



Institute for
Interlaboratory Studies

Results of Proficiency Test Free and Released Formaldehyde in Textile November 2023

Organized by: Institute for Interlaboratory Studies
Spijkenisse, the Netherlands

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1 INTRODUCTION

Since 2003 the Institute for Interlaboratory Studies (iis) organizes a proficiency scheme for the determination of Free and Released Formaldehyde in Textile every year. During the annual proficiency testing program of 2023 it was decided to continue the proficiency test for the determination of Free and Released Formaldehyde in Textile.

In this interlaboratory study 144 laboratories in 29 countries registered for participation, see appendix 3 for the number of participants per country. In this report the results of the Free and Released Formaldehyde in Textile proficiency test are presented and discussed. This report is also electronically available through the iis website www.iisnl.com.

2 SET UP

The Institute for Interlaboratory Studies (iis) in Spijkenisse, the Netherlands, was the organizer of this proficiency test (PT). Sample analyzes for fit-for-use and homogeneity testing were subcontracted to a laboratory that has performed the tests in accordance with for ISO/IEC17043 relevant requirements of ISO/IEC17025.

It was decided to send two different textile samples of 5 grams each labelled #23750 and #23751 respectively.

The participants were requested to report rounded and unrounded test results. The unrounded test results were preferably used for the statistical evaluation.

2.1 QUALITY SYSTEM

The Institute for Interlaboratory Studies in Spijkenisse, the Netherlands, has implemented a quality system based on ISO/IEC17043:2010. This ensures strict adherence to protocols for sample preparation and statistical evaluation and 100% confidentiality of participant's data. Feedback from the participants on the reported data is encouraged and customer's satisfaction is measured on regular basis by sending out questionnaires.

2.2 PROTOCOL

The protocol followed in the organization of this proficiency test was the one as described for proficiency testing in the report 'iis Interlaboratory Studies: Protocol for the Organisation, Statistics and Evaluation' of June 2018 (iis-protocol, version 3.5). This protocol is electronically available through the iis website www.iisnl.com, from the FAQ page.

2.3 CONFIDENTIALITY STATEMENT

All data presented in this report must be regarded as confidential and for use by the participating companies only. Disclosure of the information in this report is only allowed by means of the entire report. Use of the contents of this report for third parties is only allowed by written permission of the Institute for Interlaboratory Studies. Disclosure of the identity of one or more of the participating companies will be done only after receipt of a written agreement of the companies involved.

2.4 SAMPLES

For the first sample a batch of pink cotton was selected, which contains Formaldehyde. After homogenization 200 small plastic bags were filled with approximately 5 grams each and labelled #23750. Each subsample was wrapped in aluminum foil and packed again in a small plastic bag.

The homogeneity of the subsamples was checked by the determination of Free Formaldehyde in accordance with ISO14184-1 on 8 stratified randomly selected subsamples.

| | Free Formaldehyde in mg/kg |
|-----------------|-------------------------------|
| sample #23750-1 | 27.61 |
| sample #23750-2 | 27.60 |
| sample #23750-3 | 27.16 |
| sample #23750-4 | 27.65 |
| sample #23750-5 | 27.74 |
| sample #23750-6 | 27.72 |
| sample #23750-7 | 27.05 |
| sample #23750-8 | 27.68 |

Table 1: homogeneity test results of subsamples #23750

From the above test results the repeatability was calculated and compared with 0.3 times the estimated reproducibility calculated with the Horwitz equation in agreement with the procedure of ISO13528, Annex B2 in the next table.

| | Free Formaldehyde in mg/kg |
|----------------------------|-------------------------------|
| r (observed) | 0.75 |
| reference method | Horwitz |
| 0.3 x R (reference method) | 2.25 |

Table 2: evaluation of the repeatability of subsamples #23750

The calculated repeatability is in agreement with 0.3 times the estimated reproducibility calculated with the Horwitz equation. Therefore, homogeneity of the subsamples was assumed.

For the second sample a batch of grey cotton was selected, which contains Formaldehyde. After homogenization 200 small plastic bags were filled with approximately 5 grams each and labelled #23751. Each subsample was wrapped in aluminum foil and packed again in a small plastic bag.

The homogeneity of the subsamples was checked by the determination of Free Formaldehyde in accordance with ISO14184-1 on 6 stratified randomly selected subsamples.

| | Free Formaldehyde in mg/kg |
|-----------------|-------------------------------|
| sample #23751-1 | 91.60 |
| sample #23751-2 | 93.60 |
| sample #23751-3 | 94.31 |
| sample #23751-4 | 97.06 |
| sample #23751-5 | 94.80 |
| sample #23751-6 | 93.40 |

Table 3: homogeneity test results of subsamples #23751

From the above test results the repeatability was calculated and compared with 0.3 times the estimated reproducibility calculated with the Horwitz equation in agreement with the procedure of ISO13528, Annex B2 in the next table.

| | Free Formaldehyde in mg/kg |
|----------------------------|-------------------------------|
| r (observed) | 5.1 |
| reference method | Horwitz |
| 0.3 x R (reference method) | 6.4 |

Table 4: evaluation of the repeatability of subsamples #23751

The calculated repeatability is in agreement with 0.3 times the estimated reproducibility calculated with the Horwitz equation. Therefore, homogeneity of the subsamples was assumed.

To each of the participating laboratories two textile samples labelled #23750 and #23751 respectively were sent on October 4, 2023.

2.5 ANALYZES

The participants were requested to determine Free and Released Formaldehyde on both PT samples.

To ensure homogeneity it was requested not to use less than 0.5 gram per determination. It was also requested to report if the laboratory was accredited for the determined components and to report some analytical details.

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

To get comparable test results a detailed report form and a letter of instructions are prepared. On the report form the reporting units are given as well as the reference test methods (when applicable) that will be used during the evaluation. The detailed report form and the letter of

instructions are both made available on the data entry portal www.kpmd.co.uk/sgs-iis-cts/. The participating laboratories are also requested to confirm the sample receipt on this data entry portal. The letter of instructions can also be downloaded from the iis website www.iisnl.com.

3 RESULTS

During five weeks after sample dispatch, the test results of the individual laboratories were gathered via the data entry portal www.kpmd.co.uk/sgs-iis/. The reported test results are tabulated per determination in appendix 1 of this report. The laboratories are presented by their code numbers.

Directly after the deadline, a reminder was sent to those laboratories that had not reported test results at that moment. Shortly after the deadline, the available test results were screened for suspect data. A test result was called suspect in case the Huber Elimination Rule (a robust outlier test) found it to be an outlier. The laboratories that produced these suspect data were asked to check the reported test results (no reanalyzes). Additional or corrected test results are used for data analysis and the original test results are placed under 'Remarks' in the result tables in appendix 1. Test results that came in after the deadline were not taken into account in this screening for suspect data and thus these participants were not requested for checks.

3.1 STATISTICS

The protocol followed in the organization of this proficiency test was the one as described for proficiency testing in the report 'iis Interlaboratory Studies: Protocol for the Organisation, Statistics and Evaluation' of June 2018 (iis-protocol, version 3.5). For the statistical evaluation the *unrounded* (when available) figures were used instead of the rounded test results. Test results reported as '<...' or '>...' were not used in the statistical evaluation.

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

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

According to ISO13528 all (original received or corrected) results per determination were submitted to outlier tests. In the iis procedure for proficiency tests, outliers are detected prior to calculation of the mean, standard deviation and reproducibility. For small data sets, Dixon (up to 20 test results) or Grubbs (up to 40 test results) outlier tests can be used. For larger data sets (above 20 test results) Rosner's outlier test can be used. Outliers are marked by D(0.01) for the Dixon's test, by G(0.01) or DG(0.01) for the Grubbs' test and by R(0.01) for

the Rosner's test. Stragglers are marked by $D(0.05)$ for the Dixon's test, by $G(0.05)$ or $DG(0.05)$ for the Grubbs' test and by $R(0.05)$ for the Rosner's test. Both outliers and stragglers were not included in the calculations of averages and standard deviations.

For each assigned value the uncertainty was determined in accordance with ISO13528. Subsequently the calculated uncertainty was evaluated against the respective requirement based on the target reproducibility in accordance with ISO13528. In this PT the criterion of ISO13528, paragraph 9.2.1, was met for all evaluated tests. Therefore, the uncertainty of all assigned values may be negligible and need not be included in the PT report.

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

3.2 GRAPHICS

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

Furthermore, Kernel Density Graphs were made. This is a method for producing a smooth density approximation to a set of data that avoids some problems associated with histograms. Also, a normal Gauss curve (dotted line) was projected over the Kernel Density Graph (smooth line) for reference. The Gauss curve is calculated from the consensus value and the corresponding standard deviation.

3.3 Z-SCORES

To evaluate the performance of the participating laboratories the z-scores were calculated. As it was decided to evaluate the performance of the participants in this proficiency test (PT) against the literature requirements, the z-scores were calculated using a target standard deviation. This results in an evaluation independent of the variation in this interlaboratory study.

The target standard deviation was calculated from the literature reproducibility by division with 2.8. In case no literature reproducibility was available, other target values were used, like Horwitz or an estimated reproducibility based on former iis proficiency tests.

When a laboratory did use a test method with a reproducibility that is significantly different from the reproducibility of the reference test method used in this report, it is strongly advised to recalculate the z-score, while using the reproducibility of the actual test method used, this in order to evaluate whether the reported test result is fit-for-use.

The z-scores were calculated according to:

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

The $z_{(\text{target})}$ scores are listed in the test result tables in appendix 1.

Absolute values for $z < 2$ are very common and absolute values for $z > 3$ are very rare. 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 no problems were encountered with the dispatch of the samples. Six participants reported test results after the final reporting date and one other participant did not report any test results. Not all participants were able to report all parameters requested.

In total 143 participants reported 424 numerical test results. Observed were 5 outlying test results, which is 1.2%. In proficiency tests outlier percentages of 3% - 7.5% are quite normal.

Not all data sets proved to have a normal Gaussian distribution. These are referred to as “not OK” or “suspect”. The statistical evaluation of these data sets should be used with due care, see also paragraph 3.1.

