IFA
Institut für Arbeitsschutz der
Deutschen Gesetzlichen Unfallversicherung

# Proficiency testing for in-house measuring laboratories – Results and Evaluation

## Proficiency testing scheme Metals on filters

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# Summary of laboratory test results

Sample 1

| | cobalt | Z score | copper | Z score | lead | Z score | manganese | Z score | nickel | Z score |
|---|---|---|---|---|---|---|---|---|---|---|
| Unit | µg absolute | | µg absolute | | µg absolute | | µg absolute | | µg absolute | |
| 6 | 2,88 | 0,96 | 18,32 | 0,87 | 79,93 | 1,04 | 44,57 | 0,74 | 3,47 | 1,09 |
| 13 | 2,46 | -0,65 | 16,98 | 0,08 | 70,83 | -0,21 | 38,81 | -0,65 | 3,06 | -0,24 |
| 26 | 2,64 | 0,05 | 17,10 | 0,15 | 66,79 | -0,77 | 42,23 | 0,18 | 3,08 | -0,16 |
| 38 | 2,50 | -0,49 | 16,00 | -0,51 | 68,00 | -0,60 | 46,00 | 1,08 | 2,90 | -0,74 |
| 42 | 2,57 | -0,22 | 15,96 | -0,53 | 73,66 | 0,18 | 41,57 | 0,02 | 3,13 | 0,00 |
| 54 | 2,61 | -0,05 | 16,45 | -0,24 | 74,69 | 0,32 | 41,18 | -0,08 | 3,18 | 0,16 |
| 68 | 2,75 | 0,47 | 16,80 | -0,03 | 77,05 | 0,65 | 42,40 | 0,22 | 3,30 | 0,54 |
| 70 | 2,55 | -0,28 | 16,75 | -0,06 | 69,78 | -0,36 | 40,19 | -0,32 | 3,03 | -0,31 |
| 71 | 2,57 | -0,23 | 16,42 | -0,26 | 71,20 | -0,16 | 40,21 | -0,31 | 3,09 | -0,13 |
| 73 | 2,60 | -0,11 | 17,00 | 0,09 | 72,00 | -0,05 | 43,00 | 0,36 | 3,20 | 0,22 |
| 74 | 2,70 | 0,27 | 16,90 | 0,03 | 72,50 | 0,02 | 41,70 | 0,05 | 3,10 | -0,10 |
| 90 | 2,63 | 0,01 | 16,87 | 0,01 | 73,53 | 0,16 | 41,24 | -0,06 | 3,12 | -0,03 |
| 106 | 2,67 | 0,16 | 16,58 | -0,16 | 74,33 | 0,27 | 41,85 | 0,08 | 3,21 | 0,26 |
| 111 | 2,75 | 0,45 | 19,97 | 1,85 | 76,44 | 0,56 | 42,23 | 0,17 | 3,29 | 0,50 |
| 129 | 3,17 | 2,06 E | 16,76 | -0,05 | 76,66 | 0,59 | 42,69 | 0,29 | 2,61 | -1,66 |
| 138 | 2,53 | -0,37 | 16,80 | -0,03 | 82,60 | 1,41 | 46,10 | 1,11 | 3,28 | 0,48 |
| 177 | 2,10 | -2,01 E | 14,40 | -1,46 | 57,70 | -2,03 E | 37,00 | -1,08 | 2,28 | -2,72 BE |
| 206 | 2,22 | -1,55 | 15,00 | -1,10 | 60,00 | -1,71 | 35,60 | -1,42 | 2,82 | -0,99 |
| 252 | 2,55 | -0,30 | 16,34 | -0,30 | 74,67 | 0,32 | 40,75 | -0,18 | 3,04 | -0,29 |
| 263 | 2,81 | 0,69 | 19,50 | 1,57 | 70,20 | -0,30 | 35,50 | -1,45 | 3,06 | -0,22 |
| 269 | 2,87 | 0,92 | 17,80 | 0,56 | 78,80 | 0,89 | 44,10 | 0,63 | 3,49 | 1,15 |
| 272 | 2,68 | 0,20 | 16,90 | 0,03 | 73,00 | 0,09 | 41,20 | -0,07 | 3,28 | 0,48 |
| 279 | 2,63 | 0,01 | 16,00 | -0,51 | 70,10 | -0,31 | 44,40 | 0,70 | 3,13 | 0,00 |
| – | – | – – | – | – – | – | – – | – | – – | – | – – |
| Method | ISO 5725-2 | | 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 | | \|Z\|<=2,00 | |
| No. of laboratories that submitted results | 23 | | 23 | | 23 | | 23 | | 23 | |
| Mean | 2,63 | | 16,85 | | 72,37 | | 41,50 | | 3,13 | |

| | cobalt | Z score | copper | Z score | lead | Z score | manganese | Z score | nickel | Z score |
|---|---|---|---|---|---|---|---|---|---|---|
| Reproducibility s.d. | 0,21 | | 1,21 | | 5,71 | | 2,81 | | 0,20 | |
| Rel. reproducibility s.d. | 8,15 % | | 7,19 % | | 7,89 % | | 6,78 % | | 6,27 % | |
| Reference value | 2,58 | | 16,40 | | 72,10 | | 38,70 | | 2,90 | |
| Target s.d. | 0,26 | | 1,69 | | 7,24 | | 4,15 | | 0,31 | |
| Rel. target s.d. | 10,00 % | | 10,00 % | | 10,00 % | | 10,00 % | | 10,00 % | |
| Low er limit of tolerance | 2,10 | | 13,48 | | 57,89 | | 33,20 | | 2,50 | |
| Upper limit of tolerance | 3,15 | | 20,22 | | 86,84 | | 49,80 | | 3,76 | |
| Type B outliers | | | | | | | | | 1 | |
| No. of laboratories after elimination of outliers type A-D and F (w ithout laboratories that only gave states but no measured values) | 23 | | 23 | | 23 | | 23 | | 22 | |

| | |
|---|---|
| Explanation of outlier types | |
| A: Single outlier | Grubbs |
| B: Differing laboratory mean | Grubbs |
| C: Excessive laboratory s.d. | Cochran |
| D: Excluded manually | |
| E: mean outside tolerance limits | |
| F: \|Z-Score\|>3,5 | |

| | zinc | Z score | indium | Z score | |
|---|---|---|---|---|---|
| Unit | µg absolute | | µg absolute | | |
| 6 | 29,32 | 1,55 | 0,138 | 1,62 | |
| 13 | 27,77 | 0,94 | 0,124 | 0,47 | |
| 26 | 25,72 | 0,14 | 0,060 | -4,95 | BE |
| 38 | 21,00 | -1,72 | 0,120 | 0,11 | |
| 42 | 26,03 | 0,26 | 0,130 | 0,95 | |
| 54 | 23,52 | -0,73 | 0,114 | -0,37 | |
| 68 | 27,90 | 0,99 | 1,150 | 86,84 | BE |
| 70 | 24,98 | -0,16 | | | |
| 71 | 25,81 | 0,17 | 0,283 | 13,83 | BE |

| | zinc | Z score | indium | Z score |
|---|---|---|---|---|
| 73 | 27,00 | 0,64 | 0,120 | 0,11 |
| 74 | 26,20 | 0,32 | | |
| 90 | 25,05 | -0,13 | 0,090 | -2,42 E |
| 106 | 24,10 | -0,50 | 0,130 | 0,95 |
| 111 | 26,51 | 0,45 | 0,133 | 1,17 |
| 129 | 23,30 | -0,82 | | |
| 138 | 23,80 | -0,62 | 0,095 | -2,00 E |
| 177 | 21,70 | -1,45 | 0,120 | 0,11 |
| 206 | 21,30 | -1,61 | 0,100 | -1,58 |
| 252 | 23,76 | -0,64 | 0,120 | 0,11 |
| 263 | 28,30 | 1,15 | 0,124 | 0,44 |
| 269 | 29,10 | 1,47 | 0,123 | 0,36 |
| 272 | 26,60 | 0,48 | | |
| 279 | 24,90 | -0,19 | | |
| – | – | – – | – | – – |
| Method | ISO 5725-2 | | ISO 5725-2 | |
| Assessment | \|Z\|<=2,00 | | \|Z\|<=2,00 | |
| No. of laboratories that submitted results | 23 | | 18 | |
| Mean | 25,38 | | 0,119 | |
| Reproducibility s.d. | 2,35 | | 0,014 | |
| Rel. reproducibility s.d. | 9,25 % | | 11,61 % | |
| Reference value | 26,70 | | 0,124 | |
| Target s.d. | 2,54 | | 0,012 | |
| Rel. target s.d. | 10,00 % | | 10,00 % | |
| Low er limit of tolerance | 20,30 | | 0,095 | |
| Upper limit of tolerance | 30,45 | | 0,143 | |
| Type B outliers | | | 3 | |
| No. of laboratories after elimination of outliers type A-D and F (w ithout laboratories that only gave states but no measured values) | 23 | | 15 | |

# Summary of laboratory test results

Sample 2

| | cobalt | Z score | copper | Z score | lead | Z score | manganese | Z score | nickel | Z score |
|---|---|---|---|---|---|---|---|---|---|---|
| Unit | µg absolute | | µg absolute | | µg absolute | | µg absolute | | µg absolute | |
| 6 | 4,04 | 0,84 | 6,39 | 0,65 | 23,16 | 0,95 | 9,14 | 0,74 | 9,86 | 0,93 |
| 13 | 3,75 | 0,07 | 6,46 | 0,77 | 22,31 | 0,55 | 8,40 | -0,13 | 9,15 | 0,13 |
| 26 | 3,78 | 0,14 | 6,10 | 0,17 | 19,47 | -0,79 | 8,73 | 0,26 | 8,79 | -0,26 |
| 38 | 3,70 | -0,08 | 5,80 | -0,33 | 20,00 | -0,54 | 9,60 | 1,28 | 9,00 | -0,03 |
| 42 | 3,60 | -0,34 | 5,59 | -0,68 | 21,54 | 0,19 | 8,58 | 0,08 | 8,78 | -0,27 |
| 54 | 3,66 | -0,18 | 5,54 | -0,76 | 20,87 | -0,13 | 8,31 | -0,23 | 8,91 | -0,13 |
| 68 | 3,90 | 0,46 | 5,95 | -0,08 | 22,65 | 0,71 | 8,65 | 0,16 | 9,60 | 0,64 |
| 70 | 3,80 | 0,18 | 6,71 | 1,18 | 22,15 | 0,48 | 8,68 | 0,20 | 8,78 | -0,27 |
| 71 | 3,72 | -0,02 | 5,94 | -0,09 | 20,90 | -0,12 | 8,45 | -0,07 | 9,12 | 0,11 |
| 73 | 3,80 | 0,19 | 5,90 | -0,16 | 21,00 | -0,07 | 8,70 | 0,22 | 9,20 | 0,19 |
| 74 | 3,70 | -0,08 | 5,80 | -0,33 | 20,40 | -0,35 | 8,40 | -0,13 | 8,70 | -0,36 |
| 90 | 3,79 | 0,17 | 6,02 | 0,04 | 21,36 | 0,10 | 8,54 | 0,03 | 9,22 | 0,22 |
| 106 | 3,77 | 0,11 | 5,86 | -0,23 | 21,64 | 0,23 | 8,35 | -0,19 | 8,94 | -0,09 |
| 111 | 3,90 | 0,46 | 6,21 | 0,36 | 21,99 | 0,40 | 8,81 | 0,35 | 9,44 | 0,46 |
| 129 | 3,80 | 0,19 | 5,64 | -0,60 | 21,83 | 0,32 | 8,48 | -0,04 | 8,59 | -0,48 |
| 138 | 3,75 | 0,06 | 6,04 | 0,07 | 21,30 | 0,07 | 8,69 | 0,21 | 9,48 | 0,50 |
| 177 | 3,16 | -1,52 | 5,94 | -0,10 | 17,50 | -1,72 | 7,38 | -1,33 | 7,06 | -2,18 BE |
| 206 | 3,14 | -1,58 | 5,26 | -1,23 | 17,40 | -1,77 | 7,34 | -1,38 | 8,05 | -1,08 |
| 252 | 3,77 | 0,11 | 5,93 | -0,11 | 22,16 | 0,48 | 8,58 | 0,08 | 9,08 | 0,06 |
| 263 | 3,75 | 0,06 | 6,82 | 1,37 | 20,90 | -0,12 | 7,47 | -1,22 | 8,73 | -0,33 |
| 269 | 4,18 | 1,21 | 6,47 | 0,79 | 23,80 | 1,26 | 9,29 | 0,91 | 10,00 | 1,08 |
| 272 | 3,60 | -0,34 | 5,70 | -0,50 | 20,30 | -0,40 | 8,03 | -0,57 | 8,98 | -0,05 |
| 279 | 3,69 | -0,10 | 5,87 | -0,21 | 21,70 | 0,26 | 9,19 | 0,80 | 8,14 | -0,98 |
| – | – | – – | – | – – | – | – – | – | – – | – | – – |
| Method | ISO 5725-2 | | 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 | | \|Z\|<=2,00 | |
| No. of laboratories that submitted results | 23 | | 23 | | 23 | | 23 | | 23 | |
| Mean | 3,73 | | 6,00 | | 21,14 | | 8,51 | | 9,02 | |

| | cobalt | Z score | copper | Z score | lead | Z score | manganese | Z score | nickel | Z score |
|---|---|---|---|---|---|---|---|---|---|---|
| Reproducibility s.d. | 0,22 | | 0,38 | | 1,53 | | 0,56 | | 0,48 | |
| Rel. reproducibility s.d. | 5,99 % | | 6,26 % | | 7,25 % | | 6,61 % | | 5,29 % | |
| Reference value | 3,67 | | 5,77 | | 21,00 | | 8,00 | | 8,67 | |
| Target s.d. | 0,37 | | 0,60 | | 2,11 | | 0,85 | | 0,90 | |
| Rel. target s.d. | 10,00 % | | 10,00 % | | 10,00 % | | 10,00 % | | 10,00 % | |
| Low er limit of tolerance | 2,98 | | 4,80 | | 16,92 | | 6,81 | | 7,22 | |
| Upper limit of tolerance | 4,47 | | 7,20 | | 25,37 | | 10,22 | | 10,83 | |
| Type B outliers | | | | | | | | | 1 | |
| Type F outliers | | | | | | | | | | |
| No. of laboratories after elimination of outliers type A-D and F (w ithout laboratories that only gave states but no measured values) | 23 | | 23 | | 23 | | 23 | | 22 | |
| | | | | | | | | | | |
| Explanation of outlier types | | | | | | | | | | |
| A: Single outlier | Grubbs | | | | | | | | | |
| B: Differing laboratory mean | Grubbs | | | | | | | | | |
| C: Excessive laboratory s.d. | Cochran | | | | | | | | | |
| D: Excluded manually | | | | | | | | | | |
| E: mean outside tolerance limits | | | | | | | | | | |
| F: \|Z-Score\|>3,5 | | | | | | | | | | |

