EURL Proficiency Test on the Determination of PCDD/Fs, PCBs, PBDEs, HBCDDs and PFAS in Compound feed 2023

EURL-PT-POP_2302-CF

FEED

Report

PCDD/Fs and PCBs

(Report Version 1.0)

14 June 2024

EURL POPs

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Summary

Test sample	**FEED:** Compound feed [2302-CF]
Analytes of interest **Mandatory** for NRLs:	**PCDD/Fs** (17 2,3,7,8-substituted PCDD/Fs) **PCBs** (12 DL-PCBs, 6 NDL-PCBs)
Methods	**PCDD/Fs, DL-PCBs:** GC-HRMS, GC-MS/MS and alternative methods; Bioanalytical screening methods **NDL-PCBs:** Any kind of method
Participants	NRLs, OFLs, other official laboratories, commercial laboratories performing the analysis of samples taken by feed business operators
Statistical evaluation	ISO 13528:2022 [1], IUPAC Protocol [2]
Report of final results	14 June 2024 (Version 1.0)
Publication	EURL POPs reserves all rights to publish and present the anonymised results of the interlaboratory study in scientific journals and/or during conferences.

1. Structure of the ILS, test material and analytes

This proficiency test (PT) on the determination of **PCDD/Fs, PCBs, PBDEs, HBCDDs** and **PFAS** in **compound feed** was organized by European Union Reference Laboratory (EURL) for halogenated persistent organic pollutants (POPs) in Feed and Food to be performed between September and November 2023. The objective was to assess analytical performance of laboratories and interlaboratory comparability of results from analyses of PCDD/Fs, PCBs, PBDEs, HBCDDs and PFAS in one sample of **compound feed**.

National Reference Laboratories (NRLs) for halogenated POPs in Feed and Food from EU member states were requested to participate as part of their work programme for 2023. NRLs were invited to encourage the participation of Official Laboratories (OFLs) from their member states as part of their duties following Article 101 of regulation (EU) 2017/625 of the European Parliament and of the Council of 15 March 2017. Furthermore, participation of OFLs allowed the extension of the data basis for calculation of assigned values and evaluation of results. **Other official laboratories** and **commercial laboratories** performing the analysis of samples taken by feed business operators were invited to participate in this proficiency test.

The evaluated results were discussed by representatives of European Commission, NRLs and the EURL at the EURL/NRL workshop on 29 and 30 November 2023.

1.1. Samples and coding

The test sample was prepared from commercially available feed, naturally contaminated with PCDD/Fs, PCBs and PFAS and fortified with analytes of interest using technical mixtures of PBDEs and HBCDDs. Each participant received about **90 g** of the test sample in a HDPE bottle.

Compound feed	**Sample no. 2302-CF-xxx**

1.2. Analytes of interest

NRLs for halogenated POPs in feed and food were requested to determine the following parameters:

- 17 2,3,7,8-substituted PCDD/Fs
- WHO-PCDD/F-TEQ (using WHO_{2005}-TEF)
- 12 dioxin-like PCBs
- WHO-PCB-TEQ (using WHO_{2005}-TEF)
- WHO-PCDD/F-PCB-TEQ (using WHO_{2005}-TEF)
- Six non-dioxin-like PCBs (indicator PCBs): PCB 28, 52, 101, 138, 153, 180
- Sum of six non-dioxin-like PCBs (indicator PCBs)
- PCDD/F-PCB-BEQ, PCDD/F-BEQ and/or PCB-BEQ, if applicable (using bioanalytical screening methods)

1.3. Methods

One or more of the following **detection methods** could be applied:

- GC-HRMS-, GC-MS/MS-methods or other alternative methods for PCDD/Fs and dioxin-like PCBs
- Bioanalytical screening methods for PCDD/Fs and dioxin-like PCBs
- Any kind of method for non-dioxin-like PCBs

1.4. Coding of laboratories and confidentiality

The identity of participating laboratories will be kept confidential and will not be revealed to other participants.
For NRLs of EU member states, the suggested “protocol for management of underperformance in comparative testing or lack of collaboration of National Reference Laboratories (NRLs)” will be followed. The confidentiality of NRLs will be kept according to this protocol.
For OFLs of EU member states cooperating with NRL, the respective NRLs will inform the EURL for halogenated POPs about the participating OFLs and will receive the respective laboratory codes, invoices for participation fee and certificates of participation of the OFLs.

1.5. Results of PCDD/Fs and PCBs

1.5.1. Results of PCDD/Fs and PCBs determined by physico-chemical methods (GC-HRMS, GC-MS/MS, GC-LRMS, GC-ECD, …)

Laboratories should

- use their own reference standards for identification and quantification,
- report results for each analyte,
- report the limit of quantification (LOQ), at least for each non-quantified analyte,
- report upper, middle and lower bound results for WHO-PCDD/F-PCB-TEQ, WHO-PCDD/F-TEQ, WHO-PCB-TEQ and sum of six indicator PCBs,
- report if sample exceeds respective EU maximum levels or action thresholds for WHO-PCDD/F-PCB-TEQ, WHO-PCDD/F-TEQ and/or WHO-PCB-TEQ or the maximum level for the sum of six non-dioxin-like PCBs beyond reasonable doubt taking into account the measurement uncertainty,
- report the measurement uncertainty, applied for checking of compliance, for WHO-PCDD/F-PCB-TEQ, WHO-PCDD/F-TEQ, WHO-PCB-TEQ and the sum of six indicator PCBs,
- give method information and
- give information about the accreditation of the laboratory according to ISO/IEC 17025 *(for metrological traceability of consensus values of participants used as assigned values).*

Results had to be reported in **ng/kg product, relative to a feed with a moisture content of 12 %**, for PCDD/Fs and dioxin-like PCBs, and in **µg/kg product, relative to a feed with a moisture content of 12 %**, for indicator PCBs. TEQ-based results had to be calculated using the WHO-TEFs of 2005 [3].

1.5.2. Results of PCDD/Fs, PCBs, PBDEs and HBCDDs determined by physico-chemical methods (GC-HRMS, GC-MS/MS, GC-LRMS, GC-ECD, …)

Laboratories should

- use their own reference standards,
- report if the samples are suspected to be noncompliant with EU legal limits and confirmation is required,
- report PCDD/F and/or PCB results in BEQ, if applicable,
- report the reporting limit, maximum level / action threshold, which the evaluation is based on, and the bioassay cut-off, if applicable,
- give method information
- and give information about the accreditation of the laboratory according to ISO/IEC 17025.

Results had to be reported in **ng BEQ/kg, relative to a feed with a moisture content of 12 %**, for PCDD/Fs and dioxin-like PCBs.

2. Participating laboratories

This proficiency test was open for participation of:

- National Reference Laboratories (NRLs) of EU member states
- National Reference Laboratories of other European countries
- Official laboratories
- Commercial laboratories

117 laboratories registered for this proficiency test, reporting 100 sets of results for at least one parameter. Five laboratories reported two sets of data for at least one parameter.

Table 1: Participating laboratories

Participating laboratories	Region	No. of participants
National Reference Laboratories	European Union Europe Americas Oceania	27 3 1 1
Official Laboratories	European Union Other European Countries Africa Americas Asia Oceania	56 0 0 3 0 0
Commercial Laboratories	European Union Other European Countries Africa Americas Asia Oceania	19 1 0 5 0 1
	Total	**117**

2.1. Number of reported results

Table 2: Reported results for PCDD/F and PCB sum parameters and moisture content

Reported results	WHO-PCDD/F-PCB-TEQ	WHO-PCDD/F-TEQ	WHO-PCB-TEQ	Sum of six indicator PCBs	PCDD/F-PCB-BEQ [Bioanalytical screening methods]	Moisture content
All laboratories	77	77	77	90	10	95
NRLs	22	22	22	26	4	25

Table 3: Reported accreditation according to ISO/IEC 17025 by participants for PCDD/Fs and PCBs

Compound feed	PCDD/Fs, PCBs [Physico-chemical methods]	PCDD/Fs, PCBs [Bioanalytical screening methods]
yes	92	15
no	6	1

2.2. Detection methods

The following detection methods were applied:

- GC-HRMS-, GC-MS/MS-, GC-LRMS-methods for PCDD/Fs and non-ortho PCBs
- GC-HRMS-, GC-MS/MS-, GC-LRMS-, GC-ECD-methods for mono-ortho-PCBs and indicator PCBs
- Bioanalytical screening methods for PCDD/Fs and dioxin-like PCBs

Table 4: Overview of physico-chemical detection methods for PCDD/Fs and PCBs applied by participants

Detection methods	PCDD/Fs	non-ortho-PCBs	mono-ortho-PCBs	Indicator PCBs
HRMS	49	49	46	38
MS/MS	21	21	20	28
LRMS	4	4	4	11
ECD	-	-	-	6

3. Test for sufficient homogeneity

The test for sufficient homogeneity was performed according to ISO 13528:2022 [1] and the International Harmonized Protocol for the Proficiency Testing of Analytical Chemistry Laboratories [2].

Therefore, 10 portions of the test samples 2302-CF were analyzed in duplicate for PCDD/Fs and PCBs. The test for sufficient homogeneity was performed for the sum parameters WHO-PCDD/F-PCB-TEQ, WHO-PCDD/F-TEQ, WHO-PCB-TEQ, the sum of six non-dioxin-like PCBs and individual congeners. The test materials showed sufficient homogeneity for this proficiency test. The stability check of the analytes of interest applying room temperature storage was performed according to ISO 13528:2022 [1]. The test material showed sufficient stability for this proficiency test.

4. Determination of the assigned value

Statistical evaluation of the PT results was performed by the EURL for halogenated POPs in feed and food according to DIN ISO 13528:2022 [1] and the International Harmonized Protocol for the Proficiency Testing of Analytical Chemistry Laboratories [2].

The determination of the assigned value was performed according [1] by estimating of the assigned value as the consensus of participants' results (using only results of physico-chemical methods). The Huber robust mean was taken as assigned value after excluding extreme outliers (outside the range of ± 50% of the median of all reported results) and examination of the distribution of the remaining results using histogram and Kernel density estimation, if necessary.

Assigned values were calculated for WHO-PCDD/F-PCB-TEQ, WHO-PCDD/F-TEQ, WHO-PCB-TEQ, the sum of six non-dioxin-like PCBs and individual PCDD/F and PCB congeners (including limits of quantification (LOQs)), if possible. Additionally the median of all values is calculated.

For individual congeners (including LOQs) assigned values were only calculated according to the above mentioned procedure, if more than 2/3 of all results are above the LOQ and less than 1/3 of all results (including LOQs) are outside the range of ± 50% of the median of all reported results. Levels for individual congeners are only used for evaluation and calculation if these levels are equal to or above the LOQ; otherwise the LOQ is used instead.

Due to high variation of participants' results or the limited number of reported results above the LOQ, no assigned values could be calculated for:

- 2,3,7,8-TCDD
- 1,2,3,4,7,8-HxCDD
- 1,2,3,7,8,9-HxCDF
- PCB 123

Since there are no traceable reference values available, the assigned values in this PT were calculated based on the Huber robust mean of the participants' results. Therefore, the assigned values are only traceable to these submitted results. Additionally the results of all participants reporting results and the results of participants having accreditation according ISO/IEC 17025 were compared for PCDD/F and PCB sum parameters. No significant differences between the assigned values calculated for both data sets were observed (Table 5).

Table 5: Comparison of assigned values for all participants and participants with reported accreditation according to ISO/IEC 17025 for PCDD/F and PCB sum parameters in compound feed 2302-CF

Sum parameters	Assigned value All participants	Assigned value ISO/IEC 17025 accreditation	Deviation
	ng/kg, µg/kg product (12 % moisture content)	ng/kg, µg/kg product (12 % moisture content)	%
WHO-PCDD/F-PCB-TEQ ub rep	0.948	0.949	<1
WHO-PCDD/F-TEQ ub rep	0.770	0.770	-
WHO-PCB-TEQ ub rep	0.179	0.178	<1
Sum Indicator PCBs ub rep	9.44	9.36	<1

4.1. PCDD/Fs and PCBs – Sum parameters

The assigned values for the test sample 2302-CF were calculated as consensus of participants' results for the PCDD/F and PCB sum parameters, taking into account the calculation criteria described above.

Table 6: Assigned values for physico-chemical methods for PCDD/Fs and PCBs (rounded to three significant figures)

Test sample	WHO-PCDD/F-PCB-TEQ (ub)	WHO-PCDD/F-TEQ (ub)	WHO-PCB-TEQ (ub)	Sum Indicator PCBs (ub)
	ng/kg product (12 % moisture content)			µg/kg product (12 % moisture content)
Compound feed (2302-CF)	0.948	0.770	0.179	9.44

Table 7: Assigned values for PCDD/Fs and DL-PCBs for comparison with BEQ results of bioanalytical screening methods (rounded to two significant figures)

Test sample	WHO-PCDD/F-PCB-TEQ (ub)	WHO-PCDD/F-TEQ (ub)	WHO-PCB-TEQ (ub)
	ng/kg product (12 % moisture content)		
Compound feed (2302-CF)	0.95	0.77	0.18

4.2. PCDD/Fs and PCBs – Individual congeners

The assigned values for the test sample 2302-CF for individual congeners were calculated as a consensus of the participants' results, taking into account the calculation criteria described above (Figure 1-4; tabular summary see annex 1).

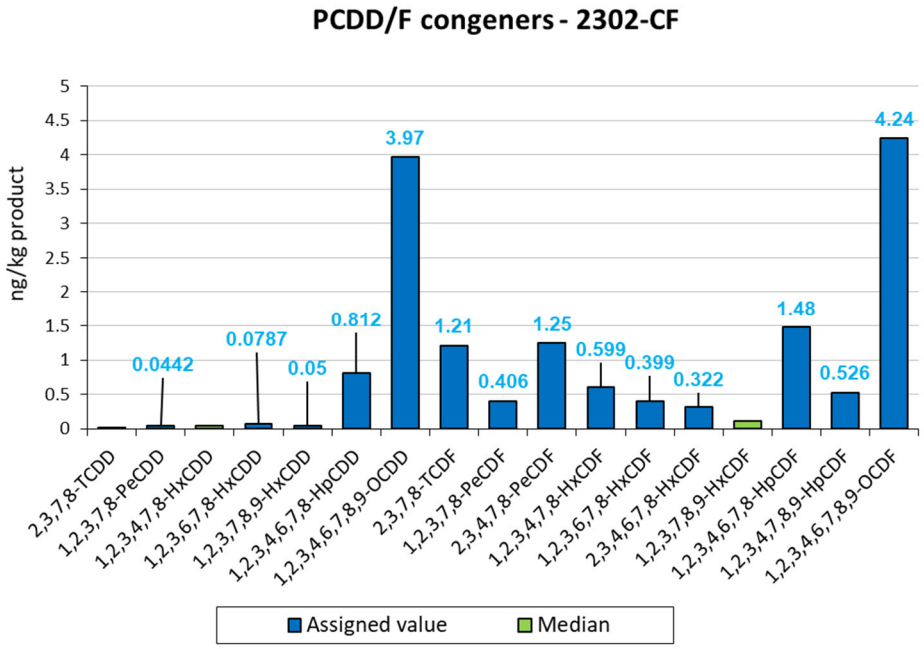

Figure 1: Assigned values (blue) and median values (green) for PCDD/F congeners for compound feed (2302-CF) [ng/kg product (12% moisture content)]

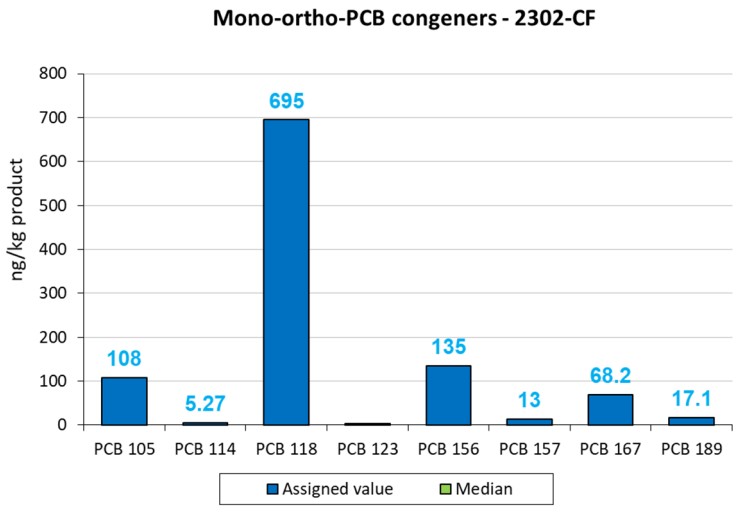

Figure 2: Assigned values (blue) and median values (green) for mono-ortho-PCB congeners for compound feed (2302-CF) [ng/kg product (12% moisture content)]

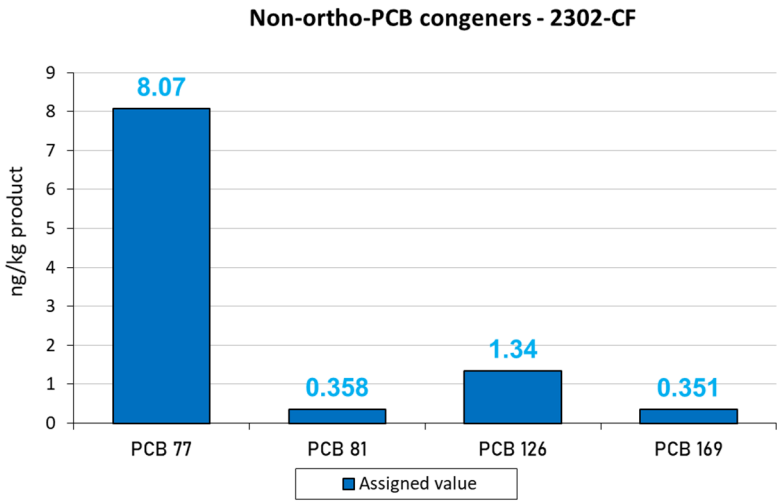

Figure 3: Assigned values (blue) for non-ortho-PCB congeners for compound feed (2302-CF) [ng/kg product (12% moisture content)]

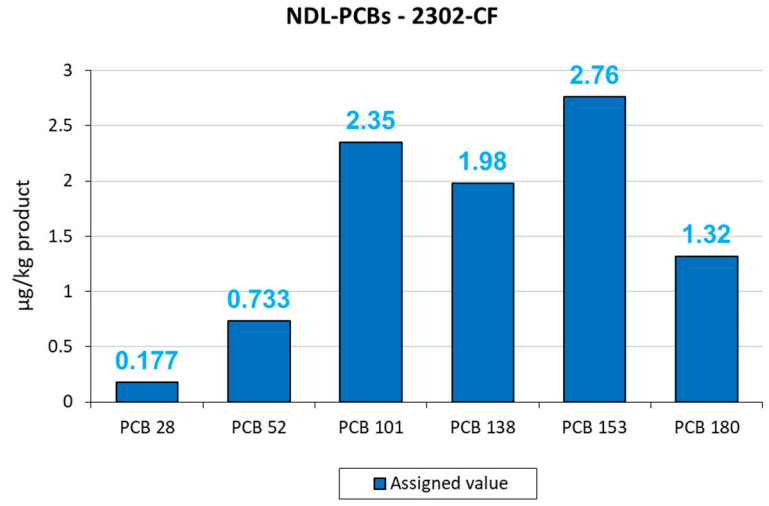

Figure 4: Assigned values (blue) for NDL-PCB congeners for compound feed (2302-CF) [µg/kg product (12% moisture content)]

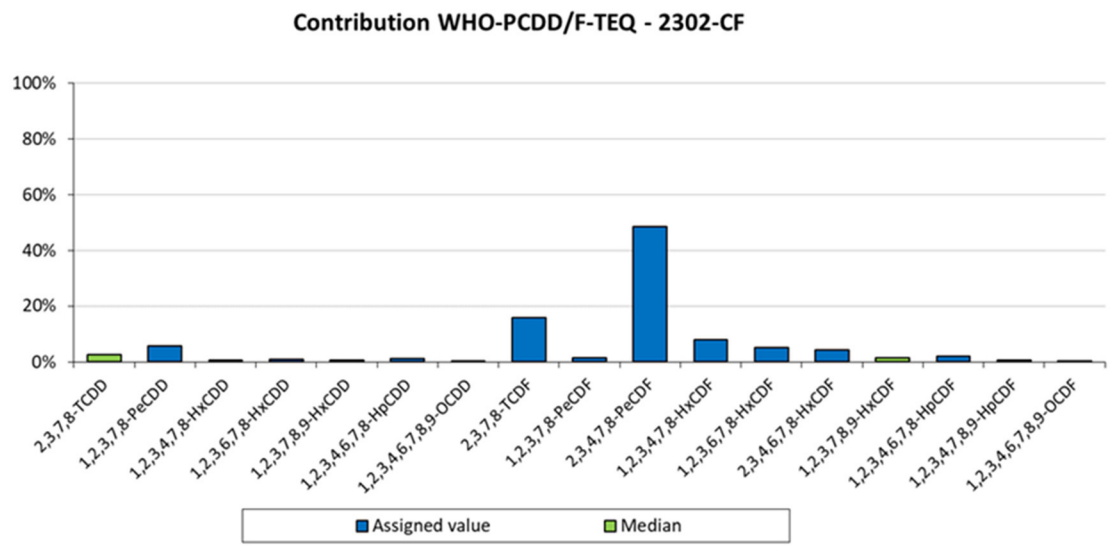

Figure 5: Contributions in % to WHO-PCDD/F-TEQ for PCDD/F assigned (blue) and median (green) values for compound feed (2302-CF)

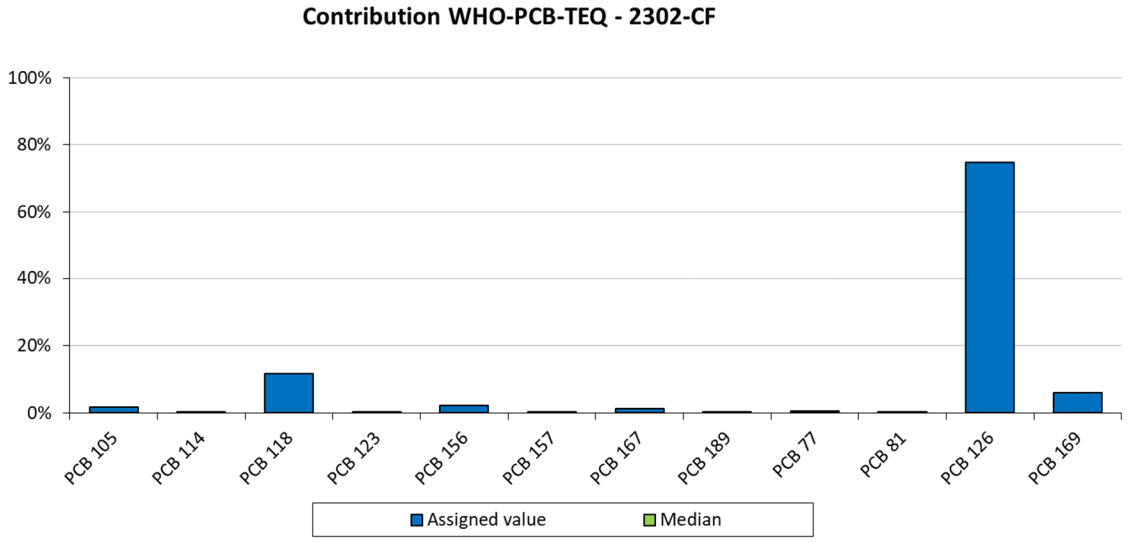

Figure 6: Contributions in % to WHO-PCB-TEQ for PCB assigned (blue) and median (green) values for compound feed (2302-CF)

4.3. Moisture content

For the moisture content an assigned value of **8.85 %** for the test sample 2302-CF was calculated as a consensus of the participants' results, taking into account the calculation criteria described above.

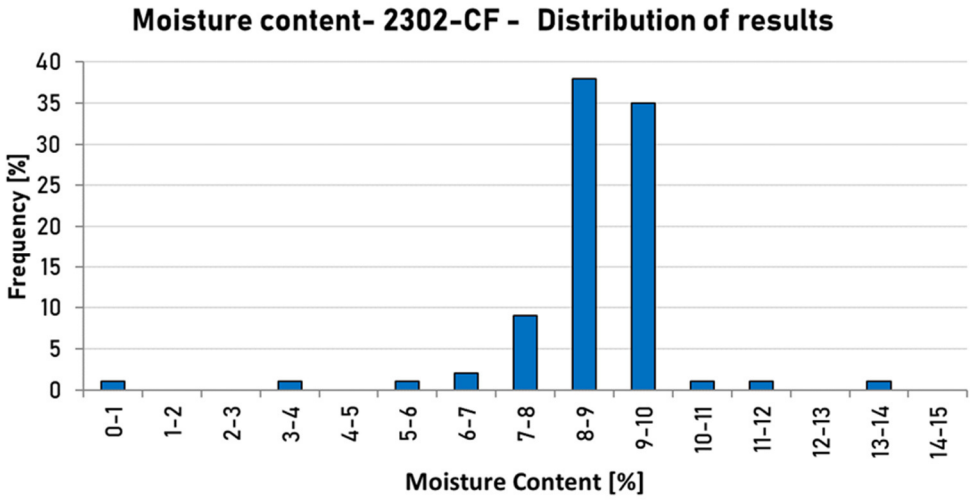

Figure 7: Frequency of participant's results for the moisture content in % for compound feed (2302-CF)

4.4. Comparison of assigned values with legal limits

Maximum levels and action thresholds for feed are defined in the Directive 2002/32/EC of the European Parliament and of the Council of 7 May 2002 on undesirable substances in animal feed (Annex I Section V and Annex II).

Table 8: Maximum levels and action thresholds for feed materials:

Undesirable Substances Compound Feed		Maximum level	Action threshold
WHO-PCDD/F-PCB-TEQ	ng/kg product*	**1.5**	-
WHO-PCDD/F-TEQ	ng/kg product*	**0.75**	**0.5**
WHO-PCB-TEQ	ng/kg product*	-	**0.5**
Sum of 6 NDL PCBs (sum of PCB 28, 52, 101, 138, 153, 180)	µg/kg product*	**10**	-

* *relative to a feed with a moisture content of 12%*

For the compound feed test sample 2302-CF the assigned values for the WHO-PCDD/F-PCB-TEQ, WHO-PCDD/F-TEQ and the sum of 6 NDL PCBs was in the range of 0.5 to 4 of the respective ML or AL (Figure 8).

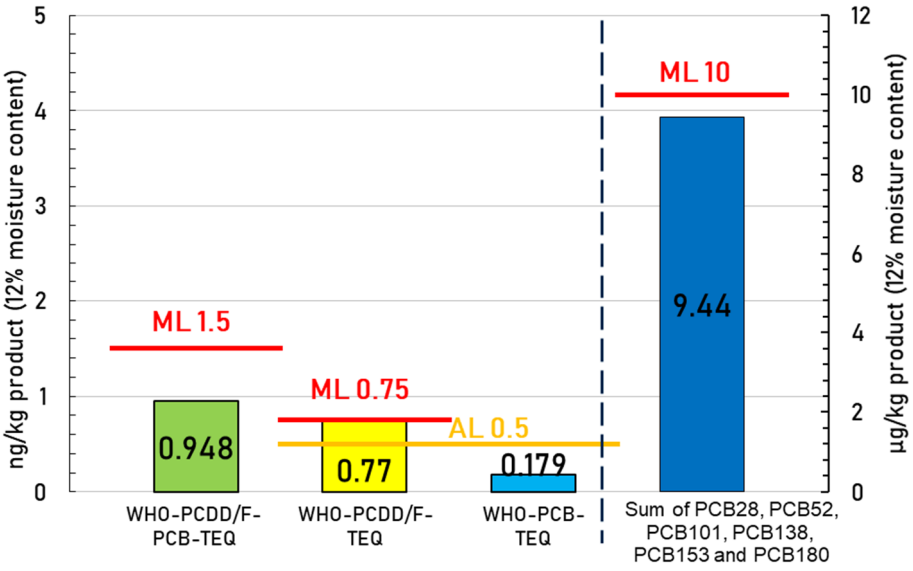

Figure 8: Comparison of the assigned values for sum parameters for compound feed (2302-CF) with maximum levels (red lines) and action thresholds (yellow line) [ng/kg and µg/kg product (12% moisture content)]

5. Scoring of results – Z-scores

5.1. Participants' results for physico-chemical methods

5.1.1 Z-scores

Criteria for successful participation of laboratories using physico-chemical methods were based on the evaluation of the results of the sum parameters WHO-PCDD/F-TEQ, WHO-PCB-TEQ, WHO-PCDD/F-PCB-TEQ and the sum of six non-dioxin-like PCBs and evaluated individual congeners. The criteria will be applicable for sum parameter concentrations in the range (about 0.5 to 4 times) of the level of interest (maximum or action level).

For evaluation of results of physico-chemical methods the z-scores were calculated according to the following formula:

$$z = \frac{(x - x_a)}{\sigma_p}$$

x: *participant's result*
x_a: *assigned value*
σ_p: *fitness-for-purpose-based standard deviation for proficiency assessment*

For WHO-PCDD/F-TEQ, WHO-PCB-TEQ and WHO-PCDD/F-PCB-TEQ the standard deviation for proficiency assessment σ_p was defined as 10 %, for the sum of six non-dioxin-like PCBs (PCB 28, 52, 101, 138, 153, 180) as 15 % and for evaluated individual PCDD/F, PCB congeners as 20 %.

Z-scores for individual congeners were only calculated and reported if levels for these congeners are equal to or above the LOQ. Otherwise no z-scores will be given.

Interpretation of z-scores:

$\lvert z\text{-score} \rvert \leq 2$	*satisfactory performance*
$2 < \lvert z\text{-score} \rvert < 3$	*questionable performance (warning signal)*
$\lvert z\text{-score} \rvert \geq 3$	*unsatisfactory performance (action signal)*

5.1.2 PCDD/Fs and PCBs - Participants' z-scores

Tabular summaries of participants' results and z-scores can be found in annex 2 and 3.

Table 9: Distribution of all participants' and NRLs only z-scores for sum parameters

Compound feed (2302-CF)	WHO-PCDD/F-PCB-TEQ	WHO-PCDD/F-TEQ	WHO-PCB-TEQ	Sum of six indicator PCBs
all Participants				
|z-score| ≤ 2	86 %	87 %	79 %	97 %
2 <|z-score| < 3	5 %	4 %	7 %	-
|z-score| ≥ 3	9 %	9 %	14 %	3 %
NRLs				
|z-score| ≤ 2	90 %	90 %	86 %	92 %
2 <|z-score| < 3	5 %	5 %	9 %	-
|z-score| ≥ 3	5 %	5 %	5%	8 %

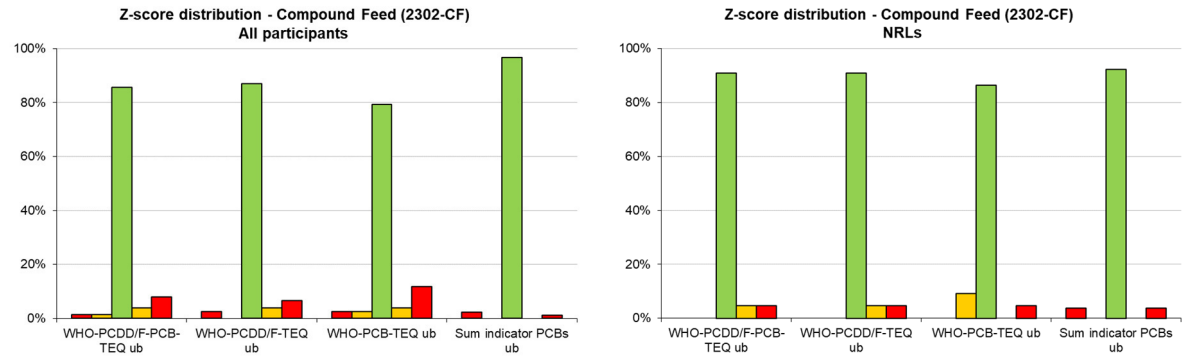

Figure 9: Distribution of all participants' z-scores and NRLs only for sum parameters for compound feed (2302-CF) [Green bars: -2 ≤ z-score ≤ 2, orange bars: -3 < z-score < -2, 2 < z-score < 3, red bars: z-score ≤ -3, z-score ≥ 3]

5.1.3 Comparison of reported and calculated sum parameters

In addition to the calculation of the sum parameters for reported individual PCDD/F and PCB congener values, the calculated sum parameters for PCDD/Fs and PCBs by the EURL were compared with the ones reported by each participant. As the reported sum parameters are decisive to compare the results with the legal limits, an incorrect calculation might lead to a wrong assessment of a sample. In case of a significant deviation of the reported sum parameter value from the (EURL) calculated one (deviation >10 %) the laboratory has therefore not successfully participated in the PT according to the positive scoring system (see 5.1.5).

Table 10: Difference between reported and calculated sum parameters for PCDD/Fs and PCBs for compound feed (2302-CF) given in percentage of participants' results

Compound feed (2302-CF)	WHO-PCDD/F-PCB-TEQ	WHO-PCDD/F-TEQ	WHO-PCB-TEQ	Sum of six indicator PCBs
Deviation ≤ 10 %	95%	97%	95%	96%
Deviation > 10 %	5%	3%	5%	4%

Up to 5% of the laboratories had differences > 10% between reported and calculated upper bound sum parameters for the WHO-PCDD/F-PCB-TEQ, the WHO-PCB-TEQ and the sum of the 6 NDL-PCBs.

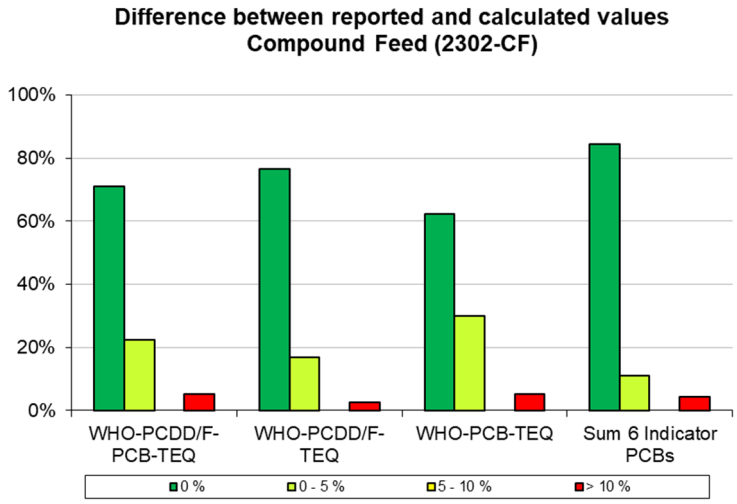

Figure 10: Difference between reported and calculated sum parameters for PCDD/Fs and PCBs [Green bars: 0 %, light green bars: 0-5 %, yellow bars: 5-10 %, red bars: > 10 %] for compound feed (2302-CF) given in percentage of participants' results

5.1.4 Difference between upper and lower bound calculation

According to Commission Regulation (EC) No 152/2009 the difference between upper bound level and lower bound level shall not exceed 20 % for confirmation of exceedance of maximum level or in case of need of action thresholds for PCDD/Fs and DL-PCBs. For indicator PCBs the difference between upper bound and lower bound levels for the sum of six indicator PCBs shall be ≤ 20 % at the level of interest. Participants with a larger deviation should review their analytical methods, especially with regard to sensitivity and limit of quantification.
For the test samples 2302-CF the assigned values for the sum parameters WHO-PCDD/F-PCB-TEQ and the sum of the 6 NDL-PCBs were below the respective maximum levels and for the WHO-PCDD/F-TEQ the assigned value was at the maximum level.

Table 11: Difference between upper and lower bound calculation for compound feed (2302-CF) given in percentage of participants' results

Compound feed (2302-CF)	WHO-PCDD/F-PCB-TEQ	WHO-PCDD/F-TEQ	WHO-PCB-TEQ	Sum of six indicator PCBs
0 – 10 %*	85%	83%	86%	98%
10 – 20 %*	9%	13%	7%	2%
20 – 50 %*	4%	3%	1%	-
> 50 %*	1%	1%	7%	-

* Difference between upper and lower bound calculation

A small percentage of laboratories (~ 7%) did not apply sufficiently enough sensitive methods (differences between ub and lb > 50%) to analyse the sum parameter WHO-PCB-TEQ in this naturally contaminated feed sample in the respective concentration range, but the assigned value was outside the range of 0.5 to 4 of the respective AL for the WHO-PCB-TEQ.

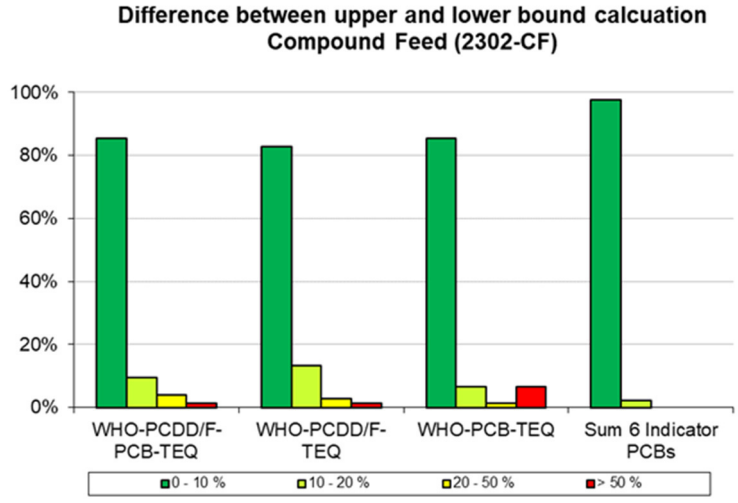

Figure 11: Difference between upper and lower bound calculation for compound feed (2302-CF) given in percentage of participants' results [Green bars: 0 – 10 %, light green bars: 10 – 20 %, yellow bars: 20 – 50 %, red bars: > 50 %]

5.1.5 Positive scoring system

The "positive scoring system" gives one assessment for each PT sample covering all relevant PCDD/F and PCB sum parameters and congeners.

The total score for the positive scoring system was calculated according to the following general principles:

- Calculation of z-scores for sum parameters and evaluated individual congeners
- Calculation of the positive scores according to the following table:

Table 12: Positive scoring system

Positive scoring system	I z-score I ≤ 2	2 < I z-score I < 3	I z-score I ≥ 3
Individual congeners	**Positive score**	**Positive score**	**Positive score**
Contribution to sum parameter* > 10 %	12	6	0
Contribution to sum parameter* 3-10 %	8	4	0
Contribution to sum parameter* < 3 %	6	3	0
Not evaluated congeners	0	0	0

* separately for the respective sum parameters WHO-PCDD/F-TEQ, WHO-PCB-TEQ and the sum of six non-dioxin-like PCBs

- Calculation of maximum achievable scores (I z-score I ≤ 2) for PCDD/F and DL-PCB and non-dioxin-like PCB congeners separately:

$$Maximum\ Score = \sum_{i=1}^{n} Max.Score_{(>10\%)i} + \sum_{i=1}^{m} Max.Score_{(3-10\%)i} + \sum_{i=1}^{p} Max.Score_{(<3\ \%)i}$$

- Calculation of the participant's scores for PCDD/F and DL-PCB and non-dioxin-like PCB congeners separately:

$$Participant's\ Score = \sum_{i=1}^{n} Score_{(>10\%)i} + \sum_{i=1}^{m} Score_{(3-10\%)i} + \sum_{i=1}^{p} Score_{(<3\ \%)i}$$

- Calculation of achieved scoring percentage for each participant:

$$Participant's\ Scoring\ Percentage = \frac{Participant's\ score}{Maximum\ score} \cdot 100$$

- Criteria for successful participation:

Sum parameters:	≤ 1 parameter with | z-score | > 2, no parameter with | z-score | ≥ 3
PCDD/F congeners:	≥ 75 % of maximum score
DL-PCB congeners:	≥ 75 % of maximum score
Non-dioxin-like PCB congeners:	≥ 75 % of maximum score
Difference between reported and calculated results for sum parameters	≤ 10 %

The assessment based on the positive scoring system is performed for each PT test sample. A laboratory participates successfully in a PT for PCDD/Fs and PCBs, if all above mentioned criteria for the reported analytes are met for each PT test sample.

Table 13: Successful participation rate according to positive scoring system for compound feed (2302-CF)

Scoring system	Successful participation		Reason for not successful participation			
Percentage of participants' results	yes	no	Sum parameters	PCDD/F congeners	NDL-PCB congeners	Calculation of sum parameters
2302-CF	80 %	20 %	12 %	2 %	6 %	9 %

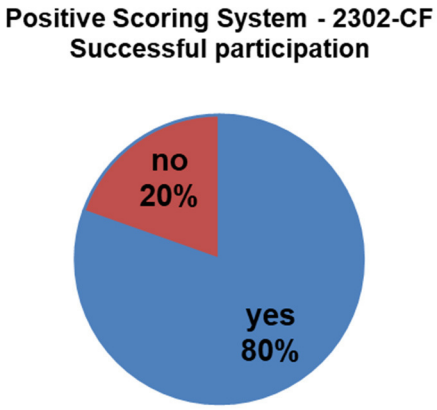

Figure 12: Successful participation in percentage in the Compound feed (2302-CF) proficiency test

5.2 Participants' results for bioanalytical screening methods

According to Commission Regulation (EC) No 152/2009, "a screening method in principle classifies a sample as compliant or suspected to be non-compliant. For this, the calculated BEQ level is compared to the cut-off value […]. Samples below the cut-off value are declared compliant, samples equal or above the cut-off value as suspected to be non-compliant, requiring analysis by a confirmatory method".

Therefore, the main criterion for evaluation of results from bioanalytical screening methods is their ability to reliably identify compliant samples and samples suspected to be non-compliant with established legal limits.

For further evaluation of the performance of bioanalytical screening methods, bioassay-scores are applied: The reported BEQ-values derived from bioanalytical screening methods are compared with the WHO-TEQ assigned values calculated on basis of the results of physical-chemical methods for the concentration range of 0.5 to 2 times the level of interest.

Because bioanalytical screening methods focus mainly on distinguishing between compliant and potentially non-compliant samples, a direct comparison of bioassay-scores and z-scores is not possible. However, bioassay scores may serve as a tool to assess method performance within the scope of external quality control measures of the respective laboratory.

Bioassay-scores are calculated according to the following formula:

$$bioassay - score = \frac{(x - x_a)}{\sigma_{bioassay}}$$

x: *participant's result (BEQ from bioanalytical screening method)*
x_a: *assigned value (physical-chemical methods)*
$\sigma_{bioassay}$: *bioassay target deviation*

For PCDD/F-BEQ, PCB-BEQ and PCDD/F-PCB-BEQ the bioassay target deviation $\sigma_{Bioassay}$ was defined as 20%.

5.2.1 Assessment of analytical results

As a consequence of the comparison of the assigned values of the test sample 2302-CF with legal limits, the assessment of the analytical results using bioanalytical screening methods should read "compliant with the maximum level for WHO-PCDD/F-PCB-TEQ and WHO-PCDD/F-TEQ", "suspected to be non-compliant with the action threshold for WHO-PCB-TEQ" and "compliant with the action threshold for WHO-PCDD/F-TEQ".

Table 14: Evaluation of assigned values for compound feed

	WHO-PCDD/F-PCB-TEQ	WHO-PCDD/F-TEQ	WHO-PCDD/F-TEQ	WHO-PCB-TEQ
2302-CF	< ML	>ML	> AL	< AL

Nine laboratories reported results using CALUX bioassay for Total-BEQ and hereof five also for PCDD/F-BEQ and/or PCB-BEQ.

Table 15: Participants' assessment of analytical results using bioanalytical screening methods for 2302-CF

Laboratories' assessment of analytical results	WHO-PCDD/F-PCB-TEQ Maximum level	WHO-PCDD/F-TEQ Maximum level	WHO-PCDD/F-TEQ Action threshold	WHO-PCB-TEQ Action threshold
Suspected to be non-compliant	6	6	5	3
Compliant	3	1	1	2

5.2.2 Participants' bioassay-scores

Concentrations for WHO-PCDD/F-PCB-TEQ and WHO-PCDD/F-TEQ in the test sample 2302-CF are in the range (about 0.5 to 2 times) of the respective maximum levels.

Table 16: Distribution of participants' bioassay-scores for BEQ parameters for compound feed (2302-CF)

Percentage of participants' results	PCDD/F-PCB-BEQ	PCDD/F-BEQ	PCB-BEQ
$\lvert$ **bioassay-score** $\rvert \leq 2$	80 %	60 %	20 %
$2 < \lvert$ **bioassay-score** $\rvert < 3$	-	-	20 %
$\lvert$ **bioassay-score** $\rvert \geq 3$	20 %	40%	60 %

6. Participants' feedback

A questionnaire for feedback from participants of this EURL proficiency test was available as online survey between 22 November 2023 and 19 January 2024. The survey was anonymous, but participants could also give their laboratory name. The identity of the laboratories is kept confidential. The survey included several questions related to different topics (participants' information, organization of the proficiency test, PT test samples and evaluation of results and summary of data) and a possibility to include comments and further suggestions.

In total, 4 laboratories replied to this survey.

Table 17: Participating laboratories in the feedback survey

Type of laboratory	Answers
National Reference Laboratory (NRL)	2
Official Laboratory (OFL)	1
Commercial laboratory	1
Other (e.g. research and development)	0
No Answer	0

General aspect

How satisfied are you with the organization of this proficiency test in general? Please rate the parts below according to your experience, with 0 stars meaning "no opinion" and 5 stars meaning "full satisfaction".

Announcement 

Instructions 

Sample shipment 

Reporting of results 

Preliminary report 

Did the proficiency test meet expectations?

Specific aspects of this proficiency test

We would like to know a bit more about specific aspects of this proficiency test. Please rate the aspects below according to your experience, with 0 stars meaning "no opinion" and 5 stars meaning "full satisfaction".

Was all necessary information for participation and performance of the PT provided in an understandable way?	
Was the time frame acceptable?	
Was the handling of EUSurvey as webtool for reporting and source of instructions manageable?	
Was the evaluation of participant's results and the information in the preliminary report clear and comprehensible?	

Was the selected sample adequate for the goal to assess analytical performance of laboratories in relevant matrices?

Choice of matrix 

Level of contamination 

Comments from participants:

- Information on ingredients would be nice to have (e.g. exact list of ingredients with quantity labeling); *Comment EURL: Natural contamination of the test material with all analytes of interest is preferred, therefore different materials have to be mixed and no information about the exact list of ingredients of the test material is possible*
- More sample material, if more than one group of analytes have to be analyzed (e.g. PCDD/Fs + PCBs and PFAS); *Comment EURL: The quantity of the sample is listed in the announcement; if more material is required, this can be ordered directly at the time of registration or later*
- Annexes linked as individual pdf files in the document e.g. like in previous PT reports. *Comment EURL: As too many participants had problems opening the pdf files linked in the document the structure of the report was changed*

7. Quality control

The Deutsche Akkreditierungsstelle GmbH attests that the provider of proficiency testing Chemisches und Veterinäruntersuchungsamt Freiburg, EU Reference Laboratory (EURL) for halogenated persistent organic pollutants (POPs) in feed and food is competent under the terms of DIN EN ISO/IEC 17043:2010 to carry out proficiency testing in the testing field of determination of halogenated persistent organic pollutants (POPs) in food and feed (Accreditation number: D-EP-18625-01-00).

8. Results of participants

An overview of the PCDD/F and PCB results for the PT test sample compound feed (2302-CF) are given in the following annexes. Laboratories are coded according to the laboratory codes sent after registration.

9. References

[1] ISO 13528:2022, Statistical methods for use in proficiency testing by interlaboratory comparisons, International Organization for Standardization

[2] M. Thompson, S.L.R. Ellison, R. Wood: The International Harmonized Protocol For The Proficiency Testing Of Analytical Chemistry Laboratories, Pure Appl. Chem., Vol. 78, No. 1, pp. 145-196, 2006.

[3] M. van den Berg et al., The 2005 World Health Organization Re-evaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds. Toxicological Sciences 93(2), 223-241 (2006)

10. Annex

Compound feed – 2302-CF	
Annex-1	Assigned values – PCDD/F, PCB
Annex-2	Participants' results – Tables – PCDD/F, PCB
Annex-3	Participants' z-scores / bioassay-scores – Tables – PCDD/F, PCB
Annex-4	Participants' z-scores – Charts – PCDD/F, PCB
Annex-5	Scoring system – PCDD/F, PCB
Annex-6	Test for sufficient homogeneity – PCDD/F and PCB
Annex-7	Participants' methods for PCDD/Fs and PCBs

EURL for halogenated POPs in Feed and Food
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Annex 1: Assigned values of PCDD/Fs and PCBs

Test sample - Compound Feed (2302-CF)

Assigned values of sum parameters and individual congeners

Estimation of the assigned value as the consensus of participants' results
Assigned value = Huber robust mean after exlusion of extreme outliers

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Compound Feed (2302-CF)
Sum parameters - Results

Analyte	Result ng/kg 12% moisture content	**Assigned value** [outliers removed]	**Robust standard deviation** [outliers removed]	**Standard uncertainty** [outliers removed]	**No. of results contributing to assigned value**	**Median** [all values]
WHO-PCDD/F-PCB-TEQ upper bound rep		0.948	0.0999	0.015	70	0.950
WHO-PCDD/F-PCB-TEQ lower bound rep		0.910	0.0913	0.014	70	0.928
WHO-PCDD/F-PCB-TEQ upper bound cal		0.958	0.100	0.015	71	0.967
WHO-PCDD/F-PCB-TEQ lower bound cal		0.911	0.0938	0.014	72	0.932

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Compound Feed (2302-CF)
PCDD/F - Assigned values

Analyte	Result ng/kg 12% moisture content	**Assigned value** [outliers removed]	**Robust standard deviation** [outliers removed]	**Standard uncertainty** [outliers removed]	**No. of results contributing to assigned value**	**Median** [all values]
WHO-PCDD/F-TEQ upper bound rep		0.770	0.0893	0.013	73	0.767
WHO-PCDD/F-TEQ lower bound rep		0.739	0.0853	0.012	74	0.740
WHO-PCDD/F-TEQ upper bound cal		0.771	0.0859	0.013	73	0.772
WHO-PCDD/F-TEQ lower bound cal		0.737	0.0834	0.012	75	0.735
2,3,7,8-TCDD						0.0200
1,2,3,7,8-PeCDD		0.0442	0.00829	0.0013	64	0.0450
1,2,3,4,7,8-HxCDD						0.0400
1,2,3,6,7,8-HxCDD		0.0787	0.0130	0.0020	68	0.0790
1,2,3,7,8,9-HxCDD		0.0500	0.00908	0.0015	60	0.0501
1,2,3,4,6,7,8-HpCDD		0.812	0.119	0.017	73	0.811
1,2,3,4,6,7,8,9-OCDD		3.97	0.570	0.085	71	4.00
2,3,7,8-TCDF		1.21	0.138	0.020	74	1.21
1,2,3,7,8-PeCDF		0.406	0.0655	0.0096	73	0.407
2,3,4,7,8-PeCDF		1.25	0.135	0.019	75	1.24
1,2,3,4,7,8-HxCDF		0.599	0.0794	0.012	73	0.597
1,2,3,6,7,8-HxCDF		0.399	0.0509	0.0074	74	0.400
2,3,4,6,7,8-HxCDF		0.322	0.0799	0.012	69	0.333
1,2,3,7,8,9-HxCDF						0.116
1,2,3,4,6,7,8-HpCDF		1.48	0.183	0.026	75	1.50
1,2,3,4,7,8,9-HpCDF		0.526	0.0891	0.013	73	0.541
1,2,3,4,6,7,8,9-OCDF		4.24	0.740	0.11	69	4.21

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Compound Feed (2302-CF)
Dioxin-like PCB - Assigned values

Analyte	Result ng/kg 12% moisture content	**Assigned value** [outliers removed]	**Robust standard deviation** [outliers removed]	**Standard uncertainty** [outliers removed]	**No. of results contributing to assigned value**	**Median** [all values]
WHO-PCB-TEQ upper bound rep		0.179	0.0213	0.0032	69	0.183
WHO-PCB-TEQ lower bound rep		0.176	0.0212	0.0033	63	0.175
WHO-PCB-TEQ upper bound cal		0.179	0.0259	0.0039	69	0.183
WHO-PCB-TEQ lower bound cal		0.175	0.0217	0.0034	65	0.175
PCB 105		108	14.8	2.2	71	106
PCB 114		5.27	0.915	0.15	56	5.37
PCB 118		695	95.4	14	73	689
PCB 123						3.90
PCB 156		135	15.4	2.2	74	135
PCB 157		13.0	1.78	0.27	66	13.0
PCB 167		68.2	9.82	1.5	71	68.1
PCB 189		17.1	2.05	0.30	72	17.1
PCB 77		8.07	1.19	0.18	67	8.14
PCB 81		0.358	0.0761	0.013	54	0.381
PCB 126		1.34	0.179	0.028	65	1.36
PCB 169		0.351	0.0610	0.0095	64	0.358

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Compound Feed (2302-CF)
Non dioxin-like PCB - Assigned values

Analyte	Result µg/kg 12% moisture content	**Assigned value** [outliers removed]	**Robust standard deviation** [outliers removed]	**Standard uncertainty** [outliers removed]	**No. of results contributing to assigned value**	**Median** [all values]
Sum Indicator PCBs upper bound rep		9.44	1.08	0.15	84	9.35
Sum Indicator PCBs lower bound rep		9.31	1.08	0.15	83	9.16
Sum Indicator PCBs upper bound cal		9.45	1.06	0.15	81	9.38
Sum Indicator PCBs lower bound cal		9.30	1.06	0.15	81	9.17
PCB 28		0.177	0.0403	0.0064	63	0.193
PCB 52		0.733	0.131	0.018	81	0.746
PCB 101		2.35	0.322	0.044	82	2.38
PCB 138		1.98	0.270	0.039	75	1.99
PCB 153		2.76	0.342	0.047	81	2.73
PCB 180		1.32	0.146	0.020	82	1.32

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Compound Feed (2302-CF)
WHO-TEQ - Assigned values - Bioanalytical screening methods

Analyte	Result ng BEQ/kg 12% moisture content	**Assigned value** [outliers removed]	**Robust standard deviation** [outliers removed]	**Standard uncertainty** [outliers removed]	**No. of results contributing to assigned value**	**Median** [all values]
WHO-PCDD/F-PCB-TEQ		0.95	0.10	0.015	70	0.95
WHO-PCDD/F-TEQ		0.77	0.089	0.013	73	0.77
WHO-PCB-TEQ		0.18	0.021	0.0032	69	0.18

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Compound Feed (2302-CF)
Moisture content (PCDD/F, PCB) - Assigned value

Analyte	Result %	**Assigned value** [outliers removed]	**Robust standard deviation** [outliers removed]	**Standard uncertainty** [outliers removed]	**No. of results contributing to assigned value**	**Median** [all values]
Moisture content		8.85	0.714	0.097	84	8.96

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Annex 2: Participants' results of PCDD/Fs and PCBs

Test sample - Compound Feed (2302-CF)

* Modified/additional results reported after distribution of preliminary results to all participating laboratories

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Compound Feed (2302-CF)
Sum parameters - Results

