

# **Round-robin tests for in-house measuring laboratories**

**Institut für Arbeitsschutz der Deutschen Gesetzlichen Unfallversicherung (IFA)  
Institute for Occupational Safety and Health of the German Social Accident Insurance**

**B. Maybaum, K. Gusbeth, Prof. Dr. D. Breuer  
Alte Heerstraße 111, 53757 Sankt Augustin  
proficiency-testing@dguv.de, +49 2241 231 2549**

## ***Results and Evaluation***

Round-robin test  
Inorganic acids with sampling,

March 2016

Part 1: volatile acids

## Summary of laboratory test results

Measurand hydrochloric acid

	Sample 1	Z score	Sample 2	Z score	Sample 3	Z score
Unit	mg/m <sup>3</sup>		mg/m <sup>3</sup>		mg/m <sup>3</sup>	
1	0,630	0,35	1,538	0,31	2,987	0,80
5	0,623	0,27	1,560	0,40	3,185	1,30
6	0,767	1,87	1,644	0,79	3,080	1,04
7	0,350	-2,77 E	1,130	-1,54	2,110	-1,39
130	0,640	0,46	1,570	0,45	2,790	0,31
184	0,630	0,35	1,680	0,95	2,880	0,54
200	0,642	0,48	1,665	0,88	3,000	0,84
201	0,603	0,05	1,463	-0,03	2,852	0,47
222	0,648	0,55	1,634	0,74	2,617	-0,12
271	0,473	-1,40	1,193	-1,26	1,967	-1,75
272	0,580	-0,21	1,100	-1,68	1,850	-2,04 E
-	-	--	-	--	-	--
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	0,599		1,471		2,665	
Reproducibility s.d.	0,107		0,222		0,471	
Rel. reproducibility s.d.	17,90 %		15,07 %		17,67 %	
Reference value	0,716		1,720		3,300	
Target s.d.	0,090		0,221		0,400	
Rel. SDPA	15,00 %		15,00 %		15,00 %	
Lower limit of tolerance	0,419		1,029		1,866	
Upper limit of tolerance	0,778		1,912		3,465	
No. of laboratories after elimination of outliers type A-D and F (without laboratories that only gave states but no measured values)	11		11		11	

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	Sample 1	Z score	Sample 2	Z score	Sample 3	Z score
No. of laboratories with E outliers	1				1	
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\text{-Score}  > 3,5$						
L: Differing laboratory mean (Grubbs II)		Grubbs für 2				

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## Summary of laboratory test results

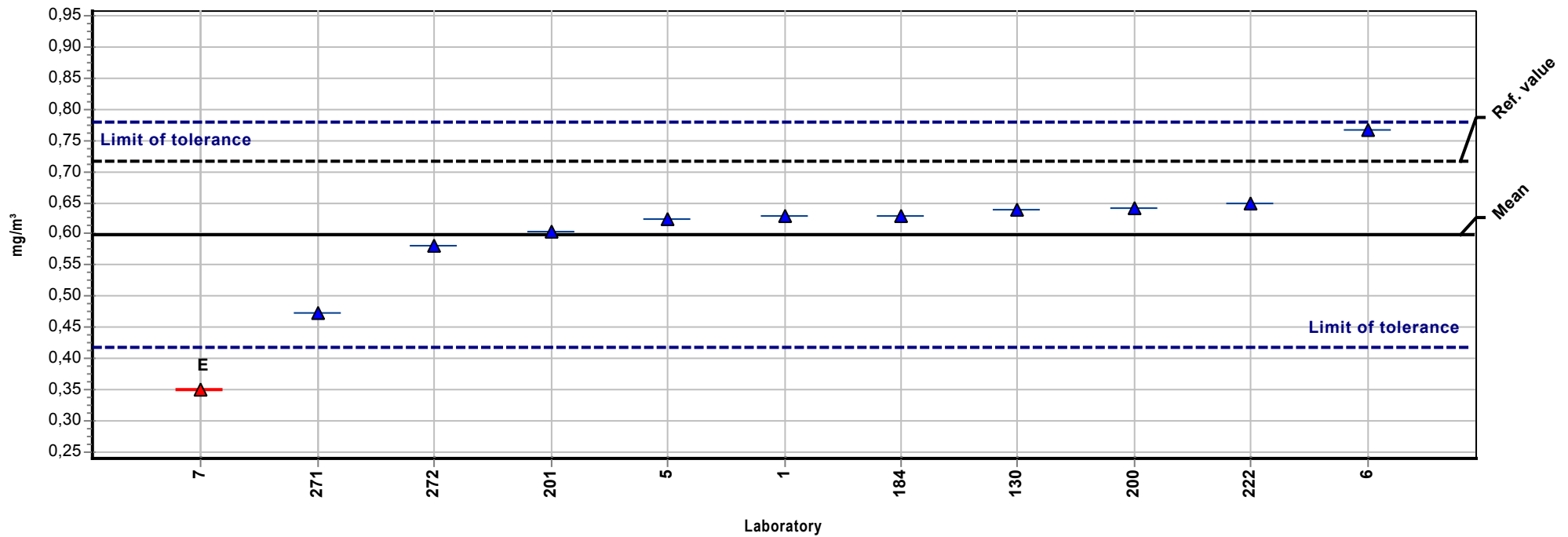
Measurand nitric acid

	Sample 1	Z score	Sample 2	Z score	Sample 3	Z score
Unit	mg/m <sup>3</sup>		mg/m <sup>3</sup>		mg/m <sup>3</sup>	
1	0,592	0,65	3,145	0,13	2,144	0,77
5	0,651	1,38	3,229	0,31	3,140	4,23 FE
6	0,615	0,93	3,295	0,45	2,066	0,50
7	0,210	-4,07 BE	1,590	-3,23 DE	1,570	-1,22
130	0,500	-0,49	2,980	-0,23	1,810	-0,39
184	0,510	-0,36	3,500	0,89	1,630	-1,01
200	0,591	0,64	3,655	1,23	2,110	0,65
201	0,506	-0,41	2,872	-0,46	2,147	0,78
222	0,579	0,49	3,539	0,98	2,010	0,31
271	0,480	-0,73	2,750	-0,73	1,808	-0,39
272	0,370	-2,09 E	1,900	-2,56 E	0,980	-3,27 DE
-	-	--	-	--	-	--
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	0,539		3,087		1,922	
Reproducibility s.d.	0,082		0,510		0,223	
Rel. reproducibility s.d.	15,26 %		16,54 %		11,61 %	
Reference value	0,691		3,510		2,470	
Target s.d.	0,081		0,463		0,288	
Rel. SDPA	15,00 %		15,00 %		15,00 %	
Lower limit of tolerance	0,378		2,161		1,345	
Upper limit of tolerance	0,701		4,012		2,498	
Type B outliers	1					
Type F outliers					1	
No. of laboratories after elimination of outliers type A-D and F (without)	10		10		9	

	Sample 1 Z score	Sample 2 Z score	Sample 3 Z score
laboratories that only gave states but no measured values)			
No. of laboratories with E outliers	2	2	2
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 >3,5			
L: Differing laboratory mean (Grubbs II)	Grubbs für 2		

