

Summary of laboratory means

Measurand hydrochloric acid

Laboratory	sample 1	Z score	sample 2	Z score	sample 3	Z score
Measurement unit	mg/m ³		mg/m ³		mg/m ³	
–	–	--	–	--	–	--
5						
15	0,881	0,243	1,970	0,591	4,550	1,109
19	0,860	-0,001	1,800	-0,323	4,450	0,864
21	0,514	-4,027 FE	1,376	-2,605 E	2,035	-5,030 FE
26	0,797	-0,738	1,953	0,501	4,263	0,409
59	0,893	0,381	1,977	0,631	4,261	0,403
68	0,827	-0,389	2,027	0,895	4,627	1,296
74	0,898	0,440	1,786	-0,398	4,361	0,647
78	0,797	-0,730	1,910	0,268	4,137	0,099
82	1,034	2,021 E	2,065	1,101	4,513	1,017
110	0,524	-3,912 FE	1,530	-1,775	1,963	-5,207 FE
131	0,764	-1,118	1,820	-0,216	3,811	-0,696
141	0,967	1,245	1,992	0,708	4,167	0,174
142	1,072	2,466 E	1,502	-1,926	2,907	-2,903 E
143	0,621	-2,780 E	1,538	-1,729	2,813	-3,131 E
149	0,882	0,254	2,108	1,333	4,427	0,808
163	1,179	3,707 FE	1,972	0,602	1,165	-7,156 FE
175	0,760	-1,164	1,800	-0,323	3,700	-0,967
176	0,873	0,150	1,971	0,596	4,071	-0,060
177	0,997	1,591	1,932	0,388	3,898	-0,482
178	0,713	-1,711	1,560	-1,613	3,630	-1,138
196	0,772	-1,025	1,820	-0,216	3,490	-1,479
242	0,834	-0,305	2,076	1,162	4,879	1,913
263	0,844	-0,191	2,070	1,128	4,225	0,314

Ringversuch Inorganic acids

Laboratory	sample 1	Z score	sample 2	Z score	sample 3	Z score
266	0,696	-1,908	1,750	-0,592	2,930	-2,847 E
-	-	--	-	--	-	--
Method	ISO 5725		ISO 5725		ISO 5725	
Assessment	Z <=2,000		Z <=2,000		Z <=2,000	
Mean	0,860		1,860		4,096	
Reproducibility s.d.	0,111		0,221		0,586	
Rel. reproducibility s.d.	12,90 %		11,87 %		14,31 %	
Reference value	0,866		2,063		4,399	
Rel. target s.d.	10,00 %		10,00 %		10,00 %	
Lower limit of tolerance	0,688		1,488		3,277	
Upper limit of tolerance	1,032		2,232		4,915	
Lower confidence limit	0,812		1,770		3,851	
Upper confidence limit	0,908		1,950		4,341	
Type B outliers	0		0		0	
Type F outliers	3		0		3	
No. of laboratories after elimination of outliers type A-D and F (without laboratories that only gave states but no measured values)	21		24		21	
Explanation of outlier types						
A: Single outlier						
B: Differing laboratory mean						
C: Excluded lab due to s.d.						
D: Excluded manually						
E: Score >Tol.						
F: Score >3,5						

Summary of laboratory means

Measurand nitric acid

Laboratory	sample 1	Z score	sample 2	Z score	sample 3	Z score
Measurement unit	mg/m ³		mg/m ³		mg/m ³	
–	–	--	–	--	–	--
5						
15	0,614	0,861	1,310	0,627	4,200	1,538
19	0,600	0,613	1,100	-1,076	4,200	1,538
21	0,401	-2,905 E	1,017	-1,752	2,736	-2,483 E
26	0,590	0,436	1,403	1,385	4,300	1,813
59	0,572	0,118	1,298	0,527	3,897	0,705
68	0,577	0,200	1,350	0,952	4,053	1,135
74	0,612	0,825	1,117	-0,938	3,890	0,686
78	0,532	-0,596	1,300	0,546	3,750	0,302
82	0,562	-0,065	1,273	0,330	3,799	0,437
110	0,437	-2,276 E	1,170	-0,508	3,120	-1,429
131	0,497	-1,209	1,132	-0,817	3,410	-0,632
141	0,574	0,155	1,344	0,901	3,604	-0,100
142	0,678	1,986	1,115	-0,953	4,233	1,628
143	0,389	-3,119 E	0,968	-2,151 E	2,494	-3,149 E
149	0,613	0,843	1,266	0,270	3,350	-0,797
163	0,676	1,957	1,664	3,499 BE	3,327	-0,860
175	0,560	-0,095	1,200	-0,265	3,500	-0,385
176	0,606	0,714	1,297	0,525	4,447	2,218 E
177	0,644	1,391	1,204	-0,233	3,478	-0,444
178	0,505	-1,067	1,080	-1,239	3,020	-1,704
196	0,580	0,259	1,260	0,222	3,530	-0,303
242	0,696	2,304 E	1,343	0,894	5,188	4,253 FE
263	0,530	-0,619	1,306	0,595	3,565	-0,207

Ringversuch Inorganic acids

Laboratory	sample 1	Z score	sample 2	Z score	sample 3	Z score
266	0,480	-1,510	1,210	-0,184	2,950	-1,896
–	–	--	–	--	–	--
Method	ISO 5725		ISO 5725		ISO 5725	
Assessment	Z <=2,000		Z <=2,000		Z <=2,000	
Mean	0,565		1,233		3,640	
Reproducibility s.d.	0,101		0,120		0,538	
Rel. reproducibility s.d.	17,87 %		9,74 %		14,77 %	
Reference value	0,587		1,323		4,037	
Rel. target s.d.	10,00 %		10,00 %		10,00 %	
Lower limit of tolerance	0,452		0,986		2,912	
Upper limit of tolerance	0,678		1,479		4,368	
Lower confidence limit	0,530		1,183		3,416	
Upper confidence limit	0,601		1,283		3,864	
Type B outliers	0		1		0	
Type F outliers	0		0		1	
No. of laboratories after elimination of outliers type A-D and F (without laboratories that only gave states but no measured values)	24		23		23	
Explanation of outlier types						
A: Single outlier						
B: Differing laboratory mean						
C: Excluded lab due to s.d.						
D: Excluded manually						
E: Score >Tol.						
F: Score >3,5						

Summary of laboratory means

Measurand phosphoric acid

Laboratory	sample 1	Z score	sample 2	Z score	sample 3	Z score
Measurement unit	mg/m ³		mg/m ³		mg/m ³	
–	–	--	–	--	–	--
5	0,107	-0,112	0,333	0,167	0,650	0,468
15						
19	0,100	-0,759	0,360	0,991	0,705	1,354
21	0,116	0,701	0,335	0,213	0,602	-0,302
26	0,060	-4,455 BE	0,260	-2,062 E	0,450	-2,753 E
59	0,107	-0,152	0,332	0,140	0,640	0,308
68						
74	0,104	-0,389	0,337	0,289	0,649	0,452
78	0,105	-0,297	0,342	0,452	0,648	0,436
82	0,108	-0,020	0,371	1,317	0,657	0,576
110	0,130	1,982	0,304	-0,729	0,616	-0,085
131	0,098	-0,944	0,324	-0,108	0,620	-0,015
141	0,087	-1,979	0,312	-0,462	0,603	-0,295
142	0,097	-1,073	0,284	-1,326	0,508	-1,824
143						
149						
163	0,146	3,492 E	0,516	5,754 BE	1,001	6,121 BE
175	0,100	-0,759	0,340	0,381	0,660	0,629
176	0,103	-0,503	0,335	0,217	0,644	0,379
177	0,102	-0,605	0,341	0,401	0,640	0,312
178	0,102	-0,574	0,265	-1,909	0,375	-3,961 BE
196	0,106	-0,205	0,329	0,045	0,650	0,468
242	0,102	-0,556	0,346	0,564	0,661	0,647
263	0,097	-1,036	0,329	0,045	0,623	0,033

