IFA
Institut für Arbeitsschutz der
Deutschen Gesetzlichen Unfallversicherung

Proficiency testing for in-house and external measuring stations - results and evaluation

Proficiency testing scheme “Inorganic acids with and without own sampling 2024”

20/21 March 2024

- **Volatile inorganic acids: Hydrochloric acid, HCl and Nitric acid, HNO_3**
- **Non-volatile inorganic acids: Phosphoric acid, H_3PO_4 and Sulphuric acid, H_2SO_4**

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Summary of laboratory test results

Sample 1

Laboratory	Hydrochloric aid	Z score	Nitric acid	Z score	Phosphoric acid	Z score	Sulphuric acid	Z score
Unit	mg/m³		mg/m³		mg/m³		mg/m³	
1	1.040	-1.66	0.880	-2.10 E	0.440	-0.89 B	0.070	-1.10
5	1.413	1.34	1.302	1.68	0.476	-0.14	0.079	0.00
13	1.950	5.65 BE	1.840	6.51 FE	0.495	0.25	0.082	0.43
26	1.234	-0.10	1.057	-0.51	0.479	-0.09	0.087	1.13
39	1.336	0.72	1.280	1.48	0.491	0.17	0.085	0.83
40	1.297	0.40	1.175	0.55	0.482	0.00	0.076	-0.32
66	1.294	0.38	1.205	0.81	0.483	0.01	0.080	0.18
73	1.309	0.50	1.255	1.26	0.471	-0.24	0.076	-0.33
82	1.164	-0.66	1.159	0.40				
83	1.371	1.00	1.329	1.92	0.487	0.09	0.077	-0.20
111	1.320	0.59	1.160	0.41	0.480	-0.06	0.080	0.18
121	0.902	-2.76 E	0.733	-3.42 E				
136	1.340	0.75	1.120	0.05	0.476	-0.14	0.079	0.05
138	1.285	0.31	1.230	1.04	0.486	0.07	0.076	-0.38
140	1.260	0.11	1.170	0.50	0.490	0.15	0.078	-0.06
150	0.300	-7.59 BE	0.470	-5.78 FE	0.490	0.15	0.078	-0.08
151	1.260	0.11	1.240	1.13	0.480	-0.06	0.080	0.18
177	1.320	0.59	1.260	1.30	0.450	-0.68 B	0.070	-1.10
188	1.314	0.54	1.266	1.36				
197	1.027	-1.76	0.946	-1.51	0.471	-0.24	0.081	0.33
212	1.300	0.43	1.110	-0.04				
242	1.110	-1.09	0.948	-1.49	0.477	-0.12	0.069	-1.22
248	1.404	1.26	0.752	-3.25 E	0.473	-0.20	0.083	0.56
263	1.260	0.11	1.140	0.23	0.502	0.40	0.077	-0.18
294	1.106	-1.13	0.917	-1.77	0.571	1.83 B	0.083	0.56
517					0.548	1.35 B	0.083	0.56
–	–	– –	–	– –	–	– –	–	– –
Method	ISO 5725-2		ISO 5725-2		ISO 5725-2		ISO 5725-2	
Assessment	|Z|<=2.00		|Z|<=2.00		|Z|<=2.00		|Z|<=2.00	

Laboratory	Hydrochloric aid	Z score	Nitric acid	Z score	Phosphoric acid	Z score	Sulphuric acid	Z score
No. of laboratories that submitted results	25		25		22		22	
Mean	1.246		1.115		0.483		0.079	
Reproducibility s.d.	0.129		0.172		0.009		0.005	
Rel. reproducibility s.d.	10.39 %		15.44 %		1.77 %		6.03 %	
Reference value	1.302		1.290		0.475		0.079	
Target s.d.	0.125		0.111		0.048		0.008	
Rel. target s.d.	10.00 %		10.00 %		10.00 %		10.00 %	
Low er limit of tolerance	0.997		0.892		0.386		0.063	
Upper limit of tolerance	1.496		1.337		0.579		0.094	
Type B outliers	2				4			
Type E outliers	3		5					
Type F outliers			2					
No. of laboratories after elimination of outliers type A-D and F (w ithout laboratories that only gave states but no measured values)	23		23		18		22	
Explanation of outlier types								
A: Single outlier	Grubbs							
B: Differing laboratory mean	Grubbs							
C: Excessive laboratory s.d.	Cochran							
D: Excluded manually								
E: mean outside tolerance limits								
F: |Z-Score|>3.50								

Summary of laboratory test results

Sample 2

Laboratory	Hydrochloric aid	Z score	Nitric acid	Z score	Phosphoric acid	Z score	Sulphuric acid	Z score
Unit	mg/m³		mg/m³		mg/m³		mg/m³	
1	0.850	-6.93 BE	0.660	-7.28 FE	0.350	-0.94	0.100	-0.70
5	2.968	0.71	2.766	1.39	0.381	-0.14	0.110	0.19
13	3.470	2.52 E	3.240	3.34 FE	0.397	0.28	0.112	0.42
26	2.729	-0.16	2.326	-0.42	0.381	-0.14	0.122	1.33
39	2.441	-1.19	2.227	-0.83	0.379	-0.19	0.108	0.05
40	2.583	-0.68	2.261	-0.69	0.378	-0.21	0.106	-0.14
66	2.978	0.74	2.651	0.91	0.400	0.35	0.107	-0.04
73	2.896	0.45	2.591	0.67	0.375	-0.29	0.104	-0.32
82	1.965	-2.91 E	1.900	-2.18 E				
83	3.034	0.95	2.752	1.33	0.394	0.20	0.105	-0.23
111	2.880	0.39	2.510	0.33	0.390	0.09	0.110	0.24
121	2.176	-2.15 E	1.741	-2.83 E				
136	3.090	1.15	2.530	0.42	0.386	-0.01	0.058	-4.60 BE
138	2.635	-0.49	2.400	-0.12	0.381	-0.14	0.104	-0.32
140	2.340	-1.56	2.090	-1.40	0.391	0.12	0.113	0.47
150	1.130	-5.92 BE	1.090	-5.51 FE	0.390	0.09	0.107	-0.04
151	2.800	0.10	2.570	0.58	0.390	0.09	0.110	0.24
177	2.780	0.03	3.010	2.39 E	0.360	-0.68	0.090	-1.63
188	2.788	0.06	2.567	0.57				
197	2.696	-0.27	2.413	-0.07	0.366	-0.53	0.106	-0.13
212	2.930	0.57	2.430	0.00				
242	2.581	-0.69	2.079	-1.44	0.388	0.04	0.097	-0.97
248	2.999	0.82	0.671	-7.24 FE	0.374	-0.32	0.115	0.70
263	2.780	0.03	2.450	0.09	0.391	0.12	0.104	-0.32
294	2.900	0.46	2.500	0.29	0.429	1.10	0.114	0.61
517	3.091	1.15	2.673	1.00	0.429	1.10	0.114	0.61
–	–	– –	–	– –	–	– –	–	– –
Method	ISO 5725-2		ISO 5725-2		ISO 5725-2		ISO 5725-2	
Assessment	|Z|<=2.00		|Z|<=2.00		|Z|<=2.00		|Z|<=2.00	

Laboratory	Hydrochloric aid	Z score	Nitric acid	Z score	Phosphoric acid	Z score	Sulphuric acid	Z score
No. of laboratories that submitted results	26		26		22		22	
Mean	2.772		2.429		0.386		0.107	
Reproducibility s.d.	0.320		0.295		0.018		0.007	
Rel. reproducibility s.d.	11.56 %		12.13 %		4.73 %		6.34 %	
Reference value	2.848		2.650		0.376		0.108	
Target s.d.	0.277		0.243		0.039		0.011	
Rel. target s.d.	10.00 %		10.00 %		10.00 %		10.00 %	
Low er limit of tolerance	2.218		1.943		0.309		0.086	
Upper limit of tolerance	3.326		2.915		0.464		0.129	
Type B outliers	2						1	
Type E outliers	5		7				1	
Type F outliers			4					
No. of laboratories after elimination of outliers type A-D and F (w ithout laboratories that only gave states but no measured values)	24		22		22		21	
Explanation of outlier types								
A: Single outlier	Grubbs							
B: Differing laboratory mean	Grubbs							
C: Excessive laboratory s.d.	Cochran							
D: Excluded manually								
E: mean outside tolerance limits								
F: |Z-Score|>3.50								

