UMBRA

# SPACE SYSTEMS CATALOG

FLIGHT-PROVEN. RELIABLE. EFFECTIVE.

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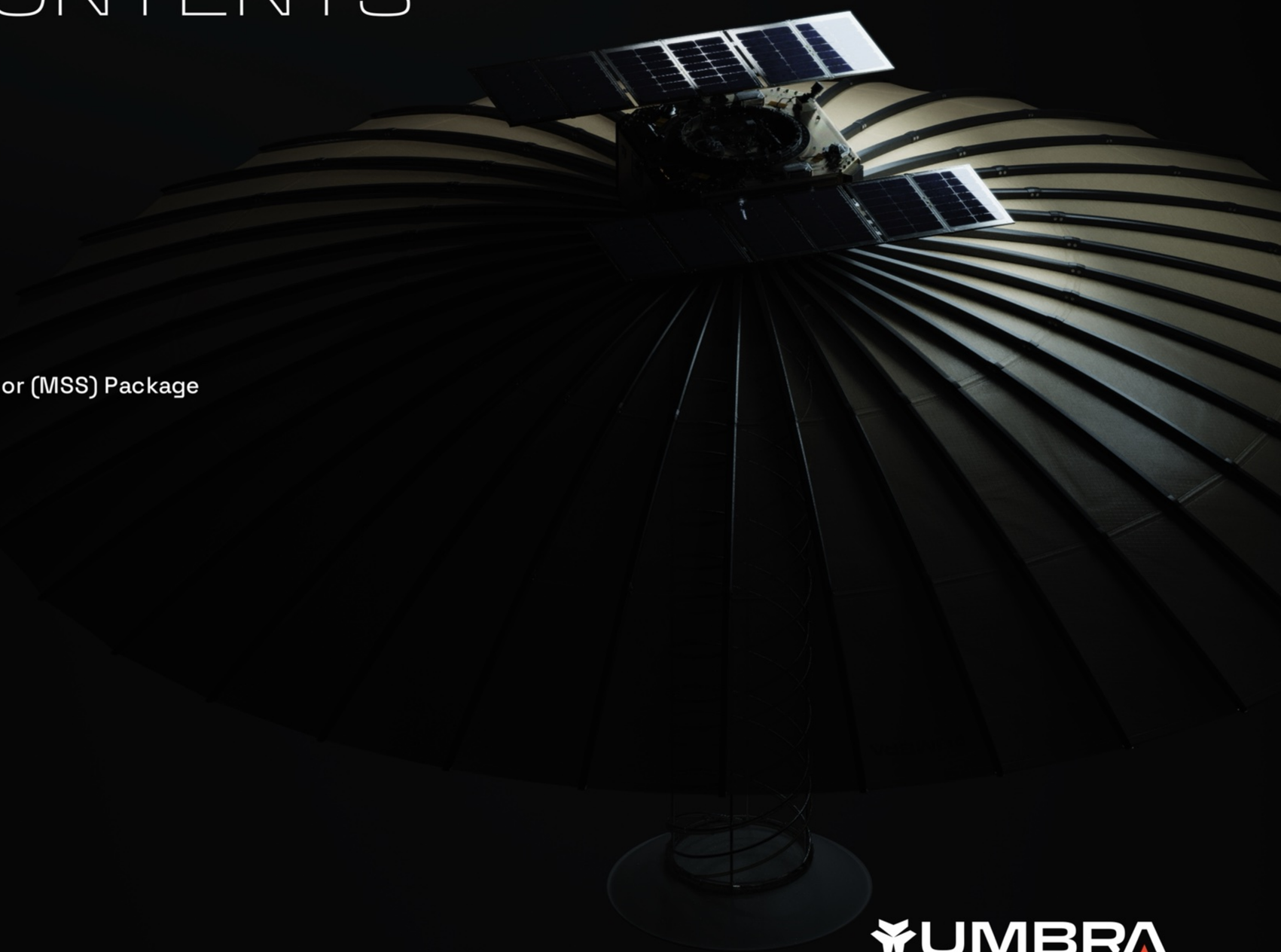

UMBRA

# UMBRA

## DELIVERING GLOBAL OMNISCIENCE

We've set a new standard for the pace of innovation. Umbra is an American space technology company that pushes the limits of what's possible, by delivering novel engineering solutions tailored to missions of the moment.

We are striving to redefine what can be done in and through space, expanding its accessibility and providing our customers with a powerful information advantage.

We design, manufacture, & operate an agile and advanced Synthetic Aperture Radar (SAR) constellation that produces the highest-quality imaging data. We arm our customers with high-resolution, high-volume geospatial intelligence powered by resilient spacecraft technology. With continuously evolving systems designs, always-up production lines, and around-the-clock space operations, we are constantly honing our technology, our products, and our craft.

Our commitment to excellence through First Principles engineering has fueled year-over-year growth since our market entry in 2021 . . . we are only just beginning.

Umbra offers solutions across three core business lines: Remote Sensing, Space Systems, and Mission Solutions.

- Remote Sensing = the data
- Space Systems = the components
- Mission Solutions = the systems

Collectively, these capabilities make Umbra second-to-none. We offer the flexibility you need and deliver the performance, resilience, and reliability your mission demands.

Harnessing the utility of space, we explore everything, solve anything, and compromise nothing.

Value + Innovation
ZERO Compromise

Vertically
Integrated

10 Satellites Designed,
Built, & Launched

USA Founded,
Funded & Operated

USA

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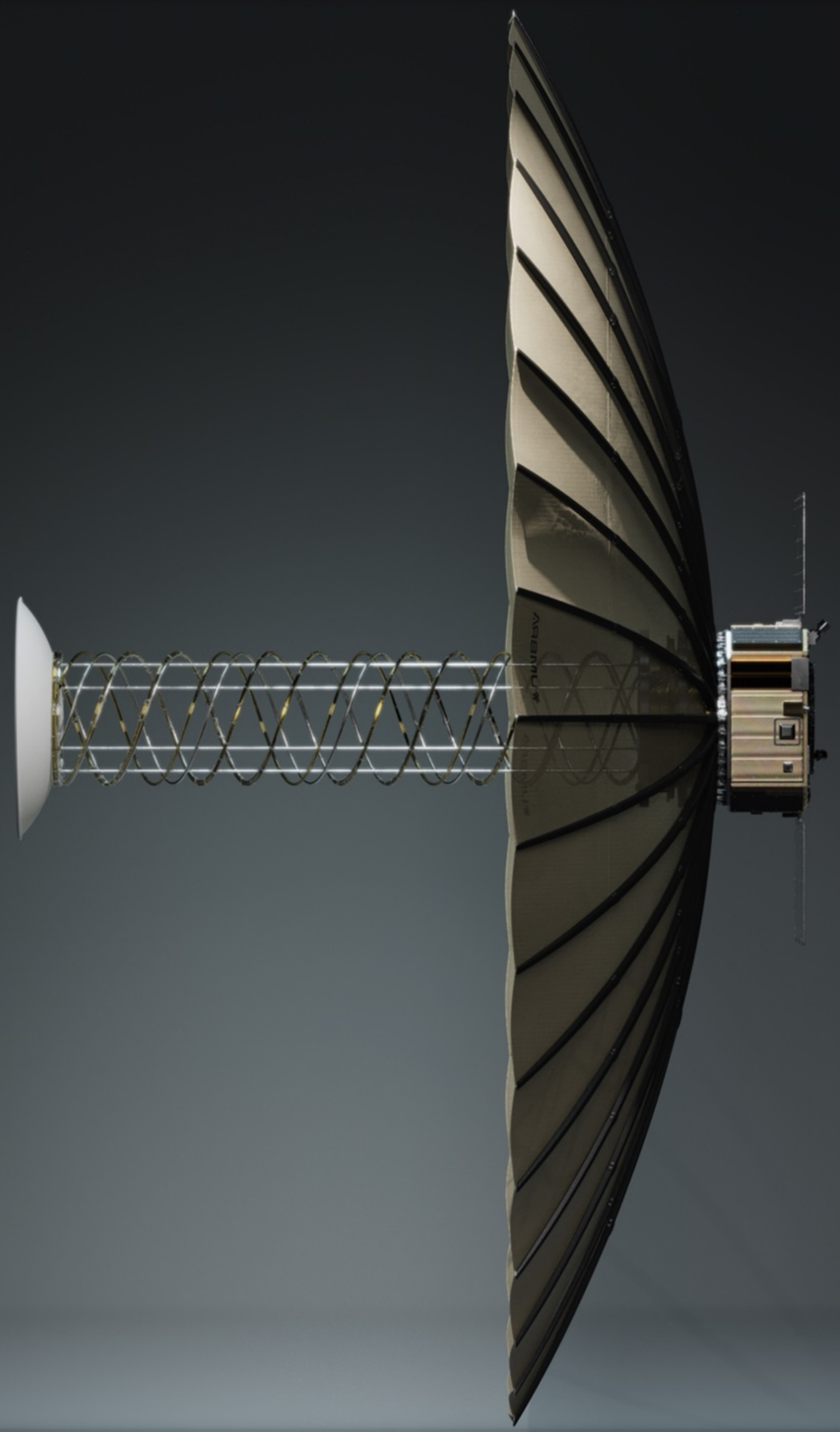


UMBRA

# SPACE SYSTEMS

To set a new pace, we took matters into our own hands. We designed, built and deployed the best components for our space missions and now we're offering those to our customers.

