bimotal

Bimotal Elevate Drive Unit Integration Guide

A high-level summary document of the engineering considerations to integrate Elevate with a small electric vehicle.

Table of Contents

Speed, Torque, and Regeneration

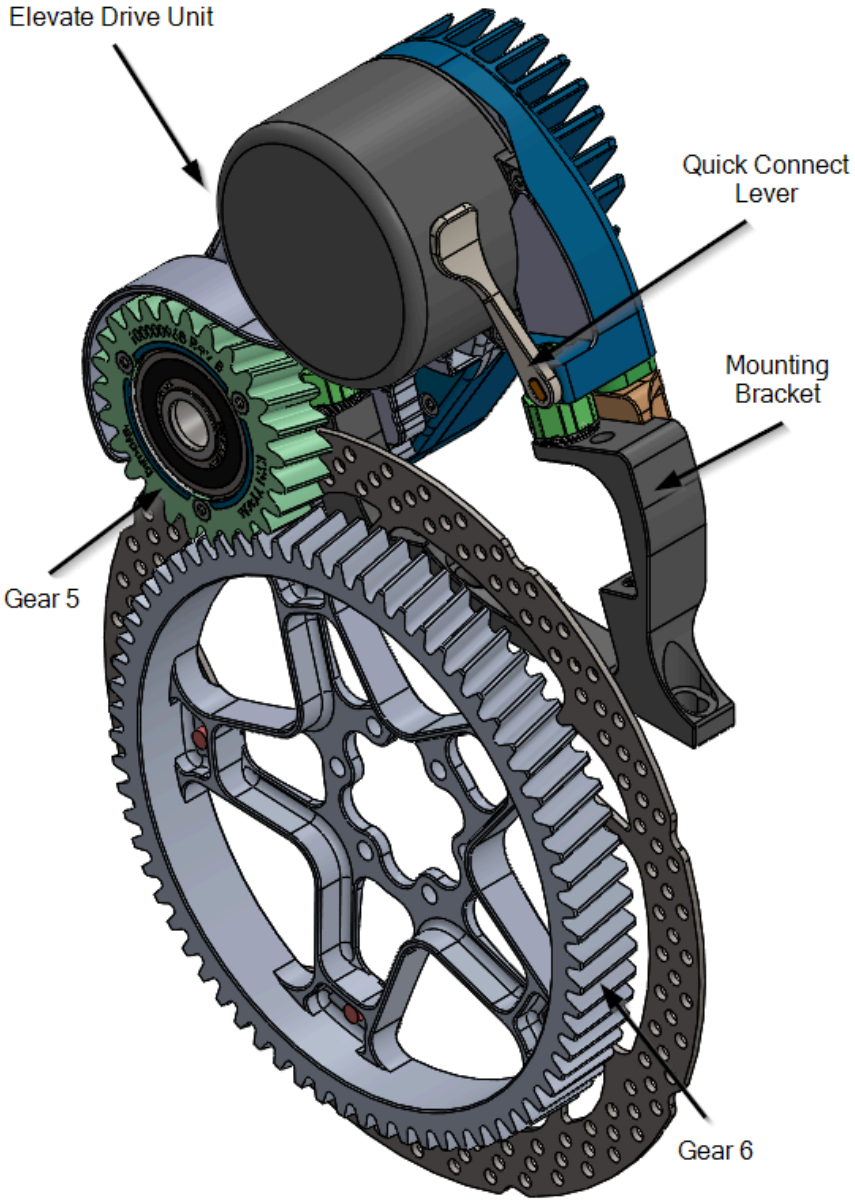
1. Top Speed is 23 mph with a 27.5" wheel and 59T large gear on the wheel hub. Speed can easily be adjusted in software and tuned to lower speeds. Top speed is capped by the max RPM of the motor.
2. Continuous system torque
    a. 50 Nm with the 59-Tooth hub gear (80 Nm peak)
    b. 59 Nm with the 69-Tooth hub gear (94 Nm peak)
3. Regenerative braking
    a. By default the system comes with a mechanical freewheel that operates silently and has no perceptible drag torque
    b. A fixed hub can be designed in place of the mechanical freewheel to enable regenerative braking, on request

CAD Files

- [Click link above for google drive access]
- Elevate enclosure "Drive unit"
- Example mounting bracket
- Gear 6
- Note: all three major components are in a single .stp assembly file