4.1 EVALUATION PER SAMPLE AND PER TEST

In this section the reported test results are discussed per sample and per test. The test methods which were used by the various laboratories were taken into account for explaining the observed differences when possible and applicable. These test methods are also in the tables together with the original data in appendix 1. The abbreviations, used in these tables, are explained in appendix 4.

The method for determination of the Free Formaldehyde is specified in the Standards of the Ecolabelling Institutes. It should be noted that ISO14184-1 corresponds to the Japanese method specified in the Japanese Law 112 and is described in the Japanese Standard JIS L1096. In test methods ISO14184-1:11 and ISO14184-2:11 some information on precision data is given. In table B.1 of ISO14184-1 and table C.2 of ISO14184-2 precision values are mentioned but obtained by (slightly) different methods than mentioned in both ISO14184 methods. Therefore, it was concluded that reliable reproducibility data cannot be obtained from test methods ISO14184-1 and -2:11. Therefore, the calculated reproducibility was compared against the estimated reproducibility calculated with the Horwitz equation.

sample #23750

Free Formaldehyde: The group of participants met the target requirements. Two statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in agreement with the estimated reproducibility calculated with the Horwitz equation.

Released Formaldehyde: The group of participants met the target requirements. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in agreement with the estimated reproducibility calculated with the Horwitz equation.

sample #23751

Free Formaldehyde: The group of participants met the target requirements. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in agreement with the estimated reproducibility calculated with the Horwitz equation.

Released Formaldehyde: The group of participants met the target requirements. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in agreement with the estimated reproducibility calculated with the Horwitz equation.

4.2 PERFORMANCE EVALUATION FOR THE GROUP OF LABORATORIES

A comparison has been made between the reproducibility as declared by the estimated reproducibility calculated with the Horwitz equation and the reproducibility as found for the group of participating laboratories. The number of significant test results, the average, the calculated reproducibility ($2.8 \cdot$ standard deviation) and the target reproducibility derived from the reference method are presented in the next table.

| Component | unit | n | average | $2.8 \cdot$ sd | R(target) |
|-----------------------|-------|-----|---------|----------------|-----------|
| Free Formaldehyde | mg/kg | 141 | 97.4 | 18.6 | 21.9 |
| Released Formaldehyde | mg/kg | 68 | 140.4 | 21.3 | 29.9 |

Table 5: reproducibilities of tests on sample #23750

| Component | unit | n | average | $2.8 \cdot$ sd | R(target) |
|-----------------------|-------|-----|---------|----------------|-----------|
| Free Formaldehyde | mg/kg | 142 | 61.5 | 12.9 | 14.8 |
| Released Formaldehyde | mg/kg | 68 | 97.9 | 19.9 | 22.0 |

Table 6: reproducibilities of tests on sample #23751

Without further statistical calculations it can be concluded that for all tests there is a good compliance of the group of participants with the reference method.

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

| | November 2023 | November 2022 | November 2021 | November 2020 | November 2019 |
|------------------------------------|---------------|---------------|---------------|---------------|---------------|
| Number of reporting laboratories | 143 | 151 | 183 | 174 | 183 |
| Number of test results | 424 | 437 | 529 | 705 | 489 |
| Number of statistical outliers | 5 | 6 | 12 | 15 | 11 |
| Percentage of statistical outliers | 1.2% | 1.4% | 2.3% | 2.1% | 2.2% |

Table 7: comparison with previous proficiency tests

In proficiency tests outlier percentages of 3% - 7.5% are quite normal.

The performance of the determinations of the proficiency test was compared to uncertainties observed in iis PTs over the years, expressed as relative standard deviation (RSD) of the PTs, see next table.

| | November 2023 | November 2022 | November 2021 | November 2020 | 2019 - 2013 |
|-----------------------|---------------|---------------|---------------|---------------|-------------|
| Free Formaldehyde | 7-8% | 8% | 7% | 6-9% | 7-13% |
| Released Formaldehyde | 5-7% | 6-7% | 8-9% | 8-10% | 7-22% |

Table 8: development of the uncertainties over the years

The uncertainties observed in this PT for Free and Released Formaldehyde are comparable to the uncertainties observed in previous iis PTs.

4.4 EVALUATION OF THE ANALYTICAL DETAILS

For this PT some analytical details were requested which are listed in appendix 2. Based on the answers given by the participants the following can be summarized:

- 90% of the participants mentioned that they are ISO/IEC17025 accredited to determine the reported component(s).
- 79% used approximately 1 grams of sample intake for the Free Formaldehyde determination and 91% used approximately 1 grams of sample intake for the Released Formaldehyde determination.
- About 65% did not confirm the Formaldehyde test result with the Dimedone test.

No further sub analysis is performed because all observed reproducibilities are in line with the target reproducibilities.

5 DISCUSSION

In this PT, the average of the homogeneity test results is not in line with the average (consensus value) from the PT results. There are several reasons for this. First, the goal of the homogeneity testing is very different from the goal of the evaluation of the reported PT results. In order to prove the homogeneity of the PT samples, a test method is selected with a high precision (smallest variation). The accuracy (trueness) of the test method is less relevant.

Secondly, the homogeneity testing is done by one laboratory only. The test results of this ISO/IEC17025 accredited laboratory will have a bias (systematic deviation) depending on the test method used. The desire to detect small variations between the PT samples leads to the use of a sensitive test method with high precision, which may be a test method with significant bias.

Also, each test result reported by the laboratories that participate in the PT will have a bias. However, some will have a positive bias and others a negative bias. These different biases compensate each other in the PT average (consensus value). Therefore, the PT consensus value may deviate from the average of the homogeneity test. At the same time the accuracy of the PT consensus value is more reliable than the accuracy of the average of the results of the homogeneity test.

All reporting participants were able to identify Free and Released Formaldehyde in the textile samples.

When the results of this interlaboratory study were compared to the Ecolabelling Standards and Requirements for Textiles in EU and with the similar Bluesign® RSL in the table below, it was noticed that not all participants would make identical decisions about the acceptability of the textiles for the determined components.

| Ecolabel | baby clothes | in direct skin contact | no direct skin contact |
|---------------|--------------|------------------------|------------------------|
| Oeko-Tex® 100 | <16 mg/kg | <75 mg/kg | <150 mg/kg |
| Bluesign® RSL | <15 mg/kg | <75 mg/kg | <300 mg/kg |

Table 9: Bluesign® RSL and Ecolabelling Standards and Requirements for Textiles in EU

sample #23750

For the category “baby clothes” all reporting laboratories would have rejected the sample. For the category “in direct skin contact” all reporting laboratories would have rejected the sample for Free and Released Formaldehyde, except one participant for Free Formaldehyde. For the category “no direct skin contact” all reporting laboratories would have accepted the sample for Free Formaldehyde. For Released Formaldehyde all reporting laboratories except five would have accepted the sample. These five laboratories would have rejected the sample for Released Formaldehyde based on Oeko-Tex®100.

sample #23751

For the category “baby clothes” all reporting laboratories would have rejected the sample.

For the category “in direct skin contact” all reporting laboratories except one would have accepted the sample for Free Formaldehyde. All laboratories would have rejected the sample for Released Formaldehyde.

For the category “no direct skin contact” all reporting laboratories would have accepted the sample.

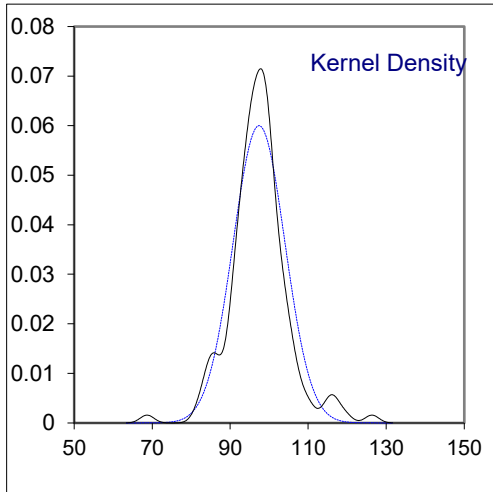
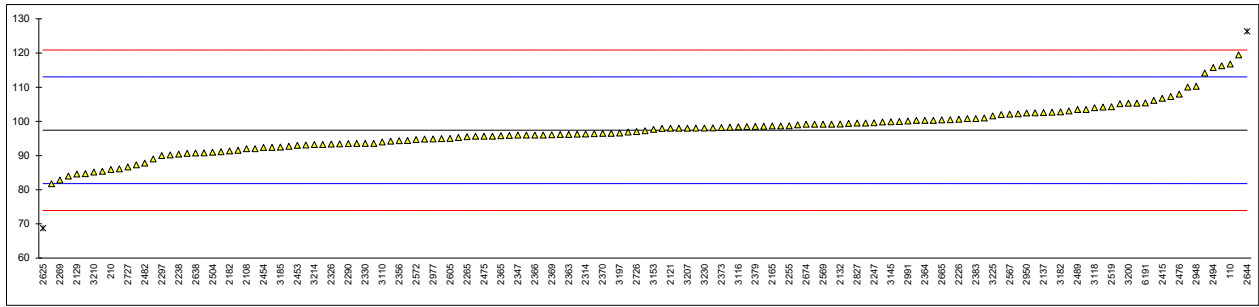
6 CONCLUSION

Each participating laboratory will have to evaluate its performance in this study and decide about any corrective actions if necessary. Therefore, participation on a regular basis in this scheme could be helpful to improve the performance and thus increase of the quality of the analytical results.

