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Institut für Arbeitsschutz der
Deutschen Gesetzlichen Unfallversicherung

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

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Results and Evaluation

Round-robin test

„Aldehydes 2014“

Summary of laboratory means

Sample 1

	Formaldehyde	Z score		Acetaldehyde	Z score	Propionaldehyde	Z score	Butyraldehyde	Z score	
Unit	mg/m³			mg/m³		mg/m³		mg/m³		
10	0,161	-0,24		0,514	0,56	0,464	-0,77	0,608	0,46	
22	0,171	0,37		0,492	0,11	0,518	0,31	0,588	0,12	
28	0,158	-0,42		0,457	-0,62	0,461	-0,83	0,530	-0,88	
29	0,179	0,85		0,515	0,58	0,546	0,87			
30	0,169	0,25		0,501	0,29	0,547	0,89	0,585	0,07	
42	0,181	0,97		0,537	1,03	0,555	1,05	0,643	1,07	
45	0,164	-0,06		0,488	0,02	0,511	0,17	0,721	2,41	E
55	0,211	2,79	BE	0,493	0,13	0,493	-0,19	0,583	0,03	
56	0,150	-0,91		0,420	-1,37	0,430	-1,44	0,490	-1,57	
58	0,165	0,02		0,499	0,25	0,523	0,42	0,596	0,25	
60	0,168	0,19		0,530	0,89	0,602	1,98	0,559	-0,38	
62	0,160	-0,30		0,500	0,27	0,480	-0,45	0,550	-0,53	
121	0,160	-0,30		0,430	-1,17	0,480	-0,45	0,630	0,84	
123	0,187	1,34		0,559	1,48	0,565	1,25	0,608	0,46	
153	0,188	1,40		0,527	0,83	0,538	0,71	0,634	0,91	
155	0,157	-0,48		0,484	-0,06	0,514	0,23	0,597	0,27	
165	0,163	-0,12		0,496	0,19	0,520	0,35	0,658	1,32	
167	0,153	-0,72		0,476	-0,22	0,511	0,17	0,576	-0,09	
174	0,160	-0,30		0,503	0,33	0,525	0,45	0,658	1,32	
186	0,173	0,49		0,515	0,58	0,555	1,05	0,633	0,89	
191	0,170	0,31		0,515	0,58	0,543	0,81	0,619	0,65	
195	0,162	-0,18		0,465	-0,45	0,518	0,31			
199	0,150	-0,91		0,434	-1,09	0,418	-1,68	0,456	-2,15	E
207	0,164	-0,06		0,498	0,23	0,527	0,49	0,577	-0,07	
219	0,165	0,00		0,503	0,33	0,521	0,37	0,611	0,51	
228	0,140	-1,51		0,420	-1,37	0,440	-1,24	0,450	-2,26	E
230	0,179	0,85		0,467	-0,41	0,487	-0,31	0,554	-0,47	
231	0,162	-0,19		0,470	-0,35	0,437	-1,30	0,543	-0,66	
241	0,150	-0,91		0,450	-0,76	0,450	-1,04	0,500	-1,40	

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	Formaldehyde	Z score	Acetaldehyde	Z score	Propionaldehyde	Z score	Butyraldehyde	Z score
260	0,160	-0,30						
262	0,183	1,09	0,493	0,13	0,516	0,27	0,592	0,19
264	0,170	0,31	0,480	-0,14	0,490	-0,25	0,550	-0,53
265	0,145	-1,22	0,405	-1,69	0,363	-2,77 E	0,505	-1,31
267	0,172	0,43	0,509	0,46	0,532	0,59	0,610	0,50
275			0,500	0,27				
281	0,170	0,31						
501	0,169	0,25	0,492	0,11				
502	0,160	-0,30	0,490	0,07				
–	–	– –	–	– –	–	– –	–	– –
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	
Mean	0,165		0,487		0,502		0,581	
Reproducibility s.d.	0,011		0,035		0,049		0,060	
Rel. reproducibility s.d.	6,78 %		7,09 %		9,79 %		10,38 %	
Reference value	0,160		0,470		0,519		0,601	
Target s.d.	0,016		0,049		0,050		0,058	
Rel. target s.d.:	10,00 %		10,00 %		10,00 %		10,00 %	
Lower limit of tolerance	0,132		0,389		0,402		0,465	
Upper limit of tolerance	0,198		0,584		0,603		0,697	
Type B outliers	1		0		0		0	
Type F outliers	0		0		0		0	
No. of laboratories that submitted results	37		36		33		31	
No. of laboratories after elimination of outliers type A-D and F (without laboratories that only gave states but no measured values)	36		36		33		31	
Explanation of outlier types								
A: Single outlier	Grubbs							
B: Differing laboratory mean	Grubbs							
C: Excessive laboratory s.d.	Cochran							
D: Excluded manually								
E: score outside tolerance limits								
F: |Score|>3,5								

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Summary of laboratory means

Sample 2

	Formaldehyde	Z score	Propionaldehyde	Z score	Butyraldehyde	Z score
Unit	mg/m³		mg/m³		mg/m³	
10	0,116	0,07	0,925	-0,81	1,030	0,38
22	0,121	0,50	1,034	0,28	1,027	0,35
28	0,113	-0,20	0,936	-0,70	0,926	-0,67
29	0,117	0,15	1,049	0,42		
30	0,116	0,07	1,079	0,72	1,021	0,29
42	0,127	1,02	1,110	1,03	1,103	1,11
45	0,116	0,07	1,030	0,24	1,269	2,79 E
55	0,146	2,67 E	0,974	-0,32	0,974	-0,19
56	0,110	-0,46	0,970	-0,36	0,960	-0,33
58	0,116	0,05	1,028	0,22	1,012	0,19
60	0,116	0,07	1,200	1,92	1,000	0,07
62	0,120	0,41	0,950	-0,56	0,940	-0,53
121	0,110	-0,46	0,970	-0,36	1,100	1,08
123	0,138	1,97	1,075	0,68	1,053	0,61
153	0,124	0,76	0,999	-0,07	1,023	0,31
155	0,108	-0,63	1,015	0,09	1,018	0,26
165	0,113	-0,20	1,041	0,34	1,150	1,59
167	0,108	-0,63	1,018	0,12	0,985	-0,08
174	0,107	-0,72	1,007	0,01		
186	0,120	0,41	1,109	1,02	1,104	1,12
191	0,112	-0,28	0,999	-0,07	0,999	0,06
195	0,109	-0,54	1,018	0,12		
199	0,105	-0,89	0,845	-1,60	0,796	-1,98
207	0,114	-0,11	1,052	0,45	0,997	0,04
219	0,112	-0,28	1,017	0,11	1,037	0,45
228	0,094	-1,84	0,840	-1,65	0,750	-2,44 E
230	0,131	1,37	0,949	-0,57	0,926	-0,67
231	0,114	-0,14	0,891	-1,15	0,965	-0,27
241	0,105	-0,89	0,880	-1,26	0,850	-1,44

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	Formaldehyde	Z score	Propionaldehyde	Z score	Butyraldehyde	Z score
260	0,110	-0,46				
262	0,124	0,76	1,039	0,32	1,051	0,59
264	0,120	0,41	0,980	-0,26	0,940	-0,53
265	0,085	-2,62 E	0,586	-4,17 BE	0,716	-2,78 E
267	0,118	0,24	1,055	0,48	1,049	0,57
281	0,117	0,15				
500	0,114	-0,11	1,058	0,51	0,997	0,04
501	0,119	0,33				
502	0,115	-0,02	1,073	0,66	0,993	0,00
–	–	––	–	––	–	––
Method	ISO 5725-2		ISO 5725-2		ISO 5725-2	
Assessment	|Z|<=2,00		|Z|<=2,00		|Z|<=2,00	
Mean	0,115		1,006		0,993	
Reproducibility s.d.	0,010		0,076		0,109	
Rel. reproducibility s.d.	9,07 %		7,59 %		10,94 %	
Reference value	0,113		1,040		1,050	
Target s.d.	0,012		0,101		0,099	
Rel. target s.d.:	10,00 %		10,00 %		10,00 %	
Lower limit of tolerance	0,092		0,805		0,794	
Upper limit of tolerance	0,138		1,208		1,191	
Type B outliers	0		1		0	
Type F outliers	0		0		0	
No. of laboratories that submitted results	38		35		32	
No. of laboratories after elimination of outliers type A-D and F (without laboratories that only gave states but no measured values)	38		34		32	
Explanation of outlier types						
A: Single outlier	Grubbs					
B: Differing laboratory mean	Grubbs					
C: Excessive laboratory s.d.	Cochran					
D: Excluded manually						
E: score outside tolerance limits						
F: |Score|>3,5						

