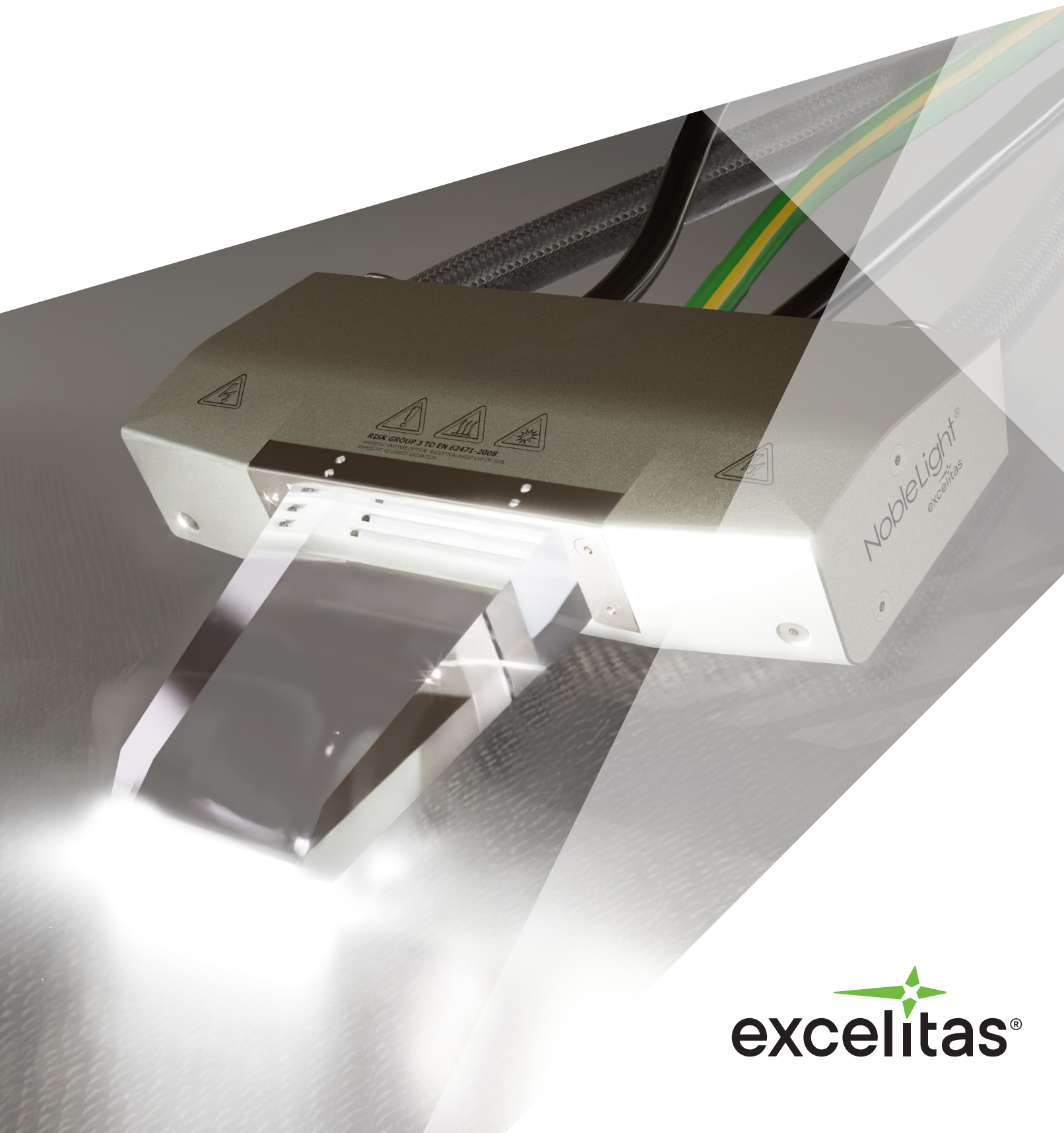
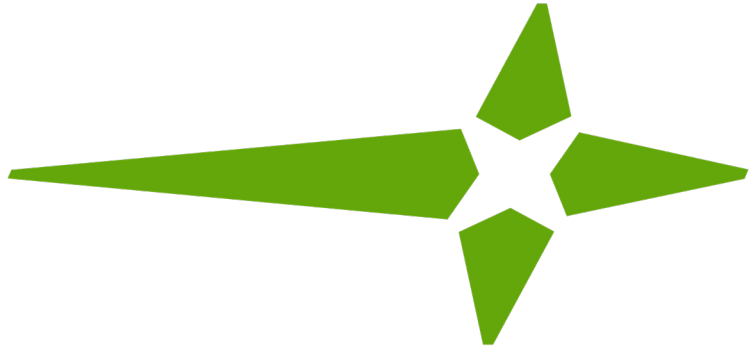