APPENDIX 1**Determination of Free Formaldehyde on sample #23750; results in mg/kg**

| lab | method | value | mark | z(targ) | remarks |
|------|------------|---------|------|---------|----------------------|
| 110 | ISO14184-1 | 116.8 | | 2.48 | |
| 210 | ISO14184-1 | 85.92 | | -1.47 | |
| 339 | ISO14184-1 | 102.7 | | 0.68 | |
| 362 | ISO14184-1 | 96.87 | | -0.07 | |
| 523 | ISO14184-1 | 119.5 | | 2.82 | |
| 551 | ISO14184-1 | 91.57 | | -0.75 | |
| 623 | ISO14184-1 | 90.8 | | -0.84 | |
| 624 | ISO14184-1 | 100.3 | | 0.37 | |
| 840 | ISO14184-1 | 94.4 | | -0.38 | |
| 2108 | ISO14184-1 | 92 | | -0.69 | |
| 2115 | ISO14184-1 | 90.63 | | -0.87 | |
| 2121 | ISO14184-1 | 98 | C | 0.08 | First reported 122.5 |
| 2129 | ISO14184-1 | 84.62 | | -1.63 | |
| 2132 | ISO14184-1 | 99.2443 | | 0.23 | |
| 2137 | ISO14184-1 | 102.6 | | 0.66 | |
| 2138 | ISO14184-1 | 94.8 | | -0.33 | |
| 2165 | ISO14184-1 | 98.656 | | 0.16 | |
| 2170 | ISO14184-1 | 99.52 | | 0.27 | |
| 2182 | ISO14184-1 | 91.35 | | -0.77 | |
| 2184 | ISO14184-1 | 102.2 | | 0.61 | |
| 2201 | ISO14184-1 | 99.4 | | 0.25 | |
| 2226 | ISO14184-1 | 100.65 | | 0.41 | |
| 2238 | ISO14184-1 | 90.42 | | -0.89 | |
| 2247 | ISO14184-1 | 99.62 | | 0.28 | |
| 2255 | ISO14184-1 | 98.7 | | 0.17 | |
| 2256 | ISO14184-1 | 93.53 | | -0.50 | |
| 2264 | GB/T2912 | 81.78 | | -2.00 | |
| 2265 | ISO14184-1 | 95.519 | | -0.24 | |
| 2269 | ISO14184-1 | 82.86 | | -1.86 | |
| 2275 | ISO14184-1 | 95.3 | | -0.27 | |
| 2289 | ISO14184-1 | 104.2 | | 0.87 | |
| 2290 | ISO14184-1 | 93.5 | | -0.50 | |
| 2297 | ISO14184-1 | 90 | | -0.95 | |
| 2310 | ISO14184-1 | 98 | | 0.08 | |
| 2311 | ISO14184-1 | 98.03 | | 0.08 | |
| 2313 | ISO14184-1 | 99.81 | | 0.31 | |
| 2314 | JIS 1041A | 96.31 | | -0.14 | |
| 2320 | ISO14184-1 | 107.3 | | 1.26 | |
| 2326 | ISO14184-1 | 93.377 | | -0.52 | |
| 2330 | ISO14184-1 | 93.58 | | -0.49 | |
| 2347 | ISO14184-1 | 96.0 | | -0.18 | |
| 2348 | ISO14184-1 | 100.8 | | 0.43 | |
| 2350 | ISO14184-1 | 97.27 | | -0.02 | |
| 2351 | ISO14184-1 | 102 | | 0.59 | |
| 2356 | ISO14184-1 | 94.38 | | -0.39 | |
| 2358 | ISO14184-1 | 96.501 | | -0.12 | |
| 2363 | ISO14184-1 | 96.2 | | -0.15 | |
| 2364 | ISO14184-1 | 100.30 | | 0.37 | |
| 2365 | ISO14184-1 | 95.8 | | -0.21 | |
| 2366 | ISO14184-1 | 96 | | -0.18 | |
| 2367 | ISO14184-1 | 100.50 | | 0.40 | |
| 2369 | ISO14184-1 | 96.08 | | -0.17 | |
| 2370 | ISO14184-1 | 96.50 | | -0.12 | |
| 2372 | ISO14184-1 | 85.4 | | -1.53 | |
| 2373 | ISO14184-1 | 98.19 | | 0.10 | |
| 2375 | ISO14184-1 | 99.2 | | 0.23 | |
| 2378 | ISO14184-1 | 96 | | -0.18 | |
| 2379 | ISO14184-1 | 98.5270 | | 0.14 | |
| 2380 | ISO14184-1 | 94.22 | | -0.41 | |
| 2381 | ISO14184-1 | 96.20 | | -0.15 | |
| 2383 | GB/T2912 | 100.8 | | 0.43 | |
| 2385 | ISO14184-1 | 86.1 | | -1.45 | |
| 2406 | ISO14184-1 | 98.31 | | 0.12 | |
| 2415 | ISO14184-1 | 106.76 | | 1.20 | |
| 2429 | ISO14184-1 | 93.6 | | -0.49 | |
| 2442 | ISO14184-1 | 97.97 | | 0.07 | |
| 2449 | ISO14184-1 | 95.91 | | -0.19 | |
| 2453 | ISO14184-1 | 93.02 | | -0.56 | |
| 2454 | ISO14184-1 | 92.4 | | -0.64 | |
| 2458 | ISO14184-1 | 95.67 | | -0.22 | |
| 2474 | ISO14184-1 | 93.1 | | -0.55 | |
| 2475 | ISO14184-1 | 95.66 | | -0.22 | |
| 2476 | ISO14184-1 | 108.0 | | 1.35 | |
| 2482 | ISO14184-1 | 87.81 | | -1.23 | |
| 2483 | ISO14184-1 | 95.0 | | -0.31 | |

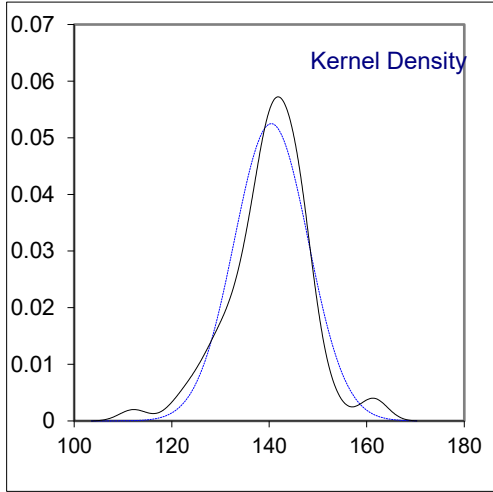
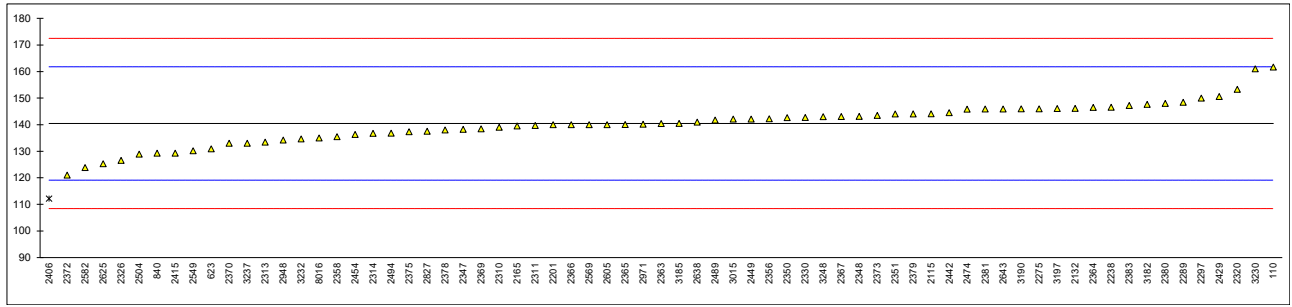
| lab | method | value | mark | z(targ) | remarks |
|------|------------------|---------|----------|---------|----------------------|
| 2489 | ISO14184-1 | 103.5 | | 0.78 | |
| 2492 | JIS L1041 | 98.68 | | 0.16 | |
| 2494 | ISO14184-1 | 115.78 | | 2.35 | |
| 2504 | ISO14184-1 | 90.961 | | -0.82 | |
| 2511 | ISO14184-1 | 110.045 | | 1.62 | |
| 2514 | ISO14184-1 | 100 | | 0.33 | |
| 2519 | ISO14184-1 | 104.3 | | 0.88 | |
| 2534 | ISO14184-1 | 106.2 | | 1.12 | |
| 2549 | ISO14184-1 | 98.5 | | 0.14 | |
| 2567 | ISO14184-1 | 102.13 | | 0.60 | |
| 2569 | ISO14184-1 | 99.2 | | 0.23 | |
| 2572 | ISO14184-1 | 94.7 | | -0.35 | |
| 2582 | ISO14184-1 | 92.7310 | | -0.60 | |
| 2590 | ISO14184-1 | 96.44 | | -0.12 | |
| 2605 | ISO14184-1 | 95.01 | | -0.31 | |
| 2625 | ISO14184-1 | 68.70 | R(0.01) | -3.67 | |
| 2638 | ISO14184-1 | 90.76 | | -0.85 | |
| 2643 | ISO14184-1 | 105.19 | | 0.99 | |
| 2644 | ISO14184-1 | 126.34 | R(0.01) | 3.70 | |
| 2665 | In house | 100.45 | | 0.39 | |
| 2674 | ISO14184-1 | 99.19 | | 0.23 | |
| 2678 | ISO14184-1 | 102.51 | | 0.65 | |
| 2726 | ISO14184-1 | 97 | | -0.05 | |
| 2727 | ISO14184-1 | 86.7 | C | -1.37 | First reported 76.4 |
| 2789 | ISO14184-1 | 87.3 | | -1.29 | |
| 2827 | ISO14184-1 | 99.51 | | 0.27 | |
| 2885 | ISO14184-1 | 95.65 | | -0.22 | |
| 2908 | ISO14184-1 | 116.32 | C | 2.42 | First reported 71.11 |
| 2921 | JIS L1041 | 84.7 | | -1.62 | |
| 2926 | ISO14184-1 | 93.25 | | -0.53 | |
| 2933 | CNS15580-1 | 96.26 | | -0.15 | |
| 2948 | ISO14184-1 | 110.25 | | 1.64 | |
| 2950 | ISO14184-1 | 102.48 | | 0.65 | |
| 2955 | ISO14184-1 | 99.2 | | 0.23 | |
| 2971 | ISO14184-1 | 98.56 | | 0.15 | |
| 2977 | ISO14184-1 | 94.858 | | -0.33 | |
| 2989 | | ---- | | ---- | |
| 2991 | GB/T2912 | 100.1 | C | 0.34 | First reported 122.2 |
| 3015 | ISO14184-1 | 91.1 | | -0.81 | |
| 3033 | ISO14184-1 | 105.321 | | 1.01 | |
| 3110 | ISO14184-1 | 94.0 | | -0.44 | |
| 3116 | ISO14184-1 | 98.4 | | 0.13 | |
| 3118 | ISO14184-1 | 104.01 | | 0.84 | |
| 3145 | ISO14184-1 | 99.9 | | 0.32 | |
| 3146 | ISO14184-1 | 90.19 | | -0.92 | |
| 3153 | ISO14184-1 | 97.67 | | 0.03 | |
| 3163 | ISO14184-1 | 84 | | -1.71 | |
| 3166 | In house | 92.02 | | -0.69 | |
| 3172 | ISO14184-1 | 100.33 | | 0.37 | |
| 3182 | ISO14184-1 | 102.81 | | 0.69 | |
| 3185 | ISO14184-1 | 92.46 | | -0.63 | |
| 3190 | ISO14184-1 | 96.02 | | -0.18 | |
| 3197 | ISO14184-1 | 96.58 | | -0.11 | |
| 3200 | ISO14184-1 | 105.30 | | 1.01 | |
| 3207 | JIS L1041 | 98 | | 0.08 | |
| 3210 | In house | 85.16 | | -1.57 | |
| 3214 | ISO14184-1 | 93.23 | | -0.53 | |
| 3216 | ISO14184-1 | 89.05 | C | -1.07 | First reported 132.1 |
| 3222 | ISO14184-1 | 103.5 | | 0.78 | |
| 3225 | ISO14184-1 | 101.63 | | 0.54 | |
| 3228 | ISO14184-1 | 99 | | 0.20 | |
| 3230 | ISO14184-1 | 98.05 | | 0.08 | |
| 3232 | ISO14184-1 | 114.15 | | 2.14 | |
| 3237 | ISO14184-1 | 103.1 | | 0.73 | |
| 3248 | GB/T2912 | 101 | C | 0.46 | First reported 71 |
| 6191 | In house | 105.42 | | 1.02 | |
| 8005 | ST2016 | 98.1 | | 0.09 | |
| 8008 | JTS ST1.6 | 93.4 | | -0.51 | |
| 8016 | ISO14184-1 | 92.40 | | -0.64 | |
| | normality | suspect | | | |
| | n | 141 | | | |
| | outliers | 2 | | | |
| | mean (n) | 97.406 | | | |
| | st.dev. (n) | 6.6476 | RSD = 7% | | |
| | R(calc.) | 18.613 | | | |
| | st.dev.(Horwitz) | 7.8234 | | | |
| | R(Horwitz) | 21.905 | | | |



