

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

## Proficiency testing scheme Organic solvents September 2021

## Summary of laboratory test results

### Sample 1

| Laboratory                                 | Cumene            | Z score | Ethylbenzene      | Z score | m-Xylene          | Z score | Methylcyclohexane | Z score |
|--|-------------------|---------|-------------------|---------|-------------------|---------|-------------------|---------|
| Unit                                       | mg/m <sup>3</sup> |         | mg/m <sup>3</sup> |         | mg/m <sup>3</sup> |         | mg/m <sup>3</sup> |         |
| 8  |                   |         |                   |         |                   |         |                   |         |
| 20   | 15,75             | -1,8    | 31,50             | -1,4    | 50,00             | -1,2    | 47,50             | -1,7    |
| 55   | 17,20             | -1,1    | 33,80             | -0,8    | 52,50             | -0,7    |                   |         |
| 68   | 16,83             | -1,3    | 34,33             | -0,7    | 52,08             | -0,8    | 54,42             | -0,5    |
| 72   | 18,80             | -0,2    | 40,60             | 1,0     | 59,50             | 0,5     | 61,70             | 0,8     |
| 100  | 15,80             | -1,8    | 32,30             | -1,2    | 48,00             | -1,5    | 56,50             | -0,1    |
| 118  | 15,49             | -2,0    | 32,32             | -1,2    | 48,27             | -1,5    | 46,94             | -1,8    |
| 138  | 19,40             | 0,1     | 42,70             | 1,6     | 68,40             | 2,1 E   | 55,60             | -0,3    |
| 162  | 16,94             | -1,2    | 33,43             | -0,9    | 50,42             | -1,1    | 51,00             | -1,1    |
| 167  | 25,00             | 3,0 E   | 51,00             | 3,9 BE  | 74,00             | 3,0 E   | 58,00             | 0,1     |
| 199  | 20,00             | 0,4     | 40,00             | 0,9     | 57,00             | 0,1     | 68,00             | 1,9     |
| 238  | 17,96             | -0,7    | 35,18             | -0,4    | 52,50             | -0,7    | 57,60             | 0,1     |
| 239  | 19,02             | -0,1    | 40,39             | 1,0     | 53,99             | -0,5    |                   |         |
| 248  | 22,20             | 1,5     | 40,30             | 1,0     | 63,40             | 1,2     | 62,90             | 1,0     |
| 256  | 20,00             | 0,4     | 39,40             | 0,7     | 67,00             | 1,8     | 67,30             | 1,7     |
| 286  | 25,52             | 3,3 E   | 34,69             | -0,6    | 52,84             | -0,7    | 56,96             | -0,1    |
| 512  | 22,20             | 1,5     | 40,60             | 1,0     | 57,50             | 0,1     | 57,50             | 0,0     |
| -  | -                 | --      | -                 | --      | -                 | --      | -                 | --      |
| Method                                     | ISO 5725-2        |         | ISO 5725-2        |         | ISO 5725-2        |         | ISO 5725-2        |         |
| Assessment                                 | Z <=2,0           |         | Z <=2,0           |         | Z <=2,0           |         | Z <=2,0           |         |
| No. of laboratories that submitted results | 16                |         | 16                |         | 16                |         | 14                |         |
| Mean                                       | 19,26             |         | 36,77             |         | 56,71             |         | 57,28             |         |
| Reproducibility s.d.                       | 3,13              |         | 3,85              |         | 7,77              |         | 6,33              |         |
| Rel. reproducibility s.d.                  | 16,23 %           |         | 10,48 %           |         | 13,70 %           |         | 11,05 %           |         |
| Reference value                            | 20,10             |         | 40,10             |         | 62,80             |         | 61,80             |         |
| Target s.d.                                | 1,93              |         | 3,68              |         | 5,67              |         | 5,73              |         |
| Rel. target s.d.                           | 10,00 %           |         | 10,00 %           |         | 10,00 %           |         | 10,00 %           |         |

| Laboratory   | Cumene  | Z score | Ethylbenzene | Z score | m-Xylene | Z score | Methylcyclohexane | Z score |
|--|---------|---------|--------------|---------|----------|---------|-------------------|---------|
| Lower limit of tolerance   | 15,41   |         | 29,42        |         | 45,37    |         | 45,82             |         |
| Upper limit of tolerance   | 23,11   |         | 44,12        |         | 68,06    |         | 68,74             |         |
| Type B outliers  |         |         | 1            |         |          |         |                   |         |
| Type E outliers  | 2       |         | 1            |         | 2        |         |                   |         |
| No. of laboratories after elimination of outliers type A-D and F (without laboratories that only gave states but no measured values) | 16      |         | 15           |         | 16       |         | 14                |         |
| 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$  |         |         |              |         |          |         |                   |         |

| Laboratory | n-Hexane          | Z score | n-Octane          | Z score | Toluol            | Z score |
|------------|-------------------|---------|-------------------|---------|-------------------|---------|
| Unit       | mg/m <sup>3</sup> |         | mg/m <sup>3</sup> |         | mg/m <sup>3</sup> |         |
| 8          |                   |         |                   |         | 59,03             | 0,6     |
| 20         | 32,25             | -0,7    | 145,50            | -1,6    | 50,50             | -1,0    |
| 55         | 33,50             | -0,4    | 168,00            | -0,3    | 53,30             | -0,5    |
| 68         | 34,92             | 0,0     | 153,67            | -1,1    | 55,47             | -0,1    |
| 72         | 36,30             | 0,4     | 163,10            | -0,6    | 58,40             | 0,4     |
| 100        | 34,30             | -0,2    | 133,00            | -2,3 E  | 55,60             | -0,1    |
| 118        | 32,62             | -0,6    | 144,34            | -1,7    | 48,56             | -1,3    |
| 138        | 37,80             | 0,8     | 166,00            | -0,4    | 64,10             | 1,5     |
| 162        | 32,72             | -0,6    | 157,34            | -0,9    | 49,67             | -1,1    |
| 167        | 47,00             | 3,5 BE  | 219,00            | 2,7 E   | 74,00             | 3,2 BE  |
| 199        |                   |         | 210,00            | 2,1 E   | 60,00             | 0,7     |
| 238        | 38,00             | 0,9     | 178,60            | 0,3     | 52,10             | -0,7    |
| 239        |                   |         |                   |         | 53,47             | -0,4    |

| Laboratory   | n-Hexane   | Z score | n-Octane   | Z score | Toluol     | Z score |
|--|------------|---------|------------|---------|------------|---------|
| 248  | 36,00      | 0,3     | 218,10     | 2,6 E   | 62,70      | 1,2     |
| 256  |            |         | 193,00     | 1,2     | 61,10      | 0,9     |
| 286  | 34,99      | 0,0     | 165,49     | -0,4    | 53,18      | -0,5    |
| 512  |            |         | 178,40     | 0,3     | 57,70      | 0,3     |
| -  | -          | --      | -          | --      | -          | --      |
| Method   | ISO 5725-2 |         | ISO 5725-2 |         | ISO 5725-2 |         |
| Assessment   | Z <=2,0    |         | Z <=2,0    |         | Z <=2,0    |         |
| No. of laboratories that submitted results   | 12         |         | 15         |         | 17         |         |
| Mean   | 34,85      |         | 172,90     |         | 55,93      |         |
| Reproducibility s.d.   | 2,01       |         | 26,73      |         | 4,71       |         |
| Rel. reproducibility s.d.  | 5,77 %     |         | 15,46 %    |         | 8,43 %     |         |
| Reference value  | 40,70      |         | 181,70     |         | 62,40      |         |
| Target s.d.  | 3,49       |         | 17,29      |         | 5,59       |         |
| Rel. target s.d.   | 10,00 %    |         | 10,00 %    |         | 10,00 %    |         |
| Lower limit of tolerance   | 27,88      |         | 138,32     |         | 44,74      |         |
| Upper limit of tolerance   | 41,83      |         | 207,48     |         | 67,12      |         |
| Type B outliers  | 1          |         |            |         | 1          |         |
| Type E outliers  | 1          |         | 4          |         | 1          |         |
| No. of laboratories after elimination of outliers type A-D and F (without laboratories that only gave states but no measured values) | 11         |         | 15         |         | 16         |         |

## Summary of laboratory test results

### Sample 2

| Laboratory                                 | Cumene            | Z score | Ethylbenzene      | Z score | m-Xylene          | Z score | Methylcyclohexane | Z score |
|--|-------------------|---------|-------------------|---------|-------------------|---------|-------------------|---------|
| Unit                                       | mg/m <sup>3</sup> |         | mg/m <sup>3</sup> |         | mg/m <sup>3</sup> |         | mg/m <sup>3</sup> |         |
| 8  |                   |         |                   |         |                   |         |                   |         |
| 20   | 47,75             | -1,9    | 24,00             | -1,7    | 67,75             | -1,4    | 95,50             | -1,8    |
| 55   | 51,80             | -1,3    | 25,00             | -1,4    | 71,30             | -0,9    |                   |         |
| 68   | 55,70             | -0,6    | 27,22             | -0,6    | 75,38             | -0,4    | 112,48            | -0,4    |
| 72   | 59,60             | 0,1     | 31,70             | 0,9     | 84,00             | 0,7     | 130,50            | 1,2     |
| 118  | 44,36             | -2,5 E  | 23,48             | -1,9    | 62,35             | -2,1 E  | 92,24             | -2,1 E  |
| 138  | 59,50             | 0,0     | 35,50             | 2,2 E   | 102,00            | 3,0 E   | 109,00            | -0,7    |
| 162  | 53,54             | -1,0    | 26,23             | -1,0    | 72,62             | -0,7    | 113,15            | -0,3    |
| 167  | 72,00             | 2,1 E   | 38,00             | 3,1 E   | 97,00             | 2,4 E   | 114,00            | -0,3    |
| 199  | 60,00             | 0,1     | 29,00             | 0,0     | 77,00             | -0,2    | 130,00            | 1,1     |
| 238  | 55,90             | -0,6    | 29,20             | 0,1     | 73,50             | -0,6    | 121,20            | 0,4     |
| 239  | 54,63             | -0,8    | 30,39             | 0,5     | 71,76             | -0,9    |                   |         |
| 248  | 68,60             | 1,6     | 31,00             | 0,7     | 87,70             | 1,2     | 132,40            | 1,3     |
| 256  | 62,00             | 0,5     | 52,70             | 8,1 BE  | 89,50             | 1,4     | 136,10            | 1,6     |
| 286  | 78,03             | 3,2 E   | 26,35             | -0,9    | 72,54             | -0,8    | 113,66            | -0,3    |
| 512  | 66,00             | 1,1     | 29,50             | 0,2     | 72,50             | -0,8    | 120,00            | 0,3     |
| -  | -                 | --      | -                 | --      | -                 | --      | -                 | --      |
| Method                                     | ISO 5725-2        |         | ISO 5725-2        |         | ISO 5725-2        |         | ISO 5725-2        |         |
| Assessment                                 | Z <=2,0           |         | Z <=2,0           |         | Z <=2,0           |         | Z <=2,0           |         |
| No. of laboratories that submitted results | 15                |         | 15                |         | 15                |         | 13                |         |
| Mean                                       | 59,29             |         | 29,04             |         | 78,46             |         | 116,94            |         |
| Reproducibility s.d.                       | 9,04              |         | 4,17              |         | 11,17             |         | 13,46             |         |
| Rel. reproducibility s.d.                  | 15,24 %           |         | 14,36 %           |         | 14,24 %           |         | 11,51 %           |         |
| Reference value                            | 60,00             |         | 30,40             |         | 84,40             |         | 124,10            |         |
| Target s.d.                                | 5,93              |         | 2,90              |         | 7,85              |         | 11,69             |         |
| Rel. target s.d.                           | 10,00 %           |         | 10,00 %           |         | 10,00 %           |         | 10,00 %           |         |
| Lower limit of tolerance                   | 47,43             |         | 23,23             |         | 62,77             |         | 93,55             |         |

