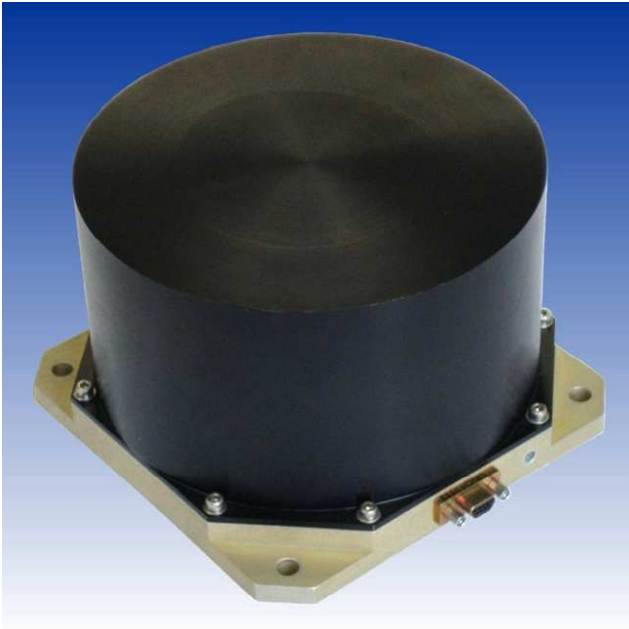


Reaction Wheel VRW-1



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VECTRONIC Aerospace has developed the VRW-1 reaction wheel series especially for small satellite applications. Reaction wheels are actuators used to influence the rotational motion of a spacecraft. According to the principle of angular momentum conservation, a torque is exerted onto the spacecraft if the wheel speed is changed. The ratio between acceleration of the wheel and the spacecraft is equal to the ratio of their moments of inertia.

The reaction wheels VRW-1 comprise the following components:

- brushless DC Motor,
- rotor,
- wheel drive electronics,
- housing.

The wheel speed is controlled with a model supported PI-loop running inside the 32 Bit micro processor which is using a low noise high efficiency four quadrant PWM method in the power stage. The wheel drive electronic includes thermal and over voltage protection circuits. The signal interface is a standard asynchronous SCI on RS422/RS485 level. It can be used in a single full-duplex configuration as well as in a half-duplex bus architecture. The baud rate is adjustable up to 1Mbaud.

The reaction wheel design is kept modular. By changing the rotor geometry, input voltage range or communication protocol, the VRW-1 characteristics are easy to adapt to customer needs.

Flexible operation in torque control mode or speed control mode is possible.

The nominal In-Orbit lifetime for this type of reaction wheels is more than 45.000 hours.

Technical Data of VRW-1

Mechanical	
Dimensions	115 mm x 115 mm x 77 mm
Mass	1.8 kg
Moment of Inertia (rotor)	$2.0 \cdot 10^{-3} \text{ kgm}^2$
Mounting pattern	4x M5 96 mm x 96 mm

Environmental	
Operating temp. range	-20°C to +70°C
Storage temp. range	-40°C to +80°C
Vibration	15 g rms random 3 axis
Radiation tolerance	>20 krad

Electrical	
Power consumption:	
@steady state, 0 rpm	<1.0 W
@steady state, 4000 rpm	<3.0 W
@max. torque	<25 W
Signal interface	RS422 / RS485
Signal characteristics	Serial asynchronous
Connector Type	MDM-9

Performance	
Nominal speed	$\pm 5000 \text{ rpm}$
Max. speed	$\pm 6500 \text{ rpm}$
Angular momentum	1.0 Nms
Max. torque	$\pm 25 \text{ mNm}$
Speed control loop accuracy (2σ)	0.25 rpm
Unbalance static/dynamic	< 1 gmm / 80 gmm ²