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Summary of laboratory means

Sample 3

	Formaldehyde	Z score	Propionaldehyde	Z score	Butyraldehyde	Z score
Unit	mg/m³		mg/m³		mg/m³	
10	0,053	-0,30	0,220	-0,77	0,376	0,81
22	0,057	0,49	0,241	0,11	0,345	-0,08
28	0,051	-0,67	0,215	-0,98	0,311	-1,05
29	0,057	0,49	0,239	0,03		
30	0,056	0,30	0,269	1,28	0,364	0,46
42	0,063	1,59	0,273	1,45	0,397	1,41
45	0,056	0,30	0,242	0,15	0,433	2,45 E
55	0,078	4,35 BE	0,252	0,57	0,366	0,52
56	0,060	1,04	0,240	0,07	0,340	-0,23
58	0,059	0,87	0,246	0,32	0,357	0,25
60	0,055	0,12	0,284	1,91	0,315	-0,95
62	0,050	-0,80	0,210	-1,19	0,310	-1,09
121	0,050	-0,80	0,230	-0,35	0,380	0,92
123	0,056	0,30	0,259	0,87	0,364	0,46
153	0,063	1,59	0,255	0,70	0,381	0,95
155	0,056	0,30	0,251	0,53	0,367	0,55
165	0,052	-0,43	0,284	1,91	0,387	1,12
167	0,054	-0,06	0,246	0,32	0,352	0,12
174	0,053	-0,25	0,242	0,15	0,357	0,26
186	0,054	-0,06	0,254	0,66	0,382	0,98
191	0,054	-0,06	0,252	0,57	0,365	0,49
195	0,052	-0,43	0,234	-0,18		
199	0,053	-0,25	0,197	-1,74	0,273	-2,15 E
207	0,053	-0,25	0,240	0,07	0,333	-0,43
219	0,053	-0,25	0,241	0,11	0,361	0,38
228	0,043	-2,09 E	0,190	-2,03 E	0,250	-2,81 E
230	0,077	4,17 FE	0,226	-0,52	0,322	-0,74
231	0,060	1,09	0,214	-1,02	0,330	-0,51
241	0,050	-0,80	0,210	-1,19	0,300	-1,38

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	Formaldehyde	Z score	Propionaldehyde	Z score	Butyraldehyde	Z score
260	0,045	-1,72				
262	0,059	0,85	0,244	0,24	0,365	0,49
264	0,060	1,04	0,250	0,49	0,340	-0,23
265	0,045	-1,63	0,165	-3,07 E	0,292	-1,60
267	0,057	0,49	0,251	0,53	0,370	0,63
281	< 0,076					
–	–	– –	–	– –	–	– –
Method	ISO 5725-2		ISO 5725-2		ISO 5725-2	
Assessment	|Z|<=2,00		|Z|<=2,00		|Z|<=2,00	
Mean	0,054		0,238		0,348	
Reproducibility s.d.	0,005		0,026		0,038	
Rel. reproducibility s.d.	8,81 %		10,75 %		10,97 %	
Reference value	0,052		0,247		0,360	
Target s.d.	0,005		0,024		0,035	
Rel. target s.d.:	10,00 %		10,00 %		10,00 %	
Lower limit of tolerance	0,043		0,191		0,278	
Upper limit of tolerance	0,065		0,286		0,417	
Type B outliers	1		0		0	
Type F outliers	1		0		0	
No. of laboratories that submitted results	35		33		31	
No. of laboratories after elimination of outliers type A-D and F (without laboratories that only gave states but no measured values)	32		33		31	
Explanation of outlier types						
A: Single outlier	Grubbs					
B: Differing laboratory mean	Grubbs					
C: Excessive laboratory s.d.	Cochran					
D: Excluded manually						
E: score outside tolerance limits						
F: |Score|>3,5						

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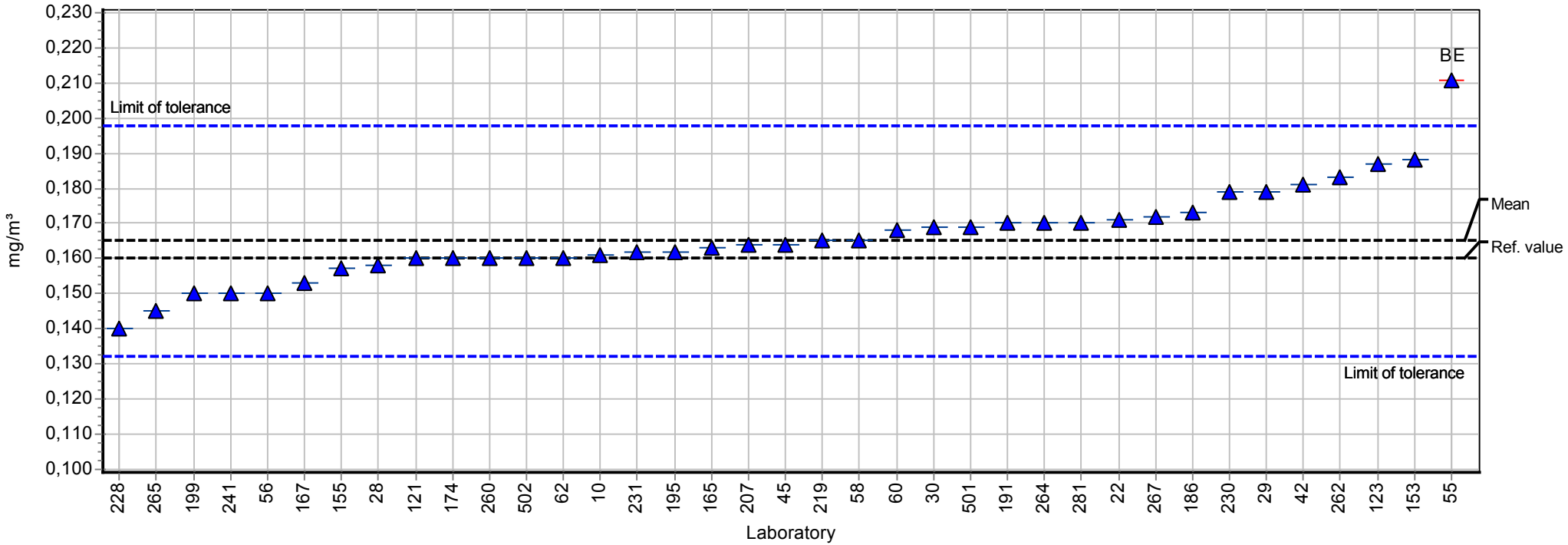
Summary results

Measurand:	**Formaldehyde**	**Mean:**	**0,165 mg/m³**
Sample:	**1**	**Reproducibility s.d.:**	**0,011 mg/m³**
Method:	**ISO 5725-2**	**Relative reproducibility s.d.:**	**6,78%**
No. of laboratories:	**36**	**Reference value:**	**0,160 mg/m³**
Relative target s.d.:	**10,00% (Limited)**	**Range of tolerance:**	**0,132 - 0,198 mg/m³ (|Z-Score| <= 2,00)**



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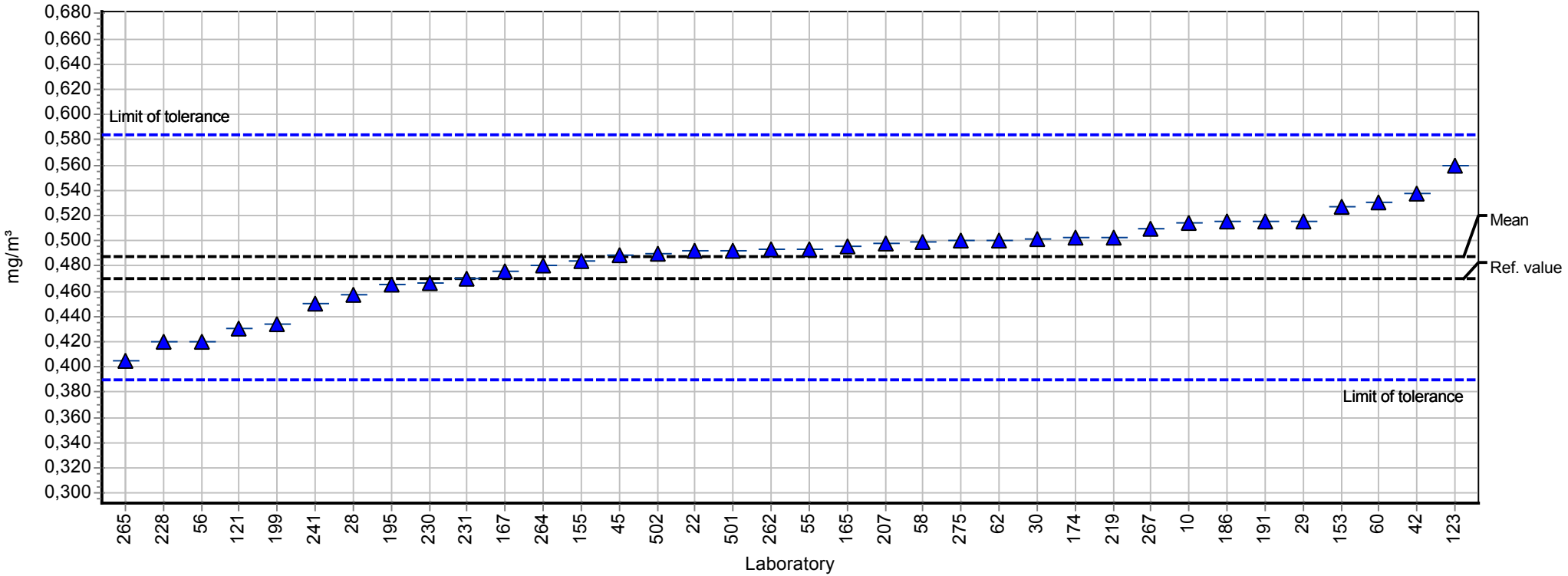
Summary results

