

Multiple Coil Arrays

Model WE-LFA-6X300 · Extended Axial Field Generation for Materials Testing & Research · 1.1 m × 300 mm Working Volume

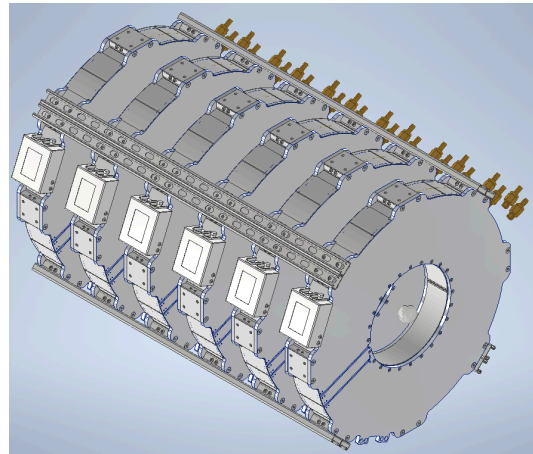


PRODUCTION READY · Six-coil linear array configuration · 302 mm clear bore access · Water-cooled for pulsed operation · Independent coil control for uniform fields or gradients · 10-minute duty cycle continuous pulsed capability

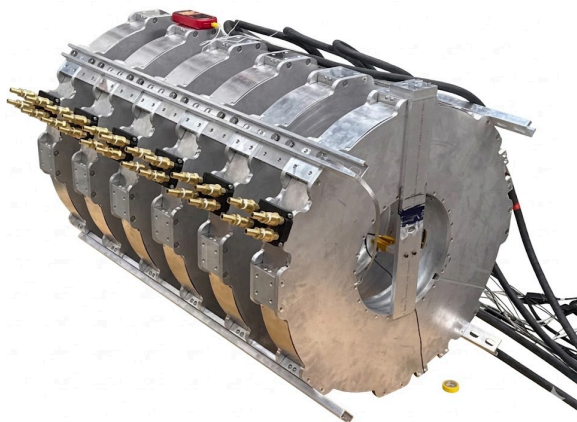
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Extended Axial Magnetic Field Generation

Woodruff Engineering's 6-Coil Linear Array System delivers precise, extended magnetic field control along a 1.1-meter working volume, making it ideally suited for applications requiring uniform axial fields or controlled field gradients over substantial sample lengths. Built around six water-cooled copper coil assemblies positioned at 200 mm intervals, the system generates highly stable magnetic fields within a 302 mm diameter bore, providing a versatile platform for materials testing, biological studies, and industrial process development where extended field exposure regions are essential.



High-Performance Pulsed Operation



Each coil assembly features heavy-gauge aluminum windings optimized for pulsed operation, with 100 mm axial length and 700 mm outer diameter providing excellent field uniformity while maintaining thermal stability under demanding duty cycles. The integrated water-cooling system enables continuous pulsed operation with 10-minute duty cycles, extracting heat efficiently from all six coil sections to prevent thermal drift during extended experimental runs. Independent current control for each coil allows researchers to configure uniform field zones, linear gradients, or custom field profiles tailored to specific experimental requirements, while the robust construction ensures repeatable performance across thousands of pulse cycles.

Industrial-Grade Mechanical Platform

A precision-machined aluminum support frame positions all six coils with tight tolerances to maintain field uniformity specifications, while the modular design simplifies installation, alignment, and future reconfiguration. The approximately 500 kg system weight reflects the substantial copper mass required for high-field pulsed performance, and the frame includes forklift pockets and crane lifting points for safe handling during installation. Typical applications include magnetic field exposure testing of electronic components, magnetocaloric materials research, magnetic nanoparticle synthesis and characterization, gradient-field biological studies, and industrial processes requiring extended uniform field zones where conventional single-coil solenoids cannot provide adequate sample coverage.

