Quick 3D
Your Single Manufacturing Platform

FREE ENGINEERING GUIDE

3D Printing Material Selection Guide

How to choose the right process and material for prototypes, tooling and end-use parts — from engineering plastics and ESD-safe grades to high-performance polymers and metals.

Inside this guide

1. Four questions to ask before choosing a material
2. The six industrial processes at a glance
3. Materials by requirement: strength, heat, chemicals, flame, static, flexibility, clarity and more
4. Understanding heat ratings
5. What to tell us when you request a quote

Quick 3D · 36, Jalan Serendah 26/41, Sekitar 26, 40400 Shah Alam, Selangor, Malaysia · +60 11-5629 2133 · sales@quick-3d.com · www.quick-3d.com

1. Four questions to ask first

Most material choices come down to what the part has to survive. Answer these four questions and the list of suitable materials gets short very quickly.

What does the part do?

A visual model, a functional prototype, a factory tool or an end-use part all need different things. Visual models need detail and finish; tools and end-use parts need strength, stiffness and durability.

What is it exposed to?

Heat, load, fuels and oils, cleaning chemicals, UV, static-sensitive electronics, food or skin contact. Each of these can rule materials in or out.

Does it need a certification?

Flame retardancy (for example UL94 V-0), flame, smoke and toxicity (FST) compliance, ESD protection, food contact or biocompatibility narrow the choice fastest.

How many, and how fast?

One part tomorrow points to FDM. A batch of repeatable nylon parts points to MJF or SLS. Higher volumes may suit urethane casting or production manufacturing.

2. The six industrial processes at a glance

Process	Best for	Example materials	Lead time from
FDM	Functional prototypes, jigs & fixtures, large parts	ABS, ASA, PC, PC-ABS, carbon-fibre nylon, ESD-safe grades, PEEK, PEKK, ULTEM™ PEI	1 day
SLA	Fine detail, smooth surfaces, clear parts, master patterns	Tough, rigid, clear, high-temperature, flame-retardant and ESD resins	3 days
SLS	Complex, support-free nylon parts and nested assemblies	PA11, PA12, glass- and carbon-filled nylon, PEEK 5100, TPU, polypropylene	7 days
MJF	Repeatable, isotropic nylon parts in batches	HP PA12, PA11, PA12 Glass Beads, TPU	7 days
PolyJet	Multi-colour, multi-material prototypes that look and feel real	VeroClear, Agilus rubber-like, Digital ABS Plus	7 days
Metal	High-strength parts with lattices or internal channels	Titanium Ti64, stainless steel 316L and 17-4 PH, aluminium AlSi10Mg and AL6061, Inconel 718 and 625, cobalt chrome, maraging steel, bronze and pure copper	7 days

Lead times are the fastest typical turnaround at Quick 3D; actual timing depends on part size, quantity and finishing.

3. Materials by requirement

You need…	Materials to consider	Notes

Strong, stiff and light	Carbon-fibre nylon and continuous carbon-fibre composites (FDM); glass- and carbon-filled nylon (SLS)	Popular for jigs, fixtures, brackets and end-of-arm tooling — often replacing machined aluminium tools.
Tough, general engineering	ABS, ASA, PC, PC-ABS (FDM); PA11, PA12 (SLS, MJF); Tough resin (SLA)	ASA also handles outdoor UV. PA12 from MJF gives consistent properties in every direction.
Heat resistance	Reinforced nylons; High Temp resin (SLA); PPS, PPSU/PPSF, ULTEM™ PEI 9085 and 1010, PEKK, PEEK (FDM); PEEK 5100 (SLS); metal	High Temp resin has very high HDT but is brittle. For parts that run hot all day, compare continuous use temperature.
Chemical resistance	PVDF, PPS, PEEK, PEKK (FDM); PEEK 5100 (SLS); Inconel and stainless steel (metal)	Used for parts exposed to fuels, oils and aggressive chemicals, such as in oil and gas equipment.
Flame retardant / FST	ULTEM™ PEI 9085; flame-retardant resin (SLA); UL94 V-0 Blue Card certified materials	ULTEM™ 9085 is FAA-approved for FST applications and meets FAR 25.853 and OSU 65/65.
ESD-safe (static-dissipative)	ABS-ESD7, PETG-ESD, PA612-ESD (FDM); ESD Resin (SLA)	For jigs, fixtures, trays and enclosures that touch or sit near static-sensitive electronics.
Flexible / rubber-like	TPU (SLS, MJF); Agilus rubber-like materials (PolyJet); Silicone 40A resin (SLA)	PolyJet can combine rigid and rubber-like materials in one print, with set Shore A hardness values.
Clips & snap-fits	PA11, PA12, polypropylene (SLS / MJF); nylon, PETG, ABS (FDM); Tough 1500 and Durable resins (SLA)	PA11 is the most forgiving for snap-fits used many times. Standard rigid resins are too brittle.
Clear / transparent	Clear resin (SLA); VeroClear (PolyJet)	Sanding, polishing and clear-coating give glass-like clarity — useful for fluid-flow visualisation.
Fine detail, smooth finish	High-detail and standard resins (SLA); PolyJet photopolymers	SLA gives the smoothest surfaces of the plastic processes, with an injection-moulded look.
Biocompatibility	ISO 10993 biocompatible materials (available on request)	Tell us the application; we recommend a material and share its documentation.
Food-grade moulds	Food-grade silicone moulds made from 3D printed masters	For confectionery, chocolate and F&B products. See our food-grade moulds service.
Metal strength	Titanium Ti64, stainless steel 316L and 17-4 PH, aluminium AlSi10Mg and AL6061, Inconel 718 and 625, cobalt chrome, maraging steel, bronze and pure copper	For lightweight, high-strength, heat- or corrosion-resistant parts with complex geometry.

Every material comes with technical and safety data sheets (TDS and SDS), so you can confirm properties before you order. Over 500 industrial materials are available.

4. Understanding heat ratings

Heat deflection temperature (HDT)

The temperature at which a standard test bar bends by a set amount under a set load. HDT is quoted at different loads (commonly 0.45 MPa and 1.8 MPa), so compare like with like.

Glass transition (Tg)

The point where an amorphous plastic changes from rigid to rubbery. Above Tg, stiffness drops sharply.

Continuous use temperature

How hot a material can run for long periods without degrading. Usually lower than HDT, and the better guide for parts that stay hot all day.

Heat resistance ≠ flame retardancy

A heat-resistant part keeps its shape when hot. A flame-retardant part resists burning and self-extinguishes (for example UL94 V-0). Some materials do both; many do only one.

5. What to tell us when you request a quote

- Your 3D file (STEP preferred) and any 2D drawing with critical dimensions and tolerances
- Quantity, and when you need the parts
- The material — or simply what the part must do: heat, load, chemicals, flexibility, food contact, ESD protection
- Any certification the part must meet
- The finish you need

Not sure which material fits? Describe the application and our engineers will recommend a process and material. We sign NDAs before you share designs.

Get a material recommendation and quote

Send your CAD file, drawing or a sample part to sales@quick-3d.com, WhatsApp +60 11-5629 2133, or visit quick-3d.com/contact-us.

More free guides: quick-3d.com/blog · 3D printing glossary

ULTEM™ is a trademark of SABIC. All other product names are trademarks of their respective owners. Material properties vary by grade and process; always confirm suitability for your application using the material's technical data sheet. © 2026 Quick 3D (Quick ED Solutions & Services Sdn. Bhd.)