.15         718       D27941       1.				R(0.01)		
311     D2163     1.645     -0.22       323     D2163     1.45     D(0.05)     3.20       324     EN27941     1.65     -0.29       335     D2163     1.6     -1.01       336     EN27941     1.6     -1.01       337     D2163     1.663     -0.10       337     D2163     1.683     -0.10       347     D2163     1.683     -0.10       347     D2163     1.68     0.15       511         704     D2163     1.640     -0.43       707     D2163     1.640     -0.43       707     D2163     1.659        912         9212         932         934     D2163     1.6591     -0.17       935     EN27941     1.7     exult excluded, laboratory did report only 5 components       1040     D105         1137     D2163     1.5930     -1.12       1138     D2163     1.642     -0.40       1139     D2163     1.5910     -1.15       1138     D2163     1.5910     -1.15 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td></t<>						
317     D2163     1.45     D(0.05)     -3.20       323     D2163     1.82     2.19       334     EN27941     1.65     -0.29       337     EN27941     1.6     -0.10       437     D2163     1.663     -0.10       444     IP405     0.41     C,R(0.01)     -18.35       445     D2163     1.683     -0.10       444     IP405     0.41     C,R(0.01)     -18.35       450     EN27941     1.666     0.38       511         707     D2163     1.663     -0.19       777     D2163     1.6581     -0.17       708     D2163     1.6581     -0.17       7106     D2163     1.6581     -0.17       7106     D2163     1.593     -1.12       711     006     D2163     1.593     -1.12       711     1006     D2163     1.593     -1.12       711     1006     D2163     1.591     -0.44       7109     D2163     1.542     -0.40       7119     D2163     1.642     -0.40       7120     D2163     1.642     -0.40       7137     D2163     1.642 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td></t<>						
323     D2163     1.82     2.19       334     ENZ7941     1.65     -0.29       335     D2163     1.6     -1.01       336     ENZ7941     1.8     -1.01       337     ENZ7941     1.8     -1.01       337     ENZ7941     1.63     -0.10       337     ENZ7941     1.66     -0.10       344     IP405     0.41     C.R(0.01)     -1.35       345     D2163     1.640     -0.43       704     D2163     1.640     -0.43       707     D2163     1.650     -1.09       868     D2163     1.5950     -1.12       704     D2163     1.5950     -1.12       705     D2163     1.593     -1.12       706     D2163     1.593     -1.12       707     D2163     1.593     -1.12       708     D2163     1.593     -1.12       709     D2163     1.593     -1.12       719     D2163     1.591     -1.16       719     D2163     1.642     -0.04       719     D2163     1.591     -1.16       719     D2163     1.642     -0.41       719     D2163     1.642						
334         EN27941         1.65         -0.29           335         D2163         1.6         -1.01           336         EN27941         1.6         -1.01           337         EN27941         1.6         -1.01           444         IP405         0.41         C,R(0.01)         18.35           444         IP405         0.41         C,R(0.01)         18.35           444         IP405         0.41         C,R(0.01)         18.35           445         D2163         1.660         0.38           511             707         D2163         1.602         -0.99           754         D2163         1.6581         -0.17           706         D2163         1.6581         -0.17           7106         D2163         1.5830         -1.12           704         D2163         1.5681         -0.08           705         D2163         1.580         -1.16           7106         D2163         1.542         -0.40           7199         D2163         1.642         -0.40           7199         D2163         1.5910         -1.15           7				D(0.05)		
335       D2163       1.6       -1.01         336       ENZ7941       1.6       -1.01         337       ENZ7941       1.6       -1.01         347       D2163       1.63       -0.10         347       D2163       1.68       -0.10         444       IP405       0.41       C.R(0.01)       -18.35         first reported 0.34       1.680       0.15         704       D2163       1.640       -0.43         707       D2163       1.692       -0.99         784       D2163       1.683       0.19         912						
336       EN27941       1.6       C       -1.01       first reported 1.85         347       D2163       1.663       -0.10       -0.10         444       IP405       0.41       C.R(0.01)       -18.35       first reported 0.34         445       D2163       1.680       0.38       -         704       D2163       1.640       -0.43         707       D2163       1.620       -0.99         764       D2163       1.6581       -0.17         707       D2163       1.6581       -0.17         708       D2163       1.6581       -0.17         709       D2163       1.6581       -0.17         7010       D2163       1.5930       -1.12         702       D2163       1.5910       -1.16         719       D2163       1.5910       -1.16         719       D2163       1.5910       -1.16         719       D2163       1.5910       -1.16         719       D2163       1.5910       -1.16         7199       D2163       1.5910       -1.16         7199       D2163       1.5910       -1.16         7180       D.256						
337       EN27941       1.6       -1.01         444       IP405       0.610       -0.10         444       IP405       0.411       C,R(0.01)       -18.35       first reported 0.34         445       D2163       1.680       0.15       irst reported 0.34         446       EN27941       1.696       0.38         511           704       D2163       1.602       -0.99         784       D2163       1.683       0.19         912           934       D2163       1.6581       -0.17         1006       D2163       1.593       -1.12         1026       ISO7941       1.7       ex       0.44         1040       D1N51619       1.664       -0.08         1197       D2163       1.727       0.84         1198       D2163       1.622       -0.40         1199       D2163       1.624       -0.40         1191       D2163       1.624       -0.40         1191       D2163       1.624       -0.40         1192            1193       R0				C		first reported 1.95
347     D2163     1.663     -0.10       444     I4905     0.41     C,R(0.01)     -18.35       445     D2163     1.68     0.33       511         707     D2163     1.640     -0.43       707     D2163     1.683     0.19       986     D2163     1.6581     -0.19       994     D2163     1.6581     -0.17       1006     D2163     1.593     -1.12       1006     D2163     1.593     -1.12       1006     D2163     1.593     -1.12       1006     D2163     1.593     -1.12       1006     D2163     1.593     -1.16       1119     D2163     1.727     0.84       1090         1197     D2163     1.727     0.84       1198     D2163     1.727     0.84       1199         1257     D2163     1.727     0.84       1198     D2163     1.727     0.84       1198     D2163     1.656     C     -0.20       1556     EN27941     1.76     1.32       1637     Inbuse     1.793     0.45				0		
444       IP405       0.41       C,R(0.01)       -18.35       first reported 0.34         445       D2163       1.68       0.15         511           704       D2163       1.640       -0.43         707       D2163       1.602       -0.99         764       D2163       1.652          988       D2163       1.653       -1.09         988       D2163       1.6581       -0.17         1006       D2163       1.593       -1.12         1026       ISC7941       1.7       exult excluded, laboratory did report only 5 components         1040       DINS1619       1.664       -0.08         1055       EN27941       1.590       -1.16         1109           1197       D2163       1.510       -1.15         1257       D2163       1.642       -0.40         1200           1257       D2163       1.642       -0.41         1265       EN27941       1.76       1.32         1557       EN27941       1.666       C       -0.23         1764       D2163 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>						
445       D2183       1.68       0.15         496       EN27941       1.696       0.38         511           707       D2163       1.640       -0.43         707       D2163       1.640       -0.43         707       D2163       1.6950       -1.09         868       D2163       1.683       0.19         912           994       D2163       1.583       -1.12         1006       D2163       1.583       -1.12         1006       D2163       1.642       -0.04         1197       D2163       1.727       0.84         1199       D2163       1.642       -0.40         1200           1259           1267       D2163       1.510       -1.15         1259            1257       D2163       1.510       -1.15         157       EN27941       1.312       R(0.01)       -5.21         1567       EN27941       1.76       1.32         157       D2163       1.642				C,R(0.01)		first reported 0.34
496         EN27941         1.696         0.38           511             704         D2163         1.602         -0.99           754         D2163         1.5950         -1.09           888         D2163         1.683         0.19           912             924         D2163         1.593         -1.12           1026         ISO7941         1.7         ex         0.44           1040         DIN51619         1.664         -0.08           1035         EN27941         1.590         -1.16           1040         DIN51619         1.664         -0.08           1039              1199              1257         D2163         1.5910         -1.15           1259              1257         D2163         1.542         -0.40           1200              1257         D2163         1.642         -0.20         first reported 2.1558           1603         in house         1.7923				-, ()		
704       D2163       1.640       -0.43         707       D2163       1.602       -0.99         868       D2163       1.683       0.19         912						
707       D2163       1.602       -0.99         754       D2163       1.5950       -1.09         986       D2163       1.683       0.19         912						
754       D2163       1.5950       -1.09         868       D2163       1.683       0.19         912           994       D2163       1.6581       -0.17         1006       D2163       1.593       -1.12         1026       ISO7941       1.7       ex       0.44         1040       DIN51619       1.664       -0.08         1095       ENZ7941       1.590       -1.16         1109           1197       D2163       1.727       0.84         1198       D2163       1.642       -0.40         1200           1257       D2163       1.5910       -1.15         1259           1491       ISO7941       1.312       R(0.01)       -5.21         1566       EN27941       1.666       C       -0.20         1575       EN27941       1.662       -0.31         1603       1.642       -0.31         1766       D2163       1.642       -0.31         1776       EN27941       1.03       R(0.01)       9.32						
