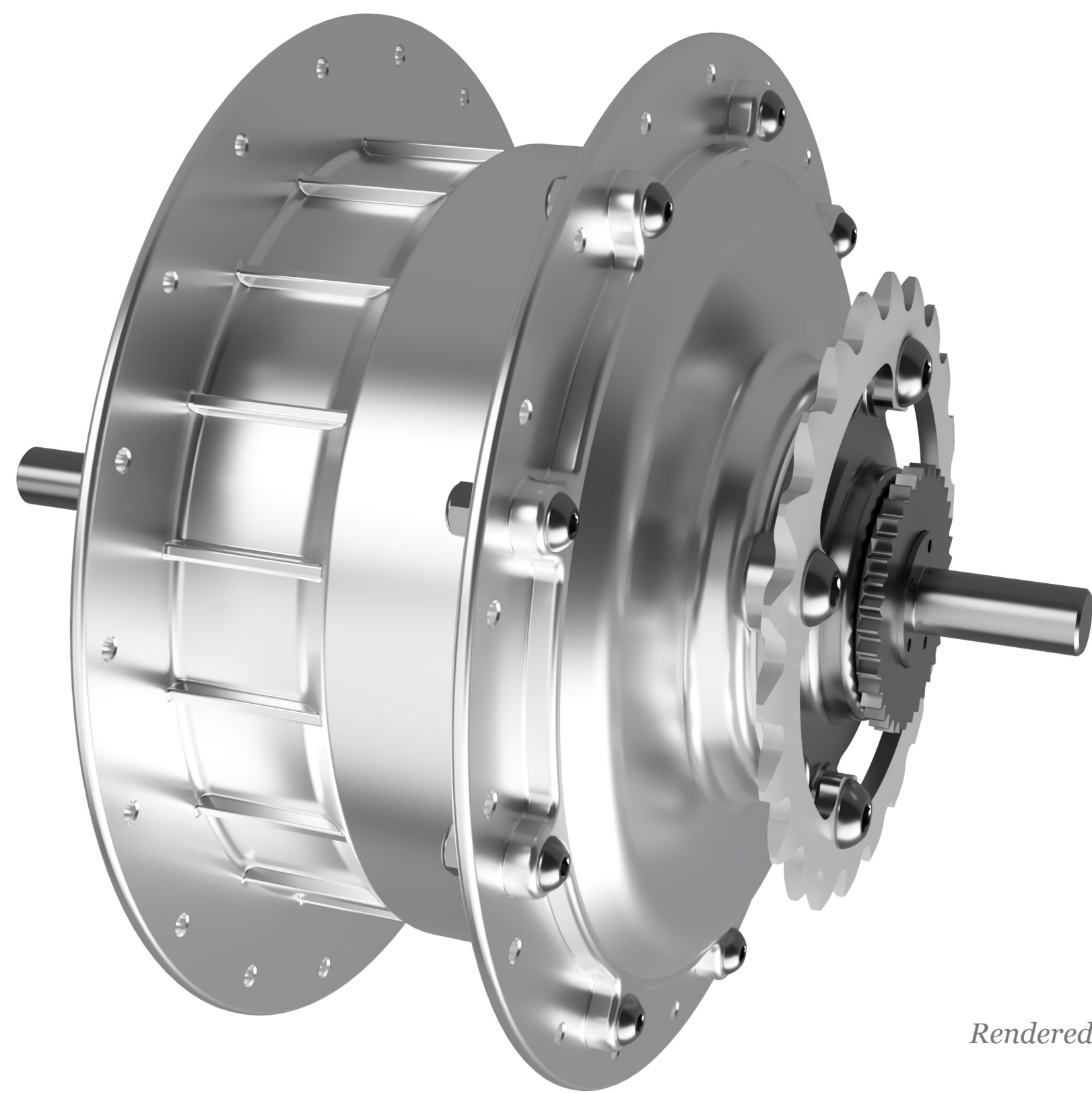


Introduction

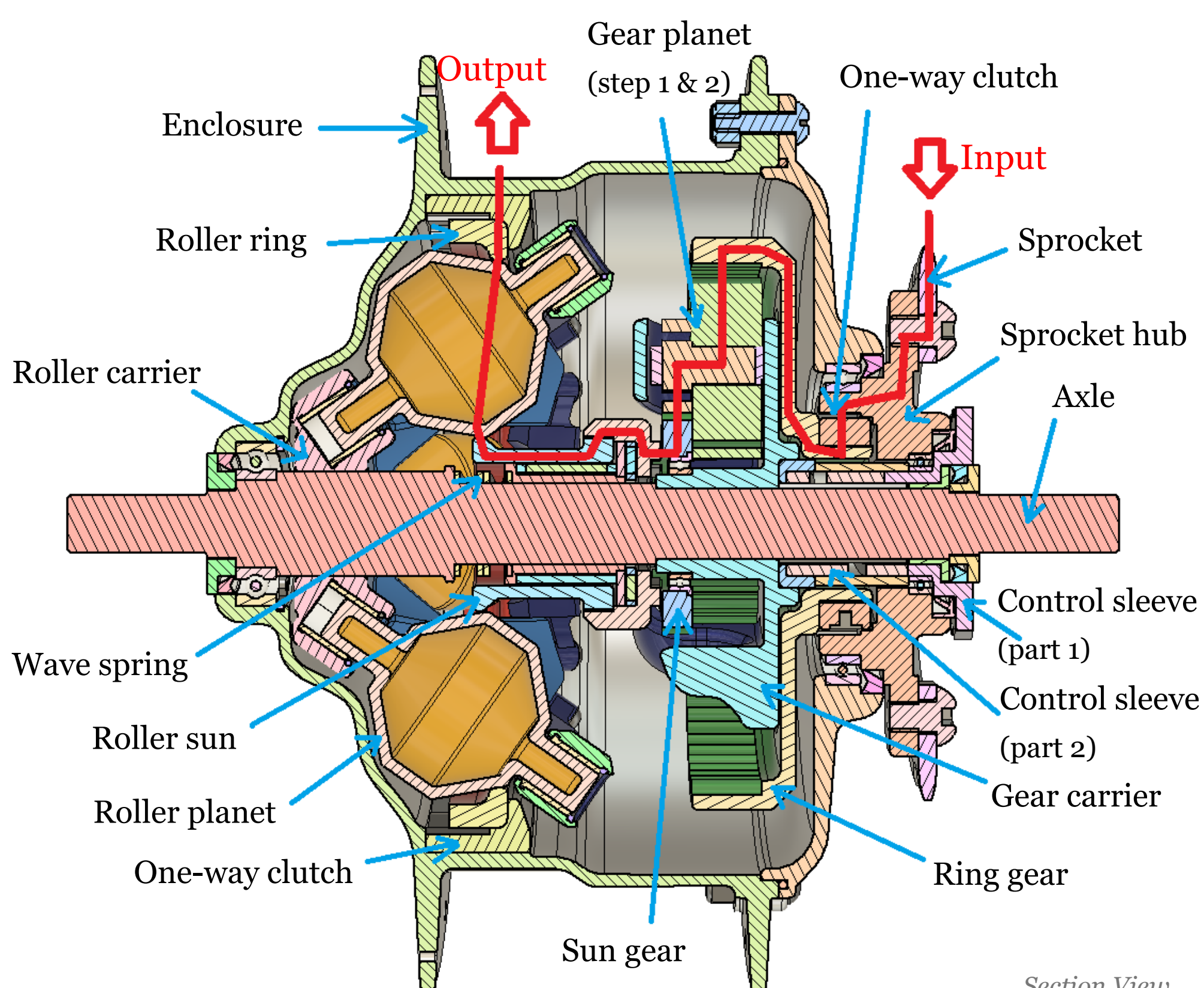
The goal of this project was to design an innovative bicycle transmission, which is also a reliable alternative to a derailleur. The entire CVT hub was designed with the CAD software Fusion 360 from Autodesk. The calculations of the different components, like gears and bearings, have been done by respecting a minimum life cycle of 5 years, in case of standard usage. All the main parts were analysed with FEA.