Measurand:	**Acetaldehyde**	**Mean:**	**0,487 mg/m³**
Sample:	**1**	**Reproducibility s.d.:**	**0,035 mg/m³**
Method:	**ISO 5725-2**	**Relative reproducibility s.d.:**	**7,09%**
No. of laboratories:	**36**	**Reference value:**	**0,470 mg/m³**
Relative target s.d.:	**10,00% (Limited)**	**Range of tolerance:**	**0,389 - 0,584 mg/m³ (|Z-Score| <= 2,00)**



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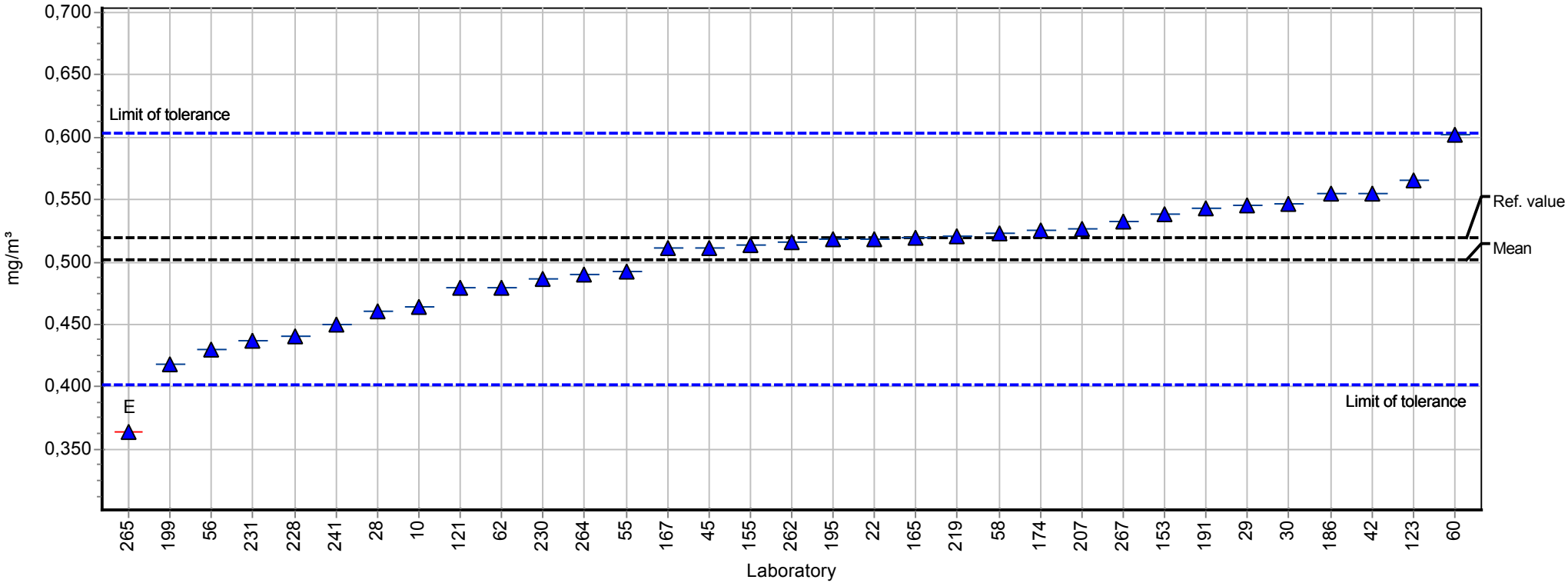
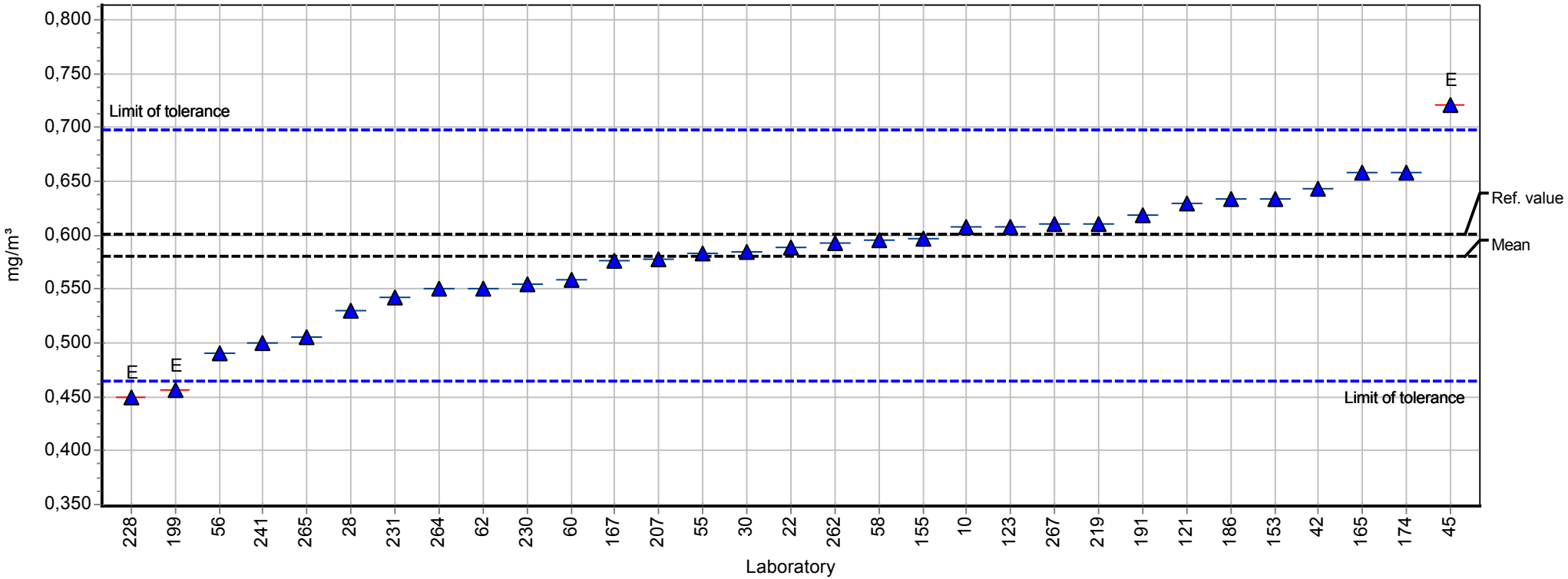
Summary results

Measurand:	**Propionaldehyde**	**Mean:**	**0,502 mg/m³**
Sample:	**1**	**Reproducibility s.d.:**	**0,049 mg/m³**
Method:	**ISO 5725-2**	**Relative reproducibility s.d.:**	**9,79%**
No. of laboratories:	**33**	**Reference value:**	**0,519 mg/m³**
Relative target s.d.:	**10,00% (Limited)**	**Range of tolerance:**	**0,402 - 0,603 mg/m³ (|Z-Score| <= 2,00)**



Summary results

Measurand:	**Butyraldehyde**	**Mean:**	**0,581 mg/m³**
Sample:	**1**	**Reproducibility s.d.:**	**0,060 mg/m³**
Method:	**ISO 5725-2**	**Relative reproducibility s.d.:**	**10,38%**
No. of laboratories:	**31**	**Reference value:**	**0,601 mg/m³**
Relative target s.d.:	**10,00% (Limited)**	**Range of tolerance:**	**0,465 - 0,697 mg/m³ (|Z-Score| <= 2,00)**