888         D2163         1.683         0.19           912             1006         D2163         1.593         -1.12           1026         ISO7941         1.7         ex         0.44           1026         ISO7941         1.7         ex         0.44           1026         ISO7941         1.593         -1.12           1026         ISO7941         1.590         -1.16           1095         ENZ7941         1.590         -1.16           1109              1200             1201         1.642         -0.40           1200             1257         D2163         1.5910         -1.15           1259              1421         ISO7941         1.76         1.32           1557         EN27941         1.656         C         -0.20           1557         EN27941         1.6482         -0.31           1776         EN27941         1.03         R(0.01)         -9.32           1786         EN27941         1.7402 </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>						
912           994       D2163       1.6581       -0.17         1006       D2163       1.593       -1.12         1026       ISO7941       1.7       ex       0.44       result excluded, laboratory did report only 5 components         1040       DIN51619       1.664       -0.08         1095       EN27941       1.590       -1.16         1109           1197       D2163       1.727       0.84         1200           1257       D2163       1.5910       -1.15         1259            1491       ISO7941       1.312       R(0.01)       -5.21         1557       EN27941       1.656       C       -0.20         1534       ISO7941       1.70       0.44         1764       D2163       1.6482       -0.31         1776       EN27941       1.03       R(0.01)       -9.32         1786       EN27941       1.738       1.52         1882       EN27941       1.7402       1.03         1960           1776						
994         D2163         1.6581         -0.17           1006         D2163         1.593         -1.12           1026         ISO7941         1.7         ex         0.44           1040         DIN51619         1.664         -0.08           1095         EN27941         1.590         -1.16           1109             1197         D2163         1.727         0.84           1188         D2163         1.642         -0.40           1250             1491         ISO7941         1.312         R(0.01)         -5.21           1556         EN27941         1.76         1.32           1557         EN27941         1.76         1.32           1557         EN27941         1.76         1.32           1557         EN27941         1.70         0.44           1764         D2163         1.6482         -0.31           1776         EN27941         1.70         0.44           1776         EN27941         1.7738         1.52           1882         EN27941         1.738         1.52           1882         EN27941		D2163				
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		D0160				
1026       ISO7941       1.7       ex       0.44       result excluded, laboratory did report only 5 components         1040       DIN51619       1.664       -0.08         1095       EN27941       1.590       -1.16         1109           1197       D2163       1.727       0.84         1198       D2163       1.642       -0.40         1200           1257       D2163       1.5910       -1.15         1259           1491       ISO7941       1.312       R(0.01)       -5.21         1557       EN27941       1.656       C       -0.20         1603       in house       1.7923       1.79         1634       ISO7941       1.70       0.44         1766       D2163       1.6482       -0.31         1776       EN27941       1.03       R(0.01)       -9.32         1786       D2163       1.639       -0.45         1788       EN27941       1.7402       1.03         1941       EN27941       1.6403       -0.43         1960						
1040       DIN51619       1.664       -0.08         1095       EN27941       1.590       -1.16         1109           1197       D2163       1.727       0.84         1198       D2163       1.642       -0.40         1200           1257       D2163       1.5910       -1.15         1259           1491       ISO7941       1.312       R(0.01)       -5.21         1566       EN27941       1.656       C       -0.20         first reported 2.1558       in house       1.7923       1.79         1634       ISO7941       1.70       0.44         1766       EN27941       1.03       R(0.01)       -9.32         1776       EN27941       1.03       R(0.01)       -9.32         1786       D2163       1.639       -0.45         1786       EN27941       1.773       1.52         1882       EN27941       1.7402       1.03         1960           1960           1960        <				AY		result excluded laboratory did report only 5 components
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$				67		
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$						
1197       D2163       1.727       0.84         1198       D2163       1.642       -0.40         1200           1257       D2163       1.5910       -1.15         1259           1491       ISO7941       1.312       R(0.01)       -5.21         1556       EN27941       1.76       1.32         1557       EN27941       1.656       C       -0.20         1634       ISO7941       1.70       0.44         1764       D2163       1.6482       -0.31         1776       EN27941       1.03       R(0.01)       -9.32         1786       D2163       1.639       -0.45         1788       EN27941       1.7738       1.52         1882       EN27941       1.7402       1.03         1941       EN27941       1.6403       -0.43         1960           2124           normality       OK          nottlers       5       +1 excl.         mean (n)       1.6696          st.dev. (n)       0.06690 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>						
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		D2163	1.727		0.84	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1198	D2163	1.642		-0.40	
1259           1491       ISO7941       1.312       R(0.01)       -5.21         1556       EN27941       1.656       C       -0.20         1631       in house       1.7923       1.79         1634       ISO7941       1.70       0.44         1764       D2163       1.6482       -0.31         1776       EN27941       1.03       R(0.01)       -9.32         1786       D2163       1.639       -0.45         1788       EN27941       1.7402       1.03         1941       EN27941       1.7402       1.03         1941       EN27941       1.6403       -0.43         1960           2124           normality       OK          n       31          2124           normality       OK          nean (n)       1.6696       -+1 excl.         mean (n)       1.6696          st.dev. (n)       0.066890          R(calc.)       0.1873						
1491ISO79411.312 $R(0.01)$ -5.211556EN279411.761.321557EN279411.656C-0.201603in house1.79231.791634ISO79411.700.441764D21631.6482-0.311776EN279411.03R(0.01)-9.321786D21631.639-0.451788EN279411.77381.521882EN279411.74021.031941EN279411.6403-0.4319602124normality mean (n)0K 1.6696 st.dev. (n)0.06690 0.06690 R(calc.)+1 excl.		D2163				
1556       EN27941       1.76       1.32         1557       EN27941       1.656       C       -0.20       first reported 2.1558         1603       in house       1.7923       1.79         1634       ISO7941       1.70       0.44         1764       D2163       1.6482       -0.31         1776       EN27941       1.03       R(0.01)       -9.32         1786       D2163       1.639       -0.45         1788       EN27941       1.7738       1.52         1882       EN27941       1.7402       1.03         1941       EN27941       1.6403       -0.43         1960           2124           normality       OK          nean (n)       1.6696       +1 excl.         mean (n)       1.6696       st.dev. (n)       0.06690         R(calc.)       0.1873		1007044				
1557EN279411.656C-0.20first reported 2.15581603in house1.79231.791634ISO79411.700.441764D21631.6482-0.311776EN279411.03R(0.01)-9.321786D21631.639-0.451788EN279411.77381.521882EN279411.74021.031941EN279411.6403-0.4319602124normality mean (n)OK 1.6696 st.dev. (n)+1 excl.mean (n) R(calc.)0.1873+1 excl.				R(0.01)		
1603       in house       1.7923       1.79         1634       ISO7941       1.70       0.44         1764       D2163       1.6482       -0.31         1776       EN27941       1.03       R(0.01)       -9.32         1786       D2163       1.639       -0.45         1788       EN27941       1.7738       1.52         1882       EN27941       1.7402       1.03         1941       EN27941       1.6403       -0.43         1960           2124           normality       OK          nean (n)       1.6696       +1 excl.         mean (n)       1.6696       st.dev. (n)       0.06690         R(calc.)       0.1873				C		first reported 2 1559
$\begin{array}{cccccccccccccccccccccccccccccccccccc$				C		liist reputteu 2.1000
$\begin{array}{cccccccccccccccccccccccccccccccccccc$						
$\begin{array}{cccccccccccccccccccccccccccccccccccc$						
$\begin{array}{cccccccccccccccccccccccccccccccccccc$				R(0.01)		
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$				()		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1788	EN27941	1.7738		1.52	
1960           2124           normality       OK          n       31          outliers       5       +1 excl.         mean (n)       1.6696         st.dev. (n)       0.06690         R(calc.)       0.1873						
2124         normality     OK        n     31        outliers     5     +1 excl.       mean (n)     1.6696       st.dev. (n)     0.06690       R(calc.)     0.1873		EN27941				
normality         OK           n         31           outliers         5         +1 excl.           mean (n)         1.6696           st.dev. (n)         0.06690           R(calc.)         0.1873						
n 31 outliers 5 +1 excl. mean (n) 1.6696 st.dev. (n) 0.06690 R(calc.) 0.1873	2124					
n 31 outliers 5 +1 excl. mean (n) 1.6696 st.dev. (n) 0.06690 R(calc.) 0.1873		normality	ОК			
outliers         5         +1 excl.           mean (n)         1.6696           st.dev. (n)         0.06690           R(calc.)         0.1873		•				
mean (n)         1.6696           st.dev. (n)         0.06690           R(calc.)         0.1873				+1 excl.		