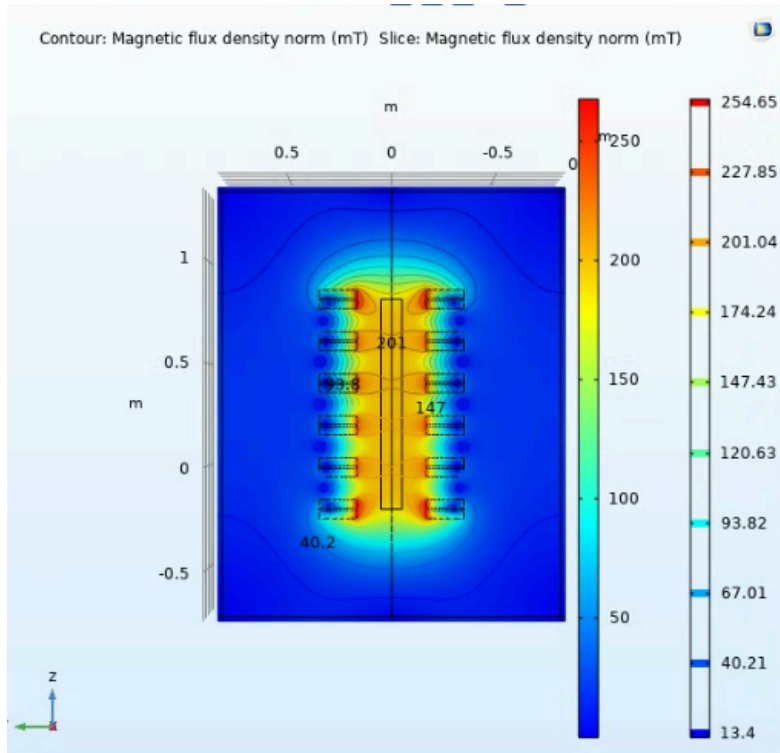
Woodruff Engineering Inc.

1003 Midtown Calle Central, Santa Fe, NM 87505, USA · woodruffeng.com

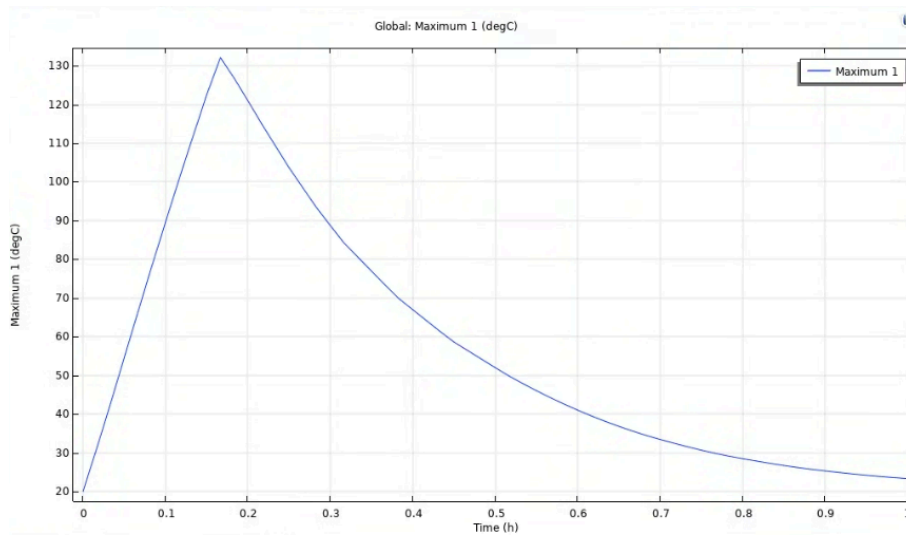
Production datasheet reviewed & accepted requirements.
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COMSOL simulations of multiple coil array