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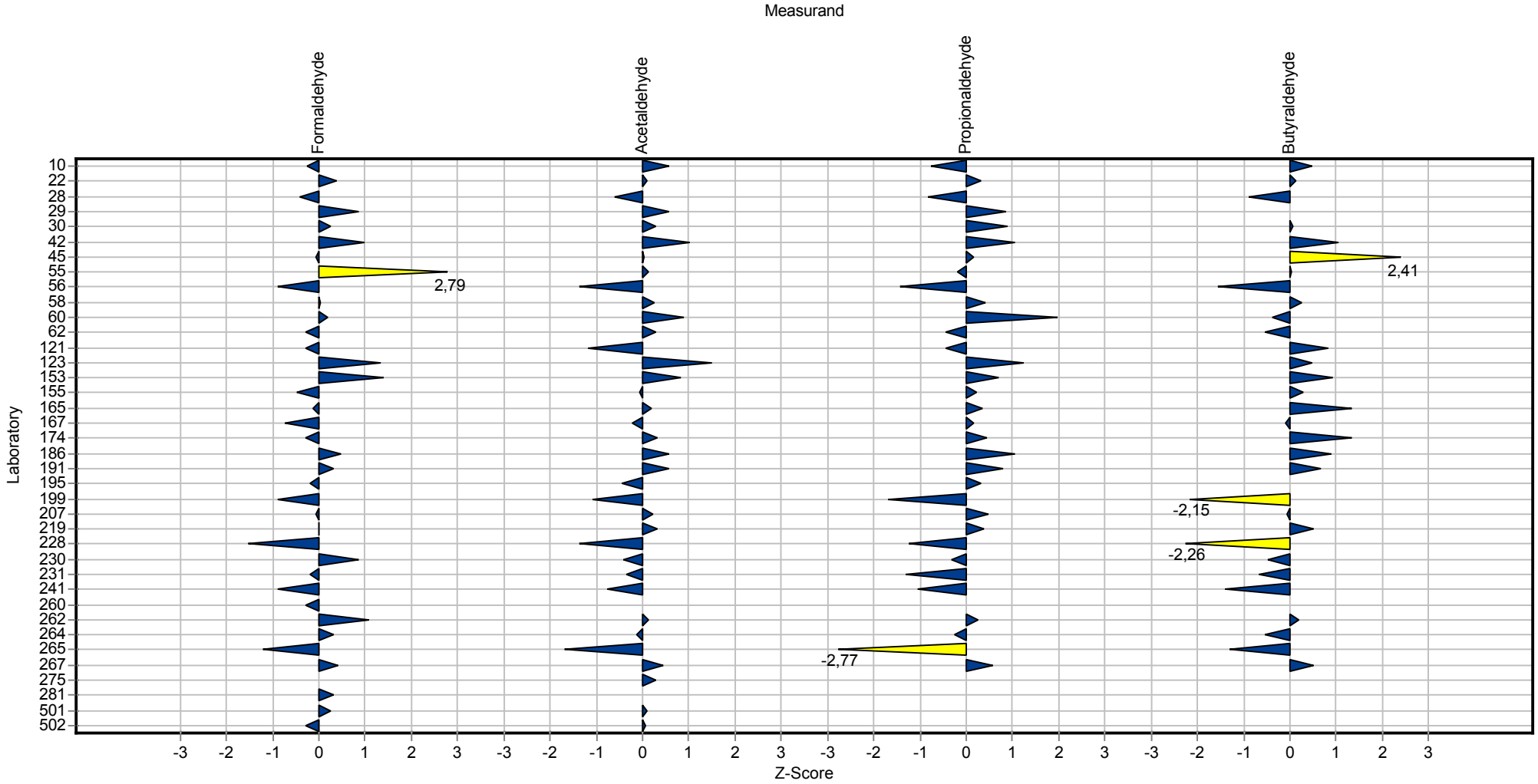
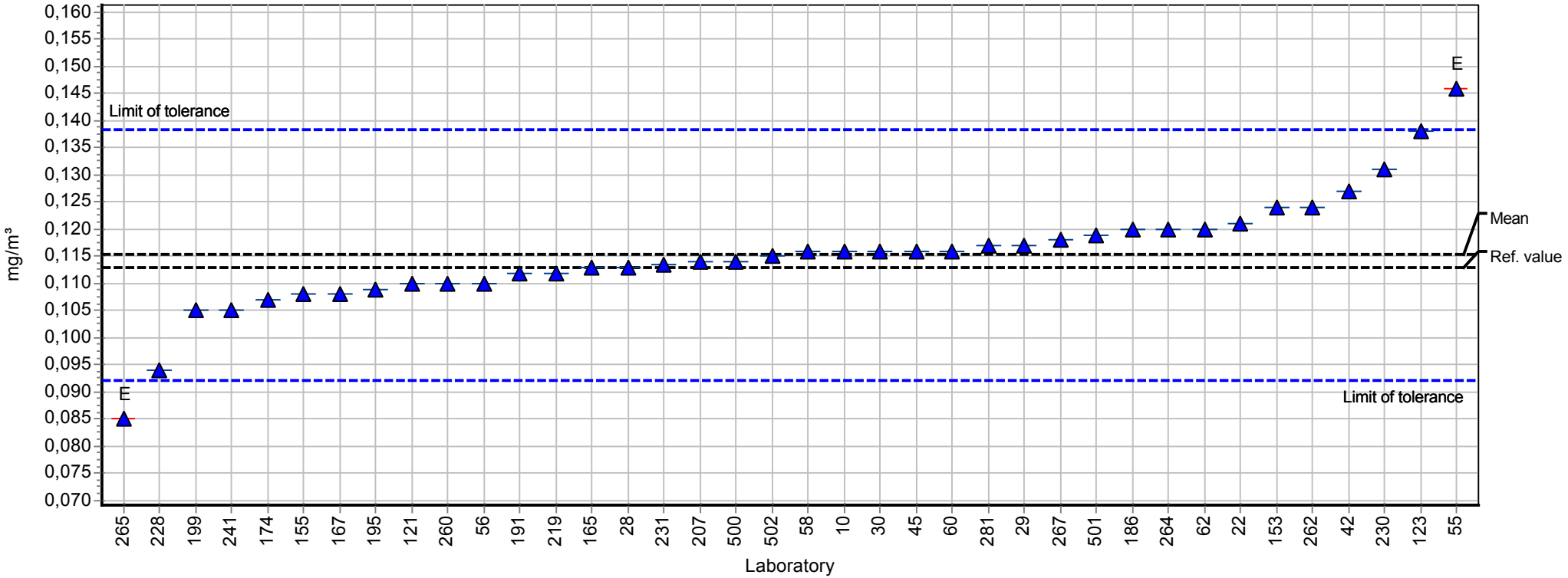
Sample chart of Z-Scores

Sample 1



Summary results

Measurand:	**Formaldehyde**	**Mean:**	**0,115 mg/m³**
Sample:	**2**	**Reproducibility s.d.:**	**0,010 mg/m³**
Method:	**ISO 5725-2**	**Relative reproducibility s.d.:**	**9,07%**
No. of laboratories:	**38**	**Reference value:**	**0,113 mg/m³**
Relative target s.d.:	**10,00% (Limited)**	**Range of tolerance:**	**0,092 - 0,138 mg/m³ (|Z-Score| <= 2,00)**



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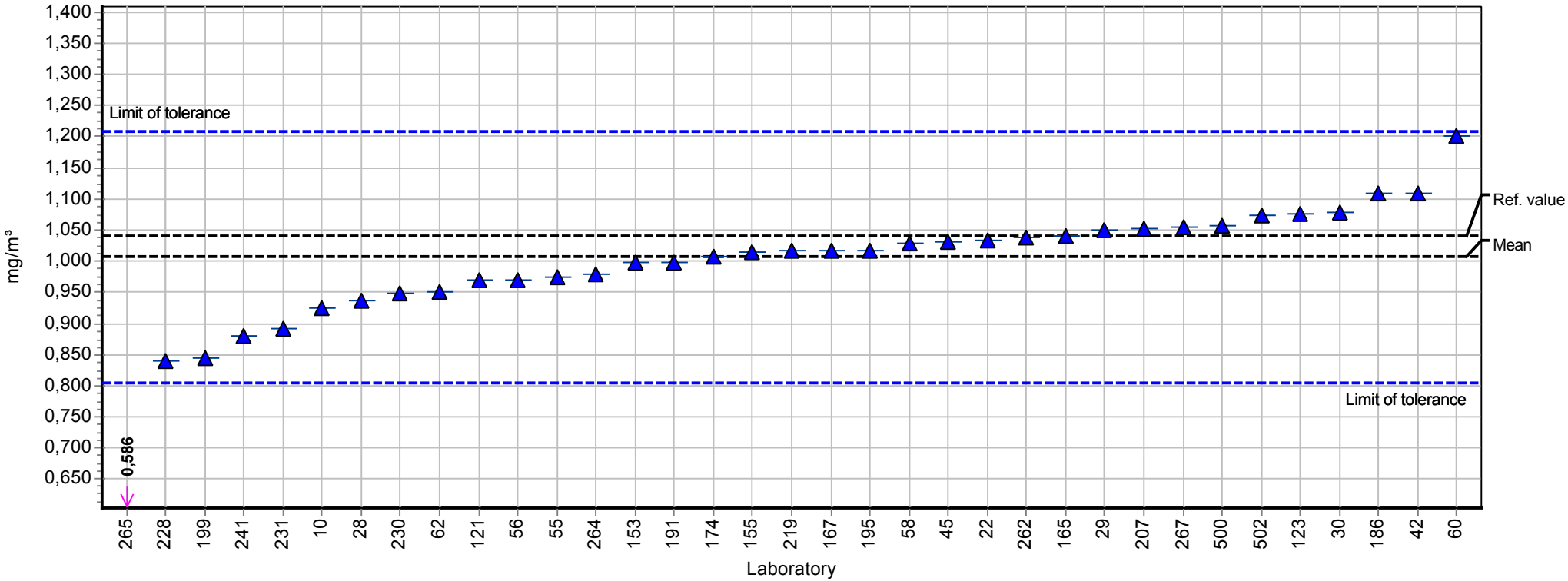
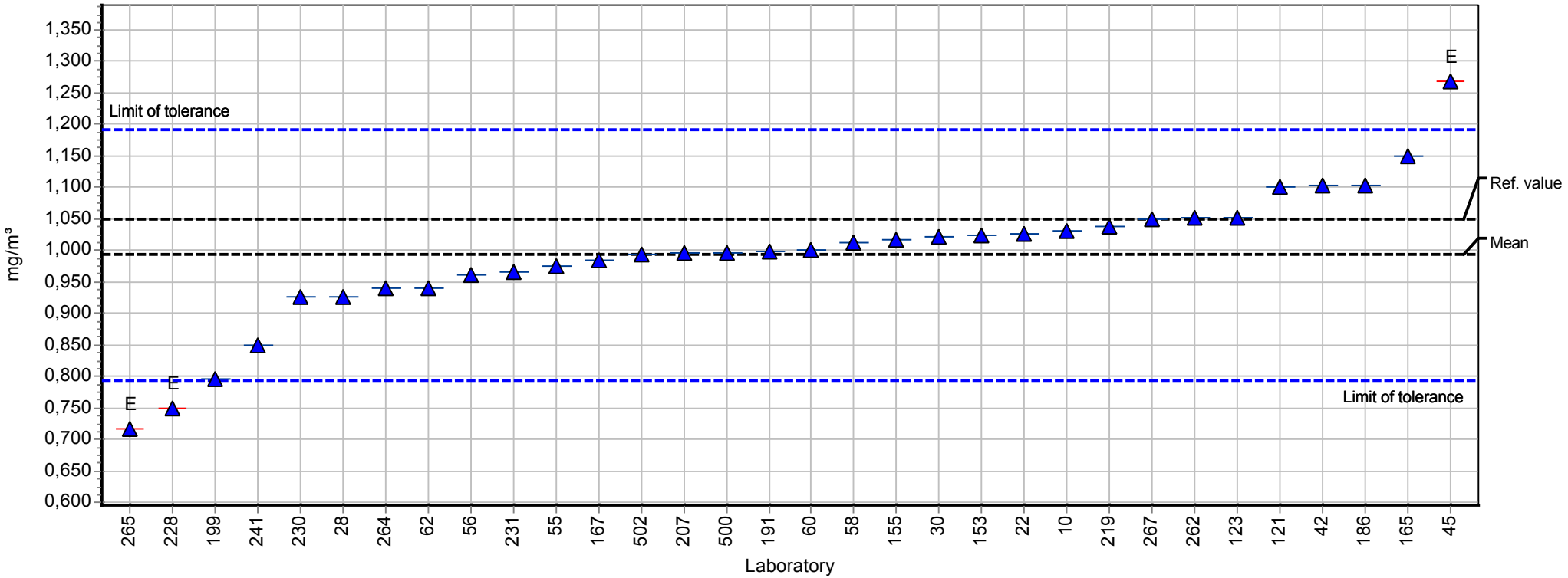
Summary results