LC	Sample	Result ng/kg 12% moisture content	WHO-PCDD/F-PCB-TEQ reported upper bound	WHO-PCDD/F-PCB-TEQ reported lower bound	WHO-PCDD/F-PCB-TEQ calculated upper bound	WHO-PCDD/F-PCB-TEQ calculated lower bound	WHO-PCDD/F-TEQ reported upper bound	WHO-PCDD/F-TEQ reported lower bound	WHO-PCDD/F-TEQ calculated upper bound	WHO-PCDD/F-TEQ calculated lower bound	WHO-PCB-TEQ reported upper bound	WHO-PCB-TEQ reported lower bound	WHO-PCB-TEQ calculated upper bound	WHO-PCB-TEQ calculated lower bound	Result µg/kg 12% moisture content	Sum 6 Indicator PCBs reported upper bound	Sum 6 Indicator PCBs reported lower bound	Sum 6 Indicator PCBs calculated upper bound	Sum 6 Indicator PCBs calculated lower bound
1	2302-CF															7.9	7.9	7.9	7.9
2	2302-CF		0.937	0.925	0.938	0.926	0.75	0.738	0.751	0.739	0.187	0.187	0.187	0.187					
3	2302-CF		1	0.68	1.01	0.677	0.82	0.65	0.818	0.649	0.19	0.028	0.187	0.0278		9.9	9.9	9.91	9.91
5	2302-CF															8.88	8.72	9.19	9.03
7	2302-CF		1.13	1.13	1.13	1.13	0.924	0.924	0.925	0.925	0.205	0.204	0.205	0.204		9.15	9.15	9.15	9.15
8	2302-CF															7.05	6.57	7.05	6.57
9	2302-CF		1.33	0.881	1.33	0.88	1.17	0.72	1.17	0.72	0.16	0.16	0.16	0.16		10.9	10.9	13.1	5.09
10	2302-CF															9.13	9.13	9.13	9.13
11	2302-CF		0.915	0.915	0.916	0.916	0.74	0.74	0.741	0.741	0.175	0.175	0.175	0.175		9.44	9.44	9.44	9.44
12	2302-CF		0.93	0.857	0.97	0.848	0.824	0.702	0.824	0.702	0.146	0.146	0.146	0.146		10.2	10.2	10.2	10.2
13	2302-CF		0.925	0.925	0.925	0.925	0.712	0.712	0.712	0.712	0.213	0.213	0.213	0.213		8.21	8.21	8.2	8.2
14	2302-CF		0.903	0.889	0.903	0.888	0.734	0.719	0.734	0.719	0.17	0.17	0.169	0.169		10.7	10.7	10.7	10.7
15	2302-CF															9.7	9.7	9.7	9.7
16	2302-CF															9.05	8.55	9.06	8.56
17	2302-CF		0.896	0.896	0.896	0.896	0.721	0.721	0.721	0.721	0.175	0.175	0.175	0.175		9.07	9.07	9.07	9.07
18	2302-CF		0.871	0.871	0.871	0.871	0.713	0.713	0.713	0.713	0.158	0.158	0.158	0.158		8.57	8.57	8.58	8.58
20	2302-CF		1.09	0.948	1.09	0.95	0.833	0.694	0.834	0.695	0.26	0.254	0.26	0.255		10.5	10.5	10.5	10.5
21	2302-CF		1	0.98	1	0.983	0.84	0.83	0.842	0.827	0.16	0.16	0.161	0.156		9.1	9.1	9.14	9.14
22	2302-CF		0.896	0.638	0.804	0.801	0.729	0.609	0.673	0.673	0.167	0.029	0.131	0.128		9.2	8.7	8.92	8.92
23	2302-CF		0.881	0.739	0.886	0.739	0.736	0.595	0.741	0.596	0.145	0.143	0.145	0.143		8.92	8.92	8.92	8.92
24	2302-CF		0.96	0.96	0.958	0.958	0.76	0.76	0.764	0.764	0.19	0.19	0.194	0.194		8.54	8.54	8.53	8.53
25	2302-CF		0.885	0.854	0.885	0.855	0.706	0.676	0.706	0.676	0.179	0.179	0.179	0.179		9.38	9.38	9.38	9.38
26	2302-CF		0.86	0.835	0.861	0.836	0.716	0.691	0.717	0.692	0.144	0.144	0.144	0.144		8.4	8.4	8.4	8.4
27	2302-CF		1.01	0.95	1.01	0.952	0.83	0.77	0.83	0.775	0.18	0.18	0.177	0.177		9.1	9.1	300	0
28	2302-CF		1.21	0.974	1.21	0.975	1.11	0.939	1.11	0.939	0.099	0.0357	0.0989	0.0357		10.1	10.1	23.4	1.03
29	2302-CF		1.01	0.871	1.01	0.871	0.806	0.699	0.807	0.699	0.206	0.173	0.206	0.172		8.62	8.62	8.61	8.61
31	2302-CF		0.98	0.98	0.981	0.981	0.783	0.783	0.784	0.784	0.197	0.197	0.197	0.197		9.24	9.24	9.24	9.24
32	2302-CF		1.04	1.04	1.04	1.04	0.763	0.763	0.763	0.763	0.278	0.278	0.278	0.278		12	12	12	12
33	2302-CF		0.93		0.931	0.842	0.74		0.742	0.678	0.19		0.189	0.164		11		10.6	10.1
34	2302-CF		1.05	0.88	1.05	0.874	0.88	0.73	0.88	0.725	0.17	0.15	0.17	0.149		8.92	8.92	8.92	8.92
35	2302-CF		1.1	1.1	1.1	1.1	0.927	0.927	0.928	0.928	0.176	0.176	0.176	0.176		8.48	8.48	8.47	8.47
36	2302-CF		0.946	0.926	0.943	0.903	0.771	0.751	0.769	0.73	0.175	0.175	0.174	0.173		9.35	9.16	9.36	9.17
37	2302-CF		0.727	0.706	0.727	0.706	0.466	0.445	0.466	0.445	0.261	0.261	0.261	0.261		9.89	9.39	9.91	9.41
38	2302-CF		0.855	0.847	0.852	0.842	0.693	0.684	0.69	0.68	0.162	0.162	0.162	0.162		9.64	9.64	9.63	9.63
39	2302-CF				1.09	1.01	0.92	0.84	0.912	0.832	0.17	0.17	0.175	0.175					
40	2302-CF		1.03	0.975	1.03	0.975	0.847	0.792	0.847	0.792	0.183	0.183	0.183	0.183		9.39	9.39	9.38	9.38
42	2302-CF																		
43	2302-CF		0.882	0.881	0.881	0.881	0.729	0.729	0.729	0.729	0.152	0.152	0.152	0.152		9.91	9.91	9.91	9.91
44	2302-CF		0.939	0.934	0.939	0.934	0.757	0.752	0.756	0.751	0.183	0.183	0.183	0.183		7.72	7.72	7.71	7.71
46	2302-CF		0.899	0.899	0.896	0.896	0.634	0.634	0.632	0.632	0.265	0.265	0.264	0.264		11.4	11.4	11.4	11.4
48	2302-CF		0.955	0.939	0.956	0.939	0.777	0.772	0.778	0.772	0.178	0.167	0.178	0.167		10.1	10.1	10.1	10.1
49	2302-CF		0.95	0.934	0.949	0.933	0.74	0.74	0.74	0.74	0.209	0.193	0.209	0.193		9.34	8.82	9.33	8.81
50	2302-CF															8.95	8.75	8.96	8.76
52	2302-CF		0.95	0.87	0.973	0.885	0.76	0.67	0.777	0.689	0.19	0.19	0.196	0.196		11	11	11.5	11.5
54	2302-CF		0.858	0.913	1.02	0.846	0.666	0.692	0.757	0.647	0.199	0.229	0.259	0.199		9.11	9.11	9.44	9.44
56	2302-CF		1.35	1.31	1.35	1.3	0.839	0.819	0.837	0.816	0.509	0.486	0.51	0.487					
57	2302-CF		1.14	0.98	1.14	0.98	0.958	0.796	0.959	0.796	0.184	0.184	0.184	0.184		9.52	9.52	9.51	9.51
58	2302-CF		1.01	1.01	0.98	0.98	0.84	0.84	0.806	0.806	0.17	0.17	0.174	0.174					
61	2302-CF		0.94	0.94	0.945	0.945	0.8	0.8	0.798	0.798	0.14	0.14	0.147	0.147		8.88	8.88	8.88	8.88
62	2302-CF		0.98	0.98	0.979	0.979	0.79	0.79	0.792	0.792	0.19	0.19	0.187	0.187					
64	2302-CF		0.928	0.857	0.949	0.853	0.707	0.695	0.725	0.69	0.221	0.162	0.224	0.163		8.55	8.27	8.55	8.55
65	2302-CF															8.59	8.49	8.59	8.49
66	2302-CF		1.07	1.05	1.07	1.04	0.86	0.84	0.86	0.834	0.21	0.21	0.21	0.21		9.63	9.63	9.63	9.63
67	2302-CF		0.78	0.78	0.78	0.78	0.63	0.63	0.631	0.631	0.15	0.15	0.149	0.149		11.3	11.3	11.3	11.3
68	2302-CF		1	0.94	1.01	0.94	0.774	0.724	0.774	0.724	0.231	0.216	0.231	0.216		10.6	10.6	10.6	10.6
69	2302-CF		0.93	0.93	0.932	0.93	0.75	0.75	0.756	0.754	0.18	0.18	0.176	0.176		10.9	10.9	10.9	10.9
70	2302-CF		0.902	0.902	0.903	0.903	0.727	0.727	0.727	0.727	0.175	0.175	0.176	0.176		9.36	9.36	9.37	9.37
71	2302-CF		1.93	0.76	1.94	0.759	1.56	0.73	1.56	0.729	0.375	0.03	0.375	0.0302		9.02	9.02	9.03	9.03
72	2302-CF															11	10.5	11	10.5
73	2302-CF		0.94	0.84	0.936	0.835	0.75	0.68	0.746	0.676	0.19	0.16	0.19	0.159		8.97	8.97	8.97	8.97
74	2302-CF																		
75	2302-CF		4.8	4.69	4.8	4.69	4.66	4.66	4.66	4.66	0.14	0.03	0.144	0.0291		3.23	3.1	3.22	3.1
77	2302-CF															9.95	9.45	9.96	9.46
78	2302-CF		0.78	0.78	0.776	0.776	0.62	0.62	0.616	0.616	0.16	0.16	0.16	0.16		8.79	8.79	8.79	8.79
81	2302-CF		1.21	1.27	1.26	1.2	0.929	0.991	0.983	0.928	0.276	0.276	0.276	0.276		17.2	17.2	17.4	16.9
82	2302-CF		1.64	1.58	1.65	1.58	1	0.959	1.01	0.96	0.635	0.62	0.635	0.62		11.4	11	11.4	11
83	2302-CF		0.914	0.865	0.914	0.865	0.723	0.674	0.723	0.674	0.191	0.191	0.191	0.191		10.6	10.6	10.6	10.6
84	2302-CF		0.971	0.964	0.98	0.964	0.818	0.801	0.816	0.8	0.163	0.167	0.164	0.164		9.47	9.47	9.48	9.48
85	2302-CF															9.59	9.59	9.59	9.59
86	2302-CF		0.964	0.964	0.964	0.964	0.774	0.774	0.775	0.775	0.19	0.19	0.189	0.189		11.4	11.4	11.4	11.4
87	2302-CF		1.02	0.996	1.02	0.997	0.83	0.804	0.832	0.805	0.192	0.192	0.192	0.192		9.66	9.66	9.67	9.67
89	2302-CF		1.01	0.946	1.01	0.947	0.803	0.773	0.804	0.774	0.204	0.173	0.203	0.173		9.25	9.05	9.26	9.06
90	2302-CF		2.65	2.56	2.66	2.55	0.704	0.616	0.705	0.604	1.95	1.95	1.95	1.95		7.36	7.36	7.36	7.36
91	2302-CF		0.86	0.88	0.873	0.855	0.71	0.73	0.725	0.708	0.15	0.15	0.148	0.147		9.5	9.5	9.55	9.55
93	2302-CF		0.954	0.954	0.953	0.953	0.763	0.763	0.762	0.762	0.191	0.191	0.191	0.191		8.28	8.28	8.28	8.28
94	2302-CF		0.867	0.872	0.873	0.868	0.684	0.689	0.689	0.684	0.184	0.184	0.184	0.184		9.72	9.72	9.73	9.73
95	2302-CF		0.818	0.817	0.791	0.791	0.654	0.654	0.654	0.654	0.164	0.163	0.137	0.137		7.77	7.77	7770	7770
96	2302-CF		0.8	0.8	0.803	0.803	0.63	0.63	0.63	0.63	0.17	0.17	0.173	0.173		7.8	7.8	7.77	7.77

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Compound Feed (2302-CF)
Sum parameters - Results

LC	Sample	Result ng/kg 12% moisture content	WHO-PCDD/F-PCB-TEQ reported upper bound	WHO-PCDD/F-PCB-TEQ reported lower bound	WHO-PCDD/F-PCB-TEQ calculated upper bound	WHO-PCDD/F-PCB-TEQ calculated lower bound	WHO-PCDD/F-TEQ reported upper bound	WHO-PCDD/F-TEQ reported lower bound	WHO-PCDD/F-TEQ calculated upper bound	WHO-PCDD/F-TEQ calculated lower bound	WHO-PCB-TEQ reported upper bound	WHO-PCB-TEQ reported lower bound	WHO-PCB-TEQ calculated upper bound	WHO-PCB-TEQ calculated lower bound	Result µg/kg 12% moisture content	Sum 6 Indicator PCBs reported upper bound	Sum 6 Indicator PCBs reported lower bound	Sum 6 Indicator PCBs calculated upper bound	Sum 6 Indicator PCBs calculated lower bound
97	2302-CF															8.32	8.12	8.32	8.12
99	2302-CF		0.977	0.977	0.977	0.977	0.788	0.788	0.789	0.789	0.189	0.189	0.188	0.188		9	9	9	9
100	2302-CF															8.22	7.22	8.22	7.22
101	2302-CF		0.981	0.981	0.981	0.981	0.815	0.815	0.815	0.815	0.166	0.166	0.166	0.166					
102	2302-CF		0.651	0.632	0.729	0.633	0.528	0.509	0.598	0.51	0.124	0.123	0.131	0.123					
103	2302-CF		1.17	1.13	1.17	1.14	0.959	0.924	0.955	0.945	0.21	0.21	0.212	0.197		10.9	10.9	10.8	10.8
104	2302-CF															7.56	7.56	7.57	7.57
105	2302-CF		1	0.94	1	0.941	0.801	0.771	0.802	0.772	0.2	0.169	0.2	0.169		9.69	9.49	9.68	9.48
106	2302-CF																		
107	2302-CF															9.7	9.2	9.69	9.19
109	2302-CF		0.942	0.942	0.942	0.942	0.76	0.76	0.76	0.76	0.182	0.182	0.182	0.182		8.25	8.25	8.25	8.25
110	2302-CF		0.831	0.827	1	0.998	0.831	0.827	0.832	0.827	0.171	0.171	0.171	0.171		8.67	8.67	8.67	8.67
111	2302-CF		0.838	0.829	0.838	0.829	0.674	0.665	0.674	0.665	0.164	0.164	0.164	0.164		10.1	10.1	10.1	10.1
113	2302-CF															9.25	8.75	9.25	8.75
114	2302-CF		0.787	0.787	0.871	0.735	0.622	0.622	0.665	0.577	0.166	0.166	0.206	0.158		11.5	11.5	11.5	11.5
115	2302-CF		0.844	0.812	0.845	0.812	0.678	0.646	0.679	0.646	0.166	0.166	0.166	0.166		8.5	8.5	8.5	8.5
116	2302-CF															10.1	9.37	9.87	9.37
117	2302-CF		1	1	1.03	1.03	0.786	0.786	0.808	0.808	0.217	0.217	0.223	0.223		3.01	3.01	3.01	3.01
5A	2302-CF															8.61	8.45	8.99	8.83
16A	2302-CF															9.79	9.29	9.79	9.29
38A	2302-CF		0.789	0.78	0.79	0.78	0.627	0.618	0.628	0.618	0.162	0.162	0.162	0.162		9.42	9.42	9.42	9.42
61A	2302-CF															9.5	8.5	9.5	8.5
106A	2302-CF																		
95*	2302-CF		0.818	0.817	0.818	0.817	0.654	0.654	0.654	0.654	0.164	0.163	0.164	0.163		7.77	7.77	7.77	7.77

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Compound Feed (2302-CF)
Assessment of analytical results, Measurement uncertainty

LC	Sample	Assessment of analytical results: Exceeds maximum level for **WHO-PCDD/F-PCB-TEQ**	Exceeds maximum level for **WHO-PCDD/F-TEQ**	Exceeds action level for **WHO-PCDD/F-TEQ**	Exceeds action level for **WHO-PCB-TEQ**	Exceeds maximum level for **Sum 6 Indicator PCBs**	Measurement uncertainty [%]: WHO-PCDD/F-PCB-TEQ	WHO-PCDD/F-TEQ	WHO-PCB-TEQ	Sum 6 Indicator PCBs
1	2302-CF									25
2	2302-CF			x			20	20	20	
3	2302-CF		X				8.2	8.2	6.6	6.4
5	2302-CF									20
7	2302-CF		x	x			15	15	15	15
8	2302-CF									20
9	2302-CF			X			20	20	20	20
10	2302-CF									15
11	2302-CF			X			13.4	15.2	20	15.5
12	2302-CF			x			20	16	17	20
13	2302-CF	-	-	-	-	-	30	30	30	30
14	2302-CF			X			20	22	20	20
15	2302-CF									30
16	2302-CF									88
17	2302-CF						20	20	20	20
18	2302-CF			X			19	17.4	22.24	25.38
20	2302-CF						20	20	20	20
21	2302-CF			X			25	35	30	20
22	2302-CF						46.7	26.9	26.4	35.6
23	2302-CF						35	30	30	30
24	2302-CF			X			22.3	22	22.8	20
25	2302-CF			X			20	25	22	21
26	2302-CF			X			21.4	25	30	30
27	2302-CF		X	X			30	30	30	30
28	2302-CF		X				29.51	29.51	20.68	26.98
29	2302-CF		X	X			20	15	15	15
31	2302-CF			X			17.3	19.8	34.7	10
32	2302-CF			x			30	30	30	30
33	2302-CF						25	25	28	13
34	2302-CF			x			15	15	15	20
35	2302-CF					x	30	30	30	30
36	2302-CF			x			30	30	30	30
37	2302-CF						35	35	35	35
38	2302-CF			x			21.3	20.5	20.8	30.4
39	2302-CF		X	X			±15	±15	±15	
40	2302-CF			X			20	20	20	20
42	2302-CF									
43	2302-CF						18.2	18	19	19
44	2302-CF						44	44	44	44
46	2302-CF			X		X	50	31.4	39.6	31.6
48	2302-CF			X			41	31	26	31
49	2302-CF			X			20.3	19.7	22.3	26.4
50	2302-CF									34.7
52	2302-CF			X			23	24	24	25
54	2302-CF		x	x		x	0.146	0.107	0.04	1.549
56	2302-CF			x			25	20	30	
57	2302-CF									
58	2302-CF						0.44	0.37	0.07	
61	2302-CF						26	19	33	28
62	2302-CF			x			25	25	25	
64	2302-CF			X			20	20	20	25
65	2302-CF									10.16
66	2302-CF						25	30	20	10
67	2302-CF						24.17	22	10	10
68	2302-CF	-	X	X	-	X	25	25	25	25
69	2302-CF			X			13.65	13.56	15.93	9.41
70	2302-CF						27	32	18	31
71	2302-CF	x	x				20	20	20	20
72	2302-CF									50
73	2302-CF			X			27.4	27.1	28.5	23.6
74	2302-CF									
75	2302-CF	x	x	x			35	35	35	35
77	2302-CF									30
78	2302-CF			X			7.5	8.7	13.5	6.49
81	2302-CF			x			29	29	29	29
82	2302-CF						15	27	3	17.8
83	2302-CF			X			22.02	14.3	16.74	16.74
84	2302-CF							20	20	25

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Compound Feed (2302-CF)
Assessment of analytical results, Measurement uncertainty

LC	Sample	Assessment of analytical results					Measurement uncertainty [%]			
		Exceeds maximum level for **WHO-PCDD/F-PCB-TEQ**	Exceeds maximum level for **WHO-PCDD/F-TEQ**	Exceeds action level for **WHO-PCDD/F-TEQ**	Exceeds action level for **WHO-PCB-TEQ**	Exceeds maximum level for **Sum 6 Indicator PCBs**	WHO-PCDD/F-PCB-TEQ	WHO-PCDD/F-TEQ	WHO-PCB-TEQ	Sum 6 Indicator PCBs
85	2302-CF									14
86	2302-CF						20	20	20	20
87	2302-CF			X			20	20	20	30
89	2302-CF						44	44	44	44
90	2302-CF	X		X	X		32	28	23	18
91	2302-CF			x			20	20	20	20
93	2302-CF			X			17	25	17	6
94	2302-CF			x			30	30	30	30
95	2302-CF						30	30	30	30
96	2302-CF						25	30.2	35.3	17.9
97	2302-CF									27.5
99	2302-CF			X			23.9	22.9	28.5	20.5
100	2302-CF					x				18
101	2302-CF			x			30	30	30	
102	2302-CF						15	15	15	
103	2302-CF			x			25	25	25	25
104	2302-CF									20
105	2302-CF			X			38	25	30	53
106	2302-CF									
107	2302-CF									55
109	2302-CF			X			21	22	16	15
110	2302-CF	X	x	x			15	15	15	15
111	2302-CF						21.3	21.3	20.8	30
113	2302-CF									20
114	2302-CF						30	30	30	30
115	2302-CF						30	30	30	25
116	2302-CF									55
117	2302-CF		X	X			25	25	25	25
5A	2302-CF									20
16A	2302-CF									88
38A	2302-CF						21.3	20.5	20.8	30.4
61A	2302-CF									40
106A	2302-CF									

EURL Proficiency Study on the Determination of PCDD/Fs, PCBs, PBDEs, HBCDDs and PFASs in Compound Feed 2023 [EURL-PT-POP_2302-CF]

EURL for halogenated Persistent Organic Pollutants (POPs) in Feed and Food

Compound Feed (2302-CF)

Difference between upper bound (ub) - lower bound (lb) calculation, Comparison of reported and calculated sum parameters

LC	Sample		Difference between upper and lower bound calculation for reported sum parameters [%]					Difference between reported and calculated upper bound sum parameters [%]				Correct calculation		Difference between reported and calculated lower bound sum parameters [%]				Correct calculation
			WHO-PCDD/F-PCB-TEQ	WHO-PCDD/F-TEQ	WHO-PCB-TEQ	Sum 6 Indicator PCBs		WHO-PCDD/F-PCB-TEQ	WHO-PCDD/F-TEQ	WHO-PCB-TEQ	Sum 6 Indicator PCBs	(deviation ≤ 10 %)		WHO-PCDD/F-PCB-TEQ	WHO-PCDD/F-TEQ	WHO-PCB-TEQ	Sum 6 Indicator PCBs	(deviation ≤ 10 %)
1	2302-CF					0					0	yes					0	yes
2	2302-CF		1.28	1.60	0			0	0	0		yes		0	0	0		yes
3	2302-CF		32	20.73	85.26	0		1	0	2	0	yes		0	0	1	0	yes
5	2302-CF					2					3	yes					3	yes
7	2302-CF		0	0	0.49	0		0	0	0	0	yes		0	0	0	0	yes
8	2302-CF					7					0	yes					0	yes
9	2302-CF		33.76	38.46	0	0		0	0	0	17	no		0	0	0	114	no
10	2302-CF					0					0	yes					0	yes
11	2302-CF		0	0	0	0		0	0	0	0	yes		0	0	0	0	yes
12	2302-CF		8	15	0	0		4	0	0	0	yes		1	0	0	0	yes
13	2302-CF		0	0	0	0		0	0	0	0	yes		0	0	0	0	yes
14	2302-CF		1.55	2.04	0	0		0	0	1	0	yes		0	0	1	0	yes
15	2302-CF					0					0	yes					0	yes
16	2302-CF					6					0	yes					0	yes
17	2302-CF		0	0	0	0		0	0	0	0	yes		0	0	0	0	yes
18	2302-CF		0	0	0	0		0	0	0	0	yes		0	0	0	0	yes
20	2302-CF		13	17	2	0		0	0	0	0	yes		0	0	0	0	yes
21	2302-CF		2.0	1	0	0		0	0	1	0	yes		0	0	3	0	yes
22	2302-CF		28.79	16.46	82.63	5.43		11	8	27	3	no		20	10	77	2	no
23	2302-CF		16	19	1	0		1	1	0	0	yes		0	0	0	0	yes
24	2302-CF		0	0	0	0		0	1	2	0	yes		0	1	2	0	yes
25	2302-CF		4	4	0	0		0	0	0	0	yes		0	0	0	0	yes
26	2302-CF		2.91	3.49	0	0		0	0	0	0	yes		0	0	0	0	yes
27	2302-CF		5.94	7.23	0	0		0	0	2	97	no		0	1	2		yes
28	2302-CF		19.50	15.41	63.94	0		0	0	0	57	no		0	0	0	881	no
29	2302-CF		14	13	16	0		0	0	0	0	yes		0	0	1	0	yes
31	2302-CF		0	0	0	0		0	0	0	0	yes		0	0	0	0	yes
32	2302-CF		0	0	0	0		0	0	0	0	yes		0	0	0	0	yes
33	2302-CF							0	0	1	4	yes						
34	2302-CF		16.19	17.05	11.76	0		0	0	0	0	yes		1	1	1	0	yes
35	2302-CF		0	0	0	0		0	0	0	0	yes		0	0	0	0	yes
36	2302-CF		2.11	2.59	0	2		0	0	1	0	yes		3	3	1	0	yes
37	2302-CF		3	5	0	5		0	0	0	0	yes		0	0	0	0	yes
38	2302-CF		1	1	0	0		0	0	0	0	yes		1	1	0	0	yes
39	2302-CF			9	0				1	3		yes			1	3		yes
40	2302-CF		5	6	0	0		0	0	0	0	yes		0	0	0	0	yes
42	2302-CF																	
43	2302-CF		0	0	0	0		0	0	0	0	yes		0	0	0	0	yes
44	2302-CF		1	1	0	0		0	0	0	0	yes		0	0	0	0	yes
46	2302-CF		0	0	0	0		0	0	0	0	yes		0	0	0	0	yes
48	2302-CF		2	1	6	0		0	0	0	0	yes		0	0	0	0	yes
49	2302-CF		2	0	8	6		0	0	0	0	yes		0	0	0	0	yes
50	2302-CF					2.23					0	yes					0	yes
52	2302-CF		8.42	11.84	0	0		2	2	3	4	yes		2	3	3	4	yes
54	2302-CF		-6.41	-3.90	-15.08	0		16	12	23	3	no		8	7	15	3	no
56	2302-CF		2.96	2.38	5			0	0	0		yes		1	0	0		yes
57	2302-CF		14	17	0	0		0	0	0	0	yes		0	0	0	0	yes
58	2302-CF		0	0	0			3	4	2		yes		3	4	2		yes
61	2302-CF		0	0	0	0		1	0	5	0	yes		1	0	5	0	yes
62	2302-CF		0	0	0			0	0	2		yes		0	0	2		yes
64	2302-CF		8	2	27	3		2	2	1	0	yes		0	1	1	3	yes
65	2302-CF					1					0	yes					0	yes
66	2302-CF		1.87	2.33	0	0		0	0	0	0	yes		1	1	0	0	yes
67	2302-CF		0.00	0.00	0	0		0	0	1	0	yes		0	0	1	0	yes
68	2302-CF		6.00	6.46	6.49	0		1	0	0	0	yes		0	0	0	0	yes
69	2302-CF		0	0	0	0		0	1	2	0	yes		0	1	2	0	yes
70	2302-CF		0	0	0	0		0	0	1	0	yes		0	0	1	0	yes
71	2302-CF		61	53	92	0		1	0	0	0	yes		0	0	1	0	yes
72	2302-CF					5					0	yes					0	yes
73	2302-CF		10.64	9.33	15.79	0		0	1	0	0	yes		1	1	1	0	yes
74	2302-CF																	
75	2302-CF		2.29	0.00	78.57	4.02		0	0	3	0	yes		0	0	3	0	yes
77	2302-CF					5.03					0	yes					0	yes
78	2302-CF		0	0	0	0		1	1	0	0	yes		1	1	0	0	yes
81	2302-CF		-5	-7	0	0		4	5	0	1	yes		6	7	0	2	yes
82	2302-CF		3.66	4.10	2.36	4		1	1	0	0	yes		0	0	0	0	yes
83	2302-CF		5.36	6.78	0	0		0	0	0	0	yes		0	0	0	0	yes
84	2302-CF		0.72	2.08	-2.45	0		1	0	1	0	yes		0	0	2	0	yes
85	2302-CF					0					0	yes					0	yes
86	2302-CF		0	0	0	0		0	0	1	0	yes		0	0	1	0	yes
87	2302-CF		2	3	0	0		0	0	0	0	yes		0	0	0	0	yes
89	2302-CF		6	4	15	2		0	0	0	0	yes		0	0	0	0	yes
90	2302-CF		3.40	13	0	0		0	0	0	0	yes		0	2	0	0	yes
91	2302-CF		-2.33	-2.82	0	0		1	2	1	1	yes		3	3	2	1	yes
93	2302-CF		0	0	0	0		0	0	0	0	yes		0	0	0	0	yes
94	2302-CF		-0.58	-1	0	0		1	1	0	0	yes		0	1	0	0	yes
95	2302-CF		0	0	0.61	0		3	0	20	100	no		3	0	19	100	no
96	2302-CF		0	0	0	0		0	0	2	0	yes		0	0	2	0	yes

EURL Proficiency Study on the Determination of PCDD/Fs, PCBs, PBDEs, HBCDDs and PFASs in Compound Feed 2023 [EURL-PT-POP_2302-CF]

EURL for halogenated Persistent Organic Pollutants (POPs) in Feed and Food

Compound Feed (2302-CF)

Difference between upper bound (ub) - lower bound (lb) calculation, Comparison of reported and calculated sum parameters

LC	Sample		**Difference between upper and lower bound calculation for reported sum parameters [%]**					**Difference between reported and calculated upper bound sum parameters [%]**				**Correct calculation**		**Difference between reported and calculated lower bound sum parameters [%]**				**Correct calculation**
			WHO-PCDD/F-PCB-TEQ	WHO-PCDD/F-TEQ	WHO-PCB-TEQ	Sum 6 Indicator PCBs		WHO-PCDD/F-PCB-TEQ	WHO-PCDD/F-TEQ	WHO-PCB-TEQ	Sum 6 Indicator PCBs	(deviation ≤ 10 %)		WHO-PCDD/F-PCB-TEQ	WHO-PCDD/F-TEQ	WHO-PCB-TEQ	Sum 6 Indicator PCBs	(deviation ≤ 10 %)
97	2302-CF					2					0	yes					0	yes
99	2302-CF		0	0	0	0		0	0	1	0	yes		0	0	1	0	yes
100	2302-CF					12					0	yes					0	yes
101	2302-CF		0	0	0			0	0	0		yes		0	0	0		yes
102	2302-CF		2.92	3.60	0.81			11	12	5		no		0	0	0		yes
103	2302-CF		3	4	0	0		0	0	1	1	yes		1	2	7	1	yes
104	2302-CF					0					0	yes					0	yes
105	2302-CF		6	4	16	2		0	0	0	0	yes		0	0	0	0	yes
106	2302-CF																	
107	2302-CF					5					0	yes					0	yes
109	2302-CF		0	0	0	0		0	0	0	0	yes		0	0	0	0	yes
110	2302-CF		0	0	0	0		17	0	0	0	no		17	0	0	0	no
111	2302-CF		1	1	0	0		0	0	0	0	yes		0	0	0	0	yes
113	2302-CF					5					0	yes					0	yes
114	2302-CF		0	0	0	0		10	6	19	0	no		7	8	5	0	yes
115	2302-CF		4	5	0	0		0	0	0	0	yes		0	0	0	0	yes
116	2302-CF					7					2	yes					0	yes
117	2302-CF		0	0	0	0		3	3	3	0	yes		3	3	3	0	yes
5A	2302-CF					2					4	yes					4	yes
16A	2302-CF					5					0	yes					0	yes
38A	2302-CF		1	1	0	0		0	0	0	0	yes		0	0	0	0	yes
61A	2302-CF					11					0	yes					0	yes
106A	2302-CF																	
95*	2302-CF		0	0	1	0		0	0	0	0	yes		0	0	0	0	yes

EURL Proficiency Study on the Determination of PCDD/Fs, PCBs, PBDEs, HBCDDs and PFASs in Compound Feed 2023 [EURL-PT-POP_2302-CF]

EURL for halogenated Persistent Organic Pollutants (POPs) in Feed and Food

Compound Feed (2302-CF)

PCDD/F - Results

LC	Sample	Result ng/kg 12% moisture content	WHO-PCDD/F-TEQ reported upper bound	WHO-PCDD/F-TEQ reported lower bound	WHO-PCDD/F-TEQ calculated upper bound	WHO-PCDD/F-TEQ calculated lower bound	2,3,7,8-TCDD	1,2,3,7,8-PeCDD	1,2,3,4,7,8-HxCDD	1,2,3,6,7,8-HxCDD	1,2,3,7,8,9-HxCDD	1,2,3,4,6,7,8-HpCDD	OCDD	2,3,7,8-TCDF	1,2,3,7,8-PeCDF	2,3,4,7,8-PeCDF	1,2,3,4,7,8-HxCDF	1,2,3,6,7,8-HxCDF	2,3,4,6,7,8-HxCDF	1,2,3,7,8,9-HxCDF	1,2,3,4,6,7,8-HpCDF	1,2,3,4,7,8,9-HpCDF	OCDF
1	2302-CF																						
2	2302-CF		0.75	0.738	0.751	0.739	0.016	0.043	0.022	0.072	0.045	0.799	3.92	1.2	0.417	1.22	0.596	0.408	0.363	< 0.12	1.53	0.537	4.05
3	2302-CF		0.82	0.65	0.818	0.649	< 0.038	< 0.1	< 0.077	< 0.077	< 0.077	0.73	3.4	1.2	0.39	1.1	0.83	0.38	0.38	< 0.077	1.4	0.52	4.2
5	2302-CF																						
7	2302-CF		0.924	0.924	0.925	0.925	0.02	0.056	0.028	0.092	0.055	0.954	4.76	1.53	0.474	1.5	0.703	0.493	0.44	0.126	1.86	0.651	5.16
8	2302-CF																						
9	2302-CF		1.17	0.72	1.17	0.72	< 0.14	< 0.22	< 0.3	< 0.29	< 0.26	0.771	3.42	1.05	0.388	1.46	0.6	0.348	0.294	0.13	1.38	0.487	3.79
10	2302-CF																						
11	2302-CF		0.74	0.74	0.741	0.741	0.0176	0.0399	0.0219	0.0749	0.0402	0.792	4.11	1.21	0.422	1.19	0.618	0.384	0.361	0.121	1.45	0.55	3.67
12	2302-CF		0.824	0.702	0.824	0.702	< 0.032	< 0.045	< 0.15	< 0.15	< 0.15	0.968	3.58	1.28	0.424	1.3	0.577	0.392	0.314	0.124	1.23	0.64	3.86
13	2302-CF		0.712	0.712	0.712	0.712	0.0163	0.0368	0.0319	0.0823	0.0517	0.572	3.58	1.2	0.371	1.2	0.574	0.368	0.246	0.0602	1.37	0.493	3.8
14	2302-CF		0.734	0.719	0.734	0.719	< 0.01	0.043	0.03	0.071	0.039	0.78	3.72	1.11	0.363	1.25	0.61	0.407	0.325	< 0.044	1.52	0.585	4.51
15	2302-CF																						
16	2302-CF																						
17	2302-CF		0.721	0.721	0.721	0.721	0.0158	0.0449	0.0265	0.0737	0.0459	0.823	4.09	1.17	0.379	1.18	0.617	0.407	0.24	0.0556	1.52	0.538	4.15
18	2302-CF		0.713	0.713	0.713	0.713	0.0172	0.0389	0.0323	0.0771	0.0522	0.811	4.21	1.12	0.387	1.13	0.622	0.411	0.309	0.133	1.41	0.557	4.48
20	2302-CF		0.833	0.694	0.834	0.695	< 0.019	< 0.068	< 0.048	< 0.097	< 0.068	< 1.2	3.36	1.33	0.467	1.37	0.447	0.337	0.377	< 0.19	1.41	0.457	3.72
21	2302-CF		0.84	0.83	0.842	0.827	0.02	0.04	< 0.05	0.09	< 0.1	0.87	3.8	1.4	0.43	1.4	0.62	0.41	0.33	0.16	1.6	0.56	5.5
22	2302-CF		0.729	0.609	0.673	0.673	0.011	0.034	0.057	0.038	0.017	0.682	4.33	1.17	0.31	1.16	0.461	0.308	0.336	0.067	1.13	0.359	7.42
23	2302-CF		0.736	0.595	0.741	0.596	< 0.03	< 0.09	0.07	< 0.06	< 0.06	0.59	2.98	1.11	0.32	1.22	0.39	0.28	0.15	< 0.13	1	0.31	2.83
24	2302-CF		0.76	0.76	0.764	0.764	0.018	0.052	0.032	0.09	0.051	0.9	4.28	1.22	0.39	1.2	0.61	0.38	0.36	0.18	1.23	0.57	4.85
25	2302-CF		0.706	0.676	0.706	0.676	0.018	< 0.03	0.028	0.071	0.055	0.942	4.41	1.15	0.408	1.13	0.615	0.384	0.25	0.193	1.47	0.498	4.46
26	2302-CF		0.716	0.691	0.717	0.692	< 0.0249	0.0419	0.027	0.0694	0.0382	0.666	3.05	1.11	0.398	1.22	0.565	0.365	0.241	0.0517	1.26	0.445	3.23
27	2302-CF		0.83	0.77	0.83	0.775	< 0.05	0.0531	< 0.05	0.0869	0.058	0.879	4.44	1.28	0.44	1.23	0.638	0.435	0.169	0.386	1.68	0.599	4.59
28	2302-CF		1.11	0.939	1.11	0.939	< 0.00644	< 0.156	< 0.0383	0.206	0.121	1.19	6.69	1.33	< 0.0484	1.68	0.977	0.588	0.369	0.282	2.45	0.734	5.61
29	2302-CF		0.806	0.699	0.807	0.699	< 0.049	< 0.049	< 0.049	0.079	< 0.049	0.828	4.45	1.26	0.417	1.25	0.594	0.38	0.395	0.087	1.57	0.521	4.05
31	2302-CF		0.783	0.783	0.784	0.784	0.00987	0.0407	0.0121	0.0759	0.0228	0.834	3.81	1.33	0.428	1.36	0.59	0.395	0.393	0.0231	1.35	0.47	3.86
32	2302-CF		0.763	0.763	0.763	0.763	0.01	0.058	0.025	0.08	0.081	0.85	4.31	1.26	0.41	1.23	0.577	0.369	0.353	0.095	1.49	0.424	2.76
33	2302-CF		0.74		0.742	0.678	< 0.04	0.04	< 0.08	< 0.08	< 0.08	0.69	3.86	1.2	0.34	1.15	0.6	0.38	0.12	0.25	1.26	0.58	4.15
34	2302-CF		0.88	0.73	0.88	0.725	< 0.05	0.05	< 0.25	< 0.25	< 0.25	0.8	< 7	1.2	0.39	1.27	0.6	0.38	0.36	< 0.25	1.5	0.56	< 7
35	2302-CF		0.927	0.927	0.928	0.928	0.0189	0.0559	0.0305	0.083	0.0501	0.833	3.95	1.43	0.546	1.63	0.679	0.433	0.393	0.0396	1.7	0.616	4.63
36	2302-CF		0.771	0.751	0.769	0.73	< 0.019	0.0433	< 0.048	0.0739	< 0.048	0.736	3.75	1.23	0.423	1.25	0.61	0.396	0.382	< 0.097	1.49	0.548	4.2
37	2302-CF		0.466	0.445	0.466	0.445	< 0.014	0.0317	< 0.021	0.0347	< 0.048	0.606	2.34	0.797	0.275	0.66	0.457	0.192	0.114	0.255	1.13	0.349	2.72
38	2302-CF		0.693	0.684	0.69	0.68	< 0.01	0.042	0.042	0.08	0.04	0.81	3.88	1.1	0.423	1.11	0.564	0.446	0.26	0.06	1.62	0.577	4.62
39	2302-CF		0.92	0.84	0.912	0.832	< 0.04	< 0.04	0.038	0.098	0.058	1.1	5.25	1.46	0.57	1.37	0.77	0.53	0.44	0.21	2.16	0.76	6.1
40	2302-CF		0.847	0.792	0.847	0.792	< 0.05	0.051	< 0.05	0.069	0.054	0.714	3.32	1.23	0.331	1.4	0.59	0.36	0.37	0.146	1.48	0.469	5.78
42	2302-CF																						
43	2302-CF		0.729	0.729	0.729	0.729	0.0248	0.0496	0.0343	0.0874	0.0532	0.841	4.37	1.08	0.385	1.17	0.614	0.387	0.307	0.0472	1.44	0.546	4.01
44	2302-CF		0.757	0.752	0.756	0.751	< 0.00504	0.0485	0.0565	0.0708	0.0407	0.803	4.22	1.21	0.408	1.3	0.553	0.404	0.269	0.0716	1.59	0.58	4.85
46	2302-CF		0.634	0.634	0.632	0.632	0.0131	0.0385	0.0236	0.0658	0.0421	0.776	4	1.08	0.357	1	0.54	0.393	0.214	0.067	1.28	0.443	3.97
48	2302-CF		0.777	0.772	0.778	0.772	0.0165	0.0583	< 0.0556	0.0868	0.0639	0.877	4.43	1.43	0.406	1.15	0.677	0.449	0.264	0.0885	1.67	0.638	4.59
49	2302-CF		0.74	0.74	0.74	0.74	0.0151	0.0519	0.0283	0.0807	0.0483	0.745	3.39	1.05	0.34	1.22	0.595	0.374	0.167	0.337	1.43	0.503	4.07
50	2302-CF																						
52	2302-CF		0.76	0.67	0.777	0.689	< 0.04	< 0.04	< 0.04	0.07	< 0.04	0.89	3.5	1.2	0.51	1.2	0.48	0.52	0.5	0.06	1.5	0.45	4.4
54	2302-CF		0.666	0.692	0.757	0.647	< 0.05	< 0.05	< 0.05	0.07	< 0.05	0.96	3.49	0.98	0.34	1.22	0.54	0.36	0.35	0.12	1.29	0.42	3.24
56	2302-CF		0.839	0.819	0.837	0.816	< 0.015	0.04	< 0.04	0.08	0.05	0.81	< 4	1.41	0.45	1.4	0.64	0.43	0.4	0.12	1.52	0.53	4.13
57	2302-CF		0.958	0.796	0.959	0.796	< 0.072	< 0.072	< 0.094	0.101	< 0.094	1.08	6.97	1.2	0.529	1.53	0.652	0.414	0.343	0.157	1.44	0.547	5.37
58	2302-CF		0.84	0.84	0.806	0.806	0.024	0.075	0.065	0.08	0.045	0.84	4.53	1.23	0.49	1.39	0.063	0.45	0.41	0.075	1.62	0.57	4.61
61	2302-CF		0.8	0.8	0.798	0.798	0.017	0.046	0.021	0.072	0.041	1.08	4.69	1.26	0.42	1.38	0.54	0.34	0.31	0.21	1.14	0.41	3.15
62	2302-CF		0.79	0.79	0.792	0.792	0.02	0.04	0.02	0.07	0.05	0.91	4.9	1.2	0.44	1.3	0.65	0.44	0.39	0.13	1.6	0.54	5.1
64	2302-CF		0.707	0.695	0.725	0.69	< 0.025	0.043	< 0.05	0.057	< 0.05	1.29	6.06	0.91	0.419	1.16	0.75	0.38	0.3	0.096	1.52	0.54	4.64
65	2302-CF																						
66	2302-CF		0.86	0.84	0.86	0.834	< 0.026	0.048	0.033	0.092	0.047	0.93	4.37	1.32	0.48	1.35	0.72	0.51	0.41	0.17	1.82	0.63	5.09
67	2302-CF		0.63	0.63	0.631	0.631	0.0097	0.0291	0.0194	0.0194	0.0388	0.679	3.59	1.11	0.359	1.19	0.339	0.271	0.204	0.0097	1.06	0.388	3.64
68	2302-CF		0.774	0.724	0.774	0.724	< 0.0499	0.0604	0.0534	0.0965	0.0847	0.748	3.15	1.13	0.401	1.21	0.558	0.385	0.232	0.0533	1.41	0.545	3.92
69	2302-CF		0.75	0.75	0.756	0.754	0.0217	0.0435	0.0271	0.0826	0.0401	0.766	3.89	1.22	0.418	1.23	0.606	0.403	0.376	< 0.0261	1.58	0.542	4.33
70	2302-CF		0.727	0.727	0.727	0.727	0.0263	0.0613	0.0466	0.114	0.0594	0.79	4.33	1.07	0.402	1.13	0.584	0.384	0.239	0.08	1.44	0.551	3.88
71	2302-CF		1.56	0.73	1.56	0.729	< 0.242	< 0.523	< 0.067	< 0.069	< 0.065	< 0.7	5.42	1.67	< 0.114	1.39	0.711	0.564	< 0.133	< 0.165	1.45	< 0.176	3.24
72	2302-CF																						
73	2302-CF		0.75	0.68	0.746	0.676	< 0.04	0.04	< 0.1	< 0.1	< 0.1	0.75	4.05	1.22	0.39	1.09	0.56	0.4	0.36	0.11	1.64	0.54	4.33
74	2302-CF																						
75	2302-CF		4.66	4.66	4.66	4.66	0.46	0.58	0.67	0.58	19	1.93	11.1	2.38	0.86	2.82	2.26	1.22	0.36	0.54	1.43	0.92	7.98
77	2302-CF																						
78	2302-CF		0.62	0.62	0.616	0.616	0.01	0.03	0.02	0.07	0.04	0.64	3.05	0.91	0.3	1.07	0.48	0.31	0.29	0.11	1.14	0.37	3.02
81	2302-CF		0.929	0.991	0.983	0.928	< 0.025	< 0.025	< 0.025	0.101	< 0.025	0.75	4.35	2.57	0.558	1.28	0.82	0.457	0.654	0.372	1.56	0.361	5.69
82	2302-CF		1	0.959	1.01	0.96	< 0.04	0.074	< 0.05	0.109	0.06	1.16	5.77	1.46	0.537	1.52	0.81	0.547	0.453	0.256	2.14	0.752	8.64
83	2302-CF		0.723	0.674	0.723	0.674	< 0.013	< 0.03	< 0.03	0.053	< 0.03	0.852	3.85	1.29	0.355	1.21	0.619	0.402	0.25	0.062	1.64	0.55	4.65
84	2302-CF		0.818	0.801	0.816	0.8	< 0.016	0.041	0.029	0.08	0.049	0.968	4.49	1.32	0.46	1.32	0.664	0.44	0.361	0.182	1.85	0.616	4.92
85	2302-CF																						
86	2302-CF		0.774	0.774	0.775	0.775	0.0181	0.0496	0.036	0.0893	0.0672	0.79	4.45	1.15	0.495	1.32	0.595	0.434	0.249	0.0446	1.54	0.504	1.42
87	2302-CF		0.83	0.804	0.832	0.805	< 0.0192	0.0592	< 0.0719	0.08	0.0765	0.845	3.87	1.39	0.481	1.27	0.679	0.428	0.409	0.0892	1.8	0.63	4.8
89	2302-CF		0.803	0.773	0.804	0.774	< 0.02	0.044	< 0.05	0.079	< 0.05	0.708	3.72	1.24	0.367	1.36	0.598	0.414	0.337	0.155	1.39	0.54	4
90	2302-CF		0.704	0.616	0.705	0.604	< 0.048	< 0.048	< 0.048	0.059	0.05	0.498	2.94	1.06	0.23	1.21	0.425	0.252	0.079	0.211	1.09	0.33	3.08
91	2302-CF		0.71	0.73	0.725	0.708	< 0.014	0.045	0.042	0.051	< 0.034	1.3	4.1	1.2	0.41	1.2	0.52	0.4	0.25	0.079	1.5	0.55	5.1
93	2302-CF		0.763	0.763	0.762	0.762	0.0161	0.0373	0.0302	0.0687	0.0633	0.771	3.85	1.22	0.382	1.3	0.591	0.374	0.341	0.0731	1.63	0.481	2.86
94	2302-CF		0.684	0.689	0.689	0.684	0.0134	0.0366	0.0286	0.0663	0.0532	0.745	3.83	1.13	0.383	1.09	0.585	0.396	0.382	< 0.05	1.56	0.559	4.46
95	2302-CF		0.654	0.654	0.654	0.654	0.00974	0.0223	0.0257	0.0655	0.0471	0.713	3.52	1.05	0.328	1.11	0.517	0.345	0.328	0.132	1.41	0.48	3.91
96	2302-CF		0.63	0.63	0.63	0.63	0.014	0.048	0.012	0.066	0.037	0.899	4.43	0.885	0.297	1.02	0.51	0.309	0.303	0.127	1.27	0.422	3.14

EURL Proficiency Study on the Determination of PCDD/Fs, PCBs, PBDEs, HBCDDs and PFASs in Compound Feed 2023 [EURL-PT-POP_2302-CF]
EURL for halogenated Persistent Organic Pollutants (POPs) in Feed and Food

Compound Feed (2302-CF)
PCDD/F - Results

LC	Sample	Result ng/kg 12% moisture content	WHO-PCDD/F-TEQ reported upper bound	WHO-PCDD/F-TEQ reported lower bound	WHO-PCDD/F-TEQ calculated upper bound	WHO-PCDD/F-TEQ calculated lower bound	2,3,7,8-TCDD	1,2,3,7,8-PeCDD	1,2,3,4,7,8-HxCDD	1,2,3,6,7,8-HxCDD	1,2,3,7,8,9-HxCDD	1,2,3,4,6,7,8-HpCDD	OCDD	2,3,7,8-TCDF	1,2,3,7,8-PeCDF	2,3,4,7,8-PeCDF	1,2,3,4,7,8-HxCDF	1,2,3,6,7,8-HxCDF	2,3,4,6,7,8-HxCDF	1,2,3,7,8,9-HxCDF	1,2,3,4,6,7,8-HpCDF	1,2,3,4,7,8,9-HpCDF	OCDF
97	2302-CF																						
99	2302-CF		0.788	0.788	0.789	0.789	0.0219	0.0429	0.0282	0.0778	0.0506	0.746	3.87	1.21	0.408	1.34	0.595	0.4	0.352	0.0833	1.53	0.521	4.14
100	2302-CF																						
101	2302-CF		0.815	0.815	0.815	0.815	0.014	0.047	0.031	0.089	0.053	0.944	4.48	1.25	0.427	1.32	0.659	0.455	0.384	0.191	1.56	0.583	4.47
102	2302-CF		0.528	0.509	0.598	0.51	< 0.02	< 0.045	< 0.051	0.055	< 0.049	0.423	2.75	0.608	0.307	0.956	0.697	0.342	0.219	< 0.052	1.52	< 0.856	3.83
103	2302-CF		0.959	0.924	0.955	0.945	0.0423	0.0509	< 0.05	0.099	< 0.05	1.49	6.21	1.18	0.564	1.66	0.853	0.581	0.204	0.0558	1.56	0.608	4.98
104	2302-CF																						
105	2302-CF		0.801	0.771	0.802	0.772	< 0.02	0.038	< 0.05	0.087	< 0.05	0.84	4.23	1.36	0.44	1.26	0.66	0.43	0.41	0.15	1.64	0.61	4.56
106	2302-CF																						
107	2302-CF																						
109	2302-CF		0.76	0.76	0.76	0.76	0.0148	0.0445	0.0256	0.0725	0.05	0.856	4.59	1.25	0.387	1.26	0.589	0.363	0.343	0.112	1.42	0.476	4.13
110	2302-CF		0.831	0.827	0.832	0.827	0.0254	0.046	< 0.044	0.0769	0.0653	0.845	4.24	1.38	0.421	1.4	0.651	0.412	0.257	0.0753	1.52	0.547	4.21
111	2302-CF		0.674	0.665	0.674	0.665	< 0.009	0.034	0.034	0.072	0.044	0.776	3.63	1.08	0.372	1.12	0.573	0.413	0.26	0.05	1.51	0.588	4.33
113	2302-CF																						
114	2302-CF		0.622	0.622	0.665	0.577	< 0.0268	< 0.0353	< 0.0537	< 0.0734	< 0.0692	0.674	3.61	1.11	0.33	1.1	0.503	0.316	0.187	< 0.0565	1.29	0.402	3.94
115	2302-CF		0.678	0.646	0.679	0.646	< 0.0214	0.0577	< 0.0592	0.0587	0.046	0.688	2.99	1.12	0.306	1.11	0.426	0.323	0.245	< 0.0502	1.22	0.403	1.84
116	2302-CF																						
117	2302-CF		0.786	0.786	0.808	0.808	0.03	0.05	0.05	0.08	0.06	0.83	3.97	1.44	0.47	1.24	0.57	0.41	0.22	0.28	1.46	0.48	5.95
5A	2302-CF																						
16A	2302-CF																						
38A	2302-CF		0.627	0.618	0.628	0.618	< 0.01	0.03	0.034	0.066	0.039	0.683	3.31	1.09	0.356	1.02	0.524	0.363	0.277	0.04	1.35	0.51	3.89
61A	2302-CF																						
106A	2302-CF																						

EURL Proficiency Study on the Determination of PCDD/Fs, PCBs, PBDEs, HBCDDs and PFASs in Compound Feed 2023 [EURL-PT-POP_2302-CF]
EURL for halogenated Persistent Organic Pollutants (POPs) in Feed and Food

Compound Feed (2302-CF)
Dioxin-like PCB - Results

LC	Sample	Result ng/kg 12% moisture content	WHO-PCB-TEQ reported upper bound	WHO-PCB-TEQ reported lower bound	WHO-PCB-TEQ calculated upper bound	WHO-PCB-TEQ calculated lower bound	PCB 105	PCB 114	PCB 118	PCB 123	PCB 156	PCB 157	PCB 167	PCB 189	PCB 77	PCB 81	PCB 126	PCB 169
1	2302-CF																	
2	2302-CF		0.187	0.187	0.187	0.187	104	5.99	692	21.9	129	12.9	59.2	16.5	8.64	0.325	1.44	0.353
3	2302-CF		0.19	0.028	0.187	0.0278	93	9.1	570	< 10	130	14	74	17	6.2	< 10	< 1.2	< 1.2
5	2302-CF																	
7	2302-CF		0.205	0.204	0.205	0.204	107	6.7	695	< 33.4	137	13	67.4	17.1	9.05	0.423	1.6	0.39
8	2302-CF																	
9	2302-CF		0.16	0.16	0.16	0.16	97.7	4.65	665	< 3.11	147	15.6	82.4	17.4	7.18	0.265	1.19	0.321
10	2302-CF																	
11	2302-CF		0.175	0.175	0.175	0.175	107	4.99	689	3	144	12.9	69.4	18.2	9.14	0.39	1.31	0.395
12	2302-CF		0.146	0.146	0.146	0.146	43.9	1.03	360	58.7	122	15.3	34.9	15.2	8.13	0.655	1.1	0.51
13	2302-CF		0.213	0.213	0.213	0.213	157	6.43	836	7.01	140	18.2	72.7	18	9.39	0.472	1.64	0.331
14	2302-CF		0.17	0.17	0.169	0.169	105	4.41	678	7.89	134	11.6	72.8	16.6	7.31	0.343	1.28	0.322
15	2302-CF																	
16	2302-CF																	
17	2302-CF		0.175	0.175	0.175	0.175	99.1	3.8	678	2.72	133	12.4	60.7	16.6	7.65	0.329	1.34	0.345
18	2302-CF		0.158	0.158	0.158	0.158	101	5.73	682	3.13	128	23.5	65.2	16.7	7.85	0.271	1.16	0.343
20	2302-CF		0.26	0.254	0.26	0.255	120	< 19	865	< 19	154	< 39	83.9	< 39	< 19	< 1.9	2.06	0.394
21	2302-CF		0.16	0.16	0.161	0.156	92.3	5.2	584	< 3	109	11.4	61.4	14.6	< 50	0.32	1.2	0.32
22	2302-CF		0.167	0.029	0.131	0.128	94.2	2.68	775	8.19	125	5.69	53.7	11.5	5.5	< 10	0.898	0.18
23	2302-CF		0.145	0.143	0.145	0.143	104	< 11	608	< 28	115	< 11	63	15	7	0.28	1.04	0.38
24	2302-CF		0.19	0.19	0.194	0.194	103	5.01	688	2.85	138	13.6	68.2	16.6	7.53	0.35	1.5	0.4
25	2302-CF		0.179	0.179	0.179	0.179	104	4.83	703	< 9.5	136	13.6	90.3	17.7	8.31	0.381	1.35	0.361
26	2302-CF		0.144	0.144	0.144	0.144	109	3.29	584	2.62	119	10.2	54.2	14.4	6.23	0.335	1.06	0.353
27	2302-CF		0.18	0.18	0.177	0.177	107	< 10	665	< 10	137	13.6	90.1	15.8	8.39	0.386	1.34	0.362
28	2302-CF		0.099	0.0357	0.0989	0.0357	106	< 5.33	682	< 6.16	140	14.8	181	15.9	8.99	1.97	< 0.562	< 0.224
29	2302-CF		0.206	0.173	0.206	0.172	99.8	< 9.7	646	< 9.7	135	11.6	65.1	16.7	< 9.7	< 9.7	1.43	< 0.97
31	2302-CF		0.197	0.197	0.197	0.197	125	6.17	705	2.89	120	12.6	69.6	18.1	9.03	0.396	1.52	0.4
32	2302-CF		0.278	0.278	0.278	0.278	150	5.03	776	13.3	174	17	112	23	15.3	0.68	2.23	0.51
33	2302-CF		0.19		0.189	0.164	92.9	4.9	704	24.1	119	10.2	87.2	15	7.26	< 0.8	1.32	< 0.8
34	2302-CF		0.17	0.15	0.17	0.149	95.6	< 40	629	< 40	123	< 40	67.5	< 40	7.09	< 2.5	1.21	< 0.5
35	2302-CF		0.176	0.176	0.176	0.176	112	4.94	620	3.01	127	12.7	65	16.2	7.73	0.389	1.36	0.353
36	2302-CF		0.175	0.175	0.174	0.173	100	< 4.83	654	< 3.86	138	12.3	56.4	15.3	8.04	< 0.386	1.33	0.335
37	2302-CF		0.261	0.261	0.261	0.261	87.3	2.66	783	< 0.757	129	9.8	52	14	3.56	< 0.159	2.22	0.212
38	2302-CF		0.162	0.162	0.162	0.162	95	4.5	606	3.6	119	11.3	62.4	15	8.62	0.37	1.25	0.3
39	2302-CF		0.17	0.17	0.175	0.175	120	6.1	710	< 6	140	14	74	18	9	0.36	1.3	0.37
40	2302-CF		0.183	0.183	0.183	0.183	114	7.7	711	12.7	109	11.9	59	17.5	8.57	0.222	1.41	0.312
42	2302-CF																	
43	2302-CF		0.152	0.152	0.152	0.152	114	5.01	773	3.41	147	14.4	76.5	17.2	9.93	< 0.472	1.06	0.359
44	2302-CF		0.183	0.183	0.183	0.183	143	21.2	764	3.44	150	15.8	73.1	19.3	7.77	0.369	1.36	0.336
46	2302-CF		0.265	0.265	0.264	0.264	119	4.7	795	8.95	139	13.7	73.4	18.1	7.76	0.286	2.21	0.239
48	2302-CF		0.178	0.167	0.178	0.167	128	6.26	627	24.1	143	13.5	92.4	18.4	12.9	0.629	1.34	< 0.369
49	2302-CF		0.209	0.193	0.209	0.193	< 303	19.1	898	< 17	146	15.1	73.5	16.9	< 64	0.954	1.49	0.285
50	2302-CF																	
52	2302-CF		0.19	0.19	0.196	0.196	100	5.8	630	< 2	110	12	68	15	6.6	0.28	1.6	0.22
54	2302-CF		0.199	0.229	0.259	0.199	121	< 10	799	13.7	145	15.6	78.6	19.6	8.12	< 2	1.62	< 2
56	2302-CF		0.509	0.486	0.51	0.487	113	< 7	784	< 7	157	12.9	76.4	18.8	8.51	< 5	4.51	< 0.7
57	2302-CF		0.184	0.184	0.184	0.184	122	6.76	760	28.9	135	12.6	65.3	17.9	8.31	0.349	1.38	0.342
58	2302-CF		0.17	0.17	0.174	0.174	110	11.6	557	2.9	121	12.1	58.2	13.4	8.32	0.39	1.35	0.37
61	2302-CF		0.14	0.14	0.147	0.147	81.7	5.22	454	17.8	93.2	10.4	52.4	13.4	6.51	0.32	1.15	0.32
62	2302-CF		0.19	0.19	0.187	0.187	113	10	749	10	163	13	69	20	8.9	0.38	1.4	0.38
64	2302-CF		0.221	0.162	0.224	0.163	115	< 10	643	< 10	144	14	58	16	8.52	< 2	1.32	< 2
65	2302-CF																	
66	2302-CF		0.21	0.21	0.21	0.21	118	6.27	748	< 0.13	140	13.9	69.9	17.1	10.2	< 0.13	1.65	0.35
67	2302-CF		0.15	0.15	0.149	0.149	128	6.42	794	109	145	216	78.4	21.1	6.22	0.252	0.96	0.262
68	2302-CF		0.231	0.216	0.231	0.216	113	5.4	879	3.69	164	15.9	84.1	17.8	10.8	< 0.499	1.76	< 0.499
69	2302-CF		0.18	0.18	0.176	0.176	128	5.51	886	3.23	161	16.6	73	21.5	7.6	0.338	1.26	0.335
70	2302-CF		0.175	0.175	0.176	0.176	96.7	3.97	665	2.6	124	11	64.9	18.9	8.06	0.356	1.34	0.379
71	2302-CF		0.375	0.03	0.375	0.0302	98.9	< 0.626	664	34.2	116	< 0.768	74.3	18.1	< 2.11	< 1.61	< 3.03	< 1.38
72	2302-CF																	
73	2302-CF		0.19	0.16	0.19	0.159	128	7.15	660	6.08	146	12.7	67.4	17.9	9.91	< 1	1.27	< 1
74	2302-CF																	
75	2302-CF		0.14	0.03	0.144	0.0291	< 0.1	42.5	26.2	23.6	35.3	< 0.88	< 1.4	75.8	44.6	61.7	< 0.62	< 1.75
77	2302-CF																	
78	2302-CF		0.16	0.16	0.16	0.16	100	< 10	630	< 10	130	10	60	20	7.2	0.32	1.21	0.31
81	2302-CF		0.276	0.276	0.276	0.276	299	232	2040	< 0.5	162	19.5	74.9	21.1	8.49	0.43	1.76	0.446
82	2302-CF		0.635	0.62	0.635	0.62	106	5.14	735	< 0.5	128	12	65.2	15.6	9.04	< 0.5	5.87	< 0.5
83	2302-CF		0.191	0.191	0.191	0.191	100	4.52	724	< 2.5	151	13.1	72.2	20.9	7.71	0.279	1.45	0.422
84	2302-CF		0.163	0.167	0.164	0.164	96.8	< 4.8	682	< 10	128	13.2	65.1	15.8	7.44	0.29	1.23	0.33

EURL Proficiency Study on the Determination of PCDD/Fs, PCBs, PBDEs, HBCDDs and PFASs in Compound Feed 2023 [EURL-PT-POP_2302-CF]

EURL for halogenated Persistent Organic Pollutants (POPs) in Feed and Food

Compound Feed (2302-CF)

Dioxin-like PCB - Results

LC	Sample	Result ng/kg 12% moisture content	WHO-PCB-TEQ reported upper bound	WHO-PCB-TEQ reported lower bound	WHO-PCB-TEQ calculated upper bound	WHO-PCB-TEQ calculated lower bound	PCB 105	PCB 114	PCB 118	PCB 123	PCB 156	PCB 157	PCB 167	PCB 189	PCB 77	PCB 81	PCB 126	PCB 169
85	2302-CF																	
86	2302-CF		0.19	0.19	0.189	0.189	114	5.74	731	22.4	140	14.4	74.5	18.6	9.09	0.382	1.44	0.356
87	2302-CF		0.192	0.192	0.192	0.192	116	5.67	817	3.93	145	13.4	76.2	16.8	8.97	0.307	1.46	0.314
89	2302-CF		0.204	0.173	0.203	0.173	88.8	4.4	586	< 3	112	11.9	59.4	15.2	7.1	< 1	1.46	< 1
90	2302-CF		1.95	1.95	1.95	1.95	93.8	5.24	618	< 0.094	125	14.3	202	19.7	18	5.45	18.9	0.771
91	2302-CF		0.15	0.15	0.148	0.147	130	4.9	550	< 0.52	140	14	67	18	7.3	< 0.33	1.1	0.3
93	2302-CF		0.191	0.191	0.191	0.191	111	5.86	727	6.51	138	12.2	77	19	8.94	0.218	1.45	0.413
94	2302-CF		0.184	0.184	0.184	0.184	113	4.74	682	2.92	135	12.8	73.5	16.6	7.93	0.364	1.41	0.353
95	2302-CF		0.164	0.163	0.137	0.137	0.0853	< 0.0128	0.56	< 0.0146	0.128	0.0103	0.0858	0.0152	6.89	0.302	1.26	0.328
96	2302-CF		0.17	0.17	0.173	0.173	77.3	5.43	503	3.43	112	10.8	49.9	14.6	5.64	< 0.0789	1.39	0.322
97	2302-CF																	
99	2302-CF		0.189	0.189	0.188	0.188	126	3.55	692	3.24	159	14.2	68.3	20.1	8.15	0.377	1.45	0.324
100	2302-CF																	
101	2302-CF		0.166	0.166	0.166	0.166	93.5	5.43	638	< 1.23	122	11.6	59.6	16.1	7.83	0.34	1.28	0.299
102	2302-CF		0.124	0.123	0.131	0.123	80.6	3.63	858	1.35	155	8.3	58.3	9.9	4.59	< 0.221	0.874	< 0.264
103	2302-CF		0.21	0.21	0.212	0.197	140	5.83	804	7.04	152	18.5	82.4	18.1	10.1	0.453	1.59	< 0.5
104	2302-CF																	
105	2302-CF		0.2	0.169	0.2	0.169	92	4.6	595	< 4	133	12.6	69	16.5	8.1	< 1	1.41	< 1
106	2302-CF																	
107	2302-CF																	
109	2302-CF		0.182	0.182	0.182	0.182	121	5.01	714	3.4	149	13.6	67.7	17.4	9.01	0.468	1.37	0.37
110	2302-CF		0.171	0.171	0.171	0.171	95.6	6.78	612	5.91	130	12.2	42.6	16.1	7.41	0.319	1.32	0.343
111	2302-CF		0.164	0.164	0.164	0.164	95.9	4.53	592	3.61	121	11.5	60.5	15.3	8.47	0.37	1.26	0.334
113	2302-CF																	
114	2302-CF		0.166	0.166	0.206	0.158	114	4.32	812	2.66	142	14.3	57.9	17.6	6.77	0.507	1.22	< 1.62
115	2302-CF		0.166	0.166	0.166	0.166	97	4.6	625	2.74	126	13	64.4	15.9	6.92	0.371	1.28	0.29
116	2302-CF																	
117	2302-CF		0.217	0.217	0.223	0.223	128	13.7	831	3.16	151	24	76.9	19.3	11.1	0.51	1.7	0.47
5A	2302-CF																	
16A	2302-CF																	
38A	2302-CF		0.162	0.162	0.162	0.162	93	4.7	581	3.5	118	10.6	63.1	14.9	8.14	0.4	1.24	0.34
61A	2302-CF																	
106A	2302-CF																	
95*	2302-CF		0.164	0.163	0.164	0.163	85.3	< 12.8	560	< 14.6	128	10.3	85.8	15.2	6.89	0.302	1.26	0.328

