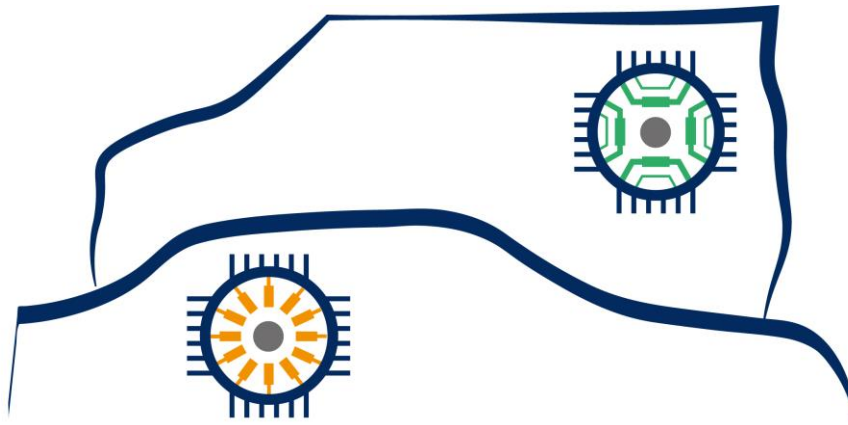




Rare Earth Free e-Drives Featuring Low Cost Manufacturing



ReFreeDrive

Collaborative Project
Grant Agreement Number 770143

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

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Deliverable no.: D 6.3

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

Contractual Date of Delivery:	February 29 th 2020
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Lead contractor for this deliverable:	MAVEL
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Participants(s):	UAQ, MAV, R13
Nature:	Confidential
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Abbreviations

KPI: Key Performance Indicator

RFD: ReFreeDrive

SynRel: Synchronous Reluctance

UAQ: University of L'Aquila

WP: Work Package

EXECUTIVE SUMMARY

This document presents the steps of the medium power (75 kW) Pure Synchronous Reluctance Motor (SynRel) manufacturing; this motor has been designed by University of L’Aquila (UAQ) within the Work Package 4 (WP4).

For this activity, the single actions have been defined for the manufacturing of the prototypes. Sub-contractors have also been identified who have dealt with some processing and motor assembling.

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

Table 1: KPIs for 75 kW Pure SynRel Motor

Parameter	Unit	75 kW		
		Reference Renault Fluence	RFD Goals	Achiev.
Specific Peak Power	kW/kg	1.94	> 2.52	4.04
Peak Power Density	kW/lit	8.75	> 8.75	13.1
Peak efficiency	%	95	≥ 97	95
Active parts weight	kg	36	< 30	23.4

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

The motor performances satisfy the KPIs given in the Table 1 except the peak efficiency (slightly lower than the RFD goal). It is important to remark that this type of motor is disadvantaged compared to Induction and Permanent Magnet motors because the rotor has no windings and magnets and this penalizes its performance.

The actions related to the construction of the medium power Pure SynRel Motor are shown in Figure 1.

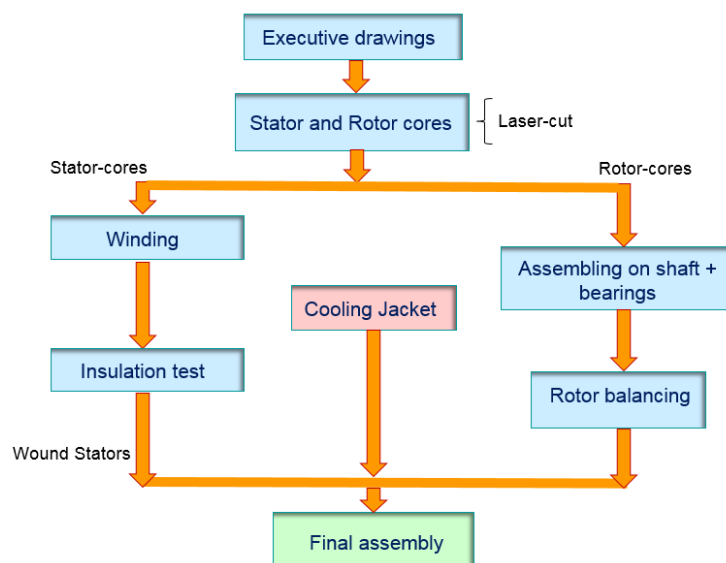


Figure 1: Actions for the 75 kW Pure SynRel motor manufacturing

The main goals of deliverable D6.3 consist in:

- Stator and rotor cores manufacturing by laser-cut
- Stator winding manufacturing with round wire
- Manufacturing of cooling jacket
- Final assembly

The D6.3 deliverable fulfilled these objectives. The deviation in time is explained by the underestimated time to manufacture some mechanical key component such as “ribbed shaft” which had to be produced by an experienced supplier.

The impact of the WP6 task 6.3 is the availability of medium power e-motor for testing and vehicle demonstration.

Figure 2 shows the wound stator and the rotor core of the 75 kW Pure SynRel motor.



Figure 2: 75 kW Pure SynRel motor: wound stator and rotor core