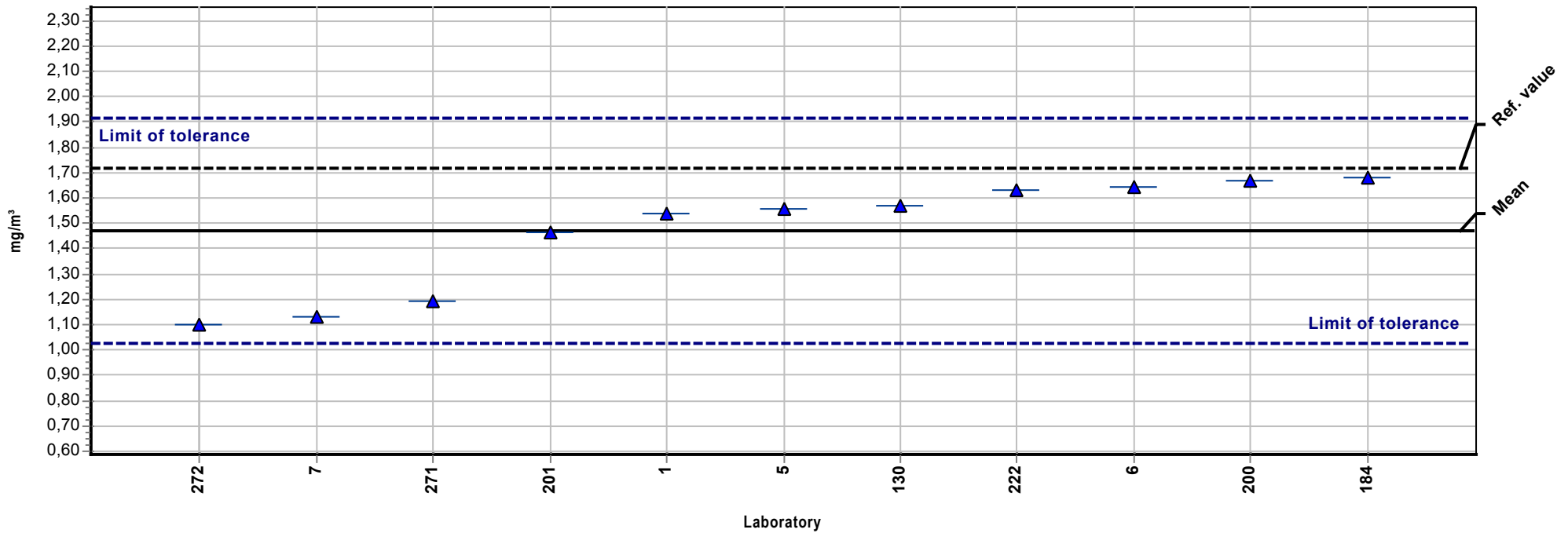
## Summary results

<b>Measurand:</b>	hydrochloric acid	<b>Mean:</b>	0,599 mg/m <sup>3</sup>
<b>Sample:</b>	1	<b>Reprod. s.d.:</b>	0,107 mg/m <sup>3</sup>
<b>Method:</b>	ISO 5725-2	<b>Rel. reprod. s.d.:</b>	17,90%
<b>Rel. target s.d.:</b>	15,00% (Limited)	<b>Reference value:</b>	0,716 mg/m <sup>3</sup>
<b>No. of laboratories:</b>	11	<b>Range of tolerance:</b>	0,419 - 0,778 mg/m <sup>3</sup> ( Z-Score  <= 2,00)



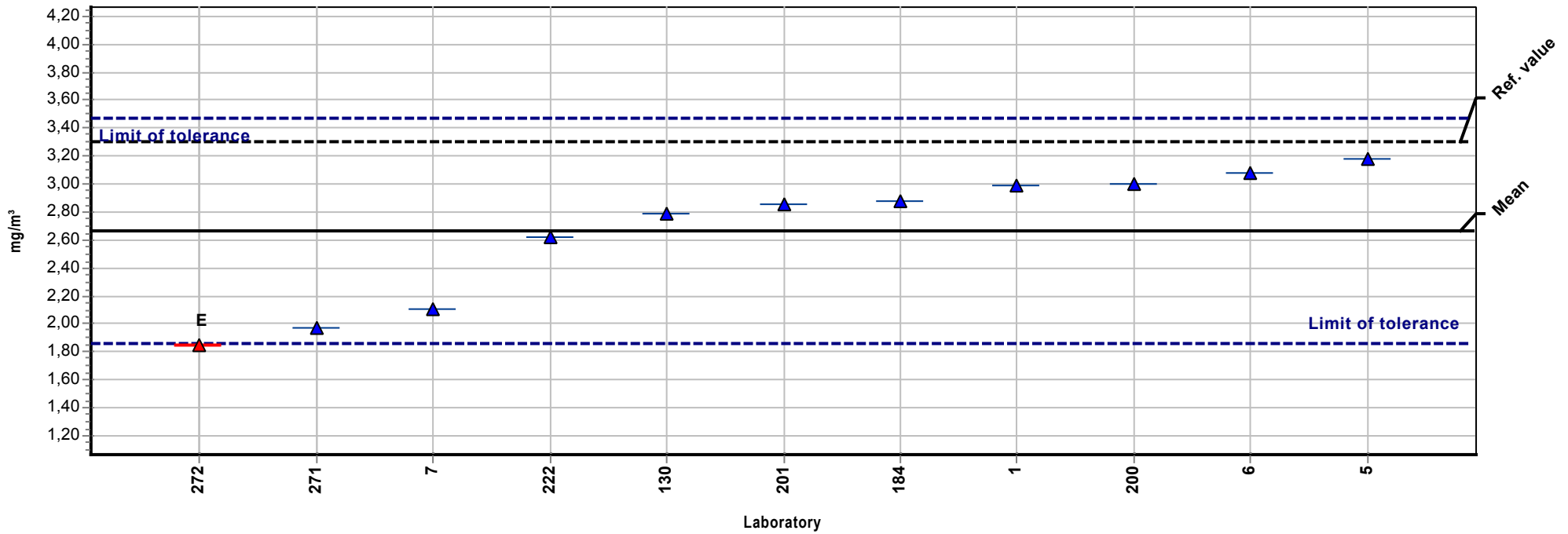
## Summary results

<b>Measurand:</b>	hydrochloric acid	<b>Mean:</b>	1,471 mg/m <sup>3</sup>
<b>Sample:</b>	2	<b>Reprod. s.d.:</b>	0,222 mg/m <sup>3</sup>
<b>Method:</b>	ISO 5725-2	<b>Rel. reprod. s.d.:</b>	15,07%
<b>Rel. target s.d.:</b>	15,00% (Limited)	<b>Reference value:</b>	1,720 mg/m <sup>3</sup>
<b>No. of laboratories:</b>	11	<b>Range of tolerance:</b>	1,029 - 1,912 mg/m <sup>3</sup> ( Z-Score  <= 2,00)



## Summary results

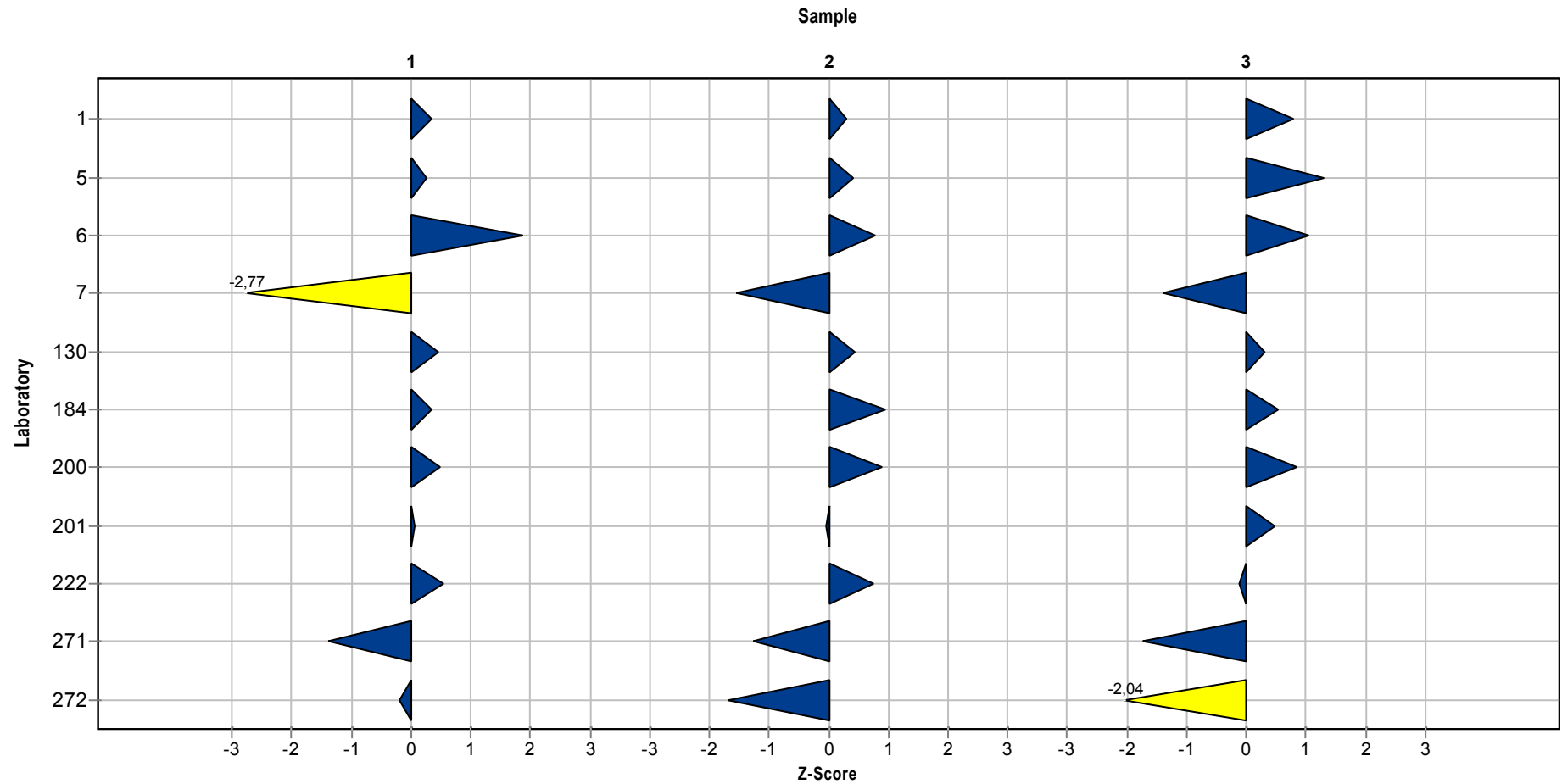
Measurand:	hydrochloric acid	Mean:	2,665 mg/m <sup>3</sup>
Sample:	3	Reprod. s.d.:	0,471 mg/m <sup>3</sup>
Method:	ISO 5725-2	Rel. reprod. s.d.:	17,67%
Rel. target s.d.:	15,00% (Limited)	Reference value:	3,300 mg/m <sup>3</sup>
No. of laboratories:	11	Range of tolerance:	1,866 - 3,465 mg/m <sup>3</sup> ( Z-Score  <= 2,00)