EURL Proficiency Study on the Determination of PCDD/Fs, PCBs, PBDEs, HBCDDs and PFASs in Compound Feed 2023 [EURL-PT-POP_2302-CF]
EURL for halogenated Persistent Organic Pollutants (POPs) in Feed and Food

Compound Feed (2302-CF)
Non dioxin-like PCB - Results

LC	Sample	Result µg/kg 12% moisture content	Sum 6 Indicator PCBs reported upper bound	Sum 6 Indicator PCBs reported lower bound	Sum 6 Indicator PCBs calculated upper bound	Sum 6 Indicator PCBs calculated lower bound	PCB 28	PCB 52	PCB 101	PCB 138	PCB 153	PCB 180
1	2302-CF		7.9	7.9	7.9	7.9	0.139	0.429	1.95	1.75	2.36	1.27
2	2302-CF											
3	2302-CF		9.9	9.9	9.91	9.91	0.19	0.82	2.5	2	2.9	1.5
5	2302-CF		8.88	8.72	9.19	9.03	< 0.16	0.733	2.57	1.76	2.6	1.37
7	2302-CF		9.15	9.15	9.15	9.15	0.154	0.723	2.32	1.86	2.78	1.31
8	2302-CF		7.05	6.57	7.05	6.57	< 0.48	0.54	1.68	1.7	1.82	0.83
9	2302-CF		10.9	10.9	13.1	5.09	0.156	0.714	2.72	< 4.1	< 3.9	1.5
10	2302-CF		9.13	9.13	9.13	9.13	0.176	0.882	2.31	1.86	2.73	1.17
11	2302-CF		9.44	9.44	9.44	9.44	0.144	0.76	2.56	1.86	2.8	1.32
12	2302-CF		10.2	10.2	10.2	10.2	0.2	0.84	2.81	2.1	2.9	1.34
13	2302-CF		8.21	8.21	8.2	8.2	0.0675	0.622	2.22	1.72	2.45	1.12
14	2302-CF		10.7	10.7	10.7	10.7	0.177	0.836	2.7	2.05	3.57	1.35
15	2302-CF		9.7	9.7	9.7	9.7	0.147	0.744	2.46	2.06	2.91	1.38
16	2302-CF		9.05	8.55	9.06	8.56	< 0.5	0.65	2.2	2.34	2.31	1.06
17	2302-CF		9.07	9.07	9.07	9.07	0.15	0.748	2.38	1.76	2.73	1.3
18	2302-CF		8.57	8.57	8.58	8.58	0.126	0.7	2.28	1.44	2.71	1.32
20	2302-CF		10.5	10.5	10.5	10.5	0.271	0.856	2.86	2.26	2.92	1.36
21	2302-CF		9.1	9.1	9.14	9.14	0.28	0.66	2.2	2	2.7	1.3
22	2302-CF		9.2	8.7	8.92	8.92	0.218	0.513	2.44	2.26	2.16	1.33
23	2302-CF		8.92	8.92	8.92	8.92	0.14	0.66	2.11	1.82	2.94	1.25
24	2302-CF		8.54	8.54	8.53	8.53	0.16	0.76	2.26	1.65	2.45	1.25
25	2302-CF		9.38	9.38	9.38	9.38	0.17	0.777	2.3	1.96	2.88	1.29
26	2302-CF		8.4	8.4	8.4	8.4	0.155	0.694	2.16	1.67	2.42	1.3
27	2302-CF		9.1	9.1	300	0	< 50	< 50	< 50	< 50	< 50	< 50
28	2302-CF		10.1	10.1	23.4	1.03	0.28	0.75	< 5.42	< 7.71	< 7.75	< 1.45
29	2302-CF		8.62	8.62	8.61	8.61	0.199	0.565	2.24	1.8	2.53	1.28
31	2302-CF		9.24	9.24	9.24	9.24	0.17	0.863	2.24	1.87	2.58	1.52
32	2302-CF		12	12	12	12	0.251	0.775	2.6	3.18	3.46	1.75
33	2302-CF		11		10.6	10.1	< 0.5	0.8	2.9	2.3	2.7	1.4
34	2302-CF		8.92	8.92	8.92	8.92	0.32	0.76	2.23	1.73	2.53	1.35
35	2302-CF		8.48	8.48	8.47	8.47	0.144	0.689	2.22	1.71	2.52	1.19
36	2302-CF		9.35	9.16	9.36	9.17	< 0.193	0.675	2.38	1.95	2.85	1.31
37	2302-CF		9.89	9.39	9.91	9.41	< 0.5	0.586	2.35	2.28	2.75	1.44
38	2302-CF		9.64	9.64	9.63	9.63	0.21	0.77	2.39	1.87	3.03	1.36
39	2302-CF											
40	2302-CF		9.39	9.39	9.38	9.38	0.158	0.802	2.44	1.52	3.06	1.4
42	2302-CF							23.5				
43	2302-CF		9.91	9.91	9.91	9.91	0.169	0.833	2.55	2.1	2.94	1.32
44	2302-CF		7.72	7.72	7.71	7.71	0.0691	0.465	1.68	1.7	2.65	1.15
46	2302-CF		11.4	11.4	11.4	11.4	0.204	0.944	2.74	2.26	3.36	1.86
48	2302-CF		10.1	10.1	10.1	10.1	0.255	1.06	2.47	2.39	2.83	1.12
49	2302-CF		9.34	8.82	9.33	8.81	< 0.52	1.08	2.38	1.75	2.31	1.29
50	2302-CF		8.95	8.75	8.96	8.76	< 0.2	0.64	2.06	2.11	2.84	1.11
52	2302-CF		11	11	11.5	11.5	0.23	0.94	2.9	2.5	3.6	1.3
54	2302-CF		9.11	9.11	9.44	9.44	0.18	0.71	2.26	1.83	3.03	1.43
56	2302-CF											
57	2302-CF		9.52	9.52	9.51	9.51	0.158	0.804	2.4	1.97	2.8	1.38
58	2302-CF											
61	2302-CF		8.88	8.88	8.88	8.88	0.16	0.35	1.74	2.74	2.54	1.35
62	2302-CF											
64	2302-CF		8.55	8.27	8.55	8.55	0.15	0.7	2.32	1.71	2.44	1.23
65	2302-CF		8.59	8.49	8.59	8.49	< 0.1	0.52	1.95	2.25	2.7	1.07
66	2302-CF		9.63	9.63	9.63	9.63	0.31	0.87	2.42	1.95	2.69	1.39
67	2302-CF		11.3	11.3	11.3	11.3	0.64	0.678	2.89	3.63	3.33	0.177
68	2302-CF		10.6	10.6	10.6	10.6	0.261	0.894	2.75	2.31	3.01	1.42
69	2302-CF		10.9	10.9	10.9	10.9	0.171	0.887	3.06	1.99	3.22	1.6
70	2302-CF		9.36	9.36	9.37	9.37	0.154	0.698	2.35	1.94	2.89	1.34
71	2302-CF		9.02	9.02	9.03	9.03	0.15	0.671	2.23	2.02	2.71	1.25
72	2302-CF		11	10.5	11	10.5	< 0.5	0.82	2.72	2.27	3.16	1.53
73	2302-CF		8.97	8.97	8.97	8.97	0.15	0.74	2.38	2.03	2.45	1.22
74	2302-CF											
75	2302-CF		3.23	3.1	3.22	3.1	0.16	2.94	< 0.01	< 0.06	< 0.02	< 0.03
77	2302-CF		9.95	9.45	9.96	9.46	< 0.5	0.79	2.53	2.32	2.55	1.27
78	2302-CF		8.79	8.79	8.79	8.79	0.12	0.6	2.15	2.44	2.39	1.09
81	2302-CF		17.2	17.2	17.4	16.9	< 0.5	1.27	4.45	5.96	3.29	1.97
82	2302-CF		11.4	11	11.4	11	< 0.33	0.7	2.43	3.2	3.14	1.57
83	2302-CF		10.6	10.6	10.6	10.6	0.212	0.731	2.54	2.01	3.63	1.52
84	2302-CF		9.47	9.47	9.48	9.48	0.16	0.74	2.46	1.94	2.77	1.41

EURL Proficiency Study on the Determination of PCDD/Fs, PCBs, PBDEs, HBCDDs and PFASs in Compound Feed 2023 [EURL-PT-POP_2302-CF]
EURL for halogenated Persistent Organic Pollutants (POPs) in Feed and Food

Compound Feed (2302-CF)
Non dioxin-like PCB - Results

LC	Sample	Result µg/kg 12% moisture content	Sum 6 Indicator PCBs reported upper bound	Sum 6 Indicator PCBs reported lower bound	Sum 6 Indicator PCBs calculated upper bound	Sum 6 Indicator PCBs calculated lower bound	PCB 28	PCB 52	PCB 101	PCB 138	PCB 153	PCB 180
85	2302-CF		9.59	9.59	9.59	9.59	0.16	1.02	2.45	2.17	2.6	1.19
86	2302-CF		11.4	11.4	11.4	11.4	0.261	0.787	2.43	1.68	4.79	1.45
87	2302-CF		9.66	9.66	9.67	9.67	0.23	0.806	2.55	1.97	2.8	1.31
89	2302-CF		9.25	9.05	9.26	9.06	< 0.2	0.75	2.37	1.91	2.7	1.33
90	2302-CF		7.36	7.36	7.36	7.36	0.163	0.418	2.27	1.79	1.97	0.753
91	2302-CF		9.5	9.5	9.55	9.55	0.16	0.79	2.5	1.9	2.9	1.3
93	2302-CF		8.28	8.28	8.28	8.28	0.118	0.733	1.79	1.76	2.61	1.27
94	2302-CF		9.72	9.72	9.73	9.73	0.165	0.777	2.59	1.97	2.89	1.34
95	2302-CF		7.77	7.77	7770	7770	119	634	1940	1640	2350	1090
96	2302-CF		7.8	7.8	7.77	7.77	0.13	0.47	1.92	1.66	2.26	1.33
97	2302-CF		8.32	8.12	8.32	8.12	< 0.2	0.59	1.91	1.85	2.39	1.38
99	2302-CF		9	9	9	9	0.147	0.722	2.26	1.8	2.63	1.44
100	2302-CF		8.22	7.22	8.22	7.22	< 1	0.52	1.4	2.3	1.94	1.06
101	2302-CF											
102	2302-CF											
103	2302-CF		10.9	10.9	10.8	10.8	0.3	0.973	2.94	2.21	3.04	1.36
104	2302-CF		7.56	7.56	7.57	7.57	0.094	0.428	1.7	1.73	2.47	1.15
105	2302-CF		9.69	9.49	9.68	9.48	< 0.2	0.82	2.38	2.12	2.89	1.27
106	2302-CF											
107	2302-CF		9.7	9.2	9.69	9.19	< 0.5	0.78	2.07	2.37	2.73	1.24
109	2302-CF		8.25	8.25	8.25	8.25	0.186	0.724	2.03	1.6	2.45	1.26
110	2302-CF		8.67	8.67	8.67	8.67	0.213	0.617	1.95	1.94	2.65	1.3
111	2302-CF		10.1	10.1	10.1	10.1	0.21	0.836	2.57	2.01	3.15	1.37
113	2302-CF		9.25	8.75	9.25	8.75	< 0.5	0.68	2.03	2.53	2.47	1.04
114	2302-CF		11.5	11.5	11.5	11.5	0.147	0.891	2.89	2.45	3.5	1.59
115	2302-CF		8.5	8.5	8.5	8.5	0.233	0.549	2.18	1.76	2.68	1.1
116	2302-CF		10.1	9.37	9.87	9.37	< 0.5	0.83	2.57	2.11	2.68	1.18
117	2302-CF		3.01	3.01	3.01	3.01	0.12	0.24	1.44	0.14	1.06	0.01
5A	2302-CF		8.61	8.45	8.99	8.83	< 0.16	0.675	2.38	1.65	2.71	1.41
16A	2302-CF		9.79	9.29	9.79	9.29	< 0.5	0.9	2.33	2.51	2.44	1.11
38A	2302-CF		9.42	9.42	9.42	9.42	0.23	0.75	2.38	1.87	2.95	1.24
61A	2302-CF		9.5	8.5	9.5	8.5	< 0.5	< 0.5	1.8	3.2	2.2	1.3
106A	2302-CF											
95*	2302-CF		7.77	7.77	7.77	7.77	0.119	0.634	1.94	1.64	2.35	1.09

EURL Proficiency Study on the Determination of PCDD/Fs, PCBs, PBDEs, HBCDDs and PFASs in Compound Feed 2023 [EURL-PT-POP_2302-CF]
EURL for halogenated Persistent Organic Pollutants (POPs) in Feed and Food

Compound Feed (2302-CF)
Bioanalytical screening methods - Results, Assessment of analytical results

LC	Sample	Result ng BEQ/kg 12% moisture content	PCDD/Fs + DL-PCBs	PCDD/Fs	DL-PCBs	Assessment of analytical results: Sample suspected to be noncompliant with … Maximum Level PCDD/Fs+DL-PCBs	Maximum Level PCDD/Fs	Action Level PCDD/Fs	Action Level DL-PCBs	Reporting Limit PCDD/Fs+ DL-PCBs	PCDD/Fs	DL-PCBs	Maximum Level on which evaluation is based on PCDD/Fs+ DL-PCBs	PCDD/Fs	DL-PCBs	Action Level on which evaluation is based on PCDD/Fs+ DL-PCBs	PCDD/Fs	DL-PCBs	Bioassay Cut-off Maximum Level PCDD/Fs+ DL-PCBs	PCDD/Fs	Bioassay Cut-off Action Level PCDD/Fs	DL-PCBs
1	2302-CF																					
2	2302-CF																					
3	2302-CF																					
5	2302-CF																					
7	2302-CF		1.9			yes	N/A	N/A	N/A	0.3			1.5			0.5						
8	2302-CF																					
9	2302-CF																					
10	2302-CF																					
11	2302-CF																					
12	2302-CF																					
13	2302-CF																					
14	2302-CF		0.86			x	x	x		0.1			0.75						0.5			
15	2302-CF																					
16	2302-CF																					
17	2302-CF																					
18	2302-CF																					
20	2302-CF																					
21	2302-CF																					
22	2302-CF																					
23	2302-CF																					
24	2302-CF																					
25	2302-CF																					
26	2302-CF																					
27	2302-CF																					
28	2302-CF																					
29	2302-CF																					
31	2302-CF																					
32	2302-CF																					
33	2302-CF																					
34	2302-CF		0.64			YES							0.75			0.5			0.5			
35	2302-CF																					
36	2302-CF																					
37	2302-CF																					
38	2302-CF																					
39	2302-CF																					
40	2302-CF																					
42	2302-CF																					
43	2302-CF																					
44	2302-CF																					
46	2302-CF																					
48	2302-CF																					
49	2302-CF																					
50	2302-CF																					
52	2302-CF		2.4	1.7	0.7	X	X						1.5	0.75			0.5	0.5	1	0.5		
54	2302-CF																					
56	2302-CF																					
57	2302-CF																					
58	2302-CF																					
61	2302-CF																					
62	2302-CF																					
64	2302-CF																					
65	2302-CF																					
66	2302-CF																					
67	2302-CF																					
68	2302-CF																					
69	2302-CF																					
70	2302-CF																					
71	2302-CF																					
72	2302-CF																					
73	2302-CF																					
74	2302-CF		1.2	0.05	1.2	no	no	no	no	0.05	0.05	0.05	1.5	1.5	1.5	0.75	0.75	0.75				
75	2302-CF																					
77	2302-CF																					
78	2302-CF																					
81	2302-CF		1	0.77	0.26		yes	yes	no		0.25	0.12	1.5	0.75			0.5	0.5		0.5		
82	2302-CF																					
83	2302-CF		1.1	0.89	0.2	no	yes	yes	no	0.4	0.2	0.2	1.5	0.75			0.5	0.35	1.11	0.7	0.38	0.27
84	2302-CF																					

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EURL for halogenated Persistent Organic Pollutants (POPs) in Feed and Food

Compound Feed (2302-CF)
Bioanalytical screening methods - Results, Assessment of analytical results

LC	Sample	Result ng BEQ/kg 12% moisture content	PCDD/Fs + DL-PCBs	PCDD/Fs	DL-PCBs	Assessment of analytical results: Sample suspected to be noncompliant with … Maximum Level PCDD/Fs+DL-PCBs	Maximum Level PCDD/Fs	Action Level PCDD/Fs	Action Level DL-PCBs	Reporting Limit PCDD/Fs+ DL-PCBs	Reporting Limit PCDD/Fs	Reporting Limit DL-PCBs	Maximum Level on which evaluation is based on PCDD/Fs+ DL-PCBs	Maximum Level on which evaluation is based on PCDD/Fs	Maximum Level on which evaluation is based on DL-PCBs	Action Level on which evaluation is based on PCDD/Fs+ DL-PCBs	Action Level on which evaluation is based on PCDD/Fs	Action Level on which evaluation is based on DL-PCBs	Bioassay Cut-off Maximum Level PCDD/Fs+ DL-PCBs	Bioassay Cut-off Maximum Level PCDD/Fs	Bioassay Cut-off Action Level PCDD/Fs	Bioassay Cut-off Action Level DL-PCBs
85	2302-CF		1.2			no				0.16			1.5			1			1			
86	2302-CF																					
87	2302-CF																					
89	2302-CF																					
90	2302-CF																					
91	2302-CF																					
93	2302-CF																					
94	2302-CF																					
95	2302-CF																					
96	2302-CF																					
97	2302-CF																					
99	2302-CF																					
100	2302-CF																					
101	2302-CF																					
102	2302-CF																					
103	2302-CF																					
104	2302-CF																					
105	2302-CF																					
106	2302-CF		1.2			yes	yes	yes	yes	0.08			1.25	0.75	-	-	0.5	0.35	0.83	0.5	0.33	0.23
107	2302-CF																					
109	2302-CF																					
110	2302-CF																					
111	2302-CF																					
113	2302-CF																					
114	2302-CF																					
115	2302-CF																					
116	2302-CF																					
117	2302-CF																					
5A	2302-CF																					
16A	2302-CF																					
38A	2302-CF																					
61A	2302-CF																					
106A	2302-CF		1.3	0.87	0.46	yes	yes	yes	yes	0.06	0.03	0.03	1.25	0.75	-	-	0.5	0.35	0.83	0.5	0.33	0.23

EURL Proficiency Study on the Determination of PCDD/Fs, PCBs, PBDEs, HBCDDs and PFASs in Compound Feed 2023 [EURL-PT-POP_2302-CF]
EURL for halogenated Persistent Organic Pollutants (POPs) in Feed and Food

Compound Feed (2302-CF)
Moisture content - Results

LC	Sample	Result %	Moisture content	Moisture content	Moisture content
			Physico-chemical methods	Bioanalytical methods	Mean
1	2302-CF		7.8		7.8
2	2302-CF		9.2		9.2
3	2302-CF		9.9		9.9
5	2302-CF		9.2		9.2
7	2302-CF		8.8	8.8	8.8
8	2302-CF		12.0		12.0
9	2302-CF		9.8		9.8
10	2302-CF		9.3		9.3
11	2302-CF		7.6		7.6
12	2302-CF		9.7		9.7
13	2302-CF		8.3		8.3
14	2302-CF		13.7	13.7	13.7
15	2302-CF		5.5		5.5
16	2302-CF		9.3		9.3
17	2302-CF		8.2		8.2
18	2302-CF		9.7		9.7
20	2302-CF		9.0		9.0
21	2302-CF		8.8		8.8
22	2302-CF		9.2		9.2
23	2302-CF				
24	2302-CF		91.4		91.4
25	2302-CF		8.7		8.7
26	2302-CF		3.9		3.9
27	2302-CF		8.9		8.9
28	2302-CF		8.1		8.1
29	2302-CF		9.0		9.0
31	2302-CF		9.1		9.1
32	2302-CF		8.7		8.7
33	2302-CF				
34	2302-CF		9.2	9.2	9.2
35	2302-CF		93.2		93.2
36	2302-CF		8.9		8.9
37	2302-CF		8.2		8.2
38	2302-CF		7.8		7.8
39	2302-CF		9.5		9.5
40	2302-CF		8.4		8.4
42	2302-CF		8.7		8.7
43	2302-CF		9.4		9.4
44	2302-CF		8.9		8.9
46	2302-CF		7.5		7.5
48	2302-CF		10.0		10.0
49	2302-CF		6.4		6.4
50	2302-CF		8.2		8.2
52	2302-CF		8.1	8.1	8.1
54	2302-CF		8.8	8.8	8.8
56	2302-CF		10.0	10.0	10.0
57	2302-CF		7.7		7.7
58	2302-CF		9.8		9.8
61	2302-CF		9.4		9.4
62	2302-CF		9.2		9.2
64	2302-CF			8.9	8.9
65	2302-CF		8.3		8.3
66	2302-CF				
67	2302-CF		9.2		9.2
68	2302-CF				
69	2302-CF		8.9		8.9
70	2302-CF		7.6		7.6
71	2302-CF		9.0		9.0
72	2302-CF		9.1		9.1
73	2302-CF		8.2		8.2
74	2302-CF			0.0	0.0
75	2302-CF		8.7		8.7
77	2302-CF		8.5		8.5
78	2302-CF		9.6		9.6
81	2302-CF				
82	2302-CF		9.0		9.0
83	2302-CF		9.1	8.7	8.9
84	2302-CF		8.5		8.5

EURL Proficiency Study on the Determination of PCDD/Fs, PCBs, PBDEs, HBCDDs and PFASs in Compound Feed 2023 [EURL-PT-POP_2302-CF]
EURL for halogenated Persistent Organic Pollutants (POPs) in Feed and Food

Compound Feed (2302-CF)
Moisture content - Results

LC	Sample	Result %	Moisture content	Moisture content	Moisture content
			Physico-chemical methods	Bioanalytical methods	Mean
85	2302-CF		8.6	8.6	8.6
86	2302-CF		9.0		9.0
87	2302-CF		8.2		8.2
89	2302-CF		9.2		9.2
90	2302-CF		8.6		8.6
91	2302-CF		9.0		9.0
93	2302-CF		9.7		9.7
94	2302-CF		92.1		92.1
95	2302-CF		9.0	9.0	9.0
96	2302-CF		9.4		9.4
97	2302-CF		8.5		8.5
99	2302-CF		8.2		8.2
100	2302-CF		8.6		8.6
101	2302-CF		9.1		9.1
102	2302-CF				
103	2302-CF		79.4		79.4
104	2302-CF		7.5		7.5
105	2302-CF		9.2		9.2
106	2302-CF			9.0	9.0
107	2302-CF		9.0	9.0	9.0
109	2302-CF		9.7		9.7
110	2302-CF		7.9		7.9
111	2302-CF		8.2		8.2
113	2302-CF		8.7		8.7
114	2302-CF		9.3		9.3
115	2302-CF		6.6		6.6
116	2302-CF		9.5		9.5
117	2302-CF		9.7		9.7
5A	2302-CF		9.2		9.2
16A	2302-CF		9.1		9.1
38A	2302-CF		7.8		7.8
61A	2302-CF		9.7		9.7
106A	2302-CF			9.0	9.0
8*	2302-CF		7.8		7.8

EURL Proficiency Study on the Determination of PCDD/Fs, PCBs, PBDEs, HBCDDs and PFASs in Compound Feed 2023 [EURL-PT-POP_2302-CF]
EURL for halogenated Persistent Organic Pollutants (POPs) in Feed and Food
14 June 2024

Annex 3: Participants' z-scores and bioassay-scores of PCDD/Fs and PCBs - Tables

Test sample - Compound Feed (2302-CF)

Z-scores of sum parameters and individual results

Calculation of z-score on basis of assigned value

$$z = (x - x_a) / \sigma_p$$

x_a: assigned value
x: participant's result
σ_p: fitness-for-purpose-based standard deviation for proficiency assessment
10%: WHO-PCDD/F-TEQ, WHO-PCB-TEQ and WHO-PCDD/F-PCB-TEQ
15%: Sum of six indicator PCBs (PCB 28, 52, 101, 138, 153, 180)
20%: Evaluated individual PCDD/F and PCB congeners

Bioassay-scores of BEQ results

Calculation of bioassay-score on basis of assigned value from physical-chemical methods

$$\text{bioassay-score} = (x - x_a) / \sigma_{bioassay}$$

x_a: assigned value (pyhsical-chemical methods)
x: participant's result (BEQ from bioanalytical screening method)
$\sigma_{bioassay}$: bioassay target deviation
20%: PCDD/F-PCB-BEQ, PCDD/F-BEQ and PCB-BEQ

* Modified/additional results reported after distribution of preliminary results to all participating laboratories

EURL Proficiency Study on the Determination of PCDD/Fs, PCBs, PBDEs, HBCDDs and PFASs in Compound Feed 2023 [EURL-PT-POP_2302-CF]
EURL for halogenated Persistent Organic Pollutants (POPs) in Feed and Food

Compound Feed (2302-CF)
Sum parameters - Z-scores

LC	Sample	Z-score [σ_p = 10 %]	WHO-PCDD/F-PCB-TEQ reported		WHO-PCDD/F-PCB-TEQ calculated		WHO-PCDD/F-TEQ reported		WHO-PCDD/F-TEQ calculated		WHO-PCB-TEQ reported		WHO-PCB-TEQ calculated		Z-score [σ_p = 15 %]	Sum Indicator PCBs reported		Sum Indicator PCBs calculated	
			upper bound	lower bound	upper bound	lower bound	upper bound	lower bound	upper bound	lower bound	upper bound	lower bound	upper bound	lower bound		upper bound	lower bound	upper bound	lower bound
1	2302-CF															-1.1	-1.0	-1.1	-1.0
2	2302-CF		-0.1	0.2	-0.2	0.2	-0.3	0.0	-0.3	0.0	0.4	0.6	0.4	0.7					
3	2302-CF		0.5	-2.5	0.5	-2.6	0.6	-1.2	0.6	-1.2	0.6	-8.4	0.4	-8.4		0.3	0.4	0.3	0.4
5	2302-CF															-0.4	-0.4	-0.2	-0.2
7	2302-CF		1.9	2.4	1.8	2.4	2.0	2.5	2.0	2.6	1.5	1.6	1.5	1.7		-0.2	-0.1	-0.2	-0.1
8	2302-CF															-1.7	-2.0	-1.7	-2.0
9	2302-CF		4.0	-0.3	3.9	-0.3	5.2	-0.3	5.2	-0.2	-1.1	-0.9	-1.1	-0.9		1.0	1.1	2.6	-3.0
10	2302-CF															-0.2	-0.1	-0.2	-0.1
11	2302-CF		-0.3	0.1	-0.4	0.1	-0.4	0.0	-0.4	0.1	-0.2	-0.1	-0.2	0.0		0.0	0.1	0.0	0.1
12	2302-CF		-0.2	-0.6	0.1	-0.7	0.7	-0.5	0.7	-0.5	-1.8	-1.7	-1.8	-1.7		0.5	0.6	0.5	0.6
13	2302-CF		-0.2	0.2	-0.3	0.2	-0.8	-0.4	-0.8	-0.3	1.9	2.1	1.9	2.2		-0.9	-0.8	-0.9	-0.8
14	2302-CF		-0.5	-0.2	-0.6	-0.3	-0.5	-0.3	-0.5	-0.2	-0.5	-0.3	-0.6	-0.3		0.9	1.0	0.9	1.0
15	2302-CF															0.2	0.3	0.2	0.3
16	2302-CF															-0.3	-0.5	-0.3	-0.5
17	2302-CF		-0.5	-0.2	-0.6	-0.2	-0.6	-0.2	-0.6	-0.2	-0.2	-0.1	-0.2	0.0		-0.3	-0.2	-0.3	-0.2
18	2302-CF		-0.8	-0.4	-0.9	-0.4	-0.7	-0.4	-0.8	-0.3	-1.2	-1.0	-1.2	-1.0		-0.6	-0.5	-0.6	-0.5
20	2302-CF		1.5	0.4	1.4	0.4	0.8	-0.6	0.8	-0.6	4.5	4.4	4.5	4.6		0.7	0.9	0.7	0.9
21	2302-CF		0.5	0.8	0.4	0.8	0.9	1.2	0.9	1.2	-1.1	-0.9	-1.0	-1.1		-0.2	-0.2	-0.2	-0.1
22	2302-CF		-0.5	-3.0	-1.6	-1.2	-0.5	-1.8	-1.3	-0.9	-0.7	-8.4	-2.7	-2.7		-0.2	-0.4	-0.4	-0.3
23	2302-CF		-0.7	-1.9	-0.8	-1.9	-0.4	-1.9	-0.4	-1.9	-1.9	-1.9	-1.9	-1.8		-0.4	-0.3	-0.4	-0.3
24	2302-CF		0.1	0.5	0.0	0.5	-0.1	0.3	-0.1	0.4	0.6	0.8	0.8	1.1		-0.6	-0.6	-0.6	-0.6
25	2302-CF		-0.7	-0.6	-0.8	-0.6	-0.8	-0.9	-0.8	-0.8	0.0	0.2	0.0	0.2		0.0	0.1	0.0	0.1
26	2302-CF		-0.9	-0.8	-1.0	-0.8	-0.7	-0.6	-0.7	-0.6	-2.0	-1.8	-2.0	-1.8		-0.7	-0.7	-0.7	-0.6
27	2302-CF		0.7	0.4	0.5	0.5	0.8	0.4	0.8	0.5	0.1	0.2	-0.1	0.1		-0.2	-0.2	205.0	-6.7
28	2302-CF		2.8	0.7	2.6	0.7	4.4	2.7	4.4	2.7	-4.5	-8.0	-4.5	-8.0		0.5	0.6	9.8	-5.9
29	2302-CF		0.7	-0.4	0.5	-0.4	0.5	-0.5	0.5	-0.5	1.5	-0.2	1.5	-0.2		-0.6	-0.5	-0.6	-0.5
31	2302-CF		0.3	0.8	0.2	0.8	0.2	0.6	0.2	0.6	1.0	1.2	1.0	1.3		-0.1	-0.1	-0.1	0.0
32	2302-CF		1.0	1.4	0.9	1.4	-0.1	0.3	-0.1	0.4	5.5	5.8	5.5	5.9		1.8	1.9	1.8	1.9
33	2302-CF		-0.2		-0.3	-0.8	-0.4		-0.4	-0.8	0.6		0.6	-0.6		1.1		0.8	0.6
34	2302-CF		1.1	-0.3	1.0	-0.4	1.4	-0.1	1.4	-0.2	-0.5	-1.5	-0.5	-1.5		-0.4	-0.3	-0.4	-0.3
35	2302-CF		1.6	2.1	1.5	2.1	2.0	2.5	2.0	2.6	-0.2	0.0	-0.2	0.1		-0.7	-0.6	-0.7	-0.6
36	2302-CF		0.0	0.2	-0.2	-0.1	0.0	0.2	0.0	-0.1	-0.2	-0.1	-0.3	-0.1		-0.1	-0.1	-0.1	-0.1
37	2302-CF		-2.3	-2.2	-2.4	-2.3	-3.9	-4.0	-4.0	-4.0	4.6	4.8	4.6	4.9		0.3	0.1	0.3	0.1
38	2302-CF		-1.0	-0.7	-1.1	-0.8	-1.0	-0.7	-1.1	-0.8	-0.9	-0.8	-0.9	-0.7		0.1	0.2	0.1	0.2
39	2302-CF				1.4	1.1	1.9	1.4	1.8	1.3	-0.5	-0.3	-0.2	0.0					
40	2302-CF		0.9	0.7	0.8	0.7	1.0	0.7	1.0	0.7	0.2	0.4	0.2	0.5		0.0	0.1	0.0	0.1
42	2302-CF																		
43	2302-CF		-0.7	-0.3	-0.8	-0.3	-0.5	-0.1	-0.5	-0.1	-1.5	-1.4	-1.5	-1.3		0.3	0.4	0.3	0.4
44	2302-CF		-0.1	0.3	-0.2	0.3	-0.2	0.2	-0.2	0.2	0.2	0.4	0.2	0.5		-1.2	-1.1	-1.2	-1.1
46	2302-CF		-0.5	-0.1	-0.6	-0.2	-1.8	-1.4	-1.8	-1.4	4.8	5.1	4.7	5.1		1.4	1.5	1.4	1.5
48	2302-CF		0.1	0.3	0.0	0.3	0.1	0.4	0.1	0.5	-0.1	-0.5	-0.1	-0.5		0.5	0.6	0.5	0.6
49	2302-CF		0.0	0.3	-0.1	0.2	-0.4	0.0	-0.4	0.0	1.7	1.0	1.7	1.0		-0.1	-0.4	-0.1	-0.4
50	2302-CF															-0.3	-0.4	-0.3	-0.4
52	2302-CF		0.0	-0.4	0.2	-0.3	-0.1	-0.9	0.1	-0.7	0.6	0.8	0.9	1.2		1.1	1.2	1.4	1.6
54	2302-CF		-0.9	0.0	0.6	-0.7	-1.4	-0.6	-0.2	-1.2	1.1	3.0	4.5	1.4		-0.2	-0.1	0.0	0.1
56	2302-CF		4.2	4.4	4.1	4.3	0.9	1.1	0.9	1.1	18.4	17.6	18.5	17.8					
57	2302-CF		2.0	0.8	1.9	0.8	2.4	0.8	2.4	0.8	0.3	0.5	0.3	0.5		0.1	0.2	0.0	0.2
58	2302-CF		0.7	1.1	0.2	0.8	0.9	1.4	0.5	0.9	-0.5	-0.3	-0.3	-0.1					
61	2302-CF		-0.1	0.3	-0.1	0.4	0.4	0.8	0.4	0.8	-2.2	-2.0	-1.8	-1.6		-0.4	-0.3	-0.4	-0.3
62	2302-CF		0.3	0.8	0.2	0.7	0.3	0.7	0.3	0.7	0.6	0.8	0.4	0.7					
64	2302-CF		-0.2	-0.6	-0.1	-0.6	-0.8	-0.6	-0.6	-0.6	2.3	-0.8	2.5	-0.7		-0.6	-0.7	-0.6	-0.5
65	2302-CF															-0.6	-0.6	-0.6	-0.6
66	2302-CF		1.3	1.5	1.2	1.4	1.2	1.4	1.2	1.3	1.7	1.9	1.7	2.0		0.1	0.2	0.1	0.2
67	2302-CF		-1.8	-1.4	-1.9	-1.4	-1.8	-1.5	-1.8	-1.4	-1.6	-1.5	-1.7	-1.5		1.3	1.4	1.3	1.4
68	2302-CF		0.5	0.3	0.5	0.3	0.1	-0.2	0.0	-0.2	2.9	2.3	2.9	2.3		0.8	0.9	0.8	0.9
69	2302-CF		-0.2	0.2	-0.3	0.2	-0.3	0.1	-0.2	0.2	0.1	0.2	-0.2	0.1		1.0	1.1	1.0	1.1
70	2302-CF		-0.5	-0.1	-0.6	-0.1	-0.6	-0.2	-0.6	-0.1	-0.2	-0.1	-0.2	0.1		-0.1	0.0	-0.1	0.1
71	2302-CF		10.4	-1.6	10.3	-1.7	10.3	-0.1	10.2	-0.1	10.9	-8.3	10.9	-8.3		-0.3	-0.2	-0.3	-0.2
72	2302-CF															1.1	0.9	1.1	0.9
73	2302-CF		-0.1	-0.8	-0.2	-0.8	-0.3	-0.8	-0.3	-0.8	0.6	-0.9	0.6	-0.9		-0.3	-0.2	-0.3	-0.2
74	2302-CF																		
75	2302-CF		40.6	41.5	40.1	41.5	50.5	53.1	50.4	53.2	-2.2	-8.3	-2.0	-8.3		-4.4	-4.4	-4.4	-4.4
77	2302-CF															0.4	0.1	0.4	0.1
78	2302-CF		-1.8	-1.4	-1.9	-1.5	-1.9	-1.6	-2.0	-1.6	-1.1	-0.9	-1.1	-0.9		-0.5	-0.4	-0.5	-0.4
81	2302-CF		2.8	4.0	3.2	3.2	2.1	3.4	2.7	2.6	5.4	5.7	5.4	5.8		5.5	5.6	5.6	5.4
82	2302-CF		7.3	7.4	7.2	7.3	3.0	3.0	3.1	3.0	25.5	25.2	25.5	25.4		1.4	1.2	1.4	1.2
83	2302-CF		-0.4	-0.5	-0.5	-0.5	-0.6	-0.9	-0.6	-0.9	0.7	0.9	0.7	0.9		0.8	0.9	0.8	0.9
84	2302-CF		0.2	0.6	0.2	0.6	0.6	0.8	0.6	0.9	-0.9	-0.5	-0.8	-0.6		0.0	0.1	0.0	0.1
85	2302-CF															0.1	0.2	0.1	0.2
86	2302-CF		0.2	0.6	0.1	0.6	0.1	0.5	0.1	0.5	0.6	0.8	0.6	0.8		1.4	1.5	1.4	1.5
87	2302-CF		0.8	0.9	0.6	0.9	0.8	0.9	0.8	0.9	0.7	0.9	0.7	1.0		0.2	0.3	0.2	0.3
89	2302-CF		0.7	0.4	0.5	0.4	0.4	0.5	0.4	0.5	1.4	-0.2	1.3	-0.1		-0.1	-0.2	-0.1	-0.2
90	2302-CF		18.0	18.1	17.8	18.0	-0.9	-1.7	-0.9	-1.8	98.9	100.8	98.9	101.4		-1.5	-1.4	-1.5	-1.4
91	2302-CF		-0.9	-0.3	-0.9	-0.6	-0.8	-0.1	-0.6	-0.4	-1.6	-1.5	-1.7	-1.6		0.0	0.1	0.1	0.2

EURL Proficiency Study on the Determination of PCDD/Fs, PCBs, PBDEs, HBCDDs and PFASs in Compound Feed 2023 [EURL-PT-POP_2302-CF]
EURL for halogenated Persistent Organic Pollutants (POPs) in Feed and Food

Compound Feed (2302-CF)
Sum parameters - Z-scores

LC	Sample	Z-score [σ_p = 10 %]	WHO-PCDD/F-PCB-TEQ reported		WHO-PCDD/F-PCB-TEQ calculated		WHO-PCDD/F-TEQ reported		WHO-PCDD/F-TEQ calculated		WHO-PCB-TEQ reported		WHO-PCB-TEQ calculated		Z-score [σ_p = 15 %]	Sum Indicator PCBs reported		Sum Indicator PCBs calculated	
			upper bound	lower bound	upper bound	lower bound	upper bound	lower bound	upper bound	lower bound	upper bound	lower bound	upper bound	lower bound		upper bound	lower bound	upper bound	lower bound
93	2302-CF		0.1	0.5	-0.1	0.5	-0.1	0.3	-0.1	0.3	0.7	0.9	0.7	0.9		-0.8	-0.7	-0.8	-0.7
94	2302-CF		-0.9	-0.4	-0.9	-0.5	-1.1	-0.7	-1.1	-0.7	0.3	0.5	0.3	0.5		0.2	0.3	0.2	0.3
95	2302-CF		-1.4	-1.0	-1.7	-1.3	-1.5	-1.2	-1.5	-1.1	-0.8	-0.7	-2.3	-2.2		-1.2	-1.1	5474.8	5563.2
96	2302-CF		-1.6	-1.2	-1.6	-1.2	-1.8	-1.5	-1.8	-1.5	-0.5	-0.3	-0.3	-0.1		-1.2	-1.1	-1.2	-1.1
97	2302-CF															-0.8	-0.9	-0.8	-0.8
99	2302-CF		0.3	0.7	0.2	0.7	0.2	0.7	0.2	0.7	0.6	0.7	0.5	0.7		-0.3	-0.2	-0.3	-0.2
100	2302-CF															-0.9	-1.5	-0.9	-1.5
101	2302-CF		0.3	0.8	0.2	0.8	0.6	1.0	0.6	1.1	-0.7	-0.6	-0.7	-0.5					
102	2302-CF		-3.1	-3.1	-2.4	-3.1	-3.1	-3.1	-2.2	-3.1	-3.1	-3.0	-2.7	-3.0					
103	2302-CF		2.3	2.4	2.2	2.5	2.5	2.5	2.4	2.8	1.7	1.9	1.8	1.3		1.0	1.1	1.0	1.1
104	2302-CF															-1.3	-1.3	-1.3	-1.2
105	2302-CF		0.5	0.3	0.4	0.3	0.4	0.4	0.4	0.5	1.2	-0.4	1.2	-0.3		0.2	0.1	0.2	0.1
106	2302-CF																		
107	2302-CF															0.2	-0.1	0.2	-0.1
109	2302-CF		-0.1	0.4	-0.2	0.3	-0.1	0.3	-0.1	0.3	0.2	0.3	0.2	0.4		-0.8	-0.8	-0.8	-0.8
110	2302-CF		-1.2	-0.9	0.4	1.0	0.8	1.2	0.8	1.2	-0.4	-0.3	-0.4	-0.2		-0.5	-0.5	-0.6	-0.5
111	2302-CF		-1.2	-0.9	-1.3	-0.9	-1.2	-1.0	-1.3	-1.0	-0.8	-0.7	-0.8	-0.6		0.5	0.6	0.5	0.6
113	2302-CF															-0.1	-0.4	-0.1	-0.4
114	2302-CF		-1.7	-1.4	-0.9	-1.9	-1.9	-1.6	-1.4	-2.2	-0.7	-0.6	1.5	-1.0		1.5	1.6	1.4	1.6
115	2302-CF		-1.1	-1.1	-1.2	-1.1	-1.2	-1.3	-1.2	-1.2	-0.7	-0.6	-0.7	-0.5		-0.7	-0.6	-0.7	-0.6
116	2302-CF															0.5	0.0	0.3	0.1
117	2302-CF		0.5	1.0	0.8	1.3	0.2	0.6	0.5	1.0	2.1	2.3	2.5	2.7		-4.5	-4.5	-4.5	-4.5
5A	2302-CF															-0.6	-0.6	-0.3	-0.3
16A	2302-CF															0.2	0.0	0.2	0.0
38A	2302-CF		-1.7	-1.4	-1.8	-1.4	-1.9	-1.6	-1.9	-1.6	-0.9	-0.8	-0.9	-0.7		0.0	0.1	0.0	0.1
61A	2302-CF															0.0	-0.6	0.0	-0.6
106A	2302-CF																		
95*	2302-CF		-1.4	-1.0	-1.5	-1.0	-1.5	-1.2	-1.5	-1.1	-0.8	-0.7	-0.8	-0.7		-1.2	-1.1	-1.2	-1.1

EURL Proficiency Study on the Determination of PCDD/Fs, PCBs, PBDEs, HBCDDs and PFASs in Compound Feed 2023 [EURL-PT-POP_2302-CF]
EURL for halogenated Persistent Organic Pollutants (POPs) in Feed and Food

Compound Feed (2302-CF)
PCDD/F - Z-scores

LC	Sample	Z-score [σ_p = 10 %]	WHO-PCDD/F-TEQ reported		WHO-PCDD/F-TEQ calculated		Z-score [σ_p = 20 %]	2,3,7,8-TCDD	1,2,3,7,8-PeCDD	1,2,3,4,7,8-HxCDD	1,2,3,6,7,8-HxCDD	1,2,3,7,8,9-HxCDD	1,2,3,4,6,7,8-HpCDD	OCDD	2,3,7,8-TCDF	1,2,3,7,8-PeCDF	2,3,4,7,8-PeCDF	1,2,3,4,7,8-HxCDF	1,2,3,6,7,8-HxCDF	2,3,4,6,7,8-HxCDF	1,2,3,7,8,9-HxCDF	1,2,3,4,6,7,8-HpCDF	1,2,3,4,7,8,9-HpCDF	OCDF
			upper bound	lower bound	upper bound	lower bound																		
1	2302-CF																							
2	2302-CF		-0.3	0.0	-0.3	0.0			-0.1		-0.4	-0.5	-0.1	-0.1	0.0	0.1	-0.1	0.0	0.1	0.6		0.2	0.1	-0.2
3	2302-CF		0.6	-1.2	0.6	-1.2							-0.5	-0.7	0.0	-0.2	-0.6	1.9	-0.2	0.9		-0.3	-0.1	0.0
5	2302-CF																							
7	2302-CF		2.0	2.5	2.0	2.6			1.3		0.8	0.5	0.9	1.0	1.3	0.8	1.0	0.9	1.2	1.8		1.3	1.2	1.1
8	2302-CF																							
9	2302-CF		5.2	-0.3	5.2	-0.2							-0.3	-0.7	-0.7	-0.2	0.8	0.0	-0.6	-0.4		-0.3	-0.4	-0.5
10	2302-CF																							
11	2302-CF		-0.4	0.0	-0.4	0.1			-0.5		-0.2	-1.0	-0.1	0.2	0.0	0.2	-0.2	0.2	-0.2	0.6		-0.1	0.2	-0.7
12	2302-CF		0.7	-0.5	0.7	-0.5							1.0	-0.5	0.3	0.2	0.2	-0.2	-0.1	-0.1		-0.8	1.1	-0.4
13	2302-CF		-0.8	-0.4	-0.8	-0.3			-0.8		0.2	0.2	-1.5	-0.5	0.0	-0.4	-0.2	-0.2	-0.4	-1.2		-0.4	-0.3	-0.5
14	2302-CF		-0.5	-0.3	-0.5	-0.2			-0.1		-0.5	-1.1	-0.2	-0.3	-0.4	-0.5	0.0	0.1	0.1	0.0		0.1	0.6	0.3
15	2302-CF																							
16	2302-CF																							
17	2302-CF		-0.6	-0.2	-0.6	-0.2			0.1		-0.3	-0.4	0.1	0.2	-0.2	-0.3	-0.3	0.2	0.1	-1.3		0.1	0.1	-0.1
18	2302-CF		-0.7	-0.4	-0.8	-0.3			-0.6		-0.1	0.2	0.0	0.3	-0.4	-0.2	-0.5	0.2	0.2	-0.2		-0.2	0.3	0.3
20	2302-CF		0.8	-0.6	0.8	-0.6								-0.8	0.5	0.8	0.5	-1.3	-0.8	0.9		-0.2	-0.7	-0.6
21	2302-CF		0.9	1.2	0.9	1.2			-0.5		0.7		0.4	-0.2	0.8	0.3	0.6	0.2	0.1	0.1		0.4	0.3	1.5
22	2302-CF		-0.5	-1.8	-1.3	-0.9			-1.2		-2.6	-3.3	-0.8	0.5	-0.2	-1.2	-0.4	-1.2	-1.1	0.2		-1.2	-1.6	3.8
23	2302-CF		-0.4	-1.9	-0.4	-1.9							-1.4	-1.2	-0.4	-1.1	-0.1	-1.7	-1.5	-2.7		-1.6	-2.1	-1.7
24	2302-CF		-0.1	0.3	-0.1	0.4			0.9		0.7	0.1	0.5	0.4	0.0	-0.2	-0.2	0.1	-0.2	0.6		-0.8	0.4	0.7
25	2302-CF		-0.8	-0.9	-0.8	-0.8					-0.5	0.5	0.8	0.6	-0.2	0.0	-0.5	0.1	-0.2	-1.1		0.0	-0.3	0.3
26	2302-CF		-0.7	-0.6	-0.7	-0.6			-0.3		-0.6	-1.2	-0.9	-1.2	-0.4	-0.1	-0.1	-0.3	-0.4	-1.3		-0.7	-0.8	-1.2
27	2302-CF		0.8	0.4	0.8	0.5			1.0		0.5	0.8	0.4	0.6	0.3	0.4	-0.1	0.3	0.5	-2.4		0.7	0.7	0.4
28	2302-CF		4.4	2.7	4.4	2.7					8.1	7.1	2.3	3.4	0.5		1.7	3.2	2.4	0.7		3.3	2.0	1.6
29	2302-CF		0.5	-0.5	0.5	-0.5					0.0		0.1	0.6	0.2	0.1	0.0	0.0	-0.2	1.1		0.3	0.0	-0.2
31	2302-CF		0.2	0.6	0.2	0.6			-0.4		-0.2	-2.7	0.1	-0.2	0.5	0.3	0.4	-0.1	-0.1	1.1		-0.4	-0.5	-0.4
32	2302-CF		-0.1	0.3	-0.1	0.4			1.6		0.1	3.1	0.2	0.4	0.2	0.0	-0.1	-0.2	-0.4	0.5		0.0	-1.0	-1.7
33	2302-CF		-0.4		-0.4	-0.8			-0.5				-0.8	-0.1	0.0	-0.8	-0.4	0.0	-0.2	-3.1		-0.7	0.5	-0.1
34	2302-CF		1.4	-0.1	1.4	-0.2			0.7				-0.1		0.0	-0.2	0.1	0.0	-0.2	0.6		0.1	0.3	
35	2302-CF		2.0	2.5	2.0	2.6			1.3	0.3	0.0	0.1	0.0		0.9	1.7	1.5	0.7	0.4	1.1		0.7	0.9	0.5
36	2302-CF		0.0	0.2	0.0	-0.1			-0.1	-0.3		-0.5	-0.3		0.1	0.2	0.0	0.1	0.0	0.9		0.0	0.2	0.0
37	2302-CF		-3.9	-4.0	-4.0	-4.0			-1.4	-2.8		-1.3	-2.1		-1.7	-1.6	-2.4	-1.2	-2.6	-3.2		-1.2	-1.7	-1.8
38	2302-CF		-1.0	-0.7	-1.1	-0.8			-0.2	0.1	-1.0	0.0	-0.1		-0.5	0.2	-0.6	-0.3	0.6	-1.0		0.5	0.5	0.4
39	2302-CF		1.9	1.4	1.8	1.3				1.2	0.8	1.8	1.6		1.0	2.0	0.5	1.4	1.6	1.8		2.3	2.2	2.2
40	2302-CF		1.0	0.7	1.0	0.7			0.8	-0.6	0.4	-0.6	-0.8		0.1	-0.9	0.6	-0.1	-0.5	0.7		0.0	-0.5	1.8
42	2302-CF																							
43	2302-CF		-0.5	-0.1	-0.5	-0.1			0.6	0.6	0.3	0.2	0.5		-0.5	-0.3	-0.3	0.1	-0.2	-0.2		-0.1	0.2	-0.3
44	2302-CF		-0.2	0.2	-0.2	0.2			0.5	-0.5	-0.9	-0.1	0.3		0.0	0.0	0.2	-0.4	0.1	-0.8		0.4	0.5	0.7
46	2302-CF		-1.8	-1.4	-1.8	-1.4			-0.6	-0.8	-0.8	-0.2	0.0		-0.5	-0.6	-1.0	-0.5	-0.1	-1.7		-0.7	-0.8	-0.3
48	2302-CF		0.1	0.4	0.1	0.5			1.6	0.5	1.4	0.4	0.6		0.9	0.0	-0.4	0.7	0.6	-0.9		0.6	1.1	0.4
49	2302-CF		-0.4	0.0	-0.4	0.0			0.9	0.1	-0.2	-0.4	-0.7		-0.7	-0.8	-0.1	0.0	-0.3	-2.4		-0.2	-0.2	-0.2
50	2302-CF																							
52	2302-CF		-0.1	-0.9	0.1	-0.7				-0.6		0.5	-0.6		0.0	1.3	-0.2	-1.0	1.5	2.8		0.1	-0.7	0.2
54	2302-CF		-1.4	-0.6	-0.2	-1.2				-0.6		0.9	-0.6		-1.0	-0.8	-0.1	-0.5	-0.5	0.4		-0.6	-1.0	-1.2
56	2302-CF		0.9	1.1	0.9	1.1			-0.5	0.1	0.0	0.0			0.8	0.5	0.6	0.3	0.4	1.2		0.1	0.0	-0.1
57	2302-CF		2.4	0.8	2.4	0.8				1.4		1.7	3.8		0.0	1.5	1.1	0.4	0.2	0.3		-0.1	0.2	1.3
58	2302-CF		0.9	1.4	0.5	0.9			3.5	0.1	-0.5	0.2	0.7		0.1	1.0	0.6	-4.5	0.6	1.4		0.5	0.4	0.4
61	2302-CF		0.4	0.8	0.4	0.8			0.2	-0.4	-0.9	1.7	0.9		0.2	0.2	0.5	-0.5	-0.7	-0.2		-1.1	-1.1	-1.3
62	2302-CF		0.3	0.7	0.3	0.7			-0.5	-0.6	0.0	0.6	1.2		0.0	0.4	0.2	0.4	0.5	1.1		0.4	0.1	1.0
64	2302-CF		-0.8	-0.6	-0.6	-0.6			-0.1	-1.4		2.9	2.6		-1.2	0.2	-0.4	1.3	-0.2	-0.3		0.1	0.1	0.5
65	2302-CF																							
66	2302-CF		1.2	1.4	1.2	1.3			0.4	0.8	-0.3	0.7	0.5		0.5	0.9	0.4	1.0	1.4	1.4		1.1	1.0	1.0
67	2302-CF		-1.8	-1.5	-1.8	-1.4			-1.7	-3.8	-1.1	-0.8	-0.5		-0.4	-0.6	-0.2	-2.2	-1.6	-1.8		-1.4	-1.3	-0.7
68	2302-CF		0.1	-0.2	0.0	-0.2			1.8	1.1	3.5	-0.4	-1.0		-0.3	-0.1	-0.2	-0.3	-0.2	-1.4		-0.2	0.2	-0.4
69	2302-CF		-0.3	0.1	-0.2	0.2			-0.1	0.2	-1.0	-0.3	-0.1		0.0	0.1	-0.1	0.1	0.1	0.8		0.3	0.2	0.1
70	2302-CF		-0.6	-0.2	-0.6	-0.1			1.9	2.2	0.9	-0.1	0.5		-0.6	0.0	-0.5	-0.1	-0.2	-1.3		-0.1	0.2	-0.4
71	2302-CF		10.3	-0.1	10.2	-0.1							1.8		1.9		0.6	0.9	2.1			-0.1		-1.2
72	2302-CF																							
73	2302-CF		-0.3	-0.8	-0.3	-0.8			-0.5			-0.4	0.1		0.0	-0.2	-0.6	-0.3	0.0	0.6		0.5	0.1	0.1
74	2302-CF																							
75	2302-CF		50.5	53.1	50.4	53.2			60.6	31.8	1895.0	6.9	9.0		4.8	5.6	6.3	13.9	10.3	0.6		-0.2	3.7	4.4
77	2302-CF																							
78	2302-CF		-1.9	-1.6	-2.0	-1.6			-1.6	-0.6	-1.0	-1.1	-1.2		-1.2	-1.3	-0.7	-1.0	-1.1	-0.5		-1.1	-1.5	-1.4
81	2302-CF		2.1	3.4	2.7	2.6				1.4		-0.4	0.5		5.6	1.9	0.1	1.8	0.7	5.2		0.3	-1.6	1.7
82	2302-CF		3.0	3.0	3.1	3.0			3.4	1.9	1.0	2.1	2.3		1.0	1.6	1.1	1.8	1.9	2.0		2.2	2.1	5.2
83	2302-CF		-0.6	-0.9	-0.6	-0.9				-1.6		0.2	-0.2		0.3	-0.6	-0.2	0.2	0.0	-1.1		0.5	0.2	0.5
84	2302-CF		0.6	0.8	0.6	0.9			-0.4	0.1	-0.1	1.0	0.7		0.5	0.7	0.3	0.5	0.5	0.6		1.3	0.9	0.8
85	2302-CF																							
86	2302-CF		0.1	0.5	0.1	0.5			0.6	0.7	1.7	-0.1	0.6		-0.2	1.1	0.3	0.0	0.4	-1.1		0.2	-0.2	-3.3
87	2302-CF		0.8	0.9	0.8	0.9			1.7	0.1	2.7	0.2	-0.1		0.7	0.9	0.1	0.7	0.4	1.4		1.1	1.0	0.7
89	2302-CF		0.4	0.5	0.4	0.5			0.0	0.0		-0.6	-0.3		0.1	-0.5	0.4	0.0	0.2	0.2		-0.3	0.1	-0.3
90	2302-CF		-0.9	-1.7	-0.9	-1.8				-1.3	0.0	-1.9	-1.3		-0.6	-2.2	-0.2	-1.5	-1.8	-3.8		-1.3	-1.9	-1.4
91	2302-CF		-0.8	-0.1	-0.6	-0.4			0.1	-1.8		3.0	0.2		0.0	0.0	-0.2	-0.7	0.0	-1.1		0.1	0.2	1.0

EURL Proficiency Study on the Determination of PCDD/Fs, PCBs, PBDEs, HBCDDs and PFASs in Compound Feed 2023 [EURL-PT-POP_2302-CF]
EURL for halogenated Persistent Organic Pollutants (POPs) in Feed and Food

Compound Feed (2302-CF)
PCDD/F - Z-scores

LC	Sample	Z-score [σ_p = 10 %]	WHO-PCDD/F-TEQ reported		WHO-PCDD/F-TEQ calculated		Z-score [σ_p = 20 %]	2,3,7,8-TCDD	1,2,3,7,8-PeCDD	1,2,3,4,7,8-HxCDD	1,2,3,6,7,8-HxCDD	1,2,3,7,8,9-HxCDD	1,2,3,4,6,7,8-HpCDD	OCDD	2,3,7,8-TCDF	1,2,3,7,8-PeCDF	2,3,4,7,8-PeCDF	1,2,3,4,7,8-HxCDF	1,2,3,6,7,8-HxCDF	2,3,4,6,7,8-HxCDF	1,2,3,7,8,9-HxCDF	1,2,3,4,6,7,8-HpCDF	1,2,3,4,7,8,9-HpCDF	OCDF
			upper bound	lower bound	upper bound	lower bound																		
93	2302-CF		-0.1	0.3	-0.1	0.3			-0.8		-0.6	1.3	-0.3	-0.2	0.0	-0.3	0.2	-0.1	-0.3	0.3		0.5	-0.4	-1.6
94	2302-CF		-1.1	-0.7	-1.1	-0.7			-0.9		-0.8	0.3	-0.4	-0.2	-0.3	-0.3	-0.6	-0.1	0.0	0.9		0.3	0.3	0.3
95	2302-CF		-1.5	-1.2	-1.5	-1.1			-2.5		-0.8	-0.3	-0.6	-0.6	-0.7	-1.0	-0.6	-0.7	-0.7	0.1		-0.2	-0.4	-0.4
96	2302-CF		-1.8	-1.5	-1.8	-1.5			0.4		-0.8	-1.3	0.5	0.6	-1.3	-1.3	-0.9	-0.7	-1.1	-0.3		-0.7	-1.0	-1.3
97	2302-CF																							
99	2302-CF		0.2	0.7	0.2	0.7			-0.1		-0.1	0.1	-0.4	-0.1	0.0	0.0	0.4	0.0	0.0	0.5		0.2	0.0	-0.1
100	2302-CF																							
101	2302-CF		0.6	1.0	0.6	1.1			0.3		0.7	0.3	0.8	0.6	0.2	0.3	0.3	0.5	0.7	1.0		0.3	0.5	0.3
102	2302-CF		-3.1	-3.1	-2.2	-3.1					-1.5		-2.4	-1.5	-2.5	-1.2	-1.2	0.8	-0.7	-1.6		0.1		-0.5
103	2302-CF		2.5	2.5	2.4	2.8			0.8		1.3		4.2	2.8	-0.1	1.9	1.6	2.1	2.3	-1.8		0.3	0.8	0.9
104	2302-CF																							
105	2302-CF		0.4	0.4	0.4	0.5			-0.7		0.5		0.2	0.3	0.6	0.4	0.0	0.5	0.4	1.4		0.5	0.8	0.4
106	2302-CF																							
107	2302-CF																							
109	2302-CF		-0.1	0.3	-0.1	0.3			0.0		-0.4	0.0	0.3	0.8	0.2	-0.2	0.0	-0.1	-0.5	0.3		-0.2	-0.5	-0.1
110	2302-CF		0.8	1.2	0.8	1.2			0.2		-0.1	1.5	0.2	0.3	0.7	0.2	0.6	0.4	0.2	-1.0		0.1	0.2	0.0
111	2302-CF		-1.2	-1.0	-1.3	-1.0			-1.2		-0.4	-0.6	-0.2	-0.4	-0.5	-0.4	-0.5	-0.2	0.2	-1.0		0.1	0.6	0.1
113	2302-CF																							
114	2302-CF		-1.9	-1.6	-1.4	-2.2							-0.8	-0.5	-0.4	-0.9	-0.6	-0.8	-1.0	-2.1		-0.6	-1.2	-0.4
115	2302-CF		-1.2	-1.3	-1.2	-1.2			1.5		-1.3	-0.4	-0.8	-1.2	-0.4	-1.2	-0.6	-1.4	-1.0	-1.2		-0.9	-1.2	-2.8
116	2302-CF																							
117	2302-CF		0.2	0.6	0.5	1.0			0.7		0.1	1.0	0.1	0.0	1.0	0.8	0.0	-0.2	0.1	-1.6		-0.1	-0.4	2.0
5A	2302-CF																							
16A	2302-CF																							
38A	2302-CF		-1.9	-1.6	-1.9	-1.6			-1.6		-0.8	-1.1	-0.8	-0.8	-0.5	-0.6	-0.9	-0.6	-0.5	-0.7		-0.4	-0.2	-0.4
61A	2302-CF																							
106A	2302-CF																							