| Laboratory   | Cumene Z score | Ethylbenzene Z score | m-Xylene Z score | Methylcyclohexane Z score |
|--|----------------|----------------------|------------------|---------------------------|
| Upper limit of tolerance   | 71,15          | 34,85                | 94,15            | 140,33                    |
| Type B outliers  |                | 1                    |                  |                           |
| Type E outliers  | 3              | 3                    | 3                | 1                         |
| No. of laboratories after elimination of outliers type A-D and F (without laboratories that only gave states but no measured values) | 15             | 14                   | 15               | 13                        |
| 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$  |                |                      |                  |                           |

| Laboratory | n-Hexane Z score  | n-Octane Z score  | Toluol Z score    |
|------------|-------------------|-------------------|-------------------|
| Unit       | mg/m <sup>3</sup> | mg/m <sup>3</sup> | mg/m <sup>3</sup> |
| 8          |                   |                   | 58,51 0,1         |
| 20         | 77,50 -1,1        | 78,50 -1,6        | 50,75 -1,2        |
| 55         | 87,00 0,0         | 90,00 -0,4        | 53,00 -0,9        |
| 68         | 88,02 0,1         | 90,28 -0,4        | 57,49 -0,1        |
| 72         | 96,30 1,0         | 95,90 0,2         | 61,70 0,6         |
| 118        | 76,95 -1,2        | 73,05 -2,2 E      | 47,52 -1,8        |
| 138        | 88,00 0,1         | 87,10 -0,7        | 72,80 2,6 E       |
| 162        | 89,98 0,3         | 90,40 -0,4        | 54,65 -0,6        |
| 167        | 112,00 2,8 BE     | 115,00 2,3 E      | 72,00 2,4 E       |
| 199        |                   | 100,00 0,7        | 59,00 0,2         |
| 238        | 93,50 0,7         | 93,50 0,0         | 52,90 -0,9        |
| 239        |                   |                   | 51,91 -1,0        |
| 248        | 89,80 0,3         | 118,40 2,6 E      | 64,60 1,1         |
| 256        |                   | 99,60 0,6         | 60,00 0,4         |

| Laboratory   | n-Hexane   | Z score | n-Octane   | Z score | Toluol     | Z score |
|--|------------|---------|------------|---------|------------|---------|
| 286  | 84,98      | -0,3    | 87,38      | -0,7    | 54,22      | -0,6    |
| 512  |            |         | 92,90      | -0,1    | 56,10      | -0,3    |
| -  | -          | --      | -          | --      | -          | --      |
| Method   | ISO 5725-2 |         | ISO 5725-2 |         | ISO 5725-2 |         |
| Assessment   | Z <=2,0    |         | Z <=2,0    |         | Z <=2,0    |         |
| No. of laboratories that submitted results   | 11         |         | 14         |         | 16         |         |
| Mean   | 87,20      |         | 93,72      |         | 57,95      |         |
| Reproducibility s.d.   | 6,17       |         | 12,16      |         | 7,11       |         |
| Rel. reproducibility s.d.  | 7,07 %     |         | 12,97 %    |         | 12,26 %    |         |
| Reference value  | 98,80      |         | 96,90      |         | 62,30      |         |
| Target s.d.  | 8,72       |         | 9,37       |         | 5,79       |         |
| Rel. target s.d.   | 10,00 %    |         | 10,00 %    |         | 10,00 %    |         |
| Lower limit of tolerance   | 69,76      |         | 74,97      |         | 46,36      |         |
| Upper limit of tolerance   | 104,64     |         | 112,46     |         | 69,54      |         |
| Type B outliers  | 1          |         |            |         |            |         |
| Type E outliers  | 1          |         | 3          |         | 2          |         |
| No. of laboratories after elimination of outliers type A-D and F (without laboratories that only gave states but no measured values) | 10         |         | 14         |         | 16         |         |

## Summary of laboratory test results

### Sample 3

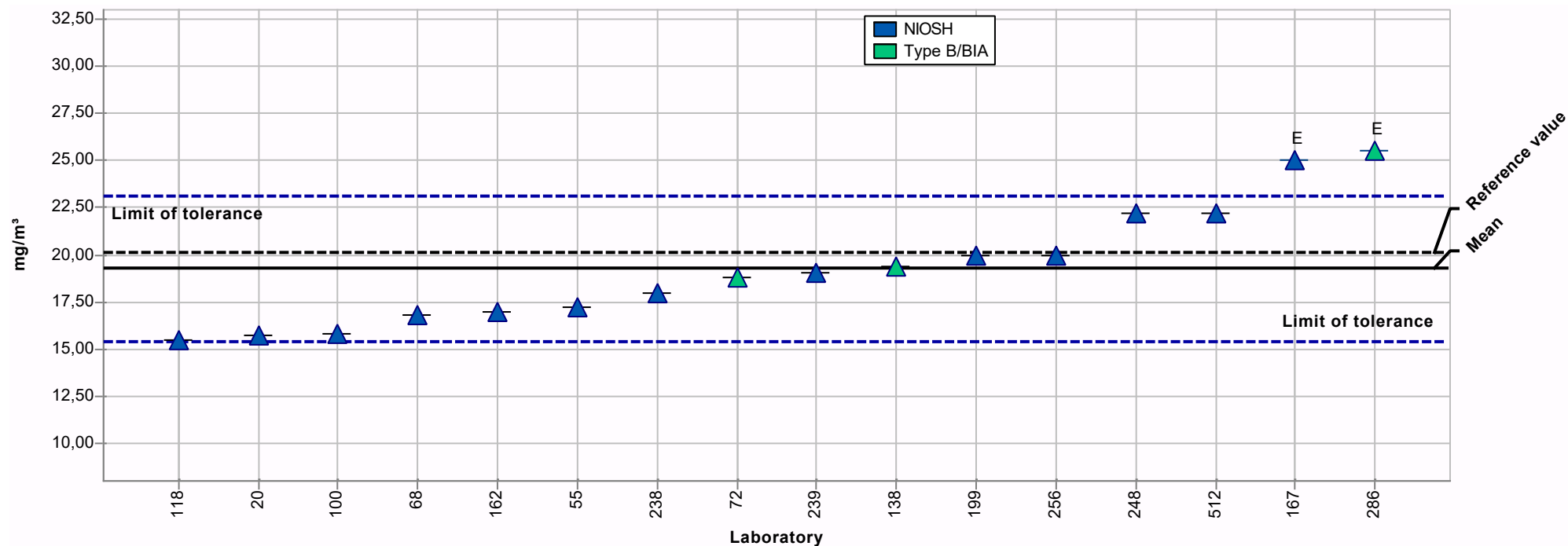
| Laboratory                                 | 1-Propanol        | Z score | 2-Propanol        | Z score | i-Butanol         | Z score |
|--|-------------------|---------|-------------------|---------|-------------------|---------|
| Unit                                       | mg/m <sup>3</sup> |         | mg/m <sup>3</sup> |         | mg/m <sup>3</sup> |         |
| 8  |                   |         | 43,03             | -0,4    |                   |         |
| 20   | 105,78            | -1,0    | 36,93             | -1,8    | 129,90            | -1,4    |
| 68   | 121,39            | 0,4     | 32,66             | -2,7 E  | 138,80            | -0,8    |
| 72   | 135,00            | 1,5     | 48,20             | 0,8     | 171,40            | 1,4     |
| 100  | 110,00            | -0,6    | 49,00             | 0,9     | 124,00            | -1,8    |
| 118  | 108,12            | -0,8    | 36,99             | -1,7    | 135,06            | -1,0    |
| 138  | 112,00            | -0,4    | 49,00             | 0,9     | 150,00            | 0,0     |
| 167  | 173,00            | 4,8 BE  | 59,00             | 3,2 E   | 203,00            | 3,5 E   |
| 199  | 110,00            | -0,6    | 52,00             | 1,6     | 180,00            | 1,9     |
| 238  | 123,70            | 0,6     | 45,80             | 0,2     | 118,00            | -2,2 E  |
| 248  | 110,50            | -0,6    | 38,10             | -1,5    | 138,80            | -0,8    |
| 256  | 134,50            | 1,5     | 48,00             | 0,7     | 159,40            | 0,6     |
| 286  | 116,05            | -0,1    | 43,98             | -0,2    | 145,33            | -0,4    |
| 512  |                   |         |                   |         | 166,10            | 1,0     |
| -  | -                 | --      | -                 | --      | -                 | --      |
| Method                                     | ISO 5725-2        |         | ISO 5725-2        |         | ISO 5725-2        |         |
| Assessment                                 | Z <=2,0           |         | Z <=2,0           |         | Z <=2,0           |         |
| No. of laboratories that submitted results | 12                |         | 13                |         | 13                |         |
| Mean                                       | 117,00            |         | 44,82             |         | 150,75            |         |
| Reproducibility s.d.                       | 10,32             |         | 7,25              |         | 24,34             |         |
| Rel. reproducibility s.d.                  | 8,82 %            |         | 16,17 %           |         | 16,14 %           |         |
| Reference value                            | 133,10            |         | 46,80             |         | 167,60            |         |
| Target s.d.                                | 11,70             |         | 4,48              |         | 15,08             |         |
| Rel. target s.d.                           | 10,00 %           |         | 10,00 %           |         | 10,00 %           |         |
| Lower limit of tolerance                   | 93,60             |         | 35,86             |         | 120,60            |         |
| Upper limit of tolerance                   | 140,40            |         | 53,79             |         | 180,90            |         |
| Type B outliers                            | 1                 |         |                   |         |                   |         |



| Laboratory  | 1-Propanol | Z score | 2-Propanol | Z score | i-Butanol | Z score |
|---|------------|---------|------------|---------|-----------|---------|
| Type E outliers   | 1          |         | 2          |         | 2         |         |
| No. of laboratories after elimination of outliers type A-D and F (w ithout laboratories that only gave states but no measured values) | 11         |         | 13         |         | 13        |         |
| 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$   |            |         |            |         |           |         |

## Summary results

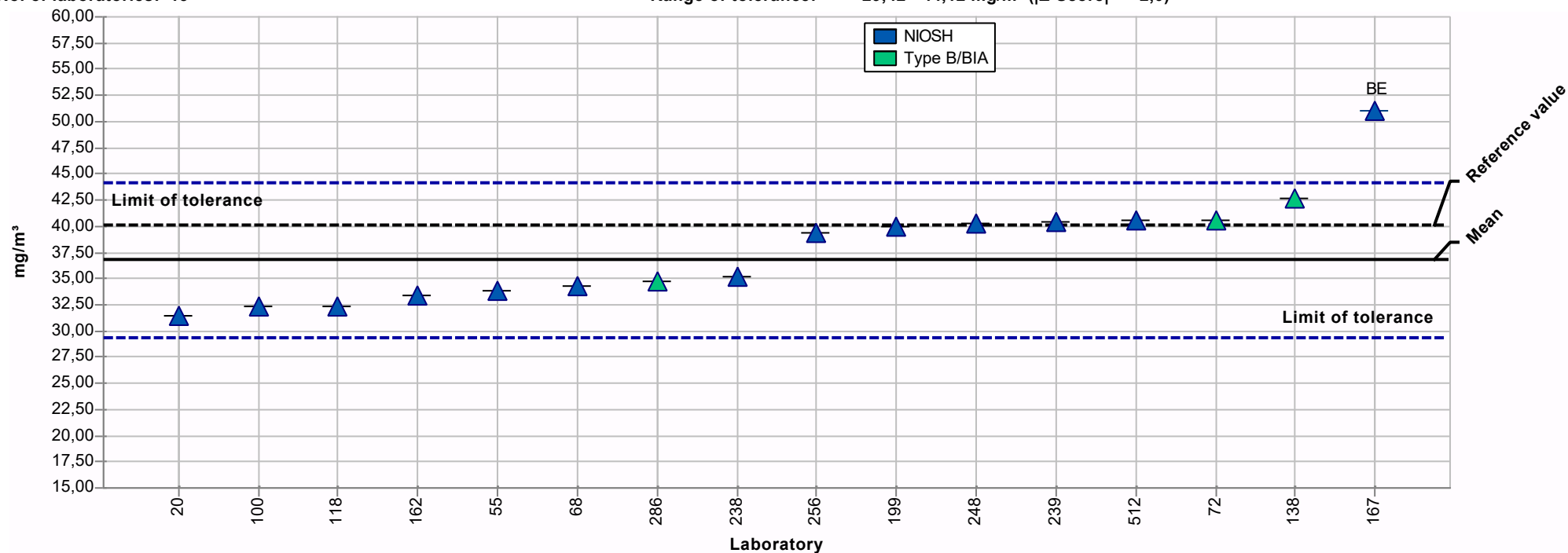
|                             |                  |                                   |  |
|-----------------------------|------------------|-----------------------------------|--|
| <b>Measurand:</b>           | Cumene           | <b>Mean:</b>                      | 19,26 mg/m <sup>3</sup>                            |
| <b>Sample:</b>              | 1                | <b>Reproducibility s.d.:</b>      | 3,13 mg/m <sup>3</sup>                             |
| <b>Method:</b>              | ISO 5725-2       | <b>Rel. reproducibility s.d.:</b> | 16,23%   |
| <b>Rel. target s.d.:</b>    | 10,00% (Limited) | <b>Reference value:</b>           | 20,10 mg/m <sup>3</sup>                            |
| <b>No. of laboratories:</b> | 16               | <b>Range of tolerance:</b>        | 15,41 - 23,11 mg/m <sup>3</sup> ( Z-Score  <= 2,0) |