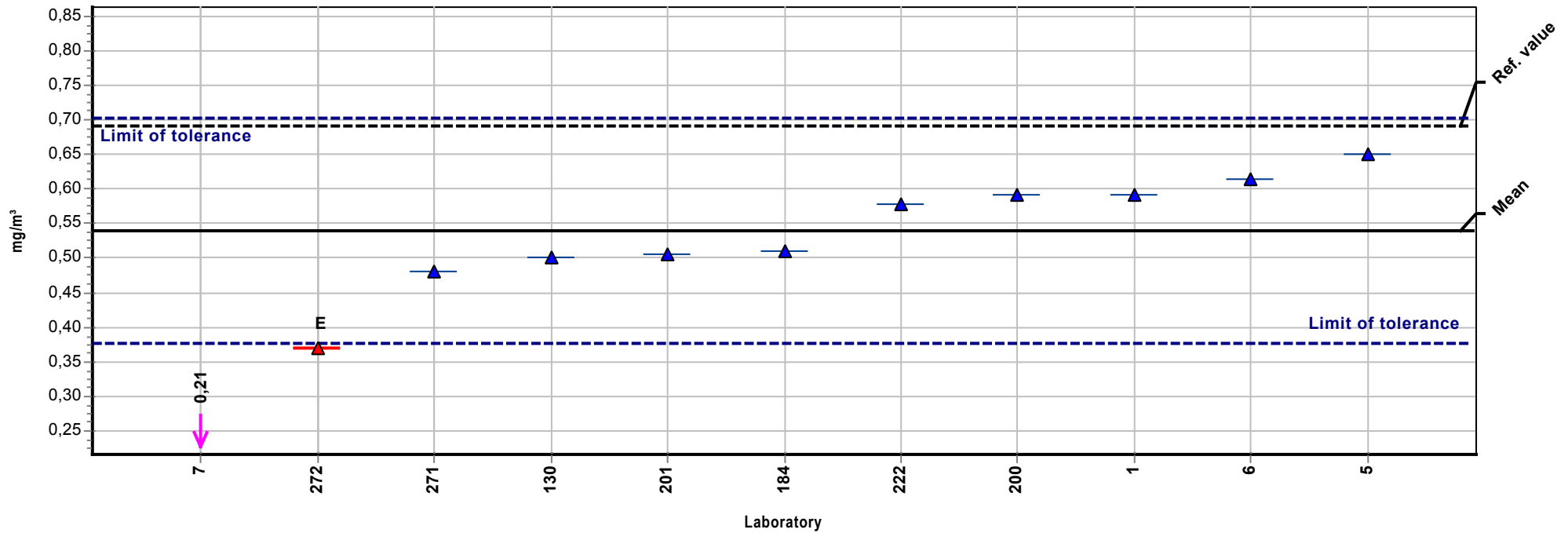
## Analyte chart of Z-Score

Measurand: hydrochloric acid



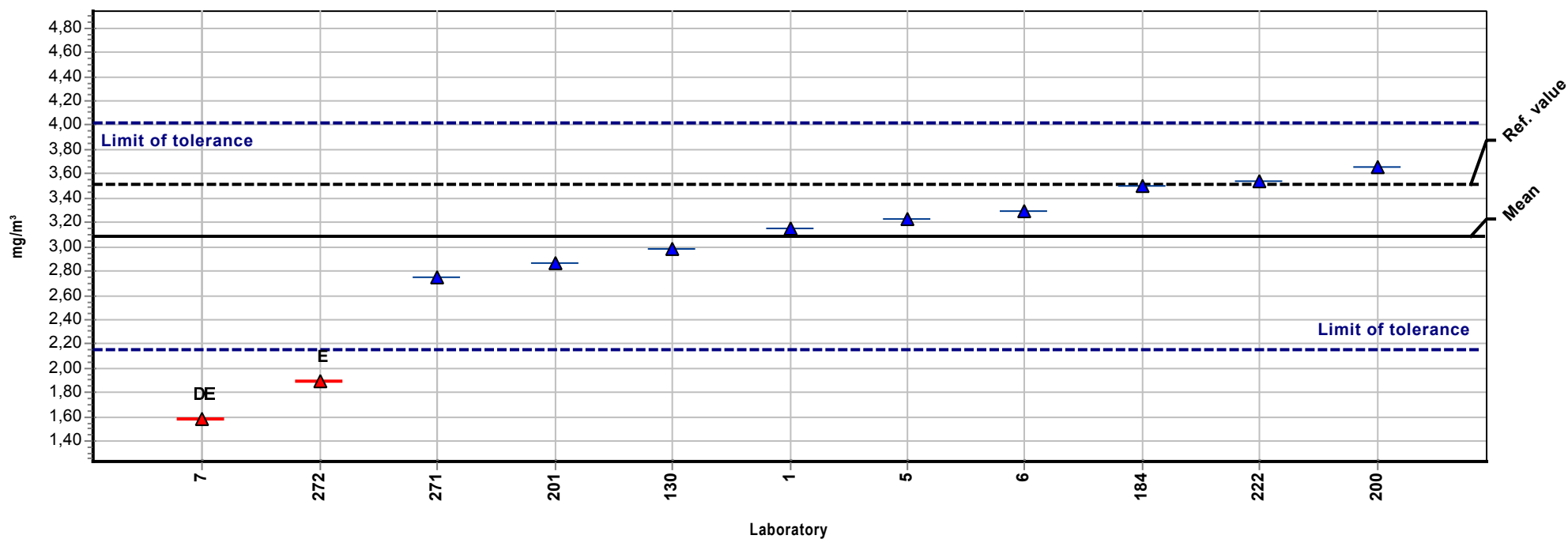
## Summary results

<b>Measurand:</b>	nitric acid	<b>Mean:</b>	0,539 mg/m <sup>3</sup>
<b>Sample:</b>	1	<b>Reprod. s.d.:</b>	0,082 mg/m <sup>3</sup>
<b>Method:</b>	ISO 5725-2	<b>Rel. reprod. s.d.:</b>	15,26%
<b>Rel. target s.d.:</b>	15,00% (Limited)	<b>Reference value:</b>	0,691 mg/m <sup>3</sup>
<b>No. of laboratories:</b>	10	<b>Range of tolerance:</b>	0,378 - 0,701 mg/m <sup>3</sup> ( Z-Score  <= 2,00)