| | zinc | Z score | indium | Z score | |
|---|---|---|---|---|---|
| Unit | µg absolute | | µg absolute | | |
| 6 | 85,50 | 1,21 | 1,854 | 1,15 | |
| 13 | 79,39 | 0,41 | 1,680 | 0,10 | |
| 26 | 76,73 | 0,06 | 0,750 | -5,49 | FE |
| 38 | 62,00 | -1,87 | 1,600 | -0,38 | |
| 42 | 84,51 | 1,09 | 1,750 | 0,53 | |
| 54 | 71,01 | -0,69 | 1,595 | -0,41 | |
| 68 | 83,45 | 0,95 | 1,750 | 0,53 | |
| 70 | 77,31 | 0,14 | | | |

| | zinc | Z score | indium | Z score | |
|---|---|---|---|---|---|
| 71 | 78,19 | 0,26 | 1,685 | 0,13 | |
| 73 | 81,00 | 0,62 | 1,800 | 0,83 | |
| 74 | 76,40 | 0,02 | | | |
| 90 | 78,32 | 0,27 | 1,250 | -2,48 | E |
| 106 | 71,80 | -0,58 | 1,640 | -0,14 | |
| 111 | 80,46 | 0,55 | 1,750 | 0,52 | |
| 129 | 70,70 | -0,73 | | | |
| 138 | 70,80 | -0,71 | 1,650 | -0,08 | |
| 177 | 63,00 | -1,74 | 0,680 | -5,91 | FE |
| 206 | 63,80 | -1,63 | 1,360 | -1,82 | |
| 252 | 74,09 | -0,28 | 1,690 | 0,16 | |
| 263 | 83,60 | 0,97 | 1,660 | -0,02 | |
| 269 | 87,70 | 1,50 | 1,890 | 1,37 | |
| 272 | 79,20 | 0,39 | | | |
| 279 | 74,50 | -0,23 | | | |
| – | – | – – | – | – – | |
| Method | ISO 5725-2 | | ISO 5725-2 | | |
| Assessment | \|Z\|<=2,00 | | \|Z\|<=2,00 | | |
| No. of laboratories that submitted results | 23 | | 18 | | |
| Mean | 76,24 | | 1,663 | | |
| Reproducibility s.d. | 7,10 | | 0,164 | | |
| Rel. reproducibility s.d. | 9,31 % | | 9,85 % | | |
| Reference value | 79,10 | | 1,570 | | |
| Target s.d. | 7,62 | | 0,166 | | |
| Rel. target s.d. | 10,00 % | | 10,00 % | | |
| Low er limit of tolerance | 60,99 | | 1,330 | | |
| Upper limit of tolerance | 91,48 | | 1,995 | | |
| Type F outliers | | | 2 | | |
| No. of laboratories after elimination of outliers type A-D and F (w ithout laboratories that only gave states but no measured values) | 23 | | 16 | | |

# Summary of laboratory test results

Sample 3

| | cobalt | Z score | copper | Z score | lead | Z score | manganese | Z score | nickel | Z score |
|---|---|---|---|---|---|---|---|---|---|---|
| Unit | µg absolute | | µg absolute | | µg absolute | | µg absolute | | µg absolute | |
| 6 | 0,47 | 0,57 | 4,24 | 0,40 | 88,42 | 0,68 | 3,08 | -0,03 | 8,49 | 0,87 |
| 13 | 0,47 | 0,48 | 4,38 | 0,74 | 86,37 | 0,43 | 3,14 | 0,16 | 7,77 | -0,05 |
| 26 | 0,45 | 0,04 | 4,12 | 0,11 | 75,43 | -0,89 | 3,17 | 0,25 | 7,64 | -0,22 |
| 38 | 0,48 | 0,71 | 4,00 | -0,19 | 79,00 | -0,46 | 3,60 | 1,64 | 7,90 | 0,12 |
| 42 | 0,46 | 0,26 | 3,96 | -0,29 | 86,90 | 0,49 | 3,33 | 0,77 | 7,59 | -0,28 |
| 54 | 0,46 | 0,33 | 3,89 | -0,45 | 83,29 | 0,06 | 3,13 | 0,13 | 7,88 | 0,09 |
| 68 | 0,50 | 1,15 | 4,15 | 0,18 | 89,05 | 0,75 | 3,20 | 0,35 | 8,50 | 0,88 |
| 70 | 0,48 | 0,82 | 5,92 | 4,53 BE | 84,82 | 0,24 | 3,24 | 0,48 | 8,09 | 0,35 |
| 71 | 0,42 | -0,72 | 4,19 | 0,27 | 83,54 | 0,09 | 3,08 | -0,03 | 7,95 | 0,18 |
| 73 | 0,44 | -0,19 | 4,10 | 0,06 | 81,00 | -0,22 | 3,10 | 0,03 | 8,00 | 0,24 |
| 74 | 0,40 | -1,08 | 3,80 | -0,68 | 76,10 | -0,81 | 2,80 | -0,95 | 7,30 | -0,65 |
| 90 | 0,46 | 0,26 | 4,11 | 0,08 | 83,98 | 0,14 | 3,15 | 0,19 | 8,10 | 0,37 |
| 106 | 0,47 | 0,48 | 4,00 | -0,19 | 81,19 | -0,20 | 3,00 | -0,30 | 7,81 | 0,00 |
| 111 | 0,49 | 1,00 | 4,40 | 0,80 | 86,72 | 0,47 | 3,26 | 0,55 | 8,26 | 0,58 |
| 129 | 0,36 | -1,97 | 3,65 | -1,05 | 84,10 | 0,16 | 3,11 | 0,06 | 7,39 | -0,54 |
| 138 | 0,41 | -0,86 | 3,94 | -0,34 | 88,70 | 0,71 | 3,04 | -0,17 | 8,10 | 0,37 |
| 177 | 0,25 | -4,42 BE | 4,34 | 0,65 | 69,00 | -1,67 | 2,56 | -1,72 | 6,68 | -1,45 |
| 206 | 0,38 | -1,52 | 3,69 | -0,95 | 68,30 | -1,75 | 2,66 | -1,40 | 7,13 | -0,87 |
| 252 | 0,42 | -0,63 | 3,94 | -0,34 | 85,57 | 0,33 | 2,99 | -0,33 | 7,71 | -0,13 |
| 263 | 0,47 | 0,57 | 4,52 | 1,09 | 82,40 | -0,05 | 2,65 | -1,43 | 7,72 | -0,11 |
| 269 | 0,51 | 1,26 | 4,26 | 0,45 | 90,70 | 0,95 | 3,32 | 0,74 | 8,62 | 1,04 |
| 272 | 0,44 | -0,19 | 4,10 | 0,06 | 83,40 | 0,07 | 3,20 | 0,35 | 8,13 | 0,41 |
| 279 | 0,41 | -0,77 | 3,91 | -0,41 | 86,70 | 0,47 | 3,30 | 0,67 | 6,86 | -1,22 |
| – | – | – – | – | – – | – | – – | – | – – | – | – – |
| Method | ISO 5725-2 | | 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 | | \|Z\|<=2,00 | |
| No. of laboratories that submitted results | 23 | | 23 | | 23 | | 23 | | 23 | |
| Mean | 0,45 | | 4,08 | | 82,81 | | 3,09 | | 7,81 | |

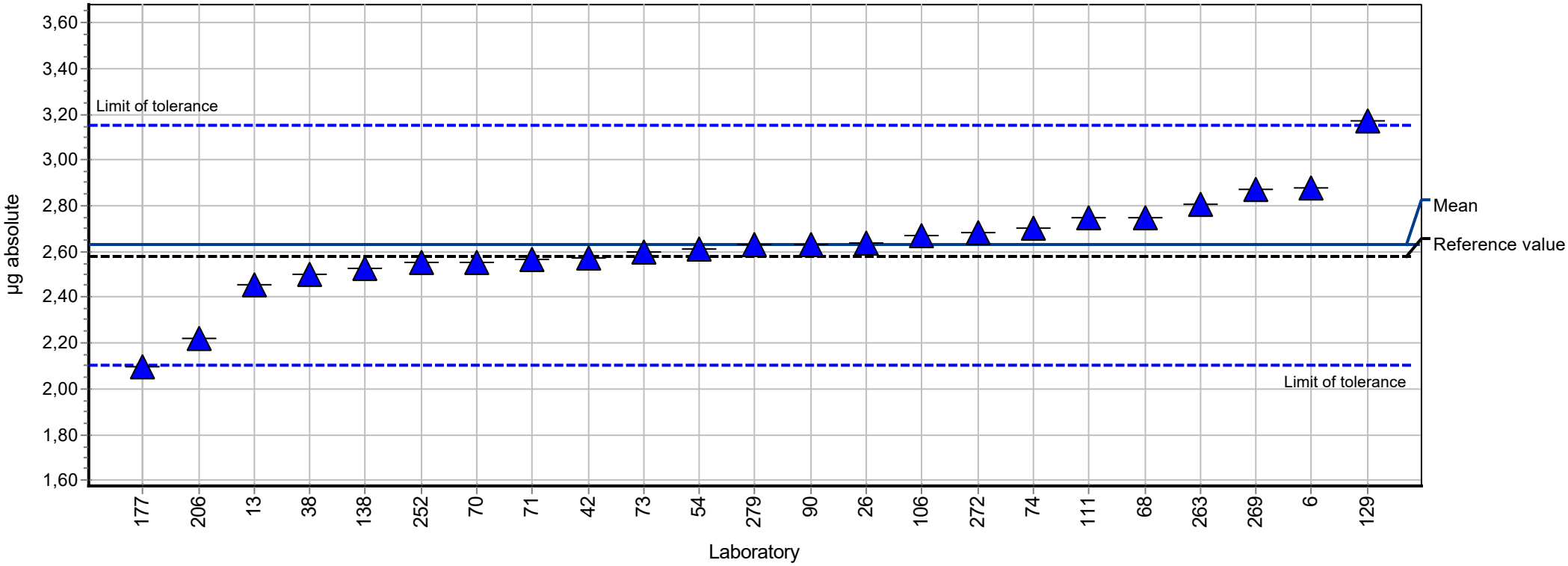
| | cobalt | Z score | copper | Z score | lead | Z score | manganese | Z score | nickel | Z score |
|---|---|---|---|---|---|---|---|---|---|---|
| Reproducibility s.d. | 0,04 | | 0,23 | | 5,89 | | 0,24 | | 0,49 | |
| Rel. reproducibility s.d. | 8,76 % | | 5,56 % | | 7,12 % | | 7,77 % | | 6,34 % | |
| Reference value | 0,46 | | 3,93 | | 81,90 | | 2,93 | | 8,11 | |
| Target s.d. | 0,04 | | 0,41 | | 8,28 | | 0,31 | | 0,78 | |
| Rel. target s.d. | 10,00 % | | 10,00 % | | 10,00 % | | 10,00 % | | 10,00 % | |
| Low er limit of tolerance | 0,36 | | 3,26 | | 66,25 | | 2,47 | | 6,25 | |
| Upper limit of tolerance | 0,54 | | 4,89 | | 99,37 | | 3,71 | | 9,37 | |
| Type B outliers | 1 | | 1 | | | | | | | |
| Type F outliers | | | | | | | | | | |
| No. of laboratories after elimination of outliers type A-D and F (w ithout laboratories that only gave states but no measured values) | 22 | | 22 | | 23 | | 23 | | 23 | |
| | | | | | | | | | | |
| 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 | | | | | | | | | | |

| | zinc | Z score | indium | Z score |
|---|---|---|---|---|
| Unit | µg absolute | | µg absolute | |
| 6 | 53,43 | 1,02 | 0,227 | 0,84 |
| 13 | 50,55 | 0,43 | 0,223 | 0,65 |
| 26 | 47,65 | -0,17 | 0,100 | -5,22 FE |
| 38 | 40,00 | -1,75 | 0,220 | 0,51 |
| 42 | 49,37 | 0,19 | 0,230 | 0,99 |
| 54 | 44,94 | -0,73 | 0,198 | -0,56 |
| 68 | 53,60 | 1,06 | < 0,350 | |
| 70 | 50,18 | 0,35 | | |

| | zinc | Z score | indium | Z score | |
|---|---|---|---|---|---|
| 71 | 50,40 | 0,40 | 0,784 | 27,45 | BE |
| 73 | 50,00 | 0,32 | 0,210 | 0,03 | |
| 74 | 45,30 | -0,65 | | | |
| 90 | 48,79 | 0,07 | 0,160 | -2,36 | E |
| 106 | 44,78 | -0,76 | 0,220 | 0,51 | |
| 111 | 50,67 | 0,45 | 0,224 | 0,70 | |
| 129 | 46,00 | -0,51 | | | |
| 138 | 42,00 | -1,33 | 0,220 | 0,51 | |
| 177 | 48,80 | 0,07 | 0,100 | -5,22 | FE |
| 206 | 42,00 | -1,33 | 0,170 | -1,88 | |
| 252 | 45,34 | -0,65 | 0,200 | -0,45 | |
| 263 | 55,62 | 1,48 | 0,220 | 0,51 | |
| 269 | 54,60 | 1,26 | 0,279 | 3,33 | FE |
| 272 | 53,10 | 0,96 | | | |
| 279 | 47,70 | -0,16 | | | |
| – | – | – – | – | – – | |
| Method | ISO 5725-2 | | ISO 5725-2 | | |
| Assessment | \|Z\|<=2,00 | | \|Z\|<=2,00 | | |
| No. of laboratories that submitted results | 23 | | 18 | | |
| Mean | 48,47 | | 0,209 | | |
| Reproducibility s.d. | 4,20 | | 0,022 | | |
| Rel. reproducibility s.d. | 8,67 % | | 10,50 % | | |
| Reference value | 49,60 | | 0,208 | | |
| Target s.d. | 4,85 | | 0,021 | | |
| Rel. target s.d. | 10,00 % | | 10,00 % | | |
| Low er limit of tolerance | 38,78 | | 0,167 | | |
| Upper limit of tolerance | 58,16 | | 0,251 | | |
| Type B outliers | | | 1 | | |
| Type F outliers | | | 3 | | |
| No. of laboratories after elimination of outliers type A-D and F (w ithout laboratories that only gave states but no measured values) | 23 | | 13 | | |