Ringversuch Inorganic acids

Laboratory	sample 1	Z score	sample 2	Z score	sample 3	Z score
266	0,104	-0,389	0,347	0,594	0,657	0,581
-	-	--	-	--	-	--
Method	ISO 5725		ISO 5725		ISO 5725	
Assessment	Z <=2,000		Z <=2,000		Z <=2,000	
Mean	0,108		0,328		0,621	
Reproducibility s.d.	0,014		0,031		0,063	
Rel. reproducibility s.d.	12,93 %		9,36 %		10,08 %	
Reference value	0,100		0,324		0,610	
Rel. target s.d.	10,00 %		10,00 %		10,00 %	
Lower limit of tolerance	0,087		0,262		0,497	
Upper limit of tolerance	0,130		0,393		0,745	
Lower confidence limit	0,102		0,314		0,592	
Upper confidence limit	0,114		0,341		0,650	
Type B outliers	1		1		2	
Type F outliers	0		0		0	
No. of laboratories after elimination of outliers type A-D and F (without laboratories that only gave states but no measured values)	20		20		19	
Explanation of outlier types						
A: Single outlier						
B: Differing laboratory mean						
C: Excluded lab due to s.d.						
D: Excluded manually						
E: Score >Tol.						
F: Score >3,5						

Summary of laboratory means

Measurand sulfuric acid

Laboratory	sample 1	Z score	sample 2	Z score	sample 3	Z score
Measurement unit	mg/m ³		mg/m ³		mg/m ³	
–	–	--	–	--	–	--
5	0,109	0,654	0,023	0,192	0,064	0,722
15						
19	0,100	-0,225	0,025	0,857	0,060	0,135
21	0,106	0,361	0,019	-1,641	0,064	0,654
26	0,080	-2,180 E	0,020	-1,137	0,050	-1,624
59	0,111	0,850	0,025	1,123	0,063	0,537
68						
74	0,107	0,459	0,024	0,635	0,062	0,387
78	0,106	0,361	0,024	0,842	0,061	0,297
82	0,113	1,045	0,030	3,442 E	0,072	2,000
110	0,181	7,660 BE	0,066	19,099 BE	0,093	5,580 BE
131	0,094	-0,812	0,020	-1,137	0,055	-0,786
141	0,089	-1,330	0,020	-1,359	0,048	-2,000
142	0,081	-2,048 E	0,016	-2,932 E	0,044	-2,662 E
143						
149						
163	0,126	2,316 E	0,055	14,373 BE	0,112	8,763 BE
175	0,097	-0,519	0,016	-2,910 E	0,051	-1,456
176	0,094	-0,776	0,019	-1,566	0,055	-0,820
177	0,100	-0,225	0,020	-1,137	0,056	-0,618
178	0,097	-0,519	0,020	-1,137	0,061	0,219
196	0,104	0,166	0,022	-0,029	0,062	0,336
242	0,104	0,175	0,024	0,606	0,063	0,537
263	0,104	0,166	0,029	2,703 E	0,069	1,504

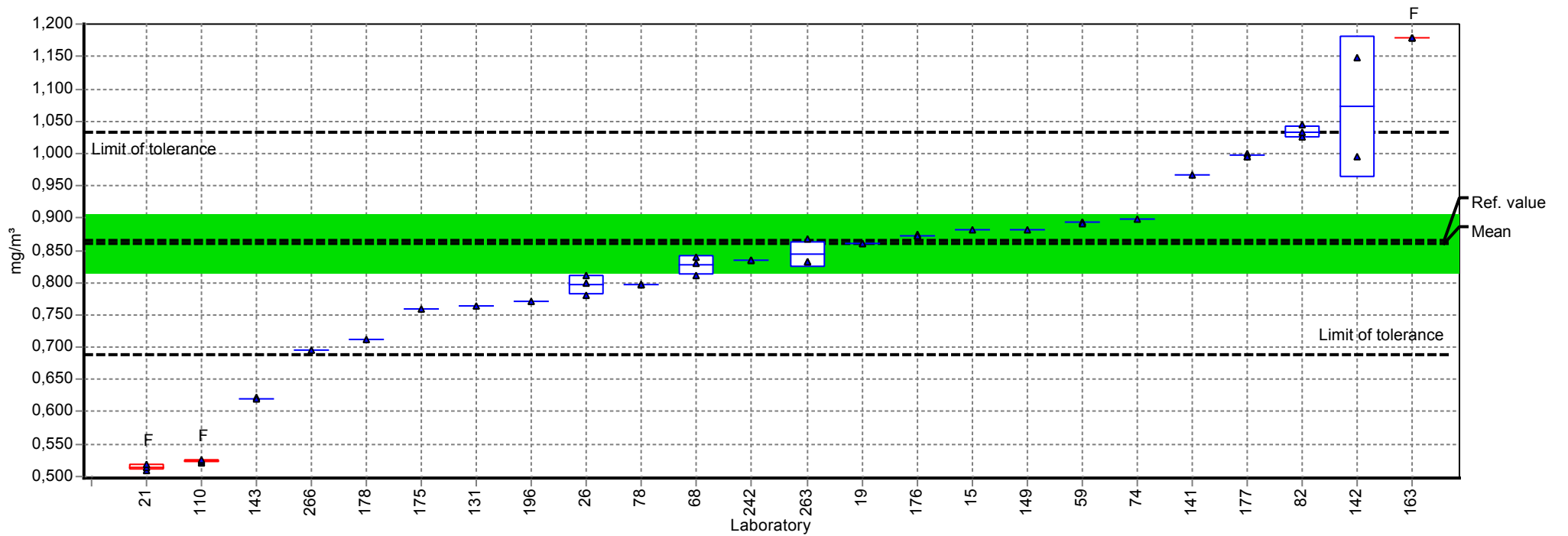
Ringversuch Inorganic acids

Laboratory	sample 1	Z score	sample 2	Z score	sample 3	Z score
266	0,104	0,166	0,023	0,192	0,059	-0,116
-	-	--	-	--	-	--
Method	ISO 5725		ISO 5725		ISO 5725	
Assessment	Z <=2,000		Z <=2,000		Z <=2,000	
Mean	0,102		0,023		0,060	
Reproducibility s.d.	0,012		0,004		0,008	
Rel. reproducibility s.d.	11,38 %		18,61 %		12,99 %	
Reference value	0,104		0,024		0,062	
Rel. target s.d.	10,00 %		10,00 %		10,00 %	
Lower limit of tolerance	0,082		0,018		0,048	
Upper limit of tolerance	0,123		0,027		0,072	
Lower confidence limit	0,097		0,021		0,056	
Upper confidence limit	0,107		0,024		0,063	
Type B outliers	1		2		2	
Type F outliers	0		0		0	
No. of laboratories after elimination of outliers type A-D and F (without laboratories that only gave states but no measured values)	20		19		19	
Explanation of outlier types						
A: Single outlier						
B: Differing laboratory mean						
C: Excluded lab due to s.d.						
D: Excluded manually						
E: Score >Tol.						
F: Score >3,5						

Summary results

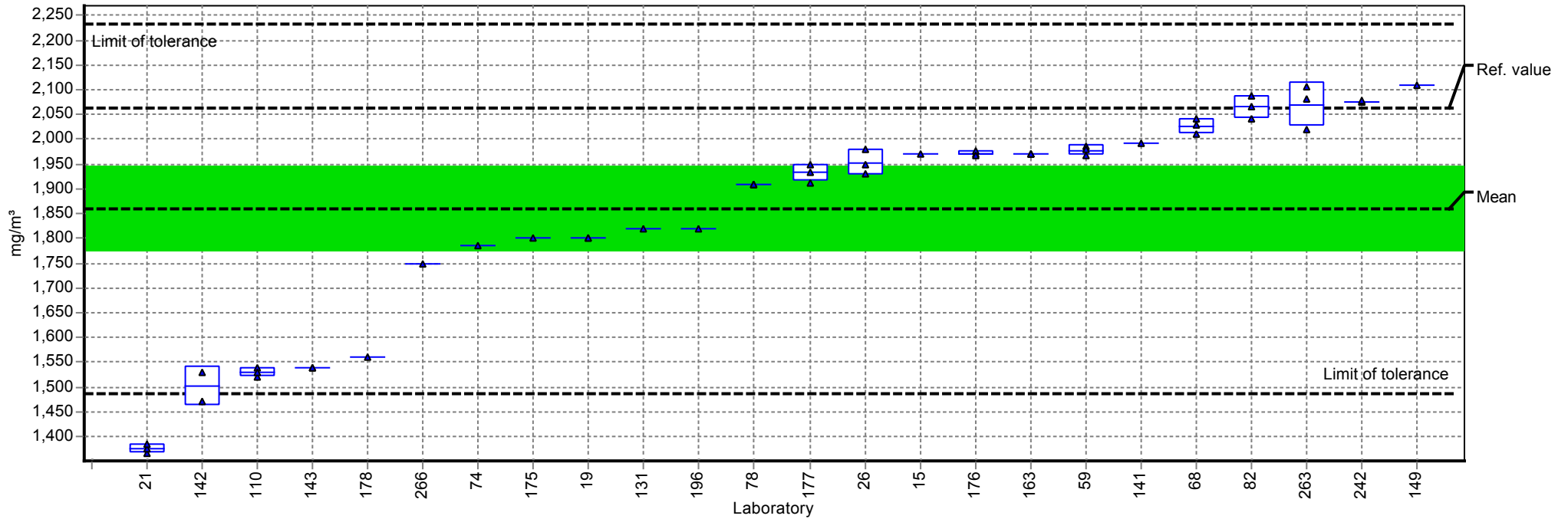
Sample: sample 1
Measurand: hydrochloric acid
Method: ISO 5725
No. of laboratories: 21

