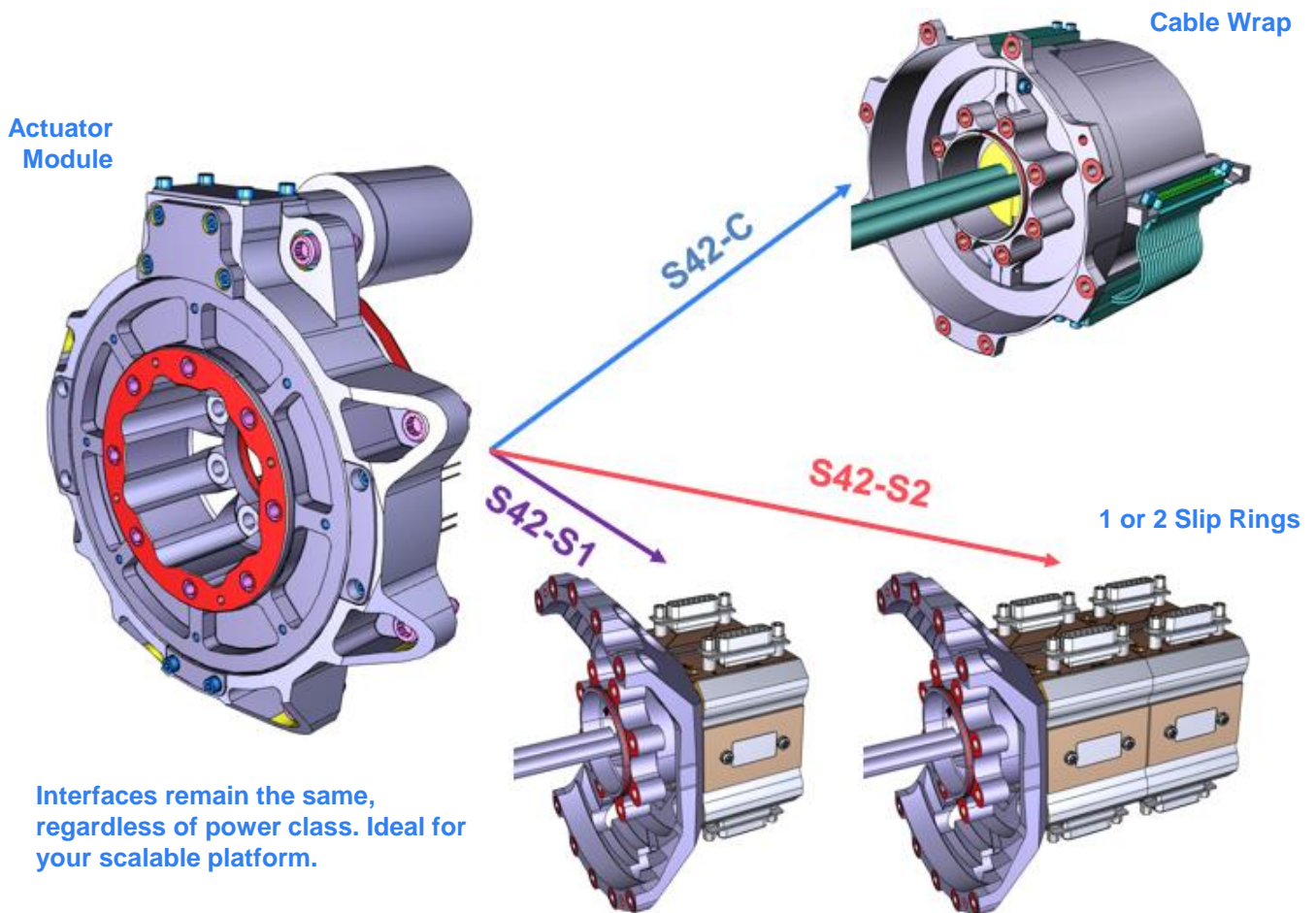


SEPTA42

Solar Array Drive Mechanism for Small Sats, Constellations and Everything

Beyond Gravity offers a modular family of Solar Array Drive Mechanisms, to serve a large range of spacecraft. The SEPTA42 is available at attractive prices and lead times and can be produced in large quantities

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
- Rolling Stock enables short lead times and flexibility

Tailored for you

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

Robust and Proven

- Flight proven slip ring technology
- Standard actuator, enables industrial scale production
- Production rate of 16 units per month available
- Qualification Status: Complete for S42-S2 (TRL8), in final life testing for S42-C (TRL8 expected 12/2024).