st.dev. (n) 0.06690 R(calc.) 0.1873						
		( )				
R(D2163:96) 0.1922 Compare R(EN27941(liq)) = 0.3842		```				
		R(D2163:96)	0.1922			Compare R(EN27941(liq)) = 0.3842

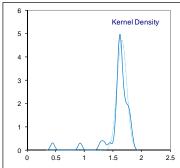




# Determination of n-Butane on sample #14202; results in %mol/mol

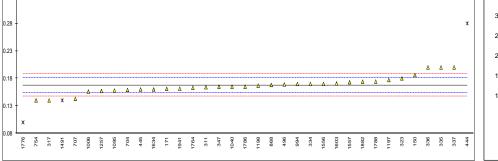
lab	method	value	mark	z(targ)	remarks
92	D2163	1.35	R(0.05)	-4.52	
150	D2163	1.835		2.59	
171	D2163	1.6428		-0.23	
311	D2163	1.6370		-0.31	
317	D2163	1.45		-3.05	
323	D2163	1.81		2.23	
334	EN27941	1.64		-0.27	
335	D2163	1.6	0	-0.85	first reported 4.00
336 337	EN27941 EN27941	1.6 1.6	С	-0.85 -0.85	first reported 1.93
347	D2163	1.655		-0.85	
444	IP405	0.45	C,R(0.01)	-17.72	first reported 0.20
445	D2163	1.63	0,1((0.01)	-0.41	
496	EN27941	1.708		0.73	
511					
704	D2163	1.636		-0.33	
707	D2163	1.577		-1.19	
754	D2163	1.6075		-0.74	
868	D2163	1.676		0.26	
912					
994	D2163	1.6489		-0.14	
1006	D2163	1.566		-1.35	
1026	ISO7941	1.7	ex	0.61	result excluded, laboratory did report only 5 components
1040	DIN51619	1.645		-0.19	
1095 1109	EN27941	1.612		-0.68	
1197	D2163	1.713		0.80	
1198	D2163	1.602		-0.82	
1200	B2100				
1257	D2163	1.5490		-1.60	
1259					
1491	ISO7941	1.286	R(0.05)	-5.46	
1556	EN27941	1.77		1.64	
1557	EN27941	1.707	С	0.72	first reported 2.2217
1603	in house	1.7582		1.47	
1634	ISO7941	1.78		1.79	
1764	D2163	1.6235		-0.51	
1776	EN27941	0.93	R(0.01)	-10.68	
1786	D2163	1.606		-0.77 1.94	
1788 1882	EN27941 EN27941	1.7907 1.7524		1.94	
1941	EN27941	1.6340		-0.35	
1960	LIN2/ 341			-0.55	
2124					
	normality	OK			
	n	32			
	outliers	4	+1 excl.		
	mean (n)	1.6582			
	st.dev. (n)	0.08457			
	R(calc.)	0.2368			
	R(D2163:96)	0.1909			Compare R(EN27941(liq)) = 0.2122
2 T					6

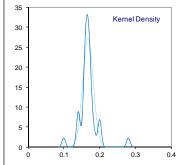




# Determination of 1-Butene on sample #14202; results in %mol/mol

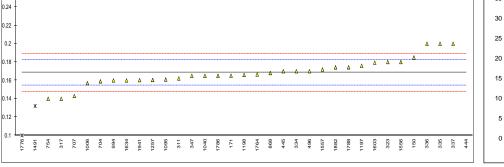
92	lab	method	value	mark	z(targ)	remarks
171     D2163     0.1610     -0.97       311     D2163     0.1613     -0.97       317     D2163     0.14     -4.02       323     D2163     0.14     -4.02       334     EN27941     0.2     4.68       336     D2163     0.165     -0.39       337     EN27941     0.2     4.68       337     EN27941     0.2     4.68       344     IP405     0.28     C.R(0.01)     first reported 0.19       511      -0.39     first reported 0.01       445     D2163     0.169     -1.12       456     EN27941     0.169     0.12       511         704     D2163     0.169     -1.26       707     D2163     0.169     0.32       1006     D2163     0.167     -0.10       1020         1199     D2163     0.167     -0.10       1090          1198     D2163     0.167     -0.10       1199     D2163     0.167     -0.10       1198     D2163     0.167     -0.10       1198     D2163     0.167     -0.10		D2163	0.186			
311       D2163       0.1639       → 0.55         323       D2163       0.14       → 0.02         324       ENZ7941       0.17       0.33         335       D2163       0.12       4.68         337       D2163       0.16       -0.39         344       ENZ7941       0.2       C       4.68         337       D2163       0.16       -0.39         444       IP405       0.28       C,R(0.01)       15.29         first reported 0.01       4.64       -0.01       -0.01         445       D2163       0.16       -0.39         704       D2163       0.150       -1.26         707       D2163       0.143       -3.58         754       D2163       0.168       -0.04         912       D2163       0.156       -1.70         1026       D185       -1.70       -1.61         1197       D2163       0.167       -0.10         1267       D2163       0.167       -0.10         1270       D2163       0.1570       -1.55         1285       PN27941       0.17       0.33         1257       D2163       <						
317     D2163     0.14     -4.02       323     D2163     0.18     1.78       334     EN27941     0.2     4.68       335     D2163     0.165     -0.39       344     IP405     0.28     C.R(0.01)     15.29       345     D2163     0.166     -1.12       446     EN27941     0.169     0.19       511         704     D2163     0.143     -3.58       754     D2163     0.166     -0.2       924     0.165     -1.70       1026         934     D2163     0.167     -0.10       1030         1197     D2163     0.167     -0.10       1030						
333 D2163 0.18 1.78  335 D2163 0.2 4.68  first reported 0.19  436 PNZP41 0.2 C 4.68  first reported 0.19  437 D2163 0.165 -0.39  439 PNZP41 0.165 -0.39  444 P405 0.28 C.R(0.01) 16.29 first reported 0.01  445 D2163 0.16 -1.12  456 D2163 0.16 -1.12  707 D2163 0.143 -3.58  754 D2163 0.168 0.04  912						
$\begin{array}{c c c c c c c c c c c c c c c c c c c $						
336     D2163     0.2     4.68       337     ENZ7941     0.2     C     4.68       337     D2163     0.165     -0.39       444     IP405     0.28     C.R(0.01)     16.29       445     D2163     0.16     -1.12       446     D2163     0.169     -1.26       707     D2163     0.143     -3.58       707     D2163     0.169     -1.26       707     D2163     0.169     -0.19       718     D2163     0.169     -0.26       707     D2163     0.169     0.32       706     D2163     0.166     -1.70       1026         707     D2163     0.167       708     D2163     0.167       709     D2163     0.167       7199     D2163     0.177       1199         7199     D2163     0.177       1198     D2163     0.177       1198     D2163     0.177       1199         1267     D2163     0.167       1198     D2163     0.167       118     D2163     0.167       118     D						
336     ENZ7941     0.2     C     4.68       347     ENZ7941     0.2     4.68       347     D2163     0.185     -0.39       444     IP405     0.28     C.R(0.01)     16.29       445     D2163     0.169     -1.12       446     ENZ7941     0.169     -1.26       707     D2163     0.159     -1.26       707     D2163     0.143     -3.58       764     D2163     0.168     0.04       912         92163     0.156     -1.70       1026     0.156     -1.70       1026     0.158     -1.41       1197     D2163     0.167     -0.39       1095     ENZ7941     0.158     -1.41       1197     D2163     0.1570     -1.55       1257     D2163     0.1570     -1.55       1256     ENZ7941     0.177     1.35       1197     D2163     0.177     1.35       1556     ENZ7941     0.170     0.34       1556     ENZ7941     0.170     0.34       1561     ENZ7941     0.170     0.34       1575     ENZ7941     0.170     0.34       15						
$\begin{array}{c c c c c c c c c c c c c c c c c c c $						
347     D2163     0.165     -0.39       444     IP405     0.28     C.R(0.01)     16.29       445     D2163     0.169     0.19       511         704     D2163     0.143     -3.58       754     D2163     0.1668     0.04       912         944     D2163     0.1669     0.32       1006     D2163     0.1669     0.32       1006     D2163     0.167        1040     DIN51619     0.165     -0.39       1055     EN27941     0.158     -1.41       1197     D2163     0.1677     -1.35       1257     D2163     0.1677     -0.10       1263     0.1677     -0.10       1270     D2163     0.1677     -0.10       1280          1290          1270     D2163     0.1677     -0.10       1280     D.1777     0.33     first reported 0.2179       1603     in house     0.1707     0.44       1575     ENZ7941     0.174     0.33       1766     D2163     0.166     -1.12 <t< td=""><td>336</td><td>EN27941</td><td>0.2</td><td>С</td><td>4.68</td><td>first reported 0.19</td></t<>	336	EN27941	0.2	С	4.68	first reported 0.19
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	337	EN27941	0.2		4.68	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	347	D2163				