Mean: 0,860 mg/m³
Reproducibility s.d.: 0,111 mg/m³
Rel. reproducibility s.d.: 12,90%
Tolerance limits: 0,688 - 1,032 mg/m³ (|Z score| < 2,00)



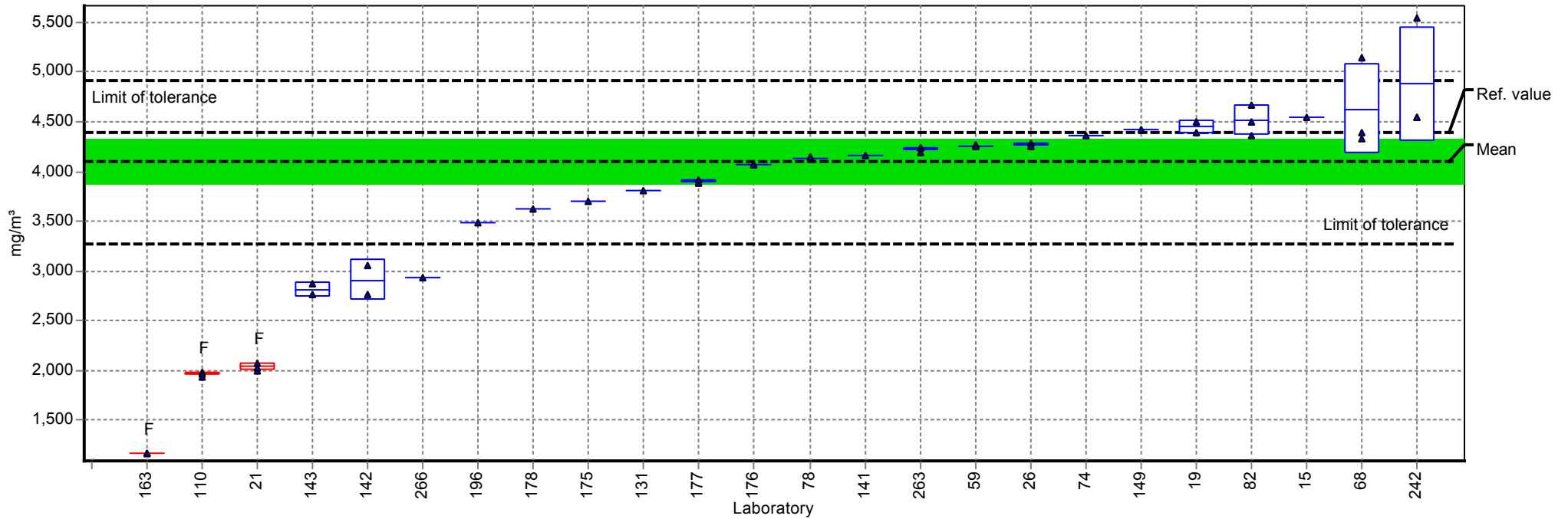
Summary results

Sample: sample 2 Mean: 1,860 mg/m³
Measurand: hydrochloric acid Reproducibility s.d.: 0,221 mg/m³
Method: ISO 5725 Rel. reproducibility s.d.: 11,87%
No. of laboratories: 24 Tolerance limits: 1,488 - 2,232 mg/m³ (|Z score| < 2,00)



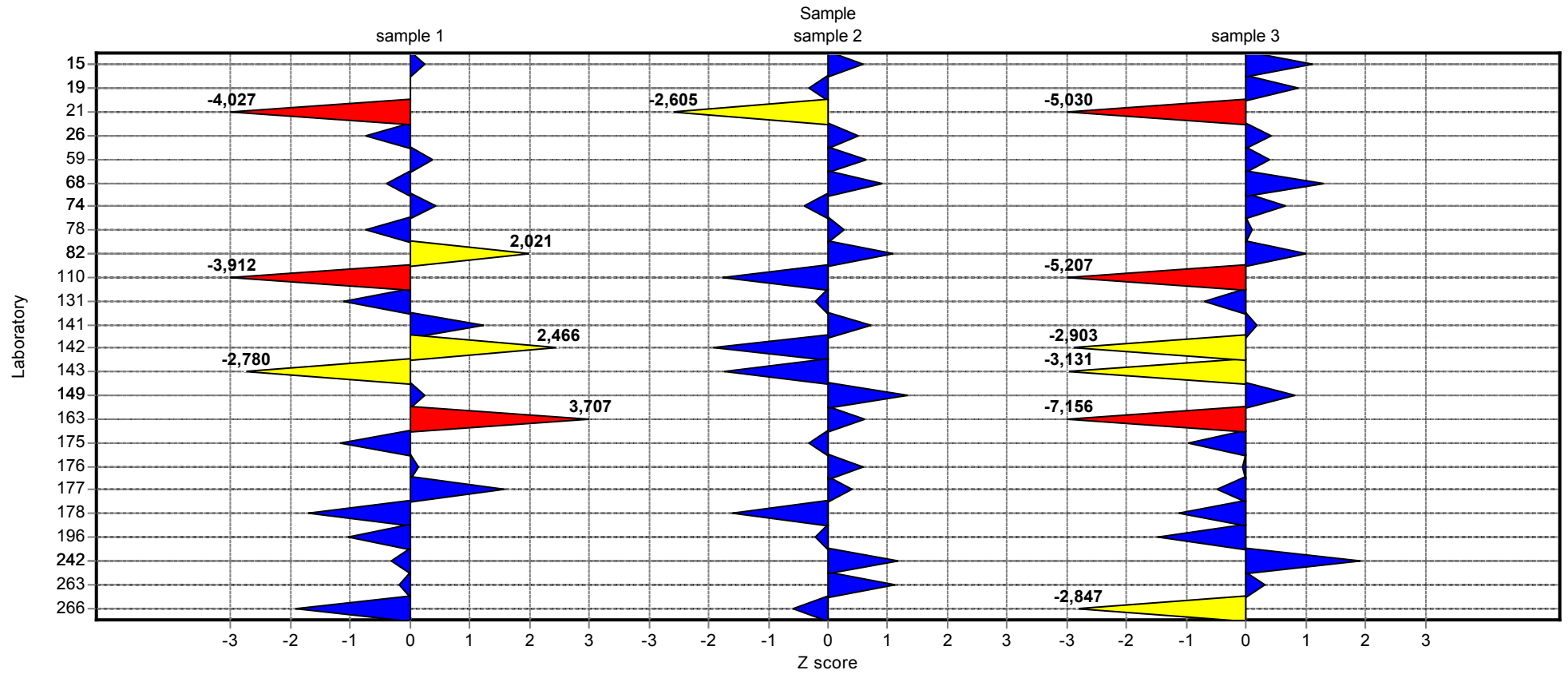
Summary results

Sample: sample 3 Mean: 4,096 mg/m³
Measurand: hydrochloric acid Reproducibility s.d.: 0,586 mg/m³
Method: ISO 5725 Rel. reproducibility s.d.: 14,31%
No. of laboratories: 21 Tolerance limits: 3,277 - 4,915 mg/m³ (|Z score| < 2,00)



