|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Table 5.14**  **Measurement of roundness by Dial gauge deflections of 10-mm Diameter Aluminium (Al) Round Bar** **Before Straightening** | | | | | | | | | | | | | | | | | | | | | | | |  |
|  | **Mean values of Dial Gauge Deflection Readings before straightening of 10 mm Aluminium round bar x 0.01 mm** | | | | | | | | | | | | | | | | | | | | | | | |  |
|  | Angles in Degrees | | | | | | | | | | | | | | | | | | | | | | | |  |
| Length in cm | 0o | 15o | 30o | 45o | 60o | 75o | 90o | 105o | 120o | 135o | 150o | 165o | 180o | 195o | 210o | 225o | 240o | 255o | 270o | 285o | 300o | 315o | 330o | 345o | STD  DEV (mm) |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 13 | 115 | 107 | 100 | 91 | 83 | 75 | 72 | 66 | 61 | 60 | 64 | 75 | 81 | 85 | 98 | 102 | 111 | 118 | 120 | 119 | 121 | 122 | 122 | 122 | 0.22284 |
| 16 | 127 | 116 | 108 | 97 | 87 | 78 | 72 | 63 | 54 | 50 | 49 | 61 | 72 | 81 | 89 | 106 | 110 | 116 | 120 | 121 | 125 | 127 | 128 | 129 | 0.27635 |
| 19 | 132 | 122 | 112 | 102 | 90 | 77 | 66 | 55 | 49 | 41 | 49 | 59 | 70 | 87 | 93 | 105 | 113 | 121 | 126 | 127 | 130 | 132 | 136 | 137 | 0.31978 |
| 22 | 144 | 132 | 120 | 108 | 93 | 77 | 66 | 53 | 49 | 41 | 41 | 50 | 69 | 84 | 95 | 109 | 118 | 123 | 132 | 136 | 138 | 140 | 142 | 145 | 0.36806 |
| 25 | 149 | 133 | 123 | 105 | 90 | 75 | 62 | 49 | 41 | 33 | 41 | 53 | 72 | 92 | 110 | 125 | 134 | 138 | 143 | 146 | 149 | 151 | 154 | 156 | 0.42223 |
| 28 | 153 | 144 | 130 | 113 | 98 | 79 | 64 | 50 | 49 | 33 | 33 | 41 | 61 | 85 | 100 | 116 | 129 | 137 | 142 | 146 | 148 | 152 | 155 | 157 | 0.43784 |
| 31 | 152 | 147 | 130 | 116 | 98 | 81 | 64 | 49 | 41 | 33 | 25 | 33 | 49 | 69 | 91 | 113 | 125 | 135 | 139 | 146 | 148 | 150 | 155 | 158 | 0.46423 |
| 31 | 157 | 145 | 133 | 120 | 102 | 83 | 66 | 50 | 49 | 25 | 33 | 41 | 50 | 74 | 93 | 111 | 126 | 138 | 141 | 146 | 149 | 152 | 155 | 158 | 0.45628 |
| 34 | 153 | 149 | 135 | 123 | 105 | 87 | 71 | 53 | 49 | 33 | 17 | 25 | 49 | 66 | 86 | 105 | 118 | 129 | 135 | 138 | 142 | 147 | 150 | 154 | 0.45514 |
| 37 | 156 | 139 | 128 | 113 | 95 | 78 | 65 | 50 | 41 | 33 | 33 | 41 | 58 | 79 | 98 | 115 | 126 | 138 | 143 | 149 | 149 | 152 | 155 | 157 | 0.44786 |
| 40 | 152 | 141 | 129 | 116 | 99 | 84 | 68 | 56 | 49 | 41 | 33 | 41 | 54 | 64 | 87 | 113 | 125 | 131 | 141 | 148 | 151 | 152 | 153 | 153 | 0.43317 |
| 43 | 103 | 95 | 82 | 72 | 57 | 49 | 41 | 41 | 41 | 51 | 68 | 90 | 106 | 116 | 124 | 127 | 130 | 131 | 135 | 136 | 137 | 136 | 126 | 120 | 0.34866 |