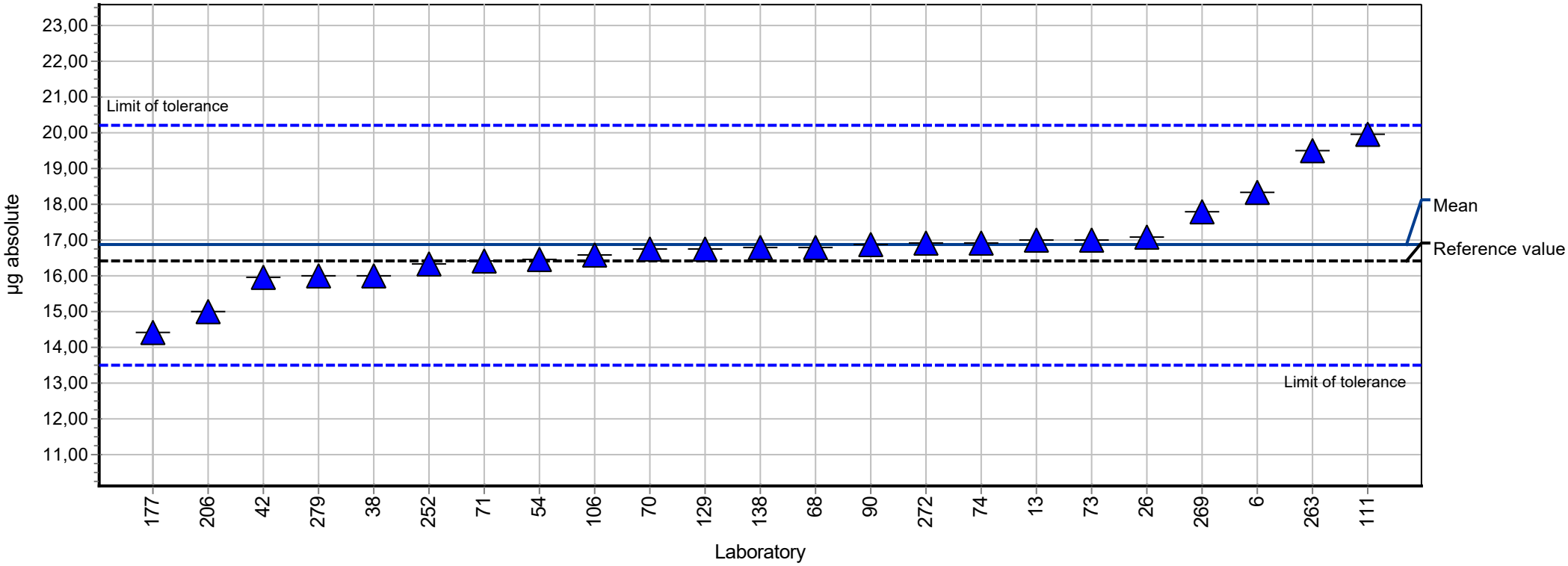
# *Summary results*

| | | | |
|---|---|---|---|
| **Measurand:** | **cobalt** | **Mean:** | **2,63 µg absolute** |
| **Sample:** | **1** | **Reprod. s.d.:** | **0,21 µg absolute** |
| **Method:** | **ISO 5725-2** | **Rel.reprod. s.d.:** | **8,15%** |
| **Rel.target s.d.:** | **10,00% (Limited)** | **Reference value:** | **2,58 µg absolute** |
| **Number of laboratories in calculation:** | **23** | **Range of tolerance:** | **2,10 - 3,15 µg absolute (\|Z-Score\| <= 2,00)** |



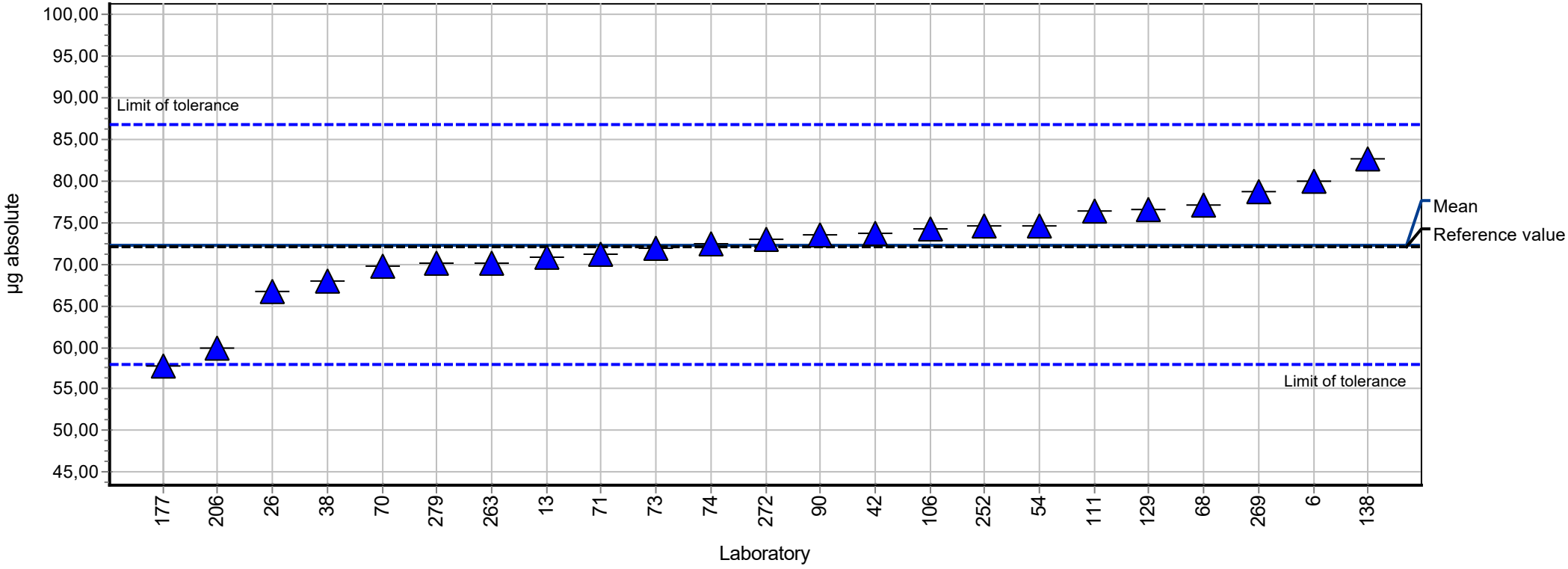
# *Summary results*

| | | | |
|---|---|---|---|
| **Measurand:** | **copper** | **Mean:** | **16,85 µg absolute** |
| **Sample:** | **1** | **Reprod. s.d.:** | **1,21 µg absolute** |
| **Method:** | **ISO 5725-2** | **Rel.reprod. s.d.:** | **7,19%** |
| **Rel.target s.d.:** | **10,00% (Limited)** | **Reference value:** | **16,40 µg absolute** |
| **Number of laboratories in calculation:** | **23** | **Range of tolerance:** | **13,48 - 20,22 µg absolute (\|Z-Score\| <= 2,00)** |



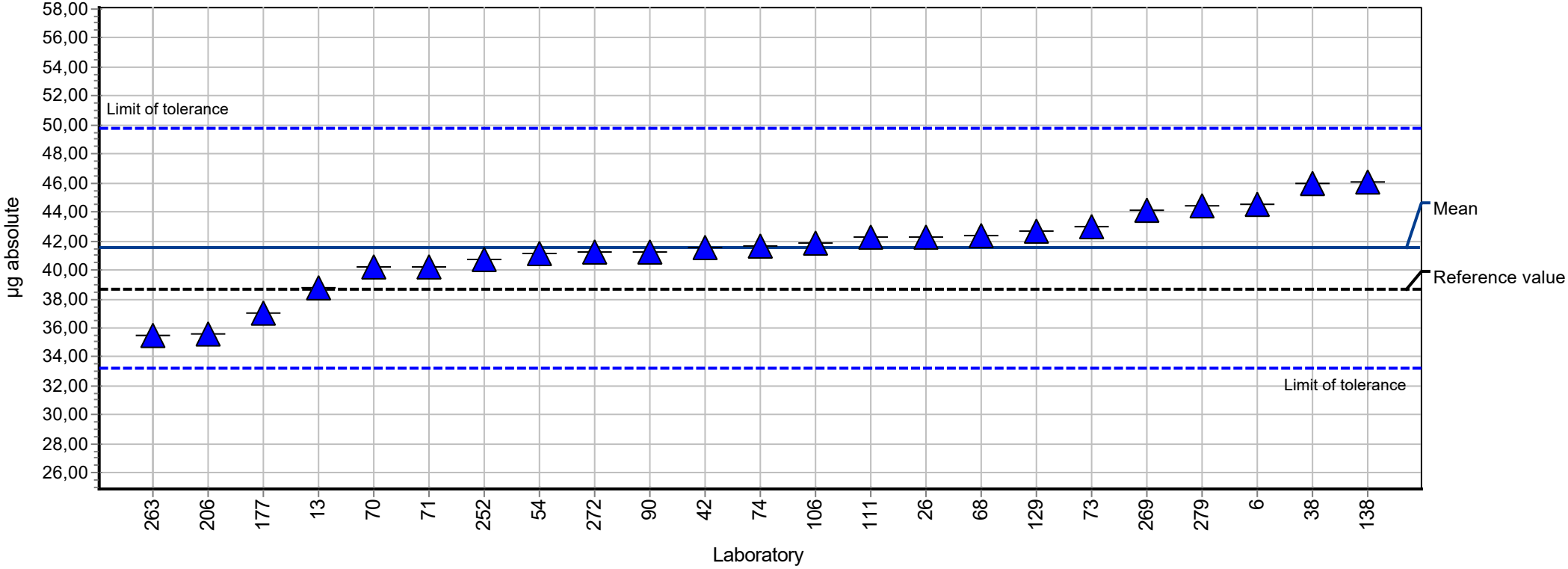
# *Summary results*

| | | | |
|---|---|---|---|
| **Measurand:** | **lead** | **Mean:** | **72,37 µg absolute** |
| **Sample:** | **1** | **Reprod. s.d.:** | **5,71 µg absolute** |
| **Method:** | **ISO 5725-2** | **Rel.reprod. s.d.:** | **7,89%** |
| **Rel.target s.d.:** | **10,00% (Limited)** | **Reference value:** | **72,10 µg absolute** |
| **Number of laboratories in calculation:** | **23** | **Range of tolerance:** | **57,89 - 86,84 µg absolute (\|Z-Score\| <= 2,00)** |



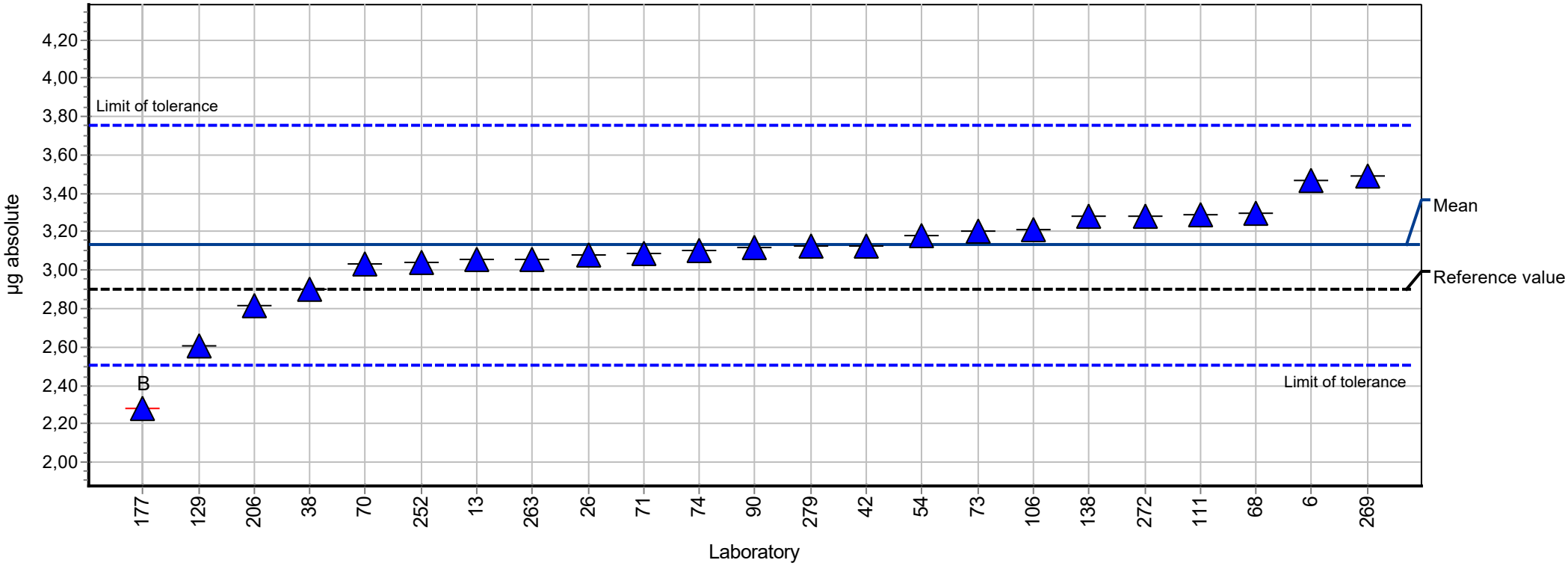
# *Summary results*

| | | | |
|---|---|---|---|
| **Measurand:** | **manganese** | **Mean:** | **41,50 µg absolute** |
| **Sample:** | **1** | **Reprod. s.d.:** | **2,81 µg absolute** |
| **Method:** | **ISO 5725-2** | **Rel.reprod. s.d.:** | **6,78%** |
| **Rel.target s.d.:** | **10,00% (Limited)** | **Reference value:** | **38,70 µg absolute** |
| **Number of laboratories in calculation:** | **23** | **Range of tolerance:** | **33,20 - 49,80 µg absolute (\|Z-Score\| <= 2,00)** |



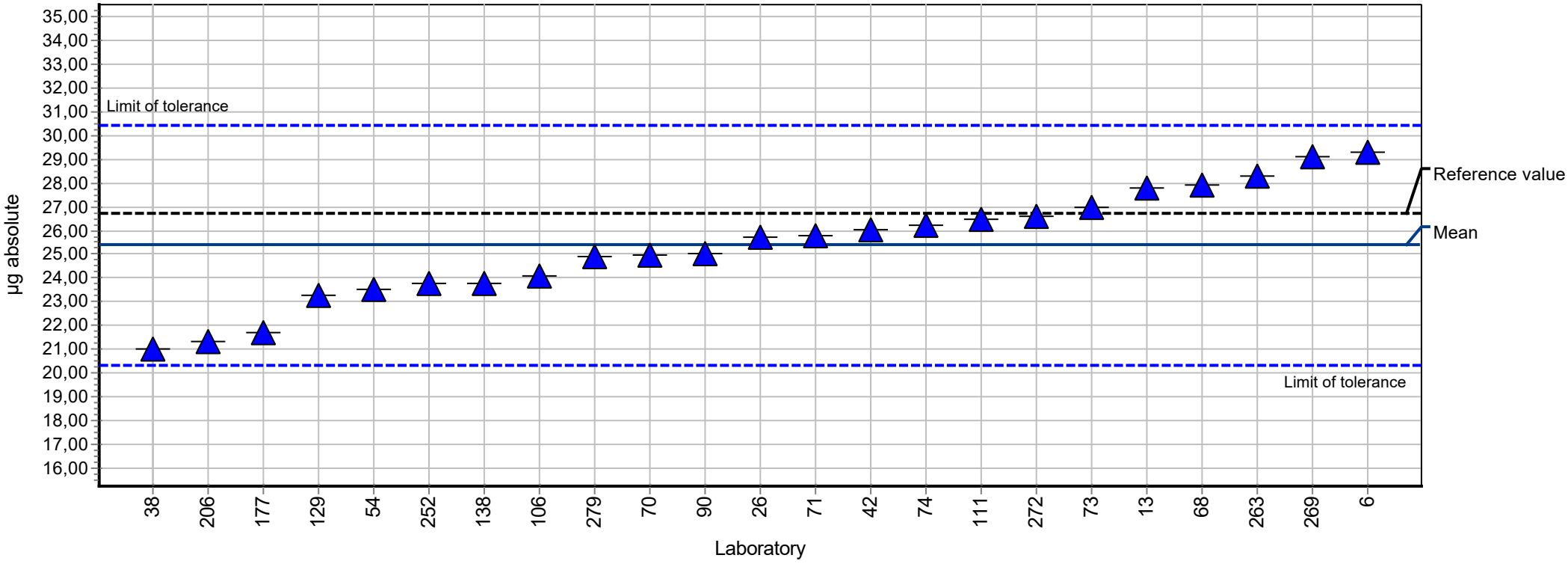
# *Summary results*

| | | | |
|---|---|---|---|
| **Measurand:** | **nickel** | **Mean:** | **3,13 µg absolute** |
| **Sample:** | **1** | **Reprod. s.d.:** | **0,20 µg absolute** |
| **Method:** | **ISO 5725-2** | **Rel.reprod. s.d.:** | **6,27%** |
| **Rel.target s.d.:** | **10,00% (Limited)** | **Reference value:** | **2,90 µg absolute** |
| **Number of laboratories in calculation + outliers:** | **23** | **Range of tolerance:** | **2,50 - 3,76 µg absolute (\|Z-Score\| <= 2,00)** |



