Contract Manufacturing Glossary of Terms

A

Aperture	An opaque device that controls the transverse mode performance of the laser cavity. Made of ceramic or SS, the aperture is usually a highly polished round disc with a center hole, which comes in various sizes.
Assist Gas for Cutting/Drilling	The gas that accompanies the laser through the nozzle, providing a moderate-to-high-pressure flow of oxygen or nitrogen, which removes molten metal from the cut area to provide a cleaner cut.
Assist Gas for Welding	The gas that accompanies the laser through the nozzle, typically argon, which provides a light low over the weld area, preventing oxidation and splatter.
Athermal Laser Machining	Ablate bioabsorbable polymers, shape memory metals & other exotic alloys without introducing heat affected zones (HAZ) which yields parts that are clean and free of any slag or recast.
Automatic-feed	Continuous conveyance of raw stock into the work envelope for machining.

B

Barrel Finishing	Production finishing process that produces a low-pressure abrasion action by tumbling work pieces in a hexagonal or octagonal barrel together with an abrasive slurry.
Burring	A thin ridge or area of roughness produced in cutting or shaping metal.

C

Cabinet Blaster	Uses compressed air to propel aluminum oxide or glass bead against the surfaces of machined parts in an enclosed cabinet. Used for: cleaning (removes rust, paint, scale & corrosion); etching (metals, glass and

	plastic); finishing (small surface imperfections & matching marks blended-in).
CAD/CAM	Computer-Assisted Design/Computer-Assisted Manufacturing. A software package that can generate "Geometry" with the design portion of the software and then convert to a .txt file using the machining portion of the software. The .txt file is used by the Computer Numerical Control (CNC) to convert the file to table motion.
Class 100,000	Federally regulated standard of environmental cleanliness: airborne particulate level kept below 100,000 per cubic foot.
Cleanroom	Facility in which environmental elements (heat, humidity, microbial growth, etc.) and user cleanliness are controlled. Used for assembly/packaging of sensitive components.
CNC	Computer Numerical Control. A dedicated purpose computer that has the capability to read computer codes and convert them into machine control and driving motor instructions.
CO^2 Laser	A type of gas laser that uses a mixture of CO^2, nitrogen and helium to produce a continuous output of laser light at a wavelength of 10.6mm.
Coherent	The optical radiation resulting from wave trains vibrating in phase with each other. Because these wave trains are composed of the same wavelength of light, they are termed "coherent."
Coil-feed	Continuous unrolling and conveyance of coiled raw stock into the work envelope for machining.
Collimated	A laser with little divergence. Lasers can emit highly divergent beams of energy. For example, a CO2 laser can emit a 1.2 mrad divergent beam (1 mrad = 1 milliradian = 1 millimeter divergence per 1 meter traveled), and an ND: YAG laser can emit a 1.2-25 mrad beam.
Convergence	From the laser's perspective, convergence refers to the laser growing smaller as it moves from point "a" to point

	"b." After the laser passes through the focus lens, the beam converges until it reaches its waist point.

D

Diamond Laser	Coherent Diamond 64 CO^2 Laser - A 150 watt sealed beam laser.
Divergence	From the laser's perspective, divergence refers to the laser growing larger as it moves from point "a" to point "b." After the laser passes through the waist point, the beam begins to diverge.
DNC	Direct Numerical Control. The direct control of a number of separate CNC machine tools by a large central host computer; part programs are downloaded directly into the memory of a CNC machine tool.
Drilling	Making a round hole or cavity by boring directly into a solid surface with rotating bits.
Dross	The small drops of re-solidified molten metal that cling to the bottom of the cut edge. Dross is easily removed in an acid-pickling bath.

E

EDM	Electrical Discharge Machining. High-energy electric current melts base metal for burr-free machining. Wire EDM can produce intricate patterns, complex shapes with extreme precision. Microhole EDM used for high-speed drilling of micro-fine holes. Minimal variation throughout production.
Electrolytic	Produced or brought about by the passage of an electric current through a non-metallic conductor.
Electron beam welding	A process that uses energy from a fast-moving beam of electrons to produce a strong, very clean and narrow weld.
Electropolishing	Producing a smooth, bright surface on a metal by immersion in an electrolytic bath.

Endotoxin	Any of a class of poisonous substances present in bacteria but separable from the cell body only on its disintegration.
Esco concept	Modified Swiss turning machining process. Rotating tool head stock around stationary bar- or coil-fed metal.
Exotic metal	Any metal not commonly used in fabrication of parts, e.g., Waspaloy, Greek Ascoloy, Hastelloy, Kovars, Inconels.

F

Fiber optics	Thin transparent fibers of glass or plastic that are enclosed by material of a lower index of refraction and that transmit light throughout their length by internal reflections.
Four & five axis machining	The use of multi-directional tool movement in a machine in which tools are held on axes which provide rotating vertical and horizontal motions on different planes.

G

Glass bead finishing	Process utilizing compressed air to bombard a surface with small particles of fused soda lime glass. Results are controllable and predictable and will not wear machine components rapidly like other abrasives.
Glove box	A sealed, protectively lined compartment with ports to which gloves are attached for use in handling materials inside the compartment.
Grit blasting	Process utilizing steel or iron that has been crushed from round particles (shot) or crushed organic abrasives made from dried nutshells or corncob. Steel grit used for removing heavy scale; iron to remove paint from steel; “soft” organic to remove contamination from delicate parts or to remove plastic flashing.