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	444	IP405		C.R(0.01)		first reported 0.01
496 EN27941 0.169 0.19 501				- / ( /		
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $						
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$						
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		D2163				
754     D2163     0.1400     -4.02       868     D2163     0.168     0.04       912         994     D2163     0.156     -1.70       1006     D2163     0.156     -1.70       1026         1040     D1N51619     0.158     -1.41       1199         1197     D2163     0.1570     -1.55       1250         1267     D2163     0.1570     -1.55       1259         1257     D2163     0.1570     -1.55       1259         1265     D.177     0.33       157     EN27941     0.17     0.33       157     EN27941     0.177     0.33       157     EN27941     0.170     0.44       1634     ISO7941     0.16     -1.12       1764     D2163     0.1651     -0.39       1786     D2163     0.1651     -0.39       1786     D2163     0.1641     -0.91       1960          1224         mean (n)     0.1677						
868       D2163       0.188       0.04         912           994       D2163       0.1699       0.32         1006       D2163       0.156       -1.70         1026           1040       DIN51619       0.165       -0.39         1095       EN27941       0.158       -1.41         1109           1197       D2163       0.177       1.35         1198       D2163       0.1570       -1.55         1250       D2163       0.1570       -1.55         1290           1491       ISO7941       0.140       ex       -4.02         1556       EN27941       0.173       C       0.77         1633       in house       0.1707       0.44         1634       ISO7941       0.165       -0.39         1786       D2163       0.165       -0.39         1786       D2163       0.165       -0.39         1786       D2163       0.165       -0.39         1786       D2163       0.1641       -0.91         1940						
$\begin{array}{c c c c c c c c c c c c c c c c c c c $						
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		D2163				
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$						
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$						
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	1006	D2163	0.156		-1.70	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	1026					
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		DIN51619	0.165		-0.39	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		EN27941				
$\begin{array}{cccccccccccccccccccccccccccccccccccc$						
1198       D2163       0.167       -0.10         1200           1257       D2163       0.1570       -1.55         1259           1491       ISO7941       0.140       ex       -4.02       see §4.1         1556       EN27941       0.17       0.33       1557       EN27941       0.170         1603       in house       0.1707       0.44           1634       ISO7941       0.16       -1.12           1764       D2163       0.1631       -0.67           1776       EN27941       0.1743       0.96           1786       EN27941       0.1743       0.96           1882       EN27941       0.1614       -0.91            1960              2124		D2163				
$\begin{array}{cccccccccccccccccccccccccccccccccccc$						
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		D2105				
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		D0460				
1491       ISO7941       0.140       ex       -4.02       see §4.1         1556       EN27941       0.173       C       0.77       first reported 0.2179         1603       in house       0.1707       0.44         1634       ISO7941       0.16       -1.12         1764       D2163       0.1631       -0.67         1776       EN27941       0.10       R(0.01)       -9.82         1786       D2163       0.165       -0.39         1788       EN27941       0.1614       -0.90         1882       EN27941       0.1614       -0.91         1960           1960           1960           1960           1960           1960           1960           1960           197       st.dev. (n)       0.01467         R(calc.)       0.0411       Compare R(EN27941(liq)) = 0.1592		D2103				
1556       EN27941       0.17       0.33         1557       EN27941       0.173       C       0.77         1603       in house       0.1707       0.44         1634       ISO7941       0.16       -1.12         1764       D2163       0.1631       -0.67         1776       EN27941       0.10       R(0.01)       -9.82         1786       D2163       0.165       -0.39         17786       D2163       0.1665       -0.39         1788       EN27941       0.1741       0.93         1941       EN27941       0.1614       -0.91         1960           2124           normality       OK          nean (n)       0.1677       st.dev. (n)       0.014677         st.dev. (n)       0.014677       R(calc.)       0.0411         R(D2163:96)       0.0193       Compare R(EN27941(liq)) = 0.1592		1007044				
1557       EN27941       0.173       C       0.77       first reported 0.2179         1603       in house       0.1707       0.44         1634       ISO7941       0.16       -1.12         1764       D2163       0.1631       -0.67         1776       EN27941       0.10       R(0.01)       -9.82         1786       D2163       0.165       -0.39         1788       EN27941       0.1741       0.93         1882       EN27941       0.1614       -0.91         1960           1960           2124           normality mean (n)       OK n R(calc.)       0.01467 				ex		see §4.1
1603       in house $0.1707$ $0.44$ 1634       ISO7941 $0.16$ $-1.12$ 1764       D2163 $0.1631$ $-0.67$ 1776       EN27941 $0.10$ $R(0.01)$ $-9.82$ 1786       D2163 $0.165$ $-0.39$ 1788       EN27941 $0.1743$ $0.96$ 1882       EN27941 $0.1741$ $0.93$ 1941       EN27941 $0.1614$ $-0.91$ 1960           2124           normality       OK $n$ $32$ outliers       2       +1 excl.          mean (n) $0.1677$ st.dev. (n) $0.01467$ R(D2163:96) $0.0193$ Compare R(EN27941(liq)) = 0.1592				_		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$				С		first reported 0.2179
$\begin{array}{cccccccccccccccccccccccccccccccccccc$						
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1634	ISO7941	0.16		-1.12	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1764	D2163	0.1631		-0.67	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1776	EN27941	0.10	R(0.01)	-9.82	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		D2163		· · · ·	-0.39	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1788	EN27941	0.1743		0.96	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$						
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$						
2124 normality OK n 32 outliers 2 +1 excl. mean (n) 0.1677 st.dev. (n) 0.01467 R(calc.) 0.0411 R(D2163:96) 0.0193 Compare R(EN27941(liq)) = 0.1592	1960	LINEFOIL				
normality OK n 32 outliers 2 +1 excl. mean (n) 0.1677 st.dev. (n) 0.01467 R(calc.) 0.0411 R(D2163:96) 0.0193 Compare R(EN27941(liq)) = 0.1592						
n 32 outliers 2 +1 excl. mean (n) 0.1677 st.dev. (n) 0.01467 R(calc.) 0.0411 R(D2163:96) 0.0193 Compare R(EN27941(liq)) = 0.1592	2124					
n 32 outliers 2 +1 excl. mean (n) 0.1677 st.dev. (n) 0.01467 R(calc.) 0.0411 R(D2163:96) 0.0193 Compare R(EN27941(liq)) = 0.1592		normality	OK			
outliers       2       +1 excl.         mean (n)       0.1677         st.dev. (n)       0.01467         R(calc.)       0.0411         R(D2163:96)       0.0193         Compare R(EN27941(liq)) = 0.1592		•				
$\begin{array}{cccccccccccccccccccccccccccccccccccc$						
st.dev. (n) 0.01467 R(calc.) 0.0411 R(D2163:96) 0.0193 Compare R(EN27941(liq)) = 0.1592				+1 excl.		