Determination of Released Formaldehyde on sample #23750; results in mg/kg

| lab | method | value | mark | z(targ) | remarks |
|------|--------------------------|----------|---------|---------|-----------------------|
| 110 | ISO14184-2 | 161.7 | | 1.99 | |
| 210 | | ---- | | ---- | |
| 339 | | ---- | | ---- | |
| 362 | | ---- | | ---- | |
| 523 | | ---- | | ---- | |
| 551 | | ---- | | ---- | |
| 623 | ISO14184-2 | 130.9 | | -0.89 | |
| 624 | | ---- | | ---- | |
| 840 | ISO14184-2 | 129.3 | | -1.04 | |
| 2108 | | ---- | | ---- | |
| 2115 | ISO14184-2 | 144.12 | | 0.35 | |
| 2121 | | ---- | | ---- | |
| 2129 | | ---- | | ---- | |
| 2132 | ISO14184-2 | 146.1149 | | 0.53 | |
| 2137 | | ---- | | ---- | |
| 2138 | | ---- | | ---- | |
| 2165 | ISO14184-2 | 139.50 | | -0.09 | |
| 2170 | | ---- | | ---- | |
| 2182 | | ---- | | ---- | |
| 2184 | | ---- | | ---- | |
| 2201 | ISO14184-2 | 140.0 | | -0.04 | |
| 2226 | | ---- | | ---- | |
| 2238 | ISO14184-2 | 146.56 | | 0.57 | |
| 2247 | | ---- | | ---- | |
| 2255 | | ---- | | ---- | |
| 2256 | | ---- | | ---- | |
| 2264 | | ---- | | ---- | |
| 2265 | | ---- | | ---- | |
| 2269 | | ---- | | ---- | |
| 2275 | ISO14184-2 | 146.0 | | 0.52 | |
| 2289 | ISO14184-2 | 148.4 | | 0.75 | |
| 2290 | | ---- | | ---- | |
| 2297 | ISO14184-2 | 150 | | 0.90 | |
| 2310 | ISO14184-2 | 139 | | -0.13 | |
| 2311 | ISO14184-2 | 139.7 | | -0.07 | |
| 2313 | ISO14184-2 | 133.44 | | -0.65 | |
| 2314 | AATCC112 | 136.74 | | -0.35 | |
| 2320 | ISO14184-2 | 153.3 | | 1.21 | |
| 2326 | ISO14184-2 | 126.609 | | -1.29 | |
| 2330 | ISO14184-2 proc. annex B | 142.73 | | 0.22 | |
| 2347 | ISO14184-2 | 138.3 | | -0.20 | |
| 2348 | ISO14184-2 | 143.1 | | 0.25 | |
| 2350 | AATCC112 | 142.62 | C | 0.21 | First reported 285.25 |
| 2351 | ISO14184-2 | 144 | | 0.33 | |
| 2356 | ISO14184-2 | 142.18 | | 0.16 | |
| 2358 | ISO14184-2 | 135.435 | | -0.47 | |
| 2363 | ISO14184-2 | 140.4 | | 0.00 | |
| 2364 | ISO14184-2 | 146.51 | | 0.57 | |
| 2365 | ISO14184-2 | 140.1 | | -0.03 | |
| 2366 | ISO14184-2 | 140 | | -0.04 | |
| 2367 | ISO14184-2 | 143.03 | | 0.24 | |
| 2369 | ISO14184-2 | 138.42 | | -0.19 | |
| 2370 | ISO14184-2 | 133.0 | | -0.70 | |
| 2372 | ISO14184-2 | 121 | | -1.82 | |
| 2373 | ISO14184-2 | 143.49 | | 0.29 | |
| 2375 | ISO14184-2 | 137.3 | | -0.29 | |
| 2378 | ISO14184-2 | 138 | | -0.23 | |
| 2379 | ISO14184-2 | 144.0585 | | 0.34 | |
| 2380 | ISO14184-2 | 148.00 | | 0.71 | |
| 2381 | ISO14184-2 | 145.90 | | 0.51 | |
| 2383 | GB/T2912 | 147.2 | | 0.63 | |
| 2385 | | ---- | | ---- | |
| 2406 | ISO14184-2 | 112.15 | R(0.05) | -2.65 | |
| 2415 | ISO14184-2 | 129.3 | | -1.04 | |
| 2429 | ISO14184-2 | 150.6 | | 0.95 | |
| 2442 | ISO14184-2 | 144.55 | | 0.39 | |
| 2449 | ISO14184-2 | 142.12 | | 0.16 | |
| 2453 | | ---- | | ---- | |
| 2454 | ISO14184-2 | 136.3 | | -0.39 | |
| 2458 | | ---- | | ---- | |
| 2474 | ISO14184-2 | 145.8 | | 0.50 | |
| 2475 | | ---- | | ---- | |
| 2476 | | ---- | | ---- | |
| 2482 | | ---- | | ---- | |
| 2483 | | ---- | | ---- | |

