

University of Stuttgart
Germany



Analytische Qualitätssicherung Baden-Württemberg

Proficiency Test 5/23
- total petroleum hydrocarbon index -

Final report

provided by
AQS Baden-Württemberg at
Institute for Sanitary Engineering, Water Quality and Solid Waste Management,
University of Stuttgart
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on behalf of the Ministry of the Environment, Climate Protection
and the Energy Sector Baden-Württemberg

Stuttgart, in September 2023

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Version of the report	1	

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1. General

This PT was provided by AQS Baden-Württemberg in the framework of the nation-wide conducted waste water PT scheme in Germany. This PT scheme is based on the requirements of the German Working Group on water issues of the Federal States and the Federal Government (LAWA), which fixed the way of doing PTs in the regulated environmental sector in its AQS-leaflet A-3 for the analysis of water, waste water and sludge. These PTs are conducted together with several PT providers nationwide in Germany in a harmonised way.

The PT was executed and evaluated according to the requirements of DIN 38402-A45 and ISO/TS 20612.

2. PT design

Each participant received the following samples:

- 3 samples for the determination of the total petroleum hydrocarbon index in 1000-ml-ground bottles with ground-in stopper. Preservation by acidification with hydrochloric acid (pH 2,1) and by cooling.

9 different concentration levels/batches were produced. The concentration levels were randomly allocated to the participants. It was ensured that each participant received one concentration level from the lower concentration levels 1-3.

3. Sample preparation

The samples for the above mentioned parameters were based on a real waste ground water matrix.

The ground water was filtered by using 5 µm and 1 µm filter cartridges to eliminate particles. To reduce germs, the ground water was irradiated with ultraviolet light. For further preparation, the matrix was pasteurised at 80 °C over night in a steel vessel . During pasteurisation the matrix was aerated with a mixture of carbon dioxide and nitrogen in a ratio of 1:1 to prevent calcium carbonate precipitation. For the preparation of the samples, each bottle was filled with matrix and was spiked with a mixture of commercial available diesel and oil (mass ratio 1:1).

The samples were cooled directly after preparation.

4. Sample distribution

The samples were dispatched on 08 May 2023 by express service (GoExpress).

5. Analytical methods

The participants were restricted to use one analytical method according to the requirements of the “Technical Module Water” from the German Working group on water issues of the Federal States and the Federal Government (LAWA).

parameter	analytical method	issue
Total petroleum hydrocarbon index	EN ISO 9377-2	2000-10

The samples had to be analysed in duplicate over the complete method (sample preparation and measurement). The participants were asked to submit the results as average values in mg/l with three significant digits.

Following limit of quantification was required:

parameter	limit of quantification
Total petroleum hydrocarbon index	0,1 mg/l

6. Submission of the results

The deadline for the submission of results was on 02 June 2023.

7. Basic principle of evaluation and assessment

The basic principle of the evaluation and assessment of the PTs from AQS Baden-Württemberg are described in the document „Evaluation of the PTs and information for the report“, which can be downloaded from www.aqsbw.de/pdf/ausw_berichte_v1_en.pdf.

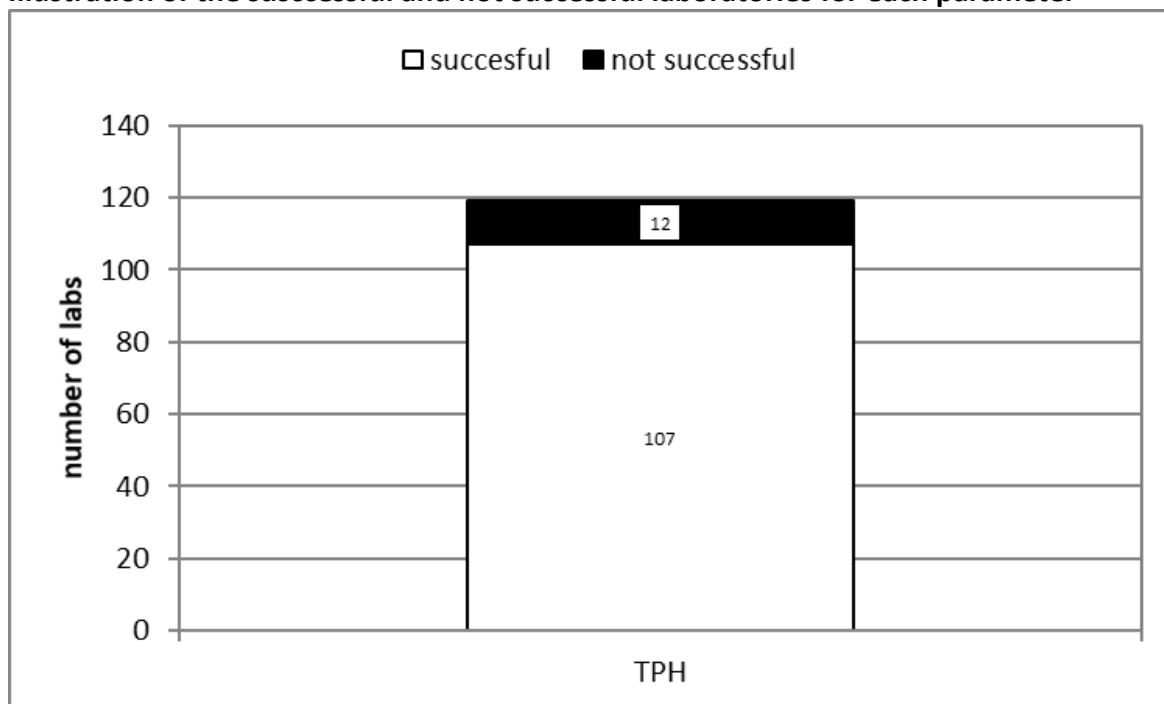
This PT was evaluated as follows:

Assigned value x_{pt}:	Consensus value (Hampel estimator)						
Standard deviation for proficiency assessment σ_{pt}:	Q method Variance function						
Upper limit of σ_{pt}:	30%						
Lower limit of σ_{pt}:	10%						
Assessment:	z_U -Score						
Classification of the single results:	<table> <tbody> <tr> <td>$z_u \leq 2,0$</td> <td>successful</td> </tr> <tr> <td>$2,0 < z_u < 3,0$</td> <td>questionable</td> </tr> <tr> <td>$z_u \geq 3,0$</td> <td>unsatisfactory</td> </tr> </tbody> </table>	$ z_u \leq 2,0$	successful	$2,0 < z_u < 3,0$	questionable	$ z_u \geq 3,0$	unsatisfactory
$ z_u \leq 2,0$	successful						
$2,0 < z_u < 3,0$	questionable						
$ z_u \geq 3,0$	unsatisfactory						
Parameter assessment:	A parameter was assessed as successful, if more than half of the values were correctly determined (2 out of 3 values are within the tolerance limits).						

8. Evaluation

Number of participants:	122 3 laboratories did not report results
Number of reported values	357
Number of accepted values:	321 (89,9 %)

Illustration of the successful and not successful laboratories for each parameter



9. Explanation for the appendices

The explanations for the appendices can be found in the document „Evaluation of the PTs and information for the report“ which can be downloaded from www.agsbw.de/pdf/ausw_berichte_v1_en.pdf.

10. Measurement uncertainty

General:

Number of labs with valid values	119
Number of labs with valid values and reported measurement uncertainties	86 (72,3 %)
Number of valid values	357
Number of valid values with measurement uncertainties	258 (72,3 %)

Measurement uncertainties against the accreditation status

Accreditation status of the values	Number of values	Number of values with measurement uncertainty
accredited	297	228 (76,8 %)
not accredited	30	15 (50 %)
not specified	30	15 (50 %)

Interpretation of the reported measurement uncertainties:

If measurement uncertainties are underestimated values assessed as “satisfactory” in the PT ($|z_U| \leq 2$), will have a large ζ -score. $|\zeta| > 2$ means that the “own” requirements (defined in terms of estimated uncertainty) are not fulfilled.

Number of values with reported measurement uncertainty having a $z_U \leq 2,0$	231
Number of values with a magnitude of ζ-scores > 2 The own requirements of the laboratory are not fulfilled and the estimation of the measurement uncertainty is too low	61 (26,4 %)

11. Traceable reference values

The explanations about traceable reference values can be found in the document „Evaluation of the PTs and information for the report“, which can be downloaded from www.aqsbw.de/pdf/ausw_berichte_v1.pdf.

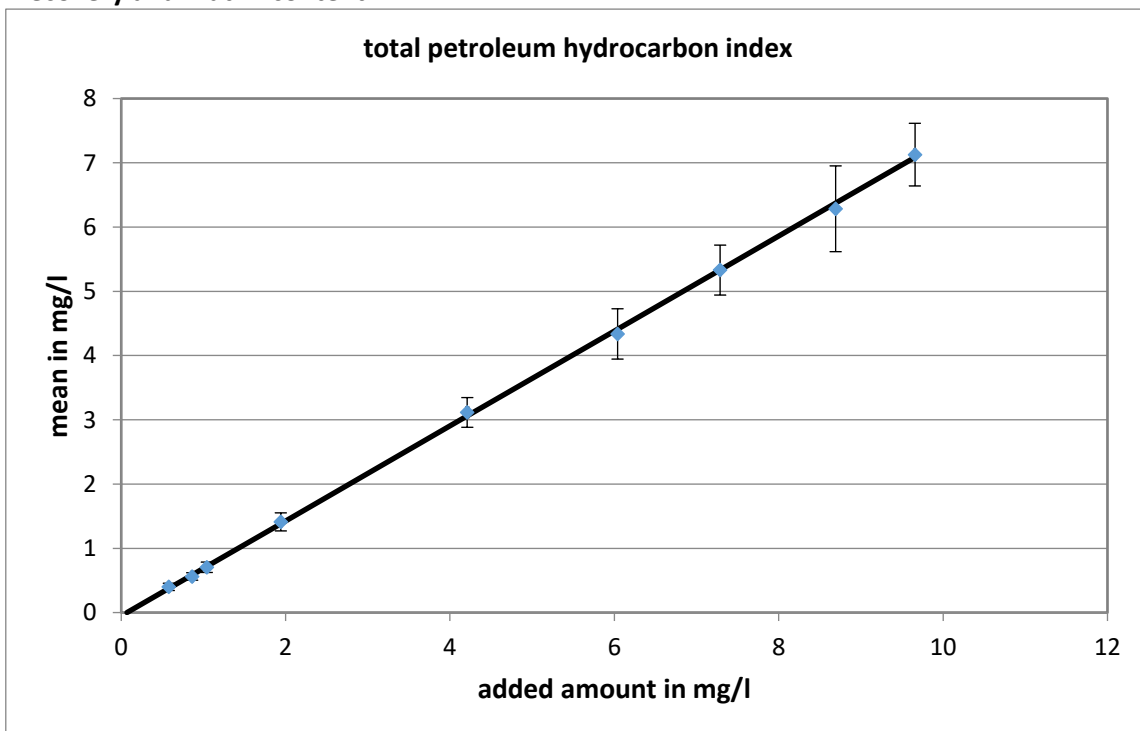
12. Internet

The report is available on the following webpage:
http://www.aqsbw.de/pdf/280/report_280.pdf

total petroleum hydrocarbon index

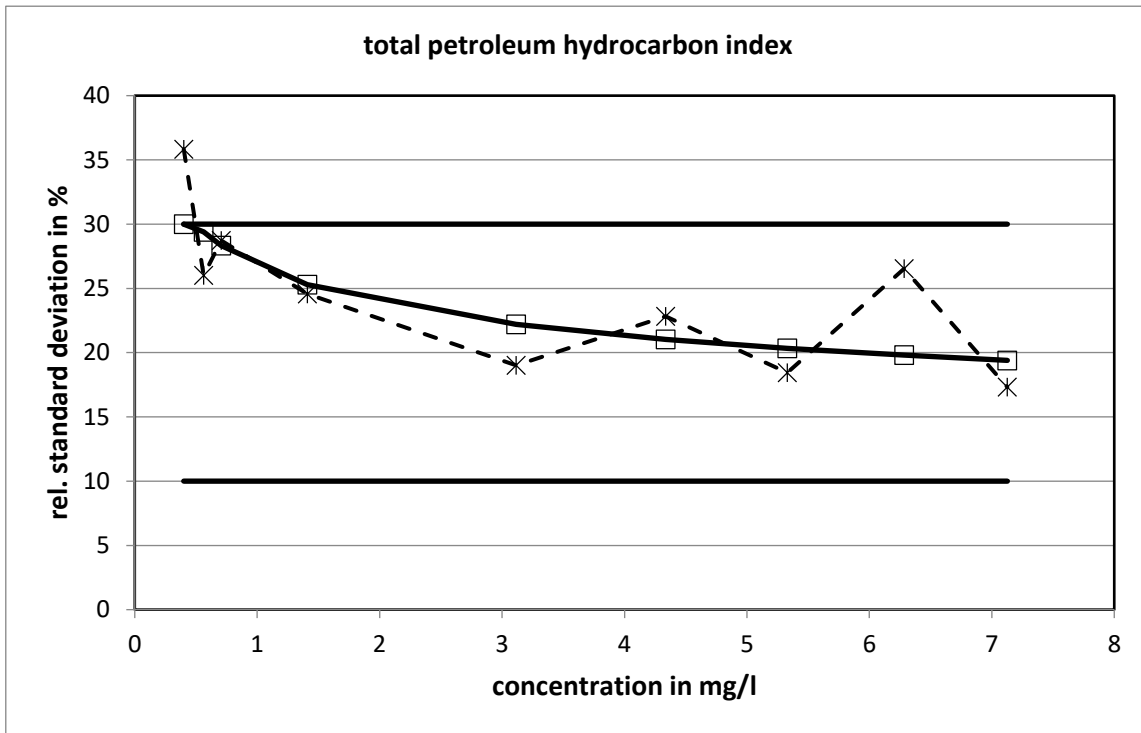
level	assigned value [mg/l]	expanded uncertainty of the assigned value [%]	standard deviation, calculated using robust statistics [mg/l]	standard deviation from variance function [mg/l]	standard deviation for proficiency assessment [mg/l]	standard deviation for proficiency assessment [%]	upper tolerance limit [mg/l]	lower tolerance limit [mg/l]	upper tolerance limit [%]	lower tolerance limit [%]	number of results	out below	out above	out [%]
1	0,3999	14,17	0,1433	0,1243	0,1200	30,00	0,6879	0,1866	72,02	-53,33	40	2	1	7,5
2	0,5620	10,28	0,1461	0,1652	0,1652	29,40	0,9571	0,2676	70,29	-52,38	40	4	0	10,0
3	0,7051	11,50	0,2026	0,1997	0,1997	28,33	1,179	0,3479	67,24	-50,65	39	4	0	10,3
4	1,411	9,96	0,3466	0,3568	0,3568	25,29	2,240	0,7666	58,77	-45,67	38	3	2	13,2
5	3,115	7,42	0,5920	0,6919	0,6919	22,21	4,690	1,853	50,56	-40,52	41	3	0	7,3
6	4,337	9,02	0,9897	0,9125	0,9125	21,04	6,398	2,666	47,52	-38,53	40	3	0	7,5
7	5,331	7,29	0,9830	1,084	1,084	20,34	7,768	3,340	45,73	-37,34	40	3	0	7,5
8	6,284	10,62	1,667	1,244	1,244	19,80	9,072	3,996	44,36	-36,42	39	4	2	15,4
9	7,127	6,85	1,234	1,383	1,383	19,40	10,22	4,581	43,34	-35,72	40	4	1	12,5
sum											357	30	6	10,1