NobleLight®

humm3® Xenon Flash Heating Systems

Broadband pulsed system for composite heating and rapid thermal processing applications





About Excelitas®

Excelitas is a leading provider of advanced, life-enriching technologies that make a difference, serving global market leaders in the life sciences, advanced industrial, next-generation semiconductor and avionics end markets. Headquartered in Pittsburgh, PA, USA, Excelitas is an essential partner in the design, development and manufacture of advanced technologies, offering leading-edge innovation in sensing, detection, imaging, optics and specialty illumination for customers worldwide.

Excelitas is at the forefront of addressing many of the relevant mega trends impacting the world today, including precision medicine, industrial automation, artificial intelligence, and connected devices (IoT).



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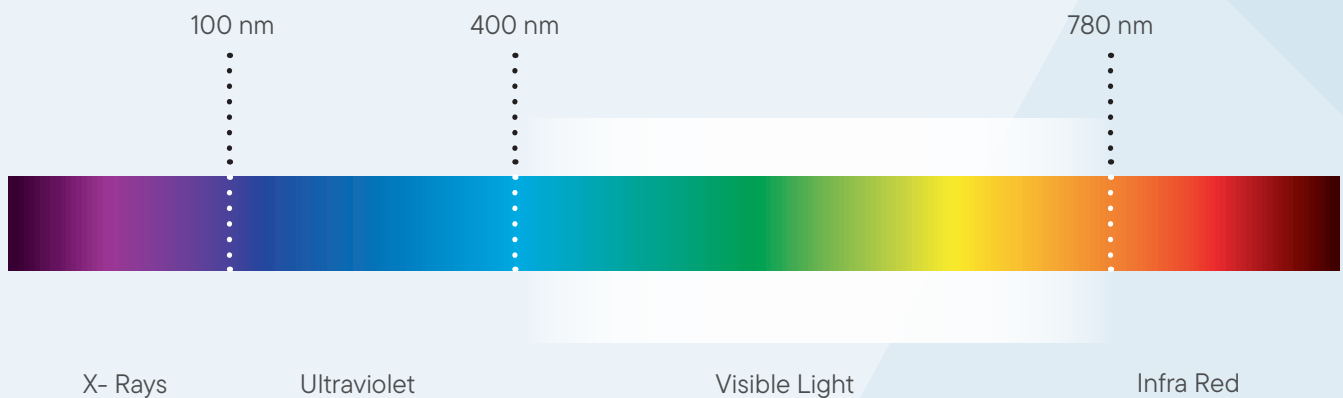
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The power of light enables the world around us

Excelitas develops “light” technologies across the electromagnetic spectrum that are integrated into equipment and manufacturing processes to change the world around us.

humm3® delivers rapid, controllable thermal processing with broad-spectrum energy from UV to IR, enabling applications from ceramic sintering to advanced thermal processing and composites heating. Its adaptable design provides efficient, targeted heating across diverse materials, supporting demanding R&D and manufacturing needs. humm3 accelerates innovation and enhances performance across all your thermal processing needs.

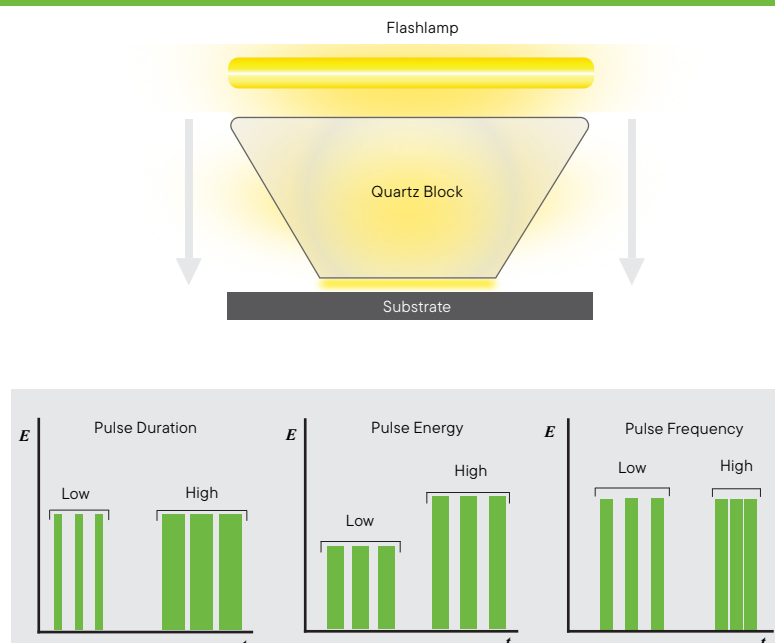


Powerful, Controllable, Pulsed Light Heating Solutions

The broadband output of humm3 is capable of heating a variety of materials without the safety risks of lasers.