Summary of laboratory test results

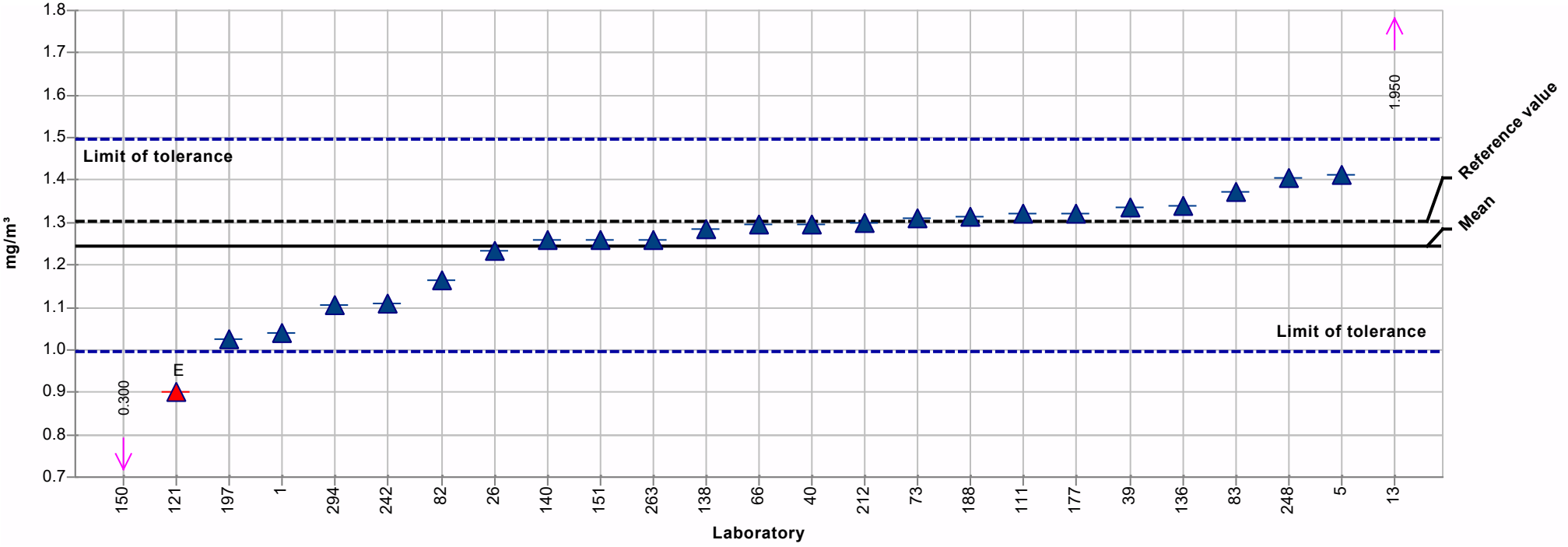
Sample 3

Laboratory	Hydrochloric aid	Z score	Nitric acid	Z score	Phosphoric acid	Z score	Sulphuric acid	Z score
Unit	mg/m³		mg/m³		mg/m³		mg/m³	
1	0.620	-6.34 FE	0.820	-7.01 FE	0.630	-0.62	0.030	-0.20
5	1.643	-0.32	2.665	-0.27	0.667	-0.07	0.029	-0.66
13	2.030	1.97	3.540	2.92 FE	0.696	0.37	0.031	0.12
26	1.655	-0.24	2.607	-0.49	0.669	-0.03	0.046	4.89 BE
39	1.575	-0.71	2.388	-1.28	0.660	-0.17	0.032	0.51
40	1.755	0.34	3.126	1.41	0.687	0.23	0.027	-1.15
66	1.712	0.09	2.773	0.12	0.667	-0.06	0.029	-0.53
73	1.668	-0.17	2.606	-0.49	0.649	-0.33	0.029	-0.53
82	0.531	-6.87 FE	0.877	-6.80 FE				
83	1.593	-0.61	3.084	1.26	0.687	0.23	0.028	-0.86
111	1.830	0.79	2.790	0.18	0.680	0.13	0.031	0.12
121	0.882	-4.80 FE	1.241	-5.47 FE				
136	1.940	1.44	2.790	0.18	0.683	0.17	0.031	0.12
138	1.665	-0.18	2.485	-0.93	0.664	-0.11	0.029	-0.69
140	2.590	5.27 FE	4.170	5.22 FE	0.670	-0.02	0.033	0.61
150			2.250	-1.79	0.700	0.43	0.029	-0.53
151	1.690	-0.04	3.020	1.02	0.690	0.28	0.030	-0.20
177	1.580	-0.69	3.200	1.68	0.610	-0.91	0.020	-3.47 BE
188	1.674	-0.13	2.858	0.43				
197	1.024	-3.96 FE	1.435	-4.76 FE	0.656	-0.23	0.029	-0.43
212	1.790	0.55	2.670	-0.25				
242	1.104	-3.49 E	1.522	-4.44 FE	0.681	0.14	0.032	0.45
248	1.792	0.56	7.623	17.83 BE	0.670	-0.02	0.034	1.10
263	1.710	0.08	2.760	0.08	0.710	0.58	0.034	1.20
294	1.783	0.51	2.667	-0.26	0.833	2.41 BE	0.033	0.78
517	1.736	0.23	2.570	-0.62	0.786	1.71 B	0.033	0.78
–	–	– –	–	– –	–	– –	–	– –
Method	ISO 5725-2		ISO 5725-2		ISO 5725-2		ISO 5725-2	
Assessment	|Z|<=2.00		|Z|<=2.00		|Z|<=2.00		|Z|<=2.00	

Laboratory	Hydrochloric aid	Z score	Nitric acid	Z score	Phosphoric acid	Z score	Sulphuric acid	Z score
No. of laboratories that submitted results	25		26		22		22	
Mean	1.696		2.739		0.671		0.031	
Reproducibility s.d.	0.180		0.253		0.024		0.002	
Rel. reproducibility s.d.	10.62 %		9.23 %		3.50 %		6.82 %	
Reference value	1.818		3.341		0.658		0.029	
Target s.d.	0.170		0.274		0.067		0.003	
Rel. target s.d.	10.00 %		10.00 %		10.00 %		10.00 %	
Low er limit of tolerance	1.357		2.192		0.537		0.025	
Upper limit of tolerance	2.035		3.287		0.806		0.037	
Type B outliers			1		2		2	
Type E outliers	6		8		1		2	
Type F outliers	5		7					
No. of laboratories after elimination of outliers type A-D and F (w ithout laboratories that only gave states but no measured values)	20		18		20		20	
Explanation of outlier types								
A: Single outlier	Grubbs							
B: Differing laboratory mean	Grubbs							
C: Excessive laboratory s.d.	Cochran							
D: Excluded manually								
E: mean outside tolerance limits								
F: |Z-Score|>3.50								

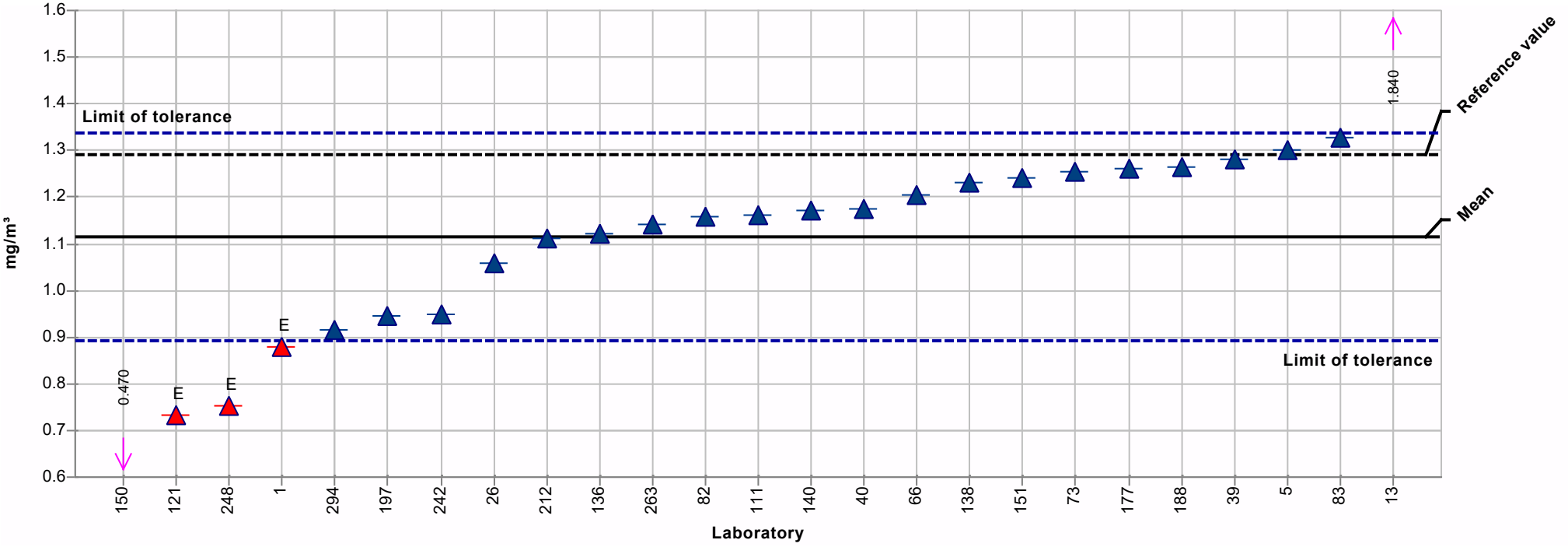
Summary results

Sample:	**1**	**Mean:**	**1.246 mg/m³**
Measurand:	**Hydrochloric aid**	**Reproducibility s.d.:**	**0.129 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**10.39%**
Rel. target s.d.:	**10.00%**	**Reference value:**	**1.302 mg/m³**
Number of laboratories in calculation + outliers:	**25**	**Range of tolerance:**	**0.997 - 1.496 mg/m³ (|Z-Score| <= 2.00)**



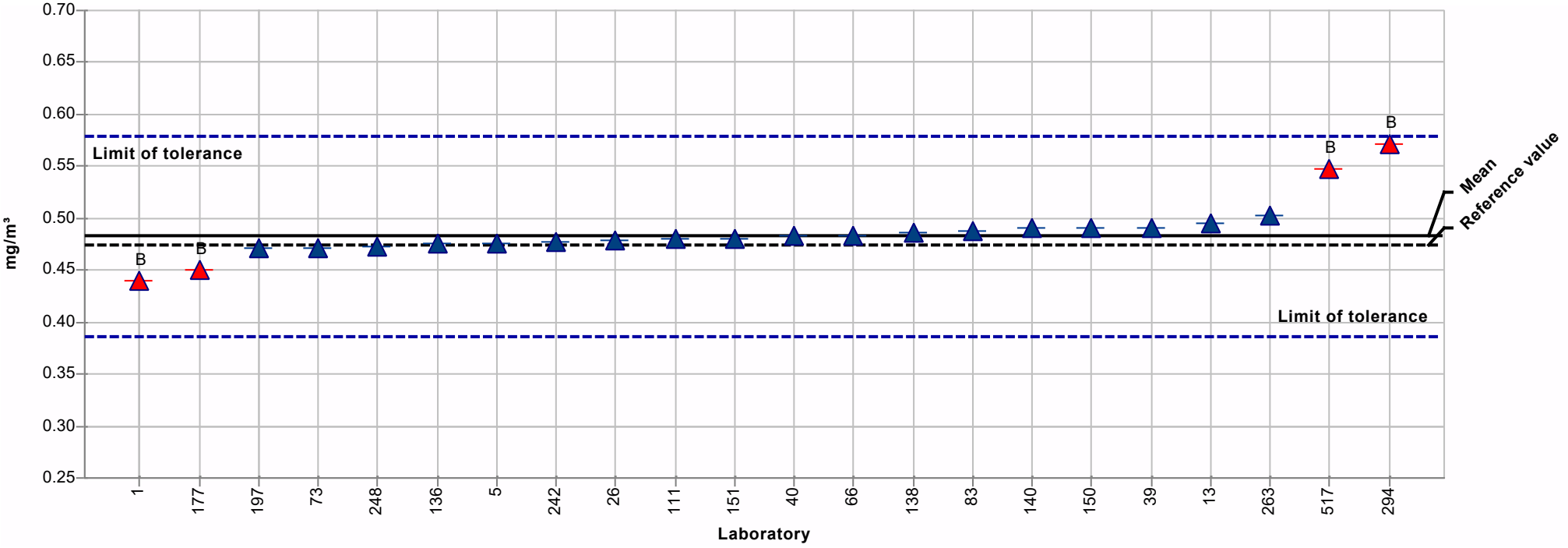
Summary results

Sample:	**1**	**Mean:**	**1.115 mg/m³**
Measurand:	**Nitric acid**	**Reproducibility s.d.:**	**0.172 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**15.44%**
Rel. target s.d.:	**10.00%**	**Reference value:**	**1.290 mg/m³**
Number of laboratories in calculation + outliers:	**25**	**Range of tolerance:**	**0.892 - 1.337 mg/m³ (|Z-Score| <= 2.00)**