Recovery and matrix content

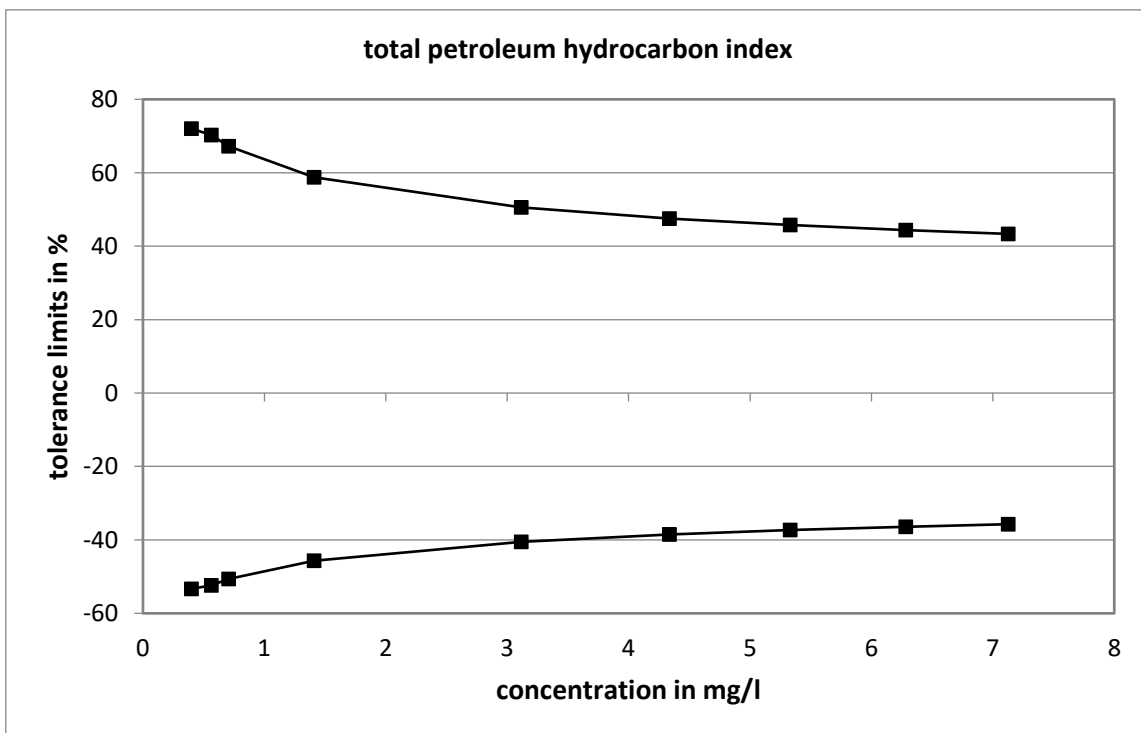


Slope of the regression: 0,739; Recovery rate: 73,9 %
 neg. x-axis value corresponds to the matrix content: 0 mg/l
 exp. uncertainty of the matrix content: 0,0698 mg/l = 0 %

Relative standard deviation and tolerance limits

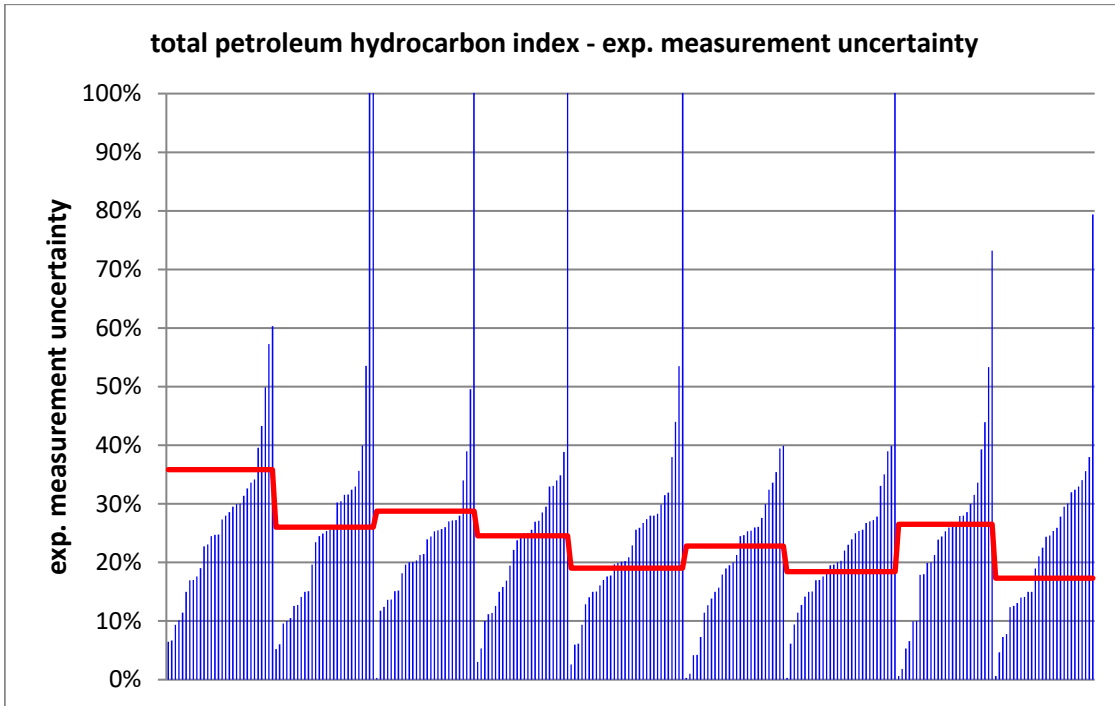


The relative standard deviations, calculated from the variance function, reached the upper limit with one concentration level.



Method specific evaluation

There is no method specific evaluation, because only one method was used.

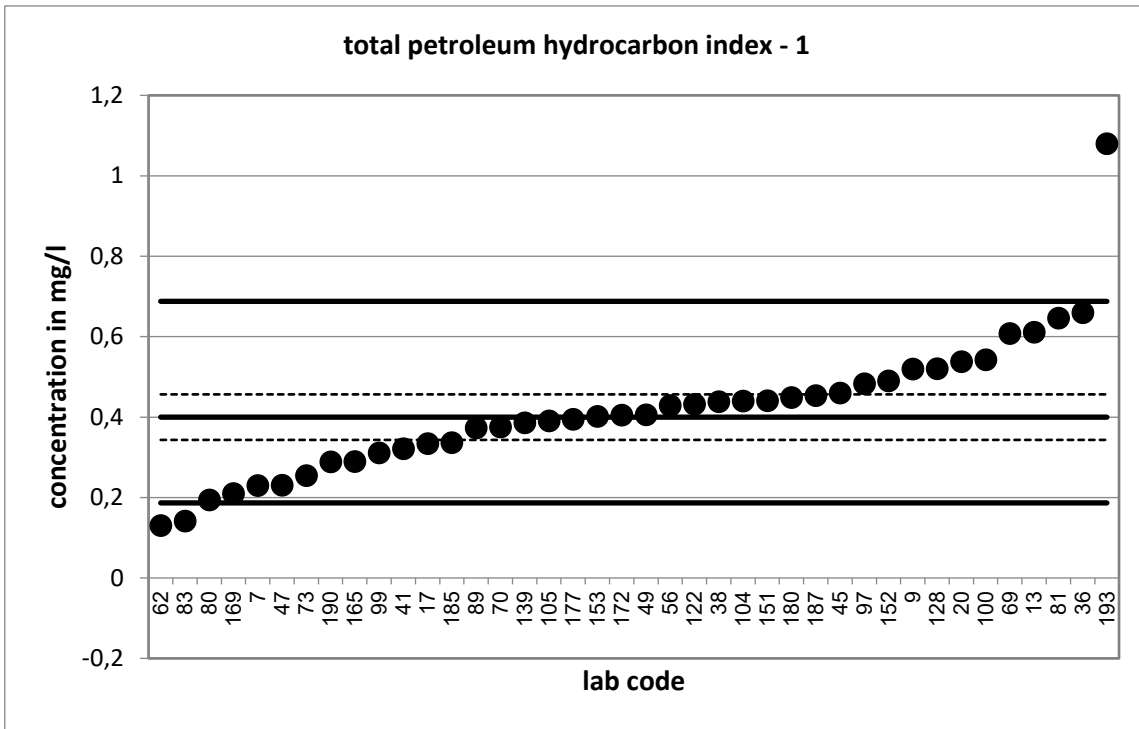


Strongly deviating values are not shown.

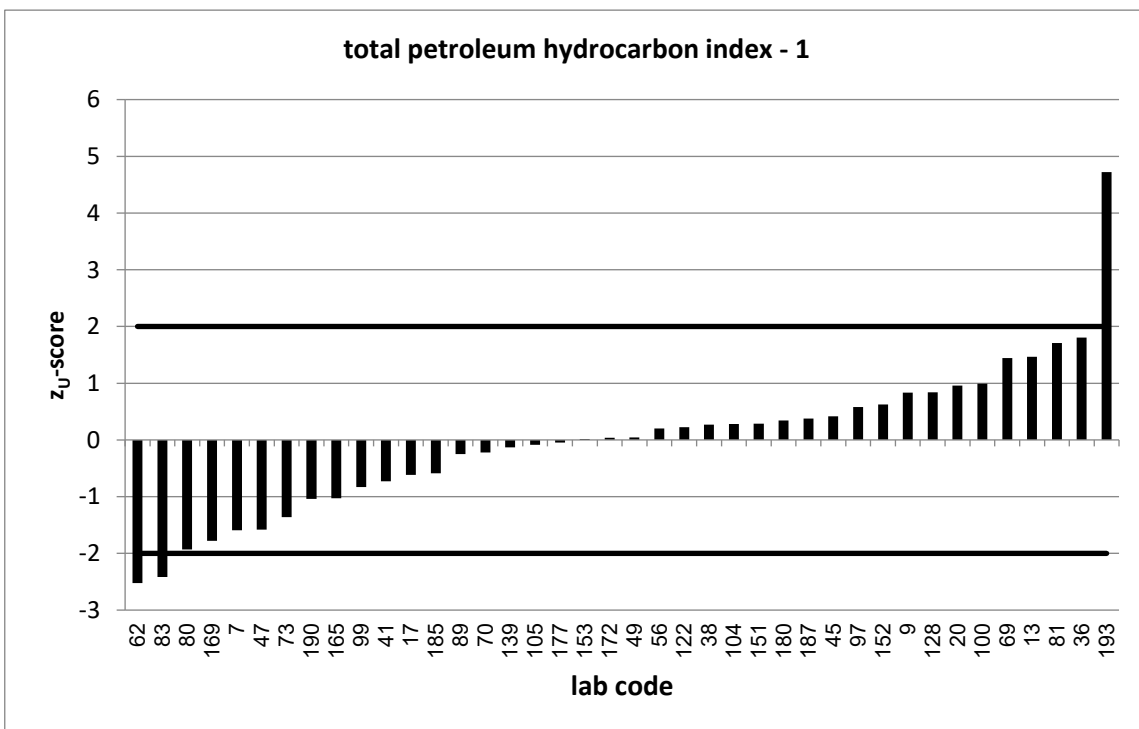
PT 5/23		total petroleum hydrocarbon index - 1			
assigned value [mg/l]*		0,3999 ± 0,0566			
upper tolerance limit [mg/l]		0,6879			
lower tolerance limit [mg/l]		0,1866			
lab code	result [mg/l]	±	z-score	Z _U -score	assessm.**
7	0,23	0,041	-4,9	-1,6	s
9	0,52	0,12	1,8	0,8	s
13	0,611	0,171	2,3	1,5	s
17	0,334	0,1	-1,1	-0,6	s
20	0,538			1,0	s
36	0,66	0,15	3,2	1,8	s
38	0,439	0,12	0,6	0,3	s
41	0,322	0,11	-1,3	-0,7	s
45	0,46	0,15	0,8	0,4	s
47	0,231	0,1	-2,9	-1,6	s
49	0,4064			0,0	s
56	0,429			0,2	s
62	0,131	0,075	-5,7	-2,5	q
69	0,608	0,091	3,9	1,4	s
70	0,376	0,111	-0,4	-0,2	s
73	0,255	0,08	-3,0	-1,4	s
80	0,194	0,048	-5,5	-1,9	s
81	0,646	0,194	2,4	1,7	s
83	0,1421			-2,4	q
89	0,373	0,186	-0,3	-0,3	s
97	0,483	0,092	1,5	0,6	s
99	0,311	0,053	-2,3	-0,8	s
100	0,543			1,0	s
104	0,44			0,3	s
105	0,391			-0,1	s
122	0,432	0,171	0,4	0,2	s
128	0,521	0,175	1,3	0,8	s
139	0,386	0,036	-0,4	-0,1	s
151	0,441			0,3	s
152	0,49	0,12	1,4	0,6	s
153	0,402			0,0	s
165	0,29	0,175	-1,2	-1,0	s
169	0,21	0,06	-4,6	-1,8	s
172	0,405	0,1	0,1	0,0	s
177	0,395	0,04	-0,1	0,0	s
180	0,449	0,03	1,5	0,3	s
185	0,337			-0,6	s
187	0,454	0,052	1,4	0,4	s
190	0,289	0,049	-3,0	-1,0	s
193	1,08	0,07	15,1	4,7	u

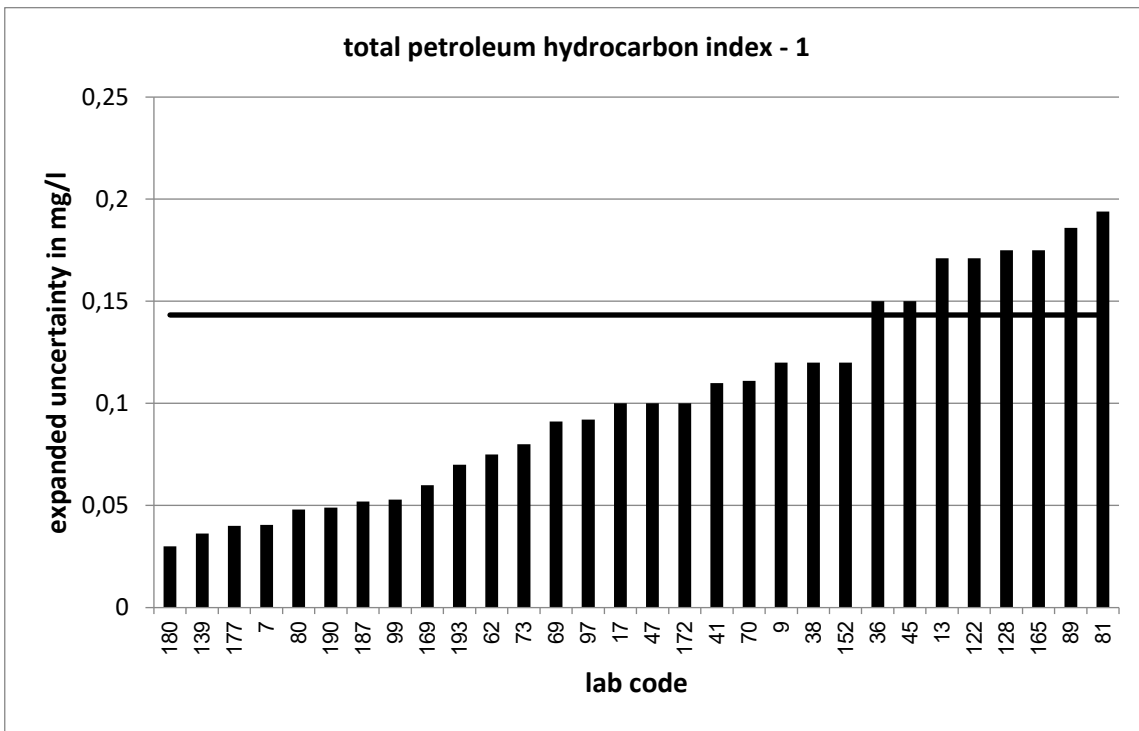
* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor k=2 corresponding to a confidence level of about 95%

** s = satisfactory, q = questionable, u = unsatisfactory

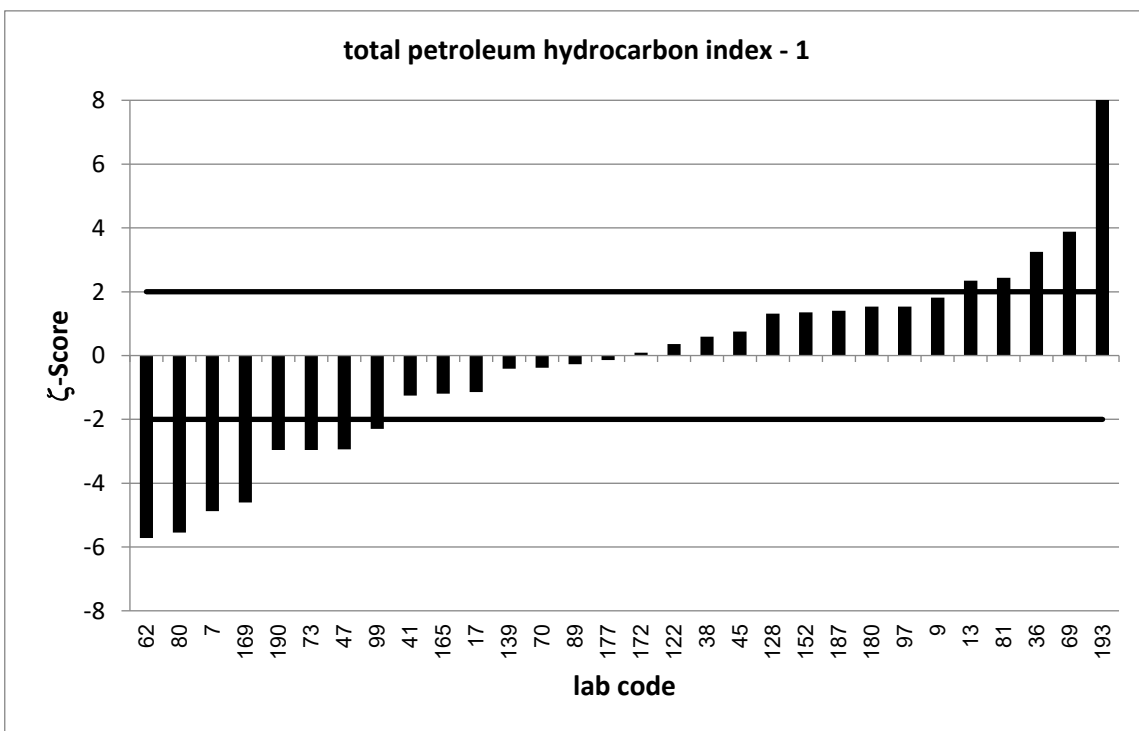


Strongly deviating values are not shown in the diagram.