humm3 systems have high peak powers and are fast to heat-up and cool-down, enabling rapid heating of complex dry fiber and thermoplastic composites, much faster than traditional infrared heaters. Flashlamp modules can also be combined for wider heating widths. Individual fiber tows can be given custom heating profiles, useful for automated fiber placement, automated tape layup and filament winding applications.

TWICE THE TEMPERATURE OF THE SUN IN LESS THAN A SECOND



The diagram illustrates the heating process. A Flashlamp at the top emits light through a trapezoidal Quartz Block, which focuses the light onto a Substrate below. The light is shown as a yellow glow. Below the diagram are three graphs showing energy (E) versus time (t) for different pulse parameters:

- Pulse Duration:** Shows two groups of pulses. The 'Low' group has narrow pulses, and the 'High' group has wider pulses.
- Pulse Energy:** Shows two groups of pulses. The 'Low' group has short pulses, and the 'High' group has taller pulses.
- Pulse Frequency:** Shows two groups of pulses. The 'Low' group has fewer pulses, and the 'High' group has more pulses.

Light from the flashlamp is directed to the substrate through a shaped lightguide.

The plasma reaches 12,000°K in milliseconds, twice the temperature of the sun.

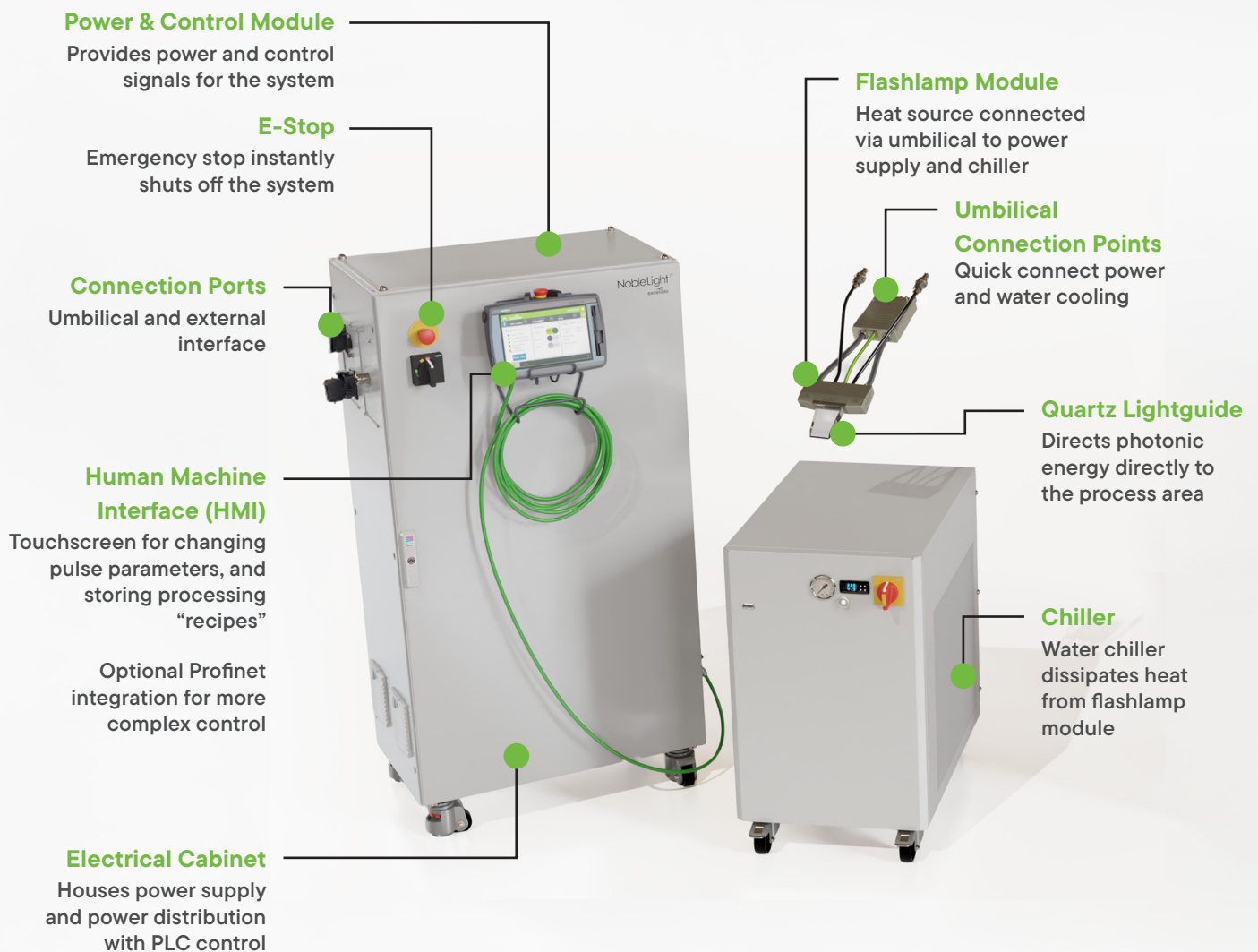
Heating is controlled by three individually controllable parameters: pulse duration, energy, and frequency. By adjusting these, users can set the optimized heating profile needed for their application.