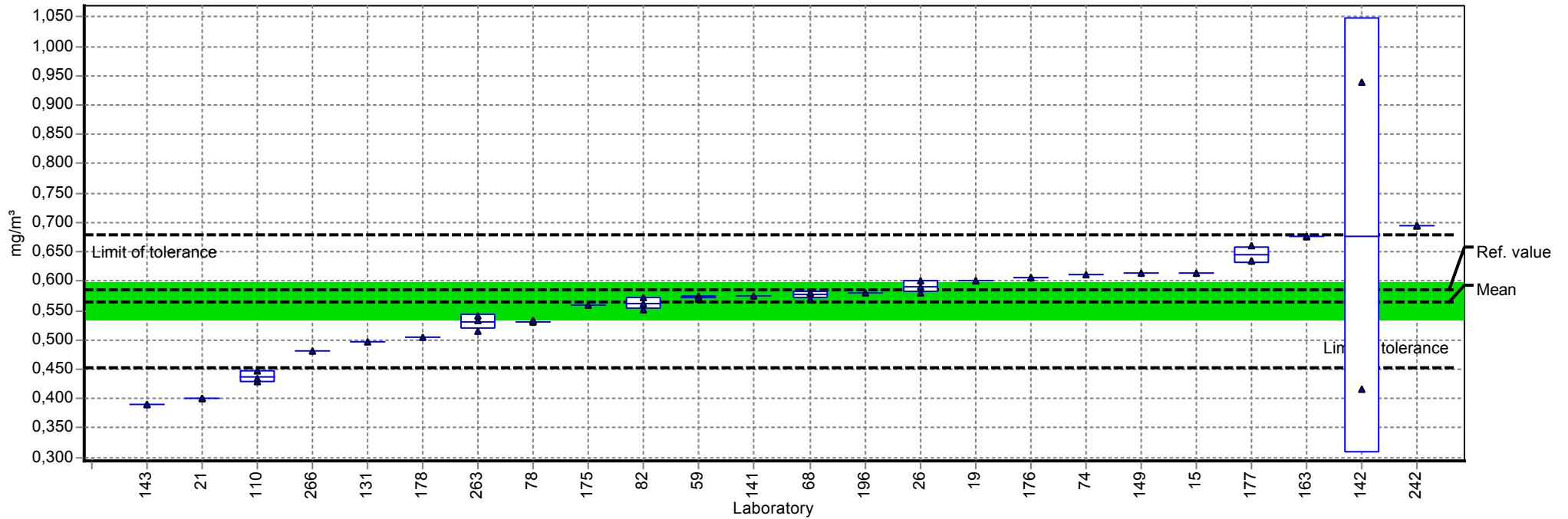
Analyte chart of Z scores

Measurand: hydrochloric acid



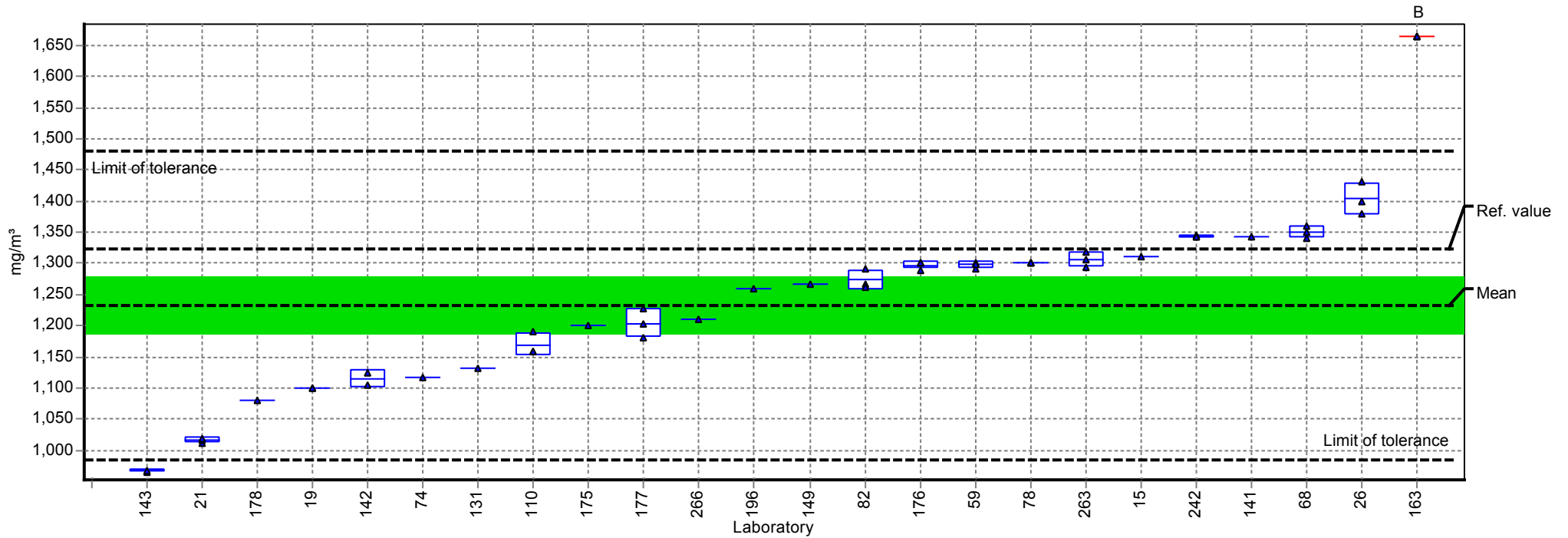
Summary results

Sample: sample 1 Mean: 0,565 mg/m³
Measurand: nitric acid Reproducibility s.d.: 0,101 mg/m³
Method: ISO 5725 Rel. reproducibility s.d.: 17,87%
No. of laboratories: 24 Tolerance limits: 0,452 - 0,678 mg/m³ (|Z score| < 2,00)



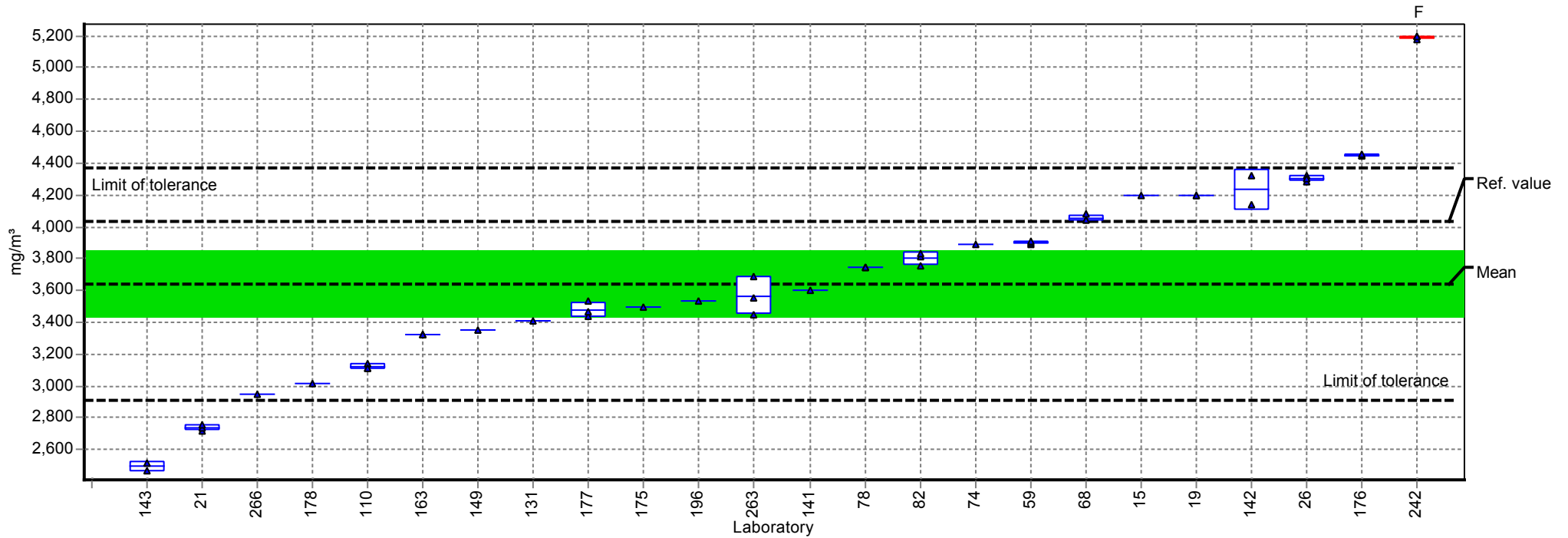
Summary results

Sample: sample 2 Mean: 1,233 mg/m³
Measurand: nitric acid Reproducibility s.d.: 0,120 mg/m³
Method: ISO 5725 Rel. reproducibility s.d.: 9,74%
No. of laboratories: 23 Tolerance limits: 0,986 - 1,479 mg/m³ (|Z score| < 2,00)