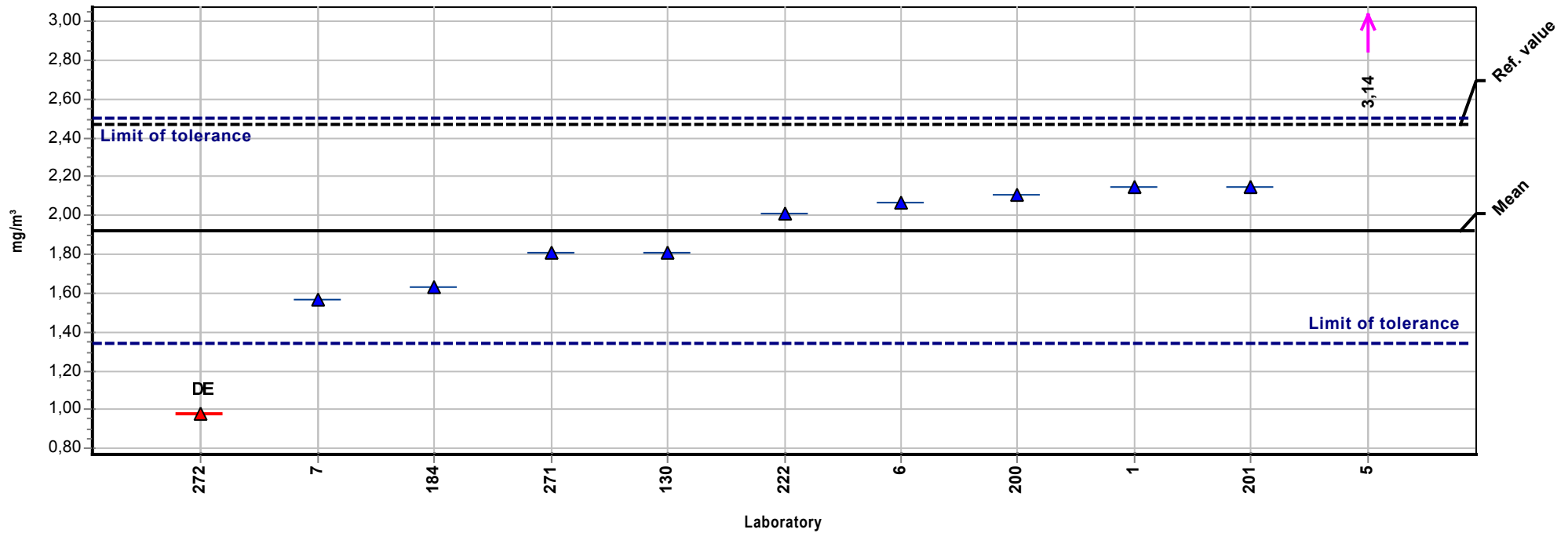
## Summary results

<b>Measurand:</b>	nitric acid	<b>Mean:</b>	3,087 mg/m <sup>3</sup>
<b>Sample:</b>	2	<b>Reprod. s.d.:</b>	0,510 mg/m <sup>3</sup>
<b>Method:</b>	ISO 5725-2	<b>Rel. reprod. s.d.:</b>	16,54%
<b>Rel. target s.d.:</b>	15,00% (Limited)	<b>Reference value:</b>	3,510 mg/m <sup>3</sup>
<b>No. of laboratories:</b>	10	<b>Range of tolerance:</b>	2,161 - 4,012 mg/m <sup>3</sup> ( Z-Score  ≤ 2,00)



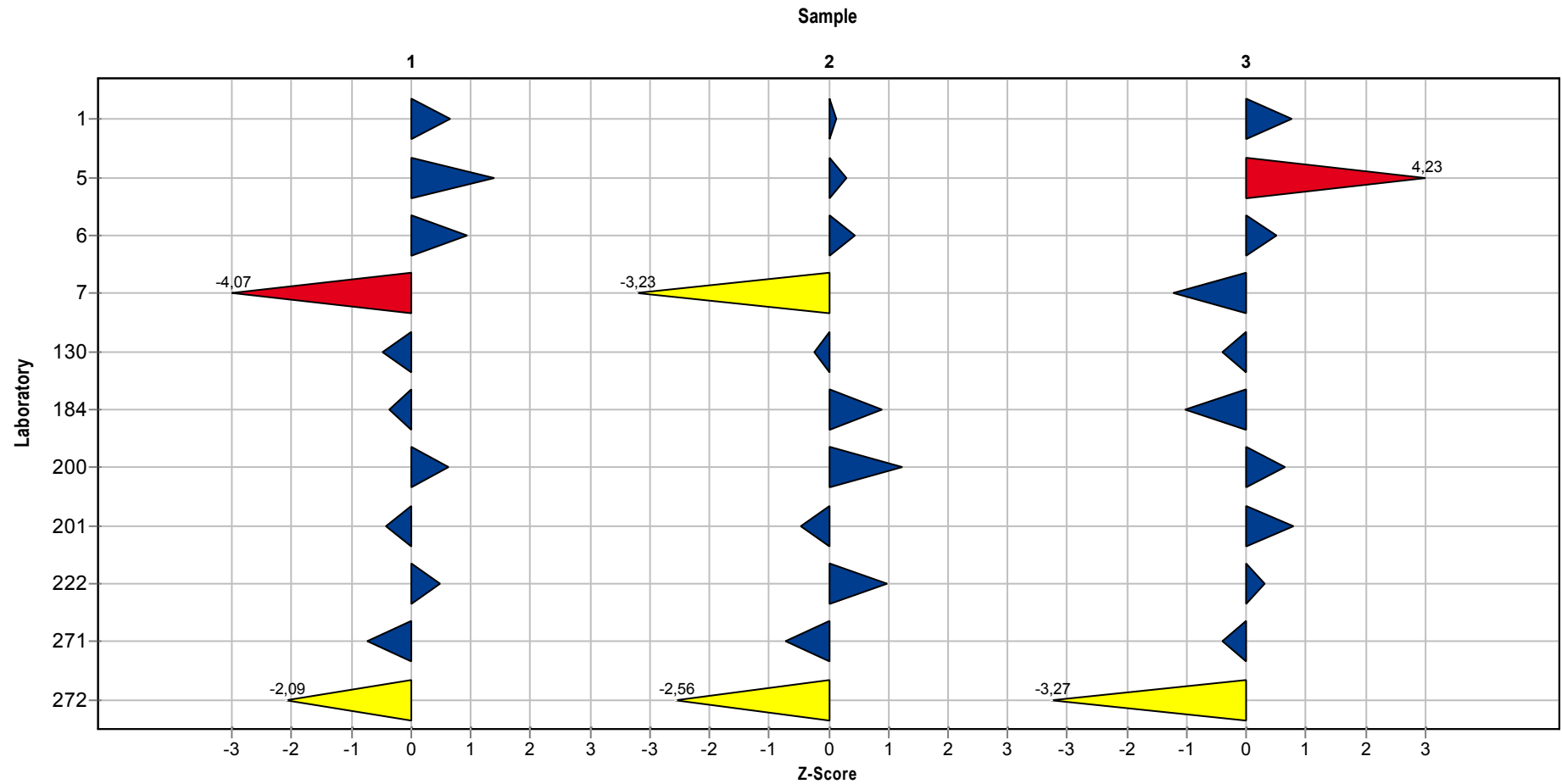
## Summary results

<b>Measurand:</b>	nitric acid	<b>Mean:</b>	1,922 mg/m <sup>3</sup>
<b>Sample:</b>	3	<b>Reprod. s.d.:</b>	0,223 mg/m <sup>3</sup>
<b>Method:</b>	ISO 5725-2	<b>Rel. reprod. s.d.:</b>	11,61%
<b>Rel. target s.d.:</b>	15,00% (Limited)	<b>Reference value:</b>	2,470 mg/m <sup>3</sup>
<b>No. of laboratories:</b>	9	<b>Range of tolerance:</b>	1,345 - 2,498 mg/m <sup>3</sup> ( Z-Score  <= 2,00)



