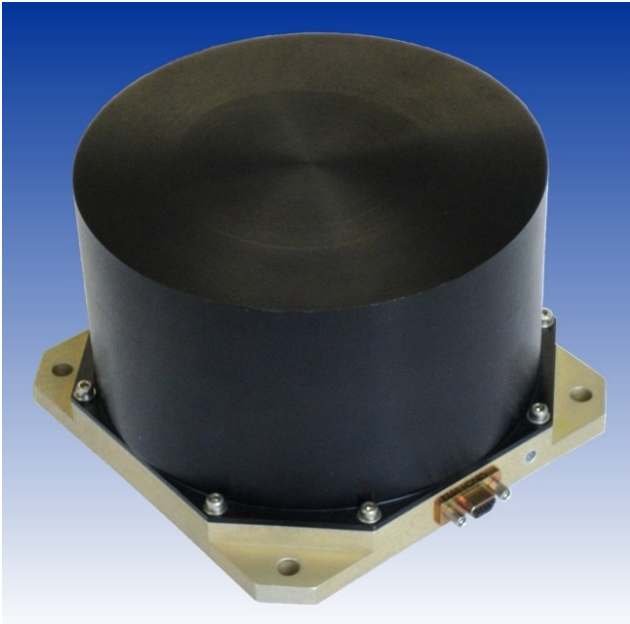




## Reaction Wheel VRW-A-1



**Reaction Wheel VRW-A-1**

VECTRONIC Aerospace has developed the VRW 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 of the VRW series 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 integrated 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. A CAN bus interface is also available.

The reaction wheel design is kept modular. By changing the rotor geometry, motor size, input voltage range or communication protocol, the VRW 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 5 years.

The VRW reaction wheels have already been used successfully in multiple space missions, in LEO as well as in GEO

### Technical Data of VRW-A-1

Mechanical	
Dimensions	115 mm x 115 mm x 80 mm
Mass	1.9 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	26 g rms random 3 axis
Radiation tolerance	>20 krad

Electrical	
Power consumption:	
@steady state, no speed	<1.5 W
@steady state, max speed	<4.5 W
@max. torque, max speed	<45 W
Input Voltage Range	9 VDC to 36 VDC
Signal interface	RS422 / RS485 / CAN
Connector Type	MDM-9 / MDM-25

Performance	
Max. speed	± 6000 rpm
Max. Angular Momentum	1.25 Nms
Max. torque	± 20 mNm
Speed control loop accuracy (2σ)	0.1 rpm
Unbalance static/dynamic	< 1 gmm / 80 gmm <sup>2</sup>