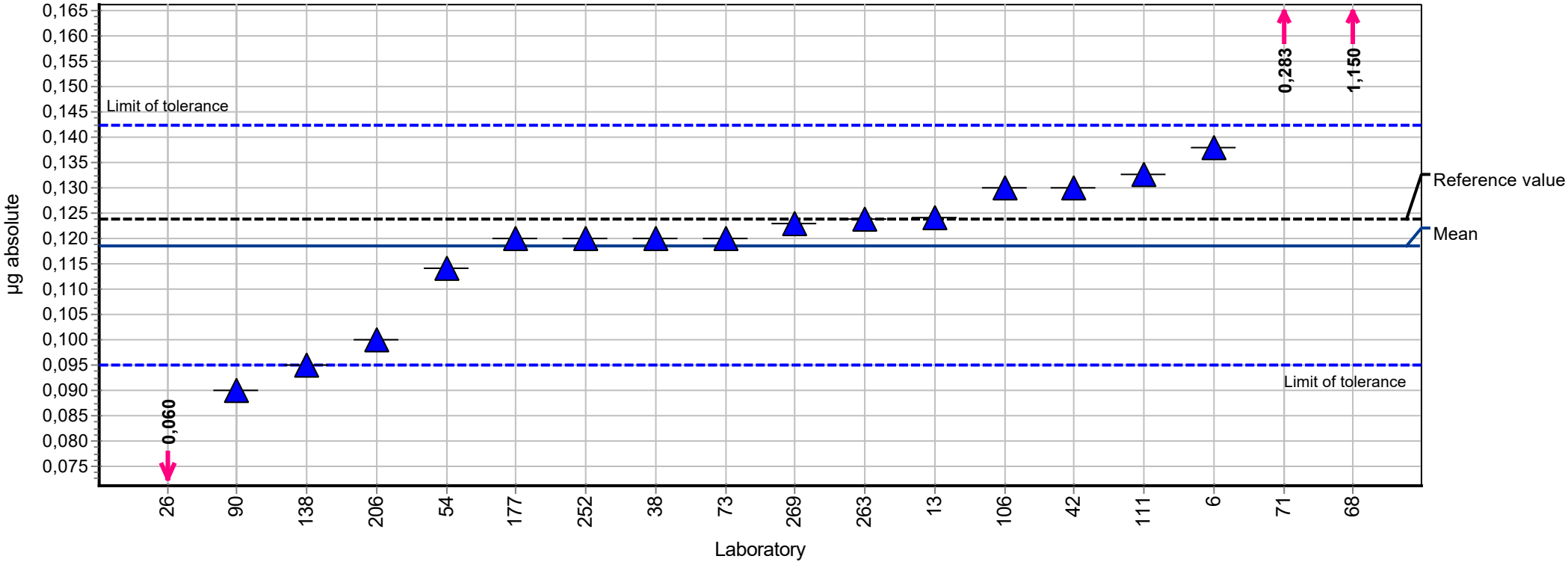
# *Summary results*

| | | | |
|---|---|---|---|
| **Measurand:** | **zinc** | **Mean:** | **25,38 µg absolute** |
| **Sample:** | **1** | **Reprod. s.d.:** | **2,35 µg absolute** |
| **Method:** | **ISO 5725-2** | **Rel.reprod. s.d.:** | **9,25%** |
| **Rel.target s.d.:** | **10,00% (Limited)** | **Reference value:** | **26,70 µg absolute** |
| **Number of laboratories in calculation:** | **23** | **Range of tolerance:** | **20,30 - 30,45 µg absolute (\|Z-Score\| <= 2,00)** |



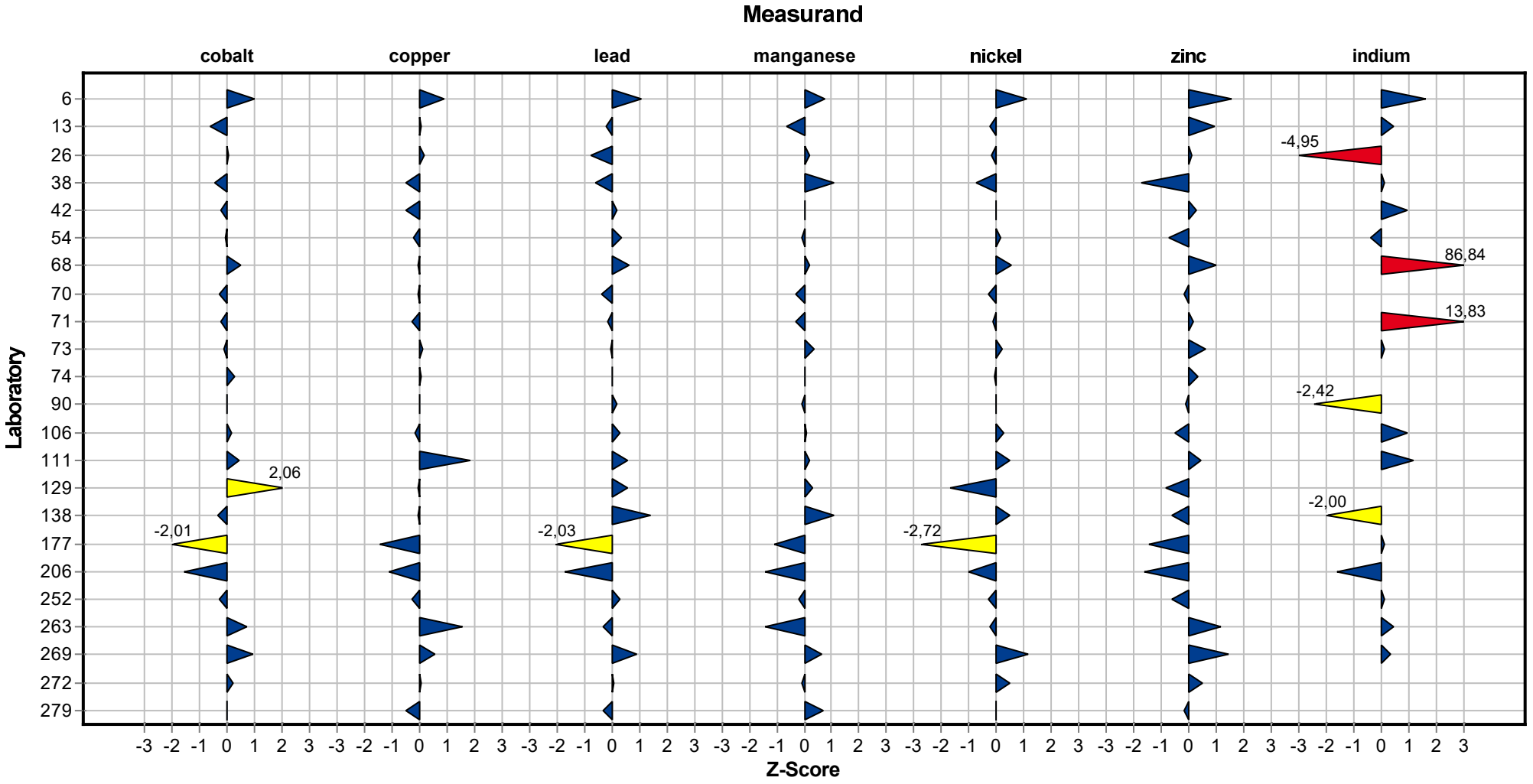
# *Summary results*

| | | | |
|---|---|---|---|
| **Measurand:** | **indium** | **Mean:** | **0,119 µg absolute** |
| **Sample:** | **1** | **Reprod. s.d.:** | **0,014 µg absolute** |
| **Method:** | **ISO 5725-2** | **Rel.reprod. s.d.:** | **11,61%** |
| **Rel.target s.d.:** | **10,00% (Limited)** | **Reference value:** | **0,124 µg absolute** |
| **Number of laboratories in calculation + outliers:** | **18** | **Range of tolerance:** | **0,095 - 0,143 µg absolute (\|Z-Score\| <= 2,00)** |



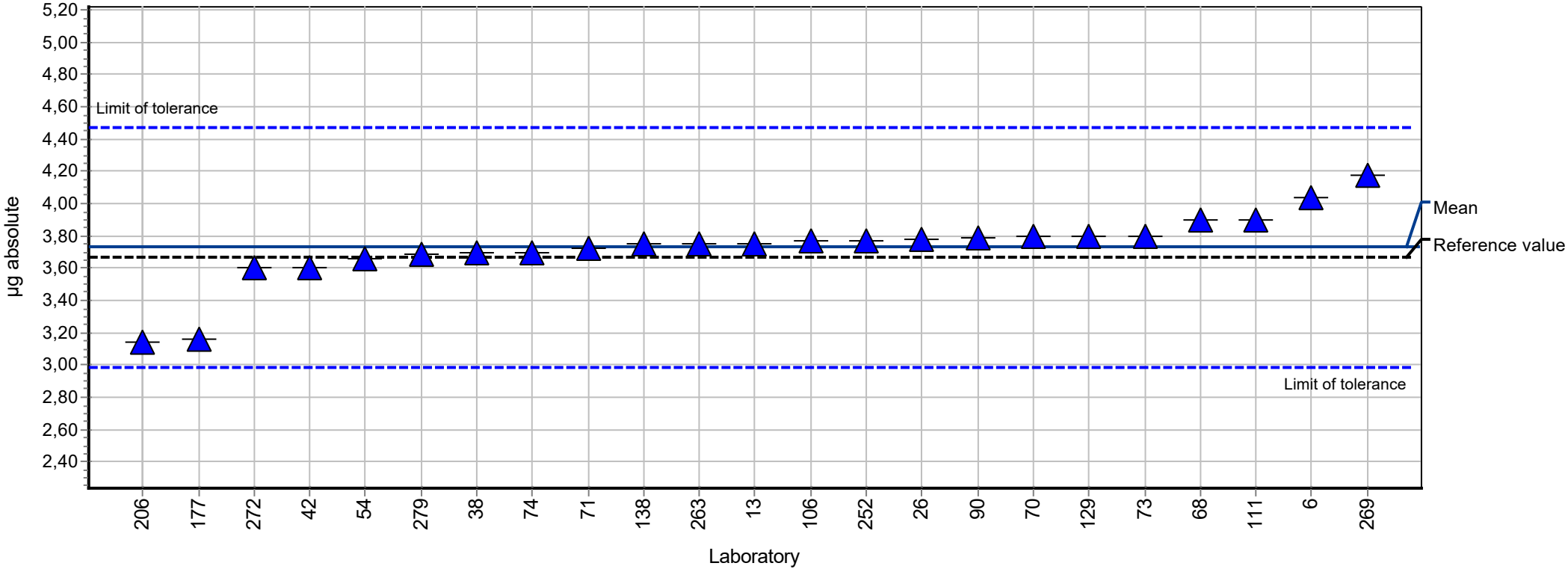
# Sample chart of Z-scores

**Sample 1**



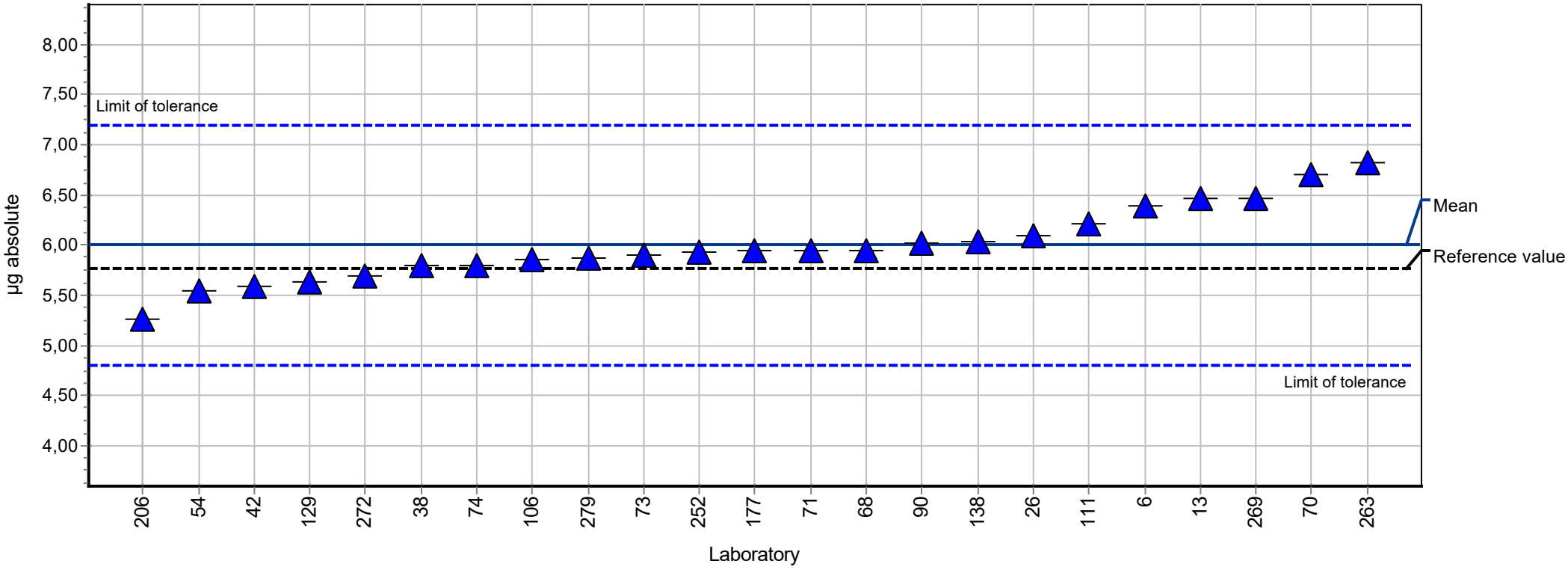
# *Summary results*

| | | | |
|---|---|---|---|
| **Measurand:** | **cobalt** | **Mean:** | **3,73 µg absolute** |
| **Sample:** | **2** | **Reprod. s.d.:** | **0,22 µg absolute** |
| **Method:** | **ISO 5725-2** | **Rel.reprod. s.d.:** | **5,99%** |
| **Rel.target s.d.:** | **10,00% (Limited)** | **Reference value:** | **3,67 µg absolute** |
| **Number of laboratories in calculation:** | **23** | **Range of tolerance:** | **2,98 - 4,47 µg absolute (\|Z-Score\| <= 2,00)** |