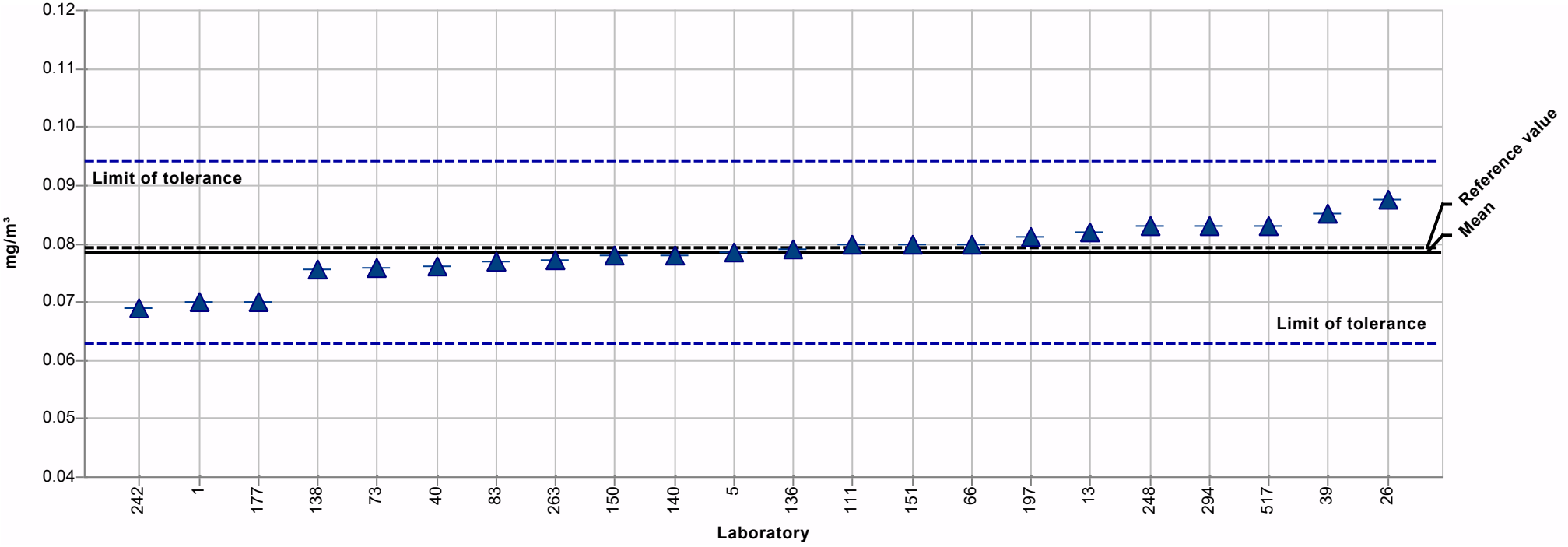
Summary results

Sample:	**1**	**Mean:**	**0.483 mg/m³**
Measurand:	**Phosphoric acid**	**Reproducibility s.d.:**	**0.009 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**1.77%**
Rel. target s.d.:	**10.00%**	**Reference value:**	**0.475 mg/m³**
Number of laboratories in calculation + outliers:	**22**	**Range of tolerance:**	**0.386 - 0.579 mg/m³ (|Z-Score| <= 2.00)**



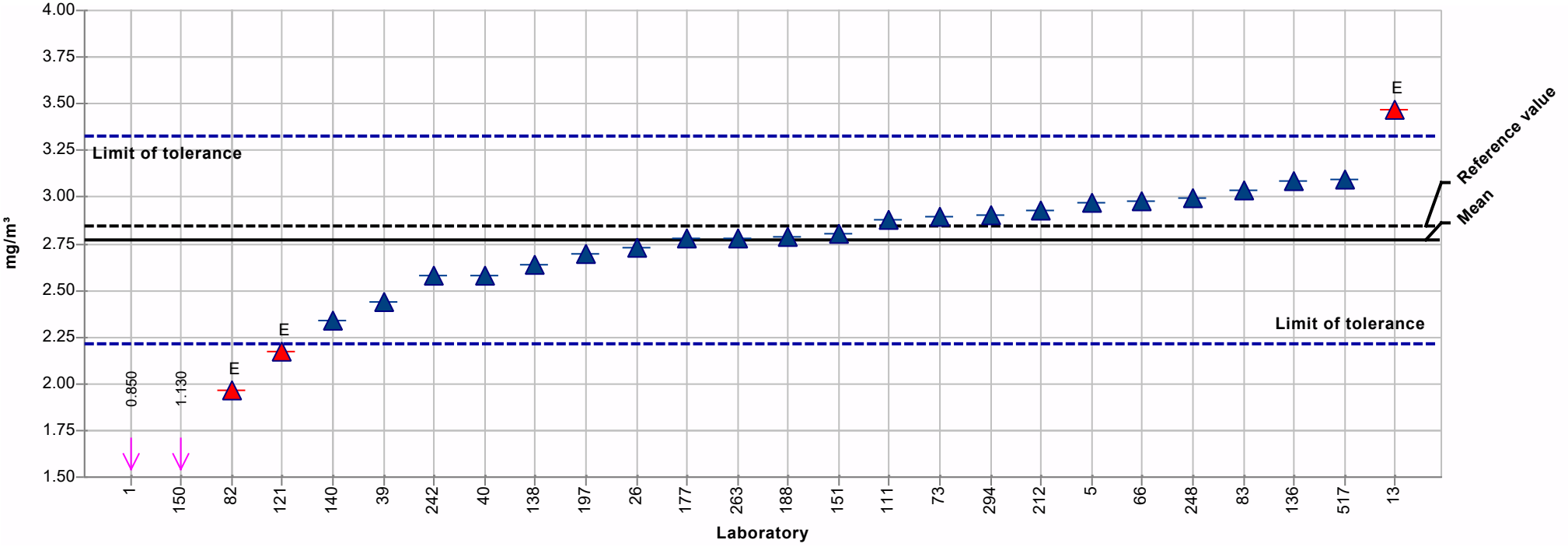
Summary results

Sample:	**1**	**Mean:**	**0.079 mg/m³**
Measurand:	**Sulphuric acid**	**Reproducibility s.d.:**	**0.005 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**6.03%**
Rel. target s.d.:	**10.00%**	**Reference value:**	**0.079 mg/m³**
Number of laboratories in calculation + outliers:	**22**	**Range of tolerance:**	**0.063 - 0.094 mg/m³ (|Z-Score| <= 2.00)**



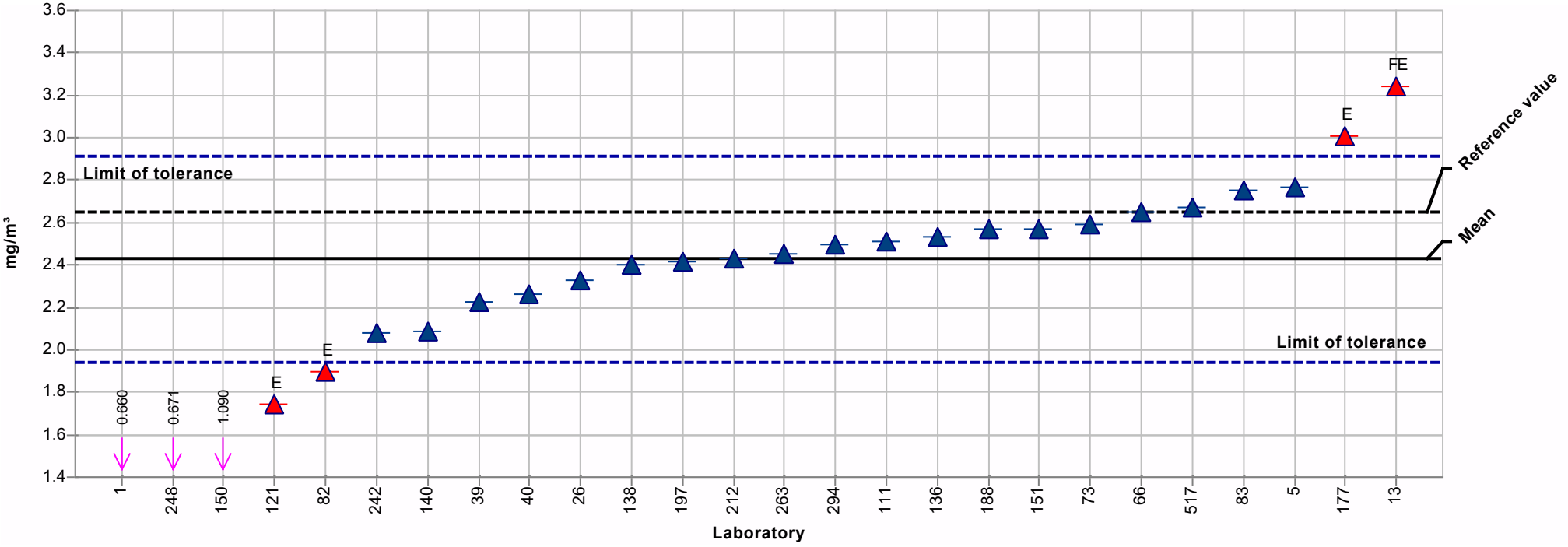
Summary results

Sample:	**2**	**Mean:**	**2.772 mg/m³**
Measurand:	**Hydrochloric aid**	**Reproducibility s.d.:**	**0.320 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**11.56%**
Rel. target s.d.:	**10.00%**	**Reference value:**	**2.848 mg/m³**
Number of laboratories in calculation + outliers:	**26**	**Range of tolerance:**	**2.218 - 3.326 mg/m³ (|Z-Score| <= 2.00)**



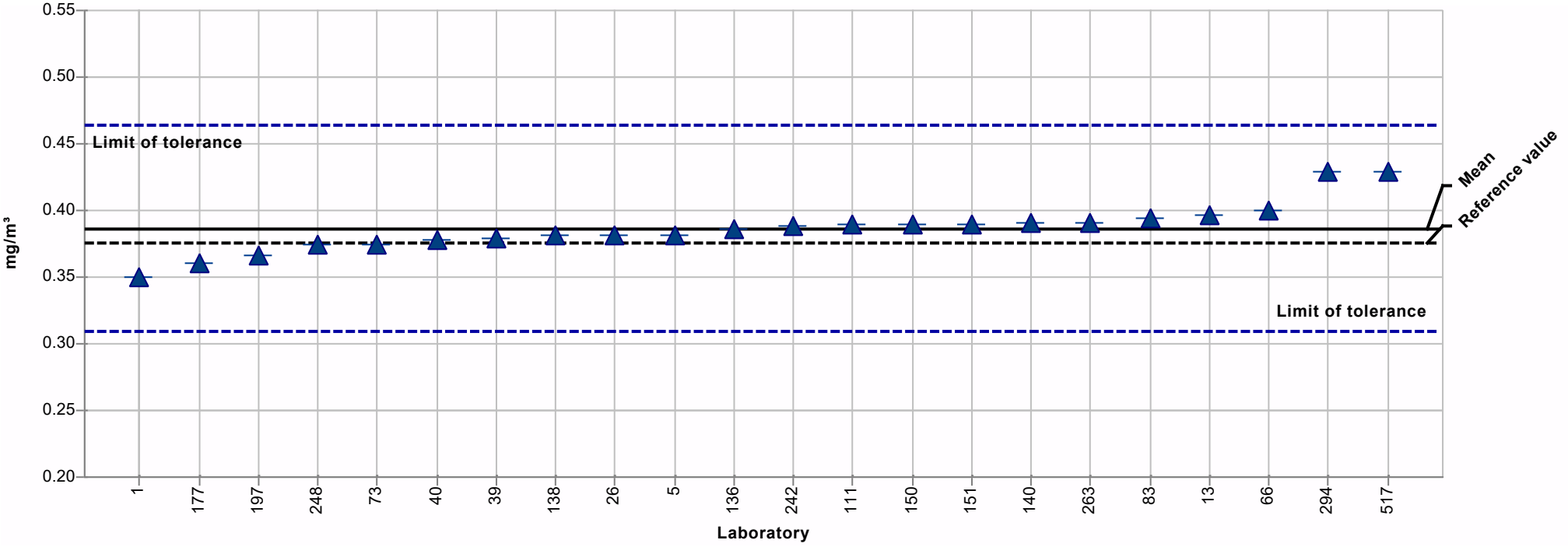
Summary results

Sample:	**2**	**Mean:**	**2.429 mg/m³**
Measurand:	**Nitric acid**	**Reproducibility s.d.:**	**0.295 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**12.13%**
Rel. target s.d.:	**10.00%**	**Reference value:**	**2.650 mg/m³**
Number of laboratories in calculation + outliers:	**26**	**Range of tolerance:**	**1.943 - 2.915 mg/m³ (|Z-Score| <= 2.00)**



