

Production processes (unit processes) for carbon fiber reinforced plastics (CFRP)

Region	Name	Treatment, standards, routes	Type of process	Source of data
GLO	Carbon fiber fabric (125g/m ² ; banded)	Fiber areal weight: 125 g/m ² ; 5% epoxy binder individual production process, at plant -	unit process	measured
GLO	Carbon fiber Non-Crimp-Fabric (NCF) (250g/m ² ; banded)	Fiber areal weight: 250 g/m ² ; 5% epoxy binder; 1.6% sewing thread individual production process, at plant -	unit process	measured
GLO	Carbon fiber Non-Crimp-Fabric (NCF) (250g/m ² ; not banded)	Fiber areal weight: 250 g/m ² ; not banded; 1.6% sewing thread individual production process, at plant -	unit process	measured
GLO	Carbon fiber Non-Crimp-Fabric (NCF) (500g/m ² ; banded)	Fiber areal weight: 500 g/m ² ; 5% epoxy binder; 1.6% sewing thread individual production process, at plant -	unit process	measured
GLO	Carbon fiber Non-Crimp-Fabric (NCF) (500g/m ² ; not banded)	Fiber areal weight: 500 g/m ² ; not banded; 1.6% sewing thread individual production process, at plant -	unit process	measured
GLO	Carbon fiber fabric (125g/m ² ; not banded)	Fiber areal weight: 125 g/m ² ; not banded individual production process, at plant -	unit process	measured
GLO	Carbon fiber fabric (250g/m ² ; banded)	Fiber areal weight: 250 g/m ² ; 5% epoxy binder individual production process, at plant -	unit process	measured
GLO	Carbon fiber fabric (250g/m ² ; not banded)	Fiber areal weight: 250 g/m ² ; not banded individual production process, at plant -	unit process	measured
GLO	Carbon fiber organo sheet PA6 (electric heated; low cuttings)	Electric heated heating press; fiber volume content: 50%; matrix: PA6; low organo sheet cuttings (20%) individual production process, at plant -	unit process	measured
GLO	Carbon fiber organo sheet PA6 (oil heated; low cuttings)	Oil heated heating press; fiber volume content: 50%; matrix: PA6; average organo sheet cuttings (40%) individual production process, at plant -	unit process	measured
GLO	Carbon fiber organo sheet PA6 (electric heated; average cuttings)	Electric heated heating press; fiber volume content: 50%; matrix: PA6; average organo sheet cuttings (40%) individual production process, at plant -	unit process	measured
GLO	Carbon fiber organo sheet PA6 (oil heated; average cuttings)	Electric heated heating press; fiber volume content: 50%; matrix: PA6; low organo sheet cuttings (20%) individual production process, at plant -	unit process	measured
GLO	Carbon fiber organo sheet PP (electric heated; low cuttings)	Electric heated heating press; fiber volume content: 50%; matrix: PP; low organo sheet cuttings (20%) individual production process, at plant -	unit process	measured
GLO	Carbon fiber organo sheet PP (oil heated; low cuttings)	Oil heated heating press; fiber volume content: 50%; matrix: PP; low organo sheet cuttings (20%) individual production process, at plant -	unit process	measured
GLO	Carbon fiber organo sheet PP (electric heated; average cuttings)	Oil heated heating press; fiber volume content: 50%; matrix: PA6; low organo sheet cuttings (20%) individual production process, at plant -	unit process	measured
GLO	Carbon fiber organo sheet PP (oil heated; average cuttings)	Oil heated heating press; fiber volume content: 50%; matrix: PP; average organo sheet cuttings (40%) individual production process, at plant -	unit process	measured
GLO	Carbon fiber thermoplastic tape PA6 (electric heated)	Electric heated heating press; fiber volume content: 50%; matrix: PA6 individual production process, at plant -	unit process	measured
GLO	Carbon fiber thermoplastic tape PA6 (oil heated)	Oil heated heating press; fiber volume content: 50%; matrix: PA6 individual production process, at plant -	unit process	measured
GLO	Carbon fiber thermoplastic tape PP (electric heated)	Electric heated heating press; fiber volume content: 50%; matrix: PP individual production process, at plant -	unit process	measured