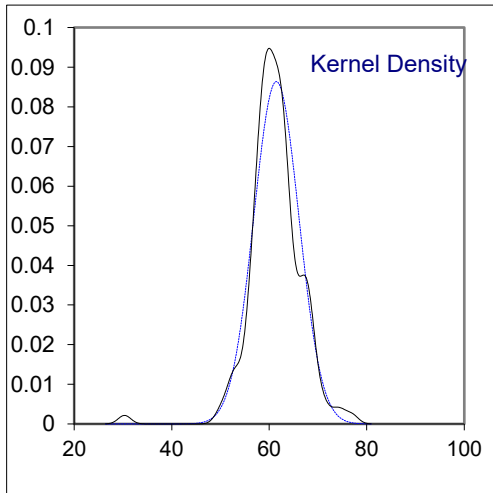
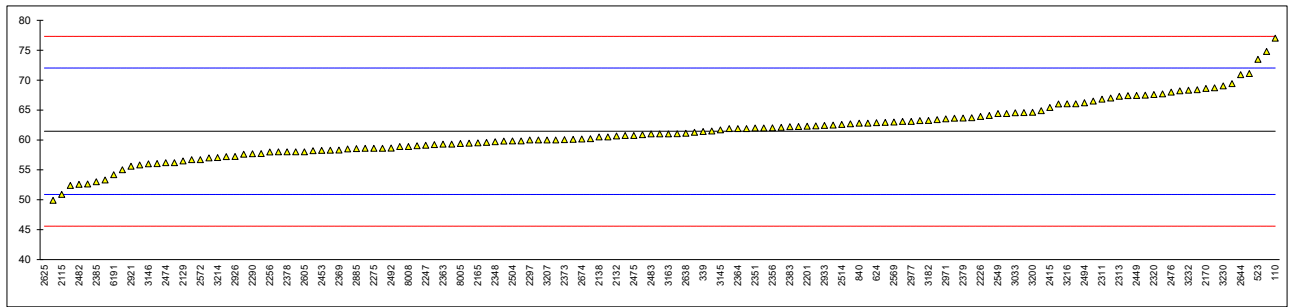
| lab | method | value | mark | z(targ) | remarks |
|------|------------------|----------|----------|---------|-----------------------|
| 2489 | ISO14184-2 | 141.7 | | 0.12 | |
| 2492 | | ---- | | ---- | |
| 2494 | ISO14184-2 | 136.77 | C | -0.34 | First reported 167.37 |
| 2504 | ISO14184-2 | 128.907 | | -1.08 | |
| 2511 | | ---- | | ---- | |
| 2514 | | ---- | | ---- | |
| 2519 | | ---- | | ---- | |
| 2534 | | ---- | | ---- | |
| 2549 | ISO14184-2 | 130.2 | | -0.96 | |
| 2567 | | ---- | | ---- | |
| 2569 | ISO14184-2 | 140 | | -0.04 | |
| 2572 | | ---- | | ---- | |
| 2582 | ISO14184-2 | 123.8266 | | -1.56 | |
| 2590 | | ---- | | ---- | |
| 2605 | ISO14184-2 | 140.00 | | -0.04 | |
| 2625 | ISO14184-2 | 125.29 | | -1.42 | |
| 2638 | ISO14184-2 | 140.975 | | 0.05 | |
| 2643 | ISO14184-2 | 145.94 | | 0.52 | |
| 2644 | | ---- | | ---- | |
| 2665 | | ---- | | ---- | |
| 2674 | | ---- | | ---- | |
| 2678 | | ---- | | ---- | |
| 2726 | | ---- | | ---- | |
| 2727 | | ---- | | ---- | |
| 2789 | | ---- | | ---- | |
| 2827 | ISO14184-2 | 137.52 | | -0.27 | |
| 2885 | | ---- | | ---- | |
| 2908 | | ---- | | ---- | |
| 2921 | | ---- | | ---- | |
| 2926 | | ---- | | ---- | |
| 2933 | | ---- | | ---- | |
| 2948 | ISO14184-2 | 134.26 | | -0.58 | |
| 2950 | | ---- | | ---- | |
| 2955 | | ---- | | ---- | |
| 2971 | ISO14184-2 | 140.21 | | -0.02 | |
| 2977 | | ---- | | ---- | |
| 2989 | | ---- | | ---- | |
| 2991 | | ---- | | ---- | |
| 3015 | ISO14184-2 | 142.1 | | 0.16 | |
| 3033 | | ---- | | ---- | |
| 3110 | | ---- | | ---- | |
| 3116 | | ---- | | ---- | |
| 3118 | | ---- | | ---- | |
| 3145 | | ---- | | ---- | |
| 3146 | | ---- | | ---- | |
| 3153 | | ---- | | ---- | |
| 3163 | | ---- | | ---- | |
| 3166 | | ---- | | ---- | |
| 3172 | | ---- | | ---- | |
| 3182 | ISO14184-2 | 147.66 | | 0.68 | |
| 3185 | ISO14184-2 | 140.44 | | 0.00 | |
| 3190 | ISO14184-2 | 145.96 | | 0.52 | |
| 3197 | AATCC112 | 146.07 | | 0.53 | |
| 3200 | | ---- | | ---- | |
| 3207 | | ---- | | ---- | |
| 3210 | | ---- | | ---- | |
| 3214 | | ---- | | ---- | |
| 3216 | | ---- | | ---- | |
| 3222 | | ---- | | ---- | |
| 3225 | | ---- | | ---- | |
| 3228 | | ---- | | ---- | |
| 3230 | ISO14184-2 | 161.03 | C | 1.93 | First reported 321.07 |
| 3232 | ISO14184-2 | 134.64 | | -0.54 | |
| 3237 | ISO14184-2 | 133.0 | | -0.70 | |
| 3248 | GB/T2912 | 143 | C | 0.24 | First reported 85 |
| 6191 | | ---- | | ---- | |
| 8005 | | ---- | | ---- | |
| 8008 | | ---- | | ---- | |
| 8016 | ISO14184-2 | 135.00 | | -0.51 | |
| | normality | OK | | | |
| | n | 68 | | | |
| | outliers | 1 | | | |
| | mean (n) | 140.431 | | | |
| | st.dev. (n) | 7.5988 | RSD = 5% | | |
| | R(calc.) | 21.277 | | | |
| | st.dev.(Horwitz) | 10.6748 | | | |
| | R(Horwitz) | 29.889 | | | |



Determination of Free Formaldehyde on sample #23751; results in mg/kg

| lab | method | value | mark | z(targ) | remarks |
|------|------------|---------|------|---------|---------------------|
| 110 | ISO14184-1 | 77.03 | | 2.94 | |
| 210 | ISO14184-1 | 59.05 | | -0.46 | |
| 339 | ISO14184-1 | 61.4 | | -0.01 | |
| 362 | ISO14184-1 | 59.22 | | -0.42 | |
| 523 | ISO14184-1 | 73.5 | | 2.28 | |
| 551 | ISO14184-1 | 58.589 | | -0.54 | |
| 623 | ISO14184-1 | 60.9 | | -0.11 | |
| 624 | ISO14184-1 | 62.9 | | 0.27 | |
| 840 | ISO14184-1 | 62.8 | | 0.25 | |
| 2108 | ISO14184-1 | 55 | | -1.22 | |
| 2115 | ISO14184-1 | 50.91 | | -1.99 | |
| 2121 | ISO14184-1 | 66 | C | 0.86 | First reported 75.5 |
| 2129 | ISO14184-1 | 56.50 | | -0.94 | |
| 2132 | ISO14184-1 | 60.6725 | | -0.15 | |
| 2137 | ISO14184-1 | 62.5 | | 0.20 | |
| 2138 | ISO14184-1 | 60.5 | | -0.18 | |
| 2165 | ISO14184-1 | 59.526 | | -0.37 | |
| 2170 | ISO14184-1 | 68.60 | | 1.35 | |
| 2182 | JST2016 | 56.99 | | -0.84 | |
| 2184 | ISO14184-1 | 63.4 | | 0.37 | |
| 2201 | ISO14184-1 | 62.3 | | 0.16 | |
| 2226 | ISO14184-1 | 63.93 | | 0.47 | |
| 2238 | ISO14184-1 | 56.04 | | -1.02 | |
| 2247 | ISO14184-1 | 59.11 | | -0.44 | |
| 2255 | ISO14184-1 | 61.5 | | 0.01 | |
| 2256 | ISO14184-1 | 57.99 | | -0.66 | |
| 2264 | JIS L1041 | 55.81 | | -1.07 | |
| 2265 | ISO14184-1 | 58.50 | | -0.56 | |
| 2269 | ISO14184-1 | 52.62 | | -1.67 | |
| 2275 | ISO14184-1 | 58.6 | | -0.54 | |
| 2289 | ISO14184-1 | 67.4 | | 1.12 | |
| 2290 | ISO14184-1 | 57.7 | | -0.71 | |
| 2297 | ISO14184-1 | 60 | | -0.28 | |
| 2310 | ISO14184-1 | 67 | | 1.05 | |
| 2311 | ISO14184-1 | 66.81 | | 1.01 | |
| 2313 | ISO14184-1 | 67.31 | | 1.11 | |
| 2314 | ISO14184-1 | 67.71 | | 1.18 | |
| 2320 | ISO14184-1 | 67.6 | | 1.16 | |
| 2326 | ISO14184-1 | 62.111 | | 0.12 | |
| 2330 | GB/T2912 | 62.35 | | 0.17 | |
| 2347 | GB/T2912 | 58.0 | | -0.65 | |
| 2348 | ISO14184-1 | 59.7 | | -0.33 | |
| 2350 | ISO14184-1 | 57.72 | | -0.71 | |
| 2351 | ISO14184-1 | 62 | | 0.10 | |
| 2356 | ISO14184-1 | 62.04 | | 0.11 | |
| 2358 | ISO14184-1 | 61.897 | | 0.08 | |
| 2363 | ISO14184-1 | 59.3 | | -0.41 | |
| 2364 | ISO14184-1 | 61.90 | | 0.08 | |
| 2365 | ISO14184-1 | 58.9 | | -0.48 | |
| 2366 | ISO14184-1 | 58 | | -0.65 | |
| 2367 | ISO14184-1 | 62.94 | | 0.28 | |
| 2369 | ISO14184-1 | 58.32 | | -0.59 | |
| 2370 | ISO14184-1 | 63.10 | | 0.31 | |
| 2372 | ISO14184-1 | 53.3 | | -1.54 | |
| 2373 | ISO14184-1 | 60.06 | | -0.26 | |
| 2375 | ISO14184-1 | 68.4 | | 1.31 | |
| 2378 | ISO14184-1 | 58 | | -0.65 | |
| 2379 | ISO14184-1 | 63.6817 | | 0.42 | |
| 2380 | ISO14184-1 | 60.00 | | -0.28 | |
| 2381 | ISO14184-1 | 60.20 | | -0.24 | |
| 2383 | GB/T2912 | 62.2 | | 0.14 | |
| 2385 | ISO14184-1 | 53 | | -1.60 | |
| 2406 | ISO14184-1 | 63.64 | | 0.41 | |
| 2415 | ISO14184-1 | 65.45 | | 0.75 | |
| 2429 | ISO14184-1 | 62.8 | | 0.25 | |
| 2442 | ISO14184-1 | 60.74 | | -0.14 | |
| 2449 | ISO14184-1 | 67.46 | | 1.13 | |
| 2453 | ISO14184-1 | 58.27 | | -0.60 | |
| 2454 | ISO14184-1 | 56.7 | | -0.90 | |
| 2458 | ISO14184-1 | 57.21 | | -0.80 | |
| 2474 | ISO14184-1 | 56.2 | | -0.99 | |
| 2475 | ISO14184-1 | 60.75 | | -0.13 | |
| 2476 | ISO14184-1 | 68.0 | | 1.24 | |
| 2482 | ISO14184-1 | 52.57 | | -1.68 | |
| 2483 | ISO14184-1 | 61.0 | | -0.09 | |