## Summary results

**Measurand:** Ethylbenzene  
**Sample:** 1  
**Method:** ISO 5725-2  
**Rel. target s.d.:** 10,00% (Limited)  
**No. of laboratories:** 15

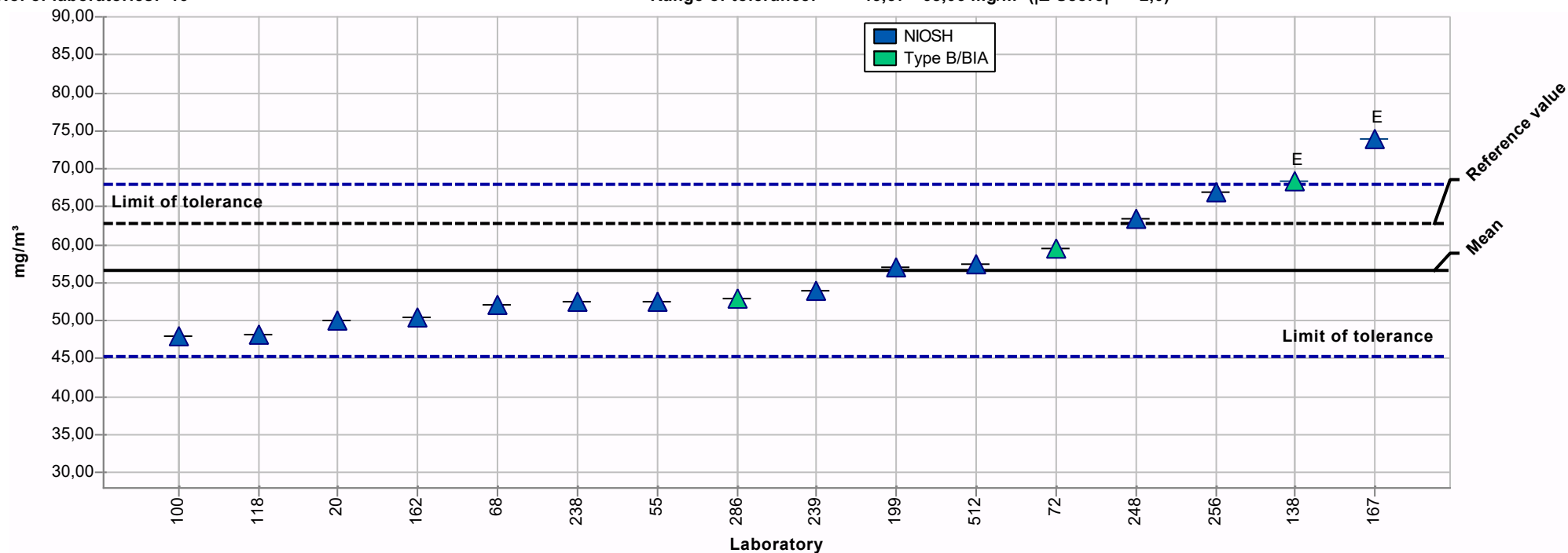
**Mean:** 36,77 mg/m<sup>3</sup>  
**Reproducibility s.d.:** 3,85 mg/m<sup>3</sup>  
**Rel. reproducibility s.d.:** 10,48%  
**Reference value:** 40,10 mg/m<sup>3</sup>  
**Range of tolerance:** 29,42 - 44,12 mg/m<sup>3</sup> (|Z-Score| <= 2,0)



## Summary results

**Measurand:** m-Xylene  
**Sample:** 1  
**Method:** ISO 5725-2  
**Rel. target s.d.:** 10,00% (Limited)  
**No. of laboratories:** 16

**Mean:** 56,71 mg/m<sup>3</sup>  
**Reproducibility s.d.:** 7,77 mg/m<sup>3</sup>  
**Rel. reproducibility s.d.:** 13,70%  
**Reference value:** 62,80 mg/m<sup>3</sup>  
**Range of tolerance:** 45,37 - 68,06 mg/m<sup>3</sup> (|Z-Score| <= 2,0)



## Summary results

Measurand: Methylcyclohexane

Sample: 1

Method: ISO 5725-2

Rel. target s.d.: 10,00% (Limited)

No. of laboratories: 14

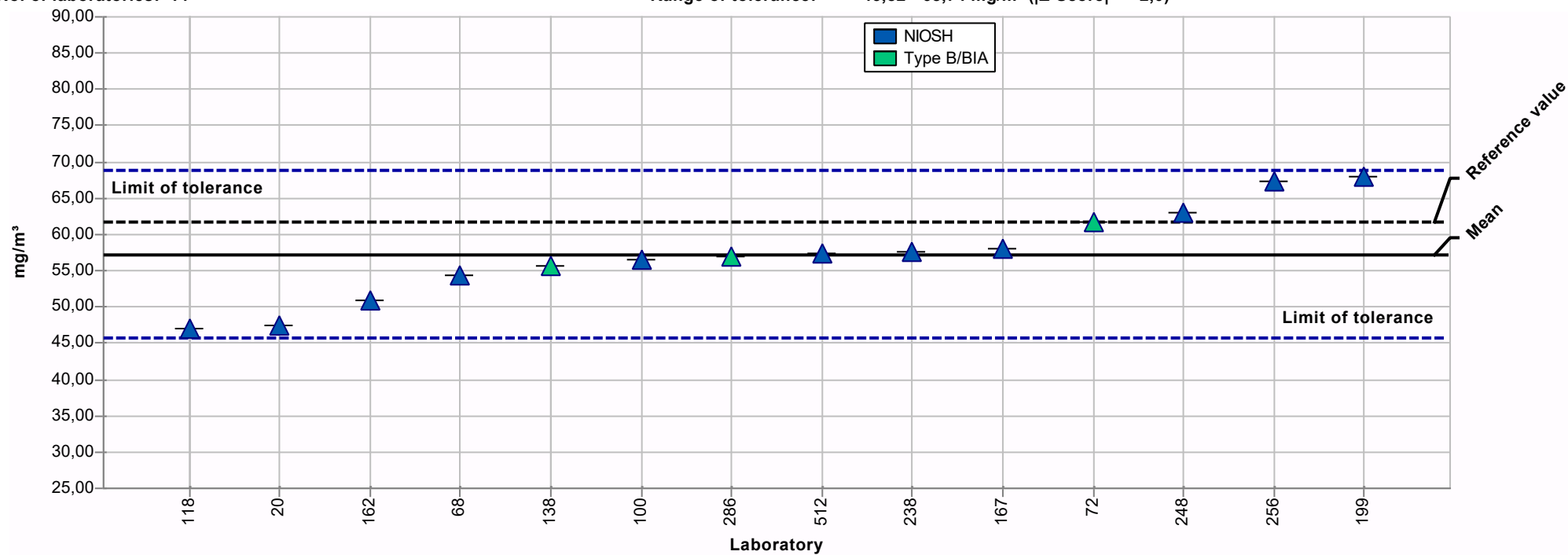
Mean: 57,28 mg/m<sup>3</sup>

Reproducibility s.d.: 6,33 mg/m<sup>3</sup>

Rel. reproducibility s.d.: 11,05%

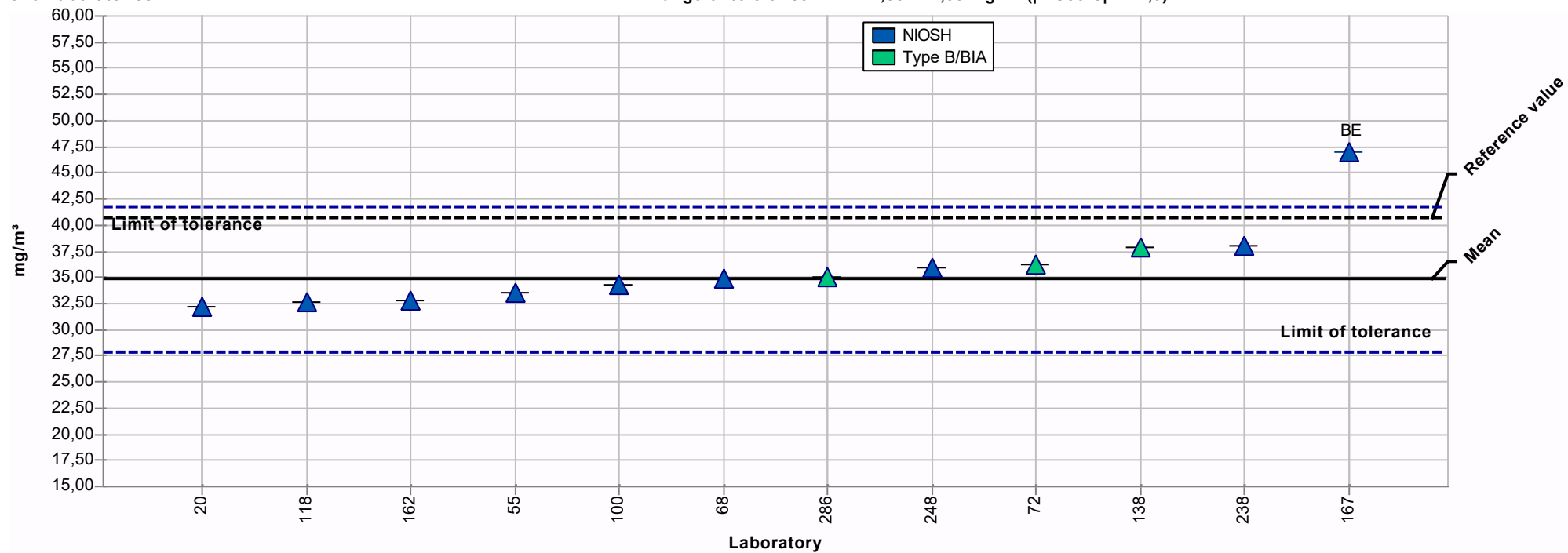
Reference value: 61,80 mg/m<sup>3</sup>

Range of tolerance: 45,82 - 68,74 mg/m<sup>3</sup> (|Z-Score| <= 2,0)