Measurand:	**Propionaldehyde**	**Mean:**	**1,006 mg/m³**
Sample:	**2**	**Reproducibility s.d.:**	**0,076 mg/m³**
Method:	**ISO 5725-2**	**Relative reproducibility s.d.:**	**7,59%**
No. of laboratories:	**34**	**Reference value:**	**1,040 mg/m³**
Relative target s.d.:	**10,00% (Limited)**	**Range of tolerance:**	**0,805 - 1,208 mg/m³ (|Z-Score| <= 2,00)**



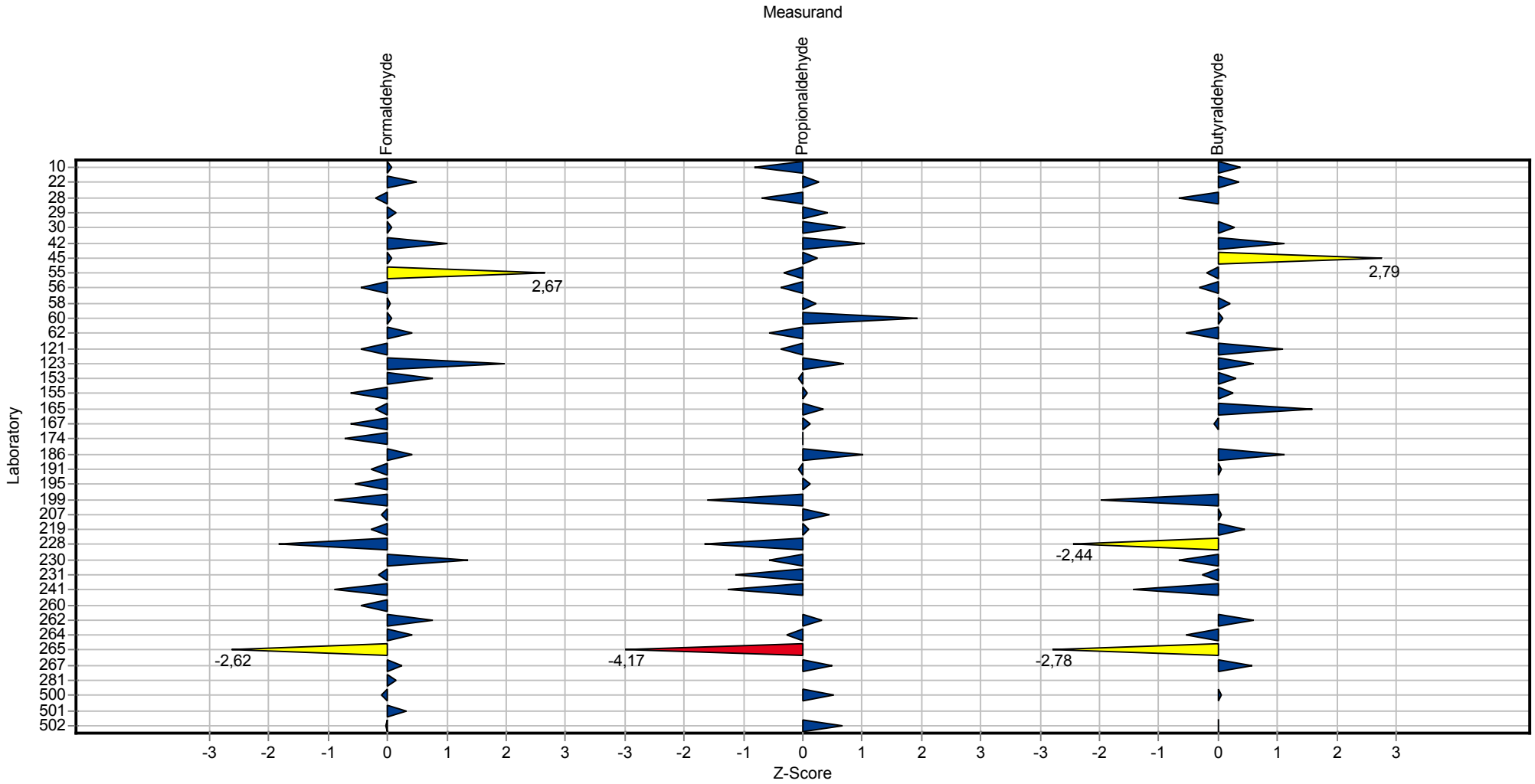
Summary results

Measurand:	**Butyraldehyde**	**Mean:**	**0,993 mg/m³**
Sample:	**2**	**Reproducibility s.d.:**	**0,109 mg/m³**
Method:	**ISO 5725-2**	**Relative reproducibility s.d.:**	**10,94%**
No. of laboratories:	**32**	**Reference value:**	**1,050 mg/m³**
Relative target s.d.:	**10,00% (Limited)**	**Range of tolerance:**	**0,794 - 1,191 mg/m³ (|Z-Score| <= 2,00)**



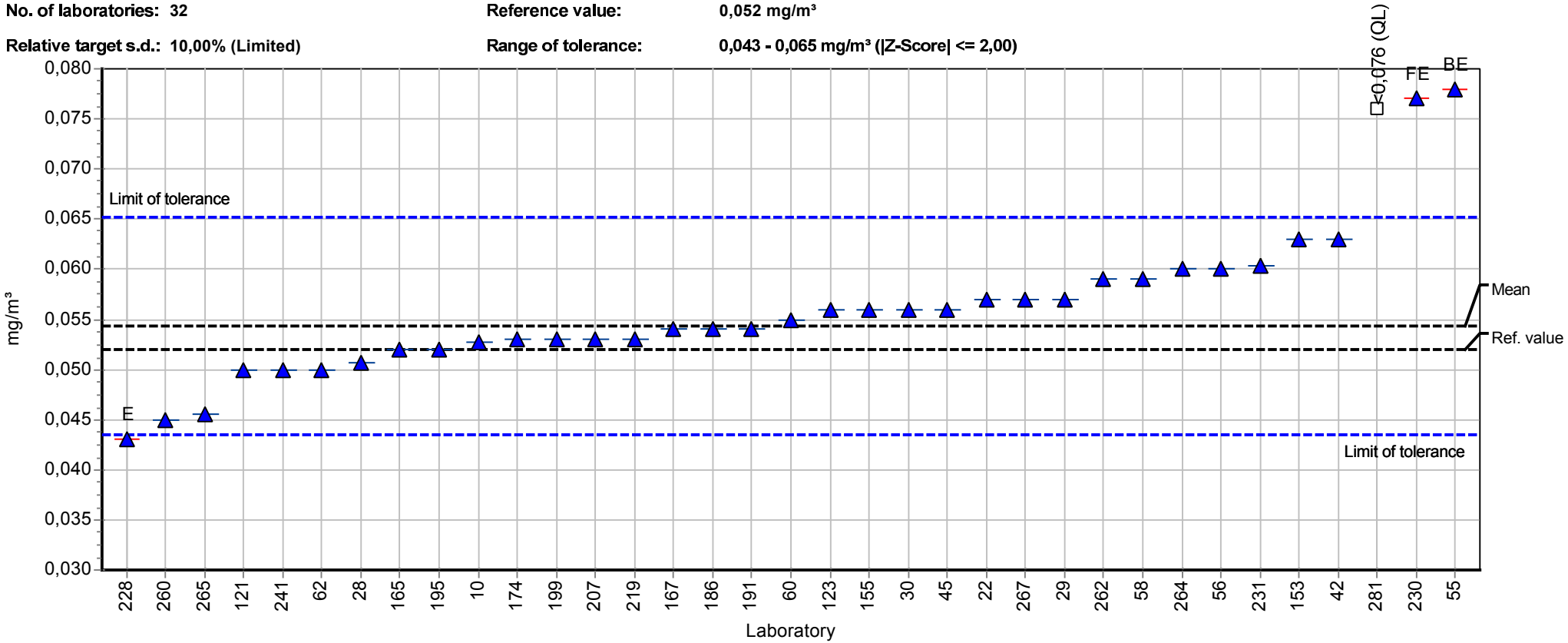
Sample chart of Z-Scores

Sample 2



Summary results

Measurand:	**Formaldehyde**	**Mean:**	**0,054 mg/m³**
Sample:	**3**	**Reproducibility s.d.:**	**0,005 mg/m³**
Method:	**ISO 5725-2**	**Relative reproducibility s.d.:**	**8,81%**
No. of laboratories:	**32**	**Reference value:**	**0,052 mg/m³**
Relative target s.d.:	**10,00% (Limited)**	**Range of tolerance:**	**0,043 - 0,065 mg/m³ (|Z-Score| <= 2,00)**