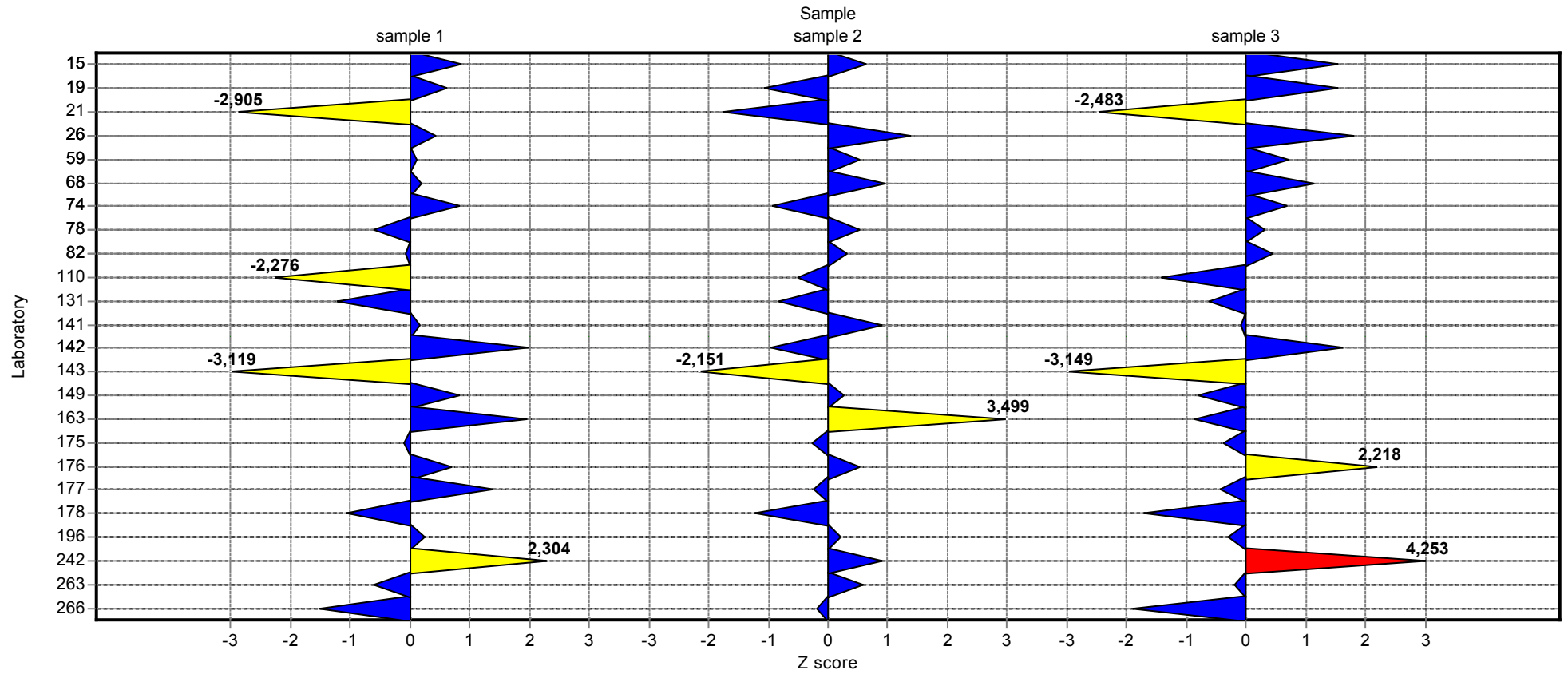
Summary results

Sample: sample 3 Mean: 3,640 mg/m³
Measurand: nitric acid Reproducibility s.d.: 0,538 mg/m³
Method: ISO 5725 Rel. reproducibility s.d.: 14,77%
No. of laboratories: 23 Tolerance limits: 2,912 - 4,368 mg/m³ (|Z score| < 2,00)



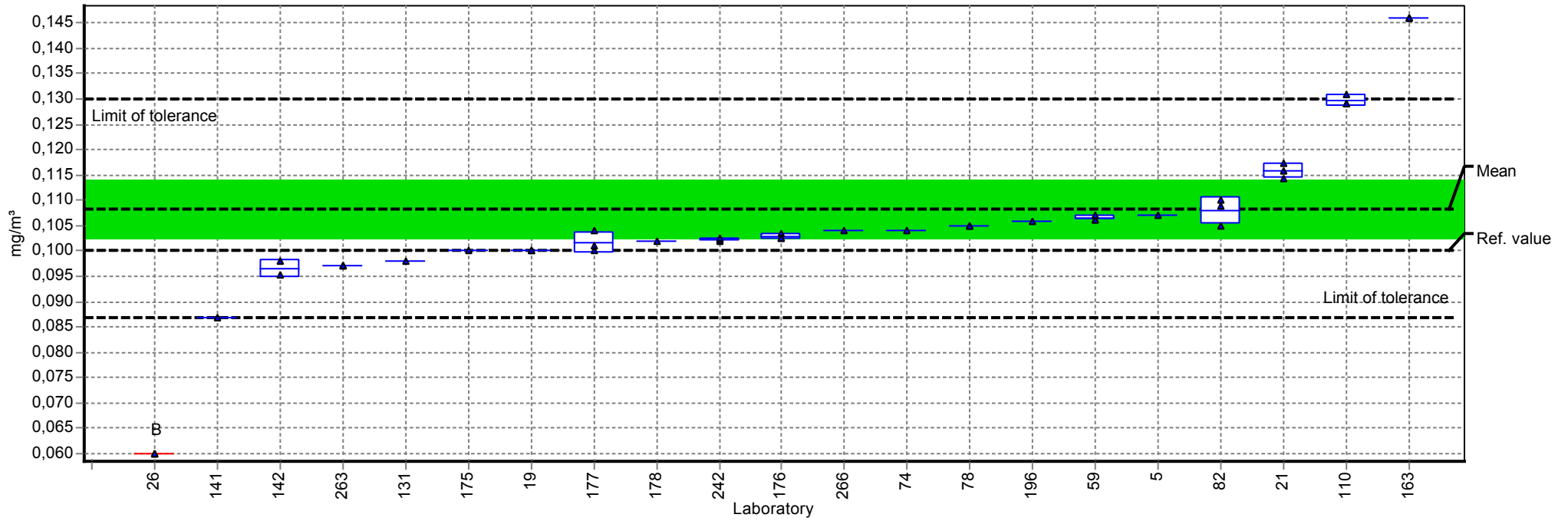
Analyte chart of Z scores

Measurand: nitric acid



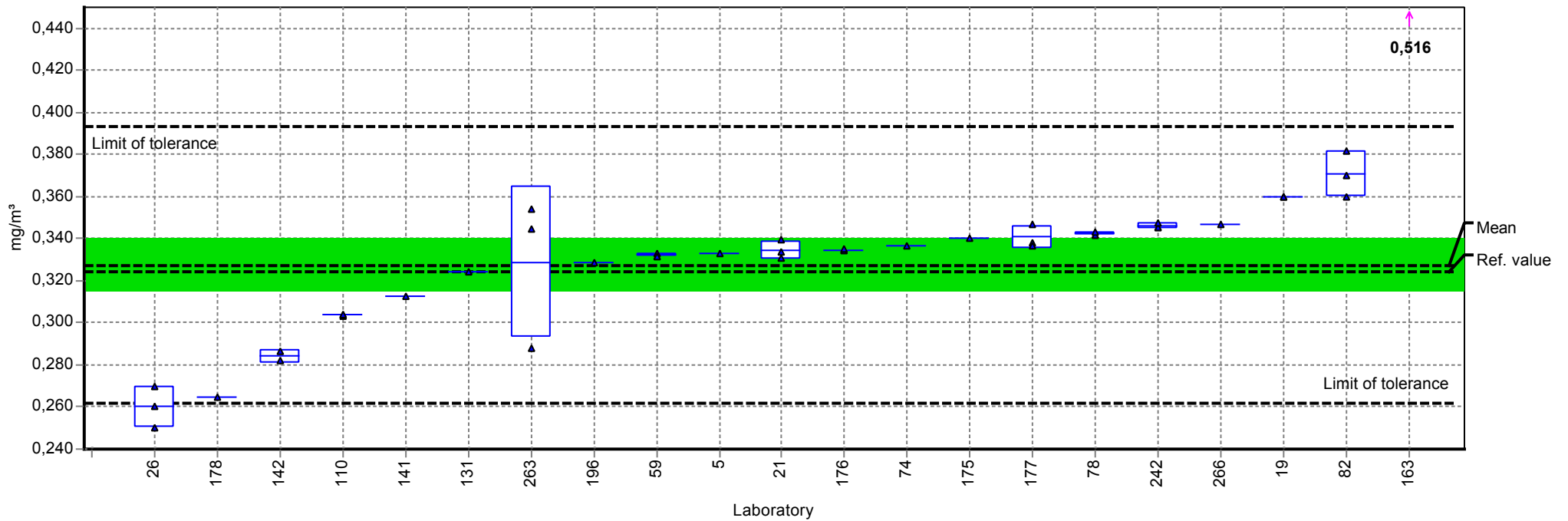
Summary results

Sample: sample 1 Mean: 0,108 mg/m³
Measurand: phosphoric acid Reproducibility s.d.: 0,014 mg/m³
Method: ISO 5725 Rel. reproducibility s.d.: 12,93%
No. of laboratories: 20 Tolerance limits: 0,087 - 0,130 mg/m³ (|Z score| < 2,00)



