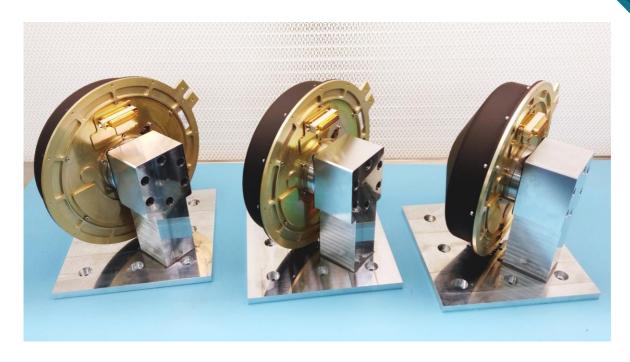


## SSTL GEO WHEEL



Surrey Satellite Technology under contract with prime contractor Airbus Defence and Space (ADS), have designed, developed and qualified in 2018 the first SSTL GEO wheel. The first GEO flight wheels were subsequently launched in July 2021 on Eutelsat Quantum. All reviews were held with Airbus Defence & Space and the European Space Agency.

### **BENEFITS**

- 15 year design life in GEO orbit
- Fully integrated radiation hard electronics
- Hermetically sealed mechanism
- Fully qualified
- Flight units launched & operational

### **FEATURES**

- Both current and speed modes implemented
- Single connector for communications & power
- Chassis or harness grounding
- Regenerated power returns back to spacecraft bus
- > ON/OFF electrically isolated (optical)
- RS485 communications