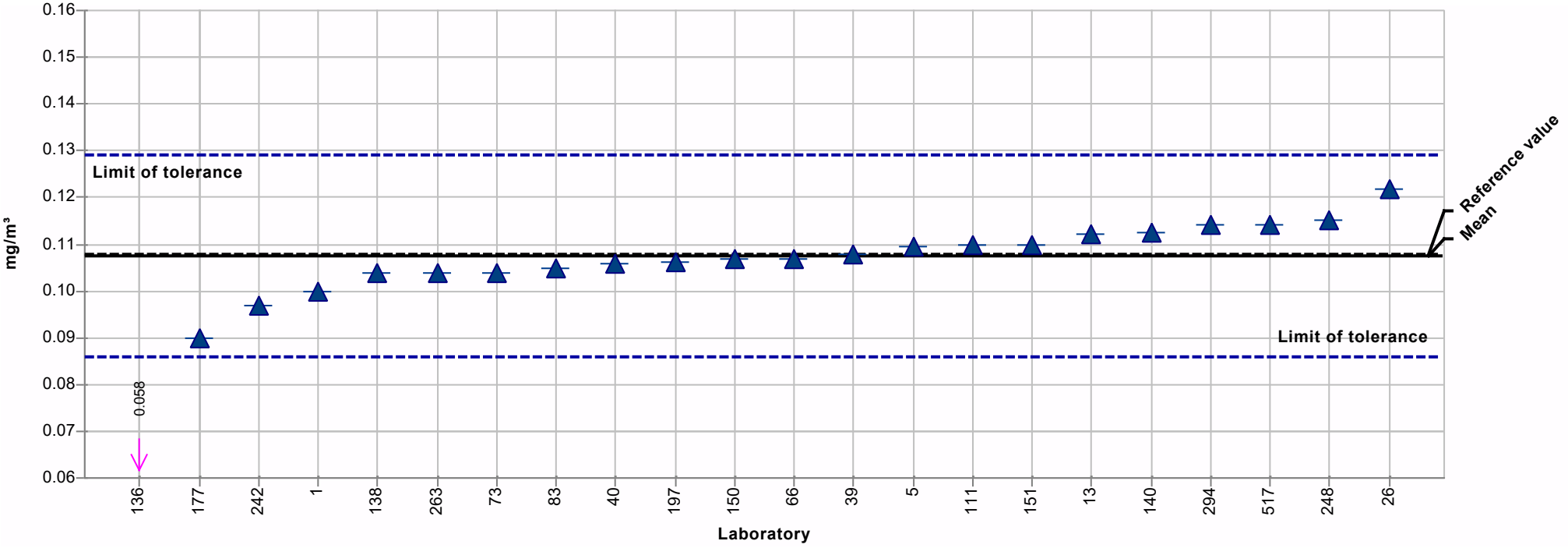
Summary results

Sample:	**2**	**Mean:**	**0.386 mg/m³**
Measurand:	**Phosphoric acid**	**Reproducibility s.d.:**	**0.018 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**4.73%**
Rel. target s.d.:	**10.00%**	**Reference value:**	**0.376 mg/m³**
Number of laboratories in calculation + outliers:	**22**	**Range of tolerance:**	**0.309 - 0.464 mg/m³ (|Z-Score| <= 2.00)**



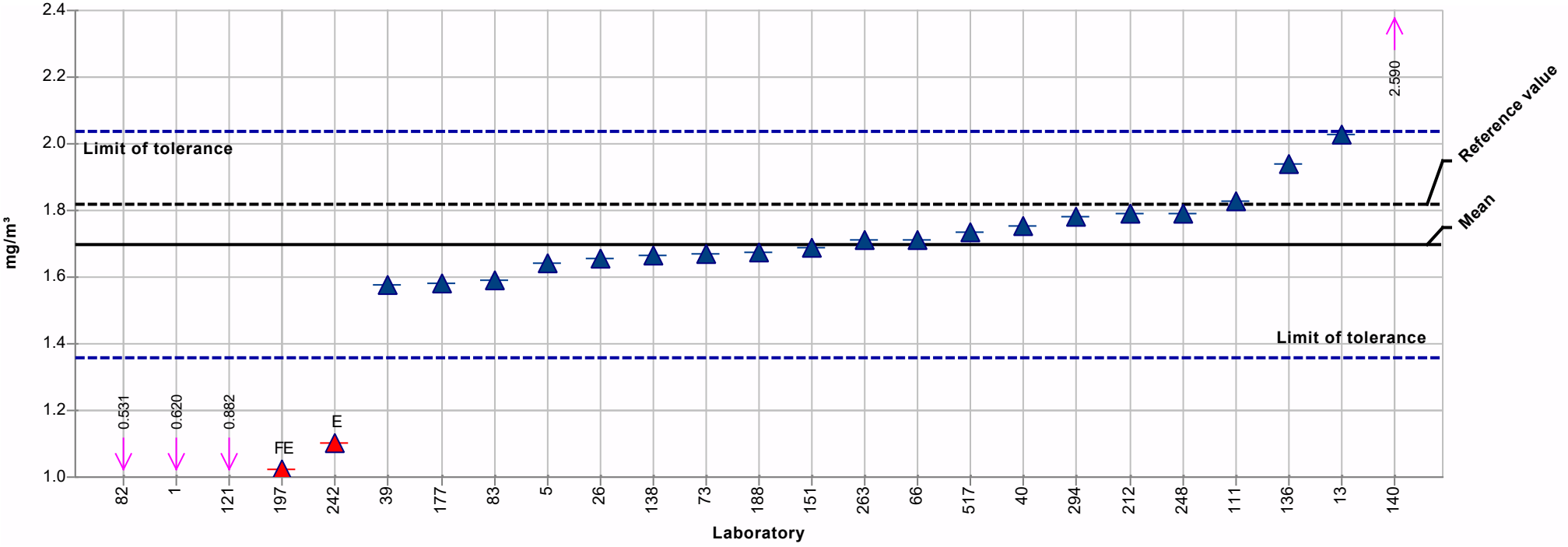
Summary results

Sample:	**2**	**Mean:**	**0.107 mg/m³**
Measurand:	**Sulphuric acid**	**Reproducibility s.d.:**	**0.007 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**6.34%**
Rel. target s.d.:	**10.00%**	**Reference value:**	**0.108 mg/m³**
Number of laboratories in calculation + outliers:	**22**	**Range of tolerance:**	**0.086 - 0.129 mg/m³ (|Z-Score| <= 2.00)**



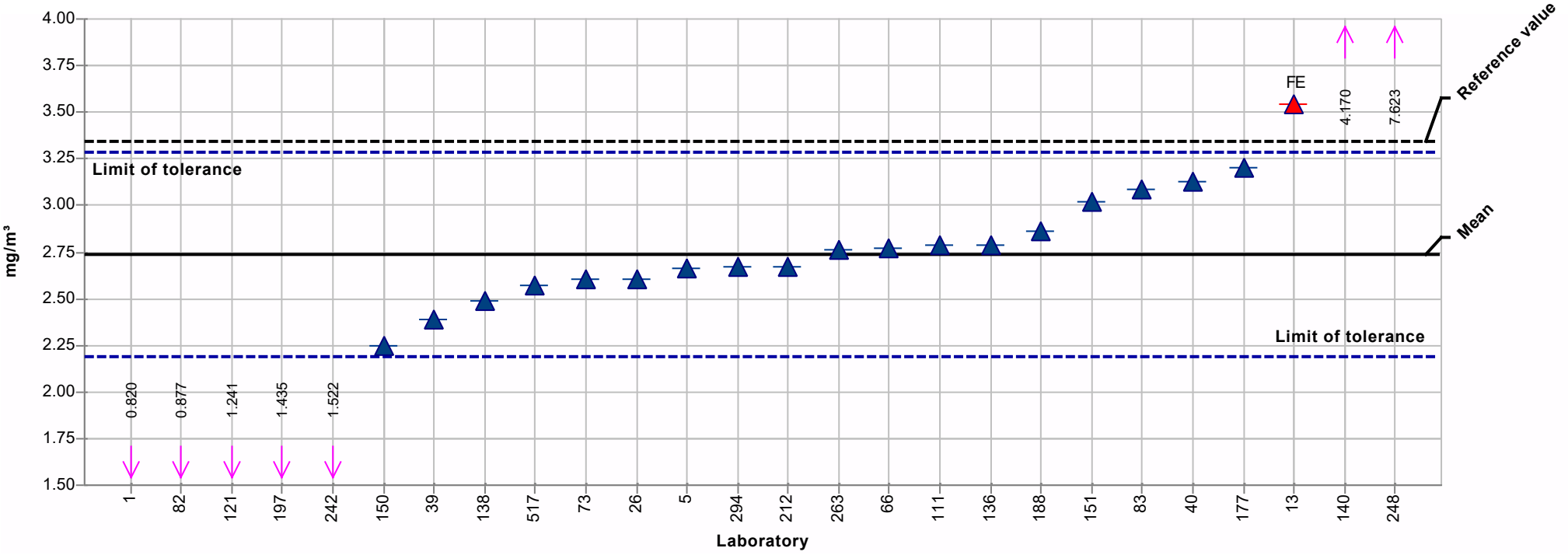
Summary results

Sample:	**3**	**Mean:**	**1.696 mg/m³**
Measurand:	**Hydrochloric aid**	**Reproducibility s.d.:**	**0.180 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**10.62%**
Rel. target s.d.:	**10.00%**	**Reference value:**	**1.818 mg/m³**
Number of laboratories in calculation + outliers:	**25**	**Range of tolerance:**	**1.357 - 2.035 mg/m³ (|Z-Score| <= 2.00)**