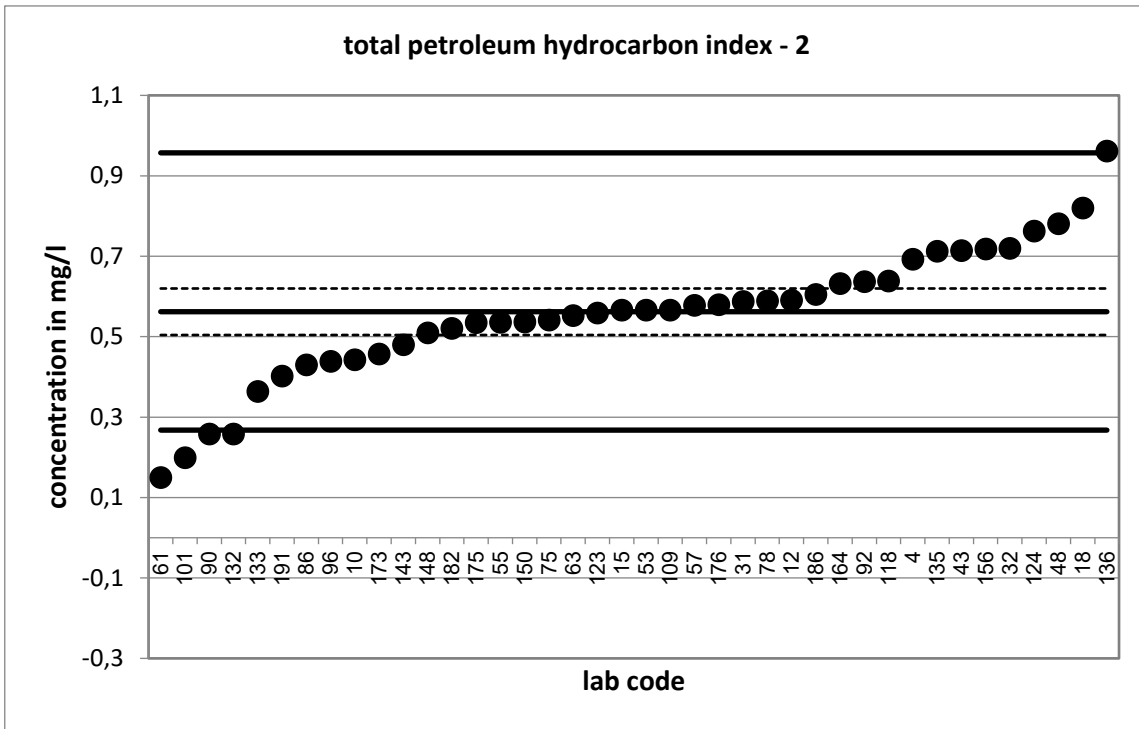
Strongly deviating values are not shown in the diagram.



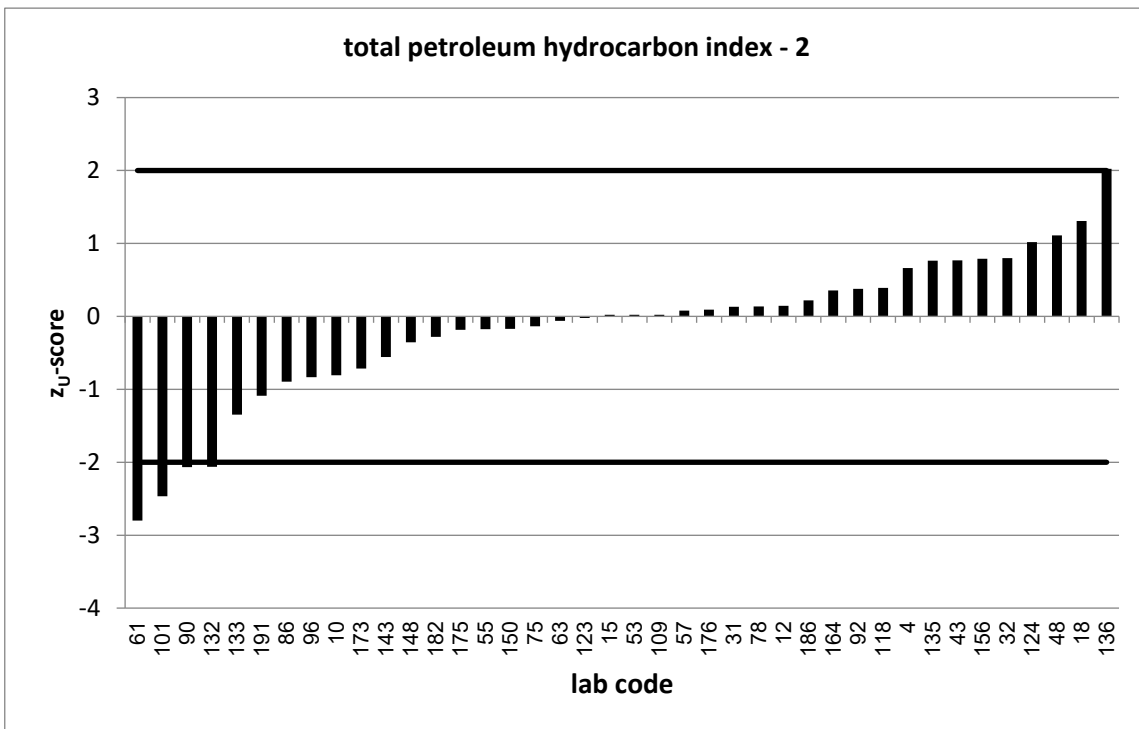
PT 5/23		total petroleum hydrocarbon index - 2			
assigned value [mg/l]*		0,562 ± 0,0578			
upper tolerance limit [mg/l]		0,9571			
lower tolerance limit [mg/l]		0,2676			
lab code	result [mg/l]	±	z-score	Z _U -score	assessm.**
4	0,693	0,371	0,7	0,7	s
10	0,443	0,14	-1,6	-0,8	s
12	0,591	0,18	0,3	0,1	s
15	0,566	10	0,0	0,0	s
18	0,82	0,21	2,4	1,3	s
31	0,588	0,144	0,3	0,1	s
32	0,72	0,227	1,3	0,8	s
43	0,714	0,107	2,5	0,8	s
48	0,781			1,1	s
53	0,566			0,0	s
55	0,536	0,136	-0,4	-0,2	s
57	0,578	0,231	0,1	0,1	s
61	0,15			-2,8	q
63	0,553	0,197	-0,1	-0,1	s
75	0,542	0,068	-0,4	-0,1	s
78	0,589	0,083	0,5	0,1	s
86	0,43	0,13	-1,9	-0,9	s
90	0,258	0,039	-8,7	-2,1	q
92	0,637			0,4	s
96	0,439	0,056	-3,1	-0,8	s
101	0,199			-2,5	q
109	0,566	0,111	0,1	0,0	s
118	0,639	0,15	1,0	0,4	s
123	0,559	0,029	-0,1	0,0	s
124	0,763	0,08	4,1	1,0	s
132	0,2583	16	0,0	-2,1	q
133	0,364	0,095	-3,6	-1,3	s
135	0,713	0,235	1,2	0,8	s
136	0,9618			2,0	s
143	0,48	0,048	-2,2	-0,6	s
148	0,51			-0,4	s
150	0,537	0,134	-0,3	-0,2	s
156	0,718			0,8	s
164	0,632			0,4	s
173	0,457	0,148	-1,3	-0,7	s
175	0,535			-0,2	s
176	0,58	0,035	0,5	0,1	s
182	0,521	0,05	-1,1	-0,3	s
186	0,605			0,2	s
191	0,402			-1,1	s

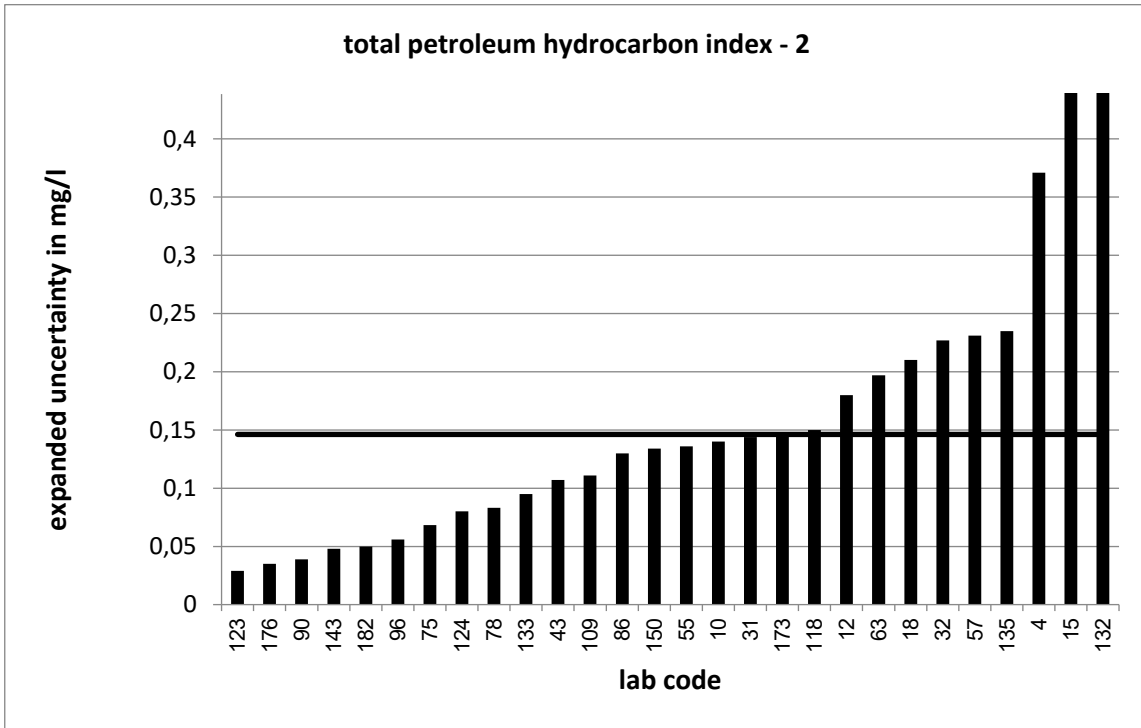
* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor k=2 corresponding to a confidence level of about 95%

** s = satisfactory, q = questionable, u = unsatisfactory

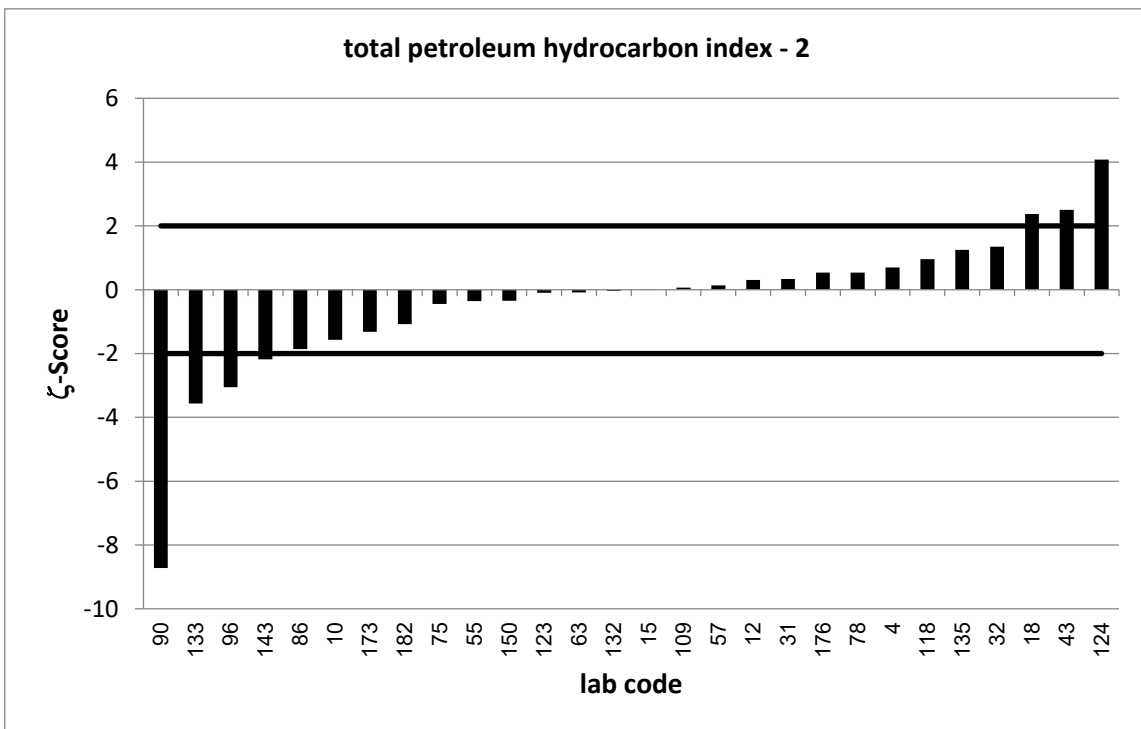


Strongly deviating values are not shown in the diagram.





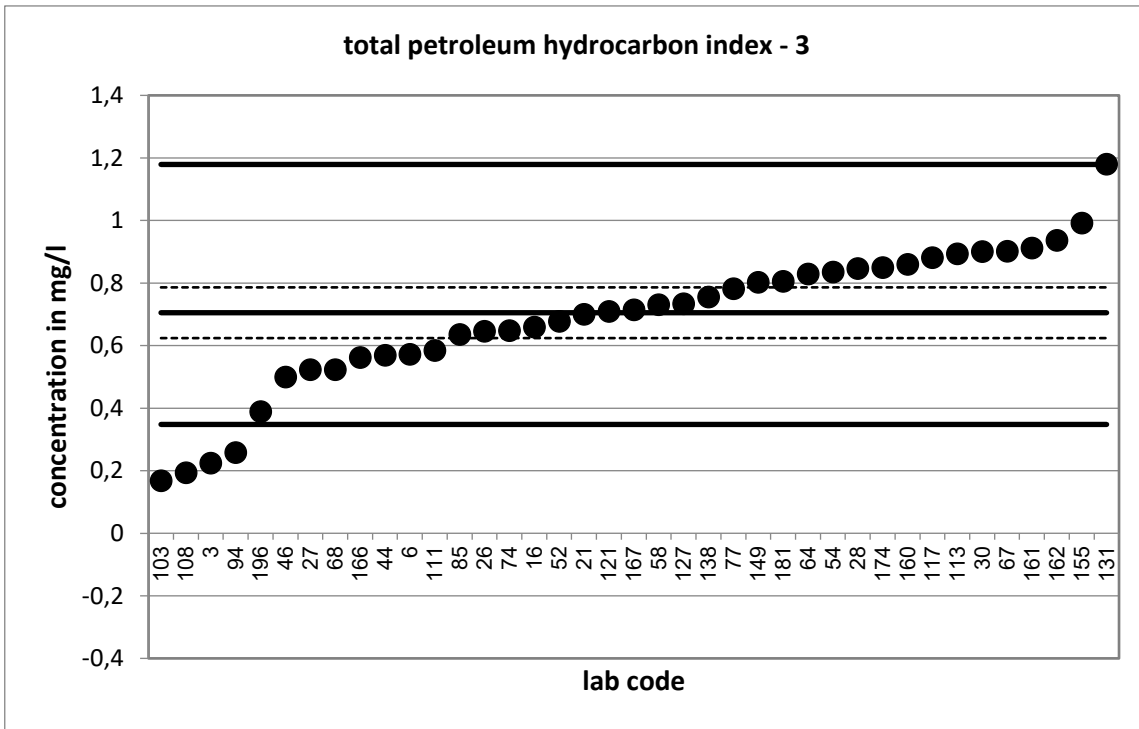
Strongly deviating values are not correctly shown in the diagram.