# Analyte chart of Z-Score

Measurand: nitric acid



## Questions and Answers

Participant	Sample carrier HCl/HNO <sub>3</sub>
1	imprägnierter GF / Orbo 53
5	Quarzfaserfilter
6	imprägnierte Quarzfaserfilter
130	Quarzplanfilter Munktell, 37 mm Durchmesser, mit 1,0 mol/L Natriumcarbonatlösung imprägniert
184	imprägnierte Quarzfaserfilter c(Na <sub>2</sub> CO <sub>3</sub> ) = 1,0 mol/L
200	imprägnierte Quarzfaserfilter 37
201	Quarzfaserfilter imprägniert mit Na <sub>2</sub> CO <sub>3</sub> -Lösung
222	ORBO 53
271	Quarzfaserfilter Firma Munkteilm (MK360, Ø 37 mm), imprägniert mit 500 µl Natriumcarbonat ( c = 1 mol/l)
272	Quarzfaserfilter imprägniert

Participant	Prefilter for chlorids/nitrat	Sampling pump
1	ja	SKC Limited 24-PCMTX8, Gilian FS-513A
5	ja	GilAirPlus
6	nicht imprägnierte Quarzfaserfilter	GSA 4000ex
130	nein	Gilian; Model HFS 513
184	Nein	Gilian GilAir Plus
200	ja QF 37 mm	GilAir Plus
201	Ja, Quarzfaserfilter nicht imprägniert	GSA SG 5100 und SG 4000
222		Gil Air 5
271	Ja; Quarzfaserfilter Firma Munkteilm (MK 360, Ø 37 mm), undotiert	GSA SG 4000
272	ja	GSA SG 2500

Participant	Volume flow	Volume flow measurement
1	2 l/min, 0,5 l/min	TSI Serie 4100 (Modell 4166) 0,01 - 20 L/min
5	2 L/min	Primärkalibrator Defender
6	2 L/min	TSI 4100

## Ring test Volatile inorganic acids 2/2016

Participant	Volume flow	Volume flow measurement
130	Run 1: 1 und 2 l/min, Run 2: 1 und 2 l/min, Run 3: 2 l/min	Gilibrator
184	1,0 l/min	Rotameter
200	2,0 L/min	GO CAL
201	ca. 1,9 l/min	Defender 510, Bereich: 0,05 bis 5 l/min
222	0,5 l/min	Bios Defender
271	2 l/min	DryCal DC-Lite
272	ca. 2 l/min	BIOS DryCal DC-Lite

Participant	Sampling time
1	120, 60, 30, 15
5	2h und 0,25 h
6	2 h bzw . 15 min.
130	Run 1: zw . 32 und 120 min, Run 2: zw . 140 und 143 min, Run 3: 15 min
184	114 - 118 min bzw . 15 min
200	2h and 15 min
201	1 Stunde oder 2 Stunden
222	15 min und 120 min
271	120 min / 120 min / 15 min (Gemisch 1/ Gemisch 2/ Gemisch 3)
272	120 min, 15 min

Participant	Analytical method
1	Nisoh 7903
5	IFA 6172 und 6173
6	IFA-Arbeitsmappe 6172 bzw . 6173
130	IFA Arbeitsmappe Nr. 6172
184	Analysemmethode HCl und HNO <sub>3</sub> BGIA 6172; H <sub>2</sub> SO <sub>4</sub> und H <sub>3</sub> PO <sub>4</sub> BGIA 6173
200	Ion chromatography
201	IFA 6172
222	IFA 6172
271	BGIA 6172 & BGIA 6173
272	IFA 6172

## Ring test Volatile inorganic acids 2/2016

Participant	Desorption solution
1	4,2 mmol/l Na <sub>2</sub> CO <sub>3</sub> /1 mmol/l NaHCO <sub>3</sub>
5	dem. H <sub>2</sub> O
6	Reinstwasser
130	Reinstwasser
184	Desorptionslösung HCl und HNO <sub>3</sub> entionisiertes Wasser; H <sub>2</sub> SO <sub>4</sub> und H <sub>3</sub> PO <sub>4</sub> Na <sub>2</sub> CO <sub>3</sub> +NaHCO <sub>3</sub>
200	Milli-Q water
201	bidest. Wasser
271	Schwefel-/ Phosphorsäure: unbehandelt, da bereits in Lösung. Salz-/ Salpetersäure: Reinstwasser
272	Reinstwasser

Participant	Volume of desorption solution
1	10 ml
5	10 ml, 4ml
6	10 mL
130	10 ml
184	Desorptionsvolumen HCl und HNO <sub>3</sub> 10 ml; H <sub>2</sub> SO <sub>4</sub> und H <sub>3</sub> PO <sub>4</sub> 4ml
200	10 mL
201	10 ml
271	10 ml Reinstwasser
272	10 ml

Participant	Time of desorption
1	30 min Ultraschall bei 60°C
5	15 min
6	15 min Ultraschall, 30 min stehen gelassen
130	30 min / 15 min im Ultraschallbad
184	Lösungsdauer HCl und HNO <sub>3</sub> 15 Minuten im Ultraschallbad + 30 Minuten stehenlassen
200	15 min
201	1 h Schütteln auf Schüttelmaschine
271	15 min im Ultraschallbad, 30 min Ruhezeit
272	10 min im Ultraschallbad, dann 30 min stehen lassen



## Ring test Volatile inorganic acids 2/2016

Participant	Ion Chromatographic System
1	Thermo Scientific ICS-3000 mit Sampler AS-1, Detektor Compartment (Leitfähigkeit) und Dual Pump SP1
5	Methrom
6	Thermo ICS 5000
130	Dionex ICS 1100
184	IC - Dionex ICS 2100; Pumpe k.A.; Detektor Leitfähigkeitsdetektor DS6; Autosampler Dionex AS
200	Dionex, conductivity detector
201	Dionex Ion Chromatograph DX-120 mit Leitfähigkeitsdetektor und Suppressor
271	Gerät: Dionex IP20; Detektor: Leitfähigkeits-Detektor (300 pS). Suppressor: ASRS 300' 4 mm , Dionex RFC 10, 59 mA, 1,2 ml/min, Dionex, Injektionsschleife 20 µl.
272	Thermo Scientific™ Dionex™ ICS-2100 integriertes IC-System mit Leitfähigkeitsdetektion, elektrolytischer Elutionsmittelerzeugung und Probenvorbereitung, Autosampler AS-DV

Participant	Analytical column
1	Thermo Scientific AS23
5	Metrosep A Supp 5-100/4.0
6	AS19, 2x250mm
130	AS 22 4 mm von Dionex
184	Trennsäule Dionex IonPac AS 18
200	AS 14A
201	Dionex Ion-Pac AS 22 mit Vorsäule
271	Vorsäule: MF Guard 7,5 mm x 4,6 mm, Alltech. Säule: IonPac AS22 250 mm x 4 mm, Dionex.
272	AS-17C, Durchmesser 2 mm

Participant	Mobile phase	Flow rate
1	4,2 mmol/l Na <sub>2</sub> CO <sub>3</sub> /1 mmol/l NaHCO <sub>3</sub>	1,0 ml/min
5	1mmol NaHCO <sub>3</sub> / 3,2 mmol Na <sub>2</sub> CO <sub>3</sub>	0,7 ml/min
6	KOH	0,25 ml/min
130	4,5 mmol Na <sub>2</sub> CO <sub>3</sub> / 1,4 mmol NaHCO <sub>3</sub>	1,2 ml/min
184	Laufmittel KOH Gradient von 23 mmol bis 31,5 mmol	Flussrate 0,25 ml/min
200	3,5 mM Na <sub>2</sub> CO <sub>3</sub> / 1,0 mM NaHCO <sub>3</sub>	1
201	Na <sub>2</sub> CO <sub>3</sub> (4,48 mMol/l) und NaHCO <sub>3</sub> (1,4 mMol/l)	1,2 ml/min
271	1,4 mM Natriumhydrogencarbonat, 4,5 mM Natriumcarbonat.	1,2 ml/min

## Ring test Volatile inorganic acids 2/2016

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Participant	Mobile phase	Flow rate
272	Wasser/KOH (Gradientensystem mit elektrolytischer Elutionsmittelerzeugung )	0,30 mL/min

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Participant	Recovery rate
1	nicht bestimmt
5	nein
6	nein
130	Ja, Zielwert erreicht
184	Wiederfindungsraten : HCl 96,5%; HNO3 96,2%; H2SO4 97,3%; H3PO4 97,3%
200	no
201	nein
271	Nein
272	nein