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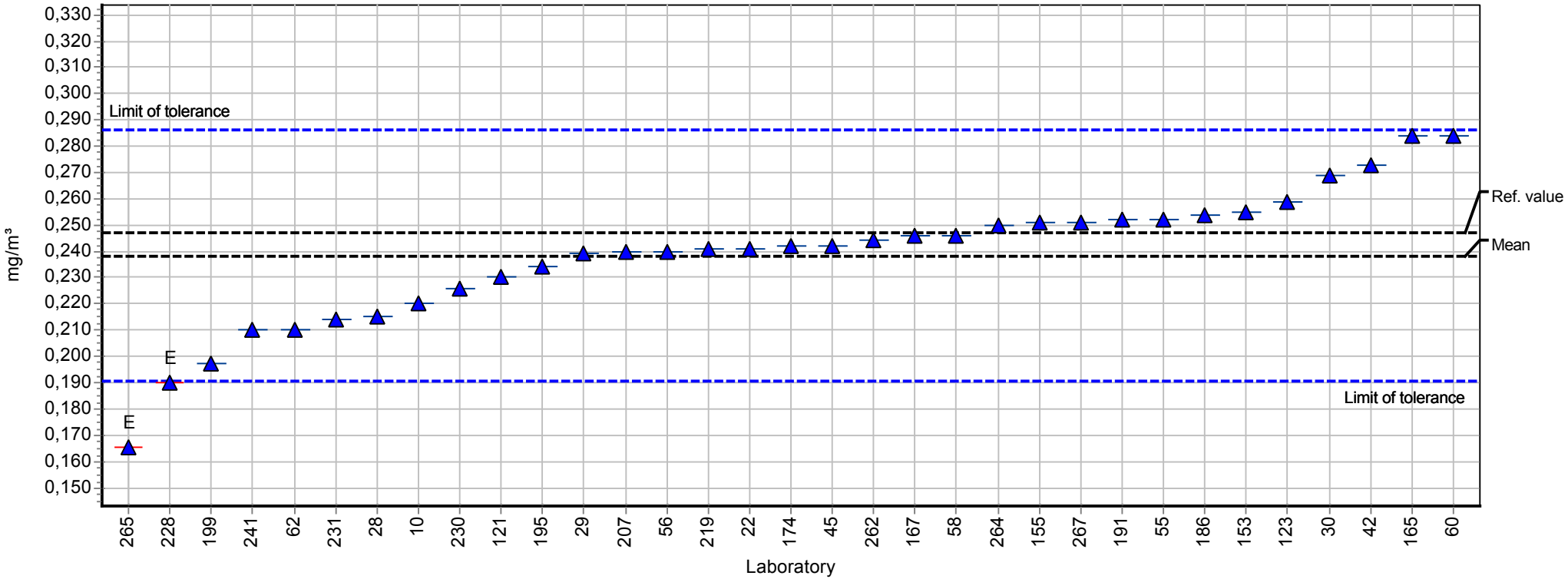
Summary results

Measurand:	**Propionaldehyde**	**Mean:**	**0,238 mg/m³**
Sample:	**3**	**Reproducibility s.d.:**	**0,026 mg/m³**
Method:	**ISO 5725-2**	**Relative reproducibility s.d.:**	**10,75%**
No. of laboratories:	**33**	**Reference value:**	**0,247 mg/m³**
Relative target s.d.:	**10,00% (Limited)**	**Range of tolerance:**	**0,191 - 0,286 mg/m³ (|Z-Score| <= 2,00)**



IFA
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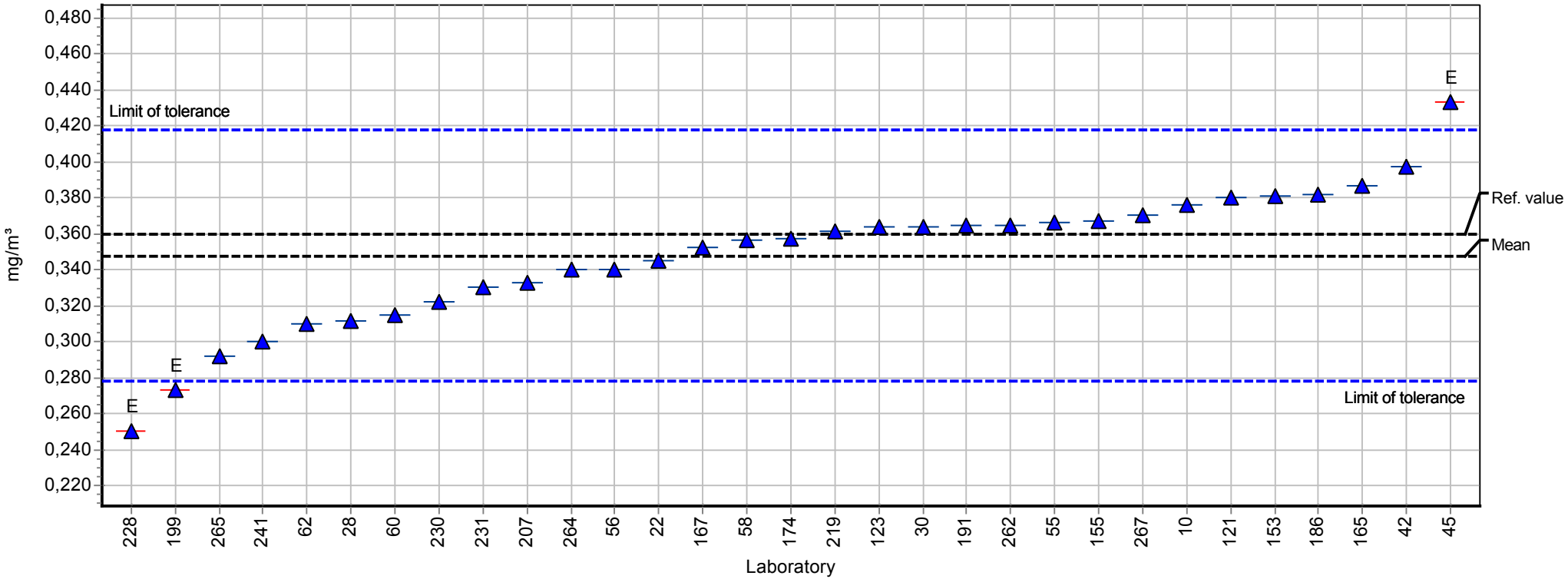
Deutschen Gesetzlichen Unfallversicherung