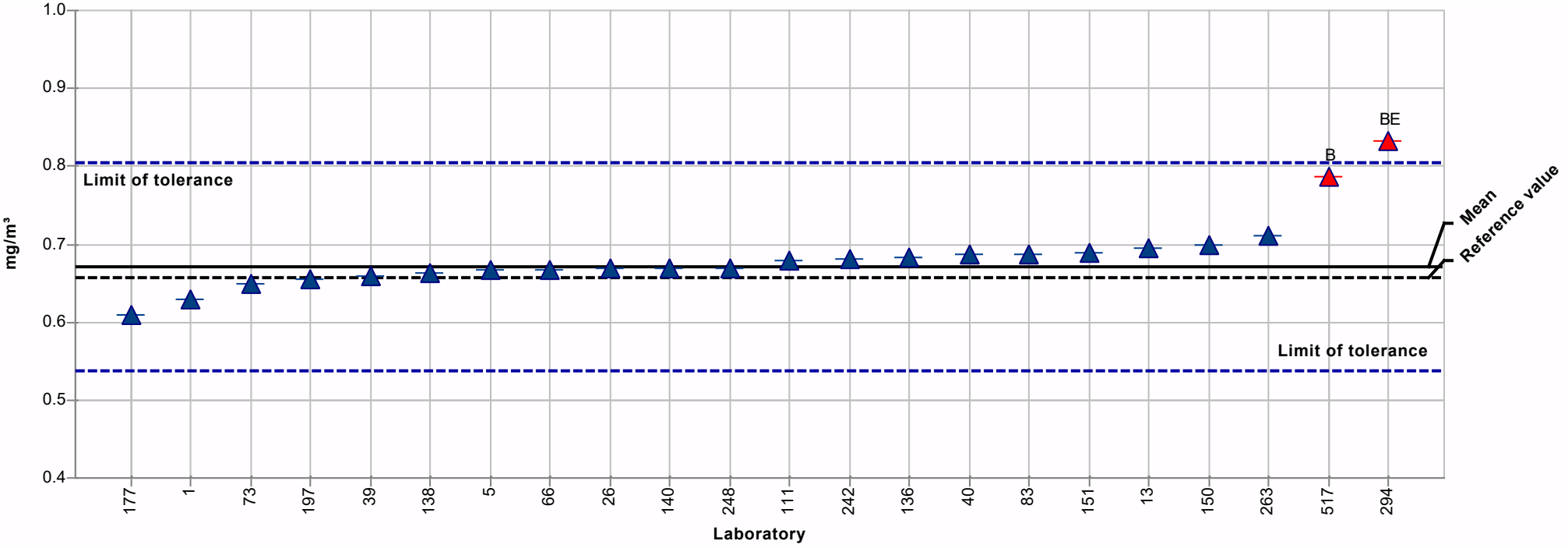
Summary results

Sample:	**3**	**Mean:**	**2.739 mg/m³**
Measurand:	**Nitric acid**	**Reproducibility s.d.:**	**0.253 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**9.23%**
Rel. target s.d.:	**10.00%**	**Reference value:**	**3.341 mg/m³**
Number of laboratories in calculation + outliers:	**26**	**Range of tolerance:**	**2.192 - 3.287 mg/m³ (|Z-Score| <= 2.00)**



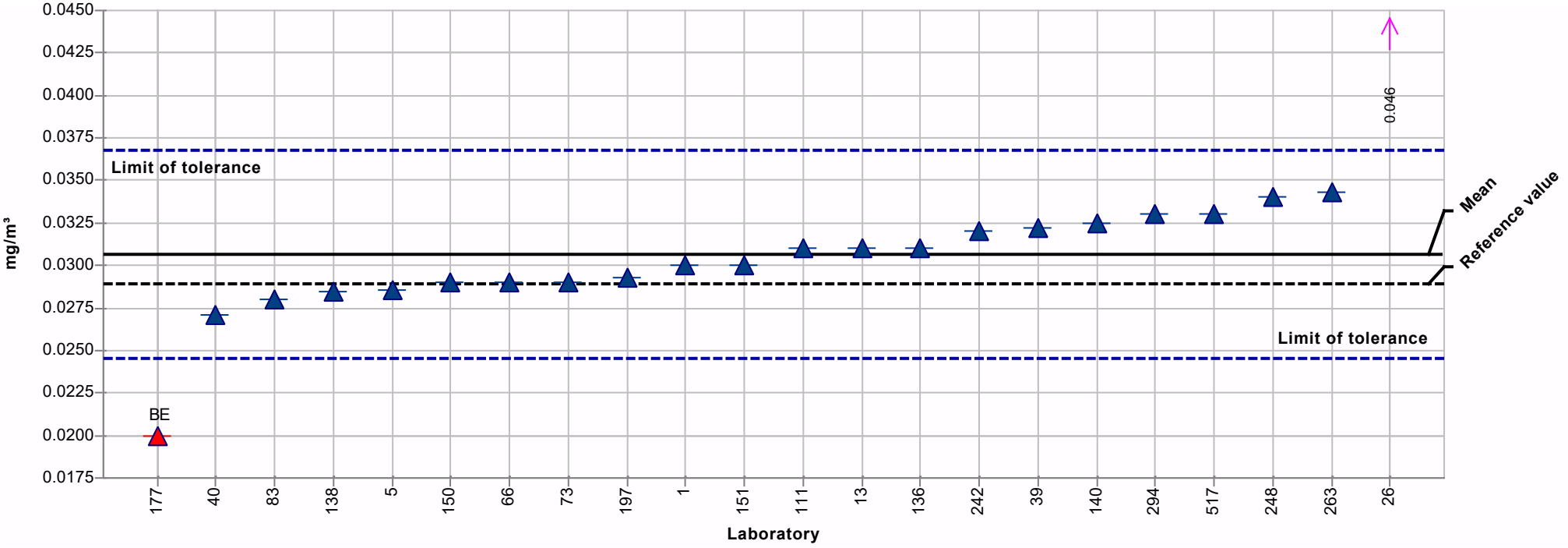
Summary results

Sample:	**3**	**Mean:**	**0.671 mg/m³**
Measurand:	**Phosphoric acid**	**Reproducibility s.d.:**	**0.024 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**3.50%**
Rel. target s.d.:	**10.00%**	**Reference value:**	**0.658 mg/m³**
Number of laboratories in calculation + outliers:	**22**	**Range of tolerance:**	**0.537 - 0.806 mg/m³ (|Z-Score| <= 2.00)**



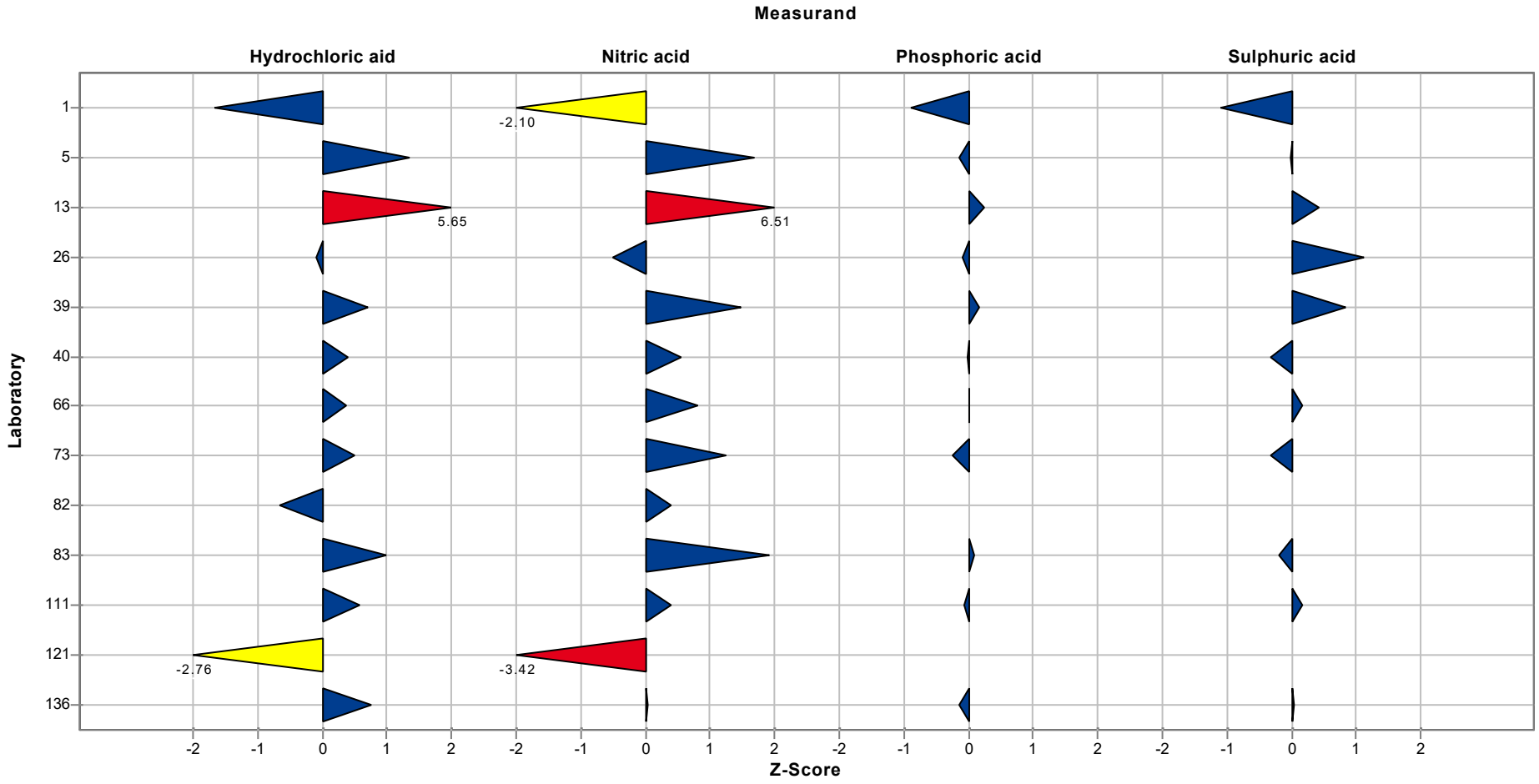
Summary results

Sample:	**3**	**Mean:**	**0.031 mg/m³**
Measurand:	**Sulphuric acid**	**Reproducibility s.d.:**	**0.002 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**6.82%**
Rel. target s.d.:	**10.00%**	**Reference value:**	**0.029 mg/m³**
Number of laboratories in calculation + outliers:	**22**	**Range of tolerance:**	**0.025 - 0.037 mg/m³ (|Z-Score| <= 2.00)**