$\begin{array}{c} R(calc.) & 0.0411 \\ R(D2163:96) & 0.0193 \end{array} \\ \hline \\ \hline \\ \\ \hline \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$						
R(D2163:96) 0.0193 Compare R(EN27941(liq)) = 0.1592						
R(D2163:96) 0.0193 Compare R(EN27941(liq)) = 0.1592			0.0411			
30 - Kernel Density		R(D2163:96)	0.0193			Compare R(EN27941(liq)) = 0.1592
30 - Kernel Density						
30 - Kernel Density	0.33 т					35
	0.28					

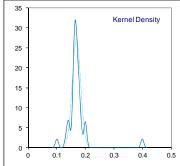




# Determination of iso-Butene on sample #14202; results in %mol/mol

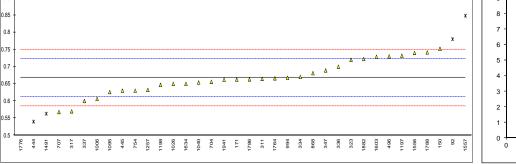
		_							
lab	method	value	mark	z(targ)	remarks				
92	D0400								
150	D2163	0.185		2.37					
171	D2163	0.1651		-0.50					
311	D2163	0.1621		-0.93					
317	D2163	0.14		-4.12					
323	D2163	0.18		1.65					
334 335	EN27941 D2163	0.17 0.2		0.21 4.53					
336	EN27941	0.2	С	4.53	first reported 0.19				
337	EN27941	0.2	C	4.53	list reported 0.19				
347	D2163	0.165		-0.52					
444	IP405	0.40	C,R(0.01)	33.39	first reported 0.02				
445	D2163	0.17	0,1((0.01)	0.21					
496	EN27941	0.170		0.21					
511	2.12.011								
704	D2163	0.159		-1.38					
707	D2163	0.143		-3.69					
754	D2163	0.1400		-4.12					
868	D2163	0.168		-0.08					
912									
994	D2163	0.1600		-1.24					
1006	D2163	0.157		-1.67					
1026									
1040	DIN51619	0.165		-0.52					
1095	EN27941	0.161		-1.09					
1109									
1197	D2163	0.176		1.07					
1198	D2163	0.166		-0.37					
1200									
1257	D2163	0.1605		-1.17					
1259	1007014								
1491	ISO7941	0.132	ex	-5.28	see §4.1				
1556	EN27941	0.18	0	1.65	first and sets d.0.400				
1557	EN27941	0.172	С	0.49	first reported 2.166				
1603	in house	0.1794		1.56					
1634	ISO7941	0.16		-1.24					
1764	D2163	0.1665	D(0.01)	-0.30					
1776 1786	EN27941 D2163	0.10 0.165	R(0.01)	-9.89					
1788	EN27941	0.1743		-0.52 0.83					
1882	EN27941 EN27941	0.1743		0.83					
1941	EN27941	0.1603		-1.19					
1941	LIN2/ 941	0.1003		-1.19					
2124									
2124									
	normality	ОК							
	n	32							
	outliers	2	+1 excl.						
	mean (n)	0.1686							
	st.dev. (n)	0.01470							
	R(calc.)	0.0412							
	R(D2163:96)	0.0194			Compare R(EN27941(liq)) = 0.1592				
	```'								
0.24						35	]		Kernel Density
							1	٨	Remei Density

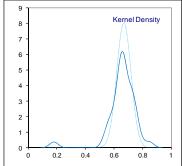




# Determination of n-Pentane on sample #14202; results in %mol/mol

lab	method	value	mark	z(targ)	remarks
92	D2163	0.78	ex	4.05	see §4.1
150	D2163	0.752	<u>.</u>	3.03	0
171	D2163	0.6627		-0.22	
311	D2163	0.6644		-0.16	
317	D2163	0.57		-3.59	
323	D2163	0.72		1.87	
334	EN27941	0.67		0.05	
335					
336	EN27941	0.7	С	1.14	first reported 0.85
337	EN27941	0.6		-2.50	
347	D2163	0.689	Cov	0.74	and \$4.1 first reported 0.02
444 445	IP405 D2163	0.54 0.63	C,ex	-4.68 -1.41	see §4.1, first reported 0.02
445 496	EN27941	0.03		2.23	
430 511	LIN2/ 341				
704	D2163	0.656		-0.46	
707	D2163	0.568		-3.66	
754	D2163	0.6300		-1.41	
868	D2163	0.681		0.45	
912					
994	D2163	0.6675		-0.04	
1006	D2163	0.606		-2.28	
1026	ISO7941	0.65	ex	-0.68	result excluded, laboratory did report only 5 components
1040	DIN51619	0.654		-0.54	
1095	EN27941	0.626		-1.55	
1109 1197	D2163	 0.732		2.30	
1197	D2163	0.647		-0.79	
1200	D2103	0.047		-0.73	
1257	D2163	0.6324		-1.32	
1259					
1491	ISO7941	0.563	ex	-3.84	see §4.1
1556	EN27941	0.74		2.59	
1557	EN27941	0.848	C,G(0.05)	6.52	first reported 1.3664
1603	in house	0.7287		2.18	
1634	ISO7941	0.65		-0.68	
1764	D2163	0.6660	D(0.04)	-0.10	
1776	EN27941	0.18	R(0.01)	-17.77	
1786 1788	D2163 EN27941	0.663 0.7415		-0.21 2.65	
1882	EN27941	0.7222		1.95	
1941	EN27941	0.6622		-0.24	
1960					
2124					
	normality	OK			
	n	30			
	outliers	2	+4 excl.		
	mean (n)	0.6687			
	st.dev. (n)	0.04973			
	R(calc.) R(D2163:96)	0.1393 0.0770			Compare R(EN27941(liq)) = 0.3095
	11(02103.30)	0.0770			Compare ((LINZ) = 0.5035)
0.9 T					
					9 Kernel Density
0.85 -					* 8
0.8					7 -





# Determination of Molar Mass on sample #14202; results in g/mol

lab	method	value	mark	z(targ)	remarks
92	D2163	44.7	ex		see §4.1
150					
171	D2421	44.64814322			
311	in house	44.66			
317	INH-001	44.58			
323					
334					
335					
336					
337 347	D2421	44.667			
444	D2421	44.007			
445	IP432	44.657			
496	D2421	44.691			
511	DZAZI				
704	D2163/D2421	44.6464			
707	D2163/D2421	44.6028			
754	D2421	44.63798			
868	D2598	44.67			
912					
994	calc	44.6565			
1006					
1026					
1040					
1095	D2421	44.6			
1109					
1197					
1198					
1200					
1257					
1259					
1491					
1556	10111 4 0 0 0	44.73			
1557	INH-1200	44.7346			
1603					
1634	D2509	 44.642			
1764	D2598	44.042			
1776 1786					
1788	ISO8973	44.73			
1882	1500375				
1941	in house	44.65954			
1960	III IIOUSC				
2124					
					Calculated by iis from all reported results
	normality	OK			OK
	n	17			30
	outliers	0 + 1 excl.			1 + 3 excl.
