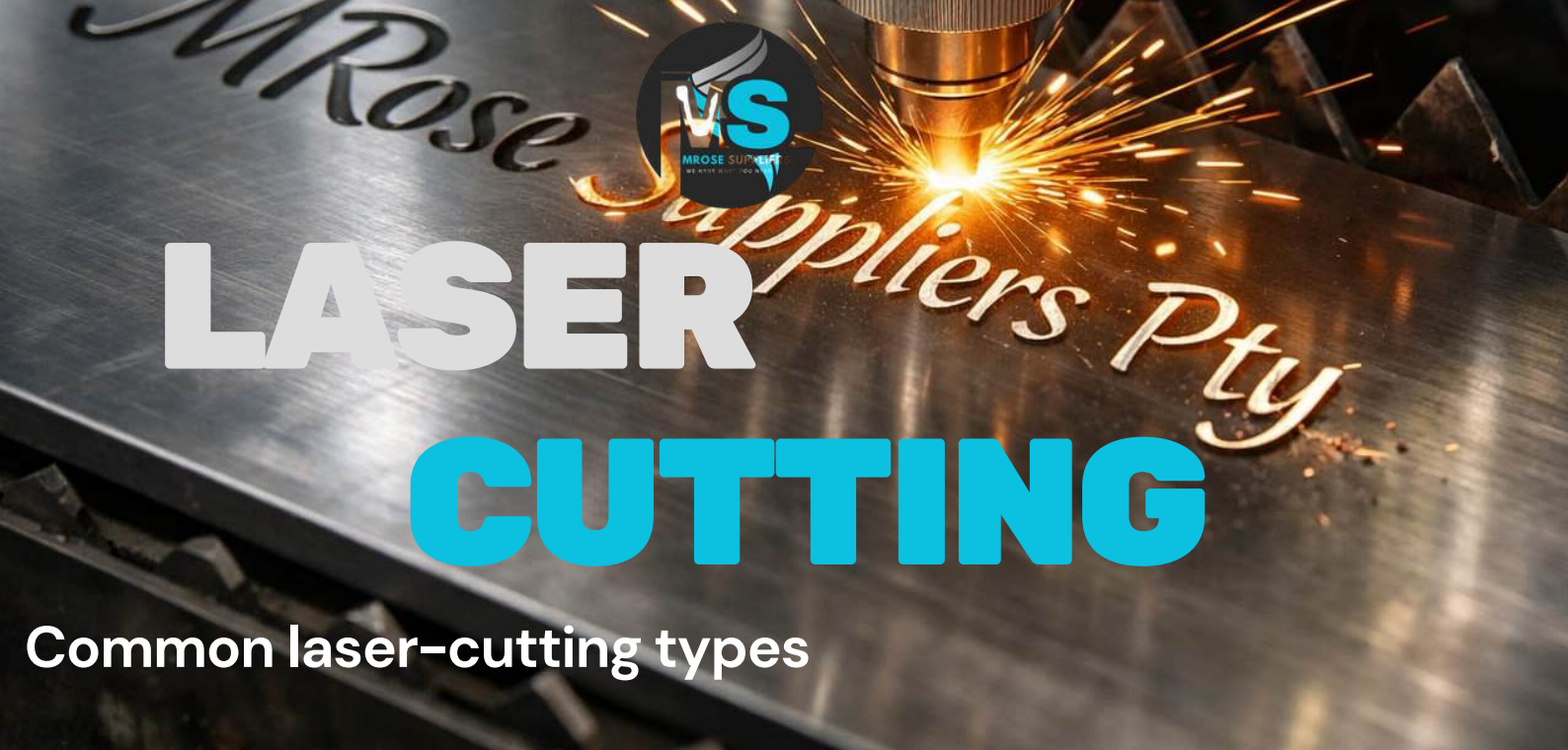




LASER CUTTING

Common laser-cutting types

Laser-cutting type	Common materials	Main characteristics	Typical applications
CO ₂ laser cutting	Mild steel, stainless steel, aluminium, acrylic, wood, plastics, rubber, textiles	Uses a gas laser; produces good-quality cuts on non-metallic materials and thin-to-medium metal sheets; generally requires more maintenance than fibre lasers	Sheet-metal cutting, signage, acrylic, wood products, packaging, gaskets
Fibre laser cutting	Mild steel, stainless steel, aluminium, brass, copper, galvanised steel	Uses a solid-state laser; highly efficient, fast, and precise; especially effective for reflective metals and thin-to-medium sheet metal	General fabrication, automotive parts, electrical enclosures, precision components
Nd:YAG laser cutting	Steel, stainless steel, aluminium, ceramics, some plastics	Produces high peak power and can be pulsed; suitable for fine details and thicker or difficult materials; usually more expensive to operate	Precision engineering, medical parts, aerospace components, small holes

Laser cutting uses a focused beam of light to melt, burn, or vaporise material along a programmed cutting path. The most common types are distinguished by the laser source, material compatibility, cutting speed, and achievable edge quality.