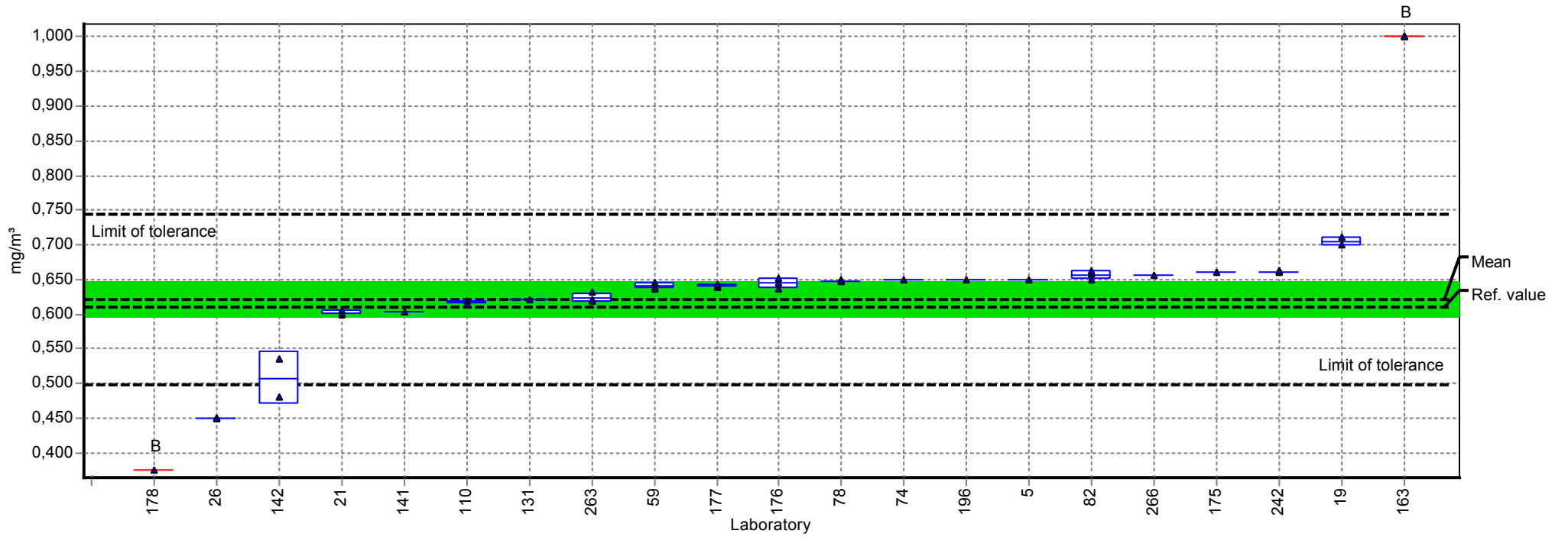
Summary results

Sample: sample 2 Mean: 0,328 mg/m³
Measurand: phosphoric acid Reproducibility s.d.: 0,031 mg/m³
Method: ISO 5725 Rel. reproducibility s.d.: 9,36%
No. of laboratories: 20 Tolerance limits: 0,262 - 0,393 mg/m³ (|Z score| < 2,00)



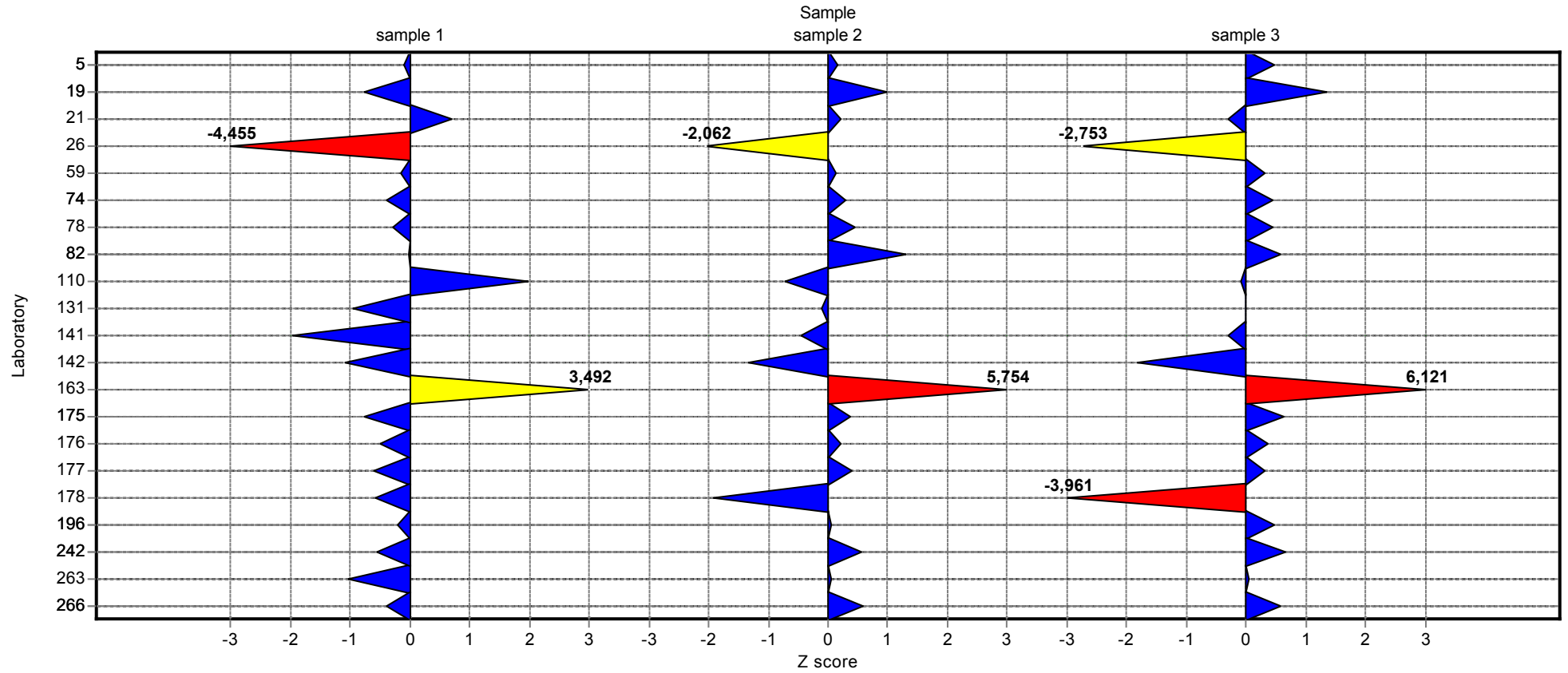
Summary results

Sample: sample 3 Mean: 0,621 mg/m³
Measurand: phosphoric acid Reproducibility s.d.: 0,063 mg/m³
Method: ISO 5725 Rel. reproducibility s.d.: 10,08%
No. of laboratories: 19 Tolerance limits: 0,497 - 0,745 mg/m³ (|Z score| < 2,00)