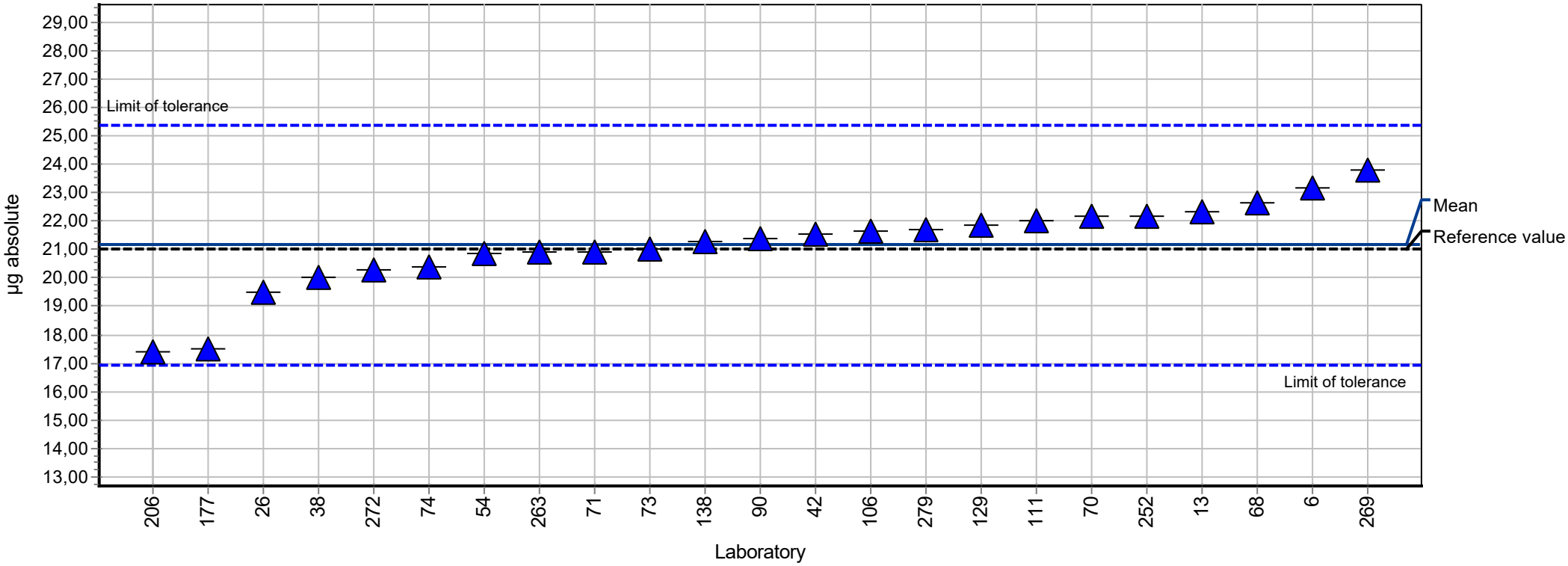
# *Summary results*

| | | | |
|---|---|---|---|
| **Measurand:** | **copper** | **Mean:** | **6,00 µg absolute** |
| **Sample:** | **2** | **Reprod. s.d.:** | **0,38 µg absolute** |
| **Method:** | **ISO 5725-2** | **Rel.reprod. s.d.:** | **6,26%** |
| **Rel.target s.d.:** | **10,00% (Limited)** | **Reference value:** | **5,77 µg absolute** |
| **Number of laboratories in calculation:** | **23** | **Range of tolerance:** | **4,80 - 7,20 µg absolute (\|Z-Score\| <= 2,00)** |



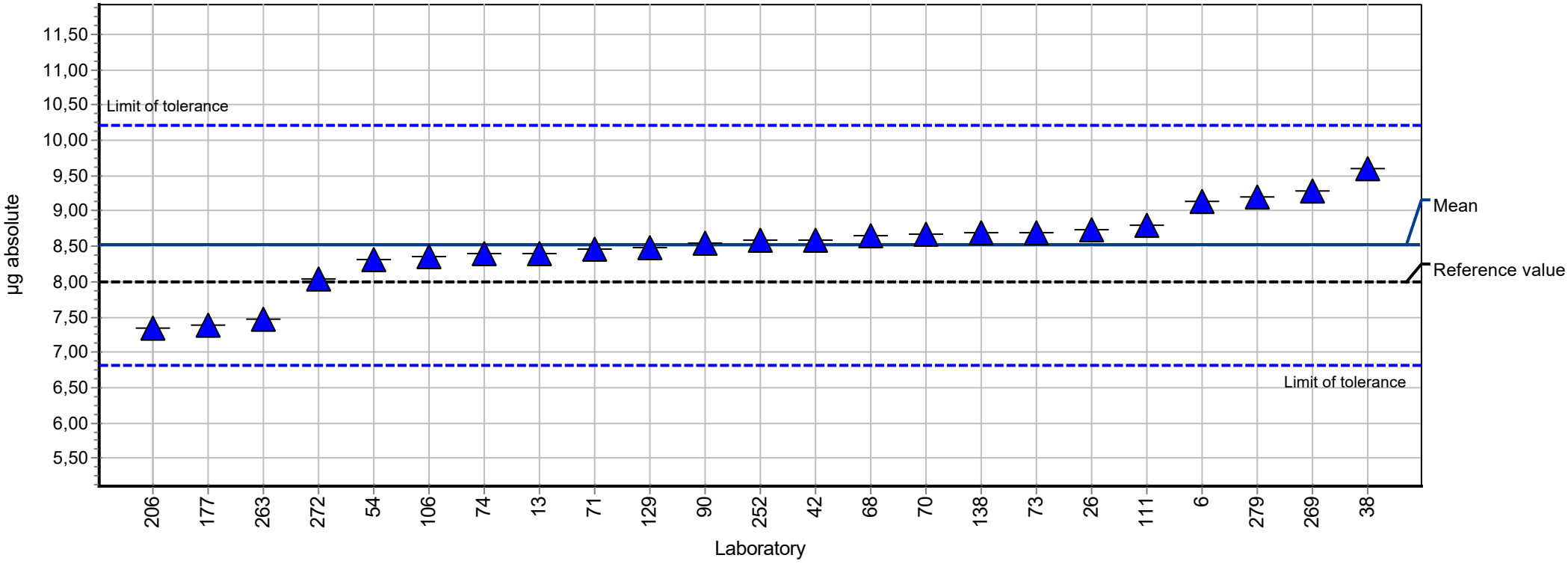
# *Summary results*

| | | | |
|---|---|---|---|
| **Measurand:** | **lead** | **Mean:** | **21,14 µg absolute** |
| **Sample:** | **2** | **Reprod. s.d.:** | **1,53 µg absolute** |
| **Method:** | **ISO 5725-2** | **Rel.reprod. s.d.:** | **7,25%** |
| **Rel.target s.d.:** | **10,00% (Limited)** | **Reference value:** | **21,00 µg absolute** |
| **Number of laboratories in calculation:** | **23** | **Range of tolerance:** | **16,92 - 25,37 µg absolute (\|Z-Score\| <= 2,00)** |



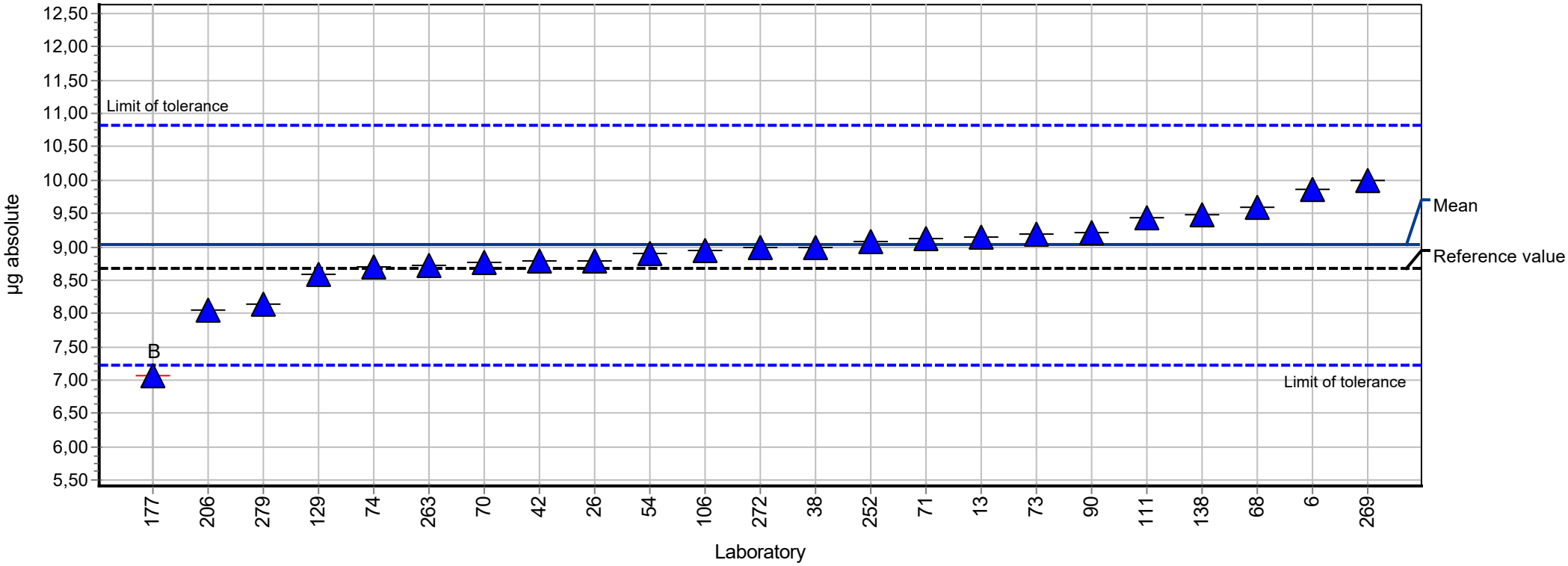
# *Summary results*

| | | | |
|---|---|---|---|
| **Measurand:** | **manganese** | **Mean:** | **8,51 µg absolute** |
| **Sample:** | **2** | **Reprod. s.d.:** | **0,56 µg absolute** |
| **Method:** | **ISO 5725-2** | **Rel.reprod. s.d.:** | **6,61%** |
| **Rel.target s.d.:** | **10,00% (Limited)** | **Reference value:** | **8,00 µg absolute** |
| **Number of laboratories in calculation:** | **23** | **Range of tolerance:** | **6,81 - 10,22 µg absolute (\|Z-Score\| <= 2,00)** |



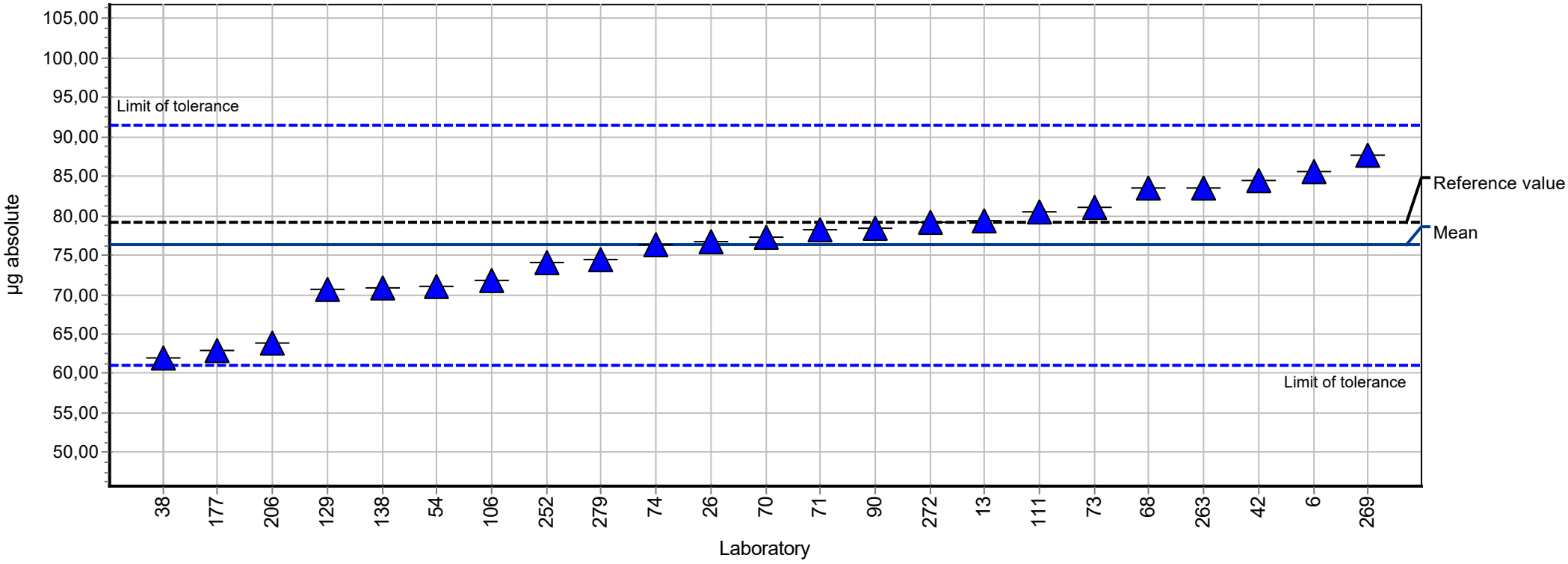
# *Summary results*

| | | | |
|---|---|---|---|
| **Measurand:** | **nickel** | **Mean:** | **9,02 µg absolute** |
| **Sample:** | **2** | **Reprod. s.d.:** | **0,48 µg absolute** |
| **Method:** | **ISO 5725-2** | **Rel.reprod. s.d.:** | **5,29%** |
| **Rel.target s.d.:** | **10,00% (Limited)** | **Reference value:** | **8,67 µg absolute** |
| **Number of laboratories in calculation + outliers:** | **23** | **Range of tolerance:** | **7,22 - 10,83 µg absolute (\|Z-Score\| <= 2,00)** |