| 46 | 102 | 94 | 85 | 80 | 73 | 64 | 57 | 52 | 51 | 56 | 64 | 77 | 85 | 97 | 105 | 111 | 117 | 117 | 120 | 119 | 118 | 118 | 112 | 104 | 0.23790 |
| 49 | 83 | 80 | 76 | 74 | 71 | 67 | 63 | 56 | 51 | 51 | 56 | 62 | 66 | 70 | 75 | 80 | 83 | 85 | 85 | 86 | 87 | 88 | 82 | 81 | 0.11628 |
| 52 | 64 | 66 | 65 | 66 | 68 | 69 | 68 | 64 | 63 | 58 | 57 | 55 | 62 | 56 | 60 | 63 | 66 | 69 | 69 | 69 | 69 | 69 | 68 | 64 | 0.04370 |
| 55 | 59 | 63 | 64 | 67 | 72 | 75 | 76 | 76 | 74 | 70 | 68 | 66 | 64 | 62 | 65 | 66 | 66 | 66 | 65 | 64 | 65 | 64 | 62 | 58 | 0.05093 |
| 58 | 50 | 52 | 54 | 58 | 64 | 66 | 69 | 68 | 68 | 65 | 63 | 61 | 59 | 57 | 58 | 57 | 56 | 55 | 54 | 51 | 51 | 50 | 50 | 50 | 0.06450 |
| 61 | 50 | 50 | 50 | 53 | 59 | 64 | 67 | 67 | 67 | 65 | 63 | 61 | 58 | 56 | 56 | 56 | 55 | 53 | 50 | 50 | 50 | 50 | 50 | 50 | 0.06317 |
| 64 | 78 | 83 | 85 | 91 | 98 | 96 | 97 | 97 | 94 | 90 | 87 | 83 | 76 | 74 | 72 | 71 | 69 | 67 | 66 | 66 | 68 | 68 | 65 | 72 | 0.11455 |
| 67 | 66 | 78 | 83 | 91 | 93 | 98 | 101 | 101 | 97 | 93 | 88 | 84 | 77 | 74 | 70 | 67 | 64 | 62 | 61 | 62 | 63 | 68 | 68 | 68 | 0.13686 |
| 70 | 64 | 67 | 77 | 83 | 93 | 97 | 97 | 99 | 98 | 93 | 89 | 84 | 77 | 71 | 66 | 62 | 60 | 56 | 56 | 55 | 56 | 62 | 61 | 61 | 0.15539 |
| 73 | 72 | 74 | 79 | 88 | 93 | 101 | 100 | 102 | 100 | 94 | 90 | 85 | 79 | 73 | 70 | 65 | 62 | 60 | 58 | 57 | 59 | 62 | 63 | 61 | 0.15545 |
| 76 | 63 | 73 | 77 | 82 | 91 | 96 | 95 | 98 | 98 | 94 | 91 | 85 | 80 | 76 | 72 | 69 | 66 | 63 | 62 | 60 | 60 | 61 | 64 | 63 | 0.13670 |
| 79 | 95 | 98 | 103 | 105 | 110 | 115 | 114 | 114 | 103 | 109 | 105 | 101 | 97 | 92 | 90 | 91 | 89 | 87 | 87 | 87 | 89 | 90 | 92 | 94 | 0.09238 |
| 81 | 56 | 56 | 53 | 54 | 54 | 60 | 63 | 65 | 66 | 68 | 69 | 69 | 71 | 71 | 70 | 71 | 73 | 72 | 73 | 72 | 71 | 68 | 66 | 63 | 0.06612 |
| 82 | 88 | 90 | 92 | 94 | 98 | 99 | 99 | 96 | 94 | 90 | 86 | 85 | 82 | 80 | 78 | 81 | 83 | 84 | 85 | 87 | 88 | 89 | 92 | 88 | 0.05902 |
| 84 | 50 | 50 | 50 | 50 | 50 | 50 | 52 | 54 | 56 | 62 | 67 | 70 | 75 | 77 | 80 | 81 | 84 | 82 | 81 | 80 | 78 | 72 | 67 | 61 | 0.12880 |
| 85 | 108 | 108 | 107 | 106 | 107 | 106 | 104 | 101 | 98 | 92 | 90 | 87 | 86 | 87 | 88 | 92 | 96 | 101 | 105 | 108 | 111 | 113 | 104 | 110 | 0.08632 |
| 87 | 55 | 51 | 51 | 51 | 51 | 51 | 51 | 54 | 57 | 66 | 67 | 74 | 78 | 82 | 87 | 88 | 89 | 90 | 86 | 86 | 84 | 79 | 72 | 66 | 0.15046 |
| 90 | 53 | 51 | 51 | 51 | 51 | 51 | 51 | 54 | 58 | 61 | 68 | 71 | 77 | 82 | 82 | 87 | 90 | 90 | 89 | 89 | 85 | 78 | 69 | 64 | 0.15388 |
| 93 | 54 | 51 | 51 | 51 | 51 | 51 | 51 | 51 | 55 | 60 | 65 | 70 | 75 | 79 | 83 | 84 | 84 | 88 | 86 | 85 | 83 | 78 | 72 | 66 | 0.14326 |