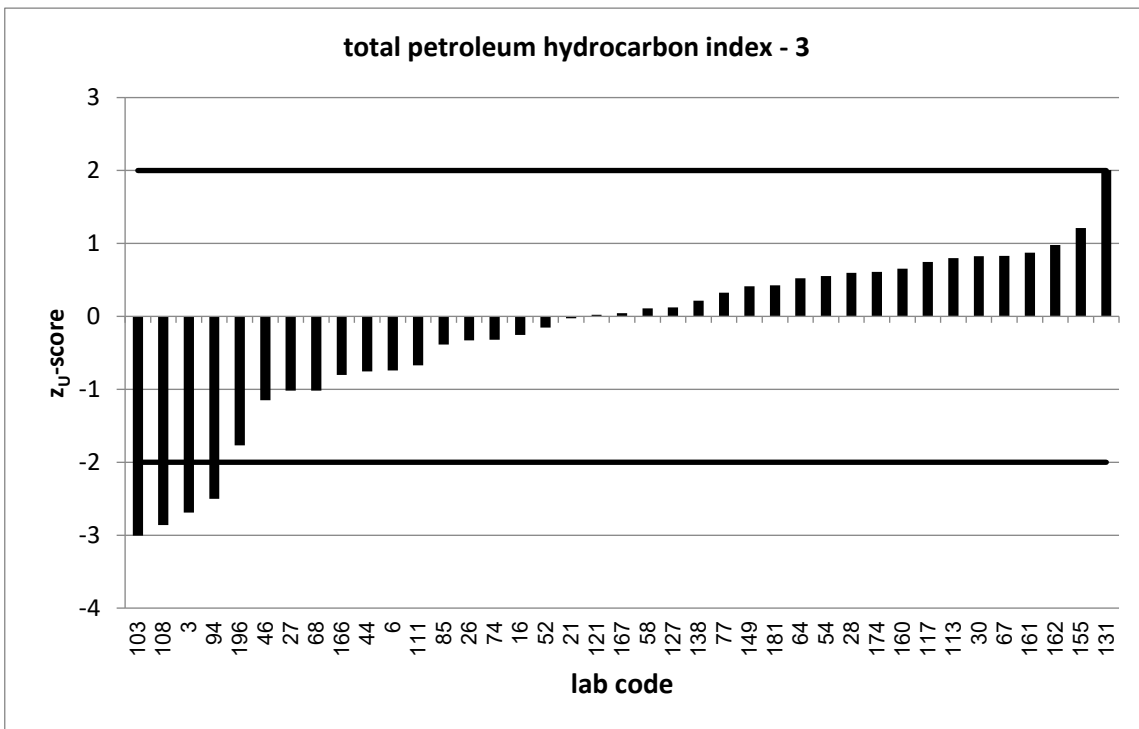
PT 5/23		total petroleum hydrocarbon index - 3			
assigned value [mg/l]*		0,7051 ± 0,0811			
upper tolerance limit [mg/l]		1,179			
lower tolerance limit [mg/l]		0,3479			
lab code	result [mg/l]	±	z-score	Z _U -score	assessm.**
3	0,225	0,045	-10,4	-2,7	q
6	0,573			-0,7	s
16	0,66	0,12	-0,6	-0,3	s
21	0,7	0,15	-0,1	0,0	s
26	0,646	0,32	-0,4	-0,3	s
27	0,523	0,142	-2,2	-1,0	s
28	0,847	0,17	1,5	0,6	s
30	0,901	0,216	1,7	0,8	s
44	0,57	7,24	0,0	-0,8	s
46	0,5	0,076	-3,7	-1,1	s
52	0,678			-0,2	s
54	0,836			0,6	s
58	0,731	0,1	0,4	0,1	s
64	0,829			0,5	s
67	0,902	0,23	1,6	0,8	s
68	0,523			-1,0	s
74	0,648			-0,3	s
77	0,782			0,3	s
85	0,636	0,125	-0,9	-0,4	s
94	0,258	0,039	-9,9	-2,5	q
103	0,168	0,047	-11,5	-3,0	u
108	0,194			-2,9	q
111	0,585	0,158	-1,4	-0,7	s
113	0,894	0,19	1,8	0,8	s
117	0,882			0,7	s
121	0,71	0,097	0,1	0,0	s
127	0,734	0,2	0,3	0,1	s
131	1,18	0,24	3,7	2,0	s
138	0,756	0,002	1,3	0,2	s
149	0,803	0,313	0,6	0,4	s
155	0,992	0,337	1,7	1,2	s
160	0,86	0,21	1,4	0,7	s
161	0,912	0,231	1,7	0,9	s
162	0,937			1,0	s
166	0,562			-0,8	s
167	0,715	0,186	0,1	0,0	s
174	0,85	0,1	2,3	0,6	s
181	0,806	0,1	1,6	0,4	s
196	0,389	0,1	-4,9	-1,8	s

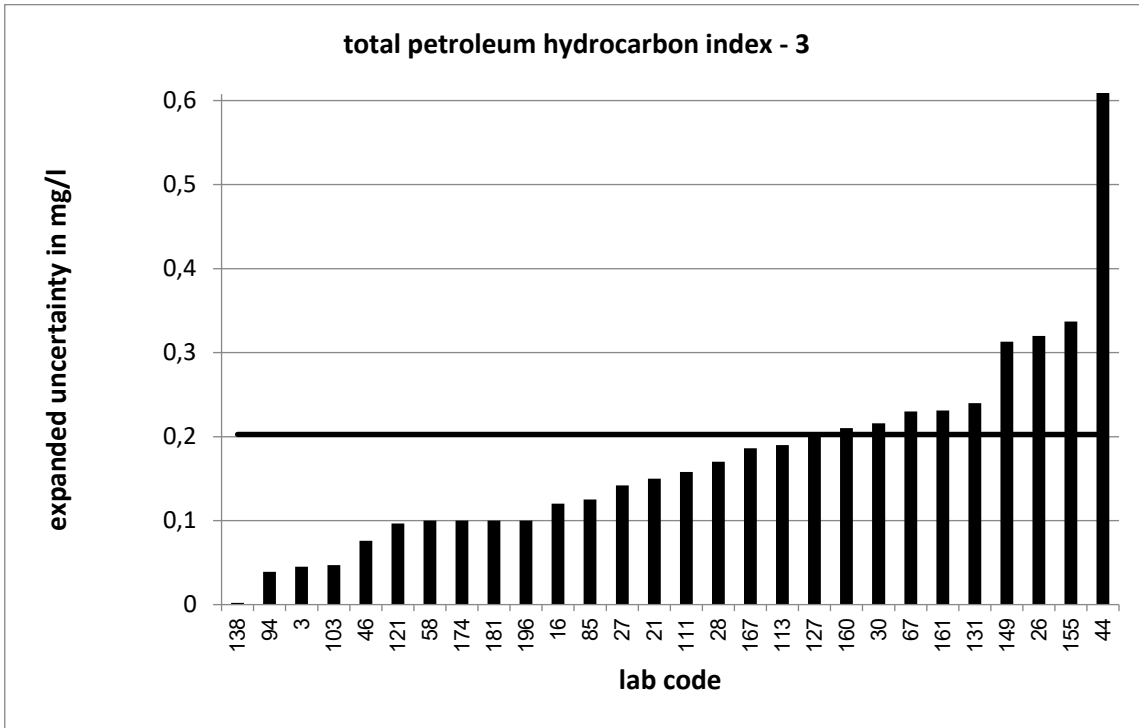
* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor k=2 corresponding to a confidence level of about 95%

** s = satisfactory, q = questionable, u = unsatisfactory

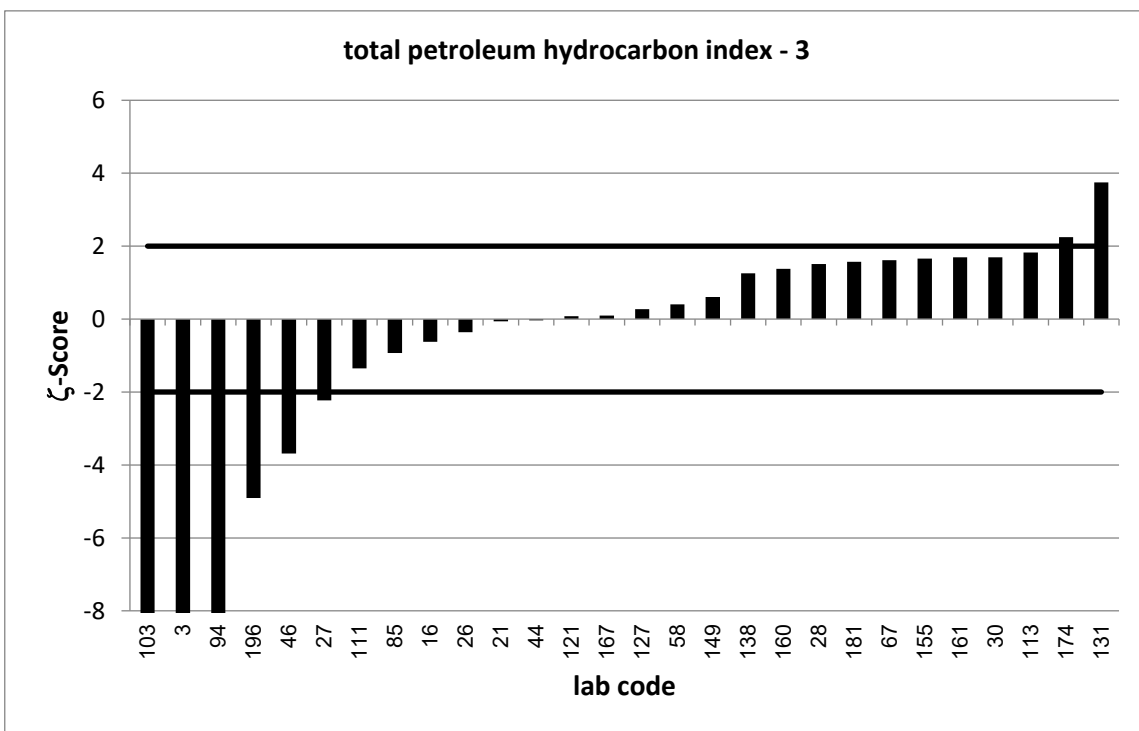


Strongly deviating values are not shown in the diagram.





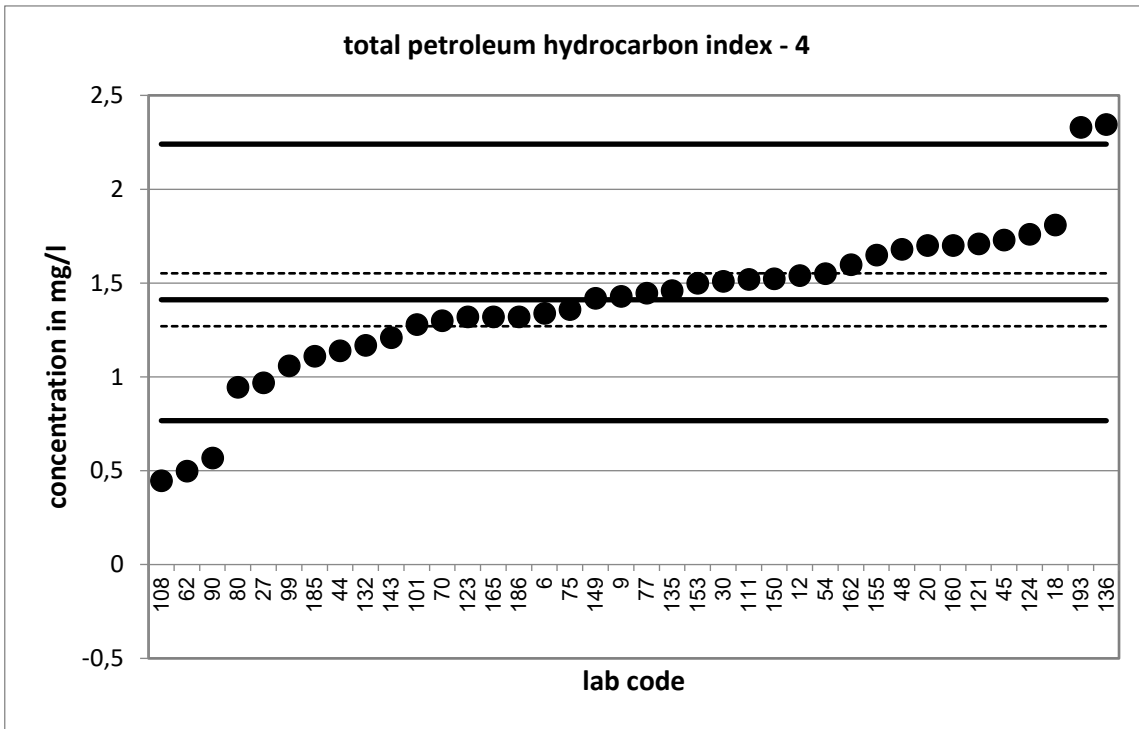
Strongly deviating values are not correctly shown in the diagram.



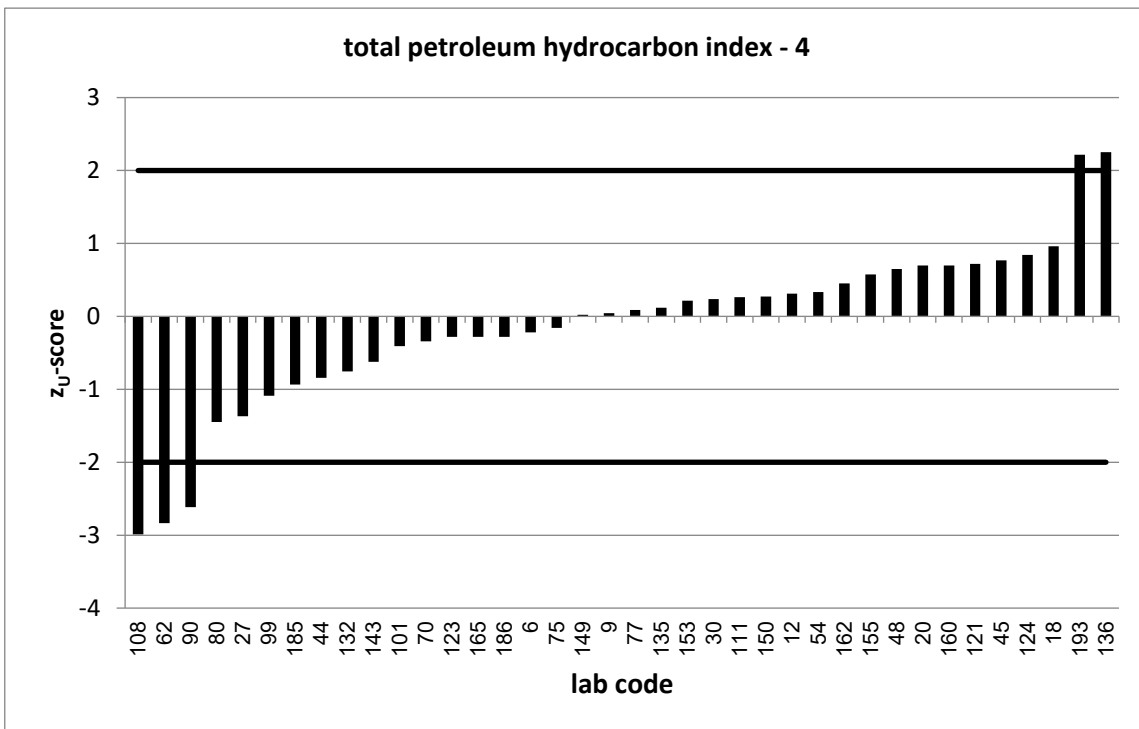
PT 5/23		total petroleum hydrocarbon index - 4			
assigned value [mg/l]*		1,411 ± 0,141			
upper tolerance limit [mg/l]		2,24			
lower tolerance limit [mg/l]		0,7666			
lab code	result [mg/l]	±	z-score	Z _U -score	assessm.**
6	1,34			-0,2	s
9	1,43	0,34	0,1	0,0	s
12	1,54	0,3	0,8	0,3	s
18	1,81	0,463	1,6	1,0	s
20	1,7			0,7	s
27	0,97	0,263	-3,0	-1,4	s
30	1,51	0,334	0,5	0,2	s
44	1,14	0,18	-2,4	-0,8	s
45	1,73	0,57	1,1	0,8	s
48	1,68			0,6	s
54	1,55			0,3	s
62	0,498	0,142	-9,1	-2,8	q
70	1,3	0,384	-0,5	-0,3	s
75	1,36	0,171	-0,5	-0,2	s
77	1,447			0,1	s
80	0,945	0,236	-3,4	-1,4	s
90	0,568	0,085	-10,3	-2,6	q
99	1,06	0,179	-3,1	-1,1	s
101	1,28			-0,4	s
108	0,448			-3,0	u
111	1,52	0,41	0,5	0,3	s
121	1,71	0,191	2,5	0,7	s
123	1,32	0,07	-1,2	-0,3	s
124	1,76	0,2	2,9	0,8	s
132	1,168	16	0,0	-0,8	s
135	1,46	0,483	0,2	0,1	s
136	2,345			2,3	q
143	1,21	0,121	-2,2	-0,6	s
149	1,42	0,552	0,0	0,0	s
150	1,523	0,381	0,6	0,3	s
153	1,5			0,2	s
155	1,65	0,561	0,8	0,6	s
160	1,7	0,42	1,3	0,7	s
162	1,598			0,5	s
165	1,32	0,46	-0,4	-0,3	s
185	1,11			-0,9	s
186	1,32			-0,3	s
193	2,33	0,07	11,7	2,2	q