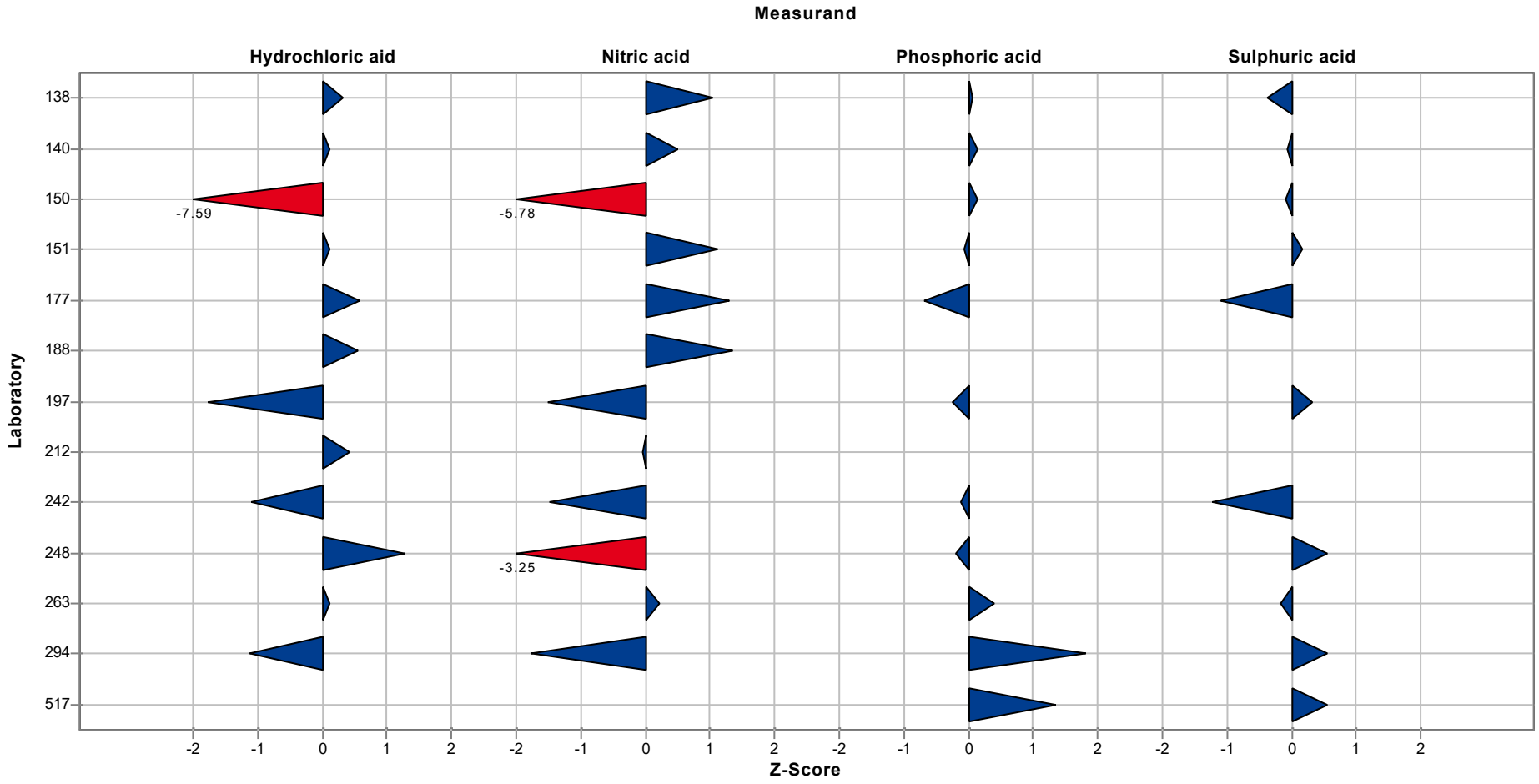
Sample chart of *Z-Scores*

Sample: 1



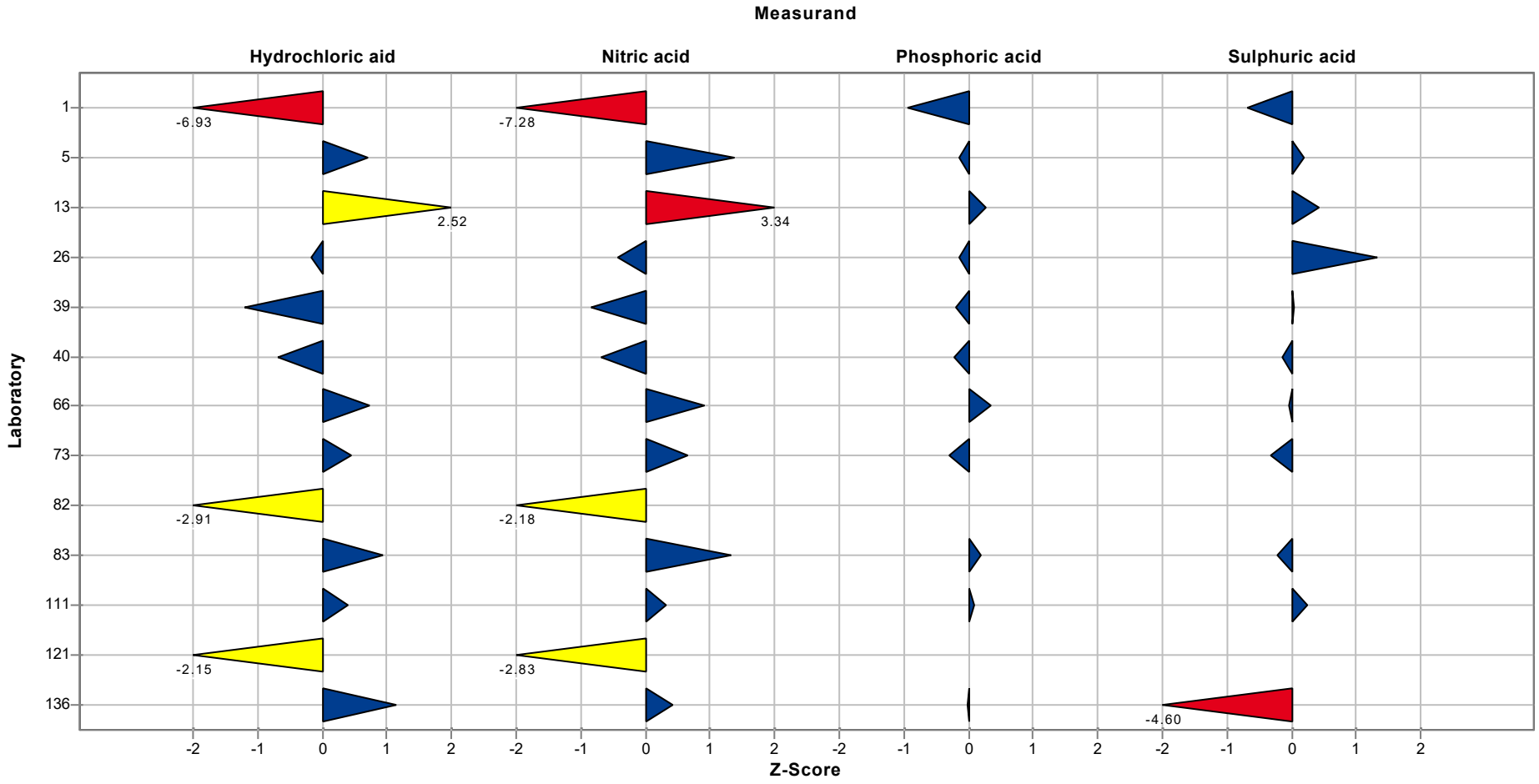
Sample chart of *Z-Scores*

Sample: 1



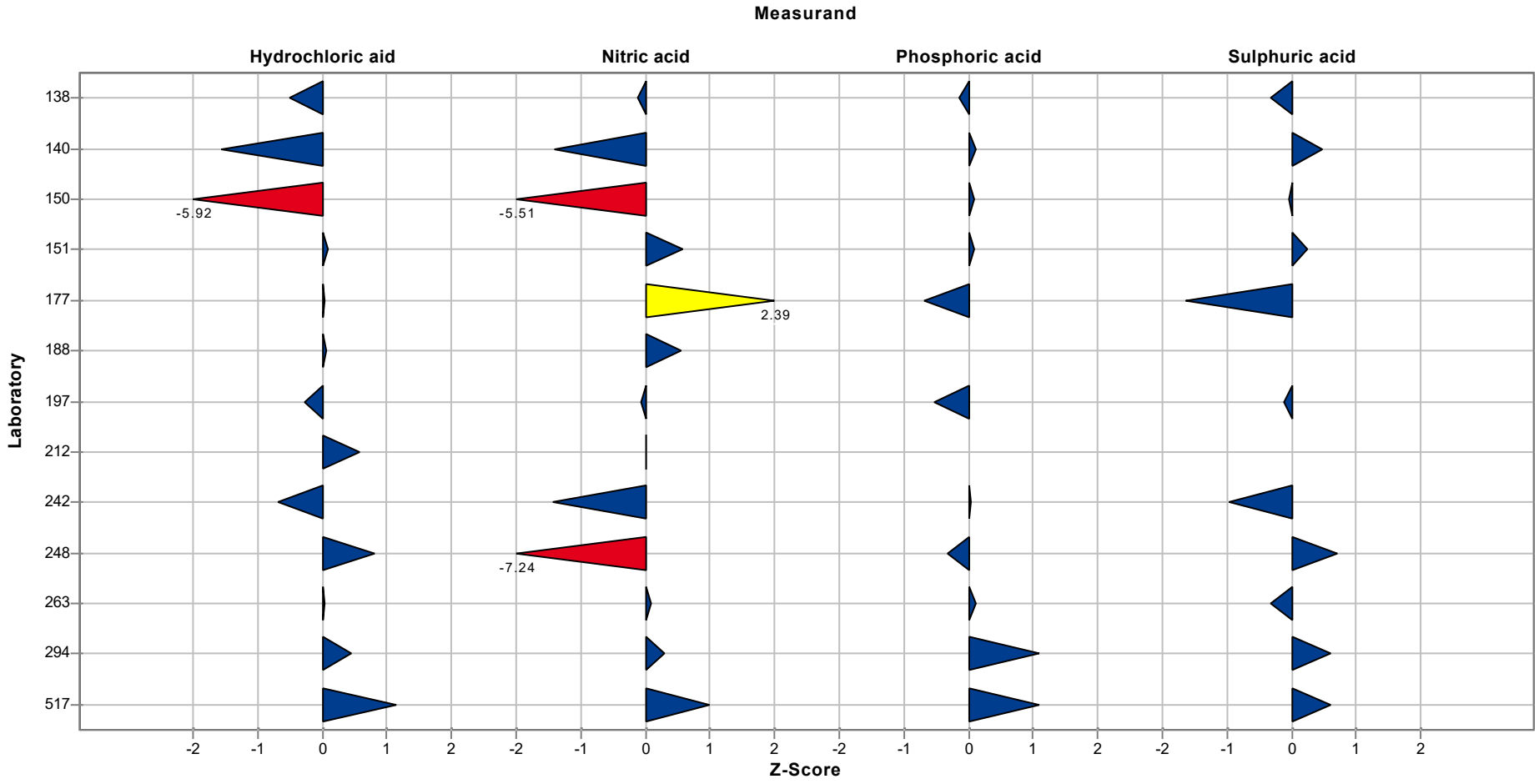
Sample chart of *Z-Scores*

Sample: **2**



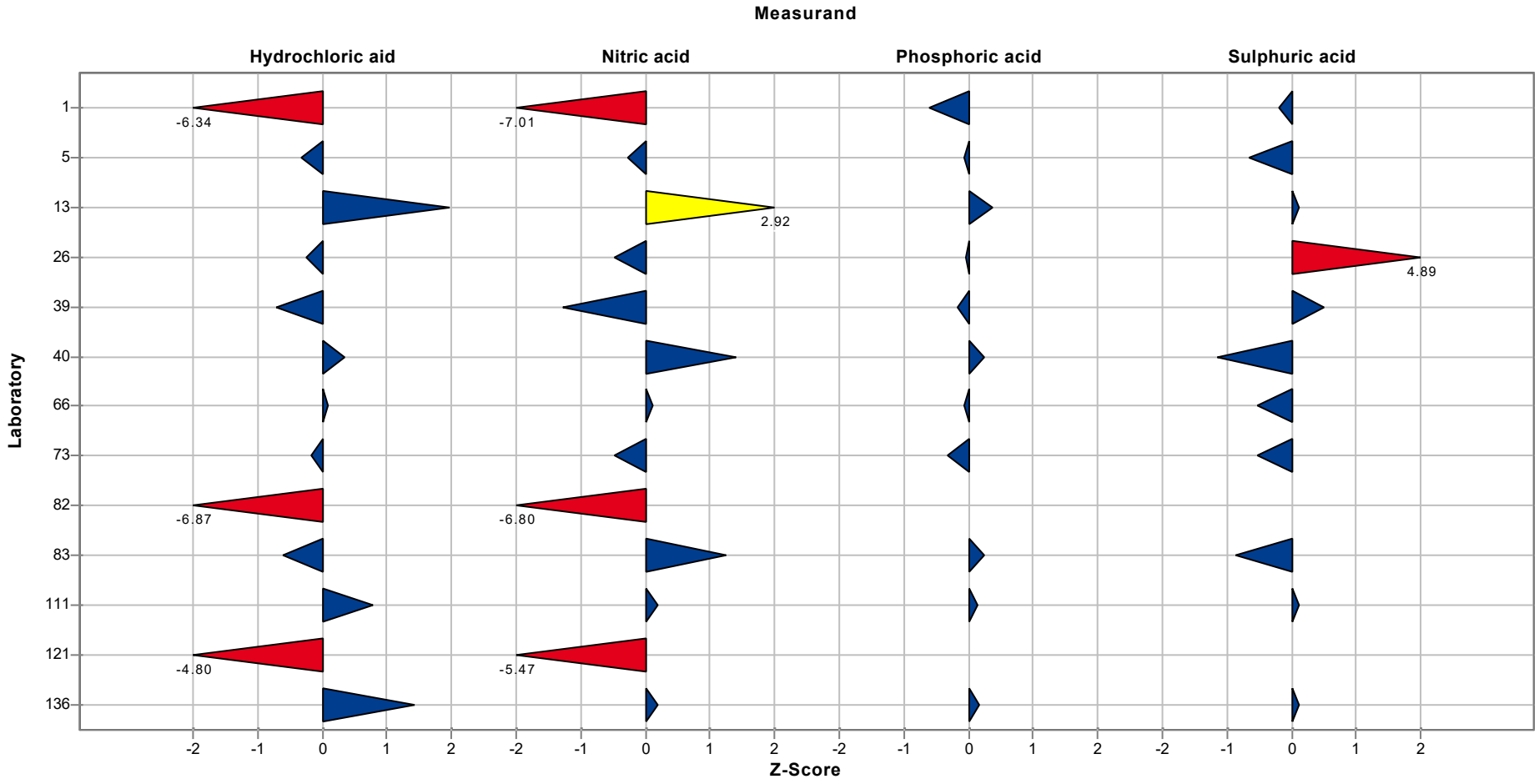
Sample chart of *Z-Scores*

Sample: **2**



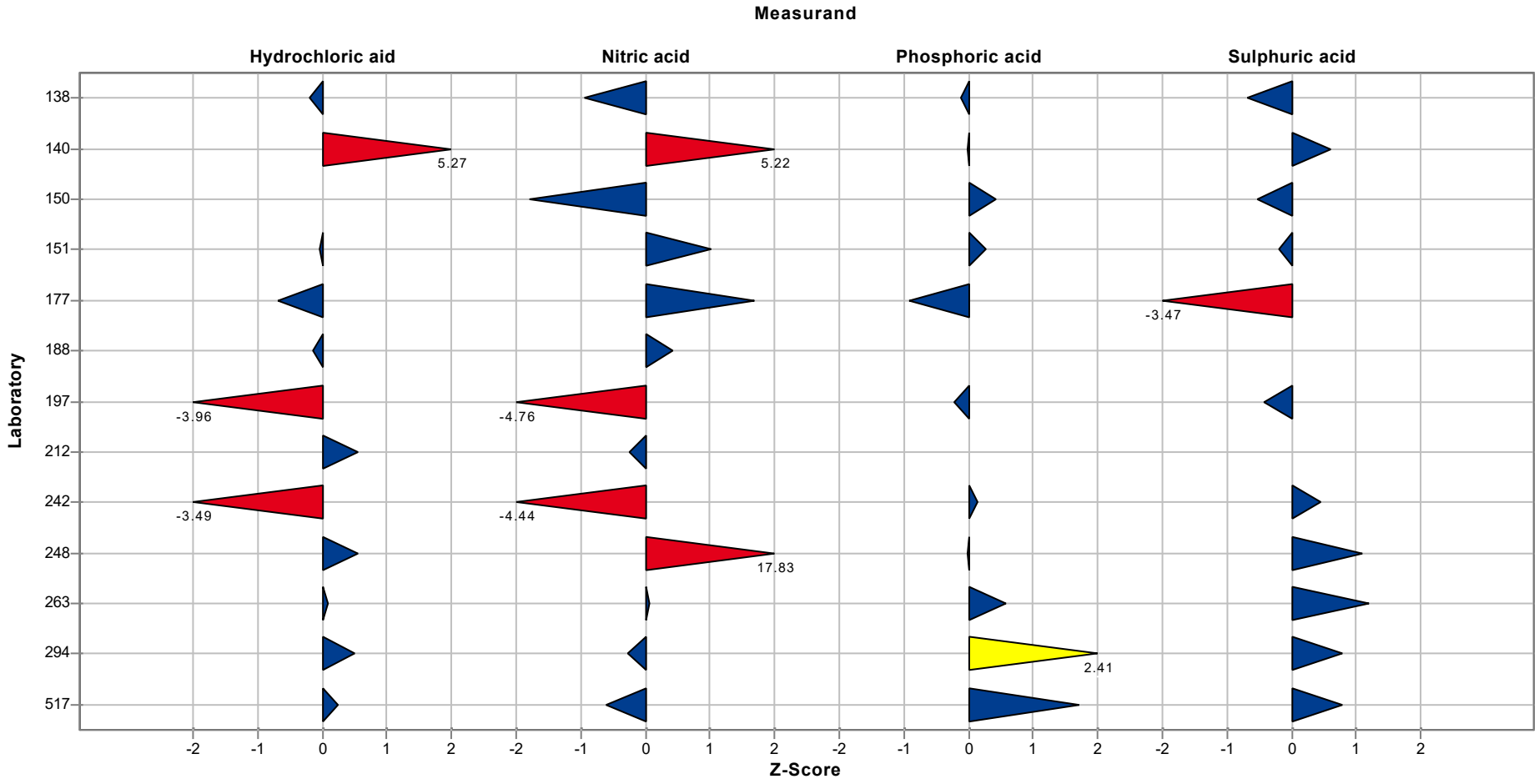
Sample chart of *Z-Scores*

Sample: 3



Sample chart of *Z-Scores*

Sample: 3



Questions and Answers

Participant	Sample carrier HCl/HNO3	Prefilter chlorides/nitrates
1	Doppelfilterkombination aus behandeltem und unbehandeltem Filter nach IFA 6172	ja
5	Imprägnierte Quarzglasplanfilter	JA
26	Doppelfiltersystem aus 2x imprägniertem QF-Filter	ja
39	Quarzfaserfilter, imprägniert mit 1,0 mol/L Na2CO3-Lösung	ja
40	Millipore Filterhaltersystem mit Na2Co3 belegte Filter	nein
66	Doppelfilter gemäß IFA 6172	ja
111	QFF mit Na2CO3/NaCO3 imprägniert	ja
121	QF-Filter 37 mm	Ja
136	Doppelfilter - Vorfilter und imprägnierter Filter	Ja
138	Filterkassette	Ja
140	Quarzfaserfilter Sartorius Q3400	ja
150	Orbo 53 Röhrchen	ja
197	Quarzfaserfilter	nein
212	Quarzfaserfilter imprägniert mit Na2CO3	Ja
242	alkalisch impägnierte Quarzfilter (37 mm MN)	ja
263	imprägnierte Quarzfaserfilter 37 mm in IFA-Kassette	ja, QF 37 mm
294	Doppelfilterkombination aus einem nicht imprägnierten und einem imprägnierten Quarzfaserfilter	Ja
517	Doppelfilter gemäß IFA 6172	ja

Participant	Sampling pump	Flow rate sampling	Flow rate measurement
1	SKC XR5000	Volumenstrom 2 l/min	elektron. Massflow meter TSI 4146
26	Gilian GilAir5	2,00 l/min	DryCal
