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 own sampling

20 – 21 March 2018

Part 1: Volatile inorganic acids

Institute for Occupationial Safety and Health of the
German Social Accident Insurance (IFA)
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Summary of laboratory test results

Measurand hydrochloric acid

Laboratory	Sample 1	Z score	Sample 2	Z score	Sample 3	Z score
Unit	mg/m³		mg/m³		mg/m³	
3	0.460	-1.56	4.450	-0.92	2.690	-2.20 E
5	0.518	-0.50	4.622	-0.57	3.247	-0.59
6	0.625	1.47	5.569	1.37	4.233	2.27 E
64	1.200	12.01 BE	5.000	0.21	3.700	0.73
66	0.560	0.27	4.670	-0.47	3.440	-0.03
111	0.590	0.82	5.077	0.36	3.510	0.18
130	0.508	-0.68	4.750	-0.30	3.100	-1.01
212	0.538	-0.13	4.710	-0.39	3.250	-0.58
243	0.547	0.04	4.832	-0.14	3.319	-0.38
259	0.560	0.27	5.310	0.84	4.000	1.60
263	0.195	-6.42 BE	3.150	-3.57 BE	0.132	-9.62 BE
–	–	– –	–	– –	–	– –
Method	ISO 5725-2		ISO 5725-2		ISO 5725-2	
Assessment	|Z|<=2.00		|Z|<=2.00		|Z|<=2.00	
No. of laboratories that submitted results	11		11		11	
Mean	0.545		4.899		3.449	
Reproducibility s.d.	0.048		0.342		0.445	
Rel. reproducibility s.d.	8.77 %		6.98 %		12.90 %	
Reference value	0.590		4.810		3.340	
Target s.d.	0.055		0.490		0.345	
Rel. target s.d.	10.00 %		10.00 %		10.00 %	
Low er limit of tolerance	0.436		3.919		2.759	
Upper limit of tolerance	0.654		5.879		4.139	
Type B outliers	2		1		1	
No. of measurement values outside of tolerance limits	2		1		3	

Laboratory	Sample 1	Z score	Sample 2	Z score	Sample 3	Z score

Explanation of outlier types	
A: Single outlier	Grubbs
B: Differing laboratory mean	Grubbs
C: Excessive laboratory s.d.	Cochran
E: mean outside tolerance limits	
F: |Z-Score|>3.5	
L: Differing laboratory mean (Grubbs II)	Grubbs für 2

Summary of laboratory test results

Measurand nitric acid

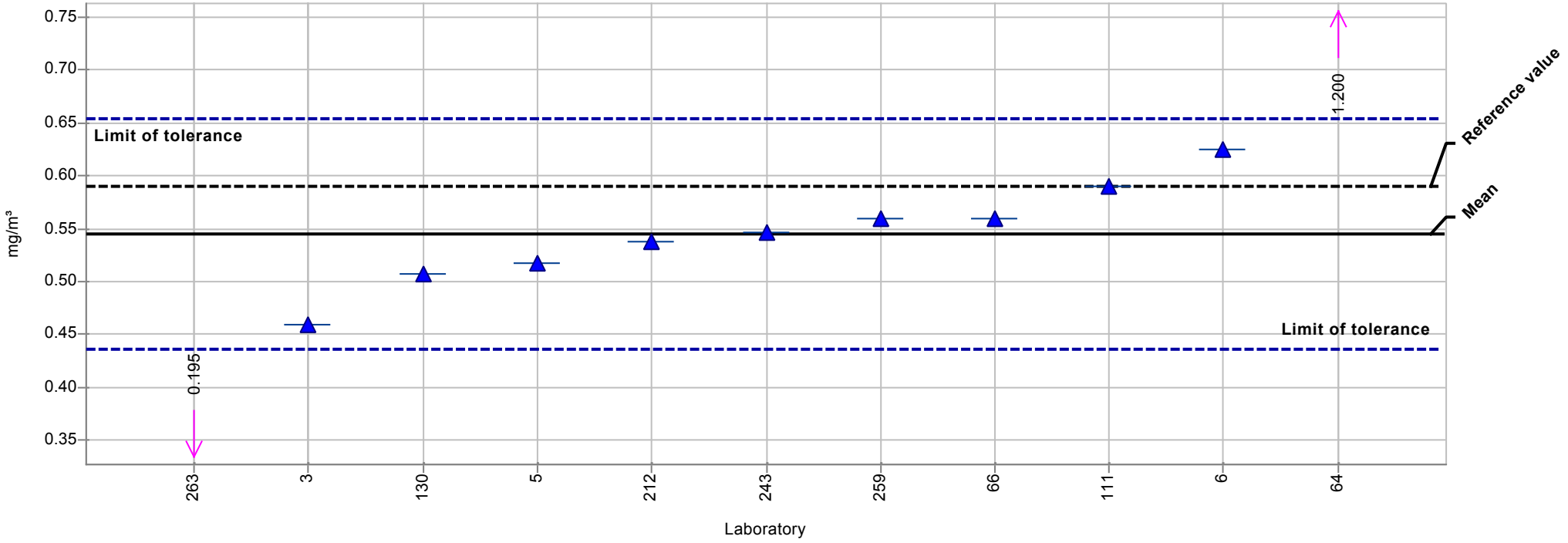
Laboratory	Sample 1	Z score	Sample 2	Z score	Sample 3	Z score
Unit	mg/m³		mg/m³		mg/m³	
3	1.850	0.15	2.510	0.25	2.210	-0.86
5	1.449	-2.05 E	2.261	-0.77	2.216	-0.84
6	1.865	0.23	2.704	1.04	2.701	1.17
64	1.900	0.42	2.500	0.21	2.500	0.34
66	2.170	1.90	2.580	0.53	2.590	0.71
111	1.875	0.28	2.451	0.01	2.420	0.01
130	1.660	-0.90	2.250	-0.81	2.250	-0.69
212	1.758	-0.36	2.180	-1.10	2.310	-0.44
243	1.915	0.50	2.435	-0.06	2.561	0.59
259	1.790	-0.18	2.620	0.70	3.200	3.24 BE
263	0.154	-9.16 BE	0.408	-8.33 BE	0.086	-9.64 BE
–	–	– –	–	– –	–	– –
Method	ISO 5725-2		ISO 5725-2		ISO 5725-2	
Assessment	|Z|<=2.00		|Z|<=2.00		|Z|<=2.00	
No. of laboratories that submitted results	11		11		11	
Mean	1.823		2.449		2.417	
Reproducibility s.d.	0.186		0.172		0.181	
Rel. reproducibility s.d.	10.20 %		7.01 %		7.47 %	
Reference value	1.890		2.500		2.820	
Target s.d.	0.182		0.245		0.242	
Rel. target s.d.	10.00 %		10.00 %		10.00 %	
Low er limit of tolerance	1.459		1.959		1.934	
Upper limit of tolerance	2.188		2.939		2.901	
Type B outliers	1		1		2	
No. of measurement values outside of tolerance limits	2		1		2	

Laboratory	Sample 1	Z score	Sample 2	Z score	Sample 3	Z score

Explanation of outlier types	
A: Single outlier	Grubbs
B: Differing laboratory mean	Grubbs
C: Excessive laboratory s.d.	Cochran
E: mean outside tolerance limits	
F: |Z-Score|>3.5	
L: Differing laboratory mean (Grubbs II)	Grubbs für 2