First Principles engineering is the cornerstone of this success. It powers our industry-leading SAR constellation and fuels Space Systems to create our own flight-proven spacecraft components and technology. Whether you're a commercial enterprise, a government agency, or a research institution, we now deliver the critical building blocks required to achieve your mission objectives.

**Flight-Proven:** We have 100% success with our spacecraft bus platforms since our first on orbit system. Umbra's components are meticulously designed and rigorously tested to offer exceptional performance and reliability.

**Reliable:** We understand the importance of timely delivery. Our streamlined processes provide a direct path to acquiring reliable, high-performance space hardware, accelerating your time to orbit and significantly reducing mission risk.

**Effective:** Built onsite by us in the U.S., our catalog of readily available components – including Battery Modules, Magnetorquers, Magnetometer Sun Sensor, Network Switches, Power Packages, Separation Systems, Reaction Wheels, S-Band Radios, and Solar Arrays (Updated quarterly) – reflects our commitment to relentless innovation and to push the boundaries of what's possible in space.

This commitment to excellence allows Umbra to deliver you unparalleled value and performance, expanding your access to space-based capabilities with our cutting-edge line of products.

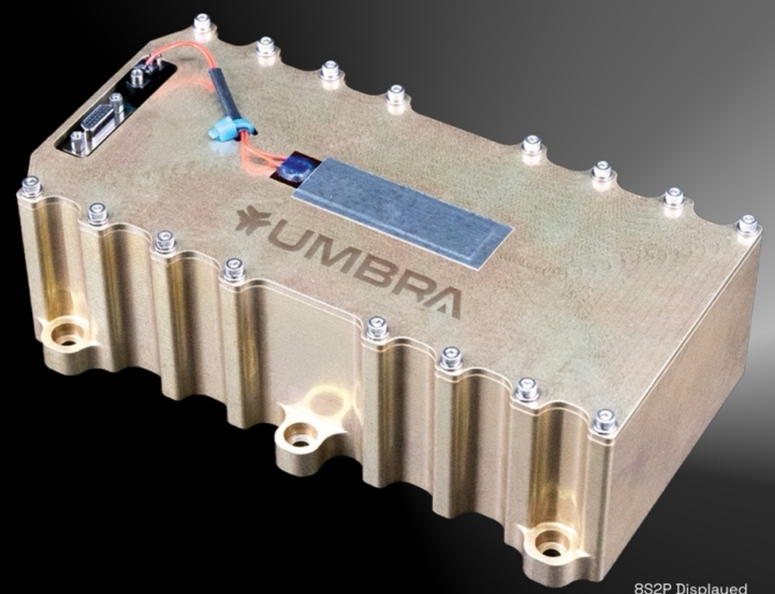
**We build, test, and fly, so you compromise nothing. Our components are second-to-none.**

**FLIGHT-PROVEN. RELIABLE. EFFECTIVE.**

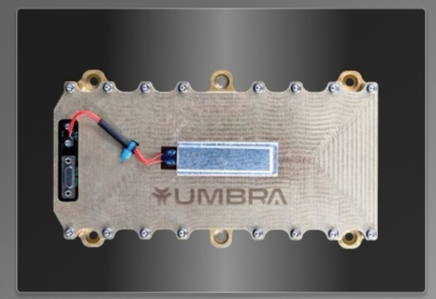
# UMBRA BATTERY MODULE

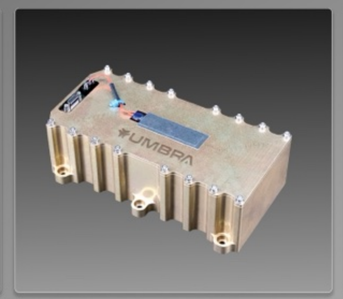
**THE UMBRA BATTERY MODULE** delivers reliable, high-energy-density power storage for demanding space missions. These flight-proven modules come in 8S1P (8-Cell) and 8S2P (16-Cell) configurations, which feature built-in cell balancing, thermal regulation, and a ruggedized design. Certified to UN 38.3 and compliant with NASA debris mitigation standards, they ensure safe and dependable operation. Choose Umbra Battery Modules for mission-critical power backed by flight-proven heritage.

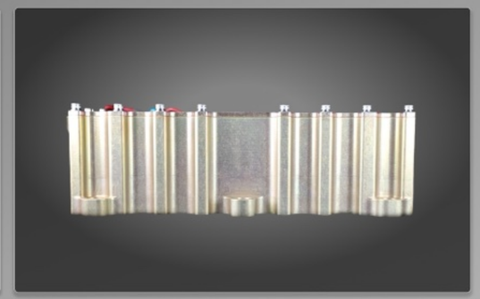
8 CELL CONFIGURATION | 16 CELL CONFIGURATION | RADIATION TOLERANT | FLIGHT PROVEN | MULTI ORBIT | LOW SWaP




8S2P Displayed



8S2P Displayed

## GENERAL SPECIFICATIONS

| | |
|---|---|
| BATTERY VOLTAGE RANGE | 22 V to 31 V |
| BATTERY VOLTAGE NOMINAL | 28 V |
| INTENDED SPACE ENVIRONMENT | Multi-Orbit |
| TRL | TRL 9 |
| DESIGN LIFE | 5+ Years |
| PRODUCTION | Assembled and tested in the USA |
| CHEMISTRY | Lithium Ion |
| ELECTRICAL INTERFACE | 15-Pin Micro-D Connector |
| MAXIMUM DISCHARGE RATE | 15 A |

## TEST DATA

| | |
|---|---|
| RANDOM VIBE | Qualified to 14.16 gRMS profile enveloping GEVS, Falcon 9, SpaceX Rideshare, and Electron levels |
| SHOCK | Qualified to 600g peak profile enveloping attenuated GEVS, Falcon 9, SpaceX Rideshare, and Electron levels |
| OPERATING TEMPERATURE | Charge: 10 C to 45 C<br>Discharge: -20 C to 60 C |
| SURVIVAL TEMPERATURE | -20 C to 50 C<br>(Higher temp possible during discharge) |
| RADIATION | >30 krad |
| DOT CERTIFICATION | UN 38.3 in compliance with 49 CFR §173.185 |
| LIMITING ORBITAL DEBRIS | Meets NASA-STD-8719.14C Requirements |

## CONFIGURATION SPECIFICATIONS

| METRIC | 8S2P | 8S1P |
|---|---|---|
| MAX DIMENSIONS | L: 7.13"<br>W: 4.04"<br>H: 2.50" | L: 7.12"<br>W: 4.03"<br>H: 1.43" |
| MASS | 1.46 kg | 0.84 kg |
| NAMEPLATE ENERGY CAPACITY | 0.25 kWh | 0.125 kWh |

## CONFIGURATIONS

| TYPE | DESCRIPTION & DETAILS | SPACE READY | LEAD TIME | COST |
|---|---|---|---|---|
| EDU | • Both 8S2P & 8S1P available<br>• Suitable for ground testbeds | No | 5-Week Lead Time | CONTACT |
| 8S2P | 16-Battery Cells | Yes | 7-Week Lead Time | CONTACT |
| 8S1P | 8-Battery Cells | Yes | 7 -Week Lead Time | CONTACT |

## FEATURES

### BUILT-IN SAFETY & PERFORMANCE
### THERMAL MANAGEMENT & CELL BALANCING

Integrated thermal regulation (with onboard heater and temperature sensor) and built-in cell balancing circuitry ensure optimal battery performance, safety, and longevity. This comprehensive management system maximizes operational life and minimizes risks associated with battery operation in space.

