DREEM

Designing use**R** centric **E**-kickscooters & business models for **E**nhancing inter**M**odality

DELIVERABLE NUMBER: **2.4**
DELIVERABLE TITLE: **HUB MOTOR PROTOTYPES (NATURE: PROTOTYPES)**

Deliverable due date: 31/10/2021
Submission date: 21/12/2021

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101007085. The sole responsibility for the content of this document lies with the DREEM project and does not necessarily reflect the opinion of neither CINEA nor the European Commission.

DELIVERABLE INFORMATION

Deliverable Number:	2.4
Deliverable Title	Hub motor prototypes (nature: prototypes)
Work Package Number	WP2
Work Package Title	Vehicle design, architecture & UX
Lead Organization	PUNCH Torino
Main author(s)	Marco Girotto (PUNCH Torino)
Contributors	ELAPHE, BUMPAIR
Reviewers	Pier Luigi Piccinini
Nature	Demonstrator
Dissemination Level	PUBLIC
Deliverable Date	31/10/2021
Draft Number	1
Version history	Rev 1
Version Number	2

PROJECT CONTRACTUAL DETAILS:

Project Title	Designing useR centric E-kickscooters & business models for Enhancing interModality
Project Acronym	DREEM
Grant Agreement No.	101007085
Project Start Date	01-02-2021
Project End Date	31-01-2023
Duration	24 months
Supplementary notes:	This document is only for use among the Partners of DREEM

MAIN COORDINATOR

Name	Federico Galliano
Organisation	PUNCH TORINO SPA
Address	Corso Castelfidardo 36, 10129 Torino, Italy
E-mail:	federico.galliano@punchtorino.com

CONSORTIUM PARTNERS

No	Organisation	Country	Acronym
1	Punch Torino	Italy	PUNCH Torino
2	Elaphe Pogonske Technologije Doo	Slovenia	ELAPHE PROPULSION TECHNOLOGIES LTD
3	Domel Elektromotorji in Gospodinjski Aparati D.O.O.	Slovenia	DOMEL D.O.O.
4	Three O'Clock	France	Three o'clock
5	5T SRL	Italy	5T
6	ICLEI European Secretariat GmbH	Germany	ICLEI
7	Bumpair	France	Bumpair
8	Goeteborgs Universitet	Sweden	UGOT
9	Tractebel Engineering	Belgium	Tractebel

ABSTRACT

Two motor prototype designs with different electromagnetic structure were produced. Both were then integrated into the housing with same design.

CONTENTS

1 HUB MOTOR PROTOTYPES

Project status is on track. Which means that the development and optimization phases of the motor are finished. Measurements of electrical characteristics also confirmed the predicted promising performance of electric HUB motor prototypes. First sample of radial HUB motor was already exchanged between PUNCH and DOMEL in order to check integrability of mechanics and electronics. Some minor changes were proposed to improve installation of the tire.
Two motor prototype designs with different electromagnetic structure were produced. Both were then integrated into the housing with same design.

1.1 HUB MOTOR HOUSING

Hub motor housing for prototypes were manufactures as per weight optimal CAD model, which included several innovative mass reduction features.

Figure 1: HUB motor rim – side view.

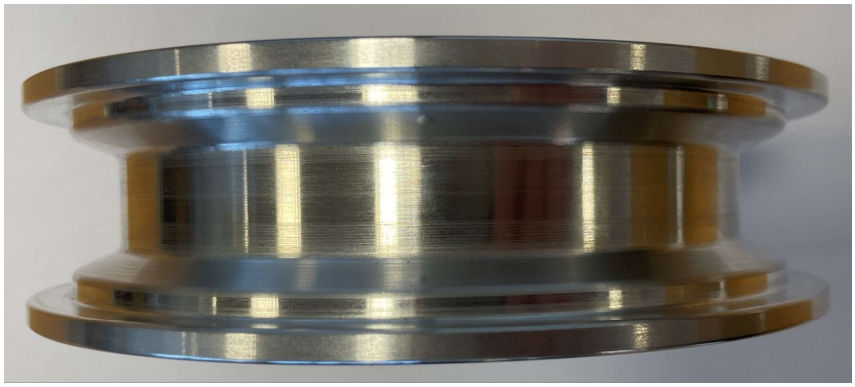

Figure 1: HUB motor rim - top view.