EURL Proficiency Study on the Determination of PCDD/Fs, PCBs, PBDEs, HBCDDs and PFASs in Compound Feed 2023 [EURL-PT-POP_2302-CF]
EURL for halogenated Persistent Organic Pollutants (POPs) in Feed and Food

Compound Feed (2302-CF)
Dioxin-like PCB - Z-scores

LC	Sample	Z-score [σ_p = 10 %]	WHO-PCB-TEQ reported upper bound	WHO-PCB-TEQ reported lower bound	WHO-PCB-TEQ calculated upper bound	WHO-PCB-TEQ calculated lower bound	Z-score [σ_p = 20 %]	PCB 105	PCB 114	PCB 118	PCB 123	PCB 156	PCB 157	PCB 167	PCB 189	PCB 77	PCB 81	PCB 126	PCB 169
1	2302-CF																		
2	2302-CF		0.4	0.6	0.4	0.7		-0.2	0.7	0.0		-0.2	0.0	-0.7	-0.2	0.4	-0.5	0.4	0.0
3	2302-CF		0.6	-8.4	0.4	-8.4		-0.7	3.6	-0.9		-0.2	0.4	0.4	0.0	-1.2			
5	2302-CF																		
7	2302-CF		1.5	1.6	1.5	1.7		0.0	1.4	0.0		0.1	0.0	-0.1	0.0	0.6	0.9	1.0	0.6
8	2302-CF																		
9	2302-CF		-1.1	-0.9	-1.1	-0.9		-0.5	-0.6	-0.2		0.4	1.0	1.0	0.1	-0.6	-1.3	-0.6	-0.4
10	2302-CF																		
11	2302-CF		-0.2	-0.1	-0.2	0.0		0.0	-0.3	0.0		0.3	0.0	0.1	0.3	0.7	0.4	-0.1	0.6
12	2302-CF		-1.8	-1.7	-1.8	-1.7		-3.0	-4.0	-2.4		-0.5	0.9	-2.4	-0.6	0.0	4.1	-0.9	2.3
13	2302-CF		1.9	2.1	1.9	2.2		2.3	1.1	1.0		0.2	2.0	0.3	0.3	0.8	1.6	1.1	-0.3
14	2302-CF		-0.5	-0.3	-0.6	-0.3		-0.1	-0.8	-0.1		0.0	-0.5	0.3	-0.1	-0.5	-0.2	-0.2	-0.4
15	2302-CF																		
16	2302-CF																		
17	2302-CF		-0.2	-0.1	-0.2	0.0		-0.4	-1.4	-0.1		-0.1	-0.2	-0.5	-0.1	-0.3	-0.4	0.0	-0.1
18	2302-CF		-1.2	-1.0	-1.2	-1.0		-0.3	0.4	-0.1		-0.3	4.0	-0.2	-0.1	-0.1	-1.2	-0.7	-0.1
20	2302-CF		4.5	4.4	4.5	4.6		0.6		1.2		0.7		1.2				2.7	0.6
21	2302-CF		-1.1	-0.9	-1.0	-1.1		-0.7	-0.1	-0.8		-1.0	-0.6	-0.5	-0.7		-0.5	-0.5	-0.4
22	2302-CF		-0.7	-8.4	-2.7	-2.7		-0.6	-2.5	0.6		-0.4	-2.8	-1.1	-1.6	-1.6		-1.6	-2.4
23	2302-CF		-1.9	-1.9	-1.9	-1.8		-0.2		-0.6		-0.7		-0.4	-0.6	-0.7	-1.1	-1.1	0.4
24	2302-CF		0.6	0.8	0.8	1.1		-0.2	-0.2	-0.1		0.1	0.2	0.0	-0.1	-0.3	-0.1	0.6	0.7
25	2302-CF		0.0	0.2	0.0	0.2		-0.2	-0.4	0.1		0.0	0.2	1.6	0.2	0.1	0.3	0.0	0.1
26	2302-CF		-2.0	-1.8	-2.0	-1.8		0.0	-1.9	-0.8		-0.6	-1.1	-1.0	-0.8	-1.1	-0.3	-1.0	0.0
27	2302-CF		0.1	0.2	-0.1	0.1		0.0		-0.2		0.1	0.2	1.6	-0.4	0.2	0.4	0.0	0.2
28	2302-CF		-4.5	-8.0	-4.5	-8.0		-0.1		-0.1		0.2	0.7	8.3	-0.4	0.6	22.5		
29	2302-CF		1.5	-0.2	1.5	-0.2		-0.4		-0.4		0.0	-0.5	-0.2	-0.1			0.3	
31	2302-CF		1.0	1.2	1.0	1.3		0.8	0.9	0.1		-0.6	-0.2	0.1	0.3	0.6	0.5	0.7	0.7
32	2302-CF		5.5	5.8	5.5	5.9		1.9	-0.2	0.6		1.4	1.5	3.2	1.7	4.5	4.5	3.3	2.3
33	2302-CF		0.6		0.6	-0.6		-0.7	-0.4	0.1		-0.6	-1.1	1.4	-0.6	-0.5		-0.1	
34	2302-CF		-0.5	-1.5	-0.5	-1.5		-0.6		-0.5		-0.4		-0.1		-0.6		-0.5	
35	2302-CF		-0.2	0.0	-0.2	0.1		0.2	-0.3	-0.5		-0.3	-0.1	-0.2	-0.3	-0.2	0.4	0.1	0.0
36	2302-CF		-0.2	-0.1	-0.3	-0.1		-0.4		-0.3		0.1	-0.3	-0.9	-0.5	0.0		0.0	-0.2
37	2302-CF		4.6	4.8	4.6	4.9		-1.0	-2.5	0.6		-0.2	-1.2	-1.2	-0.9	-2.8		3.3	-2.0
38	2302-CF		-0.9	-0.8	-0.9	-0.7		-0.6	-0.7	-0.6		-0.6	-0.7	-0.4	-0.6	0.3	0.2	-0.3	-0.7
39	2302-CF		-0.5	-0.3	-0.2	0.0		0.6	0.8	0.1		0.2	0.4	0.4	0.3	0.6	0.0	-0.1	0.3
40	2302-CF		0.2	0.4	0.2	0.5		0.3	2.3	0.1		-1.0	-0.4	-0.7	0.1	0.3	-1.9	0.3	-0.6
42	2302-CF																		
43	2302-CF		-1.5	-1.4	-1.5	-1.3		0.3	-0.2	0.6		0.4	0.5	0.6	0.0	1.2		-1.0	0.1
44	2302-CF		0.2	0.4	0.2	0.5		1.6	15.1	0.5		0.6	1.1	0.4	0.6	-0.2	0.2	0.1	-0.2
46	2302-CF		4.8	5.1	4.7	5.1		0.5	-0.5	0.7		0.1	0.3	0.4	0.3	-0.2	-1.0	3.2	-1.6
48	2302-CF		-0.1	-0.5	-0.1	-0.5		0.9	0.9	-0.5		0.3	0.2	1.8	0.4	3.0	3.8	0.0	
49	2302-CF		1.7	1.0	1.7	1.0			13.1	1.5		0.4	0.8	0.4	-0.1		8.3	0.6	-0.9
50	2302-CF																		
52	2302-CF		0.6	0.8	0.9	1.2		-0.4	0.5	-0.5		-0.9	-0.4	0.0	-0.6	-0.9	-1.1	1.0	-1.9
54	2302-CF		1.1	3.0	4.5	1.4		0.6		0.7		0.4	1.0	0.8	0.7	0.0		1.0	
56	2302-CF		18.4	17.6	18.5	17.8		0.2		0.6		0.8	0.0	0.6	0.5	0.3		11.8	
57	2302-CF		0.3	0.5	0.3	0.5		0.6	1.4	0.5		0.0	-0.2	-0.2	0.2	0.1	-0.1	0.1	-0.1
58	2302-CF		-0.5	-0.3	-0.3	-0.1		0.1	6.0	-1.0		-0.5	-0.3	-0.7	-1.1	0.2	0.4	0.0	0.3
61	2302-CF		-2.2	-2.0	-1.8	-1.6		-1.2	0.0	-1.7		-1.5	-1.0	-1.2	-1.1	-1.0	-0.5	-0.7	-0.4
62	2302-CF		0.6	0.8	0.4	0.7		0.2	4.5	0.4		1.0	0.0	0.1	0.8	0.5	0.3	0.2	0.4
64	2302-CF		2.3	-0.8	2.5	-0.7		0.3		-0.4		0.3	0.4	-0.7	-0.3	0.3		-0.1	
65	2302-CF																		
66	2302-CF		1.7	1.9	1.7	2.0		0.5	0.9	0.4		0.2	0.3	0.1	0.0	1.3		1.2	0.0
67	2302-CF		-1.6	-1.5	-1.7	-1.5		0.9	1.1	0.7		0.4	78.1	0.7	1.2	-1.1	-1.5	-1.4	-1.3
68	2302-CF		2.9	2.3	2.9	2.3		0.2	0.1	1.3		1.1	1.1	1.2	0.2	1.7		1.6	
69	2302-CF		0.1	0.2	-0.2	0.1		0.9	0.2	1.4		1.0	1.4	0.4	1.3	-0.3	-0.3	-0.3	-0.2
70	2302-CF		-0.2	-0.1	-0.2	0.1		-0.5	-1.2	-0.2		-0.4	-0.8	-0.2	0.5	0.0	0.0	0.0	0.4
71	2302-CF		10.9	-8.3	10.9	-8.3		-0.4		-0.2		-0.7		0.4	0.3				
72	2302-CF																		
73	2302-CF		0.6	-0.9	0.6	-0.9		0.9	1.8	-0.3		0.4	-0.1	-0.1	0.2	1.1		-0.3	
74	2302-CF																		
75	2302-CF		-2.2	-8.3	-2.0	-8.3			35.3	-4.8		-3.7			17.2	22.6	856.7		
77	2302-CF																		
78	2302-CF		-1.1	-0.9	-1.1	-0.9		-0.4		-0.5		-0.2	-1.2	-0.6	0.8	-0.5	-0.5	-0.5	-0.6
81	2302-CF		5.4	5.7	5.4	5.8		8.8	215.1	9.7		1.0	2.5	0.5	1.2	0.3	1.0	1.6	1.4
82	2302-CF		25.5	25.2	25.5	25.4		-0.1	-0.1	0.3		-0.3	-0.4	-0.2	-0.4	0.6		16.9	
83	2302-CF		0.7	0.9	0.7	0.9		-0.4	-0.7	0.2		0.6	0.0	0.3	1.1	-0.2	-1.1	0.4	1.0
84	2302-CF		-0.9	-0.5	-0.8	-0.6		-0.5		-0.1		-0.3	0.1	-0.2	-0.4	-0.4	-0.9	-0.4	-0.3
85	2302-CF																		
86	2302-CF		0.6	0.8	0.6	0.8		0.3	0.4	0.3		0.2	0.5	0.5	0.4	0.6	0.3	0.4	0.1
87	2302-CF		0.7	0.9	0.7	1.0		0.4	0.4	0.9		0.4	0.2	0.6	-0.1	0.6	-0.7	0.4	-0.5
89	2302-CF		1.4	-0.2	1.3	-0.1		-0.9	-0.8	-0.8		-0.9	-0.4	-0.6	-0.6	-0.6		0.4	
90	2302-CF		98.9	100.8	98.9	101.4		-0.7	0.0	-0.6		-0.4	0.5	9.8	0.8	6.2	71.1	65.5	6.0
91	2302-CF		-1.6	-1.5	-1.7	-1.6		1.0	-0.4	-1.0		0.2	0.4	-0.1	0.3	-0.5		-0.9	-0.7

EURL Proficiency Study on the Determination of PCDD/Fs, PCBs, PBDEs, HBCDDs and PFASs in Compound Feed 2023 [EURL-PT-POP_2302-CF]
EURL for halogenated Persistent Organic Pollutants (POPs) in Feed and Food

Compound Feed (2302-CF)
Dioxin-like PCB - Z-scores

LC	Sample	Z-score [σ_p = 10 %]	WHO-PCB-TEQ reported upper bound	WHO-PCB-TEQ reported lower bound	WHO-PCB-TEQ calculated upper bound	WHO-PCB-TEQ calculated lower bound	Z-score [σ_p = 20 %]	PCB 105	PCB 114	PCB 118	PCB 123	PCB 156	PCB 157	PCB 167	PCB 189	PCB 77	PCB 81	PCB 126	PCB 169
93	2302-CF		0.7	0.9	0.7	0.9		0.1	0.6	0.2		0.1	-0.3	0.6	0.6	0.5	-2.0	0.4	0.9
94	2302-CF		0.3	0.5	0.3	0.5		0.2	-0.5	-0.1		0.0	-0.1	0.4	-0.1	-0.1	0.1	0.3	0.0
95	2302-CF		-0.8	-0.7	-2.3	-2.2		-5.0		-5.0		-5.0	-5.0	-5.0	-5.0	-0.7	-0.8	-0.3	-0.3
96	2302-CF		-0.5	-0.3	-0.3	-0.1		-1.4	0.2	-1.4		-0.9	-0.8	-1.3	-0.7	-1.5		0.2	-0.4
97	2302-CF																		
99	2302-CF		0.6	0.7	0.5	0.7		0.8	-1.6	0.0		0.9	0.5	0.0	0.9	0.0	0.3	0.4	-0.4
100	2302-CF																		
101	2302-CF		-0.7	-0.6	-0.7	-0.5		-0.7	0.2	-0.4		-0.5	-0.5	-0.6	-0.3	-0.1	-0.3	-0.2	-0.7
102	2302-CF		-3.1	-3.0	-2.7	-3.0		-1.3	-1.6	1.2		0.7	-1.8	-0.7	-2.1	-2.2		-1.7	
103	2302-CF		1.7	1.9	1.8	1.3		1.5	0.5	0.8		0.6	2.1	1.0	0.3	1.3	1.3	0.9	
104	2302-CF																		
105	2302-CF		1.2	-0.4	1.2	-0.3		-0.7	-0.6	-0.7		-0.1	-0.2	0.1	-0.2	0.0		0.3	
106	2302-CF																		
107	2302-CF																		
109	2302-CF		0.2	0.3	0.2	0.4		0.6	-0.2	0.1		0.5	0.2	0.0	0.1	0.6	1.5	0.1	0.3
110	2302-CF		-0.4	-0.3	-0.4	-0.2		-0.6	1.4	-0.6		-0.2	-0.3	-1.9	-0.3	-0.4	-0.5	-0.1	-0.1
111	2302-CF		-0.8	-0.7	-0.8	-0.6		-0.6	-0.7	-0.7		-0.5	-0.6	-0.6	-0.5	0.2	0.2	-0.3	-0.2
113	2302-CF																		
114	2302-CF		-0.7	-0.6	1.5	-1.0		0.3	-0.9	0.8		0.3	0.5	-0.8	0.1	-0.8	2.1	-0.4	
115	2302-CF		-0.7	-0.6	-0.7	-0.5		-0.5	-0.6	-0.5		-0.3	0.0	-0.3	-0.4	-0.7	0.2	-0.2	-0.9
116	2302-CF																		
117	2302-CF		2.1	2.3	2.5	2.7		0.9	8.0	1.0		0.6	4.2	0.6	0.6	1.9	2.1	1.3	1.7
5A	2302-CF																		
16A	2302-CF																		
38A	2302-CF		-0.9	-0.8	-0.9	-0.7		-0.7	-0.5	-0.8		-0.6	-0.9	-0.4	-0.6	0.0	0.6	-0.4	-0.2
61A	2302-CF																		
106A	2302-CF																		
95*	2302-CF		-0.8	-0.7	-0.8	-0.7		-1.1		-1.0		-0.3	-1.0	1.3	-0.6	-0.7	-0.8	-0.3	-0.3

EURL Proficiency Study on the Determination of PCDD/Fs, PCBs, PBDEs, HBCDDs and PFASs in Compound Feed 2023 [EURL-PT-POP_2302-CF]
EURL for halogenated Persistent Organic Pollutants (POPs) in Feed and Food

Compound Feed (2302-CF)
Non dioxin-like PCB - Z-scores

LC	Sample	Z-score [σ_p = 15 %]	Sum Indicator PCBs reported upper bound	Sum Indicator PCBs reported lower bound	Sum Indicator PCBs calculated upper bound	Sum Indicator PCBs calculated lower bound	Z-score [σ_p = 20 %]	PCB 28	PCB 52	PCB 101	PCB 138	PCB 153	PCB 180
1	2302-CF		-1.1	-1.0	-1.1	-1.0		-1.1	-2.1	-0.9	-0.6	-0.7	-0.2
2	2302-CF												
3	2302-CF		0.3	0.4	0.3	0.4		0.4	0.6	0.3	0.1	0.3	0.7
5	2302-CF		-0.4	-0.4	-0.2	-0.2			0.0	0.5	-0.6	-0.3	0.2
7	2302-CF		-0.2	-0.1	-0.2	-0.1		-0.6	-0.1	-0.1	-0.3	0.0	0.0
8	2302-CF		-1.7	-2.0	-1.7	-2.0			-1.3	-1.4	-0.7	-1.7	-1.9
9	2302-CF		1.0	1.1	2.6	-3.0		-0.6	-0.1	0.8			0.7
10	2302-CF		-0.2	-0.1	-0.2	-0.1		0.0	1.0	-0.1	-0.3	-0.1	-0.6
11	2302-CF		0.0	0.1	0.0	0.1		-0.9	0.2	0.4	-0.3	0.1	0.0
12	2302-CF		1	1	1	1		0.6	0.7	1.0	0	0	0.1
13	2302-CF		-0.9	-0.8	-0.9	-0.8		-3.1	-0.8	-0.3	-0.7	-0.6	-0.8
14	2302-CF		0.9	1.0	0.9	1.0		0.0	0.7	0.7	0.2	1.5	0.1
15	2302-CF		0	0.3	0	0.3		-0.8	0.1	0.2	0.2	0.3	0.2
16	2302-CF		-0.3	-0.5	-0.3	-0.5			-0.6	-0.3	0.9	-0.8	-1.0
17	2302-CF		-0.3	-0.2	-0.3	-0.2		-0.8	0.1	0.1	-0.6	-0.1	-0.1
18	2302-CF		-0.6	-0.5	-0.6	-0.5		-1.4	-0.2	-0.1	-1.4	-0.1	0.0
20	2302-CF		0.7	0.9	0.7	0.9		2.7	0.8	1.1	0.7	0.3	0.2
21	2302-CF		-0.2	-0.2	-0.2	-0.1		2.9	-0.5	-0.3	0.1	-0.1	-0.1
22	2302-CF		-0.2	-0.4	-0.4	-0.3		1.2	-1.5	0.2	0.7	-1.1	0.0
23	2302-CF		-0.4	-0.3	-0.4	-0.3		-1.0	-0.5	-0.5	-0.4	0.3	-0.3
24	2302-CF		-0.6	-0.6	-0.6	-0.6		-0.5	0.2	-0.2	-0.8	-0.6	-0.3
25	2302-CF		0.0	0.1	0.0	0.1		-0.2	0.3	-0.1	-0.1	0.2	-0.1
26	2302-CF		-0.7	-0.7	-0.7	-0.6		-0.6	-0.3	-0.4	-0.8	-0.6	-0.1
27	2302-CF		-0.2	-0.2	205.0	-6.7							
28	2302-CF		0.5	0.6	9.8	-5.9		2.9	0.1				
29	2302-CF		-0.6	-0.5	-0.6	-0.5		0.6	-1.1	-0.2	-0.5	-0.4	-0.2
31	2302-CF		-0.1	-0.1	-0.1	0.0		-0.2	0.9	-0.2	-0.3	-0.3	0.8
32	2302-CF		2	1.9	1.8	1.9		2.1	0.3	0.5	3.0	1.3	1.6
33	2302-CF		1.1		0.8	0.6			0.5	1.2	0.8	-0.1	0.3
34	2302-CF		-0.4	-0.3	-0.4	-0.3		4.0	0.2	-0.3	-0.6	-0.4	0.1
35	2302-CF		-0.7	-0.6	-0.7	-0.6		-0.9	-0.3	-0.3	-0.7	-0.4	-0.5
36	2302-CF		0	0	0	0			-0.4	0.1	-0.1	0.2	0.0
37	2302-CF		0.3	0.1	0.3	0.1			-1.0	0.0	0.8	0.0	0.5
38	2302-CF		0.1	0.2	0.1	0.2		0.9	0.3	0.1	-0.3	0.5	0.2
39	2302-CF												
40	2302-CF		0.0	0.1	0.0	0.1		-0.5	0.5	0.2	-1.2	0.5	0.3
42	2302-CF								155.3				
43	2302-CF		0.3	0.4	0.3	0.4		-0.2	0.7	0.4	0.3	0.3	0.0
44	2302-CF		-1.2	-1.1	-1.2	-1.1		-3.0	-1.8	-1.4	-0.7	-0.2	-0.6
46	2302-CF		1.4	1.5	1.4	1.5		0.8	1.4	0.8	0.7	1.1	2.0
48	2302-CF		0.5	0.6	0.5	0.6		2.2	2.2	0.3	1.0	0.1	-0.8
49	2302-CF		-0.1	-0.4	-0.1	-0.4			2.4	0.1	-0.6	-0.8	-0.1
50	2302-CF		-0.3	-0.4	-0.3	-0.4			-0.6	-0.6	0.3	0.1	-0.8
52	2302-CF		1.1	1.2	1.4	1.6		1.5	1.4	1.2	1.3	1.5	-0.1
54	2302-CF		-0.2	-0.1	0.0	0.1		0.1	-0.2	-0.2	-0.4	0.5	0.4
56	2302-CF												
57	2302-CF		0.1	0.2	0.0	0.2		-0.5	0.5	0.1	0.0	0.1	0.2
58	2302-CF												
61	2302-CF		-0.4	-0.3	-0.4	-0.3		-0.5	-2.6	-1.3	1.9	-0.4	0.1
62	2302-CF												
64	2302-CF		-0.6	-0.7	-0.6	-0.5		-0.8	-0.2	-0.1	-0.7	-0.6	-0.3
65	2302-CF		-0.6	-0.6	-0.6	-0.6			-1.5	-0.9	0.7	-0.1	-0.9
66	2302-CF		0.1	0.2	0.1	0.2		3.8	0.9	0.1	-0.1	-0.1	0.3
67	2302-CF		1.3	1.4	1.3	1.4		13.1	-0.4	1.1	4.2	1.0	-4.3
68	2302-CF		0.8	0.9	0.8	0.9		2.4	1.1	0.9	0.8	0.5	0.4
69	2302-CF		1.0	1.1	1.0	1.1		-0.2	1.1	1.5	0.0	0.8	1.1
70	2302-CF		-0.1	0.0	-0.1	0.1		-0.6	-0.2	0.0	-0.1	0.2	0.1
71	2302-CF		-0.3	-0.2	-0.3	-0.2		-0.8	-0.4	-0.3	0.1	-0.1	-0.3
72	2302-CF		1.1	0.9	1.1	0.9			0.6	0.8	0.7	0.7	0.8
73	2302-CF		-0.3	-0.2	-0.3	-0.2		-0.8	0.0	0.1	0.1	-0.6	-0.4
74	2302-CF												
75	2302-CF		-4.4	-4.4	-4.4	-4.4		-0.5	15.1				
77	2302-CF		0.4	0.1	0.4	0.1			0.4	0.4	0.9	-0.4	-0.2
78	2302-CF		-0.5	-0.4	-0.5	-0.4		-1.6	-0.9	-0.4	1.2	-0.7	-0.9
81	2302-CF		5.5	5.6	5.6	5.4			3.7	4.5	10.1	1.0	2.5
82	2302-CF		1.4	1.2	1.4	1.2			-0.2	0.2	3.1	0.7	0.9
83	2302-CF		0.8	0.9	0.8	0.9		1.0	0.0	0.4	0.1	1.6	0.8
84	2302-CF		0.0	0.1	0.0	0.1		-0.5	0.0	0.2	-0.1	0.0	0.3
85	2302-CF		0.1	0.2	0.1	0.2		-0.5	2.0	0.2	0.5	-0.3	-0.5
86	2302-CF		1.4	1.5	1.4	1.5		2.4	0.4	0.2	-0.8	3.7	0.5
87	2302-CF		0.2	0.3	0.2	0.3		1.5	0.5	0.4	0.0	0.1	0.0
89	2302-CF		-0.1	-0.2	-0.1	-0.2			0.1	0.0	-0.2	-0.1	0.0
90	2302-CF		-1.5	-1.4	-1.5	-1.4		-0.4	-2.1	-0.2	-0.5	-1.4	-2.1
91	2302-CF		0.0	0.1	0.1	0.2		-0.5	0.4	0.3	-0.2	0.3	-0.1

EURL Proficiency Study on the Determination of PCDD/Fs, PCBs, PBDEs, HBCDDs and PFASs in Compound Feed 2023 [EURL-PT-POP_2302-CF]
EURL for halogenated Persistent Organic Pollutants (POPs) in Feed and Food

Compound Feed (2302-CF)
Non dioxin-like PCB - Z-scores

LC	Sample	Z-score [σ_p = 15 %]	Sum Indicator PCBs reported		Sum Indicator PCBs calculated		Z-score [σ_p = 20 %]	PCB 28	PCB 52	PCB 101	PCB 138	PCB 153	PCB 180
			upper bound	lower bound	upper bound	lower bound							
93	2302-CF		-0.8	-0.7	-0.8	-0.7		-1.7	0.0	-1.2	-0.6	-0.3	-0.2
94	2302-CF		0.2	0.3	0.2	0.3		-0.3	0.3	0.5	0.0	0.2	0.1
95	2302-CF		-1.2	-1.1	5474.8	5563.2		3356.6	4319.7	4122.7	4136.4	4252.2	4123.8
96	2302-CF		-1.2	-1.1	-1.2	-1.1		-1.3	-1.8	-0.9	-0.8	-0.9	0.0
97	2302-CF		-0.8	-0.9	-0.8	-0.8			-1.0	-0.9	-0.3	-0.7	0.2
99	2302-CF		0	0	0	0		-1	0	0	-1	0	0.5
100	2302-CF		-0.9	-1.5	-0.9	-1.5			-1.5	-2.0	0.8	-1.5	-1.0
101	2302-CF												
102	2302-CF												
103	2302-CF		1.0	1.1	1.0	1.1		3.5	1.6	1.3	0.6	0.5	0.2
104	2302-CF		-1.3	-1.3	-1.3	-1.2		-2.3	-2.1	-1.4	-0.6	-0.5	-0.6
105	2302-CF		0.2	0.1	0.2	0.1			0.6	0.1	0.4	0.2	-0.2
106	2302-CF												
107	2302-CF		0.2	-0.1	0.2	-0.1			0.3	-0.6	1.0	-0.1	-0.3
109	2302-CF		-0.8	-0.8	-0.8	-0.8		0.3	-0.1	-0.7	-1.0	-0.6	-0.2
110	2302-CF		-0.5	-0.5	-0.6	-0.5		1.0	-0.8	-0.9	-0.1	-0.2	-0.1
111	2302-CF		0.5	0.6	0.5	0.6		0.9	0.7	0.5	0.1	0.7	0.2
113	2302-CF		-0.1	-0.4	-0.1	-0.4			-0.4	-0.7	1.4	-0.5	-1.1
114	2302-CF		1.5	1.6	1.4	1.6		-0.8	1.1	1.1	1.2	1.3	1.0
115	2302-CF		-0.7	-0.6	-0.7	-0.6		1.6	-1.3	-0.4	-0.6	-0.1	-0.8
116	2302-CF		0.5	0.0	0.3	0.1			0.7	0.5	0.3	-0.1	-0.5
117	2302-CF		-4.5	-4.5	-4.5	-4.5		-1.6	-3.4	-1.9	-4.6	-3.1	-5.0
5A	2302-CF		-0.6	-0.6	-0.3	-0.3			-0.4	0.1	-0.8	-0.1	0.3
16A	2302-CF		0.2	0.0	0.2	0.0			1.1	0.0	1.3	-0.6	-0.8
38A	2302-CF		0	0	0	0.1		1.5	0.1	0.1	-0.3	0.3	-0.3
61A	2302-CF		0.0	-0.6	0.0	-0.6				-1.2	3.1	-1.0	-0.1
106A	2302-CF												
95*	2302-CF		-1.2	-1.1	-1.2	-1.1		-1.6	-0.7	-0.9	-0.9	-0.7	-0.9

EURL Proficiency Study on the Determination of PCDD/Fs, PCBs, PBDEs, HBCDDs and PFASs in Compound Feed 2023 [EURL-PT-POP_2302-CF]
EURL for halogenated Persistent Organic Pollutants (POPs) in Feed and Food

Compound Feed (2302-CF)
Bioanalytical screening methods - Bioassay-scores

LC	Sample	Bioassay-score [$\sigma_{bioassay}$ = 20 %]	PCDD/F + DL-PCB	PCDD/F	DL-PCB
1	2302-CF				
2	2302-CF				
3	2302-CF				
5	2302-CF				
7	2302-CF		5.0		
8	2302-CF				
9	2302-CF				
10	2302-CF				
11	2302-CF				
12	2302-CF				
13	2302-CF				
14	2302-CF		-0.5		
15	2302-CF				
16	2302-CF				
17	2302-CF				
18	2302-CF				
20	2302-CF				
21	2302-CF				
22	2302-CF				
23	2302-CF				
24	2302-CF				
25	2302-CF				
26	2302-CF				
27	2302-CF				
28	2302-CF				
29	2302-CF				
31	2302-CF				
32	2302-CF				
33	2302-CF				
34	2302-CF		-1.6		
35	2302-CF				
36	2302-CF				
37	2302-CF				
38	2302-CF				
39	2302-CF				
40	2302-CF				
42	2302-CF				
43	2302-CF				
44	2302-CF				
46	2302-CF				
48	2302-CF				
49	2302-CF				
50	2302-CF				
52	2302-CF		7.6	6.0	14.4
54	2302-CF				
56	2302-CF				
57	2302-CF				
58	2302-CF				
61	2302-CF				
62	2302-CF				
64	2302-CF				
65	2302-CF				
66	2302-CF				
67	2302-CF				
68	2302-CF				
69	2302-CF				
70	2302-CF				
71	2302-CF				
72	2302-CF				
73	2302-CF				
74	2302-CF		1.3	-4.7	28.3
75	2302-CF				
77	2302-CF				
78	2302-CF				
81	2302-CF		0.3	0.0	2.2
82	2302-CF				
83	2302-CF		0.8	0.8	0.6
84	2302-CF				
85	2302-CF		1.3		
86	2302-CF				
87	2302-CF				
89	2302-CF				
90	2302-CF				
91	2302-CF				

EURL Proficiency Study on the Determination of PCDD/Fs, PCBs, PBDEs, HBCDDs and PFASs in Compound Feed 2023 [EURL-PT-POP_2302-CF]
EURL for halogenated Persistent Organic Pollutants (POPs) in Feed and Food

Compound Feed (2302-CF)
Bioanalytical screening methods - Bioassay-scores

LC	Sample	Bioassay-score [$\sigma_{bioassay}$ = 20 %]	PCDD/F + DL-PCB	PCDD/F	DL-PCB
93	2302-CF				
94	2302-CF				
95	2302-CF				
96	2302-CF				
97	2302-CF				
99	2302-CF				
100	2302-CF				
101	2302-CF				
102	2302-CF				
103	2302-CF				
104	2302-CF				
105	2302-CF				
106	2302-CF		1.3		
107	2302-CF				
109	2302-CF				
110	2302-CF				
111	2302-CF				
113	2302-CF				
114	2302-CF				
115	2302-CF				
116	2302-CF				
117	2302-CF				
5A	2302-CF				
16A	2302-CF				
38A	2302-CF				
61A	2302-CF				
106A	2302-CF		1.8	0.6	7.8

EURL Proficiency Study on the Determination of PCDD/Fs, PCBs, PBDEs, HBCDDs and PFASs in Compound Feed 2023 [EURL-PT-POP_2302-CF]
EURL for halogenated Persistent Organic Pollutants (POPs) in Feed and Food

Compound Feed (2302-CF)
Moisture content - Z-scores

LC	Sample	Z-score [σ_p = 10 %]	**Moisture content** Physico-chemical methods	**Moisture content** Bioanalytical methods	**Moisture content** Mean
1	2302-CF		-1.2		-1.2
2	2302-CF		0.4		0.4
3	2302-CF		1.2		1.2
5	2302-CF		0.4		0.4
7	2302-CF		-0.1	-0.1	-0.1
8	2302-CF		3.6		3.6
9	2302-CF		1.1		1.1
10	2302-CF		0.5		0.5
11	2302-CF		-1.4		-1.4
12	2302-CF		1.0		1.0
13	2302-CF		-0.6		-0.6
14	2302-CF		5.5	5.5	5.5
15	2302-CF		-3.8		-3.8
16	2302-CF		0.5		0.5
17	2302-CF		-0.7		-0.7
18	2302-CF		1.0		1.0
20	2302-CF		0.2		0.2
21	2302-CF		-0.1		-0.1
22	2302-CF		0.4		0.4
23	2302-CF				
24	2302-CF		93.3		93.3
25	2302-CF		-0.2		-0.2
26	2302-CF		-5.6		-5.6
27	2302-CF		0.1		0.1
28	2302-CF		-0.8		-0.8
29	2302-CF		0.2		0.2
31	2302-CF		0.3		0.3
32	2302-CF		-0.2		-0.2
33	2302-CF				
34	2302-CF		0.4	0.4	0.4
35	2302-CF		95.3		95.3
36	2302-CF		0.1		0.1
37	2302-CF		-0.7		-0.7
38	2302-CF		-1.2		-1.2
39	2302-CF		0.7		0.7
40	2302-CF		-0.6		-0.6
42	2302-CF		-0.2		-0.2
43	2302-CF		0.7		0.7
44	2302-CF		0.1		0.1
46	2302-CF		-1.5		-1.5
48	2302-CF		1.3		1.3
49	2302-CF		-2.8		-2.8
50	2302-CF		-0.7		-0.7
52	2302-CF		-0.8	-0.8	-0.8
54	2302-CF		-0.1	-0.1	-0.1
56	2302-CF		1.2	1.2	1.2
57	2302-CF		-1.3		-1.3
58	2302-CF		1.1		1.1
61	2302-CF		0.6		0.6
62	2302-CF		0.4		0.4
64	2302-CF			0.1	0.1
65	2302-CF		-0.7		-0.7
66	2302-CF				
67	2302-CF		0.4		0.4
68	2302-CF				
69	2302-CF		0.1		0.1
70	2302-CF		-1.4		-1.4
71	2302-CF		0.2		0.2
72	2302-CF		0.3		0.3
73	2302-CF		-0.8		-0.8
74	2302-CF			-10.0	-10.0
75	2302-CF		-0.2		-0.2
77	2302-CF		-0.4		-0.4
78	2302-CF		0.9		0.9
81	2302-CF				
82	2302-CF		0.2		0.2
83	2302-CF		0.3	-0.2	0.1
84	2302-CF		-0.4		-0.4
85	2302-CF		-0.3	-0.3	-0.3
86	2302-CF		0.2		0.2
87	2302-CF		-0.7		-0.7
89	2302-CF		0.4		0.4
90	2302-CF		-0.3		-0.3
91	2302-CF		0.1		0.1

EURL Proficiency Study on the Determination of PCDD/Fs, PCBs, PBDEs, HBCDDs and PFASs in Compound Feed 2023 [EURL-PT-POP_2302-CF]
EURL for halogenated Persistent Organic Pollutants (POPs) in Feed and Food

Compound Feed (2302-CF)
Moisture content - Z-scores

LC	Sample	Z-score [σ_p = 10 %]	**Moisture content** Physico-chemical methods	**Moisture content** Bioanalytical methods	**Moisture content** Mean
93	2302-CF		1.0		1.0
94	2302-CF		94.1		94.1
95	2302-CF		0.1	0.1	0.1
96	2302-CF		0.6		0.6
97	2302-CF		-0.4		-0.4
99	2302-CF		-0.7		-0.7
100	2302-CF		-0.3		-0.3
101	2302-CF		0.3		0.3
102	2302-CF				
103	2302-CF		79.7		79.7
104	2302-CF		-1.5		-1.5
105	2302-CF		0.4		0.4
106	2302-CF			0.2	0.2
107	2302-CF		0.2	0.2	0.2
109	2302-CF		0.9		0.9
110	2302-CF		-1.1		-1.1
111	2302-CF		-0.7		-0.7
113	2302-CF		-0.2		-0.2
114	2302-CF		0.5		0.5
115	2302-CF		-2.5		-2.5
116	2302-CF		0.7		0.7
117	2302-CF		1.0		1.0
5A	2302-CF		0.4		0.4
16A	2302-CF		0.3		0.3
38A	2302-CF		-1.2		-1.2
61A	2302-CF		1.0		1.0
106A	2302-CF			0.2	0.2
8*	2302-CF		-1.2		-1.2

EURL Proficiency Study on the Determination of PCDD/Fs, PCBs, PBDEs, HBCDDs and PFASs in Compound Feed 2023 [EURL-PT-POP_2302-CF]
EURL for halogenated Persistent Organic Pollutants (POPs) in Feed and Food
14 June 2024

Annex 4: Participants' z-scores of PCDD/Fs and PCBs - Charts

Test sample - Compound Feed (2302-CF)

Z-scores of sum parameters and individual results

Calculation of z-score on basis of assigned value

$$z = (x - x_a) / \sigma_p$$

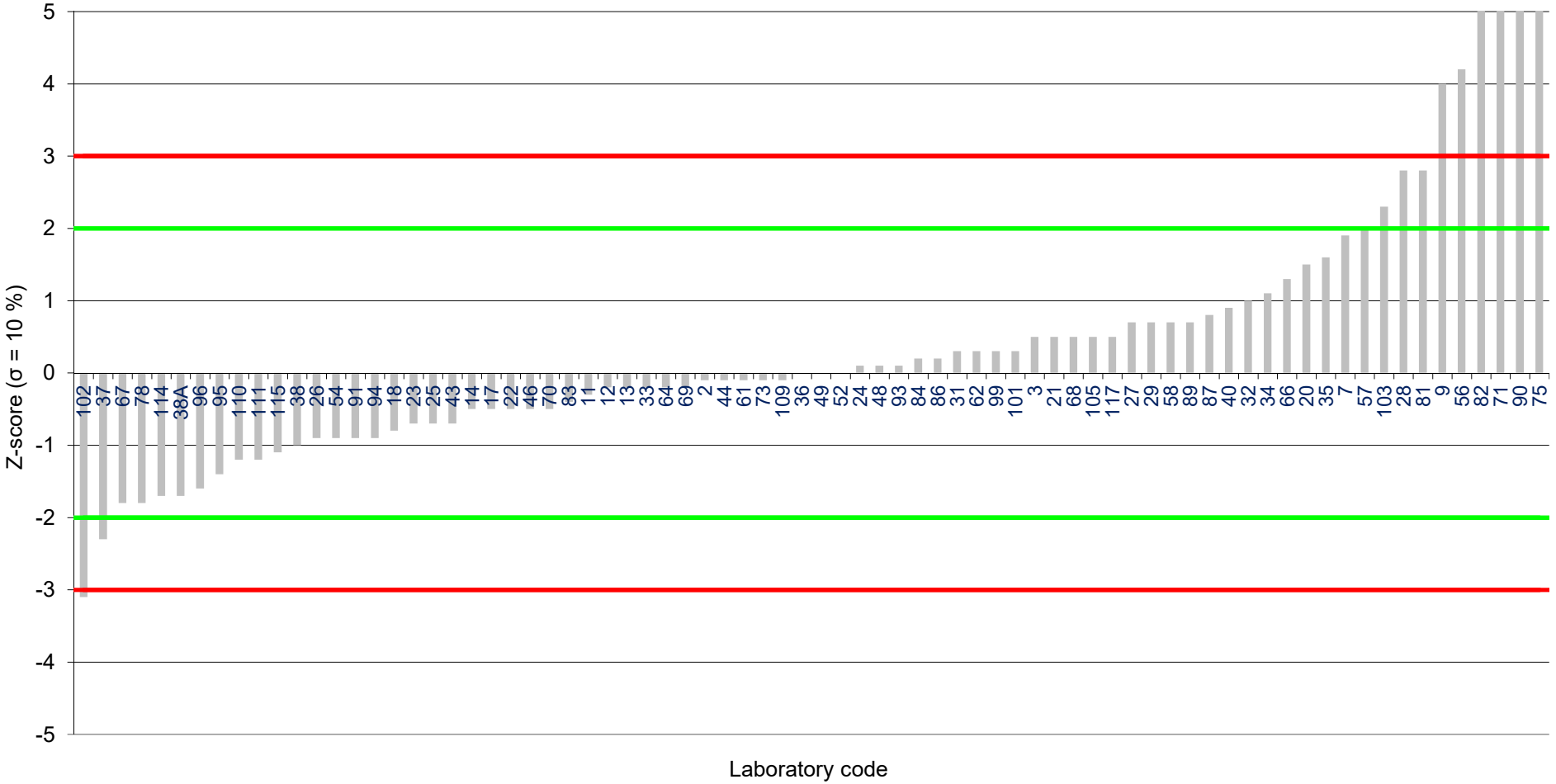
x_a: assigned value
x: participant's result
σ_p: fitness-for-purpose-based standard deviation for proficiency assessment
10%: WHO-PCDD/F-TEQ, WHO-PCB-TEQ and WHO-PCDD/F-PCB-TEQ
15%: Sum of six indicator PCBs (PCB 28, 52, 101, 138, 153, 180)
20%: Evaluated individual PCDD/F and PCB congeners

± 2 z-scores:
± 3 z-scores:

Compound Feed (2302-CF)

WHO-PCDD/F-PCB-TEQ upper bound (reported)

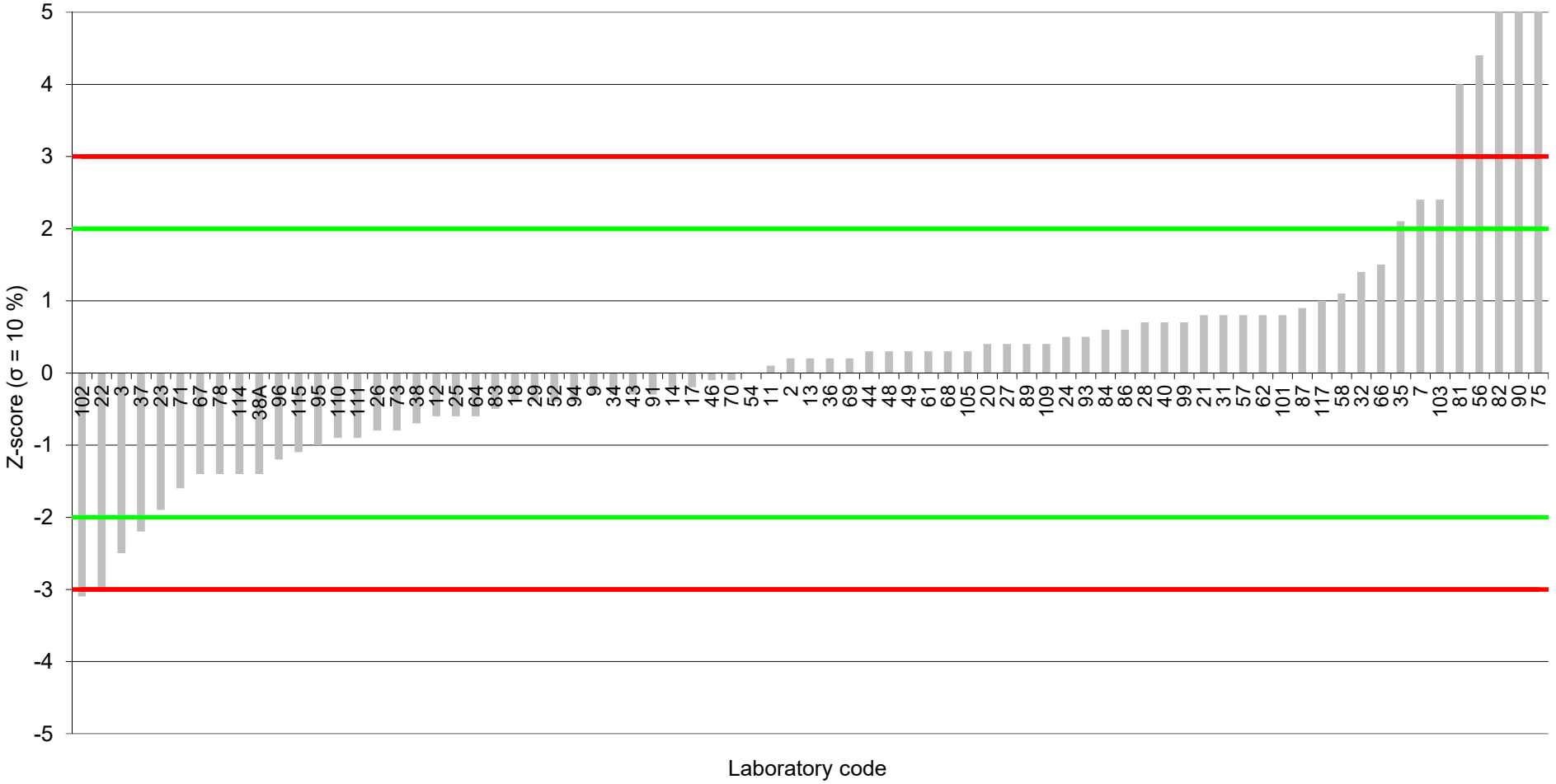
Assigned value: 0.948 ng/kg (12% moisture content)



Compound Feed (2302-CF)

WHO-PCDD/F-PCB-TEQ lower bound (reported)

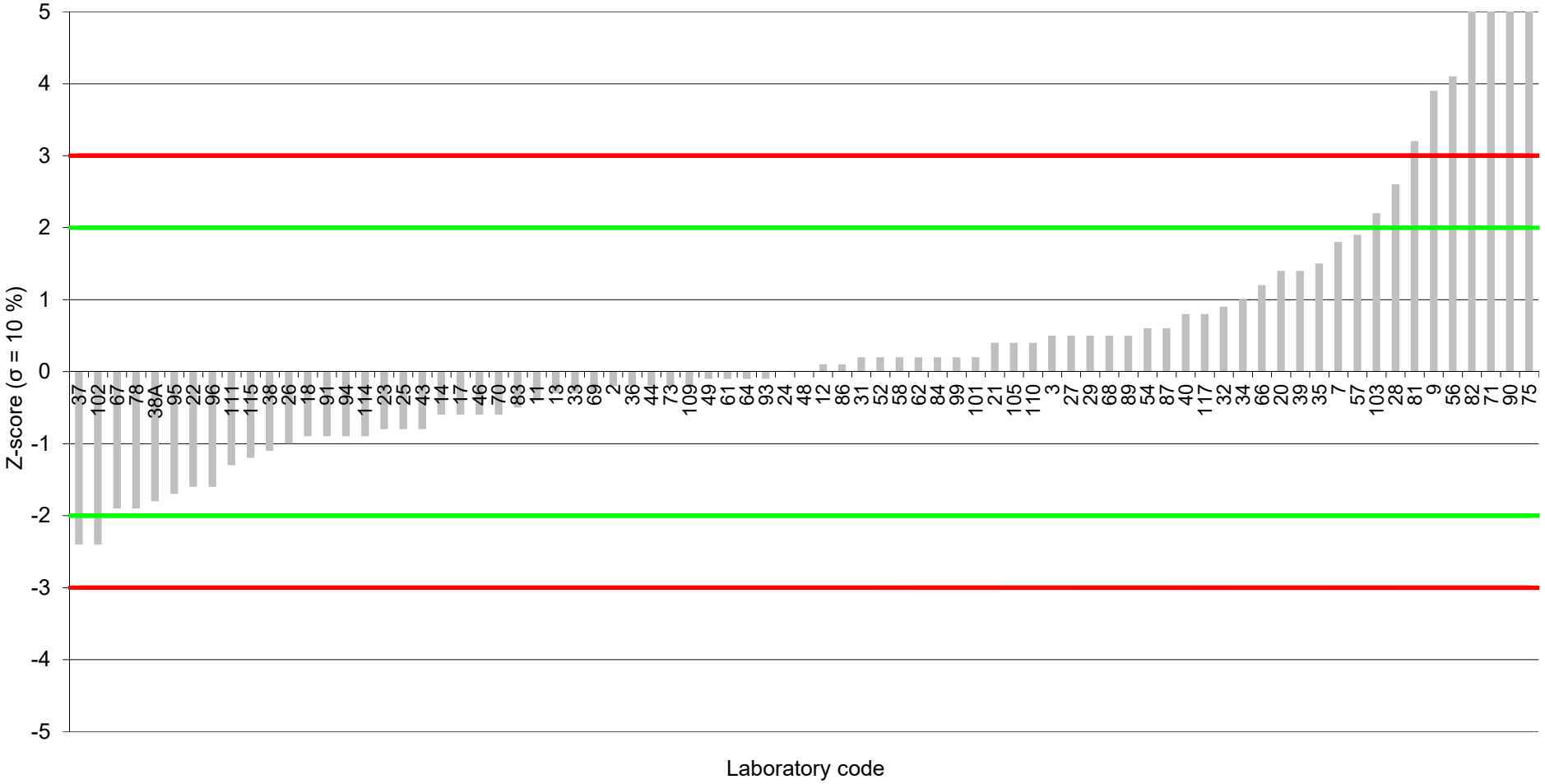
Assigned value: 0.91 ng/kg (12% moisture content)



Compound Feed (2302-CF)

WHO-PCDD/F-PCB-TEQ upper bound (calculated)

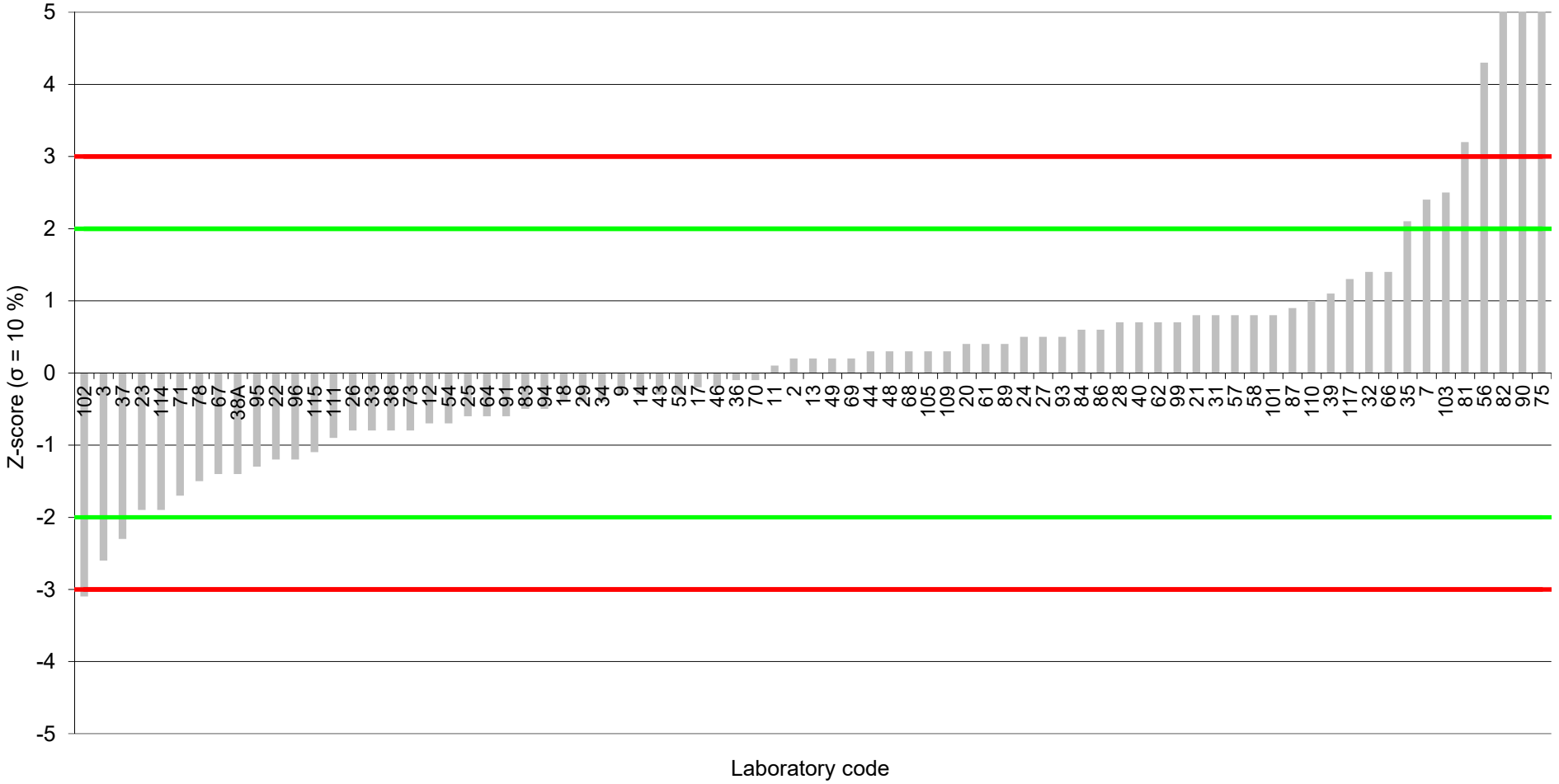
Assigned value: 0.958 ng/kg (12% moisture content)



Compound Feed (2302-CF)

WHO-PCDD/F-PCB-TEQ lower bound (calculated)

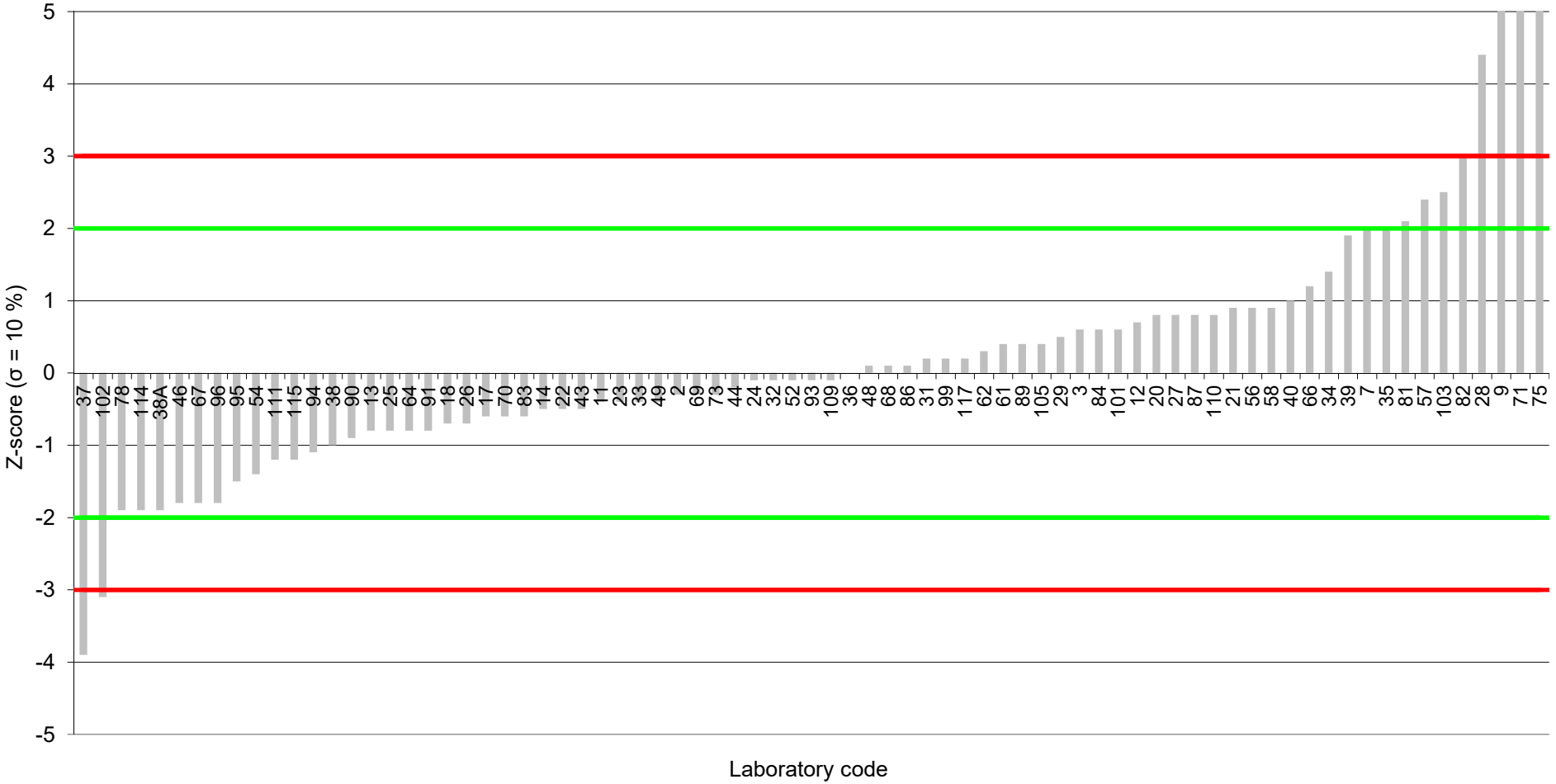
Assigned value: 0.911 ng/kg (12% moisture content)



Compound Feed (2302-CF)

WHO-PCDD/F-TEQ upper bound (reported)

