

REACTION WHEEL

PS-RW-11



On-Orbit Heritage. Smooth & Precise Pointing.

Compact, mission-ready, and flight-proven in LEO, Reaction Wheel-11 supports 6U-12U platforms that require continuous, repeatable attitude performance across multi-year missions.

KEY HIGHLIGHTS

- ▶ Compact 45 × 45 × 29mm footprint and 148 g mass, optimized for 6U-12U class satellites.
- ▶ 10.9mN•m•s rated momentum and 10mN•m peak torque for agile attitude maneuvers.
- ▶ Sensored field-oriented control (FOC) for minimal torque ripple and clean motion profiles.
- ▶ In-orbit automatic encoder calibration mode for sustained speed-estimation accuracy.
- ▶ Multi-mode operation: speed, momentum, acceleration, and torque control.
- ▶ Regenerative braking returns deceleration energy back to the satellite bus.
- ▶ Full protection suite: over-temperature, over-current, under/over-voltage.



Multi-mode control, low micro-vibration and magnetic residuals, regenerative braking, and full protections further enhance stability and efficiency.

TECHNICAL FEATURES

Performance

Rated Momentum	10.9 mN.s
Maximum Torque	10 mN.m
Rated Speed	5600 rpm
Static Imbalance	<5 mg.cm
Dynamic Imbalance	<10 mg.cm ²
Speed-control Accuracy (2σ)	<0.6 rpm
Balance Grade @ 1000 rpm (ISO-21940-11)	G 0.4

Hardware

Operating Voltage	12 V
Dimensions (WxLxH)	45 × 45 × 29 mm
Total Mass	148 g
Comm. Interface	2x CAN, UART / RS485
Rotor Inertia	186 g•cm ²

Environmental

Radiation Tolerance	>28 kRad
Random Vibration	14.16 (GEVS) gRMS
Operating Temperature	-25/+60 °C
Storage Temperature	-40/+80 °C
Designed Lifetime	> 5 years

Power

Avg. Power @ 0 rpm	0.49 W
Avg. Power @ 2000 rpm	0.67 W
Avg. Power @ Max Speed	1.22 W
Peak Power	7 W

MISSION BENEFITS

Flight-Proven in LEO: 29 PS-RW-11 wheels operating across 9 spacecraft, with the first unit on orbit since August 2024 - continuous round-the-clock performance.

Low Micro-Vibration: Each unit is individually balanced; six-axis Kistler force-moment dynamometer measurements available on request.

Long-Life Reliability: Designed lifetime exceeding 5 years.

High Pointing Stability: Speed-control accuracy below 0.6 rpm (2σ); ISO-21940-11 G0.4 balance grade after vibration.

Energy-Smart Operation: Regenerative

Engineered for long-term missions with a designed lifetime exceeding 5 years, the Reaction Wheel-11 is built for reliability.

- ▶ Micro-vibration data is available upon request, offering full transparency for mission specific performance needs.
- ▶ Each wheel is subjected to acceptance-level environmental tests.
- ▶ Each wheel is individually balanced.

HERITAGE / QUALIFICATION

TRL: 9.

Acceptance Testing: Each wheel undergoes acceptance-level environmental tests.

Balancing: Each wheel is individually balanced.

Micro-Vibration Characterization: Six-axis Kistler dynamometer.

Proven in Orbit: Flight heritage demonstrated on 9 Satellites with 29 units.

STANDARDS & COMPLIANCE

- ▶ NASA-GEVS (GSFC-STD-7000) environmental verification.
- ▶ SpaceX Rideshare Payload User's Guide (Version 10, September 2024) launch-environment compatibility.

