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## Master project, 2024-2025

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### Electromagnetic and vibro-acoustic study of Switched Reluctance Machine for roller shutters

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#### Context

In the industrial context of low-power machines for mass production applications, the search for a structure that meets the application specifications while reducing prices is an industrial necessity. In this context, SOMFY, world leader in motorisation and automation for roller shutters, blinds, garage doors and gates, is working within the PCE (Pre-Competitive Engineering) department on various electrical machine topologies. The single-phase asynchronous machine is still widely used because of its robustness and cost. However, the synchronous machine offers other advantages in terms of performance, power density and operating temperature. In the long term, the use of passive rotor synchronous machines would make it possible to avoid the use of magnets, with the need to resize the machine (longer, for example) while maintaining an acceptable noise level



Examples of SRMs.

#### Objective

The work will involve designing and studying a Switched Reluctance Machine (SRM) prototype using finite element and/or analytical models from electromagnetics to vibro-acoustics.

The aim is to quantify the performance of a SRM prototype within a Somfy application in terms of electromagnetic performance, vibrations and noise.

#### Work steps

The work will be carried out in different stages:

- A wide bibliographic study on small power small size (5 to 6 cm in diameter) SRM machines: Topologies (6/4 and 8/6), supplies, typical applications, advantages and drawbacks
- List the analytical models of SRM and their use to design, size and control such machines
- Design and size a prototype of SRM under the specifications of Somfy application
- Study the performance of the prototype using FE modeling under several supply and windings configurations.
- Calculation of the magnetic forces applied to the teeth of the machine (using the VibraMag laboratory tool) and quantify qualitatively the 'Noise and vibration' of the prototype.

#### Keywords:

Switched reluctance machine, analytical modelling, FEA, qualitative study, radial force, magnetic noise.

#### References

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