NOMENCLATURE

Mathematical modeling

\( T(r, z, t) \) Temperature distribution function, °C

\( P \) Power, \( W \)

\( Q_f \) Heat flux, \( W/m^2 \)

\( T_{\text{max}} \) Maximum temperature, °C

\( a \) Radius of heat source, \( mm \)

\( A \) Area of heat source, \( mm^2 \)

\( c_p \) Specific heat, \( J/kg \)

\( k \) Thermal conductivity, \( W/m°C \)

\( r \) Radial distance, \( μm \)

\( s \) Laplace transformed variable of \( t' \)

\( \lambda \) Hankel transformed variable of ‘\( r \)’

\( t \) Pulse duration, \( ms \)

\( H_2 \) Hermite polynomial

\( J_0 \) Bessel function of order zero

\( J_1 \) Bessel function of order one

\( I_{\frac{1}{2}} \) Modified spherical Bessel function of first kind of fractional order

\( K_{\frac{1}{2}} \) Modified spherical Bessel function of second kind of fractional order
erfc  Complementary error function

\( \alpha \)  Thermal diffusivity,  \( m^2/s \)

\( \rho \)  Density,  \( kg/m^3 \)

\( z \)  Case depth,  \( \mu m \)

ANOVA and Process optimization

\( f \)  Degrees of freedom

\( S \)  Sum of squares

\( V \)  Variance

\( F \)  F-ratio

\( S' \)  Pure sum of squares

\( P \)  Percentage contribution

\( S/N \)  Signal to noise ratio

\( MSD \)  Mean Squared Deviation

\( \overline{A_1}, \overline{A_2}, \ & \overline{A_3} \)  Factor A average at level 1, 2 and 3 respectively

\( \overline{B_1}, \overline{B_2}, \ & \overline{B_3} \)  Factor B average at level 1, 2 and 3 respectively

\( \overline{A_1B_1} \)  Average of result of factor A at level 1 and factor B at level 1

\( C. I. \)  Confidence Interval

\( n_1 \)  Degree of freedom for mean

\( n_2 \)  Degree of freedom for error

\( F(n_1,n_2) \)  F-value for degree of freedom for mean and error

\( V_e \)  Variance of error term

\( N_e \)  Effective number of replications

\( C. L. \)  Confidence level