	mean (n)	44.662			44.663
	st.dev. (n)	0.0437			0.0423
	R(calc.)	0.122			0.119
	R(iis13S03P)	0.272			0.224
44.8 T					12
					A A A Kernel Density
44.7 -					
44.6 -	Δ Δ				
44.5 -					8 -
44.5					
44.4 -					6
44.3 -					
44.2					4
44.2 -					
44.1 -					2
44	10				
317	1095 707 754	1764 704 171	994	311	

# Determination of Relative Density @60F on sample #14202; unitless results

lab meth 92 D259	od	value	mark	z(targ)	remarks
02 D200		0.511	ex		see §4.1
150 D259		0.5104	CX		300 37.1
171 D242		0.510006			
311 in ho		0.5098			
317 INH-0		0.5095			
323 D259		0.5103			
334					
335					
336					
337					
347 D259	8	0.5099			
444	-				
445 IP432	2	0.5104			
496 D259	8	0.5102			
511					
704 D259	8	0.5100			
707 D259	8	0.5097			
754 ISO8	973	0.51018			
868 D259	8	0.5101			
912					
994 D259		0.5095	E		Result calculated by iis 0.5102
1006 D259		0.5099	•		
1026 ISO8	973	0.5098	C, ex		reported 509.8 probably in a different unit
1040					result excluded, laboratory did report only 5 components
1095					
1109 1197					
1198					
1200					
1257					
1259					
1491					
1556 ISO8	973	0.5108	С		reported 510.8 probably in a different unit
1557 ISO8		0.5108			
1603					
1634 ISO8	973	0.511			
1764 D259	8	0.5099			
1776					
1786					
1788 ISO8	973	0.511			
1882					
1941 D259	18	0.51012			
1960 2124					
2124					Calculated by iis from all reported results
norm	ality	ОК			suspect
n	any	20			31
outlie	ers	0	+2 excl.		2 + 4 excl.
mear		0.51018			0.51024
st.de		0.000449			0.0002496
R(cal		0.00126			0.00069
D.("	13S03P)	0.00156			0.00134
R(IIS)					
R(IIS					1000
					900 - Kernel Density
0.5115					
0.5115					
					х д д 800 -
0.5115 T 0.511 -					Δ Δ Δ 800 - 700 -
0.5115					
0.5115 - 0.511 - 0.5105 -			A	<u> </u>	× Δ Δ 800 - Δ Δ 700 - 600 - 500 -
0.5115 T 0.511 - 0.5105 - 0.51 -	. <b>Δ</b> X	۵ ۵ ۵	Δ Δ	<u> </u>	x         Δ         800 -           Δ         700 -           600 -         500 -           400 -         400 -
0.5115 - 0.511 - 0.5105 - 0.51 -	▲ _ X	۵ ۵ ۵	۵ ۵	<u> </u>	x         Δ         800 -           Δ         700 -         600 -           500 -         400 -         300 -
0.5115 T 0.511 - 0.5105 - 0.51 -	▲ ▲ ×	۵ ۵ ۵	Δ	<u> </u>	X A A 800 - A A 700 - 600 - 500 - 400 - 300 - 200 -
0.5115 T 0.511 - 0.5105 - 0.51 - 0.5095 - Δ Δ	<u>۸</u> ۸ ۸	۵ ۵ ۵	Δ Δ	<u> </u>	X A A A A A A A A A A A A A A A A
0.5115 T 0.511 - 0.5105 - 0.51 - 0.5095 - Δ Δ 0.509	707 311 1028		171	1941 754 488	X A A 800 - A A 700 - 600 - 500 - 400 - 300 - 200 -

# Determination of Absolute Vapour Pressure @100F on sample #14202; results in psi

lab	method	value	mark	z(targ)	remarks
92 150	D2598	 186.51	Е		iis calculated 184.34
171 311	ISO8973				
317	ISO8973	190 190			
323 334					
335					
336 337					
347	D2598	185.6	С		first reported 172.7
444 445					
496	D2598	185.4			
511 704	ISO8973	 190.24			
704	ISO8973	190.24			
754 868	ISO8973 D2598	189.975 185.6			
912	D2398				
994 1006	IP432 D2598	190.194			
1006 1026	ISO8973	186.1 169.98	ex		result excluded, laboratory did report only 5 components
1040	1800072				
1095 1109	ISO8973	188.69 			
1197					
1198 1200					
1257					
1259 1491					
1556					
1557 1603					
1634	ISO8973	195	C, E		first reported 181; iis calculated 189.88
1764 1776	D2598	186.000 			
1786	1000070				
1788 1882	ISO8973	189.27 			
1941					
1960 2124					
					Calculated by iis from all reported results
	normality				ISO8973/IP432 ASTM D2598 not OK suspect
	n				32 33 0 + 2 aval
	outliers mean (n)				0 + 2 excl. 0 + 4 excl. 190.081 185.813
	st.dev. (n)				0.5477 0.5172
	R(calc.) R(iis13S03P)				1.534     1.448       2.698     2.485
	. ,				
<sup>200</sup> T					0.16 Kernel Density
195 -					▲ 0.14 -
190 -			Δ	Δ Δ	
185 -	Δ Δ Δ	Δ Δ	۵		0.1 -
180 -					0.08 -
175 -					0.06 -
170 - ×					0.02
165	m	4 10		m →	
1026	496 347 868	1764	150	1788 754	E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E         E <the< th=""> <the< th=""> <the< th=""> <the< th=""></the<></the<></the<></the<>

# Determination of Relative Vapour Pressure @100F on sample #14202; results in psi

la	b	meth	od			lue		marl	k -	z(targ		remar	ks					
92 150		D259	8		17	 0.802		Е				iis calo	culate	d 169	.64			
171 311		ISO89	273															
317		ISO89			17													
323		D259	8			0.7												
334 335																		
336																		
337 347		D259	8		17	 0.9		С				first re	norter	1158	0			
444								U				motro	ponot	. 100.				
445		IP432			17	5 0.7												
496 511		D259	0															
704		ISO89				5.55												
707 754		ISO89				5.90 5.275												
868		D259				0.9												
912 994		IP432	,			 5.236												
100		D259				5.230 1.4												
102	6																	
104 109		ISO89	973		17	 4.05												
110	9																	
119 119																		
120																		
125																		
125 149																		
155	6																	
155 160																		
163	4	ISO89			18	1		C,E				first re	ported	166;	iis ca	alcula	ted 175	5.19
176		D259	8		17	1.304												
177 178																		
178	8	ISO89	973			2.53		Е				iis calo	culate	d 174	.65			
188 194																		
196	0																	
212	4											Calcul	atod h	w iie f	rom	all ron	orted r	eculte
												ISO89	73/IP4				oncur	<u>ASTM D2598</u>
		norma	ality									not Oł 32	<					suspect 33
		n outlie	rs									3∠ 0+2€	excl.					55 0 + 4 excl.
