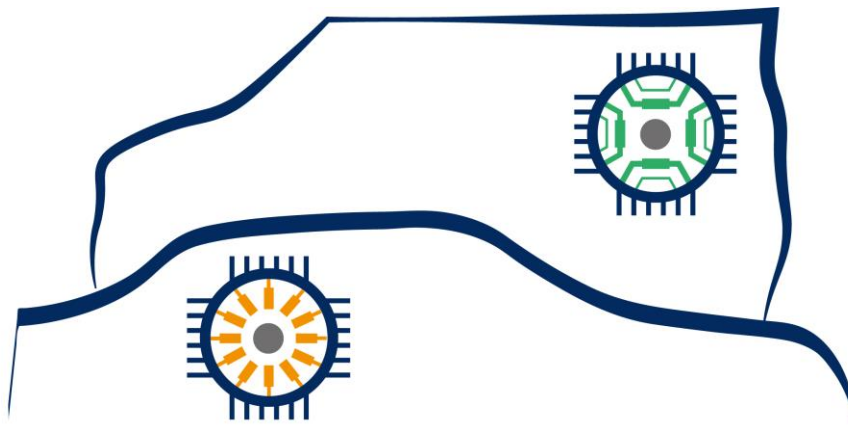




Rare Earth Free e-Drives Featuring Low Cost Manufacturing



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 6.7

Title of the deliverable: Pure Synchronous Reluctance Motor for 200 kW of operation

Contractual Date of Delivery:	February 29 th 2020
Actual Date of Delivery:	March 26 th 2020
Lead contractor for this deliverable:	MAVEL
Author(s):	Marco Villani, Giuseppe Fabri, Andrea Credo (UAQ) Matteo Benedetto (MAVEL)
Participants(s):	UAQ, MAV, R13
Nature:	Confidential
Version:	3.1



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 high power (200 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 200 kW Pure SynRel Motor

Parameter	Unit	200 kW		
		Reference Tesla Model S	RFD Goals	Achiev.
Specific Peak Power	kW/kg	3.3	> 4.3	5.3
Peak Power Density	kW/lit	19.7	>19.7	20.8
Peak efficiency	%	92	≥ 96	96
Active parts weight	kg	68	< 47	44.1

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

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

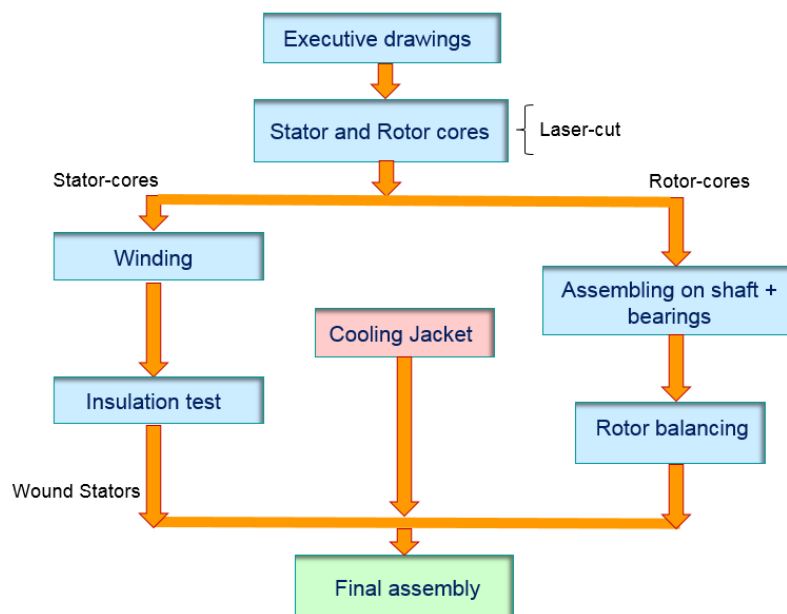


Figure 1: Actions for the 200 kW Pure SynRel motor manufacturing

The main goals of deliverable D6.7 consist in:

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

The D6.7 deliverable fulfilled these objectives. The deviation in time is explained by the underestimated time to manufacture some mechanical key component which had to be produced by an experienced supplier.

The impact of the WP6 task 6.7 is the availability of high power e-motor for testing.

Figure 2 shows the wound stator and the rotor core of the 200 kW Pure SynRel motor.



Figure 2: 200 kW Pure SynRel motor: wound stator and rotor core