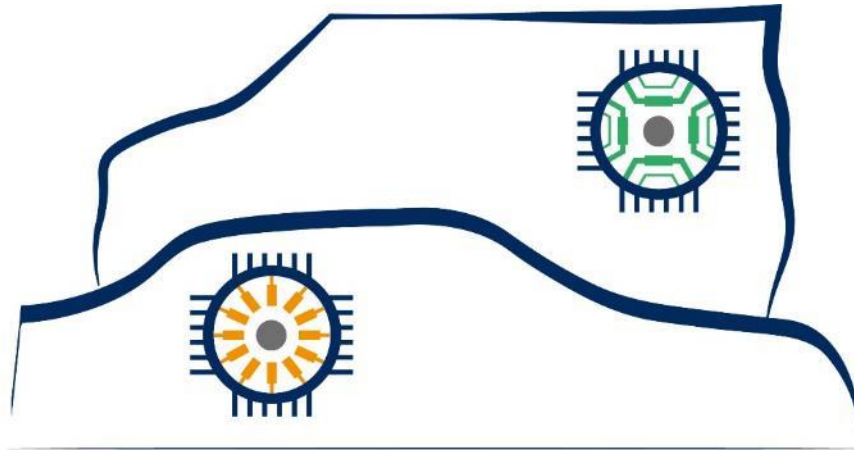




Rare Earth Free e-Drives Featuring Low Cost Manufacturing



ReFreeDrive

Collaborative Project
Grant Agreement Number 770143

Start date of the project: 1st October 2017, Duration: 36 months

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 770143

Deliverable no.: D 6.4

Title of the deliverable: PM Synchronous Reluctance Motor for 75 kW of operation

Contractual Date of Delivery:	February 29th 2020
Actual Date of Delivery:	5 May 2020
Lead contractor for this deliverable:	MAV
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Participants(s):	MAV, UAQ
Nature:	Confidential
Version:	4.1

Abbreviations

RFD: ReFreeDrive

IM: Induction Motor

PM: Permanent Magnet

SynRel: Synchronous Reluctance

WP: Work Package

KPI: Key Performance Indicator

EXECUTIVE SUMMARY

This document presents the steps of the medium power (75 kW) Permanent Magnet (PM) Synchronous Reluctance (SynRel) Motor manufacturing; this motor has been designed by IFP Energies nouvelles within the Work Package 4 (WP4).

According to the WP6 (*Figure 1*) planning, this work package has been divided in three tasks: two referring to each track motor technology and one to the prototyping of the power electronics.

Task 6.1 – Induction Motor (IM) manufacturing;

Task 6.2 – Synchronous Reluctance motors manufacturing;

Task 6.3 – Power electronics manufacturing.

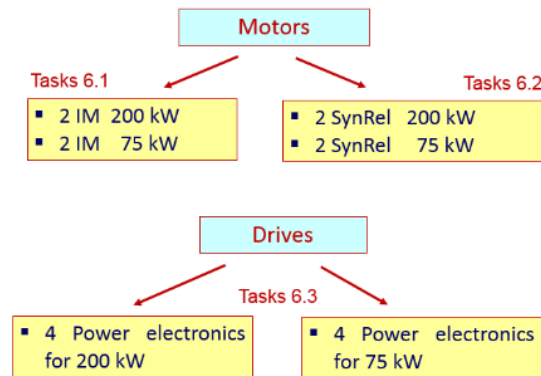


Figure 1: Work Package 6

For each task, single steps have been defined for the constructions of the prototypes. Sub-contractors have also been identified who will deal with some processing and motor assembling.

There were no deviations in content compared to what was set in the Grant Agreement.

The Key Performance Indicators (KPIs) are listed in Table 1 with the ReFreeDrive (RFD) goals.

Table 1: KPIs for 75 kW PM SynRel Motor

Parameter	Unit	75 kW		
		Reference Nissan Leaf 2012	RFD Goals	Achiev.
Motor Dimension Length	mm	177	< 310	175
Motor Dimension Diameter	mm	106	< 250	214
Active parts weight	kg	15	< 24	19.5

KPIs consider the active parts only: stator and rotor lamination, copper wires PMs and slot insulation.

The motor parameters satisfy the KPIs given in the Table 1.

