technifor

UN MARQUAGE QUI DÉFIE LE TEMPS

# GLOSSARY

# USUAL LASER TERMS AND EXPRESSIONS

*Here is a non-exhaustive list of all terms related to Laser operation, with a short description for each of them.*

| Terme | Description |
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| **Ablation (or material removal)** | Removal of material with Laser beam action. Ablation can occur on “natural” material (engraving) or on a coated material (layer removal) on anodized aluminum for instance.<br><br>✍ *See Engraving* |
| **Beam Expander** | Optical element located between the resonator and the scanning system. Its function is to expand the beam to a higher value (diam approx 9 mm) to improve scanning and focusing efficiency. |
| **Cavity** | It is the module where the beam is generated. For Nd :YAG Laser, It includes the Laser cristal.<br><br>✍ *See Nd :YAG Cristal* |
| **Cavity Mirrors** | Optical components of the resonator. Rear mirror reflects 100% of the Laser. Front mirror (or output coupler) reflects 80 to 90% (for amplification) and transmits 10 to 20% which are used for marking. |
| **Class 1 / Class 4** | Security levels for the Laser machines :<br><br>Class 1 : No danger for operator. The machine is fully cased with no access to the marking chamber. The machine can be installed in any working environment.<br><br>Class 4 : Potential danger for operator. The machine has no specific casing (open marking area). Specific protection must be assured with restricted access area and goggles wearing when operating the Laser. |

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| **CW Continuous wave mode** | When the Laser does not operate in pulsed (or Q-switched) mode, it produces a continuous wave beam (CW). This mode does not enable marking. It is used only for servicing and maintenance (beam quality and power control). |
| **Deflection mirrors (or scanner mirrors)** | 2 reflecting mirrors mounted on the galvanometers. They are oriented by the scanners and deflect the beam before focusing to produce marking on the part. Y mirror is slightly bigger than X mirror as it is placed after it.<br><br>✍ *See Galvanometers* |
| **Flat field lens** | Focusing lens that enables the focusing of the beam into a small laser spot (typically 30 to 100 µm). This focusing increases the density of energy/power and enables marking. The different types of lens produce different spot size, working distance and marking area.<br><br>✍ *See Focal Distance and Marking field* |
| **Focal Distance** | Distance where the part must be placed for optimized marking performance. It varies according to the kind of flat field lens used.<br><br>✍ *See Depth of Field* |
| **Galvanometer (or scanner)** | Small motor with a mirror mounted on its shaft. This is the element that produces deflection of the beam. There are 2 galvos, 1 for X movement, 1 for Y movement.<br><br>✍ *See Deflection Mirror* |
| **Giant First Peak** | It is the first pulse the Laser produces after a waiting period (Q-switch closing the beam). This pulse has more energy than the following ones as the cristal |

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| | accumulated energy during the waiting period. This giant peak must be eliminated to avoid overmarking effects. This is performed through and eletronic procedure in the RF Generator (24 MHz)<br><br>✍ *See RF Generator* |
| **Lamp pumping and diode pumping** | There are different technologies used to excite the cristal and accumulate the energy. It can be done using lamps or diodes.<br><br>✍ *Refer to Lamp vs Diodes document* |
| **Marking field** | Area where travels the focused Laser spot to produce marking of the parts. Its size depends on the flat field lens which is used (up to diam 350 mm aprox.)<br><br>✍ *See Flat Field lens* |
| **Material annealing** | Surface marking without removal of material (no ablation of engraving). On some materials, it produces high contrast which increases the aesthetic quality of the mark (ex : steel, titanium, etc.) |
| **Monomode (LM or $TEM_{00}$)** | High Beam Quality : the beam has only one mode with both space and time coherence. High quality beam, small spot size on the part. Global power is limited (15 to 20 W on the TL400). It is produced using and iris in the resonator.<br><br>✍ *See Spatial Filter* |
| **Multimode (MM)** | Usual beam Quality : the beam includes several modes, which produces higher power (80W on TL400), but reduces the marking quality and increases the spot size. Used for large characters marking or engraving with depth. |
| **Nd:YAG Cristal** | Or Laser Rod. It is the heart of the system, where the excited atoms (Neodymium) are. YAG is the nature of |

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| | the cristal in which are inserted the Nd atoms. |
| **Optical Mode** | Defines the optical quality of the beam.<br><br>✍ *see Multimode / monomode* |
| **Positionning diode (aiming beam diode)** | Red Laser beam with low power. It is used to assist the operator to position the parts and the elements to mark. |
| **Pulse** | A pulse represents a single impact of the Laser on the part. It is characterized by an energy and a duration, which defines an instantaneous power (called peak power). These values depend on the repetition rate.<br><br>✍ *See Repetition rate* |
| **Q-switch** | Accousto-Optic element (cristal) used to produce the pulses of the beam. It is a cristal which, when excited by a HF signal (typically 24MHz), stops the beam in the resonator, thus enabling high energy storage in the laser rod. This energy is released in a pulse when interrupting this HF signal. The repetition rate is generated by regular interruptions of the HF signal at the requested rate. Q-switch is usually cooled down with water. |
| **Repetition Rate** | Number of pulses per second. For marking, the beam is used in pulsed mode and the repetition rate is software adjustable.<br><br>✍ *See pulse and Q-switch* |
| **Resonator** | Group of elements which are used to produce the Laser (Laser source). The extremities are the cavity mirror (rear mirror and output coupler). All elements must be perfectly aligned to optimize operation of the Laser. |
| **Safety Shutter** | Mechanical safety component included in the resonator. When closed, it stops the beam, disabling |

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| | any Laser emission for operator safety. It is usually linked to a security loop (interlock) to ensure safety on the workstation. |
| **Spatial Filter (iris)** | Mechanical component inserted in the Laser cavity to reduce beam diameter. It is used to configure the beam either in Low Mode (iris in, limited power) or Multi mode (iris out, full power), depending on the application.<br><br>✍ *See optical mode and monomode* |
| **Triggering module** | Electrical component placed in the Laser source which produces, when triggering the lamp, a high voltage pulse (20 kV) to trigger the lamp. |
| **Wavelength** | It defines the kind of beam and its color. Nd :YAG Lasers are 1064 nm (not visible). Visible radiations are 350 to 700 nm. UV is below 350 and Infrared is beyond 700. |