REACTION WHEEL UNIT

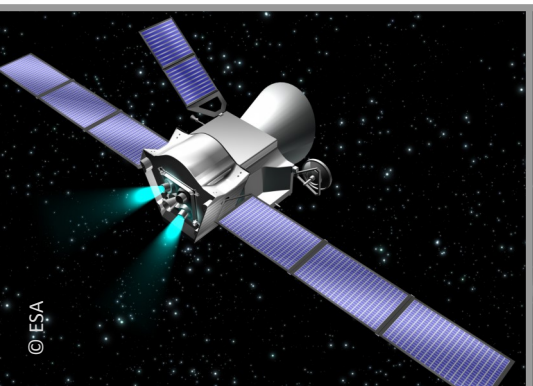
The Bradford Reaction Wheel Unit (RWU) channel consists of a Reaction Wheel Assembly (RWA) and one Wheel Drive Electronics Box (WDE). The RWA is a rotating inertial mass, driven by a brushless DC electric motor. When power is applied to the motor, the wheel accelerates, causing the satellite body to which the motor housing is attached to rotate in the opposite direction due to the induced counter torque. A minimum of three sets of RWA are needed per satellite to allow rotational control around the 3 axes. One extra RWA is generally present for redundancy purposes.

Bradford offers a range of RWA to the market, each specifically sized for a particular angular momentum control range. All wheels are based on the same proven design, maximizing the available heritage database.

Key Advantages

- High torque level over full speed range
- Fixed torque rise time allowing precise and repeatable control over full speed/torque range
- Analogue or Digital interface
- Accurate wheel speed signal
- Proven zero crossings and low RPM performance with excellent micro-vibration performance
- Most braking energy is dissipated within the WDE. No energy is injected back into the S/C power bus.
- Lifetest and in-orbit heritage:

  SOHO, RadarSat, Seastar, Olympus, INTEGRAL, XMM, Rosetta, Aeolus, BepiColombo



Reaction Wheel Unit

Characteristic	W18	W18E	W18ES	W45	W45E
Momentum Storage (Nms)	18	22	25	40	45
Maximum Operational Speed (RPM)	4000				
Number of pulses per revolution	240				
Maximum Gross Torque (Nm)	0.265			0.248	
Typical Torque Loss at max. speed (Nm)	0.037				
Static/dynamic imbalance (g.cm, g.cm^2)	0.5/5.0				
RWA Dimensions (mm)	Ø295×125	Ø295×125	Ø295×125	Ø365×125	Ø365×125
RWA Mass (kg)	5.20	5.65	6.02	6.70	7.45
2-channel WDE Dimensions (mm)	258×181×143				
2-channel WDE Mass (kg)	4.67				
Torque rise/fall time (ms)	80				
Peak Power Consumption at max. torque and speed (W)	168				
Steady State Consumption at max. constant speed (W)	29				
Quiescent Power Consumption (W)	7.6				
Power bus interface	28Vdc or 50Vdc				
Data interface	MIL-STD-1553B or analogue				
TM/TC frequency	up to 10 Hz				
Qualification Random Vibration — RWA	IP: 10 gRMS, OoP: 15 gRMS (including notch to protect bearings)				
Qualification Random Vibration — WDE	IP: 11.2 gRMS, OoP: 17.4 gRMS				
Qualification Operational temperature — RWA	-15°C to +60°C				
Qualification Operational temperature — WDE	-30°C to +60°C				
Shock environment — RWA	400g – 2000 g depending on balancing requirements				
Shock environment — WDE	2000 g				

Variants of RWU Available

2-4-5 channel WDE configuration are available.

Depending on the configuration delta qualification might be required.

RWA moment of inertia of rotation mass can be tuned.

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ABOUT

Bradford is a high-tech European developer and manufacturer of satellite control sub-systems and components.

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