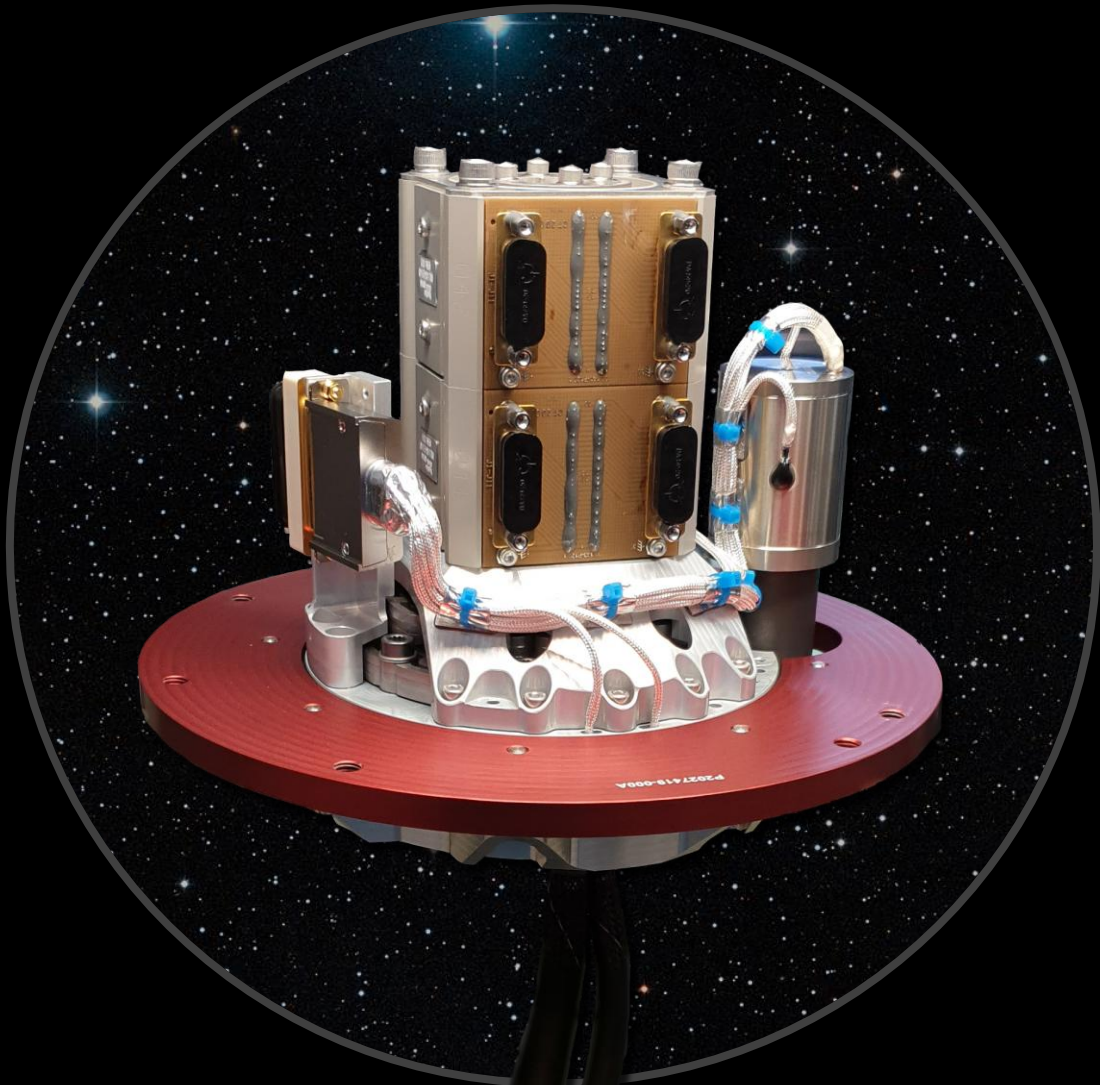


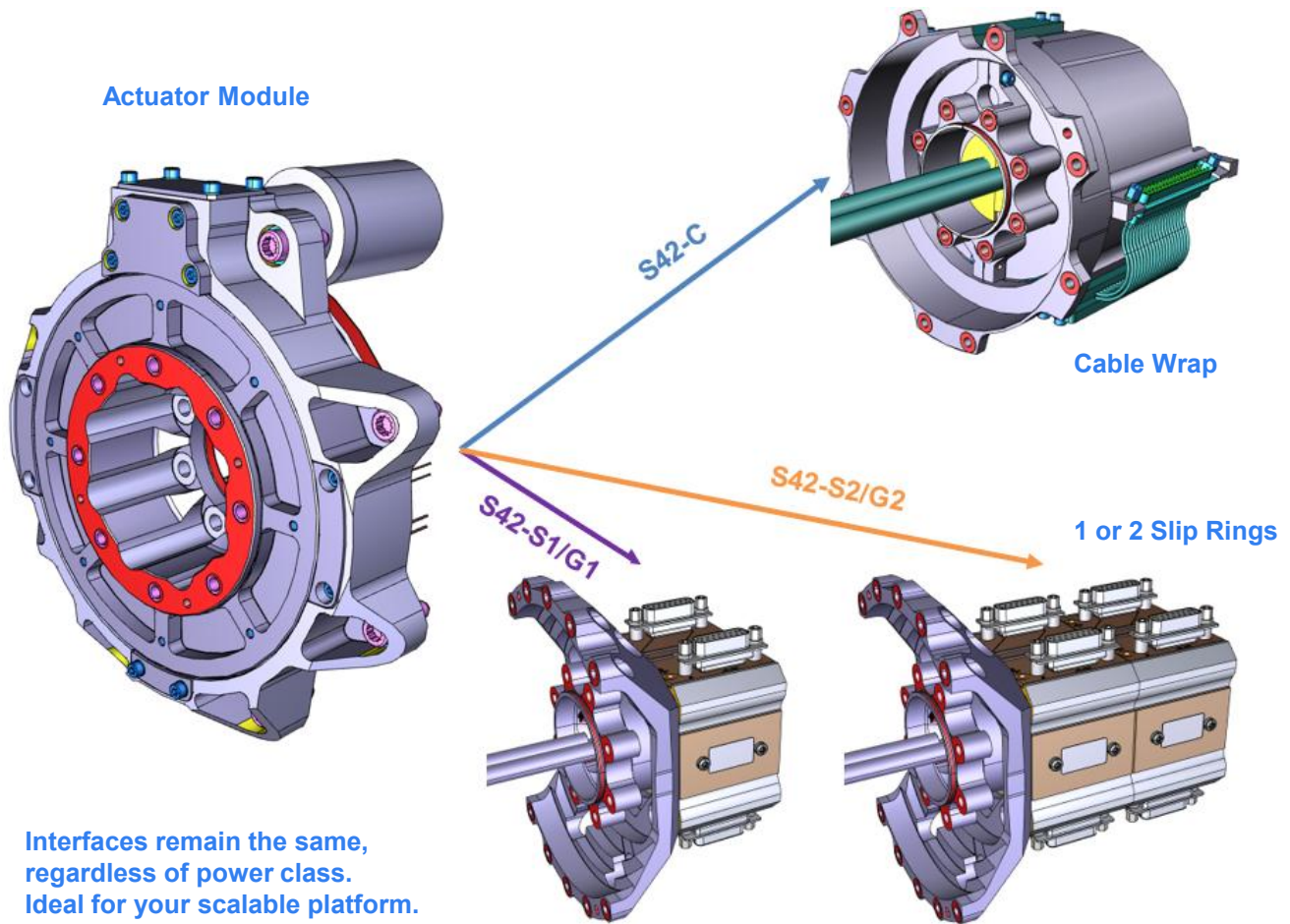


SEPTA42

Solar Array Drive Mechanism for Cost-Sensitive Applications and Constellations

Beyond Gravity's SEPTA42 is a modular family of Solar Array Drive Mechanisms serving a large range of spacecraft. It is available at attractive prices and lead times, supports both cable wrap and slip rings, has a power transfer capacity up to 22kW, and can be produced in large quantities thanks to BG's high-cadence production line. Flight heritage (TRL9) exists, and >120 FMs have been produced already.