The impact of the WP6 task 6.3 is the availability of medium power e-motor for testing and vehicle demonstration; the performance of the motors will be verified and measured during the tests on the development benches that will be carried out during the WP7.

The steps related to the construction of the 75 kW PM SynRel Motor are shown in *Figure 2* and will be illustrated in detail into the next sections.

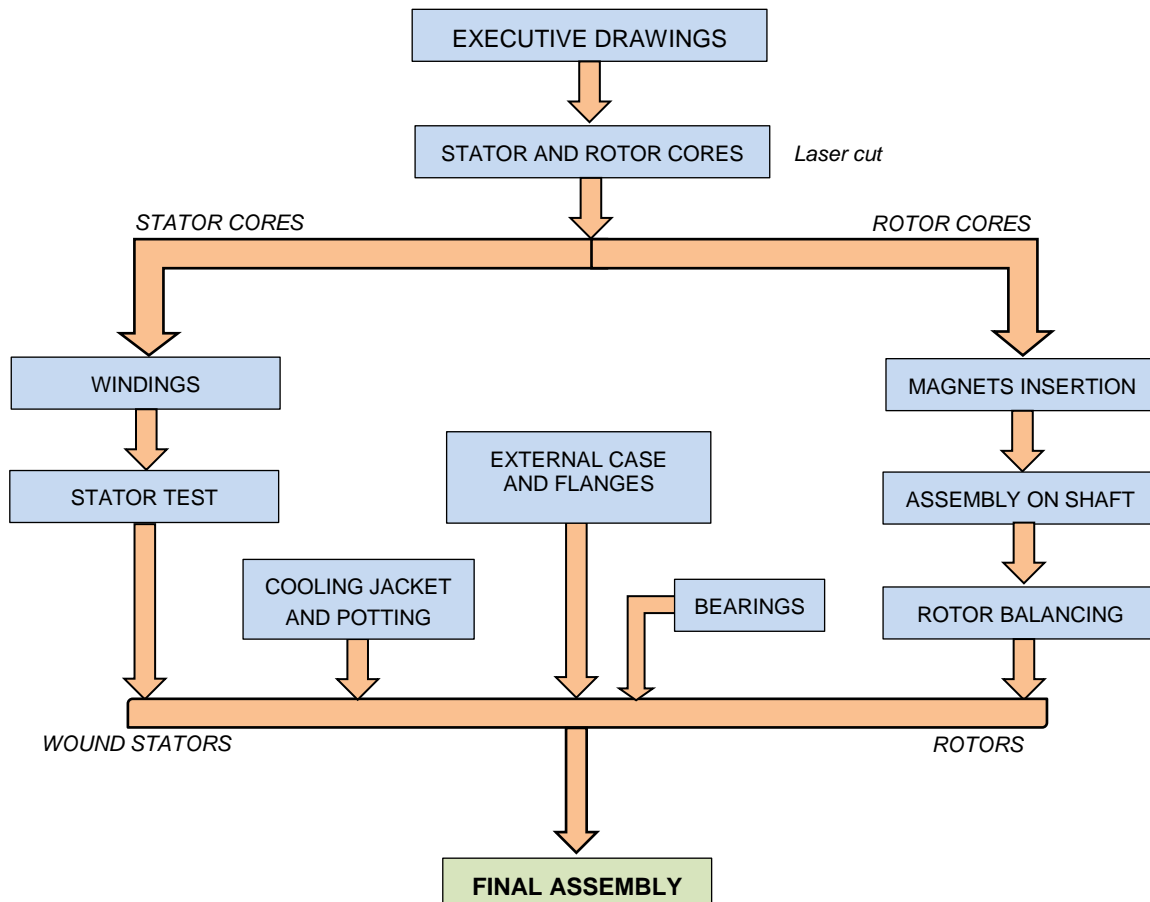


Figure 2: Actions for the PM SynRel motor manufacturing

The main goals of deliverable D6.4 consisted in:

- Stator and rotor cores manufacturing by laser-cut
- Stator winding manufacturing with round wire
- Rotor assembly
- Manufacturing of cooling jacket, external housing and flanges
- Final assembly

The D6.4 deliverable fulfilled these objectives.

Manufacturing defects found on cooling houses and external houses that forced us to redo the pieces as well as delays in the delivery of some components such as shafts and parts for assembly, caused a slight delay on the delivery time of the finished motor.