		mean	(n)									175.38	32					171.117
		st.dev R(cale	/. (n) c.)									0.5477 1.534	, ,					0.5172 1.448
		R(iis1		BP)								2.698						2.485
183 -																		0.16 Kernel Density
181 - 179 -																	۵	
177 -																		0.12 -
175 -										۵	۵	۵	۵	۵	۵	۵		0.1 -
173 -								۵	Δ									0.08 -
171 -	Δ	۵	۵	۵	۵	۵	۵											0.06 -
169 -																		0.04 -
167 -																		0.02 -
100	496	323	150	347	868	1764	1006	1788	1095	311	445	994	754	704	707	317	1634	0 , , , , , , , , , , , , , , , , , , ,

# Determination of Absolute Vapour Pressure @40°C on sample #14202; results in kPa

la h	moth o d	value	marl	-(10	remerika
lab 92	method	value	mark	z(targ)	remarks
150					
171	1000070		-		"
311 317	ISO8973 ISO8973	1351.4 1350	E C		iis calculated 1348.6 first reported 196, probably in a different unit
323	1300973		C		instreported 190, probably in a different drift
334					
335	ISO8973	1345			
336 337					
347					
444					
445 496	ISO8973	 1348.2			
511					
704	ISO8973	1349.05			
707 754	ISO8973 ISO8973	1351.60 1347.0			
868	1000373				
912					
994 1006	IP432	1348.75 			
1006	ISO8973	1236	ex		result excluded, laboratory did report only 5 components
1040					
1095	ISO8973	1338			
1109 1197					
1198					
1200					
1257 1259					
1491	ISO8973	1386	ex		see §4.1
1556	ISO8973	1240.0	G(0.01)		
1557 1603	ISO8973	1242	ex		result excluded, probably reported Relative Vapour Pressure instead
1634	ISO8973	1346	С		first reported 1245
1764	ISO8973	1351.849			
1776 1786	ISO8973	1263.03	ex		see §4.1
1788	ISO8973	1343			
1882					
1941					
1960 2124					
					Calculated by iis from all reported results
					<u>ISO8973/IP432</u>
	normality n	not OK 13			suspect 32
	outliers	1 + 4 excl.			0 + 2 excl.
	mean (n)	1350.45			1347.87
	st.dev. (n) R(calc.)	11.365 31.823			4.062 11.374
	R(iis13S03P)	n.a.			n.a.
<sup>1400</sup> T					0.07
1380 -					▲ Kernel Density
1360		Δ	Δ Δ	Δ 4	
1340 - 1320 -		<u>م</u>			
1300 -					0.04 -
1280 -					0.03 -
1260 -	×				0.02 -
<sup>1240</sup> - *	ж ж				0.01
1220 -					
1200 - <u>§</u>	1556 1557 1776	1095 1788 335	1634 754	496	

# Determination of Relative Vapour Pressure @40°C on sample #14202; results in kPa

$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	lab	method	value	mark	z(targ)	remarks
171       ISO8973       1248 0       C						
317       ISOB973       1248       C						
223       D2598       1238          334       isO6973       1244          337           338           337           337           338           337           337						
334     ISO8973     1244       335     ISO8973     1244       336     ISO8973     1244       444     IFSO8973     124.8       444     ISO8973     124.7.3       511     ISO8973     124.7.3       577     ISO8973     124.7.3       578     ISO8973     124.7.7       912				С		first reported 181, probably in a different unit
336     ISO8973     1244       337         337         347         444     IP432     1244.8       445     IP432     1246.9       1500873     1226.73        704     ISO8973     1226.77       715     ISO8973     1226.77       716     ISO8973     1226.77       717     ISO8973     1226.77       718     IP432     1247.45       7199         71006         71190         7121188         7121180         7121191         7121192         7121193         7121193         7121193         7121193         7121193         7121193         7126     ISO8973     1245     C       7176     ISO8973     1245     C       7176     ISO8973     1245		D2390				
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		ISO8973	1244			
347           444       IP432       1244.8         446       ISO8973       1247.73         704       ISO8973       1247.73         707       ISO8973       1247.75         994       IP432       1247.45         9912           992       1247.45          993       IP432       1247.45         1006           1026           1026           1026          1027						
444       P432       1244.8						
445       IP432       1244.8						
511	445					
704       ISOB973       1247.73		ISO8973				
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		1508973				
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	754					
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$						
$1006 \qquad \qquad \\ 1040 \qquad \qquad \\ 1040 \qquad \qquad \\ 1055 ISO8973 \qquad 1237 \qquad \\ 1197 \qquad \qquad \\ 1198 \qquad \qquad \\ 1257 \qquad \qquad \\ 1257 \qquad \qquad \\ 1258 \qquad \qquad \\ 1557 \qquad \qquad \\ 1557 \qquad \qquad \\ 1563 ISO8973 \qquad 1285 \qquad ex \qquad \\ 1567 \qquad \qquad \\ 1563 ISO8973 \qquad 1285 \qquad C \qquad \\ 1564 ISO8973 \qquad 1225.244 \qquad \\ 1786 \qquad \qquad \\ 1786 \qquad \qquad \\ 1882 \qquad \qquad \\ 1882 \qquad \qquad \\ 1860 \qquad \qquad \\ 1861 \qquad \qquad \\ 1860 \qquad \qquad \\ 1214 \qquad \qquad \\ 1860 \qquad \qquad \\ 1960 \qquad \\ 100 \qquad$		IP432				
1026		11 432				
1096       ISO8973       1237          1197           1198           1259           1257           1568       ISO8973       1285       ex          1557	1026					
$1109 \qquad \qquad \\ 1197 \qquad \qquad \\ 1198 \qquad \qquad \\ 1257 \qquad \qquad \\ 1259 \qquad \qquad \\ 1259 \qquad \qquad \\ 1560 \qquad \qquad \\ 1557 \qquad \qquad \\ 1557 \qquad \qquad \\ 1563 \qquad \qquad \\ 1564 \qquad ISO8973 \qquad 1245 \qquad C \qquad \\ 1786 \qquad \qquad \\ 1788 \qquad \qquad \\ 1788 \qquad \qquad \\ 1788 \qquad \qquad \\ 1882 \qquad \qquad \\ 1882 \qquad \qquad \\ 1882 \qquad \qquad \\ 1882 \qquad \qquad \\ 1941 \qquad \qquad \\ 1941 \qquad \qquad \\ 2124 \qquad \qquad \\ 2124 \qquad \qquad \\ 2124 \qquad \qquad \\ 1941 \qquad \qquad \\ 2124 \qquad \qquad \\ 2124 \qquad \qquad \\ 2124 \qquad \qquad \\ 1941 \qquad \qquad \\ 2124 \qquad \qquad$		1000070				
$1197 \qquad \dots \qquad \dots \qquad \dots \\ 1198 \qquad \dots \qquad \dots \qquad \dots \\ 1259 \qquad \dots \qquad \dots \qquad \dots \\ 1257 \qquad \dots \qquad \dots \\ 1259 \qquad \dots \qquad \dots \\ 1556 \qquad ISO8973 \qquad 1225 \qquad ex \qquad \dots \\ 1356 \qquad ISO8973 \qquad 1225 \qquad ex \qquad \dots \\ 1357 \qquad \dots \qquad \dots \\ 1557 \qquad \dots \qquad \dots \\ 1603 \qquad \dots \qquad \dots \\ 1784 \qquad ISO8973 \qquad 1245 \qquad C \qquad \dots \\ 1786 \qquad \dots \qquad \dots \\ 1786 \qquad \dots \qquad \dots \\ 1788 \qquad \dots \qquad \dots \\ 1882 \qquad \dots \qquad \dots \\ 1882 \qquad \dots \qquad \dots \\ 1882 \qquad \dots \qquad \dots \\ 1960 \qquad \dots \\ 1960 \qquad \dots \\ 1970 \qquad \dots \\ 1960 \qquad \dots \\ 1960 \qquad \dots \\ 1970 \qquad \dots \\ 1970$		1508973				
$1198 \qquad \qquad \\ 1200 \qquad \qquad \\ 1257 \qquad \qquad \\ 1259 \qquad \qquad \\ 1491  ISO8973 \qquad 11285 \qquad ex \qquad \\ 1567 \qquad \qquad \\ 1563 \qquad \qquad \\ 1578 \qquad \qquad \\ 1776 \qquad \qquad \\ 1776 \qquad \qquad \\ 1788 \qquad \qquad \\ 1882 \qquad \qquad \\ 1882 \qquad \qquad \\ 1941 \qquad \qquad \\ 1941 \qquad \qquad \\ 1942 \qquad \qquad \\ 1941 \qquad \qquad \\ 1941 \qquad \qquad \\ 1942 \qquad \qquad \\ 1944 \qquad \qquad \\ 1944 \qquad \qquad \\ 1944 \qquad \qquad \\ 1944 \qquad \qquad \\ 1946 \qquad \\ 1946 \qquad$						
1257	1198					
1259						
$1491 \  SO8973 \ 1285 \ ex \ \ see §4.1$ $1556 \  SO8973 \ 1138.7 \ G(0.01) \ \ first reported 1144$ $1564 \  SO8973 \ 1225.524 \ \ first reported 1144$ $1764 \  SO8973 \ 1225.524 \ \ Interported 1144$ $1766 \ \ \ Interported 1144$ $1766 \ \ Interported 1144 \ \ Interported 1144$ $1766 \ \ Interported 1144 \ \ Interported 1144$ $1766 \ \ Interported 1144 \ \ Interporte$						
1556 ISO8973 1138.7 G(0.01) 1557 1603 1764 ISO8973 1245 C first reported 1144 1776 1786 1786 1788 1980 1941 2124 2124 normality OK suspect normality OK suspect normality 13 32 outliers 1+1 excl. 0+2 excl. 1508973/IP432 suspect 11.50 11.37 R(iis13S03P) n.a. n.a. n.a.		ISO8973		ex		see §4.1
1633	1556	ISO8973	1138.7	G(0.01)		-
1634       ISO8973       1245       C        first reported 1144         1764       ISO8973       1250.524           1776            1786           1882           1941           1960           2124           normality outliers       0K       suspect suspect         near (n)       1245.65       1246.55         st.dev. (n)       4.109       4.652         R(calc.) mean (n)       11.50       11.37         R(iis13S03P)       n.a.       n.a.						