SEPTA42: Modular Constellation SADM



Modularity for lowest cost

- Family of SADM for a large range of missions
- Standard mechanical interfaces
- Standard actuator module for all types

Robust and Proven

- Flight proven slip ring technology
- Standard actuator, enables industrial scale production
- Qualification Status:
 - TRL8 completed for all variants
 - TRL9 for S42-C and S42-G achieved 2025
- >100 FMs delivered to customers
- Proven drive electronics combinations available: Both SADEs or direct drive via BG's constellation onboard computer (cOBC) supported. The latter **further reduces S/C-level cost** by entirely avoiding separate SADEs and complex integrated drive electronics.

Tailored for you

- Extensive engineering expertise allowing adaptation for unusual and specific applications
- Adapted interfaces, test scope, modifications, are feasible on request.

High Cadence at short lead times

- New cleanroom for state-of-the-art assembly and testing
- Up to **18 Units per month**
- Lead times down to **12 months** (considering rolling stock or, for larger quantities, early LLI procurement)

SEPTA42: Modular Constellation SADM

	SEPTA42-C	SEPTA42-S	SEPTA42-G
Operational Performance			
Range of Motion	± 175°	Continuous rotation (no “unwind” needed)	
Maximum output speed	1.0 °/s (depends on motorization requirements)		
Output Step Size (full step)	0.0074° ¹⁾		
Life Time	12 years		
Life Time Qualification Sequence	> 181’000 movements from -175° to +175°	> 133’000 full revolutions	> 58’000 full revolutions ^{1) 2)}
Delivered Torque			
Unpowered Holding Torque	> 1.4Nm ³⁾	> 3Nm ¹⁾	
Powered Holding Torque	> 18Nm continuous (at 100mA constant current) ¹⁾ > 25Nm continuous (at 130mA constant current) ¹⁾		
Powered Drive Torque	> 9.5Nm continuous (at 100mA constant current) ¹⁾ > 12Nm continuous (at 130mA constant current) ¹⁾		
Motor voltage	< 25.0V continuous, <70V peak		
Back-Drivability	Possible with unpowered motor		
Power & Signal Transfer			
Number of power lines (1 line = 1 forward & 1 return track)	36	-S1: 15 -S2: 30	-G1: 15 -G2: 30
Rated Power Capacity per Track	2.2 A _{RMS}	3.5 A _{RMS} ⁴⁾	5.0 A _{RMS} ⁴⁾
Voltage of power line	150V		
Connector-to-Connector Resistance, at 20°C	< 60 mΩ w/ 0.5m S/A harness	< 60 mΩ w/ 0.25m S/A harness	
Connector-to-Connector Resistance, at worst hot case	< 80 mΩ w/ 0.5m S/A harness	< 80 mΩ w/ 0.25m S/A harness	
Insulation	≥ 100 MΩ @ 500 V, 30s		
Noise (per line)	≤ 10 mV _{RMS} /A	≤ 20 mV _{RMS} /A	
Total Power Transfer	<11.9 kW	-S1: <7.8kW -S2: <15.6kW	-G1: <11.2kW -G2: <22.4kW
Position Measurement			
Position Output	Redundant reference position switch at two different locations (e.g. +90° and −90°)		

Notes:

- ¹⁾ Data provided in this datasheet is for standard 1:36 gearbox, but 1:50 gearbox is fully qualified and results in proportionally smaller step size / speed and increased torque capability.
- ²⁾ Performance as qualified for a customer on S42-G, but same or better capability as S42-S expected to be feasible given that actuator module is identical
- ³⁾ Lower unpowered holding torque is due to cable wrap spring-effect, and varies with position between 1.4Nm... 2.4Nm.
- ⁴⁾ S42-S slipring is qualified to 3.5A per track on S42-S, and to 4.0A on SR-level and in other programs. The S42-G slip ring is qualified to 5.0A (functional) and 4.54A (life test) on S42-G, and to 6.0A per track in other programs.

