Printing Parameters

This table summarises printing parameters. Material-dependent parameters are red-colored. For each of them, values (default/min/max) in the table are related to a specific material, **Inconel 718**, and a specific printer, **EOSINT M280**.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Unit of measurement** | **Values** | | | **Mandatory?** |
| **Default** | **Min** | **Max** |
| Layer thickness | decimal | μm | 40 | 20 | 60 | YES |
| Laser beam diameter | decimal | μm | Variable (1) | 100 | 500 | NO |
| Material | string | n/a | Inconel 718 | -- | -- | YES |
| Printing Chamber Dimensions (build volume) | 3 decimals | mm x mm x mm | 250 | 250 | 325 | YES (2) |
| No-Print Zone | 6 decimals | mm x mm x mm x mm x mm x mm | (3) | (3) | (3) | YES (2) |
| Chamber Temperature | decimal | ºC | 20 | 20 | 100 | YES |
| Material Density | decimal | kg/m3 | 8220 | 2000 | 20000 | YES |
| Thermal expansion coefficient | decimal | m/ºC-1 | 1.29e-05 | 0.10e-05 | 22.0e-05 | YES |
| Thermal shrinkage | decimal | -- | -- | -- | -- | NO |
| Instantaneous Elastic Modulus (Young modulus) | decimal | Pa | 2.076e+11 | 0.650e+11 | 2.500e+11 | YES |
| Elastic Modulus at Infinite Time | decimal | -- | -- | -- | -- | NO |
| Poisson’s ratio | decimal | unitless | 0.29 | 0.20 | 0.50 | YES |
| Elastic viscosity | decimal | -- | -- | -- | -- | NO |
| Yield stress | decimal | Pa | 7.20e+08 | 2.00e+08 | 25.0e+08 | YES |
| Saturation stress | decimal | Pa | 8.2e+08 | -- | -- | YES (4) |
| Isotropic Hardening Law | string restricted to {linear,exponential} | n/a | -- | -- | -- | YES |
| Linear Isotropic Hardening Coefficient | decimal | MPa | 80 | -- | -- | YES (4) |
| Exp. Isotropic Hardening Coefficient | decimal | unitless | 120 | -- | -- | YES (4) |
| Kinematic hardening | decimal | -- | -- | -- | -- | NO |
| Plastic viscosity | decimal | -- | -- | -- | -- | NO |
| Critical Temperature | decimal | ºC | 800 | -- | -- | YES (4) |

NOTES:

* For EOSINT M280, it generally varies during the printing process. Anyway, it is not needed for the simulation.
* They are needed to check feasibility of the process, but not used within the simulation module.
* I have no idea of their values, but I think TRONRUD can shed some light on the question.
* I think these parameters are rare in the engineering community, their usage is more common within our community of computational solid mechanics. I have no idea of minimum and maximum values. I will discuss it with Michele. Anyway, an average user of the printer will likely not know their values and use the default ones.