

Material Properties by Manufacturing Process

CNC Machining

Aluminum 6061

Tensile Strength (MPa): 290
Flexural Modulus (GPa): 68.9
Impact Strength (J/m): 35
Max Temp (°C): 150
Chemical Resistance: Moderate
Description: Lightweight, easily machinable, corrosion-resistant

Stainless Steel 304

Tensile Strength (MPa): 505
Flexural Modulus (GPa): 193
Impact Strength (J/m): 200
Max Temp (°C): 870
Chemical Resistance: Excellent
Description: High strength, excellent corrosion resistance

Brass

Tensile Strength (MPa): 350
Flexural Modulus (GPa): 97
Impact Strength (J/m): 100
Max Temp (°C): 200
Chemical Resistance: Moderate
Description: Malleable, aesthetically appealing, corrosion-resistant

Delrin (Acetal)

Tensile Strength (MPa): 70
Flexural Modulus (GPa): 2.9
Impact Strength (J/m): 120
Max Temp (°C): 110
Chemical Resistance: Good
Description: Low friction, good dimensional stability

Titanium (Grade 5)

Tensile Strength (MPa): 900
Flexural Modulus (GPa): 113
Impact Strength (J/m): 55
Max Temp (°C): 400
Chemical Resistance: Excellent
Description: High strength-to-weight ratio, corrosion-resistant

Sheet Metal

Aluminum 5052

Tensile Strength (MPa): 193
Max Temp (°C): 150
Chemical Resistance: Good
Description: Excellent formability, corrosion-resistant

Stainless Steel 304

Material Properties by Manufacturing Process

Tensile Strength (MPa): 505
Max Temp (°C): 870
Chemical Resistance: Excellent
Description: Durable, strong, corrosion-resistant

Mild Steel (CRS)

Tensile Strength (MPa): 370
Max Temp (°C): 540
Chemical Resistance: Poor
Description: Low-cost, easy to form and weld

Galvanized Steel

Tensile Strength (MPa): 300
Max Temp (°C): 400
Chemical Resistance: Good
Description: Zinc-coated for corrosion resistance

Tooling

Tool Steel (D2, A2, H13)

Tensile Strength (MPa): 700-1500
Max Temp (°C): 500-600
Description: Very hard, wear-resistant, ideal for molds and dies

Aluminum 7075

Tensile Strength (MPa): 570
Max Temp (°C): 150
Description: High strength, lightweight, often used for prototype tools

P20 Tool Steel

Tensile Strength (MPa): 950
Max Temp (°C): 550
Description: Pre-hardened for plastic injection molding tools

3D Printing

PLA

Tensile Strength (MPa): 60
Flexural Modulus (GPa): 3.5
Impact Strength (J/m): 16
Max Temp (°C): 60
Chemical Resistance: Poor
Description: Easy to print, biodegradable

ABS

Tensile Strength (MPa): 40
Flexural Modulus (GPa): 2.1
Impact Strength (J/m): 200
Max Temp (°C): 80
Chemical Resistance: Poor
Description: Tough, moderate temperature resistance

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PETG

Tensile Strength (MPa): 50
Flexural Modulus (GPa): 2.0
Impact Strength (J/m): 100
Max Temp (°C): 85
Chemical Resistance: Good
Description: Good chemical resistance, flexible

Nylon

Tensile Strength (MPa): 75
Flexural Modulus (GPa): 2.7
Impact Strength (J/m): 100
Max Temp (°C): 120
Chemical Resistance: Moderate
Description: Strong, wear-resistant

Resin (SLA/DLP)

Tensile Strength (MPa): 25-65
Flexural Modulus (GPa): 2.5-4
Impact Strength (J/m): Varies
Max Temp (°C): 50-80
Chemical Resistance: Varies
Description: High detail, brittle depending on type

Injection Molding

ABS

Tensile Strength (MPa): 40
Max Temp (°C): 80
Chemical Resistance: Poor
Description: Durable, good surface finish

Polypropylene (PP)

Tensile Strength (MPa): 30-40
Max Temp (°C): 100
Chemical Resistance: Excellent
Description: Flexible, fatigue-resistant

Polycarbonate (PC)

Tensile Strength (MPa): 70
Max Temp (°C): 135
Chemical Resistance: Moderate
Description: Extremely impact-resistant

Nylon (PA6, PA66)

Tensile Strength (MPa): 75-90
Max Temp (°C): 120
Chemical Resistance: Moderate
Description: Tough, absorbs moisture

TPU

Tensile Strength (MPa): 30-50

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Max Temp (°C): 80
Chemical Resistance: Good
Description: Flexible, rubber-like

PEEK

Tensile Strength (MPa): 90-100
Max Temp (°C): 260
Chemical Resistance: Excellent
Description: High-performance polymer for harsh environments

Aluminum Extrusion

Aluminum 6061

Tensile Strength (MPa): 290
Description: Most common, versatile, moderate strength, good corrosion resistance

Aluminum 6063

Tensile Strength (MPa): 190
Description: Better surface finish, ideal for decorative architectural applications

Urethane Casting

Polyurethane (Rigid)

Shore Hardness: 70D-90D
Tensile Strength (MPa): 30-70
Max Temp (°C): 65-80
Description: Simulates injection-molded plastics like ABS or PP

Polyurethane (Flexible)

Shore Hardness: 30A-80A
Tensile Strength (MPa): 2-10
Max Temp (°C): 50-60
Description: Rubber-like properties, good tear strength

Silicone Rubber

Shore Hardness: 20A-60A
Tensile Strength (MPa): 3-8
Max Temp (°C): 200
Description: Heat-resistant, flexible, ideal for medical or mold-making applications

Die Casting

Aluminum (A380)

Tensile Strength (MPa): 310
Max Temp (°C): 240
Description: Lightweight, good mechanical properties, corrosion-resistant

Zinc (Zamak 3, 5)

Tensile Strength (MPa): 270-320
Max Temp (°C): 150
Description: Highly detailed castings, economical, good surface finish

Magnesium (AZ91D)

Material Properties by Manufacturing Process

Tensile Strength (MPa): 230
Max Temp (°C): 220
Description: Extremely lightweight, good strength-to-weight ratio