

Plastic and Rubber

Characteristics item	Thermoplastics resin						
	FRP	Polyacetal	Polypropylene	Nylon 6	Nylon 66	Polycarbonate	ABS
Specific gravity	1.5 - 2.1	1.42	0.9 - 1.04	1.12 - 1.14	1.13 - 1.15	1.20	1.04 - 1.07
Hardness (Rockwell)	M70 - 120	M94	R80 - 110	R119	R100 - 118	M78	R90 - 115
Tensile strength (N/mm ²)	98 - 200	69	29 - 38	69 - 81	75 - 82	64 - 79	35 - 59
Compression strength (N/mm ²)	98 - 200	130	38 - 55	89	110	76	18 - 56
Izod impact value (kJ/m ²)	11 - 100	11	2.7 - 10.9	8	10	90	15 - 50
Bending strength (N/mm ²)	69 - 270	98	41 - 55	120	120	94	49 - 88
Heat resistance temperature (°C)	150 - 180	90 - 100	120 - 130	80 - 120	80 - 150	120	60 - 95
Flame resistance	Combustible	Frame resistance	Slow-burning	Extremely delayed combustion	Extremely delayed combustion	Self-extinguishing	Slow-burning
Weather Resistance	Slight change in color	Slight change in color	Cracks	Slight change in color	Slight change in color	Excellent	Change in color
Weak Acid Resistance	Good	Minor effect	Large resistance	Endure	Endure	Good	Good
Strong Acid Resistance	Minor effect	Effect	Endure other than oxidizing acid	Effect	Effect	Minor effect	Minor effect
Weak Alkali Resistance	Slight change	Minor effect	Extreme resistance	Unchanged	Unchanged	Endure	Unchanged
Strong Alkali Resistance	Effect	Minor effect	Extreme resistance	Unchanged	Unchanged	Effect	Unchanged
Organic Solvent Resistance	Slight change	Has effect	Endure below 80°C	Has effect	Has effect	Effect	Effect

Characteristics item	Thermosetting resin		
	Phenol Resin	Urea resin	Melamine resin
Specific gravity	1.36 - 1.42	1.5	1.47 - 1.52
Hardness (Rockwell)	M110 - 116	M110 - 120	M110 - M125
Tensile strength (N/mm ²)	41 - 52	38 - 69	49 - 90
Compression strength (N/mm ²)	180 - 210	180 - 260	170 - 294
Izod impact value (kJ/m ²)	1.5 - 5	1.5 - 3.3	1.5 - 3.3
Bending strength (N/mm ²)	62 - 75	55 - 110	69 - 110
Heat resistance temperature (°C)	150 - 180	77	100
Flame resistance	Extremely delayed combustion	Extremely delayed combustion	Self-extinguishing
Weather Resistance	Gradual discoloration	Discoloration to gray	Gradual discoloration
Weak Acid Resistance	Good	Slight change	Unchanged
Strong Acid Resistance	Good except effect of oxidizing acid	Erosion on surface	Effect
Weak Alkali Resistance	Good	Slight change	Unchanged
Strong Alkali Resistance	Effect of hot strength alkaline	Decomposition	Effect
Organic Solvent Resistance	Has effect	Slight change	Has effect