Magnetic modeling



Thermal modeling



COIL SPECIFICATIONS

Coil Configuration	Linear array (6 coils on single axis) <i>Axial field generation; uniform zone or gradient control</i>
Number of Coils	6 coils total <i>Independently controlled for field shaping</i>
Inner Diameter (ID)	302 mm (11.9 inches) <i>Clear bore for sample access</i>
Outer Diameter (OD)	700 mm (27.6 inches) <i>Excluding mounting structure</i>
Axial Length per Coil	100 mm (3.94 inches) <i>Compact design for tight spacing</i>
Total Array Length	1100 mm (43.3 inches) <i>End-to-end coil assembly</i>
Coil Separation	200 mm (7.87 inches) center-to-center <i>Optimized for extended uniform field region</i>
Conductor	Aluminum, kapton coated <i>Class H insulation (180°C rated)</i>
Turns per Coil	50-80 turns (configuration dependent) <i>Multi-layer precision winding</i>
DC Resistance	~0.15 Ω per coil <i>At 20°C; varies with winding configuration</i>
Field Coefficient	~8 mT per Ampere per coil <i>At center; combined field from array configuration</i>
Maximum Field (Pulsed)	Up to 200 mT (2000 Gauss) <i>10-minute duty cycle with water cooling</i>

POWER & CONTROL

Power Supply Type	6× programmable DC supplies <i>One per coil; independent control for field shaping</i>
Input Power	208/480 VAC 3-phase, 60 Hz <i>Total: 60 kW @ max pulsed operation</i>
Current Range	0 – 25 A DC per coil (typical) <i>Higher current options available for increased field</i>
Current Regulation	±0.1% stability <i>Precision current control for repeatable fields</i>
Control System	PLC-based multi-channel controller <i>Programmable field profiles; Ethernet/Modbus interface</i>
Operating Modes	Uniform field, linear gradient, custom profiles <i>Software-selectable coil current patterns</i>
Pulse Duration	1 second to 10 minutes <i>Programmable on/off cycles</i>
Duty Cycle	10-minute maximum continuous pulse <i>Water cooling maintains thermal stability</i>
Field Monitoring	Optional Hall probe array <i>Real-time axial field profile measurement</i>

WATER COOLING SYSTEM

Cooling Method	Recirculating water cooling <i>All six coils independently cooled</i>
Coolant Flow Rate	2-4 L/min per coil (12-24 L/min total) <i>Adjustable for thermal load</i>

Coolant Connections	Quick-disconnect fittings per coil <i>Standard garden hose or industrial manifold compatible</i>
Inlet Temperature	15-25°C recommended <i>Chiller-supplied for best stability</i>
Temperature Rise	<15°C at maximum pulse power <i>Maintains coil stability during 10-minute pulses</i>
Flow Monitoring	Flow switches per coil <i>Automatic shutdown on low flow</i>
Thermal Sensors	RTD embedded in each coil <i>Overtemperature protection and data logging</i>

MECHANICAL SPECIFICATIONS

Frame Construction	Modular aluminum extrusion <i>80/20 compatible; non-magnetic stainless hardware</i>
Overall Footprint	800 mm (W) × 1300 mm (L) × 800 mm (H) <i>31.5" × 51" × 31.5" approximate</i>
Total Weight	~500 kg (1100 lbs) <i>Including coils, frame, and cooling manifolds</i>
Coil Mounting	Precision-machined support rings <i>Adjustable for alignment; ±2 mm coil spacing tolerance</i>
Sample Access	Through-bore (both ends) <i>302 mm clear diameter for sample insertion</i>
Handling	Forklift pockets and crane lifting points <i>Safe installation and repositioning</i>
Mobility	Optional heavy-duty casters

Locking wheels for laboratory repositioning

PERFORMANCE SPECIFICATIONS

Working Volume	Ø250 × 1000 mm cylinder <i>Extended axial region for long samples</i>
Field Uniformity (All Coils Equal)	±5% across 800 mm axial length <i>Central uniform zone with all coils at same current</i>
Field Uniformity (Radial)	±3% across Ø200 mm <i>On-axis uniformity in radial direction</i>
Field Gradient Mode	0.1 to 50 mT/meter <i>Programmable linear gradient by varying coil currents</i>
Field Stability	<0.5% over 10-minute pulse <i>Current-regulated; thermal drift minimized by cooling</i>
Rise/Fall Time	<5 seconds to 90% field <i>Inductive time constant (L/R)</i>
Pulse Repetition	User programmable <i>Thermal management allows continuous cycling at <50% duty</i>

KEY FEATURES

Extended Axial Field Control: Six independently controlled coils enable uniform field zones, linear gradients, or custom axial field profiles across a 1-meter working length. Ideal for materials testing requiring extended field exposure regions.

