

Abbreviations

- **2PP**: Two-photon polymerization
- **3DP**: 3D printing (Binder Jetting)
- **AJP**: Aerosol jet printing
- **BJT**: Binder jetting
- **DED**: Directed energy deposition
- **DIP**: Direct inkjet printing
- **DIW**: Direct ink writing
- **DLP**: Digital light processing
- **dSLM**: Direct selective laser melting
- **dSLS**: Direct selective laser sintering
- **EBM**: Electron beam melting
- **EDX**: Energy dispersive X-ray spectroscopy
- **FFF**: Fused filament fabrication
- **iSLM**: Indirect selective laser melting
- **iSLS**: Indirect selective laser sintering
- **LIS**: Laser-induced slip casting
- **LOM**: Laminated object manufacturing
- **LSD-print**: Layerwise slurry deposition print
- **MEX**: Material extrusion
- **MJT**: Material jetting
- **PBF**: Powder bed fusion
- **P-BJT**: Powder-based binder jetting
- **RC**: Robocasting
- **S-BJT**: Slurry-based binder jetting
- **SEM**: Scanning electron microscope
- **SHL**: Sheet lamination
- **SL**: Stereolithography
- **SLM**: Selective laser melting
- **SLS**: Selective laser sintering
- **VPP**: Vat photopolymerization

Additive Manufacturing (AM) Processes

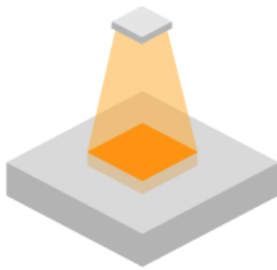
- **Direct AM Processes**: Material is applied only where needed.
- **Indirect AM Processes**: A layer of material is spread, and excess material is removed.
- **Single-Step AM**: Manufacturing in one step (rare for ceramics).
- **Multi-Step AM**: Manufacturing in multiple steps (common for ceramics).

AM Process Groups According to ISO/ASTM 52900

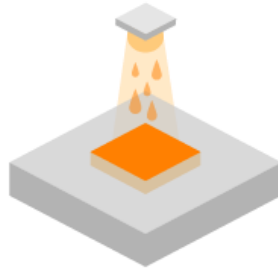
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Examples of AM Processes

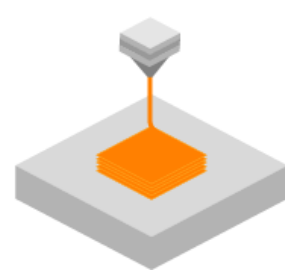
- **Vat Photopolymerization (VPP):** Photopolymeric molecules are connected by starting a reaction by the local application of a light source, High resolution AM technique
- **Material Jetting (MJT):** Layer-by-layer deposition of material droplets, high resolution but slow production.
- **Material Extrusion (MEX):** Material is extruded through a nozzle like in filament printers, cost-effective and environmentally friendly.
- **Sheet Lamination (SHL):** Cutting, stacking and bonding sheets of material, suitable for large parts.
- **Directed Energy Deposition (DED):** Material is melted and deposited using focused thermal energy, high production rate.
- **Powder Bed Fusion (PBF):** Starting with deposition of a powder layer, thermal energy fuses powder layer by layer, requires high temperatures.
- **Binder Jetting (BJT):** Liquid binder defines layer cross-sections for each deposited powder layer, suitable for large parts.



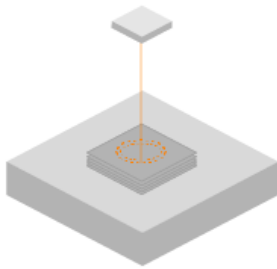
Vat Photopolymerization



Material Jetting



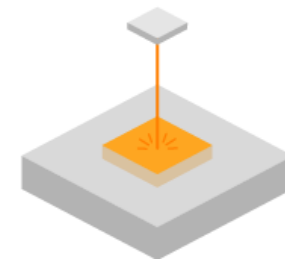
Material Extrusion



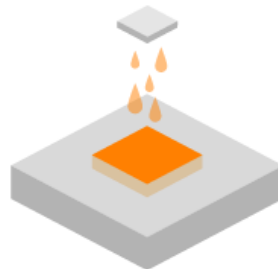
Sheet Lamination



Direct Energy Deposition



Powder Bed Fusion



Binder Jetting