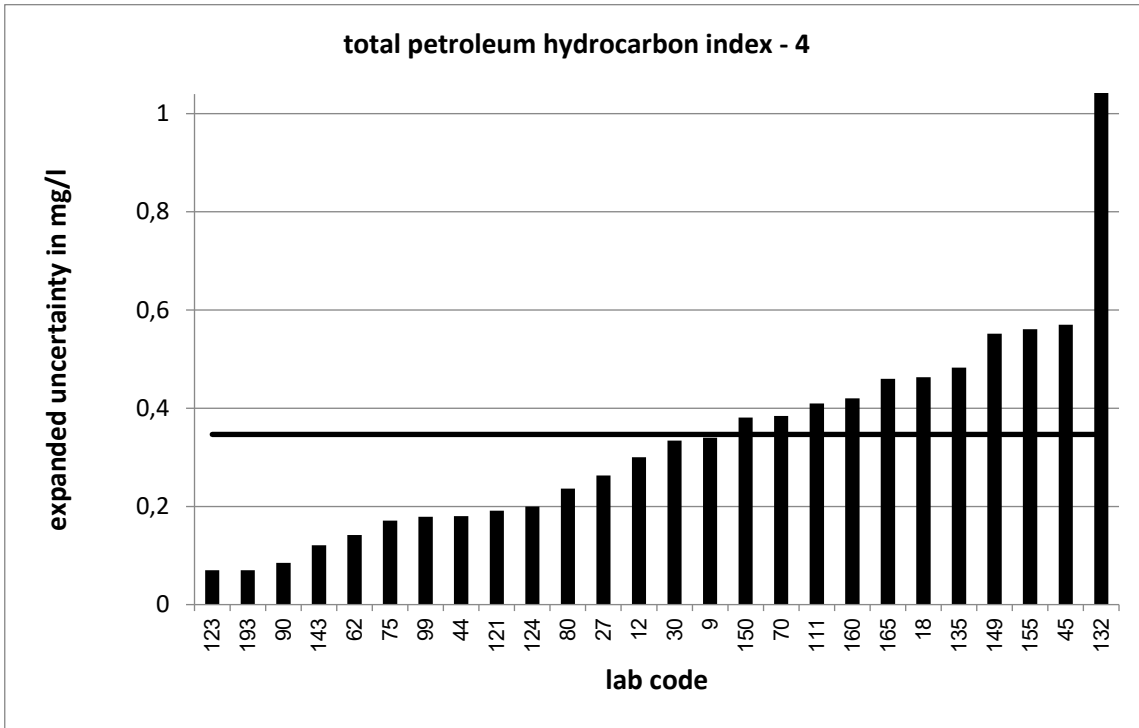
* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor k=2 corresponding to a confidence level of about 95%

** s = satisfactory, q = questionable, u = unsatisfactory

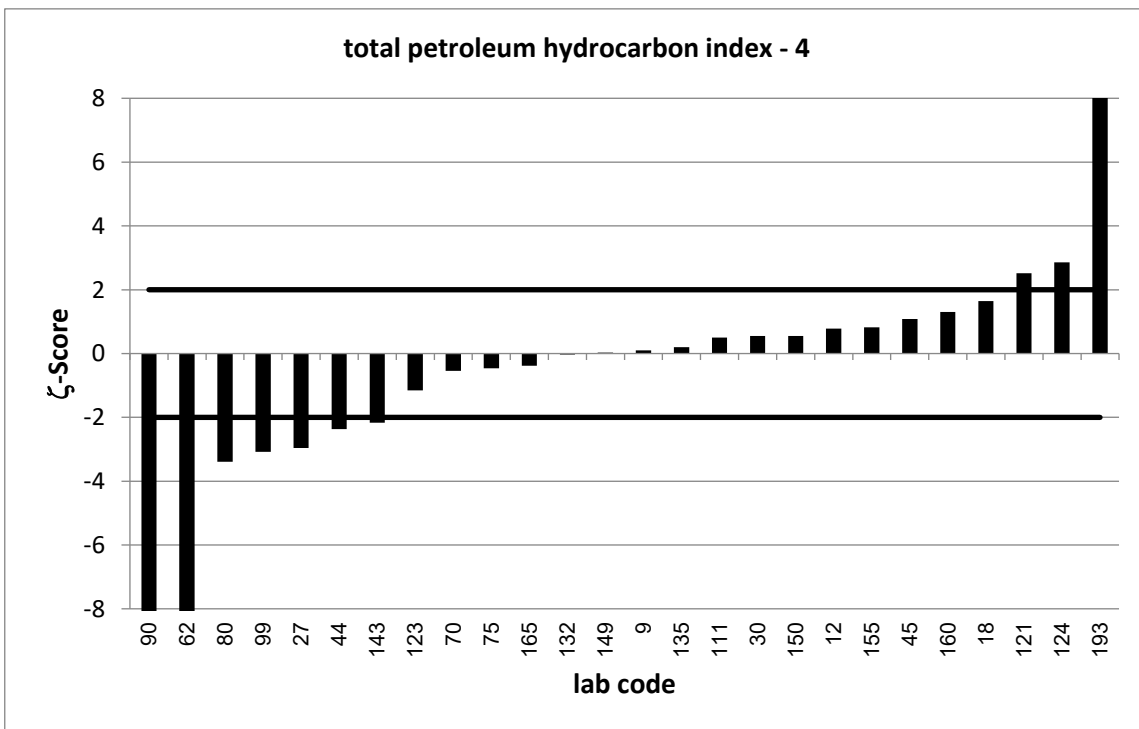


Strongly deviating values are not shown in the diagram.





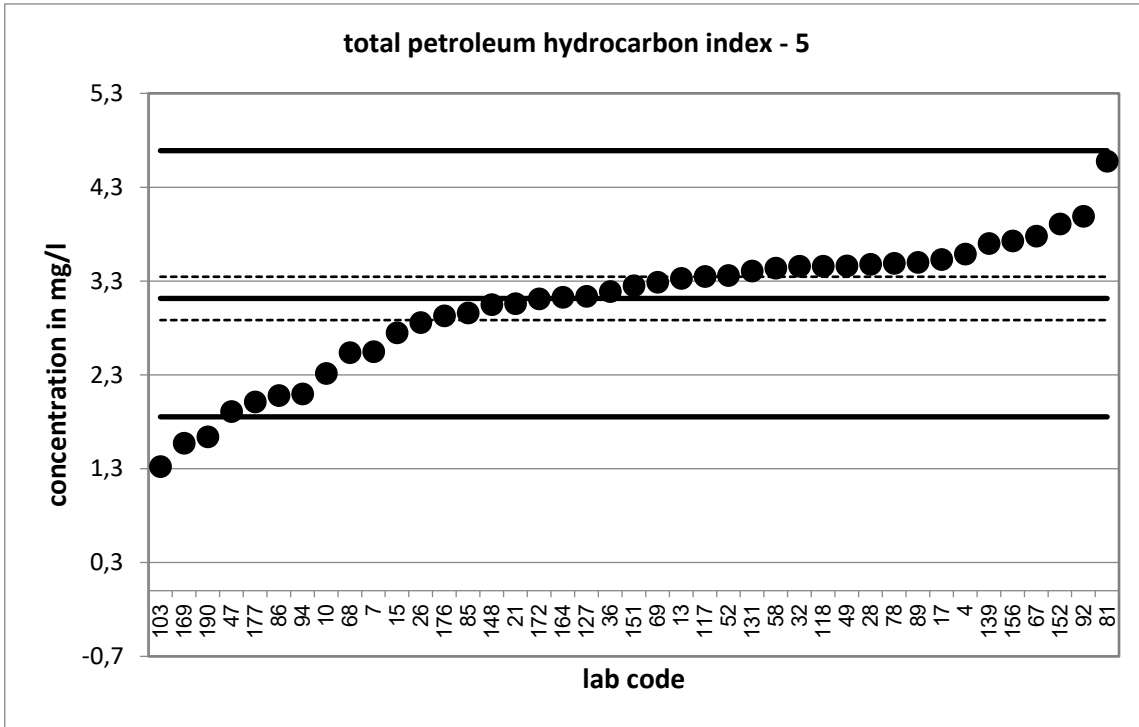
Strongly deviating values are not correctly shown in the diagram.



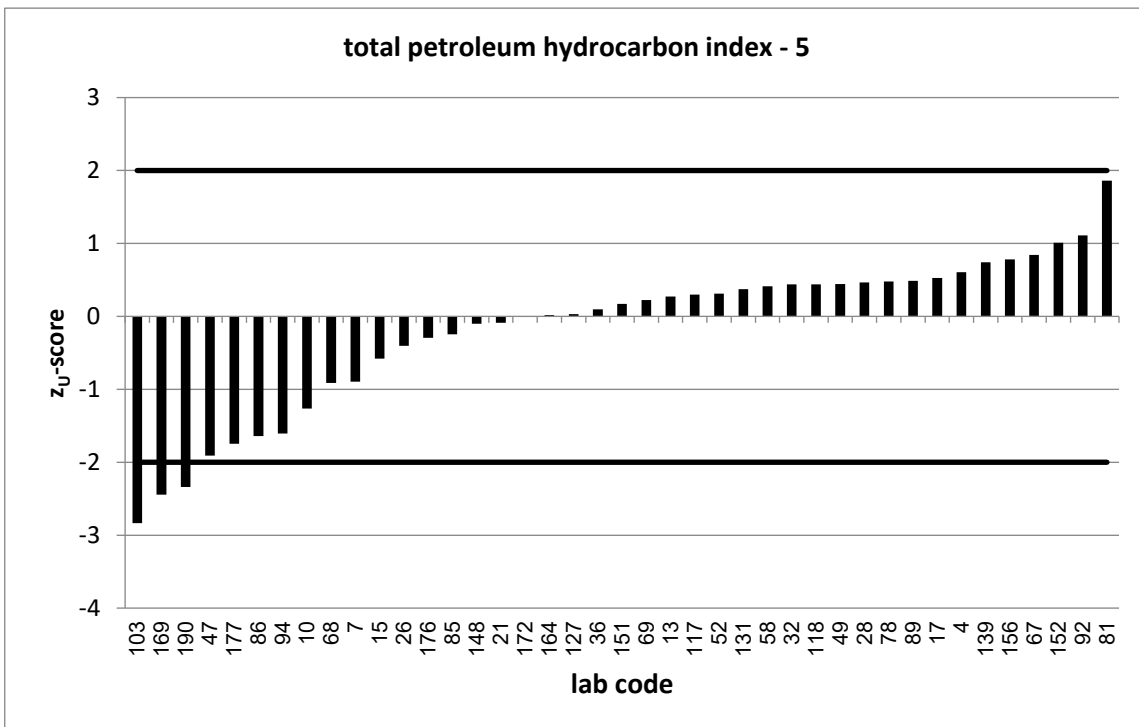
PT 5/23		total petroleum hydrocarbon index - 5			
assigned value [mg/l]*		3,115 ± 0,231			
upper tolerance limit [mg/l]		4,69			
lower tolerance limit [mg/l]		1,853			
lab code	result [mg/l]	±	z-score	Z _U -score	assessm.**
4	3,59	1,92	0,5	0,6	s
7	2,55	0,449	-2,2	-0,9	s
10	2,318	0,74	-2,1	-1,3	s
13	3,33	0,932	0,4	0,3	s
15	2,75	7,5	-0,1	-0,6	s
17	3,53	1	0,8	0,5	s
21	3,06	0,64	-0,2	-0,1	s
26	2,86	0,57	-0,8	-0,4	s
28	3,48	0,7	1,0	0,5	s
32	3,46	1,09	0,6	0,4	s
36	3,19	0,73	0,2	0,1	s
47	1,91	0,84	-2,8	-1,9	s
49	3,4631			0,4	s
52	3,36			0,3	s
58	3,44	0,09	2,6	0,4	s
67	3,78	0,98	1,3	0,8	s
68	2,54			-0,9	s
69	3,29	0,493	0,6	0,2	s
78	3,49	0,49	1,4	0,5	s
81	4,58	1,37	2,1	1,9	s
85	2,96	0,583	-0,5	-0,2	s
86	2,08	0,37	-4,7	-1,6	s
89	3,5	1,33	0,6	0,5	s
92	3,99			1,1	s
94	2,1	0,27	-5,7	-1,6	s
103	1,325	0,371	-8,2	-2,8	q
117	3,35			0,3	s
118	3,46	0,52	1,2	0,4	s
127	3,14	0,86	0,1	0,0	s
131	3,41	0,69	0,8	0,4	s
139	3,7	0,347	2,8	0,7	s
148	3,05			-0,1	s
151	3,25			0,2	s
152	3,91	1	1,5	1,0	s
156	3,73			0,8	s
164	3,13			0,0	s
169	1,572	0,42	-6,4	-2,4	q
172	3,11	0,5	0,0	0,0	s
176	2,93	0,18	-1,3	-0,3	s
177	2,012	0,12	-8,5	-1,7	s
190	1,64	0,279	-8,1	-2,3	q

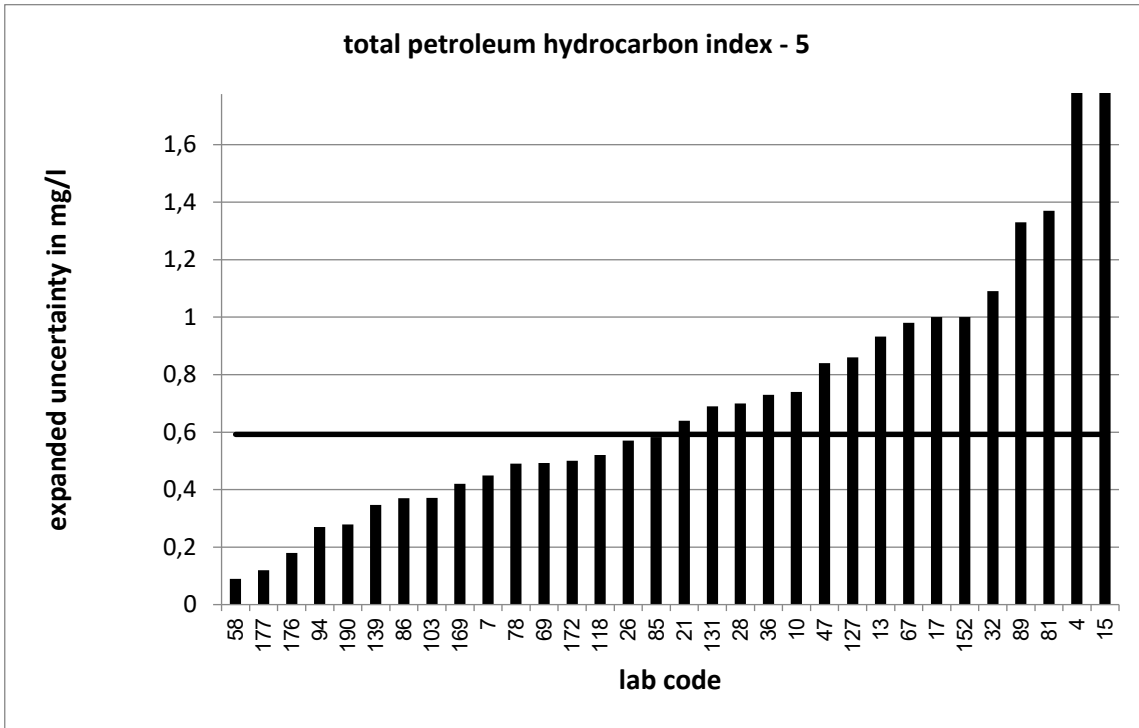
* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor $k=2$ corresponding to a confidence level of about 95%

** s = satisfactory, q = questionable, u = unsatisfactory

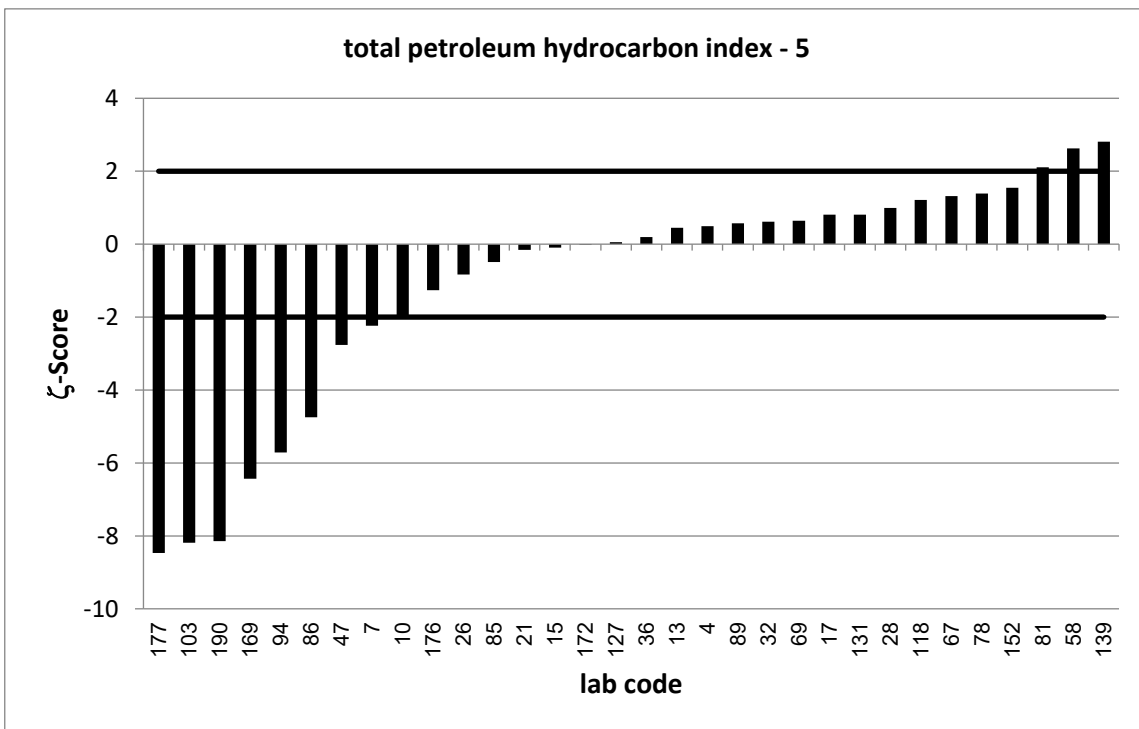


Strongly deviating values are not shown in the diagram.