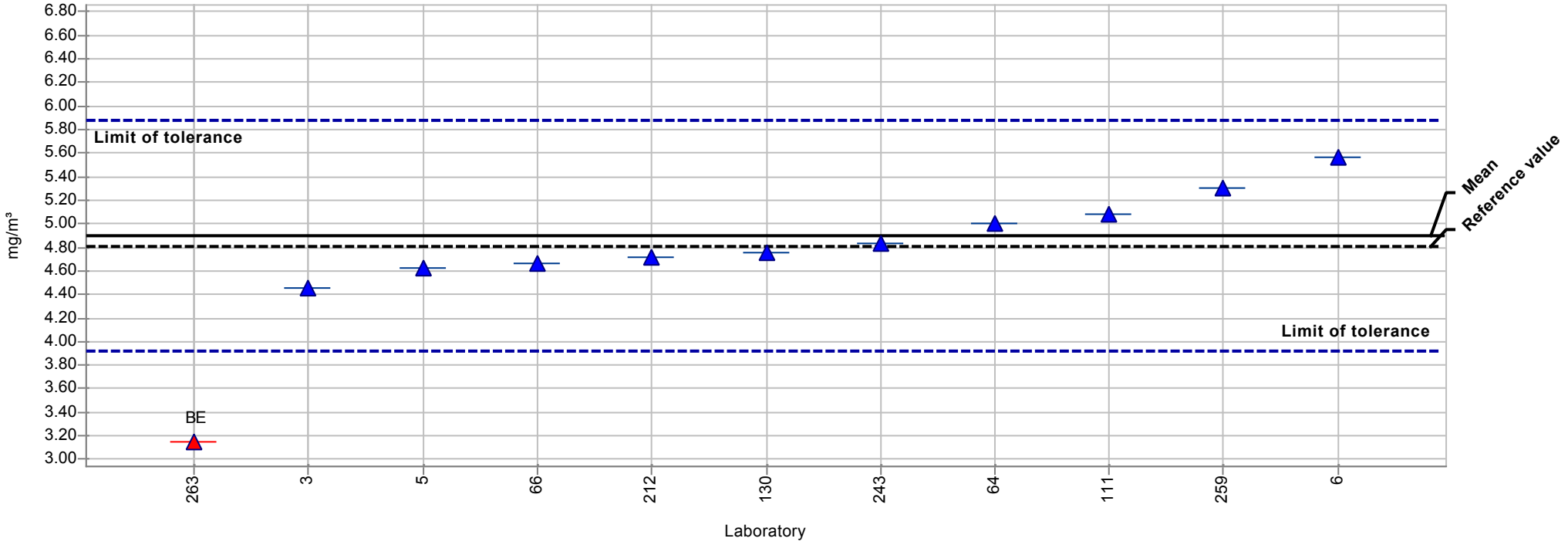
Summary results

Sample:	**Sample 1**	**Mean:**	**0.545 mg/m³**
Measurand:	**hydrochloric acid**	**Reproducibility s.d.:**	**0.048 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**8.77%**
Rel. target s.d.:	**10.00% (Limited)**	**Reference value:**	**0.590 mg/m³**
No. of laboratories:	**9**	**Range of tolerance:**	**0.436 - 0.654 mg/m³ (|Z-Score| <= 2.00)**



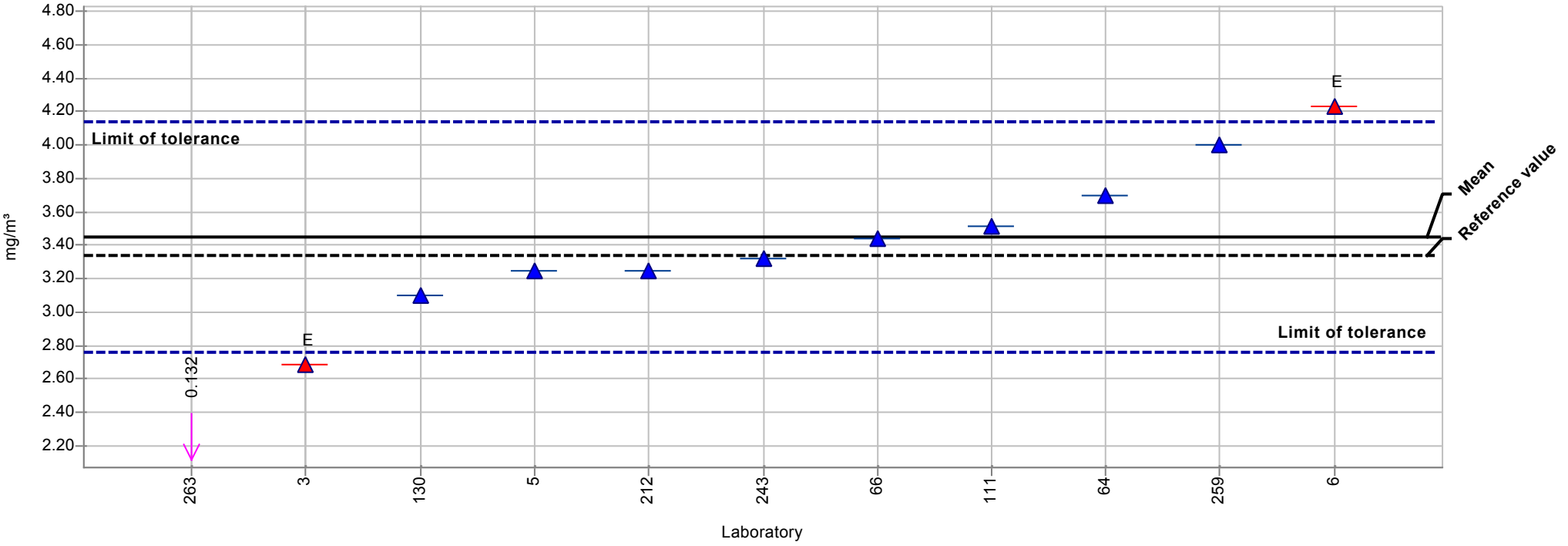
Summary results

Sample:	**Sample 2**	**Mean:**	**4.899 mg/m³**
Measurand:	**hydrochloric acid**	**Reproducibility s.d.:**	**0.342 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**6.98%**
Rel. target s.d.:	**10.00% (Limited)**	**Reference value:**	**4.810 mg/m³**
No. of laboratories:	**10**	**Range of tolerance:**	**3.919 - 5.879 mg/m³ (|Z-Score| <= 2.00)**



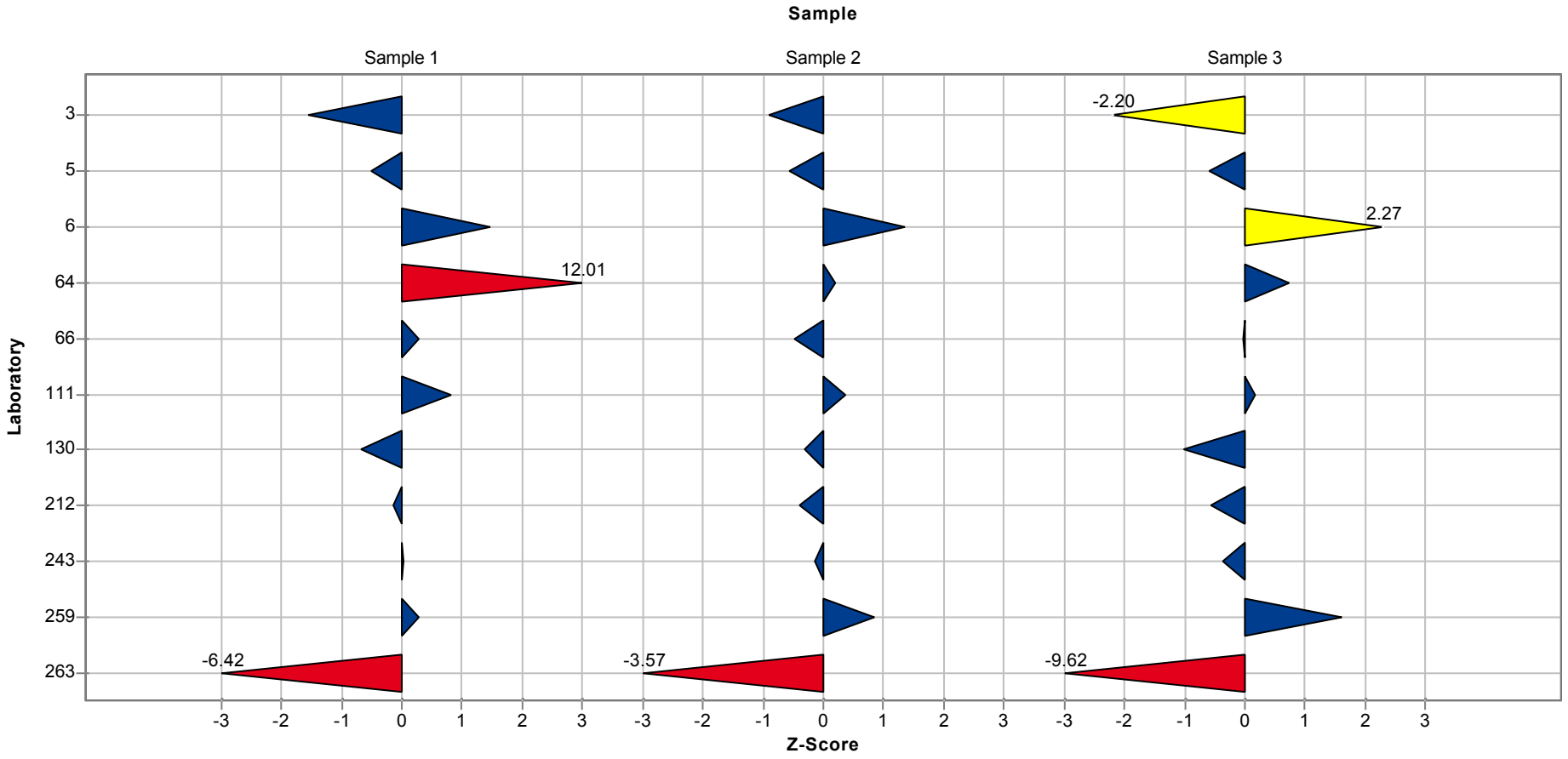
Summary results

Sample:	**Sample 3**	**Mean:**	**3.449 mg/m³**
Measurand:	**hydrochloric acid**	**Reproducibility s.d.:**	**0.445 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**12.90%**
Rel. target s.d.:	**10.00% (Limited)**	**Reference value:**	**3.340 mg/m³**
No. of laboratories:	**10**	**Range of tolerance:**	**2.759 - 4.139 mg/m³ (|Z-Score| <= 2.00)**