Common laser-cutting types

Laser-cutting type	Common materials	Main characteristics	Typical applications
Disk laser cutting	Mild steel, stainless steel, aluminium, copper, brass	Solid-state laser similar to fibre technology; provides high power, good beam quality, and fast production cutting	Heavy fabrication, automotive, industrial manufacturing
Excimer laser cutting	Polymers, plastics, ceramics, thin films, semiconductor materials	Uses ultraviolet light; removes material through photochemical ablation with a very small heat-affected zone	Microelectronics, medical devices, precision micro-machining
Laser tube cutting	Round, square, rectangular, and special-section metal tubing	Uses a fibre or CO ₂ laser with a rotary or multi-axis head; cuts holes, slots, mitres, and profiles without multiple setups	Frames, handrails, structural tubing, furniture, automotive components
Laser micro-cutting	Thin metal foil, stainless steel, nickel alloys, ceramics, plastics	Uses a very small focused beam for extremely fine cuts and small features; low material waste but slower production rates	Electronics, filters, medical components, precision instruments





Cutting methods

Cutting method	Characteristics	Advantages	Limitations
Fusion cutting	The laser melts the material, while nitrogen or argon blows the molten metal away	Produces clean, bright, oxide-free edges; excellent for stainless steel and aluminium	Gas consumption can be high; requires accurate settings
Flame cutting	Oxygen assists the laser by reacting chemically with the heated material	Fast and economical for mild steel; suitable for thicker carbon-steel plates	Creates an oxidised edge; not ideal for stainless steel or aluminium
Sublimation cutting	The laser vaporises the material directly without producing significant molten metal	Very precise cuts and fine details; suitable for thin or delicate materials	Slow and usually limited to thinner materials
Vaporisation cutting	High laser energy turns the material directly into vapour	Provides narrow cuts and high dimensional accuracy	High energy demand; commonly used for thin materials
Remote laser cutting	The laser cuts from a distance using a scanning optical system, often without a cutting nozzle	Very fast for thin sheet, foils, and complex patterns; reduces mechanical movement	Limited cutting thickness and requires accurate focus control
Perforation cutting	The laser creates a series of small holes or interrupted cuts	Useful for ventilation panels, filters, tear lines, and controlled break-outs	Produces slower cutting speeds than continuous cutting





Typical material choices

Material	Suitable laser types	General cutting characteristics
Mild steel	Fibre, CO ₂ , disk	Easy to cut; oxygen gives fast cutting, while nitrogen gives cleaner edges
Stainless steel	Fibre, CO ₂ , disk	Usually cut with nitrogen or argon to prevent heavy oxidation
Aluminium	Fibre, CO ₂ , disk	Reflective and thermally conductive; requires suitable power and process control
Brass and copper	Fibre, disk	Highly reflective; modern fibre lasers are generally preferred
Acrylic	CO ₂	Produces polished, clear edges and is widely used for signage and displays
Wood	CO ₂	Provides accurate profiles but may leave darkened or charred edges
Plastics	CO ₂ , excimer	Results depend strongly on polymer type; some plastics produce harmful fumes
Rubber and gasket sheet	CO ₂	Can produce accurate seals and gaskets, but smoke extraction is essential
Paper and textiles	CO ₂	Enables fast cutting of intricate shapes with minimal mechanical contact

Important characteristics

- **Kerf width:** The narrow cut width reduces material waste and allows close nesting of parts.
- **Heat-affected zone:** The surrounding area may experience heat distortion, discoloration, or hardening.
- **Accuracy:** CNC-controlled laser systems can produce repeatable profiles and small holes.
- **Cutting speed:** Speed depends on laser power, material type, thickness, assist gas, and required edge quality.
- **Assist gas:** Oxygen increases cutting speed in mild steel, while nitrogen or argon generally provides cleaner, oxide-free edges.
- **Edge quality:** Correct focus, nozzle height, gas pressure, and cutting speed are essential for smooth edges.
- **Safety:** Laser systems require enclosed work areas, interlocks, fume extraction, fire prevention, and material-specific safety controls.