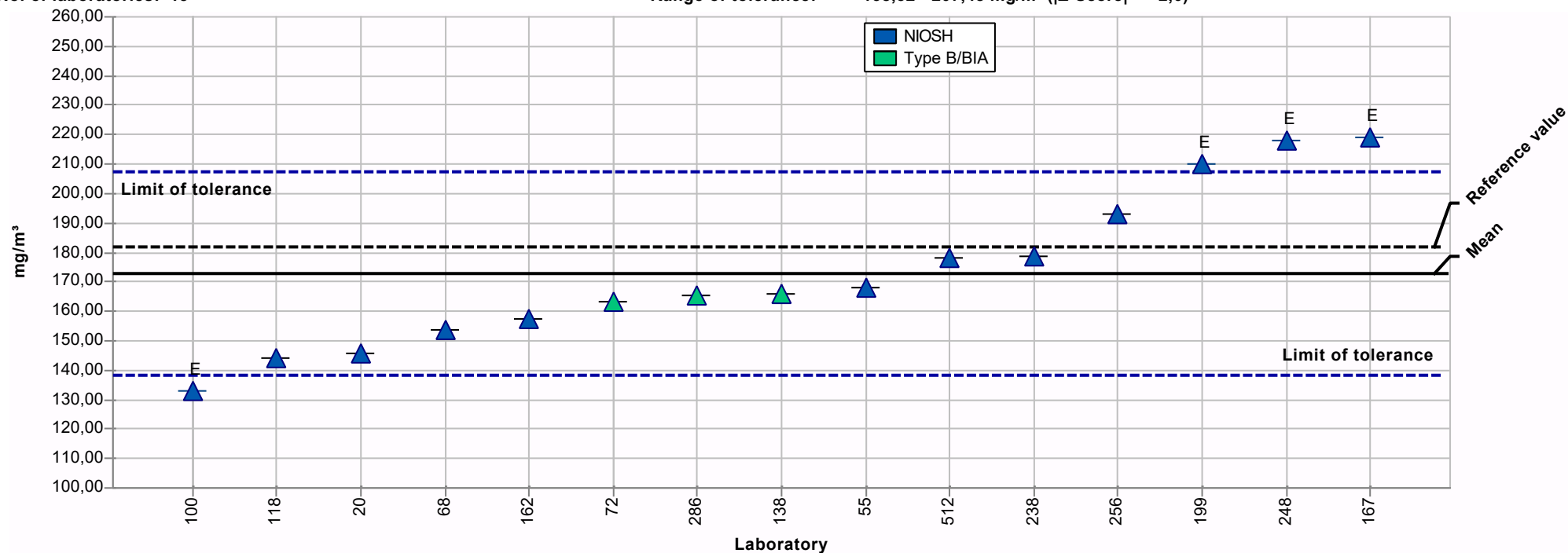
## Summary results

|                             |                  |                                   |  |
|-----------------------------|------------------|-----------------------------------|--|
| <b>Measurand:</b>           | n-Hexane         | <b>Mean:</b>                      | 34,85 mg/m <sup>3</sup>                            |
| <b>Sample:</b>              | 1                | <b>Reproducibility s.d.:</b>      | 2,01 mg/m <sup>3</sup>                             |
| <b>Method:</b>              | ISO 5725-2       | <b>Rel. reproducibility s.d.:</b> | 5,77%  |
| <b>Rel. target s.d.:</b>    | 10,00% (Limited) | <b>Reference value:</b>           | 40,70 mg/m <sup>3</sup>                            |
| <b>No. of laboratories:</b> | 11               | <b>Range of tolerance:</b>        | 27,88 - 41,83 mg/m <sup>3</sup> ( Z-Score  <= 2,0) |



## Summary results

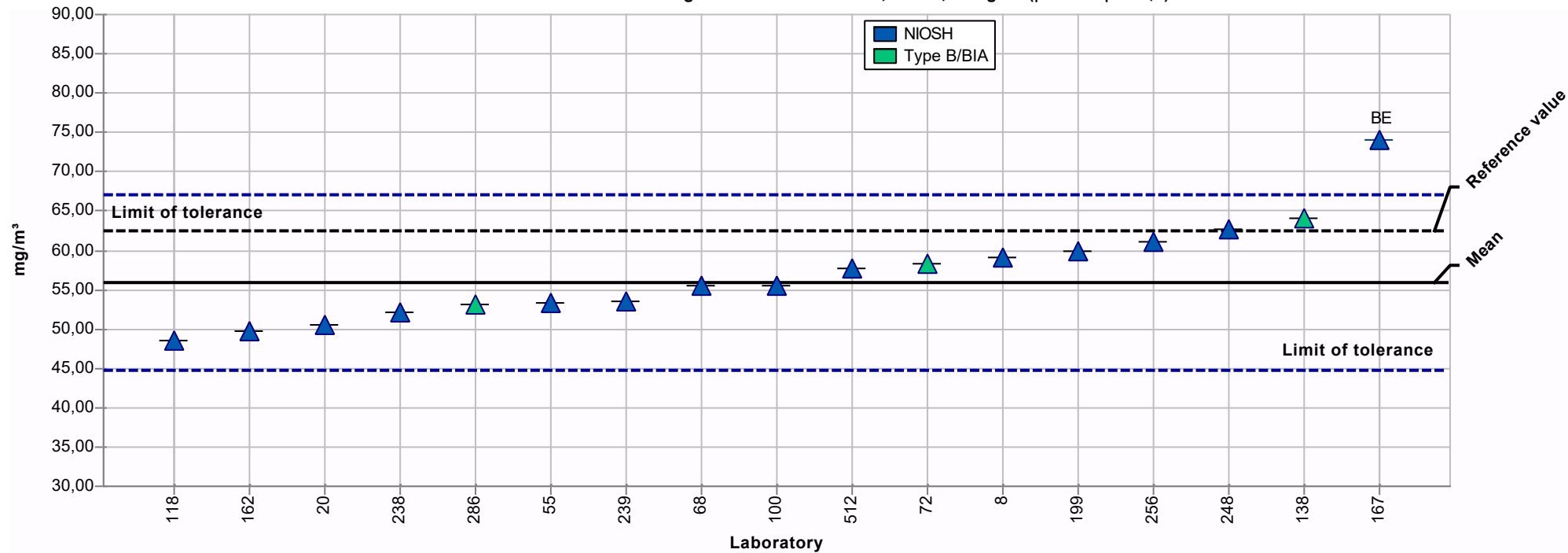
|                             |                  |                                   |  |
|-----------------------------|------------------|-----------------------------------|--|
| <b>Measurand:</b>           | n-Octane         | <b>Mean:</b>                      | 172,90 mg/m <sup>3</sup>                             |
| <b>Sample:</b>              | 1                | <b>Reproducibility s.d.:</b>      | 26,73 mg/m <sup>3</sup>                              |
| <b>Method:</b>              | ISO 5725-2       | <b>Rel. reproducibility s.d.:</b> | 15,46%   |
| <b>Rel. target s.d.:</b>    | 10,00% (Limited) | <b>Reference value:</b>           | 181,70 mg/m <sup>3</sup>                             |
| <b>No. of laboratories:</b> | 15               | <b>Range of tolerance:</b>        | 138,32 - 207,48 mg/m <sup>3</sup> ( Z-Score  <= 2,0) |



## Summary results

**Measurand:** Toluol  
**Sample:** 1  
**Method:** ISO 5725-2  
**Rel. target s.d.:** 10,00% (Limited)  
**No. of laboratories:** 16

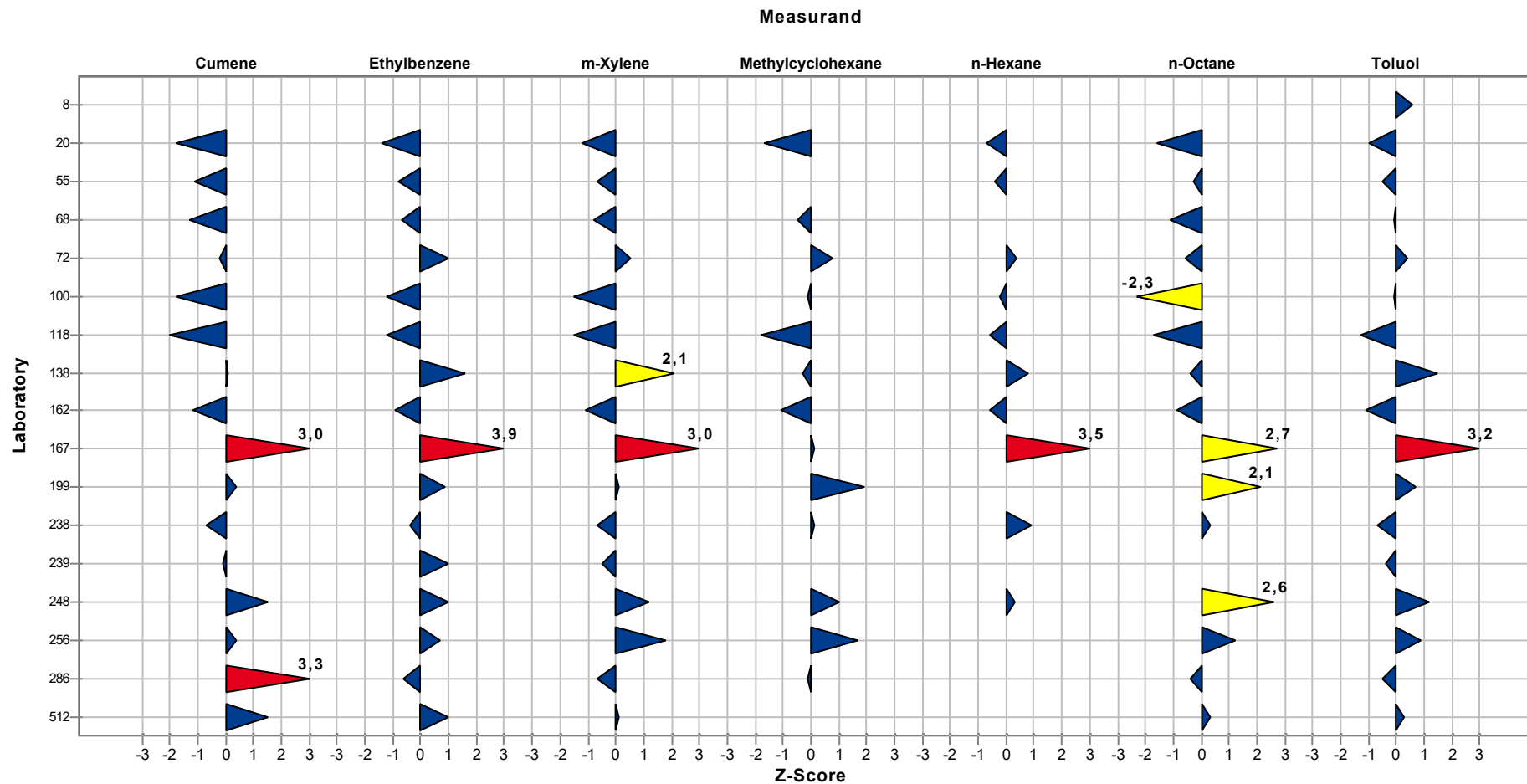
**Mean:** 55,93 mg/m<sup>3</sup>  
**Reproducibility s.d.:** 4,71 mg/m<sup>3</sup>  
**Rel. reproducibility s.d.:** 8,43%  
**Reference value:** 62,40 mg/m<sup>3</sup>  
**Range of tolerance:** 44,74 - 67,12 mg/m<sup>3</sup> (|Z-Score| <= 2,0)