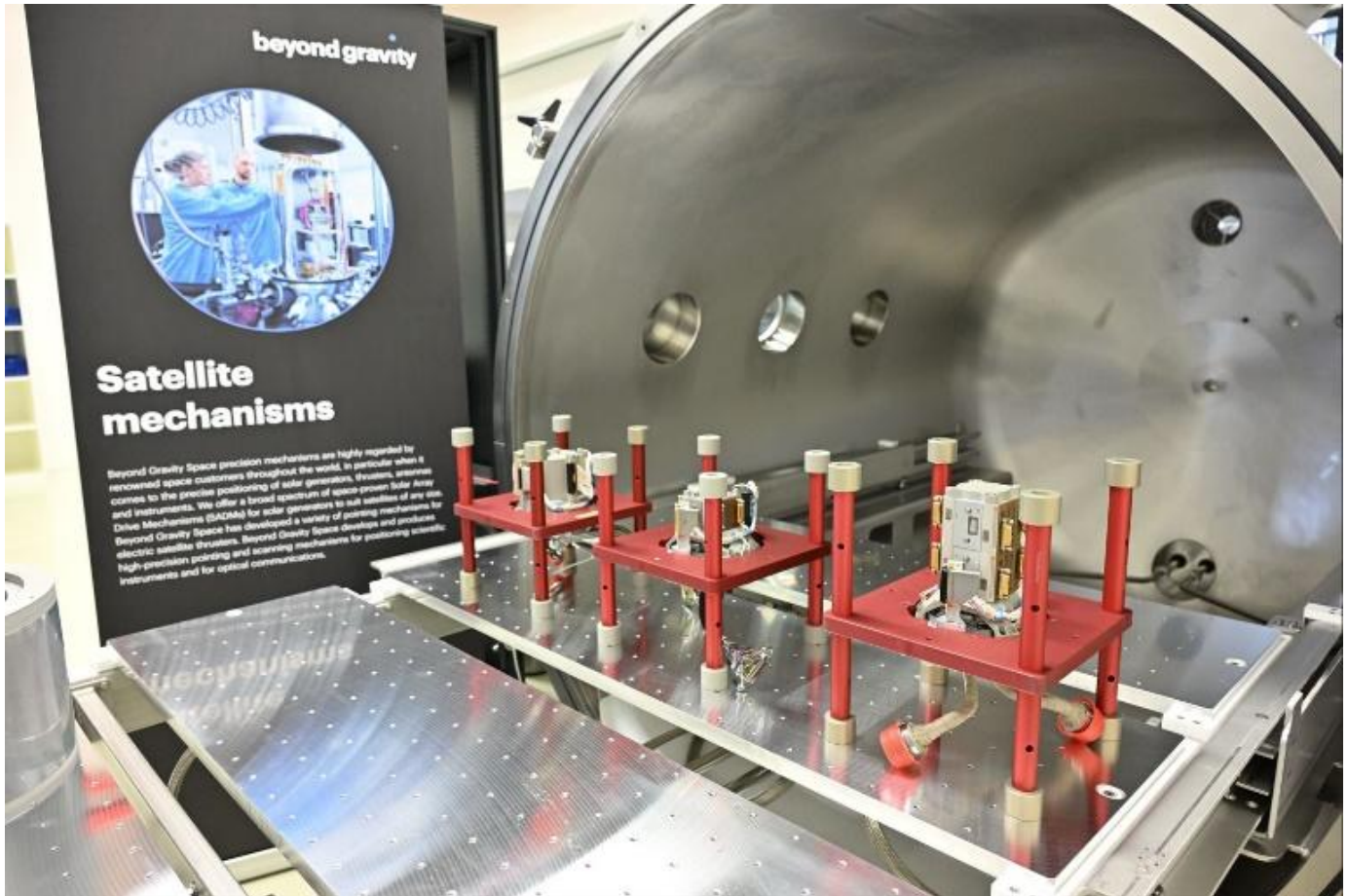
Motor Characteristics				
Coil Resistance @ 20°C		123 Ω ± 5%		
Mechanical Dimensions & Mass		SEPTA42-C	SEPTA42-S	SEPTA42-G
Max. Outer Diameter mounting flange		191 mm		
Length from front of flange		125 mm	-S1: 108.2 mm -S2: 158.0mm	-G1: 119.5mm -G2: 179.5mm
Length Overall		159 mm	-S1: 141.4 mm -S2: 191.4mm	-G1: 152.9mm -G2: 212.9mm
Mass (excl. margin & customer-specific harness)		4.9 kg	-S1: 4.5 kg -S2: 5.2kg	-G1: 4.7kg -G2: 5.4kg
S/C Interface		8 through holes for M6 on a circle with D = 175mm		
S/A Interface		8 threaded holes M6 on a circle of D = 80mm		
Static Loads (non-simultaneous)				
Axial Load		10'000 N		
Radial Load		10'000 N		
Bending Load		600 Nm		
Torsional Load		23.6 Nm (load bearing capability – backdriving may happen)		
Stiffnesses				
Axial stiffness (along y)		≥ 1.2 × 10 ⁸ N/m		
Shear stiffness (along x, z)		≥ 8.0 x 10 ⁷ N/m		
Torsion angular stiffness		≥ 7 × 10 ³ Nm/rad		
Bending angular stiffness		≥ 8.6 × 10 ⁴ Nm/rad		
First mode frequency with 2.5 kg @ 50mm from S/A interface		> 350 Hz	> 350 Hz	> 350 Hz
Mechanical Qualification Levels				
Tested with 2.5kg dummy mass with CoG 50mm from the S/A IF plane. Other levels/masses possible on request.				
High level sine vibrations:	Frequency (Hz)	S42-C	S42-S	S42-G
	0 – 22.6	±9.73 mm		±6.35mm ²⁾
	22.6 – 50.0	20g		13g ²⁾
	50.0 – 125	20g		10g ²⁾
Random vibrations:	// MOUNTING PLANE (x,y axes)		⊥ MOUNTING PLANE (z-axis)	
	Freq. (Hz)	Level	Freq. (Hz)	Level (g²/Hz)
	20 – 60	+6 dB / oct	20 – 60	+6 dB / oct
	60 – 500	0.4 g²/Hz	60 – 500	0.5 g²/Hz
	500 – 2000	-6 dB / oct	500 – 1395	-6 dB / oct
			1395 – 1450	-60dB / oct
			1450 – 2000	0.03 g²/Hz
Global:	18.3 g _{rms}		20.3 g _{rms}	