System Features

hum3[®] Discovery

hum3 Discovery systems are ideally suited for academic research and industrial applications. Systems consist of three main components: a water-cooled flashlamp module, a power supply and control module with intuitive HMI, and a chiller module to cool the flashlamp and reduce latent heat into the substrate.



humm3[®] Enterprise

humm3 Enterprise is a customizable solution which can be designed for specific industrial applications. These systems consist of the same core components which can be scaled up and fully integrated for production environments. Ideal for robot or gantry installations.



Due to the bespoke nature of Enterprise systems, specifications are available on request after consultation.



Applications & Benefits



Diverse Material Heating

Broad spectral output heats a wide range of composites, including carbon and glass fiber, dry fibers, and thermoplastics. Transparent and white materials can also be heated effectively.



Powerful Output

Discovery units can heat substrates to $>1200^{\circ}\text{C}$ in static processes. Output energy controlled by varying pulse parameters.

Controllable energy during dynamic processes to ensure consistent heat for varying process speed.



Flexible Integration

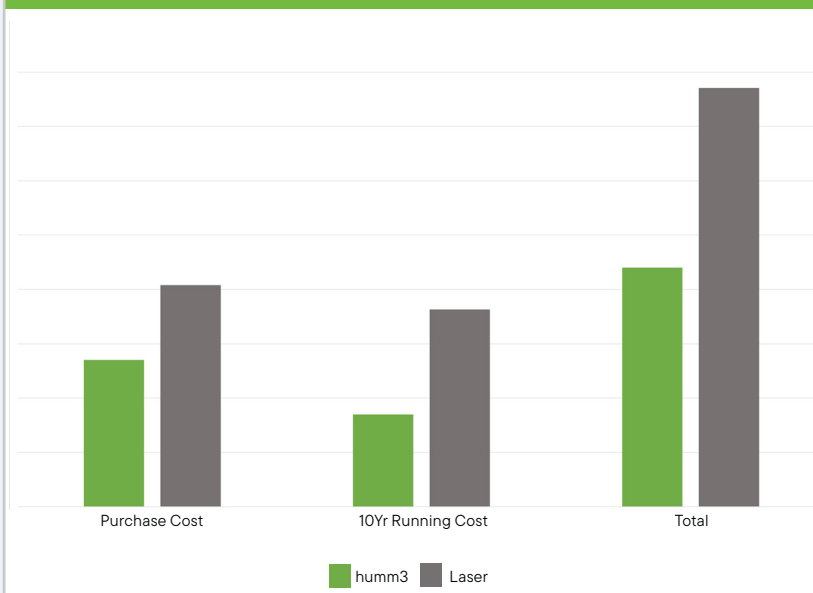
Optional Profinet upgrade for full PLC integration. Simple “plug & play” installation interfaces with existing equipment such as automated fiber placement cells.



Reduced Safety Burden

No enclosure required. As a visible light source, humm3 has less restrictive safety requirements in comparison to class 4 laser devices.

COST COMPARISON - HUMM3 DISCOVERY VS 2KW DIODE LASER WITH ENCLOSURE



With humm3, all critical elements are provided as standard. Every system arrives fully equipped and ready to perform.