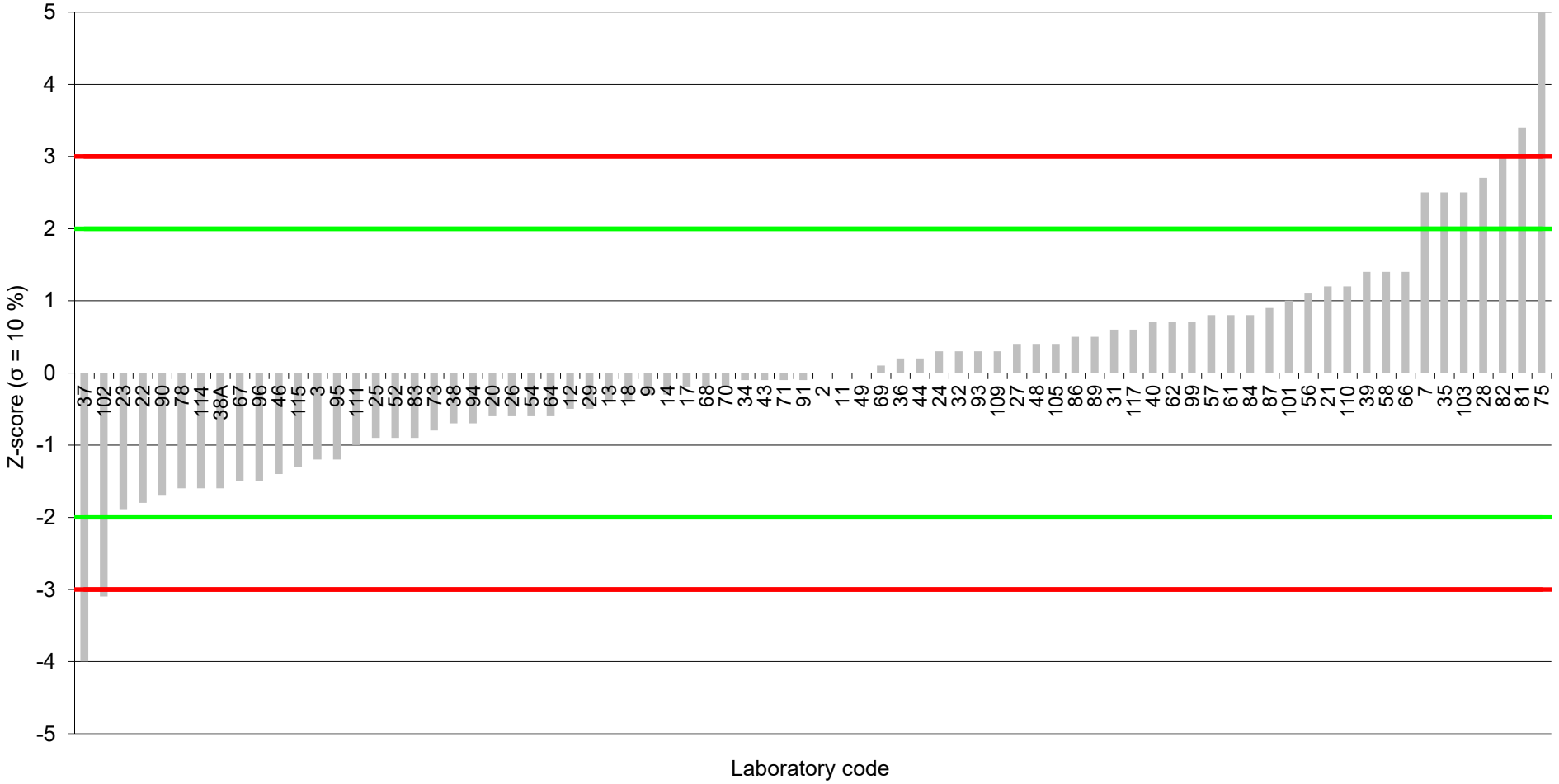
Assigned value: 0.77 ng/kg (12% moisture content)



Compound Feed (2302-CF)

WHO-PCDD/F-TEQ lower bound (reported)

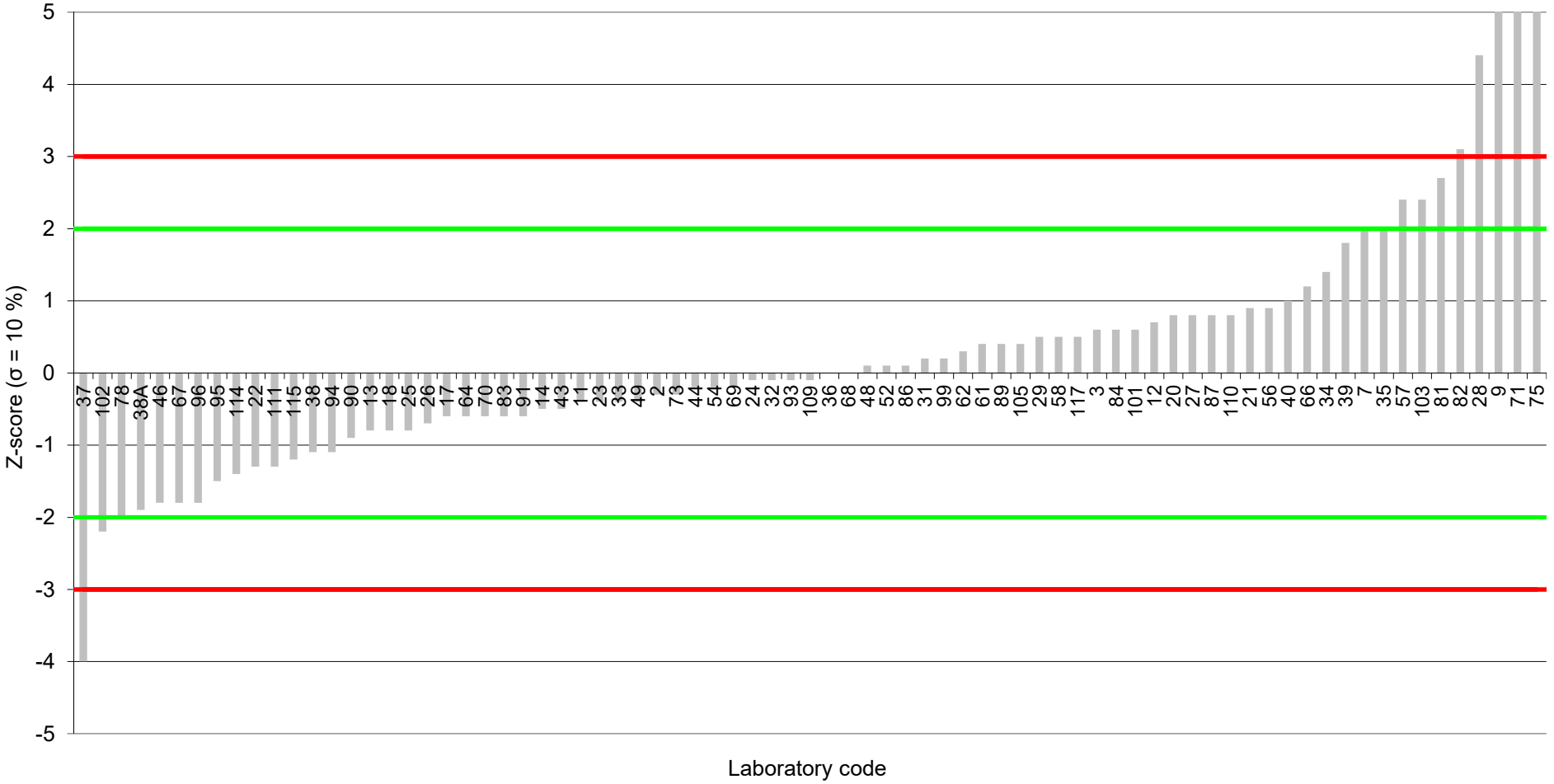
Assigned value: 0.739 ng/kg (12% moisture content)



Compound Feed (2302-CF)

WHO-PCDD/F-TEQ upper bound (calculated)

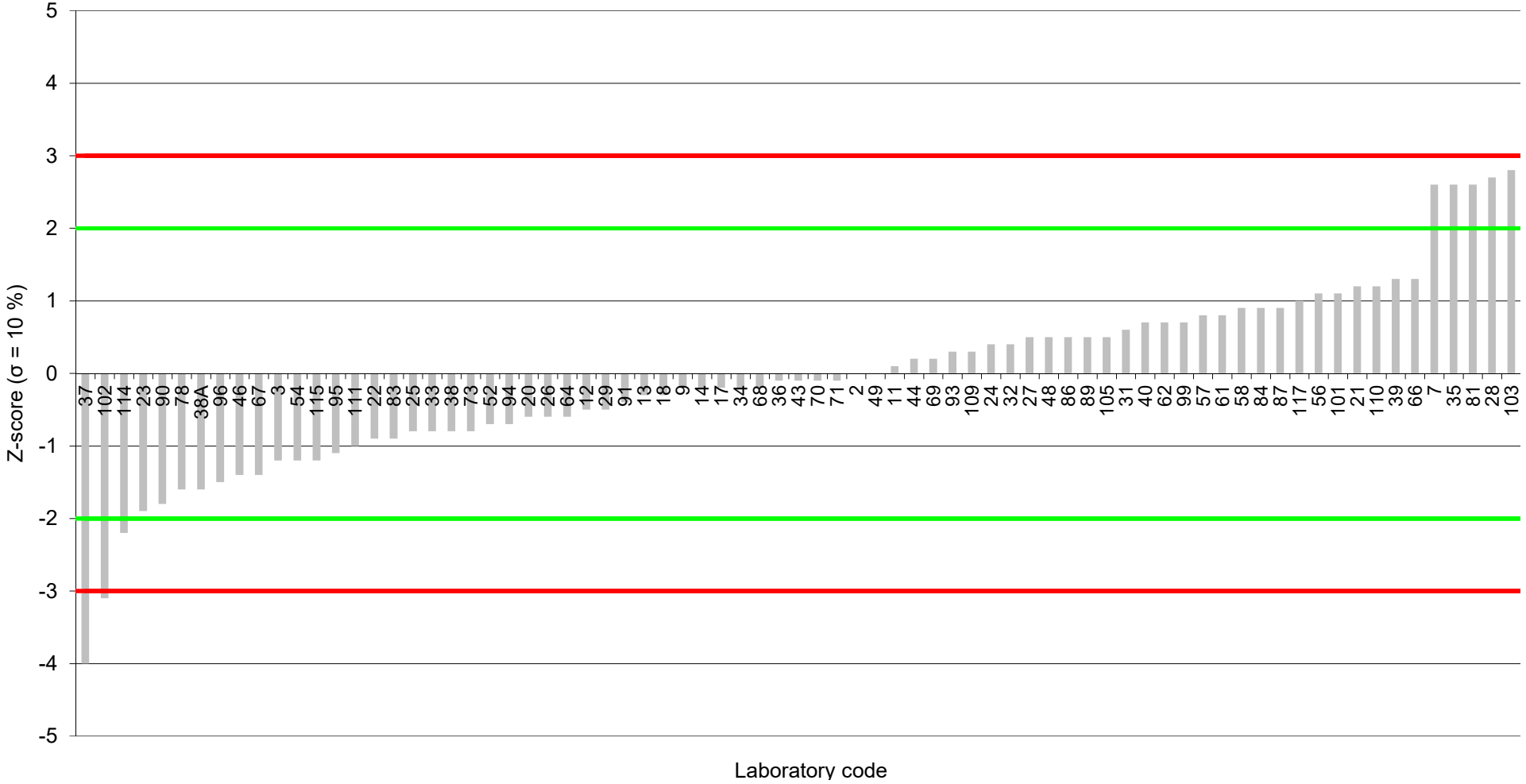
Assigned value: 0.771 ng/kg (12% moisture content)



Compound Feed (2302-CF)

WHO-PCDD/F-TEQ lower bound (calculated)

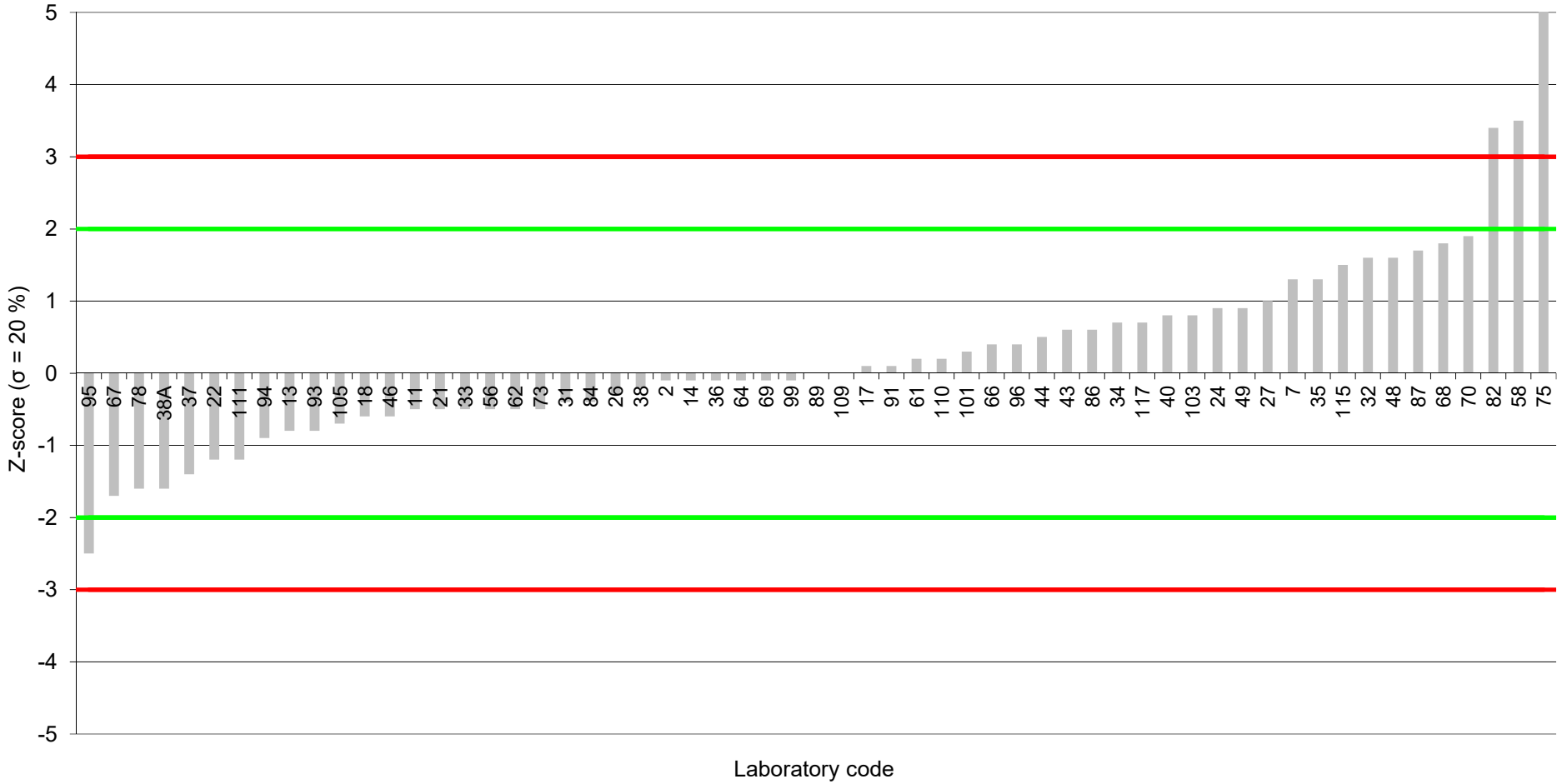
Assigned value: 0.737 ng/kg (12% moisture content)



Compound Feed (2302-CF)

1,2,3,7,8-PeCDD

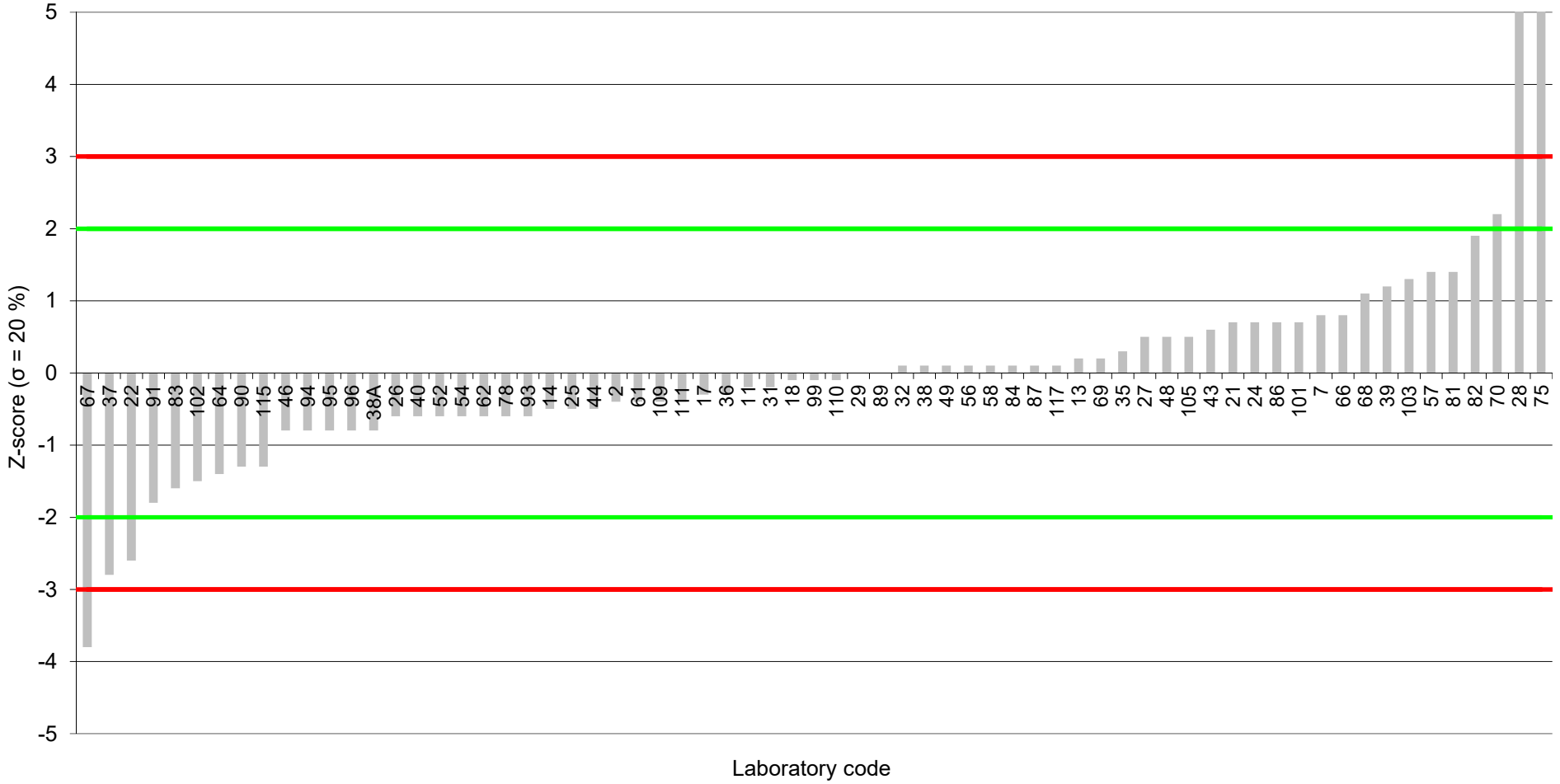
Assigned value: 0.0442 ng/kg (12% moisture content)



Compound Feed (2302-CF)

1,2,3,6,7,8-HxCDD

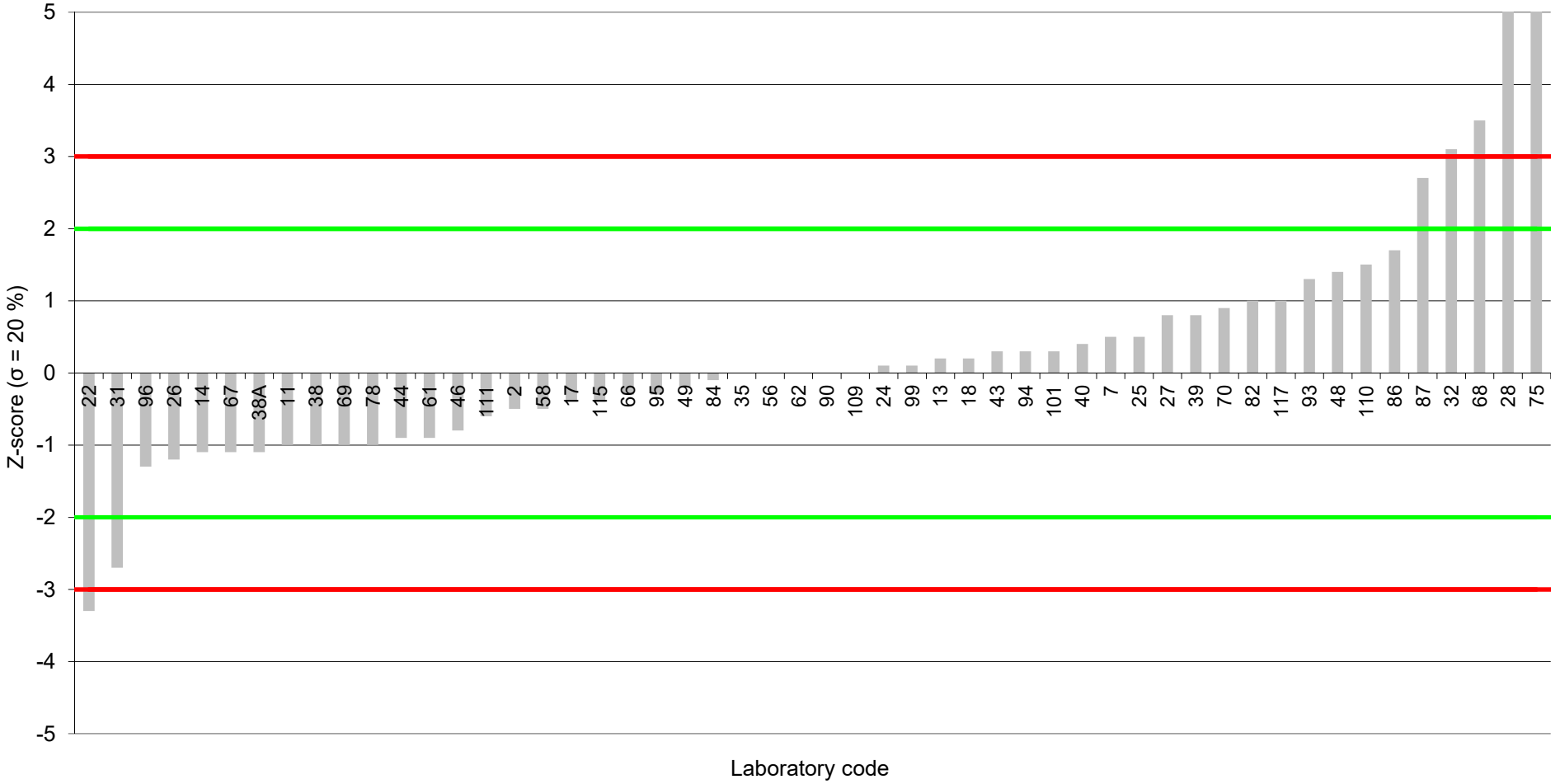
Assigned value: 0.0787 ng/kg (12% moisture content)



Compound Feed (2302-CF)

1,2,3,7,8,9-HxCDD

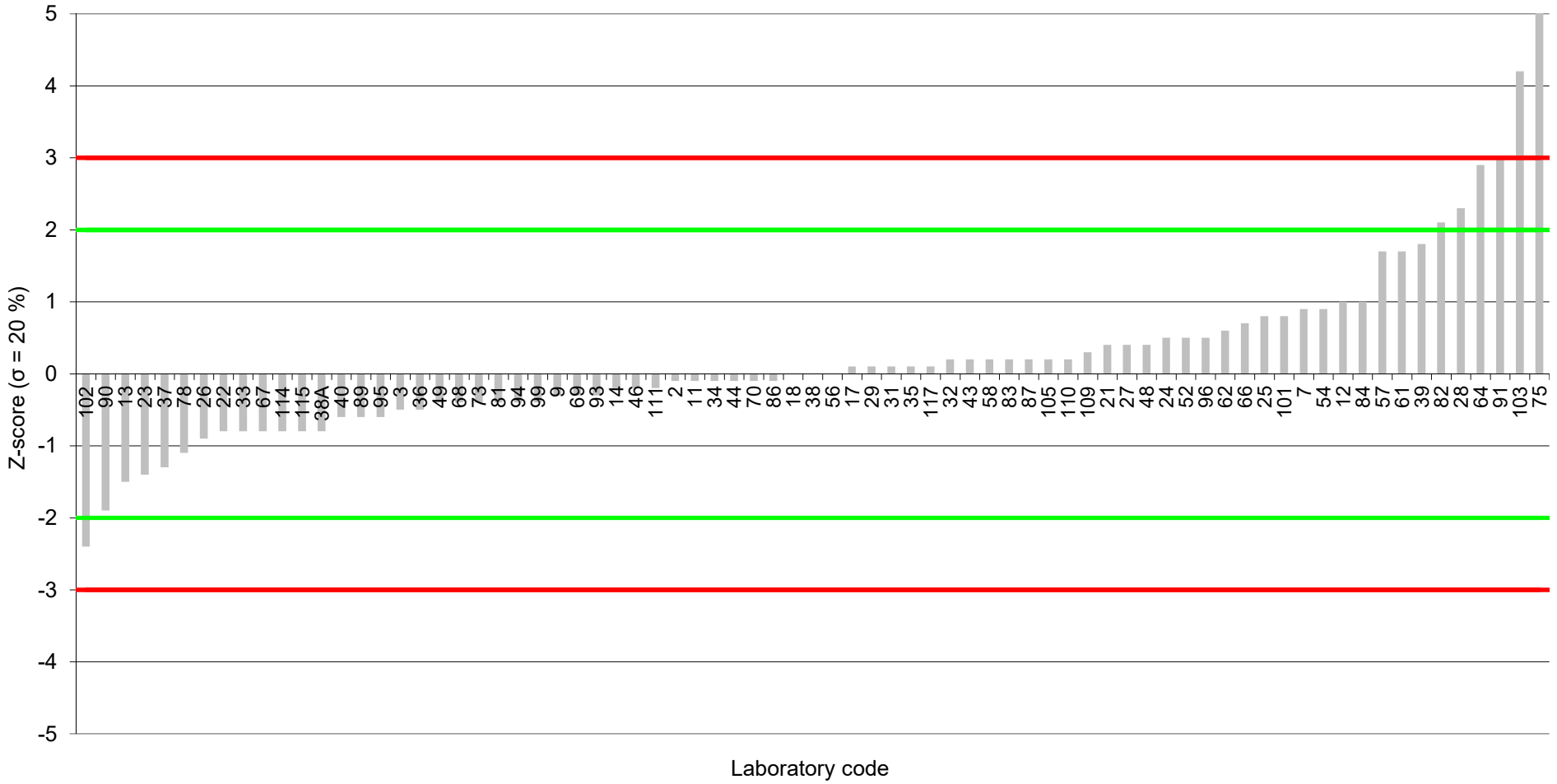
Assigned value: 0.05 ng/kg (12% moisture content)



Compound Feed (2302-CF)

1,2,3,4,6,7,8-HpCDD

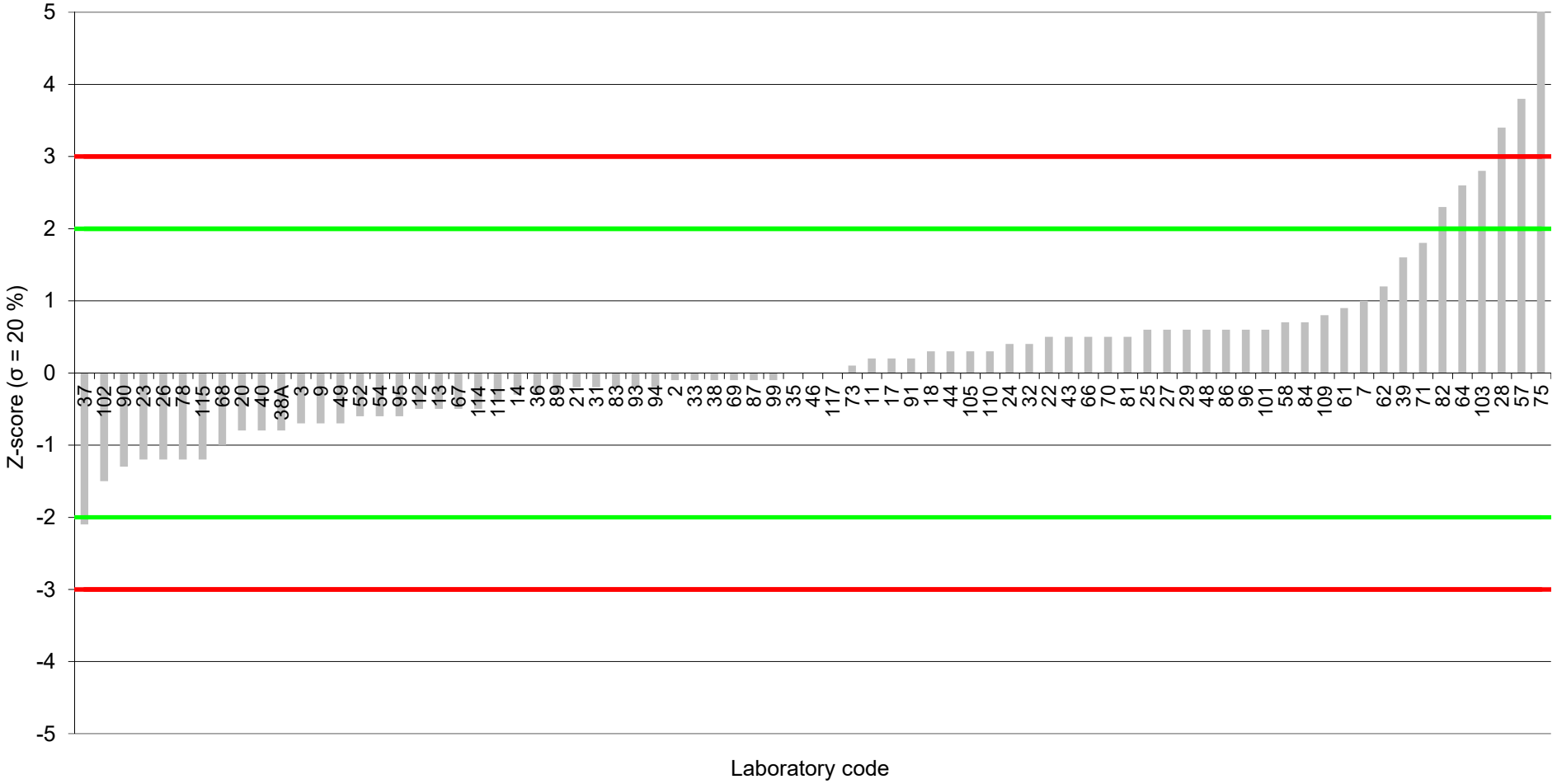
Assigned value: 0.812 ng/kg (12% moisture content)



Compound Feed (2302-CF)

OCDD

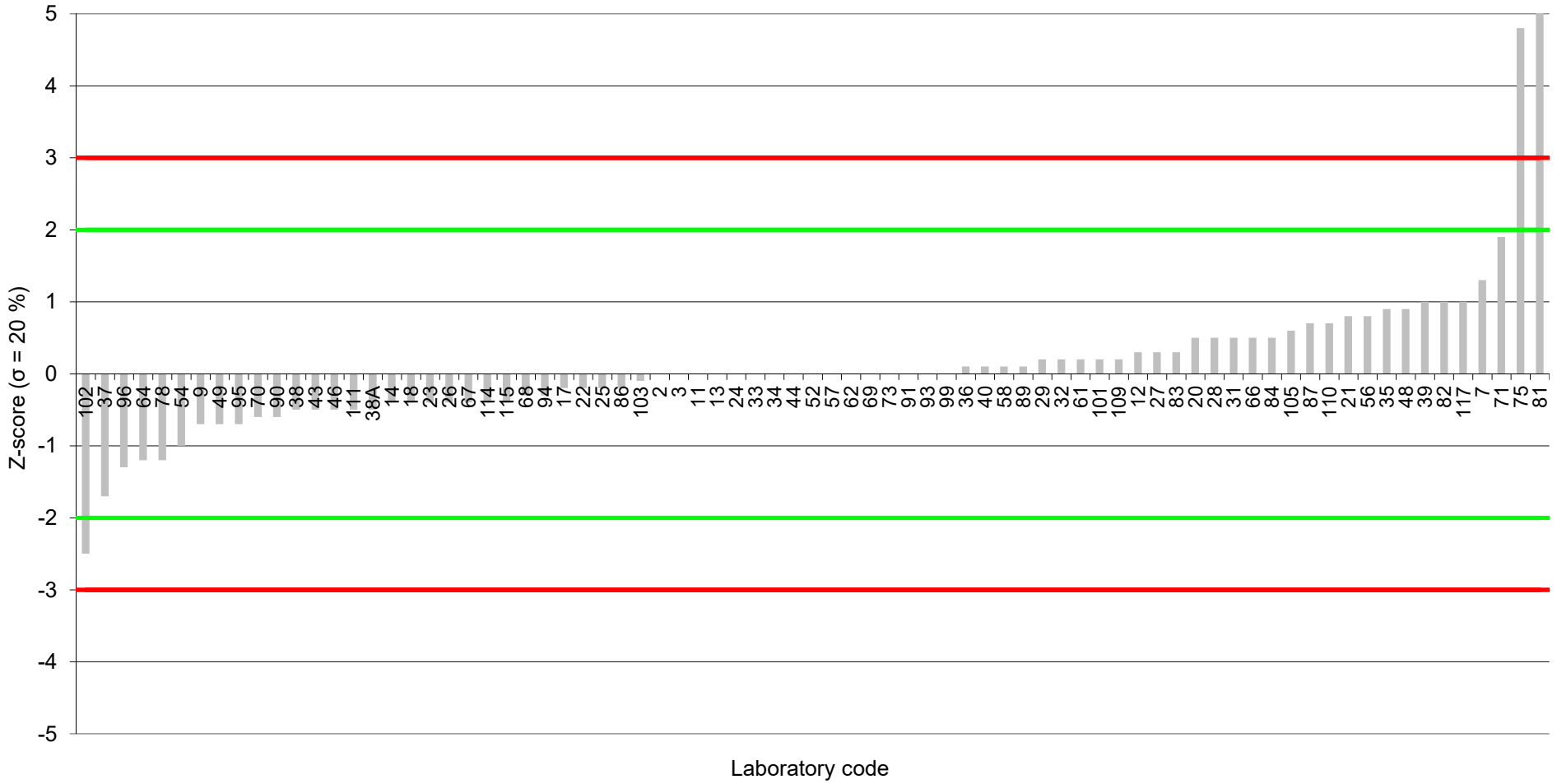
Assigned value: 3.97 ng/kg (12% moisture content)



Compound Feed (2302-CF)

2,3,7,8-TCDF

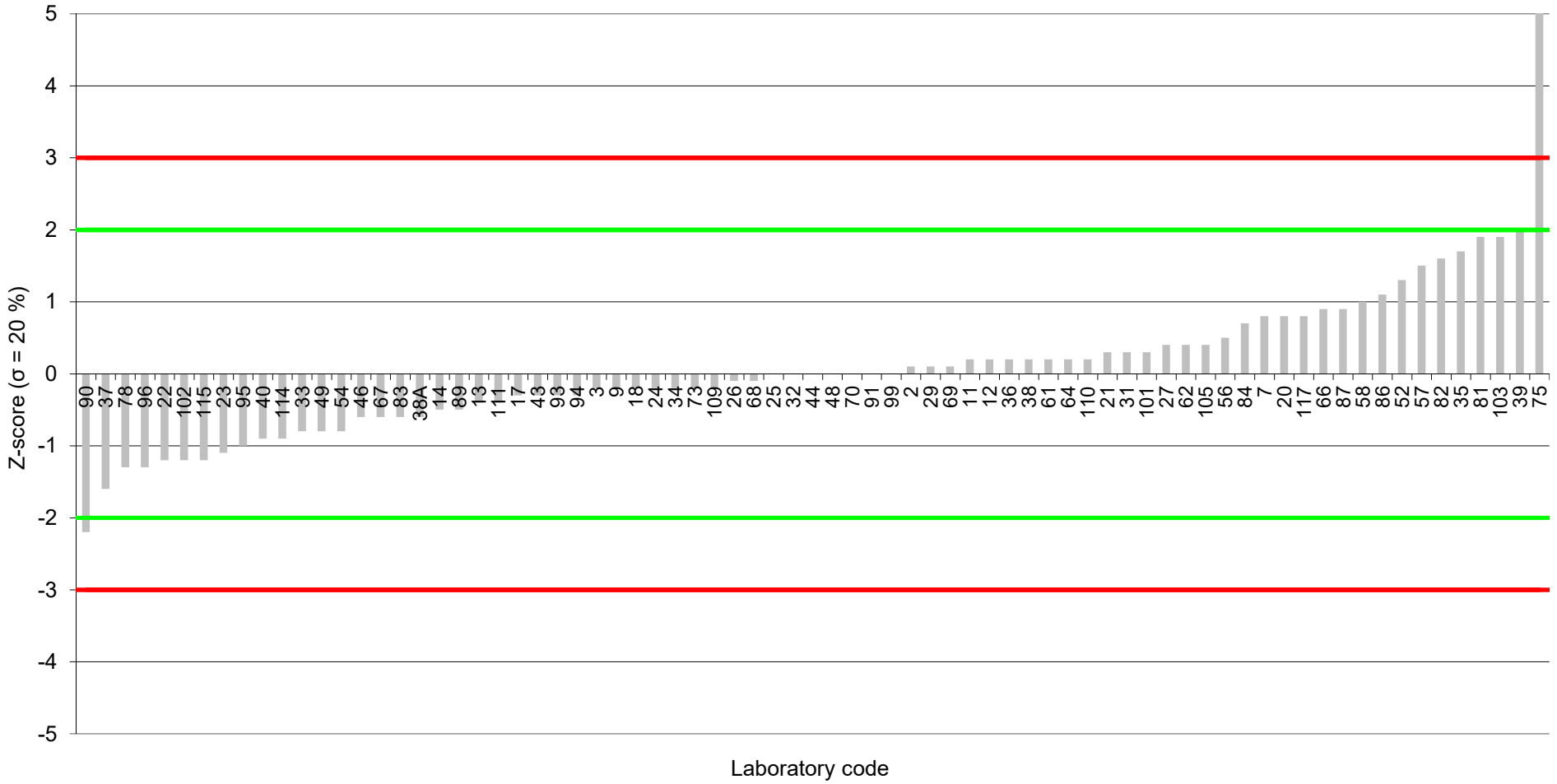
Assigned value: 1.21 ng/kg (12% moisture content)



Compound Feed (2302-CF)

1,2,3,7,8-PeCDF

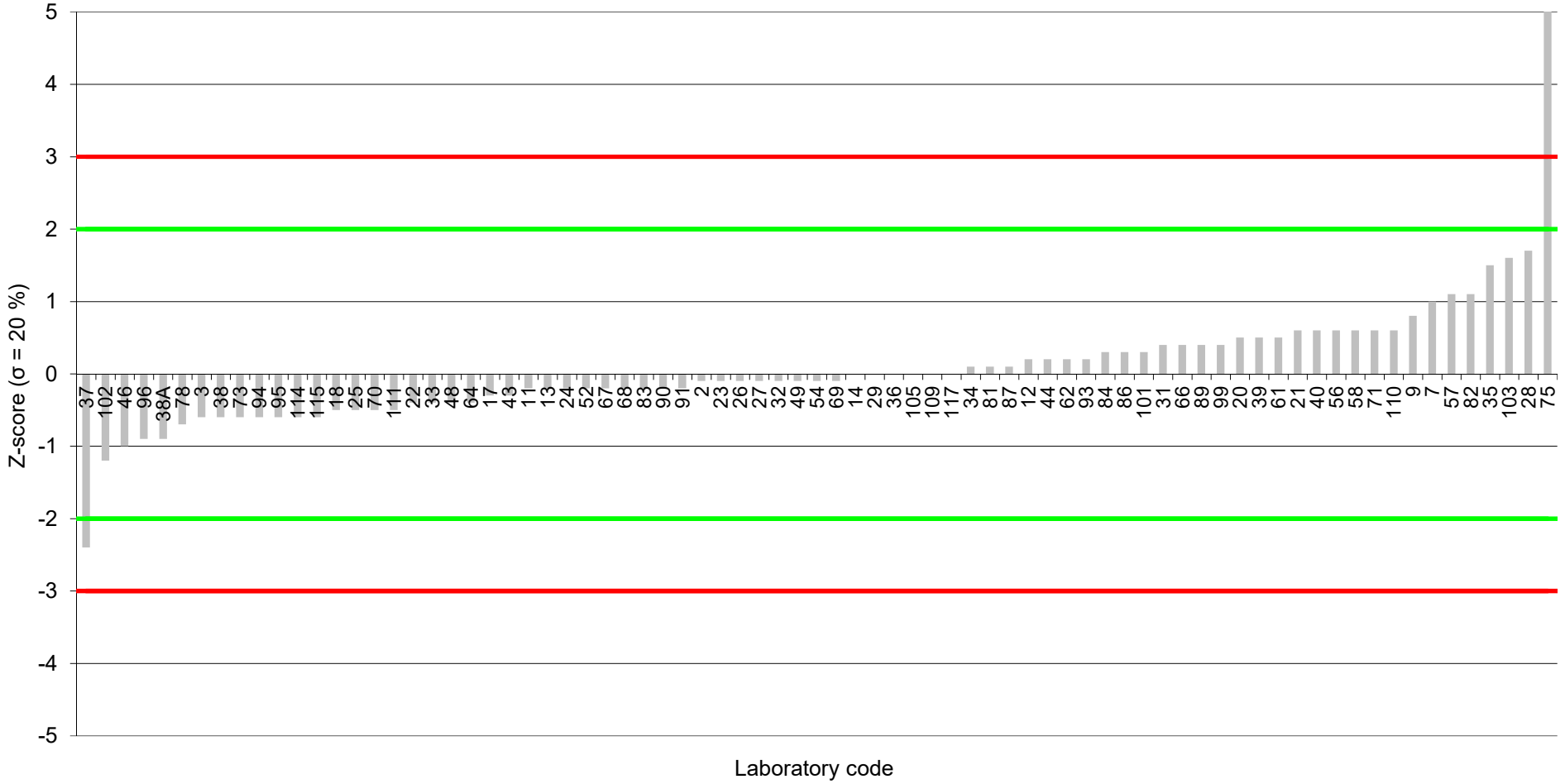
Assigned value: 0.406 ng/kg (12% moisture content)



Compound Feed (2302-CF)

2,3,4,7,8-PeCDF

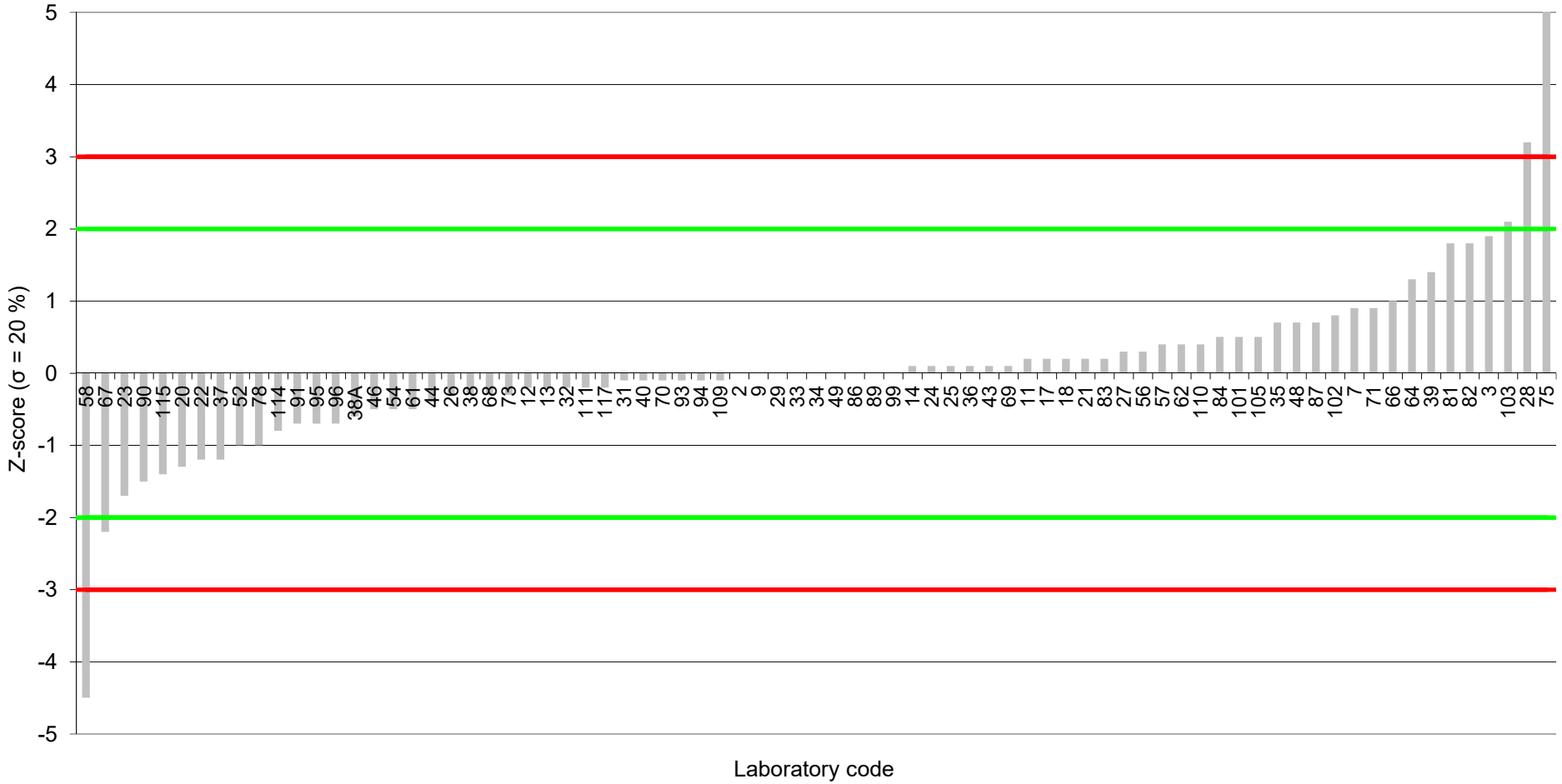
Assigned value: 1.25 ng/kg (12% moisture content)



Compound Feed (2302-CF)

1,2,3,4,7,8-HxCDF

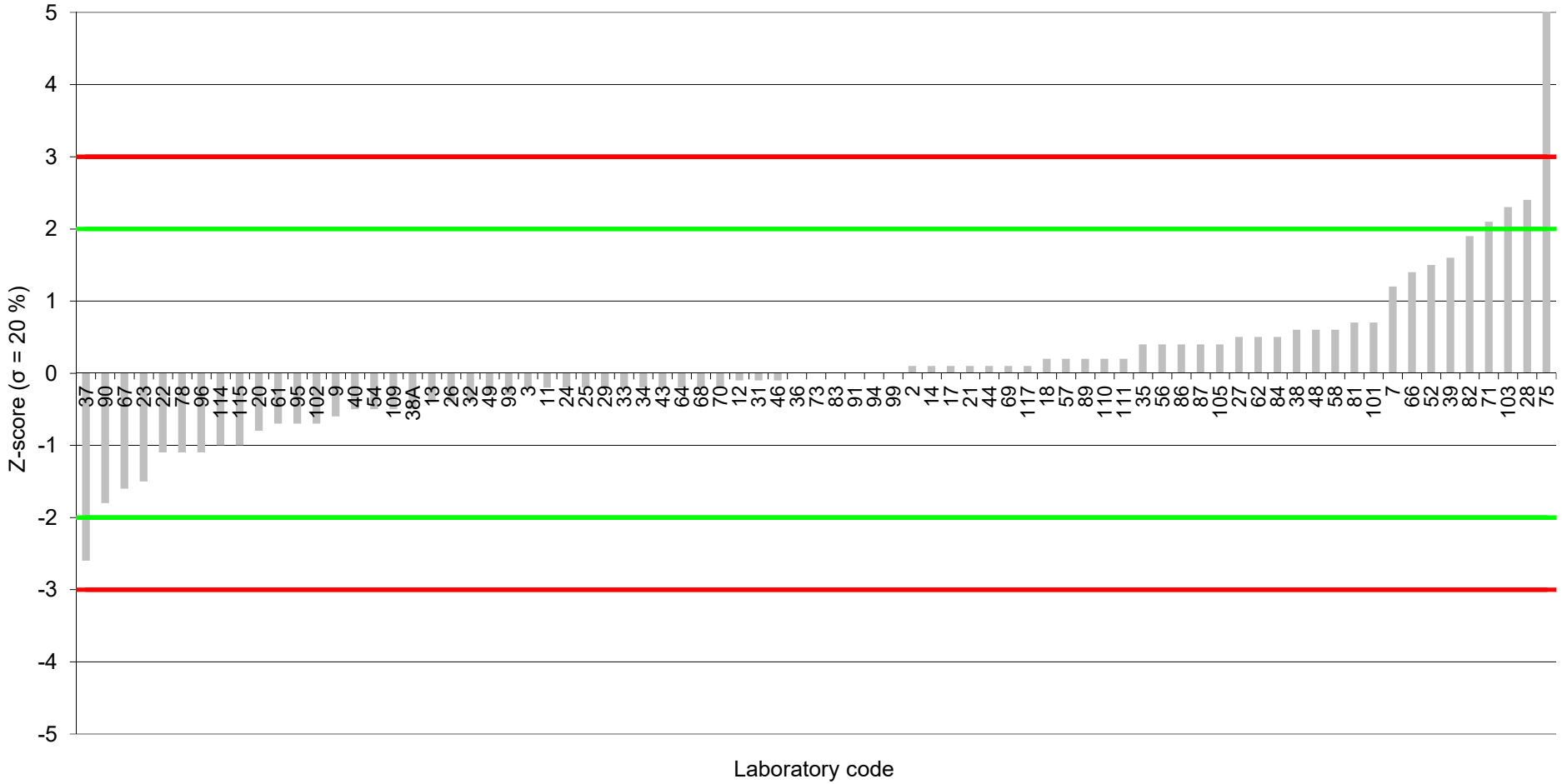
Assigned value: 0.599 ng/kg (12% moisture content)



Compound Feed (2302-CF)

1,2,3,6,7,8-HxCDF

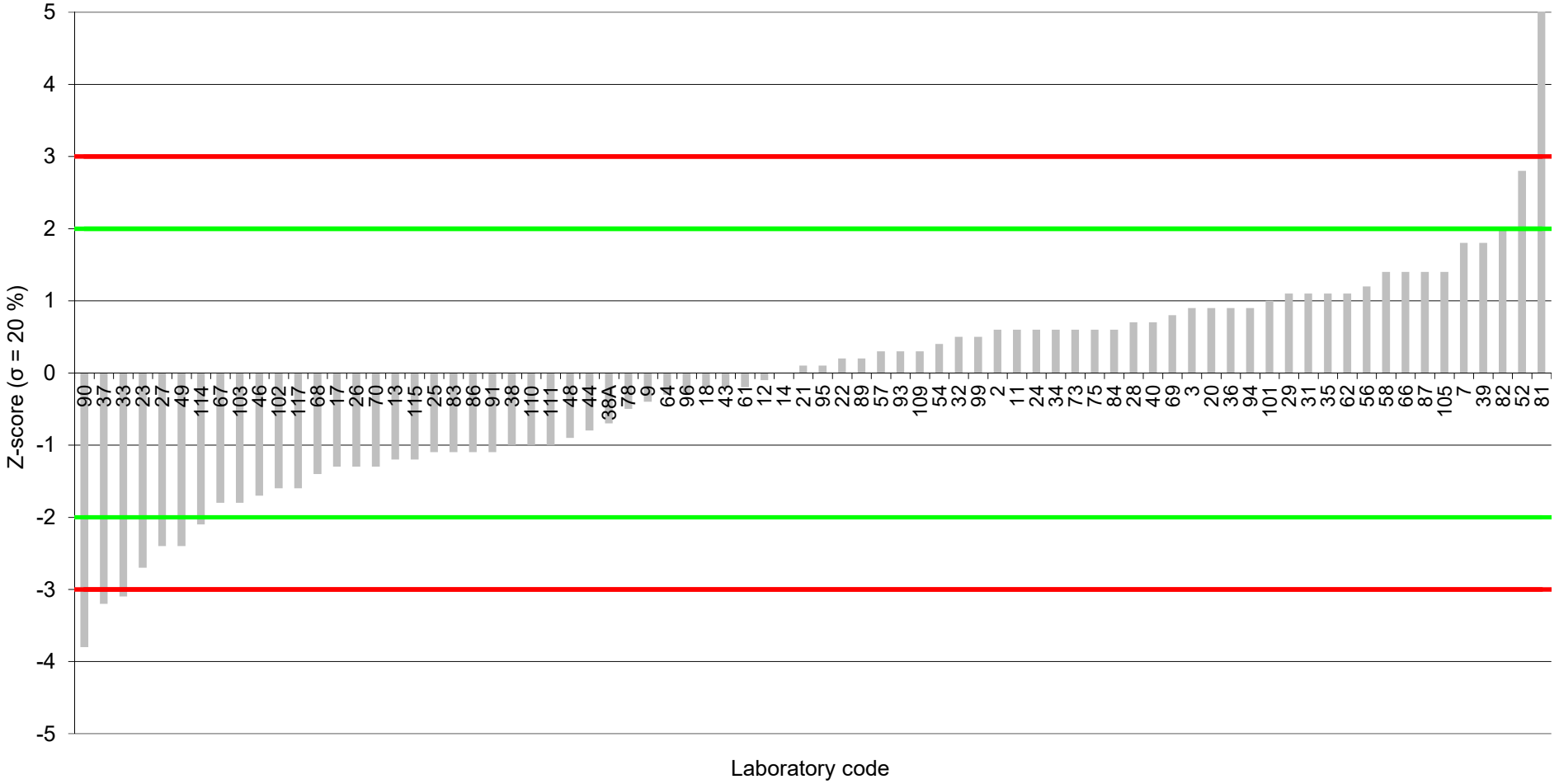
Assigned value: 0.399 ng/kg (12% moisture content)



Compound Feed (2302-CF)

2,3,4,6,7,8-HxCDF

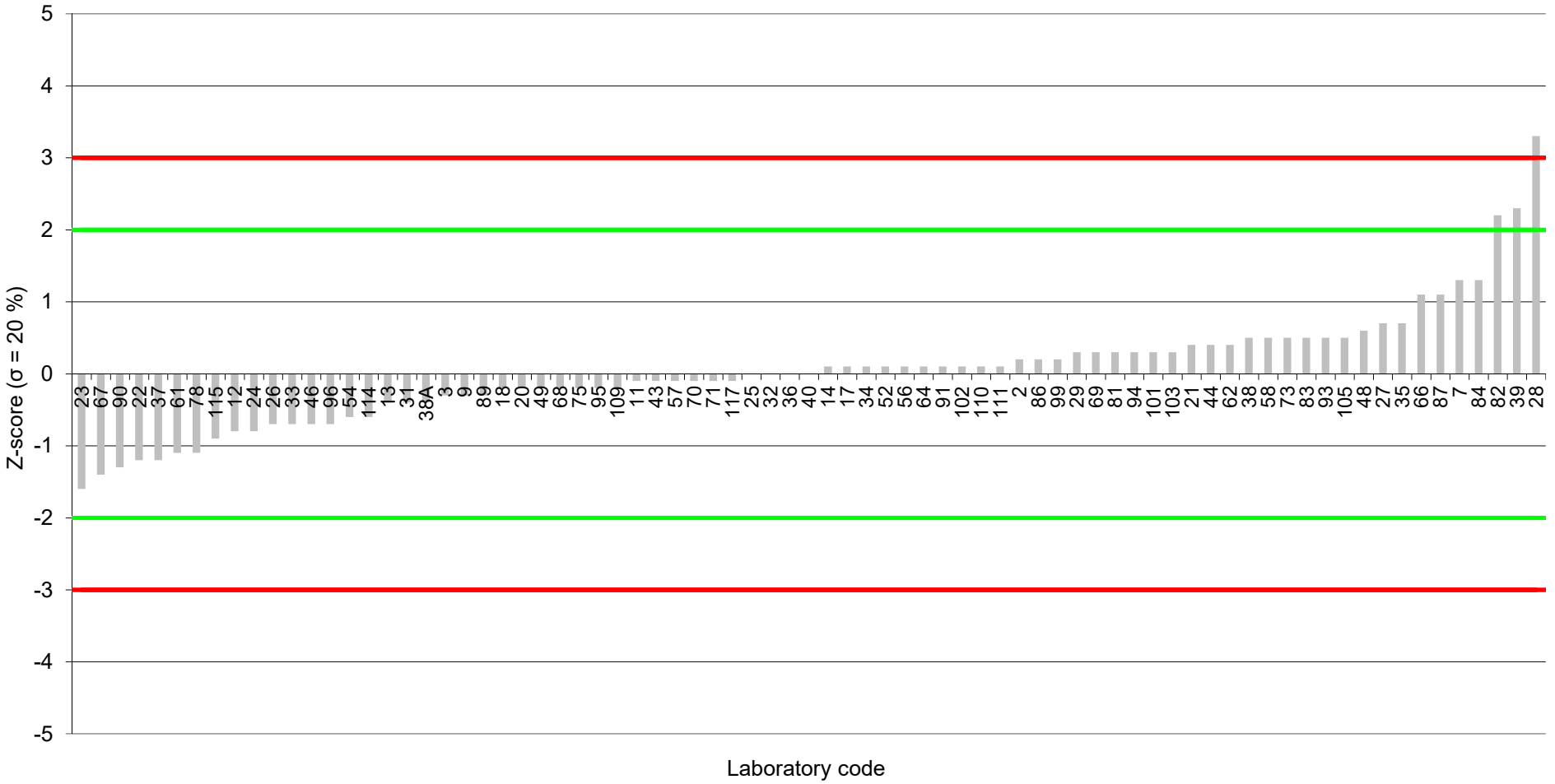
Assigned value: 0.322 ng/kg (12% moisture content)



Compound Feed (2302-CF)

1,2,3,4,6,7,8-HpCDF

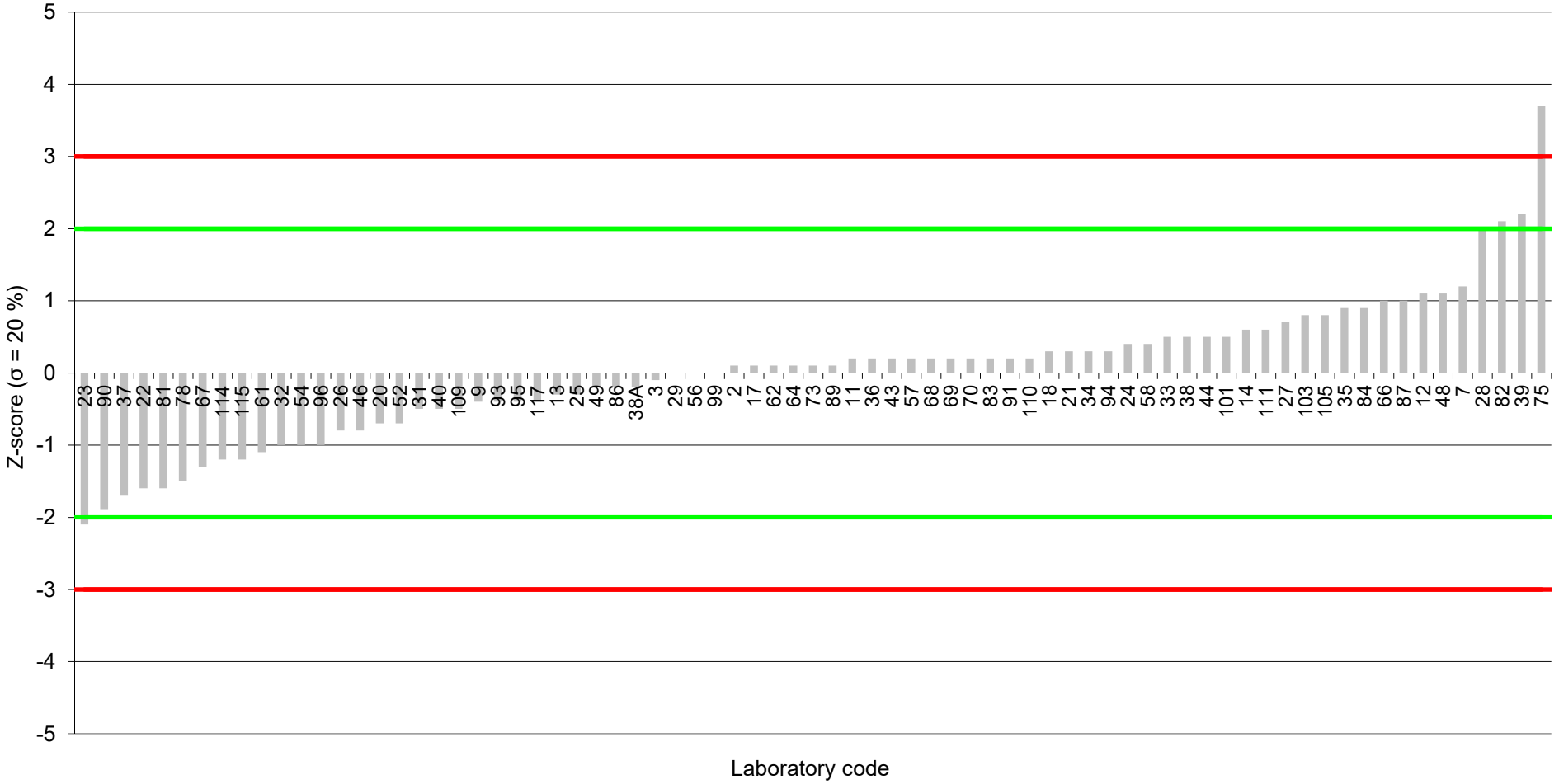
Assigned value: 1.48 ng/kg (12% moisture content)



