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Accelerometers mounting on boring bar for vibration measurement

Arrangement for off-line surface roughness measurement

Main effects plots

Vibration Spectrum at S -54 rpm, f- 0.045, doc- 0.25 mm

Vibration Spectrum at S -140, f- 0.045, doc- 0.5mm

Surface roughness profile for S -54 rpm, f- 0.045, doc- 0.25 mm

Spectrum of surface roughness for S -54 rpm, f- 0.045, doc- 0.25 mm

Surface roughness profile for S -54 rpm, f- 0.36, doc- 0.50 mm

Spectrum of surface roughness for S -54 rpm, f- 0.36, doc- 0.50 mm

Displacement plot for spindle speed 180 rpm, feed 0.045 mm/rev, doc 0.25 mm

Displacement plot for spindle speed 224 rpm, feed 0.036 mm/rev, doc 0.325 mm

Variation of Ra and tool tip displacement for spindle speed 54-224, feed 0.045 mm/rev, doc 0.25 mm

Variation of Ra and tool tip displacement for spindle speed 54-224, feed 0.36 mm/rev, doc 0.5 mm

Variation of Ra and tool tip displacement for spindle speed 140, doc 0.25 mm feed 0.045- 0.36 mm/rev

Variation of Ra and tool tip displacement for spindle speed 224, doc 0.5 mm, feed 0.045- 0.36 mm/rev

Variation of Ra and tool tip displacement for spindle speed 140, Feed 0.045 mm/rev doc 0.25 – 0.5 mm

Variation of Ra and tool tip displacement for spindle speed 224, feed 0.36mm/rev doc 0.25 – 0.5 mm
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42. Variation of surface roughness against spindle speed 250-430 rpm, feed 20 mm / min and doc 0.8 mm

43. Variation of surface roughness with resultant RMS acceleration for speed 250-430 rpm, feed 2 mm / min and doc 0.2 mm

44. Variation of acceleration against spindle speed 250-430 rpm, feed 13 mm / min and doc 0.5 mm

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LIST OF SYMBOLS

\[ \text{Ra} \quad : \quad \text{Average surface roughness} \ (\mu m) \]

\[ S \quad : \quad \text{Spindle Speed} \ (\text{rpm}) \]

\[ f \quad : \quad \text{Feed} \ (\text{mm/rev}) \text{ or } (\text{mm/min}) \]

\[ d \quad : \quad \text{Depth of cut} \ (\text{mm}) \]

\[ V \quad : \quad \text{Cutting velocity} \ (\text{m/min}) \]

\[ D \quad : \quad \text{Diameter of the work-piece} \ (\text{mm}) \]

\[ d \quad : \quad \text{Diameter of boring bar} \ (\text{mm}) \]

\[ L \quad : \quad \text{Length of boring bar} \ (\text{mm}) \]

\[ a_1 \quad : \quad \text{RMS acceleration in radial direction} \ (\mu m/s^2) \]

\[ a_2 \quad : \quad \text{RMS acceleration in tangential direction} \ (\mu m/s^2) \]

\[ a_r \quad : \quad \text{Resultant RMS acceleration} \ (\mu m/s^2) \]

\[ m \quad : \quad \text{Mass of boring bar} \ (\text{Kg}) \]

\[ k \quad : \quad \text{Stiffness of boring bar} \ (\text{Kg/m}) \]

\[ A \quad : \quad \text{Cross-section area of boring bar} \ (\text{m}^2) \]

\[ E \quad : \quad \text{Modulus of Elasticity of boring bar material} \ (\text{N/m}^2) \]

\[ I \quad : \quad \text{Mass moment of inertia of boring bar} \ (\text{m}^4) \]
\( \rho \) : Density of boring bar material (Kg/m\(^3\))

\( K_c \) : Unit cutting force (N/m\(^2\))

\( A_c \) : Chip thickness area (m\(^2\))

\( F_n \) : Nominal feed force (N)

\( \sigma_t \) : Tensile strength of work piece material (N/m\(^2\))