39	Gilian GilAir Plus		Gilibrator 3
40	Gillian Probenahmepumpen		Bios Defender-510-M
66	SKC AirChek TOUCH	2 L/Min	Analyt-MTC 35812 MLWB
111	GilAir	2 l/min	BIOS Defender
121	Gilian GilAir Plus	2 L/min	Defender 510
136	GilAir Plus	1 l/min	Casella Flow Detective
138	SKC PCXR8		Analyt-MTC Massendurchflussmesser 35813MLWB
140	GSA SG4000 ex	2 L/min	TSI 4100

Inorganic acids with own sampling 2024

Participant	Sampling pump	Flow rate sampling	Flow rate measurement
150	GSA SG 4000 bzw . 5100	0,5 L/min	DryCal DCL-ML
197	GilAIR Plus	2000 ml/min	Analyt MTC Massenflußmesser
212	GilAir Plus	1 l/min	defender 200-510H
242	GilAir 5	1,9 L/min	TSI Massflow
263	GilAir Plus	2 L/min	TSI 4164 Massendurchflussmesser
294	SG 10 2-A	2 l/min	GSA Rotameter, Fa. INFLUX (1-13 l/min)
517	GSA SG 5100	2 L/Min	Analyt-MTC 35812 MLWB

Participant	Sampling time	Analytical method
1	15 Minuten bis 2 Stunden	
26	120 Min	IFA 6172 (2023-12) / IFA 6173 (2016-05)
39		Die Analytik erfolgte gemäß interner CAM-0655902-19D Verfahren A.
40	120 min, 120 min und 20 min.	eigene SAA in Anlehnung an IFA 6172
66		IFA 6172/ IFA 6173
111	120 bzw . 15 Minuten	IFA 6172 bzw . IFA 6173
121	60-120	6172
136	2h und 15min	IFA 6173/ IFA 6173
138	120 min, 15 min	IFA 6172, IFA 6173
140		6172, 6173 (nachfolgend in dieser Reihenfolge)
150	2 h Probenahme	DFG "flüchtige anorganisch Säuren Methode 1", Ausgabe 04.1997
197	120 min	IFA 6172/6173
212	2h, 15 min	IFA 6172
242	Probenahmen über 15, 60 und 120 min	IFA 6172
263	Probe 1 und 2 120 Minuten und 2 x 60 Minuten Probe 3 4x15 Minuten	IFA 6172 und IFA 6173
294	120 min, 15 min	IFA 6172, IFA 6173
517		IFA 6172 / IFA 6173