Rendered CVT Hub

Internal Mechanism

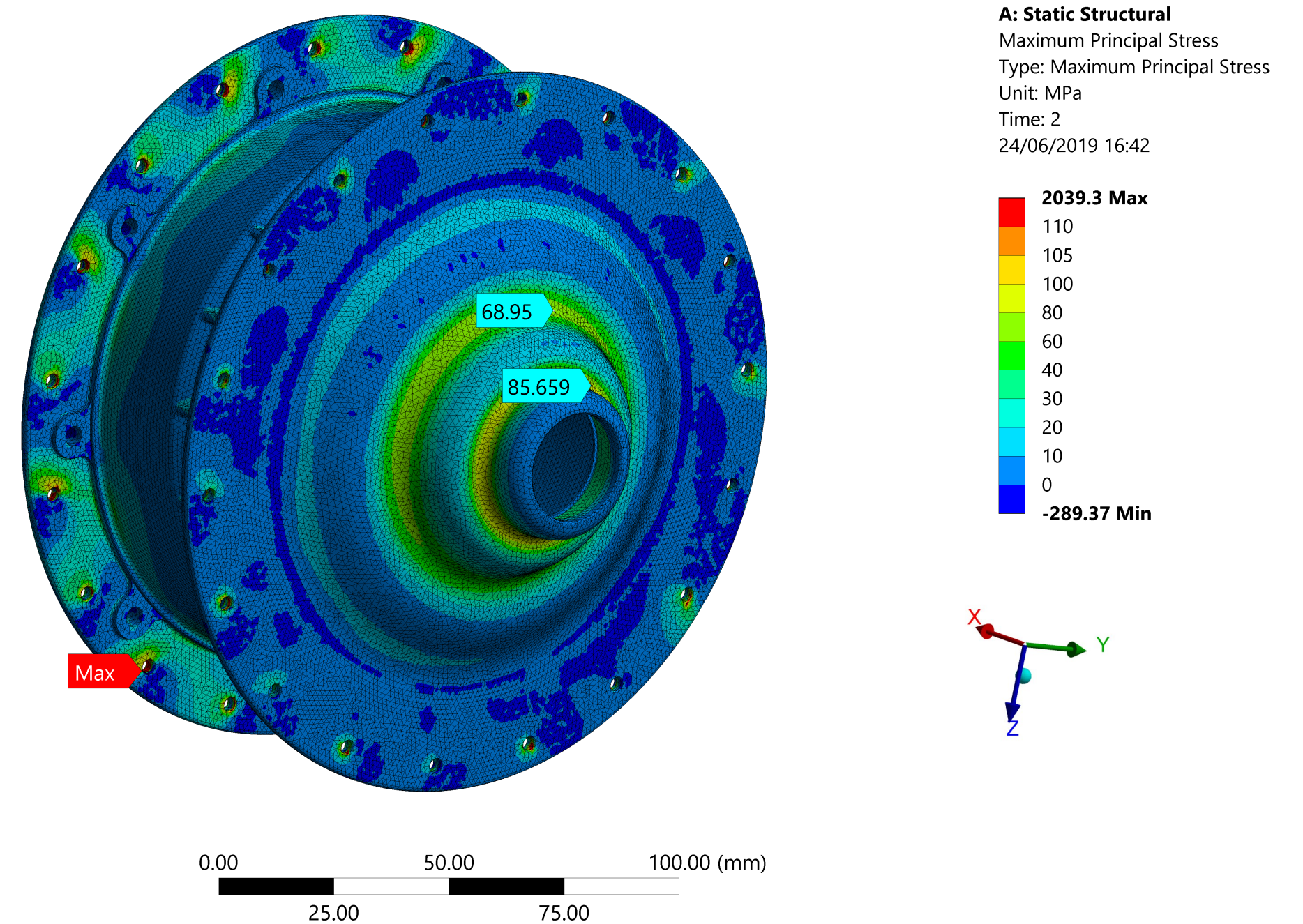
This CVT is placed in the rear wheel hub and uses a planetary train with conical rollers, which are frictionally engaged with the sun roller and ring roller. By moving the carrier that is fixed on the shaft, so it cannot rotate freely, the engaged diameters of the conical rollers are changing so that the ratio changes equally. To move this carrier, the control sleeve has to be turned. An upstream planetary gear train, where the carrier is fixed on the non-rotatable shaft, is included in the design. Their ring gear is coupled with the sprocket by a one-way clutch. There is also a one-way clutch between the outer ring of the planetary roller train and the enclosure.