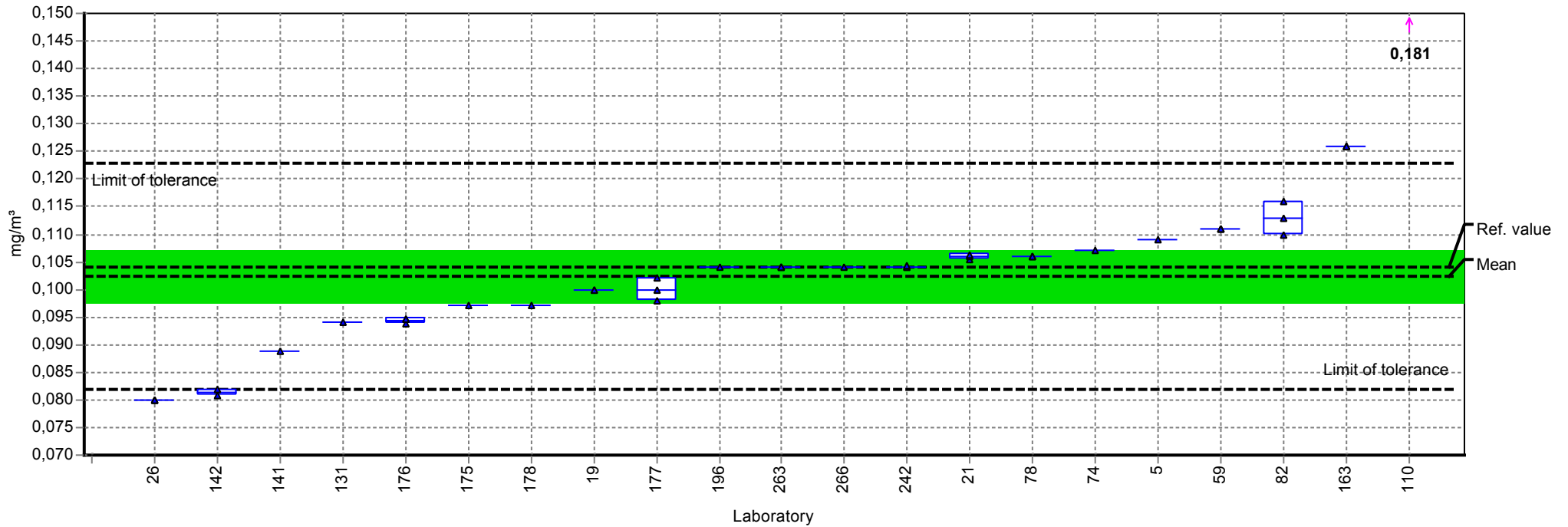
Analyte chart of Z scores

Measurand: phosphoric acid



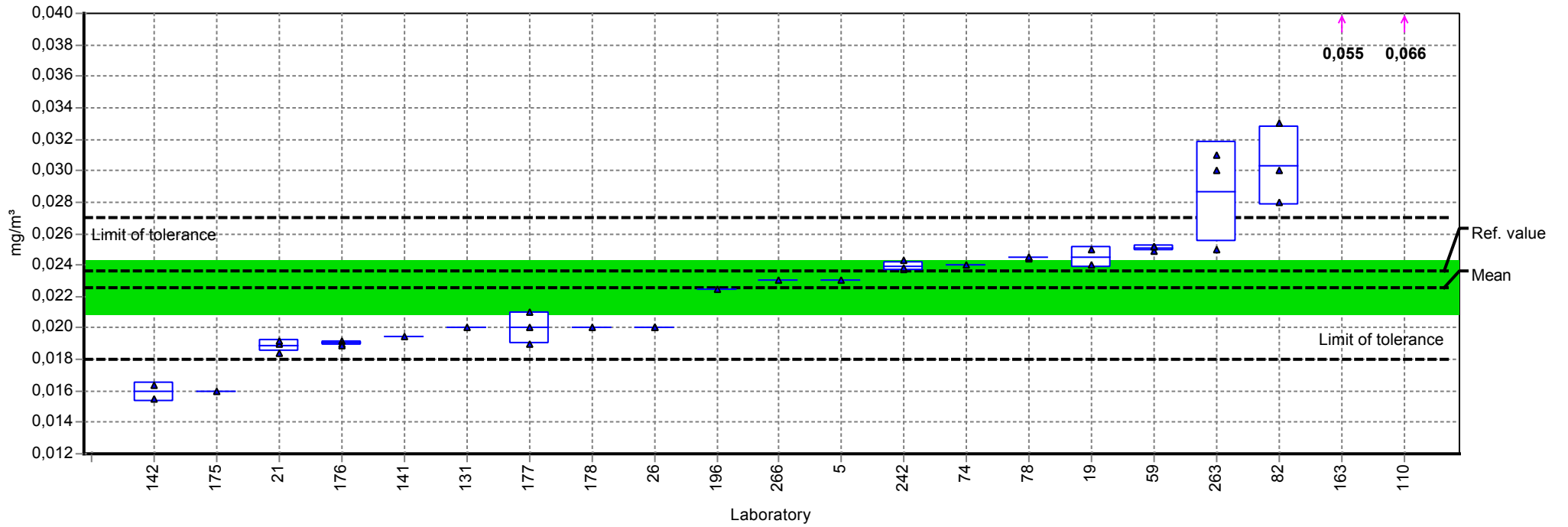
Summary results

Sample: sample 1 Mean: 0,102 mg/m³
Measurand: sulfuric acid Reproducibility s.d.: 0,012 mg/m³
Method: ISO 5725 Rel. reproducibility s.d.: 11,38%
No. of laboratories: 20 Tolerance limits: 0,082 - 0,123 mg/m³ (|Z score| < 2,00)



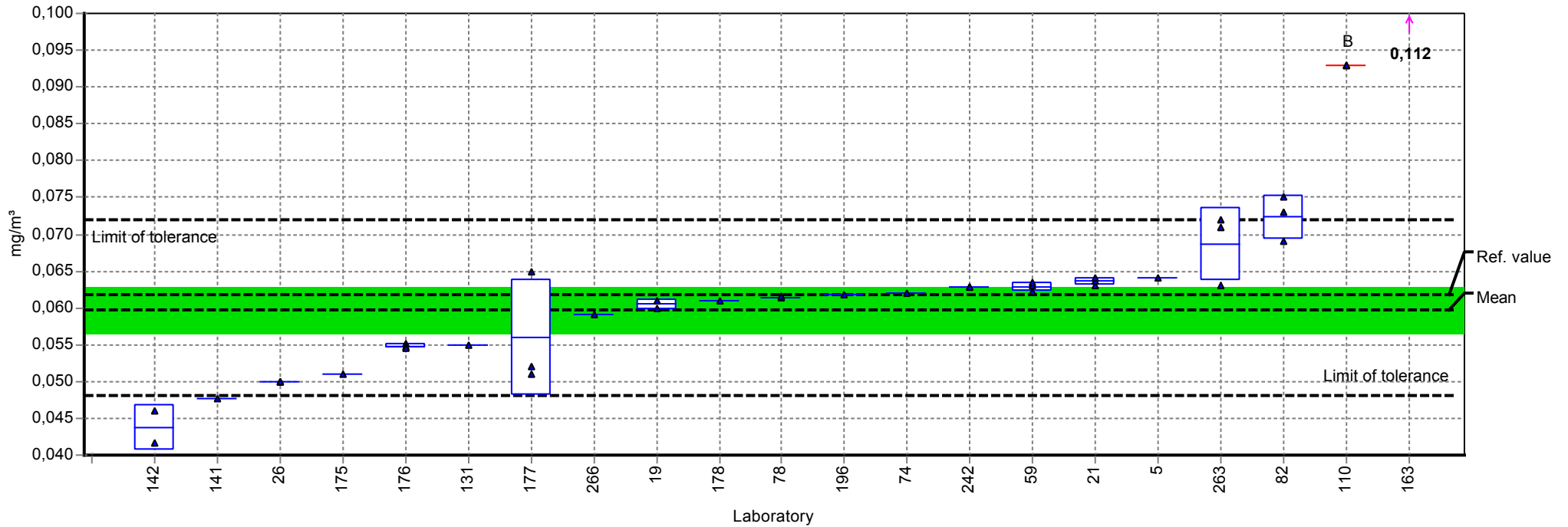
Summary results

Sample: sample 2 Mean: 0,023 mg/m³
Measurand: sulfuric acid Reproducibility s.d.: 0,004 mg/m³
Method: ISO 5725 Rel. reproducibility s.d.: 18,61%
No. of laboratories: 19 Tolerance limits: 0,018 - 0,027 mg/m³ (|Z score| < 2,00)