In contrast, the headline price of diode laser systems can be misleading. Their initial cost typically does not include essential components such as:

- Laser safety enclosure
- Fume extraction system
- Water-to-air chiller
- Optics and beam-delivery hardware
- Certified laser safety officer

Scaling Up With humm3 Technology

Flexible flashlamp module designs enable scalable heated widths, multiple modules can create individually addressable heating zones for precise, localized control.



Quartz Lightguide Options

With a variety of standard quartz block geometries available, humm3 can be optimized to deliver application-specific heating profiles, validated in house by thermal simulation and ray tracing to ensure suitability in the process.

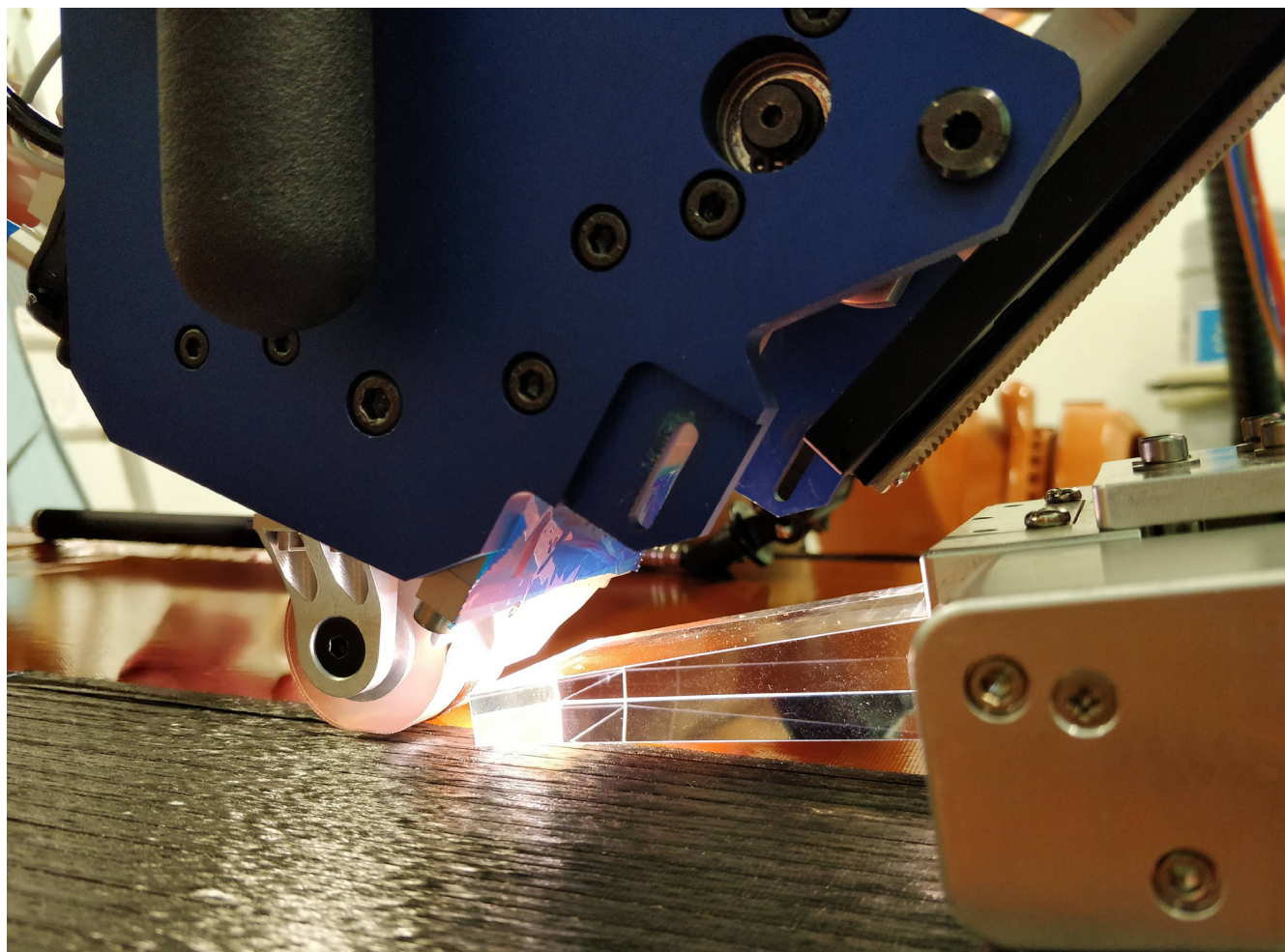


hum3 Discovery Dimensions

FLASHLAMP MODULE	
Module Size (Inch)	171 x 185 x 37.5 mm (6.73 X 7.28 X 1.48)
Radiation window (Inch)	25 - 52 mm (0.98 x 2.05)
Rated max electrical power	6.1kW
Mounting Hardware	4 x M4 holes on rear