# Sample chart of Z-Scores

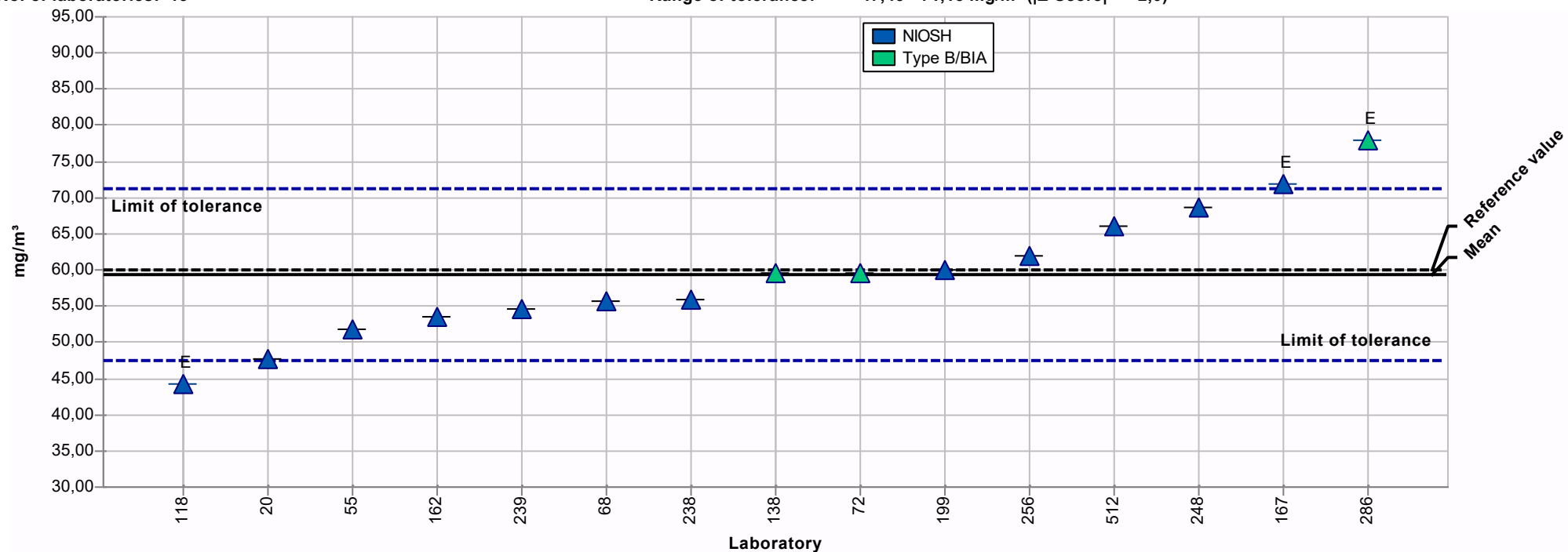
Sample: 1



## Summary results

**Measurand:** Cumene  
**Sample:** 2  
**Method:** ISO 5725-2  
**Rel. target s.d.:** 10,00% (Limited)  
**No. of laboratories:** 15

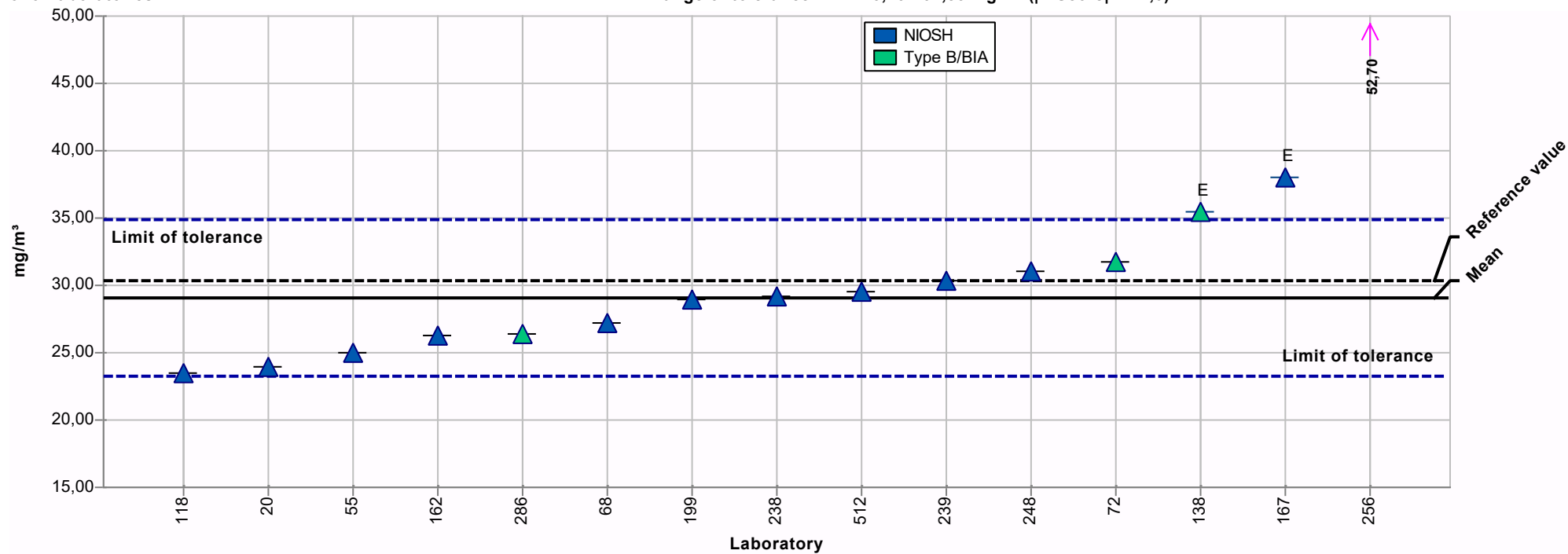
**Mean:** 59,29 mg/m<sup>3</sup>  
**Reproducibility s.d.:** 9,04 mg/m<sup>3</sup>  
**Rel. reproducibility s.d.:** 15,24%  
**Reference value:** 60,00 mg/m<sup>3</sup>  
**Range of tolerance:** 47,43 - 71,15 mg/m<sup>3</sup> (|Z-Score| <= 2,0)



## Summary results

**Measurand:** Ethylbenzene  
**Sample:** 2  
**Method:** ISO 5725-2  
**Rel. target s.d.:** 10,00% (Limited)  
**No. of laboratories:** 14

**Mean:** 29,04 mg/m<sup>3</sup>  
**Reproducibility s.d.:** 4,17 mg/m<sup>3</sup>  
**Rel. reproducibility s.d.:** 14,36%  
**Reference value:** 30,40 mg/m<sup>3</sup>  
**Range of tolerance:** 23,23 - 34,85 mg/m<sup>3</sup> (|Z-Score| <= 2,0)

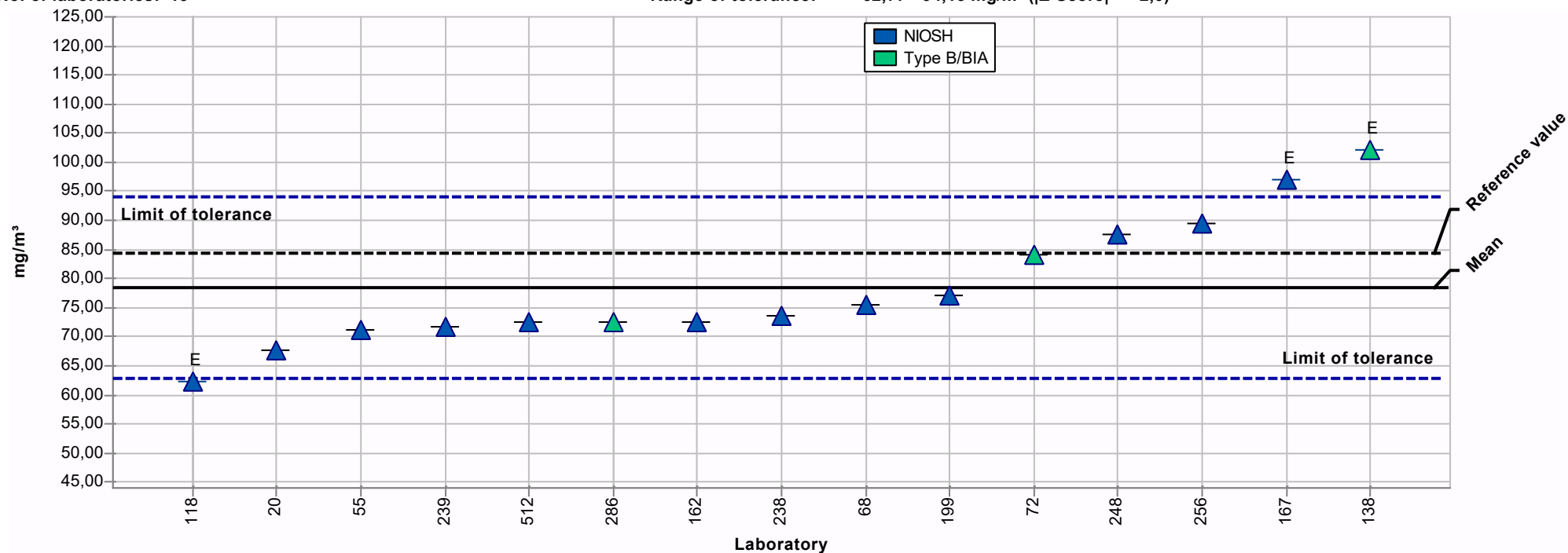


## Summary results

**Measurand:** m-Xylene  
**Sample:** 2  
**Method:** ISO 5725-2  
**Rel. target s.d.:** 10,00% (Limited)

**Mean:** 78,46 mg/m<sup>3</sup>  
**Reproducibility s.d.:** 11,17 mg/m<sup>3</sup>  
**Rel. reproducibility s.d.:** 14,24%  
**Reference value:** 84,40 mg/m<sup>3</sup>  
**Range of tolerance:** 62,77 - 94,15 mg/m<sup>3</sup> (|Z-Score| <= 2,0)

No. of laboratories: 15



## Summary results

Measurand: Methylcyclohexane

Sample: 2

Method: ISO 5725-2

Rel. target s.d.: 10,00% (Limited)