### FLIGHT-PROVEN | VALIDATED RELIABILITY

Validated through successful deployments, the Umbra Battery Module offers proven reliability and performance in real-world space environments. This flight heritage, combined with its compatibility with the complete Umbra Integrated System, provides mission-ready confidence and minimizes risk.

### CERTIFIED & COMPLIANT
### UN 38.3 & NASA STANDARDS

Umbra Battery Modules are DOT-certified to UN 38.3 for safe transportation and meet NASA-STD-8719.14C requirements for limiting orbital debris. These certifications demonstrate a commitment to safety, regulatory compliance, and responsible space operations.

### HIGH ENERGY DENSITY | OPTIMIZED FOR SWaP

Utilizing high-energy-density lithium-ion cells, Umbra Battery Modules deliver significant power storage capacity in a compact and lightweight package. This optimized SWaP (Size, Weight, and Power) performance is crucial for small satellite applications.

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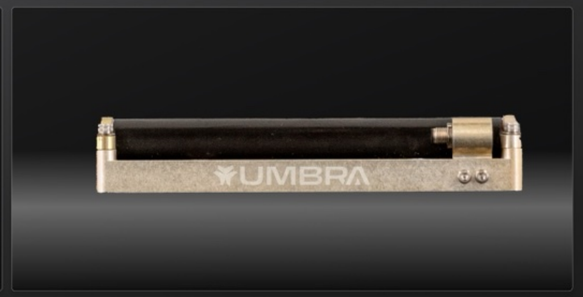
# UMBRA MAGNETORQUER 6

**THE UMBRA MAGNETORQUER 6** is engineered for precise, reliable attitude control in demanding small satellite missions. Leveraging space-proven heritage and Umbra's commitment to quality, this compact torque rod delivers at least 6 Am² dipole moment in a minimal form factor. The Umbra Magnetorquer 6 boasts high torque per required spacecraft volume, dependable attitude control, and rigorous qualification testing. Designed for seamless integration, the Umbra Magnetorquer 6 will be ready for your mission right out of the box.

SIMPLE BUILD · SIMPLE INTEGRATION

LEO ENVIRONMENT

MULTIPLE MOUNTING OPTIONS




## GENERAL SPECIFICATIONS

| | |
|---|---|
| MAX DIMENSIONS | 5.100" x 1.440" x 0.875" |
| MASS | 300 g |
| INPUT VOLTAGE RANGE | 12 V ± 1 V for > 6 Am2 performance |
| INPUT VOLTAGE NOMINAL | Electromagnetics designed for 12 V |
| PEAK POWER | 4.24 W |
| ELECTRICAL INTERFACE | Keyed 2 pin circular connector |
| INTENDED SPACE ENVIRONMENT | LEO |
| TRL | TRL 6, TRL 8 by Q4 2025 |
| DESIGN LIFE | 5+ Years |
| PRODUCTION | Assembled and tested in the USA |
| MATERIALS COMPLIANCE | ASTM E595 |

## TEST DATA

| | |
|---|---|
| RANDOM VIBE | Qualified to 14.16 gRMS profile enveloping GEVS, Falcon 9, SpaceX Rideshare, and Electron levels |
| SHOCK | Qualified to 600g peak profile enveloping attenuated GEVS, Falcon 9, SpaceX Rideshare, and Electron levels |
| OPERATING TEMPERATURE | -40°C to 80°C |
| SURVIVAL TEMPERATURE | -40°C to 100°C |
| RADIATION | >30 krad |

## FEATURES

### SIMPLE DESIGN | SIMPLE INTEGRATION

Designed for ease of integration with any GNC system, the Magnetorquer 6 can be installed in its lightest configuration using Umbra's 4-point mounting pattern or can be adapted to any other bolt pattern with the available mounting tray. The 2-pin connection is easily integrated into any GNC system. Contact us for more information about Umbra's fully integrated GNC solution.

### COMPACT POWER | HIGH TORQUE DENSITY

The Umbra Magnetorquer 6 delivers a powerful 6 Am² dipole moment in a remarkably compact and lightweight form factor. This high torque density maximizes control authority while minimizing mass and volume, optimizing your satellite's payload capacity and maneuverability.

### SEAMLESS INTEGRATION | OPERATIONALLY READY

The Umbra Magnetorquer 6 features a highly compact design, thoughtful connector placement for tight packaging, and an integrated mounting bracket for flexible installation options. This meticulous design simplifies physical integration into SWaP-constrained small satellite platforms, reducing assembly time and complexity.

### PRECISION ENGINEERING | BUILT-TO-LAST

The Umbra Magnetorquer 6 is built for the demanding space environment, utilizing space-rated materials with low outgassing properties (compliant with ASTM E595). It undergoes rigorous testing, ensuring exceptional reliability and long-term performance in orbit.

## CONFIGURATIONS

| TYPE | DESCRIPTION & DETAILS | SPACE READY | LEAD TIME | COST |
|---|---|---|---|---|
| SIM | Does not generate magnetic moment; suitable for software development testbeds | No | 4-Week Lead Time | CONTACT |
| EDU | Suitable for hardware-in-the-loop testbeds | No | 4-Week Lead Time | CONTACT |
| FLIGHT | Acceptance tested | Yes | 7-Week Lead Time | CONTACT |

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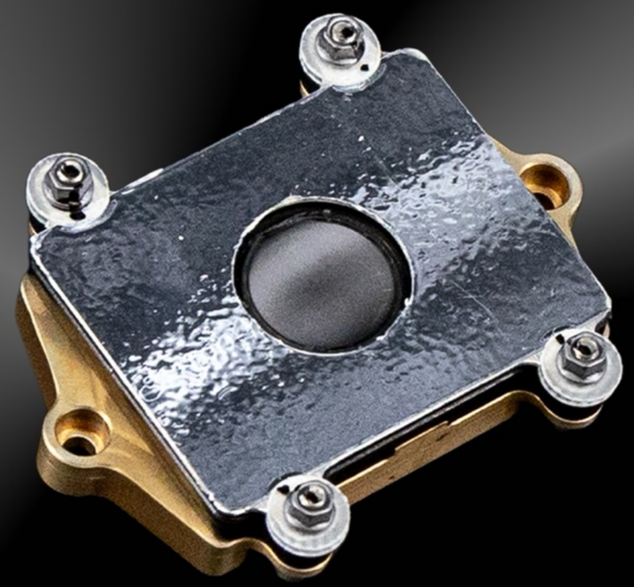
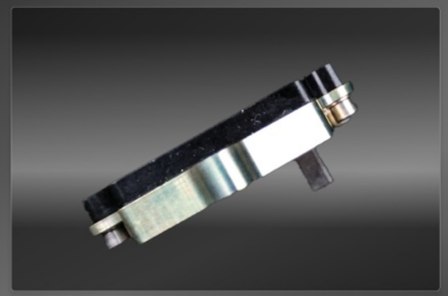
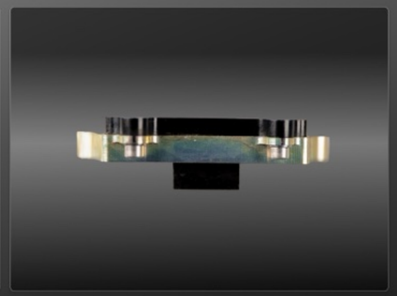
# UMBRA MSS PACKAGE

**THE UMBRA MAGNETOMETER + SUN SENSOR (MSS) PACKAGE** is a low-size, weight, and power (SWaP) solution for precise attitude determination. The integrated magnetometer and sun sensor provide essential magnetic field and solar orientation data for small satellite GNC systems. This sensor delivers flight heritage and competitive performance with respect to accuracy, reliability, and ease of integration. Its compact size and minimal power consumption make the MSS ideal for demanding missions requiring high-performance attitude knowledge in resource-constrained environments. Ready for rapid integration across diverse platforms.