Figure 2: HUB motor – side cover A.

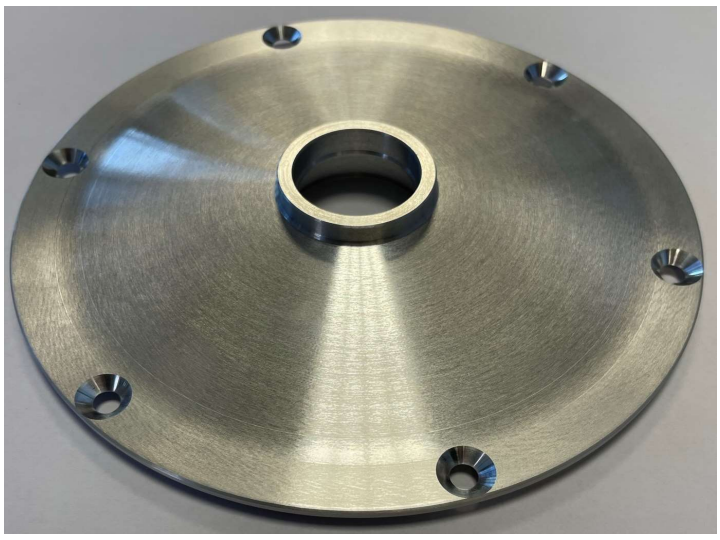

Figure 3: HUB motor cover B.