H

Hardness	The ability to resist penetration.
HAZ	Heat Affected Zone - the edge of the laser-machined surface that receives an excess of heat during the operation. In the HAZ, the microstructure is altered near the surface of the cut or weld - only into the first few thousandths of an inch of the parent material. Lasers produce significantly less HAZ than TIG or electron beam welding. Can be readily removed from metal work pieces by electropolishing.

I

ISO 9002	Designation that indicates a facility's conformance to quality standards in operations management, especially as it relates to quality control and customer service.

J

Joule	A unit of measured energy. One calorie is equal to 4.18 joules. One calorie is the amount of energy needed to raise the temperature of one gram of water one degree centigrade. In terms of power, one joule is equal to one watt-second. performance in laser applications is defined by joules per pulse instead of average power because the amount of material melted or vaporized is directly related to laser's energy per pulse, *not* its average power.

K

Kerf	The area of metal removed during the first pass of the laser.

L

Laser	The acronym of Light Amplification by Stimulated Emission of Radiation. In the typical configuration, light or electrical discharges will excite certain materials to the point where it fluoresces or "lases." Using mirrors and certain components, the emission is collected and reinforced to form a continuous stream of aligned photons. When properly aligned, the beam will be

	coherent in time and space and have minimal divergence, while producing the greatest possible energy within its diameter.
Laser etching & marking	The use of a laser to etch designs, lettering, numbers or symbols onto the surface of a material. The use of a YAG laser to produce marks and lettering or numbering on the surface of a party by burning the plating, such as an anodized surface.
Laser machining	The cutting of a material with a CO^2 or YAG laser to produce intricate part shapes and holes; it is usually a through-cut process.
Laser welding	A welding process that obtains fusion by directing a highly concentrated beam of coherent light on a very small spot.
Lasing medium	A material that emits coherent radiation by stimulation of electronic or molecular transitions to lower energy.
Lathe	A turning machine capable of producing round diameters by rotating a work piece against a stationery single-point cutting tool.

M

Memory metal	A metal which will take on a prescribed shape at certain temperatures.
Microblasting	Utilizing very fine particles in a small-diameter nozzle, extremely small parts can be blasted for cleaning and descale.
Microdeburring	The process of removing burrs from metal machined to subminiature dimensions.
Milling	A machining operation in which metal or other material is removed by bringing the work piece into contact with a horizontally or vertically mounted cutter.

N

ND:YAG	A round 3"-6" crystal of Yttrium, Aluminum and Garnet - doped with Neodymium - is the material excited in the ND:YAG laser. Light energy from high-pressure arc lamps is focused onto this crystal in order to excite the electrons of the Neodymium doping. The ND:YAG laser emits a 1.06um (approximately .000040") wavelength beam, which is in the "near infrared" portion of the Electro Magnetic Band. The electrical efficiency of an ND:YAG laser is 2%-4%.
Nitinol	A "memory metal." Can be "trained" to take on prescribed shape at specific temperatures.

O

Optics	Any lens, prism or mirror used to direct light (as in an instrument).
Oxide	A compound of oxygen with one or more metallic elements.

P

Parameters	The variables which determine the dimensions of a machined part as well as the operational sequence of the machine tools used to produce the part.
PNC	Parallel Numeric Control

R

Recast layer	The small amount of molten material that adheres to the walls of the laser-drilled hole or laser generated kerf. The amount of the recast layer depends on the material thickness, type of material and the laser parameters being used.
Repeatability	The ability of a machine to perform the same operation any number of times to a specified degree of accuracy.

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S

Subchronic use	In use for less than three months.
Swiss automatics/swiss turning	Micromachining process that uses high-speed turning of bar or coil stock with stationary tools. Extreme precision and speed for small-diameter parts. Milling, drilling, turning, tapping functions simultaneously or in sequence.

T

Tig (welding)	Gas tungsten inert arc welding (tungsten inert gas).
Tolerance	The range of variation permitted in maintaining a specified dimension, i.e., the difference between the upper and lower limits between which a size must be held.
Tooling	The selection of tools needed to produce the desired contours and dimensions of a machined metal part.
Tumble blaster	Similar to a cabinet blaster, but parts are rotating in a barrel while being blasted.

U

Ultrasonic cleaning	In a controlled bath, cleaning solutions are made up to remove surface contaminants found on parts. Often, it is advantageous to accelerate and enhance the solution's cleaning abilities by energizing transducers that agitate the solution, microscopically cavitating and exploding contaminates from the parts, leaving them exceptionally clean.

W

Waist	The smallest point on a focused beam, which is the only part that can be used for cutting.

Waterjet machining	A fine, high-pressure, high-velocity jet of water directed by a small nozzle is used to cut hard or soft materials. Abrasives such as micro-grain diamond or garnet may be mixed into the water stream.
Watt	One watt is equal to one joule of energy per second. It is used to describe the average power output of the laser's performance within a given set of parameters.
Work envelope	Interior compartment of equipment where machining takes place. Includes tools and metal stock.