



KRATOS 3U

PRODUCT NAME

KRATOS 3U CubeSat Platform: 1-Step solution, just add your payload

SUMMARY

The EXA KRATOS 3U Spacecraft bus is a 1 step cubesat solution that allows developers to focus on the payload and its mission: It includes everything needed for the spacecraft to work and even comes VTV tested, just integrate your payload and fly.

The KRATOS SCB is completely configurable: From a compact spacecraft core with a 2.5U space for large payloads, to a powerhouse containing up to 350W of power, and LASER communications at 10Mbps. it has everything needed to fly: Onboard computer with pre-installed libraries, SDR Radio with integrated power amplifier, a powerful EPS with 4 power rails, UMPPT Solar management coupled to a fast battery charger, Deployable Multifunction Solar Arrays, automated deploy/release control to up to 4 devices, embedded monopole and dipole antennas from VHF to L band, embedded magnetorquers, temperature and sun sensors in all walls, ADCS control with integrated Z axis magnetorquer, high power batteries, and radiation hardened SSD.

You can add or subtract features and expand capabilities accordingly to your project budget, the main idea is that you focus on your mission, we focus on the spacecraft.

Availability: 8 to 16 weeks

Includes:

- Full Engineering Support
- Test Reports
- EUDP, ICD
- UN38.3, CoO, MSDS
- Shipped in Pelican 1300 Case



FEATURES

- All included, Ready to fly, just add your payload
- Custom configurable to fit tight budgets
- Room for 6 standard payload boards and 3 cameras
- USB 2.0 and I2C bus as standard
- LASER communications at 10Mbps available as an option
- Embedded antennas, magnetorquers, temperature and sun sensors
- Includes ICEPS all-in-one OBC, EPS, SDR radio and ADCS systems
- Battery has temperature sensors, passive heater and optional active heaters
- Automated release and deploy of panels, antennas and room to control 2 more devices
- Designed for LEO missions and requirements
- Manufactured according to NASA and ESA space standards and materials
- Functional, performance, thermal bake out and vibration tests provided with documentation.
- Compatible and compliant with standard deployers and CubeSat Standard

PERFORMANCE

- EPS:
 - 350W max effective delivered power
 - Payload power available from 20W (min) to 95W (max)
 - 4 Power Rails: 5V@25W, 3V3@10W, 12V@50W and 1 unregulated power rail
 - 1 APU connection available
 - UMPPT 4-channel, 2A each, Solar power manager
 - Fast 2A dual Li-poly charger onboard
 - Solar array power from 3.75 W minimum to 16 W maximum
 - Solar Cell Efficiency: 28% (High power) or 19% (low cost)
 - Battery:
 - BA03/S slim high energy density array
 - 25Whr minimum, 100Whr maximum
 - Embedded temperature sensor
 - Standard graphene passive heater
 - Optional active heater
- ADCS:
 - 6 sun sensors input from all walls
 - Integrated IMU
 - Optional Novatel GPS w/antenna
 - Detumbling and B dot libraries included
 - Embedded Magnetorquers MT02:
 - Nominal Magnetic moment: $>0.14 \text{ Am}^2$
 - Saturation Magnetic moment: $>0.48 \text{ Am}^2$
 - Linearity: $\pm 4\%$ across operating design range
 - Residual moment: $<0.0075 \text{ Am}^2$
 - Torque: $3.66 \mu\text{Nm}$ @ 3.2 mTesla (1U mass)
 - Angular acceleration: 1.75 Rad/sec^2 (1U mass)