LOW SWaP | HIGH ACCURACY | COMPACT FOOTPRINT







## GENERAL SPECIFICATIONS

| | |
|---|---|
| **MAX DIMENSIONS** | 2 in x 1.52 in x 0.576 in |
| **MASS** | 21.8 g (with standard mount) |
| **INPUT VOLTAGE RANGE** | 5 +/- 1V |
| **INPUT VOLTAGE NOMINAL** | 5 V |
| **PEAK POWER** | < 50 mW |
| **AVERAGE POWER** | < 50 mW |
| **ELECTRICAL INTERFACE** | x2 Nano-D Bi-Lobe connector |
| **DATA INTERFACE** | RS-485 |
| **INTENDED SPACE ENVIRONMENT** | LEO |
| **TRL** | TRL 6, TRL 8 by Q3 2025 |
| **DESIGN LIFE** | 5+ Years |
| **PRODUCTION** | Assembled and tested in the USA |
| **FIELD OF VIEW** | 110°x 110° |
| **ACCURACY OF BORESIGHT** | <1° |
| **ACCURACY OF FOV EDGE** | 8° |
| **SOLUTION RATE** | > 10 Hz |
| **MEASUREMENT RANGE** SINGLE AXIS MAGNETIC | +/- 4 Gauss |
| **SENSITIVITY** SINGLE AXIS MAGNETIC | 1 mGauss |
| **ACCURACY** SINGLE AXIS MAGNETIC | ± 50 mGauss |

## TEST DATA

| | |
|---|---|
| **RANDOM VIBE** | Qualified to 14.16 gRMS profile enveloping GEVS, Falcon 9, SpaceX Rideshare, and Electron levels |
| **SHOCK** | Qualified to 600g peak profile enveloping attenuated GEVS, Falcon 9, SpaceX Rideshare, and Electron levels |
| **OPERATING TEMPERATURE** | -40°C to 80°C |
| **SURVIVAL TEMPERATURE** | -40°C to 100°C |
| **RADIATION** | >30 krad |

## FEATURES

### RS-485 OUTPUT | BROAD COMPATIBILITY

The Umbra MSS boasts minimal power consumption for its accuracy and precision capability. The combination of high performance and low power consumption the Umbra MSS provides is ideal for power-constrained small satellite missions.

### ULTRA-COMPACT | LIGHTWEIGHT DESIGN

At just 21.8 grams and with a minimal footprint, the Umbra MSS significantly reduces SWaP burden on small satellite platforms. This compact design enables easier integration in constrained spaces and maximizes payload capacity without sacrificing performance.

### SPACE-GRADE RELIABILITY | RIGOROUSLY TESTED

Built to withstand the demanding space environment, the MSS undergoes extensive qualification testing exceeding industry standards for vibration, shock, thermal cycling, and radiation (>30 krad). This proven resilience ensures dependable operation and mission confidence throughout its multi-year design life.

### HIGH ACCURACY | SMALL PACKAGE

The Umbra MSS provides fine sun sensor accuracy (<1° at boresight) with magnetometer readings, offering superior attitude determination compared to coarse sun sensors alone. This enhanced accuracy enables precise pointing and control for demanding and agile small satellite missions.

## CONFIGURATIONS

| TYPE | DESCRIPTION & DETAILS | SPACE READY | LEAD TIME | COST |
|---|---|---|---|---|
| EDU | Suitable for Hardware-in-the-Loop testbeds | No | 4-Week Lead Time | CONTACT |
| FLIGHT | Acceptance Tested | Yes | 7-Week Lead Time | CONTACT |
| CUSTOM | Umbra Space Systems offers custom modifications. Please contact. | Inquire | Inquire | CONTACT |

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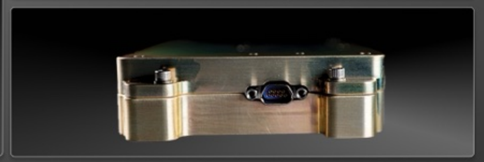
# UMBRA NETWORK SWITCH 8-1G

**THE UMBRA NETWORK SWITCH 8-1G** is a qualified ethernet device for communication between onboard modules in Low Earth Orbit (LEO). It provides mission-critical Gigabit Ethernet connectivity between 2 to 8 onboard modules, and is available in a plug-and-play unmanaged configuration, or in a managed configuration for more complex integrations. With testing tailored for Falcon 9 rideshare missions and multi-orbit compatibility, the Umbra Network Switch 8-1G offers dependable high-bandwidth intra-satellite communication, backed by rigorous testing.

RADIATION TOLERANT | MULTI ORBIT | FLIGHT PROVEN



## GENERAL SPECIFICATIONS

| | |
|---|---|
| MAX DIMENSIONS | 5.26 in x 3.16 in x 9.20 in |
| MASS | < 0.3 kg |
| INPUT VOLTAGE RANGE | 5 – 60 V |
| INPUT VOLTAGE NOMINAL | 28 V ± 5 V |
| PEAK POWER | 4.6 W |
| AVERAGE POWER | 3 W (Typical) |
| ELECTRICAL INTERFACE | 9-Socket Micro-D Connector |
| DATA INTERFACE | IX8 Type A Ethernet |
| INTENDED SPACE ENVIRONMENT | Multi-Orbit Capable |
| TRL | TRL 6, TRL 8 by Q3 2025 |
| DESIGN LIFE | 5+ Years |
| PRODUCTION | Assembled and tested in the USA |
| DATA RATE | 1 Gbps |
| NUMBER OF PORTS | 8 |
| PROTOCOLS | 10BASE-T, 100BASE-TX, 1000BASE-T |

## TEST DATA

| | |
|---|---|
| RANDOM VIBE | Qualified to 14.16 gRMS profile enveloping GEVS, Falcon 9, SpaceX Rideshare, and Electron levels |
| SHOCK | Qualified to 600g peak profile enveloping attenuated GEVS, Falcon 9, SpaceX Rideshare, and Electron levels |
| OPERATING TEMPERATURE | -30°C to 65°C |
| SURVIVAL TEMPERATURE | -40°C to 85°C |
| EMI/EMC | • Component level radiated emissions<br>• Electrical fast transient/ burst immunity<br>• Power frequency magnetic field immunity testing |
| RADIATION | >30 krad |

# FEATURES

### SPACE-HARDENED | RADIATION TOLERANT

Built to withstand the extreme conditions of space, the Umbra Network Switch 8-1G features a ruggedized design and radiation-tolerant components. This design ensures dependable operation in harsh environments, including rigorous vibration, shock, and radiation exposure.

### HIGH-BANDWIDTH | 8-PORT GIGABIT ETHERNET

The Umbra Network Switch 8-1G is equipped with eight ports of Gigabit Ethernet (1 Gbps); the switch delivers high-bandwidth data transfer capabilities for demanding intra-satellite communication needs. This design enables efficient communication between various onboard systems and payloads.

### SPACE QUALIFIED | RUGGEDIZED INTERFACES

Umbra's successful history of delivering mission critical data has led to the design of the Umbra Network Switch 8-1G. Fully space qualified, this module allows your spacecraft systems to take advantage of modern ethernet performance in a simple to use, low SWaP package.

### COMPATIBILITY | SIMPLE TO COMPLEX

Designed to create an ethernet-connected infrastructure within any small spacecraft seamlessly. The Umbra Network Switch is available in unmanaged configuration for single switches used in basic applications or in a managed configuration for complex installations utilizing multiple switches or inter-satellite connections.

## CONFIGURATIONS

| TYPE | DESCRIPTION & DETAILS | SPACE READY | LEAD TIME | COST |
|---|---|---|---|---|
| EDU | Suitable for use in:<br>• Software development<br>• Hardware-in-the-Loop testbeds | No | 4-Week Lead Time | CONTACT |
| FLIGHT UNMANAGED | • Optional strain relief<br>• Custom connector configurations available | Yes | 7-Week Lead Time | CONTACT |
| FLIGHT MANAGED | • Optional strain relief<br>• Custom connector configurations available | Yes | 7-Week Lead Time | CONTACT |

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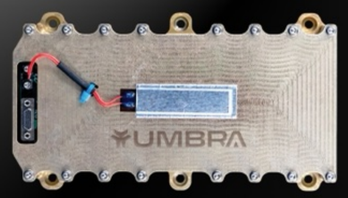
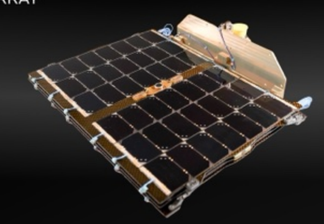
# UMBRA POWER PACKAGE

**THE UMBRA POWER PACKAGE** delivers a complete, integrated power solution for small satellites. Combining a high-efficiency, body-steered deployable solar array, high-density battery modules, and intelligent power management, it provides reliable power for demanding LEO missions. Flight-proven components, Falcon 9 heritage, and a compact design ensure mission success. Choose Umbra for a streamlined, high-performance power subsystem.