	SEPTA42-C	SEPTA42-S1	SEPTA42-S2
Operational Performance			
Range of Motion	$\pm 175^\circ$	Forward and reverse; multiturn (no "unwind" needed)	
Maximum output speed	1.0 °/s (as guideline, depends on motorization requirements)		
Output Step Size (full step)	0.0074°		
Life Time	12 years		
Revolutions Life Time (before margin)	> 60'000* movements from -175° to +175°	> 65'000 full revolutions	
Life Time Qualification Sequence	> 120'000* movements from -175° to +175°	> 133'000 full revolutions	
Delivered Torque			
Unpowered Holding Torque	> 1.4Nm **	> 3Nm	
Powered Holding Torque	> 18Nm continuous (at 100mA constant current) > 25Nm continuous ("boost mode" - 130mA constant current)		
Powered Drive Torque	> 9.5Nm continuous (at 100mA constant current) > 12Nm continuous («boost mode» - 130mA constant current)		
Motor voltage	< 29.5V		
Back-Drivability	Possible with unpowered motor		
Power & Signal Transfer			
Number of power lines (1 line = 1 forward & 1 return track)	36	15	30
Rated Power Capacity per Track	2.2 A _{RMS}	3.5 A _{RMS} ***	
Voltage of power line	150V (as qualified) 120V (nominal)		
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	$\geq 100 \text{ M}\Omega @ 500 \text{ V}, 30\text{s}$		
Noise (per line)	$\leq 10 \text{ mV}_{\text{RMS}}/\text{A}$	$\leq 20 \text{ mV}_{\text{RMS}}/\text{A}$	
Total Power Transfer	11.9 kW	6.3kW	12.6kW

* Life test ongoing, >180'000 movements from -175° to +175° (or back) are targeted.

** Lower unpowered holding torque is due to spring-effect of cable wrap. Unpowered holding torque varies with position between 1.4Nm and 2.4Nm.

*** The slipping is being qualified on component-level for 4.0 A_{RMS} current capacity per track.

Motor Characteristics				
Coil Resistance @ 20°C	123 Ω ± 5%			
Mechanical Dimensions & Mass				
	SEPTA42-C	SEPTA42-S1	SEPTA42-S2	
Max. Outer Diameter mounting flange	191 mm			
Length from front of flange	125 mm	117 mm	158 mm	
Length Overall	159 mm	150 mm	191 mm	
Mass (excl. margin & customer-specific harness)	4.9 kg	4.5 kg	5.2 kg	
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				
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 × 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				
High level sine vibrations:	Frequency (Hz)	Qualification Level		
	0-22.6	±9.73 mm		
	22.6-125	20g		
Random vibrations:	// MOUNTING PLANE (x,y axes)		⊥ MOUNTING PLANE (z-axis)	
	Freq. (Hz)	Level	Freq. (Hz)	Level (g ² /Hz)
	20 – 60	+ 6 dB / oct	20 – 60	+ 6 dB / oct
	60 – 500	0.4 g ² /Hz	60 – 500	0.5 g ² /Hz
	500 – 2000	– 6 dB / oct	500 – 1395	– 6 dB / oct
			1395-1450	-60dB / oct
		1450-2000	0.03 g ² /Hz	
Global:	18.3 g _{rms}		20.3 g _{rms}	
<p>Note: All dynamic mechanical levels are understood with a 2.5kg mass with a CoG at 50mm from the S/A interface plane. Other levels or other yoke masses are possible on request.</p>				

Shock levels for each axis (X, Y, Z):	Frequency	Shock input levels	
	100 Hz	20 g	
	1000 Hz	500 g	
	4000 Hz	1865 g	
	10000 Hz	1865 g	
Note: All dynamic mechanical levels are understood with a 2.5kg mass with a CoG at 50mm from the S/A interface plane. Other levels or other yoke masses are possible on request.			
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