Characteristics item	Rubber					
	Natural rubber (NR)	Synthetic natural rubber (IR)	Styrene rubber (SBR)	Butadiene rubber (BR)	Chloroprene rubber (CR)	Butyl rubber (IIR)
Specific gravity	0.92	0.92 - 0.93	0.93 - 0.94	0.91 - 0.94	1.15 - 1.25	0.91 - 0.93
Tensile strength (N/mm ²)	3 - 30	5 - 20	5 - 20	2 - 20	5 - 25	5 - 15
Extension (%)	100 - 1000	100 - 1000	100 - 800	100 - 800	100 - 1000	100 - 800
Impact resilience	Excellent	Excellent	Excellent	Excellent	Excellent	OK
Tensile	Excellent	Good	OK	Good	Good	Good
Abrasion resistance	Excellent	Excellent	Excellent	Excellent	Good	Good
Flex-crack resistance	Excellent	Excellent	Good	OK	Good	Excellent
Allowable Operating Temperature (°C)	-70 - 120	-70 - 120	-60 - 120	-73 - 120	-55 - 120	-55 - 120
Aging Resistance	Good	Good	Good	Good	Excellent	Excellent
Light resistance	Good	Good	Good	Good	Good	Excellent
Electrical insulation (Ω·cm)	10 ¹⁰ - 10 ¹⁵	10 ¹⁰ - 10 ¹⁵	10 ¹⁰ - 10 ¹⁵	10 ¹⁴ - 10 ¹⁵	10 ¹⁰ - 10 ¹²	10 ¹⁶ - 10 ¹⁸
Gasoline / Gas Oil	Impossible	Impossible	Impossible	Impossible	Good	Impossible
Benzene / Toluene	Impossible	Impossible	Impossible	Impossible	Impossible	OK
Alcohol	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
Ether	Impossible	Impossible	Impossible	Impossible	Impossible	OK
Ethyl Acetate	Impossible	Impossible	Impossible	Impossible	Impossible	Excellent
Water	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
Organic Acid	Impossible	Impossible	Impossible	Impossible	Impossible	OK
High temperature inorganic acid	Impossible	Impossible	Impossible	Impossible	Good	Excellent
Low temperature inorganic acid	Good	Good	Good	Good	Excellent	Excellent
Weak Alkali Resistance	Good	Good	Good	Good	Excellent	Excellent
Strong Alkali Resistance	Good	Good	Good	Good	Excellent	Excellent

Characteristics item	Rubber				
	Nitrile rubber (NBR)	Propylene rubber (EPDM)	Urethane rubber (U)	Silicone rubber (Si)	Fluoro-rubber (FPM)
Specific gravity	1.00 - 1.20	0.86 - 0.87	1.00 - 1.30	0.95 - 0.98	1.80 - 1.82
Tensile strength (N/mm ²)	5 - 25	5 - 20	20 - 45	4 - 10	7 - 20
Extension (%)	100 - 800	100 - 800	300 - 800	50 - 590	100 - 500
Impact resilience	Good	Good	Excellent	Excellent	OK
Tensile	Good	OK	Excellent	Impossible	Good
Abrasion resistance	Excellent	Good	Excellent	Impossible	Excellent
Flex-crack resistance	Good	Good	Excellent	Impossible	Good
Allowable Operating Temperature (°C)	-20 - 120	-70 - 120	-70 - 120	-70 - 120	-70 - 120
Aging Resistance	Excellent	Excellent	Good	Excellent	Excellent
Light resistance	Good	Excellent	Excellent	Excellent	Excellent
Electrical insulation (Ω·cm)	10 ⁸ - 10 ¹⁰	10 ¹² - 10 ¹⁵	10 ⁹ - 10 ¹²	10 ¹¹ - 10 ¹⁵	10 ¹⁵ - 10 ¹⁸
Gasoline / Gas Oil	Excellent	Impossible	Excellent	Impossible	Excellent
Benzene / Toluene	Impossible	OK	Impossible	Impossible - Possible	Excellent
Alcohol	Excellent	Excellent	OK	Excellent	Excellent
Ether	Impossible	Good	Impossible	Impossible	Impossible
Ethyl Acetate	Impossible	Excellent	OK	Good	Impossible
Water	Excellent	Excellent	OK	Good	Excellent
Organic Acid	Impossible	Impossible	Impossible	Impossible	Impossible
High temperature inorganic acid	OK	Good	Impossible	OK	Excellent
Low temperature inorganic acid	Good	Excellent	OK	Good	Excellent
Weak Alkali Resistance	Good	Excellent	Impossible	Excellent	OK
Strong Alkali Resistance	Good	Excellent	Impossible	Excellent	Impossible