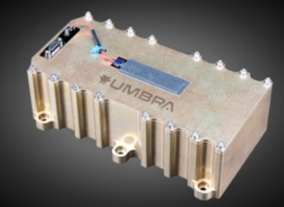
POWER EFFCIENCY | COMPACT FOOTPRINT | MORE THAN 5YR MISSION LIFE | LEO ENVIRONMENT | FLIGHT PROVEN



STOWED ARRAY



BATTERY




HDRM

## GENERAL SPECIFICATIONS

| | |
|---|---|
| **BUS VOLTAGE RANGE** | 26 V to 32 V |
| **BUS VOLTAGE NOMINAL** | 28 V |
| **PEAK POWER** | **Single Array:** 120 W generation BOL<br>**Dual Array:** 240W generation BOL |
| **AVERAGE POWER** | N/A |
| **ELECTRICAL INTERFACE** | Power Umbilical<br>Inhibits<br>TT&C |
| **DATA INTERFACE** | RS-422 |
| **INTENDED SPACE ENVIRONMENT** | LEO |
| **DESIGN LIFE** | 5+ Years |
| **PRODUCTION** | Assembled and tested in the USA |

## TEST DATA

| | |
|---|---|
| **RANDOM VIBE** | Qualified to 14.16 gRMS profile enveloping GEVS, Falcon 9, SpaceX Rideshare, and Electron levels |
| **SHOCK** | Qualified to 600g peak profile enveloping attenuated GEVS, Falcon 9, SpaceX Rideshare, and Electron levels |
| **OPERATING TEMPERATURE** | -50°C to 90°C |
| **SURVIVAL TEMPERATURE** | -60°C to 120°C |
| **RADIATION** | >30 krad |

# FEATURES

### EASY | GENERATION, STORAGE & MANAGEMENT

The Umbra Power Package provides a complete, pre-integrated power subsystem, combining solar power generation, high-density energy storage, and intelligent power management. This integrated approach simplifies procurement, reduces integration complexity, and optimizes system-level performance.

### FLIGHT-PROVEN | VALIDATED RELIABILITY

Successfully flown on Falcon 9 rideshare missions to LEO, the Umbra Power Package offers proven reliability you can trust. This flight heritage reduces mission risk and provides assurance of dependable performance in real-world space environments.

### COMPACT POWER | SIMPLE INTEGRATION

Featuring a high-efficiency, body-steered deployable (BSD) solar array and high-energy-density lithium-ion battery modules, the system delivers robust and reliable power. Body-steering removes the need for a solar array drive, while the batteries ensure continuous operation through eclipse and peak demand periods.

### LOW SWaP | REDUCE FOOTPRINT

Engineered for small satellite applications, the Power Package optimizes SWaP (Size, Weight, and Power) through its compact and lightweight design. The high stowage efficiency of the array and the high energy density of the batteries minimize the system's footprint, maximizing available payload volume.

## CONFIGURATIONS

| TYPE | DESCRIPTION & DETAILS | SPACE READY | LEAD TIME | COST |
|---|---|---|---|---|
| EDU | • Solar Panel: Deployable panel only (Cells not included)<br>• Battery Modules: Not Space Rated<br>• Power Management Unit: Not Space Rated<br>• HDRM: Not Space Rated | No | 6-Week Lead Time | **CONTACT** |
| FLIGHT | • Default flight configuration (as described in this data sheet)<br>• Umbra Steered Deployable Solar Array-120: **1x**<br>• Umbra Battery Module-8S2P: **2x**<br>• Umbra Power Management Unit: **1x**<br>• Umbra Hold Down and Release Mechanism: **1x** | Yes | 18-Week Lead Time | **CONTACT** |

**DATA SHEET** V.1.0-2025.04.03
**PART** UMB-POW-PACK-01-XXXXX
VALID AS OF 04.03.2025

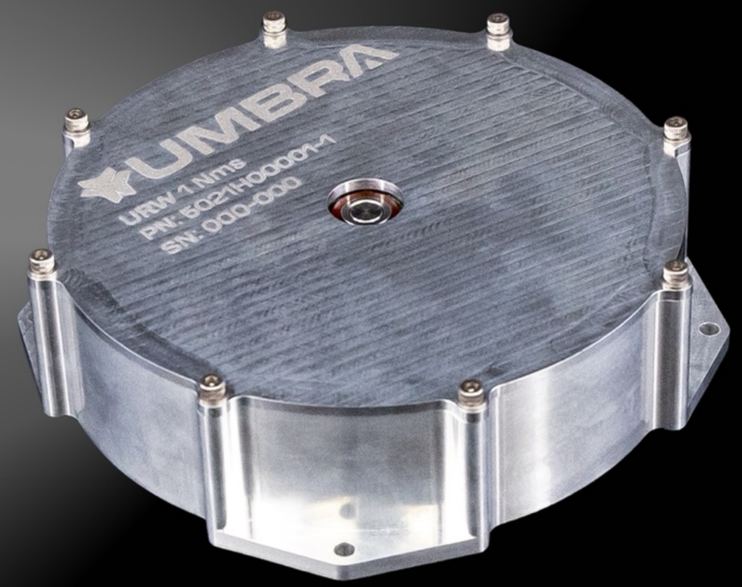


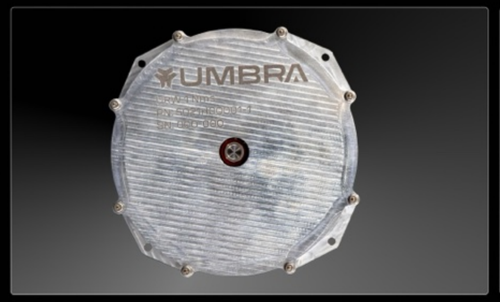
**WEB:** umbra.space/space-systems
**EMAIL:** space.systems@umbra.space

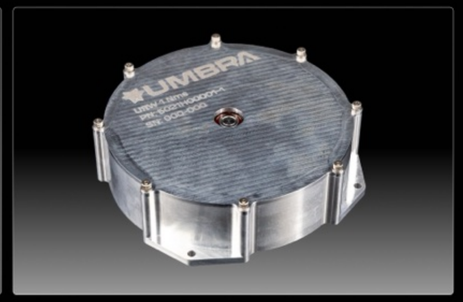
# UMBRA REACTION WHEEL

**THE UMBRA DEMISEABLE REACTION WHEEL 1** delivers precise and reliable attitude control for small satellites, focusing on responsible space debris mitigation. Designed for demisability per NASA standards, this >1 Nms reaction wheel offers high torque and momentum in a compact, lightweight package. Optimized for seamless integration with other Umbra Components and test levels tailored for Falcon 9 Rideshare, it provides a qualified, high-performance solution for demanding missions.

>1Nms ASSEMBLY | RE-ENTRY DEMISEABLE | MULTI ORBIT



## GENERAL SPECIFICATIONS

| | |
|---|---|
| MAX DIMENSIONS | 6" x 6" x 2" |
| MASS | 2 kg |
| INPUT VOLTAGE RANGE | 24-32 V |
| INPUT VOLTAGE NOMINAL | 28 V |
| PEAK POWER | 100 W at maximum torque (TYP) |
| AVERAGE POWER | 5 W steady state draw |
| ELECTRICAL INTERFACE | 15-Socket Micro-D Connector |
| DATA INTERFACE | RS-485 |
| INTENDED SPACE ENVIRONMENT | Multi-orbit |
| TRL | TRL 6, TRL 8 by Q3 2025 |
| DESIGN LIFE | 5+ Years |
| PRODUCTION | Assembled and tested in the USA |
| MOMENTUM | +/- 1.0 Nms (at max rpm) |
| MAX TORQUE | 100 mNm |
| MAX RPM | 6000 rev/min |

## TEST DATA

| | |
|---|---|
| RANDOM VIBE | Qualified to 14.16 gRMS profile enveloping GEVS, Falcon 9, SpaceX Rideshare, and Electron levels |
| SHOCK | Qualified to 600g peak profile enveloping attenuated GEVS, Falcon 9, SpaceX Rideshare, and Electron levels |
| OPERATING TEMPERATURE | -30°C to 80°C |
| SURVIVAL TEMPERATURE | -40°C to 90°C |
| RADIATION | >30 krad |

## FEATURES

### RESPONSIBLE DE-ORBITING | DEMISEABLE DESIGN

Engineered for complete demisability upon atmospheric re-entry in compliance with NASA-STD-8719.14C, this reaction wheel minimizes space debris. This commitment to responsible space operations is crucial for sustainable LEO activities and simplifies the licensing process.