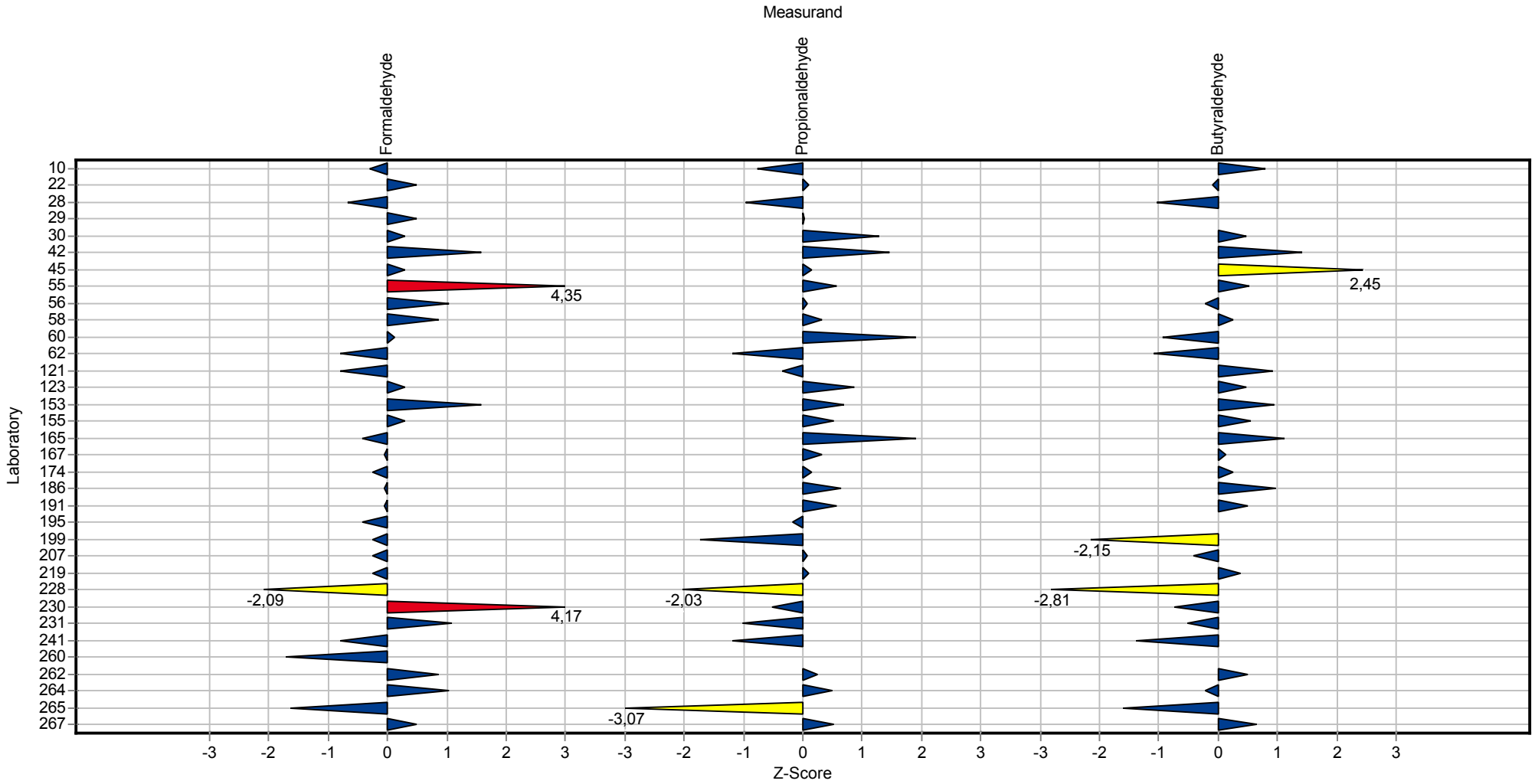
Summary results

Measurand:	**Butyraldehyde**	**Mean:**	**0,348 mg/m³**
Sample:	**3**	**Reproducibility s.d.:**	**0,038 mg/m³**
Method:	**ISO 5725-2**	**Relative reproducibility s.d.:**	**10,97%**
No. of laboratories:	**31**	**Reference value:**	**0,360 mg/m³**
Relative target s.d.:	**10,00% (Limited)**	**Range of tolerance:**	**0,278 - 0,417 mg/m³ (|Z-Score| <= 2,00)**



Sample chart of Z-Scores

Sample 3



Questions and Answers

Participant	Sample carrier	Analytical method	Date start sample preparation
10	Sigma-Aldrich	HPLC - DAD	19/09/2014
22	Sigma-Aldrich	DNPH/HPLC	16.09.2014
28	Lp DNPH S10 Cartdridge Supelco	HPLC-UV	16/09/2014
29	Waters Sep-Pak	angelehnt IFA Arbeitsmappe 6045	24.9.14
30	Waters	ISO 16000-3	08/10/2014
42	Waters Sep-Pak	HPLC	09.09.14
45	Waters Sep-Pak	ISO16000-3	17/09/2014
55	Waters Sep-Pak	HPLC-photodiode array detector	300 µl of acetonitrile extract diluted with 700 µl water
56	Waters Sep-Pak	HPLC	10/09/2014
58	DNPH-cartridge exposure	HPLC	11 september 2014
60		16000-3	22/09/2014
62	Waters Sep-Pak	HPLC/UV analysis	09/09/14
121	Supelco S10 Cartridge	IFA-Arbeitsmappe Kennzahl 6045	10.09.2014
123	Waters	NF-ISO 16000-3	22/10/14
153	Waters Sep-Pak	IFA Folder No. 6045	15.09.2014
155	Waters DNPH-Sampler WAT 047205	DIN ISO 16000-3 in Anlehnung	18.09.2014
165	Supelco Lo DNPH S10	DIN ISO 16000-3:2010	23/09/2014
167	Waters Sep-Pak XPoSure	HPLC	24/09/2014
174	Sigma Aldrich		
186	Waters Sep-Pack	NF EN ISO 16000-3	2014/09/19
191	Waters Sep-Pak	ACC-005	12/09/14
195	acetonitrile	NIOSH 2016	6-10-2014
199	Supelco DNPH Kartusche 350mg/3mL	HPLC-DAD	15.09.2014
207	LPDNPH S10 Kartuschen (Sigma ALdrich)	HPLC DAD	30.09.2014
219	SEP-PAK XPOSURE ALDEHYDE SAMPLER	HPLC	2014-09-10
228	DNPH	Hausmethode	15.09.14
230	DNPH, SEP-PAK , Fa. Waters	DIN EN ISO 16000-3	11.09.2014
231	Waters Sep-Pak	BGIA 6045	11.09.2014
241	Sigma-Aldrich LpDNPH S10	Hauseigen	15.09.2014
260	cal : sigma formol-dnph 100µg/ml en formol	NF ISO 16000-4	18/09/2014
262	Sigma-Aldrich	ISO 16000-3	16.10.2014

Participant	Sample carrier	Analytical method	Date start sample preparation
264		HPLC UV	
265	DNPH Kartuschen		17.09.2014
267	LpDNPH Sigma 21014	HPLC	29/09/2014
275	Supelco	EPA TO-11A	2014.09.09
281		NIOSH 2016	24/09/2014

Participant	Storage time after desorption	Date of analysis	Desorption solution
10	No	19/09/2014	Acetonitrile
22	12 Tage	16.09.2014	70% Acetonitril/30% Milli-Q-Wasser V/V
28	No	16/09/2014	Acetonitrile
29	keine	24.9.14	Acetonitril
30	yes, 1 day in refrigerator	09/010/2014	Acetonitril
42	Nein (-18°C)	12.09.14	Acetonitril
45	No	17/09/2014	Acetonitrile
55	desorption date: 12/09/14; analysis: 22/09/14 ; storage in refrigerator	22/09/14	acetonitrile
56	2h roomtemp	10/09/2014	Acetonitrile
58	8 september 2014	11 septemnber 2014	acetonitril
60	24h	23/09/2014	ACN
62	1 day in refrigerator	10/09/14	Acetonitrile
121	6 Tage	10.09.2014	Acetonitril
123	no storage	22/10/14	100% CH3CN
153	2 days	17.09.2014	acetonitrile
155	14 Tage	18.09.2104	Acetonitril
165	13 Tage	24/09/2014	Acetonitril
167	30 min for first sample	24/09/2014	Acetonitrile (AcN)
174			
186	No	2014/09/19	ACN
191	no	12/09/14	Acetonitrile
195	0	6-10-2014	acetonitrile
199	Nein	15.09.2014	Acetonitril
207	25 d, -18°C	30.09.2014	ACN/H2O 60/40 mmol (NH4)HCO3
219	1h	2014-09-10	Acetonitrile
228	Gefrierschrank	15.09.14	Acetonitril
230	Post	11.09.2014	Acetonitril

Participant	Storage time after desorption	Date of analysis	Desorption solution
231	6 Tage im Kühlschrank	17.09.2014	Acetonitril
241	ca. 7 Tage	17.09.2014	Acetonitirl
260	non	18/09/2014	acetonitrile 100%
262	12 Tage	16.09.2014	Acetonitril
264	1 month / freezer	16/09/14	Acétonitrile
265	48h	19.09.2014	ACN
267	25 Tage	29/09/2014	Acetonitrile
275	No	2014.09.09	Acetonitril
281	none	24/09/2014	Acetonitrile

Participant	Volume of desorption solution	Chromatography system
10	3	Perkin Serie 200
22	5 ml	Thermo: Pumpe-LPG-3400SD, Autosampler-WP-3000SL, Detektor-UV-VIS DAD-3000
28	5mL	Agilent 1100 Series
29	5ml	Niederdruckpumpe, UVD, Autosampler (Dionex)
30	5 mL	Waters2695+Waters2995
42	10 ml	Agilent Typ 1260 Infinity
45	10ml	HPLC Waters 2695 Alliance / WATERS 2996 Photodiode Array Detector
55	3 ml	Acquity Waters UPLC system
56	5 mL	Thermo Ultimate 3000
58	10 ml	Agilent 1100
60	3 mL	Agilent 1200 infinity
62	5 mL	HPLC/UV PerkinElmer Serie 200
121	5 ml	Agilent 1100
123	5 ml	HPLC/DAD
153	10 ml	Dionex
155	5 ml	Agilent 1200
165	3 ml	HPLC Agilent Tecnologies 1100
167	6 mL (filled to 10 mL with distilled water)	Perkin Elmer series 200 LC Pump, / Waters 2487 Dual Absorbance Detector / Waters 717 Autosampler
174		
186	10 mL	HPLC-PAD WATERS
191	5 ml	Waters Alliance 2690
195	5	HPLC-DAD
199	3mL	Agilent 1100