# SSTL GEO WHEEL

#### **SPECIFICATIONS:**

Model Code   SSW-200-OGS-12000		
Momentum 12Nms @ +/-5000rpm Speed range +/-5000rpm Operational revolutions (orbit) Speed accuracy 0.4166rpm (720PPR) - Encoder Speed jitter 2 x 0.416rpm Unbalance Static <2gcm Dynamic <14gcm^2 Lifetime (orbit) 15.25 years Environment Designed for Geostationary Orbit Vibration (qualification) 100Hz 20g, 1400Hz 1000g, 10000Hz 1000g Thermal (qualification) -35°C to +70°C (survival) -30°C to +60°C (operating) Electrical Interface Single male socket (D-type) 25 way  Nominal Regulated range Voltage 23.5V DC min (reduced performance) Idle power consumption Maximum power consumption ON/OFF operations Unlimited Telecommands Speed demand, current demand (torque), control gains, coast Telemetry Speed, control loop, control current, motor current internal temperatures, internal rail voltages, gains Communications RS485 Internal speed controller update rate Maximum external telemetry update rate Maximum external telemetry update rate Wheel volume Diameter 240 x 95mm Wheel mechanical interface  N-4800rpm (720PPR) - Encoder Sending (720PER) - Encoder Sending (720Petal) - Encoder Sending	Model Code	SSW-200-OGS-12000
Speed range	Reaction Torque	·
Coperational revolutions (orbit)	Momentum	
revolutions (orbit)  Speed accuracy  0.4166rpm (720PPR) - Encoder  Speed jitter  2 x 0.416rpm  Unbalance  Static <2gcm		· · · · · · · · · · · · · · · · · · ·
Speed accuracy       0.4166rpm (720PPR) - Encoder         Speed jitter       2 x 0.416rpm         Unbalance       Static <2gcm Dynamic <14gcm^2	Operational	<20.1 billion
Speed jitter       2 x 0.416rpm         Unbalance       Static <2gcm Dynamic <14gcm^2	revolutions (orbit)	
Unbalance Static <2gcm Dynamic <14gcm^2 Lifetime (orbit) 15.25 years Environment Designed for Geostationary Orbit  Vibration (qualification) 15 Grms X/Y, 16 Grms Z (qualification) 100Hz 20g, 1400Hz 1000g, 10000Hz 1000g Thermal (qualification) -35°C to +70°C (survival) -30°C to +60°C (operating)  Electrical Interface Single male socket (D-type) 25 way  Nominal Regulated range Voltage 23.5V DC (full performance) Idle power consumption Maximum power consumption Maximum power consumption ON/OFF operations Unlimited Telecommands Speed demand, current demand (torque), control gains, coast  Telemetry Speed, control loop, control current, motor current internal temperatures, internal rail voltages, gains  Communications RS485 Internal speed controller update rate  Maximum external telemetry update rate  Wheel volume Diameter 240 x 95mm  Wheel mechanical interface of Goff M6 on 38mm PCD		0.4166rpm (720PPR) - Encoder
Lifetime (orbit) 15.25 years Environment Designed for Geostationary Orbit  Vibration (qualification) 15 Grms X/Y, 16 Grms Z (qualification) Shock (qualification) 100Hz 20g, 1400Hz 1000g, 10000Hz 1000g Thermal (qualification) -35°C to +70°C (survival) -30°C to +60°C (operating)  Electrical Interface Single male socket (D-type) 25 way  Nominal Regulated range Voltage 23.5V DC (full performance) 23.5V DC min (reduced performance)  Idle power consumption Maximum power consumption ON/OFF operations Unlimited Telecommands Speed demand, current demand (torque), control gains, coast  Telemetry Speed, control loop, control current, motor current internal temperatures, internal rail voltages, gains  Communications RS485 Internal speed controller update rate  Maximum external telemetry update rate  Wheel volume Diameter 240 x 95mm  Wheel mechanical interface	Speed jitter	2 x 0.416rpm
Lifetime (orbit) Environment Designed for Geostationary Orbit  Vibration (qualification) Shock (qualification) Thermal (qualification) Thermal (qualification) -35°C to +70°C (survival) -30°C to +60°C (operating) Electrical Interface Single male socket (D-type) 25 way  Nominal Regulated range Voltage Idle power consumption Maximum power consumption ON/OFF operations Telecommands Speed demand, current demand (torque), control gains, coast Telemetry Speed, control loop, control current, motor current internal temperatures, internal rail voltages, gains  Communications RS485 Internal speed controller update rate  Maximum external telemetry update rate Wheel volume Diameter 240 x 95mm Wheel mechanical interface  Interface  Diameter 240 x 95mm Wheel mechanical interface	Unbalance	Static <2gcm
Environment Designed for Geostationary Orbit  Vibration (qualification) Shock (qualification) Thermal (qualification) -35°C to +70°C (survival) -30°C to +60°C (operating)  Electrical Interface Single male socket (D-type) 25 way  Nominal Regulated range Voltage Idle power consumption Maximum power consumption ON/OFF operations Telecommands Telecommands  Telemetry Speed, control loop, control current, motor current internal temperatures, internal rail voltages, gains  Communications RS485 Internal speed controller update rate  Maximum external telemetry update rate  Wheel volume Diameter 240 x 95mm  Wheel mechanical interface  Internal control interface  Interface  Designed for Geostationary Orbit  15 Grms X/Y, 16 Grms Z  (audification) 100Hz 20g, 1400Hz 1000g, 10000Hz 1000g  Courrival (survival) -30°C to +60°C (operating)  For to +70°C (survival) -30°C to +60°C (operating)  For to +60°C (operation)  For to +60°C (op		Dynamic <14gcm^2
Vibration (qualification)  Shock (qualification)  Thermal (qualification)  Electrical Interface  Nominal Regulated range Voltage  Idle power consumption  ON/OFF operations  Telecommands  Telemetry  Communications  Communications  Elemetry  Vibration  100Hz 20g, 1400Hz 1000g, 10000Hz 1000g  100Hz 20g, 1400Hz 1000g, 10000Hz 1000g  For to +60°C (operating)  Single male socket (D-type) 25 way  Value (For the performance)	Lifetime (orbit)	15.25 years