- B-center = 3.0 Gauss
 - B-corners = 3.1 Gauss
 - Typical resistance: 14.1 to 14.7 ohms @ 25°C
 - Random Vibration: 16g rms
 - Z Magnetorquer MT01:
 - Nominal Magnetic moment: >0.19 Am²
 - Saturation Magnetic moment: >0.85 Am²
 - Linearity: +/- 4% across operating design range
 - Residual moment: <0.0045 Am²
 - Torque: 5.36 μNm @ 7.2-3 Tesla (1U mass)
 - Angular acceleration: 3.2-3 Rad/sec² (1U mass)
 - B-center = 8.9 Gauss
 - B-corners = 14.5 Gauss
 - Typical resistance: 4.1 to 4.7 ohms @ 25°C
 - Random Vibration: 16g rms
- Sun Sensor (6):
 - Analog, GPIO, 5 to 16V digitized by ADCS
 - Linear response range from 0.2V to 5V
 - Working current: 50 mA
 - Working FOV: 65 degrees H/V
- Temperature sensor (6):
 - Analog, GPIO, 4 to 12V
 - 4 of them digitized by the OBC
 - Linear response range from 0.3V to 1.5V
 - Working current: 80 mA
 - Working temperature: -65 to 135C
- SDR Radio:
 - Epiq Z2 ARM9 SDR
 - SDR radio from 70MHz to 6GHz
 - One Transceiver port and 2 Receive only ports
 - Embedded Antennas:
 - Band Range: VHF to L-band
 - Gain:
 - Monopole configuration = 2.1 dB max
 - Dipole configuration = 3.1 dB max
 - Extended Monopole = 2.3 dB max
 - Lambda: from 1/4 to full wave
 - Optional active S-band patch with 6 dBi gain, 120 degrees aperture
 - Optional active L-band patch with 6 dBi gain, 105 degrees aperture
- OBC:
 - Xilinx ARM9 dual core @733Mhz OBC
 - Preinstalled Linux IIOS with full libraries
 - 32GB to 512GB SSD radhard storage
 - 24 onboard sensors, room for 32 GPIO inputs
 - USB and i2C concurrent buses with room for 8 user devices or payloads



- 512 MB of DDR3L RAM
- 32 MB of QSPI flash storage for uboot bootloader Linux kernel, and root file system
- 480 Mbps bus speed (USB 2.0)
- Shielding:
 - SEAM/NEMEA A-class
 - Regulates temperature to a comfortable and steady 10C inside the spacecraft
 - Stable and steady temperature trough the complete thermal cycle
 - Deters and attenuates Alpha and beta particles, Gamma and X-rays and L-neutrons
 - Can withstand 140C on the outside while providing 20C inside the spacecraft

PRODUCT PROPERTIES

- Mass (exact mass depends on configuration):
 - 1 panel: 460 g minimum
 - 2 panels: 500 g minimum
 - 3 panels: 540 g minimum
- Al T6061 structure w/ 2 tunable pushers and 1 activation switch
- Solar panels thickness:
 - Folded:
 - 1 panel: 2 mm
 - 2 panels: 4 mm
 - 3 panels: 6.25 mm
 - Unfolded: 1.5 mm
- Operating Temperature: -80 to +140°C
- Radiation Tolerance: 4 years minimum in LEO

MATERIALS

- Only TML and CVCM < 1% materials used, NASA and ESA approved:
- Contact sensors: Gold Deploy and Release
- Actuators:
 - Deploy: Spring operated
 - Release: EXA artificial muscles MDR/R1C, 50 grams max torque
- Cell Material: GaAs (High power) or mono crystalline Silicon (low cost)
- Cell Interconnector: Invar Silver plated
- PTFE (Teflon) space grade cables, multi-strand, silver plated copper (AWG26, AWG24)

TESTING

All platforms are provided with tests reports regarding the following tests:

Test	QT	AT
Functional		
Vibration	☑	
Thermal Cycling	☑	
Thermal Vacuum	☑	
Mechanical/Dimensional compliance	☑	

Continuity Isolation		
Solar cells Cracks		
Flasher Test		
Sensors Test	✓	
OBC General interoperability Test	✓	
USB & I2C bus test	✓	
Deploy/Release Test	✓	
Antennas network VSWR Test	✓	
LASER emitter net power test	✓	
Batteries test	✓	
General Performance and day-in-the-life test		