1764 ISO8973 1250.524		ISO8973		С		first reported 1144
1786				U		
$1788 \qquad \qquad \\ 1982 \qquad \qquad \\ 1941 \qquad \qquad \\ 2124 \qquad \qquad \\ 2124 \qquad \qquad \\ \frac{Calculated by iis from all reported results}{ISO8973/IP432} \\ \frac{ISO8973/IP432}{suspect} \\ suspect \\ st.dev. (n) \qquad 4.109 \qquad 4.062 \\ R(calc.) \qquad 11.50 \qquad 11.37 \\ R(iis13S03P) \qquad n.a. \qquad n.a. \qquad n.a. \\ \hline 0.12 \qquad \\ 100 \qquad$	1776					
$1882 \qquad \cdots \qquad \cdots \qquad \cdots \\1941 \qquad \cdots \qquad \cdots \qquad \cdots \\2124 \qquad \cdots \qquad \cdots \qquad \cdots \\2124 \qquad \cdots \qquad \cdots \qquad \cdots \\ \hline Calculated by iis from all reported results}{ISO8973/IP432} \\ normality OK \qquad suspect \\ n \qquad 13 \qquad 32 \\ outliers \qquad 1 + 1 excl. \qquad 0 + 2 excl. \\ mean (n) \qquad 1245.65 \qquad 1246.55 \\ st.dev. (n) \qquad 4.109 \qquad 4.062 \\ R(calc.) \qquad 11.50 \qquad 11.37 \\ R(iis13S03P) \qquad n.a. \qquad n.a. \qquad \cdots \\ \hline \begin{array}{c} 0 \\ 1 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\$						
1941						
2124 normality OK n 13 32 outliers 1+1 excl. 0+2 excl. mean (n) 1245.65 1246.55 st.dev. (n) 4.109 4.062 R(calc.) 11.50 11.37 R(iis13S03P) n.a. n.a. $x^{(iis13S03P)}$						
$ \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c}$	1960					
normality OK suspect n 13 32 outliers 1+1 excl. 0+2 excl. mean (n) 1245.65 1246.55 st.dev. (n) 4.109 4.062 R(calc.) 11.50 11.37 R(iis13S03P) n.a. n.a. x $x$ $x$ $x$ $x$ $x$ $x$ $x$ $x$ $x$	2124					Coloulated by instrom all reported regults
normality OK suspect n 13 32 outliers 1+1 excl. 0+2 excl. mean (n) 1245.65 1246.55 st.dev. (n) 4.109 4.062 R(calc.) 11.50 11.37 R(iis13S03P) n.a. n.a. $1300 - \frac{x}{4} + \frac{x}{4} +$						
outliers $1 + 1 \text{ excl.}$ $0 + 2 \text{ excl.}$ mean (n) $1245.65$ $1246.55$ st.dev. (n) $4.109$ $4.062$ R(calc.) $11.50$ $11.37$ R(iis13S03P) n.a. n.a.		normality	OK			
$\begin{array}{cccccccccccccccccccccccccccccccccccc$						
$\begin{array}{cccccccccccccccccccccccccccccccccccc$						
$\begin{array}{c} R(calc.) & 11.50 & 11.37 \\ R(iis13S03P) & n.a. & n.a. \end{array}$						
1300 -       x         1280 -       x         1290 -       x         1100 -       x         1100 -       x		R(calc.)				11.37
1220		R(iis13S03P)	n.a.			n.a.
1220						
1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 1260 - 12						
1240     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A						
1220 -     0.08 -       1200 -     0.06 -       1180 -     0.04 -       1140 - x     0.02 -       1120 -     0.02 -				<u>\</u>	Δ	
120 - 1180 - 1160 - 1140 - <b>x</b> 1120 - 1100 - 110		Δ Δ	-			0.08 -
1180 - 1160 - 1140 - x 1120 - 1100 -						0.06 -
1140 + x 1120 + 1100						
	1160 -					0.04 -
	1140 <b>x</b>					
	1100 L	33 23 33 38	335 34 33 5 45 5	754	39.4	R         E         E         E         E         III00         1150         1200         1250         1300
	31		······ •	4		

### **APPENDIX 2**

## Number of participants per country

3 labs in	AUSTRALIA
1 lab in	AZERBAIJAN
1 lab in	BELGIUM
1 lab in	CANADA
1 lab in	CHINA, People's Republic
1 lab in	CROATIA
4 labs in	FRANCE
3 labs in	GERMANY
1 lab in	INDIA
1 lab in	ITALY
3 labs in	MALAYSIA
3 labs in	NETHERLANDS
1 lab in	PERU
4 labs in	PORTUGAL
1 lab in	RUSSIAN FEDERATION
1 lab in	SAUDI ARABIA
3 labs in	SERBIA
1 lab in	SPAIN
2 labs in	SWEDEN
1 lab in	TAIWAN
2 labs in	UKRAINE
1 lab in	UNITED ARAB EMIRATES
2 labs in	UNITED KINGDOM
2 labs in	UNITED STATES OF AMERICA

### **APPENDIX 3**

#### Abbreviations:

С	= final result after checking of first reported suspect 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 outlier test
R(0.05)	= straggler in Rosner outlier test
ex	= excluded from calculations
n/a	= not applicable
W	= withdrawn on request participant
U	= reported in wrong unit
E	= error in calculations
SDS	= Safety Data Sheet

### Literature:

1	iis Interlaboratory Studies, Protocol for the Organisation, Statistics and Evaluation, April 2014
2	ASTM D2163-96
3	ASTM D2163-07
4	ASTM D2421-07
5	ISO 5725-86
6	ISO 5725, parts 1-6, 1994
7	M. Thompson and R. Wood, J. AOAC Int, <u>76</u> , 926, (1993)
8	W.J. Youden and E.H. Steiner, Statistical Manual of the AOAC, (1975)
9	IP 367/84
10	DIN 38402 T41/42
11	P.L. Davies, First reported Z. Anal. Chem, <u>331</u> , 513, (1988)
12	J.N. Miller, Analyst, <u>118</u> , 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. (see http://www.rsc.org/suppdata/an/b2/b205600n/)
15	ISO 17043:2010
16	EN 27941:1993
17	ASTM D2598-02 (reapproved 2007)
18	IP 432-2000 = ISO8973-1997
19	Work Item WK36318, proposal to revise ASTM D2598-02 (07)
20	Private communication ASTM Subcommittee D02.H
21	Bernard Rosner, Percentage Points for a Generalized ESD Many-Outlier Procedure, Technometrics,
	25(2), pp. 165-172, (1983)