(qualification)       100Hz 20g, 1400Hz 1000g, 10000Hz 1000g         Thermal (qualification)       -35°C to +70°C (survival)         -30°C to +60°C (operating)       -30°C to +60°C (operating)         Electrical Interface       Single male socket (D-type) 25 way         Nominal Regulated range Voltage       48.5 to 52.5V DC (full performance)         Idle power consumption       <5 Watts	Environment	Designed for Geostationary Orbit
Shock (qualification) Thermal (qualification) -35°C to +70°C (survival) -30°C to +60°C (operating)  Electrical Interface Single male socket (D-type) 25 way  Nominal Regulated range Voltage Idle power consumption Maximum power consumption ON/OFF operations Telecommands Telecommands Telemetry Speed, control loop, control current, motor current internal temperatures, internal rail voltages, gains  Communications Internal speed controller update rate  Maximum external telemetry update rate Wheel volume Wheel mechanical interface  Single male socket (D-type) 25 way  48.5 to 52.5 V DC (full performance)  48.5 to 52.5 V DC (full performanc		15 Grms X/Y, 16 Grms Z
Thermal (qualification) -35°C to +70°C (survival) -30°C to +60°C (operating)  Electrical Interface Single male socket (D-type) 25 way  Nominal Regulated range Voltage 48.5 to 52.5V DC (full performance) Idle power consumption Maximum power consumption ON/OFF operations Telecommands  Speed demand, current demand (torque), control gains, coast  Telemetry Speed, control loop, control current, motor current internal temperatures, internal rail voltages, gains  Communications RS485 Internal speed controller update rate  Maximum external telemetry update rate  Wheel volume Diameter 240 x 95mm Wheel mechanical interface  Over 100 control (survival) -30°C to +60°C (operating) -30°C to +60°C (operations) -30°C to +6		
Communications   Comm	Shock (qualification)	
Nominal Regulated range Voltage	Thermal (qualification)	-35°C to +70°C (survival)
Nominal Regulated range Voltage  Idle power consumption Maximum power consumption ON/OFF operations  Telecommands  Speed demand, current demand (torque), control gains, coast  Telemetry  Speed, control loop, control current, motor current internal temperatures, internal rail voltages, gains  Communications Internal speed controller update rate  Maximum external telemetry update rate  Wheel volume  Wheel mechanical interface  48.5 to 52.5V DC (full performance)  23.5V DC min (reduced performance)  (Full performance)  48.5 to 52.5V DC (full performance)  48.5 to 52.5V DC (full performance)  23.5V DC min (reduced performance)  48.5 to 52.5V DC (full performance)  48.5 to 52.5V DC (full performance)  23.5V DC min (reduced performance)  48.5 to 52.5V DC (full performance)  24.5 to 52.5V DC (full performance)  23.5V DC min (reduced performance)  24.5 to 52.5V DC (full performance)  25.5V DC min (reduced performance)  24.5 to 52.5V DC (full performance)  25.5V DC min (reduced performance)  26.5 to 52.5V DC (full performance)  27.5 to 52.5V DC (full performance)  28.5 to 52.5 to 52.		-30°C to +60°C (operating)
range Voltage 23.5V DC min (reduced performance)  Idle power consumption Maximum power consumption ON/OFF operations Unlimited Telecommands Speed demand, current demand (torque), control gains, coast  Telemetry Speed, control loop, control current, motor current internal temperatures, internal rail voltages, gains  Communications RS485 Internal speed controller update rate  Maximum external telemetry update rate  Wheel volume Diameter 240 x 95mm  Wheel mechanical interface  45 Watts  Controller demand (torque), control current, motor current internal temperatures, internal rail voltages, gains  5Hz  5Hz  6 off M6 on 38mm PCD	Electrical Interface	Single male socket (D-type) 25 way
Idle power consumption       <5 Watts	Nominal Regulated	48.5 to 52.5V DC (full performance)
consumption  Maximum power consumption  ON/OFF operations  Telecommands  Speed demand, current demand (torque), control gains, coast  Telemetry  Speed, control loop, control current, motor current internal temperatures, internal rail voltages, gains  Communications  RS485  Internal speed controller update rate  Maximum external telemetry update rate  Wheel volume  Diameter 240 x 95mm  Wheel mechanical interface  V180 Watts  College (2180 Watts)  Speed demand, current demand (torque), control gains, coast  Speed, control loop, control current, motor current internal temperatures, internal rail voltages, gains  SHZ	range Voltage	l ' '
Maximum power consumption  ON/OFF operations  Telecommands  Speed demand, current demand (torque), control gains, coast  Telemetry  Speed, control loop, control current, motor current internal temperatures, internal rail voltages, gains  Communications  RS485  Internal speed controller update rate  Maximum external telemetry update rate  Wheel volume  Diameter 240 x 95mm  Wheel mechanical interface  Value of the consumption of	Idle power	<5 Watts