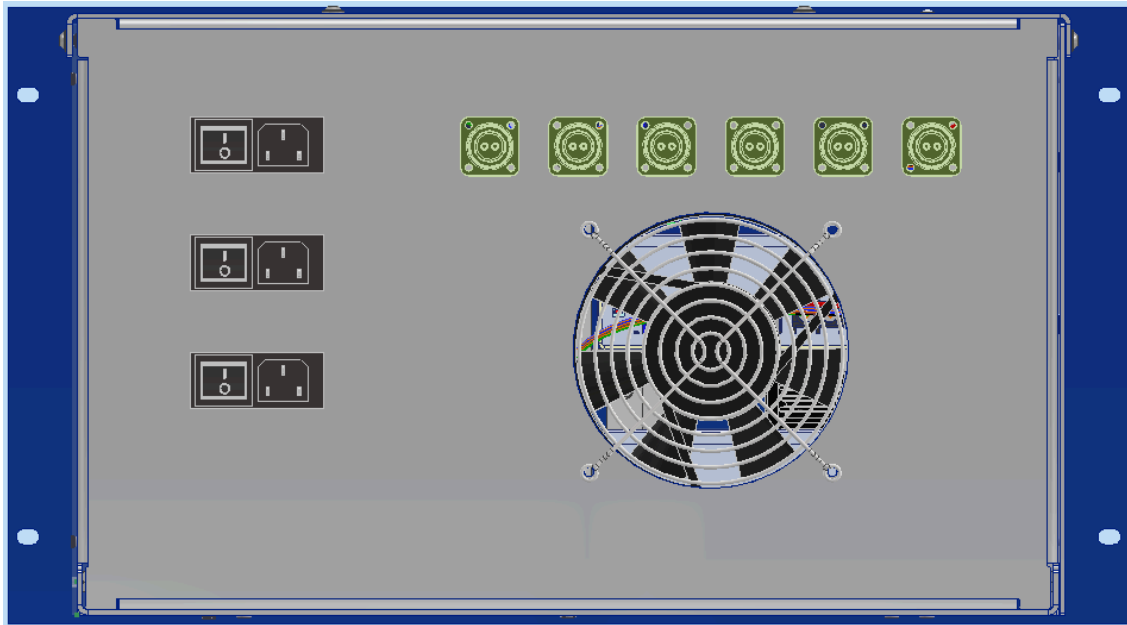
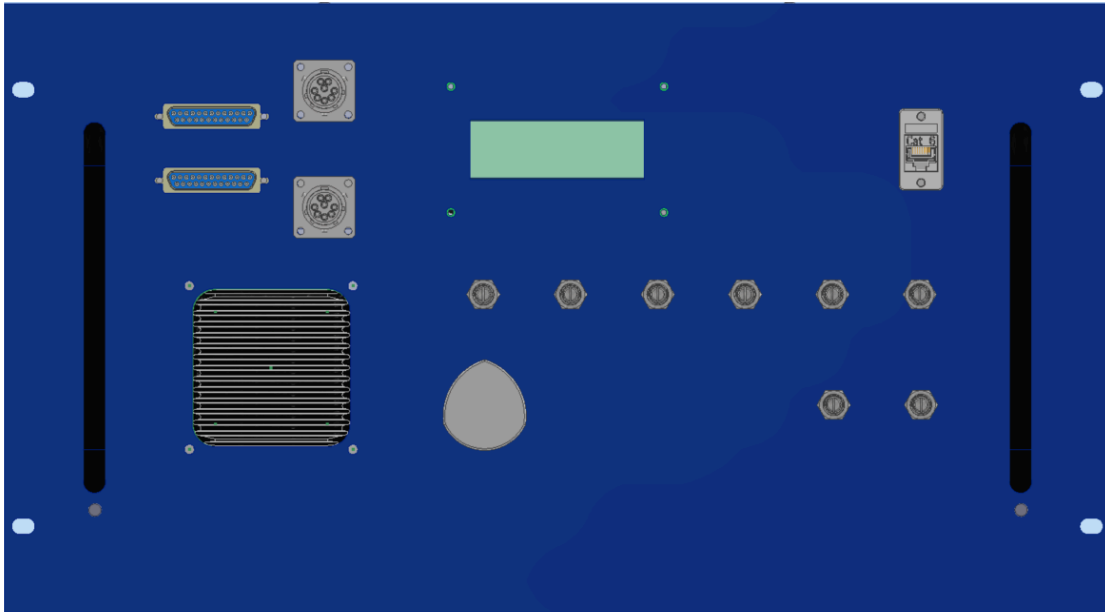
High-Field Pulsed Operation: Water-cooled copper coils deliver up to 200 mT fields with 10-minute continuous pulse capability. Integrated thermal management maintains field stability during extended experimental runs.

