



**CLEMSON  
COMPOSITES  
CENTER**

## Infrastructure Data Sheet



The **Clemson Composites Center** is a research, innovation and development facility with state-of-the-art equipment and infrastructure needed to develop, transform and commercialize cost-effective, efficient and sustainable technologies related to all aspects of composites and lightweight materials design, processing, manufacturing, characterization and testing.

### Research

Advanced research focuses across multiple disciplines, including CFRP composites, IIoT-enabled composites 4.0, multi-material manufacturing & joining, ultra-lightweight foams and composites informatic.

### Product Development

Product development with a systems approach, including lightweighting strategy analysis at vehicle level, benchmarking, and plant layout design and virtual manufacturing simulation.

### Manufacturing

Realize your product with our state-of-the-art manufacturing equipment, including manual, and automated injection, compression, forming and continuous processes.

### Testing

Validate your product with our material characterization testing and database generation, sub-assembly testing and validation, component testing, and mechanical property testing.

**Complete Path**  
*from concept to  
product launch:*

An investigative hub for  
fundamental **Research**

An engineering center for  
technology **Innovation**

A prototyping center for  
composites application  
**Development**

A teaching hub for  
distinctive workforce  
training and **Education**

## Vision

To be the premier and preferred innovation center in the country in transforming composites through the development of cost-effective and efficient yet sustainable technologies that benefit the four key sectors of education, industry, society, and the environment.

## Mission

To conduct basic and translational research; transform, develop, and rapidly transfer technologies and innovations so as to promote economic development in the state; and support Clemson University's vision to educate a highly skilled workforce.

## Contact

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## Address

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International Center for  
Automotive Research

4 Research Drive  
Greenville, SC 29607

## COMPOSITE PRODUCTION LAB

Core Technologies: HP-RTM, injection molding with MuCell, compression molding, wet compression molding, thermoforming and hybrid processes.

### 1000-Ton Hydraulic Press

Clamping force	800 kN
Mold opening force, max.	512 kN
Size of mold platens (h x v)	2500 mm x 1600 mm
Mold opening stroke	1000 mm
Mold height min	550 mm
Mold height max	900 mm
Max daylight	2000 mm
Hydraulic ejector - stroke	200 mm
Ejector force forward/backward	200 kN

### Injection Unit

Screw diameter	100 mm
Injection pressure	1445 bar
Stoke volume	1478 Cubic cm
Shot weight, PS	13050 g
Plasticizing rate max.	115 g/s
Nominal capacity of pump motor	110 kW
Installed heating capacity	43,07 kW
Adjustable barrel heating zones	6
Dry cycle number	600 1/h
Reservoir capacity	1250 l

### HP-RTM and Wet Compression Molding Doser

Nominal volumetric flow rate	8 l/min
Axial piston pump	Open circuit
Volume per revolution	6 cubic cm
High pressure filter	0.025 mm
Resin viscosity range	20 to 300 mpa*s
Measuring range (/min)	1-10 l/min
Max resin temperature	130 C
Compatible resin	Epoxy and poly-urethane

### IR Heater

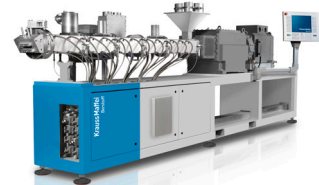
Heating area	1400 mm x 1200 mm
Max temperature	600c
Heating configuration	Top only

# Infrastructure Data

## COMPOUNDING / LAB SCALE INJECTION MOLDING LAB

### Twin Screw Extruder

Screw diameter	25mm, 2-lobe
Nominal Length	1150 mm
Actual L/D	46
Screw speed	1200 rpm
Max drive power	30 kWh



Twin Screw Extruder

### Lab Scale Injection Molding

Shot Volume	67 cubic cm
Max mold size	300 mm x 300mm x 300 mm
Clamping force	30 US tons
Platen type	SPI (std. bolt spacing)
Locating ring size	101.6mm
Special features	Mucell integrated and tie bar-less



Injection Molding Machine

## PRE- AND POST-COMPOSITE FABRICATION LAB

### Automated Fabric Cutting Table

Maximum work	2,300 Mm x 3500 mm
Compatible materials	Prepregs, dry fabric and thermoplastic composite sheets
Cutting head type	1" And 2" round tool and drag knife
Table surface	Urethane sheet or perforated masonite
Work & fabric fixturing	Vacuum suction
Software stack	Fibersim and auto nesting tool
Additional features	Heavy duty router head for plywood

### Other Equipment

Cold storage for prepreg fabrics	34 Cubic ft at -10c
Dry fabric storage racks	5' And 6' roll stand
Post processing workbench	Vacuum down draft table (48" x 108")
Hand tools for composite trimming	Pneumatic power tools



HP-RTM Doser

## CHEMICAL CHARACTERIZATION & MICRO IMAGING

Full suite of state of the art characterization equipment

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Differential Scanning Calorimeter (DSC)	TA instruments - DSC 250
Dynamic Mechanical Analyzer (DMA)	TA instruments - DDMAC 850
Thermogravimetric Analyzer (TGA)	TA instruments - TGA 550
Thermomechanical Analyzer (TMA)	TA instruments - Q400
Rheometer	TA instruments - DHR 2
Fourier Transform Infrared Microscope (FTIR)	Bruker Tensor II

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## MECHANICAL CHARACTERIZATION

Universal Testing Machine

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Load Cell Capacity	250 kN
Force Accuracy	Within 0.5% of the reading down to 1/100ths of the Load Cell Capacity
Alignment Accuracy	Specifications per AC7101 & AC7122
Strain Accuracy	Class B-1 or better (when supplied with an extensometer)
High Temperature Testing	Furnace capable of testing up to 350C
Testing Capabilities	Tensile (ASTM D3039 & D 638) Compression (ASTM D 6641) Flexural (ASTM D7264) V-Notched Iosipescu Shear Test (ASTM D5379) Flexural and Interlaminar Shear Bend Fixture Compression After Impact Anti-Buckling IITRI Compression Test Fixture

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