| 96 | 59 | 53 | 49 | 49 | 49 | 49 | 49 | 49 | 49 | 49 | 49 | 51 | 56 | 59 | 65 | 68 | 69 | 79 | 76 | 78 | 79 | 76 | 71 | 66 | 0.11386 |
| 99 | 61 | 59 | 55 | 53 | 50 | 59 | 51 | 52 | 49 | 49 | 51 | 50 | 58 | 61 | 63 | 63 | 69 | 71 | 73 | 74 | 76 | 75 | 73 | 70 | 0.09303 |
| 102 | 69 | 67 | 62 | 60 | 58 | 56 | 59 | 57 | 56 | 55 | 53 | 52 | 54 | 54 | 56 | 58 | 62 | 63 | 65 | 67 | 70 | 72 | 71 | 72 | 0.06515 |
| 105 | 71 | 67 | 65 | 64 | 61 | 59 | 60 | 58 | 55 | 51 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 51 | 58 | 61 | 66 | 68 | 70 | 71 | 0.08004 |
| 108 | 71 | 68 | 68 | 66 | 65 | 65 | 62 | 58 | 52 | 50 | 50 | 50 | 50 | 47 | 47 | 50 | 50 | 50 | 56 | 60 | 65 | 69 | 73 | 72 | 0.09307 |
| 111 | 68 | 66 | 65 | 63 | 60 | 61 | 58 | 53 | 50 | 50 | 47 | 45 | 45 | 47 | 47 | 47 | 47 | 50 | 50 | 55 | 59 | 61 | 66 | 69 | 0.08488 |
| 114 | 74 | 78 | 76 | 75 | 69 | 65 | 60 | 52 | 50 | 47 | 45 | 43 | 45 | 45 | 47 | 47 | 47 | 47 | 50 | 56 | 62 | 67 | 75 | 76 | 0.13079 |
| 117 | 76 | 76 | 75 | 72 | 70 | 65 | 57 | 50 | 47 | 45 | 45 | 43 | 41 | 43 | 45 | 47 | 47 | 49 | 50 | 57 | 63 | 69 | 74 | 76 | 0.13300 |
| 120 | 83 | 81 | 82 | 79 | 76 | 71 | 64 | 52 | 50 | 47 | 45 | 43 | 43 | 41 | 43 | 45 | 47 | 47 | 50 | 57 | 61 | 69 | 77 | 81 | 0.15687 |
| 123 | 80 | 83 | 82 | 77 | 75 | 70 | 62 | 52 | 50 | 47 | 45 | 43 | 41 | 43 | 45 | 47 | 47 | 47 | 50 | 54 | 61 | 69 | 76 | 79 | 0.15251 |
| 126 | 80 | 79 | 77 | 73 | 71 | 65 | 55 | 50 | 47 | 45 | 41 | 39 | 39 | 41 | 43 | 45 | 47 | 47 | 50 | 57 | 66 | 74 | 81 | 84 | 0.16279 |
| 129 | 106 | 104 | 104 | 100 | 101 | 93 | 85 | 73 | 63 | 51 | 50 | 47 | 45 | 44 | 43 | 44 | 45 | 47 | 51 | 51 | 60 | 67 | 73 | 78 | 0.22627 |
| 132 | 109 | 108 | 107 | 105 | 99 | 93 | 82 | 72 | 59 | 50 | 50 | 47 | 45 | 47 | 47 | 49 | 56 | 65 | 73 | 82 | 92 | 99 | 105 | 107 | 0.24830 |
| 135 | 93 | 91 | 90 | 88 | 89 | 86 | 79 | 72 | 64 | 53 | 49 | 47 | 45 | 47 | 49 | 57 | 67 | 75 | 87 | 92 | 97 | 102 | 103 | 103 | 0.20368 |
| 135 | 102 | 96 | 95 | 91 | 89 | 85 | 88 | 71 | 60 | 52 | 49 | 47 | 47 | 47 | 49 | 55 | 63 | 72 | 85 | 91 | 98 | 102 | 103 | 103 | 0.21439 |
| 138 | 94 | 93 | 92 | 95 | 92 | 88 | 80 | 73 | 63 | 54 | 49 | 47 | 45 | 47 | 49 | 49 | 56 | 67 | 73 | 79 | 84 | 88 | 90 | 91 | 0.18580 |
| 141 | 81 | 83 | 86 | 89 | 87 | 82 | 76 | 69 | 60 | 51 | 49 | 47 | 47 | 49 | 50 | 55 | 65 | 71 | 78 | 82 | 87 | 88 | 90 | 88 | 0.16086 |



**Figure 5.12(a): Box Plot of dial gauge readings dataset of mean values of 10-mm diameter Aluminium (Al) round bar before straightening**

**Figure 5.12(b): Error Plot of 10 mm Aluminium Round Bar Before Straightening**