Participant	Volume of desorption solution	Chromatography system
207	5 ml	1260 infinity LC (Agilent)
219	10 ml	Agilent
228	5 mL	Summit
230	10 ml	Fa. Agilent
231	10 ml	Dionex Summit
241	5 ml	Agilent 1100
260	2 ml	920LC Varian, détecteur UV 350nm
262	3 ml	Pumpe: Hitachi L2130 Detektor: Jasco DAD MD2010 Plus; Autosampler: AS 3500
264	5 ml	HPLC UV
265	2ml	Shimadzu LC 20 AD
267	5 ml	Agilent 1260, DAD
275	5ml	Flexar,Perkin elmer (Binary LC Pomp,Detector-Flexar UV/VIS LC,LC autosampler)
281	10 mL	HPLC Agilent 1100

Participant	Analytical column
10	Brownlee Validated C18
22	Thermo Scientific Acclaim Carbonyl C18, 3 µm 120A 3,0 x 150 mm
28	Zorbax SB-C18 4,6x250mm 3,5µm
29	Waters XBridge Phenyl
30	Allure AK 250x4.6mm 5µm
42	Prontosil 120-5C 18 ace-EPS
45	Sunfire C18, 5um, d = 4,6mm, L = 25 cm
55	Waters Acquity UPLC BEH Phenyl 1.7µm, 2.1 x 100 mm with Acquity UPLC pre-column
56	Acclaim carbonyl RSLC 2,2µm, 2,1*100 mm
58	Zorbax ODS 4,6 mm id * 25 cm (5um) van Agilent
60	C18
62	Supelco Ascentis RP-Amide
121	Prontosil Säule
123	C8
153	Zorbax Extend-C18
155	Agilent Zorbax XDB-C18 4,6mm X 150mm 5µm
165	LV18
167	Waters Symmetry C18, 3,5 µm, (4,6 x 100) mm Cartridge + Waters µBondapak C18, 10 µm, (3,9 x 20) mm Guard Column
174	

Participant	Analytical column
186	WATERS NOVAPACK C18 / 150nm*3.9mm*4µm
191	Waters Symmetry C18
195	Ascentis Express C18 (100 mm X 4.6 mm X 3 um)
199	C18
207	Kinetex 2,6µ 100mm (Phenomenex)
219	Silica C18
228	Allure-AK
230	MZ PAH C 18, 5 µm
231	SEPSERV UltraSep ES PAH, 250 mm*3,0 mm ID; Vorsäule, SEPSERV UltraSep ES PAH, 10 mm*3,0 mm ID
241	ULTRASEP ES ALD 125 x 2 mm, 3 µm
260	EC 250/3 nucléosil 100-5 C18 HD
262	YMC Pack C4
264	Acclaim carbonyl
265	Waters Nova-Pak C18 4µm
267	Symmetry C18, 250mm x 4.5mm x 5µm (Waters)
275	Perkin elmer C18 150*4.6mm 5
281	Grace C18

Participant	Mobile phase
10	70/30 (ACN / H2O)
22	Acetonitril/Wasser (Milli-Q)
28	Acétonitrile
29	H2O/ACN/THF : ACN
30	Acetonitril / water
42	A: 34 Vol.% Acetonitril / 43 Vol.% H2O / 32 Vol.% Methanol; B: Acetonitril (Gradient)
45	Acétonitril 60% / Water 40%
55	gradient elution of 10% THF in water and acetonitril
56	Water/acetonitrile
58	acetoniril / H2O
60	Eau/ACN
62	Acetonitrile/Water
121	Wasser/Acetonitril
123	CH3CN/H2O
153	Acetonitrile/Water

Participant	Mobile phase
155	Acetonitril ACN Wasser H2O Tetrahydrofuran THF
165	Wasser/Acetonitril 40/60
167	AcN with 0,1 % Phosphoric Acid and water with 0,1 % Phosphoric Acid
174	
186	water/ACN/THF
191	H2O, CH3CN, THF
195	ACN:H2O (30:70)
199	Wasser/Acetonitril
207	ACN/THF H2O
219	Acetonitrile:Water
228	Acetonitril/Wasser
230	A= dest. Wasser, B = Acetonitril
231	Wasser und Acetonitril HPLC Qualität
241	Acetonitril / Wasser
260	Acétonitrile 60%- Eau 40%
262	A: Acetonitril; B: Wasser/THF (90/10 %)
264	
265	H2O/ACN/THF
267	Acetonitrile/Wasser
275	acetonitril:water(6:4)
281	Water/Acetonitrile

Participant	Gradient-/ Temp.-program
10	No
22	Zuerst 12 min isokratisch bei 53% ACN und 47%Wasser, danach in 4,5 min linear auf 100% ACN und danach 3,5 min belassen / T=const=28°C
28	0min 60%; 7,5min 63,8%; 12,5min 63,8%; 20min 37,5%; 26min 67,5%; 30min 100%; 32min 100%; 35min 60% / 35°C
29	ja
30	0 min 55/45 18min 64/36 22min 70/30 32min 100/0
42	0 - 3 min 0 % B
45	Yes / Oven column Temp : 40°C
55	40°C
56	0 min 52% ACN 48% water ; 6 min 52% ACN 48% water ; 15 min 100% ACN ; 17 min 100% ACN
58	35°C
60	70/30

Participant	Gradient-/ Temp.-program
62	40/60 - 2 min ;75/25 - 25 min ; 100/0 - 18 min ; 30°C
121	-
123	t=0min 60/40 (H2O/CH3CN); t=48 min 20/80 (H2O/CH3CN);t=53min 60/40 (H2O/CH3CN)
153	Acetonitrile 50 % > 100 %
155	Gradient Start ACN 30% THF 10% H2O 60% Ende ACN 95% THF 5% H2O 0% 35°C constant
165	0:00-60;06:00-60;15:00-100;17:00-100;18:00-60;21:00-60;Temp 25°C
167	Water / AcN 45 / 55 (3 min), up to AcN 100 in 4 min + 1 min. Back to water / AcN 45 / 55 in 1 min + 5 min
174	
186	Mobile phase Gradient - 35°C
191	-
195	5 min. isocratic ACN:H2O (30:70), 35 min. gradient ACN:H2O (50:50), 25 min. gradient ACN:H2O (70:30), 5 min. return gradient ACN:H2O (30:70)
199	Gradient: Wasser/Acetonitril; Temp.: 30°C
207	
219	Yes, 35 C
228	
230	Beginn- A=55% + B = 45%B nach 10 Min auf 75% B; 11 Min = 100% B bis 15 Min = 45 %B
231	Temperatur: 40°C; Gradient: 0 min, 60% Wasser + 40% Acetonitril; 14 min, 20% Wasser + 80% Acetonitril; 15 min, 5% Wasser + 95% Acetonitril; 23 min 5% Wasser + 95% Acetonitril; 24 min, 60% Wasser + 40% Acetonitril; 30 min, 60% Wasser + 40% Acetonitril;
241	ca. 70 / 30 bis 80 / 20
260	isocratic-ACN 60%, Eau 40% , 33°C , durée analyse 7 min
262	0-18min, 35% A, 65% B; 18-20 min, 80% A, 20% B; 20-20,1 min, 100% A, 0%B; 20,1-30 min, 35% A, 65 % B
264	
265	60/30/10 2min; bis 31 min 40/60/0; bis 34 min 0/100/0; bis 39 min 0/100/0; bis 45 60/30/10; alles bei 40°C
267	40/60 H2O-Acetonitrile 7 min., 100% Acetonitrile 20min.
275	Isocratic
281	

Participant	Flow rate	Wavelength	Recovery rate
10	1	365	No
22	0,6 ml/min	360 nm	nein
28	1,000 mL/min	360nm	No
29	1,5	365nm	
30	1.2	360	no
42	1 ml/min	365 nm	nein

Participant	Flow rate	Wavelength	Recovery rate
45	1	360 nm	Formaldehyde : quantity 1µg (83.7%-101.3%) and quantity 10µg (94.8%-103.5%)
55	0.5	360 nm	yes
56	0,4 mL/min		
58	1 ml/min	360 nm	100%
60	1mL/min	360	95%
62	1 mL/min	360	No
121	1,5 ml / min	354 nm	Butylaldehyd 84,5%, alle anderen Aldehyde > 95%
123	1 ml/min	365.4 nm	no
153	1,00 ml/min	365/8 nm	97 %
155	1 ml / min	360nm / 365 nm / 380nm	Kontrolle der vollständigen Desorbtion erfolgte duch eine weitere Desorbtion des Adsorbers
165	1,3 ml/min	360 nm	
167	1,5 mL/min	360 nm	100 ± 2 %
174			
186	1.5 mL/min	360	yes
191	1,2 ml/min	360 nm	-
195	0.80 mL/min	360 nm	100
199	0,8mL/min.	370nm	Nein; WF:90-120%
207	1,5 ml/min	360 nm	
219	0.4 ml/min	360 nm	No
228	1,5 mL	365 nm	95%
230	0,5 ml/min	DAD = 362 nm, Referenzwellenlänge = 550 nm	nicht bestimmt
231	0,7 ml/min	365 nm	nein (95-98%)
241	0,5 ml/min	365 nm	
260	0.7ml/min	350 nm	non
262	1,5 ml/min	365	
264	0.8 mL/min		0.86 acétaldéhyde - 0.92 propionaldéhyde
265	1,0 ml/min	356nm	
267	1,5ml	365	
275	1.000	360	Yes
281	1,3 mL/min	360 nm	