ECD
Eddy Current Damper Assembly

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GENERAL DESCRIPTION

The Eddy Current Damper (ECD) is designed to fulfill a wide range of applications on satellites in LEO and GEO orbit that are used for scientific or telecommunications purposes by using a standard product to minimise costs on system level. The ECD is a passive device and is fully space qualified and ITAR free (European Space market).

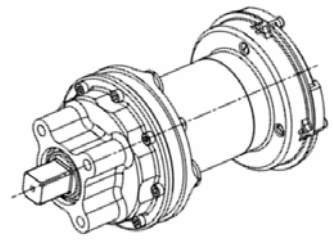

Figure 1: 3-D view of the Eddy Current Damper

The ECD consists of three basic modules:

1 Damper Unit

A high efficiency damper unit which is a self contained module with its own shaft supported by its own set of bearings. The damping is generated with a high purity copper disc rotating within a highly concentrated magnetic field. The field is provided by 12 pairs of samarium-cobalt magnets. The damping rate can be set at different levels depending on the relative orientation of the magnet pairs this can easily be set by rotating the ECD end cover (Figure 2). So it's possible to cover a wide range of damping rates.

Figure 2: Adjustable outer magnet holder housing

2 Gear Head

An intermediate gear-head is employed based on a standard planetary unit. This unit provides the first stage of torque amplification. By selecting from a rane of existing gear-head ratios the maximum level of damping rate can be set. This means that the ECD concept can be adapted to provide an extremely wide range of damping with no impact on mass and geometric envelope.

3 Input Stage

The input stage is the second stage of torque amplification and provides a further amplification ratio. This stage has a fixed ratio and is designed to accomodate very high maximum torque levels (typically up to 100 Nm).

DESIGN CHARACTERISTICS

Mechanism	
Damping rate C at Tmin to Tmax	500 < c < 1700 Nms/rad at -55 to +100°C
Damping direction	Forward and reverse rotation (endless rotation)
Stiction torque	<1.24 Nm
Shock load	Full operational cycle with input torque of 75.2 Nm
Qualified life span	In orbit: 10 years LEO, 15 years GEO
	Storage: 10 year storage in clean room environmental conditions
Revolutions performance	On ground: 100
	In orbit 20
Qualification sequence	Complete rotations: 170

Electrical	
Power consumption	None (no electrical components)
Electrical grounding	< 1 Ω

Dimension	
External diameter	61 mm
Total length	120 mm
Input shaft	10.2 mm square
Mass	M ≤ 0.750 kg

Mechanical Interface	
Mechanical interface	*For interface* see figure 3 to 5 on page 4

Qualified Temperatures			
	T_{min}	$T_{Ambient}$	T_{max}
Ground Storage	+ 10°C	+22°C	+ 40°C
In orbit non operational	- 65°C		+ 110°C
In orbit operational	- 55°C		+ 100°C

Environment conditions during operation	
Random vibration:	
10-80	+6 dB/oct
80-400	0.6 g²/Hz
400-2000	-6 dB/oct
Global	20 G_{RMS}
Quasistatic level each axes (X, Y, Z):	30 g

FLIGHT MODEL (FM) ACCEPTANCE PROGRAM

The flight model acceptance program includes the following tests:

- Inspection and control
- Mass measurement
- Grounding
- Functional characteristics measurement
- Strength
- Functional characteristics measurement
- Vibration tests (FM-level)
- Functional characteristics measurement
- Thermal vacuum cycling with performance tests
- Functional characteristics measurement
- Inspection and control

DIMENSIONS AND MECHANICAL INTERFACES FOR ECD

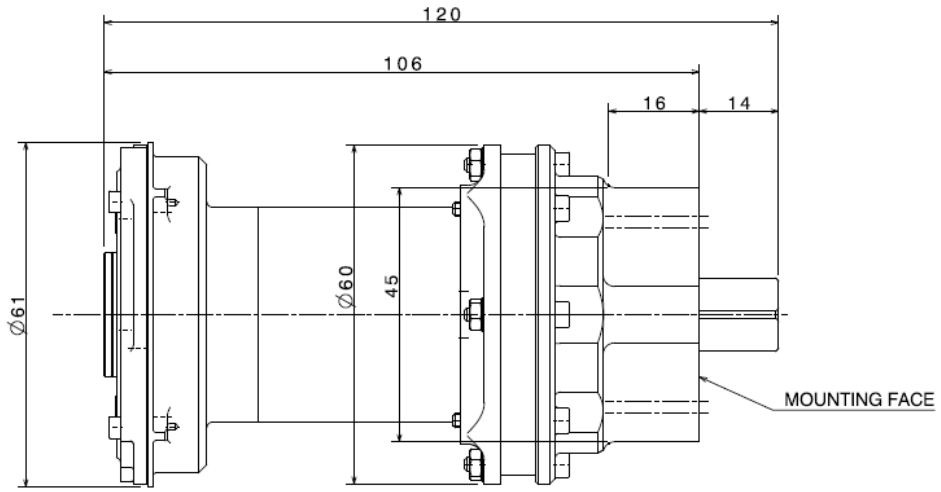

Figure 3: ECD plan view

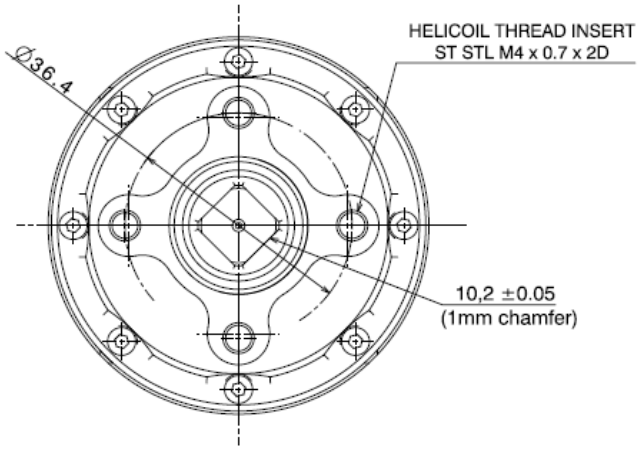

Figure 4: ECD interface side view

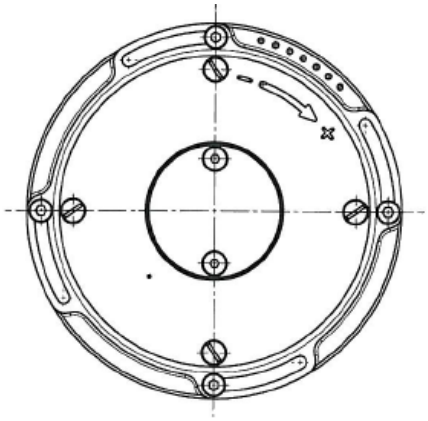

Figure 5: rear view