Compound Feed (2302-CF)

1,2,3,4,7,8,9-HpCDF

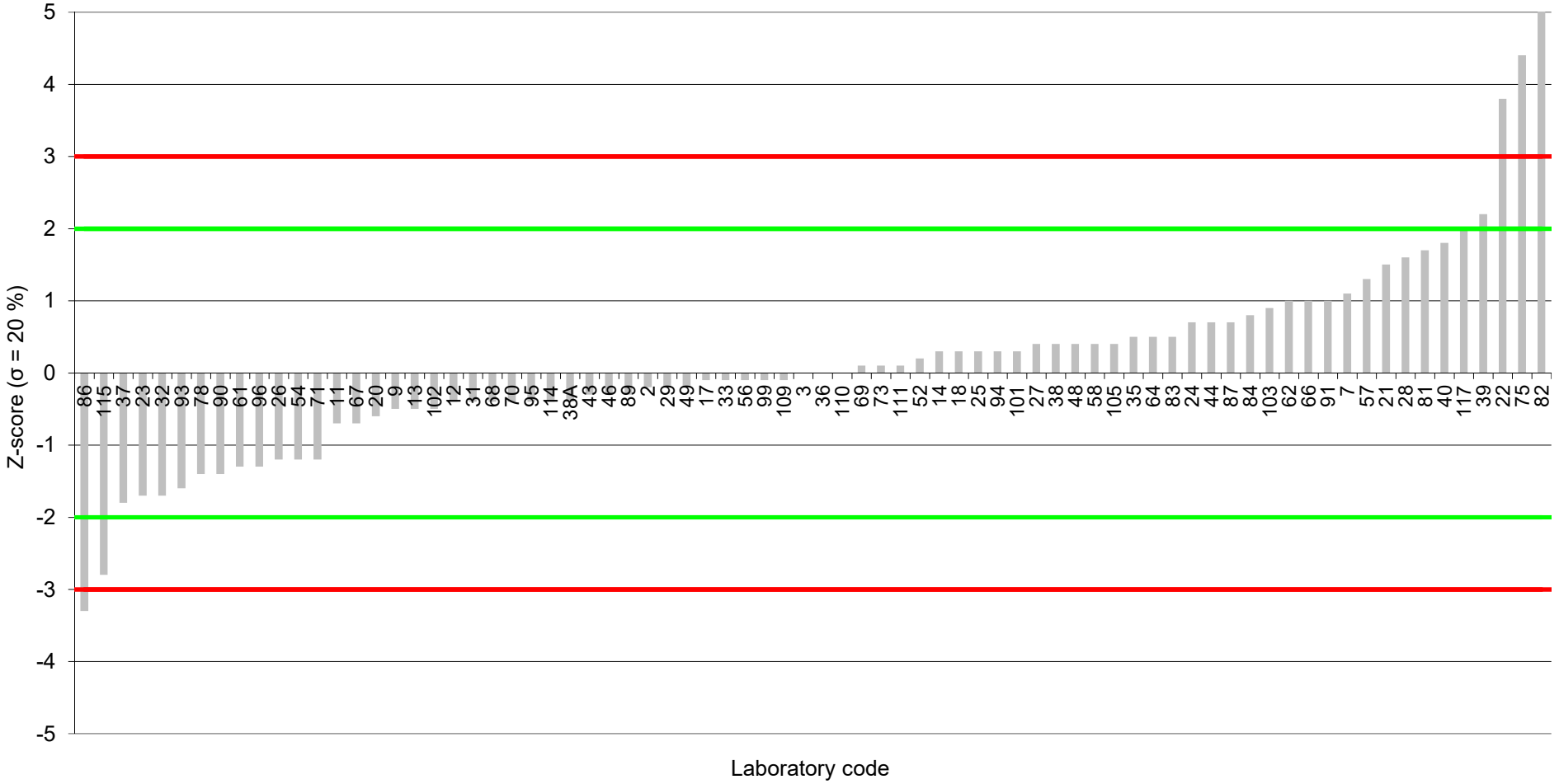
Assigned value: 0.526 ng/kg (12% moisture content)



Compound Feed (2302-CF)

OCDF

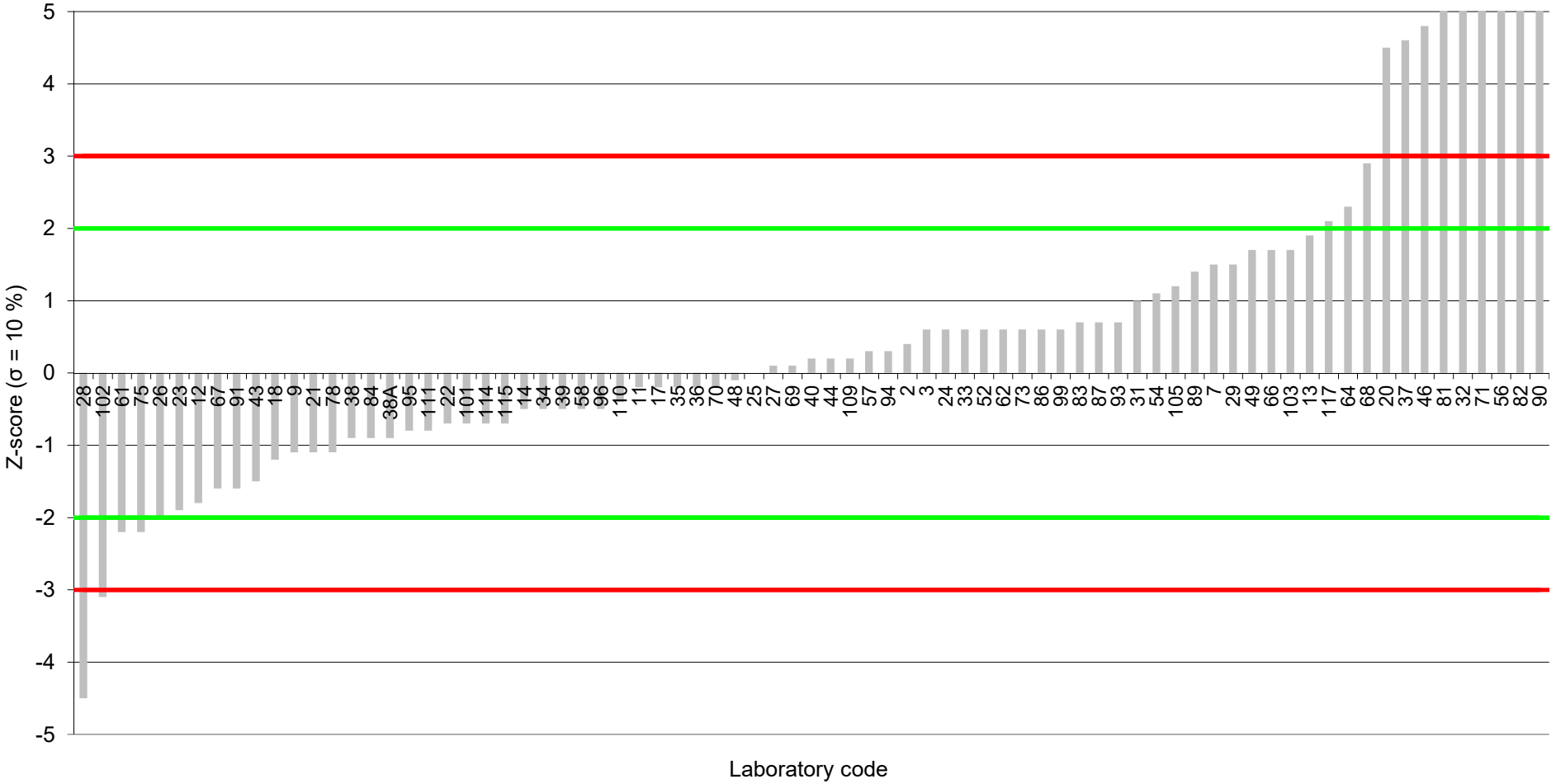
Assigned value: 4.24 ng/kg (12% moisture content)



Compound Feed (2302-CF)

WHO-PCB-TEQ upper bound (reported)

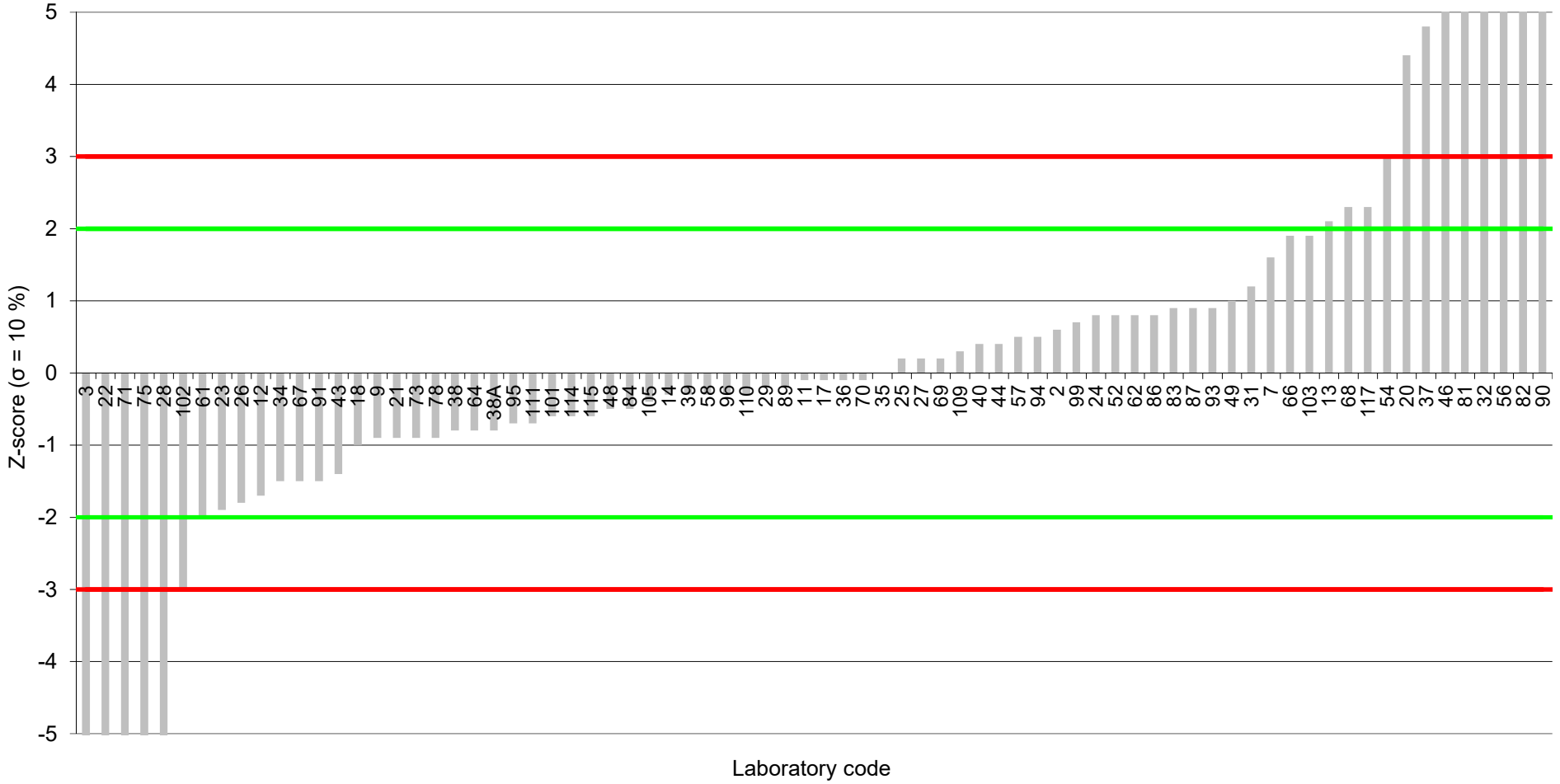
Assigned value: 0.179 ng/kg (12% moisture content)



Compound Feed (2302-CF)

WHO-PCB-TEQ lower bound (reported)

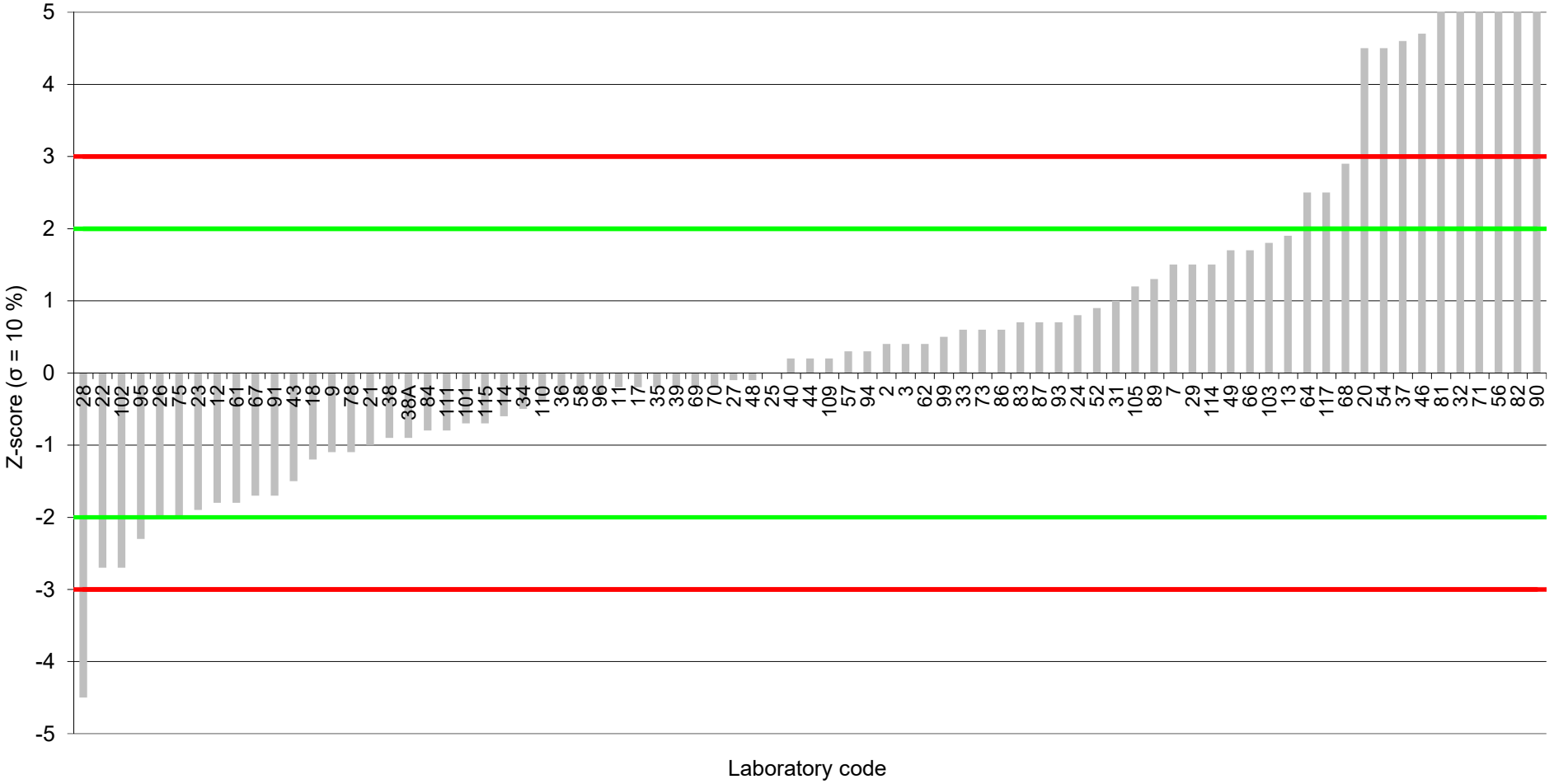
Assigned value: 0.176 ng/kg (12% moisture content)



Compound Feed (2302-CF)

WHO-PCB-TEQ upper bound (calculated)

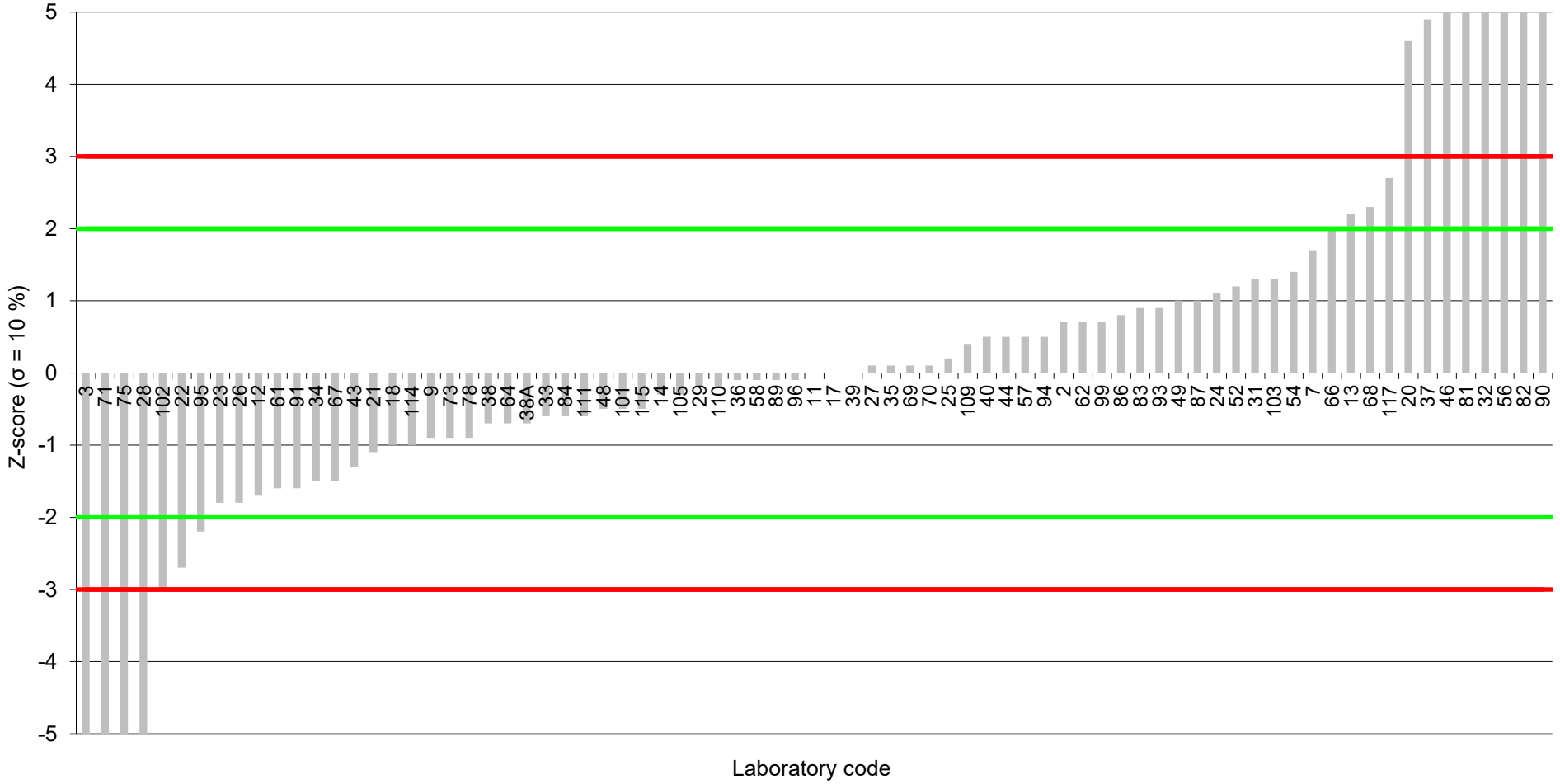
Assigned value: 0.179 ng/kg (12% moisture content)



Compound Feed (2302-CF)

WHO-PCB-TEQ lower bound (calculated)

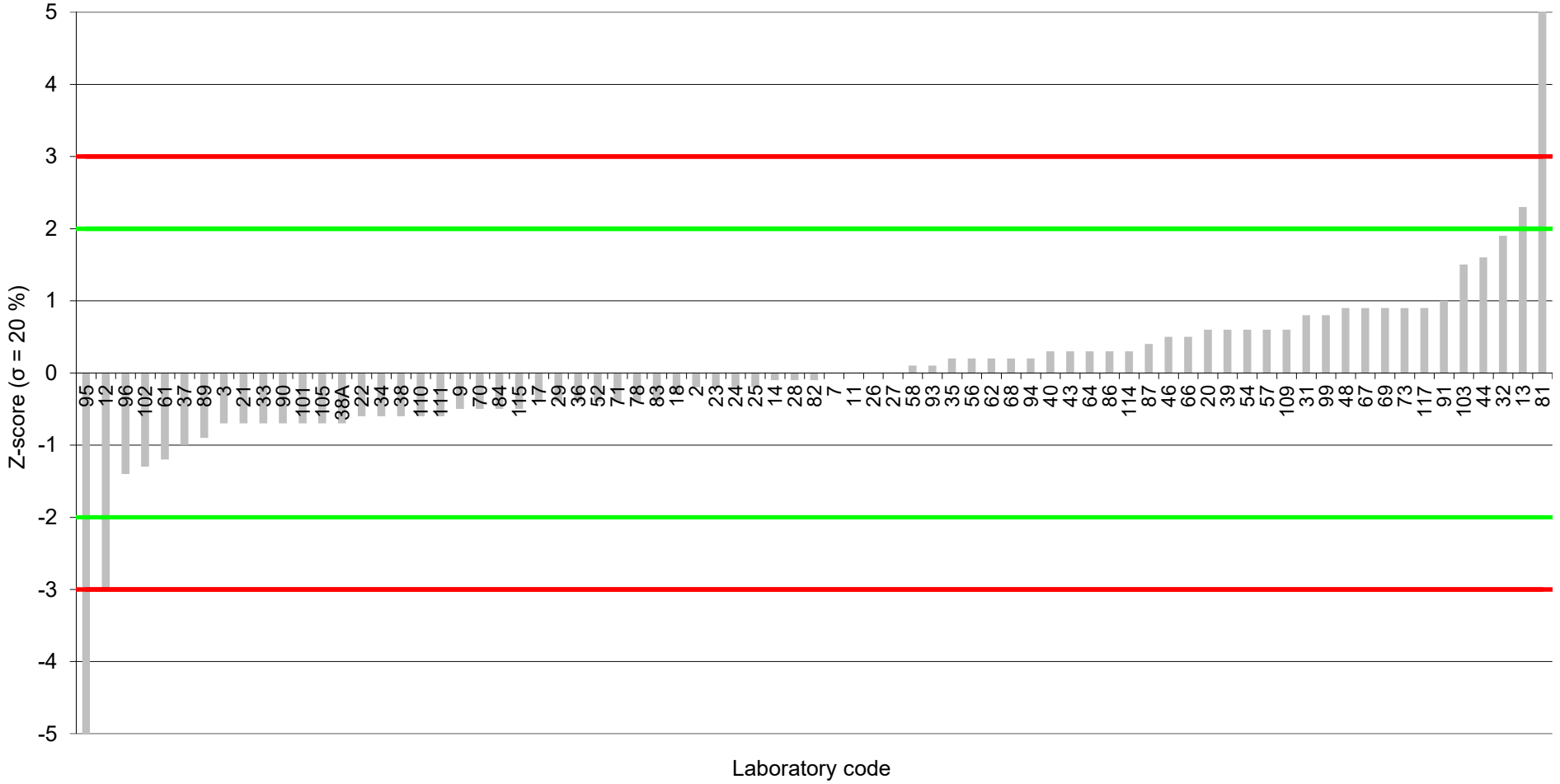
Assigned value: 0.175 ng/kg (12% moisture content)



Compound Feed (2302-CF)

PCB 105

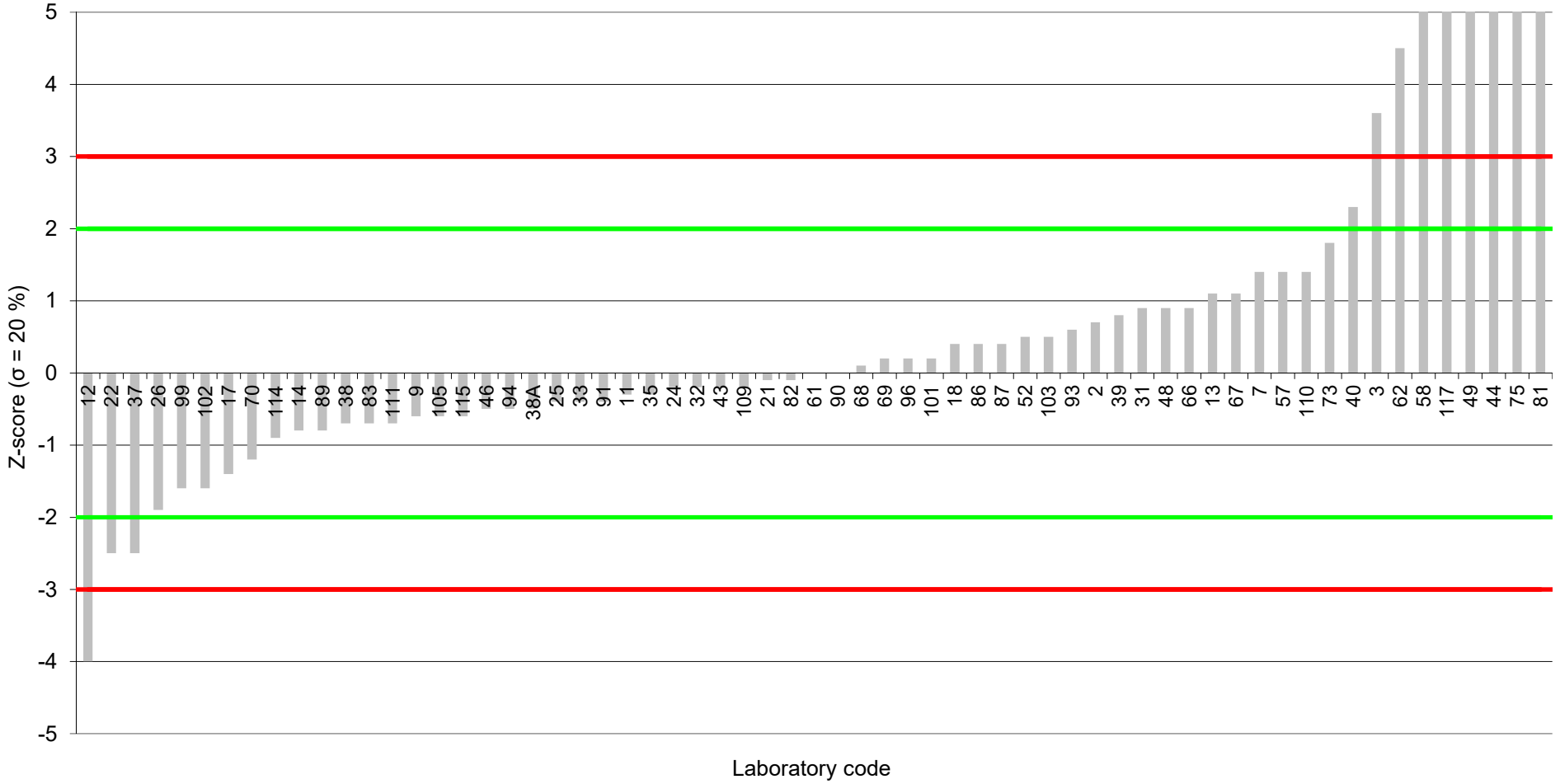
Assigned value: 108 ng/kg (12% moisture content)



Compound Feed (2302-CF)

PCB 114

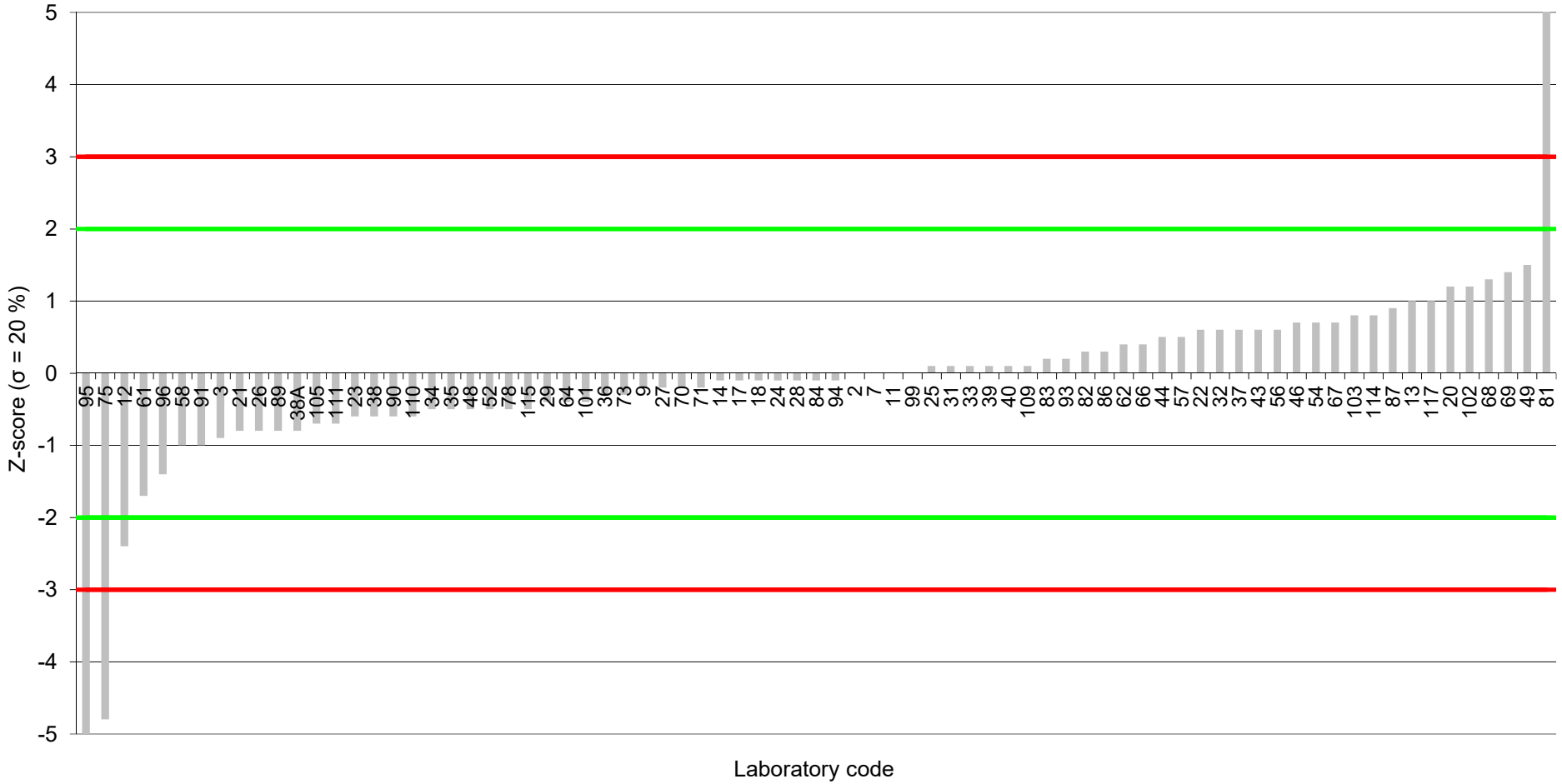
Assigned value: 5.27 ng/kg (12% moisture content)



Compound Feed (2302-CF)

PCB 118

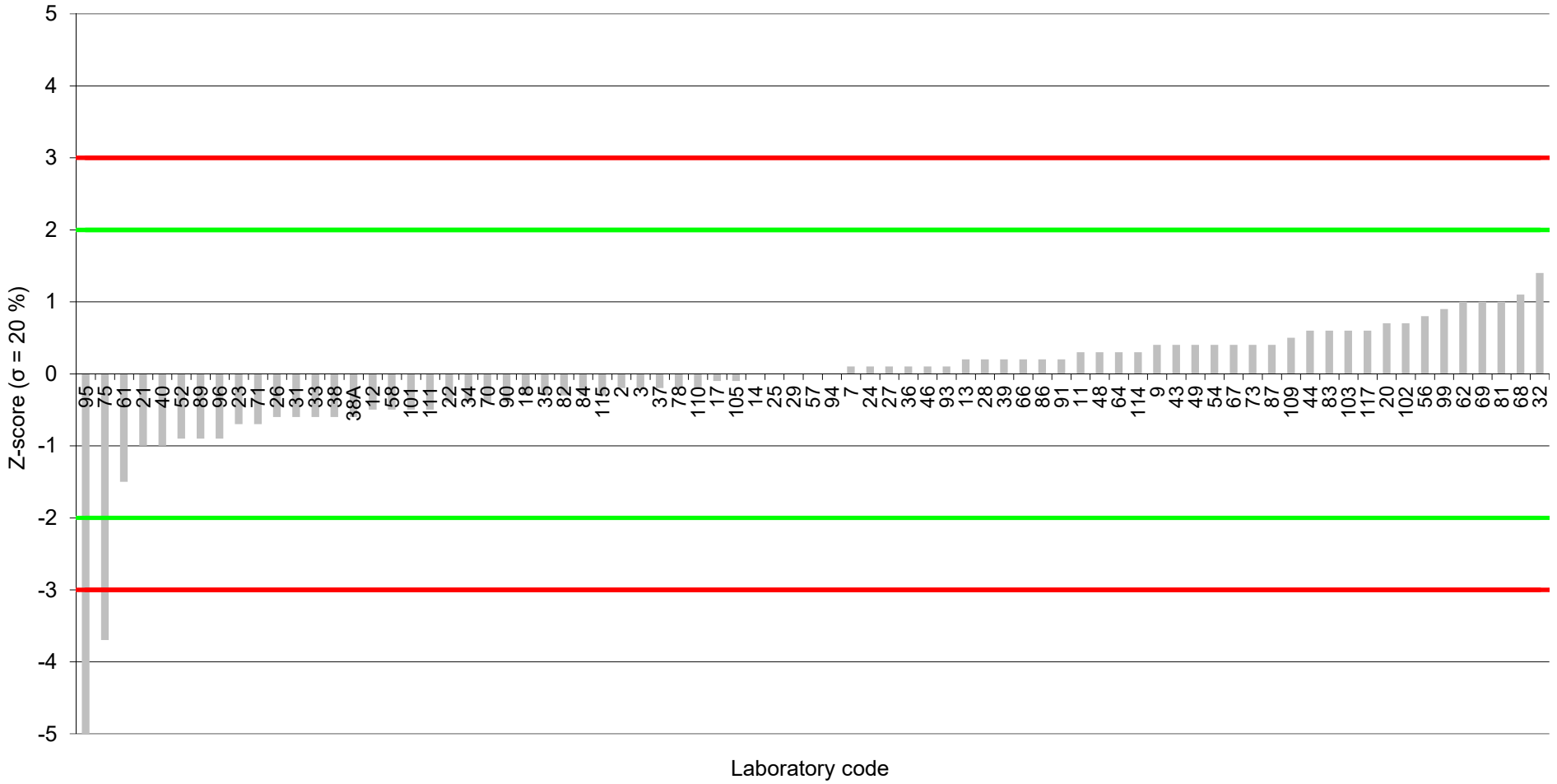
Assigned value: 695 ng/kg (12% moisture content)



Compound Feed (2302-CF)

PCB 156

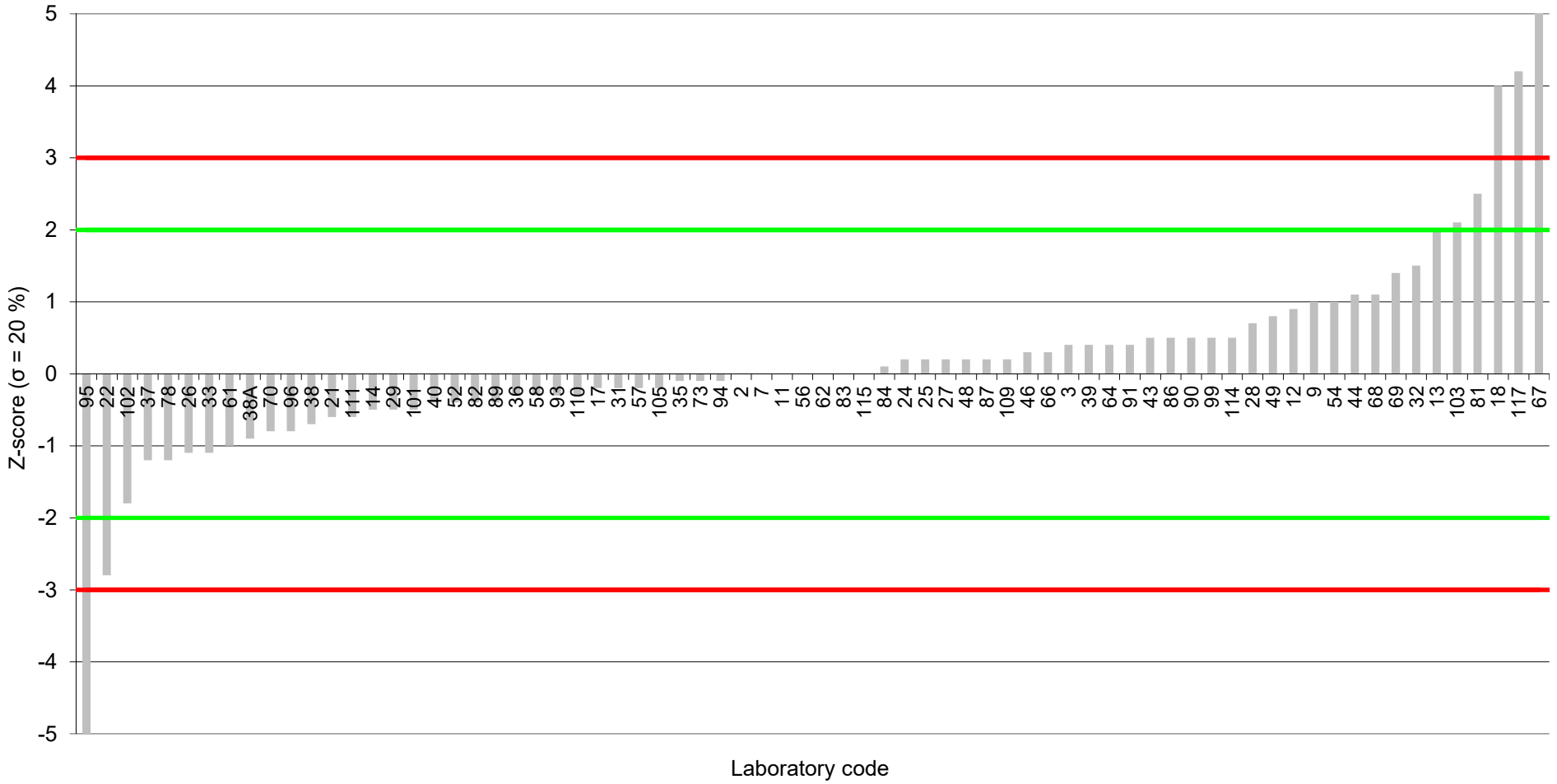
Assigned value: 135 ng/kg (12% moisture content)



Compound Feed (2302-CF)

PCB 157

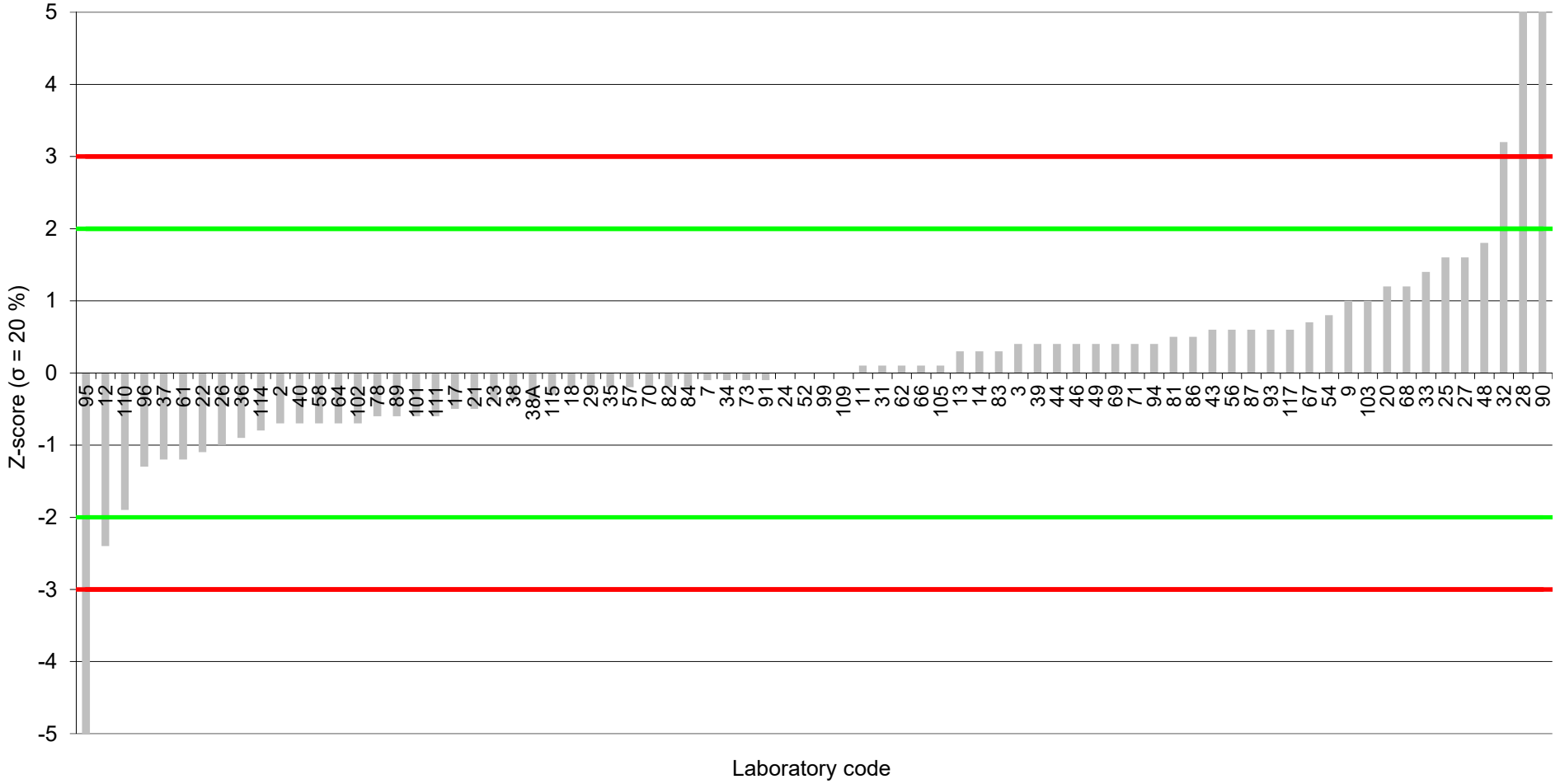
Assigned value: 13 ng/kg (12% moisture content)



Compound Feed (2302-CF)

PCB 167

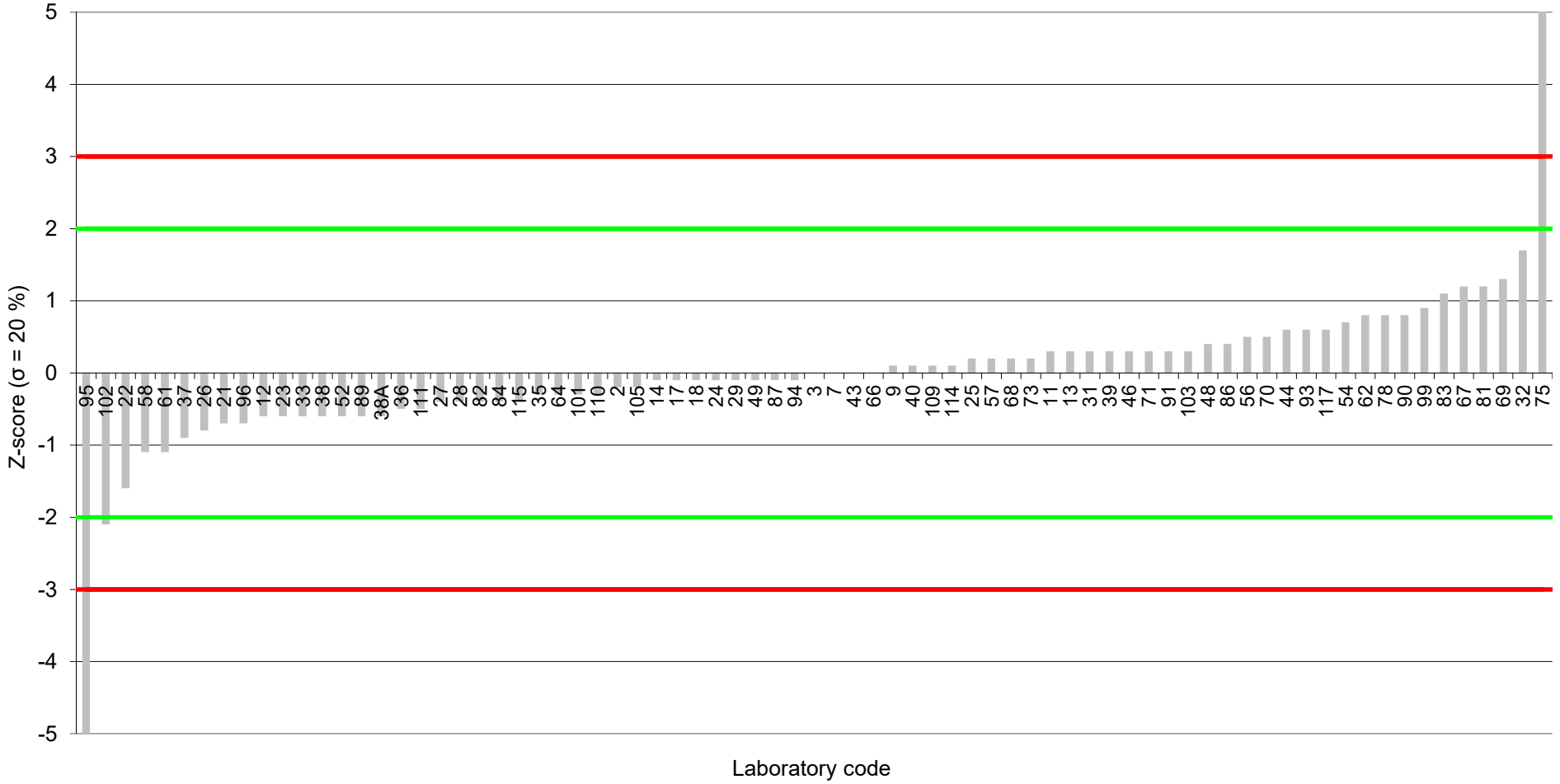
Assigned value: 68.2 ng/kg (12% moisture content)



Compound Feed (2302-CF)

PCB 189

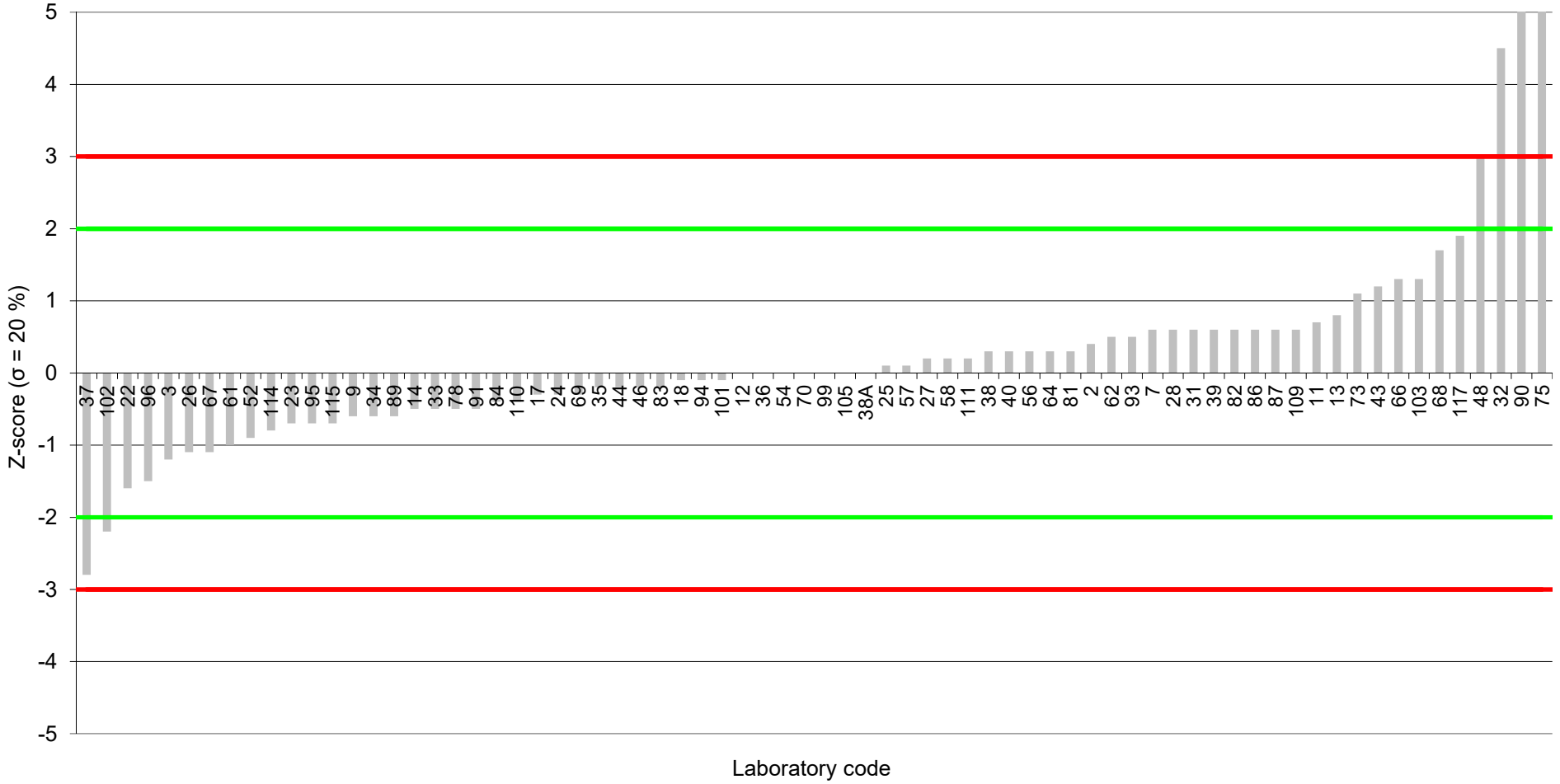
Assigned value: 17.1 ng/kg (12% moisture content)



Compound Feed (2302-CF)

PCB 77

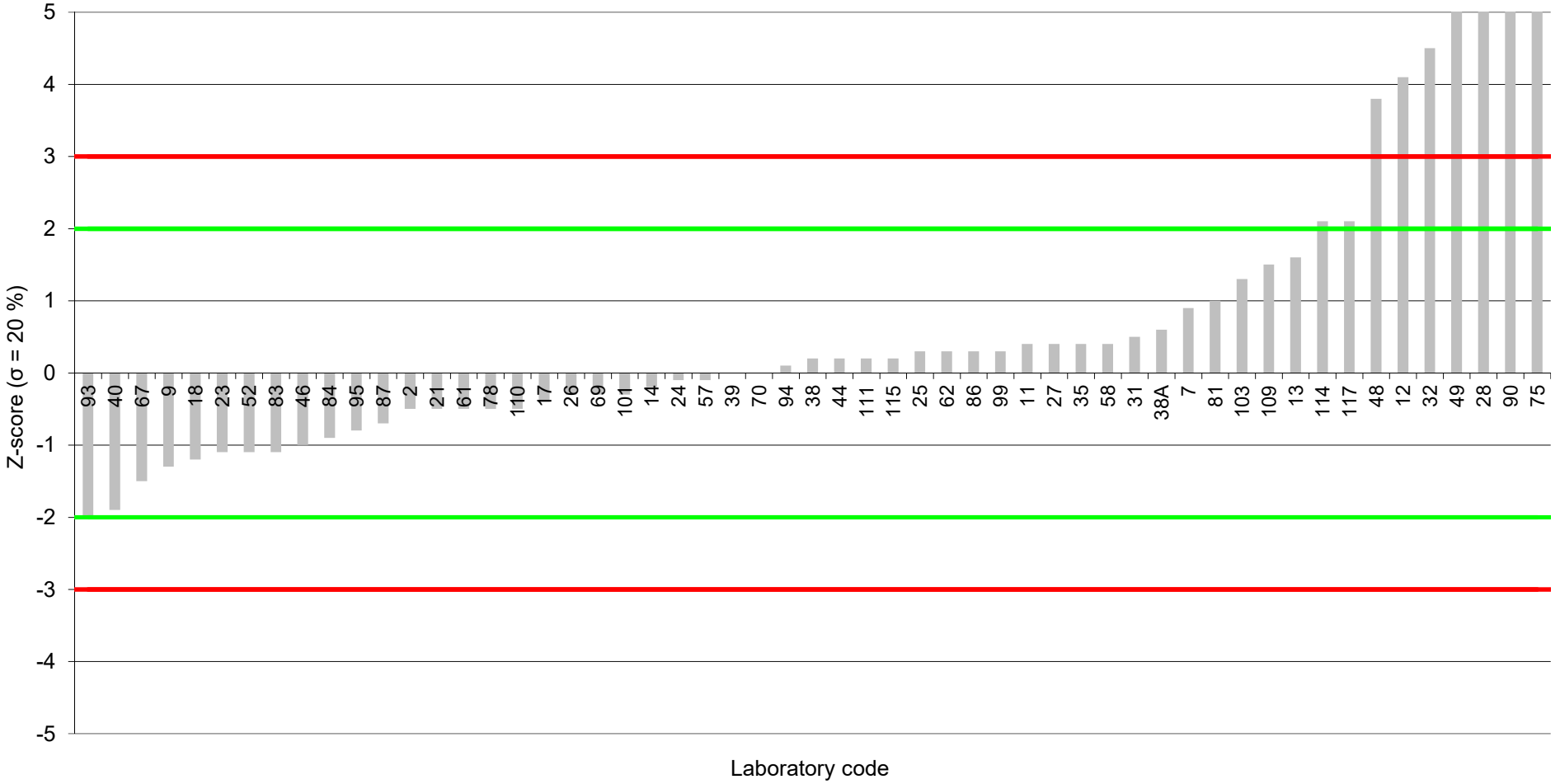
Assigned value: 8.07 ng/kg (12% moisture content)



Compound Feed (2302-CF)

PCB 81

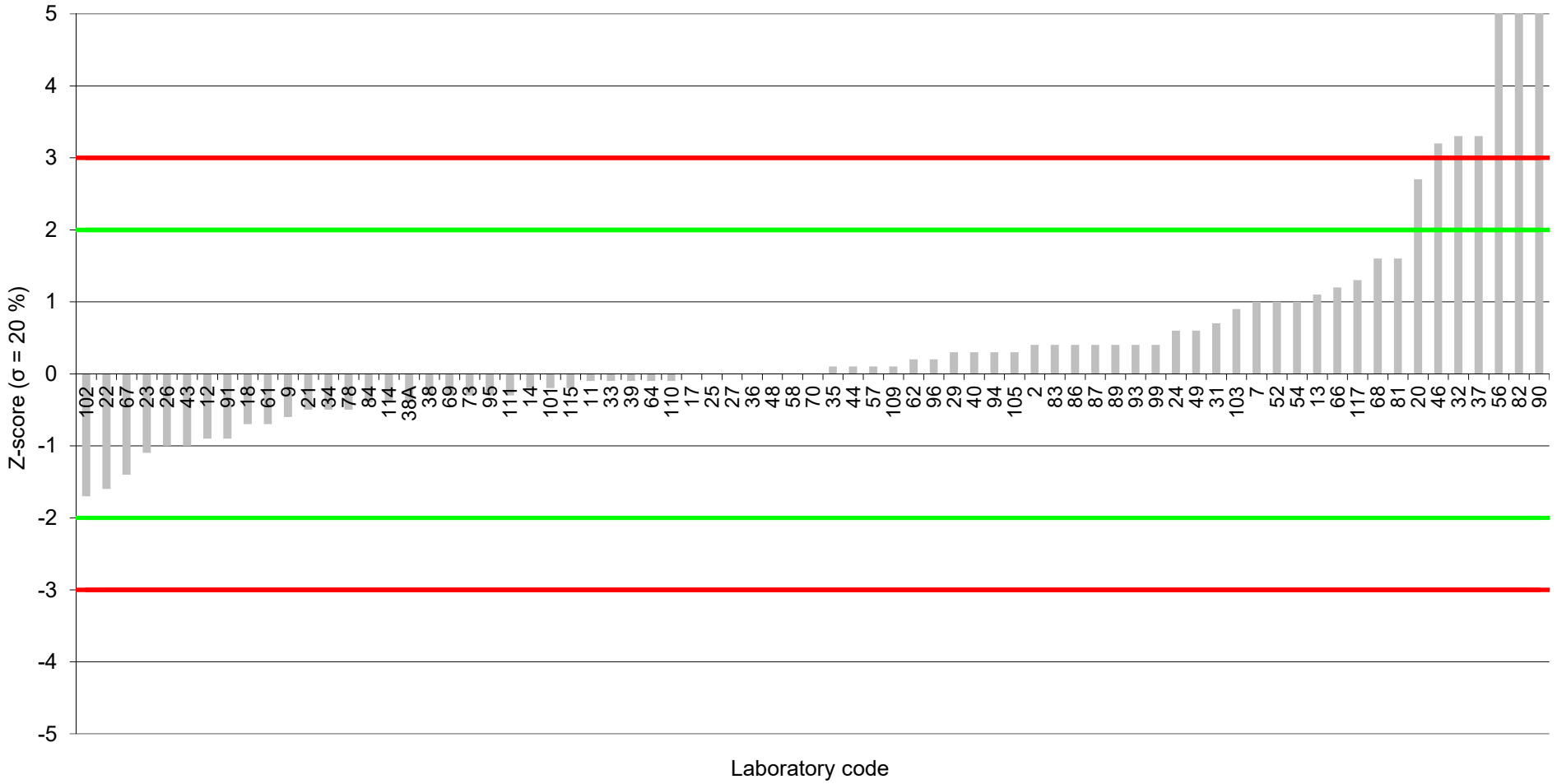
Assigned value: 0.358 ng/kg (12% moisture content)



Compound Feed (2302-CF)