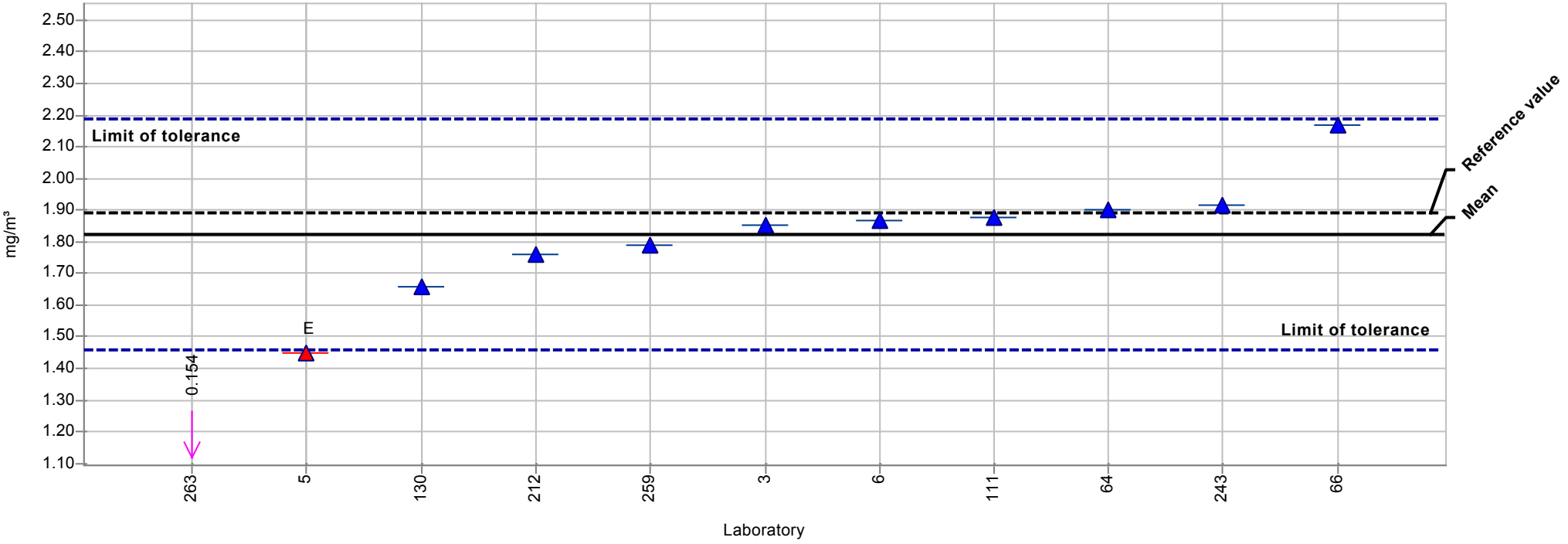
Analyte chart of Z-Scores

Measurand: **hydrochloric acid**



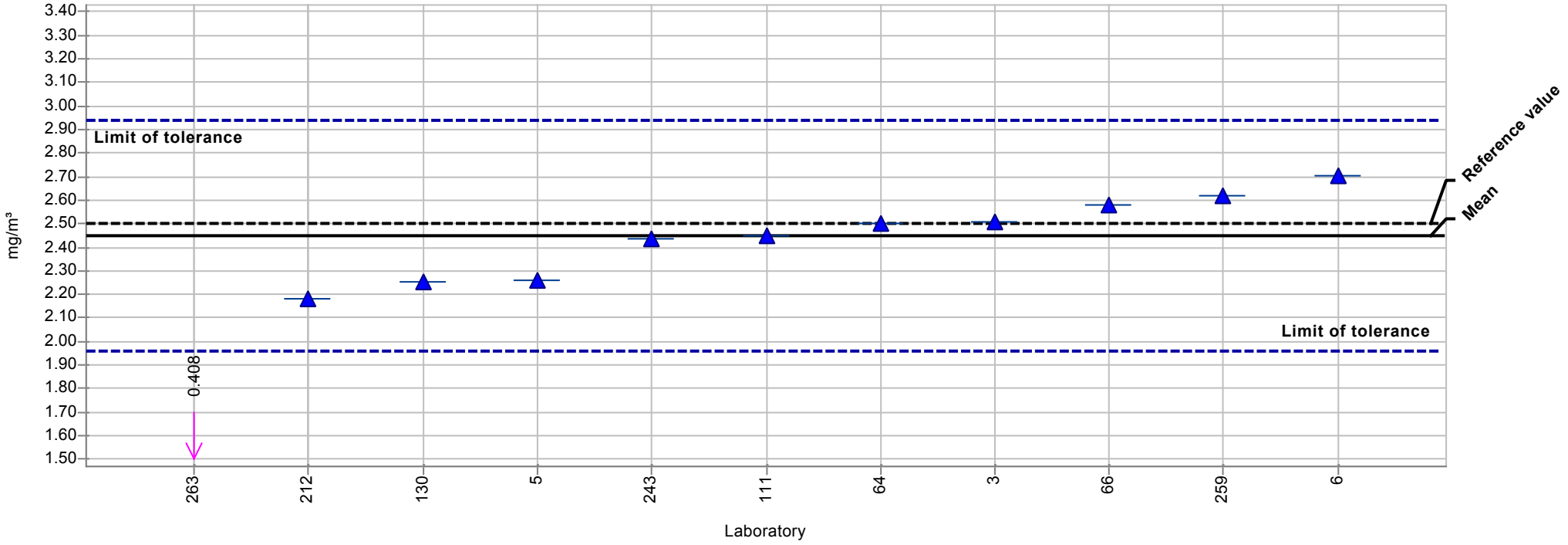
Summary results

Sample:	**Sample 1**	**Mean:**	**1.823 mg/m³**
Measurand:	**nitric acid**	**Reproducibility s.d.:**	**0.186 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**10.20%**
Rel. target s.d.:	**10.00% (Limited)**	**Reference value:**	**1.890 mg/m³**
No. of laboratories:	**10**	**Range of tolerance:**	**1.459 - 2.188 mg/m³ (|Z-Score| <= 2.00)**



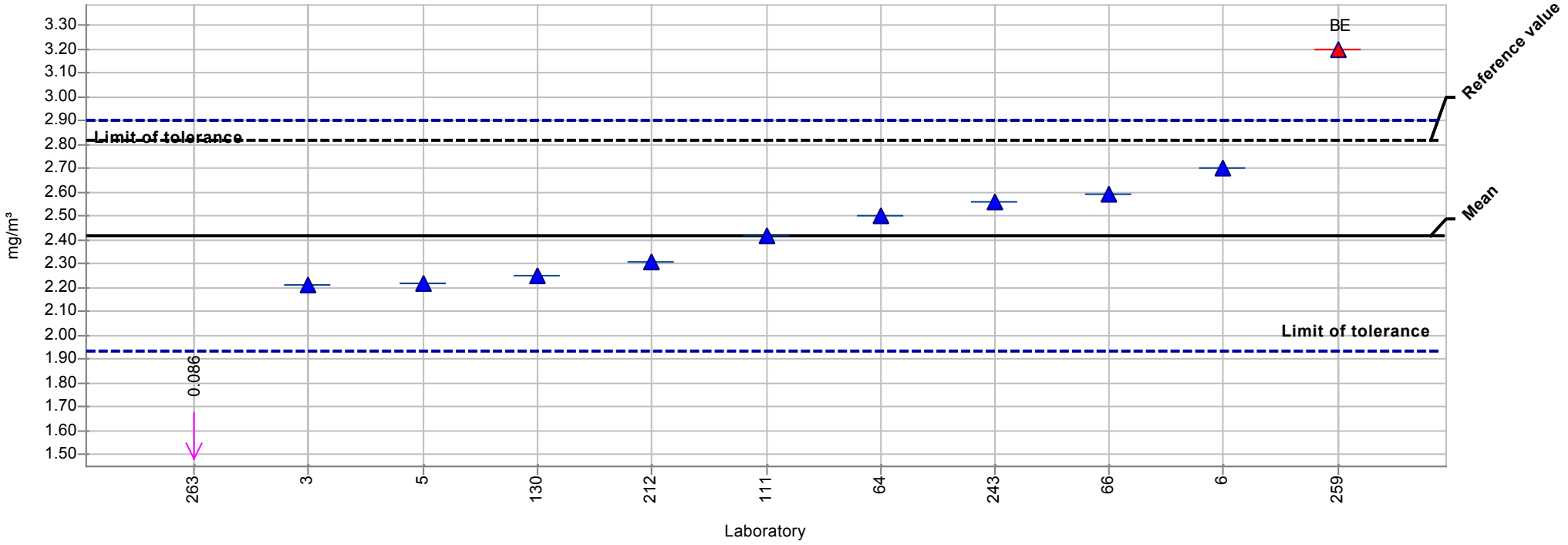
Summary results

Sample:	**Sample 2**	**Mean:**	**2.449 mg/m³**
Measurand:	**nitric acid**	**Reproducibility s.d.:**	**0.172 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**7.01%**
Rel. target s.d.:	**10.00% (Limited)**	**Reference value:**	**2.500 mg/m³**
No. of laboratories:	**10**	**Range of tolerance:**	**1.959 - 2.939 mg/m³ (|Z-Score| <= 2.00)**