FLASHLAMP CONTROL CABINET	
Flashlamp Control Cabinet Size (Inch)	1500 x 800 x 500 mm (59.05 x 31.49 x 19.68)
Control Cabinet Weight (Kg)	225 kg or 250 kg (Dependant on voltage variant)
Ambient Working Temperature	15 – 35 °C
Control Interfaces	HMI

WATER CHILLER	
Water Chiller Cabinet Size (Inch)	775 x 510 x 850 mm (30.51 x 20.07 x 33.46)
Water Chiller Cabinet Dry Weight (Kg)	125
Cooling Capacity	17L/Min
Water quality	Deionized Water



hum3 in action

humm3 Material Processing Guide

This table details indicative process temperatures for a variety of materials. Please note that exact parameters to reach these process temperatures are dependent on the desired application, environmental conditions and machinery constraints.

In addition to the above list, humm3 can process a wide variety of other high temperature materials such as oxide-oxide ceramic matrix composites (OxOx CMCs).

Excelitas has extensive material laboratory capabilities and can conduct material sample tests to validate compatibility or offer other support to help accelerate your work, for more information about how humm3 can work with your application, please contact us.

Application*	Material Group	Material Name	Material Type	Process Temperature °C
AFP / FW	Thermoplastic	CF-PEAK	Carbon Fiber Poly Ether Aryl Ketone	350
AFP	Thermoplastic	CF-LM-PAEK	Carbon Fiber Low Melt Poly Aryl Ether Ketone	280 – 350
AFP	Thermoplastic	CF-PA-12	Carbon Fiber Polyamide-12	178 – 210
AFP / FW	Thermoplastic	CF-PA-11	Carbon Fiber Polyamide-11	300
AFP / FW	Thermoplastic	GF-PA-6	Glass Fiber Polyamide-6	220 – 260
AFP	Thermoplastic	CF-PC	Carbon Fiber Reinforced Polycarbonate	140 – 307
AFP	Thermoplastic	CF-PEK	Carbon Fiber Reinforced Poly Ether Ketone	367
AFP / FW	Thermoplastic	CF-PEEK	Carbon Fiber Reinforced Poly Ether Ether Ketone	346 – 373
AFP	Thermoplastic	CF-PEEKK	Carbon Fiber Reinforced Poly Ether Ether Ketone Ketone	363
AFP	Thermoplastic	CF-PEKEKK	Carbon Reinforced Fiber Poly Ether Ketone Ether Ketone Ketone	377
AFP	Thermoplastic	CF-PEKK	Carbon Fiber Reinforced Poly Ether Ketone Ketone	330 – 375
AFP	Thermoplastic	GF-PET	Glass Fiber Reinforced Polyethyleneterephthalate	215 – 230
AFP	Thermoplastic	CF-PP	Carbon Fiber Polypropylene	190 – 205
AFP	Thermoplastic	CF-PPA	Carbon Fiber Polyphthalamide	310
AFP	Thermoplastic	CF-PPS	Carbon Fiber Reinforced Polyphenylene Sulfide	310 – 320
AFP	Thermoplastic	CF-PEI	Carbon Fiber Reinforced Poly Ether Imide	247 – 248
AFP	Thermoplastic	GF-rPET	Glass Fiber Reinforced Recycled Polyethylene Terephthalate	280 – 290
AFP	Thermoplastic	GF-HDPE	Glass Fiber Reinforced High Density Polyethylene	160 – 167
AFP	Dry Fiber	Dry Fiber	Toray Cetex TX 1100	170
AFP	Dry Fiber	Dry Fiber	Hexcel® HiTape®	170
AFP	Thermoset	CF-Uni Directional Prepreg	Carbon Fiber Reinforced Pre-impregnated Resin	60 – 80
AFP	Aramid	Polymid	Fiber Reinforcement	400
AFP / FW	Bio Composites	Various	Various - Dependent on Binder	Various
Sintering	Ceramics	Various	Various - Ceramic matrix composites	Various

*Automated Fiber Placement (AFP), Filament Winding (FW)

For more technical information please visit excelitas.com





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