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Participant	Date of analysis
1	08.03.2016
5	07.03.2016
6	04.03.16, 07.03.16
130	24.03.2016
184	Datum der Analyse: H2SO4 und H3PO4 31.03.2016 - 04.04.2016; HCl und HNO3 04.04.2016 - 07.04.2016
200	17.3.2016
201	21.03.2016
271	16.03.2016
272	04.03.2016

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# **Round-robin tests for in-house measuring laboratories**

**Institut für Arbeitsschutz der Deutschen Gesetzlichen Unfallversicherung (IFA)  
Institute for Occupational Safety and Health of the German Social Accident Insurance**

**B. Maybaum, K. Gusbeth, Prof. Dr. D. Breuer  
Alte Heerstraße 111, 53757 Sankt Augustin  
proficiency-testing@dguv.de, +49 2241 231 2549**

## ***Results and Evaluation***

**Round-robin test inorganic acids,  
February/March 2016**

**Part 2: non-volatile acids**

## Summary of laboratory test results

Measurand phosphoric acid

	Sample 1	Z score	Sample 2	Z score
Unit	mg/m <sup>3</sup>		mg/m <sup>3</sup>	
1	0,257	0,00	0,771	-0,18
5	0,246	-0,43	0,714	-0,90
6	0,265	0,31	0,783	-0,02
7	0,270	0,50	0,750	-0,44
10	0,232	-0,98	0,602	-2,33 E
68	0,260	0,11	0,970	2,36 E
72	0,272	0,58	0,794	0,12
74	0,232	-0,98	0,705	-1,02
78	0,260	0,11	0,787	0,03
82	0,212	-1,75	0,700	-1,08
83	0,271	0,54	< 0,010	
86	0,224	-1,29	0,640	-1,85
90	0,260	0,11	0,820	0,45
93	0,259	0,07	0,744	-0,52
99	0,260	0,11	0,730	-0,70
100	0,256	-0,04	0,821	0,46
110	0,265	0,31	0,749	-0,46
114	0,253	-0,16	0,783	-0,02
130	0,260	0,11	0,790	0,07
131	0,276	0,74	0,824	0,50
138	0,260	0,11	0,800	0,19
144	0,266	0,35	0,826	0,52
147	0,240	-0,66	0,850	0,83
151	0,264	0,27	0,741	-0,56
174	0,262	0,19	0,818	0,42
177	0,278	0,81	0,809	0,31
178	0,280	0,89	0,760	-0,32
184	0,280	0,89	0,740	-0,57
195	0,290	1,28	0,980	2,49 E
200	0,241	-0,63	0,808	0,30
201	0,259	0,07	0,718	-0,85
208	0,254	-0,12	0,729	-0,71
222	0,257	0,00	1,052	3,40 E
224	0,243	-0,55	0,746	-0,49
264	0,240	-0,66	0,660	-1,59
266	0,262	0,19	0,787	0,03
271	0,262	0,19	0,791	0,08
272	0,250	-0,28	0,720	-0,83
280	0,210	-1,83	0,270	-6,56 BE
505	0,295	1,48	1,012	2,89 E
-	-	--	-	--
Method	ISO 5725-2		ISO 5725-2	
Assessment	Z <=2,00		Z <=2,00	
No. of laboratories that submitted results	40		40	
Mean	0,257		0,785	
Reproducibility s.d.	0,018		0,093	
Rel. reproducibility s.d.	7,15 %		11,88 %	

	Sample 1 Z score	Sample 2 Z score
Reference value	0,267	0,772
Target s.d.	0,026	0,078
Rel. SDPA	10,00 %	10,00 %
Lower limit of tolerance	0,206	0,628
Upper limit of tolerance	0,308	0,942
Type B outliers		1
No. of laboratories after elimination of outliers type A-D and F (without laboratories that only gave states but no measured values)	40	38
No. of laboratories with E outliers		6
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\text{-Score}  > 3,5$		
L: Differing laboratory mean (Grubbs II)	Grubbs für 2	

## Summary of laboratory test results

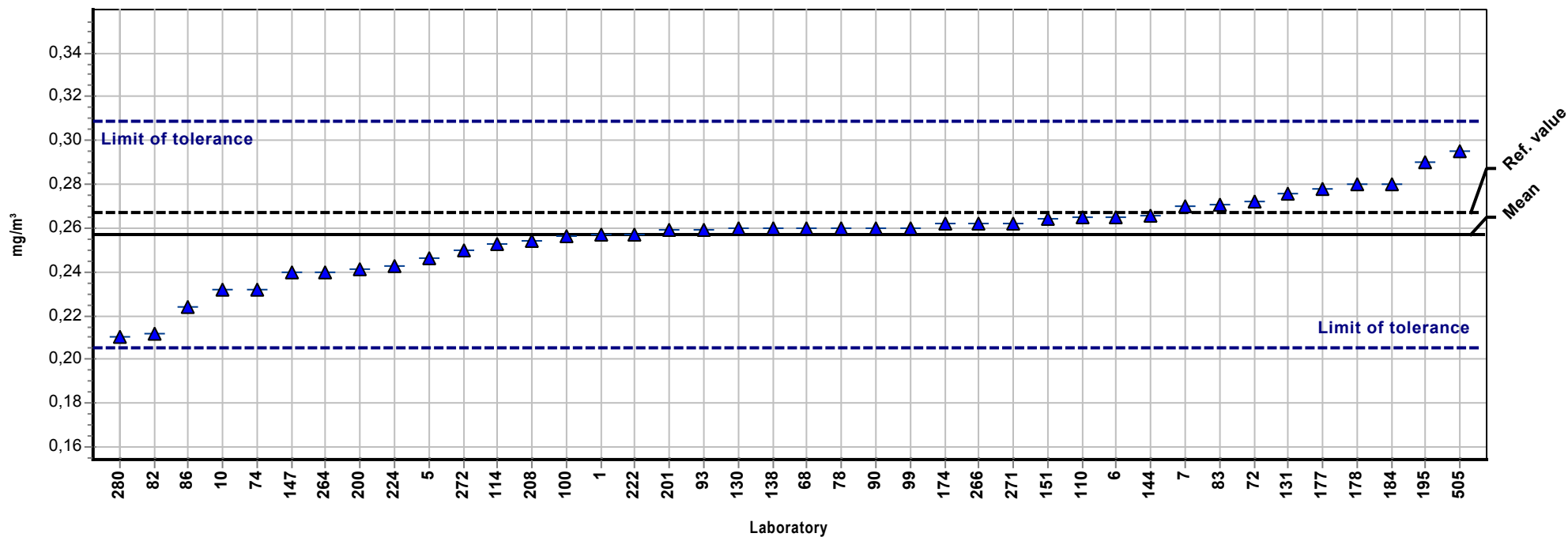
Measurand sulfuric acid

	Sample 1	Z score	Sample 2	Z score
Unit	mg/m <sup>3</sup>		mg/m <sup>3</sup>	
1	0,1880	0,20	0,0480	0,13
5	0,1803	-0,22	0,0410	-1,34
6	0,1750	-0,51	0,0430	-0,92
7	0,1900	0,31	0,0500	0,56
10	0,1770	-0,40	0,0467	-0,14
68	0,1800	-0,23	0,0500	0,56
72	0,1630	-1,16	0,0390	-1,77
74	0,1990	0,80	0,0500	0,56
78	0,1870	0,15	0,0481	0,15
82	0,1770	-0,40	0,0500	0,56
83	0,1850	0,04	0,0570	2,03 E
86	0,1550	-1,59	0,0420	-1,13
90	0,1900	0,31	0,0500	0,56
93	0,1830	-0,07	0,0450	-0,50
99	0,1900	0,31	0,0600	2,67 E
100	0,1840	-0,02	0,0510	0,77
110	0,1820	-0,13	0,0400	-1,56
114	0,1740	-0,56	0,0430	-0,92
130	0,1900	0,31	0,0480	0,13
131	0,1850	0,04	0,0440	-0,71
138	0,2000	0,85	0,0500	0,56
144	0,1920	0,42	0,0500	0,56
147	0,1800	-0,23	0,0500	0,56
151	0,1890	0,25	0,0460	-0,29
174	0,1790	-0,29	0,0440	-0,71
177	0,1970	0,69	0,0560	1,82
178	0,1900	0,31	0,0700	4,78 BE
184	0,1900	0,31	0,0440	-0,71
195	0,1800	-0,23	0,0500	0,56
200	0,1970	0,69	0,0470	-0,08
201	0,1830	-0,07	0,0460	-0,29
208	0,1890	0,25	0,0480	0,13
222	0,1860	0,09	0,0510	0,77
224	0,1700	-0,78	0,0372	-2,15 E
239	0,1850	0,04	0,0480	0,13
264	0,1700	-0,78	0,0500	0,56
266	0,1800	-0,23	0,0474	0,01
271	0,1860	0,09	0,0510	0,77
272	0,1700	-0,78	0,0400	-1,56
280	0,2000	0,85	0,0100	-7,89 BE
505	0,2100	1,39	0,0460	-0,29
-	-	--	-	--
Method	ISO 5725-2		ISO 5725-2	
Assessment	Z <=2,00		Z <=2,00	
No. of laboratories that submitted results	41		41	
Mean	0,1843		0,0474	
Reproducibility s.d.	0,0105		0,0048	