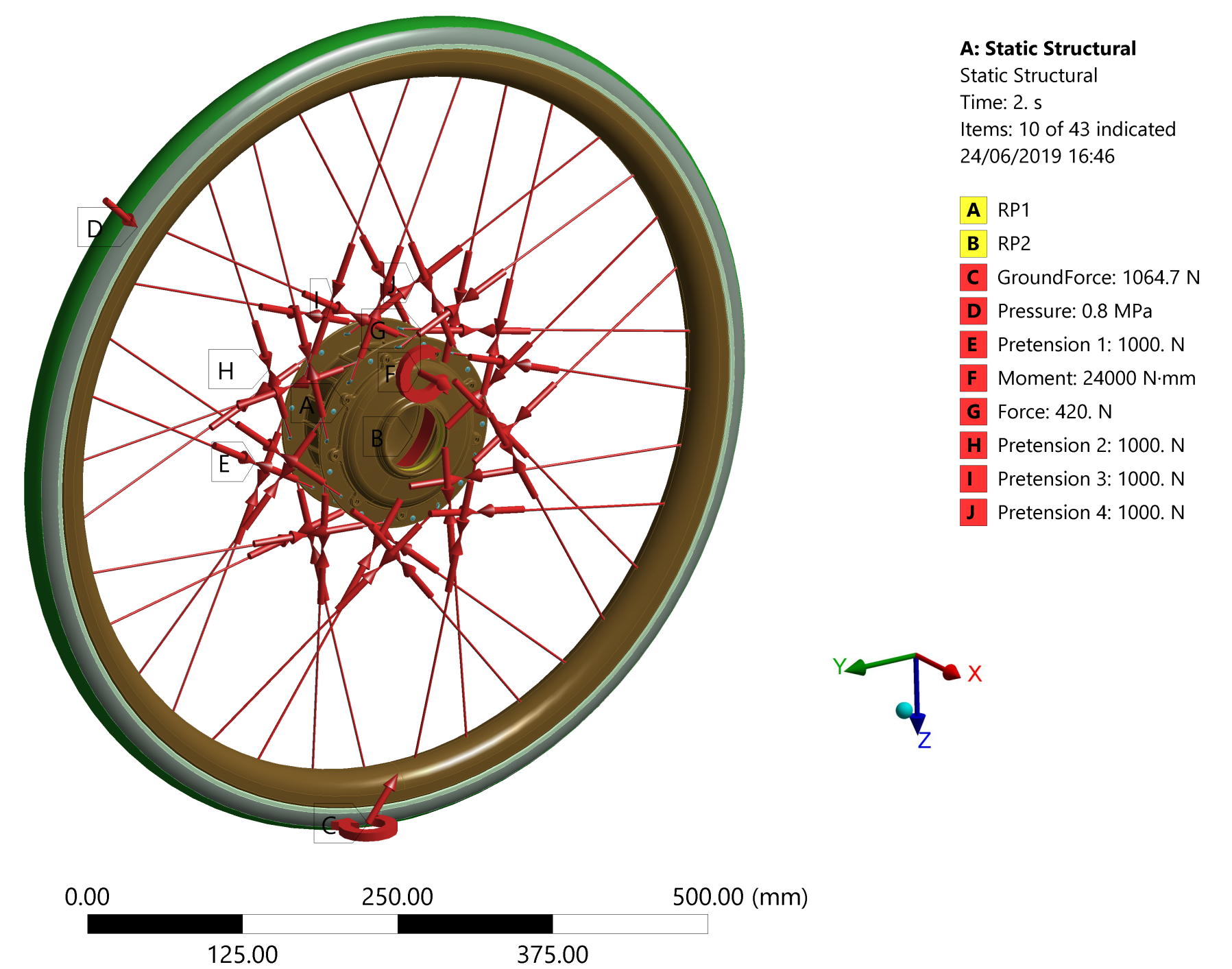
Section View

FEA Model

The static structural FEA of the enclosure, that was done in ANSYS. Wheel parts like the rim, prestressed spokes and the tyre have been added in order to get realistic results.