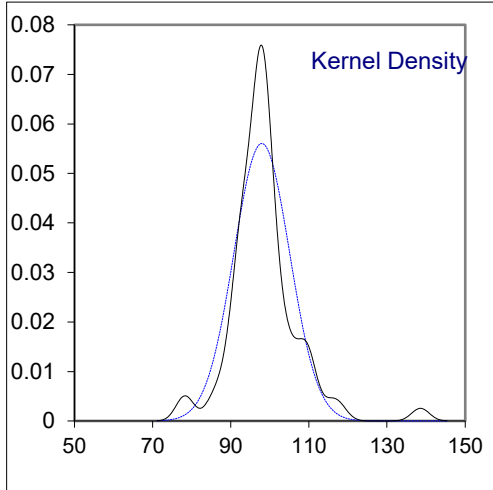
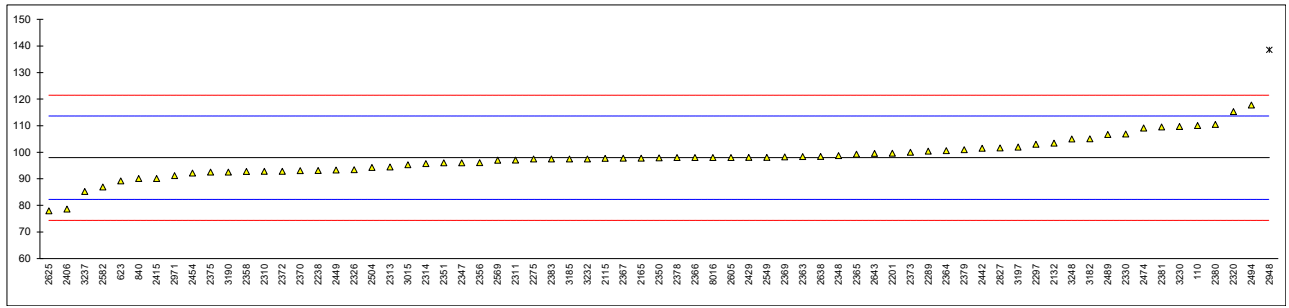
| lab | method | value | mark | z(targ) | remarks |
|------|------------------|---------|----------|---------|-----------------------|
| 2489 | ISO14184-1 | 64.9 | | 0.65 | |
| 2492 | JIS L1041 | 58.64 | | -0.53 | |
| 2494 | ISO14184-1 | 66.22 | C | 0.90 | First reported 74.76 |
| 2504 | ISO14184-1 | 59.8373 | | -0.31 | |
| 2511 | ISO14184-1 | 68.73 | | 1.37 | |
| 2514 | ISO14184-1 | 62.6 | | 0.22 | |
| 2519 | ISO14184-1 | 64.1 | | 0.50 | |
| 2534 | GB/T2912 | 69.4 | | 1.50 | |
| 2549 | ISO14184-1 | 64.4 | | 0.56 | |
| 2567 | ISO14184-1 | 62.25 | | 0.15 | |
| 2569 | ISO14184-1 | 63 | | 0.29 | |
| 2572 | ISO14184-1 | 56.7 | | -0.90 | |
| 2582 | ISO14184-1 | 59.8563 | | -0.30 | |
| 2590 | ISO14184-1 | 59.58 | | -0.36 | |
| 2605 | ISO14184-1 | 58.00 | | -0.65 | |
| 2625 | ISO14184-1 | 30.29 | R(0.01) | -5.89 | |
| 2638 | ISO14184-1 | 61.12 | | -0.06 | |
| 2643 | ISO14184-1 | 64.41 | | 0.56 | |
| 2644 | ISO14184-1 | 70.915 | | 1.79 | |
| 2665 | In house | 61.05 | | -0.08 | |
| 2674 | ISO14184-1 | 60.15 | | -0.25 | |
| 2678 | ISO14184-1 | 64.58 | | 0.59 | |
| 2726 | ISO14184-1 | 61 | | -0.09 | |
| 2727 | ISO14184-1 | 52.4 | C | -1.71 | First reported 48.1 |
| 2789 | ISO14184-1 | 59.8 | | -0.31 | |
| 2827 | ISO14184-1 | 63.23 | | 0.33 | |
| 2885 | ISO14184-1 | 58.54 | | -0.55 | |
| 2908 | ISO14184-1 | 71.11 | C | 1.82 | First reported 116.32 |
| 2921 | JIS L1041 | 55.6 | | -1.11 | |
| 2926 | ISO14184-1 | 57.25 | | -0.80 | |
| 2933 | CNS15580-1 | 62.45 | | 0.19 | |
| 2948 | ISO14184-1 | 68.22 | | 1.28 | |
| 2950 | ISO14184-1 | 62.71 | | 0.24 | |
| 2955 | ISO14184-1 | 59.3 | | -0.41 | |
| 2971 | ISO14184-1 | 63.54 | | 0.39 | |
| 2977 | ISO14184-1 | 63.1128 | | 0.31 | |
| 2989 | | ---- | | ---- | |
| 2991 | GB/T2912 | 74.8 | | 2.52 | |
| 3015 | ISO14184-1 | 57.6 | | -0.73 | |
| 3033 | ISO14184-1 | 64.545 | | 0.58 | |
| 3110 | ISO14184-1 | 58.6 | | -0.54 | |
| 3116 | ISO14184-1 | 58.2 | | -0.62 | |
| 3118 | ISO14184-1 | 66.07 | | 0.87 | |
| 3145 | ISO14184-1 | 61.7 | | 0.05 | |
| 3146 | ISO14184-1 | 56.00 | | -1.03 | |
| 3153 | ISO14184-1 | 60.12 | | -0.25 | |
| 3163 | ISO14184-1 | 61 | | -0.09 | |
| 3166 | In house | 59.48 | | -0.37 | |
| 3172 | ISO14184-1 | 63.71 | | 0.43 | |
| 3182 | ISO14184-1 | 63.28 | | 0.34 | |
| 3185 | ISO14184-1 | 56.20 | | -0.99 | |
| 3190 | ISO14184-1 | 58.28 | | -0.60 | |
| 3197 | ISO14184-1 | 61.91 | | 0.09 | |
| 3200 | ISO14184-1 | 64.64 | | 0.60 | |
| 3207 | JIS L1041 | 60 | | -0.28 | |
| 3210 | In house | 49.90 | | -2.19 | |
| 3214 | ISO14184-1 | 57.05 | | -0.83 | |
| 3216 | ISO14184-1 | 66.05 | | 0.87 | |
| 3222 | ISO14184-1 | 66.5 | | 0.95 | |
| 3225 | ISO14184-1 | 61.28 | | -0.03 | |
| 3228 | ISO14184-1 | 60 | | -0.28 | |
| 3230 | ISO14184-1 | 69.06 | | 1.44 | |
| 3232 | ISO14184-1 | 68.33 | | 1.30 | |
| 3237 | ISO14184-1 | 67.5 | | 1.14 | |
| 3248 | GB/T2912 | 62 | C | 0.10 | First reported 41 |
| 6191 | In house | 54.18 | | -1.38 | |
| 8005 | ST2016 | 59.4 | | -0.39 | |
| 8008 | JTS ST1.6 | 58.9 | | -0.48 | |
| 8016 | ISO14184-1 | 60.50 | | -0.18 | |
| | normality | OK | | | |
| | n | 142 | | | |
| | outliers | 1 | | | |
| | mean (n) | 61.460 | | | |
| | st.dev. (n) | 4.6201 | RSD = 8% | | |
| | R(calc.) | 12.936 | | | |
| | st.dev.(Horwitz) | 5.2906 | | | |
| | R(Horwitz) | 14.814 | | | |



Determination of Released Formaldehyde on sample #23751; results in mg/kg

| lab | method | value | mark | z(targ) | remarks |
|------|------------|----------|------|---------|-----------------------|
| 110 | ISO14184-2 | 110.1 | | 1.55 | |
| 210 | | ---- | | ---- | |
| 339 | | ---- | | ---- | |
| 362 | | ---- | | ---- | |
| 523 | | ---- | | ---- | |
| 551 | | ---- | | ---- | |
| 623 | ISO14184-2 | 89.2 | | -1.11 | |
| 624 | | ---- | | ---- | |
| 840 | ISO14184-2 | 90.1 | | -1.00 | |
| 2108 | | ---- | | ---- | |
| 2115 | ISO14184-2 | 97.68 | | -0.03 | |
| 2121 | | ---- | | ---- | |
| 2129 | | ---- | | ---- | |
| 2132 | ISO14184-2 | 103.4201 | | 0.70 | |
| 2137 | | ---- | | ---- | |
| 2138 | | ---- | | ---- | |
| 2165 | ISO14184-2 | 97.76 | | -0.02 | |
| 2170 | | ---- | | ---- | |
| 2182 | | ---- | | ---- | |
| 2184 | | ---- | | ---- | |
| 2201 | ISO14184-2 | 99.6 | | 0.21 | |
| 2226 | | ---- | | ---- | |
| 2238 | ISO14184-2 | 93.12 | | -0.61 | |
| 2247 | | ---- | | ---- | |
| 2255 | | ---- | | ---- | |
| 2256 | | ---- | | ---- | |
| 2264 | | ---- | | ---- | |
| 2265 | | ---- | | ---- | |
| 2269 | | ---- | | ---- | |
| 2275 | ISO14184-2 | 97.5 | | -0.06 | |
| 2289 | ISO14184-2 | 100.4 | | 0.31 | |
| 2290 | | ---- | | ---- | |
| 2297 | ISO14184-2 | 103 | | 0.64 | |
| 2310 | ISO14184-2 | 92.8 | | -0.65 | |
| 2311 | ISO14184-2 | 97.09 | | -0.11 | |
| 2313 | ISO14184-2 | 94.45 | | -0.44 | |
| 2314 | ISO14184-2 | 95.73 | | -0.28 | |
| 2320 | ISO14184-2 | 115.3 | | 2.21 | |
| 2326 | ISO14184-2 | 93.394 | | -0.58 | |
| 2330 | AATCC112 | 106.84 | | 1.13 | |
| 2347 | GB/T2912 | 96.0 | | -0.25 | |
| 2348 | ISO14184-2 | 98.7 | | 0.10 | |
| 2350 | AATCC112 | 97.90 | C | -0.01 | First reported 195.80 |
| 2351 | ISO14184-2 | 96 | | -0.25 | |
| 2356 | ISO14184-2 | 96.04 | | -0.24 | |
| 2358 | ISO14184-2 | 92.771 | | -0.66 | |
| 2363 | ISO14184-2 | 98.4 | | 0.06 | |
| 2364 | ISO14184-2 | 100.62 | | 0.34 | |
| 2365 | ISO14184-2 | 99.3 | | 0.17 | |
| 2366 | ISO14184-2 | 98 | | 0.01 | |
| 2367 | ISO14184-2 | 97.76 | | -0.02 | |
| 2369 | ISO14184-2 | 98.23 | | 0.04 | |
| 2370 | ISO14184-2 | 93.10 | | -0.62 | |
| 2372 | ISO14184-2 | 92.8 | | -0.65 | |
| 2373 | ISO14184-2 | 100.00 | | 0.26 | |
| 2375 | ISO14184-2 | 92.5 | | -0.69 | |
| 2378 | ISO14184-2 | 98 | | 0.01 | |
| 2379 | ISO14184-2 | 100.9481 | | 0.38 | |
| 2380 | ISO14184-2 | 110.49 | | 1.60 | |
| 2381 | ISO14184-2 | 109.50 | | 1.47 | |
| 2383 | GB/T2912 | 97.5 | | -0.06 | |
| 2385 | | ---- | | ---- | |
| 2406 | ISO14184-2 | 78.62 | | -2.46 | |
| 2415 | ISO14184-2 | 90.1 | | -1.00 | |
| 2429 | ISO14184-2 | 98.1 | | 0.02 | |
| 2442 | ISO14184-2 | 101.48 | | 0.45 | |
| 2449 | ISO14184-2 | 93.3 | | -0.59 | |
| 2453 | | ---- | | ---- | |
| 2454 | ISO14184-2 | 92.2 | | -0.73 | |
| 2458 | | ---- | | ---- | |
| 2474 | ISO14184-2 | 109.1 | | 1.42 | |
| 2475 | | ---- | | ---- | |
| 2476 | | ---- | | ---- | |
| 2482 | | ---- | | ---- | |
| 2483 | | ---- | | ---- | |