	Sample 1 Z score	Sample 2 Z score
Rel. reproducibility s.d.	5,67 %	10,12 %
Reference value	0,1920	0,0493
Target s.d.	0,0184	0,0047
Rel. SDPA	10,00 %	10,00 %
Lower limit of tolerance	0,1475	0,0379
Upper limit of tolerance	0,2212	0,0568
Type B outliers		2
No. of laboratories after elimination of outliers type A-D and F (without laboratories that only gave states but no measured values)	41	39
No. of laboratories with E outliers		5
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\text{-Score}  > 3,5$		
L: Differing laboratory mean (Grubbs II)	Grubbs für 2	

## Summary results

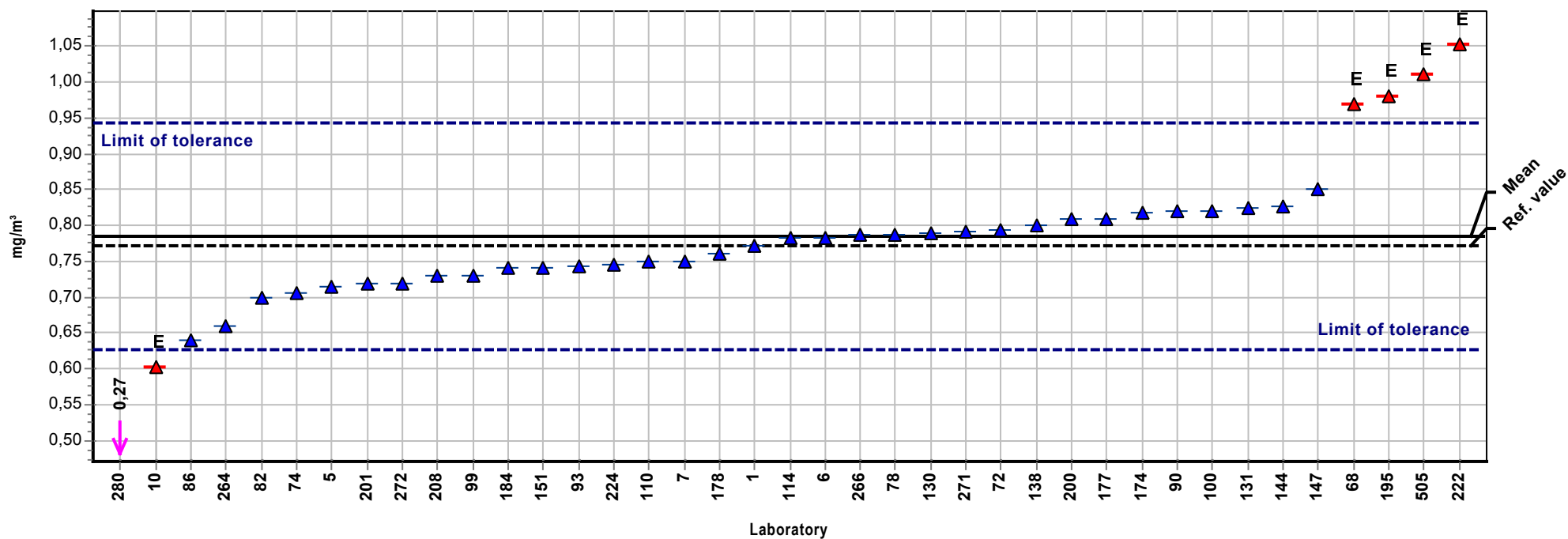
<b>Measurand:</b>	phosphoric acid	<b>Mean:</b>	0,257 mg/m <sup>3</sup>
<b>Sample:</b>	1	<b>Reprod. s.d.:</b>	0,018 mg/m <sup>3</sup>
<b>Method:</b>	ISO 5725-2	<b>Rel. reprod. s.d.:</b>	7,15%
<b>Rel. target s.d.:</b>	10,00% (Limited)	<b>Reference value:</b>	0,267 mg/m <sup>3</sup>
<b>No. of laboratories:</b>	40	<b>Range of tolerance:</b>	0,206 - 0,308 mg/m <sup>3</sup> ( Z-Score  <= 2,00)





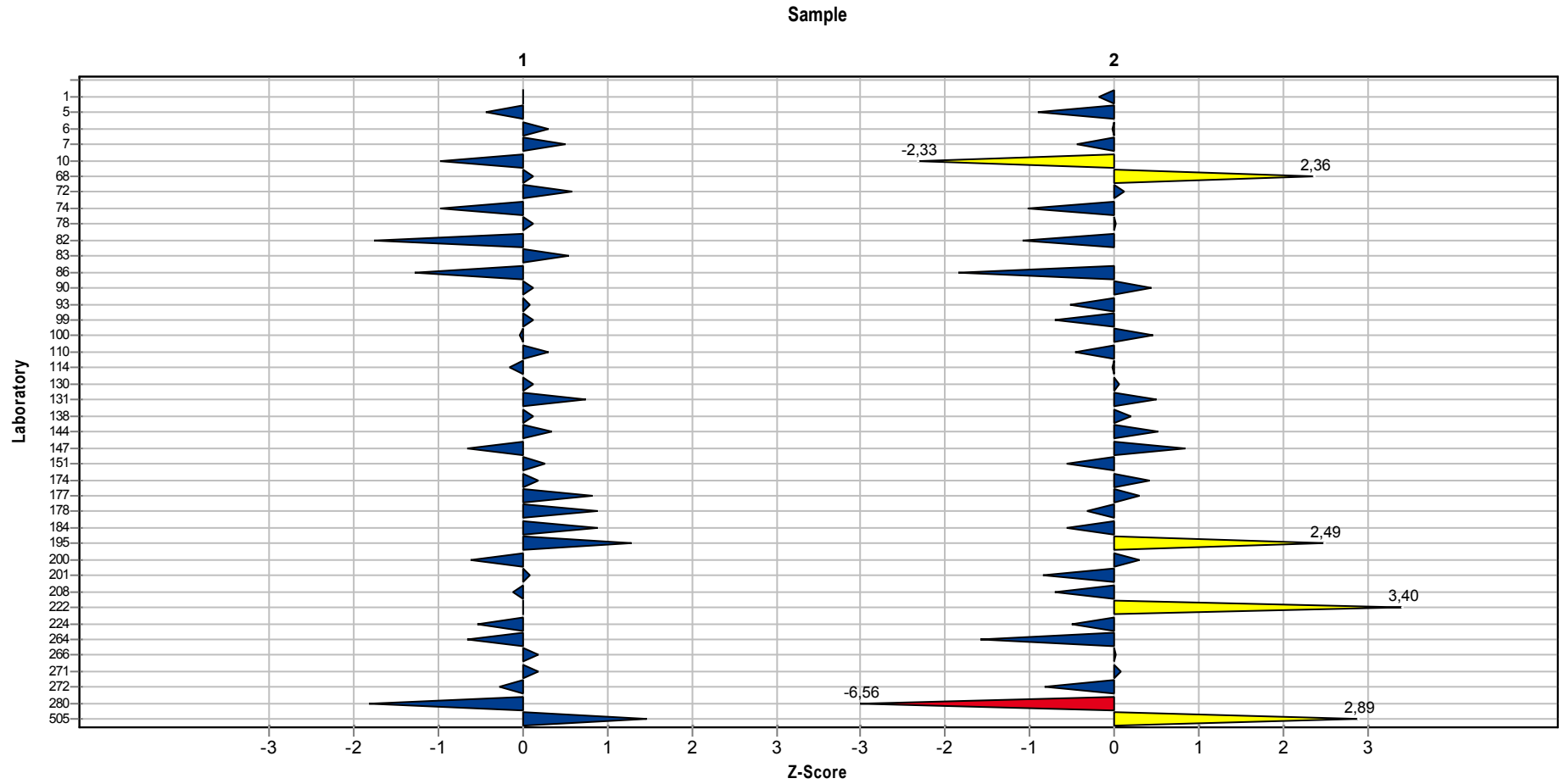
## Summary results

<b>Measurand:</b>	phosphoric acid	<b>Mean:</b>	0,785 mg/m <sup>3</sup>
<b>Sample:</b>	2	<b>Reprod. s.d.:</b>	0,093 mg/m <sup>3</sup>
<b>Method:</b>	ISO 5725-2	<b>Rel. reprod. s.d.:</b>	11,88%
<b>Rel. target s.d.:</b>	10,00% (Limited)	<b>Reference value:</b>	0,772 mg/m <sup>3</sup>
<b>No. of laboratories:</b>	38	<b>Range of tolerance:</b>	0,628 - 0,942 mg/m <sup>3</sup> ( Z-Score  <= 2,00)