consumption ON/OFF operations Unlimited  Telecommands Speed demand, current demand (torque), control gains, coast  Telemetry Speed, control loop, control current, motor current internal temperatures, internal rail voltages, gains  Communications RS485 Internal speed controller update rate  Maximum external telemetry update rate  Wheel volume Diameter 240 x 95mm  Wheel mechanical interface  ON/OFF operations Unlimited  Speed demand, current demand (torque), control current, motor current internal rail voltages, gains  Speed, control loop, control current, motor current internal rail voltages, gains  SHZ  Ontrol gains, coast  Speed, control loop, control current, motor current internal rail voltages, gains  SHZ  Ontrol gains, coast  Speed, control loop, control current, motor current internal rail voltages, gains  Communications  BY485  SHZ  Ontrol gains, coast  SPEED, control loop, control current, motor current internal rail voltages, gains  Communications  BY485  SHZ  Ontrol gains, coast  SPEED, control loop, control current, motor current internal rail voltages, gains  SHZ  Ontrol gains, coast  SPEED, control loop, control current, motor current internal rail voltages, gains  SHZ  Ontrol gains, coast  SPEED, control loop, control current, motor current internal rail voltages, gains  SHZ  Ontrol gains, coast  SPEED, control loop, control current, motor current, m	consumption	
ON/OFF operations  Telecommands  Speed demand, current demand (torque), control gains, coast  Telemetry  Speed, control loop, control current, motor current internal temperatures, internal rail voltages, gains  Communications  RS485  Internal speed controller update rate  Maximum external telemetry update rate  Wheel volume  Diameter 240 x 95mm  Wheel mechanical interface  ON/OFF operations  Speed demand, current demand (torque), control current, motor current internal rail voltages, gains  Speed, control loop, control current, motor current internal rail voltages, gains  SHZ	Maximum power	<180 Watts
Telecommands Speed demand, current demand (torque), control gains, coast  Telemetry Speed, control loop, control current, motor current internal temperatures, internal rail voltages, gains  Communications RS485 Internal speed controller update rate  Maximum external telemetry update rate  Wheel volume Diameter 240 x 95mm  Wheel mechanical interface  Speed demand, current demand (torque), controller, motor current, motor current internal rail voltages, gains  Shape Speed, control loop, control current, motor current internal rail voltages, gains  Shape Speed, control loop, control current, motor current internal rail voltages, gains  Shape Speed, control loop, control current, motor current internal rail voltages, gains		
Control gains, coast  Telemetry Speed, control loop, control current, motor current internal temperatures, internal rail voltages, gains  Communications RS485 Internal speed controller update rate  Maximum external telemetry update rate  Wheel volume Diameter 240 x 95mm  Wheel mechanical interface  Control gains, coast  Speed, control loop, control current, motor	ON/OFF operations	Unlimited
Telemetry Speed, control loop, control current, motor current internal temperatures, internal rail voltages, gains  Communications RS485 Internal speed controller update rate  Maximum external telemetry update rate  Wheel volume Diameter 240 x 95mm Wheel mechanical interface  Speed, control loop, control current, motor	Telecommands	Speed demand, current demand (torque),
current internal temperatures, internal rail voltages, gains  Communications RS485  Internal speed controller update rate  Maximum external temperatures, internal rail voltages, gains  5Hz  Maximum external temperatures, internal rail voltages, gains  5Hz  Maximum external temperatures, internal rail voltages, gains  5Hz  Maximum external temperatures, internal rail voltages, gains  6Hz  The provided HTML rail voltages, gains  6 off Maximum external speed controller update rate  Wheel volume Diameter 240 x 95mm  Wheel mechanical interface  6 off M6 on 38mm PCD		control gains, coast
voltages, gains  Communications RS485  Internal speed controller update rate  Maximum external telemetry update rate  Wheel volume Diameter 240 x 95mm  Wheel mechanical interface  Voltages, gains  SHz  Diameter 240 x 95mm  6 off M6 on 38mm PCD	Telemetry	Speed, control loop, control current, motor
Communications RS485 Internal speed controller update rate  Maximum external telemetry update rate  Wheel volume Diameter 240 x 95mm  Wheel mechanical interface  RS485  5Hz  5Hz		current internal temperatures, internal rail
Internal speed controller update rate  Maximum external telemetry update rate  Wheel volume Diameter 240 x 95mm  Wheel mechanical interface  5Hz  5Hz  6 off M6 on 38mm PCD		voltages, gains
controller update rate  Maximum external telemetry update rate  Wheel volume Diameter 240 x 95mm  Wheel mechanical interface  Controller update rate  Diameter 240 x 95mm  6 off M6 on 38mm PCD		RS485
Maximum external telemetry update rate  Wheel volume Diameter 240 x 95mm  Wheel mechanical interface 6 off M6 on 38mm PCD	Internal speed	5Hz
telemetry update rate  Wheel volume  Diameter 240 x 95mm  Wheel mechanical interface  Diameter 240 x 95mm  6 off M6 on 38mm PCD	controller update rate	
Wheel volume Diameter 240 x 95mm Wheel mechanical interface Diameter 240 x 95mm  6 off M6 on 38mm PCD	Maximum external	5Hz
Wheel mechanical 6 off M6 on 38mm PCD interface	telemetry update rate	
interface	Wheel volume	Diameter 240 x 95mm
	Wheel mechanical	6 off M6 on 38mm PCD
Mass <5.6kg	interface	
	Mass	<5.6kg

Specifications may be subject to change

SSTL designs, manufactures and operates high performance satellites, subsystems and ground systems for space agencies, international governments, and commercial customers worldwide. Our satellite platforms are designed to fly remote sensing, navigation and communication payloads in LEO, MEO and GEO orbits and beyond. Our innovative approach to low cost spacecraft engineering is changing the economics of space.





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