Flexible Field Shaping: Independent current control per coil allows researchers to configure uniform zones, linear gradients, or custom field profiles. Software-programmable patterns enable complex experimental protocols.

Through-Bore Sample Access: 302 mm clear bore diameter accommodates large samples, fixtures, and multi-sensor arrays. Dual-ended access simplifies sample loading and instrumentation integration.

Production-Ready Build: Precision-wound coils with factory calibration data. Modular aluminum frame ships assembled or flat-packed. Complete installation documentation, field mapping reports, and current-to-field conversion tables included.

Power supply



LINEAR ARRAY MAGNETIC FIELD SYSTEMS — Product Variants

MODEL	INNER DIAMETER	FIELD STRENGTH	COIL COUNT	ARRAY LENGTH	COOLING	MASS	TYPICAL APPLICATIONS	LEAD TIME
WE-LFA-4X100-LF	100mm (4")	2–10 mT DC continuous	4 coils 50 turns	500mm (20")	Passive air No cooling req'd	15kg (33 lbs)	Hall sensor calibration Low-field metrology Benchtop testing	8 wks
WE-LFA-6X150-LF	150mm (6")	5–25 mT DC continuous	6 coils 60 turns	800mm (31")	Forced air 100 CFM	40kg (88 lbs)	Magnetometer calibration Bio field studies Material screening	10 wks
WE-LFA-6X200-MF	200mm (8")	10–80 mT 10 min pulse	6 coils 80 turns	900mm (35")	Water cooled 10 L/min	120kg (265 lbs)	Materials testing Nanoparticle synthesis Gradient studies	12 wks
WE-LFA-6X300 ★	300mm (12")	20–200 mT 10 min pulse	6 coils 100 turns	1100mm (43")	Water cooled 20 L/min	500kg (1100 lbs)	Extended samples Multi-sensor arrays Process development	14 wks
WE-LFA-8X400-MF	400mm (16")	30–250 mT 10 min pulse	8 coils 120 turns	1500mm (59")	Water cooled 35 L/min	950kg (2095 lbs)	Large assemblies Industrial testing Magnetocaloric R&D	16 wks
WE-LFA-6X500-HF	500mm (20")	50–350 mT 5 min pulse	6 coils 150 turns	1400mm (55")	Water cooled 50 L/min	1400kg (3086 lbs)	Crystal growth High-field materials Electromagnet upgrade	18 wks
WE-LFA-8X600-HF	600mm (24")	80–400 mT 5 min pulse	8 coils 180 turns	1900mm (75")	Water cooled 80 L/min	2200kg (4850 lbs)	Aerospace component test Large-volume processing Production line integration	20 wks
WE-LFA-10X800-HF	800mm (31")	100–450 mT 3 min pulse	10 coils 200 turns	2500mm (98")	Water cooled 120 L/min	3800kg (8378 lbs)	Industrial scale testing Automotive components Full-scale assemblies	24 wks
WE-LFA-8X1000-UHF	1000mm (39")	150–500 mT 2 min pulse	8 coils 250 turns	2400mm (94")	High-flow water 200 L/min	6500kg (14330 lbs)	Maximum field strength Production electromagnet Dedicated facility install	28 wks
WE-LFA-XXX-GRAD	Custom as req'd	Gradient field source	4-12 coils Optimized	Custom length	Per design Water typical	Varies by config	Magneto-phoresis Gradient-field separation Custom field profiles	18-24 wks