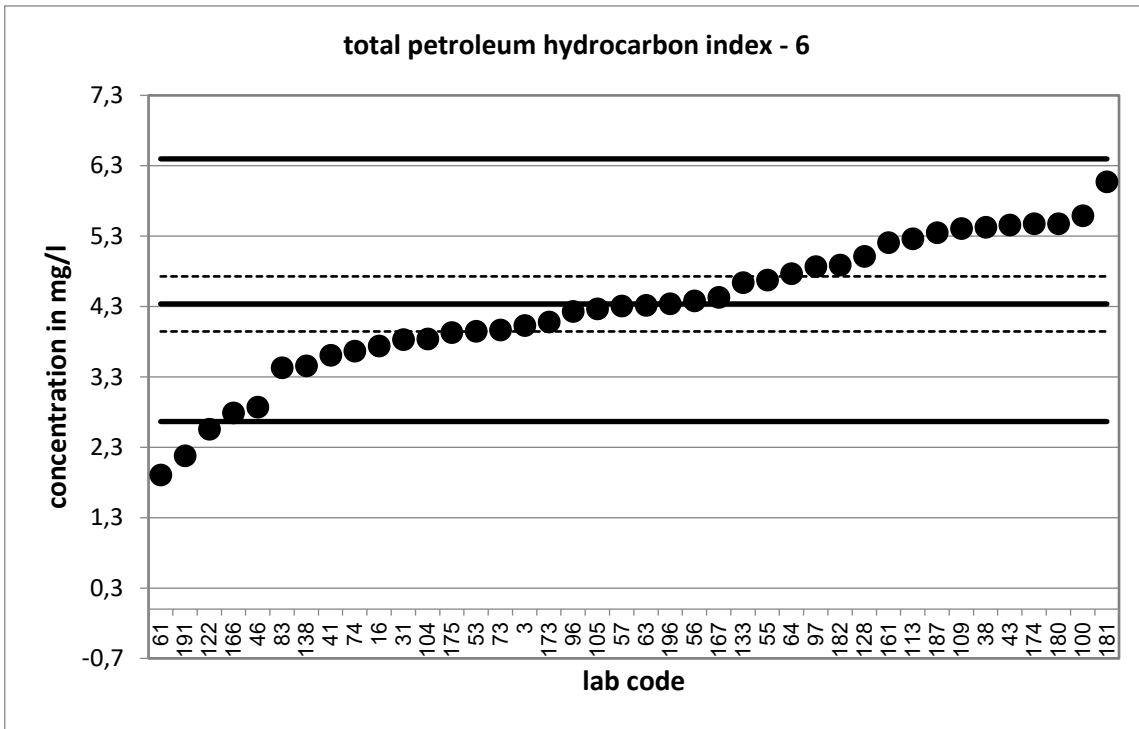
Strongly deviating values are not correctly shown in the diagram.



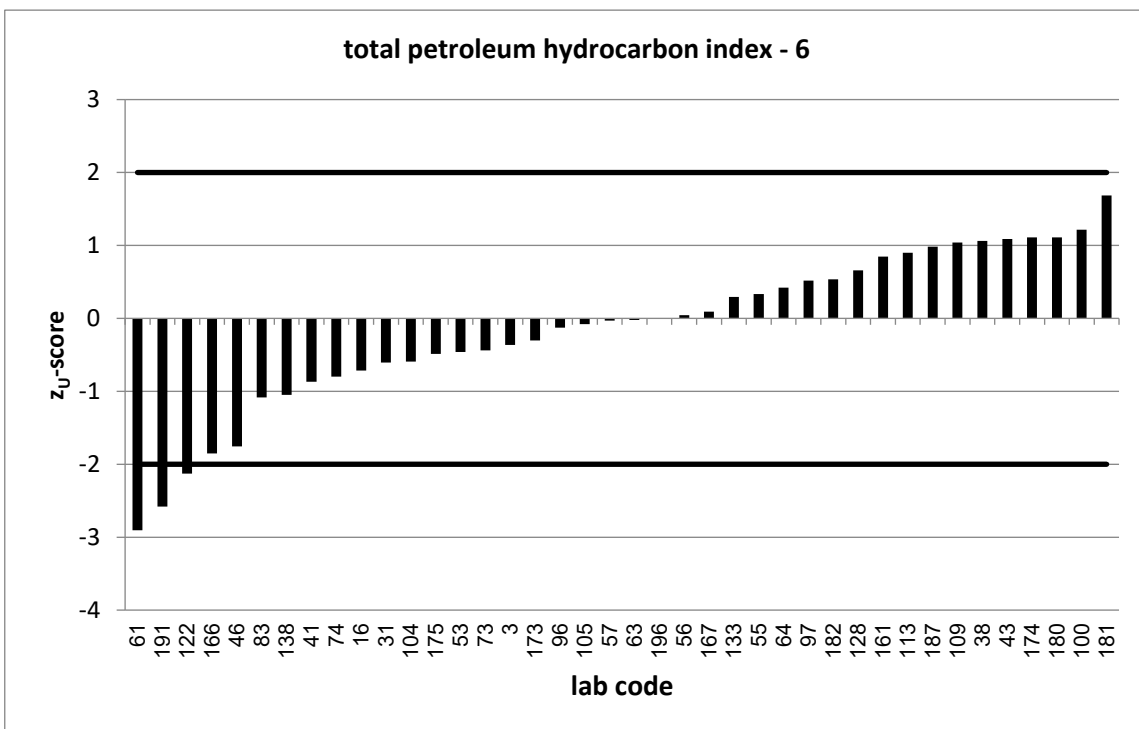
PT 5/23		total petroleum hydrocarbon index - 6			
assigned value [mg/l]*		4,337 ± 0,391			
upper tolerance limit [mg/l]		6,398			
lower tolerance limit [mg/l]		2,666			
lab code	result [mg/l]	±	z-score	Z _U -score	assessm.**
3	4,032	0,806	-0,7	-0,4	s
16	3,74	0,67	-1,5	-0,7	s
31	3,83	0,938	-1,0	-0,6	s
38	5,43	1,5	1,4	1,1	s
41	3,61	0,89	-1,5	-0,9	s
43	5,46	0,819	2,5	1,1	s
46	2,87	0,45	-4,9	-1,8	s
53	3,95			-0,5	s
55	4,68	1,19	0,5	0,3	s
56	4,38			0,0	s
57	4,31	1,72	0,0	0,0	s
61	1,91			-2,9	q
63	4,32	1,53	0,0	0,0	s
64	4,77			0,4	s
73	3,97	1,19	-0,6	-0,4	s
74	3,67			-0,8	s
83	3,4318			-1,1	s
96	4,23	0,537	-0,3	-0,1	s
97	4,87	0,925	1,1	0,5	s
100	5,59			1,2	s
104	3,84			-0,6	s
105	4,27			-0,1	s
109	5,409	1,057	1,9	1,0	s
113	5,266	1,12	1,6	0,9	s
122	2,56	1,01	-3,3	-2,1	q
128	5,016	1,685	0,8	0,7	s
133	4,64	1,21	0,5	0,3	s
138	3,46	0,01	-4,5	-1,0	s
161	5,21	1,32	1,3	0,8	s
166	2,79			-1,9	s
167	4,43	1,15	0,2	0,1	s
173	4,082	1,322	-0,4	-0,3	s
174	5,48	0,4	4,1	1,1	s
175	3,93			-0,5	s
180	5,48	0,23	5,0	1,1	s
181	6,075	0,256	7,4	1,7	s
182	4,89	0,05	2,8	0,5	s
187	5,35	0,613	2,8	1,0	s
191	2,18			-2,6	q
196	4,34	0,6	0,0	0,0	s

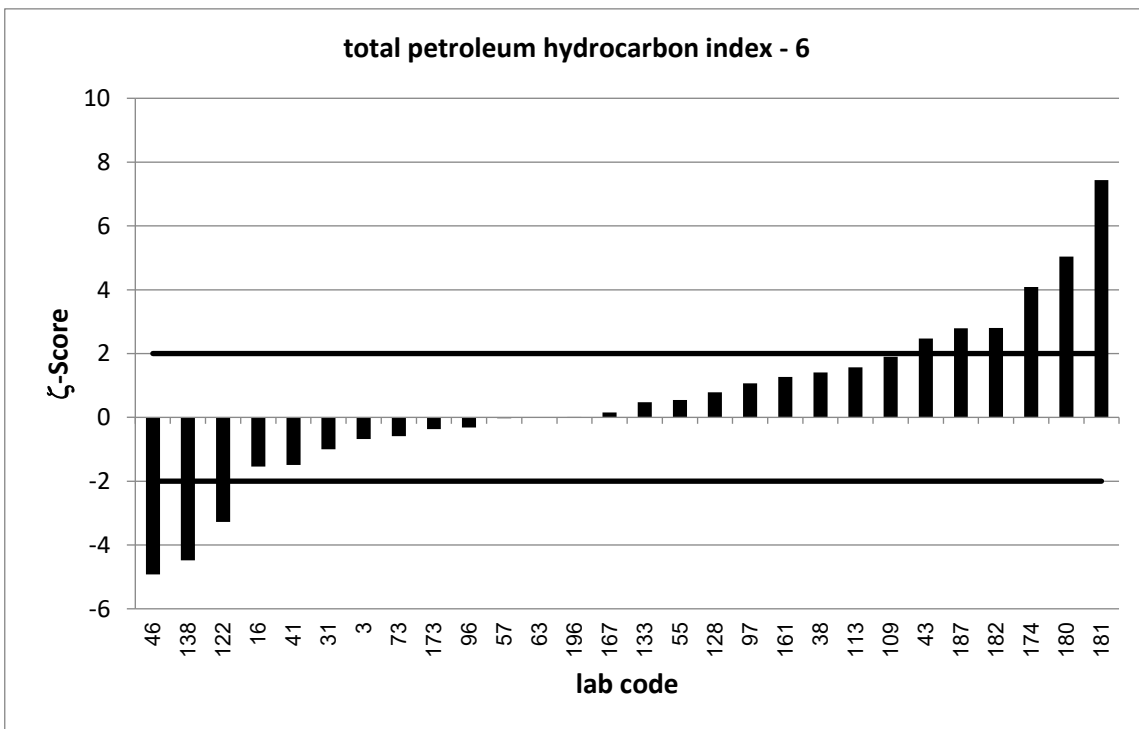
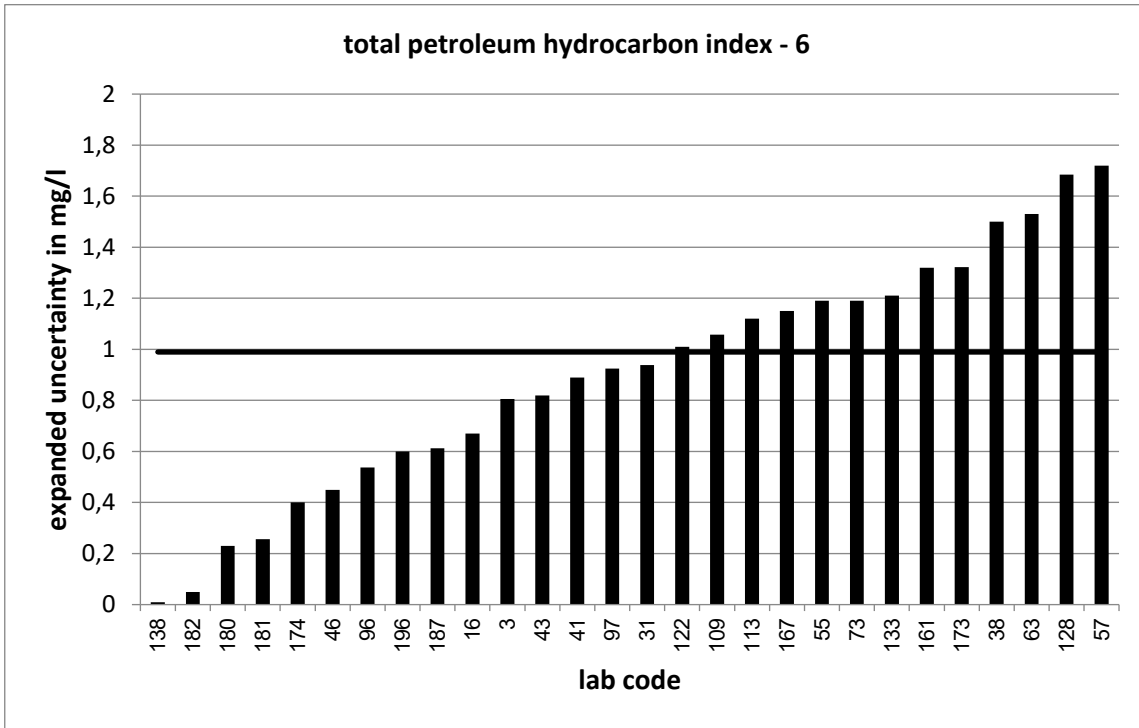
* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor k=2 corresponding to a confidence level of about 95%

** s = satisfactory, q = questionable, u = unsatisfactory



Strongly deviating values are not shown in the diagram.