No. of laboratories: 13

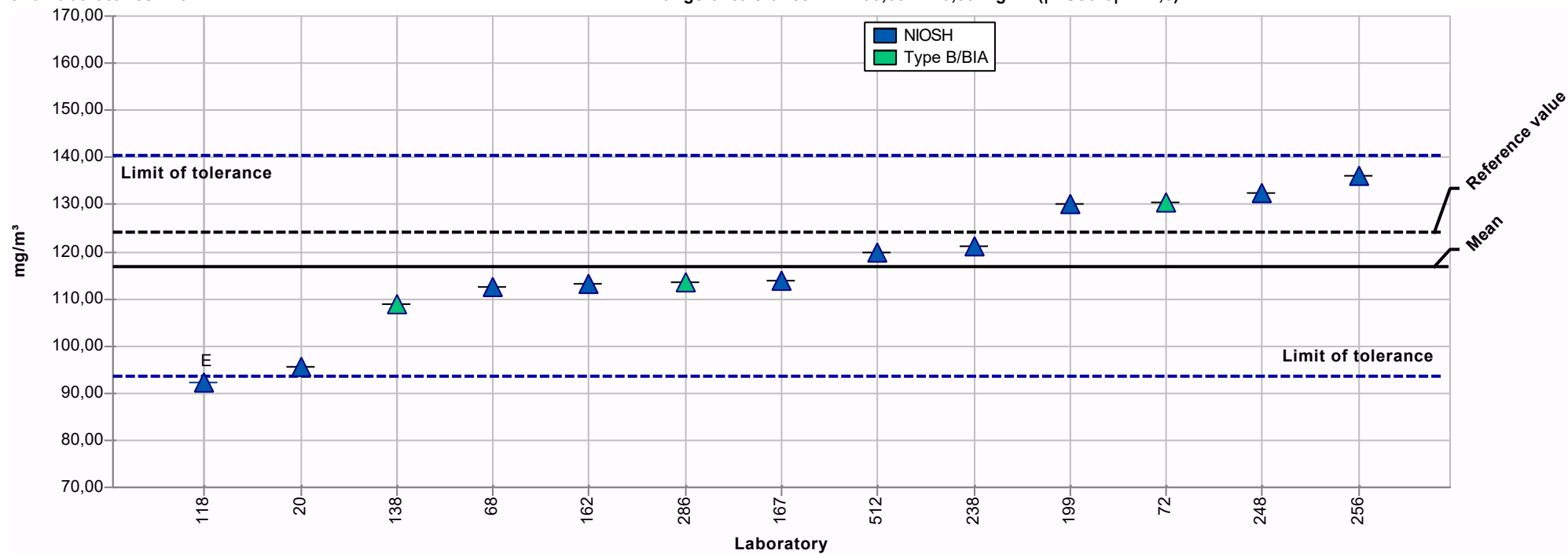
Mean: 116,94 mg/m<sup>3</sup>

Reproducibility s.d.: 13,46 mg/m<sup>3</sup>

Rel. reproducibility s.d.: 11,51%

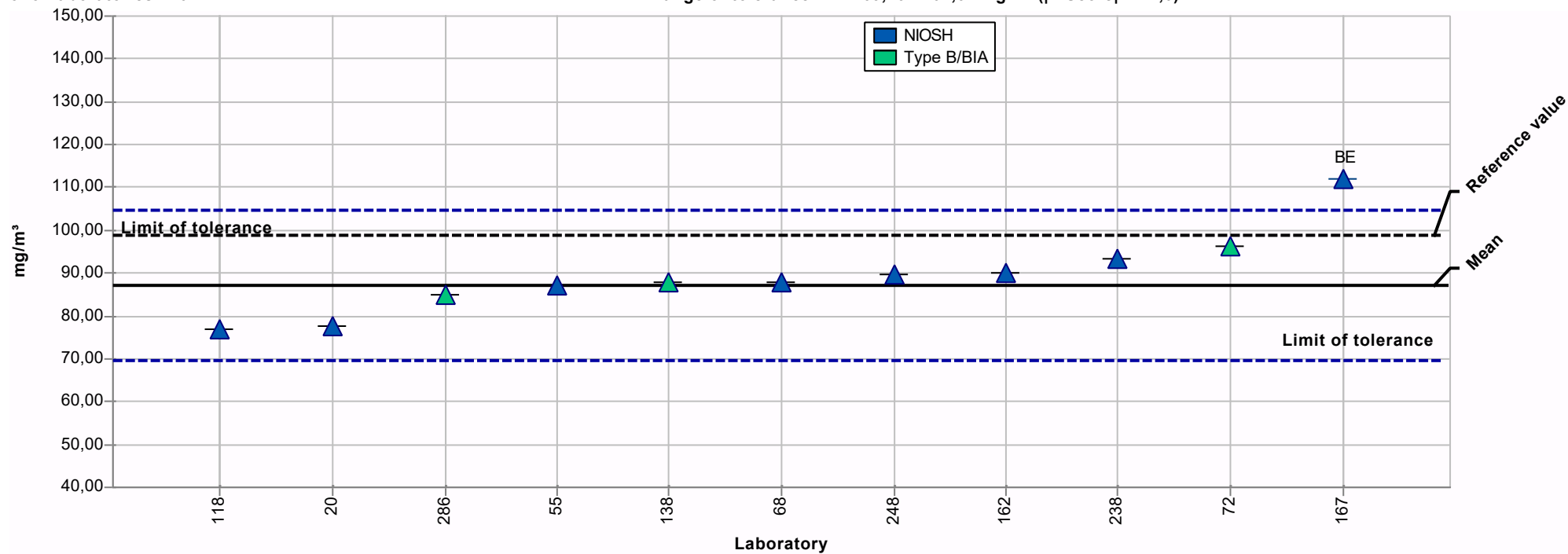
Reference value: 124,10 mg/m<sup>3</sup>

Range of tolerance: 93,55 - 140,33 mg/m<sup>3</sup> (|Z-Score| <= 2,0)



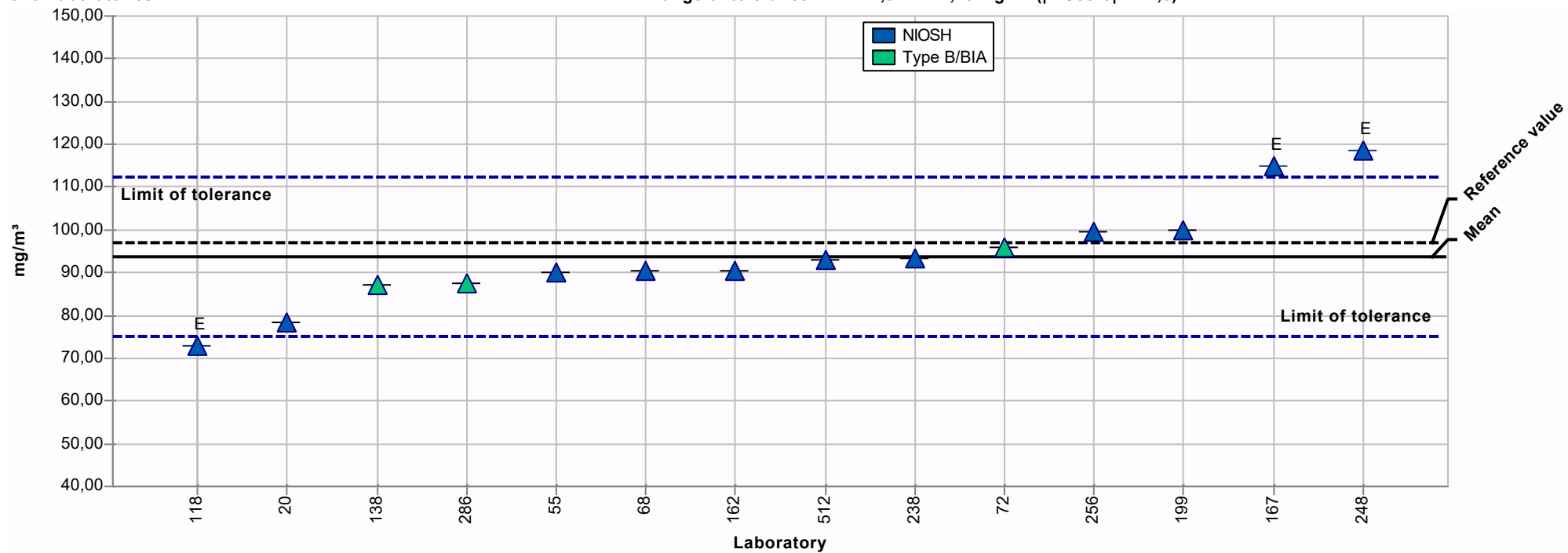
## Summary results

|                             |                  |                                   |   |
|-----------------------------|------------------|-----------------------------------|---|
| <b>Measurand:</b>           | n-Hexane         | <b>Mean:</b>                      | 87,20 mg/m <sup>3</sup>                             |
| <b>Sample:</b>              | 2                | <b>Reproducibility s.d.:</b>      | 6,17 mg/m <sup>3</sup>                              |
| <b>Method:</b>              | ISO 5725-2       | <b>Rel. reproducibility s.d.:</b> | 7,07%   |
| <b>Rel. target s.d.:</b>    | 10,00% (Limited) | <b>Reference value:</b>           | 98,80 mg/m <sup>3</sup>                             |
| <b>No. of laboratories:</b> | 10               | <b>Range of tolerance:</b>        | 69,76 - 104,64 mg/m <sup>3</sup> ( Z-Score  <= 2,0) |



## Summary results

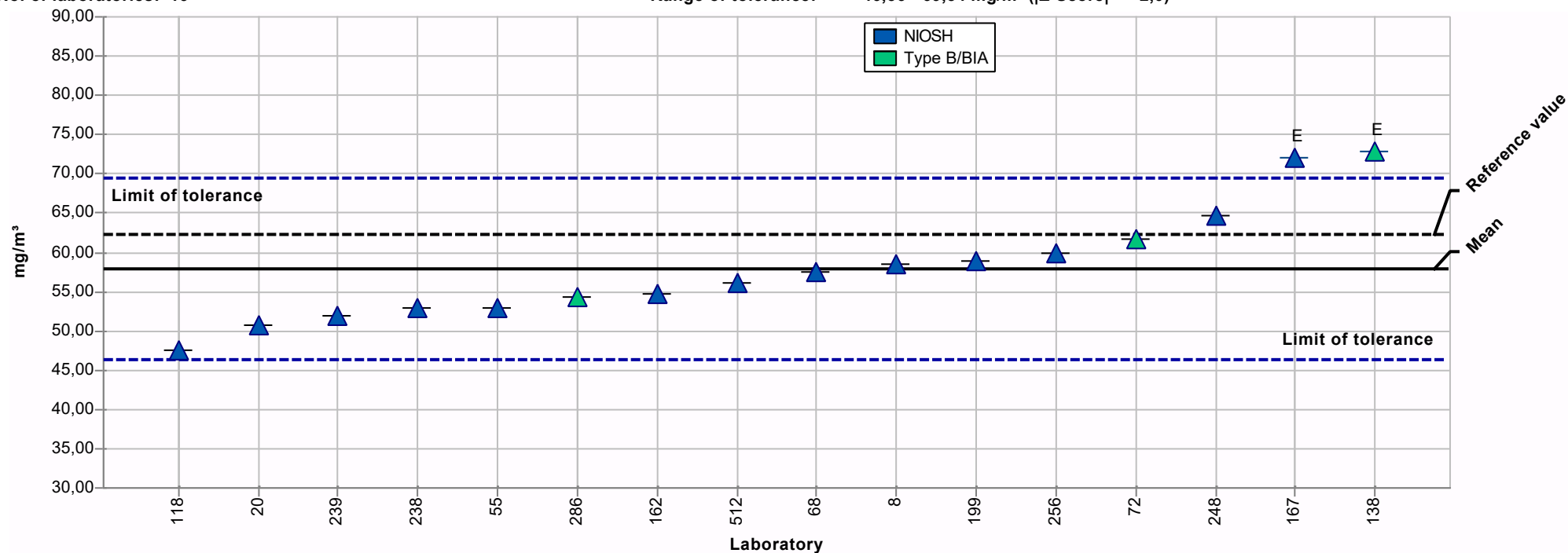
|                             |                  |                                   |   |
|-----------------------------|------------------|-----------------------------------|---|
| <b>Measurand:</b>           | n-Octane         | <b>Mean:</b>                      | 93,72 mg/m <sup>3</sup>                             |
| <b>Sample:</b>              | 2                | <b>Reproducibility s.d.:</b>      | 12,16 mg/m <sup>3</sup>                             |
| <b>Method:</b>              | ISO 5725-2       | <b>Rel. reproducibility s.d.:</b> | 12,97%  |
| <b>Rel. target s.d.:</b>    | 10,00% (Limited) | <b>Reference value:</b>           | 96,90 mg/m <sup>3</sup>                             |
| <b>No. of laboratories:</b> | 14               | <b>Range of tolerance:</b>        | 74,97 - 112,46 mg/m <sup>3</sup> ( Z-Score  <= 2,0) |



## Summary results

**Measurand:** Toluol  
**Sample:** 2  
**Method:** ISO 5725-2  
**Rel. target s.d.:** 10,00% (Limited)  
**No. of laboratories:** 16