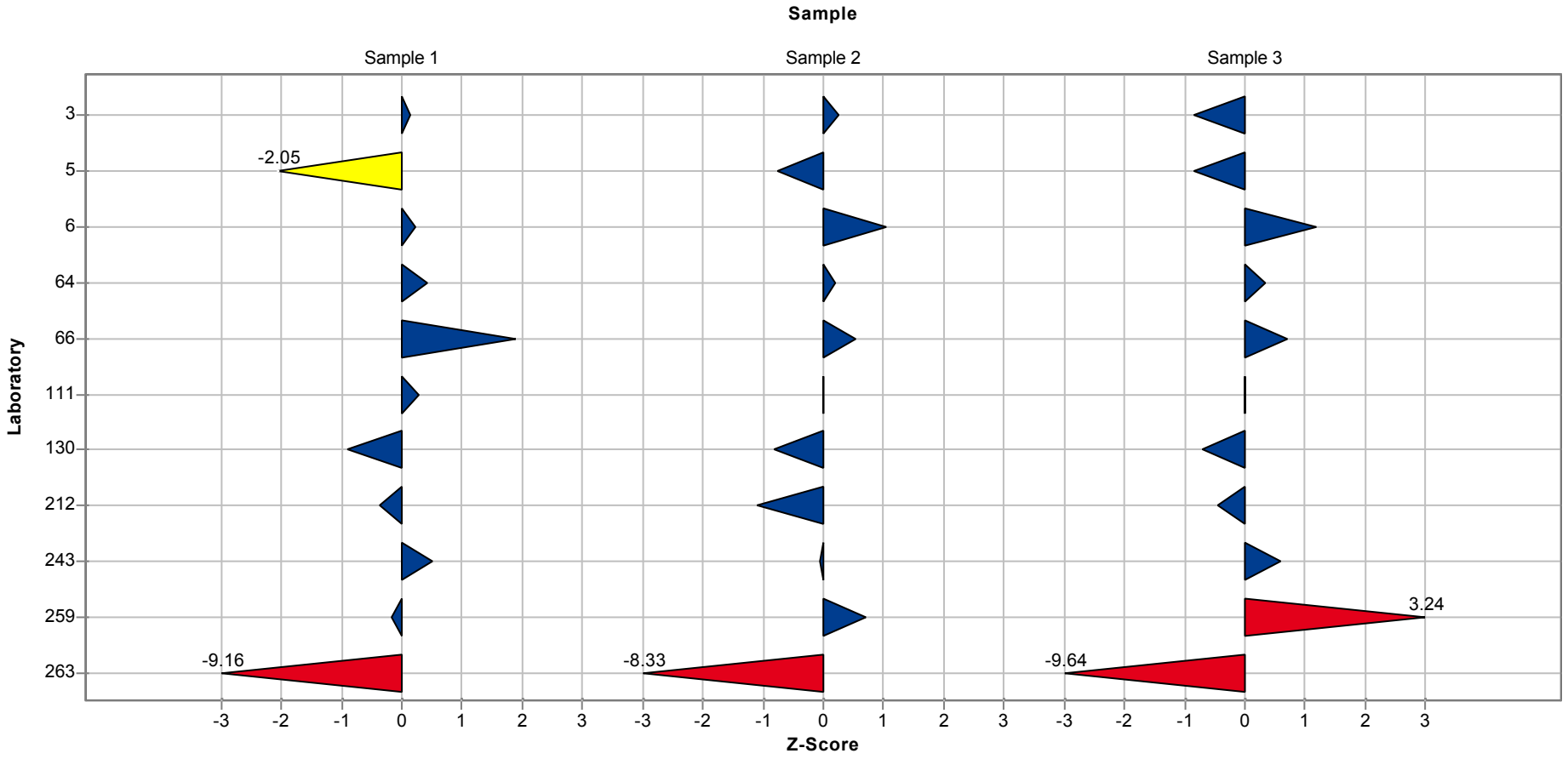
Summary results

Sample:	**Sample 3**	**Mean:**	**2.417 mg/m³**
Measurand:	**nitric acid**	**Reproducibility s.d.:**	**0.181 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**7.47%**
Rel. target s.d.:	**10.00% (Limited)**	**Reference value:**	**2.820 mg/m³**
No. of laboratories:	**9**	**Range of tolerance:**	**1.934 - 2.901 mg/m³ (|Z-Score| <= 2.00)**



Analyte chart of Z-Scores

Measurand: **nitric acid**



Questions and Answers

Participant	Sample carrier HCl/HNO3	Prefilter for chlorid/nitrat
3	37 mm Quarzfaserpalnfilter (Munktell), imprägniert mit Natriumcarbonatlösung	ja
5	Imprägnierte Glasfaserfilter	Ja
6	imprägnierter Quarzfaserfilter	ja: nicht imprägnierter Quarzfaserfilter
64	Quarzfaserfilter M37	nein
66	Quarzfaserfilter	ja
111	Quarzfaserfilter, imprägniert mit 1 mol/L Na2CO3	Ja, nicht imprägnierter Quarzfaserfilter
130	37 mm Quarzplanfilter Munktell, mit 1,0 mol/L Natriumcarbonatlsg.	nein
212	Quarzfaserfilter imprägniert mit Na2CO3	Ja
243	Impinger (VE-Wasser)	nein
259	imprägnierte Quarzfaserfilter	ja
263	Quarzfaserfilter 37mm imprägniert mit 1 mol/l Na2CO3	Ja

Participant	Sampling pump	Volume flow
3	A110-E, Fa. Honold GmbH & Co KG, Nürnbrecht,	2 l/min
5	Gilian GilAir	2000 ml/min
6	GSA 4000ex	2 L/min
64	GSA SG 5100	2l
66	SKC Deluxe (ATEX)	2 L/min
111	GilairPlus	2 L/min
130	Model PCMTX8. SKC Inc	2,0 L/min, bzw . 1,0 L/min
212	GSA 5100ex, SKC	2 L/min; 1 L/min (test gas 2)
243	GilAir Plus	1,330 L/min (80 L/h)
259	Gilian 5000	2,0 l/min

Participant	Volume flow measurement
3	Pumpe mit elektronischer Volumenstromregelung auf Basis Massflow meter, Pumpenfluss w ird jährlich mit Referenzgasuhr überprüft und mit Korrekturfaktor versehen

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Participant	Volume flow measurement
5	Defender 530
6	TSI 4100
66	Analyt-MTC Serie 358MLW
111	Bios DC Lite
130	Gilibrator
212	TSI 4146
243	Drycal Defender DC-Lite
259	Rotameter

Participant	Sampling time	Analytical method
3	140 min bzw . 15 min (MR3)	BGIA Arbeitsmappe 6172 bzw . 6173
5	2 h oder 0,5 h	IFA 6172, IFA 6173
6	2 h bzw . 15 min	IFA-Arbeitsmappe 6172 bzw . 6173
64	2,0 bzw 0,25	IFA Arbeitsmappe Nr. 6172 und 6173
66	120 min bzw . 15 min	IFA 6172
111	120 min, bzw . 15 Minuten für den Kurzzeitw ert	IFA 6172, bzw . IFA 6173
130	Run 1 + 2: je 3 x 2 h, Run 4: 2 x 15 min + 2 x 15 min	IFA-Arbeitsmappe 6172
212	120; 15 (test gas 3)	IFA 6172
243	120 min (Probe 1 und 2) bzw . 15 min (Probe 3)	HCl/HNO3: validierte Hausmethode; H2SO4/H3PO4: IFA 6173
259	120 min, 60 min, 15 min	IFA 6172

Participant	Desorption solution
3	Reinstw asser
5	VE-Wasser
6	Reinstw asser
64	entionisiertes Wasser
66	Wasser
111	dest. Wasser

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Participant	Desorption solution
130	Reinstw asser
212	Reinstw asser
243	HCL/HNO3: nicht zutreffend (Probenahme im Impinger); H2SO4/H3PO4: vom Ringversuchsveranstalter überschichtet
259	Reinstw asser
263	H2O nanopur