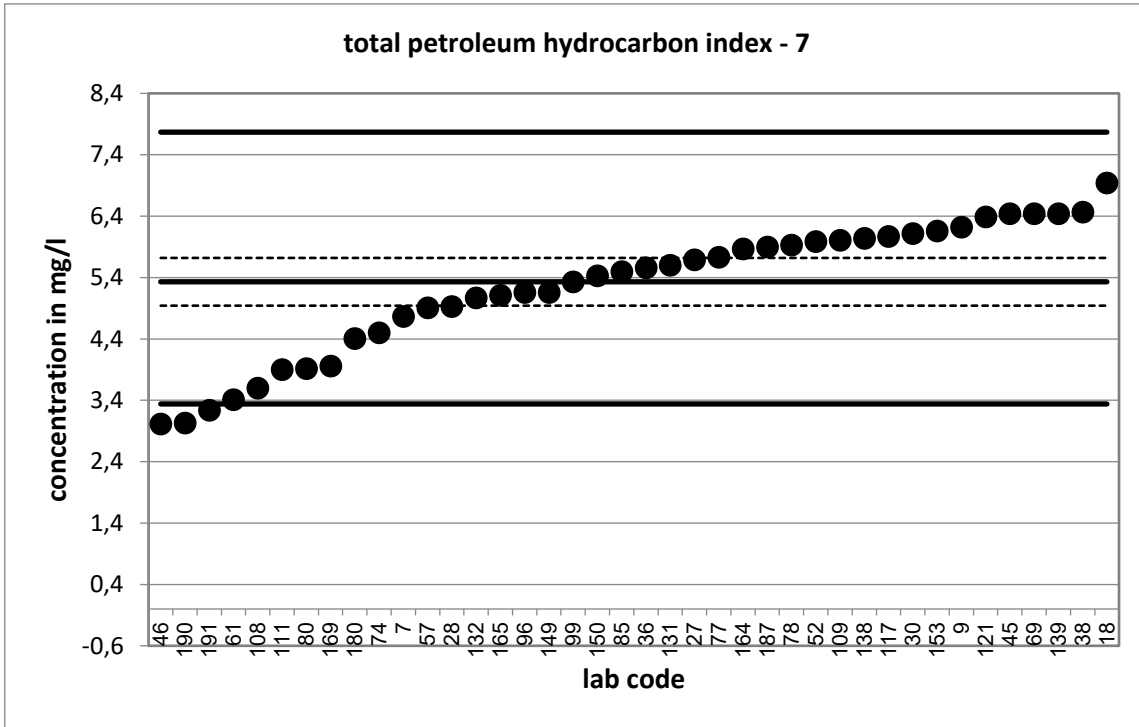




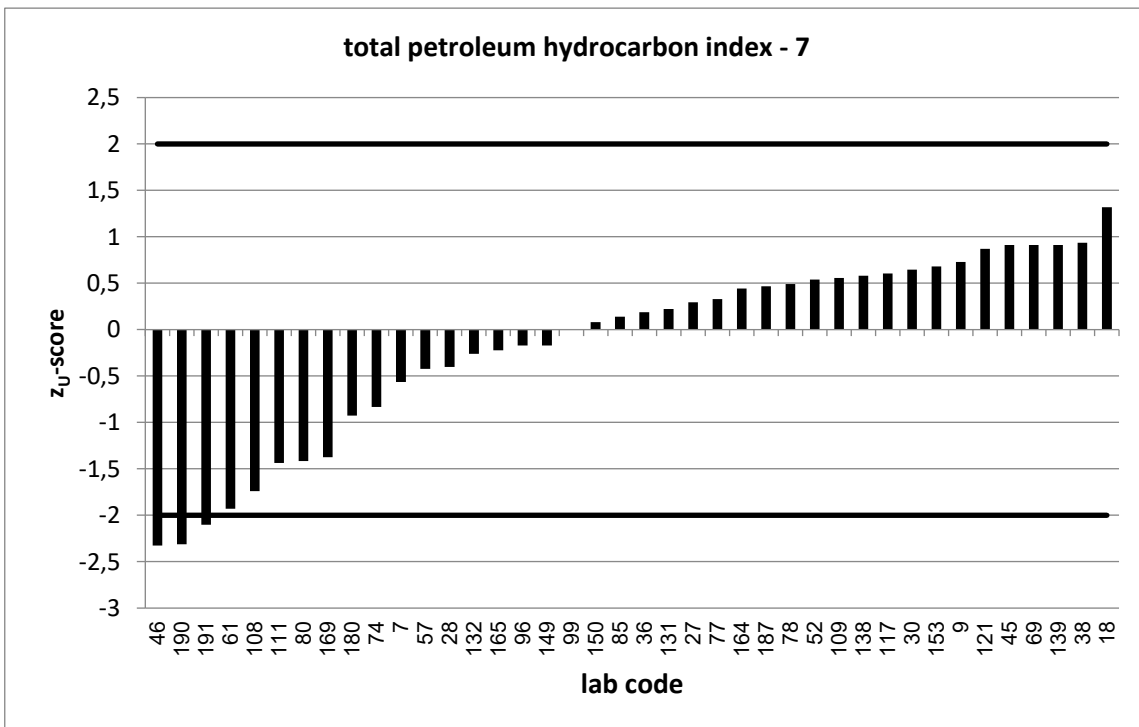
PT 5/23		total petroleum hydrocarbon index - 7			
assigned value [mg/l]*		5,331 ± 0,389			
upper tolerance limit [mg/l]		7,768			
lower tolerance limit [mg/l]		3,34			
lab code	result [mg/l]	±	z-score	Z _U -score	assessm.**
7	4,77	0,84	-1,2	-0,6	s
9	6,22	1,49	1,2	0,7	s
18	6,94	1,777	1,8	1,3	s
27	5,69	1,55	0,4	0,3	s
28	4,93	1	-0,7	-0,4	s
30	6,12	1,35	1,1	0,6	s
36	5,56	1,28	0,3	0,2	s
38	6,47	1,8	1,2	0,9	s
45	6,44	2,13	1,0	0,9	s
46	3,015	0,185	-10,8	-2,3	q
52	5,99			0,5	s
57	4,91	1,96	-0,4	-0,4	s
61	3,41			-1,9	s
69	6,44	0,966	2,1	0,9	s
74	4,5			-0,8	s
77	5,731			0,3	s
78	5,93	0,84	1,3	0,5	s
80	3,92	0,98	-2,7	-1,4	s
85	5,5	1,08	0,3	0,1	s
96	5,16	0,658	-0,4	-0,2	s
99	5,33	0,905	0,0	0,0	s
108	3,6			-1,7	s
109	6,011	1,175	1,1	0,6	s
111	3,9	1,053	-2,5	-1,4	s
117	6,07			0,6	s
121	6,39	0,96	2,0	0,9	s
131	5,6	1,12	0,5	0,2	s
132	5,072	16	0,0	-0,3	s
138	6,04	0,017	3,6	0,6	s
139	6,44	0,605	3,1	0,9	s
149	5,16	2,01	-0,2	-0,2	s
150	5,431	1,378	0,1	0,1	s
153	6,16			0,7	s
164	5,87			0,4	s
165	5,11	1,79	-0,2	-0,2	s
169	3,962	1,06	-2,4	-1,4	s
180	4,41	0,83	-2,0	-0,9	s
187	5,9	0,676	1,5	0,5	s
190	3,03	0,515	-7,1	-2,3	q
191	3,24			-2,1	q

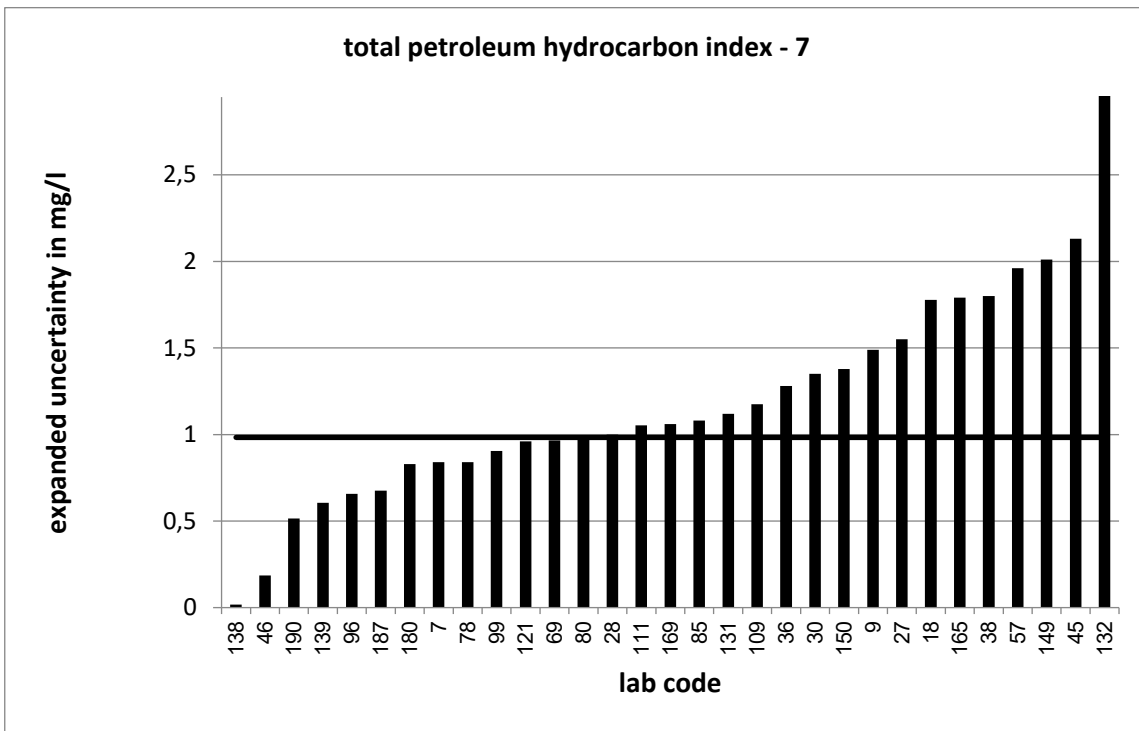
* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor k=2 corresponding to a confidence level of about 95%

** s = satisfactory, q = questionable, u = unsatisfactory

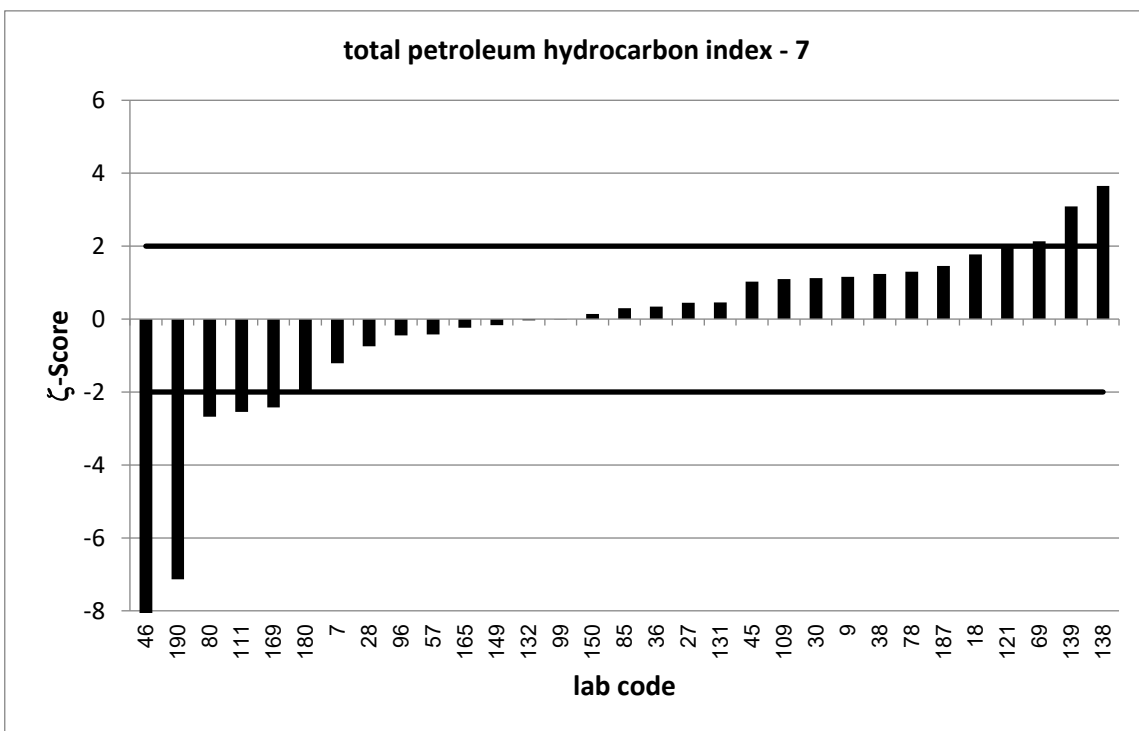


Strongly deviating values are not shown in the diagram.





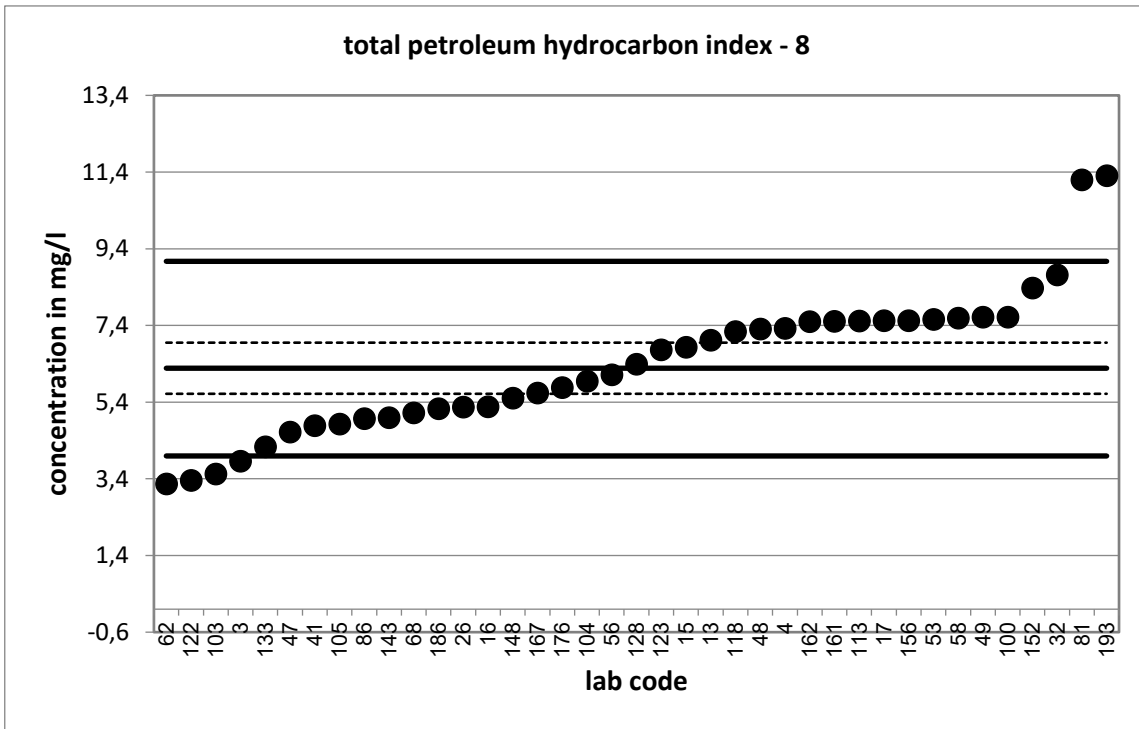
Strongly deviating values are not correctly shown in the diagram.



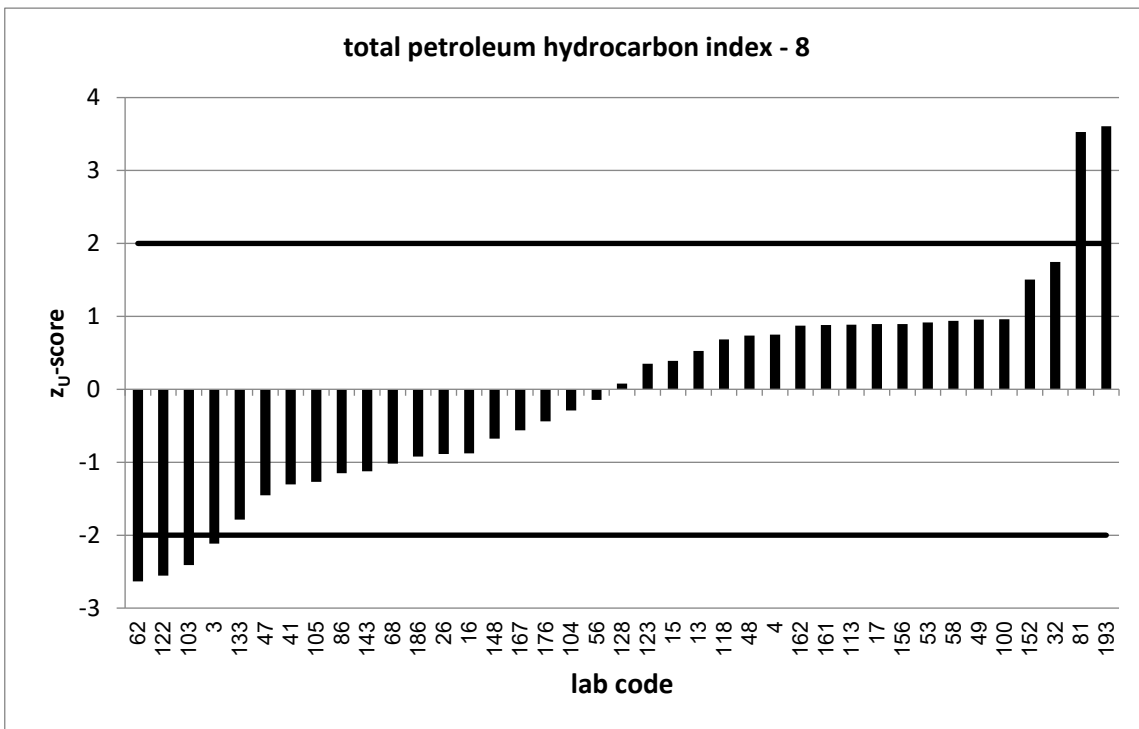
PT 5/23		total petroleum hydrocarbon index - 8			
assigned value [mg/l]*		6,284 ± 0,667			
upper tolerance limit [mg/l]		9,072			
lower tolerance limit [mg/l]		3,996			
lab code	result [mg/l]	±	z-score	Z _U -score	assessm.**
3	3,865	0,773	-4,7	-2,1	q
4	7,33	3,91	0,5	0,8	s
13	7,02	1,96	0,7	0,5	s
15	6,83	5	0,2	0,4	s
16	5,28	0,95	-1,7	-0,9	s
17	7,53	2	1,2	0,9	s
26	5,27	1,05	-1,6	-0,9	s
32	8,72	2,75	1,7	1,7	s
41	4,79	1,17	-2,2	-1,3	s
47	4,62	2,03	-1,6	-1,5	s
48	7,31			0,7	s
49	7,6166			1,0	s
53	7,56			0,9	s
56	6,12			-0,1	s
58	7,59	0,14	3,8	0,9	s
62	3,27	0,934	-5,3	-2,6	q
68	5,12			-1,0	s
81	11,2	3,36	2,9	3,5	u
86	4,97	0,89	-2,4	-1,1	s
100	7,62			1,0	s
103	3,525	0,987	-4,6	-2,4	q
104	5,95			-0,3	s
105	4,83			-1,3	s
113	7,519	1,6	1,4	0,9	s
118	7,24	0,72	1,9	0,7	s
122	3,36	1,32	-4,0	-2,6	q
123	6,77	0,36	1,3	0,3	s
128	6,394	2,149	0,1	0,1	s
133	4,24	1,1	-3,2	-1,8	s
143	5	0,5	-3,1	-1,1	s
148	5,51			-0,7	s
152	8,38	2	2,0	1,5	s
156	7,53			0,9	s
161	7,51	1,9	1,2	0,9	s
162	7,499			0,9	s
167	5,64	1,47	-0,8	-0,6	s
176	5,78	0,38	-1,3	-0,4	s
186	5,23			-0,9	s
193	11,31	0,07	15,0	3,6	u