PCB 126

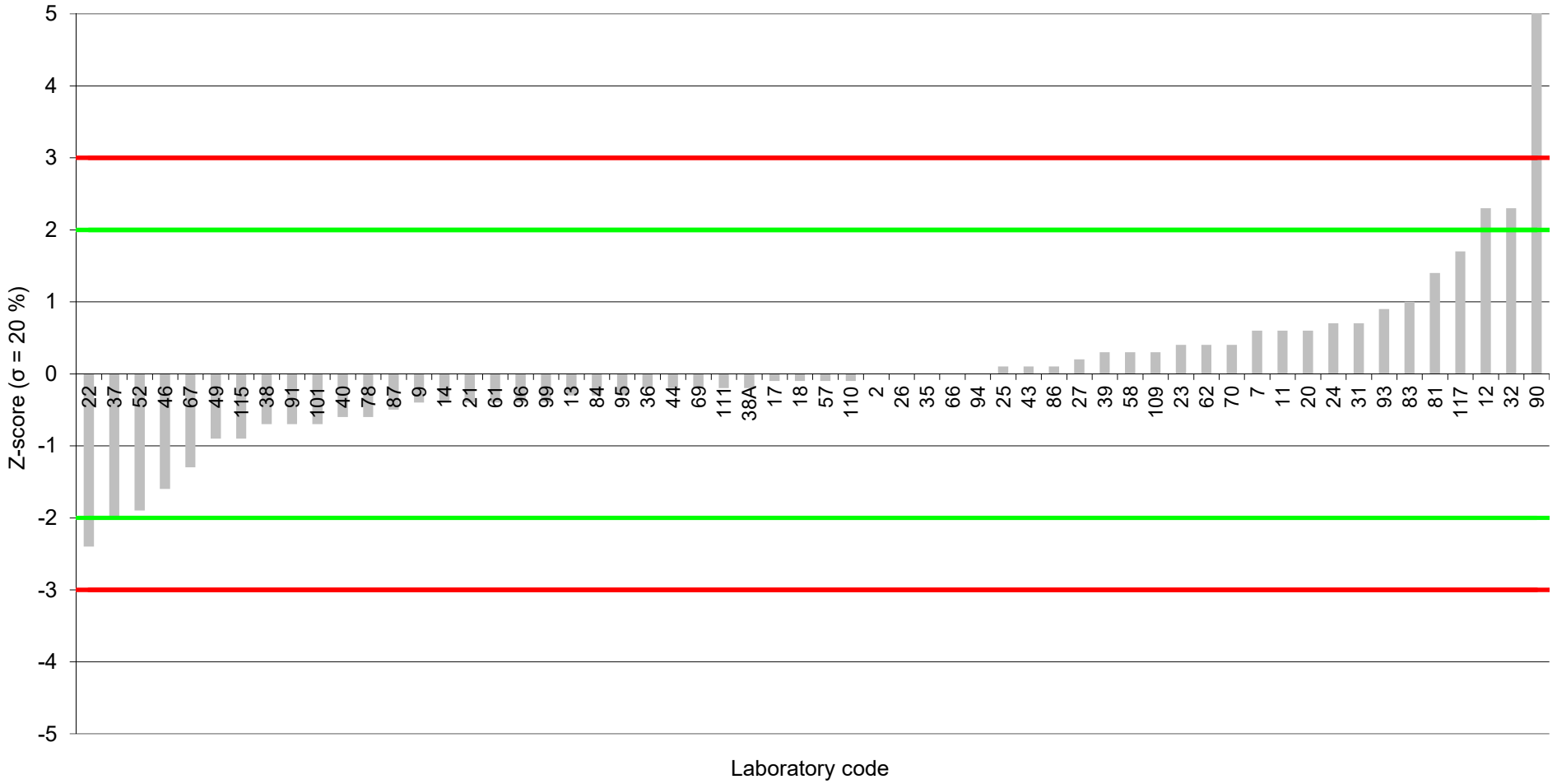
Assigned value: 1.34 ng/kg (12% moisture content)



Compound Feed (2302-CF)

PCB 169

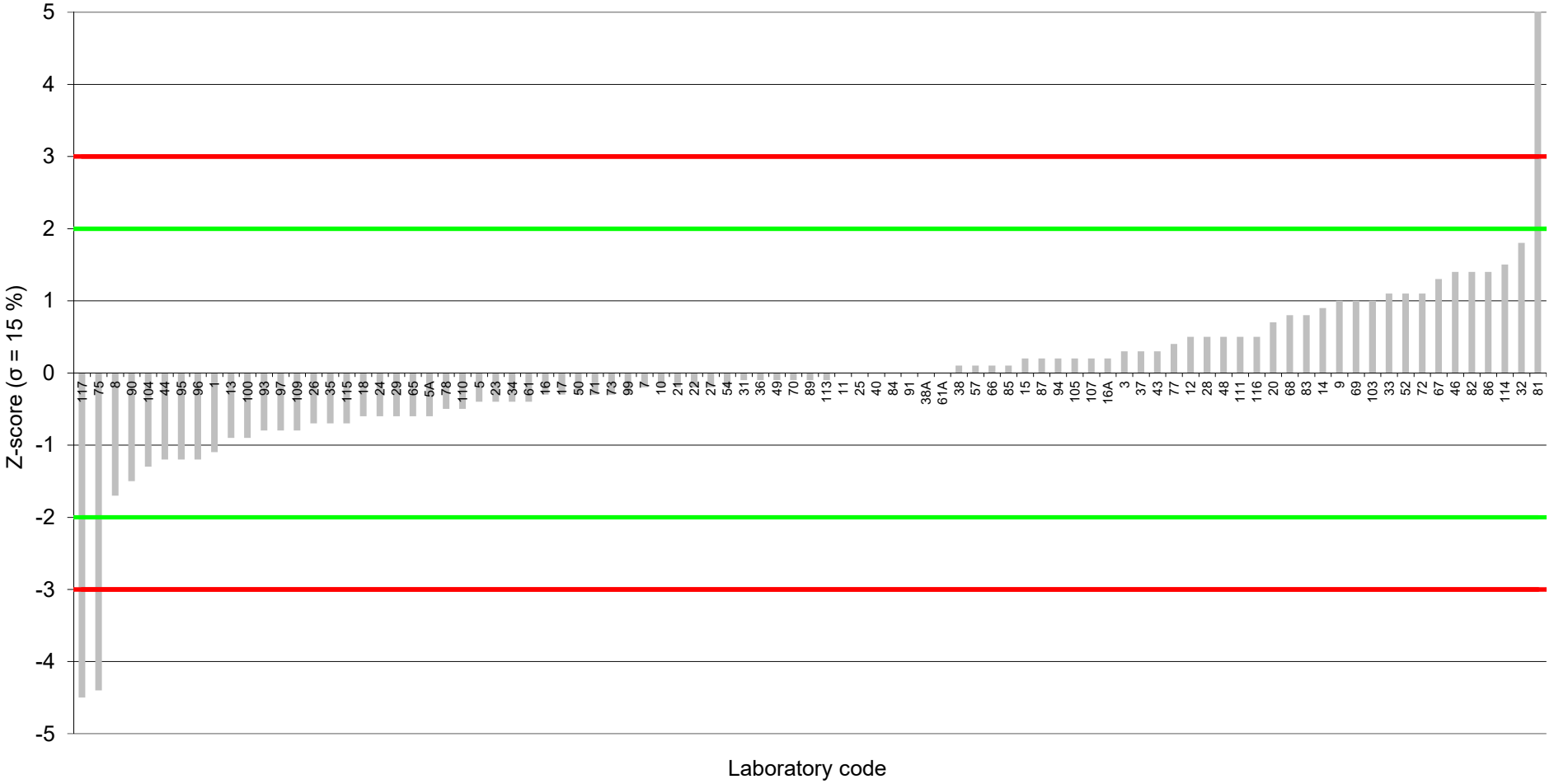
Assigned value: 0.351 ng/kg (12% moisture content)



Compound Feed (2302-CF)

Sum of 6 NDL-PCBs upper bound (reported)

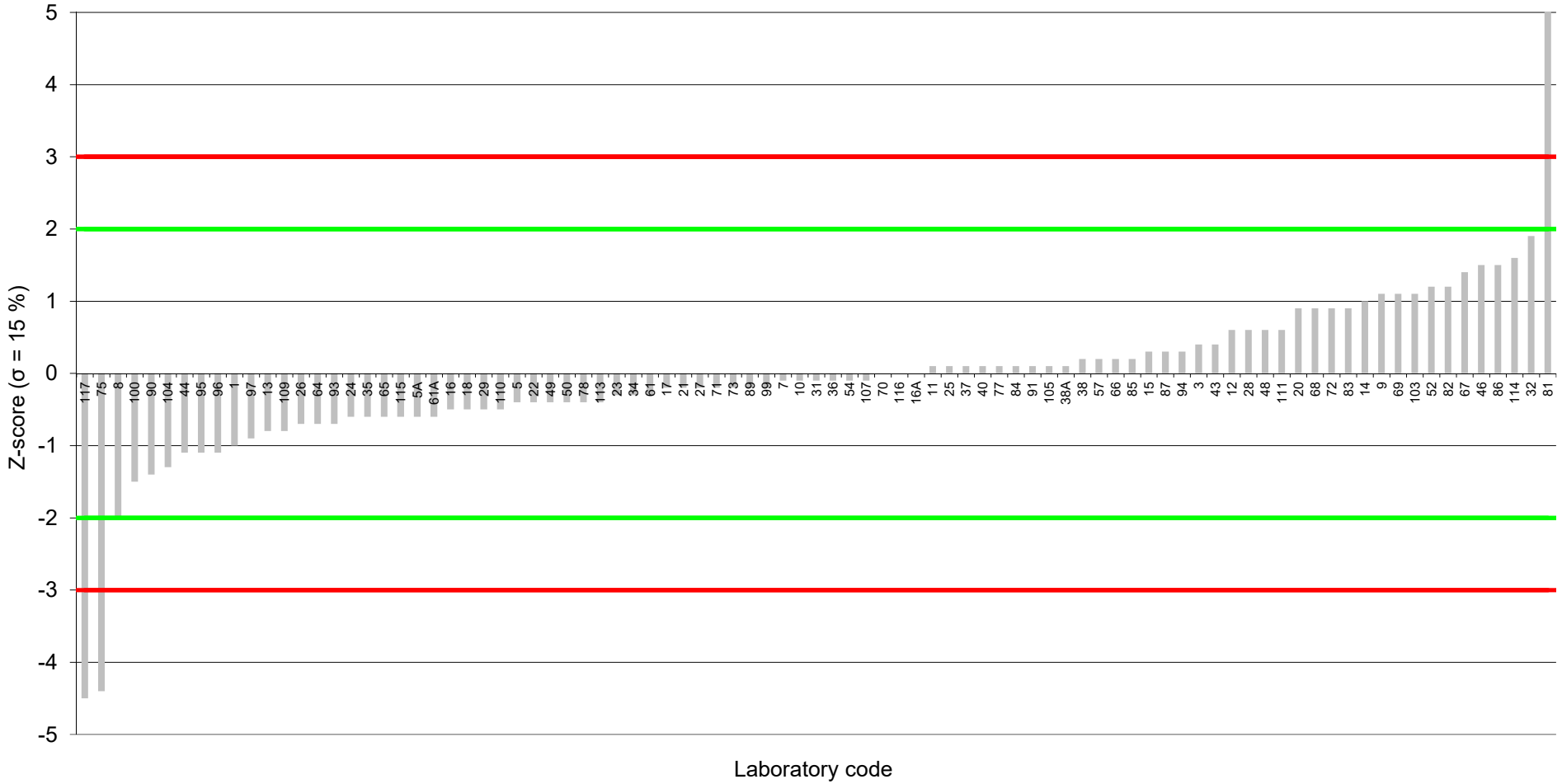
Assigned value: 9.44 µg/kg (12% moisture content)



Compound Feed (2302-CF)

Sum of 6 NDL-PCBs lower bound (reported)

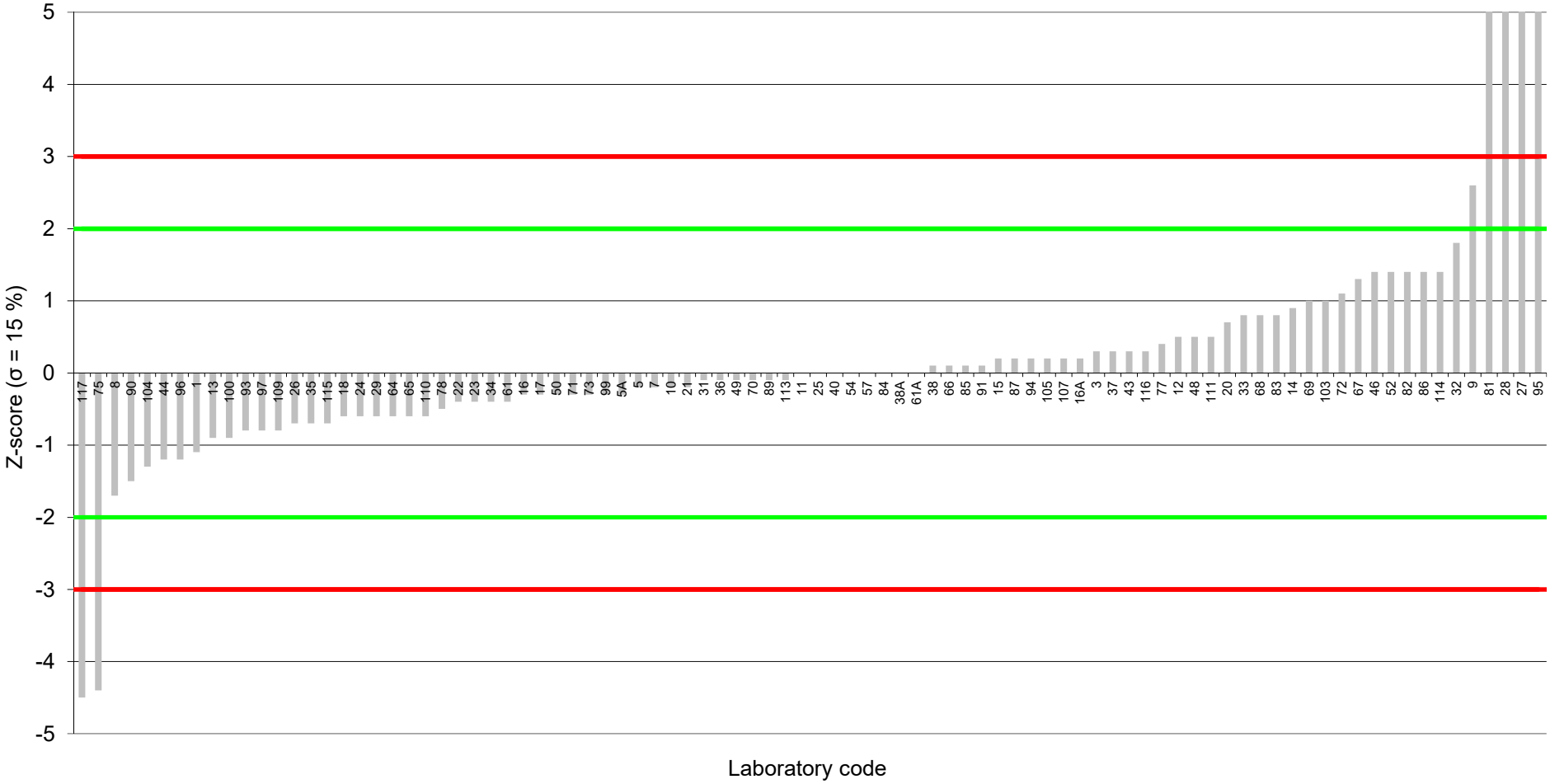
Assigned value: 9.31 µg/kg (12% moisture content)



Compound Feed (2302-CF)

Sum of 6 NDL-PCBs upper bound (calculated)

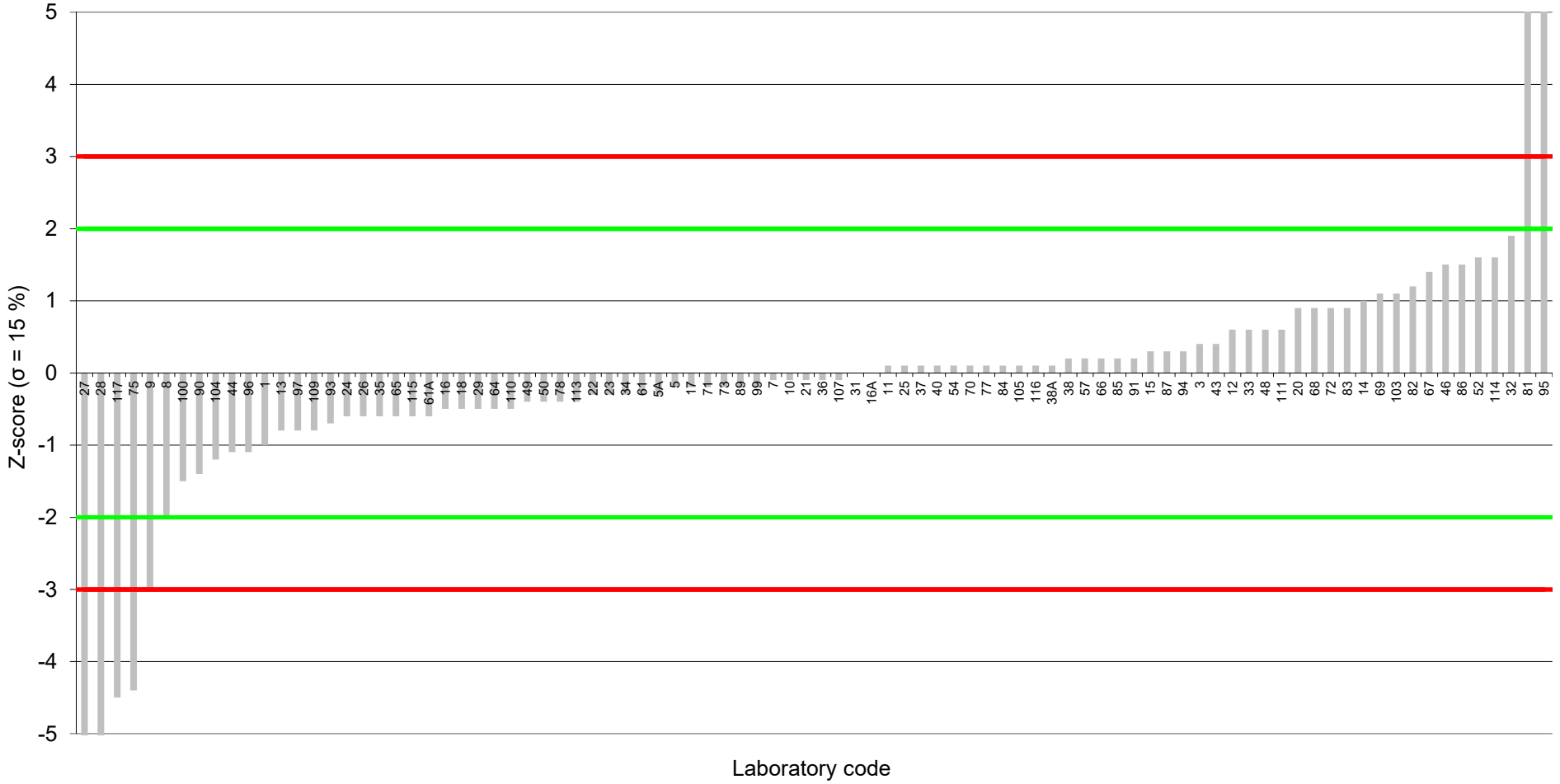
Assigned value: 9.45 µg/kg (12% moisture content)



Compound Feed (2302-CF)

Sum of 6 NDL-PCBs lower bound (calculated)

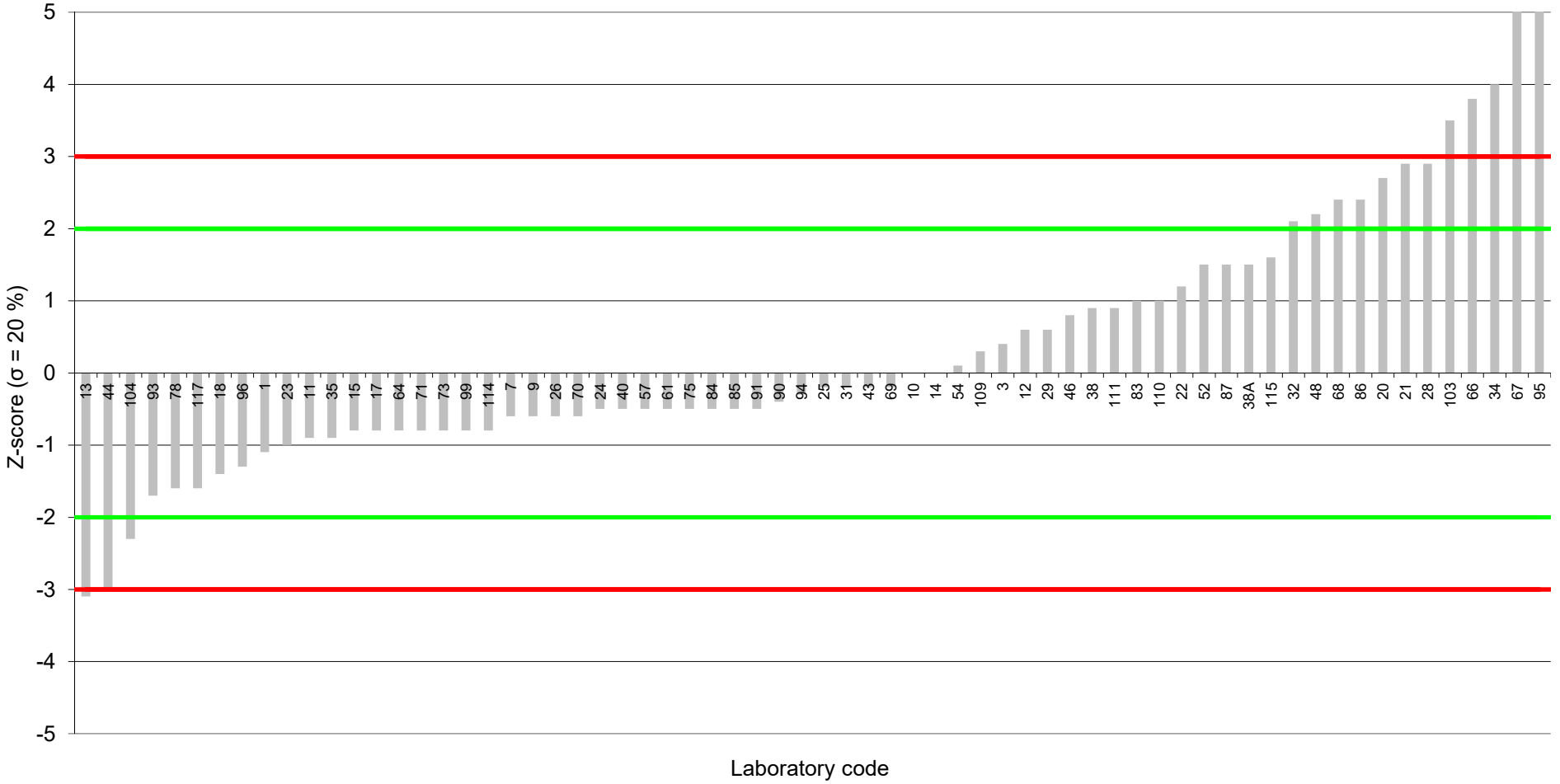
Assigned value: 9.3 µg/kg (12% moisture content)



Compound Feed (2302-CF)

PCB 28

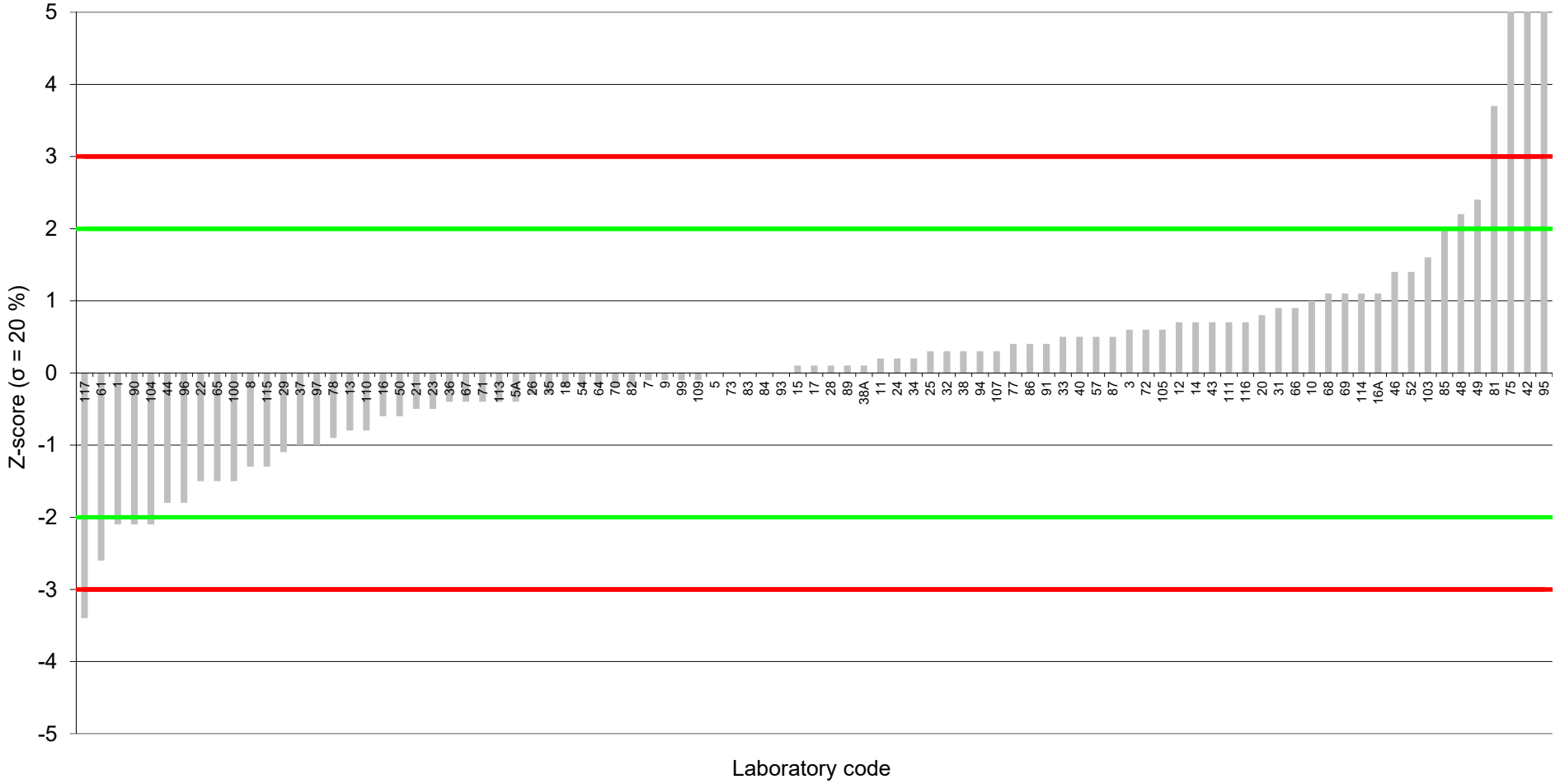
Assigned value: 0.177 µg/kg (12% moisture content)



Compound Feed (2302-CF)

PCB 52

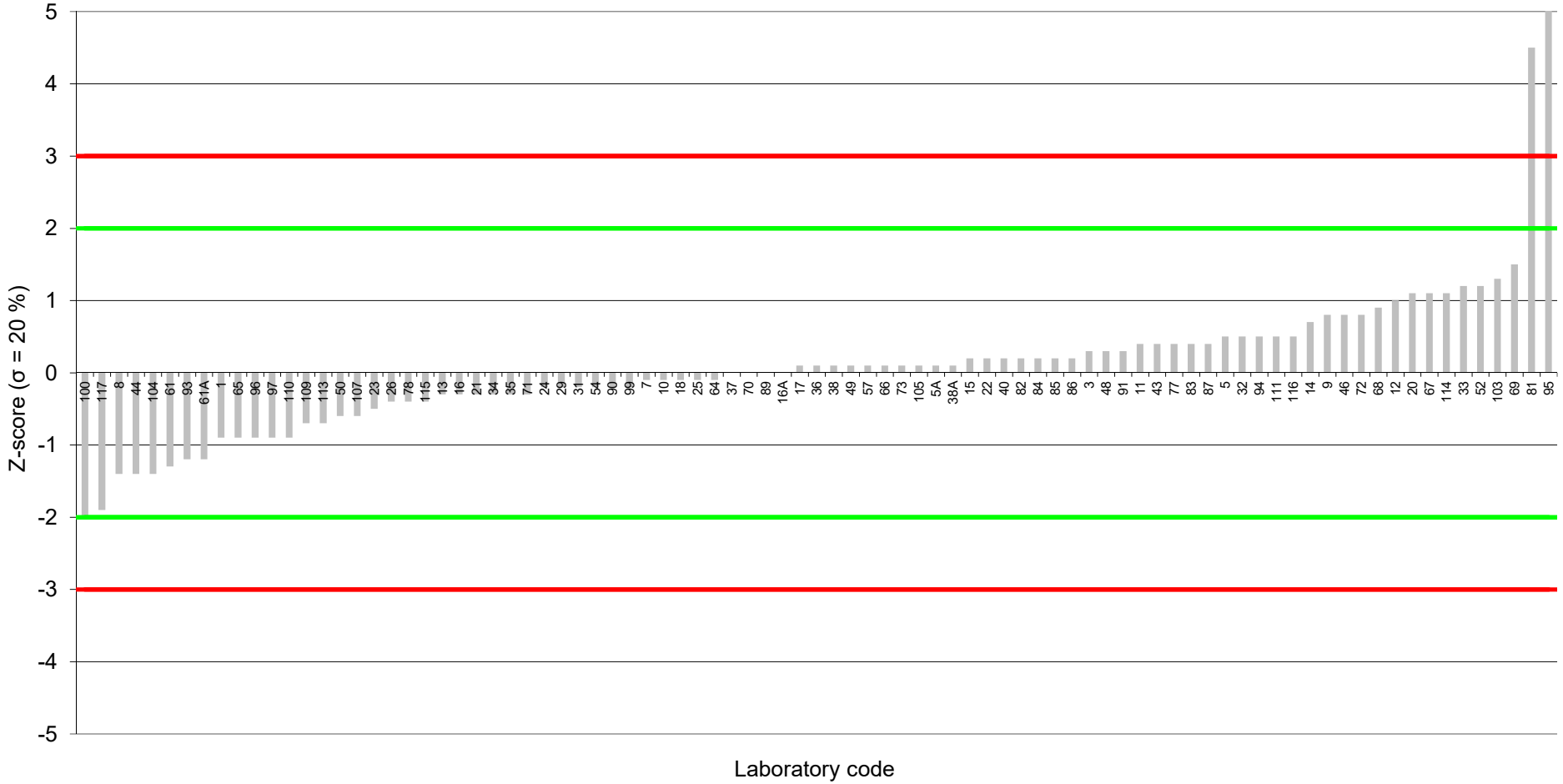
Assigned value: 0.733 µg/kg (12% moisture content)



Compound Feed (2302-CF)

PCB 101

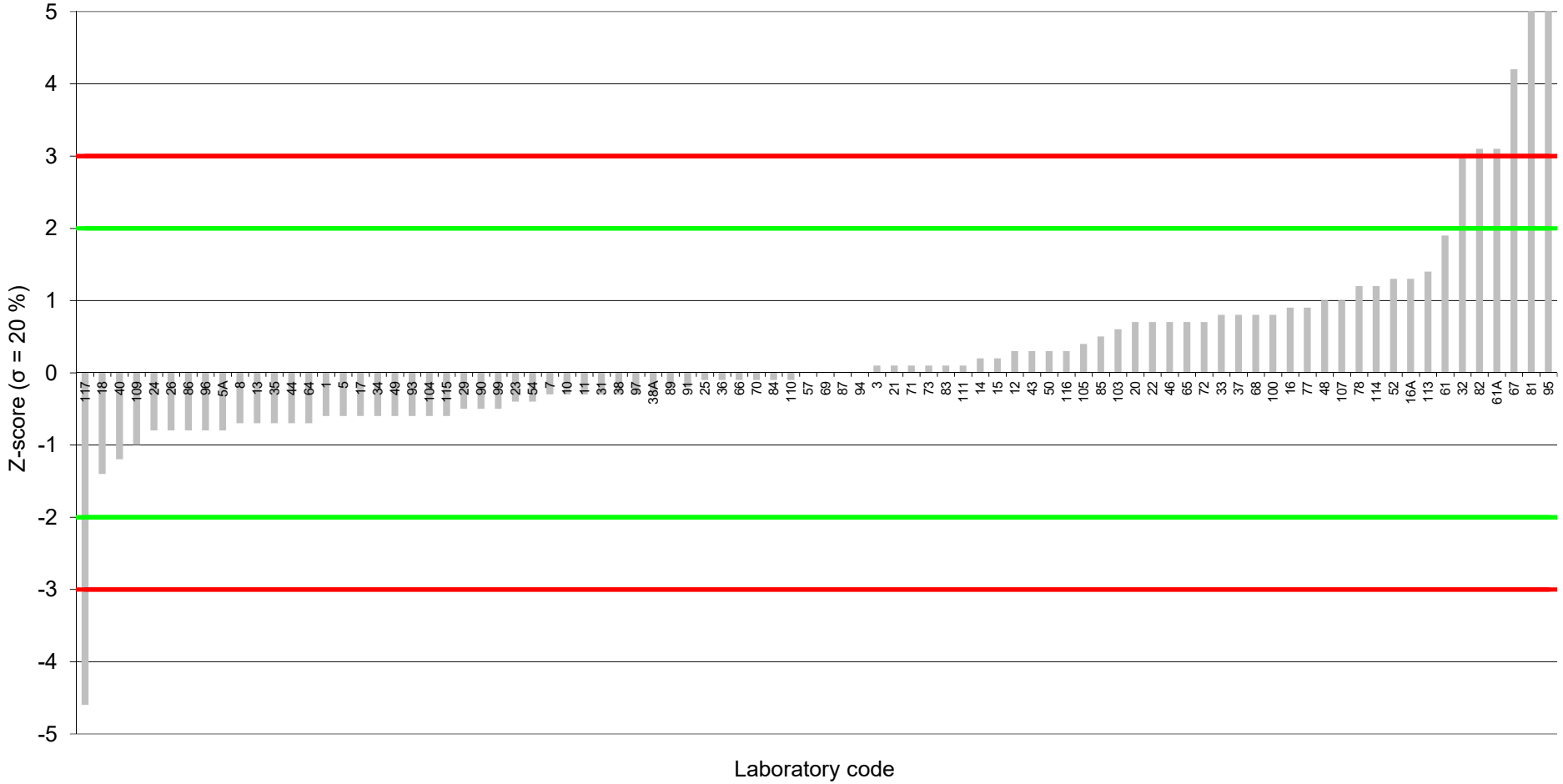
Assigned value: 2.35 µg/kg (12% moisture content)



Compound Feed (2302-CF)

PCB 138

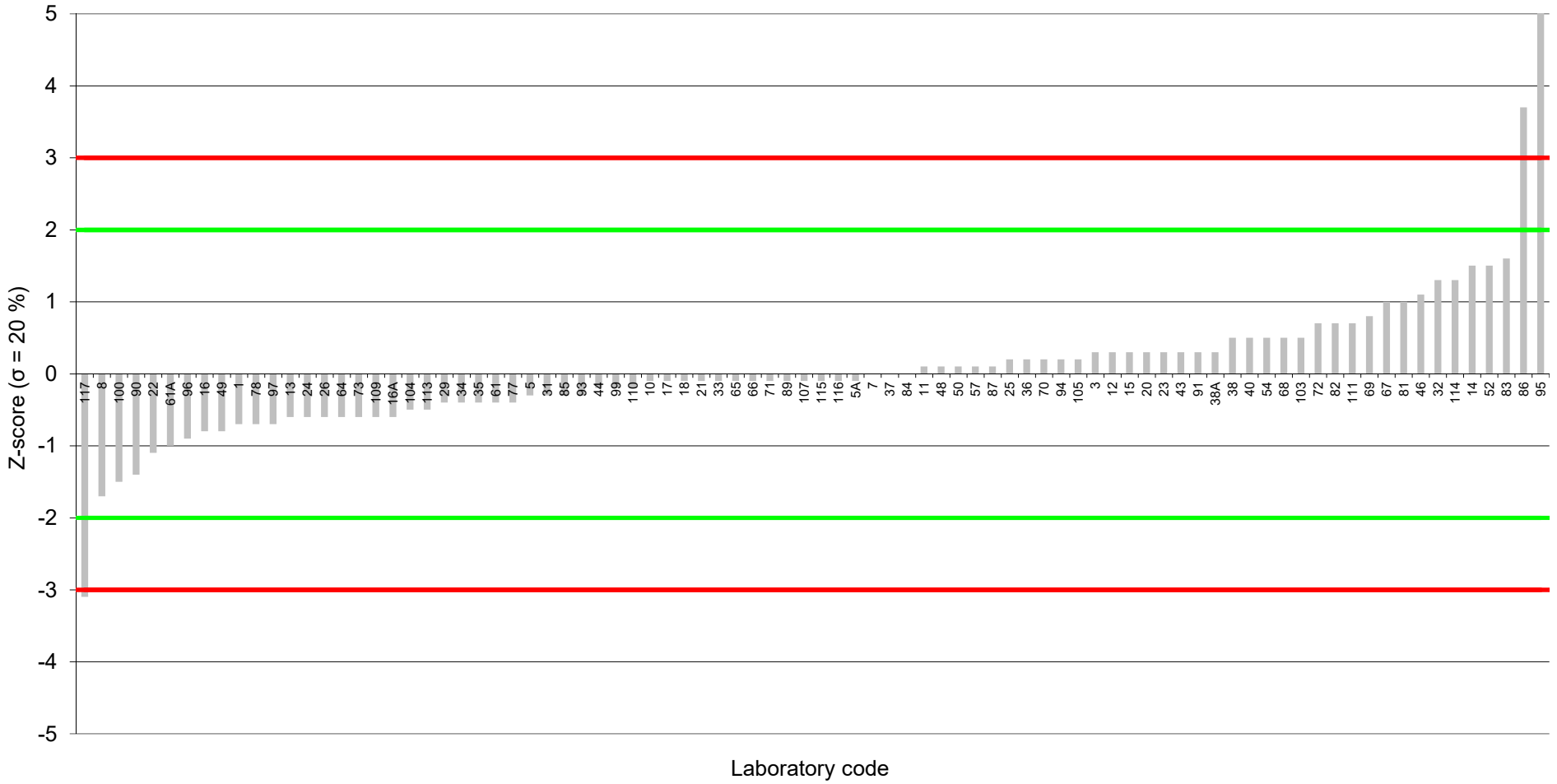
Assigned value: 1.98 µg/kg (12% moisture content)



Compound Feed (2302-CF)

PCB 153

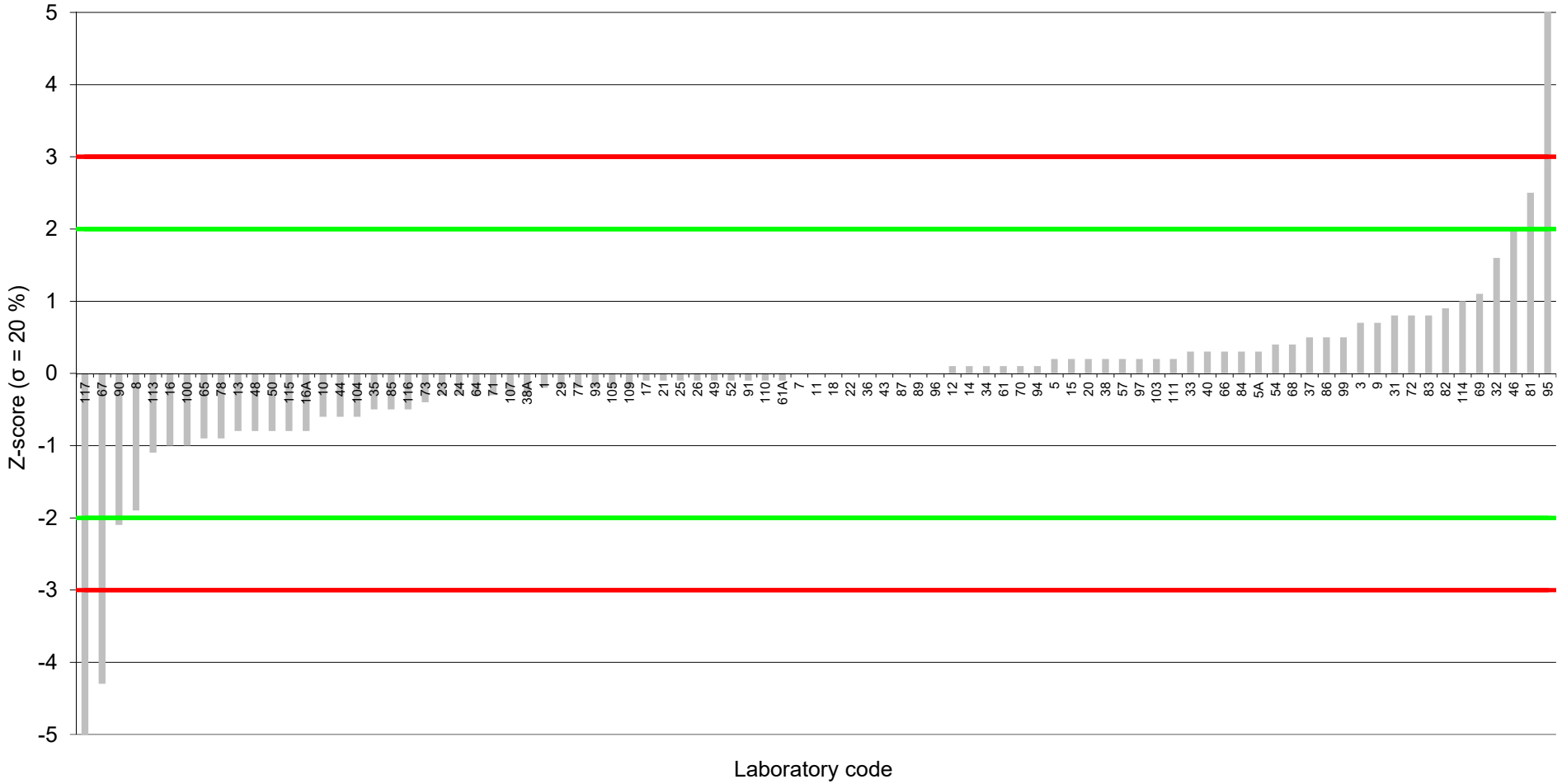
Assigned value: 2.76 µg/kg (12% moisture content)



Compound Feed (2302-CF)

PCB 180

Assigned value: 1.32 µg/kg (12% moisture content)



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Annex 5: Scoring system for PCDD/Fs and PCBs

Test sample - Compound Feed (2302-CF)

Positive scoring system

The "positive scoring system" gives one assessment for the PT sample covering all relevant PCDD/F and PCB sum parameters and congeners.
The criteria are applicable for sum parameter concentrations in the range (about 0.5 to 4 times) of the level of interest.

The total score for the positive scoring system is calculated according to the following general principles:

- Calculation of z-scores for sum parameters and evaluated individual congeners
- Calculation of the positive scores according to the following table:

Positive scoring system	| z-score | ≤ 2	2 < | z-score | < 3	| z-score | ≥ 3
Individual congeners	Positive score	Positive score	Positive score
Contribution to sum parameter* > 10 %	12	6	0
Contribution to sum parameter* 3 – 10 %	8	4	0
Contribution to sum parameter* < 3 %	6	3	0
Not evaluated congeners	0	0	0

*separately for the respective sum parameters WHO-PCDD/F-TEQ, WHO-PCB-TEQ and the sum of six indicator PCBs

- Calculation of maximum achievable scores (| z-score | ≤ 2) for PCDD/F and DL-PCB and indicator PCB congeners separately:
  Maximum score = Σmax. score(> 10 %) + Σmax. score(3-10 %) + Σmax. score(< 3 %)
- Calculation of the participant's scores for PCDD/F and DL-PCB and indicator PCB congeners separately:
  Participant's score = Σscore(> 10 %) + Σscore(3-10 %) + Σscore(< 3 %)
- Calculation of achieved scoring percentage for each participant:
  Participant's scoring percentage = Participant's score / Maximum score • 100

Criteria for successful participation:

Sum parameters:	≤ 1 parameter with |z-score| > 2, no parameter with |z-score| ≥ 3
PCDD/F congeners:	≥ 75 % of maximum score
DL-PCB congeners:	≥ 75 % of maximum score
Indicator PCB congeners:	≥ 75 % of maximum score
Difference between reported and calculated results for sum parameters	≤ 10 %

Successful participation for PCDD/Fs and PCBs, if all above mentioned criteria for the reported analytes are met.

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Compound Feed (2302-CF)
Summary Scoring system

LC	Sample	Scoring system	WHO-PCDD/F-PCB-TEQ z-score	WHO-PCDD/F-TEQ z-score	WHO-PCB-TEQ* z-score	Sum Indicator PCBs z-score	Sum Parameters (≤ 1 parameter with |z-score| ≥ 2, no parameter with |z-score| ≥ 3)	PCDD/F congeners (≥ 75 % of max. score)	DL-PCB congeners* (≥ 75 % of max. score)	NDL-PCB congeners (≥ 75 % of max. score)	Calculation of sum parameters (deviation ≤ 10 %)	Evaluation	Successful participation	Reason for not successful participation				
														Sum parameters	PCDD/F congeners	DL-PCB congeners	NDL-PCB congeners	Calculation sum param.
1	2302-CF					-1.1	Passed			94%	yes		yes					
2	2302-CF		-0.1	-0.3	0.4		Passed	100%	100%		yes		yes					
3	2302-CF		0.5	0.6	0.6	0.3	Passed	100%	89%	100%	yes		yes					
5	2302-CF					-0.4	Passed			100%	yes		yes					
7	2302-CF		1.9	2.0	1.5	-0.2	Passed	100%	100%	100%	yes		yes					
8	2302-CF					-1.7	Passed			100%	yes		yes					
9	2302-CF		4.0	5.2	-1.1	1.0	Failed	100%	100%	100%	no		no	x				x
10	2302-CF					-0.2	Passed			100%	yes		yes					
11	2302-CF		-0.3	-0.4	-0.2	0.0	Passed	100%	100%	100%	yes		yes					
12	2302-CF		-0.2	0.7	-1.8	0.5	Passed	100%	65%	100%	yes		yes					
13	2302-CF		-0.2	-0.8	1.9	-0.9	Passed	100%	96%	90%	yes		yes					
14	2302-CF		-0.5	-0.5	-0.5	0.9	Passed	100%	100%	100%	yes		yes					
15	2302-CF					0.2	Passed			100%	yes		yes					
16	2302-CF					-0.3	Passed			100%	yes		yes					
17	2302-CF		-0.5	-0.6	-0.2	-0.3	Passed	100%	100%	100%	yes		yes					
18	2302-CF		-0.8	-0.7	-1.2	-0.6	Passed	100%	93%	100%	yes		yes					
20	2302-CF		1.5	0.8	4.5	0.7	Passed	100%	88%	95%	yes		yes					
21	2302-CF		0.5	0.9	-1.1	-0.2	Passed	100%	100%	95%	yes		yes					
22	2302-CF		-0.5	-0.5	-0.7	-0.2	Passed	86%	86%	100%	no		no					x
23	2302-CF		-0.7	-0.4	-1.9	-0.4	Passed	92%	100%	100%	yes		yes					
24	2302-CF		0.1	-0.1	0.6	-0.6	Passed	100%	100%	100%	yes		yes					
25	2302-CF		-0.7	-0.8	0.0	0.0	Passed	100%	100%	100%	yes		yes					
26	2302-CF		-0.9	-0.7	-2.0	-0.7	Passed	100%	100%	100%	yes		yes					
27	2302-CF		0.7	0.8	0.1	-0.2	Passed	96%	100%		no		no					x
28	2302-CF		2.8	4.4	-4.5	0.5	Failed	57%	78%	79%	no		no	x	x			x
29	2302-CF		0.7	0.5	1.5	-0.6	Passed	100%	100%	100%	yes		yes					
31	2302-CF		0.3	0.2	1.0	-0.1	Passed	97%	100%	100%	yes		yes					
32	2302-CF		1.0	-0.1	5.5	1.8	Passed	94%	58%	85%	yes		yes					
33	2302-CF		-0.2	-0.4	0.6	1.1	Passed	91%	100%	100%	yes		yes					
34	2302-CF		1.1	1.4	-0.5	-0.4	Passed	100%	100%	90%	yes		yes					
35	2302-CF		1.6	2.0	-0.2	-0.7	Passed	100%	100%	100%	yes		yes					
36	2302-CF		0.0	0.0	-0.2	-0.1	Passed	100%	100%	100%	yes		yes					
37	2302-CF		-2.3	-3.9	4.6	0.3	Failed	76%	76%	100%	yes		no	x				
38	2302-CF		-1.0	-1.0	-0.9	0.1	Passed	100%	100%	100%	yes		yes					
39	2302-CF			1.9	-0.5		Passed	91%	100%		yes		yes					
40	2302-CF		0.9	1.0	0.2	0.0	Passed	100%	96%	100%	yes		yes					
42	2302-CF									0%							x	
43	2302-CF		-0.7	-0.5	-1.5	0.3	Passed	100%	100%	100%	yes		yes					
44	2302-CF		-0.1	-0.2	0.2	-1.2	Passed	100%	93%	95%	yes		yes					
46	2302-CF		-0.5	-1.8	4.8	1.4	Passed	100%	85%	100%	yes		yes					
48	2302-CF		0.1	0.1	-0.1	0.5	Passed	100%	88%	89%	yes		yes					
49	2302-CF		0.0	-0.4	1.7	-0.1	Passed	96%	82%	93%	yes		yes					
50	2302-CF					-0.3	Passed			100%	yes		yes					
52	2302-CF		0.0	-0.1	0.6	1.1	Passed	96%	100%	100%	yes		yes					
54	2302-CF		-0.9	-1.4	1.1	-0.2	Passed	100%	100%	100%	no		no					x
56	2302-CF		4.2	0.9	18.4		Failed	100%	80%		yes		no	x				
57	2302-CF		2.0	2.4	0.3	0.1	Passed	93%	100%	100%	yes		yes					
58	2302-CF		0.7	0.9	-0.5		Passed	85%	93%		yes		yes					
61	2302-CF		-0.1	0.4	-2.2	-0.4	Passed	100%	100%	94%	yes		yes					
62	2302-CF		0.3	0.3	0.6		Passed	100%	93%		yes		yes					
64	2302-CF		-0.2	-0.8	2.3	-0.6	Passed	94%	100%	100%	yes		yes					
65	2302-CF					-0.6	Passed			100%	yes		yes					
66	2302-CF		1.3	1.2	1.7	0.1	Passed	100%	100%	90%	yes		yes					
67	2302-CF		-1.8	-1.8	-1.6	1.3	Passed	90%	93%	52%	yes		no				x	
68	2302-CF		0.5	0.1	2.9	0.8	Passed	94%	100%	95%	yes		yes					
69	2302-CF		-0.2	-0.3	0.1	1.0	Passed	100%	100%	100%	yes		yes					
70	2302-CF		-0.5	-0.6	-0.2	-0.1	Passed	97%	100%	100%	yes		yes					
71	2302-CF		10.4	10.3	10.9	-0.3	Failed	93%	100%	100%	yes		no	x				
72	2302-CF					1.1	Passed			100%	yes		yes					
73	2302-CF		-0.1	-0.3	0.6	-0.3	Passed	100%	100%	100%	yes		yes					
74	2302-CF																	
75	2302-CF		40.6	50.5	-2.2	-4.4	Failed	13%	0%	43%	yes		no	x	x		x	
77	2302-CF					0.4	Passed			100%	yes		yes					
78	2302-CF		-1.8	-1.9	-1.1	-0.5	Passed	100%	100%	100%	yes		yes					
81	2302-CF		2.8	2.1	5.4	5.5	Failed	78%	66%	32%	yes		no	x			x	
82	2302-CF		7.3	3.0	25.5	1.4	Failed	75%	82%	79%	yes		no	x				
83	2302-CF		-0.4	-0.6	0.7	0.8	Passed	100%	100%	100%	yes		yes					
84	2302-CF		0.2	0.6	-0.9	0.0	Passed	100%	100%	100%	yes		yes					

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EURL for halogenated Persistent Organic Pollutants (POPs) in Feed and Food

Compound Feed (2302-CF)
Summary Scoring system

LC	Sample	Scoring system	WHO-PCDD/F-PCB-TEQ z-score	WHO-PCDD/F-TEQ z-score	WHO-PCB-TEQ* z-score	Sum Indicator PCBs z-score	Sum Parameters (≤ 1 parameter with |z-score| ≥ 2, no parameter with |z-score| ≥ 3)	PCDD/F congeners (≥ 75 % of max. score)	DL-PCB congeners* (≥ 75 % of max. score)	NDL-PCB congeners (≥ 75 % of max. score)	Calculation of sum parameters (deviation ≤ 10 %)	Evaluation	Successful participation	Reason for not successful participation: Sum parameters	PCDD/F congeners	DL-PCB congeners	NDL-PCB congeners	Calculation sum param.
85	2302-CF					0.1	Passed			100%	yes		yes					
86	2302-CF		0.2	0.1	0.6	1.4	Passed	94%	100%	76%	yes		yes					
87	2302-CF		0.8	0.8	0.7	0.2	Passed	97%	100%	100%	yes		yes					
89	2302-CF		0.7	0.4	1.4	-0.1	Passed	100%	100%	100%	yes		yes					
90	2302-CF		18.0	-0.9	98.9	-1.5	Failed	89%	53%	84%	yes		no	x				
91	2302-CF		-0.9	-0.8	-1.6	0.0	Passed	97%	100%	100%	yes		yes					
93	2302-CF		0.1	-0.1	0.7	-0.8	Passed	100%	100%	100%	yes		yes					
94	2302-CF		-0.9	-1.1	0.3	0.2	Passed	100%	100%	100%	yes		yes					
95	2302-CF		-1.4	-1.5	-0.8	-1.2	Passed	96%	43%	0%	no		no				x	x
96	2302-CF		-1.6	-1.8	-0.5	-1.2	Passed	100%	100%	100%	yes		yes					
97	2302-CF					-0.8	Passed			100%	yes		yes					
99	2302-CF		0.3	0.2	0.6	-0.3	Passed	100%	100%	100%	yes		yes					
100	2302-CF					-0.9	Passed			100%	yes		yes					
101	2302-CF		0.3	0.6	-0.7		Passed	100%	100%		yes		yes					
102	2302-CF		-3.1	-3.1	-3.1		Failed	89%	91%		no		no	x				x
103	2302-CF		2.3	2.5	1.7	1.0	Failed	83%	96%	90%	yes		no	x				
104	2302-CF					-1.3	Passed			89%	yes		yes					
105	2302-CF		0.5	0.4	1.2	0.2	Passed	100%	100%	100%	yes		yes					
106	2302-CF																	
107	2302-CF					0.2	Passed			100%	yes		yes					
109	2302-CF		-0.1	-0.1	0.2	-0.8	Passed	100%	100%	100%	yes		yes					
110	2302-CF		-1.2	0.8	-0.4	-0.5	Passed	100%	100%	100%	no		no					x
111	2302-CF		-1.2	-1.2	-0.8	0.5	Passed	100%	100%	100%	yes		yes					
113	2302-CF					-0.1	Passed			100%	yes		yes					
114	2302-CF		-1.7	-1.9	-0.7	1.5	Passed	95%	96%	100%	no		no					x
115	2302-CF		-1.1	-1.2	-0.7	-0.7	Passed	97%	100%	100%	yes		yes					
116	2302-CF					0.5	Passed			100%	yes		yes					
117	2302-CF		0.5	0.2	2.1	-4.5	Failed	100%	81%	29%	yes		no	x			x	
5A	2302-CF					-0.6	Passed			100%	yes		yes					
16A	2302-CF					0.2	Passed			100%	yes		yes					
38A	2302-CF		-1.7	-1.9	-0.9	0.0	Passed	100%	100%	100%	yes		yes					
61A	2302-CF					0.0	Passed			75%	yes		yes					
106A	2302-CF																	

*Sum parameters outside the range of 0.5 to 4 times of the level of interest / no legal limits defined; results not included in overall assessment

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Annex 6: Test for sufficient homogeneity for PCDD/Fs and PCBs

Test sample - Compound Feed (2302-CF)

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Compound Feed (2302-CF)
Sum parameters - Homogeneity test - Data

Analyte	Result ng/kg (12% Moisture Content)	**Mean** (n = 10, duplicate analysis)	**Median** (n = 10, duplicate analysis)	**Relative standard deviation** [%]
WHO-PCDD/F-PCB-TEQ upper bound		1.05	1.05	1%
WHO-PCDD/F-PCB-TEQ middle bound		1.05	1.05	1%
WHO-PCDD/F-PCB-TEQ lower bound		1.05	1.05	1%

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Compound Feed (2302-CF)
PCDD/F - Homogeneity test - Data

Analyte	Result ng/kg (12% Moisture Content)	**Mean** (n = 10, duplicate analysis)	**Median** (n = 10, duplicate analysis)	**Relative standard deviation** [%]
WHO-PCDD/F-TEQ upper bound		0.857	0.857	1%
WHO-PCDD/F-TEQ middle bound		0.857	0.857	1%
WHO-PCDD/F-TEQ lower bound		0.857	0.857	1%
2,3,7,8-TCDD		0.0210	0.0207	9%
1,2,3,7,8-PeCDD		0.0473	0.0471	9%
1,2,3,4,7,8-HxCDD		0.0328	0.0330	10%
1,2,3,6,7,8-HxCDD		0.0940	0.0939	6%
1,2,3,7,8,9-HxCDD		0.0564	0.0571	12%
1,2,3,4,6,7,8-HpCDD		0.928	0.932	3%
1,2,3,4,6,7,8,9-OCDD		4.49	4.52	3%
2,3,7,8-TCDF		1.43	1.43	4%
1,2,3,7,8-PeCDF		0.430	0.433	4%
2,3,4,7,8-PeCDF		1.39	1.39	3%
1,2,3,4,7,8-HxCDF		0.678	0.681	4%
1,2,3,6,7,8-HxCDF		0.399	0.397	4%
2,3,4,6,7,8-HxCDF		0.378	0.374	5%
1,2,3,7,8,9-HxCDF		0.196	0.197	5%
1,2,3,4,6,7,8-HpCDF		1.46	1.46	6%
1,2,3,4,7,8,9-HpCDF		0.587	0.585	6%
1,2,3,4,6,7,8,9-OCDF		4.83	4.78	5%

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Compound Feed (2302-CF)
DL-PCB - Homogeneity test - Data

Analyte	Result ng/kg (12% Moisture Content)	**Mean** (n = 10, duplicate analysis)	**Median** (n = 10, duplicate analysis)	**Relative standard deviation** [%]
WHO-PCB-TEQ upper bound		0.188	0.188	3%
WHO-PCB-TEQ middle bound		0.188	0.188	3%
WHO-PCB-TEQ lower bound		0.188	0.188	3%
PCB 105		107	107	2%
PCB 114		11.3	10.9	12%
PCB 118		706	704	2%
PCB 123		2.66	2.62	14%
PCB 156		142	143	2%
PCB 157		12.7	12.6	6%
PCB 167		67.5	66.6	3%
PCB 189		17.4	17.6	4%
PCB 77		8.44	8.54	3%
PCB 81		0.391	0.398	5%
PCB 126		1.44	1.44	4%
PCB 169		0.351	0.363	11%

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Compound Feed (2302-CF)
NDL-PCB - Homogeneity test - Data

Analyte	Result µg/kg (12% Moisture Content)	**Mean** (n = 10, duplicate analysis)	**Median** (n = 10, duplicate analysis)	**Relative standard deviation** [%]
Sum Indicator PCBs upper bound		8.81	8.83	2%
Sum Indicator PCBs middle bound		8.81	8.83	2%
Sum Indicator PCBs lower bound		8.81	8.83	2%
PCB 28		0.168	0.168	3%
PCB 52		0.776	0.776	2%
PCB 101		2.32	2.34	3%
PCB 138		1.75	1.77	3%
PCB 153		2.49	2.49	3%
PCB 180		1.31	1.30	3%

Compound Feed (2302-CF)
Selected congeners - Homogeneity test - Data

Sample	Replicate	Result ng/kg (12% Moisture Content)	1,2,3,7,8-PeCDF	WHO-PCDD/F-PCB-TEQ (ub)	PCB 123
43	1		0.452	1.04	2.73
	2		0.406	1.05	3.36
45	1		0.427	1.06	2.18
	2		0.455	1.05	2.52
60	1		0.408	1.04	2.61
	2		0.440	1.06	2.15
74	1		0.430	1.05	2.63
	2		0.434	1.05	2.88
101	1		0.449	1.03	2.61
	2		0.444	1.05	2.63
129	1		0.446	1.05	3.09
	2		0.432	1.03	2.29
132	1		0.439	1.05	2.64
	2		0.406	1.05	2.96
143	1		0.398	1.03	2.48
	2		0.436	1.05	3.28
172	1		0.407	1.04	3.08
	2		0.435	1.06	2.58
169	1		0.426	1.04	2.45
	2		0.419	1.02	2.06
Cochran's C-test					
C			0.288	0.210	0.249
$C_{critical}$ (α = 0.05, m = 2, n = 10)			0.602	0.602	0.602
$C_{critical}$ (α = 0.01, m = 2, n = 10)			0.718	0.718	0.718
$C < C_{critical}$			yes	yes	yes
Outliers			no evidence for analytical outliers	no evidence for analytical outliers	no evidence for analytical outliers
Homogeneity test					
General average $\bar{x}$			0.430	1.05	2.66
Standard deviation of sample averages s_x			0.010	0.008	0.257
Wthin-sample standard deviation s_w			0.020	0.012	0.360
Between-sample standard deviation s_s			0.000	0.000	0.036
Standard deviation for proficiency assessment σ_{PT}			0.086	0.209	0.532
s_s / σ_{PT}			0.0	0.0	0.07
Test for homogeneity ($s_s \leq 0.3\ \sigma_{PT}$)			passed	passed	passed

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Compound Feed (2302-CF)
Selected congeners - Stability test - Data