Participant	Volume of desorption solution
3	10 mL
5	10 ml und 8 ml
6	10 mL
64	10 ml
66	10 mL
111	5ml / 10ml
130	10 mL
212	10 ml
243	HCL/HNO3: nicht zutreffend (Probenahme im Impinger); H2SO4/H3PO4: vom Ringversuchsveranstalter überschichtet
259	10 ml
263	10 ml

Participant	Desorption time
3	15 min Ultraschallbad und anschließend 30 min stehen lassen
5	15 min
6	15 min. Ultraschall, 30 min. stehen gelassen
64	15 min im Ultraschallbad, 30 min stehen lassen
66	ja
111	15 min Ultraschallbad
130	15 min US, dann 30 min stehengelassen
212	15 min US

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Participant	Desorption time
243	HCL/HNO3: nicht zutreffend (Probenahme im Impinger); H2SO4/H3PO4: Desorptionszeit unbekannt, 15 min Ultraschallbad
259	15 min im Ultraschallbad
263	1h Schüttelapparatur

Participant	Analytical column
3	Anionensäule Metrosep A-SUPP 4 mm (ID)* 250 mm (Länge) (Metrohm Nr.: 6.1006.430)
6	AS19, 2x250mm
64	Ion Pac AS14A
66	Dionex ion pac AS 22 250*4 mm
111	IC 1: Trennsäule AS-22; IC 2: Trennsäule AS9-HC
130	AS22 4 mm von Dionex
212	Metrosep A Supp 4/5 Guard/ Metrosep A Supp 5-150
243	Vorsäule: Metrosep RP Guard (Metrohm); Trennsäule: Metrosep Anion Dual 2
259	AS 22
263	Metrosep A Supp 7 150/4.0

Participant	Ion Chromatographic System
3	IC Gerät, 861 Advanced, Firma Metrohm mit Leitfähigkeitsdetektor
6	Thermo ICS 5000
64	ICS 1100 Thermo Scientific; Leitfähigkeitsdetektor, ohne Autosampler
66	HP 1050 ASL, Dionex IC DX-120, Dionex Pulsed Electrochemical Detector
111	IC 1: Dionex ICS 1100, IC 2: Dionex ICS 2100; beide Leitfähigkeitsdetektor;beide Autosampler: Dionex AS-AP
130	Dionex ICS 1100
212	Metrohm: 881 Compact IC pro / Leitfähigkeitsdetektor
243	IC mit Leitfähigkeitsdetektor Firma Metrohm
259	IC 1000 mit Autosampler
263	Metrohm Professional IC Vario, Leitfähigkeitsdetektor, AS Professional IC 850

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Participant	Mobile phase	Flow rate
3	4 mmol/l NaHCO3 + 1 mmol/l Na2CO3	1 mL/min
6	KOH	0,25 mL/min
64	8 mM Na2CO3, 1mM NaHCO3	1 ml/min
66	Natriumcarbonat/-hydrogencarbonat-Lösung	1,2
111	IC 1: 4,5 mmol/l Natriumcarbonat / 1,4 mmol/l Natriumhydrogencarbonat; IC 2: 9mmol/l Natriumcarbonat	IC 1: 0,3 ml/min; IC 2: 1 ml/min
130	4,5 mmol Na2CO3 / 1,4 mmol NaHCO3	1,2 mL/min
212	Na2CO3/NaHCO3	0,7 mL/min
243	1,3 mmol Na2CO3 / 2,0 mmol NaHCO3 mit 2 % Aceton	0,8 mL/min
259	NaHCO3 1,4 mmmol/l, Na2CO3 4,5 mmol/l	1,2
263	3,6 mmol Na2CO3	0,7

Participant	Recovery rate	Date of analysis
3	nein	04.04.2018
5		12.04.2018
6	nein	01.04.18
64	nein	11. bis 16. April 2018
66	nein	20.04.2018
111	nein	05.04.2018 - 16.04.2018
130	ja, Zielw ertkarte	18.4.2018
212	Nein	9.4.2018; 11.4.2018
243	nein	22.03.2018 (HCl/HNO3); 06.04.2018 (H2SO4/H3PO4)
259	Doppelbestimmung	11./12.04.2018
263	-	04.04.2018 / 24.04.2018

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Deutschen Gesetzlichen Unfallversicherung

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

Proficiency testing scheme: Inorganic acids

March 2018

Part 2: Non-volatile inorganic acids

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Summary of laboratory test results

Measurand phosphoric acid

Laboratory	Sample 1	Z score	Sample 2	Z score	Sample 3	Z score
Unit	mg/m³		mg/m³		mg/m³	
3	0.296	-0.20	0.840	0.12	0.398	-0.24
5	0.319	0.56	0.867	0.44	0.429	0.51
6	0.310	0.26	0.867	0.45	0.471	1.55
10	0.288	-0.47	0.762	-0.82	0.357	-1.25
27	0.280	-0.73	0.610	-2.65 BE	0.350	-1.42
64	0.300	-0.07	0.800	-0.36	0.500	2.26 E
66	0.340	1.25	0.850	0.24	0.470	1.52
68	0.294	-0.27	0.885	0.66	0.458	1.23
72	0.312	0.33	0.850	0.24	0.422	0.35
73	0.305	0.11	0.805	-0.30	0.405	-0.08
74	0.290	-0.40	0.827	-0.03	0.384	-0.59
78	0.305	0.10	0.828	-0.02	0.410	0.05
83	0.282	-0.66	0.866	0.43	0.396	-0.28
95	0.327	0.82	0.860	0.36	0.430	0.54
110	0.310	0.26	0.820	-0.12	0.400	-0.19
111	0.312	0.33	0.834	0.05	0.415	0.17
114	0.321	0.63	0.826	-0.05	0.406	-0.05
130	0.300	-0.07	0.812	-0.22	0.407	-0.02
151	0.313	0.36	0.835	0.06	0.413	0.13
174	0.331	0.96	0.855	0.30	0.372	-0.88
177	0.301	-0.04	0.868	0.46	0.422	0.35
178	0.270	-1.06	0.800	-0.36	0.380	-0.68
195	0.200	-3.38 BE	0.750	-0.96	0.360	-1.17
208	0.313	0.36	0.806	-0.29	0.401	-0.17
224	0.285	-0.57	0.779	-0.61	0.372	-0.87
243	0.300	-0.07	0.845	0.18	0.436	0.69

Laboratory	Sample 1	Z score	Sample 2	Z score	Sample 3	Z score
248	0.309	0.23	0.859	0.35	0.426	0.44
259	0.290	-0.40	0.820	-0.12	0.390	-0.44
263	0.261	-1.37	0.702	-1.54 B	0.343	-1.58
266	0.297	-0.17	0.821	-0.11	0.413	0.13
–	–	– –	–	– –	–	– –
Method	ISO 5725-2		ISO 5725-2		ISO 5725-2	
Assessment	|Z|<=2.00		|Z|<=2.00		|Z|<=2.00	
No. of laboratories that submitted results	30		30		30	
Mean	0.302		0.830		0.408	
Reproducibility s.d.	0.018		0.033		0.036	
Rel. reproducibility s.d.	5.84 %		3.96 %		8.92 %	
Reference value	0.312		0.841		0.425	
Target s.d.	0.030		0.083		0.041	
Rel. target s.d.	10.00 %		10.00 %		10.00 %	
Low er limit of tolerance	0.242		0.664		0.326	
Upper limit of tolerance	0.363		0.996		0.489	
Type B outliers	1		2			
No. of measurement values outside of tolerance limits	1		1		1	
Explanation of outlier types						
A: Single outlier	Grubbs					
B: Differing laboratory mean	Grubbs					
C: Excessive laboratory s.d.	Cochran					
E: mean outside tolerance limits						
F: |Z-Score|>3.5						
L: Differing laboratory mean (Grubbs II)	Grubbs für 2					