Anatomy and Nomenclature

- Elevate Drive Unit
- Mounting bracket
- Quick connect levers
- Gear 6
- Gear 5

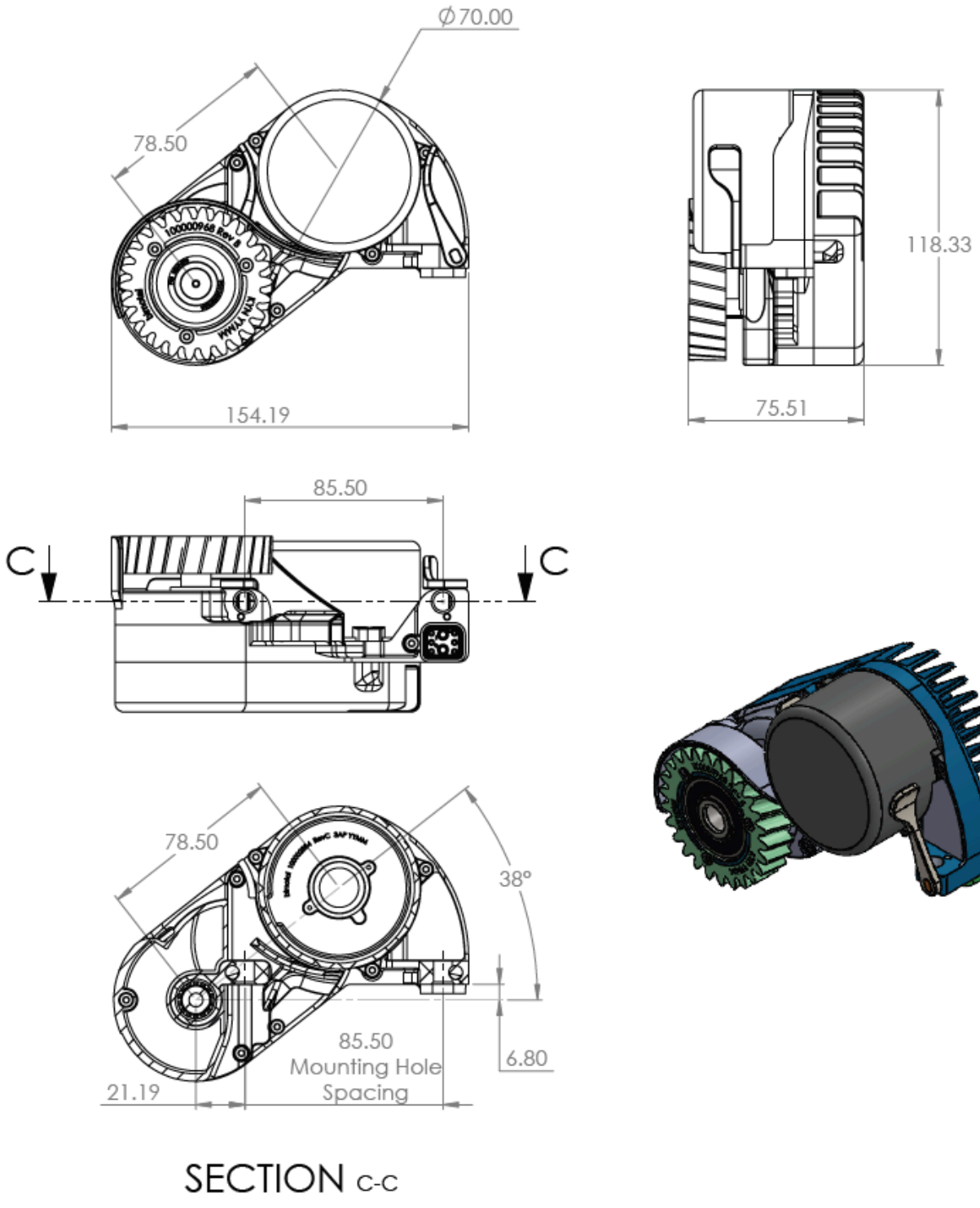


Mounting Details

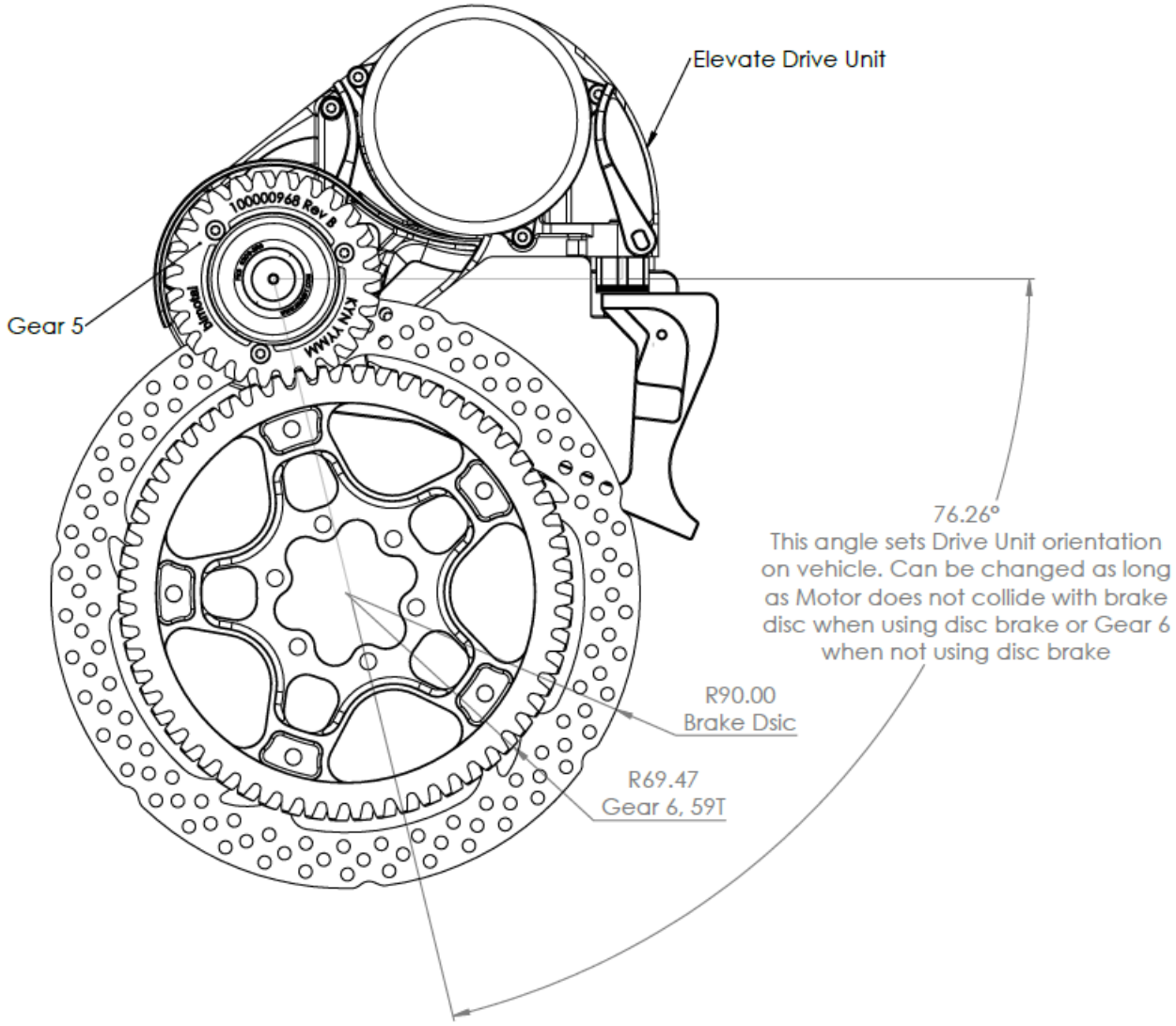
- Custom brackets can be rapidly designed and prototyped to interface with your vehicle
- Gear center distances must remain fixed
    - 98.06 mm for the 59T hub gear
    - 109.46 mm for the 69T hub gear
- Hub Gear mounting Surface
    - 10mm axial offset from Elevate Mounting holes

