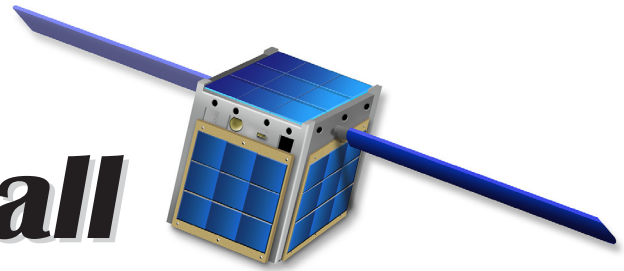


CubeSat and Small Satellite Components



CubeSat spacecraft are miniaturized satellites created for a variety of space applications and typically have the volume of a 10 centimeter cube and a mass of no more than 1.33 kilograms. Standard components are generally used in these systems although more advanced technologies may also be an option. Satellites that have an overall mass of under 500 kilograms are often referred to as small satellites.

Moog has components on countless space programs. Our 50 plus years of space heritage is being leveraged to provide small, efficient, best value products for the growing CubeSat and small satellite market.

Our components are designed to meet:

- Extreme temperature ranges
- Launch vibration and shock
- NASA material guidelines

All designs are tailored for maximum performance in the smallest volume possible. Size, weight and power are driving design criteria.

Slip Rings

Long-life fiber brush designs eliminate the need for lubricant on the contacting system. Small volume designs in drum or platter style configurations are available.

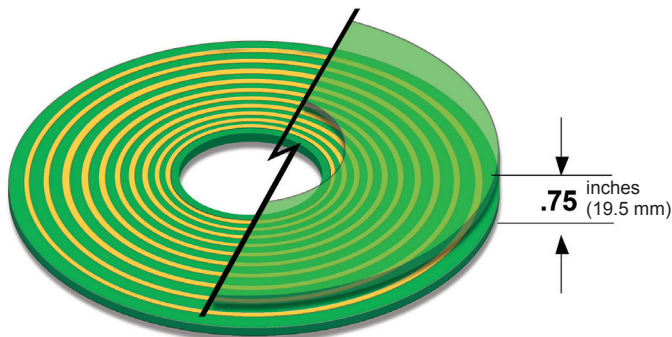
Drum: Model 3848

Diameter: 0.75 inches (19.05 mm)
 Length: 1 inch (25.4 mm)
 10 rings space rated for 0.5 A and 50 V each
 Housed with bearings

Platter Separates: Model 1021621

For space requirements, platter separates are an ideal solution. Units supplied generally consist of a slip ring based on a printed circuit board style and a matching brush block or board depending on the requirements.

Diameter: 2 inches (50.8 mm)
 Height: 0.75 inch as a set (19.05 mm)
 10 rings at 0.5 A, 50 V each



Motors

Frameless, brushless motors are designed for applications that require high torque density. The designs are optimized to minimize power for maximum efficiency and long life capability.

| DB-1500-J-1ES Matrix™ Series Motor Specifications | | |
|---|--|-----------------------|
| Size Constants | Units | Value |
| Peak Torque, T_P | oz-in (Nm) | 21 (0.149) |
| Motor Constant, K_M | oz-in / \sqrt{W} (Nm / \sqrt{W}) | 2.76 (0.019) |
| Weight | oz (kg) | 2.7 (0.076) |
| Motor Inertia, J_M | oz-in-s ² (kg m ²) | 9.08E-05 (2.0E-09) |
| Friction Torque, T_F | oz-in (Nm) | 0.4 (0.0028) |
| Electrical Time Constant, T_E | ms | 0.28 |
| Mechanical Time Constant, T_M | ms | 1.68 |
| Temperature Rise, TPR | °C / W | 13.4 |
| Number of Poles | | 8 |
| Number of Phases | | 3 "Y" |
| Winding Constants | Units | Value |
| Torque Sensitivity, K_T | oz-in / amp \pm 10% (Nm / amp) | 1.43 |
| Back EMF, K_E | V per rad / s \pm 10% | 0.010 |
| Terminal Resistance, R_M | ohms \pm 10% | 0.268 |
| Terminal Inductance, L_M | mH \pm 30% | 0.076 |
| Voltage, Stalled at Peak Torque, V_P | Volts | 4.0 |
| Amps at Peak Torque, I_P | Amps | 15 |

Performance is based on a DB-1500-J-1ES Matrix™ Series motor with the following dimensions:

Diameter: 1.5 inches (38 mm)
 Height: 0.9 inches (22.86 mm)

Resolvers

Rugged motion feedback sensors provide velocity and / or position feedback for electronic control, as well as DC motor commutation. There are no internal electronics or optics and resolvers are unaffected by electrical noise, heat, shock and vibration. No active or contacting parts for extended life.

Single-Speed - SSH-12-A-2

Outer Diameter: 1.19 inches (30.22 mm)
 Inner Diameter: 0.56 inches (14.22 mm)
 Height: 0.23 inches (5.84 mm)

Multi-Speed - SSJH-15-A-2

Outer Diameter: 1.5 inches (38.1 mm)
 Inner Diameter: 0.70 inches (17.78 mm)
 Height: 0.37 inches (9.40 mm)

| Resolver Specifications | | | | | | | | | | |
|--|-----------------|---------|----------------------|----------------------------|--------------|-------------------|-----------------|----------|------------|--------------------|
| Function | Primary Winding | Speed | Input (Voltage / Hz) | Max Error (Accuracy) (+/-) | Trans. Ratio | Phase Shift (DEG) | Max Null V (mV) | Pin (mW) | Impedances | |
| | | | | | | | | | Zpo | Zso |
| Single Speed - Part Number SSH-12-A-2 | | | | | | | | | | |
| RES RX | Rotor | 1X | 10 / 3200 | 6' | 1.0 | 8 | 20 | 32 | 250 + j850 | 330 + j1000 |
| Multi-Speed - Part Number SSJH-15-A-2 | | | | | | | | | | |
| RES RX | Rotor | 1X, 16X | 5 / 6000 | 15', 60" | 0.2, 0.2 | 5, 28 | 20, 2 | 250 | 139 + j236 | 69 + j45, 71 +j114 |

Products are subject to U.S. Government export license requirements.

Specifications and information are subject to change without prior notice.

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