Summary of laboratory test results

Measurand sulphuric acid

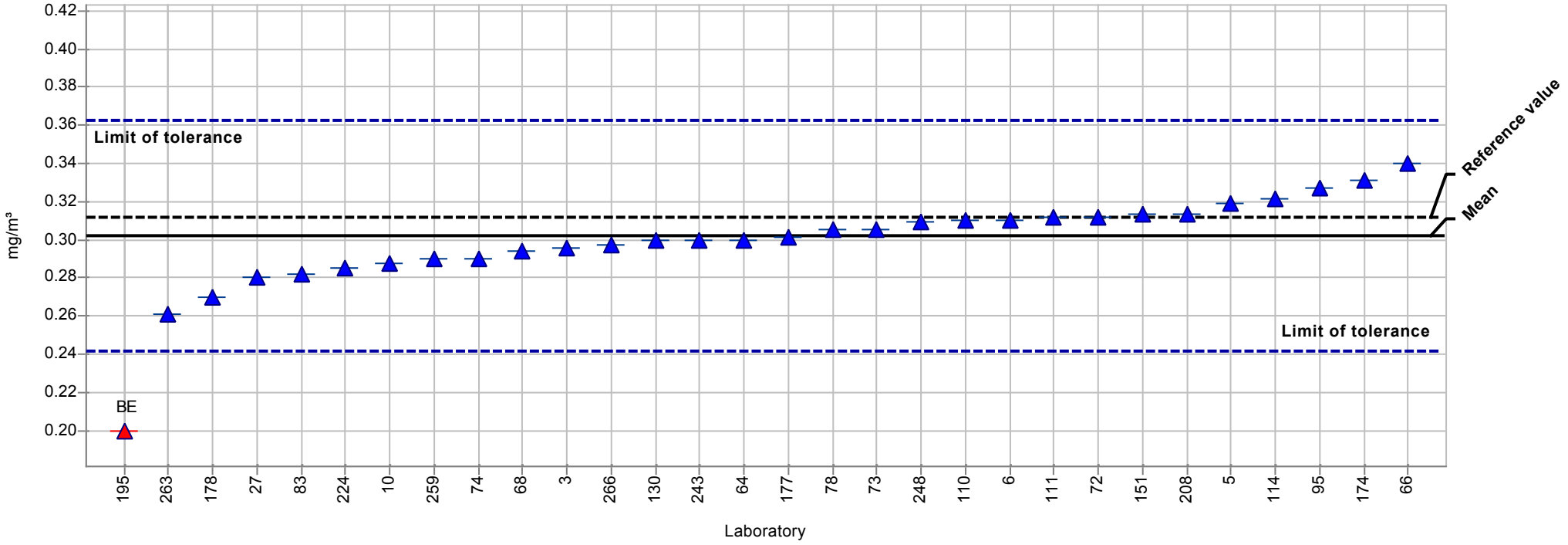
Laboratory	Sample 1	Z score	Sample 2	Z score	Sample 3	Z score
Unit	mg/m³		mg/m³		mg/m³	
3	0.1290	-0.11	0.0630	-0.14	0.0900	-0.24
5	0.1361	0.43	0.0647	0.12	0.0956	0.36
6	0.1510	1.57	0.0830	2.99 E	0.1170	2.68 E
10	0.1250	-0.42	0.0600	-0.61	0.0838	-0.92
27	0.1300	-0.04	0.0800	2.52 E	0.1000	0.84
64	0.1400	0.73	0.0700	0.95	0.0900	-0.24
66	0.1300	-0.04	0.0690	0.80	0.0950	0.30
68	0.1160	-1.11	0.0630	-0.14	0.0860	-0.68
72	0.1420	0.88	0.0650	0.17	0.0980	0.62
73	0.1308	0.02	0.0643	0.06	0.0940	0.19
74	0.1430	0.96	0.0690	0.80	0.0980	0.62
78	0.1280	-0.19	0.0576	-0.99	0.0870	-0.57
83	0.0324	-7.52 BE	0.0161	-7.48 BE	0.0230	-7.51 BE
95	0.1310	0.04	0.0590	-0.77	0.0870	-0.57
110	0.1500	1.49	0.0900	4.08 FE	0.1100	1.93
111	0.1360	0.42	0.0680	0.64	0.0970	0.52
114	0.1359	0.41	0.0591	-0.75	0.0901	-0.23
130	0.1270	-0.27	0.0620	-0.30	0.0890	-0.35
151	0.1350	0.34	0.0630	-0.14	0.0920	-0.03
174	0.1360	0.42	0.0590	-0.77	0.0870	-0.57
177	0.1430	0.96	0.0690	0.80	0.1000	0.84
178	0.1000	-2.34 E	0.0500	-2.18 E	0.0800	-1.33
195	0.1000	-2.34 E	0.0600	-0.61	0.0800	-1.33
208	0.1270	-0.27	0.0619	-0.31	0.0880	-0.46
224	0.0941	-2.79 E	0.0426	-3.34 E	0.0656	-2.89 E
243	0.1310	0.04	0.0620	-0.30	0.0950	0.30

Laboratory	Sample 1	Z score	Sample 2	Z score	Sample 3	Z score
248	0.1360	0.42	0.0640	0.01	0.0980	0.62
259	0.1600	2.26 E	0.0800	2.52 E	0.1100	1.93
263	0.1176	-0.99	0.0601	-0.60	0.0822	-1.09
266	0.1240	-0.50	0.0612	-0.42	0.0897	-0.28
–	–	– –	–	– –	–	– –
Method	ISO 5725-2		ISO 5725-2		ISO 5725-2	
Assessment	|Z|<=2.00		|Z|<=2.00		|Z|<=2.00	
No. of laboratories that submitted results	30		30		30	
Mean	0.1305		0.0639		0.0922	
Reproducibility s.d.	0.0147		0.0083		0.0101	
Rel. reproducibility s.d.	11.26 %		12.92 %		10.97 %	
Reference value	0.1340		0.0634		0.0937	
Target s.d.	0.0130		0.0064		0.0092	
Rel. target s.d.	10.00 %		10.00 %		10.00 %	
Low er limit of tolerance	0.1044		0.0511		0.0738	
Upper limit of tolerance	0.1566		0.0767		0.1107	
Type B outliers	1		1		1	
Type F outliers			1			
No. of measurement values outside of tolerance limits	5		7		3	

Explanation of outlier types	
A: Single outlier	Grubbs
B: Differing laboratory mean	Grubbs
C: Excessive laboratory s.d.	Cochran
E: mean outside tolerance limits	
F: |Z-Score|>3.5	
L: Differing laboratory mean (Grubbs II)	Grubbs für 2

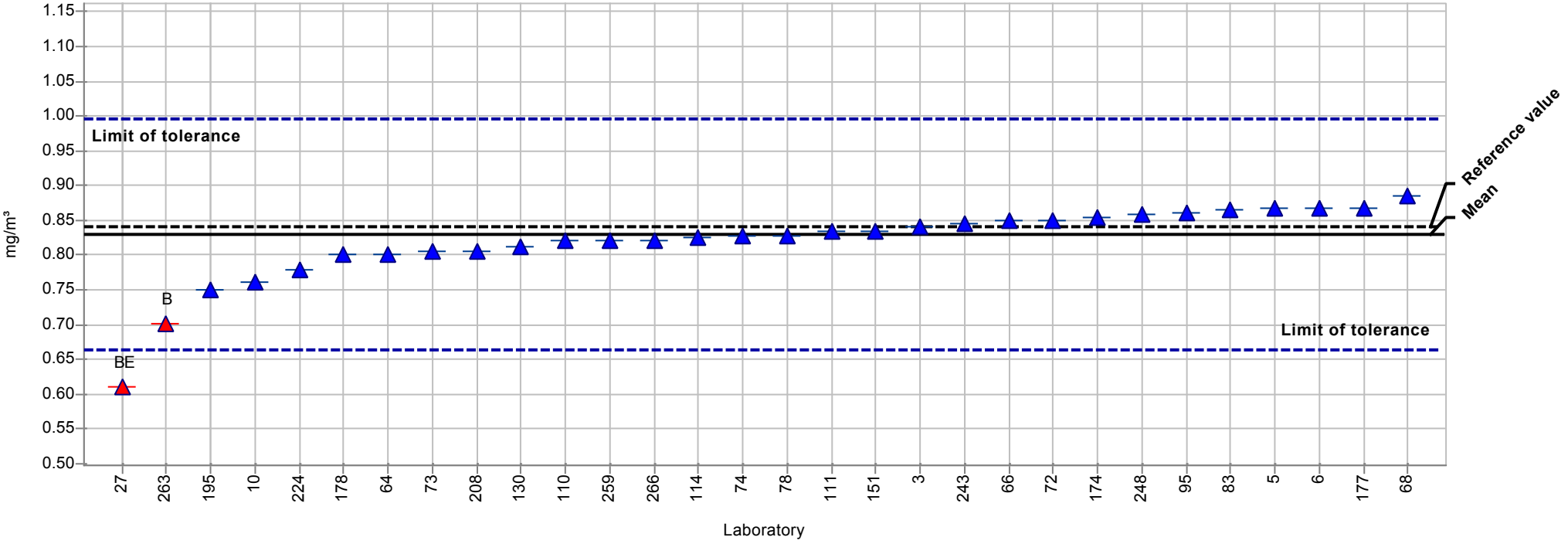
Summary results

Sample:	**Sample 1**	**Mean:**	**0.302 mg/m³**
Measurand:	**phosphoric acid**	**Reproducibility s.d.:**	**0.018 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**5.84%**
Rel. target s.d.:	**10.00% (Limited)**	**Reference value:**	**0.312 mg/m³**
No. of laboratories:	**29**	**Range of tolerance:**	**0.242 - 0.363 mg/m³ (|Z-Score| <= 2.00)**



