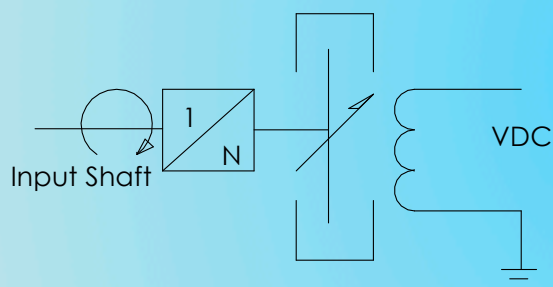




# Controlled Damping System

Introducing Avior Control Technologies, Space Rated *Controlled Damping System (CDS)*. This flexible energy absorption system provides reliable and stable damping characteristics over wide temperature range, in extreme environments.

The advantage of the CDS over previous technologies is significant. CDS offers extremely low static friction at the input shaft, as compared to Eddy Current Dampers. In fact, the CDS provides zero speed torques that rival fluid dampers. Additionally, CDS dampers offer extreme linearity and stable performance over a wide temperature range. Temperatures as low as -100° C is available with dry film lubrication system.



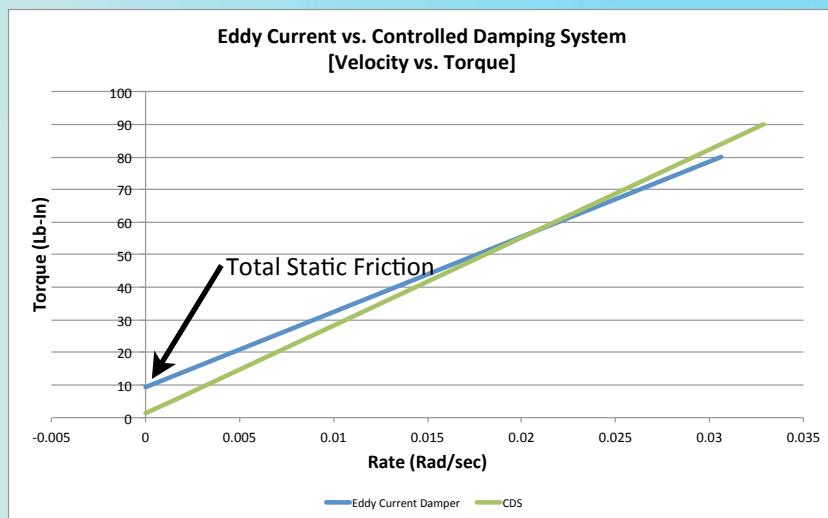
Schematic

CDS utilizes a patent pending internal feedback and control system that allows for the damping rate to be set internally at a tolerated value, or external provision may be provided to set the damping rate at user selected value, within the usable range of the CDS. Only two wire DC voltage is required for this system excitation. Current draw will depend on damping rate and energy absorption requirements. Typically for a +28VDC system, current draw requirements are less than 1 ADC.

Internally, the CDS utilizes high performance, low static friction Damper Modules and one or more stages of high reliability planetary geartrain modules. Utilizing MSFC-SPEC-522 Table 1 materials, and materials compliant with JSC-SPEC-SP-R-0022 (<0.1% CVCM and <1% TML), these dampers are designed to accommodate the most extreme NASA requirements.

#### ADVANTAGES:

- Simple DC Excitation
- High reliability
- Predictable, linear performance
- Low dead-band (backlash)
- No temperature compensation required
- Significantly lower static friction when compared to Eddy Current Dampers
- One qualified design may accommodate a wide range of deployment applications.
- Intrinsic redundancy



A graphical comparison of the CDS versus an Eddy Current Damper for a representative application is shown to the left, and delineated below.

| Parameter                                  | ECD   | CDS          |
|--|-------|--------------|
| Total Static Friction (Lbf-In)             | 9.5   | <b>1.3</b>   |
| Damping Rate at 60 Lbf-In (Lbf-In-sec/rad) | 2734  | 2757         |
| Gear Ratio                                 | 600:1 | <b>100:1</b> |
| Temp Coefficient of Damping (%/°C)         | -0.4  | <b>-0.03</b> |

**Configuration:** Avior may accommodate a wide range of mechanical interface. The diameter and length are primarily determined by the applied torque and peak torque capacity, but flexibility in these areas are available. Figure 1 shows Avior's standard mounting configuration for the CDS, and Table 1 delineates the dimensions and rated performance. **NOTE:** Damping Rates are not tabulated because those values are set internally for each application.