GLO	Carbon fiber thermoplastic tape PP (oil heated)	Oil heated heating press; fiber volume content: 50%; matrix: PP individual production process, at plant -	unit process	measured
GLO	Braiding (12k; min. lay-up rate)	12k roving; fiber angle ~45°; core diameter: ~30mm; carbon fiber remaining on the bobbins 5% individual production process, at plant -	unit process	measured
GLO	Braiding (12k; max. lay-up rate)	12k roving; fiber angle ~75°; core diameter: ~150mm; carbon fiber remaining on the bobbins 5% individual production process, at plant -	unit process	measured
GLO	Braiding (24k; min. lay-up rate)	24k roving; fiber angle ~45°; core diameter: ~35mm; carbon fiber remaining on the bobbins 5% individual production process, at plant -	unit process	measured
GLO	Braiding (24k; max. lay-up rate)	24k roving; fiber angle ~75°; core diameter: ~150mm; carbon fiber remaining on the bobbins 5% individual production process, at plant -	unit process	measured
GLO	CFRP milling (low cuttings)	Low cuttings 5% individual production process, at plant -	unit process	measured
GLO	CFRP milling (average cuttings)	Average cuttings 10% individual production process, at plant -	unit process	measured
GLO	CFRP milling (high cuttings)	High cuttings 20% individual production process, at plant -	unit process	measured
GLO	NCF Preforming: Infrared (IR) heating and press forming (small parts; low cuttings)	Part size: ~0.5m ² ; theoretical preform thickness: 1mm; low preform cuttings (20%) individual production process, at plant -	unit process	measured
GLO	NCF Preforming: Infrared (IR) heating and press forming (large parts; low cuttings)	Part size: ~1.5m ² ; theoretical preform thickness: 1.5mm; low preform cuttings (20%) individual production process, at plant -	unit process	measured
GLO	NCF Preforming: Infrared (IR) heating and press forming (small parts; average cuttings)	Part size: ~0.5m ² ; theoretical preform thickness: 1mm; average preform cuttings (40%) individual production process, at plant -	unit process	measured
GLO	NCF Preforming: Infrared (IR) Heating and press forming (big parts, average cuttings)	Part size: ~1.5m ² ; theoretical preform thickness: 1.5mm; average preform cuttings (40%) individual production process, at plant -	unit process	measured
GLO	NCF Preforming: Infrared (IR) heating and press forming (small parts; high cuttings)	Part size: ~0.5m ² ; theoretical preform thickness: 1mm; high preform cuttings (60%) individual production process, at plant -	unit process	measured
GLO	NCF Preforming: Infrared (IR) heating and press forming (large parts; high cuttings)	Part size: ~1.5m ² ; theoretical preform thickness: 1.5mm; high preform cuttings (60%) individual production process, at plant -	unit process	measured
GLO	Pultrusion (55% FVC; epoxy; open bath impregnation)	Open bath pultrusion; fiber volume content: 55%; cutting waste matrix: 7.5%; carbon fiber remaining on the bobbins: 5% individual production process, at plant -	unit process	measured
GLO	Pultrusion (65% FVC; epoxy; open bath impregnation)	Open bath pultrusion; fiber volume content: 65%; cutting waste matrix: 7.5%; carbon fiber remaining on the bobbins: 5% individual production process, at plant -	unit process	measured
GLO	Pultrusion (55% FVC; PU, polyurethane; low pressure injection)	Closed pultrusion; fiber volume content: 55%; carbon fiber remaining on the bobbins: 5%; injection device is not included and has to be modelled separately individual production process, at plant -	unit process	measured
GLO	Injection device (low pressure)	Low pressure individual production process, at plant -	unit process	measured
GLO	Pultrusion (65% FVC; PU, polyurethane; low pressure injection)	Closed pultrusion; fiber volume content: 65%; carbon fiber remaining on the bobbins: 5%; injection device is not included and has to be modelled separately individual production process, at plant -	unit process	measured
GLO	Injection device (high pressure; curing time 10min; small and thin parts)	High pressure; curing time 10min; small and thin parts individual production process, at plant -	unit process	measured