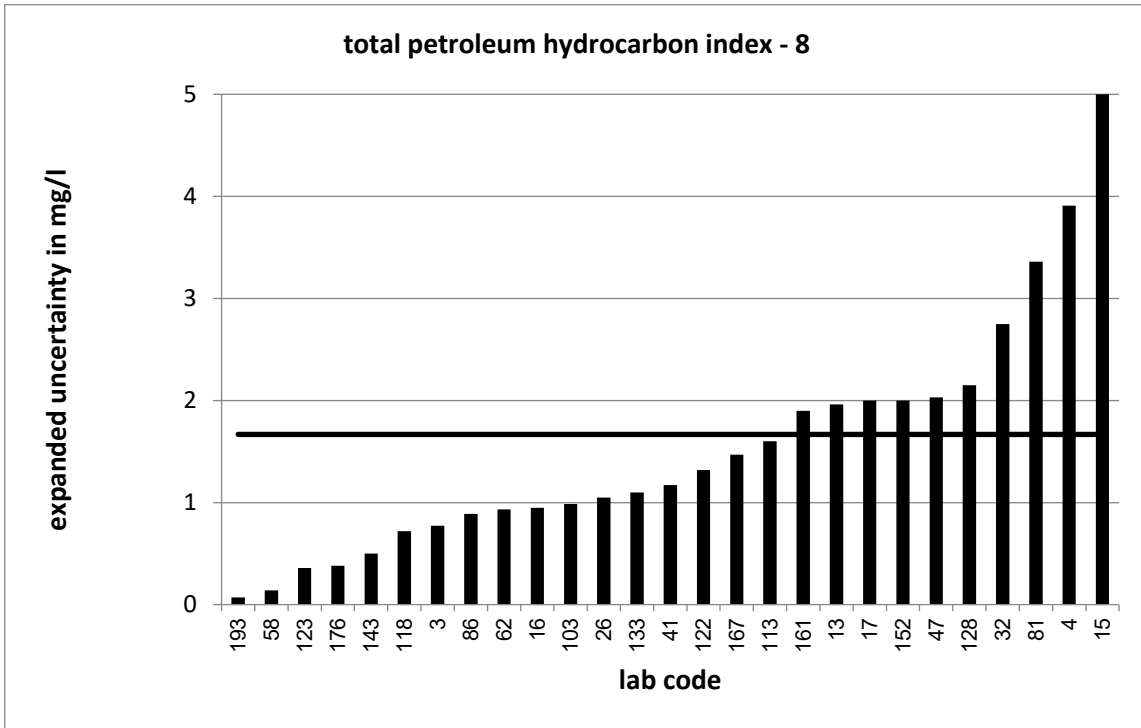
* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor k=2 corresponding to a confidence level of about 95%

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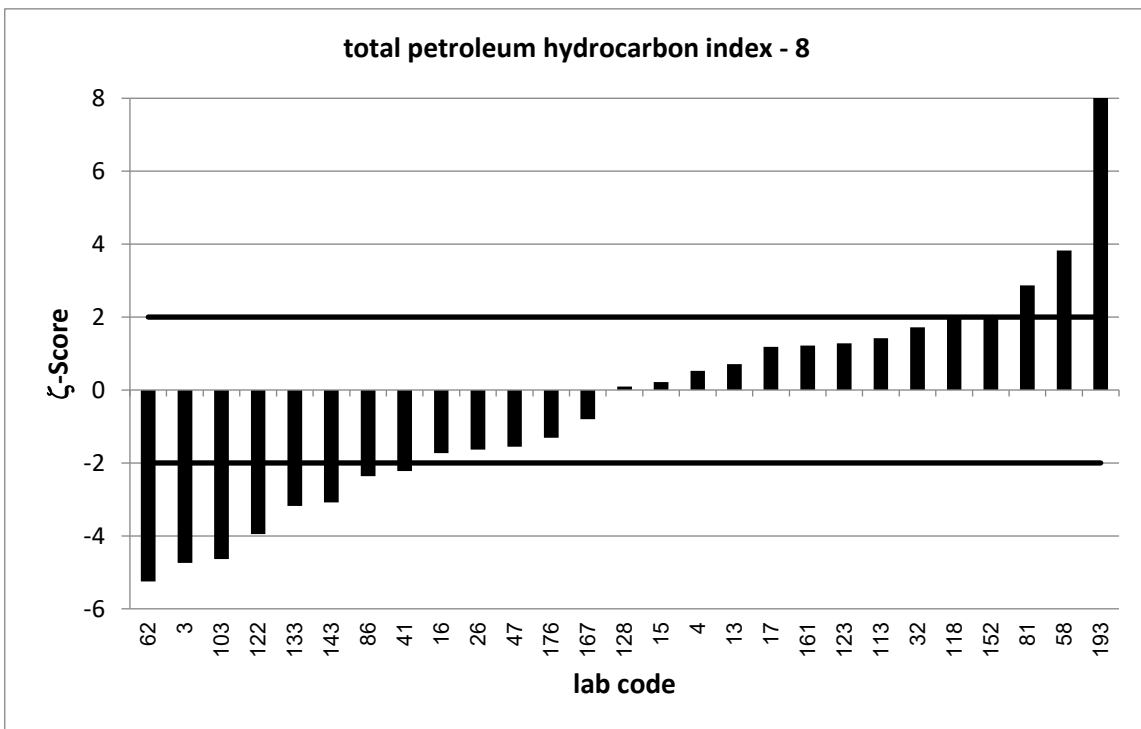


Strongly deviating values are not shown in the diagram.





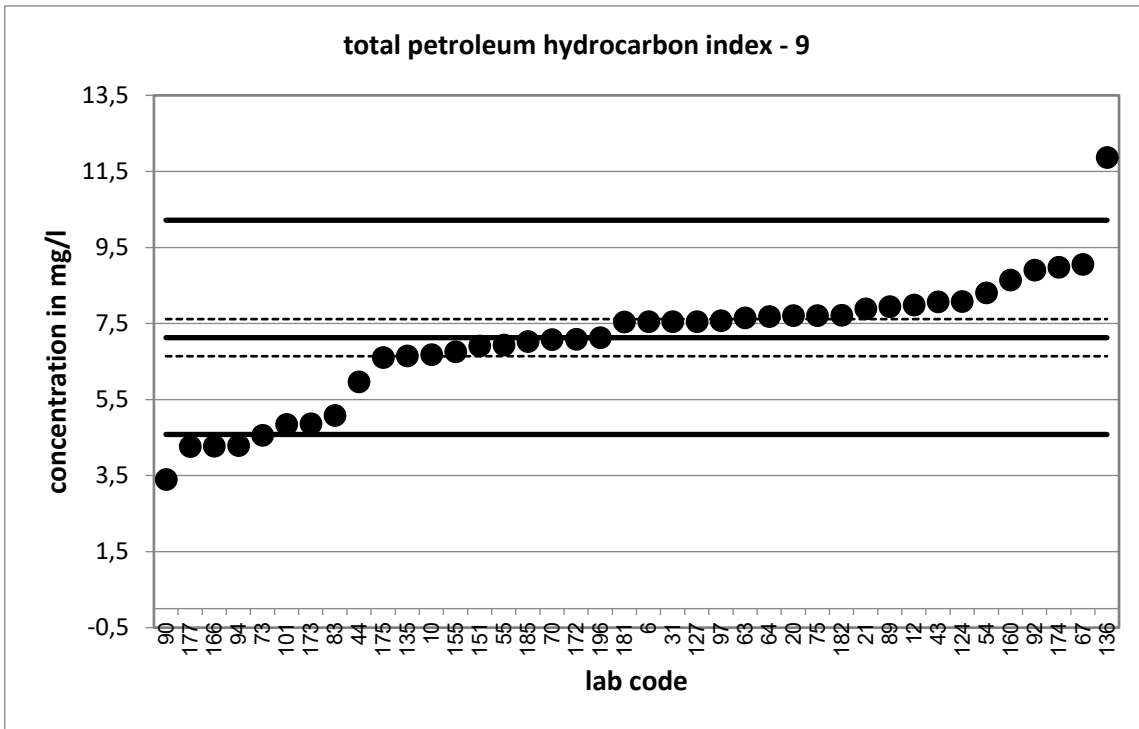
Strongly deviating values are not correctly shown in the diagram.



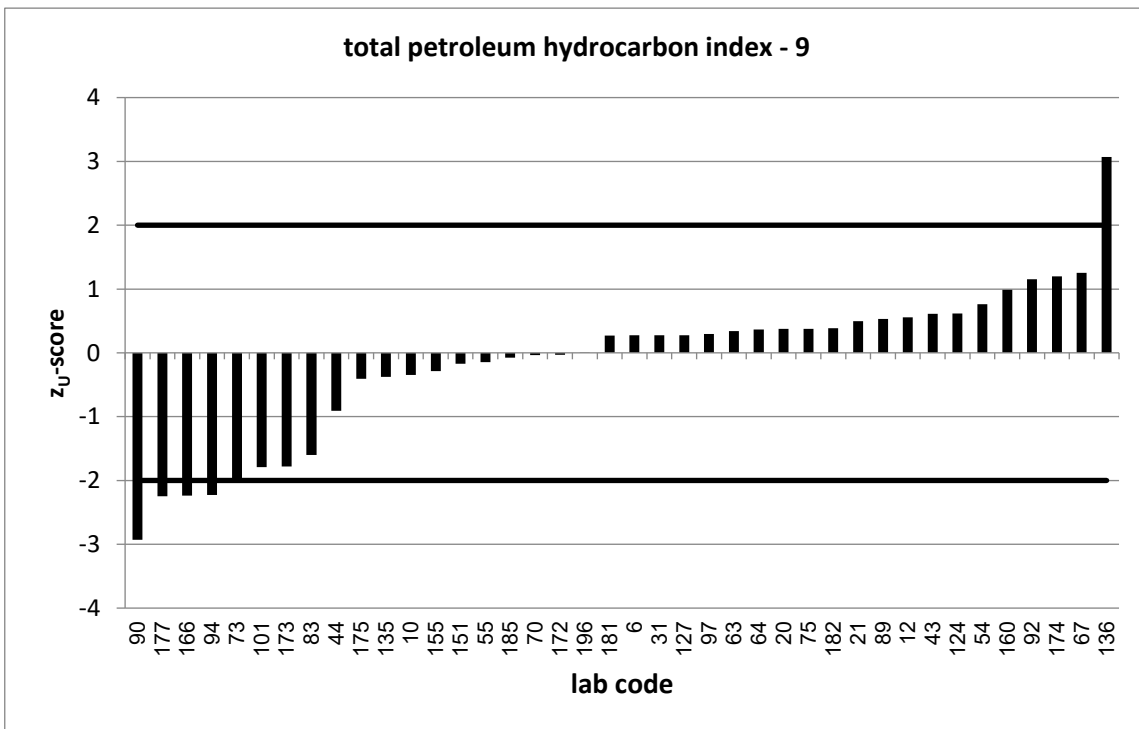
PT 5/23		total petroleum hydrocarbon index - 9			
assigned value [mg/l]*		7,127 ± 0,488			
upper tolerance limit [mg/l]		10,22			
lower tolerance limit [mg/l]		4,581			
lab code	result [mg/l]	±	z-score	Z _U -score	assessm.**
6	7,55			0,3	s
10	6,688	2,14	-0,4	-0,3	s
12	7,99	1,8	0,9	0,6	s
20	7,71			0,4	s
21	7,89	1,66	0,9	0,5	s
31	7,55	1,84	0,4	0,3	s
43	8,07	1,21	1,4	0,6	s
44	5,97	4,74	-0,5	-0,9	s
54	8,307			0,8	s
55	6,94	1,76	-0,2	-0,1	s
63	7,65	2,72	0,4	0,3	s
64	7,69			0,4	s
67	9,06	2,35	1,6	1,3	s
70	7,08	2,09	0,0	0,0	s
73	4,56	1,37	-3,5	-2,0	s
75	7,71	0,97	1,1	0,4	s
83	5,0884			-1,6	s
89	7,945	3,019	0,5	0,5	s
90	3,4	0,51	-10,6	-2,9	q
92	8,91			1,2	s
94	4,29	0,56	-7,6	-2,2	q
97	7,58	1,44	0,6	0,3	s
101	4,85			-1,8	s
124	8,08	1	1,7	0,6	s
127	7,55	2,1	0,4	0,3	s
135	6,65	2,19	-0,4	-0,4	s
136	11,87			3,1	u
151	6,91			-0,2	s
155	6,76	2,3	-0,3	-0,3	s
160	8,65	2,13	1,4	1,0	s
166	4,28			-2,2	q
172	7,09	1	-0,1	0,0	s
173	4,863	1,575	-2,7	-1,8	s
174	8,98	0,7	4,3	1,2	s
175	6,61			-0,4	s
177	4,267	0,2	-10,8	-2,2	q
181	7,545	0,55	1,1	0,3	s
182	7,72	0,05	2,4	0,4	s
185	7,03			-0,1	s
196	7,13	1	0,0	0,0	s

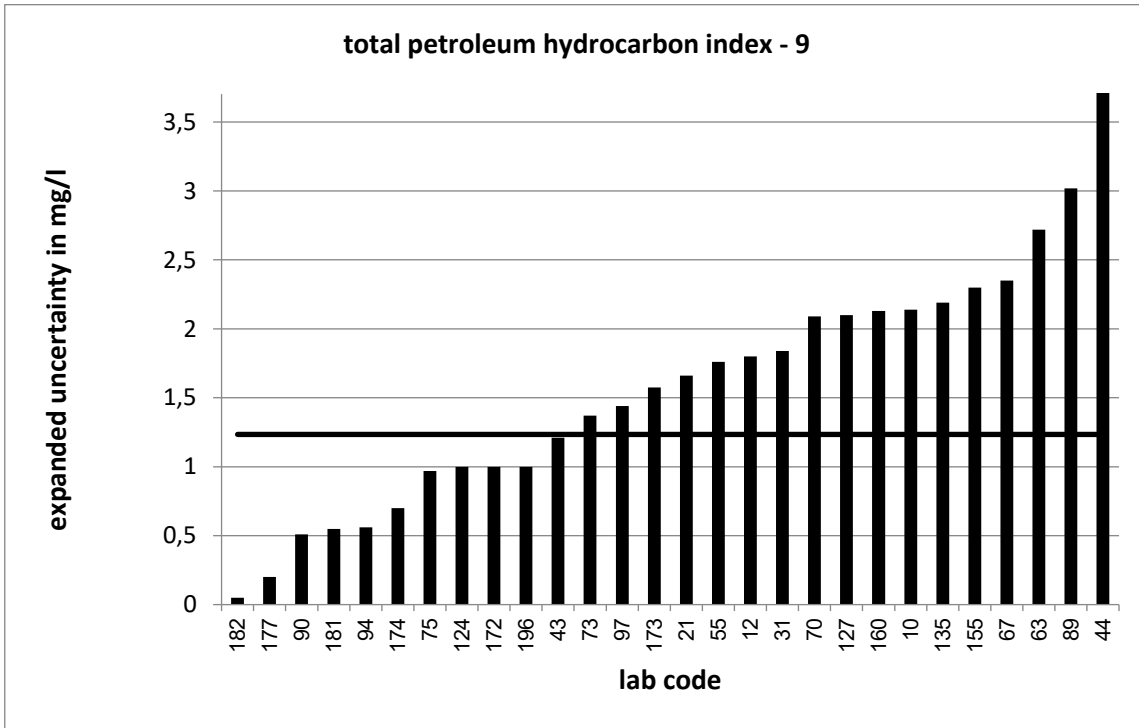
* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor k=2 corresponding to a confidence level of about 95%

** s = satisfactory, q = questionable, u = unsatisfactory



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