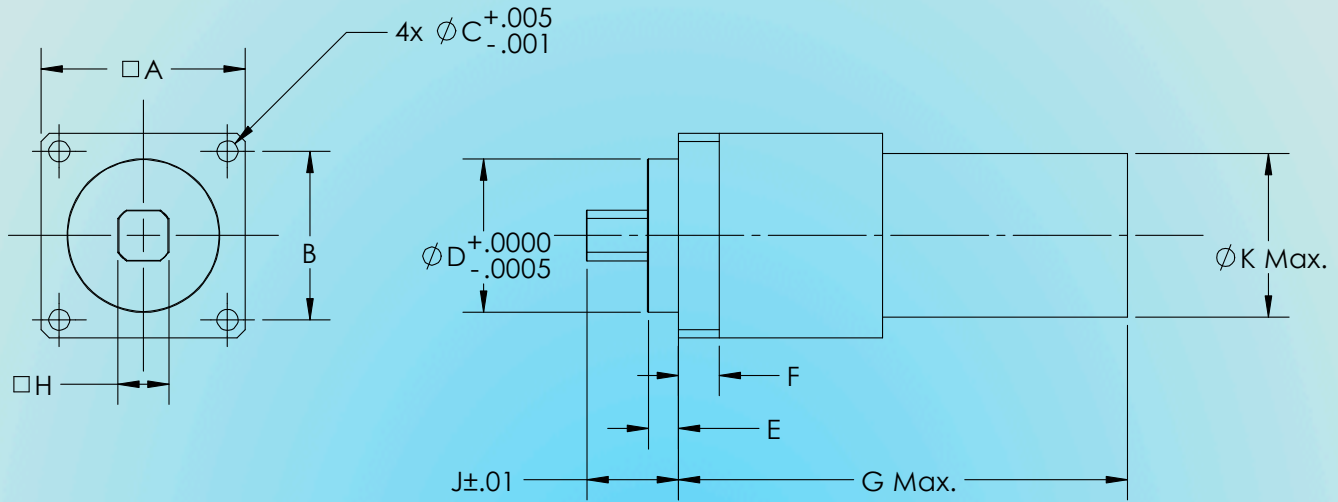


Figure 1 - Mechanical Dimensions

| Table 1 - Dimensions and Ratings |             |                       |        |       |       |        |       |       |      |       |       |       |
|----------------------------------|-------------|-----------------------|--------|-------|-------|--------|-------|-------|------|-------|-------|-------|
| Type                             | Peak Torque | Total Static Friction | A      | B     | C     | D      | E     | F     | G    | H     | J     | K     |
|                                  | Lbf-In      | Lbf-In                | INCHES |       |       |        |       |       |      |       |       |       |
| CDS-10-2                         | 100         | 1.25                  | 1.812  | 1.550 | 0.149 | 0.9375 | 0.188 | 0.250 | 4.25 | 0.312 | 0.563 | 1.812 |
| CDS-13-2                         | 200         | 1.25                  | 1.812  | 1.550 | 0.149 | 1.1875 | 0.188 | 0.250 | 4.50 | 0.375 | 0.687 | 1.812 |
| CDS-13-3                         | 200         | 2.70                  | 1.812  | 1.550 | 0.149 | 1.1875 | 0.188 | 0.250 | 5.25 | 0.375 | 0.687 | 1.812 |
| CDS-15-2                         | 400         | 2.70                  | 2.000  | 1.670 | 0.177 | 1.4375 | 0.188 | 0.250 | 4.75 | 0.500 | 0.813 | 2.000 |
| CDS-15-3                         | 400         | 6.40                  | 2.000  | 1.670 | 0.177 | 1.4375 | 0.250 | 0.313 | 5.38 | 0.500 | 0.813 | 2.000 |
| CDS-20-3                         | 800         | 6.40                  | 2.500  | 2.080 | 0.266 | 1.8750 | 0.312 | 0.375 | 5.50 | 0.750 | 1.000 | 2.500 |

Notes:

1. Damping Rate as required.
2. Other mounting configurations are available on request.
3. Data approximate and subject to change without notice.