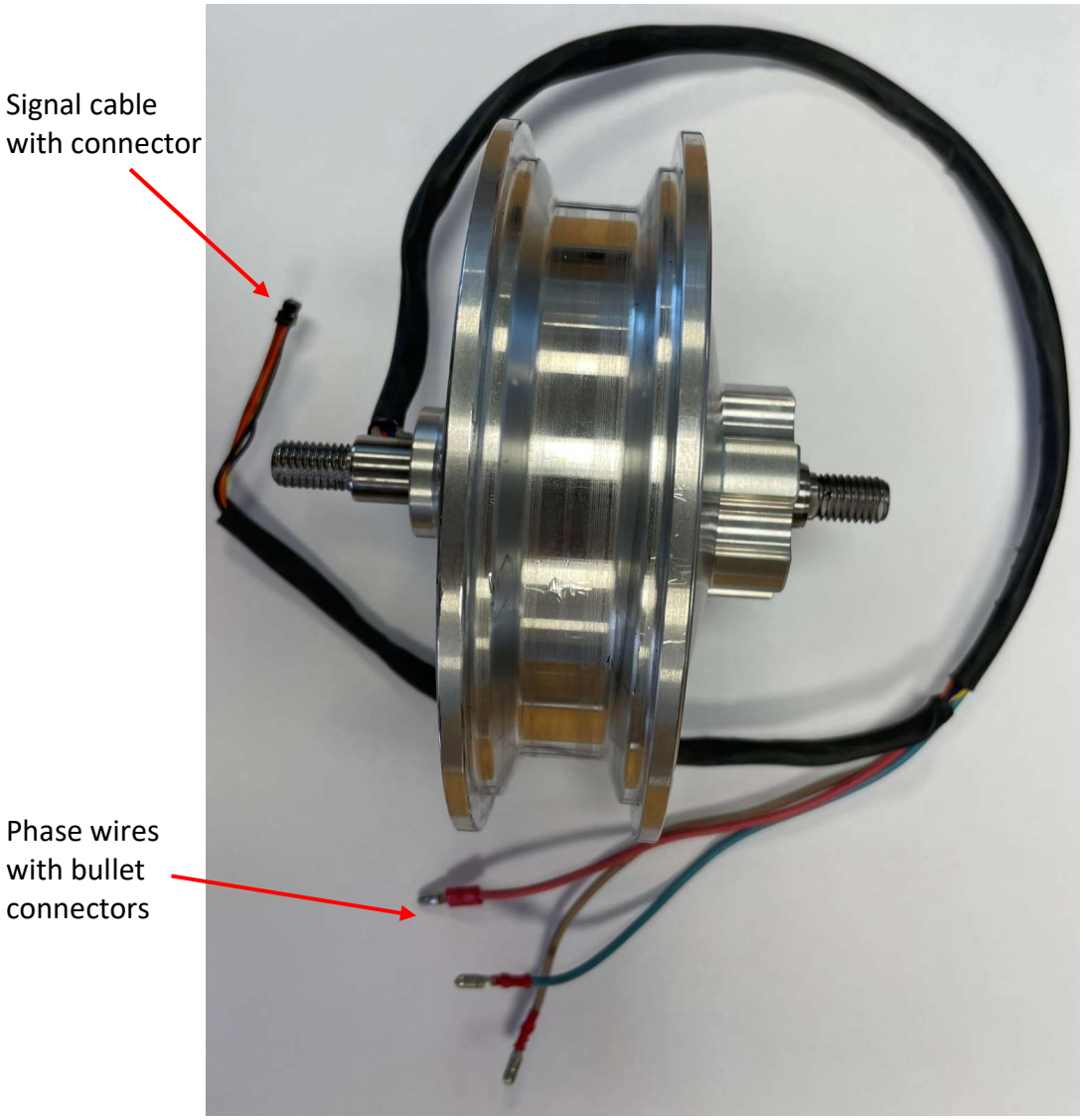

Figure 4: Complete HUB motor assembly.

HUB motor was already mounted on DREEM e-kick scooter and tested on the field. Some minor adjustments were proposed that will be included in the prototypes.

Figure 5: HUB motor integrated in e-kick scooter.

1.2 TRANSVERSAL FLUX MOTOR

Stator of transversal flux motor (TFM) was machined out of sintered soft magnetic composite material (SMC). Due to brittleness of the SMC material potting of stator was necessary.

Figure 6: TFM stator – potted.

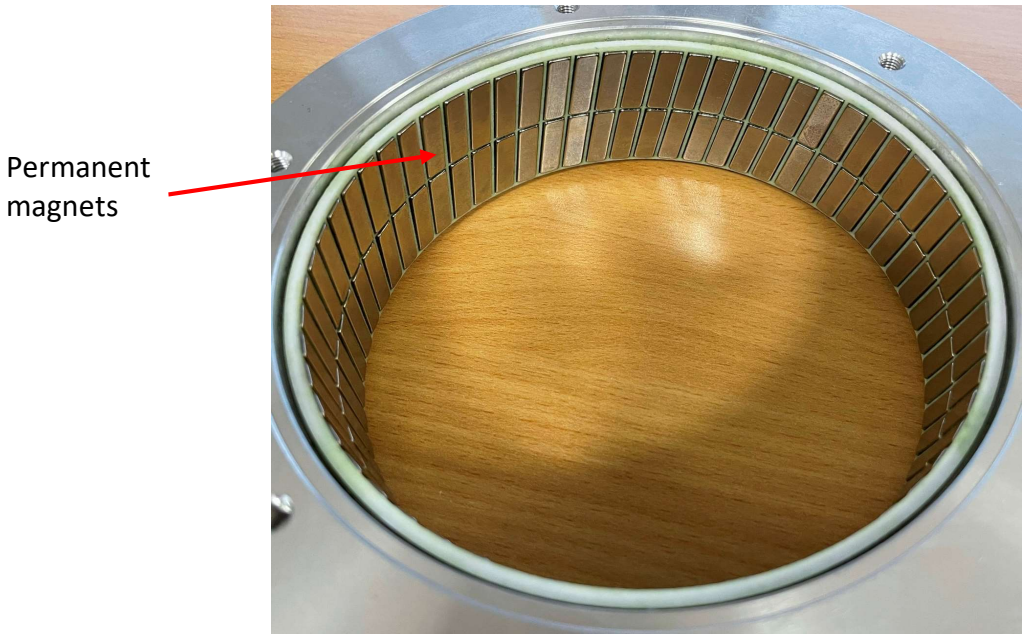

Figure 7: TFM rotor.