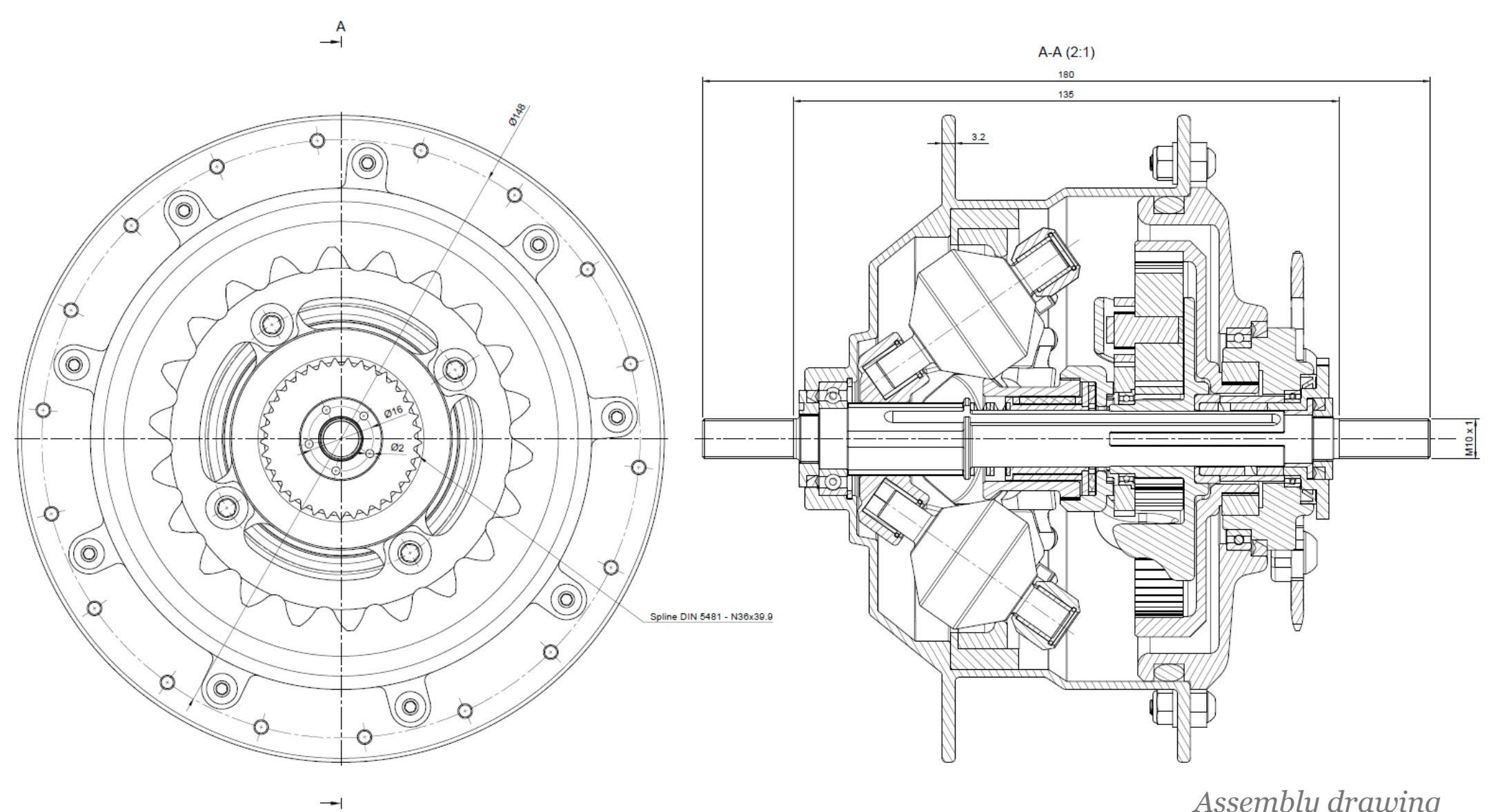
Maximum principal stress of the enclosures



Loads and constraints on the wheel assembly

Conclusions

The transmission has a ratio range of 400% and weights 2.7 kg. Due to the location in the rear wheel hub, the components are well protected from the weather. The biggest issue of the concept is that it has a lower efficiency as the derailleur and the comparably high number of components, which, however, can be enhanced in further developing updates.



Assembly drawing