| lab | method | value | mark | z(targ) | remarks |
|------|------------------|---------|----------|---------|----------------------|
| 2489 | ISO14184-2 | 106.7 | | 1.11 | |
| 2492 | | ---- | | ---- | |
| 2494 | ISO14184-2 | 117.76 | | 2.52 | |
| 2504 | ISO14184-2 | 94.275 | | -0.47 | |
| 2511 | | ---- | | ---- | |
| 2514 | | ---- | | ---- | |
| 2519 | | ---- | | ---- | |
| 2534 | | ---- | | ---- | |
| 2549 | ISO14184-2 | 98.1 | | 0.02 | |
| 2567 | | ---- | | ---- | |
| 2569 | ISO14184-2 | 97 | | -0.12 | |
| 2572 | | ---- | | ---- | |
| 2582 | ISO14184-2 | 86.8957 | | -1.41 | |
| 2590 | | ---- | | ---- | |
| 2605 | ISO14184-2 | 98.04 | | 0.01 | |
| 2625 | ISO14184-2 | 77.95 | | -2.54 | |
| 2638 | ISO14184-2 | 98.44 | | 0.06 | |
| 2643 | ISO14184-2 | 99.56 | | 0.21 | |
| 2644 | | ---- | | ---- | |
| 2665 | | ---- | | ---- | |
| 2674 | | ---- | | ---- | |
| 2678 | | ---- | | ---- | |
| 2726 | | ---- | | ---- | |
| 2727 | | ---- | | ---- | |
| 2789 | | ---- | | ---- | |
| 2827 | ISO14184-2 | 101.64 | | 0.47 | |
| 2885 | | ---- | | ---- | |
| 2908 | | ---- | | ---- | |
| 2921 | | ---- | | ---- | |
| 2926 | | ---- | | ---- | |
| 2933 | | ---- | | ---- | |
| 2948 | ISO14184-2 | 138.56 | R(0.01) | 5.17 | |
| 2950 | | ---- | | ---- | |
| 2955 | | ---- | | ---- | |
| 2971 | ISO14184-2 | 91.20 | | -0.86 | |
| 2977 | | ---- | | ---- | |
| 2989 | | ---- | | ---- | |
| 2991 | | ---- | | ---- | |
| 3015 | ISO14184-2 | 95.3 | | -0.34 | |
| 3033 | | ---- | | ---- | |
| 3110 | | ---- | | ---- | |
| 3116 | | ---- | | ---- | |
| 3118 | | ---- | | ---- | |
| 3145 | | ---- | | ---- | |
| 3146 | | ---- | | ---- | |
| 3153 | | ---- | | ---- | |
| 3163 | | ---- | | ---- | |
| 3166 | | ---- | | ---- | |
| 3172 | | ---- | | ---- | |
| 3182 | ISO14184-2 | 105.02 | | 0.90 | |
| 3185 | ISO14184-2 | 97.50 | | -0.06 | |
| 3190 | ISO14184-2 | 92.54 | | -0.69 | |
| 3197 | AATCC112 | 101.94 | | 0.51 | |
| 3200 | | ---- | | ---- | |
| 3207 | | ---- | | ---- | |
| 3210 | | ---- | | ---- | |
| 3214 | | ---- | | ---- | |
| 3216 | | ---- | | ---- | |
| 3222 | | ---- | | ---- | |
| 3225 | | ---- | | ---- | |
| 3228 | | ---- | | ---- | |
| 3230 | ISO14184-2 | 109.71 | C | 1.50 | First reported 219.8 |
| 3232 | ISO14184-2 | 97.51 | | -0.06 | |
| 3237 | ISO14184-2 | 85.2 | | -1.62 | |
| 3248 | GB/T2912 | 105 | C | 0.90 | First reported 49 |
| 6191 | | ---- | | ---- | |
| 8005 | | ---- | | ---- | |
| 8008 | | ---- | | ---- | |
| 8016 | ISO14184-2 | 98.00 | | 0.01 | |
| | normality | suspect | | | |
| | n | 68 | | | |
| | outliers | 1 | | | |
| | mean (n) | 97.944 | | | |
| | st.dev. (n) | 7.1217 | RSD = 7% | | |
| | R(calc.) | 19.941 | | | |
| | st.dev.(Horwitz) | 7.8601 | | | |
| | R(Horwitz) | 22.008 | | | |



APPENDIX 2 Analytical details

| lab | ISO/IEC 17025 accredited | Sample Intake Free Formaldehyde (grams) | Sample Intake Released Formaldehyde (grams) | Dimedone confirmation test | Dimedone confirmation done because of |
|------|--------------------------|------------------------------------------------------|------------------------------------------------------|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 110 | Yes | 1 g | 1 g | No | |
| 210 | Yes | 1g | | No | |
| 339 | Yes | 2g | | No | |
| 362 | Yes | 1g | | No | |
| 523 | Yes | 3 grams | Not apply | Yes | Not apply |
| 551 | Yes | | | --- | |
| 623 | Yes | 1 gram | 1 gram | Yes | |
| 624 | --- | | | --- | |
| 840 | Yes | 0.5g | 1g | No | |
| 2108 | Yes | 1 g | | Yes | we make the test according to ISO 14181-1 |
| 2115 | Yes | 1 g | 1 g | Yes | according to standard method UNI EN ISO 14184-1 |
| 2121 | Yes | 1g | | No | |
| 2129 | Yes | 1.0g | | No | |
| 2132 | Yes | 1g | 1g | Yes | The value are greater than detection limit. |
| 2137 | Yes | 1 | | No | |
| 2138 | Yes | 1.0 g | | No | No |
| 2165 | Yes | 0.5g | | No | |
| 2170 | Yes | 1.0 grams | Sample not enough to conduct the test. | No | |
| 2182 | Yes | 1gram | | Yes | Conduct confirmation for positive sample. |
| 2184 | No | 1g | | No | dimedone confirmation test is performed for positive sample to check interference |
| 2201 | Yes | 1g | 1g | Yes | To conform absorption is due to formaldehyde. |
| 2226 | Yes | 1.0 g | N/A | No | |
| 2238 | Yes | #23750:0.9997g&0.9998g #23751:1.0013g&1.0008g | #23750:1.0003g&0.9999g #23751:1.0003g&0.9996g | No | No |
| 2247 | --- | | | --- | |
| 2255 | Yes | 1.0 | NA | Yes | |
| 2256 | Yes | 1.0015g & 1.0042g | | Yes | Dimedone reacts all amount of formaldehyde in sample solution. If the sample solution after performed confirmation test gives an absorbance, it is due to the presence of interference. |
| 2264 | Yes | 1 gram | NA | | Yes, we perform a dimedone confirmation test used for correct the interferences. |
| 2265 | Yes | 1 gram | | Yes | sample was positive |
| 2269 | Yes | 1 grams | Not applicable in our lab | | Dimedone is used to confirm the actual presence of formaldehyde in a sample when there is a doubt that the absorption may not be due to formaldehyde but for example to an extracted coloring agent |
| 2275 | Yes | 1.0000g | 1.0000g | No | |
| 2289 | Yes | 1.00g | 1.00g | No | |
| 2290 | Yes | | | --- | |
| 2297 | Yes | 0.5 | 1 | No | |
| 2310 | Yes | 1 | 1 | No | |
| 2311 | Yes | 1 | 1 | No | |
| 2313 | Yes | 1.0g | 1.0g | Yes | |
| 2314 | Yes | 1.0 gram | 1.0 gram | No | |
| 2320 | Yes | 1g | 1g | Yes | Even dimedone correction done there was no significant results difference Pink(#23750) 1.0034 gm - 0.0028 gm Grey(#23751) 1.0089 gm - 0.0035 gm |
| 2326 | Yes | 1 gm for both samples | 1 gm for both samples | No | |
| 2330 | Yes | 1 gram | 1 gram | Yes | To confirm the result |
| 2347 | Yes | 1g | 1g | No | / |
| 2348 | Yes | 1 g each for two samples | 1 g each for two samples | No | |
| 2350 | Yes | 1g | 1g | Yes | N/A |
| 2351 | Yes | | | --- | |
| 2356 | No | #23750:1.0001 g/1.0003 g #23751:1.0022 g/1.0088 g | #23750:1.0003 g/1.0022 g #23751:1.0002 g/0.9994 g | No | None |

