|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Table 5.16**  **Measurement of roundness by Dial gauge deflections of 6-mm Diameter Copper (Cu) Round Bar** **Before Straightening** | | | | | | | | | | | | | | | | | | | | | | | | |  |
|  | Mean values of Dial Gauge Deflection Readings before straightening of 6 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) | |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |
| 16.0 | 301.5 | 297.0 | 288.0 | 275.5 | 262.5 | 251.0 | 239.5 | 225.0 | 213.5 | 202.0 | 195.5 | 187.0 | 187.0 | 197.0 | 210.0 | 225.0 | 241.5 | 256.0 | 269.0 | 284.0 | 296.0 | 302.5 | 308.5 | 310.5 | 0.4221 | |
| 18.0 | 311.0 | 306.0 | 296.0 | 285.0 | 268.0 | 253.5 | 241.5 | 230.0 | 217.0 | 203.5 | 195.5 | 187.0 | 187.0 | 198.0 | 211.5 | 228.0 | 244.5 | 259.5 | 272.0 | 285.5 | 297.0 | 302.0 | 307.0 | 312.0 | 0.4339 | |
| 20.0 | 274.0 | 269.0 | 264.5 | 256.5 | 248.0 | 241.0 | 234.0 | 227.0 | 219.0 | 210.0 | 207.0 | 205.0 | 203.0 | 208.0 | 217.5 | 226.0 | 237.0 | 245.5 | 259.0 | 265.5 | 270.0 | 276.5 | 279.5 | 282.0 | 0.2664 | |
| 22.0 | 281.0 | 276.0 | 270.0 | 260.0 | 251.0 | 243.5 | 238.0 | 228.0 | 221.5 | 213.5 | 207.5 | 204.5 | 203.0 | 208.5 | 218.5 | 228.5 | 240.0 | 252.0 | 260.0 | 268.0 | 274.5 | 279.5 | 282.5 | 283.5 | 0.2791 | |
| 25.0 | 239.0 | 238.0 | 238.5 | 237.5 | 238.0 | 237.0 | 236.0 | 236.0 | 232.5 | 232.5 | 235.5 | 239.0 | 241.0 | 241.5 | 244.5 | 245.0 | 245.0 | 242.5 | 241.0 | 240.5 | 239.0 | 247.5 | 237.0 | 245.5 | 0.0398 | |
| 30.0 | 227.5 | 225.0 | 225.5 | 229.0 | 235.5 | 239.0 | 243.5 | 247.0 | 249.5 | 250.5 | 252.0 | 253.5 | 252.0 | 251.0 | 248.0 | 243.5 | 237.0 | 230.0 | 224.5 | 218.0 | 212.0 | 210.0 | 209.5 | 209.0 | 0.1515 | |
| 35.0 | 199.0 | 208.0 | 217.5 | 227.0 | 231.0 | 238.5 | 245.5 | 250.5 | 254.5 | 256.5 | 256.0 | 254.5 | 256.0 | 254.0 | 247.0 | 240.5 | 230.5 | 221.0 | 211.5 | 203.5 | 197.0 | 194.5 | 193.0 | 194.5 | 0.2342 | |
| 40.0 | 181.5 | 195.5 | 211.0 | 227.0 | 239.0 | 250.0 | 260.0 | 268.5 | 273.0 | 276.0 | 274.5 | 273.5 | 267.5 | 262.0 | 252.5 | 243.5 | 231.0 | 217.0 | 205.0 | 194.0 | 185.0 | 181.0 | 178.0 | 178.5 | 0.3588 | |
| 45.0 | 175.5 | 196.0 | 212.0 | 228.5 | 246.0 | 259.0 | 271.0 | 284.5 | 292.0 | 297.0 | 296.5 | 293.0 | 289.5 | 280.0 | 265.5 | 252.5 | 237.5 | 222.0 | 207.5 | 191.5 | 179.0 | 172.0 | 168.5 | 169.5 | 0.4620 | |