1.3 RADIAL MOTOR

Radial motors are wound with aluminum wire that offers lower mass than conventional copper wire.

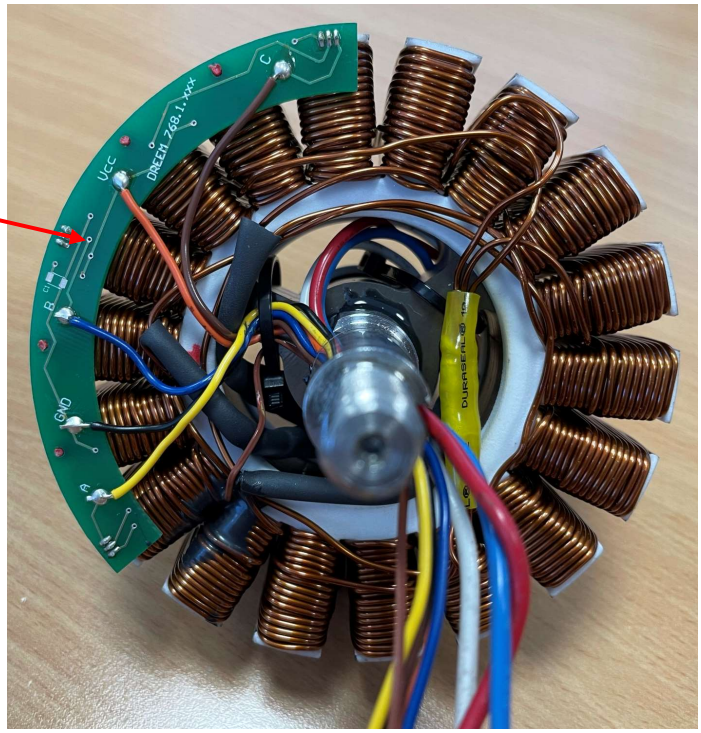

Figure 8: Wound stator of radial motor with Hall sensor PCB.

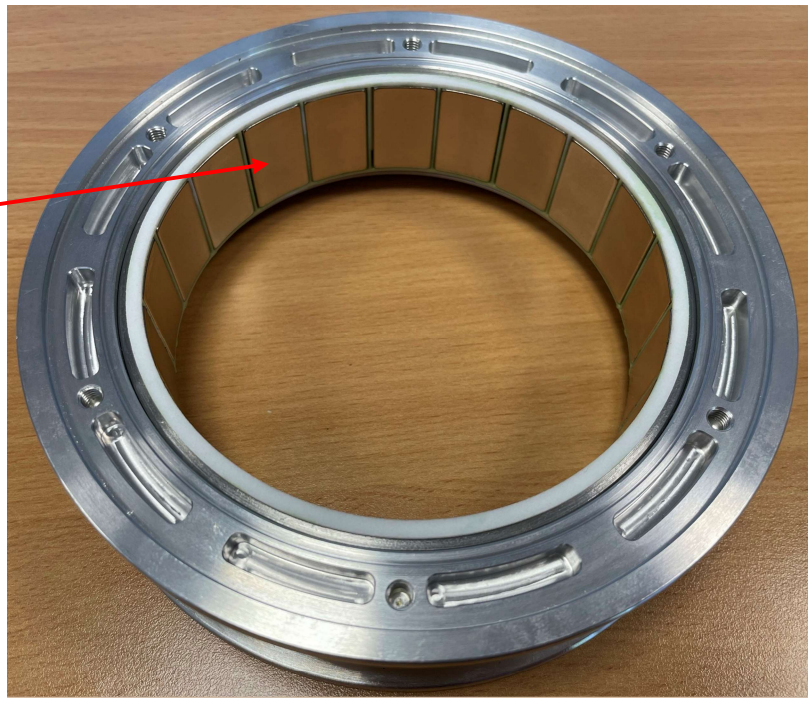

Figure 9: Radial motor rotor.