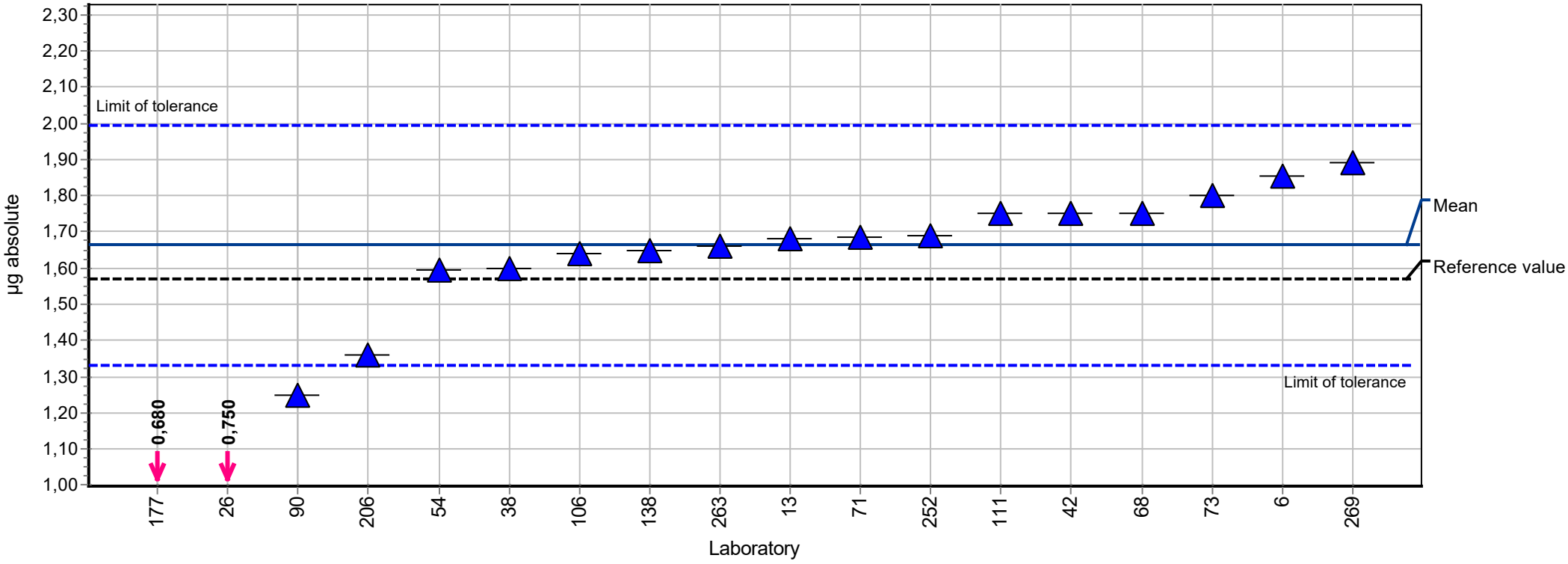
# *Summary results*

| | | | |
|---|---|---|---|
| **Measurand:** | **zinc** | **Mean:** | **76,24 µg absolute** |
| **Sample:** | **2** | **Reprod. s.d.:** | **7,10 µg absolute** |
| **Method:** | **ISO 5725-2** | **Rel.reprod. s.d.:** | **9,31%** |
| **Rel.target s.d.:** | **10,00% (Limited)** | **Reference value:** | **79,10 µg absolute** |
| **Number of laboratories in calculation:** | **23** | **Range of tolerance:** | **60,99 - 91,48 µg absolute (\|Z-Score\| <= 2,00)** |



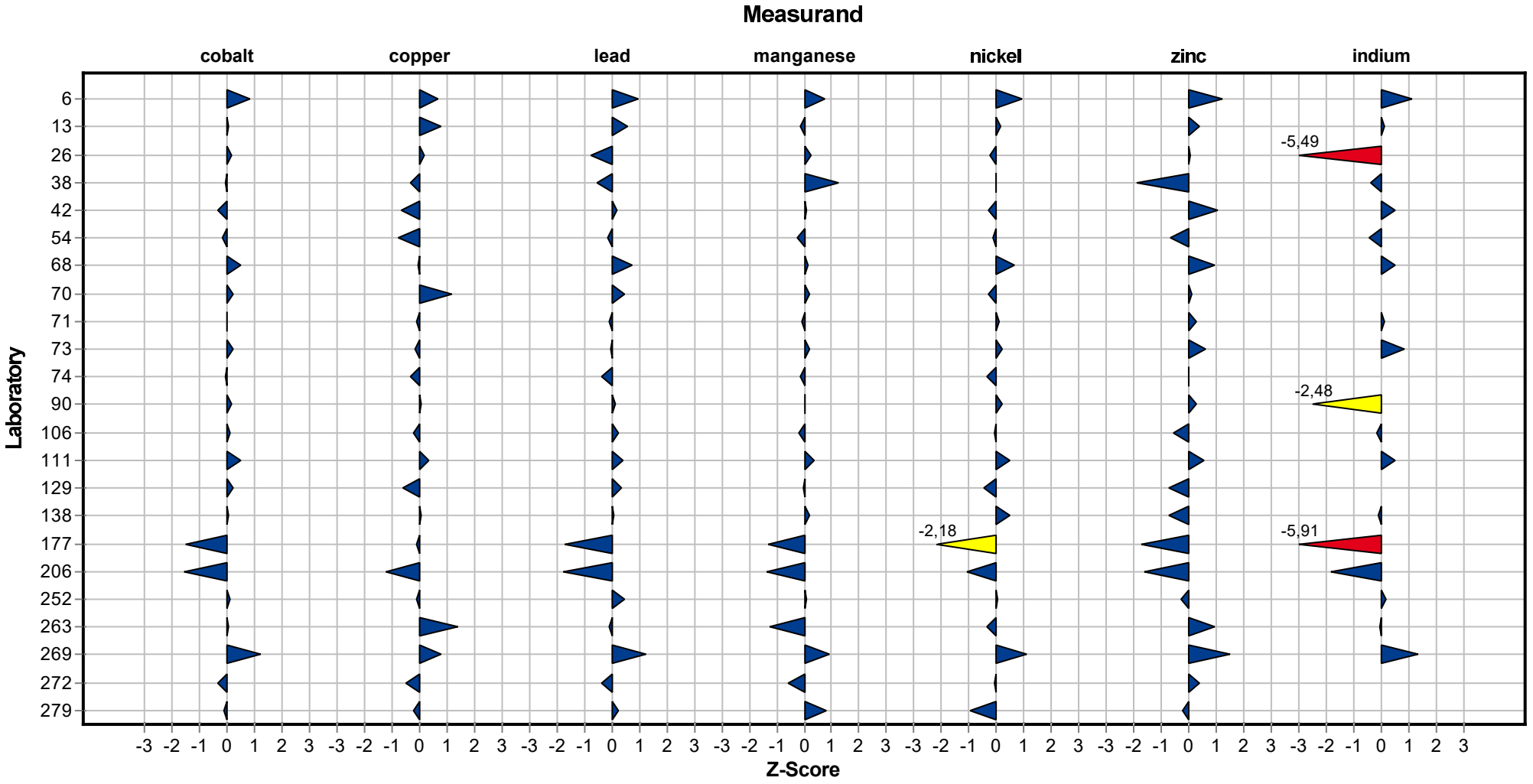
# *Summary results*

| | | | |
|---|---|---|---|
| **Measurand:** | **indium** | **Mean:** | **1,663 µg absolute** |
| **Sample:** | **2** | **Reprod. s.d.:** | **0,164 µg absolute** |
| **Method:** | **ISO 5725-2** | **Rel.reprod. s.d.:** | **9,85%** |
| **Rel.target s.d.:** | **10,00% (Limited)** | **Reference value:** | **1,570 µg absolute** |
| **Number of laboratories in calculation:** | **16** | **Range of tolerance:** | **1,330 - 1,995 µg absolute (\|Z-Score\| <= 2,00)** |



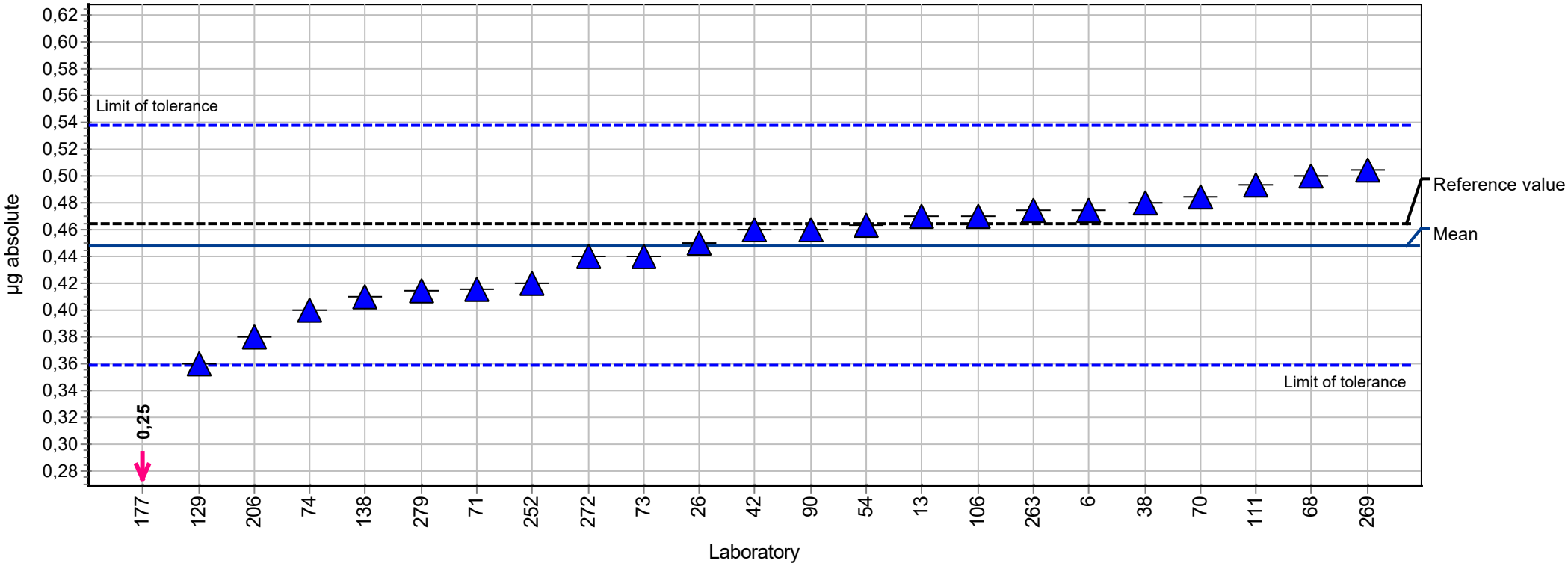
# Sample chart of Z-scores

**Sample 2**



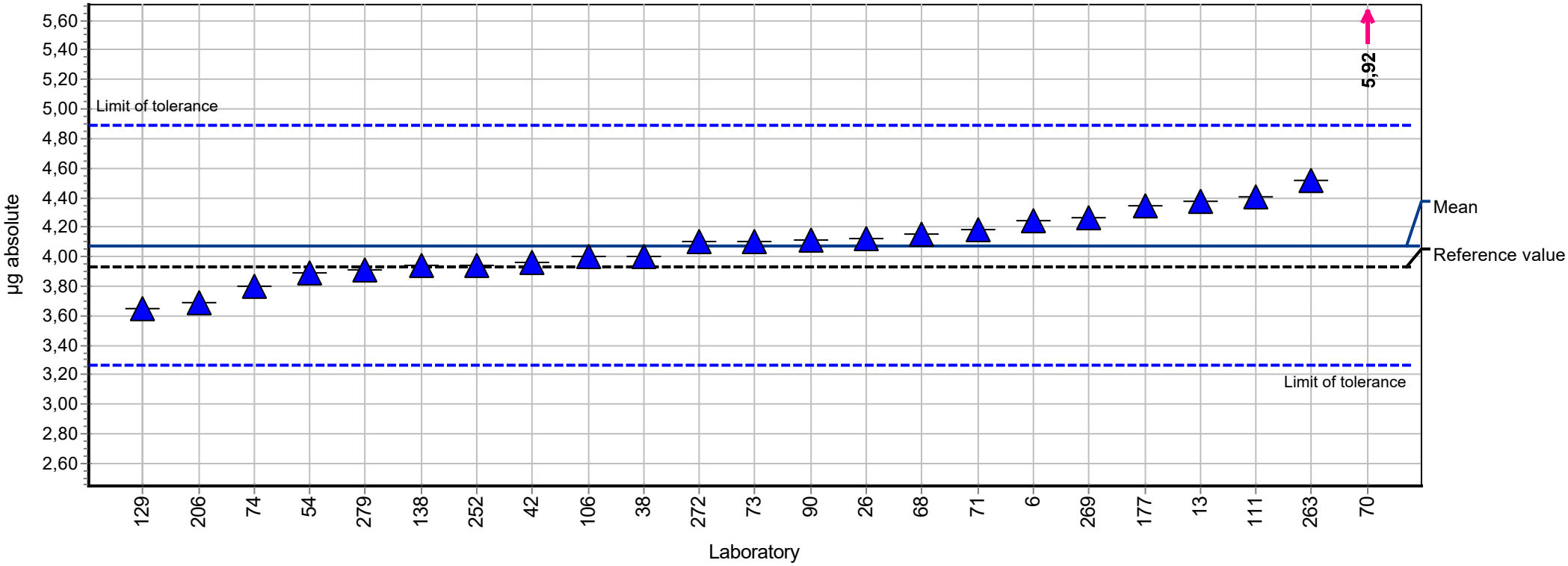
# *Summary results*

| | | | |
|---|---|---|---|
| **Measurand:** | **cobalt** | **Mean:** | **0,45 µg absolute** |
| **Sample:** | **3** | **Reprod. s.d.:** | **0,04 µg absolute** |
| **Method:** | **ISO 5725-2** | **Rel.reprod. s.d.:** | **8,76%** |
| **Rel.target s.d.:** | **10,00% (Limited)** | **Reference value:** | **0,46 µg absolute** |
| **Number of laboratories in calculation + outliers:** | **23** | **Range of tolerance:** | **0,36 - 0,54 µg absolute (\|Z-Score\| <= 2,00)** |



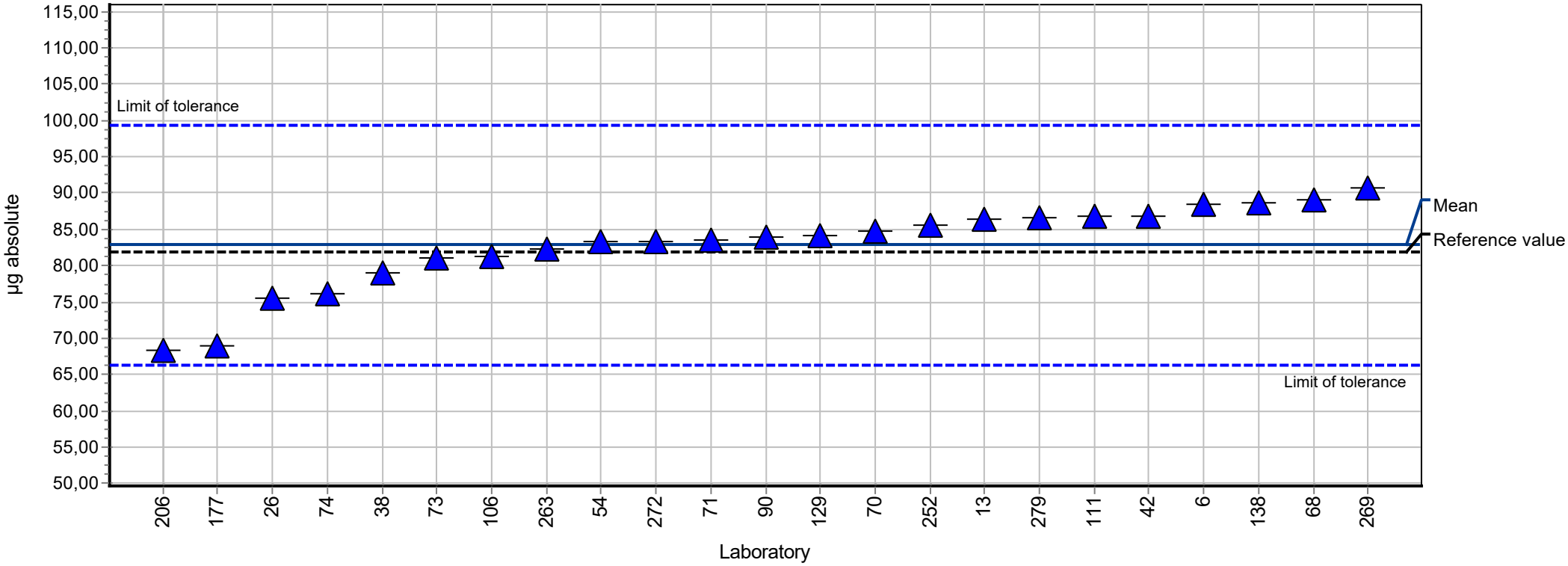
# *Summary results*

| | | | |
|---|---|---|---|
| **Measurand:** | **copper** | **Mean:** | **4,08 µg absolute** |
| **Sample:** | **3** | **Reprod. s.d.:** | **0,23 µg absolute** |
| **Method:** | **ISO 5725-2** | **Rel.reprod. s.d.:** | **5,56%** |
| **Rel.target s.d.:** | **10,00% (Limited)** | **Reference value:** | **3,93 µg absolute** |
| **Number of laboratories in calculation + outliers:** | **23** | **Range of tolerance:** | **3,26 - 4,89 µg absolute (\|Z-Score\| <= 2,00)** |