| 50.0 | 158.0 | 176.0 | 193.0 | 214.0 | 234.0 | 252.0 | 271.5 | 288.5 | 303.0 | 314.0 | 318.5 | 319.5 | 317.0 | 310.0 | 302.0 | 285.5 | 269.0 | 252.0 | 234.0 | 215.5 | 201.0 | 183.5 | 174.0 | 171.0 | 0.5507 | |
| 55.0 | 165.0 | 177.5 | 192.0 | 210.0 | 233.5 | 254.0 | 270.5 | 284.5 | 301.0 | 315.5 | 329.0 | 335.0 | 339.5 | 329.5 | 322.0 | 309.5 | 292.0 | 272.0 | 254.5 | 232.0 | 208.0 | 190.5 | 176.0 | 168.5 | 0.5959 | |
| 60.0 | 189.0 | 185.0 | 184.5 | 185.0 | 191.0 | 202.5 | 213.0 | 234.0 | 248.0 | 258.0 | 267.0 | 275.0 | 283.0 | 289.5 | 291.5 | 289.0 | 283.0 | 275.0 | 267.0 | 256.0 | 242.5 | 230.0 | 218.0 | 205.0 | 0.3837 | |
| 62.0 | 193.0 | 182.5 | 178.0 | 183.0 | 188.5 | 201.0 | 214.5 | 229.0 | 240.0 | 251.5 | 260.0 | 268.0 | 273.0 | 278.5 | 281.0 | 277.5 | 274.0 | 270.0 | 263.0 | 252.0 | 240.0 | 225.5 | 214.5 | 202.0 | 0.3548 | |
| 65.0 | 164.5 | 158.5 | 155.5 | 156.0 | 169.0 | 188.5 | 205.0 | 225.0 | 241.0 | 253.5 | 270.0 | 287.5 | 302.0 | 304.5 | 310.5 | 305.0 | 311.0 | 290.0 | 275.0 | 255.0 | 239.5 | 210.0 | 201.0 | 181.0 | 0.5544 | |
| 68.0 | 170.0 | 154.5 | 155.0 | 158.0 | 173.5 | 190.5 | 209.0 | 229.0 | 246.5 | 261.5 | 278.0 | 291.0 | 291.5 | 298.0 | 300.0 | 298.0 | 296.5 | 281.0 | 267.5 | 250.5 | 221.0 | 214.0 | 194.5 | 178.5 | 0.5246 | |
| 70.0 | 146.0 | 138.5 | 138.5 | 145.0 | 162.0 | 183.0 | 203.0 | 224.5 | 242.5 | 261.5 | 277.5 | 292.0 | 314.5 | 321.5 | 323.5 | 318.0 | 300.5 | 286.0 | 268.0 | 246.0 | 226.5 | 204.0 | 185.5 | 164.5 | 0.6410 | |
| 75.0 | 146.5 | 145.5 | 148.5 | 164.0 | 181.5 | 200.0 | 219.0 | 238.5 | 256.0 | 273.0 | 289.5 | 303.5 | 311.0 | 312.5 | 305.0 | 295.0 | 280.5 | 264.5 | 246.5 | 224.0 | 205.0 | 187.5 | 168.0 | 155.0 | 0.5868 | |
| 80.0 | 155.0 | 167.0 | 178.0 | 191.5 | 205.0 | 214.5 | 241.5 | 255.5 | 270.5 | 285.0 | 296.5 | 301.0 | 301.5 | 295.5 | 285.0 | 270.0 | 262.5 | 243.0 | 224.5 | 206.0 | 190.0 | 175.5 | 163.5 | 156.5 | 0.5099 | |
| 86.0 | 165.5 | 181.5 | 196.5 | 213.5 | 230.0 | 246.5 | 259.5 | 275.0 | 286.5 | 293.0 | 296.5 | 299.0 | 295.0 | 285.0 | 275.0 | 263.0 | 247.5 | 228.0 | 213.0 | 196.0 | 182.5 | 168.0 | 160.0 | 159.0 | 0.4899 | |



**Figure 5.14(a): Box Plot of dial gauge readings dataset of mean values of 6-mm diameter Copper (Cu) round bar before straightening**

**Figure 5.14(b): Error Plot of 6 mm Copper Round Bar Before Straightening**