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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Table 5.18**  **Measurement of roundness by Dial gauge deflections of 10-mm Diameter Copper (Cu) Round Bar** **Before Straightening** | | | | | | | | | | | | | | | | | | | | | | | |  |
|  | **Mean values of Dial Gauge Deflection Readings before straightening of 10 mm Copper 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) |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 12.3 | 79 | 71 | 67 | 64 | 61 | 64 | 64 | 65 | 71 | 77 | 84 | 88 | 95 | 100 | 104 | 107 | 110 | 108 | 105 | 103 | 98 | 93 | 88 | 85 | 0.16352 |
| 16 | 68 | 66 | 67 | 67 | 66 | 68 | 73 | 77 | 81 | 86 | 92 | 96 | 100 | 102 | 105 | 105 | 104 | 102 | 97 | 92 | 87 | 81 | 76 | 71 | 0.14430 |
| 20.5 | 73 | 70 | 65 | 63 | 60 | 60 | 62 | 63 | 67 | 70 | 74 | 78 | 83 | 86 | 91 | 94 | 96 | 97 | 97 | 93 | 90 | 85 | 81 | 76 | 0.12708 |
| 25 | 91 | 84 | 76 | 67 | 59 | 50 | 49 | 52 | 53 | 50 | 51 | 54 | 62 | 68 | 77 | 86 | 95 | 101 | 108 | 110 | 111 | 109 | 104 | 98 | 0.22512 |
| 28 | 101 | 88 | 88 | 65 | 51 | 49 | 52 | 55 | 57 | 59 | 61 | 58 | 55 | 60 | 73 | 85 | 98 | 99 | 117 | 122 | 124 | 123 | 119 | 103 | 0.26424 |
| 31 | 104 | 91 | 73 | 55 | 49 | 52 | 54 | 49 | 53 | 55 | 57 | 59 | 62 | 64 | 69 | 84 | 101 | 115 | 127 | 134 | 137 | 138 | 132 | 128 | 0.33251 |
| 31 | 116 | 97 | 82 | 61 | 50 | 49 | 49 | 49 | 49 | 49 | 49 | 49 | 49 | 59 | 75 | 91 | 108 | 121 | 131 | 138 | 140 | 138 | 131 | 121 | 0.35596 |
| 35 | 112 | 94 | 75 | 52 | 49 | 53 | 55 | 56 | 57 | 52 | 54 | 56 | 53 | 55 | 72 | 91 | 109 | 126 | 141 | 149 | 153 | 155 | 150 | 140 | 0.40274 |
| 35 | 128 | 103 | 82 | 59 | 49 | 52 | 53 | 55 | 56 | 57 | 58 | 52 | 53 | 55 | 71 | 89 | 110 | 126 | 141 | 149 | 155 | 155 | 150 | 138 | 0.40341 |
| 40 | 120 | 96 | 71 | 49 | 53 | 52 | 54 | 56 | 58 | 59 | 62 | 65 | 66 | 66 | 85 | 105 | 123 | 140 | 154 | 164 | 168 | 167 | 157 | 143 | 0.43190 |
| 45 | 113 | 94 | 66 | 49 | 50 | 54 | 56 | 58 | 62 | 64 | 65 | 69 | 56 | 72 | 87 | 104 | 124 | 142 | 159 | 169 | 175 | 174 | 167 | 149 | 0.45507 |
| 48 | 59 | 59 | 56 | 53 | 49 | 52 | 56 | 50 | 53 | 52 | 51 | 50 | 53 | 55 | 56 | 62 | 64 | 52 | 53 | 52 | 51 | 49 | 51 | 54 | 0.03918 |
| 51 | 68 | 66 | 64 | 57 | 50 | 49 | 52 | 56 | 58 | 59 | 62 | 64 | 63 | 66 | 60 | 57 | 53 | 50 | 50 | 49 | 50 | 60 | 64 | 67 | 0.06620 |
| 54 | 71 | 69 | 66 | 60 | 49 | 54 | 56 | 52 | 51 | 50 | 54 | 56 | 58 | 62 | 61 | 60 | 54 | 52 | 49 | 55 | 61 | 65 | 71 | 72 | 0.07536 |
| 57 | 70 | 66 | 62 | 53 | 59 | 50 | 49 | 52 | 53 | 50 | 51 | 54 | 62 | 68 | 69 | 72 | 74 | 65 | 62 | 49 | 60 | 66 | 69 | 72 | 0.08510 |
| 60 | 79 | 76 | 72 | 64 | 52 | 50 | 51 | 50 | 52 | 53 | 54 | 56 | 58 | 63 | 64 | 66 | 68 | 63 | 49 | 53 | 64 | 68 | 73 | 76 | 0.09571 |
| 63 | 81 | 78 | 74 | 65 | 52 | 55 | 52 | 51 | 49 | 52 | 53 | 52 | 56 | 58 | 62 | 62 | 58 | 51 | 49 | 60 | 68 | 72 | 78 | 80 | 0.11159 |
| 66 | 82 | 82 | 79 | 67 | 50 | 49 | 55 | 57 | 59 | 60 | 55 | 51 | 58 | 52 | 59 | 63 | 61 | 65 | 66 | 66 | 72 | 76 | 81 | 84 | 0.11453 |
| 69 | 82 | 79 | 74 | 64 | 49 | 52 | 56 | 58 | 62 | 74 | 72 | 65 | 56 | 49 | 56 | 67 | 65 | 49 | 57 | 66 | 72 | 78 | 82 | 84 | 0.11558 |
| 72 | 75 | 73 | 65 | 50 | 49 | 52 | 54 | 56 | 58 | 62 | 65 | 67 | 68 | 72 | 65 | 55 | 55 | 53 | 62 | 69 | 74 | 79 | 81 | 81 | 0.10207 |
| 75 | 72 | 67 | 58 | 49 | 54 | 57 | 59 | 62 | 65 | 67 | 69 | 62 | 56 | 52 | 56 | 52 | 50 | 54 | 55 | 61 | 66 | 71 | 73 | 74 | 0.07856 |
| 78 | 63 | 58 | 49 | 53 | 58 | 59 | 63 | 66 | 67 | 72 | 66 | 62 | 58 | 55 | 52 | 56 | 59 | 55 | 63 | 66 | 72 | 73 | 74 | 72 | 0.07141 |
| 81 | 64 | 61 | 50 | 49 | 53 | 64 | 69 | 56 | 62 | 65 | 59 | 53 | 50 | 49 | 56 | 59 | 62 | 49 | 53 | 58 | 64 | 67 | 68 | 69 | 0.06704 |
| 85.5 | 87 | 84 | 75 | 60 | 49 | 54 | 56 | 59 | 63 | 66 | 69 | 72 | 75 | 69 | 59 | 57 | 65 | 72 | 80 | 86 | 89 | 89 | 91 | 91 | 0.13228 |



**Figure 5.16(a): Box Plot of dial gauge readings dataset of mean values of 10-mm diameter Copper (Cu) round bar before straightening**

**Figure 5.16(b): Error Plot of 10 mm Copper Round Bar Before Straightening**