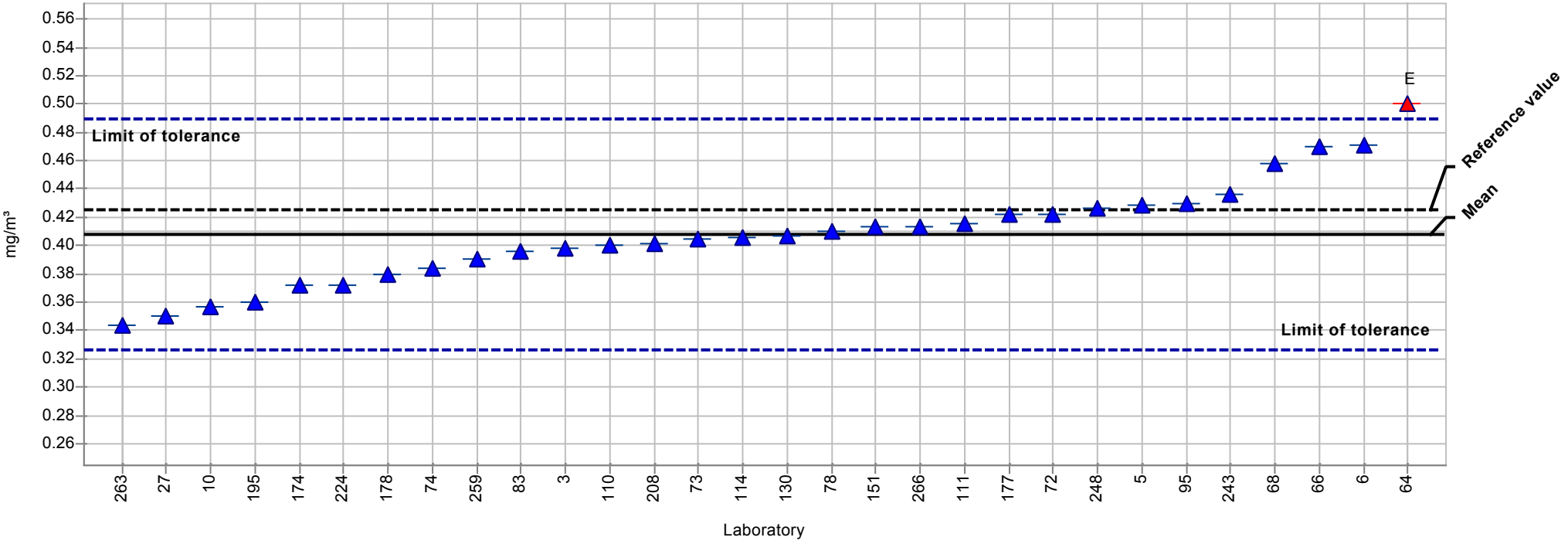
Summary results

Sample:	**Sample 2**	**Mean:**	**0.830 mg/m³**
Measurand:	**phosphoric acid**	**Reproducibility s.d.:**	**0.033 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**3.96%**
Rel. target s.d.:	**10.00% (Limited)**	**Reference value:**	**0.841 mg/m³**
No. of laboratories:	**28**	**Range of tolerance:**	**0.664 - 0.996 mg/m³ (|Z-Score| <= 2.00)**



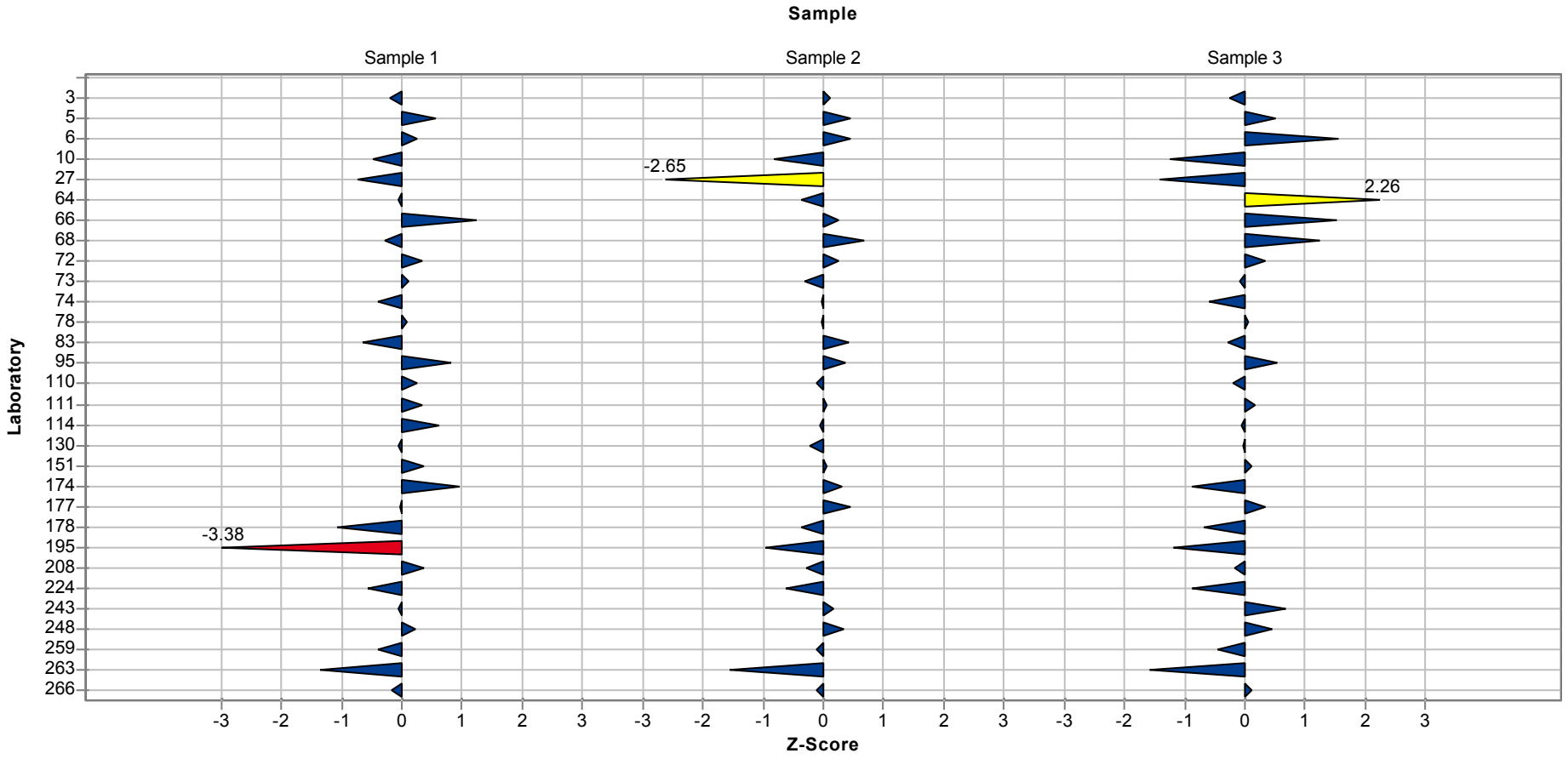
Summary results

Sample:	**Sample 3**	**Mean:**	**0.408 mg/m³**
Measurand:	**phosphoric acid**	**Reproducibility s.d.:**	**0.036 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**8.92%**
Rel. target s.d.:	**10.00% (Limited)**	**Reference value:**	**0.425 mg/m³**
No. of laboratories:	**30**	**Range of tolerance:**	**0.326 - 0.489 mg/m³ (|Z-Score| <= 2.00)**