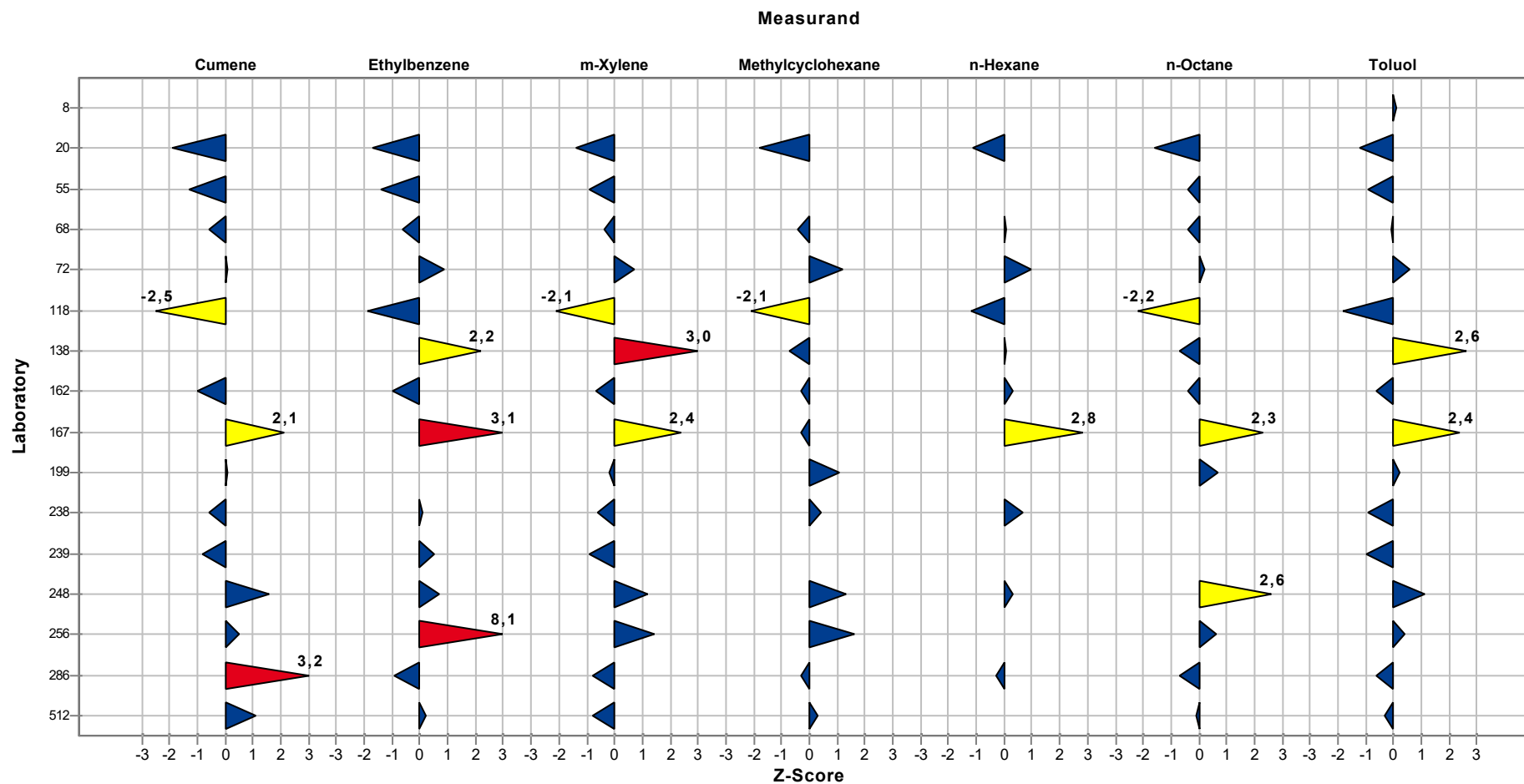
**Mean:** 57,95 mg/m<sup>3</sup>  
**Reproducibility s.d.:** 7,11 mg/m<sup>3</sup>  
**Rel. reproducibility s.d.:** 12,26%  
**Reference value:** 62,30 mg/m<sup>3</sup>  
**Range of tolerance:** 46,36 - 69,54 mg/m<sup>3</sup> (|Z-Score| <= 2,0)





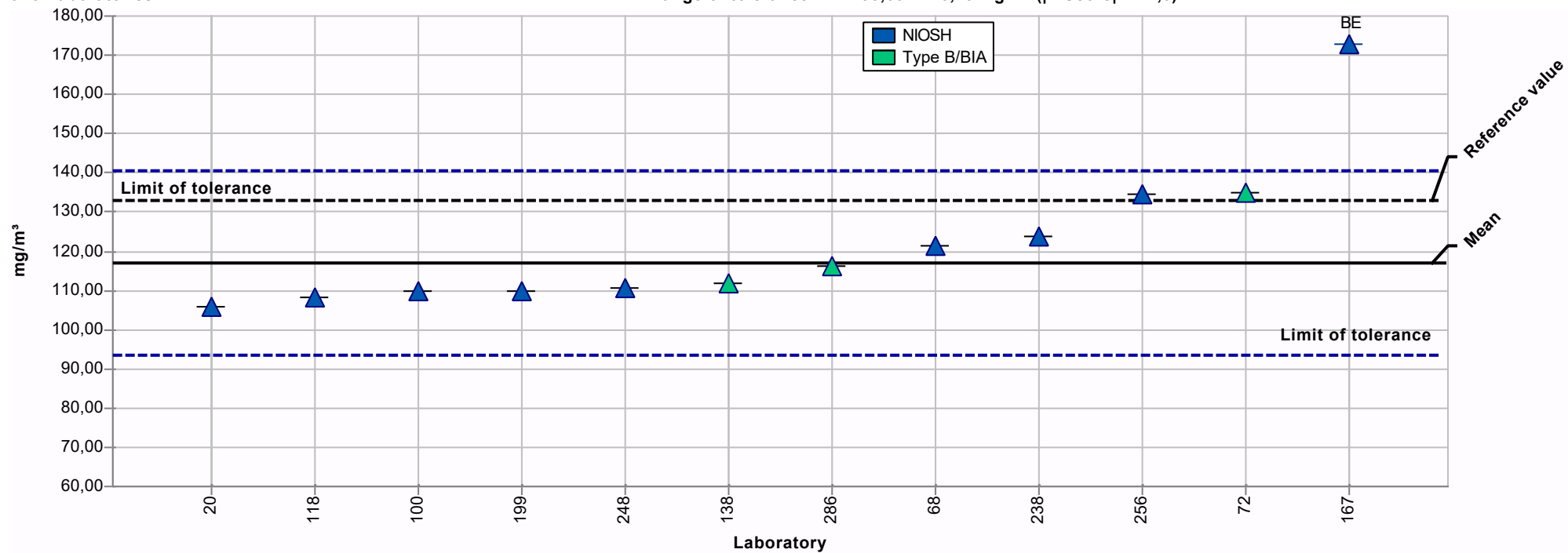
# Sample chart of Z-Scores

Sample: 2



## Summary results

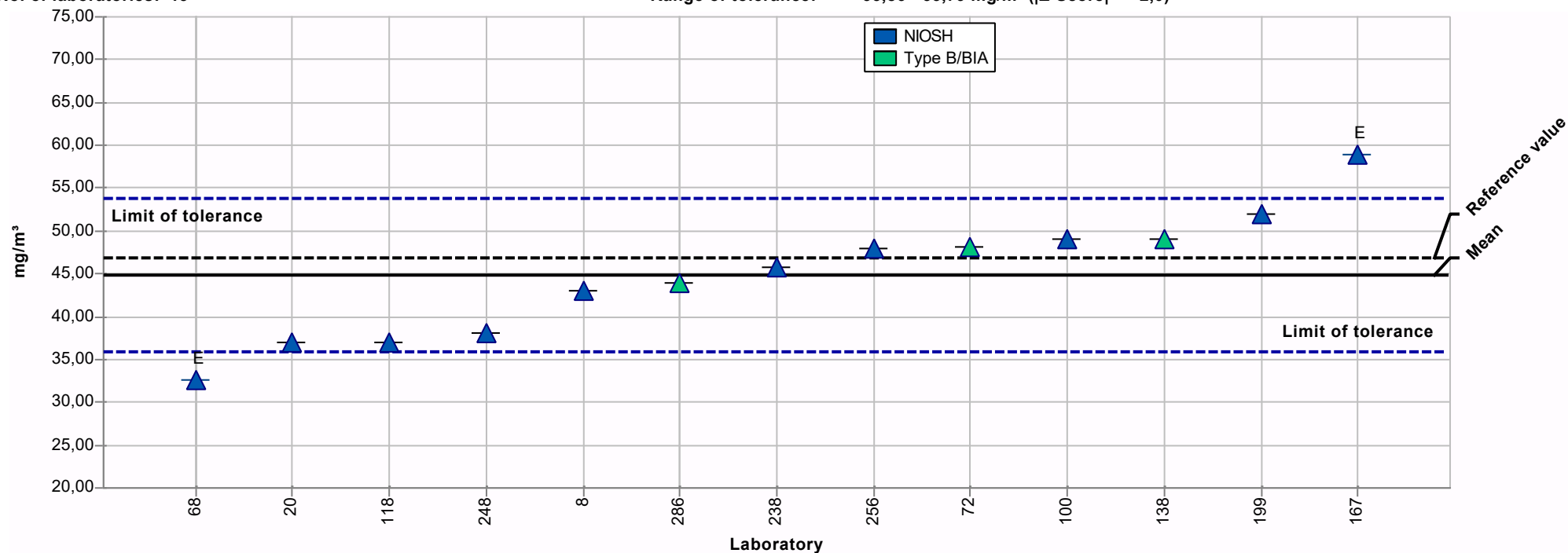
|                             |                  |                                   |   |
|-----------------------------|------------------|-----------------------------------|---|
| <b>Measurand:</b>           | 1-Propanol       | <b>Mean:</b>                      | 117,00 mg/m <sup>3</sup>                            |
| <b>Sample:</b>              | 3                | <b>Reproducibility s.d.:</b>      | 10,32 mg/m <sup>3</sup>                             |
| <b>Method:</b>              | ISO 5725-2       | <b>Rel. reproducibility s.d.:</b> | 8,82%   |
| <b>Rel. target s.d.:</b>    | 10,00% (Limited) | <b>Reference value:</b>           | 133,10 mg/m <sup>3</sup>                            |
| <b>No. of laboratories:</b> | 11               | <b>Range of tolerance:</b>        | 93,60 - 140,40 mg/m <sup>3</sup> ( Z-Score  <= 2,0) |



## Summary results

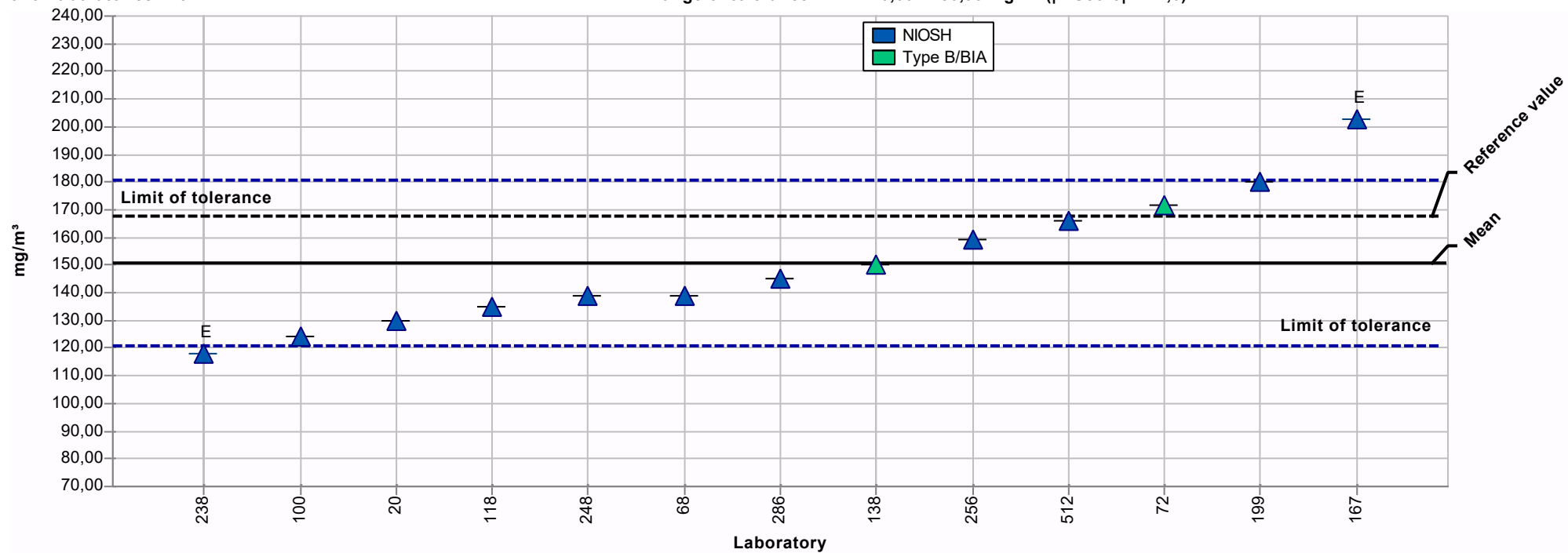
**Measurand:** 2-Propanol  
**Sample:** 3  
**Method:** ISO 5725-2  
**Rel. target s.d.:** 10,00% (Limited)  
**No. of laboratories:** 13

**Mean:** 44,82 mg/m<sup>3</sup>  
**Reproducibility s.d.:** 7,25 mg/m<sup>3</sup>  
**Rel. reproducibility s.d.:** 16,17%  
**Reference value:** 46,80 mg/m<sup>3</sup>  
**Range of tolerance:** 35,86 - 53,79 mg/m<sup>3</sup> (|Z-Score| <= 2,0)



