



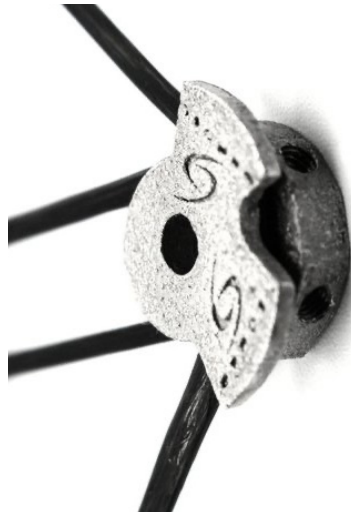

GRADEL
LIGHT WEIGHT



GRAM ®

SUSTAINABLE LIGHTWEIGHT DESIGN & PRODUCTION EQUIPMENT

Gradel Robotic **Additive Manufacturing**, endless filament wet winding equipment for 3D structures. Providing an array of applications in Space, Aircraft, Automotive, and Maritime.



GRAM [integrated solutions]

Final product design and fabrication

Customization for specific assembly processes

Installation and integration support

Operator training and certification

Ongoing technical support and troubleshooting

Software development and control systems

Turnkey solutions for complete assembly lines



Technical Data of GRAM[®] end-effector

Dimensions	1750 x 870 x 500mm
Unladen weight	137 kg
Weight fully loaded	230 kg
Winding speed	50 up to 600 mm/s
Materials	All type of fibers from 6k up to 50k or 4800 dtex
Resin systems	Mono-component epoxy resin system or 2 component epoxy resins Qualification possible on request
Processing Resin temperature	Room temperature up to 80°C (controlled)
Fiber bobbin max dimensions (mm)	Standard Core Ø76 / external Ø250 & height: 350mm
Fiber bobbin max weight	14 kg
Resin tank volume inside of GRAM	9 Ltr
Hardener tank volume inside of GRAM	4 Ltr
Number of fiber bobbins with onboard resin and hardener tank on board	1 up to 4 in parallel
Number of fiber bobbins with resin and hardener container on the 1st axis of the 6-axis robot	1 up to 6 in parallel
Resin tank volume (on 1st axis)	50 Ltr
Hardener tank volume (on 1st axis)	20 Ltr
GRAM-Robot	Recommended ABB, others on request
GRAM-Robot options:	X-rail or supplementary axis on request Multi-move controllers for two or more robots co-working
GRAM Control box	Pre-programmed process controls
Data logging	Process quality monitoring
I/O Interfacing / Communications	Following fieldbus options: - Ethercat - EtherNet/IP - Profinet RT
Dimensions	2200 x 800 x 500
Power supply	400V / 50 Hz / 32 A
Pneumatic power supply	6 bar (low consumption)
GRAM software	Plug in software modules for winding syntax and robot program for the lightweight structures to be wound.

Dr. Eng. David Macieira
[Head of GRADEL LW](#)
Tel : (+352) 39 00 44 21
Mobile: (+352) 671 155 105
Mail : d.macieira@gradel.lu

Brad Elsbury M.Sc LEED AP+
[Head of Business Development](#)
Tel : (+352) 661 61 61 60
Mail : b.elsbury@gradel.lu

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Information

[GRADEL LW SARL](#)
5, rue Bommel
ZAE Robert Steichen
L-4940 Hautcharage, Luxembourg
Tel.: (+352) 671 155 105
Internet: gradellw.com