Sample	Replicate	Result ng/kg (12% Moisture Content)	1,2,3,7,8-PeCDF	WHO-PCDD/F-PCB-TEQ (ub)	PCB 123
93	1		0.413	1.01	3.13
	2		0.436	1.03	2.52
154	1		0.402	1.00	2.42
	2		0.444	1.02	2.73
227	1		0.421	1.00	2.45
	2		0.381	0.97	2.70
Stability test					
General average (stability test) $\bar{y}$			0.416	1.01	2.66
General average (homogeneity test) $\bar{x}$			0.430	1.05	2.66
Standard deviation for proficiency assessment σPT			0.0859	0.209	0.532
$\lvert \bar{y} - \bar{x} \rvert$			0.01345	0.0385	0.0047
Test for stability ($\lvert \bar{y} - \bar{x} \rvert \leq 0.3$ σPT)			passed	passed	passed

EURL Proficiency Study on the Determination of PCDD/Fs, PCBs, PBDEs, HBCDDs and PFASs in Compound Feed 2023 [EURL-PT-POP_2302-CF]
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14 June 2024

Annex 7: Participants' methods for PCDD/Fs and PCBs

Test sample - Compound Feed (2302-CF)

EURL Proficiency Study on the Determination of PCDD/Fs, PCBs, PBDEs, HBCDDs and PFASs in Compound Feed 2023 [EURL-PT-POP_2302-CF]
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Compound Feed (2302-CF)
Physico-chemical Methods PCDD/Fs and PCBs - Internal standards

		Weighed sample	Use of isotope-labelled internal standards for all relevant …			Other internal standards		
LC	Sample	[g]	PCDD/F congeners (yes/no)	DL-PCB congeners (yes/no)	NDL-PCB congeners (yes/no)	PCDD/Fs	DL-PCBs	NDL-PCBs
1	2302-CF	3			yes			
2	2302-CF	9.96	yes	yes	yes			
3	2302-CF	6.556	yes	yes	yes	N/A	N/A	N/A
5	2302-CF	6			yes			syringe standard, PCB 70, PCB 111, PCB 170
7	2302-CF	9.731	Yes	Yes	Yes			
8	2302-CF	2.0	no	no	Yes			PCB-111 (injection standard)
9	2302-CF	18.15726	yes	yes	yes			
10	2302-CF	5.0	NO	NO	YES			SYRINGE STANDARD PCB-155-13C12
11	2302-CF	30	yes	yes	yes			
12	2302-CF	10	Yes	Yes	Yes	Recovery standards: 13C-1,2,3,4-TCDD; 13C-1,9-HxCDD	Recovery standards: 13C-PCB-101, 13C-PCB-138	
13	2302-CF	10.0	yes	yes	yes			
14	2302-CF	10.00	yes	yes	yes			
15	2302-CF	4.02			Yes			Yes
16	2302-CF	5			no			PCB 171, to check the extraction, not used for quantification
17	2302-CF	35.0	yes	yes	yes			
18	2302-CF	5	yes	yes	yes			
20	2302-CF	30	yes	yes	yes			
21	2302-CF	25.02	YES	YES	YES	1,2,3,4-Tetrachlorodibenzo-p-dioxin (13C6,99%) / 1,2,3,4,6,9-Hexachlorodibenzofuran (13C12, 98,7%)	1,2,3,4-Tetrachlorodibenzo-p-dioxin (13C6,99%) / 1,2,3,4,6,9-Hexachlorodibenzofuran (13C12, 98,7%)	2,2',3,3',4,4',5-Heptachlorobiphenyl (PCB170, 13C12,99%)
22	2302-CF	5.07	Yes	Yes	Yes			
23	2302-CF	5.241	yes	yes	yes			
24	2302-CF	30	yes	yes	yes			
25	2302-CF	10	yes	yes	yes	all 13C-: CB70, CB111, CB138, CB178, 1378-TCDD, 12478-PeCDD, 123468-HxCDD, 1234679-HpCDD	moPCBs: all 13C-: CB60, CB70, CB111, CB127, CB159, CB170 (for noPCBs see PCDD/Fs)	all 13C-: CB60, CB70, CB111, CB127, CB159, CB170
26	2302-CF	50.18	yes	yes	yes			
27	2302-CF	10	Yes	Yes	Yes			
28	2302-CF	10	yes	yes	yes			
29	2302-CF	25.059	yes	yes	yes			
31	2302-CF	35	YES	YES	YES			
32	2302-CF	10	yes	yes	yes			
33	2302-CF		Yes	Yes	Yes			
34	2302-CF	20	YES	YES	YES			
35	2302-CF	20	yes	yes	yes			
36	2302-CF	25	yes	yes	yes			
37	2302-CF	10.512	YES	YES	YES			
38	2302-CF	28.9	yes	yes	yes			
39	2302-CF	25.27	Yes (15)	Yes (12)	No	Yes - 1,2,3,4-TCDD / 1,2,3,7,8,9 HxCDD	Yes - PCB 70 / 111 / 138 / 170	No
40	2302-CF	10.21	yes	yes	yes			
42	2302-CF	5			no			no
43	2302-CF	20.8228	yes	yes	yes			
44	2302-CF	10.0547	yes	yes	no			77L for 28&52, 123L for 101, 167L for 138&153, 189L for 180
46	2302-CF	15.18	yes	yes	yes			
48	2302-CF	25.0	yes	yes	tes	ISS. Well EPA1613-ISS	ISS. Well P48-RS	ISS. Well P48-RS
49	2302-CF	15	yes	yes	yes			
50	2302-CF	20			yes			C13-PCB-178
52	2302-CF	12	yes	yes	yes			
54	2302-CF	5.0038	Yes	Yes	Yes	1,2,3,4-TCDD	1,2,3,4-TCDD	PCB159
56	2302-CF	40	yes	yes				
57	2302-CF	5.02	Yes	Yes	Yes			
58	2302-CF	10	yes	yes	-			
61	2302-CF	20	yes	yes	yes	1234-TCDD	1234-TCDD	1234-TCDD
62	2302-CF	25	yes	yes		13C-1,2,3,4-Cl4DD, 13C- 1,2,3,4,6-Cl5DF, 13C -1,2,3,4,6,9-Cl6DF, 13C-1,2,3,4,6,8,9-Cl7DF		
64	2302-CF	10						
65	2302-CF	5			no			PCB 209
66	2302-CF	15	yes	yes	yes			
67	2302-CF	40	Yes	Yes	Yes			
68	2302-CF							
69	2302-CF	7.02	yes	yes	yes			
70	2302-CF	10	Yes	Yes	Yes	-	-	-
71	2302-CF	10.004	YES	YES	YES			
72	2302-CF	5			yes			
73	2302-CF	5	YES	YES	YES			
74	2302-CF							
75	2302-CF	15.03	yes	yes	yes			
77	2302-CF	5			no			PCB 198
78	2302-CF	30.06	yes	yes	yes			
81	2302-CF							
82	2302-CF	20.05	yes	yes	yes			
83	2302-CF	10	yes	yes	yes	1,2,3,4-TCDD	PCB 111	PCB 111
84	2302-CF	10	yes	yes	yes	Recovery standards	Recovery standards	Recovery standards
85	2302-CF	10						
86	2302-CF	20	yes	yes	yes			
87	2302-CF	15	yes	yes	no			PCB-20, PCB-97
89	2302-CF	20	yes	yes	yes			
90	2302-CF	10	yes	yes	yes			

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Compound Feed (2302-CF)
Physico-chemical Methods PCDD/Fs and PCBs - Internal standards

			Use of isotope-labelled internal standards for all relevant …			**Other internal standards**		
LC	Sample	**Weighed sample** [g]	PCDD/F congeners (yes/no)	DL-PCB congeners (yes/no)	NDL-PCB congeners (yes/no)	PCDD/Fs	DL-PCBs	NDL-PCBs
91	2302-CF	15	yes	yes	yes			
93	2302-CF	37.27	YES	YES	YES			
94	2302-CF	20	yes	yes	yes			
95	2302-CF	15	yes	yes	yes			
96	2302-CF	36.2	No (were used 15 labelled congeners)	Yes	Yes			
97	2302-CF	5			no			PCB 209
99	2302-CF	10	yes	yes	yes			
100	2302-CF	2			no			PCB 209
101	2302-CF	10	yes	yes				
102	2302-CF							
103	2302-CF	15	yes	yes	yes	1,2,3,4-TCDD [C-13] for recovery of Internal Standards	PCB-111 [C-13] for recovery of Internal Standards	PCB-111 [C-13] for recovery of Internal Standards
104	2302-CF	3			yes			
105	2302-CF	30	yes	yes	yes			
106	2302-CF							
107	2302-CF	12	-	-	yes			
109	2302-CF	15	yes	yes	yes			
110	2302-CF	11.3	yes	yes	yes			
111	2302-CF	30	yes	yes	yes			
113	2302-CF	2.5						
114	2302-CF	7.08	yes	yes	yes	-	-	-
115	2302-CF	20 (10)	yes (except 1,2,3,7,8,9-HxCDD and 1,2,3,4,6,7,8,9-OCDF)	yes	no			TCMX, PCB-209, trans-nonachlor
116	2302-CF	10		no				PCB 198, Mirex
117	2302-CF	35	yes	yes	yes			
5A	2302-CF	6			yes			syringe standard, PCB 70, PCB 111, PCB 170
16A	2302-CF	5			no			PCB 171, to check the extraction, not used for quantification
38A	2302-CF	28.9	yes	yes	yes			
61A	2302-CF	25						
106A	2302-CF							

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Compound Feed (2302-CF)
Physico-chemical Methods PCDD/Fs and PCBs - Extraction

		Extraction					
LC	Sample	Sample preparation/pre-treatment	Extraction technique	Extraction solvent	Extraction time [h]	Extraction temperature [ºC]	Extraction pressure [MPa]
1	2302-CF	drying	Speed Extractor Buchi	toluene/acetone (70/30)	1	100	10
2	2302-CF		ASE	Toluene:Ethanol (70:30)			
3	2302-CF	mix with DE	ASE	dichloromethane:hexane (1:1)	0.25	100 C	10
5	2302-CF	none	ASE	n-hexane	20	120	unknown
7	2302-CF		Ase	Toluene:Ethanol 9:1	1	100	10
8	2302-CF	no	ultra turrax	hexane/acetone 50/50 (v/v)	0,017	ambiente	ambiente
9	2302-CF	NA	Soxhlet	Toluene	16	111	ambient
10	2302-CF	oven drying	ASE	ACETONE:HEXANE 1:1	1/3	100	10,34
11	2302-CF	drying (only for determination of moisture content)	ASE, Soxhlet	toluene, ethanol (ASE), toluene (Soxhlet)	30 min/sample (ASE), 8 h (Soxhlet)	100 °C (ASE)	10 MPa (ASE)
12	2302-CF		Soxhlet	Toluene	12h	boiling	
13	2302-CF	freeze drying	Twisselmann extraction	Toluol	6h	110 °C	0,1 Mpa
14	2302-CF		Soxhlet	toluene/actone	6		
15	2302-CF	80°C 72h	BUCHI	TOLUENE/ACETONE 70/30	0,75	120	100 bar
16	2302-CF		shaking	acetone, petrolether	1	room temperature	
17	2302-CF		Soxhlet	Toluene / Ethanol (30/70)	12		
18	2302-CF	drying	PLE	Tolune/Acetone (70/30)			
20	2302-CF	-	Soxhlet	hexane-dichloromethane 1:1	20h	boiling point of solvent mixture	-
21	2302-CF	N/A	SOXTEC	TOLUENE	2	160	N/A
22	2302-CF	No	ASE	Toluene	45 minutes	135	
23	2302-CF		ASE	Hexane	5 min x2	100	10,3
24	2302-CF		Twisselmann	Ethanol/Toluol 70/30	6 h	boiling point	
25	2302-CF		PLE	EtOH:Tol (7:3)	2*20 min	100 degC	1500 psi (=10MPa)
26	2302-CF		Soxhlet	Toluene	24		
27	2302-CF		ASE	Toluene / Ethanol (80/20 V/V)	0.30 (including 2 static cycles of 5 mins)	100	10.3
28	2302-CF		microwave	1:1 Methylene Chloride:Hexane	1 hour	100	NA
29	2302-CF	-	Soxtherm	Toluene	2,5	250	-
31	2302-CF	drying	ASE	HEXANE/ACETONE 50/50	0.33	100	10.13
32	2302-CF	no	ASE und Twisselmann	n-Hexan; n-Hexan/Aceton (1:1); iso-Propanol:Toluol (25:75)	30 min, 8h	120, 82	10 psi, atm
33	2302-CF			Solvent mixture			
34	2302-CF		ASE	TOLUENE + TOLUENE/ETHANOL (9/1)	3X15MIN	100	1500
35	2302-CF	no	Sox	Toluene	17h	110	
36	2302-CF		Soxhlet	toluene	3	110	ambient
37	2302-CF	NONE	SOXHLET	TOLUENE	2		
38	2302-CF	drying	ASE	90% Toluol 10% Methanol	0,25	100	10
39	2302-CF	None	ASE	Toluene	0.5	150	11.7
40	2302-CF	drying	soxhlet	toluene:acetone (70:30), toluene	8	boiling point of solvent	room
42	2302-CF	wetting with water	QuEChERS (dispersive SPE)	acetonitrile/water (1/2)			
43	2302-CF	Homogenisation	Soxhlet	Toluene /ethanol 50 / 50	24	120	atm
44	2302-CF	hydromatrix added in the extraction cell; sand added as dispersant	ASE350	Hexane:Acetone 5:1	0,333	100	10,34
46	2302-CF		Soxtherm	Hexane/Dichlormethan/Ethanol (2/2/1)	2.3	150	
48	2302-CF		Soxhlet	toluene	8		
49	2302-CF	-	ASE	(1) Toluene - (2) Toluene:Ethanol 90:10	0.25	100°C	10.3
50	2302-CF	/	cold extraction	methanol + hexane		room temperature	atmospheric pressure
52	2302-CF	Homogenisation	Liquid-liquid	n-hexane	1x60 min. + 2x30 min.	Ambient	Ambient
54	2302-CF	homogenated	Inhouse extraction method	Cyclohexane / IPA / salt water	0,1	room temperature	atmospheric
56	2302-CF		Soxhlet	Toluol	20		
57	2302-CF	No	Soxhlet	Ethanol: Toluene (70:30)	16 hrs	210	none
58	2302-CF	drying	ASE	no	1	100°C	11,7
61	2302-CF	drying 3 h	soxhlet	cyclohexane/toluene (1/1) and EtOH/toluene (7/3)	app. 12 h	70	
62	2302-CF		Soxhlet	toluene/iso-propanol (23/77)	overnight	boiling	
64	2302-CF	No	Soxhlet	Toluene/Toluene-methanol	10		
65	2302-CF			ethyl acetate/cyclohexane 1/1	24	21	
66	2302-CF		ASE	Hexane/Acetone (80/20)	1	125	10
67	2302-CF	Mixing with sodium sulfate	Soxhlet	Toluene	18	boiling	
68	2302-CF						
69	2302-CF	no	ASE	Toluen:Ethanol (90:10)	1	100	10,342
70	2302-CF	Drying	ASE	Toluene / Acetone (70/30)	0.25 h	120 °C	10 Mpa
71	2302-CF	Drying	Soxhlet	Toluène/éthanol (1:1)	20	/	/
72	2302-CF		ASE	Ethylacetate/Cyclohexane (1:1 v/v)	0,25	100	10
73	2302-CF		ASE	TOLUENE	0.5	135	1500
74	2302-CF						
75	2302-CF		ASE	toulene-ethanol (70/30)	30	120	0,4
77	2302-CF		shaking	Petrolether/Aceton 3/4	16 h	20 °c	
78	2302-CF	Homogenisation	SILICA GEL /SOLVENT EXTRACT- MANUAL	40:60 DCM:HEXANE	2-4HRS	AMBIENT	GRAVITY
81	2302-CF						
82	2302-CF	hydrolysis	soxhlet	toluene	4	120	
83	2302-CF		ASE	toluene/acetone (70/30)	0,3	100	10
84	2302-CF	-	ASE	toluene (85%) / ethanol (15%)	20 min	120	10
85	2302-CF	homogenisation	shaking	Petrolether, water	1 hour	abient	normal
86	2302-CF	no	Soxhlet	Hx/Ac	24		
87	2302-CF	homogenization using sea sand	Soxhlet	Toluene	16	110 (boiling point of toluene)	ambient pressure
89	2302-CF	no	ultrasonic bath	n-hexane	0,5		
90	2302-CF		Randall	Petroleum Ether	3		

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Compound Feed (2302-CF)
Physico-chemical Methods PCDD/Fs and PCBs - Extraction

		Extraction					
LC	Sample	Sample preparation/pre-treatment	Extraction technique	Extraction solvent	Extraction time [h]	Extraction temperature [ºC]	Extraction pressure [MPa]
91	2302-CF	none	Soxhlet	Toluene	12		
93	2302-CF		SOXHLET	PCDD/F DL-PCB TOLUENE/CYCLOHEXANE (1/1) NDL-PCB HEXANE/DCM (1/1)	24H		
94	2302-CF	none	Soxhlet	Toluene/acetone 70:30	12	70-90 °C	0.1
95	2302-CF		ASE	pentane/acetone 88/12	0,5	80	1500
96	2302-CF	sample mixed with sodium sulphate before extraction	Soxhlet	DCM:Hexane (50:50)	24 h		
97	2302-CF	yes		Acetone/Dichlormethane/Ethyl-acetate (1/1/1)	16	20-22	
99	2302-CF		ASE	Toluol/Ethanol 9/1		100	10
100	2302-CF			hexan	1/2		
101	2302-CF		twisselmann	Ethanol/Toluol (7:3)	8	boiling point	
102	2302-CF						
103	2302-CF	none	Soxhlet	Toluene, 150 ml	8	bp	atm
104	2302-CF	freeze drying	ASE	toluene/acetone 70/30	Approximately 1 hour	120	10
105	2302-CF	NO	ASE	Toluene/Acetone 60/40	N.3 static	130	10
106	2302-CF						
107	2302-CF	addition of water and sodium chloride	shaking	acetone/hexane 2/1	16	23	0,101
109	2302-CF	Mixed with sodium sulphate	ASE	Hexane/Acetone (70:30)	1	125	10.3
110	2302-CF	Drying by Steamroom	solid/liquid extraction	Hexane/IPA (60/40) + Toluène/Acétone (70/30)	/	/	/
111	2302-CF	drying	Soxhlet	toluene:aceton 9:1	24h		
113	2302-CF		QuEChERS exraction procedure	Acetonitrile/Water (1/1)		RT	
114	2302-CF	-	ASE	Hexane/DCM 1:1	0,4	125	11
115	2302-CF	thorough homogenization, drying with anhydrous Sodium Sulfate	Soxhlet (ultrasonic bath, agitate)	dichloromethane:acetone 3:1 (dichloromethane:acetone 2:1)	21 (2.5)	109 (20)	0.1
116	2302-CF		liquid/liquid extraction, shaking	100 ml water, 25 g NaCl, 200 ml acetone, 150 ml petroleum ether	1,5	ambient	
117	2302-CF	no	ASE	Toluene:Cyclohexane	40min	130oC	1500
5A	2302-CF	none	ASE	n-hexane	20	120	unknown
16A	2302-CF		shaking	acetone, petrolether	1	room temperature	
38A	2302-CF	drying	Soxhlet	90% Toluol 10% Methanol	24	90	-
61A	2302-CF			dichloromethane/n-hexane (10/40)	0,03 (2min)	room temperature	
106A	2302-CF						

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Compound Feed (2302-CF)
Physico-chemical Methods PCDD/Fs and PCBs - Clean-up

		Clean-up									
LC	Sample	Gelchromatography	Silica/sulfuric acid column	Florisil column	Alumina column	Carbon column	Others	Final volume [µl]: PCDD/F	Final volume [µl]: DL-PCB (non-ortho-PCBs)	Final volume [µl]: DL-PCB (mono-ortho-PCBs)	Final volume [µl]: Indicator PCBs
1	2302-CF						florisil + silica + silica/sulfuric acid 22% + silica/sulfuric acid 44%				50 (toluene)
2	2302-CF	no	yes	yes	yes	yes	no	15.00	15.00	25.00	
3	2302-CF	dSPE with acidified silica gel	yes	yes	no	no	Sulfoxide SPE for PCBs	100.00	100.00	100.00	100.00
5	2302-CF	no	yes	no	no	no	no				1000.00
7	2302-CF	No	Yes	No	Yes	Yes	No	500.00	500.00	500.00	500.00
8	2302-CF	no	no	no	no	no	Silica without sulfuric acid				1000.00
9	2302-CF	no	yes	no	yes	yes	no	20.00	20.00	105.00	300.00
10	2302-CF	YES	YES	NO	NO	NO	SPE SILICA COLUMN 1g/6mL				250.00
11	2302-CF	no	yes	yes	yes	yes	PowerPrep FMS columns (basic-neutral silica, alumina, carbon)	10.00	10.00	20.00	20.00
12	2302-CF	Yes	Yes	Yes	No	Yes	Sufuric acid treatment of the final extract	10.00	50.00	50.00	200.00
13	2302-CF	no	yes	no	no	no	MiURA system	50.00	0.50	100.00	100.00
14	2302-CF	no	yes	no	yes	yes		20.00	20.00	100.00	100.00
15	2302-CF	No	Yes	Yes	no	no					50.00
16	2302-CF		yes								1000.00
17	2302-CF	no	yes	no	yes	yes	acidic treatment	25.00	25.00	50.00	50.00
18	2302-CF	No	Yes	Yes	No	Yes		12.00	12.00	50.00	50.00
20	2302-CF	no	yes	yes	no	no	reverse extraction using dimethylsuphoxide	25.00	25.00	250.00	250.00
21	2302-CF	NO	YES	NO	YES	YES		20.00	20.00	20.00	200.00
22	2302-CF	No	Yes	Yes	Yes	Yes		10.00	20.00	20.00	20.00
23	2302-CF	no	yes	no	yes	yes	Silver nitrate, AgNO3	20.00	20.00	65.00	65.00
24	2302-CF	no	yes	no	yes	yes	no	20.00	15.00	500.00	500.00
25	2302-CF	no	yes	no	yes	yes	Silver nitrate column	500 µl	500 µl	200 µl	200 µl
26	2302-CF	yes (only PCB)	yes	yes (only PCDD/F)	no	yes	no	15.00	15.00	15.00	75.00
27	2302-CF	No	Yes - Miura	Yes - Miura	Yes - Miura	Yes - Miura	N/A	25 µl	25 µl	500 µl	500 µl
28	2302-CF	yes	yes	no	yes	no		20.00	20.00	20.00	20.00
29	2302-CF	no	yes	yes	yes	yes	-	20.00	20.00	20.00	20.00
31	2302-CF	NO	YES	YES	YES	YES	NO	30.00	non-ortho DL-PCBs are in the PCDD/F fraction	100.00	Indicator PCBs are in mono-ortho DL-PCB fraction
32	2302-CF	no	yes	no	yes	yes	silica/AgNO3	50.00	50.00	50.00	50.00
33	2302-CF		yes		yes	yes					
34	2302-CF	NO	YES	NO	YES	YES	NO	20.00	20.00	500.00	500.00
35	2302-CF	no	yes	no	yes	no	no	100.00	100.00	100.00	100.00
36	2302-CF	no	yes	no	yes	yes		20.00	20.00	100.00	100.00
37	2302-CF	NO	YES	NO	YES	YES		50.00	250.00	250.00	250.00
38	2302-CF	no	yes	no	yes	no	no	40.00	40.00	500.00	500.00
39	2302-CF	Yes	Yes	No	Yes	Yes	None	10.00	10.00	30.00	N/A
40	2302-CF	yes	yes	no	no	yes		10.00	10.00	10.00	10.00
42	2302-CF	no	no	no	no	no	no				
43	2302-CF	no	yes	no	yes	yes		25.00	100.00	100.00	100.00
44	2302-CF	no	no	no	no	no	purification by automatic sample preparation system GO-2HT (Miura) using columns: silver nitrate silica gel, sulfuric acid silica gel, carbon, alumina	20.00	20.00	20.00	20.00
46	2302-CF	no	yes	yes	yes	no		10.00	50.00	50.00	50.00
48	2302-CF	no	yes		yes	yes		20.00	20.00	50.00	50.00
49	2302-CF	no	yes	no	yes	yes	-	9.00	9.00	100.00	100.00
50	2302-CF	no	yes	no	yes	no	no	/	/	/	500 µl
52	2302-CF	no	yes	yes	yes	yes		20.00	20.00	100.00	100.00
54	2302-CF	no	yes	no	yes	yes	no	20.00	20.00	20.00	20.00
56	2302-CF		yes		yes	yes		30.00	60.00	60.00	
57	2302-CF	No	Yes	No	Yes	Yes		20 uL	20 uL	20 uL	20 uL
58	2302-CF	no	yes	no	yes	yes	no	10.00	10.00	10.00	-
61	2302-CF		yes	yes		yes		20.00	200.00	200.00	200.00
62	2302-CF	no	yes (Dextech)	no	yes (Dextech)	yes (Dextech)		10.00	10.00	80.00	
64	2302-CF		yes		yes						
65	2302-CF	yes									250.00
66	2302-CF	no	yes	yes	yes	yes		20.00	20.00	20.00	20.00
67	2302-CF	No	Yes	No	Yes	Yes	-	50.00	50.00	50.00	50.00
68	2302-CF										
69	2302-CF	no	yes	no	yes	yes		10.00	10.00	200.00	200.00
70	2302-CF	No	Yes	Yes	No	Yes		10.00	10.00	50.00	50.00
71	2302-CF	NO	YES	NO	YES	NO	/	10.00	500.00	500.00	500.00
72	2302-CF	yes	no	no	no	no	Silica 10% water				1000.00
73	2302-CF	no	yes	no	yes	yes		10.00	80.00	80.00	80.00
74	2302-CF										
75	2302-CF	no	yes	yes	no	no		40.00	40.00	40.00	40.00
77	2302-CF	yes	no	no	no	no	no				1000.00
78	2302-CF	NO	YES	NO	YES	YES		25.00	25.00	200.00	200.00
81	2302-CF										
82	2302-CF	no	yes	no	yes	yes		120000.00	90000.00	90000.00	5000.00
83	2302-CF	no	yes	yes	no	yes		10.00	20.00	50.00	50.00
84	2302-CF	no	yes	no	yes	yes	no	15.00	15.00	500.00	500.00
85	2302-CF	no	no	no	no	no	acid hydrolysis by sulfuric acid	0.00	0.00	0.00	500.00
86	2302-CF	yes	yes	no	yes	no		20.00	20.00	50.00	50.00
87	2302-CF	no	yes	no	yes	yes		15.00	15.00	15.00	1000.00
89	2302-CF	no	yes	no	yes	yes	NA	12.00	20.00	20.00	20.00
90	2302-CF	no	yes	no	yes	yes		10.00	10.00	200.00	200.00

EURL Proficiency Study on the Determination of PCDD/Fs, PCBs, PBDEs, HBCDDs and PFASs in Compound Feed 2023 [EURL-PT-POP_2302-CF]
EURL for halogenated Persistent Organic Pollutants (POPs) in Feed and Food

Compound Feed (2302-CF)
Physico-chemical Methods PCDD/Fs and PCBs - Clean-up

		Clean-up									
LC	Sample	Gelchromatography	Silica/sulfuric acid column	Florisil column	Alumina column	Carbon column	Others	Final volume [µl]: PCDD/F	Final volume [µl]: DL-PCB (non-ortho-PCBs)	Final volume [µl]: DL-PCB (mono-ortho-PCBs)	Final volume [µl]: Indicator PCBs
91	2302-CF	no	yes	no	yes	yes	Silica/AgNO3	50.00	50.00	100.00	100.00
93	2302-CF	NO	YES	YES	YES	YES	NO	10.00	10.00	10.00	50.00
94	2302-CF	no	yes	no	yes	yes	no	40.00	40.00	200.00	200.00
95	2302-CF	no	yes	no	yes	yes	Silver nitrate column	20.00	20.00	1000.00	1000.00
96	2302-CF	no	yes	no			basic set of "power-prep system" columns	20.00	40.00	40.00	40.00
97	2302-CF	yes									300.00
99	2302-CF	no	yes	no	yes	yes		20.00	20.00	20.00	20.00
100	2302-CF	no	yes	no	no	no	no				1000.00
101	2302-CF	no	yes	no	yes	yes	no	30.00	30.00	400.00	
102	2302-CF										
103	2302-CF	no	yes	no	yes	yes	no	25.00	25.00	500.00	500.00
104	2302-CF	no	yes	yes	no	no					50.00
105	2302-CF	no	yes	no	yes	yes	NA	10.00	20.00	20.00	20.00
106	2302-CF										
107	2302-CF	yes	yes	no	no	no	GPC				300.00
109	2302-CF	no	yes	no	yes	yes		20.00	20.00	40.00	40.00
110	2302-CF	no	yes	no	yes	yes	no	20.00	20.00	125.00	125.00
111	2302-CF	no	yes	no	yes	no	no	50.00	50.00	1000.00	1000.00
113	2302-CF						dSPE (PSA, C18)				
114	2302-CF	no	yes	no	yes	no	no	10.00	50.00	50.00	50.00
115	2302-CF	yes	yes	no	yes	yes	basic silica, silver nitrate silica	10.00	10.00	30.00	1000.00
116	2302-CF	yes	yes								1000.00
117	2302-CF	no	yes	yes	no	yes	no	10.00	40.00	500.00	500.00
5A	2302-CF	no	no	no	no	no	In-Cell Cleanup (sulfuric acid silica 44%)				1000.00
16A	2302-CF		yes								1000.00
38A	2302-CF	no	yes	no	yes	no	no	40.00	40.00	500.00	500.00
61A	2302-CF	no	yes Silica, no sulfuric	no	no	no					3500.00
106A	2302-CF										

EURL Proficiency Study on the Determination of PCDD/Fs, PCBs, PBDEs, HBCDDs and PFASs in Compound Feed 2023 [EURL-PT-POP_2302-CF]
EURL for halogenated Persistent Organic Pollutants (POPs) in Feed and Food

Compound Feed (2302-CF)
Physico-chemical Methods PCDD/Fs and PCBs - Detection

		PCDD/F				Dioxin-like PCB (non-ortho-PCB)				Dioxin-like PCB (mono-ortho-PCB)				Indicator PCB			
LC	Sample	GC injection	Injected volume [µl]	GC separation: Stationary phase	Detector	GC injection	Injected volume [µl]	GC separation: Stationary phase	Detector	GC injection	Injected volume [µl]	GC separation: Stationary phase	Detector	GC injection	Injected volume [µl]	GC separation: Stationary phase	Detector
1	2302-CF													splitless	1	HT8 - 8% phényl-polysiloxilane-carborane	LRMS (GC-MS/MS)
2	2302-CF	splitless	2,0	60 m DB-5 MS capillary column	HRMS	splitless	1,5	60 m DB-5 MS capillary column	HRMS	splitless	1,5	60 m DB-5 MS capillary column	HRMS				
3	2302-CF	splitless	20 µL	DB5	MS/MS	splitless	20 µL	HT-8	MS/MS	splitless	20 µL	HT-8	MS/MS	splitless	20 µL	HT-8	MS/MS
5	2302-CF													PTV	1	SGE HT-8, 50 m, 0,22 mm, 0,25 µm	triplequad MS/MS
7	2302-CF	PTV	100	DB-5 MS	HRMS	Splitless	2	DB-5 MS	HRMS	Splitless	2	DB-5 MS	HRMS	Splitless	2	DB-5 MS	HRMS
8	2302-CF													Splitless	1	Rxi-XLB	LRMS: GCMSMS
9	2302-CF	splitless	1uL	DB5MS	MSMS	splitless	1uL	DB5MS	MSMS	splitless	1uL	DB5MS	MSMS	splitless	1uL	DB5MS	MSMS
10	2302-CF													SPLITLESS	1	HT8 SGE	GC-MS TRIPLE QUAD
11	2302-CF	splitless	3	DB-5ms	HRMS	splitless	3	DB-5ms	HRMS	splitless	2	DB-5ms, HT8	HRMS	splitless	2	DB-5ms, HT8	HRMS
12	2302-CF	Splitless	1	ZB-5MS Plus 60 x 0.25 x 0.25	Autospec Premier HRMS	Splitless	1	ZB-5MS 60 x 0.25 x 0.25	Autospec Premier HRMS	Splitless	1	ZB-5MS 60 x 0.25 x 0.25	Autospec Premier HRMS	PTV	2	ZB-50 30 x 0.25 x 0.25	ThermoScientific TSQ Quantum XLS Ultra GC-MS/MS
13	2302-CF	PTV	7 µl	db5-ms	HRMS	PTV	7 µl	db5-ms	HRMS	PTV	7 µl	db5-ms	HRMS	PTV	7 µl	db5-ms	HRMS
14	2302-CF	splitless	2	DB-5MS	HRMS	splitless	2	DB-5MS	HRMS	splitless	2	HT 8	HRMS	splitless	2	HT 8	HRMS
15	2302-CF													Splitless	2	HT8 PCB :8% phenyl polycarborane siloxane	MS MS
16	2302-CF													splitless, PTV	1	HP5-MS UI, 30m x 0,250mm x 0,25µm	LRMS, single quadrupole
17	2302-CF	splitless	1.8	DB-5MS	HRMS (Autospec Ultima Waters)	splitless	1.0	HT8-PCB	HRMS (Autospec Ultima Waters)	splitless	1.0	HT8-PCB	HRMS (Autospec Ultima Waters)	splitless	1.0	HT8-PCB	HRMS (Autospec Ultima Waters)
18	2302-CF	Splitless	2	DB5MS	HRMS	Splitless	2	DB5MS	HRMS	Splitless	1	HT8PCB	HRMS	Splitless	1	HT8PCB	HRMS
20	2302-CF	splitless	2	Rxi-5 Sil MS	MS/MS	splitless	2	Rxi-5 Sil MS	MS/MS	splitless	1	Rxi-5 Sil MS	MS/MS	splitless	1	Rxi-5 Sil MS	MS/MS
21	2302-CF	PTV	2.5	5% Diphenyl / 95% Dimethylpolysiloxan	LRMS	PTV	2.5	5% Diphenyl / 95% Dimethylpolysiloxan	LRMS	PTV	2.5	5% Diphenyl / 95% Dimethylpolysiloxan	LRMS	PTV	1	5% Diphenyl / 95% Dimethylpolysiloxan	LRMS
22	2302-CF	Splitless	1	DB5MS	HRMS	Splitless	1	DB5MS	HRMS	Splitless	1	DB5MS	HRMS	Splitless	1	DB5MS	HRMS
23	2302-CF	Splitless	2	Rxi-5SIL MS (5% diphenyl/95% dimethyl polysiloxane)	HRMS: DFS	Splitless	2	Rxi-5SIL MS (5% diphenyl/95% dimethyl polysiloxane)	HRMS: DFS	Pulsed splitless	1	DB-XLB	Triple quadrupol (EI)	Pulsed splitless	1	DB-XLB	Triple quadrupol (EI)
24	2302-CF	PTV	5	Rtx-Dioxin2	HRMS	PTV	5	DB5	HRMS	SSL	1	HT8	HRMS	SSL	1	HT8	HRMS
25	2302-CF	PTV	100 µl	Rtx-Dioxin2	HRMS	PTV	100 µl	Rtx-Dioxin2	HRMS	PTV	5 µl	Rtx-Dioxin2	HRMS	Splitless	1 µl	Ht8	HRMS
26	2302-CF	Splitless	2	Rtx-5MS, BPX-DXN	HRMS	Splitless	2	Rtx-5MS, HT8-PCB	HRMS	Splitless	2	Rtx-5MS, HT8-PCB	HRMS	Splitless	2	Rtx-5MS, HT8-PCB	HRMS
27	2302-CF	PTV in splitless mode	6 µl	RTX Dioxin 2	HRMS	PTV in splitless mode	6 µl	RTX Dioxin 2	HRMS	PTV in splitless mode	2 µl	HT 8/RTX Dioxin 2	HRMS	PTV in splitless mode	2 µl	HT 8/RTX Dioxin 2	HRMS
28	2302-CF	splitless	1	ZB-Dioxin	HRMS	splitless	1	ZB-Dioxin	HRMS	splitless	1	ZB-Dioxin	HRMS	splitless	1	ZB-Dioxin	HRMS
29	2302-CF	splitless	5		MSMS	splitless	5		MSMS								
31	2302-CF	PTV	2	5% DiPhenyl 95% Dimethyl Polysiloxane	HRMS	PTV	2	5% DiPhenyl 95% Dimethyl Polysiloxane	HRMS	PTV	1	5% DiPhenyl 95% Dimethyl Polysiloxane	HRMS	PTV	1	8% Phenyl (equiv) Policarborane-siloxane Phase	LRMS/MS
32	2302-CF	PTV	2	DB 5 ms	HRMS	PTV	2	DB 5 ms	HRMS	PTV	1	XLB	HRMS	PTV	1	XLB	HRMS
33	2302-CF	PTV			GC-MSMS	PTV			GC-MSMS	PTV			GC-MSMS	PTV			GC-MSMS
34	2302-CF	solvent vent	5	DB 5 MS UI	MS/MS	solvent vent	5	DB 5 MS UI	MS/MS	solvent vent	1	DB 5 MS UI	MS/MS	solvent vent	1	DB 5 MS UI	MS/MS
35	2302-CF	PTV	25	DB5MS	HRMS	PTV	25	DB5MS	HRMS	PTV	10	HT-8	HRMS	PTV	10	HT-8	HRMS
36	2302-CF	splitless	3	DB5-MS	MSMS	splitless	3	DB5-MS	MSMS	splitless	3	DB5-MS	MSMS	splitless	3	DB5-MS	MSMS
37	2302-CF	SPLITLESS	1.5	DB 5 MS	MS/MS	SPLITLESS	1	DB 5 MS	MS/MS	SPLITLESS	1	DB 5 MS	MS/MS	SPLITLESS	1	DB 5 MS	MS/MS
38	2302-CF	PTV	8	DB Dioxin	HRMS	PTV	8	DB Dioxin	HRMS	PTV	3	SGE HT8	HRMS	PTV	3	SGE HT8	HRMS
39	2302-CF	Splitless	1	5%-Phenyl-Arylene-95% DimethylPolysiloxane (ZB5-MS)	Waters Micromass AutoSpec Premier HRMS	Splitless	1	5%-Phenyl-Arylene-95% DimethylPolysiloxane (ZB5-MS)	Waters Micromass AutoSpec Premier HRMS	Splitless	1	5%-Phenyl-Arylene-95% DimethylPolysiloxane (ZB5-MS)	Waters Micromass AutoSpec Premier HRMS	N/A	N/A	N/A	N/A
40	2302-CF	PTV	5	DB-5MS UI	MS/MS (QQQ)	splitless	1	DB-5MS UI	MS/MS (QQQ)	splitless	1	DB-5MS UI	MS/MS (QQQ)	splitless	1	DB-5MS UI	MS/MS (QQQ)
42	2302-CF													splitless	1	(5%-phenyl) methylpolysiloxane	micro-ECD
43	2302-CF	splitless	1	DB5MS	APGC-MSMS	splitless	1	DB5MS	APGC-MSMS	splitless	1	DB5MS	APGC-MSMS	splitless	1	DB5MS	APGC-MSMS
44	2302-CF	splitless	1	DB5ms	HRMS	splitless	1	HT8	HRMS	splitless	1	HT8	HRMS	splitless	1	HT8	HRMS
46	2302-CF	Splitless	1	VF-Xms	LRMS	Splitless	1	Rxi 5Sil MS	LRMS	Splitless	1	Rxi 5Sil MS	LRMS	Splitless	1	Rxi 5Sil MS	LRMS
48	2302-CF	splitless	2	DB-5MS	HRMS	splitless	2	DB-XLB	HRMS	splitless	2	DB-XLB	HRMS	splitless	2	DB-XLB	HRMS
49	2302-CF	PTV	5	VF5-MS	HRMS	PTV	5	VF5-MS	HRMS	Splitless	2	HT-8	HRMS	Splitless	2	HT-8	HRMS
50	2302-CF	/	/	/	/	/	/	/	/	/	/	/	/	splitless	1 µl	XLB	LR-MS
52	2302-CF	splitless	2	phenyl arylene polymer (J&W DB5-ms)	LRMS	splitless	2	phenyl arylene polymer (J&W DB5-ms)	LRMS	splitless	1	phenyl arylene polymer (J&W DB5-ms)	LRMS	splitless	1	phenyl arylene polymer (J&W DB5-ms)	LRMS
54	2302-CF	PTV	5	Column: Agilent VF-5ms 60m x 0,25mm x 0,25µm	HRMS	PTV	5	Column: Agilent VF-5ms 60m x 0,25mm x 0,25µm	HRMS	PTV	5	Column: Agilent VF-5ms 60m x 0,25mm x 0,25µm	HRMS	PTV	5	Column: Agilent VF-5ms 60m x 0,25mm x 0,25µm	HRMS
56	2302-CF	splitless	2	DB-5MS	MS/MS	splitless	2	DB-5MS	MS/MS	splitless	2	DB-5MS	MS/MS				
57	2302-CF	splitless	2 uL	(5%-phenyl)-methylpolysiloxane	HRMS	splitless	2 uL	(5%-phenyl)-methylpolysiloxane	HRMS	splitless	1 uL	(5%-phenyl)-methylpolysiloxane	HRMS	splitless	1 uL	(5%-phenyl)-methylpolysiloxane	HRMS
58	2302-CF	splitless	1	5% phenyl, 94% methyl, 1% vinylsilicone	HRMS	splitless	1	5% phenyl, 94% methyl, 1% vinylsilicone	HRMS	splitless	1	8% phenylpolycarborane-siloxane	HRMS				
61	2302-CF	splitless	2	DB-5 MS	HRMS	splitless	1	DB-5 MS	HRMS	splitless	1	DB-5 MS	HRMS	splitless	1	DB-5 MS	HRMS
62	2302-CF	splitless	1,5	Thermo TR-Dioxin (5% diphenyl - 95% polysilphenylene siloxane)	HRMS	splitless	1,5	Thermo TR-Dioxin (5% diphenyl - 95% polysilphenylene siloxane)	HRMS	splitless	1,5	Thermo TR-Dioxin (5% diphenyl - 95% polysilphenylene siloxane)	HRMS				
65	2302-CF													splitless	2	VF-5ms; 5% phenyl 95% methyl polisiloxane	MS/MS
66	2302-CF	splitless	1	DB5	HRMS	splitless	1	DB5	HRMS	splitless	1	DB5	HRMS	splitless	1	DB5	HRMS
67	2302-CF	Splitless	1.5	DB-5 MS	HRMS, DFS	Splitless	1.5	DB-5 MS	HRMS, DFS								
68	2302-CF																
69	2302-CF	splitless	2	%5 phenyl %95 polydimethylsiloxane	HRMS / APGC-MSMS	splitless	2	%5 phenyl %95 polydimethylsiloxane	HRMS / APGC-MSMS	splitless	2	%5 phenyl %95 polydimethylsiloxane	HRMS / APGC-MSMS	splitless	2	%5 phenyl %95 polydimethylsiloxane	HRMS / APGC-MSMS
70	2302-CF	Splitless	2	RTX-PCB 40m	HRMS	Splitless	2	RTX-PCB 40m	HRMS	Splitless	2	RTX-PCB 40m	HRMS	Splitless	2	RTX-PCB 40m	HRMS
71	2302-CF	Splitless	2	DB5MS	HRMS	Splitless	1	DB5MS	HRMS	Splitless	1	DB5MS	HRMS	Splitless	1	DB5MS	HRMS
72	2302-CF													splitless	1	HP 5ms UI (5%Phenyl - 95% Dimethylpolysiloxan)	MSMS
73	2302-CF	Splitless	1	5% Phenyl (equiv) polysilphenylene-siloxane	HRMS	Splitless	1	TR-PCB 8 MS	HRMS	Splitless	1	TR-PCB 8 MS	HRMS	Splitless	1	TR-PCB 8 MS	HRMS
74	2302-CF																
75	2302-CF	splitless	5	select-pah	MS (QQQ)	splitless	3	select-pah	MS (QQQ)	splitless	3	select-pah	MS (QQQ)	splitless	3	select-pah	MS (QQQ)
77	2302-CF													splitless	1000	DB-608, Rxi-1ms	ECD
78	2302-CF	PTV	10µl	DB5-MS 60m x 0.25mm x 0.25um	HRMS	PTV	10µl	DB5-MS 60m x 0.25mm x 0.25um	HRMS	PTV	10µl	DB5-MS 60m x 0.25mm x 0.25um	HRMS	PTV	10µl	DB5 60m x 0.25mm x 0.25um	HRMS
81	2302-CF																
82	2302-CF	splitless	2	5% phenyl-95% dimethyl polysiloxane	GCMSMS TQ	splitless	2	5% phenyl-95% dimethyl polysiloxane	GCMSMS TQ	splitless	2	5% phenyl-95% dimethyl polysiloxane	GCMSMS TQ	split/splitless	3	5% polysilarylene-95%polydimethylsiloxane	GCMSMS TQ
83	2302-CF	PTV splitless	2	DB-5MS	HRMS	PTV splitless	1	DB-5MS	HRMS	PTV splitless	1	DB-5MS, HT-8	HRMS	PTV splitless	1	DB-5MS, HT-8	HRMS

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Compound Feed (2302-CF)
Physico-chemical Methods PCDD/Fs and PCBs - Detection

LC	Sample	PCDD/F				Dioxin-like PCB (non-ortho-PCB)				Dioxin-like PCB (mono-ortho-PCB)				Indicator PCB			
		GC injection	Injected volume [µl]	GC separation: Stationary phase	Detector	GC injection	Injected volume [µl]	GC separation: Stationary phase	Detector	GC injection	Injected volume [µl]	GC separation: Stationary phase	Detector	GC injection	Injected volume [µl]	GC separation: Stationary phase	Detector
84	2302-CF	Splitless	5	(5%-phenyl)-methylpolysiloxane	MS/MS	Splitless	5	(5%-phenyl)-methylpolysiloxane	MS/MS	Splitless	5	(5%-phenyl)-methylpolysiloxane	MS/MS	Splitless	5	(5%-phenyl)-methylpolysiloxane	MS/MS
85	2302-CF													splitless	2	crosslinked 5% PH ME Siloxane	ECD
86	2302-CF	splitless	2	DB5MS	MSMS	splitless	2	DB5MS, DB17	MSMS	splitless	2	DB5MS	MSMS				
87	2302-CF	splitless with PTV-injector	1	Macherey-Nagel OPTIMA 5 HT + 10m Guard Column, 60m x 0.25mm x 0.25µm	GC-MS/MS	splitless with PTV-injector	1	Macherey-Nagel OPTIMA 5 HT + 10m Guard Column, 60m x 0.25mm x 0.25µm	GC-MS/MS	splitless with PTV-injector	1	Macherey-Nagel OPTIMA 5 HT + 10m Guard Column, 60m x 0.25mm x 0.25µm	GC-MS/MS	splitless with PTV-injector	1	Macherey-Nagel OPTIMA 5 HT + 10m Guard Column, 60m x 0.25mm x 0.25µm	GC-MS/MS
89	2302-CF	splitless	2	DB 5MS	GC-MSMS	splitless	1	DB 5MS	GC-MSMS	splitless	1	DB 5MS	GC-MSMS	splitless	1	DB 5MS	GC-MSMS
90	2302-CF	PTV	15	DB-5MS	LRMS	PTV	15	DB-5MS	LRMS	Splitless	2	DB-5MS	LRMS	Splitless	2	DB-5MS	LRMS
91	2302-CF	PTV	8	DBDIOXIN, DB-5	HRMS	PTV	8	DBDIOXIN, DB-5	HRMS	PTV	2	DBDIOXIN, DB-5	HRMS	PTV	2	DBDIOXIN, DB-5	HRMS
93	2302-CF	SPLITLESS	2	DB5MS	HRMS	SPLITLESS	1	DB5MS	HRMS	SPLITLESS	1	DB5MS	HRMS	SPLITLESS	1	DBXLB	HRMS
94	2302-CF	PTV	5	Rtx-Dioxin2	MS/MS	PTV	5	Rtx-Dioxin2	MS/MS	splitless	1	HT-8	MS/MS	splitless	1	HT-8	MS/MS
95	2302-CF	splitless	2	DB5-MS	HRMS	splitless	2	DB5-MS	HRMS	PTV	1	HT8	HRMS	PTV	1	HT8	HRMS
96	2302-CF	Splitless	2	DB-5MS (60 m, 0.25 mm id, 0,25 mm film)	HRMS (Mat-95 XP)	Splitless	1	DB-5MS (60 m, 0.25 mm id, 0,25 mm film)	HRMS (Mat-95 XP)	Splitless	1	DB-5MS (60 m, 0.25 mm id, 0,25 mm film)	HRMS (Mat-95 XP)	Splitless	1	DB-5MS (60 m, 0.25 mm id, 0,25 mm film)	HRMS (Mat-95 XP)
97	2302-CF													splitless	1.0	VF-5ms	MS
99	2302-CF	PTV	5	DB-5MS	HRMS	PTV	5	DB-5MS	HRMS	PTV	1	HT8-PCB	HRMS	PTV	1	HT8-PCB	HRMS
100	2302-CF													splitless	2	DB-1701	GC-ECD SCION
101	2302-CF	PTV	5	DB5	HRMS (DFS)	PTV	5	DB5	HRMS (DFS)	PTV	2	DB5	HRMS (DFS)				
102	2302-CF																
103	2302-CF	splitless	2	XLB	QQQ-MS	splitless	2	XLB	QQQ-MS	splitless	2	XLB	QQQ-MS	splitless	2	XLB	QQQ-MS
104	2302-CF													splitless	2	DB-XLB	MS MS
105	2302-CF	splitless	1	DB 5MS	HRMS	splitless	1	DB 5MS	HRMS	splitless	1	DB 5MS	HRMS	splitless	1	DB 5MS	HRMS
106	2302-CF																
107	2302-CF													PTV splitless	2	HP-5-MS	GC-MS/MS LRMS
109	2302-CF	splitless	1	ZB-5MS Plus 60m X 0.25mm X 0.1µm	HRMS	splitless	1	HT8-PCB 60m x0,25mm x 0,25µm	HRMS	splitless	1	HT8-PCB 60m x0,25mm x 0,25µm	HRMS	splitless	1	HT8-PCB 60m x0,25mm x 0,25µm	HRMS
110	2302-CF	Splitless	2	DB5	APGC	Splitless	1	DB5	APGC	Splitless	1	DB5	APGC	Splitless	1	DB5	APGC
111	2302-CF	PTV	5	SLB-5 MS	HRMS	PTV	5	HT-8	HRMS	PTV	5	HT-8	HRMS	PTV	5	HT-8	HRMS
113	2302-CF													splitless	1	HP-5-MSui	MS/MS
114	2302-CF	splitless	5	VFX ms 60m	HRMS	splitless	5	VFX ms 60m	HRMS								
115	2302-CF	splitless	1-2	DB-5MS	HRMS (R>10000)	splitless	1	DB-5MS	HRMS (R>10000)	splitless	1	DB-5MS	HRMS (R>10000)	splitless	1	HT-8	µECD
116	2302-CF													splitless, 250 °C	2	DB 608, 60 m, 0,25 mm, 0,25 µm film	LRMS
117	2302-CF	splitless	2	TR - Dioxin, 60m	HRMS	splitless	2	TR - Dioxin, 60m	HRMS	splitless	2	TR - Dioxin, 60m	HRMS	splitless	2	TR - Dioxin, 60m	HRMS
5A	2302-CF													PTV	1	SGE HT-8, 50 m, 0,22 mm, 0,25 µm	triplequad MS/MS
16A	2302-CF													splitless, PTV	1	HP5-MS UI, 30m x 0,250mm x 0,25µm	LRMS, single quadrupole
38A	2302-CF	PTV	8	DB Dioxin	HRMS	PTV	8	Db Dioxin	HRMS	PTV	3	SGE HAT 8	HRMS	PTV	3	SGE HT 8	HRMS
61A	2302-CF													split ratio 7,0	1	Rxi®-5SIL MS w/Integra-Guard®	ECD
106A	2302-CF																

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Compound Feed (2302-CF)
Bioanalytical screening methods PCDD/Fs and PCBs - Clean-up and Separation

LC	Sample	Weighed sample [g]	Extraction: Sample preparation/pre-treatment	Extraction technique	Extraction solvent	Extraction time [h]	Extraction temperature [ºC]	Extraction pressure [Mpa]
7	2302-CF	2.01	homogenisation	shaking	hexane/diethyl ether 97/3 (after mixing of sample with methanol/water 85/15)	2x 1 hr	RT	
14	2302-CF	4		Soxhlet	toluene/actone	6		
34	2302-CF	9		ASE	HEXANE : ACETONE (9:1)	3x5min	100	1500
52	2302-CF	11.96	Homogenisation	Liquid-liquid	n-hexane	1x60 min. + 2x30 min.	Ambient	Ambient
54	2302-CF	5.0038						
56	2302-CF	40		Soxhlet	Toluol	20		
74	2302-CF	5.03	Homogenization	soxhlet	Hexane	2	25	0,1
83	2302-CF	2.8	-	shaking	1. toluene:methanol 8:2 v/v 2.hexane	1	-	-
85	2302-CF	6	homogenisation	shaking	water, n-Propanol, n-Hexan/DEE v/v 97/3	1 hour and 2x 1/2 hours	ambient	normal
95	2302-CF							
106	2302-CF	5	Drying with Na2SO4	Column	n-hexane/acetone 2/1 v/v	2	18-22 (room ambient temperature)	-
107	2302-CF		addition of water and sodium chloride	shaking	acetone/hexane 2/1	16	23	0,101
106A	2302-CF	5	Drying with Na2SO4	Column	n-hexane/acetone 2/1 v/v	2	18-22 (room ambient temperature)	-

		Clean-up (PCDD/Fs and PCBs)						Clean-up (Separate analysis of PCDD/Fs and PCBs)			
LC	Sample	Silica/sulfuric acid column	Alumina column	Florisil column	Carbon/celite column	Others	Separate analysis of PCDD/Fs and DL-PCBs	Alumina column	Florisil column	Carbon/celite column	Others
7	2302-CF	yes	no	no	no	no	no	no	no	no	no separate analysis only PCDD/Fs + DL-PCBs (+ other AhR- agonist that ends up in final extract)
14	2302-CF	yes	no	no	no		no	no	no	no	
34	2302-CF	YES	NO	NO	NO		NO				
52	2302-CF	yes	no	no	no		yes	no	yes	no	
56	2302-CF	yes	yes		yes						
74	2302-CF	Yes	No	No	Xcarb		Yes	no	no	Xcarb	
83	2302-CF	yes	no	no	yes	no	yes	no	no	yes	no
85	2302-CF	yes	no	no	no		no				
106	2302-CF	yes	no	yes	no		no	no	no	no	
107	2302-CF	yes	no	no	no	GPC	no				
106A	2302-CF	yes	no	yes	no		yes	no	yes	no	

Compound Feed (2302-CF)
Bioanalytical screening methods PCDD/Fs and PCBs - Cell bioassay

LC	Sample	Name, type and provider of cell line	Method validated according to EU Regulation	Sample replicates on microtiter plate	Type of calibrators	Type of calibration function	Curve fitting method	Procedure blank correction	Recovery correction	Type of recovery reference sample(s)	Matrix of recovery reference sample(s)	Level(s) of recovery reference sample(s)		
												PCDD/F + DL-PCB	PCDD/F	DL-PCB
7	2302-CF	rat H4IIE (Wageningen University, now BDS)	yes	triplicates	reference samples	exponential fit	no	yes, automatically	yes, automatically	reference samples	chicken feed	0.02/0.29/0.48/0.70/1.57/3.35 ng TEQ/kg		
14	2302-CF	rat Hepatoma Typs H4L 1.1 c4 (University of California, Davis)	yes	triplicates	TCDD	curve model	WSSR regression	yes	yes	QC sample GC-HRMS confirmed	compound feed	80		
34	2302-CF	DR CALUX provided by BDS	NOT FOR THIS MATRIX	TRIPLICATE	TCDD	CALIBRATION CURVE	SSP	YES	YES	FEED REFERENCE MATERIAL		0,98	0,59	0,39
52	2302-CF	Rat hepatoma cellen (H4IIE), BioDetection Systems	Yes	Triplicates	TCDD		Linear	Yes	Yes	GC/HRMS confirmed	feedingstuff	53		
74	2302-CF	H1L6.1c3, mouse hepatoma, provided by Xenobiotic Detection System	yes	triplicates	We use the three calibrators TCDD, PCB126, and reference samples	curve model	by least squares estimates with the 4 parameter Hill Equation	no	yes	GC/HRMS confirmed	piensos compuestos		117	75
83	2302-CF	H1L6.1c3, XDS Inc.	yes	duplicates	TCDD, PCB 126	4-PL	SSR	yes	yes	naturally contaminated, GC/HRMS confirmed	compound feed	1,74	,69	1,05
85	2302-CF	H4IIE Pgudluc 1.1 rat hepatoma cell line from BDS	yes	triplicates	TCDD	linear	SSR	yes	yes	certified BRM 06		16,0 ng/kg		
106	2302-CF	H4IIE, rat hepatome wild type, from Helmholtz-Zentrum Neuherberg/Germany	Not for feed	triplicate	TCDD	S-Curve, 4-Parameter-Fit	WSSR	yes	yes	PT material	Grass meal (2019)	1,24 ng WHO2005-PCDD/F+dlPCB-TEQ/kg product with a moisture content of 12%	0,78 ng WHO2005-PCDD/F+dlPCB-TEQ/kg product with a moisture content of 12%	0,44 ng WHO2005-PCDD/F+dlPCB-TEQ/kg product with a moisture content of 12%
106A	2302-CF	H4IIE, rat hepatome wild type, from Helmholtz-Zentrum Neuherberg/Germany	Not for feed	triplicate	TCDD	S-Curve, 4-Parameter-Fit	WSSR	yes	yes	PT material	Grass meal (2019)	1,24 ng WHO2005-PCDD/F+dlPCB-TEQ/kg product with a moisture content of 12%	0,78 ng WHO2005-PCDD/F+dlPCB-TEQ/kg product with a moisture content of 12%	0,44 ng WHO2005-PCDD/F+dlPCB-TEQ/kg product with a moisture content of 12%

LC	Sample	Bioassay cut-off value(s) calculated from				Other approach to bioassay cut-off value(s)
		matrix-matched calibration experiments (spiking) during initial validation	multiple analysis (n>6) of a sample contaminated at the GC/MS DL	multiple analysis (n>6) of a sample contaminated at 2/3 level of interest	matrix-matched calibration experiments (confirmed samples) during re-evaluation	
7	2302-CF	no	no	no	no	using bioassay cut-off 2/3 ML for PCDD/Fs = 0.5 pg BEQ/g
14	2302-CF	no	yes	no	no	
34	2302-CF			YES		
52	2302-CF	no	no	no	no	2/3 of GCHRMS maximum limit
74	2302-CF	Yes	no	no	yes	no
83	2302-CF	yes	no	no	no	no
85	2302-CF					2/3 of ML
106	2302-CF	no	no	no	no	Cut off = 2/3 of concentration of interest
106A	2302-CF	no	no	no	no	Cut off = 2/3 of concentration of interest

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Compound Feed (2302-CF)

Physico-chemical Methods PCDD/Fs and PCBs - Additional Information

LC	Sample		**Additional information** Physical-chemical methods		**Additional information** Bioanalytical methods
7	2302-CF				no separate analysis only Total BEQ: PCDD/Fs + DL-PCBs (+ other AhR- agonist that ends up in final extract) this method is used as a screening assay, samples classified as suspect are subsequently analysed by GCHRMS analysis Compared to GCHRMS analysis the determined bioassay outcome (ng BEQ/kg) will always be higher, as the bioassay detects all Ah-receptor agonist. Thus for instance also brominated dioxines and PBBs.
16	2302-CF		sample nb. 2302-CF-136		
25	2302-CF		Treatment of the extract with MTBE after extraktion and prior to fat determination		
38	2302-CF		Die Angabe "weighed sample" entspricht der eingewogenen Trockensubstanz		
44	2302-CF		method is accreditated for PCDD/Fs and DL-PCBs, and it is not accreditated for Indicator PCBs	after Miura purification two fractions are obtained: fraction (1) containing PCDD/Fs+mono-ortho-PCBs and fraction (2) containing other DL-PCBs for analysis of the Indicator PCBs the two fractions obtained are united	
62	2302-CF		additional purification with silica/sulfuric acid after extraction		
69	2302-CF		we measured both via HRMS and APGC-MSMS		
70	2302-CF		Automatic purification MIURA		
75	2302-CF		our method is screening method		
78	2302-CF		Sample weight is as received (not dried)		
16A	2302-CF		sample nb. 2302-CF-092		
38A	2302-CF		Die Angabe "weighed sample" entspricht der eingewogenen Trockensubstanz		