GLO	Injection device (high pressure; curing time 5min; small and thin parts)	High pressure; curing time 5min; small and thin parts individual production process, at plant -	unit process	measured
GLO	Injection device (high pressure; curing time 10min; large and thick parts)	High pressure; curing time 10min; large and thick parts individual production process, at plant -	unit process	measured
GLO	Injection device (high pressure; curing time 5min; large and thick parts)	High pressure; curing time 5min; large and thick parts individual production process, at plant -	unit process	measured
GLO	Thermoplastic Automated Tape Laying (ATL) (small tape; small part)	Tape width: 50mm; part geometry ~ 0.5m ² ; low cuttings (5%) individual production process, at plant -	unit process	measured
GLO	Thermoplastic Automated Tape Laying (ATL) (small tape; large part)	Tape width: 50mm; part geometry ~ 1.5m ² ; low cuttings (5%) individual production process, at plant -	unit process	measured
GLO	Thermoplastic Automated Tape Laying (ATL) (wide tape; small part)	Tape width: 150mm; part geometry ~ 0.5m ² ; low cuttings (5%) individual production process, at plant -	unit process	measured
GLO	Thermoplastic Automated Tape Laying (ATL) (wide tape; large part)	Tape width: 150mm; part geometry ~ 1.5m ² ; low cuttings (5%) individual production process, at plant -	unit process	measured
GLO	Resin Transfer Molding (RTM) (curing time 10min; small and thin part)	Injection and curing time 10min; part geometry 0.5m ² ; thickness 2mm; injection device is not included and has to be modelled separately individual production process, at plant -	unit process	measured
GLO	Resin Transfer Molding (RTM) (curing time 5min; small and thin part)	Injection and curing time 5min; part geometry 0.5m ² ; thickness 2mm; injection device is not included and has to be modelled separately individual production process, at plant -	unit process	measured
GLO	Resin Transfer Molding (RTM) (curing time 10min; large and thick part)	Injection and curing time 10min; part geometry 1.5m ² ; thickness 3mm; injection device is not included and has to be modelled separately individual production process, at plant -	unit process	measured
GLO	Resin Transfer Molding (RTM) (curing time 5min; large and thick part)	Injection and curing time 5min; part geometry 1.5m ² ; thickness 3mm; injection device is not included and has to be modelled separately individual production process, at plant -	unit process	measured
GLO	Consolidation of thermoplastic sheets PA6 (electric heated)	Electric heated press; Matrix PA6 individual production process, at plant -	unit process	measured
GLO	Consolidation of thermoplastic sheets PA6 (oil heated)	Oil heated press; Matrix PA6 individual production process, at plant -	unit process	measured
GLO	Consolidation of thermoplastic sheets PP (electric heated)	Electric heated press; Matrix PP individual production process, at plant -	unit process	measured
GLO	Consolidation of thermoplastic sheets PP (oil heated)	Oil heated press; Matrix PP individual production process, at plant -	unit process	measured
GLO	Forming of thermoplastic sheets PA6: Infrared (IR) heating and press forming (small parts)	Part geometry 0.5m ² ; thickness 2mm; Matrix PA6 individual production process, at plant -	unit process	measured
GLO	Forming of thermoplastic sheets PA6: Infrared (IR) Heating and press forming (big/thick parts)	Part geometry 1.5m ² ; thickness 2mm; Matrix PA6 individual production process, at plant -	unit process	measured
GLO	Forming of thermoplastic sheets PP: Infrared (IR) heating and press forming (small parts)	Part geometry 0.5m ² ; thickness 2mm; Matrix PP individual production process, at plant -	unit process	measured
GLO	Forming of thermoplastic sheets PP: Infrared (IR) heating and press forming (large parts)	Part geometry 1.5m ² ; thickness 2mm; Matrix PP individual production process, at plant -	unit process	measured