### HIGH-PERFORMANCE CONTROL | MOMENTUM

Providing >1 Nms of momentum and 100 mNm of maximum torque, the Umbra Reaction Wheel enables precise attitude control and agile maneuvering for small satellites. This high-performance capability allows for demanding pointing requirements and quick response to disturbances.

### BUILT FOR RELIABILITY | REDUNDANCY & QUALITY

Built for dependable operation, the Umbra Reaction Wheel features redundant Hall Effect control and ABEC 7 ceramic angular contact bearings. These high-quality components enhance reliability and ensure long-term performance in the harsh space environment.

### STANDARD INTERFACE | EASY INTEGRATION

Designed for optimized performance and seamless integration with any GNC system utilizing RS-485 communication, the Umbra Reaction Wheel works harmoniously with other Umbra components. Contact us for more information on Umbra's fully integrated GNC solution, utilizing Umbra Reaction Wheels.

## CONFIGURATIONS

| TYPE | DESCRIPTION & DETAILS | SPACE READY | LEAD TIME | COST |
|---|---|---|---|---|
| EDU | Suitable for use in Hardware-in-the-Loop testbeds and software development testbeds | No | 4-Week Lead Time | CONTACT |
| FLIGHT | Space rated materials and acceptance tested | Yes | 12-Week Lead Time | CONTACT |
| CUSTOM | Umbra Space Systems is adding additional wheel sizes to our catalog. Please contact us with your needs. | Inquire | Inquire | CONTACT |

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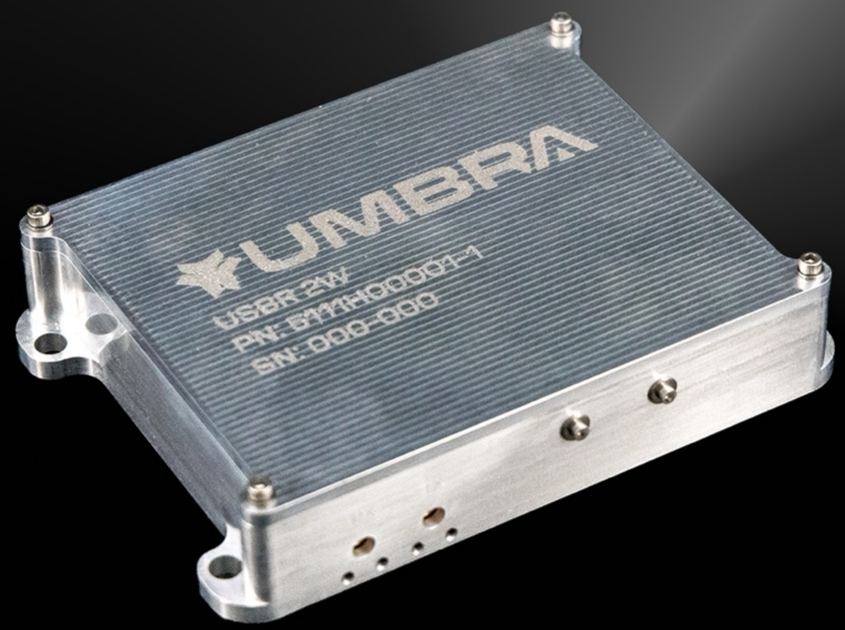
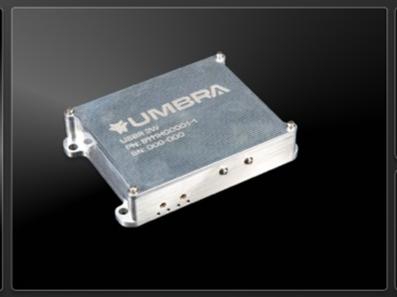
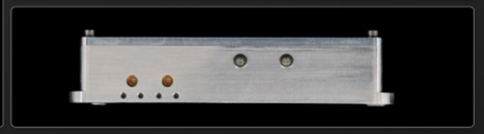
# UMBRA S-BAND RADIO

**THE UMBRA S-BAND RADIO** is a qualified transceiver for command and telemetry in Low Earth Orbit (LEO). It supports Unified S-Band, complies with modulation and coding standards defined by the Consultative Committee for Space Data Systems (CCSDS MODCOD), and integrates easily via an industrial Ethernet interface. With testing tailored for Falcon 9 rideshare missions, it offers post-launch configurability for flexibility on-orbit, reliable communication with commercial ground stations and compatibility with launch requirements. Above all, the Umbra S-Band Radio boasts high value and short lead times.

CCSDS COMPLIANT | LEO ENVIRONMENT | S BAND FULL SUPPORT | ON-ORBIT CONFIGURATION







## GENERAL SPECIFICATIONS

| | |
|---|---|
| MAX DIMENSIONS | 6.6" x 4.6" x 1.3" |
| MASS | 0.59 kg |
| BUS VOLTAGE RANGE | 22V to 32V |
| BUS VOLTAGE NOMINAL | 28V |
| PEAK POWER | 15.7W while transmitting |
| AVERAGE POWER | 4.4W while receiving |
| ELECTRICAL INTERFACE | 31-Pin Micro-D Connector |
| DATA INTERFACE | GigE over IX connector |
| INTENDED SPACE ENVIRONMENT | LEO |
| TRL | TRL 6, TRL 8 by Q3 2025 |
| DESIGN LIFE | 5+ Years |
| PRODUCTION | Assembled and tested in the USA |
| OUTPUT POWER | Up to 2 W |
| DATA RATE | 1kbps to 1Mbps |
| DOPPLER CORRECTION | 100kHz at 10kHz/s |
| SENSITIVITY @ 100KBPS | -100dBm |
| TRANSMIT MODCOD | OQPSK, HDLC, NRZ-L/M/S, Convolutional Encoding (k=7, ½, G2 inverted), Reed-Solomon (255,223) |
| RECEIVE MODCOD | BPSK, HDLC, NRZ-L/M/S |
| FREQUENCY RANGE | Uplink: 2025MHz to 2110MHz, Downlink: 2200MHz to 2290MHz |
| ACQUISITION TIME | < 3 seconds |

## TEST DATA

| | |
|---|---|
| RANDOM VIBE | Qualified to 14.16 gRMS profile enveloping GEVS, Falcon 9, SpaceX Rideshare, and Electron levels |
| SHOCK | Qualified to 600g peak profile enveloping attenuated GEVS, Falcon 9, SpaceX Rideshare, and Electron levels |
| OPERATING TEMPERATURE | -30°C to 80°C |
| SURVIVAL TEMPERATURE | -40°C to 90°C |
| EMI/EMC | MIL-STD-461 |
| RADIATION | >30 krad |

## FEATURES

### ON-ORBIT FLEXIBILITY | REMOTELY CONFIGURABLE

The Umbra S-Band Radio offers unparalleled flexibility, allowing for complete reconfiguration of communication parameters after launch. This powerful capability enables on-the-fly adjustments to optimize performance and adapt to evolving mission needs throughout the satellite's operational life.

### SPACE QUALIFIED | RADIO HERITAGE

Umbra's extensive history in RF payloads and high-performance downlinks has led to the design of the Umbra S-Band Radio. Fully space qualified, this design offers a full 2W output power to close demanding link budgets.

### GLOBAL COMPATIBILITY | UNIFIED S-BAND & CCSDS

Engineered for full compliance with the Unified S-Band standard and Consultative Committee for Space Data Systems (CCSDS) modulation and coding schemes (MODCOD), the Umbra S-Band Radio ensures robust communication compatibility. This standard adherence simplifies operations and guarantees reliable data links with diverse systems.

### WORRY-FREE TELEMETRY | SIMPLE INTEGRATION

Built on Umbra's operational experience with Telemetry, Tracking, and Control (TT&C) via commercial ground network providers. The Umbra S-Band Radio has been engineered to provide seamless integration into your spacecraft, your test Hardware-in-the-Loop testbed, and to ensure reliable connection with your chosen ground provider.