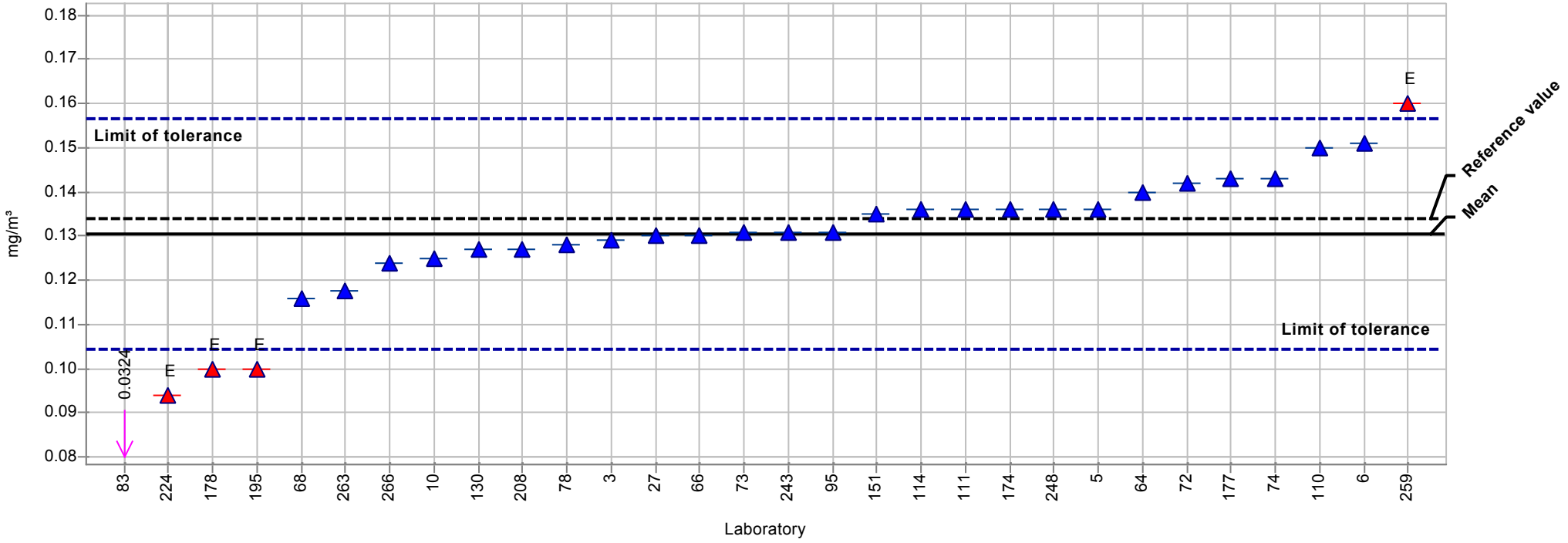
Analyte chart of Z-Scores

Measurand: **phosphoric acid**



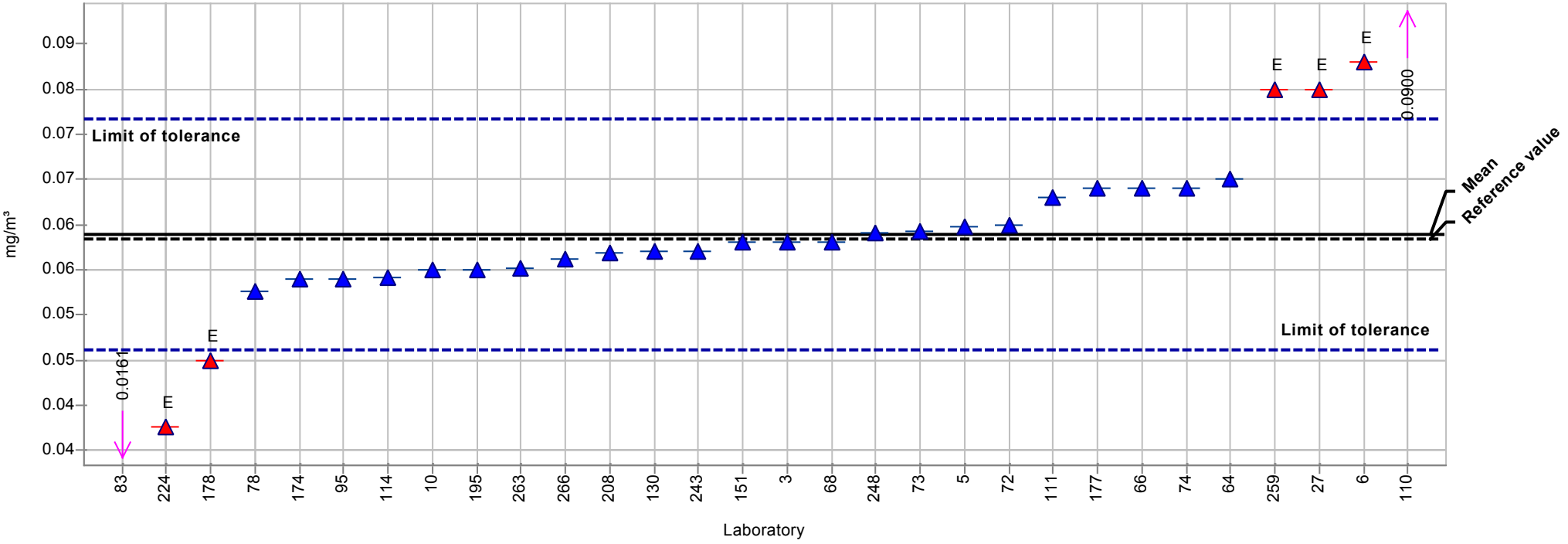
Summary results

Sample:	**Sample 1**	**Mean:**	**0.1305 mg/m³**
Measurand:	**sulphuric acid**	**Reproducibility s.d.:**	**0.0147 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**11.26%**
Rel. target s.d.:	**10.00% (Limited)**	**Reference value:**	**0.1340 mg/m³**
No. of laboratories:	**29**	**Range of tolerance:**	**0.1044 - 0.1566 mg/m³ (|Z-Score| <= 2.00)**



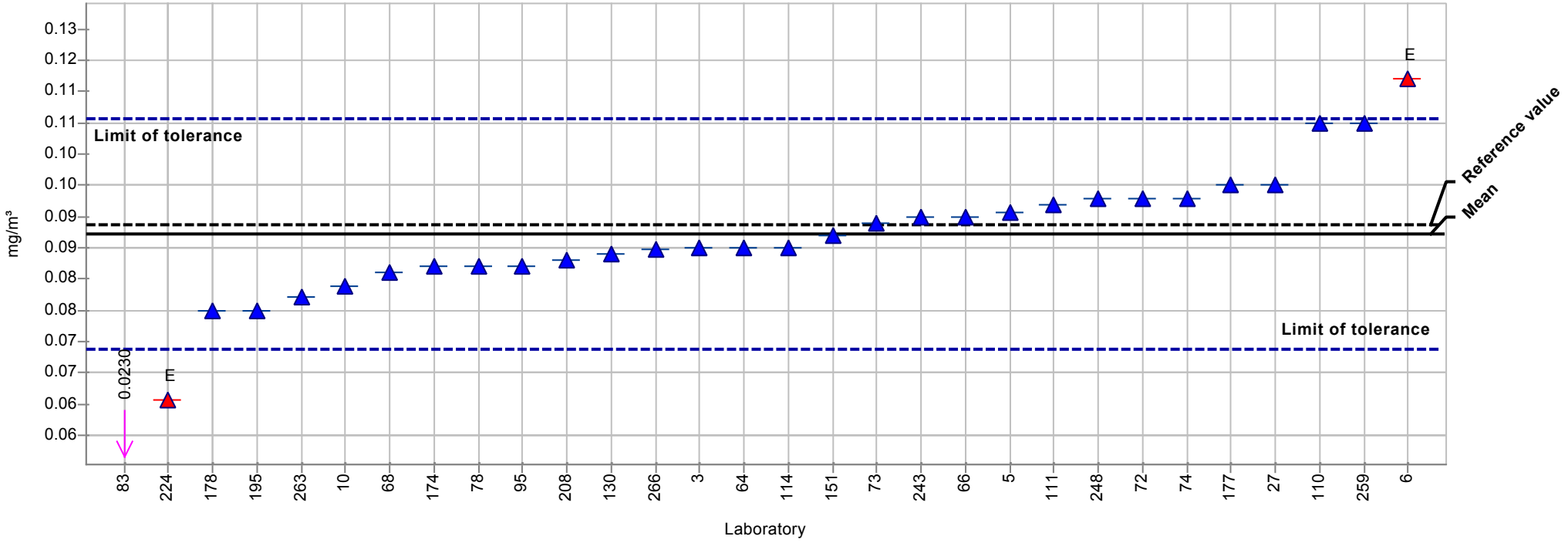
Summary results

Sample:	**Sample 2**	**Mean:**	**0.0639 mg/m³**
Measurand:	**sulphuric acid**	**Reproducibility s.d.:**	**0.0083 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**12.92%**
Rel. target s.d.:	**10.00% (Limited)**	**Reference value:**	**0.0634 mg/m³**
No. of laboratories:	**28**	**Range of tolerance:**	**0.0511 - 0.0767 mg/m³ (|Z-Score| <= 2.00)**



Summary results

Sample:	**Sample 3**	**Mean:**	**0.0922 mg/m³**
Measurand:	**sulphuric acid**	**Reproducibility s.d.:**	**0.0101 mg/m³**
Method:	**ISO 5725-2**	**Rel. reproducibility s.d.:**	**10.97%**
Rel. target s.d.:	**10.00% (Limited)**	**Reference value:**	**0.0937 mg/m³**
No. of laboratories:	**29**	**Range of tolerance:**	**0.0738 - 0.1107 mg/m³ (|Z-Score| <= 2.00)**



Analyte chart of Z-Scores

Measurand: **sulphuric acid**