Mechanical Considerations and best practices

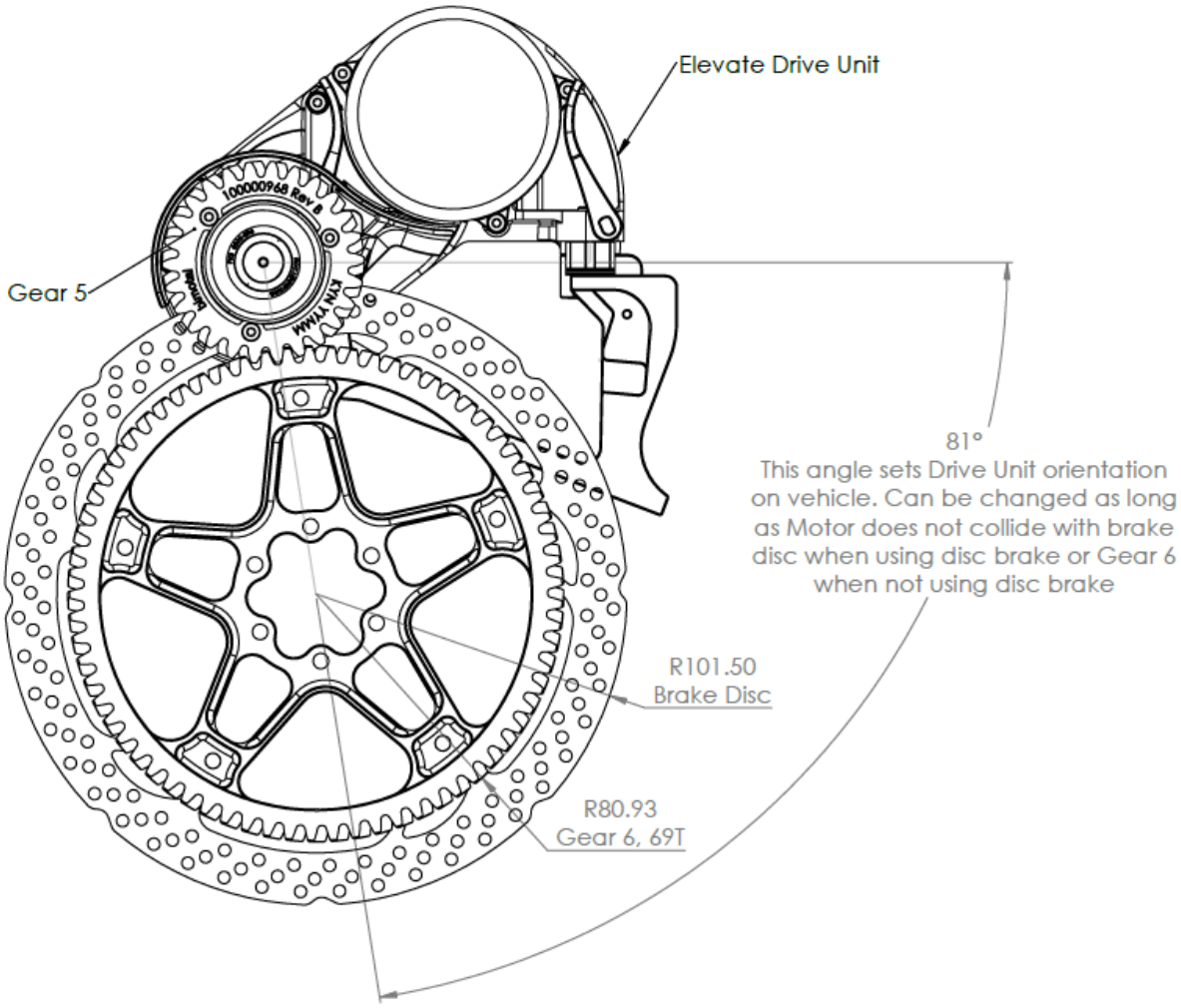
- Mounting structure should be rigid
- Drive Unit can be attached to vehicle via quick connect levers or bolted connection
- 425N separation force on the gear structure
    - This is applied ~20mm from mounting points, which applies an approximate torsional load of 8.5 Nm to the frame tube
    - Note that the gear helix angles are set to help cancel some of this torsional load (patent pending)
- Note: most steel tube, carbon tube, and bike frames designed to take braking torque loads have no issues with these forces. 1480N tangential gear force is 0.4-0.5x typical peak braking values though in the opposite direction