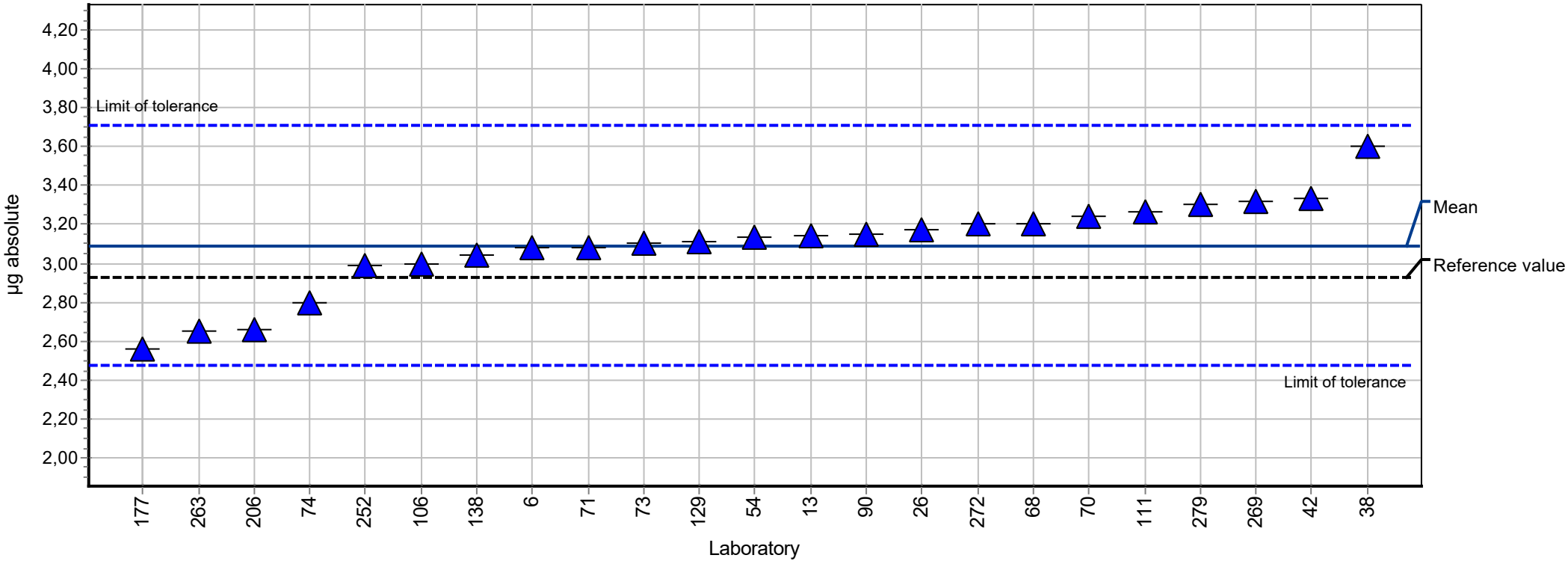
# *Summary results*

| | | | |
|---|---|---|---|
| **Measurand:** | **lead** | **Mean:** | **82,81 µg absolute** |
| **Sample:** | **3** | **Reprod. s.d.:** | **5,89 µg absolute** |
| **Method:** | **ISO 5725-2** | **Rel.reprod. s.d.:** | **7,12%** |
| **Rel.target s.d.:** | **10,00% (Limited)** | **Reference value:** | **81,90 µg absolute** |
| **Number of laboratories in calculation:** | **23** | **Range of tolerance:** | **66,25 - 99,37 µg absolute (\|Z-Score\| <= 2,00)** |



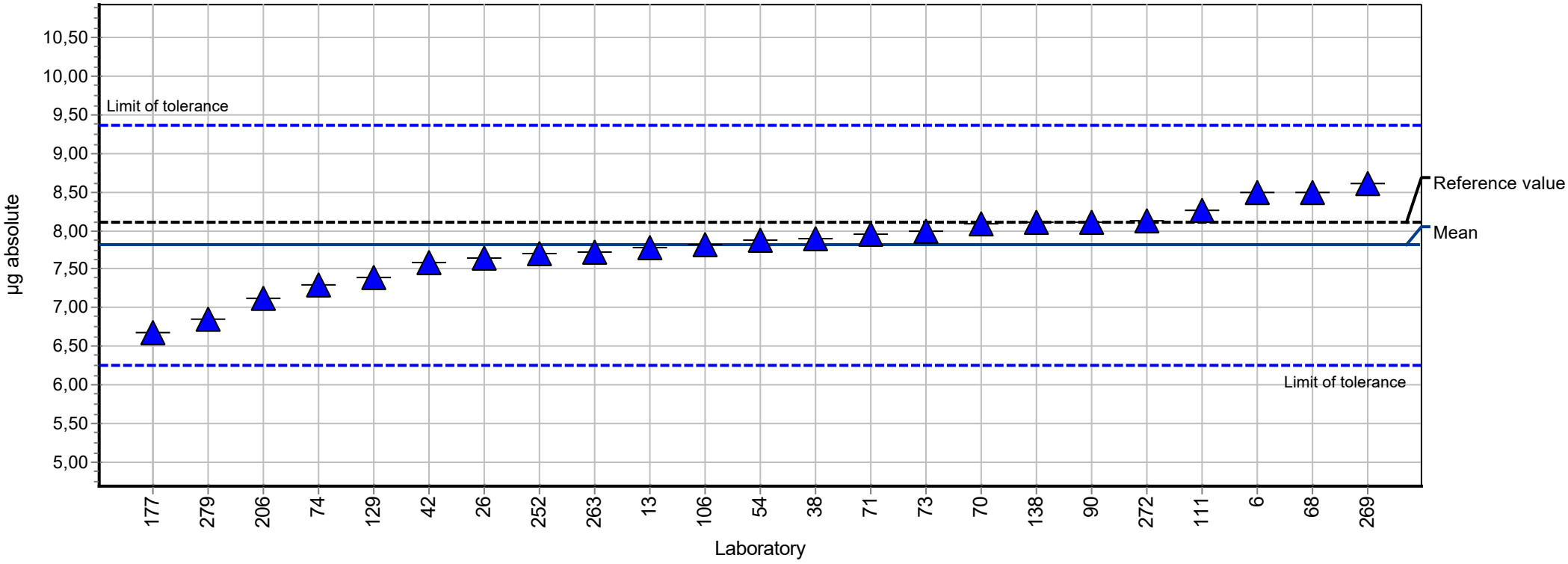
# *Summary results*

| | | | |
|---|---|---|---|
| **Measurand:** | **manganese** | **Mean:** | **3,09 µg absolute** |
| **Sample:** | **3** | **Reprod. s.d.:** | **0,24 µg absolute** |
| **Method:** | **ISO 5725-2** | **Rel.reprod. s.d.:** | **7,77%** |
| **Rel.target s.d.:** | **10,00% (Limited)** | **Reference value:** | **2,93 µg absolute** |
| **Number of laboratories in calculation:** | **23** | **Range of tolerance:** | **2,47 - 3,71 µg absolute (\|Z-Score\| <= 2,00)** |



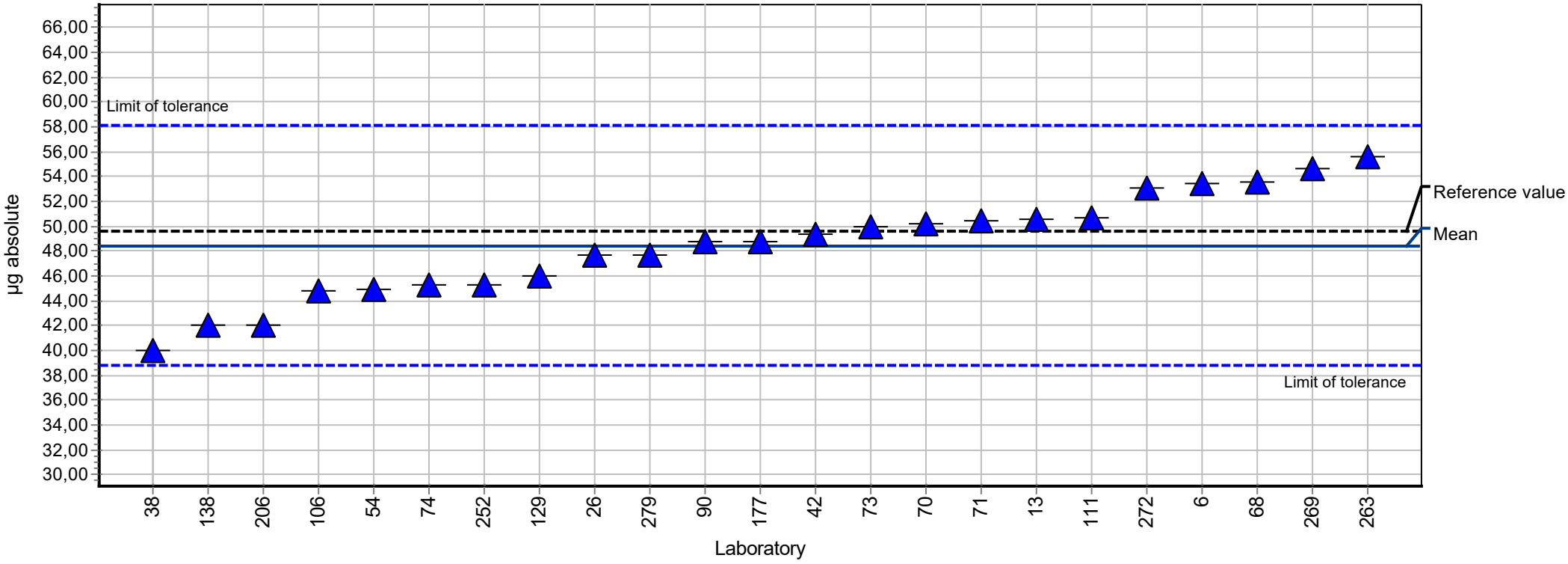
# *Summary results*

| | | | |
|---|---|---|---|
| **Measurand:** | **nickel** | **Mean:** | **7,81 µg absolute** |
| **Sample:** | **3** | **Reprod. s.d.:** | **0,49 µg absolute** |
| **Method:** | **ISO 5725-2** | **Rel.reprod. s.d.:** | **6,34%** |
| **Rel.target s.d.:** | **10,00% (Limited)** | **Reference value:** | **8,11 µg absolute** |
| **Number of laboratories in calculation:** | **23** | **Range of tolerance:** | **6,25 - 9,37 µg absolute (\|Z-Score\| <= 2,00)** |



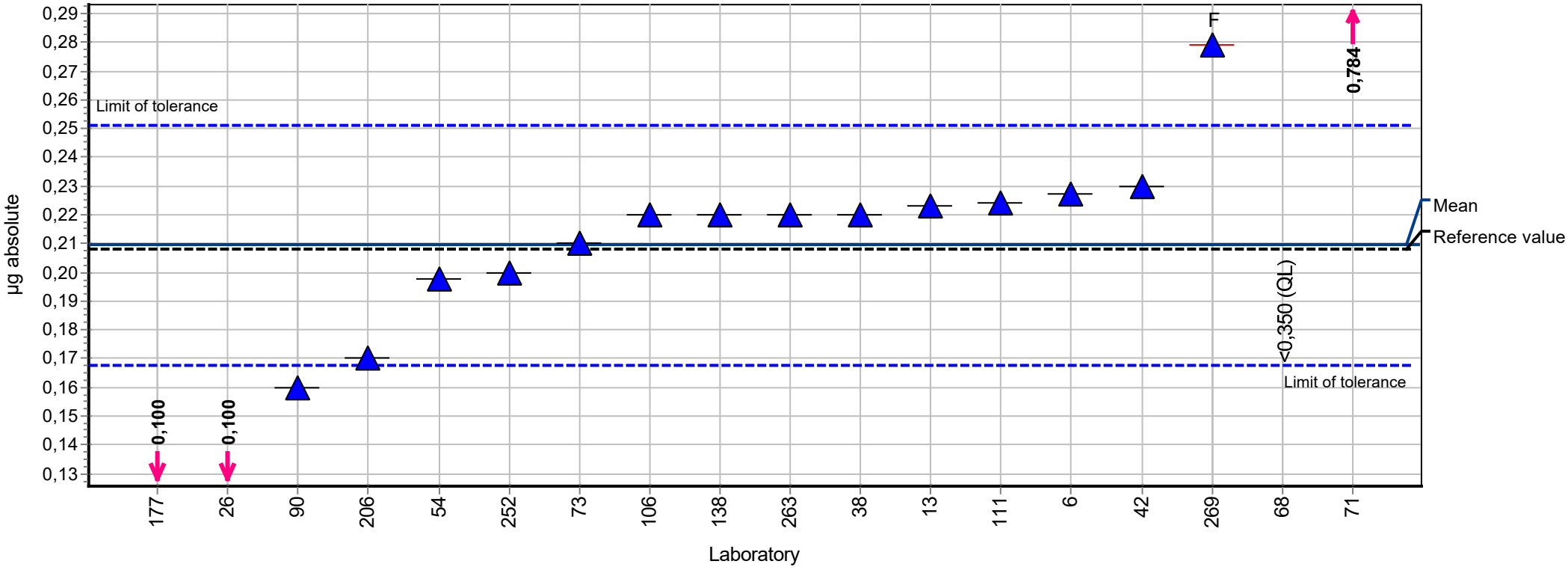
# *Summary results*

| | | | |
|---|---|---|---|
| **Measurand:** | **zinc** | **Mean:** | **48,47 µg absolute** |
| **Sample:** | **3** | **Reprod. s.d.:** | **4,20 µg absolute** |
| **Method:** | **ISO 5725-2** | **Rel.reprod. s.d.:** | **8,67%** |
| **Rel.target s.d.:** | **10,00% (Limited)** | **Reference value:** | **49,60 µg absolute** |
| **Number of laboratories in calculation:** | **23** | **Range of tolerance:** | **38,78 - 58,16 µg absolute (\|Z-Score\| <= 2,00)** |



