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# Integrated torque sensor for e-bike motors

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In electric assisted bikes today the motor is controlled so that it will only deliver power when the rider of the bike pedals. To be able to know if the rider pedals or not the torque applied to the pedals need to be measured.

## Integrated torque sensor

Today the electric motor developed and manufactured by Höganäs AB uses an external torque sensor to measure torque applied by the rider. By moving the sensor and placing it inside of the motor torque can be measured in the motor. By moving the sensor the total number of components for the end-user reduces.

## Flexible coupling

It is hard to measure applied torque in e-bike motors. To circumvent the problems one can build a device that changes the problem from a torque measurement to a measurement of a rotation angle. To achieve this transformation one can use a spring that rotates when torque is applied. You then get a rotation that depends on the amount of torque applied by the rider.

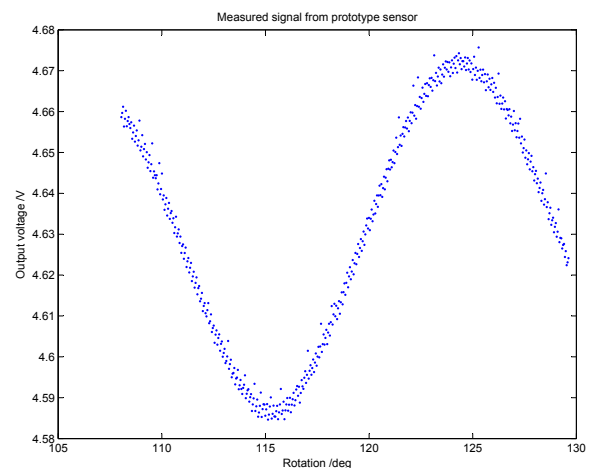
## Sensor prototype

To measure torque in the motor a prototype sensor is developed. The sensor consists of a magnetic circuit with varying reluctance. The reluctance is the equivalent to resistance in an electric circuit. The change

in reluctance is proportional to the rotation in the sensor and in turn the applied torque. The prototype consists only of the magnetic circuit and not the flexible coupling that translated applied torque to a rotation.

## Conclusions

The sensor prototype show promising result, but further work is needed to get a working sensor installed in a motor. The amplitude of the signal is relatively small and the design of the sensor needs to be changed to get a signal with the highest possible amplitude. A new sensor prototype will be built in



the future that will evaluate if the concept works when the sensor is mounted in the motor.

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