Figure 10: Wound radial motor stators.

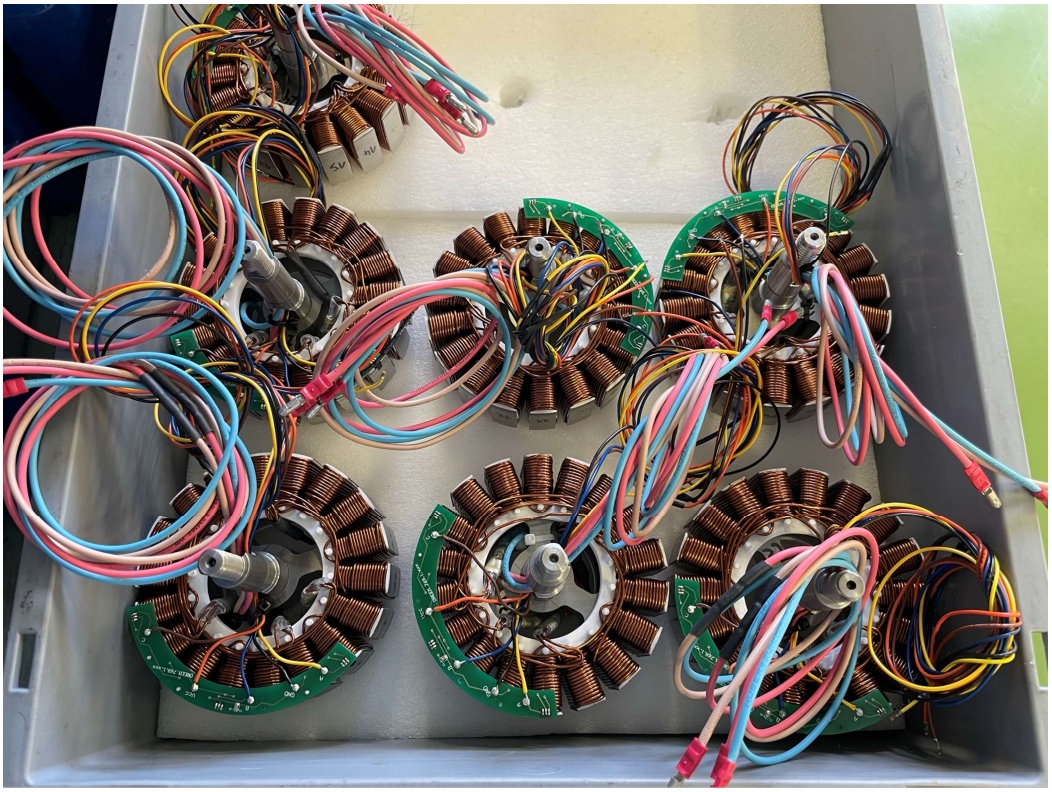

Figure 11: Complete radial motor assemblies.

DREEM E-KICKSCOOTERS

2 PARTNERS

PUNCH | Torino

elaphe

DOMEL

THREE CLOCK

TECNOLOGIE TELEMATICHE TRASPORTI TRAFFICO TORINO

ICLEI Local Governments for Sustainability EUROPE

Bumpair

UNIVERSITY OF GOTHENBURG

TRACTEBEL ENGIE

TO.TEM

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101007085. The sole responsibility for the content of this document lies with the DREEM project and does not necessarily reflect the opinion of neither CINEA nor the European Commission.