LUMICISION INC. PRECISION LASER & CNC FABRICATION

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ENGINEERING DESIGN FOR MANUFACTURING (DFM) GUIDE

DOCUMENT ID: LUM-ENG-DFM-2026 | LASER CUTTING, 200T PRESS BRAKE BENDING & MICRO-WELDING

1. 6KW CNC FIBER & CO2 LASER CUTTING DESIGN RULES

- Standard Dimensional Tolerance: +/-0.002 in (+/-0.050 mm) on features; +/-0.005 in over 5 ft x 10 ft.

- Minimum Hole & Slot Diameter: >= 0.5 x Material Thickness (T) with High-Pressure N2 Assist (1.0 x T for O2).

- Minimum Web / Bridge Width: >= 1.0 x T (or 0.040 in minimum) between adjacent cutouts to prevent heat warp.

- Kerf Compensation: Export 1:1 nominal geometry in DXF/STEP; CAM automatically offsets 0.004-0.012 in kerf.

2. 200-TON CNC PRESS BRAKE BENDING & FLAT PATTERN RULES

- Angular & Flange Repeatability: +/-0.2 deg optical laser angle verification; +/-0.010 in (+/-0.25 mm) flange.

- Standard Inside Bend Radius (R): R = 1.0 x T for 304/316L Stainless, CRS, and 5052-H32 Aluminum (<= 0.25 in).
For 6061-T6 Aluminum, specify R >= 2.0 x T to 2.5 x T (or select 5052-H32) to prevent outer grain fracturing.

- Default K-Factor: K = 0.42 (Air Bending). Minimum Flange Length: L_min >= 4.0 x T + R across V-die shoulder.

- Hole-to-Bend Distance: Keep hole edges >= 2.5 x T + R away from the inside bend tangent line to avoid ovality.

- Bend Relief Notches: Width >= 1.0 x T (min 0.060 in), Depth >= R + T beyond the bend tangent zone.

3. SPATIAL-WOBBLE LASER MICRO-WELDING &PEM HARDWARE

- Fit-Up Gap Tolerance: Zero-gap self-fixturing tab-and-slot preferred (max permissible joint gap <= 0.10 x T).

- Dissimilar EV Busbars (C110 Copper to 1050/6061 Aluminum): Lap joint overlap >= 3.0 x T; HAZ < 0.10 mm.

- PEM Self-Clinching Fasteners: Size mounting holes directly to PennEngineering chart (+/-0.002 in); do not chamfer.

4. FDA GS1 UDI & MIL-STD-130 LASER SERIALIZATION ZONES

- Reserve a minimum 4.0 mm x 4.0 mm flat pad (with >= 1.0 mm quiet zone) for ISO/IEC 15415 Grade A 2D DataMatrix.

- Free Engineering DFM Review: Upload STEP, DXF, DWG, or PDF at lumicision.com/#rfq-form (24-48h response).