Coil Arrays

Technical Specification Form

Please complete all sections below. This information will be used to prepare a detailed quotation and ensure the system meets your requirements. If you have questions about any specification, contact us at sales@woodruffeng.com

CUSTOMER INFORMATION

Organization / Institution	
Contact Name	
Email Address	
Phone Number	
Shipping Address	

SYSTEM CONFIGURATION

Number of Coils	
Inner Coil Diameter	_____ mm (Typical range: 100–1000mm)
	Outermost coil diameter: _____ mm
Coil separation	<input type="checkbox"/> Standard Helmholtz ($d = R$) <input type="checkbox"/> Custom (specify): _____

FIELD REQUIREMENTS

Maximum Field (Continuous Operation)	_____ mT (Typical range: 10–200mT continuous)
Peak Field(Pulsed, if needed)	_____ mT at _____ % duty cycle

WORKING VOLUME & UNIFORMITY

Required Uniform Volume(diameter or radius)	_____ mm (Typically 30–50% of innermost coil diameter)
Field Uniformity Specification	<input type="checkbox"/> <0.5% <input type="checkbox"/> <1% <input type="checkbox"/> <2% <input type="checkbox"/> Other: _____%
Uniformity measured over:	<input type="checkbox"/> Central sphere <input type="checkbox"/> Central cylinder (1-axis) <input type="checkbox"/> Other:

OPERATING FREQUENCY & POWER SUPPLY

Operating Mode	<input type="checkbox"/> DC only <input type="checkbox"/> AC capable <input type="checkbox"/> Both
If AC capable, frequency range:	DC to _____ Hz (Typical: DC–100Hz or DC–1000Hz)
Waveform Requirements	<input type="checkbox"/> DC <input type="checkbox"/> Sine <input type="checkbox"/> Triangle <input type="checkbox"/> Square <input type="checkbox"/> Arbitrary
Power Supply Preference	<input type="checkbox"/> Woodruff Engineering supply <input type="checkbox"/> Customer-provided
If customer-provided:	Current capability: _____ A Voltage: _____ V

COOLING & INSTALLATION

Cooling Method	<input type="checkbox"/> Air-cooled <input type="checkbox"/> Water-cooled <input type="checkbox"/> Forced air
If water-cooled:	Available water flow: _____ L/min Pressure: _____ PSI
Mounting Configuration	<input type="checkbox"/> Benchtop <input type="checkbox"/> Floor-standing <input type="checkbox"/> Custom frame
Access requirements	<input type="checkbox"/> Horizontal bore <input type="checkbox"/> Vertical bore <input type="checkbox"/> Both (3-axis)

SPECIAL REQUIREMENTS & NOTES

Computer Control Interface	<input type="checkbox"/> Not required <input type="checkbox"/> USB <input type="checkbox"/> Ethernet <input type="checkbox"/> RS-232
Control Software	<input type="checkbox"/> Standalone GUI <input type="checkbox"/> LabVIEW compatible <input type="checkbox"/> Python API
Field Sensors / Feedback	<input type="checkbox"/> Open-loop <input type="checkbox"/> Closed-loop (Hall probe feedback)
Budget Range (optional)	\$ _____ to \$ _____
Target Delivery Date	_____ (Typical lead times vary between 8–26 weeks)

Additional Requirements or Notes:

SUBMISSION

Please email this completed form to: sales@woodruffeng.com

We will review your specifications and provide a detailed quotation within 3–5 business days. If clarification is needed on any requirements, we will contact you directly.