## CONFIGURATIONS

| TYPE | DESCRIPTION & DETAILS | SPACE READY | LEAD TIME | COST |
|---|---|---|---|---|
| EDU | Includes Kratos qRadio modem configuration xml | No | 5-Week Lead Time | CONTACT |
| FLIGHT | • Optional – Diplexer + splitter<br>• Optional – Diplexer | Yes | 8-Week Lead Time | CONTACT |
| CUSTOM | Umbra Space Systems offers custom modifications. Please contact. | Inquire | Inquire | CONTACT |

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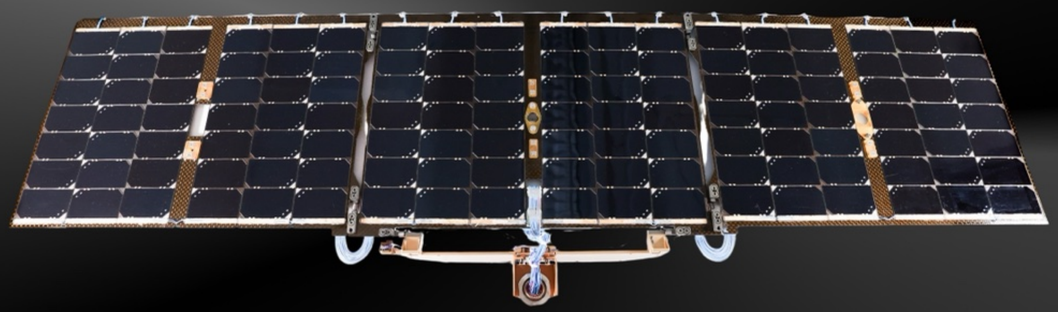
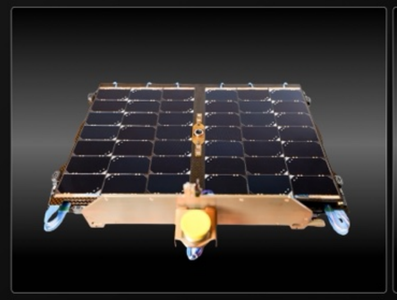
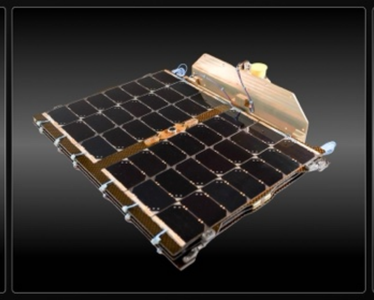
# UMBRA SOLAR ARRAY

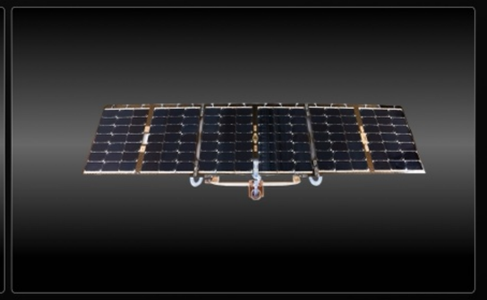
**THE UMBRA BODY STEERED DEPLOYABLE SOLAR ARRAY** delivers 120W+ of reliable power in a compact, flight-proven design for small satellites. Optimized for body-steering in Low Earth Orbit (LEO), this tri-fold array features high dynamic stability and redundant, premium triple-junction solar cells. Validated on Falcon 9 and designed for seamless integration within the Umbra Integrated System, this solar array provides a dependable, high-performance power generation solution.

120W+ MULTI-UNIT CAPACITY | MORE THAN 5YR MISSION LIFE | HIGH STOW COMPACTION | LEO ENVIRONMENT









## GENERAL SPECIFICATIONS

| | |
|---|---|
| MAX DIMENSIONS STOWED | 12.87" x 12.95" x 2.90" |
| MAX DIMENSIONS DEPLOYED | 40" x 13" x 10" |
| MASS | 2.5 kg |
| PEAK POWER | 120W generation BOL |
| ELECTRICAL INTERFACE | Single MIL-38999 Connector |
| VOC | BOL: 38.08 V<br>EOL: 35.80 V |
| VMP | BOL: 22.68 V<br>EOL: 31.66 V |
| IMP | BOL: 2.3 A |
| PMP (TOTAL ARRAY) | 120W |
| PRODUCTION | Assembled and tested in the USA |

## TEST DATA

| | |
|---|---|
| RANDOM VIBE | Qualified to 14.16 gRMS profile enveloping GEVS, Falcon 9, SpaceX Rideshare, and Electron levels |
| SHOCK | Qualified to 600g peak profile enveloping attenuated GEVS, Falcon 9, SpaceX Rideshare, and Electron levels |
| OPERATING TEMPERATURE | -50°C to 90°C |
| SURVIVAL TEMPERATURE | -60°C to 120°C |
| RADIATION | >30 krad |

## CONFIGURATIONS

| TYPE | DESCRIPTION & DETAILS | SPACE READY | LEAD TIME | COST |
|---|---|---|---|---|
| EDU | • Deployable panels only, for use in structural/thermal model builds<br>• Cells not included<br>• Single & Double Available | No | 4-Week Lead Time<br>For both Single & Double | CONTACT |
| FLIGHT | • Acceptance tested<br>• Multiple arrays can be used on the same spacecraft, or integrated into the UMBRA POWER PACKAGE | Yes | **Single:** 12-Week Lead Time<br>**Double:** 16-Week Lead Time | CONTACT |
| CUSTOM | Umbra Space Systems offers custom modifications. Please contact. | Inquire | Inquire | CONTACT |

# FEATURES

### COMPACT POWER | HIGH EFFICIENCY

The Umbra Solar Array generates 120W of peak power (BOL) from a compact, tri-fold design. This high power density, combined with premium triple-junction solar cells, maximizes energy generation while minimizing stowed volume, crucial for small satellite applications.

### BODY-STEERING OPTIMIZED DESIGN

Specifically engineered for body-steering, this array eliminates the need for complex, dedicated pointing mechanisms. This design simplifies spacecraft design, reduces weight and power consumption, and enhances overall mission efficiency for agile small satellites.

### FLIGHT-PROVEN | VALIDATED RELIABILITY

Validated through successful deployments, the Umbra Solar Array offers proven reliability and performance in real-world space environments. This flight heritage, combined with its compatibility with the Umbra HDRM, provides mission-ready confidence and minimizes risk.

### BUILT TO ENDURE | ROBUST & REDUNDANT

The Umbra Solar Array is built for long-term operation, featuring multiple layers of redundancy in the photovoltaic design, premium triple-junction cells with bypass diodes, and robust construction. Space-rated materials, rigorous testing exceeding industry standards, and customizable coverglass options ensure lasting performance in the harsh LEO environment.

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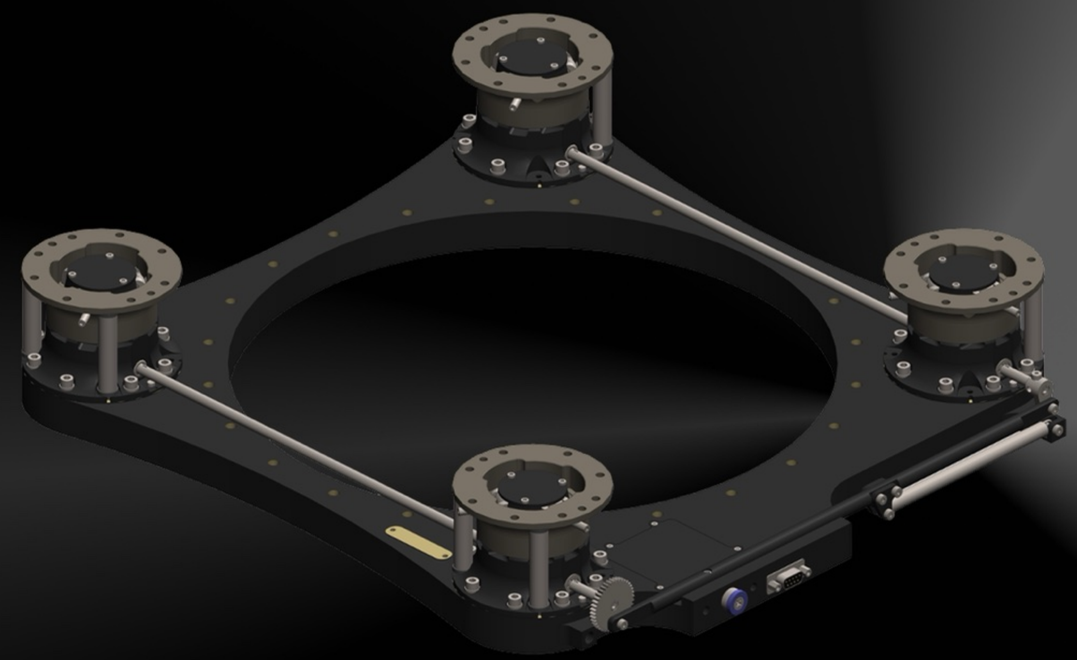
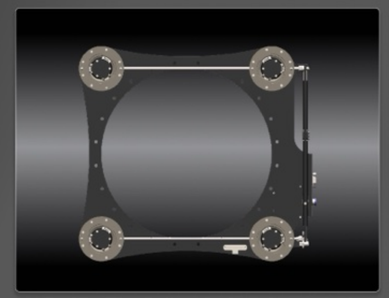
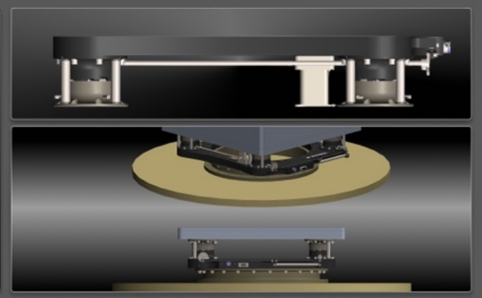
# UMBRA SYNCRELEASE 4