| lab | ISO/IEC 17025 accredited | Sample Intake Free Formaldehyde (grams) | Sample Intake Released Formaldehyde (grams) | Dimedone confirmation test | Dimedone confirmation done because of |
|------|--------------------------|----------------------------------------------|----------------------------------------------|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2358 | Yes | 1 | 1 | No | |
| 2363 | Yes | 0.5g | 0.5g | No | |
| 2364 | No | 23750:1.0027/1.0011 23751:1.0014/1.0023 | 23750:1.0013/1.0010 23751:1.0018/1.0007 | No | / |
| 2365 | Yes | 0.5g | 0.5g | No | |
| 2366 | --- | | | --- | |
| 2367 | Yes | 0.9948 | 1.0015 | Yes | |
| 2369 | Yes | | | --- | |
| 2370 | Yes | 1g | 1g | Yes | dimedone confirmation test Exclude other compounds from interfering with color development. |
| 2372 | Yes | 1g | 1g | Yes | N.A |
| 2373 | Yes | 1g | 1g | Yes | For Question 4, We perform a dimedone confirmation test for ISO 14184-1, Because there is a doubt that the absorption may not be due to formaldehyde (eg. coming from extracted coloring agent). |
| 2375 | Yes | 0,5 Gram | 1 gram | No | - |
| 2378 | Yes | 1g | 1g | No | |
| 2379 | Yes | 0.5 g | 1 g | Yes | the result of sample more than LOQ |
| 2380 | Yes | 1.0 g | 1.0 g | No | |
| 2381 | Yes | 1g | 1g | No | |
| 2383 | Yes | 23750# 1g per sample 23751# 1g per sample | 23750# 1g per sample 23751# 1g per sample | Yes | there is a doubt that the absorption may not be due to formaldehyde but, for example, to an extracted colouring agent. |
| 2385 | Yes | 1,0 | | No | |
| 2406 | No | 0.6 gram | 1 gram | No | |
| 2415 | No | 0.5 grams | 1 gram | No | |
| 2429 | No | 1g | 1g | No | |
| 2442 | Yes | 1gm | 1gm | No | |
| 2449 | Yes | 1.0 gram | 1,0 gram | Yes | |
| 2453 | No | ±1.5g | | No | |
| 2454 | Yes | 1.0000g, two parallel tests total:2.0000g | 1.0000g, two parallel tests total:2.0000g | Yes | Because the extract solution contains formaldehyde, we need to confirm the absorption is due to formaldehyde or not. |
| 2458 | Yes | | | --- | |
| 2474 | Yes | 1 gram | 1 gram | No | |
| 2475 | Yes | 0.50 | | --- | |
| 2476 | Yes | 1 gm | NA | No | |
| 2482 | Yes | 1 | not analyzed | No | |
| 2483 | Yes | 1.00 | | No | |
| 2489 | Yes | 2.5g | 1 g | No | - |
| 2492 | Yes | 0.5g | NA | No | |
| 2494 | Yes | 1 gram | 1 gram | No | |
| 2504 | Yes | 1 gram | 1 gram | No | n/a |
| 2511 | Yes | | | --- | |
| 2514 | Yes | 1.04 | | Yes | |
| 2519 | Yes | 1 | | Yes | of confirm test result. |
| 2534 | Yes | 1 gr | | No | |
| 2549 | Yes | 1 gram | 1 gm | No | |
| 2567 | --- | | | --- | |
| 2569 | Yes | 1 gm | 1 gm | No | |
| 2572 | Yes | | | --- | |
| 2582 | Yes | 23750- 1.0029 g 23751- 1.0024 g | 23750- 1.0014 g 23751- 1.0012 g | Yes | Reconfirmation on slightly extracted color |
| 2590 | Yes | 1.25g | | Yes | Dimedone confirmation showed no interferences |
| 2605 | Yes | 2g | 2g | Yes | |
| 2625 | Yes | 1g | 1g | No | |
| 2638 | No | 0.8 gm | 0.8 gm | No | |
| 2643 | Yes | 1 g | 1 g | No | |
| 2644 | Yes | 1.0000 | | Yes | To exclude interferences (above 50 mg/kg) |
| 2665 | Yes | 0.5 g | | No | |
| 2674 | No | 1g | | Yes | |
| 2678 | Yes | 1 g | | No | |
| 2726 | No | 1 g | | No | |

| lab | ISO/IEC 17025 accredited | Sample Intake Free Formaldehyde (grams) | Sample Intake Released Formaldehyde (grams) | Dimedone confirmation test | Dimedone confirmation done because of |
|------|--------------------------|---------------------------------------------------------------------------|---------------------------------------------|----------------------------|---------------------------------------------------------------------------------------------------------------------------|
| 2727 | Yes | 1 gram | | Yes | We follow the standard. |
| 2789 | Yes | 1 | | No | |
| 2827 | Yes | 0.5g | 0.5g | No | |
| 2885 | No | 1g | | No | |
| 2908 | Yes | 1.003 | | No | |
| 2921 | --- | | | --- | |
| 2926 | Yes | 1g | | Yes | To confirm Formaldehyde presence. |
| 2933 | Yes | 1 g | Null | Yes | Because the sample is positive. |
| 2948 | Yes | 1 | 1 | No | |
| 2950 | Yes | 1 gram | | No | |
| 2955 | Yes | 1.0 | N/A | No | N/A |
| 2971 | Yes | 1g | 1g | Yes | |
| 2977 | Yes | 1g | | No | |
| 2989 | --- | | | --- | |
| 2991 | Yes | 2g | | No | |
| 3015 | Yes | 1g | 1g | Yes | |
| 3033 | Yes | 2.5 g | | No | |
| 3110 | --- | | | --- | |
| 3116 | Yes | 1 | | Yes | |
| 3118 | Yes | 0.5 grams | | No | |
| 3145 | Yes | 1 g per determination | | Yes | The solutions show a yellow hue. |
| 3146 | Yes | Between 0.50g and 1.00g | Released Formaldehyde was not tested. | No | |
| 3153 | Yes | 1 gram | | No | |
| 3163 | No | 1 | | No | |
| 3166 | Yes | 0.5 | Not analyzed | No | |
| 3172 | Yes | | | --- | |
| 3182 | Yes | 1.00 grams | 1.00 grams | No | - |
| 3185 | Yes | 1g | 1g | No | / |
| 3190 | Yes | 1.0000g | 1.0000g | No | |
| 3197 | Yes | 1 g | 1 g | Yes | Dimedone step was applied to confirm Formaldehyde compound. |
| 3200 | Yes | 1g | | No | |
| 3207 | Yes | 1 gram | | Yes | #27350 Dimedone = 3 ppm #27351 Dimedone = 1 ppm |
| 3210 | Yes | 1 | | No | |
| 3214 | Yes | 1 g | N/A | Yes | |
| 3216 | Yes | Approx. 1g for each replicated. Two replicates are made from each sample. | | No | #23751: An additional replication has been carried out due to the variability of the results of the two initial analyses. |
| 3222 | Yes | 1g | | No | |
| 3225 | --- | | | --- | |
| 3228 | Yes | 1.0g | | No | |
| 3230 | Yes | 1.0g | 1.0g | No | -- |
| 3232 | Yes | 1 g | 1 g | No | |
| 3237 | Yes | 0,5 | 0,5 | Yes | |
| 3248 | Yes | 1 | 1 | Yes | Confirmation test has to be done when formaldehyde content is greater than reporting limit 16 mg/kg. |
| 6191 | No | 2 g | | No | |
| 8005 | Yes | 1 | | Yes | |
| 8008 | --- | | | --- | |
| 8016 | Yes | 1 ± 0.05 gm | 1 ± 0.05 gm | no | |

APPENDIX 3

Number of participants per country

6 labs in BANGLADESH
1 lab in BRAZIL
1 lab in BULGARIA
2 labs in CAMBODIA
1 lab in EGYPT
6 labs in FRANCE
9 labs in GERMANY
14 labs in HONG KONG
11 labs in INDIA
5 labs in INDONESIA
7 labs in ITALY
5 labs in KOREA, Republic of
1 lab in MAURITIUS
3 labs in MEXICO
2 labs in MOROCCO
31 labs in P.R. of CHINA
6 labs in PAKISTAN
1 lab in PERU
2 labs in PORTUGAL
1 lab in SINGAPORE
2 labs in SPAIN
2 labs in SRI LANKA
5 labs in TAIWAN
4 labs in THAILAND
1 lab in THE NETHERLANDS
3 labs in TUNISIA
4 labs in TURKEY
3 labs in U.S.A.
5 labs in VIETNAM

APPENDIX 4

Abbreviations

| | |
|----------|------------------------------------------------------------------------------------|
| C | = final test result after checking of first reported suspect test result |
| D(0.01) | = outlier in Dixon's outlier test |
| D(0.05) | = straggler in Dixon's outlier test |
| G(0.01) | = outlier in Grubbs' outlier test |
| G(0.05) | = straggler in Grubbs' outlier test |
| DG(0.01) | = outlier in Double Grubbs' outlier test |
| DG(0.05) | = straggler in Double Grubbs' outlier test |
| R(0.01) | = outlier in Rosner's outlier test |
| R(0.05) | = straggler in Rosner's outlier test |
| E | = calculation difference between reported test result and result calculated by iis |
| W | = test result withdrawn on request of participant |
| ex | = test result excluded from statistical evaluation |
| n.a. | = not applicable |
| n.e. | = not evaluated |
| n.d. | = not detected |
| fr. | = first reported |
| f+? | = possibly a false positive test result? |
| f-? | = possibly a false negative test result? |

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