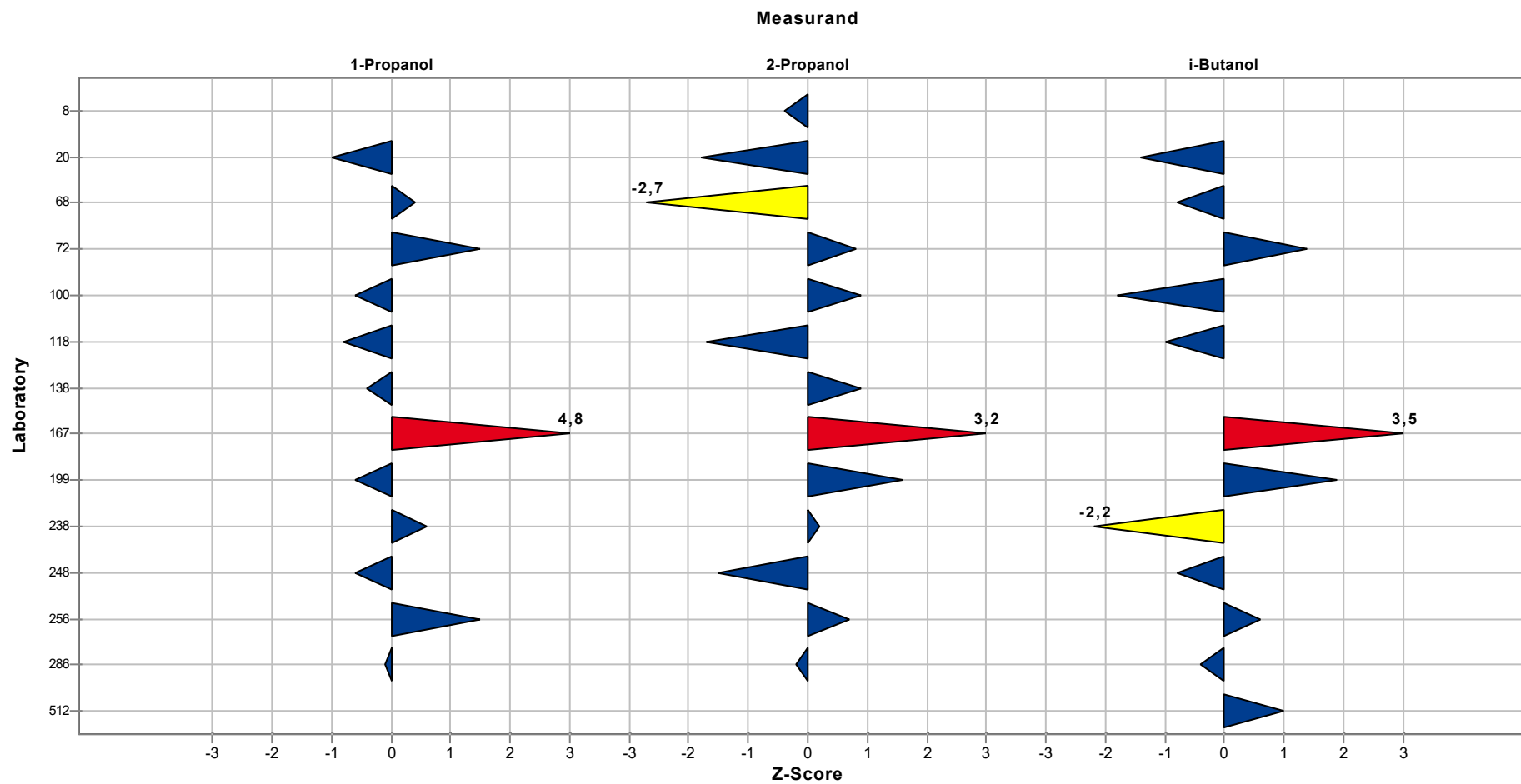
## Summary results

|                             |                  |                                   |  |
|-----------------------------|------------------|-----------------------------------|--|
| <b>Measurand:</b>           | i-Butanol        | <b>Mean:</b>                      | 150,75 mg/m <sup>3</sup>                             |
| <b>Sample:</b>              | 3                | <b>Reproducibility s.d.:</b>      | 24,34 mg/m <sup>3</sup>                              |
| <b>Method:</b>              | ISO 5725-2       | <b>Rel. reproducibility s.d.:</b> | 16,14%   |
| <b>Rel. target s.d.:</b>    | 10,00% (Limited) | <b>Reference value:</b>           | 167,60 mg/m <sup>3</sup>                             |
| <b>No. of laboratories:</b> | 13               | <b>Range of tolerance:</b>        | 120,60 - 180,90 mg/m <sup>3</sup> ( Z-Score  <= 2,0) |



# Sample chart of Z-Scores

Sample: 3



## Questions and Answers

| Participant | Analytical method   | Front- & backsection separ. |
|-------------|---|-----------------------------|
| 8           | AV20174 - Methode nach IFA: Blatt 7330 (Ethanol), Blatt 8415 (2-Propanol) und Blatt 8785 (Toluol) | Ja                          |
| 20          | interne Methode   | ja                          |
| 55          |   | yes                         |
| 68          | Weder DFG noch IFA-Arbeitsmappe   | Ja                          |
| 72          | validierte eigene SOP ""GC6"" in Anlehnung an IFA Arbeitsmappe 7732 / 7733                        | Ja                          |
| 100         | NF X 43-267 (+ Metropol M188,M40,...)   | yes                         |
| 118         | Inhouse-Methode in Anlehnung an IFA-Arbeitsmappen   | nein, zusammen              |
| 138         | DGUV 7732 und 7733  | ja                          |
| 162         | Hausmethode, angelehnt an Methoden aus der IFA-Arbeitsmappe                                       | Ja                          |
| 167         | Sampling performed by IFA   | Yes                         |
| 199         | Anlehnung an VDI 2100 Blatt 2   | nein                        |
| 238         | Metropol INRS   | Yes                         |
| 239         | NF X 43-267   | yes                         |
| 248         | IFA   | ja                          |
| 256         | VDI 2100 Blatt2   | Nein                        |
| 286         | 7732 / 7733   | Nein                        |
| 512         | in Anlehnung an VDI 2100 Blatt 2/ Part 2, 2010-11   | nein                        |

| Participant | Desorption solution   |
|-------------|---|
| 8           | ternäres Gemisch mit n-Heptan als Innerer Standard                                  |
| 20          | Schwefelkohlenstoff   |
| 55          | carbon disulfide  |
| 68          | CS <sub>2</sub>   |
| 72          | Benzylalkohol   |
| 100         | CS <sub>2</sub>   |
| 118         | ternäres Gemisch (CH <sub>2</sub> CL <sub>2</sub> :CS <sub>2</sub> :MeOH) = 60:35:5 |
| 138         | ternäres Gemisch  |
| 162         | Schwefelkohlenstoff   |

## Organic Solvents 2021

| Participant | Desorption solution   |
|-------------|---|
| 167         | CS2   |
| 199         | Benzylalkohol   |
| 238         | Carbon disulfide  |
| 239         | cs2   |
| 248         | 5 mL Schwefelkohlenstoff+1% Phenoxyethanol sowie 2 mL Schwefelkohlenstoff |
| 256         | Diethylether und CS2  |
| 286         | 95% Schwefelkohlenstoff, 5% 2-Phenoxyethanol                              |
| 512         | Dichlormethan   |

| Participant | Desorption volume   | Gas chromatograph (GC)                             |
|-------------|---|--|
| 8           | 1ml   | Agilent 6890N mit Autosampler                      |
| 20          | 1 ml  | Agilent  |
| 55          | 2   | agilent  |
| 68          | 1 ml  | GC/FID: HP 5890 Series II                          |
| 72          | 5 ml  | GC-FID HP 7890b                                    |
| 100         | 2 ml  | GC (agilent 7890)                                  |
| 118         | 10mL  | Agilent 7890A                                      |
| 138         | 5 ml  | Chrompac 9000                                      |
| 162         | 1,5   | Shimadzu GC-2010 Plus                              |
| 167         | 25  | Agilent 7890 and Agilent 6890                      |
| 199         | 5ml   | Headspace-GC/MS                                    |
| 238         | 2 ml  | GCMS and GCFID                                     |
| 239         | 0.5   | Agilent  |
| 248         | 5 mL Schwefelkohlenstoff+1% Phenoxyethanol sowie 2 mL Schwefelkohlenstoff | Thermo Trace GC/FID sowie Agilent GC/MS 6890/5975C |
| 256         | 5 mL und 5 mL   | Agilent Technologies 7890B                         |
| 286         | 10 mL   | Agilent GC6890                                     |
| 512         | 5 mL  | GC/MS  |

| Participant | Carrier gas | Sample injection | Data evaluation   |
|-------------|-------------|------------------|-------------------|
| 8           | Helium      | split            | interner Standard |

## Organic Solvents 2021

| Participant | Carrier gas | Sample injection | Data evaluation   |
|-------------|-------------|------------------|---|
| 20          | Helium      | split            | interner Std  |
| 55          | helium      | split            | internal  |
| 68          | Helium      | split            | interner Standard   |
| 72          | Helium 6.0  | split            | externer Standard, 6 Pkt. Kalibrierung  |
| 100         | He          | split            | internal standard   |
| 118         | Stickstoff  | on-column        | interner Standard   |
| 138         | Stickstoff  | split            | interner Standard   |
| 162         | Wasserstoff | Split            | Interner Standard   |
| 167         | Helium      | Splitless        | Internal Standard   |
| 199         | Helium      | split            | Quantifizierung mittels externem Standard mit Korrektur durch internen Standard |
| 238         | helium      | splitless        | internal for GCMS and external for GCFID  |
| 239         | helium      | split            | internal standard   |
| 248         | Helium      | Split/splitless  | externe Standards unter zusätzlicher Verwendung eines internen Standards        |
| 256         | Helium      | Splitless        | Interner Standard   |
| 286         | He          | Split            | interner Standard   |
| 512         | Helium      | splitlos         | externer Standard, Korrektur über internen Standard                             |

| Participant | Analytical column                                  | Detector       | Recovery rates     | Date of analysis |
|-------------|--|----------------|--------------------|------------------|
| 8           |  | FID            | Ja                 | 2021-09-21       |
| 20          | HP1 (Prüfgas 1+2) und FFAP (Prüfgas 3)             | FID            | nein               | 2021-09-21       |
| 55          | RTX 502.2  | MS             | yes                | 2021-09-29       |
| 68          | Vocol von Supelo                                   | FID            | Ja                 | 2021-10-04       |
| 72          | Phenomenex Zebron ZB-WAX, 30 m x 0,25 mm x 0,25 mm | FID            | ja (0,90 bis 0,98) | 2021-09-20       |
| 100         | DB624  | MS             | yes                | 2021-09-14       |
| 118         | DB-5 / DB-WAX                                      | FID            |                    | 2021-09-10       |
| 138         | RTX Volaties und HP Innow ax                       | FID            | ja                 | 2021-10-13       |
| 162         | CP Sil PONA CB, 40m x 0.1 mm ID x 0.2 µm Film      | FID            | nein               | 2021-09-24       |
| 167         |  | FID            | Yes                | 2021-09-21       |
| 199         | DB-1701 und DB-5,625                               | MS             | nein               | 2021-10-13       |
| 238         | RTX624   | GCMS and GCFID | No                 | 2021-09-01       |
| 239         | Restek   | ms             | no                 | 2021-09-01       |



## Organic Solvents 2021

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| Participant | Analytical column                    | Detector   | Recovery rates | Date of analysis |
|-------------|--------------------------------------|------------|----------------|------------------|
| 248         | DB-5 MS/ DB WAX/DB 624               | FID und MS | Ja             | 02.-07.09.2021   |
| 256         | RTx-624, 40 m, 0.18 mm ID, 1 ul Film | MS         | Ja             | 2021-09-07       |
| 286         | Restek DB1 / Restex RTX 200          | MSD        | ja             | 2021-10-05       |
| 512         | DB-5.625 und DB-1701                 | MS         | nein           | 2021-09-15       |

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