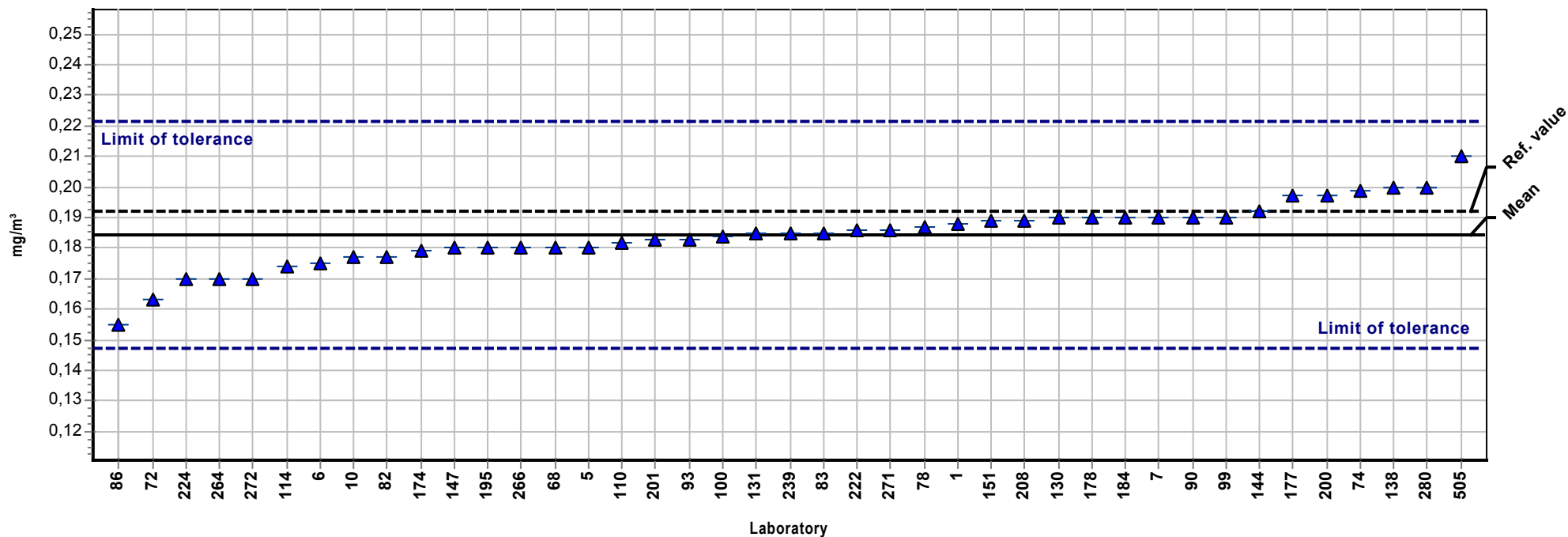
# Analyte chart of Z-Score

Measurand: phosphoric acid



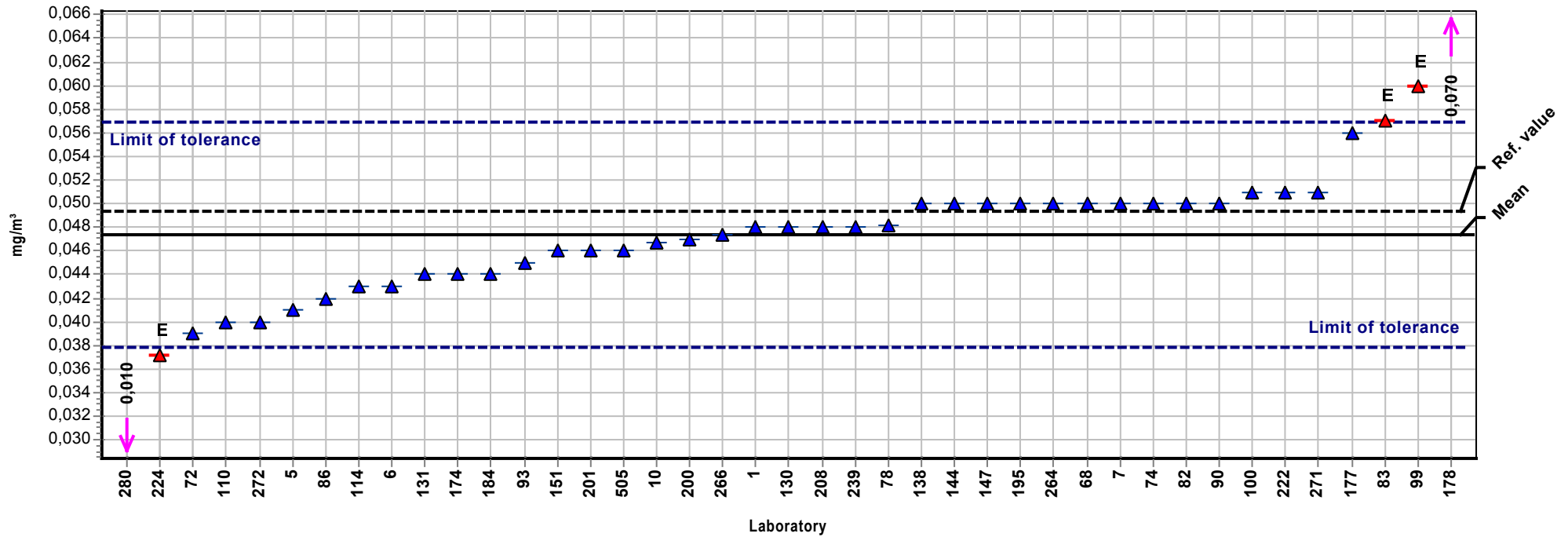
## Summary results

<b>Measurand:</b>	sulfuric acid	<b>Mean:</b>	0,1843 mg/m <sup>3</sup>
<b>Sample:</b>	1	<b>Reprod. s.d.:</b>	0,0105 mg/m <sup>3</sup>
<b>Method:</b>	ISO 5725-2	<b>Rel. reprod. s.d.:</b>	5,67%
<b>Rel. target s.d.:</b>	10,00% (Limited)	<b>Reference value:</b>	0,1920 mg/m <sup>3</sup>
<b>No. of laboratories:</b>	41	<b>Range of tolerance:</b>	0,1475 - 0,2212 mg/m <sup>3</sup> ( Z-Score  <= 2,00)



## Summary results

<b>Measurand:</b>	sulfuric acid	<b>Mean:</b>	0,0474 mg/m <sup>3</sup>
<b>Sample:</b>	2	<b>Reprod. s.d.:</b>	0,0048 mg/m <sup>3</sup>
<b>Method:</b>	ISO 5725-2	<b>Rel. reprod. s.d.:</b>	10,12%
<b>Rel. target s.d.:</b>	10,00% (Limited)	<b>Reference value:</b>	0,0493 mg/m <sup>3</sup>
<b>No. of laboratories:</b>	39	<b>Range of tolerance:</b>	0,0379 - 0,0568 mg/m <sup>3</sup> ( Z-Score  <= 2,00)



# Analyte chart of Z-Score

Measurand: sulfuric acid