Shock levels for each axis (X, Y, Z):	S42-C	S42-S	S42-G
	100 Hz: 20g		100Hz: 55g
	1000 Hz: 500g		2500Hz: 2000g
	4000 Hz: 1865g		10000Hz: 2000g
	10000 Hz: 1865g		
Qualification Temperature Levels			
	S/C conductive interface	S/A conductive interface	S/C radiative interface
Ground Storage	10°C ... 30°C	10°C ... 30°C	10°C ... 30°C
Hot Non-Operational (Survival)	+ 90°C	+ 110°C	+ 90°C
Hot Operational	+ 70°C	+ 100°C	+ 70°C
Cold Operational	– 30°C	– 50°C	– 30°C
Cold start-up limit	– 40°C	– 70°C	– 40°C
Cold Non-Operational (Survival)	– 40°C	– 70°C	– 40°C
Other			
Reliability (MIL-HDBK-217)	>99.6% ⁵⁾	>99.97%	>99.88% ⁶⁾
Total Ionizing Dose (TID) tolerance	>1E7 rad (worst-case component ; located inside spacecraft)		
Standard Electrical Interface			
Connector S/C side, Actuator ⁷⁾	1x DBMA25P		
Connector S/C side, Power & Signal	2x DCMA 37S	4x DAM 15S per slip ring	
Connector S/A side, Power & Signal ⁷⁾	4x D38999 19P	1x D38999 37P or 37S per slip ring	
Harness ⁷⁾	L=500mm, with braid	L=500mm, shielded	
Acceptance Testing			
Standard test program	Visual, physical, electrical, 2-axis RND vibe, TVAC 1x NOP + 3x OP cycles	Visual, physical, electrical, 3-axis RND vibe, TVAC 1x NOP + 2x OP cycles	
Reduced test program	Reduced testing, including batch testing approaches, available on request		

Notes:

- ⁵⁾ Using very conservative assumption that SADM is already fully “failed” when only a single power/signal transfer is lost. In particular for S42-C, which assumes a single non-redundant wire per transfer, reliability is much higher (>99.9%) if simple wire cross-strapping or redundancy is employed.
- ⁶⁾ Assumes standard S42-G harness with two SR wires per connector pin. For one SR wire per pin, reliability is equivalent to S42-S.
- ⁷⁾ Baseline – modifications possible on request.

SEPTA42: Modular Constellation SADM



SEPTA42 family. Left: S42-C, Middle: S42-S1, Right: S42-G2.



Batch of 6x S42-C FMs ready for testing.