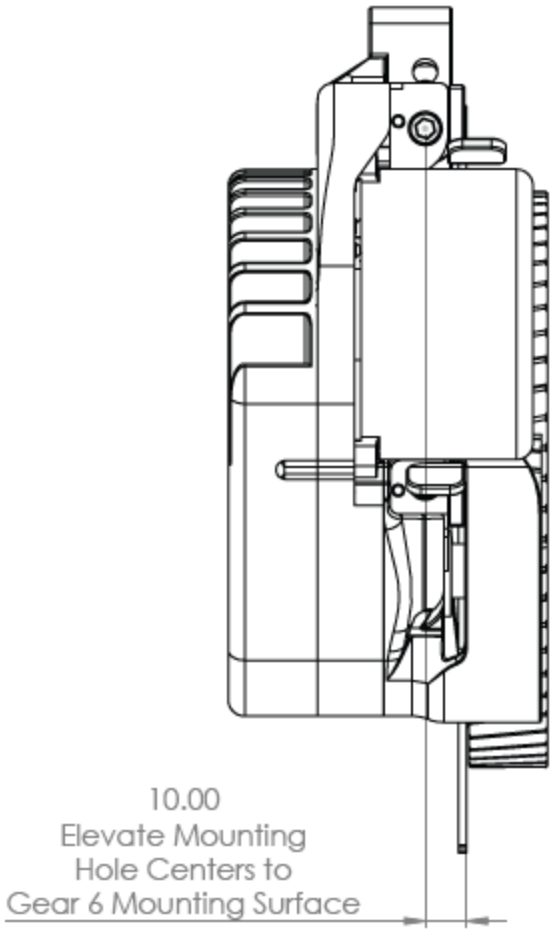
Elevate Drive Unit Dimensions



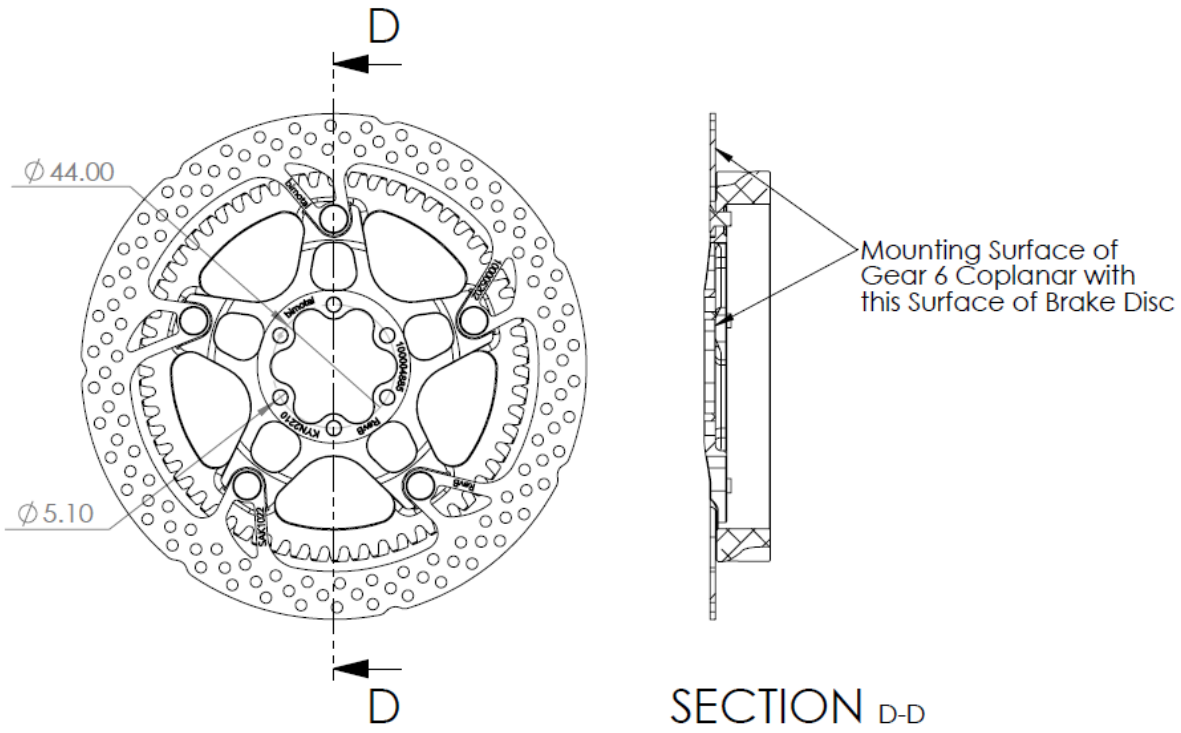
Mechanical Layout with 59 Tooth Gear 6



Mechanical Layout with 69 Tooth Gear 6



Axial Offset of Mounting Holes Relative to Gear 6 Mounting Surface



Gear 6 Cross Section and Mounting Hole Pattern

[Note: Gear can be used without brake disc when separate mechanical or regen brakes are present]

Revision History

Author	Description	Date	Revision
Toby Ricco	Initial Draft	3/9/2023	01
Neil Flock	CAD images, detailed specs	3/15/23	02