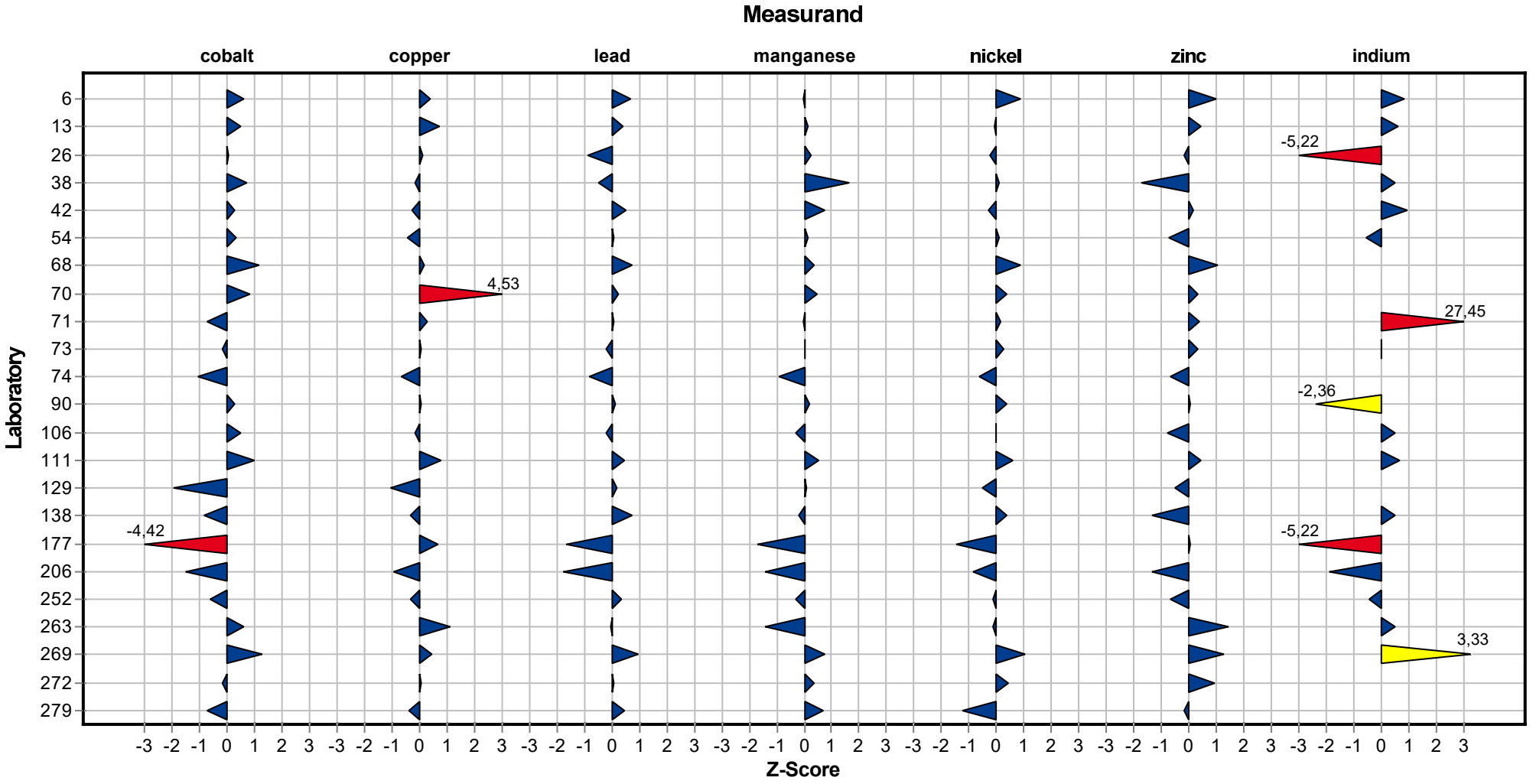
# *Summary results*

| | | | |
|---|---|---|---|
| **Measurand:** | **indium** | **Mean:** | **0,209 µg absolute** |
| **Sample:** | **3** | **Reprod. s.d.:** | **0,022 µg absolute** |
| **Method:** | **ISO 5725-2** | **Rel.reprod. s.d.:** | **10,50%** |
| **Rel.target s.d.:** | **10,00% (Limited)** | **Reference value:** | **0,208 µg absolute** |
| **Number of laboratories in calculation + outliers:** | **14** | **Range of tolerance:** | **0,167 - 0,251 µg absolute (\|Z-Score\| <= 2,00)** |



# Sample chart of Z-scores

**Sample 3**



# Questions and Answers

| Participant | pulping method | acid concentration |
|---|---|---|
| 6 | IFA- Arbeitsmappe, Blatt 6015 | HNO3 65%, HCl 25% |
| 13 | Ow n method | 12% HNO3 in final solution |
| 26 | Mikrow ellenaufschluss in Anlehnung an IFA 6015 | 3mL HNO3 (65%) + 2mlLHF (40%) |
| 38 | MW-Aufschluss nach Blatt 6015 | 69% |
| 42 | IFA-Arbeitsmappe, 6015 | HNO3 65%, HCl 25% |
| 54 | IFA Arbeitsmappe, Blatt 6015, offener Aufschluss | 69 % Salpetersäure, 25 % Salzsäure |
| 68 | | 37 % HCl / 65% HNO3 |
| 70 | IFA-Mikrow ellendruckaufschluss | 65%ige Salpetersäure |
| 71 | nach BIA | HNO3 65 %ig ; HCL 30 %ig |
| 73 | folder Mikrow ave (5 ml HNO3) | 65 % |
| 74 | IFA 6015 10ml HNO3 aufgeschlossen in der Mikrow elle | 65% |
| 90 | Microw ave digestion method 6015 | HNO3 65 % |
| 106 | Lösung in 65 % Salpetersäure bei 80 °C | 65 % Salpetersäure |
| 111 | IFA-Arbeitsmappe, Blatt 6015 | Salpetersäure 65% |
| 129 | IFA- Arbeitsmappe, Blatt 6015 | Salpetersäure: 65%; Salzsäure: 30% |
| 138 | Mikrow ave digestion according BGIA 6015 | HNO3 65 % / HCl 25 % |
| 177 | IFA-Arbeitsmappe, Blatt 6015 | HNO3 69% / HCL 37% |
| 206 | | HCl 32%, HNO3 65%, H2O2 30% |
| 252 | IFA-Arbeitsmappe, Blatt 6015 | entsprechend IFA-Arbeitsmappe, Blatt 6015 |
| 263 | Microw ellendruckaufschluss nach IFA - Arbeitsmappe (Blatt 6015) | HNO3 65% |
| 269 | IFA-Arbeitsmappe Blatt 6015 | 2 Teile (v) HNO3 (65%) + 1 Teil (v) HCl (25%) |
| 272 | Mikrow ellendruckaufschluss nach IFA-Arbeitsmappe (Blatt 6015) | 10 mL HNO3 (>65%) |
| 279 | Offener Standardaufschluss | HNO3 = 65%; HCl = 25% |

| Participant | mixing ratio |
|---|---|
| 6 | 2:1 |
| 13 | 1:1 |
| 26 | 3/2 |
| 38 | - |

| Participant | mixing ratio |
|---|---|
| 42 | HNO3 : HCl = 2 : 1 |
| 54 | 2 Anteile Salpetersäure, 1 Anteil Salzsäure |
| 68 | 1:2 |
| 70 | 10 ml Salpetersäure |
| 71 | 2:1 |
| 73 | only HNO3 |
| 74 | - |
| 90 | only HNO3 |
| 106 | 0,5 ml Salpetersäure |
| 111 | 10 ml Salpetersäure |
| 129 | 2:1 |
| 138 | 2 / 1 |
| 177 | 2:1 |
| 206 | HNO3, HCl, H2O2, H2O (1:1:1:1) |
| 252 | entsprechend IFA-Arbeitsmappe, Blatt 6015 |
| 263 | - |
| 269 | Ausfschluss mit 12,5ml des Gemisches nach 2 |
| 272 | 100% HNO3 |
| 279 | HNO3 : HCl = 2 : 1 |

| Participant | time of pulping |
|---|---|
| 6 | 2 |
| 13 | 2 |
| 26 | 25min + 15min Haltezeit + 10 Abkühlzeit = 0,83h |
| 38 | 0,75 |
| 42 | 2 |
| 54 | 2 Stunden |
| 68 | 2 |
| 70 | in 15 min auf 220°C, in 5 min auf 240°C, 45 min halten -> 65 min |
| 71 | 2h |
| 73 | 0.6 h (35 min) |
| 74 | 15 min. Rampe  45  min. Haltezeit |

| Participant | time of pulping |
|---|---|
| 90 | 1h30 |
| 106 | 2 |
| 111 | 0,25 Stunden Aufheizen auf 200°C, anschließend 1 Stunde halten bei 200°C |
| 129 | 2 |
| 138 | 0,25 |
| 177 | 2 |
| 206 | 45 Min |
| 252 | 0,5 |
| 263 | 45 Min |
| 269 | 2h (siedend) |
| 272 | Rampe: 25 min, Maximale Temperatur: 240 °C, Haltezeit 45 min, Leistung: 16000 W, Gesamtlaufzeit 1,75 Std |
| 279 | 2 |

| Participant | reagent volume | equipment |
|---|---|---|
| 6 | 50 ml | unter Rückfluss |
| 13 | 25 | Closed |
| 26 | Aufschlusslösung w ird in 50 ml-Kolben überführt und mit Reinstw asser aufgefüllt | geschlossen |
| 38 | 25 | Mikrow elle |
| 42 | 20 | unter Rückfluss |
| 54 | 20 ml | unter Rückfluss |
| 68 | 50 | geschlossen |
| 70 | aufgefüllt auf 25 ml | mikrow ellenassistierter Druckaufschluss |
| 71 | 25 mL | geschlossen |
| 73 | 25 ml | closed (Mikrow ave) |
| 74 | 25 | Mikrow ellenaufschluß |
| 90 | 10 ml HNO3 qsp 50 ml w ith w ater | closed |
| 106 | 16,25 ml | geschlossen |
| 111 | 25 ml | geschlossen (Mikrow ellendruckaufschluss) |
| 129 | 20 | offen unter Rückfluss |
| 138 | 50 | closed |
| 177 | 20 | unter Rückfluss |
| 206 | Aufschluss (10 ml) mit internem Standard, direkt 1:10 gemessen | Mikrow ellendruckaufschluss |

| Participant | reagent volume | equipment |
|---|---|---|
| 252 | 50 ml | offen |
| 263 | 50 mL | geschlossen |
| 269 | auf 25ml mit Reinstw asser | offen unter Rückfluss |
| 272 | 50 mL | Mikrow ellendruckaufschlusssystem |
| 279 | 25 | offen unter Rückfluss |

| Participant | method for cobalt | method for lead | method for zinc | method for copper |
|---|---|---|---|---|
| 6 | ICP-MS | ICP-MS | ICP-MS | ICP-MS |
| 13 | ICP-MS | ICP-MS | ICP-MS | ICP-MS |
| 26 | ICP-MS | ICP-MS | ICP-MS | ICP-MS |
| 38 | ICP-MS | ICP-MS | ICP-MS | ICP-MS |
| 42 | ICP/MS | ICP/MS | ICP/MS | ICP/MS |
| 54 | ICP-MS | ICP-MS | ICP-MS | ICP-MS |
| 68 | ICP/OES | ICP/OES | ICP/OES | ICP/OES |
| 70 | ICP-OES | ICP-OES | ICP-OES | ICP-OES |
| 71 | ICP-OES | ICP-OES | ICP-OES | ICP-OES |
| 73 | ICP-OES | ICP-OES | ICP-OES | ICP-OES |
| 74 | ICP/OES | ICP/OES | ICP/OES | ICP/OES |
| 90 | ICP-MS | ICP-MS | ICP-MS | ICP-MS |
| 106 | ICP-MS | ICP-MS | ICP-MS | ICP-MS |
| 111 | ICP-MS | ICP-MS | ICP-MS | ICP-MS |
| 129 | AAS/Flamme | AAS/Flamme | AAS/Flamme | AAS/Flamme |
| 138 | ICP / AES | ICP / AES | ICP / AES | ICP / AES |
| 177 | ICP-OES | ICP-OES | ICP-OES | ICP-OES |
| 206 | ICP-MS | ICP-MS | ICP-MS | ICP-MS |
| 252 | ICP-OES/ ICP-MS | ICP-OES/ ICP-MS | ICP-OES/ ICP-MS | ICP-OES/ ICP-MS |
| 263 | ICP-MS | ICP-MS | ICP-MS | ICP-MS |
| 269 | DIN EN ISO 11885 (ICP-OES) | DIN EN ISO 11885 (ICP-OES) | DIN EN ISO 11885 (ICP-OES) | DIN EN ISO 11885 (ICP-OES) |
| 272 | ICP-OES | ICP-OES | ICP-OES | ICP-OES |
| 279 | AAS-Graphitrohr | AAS-Graphitrohr und AAS-Flamme | AAS-Flamme | AAS-Graphitrohr |

| Participant | method for nickel | method for indium | method for mangan |
|---|---|---|---|
| 6 | ICP-MS | ICP-MS | ICP-MS |
| 13 | ICP-MS | ICP-MS | ICP-MS |
| 26 | ICP-MS | ICP-MS | ICP-MS |
| 38 | ICP-MS | ICP-MS | ICP-MS |
| 42 | ICP/MS | ICP/MS | ICP/MS |
| 54 | ICP-MS | ICP-MS | ICP-MS |
| 68 | ICP/OES | ICP/OES | ICP/OES |
| 70 | ICP-OES | Indium w urde nicht bestimmt | ICP-OES |
| 71 | ICP-OES | ICP-OES | ICP-OES |
| 73 | ICP-OES | ICP-MS/-OES | ICP-OES |
| 74 | ICP/OES | - | ICP/OES |
| 90 | ICP-MS | ICP-MS | ICP-MS |
| 106 | ICP-MS | ICP-MS | ICP-MS |
| 111 | ICP-MS | ICP-MS | ICP-MS |
| 129 | AAS/Flamme | | AAS/Flamme |
| 138 | ICP / AES | ICP / AES | ICP / AES |
| 177 | ICP-OES | AAS Graphitrohr | ICP-OES |
| 206 | ICP-MS | ICP-MS | ICP-MS |
| 252 | ICP-OES/ ICP-MS | ICP-MS | ICP-OES/ ICP-MS |
| 263 | ICP-MS | ICP-MS | ICP-MS |
| 269 | DIN EN ISO 11885 (ICP-OES) | DIN EN ISO 11885 (ICP-OES) | DIN EN ISO 11885 (ICP-OES) |
| 272 | ICP-OES | ICP-OES | ICP-OES |
| 279 | AAS-Graphitrohr | Keine Analyse durchgeführt | AAS-Graphitrohr |