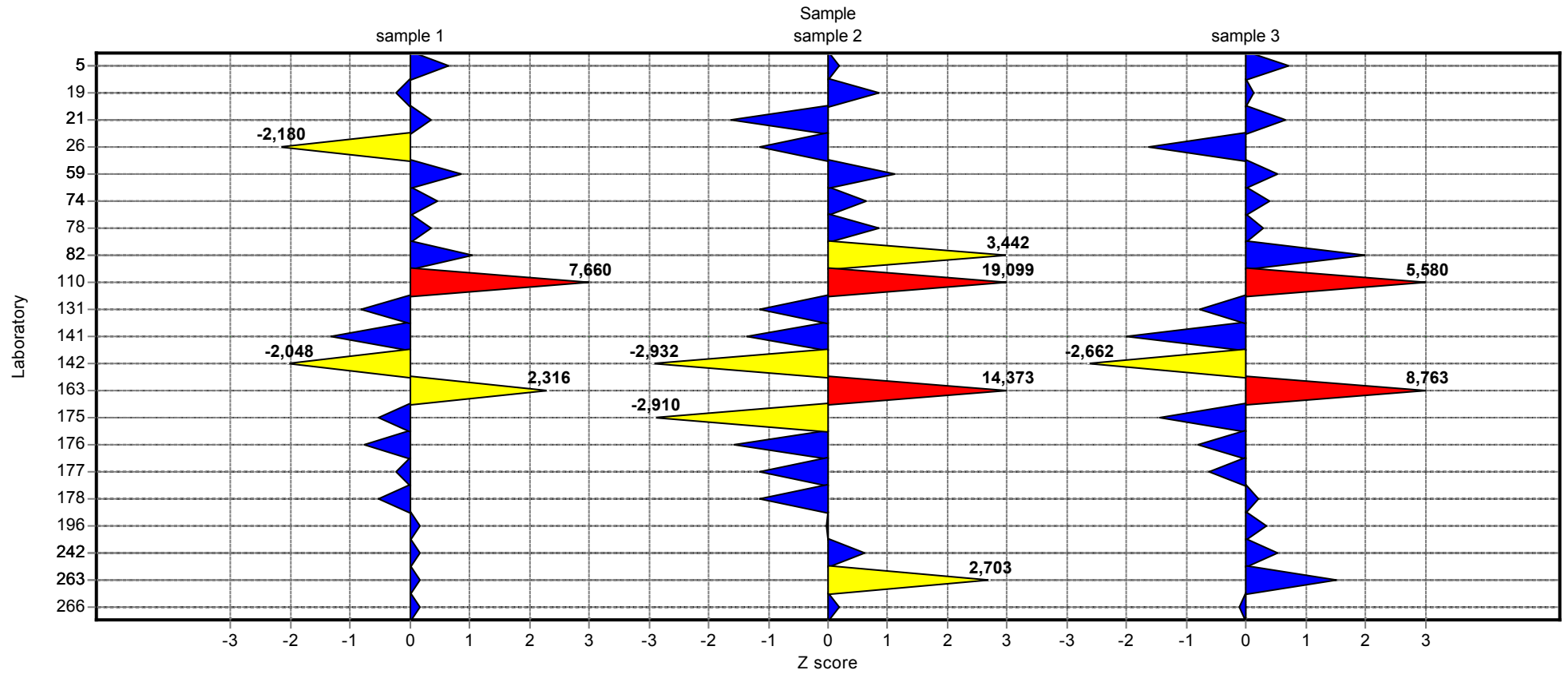
Summary results

Sample: sample 3 Mean: 0,060 mg/m³
Measurand: sulfuric acid Reproducibility s.d.: 0,008 mg/m³
Method: ISO 5725 Rel. reproducibility s.d.: 12,99%
No. of laboratories: 19 Tolerance limits: 0,048 - 0,072 mg/m³ (|Z score| < 2,00)



Analyte chart of Z scores

Measurand: sulfuric acid



Questions and Answers

Participant	sample set	desorption solution
15	only Orbo 53	deionized w ater, 10mL
141	2	DI Water, 10 mLs for tubes, and 4 mLs for filters
142	Orbo 53/Quartz fibre filters	3,5 mM Na ₂ CO ₃ /1,0 mM NaHCO ₃ , 10 ml
143	Only orbo 53	10 ml total volume
149	Only Orbo 53	10 mM sodium carbonate, 10 ml
163	2	NaOH 30mM
175	2	w ater 10 ml
176	2	w ater 5 mL
178	2	12mM Na ₂ CO ₃ +5mM HNaCO ₃ ,10ml.
196	2	10mL DI H ₂ O for tubes, 4mL 3.1mmol/L Na ₂ CO ₃ /0.35 mmol/L NaHCO ₃ for filters
266	2	Na ₂ CO ₃ 2,7mM / NaHCO ₃ 0,3mM

Participant	time of desorption	filtration
15	10 minutes	no
141	30 minutes, no ultrasonic bath	No
142	15 min, ultrasonic bath	yes
143	21.04.2011	no filtration
149	10 minutes	no
163	10 min	0.22
175		yes
176	10 min., 90°C in block heater	yes
178	15min-ultrasonic bath	yes
196	10 minutes in 100 degree C H ₂ O bath for tubes, 30 minutes for filters	Yes
266	10 minutes, No ultrasonic bath	yes - only for filters (not for the ORBO 53 tubes)

Participant	wavelength	injection volume	kind of injection
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Ringversuch Inorganic acids

Participant	wavelength	injection volume	kind of injection
15	N/A	50uL	autosampler
141	N/A, Conductivity Detector = 17 uS	100 uL	Autosampler
142		25 µl	autosampler
143		100 mikroliter	autosampler AS40
149		100	Autosampler
163	conductimetry	50 ul	hand
175		50	autosampler
176	-	100 µl	autosampler
178		75ul.	autosampler
196	N/A	50uL	Autosampler
266		50 µL	autosampler

Participant	Ion Chromatographic System
15	Dionex ICS-2000, condutivity detection
141	Dionex AI-450 Chromatography Workstation, Dionex Series DX-100 Ion Chromatograph, an anion membrane supressor and DX-100 conductivity detector
142	DIONEX ICS 1000
143	DIONEX ICS 1000
149	ICS-1000 Ion Chromatography System
163	Dionex 3000
175	
176	Agilent 1100 pump, autosampler, degasser; Merck L-7360 column thermostat, L-7470 conductivity detector; Dionex RFC-30 eluent generator
178	Dionex DX120. Conductivity detection
196	ICS 1600 w ith ASRS 300 Supressor
266	Dionex ICS-3000 w ith Isocratic pump and Conductivity detector

Participant	analytical column
15	IonPac AG18 Guard Column 4mm x 50mm, IonPac AS18 Analytical Column 4mm x 250mm
141	Dionex AS4A sepearator column 4mm (10-32) and a AG4A guard column
142	Dionex Ion Pac AS14
143	IONPAC AS9HC Analytical 4x250 mm column
149	AS9-HC 4x25 mm
163	AS-11 HC

Ringversuch Inorganic acids

Participant	analytical column
175	
176	Dionex IonPac AS11-HC 4x250 mm
178	Ion Pac AS9HC;4*250m.m
196	AS14A (4x250mm)
266	AS14A with pre-column AG14A

Participant	mobile phase	flow rate
15	32mM KOH	1mL/min
141	1.8mM Na ₂ CO ₃ + 1.7 mM NaHCO ₃	2.0 L/min
142	3,5 mM Na ₂ CO ₃ /1,0 mM NaHCO ₃	1,2 ml/min
143	10 mM Na ₂ CO ₃ solution (take 40 ml of 0,5 MNa ₂ CO ₃ solution and add ultra pure w ater-total volume 2 liter)	1 ml/min
149	10 mM sodium carbonate	1 ml/min
163	KOH 30mM	1 ml/min
175		
176	KOH solution	1 mL/min
178	12mM NaCO ₃ +5mM HNaCO ₃	1ml./min.
196	8mM NaHCO ₃ /1mM Na ₂ CO ₃	1mL/min
266	Na ₂ CO ₃ 2,7mM / NaHCO ₃ 0,3mM	1 mL/min

Participant	date of analysis	kind of pump	volume flow	sampling time	volume flow measurement
15					
141	4/13/11				
142	14/04/2011; 18-04-2011				
143	21.04.2011	gradient pump model			
149	26/04/2011	Gradient pump module			
163	09/05/11	Binary	-	-	-
175	2011-05-03				
176	11/04/2011				
178	05/05/11				
196	12/04/11	N/A	N/A	N/A	N/A
266	27/04/11				