Participant	Desorption solution
1	Reinstw asser
26	Reinstw asser
39	Reinstw asser
40	Milli-Q-Wasser mit internen Standard (Oxalsäure)
111	Reinstw asser

Participant	Desorption solution
121	keine Angabe vom Analyselabor
136	nach IFA 6173/ IFA 6173
140	Reinstw asser Pufferlösung 3,1 mmol/l Natriumcarbonat + 0,35 mmol/l Natriumhydrogencarbonat (Filter w aren schon versetzte)
150	Carbonatpuffer
197	NaHCO3/Na2CO3
212	Demineralisiertes Wasser
242	Reinstw asser
263	Wasser nanopur
294	HCl, HNO3 mit H2O; H2SO4, H3PO4 mit der mitgelieferten Desorptionslösung vom RV

Participant	Volume of desorption solution
1	10 ml
26	30 ml
39	10 mL
40	10
111	10 ml
121	keine Angabe vom Analyselabor
136	nach IFA 6173/ IFA 6173
140	10 ml 4 ml
150	10 ml
197	20
212	10 mL
242	10 mL
263	10 mL
294	HCl, HNO3 mit 10 mL H2O; H2SO4, H3PO4 mit der mitgelieferten Desorptionslösung (4 mL) vom RV

Participant	Time of desorption
1	15 Minuten Ultraschall, 30 min stehen lassen bei Raumtemperatur
26	15 Minuten im Ultraschallbad
39	15 min Ultraschallbadbehandlung, 30 min Ruhen lassen, im Anschluss Filtration und Analytik
40	15 min. im Ultraschallbad
111	15 min. Ultraschall, 30 min. Einw irkzeit
121	keine Angabe vom Analyselabor

Participant	Time of desorption
136	nach IFA 6173/ IFA 6173
140	15 Minuten im Ultraschallbad + 30 Minuten stehen lassen 15 Minuten im Ultraschallbad + 30 Minuten stehen lassen
150	15 min Ultraschall
197	U-Bad 15 min, 30min stehenlassen
212	15 Minuten im Ultraschallbad und 30 Minuten stehen
242	lassenentsprechend IFA 6172
263	1 Stunde
294	alles 15 min Ultraschall, 30 min stehen lassen

Participant	Ion Chromatography (IC)
1	Dionex/Thermo-Seintific
26	Leitfähigkeitsdetektor, 858 Professional Sample Processor, 930 IC Compact IC Flex, Deutsche Metrohm
39	Pumpe: Hochdruckpumpe, Detektor: Leitfähigkeitsmesszelle, Autosampler: Metrohm
40	Dionex ICS 5000+
111	Thermo ICS 2100
121	keine Angabe vom Analyselabor
136	/
140	Isokratische Zw eikolbenpumpe, Für Chlorid w urde der Leitfähigkeitsdetektor verw endet, für Nitrat w urde der UV-Detektor verw endet, AS-AP Autosampler der Firma ThermoFisher Isokratische Zw eikolbenpumpe
150	Ionenchromatograf ASSY Aquion DG, Fa. Thermo Fisher, Autosampler AS_DV
197	Metrohm 861 Compact IC, 838 Sampler, LF-Detektor, Doppelkolbenhochdruckpumpe
212	881 Compact IC Pro mit 585 Professional Sample Processor (Metrohm)
242	Metrohm 850 Professional System
263	Thermo Fisher Aquion, DG, AS-DV Autosampler 5 mL
294	AQUION, DG, CM7-SE / AS-AP Autosampler, Basis Konfiguration / Leitfähigkeitsdetektor

Participant	Analytical column
1	AS 23
26	ASupp 5 / 150, Deutsche Metrohm
39	IonPac AS11
40	AS11 HC mit Vorsäule
111	Dionex IonPac AG 9-HC (4 x 50 mm) und AS 9-HC (4 x 250 mm
121	keine Angabe vom Analyselabor

Inorganic acids with own sampling 2024

Participant	Analytical column
136	nach IFA 6173/ IFA 6173
140	AS14A Trennsäule von ThermoFisher AS14A Trennsäule von ThermoFisher
150	Dionex Ion Pac AS 22, 4 x 250 mm
197	Metrosep S Supp5
212	Metrosep A Supp 5-150
242	ASUPP 5 (4 x 250 mm)
263	IonPac AG23 Vorsäule 4x50mm und IonPac AS23 Trennsäule 4x250mm
294	Vorsäule: IonPac AG22, 2x50mm / Trennsäule: IonPac AS22, 2x250mm

Participant	Mobile phase IC
1	4,2 mmol Na2CO3-Lsg. / 1 mmol NaHCO3-Lsg.
26	3 mmol NaCO3 / 1 mmol NaHCO3
39	NaOH
40	KOH- 1,5mM
111	9 mM Natriumcarbonat
121	keine Angabe vom Analyselabor
136	nach IFA 6173/ IFA 6173
140	848 mg/l Natriumcarboonat und 84 mg/l Natriumhydrogencarbonat 848 mg/l Natriumcarboonat und 84 mg/l Natriumhydrogencarbonat
150	0,48 g Nacarbonat und 0,12 g Nahydrogencarbonat in 1 L Wasser
197	1mmol/l NaHCO3 / 3,2 mmol/l Na2CO3
212	3,2 mM Na2CO3 /1,0 mM NaHCO3
242	4 mM Na2CO3
263	Na2CO3 + NaHCO3
294	Eluent: 4,48 mM Na2CO3 und 1,4 mM NaHCO3

Participant	Flow rate IC
1	1,0 l/Minute
26	0,7
39	1,8 ml/min
40	0,3
111	1
121	keine Angabe vom Analyselabor
136	/

Inorganic acids with own sampling 2024

Participant	Flow rate IC
140	1 ml/min 1 ml/min
150	1,0
197	0,65
212	0,7
242	0,7 mL/min
263	1 mL/min
294	0,3 ml/min

Participant	Recovery rate
1	nein
26	nein
39	nein
40	ja, 97% bei HCl, 98% bei HNO3-ermittelte Wiederfindungen aus Methodenvalidierung
111	nein
121	keine Angabe vom Analyselabor
136	wahrscheinlich ja
140	Nein Nein
150	nein
197	nein
212	Nein, die Ergebnisse wurden nicht um die Wiederfindungsraten korrigiert (die in unserem Labor bei der Überprüfung der Methode ermittelten Wiederfindungsraten betragen 104 % für HCl und 102 % für HNO3).
242	nein
263	nein
294	keine Wiederfindungsraten berücksichtigt

Participant	Date of analysis
1	08./11.04.2024
26	02. und 15.04.2024
39	12.04 -15.04.2024
40	25.3.-27.03.2024
66	26.03. - 02.04.2024
111	03./08.04.2024
121	08.042024

Inorganic acids with own sampling 2024

Participant	Date of analysis
136	vom 8.4.2024 bis 19.4.2024
138	12.04.2024 - 23.04.2024
140	Zwischen dem 28.03.2024 – 08.04.2024 Zwischen dem 28.03.2024 – 08.04.2024
150	5.4.2024
197	28.3.2024
212	04.04.2024 + Wiederholmessung am 25.04.2024 und 17.04.2024
242	siehe Dateneingabe
294	alles am 09.04.
517	26.03. - 15.04.2024

Questions and Answers

Participant	Analytical method
13	AIR-ANAL-34 (HCl and HNO3) and AIR-ANAL-35 (H3PO4 and H2SO4)
73	IFA Arbeitsmappe 6172 (Salzsäure und Salpetersäure) 6173 (Schw efelsäure und Phosphorsäure)
82	Hausinterne Methode
83	X43-281
151	Ion Chromatograph
177	IFA-Arbeitsmappe
188	IFA-Arbeitsmappe Lfg. 2/23 XII/23
248	IFA 6172 und IFA 6173

Participant	Desorption solution	Volume of desorption solution
13	The mobile phase of the analysis w as used	10 ml
73	6172: Reinstw asser / 6173: w ie angeliefert	6172: 10ml / 6173: 4ml w ie angeliefert
82	3,2 mmol Natriumcarbonat und 1 mmol Natriumhydrogencarbonat	25 ml
83	Demineralized w ater	30 mL for filters
151	deionised w ater	10ml
177	Reinstw asser	50 ml bzw . 20 ml
188	Reinstw asser	20 ml
248	Mit Reinstw asser.	10 ml

Participant	Time of desorption
13	15 min ultrasonic
73	6172: 15 min Ultraschallbad + 30 min Wartezeit / 6173: angelieferte 4ml Desorptionslösung mit Filter 15 min Ultraschallbad + 30 min Wartezeit
82	15 min im Ultraschallbad
83	30 minutes
151	1 hour orbital shaker
177	30 Minuten im Ultraschallbad
188	15 Minuten Ultraschallbad + 30 Minuten stehen gelassen
248	15 min Ultraschallbad, Standzeit 30 min

Participant	Ion Chromatography (IC)	Analytical column
13	ICS1100 IC w ith conductivity detector and AS-DV autosampler	Dionex IonPac AS-22 RFIC w ith guard column
73	Isokratische Pumpe / Leitfähigkeitsdetektor / Autosampler	Jew eils AS14A
82	Metrohm 861	Metrosept ASupp 5-250
83	Conductivity detection method	AS9HC Dionex for H3PO4 and AS11HC Dionex for HCl, HNO3 and H2SO4
151	n/a	AS22
177	Thermo Scientific ICS-6000 mit Autosampler AS-AP	AS 15
188	IC 930 flex von Metrohm	Metrosep A Supp 4-250/4.0
248	Detektor DS 6, Autosampler AS-AP, Pumpe HPG-3200 SD	AS22

Participant	Mobile phase IC	Flow rate IC
13	1,4 mM NaHCO3 en 4,5 mM Na2CO3	0,3 ml/min
73	Jew eils Na2CO3/ NaHCO3	0,5 ml/min
82	3,2 mmol Natriumcarbonat und 1 mmol Natriumhydrogencarbonat	0,7
83	Na2CO3 + NaOH for H3PO4 and KOH for HCl, HNO3 and H2SO4	1 mL/min
151	4.5 mM Na2CO3 / 1.4 mM NaHCO3	0.3
177	KOH 12-48 mmol/l	0,3
188	Eluent Natriumcarbonat 1,8 mol/l Natriumhydrogencarboat 1,7 mol/l	1 ml/min
248	NaHCO3 / Na2CO3	1,3

Participant	Recovery rate
13	No recovery rates have been used in the calculation
73	Nein. QC Standard w ird immer mit analysiert, aber nicht mit eingerechnet.
82	Nein
83	No
248	nein

Participant	Date of analysis
13	15/04/2024 and 16/04/2024 for H3PO4 and H2SO4 and HCl and HNO3 respectively
73	s.o.
82	24.04.2024
83	March 28 and April 02
151	4/4/24

Participant	Date of analysis
177	30.04.2024
188	11.04.2024
248	15.04.24