**THE UMBRA SYNCHRONIZED RELEASE MECHANISM 4** is a spacecraft separation system designed for precise and controlled deployment from a launch vehicle. The Umbra SyncRelease 4 is engineered for small satellites to ensure low-shock, debris-free separation. Optimized for SpaceX Falcon 9 Rideshare missions, Umbra SyncRelease 4 reduces risk to its associated payload and surrounding mission assets. This lightweight, all-inclusive solution simplifies spacecraft deployment while maintaining the reliability required for extreme launch environments.

RAPID START-UP | SYNC RELEASE







## GENERAL SPECIFICATIONS

| | |
|---|---|
| MAX DIMENSIONS | 17.700" x 19.680" x 3.480" |
| MASS | **Lower/Lauch Vehicle Side:** 5.482kg<br>**Upper/Flyaway Vehicle Side:** 0.928kg |
| BUS VOLTAGE RANGE | 17V - 30V |
| BUS VOLTAGE NOMINAL | 24V |
| PEAK POWER | 4.24 W |
| AVERAGE POWER | 3W @ 24V |
| ELECTRICAL INTERFACE | DE-9 Socket |
| INTENDED SPACE ENVIRONMENT | LEO |
| TRL | TRL 6, TRL 8 by Q3 2025 |
| DESIGN LIFE | 1 Launch, >5 I&T actuation cycles |
| PRODUCTION | Assembled and tested in the USA |

## TEST DATA

| | |
|---|---|
| RANDOM VIBE | Qualified to 14.16 gRMS profile enveloping GEVS, Falcon 9, SpaceX Rideshare, and Electron levels |
| SHOCK | Qualified to 2,000g peak profile |
| OPERATING TEMPERATURE | -30°C to 70°C |
| SURVIVAL TEMPERATURE | -40°C to 80°C |
| QUASI-STATIC LOAD | Qualified to 12.5g axial and 16.88g lateral sine bursts |

## FEATURES

### DEBRIS-FREE DEPLOYMENT | EASY INTEGRATION

The mechanism ensures a simple & synchronized deployment, generating minimal foreign object debris (FOD). Unlike traditional pyrotechnic systems, the Umbra SyncRelease 4 is easily resettable, speeding up integration testing and launch site integration.

### LOW-SHOCK SEPARATION | PROTECT PAYLOAD

Engineered for low-shock separation, the Umbra SyncRelease 4 minimizes the loads on your spacecraft during deployment. This design protects sensitive instruments and components, ensuring their operational integrity after launch.

### VALIDATED | MISSION-READY RELIABILITY

Umbra continuously seeks to expand the envelope of spacecraft mass properties validated for Umbra SyncRelease 4 customers. The Umbra SyncRelease 4 provides simple actuation you can trust. The inherent reliability of the design minimizes mission risk and ensures dependable separation in real-world space environments.

### TAILORED DEPLOYMENT | CUSTOMIZABLE

Offering customization for CG offset, the Umbra SyncRelease 4 allows you to tailor the deployment parameters to your specific spacecraft and mission needs. This flexibility ensures optimal separation conditions for a wide range of small satellite platforms.

## CONFIGURATIONS

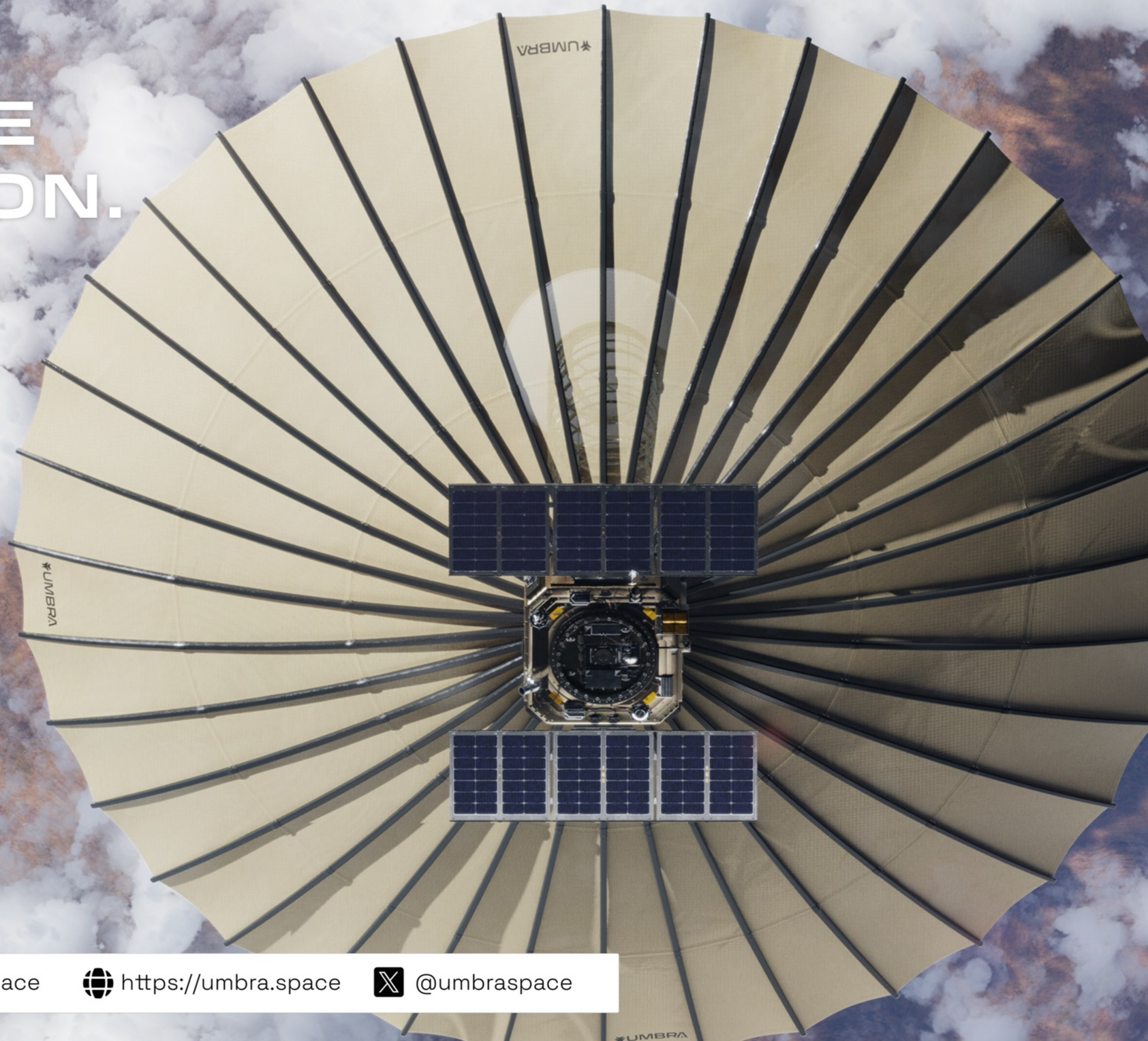
| TYPE | DESCRIPTION & DETAILS | SPACE READY | LEAD TIME | COST |
|---|---|---|---|---|
| EDU | Suitable for test fits and Hardware-in-the-Loop testbeds | No | 6-Week Lead Time | CONTACT |
| FLIGHT | Standard 4 actuator small sat configuration | Yes | 16-Week Lead Time | CONTACT |
| CUSTOM | Umbra Space Systems offers custom configurations tailored for your spacecraft mass properties.<br>Please contact. | Inquire | Inquire | CONTACT |




**WEB:** umbra.space/space-systems
**EMAIL:** space.systems@umbra.space

UMBRA

# ACCELERATE YOUR MISSION.

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